Operating Instructions

Standard 3000
with generator ADG
Disclaimer
The information in this brochure corresponds to our current state of knowledge. However, it is not to be understood as a warranty for certain characteristics or for suitability of the products for certain applications.
Our general contractual terms apply in this regard, and reference should also be made to these terms with regard to liability. No industrial property rights of any kind are granted to the user along with this brochure, nor are any assurances made with regard to a licence. Corresponding separate agreements would be necessary for this purpose. The suitability of the products for particular applications may only be checked with our own specialists. The German version of the brochure is binding with regard to accuracy of the information given.
Note

Read and precisely follow the information in this operating manual before unpacking the unit and putting it into operation!

The unit may only be used, maintained and repaired by people, who are familiar with the operating manual and the applicable regulations on work safety and accident prevention.

Agency
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Important!

When asking about your Standard 3000 ultrasonic welding system and the generator, please provide the exact type designation and the unit serial number. These are located on the type label plate (A and B) on the side of the press as well as on the back side of the generator.

**Standard 3000:**
**Press with 3000 N of maximum force**

The construction and the wiring of this unit are continuously developed and improved and are therefore at the leading edge of technology.

RINCO ULTRASONICS AG
Romanshorn, Switzerland

Preface

We are very pleased that you chose to buy a RINCO product. We are convinced that you will achieve a maximum degree of economy of operation and product quality when using this unit.

The purpose of this manual is to give the purchaser and the user all the information they need in terms of the handling, assembly, operation and care of the welding press.

To ensure that your system is always in an operational state, you should take note of and follow all the tips and instructions contained within this manual.

These instructions describe the Standard 3000 and Standard 3000 with sound enclosure SSK-H in operation with the generators ADG 20-1000, ADG20-2000 and ADG 20-3000.
1 Safety

1.1 Explanation of symbols and signs

A system of symbols indicates dangerous behaviour as well as correct behaviour. The symbols are used in the operating manual. All danger and note symbols describe conditions, during which people, things or the environment could be put at risk, if these symbols are ignored.

Danger symbols in the operating manual are structured according to a unified schema.

Structure of the danger warnings

**Note!**
*Especially important information or operating notes for problem-free operation.*

**Caution!**
*Denotes a danger warning. Ignoring this warning can lead to severe injury or damage to parts of the unit.*

**Danger!**
*Denotes a severe danger warning. Ignoring this warning can lead to death or severe injury.*
1.2 Safety information

General information
The construction of the welding system, the generator and the control correspond to the current status of technology and are dependable. The individual components as well as the complete unit are checked in an ongoing manner by our quality control system.

Intended use

The welding unit is intended exclusively for the ultrasonic welding of the plastics for which it is suited. Different use or use beyond that does not count as intended use. The producer does not accept any liability for damage caused by unintended use. The user bears sole responsibility. This system is intended for industrial use!

Unintended use

• Using the system with insufficient knowledge of how to operate, maintain or care for the system.
• Altering the welding system and the generator with, for example, attachments or conversions that could influence the safety, without the approval of RINCO ULTRASONICS.
• Making modification in the control software!
• Using unsuitable working materials.
• Opening the generator housing during operation.
• Handling the converter while energised.
• Allowing a second person to operate the two-hand start button

Special points to note
Before putting the machine into operation, carefully read the operating manual in hand. The operating manual is to be kept near the welding system, where it can be accessed!

Choosing staff
Only trained and instructed personnel should perform work with the welding system. The responsibility of the personnel to operate, set up, maintain and repair the equipment is to be clearly defined by the operating company! The operating company must make sure that only authorised personnel use the welding system. Work on the electrical equipment of the welding system may only be carried out by trained electricians according to electrical regulations. Work on the pneumatic equipment may only be carried out by trained personnel who are qualified and experience in the field of pneumatics!

Installation

Danger!
Do not attempt to hook up the equipment when it is plugged in! The electrical connection is to be earthed in all cases! Country-specific, statutory safety measures must be followed during installation! If these regulations are not adhered to, the producer refuses to accept any and all liability for personal and property damages!
The equipment must be put in a closed and secure state each time before it is put into operation. Only use dry compressed air for operation. If necessary, an air service unit can be added.
Operation

Caution!
Under no circumstances should the generator or the converter housing be opened during operation of the welding system.

Danger!
High voltage prevails inside the device – risk of injury!
• Refrain from any and all possible methods of work which may put safety at risk!
• Only operate the welding system when all protection and safety equipment, e.g. detachable protection equipment, emergency stop button, noise insulation, are present and functional.
• If safety measures such as the sound enclosure are not ordered and operated by the customer, then the producer refuses all responsibility for damages which could have been avoided, had the safety mechanisms been applied.
• Before turning on the welding system, make sure that no one can be harmed by the system starting up.

Danger!
During normal operation, the two-hand start buttons are to be actuated by one person using both hands.
If the buttons are bypassed by a second person or by other conceivable means, the producer refuses to accept any liability for personal or material damages!
Technically correct operation and careful use of the units and accompanying tools during operation
• maintain the operational readiness,
• increase the life of the device and
• reduce down time to a minimum.

1.3 Noise emissions

Caution!
Limit value: according to current understanding, ultrasonic causes no damage when the maximum level remains below 140 dB and the median level, referring to 8 hrs/day, remains under a linear 110 dB.
Pay attention to the sub-harmonic, i.e. audible pulsations, that, depending on use, fluctuate greatly and have an annoying and harmful effect. Here, the standard measure is the equivalent sound level Leq over a representative working period (at least 8 hrs/day, max. 2000 hrs/year), with a maximum level of 85-87 db(A).

When welding special materials, the 70 dB (A) sound level may be exceeded.
Counter measures:
• Wear ear protection
• Install a sound hood (optional)
• Operate with sound enclosure
(Information according to SUVA, the Swiss Accident Insurance Fund, no. 86048 d 4.94)

For more measured values see “Sound Measuring Protocol in the RINCO supplements” no. 920-3903/1.95
Emergency stop functions
If there is a risk that the user will be injured or that the press will be damaged: press the emergency stop button (1).

- When you do this, the press equipment immediately returns to its home position.
- The electrical supply to the system is switched off.

Guarantee
RINCO ULTRASONICS delivers the system with a guarantee that corresponds to VSM (Swiss Association of Machinery Manufacturers).
The conditions for RINCO ULTRASONICS fulfilling its guarantee are, among other things, the following:

- The user possesses knowledge of the contents of this operating manual.
- The instructions and warnings in this operating manual are followed.
- The operating company is not permitted to undertaken any changes or conversions of the individual parts of the press, the oscillator system or the generator of its own accord.

RINCO ULTRASONICS is happy to explain any possible ambiguities or to provide instructions by our qualified staff via telephone.
2 Transportation

Transportation work may only be carried out by trained personnel. The transportation notes on the packaging must be observed. The press and the generator must always be transported separately.

Ring bolts have been supplied for transporting the sound enclosure SSK-H. At the bottom near the two-hand start button, the front faceplate can be dismounted, so that a forklift can pick up the enclosure (1). In addition, the enclosure is packed with a palette and wooden walls on all sides for transportation purposes.

2.1 Unpacking/receiving inspection

For transportation purposes, the press is bolted with the palette on the back side. Loosen the transportation locking screws before internal transportation. The packing case for machines and units withstands the normal demands of road, rail and air transportation. After receiving the shipment, check that all parts correspond to the packing slip and that there is no visible damage. If the shipment has been damaged, contact the shipping company immediately and keep the packaging as evidence.

2.2 Damage during transportation

The shipping company is responsible for damage which occurs during transportation. A complete report that precisely describes the damage must be submitted to the shipping company and this serves as the basis for damage claims. Damage or loss of the goods delivered by us should be reported immediately and confirmed with a copy of the above-mentioned report. Provided the delivery was made by RINCO ULTRASONICS free domicile or CIF, the damaged shipment will be replaced if necessary.
2.3 Placing the system

- The release handles (1) must be clamped in the designated direction.
- Slide the transportation band in direction A to the rectangular column (2).
2.4 Site location and work place creation

The ultrasonic welding machine Standard ADG is designed for a normal, clean industrial environment.

The following descriptions of work place creation is a proposal and derived from the valid international norms for industrial work places.
3 Product information

3.1 The entire system
The entire system consists of:
1 Press
2 Generator/control
3 Anvil
4 Converter
5 Booster
6 Horn

3.2 Press
Drive
Double-acting cylinder, diameter 80 mm
- Tool stroke maximum 100 mm
- Power at 6 bar 3000 N
- Travel measurement +/- 0.01 mm
- Height adjustment 10–290 mm
- Throat depth 220 mm
- Adjustable depth stop 0.1 mm indexing
  with vernier scale
- Precision ball track on the sliding actuator carriage
- Switch for upper cylinder position
- Pressure difference sensor for starting the ultrasonic (trigger)
- Safety switch 6 mm

Ultrasonic
Working frequency, 20 kHz

Base
- Corrugated steel construction
- Tool clamping table with T-section and parallel alignment mechanism
- Two-hand safety start with emergency stop button

Energy
- dry, compressed air, maximum 7 bar (105 PSI)

Weight
- Weight, 120 kg
  (without generator)
3.3 Sound enclosure SSK-H with built-in press

Weight
- Weight 125 kg without press
  270 kg with press and generator

1 Main switch
2 Generator ADG and generator holder
3 Two-hand start button
4 Ring bolts for transportation
5 Adjustment doors
6 Lock
7 Emergency stop button
8 Lifting door
9 Front face plate, can be dismounted
   (to lift the enclosure)
3.4 Oscillator unit

7 Horn
8 RF socket Lemo 2
9 Converter
10 Booster

Amplitude gain
The amplitude can be correspondingly amplified by various booster and horn designs. The individual elements are mechanically connected by means of a screw thread.

The tightening torque for 20 kHz systems comes to 30 – 40 Nm. We recommend using the RINCO tool wrench.

The allowable operating temperature lies between 10° C and 50° C.

3.5 Booster
For RINCO 20 kHz welding units, the following booster types are available:

<table>
<thead>
<tr>
<th>Reduction-Booster</th>
<th>colour</th>
<th>material</th>
<th>booster</th>
<th>colour</th>
<th>material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:0.5</td>
<td>blue</td>
<td>aluminium</td>
<td>1:1</td>
<td>green</td>
<td>aluminium</td>
</tr>
<tr>
<td>1:0.6</td>
<td>violet</td>
<td>aluminium</td>
<td>1:1.5</td>
<td>yellow</td>
<td>aluminium</td>
</tr>
<tr>
<td>other ratios available upon request</td>
<td>1:2 white titanium</td>
<td>1:2.5 black titanium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1:3 brown titanium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Connection screw thread
- On the converter: M16
- On the horn: M12
Before mounting, the coupling surfaces are to be cleaned. Parts with damaged coupling surfaces need to be replaced.

Example
Converter: 5 µm
Booster: 1:2 10 µm
Horn: 1:3 30 µm

If heat production is too high, greater than 50° C, the converter needs to be cooled with compressed air.
A separate cooling set can be obtained for this purpose.
3.6 Generator / control

Technical data
- Dimensions (WxLxH) 205 x 340 x 345 mm
- Power classes 1000, 2000, 3000 W
- Supply voltage 230 V, 50/60 Hz
- Connection One-phase electrical supply
- Interface RS 232
- LCD display 16x40 font size
- Parameter database 32 weld data sets
- Measured values database The last 25 welds remain saved
- Weight approx. 16 kg

The generator fulfils the demands of the following basic technical norms for the industry area:
- EN 61000-6-4 EMV, emitted interference industry area
- EN 61000-6-2 EMV, interference resistance industry area
- EN 55011 class A/group 1, High frequency equipment radio interference
- Low voltage guidelines 73/23/ EWG
4 Initial operation

4.1 Power supply and connections
Take the following steps to put the equipment into operating condition:
1. Anchor the work table and screw on the press on the back side.
2. Connect the cables between the press and the generator.

⚠️
Danger!
Only use an earthed electrical connection.

3. Insert the unit plug into the socket on the generator:
   1. Press
   2. Two-hand start
   3. RF (converter connection)
   4. Power (electrical supply)

Interfaces
   5. RS232 (9-pole SUB-D)
   6. Digital input (25-pole SUB-D)
   7. Digital output (25-pol SUB-D)

For additional information, see Chapter 8 “Data analysis”; for plug allocation see Chapter 9 “PIN assignment”.

Compressed air connection maximum 7 bar; 105 psi
Turn compressed air valve (21) transversely to flow direction.
4. Connect the compressed air hose (21a) to the available compressed air mains.
5. Bring the compressed air valve (21) to the working position.

⚠️
If the input pressure exceeds 7 bar, a supplementary safety valve automatically opens to release the excess pressure.
Mounting the sound enclosure SSK-H

1. Power (electrical supply) ADG
2. Digital input (25-pole SUB-D)
3. Digital output (25-pol SUB-D)
4. Press
5. Two-hand start
6. RF (converter tension)

Rear access to the press, and/or its mounting and demounting, is gained by removing the back wall of the enclosure.
4.2 Operation and display elements

4.2.1 Welding press

1 Converter housing
The oscillator system together with the electrical supply line is located in the converter housing.

2 Horn
The horn is the actual welding tool. It is tuned to the resonant frequency by the producer.

⚠️ Warning!
*Never alter the tuned horn by making mechanical changes. This can cause damage to the oscillator system and the generator!

3 Clamping table
The integrated T-section enables rapid centring and fixing of the anvil with the fixing straps delivered with the system.

4 Parallel adjustment nuts
The parallel adjustment nuts enable a most precise alignment of the clamping table (3) and thus also the alignment of the anvil with respect to the front surface of the horn.

5 Two-hand start button
When both buttons are pressed at the same time, the welding cycle is started manually. Both of the buttons must be activated simultaneously within 0.3 seconds. This guarantees that the operator cannot reach into the area of the tool during the welding process. This precaution serves operational safety and may be neither eliminated nor structurally changed!

⚠️ Warning!
*Country-specific, statutory safety regulations must be followed during installation!

Note:
If these statutory regulations are not adhered to, the producer refuses to accept any and all liability for personal and property damages!
6 Fine adjustment screw for depth stop (vernier scale)
With this depth stop, which is provided with a scale ("0.1mm" indexing), the distance between the front surface of the horn and the anvil can be continuously adjusted.

7 Emergency stop button
When the emergency stop button is pressed, the press returns to the original position.
After the emergency stop button is pressed, it remains in a blocked position.
Unblocking the emergency stop button:
• Pull the button upwards into the starting position.

8 Gauge for the actuator
Gauge for reading off and setting the actuator.

8.1 Trigger marking
When the trigger marking is passed over, the safety switch is activated. The cycle is automatically executed without pressing the two-hand start (6 mm).

9 Release handles for adjusting the press head
Clamping mechanism for fixing the press head after rough positioning has been made.

10 Hand wheel for height adjustment
The height of the press head is adjusted with the hand wheel.

11 Compressed air connection valve
The valve for connecting the compressed air system on the press to the local compressed air mains. The valve serves to divide the energy between the local compressed air mains and those of the compressed air system on the press.

12 Clamping screws for the clamping table
Hexagonal socket clamping screws for loosening and tightening the clamping table for the parallel alignment.

13 Brief operating instructions
For quick information on the most import functions.
14 Pressure regulator DR
The pressure regulator holds the air pressure on the top side of the piston constant and is set to a height which depends on the size of the piece and the length of the weld joint as well as on the material to be welded. As a point of reference, a regulated pressure of approx. 3 [bar] can be set for a circular piece of 50 mm in diameter which is welded around the edges.

15 Throttle VD
The throttle has two functions
- It reduces the speed on the last 30 mm of the machine stroke.
- It reduces the time power development when the horn sets up on the plastic piece.

See the graphic representations in the brief instructions under the machine table panel.

Practical set value: 7

The functions named above are to be understood in combination with the tripping energy of the so-called trigger, since the trigger function corresponds to the permanent measuring of the pressure difference (DP) between the pressure progression of the top side and the bottom side of the piston.

The regulator pressure or system pressure is automatically shown to the ADG display (1).

The throttle setting is a function which must be input separately (menu information).
4.2.2 Control module AUI
The program dialog and the representation of the process results occur on the display.

4.2.2.1 Keyboard
After the process has been started, process data cannot be changed. Queries are, however, possible and easily carried out.

The keyboard is divided into four groups:

1 The function keys F1 and F2 (1)
   They correspond to the lines displayed at the very bottom of the screen and lead step by step through the menu.

2 Jump keys (2)
   **System test:**
   Ultrasonic oscillator test at idle.
   Display of power loss and frequency as well as the ADG software version, press type, generator type and generator software version, project name, database number
   **PIN:**
   For entering the respective access code
   **Home:**
   Exit from all PIN codes to the top program level
   After F1 is pressed (logout), the ADG is blocked of all changes.

3 Cursor field (3)
   <   > Cursor functions for writing and changing data.
   <   > Additional functions for changing preset values.
   **Enter:** Confirmation of delete functions
   When parameters are entered, "Enter" does not have to be pressed.
4 Data input field
   Numbers 0-9; letters A-Z
   DEL: Delete

The ‘internal’ PIN codes defined by RINCO are as follows:
PIN 1000 (operator PIN)
PIN 3000 (setup PIN)
PIN 5000 (analysis PIN)
These PIN codes can be modified to meet your own needs by setting the PIN code to internal.

5 Status line (5)
The status line provides information on the last step run by the generator. The parameterised welding mode can be set to indicate for a new welding cycle. Information is given on the following states:

- Cycle active
- Start confirmation
- P<sub>v</sub> measurement
- Pretravel
- US active
- Afterwelding
- Solidification
- Return stroke
- Afterpulse waiting time
- Afterpulse
- Ready confirmation
- Cycle ended
- Datastring

---

### Program access PIN standard values

<table>
<thead>
<tr>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjustment, parameterisation (operator PIN)</td>
</tr>
<tr>
<td></td>
<td>System functions             (Adjuster PIN)</td>
</tr>
<tr>
<td></td>
<td>Analysis                     (Analysis PIN)</td>
</tr>
</tbody>
</table>
5 Starting up the system

5.1 Welding operation

After the system has been started, the results of the “system test” are shown on the display. Using the button System test, the system test can be repeated. This occurs to protect the system in the case of a very deeply set amplitude. For measuring a higher amplitude, the corresponding PIN code must be input in order to gain access to the menu "Amplitude measurement".

For determining a possible system change, it is important to enter the Initial value of the power loss \( P_v \) for a system test on the backmost page of the manual.

Via System test, the respective software version installed on the generator and the process control ADG are displayed.

5.1.1 Starting the generator

The generator can be started by means of the POWER button at the front or automatically when the operating voltage is applied. The is selected by means of a jumper, which is located inside the generator underneath the means filter on the Standby Print and is labelled "Engaging". The settings of the jumper are marked with "manual" for startup via the POWER button and "automatic" for use in special machines.
5.2 Process programming

In order to make changes to the system, an appropriate PIN code must be entered. All functions are always visible. For parameters, which cannot be changed with the PIN entered, no cursor is displayed. The PIN codes are pre-set as standard values, but they can be modified individually. The PIN codes are arranged as follows:

5.2.1 Adjustment/parameterisation PIN

<table>
<thead>
<tr>
<th>Block</th>
<th>Access</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustment</td>
<td></td>
<td>Move the press to the lower attachment points for aligning the lower tool.</td>
</tr>
<tr>
<td>Weld parameter</td>
<td></td>
<td>Selection of the welding modes; setting the weld parameters. For setting see Chapter 7.1 &quot;System functions&quot;.</td>
</tr>
</tbody>
</table>
| Limits           |        | Set the limits of the stop conditions Time; Travel differential and absolute; Energy; Power and Part counter.  
|                  |        | ...Limit: Value beyond limit = machine stop                                |
|                  |        | Warning: Value beyond limit = notification on the display without machine stop |
| Information      |        | Entry of project information and production data                           |
| Database         |        | System parameters, limits and information are backed up to save, load, delete and log data sets. To track the last 25 welding operations. |

System parameter  See 7.1 “System functions” concerning the display of background settings for information.
5.3 Adjustment

Adjustment with the sound enclosure SSK
All the following functions described can be executed for a system with a sound enclosure SSK-H with an opened or closed door.

Installing the oscillator system

**Caution!**
Always switch off the power supply to the generator, before installing the oscillator system.
(Power OFF!)

1. Open screw (8) with the supplied allen wrench (SW 6 mm).
2. Open the cover plate (7) on the converter housing.
3. Insert the RF plug in the RF socket (23) on the converter.
4. Insert the oscillator system in the converter housing from the front.
5. Close the cover plate (7) on the converter housing again and tighten with the allen wrench.
6. Screw the horn (9) in and tighten with the special wrench (A) supplied.
   *Torque 30–40 Nm.*
   The oscillator system is ready for operation.
Changing the booster
In order to change the booster, the oscillator unit (25) without the horn can be mounted the other way around.

Note:
To determine the correct booster, the amplitude which corresponds to the application must be established in advance. See the table in the brief operating instructions on the machine table.

Adjusting the tool
1. Estimate the height “H” required to remove and insert the work pieces.
   1 Horn
   2 Work piece
   3 Anvil
   4 Clamping table

2. Loosen the knurled screw (6.1) and set height H with depth stop (6); check on the gauge (18).

3. Replace and tighten the knurled screw.
4. Loosen the release handles (19) and turn the press upwards using the height adjustment (20), so that the horn cannot drive against the anvil when the stroke is extended.

5. Retighten the release handles.

**Caution:**
*If the horn is not set adequately high, there is a risk of collision!*

---

**Energy supply**

1. Check that the emergency stop is pulled out.

2. Open the compressed air hand valve

**Caution! Do not touch the horn!**

3. The system is turned on with the POWER button. The ultrasonic system conducts a self test.

With PIN ______ and menu item “Adjustment”
Recommendation
Throttle 7-8
System pressure 1 [bar]

**Caution!**
*The anvil with the welding object may not be located under the horn.*

4. The press can be lowered to the mechanical depth stop by operating the two-hand start in manual mode or by applying the start signal in automatic mode.
5. Centre the anvil under the horn with an inserted welding object.

6. Lightly place the press on the welding object using the height adjustment.

7. Tighten the release handles.

8. Fasten the fixing straps (12) using the allen wrench.

9. First lightly tighten both sides, check if the centring is still correct, then tighten completely.
10. Use the two-hand start or the start signal to bring the press in the upper rest position.

11. Remove the welding object.
12. Lower the press again.
13. Loosen the release handles and lower the press until the welding stroke reaches the lower most position without the horn touching the anvil. This guarantees that the horn and the anvil cannot be damaged if the stroke is empty (no plastic part is inserted).
14. Go to “Database / Parameter database” in the main menu, select the desired application and then press F1 “Load data set”.
15. Press PARAMETER to check that the parameters correspond to your requirements.
16. Provided you are processing a new application, choose a similar application from the “Database” by selecting “Load dataset”.
17. Modify the project description as well as the press information under “Info”.

If the welding technology is still unfamiliar to you, carefully read through chapter 6 Welding Technology now. Afterwards, adjust the data set appropriately and optimise it by experimenting.

18. **Aligning the clamping table**
   The clamping table (13) was aligned parallel to the front surface of the horn at the factory. Should corrections of the clamping table be necessary despite this, align the clamping table with the four parallel adjustment nuts (14).

**Parallel adjustment:**
1. Loosen the clamping screws (22) using the allen wrench (A).
2. Adjust the parallel adjustment nuts (14) according to the diagram as needed.
3. Retighten the clamping screws (22) after the adjustment has occurred.
**Course of the welding cycle**

The cycle is started when both of the start buttons are pressed within 0.3 seconds. The power loss of the oscillator system is measured (system test). The magnetic valve is activated and the actuator is lowered. The start buttons must remain pressed until the safety switch (indicator underneath the 6 mm mark on the stroke scale) is passed over or until the hold time has expired.

If the start buttons are released early, the actuator returns to the original position. An error message is displayed.

The welding starts via the TRIGGER. After the weld time and hold time have expired, the actuator returns to the original position. In order to prevent the possibility that light work pieces stick to the horn, an after-pulse can be set.
6 Welding technology

In order to guarantee an ultrasonic welding process of high quality and low tolerances, the parameters

- **amplitude A [µm]** as energy source and
- **contact force F [N]** as a coupling between the plastic parts to be welded are of decisive importance for building the melting intensity.

The more precise these two quantities are controlled, the better the welding process can be reproduced.

Plastics are partly very different in their melting-on characteristics. Special semi-crystalline thermoplastics such as PP or POM require a high melting-on energy and are very thin fluid immediately thereafter.

**The stop conditions (welding modes)**

The stop conditions can be preset as constant for:

- **Time**
- **Energy**
- **Travel**
- **Contact cut-off**

Using **Limits**, you can set limit value windows, which lead to an interruption of the process if they are passed over.

In addition, a warning window can be generated on the display.

**The ultrasonic start moment (Trigger)**

In order to guarantee a high level of reproducibility, the ultrasonic is preferably triggered at a determined pretensioning force. This happens by measuring the pressure difference in the pneumatic cylinder.

See Trigger DP in Chapter 6.2. Other triggers such as travel and time can be set under “system parameters”.

---

**Melting intensity**

- Power (N)
- Amplitude A (µm)

**US stop**

- Time (s)
- Energy W (Ws)
- Travel s (mm)
6.1 Process description
A welding cycle can be divided into six sequences:

The individual process steps

0 – 1 Pretravel:
Rapid advance of the welding tool.

1 – 2 Brake:
Reduction of the lowering speed according to the throttle settings to produce a soft setting down on the welding object.

2 – 3 Power development:
Successive development of the contact force according to the throttle and regulator settings up to the trigger point.

3 – 4 Welding:
Melting of both of the plastic parts by means of power and amplitude.

4 – 5 Solidification:
Hardening and cooling of the plastic melting under power that increases with time.

5 – 6 Return stroke:
A quick return stroke of the welding tool to the upper rest position.
The cycle sequence is controlled by time, travel or energy depending on the welding mode.

The start of the ultrasonic (trigger)
The presses of the “Standard” generation contain a pressure differential measuring system, which measures the current pressure difference between the top side and bottom side of the piston.

Options for starting the ultrasonic:
- Contact force of the horn on the welding object (pressure difference measurement).
- Vertical travel coordinate of the horn
- Time from the press rest position.
6.2 Programming an initial operation

Preparation:
If the press is set in its height, the installed booster and the horn are to be recorded as gain factors under Info / Oscillator info. Thus the control system calculates the corresponding correct value in [µm]

System pressure DR:
The longer the welding joint, the higher the system pressure.

Example:
Circular ERG diameter 50 mm (length approx. 157 mm); material ABS
System pressure approx. 3 [bar]

Throttle VD:
The throttle forces the power changes over time during parts contact. The larger the value, the faster the change and the higher the melting intensity. The practical range is between 5 and 10.

Setting for the example above: Throttle 3

Note:
The steeper the power development (large throttle opening), the more intensive the melting.

Amplitude:
The range is preset with the selection of the booster and the horn gain.
In addition, the generator allows for fine variation in the range of 40% to 100% in 1% steps.

Trigger DP:
Switches the ultrasonic on according to a preset value (pressure difference between the top side and bottom side of the piston).
Set value for the example above: Trigger 1.0 [-]

Mode:
Determines the ultrasonic stop. It is simplest to begin in Time mode. It is not a problem to switch to a different mode later.

Limits: Limits are meant for optimised production and should therefore not be programmed until later.
6.3 The individual modes

The ultrasonic start moment (trigger) can be set for all welding modes under System parameters / Mode options as pressure (power), travel, time or external. For most applications, the pressure trigger makes the most sense and travel can be selected in few cases.

TIME MODE

In this type of operation, the welding process is ended after the preset time has expired.

Cycle

After the trigger is achieved, the welding is started. Welding occurs from the start until the programmed time is achieved.

TRAVEL MODE difference

With this type of operation, the welding process is ended when the melting depth is reached.

Cycle

After the trigger is achieved, the welding is started. Welding occurs from the start until the depth [ss] is achieved. The actual travel value is analysed after the hold time has expired (travel during solidification is displayed as welding travel).
**TRAVEL MODE absolute**
In this type of operation, the welding process is ended after the absolute difference from the upper rest position is achieved.

**Cycle**
After the trigger is achieved, the welding is started. Welding occurs from the start until the depth [ss] is achieved.

The actual travel value is analysed after the hold time has expired (travel during solidification is displayed as welding travel).

**ENERGY MODE**
In the energy mode, the instant power absorbed by the welding object in short time intervals is added up.

In order to detect a consistent welding quality, the energy flow is contained over time using "Limits".

**Cycle**
After the trigger (power) is achieved, the welding is started. The ultrasonics stops according to energy achieved.

**CONTACT SWITCH OFF**
For the stamping of fabrics and non-woven materials, the ultrasonic can be stopped when the metallic contact between the horn and the counter tool produces a potential of 24 V.
Signal socket STO 2_1 Inputs on the back panel of the generator is set up for this.
This is to be supplied externally with 24 V DC to Pin 1 or 2. Pin 8 is connected to the metal anvil which is insulated to the machine table.
7 In-depth system handling

With the corresponding PIN, access to the sequences System parameters and Amplitude measurements is expanded.

The menu enables expanded access:
- Adjustment
- Weld parameters
- Limits
- Information
- Database
- System parameters
- Amplitude measurements

For descriptions of “Adjustment – Database” see chapter 5.2.1.

7.1 System functions (PIN)

System parameters

<table>
<thead>
<tr>
<th>Block</th>
<th>Access</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options 1</td>
<td></td>
<td>Press type: Enter the welding unit used.</td>
</tr>
</tbody>
</table>

Trigger mode: Select the ultrasonic trigger:
- Pressure: Afterwards in the built-in differential pressure sensor.
- Time: After a certain time from the start of the cycle.
- Travel: After a programmed distance from the upper rest position
- Off: No trigger exists.
- External: Digital input

Trigger mode before according to SSW: Select the condition SSW for the ultrasonic trigger
- before: For a welding stroke longer than 6 mm > before; that means the ultrasonic start before the 6 mm safety switch (SSW).
- after: For all welding operations within 6 mm of the stroke. The ultrasonic starts after the 6 mm safety switch (SSW).

After-pulse: A light ultrasonic pulse on the return stroke of the press; prevents the plastic piece from sticking to the horn.

System pressure measurement: Disabling of the pressure gauge on the ADG display for special purpose machine configurations.

Travel measurement: Disabling of the travel gauge on the ADG display for special purpose machine configurations and selection of various travel gauges.

Amplitude mode: External control of the amplitude for special purpose machine configurations.

Holding conditions: To allow the weld to harden, the horn can be variously held on the part.
- Time
- Travel difference
- Travel absolute

Resting position: Switches of the position of rest monitoring in the case of specific machine configurations.
Options 2

Start mode:
- **Manual (CE)**
- **Automatic**: CE conformity is no longer guaranteed. The system operator must adapt the machine design to conform with the CE machine guidelines. When switching to “automatic” the online data window is switched-off by default.

Error position: Press position when blocked after an “error”.

Datastring: Weld data transfer via RS 232 to an external computing system.

interval datastring: Readout interval, a data string is always sent if there an error occurs during welding.
- 000 none
- 001 every

Database switching: External transfer of data sets.
- Off
- dec (decimal)
- bin (binary)
- RS232

Sound enclosure: Program for operating the sound enclosure SSK

Start confirmation: If this option has been activated, input START_CONFIRM_IN must have been set in order for the generator to start the cycle.

Ready confirmation: If this option has been activated, the input START_CONFIRM_IN must have been set in order for the generator to end the cycle and to set the output READY_OUT.

Good part counter output:
- **Impulse**: 300 ms long High pulse indicates a correct welding operation.
- **Signal**: The output is set to High-Level until the start of the next cycle in the event of a correct welding operation.

Bad part counter output:
- **Impulse**: 300 ms long High pulse indicates an incorrect welding operation.
- **Signal**: The output is set to High-Level until the start of the next cycle in the event of an incorrect welding operation.

Online data window: An information window that displays the travel, trigger and power is opened during the cycle.

Statistics: If the statistics function has been switched on, you can select “ongoing”, “groups” and “values” via ther < and > in the “Welding” window (HOME). The F1 button is given a new function as a result (See section 8.1 “Statistics”).

Horn

Power loss measurement: Setting the measurement before or after the welding cycle

Max. power loss: Max. limit value
- 10% to 40%

Power loss measuring interval: Measuring interval
- 0 to 9999; 0 = no measuring
### Block Access Description

<table>
<thead>
<tr>
<th>Block</th>
<th>Access</th>
<th>Description</th>
</tr>
</thead>
</table>
| Generator parameter   |              | **Start amplitude:** Is the start value for generating a soft start (see picture above).  
                        |              | • *Max value 10% - 40%*                                                                                                                     |
|                       |              | ![Graph of Start and Target Amplitude](image.png)                                                                                           |
|                       |              | **Soft start time:**  
                        |              | • 5 to 200 ms                                                                                                                                |
|                       |              | **Soft stop time:**  
                        |              | • 0 to 50 ms  
                        |              | For the soft oscillating of complicated horns.                                                                                                 |
|                       |              | **Frequency reset:** Normally the frequency most recently used is set.  
                        |              | If this is not desired, frequency reset must be set to "On".                                                                           |
|                       |              | **Upper frequency limit:**  
                        |              | • +50 to +500 Hz                                                                                                                             |
|                       |              | **Lower frequency limit:**  
                        |              | • -50 to -500 Hz                                                                                                                             |
|                       |              | **Overload switch off delay:** For disabling extremely short power peaks  
                        |              | (in continual mode)  
                        |              | • 5 to 9999 ms                                                                                                                              |
|                       |              | **Overload level:** Maximum power value for the operational limit of the generator.  
                        |              | • 5 W min. –1.2 x nominal generator power                                                                                                    |
|                       |              | **Cable length:** 1–15 m                                                                                                                     |
| Settings              |              | **PIN variation; adjusting time date; baud rate**                                                                                           |
|                       |              | **External operator PIN:**  
                        |              | • 0 to 7999                                                                                                                                     |
|                       |              | **PIN code:**  
                        |              | • *external/internal*                                                                                                                           |
|                       |              | If the PIN code has been set to internal, then the default PIN codes 1000, 3000 and 5000 are active. If the option has been set to external, then  
                        |              | the operator can determine the PIN codes.                                                                                                     |
|                       |              | **Baud rate:**  
                        |              | • *Standard 19200*                                                                                                                             |
|                       |              | **Time/date**                                                                                                                                |
| Country settings      |              | **Language**                                                                                                                                |
|                       |              | **Time format**                                                                                                                                |
|                       |              | **Travel unit**  
                        |              | • *[mm]; [inch]*                                                                                                                               |
|                       |              | **Pressure unit**  
                        |              | • *[bar]; [psi]*                                                                                                                               |
Amplitude measurement

<table>
<thead>
<tr>
<th>Block</th>
<th>Access</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuation system test</td>
<td></td>
<td>For setting and measuring the amplitudes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Preparation:</strong> For automatically calculating the amplitude, enter the gain factors under: Information/oscillator system info/ input factors booster and horn.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Measurement:</strong> Using the “System test” button or digital input &quot;US_TEST_IN&quot;</td>
</tr>
</tbody>
</table>

7.2 Analysis (PIN)

For analysis in the case of error-free machine function.

No settings are, however, possible.

<table>
<thead>
<tr>
<th>Block</th>
<th>Access</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle analysis</td>
<td></td>
<td>Display of the switch and measurement sizes</td>
</tr>
<tr>
<td>Cycle phases</td>
<td></td>
<td>Time and travel dependent display of all cycle phases in their switch moments</td>
</tr>
<tr>
<td>Press status</td>
<td></td>
<td>Display of the switch and position status of all switch and measuring members of the welding press</td>
</tr>
<tr>
<td>Inputs</td>
<td></td>
<td>Analysis of the signal inputs (STO_2.1)</td>
</tr>
<tr>
<td>Outputs</td>
<td></td>
<td>Analysis of the signal outputs (STO_2.2)</td>
</tr>
</tbody>
</table>

7.3 Reset functions (PIN)

Resets all settings to the standard values.

<table>
<thead>
<tr>
<th>Block</th>
<th>Access</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN Reset</td>
<td></td>
<td>Sets PIN to “internal” and activates the standard PIN codes</td>
</tr>
<tr>
<td>Generator reset</td>
<td></td>
<td>Initialises the generator to the standard settings</td>
</tr>
<tr>
<td>Default data set</td>
<td></td>
<td>Deletes all data sets and generates a dataset “0”</td>
</tr>
<tr>
<td>Statistic Reset</td>
<td></td>
<td>Resets the statistics and the measured values database</td>
</tr>
<tr>
<td>Factory settings</td>
<td></td>
<td>Executes directly all the above-mentioned resets</td>
</tr>
</tbody>
</table>
8 Data analysis

8.1 Statistics

Ongoing:
The median values of the travel, energy and the welding time are shown in the ongoing statistics. In addition, standard deviation is shown as a value and as a percentage. This listing of median values relates to all welding operations shown so far, meaning either from the last time that the machine was started or since the values were last reset. As soon as the parts counter has been set up, the statistics are transferred via the RS232 interface, if serial communication is used. The statistics menu appears on the display instead of the welding menu.

Groups:
These statistics are intended primarily for use when setting up. The last 25 welding operations are shown in groups of a maximum of 5. No parameter changes are permitted within a group of 5, otherwise a new group is started. If there was an incorrect welding operation within the group, this is excluded from the statistics. The number of welding operations within a group is displayed underneath the group number. Correct welding operations are shown with an “o” and incorrect welding operations are shown with an “x”.

The following displays result from the relevant welding mode:

**Time**
Energy, travel differential and travel absolute

**Travel differential**
Energy, time and travel absolute

**Travel absolute**
Energy, time and travel differential

**Energy**
Time, travel differential and travel absolute

**Contact**
Energy, time travel differential
The statistics can be shown at any time via the serial interface. Selection for triggering is done by means of the F1 and ENTER keys. The statistics and the database of measured values can be deleted at any time by pressing the DEL key.

If the energy value is greater than four digits plus one decimal place (xxxx.x), then only five digits with no decimal places (xxxx) are shown.

**Values:**
The measured values of the last 25 welding operations are specified. The measured values are output via the datastring option. Otherwise, no output is possible via the serial interface.
8.2 Data string

Brief description
For aspects of quality control and retraceability of weld parts, programs are often used which can accept the necessary data via an interface. With ADG it is possible to output a data string at the end of the welding cycle via the serial interface (RS232).

The output can be switched off or on. Equally, the interval of the output can be determined. I must be pointed out that each incorrect welding is logged when the data string is activated - independent of the interval.

Structure of the data string
The following parameters are displayed in the order listed, separated by a semicolon (;). At the end of the data string a <CR> is sent.

1 Date 9 Max. power [W]
2 Time 10 Welding time [ms]
3 Project name 11 Weld travel diff [mm]
4 Database number 12 Weld travel abs [mm]
5 Welding mode 13 Frequency [Hz]
6 Parts counter 14 Power loss [W]
7 Rejected parts counter 15 Error code
8 Energy [Ws]

Example of an output
Date; Time; Project name; Database number;
Welding mode; Parts counter; Rejected parts counter;
Energy [Ws]; Max. power [W]; Welding time [ms];
Welding travel diff [mm]; Welding travel abs [mm];
Frequency [Hz]; Power loss [W]; Error code <CR>
Example of output after multiple errors in a welding cycle

The datastring shows the relevant current error code in the event of an error. If there is more than one error, then this is indicated with the coding 100:00X. X stands for the number of errors. Warnings are not shown in the datastring.

Examples:

Error “Energy limit min” occurs:
Display: #1
Code: 5:3
Info: Energy limit min
Datastring: 005:003

Errors “Time limit max” and “Energy limit min” occur:
Display: #1
Code: 5:0
Info: Time limit max
Display: #2
Code: 5:3
Info: Energy limit min
Datastring: 100:002

Example of output after exceeding the warning window

Warning “Time warning min” is given:
Display: #1
Code: 20:1
Info: Time warning min
Datastring: 000:000
8.2 Logging the parameter data set via RS232

The contents of a data set can be shown in the “Database – Parameter database” menu by selecting RS232. The following data are output via the RS232 serial interface:

**General information:**
- Date
- Time
- Project name
- Data set No.
- Generator type
- AUI software version

**Information on the press:**
- Press type
- Set pressure
- Throttle position
- Press position, depth stop position

**Information on the oscillator:**
- Converter No.
- Booster No.
- Amplification booster
- Horn No.
- Amplification horn
- Holder No.

**Information on the generator parameters:**
- DGC software version
- Start amplitude
- Soft start time
- Soft stop time

**Information on the welding parameters:**
- Amplitude
- Start condition (pressure, travel, time trigger)
- Stop condition (time, travel, energy, contact)
- Holding condition (time, travel)

**Example 1**
13.06.06;14:01:13;HUGO;1;ADG70-100;AUI 0C70;Standard50;5.5bar;3.5;100mm;99mm; 111111;222222;1:1.5;333333;1:1.5;444444;DGC 0G64;30%;20ms;0ms;60%;Pressure:3.0; Timemode:333ms;Time:350ms;

**Example 2**
13.06.06;14:01:11;VRENI;2;ADG70-100;AUI 0C70;Standard50;79.8psi;3.5;3.9370inch; 3.8976inch;111111;222222;1:1.5;333333;1:1.5;444444; DGC 0G64;30%;20ms;0ms;60%; Time:150ms;Travel absolute:2.5846inch;Time:350ms;
## 9 PIN Assignment

### STO_2_1 Inputs

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24VDC_IO_IN</td>
<td>external supply voltage +24VDC</td>
</tr>
<tr>
<td>2</td>
<td>+24VDC_IO_IN</td>
<td>external supply voltage +24VDC</td>
</tr>
<tr>
<td>3</td>
<td>START_1_EXT_IO_IN</td>
<td>external start signal for start mode automatic</td>
</tr>
<tr>
<td>4</td>
<td>START_2_EXT_IO_IN</td>
<td>external start signal for start mode automatic</td>
</tr>
<tr>
<td>5</td>
<td>STOP_IN</td>
<td>abort cycle</td>
</tr>
<tr>
<td>6</td>
<td>US_TEST_IN</td>
<td>power loss measurement</td>
</tr>
<tr>
<td>7</td>
<td>US_STOP_1_IN</td>
<td>stop ultrasonic (24VDC)</td>
</tr>
<tr>
<td>8</td>
<td>US_STOP_2_IN</td>
<td>contact cut off (GND)</td>
</tr>
<tr>
<td>9</td>
<td>RESET_IN</td>
<td>error acknowledgment</td>
</tr>
<tr>
<td>10</td>
<td>TRIGGER_IN</td>
<td>external trigger</td>
</tr>
<tr>
<td>11</td>
<td>START_CONFIRM_IN</td>
<td>start confirm (option enable)</td>
</tr>
<tr>
<td>12</td>
<td>READY_CONFIRM_IN</td>
<td>ready confirm (option enable)</td>
</tr>
<tr>
<td>13</td>
<td>RESERVE_13_IN</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>DATASET_1_IN</td>
<td>data set switching</td>
</tr>
<tr>
<td>15</td>
<td>DATASET_2_IN</td>
<td>data set switching</td>
</tr>
<tr>
<td>16</td>
<td>DATASET_3_IN</td>
<td>data set switching</td>
</tr>
<tr>
<td>17</td>
<td>DATASET_4_IN</td>
<td>data set switching</td>
</tr>
<tr>
<td>18</td>
<td>DATASET_5_IN</td>
<td>data set switching</td>
</tr>
<tr>
<td>19</td>
<td>SSK_CABINE_IN</td>
<td>sound enclosure door closed (option enable)</td>
</tr>
<tr>
<td>20</td>
<td>SSK_CABINE_LIFT_IN</td>
<td>lift door not closed (option enabled)</td>
</tr>
<tr>
<td>21</td>
<td>RESERVE_21_IN</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>RESERVE_22_IN</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>AMPL_AIN</td>
<td>analogue amplitude input 0-10VDC (0-100% amplitude)</td>
</tr>
<tr>
<td>24</td>
<td>GND24VDC_IO_IN</td>
<td>external supply voltage GND</td>
</tr>
<tr>
<td>25</td>
<td>GND24VDC_IO_IN</td>
<td>external supply voltage GND</td>
</tr>
</tbody>
</table>
## 9.2 Outputs on STO_2_2 (DSUB25)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24VDC_IO_IN</td>
<td>external supply voltage +24VDC</td>
</tr>
<tr>
<td>2</td>
<td>+24VDC_IO_IN</td>
<td>external supply voltage +24VDC</td>
</tr>
<tr>
<td>3</td>
<td>ERROR_HIGHPRIO_OUT</td>
<td>high priority error (turn off generator)</td>
</tr>
<tr>
<td>4</td>
<td>ERROR_OUT</td>
<td>error</td>
</tr>
<tr>
<td>5</td>
<td>ERROR_CODE1_OUT</td>
<td>error code</td>
</tr>
<tr>
<td>6</td>
<td>ERROR_CODE2_OUT</td>
<td>error code</td>
</tr>
<tr>
<td>7</td>
<td>ERROR_CODE3_OUT</td>
<td>error code</td>
</tr>
<tr>
<td>8</td>
<td>READY_OUT</td>
<td>ready for new cycle</td>
</tr>
<tr>
<td>9</td>
<td>US_ACTIVE_OUT</td>
<td>ultrasonic activated</td>
</tr>
<tr>
<td>10</td>
<td>RESTPOS_OUT</td>
<td>rest position press</td>
</tr>
<tr>
<td>11</td>
<td>RESERVE_11_OUT</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>START_OUT</td>
<td>start cycle done</td>
</tr>
<tr>
<td>13</td>
<td>MV_OUT</td>
<td>magnetic valve set (cylinder pre stroke/down)</td>
</tr>
<tr>
<td>14</td>
<td>START_RETURN_OUT</td>
<td>back stroke active (cylinder back stroke/up)</td>
</tr>
<tr>
<td>15</td>
<td>GOOD_PART_COUNT_OUT</td>
<td>successful cycle finished</td>
</tr>
<tr>
<td>16</td>
<td>BAD_PART_COUNT_OUT</td>
<td>cycle finished with error</td>
</tr>
<tr>
<td>17</td>
<td>RESERVE_17_OUT</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>RESERVE_18_OUT</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>RESERVE_19_OUT</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>SSK_MV_LIFTDOR OUT</td>
<td>magnetic valve lift door (option enable)</td>
</tr>
<tr>
<td>21</td>
<td>RESERVE_21_OUT</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>RESERVE_22_OUT</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>POWER_AOUT</td>
<td>analogue power output 0-10VDC (0-120% power)</td>
</tr>
<tr>
<td>24</td>
<td>GND24VDC_IO_IN</td>
<td>external supply voltage GND</td>
</tr>
<tr>
<td>25</td>
<td>GND24VDC_IO_IN</td>
<td>external supply voltage GND</td>
</tr>
</tbody>
</table>
9.3 Press on STO_3

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24VDC_PRESS_OUT</td>
<td>supply voltage +24VDC press</td>
</tr>
<tr>
<td>2</td>
<td>HOMEPOSITION_IN</td>
<td>input sensor resting position</td>
</tr>
<tr>
<td>3</td>
<td>PU_PRESS_IN</td>
<td>input PU- switch (supervision magnetic valves)</td>
</tr>
<tr>
<td>4</td>
<td>SSW_1_PRESS_IN</td>
<td>input security switch 1 press (6mm)</td>
</tr>
<tr>
<td>5</td>
<td>SSW_2_PRESS_IN</td>
<td>input security switch 2 press (6mm)</td>
</tr>
<tr>
<td>6</td>
<td>MV_1_OUT</td>
<td>output magnetic valve 1</td>
</tr>
<tr>
<td>7</td>
<td>MV_2_OUT</td>
<td>output magnetic valve 2</td>
</tr>
<tr>
<td>8</td>
<td>SSW_1_PRESS_OUT</td>
<td>output security switch 1 press (6mm)</td>
</tr>
<tr>
<td>9</td>
<td>SSW_2_PRESS_OUT</td>
<td>output security switch 2 press (6mm)</td>
</tr>
<tr>
<td>10</td>
<td>INC_A_IN</td>
<td>travel measurement canal A</td>
</tr>
<tr>
<td>11</td>
<td>INC_B_IN</td>
<td>travel measurement canal B</td>
</tr>
<tr>
<td>12</td>
<td>PRESSURE_C_AIN</td>
<td>analogue input system pressure (4-20mA)</td>
</tr>
<tr>
<td>13</td>
<td>TRIGGER_C_AIN</td>
<td>analogue input differential pressure trigger (4-20mA)</td>
</tr>
<tr>
<td>14</td>
<td>24VDC_DELAY_OUT</td>
<td>delayed supply voltage for PU- switch</td>
</tr>
<tr>
<td>15</td>
<td>GND24VDC_PRESS_OUT</td>
<td>supply voltage GND press</td>
</tr>
</tbody>
</table>

Diagram showing connections between various components and signals.
### 9.4 Two-hand start on STO_5

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>nc</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>START_1_OUT</td>
<td>output start switch 1</td>
</tr>
<tr>
<td>3</td>
<td>START_1_NC_IN</td>
<td>input start switch 1 (normally close)</td>
</tr>
<tr>
<td>4</td>
<td>START_1_NO_IN</td>
<td>input start switch 1 (normally open)</td>
</tr>
<tr>
<td>5</td>
<td>START_2_OUT</td>
<td>output start switch 2</td>
</tr>
<tr>
<td>6</td>
<td>START_2_NC_IN</td>
<td>input start switch 2 (normally close)</td>
</tr>
<tr>
<td>7</td>
<td>START_2_NO_IN</td>
<td>input start switch 2 (normally open)</td>
</tr>
<tr>
<td>8</td>
<td>24VDC_DELAY_OUT</td>
<td>delayed suppl voltage fpr emergency stop</td>
</tr>
<tr>
<td>9</td>
<td>EMERGENCY_1_IN</td>
<td>input emergency stop 1</td>
</tr>
<tr>
<td>10</td>
<td>EMERGENCY_2_IN</td>
<td>input emergency stop 2</td>
</tr>
<tr>
<td>11</td>
<td>nc</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>GND24VDC_PRESS_OUT</td>
<td>supply voltage GND press</td>
</tr>
</tbody>
</table>

[Diagram of STO_5 Two-hand](image)
10 Example applications

10.1 Standard ADG

The cycle is initiated by pressing the two-hand start. Output READY_OUT drops out and the power loss measurement (Pv) is shown by output US_ACTIVE_OUT. The solenoid valves (MV_1,2_OUT) are set after a successful Pv measurement, whereby the press leaves the position of rest. This is indicated by output RESTPOS_OUT. The ultrasonics are started when the trigger pressure is reached. This is indicated by output US_ACTIVE_OUT. Outputs MV_1_OUT and MV_2_OUT are reset after the welding and solidification phases. The press is brought back into the position of rest as a result. Output RESTPOS_OUT indicates that the position of rest has been reached. Output READY_OUT is set as soon as the generator is ready for the next welding operation. An error-free welding operation is indicated by output GOOD_PART_COUNT_OUT. This signal is applied until the start of the next cycle.
10.2 ADG error signals

**Process step**

0 > 1  Pretravel  
1 > 2  Stroke braked  
2 > 3  Power development  
3 > 4  Melting on  
4 > 5  Solidification  
5 > 6  Return stroke

The cycle is initiated by pressing the two-hand start. Output READY_OUT drops out and the power loss measurement (Pv) is shown by output US_ACTIVE_OUT. The solenoid valves (MV_1,2_OUT) are set after a successful Pv measurement, whereby the press leaves the position of rest. This is indicated by output RESTPOS_OUT. The ultrasonics are started when the trigger pressure is reached. This is indicated by output US_ACTIVE_OUT. An error occurs during the welding operation, as a result of which the welding operation is broken off. This is indicated by output US_ACTIVE_OUT dropping out and the setting of output ERROE_OUT. The press is brought back into the position of rest by resetting the solenoid valve outputs MV_1,2_OUT. In addition to the error display, output BAD_PART_COUNT_OUT indicates an incorrect welding operation. This signal remains until the start of the next cycle. The current error can be cleared by applying a signal at input RESET_IN. If there are no further errors, the generator indicates this with output READY_OUT.
10.3 Standard ADG with sound enclosure

Process step

0 > 1 Pretravel
1 > 2 Stroke braked
2 > 3 Power development
3 > 4 Melting on
4 > 5 Solidification
5 > 6 Return stroke

The cycle is initiated by pressing the two handed release. With the cabin doors closed, indicated by the set input SSK_CABINE_IN, the output SSK_CABINE_LIFTDOOR_OUT is set which lowers the lift doors. Once the lift doors have reached the closed position, the input SSK_CABINE_LIFT_IN is set and the welding cycle begins. The power loss measurement (Pv) is indicated by the US_ACTIVE_OUT input. After the Pv reading has been successfully taken, the magnetic valves (MV_1,2_OUT) are set. The ultrasound is started by pressing a trigger. This is indicated by the output US_ACTIVE_OUT. After the welding and setting phase the outputs MV_1_OUT and MV_2_OUT are reset which returns the press to the idle position.
10.4 ADG with special actuators
(Start mode automatic)

Process step

0 > 1 Pretravel
1 > 2 Stroke braked
2 > 3 Power development
3 > 4 Melting on
4 > 5 Solidification
5 > 6 Return stroke

Engaging the inputs START_1_EXT_IO_IN and START_2_EXT_IO_IN starts the process which is indicated by the output START_OUT. The two start inputs START_1,2_EXT_IO_IN must be engaged until the output START_RETURN_OUT indicates that the press is on the return stroke.

In this application the options "Confirm start" and "Confirm stand by" are activated. For that reason, the power loss reading (Pv) is only issued after the input START_CONFIRM_IN is engaged. Equally, the stand by signal for the next welding cycle READY_OUT is only indicated if the input READY_CONFIRM_IN is engaged.
10.5 Data set switching

Data set switching is used to initiate multiple welding applications with one generator.

The welding parameters, limits, information and system parameters are stored in a data set. The data sets can be switched over according to the setting of the “Data set switching” option.

**Option „Data set switching“ dec**

<table>
<thead>
<tr>
<th>DATASET_1_IN</th>
<th>DATASET_2_IN</th>
<th>DATASET_3_IN</th>
<th>DATASET_4_IN</th>
<th>DATASET_5_IN</th>
<th>Dataset no action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

**Option „Data set switching“ bin**

<table>
<thead>
<tr>
<th>DATASET_1_IN</th>
<th>DATASET_2_IN</th>
<th>DATASET_3_IN</th>
<th>DATASET_4_IN</th>
<th>DATASET_5_IN</th>
<th>Dataset no action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>31</td>
</tr>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>32</td>
</tr>
</tbody>
</table>

**Option „Data set switching“ RS232**

<table>
<thead>
<tr>
<th>Dataset</th>
<th>ASCII-Types</th>
<th>ASCII-Types</th>
<th>Dataset</th>
<th>ASCII-Types</th>
<th>Dataset</th>
<th>ASCII-Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>11</td>
<td>@</td>
<td>21</td>
<td>E</td>
<td>31</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>12</td>
<td>&lt;</td>
<td>22</td>
<td>F</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>13</td>
<td>=</td>
<td>23</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>14</td>
<td>&gt;</td>
<td>24</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>15</td>
<td>?</td>
<td>25</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>16</td>
<td>@</td>
<td>26</td>
<td>J</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>17</td>
<td>A</td>
<td>27</td>
<td>K</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>18</td>
<td>B</td>
<td>28</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>19</td>
<td>C</td>
<td>29</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>:</td>
<td>20</td>
<td>D</td>
<td>30</td>
<td>N</td>
<td></td>
</tr>
</tbody>
</table>
The process is started by applying inputs `START_1_EXT_IO_IN` and `START_2_EXT_IO_IN` in automatic mode or by operating the two-hand start in manual mode. Inputs `DATASET_1_IN` to `DATASET_5_IN` are checked at this time. Once the option has been selected, the corresponding data set is used for the welding. Note the changeover time of 200 ms for the HF switchover boxes that are used.

<table>
<thead>
<tr>
<th>Welding cycle</th>
<th>Dataset 1</th>
<th>Welding cycle</th>
<th>Dataset 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option dec</td>
<td>Option bin</td>
<td>Option dec</td>
<td>Option bin</td>
</tr>
<tr>
<td>Dataset 1</td>
<td>Dataset 1</td>
<td>Dataset 3</td>
<td>Dataset 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATASET_1_IN</th>
<th>Start</th>
<th>0</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(STO_2_1 – Pin 14)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATASET_2_IN</th>
<th>Start</th>
<th>0</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(STO_2_1 – Pin 15)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATASET_3_IN</th>
<th>Start</th>
<th>0</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(STO_2_1 – Pin 16)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATASET_4_IN</th>
<th>Start</th>
<th>0</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(STO_2_1 – Pin 17)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATASET_5_IN</th>
<th>Start</th>
<th>0</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(STO_2_1 – Pin 18)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11 Technical data

11.1 Power supply
The generator is operated at the nominal voltage specified on the type plate. A deviation of +/-10% of the nominal voltage is permissible.

11.2 Analog and digital inputs/outputs

11.2.1 Power supply and voltage level
The digital inputs/outputs require an external power supply (+24 V DC_IO_IN) of 24 V. The voltage levels of the power supply and the digital inputs/outputs are shown in the following table.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24VDC_IO_IN</td>
<td></td>
<td>20</td>
<td>24</td>
<td>28</td>
<td>V</td>
</tr>
<tr>
<td>Digital Input High Signal</td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Digital Input Low Signal</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Digital Output High Signal</td>
<td>V_supply = 24V</td>
<td></td>
<td>24</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Digital Output Low Signal</td>
<td>V_supply = 24V</td>
<td>0</td>
<td>0.5</td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

11.2.2 Overview of the inputs/outputs
The following table gives an overview of the inputs/outputs.

<table>
<thead>
<tr>
<th>Signal type</th>
<th>Voltage level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital inputs</td>
<td>24VDC</td>
</tr>
<tr>
<td></td>
<td>Input current = 5mA type.</td>
</tr>
<tr>
<td></td>
<td>Input resistance = 8.4kΩ</td>
</tr>
<tr>
<td>Analog inputs</td>
<td>0 - 10VDC</td>
</tr>
<tr>
<td></td>
<td>Precision +/- 3%</td>
</tr>
<tr>
<td></td>
<td>Input current = 0.3mA typ.</td>
</tr>
<tr>
<td></td>
<td>Input resistance = 45kΩ</td>
</tr>
<tr>
<td>Digital outputs</td>
<td>24VDC</td>
</tr>
<tr>
<td></td>
<td>Output current = 100mA max.</td>
</tr>
<tr>
<td>Analog outputs</td>
<td>0 - 10VDC</td>
</tr>
<tr>
<td></td>
<td>Output current = 10mA max.</td>
</tr>
<tr>
<td></td>
<td>Output resistance = 680Ω</td>
</tr>
</tbody>
</table>
11.2.3 Analog input and output
In order to ensure that no errors occur at the analog input, the internal resistance of the supply source may not be greater than 450 Ω.

In order not to generate errors at the analog power output, the internal resistance of the sink that is connected must be greater than 68 kΩ.
12 Maintenance and service

12.1 Menu tree PIN 1000

**SYSTEM TEST**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**SERVICING**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**NEW MENU**
- Adjustment
  - Setting parameter
  - Values

**VALUES**
- Offset
  - Voltage
  - Current
  - Parameter
  - Values
  - Switch cursor left/Right

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**PARAMETER DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION DATABASE**
- Parameter database
  - Setting parameter
  - Values

**PARAMETERS**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**LIMITS**
- Parameter database
  - Setting parameter
  - Values

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATA**
- Parameter database
  - Setting parameter
  - Values

**DIAGNOSIS**
- Parameter database
  - Setting parameter
  - Values

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**NEW MENU**
- Adjustment
  - Setting parameter
  - Values

**VALUES**
- Offset
  - Voltage
  - Current
  - Parameter
  - Values
  - Switch cursor left/Right

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**PARAMETER DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION DATABASE**
- Parameter database
  - Setting parameter
  - Values

**PARAMETERS**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**LIMITS**
- Parameter database
  - Setting parameter
  - Values

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**NEW MENU**
- Adjustment
  - Setting parameter
  - Values

**VALUES**
- Offset
  - Voltage
  - Current
  - Parameter
  - Values
  - Switch cursor left/Right

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**PARAMETER DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION DATABASE**
- Parameter database
  - Setting parameter
  - Values

**PARAMETERS**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**LIMITS**
- Parameter database
  - Setting parameter
  - Values

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**NEW MENU**
- Adjustment
  - Setting parameter
  - Values

**VALUES**
- Offset
  - Voltage
  - Current
  - Parameter
  - Values
  - Switch cursor left/Right

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**PARAMETER DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION DATABASE**
- Parameter database
  - Setting parameter
  - Values

**PARAMETERS**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**LIMITS**
- Parameter database
  - Setting parameter
  - Values

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**NEW MENU**
- Adjustment
  - Setting parameter
  - Values

**VALUES**
- Offset
  - Voltage
  - Current
  - Parameter
  - Values
  - Switch cursor left/Right

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**PARAMETER DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION DATABASE**
- Parameter database
  - Setting parameter
  - Values

**PARAMETERS**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**LIMITS**
- Parameter database
  - Setting parameter
  - Values

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**NEW MENU**
- Adjustment
  - Setting parameter
  - Values

**VALUES**
- Offset
  - Voltage
  - Current
  - Parameter
  - Values
  - Switch cursor left/Right

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**PARAMETER DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION DATABASE**
- Parameter database
  - Setting parameter
  - Values

**PARAMETERS**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**LIMITS**
- Parameter database
  - Setting parameter
  - Values

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**NEW MENU**
- Adjustment
  - Setting parameter
  - Values

**VALUES**
- Offset
  - Voltage
  - Current
  - Parameter
  - Values
  - Switch cursor left/Right

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**PARAMETER DATABASE**
- Parameter database
  - Setting parameter
  - Values

**INFORMATION DATABASE**
- Parameter database
  - Setting parameter
  - Values

**PARAMETERS**
- Project name
- Data set number
- Test program
- Test program number
- Test program length

**LIMITS**
- Parameter database
  - Setting parameter
  - Values

**GROUPS**
- Parameter database
  - Setting parameter
  - Values

**DATABASE**
- Parameter database
  - Setting parameter
  - Values
12.3 Description of error areas (error groups)

Error groups

002  Error generator
003  Error press
004  Error sound enclosure
005  Error Limits
006  Error digital I/Os
007  Error hardware
008  Error RS232
009  Error CANopen

020  Warning limits
021  Warning parameters

12.4 Detailed description of errors (error numbers)

12.4.1 Explanation concerning priority

Low:  These errors can be cleared with buttons F1, F2 or input RESET_IN (STO_2_1 PIN9).

High: errors cannot be cleared. The generator must be switched off.

Warning: These messages are for information only. Warnings do not need to be cleared.

Error generator (error group 002:xxx)

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Priority</th>
<th>Type of error</th>
<th>ERROR_HIGHPRI0_OUT</th>
<th>ERROR_OUT</th>
<th>ERROR_CODE1_OUT</th>
<th>ERROR_CODE2_OUT</th>
<th>ERROR_CODE3_OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>002:000</td>
<td>Maximum power loss reached (Pv test)</td>
<td>low</td>
<td>Oscillator</td>
<td>0 1 1 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002:001</td>
<td>Supply voltage too low</td>
<td>high</td>
<td>Generator</td>
<td>1 1 0 1 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002:002</td>
<td>Power pack +12V defective</td>
<td>high</td>
<td>Generator</td>
<td>1 1 0 1 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002:003</td>
<td>Minimal level control final stage</td>
<td>high</td>
<td>Generator</td>
<td>1 1 0 1 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002:004</td>
<td>Temperature final stage too high</td>
<td>high</td>
<td>Generator</td>
<td>1 1 0 1 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002:005</td>
<td>Frequency minimum undershot</td>
<td>low</td>
<td>Oscillator</td>
<td>0 1 1 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002:006</td>
<td>Frequency maximum exceeded</td>
<td>low</td>
<td>Oscillator</td>
<td>0 1 1 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002:007</td>
<td>Maximum converter voltage exceeded</td>
<td>low</td>
<td>Oscillator</td>
<td>0 1 1 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002:008</td>
<td>Power overload level exceeded</td>
<td>low</td>
<td>Oscillator</td>
<td>0 1 1 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002:009</td>
<td>Full level control of the final stage reached</td>
<td>low</td>
<td>Oscillator</td>
<td>0 1 1 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002:010</td>
<td>Converter not connected</td>
<td>low</td>
<td>Oscillator</td>
<td>0 1 1 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Error press (error group 003:xxx)

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Priority</th>
<th>Type of error</th>
<th>[ERROR]_HIGHPRIO_OUT</th>
<th>[ERROR]_OUT</th>
<th>[ERROR]_CODE1_OUT</th>
<th>[ERROR]_CODE2_OUT</th>
<th>[ERROR]_CODE3_OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>003:000</td>
<td>Error when measuring travel</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>003:001</td>
<td>Error valves</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>003:002</td>
<td>Error two-hand start</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>003:003</td>
<td>Rest position of press not reached</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>003:004</td>
<td>Error safety switch</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>003:005</td>
<td>Maximum cycle time reached</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>003:006</td>
<td>Welding interrupted</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>003:007</td>
<td>Error trigger set</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>003:008</td>
<td>Error ultrasonic active</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>003:009</td>
<td>Error system pressure too low</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### Error sound enclosure (error group 004:xxx)

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Priority</th>
<th>Type of error</th>
<th>[ERROR]_HIGHPRIO_OUT</th>
<th>[ERROR]_OUT</th>
<th>[ERROR]_CODE1_OUT</th>
<th>[ERROR]_CODE2_OUT</th>
<th>[ERROR]_CODE3_OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>004:000</td>
<td>Error during initialisation</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>004:001</td>
<td>Lifting door not open at start of cycle</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>004:002</td>
<td>Time overrun lower lifting door</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>004:003</td>
<td>Time overrun raise lifting door</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>004:004</td>
<td>Enclosure door open</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>004:005</td>
<td>Lifting door open during cycle</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
## Error limits (error group 005:xxx)

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Priority</th>
<th>Type of error</th>
<th>ERROR_HIGHPRIO_OUT</th>
<th>ERROR_OUT</th>
<th>ERROR_CODE1_OUT</th>
<th>ERROR_CODE2_OUT</th>
<th>ERROR_CODE3_OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>005:000</td>
<td>Limit time max exceeded</td>
<td>low</td>
<td>Limit</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>005:001</td>
<td>Limit time min undershot</td>
<td>low</td>
<td>Limit</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>005:002</td>
<td>Limit energy max exceeded</td>
<td>low</td>
<td>Limit</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>005:003</td>
<td>Limit energy min undershot</td>
<td>low</td>
<td>Limit</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>005:004</td>
<td>Limit power max exceeded</td>
<td>low</td>
<td>Limit</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>005:005</td>
<td>Limit power min undershot</td>
<td>low</td>
<td>Limit</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>005:006</td>
<td>Limit travel absolute max exceeded</td>
<td>low</td>
<td>Limit</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>005:007</td>
<td>Limit travel absolute min undershot</td>
<td>low</td>
<td>Limit</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>005:008</td>
<td>Limit travel differential max exceeded</td>
<td>low</td>
<td>Limit</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>005:009</td>
<td>Limit travel differential min undershot</td>
<td>low</td>
<td>Limit</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>005:010</td>
<td>Target part count reached</td>
<td>low</td>
<td>Limit</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

## Error digital I/Os (Error group 006:xxx)

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Priority</th>
<th>Type of error</th>
<th>ERROR_HIGHPRIO_OUT</th>
<th>ERROR_OUT</th>
<th>ERROR_CODE1_OUT</th>
<th>ERROR_CODE2_OUT</th>
<th>ERROR_CODE3_OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>006:000</td>
<td>Stop cycle</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>006:001</td>
<td>Stop 1 set</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>006:002</td>
<td>Stop 2 set</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>006:003</td>
<td>Reset set</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>006:004</td>
<td>Start external dropped out</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>006:005</td>
<td>External start still requested</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>006:006</td>
<td>Inputs for data set transfer incorrect</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>006:007</td>
<td>Analog amplitude input too low</td>
<td>low</td>
<td>Cycle</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
### Error hardware (error group 007:xxx)

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Priority</th>
<th>Type of error</th>
<th>ERROR_HIGHPRI_OUT</th>
<th>ERROR_OUT</th>
<th>ERROR_CODE1_OUT</th>
<th>ERROR_CODE2_OUT</th>
<th>ERROR_CODE3_OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>007:001</td>
<td>Short circuit output group 1</td>
<td>high</td>
<td>Hardware</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>007:002</td>
<td>Short circuit output group 2</td>
<td>high</td>
<td>Hardware</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>007:003</td>
<td>Short circuit output group 3</td>
<td>high</td>
<td>Hardware</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>007:004</td>
<td>Short circuit output group 4</td>
<td>high</td>
<td>Hardware</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>007:005</td>
<td>Short circuit output group 5</td>
<td>high</td>
<td>Hardware</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>007:006</td>
<td>Short circuit output group 6</td>
<td>high</td>
<td>Hardware</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>007:007</td>
<td>Pressure input &lt;1mA</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>007:008</td>
<td>Trigger input &lt;1mA</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>007:009</td>
<td>Analogue amplitude input&gt;12V (120%)</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

### Error RS232 (Error group 008:xxx)

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Priority</th>
<th>Type of error</th>
<th>ERROR_HIGHPRI_OUT</th>
<th>ERROR_OUT</th>
<th>ERROR_CODE1_OUT</th>
<th>ERROR_CODE2_OUT</th>
<th>ERROR_CODE3_OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>008:000</td>
<td>Bit overrun error (characters were lost)</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>008:001</td>
<td>Parity error (incorrect parity character)</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>008:002</td>
<td>Framing error (no valid stop bit, incorrect bit rate)</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>008:003</td>
<td>Break interrupt (byte too long, incorrect bit rate)</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>008:004</td>
<td>No receiver connected</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
## Error CANopen (Error group 009:xxx)

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Priority</th>
<th>Type of error</th>
<th>ERROR_HIGHPRIO_OUT</th>
<th>ERROR_OUT</th>
<th>ERROR_CODE1_OUT</th>
<th>ERROR_CODE2_OUT</th>
<th>ERROR_CODE3_OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>009:000</td>
<td>SDO read error (possible timeout)</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>009:001</td>
<td>SDO write error (possible timeout)</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>009:002</td>
<td>SDO service (incorrect parameter)</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>009:003</td>
<td>SDO access error (incorrect value range)</td>
<td>low</td>
<td>Hardware</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
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<tr>
<td>009:004</td>
<td>SDO other error</td>
<td>low</td>
<td>Hardware</td>
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</table>

## Warnings Limits (Warning group 020:xxx)

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Priority</th>
<th>Type of error</th>
<th>ERROR_HIGHPRIO_OUT</th>
<th>ERROR_OUT</th>
<th>ERROR_CODE1_OUT</th>
<th>ERROR_CODE2_OUT</th>
<th>ERROR_CODE3_OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>020:000</td>
<td>Time max exceeded</td>
<td>Warning</td>
<td>Warnings</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
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<tr>
<td>020:001</td>
<td>Time min undershot</td>
<td>Warning</td>
<td>Warnings</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>020:002</td>
<td>Energy max exceeded</td>
<td>Warning</td>
<td>Warnings</td>
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</tr>
<tr>
<td>020:003</td>
<td>Energy min undershot</td>
<td>Warning</td>
<td>Warnings</td>
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<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>020:004</td>
<td>Power max exceeded</td>
<td>Warning</td>
<td>Warnings</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>020:005</td>
<td>Power min undershot</td>
<td>Warning</td>
<td>Warnings</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>020:006</td>
<td>Travel absolute max exceeded</td>
<td>Warning</td>
<td>Warnings</td>
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<td>020:007</td>
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<td>Warnings</td>
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<tr>
<td>020:008</td>
<td>Travel differential max exceeded</td>
<td>Warning</td>
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<td>020:009</td>
<td>Travel differential min undershot</td>
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## Warnings Parameters (Warning group 021:xxx)

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Priority</th>
<th>Type of error</th>
<th>ERROR_HIGHPRIO_OUT</th>
<th>ERROR_OUT</th>
<th>ERROR_CODE1_OUT</th>
<th>ERROR_CODE2_OUT</th>
<th>ERROR_CODE3_OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>021:000</td>
<td>Data set empty / data not loaded</td>
<td>Warning</td>
<td>Warnings</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>021:001</td>
<td>Warning data not deleted</td>
<td>Warning</td>
<td>Warnings</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
12.3 Cleaning the machine

Caution!
Cleaning and maintenance work may only be carried out by trained personnel. Before beginning the maintenance work, make sure that all power sources, such as electrical power and compressed air, are disconnected. Never clean the keyboard or the display with acidic cleaners. The multipress and the generator do not require any special maintenance.

However, regularly cleaning the
- actuator,
- clamping table (13),
- anvil (11),
- horn (9),

guarantees a long and problem-free operation of the press system.

Clamping table
Clean the clamping plate (13) regularly.

Pneumatic unit
After work is completed, bring the compressed air valve (21) into a transverse position; this reduces maintenance work.

Lubrication system
Maintenance-free.

Generator
Always keep the generator display clean.
Oscillator system

⚠️

Danger!

Work on the oscillator system and converter housing only if the supply voltage is switched off! High voltage!

Avoid contact with the RF socket of the converter.

Do not connect any measuring device to the RF socket of the converter!

The converter contains an electrical charge even after the generator has been switched off!

Screw connection

Converter (24), booster (25) and horn (9) are screwed to each other.

Tightening torque: 30 – 40 Nm

Black spots on the surfaces of the booster (25) and the horn (9) can be easily removed.

1. Lay a polishing rag on an flat surface
2. Draw the black spots over the polishing rag.
12.4 Fuses on the generator

All fuse dimensions: 5 x 20 mm.

List of the fuses for the generators
1000 W / 2000 W / 3000 W

<table>
<thead>
<tr>
<th>Generator</th>
<th>F1</th>
<th>F2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADG20-1000</td>
<td>10 A/T</td>
<td>10 A/T</td>
</tr>
<tr>
<td>ADG20-2000</td>
<td>12.5 A/T</td>
<td>12.5 A/T</td>
</tr>
<tr>
<td>ADG20-3000</td>
<td>16 A/T</td>
<td>16 A/T</td>
</tr>
</tbody>
</table>
13 Service addresses

The RINCO ULTRASONICS AG technical service agents are happy to answer any questions you may have concerning any technical malfunctions or welding problems which may occur. Our customer service agents need the following information for earnest advice:

- an exact description of the technical problem or the welding problem.
- article number and serial number of the unit

Our address:
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info@rincoultrasonics.com