

Operating Instructions



Dynamic 3000

with Generator ACU





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.

Copyright by RINCO ULTRASONICS AG, Switzerland

Version 3, gb, Art.-No. 31622

Manual established with:

ACU20-3000P-230-B1

ACU Front 01_B / 3C08

PU_B1 V1.14

DGC0401 / 0G64

NL-Bus print V4.2

NL-Distributor print V1.2

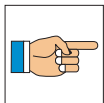
NL- I/O card V2.0

Press Dynamic 3000 Series:

Press print SW 5P07

Creation date: 08.10.2008

Note



Before the machine is unpacked and started up, these operating instructions must be read and their content must be observed when operating the machine.

The machine may only be operated, serviced and repaired by persons who are familiar with these operating instructions and the current statutory regulations for health and safety at work.

Agency

--

Content

1 Safety	6	12 Init mode	45
1.1 Explanation of symbols and signs	6	12.1 System initialisation	45
2 Safety advice	7	12.2 System initialisation «Init mode»	45
2.1 General	7	12.3 Description of data string	50
2.2 Agreed usage	7	12.3.1 Brief description	50
2.3 Not used as intended	7	12.3.2 Structure of the data string	50
2.4 Special points to note	7	12.3.3 Example of an output	50
2.5 Choosing staff	7	13 Change of modules	51
2.6 Installation	7	13.1 The ACU generator and its modules	51
2.7 Operation	8	13.2 Fuses of generator	53
2.8 Noise emissions	8	13.3 List of fuses for generators	53
2.9 Emergency stop button	9	13.4 Fuses on the press	54
2.10 Guarantee explanation	9	13.5 List of fuses for the press	54
3 Transport	10	14 General maintenance work	55
3.1 Locating the equipmen	10	14.1 Cleaning the equipment	55
3.2 Unpacking/Goods received inspection	10	14.2 Clamping table	55
3.3 Damage in transit	10	14.3 Pneumatics unit	55
4 Product information	12	14.4 Lubrication system	55
4.1 Product overview	12	14.5 Generator	55
4.1.1 Unit	12	14.6 Oscillation system	56
4.1.2 Press	12	14.6.1 Screwed connections	56
4.1.3 Sound enclosure SSK-G with Press	13	14.7 Error messages and their correction during power on	57
4.1.4 Oscillator system	14	14.8 Actuator	57
4.1.5 Booster	14	14.9 Error messages and their correction	57
4.1.6 Converter	15	14.10 Error messages and their correction during set-up and welding	57
4.1.7 Generator/Controller	15	14.11 ACU error messages	58
5 Initial set-up	16	14.11.1 Acknowledging an error message	58
5.1 Assemble and connect the device	16	14.11.2 Error codes	58
6 Operating and display elements	18	14.11.3 Generator errors (area 002:xxx)	58
6.1 Multi-press	18	14.11.4 Press errors (area 003:xxx)	62
6.2 ACU Controller module	20	14.11.5 Sound enclosure errors (area 004:xxx)	63
6.3 The graphics and text display	20	14.11.6 Main module errors (area 010:xxx)	64
6.4 The Keyboard	22	14.11.7 CAN bus errors (area 011:xxx)	66
7 Programming the equipment	24	14.11.8 Generator SW errors (area 013:xxx)	67
7.1 Set-up	24	14.11.9 Digital I/O errors (area 015:xxx)	67
7.2 Setting the clamping table up	29	14.12 Error localization	68
7.3 The weld cycle process	29	14.12.1 Overview error localization	68
8 Interaction press, generator, control system	30	14.12.2 «ACU fails to start»	69
9 Weld technology	31	14.12.3 «Booting problems»	70
9.1 Process description	32	14.12.4 «Press is not detected»	71
9.2 Dynamic 3000 weld technology	33	14.12.5 «Problems with sensor technique and control of the press»	72
10 Operating modes	35	14.12.6 «Top end position/safety switch»	73
10.1 Operating mode selection	35	14.12.7 «Start on press missing»	74
10.2 The limits	35	14.12.8 «Pneumatic problems 1»	75
10.3 The individual modes	36	14.12.9 «Pneumatic problems 2»	76
11 Database/Data transfer	43	14.12.10 «Travel measurement»	77
11.1 The Database	43	14.12.11 «Force measurement»	78
11.2 Extended data evaluation	43	14.13 Interface pin assignment	79
11.2.1 Description of functions ACUremote	43	14.13.1 Integration into special purpose machine (control through PLC)	80
11.2.2 Description of functions ACUcapture	44	14.14 The press control system	82
11.2.3 Datatransfer with datastring	44	14.14.1 Pin assignment on Dynamic control board	84
		15 Service Adresses	85

Important!

When contacting us with any questions relating to your welding press Dynamic 3000 and the generator, please be ready to give us the model description and the unit serial number.

This information is to be found on the rating plate (A and B) on the side of the unit as well as on the back of the generator.

Dynamic 3000: Press with 3000 N max. power

The design and switching of this device are constantly undergoing development and improvement and represent the present state of the art in terms of the technology used.

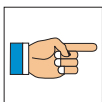
RINCO ULTRASONICS AG
Romanshorn, Schweiz

Preface

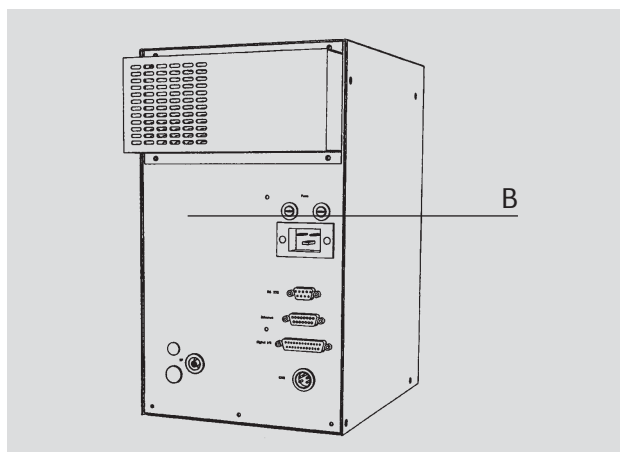
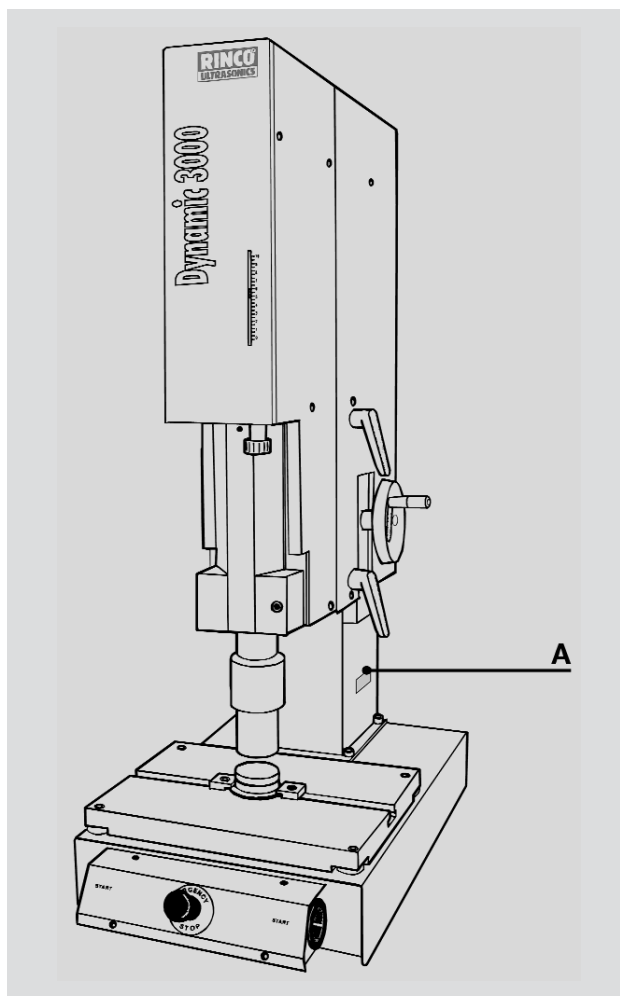
We are very pleased that you chose to buy a RINCO product. We are convinced that you will achieve a maximum degree of economy of operation and product quality when using this unit.

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.



This manual describes Dynamic 3000 with SSK-G acoustic cabin in operation with ACU-20-2000 and ACU-20-3000 generators.



RINCO
ULTRASONICS
A KREST GROUP COMPANY

Made in Switzerland by:
Rinco Ultrasonics AG
Industriestrasse 4
CH-8590 Romanshorn



RINCO
ULTRASONICS
A KREST GROUP COMPANY

Made in Switzerland by:
Rinco Ultrasonics AG
Industriestrasse 4
CH-8590 Romanshorn



Typ:

Artikel-Nr.:

Serie-Nr.:

Baujahr:

Typ:

Artikel-Nr.:

Serie-Nr.:

Baujahr:

VAC:

Generator:

Fuse

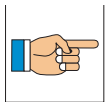
1 Safety

1.1 Explanation of symbols and signs

Hazard warnings and notices of caution are highlighted by symbols. The symbols are displayed in the operating instructions and some even on the welding equipment itself. All hazard warnings and caution symbols describe circumstances in which people could be harmed, objects and the environment could suffer damage if disregarded.

Hazard warning symbols follow the same pattern throughout the operating instructions.

Hazard warning pattern



Note!

Very important information or operational note on how to weld properly with the ultra sonic equipment.



Caution!

Describes the grave hazards to the health of people or damage to equipment that may result from disregard.



Danger!

Describes dangers that may result in death or grave bodily harm to people if disregarded.

2 Safety advice

2.1 General

The design of the welding press, the generator and the controller confirm to the highest technical standards and are safe to operate. The individual sub-assemblies as well as the complete unit are subjected to continuous quality checks.

2.2 Agreed usage



The welding press is only to be used for the ultra-sonic welding of suitable plastic materials. Any other usage which goes beyond this usage is considered to be outside the terms of agreed usage. The manufacturer accepts no responsibility for any damage so caused. The user is the sole risk bearer in such a case. Intended for industrial use.

2.3 Not used as intended

- Operating the equipment without required knowledge of how to operate, maintain and service the equipment.
- Alterations, additions and modifications to the welding equipment and the generator that could impede safety without the explicit written permission of Rinco Ultrasonics.
- Software alterations at the software control level!
- Working with improper materials.
- Opening the equipment during operations
- Improper handling of the converter while under voltage.
- Setting off the two hand trigger by a second person.

2.4 Special points to note

The Operating instructions should be read thoroughly before setting the equipment up. The Operating instructions should be available at the point of usage at all times.

2.5 Choosing staff

Only authorised personnel should work on the welding press. Only deploy trained personnel. Responsibilities for operation, set-up, maintenance and repair work must be clearly defined. Ensure that only authorised personnel carry out any work on the welding press. Any work on the electrical equipment of the welding press should only be carried out by a trained electrician or by suitably trained personnel working under the guidance and supervision of a trained electrician, in accordance with electro-technical regulations. Only personnel with knowledge and experience of pneumatics should work on the pneumatic equipment.

2.6 Installation



Danger!

Peripheral connection work should only be carried out after the mains cable is disconnected.

The power connection should always be earthed.

Any safety regulations in force in the country of installation must be observed.

The manufacturer accepts no responsibility for any damage to property or personal injury caused if any such regulations are not observed.

Make sure the equipment is in a secure and safe condition before starting to operate it.

Only dry compressed air should be used with the equipment. If necessary a water separator must be installed to ensure the air is dry.

2.7 Operation



Caution!

Neither the generator nor the converter housing should be opened while the press is in use.



Danger!

There is high voltage to be found within the equipment. Take care to avoid injury.

- Carry out all operations in such a way as to maximise personal safety.
- The welding press should only be used when all safety and security equipment such as detachable safety equipment, the EMERGENCY STOP button, sound protection are available and usable.
- If safety measures such as sound proof cabins are not ordered and used by the customer, the manufacturer accepts no responsibility for any damage which could have been avoided, had such equipment been used.
- Before switching the welding press on, make sure that nobody could be injured by the starting press.



Danger!

In normal operation, the dual safety switch should be operated by one person using both hands.

The manufacturer accepts no liability for any personal injury or damage to property caused if the dual safety switch is operated with the help of another person or in any other way other than the correct way.

The correct operation and the careful handling of equipment and their tools:

- maintains operational readiness,
- lengthens the working life and
- reduces downtime to a minimum.

2.8 Noise emissions



Caution!

Limits: According to currently accepted thinking on the subject, ultrasound doesn't cause any damage, so long as the maximum noise level is under 140 dB and the average, over the course of an 8 hour day, is under 110 dB.

Special care should be taken in respect of the subharmonic, i.e. audible oscillations which can fluctuate greatly and can have very uncomfortable and damaging effects. Of importance here is the energy equivalent long-term noise level (Leq) limit of 85-87 dB(A) based on a typical working period of a min. 8 hour day / max. 2,000 hours/year.



While welding certain materials the noise level may exceed 70 dB (A).

Counter measures:

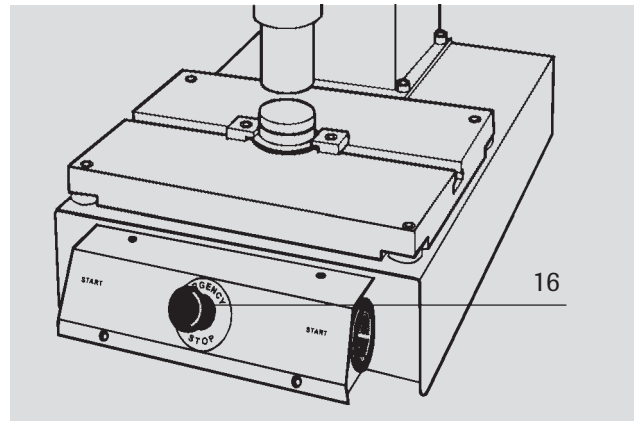
- Wear ear plugs
 - Wear noise dampening helmet (optional)
 - Operation with sound enclosure
- (Data taken from SUVA Information No. 86048 d 4.94)

For further measured values, see «Sound measurement report of RINCO systems», No. 920-3903/1.95

2.9 Emergency stop button

The Emergency stop button (16) should be pressed if there is any threat of injury to the operator or damage to the press.

- The press returns to its base position.

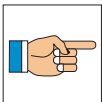


2.10 Guarantee explanation

By delivering the equipment, RINCO ULTRASONICS AG enters into a guarantee commitment in accordance with VSM (Federation of Swiss Machine Manufacturers).

The requirements necessary for the terms of the guarantee to be met by RINCO Ultrasonics AG include:

- The user must be aware of the contents of the Operating instructions.
- The instructions and advice contained within the Operating instructions must be followed.
- Any arbitrary modifications or changes made to any of the components which make up the press, the oscillator system and the generator are not allowed.



RINCO ULTRASONICS AG is very happy to clarify any points on the telephone or to give assistance with the carrying out of an instruction by a suitably qualified person.

3 Transport



Equipment may only be transported by suitably trained personnel.

Please note the transport advice on the packaging. The press and the generator should be transported separately.

Eyebolts are fitted for transporting the sound enclosure SSK-G.

The front panel can be removed at the lower end near the double-handed start switch to enable a stacker to lift the cabin. For transport purposes, the cabin is also packed with a pallet and is protected on all sides by wooden panels.

3.1 Locating the equipment

- The clamping levers (19) must be clamped in the given direction.
- Slide the transport strap up to the rectangular column (10) in direction A

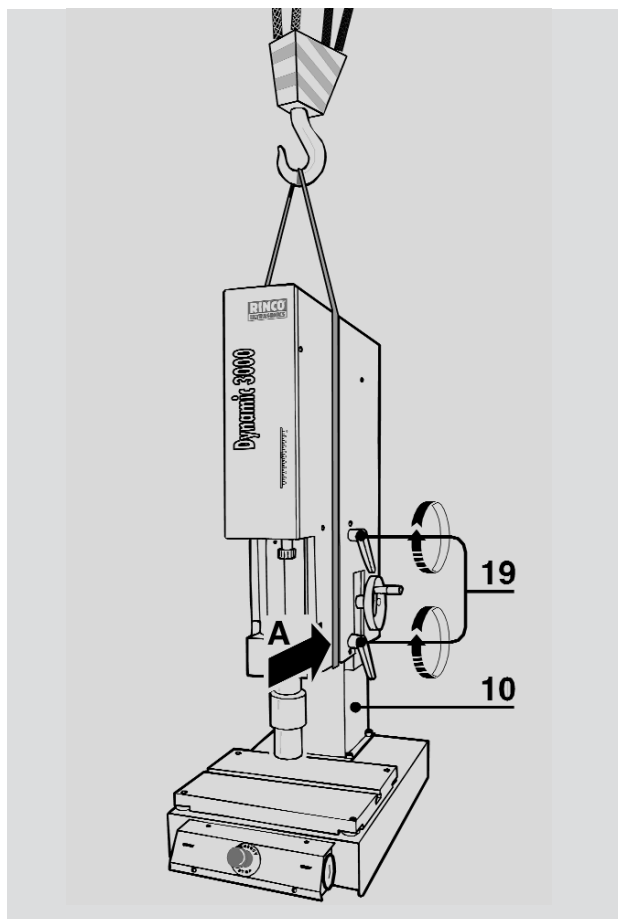
3.2 Unpacking / Goods received inspection

The press is screwed to the pallet for transport. Before moving the unit within your premises, the transport locking screws should be released. The transit container used for machines and equipment is suitable for normal transportation by road, rail or air.

After receipt of your consignment, carry out an inspection to ensure that all the parts listed on the packing manifest are there and that there is no visible damage. If there is any damage, the freight handler should be advised immediately and all packaging should be retained as evidence.

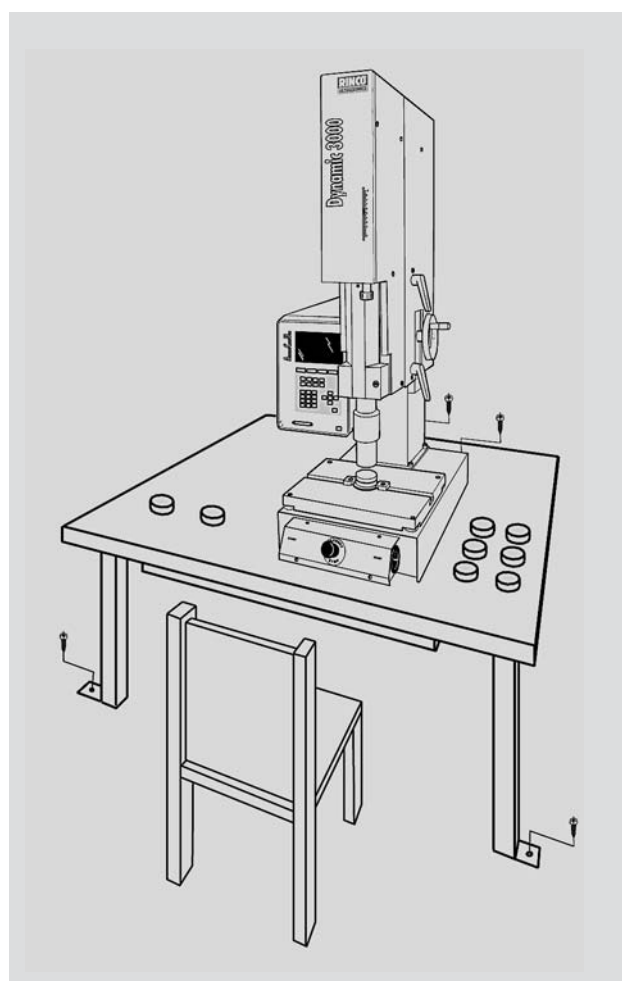
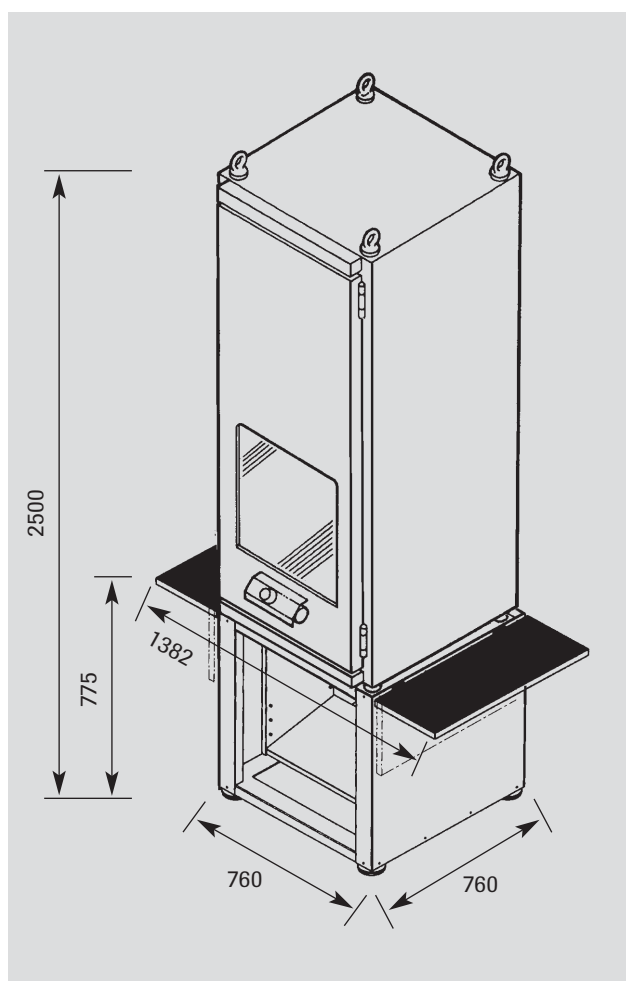
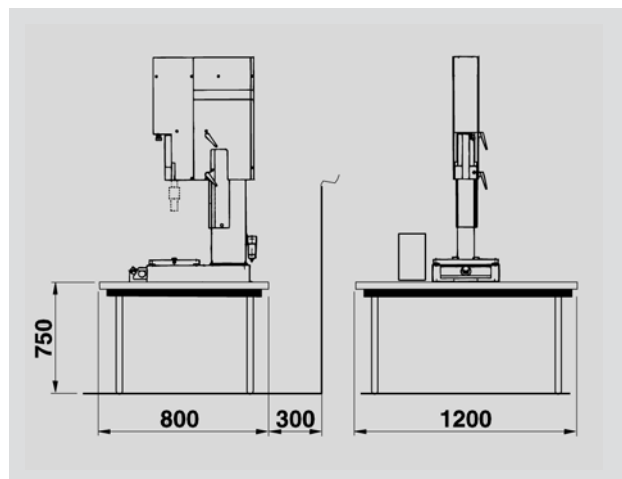
3.3 Damage in transit

The freight handler is responsible for any damage which may have occurred while the goods were in transit. A complete report giving full details of the damage must be submitted to the transport company and this forms for the basis for any claims for compensation. If there is any damage to or loss from goods delivered by us, this must be reported to



us immediately and confirmed by submitting a copy of the report mentioned above.

If the delivery from RINCO Ultrasonics AG was made on a FH or CIF basis, the damaged shipment will be replaced as necessary and a claim will be lodged with the transport firm responsible.



4 Product information

4.1 Product overview

4.1.1 Unit

The Dynamic 3000 press is proportionally pneumatically controlled and together with the ACU Control module generator, enables the application of adjusted force-profiling.

- 1 Press
- 2 Generator / Controller
- 3 Take-up
- 4 Converter
- 5 Booster
- 6 Horn

4.1.2 Press

- Maximum tool travel: 100 mm
- Force at 6 bar: 3'000 N
- Nominal frequency 20 kHz
- Travel measuring system $\pm 0,01$ mm
- Height adjustment 10-290 mm
- Overhang 220 mm (horn post)
- Adjustable depth control stop with vernier scaling 0.1 mm.
- Recision ball guide on the feed slide
- Double-action cylinder
- Switch for upper cylinder home
- Dynamic force sensor to trigger ultrasonics and to control the force used
- Power (Generator) 2000, 3000 W
- Trigger Piezzo Force-sensor

Base

- Ribbed steel construction
- Tool clamping plate with T-slot and parallel alignment mechanism
- Dual-operation safety switch and emergency stop button

Compressed air

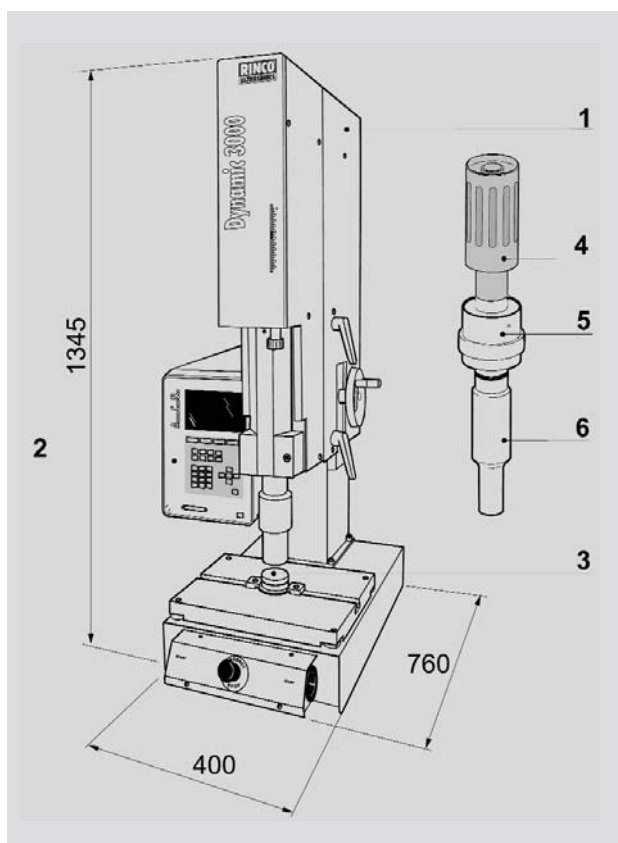
- Dry compressed air, maximum 7 bar (105 PSI).



If the inlet pressure is more than 7 bar, an additional safety valve automatically blows off the overpressure.

Weight

- Weight: 120 kg
without generator

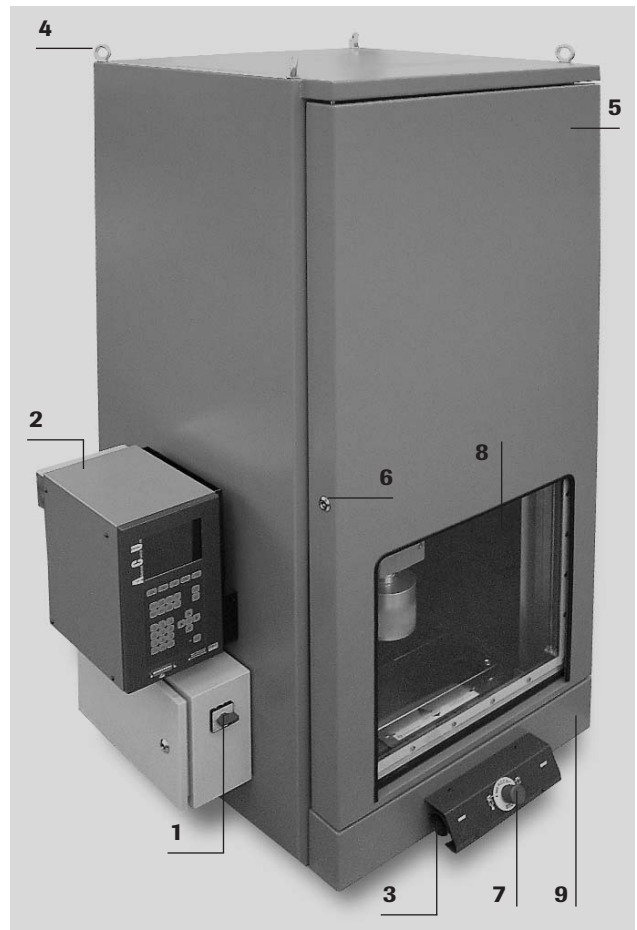


4.1.3 Sound enclosure SSK-G with press

Weight

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

- 1 Mains switch
- 2 Generator ACU and generator holder
- 3 Double-handed start switch
- 4 Eyebolts for transportation
- 5 Setting door
- 6 Lock
- 7 EMERGENCY-off switch
- 8 Lift door
- 9 Detachable front panel
(to lift the box)



4.1.4 Oscillator system

- 7 Horn
- 8 RF-connection
- 9 Converter
- 10 Booster

Amplitude amplification

The amplitude can be amplified by the use of various booster and horn types. The individual elements are mechanically thread-connected together.

The **tightening torque** for 20 kHz systems is 30 – 40 Nm. We recommend you to use the RINCO tool spanner.

The **permitted operating temperature** is between **10° C and 50° C**.

4.1.5 Booster

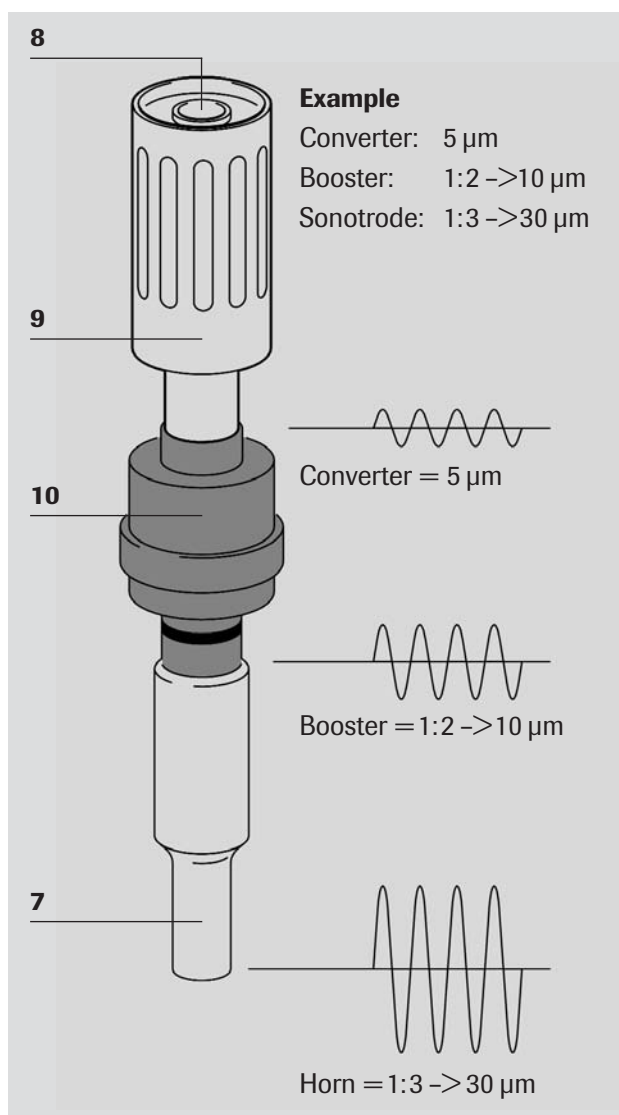
The following booster types are available for RINCO 20 kHz welding devices:

Reduce Booster	Colour	Material	Booster	Colour	Material
1:0.5	blue	aluminium	1:1	green	aluminium
1:0.6	violet	aluminium	1:1.5	yellow	aluminium
Further characteristics in accordance with order			1:2	white	titanium
			1:2.5	black	titanium
			1:3	brown	titanium

Connecting thread

- On the converter side: M16
- On the horn side: M12

Connecting surfaces should be thoroughly cleaned before assembly. If any parts exhibit damage to the connecting surfaces, they should be replaced.

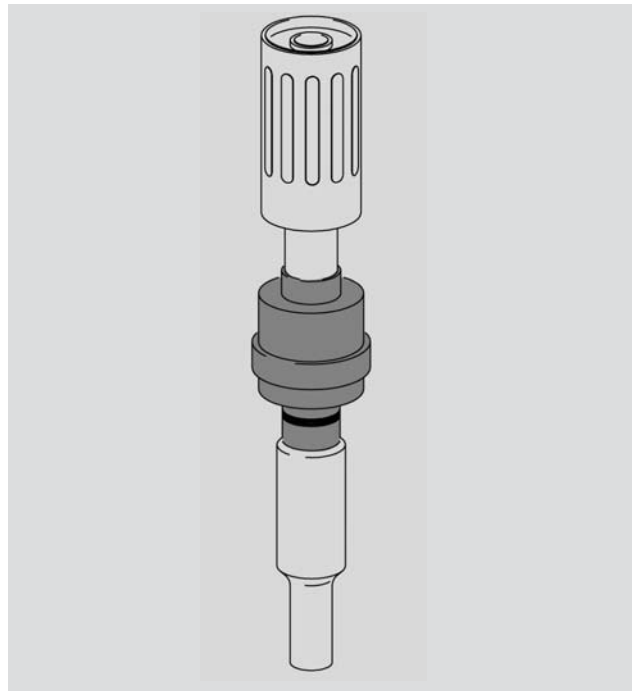


4.1.6 Converter

- Electrical connection: Lemo2 coaxial plug

If the generated heat should exceed 50°C, the converter should be cooled by the use of compressed air.

A separate cooling set is available for this purpose.



4.1.7 Generator / Controller

The modular design concept allows quick exchange of the power module as well as the controller.

Technical data

- Dimensions (WxLxH) 200 x 300 x 345 mm
- Power outputs: 2000, 3000W
- Voltage. 230 V, 50/60 Hz
- Connection Single-phase mains connection
- Interface Ethernet, RS 232
- Interface ACU/Press CAN Bus
- Display LCD graphics display 5,7"
- Parameter data base 50 welding data sets
- Procedure data base: the last 25 welding remain stored
- Weight approx. 16 kg

The generator meets the requirements of the following generic standards for industrial applications:

- EN 50081-2 EMC, interference emission
- EN 50082-2 EMC, interference immunity



5 Initial set-up

5.1 Assemble and connect the device

Carry out the following steps to get the unit ready for use:

1. Anchor the work table and bolt the press on the rearside.
2. Make the cable connections between the press and the generator.



Danger!

Only use an earthed power connection.

3. Plug the device plug into the socket on the generator:
 - 1 CAN (Press)
 - 2 HF (Converter connection)
 - 3 Power (Power connection)

Interfaces (optional):

- 4 RS232 (9 pin SUB-D)
- 5 Ethernet (15 pin SUB-D)
- 6 Digital I/O (25 pin SUB-D)

For further information, please see chapter 10, «Database/Data transfer». For pin assignment, see chapter 12.12 «Interface pin assignment».

If the actuator is delivered separately the provided sound absorbers need to be mounted on the air discharge ports at the back board before the initial operation.

Compressed air connection: maximum 7 bar.

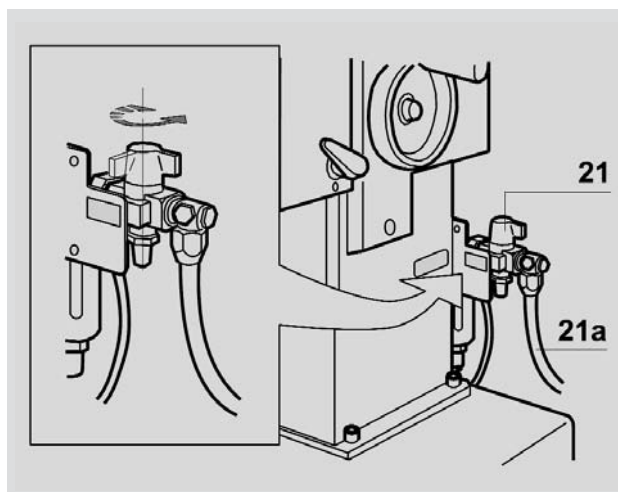
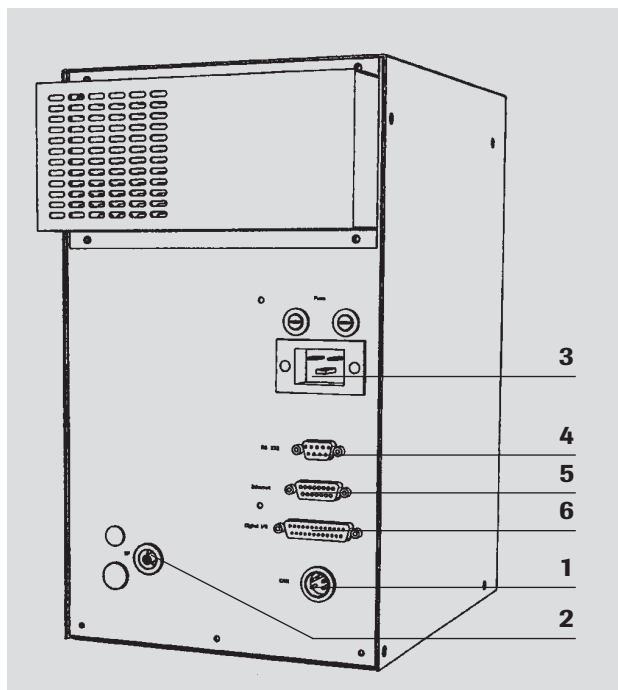
Turn the compressed air tap (21) at right angles to the direction of air flow.

4. Connect the compressed air hose (21a) to the compressed air supply network.
5. Move the compressed air tap (21) to the operating position (Fig. 4a).



During the initial installation of the converter, booster and horn, please read from the display the data when running empty concerning the stray power and frequency by pressing the «System Test» key and enter it on the last page, «Service Journal».

This entry is to be used for subsequent monitoring.



Mounted to sound enclosure SSK-G

- 1 Power (mains connection) ACU
- 2 Power (mains connection) control box
- 3 Digital Input/Output (25-pin SUB D)
- 4 CAN (press)
- 5 HF (converter housing)
- 6 Connection to air supply



Removing the rear panel of the sound enclosure enables rear access to the press and thus its installation or removal.



6 Operating and display elements

6.1 Multi-press

7 Converter housing

The oscillator system and the electrical cabling is in the converter housing.

9 Horn

The horn is actually the welding tool. It is set to the required resonance frequency by the manufacturer.



Caution!

Adjusted horns shouldn't be modified by any mechanical processes under any circumstances. This can cause subsequent damage to the oscillation system and the generator.

13 Clamping table

The integrated T slot makes it easy quickly to centre and fix the workpiece mount with the supplied fixing clamps.

14 Parallel adjusting nuts

Using the parallel adjusting nuts, you can adjust the position of the clamping table (13) very accurately which means the positioning of the workpiece mount to the horn front face is also very accurate.

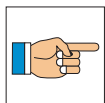
15 Dual safety switch

Pressing both switches at the same time triggers the welding cycle manually. The keys must be depressed within 0.3 seconds of each other. This guarantees that the operator cannot access the tool area at any time during the welding process. This measure was introduced to ensure operational safety and must not be removed or structurally modified in any way



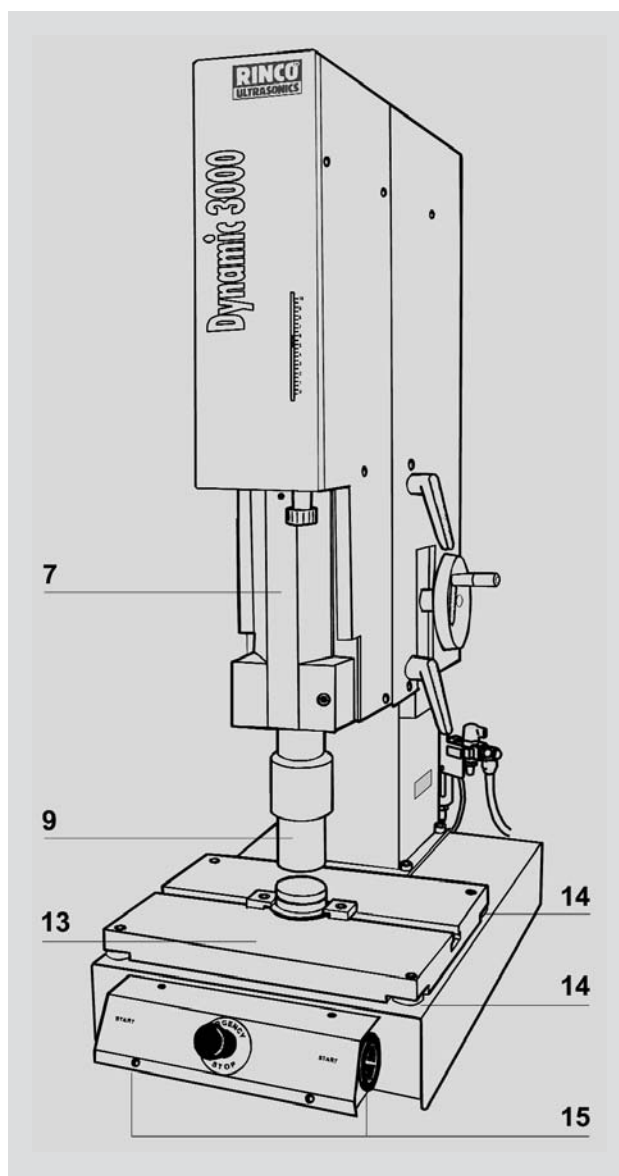
Caution!

Any safety regulations in force in the country of installation must be observed.



Note:

The manufacturer accepts no responsibility for any damage to property or personal injury caused if any such regulations are not observed.



6 Depth stop fine adjustment screw (Nonius)

The depth stop which has a 0.1mm scaling, can be used to set the distance between the horn surface and the workpiece mount to any value.

16 Emergency stop button

The press returns to its original position when you press the emergency stop button and stays locked in that position.

To release the emergency stop button:

- Pull the head of the button back to its start position.

18 Scale for feed

Scale to read-off and set-up the feed.

18.1 Trigger marking

The safety switch is activated if the trigger marking is passed. The cycle now continues automatically without the dual safety switch being pressed (6 mm).

19 Press head fixing clamping levers

Clamping device to fix the position of the press head after initial rough positioning.

20 Hand wheel for height setting

The height of the press head is set using the hand wheel.

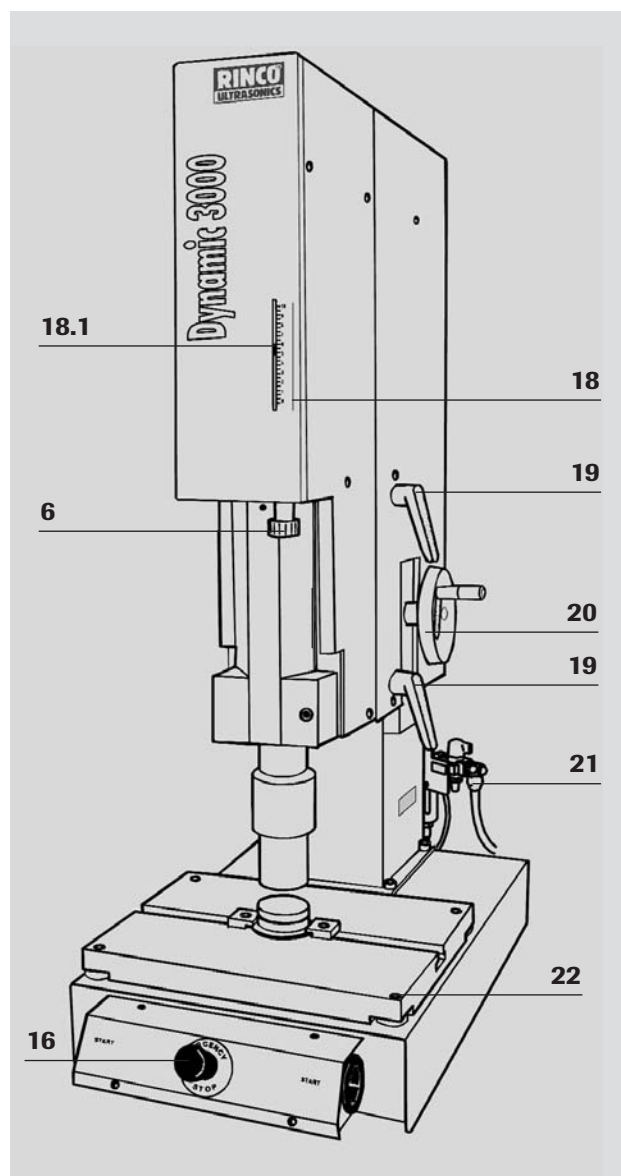
21 Compressed air connection tap

Tap to connect the press compressed air system to the local compressed air network.

The tap is used for energy separation between the local compressed air network and the press's compressed air system.

22 Clamping plate screws

Imbus clamping screws to release and fix the parallel adjustment clamping plate.

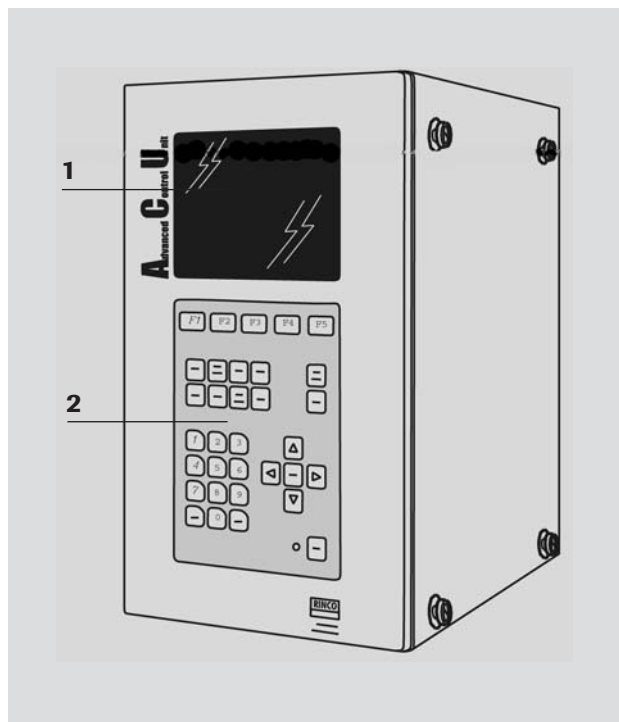


6.2 ACU Controller module

Program dialogue and result of the process are displayed numerically or graphically. During weld operation, the keyboard is locked so that no changes can be made. Enquiries can however still be made.

The keyboard can be released by entering the corresponding PIN code see chapter 7, «Programming the equipment».

- 1 Display LCD 5.7 « 1/4 VGA Monochrome Graphic display
- 2 Foil keyboard with 33 keys



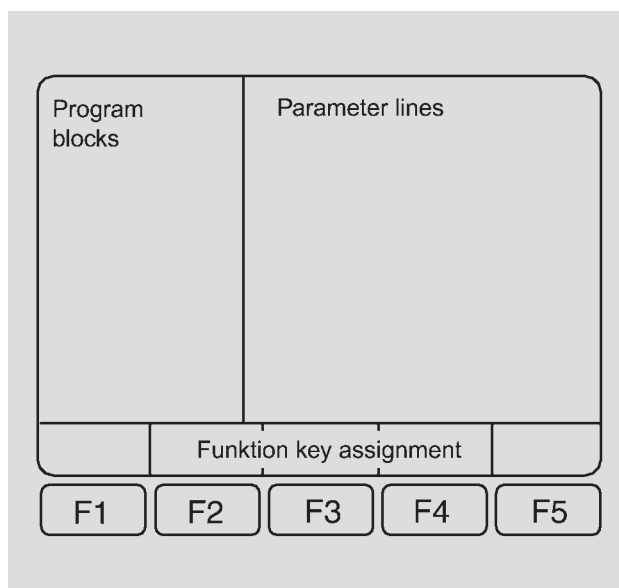
6.3 The graphics and text display

Depending on the selected function mode, the graphic and text display shows the following information:

In programming mode:

The display is divided into 3 zones:

- Program blocks (corresponding to the process steps).
- The parameter lines which belong to the current block.
- Status line: Describes the current status of the program.
- The function key assignment F1 to F5



In output mode after welding

Dynamics 3000 with ACU offers the option of showing the last weldings in a graphic or a numeric form on the screen.

Display selection is done with key Taste F1.

Numerical display

All process-relevant data is shown on the screen in order to analyse the weld. Additionally set limits are automatically shown next to the numbers.

[+]«Warning»

[!]«Error»

[*]«Limit exceeded»

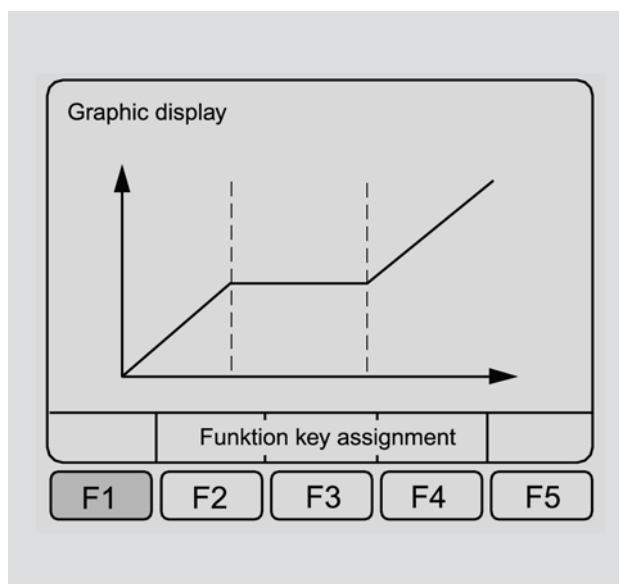
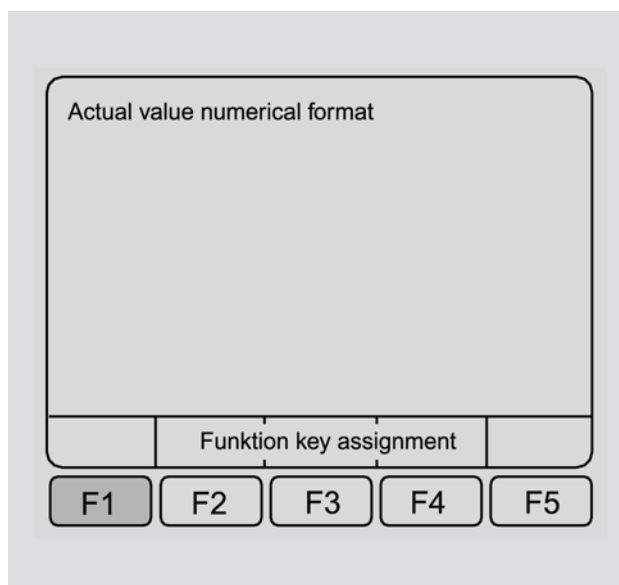
For more details check chapter 9.2, «The limits».

The last 25 welds are stored and can be queried using F4 and F5.

Graphic display

The process graphic can be enlarged with F5 ZOOM.

To enlarge the graphic further, a corresponding time window can be selected with F5 which is maintained until the equipment is switched off.



6.4 The Keyboard

The keyboard

After start-up, the controller is blocked against process data modifications. Enquiries can still be made.

The keyboard is broken down into 4 groups:

1 Function keys F1 - F5

They correspond to the functions shown on the bottom line of the screen.

2 Program help keys

Activated with PIN 1000

Mode:

Selects the corresponding operating mode

Parameter:

Process programming; data input.

Limits:

For the input of max./min. time, travel and energy values.

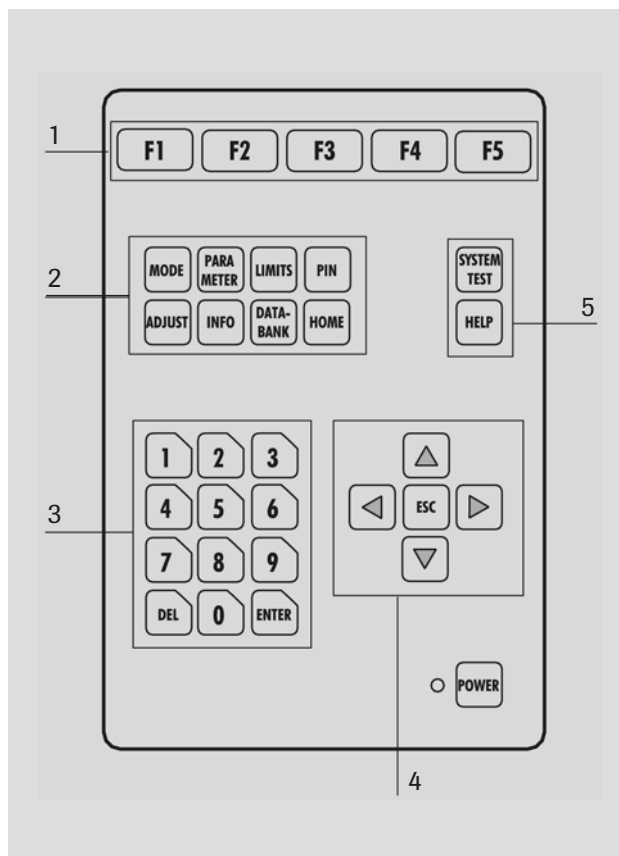
For more details check chapter 9, «Operating modes»

PIN:

For the input of the corresponding PINcode number

Adjust:

Setup operation; lowering and raising the press using the dual safety switch to centre the lower tool.



Info:

To enter information such as project or tool info, as well as the booster and horn amplifying factors for the automatic amplitude calculation.

Database:

For the direct loading, storage and deletion of data sets. Individual applications can be stored in a 50 line database.

Home:

Exits to the top program level.

3 Data input field:

Numbers 0-9; letters A-Z

DEL: delete

Enter: confirmation

For parameter entries (programming entries), it is not necessary to press «Enter».

4 Cursor field:

Cursor functions for writing and for changing data.

< > Additional functions for changing pre-set values.

ESC: Exit step by step in reversed order.

5 Systemunit:

System test: Ultrasound oscillator test

Display of stray power and frequency and the ACU software version, press type, press software version, generator type and generator software version

Help: Informative help. Related to the active display. This key can also be used without the PIN.

7 Programming the equipment

The ACU generator controller system is divided over the following levels:

Weld operation

Operation according to preset parameters without the option of making any changes.

Set-up operation

Operation with the option of changing weld parameters (PIN 1000).

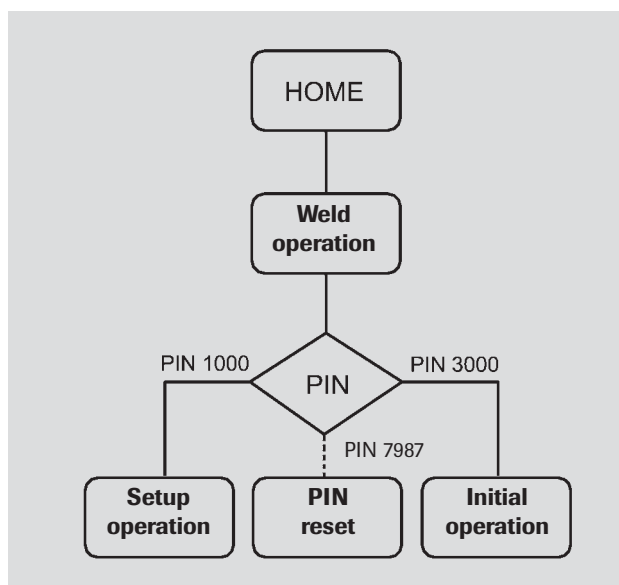
Initial operation

System initialisation PIN 3000

To define the base settings.

The 'HOME' key brings you back to the top operating level «Weld operation»

The 'ESC' key takes you back through the program levels step by step.



7.1 Set-up

All the functions described in the following can be executed with the door to the system with sound enclosure SSK-G either open or closed.

Setting the oscillation system up



Caution!

Power must be switched off at the generator before starting to install the oscillation system.

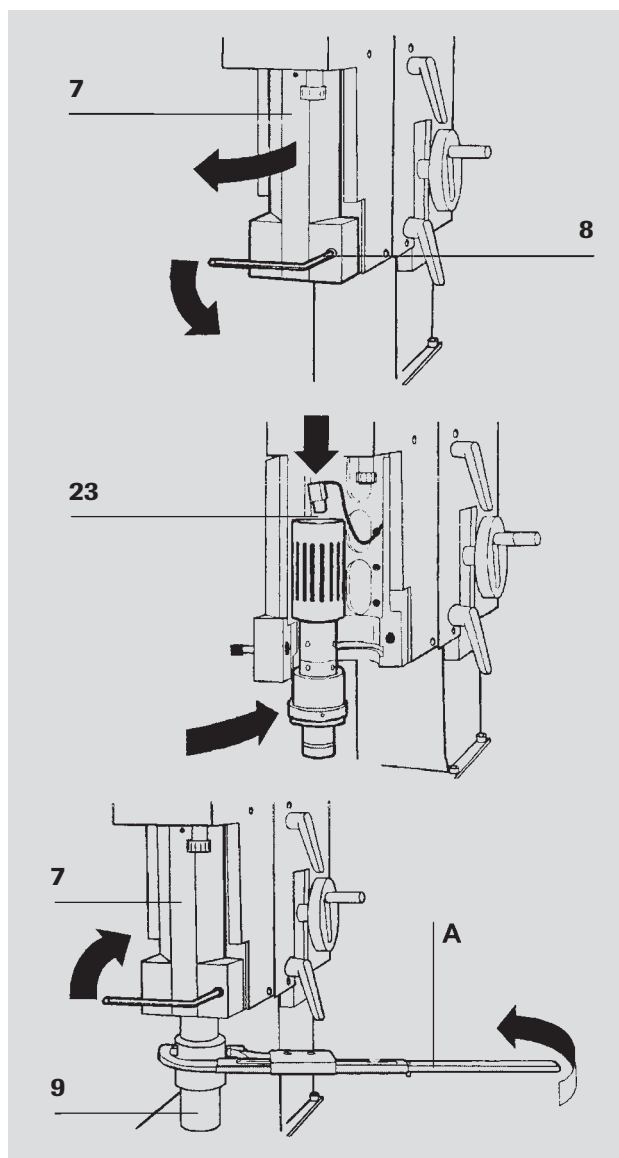
1. Open screw **(8)** with the supplied Allen key (SW 6 mm)
2. Open the cover **(7)** of the converter housing
3. Plug the HF plug in the converter HF connection **(23)**
4. Insert the oscillation system into the converter housing from the front
5. Replace the converter housing cover **(7)** and fix it in place with the Allen key

Tightening torque 20 - 30 Nm.

6. Screw the horn **(9)** in and tighten it with the special key **(A)** provided

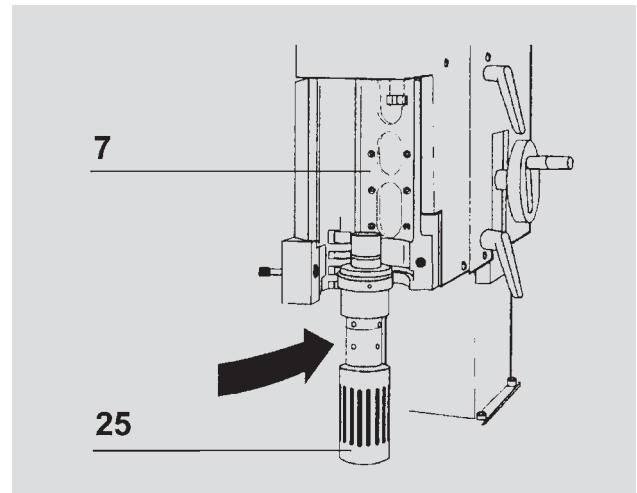
Tightening torque 30 - 40 Nm.

The oscillation system is ready for operation.



Booster change

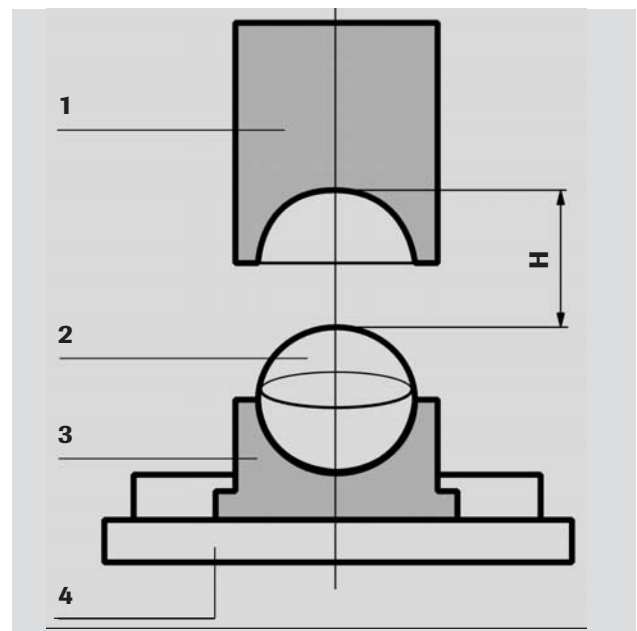
The oscillation unit **(25)** can be mounted without a horn in the reverse order in order to change the booster.



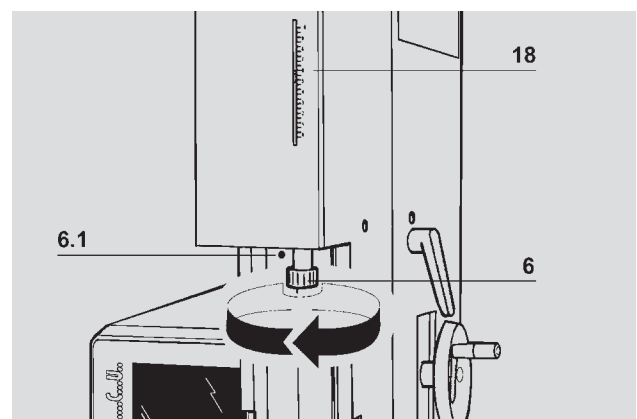
Workpiece set-up

1. Estimate the height «H» necessary to insert and remove the workpiece.

- 1 Horn
- 2 Workpiece
- 3 Workpiece mount
- 4 Clamping table



2. Loosen the knurled screw **(6.1)** and set to height H using the depth stop **(6)**. Check against the scale **(18)**.
3. Re-tighten the knurled screw.



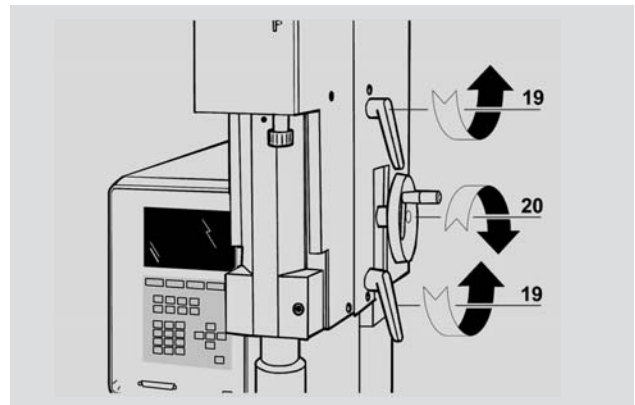
4. Release the clamping lever (19) and move the press upwards using the height adjustment (20), such that the horn cannot reach the clamping plate with the stroke fully extended.

5. Re-tighten the clamping lever.



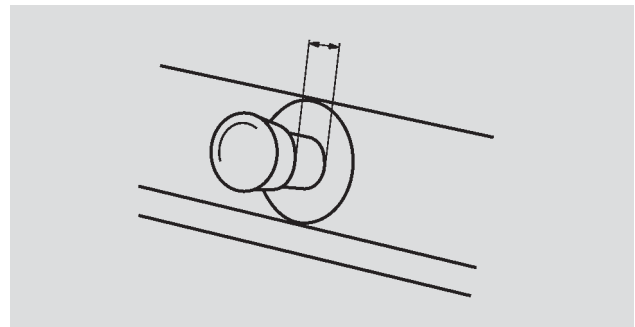
Caution:

If the horn hasn't been set high enough, there is a danger of collision.



Energieversorgung

1. Check whether the emergency stop switch is pulled out.



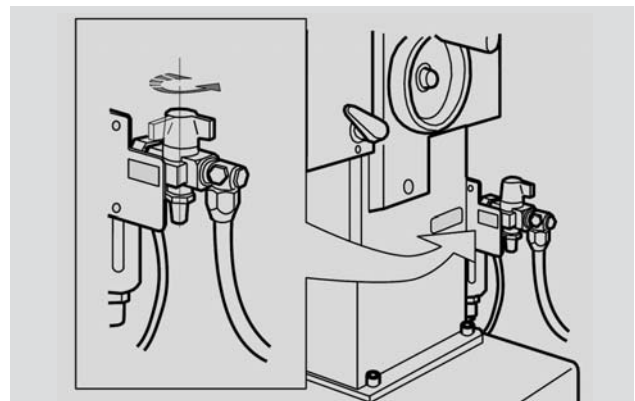
2. Open the hand operated compressed-air valve.



Caution! Don't touch the horn!

3. Switch the unit on with the POWER key.
The ultrasound system carries out a self-test.
You can call-up the Set-up operating mode with the PIN code 1000 and the key ADJUST.
The following standard values appear on the screen:

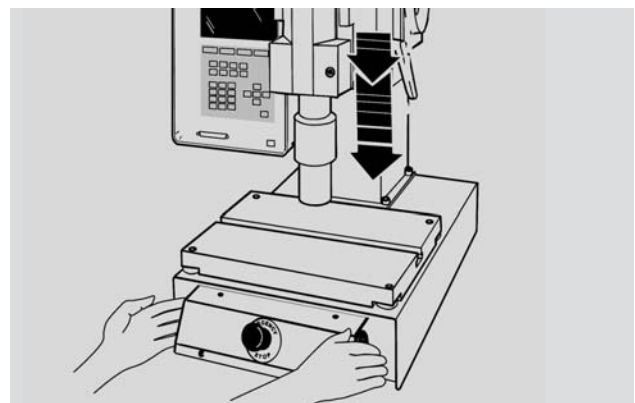
- Down travel speed: 3
- Contact force: 200 N



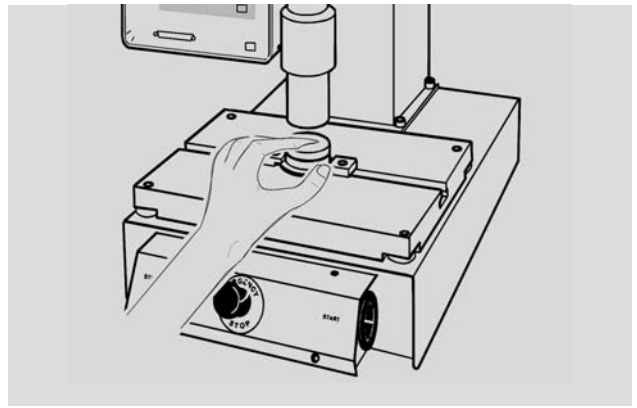
Caution!

The workpiece mount with weld object must not be under the horn.

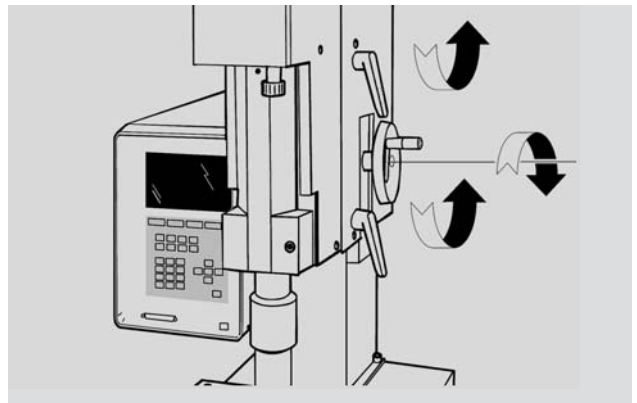
4. The press is lowered at the pre-defined speed by using the dual safety switch



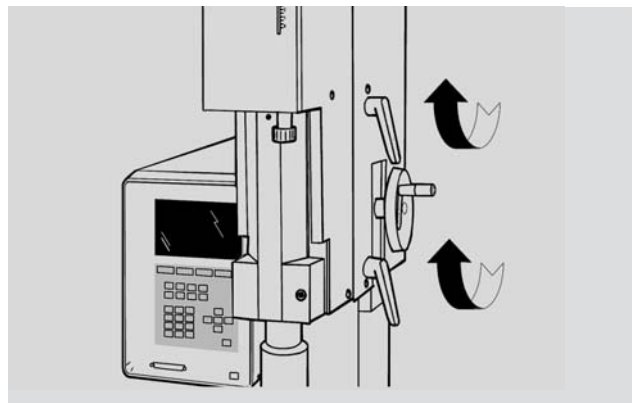
5. Centre the workpiece mount with its weld object under the horn.



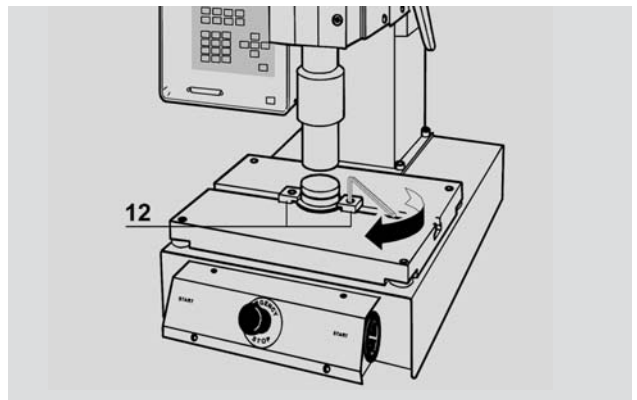
6. Set the press gently onto the weld object using the height adjustment.



7. Tighten the clamping lever.



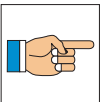
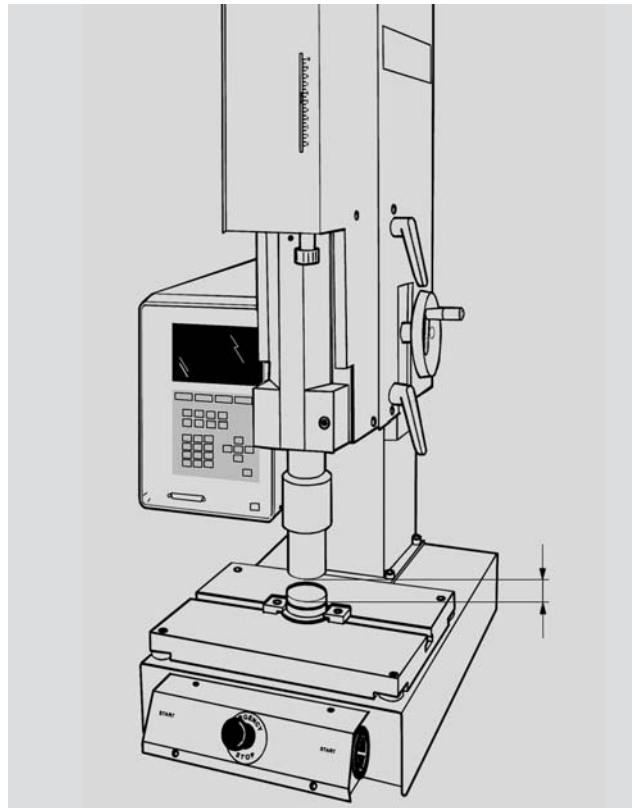
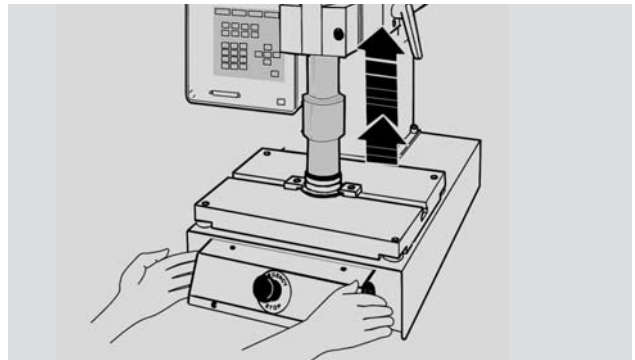
8. Tighten the clamps (12) with the Allen key
9. Partly tighten the two sides, check for correct centering and then tighten fully.



10. Bring the press to the upper rest position using the dual safety switch.
11. Remove the weld object
12. Lower the press again, using the dual safety switch.
13. Release the clamping lever and bring the press down to a point where the weld stroke has reached its lowest position but where the horn does not yet touch the workpiece mount. This protects the weld tool against breakage.
14. The DATA BANK key gives access to a list of stored data records.
15. Select the required application and press F2 «Load data record».
16. Acknowledge the info «Machine setting» with Enter.
17. Press PARAMETER to check whether the stored parameters meet your requirements.
18. If you are working on a new application, download a similar one from the database with «Load data record».
19. Change the project name and the press information under «Info».

If you are not familiar with weld technology, you should now read the capital Weld technology carefully.

Modify the data record as required and fine tune it by testing it.



Note:

Never modify more than one parameter at a time, otherwise it is very difficult to reconstruct which modification had what effect.

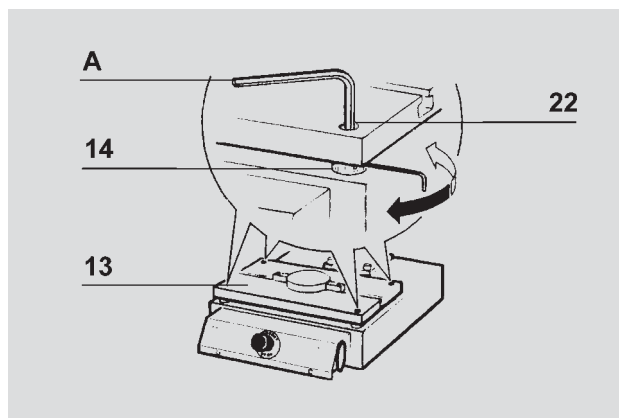
7.2 Setting the clamping table up

The clamping table (13) was factory set to be parallel to the horn front face.

If however, corrections need to be made, adjust the clamping table using the four parallel adjusting nuts (14).

Parallel adjustment:

1. Loosen the clamping screws (22) using the Allen key (A).
2. Adjust the parallel adjusting nuts (14), as shown in the picture, to your requirements.
3. Once the adjustment is complete, re-tighten the clamping screws (22).



7.3 The weld cycle process

The cycle is started by pressing the start keys within 0.3 seconds of each other. The power loss of the oscillating system is measured (system test). The solenoid valve is activated and the feed is lowered. The start keys must be held down until either the safety switch (pointer beneath the red mark on the stroke scale) is passed or until the stop time has elapsed.

If the keys are released too early, the feed returns to its original position. An error message is issued.

The weld is started by the TRIGGER . Once the weld and the dwell time have elapsed, the feed returns to its original position.

In order to stop lighter workpieces hanging on to the horn, an extra impulse can be added to the «Return stroke» process step.

8 Interaction press, generator, control system

The total installation is a combination of three control systems.

- The generator control system: for regulating the generator-specific values such as output and amplitude.
- The press control system: for controlling and regulating the stroke dynamics i.e. speed, force profile and trigger force.
- The ACU control system: for controlling the data flow across the interfaces and for storing data relevant to welding result presentation and system dialogue.

Internal interfaces

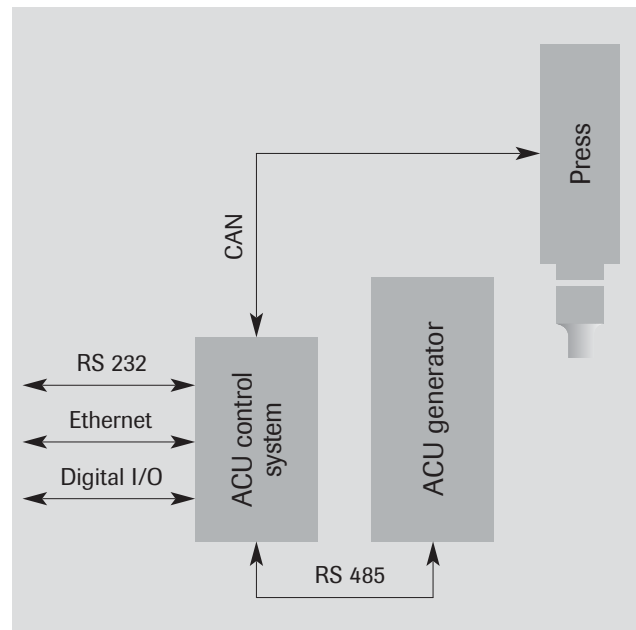
The ACU ensures internal communication between the individual modules via the RS 485 interfaces and CAN bus.

External interfaces

The following interfaces are available:

- RS232 for peripheral programs ACUcapture, ACUremote, and Datastring
- Ethernet for peripheral programs ACUcapture and ACUremote
- Digital I/O for special control systems (communication with PLC)

The RS 232 and Ethernet configurations are described in the chapter «Init mode» (PIN3000). Digital I/O is described in the chapter «Service and Maintenance».



9 Weld technology

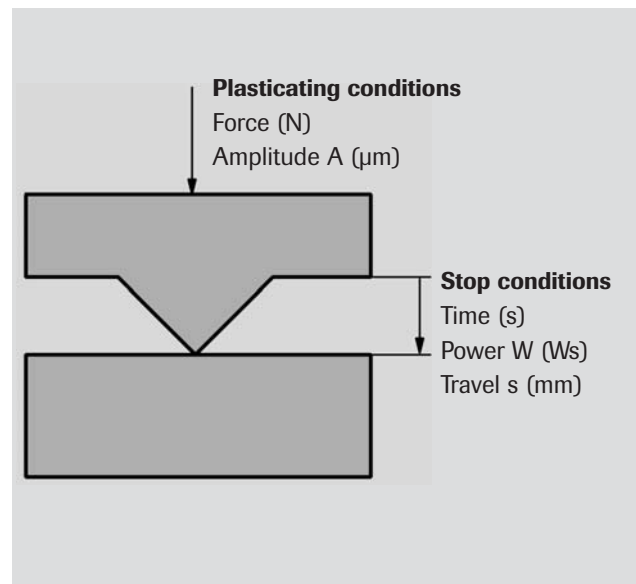
In order to guarantee the high quality and the low tolerances of the ultrasound weld process, the parameters

- **Amplitude A [μm]** as energy source and
- **Press force F [N]** as the connection between the plastics to be welded are of significance.

The more precise the control of these two parameters, the better the reproducibility of the welding process.

Plastics are often very different in terms of their melting behaviour. Special semi-crystalline thermoplastics like PP or POM requires a high melting energy and then very quickly become liquid. The optimisation of the force and the amplitude during the weld process are very important in order to be able to control the melting process.

With the **Dynamic 3000**, RINCO ULTRASONICS AG has developed a welding unit which is definable in terms of force. Using sensors and a control system, the speed, force and amplitude of the individual process phases are well balanced. Stop conditions can be preselected as time, energy or travel and then further restricted by applying limits based on quality classifications.



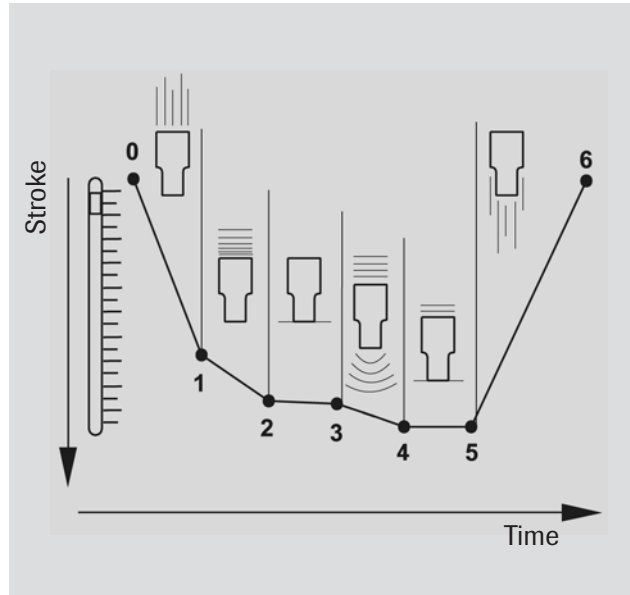
9.1 Process description

A weld cycle can be broken down into seven sequences:

The individual process steps

- 0 – 1** Pre stroke:
Fast forward movement of the weld tool.
- 1 – 2** Braking:
Reduction of the downwards travel speed to come to a gentle stop on the weld object.
- 2 – 3** Force build-up:
A gradual build-up of press force up to the trigger point.
- 3 – 4** Melting on:
Start of the melting
- 4 – 5** Melting off:
Continuing the polymer melting process.
- 5 – 6** Solidification:
Firming up and cooling down of the melted plastic under the influence of the timed application of force.
- 6 – 7** Return stroke:
Fast return of the weld tool to the upper rest position.

Using the corresponding force and amplitude profiles, the cycle sequence then continues to run, controlled either by time or travel, according to the selected weld mode.



9.2 Dynamic 3000 weld technology

Not every application needs a process point 4

By selecting the suitable weld mode, point 4 can be suppressed (see Figure)

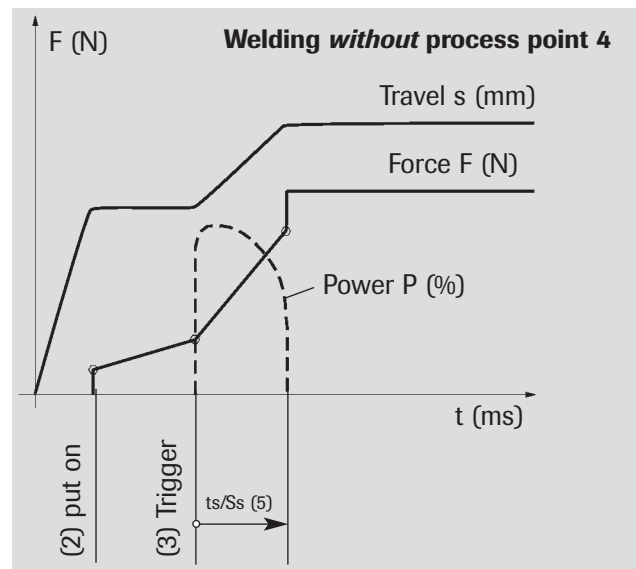
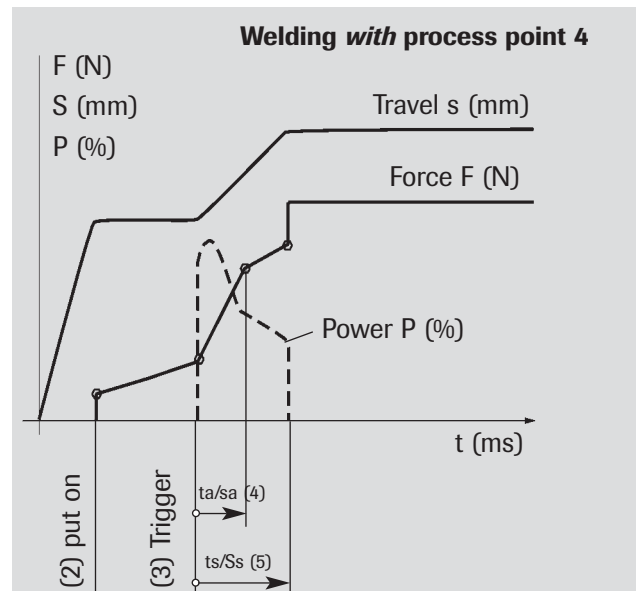
The process graphic in the ACU display

ta: Melt-on time (TIMER MODE)

sa: Melt-on travel (TRAVEL MODE)

ts: Total weld time (TIMER MODE)

ss: Total weld travel (TRAVEL MODE)

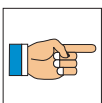


The force profile

Weld intensity is determined with each force timing change. A high change in timing means a high weld intensity.

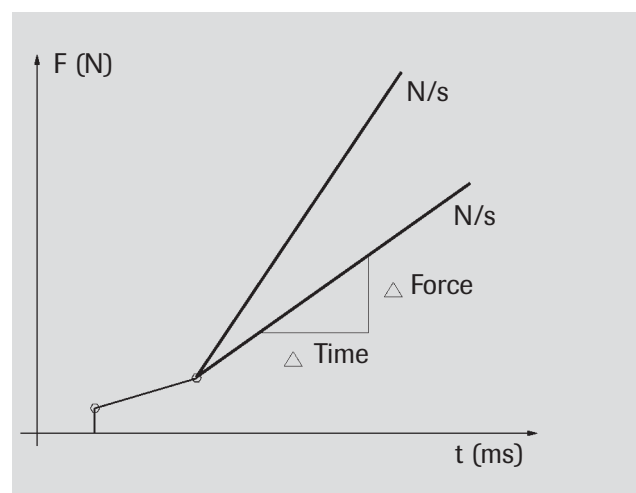
Changes can be made through parameter programming.

The force development during the weld is **always** positive. The important point here is the change in timing in [N/s]

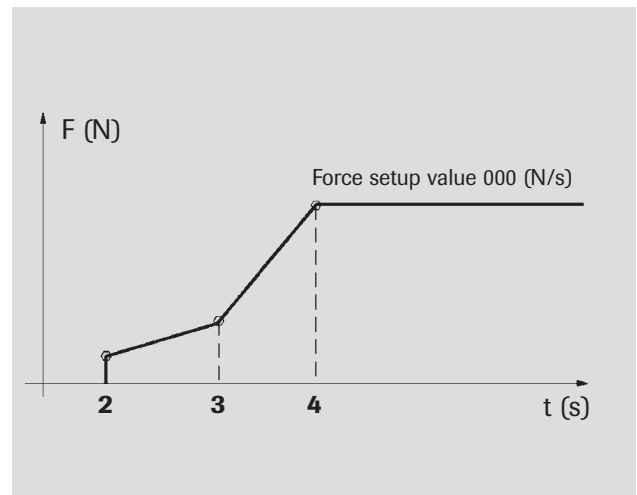


Note:

The steeper the force process, the more intensive the melting.



The minimum value is 0000 N/s, i.e. the force doesn't change over time, it remains constant.

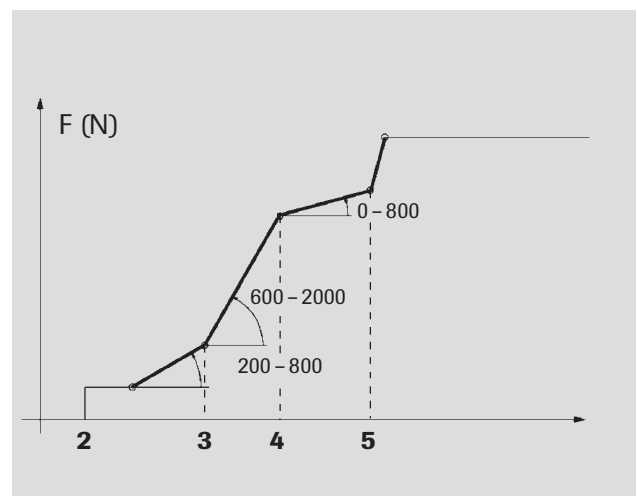


Suggested inputs

Practical values for the timed force process.

- Force build-up 2 – 3 200 – 800 N/s
- Trigger 3 120 – 350 N
- Melt on 3 – 4 600 – 2000 N/s
- Melt off 4 – 5 0 – 800 N/s

The braking speed must be adjusted accordingly for abnormally low trigger forces below 20 N.



10 Operating modes

10.1 Operating mode selection

You use the MODE key to select the operating mode, i.e. which stop conditions terminate the process.

Basically, there are four options:

- The preset time t_s (Weld time)
- The preset travel s_s (Weld depth)
- The preset Energy E_s (Weld energy)

In order to monitor the process quality, quality windows can be set for time, travel and energy, with minimum and maximum values, using the key function «Limits». A parts counter is also available.

10.2 The limits

The limits are used to help monitor quality. If a value moves outside the set limits, an error message appears on the display. Exceeding the limits can be defined as a «Warning» or an «Error».

Warning

Identification: In the Result display with [+], an exceeded value is marked with [*]

Error

Identification: In the Result display with [!].

An exceeded value is marked with [*]

If a value is exceeded, the press is blocked. It has to be released with «Enter». The blocked position can optionally be selected as «up», i.e., when at rest, or «down», i.e., in the welding position. «Down» is only available to a reduced extent due to the data communication. See also section 11.1, «System Initialisation».

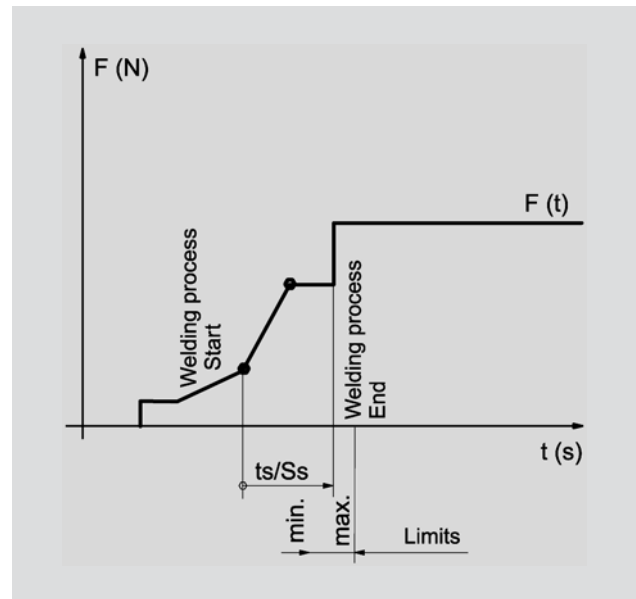
Possible limit values

- Time max / min
- Travel max / min
- Energy max / min
- Power max. / min.

Limits are set dependant on the stop condition. e.g.

Time mode: Time min/max or Energy min / max limits.

Several limits can be set at the same time.



10.3 The individual modes

Time mode 1+2

Using this operating mode, the weld depth is reached based on time.

With welding times shorter than 50 [ms] deviations of different extents are caused by the signal communication. Such weldings need to be carried out in the energy mode.

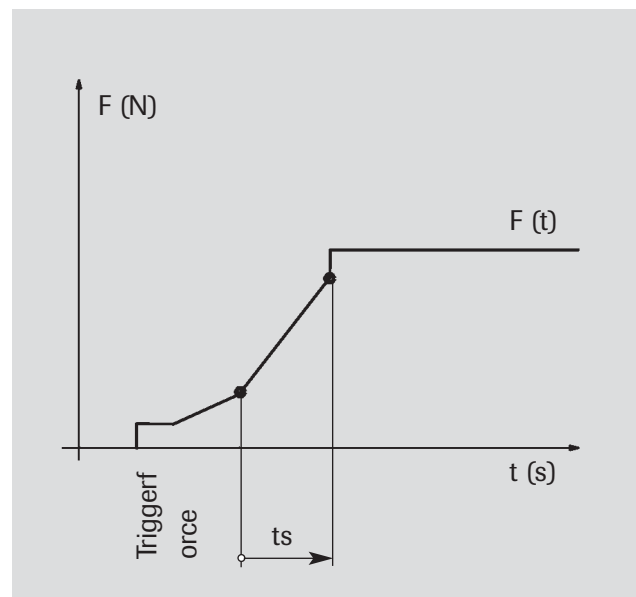
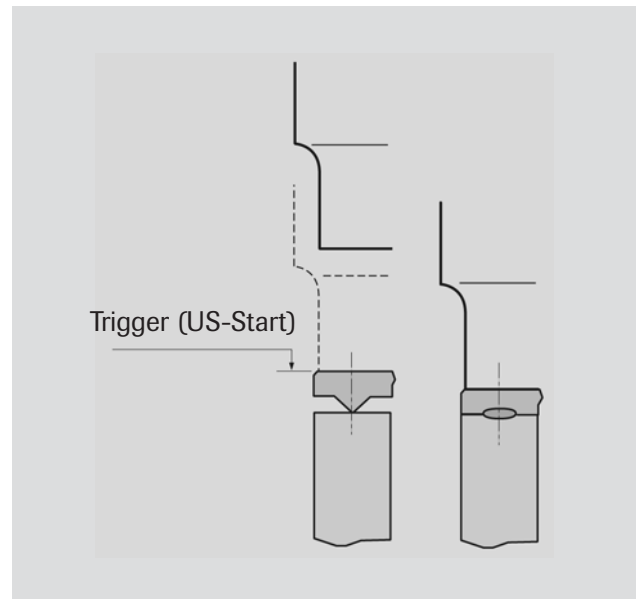
Cycle

The weld is triggered when the force trigger point is reached.

Welding continues from the trigger point until the end of the programmed time.

Time 1:

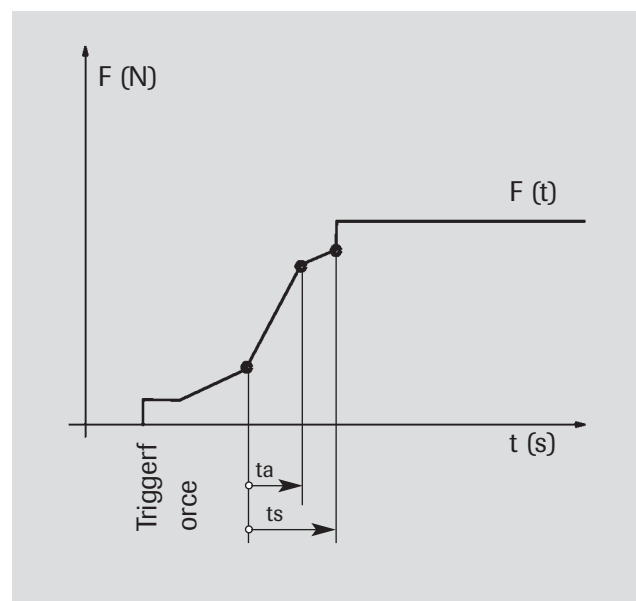
- US Start: Force trigger
- US Stop: Time from trigger
- Profile: Without «melting off»
- Limits: Travel; Energy; Power max.



Time 2:

- US Start: Force trigger
- US Stop: Time from trigger
- Profile: With «melting off»
- Limits: Travel; Energy; Power max.

The force changes can be entered in the same values, e.g. 800 N/s for an initial setting. A later modification of the melt-off condition may bring about improvements.



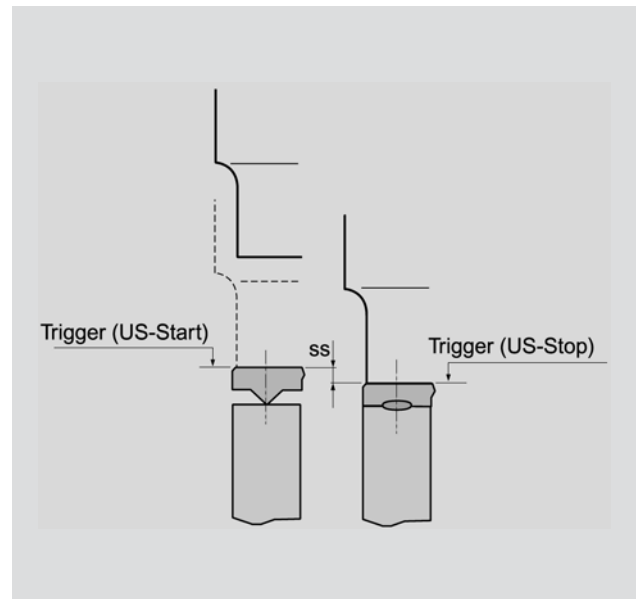
Travel mode difference 1+2

With this operating mode, exactly the same amount of material should be melted off during each weld. The melt-off depth (DEPTH) has the highest priority. The advantage of the differential method is that compensation is made continuously, to allow for weld objects with different dimensions.

Cycle

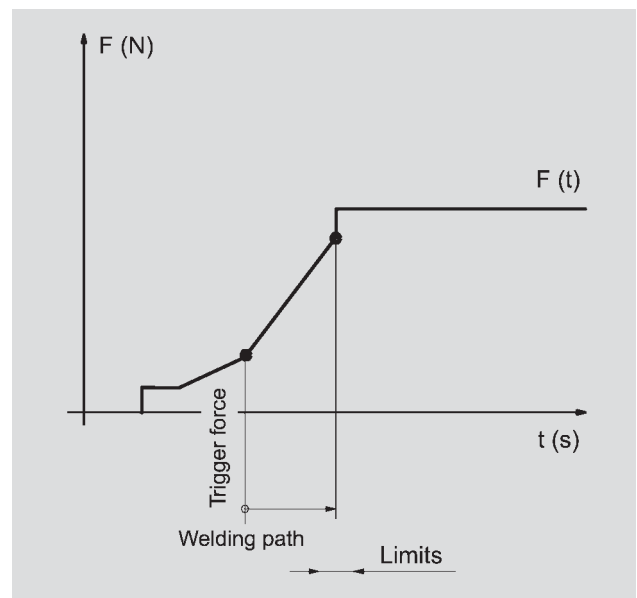
The weld is triggered when the Sensor trigger is reached. Welding continues until the DEPTH [ss] is reached.

The actual travel value is measured at the end of the dwell time.



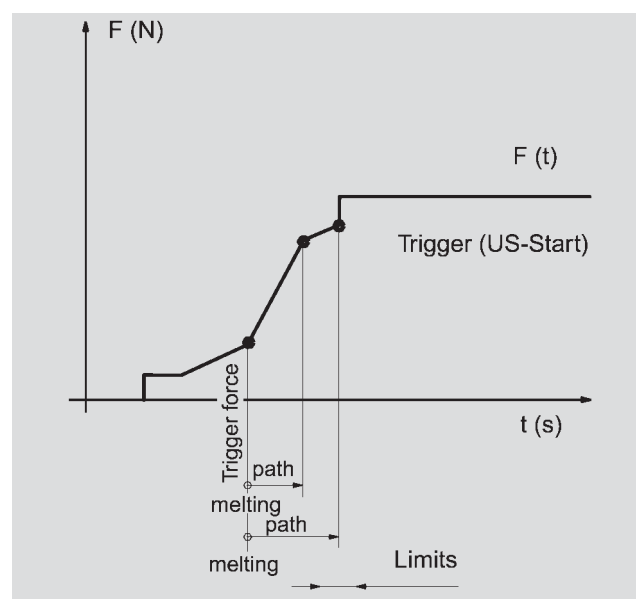
Travel diff 1:

- US Start: Force trigger
- US Stop: Travel from trigger
- Profile: Without «melting off»
- Limits: Time; Energy; Power max.



Travel diff 2:

- US Start: Force trigger
- US Stop: Travel from trigger
- Profile: With «melting off»
- Limits: Time; Energy; Power max.

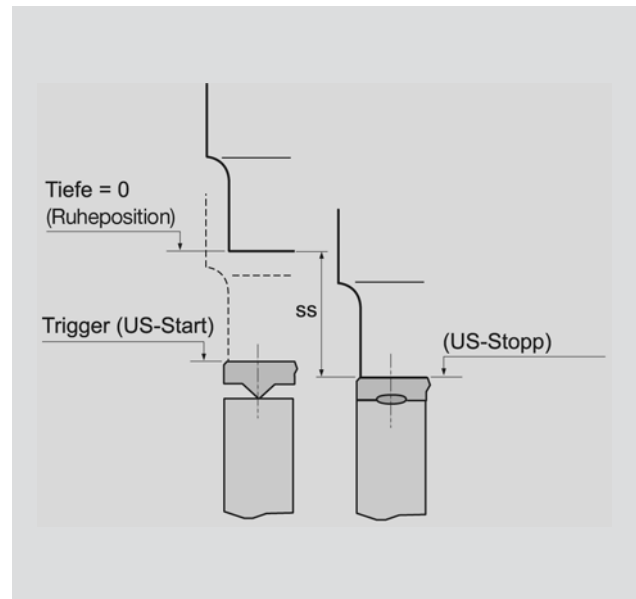


Travel mode, Absolute 1+2

The weld object should have the same end dimension after each weld with this operating mode. The weld object's end dimension has highest priority.

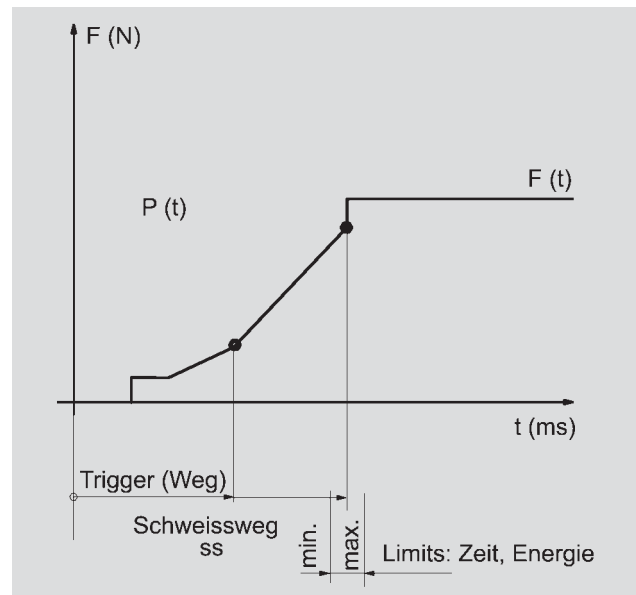
Cycle

The weld is triggered after reaching the Sensor trigger. Welding continues until the DEPTH [ss] is reached. The DEPTH value [ss] is calculated from the upper end position. The actual travel value is measured after the end of the dwell time.



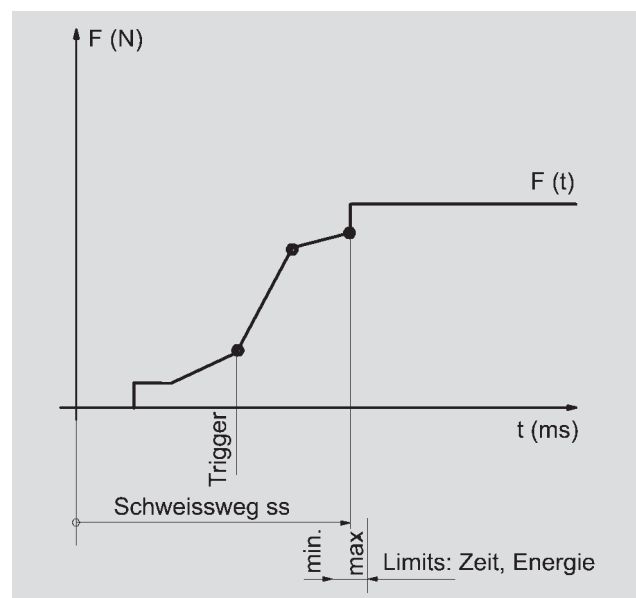
Travel absolute 1:

- US Start: Force trigger
- US Stop: Travel from rest position
- Profile: Without «melting off»
- Limits: Time; Energy; Power max.



Travel absolute 2:

- US Start: Force trigger
- US Stop: Travel from upper end position
- Profile: With «melting off»
- Limits: Time; Energy; Power max.

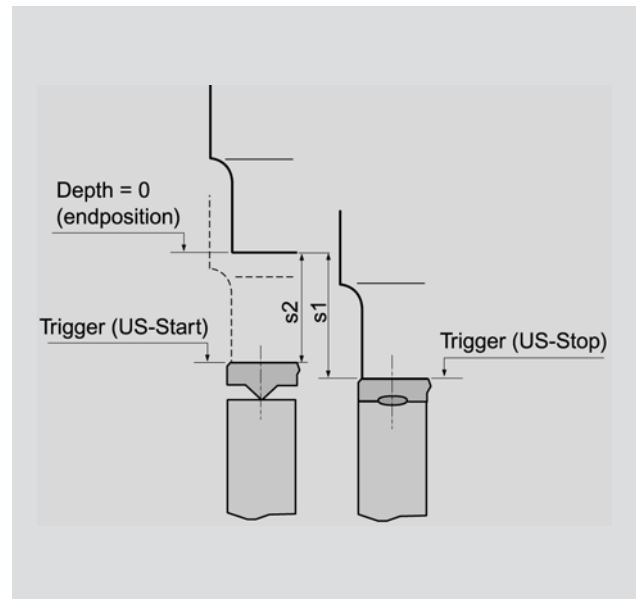


Travel mode, Absolute 3

The weld object should have the same end dimension after each weld with this operating mode. The weld object's end dimension has highest priority.

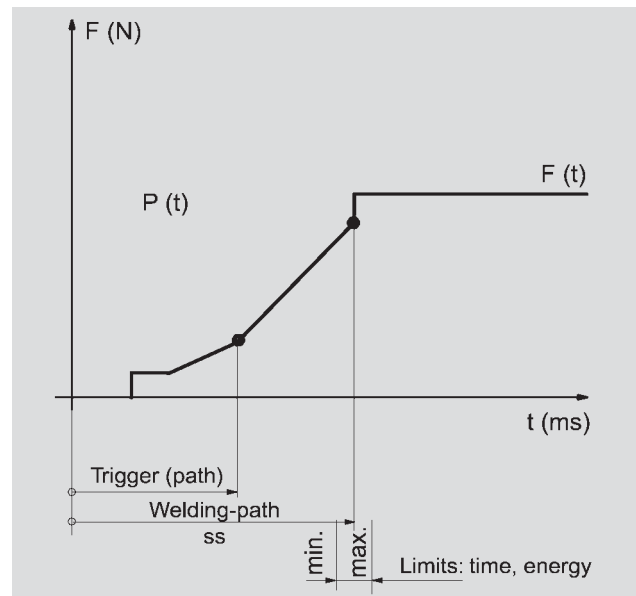
Cycle

The weld is triggered after reaching the Travel trigger[S1]. Welding continues until the DEPTH [S2] is reached. The DEPTH value [S2] is calculated from the upper end position. The actual travel value is measured after the end of the dwell time.



Travel absolute 3:

- US Start: Travel point
- US Stop: Travel from rest position
- Profile: Without «melting off»
- Limits: Time; Energy; Power max.



Energy mode

The energy is totalised on a timed basis in energy mode. A time limiting through «Limits» is to be stipulated to ensure consistent welding quality. In order to determine the effective welding energy, the system's own energy loss has to be subtracted. This takes place by briefly operating the system in no-load operation either before or after the welding process.

The corresponding measuring interval can be set in «System-Init» (PIN 3000).

Check chapter 11, «Init mode».

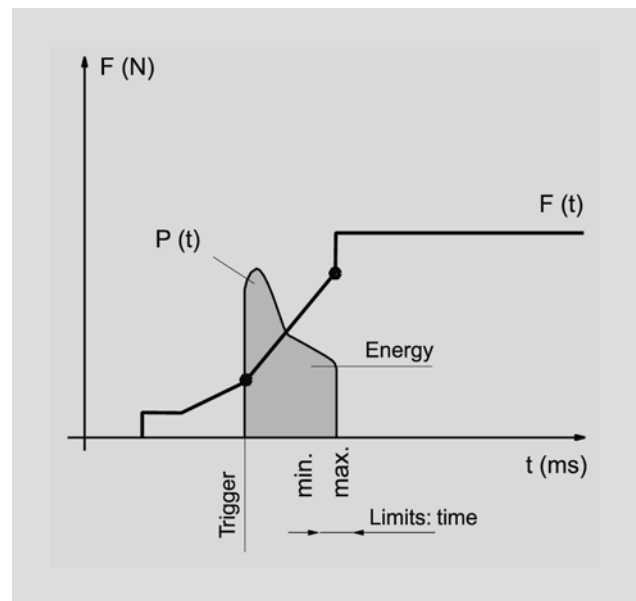
Cycles

The weld is triggered after the Force trigger is reached.

The ultrasound stops once the necessary energy has been reached.

Energy:

- US Start: Force trigger
- US Stop: Energy
- Profile: Without «melting off»
- Limits: Time; Travel



Programming

The weld process can be programmed step by step with the **PARAMETER** key. Programming is structured like the steps described in Chapter 8.1.

0 – 1 Work clearance stroke

Fast positioning of the horn

- Programming in speed steps 1-9;
- typical value: 5

1 – 2 Braking

Freely selectable path value so that the path is set such that the Sonotrode is set down as gently as possible on the object. Note that the speed reduction requires a certain distance in itself.

Note: Set the braking point to be high enough.

- Programming in speed steps 1-9;
- typical value: 2

2 – 3 Force build-up

The timed build-up of force until the ultrasonic trigger point (Force value in [N])

- Programming in increase levels 0-2000 [N/s];
- typical value: 800 [N/s]

3 – 4 Melt on

The timed build-up of force after the ultrasonic trigger point

- Programming in increase levels 0-2000 [N/s];
- typical value: 1200 [N/s]

Amplitude

- Programming in steps 1 to 9

Assuming that the amplification ratios of the booster and the horn were entered correctly in the info field «Tool info», the system calculates the value in [μm]. Normally the force increase levels and the amplitude will be selected high in this step (1000 – 1500 N/s).

In the next step, melting off, the force increase levels and the amplitude are more usually reduced.

Weld time

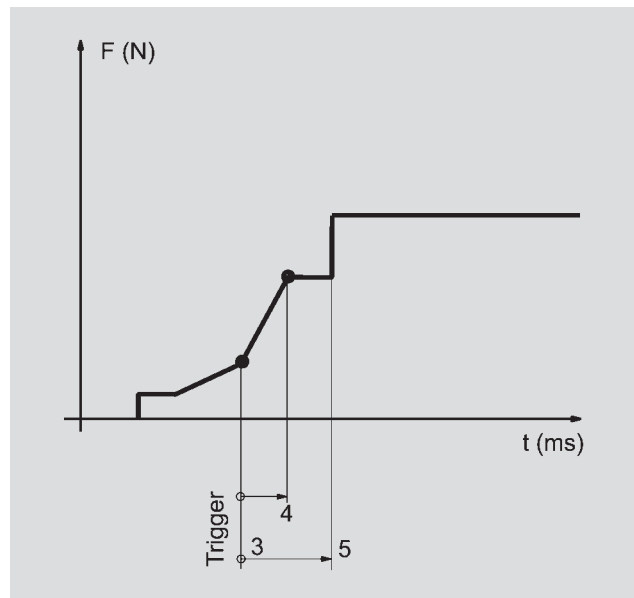
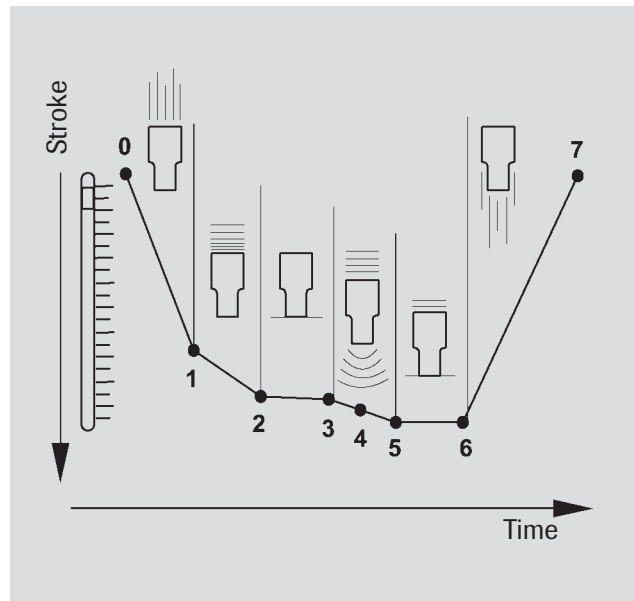
- Time from point 3 (trigger) to point 5 in [ms].

Weld travel

- Travel from point 3 (trigger) to point 5 in [mm].

Weld energy

- Energy from point 3 (trigger) until ultrasound stop in [Ws] (only with «without melt-off» modes)



4-5 Melt off

The build-up of force over time and the amplitude during welding.

- Programming in increase levels
0 – 2000 [N/s]

Note: Process item 4 can be suppressed by selecting welding mode.

5-6 Solidification

Dwell force

- Programming in units of force 0-2000 [N]

Dwell time

- Programming of the corresponding time interval [ms]

6-7 Return stroke

Return speed

- Programming in steps 1-9 [-]
So that the weld object doesn't stay hanging on the horn, a shake impulse can be entered with a specified time duration.
- Programming as Time interval [ms]
A time delay can also be defined (time delay from the start of «Return» to start of shake impulse).

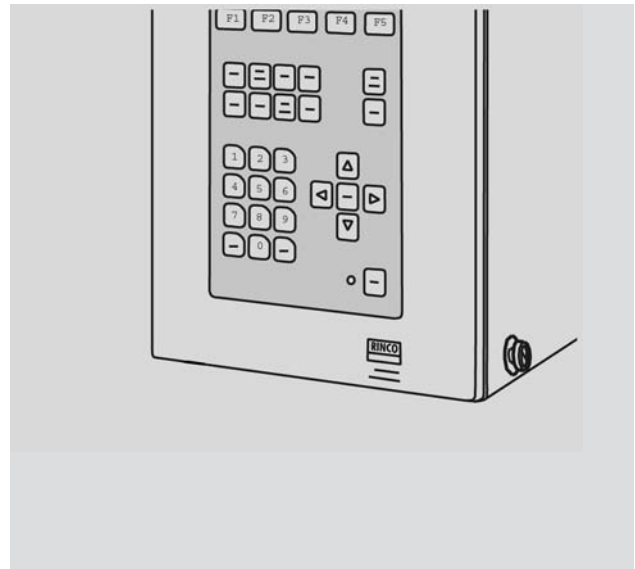
To avoid the possibility of the weld object hanging on the horn, an ultrasound «after-impulse» can be switched on.

- Delay time [ms]
- After-impulse [ms]

11 Database / Data transfer

11.1 The Database

- To store 50 parameter sets
- To load data into the weld press
- For more detailed description and specification of the data which is to be stored
 - Project info «Project Name»
 - Tool info «Tool numbers»
 - Amplification «Booster and horn amplification factors»
 - Press info «Press position (height)»
«Stop position (max. stroke)»



11.2 Extended data evaluation

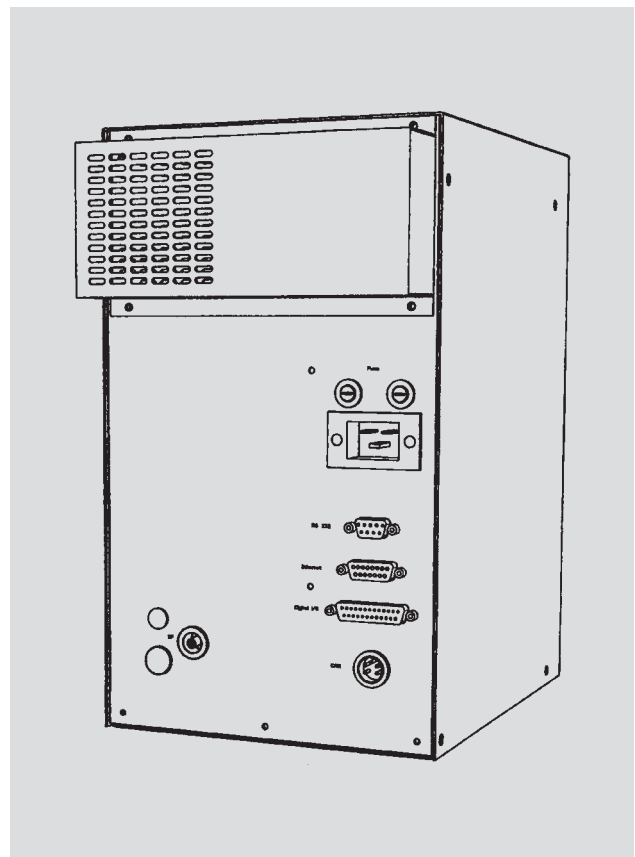
To evaluate welding data on a larger scale, the data can be transmitted via RS 232 interface or Ethernet card using TCP/ IP protocol to an industrial PC with master control.

The required programs «ACUcapture» and «ACUremote» can be obtained through RINCO ULTRASONICS AG.

When using other programs, information on required sequence modifications can be obtained through RINCO.

11.2.1 Description of functions ACUremote

- Observe online the results of the current welding on the computer
- Check results of the last 25 weldings
- Create any amount of process data and transfer them to the ACU
- Change system parameters with PIN 3000 using the computer on the ACU



11.2.2 Description of functions ACUcapture

- Take over welding results online from the current production using the computer. Selection can be made with or without the graphic display of the process.
- Save welding result in a data bank.
- Analyze welding result on the computer.
- The following options are provided to minimise the transmission time:
 - Expanding the transmission interval with PIN 3000
 - Setting the screen display to «Data» (F1).
This means that a performance graph does not appear on ACU capture.

11.2.3 Data transfer with data string

- Transfer process data via RS232 to external programs
- Programs are recommended by RINCO on request. Information on the parameterization of the generator available in chapter «Init mode».
- The content of the data string is explained in detail in chapter «Description of data string»

12 Init mode

12.1 System initialisation

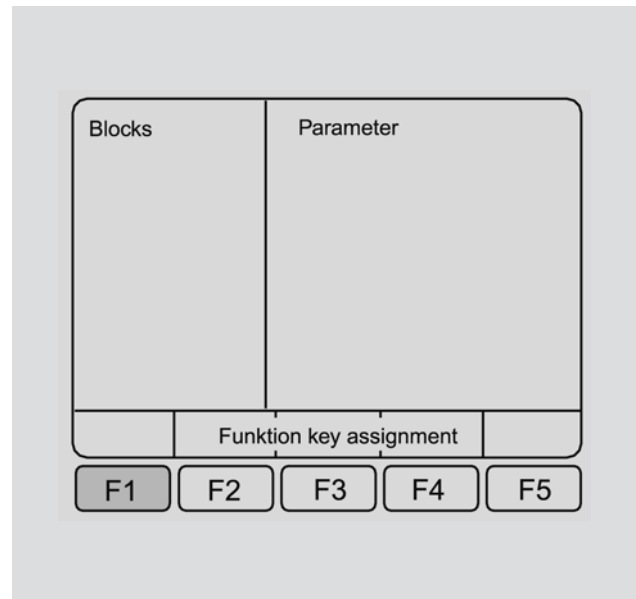
PIN 3000 takes you to the Initialisation menu. Here you can set-up the background settings.

Init operation consists of two areas:

- System parameter (F1)
- Amplitude measurement (F3) to set desired measurement values

Based on the screen assignments (in blocks and parameters) as used in the process programming, the menu is self-explanatory.

You can select values such as «above» and «below» with the «<» and «>» keys.



12.2 System initialisation «Init mode»

System parameters

Settings

«Start mode»

Describes the trigger condition

Values:

- «Manual»: For Rinco double-handed start with CE safety.
- «Automatic»: For triggering by an external source without additional safety queries (status controlled).

„Position in the case of an error«

Tool stop position in the case of an incorrect process.

Values:

- «Above»: In the case of an error, the press returns to the upper rest position.
- «Below»: The press remains in the lower position in the case of an error and can be returned with «Enter».

Default value: «Above»

The «down» position is only possible in the following configuration due to the data communication:

- Error time max.
- Path diff 1 and 2 sections 1,2,3
- Time modes 1,2
- Energy mode
- Error path max.
- Time modes 1,2
- Energy mode

Horn

For identifying and modifying the acoustic characteristics

«Max. power loss»:

Power limit while idling. If the value is exceeded, an error is displayed.

Values: 10 to 40 in [%]

Default value: 10 [%]

«Measuring performance loss PL»:

Values: «Before» «After»

Default value: «Before»

«Pv measurement interval»:

Power loss measurement interval at process start to correct the weld energy.

Values: 0000 to 9999.

Example: 00001 Measurement before each welding.
00010 Measurement before each tenth welding.
00000 No measurement.

Default value:: 0001

«Soft start»:

To protect difficult horns during initial oscillation, the start ramp-up can have different timing values.

Values: 020 to 200 [ms]

Larger value for heavy horns.

Default value: 020

«Soft stopping time»:

A soft stopping time can be set to protect the oscillator system. The ultrasound process is not switched off at once when using soft stopping. The amplitude is reduced in a linear fashion from the current amplitude value down to 0. Frequency regulation is switched off during soft stopping.

Values: 000 to 050 in [ms]

Default value: 000

Screen

«Screen»:

To set the screen colours.

Values: «white / black»
 «black / white»

Standard setting: «white / black»

Example: Black background, white text

Values: 000 to 999

Standard setting: 200

«Telnet messages»:

Status messages via Ethernet.

Values: On; Off
 the «On» setting requires the
 installation of a modem.

Default value: «Off»

PIN codes

To define the various codes individually.

Values: 0000 to 9999

Standard values: Set-up operation: PIN 1000
 Init mode: PIN 3000

Please make a note of any modified codes. If you forget them, only a member of the Rinco Service Team can set them back to their standard settings.

Date/Time

To set the date and time.

Values:

«System time»:

Internal system clock in hours and minutes.

«System Date»:

Internal system date as year, month, day.

Change settings by overwriting them.

Country setting

To set country-specific values.

«Travel unit»:

To scale the depth setting.

Values: «mm» or «inch»

Default value: «mm»

«System language»:

Dialogue text setting.

Values: German; English; French; Italian,
Spanish

Default value: English

RS 232 Kom.

Setting the serial interface.

«Baudrate»:

Transfer rate in bits

Definition of the RS232 start bit

To modify the interface

Networking

Communication settings for Ethernet.

«IP address»:

Default value: 192.168.0.80

«Subnetwork mask»:

Default value: 255.255.255.0

«Default gateway»:

Default value: 192.168.0.1.

Miscellaneous

«*Overwrite standard data records*»:

Releasing the last ten database lines that can be occupied with RINCO default data records.

Values: «Off»; «On»

Standard value: «Off» meaning that the last 10 memory locations are blocked.

«*External database changeover*»:

Allow database changeover via RS232

Values: «On», «Off»

Standard value: «Off»

«*Sound enclosure*»:

To initialize the sound enclosure.

Values: «On»; «Off»

Standard value: «Off»

Data string

For the direct transmission of welding data to an external system.

«*Transmission*»:

RS 232

Values: «On»; «Off»

Default value: «Off»

«*Interval*»:

Values: «0000»; «10,000»

Default value: «00001»

«*Interval ACU capture/ACU remote*»:

Values: «0000»; «10,000»

Default value: «00001»

13 Change of modules

13.1 The ACU generator and its modules

The generator comprises the following modules:

1 Generator module AGUD

2000 W / 230 V	3000 W / 230 V
2000 W / 200 V	3000 W / 200 V

2 NL housing for the wiring for mains voltage and interface to press an PLC.

3 ACU control system for display control and for data and interface management.

4 Hood

5 Bus board for connecting individual modules to one another and interface card.

Disassembly

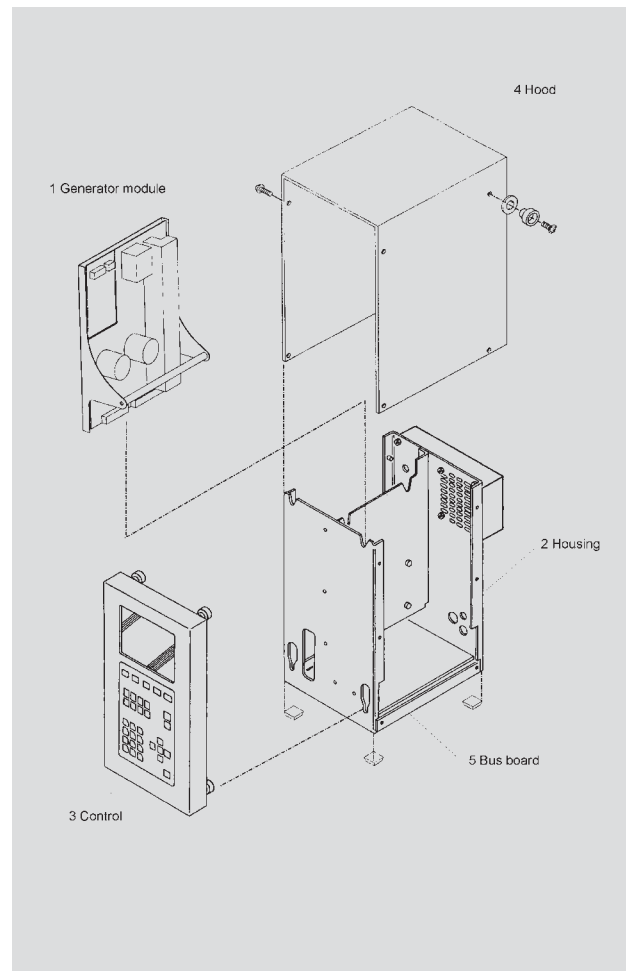
- Lift generator out of its support.
- Disconnect the machine from the mains.
- Remove housing cover with Philips screwdriver size 2.



Caution!

Disconnect all connecting cables on the back panel of the generator.

As long as the machine is connected to the mains the electrical components are live and carrying 230 V.



Fuses in the NL housing

Table of fuses

230 V	F1, 0.8 A T
6.5 V	F2, 2.0 A T
12 Vint	F3, 0.8 A T
12 Vext	F4, 0.4 A T
24 VCAN	F5, 1.2 A T
24 Vext	F6, 0.8 A T

Functions of the jumpers J5 – J10

The bus board

Different configurations possible with jumper.

J05: On / Off

On: Automatic startup of the ACU when mains supply present.

For operation of special machines.

Off: Manual startup by pushing the «Power On» key.

For standard press operation.

J10: On / Off

On: With «emergency shutdown» operation.

For standard press operation.

Off: «Emergency shutdown» bypassed.

For operation of special machines.

J11:

Reserved for later functions.

J5: Start of the ACU

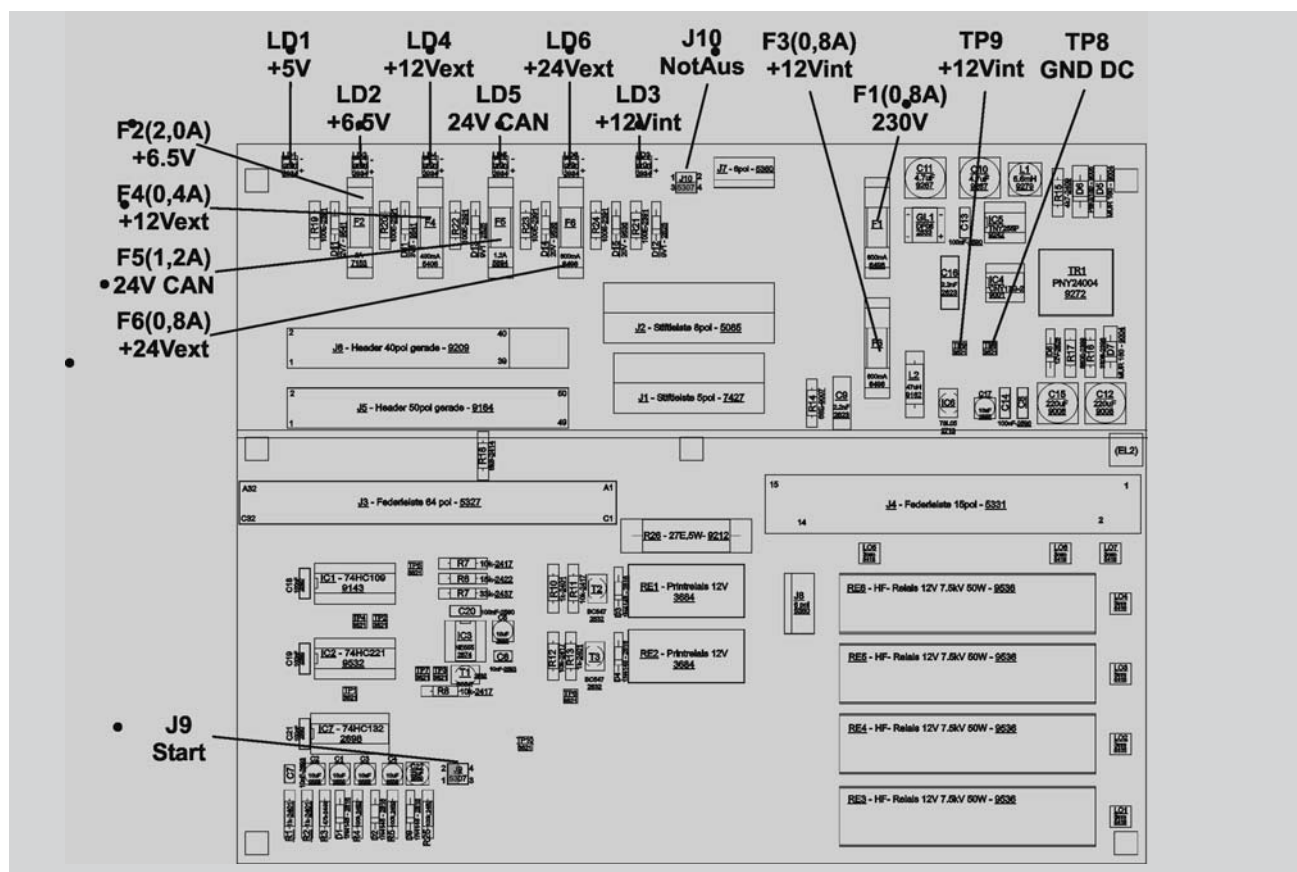
J5 «ON»: Automatic start

J5 «OFF»: Manual start by pushing the POWER key

J10: Energy feed of the I/O card

J10 «ON»: PIN 5 and 6 must be closed externally

J10 «OFF»: 24V internally on I/O card



13.2 Fuses of generator

Fuses are to be found on the following sub-assemblies:

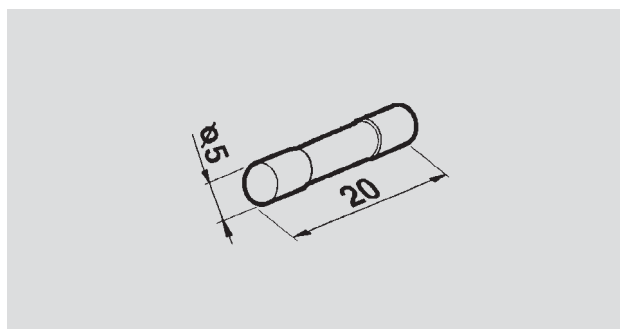
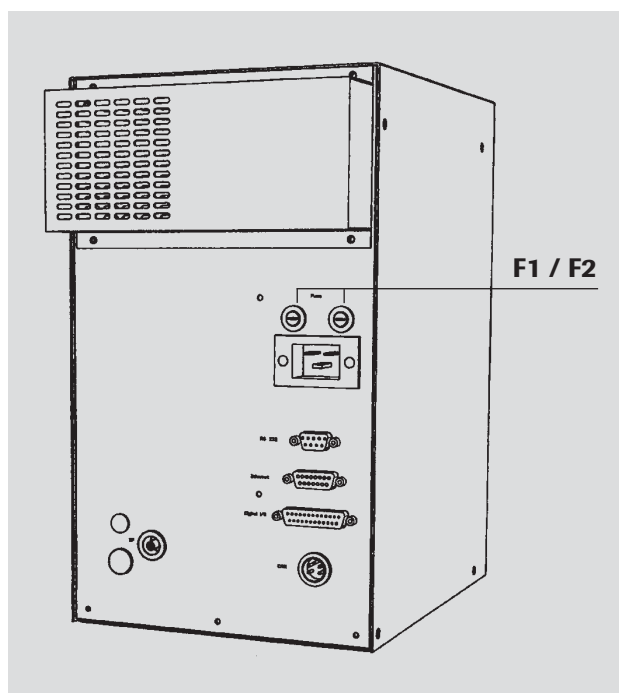
Mains socket

Dimensions of all fuse: 5 x 20 mm

13.3 List of fuses for generators

2000 W / 3000 W

Generator	Netzdose	
	F1	F2
ACU 20-2000	10 A/T	10 A/T
ACU 20-3000	16 A/T	16 A/T



13.4 Fuses on the press

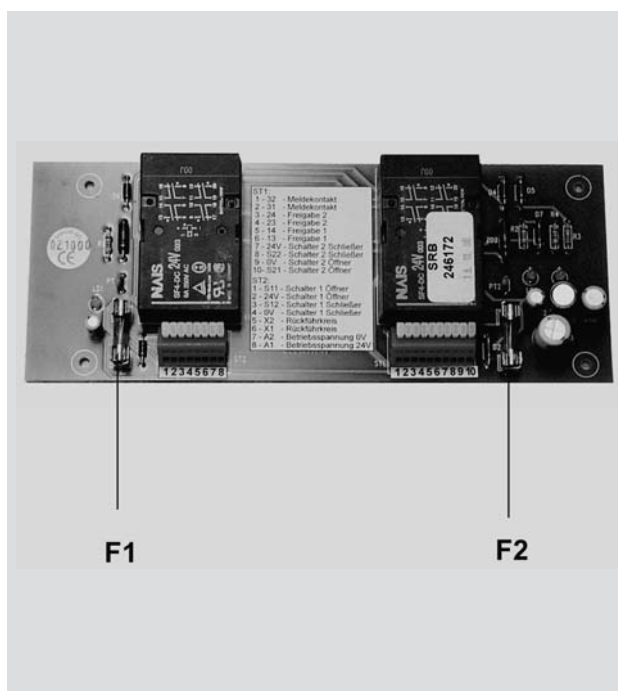
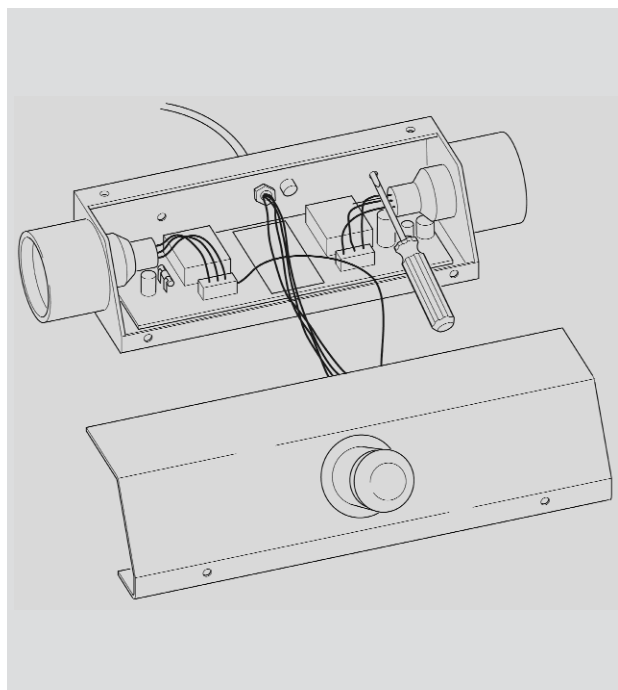
The press fuses are located on the two-hand operation module.

Access:

- Remove cover using Philips screwdriver size 2-
- Caution: Do not let the cover hang down onto the electrical connections.

13.5 List of fuses for the press:

F1 and F2: 250 mA T



14 General maintenance work

14.1 Cleaning the equipment



Caution!

Cleaning and maintenance work should only be carried out by suitable trained personnel. Before starting maintenance work, you should ensure that all energy sources (power supply, compressed air etc.) have been disconnected or disabled.

Please note: Never use aggressive cleaning agents to clean the keyboard or screen.

The generator requires no special maintenance.

However the press and the tools should be maintained regularly. Recommended maintenance rate: annually.

Regular visual control and cleaning of:

- Actuator,
- Clamping table (13),
- Workpiece mount (11),
- Horn (9),
- Booster (25),
- Converter (24),
- Converter housing (7)

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

The following factors can reduce the durability of the tools:

- wrong welding parameters
- incorrect positioning / leveling
- wrong choice of material / material specifications

14.2 Clamping table

Clean the clamping table (13) daily.

14.3 Pneumatics unit

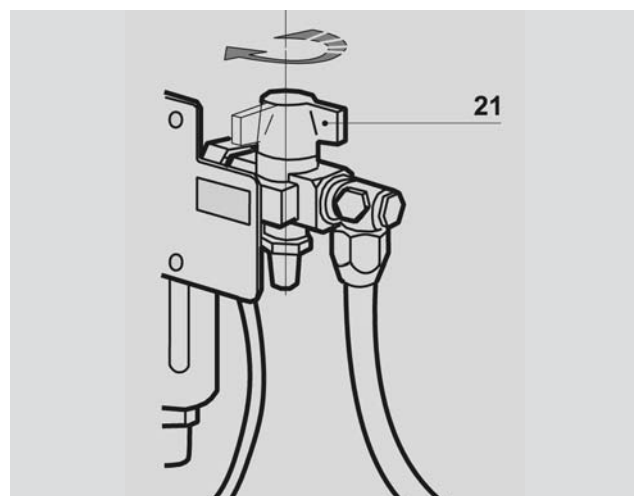
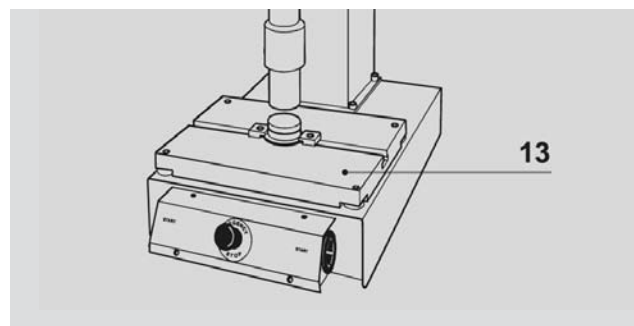
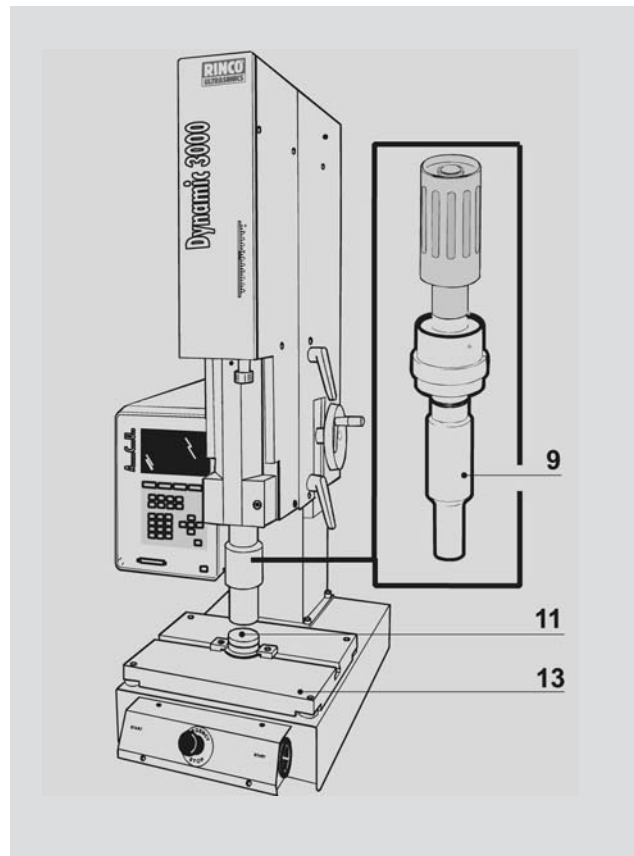
When work is completed, move the compressed-air tap (21) into the transverse position to avoid the need for maintenance. Regular filter change prevents machine failure and bad weldings caused by blocked filters.

14.4 Lubrication system

Maintenance-free.

14.5 Generator

You should ensure that the generator display is always kept clean



14.6 Oscillation system



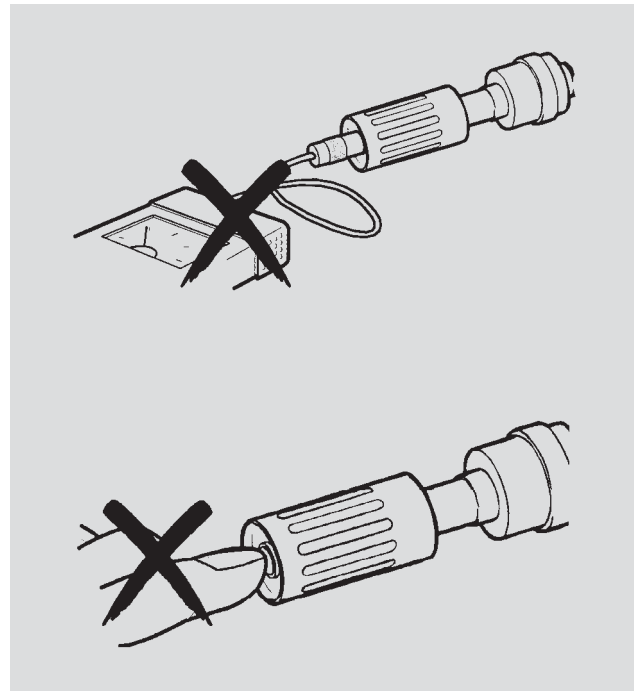
Danger!

Because of high voltages, work on the oscillation system and the converter housing must only be carried out after the unit has been removed from the power.

Avoid contact with the HF socket on the converter.

Don't connect any measuring device to the converter's HF socket.

Even after switching the generator off, the converter still has a power loading.



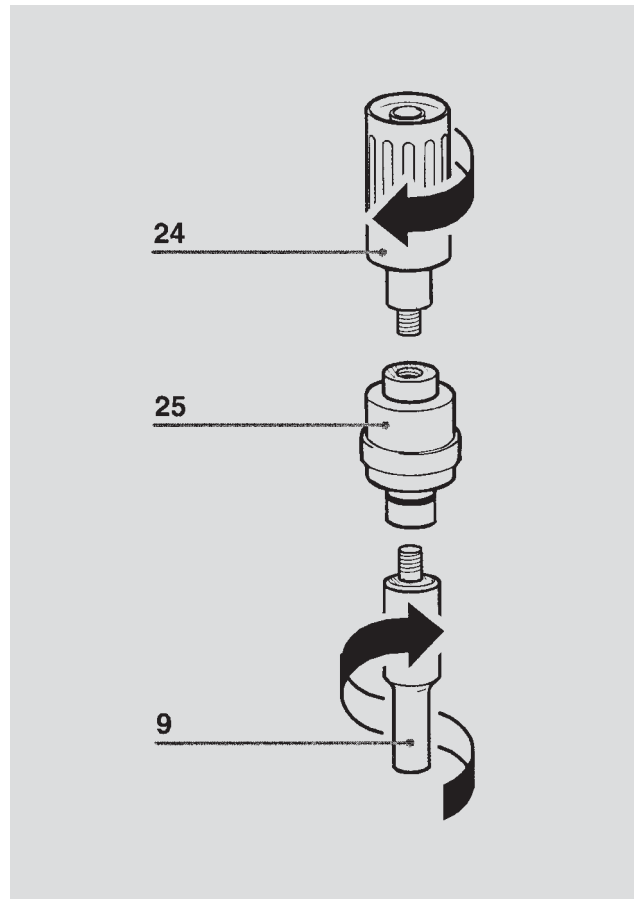
14.6.1 Screwed connections

The converter (24), booster (25) and horn(9) are screwed into each other.

Tightening torque: 30 – 40 Nm

Black marks on the surface of the booster (25) or the horn (9) can easily be removed.

1. Lay a polishing cloth on a flat surface
2. Slide the blackened surfaces over the cloth.



14.7 Error messages and their correction during power on

Error	Possible causes	Error correction
Generator is not switching on	- No power supply - Faulty fuse	- Connect to the power - Check the fuse

14.8 Actuator

After changing the components in the actuator (cylinder, proportional valves) it is key to perform a force calibration. Please contact the authorized RINCO service department (see chapter 14.13.1)

14.9 Error messages and their correction

Errors on the machine side are displayed in a self-explanatory way on the ACU display. Error situations should only be corrected by suitably trained personnel. If you are unsure of what to do, please contact your Service Centre or the manufacturers direct.

14.10 Error messages and their correction during set-up and welding

Error	Possible causes	Error correction
Horn is lowered but the ultrasonic doesn't start up	- Trigger set too high - Trigger defective	- Set the trigger lower - Contact your RINCO service centre
In spite of increasing the weld time, the parts are not welded any closer together	- Depth stop is set too low	- Set the depth stop higher

Error messages of the generator are confirmed by Enter key.

14.11 ACU error messages

14.11.1 Acknowledging an error message

Error message are generally acknowledged by pressing the ENTER key on the ACU keyboard or via the digital input «Reset.»

14.11.2 Error codes

The table below lists all ACU errors in numerical order. They are classified into the following groups:

Area	Description
002	Generator errors
003	Press errors
004	Sound enclosure errors
010	Main module errors
011	CAN bus errors
013	Generator software errors
015	Digital I/O errors

14.11.3 Generator errors (area 002:xxx)

Number	Name	Description
002:001	Powerpack + 15V faulty	The +15V supply voltage is outside the tolerance range. Check mains voltage and fuses, replace generator module.
002:002	Powerpack -15V faulty	The -15V supply voltage is outside the tolerance range. Check mains voltage and fuses, replace generator module.
002:003	Phase voltage error	The phase voltage was too high. Check oscillator system, replace generator module.
002:004	Converter voltage too high	The converter voltage was too high. Check oscillator system, replace generator module.
002:005	Converter current too high	The converter current was too high. Check oscillator system, replace generator module.
002:006	Mains voltage too low	The mains voltage measured at the generator is too low. Check mains voltage, correct, replace generator module.
002:007	DC offset error	The proportion of DC in the bridge is too high. Replace generator module.
002:008	Frequency maximum value	The frequency has exceeded the admissible maximum. Check oscillator system, replace.
002:009	Frequency minimum value	The frequency is below the admissible minimum. Check oscillator system, replace.
002:010	Maximum converter voltage	The converter voltage has exceeded the admissible maximum. Check oscillator system, change characteristic curve, replace oscillator system, replace generator module.

002:011	Drive end phase	The end phase is operated at maximum drive. Check mains voltage if working with 100%, replace generator module.
002:012	Energy minimum not achieved	The required minimum energy value was not achieved. Adjust the limit value if error persists.
002:013	Energy maximum exceeded	The energy value has exceeded the admissible maximum. Adjust the limit value if error persists.
002:014	Welding time not achieved	The required welding time was not achieved. Adjust the limit value if error persists.
002:015	Min. welding time not achieved	The required minimum welding time was not achieved. Adjust the limit value if error persists.
002:016	Max. welding time exceeded	The welding time has exceeded the admissible maximum. Adjust the limit value if error persists.
002:017	Minimum output not achieved	The required minimum output value was not achieved. Adjust the limit value if error persists.
002:018	Maximum output exceeded	The output value has exceeded the admissible maximum. Adjust the limit value if error persists.
002:019	Power overload	The current power level is greater than the admissible maximum. Adjust the limit value if error persists. Adapt the configuration or switch to a higher power classification if the value is at the maximum level.
002:020	Maximum power loss exceeded	Power loss of the horn is greater than stated in the system parameters. Check oscillator system, replace, or increase maximum power loss value.
002:021	Timeout RS485	The RS485 interface of the generator failed to respond within the specified time. Replace the generator module and/or the ACU front if error persists.
002:022	Illegal data length	The data received or transmitted does not contain the required number of characters. Replace the generator module and/or the ACU front if error persists.
002:023	Protocol error	An error has occurred in the transmission protocol. Replace the generator module and/or the ACU front if error persists.
002:024	Receiver buffer overrun	The receiver buffer cannot accept any more characters. Replace the generator module and/or the ACU front if error persists.
002:025	Invalid generator address	The generator has an invalid address. Check the module address of the generator module. Replace the generator module and/or the ACU front if error persists.

002:026	Invalid data	The generator has received invalid data. Replace the generator module and/or the ACU front if error persists.
002:027	The EEPROM is write-protected	An attempt has been made to write data into the EEPROM. Replace the generator module and/or the ACU front if error persists.
002:028	Cannot transmit data	The data cannot be transmitted to the generator module. Replace the generator module and/or the ACU front if error persists.
002:029	Unknown generator type	The generator used cannot be clearly identified. Replace the generator module and/or the ACU front if error persists.
002:030	Timeout while reading actual values data	The RS485 interface of the generator failed to respond during the specified time while reading actual values data. Replace the generator module and/or the ACU front if error persists.
002:031	Timeout while reading plot data	The RS485 interface of the generator failed to respond during the specified time while reading plotter data. Replace the generator module and/or the ACU front if error persists.
002:032	Timeout while reading plot register	The RS485 interface of the generator failed to respond during the specified time while reading the plot register. Replace the generator module and/or the ACU front if error persists.
002:033	Timeout while reading offset register	The RS485 interface of the generator failed to respond during the specified time while reading the offset register. Replace the generator module and/or the ACU front if error persists.
002:034	Power overload level reached	The generator has reached the overload level. Adjust the limit value if the error persists. Adapt the configuration or switch to a higher power classification if the value is at the maximum level.
002:035	Saturation power measurement	The power measurement was saturated. Check oscillator system, replace. Replace the generator module if error persists.
002:036	Program interrupted	The welding has been interrupted.
002:040	Energy minimum not achieved	The required minimum energy value was not achieved. Adjust the limit value if error persists.
002:041	Energy maximum exceeded	The energy value has exceeded the admissible maximum. Adjust the limit value if error persists.
002:042	US time not achieved	The required minimum welding time was not achieved. Adjust the limit value if error persists.
002:043	US time exceeded	The welding time has exceeded the admissible maximum. Adjust the limit value if error persists.
002:044	Minimum output not achieved	The required minimum output value was not achieved. Adjust the limit value if error persists.

002:045	Maximum output exceeded	The output value has exceeded the admissible maximum. Adjust the limit value if error persists.
002:048	Plotter activated	The plotter is recording data.
002:049	Frequency reset activated	The frequency will be reset to the default value after each welding operation.
002:050	Welding interrupted	The welding has been interrupted.
002:056	Mains voltage too low	The mains voltage for the oscillator is too low. Check mains voltage, correct, replace generator module.
002:057	12V power pack faulty	The 12V power pack is faulty. Check mains voltage and fuses, replace generator module.
002:058	Minimum drive end phase	The end phase is operated below the minimum drive. Check oscillator system, replace oscillator system, replace generator module.
002:059	Temperature end phase too high	The temperature on the cooling unit of the power transistors has reached the admissible maximum. Adjust welding cycle parameters, improve cooling of the generator module.
002:065	Minimum frequency not achieved	The frequency is below the admissible minimum. Check oscillator system, replace.
002:064	Maximum frequency exceeded	The frequency has exceeded the admissible maximum. Check oscillator system, replace.
002:066	Maximum converter voltage	The converter voltage has exceeded the admissible maximum. Check oscillator system, change characteristic curve, replace oscillator system, replace generator module.
002:067	Power overload	The power level has exceeded the admissible maximum. Adjust the limit value if error persists. Adapt the configuration or switch to a higher power classification if the value is at the maximum level.
002:068	Full drive end phase	The end phase is operated with maximum drive. Check mains voltage if working with 100% amplitude, adjust parameters, replace generator module
002:069	Converter not connected	The converter is not connected properly.
002:070	Converter short circuit	Short circuit on the converter outlet.

14.11.4 Press errors (area 003:xxx)

Number	Name	Description
003:000	Travel measurement error	An error has been detected on the Travel measurement. Check against calibration, replace.
003:001	Force sensor error	An error has been detected on the force sensor. Check against calibration, replace Dynamic control board.
003:002	Valve error	An error has been detected when triggering the valves. Check valves (system status menu), replace.
003:003	Two-hand error	The two-hand circuit indicates an error. Check fuses, connectors (system status menu), replace.
003:004	End position not reached	The top end position of the cylinder was not reached. Check cylinder position (system status menu), check connectors, replace.
003:005	Safety switch error	The safety switch on the press is faulty (wire breakage in the start line). Check switch (system status menu), check connector, replace.
003:006	Max. welding time exceeded	The maximum welding time of 10 s has been exceeded. Adjust parameters so that entire welding cycle is completed within 10 s.
003:007	Welding interrupted	The welding has been interrupted. Two-hand start released before reaching the safety switch.
003:008	Emergency shutdown executed	The emergency shutdown was triggered. Release the emergency shutdown.
003:009	Emergency stop executed	A malfunction has caused the press to trigger an emergency stop.
003:010	Communication error	The CAN communication between the press and the ACI is disrupted. Replace Dynamic control board or the ACU front if error persists.
003:011	Limit exceeded – interrupted	Maximum travel or maximum time was exceeded, the press has interrupted the welding. Set more appropriate limits if error persists.
003:012	Parameter error	Illogical parameters were used: – Melt path was reached before the horn was positioned – Melt path was reached before the force trigger was reached – Horn was positioned before reaching the path trigger – Horn was positioned before reaching the path braking point
003:013	Triggering of safety switch	The trigger force was reached before the safety switch. Check parameters, check distance or force measuring system.

14.11.5 Sound enclosure errors (area 004:xxx)

Number	Name	Description
004:000	Error during initialization	Initialization failed. Check sensors and actuators and connections to the sound enclosure. Replace generator if error persists.
004:001	Lift door not at top at start of cycle	The lift door is not in the top end position at the start of the cycle. The sensor does not respond. Check compressed air service to the cylinder, solenoid valve, sensor, and connection (system status menu). Replace sensor and/or solenoid valve, replace generator.
004:002	Lowering of lift door blocked	Lift door cannot be lowered in the specified time. Remove blocking parts, adjust lifting speed, check compressed air service to the cylinder, solenoid valve, sensor, and connection (system status menu). Replace sensor and/or solenoid valve, replace generator.
004:003	Raising of lift door blocked	Lift door cannot be raised in the specified time. Remove blocking parts, adjust lifting speed, check compressed air service to the cylinder, solenoid valve, sensor, and connection (system status menu). Replace sensor and/or solenoid valve, replace generator.
004:004	Sound enclosure open	The sound enclosure is not closed. The switch for monitoring of the doors does not respond. Check switch and connection (system status menu), replace, replace generator.
004:005	Lift door was opened during the cycle	The sensor signal of the lift door was removed during operation. Did manual intervention occur? Check compressed air service to the cylinder, switch, sensors, valve, replace, replace generator.

14.11.6 Main module errors (area 010:xxx)

Number	Name	Description
010:000	Maximum time limit exceeded	The time has exceeded the admissible maximum. Adjust limit value if error persists.
010:001	Minimum time limit not achieved	The required minimum time was not reached. Adjust limit value if error persists
010:002	Maximum energy limit exceeded	The energy value has exceeded the admissible maximum. Adjust the limit value if error persists.
010:003	Minimum energy limit not achieved	The required minimum energy value was not reached. Adjust the limit value if error persists.
010:004	Maximum output limit exceeded	The output value has exceeded the admissible maximum. Adjust the limit value if error persists.
010:005	Minimum output limit not achieved	The required minimum output value was not reached. Adjust the limit value if error persists.
010:006	Maximum travel limit exceeded	The travel has exceeded the admissible maximum. Adjust the limit value if error persists.
010:007	Minimum travel limit not achieved	The required minimum travel was not reached. Adjust the limit value if error persists.
010:012	No valid data	The Weld Data buffer does not yet contain valid data. Replace the ACU front if error persists.
010:013	Range exceeded	The range of individual variables was exceeded. Adjust parameters.
010:014	Reset failed	An attempt was made to initialize the system when the software was started up. Replace the ACU front if error persists.
010:015	Limit exceeded	One or more limits were exceeded during the last welding. Set more appropriate limits if error persists.
010:016	CAN communication error	Data is no longer being transferred to the press. The process data in the press are no longer being updated. Replace the ACU front and/or the Dynamic control board if error persists.
010:017	Emergency shutdown actuated	The emergency shutdown button has been actuated. Release emergency shutdown button, check emergency shutdown (system status menu), replace.
010:018	No press reported	The press could not report to the control system. Check connection. Replace the ACU front and/or the Dynamic control board if error persists.
010:019	Press reported	The press has reported.

010:020	Target quantity achieved	The set target quantity has been achieved. Delete or increase target quantity.
010:021	System parameters initialized	One or more parameters are invalid. The values are set to a default value. Please check customer-specific parameters!
010:022	Invalid start mode	AD/DA adjustment and force calibration are only possible in manual mode. Please correct start mode in system parameters.
010:023	Melt time > total time	Illogical parameters for the two times. The melt time will be set to the value of the total time.
010:024	Melt path > total path	Illogical parameters for the two paths. The melt path will be set to the value of the total path.
010:025	Brake path > melt path	Illogical parameters for the two paths. An error can occur in path Abs 1 and Abs 2. The brake path will be set to 00.0 mm. The brake path will also be set to 00.0 mm if the value is greater than 99.99 mm (can occur with path measuring unit «inch»).
010:026	Trigger path > melt path	Illogical parameters for the two paths. An error can occur in path Abs 3. The brake path will be set to 00.0 mm. The brake path will also be set to 00.0 mm if the value is greater than 99.99 mm (can occur with path measuring unit «inch»).
010:027	Brake path > trigger path	Illogical parameters for the two paths. An error can occur in path Abs 3. The brake path will be set to 00.0 mm. The brake path will also be set to 00.0 mm if the value is greater than 99.99 mm (can occur with path measuring unit «inch»).
010:028	Max time < min time	Illogical parameters for the two times. The minimum and maximum time values were set incorrectly.
010:029	Max energy < min energy	Illogical parameters for the two energy values. The minimum and maximum energy values were set incorrectly.
010:030	Max output < min output	Illogical parameters for the two output values. The minimum and maximum output values were set incorrectly.
010:031	Max path < min path	Illogical parameters for the two energy values. The minimum and maximum path values were set incorrectly.

14.11.7 CAN bus errors (area 011:xxx)

Number	Name	Description
011:020	CAN timeout	The Can command could not be transmitted in the specified time. Replace the ACU front and/or Dynamic control board if error persists.
011:021	CAN hardware error	The CAN interface indicates a hardware error. Replace the ACU front and/or Dynamic control board if error persists.
011:022	CAN data length invalid	The data length of the command received is invalid. Replace the ACU front and/or Dynamic control board if error persists.
011:023	CAN protocol error	An error has occurred in the transmission protocol. Replace the ACU front and/or Dynamic control board if error persists.
011:024	CAN buffer overrun	The receiver buffer of the CAN module cannot accept any more commands. Replace the ACU front and/or Dynamic control board if error persists.
011:025	CAN invalid response	The control system has received an invalid response from the press. Replace the ACU front and/or Dynamic control board if error persists.
011:026	CAN invalid address	The command contains an invalid address. Replace the ACU front and/or Dynamic control board if error persists.
011:027	CAN invalid data	The command contains invalid data. Replace the ACU front and/or Dynamic control board if error persists.

14.11.8 Generator SW errors (area 013:xxx)

Number	Name	Description
013:000	ErrNo_Open485	Cannot open RS485
013:001	ErrNo_LinkPRS-Modul	Error in link to PRS module
013:002	ErrNo_LinkGEN-Modul	Error in link to GEN module
013:003	ErrNo_LinkERR-Modul	Error in link to ERR module
013:004	ErrNo_LinkGEN-Event	Error in link to GEN event
013:006	ErrNo_LinkIST-Modul	Error in link to IST module
013:007	ErrNo_Close-Rs485	Cannot close RS485
013:008	ErrNo_UnLinkPRSModul	Error unlinking PRS module
013:009	ErrNo_UnLinkGENModul	Error unlinking GEN module
013:010	ErrNo_UnLinkERRModul	Error unlinking ERR module
013:011	ErrNo_UnLinkGENEvent	Error unlinking GEN event
013:012	ErrNo_UnLinkISTModul	Error unlinking IST module
013:013	ErrNo_Wrong-Value	Invalid input
013:014	ErrNo_OpenRs232	Cannot open RS232
013:015	ErrNo_CloseRS232	Cannot close RS232
013:016	ErrNo_UnlinkSYSModul	Error unlinking SYS module
013:017	ErrNo_UnlinkGENISTMODUL	Error unlinking GENIST module

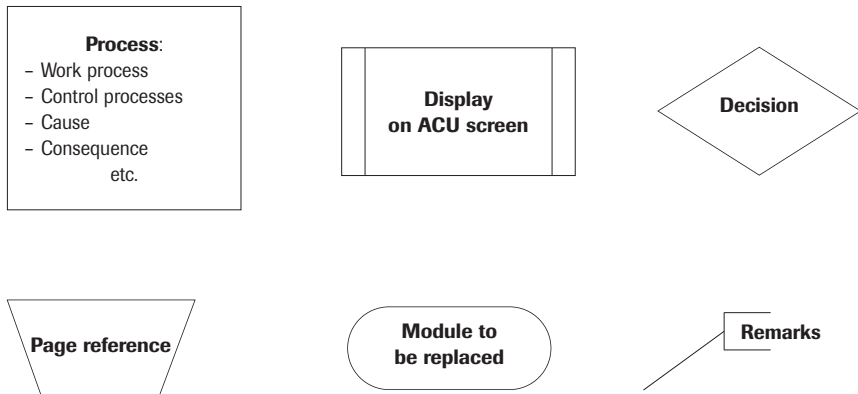
Replace the ACU module if the above errors are recurring.

14.11.9 Digital I/O errors (area 015:xxx)

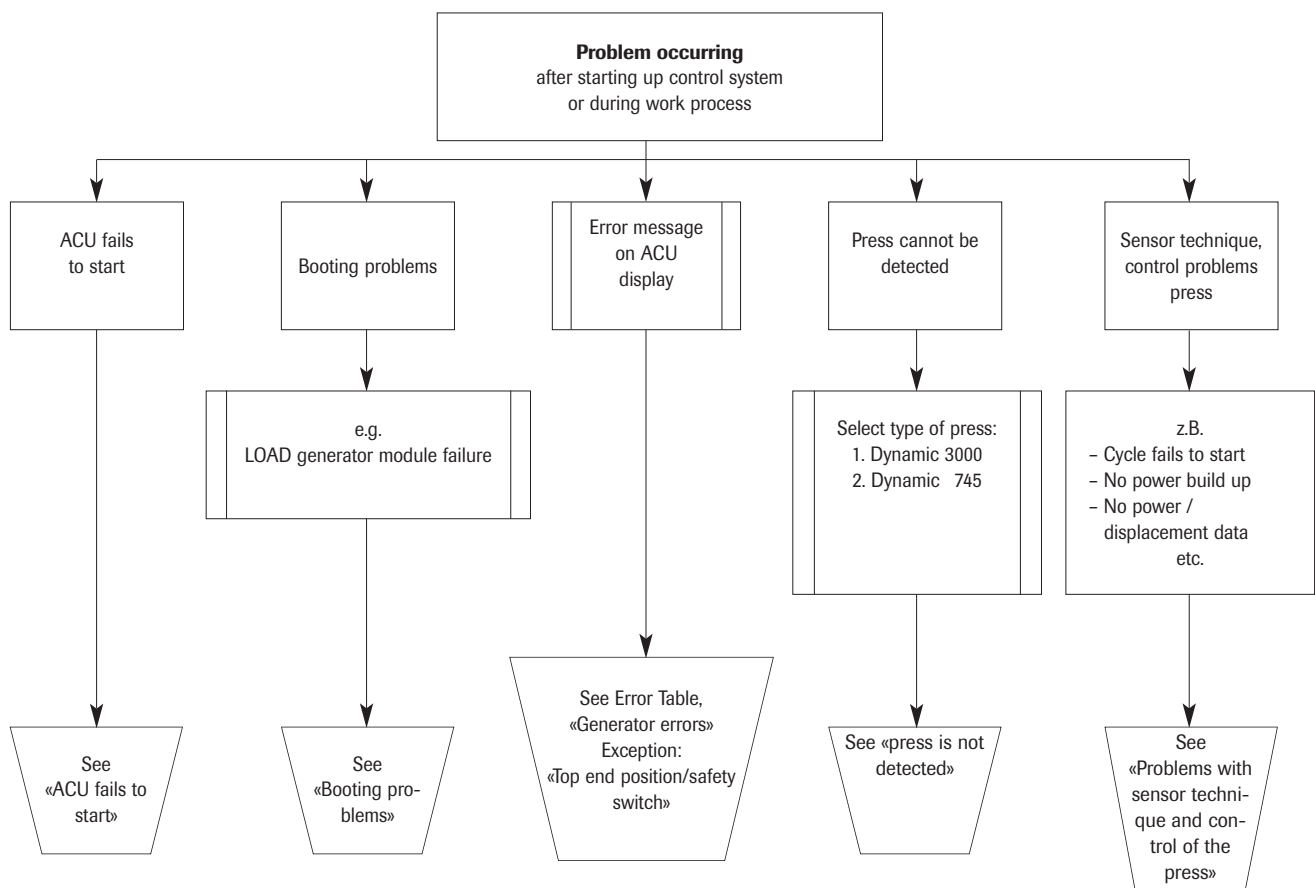
Number	Name	Description
015:000	Stop cycle	The «stop cycle» input was set.
015:001	ACU blocked	The ACU has been blocked by an external program.

14.12 Error localization

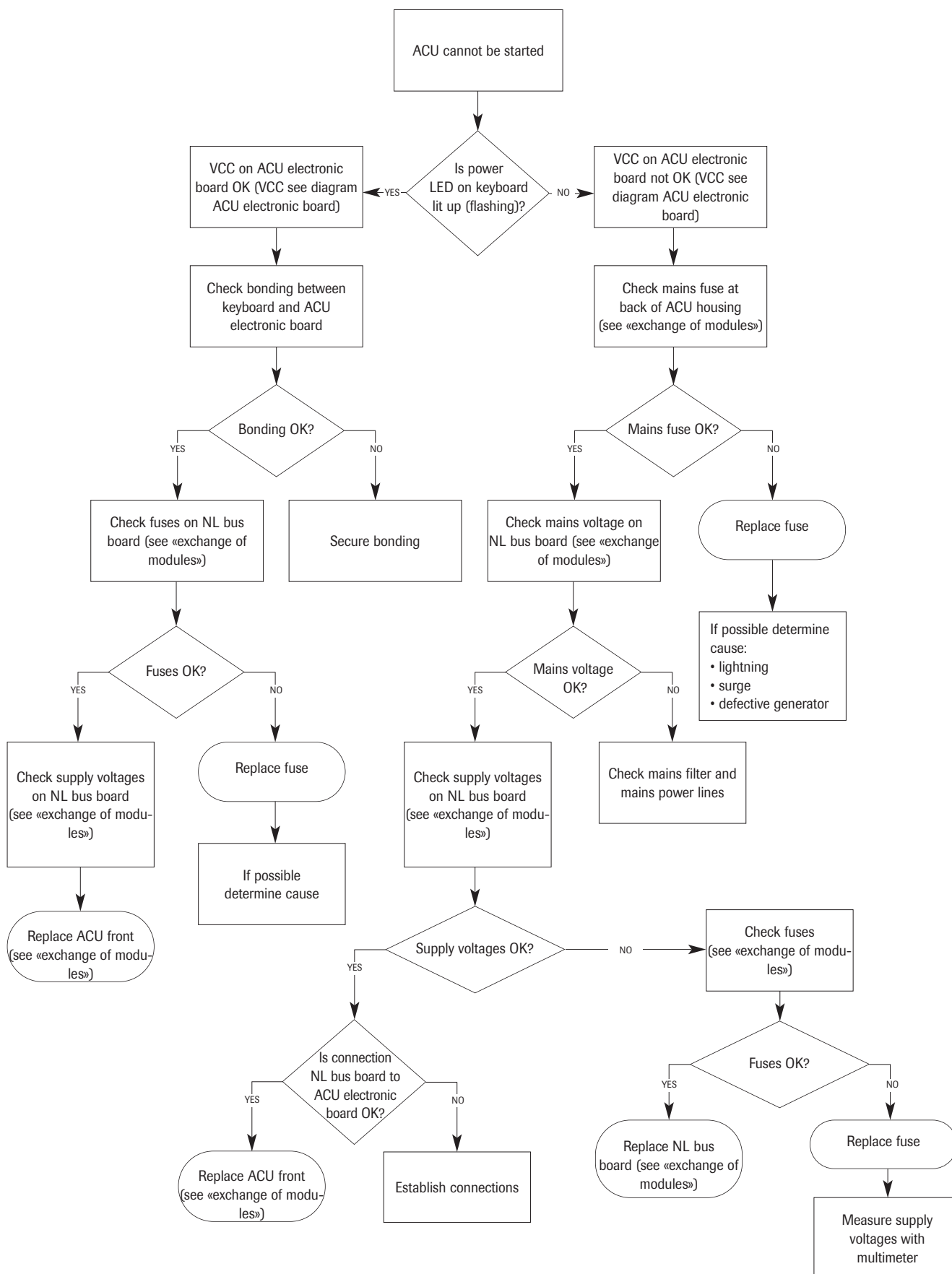
Meaning of symbols used (shapes)



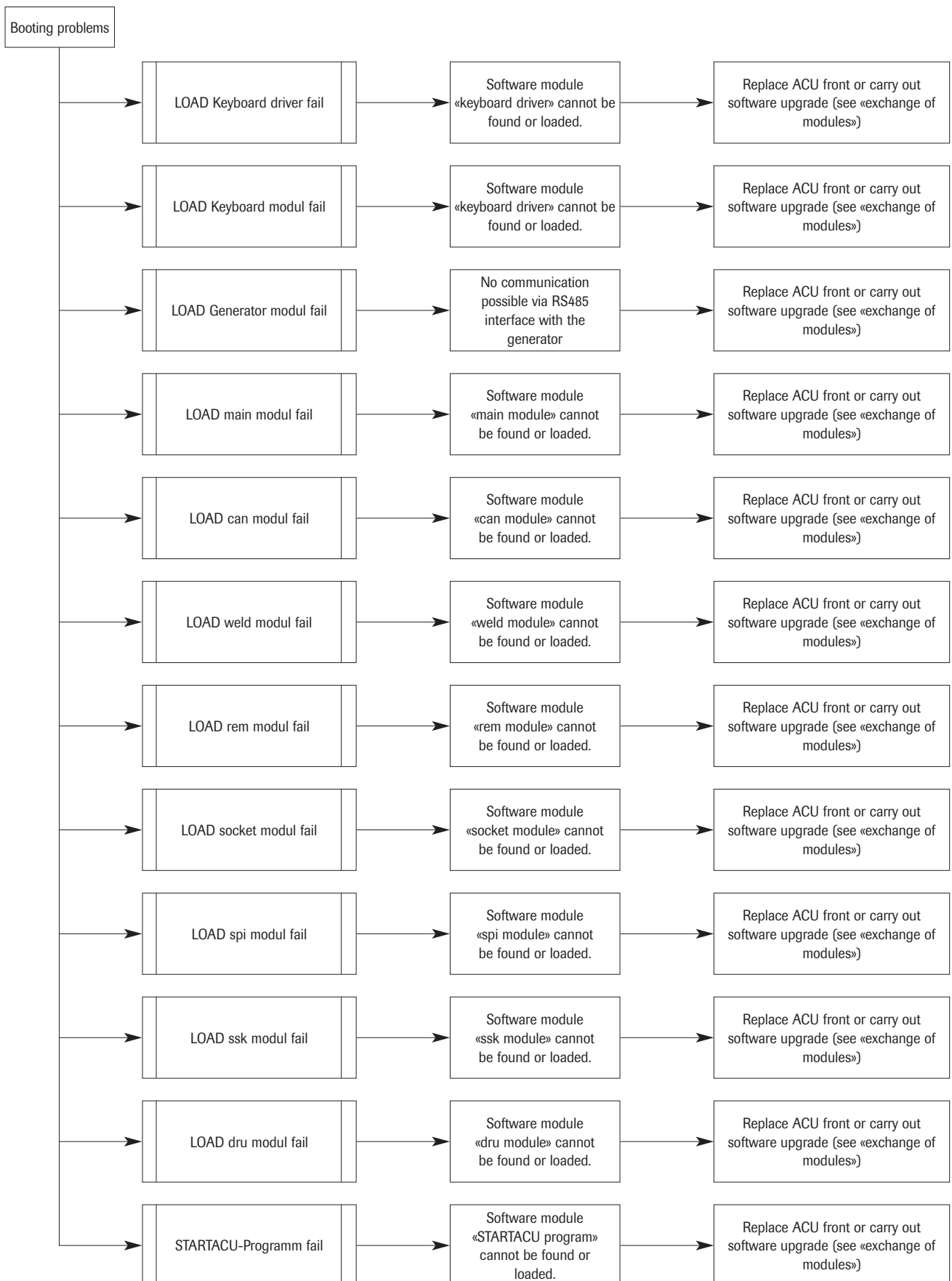
14.12.1 Overview error localization



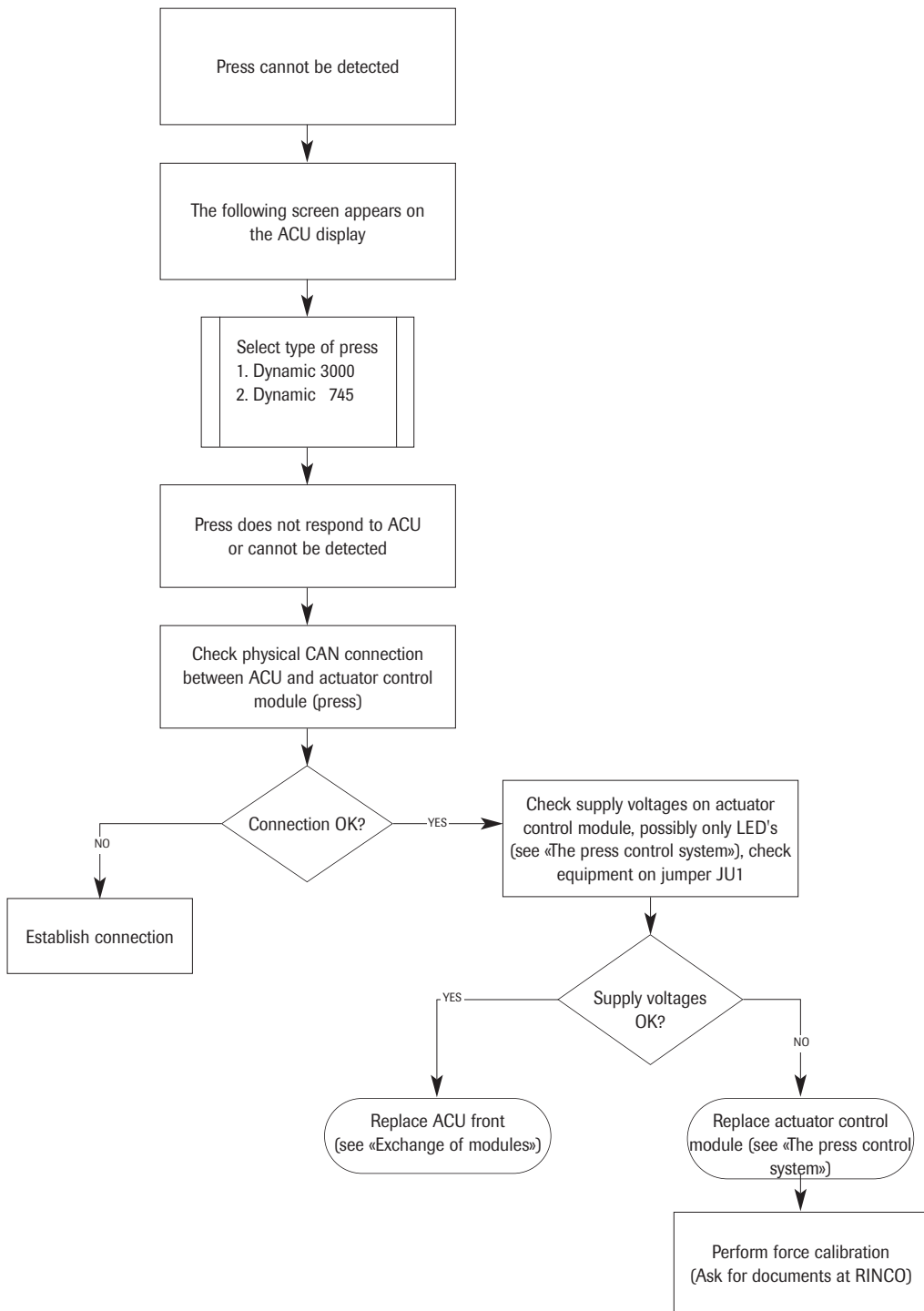
14.12.2 Error localization «ACU fails to start»



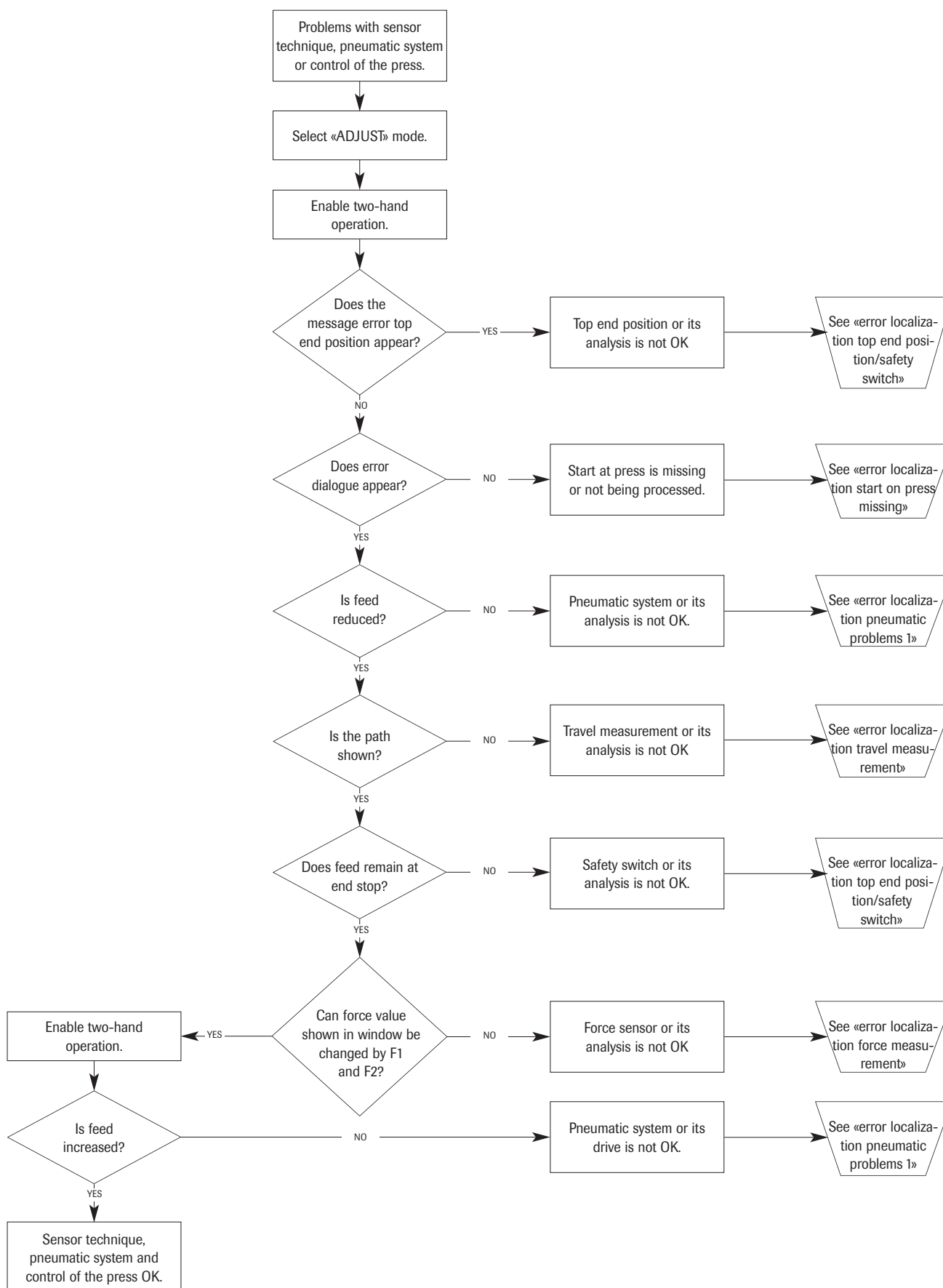
14.12.3 Error localization «Booting problems»



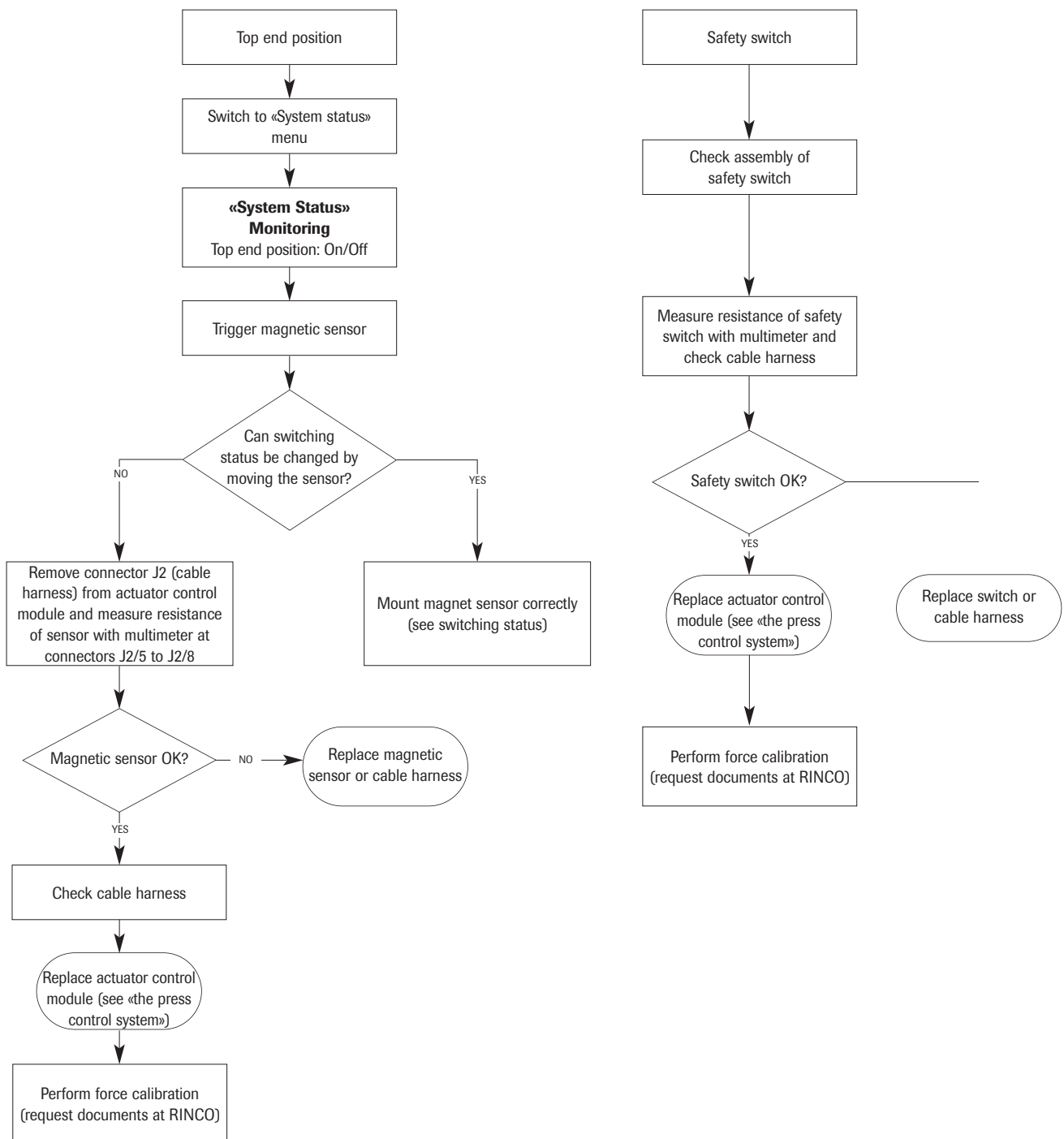
14.12.4 Error localization «Press is not detected»



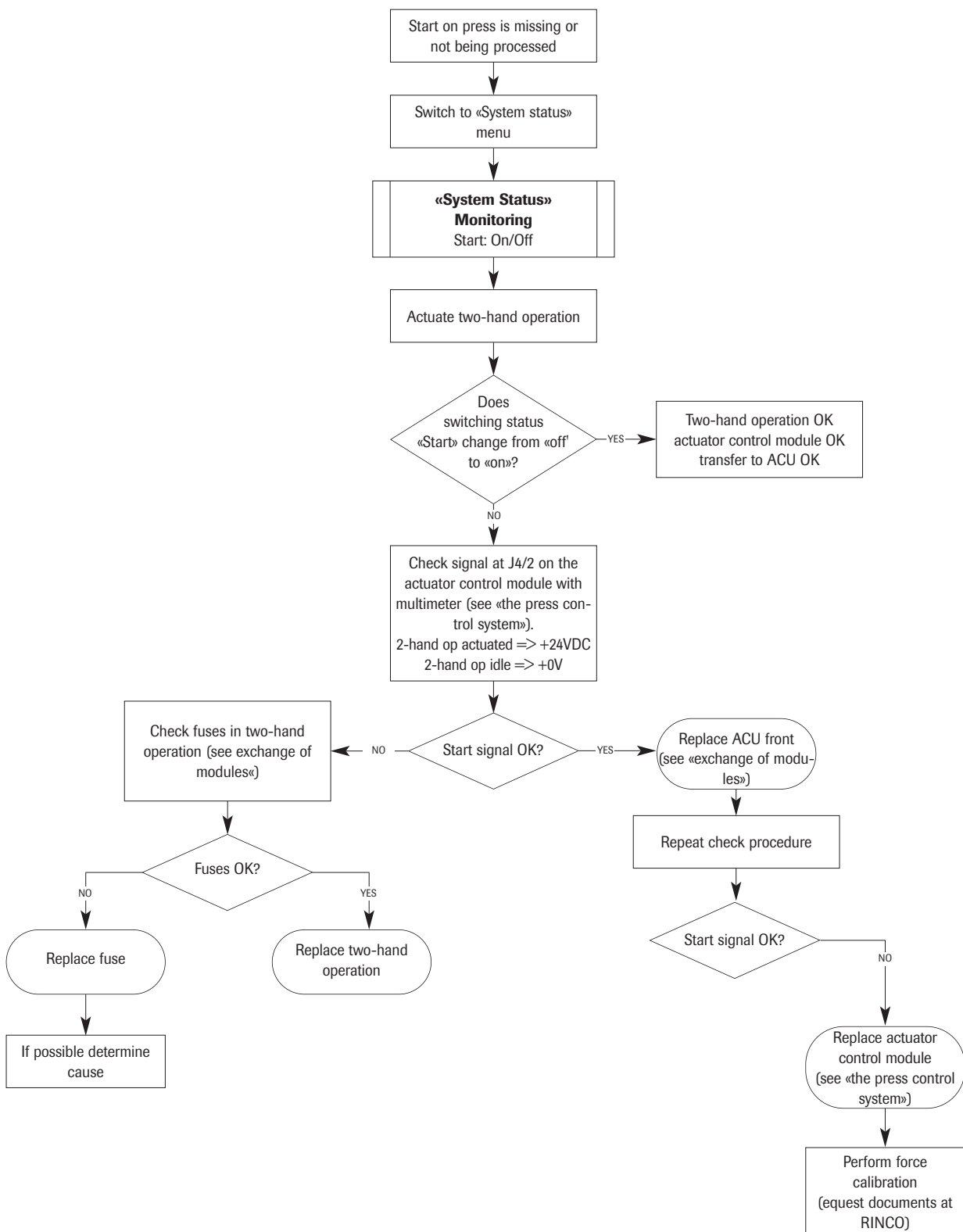
14.12.5 Error localization «Problems with sensor technique and control of the press»



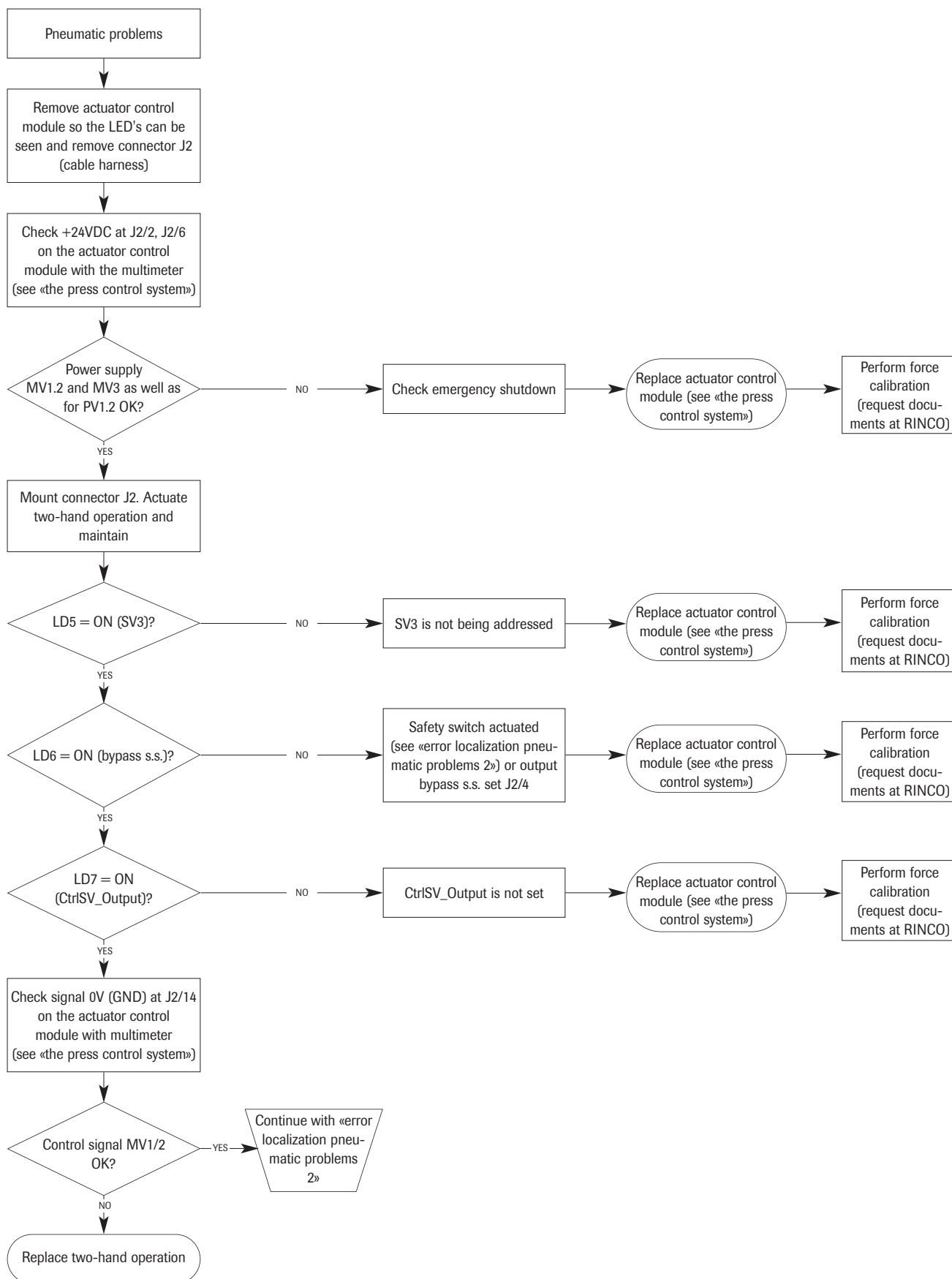
14.12.6 Error localization «Top end position/safety switch»



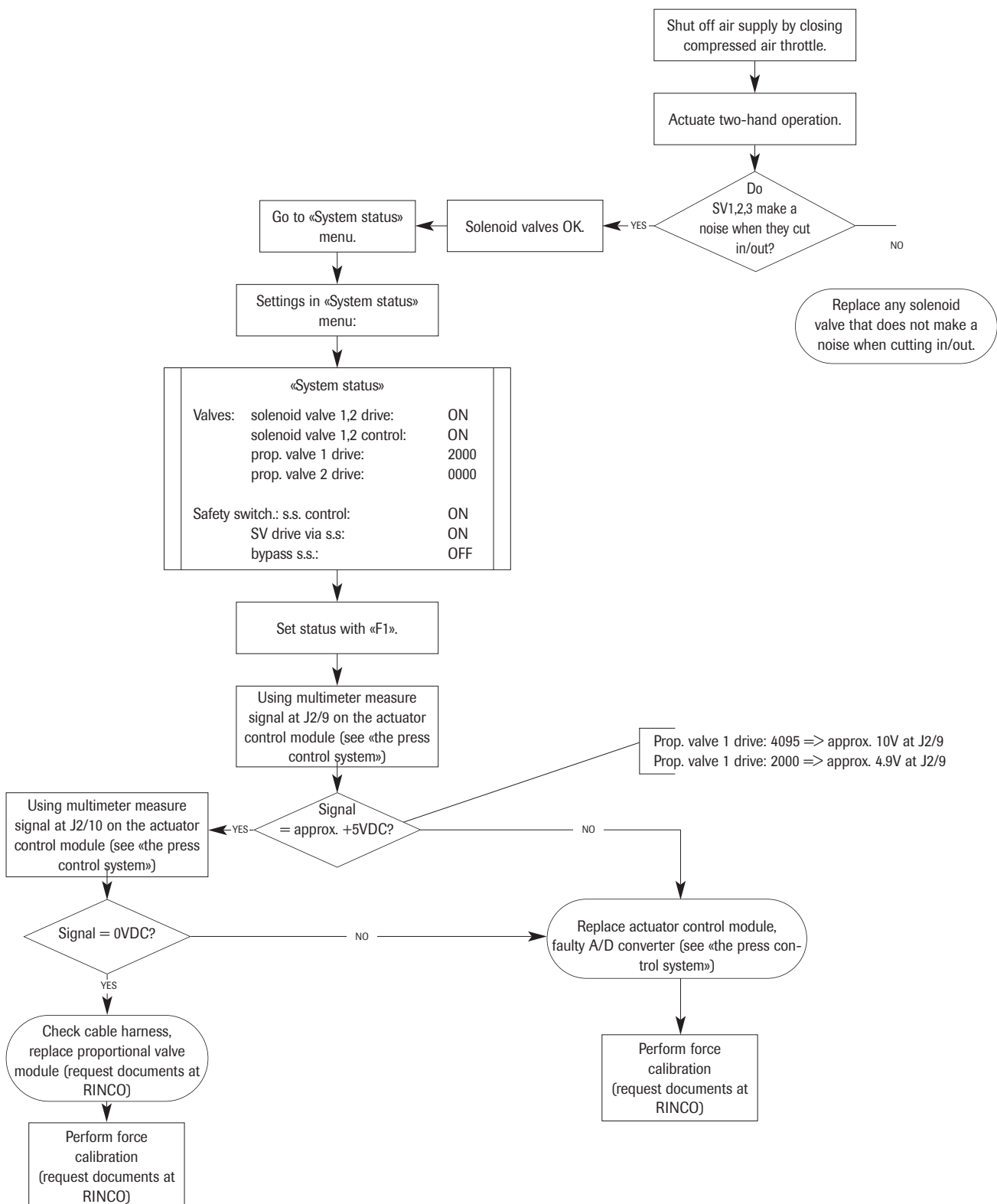
14.12.7 Error localization «Start on press missing»



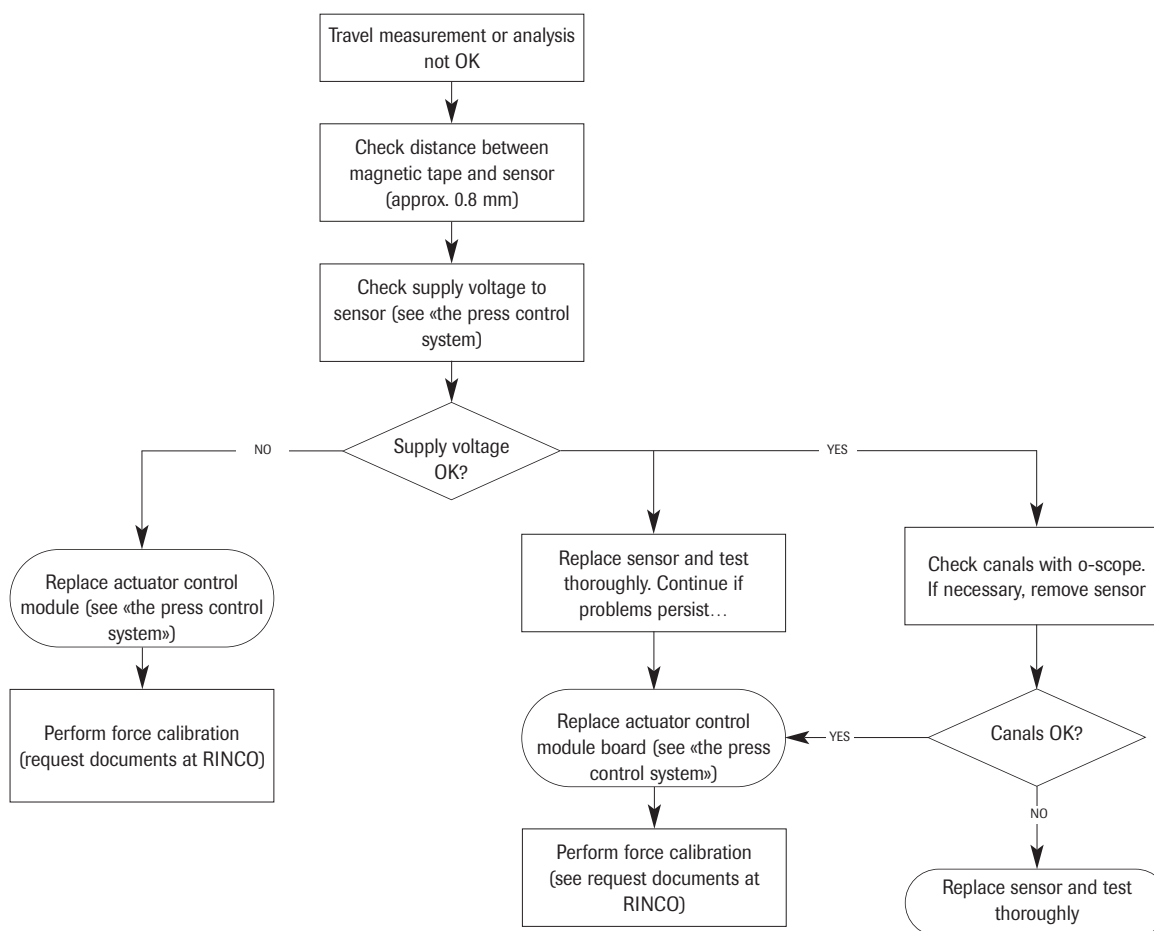
14.12.8 Error localization «Pneumatic problems 1»



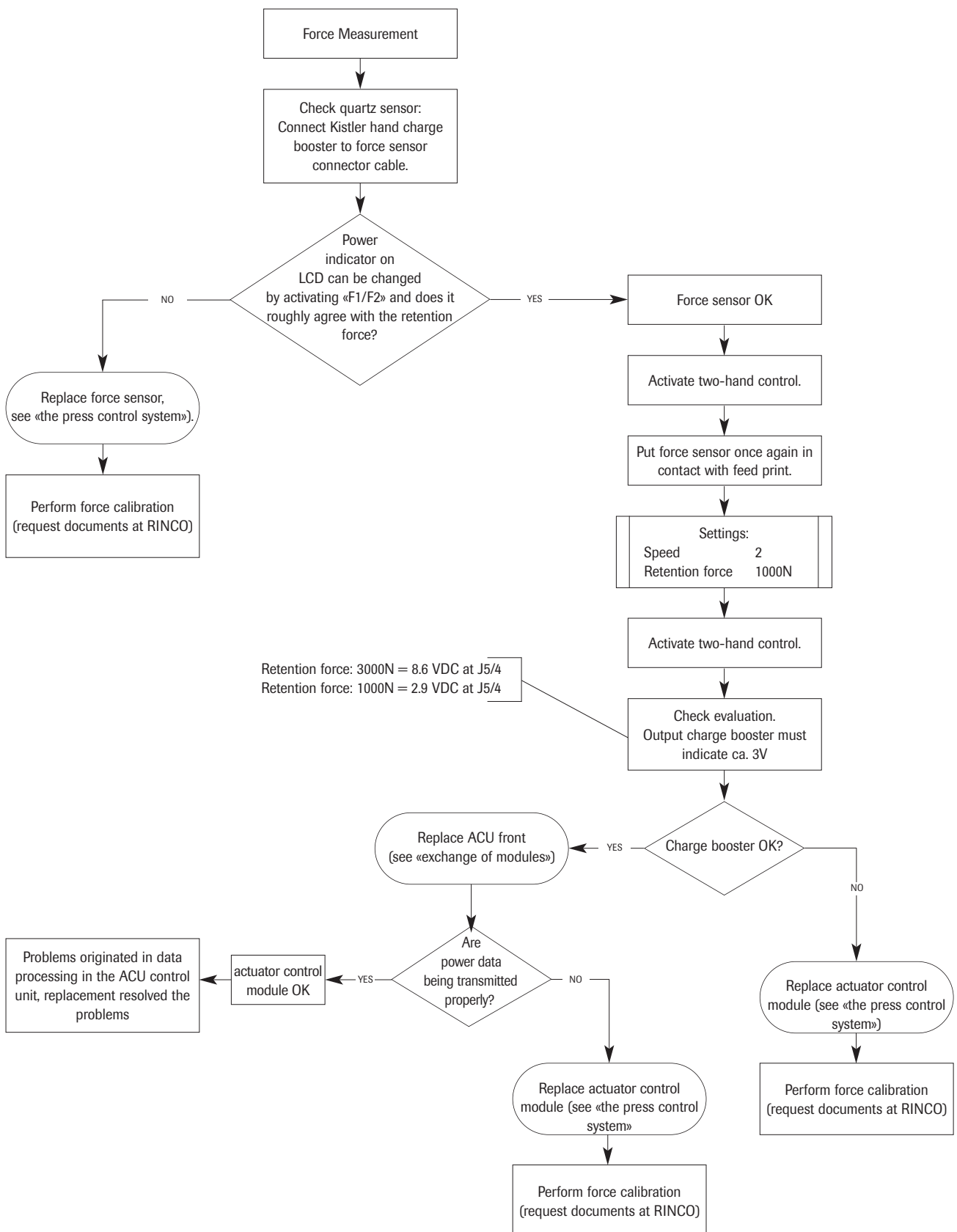
14.12.9 Error localization «Pneumatic problems 2»



14.12.10 Error localization «Travel measurement»



14.12.11 Error localization «Force measurement»



14.13 Interface pin assignment

1 RS 232 (9 pin Sub-D)

- 1 NC
- 2 TXD
- 3 RXD
- 5 GND
- 7 NC
- 8 NC

2 Ethernet (15 pin SUB-D)

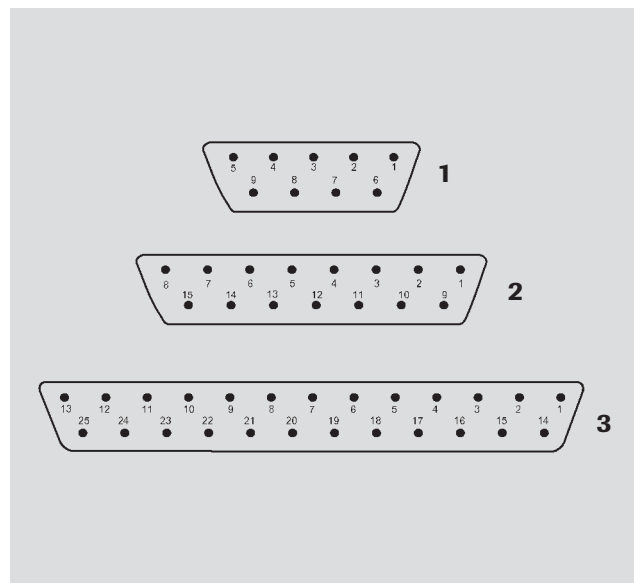
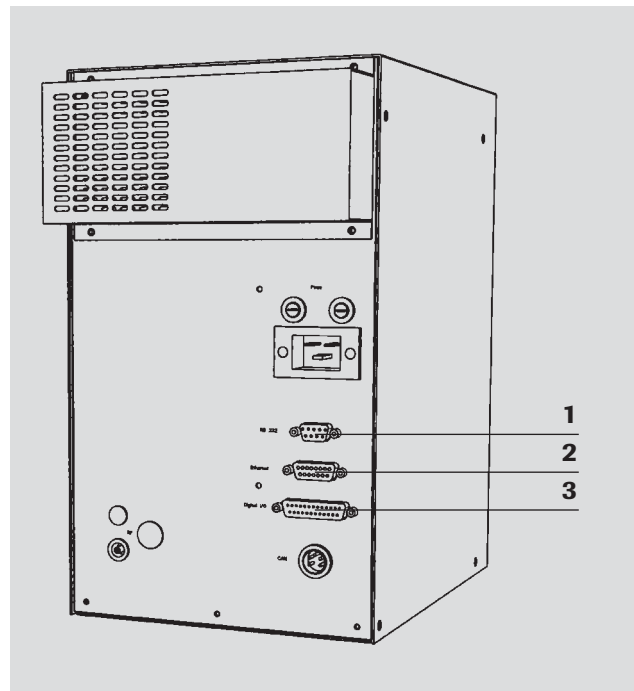
- 1 Shield
- 2 Collotion +
- 3 Transmit +
- 4 Shield
- 5 Recieve -
- 6 GND 12 V
- 7 NC
- 8 NC
- 9 Collotion -
- 10 Transmit -
- 11 Shield
- 12 Receive -
- 13 +12V

3 Digital I/O (25 pin SUB-D)

- 1 +24VDC_INT_OUT
- 2 +24VDC_INT_OUT
- 3 GND
- 4 GND
- 5 +24VDC output supply I/O card *)
- 6 +24VDC input supply I/O O card *)
- 7 Press resting position
- 8 SSK stroke-door solenoid valve
- 9 Error
- 10 Readiness
- 11 NC
- 12 Reserved
- 13 Reserved
- 14 NC
- 15 Start external
- 16 Reserved
- 17 Stop cycle
- 18 contact switches (+ 24V)
- 19 Reset (acknowledge error)
- 20 booth and lift doors SSK closed
- 21 booth door SSK closed
- 22 Reserved
- 23 Reserved
- 24 Reserved
- 25 Reserved

All inputs and outputs have been designed for 24 VDC.
The load at the outputs may not exceed 100 mA.

To modify the equipment for automation please
contact the authorized RINCO service department
(see chapter 14.13.1)



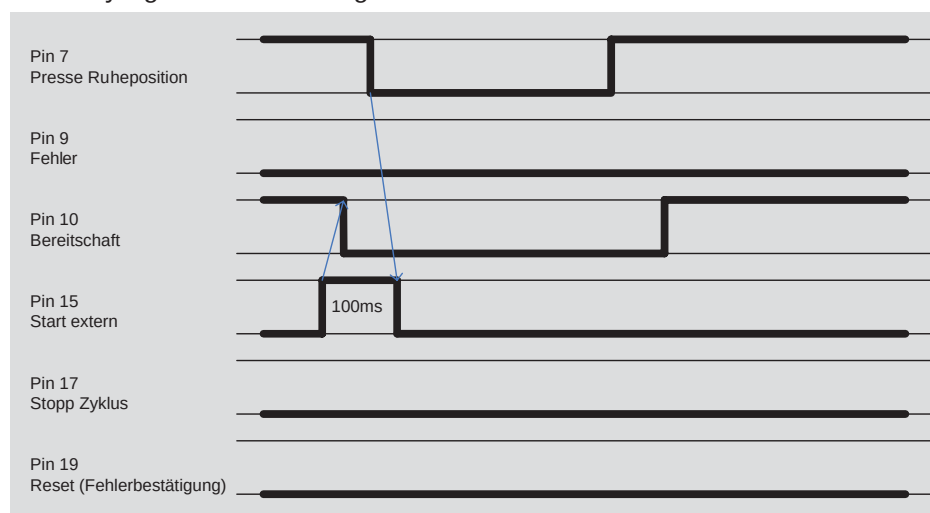
*) The jumper on the NL busprint must be set accordingly. A normally-closed contact must be included between PIN5 and PIN6. The I/O card is without power if the contact is opened, and hence a new cycle cannot be started.

14.13.1 Integration into special purpose machine (Control through PLC)

The following are signal characteristics of typical cases that occur at the integration of an ACU into a special purpose machine:

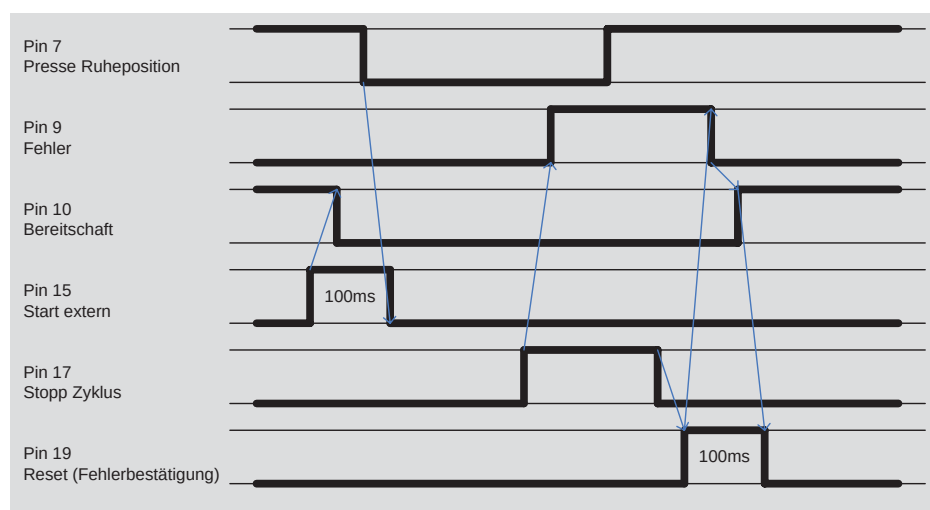
Normal weld cycle

When the machine is ready for a new weld cycle then the ready signal supplies a +24VDC signal and the error signal is 0V. A start signal is accepted when a +24VDC signal is being supplied for at least 100ms. If the ready signal is low then the start signal will not be accepted. After starting the weld cycle the ready signal is deactivated. When the weld cycle is ended the ready signal is activated again.



Stop weld cycle

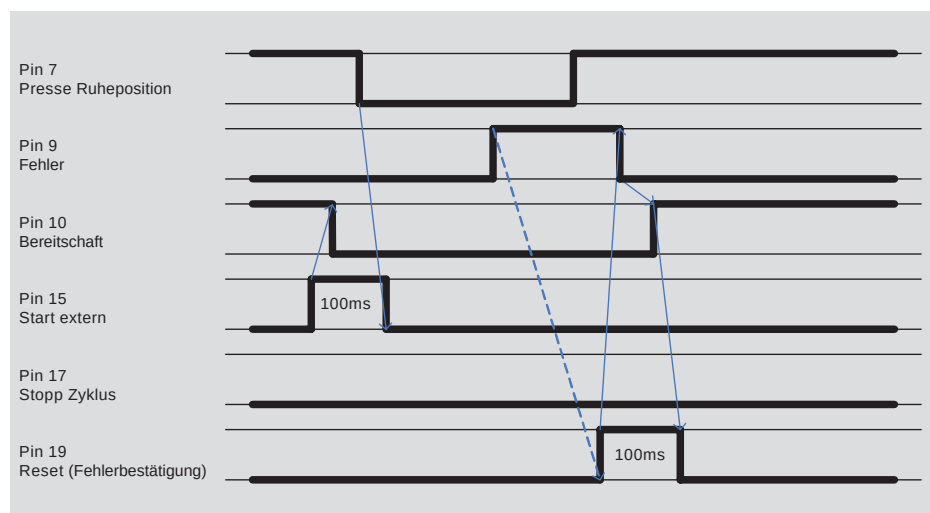
A weld cycle may be stopped at any time through a +24VDC signal at the stop cycle input. A new weld cycle can only be started with 0VDC at the stop cycle input. If the weld cycle is stopped then simultaneously the error output is activated and a error message is displayed on the ACU display. The error message can be cleared by a +24VDC signal at the reset input (acknowledge error).



Error during a weld cycle

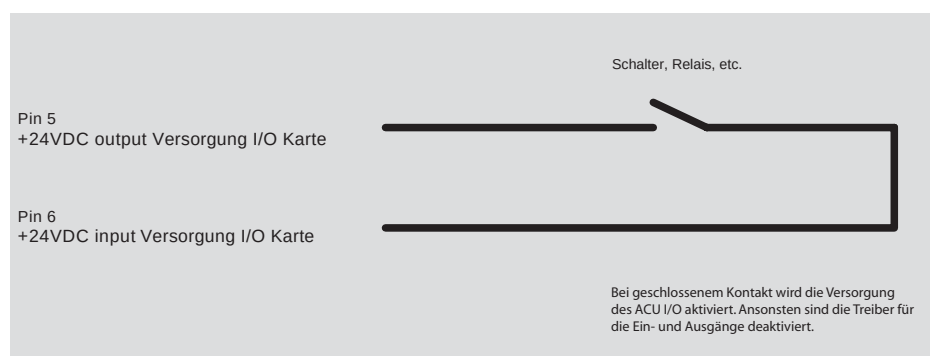
When an error occurs (e.g. from the generator) the weld cycle will be interrupted. The error output changes from low to high (+24VDC). Only when the error output is cleared through a +24VDC signal at the reset input will the error output change to 0V, now the ready signal output changes to high (+24VDC). The generator is ready for the next cycle.

The broken line between the error signal and the reset signal means, that the whole process should be also interested to reset the error on the ACU. It makes no sense if you immediately acknowledge every error without looking to the other conditions on the whole line.



Power supply

The ACU has the possibility to turn off the I/O card. In this case the jumper J10 on the NL- busprint in the ACU housing has to be set to position ON. Between pin 5 and pin 6 a contact can enable and disable the I/O card.



14.14 The press control system

The press control system is a sub-assembly attached to the rear wall. The press control system contains all the control and regulating functions required for the press, such as Travel measurement, force sensor and safety functions.

The press control system is supplied already equalised in the factory in Romanshorn.

Tools required:

- Philips screwdriver, size 2
- Screwdriver size 5
- Chip changing tweezers
- Body earthing tape

Disassembly

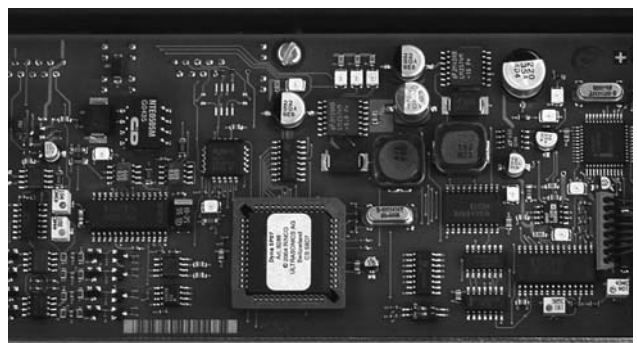
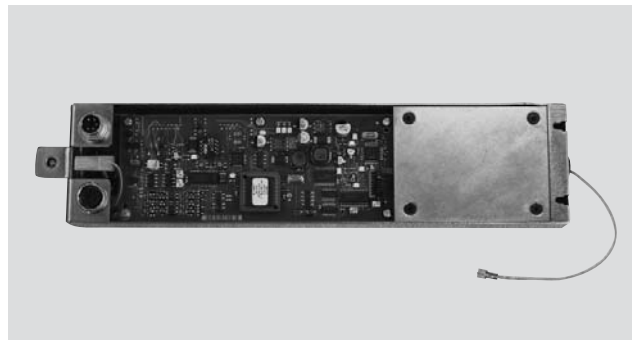
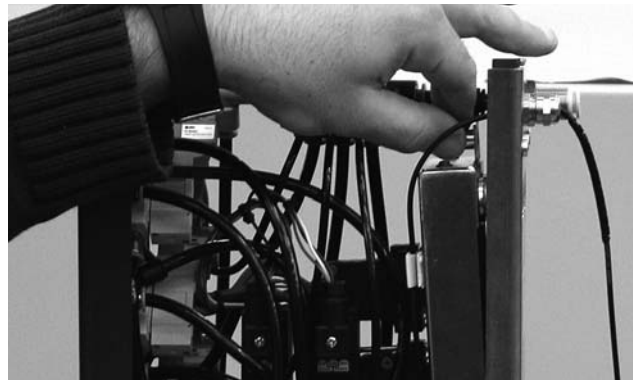
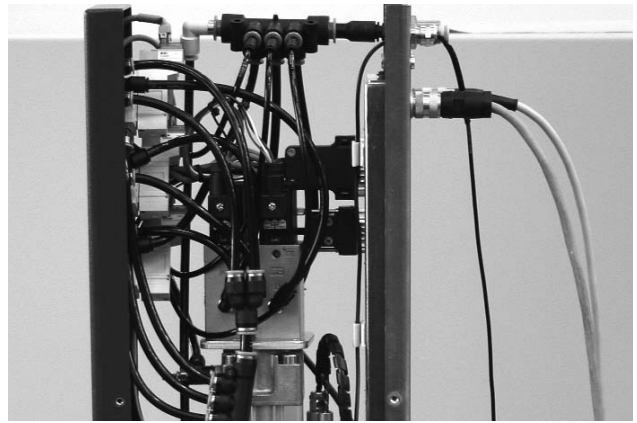
- Open the side cover.
- Disconnect the plug (cable harness, position sensor, force sensor).
- Loosen the fastening screw.
- Swing out the control module and disconnect the two plugs at the back.
- Caution, do not push the disconnected cable into the back of the press.

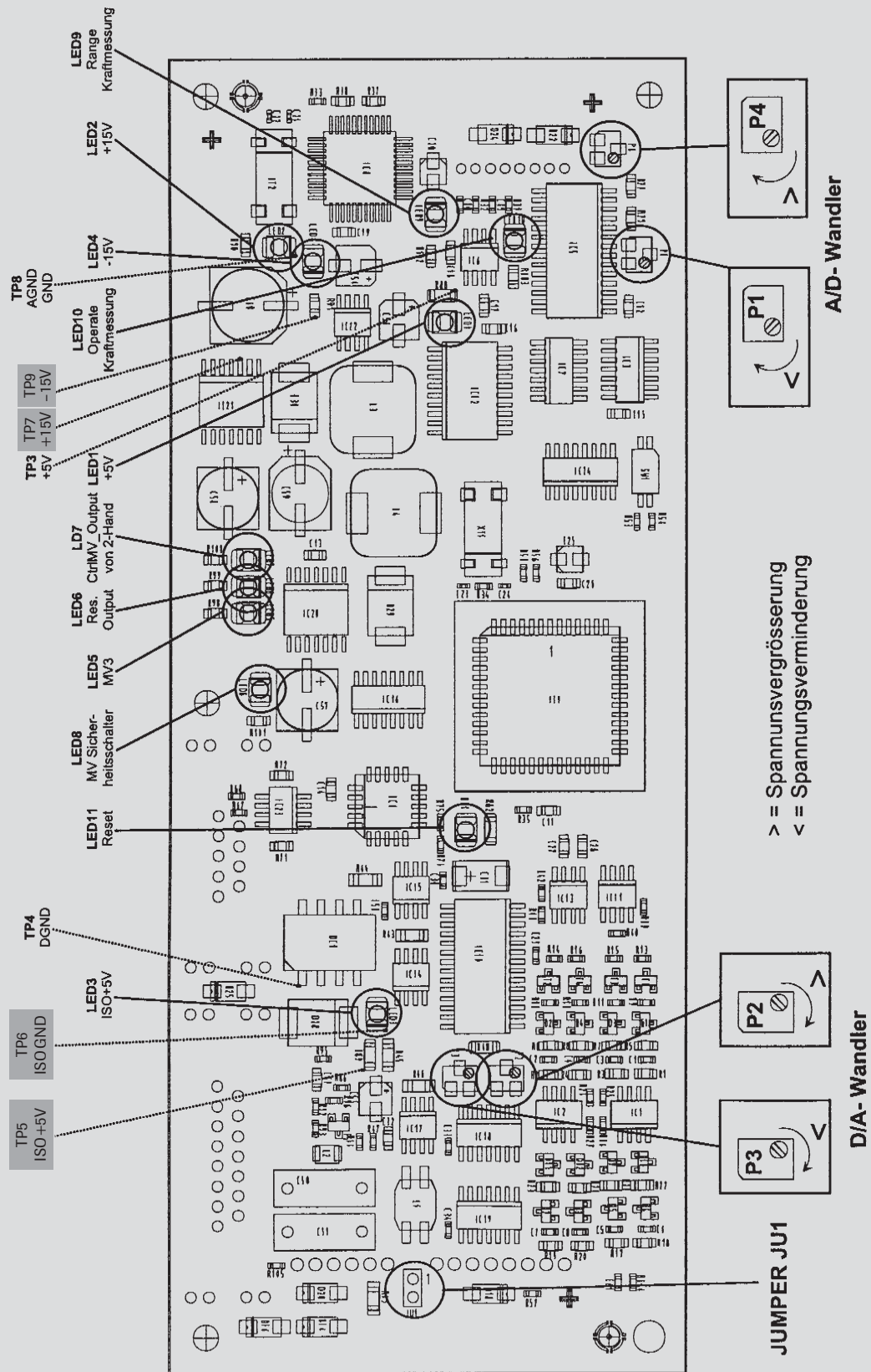
Replacing the software

Occurs when the μ -processor is changed. Calibration values are not stored in this microprocessor. Therefore, the unit has not to be recalibrated after a software update.

Replacement

- Lay the module on a clean work surface.
Caution: do not touch the charge booster.
- Remove the existing chip with the tweezers.
- Insert new chip in correct position.
- Attach the version label to the metal housing.
- To reassemble, proceed in reverse order
- Test the new versions.





14.14.1 Pin assignment on Dynamic control board

J1

Sub-D 9-pin socket

1.		<= +5
2.	red	=> CHA Travel measurement
3.	orange	=> CHB Travel measurement
4.	brown	<= +24 V
5.		NC
6.		<= DGND
7.		NC
8.		NC
9.	black	<= DGND

J3

JST 6-pin connector

1.	<=> CANH
2.	<=> CANL
3.	=> +24 V
4.	=> GND
5.	=> Earth
6.	=> Earth

J5

JST 08DS 8-pin connector

1.	<=> GND (force sensor)
2.	NC
3.	<= +24 V (force sensor)
4.	=> signal force sensor
5.	<= +24 V (Operate)
6.	<= Operate force sensor
7.	<= +24 V (Range)
8.	<= Range force sensor

J2

Sub-D 15-pin socket

1.	white	<= AGND (PV1)
2.	brown	<= +24 V_Not (for PV1+2)
3.	green	<= AGND (PV2)
4.	yellow	<= s.s. bypass (jumper J2/13)
5.	blue	=> top end position
6.	red	<= +24 V_Not (MV1+2)
7.	grey	<= signal MV3
8.	brown	<=+24 V_emergency magnetic switch
9.	blue	<= PV1
10.	purple	<= PV2
11.		=> reserve IN
12.	orange	<= SV safety switch
13.	yellow	=> no safety switch
14.	black	=> solenoid valve 1+2
15.		=> GND

J4

JST 8-pin socket

1.	<= +24 V (to emergency shutdown)
2.	=> Start1
3.	=> 24 V (from emergency shutdown)
4.	=> MV_Output from 2-hand operation
5.	=> MV_Output to 2-hand operation
6.	<= GND (to emergency shutdown)
7.	<= Earth
8.	<= Earth

=> **inputs**

<= **outputs**

15 Service addresses

If you experience problems with welding or technical faults with the equipment, please contact the Technical Customer Service of RINCO ULTRASONICS AG, who will be pleased to help you.

For an efficient response our Customer Service requires the following information:

- A precise description of the technical fault or welding problem.

Our address:

RINCO ULTRASONICS AG
Industriestrasse 4
CH-8590 Romanshorn
Switzerland

National calls

Tel. 071 466 41 00

Fax 071 466 41 01

International calls

Tel. ++41 71 466 41 00

Fax ++41 71 466 41 01

www.rincoultrasonics.com

info@rincoultrasonics.com



[illegible]



RINCO ULTRASONICS AG
Industriestrasse 4
CH-8590 Romanshorn 1
Switzerland

Tel. +41 71 466 41 00
Fax +41 71 466 41 01

info@rincoultrasonics.com
www.rincoultrasonics.com