Operating Manual

Generator Module

AGM20/35

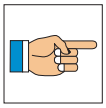
English

CE

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.

Version 2.0, gb, Art.-No. 35827

Notes



Read this operating manual before unpacking and commissioning the machine.
The machine may only be operated and maintained by staff who know this operating manual and the relevant legal regulations regarding occupational health and safety and accident prevention.

Agency

Table of contents

Important!

When making inquiries about your machine, please quote the exact type and machine serial number.
These can be found on the rating place (A) as well as on the inside of the front cover of this operating manual.
The design and switchgear of these machines is the object of ongoing further development and improvement and correspond to the latest state of technology.

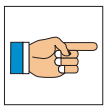
RINCO ULTRASONICS AG
Romanshorn, Switzerland

Foreword

Thank you for choosing a RINCO product. We are sure that you will achieve the best possible economy and product quality with this machine.
The intention of this manual is to provide the buyer and user with all the information needed for handling, assembly, operation and care of the machine.
The instructions contained in this manual must be followed in order to ensure that the machine always operates as efficiently as possible.

1 Explanation of signs and symbols

Please pay particular attention to sections of text with the following symbols:



Note!

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

Caution!

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

Danger!

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

2 Safety instructions

2.1 General

The design and construction of this machine correspond to the current state of technology and are safe in operation. The individual subassemblies as well as the complete machine were tested by our Quality Assurance Department before despatch.

2.2 Use according to the regulations

This machine is solely intended for the welding and cutting of suitable materials. Other use or use which goes beyond this welding and cutting is not considered to be according to the regulations.
The manufacturer shall not be liable for any damage resulting from such improper use. The risk shall be born by the user alone. This machine is intended for industrial use!

2.3 Improper use

- Use of the machine with insufficient knowledge of operation, maintenance and care of the machine.
- Changes as well as additions and modifications to the machine which could affect safety without the approval of RINCO ULTRASONICS.
- Changes to the control software!
- Use of unsuitable materials.
- Opening the machine during operation.
- Access to current-carrying parts or areas while the machine is switched on.

2.4 Special notes

Read these operating instructions carefully before commissioning the machine.
The operating instructions must be at hand at the machine location!

2.5 Qualification of staff

Only trained staff instructed in the use of the machine may work with the welder.
The plant operator must clearly allocate responsibilities for operating, setting up, maintaining and repairing the machine!
The plant operator must ensure that the only staff permitted to work with the machine are those who have been instructed to do so.
Only electrical specialists are permitted to work on the electrical equipment of the machine and they must obey the relevant electrotechnical rules.

2.6 Machine installation

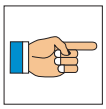
Danger!
Only carry out work on the connection of the machine when the power supply cable is disconnected!
The power connection must be provided with an earth connection!
Any specific safety regulations which apply in the country of use must be observed!
If these instructions are disregarded the manufacturer refuses liability for damage to persons or objects of any kind!
The machine must be closed and in a safe condition whenever it is switched on.

2.7 Operation

Caution!
Never open the machine during operation.

Danger!
High voltage is present inside the machine – danger of injury!

- Do not work in any way which could affect safety!
- Only operate the machine if all safety equipment and safety-related devices, e.g. removable safety equipment, noise protection, are present and functional.
- Before switching on the machine, ensure that nobody can be put at risk.



Correct operation, careful handling of machines and associated tools during operation

- maintain operating readiness
- prolong machine lifetime and
- reduce downtimes to a minimum.

2.8 Noise emissions

Caution!
Limit values: according to the present state of knowledge, ultrasonic does not cause any damage if the maximum level is below 140dB and the average level is beneath 110dB linear, related to an 8-hour day.

Pay attention to subharmonic, i.e. audible vibrations, which depending on application, can vary a great deal and present a considerable nuisance as well as causing actual damage. The decisive factor is the energy-equivalent continuous noise pressure level Leq related to a representative working period (min. 8 hours/day, max. 2,000 hours/year) of 85-87 dB(A) as a limit range.

The noise level can exceed 70 dB (A) when welding special materials.
Countermeasures:

- Wear ear protectors
- Provide a noise protection hood (optional extra) (Information according to SUVA Information No. 86048 d 4.94)

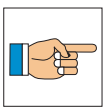
For further measured values, see the “Noise Measurement Report on RINCO Equipment” No. 920-3903/1.95

2.9 Guarantee

With supply of the machine, RINCO ULTRASONICS has entered into a guarantee obligation in accordance with VSM (Swiss Association of Machinery Manufacturers).

The prerequisites for fulfilment of the guarantee conditions by RINCO ULTRASONICS are among others:

- The user must know and understand the contents of this operating manual.
- The instructions and warnings contained in this operating manual must be observed.
- Modifications and changes to the machine, the oscillator system and the generator are not permitted without the manufacturer’s approval.



RINCO ULTRASONICS is always ready to explain any items which may be unclear by telephone or to offer training by qualified specialists.

3 Transport

The transport instructions on the packaging must be followed without fail.

3.1 Acceptance of delivery

The despatch containers for machines and equipment withstand normal loads during transport by road, rail and air.
After receipt, please make sure that the all parts agree with the packaging list and that there is no visible damage. If damage is established, inform the transport company immediately and keep the packaging as proof.

3.2 Transport damage

The transport company is responsible for damage which occurs during transport. A complete report precisely describing the damage must be submitted to the transport company and serves as the basis for the claim for damages.
Damage to or loss of goods supplied by us must be reported to us immediately and confirmed by a copy of the aforementioned report.
If delivery by RINCO ULTRASONICS was free house or CIF, the damaged consignment will be replaced if appropriate and claims will be made to the relevant transport insurance company.

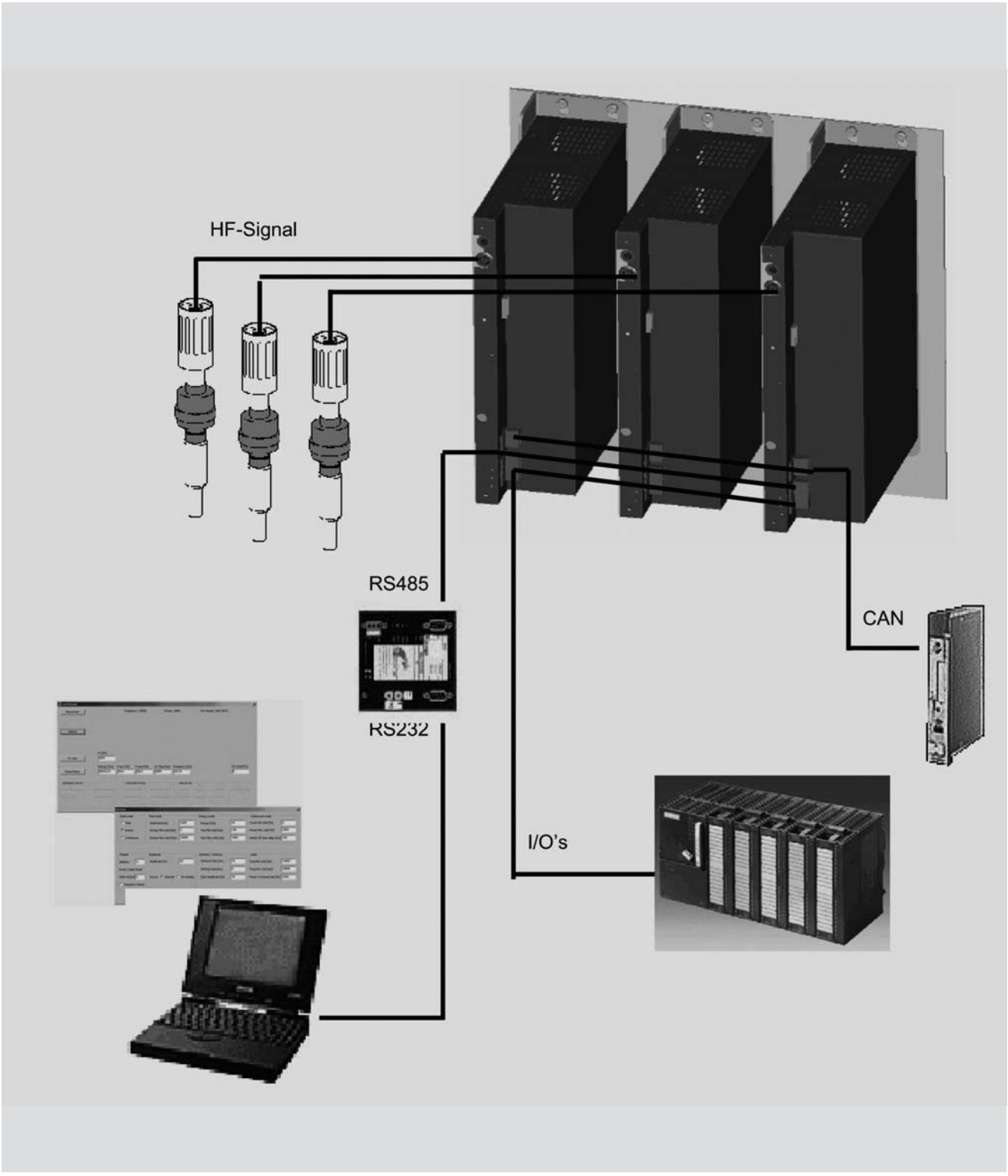
3.3 Location of machine

The location of the machine is important. In order to ensure a long lifetime, the machine should be operated in a clean environment. It must be ensured that the electronic equipment is installed vibration free.

The original works settings are implemented at 20° C. The ambient temperature during use can be between 10° and 50° C.

4 Product information

4.1 Example of how to control the AGM generator module with accessories



4.2 Short overview of functional characteristics

Structured control concept for special machines

- All control tasks and parameter input must be done by a control system (PLC)
- Integrated 24 V power supply
- Digital inputs and outputs for control system
- Analog amplitude selection (40-100%)
- Analog power output (0-120%)
- Digital error coding (generator fault, oscillating system fault, limit fault)

Increased process reliability through active process monitoring

- Digital control and regulation technology designed according to latest knowledge in the field of ultrasonic welding
- Welding controlled by digital signal processor (DSP)
- Digital PLL for frequency tuning
- Welding modes:
  - time mode (accuracy 1 ms) with energy limits
  - energy mode (accuracy 0.1Ws) with time limits
  - continuous mode with power limits (accuracy 1W)
- Amplitude regulation
- Power measurement with accuracy of ± 1% of generator performance
- Greater in-depth view of electrical signals of the generator for system analysis and therefore recognition of limit conditions of generator and converter

Comprehensive protection of generator

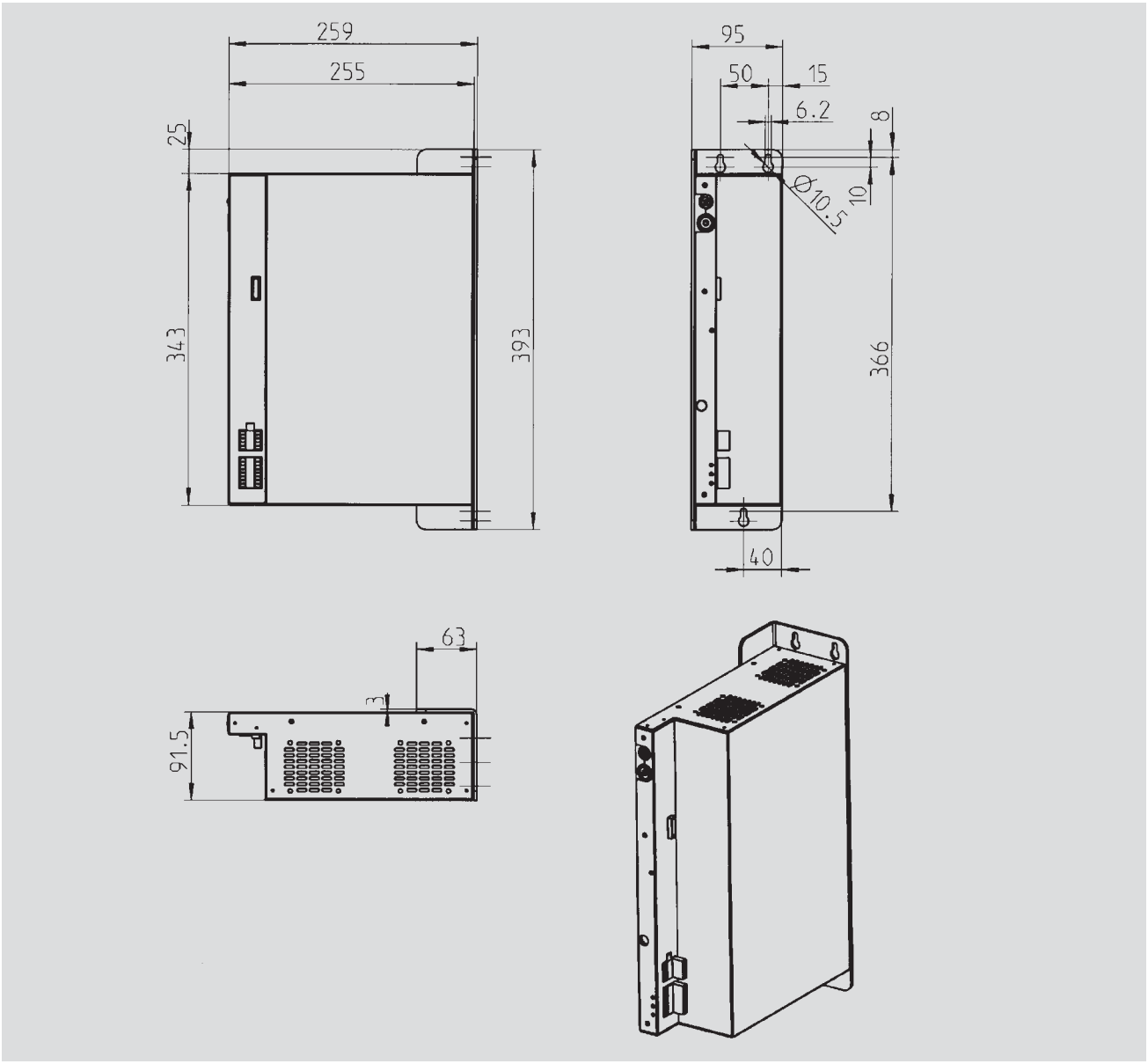
- Automatic switch off in case of errors or if limits are reached
- Soft start and soft stop time can be set for protection of the oscillator system

Data transfer through bus-capable interfaces

- Bus-capable serial interface RS485
- CANopen interface
- Operating parameters can be set via interfaces

5 Technical data

The dimensions of the AGM generator are shown in the sketch below.



The HF connector requires additional assembly depth.

HF connector	Additional assembly depth	Total assembly depth
20 kHz straight	80 mm	340 mm
20 kHz angled	20 mm	280 mm
35 kHz straight	60 mm	320 mm
35 kHz angled	18 mm	278 mm

6 Available generator modules and their variants

6.1 Output power classes

AGM generators are high-power devices and can be adapted to the relevant application.

The following output power classes are available:

20 kHz:	3000 W	2000 W	1000 W
35 kHz:	900 W	600 W	400 W

Mains voltage:

20 kHz:	230 V
35 kHz:	230 V

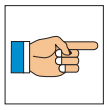
The internal cooling must be adapted to the environmental circumstances in high-load applications.

Techspan Group will be pleased to advise you in selecting a suitable design.

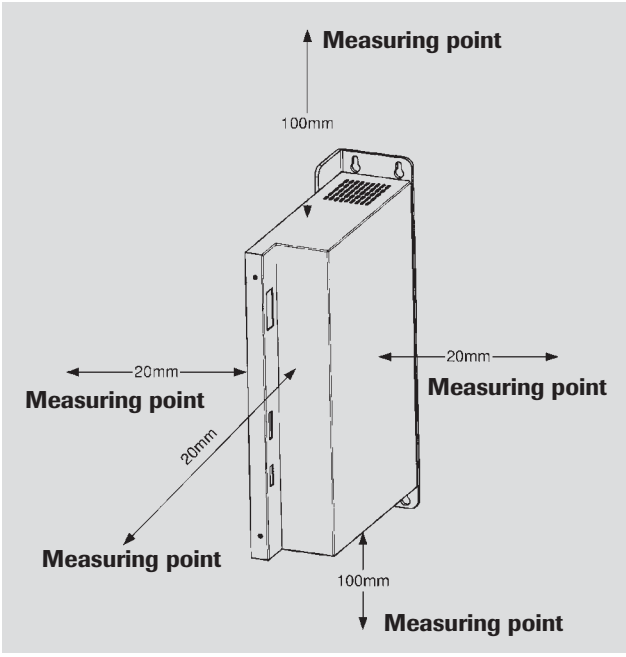
6.2 Suitable oscillator units

The oscillator units and generator modules should only be purchased from Techspan Group.
For more information, please contact Techspan Group.

The function of the AGM generator is influenced by the ambient temperature. The AGM generator has to be installed in such a way that its maximum permissible temperature is never exceeded. The ambient temperature must be checked at the points which are marked.



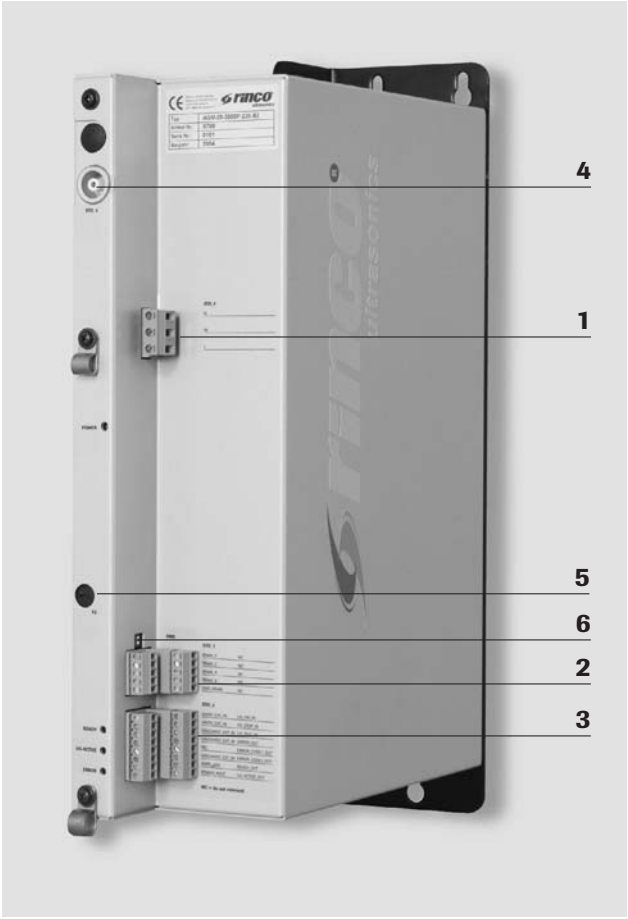
The permissible ambient temperature is 10°c to 50°C. If the specified temperature cannot be adhered to, a corresponding device (cooling device etc.) must be used. If the machine is used with high loads, continuously or quasi-continuously, cooling should normally be used.



7 Operating and display elements

7.1 Connection of AGM generator

The AGM generator has a connection to the mains voltage, connections for the control system via digital inputs and outputs, via the CANopen interface and the RS485 interface and the connection for the oscillator system.



1 Mains voltage connection (STO_0)
2 Interface (STO_1)
3 Signals (STO_2)
4 HF connection (STO_4)
5 Fuse 24VDC power supply (F2)
6 DIP switch (SW2)

7.2 DIP switch for CAN Terminators

on → terminators are switched on

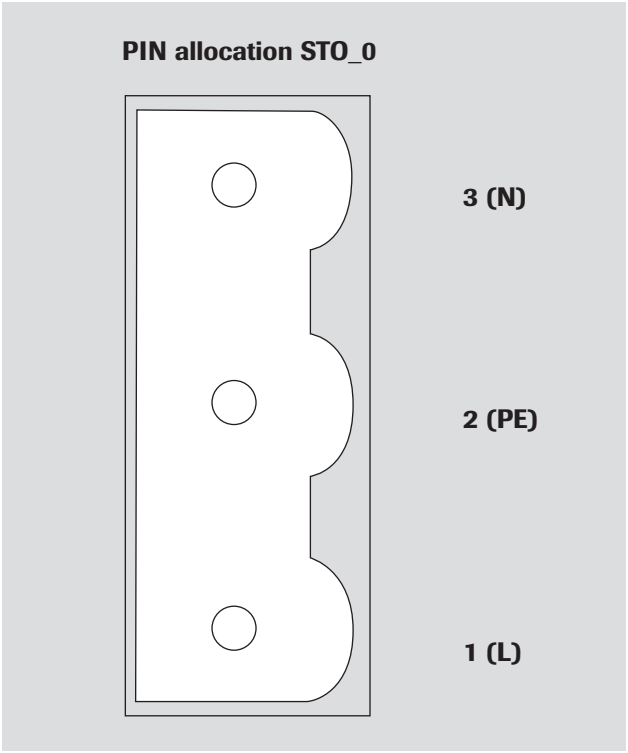
Both CAN lines are linked to terminators. These are switched in when the two DIP switches are set to «on».

7.3 Mains voltage connection of generator module (STO_0)

Mains voltage to the generator is via the STO_0 connector. The necessary fusing and filtering on the power supply side must be implemented outside the AGM generator.

7.3.1 Connection

PIN allocation STO_0



PIN 1	Phase (L)
PIN 2	Earth (PE)
PIN 3	Neutral (N)

7.3.2 Fusing

The power supply of the AGM generator must be fused in accordance with the following list:

Machine	Nom. output	Fuse
AGM20-3000P-230-B2	3000 W	16.0 A
AGM20-2000P-230-B2	2000 W	12.5 A
AGM20-1000P-230-B1	1000 W	10.0 A
AGM35-900P-230-B1	900 W	6.3 A
AGM35-600P-230-NO	600 W	4.0 A
AGM35-400P-230-NO	400 W	4.0 A

7.3.3 Filtering

The AGM generator is designed as a component within a system. For this reason, no measures have been taken regarding EMC (shielding, mains voltage filter etc.).
It is the task of the customer to connect the generator to the system.
The following filter types have been tested by RINCO ULTRASONICS and can be recommended for the individual generator modules.

Machine	Filter Type
AGM20	Schaffner FN2070-25-08
AGM35	Schaffner FS6092-8-06

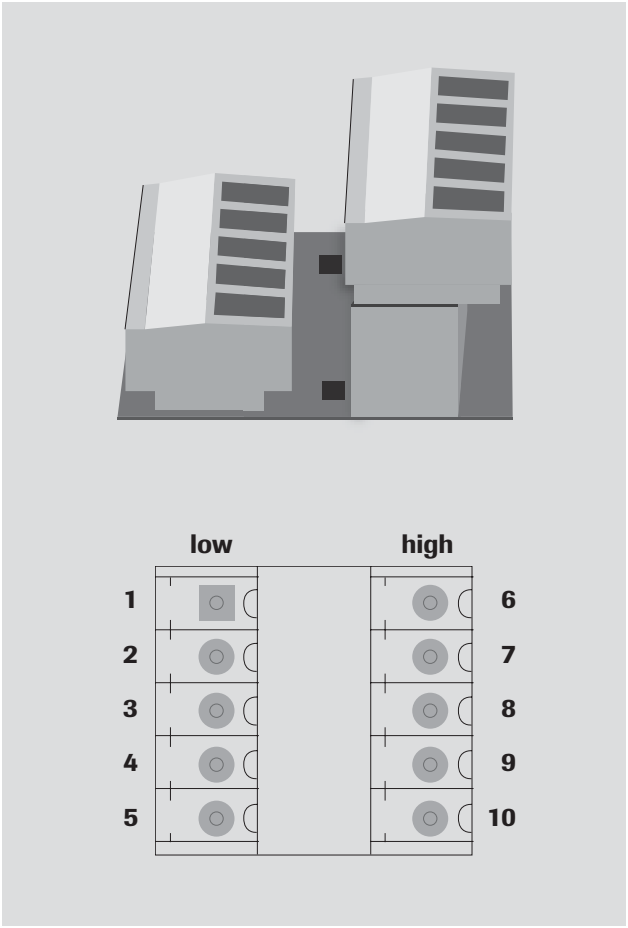
The following points must be taken into consideration in order to achieve a connection which is acceptable from the point of view of EMC:

- Power supply cable from the mains voltage filter to the AGM generator max. 50 cm
- Ferrite on each connected data cable
- Ferrite on both sides on the HF cable
- Data cables may not be led parallel to the HF cable.
- AGM generator and mains voltage filter must be mounted on the same low impedance potential (PE).

7.4 Integrated 24 V power supply, CANopen interface and RS485 interface (STO_1)

The serial RS485 interface, the CANopen bus system and the integrated 24V power supply 24VDC_OUT can be accessed via this connector.

PIN 1	RS485_Y	PIN 6	CAN_H
PIN 2	RS485_Z	PIN 7	CAN_L
PIN 3	RS485_A	PIN 8	24VDC_OUT
PIN 4	RS485_B	PIN 9	GND24VDC_OUT
PIN 5	GND_RS485	PIN 10	GND_CAN



7.4.1 Integrated 24 V power supply

A 24 V power supply is integrated in the AGM generator. It can be used, for example, for triggering of the digital inputs and outputs. The output voltage of the 24V power supply is fused via Fuse F2. It is on the front of the housing of the AGM generator.

Output voltage	**Fuse F2**
24VDC_OUT	1.25 A

7.4.2 RS485 protocol

The protocol of the RS485 interface is RINCO-specific. A detailed description of controlling via the RS485 interface can be requested from Techspan Group.

7.4.3 CANopen protocol

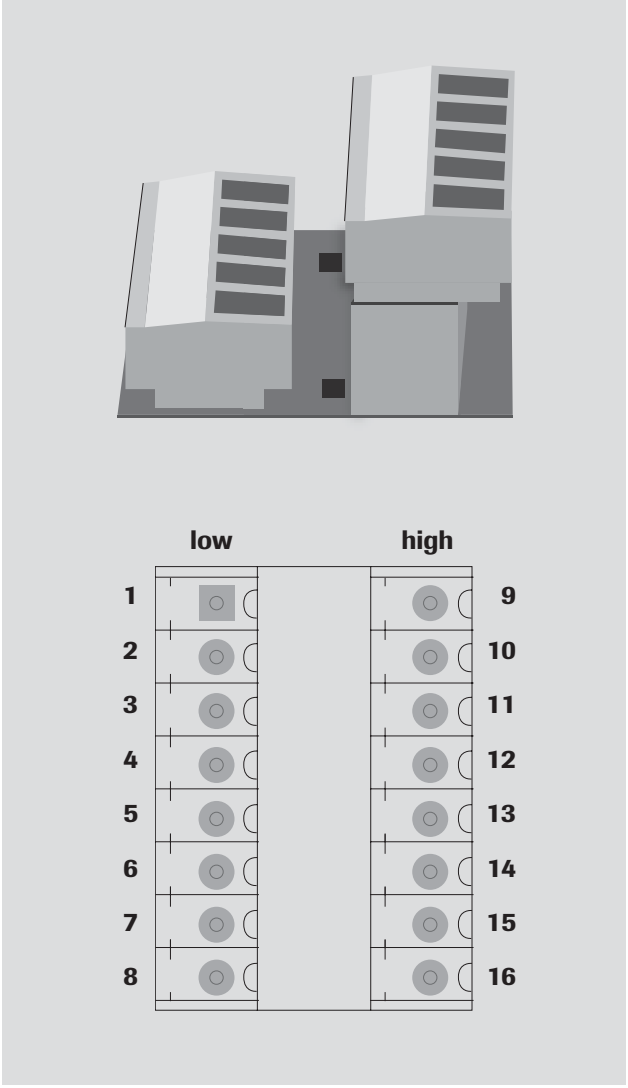
A detailed description of controlling via the CANopen interface can be requested from Techspan Group.

7.5 Signals (STO_2)

All digital and analog inputs and outputs can be accessed via the STO_2. Always consider the wiring specified for the generator being used.

PIN	1	24VDC_EXT_IN
PIN	2	24VDC_EXT_IN
PIN	3	GND24VDC_EXT_IN
PIN	4	GND24VDC_EXT_IN
PIN	5	NC
PIN	6	GND24VDC_EXT_IN
PIN	7	AMPL_AIN
PIN	8	POWER_AOUT
PIN	9	US_ON_IN
PIN	10	US_STOP_IN
PIN	11	US_TEST_IN
PIN	12	ERROR_OUT
PIN	13	ERROR_CODE1_OUT
PIN	14	ERROR_CODE2_OUT
PIN	15	READY_OUT
PIN	16	US_ACTIVE_OUT

NC = Do not connect



7.5.1 Description of signals

If the 230V power supply of the AGM generator fails, but 24VDC_EXT_IN continues to be present, all digital outputs go to '1'.
This condition never occurs with normal operation and can therefore be monitored by higher-level control systems for error detection.
The signals are briefly described in this section.
The time-related behaviour of the signals is described in Chapter 12.3.4.

24VDC_EXT_IN (PIN 1 and PIN 2)

The 24 V power supply is needed for feeding the digital and analog inputs and outputs of the oscillator. The digital and analog inputs and outputs are galvanically isolated from the internal control system of the AGM generator. The maximum tolerance for the 24VDC voltage supply is +/– 4 Volt and the voltage supply must be capable of delivering a minimum current of 1 Ampere.

GND24VDC_EXT_IN (PIN 3, PIN 4 and PIN 6)
Ground reference of supply 24VDC_EXT_IN

AMPL_AIN (PIN 7)
The amplitude can be changed in real time during welding. The analog amplitude input must be activated once via the CANopen or RS485 interface. For more detailed information, please see Chapter 8.6.

Example AMPL_AIN

Voltage at AMPL_AIN in V	Amplitude in %
4.0	40
10.0	100

POWER_AOUT (PIN 8)
This analog output gives a linear voltage from 0 to 10VDC in proportion to the current output power. The maximum output voltage of 10VDC is used for 120% of the nominal generator output.

Example POWER_AOUT

Generator	Current output power in W	Current outptut power in %	Voltage at POWER_AOUT in V
AGM20-3000	2400	80	6.67
AGM35-900	360	40	3.33

US_ON_IN (PIN 9)
Welding can be activated with this input. The input is high-active i.e. if 24VDC is available at this input, the welding process is started.

US_STOP_IN (PIN 10)
Welding can be stopped with input US_STOP_IN. If the input is set to 24VDC when welding is active, welding ceases immediately.

US_TEST_IN (PIN 11)
An ultrasonic test can be carried out with input US_TEST_IN. If the input is set to 24VDC, the ultrasonic test is started. The ultrasonic test lasts 250ms and can be used for diagnosis purposes. Error messages can be acknowledged with US_TEST. However, acknowledgement with US-Test is only possible if the fault is no longer active (e.g. in case of overtemperature). A generator fault (see Chapter 16.1) must be acknowledged with an ultrasonic test.

ERROR_OUT (PIN 12)
When faults occur this output is transferred to 0VDC. If the output is 24VDC, the system is working without faults.

ERROR_CODE1_OUT (PIN 13) ERROR_CODE2_OUT (PIN 14)
The type of error can be more precisely determined via two digital outputs by means of coding.

ERROR_ CODE1_OUT	ERROR_ CODE2_OUT	Type of error
0	0	No error
0	1	Error generator
1	0	Oscillator error
1	1	Limit error

More detailed information regarding the error type can be determined via the CANopen or the RS485 interface.

READY_OUT (PIN 15)
The generator signals readiness for the next welding with 24VDC at this output.
If the output is at 0VDC, the generator is switched off, the ultrasonic is activated or blocked because of an error.

US_ACTIVE_OUT (PIN 16)
If the ultrasonic system is activated, this is signalled with 24VDC at this output.

7.6 Connection to oscillator system (STO4)

The oscillator system is connected via this connector. Only original RINCO ULTRASONICS components may be used. Otherwise, the functionality of the entire system may be affected.

8 Operating modes

8.1 Welding modes

The AGM generator can be operated in three welding modes.

8.1.1 Time mode

In time mode, the user selects a target welding time (of up to 10 seconds). When starting the ultrasonic process, the welding time is reset and counted up in millisecond steps. When the target welding time is complete, the ultrasonic process is ended.
The actual energy is measured during the ultrasonic process in time mode. If a maximum energy, which can be set, is exceeded, the ultrasonic process is interrupted with an error message.

8.1.2 Energy mode

A target energy level can be selected in energy mode. When the target energy level is reached, the ultrasonic process is ended.
If a target maximum welding time (maximum 10 seconds) is exceeded before the target energy level is reached, the ultrasonic process is interrupted with an error message.
After the end of the ultrasonic process the welding time is compared with a selectable minimum welding time. If the minimum welding time has not been reached, an error message is generated.

8.1.3 Continuous mode

A lower and upper output level can be set in 1W steps in continuous mode. If the output power exceeds these limits for longer than a selectable time, the ultrasonic process is interrupted with an error message. There is no time or energy monitoring.

8.2 Output and energy measurement

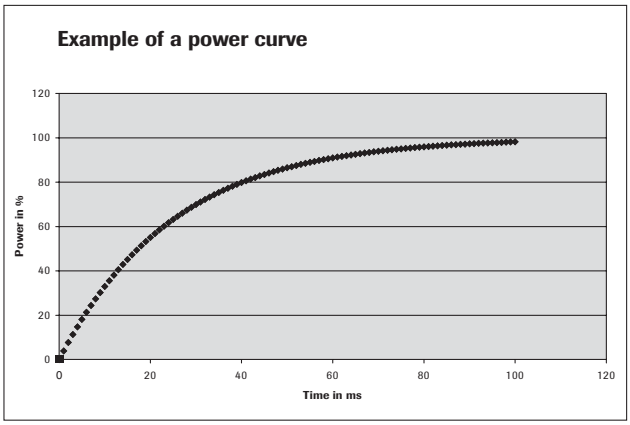
8.2.1 Output measurement and Output curve

The output power is measured during the ultrasonic process and the power curve is stored in the AGM generator (in % of the nominal generator power).

The AGM automatically determines the time intervals (power measurement intervals) at which a measured value is stored. The output measurement intervals depend on the welding time.

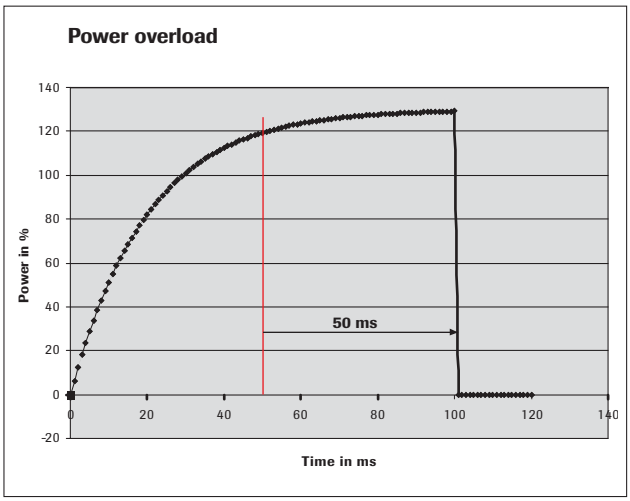
Welding time	Power measurement interval in milliseconds
5 – 512 ms	1
513 – 1024 ms	2
1025 – 2048 ms	4
2049 – 4096 ms	8
4097 – 8192 ms	16
8193 – 16384 ms	32

The data memory can store 16,384 milliseconds.
The power curve is only stored during a normal ultrasonic process. The power curve is not stored in the case of after-pulse and during power loss measurement.
The power curve can be read out via the RS485 interface after the ultrasonic process.
If the CANopen interface is used, the power can be read from the generator in real time.



8.2.2 Power overload

In order to prevent damage to the oscillator system and the generator, a protective mechanism is provided during operation with overload. If the generator is operated with more than a maximum of 120 % of the nominal generator power for more than 50 ms, the welding process is interrupted with an error message.
The output power at which the system should be switched off can be changed via the CANopen or RS485 interface.

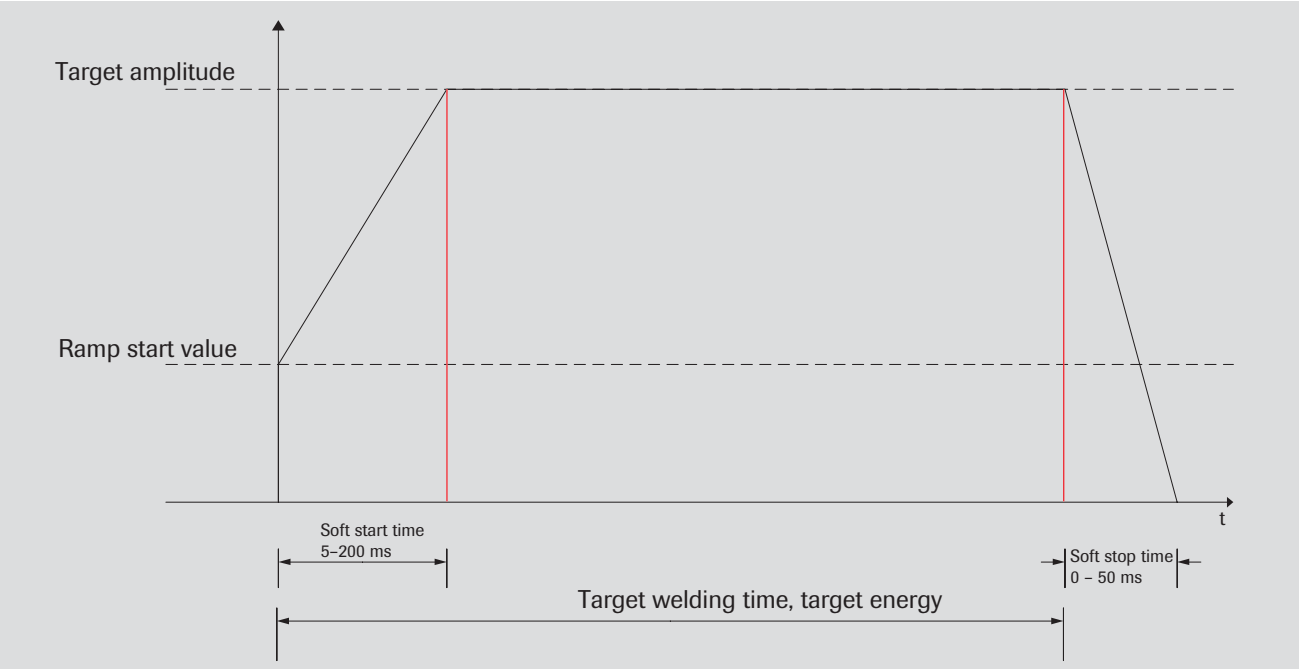


8.2.3 Energy measurement

The energy value is updated every millisecond.

8.3 Soft start, Soft stop and ramp start value

A soft start time and a soft stop time can be entered in order to protect the oscillator system.
The soft start begins the ultrasonic process with a start amplitude (= ramp start value) and increases the amplitude linearly each millisecond to the target amplitude. The time from the ramp start value to the target amplitude is called the soft start time and can be selected between 5 ms and 200 ms.
At the same time, frequency tuning is slowed down during the soft start.
This means that start-up of sonotrodes where it is difficult to begin oscillation is made easier.
With the soft stop, the ultrasonic process is not switched off immediately. The amplitude is decreased linearly from the current amplitude value down to 0. This time is called the soft stop time and can be selected between 0 ms and 50 ms. Frequency tuning is switched off during the soft stop. The illustration shows the ramp start value, the soft start time, soft stop time, set welding time and set energy.



Incorrect selection of the times must be prevented by the higher-level control system. If, for example, the target welding time is set to be shorter than the soft start time, the target amplitude is not achieved.

8.4 Ultrasonic test and power loss measurement

The power loss measurement can be used for fault diagnosis or when changing the oscillator system in order to find the optimum starting frequency for an ultrasonic process. It can be started via the CANopen or RS485 interface or via the digital US_TEST_IN input.

The power loss is measured at the amplitude which is currently set. The power loss measurement starts with the current frequency and lasts for 250 ms.
The soft start and soft stop are used in the power loss measurement. The power curve is not stored.

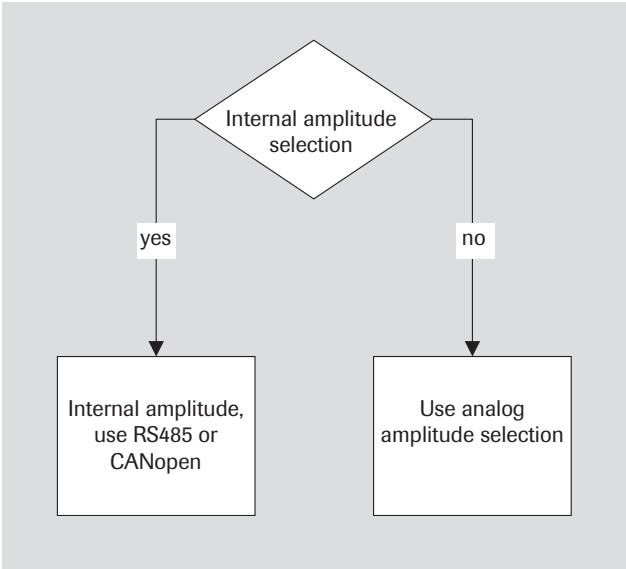
8.5 Permitted frequency range

The maximum frequency range (permitted range of the ultrasonic oscillator) reaches from +500 Hz to –500 Hz to the nominal frequency. The frequency range can be changed via the CANopen and RS485 interfaces. If the permitted frequency range is exceeded, the ultrasonic process is interrupted with an error message.

8.6 Amplitude selection

The target amplitude can be selected via the CANopen interface, the RS485 interface or the analog amplitude input.
The amplitude is given in per cent. The valid range is 40-100%.
A parameter is set to determine whether the internal variable or the analog input should be used.
The parameter can be changed via the interfaces.

Signal flow plan of amplitude selection
Amplitude selection via CANopen and the analog amplitude selection are real-time capable, i.e. the amplitude can be changed during the ultrasonic process. This is also possible via the RS485 interface to a limited extent, as the command has a delay time of 5 ms due to the transfer speed.

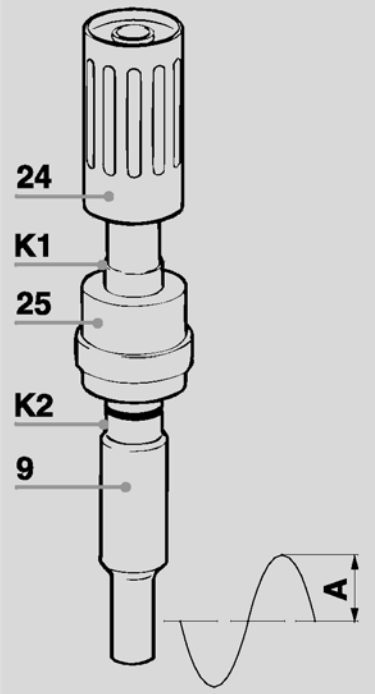


9 Amplitude values

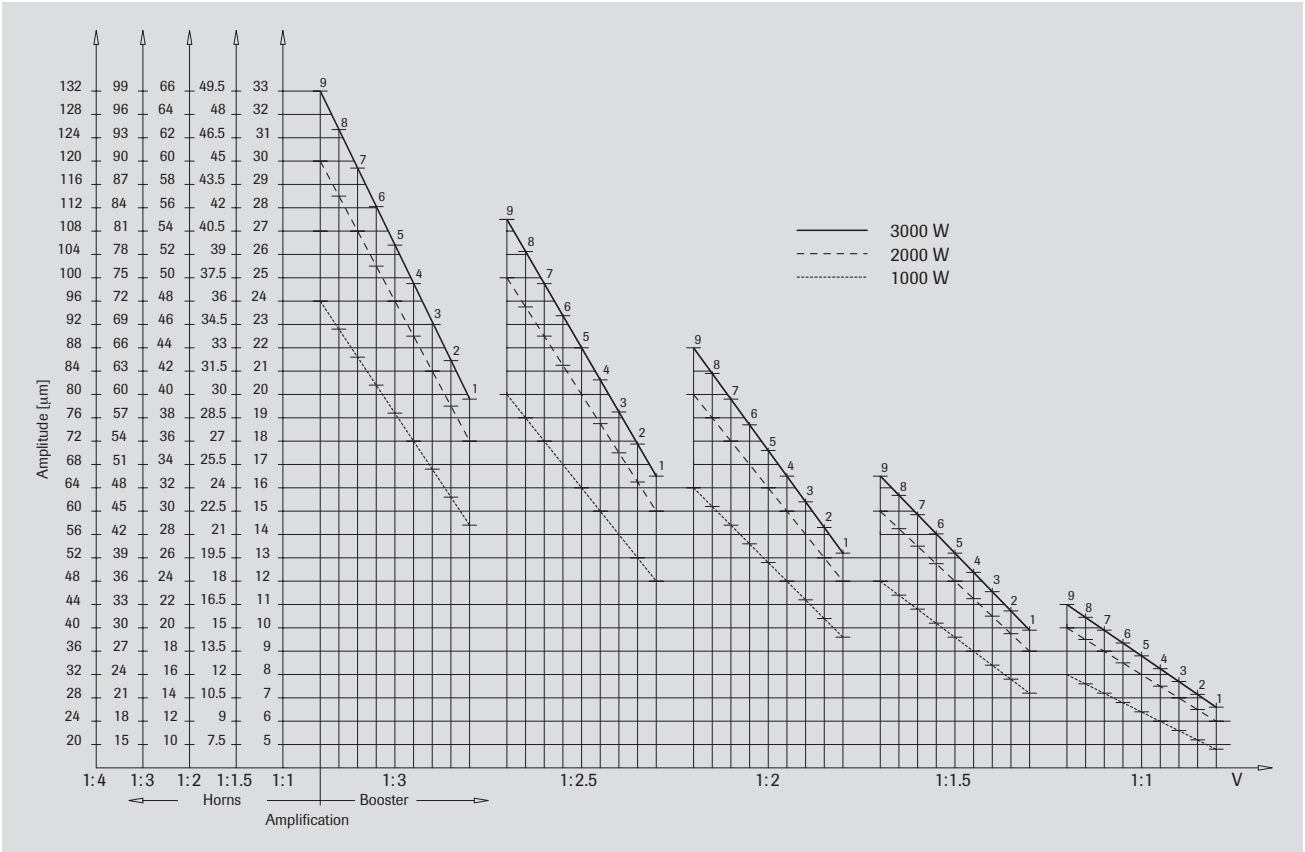
9.1 Amplitude values, 20 kHz generators

The different generator outputs result in different amplitudes. The amplitude values shown in the table below relate to the corresponding generator/booster/ sonotrode configuration.
Therefore the effective welding amplitude can be read off directly.

9 Sonotrode
24 Converter
25 Booster
A Amplitude
K1 Coupling point
K2 Coupling point

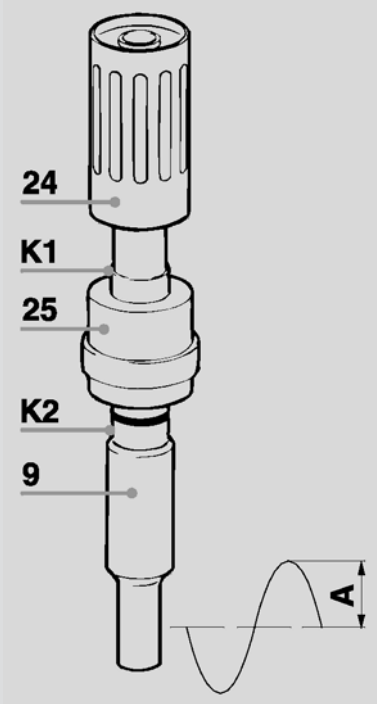


9.2 Amplitude diagram of 20 kHz generators

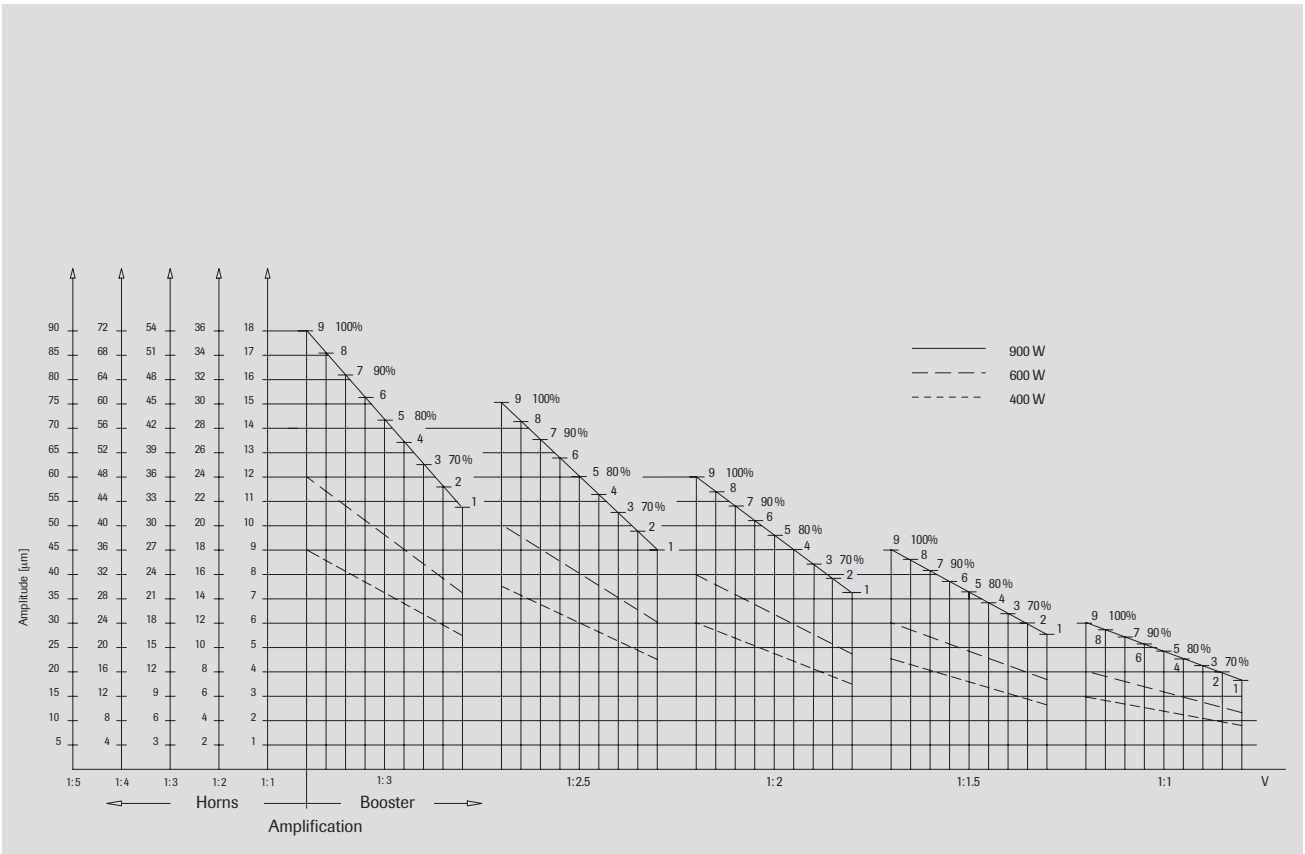


9.3 Amplitude values, 35 kHz generators

9 Sonotrode
24 Converter
25 Booster
A Amplitude
K1 Coupling point
K2 Coupling point



9.4 Amplitude diagram of 35 kHz generators



10 Operating parameters

The AGM oscillator contains various parameters which are needed for the correct running of the ultrasonic process. These can be changed via the CANopen or RS485 interface.

Parameter	Description	Unit	Min	Max	Standard
Welding mode	0 = time mode, 1 = energy mode, 2 = continuous	–	0	2	2
Amplitude value	Set amplitude	%	40	100	60
Welding time in time mode		ms	5	9999	1000
Energy minimum in time mode		Ws	0	Nominal output power * 10.0	Nominal output power/ 1000
Energy maximum in time mode		Ws	Nominal output power/ 1000	Nominal output power * 10.0	Nominal output power * 10.0
Set energy in energy mode		Ws	Nominal output power/ 1000	Nominal output power * 10.0	Nominal output power * 1.0
Minimum welding time in energy mode		ms	0	9999	100
Maximum welding time in energy mode		ms	5	9999	1000
Minimum output power in continuous mode		W	0	Nominal output power * 1.2	0
Maximum output power in continuous mode		W	0	Nominal output power * 1.2	Nominal output power * 1.1
Time to interrupt at power overload in continuous mode		ms	0	9999	100
After-pulse time		ms	5	1000	100
Soft start time	see Chapter 8.3, soft start	ms	5	200	20
Soft stop time	see Chapter 8.3, soft stop	ms	0	50	0
Frequency reset	Return frequency back to nominalfrequency after welding		0 = deactivated	1 = activated	0 = deactivated
Ramp start value	s. Chapter. 8.3, Ramp start value	%	10	40	30
Power measurement interval	Measuring interval for power curve 1 ms, 2 ms, 4 ms, 8 ms, 16 ms oder 32 ms (see section 5.4.1)	ms	1	32	Automatically set by AGM generator
Power overload level	The ultrasonic is interrupted in case of power overload	W	5	Nominal output *1.2	Nominal output *1.1
Upper frequency limit	As positive offset to the nominal frequency	Hz	50	500	500
Lower frequency limit	As negative offset to the nominal frequency	Hz	50	500	500
Amplitude source	internal or external		0 = internal	1 = external	0 = internal

11 Example applications

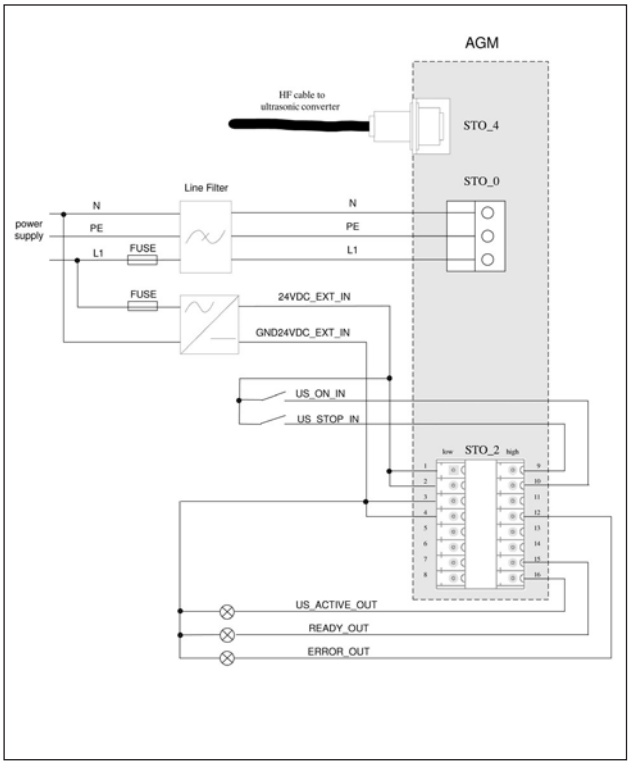
Some example applications are shown in the following text.
if there are any questions, please contact Techspan Group.

The example applications show that the AGM generator has to be protected in front of the main voltage filter. Protection of the AGM generator is described in Chapter 7.3.2.

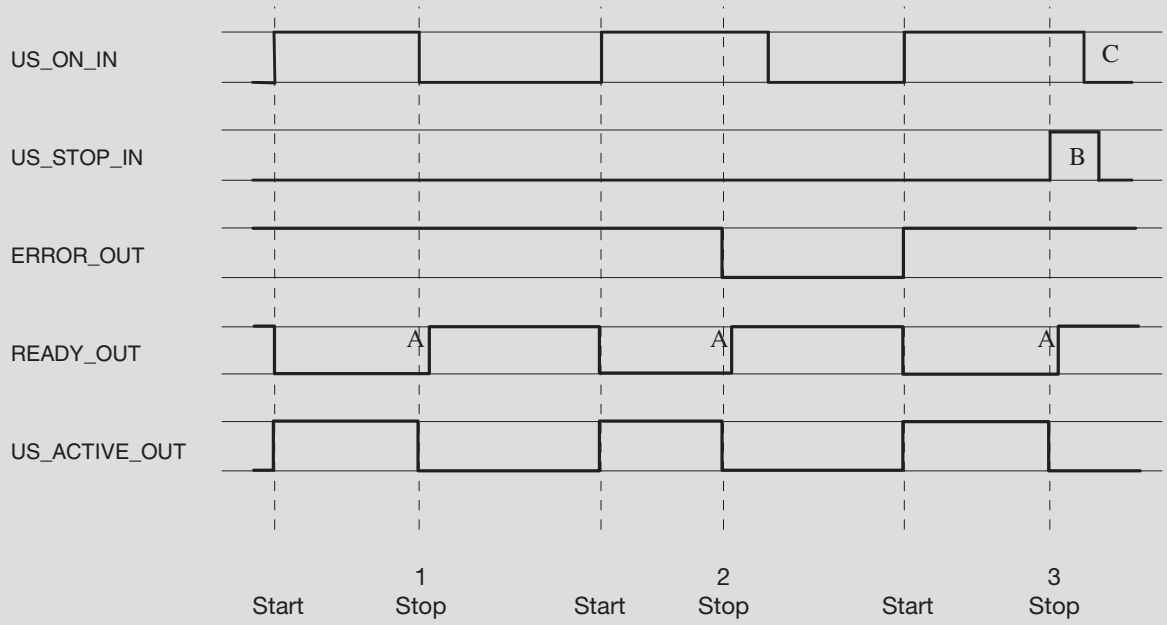
The digital inputs and outputs are supplied via an external 24VDC supply in the example applications. The integrated 24V power supply can be used as an alternative (see Chapter 7.4.1).

11.1 Start and Stop Ultrasonic

Basic circuit to start the ultrasonic via digital input US_ON_IN. In order to start, the signal is set to 24VDC and back to 0VDC in order to switch off. As a further option, input US_STOP_IN is used to switch off the ultrasonic. The ultrasonic is switched off automatically in case of errors.
In addition, the readiness message (Signal READY_OUT) and monitoring of the ultrasonic (Signal US_ACTIVE_OUT) is described.



Circuit diagram of ultrasonic start and stop



1 The end of welding is triggered by one of the following conditions:
- Input US_ON_IN set to 0VDC (continuous mode)
- Parametered target value reached (time mode, energy mode)
- Stop via RS485 or CANopen

2 Welding was stopped because of an error:
- Oscillator or limit error (READY_OUT changes back to 24VDC)
- Generator fault (READY_OUT remains at 0VDC)

3 Interruption of welding by 24VDC at US_STOP_IN

A Time delay until READY_OUT changes to 24VDC is <1 ms

B US_STOP_IN must be available for 5 ms until Stop is recognized

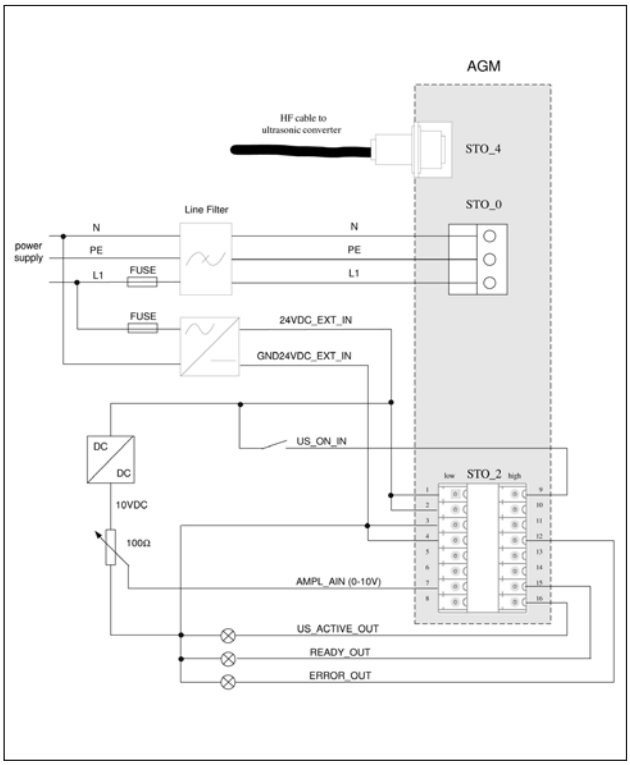
C Signal level US_ON_IN is not relevant

11.2 Amplitude selection

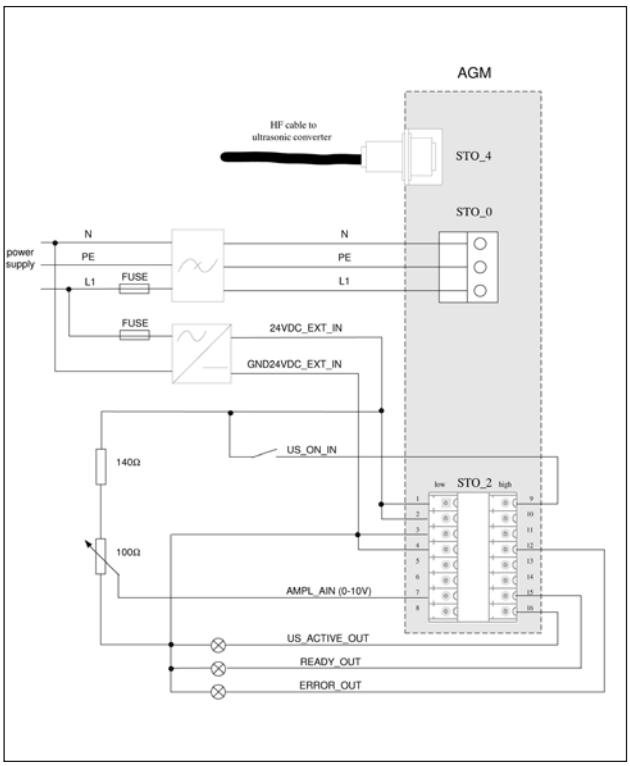
The amplitude can be varied between 40 and 100% via analog input AMPL_AIN (4 to 10V).
If the analog signal is below 4V, the generator reports an error. It is possible to change the amplitude at all times.

The generator must be parametered for external amplitude.

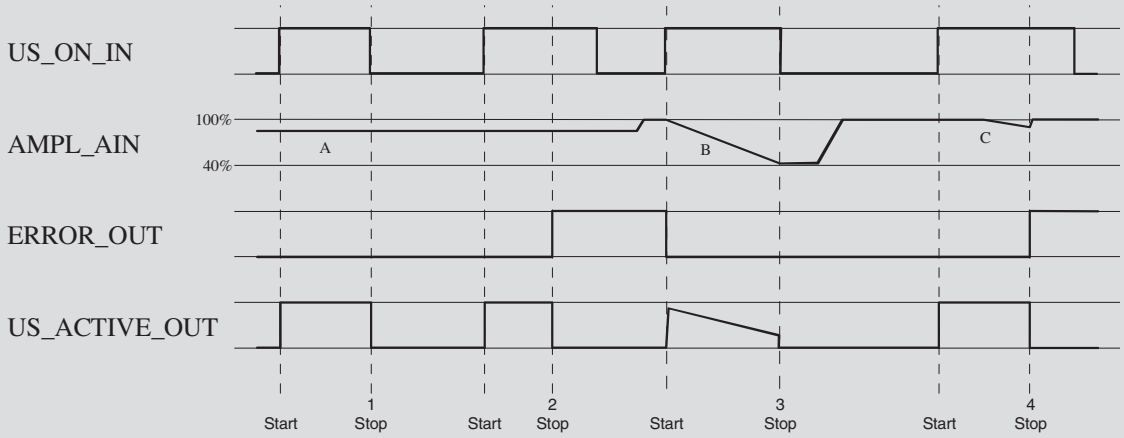
Please see Chapter 8.6 for more detailed information.



Amplitude selection circuit diagram (with external +10VDC power supply)



Amplitude selection circuit diagram (voltage divider)



1 The end of welding was triggered by one of the following conditions:
- Input US_ON_IN set to 0VDC (continuous mode)
- Parametered target value reached (time mode, energy mode)
- Stop via RS485 or CANopen

2 Welding was interrupted because of an error or fault:
- Oscillator or limit error (READY_OUT changes back to 24VDC)
- Generator error (READY_OUT remains at 0VDC)

3 The end of welding was triggered by one of the following conditions:
- Input US_ON_IN set to 0VDC
- Parametered target value reached
- Stop via RS485

4 Welding was interrupted because of an error:
- Oscillator or limit error (READY_OUT changes back to 24VDC)
- Generator fault (READY_OUT remains at 0VDC)

A Welding is carried out with 80% amplitude (80% corresponds to 8VDC)

B Welding is started with 100% amplitude (10VDC) and will be reduced constantly and linearly to 40% amplitude (4VDC).

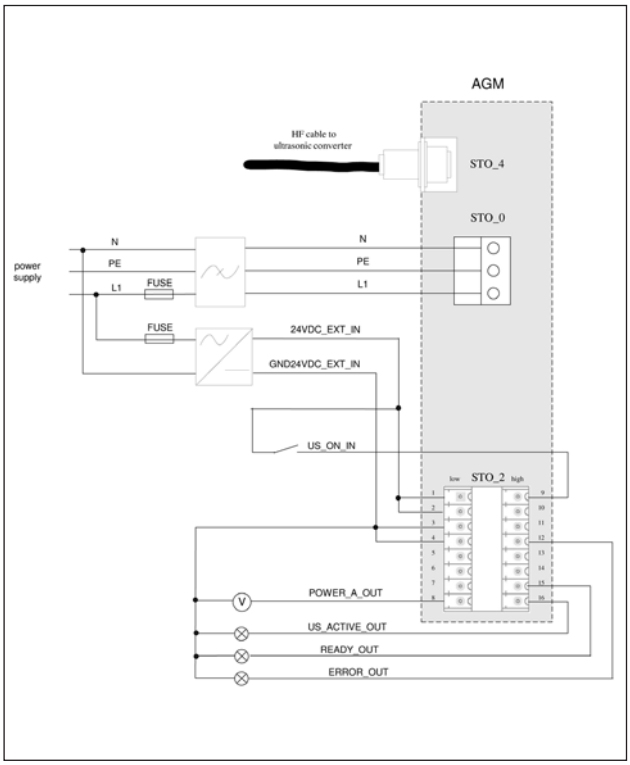
C Welding is started with 100% amplitude (10VDC). After the desired time the amplitude is reduced externally. The welding is interrupted because of an error.

11.3 Power measurement

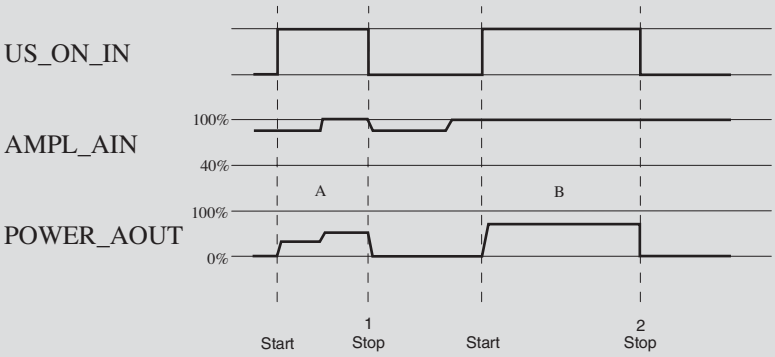
The analog signal of the POWER_AOUT (0 to 10VDC) output can be used for any desired interpretations or control tasks. The maximum value of 10VDC corresponds to an output of 120% of the nominal output power.

This means that 100% nominal output power is represented by a voltage value of 8.33VDC.

The timing diagrams with POWER_AOUT were created with a theoretical model for welding, as all applications differ hugely in practice. It is assumed that the characteristics of the workpiece to be processed and the pressure conditions at the tool do not change. The power output will demonstrate deviating behaviour in practice.



Power measurement circuit diagram



1,2

The end of welding was triggered by one of the following conditions:

- Input US_ON_IN set to 0VDC (continuous mode)
- parametered target value reached (time mode, energy mode)
- Stop via RS485 or CANopen

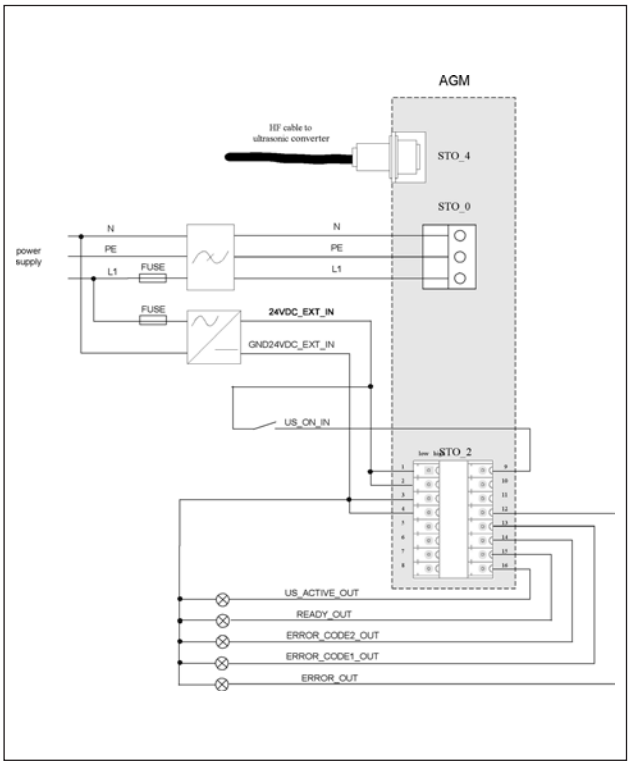
A Welding is started with 80% amplitude (8VDC) and is increased to 100% amplitude (10VDC) after half of the welding time. In the theoretical model the output power depends on the amplitude, it therefore goes through a sudden increase after half the welding time. The output value (0 to 10VDC) varies depending on application.

B Welding is started by 24VDC at input US_ON_IN. During the welding process the analog output POWER_OUT (0 to 10VDC) is read into a control system and integrated up to an energy. When the set energy is reached, the signal US_ON_IN is set to 24VDC and welding stops. This method is designated as energy mode.

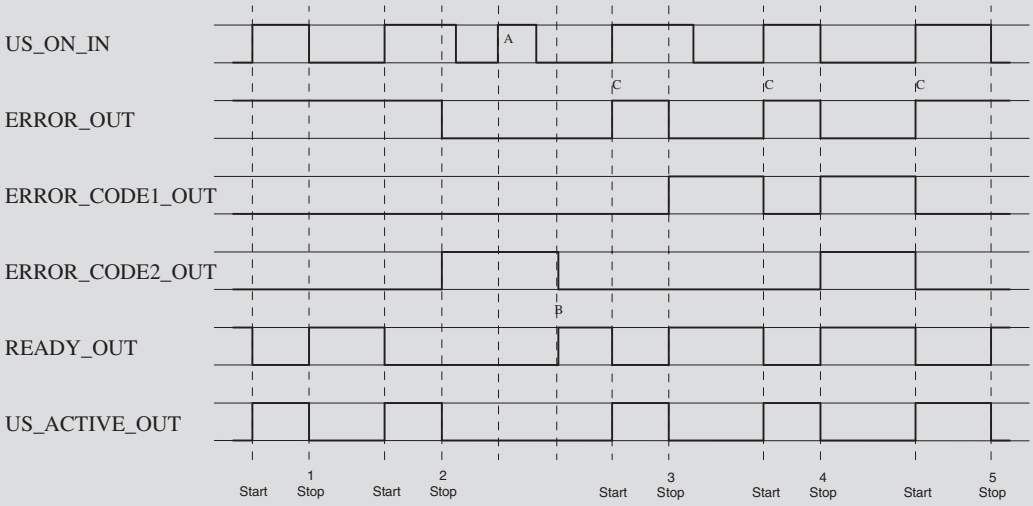
11.4 Error analysis

Coding allows errors to be divided into generator and oscillator systems and limit error. The outputs ERROR_OUT, ERROR_CODE1_OUT and ERROR_CODE2_OUT are used for this. More precise error analysis can be implemented via the CANopen or RS485 interface.

ERROR	ERROR_ CODE1_OUT	ERROR_ CODE2_OUT	Error type
1	0	0	No error
0	0	1	Error Generator
0	1	0	Error Oscillator
0	1	1	Error Limit



Error analysis circuit diagram



1,5
The end of welding was triggered by one of the following conditions:
- Input US_ON_IN set to 0VDC (continuous mode)
- Parametered target value reached (time mode, energy mode)
- Stop via RS485 or CANopen

2 End of welding by generator error.

3 End of welding by oscillator system error.

4 End of welding by limit error

A In the case of generator errors the signal READY_OUT remains at 0VDC. This signals that no new welding can be started.

B The generator error no longer exists and an ultrasonics test was performed. The signal ERROR_CODE2_OUT changes to 24VDC. For this reason the signal READY_OUT also changes to 24VDC. The next welding process can be started.

C If an error exists (ERROR_OUT at 0VDC), a welding process can be started with 24VDC at US_ON_IN. The prerequisite is the readiness signal via 24VDC at output READY_OUT.

12 Technical data

12.1 Power supply 230V

The AGM generator requires a supply voltage of 230VAC.
The permissible voltage levels are:

Parameter	Min	Typical	Max	Unit
230VAC	200	230	250	V

12.2 Integrated 24VDC power supply

The AGM generator includes an unregulated 24V power supply. The output voltage of the power supply 24VDC_OUT can be accessed via connection STO_1 and is fused with fuse F2 (on the front of the AGM generator housing).

Parameter	Typical	Unit
24VDC_OUT	24	V

12.3 Analog and digital inputs and outputs

12.3.1 Voltage supply and voltage level

The digital and analog inputs and outputs are galvanically isolated from the internal control system of the AGM generator. They therefore require an external power supply (24VDC_EXT_IN) of 24V.
The voltage level of the power supply and the digital inputs and outputs are shown in the following table.

Parameter	Condition	Min	Type	Max	Unit
24VDC_EXT_IN		20	24	28	V
Digital Input High Signal		20			V
Digital Input Low Signal				1	V
Digital Output High Signal	$V_{Supply} = 24V$		24		V
Digital Output Low Signal	$V_{Supply} = 24V$		0	0.5	V

If the 230V power supply of the AGM fails but 24VDC_EXT_IN continues to be present, all digital outputs go to '1'. This condition is never present in normal operation and can therefore by monitored by higher-level control systems for purposes of fault detection.

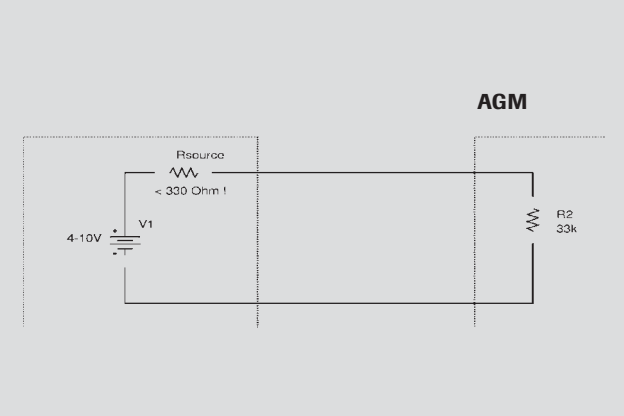
12.3.2 Overview of inputs and outputs

The following table shows an overview of inputs and outputs.

Name	Type	Description	Voltage level
US_ON_IN	Input	Starts ultrasonic process	24VDC = Activate ultrasonic process Input current = 5 mA typical Input resistance = 4.7 kΩ_
US_STOP_IN	Input	Stops ultrasonic process	24VDC = Stop Input current = 5 mA typical Input resistance = 4.7 kΩ
US_TEST_IN	Input	Acknowledges errors and carries out a power loss measurement	24VDC = Test Input current = 5 mA typical Input resistance = 4.7 kΩ
AMPL_AIN	Input	Analog Amplitude selection	0–10 V corresponds to an amplitude between 0% and 100% Accuracy = ± 3% Input current = 0.3 mA typical Input resistance = 33 kΩ
US_ACTIVE_OUT	Output	Ultrasonic process active	24VDC = Ultrasonics active Output current = 100 mA max.
US_ERROR_OUT	Output	Generator error	0VDC = Error, 24VDC no error Output current = 100 mA max.
US_ERROR_CODE1_OUT US_ERROR_CODE2_OUT	Outputs	Coding Generator error	24VDC = 1, 0VDC = 0 Output current = 100 mA max. 01 -> Generator error 10 -> Oscillator system error 11-> Limit error
US_READY_OUT	Output	Generator is ready for the next ultrasonic process	24VDC = Ready Output current 100 mA max.
POWER_AOUT	Output	Analog power output	0-10V corresponds to 0W up to generator output * 1.2 (e.g. 0 to 3600 W at 3000 W generator Accuracy = ± 3% Output current = 10 mA max. (see 12.3.3) Output resistance = 680 Ω

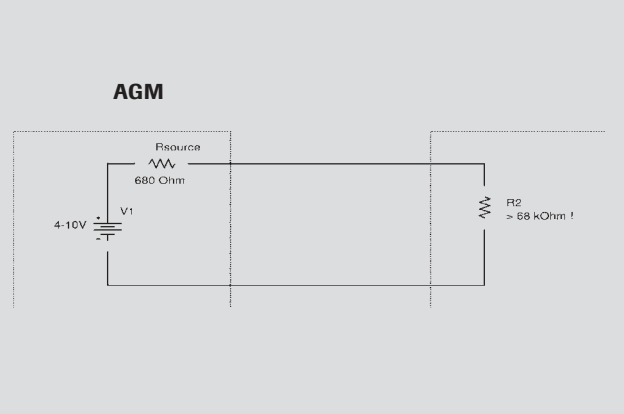
12.3.3 Analog input and output

Because of the circuit the analog input has a delay of max. 0.7 ms. The analog power output also has a delay of 0.7 ms. In order to avoid inaccuracy at the analog input the internal resistance of the connected source may not be greater than 330 Ω.



AMPL_AIN-Input

In order to avoid inaccuracy at the power output, the internal resistance of the connected drain must be greater than 68 kΩ.

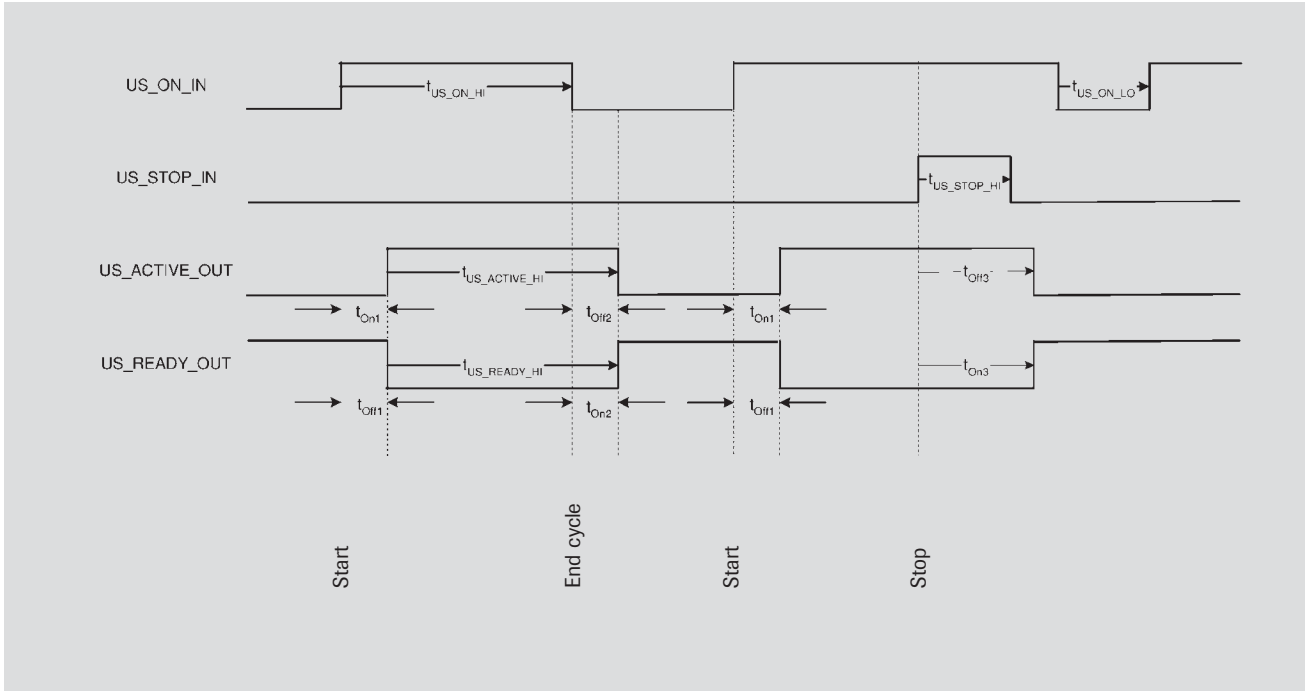


POWER_AOUT-Output

12.3.4 Time behaviour of digital inputs and outputs

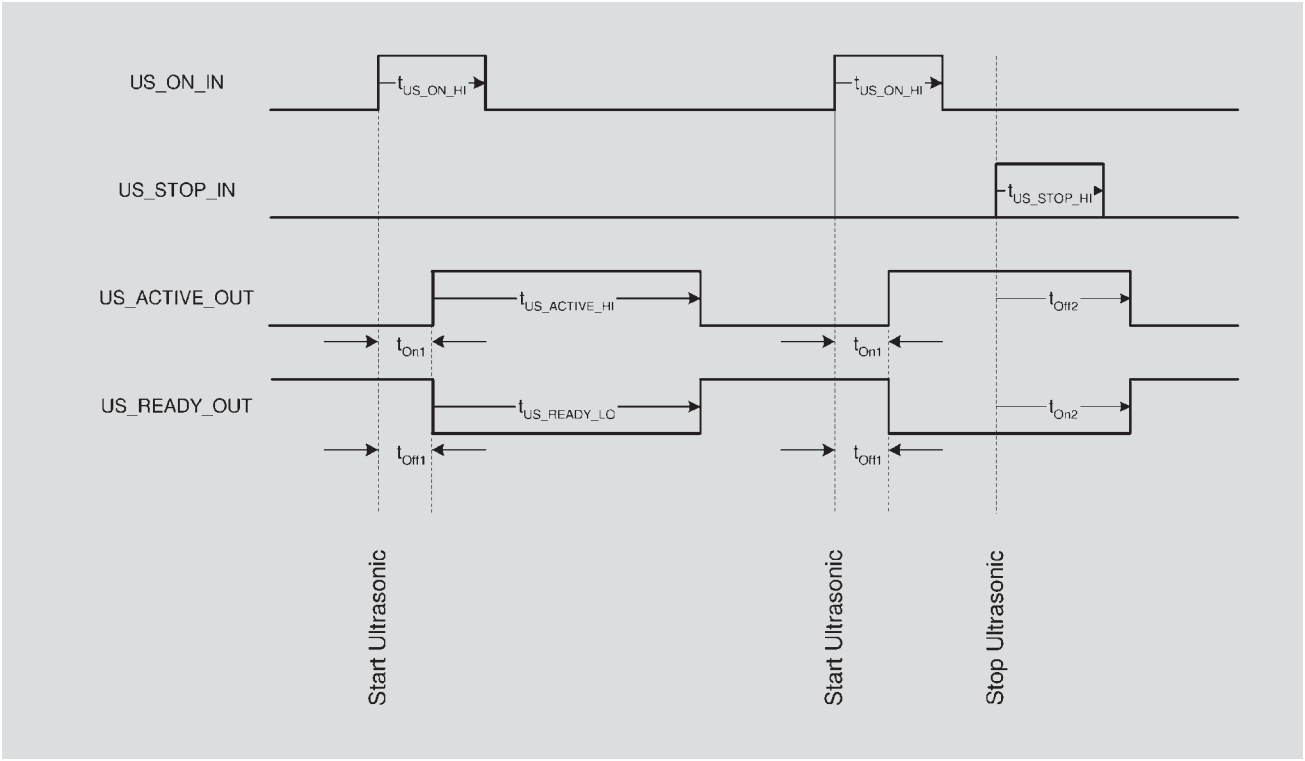
The next diagrams show the time behaviour of the different inputs and outputs.

US_ON_IN, US_STOP_IN, US_ACTIVE_OUT and US_READY_OUT in continuous mode



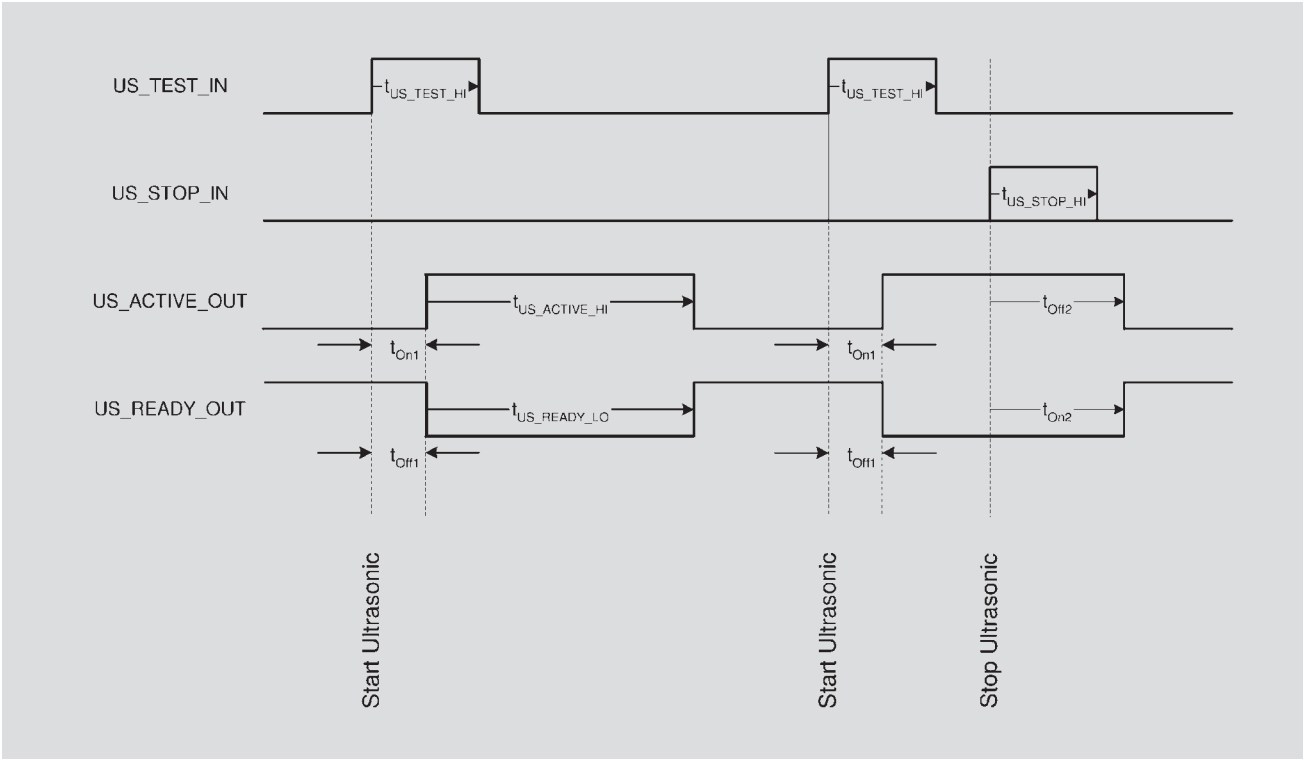
Parameter	Condition	Symbol	Min	Typ	Max	Unit
US_ON_IN Pulse Width High		$t_{US\_ON\_HI}$	5			ms
US_ON_IN Pulse Width Low		$t_{US\_ON\_LO}$	1			ms
US_STOP_IN Pulse Width High		$t_{US\_STOP\_HI}$	5			ms
US_ACTIVE_OUT High		$t_{US\_ACTIVE\_HI}$		$t_{US\_ON\_HI}$ -5		ms
US_ON_IN High to US_ACTIVE_OUT High Delay		t_{On1}		5.2	5.8	ms
US_ON_IN Low to US_ACTIVE_OUT Low Delay		t_{Off2}		0.5	1	ms
US_STOP_IN High to US_ACTIVE_OUT Low Delay		t_{Off3}		5.2	5.8	ms
US_READY_OUT Low		$t_{US\_READY\_LO}$		$t_{US\_ON\_HI}$ -5		ms
US_ON_IN High to US_READY_OUT Low Delay		t_{Off1}		5.2	5.8	ms
US_ON_IN Low to US_READY_OUT High Delay		t_{On2}		1	1.3	ms
US_STOP_IN High to US_READY_OUT High Delay		t_{On3}		5.2	5.8	ms

US_ON_IN, US_STOP_IN, US_ACTIVE_OUT and US_READY_OUT in time and energy mode



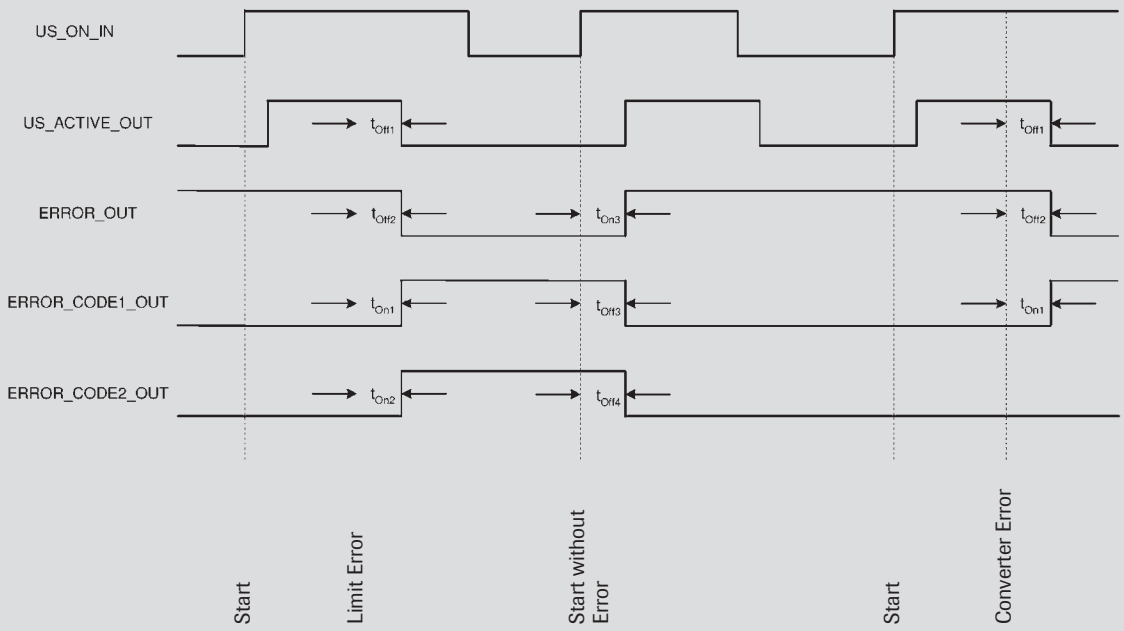
Parameter	Condition	Symbol	Min	Typ	Max	Unit
US_ON_IN Pulse Width High		$t_{US\_ON\_HI}$	5			ms
US_STOP_IN Pulse Width High		$t_{US\_STOP\_HI}$	5			ms
US_ACTIVE_OUT High	time mode, nominal US-Time = 250 ms	$t_{US\_ACTIVE\_HI}$	249.7	250.2	250.7	ms
US_ACTIVE_OUT High	time mode, nominal US-Time = 1000 ms	$t_{US\_ACTIVE\_HI}$	999.7	1000.2	1000.7	ms
US_ON_IN High to US_ACTIVE_OUT High Delay		t_{On1}		5.2	5.8	ms
US_STOP_IN High to US_ACTIVE_OUT Low Delay		t_{Off2}		5.2	5.8	ms
US_READY_OUT Low	time mode, nominal US-Time = 250 ms	$t_{US\_READY\_LO}$	249.7	250.2	250.7	ms
US_READY_OUT Low	time mode, nominal US-Time = 1000 ms	$t_{US\_READY\_LO}$	999.7	1000.2	1000.7	ms
US_STOP_IN High to US_READY_OUT Low Delay		t_{Off1}		5.2	5.8	ms
US_ON_IN High to US_READY_OUT High Delay		t_{On2}		5.2	5.8	ms

US_TEST_IN-Input



Parameter	Condition	Symbol	Min	Typ	Max	Unit
US_TEST_IN Pulse Width High		$t_{US\_TEST\_HI}$	5			ms
US_STOP_IN Pulse Width High		$t_{US\_STOP\_HI}$	5			ms
US_ACTIVE_OUT High		$t_{US\_ACTIVE\_HI}$	249.7	250.2	250.7	ms
US_ TEST _IN High to US_ACTIVE_OUT High Delay		t_{On1}		5.2	5.8	ms
US_STOP_IN High to US_ACTIVE_OUT Low Delay		t_{Off2}		5.2	5.8	ms
US_READY_OUT Low		$t_{US\_READY\_LO}$	249.7	250.2	250.7	ms
US_STOP_IN High to US_READY_OUT Low Delay		t_{Off1}		5.2	5.8	ms
US_ TEST _IN High to US_READY_OUT High Delay		t_{On2}		5.2	5.8	ms

Error outputs



Parameter	Condition	Symbol	Min	Typ	Max	Unit
Error to US_ACTIVE_OUT Low Delay		t_{Off1}		0.2	0.5	ms
Error to ERROR_OUT Low Delay		t_{Off2}		0.2	0.5	ms
Error to ERROR_CODE1_OUT High Delay		t_{On1}		0.2	0.5	ms
Error to ERROR_CODE2_OUT High Delay		t_{On2}		0.2	0.5	ms
US_ON_IN High to ERROR_OUT High Delay		t_{On3}		5.2	5.8	ms
US_ON_IN High to ERROR_CODE1_OUT Low Delay		t_{Off3}		5.2	5.8	ms
US_ON_IN High to ERROR_CODE2_OUT Low Delay		t_{Off4}		5.2	5.8	ms

13 Cleaning and maintenance

The generator does not require any maintenance. However, the converter, booster and sonotrode should be checked from time to time and kept clean from the outside.

14 Services internal components

This generator is maintenance-free if correctly operated.
If fan cooling is intended, it must be periodically checked for dust depending on operating environment and cleaned if necessary.
If filters are used in combination with a fan, these must be replaced periodically.

15 Error elimination

In the case of errors which do not originate from the application, the nearest RINCO ULTRASONICS service point must be contacted.

16 Error messages

The following tables show the error messages of the AGM generator. The error messages can be acknowledged with US_TEST. However, acknowledgement with US-Test is only possible if the error is no longer active, e.g. is the overtemperature no longer exists. Acknowledgement with US-Test can be carried out both via CANopen or RS485 and via the US_TEST_IN input.

16.1 Generator faults

Fault	Cause	Reaction
Mains voltage too low	Input voltage is less than 200 V	Error message is generated Ultrasonic process interrupted New ultrasonic process is blocked. Error message must be acknowledged with US-Test.
Power supply +12 V faulty	+12 V power supply can fail through short circuit, overtemperature or faulty components	Error message is generated Ultrasonic process interrupted New ultrasonic process is blocked. Error message must be acknowledged with US-Test
Minimal modulation end stage	Minimal modulation of end stage, defective component in generator	Error message is generated Ultrasonic process interrupted New ultrasonic process is blocked. Error message must be acknowledged with US-Test.
Temperature of power unit too high	Temperature of power unit too high	Error message is generated Ultrasonic process interrupted New ultrasonic process is blocked. Error message must be acknowledged with US-Test.

16.2 Converter and application faults

Fault	Cause	Reaction
Frequency minimum exceeded	Oscillator system not connected or Oscillator system faulty or too high damping of the oscillator system	Error message is generated Ultrasonic process interrupted New ultrasonic process starts at nominal frequency
Frequency maximum exceeded	Oscillator system not connected or oscillator system faulty or too high damping of oscillator system	Error message is generated Ultrasonic process interrupted New ultrasonic process starts at nominal frequency
Maximum converter voltage exceeded	Oscillator system faulty or too high damping of oscillator system	Error message is generated Ultrasonic process interrupted
Power overload level exceeded	Oscillator system faulty or too high damping of oscillator system	Error message is generated Ultrasonic process interrupted
Full modulation of end stage	Oscillator system faulty or too high damping of oscillator system	Error message is not generated. Digital error outputs are not set. Ultrasonic process **not** interrupted. Error can only be recognized by RS485 or CANopen.
Converter not connected	No converter connected or current measuring path faulty	Error message is generated Ultrasonic process interrupted after 100 ms

16.3 Limit faults

Fault	Cause	Reaction
Energy minimum not achieved (time mode)	Welding time too short or output power too low to reach minimum energy	Error message is generated after end of ultrasonic process
Energy maximum exceeded (time mode)	Welding time too high or output power too high	Error message is generated Ultrasonic process interrupted
Minimum welding time not achieved (energy mode)	Wrong minimum welding time set or output power too high	Error message is generated after end of ultrasonic process
Welding time maximum exceeded (energy mode)	Wrong maximum welding time set or output power too low	Error message is generated Ultrasonic process interrupted
Minimum output power not achieved (continuous mode)	Minimum output power wrongly set or output power too high	Error message is generated Ultrasonic process interrupted
Maximum output power exceeded (continuous mode)	Maximum output power wrongly set or output power too low	Error message is generated Ultrasonic process interrupted
Analog amplitude too low	The voltage at the external analog amplitude input is below the value of the start amplitude (1 V – 4 V) before or during the ultrasonic process.	An error message is generated The untrasonic process is interrupted or an ultrasonic process is prevented from starting

17 Service Addresses

If you experience problems with welding or technical faults with the equipment, please contact the Technical Customer Service of Techspan Group, 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:
Techspan Group
P O Box 1012, Mascot,
NSW 1460,
Australia

Australia :
Techspan Group :
Ph : 1800 148 791

New Zealand :
Ph : +64 9 827 6567

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