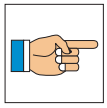
Operating Manual

Interface
RS485

English

Version 1.0, gb, Art.-No. 35753

Notes



These operating instructions must be read and observed before unpacking and commissioning this device.
The machine may only be operated and maintained by persons familiar with these operating instructions and the statutory regulations concerning safety at work and accident prevention.

Representation

Table of contents

Important!

If you have any queries concerning your device, please specify the exact type and device serial number.
This can be found on the type plate and on the inside cover of these operating instructions.
The design and circuitry of these devices are constantly being further developed and improved, and are state of the art.

RINCO ULTRASONICS AG
Romanshorn, Switzerland

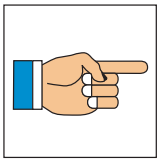
Preface

We are pleased that you have chosen to purchase a RINCO product.
We are convinced that, by using this product, you will achieve a high degree of operating efficiency and product quality.
The purpose of this manual is to provide the purchaser and operator with all the information necessary for handling, assembling, operating and maintaining the device.
In order to ensure the constant readiness for operation of the device, it is necessary to follow the notes and instructions in this manual.

1 Explanation of signs and symbols

Pay particular attention to text sections with the following symbols:

Special information or operating notes.



Notes on risk of injury to persons or damage to parts of the device.

2 Safety notes

2.1 General

The design of this device corresponds to the current state of the art and is fail-safe. The individual components and the complete device have been checked by our Quality Assurance before delivery.

2.2 Use according to regulations

This device is intended solely for welding and cutting suitable materials. Any use other than or beyond this is deemed not according to regulations. The manufacturer shall not be liable for any damages resulting from such use. The risk shall be borne solely by the user. This device is intended for industrial use!

2.3 Use not according to regulations

- Operating the device with inadequate knowledge of operating, maintaining, servicing and supervising the device.
- Carrying out changes or additions and modifications to the device, which could adversely affect the safety, without authorisation from RINCO ULTRASONICS.
- Making software changes to the control software.
- Use of unsuitable materials.
- Opening the device during operation.
- Accessing live areas when the device is switched on.

2.4 To be particularly observed

The operating instructions supplied must be read carefully before commissioning the device.
The operating instructions must be kept ready to hand at the place where the device is used!

2.5 Qualification of personnel

Work on the welding device may only be carried out by trained and instructed personnel.
The responsibilities of the personnel for operating, setting up, maintaining and commissioning must be clearly laid down by the operating company!
The operating company must ensure that only authorised personnel work on the device. Work on the electrical equipment of the device may only be carried out by qualified electricians in accordance with electrotechnical regulations.

2.6 Installation of the device

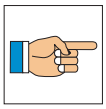
Danger!
Only perform connection work on the device when the mains cable is detached!
The mains connection must be earthed!
Countryspecific, statutory safety measures must be observed here!
If these regulations are not observed, the manufacturer shall refuse any liability for damage to persons or material!
Before any commissioning, the device must be in a closed and secure state.

2.7 Operation

Caution!
The device must not be opened during operation under any circumstances.

Danger!
There is high voltage in the interior of the device – Risk of injury!

- Desist from any time of work with questionable safety!
- Only operate the device when all protective and safety-related equipment, e.g. removable protective equipment, soundproofing, is present and functional.
- Before switching on the device, ensure that no-one can be put at risk by the device starting up.



Professional operation, careful handling of devices and the corresponding tools during operation

- maintain readiness for operation,
- increase useful life and
- reduce downtimes to a minimum.

2.8 Noise emissions

Caution!
Limit values: According to current knowledge, ultrasonic does not cause any damage if the maximum level is under 140 dB and the middle value level, based on 8 hrs/day, is under linear 110 dB.

Attention must be paid to subharmonic, i.e. audible vibrations which, according to the application, fluctuate strongly and have a very annoying and damaging effect. The decisive factor here is the energy equivalent continuous sound level, related to a representative work period (min. 8 hrs./day, max. 2000 hrs./year), of 85-87 dB(A) as a limit range.

When welding special materials, the noise level can exceed 70 dB (A). Counter measures:

- Where ear protection
- Mount sound insulation cover (option) (details in accordance with SUVA information no. 86048 d 4.94)

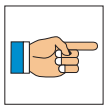
Further measuring values see «Sound ranging protocol from RINCO systems» Nr. 920-3903/1.95

2.9 Guarantee declaration

With the delivery of the device, RINCO ULTRASONICS has entered into a guarantee obligation in accordance with VSM (Verein Schweizerischer Maschinenindustrieller [Institute of Swiss Machine Industrialists]).

The requirements for RINCO ULTRASONICS meeting the guarantee conditions are, among other things:

- The user must have knowledge of the contents of these operating instructions.
- The instructions and warnings contained in these operating instructions must be followed.
- Unauthorised modifications or changes to parts of the device, the resonator system and the generator are not permitted.

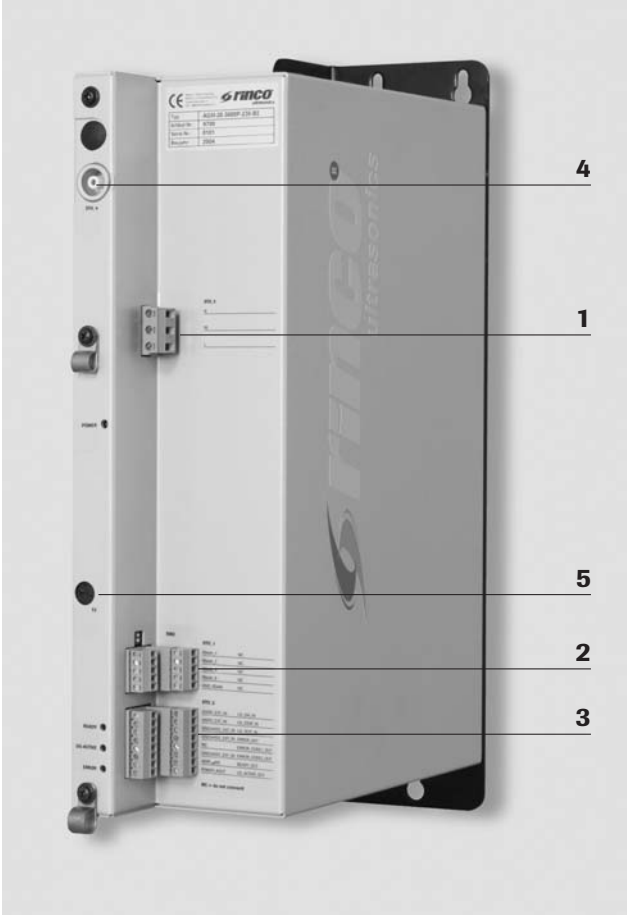


RINCO ULTRASONICS is very happy to give explanations over the telephone or to give training using specialist personnel.

3 Connection of the AGM generator

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

1 Mains connection (STO_0)
2 Interface (STO_1)
3 Signals (STO_2)
4 HF connection (STO_4)
5 Fuse 24VDC power pack (F2)



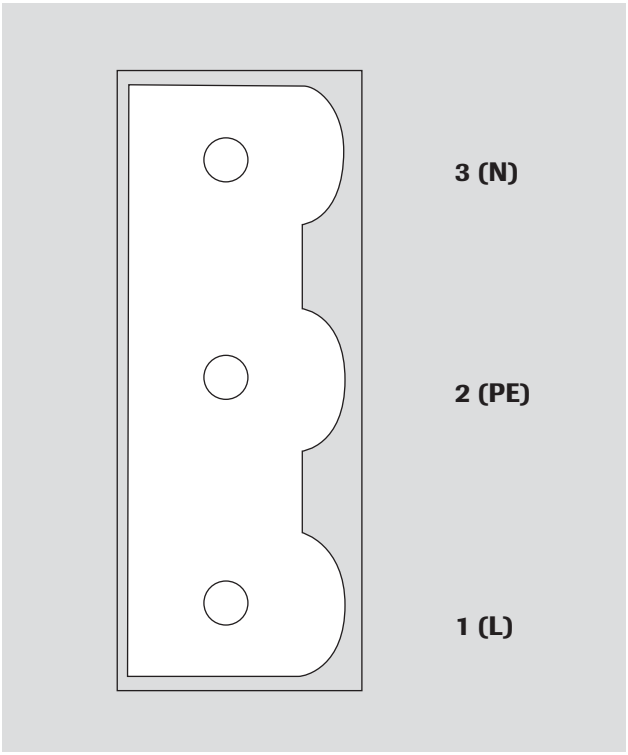
3.1 Mains connection of the generator module (STO_0)

The generator is supplied via the connector STO_0. The required fusing and filtering on the mains side must be effected outside the AGM generator.

3.1.1 Connection

PIN allocation STO_0

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



3.1.2 Fusing

The supply voltage of the AGM generator must be fused according to the following list:

Device description	Nominal power	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-B1	600 W	4.0 A
AGM35-400P-230-B1	400 W	4.0 A

3.1.3 Filtering

The AGM generator is designed as a component of a system. Therefore, no measures have been taken with regard to EMC (screening, line filter, etc.). It is the task of the customer to connect it to the system correctly according to standards.
The following listed filter types have been tested by RINCO ULTRASONICS, and can be recommended for the individual generator modules:

Device description	Filter type
AGM20	Schaffner FN2070-25-08
AGM35	Schaffner FS6092-8-06

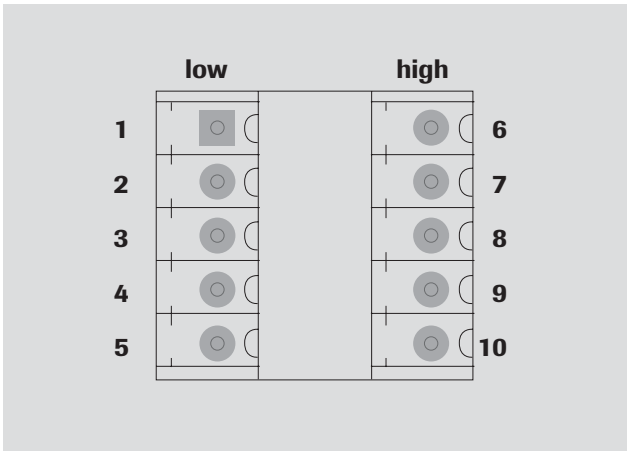
For EMC-compatible connection, the following points must be observed:

- Mains cable from line filter to AGM generator max 50 cm
- Ferrite on each supplied data cable
- Ferrite double-sided on the HF cable
- Data cables must not be laid parallel to the HF cable or mains cable.
- AGM generator and line filter must be mounted on the same low-resistance potential (PE).

3.2 24V Power pack and interfaces CANopen, RS485 (STO_1)

The serial interface RS485, the bus system CANopen and the integrated 24V voltage supply 24VDC_OUT can be read off 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



3.2.1 24V Power pack

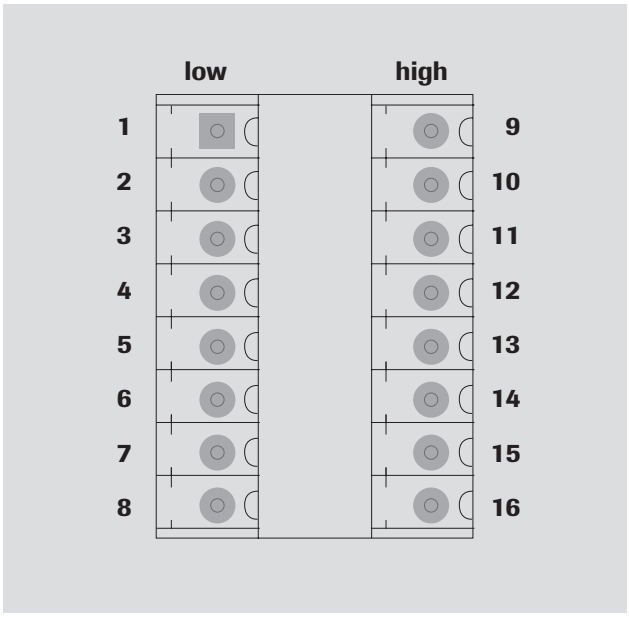
A 24V power pack is integrated in the AGM generator. It can, for example, be used for the activation of digital inputs/ outputs. The output voltage of the 24V power pack is protected by the fuse F2. It is situated on the front of the housing of the AGM generator.

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

3.3 Signals (STO_2)

All digital and analog inputs and outputs can be read off using the connector STO_2. The stipulated wiring for the generator used must always be observed here.

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



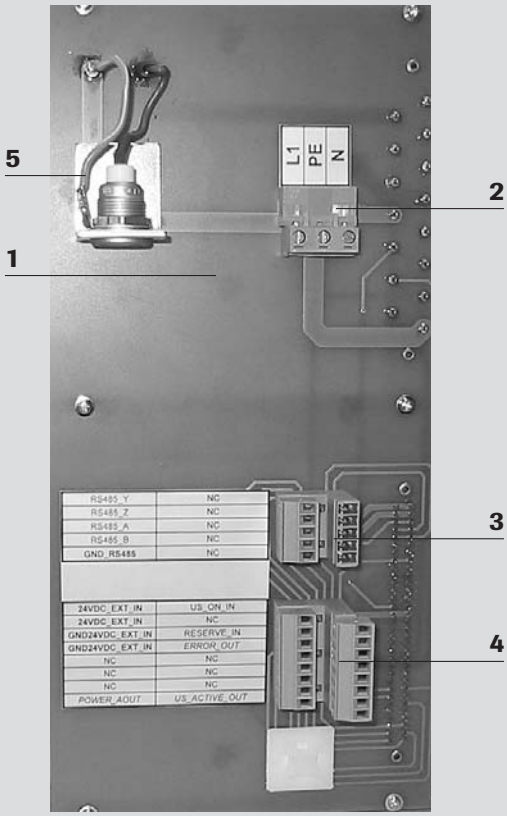
NC = Do not connect

More details are available in the “Generator module AGM20/35“ operating instructions.

4 Connection of the GMD generator

1 Busprint GM 2–3 kW
2 mains connection (STO_0)
3 interface (STO_1)
4 signals (STO_2)
5 HF connection (STO_4)

All the necessary signals from the generator can be read off via the connectors on the rear wall, STO_0, STO_1, STO_2 und STO_4, or forwarded to the generator.



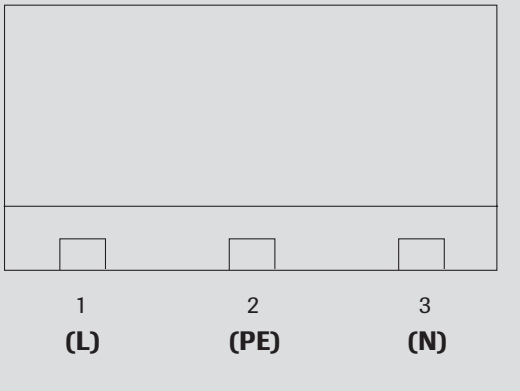
4.1 Mains connection of the generator module (STO_0)

The generator is supplied via the connector STO_0. The required fusing and filtering on the mains side must be effected outside the GMD-Multirack.

4.1.1 Connection

PIN allocation STO_0

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



4.1.2 Fusing

The supply voltage of the individual generator modules must be fused according to the following list:

Generator module	Fuse
GMD20-2000P-230-NO	12.5 A
GMD20-3000P-230-NO	16 A

4.1.3 Filtering

The GMD Multirack is designed as a system component. For this reason, no measures have been taken with regard to EMC (screening, line filter, etc.). Correct connection to the system according to standard is the responsibility of the customer.
The types of filter listed below have been tested by RINCO ULTRASONICS and can be recommended for the individual generator modules:

Generator module	Filter type	Article No.
GMD20	Schaffner FN2070-25-08	00009761

For EMC-compatible connection, the following points must be observed:

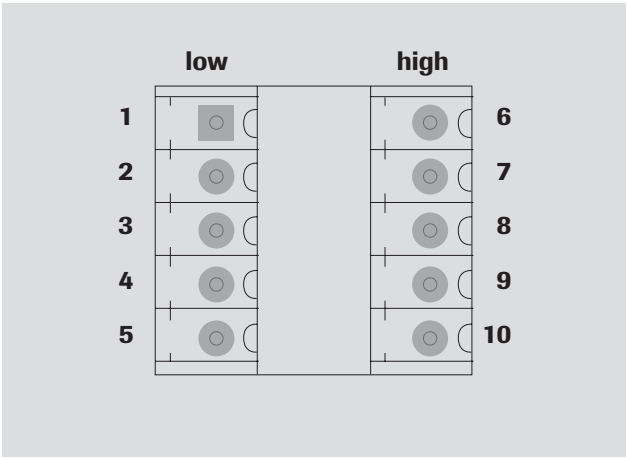
- Mains cable from line filter to AGM generator max 50 cm
- Ferrite on each supplied data cable
- Ferrite double-sided on the HF cable Data cables must not be laid parallel to the HF cable or mains cable.
- AGM generator and line filter must be mounted on the same lowresistance potential (PE).

4.2 Interface CANopen, RS485 (STO_1)

The serial interface RS485 and the bus system CANopen can be read off via this connector.

PIN allocation STO_1

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

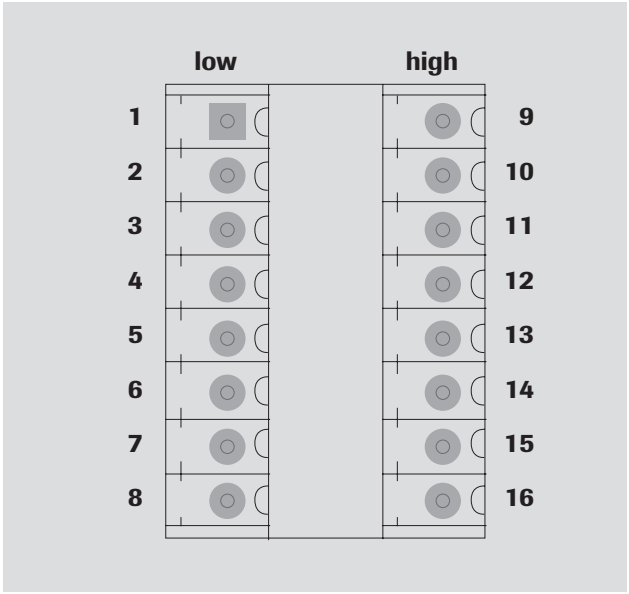


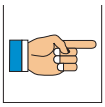
4.3 Signals (STO_2)

All digital and analog inputs and outputs can be read off via the connector STO_2. The wiring stipulated for the generator used must always be observed.

PIN allocation STO_2

PIN 1	24VDC_EXT_IN
PIN 2	24VDC_EXT_IN
PIN 3	GND24VDC_EXT_IN
PIN 4	GND24VDC_EXT_IN
PIN 5	AMPL_PULSE_IN
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





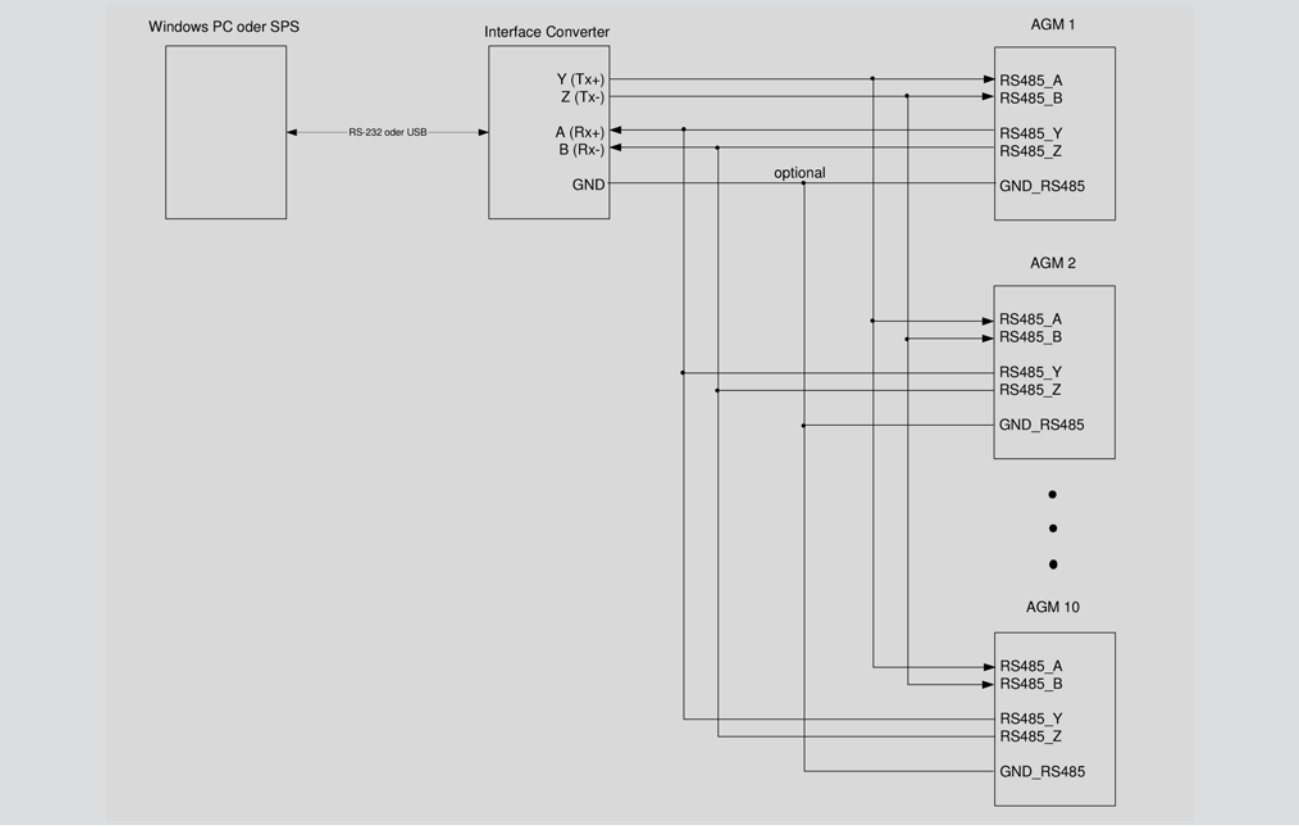
More detailed information is available form the operating instructions «Generator module GMD20/35 and GMD-Multirack»

5 Protocol of the RS485-interface

5.1 Introduction

The RS485 bus is a bi-directional bus system for serial data transmission over long distances. The 4-wire RS485 bus system is used with the generator. This contains the master/slave architecture, i.e. a master (e.g. a PC or PLC) controls several slaves (e.g. AGM generators). Each slave has a clear module address and only answers to commands addressed to him.

The 4-wire architecture permits the connection of up to 10 slaves to a master. It should be noted that it is not possible to send several slaves simultaneously; this would lead to data loss. Since the generator never sends without a prior request from the master, this must be taken into consideration in the programming of the master software.



5.2 Transmission parameters

The generator has set the following transmission parameters:

Transmission parameters	value
Bits per second	19200
Data bits	8
Stop bits	1
Parity none	none

5.3 Protocol syntax

There are three different types of command:

- Commands without data
- Writing parameters and data
- Reading parameters and data

The protocol syntax looks different for the different types of command.

If several generators are operated via a control, a clear module address must be allocated to each generator. The module address can be changed with the command 'ae' (see example in section 5.3.2).

5.3.1 Commands without data

A control can send commands to the generator. The syntax looks as follows:

Module adress (1 Byte)	Command	End sign
q...z	two lower case letters (e.g. aa)	<CR> (0x0D)

Due to time reasons, these commands are not confirmed by the generator.

Examples:

Control --> Generator: qaa start ultrasonic
Control --> Generator: qab stop ultrasonic

5.3.2 Writing data

With these commands, parameters and data can be written in the generator. This data is not time critical and is written outside the welding cycle (output: setting amplitude). The transmitted parameters and data are checked in the generator and confirmed with an answer.

Module adress (1 Byte)	Command	Data	End sign
q...z	two small case letters (z.B. ah)	ASCII-Sign Length varying	<CR> (0x0D)

The data is confirmed by the generator with an answer telegram:

Module adress (1 Byte)	Separator	Confirmation	End sign
q...z	= (0x3d)	1 Sign (see below)	<CR> (0x0D)

The confirmation sign can assume the following values:

0 = no fault, data is valid
1 = length of the data false
2 = data area invalid
3 = unknown command
4 = ultrasonic cannot be started (ultrasonic either already active or active US_STOP_IN-input)

Examples:

Control -> generator:	qaer	Change module address from 'q' to 'r'
generator -> control:	r = 0	New module address was accepted
Control: -> generator:	raj0020	Write soft start (20 ms) in the generator module with the address r.
Generator -> Control:	r = 0	Generator module r answers. Data is valid and was accepted
Control -> Generator:	zbf0001	Write maximum welding time (1 ms) in generator module with the address z.
Generator -> Control:	z = 2	Generator module z answers. Data is outside the valid range.
Control -> Generator:	san00090.00	Write energy minimum in time mode (90 Ws) in generator module with the address s. Generator module s answers.
Generator -> Control:	s = 0	Data is valid and was accepted.

5.3.3 Reading data

With these commands, parameters and data can be read from the generator.
This data is not time critical and is read outside the welding cycle.

Module adress (1 Byte)	Command	End sign
q...z	two lower case letters (e.g. ai)	<CR> (0x0D)

The data is confirmed by the generator with a data telegram:

Module adress (1 Byte)	Data	End sign
q...z	ASCII- or HEXsign length varying	<CR> (0x0D)

Examples:

Control -> Generator:	qaq	Read welding mode of the generator module with the address q.
Generator -> Control:	q0	Generator module q answers. Welding mode = time mode
Control -> Generator:	zam	Read welding time of the generator module with the address z.
Generator -> Control:	z1000	Generator module answers. Welding = 1000 ms
Control -> Generator:	rao	Read energy minimum of the generator module with the address r.
Generator -> Control:	r00009.00	Generator module r answers. Energy minimum = 9.00 Ws

5.4 Commands

5.4.1 Direct control commands

Command	Protocol syntax	Function
aa	Command without data	Start ultrasonic
ab	Command without data	Stop ultrasonic
ac	Command without data	Measuring no-load power
da	Command without data	Start shake-off impulse

5.4.2 Welding mode parameter setting

Command	Protocol syntax	Function	Unit	Minimum	Maximum	Standard	Data bytes
ae	Writing data	module address		'q'	'z'	'q'	1
af	Writing data	Welding mode (0=time, 1=energy, 2=continuous)		0	2	2	1
ag	Reading data	Welding mode (0=time, 1=energy, 2=continuous)					1
ah	Writing data	Amplitude value		0040	0100	0100	4
ai	Reading data	Amplitude value					4
al	Writing data	Welding time in time mode	ms	0005	9999	1000	4
am	Reading data	Welding time in time mode	ms				4
an	Writing data	Energy minimum in time mode	Ws	00000.0	Nominal power * 10	Nominal power / 1000	8
ao	Reading data	Energy minimum in time mode	Ws				8
ap	Writing data	Energy maximum in time mode	Ws	Nominal power/1000	Nominal power * 10	Nominal power * 10	8
ba	Reading data	Energy maximum in time mode	Ws				8
bb	Writing data	Set energy in energy mode	Ws	Nominal power/1000	Nominal power * 10	Nominal power * 1	8
bc	Reading data	Set energy in energy mode	Ws				8
bd	Writing data	Welding time minimum in energy mode	ms	0005	9999	0100	4
be	Reading data	Welding time minimum in energy mode	ms				4
bf	Writing data	Welding time maximum in energy mode	ms	0005	9999	1000	4
bg	Reading data	Welding time maximum in energy mode	ms				4
bh	Writing data	Minimum power in power mode	W	0	Nominal power * 1.2	0	4
bi	Reading data	Minimum power in power mode	W				4
bj	Writing data	Maximum power in power mode	W	0	Nominal power * 1.2	Nominal power * 1.1	4
bk	Reading data	Maximum power in power mode	W				4
bl	Writing data	Delay time for overload up to termination in power mode	ms	0005	9999	0100	4
bm	Reading data	Delay time for Overload up to termination in power mode	ms				4
db	Writing data	Shake-off time	ms	0005	1000	0100	4
dc	Reading data	Shake-off time	ms				4
ph	Reading data	External analog amplitude	%				4

5.4.3 Reading measuring values and status

Command	Protocol syntax	Function	Unit	Data bytes
ad	Reading data	Instantaneous power	W	4
ha	Reading data	Issuing actual value register (see below)		36
hc	Reading data	Issuing power graph according to settings in the plot flag register (see below)		according to welding time and Plot flag register
hf	Reading data	Version		8
ed	Reading data	Plot flag register		2

The answer to the command 'Issuing actual value register' has the following structure:

Adress	Energy Ws	Power max. W	Power mom. W	Welding time ms	Power loss W	Frequency z/10	Status 1	Status 2	End sign
q..z	xxxxx.xx	xxxx	xxxx	xxxx	xxxx	xxxx	0xFFFF	0xFFFF	<CR>

If the energy is greater than 99999.99 Ws or the welding time is greater than 9999 ms, it is not the numerical value that is transmitted but 'XXXXX.XX' or 'XXXX'.

The bit registers Status 1 and Status 2 are structured in the following way:

MSB															LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

The individual bits signifiy:

Bit position Status 1	Error
0	Energy minimum not reached in time mode
1	Energy maximum exceeded in time mode
2	Minimum welding time not reached Energy Mode
3	Maximum welding time exceeded Energy Mode
4	Power minimum not reached in continuous mode
5	Power maximum not reached in continuous mode
6	Analog amplitude too deep (<4V)
7	No function
8	No function
9	No function
10	Welding stop
11	No function
12	No function
13	No function
14	No function
15	Ultrasonic active

Bit position Status 2	Error
0	Mains voltage too low
1	12V power pack faulty
2	Minimum level control final stage
3	Temperature final stage too high
4	No function
5	No function
6	No function
7	No function
8	Frequency minimum not reached
9	Frequency maximum exceeded
10	Maximal converter voltage
11	Power overload
12	Full scale of the final stage reached
13	Converter not connected
14	No function
15	No function

Power graph
The data of the power graph is transmitted in the following format:
qxxxxxxxxxxxxxxx<CR>

The measured power values are displayed for x. Here the graph can contain the hexadecimal values 0x30, which represent a power of 0% of the generator nominal power, to 0xFF for 207% of the generator nominal power.

A power measurement interval is automatically created by the generator using the welding time. This can be read out with the command 'ed'. The connection of the number of measuring values to the welding time is shown by the following table

Welding time	**Performance 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 number of measuring values for the performance graph can be calculated using the power measuring interval and the welding time, If there is a fraction in the formula shown below, it is always rounded up!
Number of power values = welding time in ms / Power measuring interval

Examples:
Number = 100 ms / 1 = 100
Number = 513 ms / 2 = 257
Number = 1024 ms / 2 = 512
Number = 8001 ms / 16 = 501

Version query
The software version consists of 8 signs: "DGC xGxx" whereby x are dependent on the software version.

5.4.4 Internal generator settings

Command	Protocol syntax	Function	Unit	Minimum	Maximum	Standard	Data bytes
aj	Writing data	Soft start time (time from ramp start value to to the set amplitude)	ms	0005	0200	0020	4
ak	Reading data	Soft start time (time from ramp start value to to the set amplitude)	ms				4
bn	Writing data	Soft stop time (slow reduction of the amplitude)	ms	0000	0050	0000	4
bo	Reading data	Soft stop time (slow reduction of the amplitude)	ms				4
ea	Writing data	Frequence reset (0 = deactivated, 1= activated)		0	1	0	1
eb	Reading data	Frequency reset (0 = deactivated, 1= activated)					1
ed	Reading data	Power measurement interval 1ms, 2ms, 4ms, 8ms, 16ms oder 32ms (see 10.5.3)	ms	1	32		2
ef	Writing data	Amplitude source (0 = internal, 1 = external analog)		0	1	1	1
eg	Reading data	Amplitude source (0 = internal, 1 = external analog)					1
fe	Reading data	Generator frequency	kHz				2
nk	Writing data	Overload level	W	0005	Nom. power * 1.2	Nom. power * 1.1	4
nl	Reading data	Overload level	W				4
of	Reading data	Generator nominal	W				4
og	Writing data	Frequency limit top (as positive offset to basic frequency)	Hz	0050	0500	0500	4
oh	Reading data	Frequency limit top (as positive offset to basic frequency)	Hz				4
oi	Writing data	Frequency limit bottom (as negative offset to basic frequency)	Hz	0050	0500	0500	4
oj	Reading data	Frequency limit bottom (as negative offset to basic frequency)	Hz				4
pe	Writing data	Ramp start value		10	40	30	4
pf	Reading data	Ramp start value					4

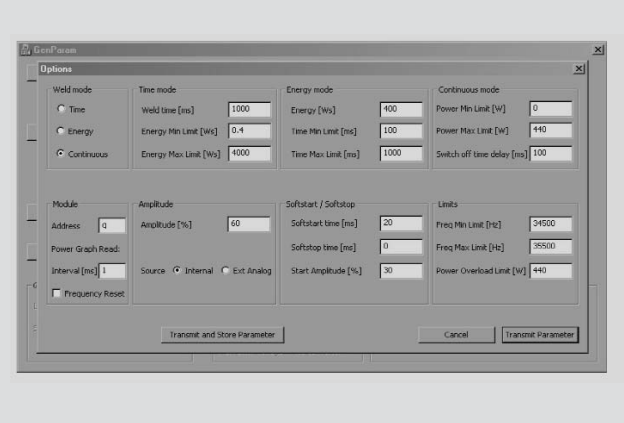
5.4.5 Saving/loading and initialising operating parameters

The generator has an electrically erasable memory for the operating parameters. The current operating parameters can be saved in it, or operating parameters can be loaded out of it. There is also a command to restore the standard setting for the operating parameters.

Command	Protocol syntax	Function	Data bytes
oa	Writing data	Saving operating parameters	0
ob	Writing data	Loading operating parameters	0
oo	Writing data	Initialising and subsequently saving operating parameters	0

6 Windows GenParam program

The operating parameters can be configured easily with the Windows GenParam program. More detailed information on GenParam is available from RINCO ULTRASONICS.

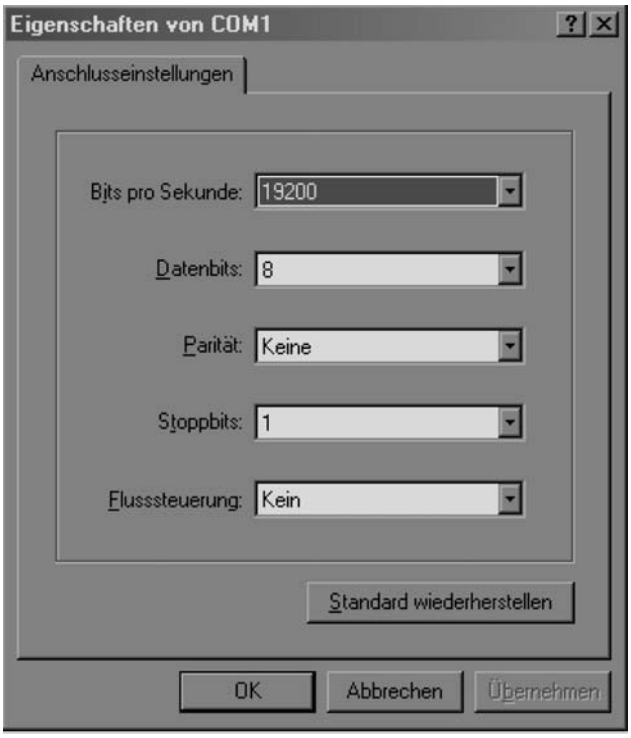


7 Example applications

Communication with the generator module can take place using a computer by means of GenParam or HyperTerminal, or with a superordinate control (e.g. PLC).

7.1 Communication example HyperTerminal

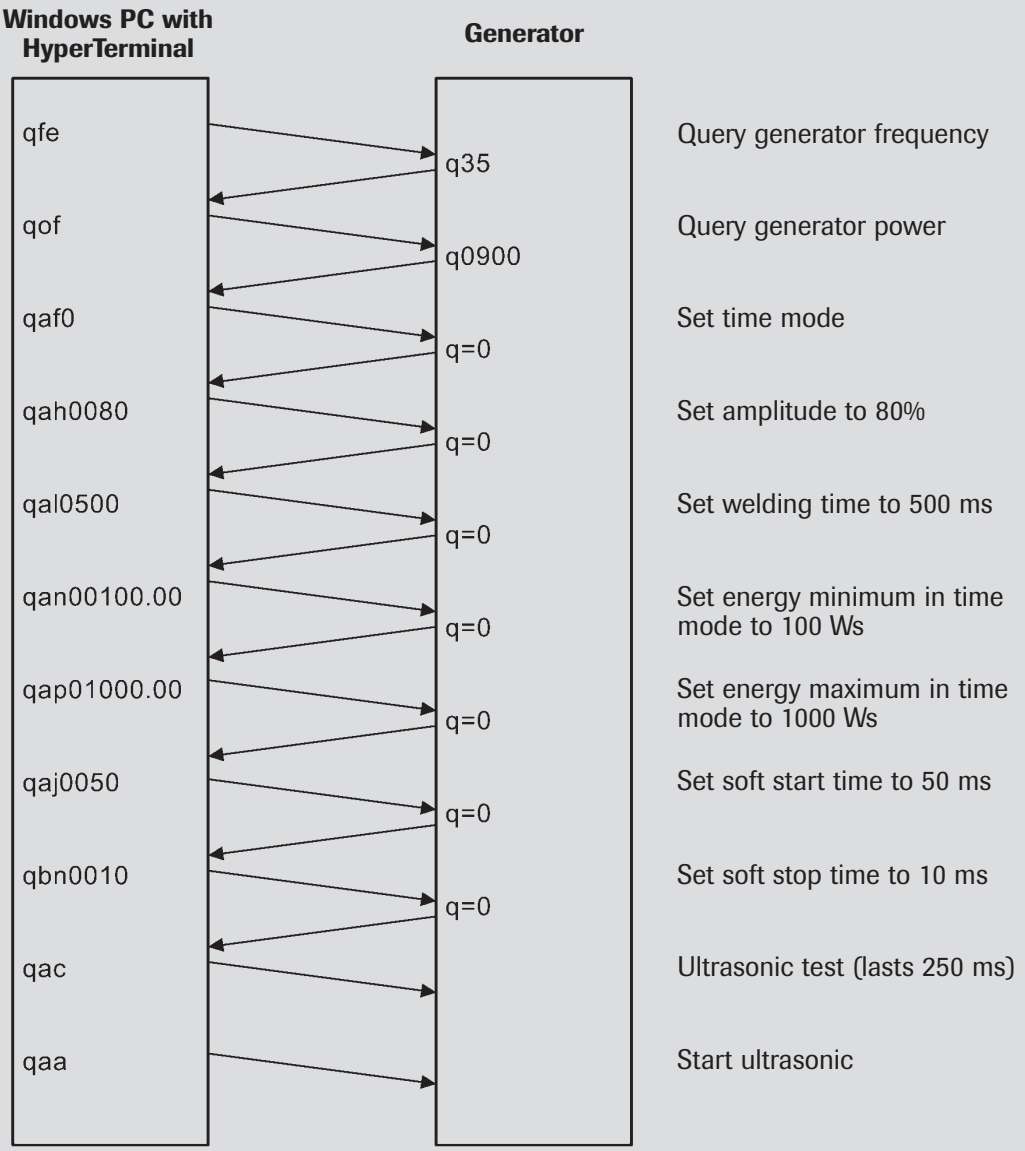
In order to use the RS485 interface with a Windows PC, a RS232-RS485 interface is required. In order to send commands to the generator, for example, the program HyperTerminal, which is part of the Windows scope of delivery, can be used. HyperTerminal must be set in the following way:



Connection settings of HyperTerminal

ASCII configuration of HyperTerminal

The illustration below shows a advisable sequence for setting parameters via the RS485 interface. The commands for setting parameters are sent by HyperTerminal. The generator answers in each case with a confirmation.



7.2 Important notes on implementation

Compliance with the command syntax is imperative. Some error sources and various ways of avoiding them are listed below.

7.2.1 Error source incorrect end mark

A frequent error source is an incorrect end mark <CR> at the end of the command. For problems with transmission, a time delay of two seconds can be inserted between commands for test purposes. With this delay, the software for the generator corrects the problem with the incorrect end sign.

7.2.2 Evaluation of the answer of the generator module

For reception of the generator answer, the entry buffer of the serial interface must be read out after receipt of the end mark <CR> . Then there must be an evaluation of the answer in the software of the superordinate control before the next command is sent.

7.2.3 Securing parameter setting

The parameter setting of the generator is stored in a volatile memory. Only with the command “Save operating parameters” (oa) can the parameters be saved in a non-volatile memory. For this reason, the operating parameters should be saved after each the parameters are set.

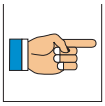
7.2.4 Checking the communication

To check communication, the superordinate control must have functions for reading back the parameters and issuing them on a display. Without such functions, the communication cannot be checked.

7.2.5 Actual value register

A further important control function is the reading of the actual value register (ha). This register can be used in the event of possible errors to look for the exact cause of the error. The register also includes measuring values which can be used for a statistical evaluation.

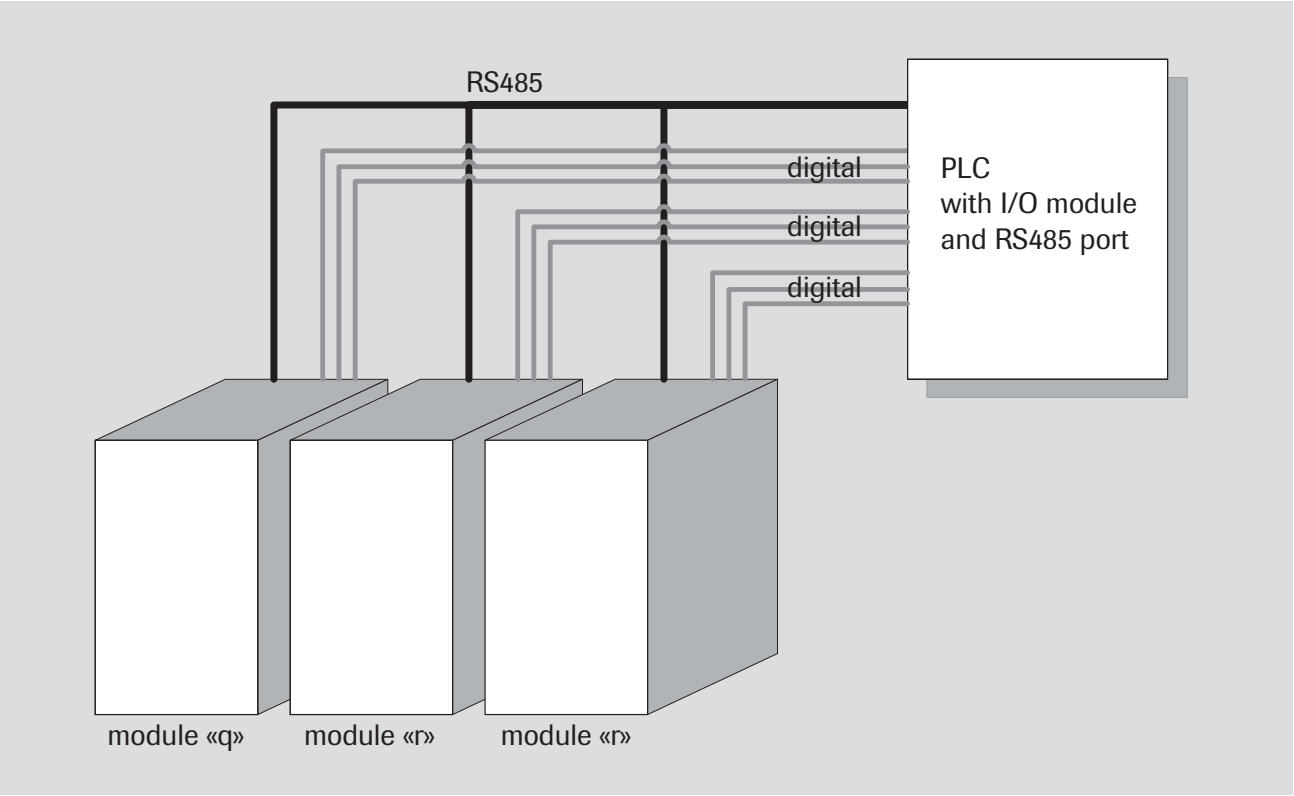
In the event of problems with the total cycle time of the machine, the reading should only be carried out in the event of an error or with an interval (e.g. for each fifth weld).



The superordinate control must have functions for reading parameter settings from the generator and reading the actual value register!

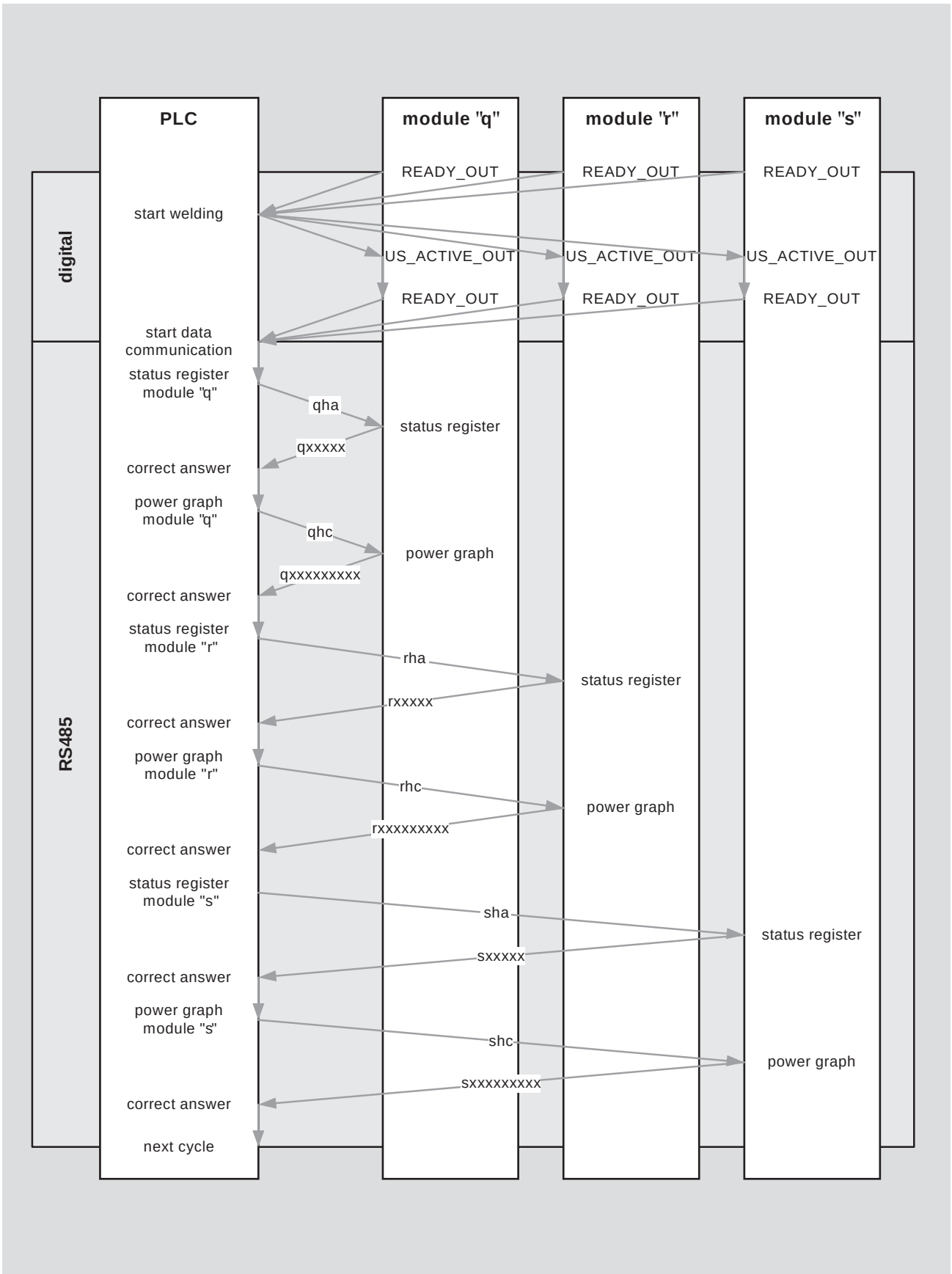
7.3 Activation of three generators using a PLC

The machine in the sample application has the following structure:



The PLC has a connection to the generator modules via the port RS485. The generator modules have the module addresses “q”, “r” and “s”. The start signal (US_ON_IN), the signal US active (US_ACTIVE_IN) and the readiness signal (READY_OUT) from the generator modules are linked with the digital inputs/outputs of the PLC. The communication between PLC and generator module begins, when the READY_OUT signal has been set, with the transmission of all welding parameters once the machine has been started up. In this moment, it is sure that the generator modules have the correct parameters. Following transfer of the parameters to the generator module, it is advisable to save in the non-volatile memory.

The next step is the welding. The PLC checks the READY_OUT output of the generator module for a high signal (24 VDC). If the generator modules is ready, a welding process can be started with the US_ON_IN input. During welding, the output US_ACTIVE_OUT changes to a high signal (24 VDC). The generator module registers with a high signal (24 VDC) to READY_OUT and a low-signal (0 VDC) to US_ACTIVE_OUT, that welding has finished. If the PLC has received this message, then it sends the command to read out the actual value register. The generator module answers with the measured values. If the PLC registers the correct answer, the command for the power curve may be sent. The generator module then answers with all the power data. Following this correct answer, the machine is ready for the next welding cycle. The picture on the next page shows the process described.


PLC
module "q"
module "r"
module "s"
digital
RS485
READY_OUT
READY_OUT
READY_OUT
start welding
US_ACTIVE_OUT
US_ACTIVE_OUT
US_ACTIVE_OUT
READY_OUT
READY_OUT
READY_OUT
start data communication
status register module "q"
qha
status register
qxxxxx
correct answer
power graph module "q"
qhc
power graph
qxxxxxxxxx
correct answer
status register module "r"
rha
status register
rxxxxx
correct answer
power graph module "r"
rhc
power graph
rxxxxxxxxx
correct answer
status register module "s"
sha
status register
sxxxxx
correct answer
power graph module "s"
shc
power graph
sxxxxxxxxx
correct answer
next cycle

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