GOSSEN METRAWATT

R2900

DIN Draft 19244 Interface

3-349-204-15
2/10.02

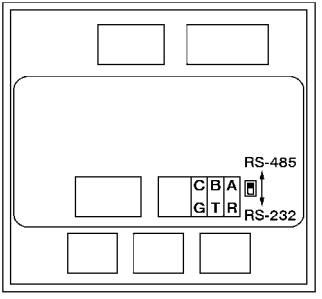
Contents

1 General

1.1 Interface hardware

To communicate with a host computer, an SPS, etc., the controllers R2900 must be equipped with marking F1. In this case, the controllers are equipped with a serial interface having the following data:

- Level types RS-232 and RS-485 (two-wire) in the unit selectable
- Baud rate 9600 bd
- Character format 8 data bits, 1 parity bit, 1 stop bit
- Parity Even
- Maximum number of equipment on the bus: 32
- With RS-485 bus operation, each connected R2900 must have a different interface address (***Addr*** = 0 ... 250) (see operating instructions 3-349-203-15).



1.2 Communications protocol

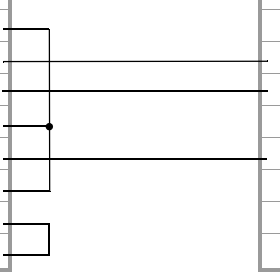
The transmission protocol used complies with DIN draft 19244. The R2900 uses only a partial amount of the defined functions which are described below.

1.3 How to connect the interface

1.3.1 RS-232 connection

When using the a RS-232 interface, only one R2900 can be connected to a master (e.g. PC), for example, for pre-loading the unit with user-specific data.

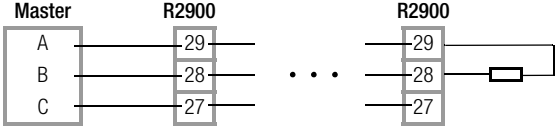
Sub-D socket			R2900	
Number of pins:	25	9		
DCD	8	1		
RxD	3	2	28	TxD
TxD	2	3	29	RxD
DTR	20	4		
Gnd	7	5	27	Gnd
DSR	6	6		
RTS	4	7		
CTS	5	8		



Depending upon the driver software, the jumpers on the master side can be omitted and/or can be different.

1.3.2 RS-485 connection

When using a RS-485 interface, as many as 32 equipment (R2900 and others) can be connected to the bus. Thereby, all terminals A, B and/or C are interconnected in parallel. The wiring must be made from equipment to equipment and must not be a star connection. With longer bus lines (longer than about 5 m) the bus should be terminated at both ends with the characteristic impedance
(e.g. 200 Ω between A and B).



1.4 Principal function

Involved is a master/slave protocol with a fixedly assigned master (e.g. SPS) and as many as 255 slaves (equipment e.g. R2900).
Communication is in half-duplex mode.
An equipment connected to the master becomes active (responds) only, when

- it receives a valid telegram addressed to itself and
- the minimum specified response delay time (t_{av}) has elapsed so that the host computer has time to get ready to receive data.

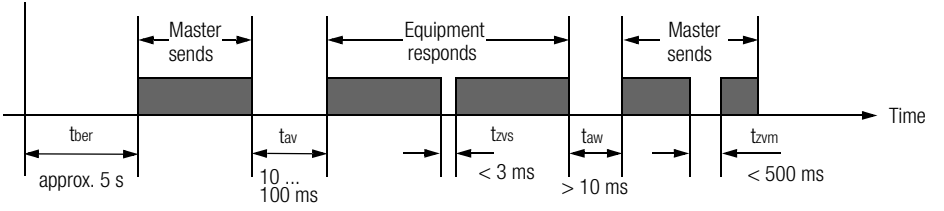
Following, the master may only become active again, when

- it receives a reply telegram from the addressed equipment and the specified wait time after a reply telegram (t aw) has elapsed, or
- the maximum specified response delay time (t_{av}) has elapsed.

Within a telegram, pauses of limited duration (t_{zv} = character delay time) may occur between 2 character transmissions.

1.5 Time action

Ready to send/receive after turn-on	t_{ber}		approx.5 s
Character delay time (R2900 transmitter)	t_{zvs}	<	3 ms
Character delay time (master)	t_{zvm}	<	500 ms
Response delay time (R2900 transmitter)	10 ms	<	t_{av} < 100 ms
Wait time after R2900 response (master)	t_{aw}	>	10 ms



2 Telegram structure

All telegrams consist of one of 3 sets in both request and reply direction, they differ in their principal structure. Their use is fixed for each interface function of the R2900.
Structure and use of the set types are described as follows.

2.1 Short set

Short sets are used on the request side (from the master)

- for transmission of short instructions to the equipment (e.g. Reset)
- for short requests of important data from the equipment (e.g. event data)

Short sets are used on the reply side (from the R2900)

- for acknowledgement of requests that require no reply data.

Principal construction short set

Character No.	Contents	Meaning	Remarks
1	10h	Start character	Especially for short set
2	0 ... FAh, FFh	Equipment address	*Addr* and/or 255 (see 2.4.1)
3		Function field (FF)	see 2.4.2
4		Checksum (PS)	= Equipment address + FF
5	16h	End character	Common to all set types

2.2 Control set

The R2900 uses control sets on the request side only. They serve to request all equipment data that cannot be requested via a short set because a detailed specification is required for them.

Principal construction control set

Character No.	Contents	Meaning	Remarks
1	68h	Start character	
2	3 and/or 6	Length	Number of characters from equipment address to checksum exclusive
3	3 and/or 6	Length (repeat)	
4	68h	Start character (repeat)	
5	0 ... FAh, FFh	Equipment address	***Addr*** and/or 255 (see 2.4.1)
6		Function field (FF)	see 2.4.2
7		Parameter index (PI)	see 2.4.3
8	1	From channel	For reasons of compatibility with multi-channel controllers these characters must be available, omitted for parameter index 30h ... 3Fh.
9	1	To channel	
10	0	Receipt number	
8 and/or 11		Checksum (PS)	[1]
9 and/or 12	16h	End character	

[1] For the set types, the checksum is formed by bytewise summation without overflow summation over all characters from the equipment address to checksum exclusive.

2.3 Long set

The R2900 uses long sets to transmit instructions and parameters to the equipment and to receive data from the equipment.

Principal construction long set

Character No.	Contents	Meaning	Remark
1	68h	Start character	
2		Length	Number of characters from equipment address to checksum exclusive
3		Length (repeat)	
4	68h	Start character (repeat)	
5	0 ... FAh, FFh	Equipment address	*Addr* and/or 255 (see 2.4.1)
6		Function field (FF)	see 2.4.2
7		Parameter index (PI) [1]	see 2.4.3
8	1	From channel [1]	Omitted for parameter index 30h ... 3Fh
9	1	To channel [1]	
10	0	Receipt number [1]	
. . .		n character data block	see 2.4.4
Length + 5		Checksum (PS)	[2]
Length + 6	16h	End character	

[1] Omitted for reply cycle data and event data.

[2] For the set types, the checksum is formed by bytewise summation without overflow summation over all characters from the equipment address to checksum exclusive.

2.4 Function and value range of the format characters

2.4.1 Equipment address

- 0 ... 250 Range for individual equipment addresses = interface address *Addr*
- 255 All equipment connected to a bus can simultaneously be addressed under this address. Data and instructions entered with this address are accepted by all equipment, but there is no acknowledgement made to the master.

2.4.2 Function field (FF)

The function field contains

- with the short set the proper user information, predefined by bits and different in request and response direction
- with the control and long set the direction and control information for the transmitted data block

2.4.2.1 Function coding of the function field in request direction

Request check	Code	Set	Remark
Reset equipment	09h	Short set	The R2900 evaluates the given codes only; an error acknowledgement is issued for invalid ones
Interrogation: Equipment OK?	29h		
Request cycle data from equipment	89h		
Request event data from equipment	A9h		
Send data to R2900	69h	Long set	
Request data from R2900	89h		

2.4.2.2 Function coding of the function field (FF) in response direction

Bit No.	Function	Value	Meaning
0 ... 2	Reserved	0, 0, 0	(fixed)
3	Request disable	0 1	Instruction executed, equipment ready Equipment not ready for this instruction, eventually repeat instruction
4	Instruction acknowledge-ment	0 1	Instruction executed, equipment ready Instruction could not be executed, equipment ready
5	Transmission error	0 1	Request telegram correct Request telegram incorrect
6	Not used	0	
7	Service request	0 1	None of the errors contained in error status words 1 and 2 occurred One or more errors occurred, request error status for exact identification!

2.4.3 Parameter index (PI)

The type of the data to be transmitted is defined via the parameter index. The "PI" character is interpreted as follows:

Bit 7-4	Bit 3-0
0 ... Fh	0 ... Fh
Selection number for main parameter group	Selection number for a special parameter in the main group

Functionally used data and/or setting parameters of an equipment are combined in the main parameter groups. Only those parameter indices documented in section 4 can be addressed in the R2900, an error message is issued for all others.

2.4.4 Length and format of the data block

Length and format of the data block are variable and a function of PI and FF.
The transmitted values can have byte or word format:

8 Bit		Number without sign
± 7 Bit	2's complement presentation	Number with sign
16 Bit	LS byte first	Number without sign
± 15 Bit	LS byte first, 2's complement presentation	Number with sign
8/16 Bit	LS byte first	Bit field

2.5 Criteria for the validity of a request telegram

The R2900 checks the characters of the telegrams received in accordance with the following tables:

For short set:

Character No.	Criterion
1	10h
2	Interface address ***Addr*** or 255 (see 2.4.2)
3	FF = valid function coding
4	PS = ***Addr*** or 255 + FF
5	16h

For control and long set:

Character No.	Criterion
1	68h
2	Note length for PS and end character
3	Character 3 = character 2
4	68h
5	Interface address ***Addr*** or 255
6	FF = 69h oder 89h
7	PI = valid parameter index (see section 4)
. . .	(data block)
Length + 5	PS = [1]
Length + 6	16h

[1] Bytewise sum without overflow over all characters from equipment address (*Addr* or 255) to checksum exclusive

If incorrect values are received for FF, PI and PS, the R2900 responds with a short set with set transmission error bit. If the user data is entered beyond its specific value ranges, the R2900 responds with a short set with set service request bit. The bit "impermissible value" is set in the error status word 2.
If there are other deviations or a parity error, the telegram is invalid, the R2900 does not respond.

3 Telegram contents R2900

3.1 Equipment reset

The addressed equipment performs a hardware reset same as in the case of a short interruption of the auxiliary voltage.

Example: Equipment address = 2

Request from master (short set):

10h	02h	09h	0Bh	16h
		FF	PS	

R2900 response:

None

3.2 Interrogation: Equipment OK?

The addressed equipment shows the function field only:

Example: Equipment address = 3

Request from master (short set):

10h	03h	29h	2Ch	16h
		FF	PS	

R2900 response (short set):

10h	03h	„FF“	„FF“+3	16h

See 2.4.2.2 for contents of the function field.

3.3 Request for cycle data

You will get the most important measuring and output values of the controller in one data package. Cyclic requests of these values are thus made possible in compact form (short set request).

Example: Equipment address = 2

Request from master (short set):

10h	02h	89h	8Bh	16h
		FF	PS	

R2900 response (long set, see 2.3):

68h	09h	09h	68h	02h	„FF“	Data block	„PS“	16h
						7 characters		

See 2.4.2.2 for contents of the function field (FF)
The 7 characters of the cycle data block have the following format:

Character No.	Contents, e.g.	Format	Unit of measure	Remark	Condition
7, 8	2Ch, 01h	± 15 bits	1 ° / 0.1 ° / 1	1st measured value (e.g. 300 °)	
9, 10	36h, 01h	± 15 bits	1 ° / 0.1 ° / 1	2nd measured value (e.g. 310 °)	B3, B4
	0, 0			—	B1, B2
11	CEh	± 7 bits	1 %	Current ON time (e.g. –50 %)	
12, 13	28h, 00h	± 15 bits	0.1 A	Meas. val. of the heating curr. (e.g. 4,0 A)	not A5, A6
			1 %	Position feedback (e.g. 40 %)	A5, A6

3.4 Request for event data

The event date, combined in 2 words, contain all error messages and alarms of the equipment.
They can be called up via short set to identify a special error.
This request can be made asynchronous, for example, if the service request bit (collected errors) was set before in any random response telegram in the function field (FF).

Example: Equipment address = 5

Request from master (short set):	10h	05h	A9h	AEh	16h				
R2900 response (long set, see 2.3):	68h	06h	06h	68h	05h	„FF“	Data block	„PS“	16h

4 characters

See 2.4.2.2 for contents of the function field (FF)

The 4 characters of the event data block are bit fields which are combined to form the error status words 1 and 2.
These 4 characters can also be read by data request with parameter index 21h.
See the operating instructions for more explanations and information on error elimination.

Event data, character 1 and 2

Character	Bit No.	Meaning	Display on equipment	Remark
1.	0	Sensor breakage measuring circuit 2	SE H	Status error word 1 (control loop)
	1	Wrong polarity measuring circuit 2	SE L	
	2	Analog error	AE	
	3	Sensor breakage measuring circuit 1	SE H	
	4	Wrong polarity measuring circuit 1	SE L	
	5	Low limit 1 fallen below	Associated data display flashes	
	6	Low limit 2 fallen below		
	7	High limit 1 exceeded		
2.	8	High limit 2 exceeded		
	9	Impermissible parameter, see 2.5 [1]		
	10			
	11	Error in heating circuit [1]	LE	
	12	Error at start of self-optimizing [1]	no t	
	13	Error during self-optimizing + stop [1]	tE	
	14			
	15			

[1] These error bits are deleted after reading. With *LE* and/or *tE* , the control function is reactivated.

Event data, character 3 and 4

Character	Bit No.	Meaning	Display on equipment	Remark
3.	0	Sensor error position feedback	YE	Error status word 2 (heating current monitor, equipment)
	1	Sensor error heating current	CE	
	2			
	3			
	4	Heating current not "off" with positioning signal switched off	Current display flashes	
	5	Heating current < 80 % of the setpoint of the heating current with active positioning signal		
	6			
	7			
4.	8	EEPROM error [1)]	PE	
	9			
	10			
	11	Error of measured value calibration	dE	
	12			
	13	Invalid combination of markings	AE	
	14			
	15			

[1)] EEPROM error reset by setting the standard parameters with PI = 32h.

3.5 Request data from R2900

This communication makes it possible to request all values, parameters, configurations, states and equipment markings.
Thereby, the data is individually addressed per parameter index. See section 4 for the complete list of all parameter indices.

3.5.1 Request an equipment specification

The parameter index lies between 30h and 3Fh. Thus the characters "from/to channel" and "receipt No." in the control and long set are omitted.

Example: Request for equipment marking having the address = 33 = 21h (see chap. 4.4)

Request from master (control set, see chap. 2.2):

68h	03h	03h	68h	21h	89	30h	DAh	16h
					FF	PI	PS	

Equipment response (long set, see chap. 2.3):

68h	04h	04h	68h	21h	„FF“	30h	29h	„PS“	16h
						PI	Data block		

See 2.4.2.2 for the contents of the function field (FF).
The "data block" consists of a character 29h as marking for the R2900 (see chap. 4.4).

3.5.2 Request for a temperature parameter, for example

The parameter index is not 3xh, thus the characters "from/to channel" and "receipt No." = 1, 1, 0 are contained in the control and long set.

Example: Request for the maximum selectable setpoint (SPH) of the R2900 with address = 33 = 21h (see chap. 4.1)

Request from master (control set, see chap. 2.2):

68h	06h	06h	68h	21h	89	07h	01h	01h	00h	B3h	16h
					FF	PI				PS	

Equipment response (long set, see chap. 2.3):

68h	08h	08h	68h	21h	„FF“	07h	01h	01h	00h	52h	03h	„PS“	16h
						PI				2 characters Data block			

See 2.4.2.2 for the contents of the function field (FF)

According to 4.1 and 2.4.4, the two characters of the data block (52h, 03h) result in:

SPH = 0352h = 850

If it is an equipment with marking B1 and configuration "sensor type" = 0 ... 6 and "sensor unit" = even number, the unit is °C (the configuration could be requested with PI = 32h and 33h).

3.6 Send data to R2900

This communication makes it possible to set all parameters, configurations and operating states which can be changed via operation. Thereby, the data is individually addressed per parameter index. See section 4 for the complete list of all parameter indices. There is **no protection** against overwriting. The settings of the DIP switches for disabling of the configuration and/or parameter setting are of no importance. Also the start of optimizing cannot be disabled.
The R2900 checks the transmitted value for its setting range. Should it be beyond its permissible range, it is not stored, the bit "impermissible value" is set in error status word 1, and the "service request" bit is set in the acknowledgement short set.
Same as with manual operation of the equipment, it must be noted, that a complete configuration must be made before parameters are set: That is, the "control instructions" and "equipment specifications" must first be transmitted which influence the presentation of the "temperature parameters" (see chap. 4.3 and 4.4).

3.6.1 Sending an equipment specification

The parameter index lies between 30h and 3Fh. Thus the characters "from/to channel" and "receipt No." are omitted in the long set.

Example: Setting the thermocouple type "K" on the equipment having the address = 0 (see chap. 4.4).

Request from master (long set, see chap. 2.3):

68h	05h	05h	68h	00h	69	33h	02h	00h	9Eh	16h
					FF	PI	Data block		PS	

Acknowledgement from equipment (short set):

10h	00h	„FF“	„FF“	16h
			PS	

See 2.4.2.2 for the contents of the function field (FF)
The first character of the data block is the configuration "sensor type". The second character (B marking) cannot be stored, but a character (any, e.g. 00h) must be sent.

3.6.2 Send a control parameter, for example

The parameter index (PI) is not 3xh, thus the characters "from/to channel" and "receipt No." = 1, 1, 0 are contained in the long set.

Example: Send the proportional band heating **Pb I** = 2.3% to R2900 with the address = 1 (see chap. 4.2).

Transmission from master (long set, see 2.3):

68h	08h	08h	68h	01h	69	10h	01h	01h	00h	17h	00h	93h	16h
					FF	PI				Data block		PS	

Acknowledgement from equipment (short set):

10h	01h	„FF“	„FF“ + 1	16h
			PS	

See 2.4.2.2 for the contents of the function field (FF)
Acc. to 4.2 and 2.4.4, the two characters of the data block (17h, 00h) are calculated to be: **Pb I** in 0.1% = 23 = 0017h

4 Parameter indices of the equipment parameters

For a request and/or transmission of data from and/or to the R2900, not only the parameter index for the individual data but also the format and thus the length of the data block in the long set are of interest. From the column "Format" of the parameter tables and section 2.4.4, the number, order and contents of the characters of the data block can be found.
See the operating instructions 3-349-203-15 for detailed information on the function of the data.

4.1 Temperature parameters

The temperature parameters are combined in the main parameter group 0.
In the R2900, they are stored in standardized form to the measuring range so that other values result when the sensor type or the unit of measure is re-configured, or when a change is made from fixed value or slave controller to differential controller.

4.1.1 Table of temperature parameters

X1 = lower range limit, X2 = upper range limit, MRS (measuring range span) = X2 - X1, see chap. 4.1.3

PI	Parameter	Display	Format	Unit	Setting range	Remarks
00h	Setpoint		± 15 bits	(4.1.2)	SPL... SPH	
01h	High limit for relay A1	AL 1H	± 15 bits	(4.1.2)	0 = oFF, 1... MRS	At rel. limit
					X1 = oFF, X1 + 1 ... X2	At abs. limit and fixed value controller
					–MRS/2 = oFF, –MRS/2 + 1 ... +MRS/2	At abs. limit and differential controller
02h	Low limit for relay A1	AL 1L	± 15 bits	(4.1.2)	Same as PI = 01h	Same as PI = 01h
03h	Second setpoint	SP 2	± 15 bits	(4.1.2)	SPL ... SPH	
04h	High limit for relay A2	AL2H	± 15 bits	(4.1.2)	Same as PI = 01h	Same as PI = 01h
05h	Low limit for relay A2	AL2L	± 15 bits	(4.1.2)	Same as PI = 01h	Same as PI = 01h
06h	Low setpoint	SP L	± 15 bits	(4.1.2)	X1 ... SPH	fixed value & slave controller
					–MRS/2 ... SPH	For differential controller
07h	High setpoint	SP H	± 15 bits	(4.1.2)	SPL ... X2	For fixed value controller, slave controller
					SPL ... MRS/2	For differential controller
08h	Lower range limit standard signal	rn L	± 15 bits		–1500 ... rnH	For B2, B4, A7, A8
09h	Upper limit standard signal	rn H	± 15 bits		rnL....9999	For B2, B4, A7, A8
0Ch	Calibration actual value	CAL	± 15 bits	(4.1.2)	–MRS/4 ... +MRS/4	For B1, B3, B4 and TC
					–MRS/4 = Auto, –MRS/4 + 1 ... MRS/4	For B1, B3, B4 & Pt100
0Dh	Location of decimal point	dPnt	8 bits	1)	0, 1 = 9.999, 2 = 9999, 3 = 999.9, 4 = none	For B2
0Eh	Ramp for rising setpoints	SPuP	± 15 bits	2)	0 = oFF, 1 ... MRS	
0Fh	Ramp for falling setpoints	SPdn	± 15 bits	2)	0 = oFF, 1 ... MRS	

1) The decimal point is for the display on the R2900 only, **not** for the parameter values.
2) Unit per minute, see 4.1.2 for units

4.1.2 Unit of the temperature parameters

The unit of the temperature parameters depends upon

- the range marking B1 ... B5 of the equipment (see PI = 33h),
- the configured sensor type (see PI = 33h) and
- the configured unit of the sensor (see PI = 32h).

Marking	Sensor type	
	0 ... 7	8
B1, B3, B4	1°C / 1°F	0.1°C / 0.1°F
B2, B5	1, 0.1, 0.01, 0.001	

With standard signal (B2, B5) and Pt100 with 0.1° display, the decimal point only serves for the display on the R2900, not for the parameter values. That is, a value of 234.5 in the display, for example, is to be transmitted as 2345 = 0929. The two characters of the data block then are 29h, 09h.

4.1.3 Table of measuring ranges

Sensor type			Lower range limit X1		Upper range limit X2		Range span MRS	
Code	Kind	Type	in °C	in °F	in °C	in °F	in °C	in °F
0	TC	J	–18	0	850	1562	868	1562
1		L	–18	0	850	1562	868	1562
2		K	–18	0	1200	2192	1218	2192
3		B	0	32	1820	3308	1820	3276
4		S	–18	0	1770	3218	1788	3218
5		R	–18	0	1770	3218	1788	3218
6		N	–18	0	1300	2372	1318	2372
7	Pt100	1° display	–100	–148	500	932	600	1080
8		0.1° display	–100.0	–148.0	500.0	932.0	600.0	1080.0
0	Standard signal	0 ... 20 mA / 0 ... 10 V	rn L		rn H		rn H – rn L	
1		4 ... 20 mA / 2 ... 10 V						

4.2 Control parameters

The control parameters are listed in the main parameter index group 1.

4.2.1 Table of the control parameters

PI	Parameter	Display	Format	Unit	Setting range
10h	Proportional band heating	Pb I	16 bits	0.1 %	1 ... 9999
11h	Proportional band cooling	Pb II	16 bits	0.1 %	1 ... 9999
12h	Deadband	dbnd	16 bits	(4.1.2)	0 ... MRS
14h	Delay time of the controlled system	tu	16 bits	1 s	0 ... 9999
15h	Output cycle time	tc	16 bits	0.5 s	1 ... 1200
16h	PWR (pulse width ratio) for positioner mode	y St	± 7 bits	1 %	–100 ... 100
18h	Motor running time	ty	16 bits	1 s	5 ... 5000
1Dh	Maximum PWR	y H	± 7 bits	1 %	–100 ... 100
1Eh	PWR with sensor error	y SE	± 7 bits	1 %	–100 ... 100
1Fh	Switching hysteresis for alarms and limit monitor	HYSt	8 bits	(4.1.2)	0 ... 1.5 % MRS

4.3 Control instructions

The control instructions in main group 2 of the parameter index define the control action of the equipment

4.3.1 Table of the control instructions

PI	Parameter	Format	Unit	Setting range	Remarks	Contents
20h	Control status control channel	16 bits	Bit field	See 4.3.2		Controller type (= CnF 1, 2nd digit), SP2 active? Start/Stop self-optimizing
21h	Error status Control loop / heating current monitoring / instrument	2x16 bits	Bit field	See 3.4 event data	Read only	Summary of all error messages
22h	Configuration 2nd signal input	8 bits		See 4.3.3	Influences the display of the temperature parameters	CnF2, 2nd digit Fixed value, differential, slave controller input range with standard signal
23h	Automatic mode Off and/or manual mode	8 bits		AAh = Automatic, manual via binary input 55h = Off / manual		
28h	Manual PWR with manual mode	± 7 bits	1 %	–100 ... 100		Writing only permitted in manual mode

4.3.2 Control status controller channel (PI = 20h):

Bit No.	Value	Meaning	Remarks
0 - 2		Controller type =	
	000	Limit monitor	
	001	Positioner	
	010	2-step controller heating / continuous controller falling characteristic	
	011	2-step controller cooling / continuous controller rising characteristic	
	100	3-step controller / split range controller	
	101	3-step controller water cooling	
	110	Step controller	
	111		Impermissible
3 - 6	0		
7	0 / 1	SP active / SP2 active	Read only [1]
8	0		
9	0 / 1	Self-optimizing Stop / Start	Not for controller types 000, 001 [2]
10	0		
11	0 / 1	Binary input open / closed	Read only [3]
12 - 15	0		

[1] Binary input for proxy setpoint configured

[2] Otherwise bit 12 "Error at start of self-optimizing" will be set in error status word 1 (see chap. 3.4)

[3] Binary input for manual/automatic operation and/or PWR out offset configured

4.3.3 Configuration of the 2nd signal input (PI = 22)

	Function signal input 2		Standard signal 2
Code	B3	B4	B4
0	Fixed value controller (internal setpoint)		0 ... 20 mA 0 ... 10 V
1	Differential controller	Fixed value controller	
2	–	Slave controller	
3	–		
4	–	Fixed value controller	4 ... 20 mA 2 ... 10 V
5	–		
6	–	Slave controller	
7	–		

4.4 Equipment specifications

The equipment specifications in main group 3 of the parameter index among others include marking identification, software version and some configurations.

4.4.1 Table of equipment specifications

PI	Parameter	Format	Unit	Setting range	Remarks
30h	Equipment marking	8 bits		29h	Read only
31h	Marking identification	8 bits	Bit field	(4.4.2)	Read only
32h	Configuration Sensor unit, continuous output	8 bits		(4.4.3)	CnF 1, 4th digit
33h	Sensor type, B marking	2x8 bits		(4.4.4)	CnF 1, 3rd digit
35h	Software version	8 bits		e.g. 18h = version 1.8	Read only
36h	Configuration of alarms 1 / 2	8 bits	Bit field	(4.4.5)	CnF 1, 1st digit CnF2, 1st digit
3Ah	Continuous signal Cont	8 bits		0 = current setpoint 1 = Cooling PWR (instead of II)	Only active, if PI = 32h set to ≥ 8
3Fh	OEM version number	8 bits		0 = no OEM version	Read only

4.4.2 Marking identifications (PI = 31h)

Bit No.	Value	Meaning	Remark
0 ... 3	0000	A5	
	0010	A1	
	0011	A7	
	0110	A3	
	1010	A2	
	1100	A6	
	1110	A4	
	1111	A8	
4 ... 6	010	B2	Different from PI = 33h
	011	B1	
	101	B4	
	111	B3	
7	0	D0	
	1	D1	

4.4.3 Configuration: Sensor unit, continuous output (PI = 32h)

Code	Sensor unit [1]	Continuous output	
		Output range	Output quantity
0	°C	0 ... 20 mA 0 ... 10 V	Actual value (switching controller)
1	°F		
2	°C	4 ... 20 mA 2 ... 10 V	
3	°F		
4	°C	0 ... 20 mA 0 ... 10 V	PWR (continuous controller)
5	°F		
6	°C	4 ... 20 mA 2 ... 10 V	
7	°F		
8	°C	0 ... 20 mA 0 ... 10 V	Select output quantity with **Cont** (PI = 3Ah)
9	°F		
0Ah	°C	4 ... 20 mA 2 ... 10 V	
0Bh	°F		
0Ch	(no function)		

Code	Function	⚠ Note
0Dh	The current setting [2] is stored as a user defined default setting.	Configuration in accordance with customer specifications (K9) is stored at this location and is thus overwritten.
0Eh	The user defined default setting [2] is uploaded. If a setting has never been previously stored with **d**, the factory default setting or the configuration in accordance with customer specifications (K9) is uploaded.	All entries are overwritten, including the results of self-optimization and calibration.
0Fh	The factory default setting [2] is uploaded.	

[1] When switching-over, the physical quantity of the temperature parameter is preserved

[2] Configuration digits and all parameters except for the interface address *Addr*.

4.4.4 Sensor type, B marking (PI = 33h)

1st character = sensor type:

Code	Sensor type [1]		
	Type	Kind	Condition
0	J	Thermocouple	For signal input 1 at marking B1, B4 For both signal inputs at marking B3
1	L		
2	K		
3	B		
4	S		
5	R		
6	N		
7	1° display	Pt 100	
8	0.1° display		
0	0 ... 20 mA / 0 ... 10 V	Standard signal	For signal input 1 at marking B2
1	4 ... 20 mA / 2 ... 10 V		

[1] A change influences the presentation of the temperature parameters

2nd character = B marking:

Value	Meaning	Remarks
1	B4	read only, different from PI = 31h
3	B3	
6	B2	
7	B1	

4.4.5 Configuration of alarms 1 (PI = 36h)

Bit No.	Alarms 1				
0 ... 3	Code	[1]	Start-up suppression	Contact	Heating circuit monitor
	0	Relative	Inactive	NOC	Inactive
	1	Absolute			
	2	Relative	Active		
	3	Absolute			
	4	Relative	Inactive	NCC	
	5	Absolute			
	6	Relative	Active		
	7	Absolute			
	8	Relative	Inactive	NOC	Active
	9	Absolute			
	0Ah	Relative	Active		
	0Bh	Absolute			
	0Ch	Relative	Inactive	NCC	
	0Dh	Absolute			
	0Eh	Relative	Active		
	0Fh	Absolute			

[1] A change between relative and absolute changes the numeric values of the high and low limits.

4.4.6 Configuration of alarms 2 (PI = 36h)

Bit-No.	Alarms 2				
4 ... 7	Code	[1]	Start-up suppression	Contact	Binary input
	0	Relative	Inactive	NOC	Second setpoint
	1	Absolute			
	2	Relative	Active		
	3	Absolute			
	4	Relative	Inactive	NCC	
	5	Absolute			
	6	Relative	Active		
	7	Absolute			
	8	Relative	Inactive	NOC	manual / automatic and/or PWR out offset on
	9	Absolute			
	0Ah	Relative	Active		
	0Bh	Absolute			
	0Ch	Relative	Inactive	NCC	
	0Dh	Absolute			
	0Eh	Relative	Active		
	0Fh	Absolute			

[1] A change between relative and absolute changes the numeric values of the high and low limits.

4.5 Heating current monitor

Main group 6 of the parameter index includes the parameters for heating current monitoring.

4.5.1 Table of the parameters for the heating current monitor

PI	Parameter	Display	Format	Unit	Setting range	Remarks
60h	setpoint of the heating current	AMPS	± 15 bits	0.1 A	0 = Off, 1 ... AH	
64h	Upper range limit for heating current	A H	± 15 bits	0.1 A	10 ... 999	Current value at which 10 V DC are applied to the input

5 Storage operations

To store all parameter and configuration data of an equipment, it is not required to address all data individually via parameter indices. It is possible instead to directly read and/or write **all** data stored in the non-volatile data memory (EEPROM) in **one** record.
This function serves to save the data, to quickly load or duplicate user-specific settings to the R2900. Length and format of the data block depends upon the EEPROM allocation which can change with the software version of the R2900. That is why no information is given about it. Loading of a record to the R2900 can, therefore, only be made for the same software version.

5.1 Request a record

Make the request as described in 3.5, the parameter index = D8h.

Example: Equipment address = 4

Request from master (control set, see chap. 2.2):

68h	06h	06h	68h	04h	89h	D8h	01h	01h	00h	67h	16h
					FF	PI				PS	

Response from R2900 (long set):

68h	L + 6	L + 6	68h	04h	„FF“	D8h	01h	01h	18h	Data block	„PS“	16h
						PI			software version	L character		

5.2 Send a record

The long set for sending to the R2900 can practically only be generated from the received long set at the request of a record. The function field (6th character) in 69h (write data) must be changed for that purpose. When copying to another R2900, the equipment address must be adapted (5th character). Following, the checksum (last but one character) must be corrected.

Send from master (control set, e.g. equipment address = 4):

68h	L + 6	L + 6	68h	04h	69h	D8h	01h	01h	18h	Data block	„PS“	16h
					FF	PI						
										L character		

Response from R2900 (short set):

10h	04h	„FF“	„FF“ + 4	16h

The record will only be accepted by the equipment, when the software version (12th character) and the length of the data block agree with the equipment. The content of the data block is **not** checked as it is correct in itself when it comes from a R2900.

It must be noted to send a record only to an equipment having the same A and B markings as the equipment from which the record comes. If this is not observed (e.g. by impermissible configuration data) an unreasonable action of the R2900 may result which can be dangerous to the system.

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