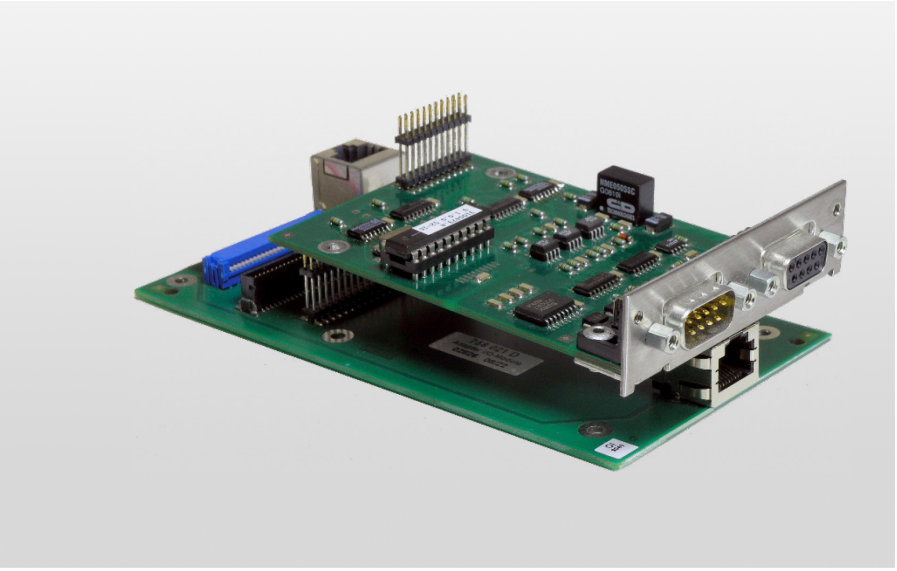
EasyLine EL3000, EL3010-C, EL3060

Continuous gas analyzers



Modbus protocol

Measurement made easy

Modbus Module for EasyLine EL3000

Introduction

Information from the gas analyzer can be transferred to a PC or DCS via the Modbus. Measured values, status signals as well as device information are provided this way for further processing.

Additional Information

Additional documentation on EasyLine EL3000, EL3010-C, EL3060 is available for download free of charge at www.abb.com/analytical. Alternatively simply scan this code:

EL3000

EL3060

Table of contents

1 General description

Applications

Information from the gas analyzer can be transferred to a PC or DCS via the Modbus®. Measured values, status signals as well as device information are provided this way for further processing.

Basic documents

- Modbus Application Protocol Specification V1.1b, December 28, 2006
- Modbus Over Serial Line Specification and Implementation Guide V1.02, December 20, 2006
- Modbus Messaging on TCP/IP Implementation Guide V1.0b, October 24, 2006

These documents are available at http://www.modbus.org/specs.php.

Interfaces

EL3000, EL3060
The RS232 and the RS485 interface are supported (see **Modbus® via RS232/RS485** on page 5), and are located on the Modbus® Module (installed as an option in the gas analyzer).
As an alternative, the Ethernet 10/100BASE-T interface can be used for data transmission via Modbus® TCP/IP protocol (see **Modbus via TCP/IP** on page 7) (from software version 3.3.2).

EL3010-C
The Ethernet 10/100BASE-T interface is used for data transmission via the Modbus® TCP/IP protocol (see **Modbus via TCP/IP** on page 7).

2 Modbus® via RS232/RS485

Note
The RS232 and RS485 interfaces are supported only in the EL3000 series and EL3060 series gas analyzers.

Parameters

Function

The gas analyzer can be connected e.g. to a PC or a DCS via the RS232 or RS485 interface when it is equipped with the Modbus® module (option).
The gas analyzer supports the Modbus® slave protocol with RTU (Remote Terminal Unit) mode. The access interval of the Modbus master should be > 100 ms.

Setup

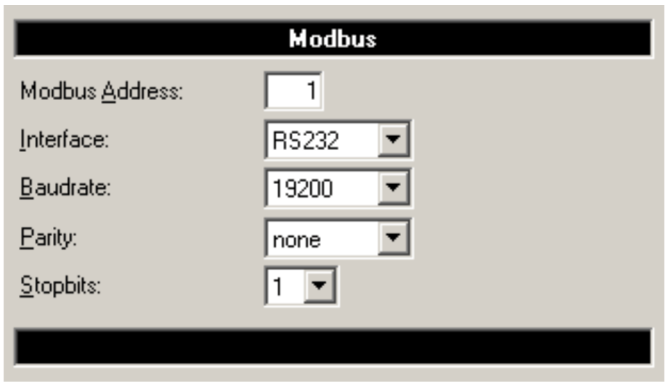


Figure 1: Modbus® Parameters

The Modbus®parameters can only be set in the configurator and not in the gas analyzer.

Modbus parameters

Parameter	Value range
Modbus address	1* to 255
Interface	RS232*, RS485
Baud rate	9600, 19200*, 38400
Parity bit	none*, odd, even
Stop bits	1*, 2

* Default setting

Electrical connections

Connection via the RS232 interface

Connect the Modbus® master to the RS232 interface of the gas analyzer. This connection only provides a point to point access (e.g. EL3000 and a PC).
A null-modem cable (9-pin female Sub-D connector–connector, pins 2 and 3 twisted pair) is needed for connecting.

Connection via the RS485 interface

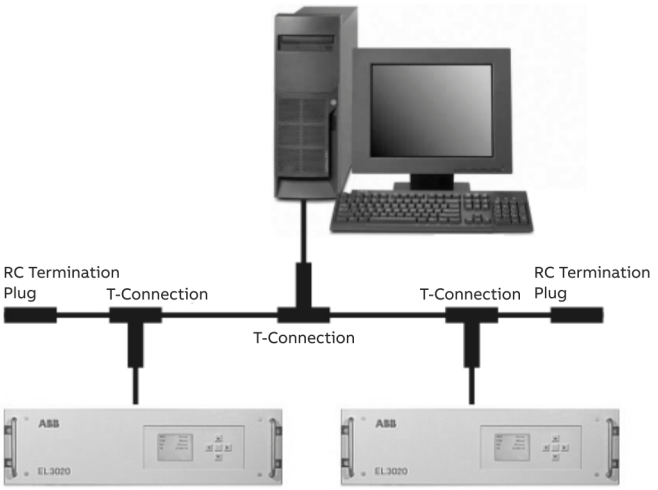


Figure 2: RS485 network (example)

Several gas analyzers (max. 32) can be connected to the PC in a network via the RS485 interface.
A linear topology as shown in the following illustration must be complied with for the cabling. In this connection, the exposed cable ends must be terminated with RC terminating connectors. This also applies for point-to-point connections.

… 2 Modbus® via RS232/RS485

… Electrical connections

Cable type

In terms of cable type, a three-core twisted-pair cable with cable cross-section of 0.25 mm^2 (for example Thomas & Betts, type LiYCY) is used. The maximum line length is 1200 m.

Level converter

If the PC does not have an RS485 interface, an RS232 / RS485 level converter must be connected between the PC and the Modbus cabling.

Cabling with RC terminating connectors

Refer to the illustration below for technical details. Please note the illustrated slave input circuit.

- Any existing DC or AC terminations on the terminal units must be removed.
- AC terminations may only be implemented at the cable ends by means of the provided RC terminating connectors.
- Alternative cabling elements can be used as long as they comply with the specifications in **Figure 3**.

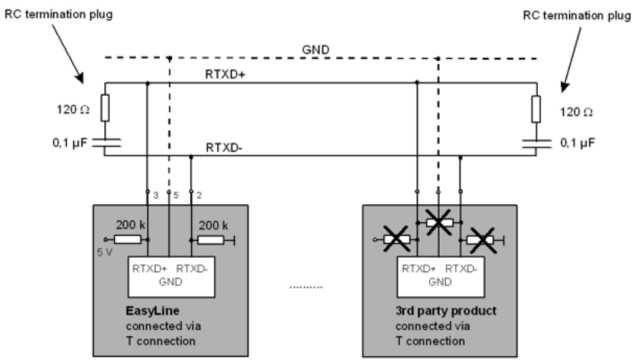


Figure 3: Modbus cabling

Components for the RS485 cabling

T-joint

Order number 24009-4-0746617

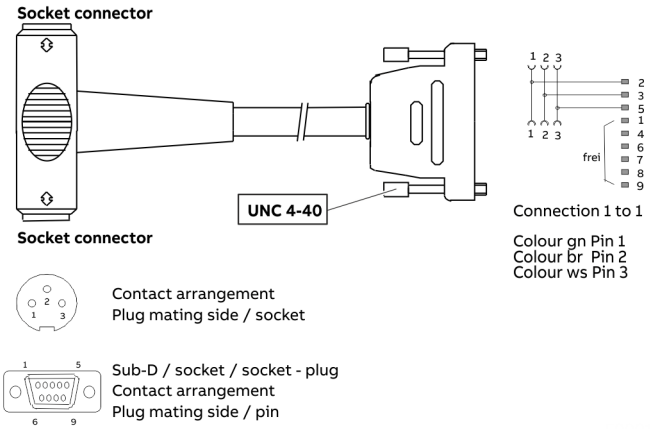


Figure 4: RS485 T-joint

RC terminating connector

Order number 24009-4-0746616

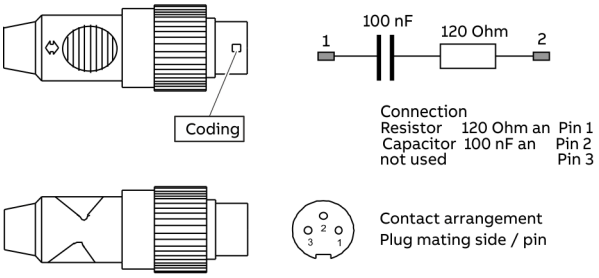


Figure 5: RS485 RC terminating connector

Variable connection

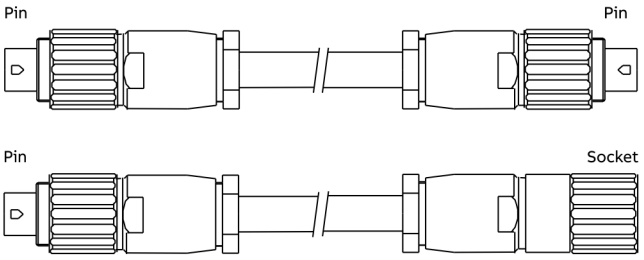


Figure 6: Cable with a variable length

The desired cable lengths must be specified in the order in the case of this connection variant. The connectors and sockets must be attached to the cable on-site.
There are two executions:

- Direct connection of two T-joints. Pin contacts must be provided on both sides.
- Extension with a male connector on one side and a female connector on the other side.

Type	Order no.
Cable with a variable length	24009-4-0746622
Pin plug	24009-4-0746318
Socket connector	24009-4-0746471

Preassembled connection

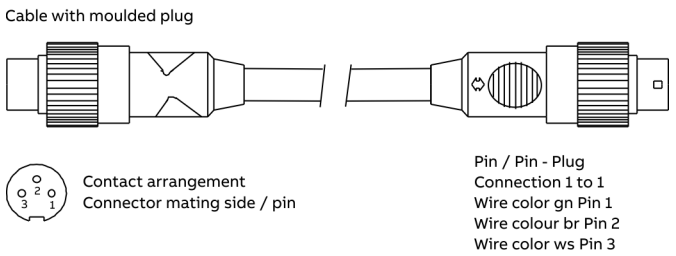


Figure 7: Preassembled connection

The cable is used for the direct connection of two T-joints. There is a choice of three preassembled lengths for this connection variant.

Length	Order no.
1.0 m	24009-4-0746619
2.0 m	24009-4-0746620
5.0 m	24009-4-0746621

3 Modbus via TCP/IP

Modbus/TCP client

Activate Modbus®/TCP

The Modbus/TCP Server is deactivated when delivered.

- The Modbus/TCP Server must be explicitly activated during commissioning via the ECT configuration software.

Integration

The EL3000 Modbus/TCP server expects requests from the current IP-addresses via the communication port.

A maximum of 4 clients can be connected to the Modbus/TCP server of an EL3000 at the same time.
As soon as the starting process of the gas analyzer has ended (after approx. 3 minutes), Modbus requests can be sent.

The data refresh interval is max. 25 ms.
The sensor signal is refreshed at intervals of 100 ms.
If the connection to a client breaks down, the connection status in the Modbus/TCP server is enabled again after a max. 60 seconds.

Reading out data from the EL3000 Modbus/TCP server

The following procedure must be executed on the Modbus client, in order to receive data from the EL3000 Modbus/TCP server:

1. Establish a TCP connection to port 502 on the server.
2. Create a Modbus request.
3. Send the Modbus request incl. the Modbus/TCP MBAP Header.
4. Wait for a response to the same TCP connection.
5. Read the first 6 bytes of the response; these state the length of the response.
6. Read the remaining bytes of the response.

Functions, addresses and registers

The supported functions and the addresses and registers of Modbus over TCP/IP are equivalent to those of Modbus over RS232 / RS485.

… 3 Modbus via TCP/IP

Example: Scanning of a measured value via Modbus® TCP/IP

The example shows how the measured value of sample component 1 is scanned in the IEEE-754 32 bit floating-point format (see **Modbus® protocol and IEEE-754 format** on page 84) via Modbus TCP/IP.

Addresses for scanning floating point measured values

Modicon Modbus address	Type	Register number	Description
30001	Input register	0	Measured value of Component 1
30002	Input register	1	
30003	Input register	2	Status of Component 1

Scan

Byte	Description	Value	Explanation
	MBAP Header		
0	Transaction identifier	0x00	Transaction identifier: 0x0005 = We are sending the 5th request
1	Transaction identifier	0x05	
2	Protocol identifier	0x00	Protocol identifier: 0x0000 = Modbus protocol
3	Protocol identifier	0x00	
4	Length	0x00	Length: 0x0006 bytes follow this byte, this includes the last byte of the MBAP header
5	Length	0x06	
6	Unit identifier	0xFF	Unit: any value
	General Modbus Frame		
7	Function code	0x04	Function code 0x04 = Read out input register
8	Starting address	0x00	Starting address = 0x0000
9	Starting address	0x00	
10	Quantity of registers	0x00	Quantity of registers = 0x0003
11	Quantity of registers	0x03	

Answer

Byte	Description	Value	Explanation
	MBAP Header		
0	Transaction identifier	0x00	Transaction identifier: 0x0005 is returned as sent by the client
1	Transaction identifier	0x05	
2	Protocol identifier	0x00	Protocol identifier: 0x0000 = Modbus protocol
3	Protocol identifier	0x00	
4	Length	0x00	Length: 0x0009 bytes follow this byte, this includes the last byte of the MBAP header
5	Length	0x09	
6	Unit identifier	0xFF	Unit: is returned as sent by the client
	General Modbus Frame		
7	Function code	0x04	Function code 0x04 = Read out input register
8	Byte count	0x06	Number of bytes: 0x06 bytes with data follow
9	Byte 1	0x41	0x411E3282 = 9.887331
10	Byte 2	0x1E	
11	Byte 3	0x32	
12	Byte 4	0x82	
13	Byte 5	0x00	0x000 = Status ‘No error’
14	Byte 6	0x00	

4 Modbus® in accordance with VDI 4201 Part 3

General

Function code
For reading device parameters to
- read measured values,
- transfer simulation data and
- apply reference material.

the function code 43 with MEI 14 is used
(MEI = Modbus Encapsulated Interface).

Address assignment of the device parameters for function code 43
There is read access to the device parameters.

Measurement components are mapped with the following structure:
- Name
- Lower range value
- Upper range value
- Unit

The number of the first measured values register is listed under BasisM in the device parameters list.
The measured value status is implemented as NAMUR status:

Bit	Assignment
0	Error
1	Maintenance
2	Maintenance need, maintenance requirement
3	Beyond specification
4	Test operation, simulation measured value transmitted
5 to 15	Reserved for extensions
16 to 31	Vendor-specific

The number of the first simulation data register is listed under BasisS in the device parameters list.

The number of the register to apply reference material is listed under BasisR in the device parameters list. Maximum 32 Bus DIs are reserved for transferring reference material.

The register "status of application" is used for feedback of the DIs for which a hardware digital output is connected. When reference material is applied, the status "maintenance" is set and a message is displayed on the gas analyzer's screen.

Reference material application

Reference material application is done according the table below.
Reference material for zero point is automatically applied when the calibration cell is inserted.

Bit	Assignment	
0	Reference material 1	Zero point
1	Reference material 2	End point 1
2	Reference material 3	End point 2
3	Reference material 4	End point 3
4	Reference material 5	End point 4
5	Reference material 6	End point 5
6 to 7	Reserved	
8	Reference material 9	Calibration cell 1
9	Reference material 10	Calibration cell 2
10	Reference material 11	Calibration cell 3
11	Reference material 12	Calibration cell 4
12	Reference material 13	Calibration cell 5
13 to 31	Reserved	

Device parameters list

Name	Object ID	Encoding	Table	Attribute	Description
VendorName	0x00	String	System_control	Fabrication_number	Manufacturer name
ProductCode	0x01	String	System_control	Product_Code	Manufacturer-specific device identifier
MajorMinorRevision	0x02	String	System_control	Version	Software version of measuring system
ProductName	0x04	String	System_control	Product_Name	Device name
SerialNumber	0x80	String	System_control	SerialNumber	Serial number of measuring system
ComponentNumber	0x81	Word	Detector_para	Classification = 0	Number of measurands
BasisM	0x82	Word	Modbus_conf	Registernumber	First register of the measurands block
BasisS	0x83	Word	Modbus_conf	Registernumber	First register of the simulation data
BasisR	0x84	Word	Modbus_conf	Registernumber	First register of the reference material data
Component1_Name	0x85	String	Component_para	Name	Name of measured component 1
Component1_ Range_Start	0x86	Float	Meas_range_para	Lower_meas_range	Lower limit of output range of measured component 1
Component1_ Range_End	0x87	Float	Meas_range_para	Upper_meas_range	Upper limit of output range of measured component 1
Component1_Unit	0x88	String	Component_para	Unit_name	Unit of measured component 1
Component2_Name	0x89	String	Component_para	Name	Name of measured component 2
Component2_ Range_Start	0x8A	Float	Meas_range_para	Lower_meas_range	Lower limit of output range of measured component 2
Component2_ Range_End	0x8B	Float	Meas_range_para	Upper_meas_range	Upper limit of output range of measured component 2
Component2_Unit	0x8C	String	Component_para	Unit_name	Unit of measured component 2
…	…	…	…	…	…

5 Functional overview

Function	Description
Measured values as floating-point numbers with measured value status (see **Measured values** on page 15)	Measured value, in each case followed by the associated measured value status (as a 16-bit integer). The active component (see **Component switch-over** on page 24) is shown for detectors with several components (max. 5).
Measured values as fixed-point numbers with measured value status (see **Integer measured values** on page 15)	Measured value in % span, in each case followed by the associated measured value status (both values as 16-bit integers). The active component (see **Component switch-over** on page 24) is shown for detectors with several components (max. 5).
Measuring range limits (see **Measuring range** on page 16)	Lower value and end-point of measuring range 2 as floating-point numbers. The active component (see **Component switch-over** on page 24) is shown for detectors with several components (max. 5).
Drift, delta drift (see **Drift values** on page 17)	Drift values and delta drift values as floating point number. The active component (see **Component switch-over** on page 24) is shown for detectors with several components (max. 5).
Status signals (see **Status** on page 22)	Status signals Error, Function Check and Maintenance Required as a 1 bit value in each case.
Status of limit values (see **Limit values** on page 22)	Status of the alarm values as a 1-bit value. Up to 10 alarm values.
Bus digital inputs (see **Bus digital inputs** on page 26)	Eight digital inputs as 1-bit values, writable.
Autocalibration control (see page **Fehler! Textmarke nicht definiert.**)	Starting, aborting and disabling the autocalibration.
Autocalibration status (see **Autocalibration status** on page 28)	Autocalibration running.
Autocalibration mode (see **Autocalibration mode** on page 27)	Mode of the autocalibration: zero point and end-point calibration alone or together.
Autocalibration of calibration setpoints (see **Autocalibration set points** on page 27)	Setpoints of the zero point and span gases for the autocalibration. Format: floating-point numbers, alterable, for up to 5 components.
Active component (see **Component switch-over** on page 24)	Selection of the active component with up to 5 detectors. A 16 bit register in each case.

Function	Description
Low pass time constants (see **Low pass** on page 23)	Time constant, time constant for non-linear filter and threshold for non-linear filter as a floating-point number. The active component (see **Component switch-over** on page 24) is shown for detectors with several components (max. 5).
Status of the digital inputs (see **I/O module digital inputs** on page 25)	Status of the digital inputs as a 1-bit value, 16 objects for 4 IO modules with 4 inputs each.
Status of the digital outputs (see **I/O module digital outputs** on page 26)	Status of the digital outputs as a 1-bit value, 16 objects for 4 IO modules with 4 outputs each.
Externally controlled calibration (see **Externally controlled calibration** on page 29)	Control signals for initiation of the calibration, control signals for initiation of the calibration reset, control signals for insertion of the calibration cells, control signals for control of the Fidas24 NMHC, transmission of the calibration setpoints, parameterization of the calibration method, feedback signal of the externally controlled calibration
Control of the Fidas24 (see **Control of the Fidas24** on page 39)	Fidas24 Standby, Fidas24 Standby/Purge, Fidas24 Restart
User memory (see **User memory** on page 40)	User Memory Record, User Memory Store
Measured values of the auxiliary variables (see **Auxiliary variables** on page 41)	Temperature detectors, temperature controllers, pressure detectors, pressure controllers, flow detectors, flow controllers, flame monitoring Fidas24
Device information (see **Instrument information** on page 46)	Production number, serial number, software version, software version date
Administration of system events (see **Administration of system events** on page 74)	Location of the event files, reading the sender ID, reading the event texts

6 Address and register overview

Modicon Modbus-address	Type	Register number	Description/name
30001	Input Register	0	Measured values (see page 15)
30101	Input Register	100	Integer measured values (see page 15)
30201	Input Register	200	Measuring range (see page 16)
30301	Input Register	300	Drift values (see page 17)
30401	Input Register	400	Temperature detectors (see page 41)
30451	Input Register	450	Temperature controller (see page 42)
30501	Input Register	500	Pressure detectors (see page 43)
30551	Input Register	550	\Pressure controller (see page 44)
30601	Input Register	600	Flow detectors (see page 45)
30651	Input Register	650	Flow controller (see page 45)
30701	Input Register	700	Flame monitoring Fidas24 (see page 45)
31001	Input Register	1000	Production number (see page 47)
31021	Input Register	1020	Serial number (see page 47)
31041	Input Register	1040	Software version (see page 48)
31061	Input Register	1060	Software version date (see page 48)
31101	Input Register	1100	IR Linearization (see page 18)
31201	Input Register	1200	Polynomial linearization components (see page 20)
31301	Input Register	1300	Polynomial linearization measuring range (see page 21)
10001	Input Status	0	Status (see page 22)
11001	Input Status	1000	Limit values (see page 22)
11101	Input Status	1100	I/O module digital inputs (see page 25)
11201	Input Status	1200	I/O module digital outputs (see page 26)
11301	Input Status	1300	Autocalibration status (see page 28)
11301	Input Status	1300	Externally controlled calibr. status (see page 36)
1001	Coil Status	1000	Bus digital inputs (see page 26)
1101	Coil Status	1100	Autocalibration control (see page 28)
1111	Coil Status	1110	Start the calibration (see page 30)
1131	Coil Status	1130	Initiation of the calibration reset (see page 31)
1151	Coil Status	1150	Inserting the calibration cells Uras26 (see page 31)
1161	Coil Status	1160	Control of the Fidas24 NMHC (see page 32)
1171	Coil Status	1170	Fidas24 Control (see page 39)
1181	Coil Status	1180	User memory (see page 40)
40001	Holding Register	0	Component switch-over (see page 24)
40101	Holding Register	100	Autocalibration set points (see page 27)
40151	Holding Register	150	Transfer calibration set points (see page 33)
40201	Holding Register	200	Autocalibration mode (see page 27)
40211	Holding Register	210	Setting the calibration method (see page 34)
40301	Holding Register	300	Low pass (see page 23)

7 Measured value functions

Measured values

Modicon Modbus address	Type	Register number	Description/name
30001	Input Register	0	Component 1
30002		1	
30003	Input Register	2	Measured value status comp. 1
30004	Input Register	3	Component 2
30005		4	
30006	Input Register	5	Measured value status comp. 2
30007	Input Register	6	Component 3
30008		7	
30009	Input Register	8	Measured value status comp. 3
30010	Input Register	9	Component 4
30011		10	
30012	Input Register	11	Measured value status comp. 4
30013	Input Register	12	Component 5
30014		13	
30015	Input Register	14	Measured value status comp. 5

The measured values are transmitted in the IEEE 754 32 bit floating-point format (see **Modbus® protocol and IEEE-754 format** on page 84). Two Word registers are used to represent a floating-point value.. The measured value of the active component of a detector is transmitted in each case.

Integer measured values

Modicon Modbus address	Type	Register number	Description/name
30101	Input Register	100	Component 1
30102	Input Register	101	Measured value status comp. 1
30103	Input Register	102	Component 2
30104	Input Register	103	Measured value status comp. 2
30105	Input Register	104	Component 3
30106	Input Register	105	Measured value status comp. 3
30107	Input Register	106	Component 4
30108	Input Register	107	Measured value status comp. 4
30109	Input Register	108	Component 5
30110	Input Register	109	Measured value status comp. 5

The measured value is transmitted in % MBU (measuring range) × 100 as an integer value. The measured value of the active component of a detector is transmitted in each case.

… 7 Measured value functions

Measuring range

Modicon Modbus address	Type	Register number	Description/name
30201	Input Register	200	Component 1 lower range value
30202		201	
30203	Input Register	202	Component 1 upper range value
30204		203	
30205	Input Register	204	Component 2 lower range value
30206		205	
30207	Input Register	206	Component 2 upper range value
30208		207	
30209	Input Register	208	Component 3 lower range value
30210		209	
30211	Input Register	210	Component 3 upper range value
30212		211	
30213	Input Register	212	Component 4 lower range value
30214		213	
30215	Input Register	214	Component 4 upper range value
30216		215	
30217	Input Register	216	Component 5 lower range value
30218		217	
30219	Input Register	218	Component 5 upper range value
30220		219	

The measuring range is transmitted in the IEEE 754 32 bit floating-point format (see **Modbus® protocol and IEEE-754 format** on page 84). Two Word registers are used to represent a floating-point value.. The measuring range of the active component of a detector is transmitted in each case.

Drift values

Modicon Modbus address	Type	Register number	Description/name
30301	Input Register	300	Offset Drift Component 1
30302		301	
30303	Input Register	302	Ampl. Drift Component 1
30304		303	
30305	Input Register	304	Delta Offset Drift Component 1
30306		305	
30307	Input Register	306	Delta Ampl. Drift Component 1
30308		307	
30309	Input Register	308	Offset Drift Component 2
30310		309	
30311	Input Register	310	Ampl. Drift Component 2
30312		311	
30313	Input Register	312	Delta Offset Drift Component 2
30314		313	
30315	Input Register	314	Delta Ampl. Drift Component 2
30316		315	
30317	Input Register	316	Offset Drift Component 3
30318		317	
30319	Input Register	318	Ampl. Drift Component 3
30320		319	
30321	Input Register	320	Delta Offset Drift Component 3
30322		321	
30323	Input Register	322	Delta Ampl. Drift Component 3
30324		323	
30325	Input Register	324	Offset Drift Component 4
30326		325	
30327	Input Register	326	Ampl. Drift Component 4
30328		327	
30329	Input Register	328	Delta Offset Drift Component 4
30330		329	
30331	Input Register	330	Delta Ampl. Drift Component 4
30332		331	
30333	Input Register	332	Offset Drift Component 5
30334		333	
30335	Input Register	334	Ampl. Drift Component 5
30336		335	
30337	Input Register	336	Delta Offset Drift Component 5
30338		337	
30339	Input Register	338	Delta Ampl. Drift Component 5
30340		339	

The drift values are transmitted in the IEEE 754 32 bit floating-point format (see **Modbus® protocol and IEEE-754 format** on page 84). Two Word registers are used to represent a floating-point value.. The drift values of the active component of a detector are transmitted in each case.

… 7 Measured value functions

Linearization

The linearization parameters are transmitted in the IEEE 32 bit floating-point format (see **Modbus® protocol and IEEE-754 format** on page 84).
The EL 3000 uses two Word registers to represent a floating-point value.

IR Linearization

Modicon Modbus address	Type	Input number	Description/name
31101	Input Register	1100	Lin Parameter A1
31102		1101	Component 1
31103	Input Register	1102	Lin Parameter A2
31104		1103	Component 1
31105	Input Register	1104	Lin Parameter A3
31106		1105	Component 1
31107	Input Register	1106	Lin Parameter A4
31108		1107	Component 1
31109	Input Register	1108	Lin Parameter A2
31110		1109	NL Component 1
31111	Input Register	1110	Lin Parameter A4
31112		1111	NL Component 1
31113	Input Register	1112	Lin Parameter A1
31114		1113	Component 2
31115	Input Register	1114	Lin Parameter A2
31116		1115	Component 2
31117	Input Register	1116	Lin Parameter A3
31118		1117	Component 2
31119	Input Register	1118	Lin Parameter A4
31120		1119	Component 2
31121	Input Register	1120	Lin Parameter A2
31122		1121	NL Component 2
31123	Input Register	1122	Lin Parameter A4
31124		1123	NL Component 2
31125	Input Register	1124	Lin Parameter A1
31126		1125	Component 3
31127	Input Register	1126	Lin Parameter A2
31128		1127	Component 3
31129	Input Register	1128	Lin Parameter A3
31130		1129	Component 3
31131	Input Register	1130	Lin Parameter A4
31132		1131	Component 3
31133	Input Register	1132	Lin Parameter A2
31134		1133	NL Component 3
31135	Input Register	1134	Lin Parameter A4
31136		1135	NL Component 3

Continued on next page

Modicon Modbus address	Type	Input number	Description/name
31137	Input Register	1136	Lin Parameter A1
31138		1137	Component 4
31139	Input Register	1138	Lin Parameter A2
31140		1139	Component 4
31141	Input Register	1140	Lin Parameter A3
31142		1141	Component 4
31143	Input Register	1142	Lin Parameter A4
31144		1143	Component 4
31145	Input Register	1144	Lin Parameter A2
31146		1145	NL Component 4
31147	Input Register	1146	Lin Parameter A4
31148		1147	NL Component 4

… 7 Measured value functions

… Linearization

Polynomial linearization components

Modicon Modbus address	Type	Input number	Description/name
31201	Input Register	1200	Lin Parameter A0
31202		1201	Component 1
31203	Input Register	1202	Lin Parameter A1
31204		1203	Component 1
31205	Input Register	1204	Lin Parameter A2
31206		1205	Component 1
31207	Input Register	1206	Lin Parameter A3
31208		1207	Component 1
31209	Input Register	1208	Lin Parameter A4
31210		1209	NL Component 1
31211	Input Register	1210	Lin Parameter A0
31212		1211	Component 2
31213	Input Register	1212	Lin Parameter A1
31214		1213	Component 2
31215	Input Register	1214	Lin Parameter A2
31216		1215	Component 2
31217	Input Register	1216	Lin Parameter A3
31218		1217	Component 2
31219	Input Register	1218	Lin Parameter A4
31220		1219	NL Component 2
31221	Input Register	1220	Lin Parameter A0
31222		1221	Component 3
31223	Input Register	1222	Lin Parameter A1
31224		1223	Component 3
31225	Input Register	1224	Lin Parameter A2
31226		1225	Component 3
31227	Input Register	1226	Lin Parameter A3
31228		1227	Component 3
31229	Input Register	1228	Lin Parameter A4
31230		1229	NL Component 3
31231	Input Register	1230	Lin Parameter A0
31232		1231	Component 4
31233	Input Register	1232	Lin Parameter A1
31234		1233	Component 4
31235	Input Register	1234	Lin Parameter A2
31236		1235	Component 4
31237	Input Register	1236	Lin Parameter A3
31238		1237	Component 4
31239	Input Register	1238	Lin Parameter A4
31240		1239	NL Component 4

Polynomial linearization measuring range

Modicon Modbus address	Type	Input number	Description/name
31301	Input	1300	Lin Parameter A0
31302	Register	1301	Measuring range component 1
31303	Input	1302	Lin Parameter A1
31304	Register	1303	Component 1 measuring range
31305	Input	1304	Lin Parameter A2
31306	Register	1305	Component 1 measuring range
31307	Input	1306	Lin Parameter A3
31308	Register	1307	Component 1 measuring range
31309	Input	1308	Lin Parameter A4
31310	Register	1309	NL Component 1 measuring range
31311	Input	1310	Lin Parameter A0
31312	Register	1311	Component 2 measuring range
31313	Input	1312	Lin Parameter A1
31314	Register	1313	Component 2 measuring range
31315	Input	1314	Lin Parameter A2
31316	Register	1315	Component 2 measuring range
31317	Input	1316	Lin Parameter A3
31318	Register	1317	Component 2 measuring range
31319	Input	1318	Lin Parameter A4
31320	Register	1319	NL Component 2 measuring range
31321	Input	1320	Lin Parameter A0
31322	Register	1321	Component 3 measuring range
31323	Input	1322	Lin Parameter A1
31324	Register	1323	Component 3 measuring range
31325	Input	1324	Lin Parameter A2
31326	Register	1325	Component 3 measuring range
31327	Input	1326	Lin Parameter A3
31328	Register	1327	Component 3 measuring range
31329	Input	1328	Lin Parameter A4
31330	Register	1329	NL Component 3 measuring range
31331	Input	1330	Lin Parameter A0
31332	Register	1331	Component 4 measuring range
31333	Input	1332	Lin Parameter A1
31334	Register	1333	Component 4 measuring range
31335	Input	1334	Lin Parameter A2
31336	Register	1335	Component 4 measuring range
31337	Input	1336	Lin Parameter A3
31338	Register	1337	Component 4 measuring range
31339	Input	1338	Lin Parameter A4
31340	Register	1339	NL Component 4 measuring range

… 7 Measured value functions

Status

Modicon Modbus address	Type	Input number	Description/name
10001	Input Status	0	Failure
10002	Input Status	1	Function Check
10003	Input Status	2	Maintenance Required

The Modbus has read access to the instrument status.
0 = inactive, 1 = active.

Limit values

Modicon Modbus address	Type	Input number	Description/name
11001	Input Status	1000	Status Limit 1
11002	Input Status	1001	Status Limit 2
11003	Input Status	1002	Status Limit 3
11004	Input Status	1003	Status Limit 4
11005	Input Status	1004	Status Limit 5
11006	Input Status	1005	Status Limit 6
11007	Input Status	1006	Status Limit 7
11008	Input Status	1007	Status Limit 8
11009	Input Status	1008	Status Limit 9
11010	Input Status	1009	Status Limit 10

The Modbus has read access to the status of the alarm values (limit).
0 = normal, 1 = Alarm.

Low pass

Modicon Modbus address	Type	Register number	Description/name
40301	Holding Register	300	Low pass time 1 component 1
40302		301	
40303	Holding Register	302	Low pass time 2 component 1
40304		303	
40305	Holding Register	304	Threshold component 1
40306		305	
40307	Holding Register	306	Low pass time 1 component 2
40308		307	
40309	Holding Register	308	Low pass time 2 component 2
40310		309	
40311	Holding Register	310	Threshold component 2
40312		311	
40313	Holding Register	312	Low pass time 1 component 3
40314		313	
40315	Holding Register	314	Low pass time 2 component 3
40316		315	
40317	Holding Register	316	Threshold component 3
40318		317	
40319	Holding Register	318	Low pass time 1 component 4
40320		319	
40321	Holding Register	320	Low pass time 2 component 4
40322		321	
40323	Holding Register	322	Threshold component 4
40324		323	
40325	Holding Register	324	Low pass time 1 component 5
40326		325	
40327	Holding Register	326	Low pass time 2 component 5
40328		327	
40329	Holding Register	328	Threshold component 5
40330		329	

The low pass values are transmitted in the IEEE 754 32 bit floating-point format (see **Modbus® protocol and IEEE-754 format** on page 84).
The filter values of the active component of a detector are transmitted in each case.
Time 1 = low pass time constant
Time 2 = low pass time constant non-linear filtering
Threshold = threshold for non-linear filtering

… 7 Measured value functions

Component switch-over

Modicon Modbus address	Type	Register number	Description/name
40001	Holding Register	0	Active component Detector 1
40002	Holding Register	1	Active component Detector 2
40003	Holding Register	2	Active component Detector 3
40004	Holding Register	3	Active component Detector 4
40005	Holding Register	4	Active component Detector 5

The component switch-over has an effect on the measured values, measuring ranges, drift values and low-pass values. The values of the active component are output. When writing a value, e.g. low pass, only the active component is written to.
Component 1 = 1, component 2 = 2, …

8 Inputs and outputs

I/O module digital inputs

Modicon Modbus address	Type	Input number	Description/name
11101	Input Status	1100	IO module 1 DI1
11102	Input Status	1101	IO module 1 DI2
11103	Input Status	1102	IO module 1 DI3
11104	Input Status	1103	IO module 1 DI4
11105	Input Status	1104	IO module 2 DI1
11106	Input Status	1105	IO module 2 DI2
11107	Input Status	1106	IO module 2 DI3
11108	Input Status	1107	IO module 2 DI4
11109	Input Status	1108	IO module 3 DI1
11110	Input Status	1109	IO module 3 DI2
11111	Input Status	1110	IO module 3 DI3
11112	Input Status	1111	IO module 3 DI4
11113	Input Status	1112	IO module 4 DI1
11114	Input Status	1113	IO module 4 DI2
11115	Input Status	1114	IO module 4 DI3
11116	Input Status	1115	IO module 4 DI4

The Modbus® has read access to the digital inputs.

… 8 Inputs and outputs

I/O module digital outputs

Modicon Modbus address	Type	Input number	Description/name
11201	Input Status	1200	IO module 1 DO1
11202	Input Status	1201	IO module 1 DO2
11203	Input Status	1202	IO module 1 DO3
11204	Input Status	1203	IO module 1 DO4
11205	Input Status	1204	IO module 2 DO1
11206	Input Status	1205	IO module 2 DO2
11207	Input Status	1206	IO module 2 DO3
11208	Input Status	1207	IO module 2 DO4
11209	Input Status	1208	IO module 3 DO1
11210	Input Status	1209	IO module 3 DO2
11211	Input Status	1210	IO module 3 DO3
11212	Input Status	1211	IO module 3 DO4
11213	Input Status	1212	IO module 4 DO1
11214	Input Status	1213	IO module 4 DO2
11215	Input Status	1214	IO module 4 DO3
11216	Input Status	1215	IO module 4 DO4

The Modbus® has read access to the digital outputs.

Bus digital inputs

Modicon Modbus address	Type	Coil number	Description/name
1001	Coil Status	1000	Bus DI1
1002	Coil Status	1001	Bus DI2
1003	Coil Status	1002	Bus DI3
1004	Coil Status	1003	Bus DI4
1005	Coil Status	1004	Bus DI5
1006	Coil Status	1005	Bus DI6
1007	Coil Status	1006	Bus DI7
1008	Coil Status	1007	Bus DI8

The Modbus® has read/write access to the bus digital inputs.

9 Automatic calibration

Autocalibration mode

Modicon Modbus address	Type	Register number	Description/name
40201	Holding Register	200	Autocalibration mode
40202	Holding Register	201	Number of nth zero point

Autocalibration mode:
1 = only zero point calibration (ZP)
2 = only end-point calibration (EP)
3 = End-point calibration at every nth zero-point calibration
Number of nth zero point:
Example: Value = 3 ⇒ ZP, ZP, ZP+EP

Autocalibration set points

Modicon Modbus address	Type	Register number	Description/name
40101	Holding Register	100	Setpoint of zero point component 1
40102		101	
40103	Holding Register	102	Setpoint of end point component 1
40104		103	
40105	Holding Register	104	Setpoint of zero point component 2
40106		105	
40107	Holding Register	106	Setpoint of end point component 2
40108		107	
40109	Holding Register	108	Setpoint of zero point component 3
40110		109	
40111	Holding Register	110	Setpoint of end point component 3
40112		111	
40113	Holding Register	112	Setpoint of zero point component 4
40114		113	
40115	Holding Register	114	Setpoint of end point component 4
40116		115	
40117	Holding Register	116	Setpoint of zero point component 5
40118		117	
40119	Holding Register	118	Setpoint of end point component 5
40120		119	

The calibration set points are transmitted in the IEEE 754 32 bit floating-point format (see **Modbus® protocol and IEEE-754 format** on page 84). Two Word registers are used to represent a floating-point value..

… 9 Automatic calibration

Autocalibration control

Modicon Modbus address	Type	Input number	Description/name
1101	Coil Status	1100	Start autocalibration
1102	Coil Status	1101	Abort autocalibration
1103	Coil Status	1102	Disable autocalibration

The Modbus has read/write access.
Starting the autocalibration on the value changing from 0 to 1.
Aborting an autocalibration in progress on the value changing from 0 to 1.
Preventing an autocalibration from starting and aborting an autocalibration in progress when the value is set to 1.

Autocalibration status

Modicon Modbus address	Type	Input number	Description/name
11301	Input Status	1300	Autocalibration status

Status = 1: Autocalibration in progress

10 Externally controlled calibration

Introduction

The user has full control over the sequence of the calibration and the feed-in of the calibration gases in this type of calibration. The instrument carries out a calibration immediately after transmission of the calibration command. The only exception here is the check of the raw values during an end-point calibration: an end-point calibration with zero gas is not carried out.

The following input and control signals are required for the externally controlled calibration:

- Control signals (see page 30) or initiation of the zero point or end-point calibration in one or more detectors
- Control signals (see page 31) for initiation of the calibration reset
- Control signals (see page 31) for insertion of the calibration cells of the Uras26 for the end-point calibration
- Control signals (see page 32) for control of the Fidas24 NMHC
- Specification (see page 33) of the setpoints for zero points and end-points
- Setting (see page 34) the calibration method
- Feedback signal (see page 36) of the calibration process

… 10 Externally controlled calibration

Control signals to start the calibration

Modicon Modbus address	Type	Coil number	Description/name
1111	Coil Status	1110	Ext. Ext. calibration of zero point detector 1
1112	Coil Status	1111	Ext. Ext. calibration of zero point detector 2
1113	Coil Status	1112	Ext. Ext. calibration of zero point detector 3
1114	Coil Status	1113	Ext. Ext. calibration of zero point detector 4
1115	Coil Status	1114	Ext. Ext. calibration of zero point detector 5
1121	Coil Status	1120	Ext. Ext. calibration of end point detector 1
1122	Coil Status	1121	Ext. Ext. calibration of end point detector 2
1123	Coil Status	1122	Ext. Ext. calibration of end point detector 3
1124	Coil Status	1123	Ext. Ext. calibration of end point detector 4
1125	Coil Status	1124	Ext. Ext. calibration of end point detector 5

The externally controlled calibration can be activated separately for each detector for zero and end-point adjustment. The change of a control signal from ‘0’ to '1’ initiates the calibration process. Control signals for more than one detector can be sent consecutively. The calibration processes are performed only 2 seconds after transmission of the first control signal. All detectors where the start signals have been set to ‘1’ are calibrated together.
The active component is always adjusted for a detector with several components (such as Magnos206 or Fidas24). The desired component of the detector must therefore be activated before the adjustment.

Control signals for initiation of the calibration reset

Modicon Modbus address	Type	Coil number	Description/name
1131	Coil Status	1130	Ext. Calibration reset detector 1
1132	Coil Status	1131	Ext. Calibration reset detector 2
1133	Coil Status	1132	Ext. Calibration reset detector 3
1134	Coil Status	1133	Ext. Calibration reset detector 4
1135	Coil Status	1134	Ext. Calibration reset detector 5

A calibration reset resets the calibration parameters to the status of the last initial calibration. A calibration reset can be activated separately for each detector. The change of a signal from "0" to "1" initiates the calibration reset.
In order to compensate for transmission delays, a calibration reset started by the first signal waits 2 seconds and then re-reads the start signals. After the calibration reset has been completed, the processed control inputs are automatically reset to "0".

All components are reset for a detector with several components.
The status signal function check is set during the calibration reset. The output "External calibration / Calibration Reset in progress" is set as a feedback signal (see **Feedback signal of the externally controlled calibration** on page 36), that a calibration reset is in progress.

Control signals for inserting the calibration cells of the Uras26 and the Limas23

Modicon Modbus address	Type	Coil number	Description/name
1151	Coil Status	1150	Calibration cell 1
1152	Coil Status	1151	Calibration cell 2
1153	Coil Status	1152	Calibration cell 3
1154	Coil Status	1153	Calibration cell 4
1155	Coil Status	1154	Calibration cell 5

In the **Uras26**, one calibration cell per sample cell can be installed. All calibration cells can be inserted together.
In the **Limas23**, one calibration cell per sample component can be installed. Only one calibration cell can be inserted. The previous calibration cell must be removed before another calibration cell can be inserted.

An inserted calibration cell is automatically considered during an end-point calibration. The setpoint for the calibration is then specified by the calibration cell.

A maximum of 5 control signals are available. The change of a control signal from "0" to "1" initiates the calibration cell insertion. The calibration cell status can be interrogated by means of a read access.

… 10 Externally controlled calibration

Control signals for control of the Fidas24 NMHC

Modicon Modbus address	Type	Coil number	Description/name
1161	Coil Status	1160	NMHC 1
1162	Coil Status	1161	NMHC 2

A Fidas24 with the NMHC application has two internal sample gas feed paths for CH_4 measurement via converter (cutter) or for direct THC measurement. Two special solenoid valves NMHC 1 and NMHC 2 are set up in the configuration of the data record. They define the operating status of the switching valve installed in the instrument.
The following are set up in the data record of the Fidas24 NMHC:

- Detector 1: CH_4 (measurement via converter),
- Detector 2: THC,
- Detector 3: NMHC (is only calculated if the measuring mode is to be switched over to automatically).

Control is executed as follows:

NMHC 1	NMHC 2	Function
0	0	Automatic switchover is activated
1	0	Measurement of detector 1, CH_4 (cutter) (automatic switchover off)
0	1	Measurement of detector 2, THC (bypass) (automatic switchover off)
1	1	Measurement of detector 1, CH_4 (bypass) (automatic switchover off) for checking the converter effectiveness

Any activated automatic switchover of the detectors must be deactivated and one detector permanently set before starting a calibration.

Transmission of the calibration set points

Modicon Modbus address	Type	Register number	Description/name
40151	Holding Register	150	Setpoint zero point detector 1
40152		151	
40153	Holding Register	152	Setpoint end point detector 1
40154		153	
40155	Holding Register	154	Setpoint zero point detector 2
40156		155	
40157	Holding Register	156	Setpoint end point detector 2
40158		157	
40159	Holding Register	158	Setpoint zero point detector 3
40160		159	
40161	Holding Register	160	Setpoint end point detector 3
40162		161	
40163	Holding Register	162	Setpoint zero point detector 4
40164		163	
40165	Holding Register	164	Setpoint end point detector 4
40166		165	
40167	Holding Register	166	Setpoint zero point detector 5
40168		167	
40169	Holding Register	168	Setpoint end point detector 5
40170		169	

The setpoints of the manual calibration are used as the setpoints for the externally controlled calibration.

Setpoint pairs for five detectors are available via the Modbus interface. If a detector has more than one component, the setpoints for the active component and activated calibration method apply. A component must be activated before its setpoints can be written.

The calibration set points are transmitted in the IEEE 754 32 bit floating-point format (see **Modbus® protocol and IEEE-754 format** on page 84). Two Word registers are used to represent a floating-point value..

… 10 Externally controlled calibration

Setting the calibration method

Calibration method

Information on the "calibration method" is included in the operator's manual of the gas analyzer.
The calibration method can be set for each detector via the following register:

Modicon Modbus address	Type	Register number	Description/name
40211	Holding Register	210	Extcal. Mode detector 1
40212	Holding Register	211	Extcal. Mode detector 2
40213	Holding Register	212	Extcal. Mode detector 3
40214	Holding Register	213	Extcal. Mode detector 3
40215	Holding Register	214	Extcal. Mode detector 4

The following applies here:

Calibration method	Value
Common calibration	0
Substitute gas calibration	1
Standard gas calibration	2
Single-point gas calibration	3

Permissible calibration methods for the analyzers:

Calibration method	Uras26	Limas23	Magnos206	Magnos27	Caldos25	Caldos27	Fidas24
Common calibr.	X	X	X	X	X	X	X
Substitute gas calibr.			X	X	X	(X)	X
Standard gas calibr.						X	
Single-point gas calibr.			X				

If a non-permissible calibration method is set, the common calibration is automatically activated as the method. Since only the common calibration is permissible for Uras26 and Limas23, there is no write access for the calibration method.

Example of a calibration sequence

Fidas24 with a detector and 3 components THC, CH_4 and C_3H_8.

A **substitute gas calibration** with the component C_3H_8 is set at the zero and end-point for the detector.

1. The calibration method of the detector is set to 1 (substitute gas calibration).
2. The active component of the detector is set to C_3H_8 (C_3H_8 is now measured and displayed).
3. The setpoints for the substitute gas calibration can now be set.
4. If a calibration is now initiated, a substitute gas calibration is executed for this detector.

If the setting **common calibration** is selected as a calibration method for this detector, the above sequence results in the following:

1. The calibration method of the detector is set to 0 (common calibration).
2. The active component of the detector is set to propane (C_3H_8 is now measured and displayed).
3. The setpoints for the common calibration can now be set.
4. If a calibration is now initiated, a common calibration is executed for this component.

... 10 Externally controlled calibration

Feedback signal of the externally controlled calibration

The feedback signals of the externally controlled calibration and the calibration reset can be output at digital outputs. "External calibration / calibration reset running" and a status bit are available as feedback functions. The status signals are associated with the automatic calibration.

Modicon Modbus address	Type	Input number	Description/name
11301	Input Status	1300	Autocal. Status
11302	Input Status	1301	Extcal. / calibration reset running
11303	Input Status	1302	Extcal. Status detector 1
11304	Input Status	1303	Extcal. Status detector 2
11305	Input Status	1304	Extcal. Status detector 3
11306	Input Status	1305	Extcal. Status detector 4
11307	Input Status	1306	Extcal. Status detector 5

Extcal. running:	"1"	Externally controlled calibration / calibration reset currently running
	"0"	No externally controlled calibration
Extcal. Status:	"0"	Calibration OK
	"1"	Calibration error (The calibration was aborted; does not occur for drift events.)

The status signals are deleted at the beginning of a calibration and set at the end. The status is then active until the next calibration or until a cold restart of the instrument.

Example: Performing an externally controlled calibration

Preliminary remarks

The following example is based on procedures which are described in the 'Modbus Application Protocol Specification V1.1b, December 28, 2006' document.

The example describes the procedure of a zero point and end point calibration in detector 1 of a gas analyzer.

Step 1: Writing the set points

Addresses and registers

Modicon Modbus address	Type	Register number	Description/name
40151	Holding	150	Setpoint zero point detector 1
40152	Register	151	
40153	Holding	152	Setpoint end point detector 1
40154	Register	153	

Use Modbus function no. 16 to write multiple registers (see section 6.12 in the 'Modbus Application Protocol Specification V1.1b' document).

Write set point for zero-point calibration

Set point '0' in format 4 byte real is converted to [0;0] in format U16. Send '0' to register no. 150 and the following:

Request		Response	
Field Name	**Hex**	**Field Name**	**Hex**
Function	10	Function	10
Starting Address Hi	00	Starting Address Hi	00
Starting Address Lo	96	Starting Address Lo	96
Quantity of Registers Hi	00	Quantity of Registers Hi	00
Quantity of Registers Lo	02	Quantity of Registers Lo	02
Byte Count (4 byte following)	04		
Registers Value Hi	00		
Registers Value Lo	00		
Registers Value Hi	00		
Registers Value Lo	00		

Write set point for end-point calibration

Set point '1000' in Format 4 byte real is converted to [17530;0] in format U16. Send '17530' to register no. 152 and the following:

Request		Response	
Field Name	**Hex**	**Field Name**	**Hex**
Function	10	Function	10
Starting Address Hi	00	Starting Address Hi	00
Starting Address Lo	98	Starting Address Lo	98
Quantity of Registers Hi	00	Quantity of Registers Hi	00
Quantity of Registers Lo	02	Quantity of Registers Lo	02
Byte Count (4 byte following)	04		
Registers Value Hi	44		
Registers Value Lo	7A		
Registers Value Hi	00		
Registers Value Lo	00		

… 10 Externally controlled calibration

… Example: Performing an externally controlled calibration

Step 2: Performing the calibration

Zero-point calibration

Modicon Modbus address	Type	Coil number	Description/name
1111	Coil Status	1110	Ext. Ext. calibration of zero point detector 1

Procedure

1. Use Modbus function no. 05 to write coils (see section 6.5 in 'Modbus Application Protocol Specification V1.1b' document).

Send 'On' to coil no. 1110:

Request		Response	
Field Name	**Hex**	**Field Name**	**Hex**
Function	05	Function	05
Output Address Hi	04	Output Address Hi	04
Output Address Lo	56	Output Address Lo	56
Output Value Hi	FF	Output Value Hi	FF
Output Value Lo	00	Output Value Lo	00

2. Wait for two seconds.
3. Use Modbus function no. 01 to read coils until Hex 00 is sent (see section 6.1 in the 'Modbus Application Protocol Specification V1.1b' document).

Read coil No. 1110:

Request		Response	
Field Name	**Hex**	**Field Name**	**Hex**
Function	01	Function	01
Starting Address Hi	04	Byte Count	01
Starting Address Lo	56	Output Status	01
Quantity of Outputs Hi	00		
Quantity of Outputs Lo	01		

End-point calibration

Modicon Modbus address	Type	Coil number	Description/name
1121	Coil Status	1120	Ext. Ext. calibration of end point detector 1

Procedure

(like zero-point calibration)

1. Use Modbus function No. 05 to write coils.
2. Wait for two seconds.
3. Use Modbus function no. 01 to read coils until Hex 00 is sent.

11 Control of the Fidas24

Addresses and registers

The respective function is initiated by setting a coil. Only one of the three coil statuses may be set in each case.

Modicon Modbus address	Type	Coil number	Description/name
1171	Coil Status	1170	Fidas24 standby
1172	Coil Status	1171	Fidas24 Standby/Purge*
1173	Coil Status	1172	Fidas24 restart

* not in EL3010-C

Fidas24 Standby
In this mode, the detector flame is out, and there is no sample gas flow.
The detector is kept at setpoint temperature:

- The fuel gas valve is switched off.
- The injector air is switched off.
- All pressure controllers have the output variable 0.
- The detector temperature remains at its set point.

For safe standby operation, it is recommended that the detector is purged with zero gas before execution of the standby function (Purge; only in EL3000 if calibration gas valves are present).

Fidas24 Standby/Purge
This function requires a zero gas valve and can therefore not be used in the EL3010-C.

Fidas24 Restart
The automatic ignition procedure of the Fidas24 is started. The Fidas24 varies the combustion air quantity and the fuel gas quantity during the ignition procedure.

Successful ignition of the flame is indicated by the temperature display of the flame monitoring increasing to approx. 30 °C above the current detector temperature.

In the case of a restart from standby operation, the detector temperature is 191 °C.

12 User memory

Use and functionality

The User Memory area enables user data or parameters, e.g. external calculation quantities for the calibration or measured value correction, to be stored in the device.

'Read File Record' and 'Write File Record' are required as functions in the Modbus stack for reading and writing to the User Memory area. Four file records with 4 kBytes (2 kWord Register) are available.

The data is initially stored in the RAM after it is written to the file record. It is permanently stored in the database of the instrument by setting an additional coil register.

The User Memory segments are stored in the database and the database backed up on the flash disk by setting the coil status. The coil status can be read at this time thereby enabling the storage event to be monitored. At the earliest, a read request may be sent 1 second after the coil status has been set. The conclusion of the storage event is indicated by the reset status.

User Memory Record

Modicon Modbus address	Type	Record number	Description/name
	File Record	1	User memory segment 1
	File Record	2	User memory segment 2
	File Record	3	User memory segment 3
	File Record	4	User memory segment 4

User Memory Store

Modicon Modbus address	Type	Coil number	Description/name
1181	Coil Status	1180	Store user memory segments

13 Auxiliary variables

Introduction

The measured values of the auxiliary variables are transmitted in the IEEE-754 32 bit floating-point format (see **Modbus® protocol and IEEE-754 format** on page 84). Two Word registers are used to represent a floating-point value..

Temperature detectors

Modicon Modbus address	Type	Register number	Description/name
30401	Input Register	400	Temperature detector 1
30402		401	Uras26 , Magnos206, Limas23
30403	Input Register	402	Measured value status temperature detector 1
30404	Input Register	403	Temperature detector 2
30405		404	
30406	Input Register	405	Measured value status temperature detector 2
30407	Input Register	406	Temperature detector 3
30408		407	
30409	Input Register	408	Measured value status temperature detector 3
30410	Input Register	409	Temperature detector 4
30411		410	
30412	Input Register	411	Measured value status temperature detector 4
30413	Input Register	412	Temperature detector 5
30414		413	
30415	Input Register	414	Measured value status temperature detector 5

… 13 Auxiliary variables

Temperature controllers

Modicon Modbus address	Type	Register number	Description/name
30451	Input Register	450	Temperature controller 1
30452		451	Thermostat temperature Uras26, Limas23*, Fidas24, Magnos206
30453	Input Register	452	Output variable temperature controller 1
30454		453	
30455	Input Register	454	Measured value status temperature controller 1
30456	Input Register	455	Temperature controller 2
30457		456	Fidas24 heated sample gas inlet
30458	Input Register	457	Output variable temperature controller 2
30459		458	
30460	Input Register	459	Measured value status temperature controller 2
30461	Input Register	460	Temperature controller 3
30462		461	Fidas24 NMHC Block (optional)
30463	Input Register	462	Output variable temperature controller 3
30464		463	
30465	Input Register	464	Measured value status temperature controller 3
30466	Input Register	465	Temperature controller 4
30467		466	Fidas24 preamplifier
30468	Input Register	467	Output variable temperature controller 4
30469		468	
30470	Input Register	469	Measured value status temperature controller 4
30471	Input Register	470	Temperature controller 5
30472		471	
30473	Input Register	472	Output variable temperature controller 5
30474		473	
30475	Input Register	474	Measured value status temperature controller 5

* for Limas23:

No.	Component
1	Sample cell
2	Lamp (EDL)
3	Beam splitter
4	Reference amplifier
5	Measurement amplifier

Pressure detectors

Modicon Modbus address	Type	Register number	Description/name
30501	Input Register	500	Pressure detector 1
30502		501	Atmospheric pressure Uras26, Limas23, Magnos206
30503	Input Register	502	Measured value status pressure detector 1
30504	Input Register	503	Pressure detector 2
30505		504	
30506	Input Register	505	Measured value status pressure detector 2
30507	Input Register	506	Pressure detector 3
30508		507	
30509	Input Register	508	Measured value status pressure detector 3
30510	Input Register	509	Pressure detector 4
30511		510	
30512	Input Register	511	Measured value status pressure detector 4
30513	Input Register	512	Pressure detector 5
30514		513	
30515	Input Register	514	Measured value status pressure detector 5

… 13 Auxiliary variables

Pressure controllers

Modicon Modbus address	Type	Register number	Description/name
30551	Input Register	550	Pressure controller 1
30552		551	combustion air Fidas24
30553	Input Register	552	Output variable
30554		553	Pressure controller 1
30555	Input Register	554	Measured value status
			Pressure controller 1
30556	Input Register	555	Pressure controller 2
30557		556	combustion gas Fidas24
30558	Input Register	557	Output variable
30559		558	Pressure controller 2
30560	Input Register	559	Measured value status
			Pressure controller 2
30561	Input Register	560	Pressure controller 3
30562		561	sample gas inlet Fidas24
30563	Input Register	562	Output variable
30564		563	Pressure controller 3
30565	Input Register	564	Measured value status
			Pressure controller 3
30566	Input Register	565	Pressure controller 4
30567		566	sample gas outlet Fidas24
30568	Input Register	567	Output variable
30569		568	Pressure controller 4
30570	Input Register	569	Measured value status
			Pressure controller 4
30571	Input Register	570	Pressure controller 5
30572		571	
30573	Input Register	572	Output variable
30574		573	Pressure controller 5
30575	Input Register	574	Measured value status
			Pressure controller 5

Flow detectors

Modicon Modbus address	Type	Register number	Description/name
30601	Input Register	600	Flow detector 1
30602		601	Sample gas flow Uras26, Limas23, Magnos206, Fidas24
30603	Input Register	602	Measured value status flow detector 1
30604	Input Register	603	Flow detector 2
30605		604	
30606	Input Register	605	Measured value status flow detector 2

Flow controllers

Modicon Modbus address	Type	Register number	Description/name
30651	Input Register	650	Flow controller 1
30652		651	
30653	Input Register	652	Output variable flow controller 1
30654		653	
30655	Input Register	654	Measured value status flow controller 1
30656	Input Register	655	Flow controller 2
30657		656	
30658	Input Register	657	Output variable flow controller 2
30659		658	
30660	Input Register	659	Measured value status flow controller 2

Flame monitoring Fidas24

Modicon Modbus address	Type	Register number	Description/name
30701	Input Register	700	Flame combustion chamber 1
30702		701	
30703	Input Register	702	Measured value status flame 1
30704	Input Register	703	Flame combustion chamber 2
30705		704	
30706	Input Register	705	Measured value status flame 2

14 Instrument information

Introduction

The following device information is available:

- Production number (see page 47)
- Serial number (see page 47)
- Software version number (see page 48)
- Software version date (see page 48)
- System (see page 49)

Device information data is stored as ASCII code. Up to 16 register numbers are reserved for each information. Data can be extracted by reading the content of the subsequent register numbers. A "Hex 00" content is used as terminator and readout may be stopped.

The serial number is the ID of the built in PCB. The last digits of the serial number correspond to the MAC address.

Additional device information is available for the individual analyzer modules:

- Ultraviolet photometer Limas23 (see page 50)
- Infrared photometer Uras26 (see page 53)
- Thermal conductivity analyzer Caldos25 (see page 56)
- Thermal conductivity analyzer Caldos27 (see page 58)
- Oxygen analyzer Magnos27 (see page 60)
- Oxygen analyzer Magnos206 (see page 62)
- Oxygen analyzer Magnos28 (see page 64)
- Flame ionization detector Fidas24 (see page 67)
- Trace oxygen analyzer ZO23 (see page 70)
- Electrochemical oxygen sensor (see page 72)

Production number

Modicon Modbus address	Type	Register number	Description/name
31001	Input Register	1000	Production number
31002		1001	
31003		1002	
31004		1003	
31005		1004	
31006		1005	
31007		1006	
31008		1007	
31009		1008	
31010		1009	
31011		1010	
31012		1011	
31013		1012	
31014		1013	
31015		1014	
31016		1015	

Serial number

Modicon Modbus address	Type	Register number	Description/name
31021	Input Register	1020	Serial number (MAC address)
31022		1021	
31023		1022	
31024		1023	
31025		1024	
31026		1025	
31027		1026	
31028		1027	
31029		1028	
31030		1029	
31031		1030	
31032		1031	
31033		1032	
31034		1033	
31035		1034	

… 14 Instrument information

Software version number

Modicon Modbus address	Type	Register number	Description/name
31041	Input Register	1040	Software version
31042		1041	
31043		1042	
31044		1043	
31045		1044	
31046		1045	
31047		1046	
31048		1047	
31049		1048	
31050		1049	
31051		1050	
31052		1051	
31053		1052	
31054		1053	
31055		1054	
31056		1055	

Software version date

Modicon Modbus address	Type	Register number	Description/name
31061	Input Register	1060	Date of the software version
31062		1061	
31063		1062	
31064		1063	
31065		1064	
31066		1065	
31067		1066	
31068		1067	
31069		1068	
31070		1069	
31071		1070	
31072		1071	
31073		1072	
31074		1073	
31075		1074	
31076		1075	

System

Start register	Register offset	Register count	Data type	Base register	Value	Description/name
4000	0	16	32 Byte char string	4000		Product identification
4016	16	15	30 Byte char string			Serial number
4031	31	16	32 Byte char string			Serial number
4047	47	16	32 Byte char string			Software version
4063	63	2	float32			Pressure sensor, measured value in hPa
4065	65	1	uint16			Pressure sensor, status
4066	66	2	float32			Pressure sensor, lower range value
4068	68	2	float32			Pressure sensor, upper range value
4070	70	2	float32			Flow sensor, measured value in l/h
4072	72	1	uint16			Flow sensor, status
4073	73	2	float32			Flow sensor, lower range value
4075	75	2	float32			Flow sensor, upper range value
4077	77	1	uint16			Pump, on / off
4078	78	2	float32			Pump, output in %
4080	80	1	uint16			Quantity of Limas23
4081	81	1	uint16	3000*		Start register
4082	82	1	uint16		706	Quantity of registers
4083	83	1	uint16			Quantity of Uras26
4084	84	1	uint16	5000*		Start register
4085	85	1	uint16		633	Quantity of registers
4086	86	1	uint16			Quantity of Fidas24
4087	87	1	uint16	6000*		Start register
4088	88	1	uint16		671	Quantity of registers
4089	89	1	uint16			Quantity of Magnos206
4090	90	1	uint16	7000*		Start register
4091	91	1	uint16		619	Quantity of registers
4092	92	1	uint16			Quantity of Magnos28
4093	93	1	uint16	8000*		Start register
4094	94	1	uint16		633	Quantity of registers
4095	95	1	uint16			Quantity of Magnos27
4096	96	1	uint16	9000*		Start register
4097	97	1	uint16		616	Quantity of registers
4098	98	1	uint16			Quantity of Caldos25
4099	99	1	uint16	10000*		Start register
4100	100	1	uint16		616	Quantity of registers
4101	101	1	uint16			Quantity of Caldos27
4102	102	1	uint16	11000*		Start register
4103	103	1	uint16		616	Quantity of registers
4104	104	1	uint16			Quantity of ZO23
4105	105	1	uint16	12000*		Start register
4106	106	1	uint16		623	Quantity of registers
4107	107	1	uint16			Quantity of O_2-sensors
4108	108	1	uint16	13000*		Start register
4109	109	1	uint16		609	Quantity of registers

* example, for the analyzer module. The actual system-specific register addresses must be read out of the system.

… 14 Instrument information

Note
The device information per analyzer module is presented in the following chapters.
The presentation corresponds to the sample system described at page 49.
The specific start register of a system must be read out since the first number of the start register can differ from the designation shown below.
So for example, Lima23 can start at Register 5000 instead of 3000.

Limas23

Start register	Register offset	Register count	Data type	Description/name
Analyzer module information				
3000	0	8	16 Byte char string	Serial number of the analyzer
3008	8	16	32 Byte char string	Name of the analyzer
3024	24	16	32 Byte char string	User-defined text of the analyzer
3040	40	16	32 Byte char string	Software version of the analyzer
3056	56	2	uint32	Module status of the analyzer
3058	58	1	uint16	Number of sample components used
3059	59	1	uint16	Number of detectors used
3060	60	1	uint16	Number of calibration cells used
Sample components and drift values				
Sample component 1				
3061	61	16	32 Byte char string	Name of the sample component
3077	77	2	float 32	Current measured value of the sample component
3079	79	1	uint16	Current status of the sample component
3080	80	16	32 Byte char string	Unit of the sample components
3096	96	2	float32	Lower range value of the sample component
3098	98	2	float32	Upper range value of the sample component
3100	100	2	float32	Current offset drift value
3102	102	2	float32	Current amplification drift value
3104	104	2	float32	Current offset drift difference
3106	106	2	float32	Current amplification drift difference
3108	108	2	float32	Limit value for offset drift
3110	110	2	float32	Limit value for amplification drift
3112	112	2	float32	Limit value for offset drift difference
3114	114	2	float32	Limit value for amplification drift difference

Continued on next page

Start register	Register offset	Register count	Data type	Description/name
Sample components and drift values (... continued)				
Sample component 2				
3116	116	16	32 Byte char string	Name of the sample component
3132	132	2	float 32	Current measured value of the sample component
3134	134	1	uint16	Current status of the sample component
3135	135	16	32 Byte char string	Unit of the sample components
3151	151	2	float32	Lower range value of the sample component
3153	153	2	float32	Upper range value of the sample component
3155	155	2	float32	Current offset drift value
3157	157	2	float32	Current amplification drift value
3159	159	2	float32	Current offset drift difference
3161	161	2	float32	Current amplification drift difference
3163	163	2	float32	Limit value for offset drift
3165	165	2	float32	Limit value for amplification drift
3167	167	2	float32	Limit value for offset drift difference
3169	169	2	float32	Limit value for amplification drift difference
Sample component 3 to 9				
... +55	... +55	see sample component 2	see sample component 2	see sample component 2
Sample component 10				
3556	556	16	32 Byte char string	Name of the sample component
3572	572	2	float 32	Current measured value of the sample component
3574	574	1	uint16	Current status of the sample component
3575	575	16	32 Byte char string	Unit of the sample components
3591	591	2	float32	Lower range value of the sample component
3593	593	2	float32	Upper range value of the sample component
3595	595	2	float32	Current offset drift value
3597	597	2	float32	Current amplification drift value
3599	599	2	float32	Current offset drift difference
3601	601	2	float32	Current amplification drift difference
3603	603	2	float32	Limit value for offset drift
3605	605	2	float32	Limit value for amplification drift
3607	607	2	float32	Limit value for offset drift difference
3609	609	2	float32	Limit value for amplification drift difference

… 14 Instrument information

… Limas23

Start register	Register offset	Register count	Data type	Description/name
EDL Intensity				
Notice				
The Limas23 supports several sample components, but has only three physical detectors. The numbers in brackets (1 to 3) in the start register and register offset columns correspond to the associated detector 1 to 3.				
3611 (1), 3627 (2), 3643 (3)	611 (1), 627 (2), 643 (3)	2	float32	Measurement Detector Measurement Phase Detector 1 to 3 actual
3613 (1), 3629 (2), 3645 (3)	613 (1), 613 (2), 645 (3)	2	float32	Measurement Detector Measurement Phase Detector 1 init
3615 (1), 3631 (2), 3647 (3)	615 (1), 631 (2), 647 (3)	2	float32	Measurement Detector Reference Phase Detector 1 actual
3617 (1), 3633 (2), 3649 (3)	617 (1), 633 (2), 649 (3)	2	float32	Measurement Detector Reference Phase Detector 1 init
3619 (1), 3635 (2), 3651 (3)	619 (1), 635 (2), 651 (3)	2	float32	Reference Detector Measurement Phase Detector 1 actual
3621 (1), 3637 (2), 3653 (3)	621 (1), 637 (2), 653 (3)	2	float32	Reference Detector Measurement Phase Detector 1 init
3623 (1), 3639 (2), 3655 (3)	623 (1), 639 (2), 655 (3)	2	float32	Reference Detector Reference Phase Detector 1 actual
3625 (1), 3641 (2), 3657 (3)	625 (1), 641 (2), 657 (3)	2	float32	Reference Detector Reference Phase Detector 1 init
Module auxiliary values				
3659	659	2	float 32	Sample Cell Heating actual
3661	661	2	float 32	Sample Cell Heating control variable
3663	663	1	uint16	Sample Cell Heating status
3664	664	2	float 32	Sample Cell Heating set point
3666	666	2	float 32	Beam Heating actual
3668	668	2	float 32	Beam Heating control variable
3670	670	1	uint16	Beam Heating status
3671	671	2	float 32	Beam Heating set point
3673	673	2	float 32	EDL Heating actual
3675	675	2	float 32	EDL Heating control variable
3677	677	1	uint16	EDL Heating status
3678	678	2	float 32	EDL Heating set point
3680	680	2	float 32	Measurement Detector Heating actual
3682	682	2	float 32	Measurement Detector Heating control variable
3684	684	1	uint16	Measurement Detector Heating status
3685	685	2	float 32	Measurement Detector Heating set point
3687	687	2	float 32	Reference Detector Heating actual
3689	689	2	float 32	Reference Detector Heating control variable
3691	691	1	uint16	Reference Detector Heating status
3692	692	2	float 32	Reference Detector Heating set point
Calibration cell				
The Limas23 supports several sample components, but has only three physical detectors. Accordingly, there are three calibration cells available which can be allocated to the detectors.				
3694	694	2	float 32	Calibration Cell Component 1 concentration
3696	696	2	float 32	Calibration Cell Component 1 factor
3698	698	2	float 32	Calibration Cell Component 2 concentration
3700	700	2	float 32	Calibration Cell Component 2 factor
3702	702	2	float 32	Calibration Cell Component 3 concentration
3704	704	2	float 32	Calibration Cell Component 3 factor

Uras26

Start register	Register offset	Register count	Data type	Description/name
Analyzer module information				
5000	0	8	16 Byte char string	Serial number of the analyzer
5008	8	16	32 Byte char string	Name of the analyzer
5024	24	16	32 Byte char string	User-defined text of the analyzer
5040	40	16	32 Byte char string	Software version of the analyzer
5056	56	2	uint32	Module status of the analyzer
5058	58	1	uint16	Number of sample components used
5059	59	1	uint16	Number of calibration cells used
Sample components and drift values				
Sample component 1				
5060	60	16	32 Byte char string	Name of the sample component
5076	76	2	float 32	Current measured value of the sample component
5078	78	1	uint16	Current status of the sample component
5079	79	16	32 Byte char string	Unit of the sample components
5095	95	2	float32	Lower range value of the sample component
5097	97	2	float32	Upper range value of the sample component
5099	99	2	float32	Current offset drift value
5101	101	2	float32	Current amplification drift value
5103	103	2	float32	Current offset drift difference
5105	105	2	float32	Current amplification drift difference
5107	107	2	float32	Limit value for offset drift
5109	109	2	float32	Limit value for amplification drift
5111	111	2	float32	Limit value for offset drift difference
5113	113	2	float32	Limit value for amplification drift difference

Continued on next page

… 14 Instrument information

… Uras26

Start register	Register offset	Register count	Data type	Description/name
Sample components and drift values (… continued)				
Sample component 2				
5115	115	16	32 Byte char string	Name of the sample component
5131	131	2	float 32	Current measured value of the sample component
5133	133	1	uint16	Current status of the sample component
5134	134	16	32 Byte char string	Unit of the sample components
5150	150	2	float32	Lower range value of the sample component
5152	152	2	float32	Upper range value of the sample component
5154	154	2	float32	Current offset drift value
5156	156	2	float32	Current amplification drift value
5158	158	2	float32	Current offset drift difference
5160	160	2	float32	Current amplification drift difference
5162	162	2	float32	Limit value for offset drift
5164	164	2	float32	Limit value for amplification drift
5166	166	2	float32	Limit value for offset drift difference
5168	168	2	float32	Limit value for amplification drift difference
Sample component 3 to 9				
… +55	… +55	see sample component 2	see sample component 2	see sample component 2
Sample component 10				
5555	555	16	32 Byte char string	Name of the sample component
5571	571	2	float 32	Current measured value of the sample component
5573	573	1	uint16	Current status of the sample component
5574	574	16	32 Byte char string	Unit of the sample components
5590	590	2	float32	Lower range value of the sample component
5592	592	2	float32	Upper range value of the sample component
5594	594	2	float32	Current offset drift value
5596	596	2	float32	Current amplification drift value
5598	598	2	float32	Current offset drift difference
5600	600	2	float32	Current amplification drift difference
5602	602	2	float32	Limit value for offset drift
5604	604	2	float32	Limit value for amplification drift
5606	606	2	float32	Limit value for offset drift difference
5608	608	2	float32	Limit value for amplification drift difference

Start register	Register offset	Register count	Data type	Description/name
Module auxiliary values				
5610	610	2	float32	Cover heating actual
5612	612	2	float32	Cover heating control variable
5614	614	1	uint16	Cover heating status
5615	615	2	float32	Cover heating set point
Calibration cells				
The Uras26 supports several sample components, but has only four physical detectors. Accordingly, there are four calibration cells available which can be allocated to the detectors.				
5617	617	2	float32	Calibration cell component 1 concentration
5619	619	2	float32	Calibration cell component 1 factor
5621	621	2	float32	Calibration cell component 2 concentration
5623	623	2	float32	Calibration cell component 2 factor
5625	625	2	float32	Calibration cell component 3 concentration
5627	627	2	float32	Calibration cell component 3 factor
5629	629	2	float32	Calibration cell component 4 concentration
5631	631	2	float32	Calibration cell component 4 factor

… 14 Instrument information

Caldos25

Start register	Register offset	Register count	Data type	Description/name
Analyzer module information				
10000	0	8	16 Byte char string	Serial number of the analyzer
10008	8	16	32 Byte char string	Name of the analyzer
10024	24	16	32 Byte char string	User-defined text of the analyzer
10040	40	16	32 Byte char string	Software version of the analyzer
10056	56	2	uint32	Module status of the analyzer
10058	58	1	uint16	Number of sample components used
Sample components and drift values				
Sample component 1				
10059	59	16	32 Byte char string	Name of the sample component
10075	75	2	float 32	Current measured value of the sample component
10077	77	1	uint16	Current status of the sample component
10078	78	16	32 Byte char string	Unit of the sample components
10094	94	2	float32	Lower range value of the sample component
10096	96	2	float32	Upper range value of the sample component
10098	98	2	float32	Current offset drift value
10100	100	2	float32	Current amplification drift value
10102	102	2	float32	Current offset drift difference
10104	104	2	float32	Current amplification drift difference
10106	106	2	float32	Limit value for offset drift
10108	108	2	float32	Limit value for amplification drift
10110	110	2	float32	Limit value for offset drift difference
10112	112	2	float32	Limit value for amplification drift difference

Continued on next page

Start register	Register offset	Register count	Data type	Description/name
Sample components and drift values (... continued)				
Sample component 2				
10114	114	16	32 Byte char string	Name of the sample component
10130	130	2	float 32	Current measured value of the sample component
10132	132	1	uint16	Current status of the sample component
10133	133	16	32 Byte char string	Unit of the sample components
10149	149	2	float32	Lower range value of the sample component
10151	151	2	float32	Upper range value of the sample component
10153	153	2	float32	Current offset drift value
10155	155	2	float32	Current amplification drift value
10157	157	2	float32	Current offset drift difference
10159	159	2	float32	Current amplification drift difference
10161	161	2	float32	Limit value for offset drift
10163	163	2	float32	Limit value for amplification drift
10165	165	2	float32	Limit value for offset drift difference
10167	167	2	float32	Limit value for amplification drift difference
Sample component 3 to 9				
... +55	... +55	see sample component 2	see sample component 2	see sample component 2
Sample component 10				
10554	554	16	32 Byte char string	Name of the sample component
10570	570	2	float 32	Current measured value of the sample component
10572	572	1	uint16	Current status of the sample component
10573	573	16	32 Byte char string	Unit of the sample components
10589	589	2	float32	Lower range value of the sample component
10591	591	2	float32	Upper range value of the sample component
10593	593	2	float32	Current offset drift value
10595	595	2	float32	Current amplification drift value
10597	597	2	float32	Current offset drift difference
10599	599	2	float32	Current amplification drift difference
10601	601	2	float32	Limit value for offset drift
10603	603	2	float32	Limit value for amplification drift
10605	605	2	float32	Limit value for offset drift difference
10607	607	2	float32	Limit value for amplification drift difference
Module auxiliary values				
10609	609	2	float32	Detector heating actual
10611	611	2	float32	Detector heating control variable
10613	613	1	uint16	Detector heating status
10614	614	2	float32	Detector heating set point

… 14 Instrument information

Caldos27

Start register	Register offset	Register count	Data type	Description/name
Analyzer module information				
11000	0	8	16 Byte char string	Serial number of the analyzer
11008	8	16	32 Byte char string	Name of the analyzer
11024	24	16	32 Byte char string	User-defined text of the analyzer
11040	40	16	32 Byte char string	Software version of the analyzer
11056	56	2	uint32	Module status of the analyzer
11058	58	1	uint16	Number of sample components used
Sample components and drift values				
Sample component 1				
11059	59	16	32 Byte char string	Name of the sample component
11075	75	2	float 32	Current measured value of the sample component
11077	77	1	uint16	Current status of the sample component
11078	78	16	32 Byte char string	Unit of the sample components
11094	94	2	float32	Lower range value of the sample component
11096	96	2	float32	Upper range value of the sample component
11098	98	2	float32	Current offset drift value
11100	100	2	float32	Current amplification drift value
11102	102	2	float32	Current offset drift difference
11104	104	2	float32	Current amplification drift difference
11106	106	2	float32	Limit value for offset drift
11108	108	2	float32	Limit value for amplification drift
11110	110	2	float32	Limit value for offset drift difference
11112	112	2	float32	Limit value for amplification drift difference

Continued on next page

Start register	Register offset	Register count	Data type	Description/name
Sample components and drift values (... continued)				
Sample component 2				
11114	114	16	32 Byte char string	Name of the sample component
11130	130	2	float 32	Current measured value of the sample component
11132	132	1	uint16	Current status of the sample component
11133	133	16	32 Byte char string	Unit of the sample components
11149	149	2	float32	Lower range value of the sample component
11151	151	2	float32	Upper range value of the sample component
11153	153	2	float32	Current offset drift value
11155	155	2	float32	Current amplification drift value
11157	157	2	float32	Current offset drift difference
11159	159	2	float32	Current amplification drift difference
11161	161	2	float32	Limit value for offset drift
11163	163	2	float32	Limit value for amplification drift
11165	165	2	float32	Limit value for offset drift difference
11167	167	2	float32	Limit value for amplification drift difference
Sample component 3 to 9				
... +55	... +55	see sample component 2	see sample component 2	see sample component 2
Sample component 10				
11554	554	16	32 Byte char string	Name of the sample component
11570	570	2	float 32	Current measured value of the sample component
11572	572	1	uint16	Current status of the sample component
11573	573	16	32 Byte char string	Unit of the sample components
11589	589	2	float32	Lower range value of the sample component
11591	591	2	float32	Upper range value of the sample component
11593	593	2	float32	Current offset drift value
11595	595	2	float32	Current amplification drift value
11597	597	2	float32	Current offset drift difference
11599	599	2	float32	Current amplification drift difference
11601	601	2	float32	Limit value for offset drift
11603	603	2	float32	Limit value for amplification drift
11605	605	2	float32	Limit value for offset drift difference
11607	607	2	float32	Limit value for amplification drift difference
Module auxiliary values				
11609	609	2	float32	Detector heating actual
11611	611	2	float32	Detector heating control variable
11613	613	1	uint16	Detector heating status
11614	614	2	float32	Detector heating set point

… 14 Instrument information

Magnos27

Start register	Register offset	Register count	Data type	Description/name
Analyzer module information				
9000	0	8	16 Byte char string	Serial number of the analyzer
9008	8	16	32 Byte char string	Name of the analyzer
9024	24	16	32 Byte char string	User-defined text of the analyzer
9040	40	16	32 Byte char string	Software version of the analyzer
9056	56	2	uint32	Module status of the analyzer
9058	58	1	uint16	Number of sample components used
Sample components and drift values				
Sample component 1				
9059	59	16	32 Byte char string	Name of the sample component
9075	75	2	float 32	Current measured value of the sample component
9077	77	1	uint16	Current status of the sample component
9078	78	16	32 Byte char string	Unit of the sample components
9094	94	2	float32	Lower range value of the sample component
9096	96	2	float32	Upper range value of the sample component
9098	98	2	float32	Current offset drift value
9100	100	2	float32	Current amplification drift value
9102	102	2	float32	Current offset drift difference
9104	104	2	float32	Current amplification drift difference
9106	106	2	float32	Limit value for offset drift
9108	108	2	float32	Limit value for amplification drift
9110	110	2	float32	Limit value for offset drift difference
9112	112	2	float32	Limit value for amplification drift difference

Continued on next page

Start register	Register offset	Register count	Data type	Description/name
Sample components and drift values (... continued)				
Sample component 2				
9114	114	16	32 Byte char string	Name of the sample component
9130	130	2	float 32	Current measured value of the sample component
9132	132	1	uint16	Current status of the sample component
9133	133	16	32 Byte char string	Unit of the sample components
9149	149	2	float32	Lower range value of the sample component
9151	151	2	float32	Upper range value of the sample component
9153	153	2	float32	Current offset drift value
9155	155	2	float32	Current amplification drift value
9157	157	2	float32	Current offset drift difference
9159	159	2	float32	Current amplification drift difference
9161	161	2	float32	Limit value for offset drift
9163	163	2	float32	Limit value for amplification drift
9165	165	2	float32	Limit value for offset drift difference
9167	167	2	float32	Limit value for amplification drift difference
Sample component 3 to 9				
... +55	... +55	see sample component 2	see sample component 2	see sample component 2
Sample component 10				
9554	554	16	32 Byte char string	Name of the sample component
9570	570	2	float 32	Current measured value of the sample component
9572	572	1	uint16	Current status of the sample component
9573	573	16	32 Byte char string	Unit of the sample components
9589	589	2	float32	Lower range value of the sample component
9591	591	2	float32	Upper range value of the sample component
9593	593	2	float32	Current offset drift value
9595	595	2	float32	Current amplification drift value
9597	597	2	float32	Current offset drift difference
9599	599	2	float32	Current amplification drift difference
9601	601	2	float32	Limit value for offset drift
9603	603	2	float32	Limit value for amplification drift
9605	605	2	float32	Limit value for offset drift difference
9607	607	2	float32	Limit value for amplification drift difference
Module auxiliary values				
9609	609	2	float32	Chamber Heating actual
9611	611	2	float32	Chamber Heating control variable
9613	613	1	uint16	Chamber Heating status
9614	614	2	float32	Chamber Heating set point

… 14 Instrument information

Magnos206

Start register	Register offset	Register count	Data type	Description/name
Analyzer module information				
7000	0	8	16 Byte char string	Serial number of the analyzer
7008	8	16	32 Byte char string	Name of the analyzer
7024	24	16	32 Byte char string	User-defined text of the analyzer
7040	40	16	32 Byte char string	Software version of the analyzer
7056	56	2	uint32	Module status of the analyzer
7058	58	1	uint16	Number of sample components used
Sample components and drift values				
Sample component 1				
7059	59	16	32 Byte char string	Name of the sample component
7075	75	2	float 32	Current measured value of the sample component
7077	77	1	uint16	Current status of the sample component
7078	78	16	32 Byte char string	Unit of the sample components
7094	94	2	float32	Lower range value of the sample component
7096	96	2	float32	Upper range value of the sample component
7098	98	2	float32	Current offset drift value
7100	100	2	float32	Current amplification drift value
7102	102	2	float32	Current offset drift difference
7104	104	2	float32	Current amplification drift difference
7106	106	2	float32	Limit value for offset drift
7108	108	2	float32	Limit value for amplification drift
7110	110	2	float32	Limit value for offset drift difference
7112	112	2	float32	Limit value for amplification drift difference

Continued on next page

Start register	Register offset	Register count	Data type	Description/name
Sample components and drift values (... continued)				
Sample component 2				
7114	114	16	32 Byte char string	Name of the sample component
7130	130	2	float 32	Current measured value of the sample component
7132	132	1	uint16	Current status of the sample component
7133	133	16	32 Byte char string	Unit of the sample components
7149	149	2	float32	Lower range value of the sample component
7151	151	2	float32	Upper range value of the sample component
7153	153	2	float32	Current offset drift value
7155	155	2	float32	Current amplification drift value
7157	157	2	float32	Current offset drift difference
7159	159	2	float32	Current amplification drift difference
7161	161	2	float32	Limit value for offset drift
7163	163	2	float32	Limit value for amplification drift
7165	165	2	float32	Limit value for offset drift difference
7167	167	2	float32	Limit value for amplification drift difference
Sample component 3 to 9				
... +55	... +55	see sample component 2	see sample component 2	see sample component 2
Sample component 10				
7554	554	16	32 Byte char string	Name of the sample component
7570	570	2	float 32	Current measured value of the sample component
7572	572	1	uint16	Current status of the sample component
7573	573	16	32 Byte char string	Unit of the sample components
7589	589	2	float32	Lower range value of the sample component
7591	591	2	float32	Upper range value of the sample component
7593	593	2	float32	Current offset drift value
7595	595	2	float32	Current amplification drift value
7597	597	2	float32	Current offset drift difference
7599	599	2	float32	Current amplification drift difference
7601	601	2	float32	Limit value for offset drift
7603	603	2	float32	Limit value for amplification drift
7605	605	2	float32	Limit value for offset drift difference
7607	607	2	float32	Limit value for amplification drift difference
Module auxiliary values				
7609	609	2	float32	Chamber Heating actual
7611	611	2	float32	Chamber Heating control variable
7613	613	1	uint16	Chamber Heating status
7614	614	2	float32	Chamber Heating set point
7616	616	2		Preamplifier Board temperature actual
7618	618	1		Preamplifier Board temperature status

… 14 Instrument information

Magnos28

Start register	Register offset	Register count	Data type	Description/name
Analyzer module information				
8000	0	8	16 Byte char string	Serial number of the analyzer
8008	8	16	32 Byte char string	Name of the analyzer
8024	24	16	32 Byte char string	User-defined text of the analyzer
8040	40	16	32 Byte char string	Software version of the analyzer
8056	56	2	uint32	Module status of the analyzer
8058	58	1	uint16	Number of sample components used
Sample components and drift values				
Sample component 1				
8059	59	16	32 Byte char string	Name of the sample component
8075	75	2	float 32	Current measured value of the sample component
8077	77	1	uint16	Current status of the sample component
8078	78	16	32 Byte char string	Unit of the sample components
8094	94	2	float32	Lower range value of the sample component
8096	96	2	float32	Upper range value of the sample component
8098	98	2	float32	Current offset drift value
8100	100	2	float32	Current amplification drift value
8102	102	2	float32	Current offset drift difference
8104	104	2	float32	Current amplification drift difference
8106	106	2	float32	Limit value for offset drift
8108	108	2	float32	Limit value for amplification drift
8110	110	2	float32	Limit value for offset drift difference
8112	112	2	float32	Limit value for amplification drift difference

Continued on next page

Start register	Register offset	Register count	Data type	Description/name
Sample components and drift values (... continued)				
Sample component 2				
8114	114	16	32 Byte char string	Name of the sample component
8130	130	2	float 32	Current measured value of the sample component
8132	132	1	uint16	Current status of the sample component
8133	133	16	32 Byte char string	Unit of the sample components
8149	149	2	float32	Lower range value of the sample component
8151	151	2	float32	Upper range value of the sample component
8153	153	2	float32	Current offset drift value
8155	155	2	float32	Current amplification drift value
8157	157	2	float32	Current offset drift difference
8159	159	2	float32	Current amplification drift difference
8161	161	2	float32	Limit value for offset drift
8163	163	2	float32	Limit value for amplification drift
8165	165	2	float32	Limit value for offset drift difference
8167	167	2	float32	Limit value for amplification drift difference
Sample component 3 to 9				
... +55	... +55	see sample component 2	see sample component 2	see sample component 2
Sample component 10				
8554	554	16	32 Byte char string	Name of the sample component
8570	570	2	float 32	Current measured value of the sample component
8572	572	1	uint16	Current status of the sample component
8573	573	16	32 Byte char string	Unit of the sample components
8589	589	2	float32	Lower range value of the sample component
8591	591	2	float32	Upper range value of the sample component
8593	593	2	float32	Current offset drift value
8595	595	2	float32	Current amplification drift value
8597	597	2	float32	Current offset drift difference
8599	599	2	float32	Current amplification drift difference
8601	601	2	float32	Limit value for offset drift
8603	603	2	float32	Limit value for amplification drift
8605	605	2	float32	Limit value for offset drift difference
8607	607	2	float32	Limit value for amplification drift difference

… 14 Instrument information

… Magnos28

Start register	Register offset	Register count	Data type	Description/name
Module auxiliary values				
8609	609	2	float32	Chamber Heating actual
8611	611	2	float32	Chamber Heating control variable
8613	613	1	uint16	Chamber Heating status
8614	614	2	float32	Chamber Heating set point
8616	616	2	float32	ADC Heating actual
8618	618	2	float32	ADC Heating control variable
8620	620	1	uint16	ADC Heating status
8621	621	2	float32	ADC Heating set point
8623	623	2	float32	Bypass Heating actual
8625	625	2	float32	Bypass Heating control variable
8627	627	1	uint16	Bypass Heating status
8628	628	2	float32	Bypass Heating set point
8630	630	2	float32	Preamplifier Board temperature actual
8632	632	1	uint16	Preamplifier Board temperature status

Fidas24

Start register	Register offset	Register count	Data type	Description/name
Analyzer module information				
6000	0	8	16 Byte char string	Serial number of the analyzer
6008	8	16	32 Byte char string	Name of the analyzer
6024	24	16	32 Byte char string	User-defined text of the analyzer
6040	40	16	32 Byte char string	Software version of the analyzer
6056	56	2	uint32	Module status of the analyzer
6058	58	1	uint16	Number of sample components used
Sample components and drift values				
Sample component 1				
6059	59	16	32 Byte char string	Name of the sample component
6075	75	2	float 32	Current measured value of the sample component
6077	77	1	uint16	Current status of the sample component
6078	78	16	32 Byte char string	Unit of the sample components
6094	94	2	float32	Lower range value of the sample component
6096	96	2	float32	Upper range value of the sample component
6098	98	2	float32	Current offset drift value
6100	100	2	float32	Current amplification drift value
6102	102	2	float32	Current offset drift difference
6104	104	2	float32	Current amplification drift difference
6106	106	2	float32	Limit value for offset drift
6108	108	2	float32	Limit value for amplification drift
6110	110	2	float32	Limit value for offset drift difference
6112	112	2	float32	Limit value for amplification drift difference

Continued on next page

… 14 Instrument information

… Fidas24

Start register	Register offset	Register count	Data type	Description/name
Sample components and drift values (… continued)				
Sample component 2				
6114	114	16	32 Byte char string	Name of the sample component
6130	130	2	float 32	Current measured value of the sample component
6132	132	1	uint16	Current status of the sample component
6133	133	16	32 Byte char string	Unit of the sample components
6149	149	2	float32	Lower range value of the sample component
6151	151	2	float32	Upper range value of the sample component
6153	153	2	float32	Current offset drift value
6155	155	2	float32	Current amplification drift value
6157	157	2	float32	Current offset drift difference
6159	159	2	float32	Current amplification drift difference
6161	161	2	float32	Limit value for offset drift
6163	163	2	float32	Limit value for amplification drift
6165	165	2	float32	Limit value for offset drift difference
6167	167	2	float32	Limit value for amplification drift difference
Sample component 3 to 9				
… +55	… +55	see sample component 2	see sample component 2	see sample component 2
Sample component 10				
6554	554	16	32 Byte char string	Name of the sample component
6570	570	2	float 32	Current measured value of the sample component
6572	572	1	uint16	Current status of the sample component
6573	573	16	32 Byte char string	Unit of the sample components
6589	589	2	float32	Lower range value of the sample component
6591	591	2	float32	Upper range value of the sample component
6593	593	2	float32	Current offset drift value
6595	595	2	float32	Current amplification drift value
6597	597	2	float32	Current offset drift difference
6599	599	2	float32	Current amplification drift difference
6601	601	2	float32	Limit value for offset drift
6603	603	2	float32	Limit value for amplification drift
6605	605	2	float32	Limit value for offset drift difference
6607	607	2	float32	Limit value for amplification drift difference

Start register	Register offset	Register count	Data type	Description/name
Module auxiliary values				
6609	609	2	float32	Sample gas inlet heating actual
6611	611	2	float32	Sample gas inlet heating control variable
6613	613	1	uint16	Sample gas inlet heating status
6614	614	2	float32	Sample gas inlet heating set point
6616	616	2	float32	Detector heating actual
6618	618	2	float32	Detector heating control variable
6620	620	1	uint16	Detector heating status
6621	621	2	float32	Detector heating set point
6623	623	2	float32	Nmhc heating actual
6625	625	2	float32	Nmhc heating control variable
6627	627	1	uint16	Nmhc heating status
6628	628	2	float32	Nmhc heating set point
6630	630	2	float32	Preamplifier heating actual
6632	632	1	uint16	Preamplifier heating control variable
6634	634	1	uint16	Preamplifier heating status
6635	635	2	float32	Preamplifier heating set point
6637	637	2	float32	Combustion air pressure actual
6639	639	2	float32	Combustion air pressure control variable
6641	641	1	uint16	Combustion air pressure status
6642	642	2	float32	Combustion air pressure heating set point
6644	644	2	float32	Combustion gas pressure actual
6646	646	2	float32	Combustion gas pressure control variable
6648	648	1	uint16	Combustion gas pressure status
6649	649	2	float32	Combustion gas pressure heating set point
6651	651	2	float32	Sample gas inlet pressure actual
6653	653	2	float32	Sample gas inlet pressure control variable
6655	655	1	uint16	Sample gas inlet pressure status
6656	656	2	float32	Sample gas inlet pressure heating set point
6658	658	2	float32	Sample gas outlet pressure actual
6660	660	2	float32	Sample gas outlet pressure control variable
6662	662	1	uint16	Sample gas outlet pressure status
6663	663	2	float32	Sample gas outlet pressure heating set point
6665	665	2	float32	Flame temperature actual
6667	667	1	uint16	Flame temperature status
6668	668	2	float32	Flow actual
6670	670	1	uint16	Flow status

… 14 Instrument information

ZO23

Start register	Register offset	Register count	Data type	Description/name
Analyzer module information				
12000	0	8	16 Byte char string	Serial number of the analyzer
12008	8	16	32 Byte char string	Name of the analyzer
12024	24	16	32 Byte char string	User-defined text of the analyzer
12040	40	16	32 Byte char string	Software version of the analyzer
12056	56	2	uint32	Module status of the analyzer
12058	58	1	uint16	Number of sample components used
Sample components and drift values				
Sample component 1				
12059	59	16	32 Byte char string	Name of the sample component
12075	75	2	float 32	Current measured value of the sample component
12077	77	1	uint16	Current status of the sample component
12078	78	16	32 Byte char string	Unit of the sample components
12094	94	2	float32	Lower range value of the sample component
12096	96	2	float32	Upper range value of the sample component
12098	98	2	float32	Current offset drift value
12100	100	2	float32	Current amplification drift value
12102	102	2	float32	Current offset drift difference
12104	104	2	float32	Current amplification drift difference
12106	106	2	float32	Limit value for offset drift
12108	108	2	float32	Limit value for amplification drift
12110	110	2	float32	Limit value for offset drift difference
12112	112	2	float32	Limit value for amplification drift difference

Continued on next page

Start register	Register offset	Register count	Data type	Description/name
Sample components and drift values (... continued)				
Sample component 2				
12114	114	16	32 Byte char string	Name of the sample component
12130	130	2	float 32	Current measured value of the sample component
12132	132	1	uint16	Current status of the sample component
12133	133	16	32 Byte char string	Unit of the sample components
12149	149	2	float32	Lower range value of the sample component
12151	151	2	float32	Upper range value of the sample component
12153	153	2	float32	Current offset drift value
12155	155	2	float32	Current amplification drift value
12157	157	2	float32	Current offset drift difference
12159	159	2	float32	Current amplification drift difference
12161	161	2	float32	Limit value for offset drift
12163	163	2	float32	Limit value for amplification drift
12165	165	2	float32	Limit value for offset drift difference
12167	167	2	float32	Limit value for amplification drift difference
Sample component 3 to 9				
... +55	... +55	see sample component 2	see sample component 2	see sample component 2
Sample component 10				
12554	554	16	32 Byte char string	Name of the sample component
12570	570	2	float 32	Current measured value of the sample component
12572	572	1	uint16	Current status of the sample component
12573	573	16	32 Byte char string	Unit of the sample components
12589	589	2	float32	Lower range value of the sample component
12591	591	2	float32	Upper range value of the sample component
12593	593	2	float32	Current offset drift value
12595	595	2	float32	Current amplification drift value
12597	597	2	float32	Current offset drift difference
12599	599	2	float32	Current amplification drift difference
12601	601	2	float32	Limit value for offset drift
12603	603	2	float32	Limit value for amplification drift
12605	605	2	float32	Limit value for offset drift difference
12607	607	2	float32	Limit value for amplification drift difference
Module auxiliary values				
12609	609	2	float32	Detector Heating actual
12611	611	2	float32	Detector Heating control variable
12613	613	1	uint16	Detector Heating status
12614	614	2	float32	Detector Heating set point
12616	616	2	float32	Flow controller actual
12618	618	2	float32	Flow controller control variable
12620	620	1	uint16	Flow controller status
12621	621	2	float32	Flow controller set point

… 14 Instrument information

Electrochemical oxygen sensor O_2

Start register	Register offset	Register count	Data type	Description/name
Analyzer module information				
13000	0	8	16 Byte char string	Serial number of the analyzer
13008	8	16	32 Byte char string	Name of the analyzer
13024	24	16	32 Byte char string	User-defined text of the analyzer
13040	40	16	32 Byte char string	Software version of the analyzer
13056	56	2	uint32	Module status of the analyzer
13058	58	1	uint16	Number of sample components used
Sample components and drift values				
Sample component 1				
13059	59	16	32 Byte char string	Name of the sample component
13075	75	2	float 32	Current measured value of the sample component
13077	77	1	uint16	Current status of the sample component
13078	78	16	32 Byte char string	Unit of the sample components
13094	94	2	float32	Lower range value of the sample component
13096	96	2	float32	Upper range value of the sample component
13098	98	2	float32	Current offset drift value
13100	100	2	float32	Current amplification drift value
13102	102	2	float32	Current offset drift difference
13104	104	2	float32	Current amplification drift difference
13106	106	2	float32	Limit value for offset drift
13108	108	2	float32	Limit value for amplification drift
13110	110	2	float32	Limit value for offset drift difference
13112	112	2	float32	Limit value for amplification drift difference

Continued on next page

Start register	Register offset	Register count	Data type	Description/name
Sample components and drift values (... continued)				
Sample component 2				
13114	114	16	32 Byte char string	Name of the sample component
13130	130	2	float 32	Current measured value of the sample component
13132	132	1	uint16	Current status of the sample component
13133	133	16	32 Byte char string	Unit of the sample components
13149	149	2	float32	Lower range value of the sample component
13151	151	2	float32	Upper range value of the sample component
13153	153	2	float32	Current offset drift value
13155	155	2	float32	Current amplification drift value
13157	157	2	float32	Current offset drift difference
13159	159	2	float32	Current amplification drift difference
13161	161	2	float32	Limit value for offset drift
13163	163	2	float32	Limit value for amplification drift
13165	165	2	float32	Limit value for offset drift difference
13167	167	2	float32	Limit value for amplification drift difference
Sample component 3 to 9				
... +55	... +55	see sample component 2	see sample component 2	see sample component 2
Sample component 10				
13554	554	16	32 Byte char string	Name of the sample component
13570	570	2	float 32	Current measured value of the sample component
13572	572	1	uint16	Current status of the sample component
13573	573	16	32 Byte char string	Unit of the sample components
13589	589	2	float32	Lower range value of the sample component
13591	591	2	float32	Upper range value of the sample component
13593	593	2	float32	Current offset drift value
13595	595	2	float32	Current amplification drift value
13597	597	2	float32	Current offset drift difference
13599	599	2	float32	Current amplification drift difference
13601	601	2	float32	Limit value for offset drift
13603	603	2	float32	Limit value for amplification drift
13605	605	2	float32	Limit value for offset drift difference
13607	607	2	float32	Limit value for amplification drift difference

15 Administration of system events

Accessing the system events

The system events in the instrument are administered in a system memory area. All events can be read and registered. A series of events requires acknowledgement and has to be noted and acknowledged by the user before the active status messages are reset.

The system events of the device are accessed via Modbus function 20 (read file record). The data is updated and the system events which require acknowledgment are acknowledged via the Modbus function 21 (write file record).

The system events are stored in the instrument as a sender address with the event number as an ID. A detailed breakdown according to detector / component, etc. in plain language is not possible until it appears in the display of the instrument.
Only the event number and a sender ID are entered in the list of system events. If an event is to be completely decoded, the sender text and the event text can also be read out.

The event texts are available in the two installed languages of the instrument. These texts depend only on the software version of the instrument, but are always the same within the instrument family. Once the text of an event number is known, it no longer has to be read.

The sender ID depends on the configuration. If the configuration in the instrument has changed (data record input with ECT/TCT), the sender IDs could also change. The event sender must also be read in after a cold restart of the instrument. This sender ID is valid unless the configuration in the instrument has been changed.

Location of the event files in the device

Modicon Modbus address	Type	File number	Description/name
	File	256	Reading / acknowledging system events
	File	257	Read the event address data ID
	File	258	Read event texts via number

System events

All events of the instrument are stored in the event store. This event store is volatile, i.e. no events are visible after a cold restart of the system. However, if a system defect or similar is present, the resulting event is detected again during the run-up phase of the instrument and entered in the event store.

Structure of the Modbus event file

The events are stored in Modbus file 256. Since the events in the instrument event store are dynamically generated and deleted, the Modbus event file is always a static copy of the instrument event store.

The user can check whether there are any changes by reading out the header section of the file and initiate updating if necessary. Conclusion of the updating is also reported in the header. The events can subsequently be read out non-time critically.

Contents of the records in the event file

Record no.	Meaning read file record	Meaning write file record
Header		
0	File status Bit 0: copying in progress 0 = completed 1 = Copying in progress Bit1: Freshness of the file 0 = Current events 1 = Changes in the event store	Update Bit 0: 1 = Re-read data This starts the job request to update the events in the file.
1	Number of events in the file	not allowed
Events		
2–9	Event 1 (see **Format of an event** on page 75)	Acknowledgment (see **Event acknowledgment** on page 76)
10-17	Event 2	Acknowledgement
18-25	Event 3	Acknowledgement
…		
2722-2729	Event 340	Acknowledgement

Updating the event file

Record 0 must be written to the event file (file 256) to update the message file.

Record	Meaning (write Record)
0	Bit 0: 1 = Re-read data

Updating is started internally after this bit has been written to Record 0. The updating is shown in Record 0 in the event file (file 256).

Record	Meaning (read record)
0	Bit 0: Copying 0 = completed 1 = Copying in progress

The current event data is available after Bit 0 has been reset to "0".
The current number of events in the file can be read in Record 1 of the event file (file 256).

Record	Meaning (read record)
1	Number of events in the file

Format of an event

An event comprises 8 Records. The first event begins with Record #2 of the file.

Structure of an event in the event file

Record offset	Meaning of the record (read)	
0	Sender ID	
1	Event number	
2	Status identifier	Event type
3	Event behavior	NAMUR status signals
4	Incoming time stamp Low Word	
5	Incoming time stamp High Word	
6	Outgoing / Acknowledgement time stamp Low Word	
7	Outgoing / Acknowledgement time stamp High Word	

Sender ID:

Unique sender ID of the events for this device (16 bit).

Event number:

Unique event number of the device range (16 bit).

Status identifier:

Describes the current status of the respective event (8 bit high byte).

0: Event gone. Wait for acknowledgement.
1: Event is active.
2: Event is active and has been acknowledged.

Event type:

Information on the classification of an event (8-bit low byte). The classification has no effects on the NAMUR status management.

1: Event type system error
2: Event type runtime error (e.g. during calibration)
3: Event type maintenance need
7: Event type log book (currently not supported).

Event behavior:

(8 bit High Byte) Describes the processing instruction for the event.

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Meaning
X	X	X	X	0	0	0	0	Acknowledgment not required. Status signals follow the event.
X	X	X	X	0	0	0	1	Acknowledgment requirement 1 Status signals go when the event becomes inactive. The event itself must be acknowledged.
X	X	X	X	0	0	1	0	Acknowledgment requirement 2 Status signals and event do not go until the event is inactive and has been acknowledged.
X	X	X	X	0	1	0	0	Inactive (no storage)
X	X	X	X	0	1	0	1	Inactive acknowledgment requirement 1 No status signals are output, but the event is registered and is deleted after acknowledgment.

'X': Bit has no meaning and must be ignored.

… 15 Administration of system events

… System events

NAMUR status signals:

(8 bit Low Byte) describes the current NAMUR status behavior of the event, i.e. which status outputs have been set. The 'overall status' bit can be combined with the bits of the other status outputs. The content is changed for the runtime, e.g. if an event requiring acknowledgement (according to acknowledgement requirement 1) goes but has not yet been acknowledged. This event no longer initiates a status, the register is '0'.

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Meaning
X	X	X	X	0	0	0	1	Failure
X	X	X	X	0	0	1	0	Maintenance mode
X	X	X	X	0	1	0	0	Function Check
X	X	X	X	1	0	0	0	Overall status

'X': Bit has no meaning and must be ignored.

Incoming time stamp:

Point of time in the device at which the event was generated (32 bit).

Time in seconds since 00:00:00 UTC 01.01.1970.

Outgoing / Acknowledgement time stamp:

Point of time in the device at which the event was canceled by the system or acknowledged by the user (32 bit).

Time in seconds since 00:00:00 UTC 01.01.1970.

Event acknowledgment

If an event in the instrument requires acknowledgement, the event must be confirmed, before it is removed from the event system of the instrument. Confirmation can be made on the HMI of the device (see '**Event behavior**' in **Structure of an event in the event file** on page 75).

The events can be acknowledged via the Modbus event file (file 256) by a write access to the relative Record 0 of the event.

Record offset	Meaning (write Record)
0	Sender ID Writing the sender ID acknowledges the event.

Write file

Example

- Event 1 of the event list is acknowledged by writing the sender ID of Event 1 in Record 2 of file 256.
- Event 2 of the event list is acknowledged by writing the sender ID of Event 2 in Record 12 of file 256.

After acknowledgement, a change in the event list is shown in Bit 1 of Record 0. All the events in the file can be acknowledged before the file is updated. The acknowledgement of an event which does not require acknowledgement or the transmission of an invalid sender ID does not cause a system reaction.

Read-out of the sender ID

The sender of an event is transmitted in the event file encoded in the sender ID (relative Record 0, see Format of an event (see **Format of an event** on page 75).
The sender ID is unique for an instrument but depends on the configuration. If the configuration has changed in an instrument (data record input with ECT/TCT), the sender IDs may also change. The event sender can be identified via Modbus file 257.

Location of the event sender file in the device

Modicon Modbus address	Type	File number	Description/name
	File	257	Read out event sender ID

Starting the read-out of a sender ID

Record 1 must be written to the event sender file (file 257), in order to read out a sender ID.

Write file

Record	Meaning (write Record)
1	Sender ID

Read file

After writing the ID in Record 1, read-out of the event sender in plain language is initiated. The updating is shown in the event sender file (file 257) in Record 0.

Record	Meaning (read record)
0	Bit 0: Read-out process 0 = completed 1 = Evaluation in progress

Once the content of Record 0 of the event sender file (file 257) returns to '0', the requested sender ID is ready for read-out in plain language.

Format of the sender ID file

Once a sender ID has been determined (see **Starting the read-out of a sender ID** on page 77), the sender of the event can be read out in plain language.
The transmission takes place in the form of a UTF8 encoded character string with a '0x00' (zero byte) as termination. 2 bytes of the character string in a record of the Modbus file (257) are transmitted.

Record	Meaning (read record)
Header	
0	Bit 0: Read-out process 0 = completed 1 = Evaluation in progress
1	Sender ID
2	Quantity of the records for this identifier (excluding header)
Identifier data	
3	Sender ID in plain language (Byte 1 and 2)
…	Sender ID in plain language (2 bytes per record)
n	Sender ID in plain language (0x00 termination or 1 byte and 0x00 termination)

Read file

Format of a sender ID

The sender ID can be transmitted multilingually. The individual language texts are transmitted in succession in a character string separated by an identifier. The transmission takes place in the form of a UTF8 encoded character string. If there is no language identifier, the text is directly applicable.

… 15 Administration of system events

… Read-out of the sender ID

Structure of a language text

Language encoding	
Character	**Meaning**
"|"	ASCII character 124;0x7C as one byte (not UTF8-encoded) precedes a language identifier and therefore separates the individual language texts.
001	Three-digit identifier of the language of the subsequent text. The following are currently available: 001 English (language as delivered, default identifier) 049 German (language as delivered) 086 Chinese 351 Portuguese 033 French 081 Japanese 034 Espanol 039 Italian 055 Brasilian 007 Russian 090 Turkish 358 Finnish
Text	
UTF8	Text of the sender ID

Ranking for the applicability of the language texts:

- If the desired language identifier exists, this text applies.
- If not: If the language identifier |001 exists, this text applies.
- If not: If a language identifier exists, this text applies.
- If not: The complete text applies.

Example – Multilingual text

Sender ID:

‘|001Fidas24:A.Pres.|049Fidas24:Luftd.’

Identifier	**Language**	**Text**
001	English	Fidas24:A.Pres.
049	German	Fidas24:Luftd.

Example – Monolingual text with language identifier

Sender ID:

‘|001Fidas24:TOC’

Identifier	**Language**	**Text**
001	English	Fidas24:TOC

Example – Monolingual text without language identifier

Sender ID:

‘System’

Identifier	**Language**	**Text**
- - -	Universal	System

Reading event texts

The meaning of an event is transmitted in the event file encoded in the event number (relative Record 1, see Format of an event (see **Format of an event** on page 75).
The event number is unique for all instruments of a software version. The meaning of an event can be determined in plain language via Modbus file 258.

Location of the event files in the device

Modicon Modbus address	Type	File number	Description/name
	File	258	Read event texts via number

Starting the read-out of an event text

To read out an event text, Record 1 must be written to the event text file (file 258).

Write file

Record	Meaning (write Record)
1	Event number

Read file

After writing the event number in Record 1, read-out of the event text in plain language is initiated. The updating is shown in the event text file (file 258) in Record 0.

Record	Meaning (read record)
0	Bit 0: Read-out process 0 = completed 1 = Evaluation in progress

Once the content of Record 0 of the event text file (file 258) returns to ‘0’, the requested event number is ready for read-out in plain language.

Format of the event text file

Once an event number has been determined (see **Starting the read-out of an event text** on page 79), the event text can be read out in plain language.

The transmission takes place in the form of a UTF8 encoded character string with a "0x00" (zero byte) as termination.
2 bytes of the character string in a record of the Modbus file (258) are transmitted.

Read file

Record	Meaning (read record)
Header	
0	Bit 0: Read-out process 0 = completed 1 = Evaluation in progress
1	Event number
2	Quantity of the records for this identifier (excluding header)
Identifier data	
3	Event text in plain language (Byte 1 and 2)
…	Event text in plain language (2 bytes per record)
n	Event text in plain language (0x00 termination or 1 Byte and 0x00 termination)

… 15 Administration of system events

… Reading event texts

Format of an event text

The event text can be transmitted multilingually.
The individual language texts are transmitted in succession in a character string separated by an identifier.
The transmission takes place in the form of a UTF8 encoded character string.
If there is no language identifier, the text is directly applicable.

Structure of an event language text

Character	Meaning
Language encoding	
"|"	ASCII character 124;0x7C as one byte (not UTF8-encoded) precedes a language identifier and therefore separates the individual language texts.
001	Three-digit identifier of the language of the subsequent text. The following are currently available: 001 English (language as delivered, default identifier) 049 German (language as delivered) 086 Chinese 351 Portuguese 033 French 081 Japanese 034 Espanol 039 Italian 055 Brasilian 007 Russian 090 Turkish 358 Finnish
Text	
UTF8	Text of the event (see below for format)

The event texts are stored in several lines. The character '§' is used as a line separator. The first line is a short description of the event which is used in the display of overview lists. The detailed description of the event begins from line 2; the detailed description can comprise a maximum of 20 lines.

Structure of an event text

Character	Meaning
UTF8	Line 1 of the event (event short text)
"§"	ASCII character 167;0xA7 as one byte (not UTF8-encoded) line separator
UTF8	Line 2 of the event (beginning [Line 1] of the detailed description)
"§"	ASCII character 167;0xA7 as one byte (not UTF8-encoded) line separator
UTF8	Line 3 of the event (line 2 of the detailed description)
	…
"§"	ASCII character 167;0xA7 as one byte (not UTF8-encoded) line separator
UTF8	Line 21 of the event (Line 20 of the detailed description)

Example – Multilingual text

Event text:

'|001Offset >>§The offset drift§exceeds the§permissible range.|049Offset >>§Die Offsetdrift§überschreitet den§zulaessigen Bereich.'

Identifier	Language	Event text	
001	English	Event short text:	Line 1: Offset >>
		Details of the event:	Line 2: The offset drift Line 3: exceeds the Line 4: permissible range.
049	German	Event short text:	Line 1: Offset >>
		Details of the event:	Line 2: the offset drift Line 3: up-scales the Line 4: permissible range.

16 Status messages

Uras26

Error code	Status message	Brief description
0x0001	Detector error	No interrupt inside the time window
0x0002	Overrange	Measuring range of the ADC over/underranged
0x0004	Half	Half the drift range (offset or ampl.) overranged
0x0008	Over	Drift range (offset or ampl.) overranged
0x0010	Delta Over	Calibration drift (offset or ampl.) overranged
0x0020	Floating-point error	An error has occurred in the measured value calculation
0x0040	Temperature controller error	Control deviation 1, 2 or measured temperature value incorrect
0x0080	Temperatur comp. Error	Measured value for the temperature compensation incorrect
0x0200	Pressure comp. Error	Measured value for the pressure compensation incorrect
0x0400	CS correction error	Measured value of the disturbance variable not OK
0x0800	Carrier gas correction error	Measured value of the disturbance variable not OK
0x1000	ADC read error	Incorrect or no data transmission from the ADC

Limas23

Error code	Status message	Brief description
0x0001	Detector error	No interrupt inside the time window
0x0002	Overrange	Measuring range of the ADC over/underranged
0x0004	Half	Half the drift range (offset or ampl.) overranged
0x0008	Over	Drift range (offset or ampl.) overranged
0x0010	Delta Over	Calibration drift (offset or ampl.) overranged
0x0020	Floating-point error	An error has occurred in the measured value calculation
0x0040	Temperature controller error	Control deviation 1, 2 or measured temperature value incorrect
0x0080	Temperatur comp. Error	Measured value for the temperature compensation incorrect
0x0200	Pressure comp. Error	Measured value for the pressure compensation incorrect
0x0400	CS correction error	Measured value of the disturbance variable not OK
0x0800	Carrier gas correction error	Measured value of the disturbance variable not OK
0x1000	Measurement preamplifier error	Measurement amplifier defective
0x2000	Ref. preamplifier error	Reference preamplifier defective
0x4000	Intensity Half error	Half of lamp intensity limit underranged
0x8000	Intensity Over error	Lamp intensity limit underranged

… 16 Status messages

Magnos206

Error code	Status message	Brief description
0x0001	Detector error	No interrupt inside the time window
0x0002	Overrange	Measuring range of the ADC over/underranged
0x0004	Half	Half the drift range (offset or ampl.) overranged
0x0008	Over	Drift range (offset or ampl.) overranged
0x0010	Delta Over	Calibration drift (offset or ampl.) overranged
0x0020	Floating-point error	An error has occurred in the measured value calculation
0x0040	Temperature controller error	Control deviation 1, 2 or measured temperature value incorrect
0x0080	Temperatur comp. Error	Measured value for the temperature compensation incorrect
0x0200	Pressure comp. Error	Measured value for the pressure compensation incorrect

Magnos27

Error code	Status message	Brief description
0x0001	Detector error	No interrupt inside the time window
0x0002	Overrange	Measuring range of the ADC over/underranged
0x0004	Half	Half the drift range (offset or ampl.) overranged
0x0008	Over	Drift range (offset or ampl.) overranged
0x0010	Delta Over	Calibration drift (offset or ampl.) overranged
0x0020	Floating-point error	An error has occurred in the measured value calculation
0x0040	Temperature controller error	Control deviation 1, 2 or measured temperature value incorrect

Caldos25

Error code	Status message	Brief description
0x0001	Detector error	No interrupt inside the time window
0x0002	Overrange	Measuring range of the ADC over/underranged
0x0004	Half	Half the drift range (offset or ampl.) overranged
0x0008	Over	Drift range (offset or ampl.) overranged
0x0010	Delta Over	Calibration drift (offset or ampl.) overranged
0x0020	Floating-point error	An error has occurred in the measured value calculation
0x0040	Temperature controller error	Control deviation 1, 2 or measured temperature value incorrect

Caldos27

Error code	Status message	Brief description
0x0001	Detector error	No interrupt inside the time window
0x0002	Overrange	Measuring range of the ADC over/underranged
0x0004	Half	Half the drift range (offset or ampl.) overranged
0x0008	Over	Drift range (offset or ampl.) overranged
0x0010	Delta Over	Calibration drift (offset or ampl.) overranged
0x0020	Floating-point error	An error has occurred in the measured value calculation
0x0040	Temperature controller error	Control deviation 1, 2 or measured temperature value incorrect
0x0200	Pressure comp. Error	Measured value for the pressure compensation incorrect

Fidas24

Error code	Status message	Brief description
0x0001	Detector error	No interrupt inside the time window
0x0002	Overrange	Measuring range of the ADC over/underranged
0x0004	Half	Half the drift range (offset or ampl.) overranged
0x0008	Over	Drift range (offset or ampl.) overranged
0x0010	Delta Over	Calibration drift (offset or ampl.) overranged
0x0020	Floating-point error	An error has occurred in the measured value calculation
0x0040	Temperature controller error	Control deviation 1, 2 or measured temperature value incorrect
0x0100	Pressure controller error	Control deviation 1, 2 or measured pressure value incorrect
0x1000	Steam error	The operating temperature has not (yet) been reached
0x2000	Flame error	Flame(s) not lit (always the case except in the MEAS_MODE)
0x4000	Fail Safe	Fail Safe Mode

17 Appendix

Modbus® protocol and IEEE-754 format

Processing the format

The Modbus protocol provides 16 bit registers as transmission values. However, some of the gas analyzer data is stored in the IEEE-754 format (32 bit). For this reason, the format must be processed on the application side.

Structure of the IEEE-754 format

Description	Quantity of bits	Meaning
S	1	Sign bit; states the sign (0 = positive, 1 = negative)
E	8	Exponent in two's-complement representation. The true value is therefore the exponent minus 127.
M	23	Mantissa. The 'Most Significant Bit' of the standardized mantissa in front of the decimal point is implicitly 1, but is not stored. The value range is therefore between 1.0 (inclusive) and 2.0.

Example

The number –12.5 is stored as a hexadecimal value **0xC1480000**.
The following table describes the memory assignment:

Address	+0	+1	+2	+3
Format	**SEEEEEEE**	**EMMMMMMM**	**MMMMMMMM**	**MMMMMMMM**
Binary	**11000001**	**01001000**	**00000000**	**00000000**
Hexadecimal	**C1**	**48**	**00**	**00**

Explanation

The sign bit **S** is **1**, i.e. the value is negative.
The exponent **E** is **10000010** binary, which corresponds to a decimal value of 130.
If 127 is subtracted from 130, the result is 3. This is the exponent value.

The stored mantissa value **M** is **10010000000000000000000**.
The value **1.10010000000000000000000** is obtained by adding the non-stored leading 1 in front of the decimal point.

1100.10000000000000000000 is obtained after adjusting the mantissa to the exponent (shift by three places). This binary number corresponds to the decimal number 12.5.

This decimal number still has to be provided with the negative sign. The number –12.5 is obtained from this.

Trademarks

Modbus is a registered trademark of the Modbus Organization

Notes

Notes

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3KXG112012R4001

COM/EL3000/MODBUS-EN Rev. E 02.2020