



Interface Description

Sensistor[®] Sentrac[®]

Serial Protocol Description

Catalog No.

Type number: SEN.122.164, SEN.122.165, SEN.122.166

From software version

5.01.01



INFICON AB

Wahlbecksgatan 25A

SE-582 13 Linköping

Sweden

Table of Contents

1	General Information	5
1.1	Related Models	5
1.2	Related Manuals	5
1.3	Document History	5
2	Connections.....	6
2.1	USB-C	6
2.2	LD BUS	6
2.3	I/O (APC) Port	6
2.4	24 V + GND	7
2.5	PROBE CONNECTION	8
3	Protocols.....	9
3.1	ASCII Protocol.....	11
3.1.1	Command Format	11
3.1.2	Commands.....	12
3.1.3	Configuration values	21
3.1.4	Examples	30
3.1.5	Error Messages.....	31
3.2	LD Protocol	32
3.2.1	Command Format	32
3.2.2	Status Word	35
3.2.3	Commands.....	37

3.2.4	Configuration values	45
3.2.5	Error Messages.....	55
3.3	Fieldbus Protocol	56
3.3.1	Preface.....	56
3.3.2	Setup.....	56
3.3.3	Cyclic Write Process Data	56
3.3.4	Cyclic Read Process Data	56
3.3.5	Acyclic Data transfer	58
3.3.5.1	Addressing Rules for Acyclic Access.....	58
3.3.5.2	CIP Object "ADI object" (A2h)	58
3.3.6	Hardware Configurations for PROFIBUS.....	60
3.3.7	Hardware Configurations for PROFINET.....	62
4	Troubleshooting	63
4.1	Serial communication via RS232 (common).....	63
4.2	ASCII Protocol specific.....	64
4.3	LD Protocol specific	65

1 General Information

1.1 Related Models

The descriptive contents of the interface description is intended for use the following INFICON leak detectors.

Sensistor Sentrac			Part no.
1	Sensistor Sentrac, desktop model	For stationary use	590-970
2	Sensistor Sentrac, portable model	12 hours operating time on batteries	590-971
3	Sensistor Sentrac, panel model	For stationary use	590-972

1.2 Related Manuals

Manual	
Sensistor Sentrac Combined Operating Manual	Part no. 592-186
AP29ECO Operating Instructions	Document no. ninb69en1
IO1000 Operating Instructions	Document no. jiqc10en1
BM1000 Operating Instructions	Document no. jiqb10en1

1.3 Document History

Revision	Date	Remark
01	10-2023	First public release
02	05-2024	Second public release

2 Connections

2.1 USB-C

When connected to a PC it can be used to control and configure the leak detector. When a memory stick is connected it can be utilized for software upgrades, transfer of log files and import and export of parameter settings.

Data format: 115200 baud, 8 data bits, no parity, 1 stop bit

2.2 LD BUS

The LD Bus can be used to connect to IO1000 and BM1000 modules.

Data format: 19200 baud, 8 data bits, no parity, 1 stop bit

2.3 I/O (APC) Port

The I/O (APC) port can be used to connect an AP29ECO. The In and Out signals are 24 V.

Pin designation	Function	Status Output
P01	GND	GND
P02	24 V	24 V
P03	Output	
P07	Output	
P08	Output	
P09	Output	
P10	Output	ACCEPT

Pin designation	Function	Status Output
P11	Output	
P12	GND	GND
P13	Output	WAIT
P14	Output	SIGNAL
P15	Output	ON
P16	Output	CALIBRATION OK
P17	Output	REJECT
P18	Output	ERROR
P19	Input	
P20	Input	
P21	Input	
P22	Input	
P23	Input	
P24	GND	GND

P01 and P24 is to the left and right, respectively, when looking at the instrument from the backside. Hence P24 is closest to the LD BUS connector.

2.4 24 V + GND

This connection is not described in this manual. It is included in this list for completeness only.

This connection is labelled Not Connected on the Desktop and Portable models.

2.5 PROBE CONNECTION

This connection is not described in this manual. It is included in this list for completeness only.

3 Protocols

Two serial Interface protocols can be used to communicate to this instrument with the IO1000 module or via the USB-C connection.

They are the ASCII Protocol and the LD Protocol.

ASCII- and LD protocol have nearly the same functional range, but each of them have some advantages and disadvantages:

ASCII protocol:

Advantages:

- human readable
- easy to use with simple terminal program

Disadvantages:

- No checksum, therefore lower data security
- PC/ PLC software must convert numerical values from ASCII string to binary
- Lower efficiency (for example: 8 data bytes for one float value)

LD protocol:

Advantages:

- Leak detector status always transmitted in each slave telegram
- High data security due to CRC checksum
- Binary transmission of numerical values – no conversion needed in PC/PLC software
- High efficiency (for example: 4 data bytes for one float value)

Disadvantages:

- Not human readable
- Not useable with simple terminal program

Fieldbus communication can be achieved with the BM1000 Bus Module via the LD Bus connection.

Fieldbus protocols:

- PROFIBUS-DP
- PROFINET
- DeviceNet
- EtherNet/IP

3.1 ASCII Protocol

3.1.1 Command Format

In ASCII protocol all commands start with « * » (ASCII code 42dec/2Ahex) and is finished with the end sign CR (ASCII code 13dex/0Dhex). There is no differentiation between upper and lower case. A blank is required between the command and the parameter, no other blanks are allowed.

There is a short and an extended form of the command. Either the short or the extended command must be used, no other abbreviations are allowed (In this document the short form is written in capitals but the SW don't difference upper and lower cases). Command Words have to be separated by a colon. A command can be composed of up to four words. Parameters have to be separated by a comma.

Each command is answered with the requested data, „ok“ or „EXX“ (in case of an error). A list of all error messages, can be found in chapter "Error Messages [▶ 31]". The transmission can be cancelled and the receive-buffer will be cleared with ESC (ASCII code 27dec/1Bhex), ^C (ASCII code 3dec/03hex) or ^X (ASCII code 24dec/18hex).

Some commands can be used as queries, some can be used to set menu parameter and some can be used for both. A query is marked by a "?" (ASCII code 63dec/3Fhex) after the command; for setting data the command has to be followed by the new value to be set.

Parameter can be Boolean or numerical:

	Boolean	0 / 1 or OFF / ON
<No>	Numeric representation format: integer, real (15.6) or exponential (4.5 ⁻⁷)	
	Format: [space] [sign] [ddd] [.] [e[sign]ddd] (d:digit)	



Error due to incorrect format

If a comma is used during numerical data entry, the conversion of the number is cancelled at this point and only the integer part of the number will be used.

- ▶ Always use a point as the decimal marker.

Timing recommendations for the PC/PLC - Program:

- Sample rate > 100 ms
- Timeout between request to and answer from Sentrac: 1500 ms

After sending a command the answer must be waited for before sending a new command. Otherwise the receive buffer may be overwritten.

3.1.2 Commands

Command	Meaning	Refers to LD command no.	R/W	Format
*READ	Most recent measure value	128	R	Float as string: "%f"
*LOCate	Most recent raw locate value	2755	R	Float as string: "%f"
*BEEP	Play a beep	423	W	Sound through the air
*CAL	Start a calibration, currently only for APC	4	W	
*CLS	Clear warnings and errors	5	W	
*ZERO	Zero locate	6	W	
*WAKE	Wake up screen from screensaver	2710	W	Screen wakes up
*START	Start active process (APC or I-Guide)	1	W	
*STOP	Stop active process (APC or I-Guide)	2	W	
*I-GUIDE:LOG_ENTries	Read number of lines in I*Guide log	2219	R	integer: [0, 30]
*I-GUIDE:LOG	Read one line of I*Guide log	2220	R	integer: [0, 30]/Line content as string
*I-GUIDE:BACK	Discard current I*Guide point	2248	W	
*I-GUIDE:ABORT	Abort current I*Guide cycle	2249	W	
*IDN:DEVIce	Device name	301	R	Always "Sensistor Sentrac"
*IDN:SERIal	Sentrac serial number	406	R	1-16 chars

Command	Meaning	Refers to LD command no.	R/W	Format
*IDN:VERsion	Sentrac software version	310	R	major, minor, patch
*IDN:BUILDTIME	Sentrac software time of build	2701	R	mon-dd-yyyy hh-mm-ss
*IDN:BUILDHASH	Git hash of Sentrac software	2703	R	<8 char git hash>
*IDN:BLVersion	Sentrac boot loader version	318	R	
*IDN:BLBUILDTIME	Sentrac boot loader time of build	2702	R	mon-dd-yyyy hh-mm-ss
*IDN:SNSerial	Probe serial number	404	R	1-16 chars
*IDN:SNVersion	Probe software version	312	R	8 chars
*IDN:SNBLVERsion	Probe boot loader version	2704	R	8 chars
*IDN:SNTYPE	Probe type	302	R	"Unknown", "Strix", "P60", "Combox60", ...
*IDN:IOVersion	IO module version	313	R	major, minor, patch
*IDN:IOSerial	IO module serial number	408	R	11 chars
*IDN:BMNETType	BM module network type	324	R	40 chars
*IDN:BMSerial	BM module serial number	325	R	32 bit unsigned integer
*IDN:BMVersion	BM module firmware version	323	R	major, minor, patch
*STATus:TRIGger	Read current trigger state	387	R	"ON" or "OFF"
*STATus:SERVHist	Service date	2641	R	"dd-mm-yyyy, hh:mm"
*STATus:MODE	Current mode	401	R/W	One of mode list
*STATus:SWITCH_ON_COUNT	The number of startups for this unit	157	R	integer: [0, 65535]

Command	Meaning	Refers to LD command no.	R/W	Format
*STATus:CAL	Status of calibration	260	R	Calibration status and calibration state Example: "CALIBRATED,NOT_ACTIVE"
*STATus:ERRor	Current number of error	290	R	Error code list
*STATus:BUSModule	Get the current status of the busmodule	330	R	One of: "SETUP", "NW_INIT", "WAIT_PROCESS", "IDLE", "PROCESS_ACTIVE", "ERROR", "UNKNOWN", "EXCEPTION"
*STATus:BUSMODule:STATUS_WORD	Get the current bus statusword.	322	R	Hexadecimal representation of a u16
*STATus:BUSModule:ADDRESS	Get the current node address for the active busmodule.	326	R	integer: [0, 255]
*STATus:BUSModule:BAUDrate	Get the current baud rate for the active busmodule	327	R	integer: [0, 255]
*STATus:BUSModule:IPADDRESS	Get the current IP address for the active busmodule. (IP based field buses only)	337	R	###.###.###.###
*STATus:BUSModule:IPSUBNETMask	Get the current IP subnet mask for the active busmodule. (IP based field buses only)	338	R	###.###.###.###

Command	Meaning	Refers to LD command no.	R/W	Format
*STATus:BUSModule:IPGATEWay	Get the current IP address of the gateway for the active busmodule. (IP based field buses only)	339	R	###.###.###.###
*STATus:BUSModule:DHCP	Get if DHCP is enabled for the active busmodule. (IP based field buses only)	340	R	"ON" or "OFF"
*STATus:BUSModule:STATIONName	Get the current field bus station name	336	R	Max 20 character string
*STATus:BUSModule:ERRORCnt	Error counters from the busmodule	329	R	4 integers: [0, 65535] Discarded commands, Discarded responses, Serial reception errors, Fragmentation errors
*STATus:BUSModule:EXCEPTION	Exception Code from Bus module	328	R	1 hex digit as text.
*STATus:I-GUIDE:STATE	Read current I*Guide state.		R	State as string
*STATus:I-GUIDE:POINT	Read current point number for I*Guide		R	integer: [0, 25]
*STATus:I-GUIDE:SINGLE	Read if one of I*Guide points measure value is above reject level.		R	"ON" or "OFF"
*STATus:I-GUIDE:SUM	Read if sum of I*Guide points measure values is above reject level.		R	"ON" or "OFF"
*MEASure:U24	Read input voltage of leak detector	200	R	Float as string: "%f"
*MEASure:U24IO	Read input voltage of IO module	213	R	Float as string: "%f"

Command	Meaning	Refers to LD command no.	R/W	Format
*MEASure:LDIN	Read input state of IO connector	255	R	2 hex digits as text, see table below
*MEASure:LDOUT	Read output state of IO connector	257	R	4 hex digits as text, see table below
*MEASure:MODIN	Read input state of PLC In on IO1000	261	R	4 hex digits as text, see table below
*MEASure:MODOUT	Read output state of PLC Out on IO1000	262	R	2 hex digits as text, see table below
*CONF:MUTE	Mute volume	18	R/W	"ON" or "OFF"
*CONF:VOLume	Read or set Sentrac volume	420	R/W	integer: [0, 20]
*CONF:AUDIO_BASE_FREQ	Read or set audio base frequency	2748	R/W	integer: One from base frequency list.
*CONF:MUTE_IF_HEADP	Enable or disable mute speaker when headphone is connected	2749	R/W	"ON" or "OFF"
*CONF:MUTE_IF_SRNSAVER	Enable or disable mute speaker when screensaver is active	2750	R/W	"ON" or "OFF"
*CONF:SCRENSAVER	Change screensaver interval time	2708	R/W	integer: One from screensaver interval list.
*RST:FACTORY	Reset configuration to factory default	1161	W	
*RST:CALIBRATION	Reset calibration configuration	1161	W	
*RST:NETWORK	Reset network configuration	1161	W	
*CONF:RECIPE:ACTive	Enable/disable recipe system	2705	R/W	"ON" or "OFF"

Command	Meaning	Refers to LD command no.	R/W	Format
*CONF:RECIPE:CURRENT	Read or set current recipe will load the recipe on set. If the recipe name does not exist, the command will fail silently.	2706	R/W	1-12 chars
*CONF:GAS:NAME	Read or set current measure gas (unrecognized text interpreted as user-custom gas)	2130	R/W	One from gas list or a custom gas (1-13 chars).
*CONF:GAS:VISCosity	Read or set current measure gas viscosity (set only for custom)	2137	R/W	Float as string: "%f"
*CONF:GAS:DENSity	Read or set current measure gas density (set only for custom)	2732	R/W	Float as string: "%f"
*CONF:SHOW_GAS_NAME	Read or set if gas name should be displayed	2734	R/W	"ON" or "OFF"
*CONF:TRIGGER1	Read or set the current reject level	384	R/W	Float as string: "%f"
*CONF:LANGUAGE	Read or set the language	398	R/W	integer: Microsoft LCID from language list.
*CONF:BRIGHTNESS	Read or set the screen brightness	2709	R/W	integer: [1, 10]
*CONF:SHOW_REJECT_LVL	Enable or disable displaying the reject level	2745	R/W	"ON" or "OFF"
*CONF:REJECT_CHOP	Enable or disable audio reject chop	2746	R/W	"ON" or "OFF"
*CONF:REJECT_FLASH	Enable or disable probe lamp reject flash	2747	R/W	"ON" or "OFF"
*CONF:CAL:CORRelation	Read or set the current correlation value	1467	R/W	Float as string: "%f"

Command	Meaning	Refers to LD command no.	R/W	Format
*CONF:MEASURE:AUDIO_THRESHOLD	Read or set the current measure audio threshold	2735	R/W	integer: [0, 90]
*CONF:MEASURE:MIN_PRES_TIME	Read or set the measure min presentation time	2736	R/W	integer: [0, 1000] ds
*CONF:MEASURE:DISP_THRESHOLD	Read or set the measure display threshold	2737	R/W	integer: [0, 90]
*CONF:MEASURE:READY_PULSE	Enable or disable measure ready pulse	2738	R/W	"ON" or "OFF"
*CONF:LOCATE:SENSitivity	Read or set the configuration sensitivity value	2744	R/W	integer: [1, 15]
*CONF:LOCATE:AUTO_RANGE	Read or set locate auto range enabled	2740	R/W	"ON" or "OFF"
*CONF:LOCATE:AUDIO_THRESHOLD	Read or set the locate audio threshold	2739	R/W	integer: [0, 90]
*CONF:LOCATE:REJECT_INDicate	Enable or disable locate reject indication	2741	R/W	"ON" or "OFF"
*CONF:LOCATE:READY_PULSE	Enable or disable locate ready pulse	2742	R/W	"ON" or "OFF"
*CONF:LOCATE:DIRECT_SENS_ADJ	Enable or disable locate direct sensitivity adjust	2743	R/W	"ON" or "OFF"
*CONF:UNIT:LRSNIFF	Read or set current measure-mode unit (unrecognized text interpreted as user-custom unit)	432	R/W	One of unit list or a custom unit (1-13 chars).
*CONF:PROBE_FUNCTION	Read or set probe button function	422	R/W	Text one from probe button function list
*CONF:PROBE_LAMP	Enable or disable probe lamp	2751	R/W	"ON" or "OFF"

Command	Meaning	Refers to LD command no.	R/W	Format
*CONF:STATUS_OUT_ACTIVE	Enable or disable outputs	2758	R/W	"ON" or "OFF"
*CONF:BUSMODule:TYPE	Read or set busmodule type	2717	R/W	"IO1000" or "BM1000"
*CONF:BUSMODule:ACTIVE	Enable or disable busmodule external 24V	2754	R/W	"ON" or "OFF"
*CONF:PROTOCOL_IO	Read or set io1000 protocol software configured	2593	R/W	"LD" or "ASCII"
*CONF:ACTIVE_PROT_IO	Read io1000 protocol in use, software configured can be overruled by switches on io module	1800	R	"LD" or "ASCII"
*CONF:CAL:UNIT	Read or set calibration unit (unrecognized text interpreted as user-custom unit)	428	R/W	One of unit list or a custom unit (1-13 chars).
*CONF:CAL:LEAK_VALUE	Read or set calibration leak value	830	R/W	Float as string: "%f"
*CONF:CAL:SAMPLE_TIME	Read or set calibration sampling time	2729	R/W	integer: [3, 60]
*CONF:CAL:GAS:NAME	Read or set calibration gas type	2730	R/W	One from gas list or a custom gas (1-13 chars).
*CONF:CAL:GAS:VISCOsity	Read or set calibration gas viscosity (set only for custom)	2731	R/W	Float as string: "%f"
*CONF:CAL:GAS:DENSity	Read or set calibration gas density (set only for custom)	2733	R/W	Float as string: "%f"
*CONF:CAL:INTERVAL	Read or set calibration interval	418	R/W	One of calibration interval list.
*CONF:CAL:INTERVAL_ENABLE	Read or set calibration interval enabled	419	R/W	"ON,OK", "ON,WARNING", "ON,EXPIRED", "OFF"

Command	Meaning	Refers to LD command no.	R/W	Format
*APC:PURGE	Read or set APC purge state	15	W	
*CONF:APC:TIMER:ACCUMULATING	Read or set APC accumulating timer	2724	R/W	integer: [0, 9999990] ds
*CONF:APC:TIMER:SAMPLING	Read or set APC sampling timer	2725	R/W	integer: [0, 9999990] ds
*CONF:APC:TIMER:MEASURING	Read or set APC measuring timer	2726	R/W	integer: [0, 9999990] ds
*CONF:APC:TIMER:AFTER_PURGE	Read or set APC after purge timer	2727	R/W	integer: [0, 9999990] ds
*CONF:APC:PURGE_TRIGGER	Read or set APC purge trigger	2728	R/W	One of [0.0, 1.0, 1.5, 2.0, 5.0, 10.0]
*CONF:I-GUIDE:ENABLE	Read or set I*Guide enable	2235	R/W	
*CONF:I-GUIDE:POInts	Read or set number of I*Guide points. 0 means dynamic I*Guide mode	2236	R/W	integer: [0, 25]
*CONF:I-GUIDE:WAITTime	Read I*Guide wait time always fixed	2239	R	integer: [0, 65535] ds
*CONF:I-GUIDE:MEASTime	Read or set I*Guide measurement time	2240	R/W	integer: [0, 9990] ds
*CONF:I-GUIDE:SUM_REJect	Read or set I*Guide sum reject	2756	R/W	"ON" or "OFF"
*CONF:I-GUIDE:WAIT_LOW	Read or set I*Guide wait measure low	2757	R/W	"ON" or "OFF"
*HOUR:DATE	Current date	450	R/W	"dd-mm-yyyy"
*HOUR:TIME	Current time (setting seconds is optional)	450	R/W	"hh:mm"
*HOUR:POWER	Time since power on in minutes	147	R	Unsigned decimal int as string: "%u"
*HOUR:DEVIce	Operating hours of unit in hours.	142	R	Unsigned decimal int as string: "%u"

3.1.3 Configuration values

These tables list the predefined values for certain settings, e.g: for the measure-mode gas these are the strings which are not treated as a user-custom setting.

Upper- and lowercase letters are ignored.

Gas	Setting string
Air	Air
H ₂	H2
He	He
N ₂	N2
r22	r22
r134a	r134a
r290	r290
r404a	r404a
r407c	r407c
r410a	r410a
r600a	r600a
r1234yf	r1234yf

Unit	Setting string
ppm	ppm
Pa m ³ /s	Pa m3/s
cc/s	cc/s
cc/min	cc/min
SCCM	SCCM
g/y	g/y
oz/y	oz/y
mbarl/s	mbarl/s
mm ³ /s	mm3/s
mm ³ /min	mm3/min

Language	MS-LCID
English	9
German	7
Chinese	4
Japanese	17
French	12
Italian	16
Spanish	10

Calibration interval

Off	OFF
1 hour	PT1H
2 hours	PT2H
4 hours	PT4H
8 hours	PT8H
12 hours	PT12H
1 day	P1D
2 days	P2D
7 days	P7D
14 days	P14D
30 days	P30D
60 days	P60D

Calibration status

- NOT_CALIBRATED
- CALIBRATED
- WARNING
- EXPIRED

Calibration state

- WARMUP
- EXPOSE_BACKGROUND
- READY_START
- SAMPLING
- SAMPLING_SENSING_GAS
- SAMPLING_REMOVE_PROBE
- WAIT_RECOVERY
- DONE_FAIL
- DONE_SUCCESS

I-Guide state

Index	Name
0	INIT
1	WAIT
2	STANDBY
3	MEASURE
4	MEASURE_READY
5	RESULTS

Screensaver interval

Off	OFF
30 seconds	PT30S
1 minute	PT1M
2 minutes	PT2M
5 minutes	PT5M
10 minutes	PT10M
20 minutes	PT20M
30 minutes	PT30M
1 hour	PT1H
2 hours	PT2H

Mode

- Measure
- Locate
- Combined
- APC

Base frequency

- 200
- 300
- 400
- 500
- 600
- 700

Probe button function

- NO_FUNCTION
- TOGGLE_MODE
- ZERO_LOCATE_SIGNAL
- PROBE_LAMP
- PRINT
- SENSITIVITY

Error code

Index	Code
1	Sensor voltage high
2	Sensor voltage low
3	Sensor temperature error
4	Probe disconnected
5	Probe communication error
6	Probe software incompatible
7	Too many probes connected
8	Failed to load configuration
9	Calibration sensitivity low
11-18	Hardware error

Input / Output hex description

Leak Detector Outputs	Hex code	Logic
P03	0001	Not inverted
P04	0002	Not inverted
P05	0004	Not inverted
P06	0008	Not inverted
P07	0010	Not inverted
P08	0020	Not inverted
P09	0040	Not inverted
P10	0080	Not inverted
P11	0100	Not inverted
P13	0200	Not inverted
P14	0400	Not inverted
P15	0800	Not inverted
P16	1000	Not inverted
P17	2000	Not inverted
P18	4000	Not inverted

Leak Detector Inputs	Hex code	Logic
P19	01	Not inverted
P20	02	Not inverted
P21	04	Not inverted
P22	08	Not inverted
P23	10	Not inverted
PROBE 1	20	Inverted
PROBE 2	40	Inverted
Headphones	80	Inverted

Module Outputs	Hex code	Logic
PLC Out 1	01	Not inverted
PLC Out 2	02	Not inverted
PLC Out 3	04	Not inverted
PLC Out 4	08	Not inverted
PLC Out 5	10	Not inverted
PLC Out 6	20	Not inverted
PLC Out 7	40	Not inverted
PLC Out 8	80	Not inverted

Module Inputs	Hex code	Logic
PLC In 1	0001	Not inverted
PLC In 2	0002	Not inverted
PLC In 3	0004	Not inverted
PLC In 4	0008	Not inverted
PLC In 5	0010	Not inverted
PLC In 6	0020	Not inverted
PLC In 7	0040	Not inverted
PLC In 8	0080	Not inverted
PLC In 9	0100	Not inverted
PLC In 10	0200	Not inverted
DIP 1 (S1.1)	0400	Not inverted
DIP 2 (S1.2)	0800	Not inverted
DIP 3 (S1.3)	1000	Not inverted
DIP 4 (S1.4)	2000	Not inverted
DIP 5 (S2.1)	4000	Not inverted
DIP 6 (S2.2)	8000	Not inverted

3.1.4 Examples

*IDN:VERSION?<CR> is used to get the software version.

*HOUR:DATE dd-mm-yyyy<CR> is used to set or get the current date.

*I-GUIDE:LOG_ENTRIES?<CR> is used to get the number of lines in the I*Guide log. The response could be 3<CR>

*I-GUIDE:LOG?0<CR> is used to read the first line in the I*Guide log. The response is Point<TAB>Time<TAB>Measure<TAB>Result<CR>

*I-GUIDE:LOG?1<CR> is used to read the second line in the I*Guide log. The response could be
Point1<TAB>13:44:07<TAB>1.20E-04<TAB>Reject<CR>

*I-GUIDE:LOG?2<CR> is used to read the third line in the I*Guide log. The response could be
Sum<TAB>13:44:07<TAB>1.20E-04<TAB>Reject<CR>

3.1.5 Error Messages

Message	Meaning
OK	command completed
E01	wrong command start (no „*“)
E02	illegal blank
E03	command word 1 illegal
E04	command word 2 illegal
E05	command word 3 illegal
E06	control by RS232 not enabled
E07	argument faulty
E08	no data available
E09	error buffer overflow
E10	command invalid
E11	query not allowed
E12	only query allowed
E13	not yet implemented
E14	command word 4 illegal
E15	illegal state

3.2 LD Protocol

3.2.1 Command Format

Telegram structure:

Master sends

ENQ	LEN	ADR	CmdH	CmdL	DATA (n bytes)	CRC
0	1	2	3	4	5	5 + n

Slave answers

STX	LEN	StwH	StwL	CmdH	CmdL	DATA (n bytes)	CRC
0	1	2	3	4	5	6	6 + n

Command	Meaning	
ENQ	0x05	Start of master request
STX	0x02	Start of slave response
LEN	Number of telegram bytes	without ENQ(STX)/LEN, however with CRC max. 253, so the total slave telegram length is max. 255
ADR	Slave address	Slave address = 1: non-addressed bus. Address byte is ignored.
Stw H/L	Status word	Info from slave to master see "Status Word [▶ 35]"
Cmd H/L	Command	Bit 15 ... 13: Command-specifier Read/Write etc. see "Commands [▶ 37]" Bit 12: free Bit 11 ... 0: Command see "Commands [▶ 37]"

Command	Meaning	
DATA	Data belonging to master request (Slave reply to write command is sent without data)	$0 \leq n \leq 248$ If I/O module (7-byte additional header) is used, then limit maximum data length to 241.
CRC	Checksum	Calculate CRC for all bytes (except CRC byte) Polynomial: 0x98, Name: DOWCRC, Maxim/Dallas, $X^8+X^5+X^4+1$ Info: CRC calculation see file "CRC_calculation.c" (C source code)

Cmd H/L: Command: Command-specifier

Bit 15 ... 13	Meaning	High Nibble (Hex)	Comments
000	Read value	0	
001	Write value	2	
010	Read lower limit value	4	Min values also defined for read commands.
011	Read upper limit value	6	Max values also defined for read commands.
100	Read default value	8	Def values also defined for read commands.
101	Read command name in plain text	A	Please refer to chapter "Command name in plain text" below.
110	Read command info	C	Please refer to table "Command info" below
111	not used	E	

Command name in plain text

- 7-Bit ASCII, only printable characters (0x20 and 0x7E)
- Always in English, Units in square brackets

Command info

1. Byte	Data type see "Telegram structure"
2. Byte	Number of array elements: 0 = no data, no array 1 = data, no array 2 ... 255 = array
3. Byte	Bit 0: 1 = Reading allowed, 0 = Reading not allowed Bit 1: 1 = Writing allowed, 0 = Writing not allowed Bit 2 ... 7: always 0 (not used)

Data Types

Value	Meaning	Acronym	Comments
1	Signed 8 bit integer	SINT8	
2	Signed 16 bit integer	SINT16	
3	Signed 32 bit integer	SINT32	
4	Unsigned 8 bit integer	UINT8	
5	Unsigned 16 bit integer	UINT16	
6	Unsigned 32 bit integer	UINT32	
7	Character	CHAR	ISO 8859-1; printable characters
16	Signed 64 bit integer	SINT64	
17	Unsigned 64 bit integer	UINT64	
18	Floating point/real number	FLOAT	IEEE 754
20	no data	NO_DATA	For commands without data, such as Start

All data types are used in Big Endian format, i.e. the byte with the highest-order bits is transferred first.

Arrays

- Read single elements: Array index in first DATA-byte
- Write single elements: Array index in first DATA byte and values in following DATA bytes
- Read all elements: Pseudo array index 255 in first DATA byte
- Write all elements: Pseudo array index 255 in first DATA byte and values in following DATA bytes
- Response from slave (in case data are sent): Array index or pseudo array index in first DATA byte and values in following DATA bytes

All elements of an array have the same Min/Def/Max value.

Array parameters can be found in Chapter "Commands [▶ 37]": The number of array elements is set in brackets behind the data type.

3.2.2 Status Word

Bit number	Function	Bit mask
1	ID STATE	0x000F
2		
3		
4		
5	ZERO	0x0010
6	STILL_WARNING	0x0020
7	PROBE_BUTTON	0x0040
8	USER_CHANGE	0x0080
9	PLC_OUT_CHANGE	0x0100
10	REJECT	0x0200
11	SIGNAL	0x0400
12	RESULT_READY	0x0800
13	CALIBRATION_OK	0x1000

Bit number	Function	Bit mask
14	WARNING	0x2000
15	ERROR	0x4000
16	COMMAND_ERROR	0x8000

ID STATE	Name
0	Combined
1	Measure
2	Locate
3	APC
4	I-Guide Combined
5	Menu
6	Calibration
7	Service
8	Splash
9	I-Guide Measure

3.2.3 Commands

Command		Name	Meaning	R/W	Data type	Data content
dec	hex					
128	80	Leak rate [interface unit]	Most recent measure value	R	FLOAT	
2755	AC3	Locate value	Most recent raw locate value	R	FLOAT	
423	1A7	Speaker beep	Play a beep	W	NO_DATA	
4	4	Calibration	Start a calibration, currently only for APC	W	NO_DATA	
5	5	Clear error	Clear warnings and errors	W	NO_DATA	
6	6	Zero locate	Zero locate	W	NO_DATA	
2710	A96	Wake up screen	Wake up screen from screensaver	W	NO_DATA	
1	1	Start	Start active process (APC or I-Guide)	W	NO_DATA	
2	2	Stop	Stop active process (APC or I-Guide)	W	NO_DATA	
1284	504	Control word	Control word, used to send commands from bus networks to LD	R/W	UINT16	
2219	8AB	I*Guide Used entries in Log	Read number of lines in I*Guide log	R	UINT8	integer: [0, 30]
2220	8AC	I*Guide Log	Read one line of I*Guide log	R	CHAR[*]	Line content as string
2248	8C8	I*Guide Back	Discard current I*Guide point	W	NO_DATA	
2249	8C9	I*Guide Abort	Abort current I*Guide cycle	W	NO_DATA	
300	12C	Device identification	Device ID	R	UINT8[2]	Always [1,80]
301	12D	Device name	Device name	R	CHAR[17]	Always "Sensistor Sentrac"
406	196	Serial number leak detector	Sentrac serial number	R	CHAR[*]	
310	136	SW-version leak detector	Sentrac software version	R	UINT8[3]	Version
2701	A8D	Build time leak detector	Sentrac software time of build	R	CHAR[*]	mon-dd-yyyy hh-mm-ss
2703	A8F	Build hash leak detector	Git hash of Sentrac software	R	CHAR[8]	

Command		Name	Meaning	R/W	Data type	Data content
dec	hex					
318	13E	SW version boot loader leak detector	Sentrac boot loader version	R	UINT8[3]	Version
2702	A8E	Sentrac boot loader time of build	Build time leak detector boot loader	R	CHAR[*]	mon-dd-yyyy hh-mm-ss
404	194	Serial number probe	Probe serial number	R	CHAR[*]	
312	138	SW-version probe	Probe software version	R	UINT8[3]	Version
2704	A90	SW-version boot loader probe	Probe boot loader version	R	UINT8[3]	Version
302	12E	Probe type	Probe type	R	UINT8	1 = P60 2 = PL60 3 = COMBOX60 9 = STRIX
313	139	SW-version I/O module	IO module version	R	UINT8[3]	Version
408	198	Serial number I/O module	IO module serial number	R	CHAR[*]	
324	144	Fieldbus type	BM module network type	R	UINT16	0x0005 = Profibus 0x0025 = DeviceNet 0x0096 = Profinet 2-Port 0x0085 = EtherNet/IP
325	145	Fieldbus module serial number	BM module serial number	R	UINT32	
323	143	Fieldbus module SW version	BM module firmware version	R	UINT8[3]	Version
387	183	Trigger status	Read current trigger state	R	BOOL	
2641	A51	Service date	Service date	R	UINT8[6]	Date + Time
401	191	Operation mode	Current mode	R/W	UINT8	Mode list
157	9D	Switch on counter	The number of startups for this unit	R	UINT16	
260	104	Calibration status	Status of calibration	R	UINT8	Calibration status table
290	122	Number of actual error	Current number of error	R	UINT16	Error code list

Command		Name	Meaning	R/W	Data type	Data content
dec	hex					
330	14A	Fieldbus module state	Get the current status of the busmodule	R	UINT8	0x00 = Setup 0x01 = Network Init 0x02 = Wait process 0x03 = Idle 0x04 = Process active 0x05 = Error 0x06 = Unknown 0x07 = Exception
322	142	Fieldbus status word	Get the current bus statusword.	R	UINT16	Status word table
326	146	Field bus address actual value	Get the current node address for the active busmodule.	R	UINT8	
327	147	Field bus baud rate	Get the current baud rate for the active busmodule	R	UINT8	Index for baud rate of current module. Check anybus documentation for current module.
337	151	Fieldbus IP address	Get the current IP address for the active busmodule. (IP based field buses only)	R	UINT8[4]	
338	152	Fieldbus IP subnet mask	Get the current IP subnet mask for the active busmodule. (IP based field buses only)	R	UINT8[4]	
339	153	Fieldbus gateway IP address	Get the current IP address of the gateway for the active busmodule. (IP based field buses only)	R	UINT8[4]	
340	154	Fieldbus DHCP enable	Get if DHCP is enabled for the active busmodule. (IP based field buses only)	R	BOOL	

Command		Name	Meaning	R/W	Data type	Data content
dec	hex					
336	150	Fieldbus station name	Get the current field bus station name	R	CHAR[*]	Exception code from current module. Check anybus documentation for current module.
329	149	Fieldbus module error counters	Error counters from the busmodule	R	UINT16[4]	[0] = Discarded commands [1] = Discarded Responses [2] = Serial Reception errors [3] = Fragmentation errors
328	148	Fieldbus module exception code	Exception Code from Bus module	R	UINT8	
2213	8A5	I*Guide state	Read current I*Guide state.	R	UNIT8	[0] = State, I-Guide state list [1] = Current point [2] = Single reject (BOOL) [3] = Sum reject (BOOL)
200	C8	24 V supply [V]	Read input voltage of leak detector	R	FLOAT	
213	D5	24 V supply IO [V]	Read input voltage of IO module	R	FLOAT	
255	FF	PLC input state leak detector	Read input state of IO connector	R	UINT8	LD Inputs table
257	101	PLC output state leak detector	Read output state of IO connector	R	UINT16	LD Outputs table
261	105	PLC input state IO module	Read input state of PLC In on IO1000	R	UINT16	Module Inputs table
262	106	PLC output state IO module	Read output state of PLC Out on IO1000	R	UINT8	Module Outputs table
18	12	Mute audio	Mute volume	R/W	BOOL	
420	1A4	Speaker volume	Read or set Bumblebee volume	R/W	UINT8	
2748	ABC	Audio base frequency	Read or set audio base frequency	R/W	UINT16	One from base frequency list.
2749	ABD	Mute speaker headphone	Enable or disable mute speaker when headphone is connected	R/W	BOOL	

Command		Name	Meaning	R/W	Data type	Data content
dec	hex					
2750	ABE	Mute speaker screensaver	Enable or disable mute speaker when screensaver is active	R/W	BOOL	
2708	A94	Screensaver time	Change screensaver	R/W	CHAR[*]	One from screensaver interval list.
1161	489	Parameter reset	Reset configuration to factory default	W	UINT8	1 = Factory default 6 = Network reset 10 = Calibration reset
2705	A91	Recipe active	Enable/disable recipe system	R/W	BOOL	
2706	A92	Current active recipe	Read or set current recipe will load the recipe on set. If the recipe name does not exist. The command will fail silently.	R/W	CHAR[*]	
2130	852	Measure gas name (unrecognized text interpreted as user-custom gas)	Read or set current measure gas (unrecognized text interpreted as user-custom gas)	R/W	CHAR[*]	One from gas list or a custom gas (1-13 chars)
2137	859	Measure gas viscosity (set only for custom)	Read or set current measure gas viscosity (set only for custom)	R/W	FLOAT	
2732	AAC	Measure gas density	Read or set current measure gas density (set only for custom)	R/W	FLOAT	
2734	AAE	Display gas name	Read or set if gas name should be displayed	R/W	BOOL	
384	180	Trigger [sel. unit]	Read or set the current reject level	R/W	FLOAT	
398	18E	Language [Microsoft LCID]	Read or set the language	R/W	UINT8	Microsoft LCID from language list.
2709	A95	LCD Brightness	Read or set the screen brightness	R/W	UINT8	
2745	AB9	Show reject level	Enable or disable displaying the reject level	R/W	BOOL	
2746	ABA	Reject audio chop	Enable or disable audio reject chop	R/W	BOOL	

Command		Name	Meaning	R/W	Data type	Data content
dec	hex					
2747	ABB	Reject probe lamp flash	Enable or disable probe lamp reject flash	R/W	BOOL	
1467	5BB	Correlation value	Read or set the current correlation value	R/W	FLOAT	
2735	AAF	Measure audio threshold [%]	Read or set the current measure audio threshold	R/W	UINT8	
2736	AB0	Measure min presentation time [ds]	Read or set the measure min presentation time	R/W	UINT16	
2737	AB1	Measure display threshold [%]	Read or set the measure display threshold	R/W	UINT8	
2738	AB2	Measure ready pulse	Enable or disable measure ready pulse	R/W	BOOL	
2744	AB8	Configured sensitivity value	Read or set the configuration sensitivity value	R/W	UINT8	
2740	AB4	Auto locating range	Read or set locate auto range enabled	R/W	BOOL	
2739	AB3	Locate audio threshold	Read or set the locate audio threshold	R/W	UINT8	
2741	AB5	Locate reject indication	Enable or disable locate reject indication	R/W	BOOL	
2742	AB6	Locate ready pulse	Enable or disable locate ready pulse	R/W	BOOL	
2743	AB7	Direct sensitivity adjustment	Enable or disable locate direct sensitivity adjust	R/W	BOOL	
432	1B0	Leak rate unit	Read or set current measure-mode unit (unrecognized text interpreted as user-custom unit)	R/W	CHAR[*]	One from unit list or a custom unit (1-13 chars).
422	1A6	Probe button function	Read or set probe button function	R/W	UINT8	Index from probe button function list
2751	ABF	Probe lamp state	Enable or disable probe lamp	R/W	BOOL	
2758	AC6	Activate outputs state	Activate outputs state	R/W	BOOL	
2717	A9D	Configured connected LD module	Read or set busmodule type	R/W	UINT8	0 = IO1000 1 = BM1000

Command		Name	Meaning	R/W	Data type	Data content
dec	hex					
2754	AC2	Busmodule external 24V	Enable or disable busmodule external 24V	R/W	BOOL	
2593	A21	Interface protocol I/O	Read or set io1000 protocol software configured	R/W	UINT8	0 = LD 1 = ASCII
1800	708	Active protocol I/O	Read io1000 protocol in use, software configured can be overruled by switches on io module	R	UINT8	0 = LD 1 = ASCII
428	1AC	Calibration unit	Read or set calibration unit (unrecognized text interpreted as user-custom unit)	R/W	CHAR[*]	
830	33E	Calibration leak value [sel. unit]	Read or set calibration leak value	R/W	FLOAT	
2729	AA9	Calibration sample time [s]	Read or set calibration sampling time	R/W	UINT8	
2730	AAA	Calibration gas name	Read or set calibration gas type	R/W	CHAR[*]	One from gas list or a custom gas (1-13 chars)
2731	AAB	Calibration gas viscosity (set only for custom)	Read or set calibration gas viscosity (set only for custom)	R/W	FLOAT	
2733	AAD	Calibration gas density (set only for custom)	Read or set calibration gas density (set only for custom)	R/W	CHAR[*]	
418	1A2	Calibration interval	Read or set calibration interval	R/W	CHAR[*]	One of calibration interval list
419	1A3	Calibration interval enable	Read or set calibration interval enabled	R/W	UINT8	Write: 0 = OFF 1 = ON Read: 0 = OFF 1 = ON,OK 2 = ON,Warning 3 = ON,Expired

Command		Name	Meaning	R/W	Data type	Data content
dec	hex					
15	F	APC Purge	Read or set APC purge state	W	BOOL	
2724	AA4	APC timer accumulating [ds]	Read or set APC accumulating timer	R/W	UINT32	
2725	AA5	APC timer sampling [ds]	Read or set APC sampling timer	R/W	UINT32	
2726	AA6	APC timer measuring [ds]	Read or set APC measuring timer	R/W	UINT32	
2727	AA7	APC timer after purge [ds]	Read or set APC after purge timer	R/W	UINT32	
2728	AA8	APC Purge trigger	Read or set APC purge trigger	R/W	UINT8	0 = 0.0 1 = 1.0 2 = 1.5 3 = 2.0 4 = 5.0 5 = 10.0
2235	8BB	I*Guide enable	Read or set I*Guide enable	R/W	BOOL	
2236	8BC	I*Guide points	Read or set number of I*Guide points. 0 means dynamic I*Guide mode	R/W	UINT8	
2239	8BF	I*Guide wait time [ds]	Read I*Guide wait time always fixed	R	UINT16	
2240	8C0	I*Guide measuring time [ds]	Read or set I*Guide measurement time	R/W	UINT16	
2756	AC4	I*Guide sum reject	Read or set I*Guide sum reject	R/W	BOOL	
2757	AC5	I*Guide wait measure low	Read or set I*Guide wait measure low	R/W	BOOL	
450	1C2	Current leak detector time	Current date	R/W	UINT8[6]	
450	1C2	-	Current time (setting seconds is optional)	R/W	-	
147	93	Time since power on [min]	Time since power on in minutes	R	UINT32	
142	8E	Leak detector operation hours [h]	Operating hours of unit in hours.	R	UINT32	

3.2.4 Configuration values

These tables list the predefined values for certain settings, e.g: for the measure-mode gas these are the strings which are not treated as a user-custom setting.

Upper- and lowercase letters are ignored.

Gas	Setting string
Air	Air
H ₂	H2
He	He
N ₂	N2
r22	r22
r134a	r134a
r290	r290
r404a	r404a
r407c	r407c
r410a	r410a
r600a	r600a
r1234yf	r1234yf

Unit	Setting string
ppm	ppm
Pa m ³ /s	Pa m3/s
cc/s	cc/s
cc/min	cc/min
SCCM	SCCM

Unit	Setting string
g/y	g/y
oz/y	oz/y
mbarl/s	mbarl/s
mm ³ /s	mm3/s
mm ³ /min	mm3/min

Language	MS-LCID
English	9
German	7
Chinese	4
Japanese	17
French	12
Italian	16
Spanish	10

Calibration interval

Off	OFF
1 hour	PT1H
2 hours	PT2H
4 hours	PT4H
8 hours	PT8H
12 hours	PT12H
1 day	P1D

2 days	P2D
7 days	P7D
14 days	P14D
30 days	P30D
60 days	P60D

Screensaver interval

Off	OFF
30 seconds	PT30S
1 minute	PT1M
2 minutes	PT2M
5 minutes	PT5M
10 minutes	PT10M
20 minutes	PT20M
30 minutes	PT30M
1 hour	PT1H
2 hours	PT2H

Mode

Index	Name
0	COMBINED
1	MEASURE
2	LOCATE
3	APC

Base frequency

- 200
- 300
- 400
- 500
- 600
- 700

Probe Button Function

Index	Command text
0	NO_FUNCTION
1	TOGGLE_MODE
2	ZERO_LOCATE_SIGNAL
3	PROBE_LAMP
4	PRINT
5	SENSITIVITY

Error Code

Index	Code
1	Sensor voltage high
2	Sensor voltage low
3	Sensor temperature error
4	Probe disconnected
5	Probe communication error

Index	Code
6	Probe software incompatible
7	Too many probes connected
8	Failed to load configuration
9	Calibration sensitivity low
11-18	Hardware error

Binary date format

Index	Date + Time
0	year (0 - 99), 0 = 2000
1	month (1 -12)
2	day (1-31)
3	hour (0-23)
4	minute (0 - 59)
5	second (0 - 59)

Binary version format

Index	Version
0	Main
1	Sub
2	Debug

Calibration status

Process status				Expiration state			
8	7	6	5	4	3	2	1
0 = Not active				0 = Not calibrated			
1 = Warmup				1 = Calibrated			
2 = Expose background				2 = Expiration warning			
3 = Ready start				3 = Expired			
4 = Sampling							
5 = Sampling sensing gas							
6 = Sampling remove probe							
7 = Wait recovery							
8 = Done failed							
9 = Done success							

I-Guide state

Index	Name
0	INIT
1	WAIT
2	STANDBY
3	MEASURE
4	MEASURE_READY
5	RESULTS

Bit number	Name	Bit mask	Meaning	Similar to RS232 cmd.
1	NOT USED	0x0001		
2	ZERO	0x0002	0→1 Zero locate	6
3	CLEAR	0x0004	0→1 Clear errors and warnings	5
4	START	0x0008	0→1 Start 1→0 Stop	1, 2
5	CAL	0x0010	0→1 Start cal	4
6	BACK	0x0020	0→1 Back	2248
7	ABORT	0x0040	0→1 Abort	2249
8	NOT USED	0x0080		
9	MODE	0x0700	Mode index from list	401
10				
11				
12	NOT USED	0xF800		
13				
14				
15				
16				

Input / Output hex description

Leak Detector Outputs	Hex code	Logic
P03	0001	Not inverted
P04	0002	Not inverted
P05	0004	Not inverted
P06	0008	Not inverted
P07	0010	Not inverted
P08	0020	Not inverted
P09	0040	Not inverted
P10	0080	Not inverted
P11	0100	Not inverted
P13	0200	Not inverted
P14	0400	Not inverted
P15	0800	Not inverted
P16	1000	Not inverted
P17	2000	Not inverted
P18	4000	Not inverted

Leak Detector Inputs	Hex code	Logic
P19	01	Not inverted
P20	02	Not inverted
P21	04	Not inverted
P22	08	Not inverted
P23	10	Not inverted
PROBE 1	20	Inverted
PROBE 2	40	Inverted
Headphones	80	Inverted

Module Outputs	Hex code	Logic
PLC Out 1	01	Not inverted
PLC Out 2	02	Not inverted
PLC Out 3	04	Not inverted
PLC Out 4	08	Not inverted
PLC Out 5	10	Not inverted
PLC Out 6	20	Not inverted
PLC Out 7	40	Not inverted
PLC Out 8	80	Not inverted

Module Inputs	Hex code	Logic
PLC In 1	0001	Not inverted
PLC In 2	0002	Not inverted
PLC In 3	0004	Not inverted
PLC In 4	0008	Not inverted
PLC In 5	0010	Not inverted
PLC In 6	0020	Not inverted
PLC In 7	0040	Not inverted
PLC In 8	0080	Not inverted
PLC In 9	0100	Not inverted
PLC In 10	0200	Not inverted
DIP 1 (S1.1)	0400	Not inverted
DIP 2 (S1.2)	0800	Not inverted
DIP 3 (S1.3)	1000	Not inverted
DIP 4 (S1.4)	2000	Not inverted
DIP 5 (S2.1)	4000	Not inverted
DIP 6 (S2.2)	8000	Not inverted

3.2.5 Error Messages

Telegram error handling

- Slave discards all characters until it receives a STX as telegram start identifier.
- Slave does not generate an error message, if address is not correct.
- Slave reports CRC errors with error message 1 (CRC failure)
- Slave reports length errors with error message 2 (Illegal telegram length) or 11 (Data length is not correct for the command)

To prevent the response from colliding with the next request, the slaves do not respond in case of a timeout.

Error numbers (if status word Bit 15 is set 1)

Error No.	Meaning
1	CRC-failure
2	Illegal telegram length
10	command doesn't exist
11	Data length is not correct for the command
12	Read not allowed
13	Write not allowed
14	Array-Index out of range or missing
20	Control actually not allowed with this interface
21	Password not OK
22	Command actually not allowed (e.g. calibration during Run-Up)
30	Data not in range
31	No data available

In case of error: STX, LEN, Stw, Cmd and one Data-Byte (with error number) sent

3.3 Fieldbus Protocol

3.3.1 Preface

In order to use fieldbus communication with a Sentrac instrument, you need an INFICON Bus-Module BM1000 connected to the LD bus port of the Sentrac instrument.

Fieldbus systems normally support device-specific configuration files e.g. GSD files for the PROFIBUS field bus system.

You will find the appropriate configuration files on the USB memory stick which is supplied with your bus module.

3.3.2 Setup

Select BM1000 at Settings > Communication > LD Bus > Module.

Attention:

Address do not come into effect until a restart of the leak detector!

3.3.3 Cyclic Write Process Data

This data word (2 Bytes) is send periodically from the field bus master (e.g. programmable logic controller) to the leak detector.

PROFIBUS and PROFINET IO receive high byte first, DeviceNet and EtherNet/IP receive low byte first.

The content in this information is the same as the Control Word, see table in "Configuration values [▶ 45]".

3.3.4 Cyclic Read Process Data

These 29 data bytes are send periodically from the leak detector to the field bus master (e.g. a programmable logic controller): Attention:

PROFIBUS and PROFINET IO send high byte first, DeviceNet and EtherNet/IP send low byte first.

Title	Byte	Name	Meaning	Similar to RS232 cmd.
Status word	1-2			322
Leak rate	3-6	Leak rate [interface unit]	Actual leak rate in configured unit. (IEEE 754 float value)	128
Not used	7-10	Always NaN		
Error code	11-12	Current error number	Error/warning code (16 bit unsigned integer)	290
Trigger status	13	Status of trigger	0 = Leak rate lower than trigger level 1 = Leak rate higher than trigger level	387
Calibration status	14	Calibration status	For possible values please refer to command 260	260
Leak detector ID	15	Leak detector ID	Always 80 for Sensistor Sentrac	303
Device specific float 1	16-19	Device specific float 1	Locate value (IEEE 754 float value)	2755
Device specific float 2	20-23	Device specific float 2	Not used always NaN	
Device specific float 3	24-27	Device specific float 3	Not used always NaN	
Device specific word	28-29	Device specific word	Not used always 0	

3.3.5 Acyclic Data transfer

If you want to use acyclic data transfer with PROFIBUS, you must use a PROFIBUS master which supports DPV1 data transfers. A PROFIBUS master which supports DPV0 only, can only use cyclic data transfer.

3.3.5.1 Addressing Rules for Acyclic Access

Mapping from LD command number to field bus:

Fieldbus	Rule	Example for LD_command_number 506 (Mass)
PROFIBUS	$LD_command_number = slot \cdot 255 + index + 1$ $slot = (ADI - 1) / 255$ $index = (ADI - 1) \text{ MOD } 255$	Slot = 1 index = 250
PROFINET IO	Application Process Instance (API) = 0 Slot = 0 Subslot = 1 Index = LD_command_number	API = 0 Slot = 0 Subslot = 1 Index = 506dez = 01FAhex
DeviceNet	Object number A2h (ADI object) Instance_number = LD_command_number Attribute 5 (Value)	Instance_number = 506
EthernetIP	Object number A2h (ADI object) Instance_number = LD_command_number Attribute 5 (Value)	Instance_number = 506

Fieldbus supports all commands from LD protocol, except the commands with data type NO_DATA in the LD command list, see "Commands [▶ 37]".

3.3.5.2 CIP Object "ADI object" (A2h)

The following text only applies to DeviceNet and Ethernet/IP:

Instance Attributes:

#	Name	Access	Type	Description
1	Name	Get	SHORT_STRING	Parameter name (Including length)
2	ABCC Data type	Get	USINT	Data type of instance value
3	No. of elements	Get	USINT	Number of elements of the specified data type
4	Descriptor	Get	USINT	Bit field describing the access rights for this instance Bit:Meaning: 0 Set = Get Access 1 Set = Set Access
5	Value ^{a)}	Get/Set	Determined by attribute #2	Instance value
6	Max value ^{a)}	Get		The maximum permitted parameter value
7	Min value ^{a)}	Get		The minimum permitted parameter value
8	Default value ^{a)}	Get		The default parameter value

a) Converted to/from CIP standard by the module

ABCC Data type:

#	Type	Bits	Description	Range
1	SINT8	8	Signed 8 bit integer	-128... +127
2	SINT16	16	Signed 16 bit integer	-32768... +32767
3	SINT32	32	Signed 32 bit integer	$-2^{31} \dots +(2^{31}-1)$
4	UINT8	8	Unsigned 8 bit integer	0... +255
5	UINT16	16	Unsigned 16 bit integer	0... +65535
6	UINT32	32	Unsigned 32 bit integer	0... $+(2^{32}-1)$
7	CHAR	8	Character (ISO 8859-1)	0... +255

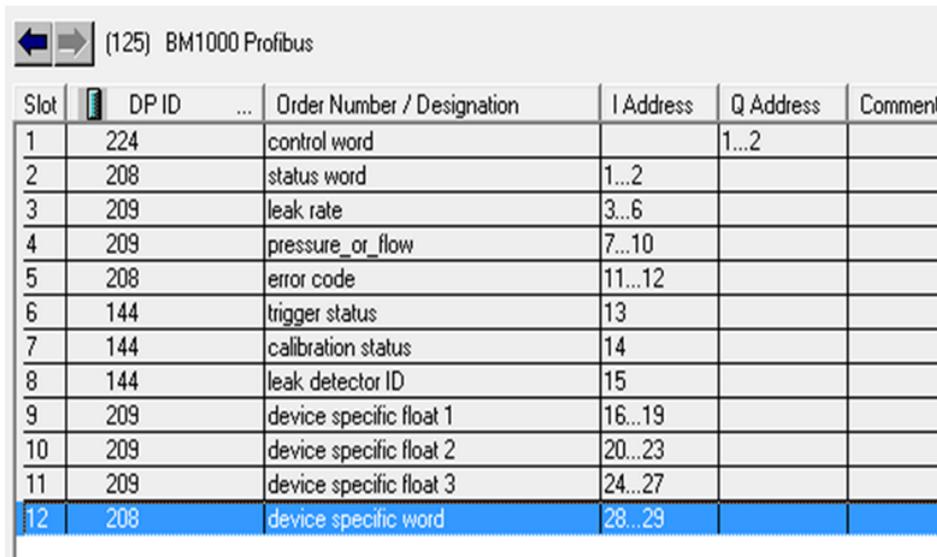
#	Type	Bits	Description	Range
16	SINT64	64	Signed 64 bit integer	$-2^{63} \dots +(2^{63}-1)$
17	UINT64	64	Unsigned 64 bit integer	$0 \dots +(2^{64}-1)$
18	FLOAT	32	Floating point (IEC 60559)	$\pm 1.17549435E-38 \dots$ $\pm 3.40282347E+38$

3.3.6 Hardware Configurations for PROFIBUS

Hardware configuration

Attention:

You must select INFICON profile and must use IFCN0E8D.GSD file for this configuration



Slot	DP ID	...	Order Number / Designation	I Address	Q Address	Comment
1	224		control word		1...2	
2	208		status word	1...2		
3	209		leak rate	3...6		
4	209		pressure_or_flow	7...10		
5	208		error code	11...12		
6	144		trigger status	13		
7	144		calibration status	14		
8	144		leak detector ID	15		
9	209		device specific float 1	16...19		
10	209		device specific float 2	20...23		
11	209		device specific float 3	24...27		
12	208		device specific word	28...29		

Fig. 1: Example hardware configuration (detail from PLC configuration window)

Assignment of the PROFIBUS Address

The PROFIBUS address can be assigned via CU1000 or via the hardware configuration tool of the PLC.

To assign the PROFIBUS address via Sentrac select

- ▶ Settings > Communication > LD Bus > Address

To assign the PROFIBUS address via hardware configuration tool of the PLC

- ▶ refer to the documentation of your PLC.

If you use a Siemens Step 7 you can also

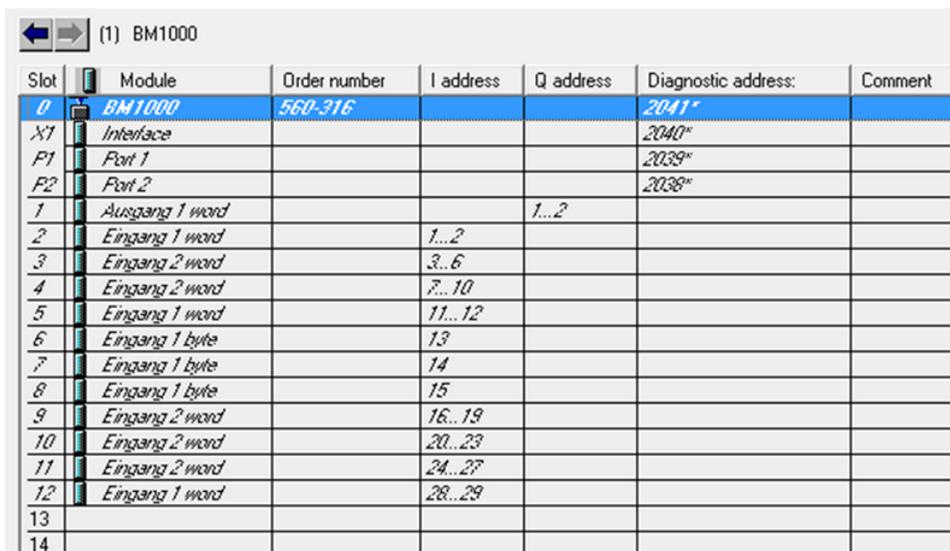
- ▶ refer to the document: "How to configure an Anybus PROFIBUS slave module with Siemens Step 7". You will find this document on the USB memory stick which is supplied with your Sensistor Sentrac.

3.3.7 Hardware Configurations for PROFINET

Hardware Configuration

Attention:

You must select INFICON profile and must use the GSDML-V2.3-Inficon-BM1000_PROFINET-20131206.XML file. In addition you must put the INFICON Bitmap File GSDML-0282-03E8-INFICON-BM1000.BMP in the same folder as the xml file.



Slot	Module	Order number	I address	Q address	Diagnostic address:	Comment
0	BM1000	560-316			2041*	
X1	Interface				2040*	
P1	Port 1				2039*	
P2	Port 2				2038*	
1	Ausgang 1 word			1...2		
2	Eingang 1 word		1...2			
3	Eingang 2 word		3...6			
4	Eingang 2 word		7...10			
5	Eingang 1 word		11...12			
6	Eingang 1 byte		13			
7	Eingang 1 byte		14			
8	Eingang 1 byte		15			
9	Eingang 2 word		16...19			
10	Eingang 2 word		20...23			
11	Eingang 2 word		24...27			
12	Eingang 1 word		28...29			
13						
14						

Fig. 2: Sequence of the data words (slots) for PROFINET

Assignment of the PROFINET address

The PROFINET address can only be assigned via the hardware configuration tool of the PLC. To assign the PROFINET IP address via hardware configuration tool of the PLC, please refer to the documentation of the PLC.

4 Troubleshooting

4.1 Serial communication via RS232 (common)

Error	Possible Reason	Solution	Valid also for USB comm.
No characters are received via the interface/the leak detector does not answer	Wrong cable	Please use a 1:1 cable, (NO null-modem cable, also called cross-over cable!)	NO
	Problems with flow control	Deactivate flow control in PC/PLC or use cable according to the wiring diagram in Section 2	YES
	Wrong COM-Port used at PC	Select correct COM-Port	YES
No characters are received via the interface/the leak detector does not answer	Wrong interface parameters (Baud rate, Data bits, Parity, Stop bits)	Check if interface parameters (Baud rate, number of data bits, parity bit and number of stop bits in the leak detector and PC/PLC match)	YES
	Wrong protocol selected in the leak detector	Select correct protocol in the leak detector	YES
	PC uses an USB-RS232 converter	In general the IO1000 will also work with an USBRS232-converter. However, these often cause multiple difficult to track problems (driver, flow control.) Please test your PC program on a "real" RS232 interface first preferably. Especially with USB-RS232-converters it is often helpful to use a cable according to the wiring diagram in chapter 4 of the IO1000 documentation.	YES

Error	Possible Reason	Solution	Valid also for USB comm.
	Serial interface of PC is (still) occupied with a different program	Check if other programs uses the serial interface. It is also possible that an already closed program has not released the interface again yet. In this case a restart of the PC will help.	YES
The leak detector replies with "unreadable" characters	Wrong interface parameters (Baud rate, Data bits, Parity, Stop bits)	Check if interface parameters (Baud rate, number of data bits, parity bit and number of stop bits in the IO1000 and PC/PLC match)	YES
	Wrong protocol selected in the leak detector	Select correct protocol in the leak detector	YES

4.2 ASCII Protocol specific

Error	Possible Reason	Solution
IO1000 does not reply/leak detector replies after several command with "E10"	"Carriage Return" at the end of the command is missing	Finish all commands with "Carriage Return" (ASCII 0dhex/13dez)
leak detector replies with error message to the first command only, following commands are interpreted correctly	Receiving buffer of the leak detector was not empty before sending the first command (e.g. by plugging in the RS232 cable during operation)	In the ASCII protocol the leak detector has not time out function which will empty the receiving buffer automatically. Therefore, the buffer should be emptied before the first command by sending of ESC, ^C or ^X

4.3 LD Protocol specific

Error	Possible Reason	Solution
IO1000 does not reply	Wrong Address	Always use Address 1 in LD protocol.
	Other protocol errors	Try to use NOP command (05hex 04hex 01hex 00hex 00hex 77hex) first, to check if connection works in general. The answer should be 02hex 05hex XXhex XXhex 00hex 00hex XXhex
IO1000 replies with CRC error (error code 1)	Wrong CRC calculation	Check you CRC code calculation. See example C source file "CRC_calculation.c" provided by INFICON. Check your code with unit test function in this source code file.

