AE XS

Ultra-low noise, high-performance acoustic emission and dynamic load sensor

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Modbus Reference Guide

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2 Revision History

Revision	Date	Author(s)	Description
V20231129	29.11.2023	JW	Update formatting; Update cover and disclaimer; Update product name
V20211129	29.11.2021	JW	Add cfg reg of tmp sensor pwr state
V20210708	08.07.2021	JW	Remove chAMP frequency "Min" setting; Add chAMP signal generator
V20210614	14.06.2021	JW	Initial release

3 General

tbd

4 Supported Registers

Data transfer from and to registers is organized in terms of 16-bit integers. Please note: All registers in this manual are printed as absolute addresses. In general Modbus libraries only ask for the relative address according to the function code used.

4.1 Memory Layout

The virtual memory provided as Modbus registers is divided into three sections:

Reg Addresses	Description	Type	R/W	Notes
0x00000 - 0x0FFFF	Runtime Flags	bool	R/W	FC 0x01, 0x05
0x30000 - 0x3FFFF	Measurement	u16	R	FC 0x04
0x40000 - 0x4FFFF	Configuration	u16	R/W	FC 0x03, 0x06, 0x10

Example Usage

The address of interest is 0x30123. The relative address is 0x0123 and the only possible function is "0x04 Read Input register".

If the address of interest is 0x40234, then possible function codes are 0x03, 0x06 and 0x10. Please see supported function codes in section "Supported Function Codes".

4.2 Status Coil Registers

Reg. Addresses	Description	Type	R/W	Notes
0x00000	Device Ready	bool	R	1 Booting finished successfully
0x0FFFF	Reboot Device	bool	W	1 reboot, see [COIL1]

[COIL1] Reboot Device
Reboot is done after response has been sent

4.3 Measurement Registers

Reg. Addresses	Description	Type	R/W	Notes
0x30000	Sensor Temperature	u16	R	see [MEA1]

[MEA1] Unit Conversion of Temperature Sensors

Read Value is in Deci-Kelvin

Conversion: $T = uint16\_value / 10 - 273.15$ (Degree Celcius)

4.4 Configuration Registers

Settings are saved directly to eeprom, after they are sent to the device.

Reg. Addresses	Description	Type	R/W	Notes
0x40000 - 0x40001	Unique Hardware ID	u32	R	
0x40002	Hardware Version	u16	R	
0x40003 - 0x40004	Firmware Version	u32	R	
0x40005	AE XS Mode	u16	R/W	see [CFG1]
0x40006	Modbus Slave ID	u16	R/W	see [CFG2]
0x40007	Modbus Speed	u16	R/W	see [CFG3]
0x40008	Mb Termination Resis.	u16	R/W	0 off (default), 1 on
0x40009	chAMP frequency	u16	R/W	see [CFG4]
0x4000A	chAMP gain	u16	R/W	see [CFG5]
0x4000B	chAMP Sig. Gen. Type	u16	R/W	see [CFG6]
0x4000C - 0x4000D	chAMP Sig. Gen. Freq.	f32	R/W	see [CFG7]
0x4000E	chAMP Sig. Gen. Amp.	u16	R/W	see [CFG8]
0x4000F	tmp sensor pwr state	u16	R/W	0 off, 1 on (default)

[CFG1] AE XS Mode
1 bootloader, 2 general, 3 power save (default)
Mode will be set and applied after Modbus response is sent

[CFG2] Modbus Slave ID
Min: 1, Max: 247, Default: 1
Response will be replied with previous slave ID, new messages require new slave ID

[CFG3] Modbus Speed
0 1200, 1 2400, 2 4800, 3 9600, 4 19200 (default), 5 38400, 6 56000, 7 57600, 8 115200
Configuration will be applied immediately. A response will be sent with the new Modbus Speed.

[CFG4] chAMP frequency setting
1 Low, 2 Medium (default), 3 High

[CFG5] chAMP gain setting
0 -20 dB, 1 0 dB (default), 2 +20 dB, 3 Max

[CFG6] chAMP signal generator: Signal Type
0 Off (default), 1 Sine, 2 Triangle, 3 Square, 4 Ramp
Setting is not saved in EEPROM and will be reset to default at next system start

[CFG7] chAMP signal generator: Signal Frequency
default: 1000 Hz, min: 38.14 Hz, Max: 12500.00 Hz
Setting is applied after LSB register is written

Setting is not saved in EEPROM and will be reset to default at next system start
If setting couldn't be applied, nearest possible frequency is chosen

[CFG8] chAMP signal generator: Signal Amplitude (%)
default: 90, min: 0, max: 100
Value is percentage of maximum possible amplitude of signal
Setting is not saved in EEPROM and will be reset to default at next system start

Setting is not saved in EEPROM and will be reset to default at next system start
If setting couldn't be applied, nearest possible frequency is chosen

[CFG8] chAMP signal generator: Signal Amplitude (%)
default: 90, min: 0, max: 100

Declaration of Conformity

- CE compliant
- RoHS compliant
- 3TG compliant
- REACH compliant

The AE XS is a component, which contains lead zirconium titanate in a proportion of more than 0.1% by weight.

Lead zirconium titanate (abbreviation: PZT, Lead titanium zirconium oxide) has been included in the SVHC list by the European Chemicals Agency (ECHA) (EC No: 235-727-4, CAS No: 12626-81-2).

iNDTact GmbH does not manufacture PZT itself but purchases it in crystalline and insoluble form from suppliers who have registered the substance with the ECHA. If the device is used as intended, no re-lease of PZT can occur at any time. Risks can only occur in the case of inhalation or oral uptake (e.g. in the form of dust after mechanical processing or machining), but these can be ruled out if used as in-tended.

Legal Disclaimer

Pre-Series Versions (engineering samples)
Herein described is a pre-series version of the AE XS product. These versions are seen as engineering samples and may vary from the valid technical specifications of the product series contained in this data sheet. They are therefore not intended or fit for resale to third parties or for use in end products. Their sole purpose is internal client testing. The testing of an engineering sample may in no way replace the testing of a product series. iNDTact assumes no liability for the use of samples. The purchaser shall indemnify iNDTact from all claims arising from the use of pre-series versions.

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Application Examples
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