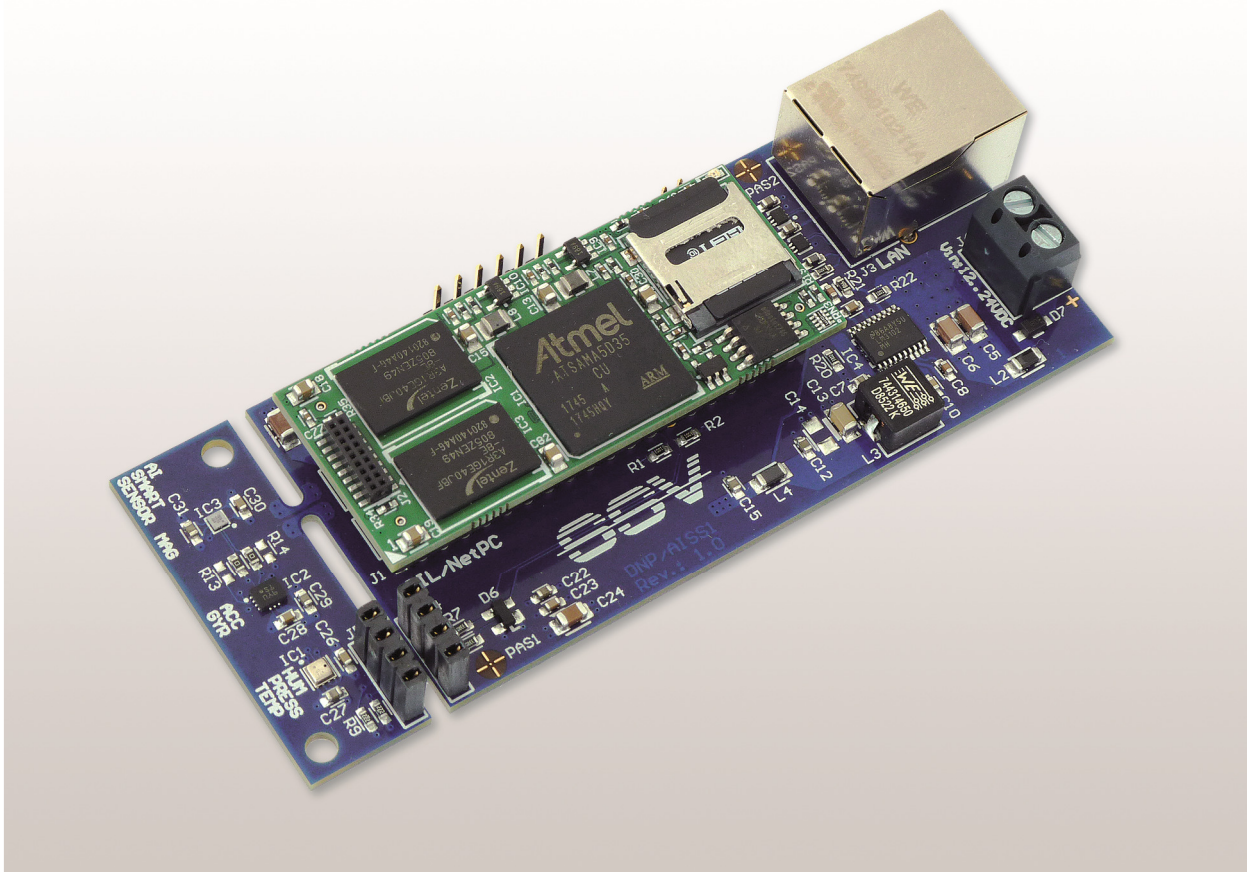


DNP/AISS1

AI Smart Sensor Evaluationboard

Hardware Reference



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1 INTRODUCTION

This document describes the basic hardware components of the DNP/AISS1 as well as the properties of the I/Os.

1.1 Safety Guidelines

Please read the following safety guidelines carefully! In case of property or personal damage by not paying attention to this document and/or by incorrect handling, we do not assume liability. In such cases any warranty claim expires.



ATTENTION!

Observe precautions for handling – electrostatic sensitive device!

- Do NOT turn on the power supply while connecting any cables, especially the power cables. This could cause damaged board components! First connect the cables and THEN turn the power supply on.
- Discharge yourself before you work with the device, e.g. by touching a heater of metal, to avoid damages.
- Stay grounded while working with the device to avoid damage through electrostatic discharge.

1.2 Conventions

Convention	Usage
bold	Important terms
<code>monospace</code>	Pathnames, internet addresses and program code

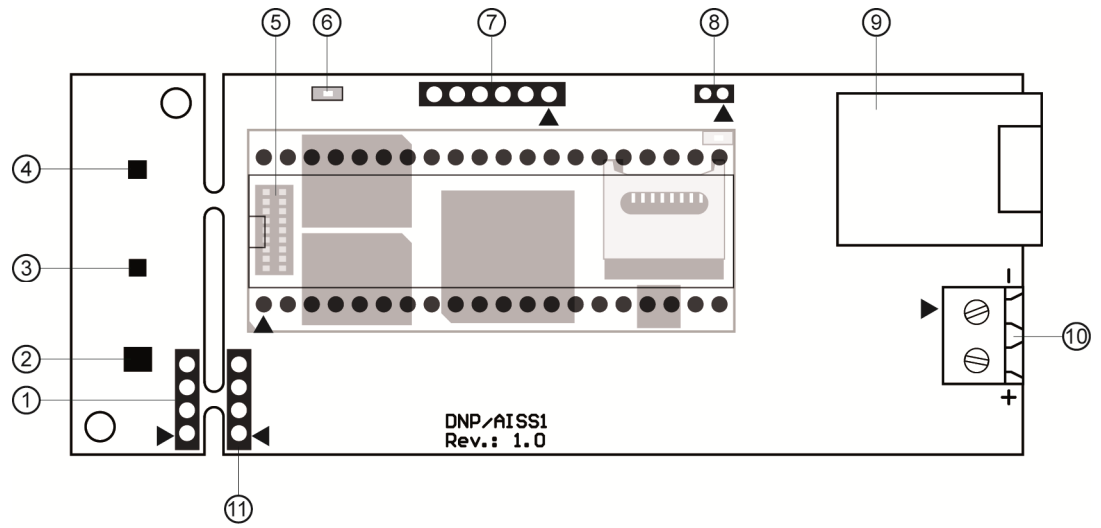
Table 1: Conventions used in this document

1.3 Features and Technical Data

Interfaces	
Power	1x 2-pin screw terminal
Ethernet	1x 10/100 Mbps (LAN 1, RJ45)
System I/O	2x I2C 4-pin connector
Debug UART	1x 6-pin connector
DIL/NetPC	1x DIL40 socket for DNP/9535
Special Functions	
Bosch BME280	Integrated environmental sensor for pressure, temperature and humidity
Bosch BMI160	Inertial measurement unit with 3-axis accelerometer and 3-axis gyroscope
Bosch BMM150	3-axis digital geomagnetic sensor
Software (on DNP/9535)	
Operating system	Embedded Linux kernel version 4.9
Web server	lighttpd with SSL support
Programming environment	Python 3, Node.js, Bash
IP address assignment	Static, DHCP, AutoIP, UPnP
Protocol stack	ARP, ICMP, IP, TCP, UDP, Telnet, FTP, HTTP, TFTP, Modbus TCP/RTU (server + client), MQTT, OPC UA and others
Security protocols	SSL/SSH, HTTPS, TLS 1.2, OpenVPN (server + client)
TCP servers	Telnet, (S)FTP, TFTP, HTTP
Firewall	netfilter + iptables
Proxy functions	HTTP(S), FTP, Telnet, SSH, generic TCP port mapping
IoT tools	Node-RED flow editor
Python data science software	NumPy, Pandas, SciPy, Matplotlib, Seaborn, Sklearn, Jupyter Notebook Kernel
Configuration	SSV/WebUI
Displays / Control Elements	
LEDs	1x User LED (yellow) 1x LAN LED for Ethernet interface LAN1
Electrical Characteristics	
Power supply	12 .. 24 VDC ±10% from external power supply
Power consumption	< 2.5 W
Mechanical Characteristics	
Mass	< 50 g
Dimensions	100 mm x 40 mm x 18 mm
Operating temperature	0 .. 70 °C
Standards and Certifications	
EMC	CE
Environmental standards	RoHS, WEEE

Table 2: Features DNP/AISS1

2 OVERVIEW



- | | |
|------------------------------------|--------------------------------|
| ① J5: I2C connector B | ⑦ J2: Debug UART connector |
| ② IC1: Bosch sensor BME280 | ⑧ JP1: RCM jumper |
| ③ IC2: Bosch sensor BMI160 | ⑨ J3: 10/100 Mbps Ethernet LAN |
| ④ IC3: Bosch sensor BMM150 | ⑩ J6: Power connector |
| ⑤ J1: DIL-40 socket (for DNP/9535) | ⑪ J4: I2C connector A |
| ⑥ D1: User LED | |

Figure 1: Overview DNP/AISS1

3 INTERFACES

3.1 DIL-40 Socket – J1

Pin	Name	Group	Function
1	---	---	Not connected
2	---	---	Not connected
3	---	---	Not connected
4	---	---	Not connected
5	---	---	Not connected
6	---	---	Not connected
7	---	---	Not connected
8	---	---	Not connected
9	---	---	Not connected
10	---	---	Not connected
11	---	---	Not connected
12	---	---	Not connected
13	I2CSCL	SIO	I2C interface serial clock line
14	I2CSDA	SIO	I2C interface serial data line
15	---	---	Not connected
16	---	---	Not connected
17	---	---	Not connected
18	---	---	Not connected
19	---	---	Not connected
20	GND	---	Ground
21	RCM	---	RCM (Remote Console Mode) Input
22	TX+	LAN	10/100 Mbps LAN, TX+ Pin
23	TX-	LAN	10/100 Mbps LAN, TX- Pin
24	RX+	LAN	10/100 Mbps LAN, RX+ Pin
25	RX-	LAN	10/100 Mbps LAN, RX- Pin
26	---	---	Not connected
27	---	---	Not connected
28	RI1	SIO	Not used
29	DTR1	SIO	Not used
30	DSR1	SIO	Not used
31	DCD1	SIO	Not used
32	RTS1	SIO	COM1 Serial Port, RTS Pin
33	CTS1	SIO	COM1 Serial Port, CTS Pin
34	TXD1	SIO	COM1 Serial Port, TXD Pin
35	RXD1	SIO	COM1 Serial Port, RXD Pin
36	LANLED	---	10/100 Mbps LAN activity LED
37	GPLED	---	General purpose LED D1
38	---	---	Not connected
39	---	---	Not connected
40	VCC3	---	3.3 Volt Power Input

Table 3: Pinout DIL40 socket

3.2 Debug UART Connector – J2

Pin	Name	Function
1	GND	Ground
2	RTS	COM1 Serial Port, RTS Pin
3	---	Not Connected
4	RXD	COM1 Serial Port, RXD Pin
5	TXD	COM1 Serial Port, TXD Pin
6	CTS	COM1 Serial Port, CTS Pin

Table 4: Pinout debug UART connector



Please note:

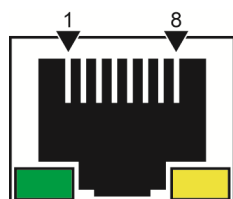
For a direct match please use an **FTDI TTL-232R-3V3** cable.

3.3 10/100 Mbps Ethernet Interface LAN1 – J3

The LAN1 interface offers one green LED which is on when there is a LAN link established and blinks when there is traffic. The yellow LED is not connected.

Pin	Name	Function
1	TX+	10/100 Mbps LAN, TX+
2	TX-	10/100 Mbps LAN, TX-
3	RX+	10/100 Mbps LAN, RX+
4	---	Not Connected
5	---	Not Connected
6	RX-	10/100 Mbps LAN, RX-
7	---	Not Connected
8	---	Not Connected

Table 5: Pinout Ethernet interface LAN1



3.4 I2C Connector A – J4

Pin	Name	Function
1	VCC3	3.3 Volt Power
2	SDA	I2C interface serial data line
3	SCL	I2C interface serial clock line
4	GND	Ground

Table 6: Pinout I2C connector A

3.5 I2C Connector B – J5

Pin	Name	Function
1	VCC3	3.3 Volt Power
2	SDA	I2C interface serial data line
3	SCL	I2C interface serial clock line
4	GND	Ground

Table 7: Pinout I2C connector B

The I2C connectors J4 and J5 are intended for a connection with the 4-wire cable included in the scope of delivery if the sensor part of the DNP/AISS1 is used as a breakout board like shown in **fig. 2**.

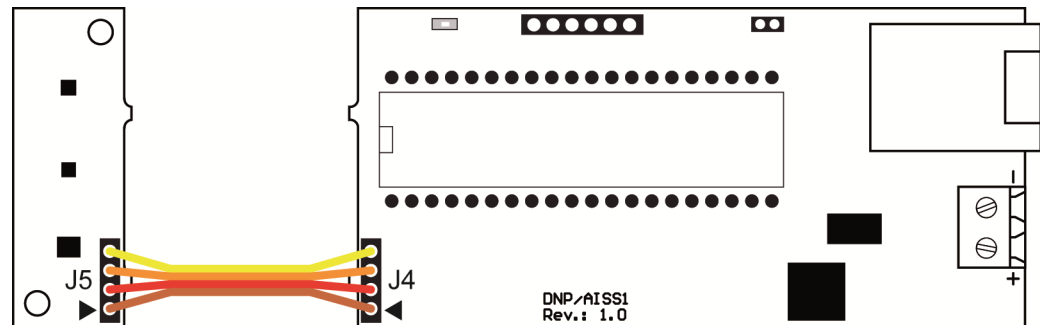


Figure 2: I2C connection between sensor part and main part of the DNP/AISS1

3.6 I2C Address Assignment

Table 8 shows the I2C addresses of the sensors.

I2C Address	Sensor
0x77	BME280 (Humidity, Pressure, Temperature)
0x69	BMI160 (3-Axis Accelerometer, 3-Axis Gyroscope)
0x13	BMM150 (3-Axis Geomagnetic Field)

Table 8: I2C address assignment

3.7 RCM Jumper – JP1

The RCM (Remote Console Mode) offers the possibility to control the DNP/AISS1 via a terminal emulation program over the UART based serial port COM1 (serial-based CLI = Command Line Interface).

To enable RCM put a jumper cap on the RCM jumper.

RCM jumper	Function
Not set (default)	Disable Remote Console Mode
Set	Enable Remote Console Mode

Table 9: RCM jumper settings

3.8 User LED – D1

The LED D1 is programmable and offers different modes. It can be configured with the Linux command `ledstat` with a command line tool like Telnet or Shell-in-a-Box.

Table 10 shows the possible modes.

Mode	Function
0	LED permanently off
1	LED permanently on
2	1 s on and 1 s off (periodic)
3	100 ms on and 1 s off (periodic)
4	300 ms on and 300 ms off (periodic)
5	100 ms on and 100 ms off (periodic)
6	1 s on and 100 ms off (periodic)
?	Shows the current LED mode
2:8	200 ms on and 800 ms off (periodic, freely selectable)

Table 10: LED D1 modes



Please note:

Because of an error in the **firmware version 3.0-7392** of the DNP/AISS1, the assignment of the following LED modes is inverted: 0 is 1 and 3 is 6.

If the command `ledstat` is executed without additional parameters, an overview of the possible modes and the usage of the command will be shown.

The following example shows the usage of the command:

```
ledstat 1 4
```

The first number ("1") selects the LED, the second number ("4") is the desired mode.

4 POWER SUPPLY

The DNP/AISS1 needs a supply voltage of 12 .. 24 VDC $\pm 10\%$ to work. Use the external power supply included in the scope of delivery to provide the DNP/AISS1 with the necessary power like shown in **figure 3**.

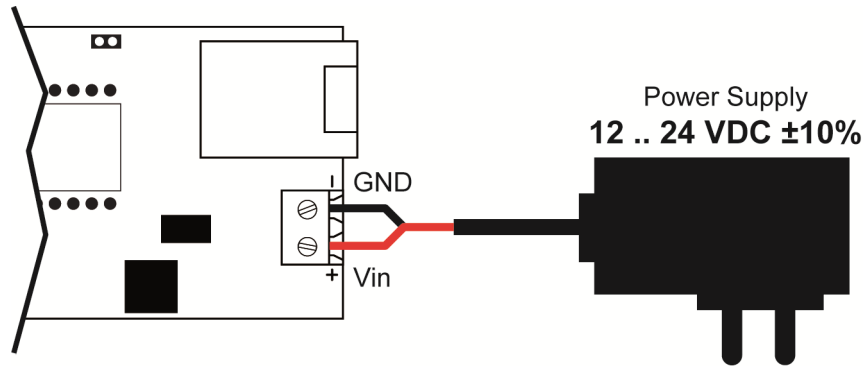


Figure 3: Power supply for the DNP/AISS1

Terminal	Signal
Plus (+)	Vin 12 .. 24 VDC $\pm 10\%$
Minus (-)	GND

Table 11: Screw terminals for power supply



CAUTION!

Providing the DNP/AISS1 with a higher voltage than the regular 12 .. 24 VDC $\pm 10\%$ could cause damaged device components!

Do NOT turn on the power supply while connecting any cables, especially the power cables. This could cause damaged device components! First connect the (power) cables and THEN turn the power supply on.

5 MECHANICAL DIMENSIONS

All length dimensions have a tolerance of 0.5 mm. The drillings are suitable for M3 screws.

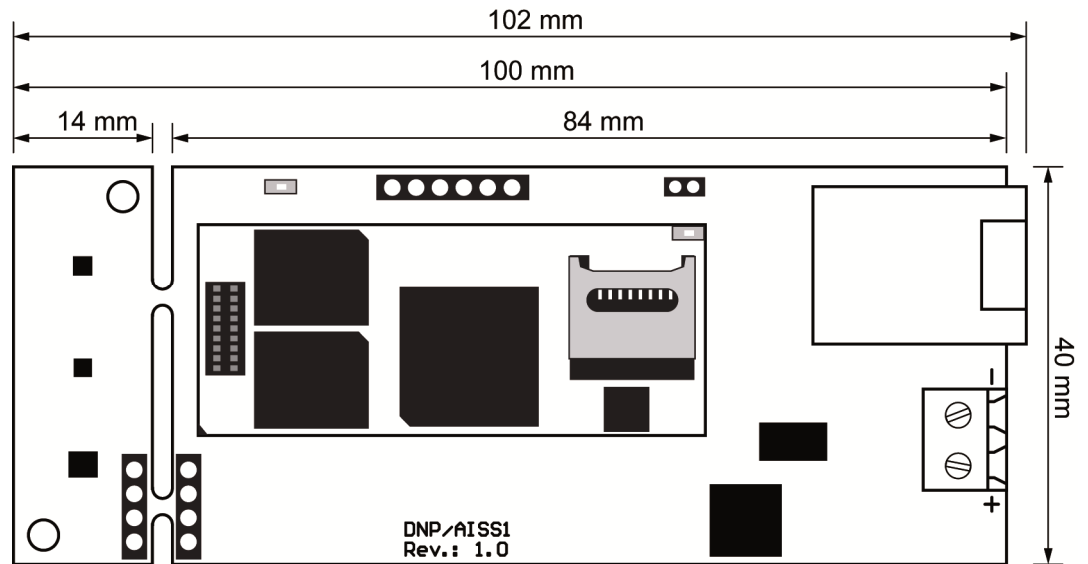


Figure 4: Mechanical dimensions of DNP/AISS1

6 HELPFUL LITERATURE

- DNP/9535 hardware reference

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