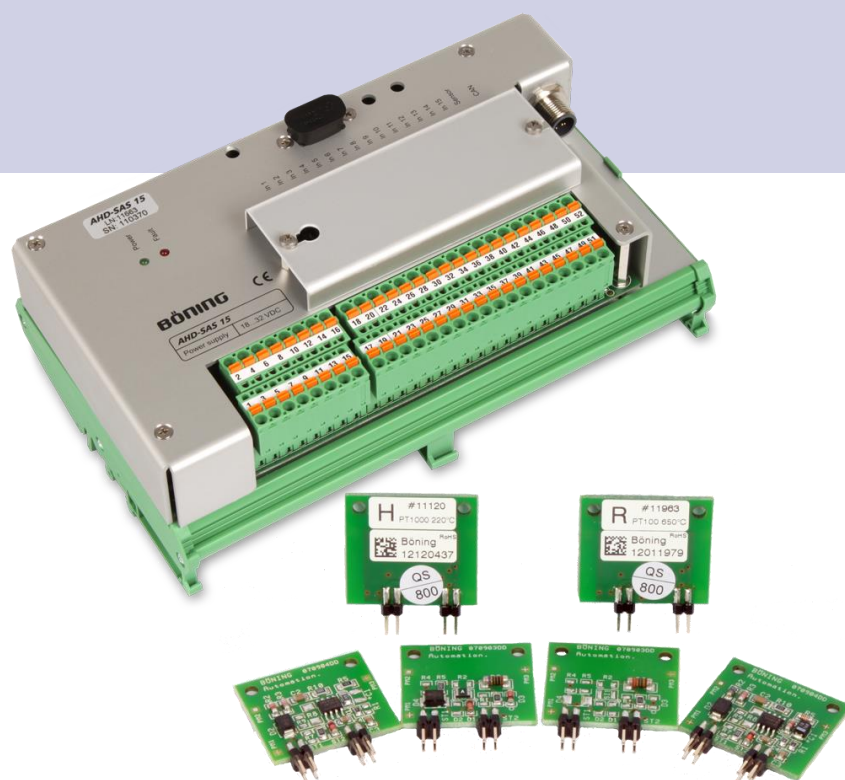


Data Station with 15 Inputs for Analog and Binary Sensors AHD-SAS 15



Operating Manual

Appendix I: Input Modules for AHD-SAS 15

Before beginning any work, read this manual as well as the Operating Manual for AHD-SAS 15!



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Change History

for Operating Manual for the AHD-SAS 15 Modules

Date	Version	Reason for Change	Page	Author
03/28/2012	AHD-SAS_15_Module_Doku_en_V1_20120328	New creation of the operating manual for the modules / translation from DE	n.a.	Pasuki, Bahram (PaB)
06/26/2012	AHD-SAS_15_Module_Doku_en_V2_20120628	Corrections modules B, C, G, I, J, K, L, P, U Rework illustrations	All modules	Pasuki, Bahram (PaB)
10/02/2012	AHD-SAS_15_Module_DOK_en_V3_20121002	Module N: Notice added Module P: Header changed	33 35	Pasuki, Bahram (PaB)
12/17/2012	AHD-SAS_15_Module_DOK_en_V4_20121217	Polarity description for sensor connection added.	14	Pasuki, Bahram (PaB)
03/19/2013	AHD-SAS_15_Module_DOK_EN_V5_20103019	Corrections in table module G, H, I, R, S	45-48	Pasuki, Bahram (PaB)
04/25/2013	AHD-SAS_15_Module_DOK_EN_V6_20134025	Corrections for module I Spelling corrected and other minor changes	45 n.a.	Patzke, Jens (PaJ)
06/11/2013	AHD-SAS_15_Module_DOK_EN_V7_20130611	Correction Transfer function Amendments Block diagram	Module R Module S Module U Module B Module C Module E Module F Module P	Pasuki, Bahram (PaB)
04/07/2014	AHD-SAS_15_Module_DOK_EN_V8_20140407	Correction Module I – Transfer function Corrections and amendments	Module I Module T Module V	Pasuki, Bahram (PaB)
31/01/2023	AHD-SAS_15_Module_DOK_EN_V9_20230131	Corrections and amendments	Modul N Modul Tables	Hof (HoA)

1 General Information

1.1 About this Manual

**Read this manual carefully before beginning any work!
It is part of the product and must be kept in the product's immediate vicinity, so that it is always available to the personnel.
Include this manual when handing the product over to third parties.**

This manual includes important product handling instructions. On the following pages, this manual describes the input modules for Data Station AHD-SAS 15 with 15 inputs for analog and binary sensors.

This manual is only valid when used with the Operating Manual for Data Station AHD-SAS 15. It is to be understood exclusively as a single unit. It is not permitted to use excerpts from this manual as the sole documentation without referring to the complete document.

Adhering to all product safety and handling instructions for the product and all connected components is a prerequisite for safe operation.

In addition, the local accident prevention and general safety rules for the device's area of operation must be observed.

The illustrations in this manual are intended to demonstrate the contents more clearly. They are not necessarily drawn to scale and can vary from the actual product in minor details.

This manual has to be regarded as a complete unit. Using of excerpts from this manual as stand-alone documentation without considering the complete manual is not allowed.

1.2 Explanation of Symbols

Warnings

In this manual, warnings are marked by symbols. The warnings are introduced by signal words indicating the degree of danger. It is important to heed these warnings and act with caution to avoid accidents, personal injury and property damage.



DANGER!

... indicates an imminently hazardous situation that can result in death or severe injury, if not avoided.



WARNING!

... indicates a potentially hazardous situation which can result in death or severe injury, if not avoided.



CAUTION!

... indicates a potentially hazardous situation that can result in minor or light injury, if not avoided.



CAUTION!

... indicates a potentially hazardous situation that can result in equipment damage, if not avoided.

Tips and Recommendations



NOTE:

... indicates useful tips and recommendations and information for efficient and error-free operation.

1.3 Limitation of Liability

All information and instructions in this manual have been compiled in consideration of current norms and regulations, the state of technology, and our knowledge and experience of many years.

The manufacturer is not responsible for damages due to:

- Noncompliance with the instructions in this manual
- Unintended use
- Employment of untrained personnel
- Unauthorized modifications
- Technical modifications
- Use of unauthorized spare parts

The actual scope of delivery can vary from the explanations and illustrations in this manual in case of customized models, special ordering options or the latest technical improvements.

In addition, the agreed upon obligations in the delivery contract, the general terms and conditions, the manufacturer's delivery terms and the legal regulations current at the contract signing are in force.

We reserve the right to make changes to improve the device's service properties and to further develop the product.

1.4 Copyright

This operation manual is a confidential document. It is intended solely for those persons working with the product. It is not permitted to hand this manual over to third parties without the manufacturer's prior written permission.



NOTE:

The information, texts, drawings, illustrations, and other representations in this manual are protected by copyright laws and are subject to industrial property rights. Any misuse is subject to prosecution.

It is not permitted to duplicate this manual in any type or form – even in excerpts – or use and/or communicate its contents without the manufacturer's written permission. Contraventions are liable to compensation. We reserve other rights.

1.5 Spare Parts



WARNING!

Risk of injury from incorrect spare parts!

Incorrect or defective spare parts can cause damages, malfunctions or complete failure and jeopardize the vessel's safety.

Therefore:

- Only use the manufacturer's original spare parts.

Please order spare parts from a contracted reseller or directly from the manufacturer. Refer to page 2 for the address.

1.6 Warranty Terms

The warranty terms can be found in the General Terms and Conditions (GTC) of the manufacturer's sales documents.

1.7 Customer Care

Our customer service department is available to assist you with technical information.

Information about the corresponding customer contact is always accessible via telephone, fax, e-mail, or the Internet. Please refer to page 2 for the manufacturer's address.

In addition, our staff are always interested in new information and experiences resulting from the use of the product which can be used to further improve our products.

2 Safety

This chapter provides an overview of all important safety aspects for optimal protection of the personnel as well as safe and error-free operation.

Noncompliance with the handling and safety instructions listed in this manual can cause significant hazards.

2.1 Operator's Responsibilities

This product is intended for commercial use. Therefore its operation is subject legal workplace safety regulations.

In addition to the workplace safety instructions in this manual, the current safety, accident prevention, and environmental protection regulations for the product's place of use must be observed. Especially:

- The operator must stay abreast of the current workplace safety regulations and determine through a risk assessment any additional hazards resulting from the special working conditions of the product's place of use. He must implement these in the form of operating instructions for the product's use.
- During the product's entire period of operation, the operator must verify that his operating instructions are in compliance with current regulations and revise them, if necessary.
- The operator must clearly regulate and define areas of responsibility for installation, operation, maintenance and cleaning.
- The operator must ensure that all employees handling the product have read and understood this manual.
- In addition, he must train the personnel in regular intervals and inform them about any dangers.

Furthermore, the operator is responsible for always keeping the product in perfect working condition.

2.2 Personnel Requirements

2.2.1 Qualifications



WARNING!

Risk of injury from insufficient qualification!

Insufficient qualification can lead to significant personal injury and equipment damage.

Therefore:

- Only allow qualified personnel to do any work.

This manual lists the following qualifications for various areas of activity.

- **Trained Person**
has been trained by the operator through an orientation for the assigned tasks and has been informed about possible hazards from improper execution.
- **Specialist**
is able to execute the assigned tasks and recognize and avoid potential hazards independently due to formal training, knowledge and experience, as well as knowledge of the situational norms and regulations.
- **Electrician**
is able to work on electrical systems and recognize and avoid potential hazards independently due to formal training, knowledge and experience, as well as knowledge of the situational norms and regulations.
The electrician is trained for the specific work site in which he is active and knows the relevant norms and regulations.

Only those persons who can be expected to do their work reliably are permitted as personnel. Persons, whose responsiveness is diminished by e.g. drugs, alcohol, or medication, are not permitted.

- Observe the local age and profession specific regulations when selecting the personnel.

2.2.2 Unauthorized Persons



WARNING! Danger for unauthorized persons!

Unauthorized persons who do not meet the requirements described in this manual do not know the occupational hazards.

Therefore:

- Keep unauthorized persons out of the work area.
- When in doubt, approach persons and remove them from the work area.
- Interrupt all work as long as unauthorized persons remain in the work area.

2.3 Intended Use

The modules for Data Station AHD-SAS 15 have been exclusively designed and constructed for the purpose described here.

Each of the modules described in this document can only be used for a specific purpose in connection with Data Station AHD-SAS 15. For this, the respective module must be inserted into the accordingly configured slot of the data station.



WARNING!

Danger from unintended use!

Any use of the product beyond and/or other its intended use can cause hazardous situations.

Therefore:

- Only use the product as intended.
- Strictly adhere to all instructions in this manual.
- In particular, avoid the following unintended use:
 - Using a supply voltage other than the one indicated in this manual

Any claims for damages resulting from unintended use are void.

The operator is solely responsible for any damages resulting from unintended use.



WARNING!

Danger from improper operation of the product!

Product failure or malfunctions can lead to personal injury or equipment damage in the overall system.

Therefore:

- Although the product itself is not dangerous, the effects of failures or malfunctions on the overall system must be considered.
- Always discontinue using the products when they develop smoke or abnormal heat.



CAUTION!

The inserted modules must not be pulled out when the unit is running.

By the same token, Data Station AHD-SAS 15 may only be operated when all module slots are filled with a module according to the configuration.



CAUTION!

Data Station AHD-SAS 15 may only be operated when configured.

3 Design and Function of the Modules

3.1 General Function

Data Station AHD-SAS 15 includes 15 inputs for capturing analog or binary signals.

The following input quantities can be processed:

- Voltage metering (0-10V)
- Current measurement (0-25mA)
- Heat resistance measurement (PT100; PT1000)
- NiCrNi- thermocouples
- Binary input (contact or switched voltage)

Pluggable analog input module cards (analog modules), that are distributed over the 15 input slots according to the given project specific configuration, are available to capture the various input measurands. In this process, the type and sequence of the analog modules used for Data Station AHD-SAS 15 is freely configurable.

For safety reasons, inputs that are not configured are filled with a so-called blank module.

Every sensor type can be connected directly to the data station via the pluggable terminal strip.

The slots of the 15 input channels (In1 – In15) of Data Station AHD-SAS 15 are filled with the analog modules for the corresponding input measurands according to the given project specific configuration.

Analog modules are divided between active and passive modules. Active modules include an amplifier element for signal conditioning.

3.2 Name Plate

BÖNING **CE**

AHD-SAS 15	
Power supply	18...32 VDC

The module's name plates are located on the front side of each module and contain the following information:

- Manufacturer
- Serial number (may be on separate label)
- Module designation

Design and Function of the Modules

3.3 Sensor Connection – Application of the Analog Modules

To connect a sensor, Data Station AHD-SAS 15 features two terminals each for each input channel:

- Terminal A: uneven terminal number (positive pole)
- Terminal B: even terminal number (negative pole)



CAUTION!

Observe the polarity when connecting the sensors!

A voltage reversal leads to malfunction!

All sensor types can be connected to the data station so that in general, no additional intermediate terminal strips are required.

The input modules are freely configurable so that in principle, any module can be inserted into any slot, independently of the module type.

In this process, inputs that are not configured are filled with a so-called blank module (Module O) for safety reasons.

4 Installation and Initial Startup

4.1 Safety

Personnel

- Installation and initial startup may only be performed by specially trained personnel.
- Only electricians may work on the electrical system.

Basic Information



Caution!

Risk of injury from improper installation and initial startup!

Improper installation and initial startup can cause personal injury and equipment damage.

Therefore:

- Ensure sufficient installation space before beginning any work.
- Handle parts with exposed sharp edges carefully.
- Observe orderliness and cleanliness in the work area!
- Install parts properly.

4.2 Installation

General Information



CAUTION!

Equipment damage from improper handling and selection of installation locations!

Installing the products in locations that do not meet the requirements of the technical specifications and improper handling can lead to system errors and equipment damage.

Therefore:

- Observe the products' technical specifications when selecting the installation location.
- Only trained personnel may perform the installation.
- Never install the products in areas that are not of the required protection type.
- Never install the products in extreme high or low temperature areas.
- Never install the products on ceilings that cannot support their weight.
- Never bump or shake the products vigorously.



CAUTION!

During installation, ensure that varying voltage systems (24 V power supply, starter batteries, shore power) may not be connected to the ground side of the AHD-SAS 15 (insulation fault).

If another earth connection exists in the ship's electrical system, very high equalization currents can be generated, which inevitably lead to the components' destruction.

In this case, always use the insulated modules.

Installation Requirements

- All required connecting cables are of the required version, equipped with plug connectors according to technical specifications or project drawings, led to the intended installation location, and are properly installed and stripped. Free cables are of sufficient installation length and are secured against short circuit and earth fault.
- The product is not connected to the supply voltage and switched off-circuit.

Installation and Initial Startup

Installation

1. Install the AHD-SAS 15 properly in the intended installation location according to technical specifications or project drawings.



NOTE:

The data stations are delivered preconfigured according to the project specifications, when systems are shipped. This encompasses the setting of the correct system address and the loading with the required analog modules. When several data stations are integrated into the system, it is imperative to observe the correct selection of the installation location for the configured unit.

You may need to adjust this configuration when modifying the project specific configuration.

2. Wire all inputs and outputs according to the project drawings.



CAUTION!

Equipment damage from incorrect cable connections!

Improperly connected cables can cause system errors and equipment damages.

Therefore:

- Always verify cable and wire designations before connecting them. Check for secure seating of the connecting wires in the terminals.
- To avoid short circuits, verify that all wires are connected in the terminal.
- To not over tighten the terminal clamps.
- When using pluggable terminal strips or plug connectors, it is imperative to ensure insertion in the correct socket and secure seating.

3. Test the system for earth/ground fault.



CAUTION!

System failure or malfunction!

During earth/ground fault, incorrect data can be transmitted and lead to overall system failure or malfunctions.

Therefore:

Immediately correct any discovered earth/ground fault.

4.3 Installing the Analog Modules

Normally, the data stations are already equipped with the analog module factory-side, based on the project specific configuration. If an analog module must be moved or replaced, due to a change in the configuration or defect, the analog modules' covering must be removed first to gain access to the module slots.



CAUTION!

The inserted modules may not be removed when the device is running, since this leads to undesirable effects and incorrect sensor data.

By the same token, Data Station SAS-AHD 15 may only be operated when all module slots are filled with a module according to the configuration. Slots that are not configured must be filled with a blank module.

A module may only be inserted into the slot for which it was configured.

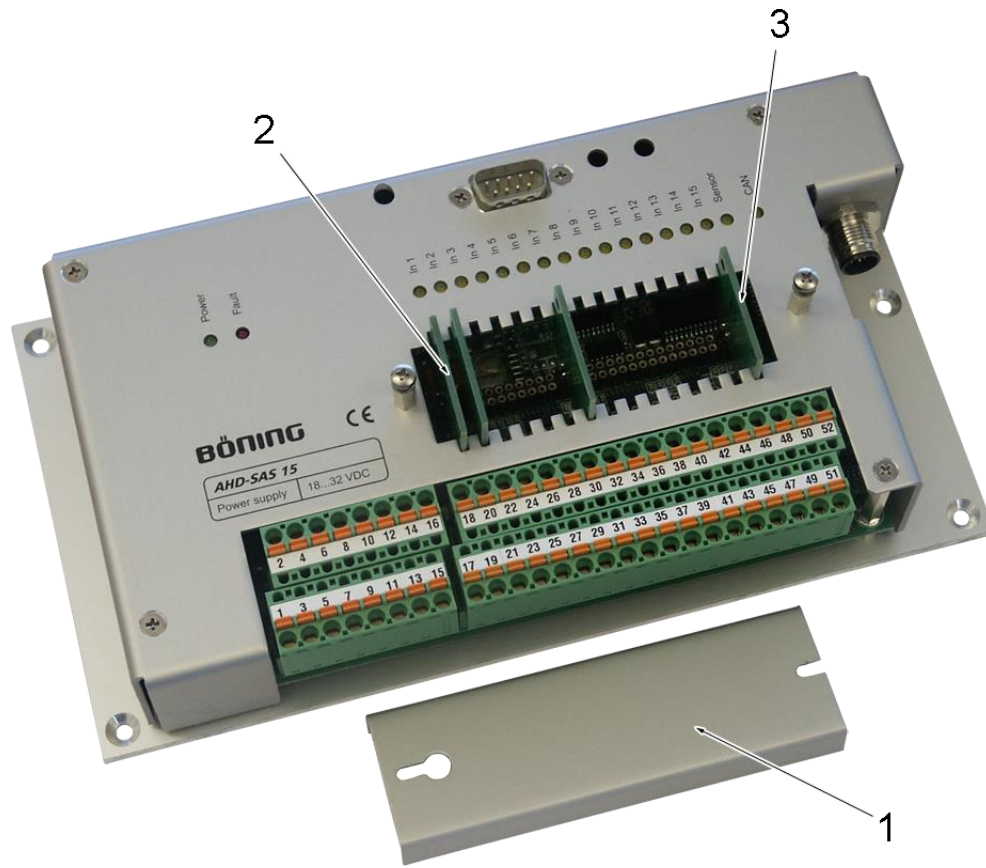
Defective, missing or incorrectly inserted modules cause undesirable effects and falsified sensor data.



CAUTION!

Data Station AHD-SAS 15 may only be operated when configured.

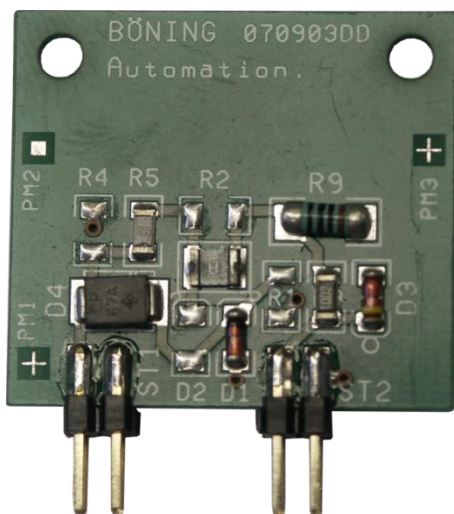
Installation and Initial Startup



Arrangement of analog modules / slots:

1. Analog module covering
2. Slot for analog module, input channel 1
3. Slot for analog module, input channel 15

Analog Module (Example)



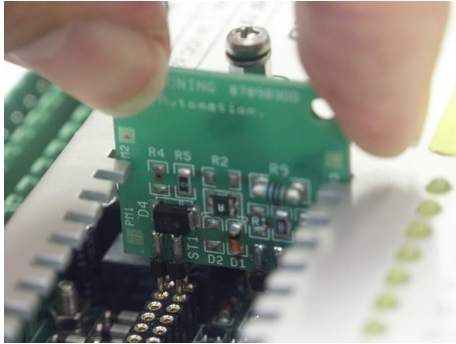
The various modules consist of uniformly shaped, but variously mounted electronic cards, depending on the input measurand to be captured.

Two 4-pin headers are located on the bottom side the modules that, combined with the countersunk card guides in the cover hood and the associated socket connector strip of Data Station AHD-SAS 15, unambiguously determine the module's position.

The analog module type can be identified either by a corresponding label or the analog module's code letter on the back of the module.

Installation and Initial Startup

Installation of Analog Modules



CAUTION!

To avoid damages or incorrect sensor values, the modules may only be inserted and removed when the device is powered off. Therefore, Data Station AHD-SAS 15 must be disconnected from the power supply before beginning any work.

After selecting the correct type for the desired input according to the project specific configuration, the analog modules are installed as follows:

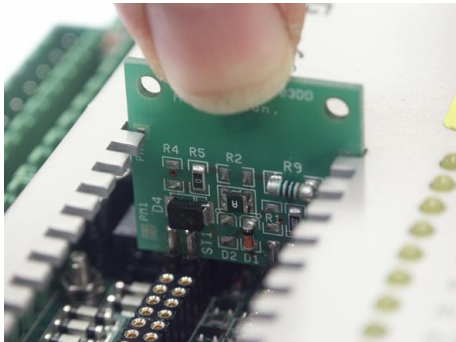
1. Identify the input channel, using the markings on the cover hood (In1 ... In15, example: channel In1).
2. Check the plug direction, referring to the pin and socket assignment.
3. Insert the analog module into the input channel's corresponding card guide.
4. Verify that all module pins fit into the electronic card's sockets.



NOTE:

We recommend inserting the modules, beginning with input channel 15 and working toward input channel 1.

Unused inputs must be filled with a blank module (module type O).



5. Use light pressure from above to push the analog module onto the connector strip up to the stop.
6. Check the seating of the pins.
7. Reinstall the analog module's covering after completing the installation.
8. Reestablish the power supply for Data Station AHD-SAS 15.

The modules are uninstalled in reverse order.

5 Input-Modules for Data Station AHD-SAS 15

Overview

Code ¹⁾	Anwendung	Messung ²⁾	Bemerkung
B	Sensor with current output (2-pole)	Current [mA]	Sensor is supplied via AHD-SAS 15
C	Sensor with current output (4-pole)	Current [mA]	Sensor is supplied via separate sources
E	Sensor with contact / push button (plus signal)	Binary value [0 / 1]	Switched plus (same potential as system)
F	Sensor with contact / push button (potential-free)	Binary value [0 / 1]	Potential-free contact, switched minus (same potential as system)
G	PT100 temperature sensor (max. 220°C / 2-pole)	Temperature [°C]	Without sensor-fault monitoring
	PT100 temperature sensor (max. 220°C / 2-pole)	Temperature [°C]	With sensor-fault monitoring (evaluation mode "type" = 2)
	Resistance sensor with free characteristic curve (max. 183 Ohms)	Resistance [Ohm]	Specify characteristic curve (evaluation mode "type" = 3)
H	PT1000 temperature sensor (max. 220°C / 2-pole)	Temperature [°C]	Without sensor-fault monitoring
	PT1000 temperature sensor (max. 220°C / 2-pole)	Temperature [°C]	With sensor-fault monitoring (evaluation mode "type" = 2)
	Resistance sensor with free characteristic curve (max. 1830 Ohms)	Resistance [Ohm]	Specify characteristic curve (evaluation mode "type" = 3)
I	NiCrNi temperature sensor (max. 950°C)	Temperature [°C]	Define channel for compensation of ambient temperature!
J	Voltage measurement (max. 6 volts)	Voltage [V]	Measurement against system ground
K	Voltage measurement (max. 12 volts)	Voltage [V]	Measurement against system ground
L	Voltage measurement (max. 36 volts)	Voltage [V]	Replace by T-module in new installations
M	Resistance sensor (Manufact. Racor / Parker)	Raw Value [0..4095]	Water detection
N	Sensor with Frequency signal (max. 8000 Hz)	Frequency [Hz]	Galvanically isolated input (e.g. Speed Pick-Up)
O	Place holder (no sensor)	Raw Value [0..4095]	Without function
P	Sensor with current output (2-pole)	Current [mA]	Galvanically isolated input
PV	no longer available, replace with V-module		
R	PT100 temperature sensor (max. 650°C / 2-pole)	Temperature [°C]	Without sensor-fault monitoring
	PT100 temperature sensor (max. 650°C / 2-pole)	Temperature [°C]	With sensor-fault monitoring (evaluation mode "type" = 2)
	Resistance sensor with free characteristic (max. 330 Ohm)	Resistance [Ohm]	Specify characteristic curve (evaluation mode "type" = 3)
S	PT1000 temperature sensor (max. 650°C / 2-pole)	Temperature [°C]	Without sensor-fault monitoring
	PT1000 temperature sensor (max. 650°C / 2-pole)	Temperature [°C]	With sensor-fault monitoring (evaluation mode "type" = 2)
	Resistance sensor via free characteristic (max. 3300Ohm)	Resistance [Ohm]	Specify characteristic curve (evaluation mode "type" = 3)

Input-Modules for Data Station AHD-SAS 15

Code ¹⁾	Anwendung	Messung ²⁾	Bemerkung
T	Voltage measurement (max. 44.9 Volts)	Voltage [V]	Measurement to system ground
U	General resistance sensor up to 400 Ohm (specified for the Range 15...200 Ohm)	Resistance [Ohm]	Galvanically isolated input ³⁾
U1	Voltage measurement (0...100 mV)	Voltage [mV]	Galvanically isolated input ³⁾
U2	Voltage measurement (0...600 mV)	Voltage [mV]	Galvanically isolated input ³⁾
U3	Voltage measurement (0...2000 mV)	Voltage [mV]	Galvanically isolated input ³⁾
V	Voltage measurement (max. 44.9 Volts)	Voltage [V]	Galvanically isolated input (min. voltage = 7 Volt)

¹⁾ The typical sensor or measuring range is indicated.

In connection with AHD-DPU 9 the modules "G", "H", "R" or "S" can be operated in three different ways (selection via Device-Config).

The following applies for U1...U3: When evaluating within the AHD-SAS 15, the raw value output must be considered (= 4000 in the upper measuring range).

²⁾ Output value and unit depend on the selected input module.

³⁾ Module requires 2 slots on AHD-SAS 15 due to its size



NOTE!

In the following module descriptions the designations "Passive" and "Active" are used.

While passive modules work without active amplification, active modules have an internal measuring amplifier for further processing.

Supply terminals are indicated as follows:

- "UBat" refers to the on-board voltage of 24VDC (+30%/-25%).
- "+24V" refers to the device internally generated stabilized voltage.

The module connection terminals for the sensors are marked "A" and "B". The following applies:

- A = odd terminal
- B = even terminal

Input-Modules for Data Station AHD-SAS 15

5.1 Module B – Current 20 mA 2pin

Analog module “B” is used to connect sensors with a 4 – 20 mA current signal output without an external power supply (2-pin connection). Data Station AHD-SAS 15 is also the power supply for the sensor. Analog module “B” functions in a measuring range of 0 to 25 mA.



NOTE!

A short circuit between the lines may be recorded as a valid measured value under certain circumstances.

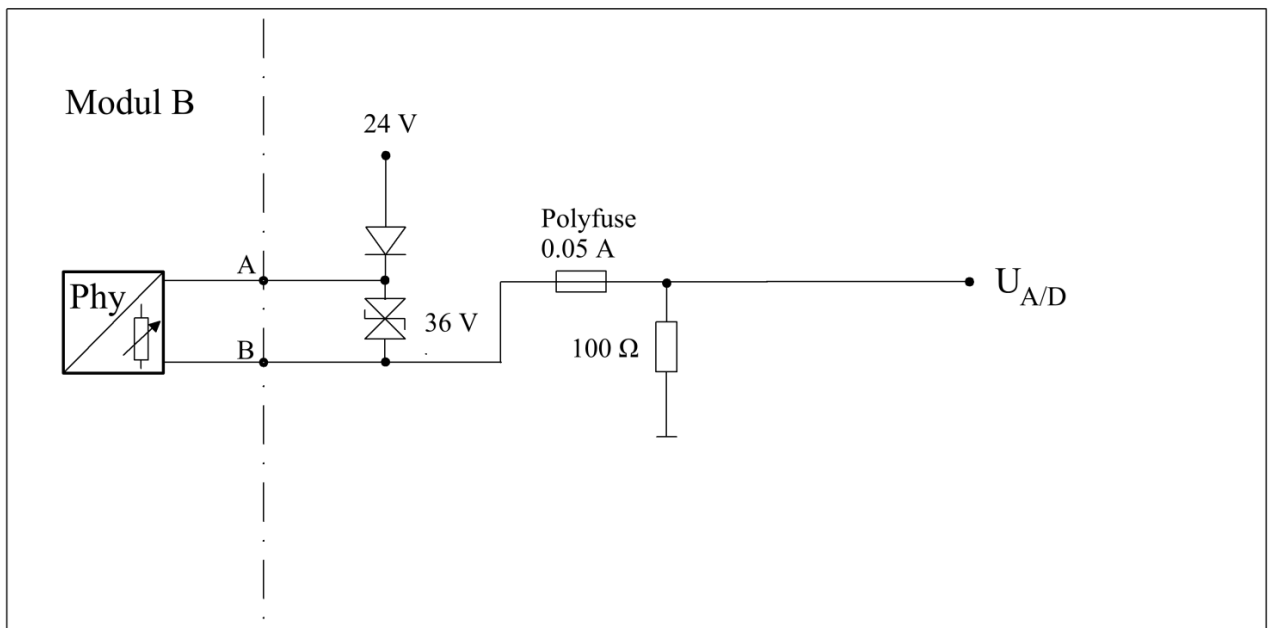


Fig.: Block diagram Module B

Measured range:	$0.1 \leq I_x \leq 40.95$	[mA]
Transfer function:	$A/D = I_x * 100$	[bit]
Range of error:	$4 - 20 \text{ mA} \triangleq E_{abs} < 0.1 \%$	

Maximum load (for $100\Omega + \text{Polyfuse } (3,6\Omega \text{ to } 50\Omega) = 150\Omega$

At 20mA ~ 1100Ω

At 22mA ~ 990Ω

At 40mA ~ 500Ω

Input short-circuit-proof, reverse polarity protected

Input-Modules for Data Station AHD-SAS 15

5.2 Module C – Power Current 20 mA 4pol.

Use analog module “C” to connect sensors with a 4 – 20 mA current signal output and external power supply (4-pin connection). The sensor's power supply is external. In this process, analog module can capture a measured range of 0 to 25 mA.



NOTE:

A short-circuit to the battery may under circumstances be recognized as a valid measurement value.

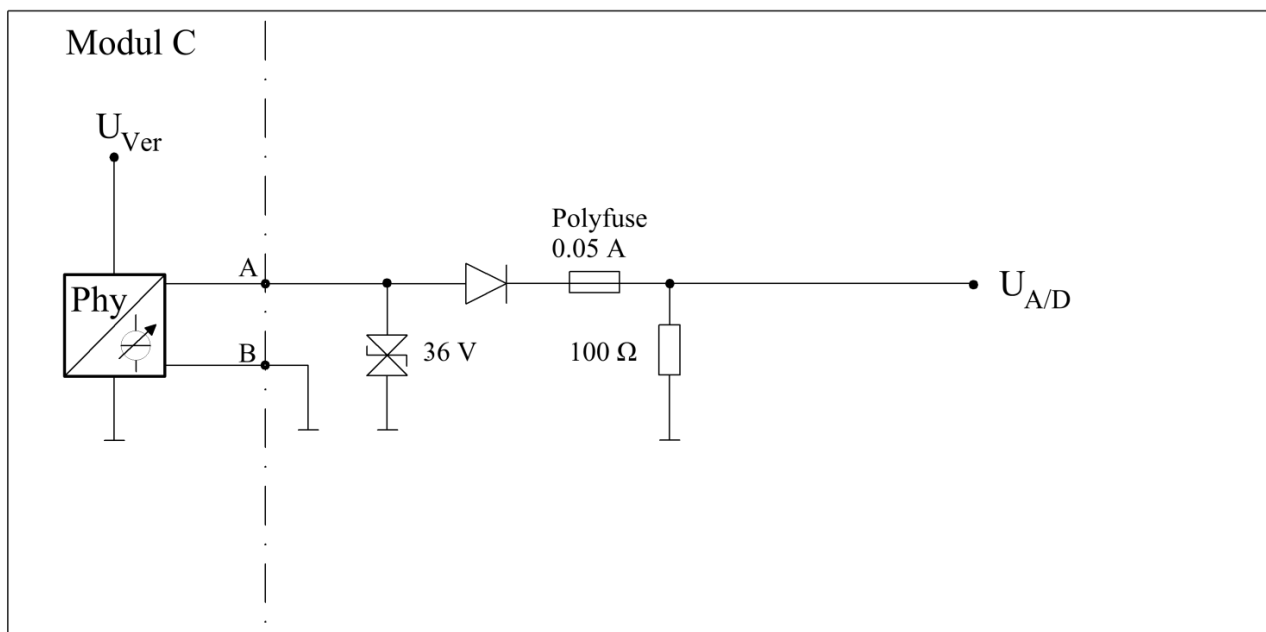


Fig.: Block diagram Module C

Measured range: $0.1 \leq I_x \leq 40.95$ [mA]

Transfer function: $A/D = I_x * 100$ [bit]

Range of error: $4 - 20 \text{ mA} \triangleq E_{\text{abs}} < 0.1 \%$

Load for:

100Ω + Polyfuse (3,6Ω to 50Ω): min: 103,6Ω
max: 150Ω

Input short-circuit-proof, reverse polarity protected

Input-Modules for Data Station AHD-SAS 15

5.3 Module E – Contact Plus Switched

Use analog module “E” to connect sensors that switch the voltage potential U_{Bat+} of the ship alarm system via a contact. Analog module “E” evaluates voltages as a closed contact as follows:

- Under 5V logical 0
- Above 8V logical 1

Values between 5V and 8V are not within specification and should therefore be avoided.

Contact switches U_{Bat+} passive.

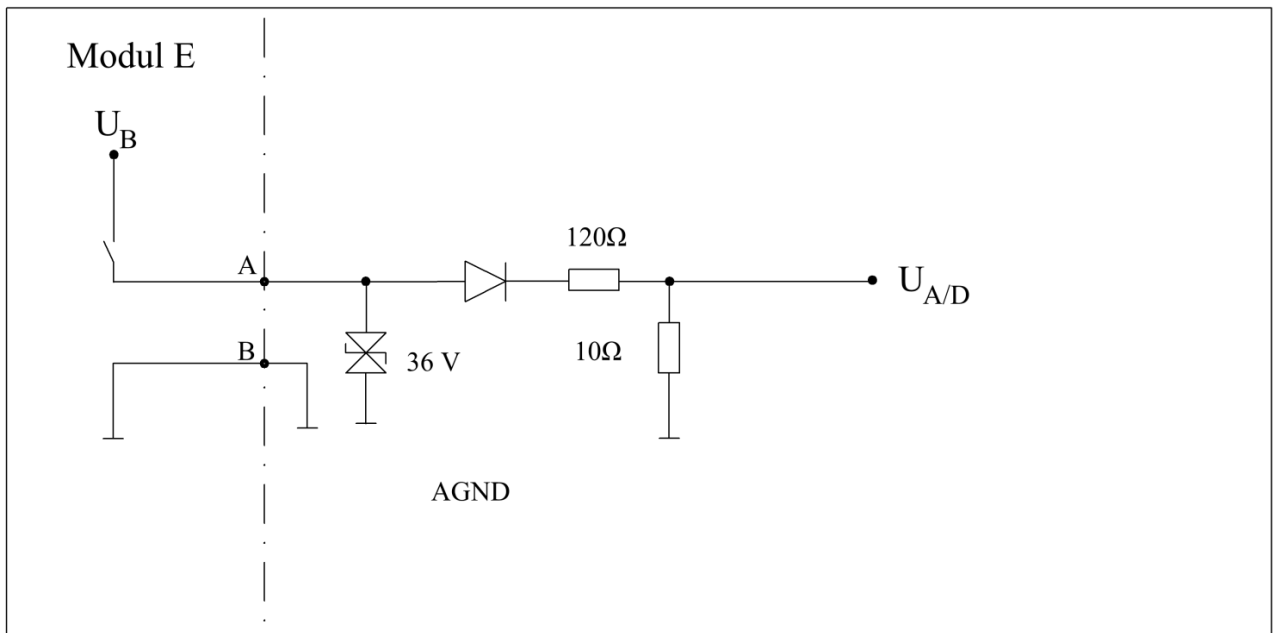


Fig.: Block diagram Module E

Transmit function: If $A/D > 500$ bit, then measured value = 1

Measured range: N/A

Range of error: N/A

Evaluation of switching status takes place internally by firm

Input resistance 130kΩ; short-circuit-proof

The separation between AGND and battery / PE is then neutralized.



NOTE:

To ensure the capture of the contact switching procedure, the data station's supply voltage should be used as the switching voltage. When connected to higher voltages than the Data Station AHD-SAS 15's specified supply voltage, the analog module's measurement input could be destroyed under certain circumstances.

Input-Modules for Data Station AHD-SAS 15

5.4 Module F – Contact Potential-Free

Use analog module “F” to connect sensors switching a potential-free contact. The internal device minus potential is switched via the potential free contact and captured as a closed contact by analog module “F.”

1. Potential-free contact
2. Contact switches to minus

- Under 5V logical 0
- Above 8V logical 1

Values between 5V and 8V are not within specification and should therefore be avoided.

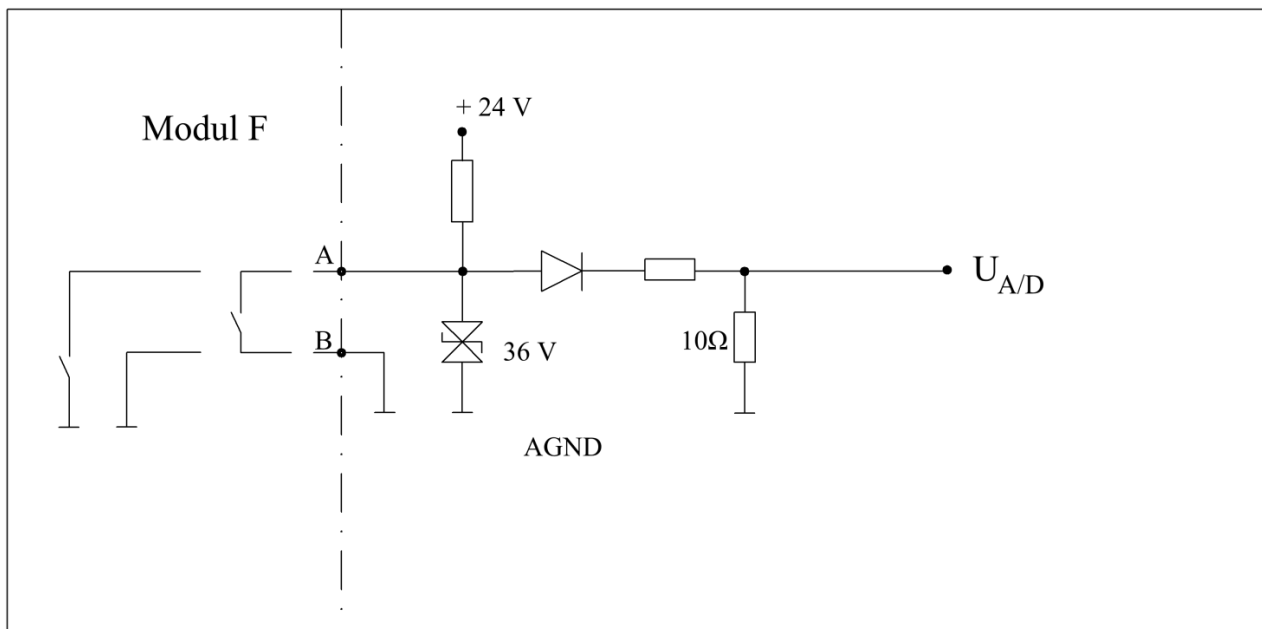


Fig.: Block diagram Module F

Transmit function:	If A/D > 500 bit, then measured value = 0
Measured range:	N/A
Range of error:	N/A

Evaluation of switching status takes place internally by firm

Current through switch ~ 5mA

If contact switches to GND, B must be connected to GND of the system.

The separation between AGND and battery / PE is then neutralized.

Input-Modules for Data Station AHD-SAS 15

5.5 Module G1...G3 – Resistor PT100 / max. 220 °C

The analog module "G" is used to connect PT100 resistance sensors. It can detect a temperature up to max. 220°C, there are 3 versions available. The power supply of the resistance sensor is done via the data station AHD-SAS 15.

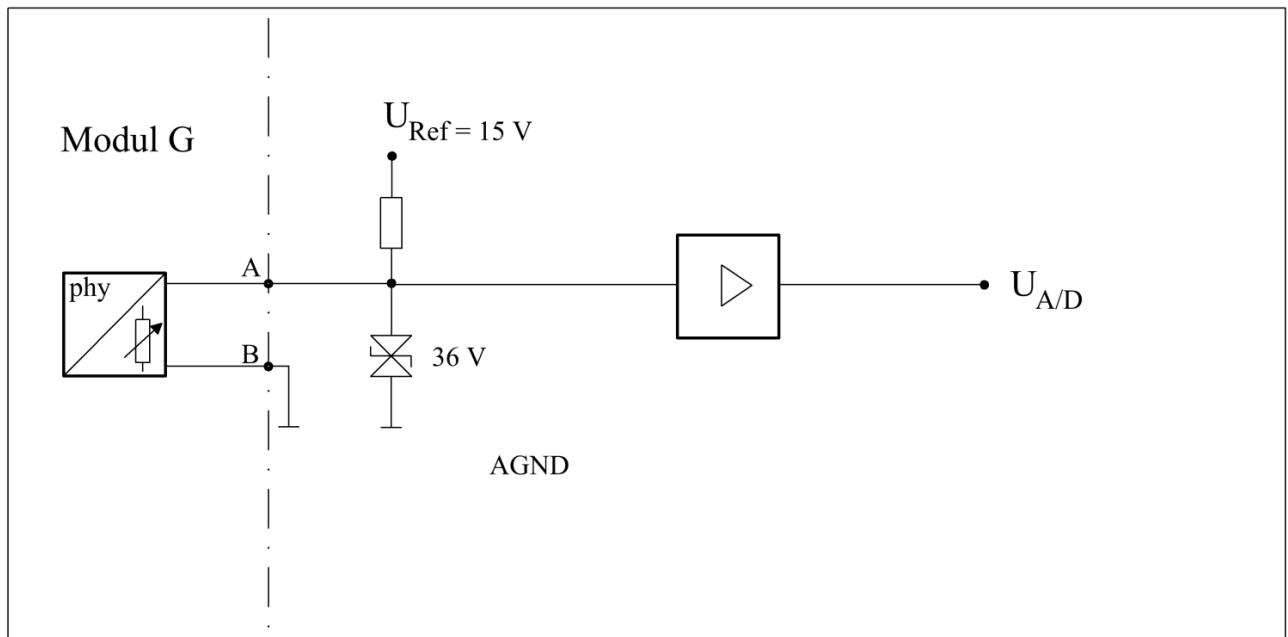


Fig.: Block diagram Module G

Measured value:	$0.26 \leq R_x \leq 185.0$	[Ω]
Transmit function:	$A/D = R_x / (R_x + 1870) * 14.99V * 1000 * 3$	[bit]
Range of error:	$20 - 185 \Omega \triangleq E_{abs} < 0.1 \%$	
Current through PT100:	max 8mA	
Max. input voltage:	36V (damage) 1.67V (function)	

Input-Modules for Data Station AHD-SAS 15

Module variants:

Version G1 for **PT100** without sensor error monitoring

Measuring range min = -80°C

Measuring range max = $+220^{\circ}\text{C}$

Version G2 for **PT100** with sensor error monitoring

Measuring range min = -80°C

Measuring range max = $+220^{\circ}\text{C}$

Version G3 for alternative resistance sensors

Measuring range min = 68 Ohm

Measuring range max = 183 Ohm

The sensor characteristic curve is set via Device-Config under "Characteristic Curve"!

5.6 Module H1...H3 – Resistor PT1000 / max. 220°C

The analog module "H" is used to connect PT1000 resistance sensors. It can detect a temperature up to max. 220°C , there are 3 versions available. The power supply of the resistance sensor is done via the data station AHD-SAS 15.

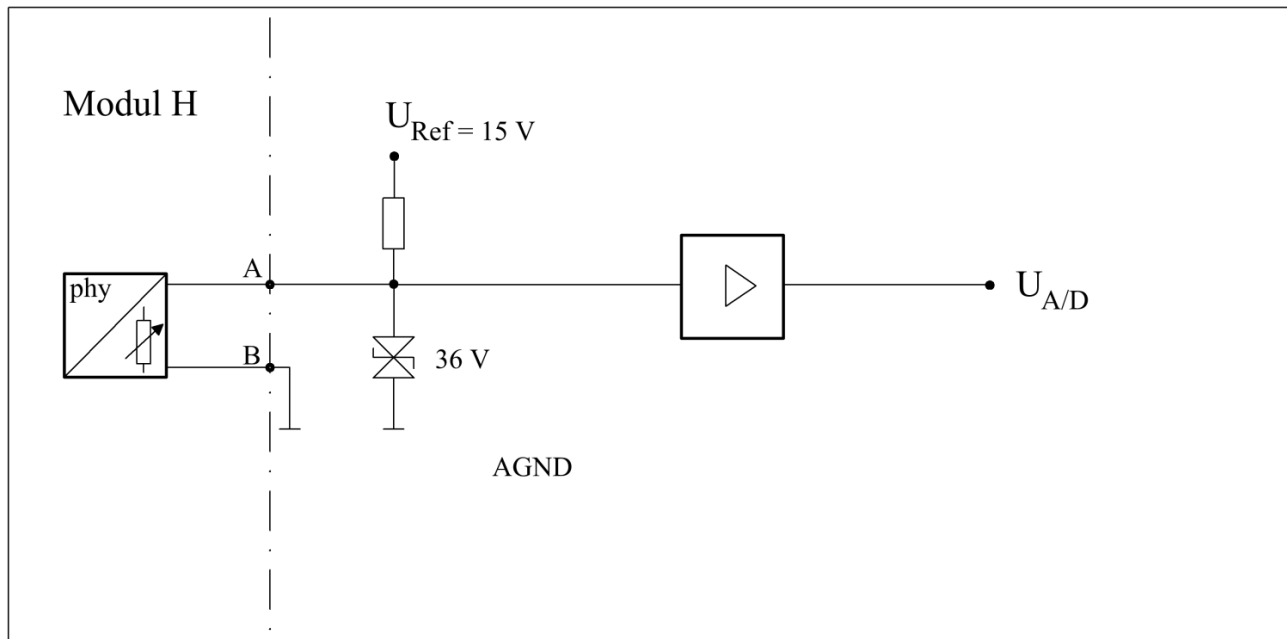


Fig.: Block diagram Module H

Input-Modules for Data Station AHD-SAS 15

Measured range:	$2.0 \leq R_x \leq 1860.0$	[Ω]
Transmit function:	$A/D = R_x / (R_x + 4990) * 14.99V * 1000$	[bit]
Range of error:	$20 - 1860 \Omega \triangleq E_{abs} < 0.1 \%$	
Current through PT1000:	max 8mA	
Max. input voltage:	36V (damage) 5V (function)	

Module variants:

Version H1 for **PT1000** without sensor error monitoring
 Measuring range min = -80°C
 Measuring range max = +220°C

Version H2 for **PT1000** with sensor error monitoring
 Measuring range min = -80°C
 Measuring range max = +220°C

Version H3 for alternative resistance sensors
 Measuring range min = 680 Ohm
 Measuring range max = 1830 Ohm

The sensor characteristic curve is set via Device-Config under "Characteristic Curve"!

Input-Modules for Data Station AHD-SAS 15

5.7 Module I – Voltage NiCrNi

Use analog module “I” to connect sensors with NiCrNi thermocouples. When connecting a sensor directly to a NiCrNi thermocouple, the environmental temperature at the input terminal clamps must also be measured to compensate for the thermal transfer, so that the actual sensor temperature can be determined. A precision resistor RC1000, which can be directly clamped to a PT1000 input (analog module “H”), is available for this.

The module is laid out for the capture of a wide range of thermovoltages.

When using a sensor with thermocouple NiCrNi, type K, the measured range is between approximately 0°C and 950°C.

This module can alternatively be used to measure a general voltage in the range of 3 - 4083µV.

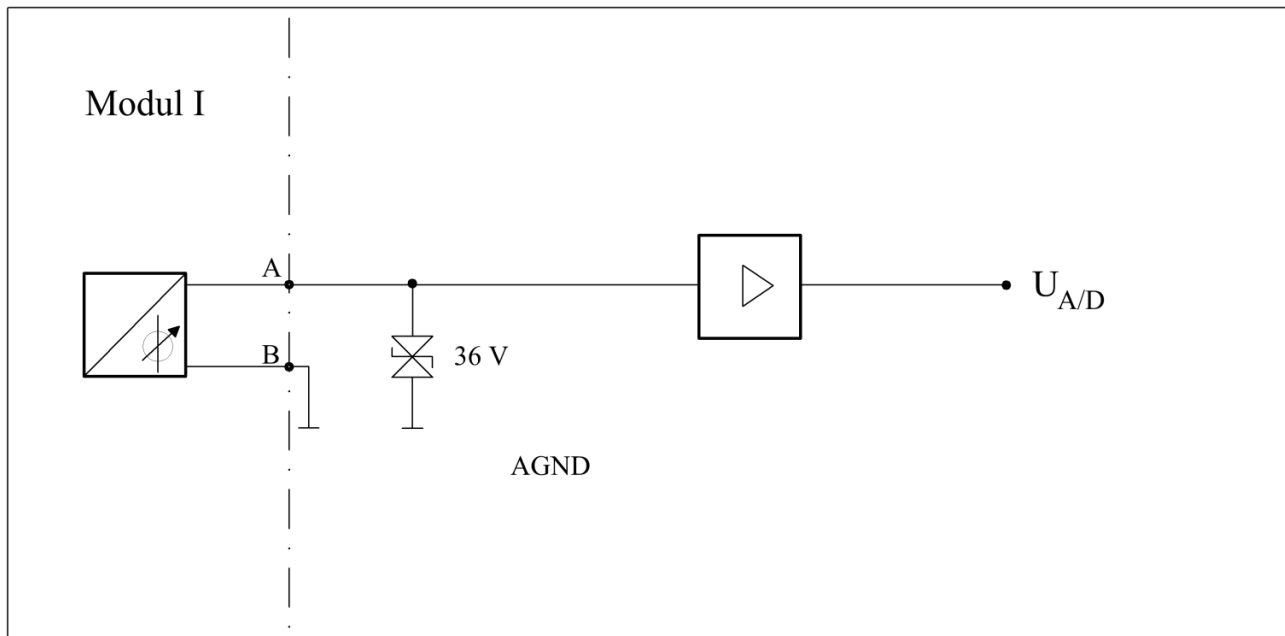


Fig.: Block diagram Module I

Measured range:	$3.0 \leq U_x \leq 4083.0$	[µV]
Transfer function:	$A/D = 100 * U_x$	[bit]
Range of error:	$33 - 4083 \mu V \triangleq E_{abs} < 0.1 \%$	
Max. input voltage:	36V (damage)	
	0.05V (function)	

5.8 Module J – Voltage 5V

Use analog module “J” to connect voltage sensors with an output signal range of 0 – 5VDC. This analog module can capture a measured range of 0 – 6VDC.

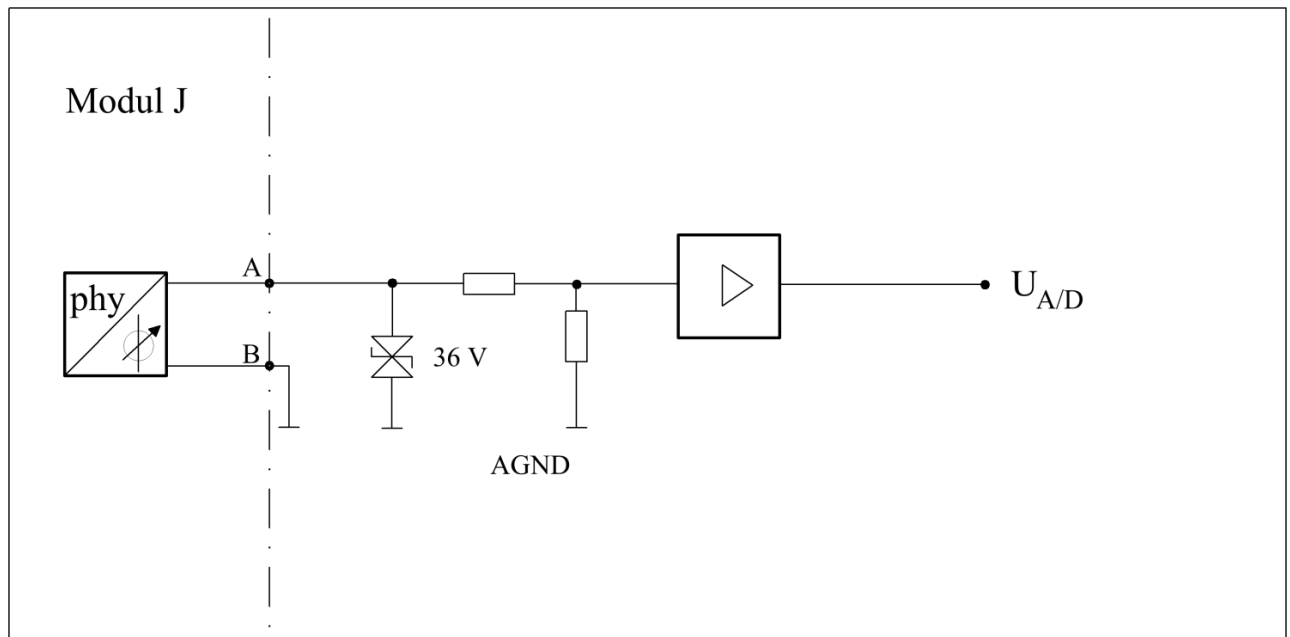


Fig.: Block diagram Module J

Measured range:	$-0.0 \leq U_x \leq 6.125$	[V]
Transfer function:	$A/D = 666.67 * U_x$	[bit]
Range of error:	$0.05 - 6.125 \text{ V} \triangleq E_{abs} < 0.1 \%$	
Input resistance:	30kΩ	
Max. input voltage:	36V (damage) 6.144V (function)	

Input-Modules for Data Station AHD-SAS 15

5.9 Module K – Voltage 10V

Use analog module “K” to connect voltage sensors with an output signal range of 0 – 10VDC (range of specification). This analog module can capture a measured range of 0 – 12VDC.

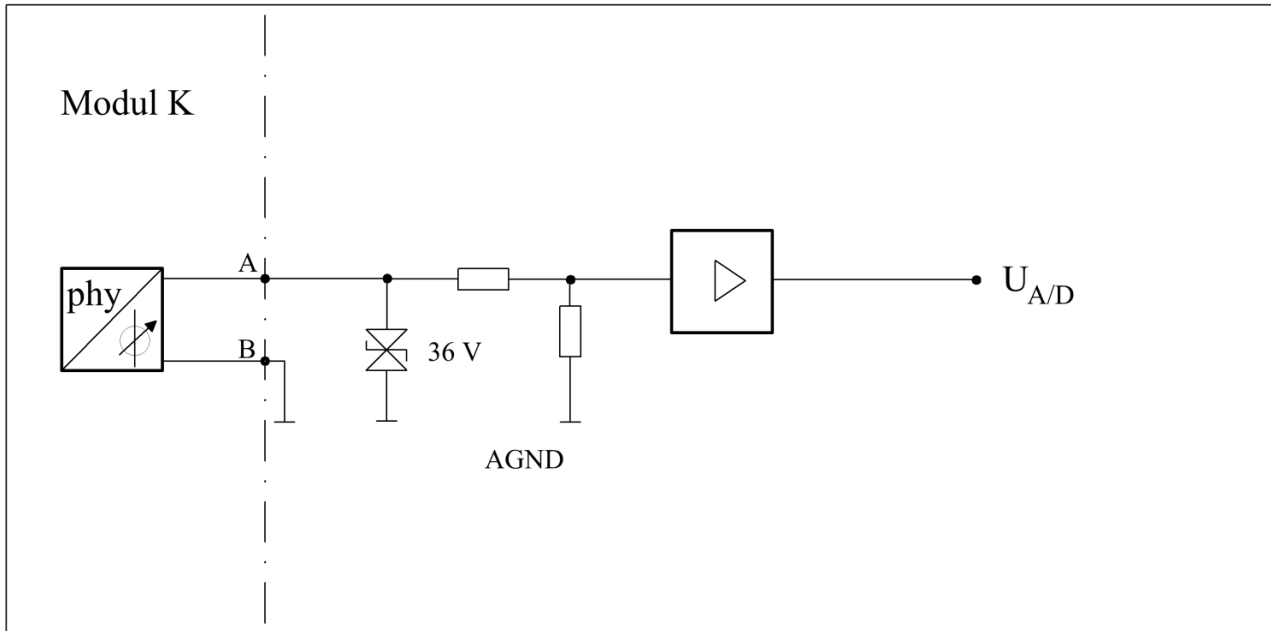


Fig.: Block diagram Module K

Measured Range:	$-0.0 \leq U_x \leq 12.24$	[V]
Transfer function:	$A/D = 333.3 * U_x$	[bit]
Range of Error:	$0.25 - 12.0 \text{ V} \triangleq E_{abs} < 0.1 \%$	
Input resistance:	30kΩ	
Max. input voltage:	36V (damage) 12.24V (function)	

Input-Modules for Data Station AHD-SAS 15

5.10 Module L – Voltage 30V

Use analog module “L” to connect voltage sensors with an output signal range of 0 – 30VDC. This analog module can capture a measured range of 0 – 36VDC.

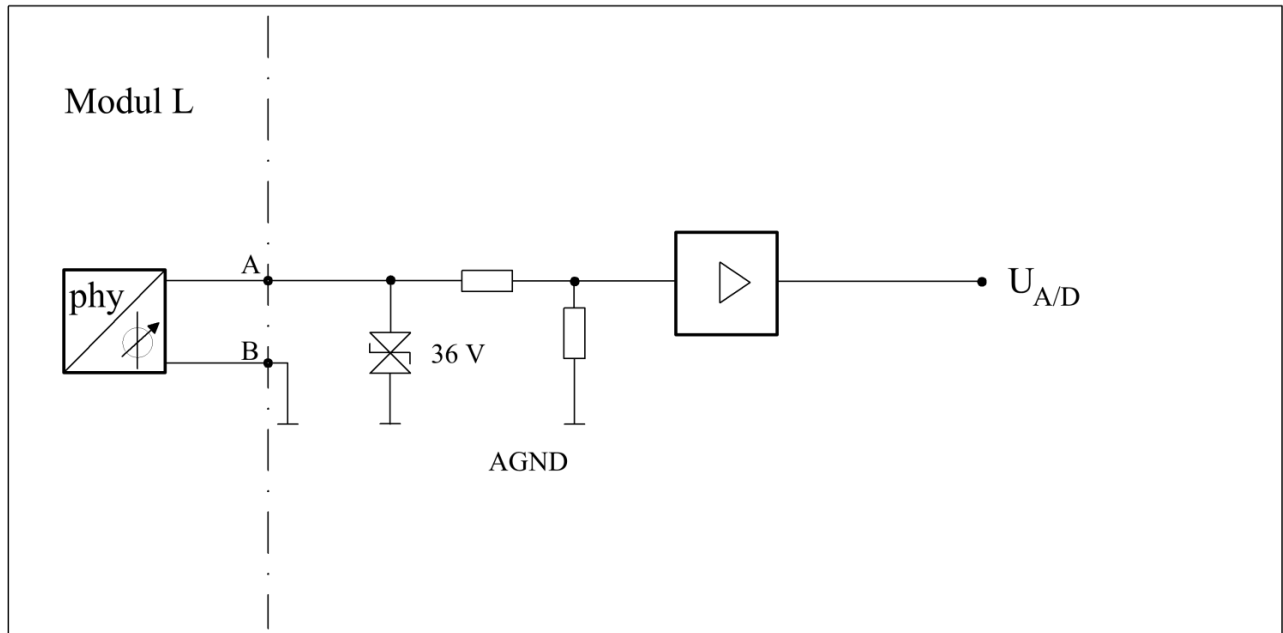


Fig.: Block diagram Module L

Measured range:	$-0.0 \leq U_x \leq 32$	[V]
Transfer function:	$A/D = 110.72 * U_x$	[bit]
Range of Error:	$0.25 - 32V \triangleq E_{abs} < 0.1 \%$	
Input resistance:	22.5kΩ	
Max. input voltage:	36V (damage) <36V (function)	



NOTE:

Our factory no longer supplies Module L.
Module T or Module V can be used as substitutes.

Input-Modules for Data Station AHD-SAS 15

5.11 Module M – RACOR Water Detection

The RACOR module was developed to detect special resistance sensors from the company Racor (Parker). With this type of sensor, the water content in the diesel fuel is measured via a resistance measurement.

The Racor sensor has a high resistance when dry and changes its value to $<10 \text{ k}\Omega$ when in contact with water. Module "M" can detect a sensor resistance below $100 \text{ k}\Omega$, but the signal evaluation should only be binary due to high sensor tolerances (high resistance / low resistance).

When wiring, it must be taken into account that the sensor is connected to ground on one side and that this eliminates the separation of AGND to battery / PE.

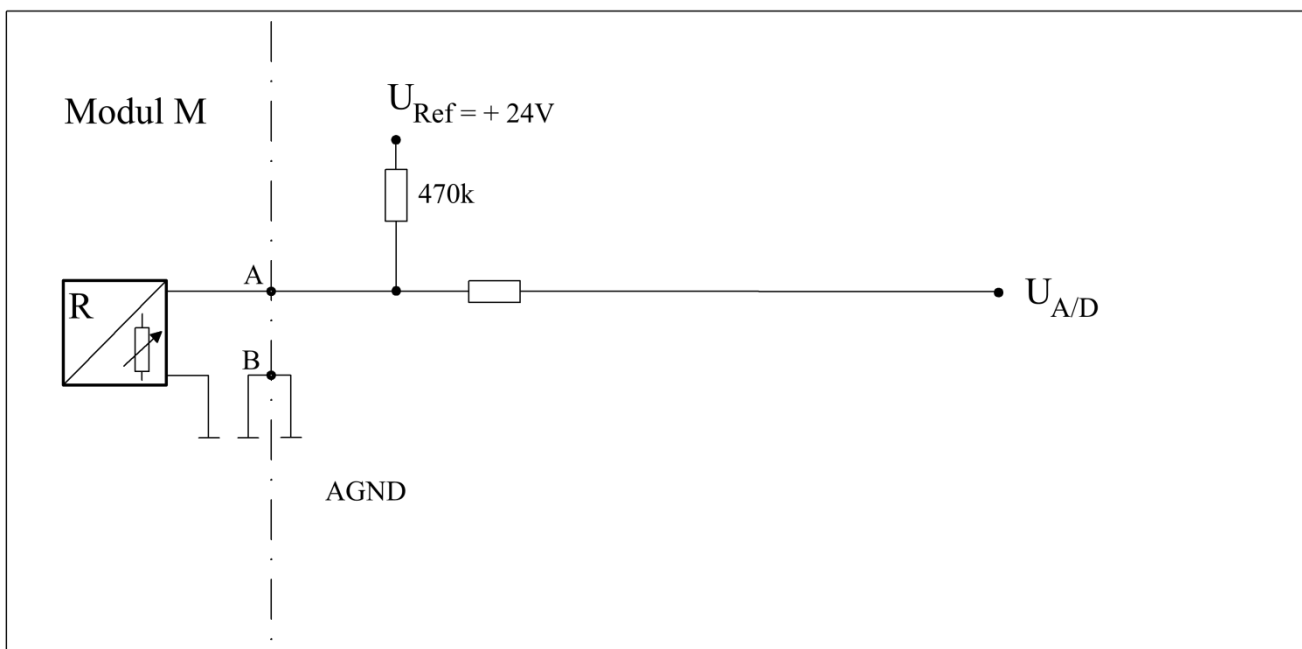


Fig.: Block diagram Module M

Transfer function:

Transistor / Switch

Measured range:

0...100 k Ω

Range of error:

N/A



NOTE:

For the evaluation it is recommended to configure an intermediate alarm-min limit value (related to the input voltage at the A/D converter, the value **2000** has proven to be useful).

Input-Modules for Data Station AHD-SAS 15

5.12 Module N – Frequency 8 kHz

Module "N" is a galvanically isolated f/U-converter. With this module, sinus and square wave signals in the 0 – 8kHz can be captured.

These signals can be zero point symmetrical as well as "positive." Here, there is typically a "duty cycle" of 50%.

AC-signal: $-32 \text{ to } -4 \leq U_x \leq 4 \text{ to } 32 \text{ V}$

DC- signal: $4 \leq U_x \leq 32 \text{ V}$

Tacho generators, "pickups," or flow meters can be used as signal generators.



NOTE!

The signal source is burdened with 1,5mA.

the frequency range of 8kHz – 10kHz the module delivers the highest possible internal value (4095mV). Therefore, frequencies above 10kHz can no longer be evaluated clearly.

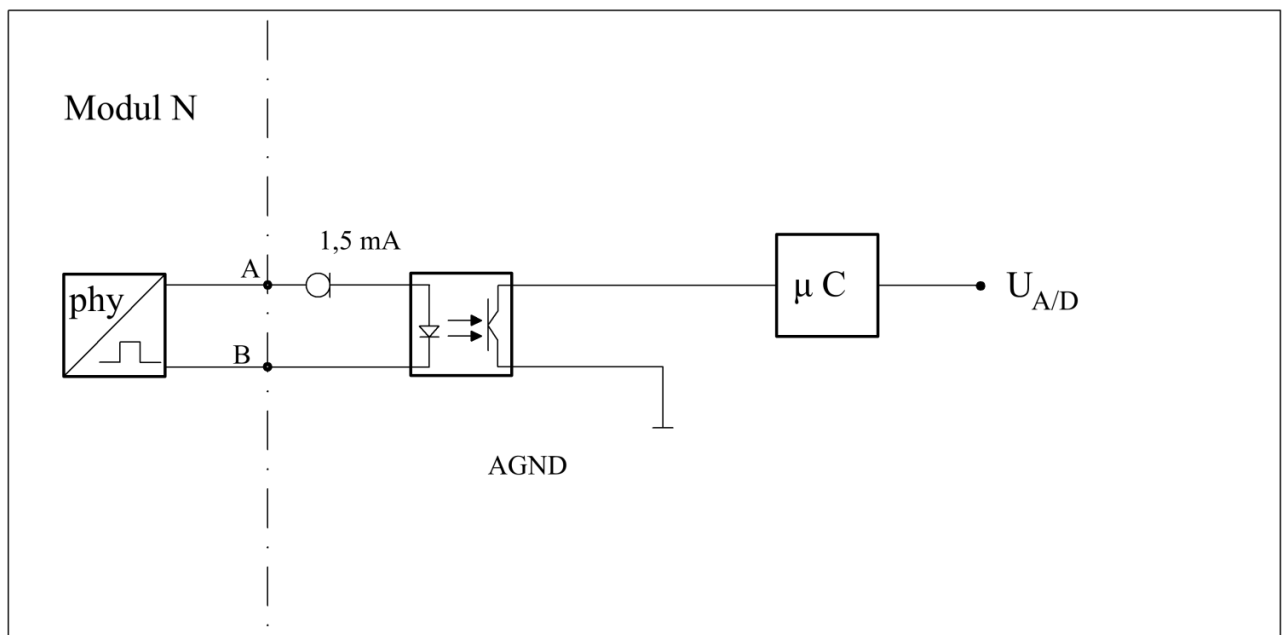


Fig.: Block diagram Module N

Measured range:	$\sim 0 \leq f_x \leq 8000$	[Hz]
Transfer function:	$A/D = 0.5 \cdot f_x + 10$	[bit]
Range of error:	$10 - 8000 \text{ Hz} \triangleq E_{abs} < 0.1 \%$	
Galvanically isolated		

Input-Modules for Data Station AHD-SAS 15

If required, the input of the module can be adapted to special conditions of the used pick-up or tachogenerator. This is done via solder bridges, which are open by default at factory.

Setting Frequency range:

JP4	JP3	JP2	max. Frequency
Open	Open	Open	8000Hz
Open	Open	Closed	4000Hz
Open	Closed	Open	2000Hz
Open	Closed	Closed	1000Hz
Closed	Open	Open	500Hz
Closed	Open	Closed	250Hz
Closed	Closed	Open	125Hz
Closed	Closed	Closed	62,5Hz

Default Erfassungsbereich = 0...8000 Hz

Setting input sensitivity:

JP5	Pick-up voltage	
Open	min. 2,7V	
Close	min. 2,1V	Reverse polarity protection not active!

Default signal level = min. 2,7 V.

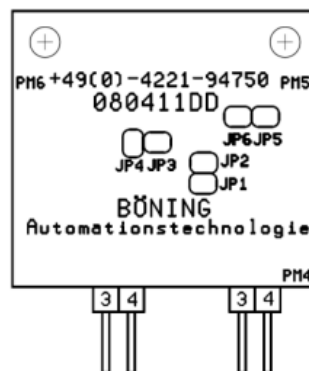


Fig.: Module N - Jumper positions



NOTE!

Jumpers J1 and J6 are internally predefined and must not be changed!

When reducing the input sensitivity to 2.1V, the integrated protection against reverse polarity is not provided.

Input-Modules for Data Station AHD-SAS 15

5.13 Module O – Blank Module

Module O is a blank module without function to fill slots that are not used. This is necessary for safety reasons as well as a stabile function of the data station.



TIP!

The data station AHD-SAS 15 should not be operated with empty module sockets.

If the "O" module is not available, a B, G or H module can be used as an alternative.

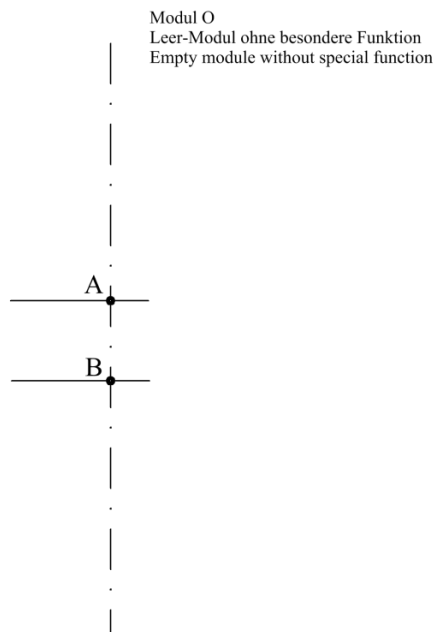


Fig.: Block diagram Module O

Input-Modules for Data Station AHD-SAS 15

5.14 Module P – Current 20mA 2pin (galv. isolated)

Use analog module “P” to connect sensors with a 4 – 20 mA current signal output and without an external power supply (2-pin connection). The sensor is powered via Data Station AHD-SAS 15. The module can capture a measured range from 1 to 40mA, whereby the current metering is galvanically isolated. This module is typically used, if a signal is to be evaluated or displayed by two measuring points.

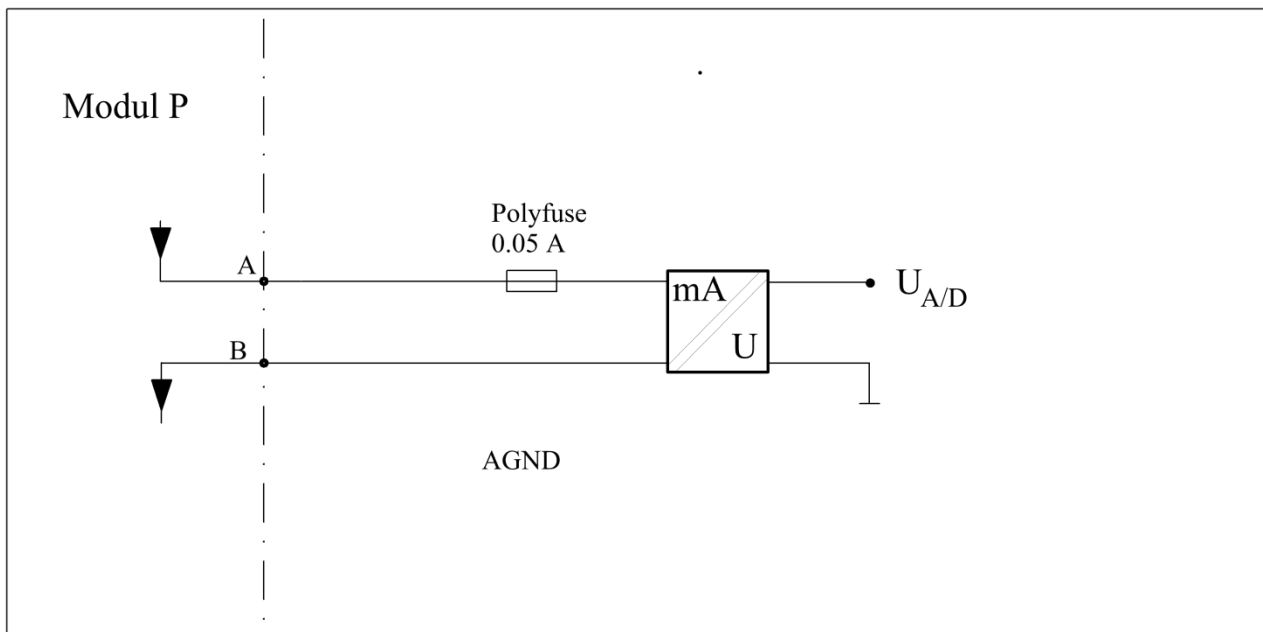


Fig.: Block diagram Module P

Measured range:	$0.1 \leq I_x \leq 40.95$	[mA]
Transfer function:	$A/D = 100 * I_x$	[bit]
Range of error:	$4 - 20 \text{ mA} \triangleq E_{abs} < 0.1 \%$	
Linear transmission behavior → compatible with module B		
Load impedance:	Voltage drop ~ 4V independent of loop current	
Common mode voltage:	$\pm 100V$	

5.15 Module PV – Voltage 45 V



NOTE!

Module PV is no longer available factory side.
As a replacement module V is available.

5.16 Modul R1...R3 – Resistor PT100 / max 650°C

The analog module "R" is used to connect PT100 resistance sensors. It can detect a temperature up to max. 650°C, there are 3 versions available. The power supply of the resistance sensor is done via the data station AHD-SAS 15.

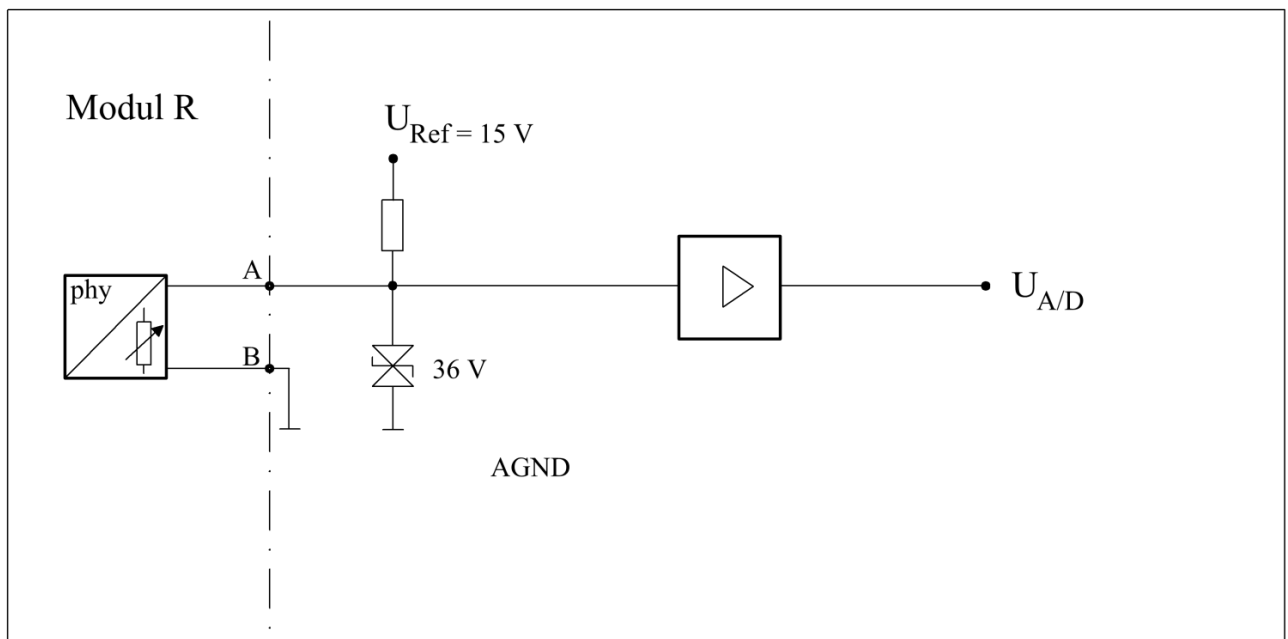


Fig.: Block diagram Module R

Measured range:	$10 \leq R_x \leq 390$	[Ω]
Transfer function:	$A/D = -5,212 \text{ E-}36 * R_x^2 + 12,342 * R_x - 10,088$	[bit]
Range of error:	$10 - 390 \Omega \triangleq E_{abs} < 0,1 \%$	
Current through PT100:	max 8mA	
Max. input voltage:	36V (damage) 3.2V (function)	

Input-Modules for Data Station AHD-SAS 15

Module variants:

Version R1 for **PT100** without sensor error monitoring

Measuring range min = -80°C

Measuring range max = $+650^{\circ}\text{C}$

Version R2 for **PT100** with sensor error monitoring

Measuring range min = -80°C

Measuring range max = $+650^{\circ}\text{C}$

Version R3 for alternative resistance sensors

Measuring range min = 68 Ohm

Measuring range max = 330 Ohm

The sensor characteristic curve is set via Device-Config under "Characteristic Curve"!

5.17 Modul S1...S3 – Widerstand PT1000 / max. 650°C

The analog module "S" is used to connect PT1000 resistance sensors. It can detect a temperature up to max. 650°C , there are 3 versions available. The power supply of the resistance sensor is done via the data station AHD-SAS 15.

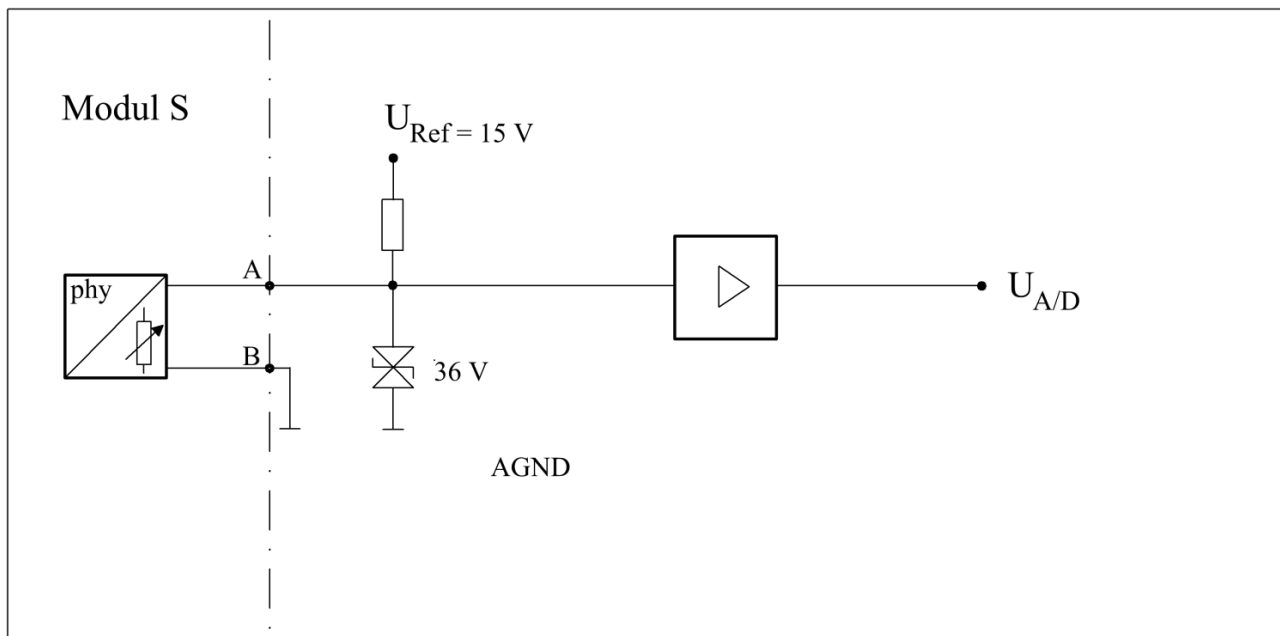


Fig.: Block diagram Module S

Input-Modules for Data Station AHD-SAS 15

Measured range:	$100 \leq R_x \leq 3700$	[Ω]
Transfer function:	$A/D = -87,905 \text{ E-6} * R_x^2 + 1,4177 * R_x + 28,978$	[bit]
Range of error:	$100 - 3700 \text{ } \Omega \triangleq E_{\text{abs}} < 0,1 \text{ } \%$	
Current through PT1000:	max. 1,5mA	
Max. input voltage:	36V (Schaden)	
	5V (Funktion)	

Module variants:

Version S1 for **PT1000** without sensor error monitoring
 Measuring range min = -80°C
 Measuring range max = +650°C

Version S2 for **PT1000** with sensor error monitoring
 Measuring range min = -80°C
 Measuring range max = +650°C

Version S3 for alternative resistance sensors
 Measuring range min = 680 Ohm
 Measuring range max = 3300 Ohm
 The sensor characteristic curve is set via Device-Config under "Characteristic Curve"!

Input-Modules for Data Station AHD-SAS 15

5.18 Module T – Voltage 45V

Use analog module “T” to connect voltage sensors with an output signal range of 0 – 44.9VDC (specification range).

Due to the relatively high input voltage, we recommend that each of the two connections is secured with a fast 50 mA fuse.



TIP!

The signal source is burdened with 5,8mA.

Above 51V the current consumption increases rapidly, therefore it is recommended that each of the two connections is secured with a fast 50mA fuse.

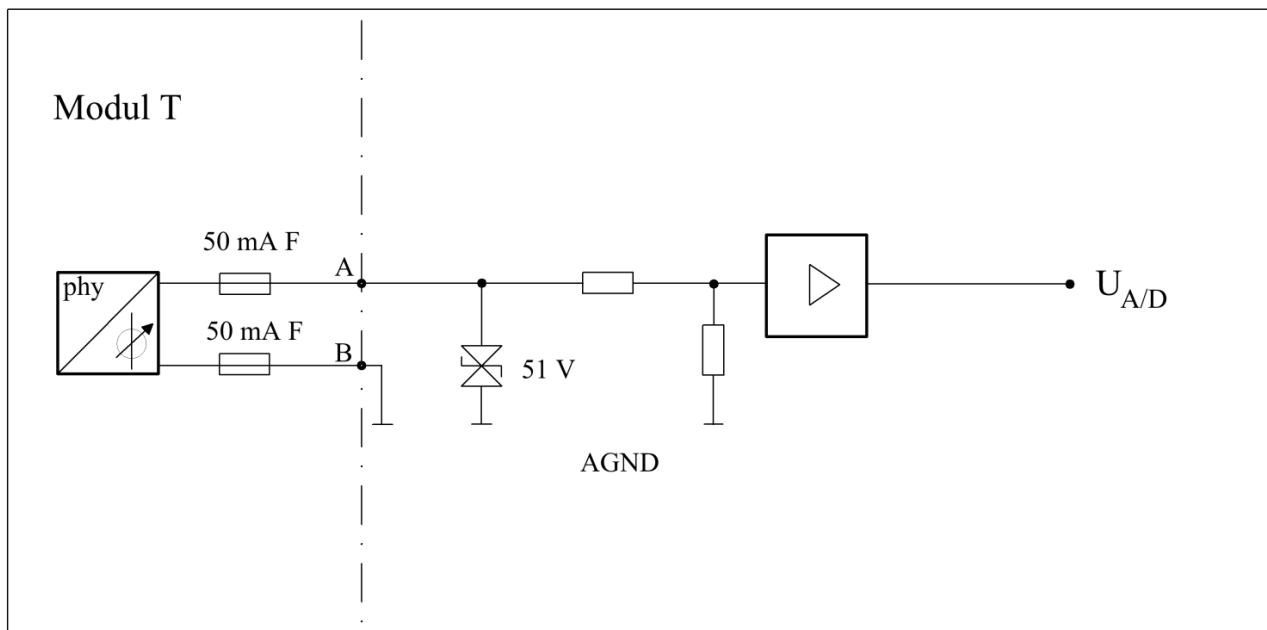


Fig.: Block diagram Module T

Measured range:	$0.0 \leq U_x \leq 44.9$	[V]
Transfer function:	$A/D = (U_x - 0.68) * 92.5$	[bit]
Range of error:	$0.0 - 44.9 \text{ V} \triangleq E_{abs} < 0.1 \%$	
Input resistance:	110kΩ	
Max. input voltage:	51V (damage)	
	45V (function)	

Input-Modules for Data Station AHD-SAS 15

5.19 Module U – Resistor 200R (galv. isolated)

Analog module “U” was designed for the galvanically isolated measuring of resistors. With the module resistors in the range of 0 - 400Ω can be captured, accurate measurement is specified for the range **15 - 200Ω**.

A typical application is the capture of tank sensors with one ground / PE connection. However, it must be taken into consideration that this cancels the separation of AGND to battery / PE.

The module can alternatively be used with a PT100 resistance sensor for temperature measurement.

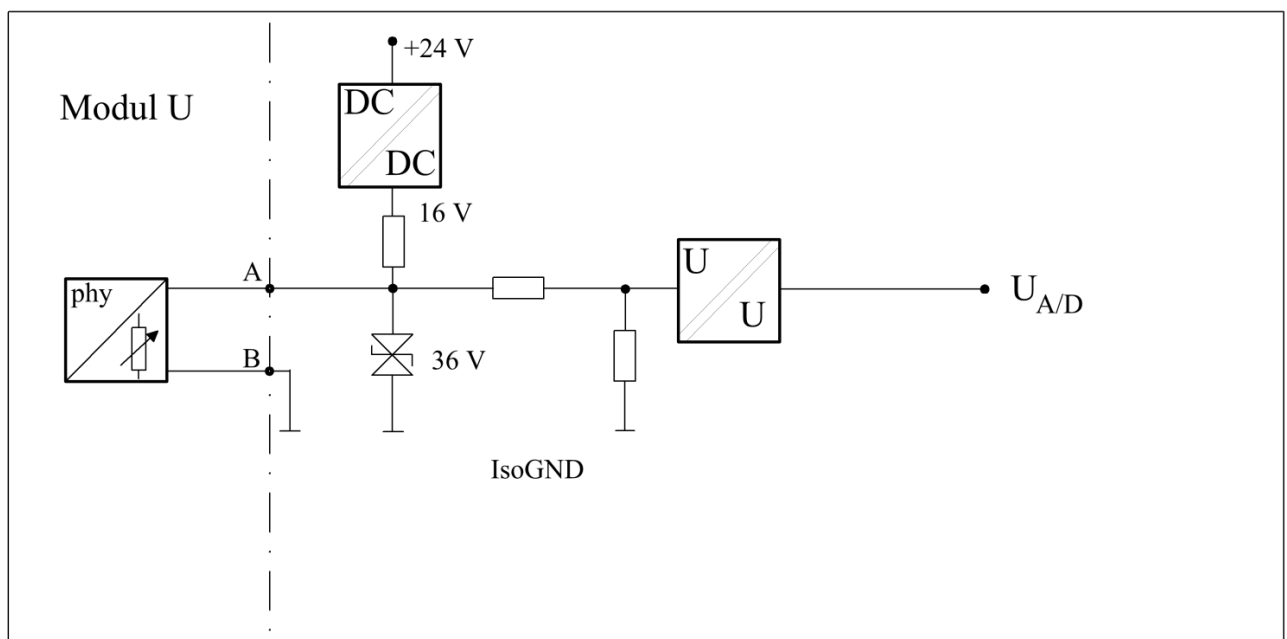


Fig.: Block diagram Module U

Measured range:	$0.0 \leq R_x \leq 400.0$	[Ω]
Transfer function:	$A/D = -984,28 \text{ E-}6 * R_x^2 + 10,4145 * R_x + 1,7362$	[bit]
Range of error:	$15.0 - 400.0 \text{ V} \triangleq E_{abs} < 0.1 \%$	
Max. input voltage:	36V (damage) 36V (function)	



NOTE!

Due to the size of the module, 2 slots are taken on the AHD-SAS 15.

Input-Modules for Data Station AHD-SAS 15

5.20 Module U1..U3 – Voltage up to 2000 mV (galv. isolated)

The module types U1, U2 and U3 are available for galvanically isolated measurements of lower voltages.

These are also suitable for potential-free current measurement via shunt in an existing external system.

The raw values are normalized to 4000mV when the respective upper measuring range is reached.

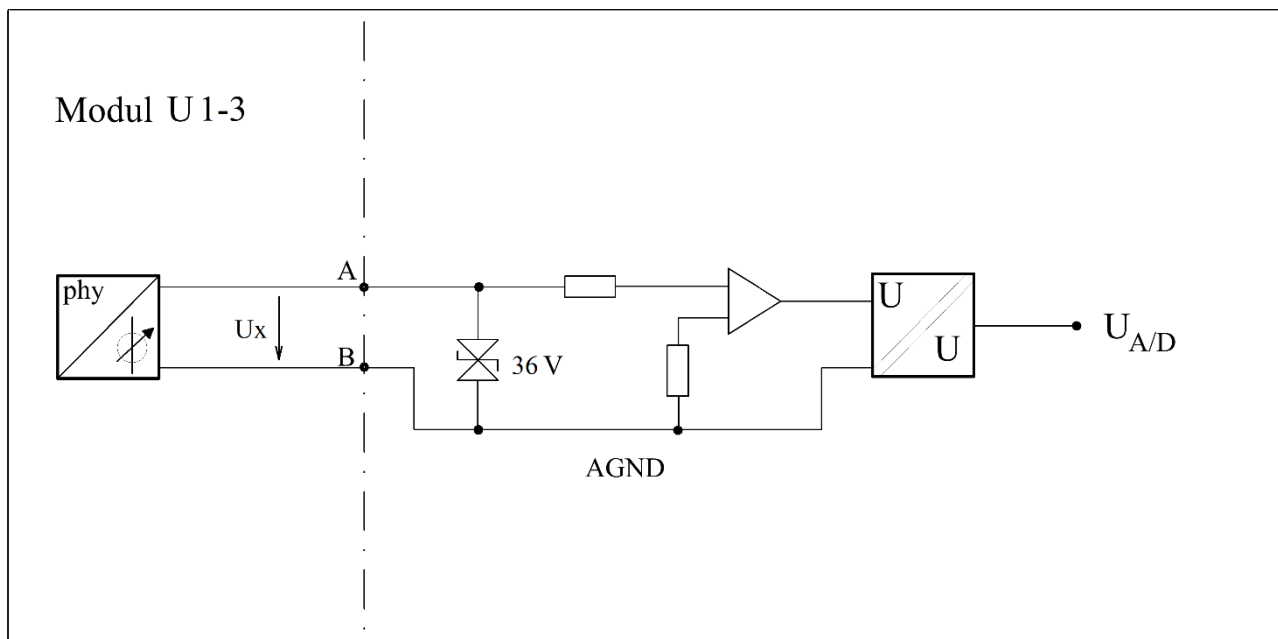


Fig.: Block diagram Module U1...U3

Version U1 (0...100mV)

Measured range:	$0 \leq U_x \leq 100$	[mV]
Transfer function:	$A/D = U_x * 40$	
Input current:	max. 1,6mA bei 36VDC	
Input resistance:	>20kΩ	
Max. input voltage:	36V (damage)	
	100mV (function)	

Input-Modules for Data Station AHD-SAS 15

Version U2 (0...600mV)

Measured range:	$0 \leq U_x \leq 600$	[mV]
Transfer function:	$A/D = U_x * 6,667$	
Input current:	max. 1,6mA bei 36VDC	
Input resistance:	>20k Ω	
Max. input voltage:	36V (damage) 600mV (function)	

Version U3 (0...20600mV)

Measured range:	$0 \leq U_x \leq 2000$	[mV]
Transfer function:	$A/D = U_x * 2$	
Input current:	max. 1,6mA bei 36VDC	
Input resistance:	>20k Ω	
Max. input voltage:	36V (damage) 2000mV (function)	



NOTE!

Due to the size of the module, 2 slots are taken on the AHD-SAS 15.

Input-Modules for Data Station AHD-SAS 15

5.21 Module V – Voltage 45V (galv. isolated)

Analog module “V” can be used to measure 7 – 44.9VDC voltage sensors (specification range) that must be galvanically isolated.

Due to the higher input voltage, it is recommended to protect both Terminals with a 50mA fuse (fast-blow).



TIP!

The module V replaces the module PV.

The signal source is burdened with 5,8mA. Above 51V the current consumption increases rapidly, therefore it is recommended that each of the two connections is secured with a fast 50mA fuse.

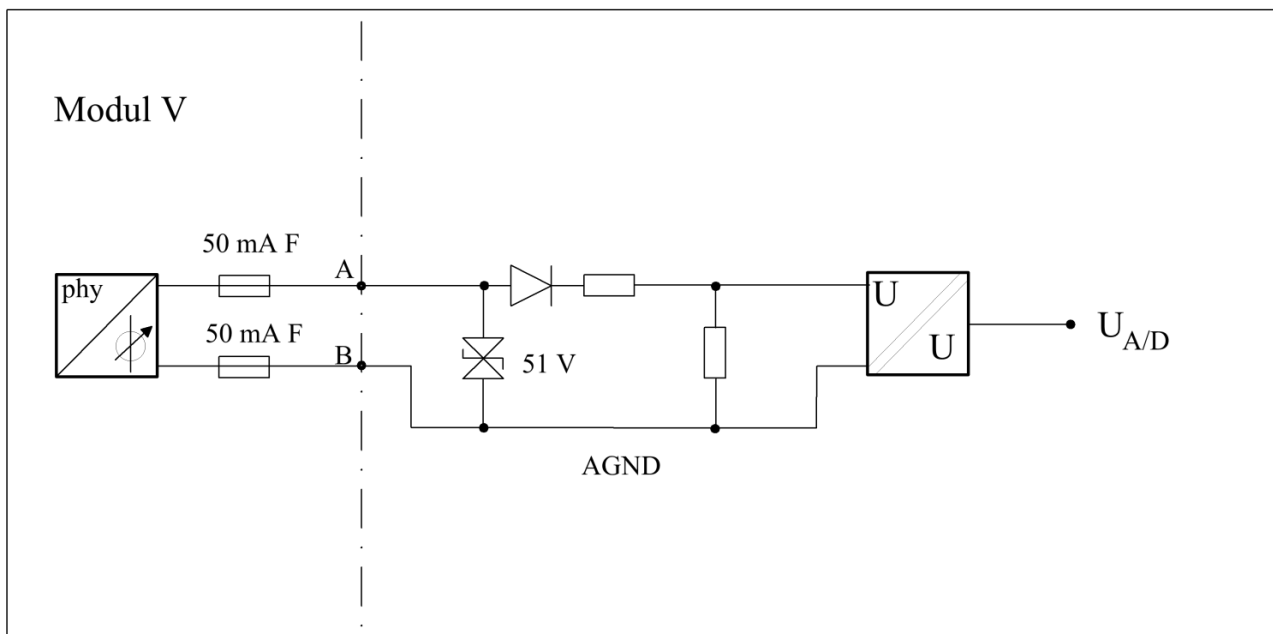


Fig.: Block diagram Module V

Measured range:	$7.0 \leq U_x \leq 44.9$	[V]
Transfer function:	$A/D = (U_x - 0.68) * 92.5$	[bit]
Range of error:	$7.0 - 44.9 \text{ V} \triangleq E_{abs} < 0.1 \%$	
Input current:	max. 5.8mA at 45VDC	
Input resistance:	110kΩ	
Max. input voltage:	51V (damage) 45V (function)	

6 Transport, Packaging and Storage

6.1 Transport Safety Information

Improper Transport



CAUTION!

Damages from improper transport!

Improper transport can cause significant equipment damage.

Therefore:

- Use caution when unloading the packages during delivery and on-site transport and observe the symbols and instructions on the packaging.
- Remove the packaging only shortly before installation.

6.2 Transport Inspection

Inspect the delivery for completeness and damages in transport immediately upon receipt.

Proceed as follows when noticing external transport damages:

- Do not accept delivery, or accept it only with reservation.
- Note the scope of the damage on the transport documents or the deliverer's bill of lading.
- File a claim.



TIP!

Claim any fault as soon as it is noticed. Damage claims can only be filed within their respective reclamation periods.

6.3 Packaging

About the Packaging

The individual parts are packaged according to the expected transport conditions. Only environmentally safe materials have been used for the packaging.

The packaging is intended to protect the individual parts from transport damages, corrosion and other damages. Therefore, the packaging may not be destroyed, and it may only be removed shortly before installation.

Transport, Packaging and Storage

Handling the Packaging Materials

The packaging materials must be disposed according to current legal regulations and local ordinances.



CAUTION!

Environmental damages from improper disposal!

Packaging materials are valuable raw materials and can often be reused or meaningfully processed and recycled.

Therefore:

- Dispose packaging materials in an environmentally safe manner.
- Observe the local disposal regulations. When necessary, contract a specialist company.

Storage

Store the packages under the following conditions:

- Do not store them outdoors.
- Store them in a dry, dust free environment.
- Do not expose them to aggressive media.
- Protect them from sunlight.
- Observe the storage temperature (see technical data).
- Avoid mechanical shock.
- When storing longer than 3 months, regularly inspect the general condition of all parts and the packaging.



TIP!

In some cases, the packages contain instructions which extend beyond the requirements listed in this manual. These must be observed accordingly.

7 Appendix: Module Spezification

The following table shows all available input module types for the capture of different sensors and signals.

In column "Device Config Tool Settings" all available settings (English translation) inside DeviceConfig can be found. The parameter already contains typical information about sensor and measuring range, as well as the maximum possible detection range (values in brackets).

If the AHD-SAS 15 is operated in the passive mode, the modules "G", "H", "R" or "S" can be run in three different ways (a)...(c) (requires AHD-DPU 9 from firmware 2.1).

The setting in Device-Config (Tabelle „Channel Sources - Input Module“) tells the system how the associated measured value is to be evaluated.

The following applies to modules U1...U3: If the processing takes place within the AHD-SAS 15 (in its active mode), the output raw value must be taken into account. The upper measuring range corresponds to the raw value "4000".

The output variable specified under column "Result" depends on the selected input module. Further processing steps are also based on this, for example definition of characteristic curves, range specifications or comparisons with alarm limits.

Type	Part-No.	Device Config Tool	Sensor detection range	Application	Result	Remark
B	11109V02	B Module "4..20mA" (1..40mA, 2pol.)	0...40 mA	Sensor with current output (2-pole)	Current [mA]	Sensor is supplied via AHD-SAS 15
C	11110V02	C Module "4..20mA" (1..40mA, 4pol.)	0...40 mA	Sensor with current output (4-pole)	Current [mA]	Sensor is supplied via separate source
E	11111V02	E Module "Binary" (Contact Plus Switched)	6,5...36 V	Sensor with switch contact or push button (plus signal)	Binary value [0 or 1]	Switched plus (same potential as system supply) <i>(Function without wire break detection. If fault monitoring is required, the channel must be acquired in analog mode. (e.g. voltage or resistance measurement).</i>
F	11112V02	F Module "Binary" (Contact Potential Free)	6,5...36 V	Sensor with contact or push button (potential-free)	Binary value [0 or 1]	Potential-free contact or switched minus (same potential as system supply) <i>(Function without wire break detection. If fault monitoring is required, the channel must be acquired in analog mode. (e.g. voltage or resistance measurement).</i>

Appendix: Module Spezifikation

Type	Part-No.	Device Config Tool	Sensor detection range	Application	Result	Remark
G (a)	11119	G Module "PT100" (-80...+220°C)	68...183 Ohm	PT100 temperature sensor (2-pole, max. 220°C)	Temperature [°C]	PT100 without sensor-fault monitoring <i>the sensor characteristic curve is stored internally, an additional configuration under "Characteristic Curve" is not necessary</i>
G (b)		G Module Type 2 "PT100" (-80...+220°C incl. SF)	68...183 Ohm	PT100 temperature sensor (2-pole, max. 220°C)	Temperature [°C]	PT100 with sensor-fault monitoring <i>the sensor characteristic curve is stored internally, an additional configuration under "Characteristic Curve" is not necessary</i> Setting only with AHD-DPU 9 (from firmware 2.1)
G (c)		G Module Type 3 "Resistor" (68...183 Ohm)	68...183 Ohm	Common resistance sensor (max. 183 Ohm)	Resistance [Ohm]	free curve <i>Define "Characteristic Curve" table !</i> Setting only with AHD-DPU 9 (from firmware 2.1)
H (a)	11120	H Module "PT1000" (-80...+220°C)	680...1830 Ohm	PT1000 temperature sensor (2-pole, max. 220°C)	Temperature [°C]	PT1000 without sensor-fault monitoring <i>the sensor characteristic curve is stored internally, an additional configuration under "Characteristic Curve" is not necessary</i>
H (b)		H Module Type 2 "PT1000" (-80...+220°C incl. SF)	680...1830 Ohm	PT1000 temperature sensor (2-pole, max. 220°C)	Temperature [°C]	PT1000 with sensor-fault monitoring <i>the sensor characteristic curve is stored internally, an additional configuration under "Characteristic Curve" is not necessary</i> Setting only with AHD-DPU 9 (from firmware 2.1)
H (c)		H Module Type 3 "Resistor" (680...1830 Ohm)	680...1830 Ohm	Common resistance sensor (max. 1830 Ohm)	Resistance [Ohm]	free curve <i>Define "Characteristic Curve" table !</i> Setting only with AHD-DPU 9 (from firmware 2.1)
I	11121	I Module „NiCrNi“ (0..950°C)	0...40 mV	NiCrNi temperature sensor Typ K (max. 950°C)	Temperature [°C]	Additional channel for compensation of ambient temperature needed!
J	11122	J Module "0..5V" (0..6V)	0...6 V	Voltage measurement (max. 6 volts)	Voltage [V]	Measurement against system ground

Appendix: Module Spezifikation

Type	Part-No.	Device Config Tool	Sensor detection range	Application	Result	Remark
K	11123	K Module "0..10V" (0..12V)	0...12 V	Voltage measurement (max. 12 volts)	Voltage [V]	Measurement against system ground
L	11124	L Module "0..30V" (0..36V)	0...36 V	Voltage measurement (max. 36 volts)	Voltage [V]	not for new systems, replaced by module "T"
M	10893V02	M Module "Racor/Parker" (0..100kOhm)	0...100 kOhm	Resistance sensor (Manufact. Racor / Parker)	Raw Value [0..4095]	Output = internal raw value in mV <i>(recommended setting "Limit AL min" = 2000 mV for limit comparison with raw value (alarm on water contact: Rsens < 45 kOhm at Uref = 24V)).</i>
N	11961	N Module „Frequency“ (0..8000Hz)	0...8000 Hz 2,7...36V	Sensor with Frequency signal (max. 8000 Hz)	Frequency [Hz]	Galvanically isolated input (e.g. Speed Pick-Up) <i>For special applications, measuring range and sensitivity can be modified (OEM version).</i>
O	11965V02	O Module „Blank“ (no Function)	entfällt	Place holder (no sensor)	Raw Value [0..4095]	Output = internal raw value in mV <i>Blank module (without function)</i>
P	11960	P Module "4..20mA" (1..40mA, 2pol., galv. isol.)	0...40 mA	Sensor with current output (2-pole)	Current [mA]	Galvanically isolated input
PV	14239	No longer available from the factory, replacement by module "V"				
R (a)	11963	R Module "PT100" (-80..+650°C)	68...330 Ohm	PT100 temperature sensor (2-pole, max. 650°C)	Temperature [°C]	PT100 without sensor-fault monitoring <i>the sensor characteristic curve is stored internally, an additional configuration under "Characteristic Curve" is not necessary</i>
R (b)		R Modul Type2 "PT100" (-80..+650°C incl. SF)	68...330 Ohm	PT100 temperature sensor (2-pole, max. 650°C)	Temperature [°C]	PT100 with sensor-fault monitoring <i>the sensor characteristic curve is stored internally, an additional configuration under "Characteristic Curve" is not necessary</i> Setting only with AHD-DPU 9 (from firmware 2.1)
R (c)		R Modul Type3 "Resistor" (68...330 Ohm)	68...330 Ohm	Common resistance sensor (max. 330 Ohm)	Resistance [Ohm]	free curve <i>Define "Characteristic Curve" table !</i> Setting only with AHD-DPU 9 (from firmware 2.1)

Appendix: Module Spezifikation

Type	Part-No.	Device Config Tool	Sensor detection range	Application	Result	Remark
S (a)	11964	S Module "PT1000" (-80..+650°C)	680...3300 Ohm	PT1000 temperature sensor (2-pole, max. 650°C)	Temperature [°C]	PT1000 without sensor-fault monitoring <i>the sensor characteristic curve is stored internally, an additional configuration under "Characteristic Curve" is not necessary</i>
S (b)		S Modul Type2 "PT1000" (-80..+650°C incl. SF)	680...3300 Ohm	PT1000 temperature sensor (2-pole, max. 650°C)	Temperature [°C]	PT1000 with sensor-fault monitoring <i>the sensor characteristic curve is stored internally, an additional configuration under "Characteristic Curve" is not necessary</i> Setting only with AHD-DPU 9 (from firmware 2.1)
S (c)		S Modul Type3 "Resistor" (680...3300 Ohm)	680...3300 Ohm	Common resistance sensor (max. 3300 Ohm)	Resistance [Ohm]	free curve <i>Define "Characteristic Curve" table !</i> Setting only with AHD-DPU 9 (from firmware 2.1)
T	13142	T Module "0..44V" (0..44.9V)	0...44,9V	Voltage measurement (max. 44.9 Volts)	Voltage [V]	Measurement to system ground (50 mA fuse recommended on both sides)
U	20769	U Module "15..200 Ohm" (0..400 Ohm galv. isol.)	15...200 Ohm	General resistance sensor (max. 400 Ohm)	Resistance [Ohm]	Input galvanically isolated (use with grounded sensors) <u>Module requires 2 slots on AHD-SAS 15 due to size</u>
U1	20770	U1 Module "0..100 mV" (0-100mV, 2pol, galv. isol.)	0..100mV	Voltage measurement (max. 100mV)	Voltage [mV]	Galvanically isolated input <u>Module requires 2 slots on AHD-SAS 15 due to size</u>
U2	20771	U2 Module "0..600 mV" (0-600mV, 2pol, galv. isol.)	0..600mV	Voltage measurement (max. 600mV)	Voltage [mV]	Galvanically isolated input <u>Module requires 2 slots on AHD-SAS 15 due to size</u>
U3	20772	U3 Module "0..2000 mV" (0-2000mV, 2pol, galv. isol.)	0..2000mV	Voltage measurement (max. 2000mV)	Voltage [mV]	Galvanically isolated input <u>Module requires 2 slots on AHD-SAS 15 due to size</u>
V	14332	V Module "8..44V" (7..44.9V galv. isol.)	7...44,9V	Voltage measurement (max. 44.9 Volts)	Voltage [V]	Galvanically isolated input (min. voltage = 7 Volt)



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