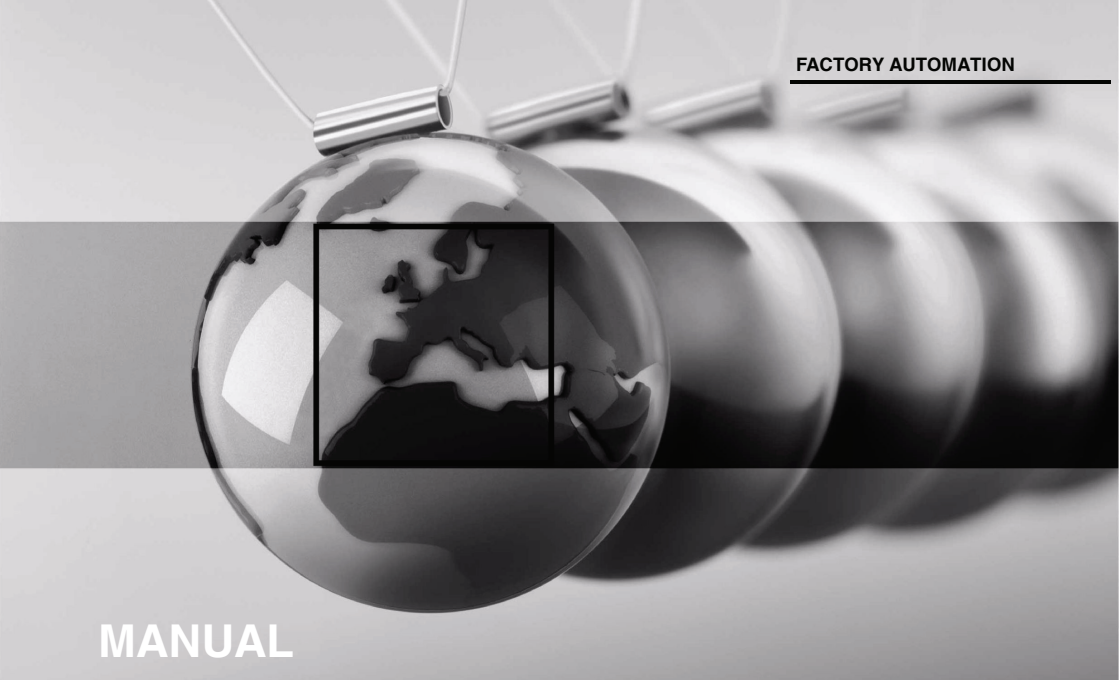
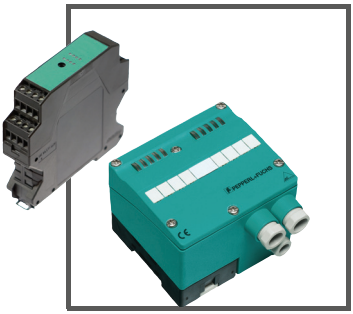


MANUAL

VBA-4E-G4-PT100
VBA-2E-G4-I
VBA-2E-G4-U
VBA-2A-G4-I
VBA-2A-G4-U
VBA-2A-KE2-I/U
VBA-2E-KE2-I/U
VBA-2E-KE2-I/U-V3.0

AS-Interface Analog Modules



PEPPERL+FUCHS
SENSING YOUR NEEDS

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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1. Symbol catalog

Information!

This symbol indicates important information.

Attention!

This symbol warns of a potential failure. Non-compliance may lead to interruptions of the device, the connected peripheral systems, or plant, potentially leading to total malfunctioning.

Warning!

This symbol warns of an imminent danger. Non-compliance may lead to personal injuries that could be fatal or result in material damages and destruction.

1.1 Abbreviations

AS-i	Aktuator-Sensor-Interface
nc	not connected
1E, 2E, 4E	Input module with 1, 2 ,4 channels
1A, 2A, 4A	Output module with 1, 2 ,4 channels
U	Voltage
I	Current
Pwr	Voltage status display
Aux	External supply
Diag	Diagnosis status display
Fault	error status display
In	Input
Out	Output
Cal	Calibration status display
Analog	Channel status display
Int	Voltage supply status display
I1, I2, ...	Channel state status display
O1, O2, ..	
OutU, OutI	Voltage/current output
InU, InI	Voltage/current input
CH+	Channel connection +
CH-	Channel connection -
CHS+	Channel Sense Connection +
CHS-	Channel Sense Connection -
Sig.	Signal in-/output
Rel	Relay

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2. General Information

2.1 Product information

This system manual applies to the following Pepperl+Fuchs GmbH equipment:

Article	Type	Chan-nels	In-puts	Out-puts	AS-Inter-face Profile	Housing L * W * H [mm]	Protection class	Contakt AS-Inteface	Contact-Analog side	ID1	ID	ID2	IO
VBA-4E-G4-Pt100	PT100	4	4		"7.3"	90 * 80 * 70	IP65	Piercing con.	PG + Cage clamps	F	3	E	7
VBA-2E-G4-I	4 - 20 mA	2	2		"7.3"	90 * 80 * 70	IP65	Piercing con.	PG + Cage clamps	F	3	D	7
VBA-2E-G4-U	0 - 10 V	2	2		"7.3"	90 * 80 * 70	IP65	Piercing con.	PG + Cage clamps	F	3	D	7
VBA-2A-G4-I	0 - 20 mA	2		2	"7.3"	90 * 80 * 70	IP65	Piercing con.	PG + Cage clamps	F	3	5	7
VBA-2A-G4-U	0 - 10 V	2		2	"7.3"	90 * 80 * 70	IP65	Piercing con.	PG + Cage clamps	F	3	5	7
VBA-2A-KE2-I/U	0-10V/ 4-20mA	2		2	"7.3"	99 * 22,5 * 92	IP20	Combicon	Combicon	F	3	5	7
VBA-2E-KE2-I/U	4-20mA/ 0-10V	2	2		"7.3"	99 * 22.5 * 92	IP20	Combicon	Combicon	F	3	D	7
VBA-2E-KE2-I/U-V3.0	4-20mA/ 0-10V	2	2		"7.A.9"	99 * 22.5 * 92	IP20	Combicon	Combicon	1	A	9	7

Tab. 2-1.

1. ID1 code see table chap. <Slave Profile>.

With the new AS-Interface specification it is possible to transmit analog values via AS-Interface as simple as binary signals. For these reasons the new AS-Interface slave profiles 7.3 and 7.4 for the transmission of analog values have been defined. According to the profil 7.3 the AS-Interface master puts the analog slaves into operation in the same way as the digital slaves and starts the data exchange automatically. The host system (PC, PLC, Fieldbus) can read the 16 bit value directly out of the AS-Interface master. The analog value transmission between AS-Interface master and AS-Interface slave is done invisibily for the user.

The user's advantages are obvious. He does not have to pay attention to the handling of the data transmission. This means in the majority of applications that the transmission time of analog values via AS-Interface will be reduced because the transmission time depends on the AS-Interface cycle time and not as it was before on the cycle time of the PLC program.

Pepperl+Fuchs GmbH has developed AS-Interface analog modules for safe and direct connection of sensors and actuators according to the new standardized Profile 7.3 resp. 7.A.9.

Analog data such as pressure and room temperature is transmitted by the module in interference-free digital signal form. In factory applications the module is installed as with isolation amplifier or real power transformer. They are simply clambed onto the AS-Interface cable and directly supported by the AS-Interface master: The protection class IP65 modules are simply clamped onto the AS-Interface cable via AS-Interface penetration technology and then directly supported by the AS-Interface master: Simply Plug and Play! There is no need to program a function block to transmit the AS-Interface analog value via AS-Interface.

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2.2 Accessories for Analog Modules in IP65 (optional)

Substructure modules for connection of AS-Interface and if necessary of external 24 V power supply:

- AS-Interface substruce module to connect 2 AS-Interface flat cables
- AS-Interface substructure module to connect 1 AS-Interface round cable, 1 flat cable for additional supply
- AS-Interface substructure module to connect 2 AS-Interface round cables
- AS-Interface substructure module to 1 AS-Interface round cable, 1 round cable for additional supply

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3. Safety

3.1 Intended use

Warning!

This symbol warns of a possible danger. The protection of operating personnel and the system against possible danger is not guaranteed if the control interface unit is not operated in accordance to its intended use.

3.2 General safety information

Warning!

Safety and correct functioning of the device cannot be guaranteed if any operation other than described in this operation manual is performed. Connecting the equipment and conducting any maintenance work under power must exclusively be performed by appropriately qualified personnel. In case a failure cannot be eliminated, the device must be taken out of operation and inadvertently operation must be prevented. Repair work must be performed by the manufacturer only. Additions or modifications to the equipment are not permitted and will void the warranty.

Information!

The operator is responsible for the observation of local safety standards.

3.2.1 Disposal

Information!

Electronic waste is hazardous waste. Please comply with all local ordinances when disposing this product!

The device does not contain batteries that need to be removed before disposing it.

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4. Technical Overview of all Modules

For further information please visit the homepage of:
http://www.pepperl-fuchs.de

4.1 Analog Modules with 2 Channels in Protection Category IP65

Article	**VBA-2E-G4-I**	**VBA-2E-G4-U**	**VBA-2A-G4-I**	**VBA-2A-G4-U**	**VBA-4E-G4-Pt100**
Features	Current input	Voltage input	Current output	Voltage output	Pt100
Number of inputs	2	2			4
Number of outputs			2	2	
Resolution	16 Bit	16 Bit	16 Bit	16 Bit	16 Bit
Kind of measuring	curren	voltage			temperature
Kind of output			current	voltage	
Display of channel states	yes	yes	yes	yes	yes
Potential relationship between sensors/actuators/ Pt100 and AS-i	+24 V out of AS-i: potential connected to AS-i +24 V out of external help voltage: galv. seperation	+24 V out of AS-i: potential connected to AS-i +24 V out of external help voltage: galv. seperation	+24 V out of AS-i: potential connected to AS-Interface +24 V out of external help voltage: galv. seperation	+24 V out of AS-i: potential connected to AS-i +24 V out of external help voltage: galv. seperation	potential connected to AS-i
AS-i parameters	**P0** 1: 50 Hz filter 0: 60 Hz filter **P1** 1: channel 2 on 0: channel 2 off **P2** 1: P-error allowed 0: not allowed **P3** not used	**P0** 1: 50 Hz filter 0: 60 Hz filter **P1** 1: channel 2 on 0: channel 2 off **P2** 1: P-error allowed 0: not allowed **P3** not used	**P0, P1, P3** not used **P2** 1: P-error allowed 0: not used	**P0, P1, P3** not used **P2** 1: P-error allowed 0: not used	**P0** 1: 50 Hz filter 0: 60 Hz filter **P1, P2:** P-error release of cannel **P3: sensor** 1: 2-wire 0: 3-wire
Max. current out of AS-i by sensor/ actuator supply out of AS-i[1]	200 mA	200 mA	200 mA	200 mA	50 mA
Max. sensor/actuator current by sensor/actuator supply out of AS-i	150 mA	150 mA	100 mA	100 mA	-
Max. sensor/actuator supplysors/ actuators by external 24 V supply (melting fuse)	500 mA	500 mA	500 mA	500 mA	-

Tab. 4-2.

1. at maximal sensor/actuator current

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LED displays:

LED (green) Analog 1: State of channel 1
LED (green) Analog 2: State of channel 2
LED (green) Analog 3: State of channel 3 (only for Pt100 module)
LED (green) Analog 4: State of channel 4 (only for Pt100 module)
LED (green) power: Voltage supply +24 V out of AS-Interface for analog part OK (not for Pt100-Module)
LED (green) AS-i: Voltage on AS-Interface terminals OK
LED (red) FAULT: AS-Interface communication fault, peripheral fault

The range consists of following AS-Interface analog modules:

- 2 analog inputs 0 - 10 V
- 2 analog inputs 4 - 20 mA
- 4 analog inputs Pt100
- 2 analog outputs 0 - 10 V
- 2 analog outputs 0 - 20 mA

The module with IP65 protection can be directly installed in the field.

4.1.1 Analog Modules with 2 Inputs

The analog modules have 2 analog inputs. The conversion of the measured value and the data transmission via AS-Interface occurs asynchronically according to AS-Interface Profile 7.3. Analog sensors can be connected via cage clamp terminals. The sensors can be supplied by AS-Interface or external help voltage (according to PELV) via the black ribbon cable. The resolution of the analog data is 16 bit. The analog modules contain 50 Hz and 60 Hz filters. These filters can be optionally switched with the help of the AS-Interface parameters.

The measuring range of voltage input modules amounts to 0 - 10 V and of current input modules 4 - 20 mA.

4.1.2 Analog Modules with 2 Outputs

The analog modules have 2 analog outputs. The digital-analog conversion and the data transmission via AS-Interface occurs asynchronically according to AS-Interface Profile 7.3. Analog actuators can be connected via cage clamp terminals. The actuators can be supplied by AS-Interface or external help voltage (according to PELV) via the black ribbon cable. The resolution of the analog data is 16 bit.

The measuring range of voltage output modules amounts to 0 - 10 V and of current output modules 0 - 20 mA.

4.1.3 Analog Module with 4 Pt100 Inputs

The analog module has got 4 Pt100 inputs. The commission of the measured value and the data transmission via AS-Interface occurs asynchronically according to AS-Interface Profile 7.3. Four analog sensors can be connected via cage clamp terminals. The sensors are supplied by AS-Interface.

The resolution of the analog data is 16 bit. The Pt100 module contains 50 Hz and 60 Hz filters. These filters can be optionally switched with the help of the AS-Interface parameters.

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4.2 Analog Modules with 2 Channels in Protection Category IP20

Article	**VBA-2E-KE2-I/U** **VBA-2E-KE2-I/U-V3.0**	**VBA-2A-KE2-I/U**
Characteristics	input module	output module
Number of inputs	2	-
Number of outputs	-	2
Resolution	16 bit (VBA-2E-KE2-I/U) 14 bit (VBA-2E-KE2-I/U-V3.0)	16 bit
Display of state of the channels	yes	yes
Potential conditions between sensors/actuators/Pt100 and AS-i	Current supply of the sensors can take place via the slide switch S1 either from AS-i or from external auxiliary voltage: +24 V out of AS-i: potential connected to AS-i +24 V out of external help voltage: galv. separation	Current supply of the actuators can take place via the slide switch S1 either from AS-i or from external auxiliary voltage: +24 V out of AS-i: potential connected to AS-i +24 V out of external help voltage: galv. separation
AS-i parameters	**P0** 1: 50 Hz filter 0: 60 Hz filter **P1** VBA-2E-KE2-I/U: 1: channel 2 isprojected 0: channel 2 is not projected VBA-2E-KE2-I/U-V3.0: 1: normal operation 0: both channels in current mode and without wire brake recognition **P2** 1: p-fault allowed 0: not allowed **P3** VBA-2E-KE2-I/U: 1: normal operation 0: both channels in current mode and without wire brake recognition	**P0** 1 automatic module recognition 0: P1, P3 define the mode of channel 1 and 2 P1: channel 1 is 1 current module 0: voltage module **P2** 1: p-fault allowed 0: not allowed **P1** channel 2 is 1 current module 0: voltage module
Max. current out of AS-i at supply of sensors/actuators out of AS-i[1]	200 mA	200 mA
Max. current of sensors/actuators at supply of sensors/actuators out of AS-i	150 mA	150 mA
Max. current of sensors/actuators (melting fuse) at external 24 V supply	500 mA	500 mA
Features	channel 2 can be switched off also with slied switch S2 VBA-2E-KE2-I/U-V3.0: the data capacity (14 bit/16 bit) and the channel number can be defined	-

Tab. 4-3.

1. at max. current of sensor/actuator!

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LED displays:

VBA-2E-KE2-I/U:

LED (green) Input 1/Output 1: State of channel1
LED (green) Input 2/Output 2: State of channel 2
LED (green) Input 1/Output 1: Voltage/current channel 1
LED (green) Input 2/Output 2: Voltage/current channel 2

VBA-2E-KE2-I/U-V3.0:

LED (green) Input Status 1: State of channel 1
LED (green) Input Status 2: State of channel 2
LED (green) Input Mode 1: Voltage/current channel 1
LED (green) Input Mode 2: Voltage/current channel 2
LED (green) PWR: Voltage on AS-Interface terminals OK
LED (red) FAULT: AS-Interface communication fault, peripheral fault
LED (green) AUX: External help voltage 24 V OK
LED (green) INT: Voltage supply out of AS-Interface for analog part OK

4.2.1 Analog Module with 2 Inputs

The analog module has 2 analog inputs.

The connection of sensors is made by Combicon clamps. Current or voltage signals can be attached over different clamps.

This module even can detect automatically, if there is a current or a voltage signal at the module´s input. A channel input can only detect either a voltage or a current signal each.

The current supply of the sensors can take place depending upon position of a slide switch from AS-Interface or from external help voltage (after PELV). With the help of a second slide switch the 2. channel in favor of faster data communication can be switched off. The position of the slide switches is indicated over LEDs.

The conversion of the measured value and the data transmission via AS-Interface occurs asynchronically according to AS-Interface Profile 7.3 resp. 7.A.9. The resolution of the analog data is 16 bit resp. 14 bit. Alternatively, the analog module VBA-2E-KE2-I/U-V3.0 can be switched to 12 bit. The analog modules contains 50 Hz and 60 Hz filters. These filters can be optionally switched with the help of the AS-Interface parameters.

4.2.2 Analog Module with 2 Outputs

The analog module has 2 analog outputs.

The connection of actuators is made by Combicon clamps. Current or voltage signals can be delivered over different clamps.

This module even detects automatically, if there is a current or a voltage processing actuator at the module´s output. At a channel output can only be detected either a voltage or a current processing device each.

The current supply of the actuators can take place depending upon position of a slide switch from AS-Interface or from external help voltage (after PELV). The position of the slide switch is indicated over LEDs. The conversion of the measured value and the data transmission via AS-Interface occurs asynchronically according to AS-Interface Profile 7.3. The resolution of the analog data is 16 bit.

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5. Analog Modules in Protection Class IP65 with PG-Screw Connection

Modules with 2 analog in- or outputs in IP65:

On the front panel of the modules are:

- Cage clamp terminals to connect the power supply and for signal in-, respectively outputs
- 5 LEDs
- A jumper-block for selecting the connections of power supply (from AS-i, external)

Module witht 4 Pt100 inputs in IP65:

On the front panel of the module are:

- Cage clamp terminals for the signal inputs
- 6 LEDs

5.1 Connections, Displays and Operating Keys

5.1.1 Power Supply of the Analog Modules

Attention!

Analog modules offer the possibilities to supply the attached sensors/actuators either via AS-i or via external help voltage 24 V. The choice is made with the jumpers inside the module. The substructure module has to be selected according to the variant of power supply connection – supply by AS-i or external help voltage by 24 V – that is chosen.

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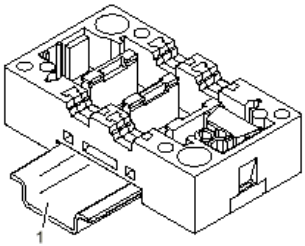
The analog module is attached to the AS-interface by using the electromechanical interface EMS or the expanded electromechanical interface EEMS.

5.1.1.1 Supplying the Sensors/Actuators by AS-i

If the voltage supply of the sensors which are to be attached shall be maintained by AS-i, please use the AS-i substructure module (article no. U-G1F) to connect 2 AS-i flat cables, respectively the AS-i substructure module (article no. U-G1P) to connect round cables.

Information!

If sensors/actuators are supplied by AS-i, the sum must not exceed 200 mA.



Information!

The AS-i Pt100 module can only be powered by AS-i.

5.1.1.2 Supplying the Sensors/Actuators by external Help Voltage

If the sum of energy that is needed to supply the sensors/actuators exceeds 200 mA an additional auxiliary power-transmission line must be attached to the analog module.

Information!

The external help voltage is protected with a melting fuse (750 mA).

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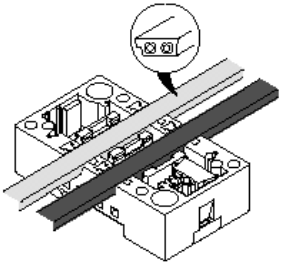
To do so, please use the AS-i substructure module (article no. U-G1FF) to connect 1 AS-i flat cable and 1 flat cable for external help voltage, respectively the AS-i substructure module (article no. U-G1PP) to connect 1 AS-i round cable and 1 round cable for external help voltage. The external help voltage are connected by using a connection block which is stuck into the substructure module.

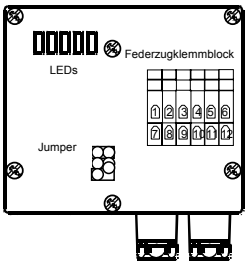


Attention!
If an external supply is used, the power supply must be according to PELV (Protective Extra Low Voltage EN 50 178).

Information!
The substructure module is not included in delivery and must be ordered separately.

5.1.1.3 Positioning of Jumpers (Input/Output Modules)

By means of the jumpers, the choice is made whether the sensors/actuators of the modules with 2 inputs, respectively 2 outputs are supplied by AS-i or by a external help voltage. In order to attach the sensors/actuators and to put the jumpers into the right position, the cover of the analog module must be opened.



Attention!
Jumpers shall only be put or pulled in unpowered condition.

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If the attached sensors and actuators are supplied by AS-i, the following position of jumpers must be used:


24V AS-i

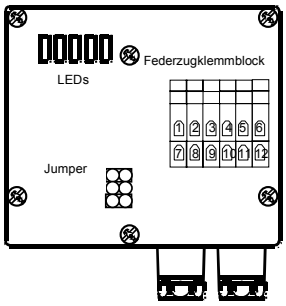
If the attached sensors and actuators are supplied by external help voltage, the following position of jumpers must be used:


24V ext.

5.1.2 Terminal Configuration

5.1.2.1 Input/Output Modules

Connections:	
1	24 V ext.
2	Sig.+ Ch2
3	0 V ext.
4	Sig.- Ch2
5	Shield
6	Shield
7	24 V ext.
8	Sig.+ Ch1
9	0 V ext.
10	Sig.- Ch1
11	FG
12	FG



FG: Function ground for EMC reasons.

Information!

For prevention of a peripheral fault by an unsed channel 2 of the input current module between terminals 1 - 2 a 5,6 kOhm resistor,

between terminals 3 - 4 a bridge must be connected.

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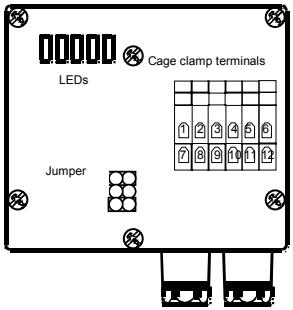
5.1.2.2 Pt100 Module

Connections:	
1	Channel 1+
2	Channel 1 Sense-
3	Channel 1 -
4	Channel 2 +
5	Channel 2 Sense-
6	Channel 2 -
7	Channel 3 +
8	Channel 3 Sense-
9	Channel 3 -
10	Channel 4 +
11	Channel 4 Sense-
12	Channel 4 -



1, 4, 7, 10 are connected internally.

Information!

For prevention of a peripheral fault by unsed channels 2, 3 and/or 4
for channel 2 between terminals 4 - 6 a 220 Ohm resistor,
for channel 3 between terminals 7 - 9 a 220 Ohm resistor,
for channel 4 between terminals 10 - 12 a 220 Ohm resistor must be connected.

Information!

For prevention of a periphery fault by unsed channel 2 for channel 2 between terminals 4 - 6 a 220 Ohm resistor must be connected.

5.1.3 Displays

5.1.3.1 LEDs of the Input/Output Modules

Analog 1 (green)
off: Analog signal not attached (only current input modules)
on: Analog signal within range of values flashing: Analog signal outside range of values
Analog 2 (green)
off: Analog signal not attached (only current input modules)
on: Analog signal within range of values flashing: Analog signal outside range of values
PWR (green)
an: Voltage for analog part OK
off: Voltage for analog part not OK
AS-i (green)
on: Voltage on AS-i terminals OK

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FAULT (red)
on: AS-i communication fault
flashing: Peripheral fault

A peripheral fault is shown if at least one of the signals Analog 1 or Analog 2 is outside the range of values.

5.1.3.2 LEDs of the Pt100 Module

Analog 1 (green)
off: Analog signal not attached
on: Analog signal within measuring range
flashing: Analog signal outside measuring range
Analog 2 (green)
off: Analog signal not attached
on: Analog signal within measuring range
blinkend: Analog signal outside measuring range
Analog 3 (green)
off: Analog signal not attached
on: Analog signal within measuring range
flashing: Analog signal outside measuring range
PWR (green)
on: Voltage on AS-i terminals OK
off: Voltage on AS-i terminals not OK
FAULT (red)
an: AS-i communication fault
flashing: Peripheral fault

A peripheral fault is shown when at least one of the signals Analog 1, Analog 2, Analog 3 or Analog 4 is outside the measuring range or at least one of the analog channels is unattached.

Analog 4 (green)
off: Analog signal not attached
on: Analog signal within measuring range
flashing: Analog signal outside measuring range

5.1.4 Connection of Actuators/Sensors to the Modules

Warning!
*Do **never** connect the power supply **directly** to the voltage in- and outputs otherwise the module will be destroyed.*

In order to improve EMC during signal transmission, the analog sensors and actuators can be attached by using shielded cables. Therefore the shielding has to be connected with terminal 5 and 6. Function ground is connected with terminal 11 and 12.

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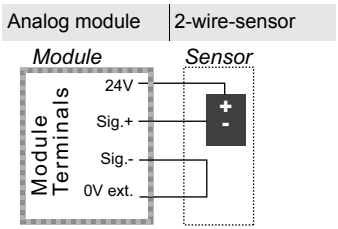
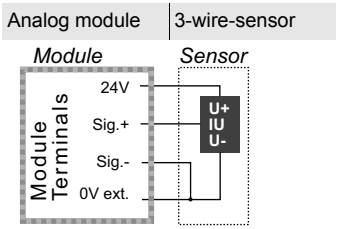
5.1.4.1 Terminal Configuration of 2I module

Connection of a 2-wire-sensor to the analog input module with 2 channels:



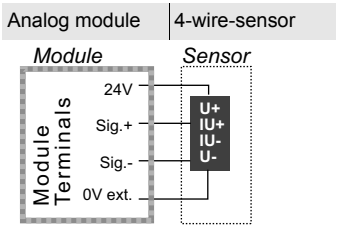
A 2-wire-sensor is attached to terminal 7 (24 V) and 8 (Sig.+) of channel 1. Terminals 9 (0 V ext.) and 10 (Sig.-) have to be connected to each other by using a bridge. Corresponding channel 2 is attached via terminal 1 (24 V) and 2 (Sig.+) as well as 3 (0 V ext.) and 4 (Sig.-).

Connection of a 3-wire-sensor to the analog input module with 2 channels:



A 3-wire-sensor is attached to terminal 7 (24 V), 8 (Sig.+) and 9 (0 V ext.) of channel 1. Terminals 9 (0 V ext.) and 10 (Sig.-) have to be connected to each other by using a bridge. Corresponding channel 2 is attached via terminal 1 (24 V) and 2 (Sig.+) as well as 3 (0 V ext.) and 4 (Sig.-).

Connection of a 4-wire-sensor to the analog input module with 2 channels:



A 4-wire-sensor is attached to terminal 7 (24 V), 8 (Sig.+), 9 (0 V ext.) and 10 (Sig.-) of channel 1 see figure above for details. Corresponding channel 2 is attached via 1 (24 V) and 2 (Sig.+) as well as 3 (0 V ext.) and 4 (Sig.-).

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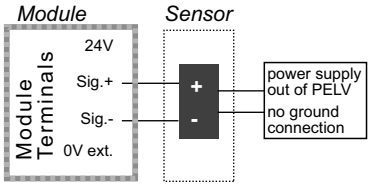
Analog input modules with 2 current inputs are delivered with a resistor between terminals 1 and 2 and a bridge between terminals 3 and 4. With that, it is prevented that a fault message for input channel 2 is notified by the module when it is brought into service and only one sensor at input channel 1 is attached.

By using of a sensor at channel 2 the resistor and, if necessary, the bridge have to be removed.

Connection of a sensor with own power supply to an analog input module with 2 channels:

Analog module	Sensor with own power supply

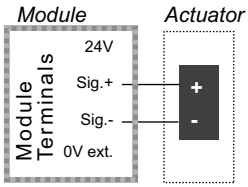


A sensor with own supply is attached to terminal 8 (Sig.+) and 10 (Sig.-) of channel 1. Corresponding channel 2 is attached via 2 (Sig.+) and 4 (Sig.-).

5.1.4.2 Terminal Configuration of 2O module (0 … 20 mA)

Connection of an actuator without separate power supply to the analog output module with 2 channels:

Analog module	Actuator without separate 24 V supply



A 2-wire-actuator is attached to terminal 8 (Sig.+) and 10 (Sig.-) of channel 1. Corresponding channel 2 is attached via 2 (Sig.+) and 4 (Sig.-).

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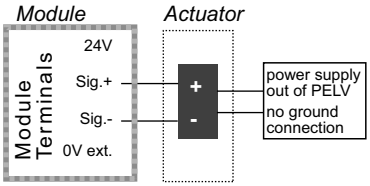
Connection of an actuator with own power supply to the analog output module with 2 channels:

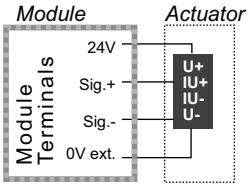
Analog module	Actuator with own power supply



An actuator with own power supply (e. g. an ampmeter) is attached to terminal 8 (Sig.+) and 10 (Sig.-) of channel 1. Corresponding channel 2 is attached via 2 (Sig.+) and 4 (Sig.-).

Connection of an actuator with separate 24 V power supply to the analog output module with 2 channels:

Analog module	Actuator with separate 24 V power supply

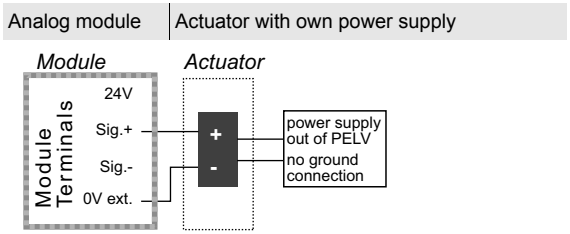


The separate 24V are attached to terminal 7 (24V) and 9 (0V ext.), the analog signal to terminal 8 (Sig.+) and 10 (Sig.-) of channel 1. Corresponding channel 2 is attached via terminals 1 (24V) and 3 (0V ext.) as well as 2 (Sig.+) and 4 (Sig.-).

Issue date: 6.5.2011

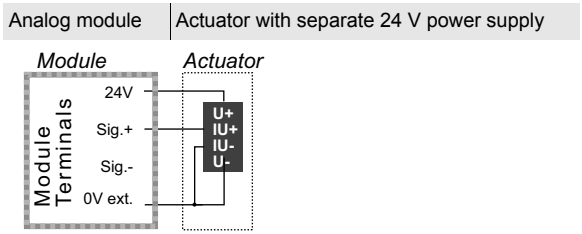
5.1.4.3 Terminal Configuration of 2O Module (0 … 10 V)

Connection of an actuator with own power supply to the analog output module with 2 channels:



An actuator with own power supply (e. g. a voltmeter) is attached to terminals 8 (Sig.+) and 9 (0 V ext.) of channel 1, as well as terminals 2 (Sig.+) and 3 (0 V ext.) of channel 2.

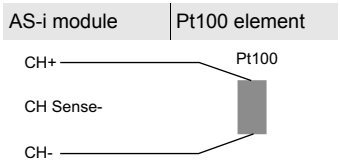
Connection of an actuator with separate 24 V power supply to the analog output module with 2 channels:



The separate 24 V are attached to terminal 7 (24 V) and 9 (0 V ext.), the analog signal to terminal 8 (Sig.+) and 9 (0 V ext.) of channel 1. Corresponding channel 2 is attached via terminals 1 (24 V) and 3 (0 V ext.) as well as 2 (Sig.+) and 3 (0 V ext.).

5.1.4.4 Terminal Configuration of the Pt100 Modules

Connection of a 2-wire-Pt100 element to the Pt100 module:



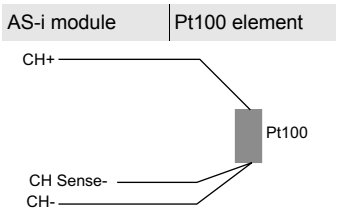
Information!
The information for channel 3 and 4 is valid only for a Pt100 module with 4 channels.

Issue date: 6.5.2011

For channel 1 the terminals 1 and 3, for channel 2 the terminals 4 and 5, for channel 3 the terminals 7 and 9 and for channel 4 the terminals 10 and 12 are valid.

The terminals 1, 4, 7 and 10 (CH. +) are connected internally.

Connection of a 3-wire-Pt100 element to the Pt100 module:



Information!
The information for channel 3 and 4 is valid only for a Pt100 module with 4 channels.

For channel 1 the terminals 1 - 3, for channel 2 the terminals 4 - 6, for channel 3 the terminals 7 - 9 and for channel 4 the terminals 10 - 12 are valid.

The terminals 1, 4, 7 and 10 (CH. +) are connected internally.

3-wire-Pt100 sensors give more exact results than 2-wire-Pt100 sensors. In addition the inlets must be alike in their resistance.

The change-over between the 3- and 2-wire-sensors is made by AS-i parameter bit 3.

With the Pt100 module on delivery a resistance is equipped between the terminals 4 and 6, 7 and 9 and 10 and 12, so that with start-up of the module with only an attached sensor no error message is indicated by the module.

5.2 Operating the Modules

5.2.1 Addressing the Modules

The addressing of the AS-i slaves takes place by the aid of a hand addressing device or an AS-i master.

When employing the hand addressing device the AS-i slave is simply stuck on the device and addressed. It is possible to use addresses between 1 and 31. In the condition of delivery the address is 0.

5.2.2 Operation of the Analog Input Modules

This chapter gives all necessary information which is needed to operate the AS-i analog input modules with either 2 inputs 4 - 20 mA or 2 inputs 0 - 10 V.

Issue date: 6.5.2011

Presupposition: The AS-i analog module supports AS-i analog profile 7.3. Via AS-i two 16 bit values per module are transmitted to the AS-i master. In order to operate the module, it is necessary to use an AS-i master which supports the analog profile 7.3.

5.2.2.1 Slave Profile

The configuration of the analog input modules is as follows:

I/O code: 7_{hex}
ID code: 3_{hex}
ID2 code: D_{hex}

5.2.2.2 Parameterization of the Analog Input Modules

The adjustment of differing operation ranges is known as parameterization. It is done via the AS-i master by executing the command "write AS-i parameter" for example in the AS-i Control Tools in the window "slave configuration". Under "data and parameters" the AS-i parameter bits can be set or deleted.

Parameter settings of AS-i analog input modules can be adjusted as follows:

AS-i parameter bit 0: Filter for mains frequency

P0	Filter in the A/D converter for
1	50 Hz (default)
0	60 Hz

The 50 Hz filter is valid in the whole of Europe.

AS-i parameter bit 1: Configuration of channel 2

By means of AS-i parameter bit 1 it is possible to adjust whether measuring channel 2 of the analog input module is active or not. Deactivating channel 2 shortens the conversion and transmission time and influences LED and peripheral fault messages. LED displays and peripheral fault messages are not affected by this channel anymore.

By deactivating channel 2 conversion and transmission time in the AS-i slave can be intensely reduced (for additional information see chap. <Transmission Time of Analog Input Parameters> respectively chap. <Parameterization of Analog Output Modules>).

P1	Channel 2 is
1	configured (active)
0	not configured (not active)

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AS-i parameter bit 2: Display of a peripheral fault

By means of this bit, it is possible to adjust whether an adjacent peripheral fault is notified by the flashing "FAULT"-LED of the module and the peripheral fault is transmitted to the AS-i master.

P2	peripheral fault is
1	notified
0	not notified

AS-i parameter bit 3:

Not used

5.2.2.3 Measuring Range of Analog Input Modules

Analog Input Module, 4 - 20 mA:

Range 4 … 20 mA	Units dec.	Units hex.	Analog LED	Range
> 23 mA	32767	7FFF	flashing	Overflow
23 mA	23000	59D8		Overrange
…	…	…	on	
20,001 mA	20001	4E21		
20 mA	20000	4E20		Nominal range
19,999 mA	19999	4E1F		
…	…	…	on	
4,001 mA	4001	0FA1		
4 mA	4000	0FA0		
3,999 mA	3999	0F9F		Underrange
…	…	…	on	
1 mA	1000	03E8		
< 1 mA	32767	7FFF	off	Wire break

When switching the channel 2 from active condition to inactive condition its last value is shown.

Input resistance: 50 Ohm
Max. input current: 40 mA
Wire break detection: yes

Issue date: 6.5.2011

Analog Input Module, 0 - 10 V:

Range 0 … 10 V	Units dec.	Units hex.	Analog LED	Range
> 11,5 V	32767	7FFF	flashing	Overflow
11,5 V	11500	2CEC		Overrange
…	…	…	on	
10,001 V	10001	2711		
10 V	10000	2710		Nominal range
9,999 V	9999	270F		
…	…	…	on	
1 mV	0001	0001		
0 V	0000	0000		
< 0 V	0000	0000	on	Underrange

When switching a channel from active condition to inactive condition its last value is shown.

Max. voltage: 50 V
Input resistance: 100 kOhm
Wire break detection: no

5.2.2.4 Transmission Time of Analog Input Parameters

The transmission time of analog parameters depends on the one hand on the conversion time of analog signals to digital signals in the AS-i module, on the other hand on the transmission time via the AS-i.

More exact views to the transmission time are in chap. <Cycle Times during the Analog Value Transmission>.

5.2.3 Operation of Analog Output Modules

This chapter gives all necessary information which is needed to operate an AS-i analog output module with either 2 outputs 0 - 20 mA or 2 outputs 0 - 10 V.

Presupposition: The AS-i analog modules support AS-i analog profile 7.3. Via AS-i two 16 bit values per module are transmitted to the AS-i master. In order to operate the module, it is necessary to use an AS-i master which supports analog profile 7.3.

5.2.3.1 Slave Profile

The configuration of analog output modules is as follows:

I/O code: 7_{hex}
ID code: 3_{hex}
ID2 code: 5_{hex}

Issue date: 6.5.2011

5.2.3.2 Parameterization of Analog Output Modules

The adjustment of differing operation ranges is known as parameterization. It is done via the AS-i master by executing the command "write AS-i parameter" for example in the AS-i Control Tools in the window "slave configuration". Under "data and parameters" the AS-i parameter bits can be set or deleted.

Parameter settings of AS-i analog output modules can be adjusted as follows:

AS-i parameter bit 0:

Not used

AS-i parameter bit 1:

Not used

AS-i parameter bit 2: Display of a peripheral fault

By means of this bit, it is possible to adjust whether an adjacent peripheral fault is notified by the flashing "FAULT"-LED of the module and the peripheral fault is transmitted to the AS-i master.

P2	Peripheral fault is
1	notified
0	not notified

AS-i parameter bit 3:

Not used

5.2.3.3 Value Range of Analog Output Modules

Analog Output Module, 0 - 20 mA:

Output value 0 … 20 mA	Units dec.	Units hex.	Analog LED	Range
23 mA	>23000	>59D8	flashing	Overflow
23 mA	23000	59D8		Overrange
…	…		on	
20,001 mA	20001	4E21		
20 mA	20000	4E20		Nominal range
19,999 mA	19999	4E1F		
…	…	…	on	
1 µA	0001	0001		
0 mA	0000	0000		
0 mA	< 0000	< 0000	flashing	Underrange

Shunt resistance: max. 600 Ohm
Short-circuit proof: yes
Wire break recognition: no

Issue date: 6.5.2011

Analog Output Module, 0 - 10 V:

Output range 0 … 10 V	**Units dec.**	**Units hex.**	**Analog LED**	**Range**
11,5 V	> 11500	> 2CEC	flashing	Overflow
11,5 V	11500	2CEC		Overrange
…	…	…	on	
10,001 V	10001	2711		
10 V	10000	2710		Nominal range
9,999 V	9999	270F		
…	…	…	on	
1 mV	0001	0001		
0 V	0000	0000		
0 V	< 0000	< 0000	flashing	Underrage

Load resistence (min.): 3,3 kOhm
Short-circuit proof: yes
Short-circuit current: 4 mA
Wire break recognition: no

5.2.3.4 Transmission Time of Analog Parameters

The transmission time of analog parameters depends on the one hand on the conversion time of digital signals to analog signals in the AS-i module, on the other hand on the transmission time via the AS-i.

More exact views to the transmission time are in chap. <Cycle Times during the Analog Value Transmission>.

5.2.4 Operation of the Pt100 Modules

This chapter gives all necessary information which is needed to operate the Pt100 module.

Presupposition: The AS-i Pt100 module supports AS-i analog profile 7.3. Via AS-i four 16 bit values are transmitted from the Pt100 module to the AS-i master. In order to operate the module, it is necessary to use an AS-i master which supports analog profile 7.3.

It is necessary to attach at least one Pt100 sensor in order to start the A/D converter before switching on the slave. Otherwise the input LEDs will blink with a frequency of app. 5 Hz.

Issue date: 6.5.2011

5.2.4.1 Slave Profile

The configuration of the AS-i Pt100 module is as follows:

I/O code: 7_{hex}
ID code: 3_{hex}
ID2 code: E_{hex}

5.2.4.2 Parameterization of the Pt100 Module

The adjustment of differing operation ranges is known as parameterization. It is done via the AS-i master by executing the command "write AS-i parameter"

Parameter settings of AS-i Pt100 module can be adjusted as follows:

AS-i parameter bit 0: Filter for mains frequency

P0	Filter in the A/D converter for
1	50 Hz (default)
0	60 Hz

The 50 Hz filter is valid in the whole of Europe.

AS-i parameter bits 1 and 2: Configuration of peripheral fault messages of channels 1 to 4

By means of AS-i parameter bits P1 and P2 it is possible to adjust which measuring channels of the module release peripheral fault messages. Configuration only effects peripheral fault messages. Adjacent measuring parameters of all 4 channels are always transmitted via AS-i.

		Peripheral fault can be caused by channel			
P1	**P2**	**1**	**2**	**3**	**4**
0	0	yes	no	no	no
0	1	yes	yes	no	no
1	0	yes	yes	yes	no
1	1	yes	yes	yes	yes

AS-i parameter bit 3: Pt100-elements which are to be attached

By means of this parameter bit, it is possible to adjust whether 2-wire-Pt100 elements or 3-wire-Pt100 elements are attached.

P3	Mode
1	2-wire-mode
0	3-wire-mode

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5.2.4.3 Measuring Range of the AS-i Pt100 Modules

Range -200° C ... +850° C	Units dec.	Units hex.	Analog LED	Range
> +883,6° C	32767	7FFF	off	Wire break
+883,6° C	8836	2090		Overrange
…	…	…	on	
+850,1° C	8501	2135		
+850° C	8500	2134		Nominal range
+849,9° C	8499	2133		
…	…	…	on	
-199,9° C	-1999	F831		
-200° C	-2000	F830		
-200,1° C	-2001	F82F		Underrange
…	…	…	on	
-219,4° C	-2194	F76E		
< -219,4° C	32767	7FFF	flashing	Short-circuit

Measuring current: < 1,20 mA

5.2.4.4 Transmission Time of Analog Values of the Pt100 Modules

The transmission time of analog parameters depends on the one hand on the conversion time of analog signals to digital signals in the AS-i module, on the other hand on the transmission time via the AS-i.

More exact views to the transmission time are in chap. <Cycle Times during the Analog Value Transmission>.

Issue date: 6.5.2011

6. Analog Modules in Protection Class IP20 with 2 Channels

Modules with 2 analog in- or outputs in IP20:

On the front panel of the modules are:

- Terminals to connect the power supply and terminals for signal in-, respectively outputs
- 8 LEDs
- A slide switch for the selecetion of the power supply (out of AS-i, extern)
- A slide switch for the turn on or off of the 2. channel (only input module, chap. <Parameterization of the Analog Input Modules>).

Automatic signal detection:

The input module detects automatically, if there is a current or a voltage signal at the input. On an input module even current and voltage signals can be connected combined. By the analog input module VBA-2E-KE2-I/U both channels can be switched in current mode. By the analog input module VBA-2E-KE2-I/U-V3.0 the data capacity and the number of channel can be defined.

By the output module can be defined with the help of the AS-i parameters, if the AS-i analog output module should detect the respective output modus automatically or it is set by the use of the AS-i parameter bits P1 respectively P3.

6.1 Connections, Displays and Operating Keys

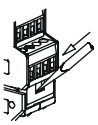
6.1.1 Power Supply

Attention!

The analog modules offer the possibility to supply the sensors out of AS-i or from external help voltage. This is selected by a switch inside the module.

Therefore the case of the module has to be opened as follows and the switch has to be adjusted:

1. Unlocking of the module´s top



On both sides of the module force the unlock buttons with help of a screw driver.

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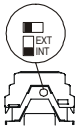
2. Openning the module
   Pull out the top until stop
3. Adjusting of the supply



EXT: Power supply of the analog part and of the actuators/ sensors out of external voltage.
INT: Power supply of the analog part and of the actuators/sensors out of AS-i.

Attention!

The switch may be actuated by power-off only.

Attention!

Supplying external loads:

by supply out of AS-i: 50 mA max.

by external supply: 500 mA max. (750 mA melting fuse)

No PE connection may exist at 24 V aux. supply!

Information!

The analog modules in IP20 with 2 channels can be used as current or voltage modules optionally.

The recognition of the signal type follows after a power reset.

The analog module is connected by clamp terminals to AS-i. The external help voltage can be connectd by clamps.

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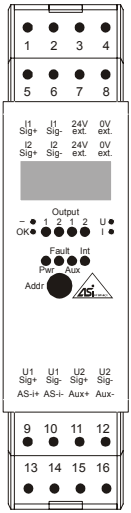
6.1.2 Connections of the Terminals

Connections;	
	Input
1	I1 Sig.+
2	I1 Sig.-
3	24 V ext.
4	0 V ext.
5	I2 Sig.+
6	I2 Sig.-
7	24 V ext.
8	0 V ext.
9	U1 Sig.+
10	U1 Sig.-
11	U2 Sig.+
12	U2 Sig.-
13	AS-i+
14	AS-i-
15	AUX+
16	AUX-



6.1.2.1 Input Module

The input currents and voltages are connected via the appropriate terminals (terminals 1, 2/5, 6 respect. 9, 10/11, 12).

Information!

Not used input channels have to be brigded between Sig.+ and Sig.-.

Automatic signal detection:

The input module detects automatically by turn on, if there is an current or a voltage signal at the input.

On an input module even current and voltage signals can be connected combined. According to the adjacent current respectively voltage signal the module works in the correspondening mode.

I_{input}: > 1 mA: Mode current module

U_{input}: > 1 V: Mode voltage module

else: The module works in the last recognized configuration

Information!

*A channel input can process only either a current **or** a voltage signal*

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Warning!

*If a current **and** a voltage signal are connected to one channel input at the same time, the module and the signal transmitters will be destroyed.*

According to the position of switch S2 the second channel can be switched on or off (see chap. <Power Supply>).

Information!

The analog modules in IP20 with 2 channels can be used as current or voltage modules optionally.

The recognition of the signal type follows after a power reset.

6.1.2.2 Output Module

The output currents and voltages are connected via the appropriate terminals (terminals 1, 2/5, 6 respect. 9,10/11, 12).

Information!

Not used output channels have to be open and not to be brigded.

Automatic signal detection:

The output module detects automatically, if it has to deliver current or voltage (requirements: AS-i parameter bit P0 = 1).

On an output module even current and voltage output signals can be connected combined. According to the adjacent current respectively voltage signal the module works in the correspondening mode:

Information!

*At a channel output may be connected only either a current **or** a voltage signal processing actuator.*

If the input data is larger than 1000 dec. by turning on and the voltage at the measuring resistor of the current output is larger as 100 mV: Current module, else voltage module.

If the input data is smaller than 1000 dec. by turning on, the module works in the last recognized configuration.

6.1.3 Displays

6.1.3.1 LEDs of Input/Output Modules

PWR (green)
on: Voltage on AS-i terminals OK
FAULT (red)
on: AS-i communication fault
flashing: Peripheral fault

A peripheral fault is shown when at least one of the signals Input 1/Output 1 or Input 2/Output 2 resp. Input Status 1 or Input Status 2 is outside the range of values.

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AUX (green)
on: 24 V supply for analog part OK
INT (green)
on: Voltage supply out of AS-i for analog part OK
VBA-2E-KE2-I/U, VBA-2A-KE2-I/U:
Input 1/Output 1 -/OK (green)
off: Analog signal not attached (only current input module)
on: Analog signal within range of values
flashing: Analog signal outside range of values
Input 2/Output 2 -/OK (green)
off: Analog signal not attached (only current input module)
on: Analog signal within range of values
flashing: Analog signal outside range of values
Input 1/Output 1 U/I (green):
off: Voltage in-/output
on: Current in-/output
Input 2/Output 2 U/I (green):
off: Voltage in-/output
on: Current in-/output
VBA-2E-KE2-I/U-V3.0:
Input Status 1 (green)
off: Analog signal not attached (only current input module)
on: Analog signal within range of values
flashing: Analog signal outside range of values
Input Status 2 (green)
off: Analog signal not attached (only current input module)
on: Analog signal within range of values
flashing: Analog signal outside range of values
Input Mode 1 (green):
off: Voltage input
on: Current input
Input Mode 2 (green):
off: Voltage input
on: Current input

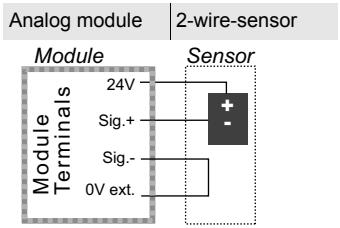
6.1.4 Connection of Actuators/Sensors to the Analog Modules

Warning!
*Do **never** connect the power supply **directly** to the voltage in- and output otherwise the module will be destroyed.*

Issue date: 6.5.2011

6.1.4.1 Connection of 2I modules

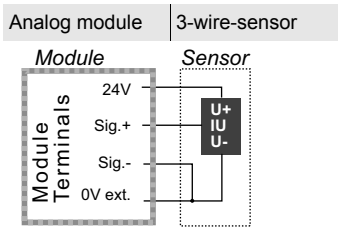
Connection of a 2-wire-sensor to the analog input module:



A 2-wire-sensor is attached to terminal 3 (24 V) and 1 (I1 Sig.+) of channel 1 for current input respectively to 9 (U1 Sig.+) for voltage input. The terminals 3 (0 V ext.) and 2 (I1 Sig.-) for current input respectively 10 (U1 Sig.-) for voltage input have to be connected to each other by using a bridge.

Corresponding channel 2 is atteched via terminal 7 (24 V) and 5 (I2 Sig.+) respectively 11 (U2 Sig.+) as well as 8 (0 V ext. and 6 (I2 Sig.-) respectively 12 (U2 Sig.-). The terminals 8 (0 V ext.) and 6 (I2 Sig.-) for current input respectively 12 (U2 Sig.-) for voltage input have to be connected to each other by using a bridge.

Connection of a 3-wire-sensor to the analog input module:



A 3-wire-sensor is attached to terminal 3 (24 V), 1 (I1 Sig.+) for current input repectively 9 (U1 Sig.+) for voltage input and 4 (0 V ext.) of channel 1. Terminals 4 (0 V ext.) and 2 (I1 Sig.-) for current input repectively 10 (U1 Sig.-) for voltage input have to be connected to each other by using a bridge.

Corresponding channel 2 is attached via terminal 7 (24 V) and 5 (I2 Sig.+) for current input respectively 11 (U2 Sig.+) for voltage input as well as 8 (0 V ext.) and 6 (I2 Sig.-) for current input respectively 12 (U2 Sig.-) for voltae input.

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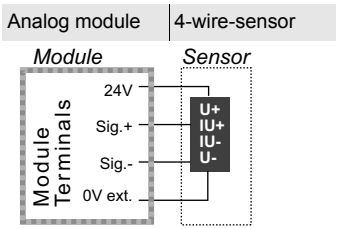
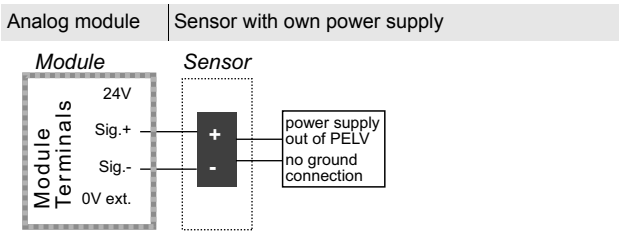
Connection of a 4-wire-sensor to the analog input module:



A 4-wire-sensor is attached to terminal 3 (24 V), 1 (I1 Sig.+) for current input respectively 9 (U1 Sig.+) for voltage input, 4 (0 V ext.) and 2 (I1 Sig.-) for current input respectively 10 (U1 Sig.-) of channel 1 see figure above for details.

Corresponding channel 2 is attached via 7 (24 V) and 5 (I2 Sig.+) for current input respectively 11 (U2 Sig.+) for voltage input as well as 8 (0 V ext.) and 6 (I2 Sig.-) for current input repsectively 12 (U2 Sig.-) for voltage input.

Connection of a sensor with own power supply to the analog input module:



A sensor with own supply is attached for channel 1 to terminal 1 (I1 Sig.+) and 2 (I1 Sig.-) respectively for voltage input to terminals 9 (U1 Sig.+) and 10 (U1 Sig.-) of channel 1. Corresponding channel 2 is attached for current input via 5 (I2 Sig.+) and 6 (I2 Sig.-) respectively for voltage input via 11 (U2 Sig.+) and 12 (U2 Sig.-).

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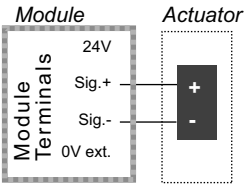
6.1.4.2 Connection of the Analog Output Module (0 … 20 mA)

Connection of an actuator without separate power supply to the analog output module:

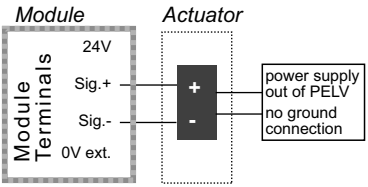
Analog module	Actuator without separate 24 V supply



A 2-wire-actuator is attached to terminal 1 (I1 Sig.+) and 2 (I1 Sig.-) of channel 1. Corresponding channel 2 is attached via 5 (I2 Sig.+) and 6 (I2 Sig.-).

Connection of an actuator with own power supplyto the analog output module:

Analog module	Actuator with own power supply



An actuator with own power supply (e. g. an ampmeter) is attached to terminal 1 (I1 Sig.+) and 2 (I1 Sig.-) of channel 1. Corresponding channel 2 is attached via 5 (I2 Sig.+) and 6 (I2 Sig.-).

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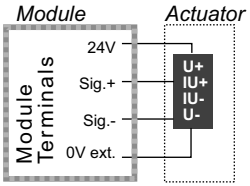
Connection of an actuator with separate 24 V power supplyto the analog output module:

Analog module	Actuator with separate 24 V power supply

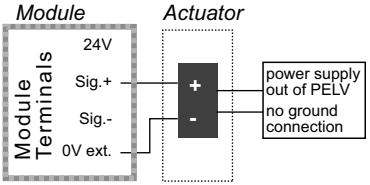


The separate 24 V are attached to terminals 3 (24 V) and 4 (0 V ext.), the analog signal to terminals 1 (I1 Sig.+) and 2 (I1 Sig.-) of channel 1. Corresponding channel 2 is attached via terminals 7 (24 V) and 8 (0 V ext.) as well as 5 (I2 Sig.+) and 6 (I2 Sig.-).

6.1.4.3 Terminal Configuration of the Analog Output Module (0 … 10 V)

Connection of an actuator with own power supply to the analog output module:

Analog module	Actuator with own power supply



An actuator with own power supply (e. g. a voltmeter) is attached to terminals 9 (U2 Sig.+) and 4 (0 V ext.) of channel 1, as well as terminals 11 (U2 Sig.+) and 8 (0 V ext.) of channel 2.

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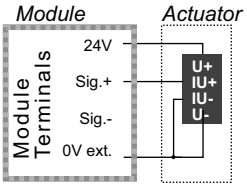
Connection of an actuator with separate 24 V power supply to the analog output module:

Analog module	Actuator with separate 24 V power supply



The separate 24 V are attached to terminal 3 (24 V) and 4 (0 V ext.), the analog signal to terminal 9 (U2 Sig.+) and 4 (0 V ext.) of channel 1. Corresponding channel 2 is attached via terminals 7 (24 V) and 8 (0 V ext.) as well as 11 (U2 Sig.+) and 8 (0 V ext.).

6.2 Operating the Modules

The addressing of the AS-i slaves takes place by the aid of a hand addressing device or an AS-i master.

When employing the hand addressing device the AS-i slave is simply stuck on the device and addressed. It is possible to use addresses between 1 and 31. In the condition of delivery the address is 0.

6.2.1 Operation of Analog Input Modules

This chapter gives all necessary information which is needed to operate the AS-i analog input modules with either 2 inputs 4 - 20 mA or 2 inputs 0 - 10 V.

Presupposition: The AS-i analog module support AS-i analog profile 7.3 resp 7.A.9. Via AS-i two 16 bit resp. 14 bit values per module are transmitted to the AS-i master. In order to operate the module, it is necessary to use an AS-i master which supports the respective analog profile.

6.2.1.1 Slave Profile

Configuration of the analog input modules is as follows:

Analog input modules with 2 channels (VBA-2E-KE2-I/U):

I/O code: 7_{hex}
ID code: 3_{hex}
ID2 code: D_{hex}

Analog input modules with 2 channels (VBA-2E-KE2-I/U-V3.0):

I/O code: 7_{hex}
ID code: A_{hex}
ID2 code: 9_{hex}

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ID1 code: Setting of data capaciity and channel number

Code-Definition ID1		
data capacity	14 bit	12 bit
Channel 1	0; 2; 3	1
Channel 1+2	4; 5; 7 (Default value ID1=7)	6

6.2.1.2 Parameterization of the Analog Input Modules

The adjustment of differing operation ranges is known as parameterization. It is done via the AS-i master by executing the command "write AS-i parameter" for example in the AS-i Control Tools in the window "slave configuration". Under "data and parameters" the AS-i parameter bits can be set or deleted.

Parameter settings of AS-i analog input modules can be adjusted as follows:

AS-i parameter bit 0: Filter for mains frequency

P0	Filter in the A/D converter for
1	50 Hz (default)
0	60 Hz

The 50 Hz filter is valid in the whole of Europe.

AS-i parameter bit 1: Configuration of channel 2 (VBA-2E-KE2-I/U)

By means of AS-i parameter bit 1 it is possible to adjust whether measuring channel 2 of the analog input module is active or not. Deactivating channel 2 shortens the conversion and transmission time and influences LED and peripheral fault messages. LED displays and peripheral fault messages are not affected by this channel anymore.

By deactivating channel 2 conversion and transmission time in the AS-i slave can be intensely reduced.

P1	Channel 2 is
1	configured (active)
0	not configured (not active)

Additionally it is possible by the analog input module in IP20, that the 2. channel is switched off with a switch inside the device.

Therefore the case of the module has to be opened as follows and the switch has to be adjusted:

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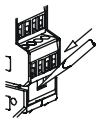
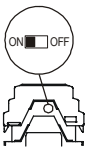
1. Unlocking of the module´s top



On both sides of the module force the unlock buttons with help of a screw driver

2. Openning the module
   Pull out the top until stop.
3. Adjusting the supply



ON: Channal 2 on
OFF: Channal 2 off

Attention!

The switch may be actuated by power-off only.

P1	Switch position	Channel 2
1	ON	on
1	OFF	off
0	ON	off
0	OFF	off

AS-i parameter bit 1: Current Mode (VBA-2E-KE2-I/U-V3.0)

By means of this bit, it is possible to adjust whether both channels work in current mode.

P1	Mode
1	normal operation
0	both channels in current mode and without wire brake recognition

AS-i parameter bit 2: Display of a peripheral fault

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By means of this bit, it is possible to adjust whether an adjacent peripheral fault is notified by the flashing "FAULT"-LED of the module and the peripheral fault is transmitted to the AS-Interface master.

P2	Peripheral fault is
1	notified
0	not notified

AS-i parameter bit 3 (VBA-2E-KE2-I/U-V3.0):

Not used

AS-i parameter bit 3: Current Mode (VBA-2E-KE2-I/U)

By means of this bit, it is possible to adjust whether both channels work in current mode.

P1	Mode
1	normal operation
0	both channels in current mode and without wire brake recognition

6.2.1.3 Measuring Range of Analog Input Modules

Analog input module 2 inputs, 4 - 20 mA:

Range 4 … 20 mA	Units dec.	Units hex.	Analog LED	Range
> 23 mA	32767	7FFF	flashing	Overflow
23 mA	23000	59D8		Overrange
…	…	…	on	
20,001 mA	20001	4E21		
20 mA	20000	4E20		Nominal range
19,999 mA	19999	4E1F		
…	…	…	on	
4,001 mA	4001	0FA1		
4 mA	4000	0FA0		
3,999 mA	3999	0F9F		Underrange
…	…	…	on	
1 mA	1000	03E8		
< 1 mA	32767	7FFF	off	Wire break

When switching channel 2 from active to inactive condition its last value is shown.

Input resistor: 50 Ohm
Max. input current: 40 mA
Wire break detection: yes

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Analog input module 2 inputs, 0 - 10 V:

Range 0 … 10 V	Units dec.	Units hex.	Analog LED	Range
> 11,5 V	32767	7FFF	flashing	Overflow
11,5 V	11500	2CEC		Overrange
…	…	…	on	
10,001 V	10001	2711		
10 V	10000	2710		Nominal range
9,999 V	9999	270F		
…	…	…	on	
1 mV	0001	0001		
0 V	0000	0000		
< 0 V	0000	0000	on	Underrange

When switching a channel from active condition to inactive condition its last value is shown.

Max. voltage: 50 V
Input resistance: 100 kOhm
Wire break detection: no

6.2.1.4 Transmission Time of Analog Parameters

The transmission time of analog parameters depends on the one hand on the conversion time of analog signals to digital signals in the AS-i module, on the other hand on the transmission time via the AS-i.

More exact views to the transmission time are in chap. <Cycle Times during the Analog Value Transmission>.

6.2.2 Operation of Analog Output Modules

This chapter gives all necessary information which is needed to operate an AS-i analog output module with either 2 outputs 4 - 20 mA or 2 outputs 0 - 10 V.

Presupposition: The AS-i analog modules support AS-i analog profile 7.3. Via AS-i two resp. four 16 bit values per module are transmitted to the AS-i master. In order to operate the module, it is necessary to use an AS-i master which supports analog profile 7.3.

6.2.2.1 Slave Profile

Configuration of the analog output modules is as follows:

Analog output modules with 2 channels:

I/O code: 7_{hex}
ID code: 3_{hex}
ID2 code: 5_{hex}

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6.2.2.2 Parameterization of Analog Output Modules

The adjustment of differing operation ranges is known as parameterization. It is done via the AS-i master by executing the command "write AS-i parameter".

Parameter settings of AS-i analog output modules with 2 channels can be adjusted as follows:

AS-i parameter bit 0:

With the parameter bit 0 it can be adjusted, if the AS-i analog output module should detect the respective ouput mode automatically or the mode is adjustetd stationary by the AS-i parameter bits P1 respectively P3.

P0	Selection of the output mode
1	Automatic detection of the module
0	With the parameter bits P1, P3 the mode for channel 1 and 2 can be adjusted

AS-i parameter bit P1 and P3: Adjusting the mode for channel 1 and 2

If parameter bit P0 = 0, the mode for channel 1 and 2 can be adjusted stationary with the help of parameter bits P1 and P3.

P1	Channel 1 works as
1	current output
0	voltage output

P3	Channel 2 works as
1	current output
0	voltage output

AS-i parameter bit 2: Display of a peripheral fault

By means of this bit, it is possible to adjust whether an adjacent peripheral fault is notified by the flashing "FAULT"-LED of the module and the peripheral fault is transmitted to the AS-Interface master.

P2	Peripheral fault is
1	notified
0	not notified

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6.2.2.3 Value Range of Analog Output Modules

Analog Output Module 2 outputs, 0 - 20 mA:

Output value 0 … 20 mA	**Units dcz.**	**Units hex**	**Analog LED**	**Range**
23 mA	>23000	>59D8	flashing	Overflow
23 mA	23000	59D8		Overrange
…	…		on	
20,001 mA	20001	4E21		
20 mA	20000	4E20		Nominal range
19,999 mA	19999	4E1F		
…	…	…	on	
1 µA	0001	0001		
0 mA	0000	0000		
0 mA	< 0000	< 0000	flashing	Underrange

Shunt resistance: max. 600 Ohm
Short-circuit proof: yes
Wire break recognition: no

Analog Output Module 2 outputs, 0 - 10 V:

Output range 0 … 10 V	**Units dcz.**	**Units hex**	**Analog LED**	**Range**
11,5 V	> 11500	> 2CEC	flashing	Overflow
11,5 V	11500	2CEC		Overrange
…	…	…	on	
10,001 V	10001	2711		
10 V	10000	2710		Nominal range
9,999 V	9999	270F		
…	…	…	on	
1 mV	0001	0001		
0 V	0000	0000		
0 V	< 0000	< 0000	flashing	Underrange

Load resistence (min.): 1,2 kOhm
Short-circuit proof: yes
Short-circuit current: 18 mA
Wire break recognition: no

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6.2.2.4 Transmission Time of Analog Parameters

The transmission time of analog parameters depends on the one hand on the conversion time of digital signals to analog signals in the AS-i module, on the other hand on the transmission time via the AS-i.

More exact views to the transmission time are in chap. <Cycle Times during the Analog Value Transmission>.

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7. Cycle Times during the Analog Value Transmission

By the general view of cycle times during the analog value transmission of analog modules several values are decisive: cycle time of the AS-i circuit, conversion time, transmission time and the used profile.

7.1 Cycle Time of the AS-i Circuit

The cycle time is depending on the number of connected slaves.

Formula: Cycle time = 150 µs * (n + 2)

n: Number of connected slaves

150 µs: Response time for one slave address

2: Sum out of inclusion phase (1 telegram) plus management phase (1 telegram)

7.2 Conversion Time

The conversion time is the time, which the analog module needs to convert a analog signal in a digital value.

This time is depending on the used technologie (A/D converter) as well as the wanted settle time (which time should the module wait to decise, that the fitting signal is stable). These values are depending on the used hardware and the manufacturer of the analog module.

Further the number of channels has to be taken into consideration. If more than one channel has to be transmitted on AS-i, it must be "switched" between the channels. This costs additional time.

7.3 Transmission Time

The principle of the transmission of 4 bit data per slave address with AS-i has been changed in none of the new and existing specifications and profiles. During the transmission of data larger than 4 bit, the value hat to be separated into smaller packages. Over several cycles these packages are fetched by the slave and joined in the gateway to a whole value.

If per slave still even several channels are transferred, then further cycles are needed, in order to transport also these values to the gateway (it is possible for 1 to 4 channels, depending upon profile and commissioning, per slave).

The transmission time is thus the time, which is needed, to transfer a changed analog signal to the gateway until it is completely available in the memory of the gateway. This procedure is fixed by the specifications of the AS-i consortium.

7.3.1 Cycle Times

7.3.1.1 AS-i Profile 7.3 (AS-i 2.1): 16-bit transmission

Analog Module below AS-i Profile 7.3 (AS-i Specification 2.1):

16 Bit Transmission

Precondition:

Slave address occupied as single slave: 4 analog inputs, 4 analog outputs.

1 channel activated:

Cycle time: Depending on the number of slaves, max. 35 ms

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Conversion time: 20 ms

Transmission time: 7 * cycle time

Total transmission time: 20 ms + 7 * cycle time * 1 (channel)

2 channels activated:

Cycle time: Depending on the number of slaves, max. 70 ms

Conversion time: 120 ms

Transmission time: 7 * cycle time

Total transmission time: 120 ms + 7 * cycle time * 2 (channels)

3 channels activated:

Cycle time: Depending on the number of slaves, max. 105 ms

Conversion time: 180 ms

Transmission time: 7 * cycle time

Total transmission time: 180 ms + 7 * cycle time * 3 (channels)

4 channels activated:

Cycle time: Depending on the number of slaves, max. 140 ms

Conversion time: 240 ms

Transmission time: 7 * cycle time

Total transmission time: 240 ms + 7 * cycle time *4 (channels)

7.3.1.2 AS-i Profile S-7.A.9 (AS-i 3.0): 14-bit transmission

Analog Module below AS-i Profile S-7.A.9 (AS-i Specification 3.0):

14 Bit Transmission

Precondition:

Slave address occupied as single slave resp. as A or B slave: 2 analog inputs.

1 channel activated:

Cycle time: Depending on the number of slaves, max. 20 ms

Conversion time: 33 ms

Transmission time: 4 * cycle time

Total transmission time: 33 ms + 4 * cycle time * 1 (channel)

2 channels activated:

Cycle time: Depending on the number of slaves, max. 40 ms

Conversion time: 33 ms

Transmission time: 4 * cycle time

Total transmission time: 33 ms + 4 * cycle time * 2 (channels)

Information!

By AB addressing:

Is the slave address occupied with 1 A and 1 B slave, the cycle time is doubling.

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7.3.1.3 AS-i Profile S-7.A.9 (AS-i 3.0): 12-bit transmission

Analog Module below AS-i Profile S-7.A.9 (AS-i Specification 3.0):
12 Bit Transmission

Precondition:
Slave address occupied as single slave resp. as A or B slave: 2 analog inputs.

1 channel activated:
Cycle time: Depending on the number of slaves, max. 15 ms
Conversion time: 4,2 ms
Transmission time: 3 * cycle time
Total transmission time: 4,2 ms + 3 * cycle time * 1 (channel)

2 channels activated:
Cycle time: Depending on the number of slaves, max. 30ms
Conversion time: 4,2 ms
Transmission time: 3 * cycle time
Total transmission time: 4,2 ms + 3 * cycle time * 2 (channels)

Information!
By AB addressing:
Is the slave address occupied with 1 A and 1 B slave, the cycle time is doubling.

7.3.1.4 AS-i Profile S-7.A.9 (AS-i 3.0): 14-bit transmission

Analog Module below AS-i Profile S-7.A.9 (AS-i Specification 3.0):
14 Bit Transmission

Precondition:
Slave address occupied as A and B slave: 2 analog inputs.

1 channel activated:
Cycle time: Depending on the number of slaves, max. 40 ms
Conversion time: 33 ms
Transmission time: 8 * cycle time
Total transmission time: 33 ms + 8 * cycle time * 1 (channel)

2 channels activated:
Cycle time: Depending on the number of slaves, max. 80 ms
Conversion time: 33 ms
Transmission time: 8 * cycle time
Total transmission time: 33 ms + 8 * cycle time * 2 (channels)

7.3.1.5 AS-i Profile S-7.A.9 (AS-i 3.0): 12-bit transmission

Analog Module below AS-i Profile S-7.A.9 (AS-i Specification 3.0):
12 Bit Transmission

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Precondition:

Slave address occupied as A and B slave: 2 analog inputs.

1 channel activated:

Cycle time: Depending on the number of slaves, max. 30 ms

Conversion time: 4,2 ms

Transmission time: 6 * cycle time

Total transmission time: 4,2 ms + 6 * cycle time * 1 (channel)

2 channels activated:

Cycle time: Depending on the number of slaves, max. 60 ms

Conversion time: 4,2 ms

Transmission time: 6 * cycle time

Total transmission time: 4,2 ms + 6 * cycle time * 2 (channels)

Information!

By AB addressing:

Is the slave address occupied with 1 A and 1 B slave, the cycle time is doubling.

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