

WAGO → I/O → SYSTEM 750

Fieldbus Independent I/O Modules

**2 AI 0-20 mA Differential
Measurement Input
750-480**



Manual

Version 1.0.2

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Every conceivable measure has been taken to ensure the correctness and completeness of this documentation. However, as errors can never be fully excluded, we would appreciate any information or ideas at any time.

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We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally trademark or patent protected.

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1 Important Comments

To ensure fast installation and start-up of the units described in this manual, we strongly recommend that the following information and explanations are carefully read and abided by.

1.1 Legal Principles

1.1.1 Copyright

This manual is copyrighted, together with all figures and illustrations contained therein. Any use of this manual which infringes the copyright provisions stipulated herein, is not permitted. Reproduction, translation and electronic and photo-technical archiving and amendments require the written consent of WAGO Kontakttechnik GmbH & Co. KG. Non-observance will entail the right of claims for damages.

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1.1.2 Personnel Qualification

The use of the product detailed in this manual is exclusively geared to specialists having qualifications in PLC programming, electrical specialists or persons instructed by electrical specialists who are also familiar with the valid standards. WAGO Kontakttechnik GmbH & Co. KG declines all liability resulting from improper action and damage to WAGO products and third party products due to non-observance of the information contained in this manual.

1.1.3 Intended Use

For each individual application, the components supplied are to work with a dedicated hardware and software configuration. Modifications are only permitted within the framework of the possibilities documented in the manuals. All other changes to the hardware and/or software and the non-conforming use of the components entail the exclusion of liability on part of WAGO Kontakttechnik GmbH & Co. KG.

Please direct any requirements pertaining to a modified and/or new hardware or software configuration directly to WAGO Kontakttechnik GmbH & Co. KG.

1.2 Symbols



Danger

Always abide by this information to protect persons from injury.



Warning

Always abide by this information to prevent damage to the device.



Attention

Marginal conditions must always be observed to ensure smooth operation.



ESD (Electrostatic Discharge)

Warning of damage to the components by electrostatic discharge. Observe the precautionary measure for handling components at risk.



Note

Routines or advice for efficient use of the device and software optimization.



More information

References on additional literature, manuals, data sheets and INTERNET pages

1.3 Number Notation

Number Code	Example	Note
Decimal	100	normal notation
Hexadecimal	0x64	C notation
Binary	'100' '0110.0100'	Within ', Nibble separated with dots

1.4 Safety Notes



Warning

Switch off the system prior to working on bus modules!

In the event of deformed contacts, the module in question is to be replaced, as its functionality can no longer be ensured on a long-term basis.

The components are not resistant against materials having seeping and insulating properties. Belonging to this group of materials is: e.g. aerosols, silicones, triglycerides (found in some hand creams).

If it cannot be ruled out that these materials appear in the component environment, then additional measures are to be taken:

- installation of the components into an appropriate enclosure
 - handling of the components only with clean tools and materials.
-



Attention

Cleaning of soiled contacts may only be done with ethyl alcohol and leather cloths. Thereby, the ESD information is to be regarded.

Do not use any contact spray. The spray may impair the functioning of the contact area.

The WAGO-I/O-SYSTEM 750 and its components are an open system. It must only be assembled in housings, cabinets or in electrical operation rooms. Access must only be given via a key or tool to authorized qualified personnel.

The relevant valid and applicable standards and guidelines concerning the installation of switch boxes are to be observed.



ESD (Electrostatic Discharge)

The modules are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the modules, ensure that the environment (persons, workplace and packing) is well grounded. Avoid touching conductive components, e.g. gold contacts.

1.5 Scope

This manual describes the Analog Input Module 750-480
2 AI 0-20 mA Differential Measurement Input of the modular
WAGO-I/O-SYSTEM 750.

Handling, assembly and start-up are described in the manual of the Fieldbus Coupler. Therefore this documentation is valid only in the connection with the appropriate manual.

2 I/O Modules

2.1 Analog Input Module

2.1.1 750-480 [2 AI 0-20 mA Differential Measurement Input]

2-Channel Analog Input Module 0-20 mA,
differential measurement input

2.1.1.1 View

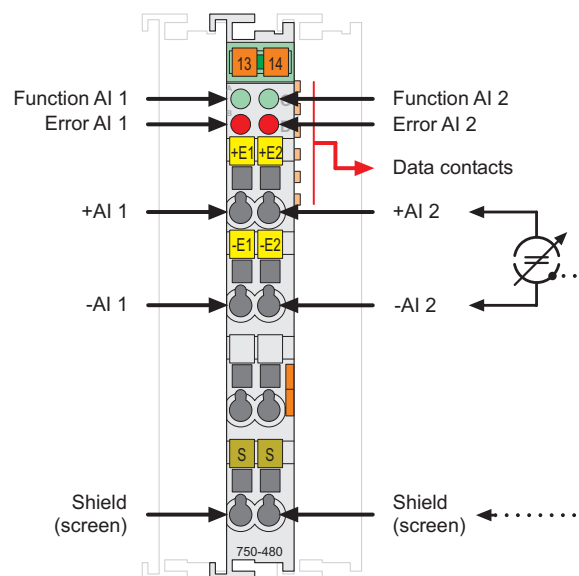


Fig. 2.1.1-1: 2-Channel Analog Input Module 0-20 mA

g048000e

2.1.1.2 Description

The analog input module receives differential signals of values 0-20 mA.

The module has two differential input channels and can receive differential signals via the connections +AI 1 and -AI 1 or +AI 2 and -AI 2.

The shield (screen) is directly connected to the DIN rail. A capacitive connection is made automatically when snapped onto the DIN rail.

The input signal of each channel is electrically isolated and will be transmitted with a resolution of 13 bits.

The operational readiness and trouble-free internal data bus communication of the channels are indicated via a green Function LED. Overrange or underflow of the measuring range is indicated via a red error LED.

Any configuration of the input modules is possible when designing the fieldbus node. Grouping of module types is not necessary.

The voltage supply is done via system voltage.



Attention

This module has no power contacts. For field supply to downstream I/O modules, a supply module will be needed.

The analog input module 750 480 can be used with all couplers/controllers of the WAGO-I/O-SYSTEM 750 (except for the economy types 750-320, -323, -324 and -327).

2.1.1.3 Display Elements

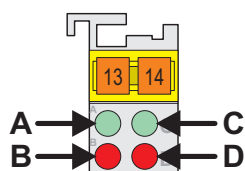


Fig. 2.1.1-2: Display Elements g041802x

LED	Channel	Designation	State	Function
A green	1	Function AI 1	off	No operational readiness or the internal data bus communication is interrupted
			on	Operational readiness and trouble-free internal data bus communication
B red		Error AI 1	off	Normal operation
			on	Overrange/underflow of the admissible measuring range
C green	2	Function AI 2	off	No operational readiness or the internal data bus communication is interrupted
			on	Operational readiness and trouble-free internal data bus communication
D red		Error AI 2	off	Normal operation
			on	Overrange/underflow of the admissible measuring range

2.1.1.4 Schematic Diagram

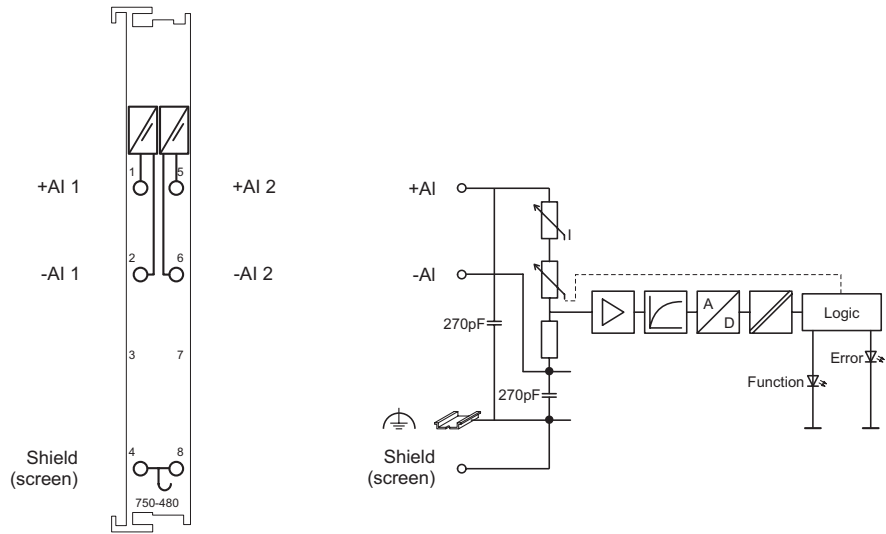






Fig. 2.1.1-3: 2-Channel Analog Input Module 0-20 mA

g048001e

2.1.1.5 Technical Data

Module Specific Data	
Number of outputs	2, electrically isolated from each other
Measured-value acquisition	time synchronous
Voltage supply	via system voltage DC /DC
Current consumption _{typ.} (internal)	80 mA
Signal current	0 mA ... 20 mA
Internal resistance	< 270 Ω at 20 mA
Overrange/ measuring range underflow	status byte and LED
Input filter	low pass first order, f _G = 5 kHz
Resolution of the A/D converter	14 Bit
Monotonicity without missing codes	yes
Resolution of the measured value	13 Bit
Value of a LSB (Bit 2) (Least Significant Bit)	2.4 μA
Measuring error _{25 °C}	≤ ±0.05% of the full scale value
Temperature coefficient	< ±0.01%/K of the full scale value
Measuring error	≤ 0.4 % over whole temperature range ≤ 0.1 % of upper range value (non-linearity)
Crosstalk attenuation	≥ 80 db
Sampling time of repetition	1 ms
Sampling delay (module)	1 ms
Sampling delay (channel/channel)	≤ 1 μs
Sampling duration	≤ 5 μs
Method of conversion	SAR (Successive Approximation Register)
Operating mode	continuously sampling (preset)
Protection	non-linear limiting
Admissible continuous overload	30 V
Voltage resistance	DC 500V (Channel/Channel or Channel/System)
Bit width	2 x 16 bits data 2 x 8 Bit bits control/status (option)
Dimensions (mm) W x H x L	12 x 64* x 100 * from upper edge of 35 DIN rail
Weight	ca. 55 g
Standards and Regulations (cf. Chapter 2.2 of the Coupler/Controller Manual)	
EMC-Immunity to interference (CE)	acc. to EN 50082-2 (96)
EMC-Emission of interference (CE)	acc. to EN 50081-1 (93)

Approvals (cf. Chapter 2.2 of the Coupler/Controller Manual)		
	cUL _{US} (UL508)	
	cUL _{US} (UL1604)	Class I Div2 ABCD T4A
	DEMKO	II 3 GD EEx nA II T4
	Conformity Marking	



More Information

Detailed references to the approvals are listed in the document "Overview Approvals WAGO-I/O-SYSTEM 750", which you can find on the CD ROM ELECTRONICC Tools and Docs (Item-No.: 0888-0412) or in the internet under:
www.wago.com → Documentation → WAGO-I/O-SYSTEM 750 → System Description

2.1.1.6 Process Image

The analog input module 750-480 transmits 16-bit measured values and 8 optional status bits per channel.

The digitalized measured value is transmitted in a data word (16 bits) as input byte 0 (low) and input byte 1 (high) into the process image of the coupler / controller.

This value is represented with a 13 bit resolution on bit B2 ... B14. The most significant bit15 (MSB) is always '0'.

The states of the first two least significant bits B0 and B1 are not defined in the range between 0 and 20 mA. Therefore, they are represented with a 'X' in the table.

The hexadecimal and decimal measured values are listed in the table provided that the first two bits have the state '0'. If the state '1' is taken into consideration for both bits, the decimal measured value will be higher by the value 3 as it is indicated in the table.

Some fieldbus systems can process input channel status information by means of a status byte.

This status byte can be displayed via the starting tool WAGO-I/O-CHECK 2. However, processing via the coupler / controller is optional, which means that accessing or parsing the status information depends on the fieldbus system.



Attention

The representation of the process data of some I/O modules or their variations in the process image depends on the fieldbus coupler/-controller used. Please take this information as well as the particular design of the respective control/status bytes from the section "Fieldbus Specific Design of the Process Data" included in the description concerning the process image of the corresponding coupler/controller.

2.1.1.6.1 Standard Format

For the standard module 750-480, the input current ranging from 0 mA to 20 mA is scaled on the numerical values ranging from 0x0000 to 0x7FFF.

Process values of module 750-480					
Input current 0 mA – 20 mA	Numerical value			Status- byte hex.	LED error AI 1, 2
	binary	hex.	dec.		
<-1.00	'0000.0000.0000.00XX'	0x0000	0	0x41	on
<0.00	'0000.0000.0000.00XX'	0x0000	0	0x00	off
0.00	'0000.0000.0000.00XX'	0x0000	0	0x00	off
2.50	'0001.0000.0000.00XX'	0x1000	4096	0x00	off
5.00	'0010.0000.0000.00XX'	0x2000	8192	0x00	off
7.50	'0011.0000.0000.00XX'	0x3000	12288	0x00	off
10.00	'0100.0000.0000.00XX'	0x4000	16384	0x00	off
12.50	'0101.0000.0000.00XX'	0x5000	20480	0x00	off
15.00	'0110.0000.0000.00XX'	0x6000	24576	0x00	off
17.50	'0111.0000.0000.00XX'	0x7000	28672	0x00	off
20.00	'0111.1111.1111.11XX'	0x7FFC	32764	0x00	off
>20.00	,0111.1111.1111.1111'	0x7FFF	32767	0x00	off
>21.00	,0111.1111.1111.1111'	0x7FFF	32767	0x42	on

2.1.2 750-480/000-001 [Differential Measurement Input]

2-Channel Analog Input Module 0-20 mA,
differential measurement input
(triggered only with coupler 750-303)

2.1.2.1 View

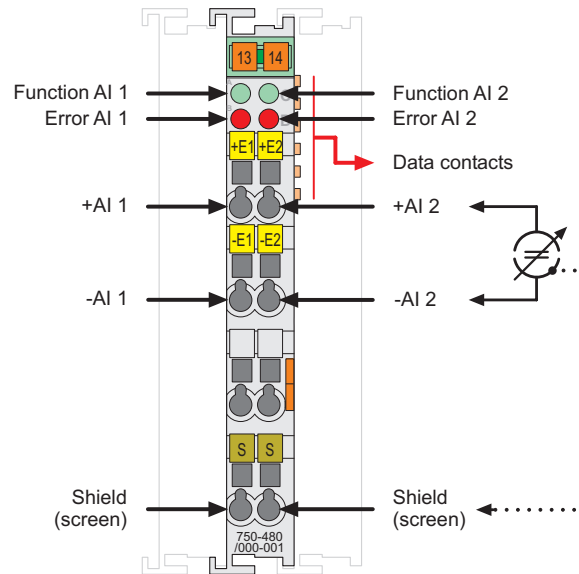


Fig. 2.1.2-1: 2-Channel Analog Input Module 0-20 mA

g048000e

2.1.2.2 Description

This analog input module receives signals with standardized values of 0-20 mA.

The module works synchronously with the internal data bus for all couplers/controllers used. When the module is connected to the Profibus Fieldbus Coupler 750-303, the (fieldbus) network wide acquisition of measured values can also be done synchronously. Triggering is done via this special Profibus-DP/FMS (12 Mbaud) coupler. After receiving the command "Global Control Command", the acquisition of measured values is initiated by the coupler. A delay of one cycle is to be expected when scaling the measured values. Sampling cycles ≥ 1 ms can be achieved.

The module has two differential input channels and can receive differential signals via the connections +AI 1 and -AI 1 or +AI 2 and -AI 2. The Shield (screen) is directly connected to the DIN rail. A capacitive connection is made automatically when snapped onto the DIN rail.

The input signal of each channel is electrically isolated and will be transmitted with a resolution of 13 bits.

The operational readiness and trouble-free internal data bus communication of the channels are indicated via a green Function LED. Overrange or underflow of the measuring range is indicated via a red error LED.

Any configuration of the input modules is possible when designing the fieldbus node. Grouping of module types is not necessary.

The voltage supply is done via system voltage.



Attention

This module has no power contacts. For field supply to downstream I/O modules, a supply module will be needed.

The analog input module 750-480/000-001 can be used with all couplers/controllers of the WAGO-I/O-SYSTEM 750 (except for the economy types 750-320, -323, -324 and -327).

2.1.2.3 Display Elements

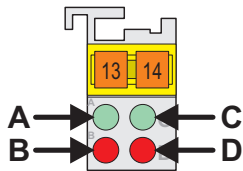


Fig. 2.1.2-2: Display Elements g041802x

LED	Channel	Designation	State	Function
A green	1	Function AI 1	off	No operational readiness or the internal data bus communication is interrupted
			on	Operational readiness and trouble-free internal data bus communication
B red		Error AI 1	off	Normal operation
			on	Overrange/underflow of the admissible measuring range
C green	2	Function AI 2	off	No operational readiness or the internal data bus communication is interrupted
			on	Operational readiness and trouble-free internal data bus communication
D red		Error AI 2	off	Normal operation
			on	Overrange/underflow of the admissible measuring range

2.1.2.4 Schematic Diagram

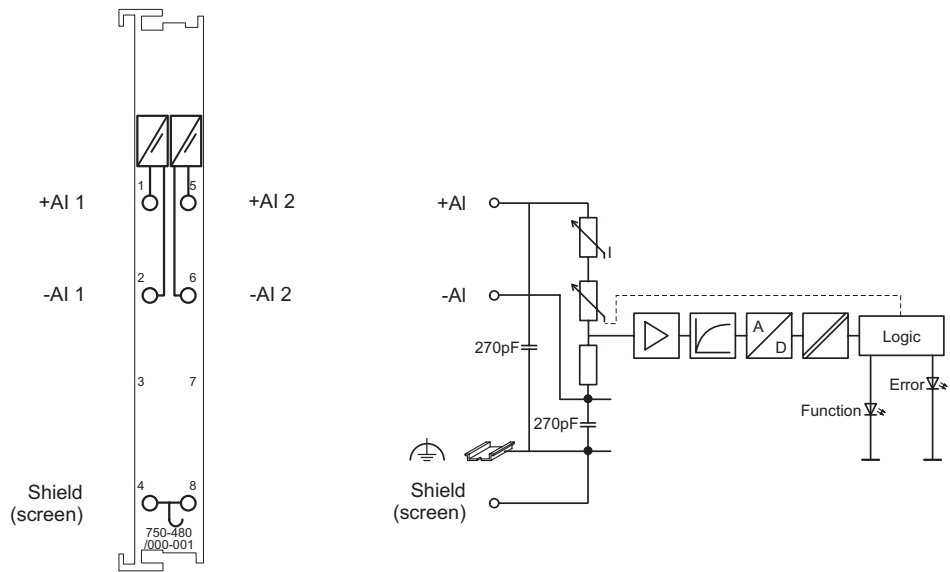



Fig. 2.1.2-3: 2-Channel Analog Input Module 0-20 mA

g048001e

2.1.2.5 Technical Data

Module Specific Data	
Number of outputs	2, electrically isolated from each other
Measured-value acquisition	time synchronous ¹⁾
Voltage supply	via system voltage DC /DC
Current consumption (internal)	≤ 100 mA
Signal current	0 mA ... 20 mA
Internal resistance	< 270 Ω at 20 mA
Overrange/ measuring range underflow	status byte, status bits, measured value and LED ²⁾
Input filter	low pass first order, f _G = 5 kHz
Resolution of the A/D converter	14 Bit
Monotonicity without missing codes	yes
Resolution of the measured value	13 Bit
Value of a LSB (Least Significant Bit)	2.4 μA
Measuring error _{25 °C}	≤ ±0.05% of the full scale value
Temperature coefficient	< ±0.01%/K of the full scale value
Measuring error	≤ 0.4 % over whole temperature range ≤ 0.1 % of upper range value (non-linearity)
Crosstalk attenuation	≥ 80 db
Sampling time of repetition	1 ms
Operating mode	triggered
Sampling delay (instruction/conversion)	≤ 50 μs
Sampling delay (module)	1 ms
Sampling delay (channel/channel)	≤ 1 μs
Sampling duration	≤ 5 μs
Method of conversion	SAR (Successive Approximation Register)
Protection	non-linear limiting
Admissible continuous overload	30 V
Voltage resistance	DC 500V (Channel/Channel or Channel/System)
Bit width	2 x 16 bits data 2 x 8 Bit bits control/status (option)
Dimensions (mm) W x H x L	12 x 64* x 100 * from upper edge of 35 DIN rail
Weight	ca. 55 g

Standards and Regulations (cf. Chapter 2.2 of the Coupler/Controller Manual)	
EMC-Immunity to interference (CE)	acc. to EN 50082-2 (96)
EMC-Emission of interference (CE)	acc. to EN 50081-1 (93)
Approvals (cf. Chapter 2.2 of the Coupler/Controller Manual)	
	Conformity Marking

²⁾ Min./max. limiting values can also be set according to customers' specifications!

¹⁾ In connection with synchronized sampling of the slave (fieldbus coupler 750-303 (as from version 0101))



More Information

Detailed references to the approvals are listed in the document "Overview Approvals WAGO-I/O-SYSTEM 750", which you can find on the CD ROM ELECTRONICC Tools and Docs (Item-No.: 0888-0412)

or in the internet under:

www.wago.com → Documentation → WAGO-I/O-SYSTEM 750 → System Description

2.1.2.6 Process Image

The analog input module 750-480/000-001 transmits 16-bit measured values per channel with status information as well as 8 optional status bits to the coupler/controller.
 However, accessing the status byte depends on the fieldbus system being used.



Attention

The representation of the process data of some I/O modules or their variations in the process image depends on the fieldbus coupler/-controller used. Please take this information as well as the particular design of the respective control/status bytes from the section "Fieldbus Specific Design of the Process Data" included in the description concerning the process image of the corresponding coupler/controller.

The status information of the 16-bit value is mapped in bit 0 and bit 1, the digitalized measured value in bit 2 to bit 14.

The most significant bit (MSB) is always '0'.

Process values of module 750-480/000-001							
Input current 0 mA - 20 mA	Numerical value with status information ¹⁾				Status byte Hex.	LED Error AI 1, 2	
	Binary	FÜ ¹⁾	Hex.	Dez.			
>20.00	'0111.1111.1111.11	01'	0x7FFD	32765	0x42	on	
20.00	'0111.1111.1111.11	00'	0x7FFC	32764	0x00	off	
17.50	'0111.0000.0000.00	00'	0x7000	28672	0x00	off	
15.00	'0110.0000.0000.00	00'	0x6000	24576	0x00	off	
12.50	'0101.0000.0000.00	00'	0x5000	20480	0x00	off	
10.00	'0100.0000.0000.00	00'	0x4000	16384	0x00	off	
7.50	'0011.0000.0000.00	00'	0x3000	12288	0x00	off	
5.00	'0010.0000.0000.00	00'	0x2000	8192	0x00	off	
2.50	'0001.0000.0000.00	00'	0x1000	4096	0x00	off	
0.00	'0000.0000.0000.00	00'	0x0000	0	0x00	off	
<0.00	'0000.0000.0000.00	01'	0x0001	1	0x41	on	

1) status information : F: error, Ü: over control



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