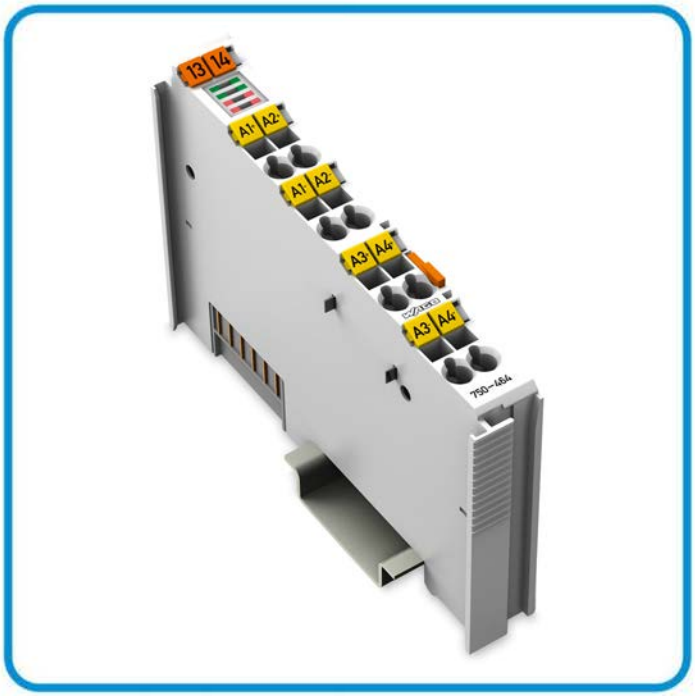
Manual



WAGO-I/O-SYSTEM 750

2/4 AI RTD configurable

750-464

2-/4-Channel Analog Input Module for RTDs

Version 1.0.1

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Every conceivable measure has been taken to ensure the accuracy and completeness of this documentation. However, as errors can never be fully excluded, we always appreciate any information or suggestions for improving the documentation.

E-Mail: documentation@wago.com

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 protected by trademark or patent.

Table of Contents

1 Notes about this Documentation

Note

Keep this documentation!
The operating instructions are part of the product and shall be kept for the entire lifetime of the device. They shall be transferred to each subsequent owner or user of the device. Care must also be taken to ensure that any supplement to these instructions are included, if applicable.

1.1 Validity of this Documentation

This documentation is only applicable to the I/O module 750-464 (2/4 AI RTD configurable) of the WAGO-I/O-SYSTEM 750 series and the variants listed in the table below.

Table 1: Variants

Item Number/Variant	Designation
750-464	2/4 AI RTD configurable
750-464/020-000	2/4 AI RTD configurable/I

The I/O module 750-464 shall only be installed and operated according to the instructions in this manual and in the manual for the used fieldbus coupler/controller.

NOTICE

Consider power layout of the WAGO-I/O-SYSTEM 750!
In addition to these operating instructions, you will also need the manual for the used fieldbus coupler/controller, which can be downloaded at www.wago.com. There, you can obtain important information including information on electrical isolation, system power and supply specifications.

1.2 Copyright

1.3 Symbols

⚠ DANGER

Personal Injury!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ DANGER

Personal Injury Caused by Electric Current!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Personal Injury!
Indicates a moderate-risk, potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Personal Injury!
Indicates a low-risk, potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Damage to Property!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

NOTICE

Damage to Property Caused by Electrostatic Discharge (ESD)!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

Note

Important Note!
Indicates a potential malfunction which, if not avoided, however, will not result in damage to property.

Information

Additional Information:
Refers to additional information which is not an integral part of this documentation (e.g., the Internet).

1.4 Number Notation

Table 2: Number notation

Number code	Example	Note
Decimal	100	Normal notation
Hexadecimal	0x64	C notation
Binary	'100' '0110.0100'	In quotation marks, nibble separated with dots (.)

1.5 Font Conventions

Table 3: Font conventions

Font type	Indicates
italic	Names of paths and data files are marked in italic-type. e.g.: *C:\Programme\WAGO-I/O-CHECK*
Menu	Menu items are marked in bold letters. e.g.: **Save**
>	A greater-than sign between two names means the selection of a menu item from a menu. e.g.: **File** > **New**
Input	Designation of input or optional fields are marked in bold letters, e.g.: **Start of measurement range**
“Value”	Input or selective values are marked in inverted commas. e.g.: Enter the value “4 mA” under **Start of measurement range**.
[Button]	Pushbuttons in dialog boxes are marked with bold letters in square brackets. e.g.: **[Input]**
[Key]	Keys are marked with bold letters in square brackets. e.g.: **[F5]**

2 Important Notes

This section includes an overall summary of the most important safety requirements and notes that are mentioned in each individual section. To protect your health and prevent damage to devices as well, it is imperative to read and carefully follow the safety guidelines.

2.1 Legal Bases

2.1.1 Subject to Changes

WAGO Kontakttechnik GmbH & Co. KG reserves the right to provide for any alterations or modifications that serve to increase the efficiency of technical progress. WAGO Kontakttechnik GmbH & Co. KG owns all rights arising from the granting of patents or from the legal protection of utility patents. Third-party products are always mentioned without any reference to patent rights. Thus, the existence of such rights cannot be excluded.

2.1.2 Personnel Qualifications

All sequences implemented on Series 750 devices may only be carried out by electrical specialists with sufficient knowledge in automation. The specialists must be familiar with the current norms and guidelines for the devices and automated environments.

All changes to the coupler or controller should always be carried out by qualified personnel with sufficient skills in PLC programming.

2.1.3 Use of the 750 Series in Compliance with Underlying Provisions

Couplers, controllers and I/O modules found in the modular WAGO-I/O-SYSTEM 750 receive digital and analog signals from sensors and transmit them to the actuators or higher-level control systems. Using programmable controllers, the signals can also be (pre-) processed.

The components have been developed for use in an environment that meets the IP20 protection class criteria. Protection against finger injury and solid impurities up to 12.5 mm diameter is assured; protection against water damage is not ensured. Unless otherwise specified, operation of the components in wet and dusty environments is prohibited.

Operating 750 Series components in home applications without further measures is only permitted if they meet the emission limits (emissions of interference) according to EN 61000-6-3. You will find the relevant information in the section on "WAGO-I/O-SYSTEM 750" → "System Description" → "Technical Data" in the manual for the used fieldbus coupler/controller.

Appropriate housing (per 94/9/EG) is required when operating the WAGO-I/O-SYSTEM 750 in hazardous environments. Please note that a prototype test certificate must be obtained that confirms the correct installation of the system in a housing or switch cabinet.

2.1.4 Technical Condition of Specified Devices

The components to be supplied Ex Works, are equipped with hardware and software configurations, which meet the individual application requirements. WAGO Kontakttechnik GmbH & Co. KG will be exempted from any liability in case of changes in hardware or software as well as to non-compliant usage of components.

Please send your request for modified and new hardware or software configurations directly to WAGO Kontakttechnik GmbH & Co. KG.

2.2 Safety Advice (Precautions)

For installing and operating purposes of the relevant device to your system the following safety precautions shall be observed:

DANGER

Do not work on components while energized!
All power sources to the device shall be switched off prior to performing any installation, repair or maintenance work.

DANGER

Installation only in appropriate housings, cabinets or in electrical operation rooms!
The WAGO-I/O-SYSTEM 750 and its components are an open system. As such, install the system and its components exclusively in appropriate housings, cabinets or in electrical operation rooms. Allow access to such equipment and fixtures to authorized, qualified staff only by means of specific keys or tools.

NOTICE

Replace defective or damaged devices!
Replace defective or damaged device/module (e.g., in the event of deformed contacts), since the long-term functionality of device/module involved can no longer be ensured.

NOTICE

Protect the components against materials having seeping and insulating properties!
The components are not resistant to materials having seeping and insulating properties such as: aerosols, silicones and triglycerides (found in some hand creams). If you cannot exclude that such materials will appear in the component environment, then install the components in an enclosure being resistant to the above-mentioned materials. Clean tools and materials are imperative for handling devices/modules.

NOTICE

Cleaning only with permitted materials!
Clean soiled contacts using oil-free compressed air or with ethyl alcohol and leather cloths.

NOTICE

Do not use any contact spray!
Do not use any contact spray. The spray may impair contact area functionality in connection with contamination.

NOTICE

Do not reverse the polarity of connection lines!
Avoid reverse polarity of data and power supply lines, as this may damage the devices involved.

NOTICE

Avoid electrostatic discharge!
The devices are equipped with electronic components that you may destroy by electrostatic discharge when you touch. Pay attention while handling the devices to good grounding of the environment (persons, job and packing).

3 Device Description

The I/O module 750-464(2/4 AI RTD configurable) measures resistance at field level or evaluates platinum or nickel resistance sensors.
The resistance values are converted into temperature values. A microprocessor in the I/O module linearizes the measured resistance values and converts them into a numeric value proportional to the temperature of the selected resistance sensor.
The **WAGO-I/O-*CHECK*** commissioning tool can be used to configure the required operating mode.

The I/O module has two or four input channels (configurable), providing a direct connection to 2- or 3-wire resistance sensors.
The input signals are connected to the CAGE CLAMP® connections +R1/-R1 ... +R4/-R4.
The assignment of the connections is described in the "Connections" section.
Connection examples are shown in section "Connecting Devices" → "Connection Examples".

The "ready" state of the respective channel and the internal data communication is indicated by a green function LED.
A red fault LED per channel indicates a wire break, a short circuit or that the signal is outside the measuring range.
The meaning of the LEDs is described in the “Display Elements” section.

The I/O module receives the 24V voltage supply for the field level from an upstream I/O module or from the fieldbus coupler/controller via the power contacts used as blade contacts. It then provides this potential to subsequent I/O modules via the power contacts used as spring contacts.

NOTICE

Do not exceed maximum current via power contacts!
The maximum current to flow through the power contacts is 10 A.
Greater currents can damage the power contacts.
When configuring the system, ensure that this current is not exceeded. If exceeded, an additional potential feed module must be used.

Note

Use potential feed module for Ground (earth)!
The I/O module has no power contacts for PE intake and transfer. Use a potential feed module when a PE feed is needed for the subsequent I/O modules.

The field voltage and the system voltage are electrically isolated from each other.

With consideration of the power jumper contacts, the individual modules can be arranged in any combination when configuring the fieldbus node. An arrangement in groups within the group of potentials is not necessary.

The I/O module 750-464 can be used with all fieldbus couplers/controllers of the WAGO-I/O-SYSTEM 750 (except for the economy types 750-320, -323, -324 and -327).

3.1 View

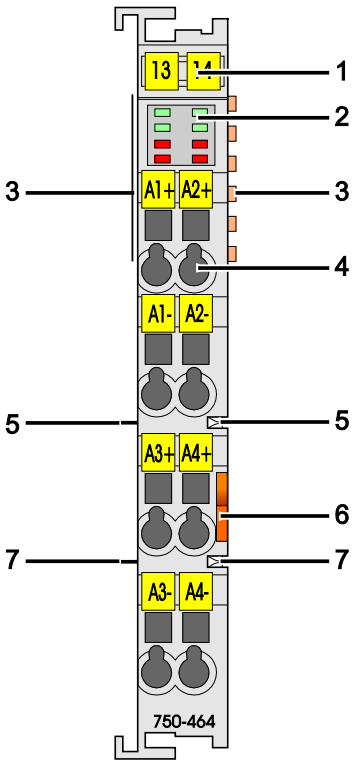


Figure 1: View

Table 4: Caption acc. to figure “View“

Pos.	Designation	Description	Details see chapter
1	---	Marking possibility with Mini-WSB	---
2	A … H	Status-LEDs	„Technical manual“ > „Display elements“
3	---	Data contacts	„Technical manual“ > „Display elements“
4	1 ... 8	CAGE CLAMP®-Anschlüsse Analogeingänge AI	„Technical manual“ > „Display elements“
5	---	Power jumper contacts +24 V	„Technical manual“ > „Display elements“
6	---	Release clip	„Mounting“ > „Mounting device“
7	---	Power jumper contacts 0 V	„Technical manual “ > „Connections“

3.2 Connectors

3.2.1 Data Contacts/Internal Bus

Communication between the coupler/controller and the I/O modules as well as the system supply of the I/O modules is carried out via the internal bus. It is comprised of 6 data contacts, which are available as self-cleaning gold spring contacts.

Figure 2: Data contacts

NOTICE

Do not place the I/O modules on the gold spring contacts!
Do not place the I/O modules on the gold spring contacts in order to avoid soiling or scratching!

NOTICE

Ensure that the environment is well grounded!
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. data contacts.

3.2.2 Power Jumper Contacts/Field Supply

⚠ CAUTION

Risk of injury due to sharp-edged male contacts!
The male contacts are sharp-edged. Handle the module carefully to prevent injury.

The I/O module 750-464 has 2 self-cleaning power jumper contacts that supply and transmit power for the field side. The contacts on the left side of the I/O module are designed as male contacts and the contacts on the right side as spring contacts.

Table 5: Power jumper contacts

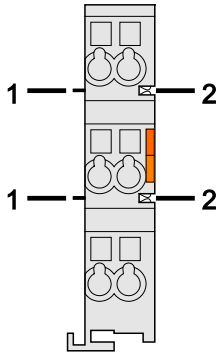


Figure 3: Power jumper contacts

Connection	Type	Number	Function
1	Blade contact	2	Infeed of the field supply voltage (U_V and 0 V)
2	Spring contact	2	Forwarding of the field supply voltage (U_V and 0 V)

NOTICE

Do not exceed maximum current via power contacts!
The maximum current to flow through the power contacts is 10 A.
Greater currents can damage the power contacts.
When configuring the system, ensure that this current is not exceeded. If exceeded, an additional potential feed module must be used.

Note

Use potential feed module for Ground (earth)!
The I/O module has no power contacts for PE intake and transfer. Use a potential feed module when a PE feed is needed for the subsequent I/O modules.

3.2.3 CAGE CLAMP® Connectors

3.2.4 Connections 4-Channel, 2-Wire

Table 6: Connections 4-channel, 2-wire

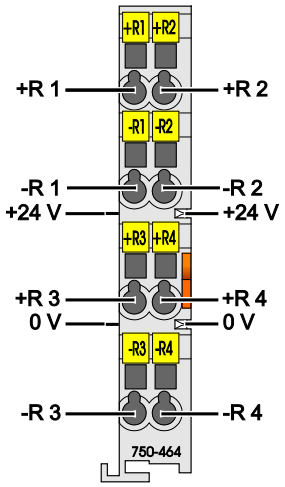


Figure 4: Connections

Connection	Designation	Channel	Function
1	+R1	1	Sensor 1: +R
2	-R1	1	Sensor 1: -R
3	+R3	3	Sensor 3: +R
4	-R3	3	Sensor 3: -R
5	+R2	2	Sensor 2: +R
6	-R2	2	Sensor 2: -R
7	+R4	4	Sensor 4: +R
8	-R4	4	Sensor 4: -R
Power jumper contacts	+24 V	---	Field supply 24 V
Power jumper contacts	0 V	---	Field supply 0 V

3.2.5 Connections 2-Channel, 3-Wire

Table 7: Connections 2-channel, 3-wire

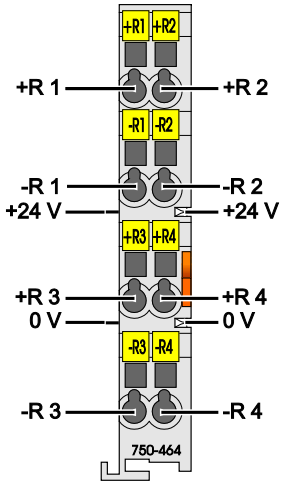


Figure 5: Connections

Connection	Designation	Channel	Function
1	+R1	1	Sensor 1: +R
2	-R1	1	Sensor 1: RL
3	+R3	---	Not connected
4	-R3	1	Sensor 1: -R
5	+R2	2	Sensor 2: +R
6	-R2	2	Sensor 2: RL
7	+R4	---	Not connected
8	-R4	2	Sensor 2: -R
Power jumper contacts	+24 V	---	Field supply 24 V
Power jumper contacts	0 V	---	Field supply 0 V

3.2.6 Connections 2-Channel, 2-Wire

Table 8: Connections 2-channel, 2-wire

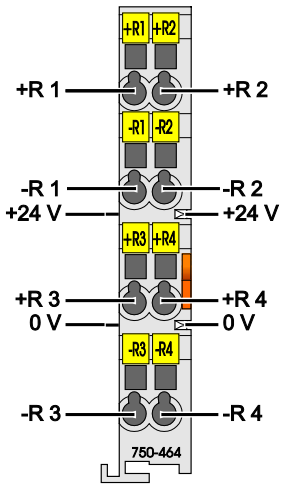


Figure 6: Connections

Connection	Designation	Channel	Function
1	+R1	1	Sensor 1: +R
2	-R1	---	Not connected
3	+R3	---	Not connected
4	-R3	1	Sensor 1: -R
5	+R2	2	Sensor 2: +R
6	-R2	---	Not connected
7	+R4	---	Not connected
8	-R4	2	Sensor 2: -R
Power jumper contacts	+24 V	---	Field supply 24 V
Power jumper contacts	0 V	---	Field supply 0 V

Note

Use shielded signal lines!

Only use shielded signal lines for analog signals and I/O modules which are equipped with shield clamps. Only then can you ensure that the accuracy and interference immunity specified for the respective I/O module can be achieved even in the presence of interference acting on the signal cable.

3.3 Display Elements

Table 9: Display elements

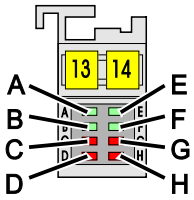


Figure 7: Display elements

LED	Channel	Designation	State	Function
A	1	Status R 1	off	Not ready for operation or no or disturbed internal bus communication (when Watchdog timer enabled only, see section "Parameterization")
			green	Operational readiness and trouble-free internal data bus communication
B	2	Status R 2	off	Not ready for operation or no or disturbed internal bus communication (when Watchdog timer enabled only, see section "Parameterization")
			green	Operational readiness and trouble-free internal data bus communication
C	1	Error R 1	off	Normal operation
			red	Overrange/underrange of the admissible measuring range*), broken wire, short circuit*)
D	2	Error R 2	off	Normal operation
			red	Overrange/underrange of the admissible measuring range*), broken wire, short circuit*)
E	3	Status R 3	off	Not ready for operation or no or disturbed internal bus communication (when Watchdog timer enabled only, see section "Parameterization")
			green	Operational readiness and trouble-free internal data bus communication
F	4	Status R 4	off	Not ready for operation or no or disturbed internal bus communication (when Watchdog timer enabled only, see section "Parameterization")
			green	Operational readiness and trouble-free internal data bus communication
G	3	Error R 3	off	Normal operation
			red	Overrange/underrange of the admissible measuring range*), broken wire, short circuit*)
H	4	Error R 4	off	Normal operation
			red	Overrange/underrange of the admissible measuring range*), broken wire, short circuit*)

*) Depending on the hardware, it is not possible to distinguish between a range underrange and a wire break when using NTC version 750-464/020-000. In the case of wire break, a range underrange is always detected and displayed.

3.4 Operating Elements

The I/O module 750-464 has no operating elements.

3.5 Schematic Diagram

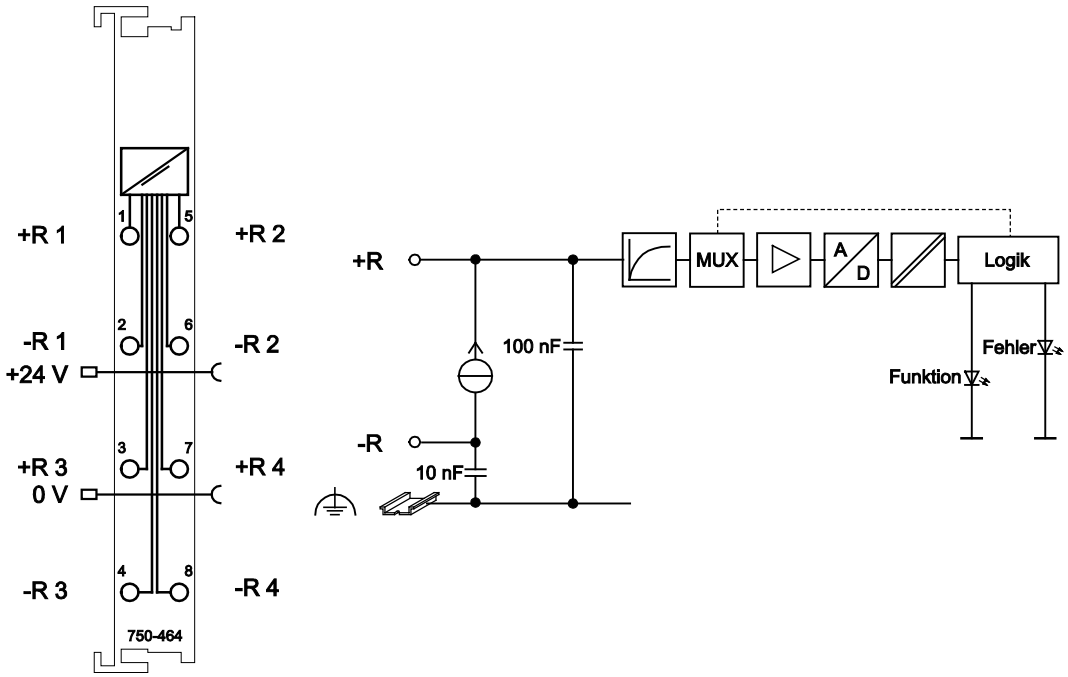


Figure 8: Schematic diagram

3.6 Technical Data

3.6.1 Device data

Table 10: Technical data device

Width	12 mm
Height (from upper edge of 35 DIN rail)	64 mm
Depth	100 mm
Weight	ca. 48 g

3.6.2 Supply

Table 11: Technical data supply

Voltage supply	Via system voltage terminal bus (5 V DC)
Current consumption $_{typ.}$ (internal) (5 V DC)	50 mA
Input current $_{typ}$ (Field) (24 V DC)	---
Voltage via power jumper contacts	24 V DC
Current via power contacts $_{max.}$	10 A
Isolation (Peak value)	500 V System/Supply

3.6.3 Communication

Table 12: Technical data communication

Internal bit width (Terminal bus)	
4-Channel operation	4 x 16 Bit Data, 4 x 8 Bit Control/Status (optional)
2-Channel operation	2 x 16 Bit Data, 2 x 8 Bit Control/Status (optional)

3.6.4 Inputs (RTD-variant 750-464)

Table 13: Technical data inputs (RTD-variant 750-464)

Number of inputs	2 or 4 (parametrizable)
Sensor types	Pt100 (IEC 751, default), Ni100 (DIN 43760), Pt1000 (IEC 751), Pt500 (IEC 751), Pt200 (IEC 751), Ni1000 (DIN 43760), Ni120 (Minco), Ni1000 (TK 5000), Potentiometer, Measurement resistance 10 Ω … 5000 Ω, Measurement resistance 10 Ω … 1200 Ω
Sensor connection	2-wire, 3-wire
Measuring current (typ.)	≤ 350 µA per measuring circuit
Conversion time	≤ 320 ms
Resolution	16 Bit
Absolute accuracy at 25°C	≤ ±0,2 % of the full scale value
typical	≤ ±0,1 % of the full scale value
Temperature coefficient	≤ ±20 ppm / K
typical	≤ ±15 ppm / K

3.6.5 Inputs (NTC-variants 750-464/020-000)

Table 14: Technical data inputs (NTC-variant 750-464/020-000)

Number of inputs	4
Sensor types	NTC 10 kΩ, (default), NTC 20 kΩ, NTC-Thermokon 10 kΩ
Sensor connection	2-wire
Measuring current	≤ 350 µA per measuring circuit
Conversion time	≤ 320 ms
Resolution	16 Bit
Absolute accuracy at 25°C	≤ ±0,2 % of the full scale value
typical	≤ ±0,1 % of the full scale value
Temperature coefficient	≤ ±20 ppm / K
typical	≤ ±15 ppm / K

3.7 Approvals

Information

More Information about Approvals
Detailed references to the approvals are listed in the document "Overview Approvals **WAGO-I/O-SYSTEM 750**", which you can find on the DVD "AUTOMATION Tools and Docs" (order no. 0888-0412) or via the internet under: www.wago.com → Documentation → WAGO-I/O-SYSTEM 750 → System Description.

The following approvals have been granted to the basic version and all variations of 750-464 I/O modules:

Conformity Marking

$_{C}UL_{US}$ UL508

The following Ex approvals have been granted to the basic version and all variations of 750-464 I/O modules:

TÜV 07 ATEX 554086 X

I M2 Ex d I Mb
II 3 G Ex nA IIC T4 Gc
II 3 D Ex tc IIIC T135°C Dc

Ambient temperature range: 0 °C ≤ T_a ≤ +60 °C

IECEx TUN 09.0001 X

Ex d I Mb
Ex nA IIC T4 Gc
Ex tc IIIC T135°C Dc

Ambient temperature range: 0 °C ≤ T_a ≤ +60 °C

$_{C}UL_{US}$ ANSI/ISA 12.12.01

Class I, Div2 ABCD T4

The following Ex approvals have been granted to the basic version and all variations of 750-464 I/O modules:

ABS (American Bureau of Shipping)

Federal Maritime and Hydrographic Agency

	BV (Bureau Veritas)	
	DNV (Det Norske Veritas)	Class B
	GL (Germanischer Lloyd)	Cat. A, B, C, D (EMC 1)
	KR (Korean Register of Shipping)	
	LR (Lloyd’s Register)	Env. 1, 2, 3, 4
	NKK (Nippon Kaiji Kyokai)	
	RINA (Registro Italiano Navale)	

3.8 Standards and Guidelines

All variations of 750-464 I/O modules meet the following requirements on emission and immunity of interference:

EMC CE-Immunity to interference	acc. to EN 61131-2: 2007
EMC CE-Emission of interference	acc. to EN 61131-2: 2003
EMC marine applications-Immunity to interference	acc. to Germanischer Lloyd (2003)
EMC marine applications-Emission of interference	acc. to Germanischer Lloyd (2003)

4 Mounting

4.1 Mounting Sequence

All system components can be snapped directly on a carrier rail in accordance with the European standard EN 50022 (DIN 35).

The reliable positioning and connection is made using a tongue and groove system. Due to the automatic locking, the individual components are securely seated on the rail after installation.

Starting with the coupler/controller, the I/O modules are mounted adjacent to each other according to the project design. Errors in the design of the node in terms of the potential groups (connection via the power contacts) are recognized, as the I/O modules with power contacts (male contacts) cannot be linked to I/O modules with fewer power contacts.

⚠ CAUTION

Risk of injury due to sharp-edged male contacts!
The male contacts are sharp-edged. Handle the module carefully to prevent injury.

NOTICE

Connect the I/O modules in the required order!
Never plug I/O modules from the direction of the end terminal. A ground wire power contact, which is inserted into a terminal without contacts, e.g. a 4-channel digital input module, has a decreased air and creepage distance to the neighboring contact in the example DI4.

NOTICE

Assemble the I/O modules in rows only if the grooves are open!
Please take into consideration that some I/O modules have no or only a few power jumper contacts. The design of some modules does not allow them to be physically assembled in rows, as the grooves for the male contacts are closed at the top.

Note

Don't forget the end module!
Always plug an end module 750-600 onto the end of the fieldbus node! You must always use an end module at all fieldbus nodes with the WAGO I/O System 750 fieldbus couplers/controllers to guarantee proper data transfer.

4.2 Inserting and Removing Devices

DANGER

Use caution when interrupting the PE!
Make sure that people or equipment are not placed at risk when removing an I/O module and the associated PE interruption. To prevent interruptions, provide ring feeding of the ground conductor, see section "Grounding/Ground Conductor" in manual "System Description WAGO-I/O-SYSTEM 750".

NOTICE

Perform work on devices only if the system is de-energized!
Working on devices when the system is energized can damage the devices. Therefore, turn off the power supply before working on the devices.

4.2.1 Inserting I/O Module

1. Position the I/O module so that the tongue and groove joints to the fieldbus coupler/controller or to the previous or possibly subsequent I/O module are engaged.

Figure 9: Insert I/O module

2. Press the I/O module into the assembly until the I/O module snaps into the carrier rail.

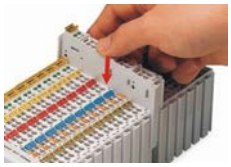


Figure 10: Snap the I/O module into place

With the I/O module snapped in place, the electrical connections for the data contacts and power contacts (if any) to the fieldbus coupler/controller or to the previous or possibly subsequent I/O module are established.

4.2.2 Removing the I/O Module

1. Remove the I/O module from the assembly by pulling the release tab.

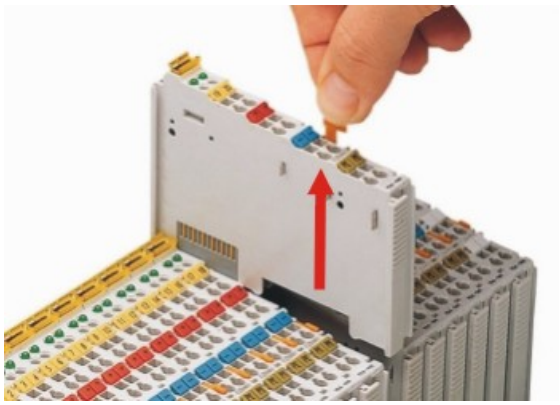


Figure 11: Removing the I/O module

Electrical connections for data or power contacts are disconnected when removing the I/O module.

5 Connect Devices

5.1 Connecting a Conductor to the CAGE CLAMP®

The WAGO CAGE CLAMP® connection is appropriate for solid, stranded and finely stranded conductors.

Note

Only connect one conductor to each CAGE CLAMP® connection!
Only one conductor may be connected to each CAGE CLAMP® connection.
Do not connect more than one conductor at one single connection!

If more than one conductor must be routed to one connection, these must be connected in an up-circuit wiring assembly, for example using WAGO feed-through terminals.

Exception:
If it is unavoidable to jointly connect 2 conductors, then you must use a ferrule to join the wires together. The following ferrules can be used:

Length	8 mm
Nominal cross section $_{max.}$	1 mm^2 for 2 conductors with 0.5 mm^2 each
WAGO Product	216-103 or products with comparable properties.

1. To open the CAGE CLAMP® insert the actuating tool into the opening above the connection.
2. Insert the conductor into the corresponding connection opening.
3. To close the CAGE CLAMP® simply remove the tool - the conductor is then clamped firmly in place.

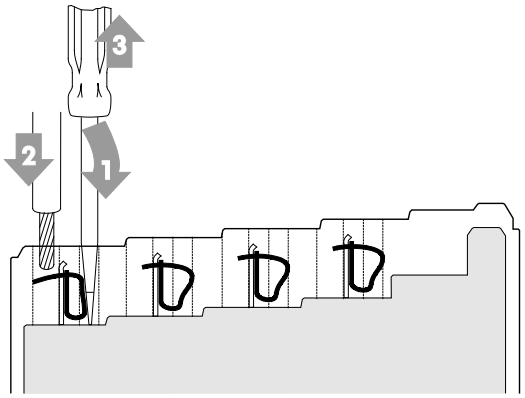


Figure 12: Connecting a conductor to a CAGE CLAMP®

5.2 Connection Examples

Note

Use shielded signal lines!
Only use shielded signal lines for analog signals and I/O modules which are equipped with shield clamps. Only then can you ensure that the accuracy and interference immunity specified for the respective I/O module can be achieved even in the presence of interference acting on the signal cable.

5.2.1 750-464 (RTD) Version, 4-Channel Operation

5.2.1.1 4 x 2-Wire

Note

Important information for 4-channel operation
Please note the special features of 4-channel operation in the following chapter!

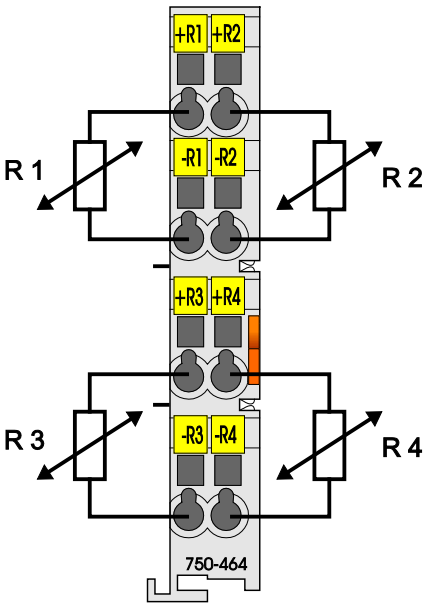


Figure 13: Connection example, version 750-464 (RTD), 4-channel, 4 x 2-wire

5.2.1.2 Special Features in 4-Channel Operation

5.2.1.2.1 Open Input Wiring

The resistors and/or temperature sensors connected to the bus terminal are metered sequentially (channel 1, channel 3, channel 2, channel 4). In so doing, channel 1 and channel 3, or channel 2 and channel 4 form a common measuring circuit in the circuit design. Therefore, in 4-channel operation, either both channels of a measuring circuit have to be connected or unused channels have to be connected at a resistance of 0 Ω ... 5 kΩ.

5.2.1.2.2 Measuring Circuit Line Break Detection

Metering in series results in a special behavior in the case of wire break, such that this is always detected for both sensors connected to a measuring circuit. This applies independently of the selected setting for "indicate wire break/short circuit" (see section "Register assignment", Register 32).

5.2.1.2.3 Influencing a Measuring Circuit Channel through a Quick Change in Temperature

As a rule, temperatures change relatively slowly. If a channel's applied resistance changes over a short period of time by a large resistance value (large in relation to the converted temperature change), then this can influence the other channel within the measuring circuit.

5.2.2 750-464 (RTD) Version, 2-Channel Operation

5.2.2.1 2 x 2-Wire

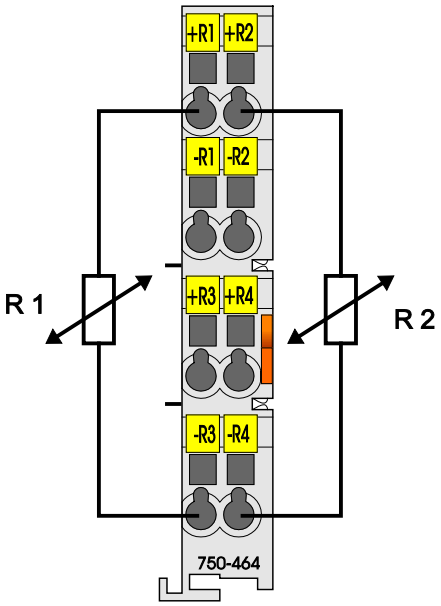


Figure 14: Connection example, version 750-464 (RTD), 2-channel, 2 x 2-wire

5.2.2.2 2 x 3-Wire

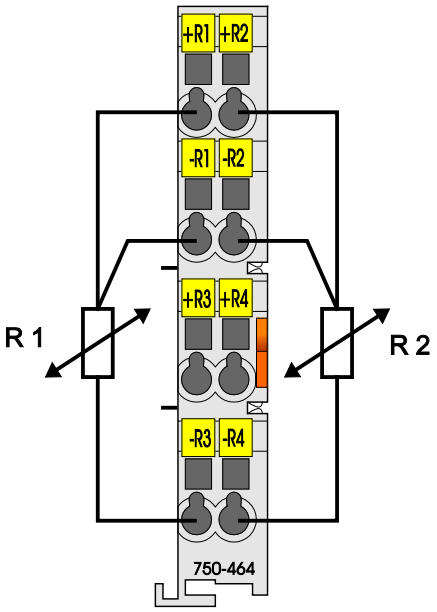


Figure 15: Connection example, version 750-464 (RTD), 2-channel, 2 x 3-Wire

5.2.2.3 1 x 2-Wire + 1 x 3-Wire

Due to the adjustability by channel, all combinations of 2-wire and 3-wire connections are possible.

5.2.3 750-464/020-000 (NTC) Version

5.2.3.1 4 x 2-Wire

Note

Important information for 4-channel operation
Please note the special features in the following chapter

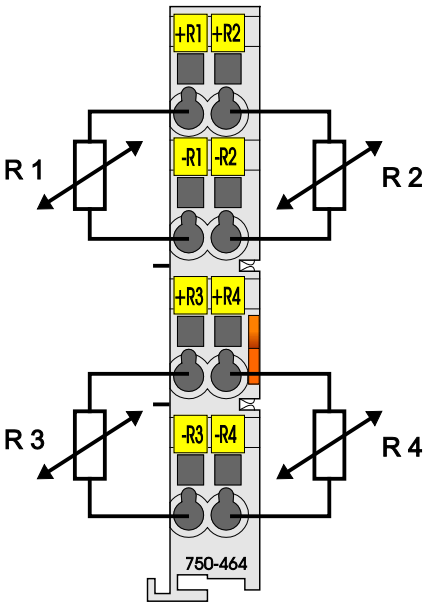


Figure 16: Connection example, version 750-464/020-000 (NTC)

5.2.3.2 Special Features

5.2.3.2.1 Influencing a Measuring Circuit Channel through a Quick Change in Temperature

As a rule, temperatures change relatively slowly. If a channel's applied resistance changes over a short period of time by a large resistance value (large in relation to the converted temperature change), then this can influence the other channel within the measuring circuit.

5.2.3.2.2 Underrange and Wire Break

Depending on the hardware, it is not possible to distinguish between a (temperature) underrange and a wire break when using the NTC version 750-464/020-000. In the case of wire break, an underrange is always detected.

6 Commissioning

6.1 Setting Parameters via Register Communication

The operating mode and the parameters for the 750-464 I/O module can be set directly using the register communication.
The values for channel 1 are set via control byte C0 and status byte S0 for the addressing and via the data bytes D0 and D1 for the transmission of values to be set.

Note

Enter the password!
Before writing to the user register 32 and following, "0x1235" must be written to the password register 31.
The number of user registers depends on the I/O module used.

The bits 0 … 5 of the control byte contain the register number. Via bit 6 (R/W) the access direction (read or write) is set. To switch on the register communication, bit 7 (Reg_Com) is set to "1".

Note

No access to process data during register communication!
During register communication, process data cannot be accessed!
Process data that may be displayed are invalid!

The values to be set are written into the output data bytes D0 and D1.
Via the input data bytes D0 and D1, the set values can be read out of the module.

Note

Check the set values!
After writing to the register, the set values can be checked by reading out the register.

The corresponding bits of the control byte are mirrored in bits 0 ... 5 and 7 of the status byte.

Note

Do not forget: Reset the password!
After writing to the registers, the password register 31 must be reset with "0x0000." Otherwise write access to these registers remains enabled as long as the supply voltage is switched on.

Set the parameters for channel 2 via control byte C1, status byte S1 and data bytes D2 and D3. Use the same procedure as for channel 1.
Set the parameters for channel 3 via control byte C2, status byte S2 and data bytes D4 and D5.
Set the parameters for channel 4 via control byte C3, status byte S3 and data bytes D6 and D7.

6.1.1 Register Assignment

Table 15: Register 32

Register	Function	Memory	Access	Default settings
32	**Mode setting**	**EEPROM**	**R/W**	**0x0106**
Bit 0: User scaling				
0*	The user scaling is switched off.			
1	The user scaling is switched on.			
Bit 1: Manufacturer scaling				
0	The manufacturer scaling is switched off.			
1*	The manufacturer scaling is switched on.			
Bit 2: Watchdog timer (terminal box)				
0	The Watchdog timer is not active.			
1*	The Watchdog timer is active: The watchdog trips if no process data is received within 100 ms.			
Bit 3: Number notation				
0*	Numeric values appear in two's complement.			
1	Numeric values appear in amount / sign format.			
Bit 4: S5-FB250 output format				
0*	Numeric values appear in default format.			
1	Numeric values appear in S5-FB250 format.			
Bit 5: Manufacturer or user calibration				
0*	The manufacturer calibration (R17, R18) is switched on.			
1	The user calibration (R38, R39) is switched on.			
Bit 6: Wire break / short circuit diagnostics				
0*	Diagnostics is switched off.			
1	Diagnostics is switched on.			
Bit 7: Mean value filter				
0*	The mean value filter is switched off.			
1	The mean value filter is switched on.			
Bit 8: Overflow limit				
0	The overflow limit is switched off.			
1*	The overflow limit is switched on: Numeric values are limited to values in R50, R51.			
Bit 9: Reserved				
0*	This bit is reserved and may not be changed.			
Bit 10: Number of measuring lines.				
0*	2-wire			
1	3-wire			
Bit 11: Reserved				
0*	This bit is reserved and may not be changed.			

Table 15: Register 32

Register	Function	Memory	Access	Default settings
32	**Mode setting**	**EEPROM**	**R/W**	**0x0106**
Bit 12 ... 15: Characteristic or sensor types of the 750-464 (RTD) version				
0*	Pt100	(IEC 751)		
1	Ni100	(DIN 43760)		
2	Pt1000	(IEC 751)		
3	Pt500	(IEC 751)		
4	Pt200	(IEC 751)		
5	Ni1000	(DIN 43760)		
6	Ni120	(Minco)		
7	Ni1000	(TK 5000)		
8 ... 12	Reserved			
13	Potentiometer			
14	Output in Ohm	(10R … 5000R)		
15	Output in Ohm	(10R … 1200R)		
Bit 12 ... 15: Characteristic or sensor types of the 750-464/000-002 (NTC) version				
0*	NTC (default)	10 kOhm		
1	NTC	20 kOhm		
2	NTC-Thermokon	10 kOhm		
3 ... 15	Reserved			

* Default settings

Table 16: Register 33

Register	Function	Memory	Access	Default settings
33	**User scaling Offset B_W**	**EEPROM**	**R/W**	**0x0000**
16-bit signed integer User scaling is active if bit 1 is set in register 32. Y5 = R34 * Y4 / 256 + R33				

Table 17: Register 34

Register	Function	Memory	Access	Default settings
34	**User scaling Gain A_W**	**EEPROM**	**R/W**	**0x0100**
16-bit unsigned integer User scaling is active if bit 1 is set in register 32. Y5 = R34 * Y4 / 256 + R33				

Table 18: Register 35

Register	Function	Memory	Access	Default settings
35	**User Underrange**	**EEPROM**	**R/W**	**0x8001**
16-bit signed integer The measured value Y5 is compared to this limit and the comparison result entered in status byte Sx in bits 2, see Status Byte Description. The resolution / LSB is in accordance with the respective process value.				

Table 19: Register 36

Register	Function	Memory	Access	Default settings
36	**User Overrange**	**EEPROM**	**R/W**	**0x7FFF**
The measured value Y5 is compared to this limit and the comparison result entered in status byte Sx in bits 3, see Status Byte Description. The resolution / LSB is in accordance with the respective process value.				

Table 20: Register 37

Register	Function	Memory	Access	Default settings
37	**Coefficients Mean value filter**	**EEPROM**	**R/W**	**0x0003**
16-bit unsigned integer Acceptable value range 2, 3 and 4. Coefficients for the mean value filter before calculation of Y1. Bit 7 of the Feature register can be used to switch ON/OFF mean value filtering. Filtering is enabled immediately after determining the measured resistance value on the sensor input. The number of measured values averaged is indicated in register 37 and can be configured via WAGO-I/O-CHECK. Possible values are 2 and 3 (possibly 4). Mean value filtering is switched off by default (i.e. bit 7 = 0). The default value for register 37 is 0x0003, i.e. when filtering is active, the mean value is outoupt from the last 3 measured values. The mean value filter is only enabled if the determined resistance value of the sensor does not fall below or exceed the previously determined value by 24 mOhm. Otherwise, it is not averaged and the current measured value is used as the baseline for the next (possible) filtering.				

Table 21: Register 39

Register	Function	Memory	Access	Default settings
39	**User calibration Offset**	**EEPROM**	**R/W**	**0x0000**
16-bit unsigned integer In 2-wire mode, the measured resistance is reduced by the value specified in register 22. The resolution is 1/256. The calibration value is entered to eliminate the internal line or coil resistence.				

Table 22: Register 40

Register	Function	Memory	Access	Default settings
40	**User calibration Gain**	**EEPROM**	**R/W**	**0x4000**
16-bit unsigned integer Gain for calibration of the 1000Ohm reference resistance at a resolution of 1/16384.				

Table 23: Register 47

Register	Function	Memory	Access	Default settings
47	**Advanced settings**	**EEPROM**	**R/W**	**0x0000**
Bit 0: Number of channels				
0*	4 channels			
1	2 channels			
Bit 1 ... 7: reserved				
0*	These bits are reserved and may not be changed.			
Bit 8, 9: Interference frequency suppression				
0*	50 Hz			
1	60 Hz			
2	50/60 Hz			
3	Illegal			
Bit 10 ... 15: reserved				
0*	These bits are reserved and may not be changed.			

* Default settings

6.1.2 Control and Status Bytes for Register Communication

The following tables show the assignment of the control and status bytes for register communication.

With the bits 0 ... 5 and 7 in the respective status byte, the register communication is acknowledged by the I/O module.

Table 24: Control Byte C0 for Register Communication

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	R/W	Register number					

Register number	Register number of the selected function (cf. "Register Assignment" section)	
R/W	0:	Read access
	1:	Write access
Reg_Com	1:	Register Communication

Table 25: Status Byte S0 for Register Communication

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	R/W	Register number					

Register number	Register number of the selected function (cf. "Register Assignment" section) mirrored from control byte C0	
R/W	0:	Read access (acknowledgement)
Reg_Com	1:	Register communication, mirrored from control byte C0

Table 26: Control Byte C1 for Register Communication

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	R/W	Register number					

Register number	Register number of the selected function (cf. „Register Assignment“ section)	
R/W	0:	Read access
	1:	Write access
Reg_Com	1:	Register communication

Table 27: Status Byte S1 for Register Communication

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	R/W	Register number					

Register number	Register number of the selected function (cf. „Register Assignment“ section), mirrored from control byte C1	
R/W	0:	Read access (acknowledgement)
Reg_Com	1:	Register communication, mirrored from control byte C1

Table 28: Control Byte C2 for Register Communication

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	R/W	Register number					

Register number	Register number of the selected function (cf. „Register Assignment“ section)	
R/W	0:	Read access
	1:	Write access
Reg_Com	1:	Register communication

Table 29: Status Byte S2 for Register Communication

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	R/W	Register number					

Register number	Register number of the selected function (cf. „Register Assignment“ section), mirrored from control byte C2	
R/W	0:	Read access (acknowledgement)
Reg_Com	1:	Register communication, mirrored from control byte C2

Table 30: Control Byte C3 for Register Communication

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	R/W	Register number					

Register number	Register number of the selected function (cf. „Register Assignment“ section)	
R/W	0:	Read access
	1:	Write access
Reg_Com	1:	Register communication

Table 31: Status Byte S3 for Register Communication

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	R/W	Register number					

Register number	Register number of the selected function (cf. „Register Assignment“ section), mirrored from control byte C3	
R/W	0:	Read access (acknowledgement)
Reg_Com	1:	Register communication, mirrored from control byte C3

6.2 Setting Parameters via Parameter Channels

6.2.1 Introduction

A common data channel between the application and the I/O module is used to exchange parameter sets acyclically and have them checked by the complex I/O module. In order to access via all available interfaces of a fieldbus coupler or fieldbus controller, the parameter channel is mapped to the existing register model. Currently, the parameter channel can be operated with the following interfaces:

- via the control/status byte during the process data exchange
- via the 2-byte process data interface (SPS interface)
- via the parameter exchange for the corresponding fieldbus systems (e.g. PROFIBUS-DP/DP-V1)
- via the asynchronous serial interface of the fieldbus coupler/controller (e.g., for WAGO-I/O-*CHECK*, WAGO-I/O-*PRO*).

The parameter channel is mapped via registers 56 and 57 of the corresponding table or the corresponding channel. The parameter data is stored word by word in register 56, communication control is done via register 57. The structure for registers 56 and 57 is described in the following sections.

6.2.2 Structure of the Register

6.2.2.1 Parameter Data (Register 56)

Register 56 contains the parameter data to be read or written. Depending on the access type, either the I/O module (read parameters) or the fieldbus coupler/controller (write parameters) will write data to the register.

Table 32: Parameter Data (Register 56)

Bit	**7**	**6**	**6**	**4**	**3**	**2**	**1**	**0**
Parameter	PRM 7	PRM 6	PRM 5	PRM 4	PRM 3	PRM 2	PRM 1	PRM 0
Bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Parameter	PRM 15	PRM 14	PRM 13	PRM 12	PRM 11	PRM 10	PRM 9	PRM 8
PRM0 ... PRM15	Parameter data bit 0 to bit 15							

6.2.2.2 Communication Control (Register 57)

Parameter channel control and diagnostics are done via register 57.

Table 33: Communication Control (Register 57)

Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Request parameter	A7	A6	A5	A4	A3	A2	A1	A0
Response parameter	A7	A6	A5	A4	A3	A2	A1	A0
Bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Request parameter	TGL_ MS	PRM_ RW	MORE _PRM	RES	RES	RES	RES	RES
Response parameter	TGL_ SM	TIME OUT	BUF_ OVF	PRM_ ERR	PRM_ UPD	SR_ LEN_ UPD	RES	RES

Request parameter	Information is written by the application and read by the I/O module
Response parameter	Information is written by the I/O module and read by the application

Table 34: Communication Control Parameters

Parameter	**Value range**	**Meaning**
A0-A7	0...255	Word address of the parameter to be read / to be written.
TGL_MS	FALSE, TRUE	Toggle bit to release new instructions from the application to the module. If TGL_SM and TGL_MS have the same status, no new instruction has been released yet. If the flags have different statuses, a new instruction has been released and is currently being processed.
PRM_RW	FALSE	Parameter data of A7 ... A0 are read
	TRUE	Parameter data are written to A7 ... A0
MORE_PRM	FALSE	End of parameter transmission
	TRUE	More parameter data to follow
TGL_SM	FALSE, TRUE	Toggle bit indicating that a parameter sent by the module has been transferred. If TGL_SM and TGL_MS have different statuses, the corresponding instruction is processed by the module. If both flags have the same status, the instruction for the parameter that was sent or requested is completed.

Table 34: Communication Control Parameters

Parameter	Value range	Meaning
TIMEOUT	FALSE	The transmission of the parameters has been completed within the stipulated time (parameter address 0).
	TRUE	The maximum time for the transmission of the parameters between I/O module and application was exceeded.
BUF_OVF	FALSE	Access to the write or read buffer of the I/O module was permitted.
	TRUE	Parameters outside of the write or read buffer were accessed.
PRM_ERR	FALSE	The parameter/all parameters previously transmitted are valid.
	TRUE	At least one transmitted parameter was defective. The flag can either be set after each parameter that is received or after the transmission of the parameters is completed.
PRM_UPD	FALSE	No change in modules individual parameter data set.
	TRUE	Module's individual parameter data set has been changed. A respective iPar-Server request is to be initiated by the PROFIBUS/PROFINET coupler/controller.
SR_LEN_UPD	FALSE	No change in modules KBUS shift register size.
	TRUE	Modules KBUS shift register size will be changed. The initiation of a KBUS reset sequence is necessary.
RES	FALSE	Reserved for expansions

6.2.3 Parameter Sets

For use of the parameter channel, parameter sets are defined and indexed using parameter addresses (A7 ... A0). Module-specific parameters (parameters 0 through 249) and general system parameters (parameters 250 through 255) are differentiated.

6.2.3.1 General Parameter Data (System Parameter Range)

The following addresses are defined to access the system parameters of the I/O modules:

Table 35: System Parameters

Address	Mode	Parameter	Description
250 ... 253	R/W	RESERVED	Reserved for expansions
254	R/W	TIMEOUT	This parameter contains the maximum permissible time in milliseconds that can elapse for the transfer of the parameter set. If TIMEOUT = 0, the monitoring time is infinite.
255	R	NO_OF_PRMS	Number of words (parameter data) of the I/O module.
	W	SET_DEFAULT_PRMS	The I/O module is reset to the default setting.

6.2.3.2 I/O Module-Specific Parameter Data

The following addresses are defined for access to the specific parameter data of the I/O module:

Table 36: Parameter channel address 0

Parameter channel address	Register	Memory	Access	Default settings
0	**32 (proportionate)**	**EEPROM**	**R/W**	**0x0000**
Bit 0: 2/4-channel switching				
0*	4-channel operation is switched on.			
1	2-channel operation is switched on.			
Bit 1: 2/3-wire switching channel 1				
0*	2-wire operation for channel 1 is switched on.			
1	3-wire operation for channel 1 is switched on.			
Bit 2: 2/3-wire switching channel 2				
0*	2-wire operation for channel 2 is switched on.			
1	3-wire operation for channel 2 is switched on.			
Bit 3: 2/3-wire switching channel 3				
0*	2-wire operation for channel 3 is switched on.			
1	3-wire operation for channel 3 is switched on.			
Bit 4: 2/3-wire switching channel 4				
0*	2-wire operation for channel 4 is switched on.			
1	3-wire operation for channel 4 is switched on.			
Bit 5 ... 15: reserved				
0*	These bits are reserved and may not be changed.			

* Default settings

Table 37: Parameter channel address 1

Parameter channel address	Register	Memory	Access	Default settings
1	**32 (proportionate)**	**EEPROM**	**R/W**	**0x0000**
Bit 0 ... 3: Sensor type channel 1				
0 ... 15	See registration assignment, register 32, bit 12 ... 15			
Bit 4 ... 7: Sensor type channel 2				
0 ... 15	See registration assignment, register 32, bit 12 ... 15			
Bit 8 ... 11: Sensor type channel 3				
0 ... 15	See registration assignment, register 32, bit 12 ... 15			
Bit 12 ...15: Sensor type channel 4				
0 ... 15	See registration assignment, register 32, bit 12 ... 15			

Table 38: Parameter channel address 16 ... 142

	Parameter channel address			
Register	**Channel 1**	**Channel 2**	**Channel 3**	**Channel 4**
32	16	56	96	136
33	17	57	97	137
34	18	58	98	138
35	19	59	99	139
36	20	60	100	140
39	21	61	101	141
40	22	62	102	142

6.2.4 Parameter transmission process

Parameter data are exchanged between application and bus modules by means of the Request-Response process. The application initiates an order with the help of the toggle bit (TGL_MS != TGL_SM). The communications control register (R57) then polls the module until the latter acknowledges the execution of the order (TGL_SM == TGL_MS).

The possible orders to the parameterizing interface of the bus module are listed in the following.

6.2.4.1 Determining the maximum bus module parameter data (system parameters)

Request (Application)

Table 39: Determining the maximum bus module parameter data (Request)

Parameter	Value	Meaning
TGL_MS	!= TGL_SM	Initiate order
PRM_RW	= FALSE	Read access
A0 ... A7	255	Address of parameter data length

Response (I/O module)

Table 40: Determining the maximum bus module parameter data (Response)

Parameter	Value	Meaning
TGL_SM	== TGL_MS	Order executed
A0 ... A7	255	Address of parameter data length mirrored
PRM0 ... PRM15	N	Number of parameters in the address range 0 ... (n-1), $n \in \{N < 250\}$

6.2.4.2 Restoring factory settings (system parameters)

Request (Application)

Table 41: Restoring factory settings (Request)

Parameter	Value	Meaning
TGL_MS	!= TGL_SM	Initiate order
PRM_RW	= TRUE	Write access
A0 ... A7	255	Address of factory settings

Response (I/O module)

Table 42: Restoring factory settings (Response)

Parameter	Value	Meaning
TGL_SM	== TGL_MS	Order executed
A0 ... A7	255	Address of factory settings mirrored

6.2.4.3 Reading/writing parameters (I/O module-specific)

Request (Application)

Table 43: Reading/writing parameters (Request)

Parameter	Value	Meaning
TGL_MS	!= TGL_SM	Initiate order
PRM_RW	= FALSE	Read access
	= TRUE	Write access
MORE_PRM	= FALSE	The transmission of the parameter data is terminated with the currently transmitted parameter.
	= TRUE	Further parameter data are to follow.
A0 ... A7	0 ... (n-1)	Address of parameter data
PRM0 ... PRM15	0 ... 65535	Parameter data for write access

Response (I/O module)

Table 44: Reading/writing parameters (Response)

Parameter	Value	Meaning
TGL_SM	== TGL_MS	Order executed
A0 ... A7	0 ... (n-1)	Address of parameter data mirrored
TIMEOUT	FALSE, TRUE	Monitoring time expired
BUF_OFL	FALSE, TRUE	Access outside the module parameter range
PRM_ERR	FALSE, TRUE	Parameter/parameter set error
PRM0 ... PRM15	0 ... 65535	Parameter data for read access

Errors when exchanging parameter data are reported by the module in the error flags TIMEOUT, BUF_OV and PRM_ERR.

When the last parameter has been transferred to the module (MORE_PRM = FALSE), the entire parameter set is checked by the module and accepted if correct. Otherwise, the module returns a parameterizing error (PRM_ERR = TRUE).

6.3 Parameterization with WAGO-I/O-*CHECK*

6.3.1 2/4-Channel Input Module for Resistance Sensors 750-464 (configuration dialog)

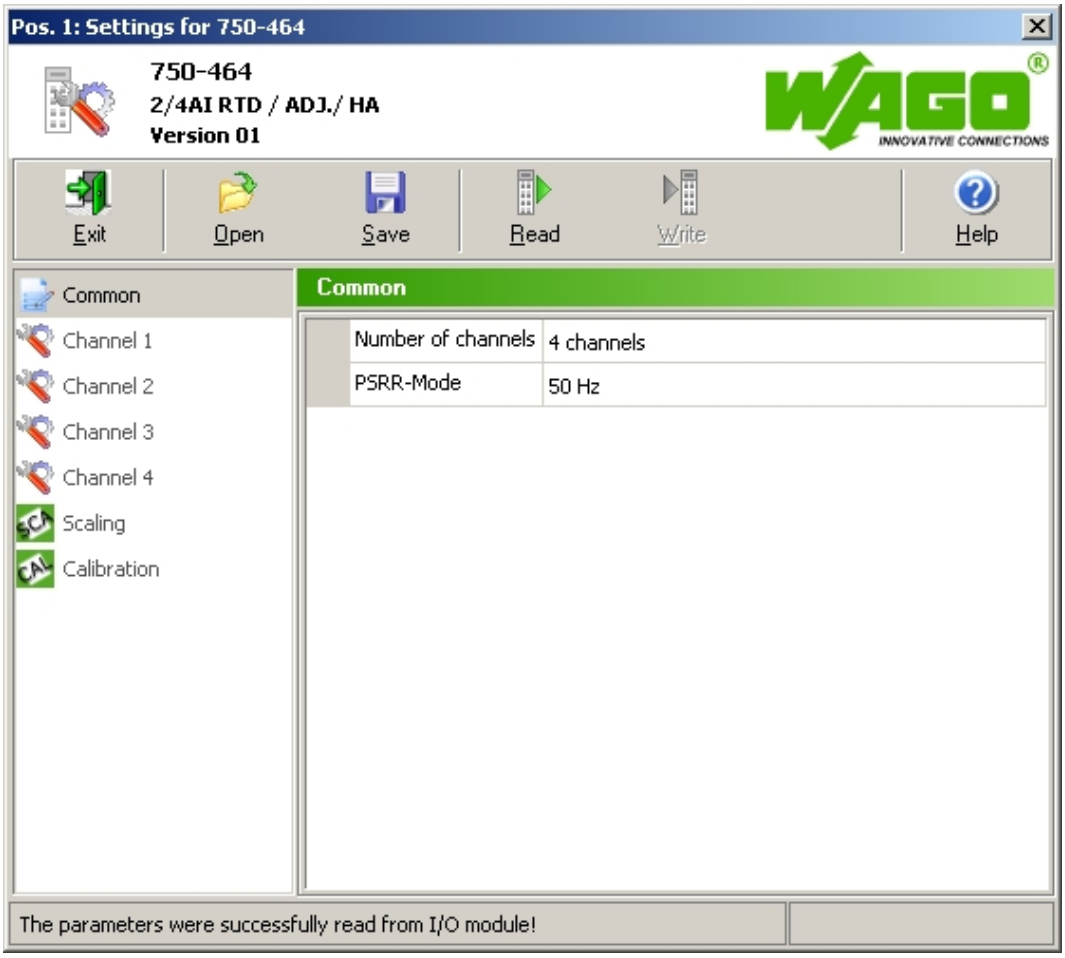


Figure 17: General dialog

The parameter dialog is divided into the following areas:

Title bar with position and item number of the selected I/O module

information area including item number, name as well as version number and version date of the I/O module

Toolbar

Navigation area

Parameter range (selectable via navigation between general settings, channel settings, calibration and scaling)

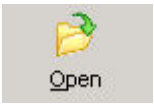
Status bar

6.3.2 Toolbar on the Configuration Dialog

The toolbar contains the following buttons:

Figure 18: Toolbar

Table 45: Toolbar

Button	Function	Description
	[Exit]	Closes the configuration dialog.
	Open	Opens an existing parameterization file. WAGO-I/O-*CHECK* displays the default dialog for opening files.
	Save	Saves the current parameter in a parameter file. WAGO-I/O-*CHECK* displays the default dialog for saving files.
	Reading	Reads the current parameters of the selected module.
	Write	Writes the current parameters to the selected module.
	Default	Resets the selected module to the WAGO default settings.
	Help	Opens the WAGO-I/O-*CHECK* online help.

6.3.3 2/4-Channel Input Module for Resistence Sensors 750-464 (navigation area)

The navigation area contains the following buttons:

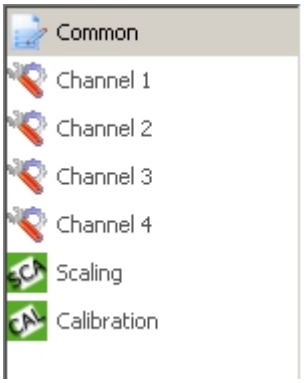


Figure 19: Navigation

Press one of the buttons to display the corresponding parameters:

Table 46: Navigation

Button	Function	Description
Common	General	Opens a page with parameters for general settings
Channel 1	Channel 1	Opens a page with parameters for channel 1 settings
Channel 2	Channel 2	Opens a page with parameters for channel 2 settings
Channel 3	Channel 3	Opens a page with parameters for channel 3 settings. This button is only available if the operating mode of the I/O module is set to "4-channel".
Channel 4	Channel 4	Opens a page with parameters for channel 4 settings. This button is only available if the operating mode of the I/O module is set to "4-channel".
Scaling	Scaling	Opens a page for the scaling settings for channel 1 ... 2 (4).
Calibration	Calibration	Opens a page for the calibration settings for channel 1 ... 4. This button is only available if the operating mode of the I/O module is set to "4-channel".

6.3.3.1 2/4-Channel Analog Input Module for Resistance Sensors 750-464 (general)

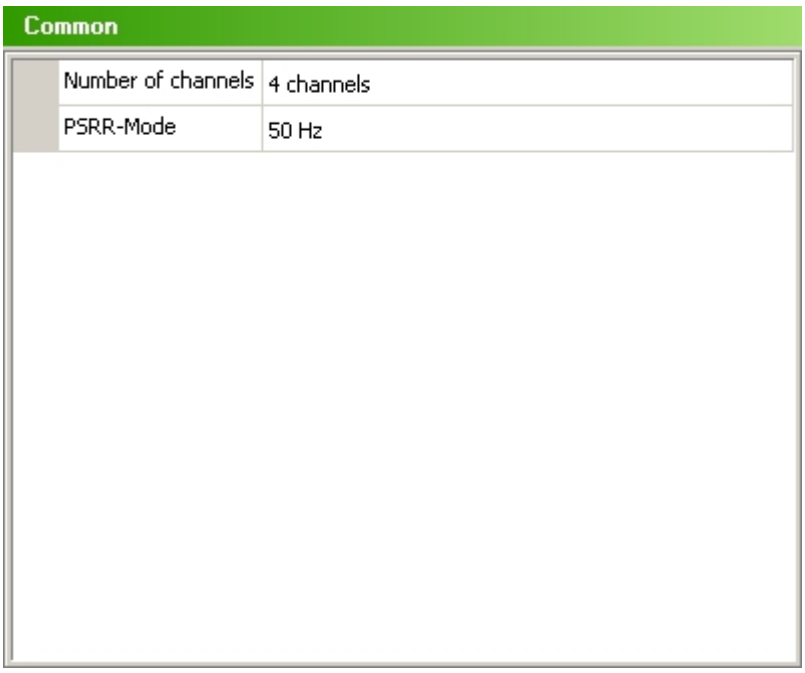


Figure 20: "General" parameters

The following selection boxes are displayed in tabular form:

Table 47: "General" parameters

Selection box	Settings
Channel qty	2 channels
	4 channels
PSSR mode	50 Hz
	60 Hz
	50/60 Hz

6.3.3.2 2/4-Channel Analog Input Module for Resistance Sensors 750-464 (channels)

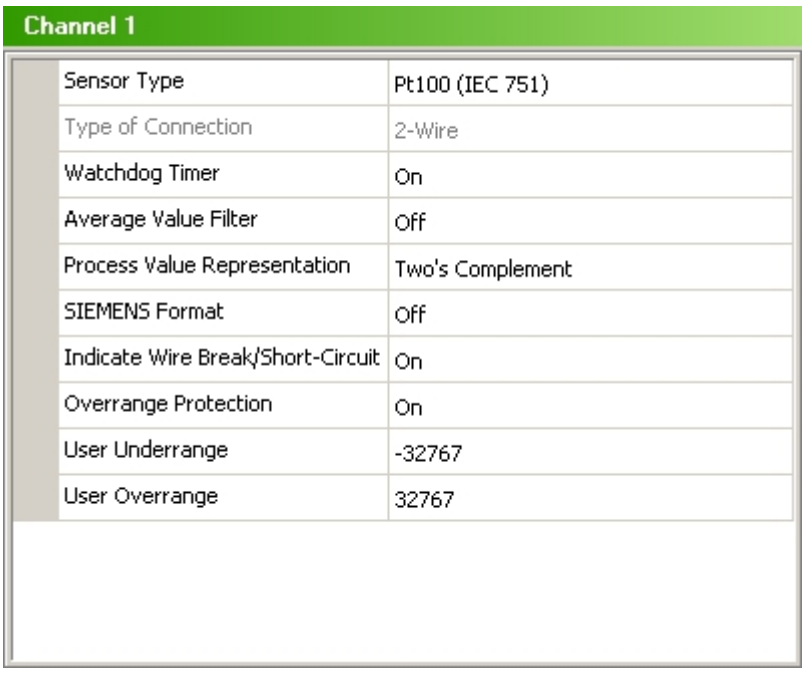


Figure 21: "Channel" parameters

The following selection boxes are displayed in tabular form:

Table 48: "Channel" parameters

Selection box	Possible settings	
Sensory type (750-464)	Pt100 (IEC 751)*, Ni100 (DIN 43760), Pt1000 (IEC 751), Pt500 (IEC 751), Pt200 (IEC 751), Ni1000 (DIN 43760), Ni120 (Minco), Ni1000 (TK 5000), Potentiometer, Resistance measurement 10 Ω … 5000 Ω, Resistance measurement 10 Ω … 1200 Ω	
Sensor type (750-464/000-020)	NTC 10 kΩ*, NTC 20 kΩ, NTC-Thermokon 10 kΩ	
Connection type	2-wire	2-wire connection technology
	3-wire	3-wire connection technology (not for 750-464 in operating mode "4-channel" not for 750-464/000-020)
Watchdog Timer	Off	The Watchdog timer is not active. The green LEDs illuminate continuously.
	On*	The Watchdog timer is active. If no process data is exchange with the bus coupler for 100 ms, the green LEDs go out.
Mean value filter	Off	The mean value filter is switched off.
	On	The mean value filter is switched on. To reduce the digital noise, the I/O module uses a software-based mean value filter (median filter). A resistance value is assumed to be constant if the voltage drop considered for the measurement differs by less than the specific (very small) value by the resistance applied in the circuit. It is recommended to always leave the mean value filter on for each channel.
Process Data Representation	2nd complement	Two's complement representation
	Amount/ leading sign	Representation as an amount with leading sign

Table 48: "Channel" parameters

Selection box	Possible settings	
SIEMENS Format	Off*	No display of status indicators
	On	Display of status indicators in the bottom three bits: Bit 0: Overflow. Set for Overrange/Underrange (if "Overflow Limit" is active). Bit 1: Error. Set for wire break/short circuit (if "Indicate wire break/short circuit" is active). Bit 2: Always 0
	 **Note** **Important Note!** If SIEMENS format is ON, the "Manufacturer scaling" setting is not taken into account!	
Indicate wire break/short circuit	Off	A wire break or short circuit is not indicated in the status byte.
	On	A wire break or short circuit is indicated in the status byte. The setting has no impact on the process data representation. The process value is always saturated on the respective resistance limits of the sensor type set.
	 **Note** **Important Note!** The setting has no impact on the process data representation. The process value is always saturated on the respective resistance limits of the sensor type set. (Principle: "Analog measuring instrument").	
Overflow Limit	Off	A measuring range overrange/underrange is not indicated in the status byte.
	On	A measuring range overrange/underrange is indicated in the status byte. The setting has no impact on the process data representation. The process value is always saturated on the respective resistance limits of the sensor type set.

Table 48: "Channel" parameters

Selection box	Possible settings
	Note **Important Note!** The setting has no impact on the process data representation. The process value is always saturated on the respective resistance limits of the sensor type set. (Principle: "Analog measuring instrument").
Underrange	At these points, the user can define limits, which will result in setting the corresponding bits in the status byte (see section "Control / status byte") in the event of an underrange or overrange. The selected decimal value always refers to the final output process value. As delivered, the limits for the underrange/overrange are selected, so that they cannot be exceeded. The function is thereby virtually deactivated.
Range exceeded	At these points, the user can define limits, which will result in setting the corresponding bits in the status byte (see section "Control / status byte") in the event of an underrange or overrange. The selected decimal value always refers to the final output process value. As delivered, the limits for the underrange/overrange are selected, so that they cannot be exceeded. The function is thereby virtually deactivated.
	* Default setting

6.3.3.3 2/4-Channel Analog Input Module for Resistance Sensors 750-464 (calibration)

Note

Calibration in "4-channel mode" only!
The module can only be calibrated depending on the topology in "4-channel mode"!

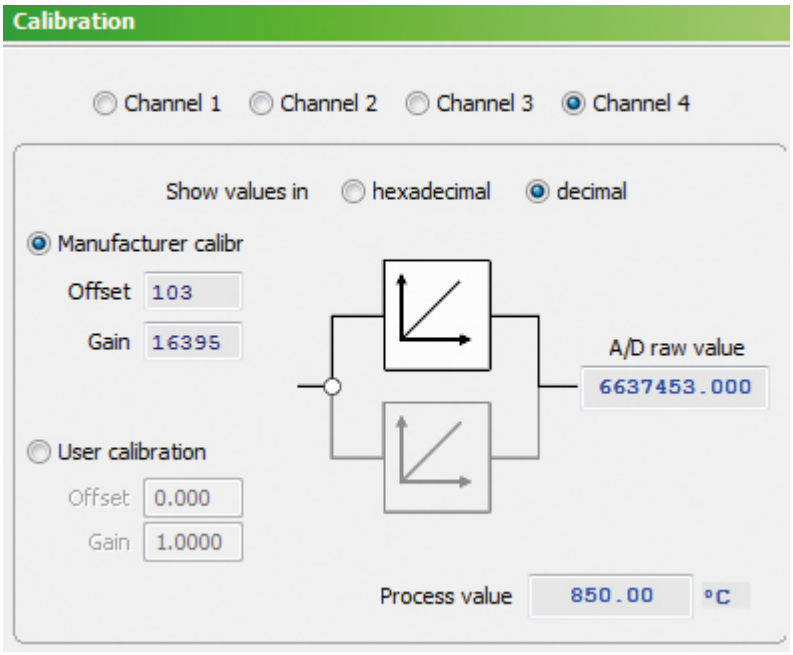


Figure 22: Calibration dialog

To select the respective channel, select the **[Channel 1]** ... **[Channel 4]** radio button.

To enter the value in hexadecimal format, select the **[hexadecimal]** radio button.

To enter the value in decimal format, select the **[decimal]** radio button.

To select the **Offset** and **Gain** factory setting, select the **[Manufacturer Calibration]** radio button.

To enter your settings in the **Offset** and **Gain** fields, select the **[User Calibration]** radio button.

The corresponding value appears in the **A/D raw value** field.

The value appears in °C in the **Process value** field.

The measuring circuits can be calibrated independently in the same way.

Note

Calibration independent of sensor type!
Any sensor type selected can be calibrated independently!

Note

Use resistance decade boxes for calibration!
For best possible calibration of the module, use resistors or resistance decade boxes that are a accurate as possible, i.e. exhibit low tolerance. Otherwise, the measuring accuracy specified in the data sheet may not be achieved!

6.3.3.4 2/4-Channel Analog Input Module for Resistance Sensors 750-464 (scaling)

The settings in the Scaling dialog have a direct impact on the process value. Scaling is carried out for each channel and is saved permanently, i.e. available after restarting the node.

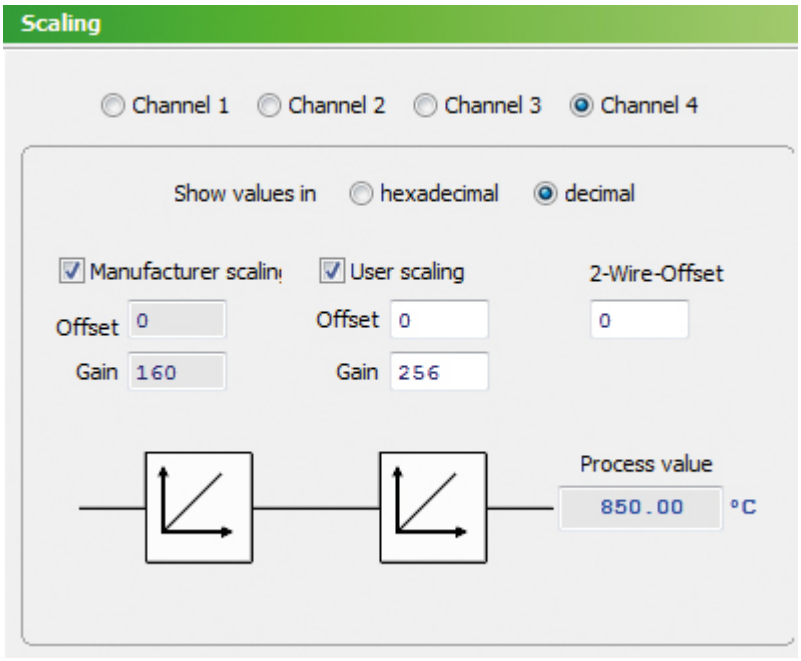


Figure 23: Scaling parameters

To select the process value for the respective channel, select the **[Channel 1] ... [Channel (2) 4]** radio button.

To display the value in hexadecimal format, select the **[hexadecimal]** radio button.

To display the value in decimal format, select the **[decimal]** radio button.

To switch on manufacturer scaling, select the **[Manufacturer scaling]** radio button. When manufacturer scaling is ON, the process value appears scaled in 1/10 °C or Ohm per digit. When manufacturer scaling is OFF, the process value appears scaled 1/16 °C or Ohm per digit.
For sensor types with ineffective manufacturer scaling (resistance ... 5 kOhm), the process value appears scaled in 0.5 Ohm per digit.

To switch on user scaling, select the **[User scaling]** radio button. When user scaling is ON, the signal charge can be viewed immediately after the manufacturer scaling. The **Offset** and **Gain** fields involve linearization according to the formula of a linear equation:

$$f(x) = mx+b$$

Where:

m = Gain [1/256 per digit, data type: unsigned integer],

x = Resistance or temperature value

b = Offset

If connection type "2-wire" is set in the **2-wire offset** field for a connected resistance/temperature sensor, the line resistance of the sensor has a direct impact on the measurement results and can this distort it. The line resistance can be intered here in 1/256 Ohm resistance per digit. This is then always subtracted from the measurement results.

7 Process Image

Note

Mapping of process data in the process image of fieldbus systems
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.

7.1 Overview

7.1.1 Process Image for 2-Channel Operation

Table 49: Process image for 2-channel operation

Input		Output	
Byte 0	Status byte S0	Byte 0	Control byte C0
Byte 1	Data byte D0	Byte 1	Data byte D0
Byte 2	Data byte D1	Byte 2	Data byte D1
Byte 3	Status byte S1	Byte 3	Control byte C1
Byte 4	Data byte D2	Byte 4	Data byte D2
Byte 5	Data byte D3	Byte 5	Data byte D3

7.1.2 Process Image for 4-Channel Operation

Table 50: Process image for 4-channel operation

Input		Output	
Byte 0	Status byte S0	Byte 0	Control byte C0
Byte 1	Data byte D0	Byte 1	Data byte D0
Byte 2	Data byte D1	Byte 2	Data byte D1
Byte 3	Status byte S1	Byte 3	Control byte C1
Byte 4	Data byte D2	Byte 4	Data byte D2
Byte 5	Data byte D3	Byte 5	Data byte D3
Byte 6	Status byte S2	Byte 6	Control byte C2
Byte 7	Data byte D4	Byte 7	Data byte D4
Byte 8	Data byte D5	Byte 8	Data byte D5
Byte 9	Status byte S3	Byte 9	Control byte C3
Byte 10	Data byte D6	Byte 10	Data byte D6
Byte 11	Data byte D7	Byte 11	Data byte D7

7.2 Control/Status Bytes

Table 51: Control Byte C0

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RegCom	0	0	0	0	0	0	0

RegCom	Register Communication	
	0:	Register communication is switched off (normal mode)
	1:	Register communication is switched on (configuration, see section "Setting Parameters via Register Communication")
0	The bit is reserved and many not be changed.	

Table 52: Status byte S0

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	General Error	Wire Break	Short Circuit	User Over-range	User Under-range	Over-range	Under-range

Underrange	Underrange	
	Ptxxx, Nixxx, NTCxxk	
	0:	The overrange limit (see section "Feature Register) is OFF or the resistance value is above the lower temperature limit in relation to the calculated temperature.
	1:	The overrange limit is ON and the resistance value is below the lower temperature limit in relation to the calculated temperature.
	10R…1k2R, 10R…5kR	
	0:	The overrange limit (see section "Feature Register") is OFF or the resistance value is above the lower resistance limit.
	1:	The overrange limit is ON and the resistance value is below the lower resistance limit.
	Potentiometer	
	0:	This bit is always 0.
Overrange	Range exceeded	
	Ptxxx, Nixxx, NTCxxk	
	0:	The overrange limit (see section "Feature Register) is OFF or the resistance value is below the upper temperature limit in relation to the calculated temperature.
	1:	The overrange limit is ON and the resistance value is above the upper temperature limit in relation to the calculated temperature.
	10R…1k2R, 10R…5kR	
	0:	The overrange limit (see section "Feature Register") is OFF or the resistance value is below the upper resistance limit.
	1:	The overrange limit is ON and the resistance value is above the upper resistance limit.
	Potentiometer	
	0:	This bit is always 0.

Table 52: Status byte S0

User Underrange	User underrange	
	0:	The process value is greater than specified for the underrange (see section “Feature Register”).
	1:	The process value is less than specified for the underrange. The format of the number notation (see section "Feature Register") is taken into account.
User Overrange	User overrange	
	0:	The process value is less than specified for the overrange (see section “Feature Register”).
	1:	The process value is greater than specified for the overrange. The format of the number notation (see section "Feature Register") is taken into account.
Short Circuit	Short Circuit	
	0:	"Indicate wire break/short circuit" (see section "Feature Register") is OFF or there is no short circuit.
	1:	"Indicate wire break/short circuit" is ON and there is a short circuit.
Wire Break	Wire Break	
	0:	"Indicate wire break/short circuit" (see section "Feature Register") is OFF or there is no wire break.
	1:	"Indicate wire break/short circuit" is ON and there is a wire break.
General Error	Group Error	
	0:	No error, bit 0 (underrange), bit 1 (overrange), bit 4 (short circuit) and bit 5 (wire break) is not set.
	1:	Error, bit 0 (underrange), bit 1 (overrange), bit 4 (short circuit) or bit 5 (wire break) is set.
RegCom	Register Communication	
	0:	Register communication is switched off (normal mode)
	1:	Register communication is switched on (configuration, see section "Setting Parameters via Register Communication")

Table 53: Control Byte C1

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RegCom	0	0	0	0	0	0	0

RegCom	Register Communication	
	0:	Register communication is switched off (normal mode)
	1:	Register communication is switched on (configuration, see section "Setting Parameters via Register Communication")
0	The bit is reserved and many not be changed.	

Table 54: Status byte S1

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	General Error	Wire Break	Short Circuit	User Over-range	User Under-range	Over-range	Under-range

Underrange	Underrange	
	Ptxxx, Nixxx, NTCxxk	
	0:	The overrange limit (see section "Feature Register”) is OFF or the resistance value is above the lower temperature limit in relation to the calculated temperature.
	1:	The overrange limit is ON and the resistance value is below the lower temperature limit in relation to the calculated temperature.
	10R…1k2R, 10R…5kR	
	0:	The overrange limit (see section "Feature Register") is OFF or the resistance value is above the lower resistance limit.
	1:	The overrange limit is ON and the resistance value is below the lower resistance limit.
	Potentiometer	
	0:	This bit is always 0.
Overrange	Range exceeded	
	Ptxxx, Nixxx, NTCxxk	
	0:	The overrange limit (see section "Feature Register”) is OFF or the resistance value is below the upper temperature limit in relation to the calculated temperature.
	1:	The overrange limit is ON and the resistance value is above the upper temperature limit in relation to the calculated temperature.
	10R…1k2R, 10R…5kR	
	0:	The overrange limit (see section "Feature Register") is OFF or the resistance value is below the upper resistance limit.
	1:	The overrange limit is ON and the resistance value is above the upper resistance limit.
	Potentiometer	
	0:	This bit is always 0.

Table 54: Status byte S1

User Underrange	User underrange	
	0:	The process value is greater than specified for the underrange (see section “Feature Register”).
	1:	The process value is less than specified for the underrange. The format of the number notation (see section "Feature Register") is taken into account.
User Overrange	User overrange	
	0:	The process value is less than specified for the overrange (see section “Feature Register”).
	1:	The process value is greater than specified for the overrange. The format of the number notation (see section "Feature Register") is taken into account.
Short Circuit	Short Circuit	
	0:	"Indicate wire break/short circuit" (see section "Feature Register") is OFF or there is no short circuit.
	1:	"Indicate wire break/short circuit" is ON and there is a short circuit.
Wire Break	Wire Break	
	0:	"Indicate wire break/short circuit" (see section "Feature Register") is OFF or there is no wire break.
	1:	"Indicate wire break/short circuit" is ON and there is a wire break.
General Error	Group Error	
	0:	No error, bit 0 (underrange), bit 1 (overrange), bit 4 (short circuit) and bit 5 (wire break) is not set.
	1:	Error, bit 0 (underrange), bit 1 (overrange), bit 4 (short circuit) or bit 5 (wire break) is set.
RegCom	Register Communication	
	0:	Register communication is switched off (normal mode)
	1:	Register communication is switched on (configuration, see section "Setting Parameters via Register Communication")

Note

Control/status bytes in 4-channel operation!

Control and status bytes C2, S2, C3 and S3 are only available in the process image for 4-channel operation!

Table 55: Control Byte C2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RegCom	0	0	0	0	0	0	0

RegCom	Register Communication	
	0:	Register communication is switched off (normal mode)
	1:	Register communication is switched on (configuration, see section "Setting Parameters via Register Communication")
0	The bit is reserved and many not be changed.	

Table 56: Status byte S2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	General Error	Wire Break	Short Circuit	User Over-range	User Under-range	Over-range	Under-range

Underrange	Underrange	
	Ptxxx, Nixxx, NTCxxk	
	0:	The overrange limit (see section "Feature Register) is OFF or the resistance value is above the lower temperature limit in relation to the calculated temperature.
	1:	The overrange limit is ON and the resistance value is below the lower temperature limit in relation to the calculated temperature.
	10R…1k2R, 10R…5kR	
	0:	The overrange limit (see section "Feature Register") is OFF or the resistance value is above the lower resistance limit.
	1:	The overrange limit is ON and the resistance value is below the lower resistance limit.
	Potentiometer	
	0:	This bit is always 0.
Overrange	Range exceeded	
	Ptxxx, Nixxx, NTCxxk	
	0:	The overrange limit (see section "Feature Register) is OFF or the resistance value is below the upper temperature limit in relation to the calculated temperature.
	1:	The overrange limit is ON and the resistance value is above the upper temperature limit in relation to the calculated temperature.
	10R…1k2R, 10R…5kR	
	0:	The overrange limit (see section "Feature Register") is OFF or the resistance value is below the upper resistance limit.
	1:	The overrange limit is ON and the resistance value is above the upper resistance limit.
	Potentiometer	
	0:	This bit is always 0.

Table 56: Status byte S2

User Underrange	User underrange	
	0:	The process value is greater than specified for the underrange (see section “Feature Register”).
	1:	The process value is less than specified for the underrange. The format of the number notation (see section "Feature Register") is taken into account.
User Overrange	User overrange	
	0:	The process value is less than specified for the overrange (see section “Feature Register”).
	1:	The process value is greater than specified for the overrange. The format of the number notation (see section "Feature Register") is taken into account.
Short Circuit	Short Circuit	
	0:	"Indicate wire break/short circuit" (see section "Feature Register") is OFF or there is no short circuit.
	1:	"Indicate wire break/short circuit" is ON and there is a short circuit.
Wire Break	Wire Break	
	0:	"Indicate wire break/short circuit" (see section "Feature Register") is OFF or there is no wire break.
	1:	"Indicate wire break/short circuit" is ON and there is a wire break.
General Error	Group Error	
	0:	No error, bit 0 (underrange), bit 1 (overrange), bit 4 (short circuit) and bit 5 (wire break) is not set.
	1:	Error, bit 0 (underrange), bit 1 (overrange), bit 4 (short circuit) or bit 5 (wire break) is set.
RegCom	Register Communication	
	0:	Register communication is switched off (normal mode)
	1:	Register communication is switched on (configuration, see section "Setting Parameters via Register Communication")

Table 57: Control Byte C3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RegCom	0	0	0	0	0	0	0

RegCom	Register Communication	
	0:	Register communication is switched off (normal mode)
	1:	Register communication is switched on (configuration, see section "Feature Register")
0	The bit is reserved and many not be changed.	

Table 58: Status byte S3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reg_Com	General Error	Wire Break	Short Circuit	User Over-range	User Under-range	Over-range	Under-range

Underrange	Underrange	
	Ptxxx, Nixxx, NTCxxk	
	0:	The overrange limit (see section "Feature Register) is OFF or the resistance value is above the lower temperature limit in relation to the calculated temperature.
	1:	The overrange limit is ON and the resistance value is below the lower temperature limit in relation to the calculated temperature.
	10R…1k2R, 10R…5kR	
	0:	The overrange limit (see section "Feature Register") is OFF or the resistance value is above the lower resistance limit.
	1:	The overrange limit is ON and the resistance value is below the lower resistance limit.
	Potentiometer	
	0:	This bit is always 0.
Overrange	Range exceeded	
	Ptxxx, Nixxx, NTCxxk	
	0:	The overrange limit (see section "Feature Register) is OFF or the resistance value is below the upper temperature limit in relation to the calculated temperature.
	1:	The overrange limit is ON and the resistance value is above the upper temperature limit in relation to the calculated temperature.
	10R…1k2R, 10R…5kR	
	0:	The overrange limit (see section "Feature Register") is OFF or the resistance value is below the upper resistance limit.
	1:	The overrange limit is ON and the resistance value is above the upper resistance limit.
	Potentiometer	
	0:	This bit is always 0.

Table 58: Status byte S3

User Underrange	User underrange	
	0:	The process value is greater than specified for the underrange (see section “Feature Register”).
	1:	The process value is less than specified for the underrange. The format of the number notation (see section "Feature Register") is taken into account.
User Overrange	User overrange	
	0:	The process value is less than specified for the overrange (see section “Feature Register”).
	1:	The process value is greater than specified for the overrange. The format of the number notation (see section "Feature Register") is taken into account.
Short Circuit	Short Circuit	
	0:	"Indicate wire break/short circuit" (see section "Feature Register") is OFF or there is no short circuit.
	1:	"Indicate wire break/short circuit" is ON and there is a short circuit.
Wire Break	Wire Break	
	0:	"Indicate wire break/short circuit" (see section "Feature Register") is OFF or there is no wire break.
	1:	"Indicate wire break/short circuit" is ON and there is a wire break.
General Error	Group Error	
	0:	No error, bit 0 (underrange), bit 1 (overrange), bit 4 (short circuit) and bit 5 (wire break) is not set.
	1:	Error, bit 0 (underrange), bit 1 (overrange), bit 4 (short circuit) or bit 5 (wire break) is set.
RegCom	Register Communication	
	0:	Register communication is switched off (normal mode)
	1:	Register communication is switched on (configuration, see section "Setting Parameters via Register Communication")

7.3 Process Data of the Standard Version 750-464 (RTD, configurable)

7.3.1 Pt100 (acc. IEC 751)

With the setting "Pt100 (acc. IEC 751)", the I/O module converts the resistance measured values of Pt100 sensors (acc. IEC 751) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).
The possible numeric range corresponds to the defined temperature range of -200 °C to +850 °C for Pt100 sensors (acc. IEC 751).

Table 59: Process image for 750-464, Pt100 setting (acc. IEC 751)

Temperature °C	Resistance Ω	Numeric value [1]			Status byte hex.	LED error AI 1, 2
		Binary	Hex.	Dec.		
---	< 9.00	'1111.1000.0011.0000'	0xF830	-2000	0x51	on
Short circuit [2]						
< -200.0	< 18.52	'1111.1000.0011.0000'	0xF830	-2000	0x41	on
Underrange [3]						
-200.0	18.52	'1111.1000.0011.0000'	0xF830	-2000	0x00	off
-100.0	60.256	'1111.1100.0001.1000'	0xFC18	-1000	0x00	off
0.0	100.000	'0000.0000.0000.0000'	0x0000	0	0x00	off
100.0	138.506	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
200.0	175.856	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
500.0	280.978	'0001.0011.1000.1000'	0x1388	5000	0x00	off
750.0	360.638	'0001.1101.0100.1100'	0x1D4C	7500	0x00	off
800.0	375.704	'0001.1111.0100.0000'	0x1F40	8000	0x00	off
850.0	390.481	'0010.0001.0011.0100'	0x2134	8500	0x00	off
> 850.0	> 390.481	'0010.0001.0011.0100'	0x2134	8500	0x42	on
Overrange [3]						
---	> 5500.00	'0010.0001.0011.0100'	0x2134	8500	0x62	on
Wire break [2]						

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.3.2 Pt200 (acc. IEC 751)

With the setting "Pt200 (acc. IEC 751)", the I/O module converts the resistance measured values of Pt200 sensors (acc. IEC 751) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).
The possible numeric range corresponds to the defined temperature range of -200 °C to +850 °C for Pt200 sensors (acc. IEC 751).

Table 60: Process image for 750-464, Pt200 setting (acc. IEC 751)

Temperature °C	Resistance Ω	Numeric value [1]			Status byte hex.	LED error AI 1, 2
		Binary	Hex.	Dec.		
---	< 9.00	'1111.1000.0011.0000'	0xF830	-2000	0x51	on
Short circuit [2]						
< -200.0	< 37.04	'1111.1000.0011.0000'	0xF830	-2000	0x41	on
Underrange [3]						
-200.0	37.04	'1111.1000.0011.0000'	0xF830	-2000	0x00	off
-100.0	120.51	'1111.1100.0001.1000'	0xFC18	-1000	0x00	off
0.0	200.00	'0000.0000.0000.0000'	0x0000	0	0x00	off
100.0	277.01	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
200.0	351.71	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
500.0	561.96	'0001.0011.1000.1000'	0x1388	5000	0x00	off
750.0	721.28	'0001.1101.0100.1100'	0x1D4C	7500	0x00	off
800.0	751.41	'0001.1111.0100.0000'	0x1F40	8000	0x00	off
850.0	780.96	'0010.0001.0011.0100'	0x2134	8500	0x00	off
> 850.0	> 780.96	'0010.0001.0011.0100'	0x2134	8500	0x42	on
Overrange [3]						
---	> 5500.00	'0010.0001.0011.0100'	0x2134	8500	0x62	on
Wire break [2]						

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.3.3 Pt500 (acc. IEC 751)

With the setting "Pt500 (acc. IEC 751)", the I/O module converts the resistance measured values of Pt500 sensors (acc. IEC 751) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).
The possible numeric range corresponds to the defined temperature range of -200 °C to +850 °C for Pt500 sensors (acc IEC 751).

Table 61: Process image for 750-464, Pt500 setting (acc. IEC 751)

Temperature °C	Resistance Ω	Numeric value [1]			Status byte hex.	LED error AI 1, 2
		Binary	Hex.	Dec.		
---	< 9.00	'1111.1000.0011.0000'	0xF830	-2000	0x51	on
Short circuit [2]						
< -200.0	< 92.60	'1111.1000.0011.0000'	0xF830	-2000	0x41	on
Underrange [3]						
-200.0	92.60	'1111.1000.0011.0000'	0xF830	-2000	0x00	off
-100.0	301.28	'1111.1100.0001.1000'	0xFC18	-1000	0x00	off
0.0	500.00	'0000.0000.0000.0000'	0x0000	0	0x00	off
100.0	692.53	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
200.0	879.28	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
500.0	1404.89	'0001.0011.1000.1000'	0x1388	5000	0x00	off
750.0	1803.19	'0001.1101.0100.1100'	0x1D4C	7500	0x00	off
800.0	1878.52	'0001.1111.0100.0000'	0x1F40	8000	0x00	off
850.0	1952.41	'0010.0001.0011.0100'	0x2134	8500	0x00	off
> 850.0	> 1952.41	'0010.0001.0011.0100'	0x2134	8500	0x42	on
Overrange [3]						
---	> 5500.00	'0010.0001.0011.0100'	0x2134	8500	0x62	on
Wire break [2]						

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.3.4 Pt1000 (acc. IEC 751)

With the setting "Pt1000 (acc. IEC 751)", the I/O module converts the resistance measured values of Pt1000 sensors (acc. IEC 751) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).
The possible numeric range corresponds to the defined temperature range of -200 °C to +850 °C for Pt1000 sensors (acc. IEC 751).

Table 62: Process image for 750-464, Pt1000 setting (acc. IEC 751)

Temperature °C	Resistance Ω	Numeric value [1]			Status byte hex.	LED error AI 1, 2
		Binary	Hex.	Dec.		
---	< 9.00	'1111.1000.0011.0000'	0xF830	-2000	0x51	on
Short circuit [2]						
< -200.0	< 185.20	'1111.1000.0011.0000'	0xF830	-2000	0x41	on
Underrange [3]						
-200.0	185.20	'1111.1000.0011.0000'	0xF830	-2000	0x00	off
-100.0	602.56	'1111.1100.0001.1000'	0xFC18	-1000	0x00	off
0.0	1000.00	'0000.0000.0000.0000'	0x0000	0	0x00	off
100.0	1385.06	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
200.0	1758.56	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
500.0	2809.78	'0001.0011.1000.1000'	0x1388	5000	0x00	off
750.0	3606.38	'0001.1101.0100.1100'	0x1D4C	7500	0x00	off
800.0	3757.04	'0001.1111.0100.0000'	0x1F40	8000	0x00	off
850.0	3904.81	'0010.0001.0011.0100'	0x2134	8500	0x00	off
> 850.0	> 3904.81	'0010.0001.0011.0100'	0x2134	8500	0x42	on
Overrange [3]						
---	> 5500.00	'0010.0001.0011.0100'	0x2134	8500	0x62	on
Wire break [2]						

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.3.5 Ni100 (acc. DIN 43760)

With the setting "Ni100 (acc. DIN 43760)", the I/O module converts the resistance measured values of Ni100 sensors (acc. DIN 43760) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).
The possible numeric range corresponds to the defined temperature range of -60 °C to +300 °C for Ni100 sensors (acc. DIN 43760).

Table 63: Process image for 750-464, Ni100 setting (acc. DIN 43760)

Temperature °C	Resistance Ω	Numeric value [1]			Status byte hex.	LED error AI 1, 2
		Binary	Hex.	Dec.		
---	< 9.00	'1111.1101.1010.1000'	0xFDA8	-600	0x51	on
Short circuit [2]						
< -60.0	< 69.52	'1111.1101.1010.1000'	0xFDA8	-600	0x41	on
Underrange [3]						
-60.0	69.52	'1111.1101.1010.1000'	0xFDA8	-600	0x00	off
-50.0	74.26	'1111.1110.0000.1100'	0xFE0C	-500	0x00	off
0.0	100.00	'0000.0000.0000.0000'	0x0000	0	0x00	off
50.0	129.11	'0000.0001.1111.0100'	0x01F4	500	0x00	off
100.0	161.78	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
150.0	198.64	'0000.0101.1101.1100'	0x05DC	1500	0x00	off
200.0	240.66	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
250.0	289.16	'0000.1001.1100.0100'	0x09C4	2500	0x00	off
300.0	345.66	'0000.1011.1011.1000'	0x0BB8	3000	0x00	off
> 300.0	> 345.66	'0000.1011.1011.1000'	0x0BB8	3000	0x42	on
Overrange [3]						
---	> 5500.00	'0000.1011.1011.1000'	0x0BB8	3000	0x62	on
Wire break [2]						

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.3.6 Ni120 (Minco)

With the setting "Ni120 (Minco)", the I/O module converts the resistance measured values of Ni120 sensors (Minco) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).
The possible numeric range corresponds to the defined temperature range of -80 °C to +260 °C for Ni120 sensors (Minco).

Table 64: Process image for 750-464, Ni120 setting (Minco)

Temperature °C	Resistance Ω	Numeric value [1]			Status byte hex.	LED error AI 1, 2
		Binary	Hex.	Dec.		
---	< 9.00	'1111.1100.1110.0000'	0xFCE0	-800	0x51	on
Short circuit [2]						
< -80.0	66.60	'1111.1100.1110.0000'	0xFCE0	-800	0x41	on
Underrange [3]						
-80.0	66.60	'1111.1100.1110.0000'	0xFCE0	-800	0x00	off
-50.0	86.16	'1111.1110.0000.1100'	0xFE0C	-500	0x00	off
0.0	120.00	'0000.0000.0000.0000'	0x0000	0	0x00	off
50.0	157.75	'0000.0001.1111.0100'	0x01F4	500	0x00	off
100.0	200.64	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
150.0	248.95	'0000.0101.1101.1100'	0x05DC	1500	0x00	off
200.0	303.45	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
250.0	366.53	'0000.1001.1100.0100'	0x09C4	2500	0x00	off
260.0	380.31	'0000.1010.0010.1000'	0x0A28	2600	0x00	off
> 260.0	> 380.31	'0000.1010.0010.1000'	0x0A28	2600	0x42	on
Overrange [3]						
---	> 5500.00	'0000.1010.0010.1000'	0x0A28	2600	0x62	on
Wire break [2]						

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.3.7 Ni1000 (acc. DIN 43760)

With the setting "Ni1000 (acc. DIN 43760)", the I/O module converts the resistance measured values of Ni1000 sensors (acc. DIN 43760) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).
The possible numeric range corresponds to the defined temperature range of -60 °C to +300 °C for Ni1000 sensors (acc. DIN 43760).

Table 65: Process image for 750-464, Ni1000 setting (acc. DIN 43760)

Temperature °C	Resistance Ω	Numeric value [1]			Status byte hex.	LED error AI 1, 2
		Binary	Hex.	Dec.		
---	< 90.00	'1111.1101.1010.1000'	0xFDA8	-600	0x51	on
Short circuit [2]						
< -60.0	< 695.20	'1111.1101.1010.1000'	0xFDA8	-600	0x41	on
Underrange [3]						
-60.0	695.20	'1111.1101.1010.1000'	0xFDA8	-600	0x00	off
-50.0	742.60	'1111.1110.0000.1100'	0xFE0C	-500	0x00	off
0.0	1000.00	'0000.0000.0000.0000'	0x0000	0	0x00	off
50.0	1291.10	'0000.0001.1111.0100'	0x01F4	500	0x00	off
100.0	1617.80	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
150.0	1986.40	'0000.0101.1101.1100'	0x05DC	1500	0x00	off
200.0	2406.60	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
250.0	2891.60	'0000.1001.1100.0100'	0x09C4	2500	0x00	off
300.0	3456.60	'0000.1011.1011.1000'	0x0BB8	3000	0x00	off
> 300.0	> 3456.60	'0000.1011.1011.1000'	0x0BB8	3000	0x42	on
Overrange [3]						
---	> 5500.00	'0000.1011.1011.1000'	0x0BB8	3000	0x62	on
Wire break [2]						

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.3.8 Ni1000 TK5000

With the setting "Ni1000 TK5000", the I/O module converts the resistance measured values of type Ni1000 TK5000 sensors and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).
The possible numeric range corresponds to the defined temperature range of -60 °C to +250 °C for type Ni1000 TK5000 sensors.

Table 66: Process image for 750-464, type Ni1000 TK5000 sensor setting

Temperature °C	Resistance Ω	Numeric value [1]			Status byte hex.	LED error AI 1, 2
		Binary	Hex.	Dec.		
---	< 9	'1111.1101.1010.1000'	0xFDA8	-600	0x51	on
Short circuit [2]						
< -60.0	< 751.79	'1111.1101.1010.1000'	0xFDA8	-600	0x41	on
Underrange [3]						
-60.0	751.79	'1111.1101.1010.1000'	0xFDA8	-600	0x51	on
-50.0	790.88	'1111.1110.1101.0000'	0xF1F4	-500	0x00	off
0.0	1000.00	'1111.1111.1001.1000'	0xFF9C	0	0x00	off
50.0	1234.98	'0000.0000.0110.0000'	0x01F4	500	0x00	off
100.0	1500.00	'0000.0001.0010.1000'	0x03E8	1000	0x00	off
150.0	1799.27	'0000.0001.1111.0000'	0x05DC	1500	0x00	off
200.0	2136.96	'0000.0010.1011.1000'	0x07D0	2000	0x00	off
250.0	2517.27	'0000.0011.1000.0000'	0x09C4	2500	0x00	off
> 250.0	> 2517.27	'0000.0011.1000.0000'	0x09C4	2500	0x42	on
Overrange [3]						
---	> 5500	'0000.0011.1000.0000'	0x09C4	2500	0x62	on
Wire break [2]						

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.3.9 Resistance Measurement 10 Ohm to 1.2 kOhm

With the setting "Resistance measurement 10 Ohm to 1.2 kOhm", the I/O module outputs the resistance measured values of the sensors directly.
The resistances values are displayed at a resolution of 1 digit per 0.1 Ω in one word (16-bit). The possible numeric range corresponds to the defined measurement range of 10 Ω to 1.2 kΩ.

Table 67: Process image for 750-464, setting 10 Ω ... 1.2 kΩ

Resistance Ω	Numeric value [1]			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
< 9 Short circuit [2]	'0000.0000.0110.0100'	0x0064	100	0x51	on
< 10 Underrange [3]	'0000.0000.0110.0100'	0x0064	100	0x41	on
10	'0000.0000.0110.0100'	0x0064	100	0x00	off
100	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
200	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
300	'0000.1011.1011.1000'	0x0BB8	3000	0x00	off
400	'0000.1111.1010.0000'	0x0FA0	4000	0x00	off
500	'0001.0011.1000.1000'	0x1388	5000	0x00	off
750	'0001.1101.0100.1100'	0x1D4C	7500	0x00	off
1000	'0010.0111.0001.0000'	0x2710	10000	0x00	off
1200	'0010.1110.1110.0000'	0x2EE0	12000	0x00	off
> 1200 Overrange [3]	'0010.1110.1110.0000'	0x2EE0	12000	0x42	on
> 5500 Wire break[2]	'0010.1110.1110.0000'	0x2EE0	12000	0x62	on

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.3.10 Resistance Measurement 10 Ohm to 5.0 kOhm

With the setting "Resistance measurement 10 Ohm to 5.0 kOhm", the I/O module outputs the resistance measured values of the sensors directly.
The resistances values are displayed at a resolution of 1 digit per 0.5 Ω in one word (16-bit). The possible numeric range corresponds to the defined measurement range of 10 Ω to 5.0 kΩ.

Table 68: Process image for 750-464, setting 10 Ω ... 5 kΩ

Resistance Ω	Numeric value [1]			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
< 9 Short circuit [2]	'0000.0000.0001.0100'	0x0014	20	0x51	on
< 10 Underrange [3]	'0000.0000.0001.0100'	0x0014	20	0x41	on
10	'0000.0000.0001.0100'	0x0014	20	0x00	off
100	'0000.0000.1100.1000'	0x00C8	200	0x00	off
200	'0000.0001.1001.0000'	0x0190	400	0x00	off
300	'0000.0010.0101.1000'	0x0258	600	0x00	off
1000	'0000.0111.1101.0000'	0x07D0	2000	0x00	off
2000	'0000.1111.1010.0000'	0x0FA0	4000	0x00	off
3000	'0001.0111.0111.0000'	0x1770	6000	0x00	off
4000	'0001.1111.0100.0000'	0x1F40	8000	0x00	off
5000	'0010.0111.0001.0000'	0x2710	10000	0x00	off
> 5000 Overrange [3]	'0010.0111.0001.0000'	0x2710	10000	0x42	on
> 5500 Wire break[2]	'0010.0111.0001.0000'	0x2710	10000	0x62	on

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.3.11 Potentiometer

With the setting "Potentiometer", the I/O module outputs the resistance ratio between the connections +R1/-R1 and -R1/-R3 or +R2/-R2 und -R2/-R4. Potentiometers of 1 kOhm to 5 kOhm can be used.
The set values are displayed at a resolution of 1 digit per 0.1% in one word (16-bit). The possible numeric range corresponds to the defined measurement range of 0% to 100%.

Table 69: Process image for 750-464, "Potentiometer" setting

Percent %	Numeric value			Status byte hex.	LED error AI 1, 2
	Binary	Hex.	Dec.		
0.0	'0000.0000.0000.0000'	0x0000	0	0x00	off
20.0	'0000.1111.1010.0000'	0x0FA0	4000	0x00	off
40.0	'0001.1111.0100.0000'	0x1F40	8000	0x00	off
60.0	'0010.1110.1110.0000'	0x2EE0	12000	0x00	off
80.0	'0011.1110.1000.0000'	0x3E80	16000	0x00	off
100.0	'0100.1110.0010.0000'	0x4E20	20000	0x00	off

Note

No error detection for the "Potentiometer" setting!
Detection of a wire break or short circuit is not possible depending on the model. An overrange or underrange is also not possible depending on the sensor. Accordingly, the status byte is always 0x00.

7.4 Process Data of the Standard Version 750-464 (RTD, configurable) Siemens Format

7.4.1 Pt100 (acc. IEC 751)

With the setting "Pt100 (acc. IEC 751)" and activated Siemens format, the I/O module converts the resistance measured values of Pt100 sensors (acc. IEC 751) and outputs them as temperature values. The temperature values are displayed at a resolution of 1 digit per 0.5 °C).
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 70: Process image for 750-464, Pt100 setting (acc. IEC 751)

Temperature °C	Resistance Ω	Numeric value [2] with status information [4]				Status byte hex.	LED error AI 1, 2
		Binary	XFÜ	Hex.	Dec.		
---	< 9.00	'1111.0011.1000.0	011'	0xF383	-3197	0x51	on
Short circuit [2]							
< -200.0	< 18.52	'1111.0011.1000.0	001'	0xF381	-3199	0x41	on
Underrange [3]							
-200.0	18.52	'1111.0011.1000.0	000'	0xF380	-3200	0x00	off
-100.0	60.256	'1111.1001.1100.0	000'	0xF9C0	-1600	0x00	off
0.0	100.000	'0000.0000.0000.0	000'	0x0000	0	0x00	off
100.0	138.506	'0000.0110.0100.0	000'	0x0640	1600	0x00	off
200.0	175.856	'0000.1100.1000.0	000'	0x0C80	3200	0x00	off
500.0	280.978	'0001.1111.0100.0	000'	0x1F40	8000	0x00	off
750.0	360.638	'0010.1110.1110.0	000'	0x2EE0	12000	0x00	off
800.0	375.704	'0011.0010.0000.0	000'	0x3200	12800	0x00	off
850.0	390.481	'0011.0101.0010.0	000'	0x3520	13600	0x00	off
> 850.0	> 390.481	'0011.0101.0010.0	001'	0x3521	13601	0x42	on
Overrange [3]							
---	> 5500.00	'0011.0101.0010.0	011'	0x3523	13603	0x62	on
Wire break [2]							

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.4.2 Pt200 (acc. IEC 751)

With the setting "Pt200 (acc. IEC 751)" and activated Siemens format, the I/O module converts the resistance measured values of Pt200 sensors (acc. IEC 751) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.5 °C).
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 71: Process image for 750-464, Pt200 setting (acc. IEC 751)

Temperature °C	Resistance Ω	Numeric value [1] with status information [4]				Status byte hex.	LED error AI 1, 2
		Binary	XFÜ	Hex.	Dec.		
---	< 9.00	'1111.0011.1000.0	011'	0xF383	-3197	0x51	on
Short circuit [2]							
< -200.0	< 37.04	'1111.0011.1000.0	001'	0xF381	-3199	0x41	on
Underrange [3]							
-200.0	37.04	'1111.0011.1000.0	000'	0xF380	-3200	0x00	off
-100.0	120.51	'1111.1001.1100.0	000'	0xF9C0	-1600	0x00	off
0.0	200.00	'0000.0000.0000.0	000'	0x0000	0	0x00	off
100.0	277.01	'0000.0011.1110.1	000'	0x0640	1600	0x00	off
200.0	351.71	'0000.1100.1000.0	000'	0x0C80	3200	0x00	off
500.0	561.96	'0001.1111.0100.0	000'	0x1F40	8000	0x00	off
750.0	721.28	'0010.1110.1110.0	000'	0x2EE0	12000	0x00	off
800.0	751.41	'0011.0010.0000.0	000'	0x3200	12800	0x00	off
850.0	780.96	'0011.0101.0010.0	000'	0x3520	13600	0x00	off
> 850.0	> 780.96	'0011.0101.0010.0	001'	0x3521	13601	0x42	on
Overrange [3]							
---	> 5500.00	'0011.0101.0010.0	011'	0x3523	13603	0x62	on
Wire break [2]							

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.4.3 Pt500 (acc. IEC 751)

With the setting "Pt500 (acc. IEC 751)" and activated Siemens format, the I/O module converts the resistance measured values of Pt500 sensors (acc. IEC 751) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.5 °C.
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 72: Process image for 750-464, Pt500 setting (acc. IEC 751)

Temperature °C	Resistance Ω	Numeric value [1] with status information [4]				Status byte hex.	LED error AI 1, 2
		Binary	XFÜ	Hex.	Dec.		
---	< 9.00	'1111.0011.1000.0	011'	0xF383	-3197	0x51	on
Short circuit [2]							
< -200.0	< 92.60	'1111.0011.1000.0	001'	0xF381	-3199	0x41	on
Underrange [3]							
-200.0	92.60	'1111.0011.1000.0	000'	0xF380	-3200	0x00	off
-100.0	301.28	'1111.1001.1100.0	000'	0xF9C0	-1600	0x00	off
0.0	500.00	'0000.0000.0000.0	000'	0x0000	0	0x00	off
100.0	692.53	'0000.0011.1110.1	000'	0x0640	1600	0x00	off
200.0	879.28	'0000.1100.1000.0	000'	0x0C80	3200	0x00	off
500.0	1404.89	'0001.1111.0100.0	000'	0x1F40	8000	0x00	off
750.0	1803.19	'0010.1110.1110.0	000'	0x2EE0	12000	0x00	off
800.0	1878.52	'0011.0010.0000.0	000'	0x3200	12800	0x00	off
850.0	1952.41	'0011.0101.0010.0	000'	0x3520	13600	0x00	off
> 850.0	> 1952.41	'0011.0101.0010.0	001'	0x3521	13601	0x42	on
Overrange [3]							
---	> 5500.00	'0011.0101.0010.0	011'	0x3523	13603	0x62	on
Wire break [2]							

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.4.4 Pt1000 (acc. IEC 751)

With the setting "Pt1000 (acc. IEC 751)" and activated Siemens format, the I/O module converts the resistance measured values of Pt1000 sensors (acc. IEC 751) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.5 °C.
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 73: Process image for 750-464, Pt1000 setting (acc. IEC 751)

Temperature °C	Resistance Ω	Numeric value [1] with status information [4]				Status byte hex.	LED error AI 1, 2
		Binary	XFÜ	Hex.	Dec.		
---	< 9.00	'1111.0011.1000.0	011'	0xF383	-3197	0x51	on
Short circuit [2]							
< -200.0	< 185.20	'1111.0011.1000.0	001'	0xF381	-3199	0x41	on
Underrange [3]							
-200.0	185.20	'1111.0011.1000.0	000'	0xF380	-3200	0x00	off
-100.0	602.56	'1111.1001.1100.0	000'	0xF9C0	-1600	0x00	off
0.0	1000.00	'0000.0000.0000.0	000'	0x0000	0	0x00	off
100.0	1385.06	'0000.0011.1110.1	000'	0x0640	1600	0x00	off
200.0	1758.56	'0000.0111.1101.0	000'	0x0C80	3200	0x00	off
500.0	2809.78	'0001.1111.0100.0	000'	0x1F40	8000	0x00	off
750.0	3606.38	'0010.1110.1110.0	000'	0x2EE0	12000	0x00	off
800.0	3757.04	'0011.0010.0000.0	000'	0x3200	12800	0x00	off
850.0	3904.81	'0011.0101.0010.0	000'	0x3520	13600	0x00	off
> 850.0	> 3904.81	'0011.0101.0010.0	001'	0x3521	13601	0x42	on
Overrange [3]							
---	> 5500.00	'0011.0101.0010.0	011'	0x3523	13603	0x62	on
Wire break [2]							

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.4.5 Ni100 (acc. DIN 43760)

With the setting "Ni100 (acc. DIN 43760)" and activated Siemens format, the I/O module converts the resistance measured values of Ni100 sensors (acc. DIN 43760) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.5 °C.
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 74: Process image for 750-464, Ni100 setting (acc. DIN 43760)

Temperature °C	Resistance Ω	Numeric value [1] with status information [4]				Status byte hex.	LED error AI 1, 2
		Binary	XFÜ	Hex.	Dec.		
---	< 9.00	'1111.1100.0100.0	011'	0xFC43	-957	0x51	on
Short circuit [2]							
< -60.0	< 69.52	'1111.1100.0100.0	001'	0xFC41	-959	0x41	on
Underrange [3]							
-60.0	69.52	'1111.1100.0100.0	000'	0xFC40	-960	0x00	off
-50.0	74.26	'1111.1100.1110.0	000'	0xFCE0	-800	0x00	off
0.0	100.00	'0000.0000.0000.0	000'	0x0000	0	0x00	off
50.0	129.11	'0000.0011.0010.0	000'	0x0320	800	0x00	off
100.0	161.78	'0000.0110.0100.0	000'	0x0640	1600	0x00	off
150.0	198.64	'0000.1001.0110.0	000'	0x0960	2400	0x00	off
200.0	240.66	'0000.1100.1000.0	000'	0x0C80	3200	0x00	off
250.0	289.16	'0000.1111.1010.0	000'	0x0FA0	4000	0x00	off
300.0	345.66	'0001.0010.1100.0	000'	0x12C0	4800	0x00	off
>300.0	> 345.66	'0001.0010.1100.0	001'	0x12C1	4801	0x42	on
Overrange [3]							
---	> 5500.00	'0001.0010.1100.0	011'	0x12C3	4803	0x62	on
Wire break [2]							

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.4.6 Ni120 (Minco)

With the setting "Ni120 (Minco)" and activated Siemens format, the I/O module converts the resistance measured values of Ni120 sensors (Minco) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.5 °C.
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 75: Process image for 750-464, Ni120 setting (Minco)

Temperature °C	Resistance Ω	Numeric value [1] with status information [4]				Status byte hex.	LED error AI 1, 2
		Binary	XFÜ	Hex.	Dec.		
---	< 9.00	'1111.1011.0000.0	011'	0xFB03	-1277	0x51	on
Short circuit [2]							
< -80.0	66.60	'1111.1011.0000.0	001'	0xFB01	-1279	0x41	on
Underrange [3]							
-80.0	66.60	'1111.1011.0000.0	000'	0xFB00	-1280	0x00	off
-50.0	86.16	'1111.1100.1110.0	100'	0xFCE0	-800	0x00	off
0.0	120.00	'0000.0000.0000.0	000'	0x0000	0	0x00	off
50.0	157.75	'0000.0011.0010.0	000'	0x0320	800	0x00	off
100.0	200.64	'0000.0110.0100.0	000'	0x0640	1600	0x00	off
150.0	248.95	'0000.1001.0110.0	000'	0x0960	2400	0x00	off
200.0	303.45	'0000.1100.1000.0	000'	0x0C80	3200	0x00	off
250.0	366.53	'0000.1111.1010.0	000'	0x0FA0	4000	0x00	off
260.0	380.31	'0001.0000.0100.0	000'	0x1040	4160	0x00	off
> 260.0	>380.31	'0001.0000.0100.0	001'	0x1041	4161	0x42	on
Overrange [3]							
---	> 5500.00	'0001.0000.0100.0	011'	0x1043	4163	0x62	on
Wire break [2]							

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.4.7 Ni1000 (acc. DIN 43760)

With the setting "Ni1000 (acc. DIN 43760)" and activated Siemens format, the I/O module converts the resistance measured values of Ni1000 sensors (acc. DIN 43760) and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.5 °C.
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 76: Process image for 750-464, Ni1000 setting (acc. DIN 43760)

Temperature °C	Resistance Ω	Numeric value [1] with status information [4]				Status byte hex.	LED error AI 1, 2
		Binary	XFÜ	Hex.	Dec.		
---	< 9.00	'1111.1100.0100.0	011'	0xFC43	-957	0x51	on
Short circuit [2]							
< -60.0	< 695.20	'1111.1100.0100.0	001'	0xFC41	-959	0x41	on
Underrange [3]							
-60.0	695.20	'1111.1100.0100.0	000'	0xFC40	-960	0x00	off
-50.0	742.55	'1111.1100.1110.0	000'	0xFCE0	-800	0x00	off
0.0	1000.00	'0000.0000.0000.0	000'	0x0000	0	0x00	off
50.0	1291.05	'0000.0011.0010.0	000'	0x0320	800	0x00	off
100.0	1617.79	'0000.1110.0100.0	000'	0x0640	1600	0x00	off
150.0	1986.35	'0000.1001.0110.0	000'	0x0960	2400	0x00	off
200.0	2406.60	'0000.1100.1000.0	000'	0x0C80	3200	0x00	off
250.0	2891.56	'0000.1111.1010.0	000'	0x0FA0	4000	0x00	off
300.0	3456.63	'0001.0010.1100.0	000'	0x12C0	4800	0x00	off
> 300.0	>3456.63	'0001.0010.1100.0	001'	0x12C1	4801	0x42	on
Overrange [3]							
---	> 5500.00	'0001.0010.1100.0	011'	0x12C3	4803	0x62	on
Wire break [2]							

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.4.8 Ni1000 TK5000

With the setting "Ni1000 TK5000" and activated Siemens format, the I/O module converts the resistance measured values of Ni1000 TK5000 sensors and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.5 °C.
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 77: Process image for 750-464, type Ni1000 TK5000 sensor setting

Temperature °C	Resistance Ω	Numeric value [1] with status information [4]				Status byte hex.	LED error AI 1, 2
		Binary	XFÜ	Hex.	Dec.		
---	< 9	'1111.1100.0100.0	011'	0x FC43	-957	0x51	on
Short circuit [2]							
< -60.0	< 751.79	'1111.1100.0100.0	001'	0x FC41	-959	0x41	on
Underrange [3]							
-60.0	751.79	'1111.1100.0100.0	000'	0xFC40	-960	0x00	off
-50.0	790.88	'1111.1100.1110.0	000'	0xFCE0	-800	0x00	off
0.0	1000.00	'0000.0000.0000.0	000'	0x0000	0	0x00	off
50.0	1234.98	'0000.0011.0010.0	000'	0x0320	800	0x00	off
100.0	1500.00	'0000.0110.0100.0	000'	0x0640	1600	0x00	off
150.0	1799.27	'0000.1001.0110.0	000'	0x0960	2400	0x00	off
200.0	2136.96	'0000.1100.1000.0	000'	0x0C80	3200	0x00	off
250.0	2517.27	'0000.1111.1010.0	000'	0x0FA0	4000	0x00	off
> 250.0	> 2517.27	'0000.1111.1010.0	001'	0x0FA1	4001	0x00	on
Overrange [3]							
---	> 5500	'0000.1111.1010.0	011'	0x0FA3	4003	0x00	on
Wire break [2]							

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.4.9 Resistance Measurement 10 Ohm to 1.2 kOhm

With the setting "Resistance measurement 10 Ohm to 1.2 kOhm" and activated Siemens format, the I/O module outputs the resistance measured values of the sensors directly.
The resistances values are displayed at a resolution of 1 digit per 0.5 Ω.
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 78: Process image for 750-464, setting 10 Ω ... 1.2 kΩ

Resistance Ω	Numeric value [1] with status information [4]				Status byte hex.	LED error AI 1, 2
	Binary	XFÜ	Hex.	Dec.		
< 9 Short circuit [2]	'0000.0000.1010.0	011'	0x00A3	163	0x51	on
< 10 Underrange [3]	'0000.0000.1010.0	001'	0x00A1	161	0x41	on
10	'0000.0000.1010.0	000'	0x00A0	160	0x00	off
100	'0000.0110.0100.0	000'	0x0640	1600	0x00	off
200	'0000.1100.1000.0	000'	0x0C80	3200	0x00	off
300	'0001.0010.1100.0	000'	0x12C0	4800	0x00	off
400	'0000.1111.1010.0	000'	0x1900	6400	0x00	off
500	'0001.1111.0100.0	000'	0x1F40	8000	0x00	off
750	'0010.1110.1110.0	000'	0x2EE0	12000	0x00	off
1000	'0011.1110.1000.0	000'	0x3E80	16000	0x00	off
1200	'0100.1011.0000.0	000'	0x4B00	19200	0x00	off
> 1200 Overrange [3]	'0100.1011.0000.0	001'	0x4B01	19201	0x42	on
> 5500 Wire break [2]	'0100.1011.0000.0	011'	0x4B03	19203	0x62	on

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.4.10 Resistance Measurement 10 Ohm to 5.0 kOhm

With the setting "Resistance measurement 10 Ohm to 5.0 kOhm" and activated Siemens format, the I/O module outputs the resistance measured values of the sensors directly.
The resistances values are displayed at a resolution of 1 digit per 4 Ω. The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 79: Process image for 750-464, setting 10 Ω ... 5 kΩ

Resistance Ω	Numeric value [1] with status information [4]				Status byte hex.	LED error AI 1, 2
	Binary	XFÜ	Hex.	Dec.		
< 9 Short circuit [2]	'0000.0000.0001.0	100'	0x0013	19	0x51	on
< 10 Underrange [3]	'0000.0000.0001.0	100'	0x0011	17	0x41	on
10	'0000.0000.0001.0	100'	0x0010	16	0x00	off
100	'0000.0000.1100.1	000'	0x00C8	200	0x00	off
200	'0000.0001.1001.0	000'	0x0190	400	0x00	off
300	'0000.0010.0101.1	000'	0x0258	600	0x00	off
1000	'0000.0111.1101.0	000'	0x07D0	2000	0x00	off
2000	'0000.1111.1010.0	000'	0x0FA0	4000	0x00	off
3000	'0001.0111.0111.0	000'	0x1770	6000	0x00	off
4000	'0001.1111.0100.0	000'	0x1F40	8000	0x00	off
5000	'0010.0111.0001.0	000'	0x2710	10000	0x00	off
> 5000 Overrange [3]	'0010.0111.0001.0	000'	0x2711	10001	0x42	on
> 5500 Wire break[2]	'0010.0111.0001.0	000'	0x2713	10003	0x62	on

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.4.11 Potentiometer

Note

No error detection for the "Potentiometer" setting!
Detection of a wire break or short circuit is not possible depending on the model. An overrange or underrange is also not possible depending on the sensor. Accordingly, the status byte is always 0x00. Therefore, this sensor type is not recommended because the only effect would be a change in the resolution.

7.5 Data of the Version 750-464/020-000 (NTC, configurable)

7.5.1 NTC 10 kOhm

With the setting "NTC 10 kOhm", the I/O module converts the resistance measured values of NTC 10kOhm resistance sensors and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).
The possible numeric range corresponds to the defined temperature range of the sensors from -50 °C to +150 °C.

Table 80: Process image for 750-464/020-000, NTC 10 kOhm setting

Temperature °C	Resistance kΩ	Numeric value [1]			Status byte hex.	LED error AI 1, 2
		Binary	Hex.	Dec.		
< -50.0	>1144.48	'1110.1100.0111.1000'	0xFE0C	-500	0x41	on
Underrange [3]						
-50.0	1144.48	'1110.1100.0111.1000'	0xFE0C	-500	0x00	off
0.0	36.35	'0000.0000.0000.0000'	0x0000	0	0x00	off
25.0	10.00	'0000.0000.1111.1010'	0x00FA	250	0x00	off
50.0	3.36	'0000.0011.0010.0000'	0x01F4	500	0x00	off
100.0	0.59	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
150.0	0.155	'0000.0101.1101.1100'	0x05DC	1500	0x51	off
> 150.0	< 0.155	'0000.0101.1101.1100'	0x05DC	1500	0x42	on
Overrange [3]						
---	< 0.009	'0000.0101.1101.1100'	0x05DC	1500	0x52	on
Short circuit [2]						

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.5.2 NTC 20 kOhm

With the setting "NTC 20 kOhm", the I/O module converts the resistance measured values of NTC 20kOhm resistance sensors and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).
The possible numeric range corresponds to the defined temperature range of -50 °C to +150 °C.

Table 81: Process image for 750-464/020-000, NTC 20 kOhm setting

Temperature °C	Resistance kΩ	Numeric value [1]			Status byte hex.	LED error AI 1, 2
		Binary	Hex.	Dec.		
< -50.0	> 2288.96	'1110.1100.0111.1000'	0xFE0C	-500	0x41	on
Underrange [3]						
-50.0	2288.96	'1110.1100.0111.1000'	0xFE0C	-500	0x00	off
0.0	72.70	'0000.0000.0000.0000'	0x0000	0	0x00	off
25.0	20.00	'0000.0000.1111.1010'	0x00FA	250	0x00	off
50.0	6.72	'0000.0001.1111.0100'	0x01F4	500	0x00	off
100.0	1.18	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
150.0	0.305	'0000.0101.1101.1100'	0x05DC	1500	0x00	off
> 150.0	< 0.305	'0000.0101.1101.1100'	0x05DC	1500	0x42	on
Overrange [3]						
---	<0.009	'0000.0101.1101.1100'	0x05DC	1500	0x52	on
Short circuit [2]						

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.5.3 NTC 10 kOhm Thermokon

With the setting "NTC 10 kOhm Thermokon", the I/O module converts the resistance measured values of NTC 10 kOhm Thermokon resistance sensors and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.1 °C in one word (16-bit). Temperature values below 0 °C are represented in two's complement binary. As a result, 0 °C corresponds to the numeric value 0x0000 and 100 °C to the numeric value 0x03E8 (dec. 1000).
The possible numeric range corresponds to the defined temperature range of -40 °C to +150 °C.

Table 82: Process image for 750-464/020-000, NTC 10 kOhm Thermokon setting

Temperature °C	Resistance kΩ	Numeric value [1]			Status byte hex.	LED error AI 1, 2
		Binary	Hex.	Dec.		
< -40.0	> 426.50	'1111.1110.0111.0000'	0xFE70	-400	0x41	on
Underrange [3]						
-40.0	> 426.50	'1111.1110.0111.0000'	0xFE70	-400	0x41	on
-30.0	210.08	'1111.1110.1101.0100'	0xFED4	-300	0x00	off
0.0	34.28	'0000.0000.0000.0000'	0x0000	0	0x00	off
25.0	10.00	'0000.0000.1111.1010'	0x00FA	250	0x00	off
50.0	3.53	'0000.0001.1111.0100'	0x01F4	500	0x00	off
100.0	0.67	'0000.0011.1110.1000'	0x03E8	1000	0x00	off
150.0	0.185	'0000.0101.1101.1100'	0x05DC	1500	0x00	off
> 150.0	< 0.185	'0000.0101.1101.1100'	0x05DC	1500	0x42	on
Overrange [3]						
---	<0.009	'0000.0101.1101.1100'	0x05DC	1500	0x52	on
Short circuit [2]						

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")

7.6 Data of the Version 750-464/020-000 (NTC, configurable) Siemens Format

7.6.1 NTC 10 kOhm

With the setting "NTC 10 kOhm" and activated Siemens format, the I/O module converts the resistance measured values of NTC10 kOhm resistance sensors and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.5 °C.
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 83: Process image for 750-464/020-000, NTC 10 kOhm setting

Temperature °C	Resistance kΩ	Numeric value [1] with status information [4]				Status-byte Hex.	LED error AI 1, 2
		Binary	XFÜ	Hex.	Dec.		
< -50.0	>1144.48	'1111.1100.1110.0	001'	0xFCE1	-799	0x41	ein
Underrange[3]							
-50.0	1144.48	'1111.1100.1110.0	000'	0xFCE0	-800	0x00	aus
0.0	36.35	'0000.0000.0000.0	000'	0x0000	0	0x00	aus
25.0	10.00	'0000.0001.1001.0	000'	0x0190	400	0x00	aus
50.0	3.36	'0000.0011.0010.0	000'	0x0320	800	0x00	aus
100.0	0.59	'0000.0110.0100.0	000'	0x0640	1600	0x00	aus
150.0	0.155	'0000.1001.0110.0	000'	0x0960	2400	0x00	aus
> 150.0	< 0.155	'0000.1001.0110.0	001'	0x0961	2401	0x42	ein
Overrange[3]							
---	< 0.009	'0000.1001.0110.0	011'	0x0963	2403	0x52	ein
Short circuit[2]							

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.6.2 NTC 20 kOhm

With the setting "NTC 20 kOhm" and activated Siemens format, the I/O module converts the resistance measured values of NTC20 kOhm resistance sensors and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.5 °C.
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 84: Process image for 750-464/020-000, NTC 20 kOhm setting

Temperature °C	Resistance kΩ	Numeric value [1] with status information [4]				Status-byte Hex.	LED error AI 1, 2
		Binary	XFÜ	Hex.	Dec.		
< -50.0	> 2288.96	'1111.1100.1110.0	001'	0xFCE1	-799	0x41	on
Underrange[3]							
-50.0	2288.96	'1111.1100.1110.0	000'	0xFCE0	-800	0x00	off
0.0	70.20	'0000.0000.0000.0	000'	0x0000	0	0x00	off
25.0	20.00	'0000.0001.1001.0	000'	0x0190	400	0x00	off
50.0	6.72	'0000.0011.0010.0	000'	0x0320	800	0x00	off
100.0	1.18	'0000.0110.0100.0	000'	0x0640	1600	0x00	off
150.0	0.305	'0000.1001.0110.0	000'	0x0960	2400	0x00	off
> 150.0	< 0.305	'0000.1001.0110.0	001'	0x0961	2401	0x42	on
Overrange[3]							
---	<0.009	'0000.1001.0110.0	011'	0x0963	2403	0x52	on
Short circuit[2]							

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

7.6.3 NTC 10 kOhm Thermokon

With the setting "NTC 10 kOhm Thermokon" and activated Siemens format, the I/O module converts the resistance measured values of NTC 10 kOhm Thermokon resistance sensors and outputs them as temperature values.
The temperature values are displayed at a resolution of 1 digit per 0.5 °C.
The status information is depicted in bit 0 to bit 2 and the digitalized measured value in bit 3 to bit 15.

Table 85: Process image for 750-464/020-000, NTC 10 kOhm Thermokon setting

Temperature °C	Resistance kΩ	Numeric value [1] with status information [4]				Status-byte Hex.	LED error AI 1, 2
		Binary	XFÜ	Hex.	Dec.		
< -40.0	>426.48	'1111.1101.1000.0	001'	0xFD81	-639	0x41	on
Underrange[3]							
-40.0	426,48	'1111.1101.1000.0	000'	0xFD80	-640	0x00	off
-30.0	210,08	'1111 1110 0010 0	000'	0xFE20	-480	0x00	off
0.0	34,28	'0000.0000.0000.0	000'	0x0000	0	0x00	off
25.0	10,00	'0000.0001.1001.0	000'	0x0190	400	0x00	off
50.0	3,53	'0000.0011.0010.0	000'	0x0320	800	0x00	off
100.0	0,67	'0000.0110.0100.0	000'	0x0640	1600	0x00	off
150.0	0,185	'0000.1001.0110.0	000'	0x0960	2400	0x00	off
> 150.0	0,185	'0000.1001.0110.0	001'	0x0961	2401	0x42	on
Overrange[3]							
---	< 0.009	'0000.1001.0110.0	011'	0x0963	2403	0x52	on
Short circuit[2]							

1) Temperature values below 0 °C are represented in two's complement binary.
2) When short circuit and wire break monitoring is ON (see section "Behavior in the Event of an Error")
3) When underrange / overrange limit is ON (see section "Behavior in the Event of an Error")
4) Status information: X: Not used, F: Short circuit, wire break, Ü: Overrange

8 Diagnostics

8.1 Behavior in the Event of an Error

The behavior in the event of an error depends on the configuration of the wire break/short circuit monitoring and the underrange/overrange monitoring.

Table 86: Behavior in the event of an error dependent on the configuration

Configuration		Behavior for range violation	Behavior for wire break/ short circuit
Wire break/ short circuit monitoring	**Underrange/ overrange monitoring**		
Off	Off	Process value is saturated, no change in statues byte, error LED on	Process value is saturated, no change in statues byte, error LED on
Off	On	Process value is saturated, error bit (bit 0: Underrange or bit 1: Overrange), Gen. error (bit 6) is set, error LED on	Process value is saturated, error bit (bit 0: Underrange for short circuit or bit 1: Overrange for wire break), Gen. error (bit 6) is set, error LED on
On	Off	Process value is saturated, no change in statues byte, error LED on	Process value is saturated, error bit (bit 4 for short circuit or bit 5 for wire break) is set, Gen. error (bit 6) is set, error LED on
On	On	Process value is saturated, error bit (bit 0: Underrange or bit 1: Overrange), Gen. error (bit 6) is set, error LED on	Process value is saturated, error bits (bit 0 and bit 4 for short circuit or bit 1 and bit 5 for wire break) is set, Gen. error (bit 6) is set, error LED on

The limits for detecting an underrange/overrange or a short circuit or wire break and the output process values are specified in the process image tables.

9 Use in Hazardous Environments

The **WAGO-I/O-SYSTEM 750** (electrical equipment) is designed for use in Zone 2 hazardous areas.

The following sections include both the general identification of components (devices) and the installation regulations to be observed. The individual subsections of the "Installation Regulations" section must be taken into account if the I/O module has the required approval or is subject to the range of application of the ATEX directive.

9.1 Marking Configuration Examples

9.1.1 Marking for Europe according to ATEX and IEC-Ex

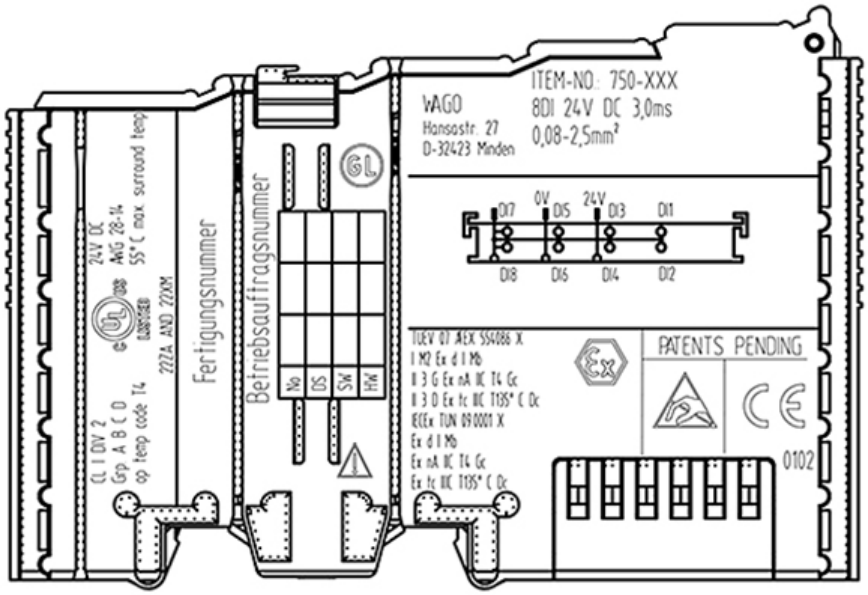


Figure 24: Side marking example for approved I/O modules according to ATEX and IECEx

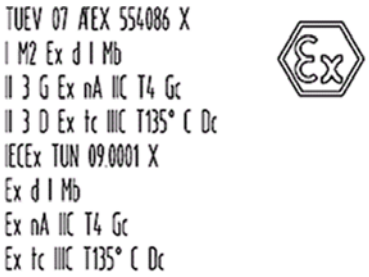


Figure 25: Printing Text detail – Marking example for approved I/O modules according to ATEX and IECEx.

Table 87: Description of marking example for approved I/O modules according to ATEX and IECEx

Printing on Text	Description
TÜV 07 ATEX 554086 X IECEx TUN 09.0001 X	Approving authority and certificate numbers
Dust	
II	Equipment group: All except mining
3D	Category 3 (Zone 22)
Ex	Explosion protection mark
tc Dc	Type of protection and equipment protection level (EPL):protection by enclosure
IIIC	Explosion group of dust
T 135°C	Max. surface temperature of the enclosure (without a dust layer)
Mining	
I	Equipment group: Mining
M2	Category: High level of protection
Ex	Explosion protection mark
d Mb	Type of protection and equipment protection level (EPL): Flameproof enclosure
I	Explosion group for electrical equipment for mines susceptible to firedamp
Gases	
II	Equipment group: All except mining
3G	Category 3 (Zone 2)
Ex	Explosion protection mark
nA Gc	Type of protection and equipment protection level (EPL): Non-sparking equipment
nC Gc	Type of protection and equipment protection level (EPL): Sparking apparatus with protected contacts. A device which is so constructed that the external atmosphere cannot gain access to the interior
IIC	Explosion group of gas and vapours
T4	Temperature class: Max. surface temperature 135°C

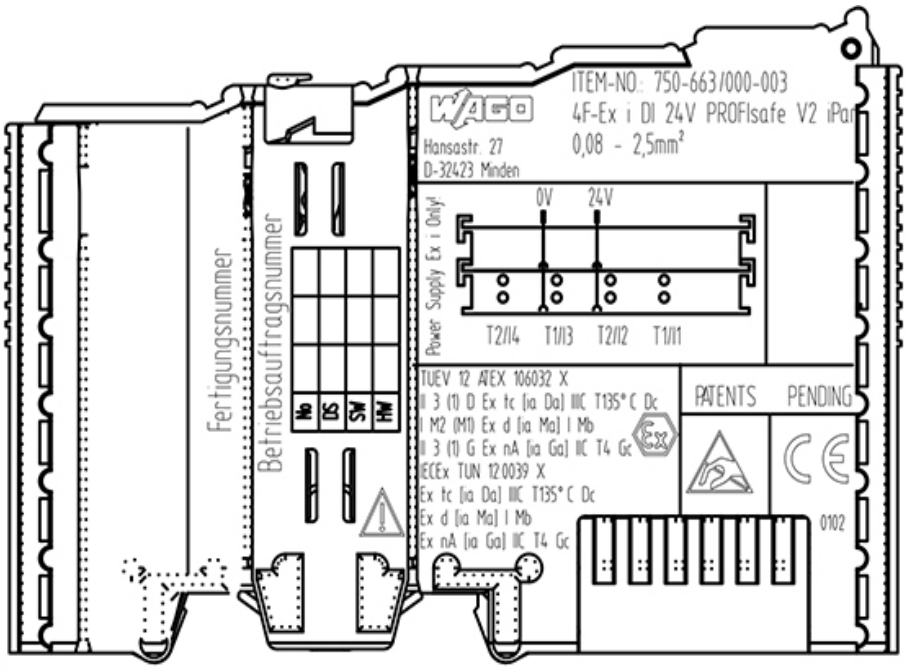


Figure 26: Side marking example for approved Ex i I/O modules according to ATEX and IECEx.

TUEV 12 ATEX 106032 X
II 3 (1) D Ex tc [ia Da] IIIC T135° C Dc
I M2 (M1) Ex d [ia Ma] I Mb
II 3 (1) G Ex nA [ia Ga] IIC T4 Gc
IECEx TUN 12.0039 X
Ex tc [ia Da] IIIC T135° C Dc
Ex d [ia Ma] I Mb
Ex nA [ia Ga] IIC T4 Gc

Figure 27: Text detail – Marking example for approved Ex i I/O modules according to ATEX and IECEx.

Table 88: Description of marking example for approved Ex i I/O modules according to ATEX and IECEx

Inscription text	Description
TÜV 07 ATEX 554086 X IECEx TUN 09.0001X TÜV 12 ATEX 106032 X IECEx TUN 12.0039 X	Approving authority and certificate numbers
Dust	
II	Equipment group: All except mining
3(1)D	Category 3 (Zone 22) equipment containing a safety device for a category 1 (Zone 20) equipment
3(2)D	Category 3 (Zone 22) equipment containing a safety device for a category 2 (Zone 21) equipment
Ex	Explosion protection mark
tc Dc	Type of protection and equipment protection level (EPL): protection by enclosure
[ia Da]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 20
[ib Db]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 21
IIIC	Explosion group of dust
T 135°C	Max. surface temperature of the enclosure (without a dust layer)
Mining	
I	Equipment Group: Mining
M2 (M1)	Category: High level of protection with electrical circuits which present a very high level of protection
Ex d Mb	Explosion protection mark with Type of protection and equipment protection level (EPL): Flameproof enclosure
[ia Ma]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety electrical circuits
I	Explosion group for electrical equipment for mines susceptible to firedamp

Table 88: Description of marking example for approved Ex i I/O modules according to ATEX and IECEx

Gases	
II	Equipment group: All except mining
3(1)G	Category 3 (Zone 2) equipment containing a safety device for a category 1 (Zone 0) equipment
3(2)G	Category 3 (Zone 2) equipment containing a safety device for a category 2 (Zone 1) equipment
Ex	Explosion protection mark
nA Gc	Type of protection and equipment protection level (EPL): Non-sparking equipment
[ia Ga]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 0
[ia Gb]	Type of protection and equipment protection level (EPL): associated apparatus with intrinsic safety circuits for use in Zone 1
IIC	Explosion group of gas and vapours
T4	Temperature class: Max. surface temperature 135°C

9.1.2 Marking for America according to NEC 500

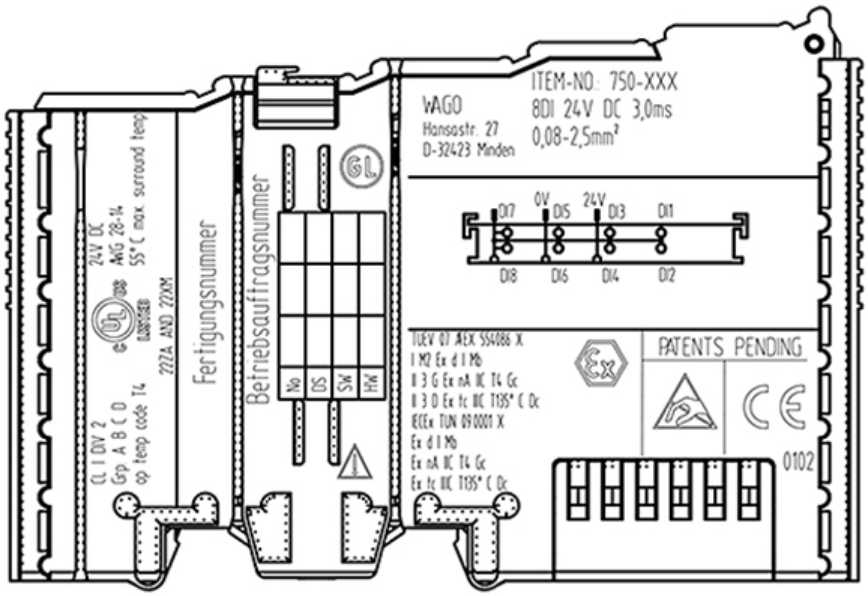


Figure 28: Side marking example for I/O modules according to NEC 500

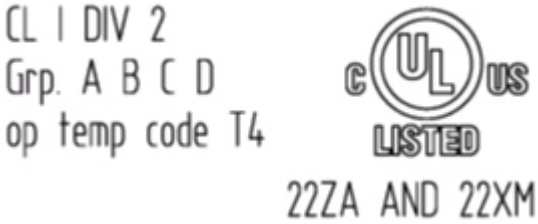


Figure 29: Text detail – Marking example for approved I/O modules according to NEC 500

Table 89: Description of marking example for approved I/O modules according to NEC 500

Printing on Text	Description
CL I	Explosion protection group (condition of use category)
DIV 2	Area of application
Grp. ABCD	Explosion group (gas group)
Op temp code T4	Temperature class

9.2 Installation Regulations

For the installation and operation of electrical equipment in hazardous areas, the valid national and international rules and regulations which are applicable at the installation location must be carefully followed.

9.2.1 Special conditions for safe use (ATEX Certificate TÜV 07 ATEX 554086 X)

1. For use as Gc- or Dc-apparatus (in zone 2 or 22) the Field bus Independent I/O Modules WAGO-I/O-SYSTEM 750-*** shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) EN 60079-0, EN 60079-11, EN 60079-15 and EN 60079-31.
   For use as group I electrical apparatus M2 the apparatus shall be erected in an enclosure that ensures a sufficient protection according to EN 60079-0 and EN 60079-1 and the degree of protection IP64.
   The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExNB.
2. Measures have to be taken outside of the device that the rating voltage is not being exceeded of more than 40 % because of transient disturbances.
3. Dip-switches, binary-switches and potentiometers, connected to the module may only be actuated when explosive atmosphere can be excluded.
4. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes. The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded.
   This is although and in particular valid for the interfaces “Memory-Card”, “USB”, “Fieldbus connection”, “Configuration and programming interface”, “antenna socket”, “D-Sub”, “DVI-port” and the “Ethernet interface”. These interfaces are not energy limited or intrinsically safe circuits. An operating of those circuits is in the behalf of the operator.
5. For the types 750-606, 750-625/000-001, 750-487/003-000, 750-484, 750-633 the following shall be considered: The Interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in EN 60664-1.
6. For replaceable fuses the following shall be considered: Do not remove or replace the fuse when the apparatus is energized.
7. The following warnings shall be placed nearby the unit:
   WARNING – DO NOT REMOVE OR REPLACE FUSE WHEN ENERGIZED
   WARNING – DO NOT SEPARATE WHEN ENERGIZED
   WARNING – SEPARATE ONLY IN A NON-HAZARDOUS AREA

9.2.2 Special conditions for safe use (ATEX Certificate TÜV 12 ATEX 106032 X)

1. For use as Gc- or Dc-apparatus (in zone 2 or 22) the Field bus Independent I/O Modules WAGO-I/O-SYSTEM 750-*** Ex i shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) EN 60079-0, EN 60079-11, EN 60079-15 and EN 60079-31.
   For use as group I electrical apparatus M2 the apparatus shall be erected in an enclosure that ensures a sufficient protection according to EN 60079-0 and EN 60079-1 and the degree of protection IP64.
   The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExNB.
2. Measures have to be taken outside of the device that the rating voltage is not being exceeded of more than 40 % because of transient disturbances.
3. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes. The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded.
4. For the type 750-633/000-003 the following shall be considered: The Interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in EN 60664-1.

9.2.3 Special conditions for safe use (IEC-Ex Certificate TUN 09.0001 X)

1. For use as Gc- or Dc-apparatus (in zone 2 or 22) the Field bus Independent I/O Modules WAGO-I/O-SYSTEM 750-*** shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) IEC 60079-0, IEC 60079-11, IEC 60079-15 and IEC 60079-31.
   For use as group I electrical apparatus M2 the apparatus shall be erected in an enclosure that ensures a sufficient protection according to IEC 60079-0 and IEC 60079-1 and the degree of protection IP64.
   The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExCB.
2. Measures have to be taken outside of the device that the rating voltage is not being exceeded of more than 40 % because of transient disturbances.
3. DIP-switches, binary-switches and potentiometers, connected to the module may only be actuated when explosive atmosphere can be excluded.
4. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes. The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded.
   This is although and in particular valid for the interfaces “Memory-Card”, “USB”, “Fieldbus connection”, “Configuration and programming interface”, “antenna socket”, “D-Sub”, “DVI-port” and the “Ethernet interface”. These interfaces are not energy limited or intrinsically safe circuits. An operating of those circuits is in the behalf of the operator.
5. For the types 750-606, 750-625/000-001, 750-487/003-000, 750-484, 750-633 the following shall be considered: The Interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in IEC 60664-1.
6. For replaceable fuses the following shall be considered: Do not remove or replace the fuse when the apparatus is energized.
7. The following warnings shall be placed nearby the unit:
   WARNING – DO NOT REMOVE OR REPLACE FUSE WHEN ENERGIZED
   WARNING – DO NOT SEPARATE WHEN ENERGIZED
   WARNING – SEPARATE ONLY IN A NON-HAZARDOUS AREA

9.2.4 Special conditions for safe use (IEC-Ex Certificate IECEx TUN 12.0039 X)

1. For use as Gc- or Dc-apparatus (in zone 2 or 22) the Field bus independent I/O Modules WAGO-I/O-SYSTEM 750-*** Ex i shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) IEC 60079-0, IEC 60079-11, IEC 60079-15, IEC 60079-31.
   For use as group I electrical apparatus M2 the apparatus shall be erected in an enclosure that ensures a sufficient protection according to IEC 60079-0 and IEC 60079-1 and the degree of protection IP64.
   The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExCB.
2. Measures have to be taken outside of the device that the rating voltage is not being exceeded of more than 40 % because of transient disturbances.
3. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes. The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded.
4. For the type 750-633/000-003 the following shall be considered: The Interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in IEC 60664-1.

9.2.5 ANSI/ISA 12.12.01

A. This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.
B. This equipment is to be fitted within tool-secured enclosures only.
C. WARNING Explosion hazard - substitution of components may impair suitability for Class I, Div. 2.
D. “WARNING – Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous” has to be placed near each operator accessible connector and fuse holder.
E. When a fuse is provided, the following information shall be provided: “A switch suitable for the location where the equipment is installed shall be provided to remove the power from the fuse.”
F. For devices with Ether CAT/Ethernet connectors “Only for use in LAN, not for connection to telecommunication circuits”.
G. WARNING - Use Module 750-642 only with antenna module 758-910.
H. For Couplers/Controllers and Economy bus modules only: “The configuration interface Service connector is for temporary connection only. Do not connect or disconnect unless the area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion.”
I. Modules containing fuses only: “WARNING - Devices containing fuses must not be fitted into circuits subject to over loads, e.g. motor circuits”
K. Modules containing SD card reader sockets only: “WARNING - Do not connect or disconnect SD-Card while circuit is live unless the area is known to be free of ignitable concentrations of flammable gases or vapors.”

Information

Additional Information

Proof of certification is available on request. Also take note of the information given on the module technical information sheet. The Instruction Manual, containing these special conditions for safe use, must be readily available to the user.

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