

WAGO → I/O → SYSTEM 750

**Fieldbus Independent
I/O Modules**

**Incremental Encoder Interface
750-634**



Manual

Version 1.0.5

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

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

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1 Important 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.

1.1 Legal Bases

1.1.1 Copyright

This Manual, including all figures and illustrations, is copyright-protected. Any further use of this Manual by third parties that violate pertinent copyright provisions is prohibited. Reproduction, translation, electronic and phototechnical filing/archiving (e.g., photocopying) as well as any amendments require the written consent of WAGO Kontakttechnik GmbH & Co. KG, Minden, Germany. Non-observance will involve the right to assert damage claims.

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1.1.2 Personnel Qualifications

The use of the product described in this Manual requires special personnel qualifications, as shown in the following table:

Activity	Electrical specialist	Instructed personnel*)	Specialists**) having qualifications in PLC programming
Assembly	X	X	
Commissioning	X		X
Programming			X
Maintenance	X	X	
Troubleshooting	X		
Disassembly	X	X	

*) Instructed persons have been trained by qualified personnel or electrical specialists.

**) A specialist is a person, who – thanks to technical training – has the qualification, knowledge and expertise to meet the required specifications of this work and to identify any potential hazardous situation in the above listed fields of activity.

All responsible persons have to familiarize themselves with the underlying legal standards to be applied. WAGO Kontakttechnik GmbH & Co. KG does not assume any liability whatsoever resulting from improper handling and damage incurred to both WAGO's own and third-party products by disregarding detailed information in this Manual.

1.1.3 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.

1.1.4 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. Changes in hardware, software and firmware are permitted exclusively within the framework of the various alternatives that are documented in the specific manuals. 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.

1.2 Standards and Guidelines for Operating the 750 Series

Please adhere to the standards and guidelines required for the use of your system:

- The data and power lines shall be connected and installed in compliance with the standards required to avoid failures on your system and to substantially minimize any imminently hazardous situations resulting in personal injury.
- For assembly, start-up, maintenance and troubleshooting, adhere to the specific accident prevention provisions which apply to your system (e.g. BGV A 3, "Electrical Installations and Equipment").
- Emergency stop functions and equipment shall not be made ineffective. See relevant standards (e.g. DIN EN 418).
- The equipment of your system shall conform to EMC guidelines so that any electromagnetic interferences will be eliminated.
- Operating 750 Series components in home applications without further measures is permitted only if they meet the emission limits (emissions of interference) in compliance with EN 61000-6-3. You will find the detailed information in section "WAGO-I/O-SYSTEM 750" → "System Description" → "Technical Data".
- Please observe the safety precautions against electrostatic discharge in accordance with DIN EN 61340-5-1/-3. When handling the modules, please ensure that environmental factors (persons, working place and packaging) are well grounded.
- The valid standards and guidelines applicable for the installation of switch cabinets shall be adhered to.

1.3 Symbols



Danger

Always observe this information to protect persons from injury.



Warning

Always observe this information to prevent damage to the device.



Attention

Marginal conditions that must always be observed to ensure smooth and efficient operation.



ESD (Electrostatic Discharge)

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



Note

Make important notes that are to be complied with so that a trouble-free and efficient device operation can be guaranteed.



Additional Information

References to additional literature, manuals, data sheets and internet pages.

1.4 Safety Information

When connecting the device to your installation and during operation, the following safety notes must be observed:



Danger

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



Danger

All power sources to the device must always be switched off before carrying out any installation, repair or maintenance work.



Warning

Replace defective or damaged device/module (e.g. in the event of deformed contacts), as the functionality of field bus station in question can no longer be ensured on a long-term basis.



Warning

The components are not resistant against materials having seeping and insulating properties. Belonging to this group of materials is: e.g. aerosols, silicones, triglycerides (found in some hand creams). If it cannot be ruled out that these materials appear in the component environment, then the components must be installed in an enclosure that is resistant against the above mentioned materials. Clean tools and materials are generally required to operate the device/module.



Warning

Soiled contacts must be cleaned using oil-free compressed air or with ethyl alcohol and leather cloths.



Warning

Do not use contact sprays, which could possibly impair the functioning of the contact area.



Warning

Avoid reverse polarity of data and power lines, as this may damage the devices.



ESD (Electrostatic Discharge)

The devices are equipped with electronic components that may be destroyed by electrostatic discharge when touched.



Warning

For components with ETHERNET/RJ-45 connectors:
Only for use in LAN, not for connection to telecommunication circuits.

1.5 Font Conventions

- italic* Names of paths and data files are marked in italic-type.
e.g.: *C:\Programs\WAGO-IO-CHECK*
- italic** Menu items are marked in italic-type, bold letters.
e.g.: ***Save***
- \ A backslash between two names characterizes the selection of a menu point from a menu.
e.g.: ***File \ New***
- END** Pushbuttons are marked as bold with small capitals
e.g.: **ENTER**
- <>** Keys are marked bold within angle brackets
e.g.: **<F5>**
- Courier** The print font for program codes is Courier.
e.g.: **END_VAR**

1.6 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 (.)

1.7 Scope

This manual describes the Module 750-634 Incremental Encoder Interface of the modular WAGO-I/O-SYSTEM 750.

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

2 I/O Modules

2.1 Special Modules

2.1.1 750-634 [Incremental Encoder Interface]

Incremental Encoder Interface

2.1.1.1 View

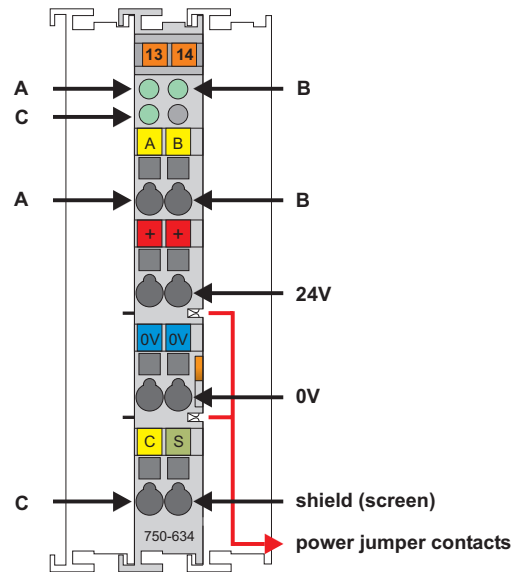


Fig. 2.1.1-1: View

g063400e

2.1.1.2 Description

The I/O module is an interface for the direct connection of any 24 V incremental encoders. A 16-bit counter with quadrature decoder and a 16-bit latch for the zero pulse can be read, set or activated. The counter status is transferred rapidly and is not susceptible to faults to a PC, a PLC or a CNC via the fieldbus.

A period measurement with a resolution of 200 ns is possible.

Sensors may be connected using the inputs A, B and C and the supply connections 24 V and 0 V and shield (screen).

The shield is directly connected to the carrier rail.

Input	Function
A, B,	Quadrature input, DC 24 V Increment pulse signal channel A or B of the Incremental Encoder
C	Zero reference input, DC 24 V
Screen (Shield)	Connection for the encoder line screen The shield is directly connected to the carrier rail.
+24V	24 V supply voltage for the module
0V	Ground for the 24 V supply voltage

Individual green status LEDs indicate the signal status of the A, B and C inputs.

Field and system level are electrically isolated.

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

The field side supply voltage of 24 V and 0 V for the electronic of the sensors and for the evaluation is derived from adjacent I/O modules or from a supply module. The supply voltage for the field side is made automatically through the individual I/O modules by means of power jumper contacts.



Attention

This module has no power contacts for ground (earth). For field supply with ground (earth) to downstream I/O modules, a supply module will be needed.



Warning

The maximum current of the internal power jumper contacts is 10 A. When configuring the system it is important not to exceed the maximum/sum current. However, if such a case should occur, another supply module must be added.

The module 750-634 can be used with all couplers/controllers of the WAGO-I/O-SYSTEM 750 (except for the economy types 750-320, -323, -324 and -327).

2.1.1.3 Display Elements

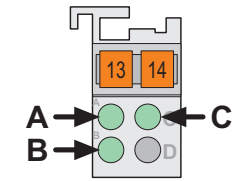


Fig. 2.1.1-2: Display Elements g063402x

LED	Denotation	State	Function
A	Quadrature Input	green	is equivalent to $U > 15\text{ V}$
		off	is equivalent to $U < 5\text{ V}$
B	Quadrature Input	green	is equivalent to $U > 15\text{ V}$
		off	is equivalent to $U < 5\text{ V}$
C	Zero reference Input	green	is equivalent to $U > 15\text{ V}$
		off	is equivalent to $U < 5\text{ V}$

2.1.1.4 Schematic Diagram

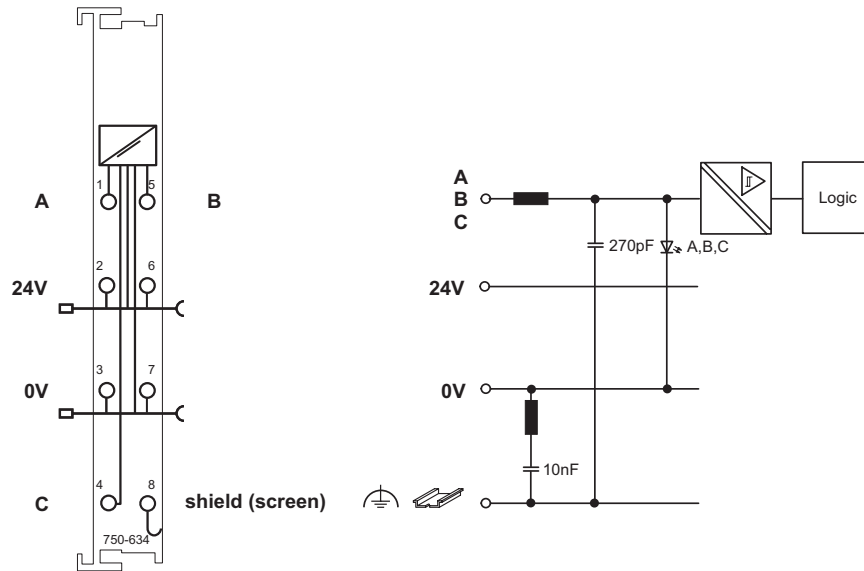



Fig. 2.1.1-3: Schematic Diagram

g063401e

2.1.1.5 Technical Data

Module Specific Data	
Sensor connection	A, B, C
Sensor operation voltage	DC 24 V
Signal voltage A, B, C	(1) $U > 15 \text{ V}$ (0) $U < 5 \text{ V}$
Counter	16 Bit binary
Cut off frequency	1 MHz
Quadrature decoder	4- fold report
Zero impulse latch	16 bits
Commands	read, set, enable
Voltage supply	DC 24 V (- 15 % ... + 20 %)
Current consumption _{max} (internal)	50 mA
Current consumption _{max} (field side)	0 mA (without sensor load)
Isolation	500 V (system/supply)
Bit width	2 x 16 bits data 1 x 8 bits Control/Status 1 x 8 bits reserved
Dimensions (mm) W x H x L	12 x 64* x 100 *from upper edge of DIN 35 rail
Weight	ca. 60 g
Standards and Regulations (cf Chapter 2.2 of the Coupler/Controller Manual)	
EMC-Immunity of interference	acc. to EN 61000-6-2: 2005
EMV-Emission of interference	acc. to EN 61000-6-4: 2007
Approvals (cf Chapter 2.2 of the Coupler/Controller Manual)	
	Conformity Marking

**More Information**

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

2.1.1.6 Functional Description

Typically, incremental encoders supply two output signals for the encoder track, both 90° offset. These signals are designated A and B.

Usually, incremental encoders have an index track in addition to the two track signals. This index track only produces one pulse per one full encoder revolution. This pulse and the counter reading can be used to determine the absolute encoder position during rotation. The index pulse has a duration of a track position pulse. We recommend to always perform the latch process in the same rotational direction.

2.1.1.7 Process Image

Using the I/O module 750-634, a 5 byte input and output process image can be transferred to the fieldbus coupler / controller via one logical channel. The data sent and received is stored in 2 output bytes (D0, D1) and 5 input bytes (D0, D1, D2, D3, D4). The output bytes D2 ... D4 are reserved and without function. One control byte (C) and one status byte (S) are used to control the data flow.



Attention

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

Input Data		Output Data	
S	Status byte	C	Control byte
D0	Counter value byte 0 (LSB)	D0	Counter set value byte 0 (LSB)
D1	Counter value byte 1 (MSB)	D1	Counter set value byte 1 (MSB)
D2	Signal A, B and C / Cycle duration byte 2 (MSB)	D2	reserved
D3	Latch value byte 0 (LSB) / Cycle duration byte 0 (LSB)	D3	reserved
D4	Latch value byte 1 (MSB) / Cycle duration byte 1	D4	reserved

Status Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	OVER-FLOW	UNDER-FLOW	CNTSET_ACC	RD-PERIOD_Q	LATC_VAL

LATC_VAL	A zero point (latch) has occurred. The data D3, D4 in the process image match the latched value in case the cycle duration has not been requested and the bit is set. In order to reactivate the latch input it is necessary to reset EN_LATC, to wait for the acknowledgement and to reset the bit.
RD-PERIOD_Q	The data bytes D2, D3, D4 contain the cycle duration.
CNTSET_ACC	Acknowledge bit for CNT_SET Reset if CNT_SET=0
UNDER-FLOW	In the event of an underflow (0 to 65535) of the 16-Bit counter, this bit will be set. A reset will take place if the counter underruns two third of the measuring range (43690 to 43689) or as soon as an overflow occurs.
OVER-FLOW	In the event of an overflow (65535 to 0) of the 16-Bit counter, this bit will be set. A reset will take place if the counter exceeds one third of the measuring range (21845 to 21846) or as soon as an underflow occurs.
0	reserved

Control Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	CNT_SET	RD-PERIOD	EN_LATC

EN_LATC	Zero point (input C) is activated. If the EN_LATC bit is set, the counter value will be stored in the latch register with the first latch pulse. The following pulses have no effect on the latch register.
RD-PERIOD	The cycle duration between positive edges (input A) is measured with a resolution of 200 ns. If the bit is set, the cycle duration will be stored in data bytes D2, D3, D4.
CNT_SET	With a positive edge, the counter is initialized with the set value.
0	reserved

Signal A, B and C in Data Byte 2

The input signals A, B and C are send in data byte 2 (D2) of the input data, if bit 1 (RD-PERIOD) in the Control byte is '0'.

Signal A, B and C in D2							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	Signal A	Signal B	Signal C	0	0	0



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