

WAGO → I/O → SYSTEM 750

**Fieldbus Independent
I/O Modules**

**TTY-Interface 20mA Current Loop
750-651 (/xxx-xxx)**



Manual

Version 1.0.2

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

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

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1 Important Comments

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

1.1 Legal Principles

1.1.1 Copyright

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1.1.2 Personnel Qualification

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

1.1.3 Intended Use

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

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

1.2 Symbols



Danger

Always abide by this information to protect persons from injury.



Warning

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



Attention

Marginal conditions must always be observed to ensure smooth operation.



ESD (Electrostatic Discharge)

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



Note

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



More information

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

1.3 Number Notation

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

1.4 Safety Notes



Warning

Switch off the system prior to working on bus modules!

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

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

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

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



Attention

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

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

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

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



ESD (Electrostatic Discharge)

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

1.5 Scope

This manual describes the Digital Input Module 750-651 (/xxx-xxx) TTY-Interface 20mA Current Loop 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

2.1.1 750-651 (/xxx-xxx) [TTY-Interface 20mA Current Loop]

2.1.1.1 View

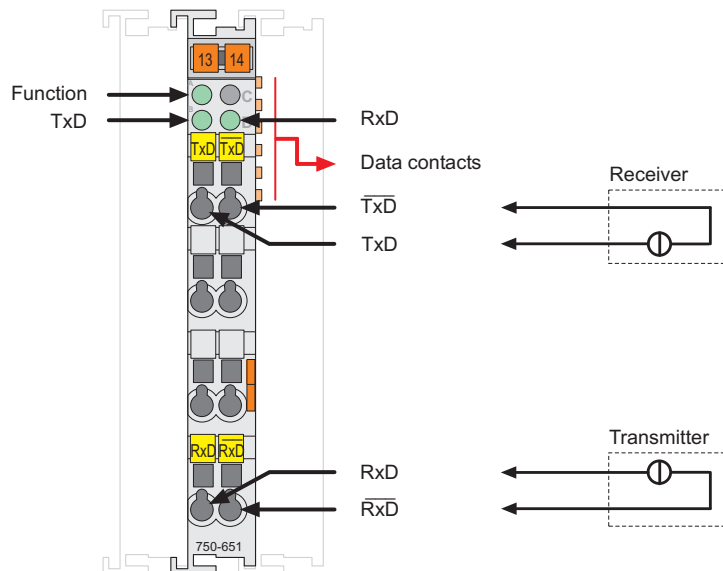


Fig. 2.1.1-1: TTY-Interface 750-651

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2.1.1.2 Variations

Item-No.	Designation	Description
750-651	TTY/ 9600/ N/ 8/ 1	Baud rate: 9600 baud, Parity: none, data bits: 8, stop bits: 1
750-651/000-001	TTY/ 9600/ N/ 8/ 1/ 5 byte	Baud rate: 9600 baud, Parity: none, data bits: 8, stop bits: 1, user data: 5 byte
750-651/000-002	TTY/ 9600/ E/ 8/ 1	Baud rate: 9600 baud, Parity: even, data bits: 8, stop bits: 1
750-651/000-003	TTY/ 1200/ N/ 8/ 1	Baud rate: 1200 baud, Parity: none, data bits: 8, stop bits: 1

2.1.1.3 Description

This interface allows the connection of devices which are equipped with a 20 mA current interface.

The wiring to the communication partner is made by the connections TxD, /TxD, RxD and /RxD.

The interface is working in active, semi-active or passive operation mode. The module communicates with the control unit over the fieldbus coupler/-controller.

The active communication channel works independently of the higher-level fieldbus system and allows full duplex operation up to 19200 baud.

Three green LEDs signal readiness for operation and troublefree internal bus communication as well as the condition of the signal transmission.

The TTY interface guarantees high interference immunity because of the electrical isolation and the driven loop current.

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



Attention

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

The TTY-Interface module 750-651 and its variations 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).

This description is valid from hardware and software version XXXX3A03... and up. The version is specified in the manufacturing number, which is part of the lateral marking on the module.

2.1.1.4 Display Elements

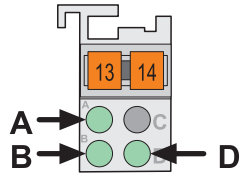


Fig. 2.1.1-2: Display Elements g065002x

LED	Channel	State	Function
A green	Function	off	No operational readiness or the internal data bus communication is interrupted
		on	Operational readiness and trouble-free internal data bus communication
B green	TxD	off	Loop current ≤ 2 mA (SPACE)
		on	Loop current ≥ 12 mA (MARK)
D green	RxD	off	Loop current ≤ 2 mA (SPACE)
		on	Loop current ≥ 12 mA (MARK)

2.1.1.5 Schematic Diagram

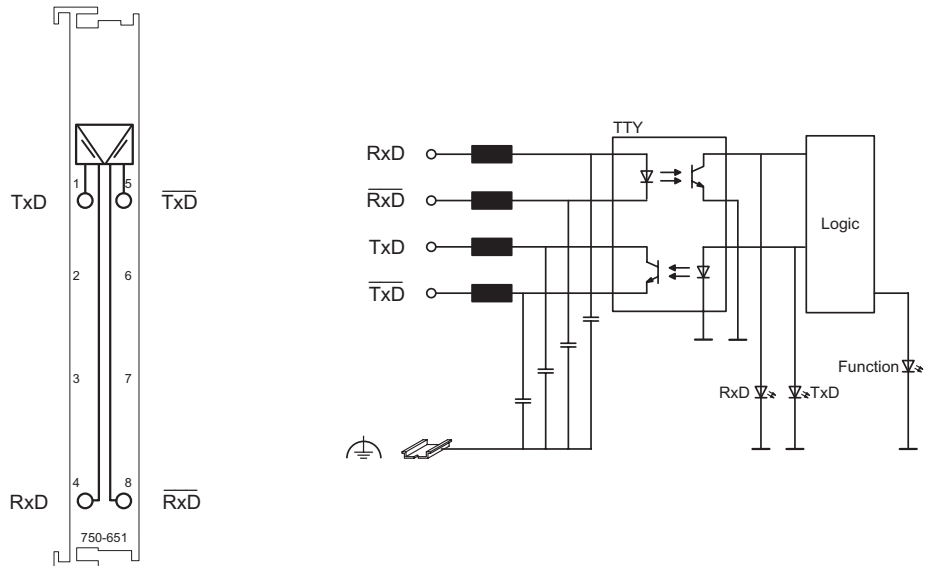













Fig. 2.1.1-3: TTY-Interface 750-651

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2.1.1.6 Technical Data

Module Specific Data			
Transmission channel	1 TxD / 1 RxD, full duplex		
Baud rate	1200 ... 19200 baud		
Bit transmission	MARK: $I \geq 12 \text{ mA}$, SPACE: $I \leq 2 \text{ mA}$		
Load impedance	$< 500 \Omega$		
Line length _{max.}	1,2 kBd $\leq 800 \text{ m}$	2,4 kBd $\leq 400 \text{ m}$	9,6 kBd $\leq 100 \text{ m}$
Buffer	128 bytes in / 16 bytes out		
Current consumption (internal)	55 mA		
Voltage supply	via system voltage DC/DC		
Isolation	500 V (System/Supply)		
Bit width	1 x 40 bits data 1 x 8 bits control/status		
Dimensions (mm) W x H x L	12 x 64* x 100 * from upper edge of 35 DIN rail		
Weight	ca. 55 g		
Standards and Regulations (cf. Chapter 2.2 of the Coupler/Controller Manual)			
EMC-Immunity to interference (CE)	acc. to EN 50082-2 (96)		
EMC-Emission of interference (CE)	acc. to EN 50081-1 (93)		
Approvals (cf. Chapter 2.2 of the Coupler/Controller Manual)			
	cUL _{US} (UL508)		
	ABS (American Bureau of Shipping)		
	BV (Bureau Veritas)		
	DNV (Det Norske Veritas)	Cl. B	
	GL (Germanischer Lloyd)	Cat. A, B, C, D	
	KR (Korean Register of Shipping)		
	LR (Lloyd's Register)	Env. 1, 2, 3, 4	
	NKK (Nippon Kaiji Kyokai)		
	RINA (Registro Italiano Navale)	(only for 750-651)	
	cUL _{US} (UL1604)	Class I Div2 ABCD T4A	
	KEMA	II 3 G EEx nA II T4	
	Conformity Marking		



More Information

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

or in the internet under:

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

2.1.1.7 Functional description

The interface module is designed to operate with all WAGO I/O fieldbus couplers. The TTY interface module allows the connection of TTY-Interface devices to the WAGO I/O SYSTEM. The TTY Interface module can provide gateways within the fieldbus protocol. This allows serial equipment such as printers, barcode readers, and links to local operator interfaces to communicate directly by the fieldbus protocol with the PLC or PC Master. This module supports no higher level of protocol. Communication is made completely transparent to the fieldbus allowing flexibility in further applications of the serial interface module. The communication protocols are configured at the Master PLC or PC.

The 128 byte input buffer provides for high rates of data transmission. When using lower rates of transmission speed you can collect the received data, with less priority, without losing data.

The 16 byte output buffer provides for faster transmission of larger data strings.



Attention

The data transmission takes place at 9600 baud (default value). 1 startbit, 8 databits and 1 stopbit will be transmitted. No parity is available. The drivers are high ohmic. The control of data is made by the user software.



Attention

The TTY Interface is passive in sending and receiving , thus having no current sources. For data conversion an active partner is needed or an additional current source has to be connected.

12 • 750-651 (/xxx-xxx) [TTY-Interface 20mA Current Loop]
 Functional description

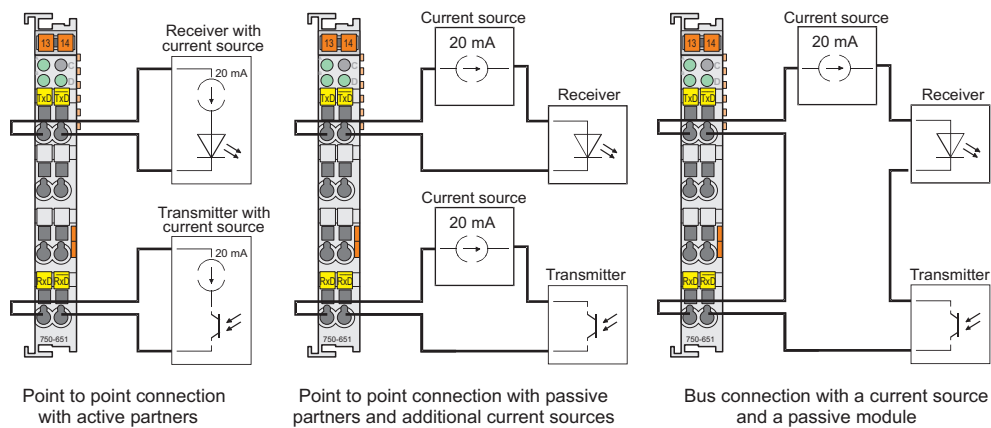


Fig. 2.1.1-4: Employment of the TTY interface module

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2.1.1.8 Process Image

Using the module 750-651, a 6 byte input and output process image can be transferred to the fieldbus coupler / controller via one logical channel. The transfer of the data to be transmitted and the received data is made via 5 output and 5 input bytes (D0 ... D4). 1 Control byte (C) and 1 Status byte (S) are used to control the floating data..



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.

Up to 5 characters which have been received via interface can be stored in the input bytes. The output bytes will contain the characters to be sent.

Input data		Output data	
S	Status byte	C	Control byte
D0	Input byte 0	D0	Output byte 0
D1	Input byte 1	D1	Output byte 1
D2	Input byte 2	D2	Output byte 2
D3	Input byte 3 *) , **)	D3	Output byte 3 *) , **)
D4	Input byte 4 **)	D4	Output byte 4 **)

*) with variations with 4 Data bytes, **) with variations with 5 Data bytes

Control byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	OL 2	OL 1	OL 0	0	IR	RA	TR

TR Transmit request

RA Receive acknowledge

IR Initialization request

OL 0, OL 1, OL 2 Output length (number of characters to be sent, which have been stored in the output bytes)

0 Constant value must always be 0.

Status byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	IL 2	IL 1	IL 0	BUF_F	IA	RR	TA

- TA Transmit acknowledge
- RR Receive request
- IA Initialization acknowledge
- BUF_F Buffer full
- IL 0, Input length (number of received characters , which have been stored in the
IL 1, input data)
IL 2
- 0 Constant value must always be 0.

2.1.1.9 Datatransfer

With the control and status byte the controlling of the sending and receive mode takes place. Requests are indicated by a bit change of state. An assigned bit indicates execution by adopting the value of the request bit.

Initialization of the module:

- Set IR bit in the control byte
- Initialization of the module
- Transmit/receive functions are blocked
- Output/input buffers are erased
- Serial interface module will load its configuration data

Transmitting data:

- TR=TA: put characters into output bytes
- Amount of characters is specified in OL0 to OL2
- TR is inverted and read out
- Characters are put into output buffer if TR=TA

Receiving data:

- RR≠RA: data in input bytes characters are available
- Amount of characters is specified in IL0 to IL2
- Characters in IL0 to IL2 are read out
- RA is inverted and read out
- All characters are read when RR=RA

The transmitting and receiving of data can be done simultaneously. The initialization request has priority and will stop transmitting and receiving of data immediately.



Attention

Resetting the initialization bit can be performed with the following message.

Message: input buffer full (Bit 3)

Input buffer is full. Data which is being currently received is now lost.

2.1.1.9.1 Example

The module is initialized.

The initialization bit in the control byte is set.

Output byte 0	Control byte	Output byte 2	Output byte 1
0x00	'0000.0100'	0x00	0x00

After the initialization has been executed, the status byte will give back 000.0100.

Input byte 0	Statusbyte	Input byte 2	Input byte 1	
XX	'0XXX.X0XX'	XX	XX	Module is still being reset.
XX	'0XXX.X1XX'	XX	XX	Initialization completed.

Sending of the data string "Hello"

The first 3 characters and the buffer length of 3 are transmitted.

Output byte 0	Control byte	Output byte 2	Output byte 1
"H" (0x48)	'0011.0000'	"1" (0x6C)	"a" (0x60)

The transmission request bit (TR) is inverted.

Output byte 0	Control byte	Output byte 2	Output byte 1
"H"	'0011.0001'	"1"	"a"

As soon as $TR=TA$, the rest of the data can be sent.

Input byte 0	Statusbyte	Input byte 2	Input byte 1	
XX	'0XXX.XXX0'	XX	XX	The data is still being transferred.
XX	'0XXX.XXX1'	XX	XX	Data transfer completed.

The last 2 characters and the buffer length of 2 are transmitted.

Output byte 0	Control byte	Output byte 2	Output byte 1
"1"	'0010.0001'	XX	"o" (0x6F)

The transmission request bit (TR) is inverted.

Output byte 0	Control byte	Output byte 2	Output byte 1
"1"	'0010.0000'	XX	"o"

As soon as $TA = TR$, the data has been transferred to the output buffer.

Input byte 0	Statusbyte	Input byte 2	Input byte 1	
XX	'0XXX.XXX1'	XX	XX	The data is still being transferred.
XX	'0XXX.XXX0'	XX	XX	Data transfer completed.

Receiving the character chain "WAGO"

As soon as $RA \neq RR$, the input bytes contain data.

Output byte 0	Control byte	Output byte 2	Output byte 1
XX	'0XXX.000X'	XX	XX

Input byte 0	Statusbyte	Input byte 2	Input byte 1	
XX	'0XXX.0X0X'	XX	XX	No received data available..
"W"	'0011.0X1X'	"G"	"A"	The information is in the input bytes.

After the 3 characters have been processed, RA is inverted.

Output byte 0	Control byte	Output byte 2	Output byte 1
XX	'0XXX.001X'	XX	XX

If RA≠RR, the receiving of additional characters will continue.

Input byte 0	Statusbyte	Input byte 2	Input byte 1	
XX	'0XXX.0X1X'	XX	XX	No received data available.
'0'	'0001.0X0X'	XX	XX	The information is in the input bytes.

After the characters have been processed, RA is inverted.

Output byte 0	Control byte	Output byte 2	Output byte 1
XX	'0XXX.000X'	XX	XX



Note

An X indicates that this particular value has no importance.
XX indicates that the whole value has no importance.



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