EN
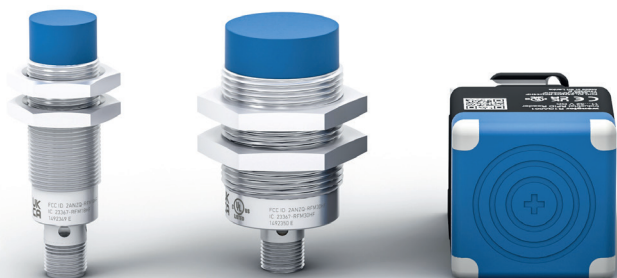

R18A001
R30A001
R1QA001

Industrial RFID

Operating Instructions

Table of Content

1. General

1.1 Information Concerning these Instructions

- These instructions apply to products designated R18A001, R30A001, and R1QA001.
- These instructions make it possible to use the product safely and efficiently.
- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- Local accident prevention regulations and national work safety regulations must be complied with as well.
- The product is subject to further technical development, and thus the information contained in these operating instructions may also be subject to change. The current version can be found at www.wenglor.com in the product's separate download area.

NOTE!
The operating instructions must be read carefully before using the product and must be kept on hand for later reference.

1.2 Explanation of Symbols

- Safety precautions and warnings are emphasized by means of symbols and signal words.
- Safe use of the product is only possible if these safety precautions and warnings are adhered to.

The safety precautions and warnings are laid out in accordance with the following principle:

SIGNAL WORD!
Type and source of danger!
Possible consequences in the event that the hazard is disregarded.
- Measures for averting the hazard.

The meanings of the signal words, as well as the scope of the associated hazards, are listed below:

DANGER!
This signal word indicates a hazard with a high degree of risk which, if not avoided, results in death or severe injury.

WARNING!
This signal word indicates a hazard with a medium degree of risk which, if not avoided, may result in death or severe injury.

CAUTION!
This signal word indicates a hazard with a low degree of risk which, if not avoided, may result in minor or moderate injury.

ATTENTION!
This signal word draws attention to a potentially hazardous situation which, if not avoided, may result in property damage.

NOTE!
A note draws attention to useful tips and suggestions, as well as information regarding efficient, error-free use.

1.3 Limitation of Liability

• The product has been developed in consideration of the current state-of-the-art technology, as well as applicable standards and guidelines. Subject to change without notice.
• A valid declaration of conformity can be accessed at www.wenglor.com in the product's separate download area.
• wenglor sensoric elektronische Geräte GmbH (hereinafter referred to as "wenglor") excludes all liability in the event of:
    • Non-compliance with the instructions,
    • Use of the product for purposes other than those intended,
    • Use by untrained personnel,
    • Use of unapproved spare parts,
    • Unapproved modification of products.
• These operating instructions do not include any guarantees from wenglor with regard to the described procedures or specific product characteristics.
• wenglor assumes no liability for printing errors or other inaccuracies contained in these operating instructions unless wenglor was verifiably aware of such errors at the point in time at which the operating instructions were prepared.

1.4 Copyrights

• The contents of these instructions are protected by copyright law.
• All rights are reserved by wenglor.
• Commercial reproduction or any other commercial use of the provided content and information, in particular graphics and images, is not permitted without previous written consent from wenglor.

2. For Your Safety

2.1 Use for Intended Purpose

These RFID readers are used to read and write RFID data carriers.

RFID stands for radio-frequency identification. The read/write devices emit an electromagnetic field, which is received by a transponder. The exchange of energy initiates mutual communication, which allows data to be exchanged between the transponder and the read/write device. The RFID readers listed in these instructions have an IO-Link interface, which enables easy and fast parametrization.

This product can be used for production control and reliable traceability in the following industry sectors:

- Special-purpose mechanical engineering
- Logistics
- Automotive industry
- Food industry
- Packaging industry
- Clothing industry
- Plastics industry
- Consumer goods industry
- Electronics industry
- Chemicals industry

2.2 Use for Other than the Intended Purpose

- Not a safety component in accordance with 2006/42/EC (Machinery Directive).
- The product is not suitable for use in potentially explosive atmospheres.
- The product may be used only with accessories supplied or approved by wenglor, or in combination with approved products. A list of approved accessories and combination products can be found at www.wenglor.com on the product detail page.

	DANGER! **Risk of personal injury or property damage in case of use for other than the intended purpose!** Use for other than the intended purpose may lead to hazardous situations. • Instructions regarding use for intended purpose must be observed.

2.3 Personnel Qualifications

• Suitable technical training is a prerequisite.
• In-house electronics training is required.
• Trained personnel who use the product must have (uninterrupted) access to the operating instructions.

DANGER!
Risk of personal injury or property damage in case of incorrect initial start-up and maintenance!
Personal injury and damage to equipment may occur.
• Adequate training and qualification of personnel.

2.4 Modification of Products

DANGER!
Risk of personal injury or property damage if the product is modified.
Personal injury and damage to equipment may occur. Non-observance may result in loss of the CE mark, and the guarantee may be rendered null and void.
• Modification of the product is impermissible.

2.5 General Safety Precautions

NOTE!
• These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
• In the event of possible changes, the respectively current version of the operating instructions can be accessed at www.wenglor.com in the product's separate download area.
• Read the operating instructions carefully before using the product.
• Protect the sensor against contamination and mechanical influences.

2.6 Approvals and Protection Class

$C\,\epsilon$ ⬦(III) c(UL)us LISTED IND. CONT. EQ. 11RZ ⊘ ☑ RoHS FC IC

FCC Information:
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause any harmful interference
(2) This device must accept all interference, including interference that may cause undesired operation

Attention! Any changes or modifications that have not been expressly approved by the institution responsible for compliance could void the user's authorization to operate the equipment.

FCC identifier: 2ANZQ-RFM18HF | 2ANZQ-RFM30HF | 2ANZQ-RF44HF

IC Information:
This device complies with the license-exempt RSS standards of Industry Canada. Operation is subject to the following two conditions:
(1) This device may not cause any harmful interference
(2) This device must accept all interference, including interference that may cause undesired operation

Certificate no.: 23367-RFM18HF | 23367-RFM30HF | 23367-RFC44HF

**This device complies with the ISO 15693 standard.**

3. Technical Data

3.1 General Data

Order Number / Technical Data	R18A001	R30A001	R1QA001
RFID Data			
Working range *	0…34 mm	0…50 mm	0…78 mm
Carrier frequency	13.56 MHz		
Installation method	Non-flush		
Electrical Data			
Supply power with IO-Link	18…30 V DC		
Supply voltage	11…32 V DC		
Current consumption (supply voltage = 24 V)	< 50 mA		
Transmission speed	26.5 kbit/s		
Temperature range (during operation)	−25…80 °C		
Number of analog outputs	-		
Number of switching outputs	2		
Switching output switching current	200 mA		
Short-circuit proof	Yes		
Reverse polarity and overload-proof	Yes		
Interface	IO-Link V1.1		
Protection class	III		
Mechanical Data			
Setting method	IO-Link		
Housing material	CuZn, chrome-plated		Plastic, PBT
Degree of protection	IP67		IP68/IP69K
Connection type	M12×1, 4/5-pin		
Technical Safety Data			
MTTFd (EN ISO 13849-1)	644 a		
Output Functions			
Output A1	Push-pull		
	NO		
Output A2	PNP		
	NO		

* The specified working range relates to a transponder with Ø 50 mm and RSSI ≥ 0. Depending on the transponder, the resulting working range may vary.

3.2 Transponder-Specific Ranges
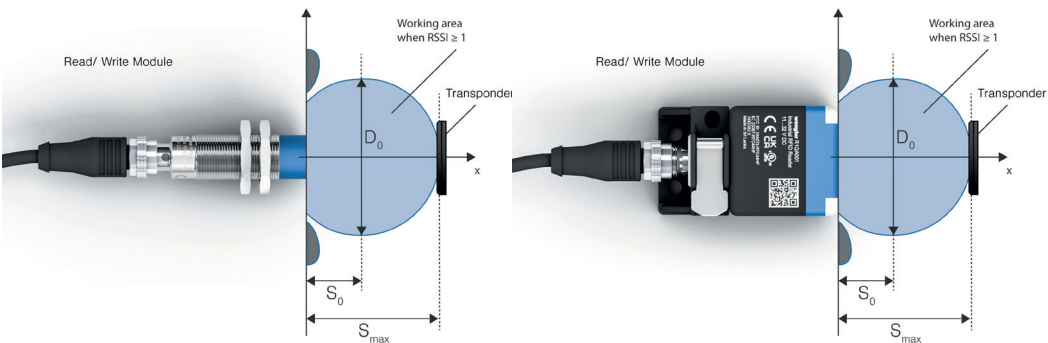
Typical Ranges for RSSI ≥ 1

Transponder	R18A001			R30A001			R1QA001		
	S_{max} [mm]	S_0 [mm]	D_0 [mm]	S_{max} [mm]	S_0 [mm]	D_0 [mm]	S_{max} [mm]	S_0 [mm]	D_0 [mm]
Z89Q001	19	8	23	26	11	30	40	18	44
Z89Q002	11	3.5	15	17	5.5	24	24	9	32
Z89Q003	18	8.5	22	28	13	31	40	20	44
Z89Q004	22	9	28	30	13	38	44	21	48
Z89Q005	24	6	42	46	19	54	64	32	68
Z89Q006	17	6	21	26	11.5	31	38	17	42
Z89Q007	19	5	28	34	15	38	46	23	52
Z89Q008	20	4	39	46	20	52	46	20	52

NOTE!
The ranges indicated present a selection for sample data carriers. However, the specified RFID readers can be combined with transponders which use the ISO/IEC 15693 protocol and a transmission frequency of 13.56 MHz. Depending on the data carrier, the range may be greater or smaller than indicated here.
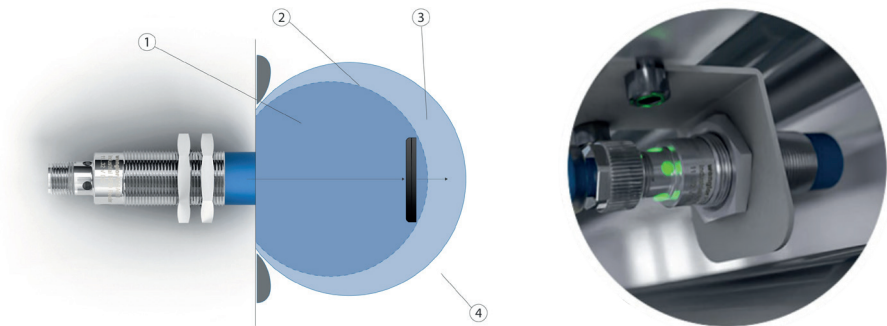
NOTE!
The specified transponders are not suitable for direct mounting on metallic materials. In addition, the following environments can impair the function of the RFID readers:
• Damp/wet environments
• Metallic environments
• Use of inductive sensors

3.3 Status Indicators

Status indicators for the metric formats **R18A001** and **R30A001**:

Affected LED	Color	Status
All four LEDs	Off	• The device is not ready for use
	Solid green	• SIO mode: the RFID reader is ready for use
	Flashing green (1 Hz)	• IO-Link mode: the RFID reader is ready for use
	Flashing yellow (1 Hz)	• IO-Link mode: the transponder is in zone 1
	Flashing yellow (5 Hz)	• IO-Link mode: the transponder is in zone 3
	Solid yellow	• SIO mode: A1 is active
	Flashing green/yellow (5 Hz)	• SIO mode: the transponder is in zone 3

Status indicators for the cubic format **R1QA001**:
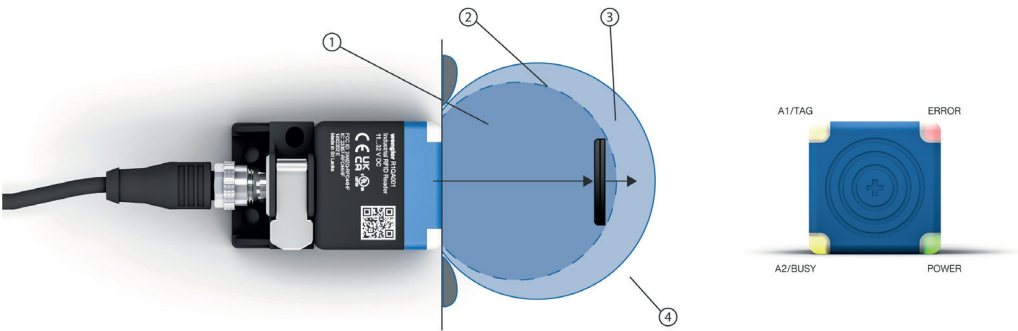
Affected LED	Color	Status
Power LED	Off	• The device is not ready for use
	Solid green	• SIO mode: the RFID reader is ready for use
	Flashing green (1 Hz)	• IO-Link mode: the RFID reader is ready for use
A1/TAG	Off	• IO-Link mode: the transponder is in zone 4
	Flashing yellow (1 Hz)	• IO-Link mode: the transponder is in zone 1
	Flashing yellow (5 Hz)	• IO-Link mode: the transponder is in zone 3 • The transponder is in zone 3
	Solid yellow	• SIO mode: A1 is active
A2/BUSY	Off	• IO-Link mode: no pending command
	Flashing yellow (1 Hz)	• IO-Link mode: the RFID reader is processing information
	Flashing yellow (5 Hz)	• SIO mode: the transponder is in zone 3
	Solid yellow	• SIO mode: A2 is active
ERROR	Solid red	• An error has occurred

The error messages of the three RFID readers specified can be attributed to the following causes:

| Error Number	Description of the Error	Explanation
1	Command Not Supported	The command is not supported by the RFID reader.
2	Format Error	The command is not recognized due to a format error.
3	Option Not Supported	The desired function is not supported.
5	Command Problem	The command cannot be executed.
6	Comm Tag Error	The transponder could not process the command information.
15	Tag Error	There is no response signal from the transponder.
16	No Memory Block	The data block does not exist.
18	Block Protected	The data block is locked and cannot be overwritten or read.
27	App LOG Error	The RFID reader's password does not match the password of the data carrier.
30	TAG Comm Error	There is a communication error with the transponder (for example, if several transponders are detected).
255	App General Error	Error without a specific error code.

3.4 Functions Overview

The sensor can be set via IO-Link. wenglor's proprietary wTeach2 software enables quick and clear parametrization of the RFID reader. The following sections describe the different setting options.

3.4.1 Setting the RSSI Value

The RSSI value is an important parameter for defining the working range. It describes the signal strength of the response from the transponder to the read/write device. For the RFID readers listed here, the final value 7 represents the highest signal strength, while the value 0 represents the lowest signal level. The RSSI value is determined by the following influencing factors:
• The larger the transponder is, the higher the RSSI value
• The greater the distance between the read/write device and the transponder, the lower the RSSI value
• Metals in the vicinity of the transponder can interfere with electromagnetic waves and impair the RSSI value

Using IO-Link, a limit value can be set on the read/write device to determine the RSSI values at which the read/write device is to react. The defined limit value then specifies the minimum RSSI value that must be reached in order to process the transponder data.
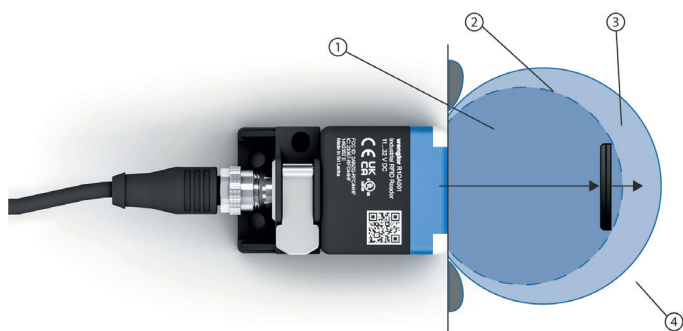
The effective range of the read/write devices can be divided into four zones:

Range	RSSI value	Meaning
1	RSSI level of the transponder ≥ set limit value	The RSSI level of the transponder is greater than/equal to the set limit value. The RFID tag is therefore in the optimum working range.
2	RSSI level of the transponder = set limit value	The RSSI level of the transponder corresponds to the set limit value.
3	RSSI level of the transponder < set limit value	The RSSI value of the transponder is still within the detection range of the RFID reader, but outside the set limit value. No reading and writing process is executed.
4		The transponder is outside the detection range of the RFID reader.

An RSSI level of 0 to 7 can be set for the RFID readers listed here. The default values can be found in the interface protocol.

3.4.2 Pin Function

In SIO mode, the read/write devices offer two configurable switching outputs, while one switching output is available in IO-Link mode.

Pin	Possible Settings	Default
A1	**Switching output** The following triggers can be set for the switching output: • **Presence of the transponder:** The output switches as soon as the RFID chip enters zone 1 of the RFID reader • **Data comparison:** The output switches as soon as the data of the data carrier matches the reference data • **Alarm:** The output switches as soon as the conditions for alarm 1 or alarm 2 are satisfied	Presence of the transponder
A2	**Switching output** The following triggers can be set for the switching output: • **Presence of the transponder:** The output switches as soon as the RFID chip enters zone 1 of the RFID reader • **Data comparison:** The output switches as soon as the data of the data carrier matches the reference data • **Alarm:** The output switches as soon as the conditions for alarm 1 or alarm 2 are satisfied	Presence of the transponder

3.4.3 Output Function

The output functions are used to set the physical outputs.

Function	Possible Settings and Functions	Default
Polarity A1	Push-pull	Push-pull
Polarity A2	PNP	PNP
Circuit	**Normally Open (NO)** The output is high when the condition has been satisfied, depending on the settings. **Normally Closed (NC)** The output is low when the condition has been satisfied, depending on the settings.	NO

3.4.4 Setting the Alarm

Two alarms can be configured via IO-Link and read out via the output in SIO mode. For this purpose, the following triggers can be set for both alarm types:

RSSI Less Than Set Limit Value
An alarm is triggered if the receiving signal strength (= RSSI value) is below the specified threshold value. A value between 0 and 7 must be defined as the threshold value.

Transponder Presence Time Falls Below Limit Value
The alarm is triggered if the transponder is in the working range of the RFID reader for less than the specified time span. The value is specified in ms.

Number of Switching Operations Exceeds Limit Value
The alarm is triggered as soon as the number of switching operations exceeds a specified number.

3.4.5 Writing, Reading and Comparing Data

The RFID readers listed in these operating instructions enable RFID data carriers to be both written and read out. By configuring the switching outputs, the data can also be compared with reference data. Parametrization and data transfer are carried out exclusively via IO-Link.

Writing and Reading Data
The RFID reader divides the data into data blocks of four bytes each:

Data Block	Byte 3	Byte 2	Byte 1	Byte 0
0				
1				
2				
…				

Seven data blocks can be written or read out simultaneously. Each byte has a numerical value between 0 and 255. The ADDRESS (ADD) process parameter defines the data block from which the data is written or read out. The NB BLOCK process parameter defines the number of data blocks to be written or read out.

NOTE!
Bear in mind that the bytes are often referred to as data in the IO-Link tools. Byte 3 of Data Block 1 is thus referred to as Data 7 in the IO-Link tools. The numbering is consecutive.

In addition, the following functions are available for triggering the read/write function under the CMD process parameter:

Value	Explanation
Auto-read	The RFID reader reads the data of the transponder as soon as it enters the working range of the RFID reader.
Auto-write	The RFID reader overwrites the data of the transponder as soon as it enters the working range of the RFID reader.
Read	The RFID reader reads the data of the transponder as soon as the START process parameter is set to true.
Write	The RFID reader overwrites the data of the transponder as soon as the START process parameter is set to true.
UID	The transponder ID and transponder times are read out.

NOTE!
To use the read and write function, the antenna status must be set to "Antenna on." If the RSSI value falls below the set limit value, no reading or writing process is triggered.

Comparing Data
Four bytes (one data block) can be compared with specific reference data. These must be defined as hexadecimal numbers in index 0x0041 with subindex 0x03 or 0x08. It should be noted that the data content of the bytes is stored in reverse order in the subindex:

Sample dataset:

Data Block	Byte 3	Byte 2	Byte 1	Byte 0
0	4	3	2	1

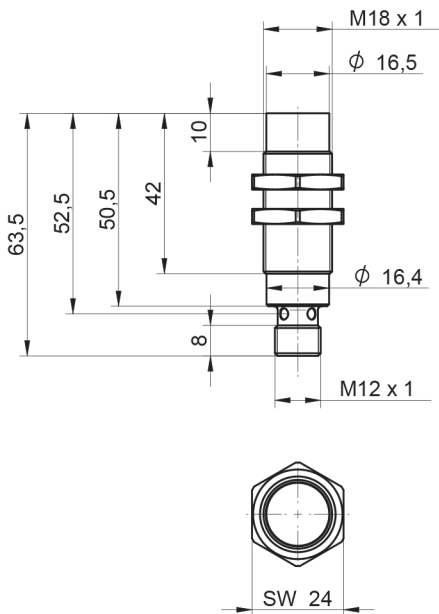Data sequence to be stored in subindex 0x03: 04030201h

The data block that is to be compared with the reference data is defined in subindexes 0x02 and 0x07.

For switching outputs A1 and A2, the data comparison can be set as a switching condition under index 0x0041 for subindex 0x01 or 0x06.

3.5 Housing Dimensions

R18A001
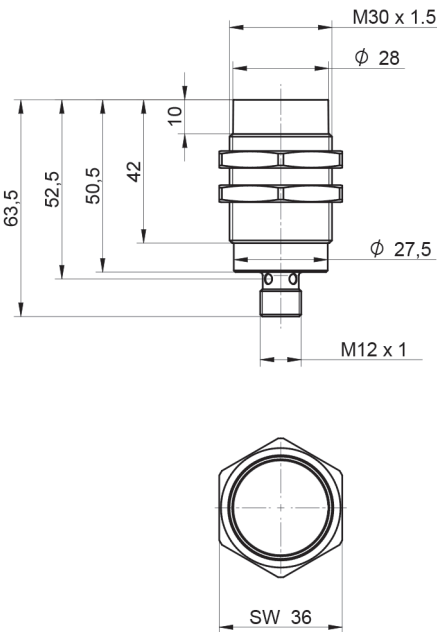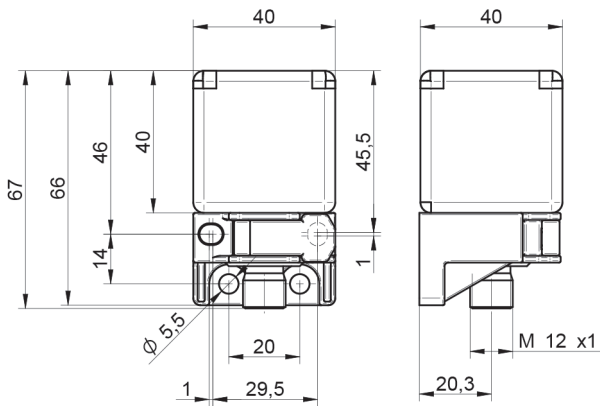

M18 x 1
ϕ 16,5
10
42
52,5
50,5
63,5
ϕ 16,4
8
M12 x 1

SW 24

R30A001

M30 x 1.5
ϕ 28
10
42
52,5
50,5
63,5
ϕ 27,5
M12 x 1

SW 36

R1QA001

40
40
46
40
45,5
67
66
14
1
ϕ 5,5
20
M 12 x1
1
29,5
20,3

Dimensions in mm

3.6 Complementary Products

wenglor can provide you with suitable connection equipment for your product.

Suitable mounting technology no.	R18A001: 150 R30A001: 130 R1QA001: --
Suitable connection equipment no.	2 35 272
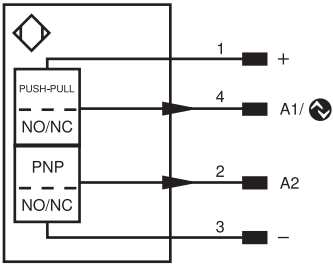
IO-Link Master
wTeach2 software DNNF005
Software for IO-Link Device Tool, DNNF019

3.7 Scope of Delivery

• RFID reader
• Information sheet

4. Transport and Storage

4.1 Transport

Upon receipt of shipment, inspect the goods for damage in transit. In the case of damage, conditionally accept the package and notify the manufacturer of the damage. Then return the device, making reference to damage in transit.

4.2 Storage

The following points must be taken into consideration with regard to storage:

• Do not store the product outdoors.
• Store the product in a dry, dust-free place.
• Protect the product against mechanical impacts.
• Protect the product against exposure to direct sunlight.

⚠️ **ATTENTION!**
Risk of property damage in case of improper storage!
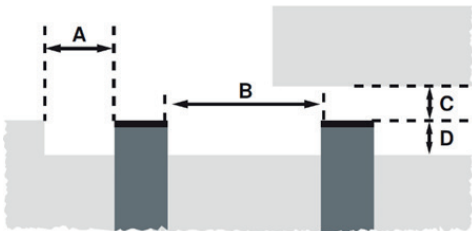The product may be damaged.
• Storage instructions must be complied with.

---

5. Installation and Electrical Connection

5.1 Installation

• Protect the product from contamination during installation.
• Observe all applicable electrical and mechanical regulations, standards and safety rules.
• The product must be protected against mechanical impact.
• Make sure that the RFID reader is mounted in a mechanically secure fashion.
• To ensure reliable detection of the data carriers, the required distances as shown in the following installation drawing must be observed:

Installation drawing for R18A001/R30A001:   Installation drawing for R1QA001:
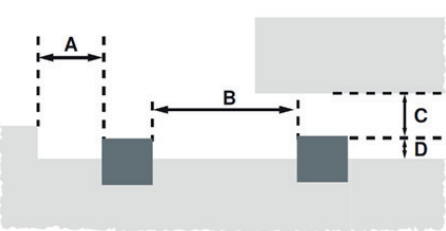
RFID Reader	A	B	C	D
R18A001	21 mm	36 mm	60 mm	10 mm
R30A001	30 mm	60 mm	90 mm	10 mm
R1QA001	40 mm	80 mm	120 mm	10 mm

ATTENTION!
Risk of property damage in case of improper installation!
The product may be damaged.
• Installation instructions must be complied with.

CAUTION!
Risk of personal injury or property damage during installation!
Personal injury and damage to the product may occur.
• A safe installation environment must be assured.

5.2 Electrical Connection

• Wire the sensor in accordance with the connection diagram.
• Switch on the supply voltage (see "3. Technical Data" on page 8).

Connection Diagram
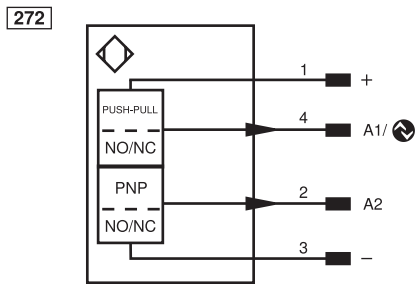
Legend

+	Supply Voltage +	
−	Supply Voltage 0 V	
~	Supply Voltage (AC Voltage)	
A	Switching Output	(NO)
Ā	Switching Output	(NC)
V	Contamination/Error Output	(NO)
V̄	Contamination/Error Output	(NC)
E	Input (analog or digital)	
T	Teach Input	
Z	Time Delay (activation)	
S	Shielding	
RxD	Interface Receive Path	
TxD	Interface Send Path	
RDY	Ready	
GND	Ground	
CL	Clock	
E/A	Output/Input programmable	
◈	IO-Link	
PoE	Power over Ethernet	
IN	Safety Input	
OSSD	Safety Output	
Signal	Signal Output	
BI_D+/−	Ethernet Gigabit bidirect. data line (A-D)	
EN₀RS422	Encoder 0-pulse 0-0̄ (TTL)	

PT	Platinum measuring resistor
nc	not connected
U	Test Input
Ū	Test Input inverted
W	Trigger Input
W −	Ground for the Trigger Input
O	Analog Output
O −	Ground for the Analog Output
BZ	Block Discharge
AMV	Valve Output
a	Valve Control Output +
b	Valve Control Output 0 V
SY	Synchronization
SY −	Ground for the Synchronization
E+	Receiver-Line
S+	Emitter-Line
⏚	Grounding
SnR	Switching Distance Reduction
Rx+/−	Ethernet Receive Path
Tx+/−	Ethernet Send Path
Bus	Interfaces-Bus A(+)/B(−)
La	Emitted Light disengageable
Mag	Magnet activation
RES	Input confirmation
EDM	Contactor Monitoring

ENARS422	Encoder A/Ā (TTL)
ENBRS422	Encoder B/B̄ (TTL)
ENA	Encoder A
ENB	Encoder B
AMIN	Digital output MIN
AMAX	Digital output MAX
AOK	Digital output OK
SY In	Synchronization In
SY OUT	Synchronization OUT
OLT	Brightness output
M	Maintenance
rsv	reserved

Wire Colors according to IEC 60757

BK	Black
BN	Brown
RD	Red
OG	Orange
YE	Yellow
GN	Green
BU	Blue
VT	Violet
GY	Grey
WH	White
PK	Pink
GNYE	Green/Yellow

DANGER!
Risk of personal injury or property damage due to electric current.
Voltage-conducting parts may cause personal injury or damage to equipment.
• The electric device may be connected by appropriately qualified personnel only.

6. Default Settings

The default values of the individual parameters are listed in the interface protocol.

7. wTeach2 Configuration Software

For information on installing and connecting the software and its structure, as well as information on the general functions, see the wTeach operating instructions. They can be found online in the download area under order number DNNF005.

8. Maintenance Instructions

NOTE!
- This RFID reader is maintenance-free.
- Cleaning and inspection of the plug connections at regular intervals are advisable.
- Do not clean the sensor with solvents or cleaning agents that could damage the product.
- The product must be protected against contamination during initial start-up.

9. Proper Disposal

wenglor sensoric GmbH does not accept the return of unusable or irreparable products. Respectively valid national waste disposal regulations apply to product disposal.

10. Appendix

10.1 Change Index for the Operating Instructions

Version	Date	Description/Changes
1.0.0	11/02/2023	Initial version of the operating instructions
1.0.1	11/23/2023	Addition to the chapter "2.6 Approvals and Protection Class" on page 7
1.0.2	01/08/2024	Addition to the notes in chapter "3.2 Transponder-Specific Ranges" on page 9

10.2 Declarations of Conformity

The applicable declarations of conformity can be found on our website at www.wenglor.com in the product's separate download area.