

Rotary feed-through

DDF-I 40-63

Assembly and Operating Manual



Imprint

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Technical changes:

We reserve the right to make alterations for the purpose of technical improvement.

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Dear customer,

congratulations on choosing a SCHUNK product. By choosing SCHUNK, you have opted for the highest precision, top quality and best service.

You are going to increase the process reliability of your production and achieve best machining results – to the customer's complete satisfaction.

SCHUNK products are inspiring.

Our detailed assembly and operation manual will support you.

Do you have further questions? You may contact us at any time – even after purchase.

Kindest Regards

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1 About this manual

This instruction is an integral part of the product and contains important information for a safe and proper assembly, commissioning, operation, maintenance and help for easier trouble shooting.

Before using the product, read and note the instructions, especially the chapter "Basic safety notes".

1.1 Warnings

To make risks clear, the following signal words and symbols are used for safety notes.

	! DANGER Danger for persons. Non-compliance will inevitably cause irreversible injury or death.
	! WARNING Dangers for persons. Ignoring a safety note like this can lead to irreversible injury and even death.
	! CAUTION Dangers for persons. Non-observance can cause minor injuries.
	NOTICE Material damage Information about avoiding material damage.

1.2 Applicable documents

- General terms of business
- Catalog data sheet of the purchased product

The documents listed here, can be downloaded on our homepage www.schunk.com

2 Basic safety notes

2.1 Intended use

The rotary feed-through was designed to transfer the energy (electrical signals and air) to the handling module in robotic applications with endless rotation.

The product is intended for installation in a machine/system. The requirements of the applicable guidelines must be observed and complied with.

The product may be used only in the context of its defined application parameters ([👉 5, Page 8](#)).

The product is designed for industrial use.

To use this unit as intended, it is also essential to observe the technical data and installation and operation notes in this manual and to comply with the maintenance intervals.

2.2 Not intended use

Use which is not specified as an intended use is for instance when the product is for example used as a pressing tool, stamping tool, lifting tool, guide for tools, cutting tool, tensioning mean, boring tool.

2.3 Ambient conditions and operating conditions

- Make sure that the product has a sufficient size for the application.
- Make sure that the environment is free from splash water and vapors as well as from abrasion or processing dust. Exceptions are products that are designed especially for contaminated environments.

2.4 Product safety

Dangers arise from the product, if:

- the product is not used in accordance with its intended purpose.
- the product is not installed or maintained properly.
- the safety and installation notes are not observed.

Avoid any manner of working that may interfere with the function and operational safety of the product.

Wear protective equipment.

NOTE

More information are contained in the relevant chapters.

2.4.1 Protective equipment

Provide protective equipment per EC Machinery Directive.

2.4.2 Constructional changes, attachments, or modifications

Additional drill holes, threads, or attachments that are not offered as accessories by SCHUNK may be attached only with permission of SCHUNK.

2.4.3 Personnel qualification

The assembly, initial commissioning, maintenance, and repair of the product may be performed only by trained specialist personnel. Every person called upon by the operator to work on the product must have read and understood the complete assembly and operating manual, especially the chapter "Basic safety notes" ([👉 2, Page 5](#)). This applies particularly to personnel only used occasionally, such as maintenance personnel.

2.5 Using personal protective equipment



When using this product, observe the relevant industrial safety regulations and use the personal protective equipment (PPE) required!



- Use protective gloves, safety shoes and safety goggles.
- Observe safe distances.
- Minimal safety requirements for the use of equipment.

2.6 Notes on particular risks

Generally valid:

- Remove the energy supplies before installation, modification, maintenance, or adjustment work.
- Make sure that no residual energy remains in the system.
- Do not move parts by hand when the energy supply is connected.
- Do not reach into the open mechanism or the movement area of the unit.
- Perform maintenance, modifications, and additions outside the danger zone.
- Secure the product during all operations against uncontrolled activation.
- Take a precautionary approach by maintenance and disassembly.
- Only specially trained staff should disassemble the product.

	 WARNING
	<p>Risk of injury from objects falling and being ejected</p> <ul style="list-style-type: none"> • The danger zone must be surrounded by a safety fence during operation.

	 WARNING
	<p>Risk of injury when the machine/system moves unexpectedly.</p>

3 Warranty

If the product is used as intended, the warranty is valid for 24 months from the date of delivery from the production facility under the following conditions:

- Observance of the ambient conditions and operating conditions ([☞ 2.3, Page 5](#))
- Observance of the maintenance and lubrication intervals ([☞ 9, Page 20](#))

Parts touching the workpiece and wearing parts are not part of the warranty.

4 Scope of delivery

The scope of delivery includes:

- Rotary feed-through DDF-I in the ordered model.
- Accessory pack

5 Technical data

Further technical data can be found in the catalog data sheet. The most recent version applies.

DDF	40-63
Weight [kg]	1.9
Max. rotation speed [min ⁻¹]	120
Max. rotation speed [°/s]	720
Noise emission [dB(A)]	≤ 70
Energy transmission	
Lines for air feed-through [number]	1x
Max. compressed air per connection [bar]	10
sealing air, flow rate at 1bar [liter/ min.]	< 3
Vacuum (☞ 6.2, Page 12)	0x/ 1x
Lines for electrical signals [number]	2x
Max. voltage [V]	48
Max. current [A]	0,5
Lines for electrical energy [number]	2x
Max. voltage [V]	48 V
Max. current [A]	4 A

6 Assembly



WARNING

Risk of injury during assembly!

- Switch off the energy supply.

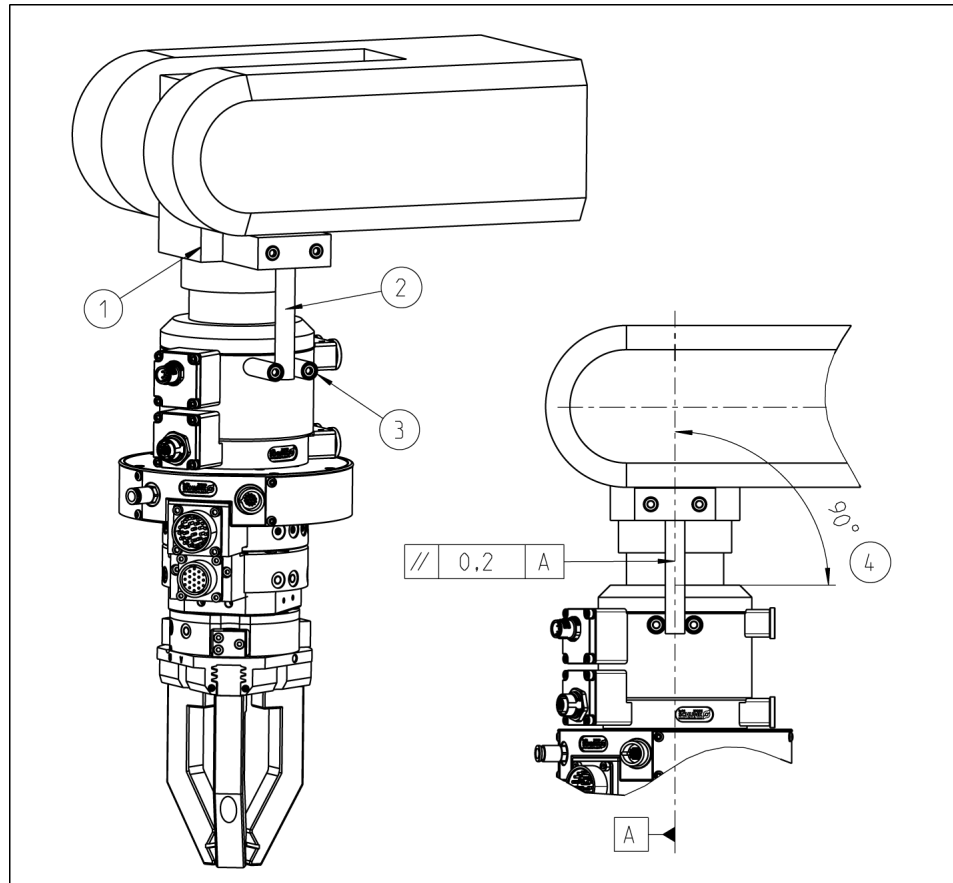


Fig. 1

1	The torque support (shaft) must be mounted on the non-moving housing of the robot.
2	Shaft with shaft- \varnothing (↩ 6.1, Page 10)
3	Bracket on the DDF-I
4	The shaft for the torque support (torque pin) should run precisely parallel to the »middle axis« of the DDF-I and at a »right angle« (90°) to the bracket.

6.1 Mounting the DDF-I on the robot

Check the evenness of the bolting surface The values relate to the entire bolting surface.

Requirements for levelness of the bolting surface (Dimensions in mm)

Diameter	Permissible unevenness
< 100	< 0.02
> 100	< 0.05

Assembly of the DDF

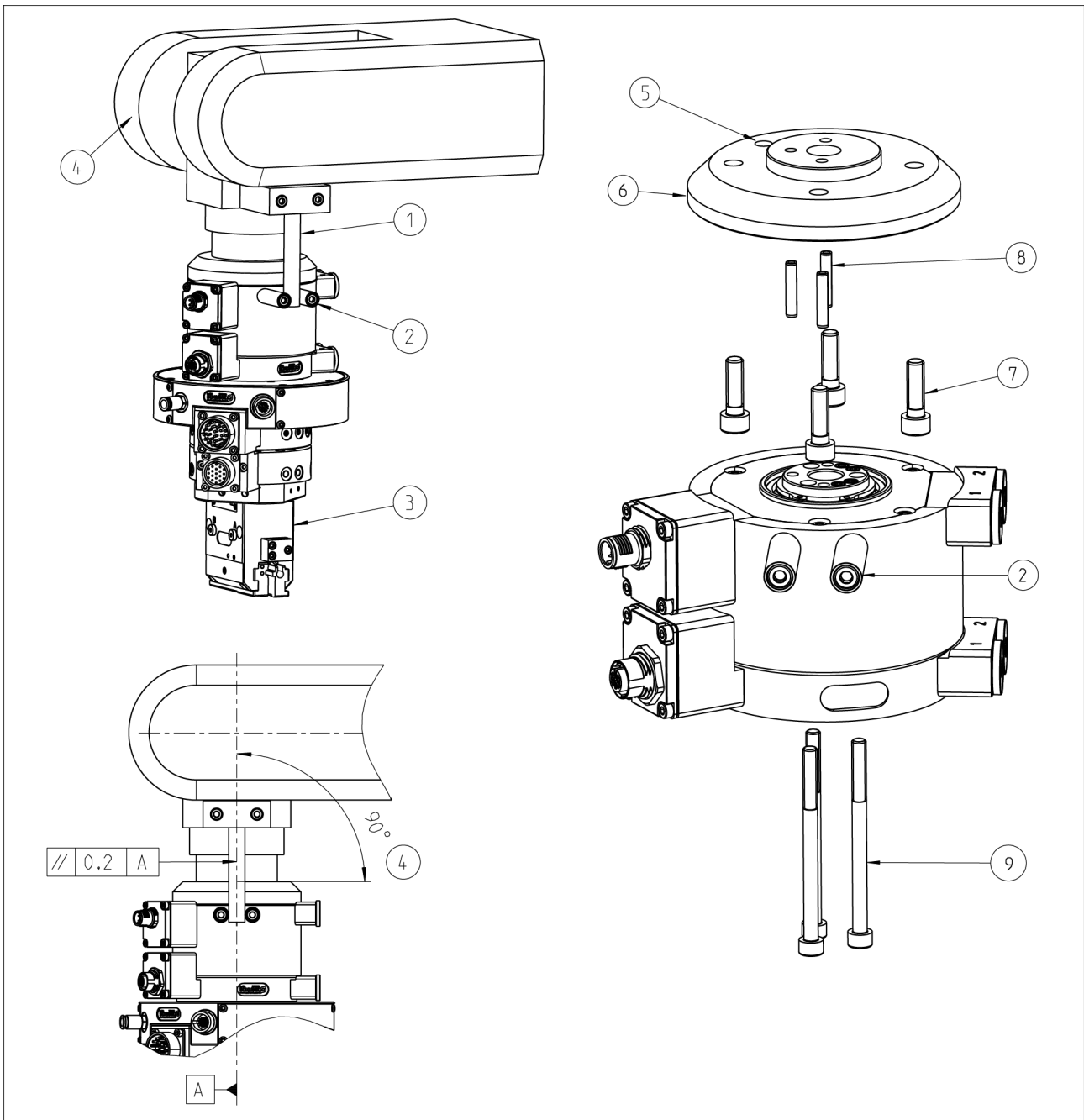


Fig. 2

1	Torque support shaft (provided by customer)
2	Bracket on the DDF (driver) (included in scope of delivery)
3	Tool, e.g. SCHUNK PGN type gripper
4	Robot with interface according to DIN ISO 9409
5	Fitting bore for a cylindrical pin used to position the unit
6	Flange with interface according to DIN ISO 9409 for connecting to robot
7	Screws for mounting the flange on the robot interface (in accessory pack)
8	Cylindrical pin for positioning the flange relative to the shaft

Shaft- \varnothing of the torque support


	Shaft- \varnothing of the torque support
DDF 40	\varnothing 12 mm
DDF 50	\varnothing 12 mm
DDF 63	\varnothing 12 mm


- 1 Mount the flange (6) on the robot interface using M6 cylindrical screws and a cylindrical pin (5) with a hexagon socket (7) (in accessory pack).
- 2 Insert the cylindrical pins (8) into the shaft of the assembled unit.
- 3 Place the fully assembled unit on the flange
NOTICE! This pre-assembled unit must not be separated!
- 4 Screw the shaft and the flange together using the screws (9).


Tightening torque for screws

Screw	Tightening torque [Nm]
M5	10
M6	17

6.2 Air connection

	⚠ WARNING
	Risk of injury during connection! <ul style="list-style-type: none"> Switch off the energy supply.

	NOTICE
	If the maximum pressure at the air purge connection is exceeded, the unit may be damaged. (☞ 5, Page 8)

	NOTICE
	The vacuum feed-through may only be pressurized with under-pressure (air pressure lower than the ambient pressure).

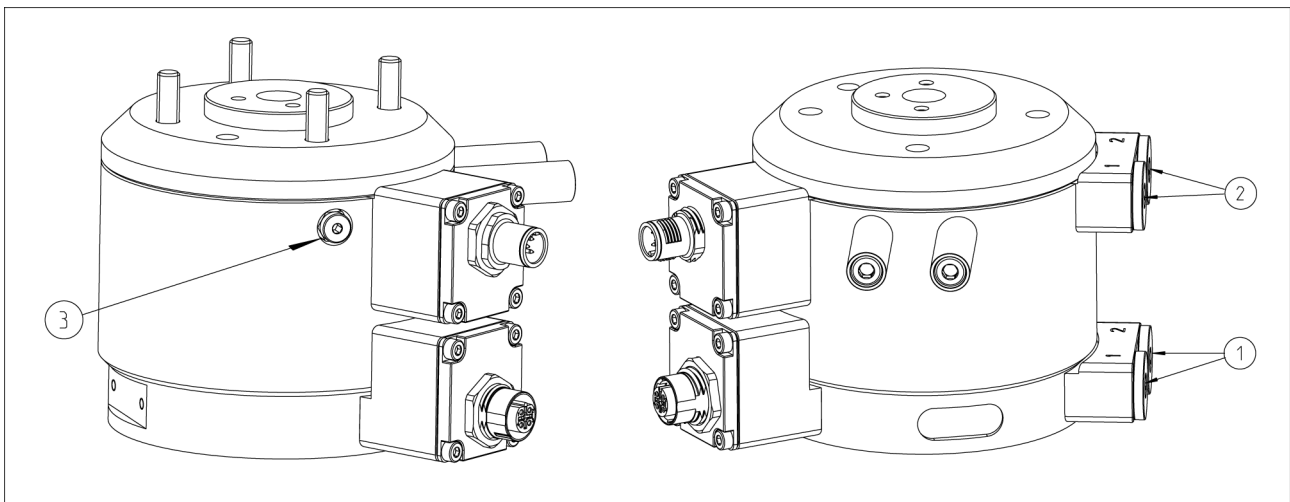




Fig. 3

1	Air connections, tool-side	DDF-I V1-P1:	DDF-I P1:
2	Air connections, robot side g	1 = Vacuum channel	1 and 2 = combined
		2 = Compressed air channel	compressed air channel
3	Air purge connection: 1 bar excess pressure/3 bar maximum excess pressure, flow rate at 1 bar < 3 liters/min.		

The precise positions of the air connections are shown in the SCHUNK catalog.

6.3 Electrical connection

	 WARNING
	<p>Risk of injury when the machine/system moves unexpectedly! Switch off power supply.</p>

NOTE

Electrical power: ([↩ 5, Page 8](#))

Connector assignment

Pin allocation for the DDF-I 40/50/63	
Pin 1	Vcc
Pin 2	Data cable A
Pin 3	GND
Pin 4	Data cable B
Pin 5	Shielding

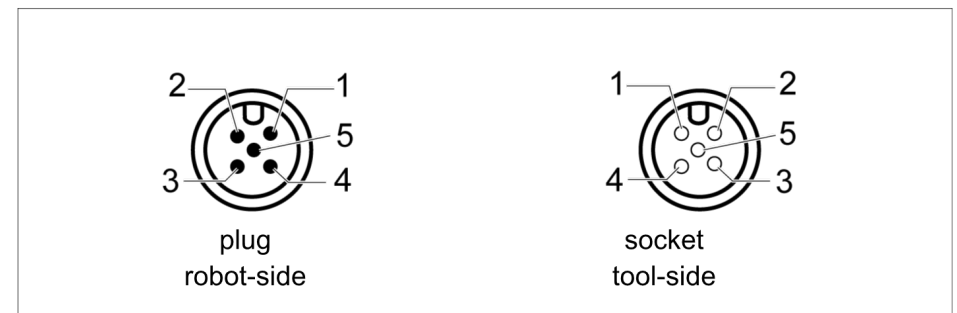


Fig. 4 Pin allocation for M12 plug/socket (5-pin, B-coded)

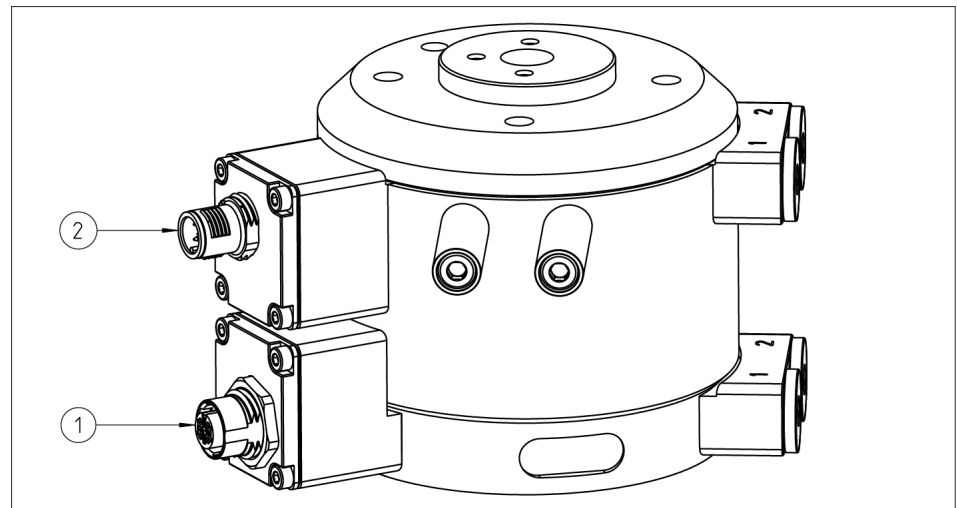


Fig. 5

1	Plug-in connection, tool-side
2	Plug-in connection, robot-side

7 Data transmission via slip rings

Signals as waves Signals are transmitted as square "stress waves" (by Profibus, for example).

Waves are generally subject to a number of different influences. They can be dampened, disrupted and reflected. For instance, a wave on a rope will behave in different ways depending on how the end of it is fastened.

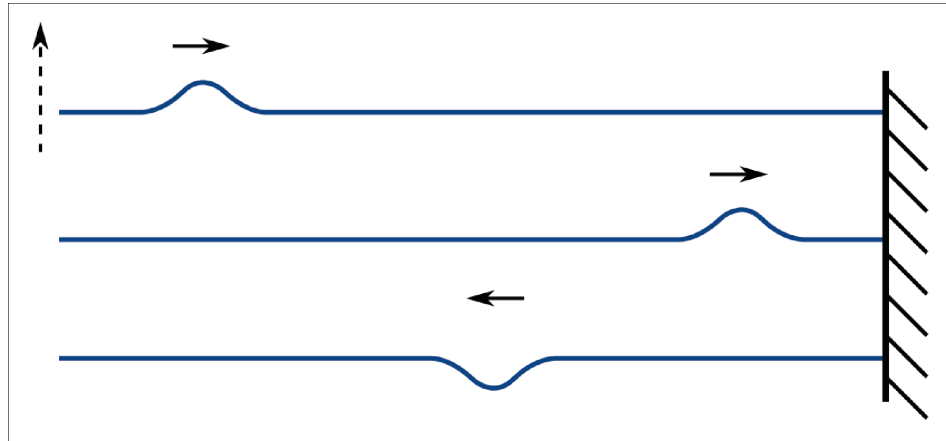


Fig. 6 Reflection with phase reversal at a fixed end

If the end is fixed, a wave peak is reflected as a wave trough – reflection with phase reversal.

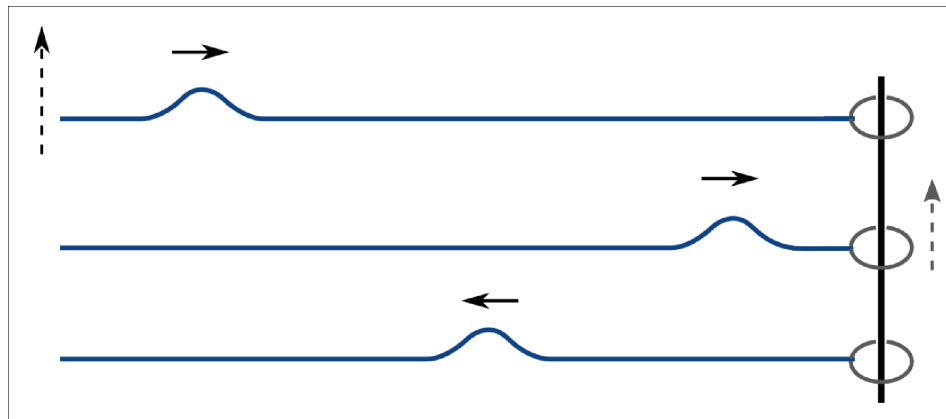


Fig. 7 Reflection without phase reversal at a free end

However, if the rope is fixed to a free-moving end (such as a ring that can move up and down on a bar), the wave is reflected as a peak – reflection without phase reversal.

The behavior can also be seen in stress waves on a signal cable. Reflected waves disrupt incident waves by altering their signal level and form. This can cause communication failures, as the receiver is no longer able to recognize a signal as a signal.

In order to prevent reflection, the wave must be cushioned at the end of its propagation distance.

In a communication line, this purpose is fulfilled by the termina-

tion resistor. This absorbs the energy of the wave, converts it into heat and thus prevents it from reflecting.

Wave resistance An important criterion for the reflection is the wave resistance, which comprises the resistance, conductivity and capacity between the conductors and inductivity per unit length (resistance per unit length R' , ground per unit length G' , capacity per unit length C' and inductivity per unit length L'), is unaffected by the length and is specified in ohms (Ω).

In turn, the capacitive behavior of the cable is determined by its properties in terms of materials and geometry.

For technical reasons, different bus systems have different wave resistances. In order to ensure that all incoming waves can be absorbed, the termination resistance of a communication cable must precisely match the wave resistance.

The correct termination resistors for a bus system are built into the connection plugs designed for that system.

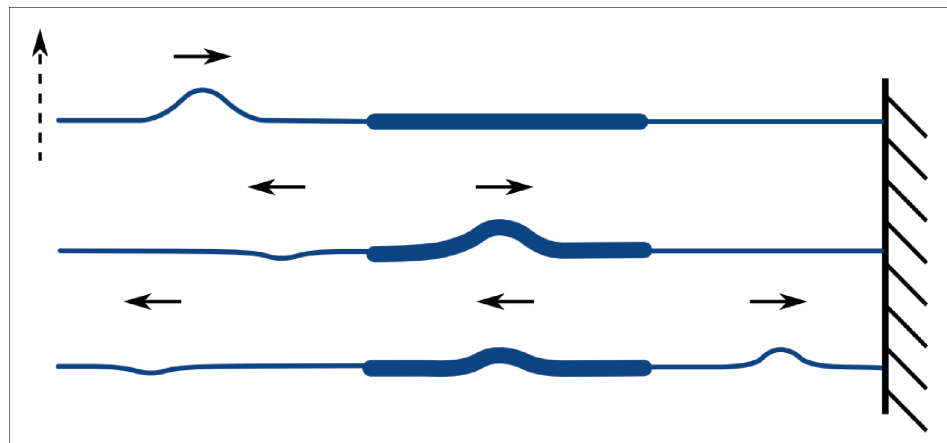


Fig. 8 Reflections with ropes of different weights

If we go back to the example of the wave on the rope, we can see that the transmission of ropes with different weights also causes a reflection.

A similar effect can be observed in the transmissions of cables with different wave resistances. As such, it is important that only cables with the correct electrical characteristics and specially tuned connection plugs are used. This applies especially to Profibus installations.

Slip rings in signal transmissions Like the cables for other bus systems, Profibus cables are standardized.

The standards define the electrical characteristics and geometric design that a cable must fulfill for a bus system. A slip ring as used in a rotary distributor limits both these requirements.

Whereas the wires in a signal cable are often drilled and shielded, the design of slip rings prevents this. The range of materials that can be used is also restricted. In order to ensure a long life span for the slip ring, it is made of corrosion-resistant materials such as gold. For this reason, it is never possible to meet the standardized requirements for a signal cable.

Due to the number of contact points within a slip ring, there may also be irregularities in the signal duration and the dampening of transmissions. In order to enable optimum signal transmission, the manufacturer adapts the electrical characteristics – especially the wave resistance – to the bus cables.

It is always important to monitor the bus installation and check the communication for reflections if necessary. If the form and amplitude of the signals are not too severely affected, the signals can be read and processed by participants (depending on how sensitive they are). In case of heavy reflections, corrective measures can often be taken to reduce the transmission rate or install special devices that use sliding contacts to prepare the communication signals for transmission (power rail boosters).

If the topology of the bus includes a low number of participants downstream of the slip ring, and the cable length is not all in use, it is safe to assume that a slip ring could also be used to transmit bus signals.

In order to achieve maximum bus system performance using rotary distributors, it may also be useful to look at other, more complex transmission technologies (inductive, capacitive or optical) with the corresponding bus electronics.

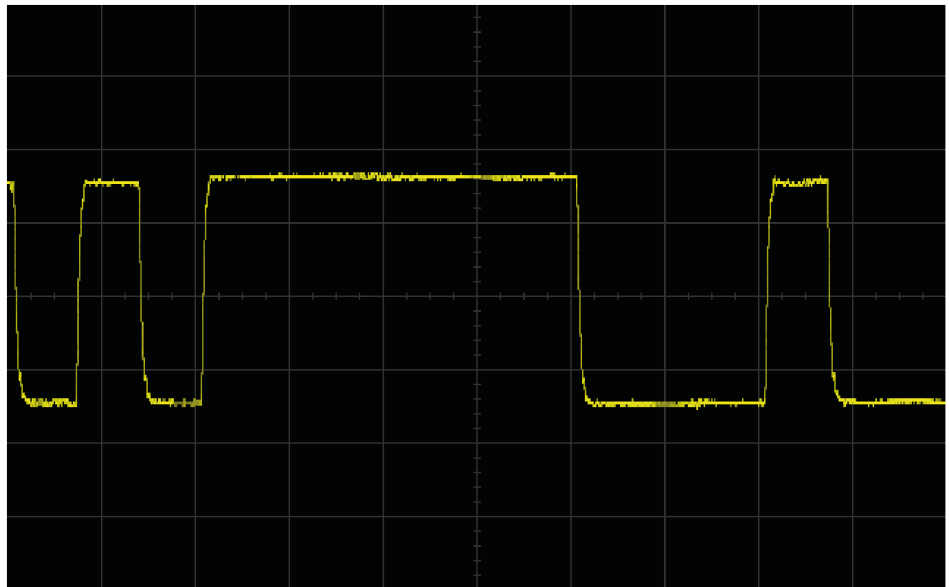


Fig. 9 Profibus signal without reflections

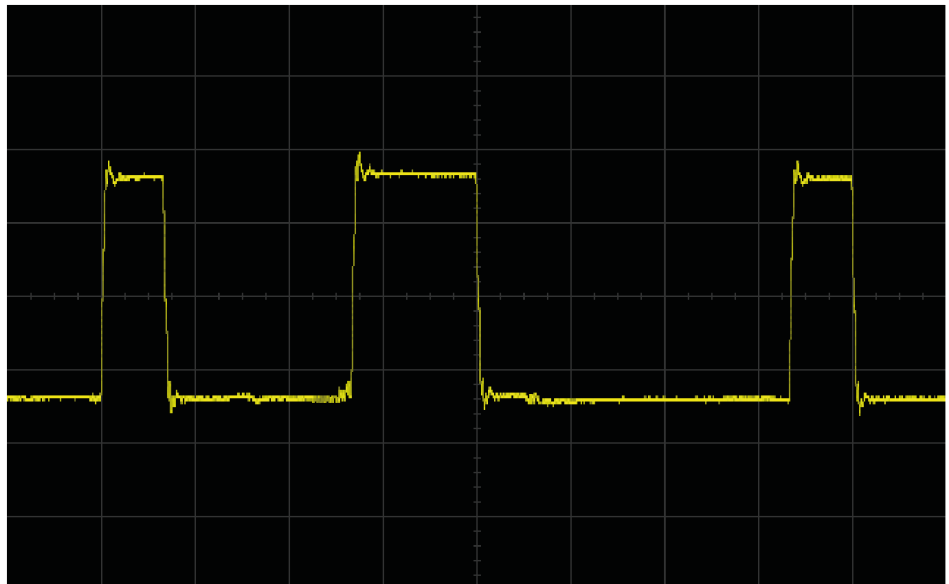


Fig. 10 Profibus signal with reflections caused by a slip ring

7.1 Using the DDF-I in Profibus installations

The DDF-I transmits signals using a special slip ring. Depending on the design, this may not precisely fulfill the usual standards for signal cables for bus installations. Due to the number of contact points inside the slip ring, it may also be impossible to define either the signal duration or the dampening of the signal precisely.

The following measures are recommended for optimum transmission of Profibus signals:

- The number of participants downstream of the slip ring should be limited and the cable length kept to a minimum right from the system design stage.
- If heavy reflections still occur, the transmission rate should be reduced or special devices installed to prepare the communication signals for transmission using sliding contacts (power rail boosters).

8 Troubleshooting

8.1 DDF-I lets out air when shut down?

Possible cause	Corrective action
Air connection not installed correctly	Tighten air connection (👉 6.2, Page 12)
Connections that are not in use are not closed	Close connections


8.2 DDF-I lets out air when operating?

Possible cause	Corrective action
Components have become loose e.g. through over-loading.	Send the module to SCHUNK with a repair order.

8.3 Electric signals are not transmitted?

Possible cause	Corrective action
Cable is not connected correctly	Check both the pin terminals are seated correctly.
Strands swapped	Check, if strands are swapped. Observe Pin-assignment.
Feed-through defective	Send the module to SCHUNK with a repair order.

9 Maintenance and care

	NOTICE
	<p>At ambient temperature above 60°C the lubricants can harden faster.</p> <ul style="list-style-type: none"> Interval decrease accordingly.

Maintenance intervals

Size	40/50/63
Interval [Mio. cycles]	6

Maintenance to be performed by SCHUNK only Depending on its operating environment – but at latest after the prescribed number of cycles – the unit must be sent to SCHUNK for maintenance.