

UNIVERSAL ROTARY ACTUATOR PRL

SIZES 60, 80, 100, 120



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. You can reach us directly at the mentioned addresses in the last chapter of these instructions.

Kindest Regards,

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1. Safety

1.1. Explanation of symbols



This symbol is displayed wherever there is a possibility of **danger to life and limb**.



This symbol is displayed wherever there is a possibility of **damage to the unit** exists.



This symbol denotes **important information** about the product and its handling.

1.2. Intended use

The unit may be used only within the range of its technical data.

The PRL modules are intended for installation / mounting in electrical machines and equipment.

The conditions specified in the machine directive for interchangeable equipment shall apply.

Observe the safety information in the standard "Electrical Equipment for Machines" (DIN EN 60204).

Appropriate use also includes compliance with the conditions the manufacturer has specified for commissioning, assembly, operation, environment and maintenance..

Using the system with disregard to even a minor specification will be deemed inappropriate use. The manufacturer assumes no liability for any injury or damage resulting from inappropriate use.

1.3. Environmental and operating conditions


- Use the unit only within the application parameters defined in the Technical Catalog. The most recent version applies (according to Chapter 2.3 of the General Terms and Conditions).
- Clean ambient conditions at room temperature are required. If these conditions are not ensured, the maintenance interval will be shorter, depending on the actual utilization.
- The environment must be free of splashing water and vapors, and also of abrasive dust and process dust. This does not apply to units designed especially for unclean environments.


1.4. Safety information


1. There are potential risks associated with the unit, for example if:
 - the unit is improperly used, installed or serviced.
 - the unit is used other than for the intended purpose.
 - the EC Machine Directive, the accident prevention regulations, the VDE guidelines or the safety and installation instructions are not observed.

2. All personnel who are responsible for installation, commissioning and servicing must have read and understood the entire operating manual, in particular the chapter on »Safety«. It is recommended to have this confirmed in writing.


3. Installation and dismantling, connections and commissioning may be carried out only by authorized personnel.

4.  Dangers exist due to units automatically starting up!
 - Do not reach into the area of motion of the rotary unit.
 - Do not move any parts by hand when the unit is connected to the power supply.
 - Remove the power supply cables for assembly, modification, maintenance and adjustment of the unit.


5.  During connection, adjusting, commissioning and testing, measures must be taken to prevent the risk of inadvertent activation of the unit by the fitter / installer or other persons.





6.  During operation dangers can be caused by the rotary unit due to:
 - moving or rotating parts
 - or hot surfaces – up to 110°C!

Therefore, suitable protective measures such as protective covers must be provided in accordance with the EC Machine Directive.

7.  **The electric unit is not suitable for use in potentially explosive areas.**

If the electric rotary unit is to be used in special applications (e.g. potentially explosive areas), always comply with the required standards and regulations (e.g. EN 50014 and EN 50018).
The approval for such special areas of application must always be obtained from Schunk in writing.

8.  Ensure compliance with EMC directives when connecting the unit.

9.  Danger due to overload of the unit!
The result of overload of the rotary unit is that the brake no longer has any effect on the output and the customer's attachment cannot be held!
- Prevent overload of the rotary unit by compliance with the specified loads (see »Technical Data«).
 - - Secure area of motion of the rotary unit to prevent accidental entry.
11.  The rotary unit is equipped with an electric drive.
Serious injuries and major damages can be prevented by:
- Assignment of only qualified personnel for all work on/with the unit! (Personnel who are familiar with electric drive systems and with the installation, assembly, commissioning and operation of electric drives.)
 - Observe the applicable national accident prevention regulations etc. Cp. IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC-Report 664 or VDE 0110 and national accident prevention regulations or VBG 4.)
 - During transport and handling, make sure that no components are bent and that no insulation clearances are changed. (Electric rotary units contain electrostatically sensitive components.)
 - Establish all electrical connections in accordance with the information in this documentation and the relevant regulations (e.g. wire size, fuses, protective conductors).
12.  Repairs in and on an electric rotary unit may be carried out only by the manufacturer or an authorized repair center.
Unauthorized opening and improper handling can result in bodily injury and material damage.
13.  Electronic devices are not fail-safe. The user is personally responsible for ensuring that the drive is in a safe state in the event of a failure.
14. Additional bore holes, threads or attachments not offered by SCHUNK as accessories may be mounted only after obtaining the approval of SCHUNK.
15. In addition, the applicable safety regulations and accident prevention regulations must be observed.

2. Warranty

The warranty period is 24 months from the date of delivery when utilized as intended in compliance with the specified maintenance and lubrication intervals. Parts that come into contact with the workpiece and wearing parts are not covered by the warranty. See also our General Terms and Conditions in this regard.

The unit is considered defective when the basic rotary function (to drive) is inoperable.

3. Scope of delivery

The scope of delivery includes:
PRL (in the ordered model)

- CD-ROM
- Additional Package

Content of the CD-ROM

- Operating manual PRL in PDF format
- Software manual in PDF format
- Software PowerCube

Content of the additional Package

- Jumper (3x)
- Wire end sleeves (10x)
- Cable lugs (2x)



Other accessories for the unit are available in the SCHUNK catalog, at www.schunk.com or from your SCHUNK contact person.

4. Technical Data

4.1. Basic data

Type	60	80	100	120
ID.-No.	0306910	0306915	0306920	0306925
Motor power [W]	40	80	130	250
Motor type	Brushless DC servo.motor			
Holding brake	integrated			
Nominal torque [Nm]	4.5	20.7	81.5	216.0
Peak torque [Nm]	9.6	41.4	176.0	372.0
Angle of rotation (>) [°]	> 360.0	> 360.0	> 360.0	> 360.0
Weight [kg]	1.0	1.2	2.0	3.6
Swivelling time (90°) with mean attached load [s]	2.55	4.25	4.25	4.25
min. ambient temperature [°C]	5	5	5	5
max. ambient temperature [°C]	55	55	55	55
Repeat accuracy [°]	0.002	0.002	0.002	0.002
max. angular velocity [°/s]	50	25	24	25
max. acceleration [°/s ²]	200	100	95	100
Gear ratio	300:1	552:1	625:1	596:1
Hollow shaft for media feed-through Ø [mm]	8	12	13	18
Noise level [dB(A)]	<= 70	<= 70	<= 70	<= 70
Dimensions	see page 10	see page 10	see page 11	see page 11
Electrical operating data				
Nominal voltage [VDC]	24.0	24.0	24.0	24.0
Nominal power current [A]	2.0	3.0	4.0	5.0
Max. current [A]	4.0	6.0	8.0	10.0
Resolution [°]	2.0	1.0	1.0	1.0
Control electronics				
Integrated electronics	yes	yes	yes	yes
Voltage supply [VDC]	24.0	24.0	24	24.0
Nominal power current [A]	0.5	0.5	0.5	0.5
Sensor system	Incremental encoder with absolute encoder function			
Interfaces	RS-232; PROFIBUS-DP; CAN-Bus			

Table 1

Factory settings of all modules

DEFAULT values	
Communication	RS232
Module address	15

Table 2



Note

Additional technical data can be found in our catalog. The most recent version applies. (according to Terms and Conditions in Chapter 2.3)

4.2. Dimensions

4.2.1. PRL 60

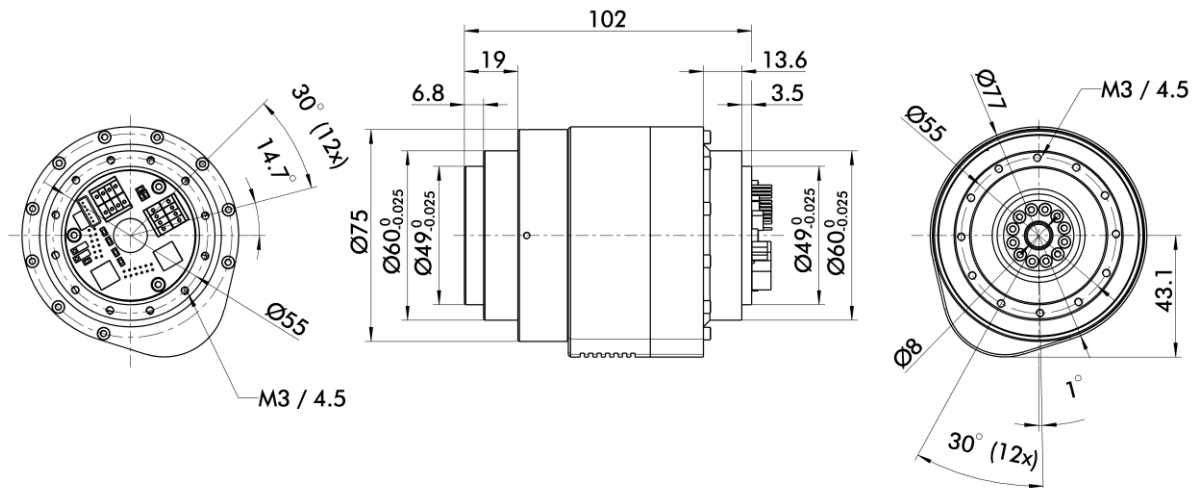


Fig. 1: Dimensions PRL 60

4.2.2. PRL 80

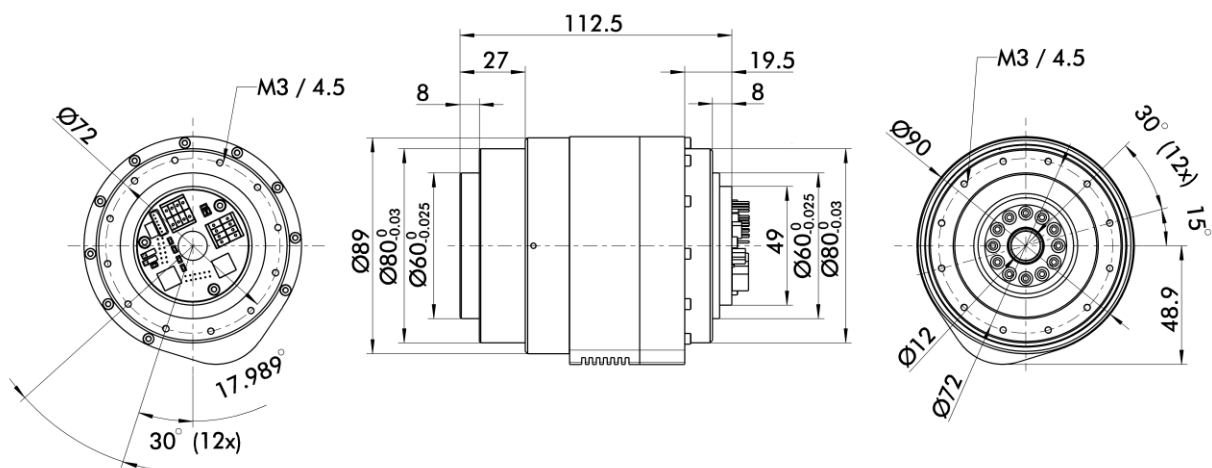


Fig. 2: Dimensions PRL 80

4.2.3. PRL 100

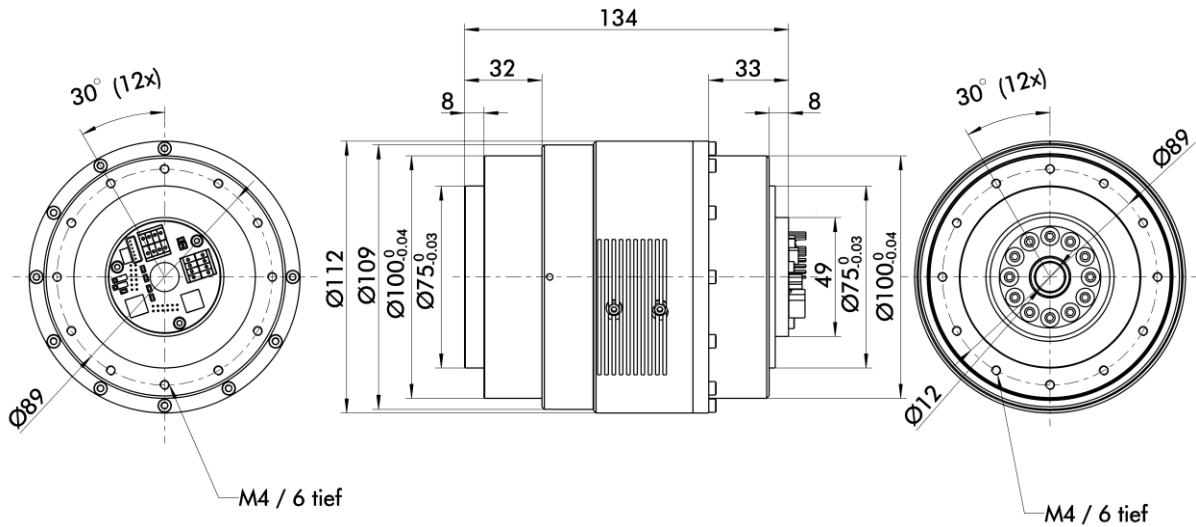


Fig. 3: Dimensions PRL 100

4.2.4. PRL 120

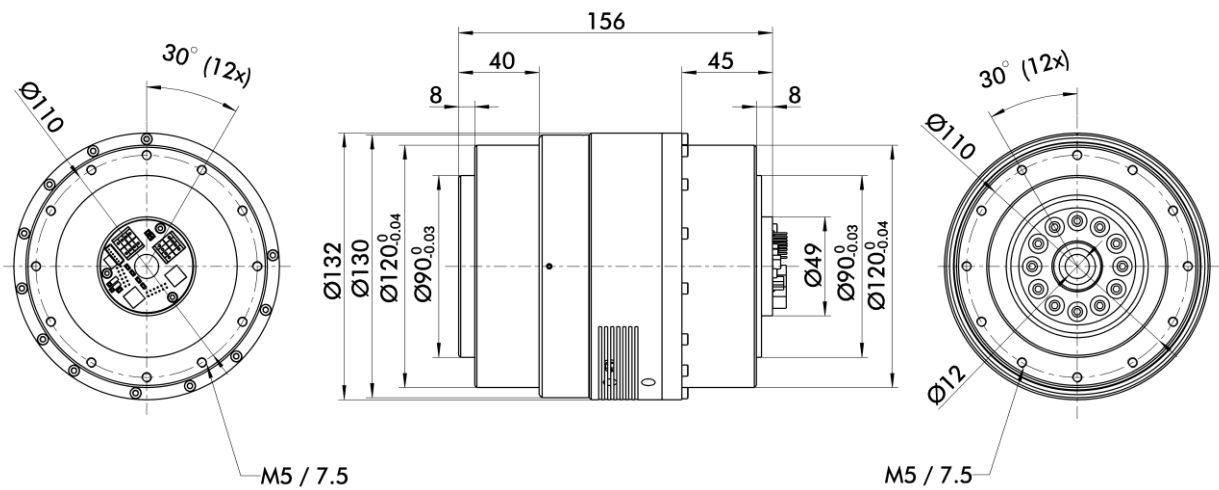


Fig. 4: Dimensions PRL 120

5. Description of the module

5.1. Operating principle

The **actuator** (the brushless DC servo motor) is controlled by the **internal logic**, which receives the required parameters from the master controller.

The module executes a movement. Their position is monitored constantly. The required data is transmitted by **sensors** back to the **internal logic**.

The unit is controlled via the **user interface**, where the required data is transmitted via the internal logic. You can define the following parameters, for example:

- Current i ;
- Angular positioning
- Speed v ;
- Acceleration α .

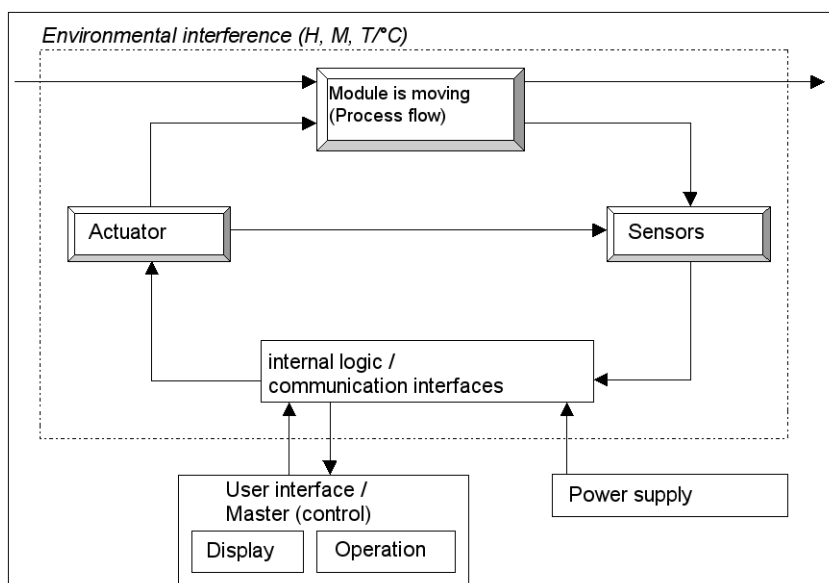


Fig. 5

6. Assembly

6.1. Mechanical Connection

6.1.1. Mounting of the unit



Danger!

Falling parts as a result of incorrect modifications and attachments to the machine or system! Fatal head injuries (e.g. lacerations) or severe bodily injuries (e.g. contusions) are possible!

- Leave power switched off until all mounting work has been completed.
- Have mounting work carried out only by qualified or specially trained personnel.
- Wear proper protective gear (e.g. safety helmet).

Also observe the safety information in chapter 1.4 on page 5!

Mount the unit so that:

- The connection cable does not present a hazard to personnel or the machine. (e.g.: prevent malfunctions by winding up the cable!)
- Personnel and the machine are not exposed to hazards. (e.g.: prevent crushing between machine parts; prevent collisions of machine parts)



Warning!

Nonobservance will lead to leakage of the module and may result in destruction of the integrated Electronic!

Before mounting the PowerCube-Modules, check the permissible depth of engagement. In Table 3 you find the corresponding Data, measured from module surface.



SCHUNK suggest to use special connecting elements. Information on this can be found in Chapter "Accessories" and in the current issue of the SCHUNK catalog.

Requirements for levelness of the bolting surface

(in relation to the entire bolting surface for the gripper)

- < 0.02 mm for an edge length up to 100 mm
- < 0.05 mm for an edge length of 100 mm or more

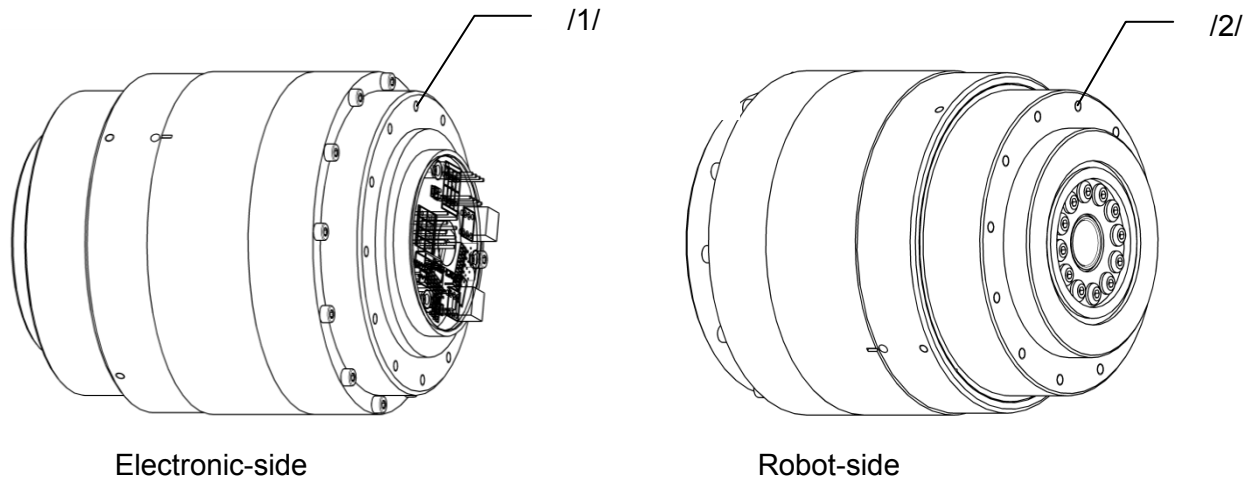


Fig. 6: Mechanical Connection

Pos.	Description	Type PRL			
		60	80	100	120
/1/	Thread for mounting the module	M3 / 4,5	M3 / 4,5	M4 / 6,0	M5 / 7,5
/2/	Thread for mounting the module	M3 / 4,5	M3 / 4,5	M4 / 6,0	M5 / 7,5
	Screws of strength class	8.8	8.8	8.8	8.8
	Max. tightening torque [Nm]	1,27	1,27	3,0	5,9

Table 3: Details Fig. 6

6.1.2. Example of mounting

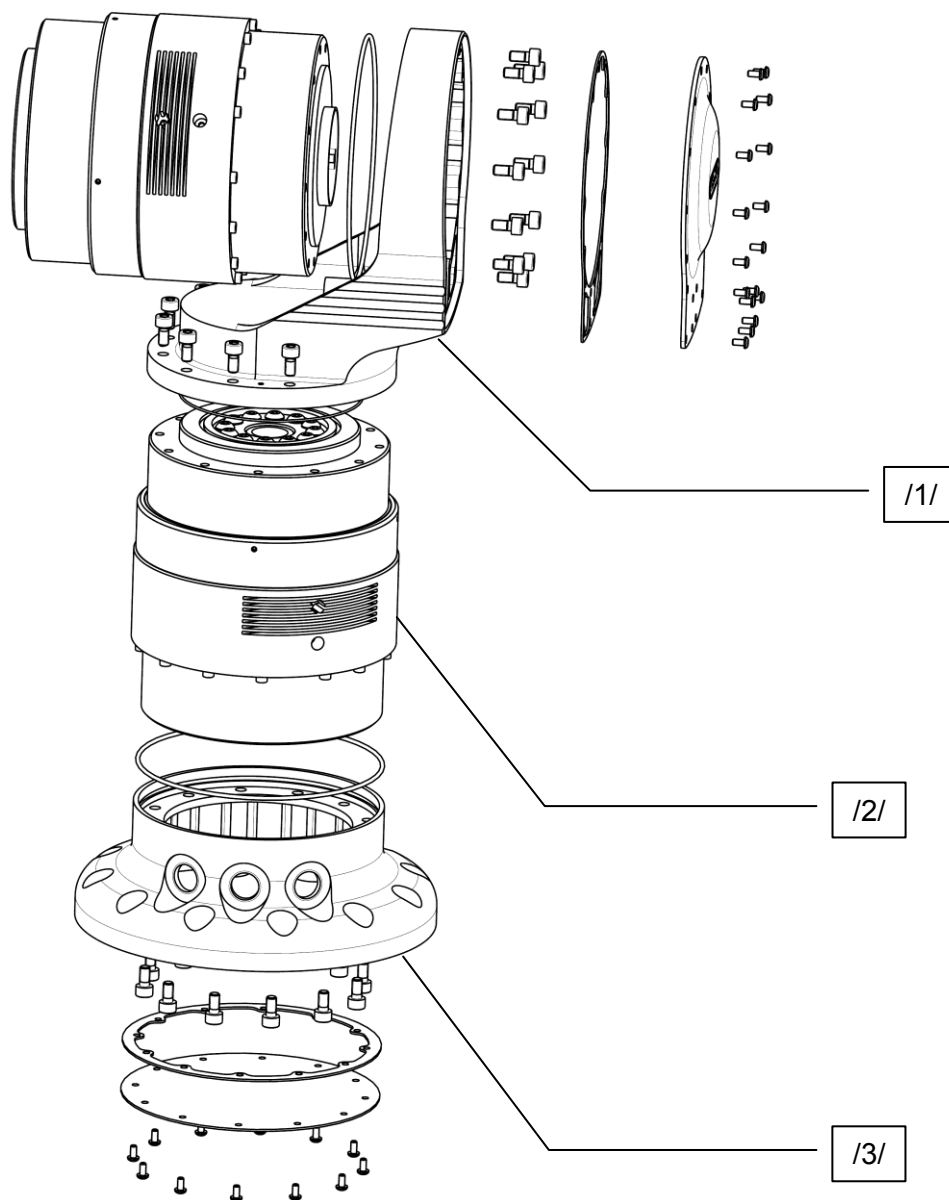


Fig. 7: Example of mounting PRL modules

Pos.	Description
/1/	Connection element 120
/2/	PRL 120
/3/	Pedestal PRL 120

Table 4: Details Fig. 7

6.2. Electrical Connection

6.2.1. Connection to the power supply



Danger of short circuit!
 The printed circuit board could be destroyed!
 Due to incorrect connection of the power supply.
 - Note layout of the terminals..

6.2.2. Connection Communication interface RS232

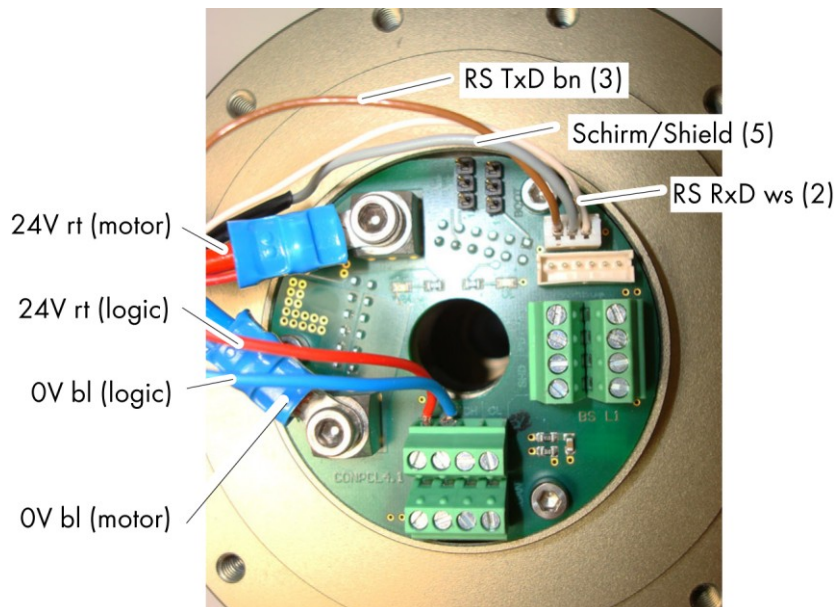
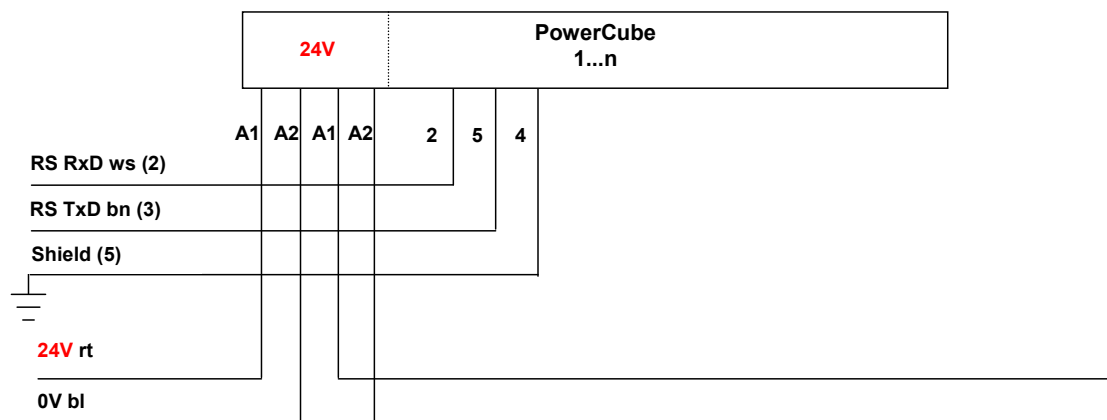


Fig. 8: Example of mounting



6.2.3. Connection CAN-Bus

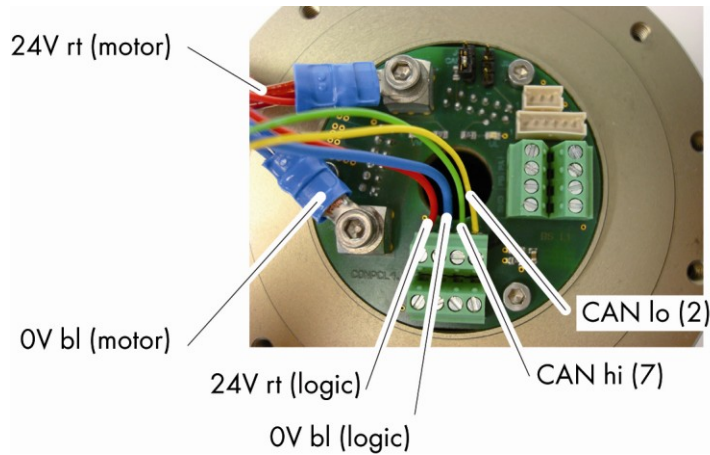
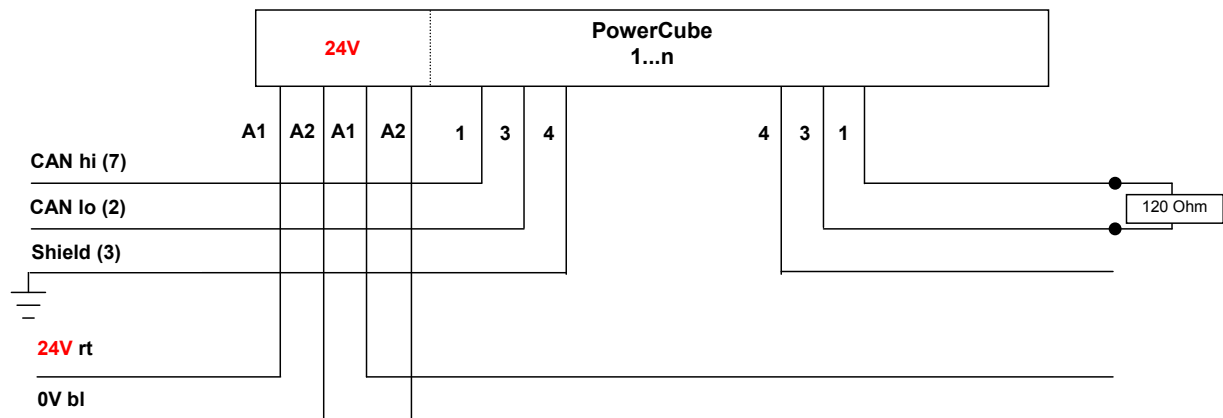


Fig. 9: Assembling example CAN-Bus



Notice!

The CAN bus has to be terminated with 120 Ω on both ends. Please check your CAN-Interface whether there is a terminator integrated! Many interfaces have jumper configurable terminators on board.



6.2.4. Connection PROFIBUS DB



Notice!

Please make sure the A1 and B1 lines of the PROFIBUS are connected exactly as specified above. If communication fails to start you may try to exchange both lines.

The bus must be terminated on both ends using an active Terminator.

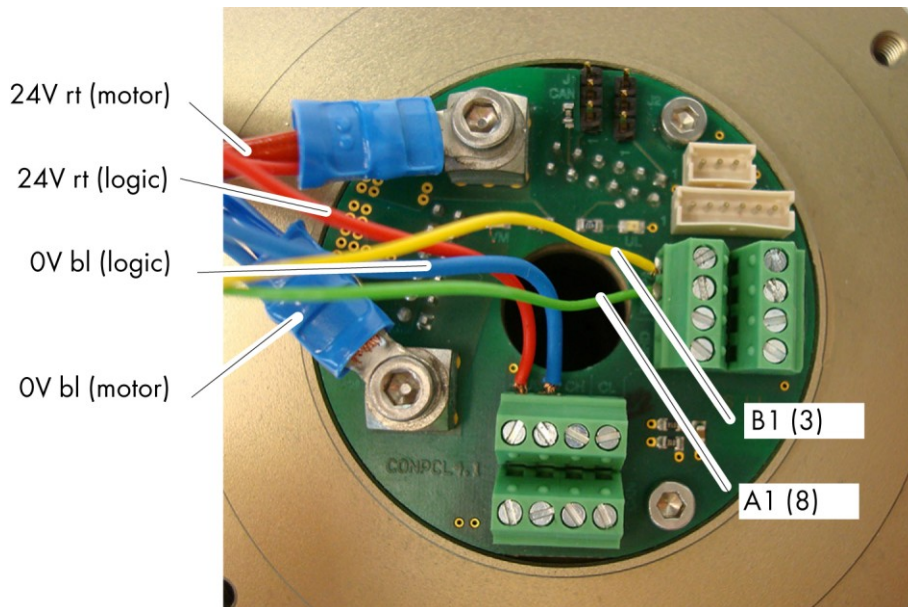
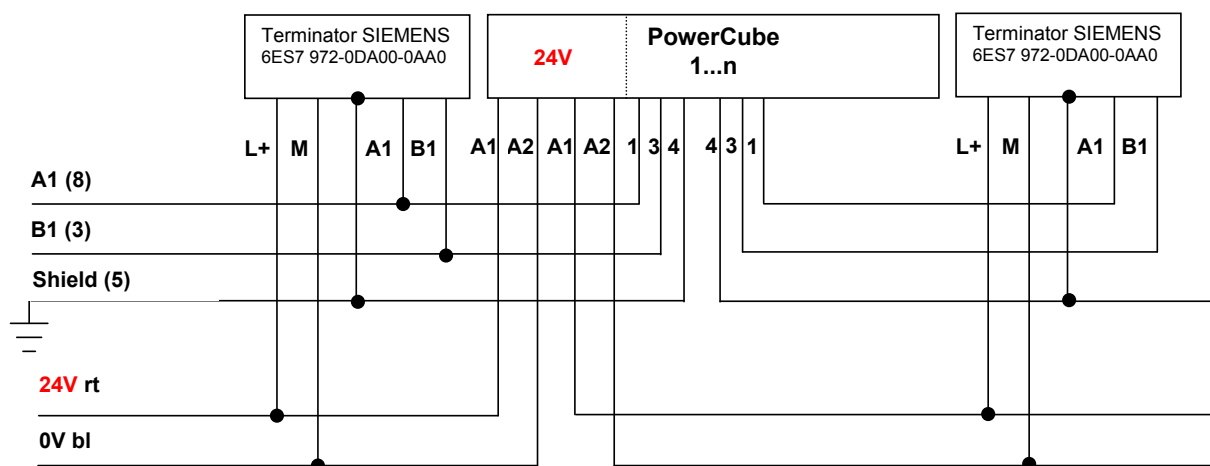


Fig. 10: Assembling example Profi-Bus



6.3. Special arrangements for termination

For termination of CAN-Bus and PROFIBUS a terminator has to be

set. **CAN-Bus**

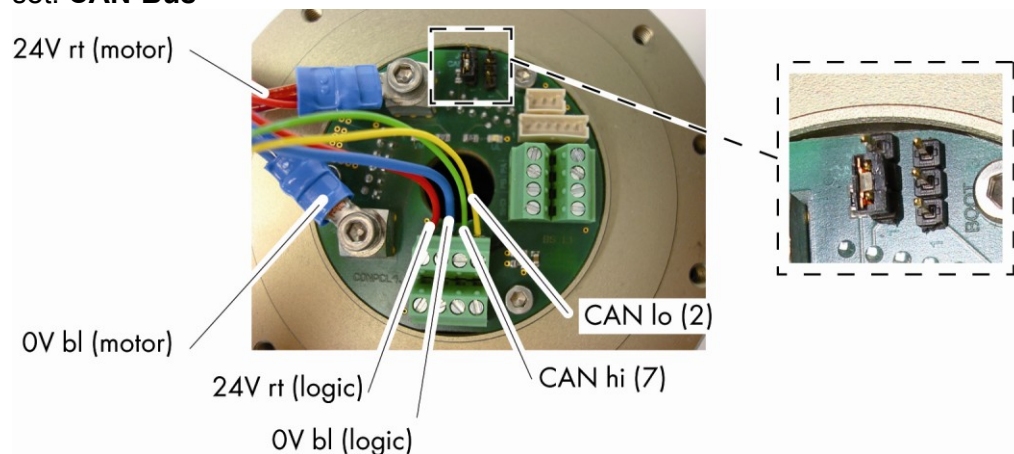


Fig. 11: terminating resistor CAN-Bus

Set the jumper as shown in Fig. 11

PROFIBUS DB

SCHUNK advises the use of an active terminator (e.g. Siemens 6E7 972 0DA00-0AA0)

6.4. Host connectors

6.4.1. Connecting to a RS232-Master (e.g. PC)

Connector (female)	Pin	Color	Description
	1	-	-
	2	white	RxD
	3	brown	TxD
	4	-	-
	5	Shield	GND
	6	-	-
	7	-	-
	8	-	-
	9	-	-

Table 5

6.4.2. Connecting to a CAN-Host(e.g. PC with CAN-board)

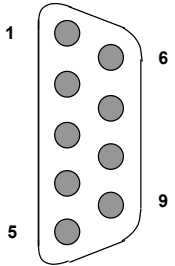
Connector (female)	Pin	Color	Description
	1	-	-
	2	yellow	CAN-Lo
	3	Shielding	GND
	4	-	-
	5	-	-
	6	-	-
	7	green	CAN-Hi
	8	-	-
	9	-	-

Table 6

6.4.3. Connecting to a PROFIBUS-Master (e.g. SPS)

Connector (female)	Pin	Color	Description
	1	-	-
	2	-	-
	3	yellow	B1
	4	-	-
	5	Shield	GND
	6	-	-
	7	-	-
	8	green	A1
	9	-	-

Table 7

6.5. Circuit diagram and maximum cable length

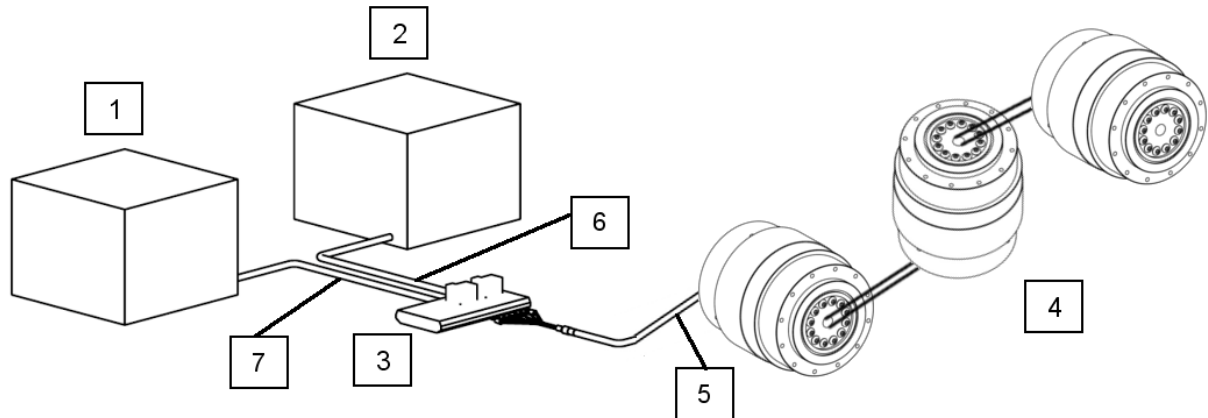


Fig. 12: Circuit diagram for power supply

- 1 Power supply (transformer with rectifier or switching power pack)
- 2 PC, SPS or other suitable control
- 3 PowerCube Terminal Block
- 4 PowerCube-Module 1 to n
- 5 Bus cable from Terminal Block to module
- 6 Cable for Communication
- 7 Cable for power supply

A secure and lasting function of the modules is achieved by limiting the cable lengths to the given maximum. Longer cable connections or use of low quality cables can lead to instable communication and loss of power.

Communication interface	Baud rate	Maximum Length of Bus cable	Typical Acknowledge Time
RS232	9600 bit/s	10 m	(24 + 10 x n) ms *
	19200 bit/s	8 m	(12 + 5 x n) ms *
	38400 bit/s	6 m	(6 + 2.5 x n) ms *
CAN	250 kBit/s	50 m	0.9 ms
	500 kBit/s	30 m	0.6 ms
	1000 kBit/s	9 m	0.5 ms
PROFIBUS DP	1500 kBit/s	30 m	39 ms *

Table 8: Details for Pos. 5 of Fig. 12

(*) In these applications the acknowledge time depends on the amount of modules (n) connected to the bus..

7. System integration and initial operation

7.1. Getting started



Danger due to collapse of the unit!

Overloading the rotary unit can cause the drive belt to break. The result of this is that the brake no longer has any effect on the output and the customer's attachment cannot be held!

- Observe specified loads (see »Technical Data«).
- Secure area of motion of the rotary unit to prevent accidental entry.

These are the 5 steps you need to take:

- Check the system requirements (see Chapter 7.2 page 22)
- Install the communication interface (Hard- and Software) (see Chapter 7.3 page 23)
- Check electrical connection to a power supply and to the communication interface (see Chapter 6.2 „electrical connection“ page 16 to 18)
- Install the Demo-Software (PowerCube Software) (see Chapter 7.4 page 23)
- Check the correct function of the module with the Demo-Software (see Software manual PowerCube.pdf)



Further information can be found Software manual „PowerCube“.

7.2. System requirements

Before you start the installation please check the system requirements. The table following shows the compatibility of communication interfaces and PD operation systems.

PowerCube Communication Interface	Available and supported Interface boards	Supported Operating Systems					
		Win 9x	Win NT	Win 2K	Win XP	Linux	QNX
RS232	PC internal	x	x	x	x	x	x
CAN	ESD PCI331 (PCI-board)	x	x	x	x	x	x
	ESD USB-Mini (USB-interface)	x		x	x	x	
PROFIBUS DP	Simatic CP5611	x	x	x	x		

Table 9

In order to use the PowerCube Modules with the desired communication interface you will need to specify what interface you have installed. This is done by entering a valid InitString

You can find the InitString on the CD-ROM in the File Initstring.txt

7.3. Installing the Communication Interface

Please refer to the installation procedure provided by the vendor of the interface board. All necessary manuals are shipped with the SCHUNK CD-Rom. For latest information please refer to these websites:

manufacturer	Website
ESD Electronic GmbH	www.esd-electronics.com
Siemens AG	www.ad.siemens.de/PROFIBUS

Table 10

Every communication board has an own test program shipped with the board. Using these test programs you can verify the correct installation of the board.

7.4. Installing the PowerCube Software

The PowerCube Software is used for a fast start-up and checking of your PRL-Modules. Installation Files can be found on the provided CD-ROM.

1. Insert the CD-ROM into the CD- drive of you PC and start „PowerCube.setup“.
2. Follow the instructions on your screen.



8. Troubleshooting

Event	Possible cause	Corrective action
Module does not respond / does not move	(a) Communication incorrectly connected (b) Cable damaged	(a) Check connection (see Chapter 6.2 page 16) (b) Check cable for signs of damage. replace all damaged cables
Module stops abruptly (This can be reported by the module with the parameter ERROR_CABLE_BREAK , if the GSD file included in the delivery has been integrated.)	Malfunctions at the bus cable (connection to module was interrupted)	See software manual „PowerCube“.
Program "FLOAT in Intel". Before the display of the result, the program quits	"FLOAT" is a Dos-Command, so the Filename call is wrong interpreted by Win.	Copy program to Hard drive, this is the only way to start it,
After Flashing of a new Firmware (possibly after some time) Error messages appear which are not traceable.	When flashing the Firmware partial values of the configuration are overwritten, e. g. maximum working temperature. To avoid this, transfer a backup copy the configuration after flashing the new Firmware	Before flashing a Firmware, create a backup copy of the configuration.

Table 11

9. Maintenance and care

9.1. Cleaning

- Clean the PRL (Dry materials only) at regular intervals.
- Remove all dirt and swarf. Dirt and swarf tend to collect in the cavities of the module.

9.2. Disassembly of the module

The module may disassembled and repaired only by SCHUNK, otherwise the warrantys expires!

10. Accessories

10.1. Terminal Block

Connecting of signals at the Terminal Block

The Terminal Block has one connection area for input (on the follow picture **IN**) and one for output (on the follow picture **OUT**).

The Terminal Block allows the connecting of an emergency push button for the connected PowerCube modules

The emergency push button connected to the clamps **NIN** and **NOUT** switches off the power supply VM1 und VM2.

Additional the power supply VM1 ,VMS ,logic UL and emergency-circuit are protected by fuses F1 to F4.

If the host connected with CAN, the active Terminator can set at the Terminal Block with the jumper J1.

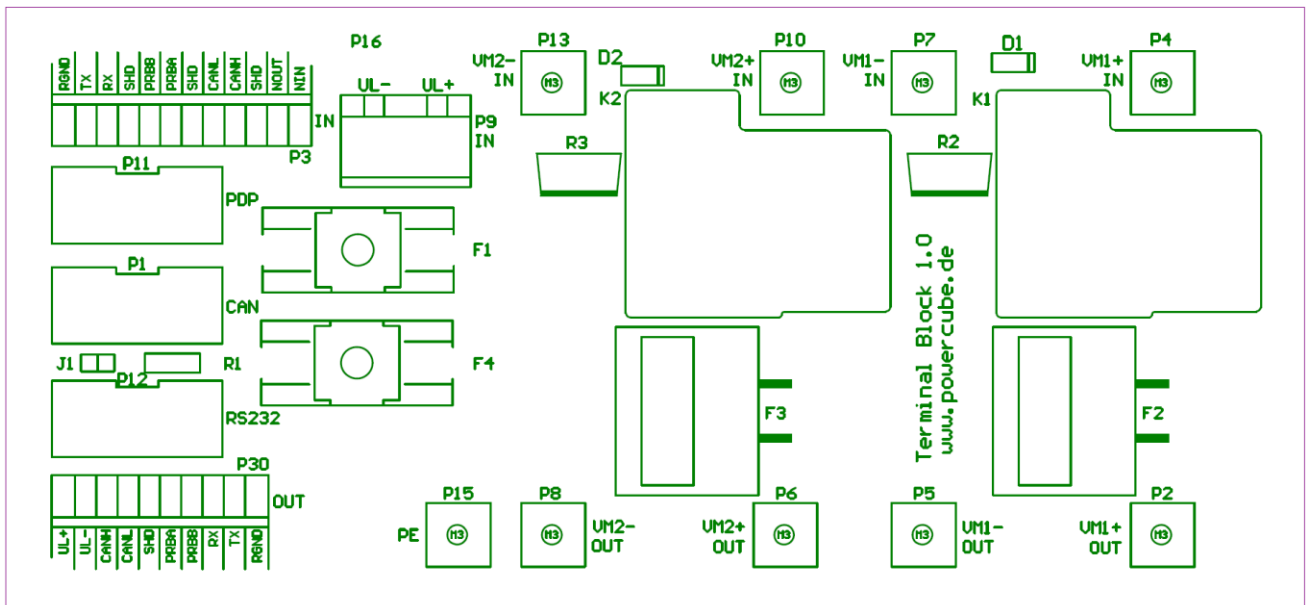


Fig. 13: Terminal Block 1.0

Signal Type		Plug connector	PowerCube cable	Terminal Block (IN)
Logic voltage	0 VDC	-	white →	UL-
	24 VDC	-	brown →	UL+
Motor voltage ¹	0 VDC	-	blue →	VM1-
	24 VDC	-	red →	VM1+
CAN Bus*	Lo	SUB-D9 socket Pin 2	yellow* →	CANL
	Hi	SUB-D9 socket Pin 7	green* →	CANH
	GND	SUB-D9 Socket Pin 3	shield* →	SHD
PROFIBUS DP*	A	SUB-D9 socket Pin 8	yellow* →	PRBA
	B	SUB-D9 socket Pin 3	green* →	PRBB
	GND	SUB-D9 socket Pin 5	shield* →	SHD
RS232*	TxD	SUB-D9 socket Pin 3	yellow* →	TX
	RxD	SUB-D9 socket Pin 2	green* →	RX
	GND	SUB-D9 socket Pin 5	shield* →	RGND

Table 12: Assignment of the Terminal Blocks (see Fig. 13)

* The communication wires are used alternatively.

10.2. Cable

If you need information on the various cables, please contact your SCHUNK-contact person

10.3. Connection Elements

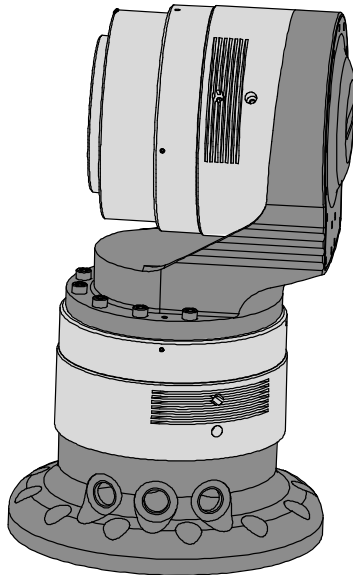


Fig. 14

Connection	Description	ID-No.
Pedestal → PRL 120	Pedestal PRL 120	5517282
PRL 120 → PRL 120	Connection element 120 / 120	5517276
PRL 120 → PRL 100	Connection element 120 / 100	5517277
PRL 100 → PRL 100	Connection element 100 / 100	5517278
PRL 100 → PRL 80	Connection element 100 / 80	5517279
PRL 80 → PRL 80	Connection element 80 / 80	5517280
PRL 80 → PRL 60	Connection element 80 / 60	5517281
PRL 60 → PRL 60	Connection element 60 / 60	5518539

Table 13

11. Translation of original EC declaration of incorporation

In terms of the EC Machinery Directive 2006/42/EC, annex II part B

Manufacturer/
distributor SCHUNK GmbH & Co. KG.
 Spann- und Greiftechnik
 Bahnhofstr. 106 – 134
 74348 Lauffen/Neckar, Germany

We hereby declare that the following product:

Product designation Lightweight Modules
Type designation: PRL 60...PRL 120
ID number: 0306910...0306925

meets the applicable basic requirements of the Directive **Machinery (2006/42/EC)**.

The incomplete machine may not be put into operation until conformity of the machine into which the incomplete machine is to be installed with the provisions of the Machinery Directive (2006/42/EC) is confirmed.

Applied harmonized standards, especially:

EN ISO 12100-1 Safety of machines - Basic concepts, general principles for design -- Part 1:
 Basic terminology, methodology
EN ISO 12100-2 Safety of machines - Basic concepts, general principles for design -- Part 2:
 Technical principles

The manufacturer agrees to forward on demand the special technical documents for the incomplete machine to state offices.

The special technical documents according to Annex VII, Part B, belonging to the incomplete machine have been created.

Person responsible for documentation: Mr. Michael Eckert, Tel.: +49(0)7133/103-2204

Location, date/signature: Lauffen, Germany, January 2010 ppa. 

Title of the signatory Director for Development/Design

12. Contact



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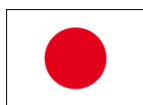
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