



# Automation Products Cable Protection System for Automation Applications

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# Automation Products Introduction

PMA Cable Protection System for Automation applications. This PMA Cable Protection System has been conceived to protect cables and wires in extreme automation and robotic installations. Through different conduit types for various requirements, system supports and a range of special accessories, torsion can be avoided and the stresses upon the cables reduced to a minimum.



# Automation Products Introduction



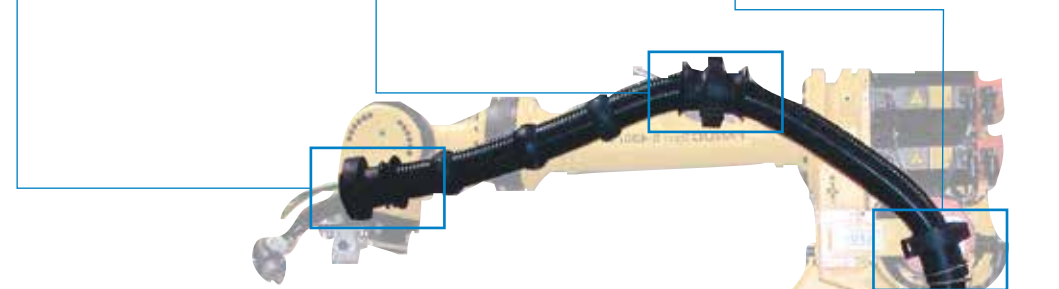
■ Tube clamp with ball joint termination



■ Tube clamp with ball joint sleeve



■ Tube clamp with gliding bush



## Automation accessories

### General technical details

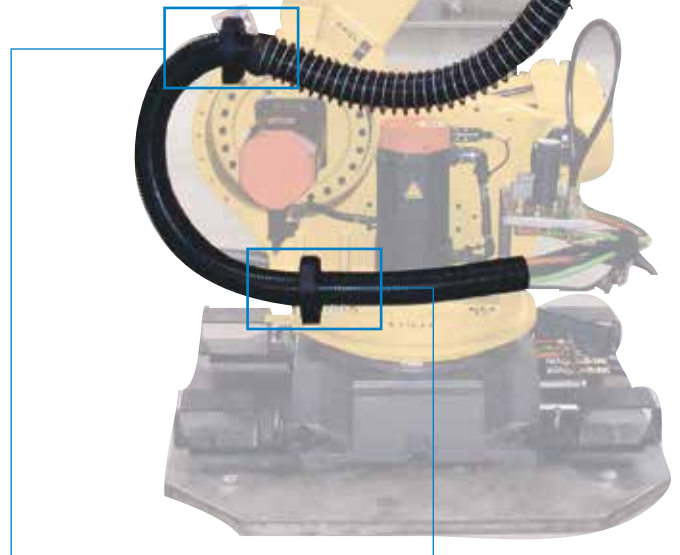
#### Material

- Specially formulated polyamide 6
- Free from halogens, REACH + RoHS compliant
- Temperature range:  $-40\text{ °C}$  to  $+105\text{ °C}$ , short term to  $+160\text{ °C}$

#### Characteristics

- Reduce wear to guidance and control elements
- Increase the degree of freedom of robotic installations
- Allow optimal layout of cables along moving elements
- Increase the lifetime of moving installations
- Allow quick and easy installation

Products in this brochure are based on a size range from NW29–NW70. Many of the individual products described here are available also in other sizes. Please refer to our PMA main catalogue on [www.pma.ch](http://www.pma.ch).



■ Tube clamp with slide half-shells and abrasion protection sleeve

■ Tube clamp with strain relief half-shells



# Automation Products

## Overview of conduits for Automation/movable systems

	XR90	PIS/PIH	ESD	PUE	POS
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### Material

Material	PA12	PA12	PA12	PUR	PP
Special feature	3-layer conduit	flame retarded	antistatic		
Free from halogens, REACH + RoHS compliant	yes	yes	yes	yes	yes
Temperature range	-40 °C ...+95 °C continuous	-40 °C ...+95 °C continuous	-40 °C ...+95 °C continuous	-60 °C ...+50 °C continuous	-25 °C ...+95 °C continuous

### Characteristics

Fatigue/reversed bending					
Multiaxial movements	●	◆	◆	●	-
Abrasion resistance					

### Application areas

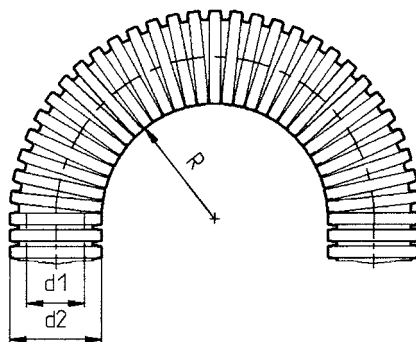
Automation	●	●	◆	◆	●
Robotics	●	●	◆	●	◆

### Features

	with wear indicator	UL 94 V0	electrostatically discharging	for tight bending radii	inexpensive
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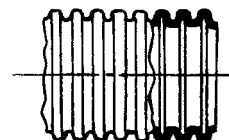
### Key

- |||| very high
- | low
- recommended
- ◆ suitable

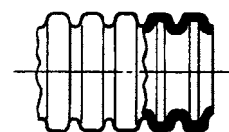


Stat. radius = Lowest recommended bending radius for static (fixed) installation

Dyn. radius = Lowest recommended bending radius for dynamic (flexible) installation



Fine profile T  
Tight bending radius



Coarse profile G  
High pull-out strength

# Automation Products

## Conduits



XR90

### XR90

Three layer corrugated conduit, very flexible, medium-duty. Strain relief half-shell reduction.

- For robotics and automation applications
- With wear indicator

Order No. black	Conduit size		Inside ∅	Outside ∅	Stat./Dyn. radius	PU meter
	NW	metric				
XR90G-29BR	29	32	29.1 mm	34.3 mm	45/110 mm	50
XR90G-36BR	36	40	36.8 mm	42.2 mm	60/165 mm	30
XR90G-48BR	48	50	47.3 mm	54.2 mm	70/200 mm	30
XR90G-56BR	56	68	56.3 mm	67.3 mm	110/270 mm	30
XR90G-70BR	70	80	67.4 mm	79.8 mm	150/350 mm	30

- Outer, intermediate and inner layer made from specially formulated polyamide 12
- Very good chafing resistance
- Excellent resistance to continuous bending
- No abrupt conduit failure due to high tear propagation resistance
- Temperature range: -40 °C to +95 °C, short-term to +150 °C




PIS/PIH

### PIS/PIH

Highly flexible, medium- and heavy-duty

- For robotics and automation applications
- UL 94 V0

	Order No. black	Conduit size		Inside ∅	Outside ∅	Stat./Dyn. radius	PU meter
		NW	metric				
c  US	PIST-29B	29	32	29.0 mm	34.3 mm	45/110 mm	50
	PIST-36B	36	40	36.5 mm	42.5 mm	60/165 mm	30
	PIST-48B	48	50	47.5 mm	54.5 mm	70/180 mm	30
	PIHG-56B	56	68	56.3 mm	67.2 mm	110/270 mm	30
	PIHG-70B	70	80	67.2 mm	79.6 mm	150/350 mm	30

- Specially formulated polyamide 12
- Very good resistance to reversed bending
- Temperature range: -50 °C to +95 °C, short-term to +150 °C

#### Approvals



# Automation Products

## Conduits



ESD

### ESD

#### Very flexible, medium-duty

- For dynamic applications in robotics and automation where electrostatic charge and uncontrolled discharge need to be avoided

Order No. black	Conduit size		Inside ∅	Outside ∅	Stat./Dyn. radius	PU meter
	NW	metric				
ESDT-29B	29	32	29.0 mm	34.3 mm	55/110 mm	50
ESDT-36B	36	40	36.5 mm	42.5 mm	60/160 mm	30
ESDT-48B	48	50	47.5 mm	54.5 mm	70/200 mm	30
ESDG-56B	56	68	56.5 mm	67.0 mm	110/250 mm	30
ESDG-70B	70	80	67.5 mm	80.0 mm	150/330 mm	10

- Specially formulated polyamide 12
- Prevents electrostatic charging
- High dynamic load resistance
- Temperature range: –40 °C to +90 °C, short-term to +150 °C



PUE

### PUE

#### Highly flexible, medium-duty

- For robotic applications with multi-axial movements
- Specially suitable for tight bending-radii

Order No. black	Conduit size		Inside ∅	Outside ∅	Stat./Dyn. radius	PU meter
	NW	metric				
PUET-29B	29	32	28.8 mm	34.5 mm	40/90 mm	30
PUET-36B	36	40	35.8 mm	42.4 mm	50/120 mm	30
PUET-48B	48	50	48.6 mm	54.5 mm	60/130 mm	21
PUEG-56B	56	68	56.3 mm	67.2 mm	90/170 mm	30
PUEG-70B	70	80	68.2 mm	80.5 mm	100/220 mm	30

- Specially formulated polyurethane
- Highest reversed bending resistance
- Excellent chafing characteristics
- Temperature range: –60 °C to +50 °C



POS

### POS

#### Highly flexible, medium-duty

- For automation as well as for machine building and industrial installations, especially where continuous movements occur

Order No. black	Conduit size		Inside ∅	Outside ∅	Stat./Dyn. radius	PU meter
	NW	metric				
POST-29B	29	32	29.0 mm	34.5 mm	50/120 mm	50
POST-36B	36	40	36.5 mm	42.5 mm	60/180 mm	30
POST-48B	48	50	47.5 mm	54.5 mm	70/195 mm	30
POSG-70B	70	80	67.2 mm	79.6 mm	150/350 mm	30

# Automation Products

## Automation accessories



SH

### SH

#### Tube clamp, one-piece

- To be used with GN half-shells to optimally fix/guide conduits
- Serves as a fixation for functional inserts (TK, KE) which increase the degrees of freedom for cable packs and reduce mechanical stresses

Order No. black	Fits with half-shell GN			Fits to conduit size		Length	Height	Width
	Fine Profile	Coarse Profile	Slide	NW	metric			
BSH-R29	BGN-S29T	BGN-S29G	BGN-R29	29	32	71.0 mm	67.0 mm	26.0 mm
BSH-R36	BGN-S36T	BGN-S36G	BGN-R36	36	40	81.5 mm	77.5 mm	26.0 mm
BSH-R48	BGN-S48T	BGN-S48G	BGN-R48	48	50	96.0 mm	91.0 mm	26.0 mm
BSH-R56	–	BGN-S56G	BGN-R56	56	68	112.5 mm	103.5 mm	30.0 mm
BSH-R70	–	BGN-R70G	BGN-R70	70	80	149.0 mm	144.0 mm	40.0 mm

- Content of delivery:  
Tube clamp, 1 PT screw, 1 straight pin



GN

### GN

#### Strain relief half-shell

- For conduit fixation in combination with tube clamp SH
- Fixes conduit against axial movements
- Allows for rotation of the conduit (within tube clamp SH)

Order No. black	Fine Profile	Coarse Profile	Fits with:	Fits to conduit size		Outside	Width
				NW	metric	∅	
BGN-S29T	BGN-S29G	BGN-S29G	BSH-R29	29	32	47.0 mm	34.0 mm
BGN-S36T	BGN-S36G	BGN-S36G	BSH-R36	36	40	55.0 mm	34.0 mm
BGN-S48T	BGN-S48G	BGN-S48G	BSH-R48	48	50	66.5 mm	36.5 mm
–	BGN-S56G	BGN-S56G	BSH-R56	56	68	81.0 mm	38.0 mm
–	BGN-R70G	BGN-R70G	BSH-R70	70	80	105.0 mm	45.0 mm
–	BGN-S70G	BGN-S70G	BLH-R70G	70	80	93.5 mm	38.0 mm



GN

### GN

#### Slide half-shell

- Insert in combination with tube clamp SH
- Allows gliding of the conduit in the clamps and thus reduce axial stress on the conduit
- Allow for both rotation of the conduit and axial movement

Order No. black	Fits with:	Fits to conduit size		Outside	Width
		NW	metric	∅	
BGN-R29	BSH-R29	29	32	47.0 mm	34.0 mm
BGN-R36	BSH-R36	36	40	55.0 mm	36.0 mm
BGN-R48	BSH-R48	48	50	66.5 mm	36.5 mm
BGN-R56	BSH-R56	56	68	81.0 mm	38.0 mm
BGN-R70	BSH-R70	70	80	105.0 mm	45.0 mm



# Automation Products

## Automation accessories



GN

### GN

#### Strain relief half-shell reduction

- For reduction to the next smaller conduit size
- In combination with ball joint parts NW70

Order No. black	Fits to	Fits to conduit size metric		Conduit profile	Outside $\varnothing$ Width
BGN-R56G/70G	BTR-R70G	70–56	80–68	G	80.0 mm / 35.0 mm
	BKE-R70G				



GS

### GS

#### Grommet half-shell

- Insert to the SH-R70 tube clamp to hold a grommet (KS-R70/xx)

Order No. black	Fits to conduit size metric		Outside $\varnothing$	Width
BGS-R70	70	80	105.0 mm	45.0 mm



KS

### KS

#### Grommet

- For arrangement and strain relief of a loom of hoses and leads of given dimensions in cable assemblies
- To be fixed in GS-R70 grommet half-shell or directly inserted into KE-R70G

Order No. black	Fits to conduit size NW	Inside $\varnothing$	Outside $\varnothing$	Width
BKS-R70/00	70	17.5 mm	81.5 mm	35.0 mm
BKS-R70/01	70	28.0 mm	81.5 mm	35.0 mm
BKS-R70/02	70	13.2 mm	81.5 mm	35.0 mm
BKS-R70/03	70	17.5 mm	81.5 mm	35.0 mm
BKS-R70/04	70	17.5 mm	81.5 mm	30.0 mm
BKS-R70/05	70	28.0 mm	81.5 mm	30.0 mm

- Special polymeric material
- Free from halogens and cadmium

# Automation Products

## Automation accessories



TK

### TK

#### Ball joint sleeve

- Used within SH-R70 tube clamp
- Increased degree of freedom for cable packs in robotic applications
- The ball joint offers additional flexibility and reduces mechanical stress on the conduit
- Can be used with TR strain relief insert to fix the conduit in axial direction

Order No. black	Fits to conduit size NW metric		PT screws	Outside ∅	Length
BTK-R70	70	80	KA 50x20	122.0 mm	140.0 mm

- Content of delivery:  
Ball joint sleeve, 4 PT screws



TR

### TR

#### Strain relief insert

- Used to fix the conduit against axial movements in TK ball joint sleeves
- Rotation of the conduit remains possible

Order No. black	Fits to conduit size NW metric		Outside ∅	Length
BTR-R70G	70	80	92.0 mm	25.0 mm



KE

### KE

#### Ball joint termination

- Used in the SH-R70 tube clamp
- Offers highest flexibility at the end of the installation
- Provides additional relief to conduit and cables due to reduced mechanical stress
- A grommet can be inserted directly into this termination to hold and strain-relief the cables

Order No. black	Fits to conduit size NW metric		PT screws	Outside ∅	Length
BKE-R70G	70	80	KA 50x20	122.0 mm	128.0 mm

- Content of delivery:  
Ball joint termination, 4 PT screws

# Automation Products

## Automation accessories



LH

### LH

#### Tube clamp, two-pieces

- In automation applications for fixing PMA conduits
- Compact, space saving design

Order No. black	Including half-shell GN	Fits to conduit size		Conduit profile	Length	Height	Width
		NW	metric				
BLH-R56G	BGN-S56G/70G	56	68	G	121.0 mm	128.0 mm	30.0 mm
BLH-R70G	BGN-S70G	70	80	G	121.0 mm	128.0 mm	30.0 mm

- Allows optimum installations in automation applications due to space saving design
- Content of delivery:  
Tube clamp, GN half shells, 2 PT screws, 1 straight pin



SS/SV

### SS/SV

#### Abrasion protection sleeve

- Abrasion protection for corrugated conduits in positions exposed to chafing
- Excellent chafing characteristics

Order No. black	Fits to conduit size		Outside Ø	Width
	NW	metric		
BSS-29	29	32	55.0 mm	26.0 mm
BSS-36	36	40	63.0 mm	30.0 mm
BSS-48	48	50	75.0 mm	30.0 mm
BSS-56G	56	68	90.0 mm	33.0 mm
BSV-70G	70	80	108.0 mm	60.0 mm

- Content of delivery:  
Abrasion protection sleeves with assembling screws



DKLK

### DKLK

#### Heavy-duty swivel base

- For SH + LH tube clamps
- Allows rotation of cable pack supports

Order No. black	Fits to tube clamp	Length	Height	Width
DKLK-R56X56	BSH-R29/BSH-R48	56.0 mm	56.0 mm	21.5 mm
DKLK-R100X80	BSH-R70	100.0 mm	80.0	20.0 mm
DKLK-R100X80/01	BSH-R29/BSH-R48	100.0 mm	80.0 mm	23.0 mm

- Black anodised aluminium
- Robust construction, sealed high quality bearing with minimal play
- Temperature range: -50 °C to +105 °C
- Content of delivery:  
Swivel Base, 1 hexagon socket head cap screw

# Automation Products

## Automation accessories



AS

### AS

#### Conduit support sleeve

– Conduit support sleeve for PMA conduit type PUE to increase the system pull-out strength

Order No. black	Fits to conduit size metric		Conduit profile	Inside Ø	Outside Ø	Length
BAS-29T	29	32	T	30.0 mm	30.0 mm	34.0 mm
BAS-36T	36	40	T	38.0 mm	38.0 mm	47.0 mm
BAS-48T	48	50	T	50.0 mm	50.0 mm	47.0 mm



ES

### ES

#### Internal conduit sleeve support

– Conduit support sleeve for PMA conduits type PUE and PIH to increase the system pull-out strength

Order No. black	Fits to conduit size metric		Conduit profile	Inside Ø	Outside Ø	Length
BES-70G	70	80	G	63.0 mm	80.0 mm	23.0 mm



GG

### GG

#### Flange straight

– Ingress protection: IP50 without conduit seal ring (IP65 with conduit seal ring)

Order No. black	Order No. grey	Fits to conduit size NW	Width	Height	Depth
BGG-56	SGG-56	56	82.0 mm	97.0 mm	42.0 mm
BGG-70	SGG-70	70	97.0 mm	114.0 mm	48.0 mm

- Flange seal FG04 made from EPDM
- Flange seal FG04/01 made from NBR
- Temperature range with FG04:
  - 40 °C to +105 °C
- Temperature range with FG04/01:
  - 25 °C to +70 °C
- Content of delivery: Flange part, fixation clamps (incl. 2 screws), flange seal (FG04 or FG04/01), conduit seal ring (optional for IP65)

#### Approvals



# Automation Products

## Automation accessories



GO

### Approvals



### GO

#### Flange 90° elbow

- Ingress protection: IP50 without conduit seal ring (IP65 with conduit seal ring)

Order No. black	Order No. grey	Fits to conduit size NW	Width	Height	Depth
BGO-56	SGO-56	56	82.0 mm	97.0 mm	101.0 mm
BGO-70	SGO-70	70	97.0 mm	114.0 mm	115.0 mm

- Flange seal FG04 made from EPDM
- Flange seal FG04/01 made from NBR
- Temperature range with FG04: –40 °C to +105 °C
- Temperature range with FG04/01: –25 °C to +70 °C
- Content of delivery: Flange part, fixation clamps (incl. 2 screws), flange seal (FG04 or FG04/01), conduit seal ring (optional for IP65)



GH

### GH

#### Tube clamp, two-pieces

- For general machine and installation applications

Order No. black	Order No. grey	Fits to conduit size		Width	Fixing screws
		NW	metric		
BGH-23	SGH-23	23	25	16.0 mm	2 x M5
BGH-29	SGH-29	29	32	19.0 mm	2 x M6
BGH-36	SGH-36	36	40	24.0 mm	2 x M6
BGH-48	SGH-48	48	50	24.0 mm	2 x M6

- Integrated rib provides axial strain relief
- Allows turning of the conduit thus avoiding torsion stresses
- Pre-fixation on the conduit possible
- Allows solid fixation with 2 screws



SGS

### SGS

#### Tube clamp

- For fixation of static conduits

Order No. black	Fits to conduit size NW	Width	Height	Depth
SGS-36	36	80.0 mm	48.0 mm	19.0 mm
SGS-48	48	94.0 mm	58.0 mm	19.0 mm
SGS-56	56	118.0 mm	72.0 mm	24.0 mm
SGS-70	70	130.0 mm	85.0 mm	24.0 mm

- Galvanized steel
- Elastomer profile (EPDM) free from halogens
- Smooth connection to PMA conduits
- Good resistance to ozone and ageing
- Temperature range: –40 °C to +120 °C








# Automation Products

## Possible combinations

### Tube clamp and half-shell

	Tube clamp	Half-shells		Swivel base
		Slide half-shells	Strain relief half-shells	
	SH	GN	GN	DKLK
				
Conduit size	Tube clamp	Slide half-shell	Strain relief half-shell	Swivel base
29	BSH-R29	BGN-R29	BGN-S29*	DKLK-R56x56
36	BSH-R36	BGN-R36	BGN-S36*	DKLK-R56x56
48	BSH-R48	BGN-R48	BGN-S48*	DKLK-R56x56
56	BSH-R56	BGN-R56	BGN-S56	DKLK-R100x80
70	BSH-R70	BGN-R70	BGN-R70G	DKLK-R100x80
				
		SH + GN	SH + GN	SH + DKLK

### Tube clamp and ball joint sleeve

	SH	TK	TK + TR + (GN)	DKLK
				
Conduit size	Tube clamp	Slide half-shell	Strain relief insert	Swivel base
56	BSH-R70	BTK-R70	BTK-R70 + BTR-R70G + BGN-R56G/70G	DKLK-R100x80
70	BSH-R70	BTK-R70	BTK-R70 + BTR-R70G	DKLK-R100x80
				
		SH + TK	SH + TK + TR + (GN)	SH + DKLK

### Tube clamp and ball joint termination

	SH	KE + (GN)	DKLK
			
Conduit size	Tube clamp	Ball joint termination	Swivel base
56	BSH-R70	BKE-R70G + BGN-R56G/70G	DKLK-R100x80
70	BSH-R70	BKE-R70G	DKLK-R100x80
			
		SH + KE + (GN)	SH + DKLK

\* Replace with "T" to order fine profile or "G" to order coarse profile



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