



Automation Products

PMA Cable Protection System for Automation Applications

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 accessories

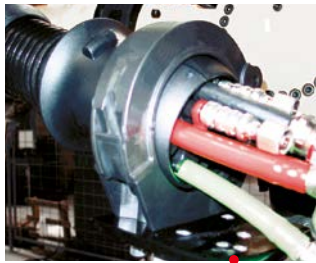
General technical details

Material

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

Characteristics

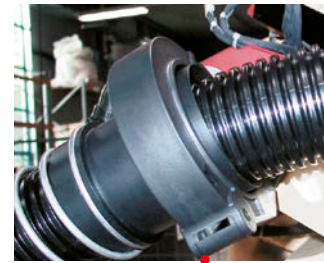
- Reduce wear to guidance and control elements
- Increase the degree of freedom of robotic installations
- Allow optimal layout of cables along moving elements
- Increase the lifetime of moving installations
- Allow quick and easy installation



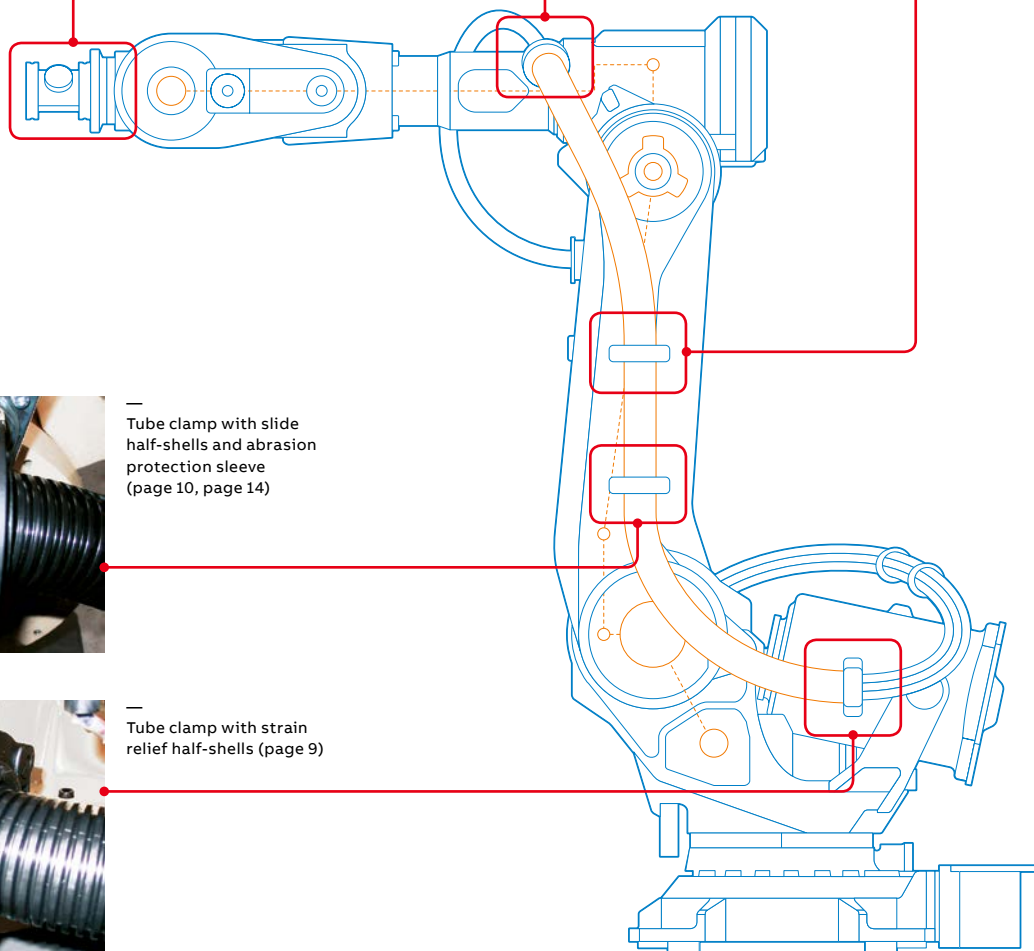
— Tube clamp with ball joint termination (page 13)



— Tube clamp with ball joint sleeve (page 12)



— Tube clamp with gliding bush



— Tube clamp with slide half-shells and abrasion protection sleeve (page 10, page 14)



— Tube clamp with strain relief half-shells (page 9)

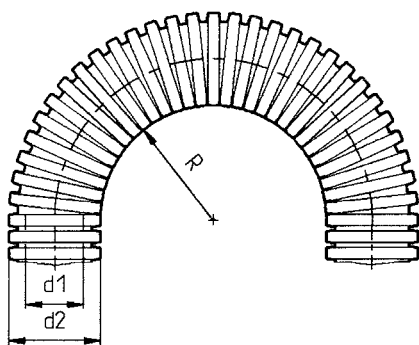
Automation Products

Overview of conduits for Automation/movable systems

	XR90	PIS/PIH	ESD	PUE	POS
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

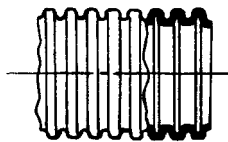
Key

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

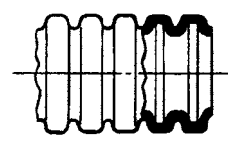


Stat. radius = Lowest recommended bending radius for static (fixed) installation

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 – Three layer corrugated conduit, very flexible, medium-duty

- For robotics and automation applications
- With wear indicator (three different colours)

Order No. black	Conduit size		Inside Ø	Outside Ø	Stat./Dyn. radius	PU meter
	NW	metric				
XR90G-233R	23	25	22.7 mm	28.4 mm	40/100 mm	50
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

Technical data

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:

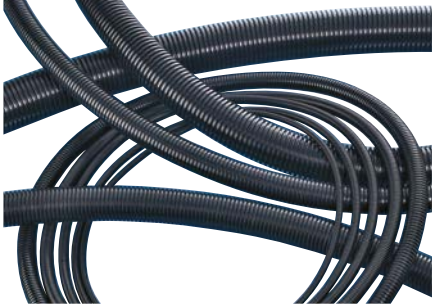
-40 °C to +95 °C, short-term to +150 °C

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.

For smaller conduit sizes please ask your local sales contact.

Automation Products

Conduits



PIS/PIH – Highly flexible, medium- and heavy-duty

- For robotics and automation applications
- UL 94 V0



Order No. black	Conduit size		Inside Ø	Outside Ø	Stat./Dyn. radius	PU meter
	NW	metric				
PIST-23B	23	25	22.6 mm	28.4 mm	35/90 mm	50
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

Technical data

Specially formulated polyamide 12

Very good resistance to reversed bending

Temperature range:

-50 °C to +95 °C, short-term to +150 °C

Automation Products

Conduits



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 Ø	Outside Ø	Stat./Dyn. radius	PU meter
	NW	metric				
ESDT-23B	23	25	22.6 mm	28.4 mm	45/90 mm	50
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

Technical data

Specially formulated polyamide 12

Prevents electrostatic charging

High dynamic load resistance

Temperature range:

-40 °C to +90 °C, short-term to +150 °C

Automation Products

Conduits



PUE – Highly flexible, medium-duty

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

Order No. black	Conduit size		Inside Ø	Outside Ø	Stat./Dyn. radius	PU meter
	NW	metric				
PUET-23B	23	25	22.4mm	28.5 mm	35/70 mm	50
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

Technical data

Specially formulated polyurethane

Highest reversed bending resistance

Excellent chafing characteristics

Temperature range: -60 °C to +50 °C



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 Ø	Outside Ø	Stat./Dyn. radius	PU meter
	NW	metric				
POST-23B	23	25	22.6 mm	28.5 mm	40/100 mm	50
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

For smaller conduit sizes please ask your local sales contact.

Automation Products

Automation accessories



SH – Tube clamp, one-piece

- Serves as a fixation for functional inserts which increase the degrees of freedom for cable packs and reduce mechanical stresses
- To be used with: GN or GS half-shells, SSK, TK or KE ball-joint elements

Order No. black	Length	Height	Width
BSH-R23	63.3 mm	60.5 mm	26.0 mm
BSH-R29	70.3 mm	67.0 mm	26.0 mm
BSH-R36	81.6 mm	77.5 mm	26.0 mm
BSH-R48	95.8 mm	91.0 mm	26.0 mm
BSH-R56	112.6 mm	109.8 mm	30.0 mm
BSH-R70	148.7 mm	144.0 mm	40.0 mm

Technical data

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



GN – Strain relief half-shell

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

Order No. black Fine Profile	Coarse Profile	Fits with tube clamp	Fits to conduit size		Outside ø	Width
			NW	metric		
BGN-S23T	BGN-S23G	BSH-R23	23	25	39.5 mm	34.0 mm
BGN-S29T	BGN-S29G	BSH-R29	29	32	47.0 mm	34.0 mm
BGN-S36T	BGN-S36G	BSH-R36	36	40	55.0 mm	36.5 (T) / 34.0 (G) mm
BGN-S48T	BGN-S48G	BSH-R48	48	50	66.5 mm	34.0 mm
–	BGN-S56G	BSH-R56	56	68	81.0 mm	38.0 mm
–	BGN-R70G	BSH-R70	70	80	105.0 mm	45.0 mm
–	BGN-S70G	BLH-R70	70	80	93.5 mm	38.0 mm

Automation Products

Automation accessories



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 Ø	Width
		NW	metric		
BGN-R29	BSH-R29	29	32	47.0 mm	34.0 mm
BGN-R36	BSH-R36	36	40	55.0 mm	36.5 mm
BGN-R48	BSH-R48	48	50	66.5 mm	34.0 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



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 with	Fits to conduit size		Conduit profile	Outside Ø Width
		NW	metric		
BGN-R56G/70G	BTR-R70G BKE-R70G	70–56	80–68	G	80.0 mm / 35.0 mm

Automation Products

Automation accessories



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		Outside Ø	Width
	NW	metric		
BGS-R70	70	80	105.0 mm	45.0 mm



SSK – Ball-joint half shells

- Ball-joint half shells providing additional freedom of movement (15°–20°) for corrugated conduits fixed in SH automation tube clamps

Order No. black	Fits to conduit size		To be used with tube clamps	Dimensions (nom.)		Complete Kit part number
	NW	metric		d1	A	
BSSK-23GT	23	25	BSH-R23	42.2 mm	27 mm	KIT-BSSK/R23GT
BSSK-29GT	29	32	BSH-R29	48.1 mm	28 mm	KIT-BSSK/R29GT
BSSK-36GT	36	40	BSH-R36	55.0 mm	30 mm	KIT-BSSK/R36GT
BSSK-48GT	48	50	BSH-R48	65.9 mm	30 mm	KIT-BSSK/R48GT
BSSK-56G	56	68	BSH-R56	80.9 mm	34 mm	KIT-BSSK/R56G

Automation Products

Automation accessories



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		PT screws	Outside Ø	Length
	NW	metric			
BTK-R70	70	80	KA 50x20	122.0 mm	140.0 mm

Technical data

Content of delivery: Ball joint sleeve, 4 PT screws



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		Outside Ø	Length
	NW	metric		
BTR-R70G	70	80	92.0 mm	25.0 mm

Automation Products

Automation accessories



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		PT screws	Outside Ø	Length
	NW	metric			
BKE-R70G	70	80	KA 50x20	122.0 mm	128.0 mm

Technical data

Content of delivery: Ball joint termination, 4 PT screws



LH – Tube clamp, two-pieces

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

Order No. black	Contains tube clamps + half-shell GN	Fits to conduit size		Conduit profile	Length	Height	Width
		NW	metric				
BLH-R56G	BLH-R70 + BGN-S56G/70G	56	68	G	121.0 mm	128.0 mm	30.0 mm
BLH-R70G	BLH-R70 + BGN-S70G	70	80	G	121.0 mm	128.0 mm	30.0 mm

Technical data

Allows optimum installations in automation applications due to space saving design

Content of delivery: Tube clamp LH, GN half shells, 2 PT screws, 1 straight pin

Automation Products

Automation accessories



SS/SV – Abrasion protection sleeve

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

Order No. black	Fits to conduit size		Outside Ø	Width
	NW	metric		
BSS-23	23	25	49.0 mm	26.0 mm
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

Technical data

Content of delivery:
Abrasion protection sleeves with assembling screws



DKLK – Heavy-duty swivel base

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

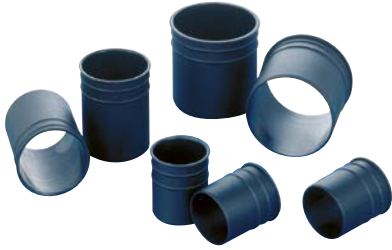
Order No. black	Fits to tube clamp	Length	Width	Height
DKLK-R56X56	BSH-R29/BSH-R48	56.0 mm	56.0 mm	21.5 mm
DKLK-R100X80	BSH-R70	100.0 mm	80.0	20.0 mm
DKLK-R100X80/01	BSH-R29/BSH-R48	100.0 mm	80.0 mm	23.0 mm

Technical data

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 – 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		Conduit profile	Inside ∅	Outside ∅	Length
	NW	metric				
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 – 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		Conduit profile	Inside ∅	Outside ∅	Length
	NW	metric				
BES-70G	70	80	G	63.0 mm	80.0 mm	23.0 mm

Automation Products

Automation accessories



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

Technical data

Flange seal FGO4 made from EPDM

Flange seal FGO4/01 made from NBR

Temperature range with FGO4: -40 °C to +105 °C

Temperature range with FGO4/01: -25 °C to +70 °C

Content of delivery: Flange part, fixation clamps (incl. 2 screws), flange seal (FGO4 or FGO4/01), conduit seal ring (optional for IP65)

Automation Products

Automation accessories



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

Technical data

Flange seal FGO4 made from EPDM

Flange seal FGO4/01 made from NBR

Temperature range with FGO4: -40 °C to +105 °C

Temperature range with FGO4/01: -25 °C to +70 °C

Content of delivery: Flange part, fixation clamps (incl. 2 screws), flange seal (FGO4 or FGO4/01), conduit seal ring (optional for IP65)

Automation Products

Automation accessories



GH – Tube clamp, one-piece

- 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

Technical data

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

Automation Products

Automation accessories



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

Technical data

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


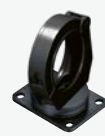
Tube clamp and half-shell

	Tube clamp	Half-shells		Swivel base
		Slide half-shells	Strain relief half-shells	
	BSH	BGN	BGN	DKLK
				
Conduit size	Tube clamp	Slide half-shell	Strain relief half-shell	Swivel base
23	BSH-R23		BGN-S23*	DKLK-R56x56
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-S56G	DKLK-R100x80
70	BSH-R70	BGN-R70	BGN-R70G	DKLK-R100x80
				
		BSH + BGN	BSH + BGN	BSH + DKLK

Tube clamp and ball joint sleeve

	BSH	BTK	BSSK; BTK + BTR + (BGN)	DKLK
				
Conduit size	Tube clamp	Slide half-shell	Strain relief insert	Swivel base
23	BSH-R23		BSSK-23GT	
29	BSH-R29		BSSK-29GT	DKLK-R56x56
36	BSH-R36		BSSK-36GT	DKLK-R56x56
48	BSH-R48		BSSK-48GT	DKLK-R56x56
56	BSH-R56		BSSK-56G	DKLK-R56x56
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
			 	
		BSH + BTK	BSH + BSSK BSH + BTK + BTR + (BGN)	BSH + DKLK

Conduit size	Tube clamp
56	BSH-R70
70	BSH-R70

Conduit size	Ball joint termination	Swivel base
56	BKE-R70G + BGN-R56G/70G	DKLK-R100x80
70	BKE-R70G	DKLK-R100x80
		
	BSH + BKE + (BGN)	BSH + DKLK

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

Index

Products in alphabetical order

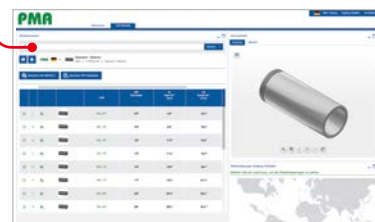
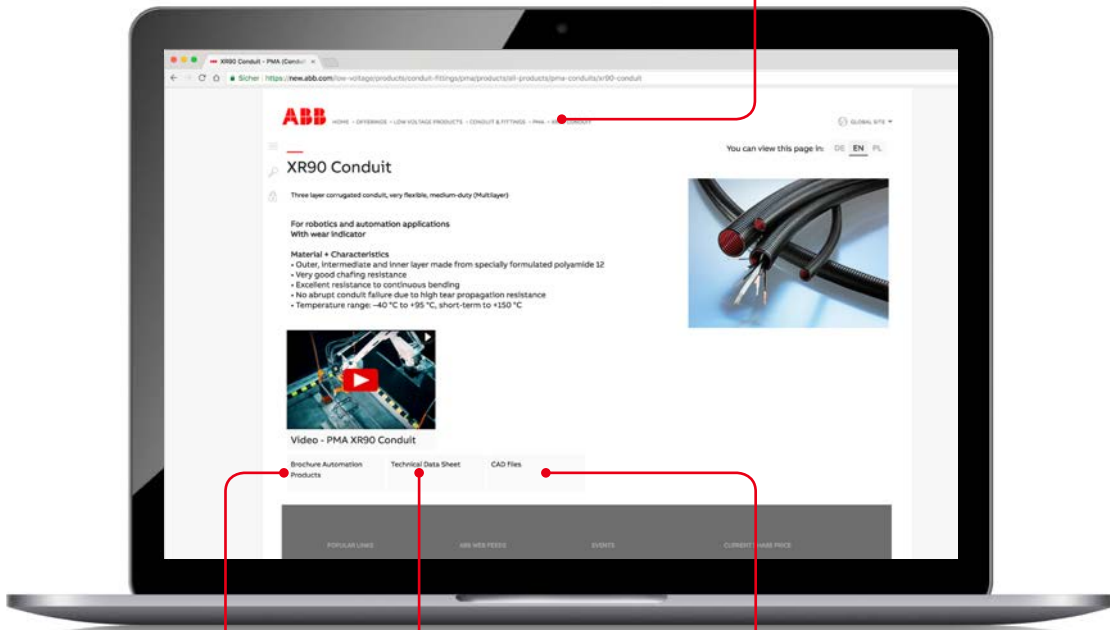
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BAS-36T	7TAA292850R0001	15	ESDG-70B.10	7TCA292000R7722	7
BAS-48T	7TAA292850R0002	15	ESDT-29B.50	7TAA292240R0054	7
BES-70G	7TAA292850R0012	15	ESDT-36B.30	7TAA292240R0055	7
BGG-56	7TAA292860R0001	16	ESDT-48B.30	7TAA292240R0056	7
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BGH-48	7TAA292720R0017	18	PIST-48B.30	7TAA292240R0169	6
BGN-R29	7TAA292890R0001	10	POSG-70B.30	7TAA292900R0008	8
BGN-R36	7TCA292000R7436	10	POST-29B.50	7TAA292240R0175	8
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BGN-R56G/70G	7TAA292890R0007	10	PUEG-56B.30	7TAA292360R0043	8
BGN-R70	7TAA292890R0009	10	PUEG-70B.30	7TAA292360R0044	8
BGN-R70G	7TAA292890R0010	9	PUET-29B.30	7TAA292900R0005	8
BGN-S29G	7TAA292680R0005	9	PUET-36B.30	7TAA292900R0006	8
BGN-S29T	7TAA292680R0006	9	PUET-48B.21	7TAA292900R0007	8
BGN-S36G	7TAA292680R0007	9	SGH-23	7TAA292720R0047	18
BGN-S36T	7TAA292680R0008	9	SGH-29	7TAA292720R0048	18
BGN-S48G	7TAA292680R0009	9	SGH-36	7TAA292720R0049	18
BGN-S48T	7TAA292680R0010	9	SGH-48	7TAA292720R0050	18
BGN-S56G	7TCA292000R7438	9	SGS-36	7TAA292720R0061	19
BGN-S70G	7TAA292680R0011	9	SGS-48	7TAA292720R0062	19
BGO-56	7TAA292860R0010	17	SGS-56	7TAA292720R0063	19
BGO-70	7TAA292860R0011	17	SGS-70	7TAA292720R0064	19
BGS-R70	7TAA292890R0011	11	XR90G-29BR.50	7TAA292240R0322	5
BKE-R70G	7TAA292890R0012	13	XR90G-36BR.30	7TAA292240R0323	5
BLH-R56G	7TCA292000R0025	13	XR90G-48BR.30	7TAA292240R0324	5
BLH-R70G	7TCA292000R0026	13	XR90G-56BR.30	7TCA292000R7415	5
BSH-R29	7TAA292890R0015	9	XR90G-70BR.30	7TCA292000R7414	5
BSH-R36	7TCA292000R7433	9			
BSH-R48	7TAA292890R0016	9			
BSH-R56	7TCA292000R7435	9			
BSH-R70	7TAA292890R0017	9			
BSS-29	7TAA292850R0015	14			
BSS-36	7TAA292850R0016	14			
BSS-48	7TAA292850R0017	14			
BSS-56G	7TAA292850R0018	14			
BSSK-23GT	7TCA292000R9835	11			
BSSK-29GT	7TCA292000R9729	11			
BSSK-36GT	7TCA292000R9731	11			
BSSK-48GT	7TCA292000R9818	11			
BSSK-56G	7TCA292000R9820	11			
BSV-70G	7TAA292850R0019	14			
BTK-R70	7TAA292890R0018	12			
BTR-R70G	7TAA292780R0022	12			
DKLK-R100X80	7TAA292890R0019	15			
DKLK-R100X80/01	7TAA292890R0020	15			
DKLK-R56X56	7TAA292890R0021	15			

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ABB Switzerland Ltd.

PMA Cable Protection
Aathalstrasse 90
CH-8610 Uster
Phone +41 58 585 00 11
pma-info@ch.abb.com

www.pma.ch

abb.com



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