



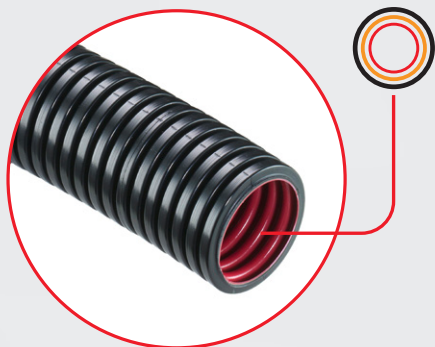
PMA® Cable Protection for the robotics and automation industry

Boosting productivity, preserving safety across production cycles.



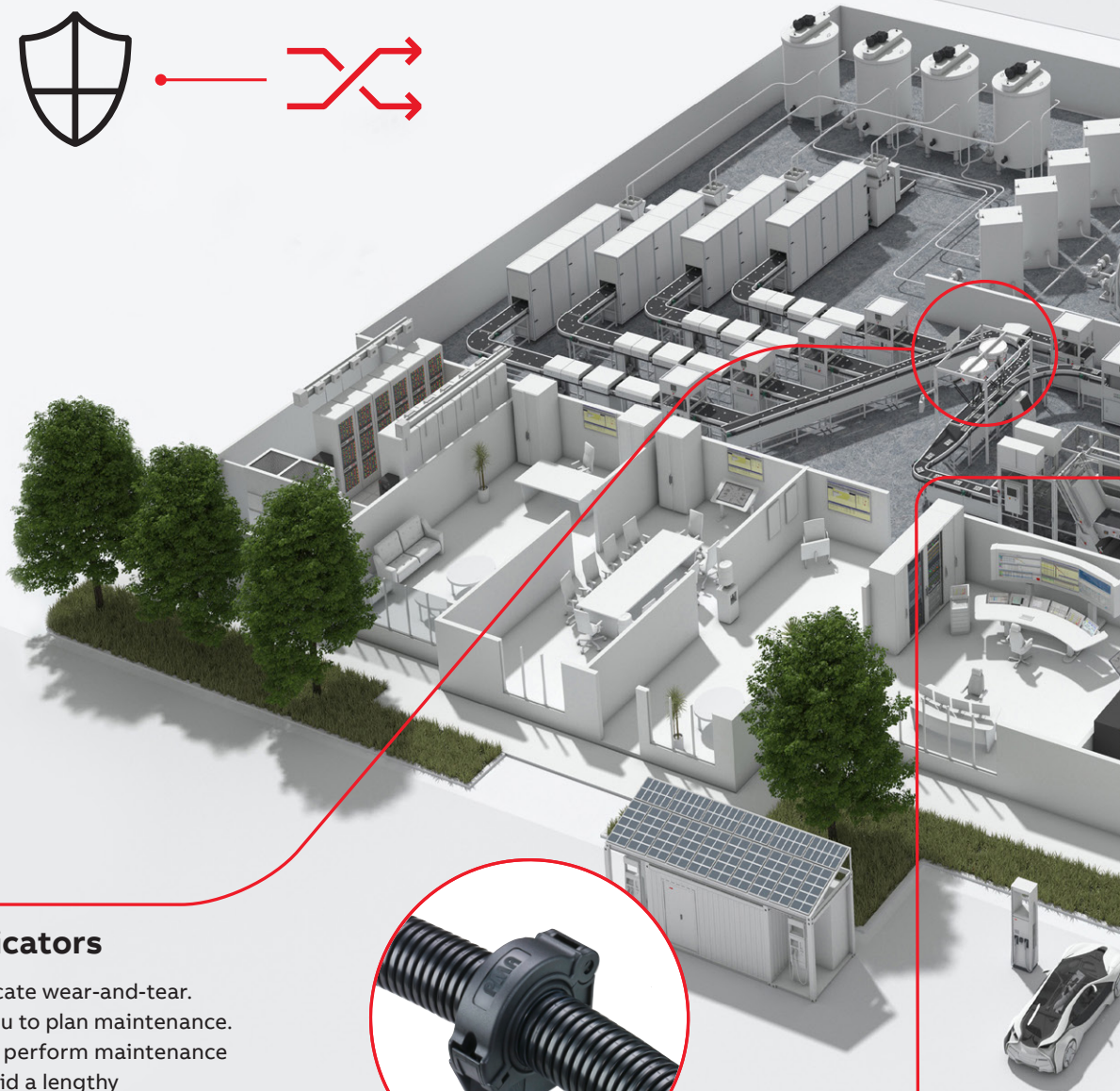
Maintenance indicators

Smart functionalities indicate wear-and-tear. The yellow layer notifies you to plan maintenance. The red layer urges you to perform maintenance as soon as possible to avoid a lengthy production downtime.



Easy-to-replace

ABB helps to reduce costly downtime in robotics operation by offering easy to replace installation products.





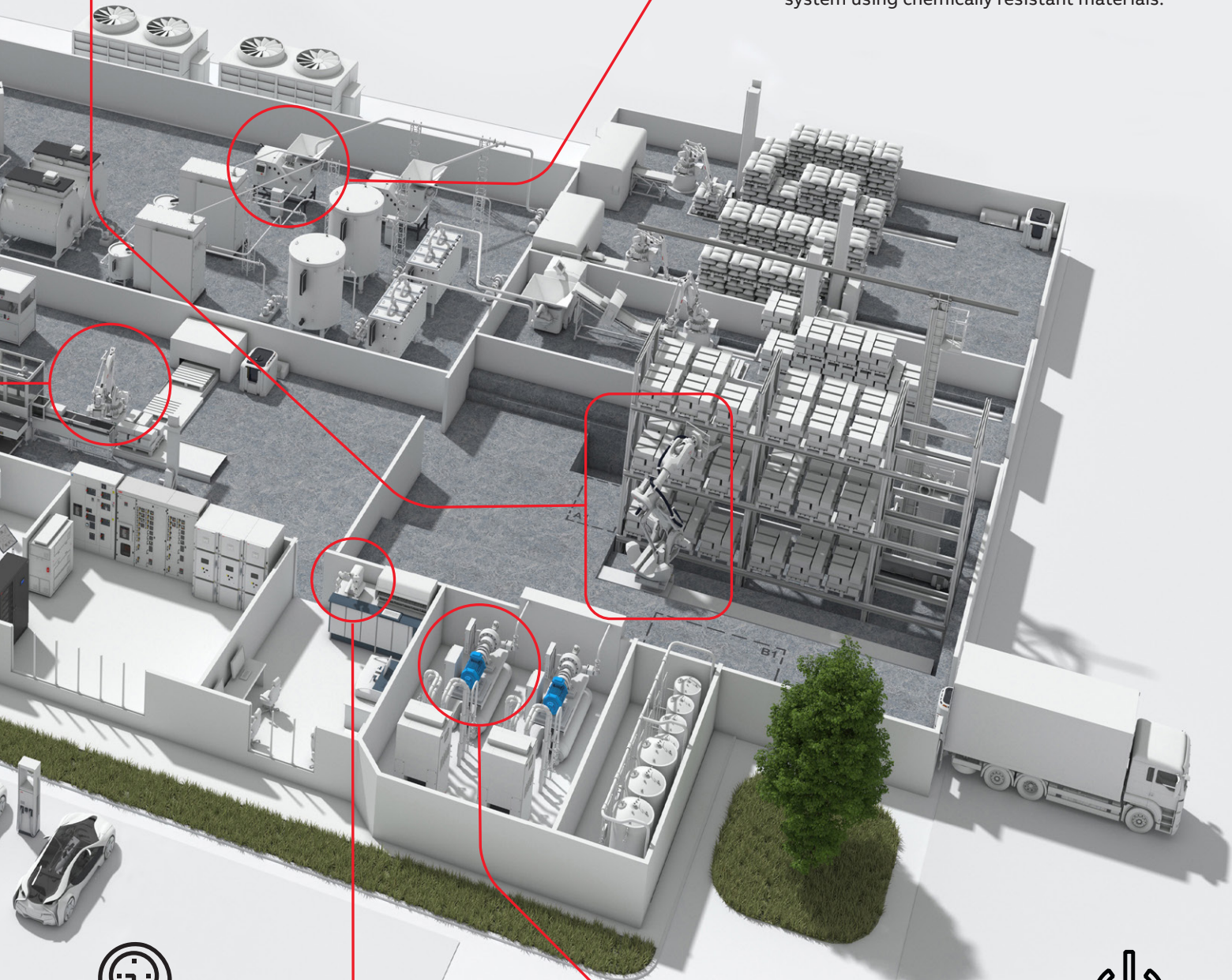
Maximum flexibility

PMA's hose pack systems for cobots allow the holder a high degree of movement freedom. This enables the cobot movements to be frictionless, resulting in increased uptime and productivity.



Chemical resistance

Cleaning and sanitation crews in F&B often use high-pressure wash down cleaning equipment with high-temperature chemical solutions. With these processes in mind, ABB constructed a food and beverage system using chemically resistant materials.



Industry specific solutions

A broad and extensive portfolio has dedicated solutions for product applications operating directly in the field. To balance costs and regulatory pressures, operations should be viewed holistically. Adaptability is essential for complex and constantly changing industries.



Reliability

Processing plants require a high reliability level from their electrical systems, because shutdowns can cost from minutes' to days' worth of production if a batch must be scrapped.

PMA's tested and certified excellence in cable protection

Intensive testing, research and development activity is a top priority at PMA® every day. That's why PMA® is a market leader in the field of cable protection.

PMA cable protection from ABB are used globally, extensively in many areas and applications. The level of protection we have to offer to cables is constantly increasing. Extensive testing is therefore critical for research and development of new cable protection products as well as in quality control. Our products are tested to both international standards and internal test procedures. The internal PMA procedures are designed to supplement the international standards simulating real applications, testing to destruction finding the real limits of the product.

PMA cable protection delivers innovative, customised solutions that aim to streamline

testing processes:

- Product development based on market needs
- Two in-house test laboratories (Uster and Coleshill)
- Broad range of available test installations
- Intensive product quality testing over specified periods

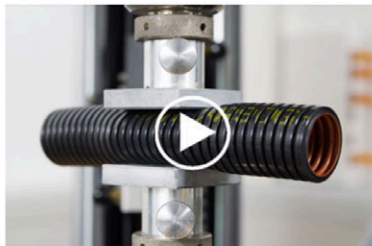
Our rigorous testing process helps ensure that your products align with all applicable requirements and expectations. To the extremes of cold to the extremes of heat and humidity. Our global team's knowledge helps to stay ahead of requirements, materials and technologies. It gives our customer the confidence that our products perform without failure or problems, meet their expectations and all regulations.

Customers' application-specific needs are a top priority at PMA. That's why PMA has more than 15 test procedures ("PMA DO") that enables us to perform cable protection-related, application-specific material and product tests.



PMA® Cable Protection

Test videos



PMA Test

Compression Strength



PMA Test

Resistance to Impact



PMA Test

Flexibility at Low Temperature



PMA Test

Resistance to Fatigue when Exposed to Continuous Bending 2



PMA Test

System Security – Pull-Out Strength



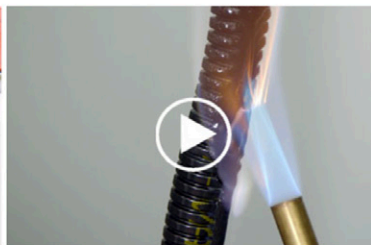
PMA Test

Ingress Protection for Static Applications



PMA Test

Resistance to Thermal Ageing



PMA Test

Flammability Tests



PMA Test

Flammability Test – Limited Oxygen Index



PMA Test

Resistance to Fatigue when Exposed to Continuous Bending



PMA Test

Ingress Protection for Dynamic Applications



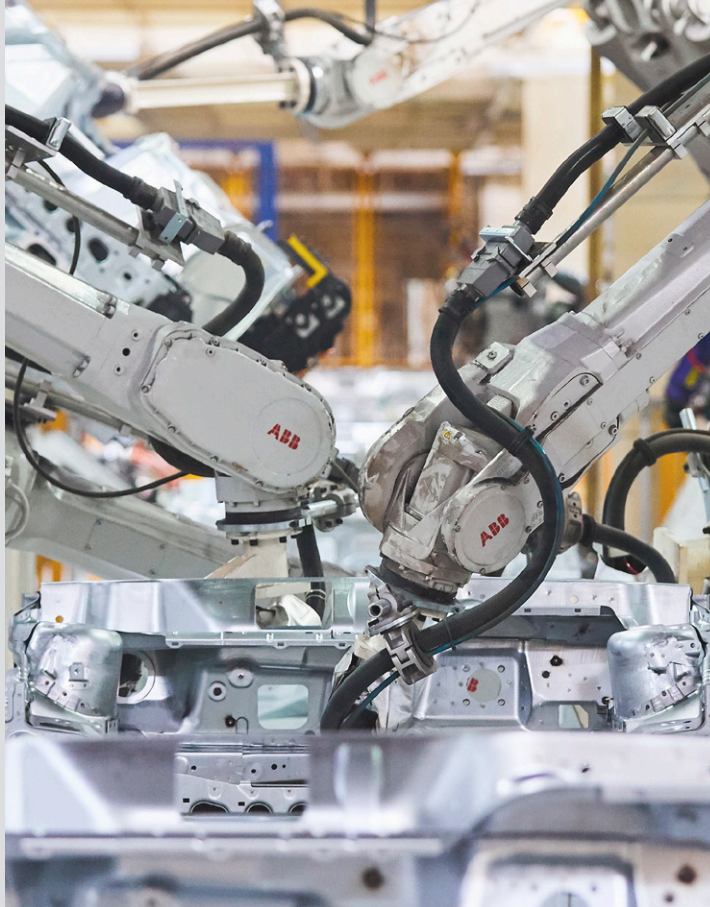
PMA Test

Resistance to Chemicals





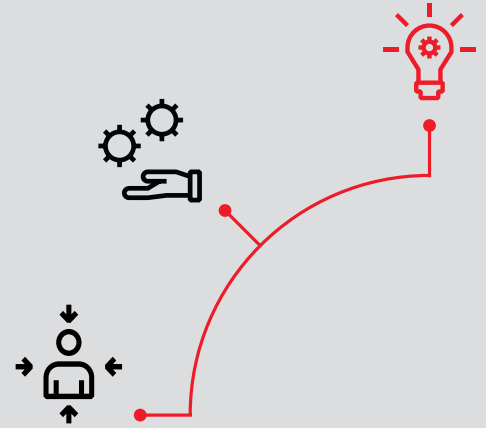
PMA® Cable protection solutions
From pioneer to market leader. High performance, reliability and safety in cable protection for the automotive industry.



Automotive industry

Robotics and automation

The ability to adjust technology to meet the market demand.



Performance, quality and technical support

Today's automotive business demands high-quality product output, increased profitability, and the ability to adjust technology to meet business needs and market demand.

In the automotive industry, growing global competition requires flexibility from manufacturers who need production and logistic systems to serve the ever-increasing demand for model diversity. To further meet that demand, auto manufacturers must expand and even redefine their core competencies in order to adapt to Industry 4.0 developments, demographic change and data-driven production.

PMA® Cable Protection System for Automation applications has been developed 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.

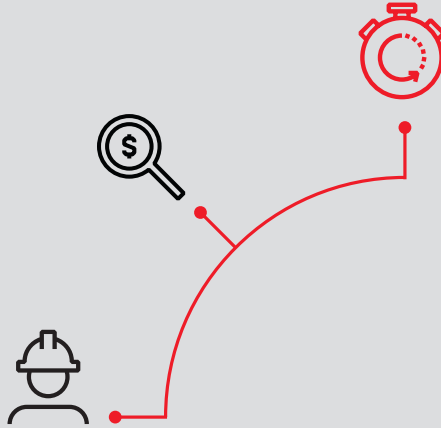


New construction methods

Robotics and automation

Meeting the specific needs of construction.

SEE MORE



Construction industry

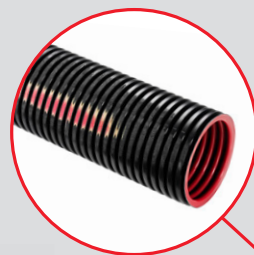
In construction environments, there are ever-increasing demands for solutions that are faster and easier to install. These solutions must also meet safety, technical performance and the specific requirements of municipal buildings and infrastructure projects.

PMA® helps to develop new construction methods. Digital fabrication technologies from the research stage to their practical architectural application.

As part of the DFAB HOUSE construction project, researchers at ETH Zurich are working together with experts and planning specialists from the building industry to research and test how digital fabrication can alter the design and construction process. ABB Robotics and ABB PMA® cable protection are both playing an important role in this new digital fabrication technology.



The cable protection solutions developed by PMA® for automation applications satisfy the demanding mechanical requirements in key aspects.



PMA® Multilayer conduit
The abrasion indicator allows maintenance to be scheduled without incurring lengthy production downtimes.





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Wooden building modules are pre-fabricated in ETH's Robotic Fabrication Laboratory by two ABB robots equipped with PMA®'s cable protection products.

Gramazio Kohler Research, ETH Zurich.



A complete cable protection system for automation solutions

Specially designed conduits, clamps and abrasion protection sleeves provide highly effective protection for all moving parts, massively reducing torsional forces.



Copyright Roman Keller / NCCR Digital Fabrication.



Copyright Roman Keller / NCCR Digital Fabrication.

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The 'Spatial Timber Assemblies' process was used during construction. The wooden building modules were pre-fabricated in ETH's Robotic Fabrication Laboratory by two ABB robots equipped with PMA®'s cable protection products.

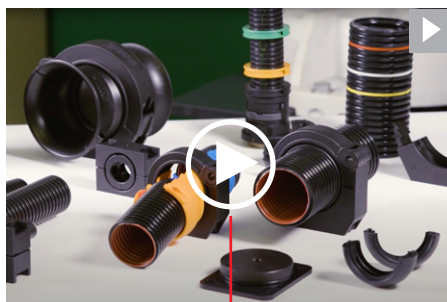
Next generation cable protection

for robotics and automation

PMA® cable protection system for automation has been developed to protect cables and wires in extreme automation and robotic installations. Different conduit types are available for various requirements, system supports and a range of special accessories, so torsion and cable stress can be minimised. Special conduit designs, supports and abrasion protection sleeves provide optimal protection along the entire length of moving elements, enabling engineers to significantly reduce torsion forces.

[SEE MORE](#)

PMA® Conduits for robotic applications
Protecting cables and wires in extreme automation and robotic installations.

[SEE MORE](#)

PMA® Accessories for cable protection in robotic applications
Dependable protection against abrasion and preventing wearing through insulation.



PMA® the next generation of cable protection for robotics and automation



3
Layers



Multilayer conduit

Consists of 3 protective layers

PMA Multilayer conduit provides optimal cable protection in robotics and all of your automation applications, including dependable protection:

- Holds up against abrasion
- Prevents insulation wear
- Provides maximum flexibility and
- Extends service life in motion-intensive applications.



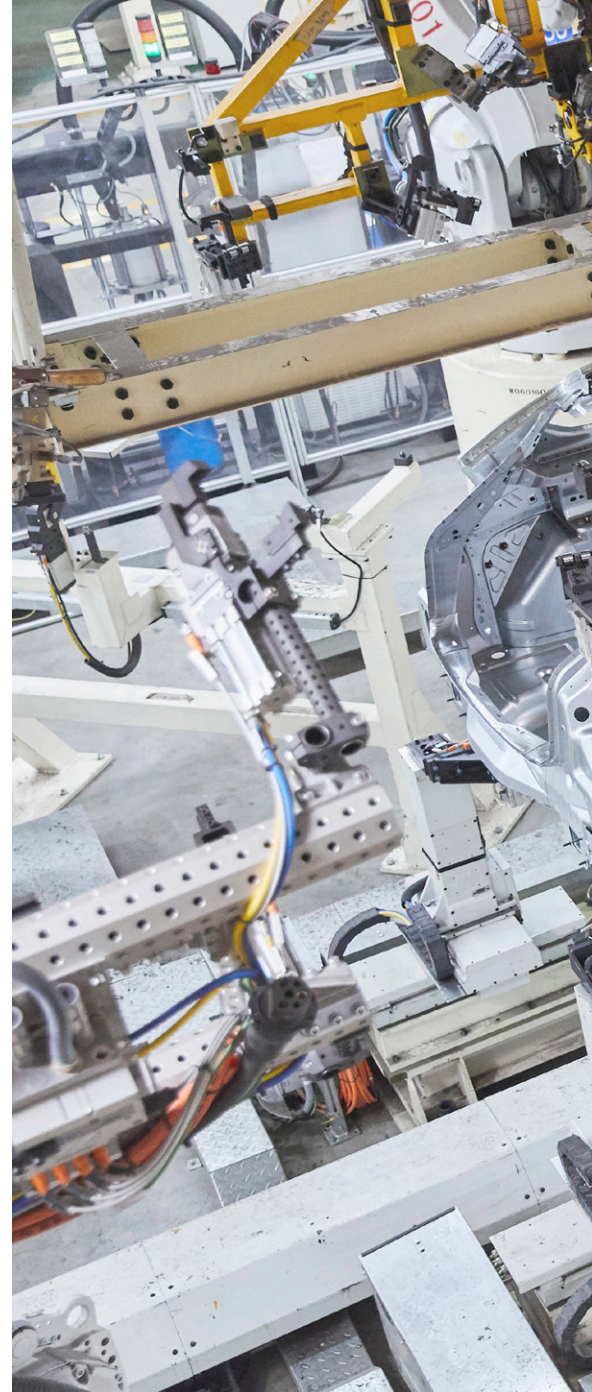
PMAFIX Pro fittings

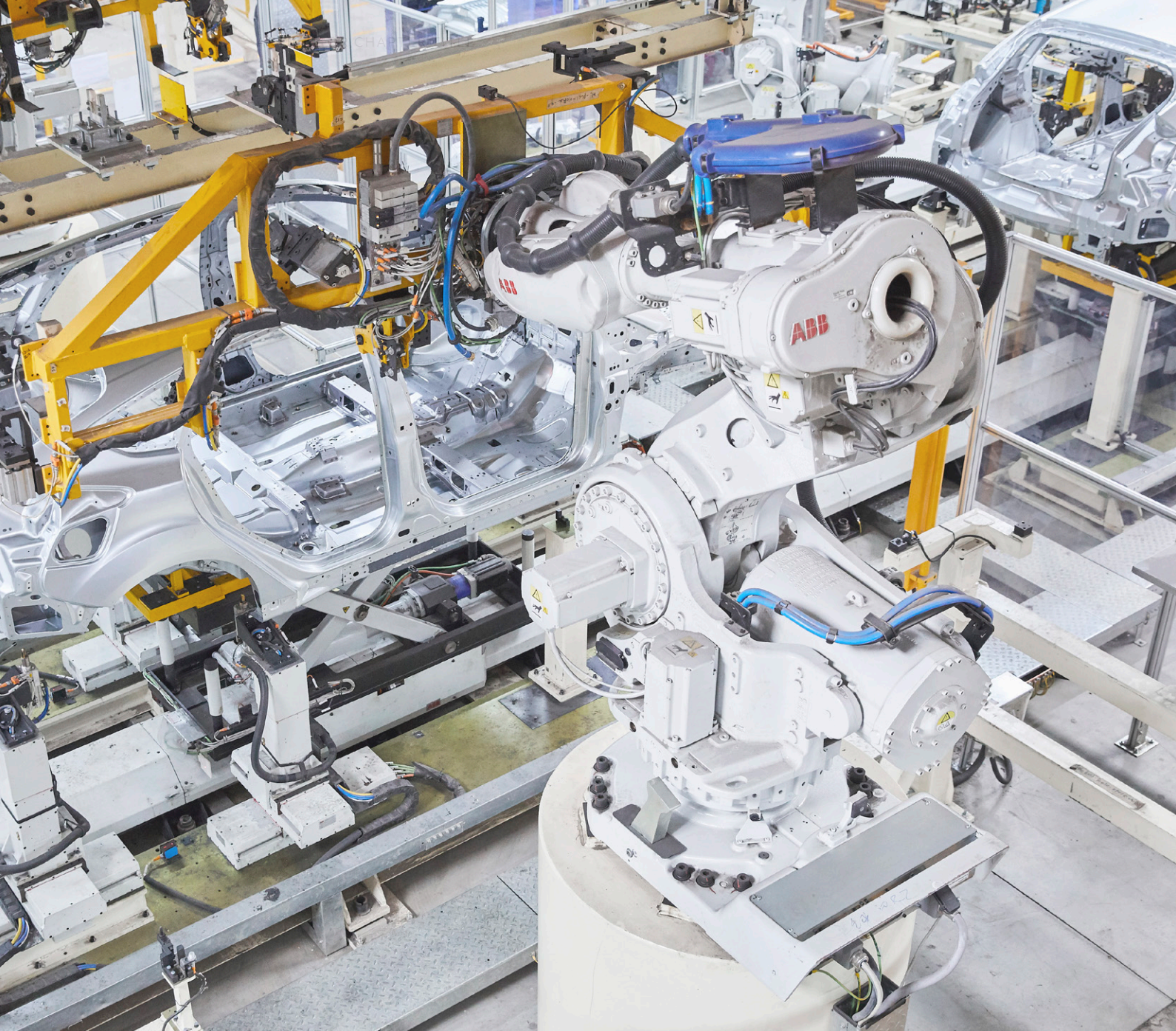
The PMAFIX Pro has two components, an outer body and an inner sealing element. The sealing element functions both as a seal and as a locking mechanism providing all ingress protection grades up to IP68 and IP69K, even in applications where there is long term continuous movement. PMAFIX Pro is manufactured by using a multiple component injection moulding process.



Tube clamps, ball-joints, and half shell inserts

The range includes the BSH tube clamp, which serves as a fixation for functional inserts. The BTK ball joint sleeve offers additional flexibility and reduces mechanical stress on the conduit. BSSK ball joint half shells provide additional freedom of movement for corrugated conduits fixed in BSH automation tube clamps.





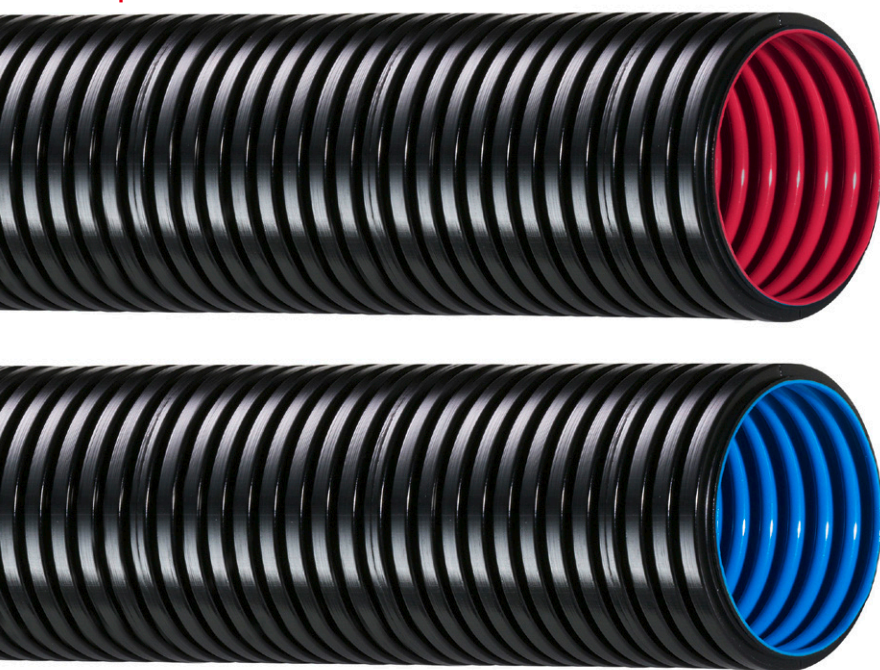
Abrasion sleeves and other accessories

Accessories include the BSS/BSV abrasion protection sleeve, providing abrasion protection for corrugated conduits in positions exposed to chafing. The BKS cable stars are tailored and designed-to-order.





Very flexible multilayer conduit for robotics and automation applications subject to mechanical wear and elongation created by the movement of axis 2 and/or 5, featuring wear indication function.

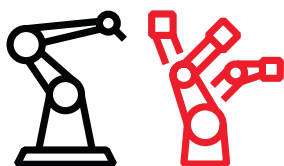


XR90, XTPC conduits

These new conduits provide previously unattained performance levels. The XR90 & XTPC ranges offer multilayer conduits for demanding technical applications and special requirements. The new PMAFLEX multilayer conduits (X-Series) are based upon advanced multi-layer-extrusion technology allowing the manufacture of three-layer corrugated conduits combining the best characteristics of different materials on inner and outer layers.

Automation/Robotics

In the field of automation, there is a need for products that can withstand the stress of motion-intensive applications. Solutions developed by ABB for the automation industry fully meet these requirements. Special conduit designs, supports and abrasion protection sleeves provide optimal protection along the entire length of all moving elements, enabling engineers to achieve a reduction in torsional forces.



Over
500,000
Robots installed
worldwide

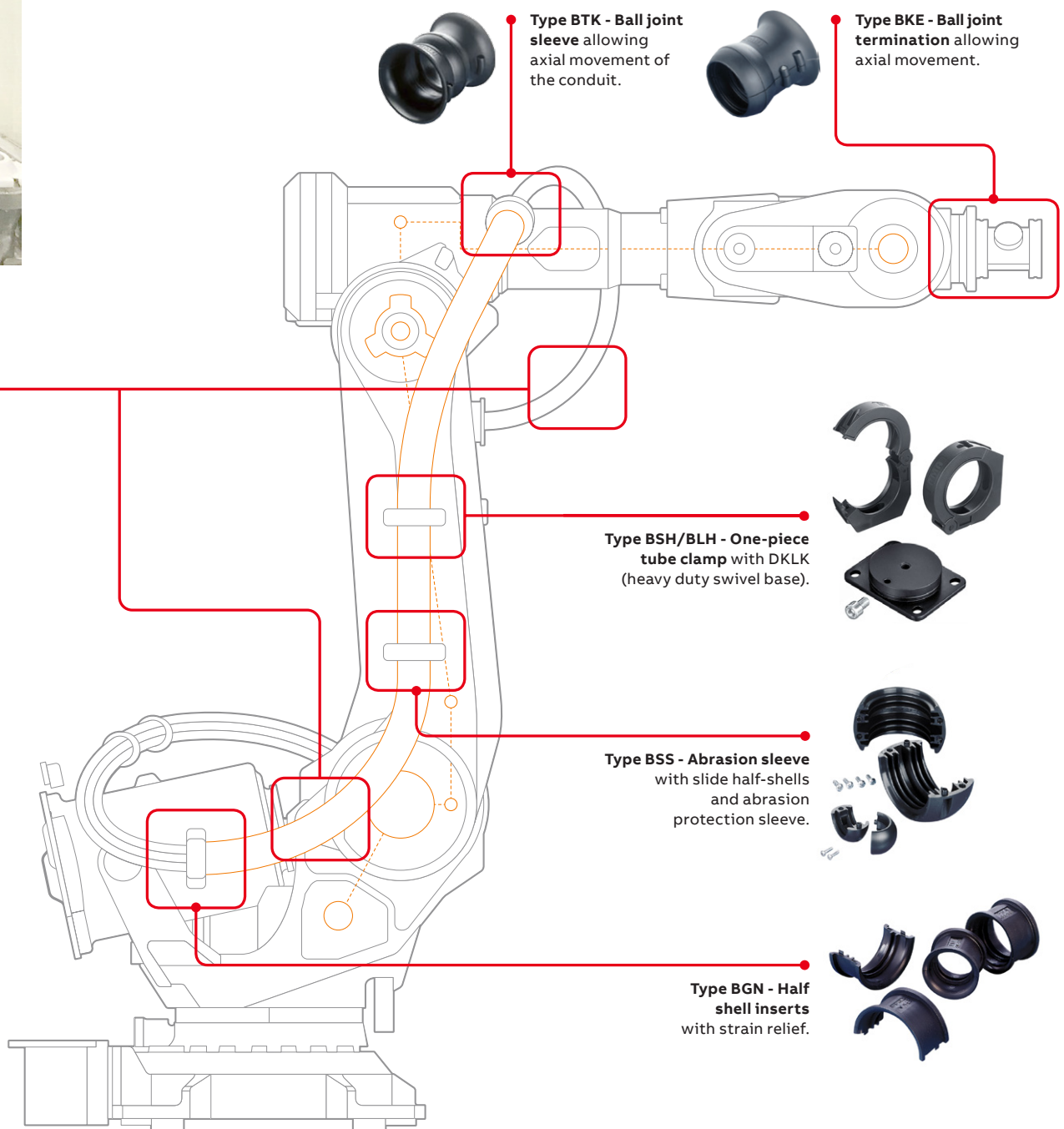
Technical specifications

Material

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



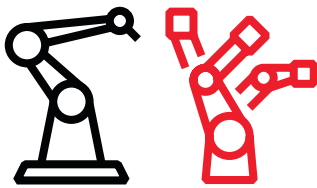
PMA® Cable protection

in robotics and automation



PMA® conduits

Highly flexible to accommodate continuous bending, especially suitable for narrow bending radii, with abrasion resistance and wear indicator.

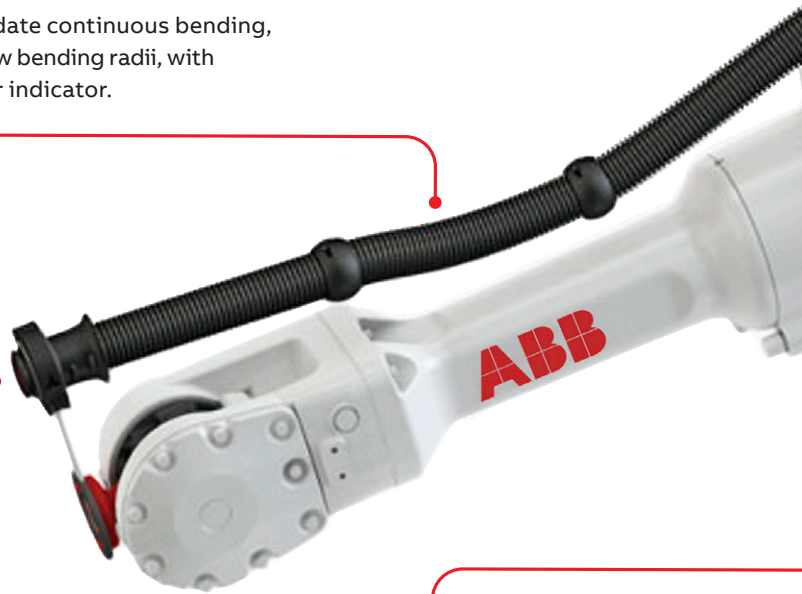


PMA® Cable Protection System for automation is designed to protect cables and wires in extreme automation and robotic installations.

SEE MORE



Learn more about the features and benefits in this PMA® robotic animation video.



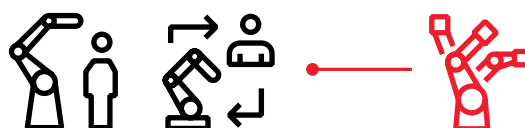
Tube clamp with ball joint sleeve

Offers additional flexibility and reduces mechanical stress on the conduit.



BKS cable star

Use to reduce the lateral movement and strain of the cables and prevent any debris from entering the exposed conduit end.



PMAFIX Pro

Cable protection system

Next generation cable protection. The extremely successful and technically proven PMAFIX System has been developed further to create the PMAFIX Pro product range.

These new generation fittings are the product of experience gained over many years in the most varied application areas. The PMAFIX Pro has two components, an outer body and an inner sealing element. The sealing element functions both as a seal and as a locking mechanism, providing all ingress protection grades up to IP68 and IP69 even in applications where there is long term continuous movement. PMAFIX Pro is manufactured by using a multiple component injection moulding process.

Key features

- Meets all ingress protection categories up to and including IP68 and IP69, and when the conduit connection is continually in motion
- Manufactured with newest two-component injection moulding technology
- Fulfills highest international quality and standard requirements
- Intelligent safety locking mechanism
- Allows simple “push-in” installation of conduits
- Due to the integrated conduit supports, conduit remains centralised with little deformation even when bent sharply directly at the fitting



PMAFLEX Multilayer conduit
Consists of 3 protective layers



Easy push in assembly
Guarantees correct installation



Optimised sealing
Using two-component injection moulding technology

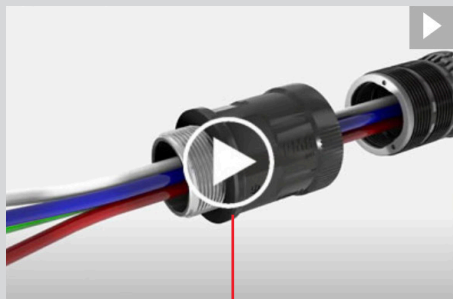


PMAFIX Pro fitting
Highest impact resistance through fully closed design

SEE MORE



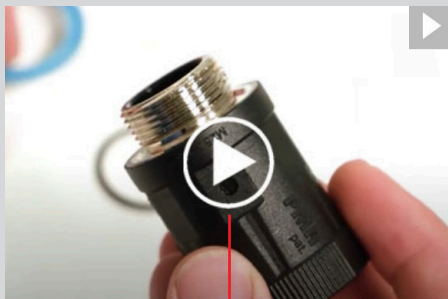
Technical specifications



SEE MORE



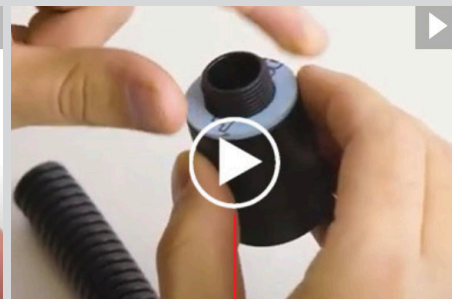
PMAFIX Pro fitting and PMAFLEX multilayer conduit
ABB offers a comprehensive state-of-the-art cable protection solution.



SEE MORE



PMAFIX Pro metal thread fittings assembly
Demonstrating an easy way to install and disassemble PMAFIX Pro metal thread fittings.



SEE MORE



PMAFIX Pro polyamide thread assembly
Demonstrating an easy way to install and disassemble PMAFIX Pro polyamide thread fittings.

Material

- Fittings made from specially modified polyamide 6
- Threads made from nickel-plated brass or polyamide 6
- Sealings made from cross linked polyester elastomer
- Self-extinguishing
- Free from halogens, REACH + RoHS compliant
- Temperature range: -50°C to +105°C, short-term to +160°C

Characteristics

- High assembly reliability – the fitting only locks when the sealing element is fully inserted
- Operational safety assured through visual and acoustic correct assembly controls
- Excellent resistance to ultraviolet rays and weathering
- High impact resistance through fully closed design
- High conduit pull out strength
- Vibration-proof connection to PMA conduits
- Fits conduit profiles – fine (T) and coarse (G)
- To avoid accidental opening, disassembling only possible with a screwdriver

Static + dynamic

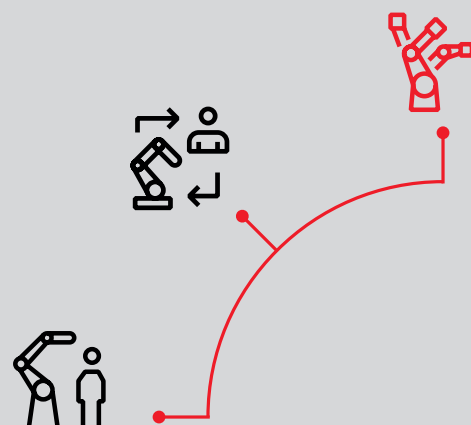
- Highest sealing through fully closed system, also in the highest dynamic applications
- Extra long ribbed sealing areas (cross linked material)
- 360° locking and sealing element shields against high pressure water jets (up to 100 bar)
- Content of delivery: Locking and sealing element and thread seal for male threads (O-Ring and/or flat gasket)



IP68/69

Ingress protection

Fully closed static +
dynamic seal on fittings



Type XR90

PMAFLEX multilayer conduit



Very flexible, medium-duty conduit

For dynamically moving conduit systems in robotics and automation industry.

Very flexible conduit with a unique wear indication function, especially suitable for applications with a pullback system.

- Wear indication function
- High resistance to continuous bending
- No abrupt conduit failure due to high tear propagation resistance
- High abrasion resistance
- High resistance to torsion
- Suitable for applications with a pullback system
- Long service life

- **Material:** Outer, intermediate and inner layer made from high-grade, specially formulated polyamide 12
- **Temperature range:** -40°C to +95°C continuous, short-term to +150°C
- **Compatible with:** PMA Automation Products, PMAFIX Pro, PMAFIX fittings, PMAGRIP Flange, PMA Accessories
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant

Type XR90 - Very flexible, medium-duty



XR90 Index

min.	max.
Ductility	
Fatigue reversed bending	
Compression resistance	
Low temperature performance	
Weathering resistance	

Approvals



SEE MORE



Type PIS/PIH

Highly flexible,
heavy-duty conduit

Highly flexible UL recognised conduits*
ideal for dynamic applications in robotic
and automation industry.



Highly flexible, heavy-duty conduit

Excellent mechanical
characteristics, also
under extreme
climatic conditions
(low temperature and
low humidity).

* PIS: Medium-wall
(Nom. width 07 to 48) /
PIH: Heavy-wall
(Nom. width 56 to 125).



- Very good reversed bending characteristics
- Good mechanical characteristics even under extreme conditions, such as low temperatures

- **Material:** High-grade, specially formulated polyamide 12
- **Temperature range:** -50 °C to +95 °C, short-term to +150 °C
- **Compatible with:** PMAFIX Pro, PMAFIX fittings, PMAGRIP flange, PMA accessories
- **Conforms to:** UL94 V0, UL1696 (UL File E80294)
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant

Approvals



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

PIS/PIH Index

min.	max.
Ductility	
Fatigue reversed bending	
Compression resistance	
Low temperature performance	
Weathering resistance	



Type JLLPA

Flexible, heavy-duty conduit

Flexible, smooth over-extruded conduit for
applications with cleaning requirements.

Type JLLPA - Flexible, heavy-duty

JLLPA Index

min.	max.
Ductility	
Fatigue reversed bending	
Compression resistance	
Low temperature performance	
Weathering resistance	



- **Material:** High-grade, specially formulated polyamide 6 / Overextrusion: modified polyamide 6
- **Temperature range:** -18°C to +105°C continuous, short-term to +160°C
- **Compatible with:** PMAFIX Pro, PMAGRIP flange, PMA accessories
- **Conforms to:** UL94 V2, UL1696 (UL File E80294)
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant

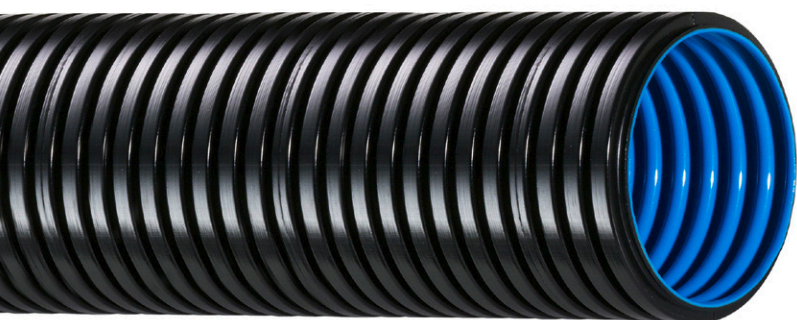
SEE MORE

Approvals



Type XTPC

PMAFLEX Multilayer conduit



Highly flexible, medium-duty conduit

Especially suitable for
narrow bending radii.

Highly flexible conduit for
robotic applications with high
resistance to abrasion and
wear indication function.

- Wear indication function
- High resistance to continuous bending
- No abrupt conduit failure due to high tear propagation resistance
- Very high abrasion resistance
- High resistance to torsion
- Suitable for tight bending-radii
- Long service life

Type XTPC - Highly flexible,
medium-duty



XTPC Index

min.	max.
Ductility	████████████████████
Fatigue reversed bending	████████████████████
Compression resistance	████████████████████
Low temperature performance	████████████████████
Weathering resistance	████████████████████

- **Material:** Outer, intermediate and inner layer made from high-grade, specially modified Thermoplastic copolyester elastomer
- **Temperature range:** -40°C to +105°C continuous, short-term to +150°C
- **Compatible with:** PMA Automation Products, PMAFIX Pro, PMAFIX fittings, PMAGRIP flange, PMA Accessories
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant

Approvals



SEE MORE



Type ESD

Highly flexible,
light-grade conduit



Highly flexible, light-grade conduit

For indoor and outdoor use
(very good cold temperature
performance).

For dynamic robotic
applications where
electrostatic charge and
uncontrolled discharge
need to be avoided.

- **Material:** Specially modified polyamide 12
- Prevents electrostatic charging
- High dynamic load resistance
- For indoor and outdoor use (very good cold temperature performance)
- Excellent UV-resistance
- **Environmental properties:** Free from halogens, RoHS and REACH compliant
- **Temperature range:** -40 °C to +90 °C, short-term to +150 °C

SEE MORE

Type ESD - Very flexible, medium-duty conduit

ESD Index

min.	max.
Ductility	
Fatigue reversed bending	
Compression resistance	
Low temperature performance	
Weathering resistance	



Approvals



Type PUE

Highly flexible,
soft-grade conduit



Highly flexible, soft-grade conduit

Especially suitable for
tight bending radii.

Highly flexible conduit
for robotic applications
with multi-axial
movements and excellent
chafing characteristics.

- **Material:** Specially formulated polyurethane
- **Temperature range:** continuous -60°C to +50°C
- **Compatible with:** PMAFIX Pro, PMAFIX fittings, PMAGRIP flange, PMA Accessories
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant

SEE MORE

Type PUE - Highly flexible, medium-duty

PUE Index

min.	max.
Ductility	
Fatigue reversed bending	
Compression resistance	
Low temperature performance	
Weathering resistance	



Approvals



Type BSH

One-piece tube clamp



One-piece tube clamp
Serves as a fixation for functional inserts.

Approvals



To be used with BGN half-shells to optimally fix/guide conduits.



- Single-piece, robust construction
- Easy installation
- To be used in combination with standard halfshells BGN
- Space saving design allows optimum installation in applications
- Reduces mechanical stress on the cable harness extending the lifespan of the application
- Also serves as a fixation for functional inserts (BTK, BKE) reducing mechanical stresses

- **Material:** High-grade, specially formulated polyamide 6
- **Compatible with:** PMAFLEX Pro Conduits, PMAFLEX Multilayer Conduits, PMAFLEX Conduits
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant

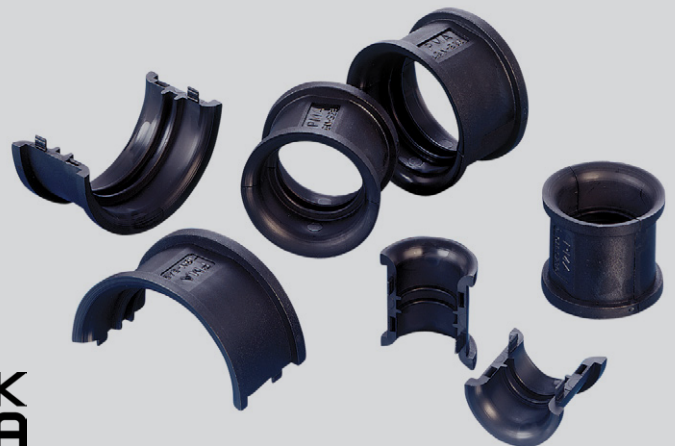
Type BGN

Half-Shell Inserts



Strain relief half-shell inserts
Possibility to block axial movement of the conduit to reduce stress and torsion.

Approvals



Half shell inserts for BSH Tube clamp for conduit guiding or strain relief.



- Especially suitable for narrow bending radii
- Provide axial strain relief for conduits but allowing rotation
- Easy installation
- Especially suitable for dynamic applications
- Flexible combination with system blocks
- Variety of fixation possibilities
- Excellent impact strength

- **Material:** High-grade, specially formulated polyamide 6
- **Compatible with:** PMAFLEX Pro Conduits, PMAFLEX Multilayer Conduits, PMAFLEX Conduits, PMA Smart Line Conduits

Type BSS/BSV

Abrasion protection sleeve



Abrasion protection sleeve
Increases the life time of moving conduits.

Approvals



Abrasion protection for corrugated conduits in positions exposed to chafing.

- Increases the life time of moving conduits
- Excellent chafing characteristics
- Very good chemical properties
- Fits both conduit profiles - fine (T) and coarse (G)
- Conforms to: EN 45545-2 HL3 (R22 & R23), NFPA 130, UL 94 (V0)

- **Material:** High-grade, specially formulated polyamide 6
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant
- **Compatible with:** PMAFLEX Pro Conduits, PMAFLEX Multilayer Conduits, PMAFLEX Conduits, PMA Smart Line Conduits



Type BSS-OS

Screwless protection sleeve



Screwless abrasion protection sleeve
An easy-to-install, metal / screw-free solution to protect corrugated conduits against abrasion and chafing.

Approvals



Screwless abrasion protection for corrugated conduits in positions exposed to chafing.

- Increases lifetime of moving conduits in dynamic applications
- Optimised for high impact resistance
- No metal parts, no screws
- Tool-free installation
- Easy (re-)positioning without full disassembly
- Excellent chafing characteristics
- Fits both conduit profiles - fine (T) and coarse (G)

- **Material:** High-grade, specially formulated polyamide 6
- **Compatible with:** PMAFLEX Pro Conduits, PMAFLEX Multilayer Conduits, PMAFLEX Conduits, PMA Smart Line Conduits
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant



Type BTK

Ball joint sleeve



Strain relief functionality possible via additional BTR
Possibility to block axial movement of the conduit to reduce stress and torsion.

Approvals



Ball joint sleeve used in BSH tube clamps for gliding and guiding PMA conduits.

- Increased degree of freedom for cable packs
- The ball joint offers additional flexibility and reduces mechanical stress on the conduit
- Can be used with strain relief insert BTR to block conduit movement in axial direction
- Easy to install and exchange

- **Material:** High-grade, specially formulated polyamide 6
- **Compatible with:** BSH Tube clamp, PMAFLEX Pro Conduits, PMAFLEX Multilayer Conduits, PMAFLEX Conduits
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant



Type BKE

Ball joint termination



Strain relief functionality possible via additional BKS cable star
A grommet can be inserted directly into this termination to hold and strain-relief the cables.

Approvals



Provides additional relief to conduit and cables due to reduced mechanical stress.

- Increased degree of freedom for cable packs
- Optimum solution for cable guidance in automation applications
- Reduces mechanical stress on the cable harness extending the lifespan of the application
- Easy to install and exchange
- Strain relief of cables and wires
- A grommet can be inserted directly into this termination to hold and strain-relief the cables

- **Material:** High-grade, specially formulated polyamide 6
- **Compatible with:** BSH Tube clamp, BKS Grommets, PMAFLEX Pro Conduits, PMAFLEX Multilayer Conduits, PMAFLEX Conduits
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant



Type BSSK

Ball joint half shells



Strain relief ball joint half shells
Allowing axial movement of the conduit to reduce stress and torsion.

Approvals



Ball joint half shells provide additional freedom of movement for corrugated conduits fixed in BSH tube clamps.

- Increases freedom of movement for conduits
- Optimum solution for cable guidance in automation applications
- Extends lifetime of conduit and cables due to reduced mechanical stress
- Easy to install and exchange

- **Material:** High-grade, specially formulated polyamide 6
- **Compatible with:** PMA Accessories, tube clamp BSH
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant



Type BKS

Cable stars



Strain relief ball joint termination
Allowing axial movement of the conduit to reduce stress and torsion.

Approvals



Customized solutions for arrangement and strain relief of a loom of hoses and leads of given dimensions in cable assemblies.

- Rubber inserts that are used at the conduit end to reduce the lateral movement and strain of the cables
- Prevents any debris from entering the exposed conduit end
- The rubber disc is held by strain relief half shells BGS or ball joint termination BKE

- **Material:** Special polymer
- **Compatible with:** Compatible with BKE and BTK (based on sizes) and BGS half shells
- **Environmental properties:** Free from halogens and cadmium



PMACLIP Type BFH-0

One-piece system support



One-piece system support
Allowing optimal axial strain relief and impact resistance.



Approvals



One-piece system support, with safety lid.



- One-piece construction
- Very high impact resistance
- Optimal axial strain relief due to integrated rib
- Suitable for overhead installations due to safety lid
- High retention forces
- Quick mounting due to single hole fixing
- Very good chemical properties
- Fits both conduit profiles - fine (T) and coarse (G)
- Fits to PMACLIP - BFHS - Rail for system support

- **Material:** High-grade, specially formulated polyamide 6
- **Compatible with:** PMAFLEX Pro Conduits, PMAFLEX Multilayer Conduits, PMAFLEX Conduits, PMA Smart Line Conduits
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant

DKLK swivel base

Heavy duty swivel base



Approvals



For BSH + BLH tube clamps. Allows rotation of cable pack supports.



- Robust construction
- Sealed high quality bearing with minimal play
- Allows rotation of cable pack supports
- Suitable for high mechanical forces in all assembly positions
- BSH tube clamp easy to install on the bearing with central screw
- Cylinder pin prevents twisting of the clamp on the bearing

- **Material:** Black anodised aluminium
- **Compatible with:** BSH - Tube clamp
- **Temperature range:** -50 °C to +105 °C
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant

Type BTR

Strain relief insert



Strain relief inserts

Possibility to block axial movement of the conduit to reduce stress and torsion.

Approvals



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



- Increased degree of freedom for cable packs
- The ball joint offers additional flexibility and reduces mechanical stress on the conduit
- Can be used with strain relief insert TR to fix the conduit in axial direction
- Easy to install and exchange
- Used in BSH tube clamps for gliding and guiding PMA conduit

- **Material:** High-grade, specially formulated polyamide 6
- **Compatible with:** BSH Tube clamp, BKS Grommets, PMAFLEX Pro Conduits, PMAFLEX Multilayer Conduits, PMAFLEX Conduits
- **Environmental properties:** Free from halogens and cadmium, RoHS and REACH compliant



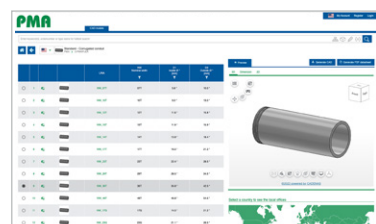
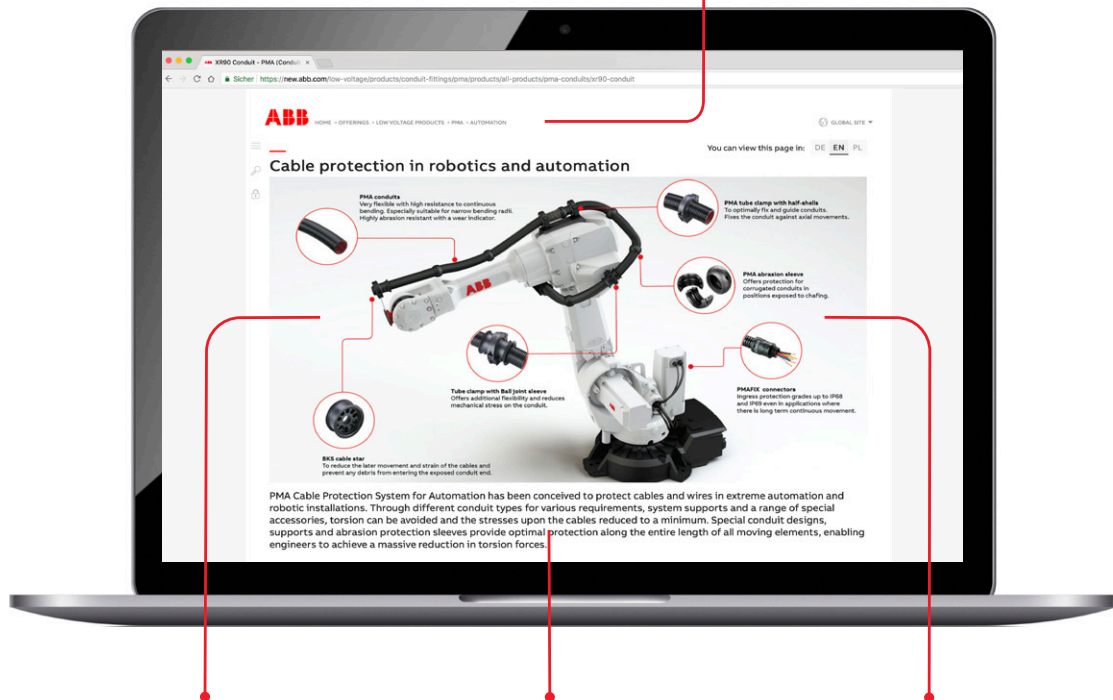
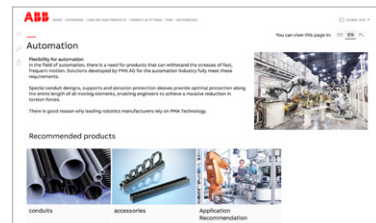
Further information

Visit our website

Visit the PMA web pages on ABB.com for our most up-to-date product line-up, and much more. This is the place to go to find all of the planning documents you need at your fingertips, including:

- Technical data sheets
- Brochure Automation Products
- CAD files
- Complete PMA automation product portfolio
- Videos

SEE MORE



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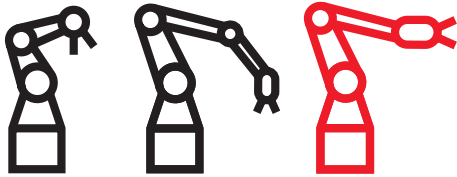
With over 500,000 robots installed worldwide, ABB leads the way in the field of industrial robots, satisfying the productivity and safety requirements of its customers. In addition, ABB's range of installation products includes individual equipment components for robots. ABB cable protection systems help to ensure overall quality and reliability.

PMA® CobotProtect™

Dresspack solution for collaborative robots



PMA® BCCH universal cobot conduit holder
With Velcro™ strap. For fixing PMA® conduits along a variety of cylindrical & elliptical shaped collaborative robot (cobot) arms.



PMA cobot dresspack solution:
one design to dress them all. Easy to
install and flexible positioning along
the cobot arm. A flexible holder base
ensures compatibility with most
widely-used cobots on the market.

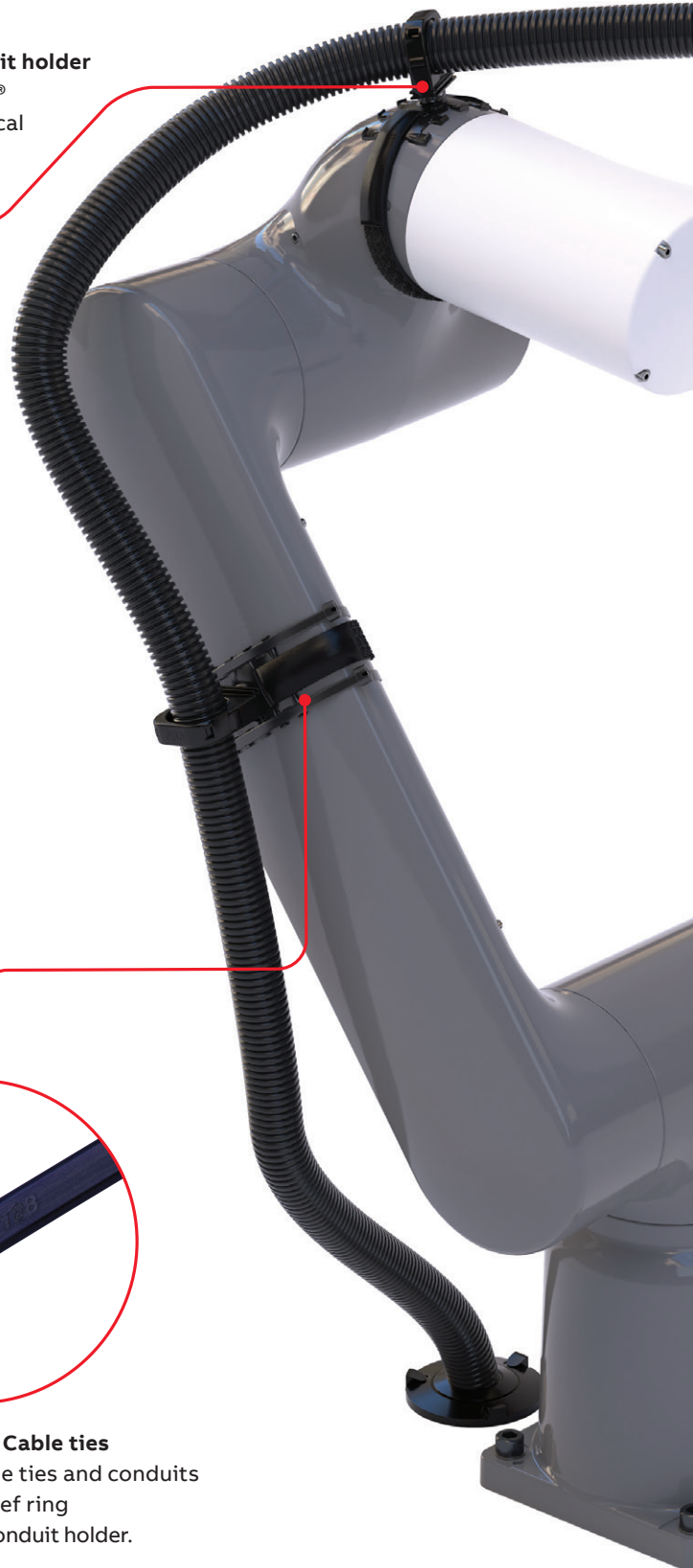
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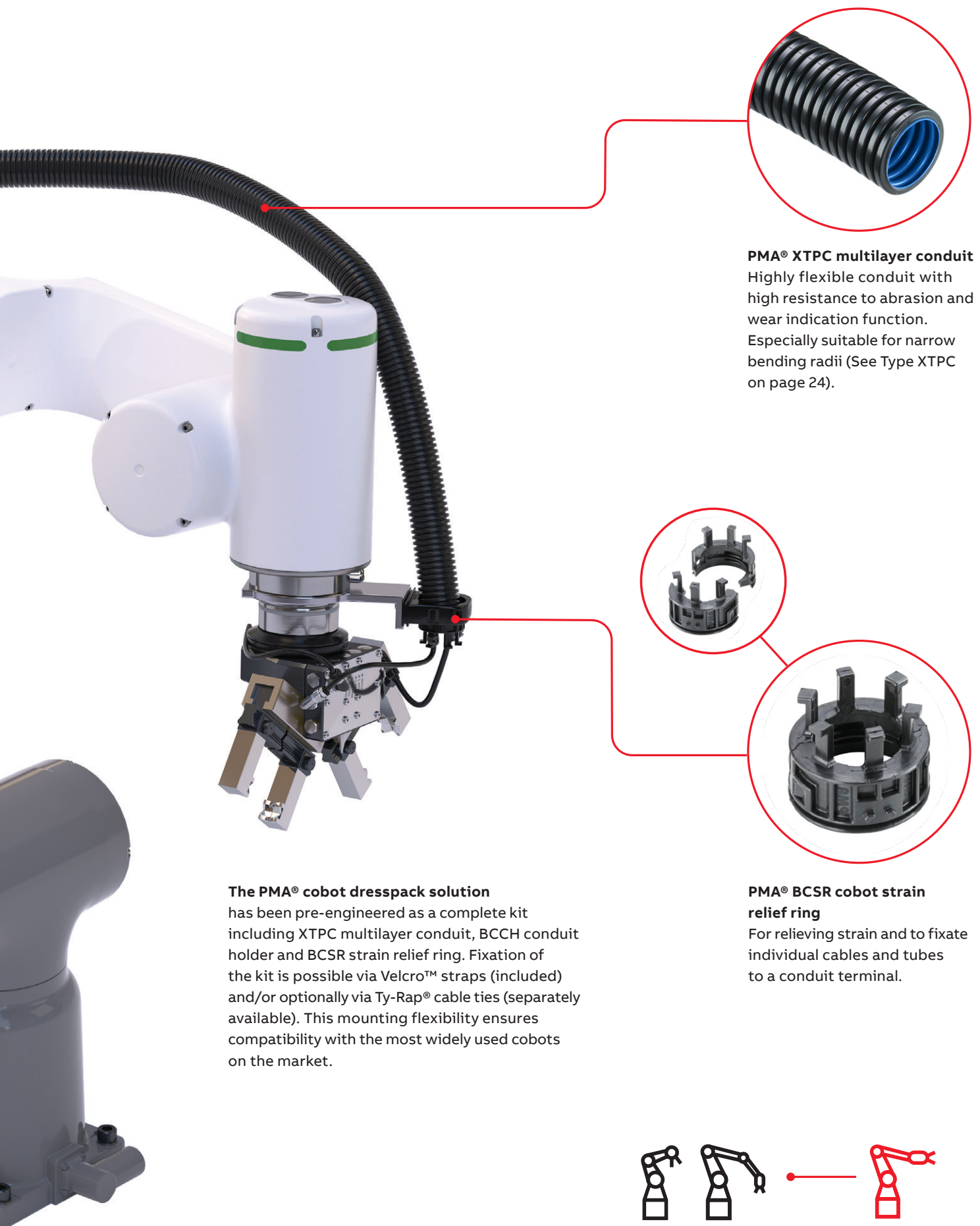


Learn more
about the features
and benefits in
this cobot
animation video.



Optional Ty-Rap® Cable ties
For fastening cable ties and conduits
to BCSR strain relief ring
and BCCH cobot conduit holder.



**PMA® XTPC multilayer conduit**

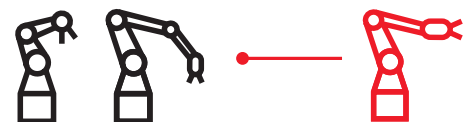
Highly flexible conduit with high resistance to abrasion and wear indication function. Especially suitable for narrow bending radii (See Type XTPC on page 24).

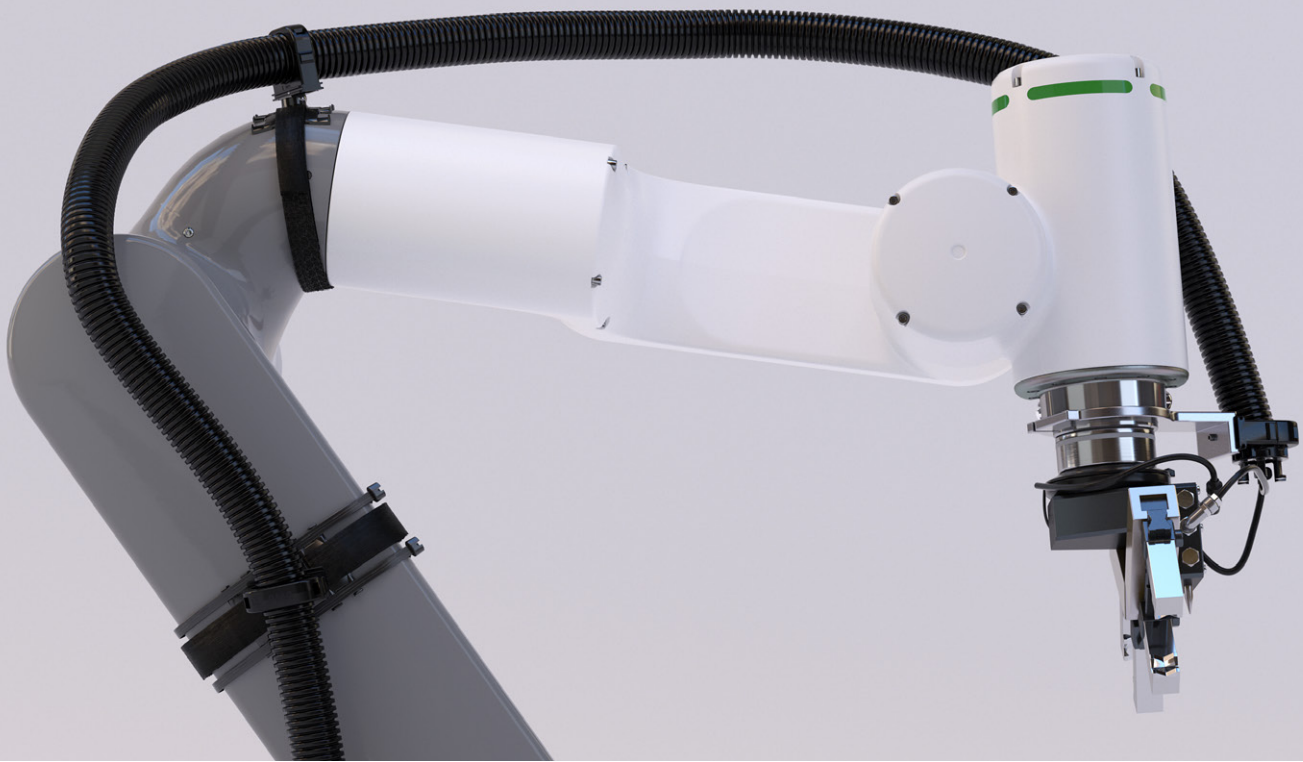
The PMA® cobot dresspack solution

has been pre-engineered as a complete kit including XTPC multilayer conduit, BCCH conduit holder and BCSR strain relief ring. Fixation of the kit is possible via Velcro™ straps (included) and/or optionally via Ty-Rap® cable ties (separately available). This mounting flexibility ensures compatibility with the most widely used cobots on the market.

PMA® BCSR cobot strain relief ring

For relieving strain and to fixate individual cables and tubes to a conduit terminal.





PMA® CobotProtect™

Dresspack solution for collaborative robots

Cable protection kit, suitable for the most widely used collaborative robots on the market.

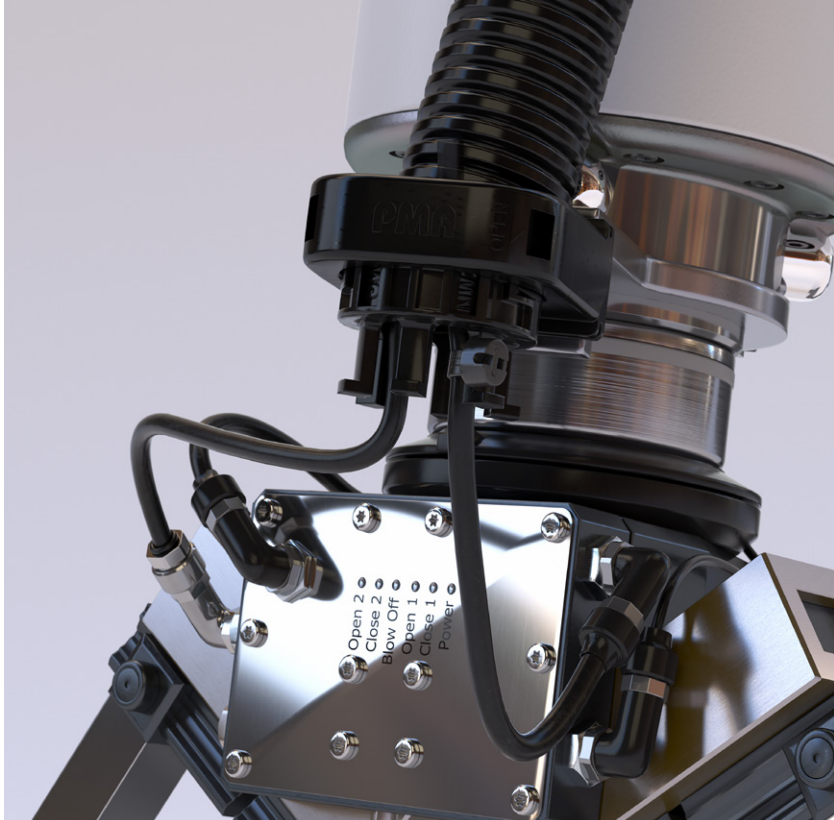
PMA CobotProtect™

The PMA CobotProtect™ cobot dresspack solution has been pre-engineered as a complete kit including XTPC multilayer conduit, BCCH conduit holder and BCSR strain relief ring. The special design of the base of BCCH conduit holder combined with the option to mount it via Velcro™ strap (included) and/or Ty-Rap® cable ties (separately available) makes it highly flexible and compatible with the most widely used cobots on the market.

Kit includes:

- 3 meter XTPC multilayer conduit
- 2x BCCH conduit holder with Velcro™ strap
- 1x BCSR strain relief ring
- 1x BFH Mounting





PMA® BCCH cobot conduit holder for fixing PMA® conduits along cobot arms

Easy to install and to exchange PMA® conduit holder for fixing PMA® conduits along a variety of cylindrical & elliptical shaped collaborative robot (cobot) arms. Flexible design of swivel base ensures compatibility with cobot models of most widely used cobot manufacturers. Fastening along cobot arm with Velcro™ and/or cables ties. 360° swiveling of BFH-0 clip gives flexibility and reduces mechanical stress induced by cobot movements. 10° tilt angle of FH-clip in any direction.

[SEE MORE](#)



More information
about the **PMA®**
Cable protection
Dresspack solution for
collaborative robots.

PMA® BCSR cobot strain relief ring

To relief strain and to fixate individual cables and tubes to a conduit terminal In automation applications. For fastening of individual cables/tubes to a conduit terminal via cable ties (not included). Can be be used freely rotating around conduit axis, or in "lock" mode using a BFH-0 clip. Easy to install and to exchange.

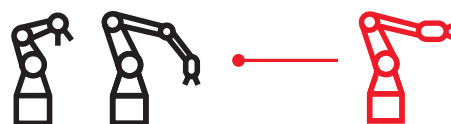




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