



# **PMA<sup>®</sup> Cable Protection**

For sustainable energy solutions



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**PMA® cable protection products from ABB can be used in an extremely wide range of applications. The list is virtually endless, including rail vehicles and infrastructure, industrial machines, electrical systems on ships, solar and wind energy generation installations, telecommunications, construction and medical equipment. Wherever cables are installed and exposed to mechanical stresses and environmental hazards. Today and tomorrow we guarantee best quality regarding products, technical support, service and delivery.**



# PMA conduits and fittings for the energy market

We offer many types of conduits and fittings with different technical characteristics to serve the diverse requirements of various applications like on- and offshore wind energy installations and photovoltaic installations.

PMA offers a broad product portfolio of cable protection products for high and low frequency technology applications and also for fibre optic cables. Our 45 years experience in the design and production of cable protection systems guarantees optimal solutions for use in power generation applications whether they are driven by water, wind, sunlight or gas.



## UL-Recognition

The PMA product portfolio comprises a large choice of conduits and connectors which are tested and surveyed by UL. The products have been tested at UL according to the requirements of the Bi-National cable protection standard UL 1696 \_CSA C22.2 No.227.3-05 and are approved for both USA and Canada.

## Typical applications:

Wind energy installations on- and offshore

- Photovoltaic installations
- Solar heating and electricity generation
- Hydroelectric power stations
- Energy storage facilities in the form of potential energy of water or air pressure
- Geothermal installations
- Biogas equipment

## Advantages for the user

- Simple time saving assembly
- System life time
- High UV-resistance
- Water and dust tight to IP68 and IP69
- Divisible system for retrofit to completed assemblies
- Flexible – post installation cable introduction possible



## From pioneer to market leader

# Highest performance, reliability and safety in cable protection for the energy industry

ABB has been developing, producing, and selling top-quality PMA cable protection systems since 1975. Our high-quality Swiss products have rapidly earned us an excellent reputation worldwide and established us as the market leader.

Our range of more than 6,500 products gives customers the protection they need in railway applications worldwide, where power and data cables require dependable protection.

**Energy is required all around the globe and from year to year in ever increasing quantity.**

Along with the traditional sources of energy coal, gas, atomic and hydro-electric power stations,

in recent years many alternative, environmental friendly energy generation methods have begun to play an important role such as solar power installations, windmills and tidal power stations.

Reliable, continuous uninterrupted operation is for all these complex installations essential. PMA cable protection systems contribute already in many instances through their high quality and durability to securing the functionality of these energy generation plants.

### Unique benefits of PMA products from ABB

Service to the customer is what motivates us. In addition to series production, PMA can build fittings and conduits to meet individual requirements as a special service to our customers.

- A safe, reliable system that is easy to install
- High system connection strength
- High conduit retention force and resistance to vibration
- Ingress protection conforming to recognised test methods



We use **QR codes** in this brochure to provide more information and technical details are available on our website. Simply use the camera of your smartphone to scan the code.





## Worldwide recognitions

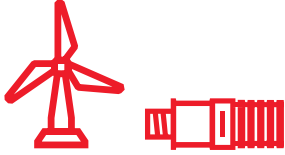
All PMA products are rigorously tried and tested to meet the demands of the energy industry worldwide.





## Cable protection for wind turbines

Strict fire safety regulations must be complied with and the cables must be protected from torsion, UV and extreme temperatures.



PMA cable protection for

### Lift power cables

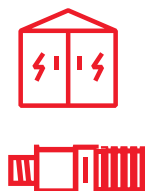
between the nacelle and tower



PMA cable protection for

### Nacelle

wiring in electrical cabinet and tower controller



Cable protection with PMA conduits

### Grid connection

Installation in the tower base and ground cable protection with PMA conduits



## Cable protection for solar applications

Strict fire safety regulations must be complied with and the cables must be protected from damage and weather conditions.



PMA cable protection for

### Control box

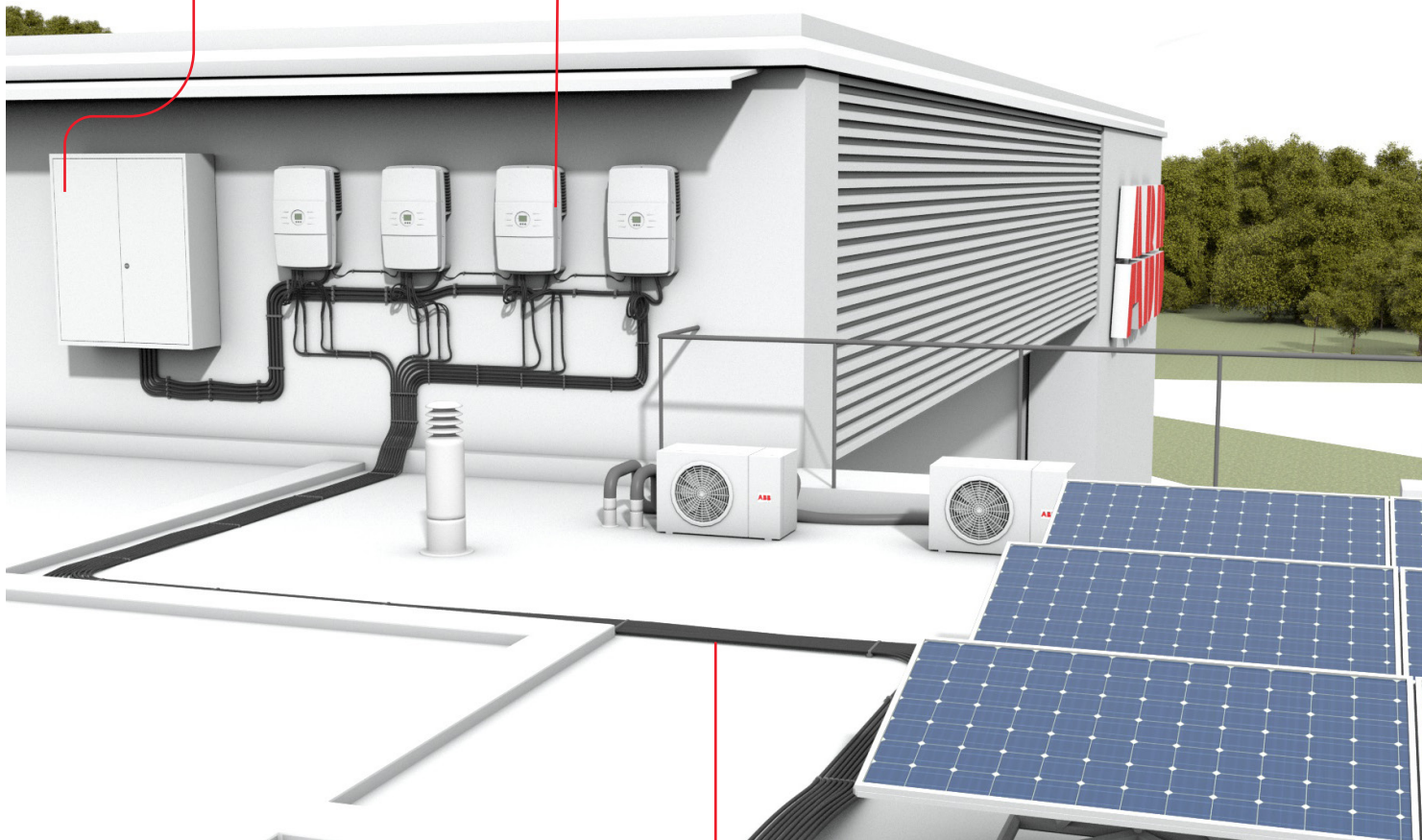
of a photovoltaic system



PMA cable protection for

### Inverter

cabinets to convert DC power to AC power



Bundled

### DC power

cable protection with PMA conduits

# PMA conduits for the energy industry

For in- and outdoor applications requiring the highest performance.

PMA conduits for renewable energy applications with numerous worldwide approvals. Outdoor applications require the highest resistance to UV and weathering. PMA conduits provide proven performance many years service in demanding applications.

**XSOL: PA12/PA6 – Medium-duty conduit for dynamic and static applications:**

- Excellent compression and impact strengths under all climatic conditions
- Excellent flexibility and resistance to fatigue
- Excellent UV resistance, weathering and ageing characteristics
- Wear indicator
- UL Recognised

**VCS: PA6 – Heavy-duty monolayer conduit for static applications:**

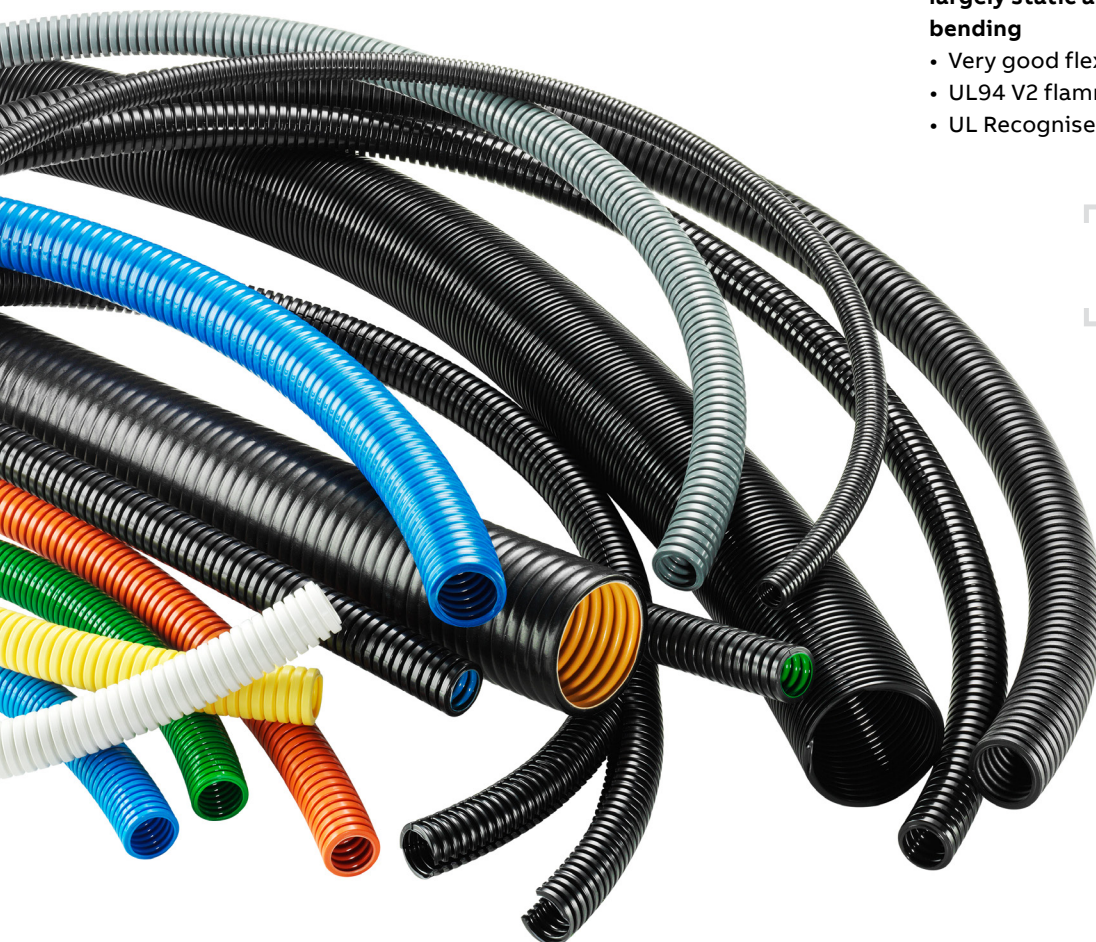
- Excellent compression and impact strengths under all climatic conditions
- Very good UV resistance, weathering and ageing characteristics
- Resistant to build up of fungus and moulds
- Resistant to damage due to rodents
- Black recommended for external applications
- UL Recognised (UR)

**PCL: PA6 – Medium-duty monolayer conduit for static and lightly dynamic indoor applications:**

- Very good UV resistance, weathering and ageing characteristics
- Very good flexibility and resistance to fatigue
- UL94 V2 flammability rating
- UL Recognised (UR)

**LLPA: PA6 – Medium-duty monolayer conduit for largely static applications with occasional bending**

- Very good flexibility and resistance to fatigue
- UL94 V2 flammability rating
- UL Recognised (UR)





## PMA Divisible System

### General technical details

One-piece Divisible System. The ideal solution for repairs, retrofit and pre-loomed applications.



PMA offers a divisible system based upon PMA standard nominal widths. This allows free combination of the PACOF and PPCOF divisible conduits with PMAFIX Pro, PMAFIX and PMA Smart Line fittings. Using the PMA Divisible System fittings, repairs can be easily made to existing installations without disconnecting cables. Equally all PMA conduits - also slit - are compatible with the fittings of the divisible system.



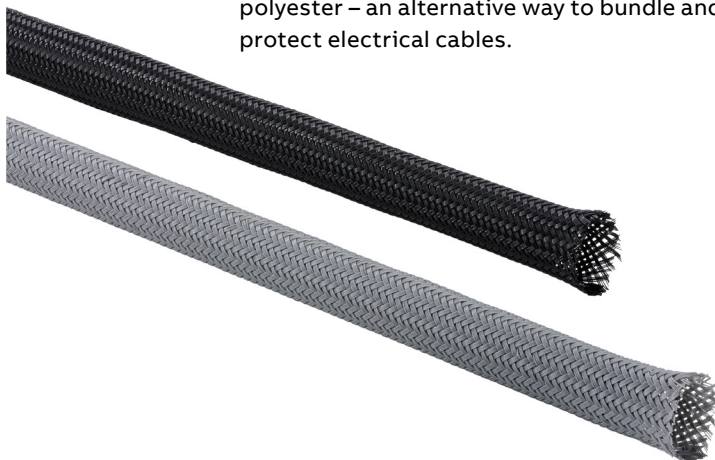
Smartphone for detailed product information.



## PMAJACK Plastic braids

### Bundle and protect electrical cables

Bundling and abrasion protection. Polyamide, polyester – an alternative way to bundle and protect electrical cables.



Plastic braids manufactured from polyester and polyamide filaments – the other alternative solution for protecting and bundling cables.

This PMA cable protection system provides simple bundling and abrasion protection for cables and wires.

Various braid types to fulfill different requirements complimented by a range of braid terminations for simple and clean assembly.

#### Material

- Braids made from polyamide 6.6 or polyester
- Terminations made from PA 6, aluminium or brass
- Free from halogens, REACH + RoHS compliant

#### Characteristics

- Flammability of braids: Polyamide 6.6 UL 94 V2
- Braid design: Following DIN 65 164 part 1+2
- EN 45545-2 HL3
- NFPA 130 for 6.6 Braids



Smartphone for detailed product information.



# PMAFIX Connectors

## With ingress protection IP66 and IP68

The designation PMAFIX describes a very large range of connectors for PMA conduits with the patented PMA safety clip system.

Connectors are available for degrees of ingress protection IP66 and IP68 according to IEC 60529. IP66 connectors are fitted with a pre-installed universal safety clip which ensures a quick “push-in” installation. IP68 connectors for increased requirements will be delivered with a special conduit seal cap.

The new PMAFIX IP68GT fittings combine simplest push-in assembly with highest sealing performance. It is also possible to upgrade to IP69 by retrofitting water impact protection.

### Material

- Fittings made from specially formulated polyamide 6
- Threads made from nickel-plated brass or polyamide 6
- Self-extinguishing
- Free from halogens, REACH + RoHS compliant
- Very good chemical properties
- Temperature range: -40°C to +105°C, short-term to +160°C

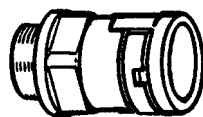
### Characteristics

- Excellent conduit pull-out strength
- High impact resistance
- Vibration-proof connection to PMA corrugated conduits
- Fits conduit profiles – fine (T) and coarse (G)
- To avoid accidental opening, disassembly is only possible with a screwdriver

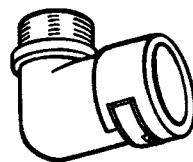


## Connector series

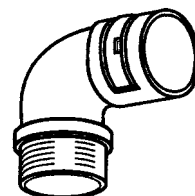
- 01 Serie N
- 02 Serie W
- 03 Serie B
- 04 Serie A
- 05 Serie O
- 06 Serie I
- 07 Serie Y
- 08 Serie T



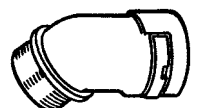
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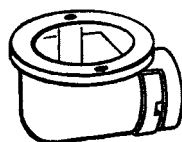
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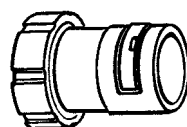
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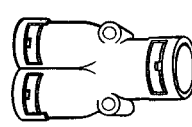
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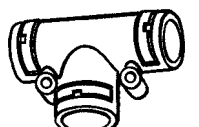
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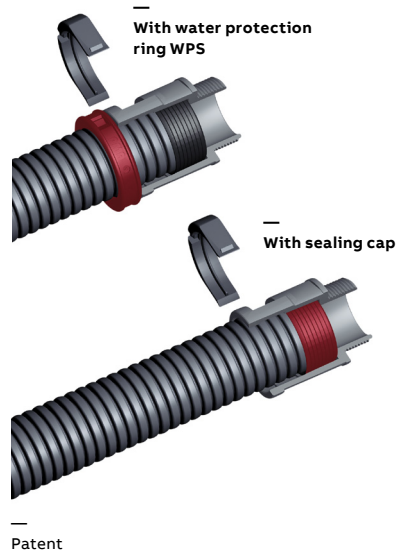


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## PMAFIX

### General technical details



## IP68

### IP68, IP69 static

### IP67, IP69 dynamic

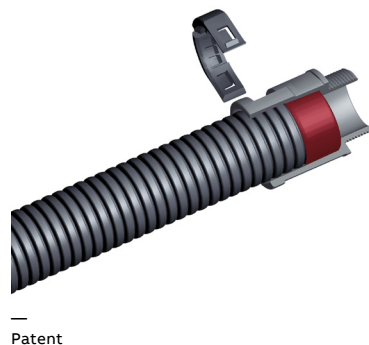
- High sealing through additional seal cap
- For highest dynamic applications
- Additional water protection ring WPS for IP69 ingress protection in conjunction with the IP68 system to be applied right after the IP68 connector onto the conduit
- Content of delivery: Connector with sealing cap, safety clip and thread seal for male thread (O-ring and/or flat gasket)

## IP68GT

### IP68, IP69 static

### IP67, IP69 dynamic

- The single piece PMAFIX IP68GT fitting with integrated sealing cap and pre-installed locking clip
- Simple push-in assembly (as with the proven PMAFIX IP66 system)
- The extra long sealing cap guarantees the highest level of ingress protection
- Identical approvals as for the PMAFIX IP68 system component version
- Fast modification of specification drawings through simple addition of "GT" to the existing order number (e.g. BVNV-M257/BVNV-M257GT)
- Additional water protection ring WPS for IP69 ingress protection in conjunction with the IP68 system to be applied right after the IP68 connector onto the conduit
- Content of delivery: Connector with integrated sealing cap, pre-installed safety clip and thread seal for male thread (O-ring and/or flat gasket)

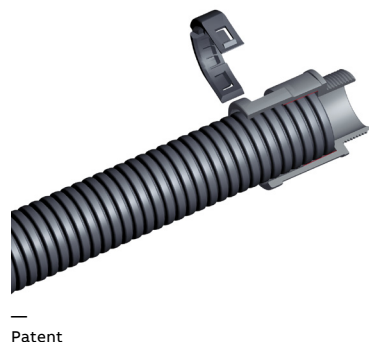


## IP66

### IP66 static

### IP54 dynamic

- One piece fitting
- Conical sealing method
- Easy "push-in" installation
- Pre-installed safety clip AFN2
- Content of delivery: Connector with pre-installed safety clip



# PMAFIX Pro

## Next generation cable protection

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

The 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 multiple component injection moulding process.

### Key features

- Meets all ingress protection categories up to and including IP68 and IP69 also when the conduit connection is continually in motion
- Manufactured with newest 2-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





## PMAFIX Pro

### General technical details

—  
01 patent  
—  
02 Up to 100 bar

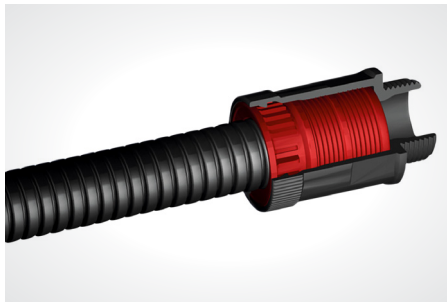
#### Material

- 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

- Highest assembly reliability – the fitting only locks when the sealing element is fully inserted
- Highest operational safety assured through visual and acoustic correct assembly controls
- Excellent resistance to ultra violet rays and weathering
- Highest impact resistance through fully closed design
- Highest 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

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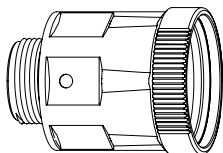


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IP68 + IP69

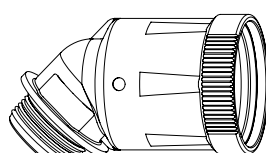
#### Static + dynamic

- Highest sealing through fully closed system also in 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)

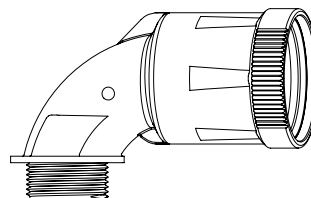
### Connector series IP68 + IP69



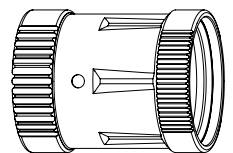
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01



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02



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03



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04

—  
01 Straight (N)  
—  
02 45° elbow (A)  
—  
03 90° curved elbow (B)  
—  
04 Female thread (I)

# 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



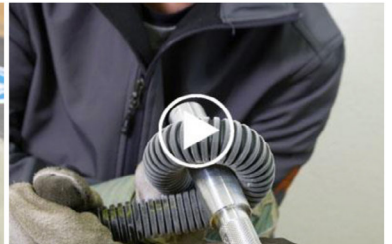
PMA Test

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



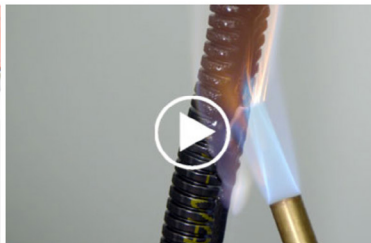
PMA Test

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





## Success stories of our customers with sustainable energy solutions



Thanks to innovative technologies, ABB has reduced the energy consumption of Umwelt Arena Switzerland by 30%. So for example, the PMA® conduits are used in the building-integrated photovoltaic installation to protect DC power cables.



One of the world's highest photovoltaic systems delivers renewable energy. A floating solar power plant in the Alps equipped with PMA® conduits providing the greatest UV protection for cables in photovoltaic applications.





## Further information

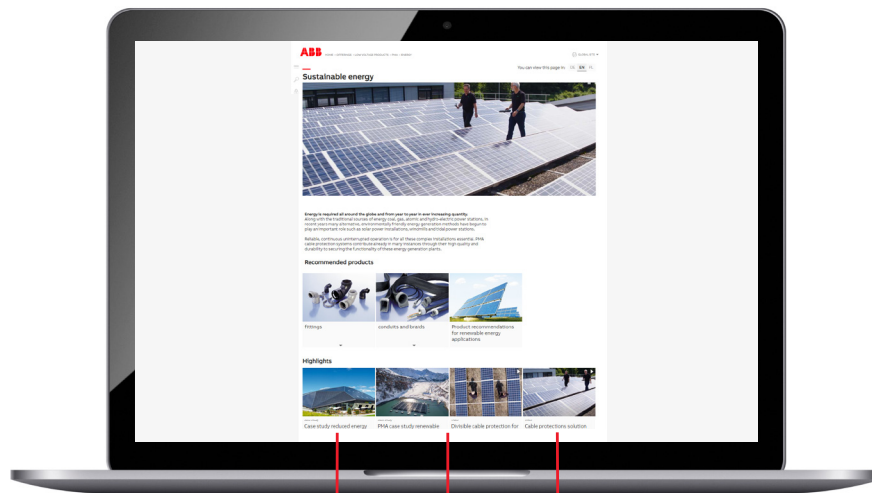
Visit our website

Visit the PMA energy web page on **pma.ch** for our most up-to-date product lineup, 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
- General technical details
- CAD files
- Brochures
- Application recommendations
- White paper
- Latest new and updates
- Videos



Smartphone  
for detailed  
product  
information.



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