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Additional information

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Tested and certified **excellence** in cable protection

PMA a market leader in the field of innovative
cable protection solutions

Customer needs are a top priority at ABB, and we work every day to ensure all our customer requirements are met in our products. We offer cable protection solutions and services that are tailored to meet requirements in every type of application.

State-of-the-art cable protection

Everything you need, anywhere in the world

ABB has been developing, producing, and selling top-quality cable protection systems since 1975. Our high-quality products have rapidly earned us an excellent reputation worldwide and established us as the market leader in many fields. Our broad range of products gives customers the protection they need for electrical and shipbuilding applications worldwide, where power and data cables require dependable protection.

Our intensive research and development activities, which include the field of new materials, are a major reason why ABB continues to set new standards and trends in the cable protection marketplace. These efforts together with excellent quality and service have helped us build up an outstanding reputation with leading corporations around the world.



Worldwide recognitions

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

ABB's PMA cable protection products conform to worldwide standards and regulations. As a pioneer in the field of cable protection, we have influenced the development of the international standards. Standards committees with responsibility for cable systems regularly ask our company to provide advice or participate as an active member.

Innovation and the pioneering of new technologies are part of ABB's DNA. We continue to research and implement the newest, most advanced raw materials in order to produce cable protection products meeting the requirements of the latest standards.

From basic items to high-tech products, all of our products meet the most stringent quality requirements.

Some of the outstanding are:

- Resistance to temperature, weathering, UV radiation and chemical agents
- High system pull-out resistance
- Excellent fire protection characteristics (flammability, smoke density and toxicity)
- Excellent system ingress protection up to IP68 and IP69
- Extremely long service life
- Conformance to all major international product standards

electrosuisse»

BOMBARDIER
Transportation



SIEMENS



EN

ALSTOM





Mechanical engineering

A considerable number of PMA cable protection systems are used in mechanical engineering. A few examples illustrate how varied the range of mechanical engineering applications is. You will find our products in machine tools, packaging machines, printing machines, as well as heating, ventilation, conveyor, and filling systems. PMA products also make a vital contribution to the smooth operation of high voltage and emergency power systems, can production machinery and woodworking machines, etc. PMA cable protection solutions safeguard cables, wires and data links against heat, cold, tensile stress, pressure stress, and other external influences in the important mechanical engineering industry.



Rail vehicles/Rail infrastructure

PMA products from ABB have proven their dependability in railway construction projects around the world. This is the reason why large corporations including Siemens, Alstom, Bombardier, PESA, CSR/CNR, Deutsche Bahn, and SNCF have chosen us as supplier over a period of many years. Our special railway engineering product line provides protection and safety on signalling systems, couplings, trucks, and gangways, as well as roof, and underfloor equipment.

The range of applications is very extensive. PMA products contribute to the safe operation of trams, locomotives, freight cars, high-speed trains, and even roller coasters.



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 massive reduction in torsional forces. There is good reason why leading robotics manufacturers rely on ABB technology.



Countless applications

PMA cable protection products from ABB can be used in an extremely wide range of applications. The list is virtually endless and includes industries such as telecommunications, construction equipment and medical equipment. Wherever there is a need for cable protection, the PMA product portfolio provides safe, dependable, forward-looking solutions or will develop them specially for you to meet your individual needs.

The way towards product excellence

Our test laboratories in Switzerland and Great Britain are an essential part of design engineering

Our intensive research and development activities, which include the field of materials technology, are a major reason why PMA products continue to set a benchmark for the flexible cable protection industry.

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.

These efforts together with excellent quality and service performance have helped establish and maintain business relationships with many leading corporations around the world.





Laboratory facilities in Uster, Switzerland and Coleshill, England

In addition to the extensive laboratory facilities in Uster, Switzerland, PMA can also perform tests at the ABB UK laboratory in Coleshill, England. This facility is particularly well equipped for ingress protection tests according to IEC EN 60529.



Our testing methods

Our test laboratories are an essential part of design engineering

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





Resistance to fatigue when exposed to Continuous Bending Test

According to EC EN 61386 and PMA DO 9.21-4425 test procedures. Both procedures describe tests designed to evaluate conduit resistance to fatigue when exposed to continuous cycles of repetitive bending. The test procedure involves bending back and forth around a central pivotal point. Although the test procedure is the same for both standards there are differences in the test parameters and the classification of results.



Resistance to fatigue when exposed to Continuous Bending Test 2

According to PMA DO 9.21-4420 test procedures. The PMA DO 9.21-4420 test procedures describes a demanding test for conduit fatigue when exposed to continuous repetitive bending. The conduit is fixed at the top of the apparatus, it passes over and under two pulley wheels. A weight is suspended at the bottom end simulating the weight of cables within the conduit. The pulley wheels move up and down continuously bending the conduit twice through 180° over its entire length.



Resistance to Impact Test

According to IEC EN 61386 standard and PMA DO 9.21-4330 test procedures. IEC EN 61386 and PMA DO 9.21-4330 describe tests to evaluate the resistance of conduits to high energy impacts. They can be performed on conduits at various temperatures. Weights of different mass are dropped from an adjustable height directly onto a conduit sample which has been conditioned at the specified temperature.



Compression Strength Test

According to IEC EN 61386 standard and PMA DO 9.21-4320 test procedures. Both, procedures describe a test designed to evaluate conduit resistance to compression forces. Excessive deformation of a conduit under compression could potentially cause damage to cables being protected within it. The force required to compress the conduit between two square plates to a specific % of its original diameter is measured. Relaxation over time and recovery after removal of the force are evaluated.



PMA CABLE PROTECTION

Information and guidance on application specific challenges, and develops products to meet the needs of the industry.





Flexibility at Low Temperature Test

According to PMA DO 9.21-4380 test procedures.

This standard describes a test procedure to evaluate the flexibility of conduits at low temperatures. The conduit under test is placed in a climatic chamber at the lowest specified operating temperature for four hours. It is then removed and immediately bent around a mandrel of diameter related to the outside diameter (OD) of the conduit.



System Security - Pull-Out Strength Test

According to IEC EN 61386 and PMA DO 9.21-4610

test procedures. IEC EN 61386 and PMA DO 9.21-4610 are designed to test the security of the connection between conduit and fitting. Two fittings with a piece of conduit between them are pulled apart with steadily increasing force. Extension of the conduit is recorded graphically against the force applied. The force required to pull the conduit out of the fitting is determined. The tests are performed at 23°C and 50% r.h.



Ingress Protection Test for Static Applications

According to IEC EN 60529 standard and PMA DO 7.3-1160-00 test procedures. IEC EN 60529 describes various levels of system ingress protection against both water and dust. IP*7 and IP*8 are sealing ratings for a system fully immersed under water. IP*7 is precisely defined as immersion to a depth of 1 meter for 30 minutes. An IP*8 rating indicates that the system remains dry after immersion to a depth > 1m and/or duration >30minutes. It is the intention of the standard that the time and depth of the test should be agreed between customer and supplier according to the requirements of the application.



Ingress Protection Test for Dynamic Applications

According to PMA DO 9.21-4440 test procedures.

This PMA internal procedure allows the sealing performance of a cable protection system which is in continuous motion to be tested. It is significantly more difficult to achieve an efficient and long-lasting seal against ingress of water for a dynamic system than for a static system. The test equipment simulates typical movement of a cable protection system while it is submerged under water.



PMA (DO) test procedures

PMA has more than 15 test procedures (PMA DO) that enables us to perform cable protection-related, application-specific material and product tests.

Customers' application-specific needs are a top priority at PMA. That's why the company, as a leading manufacturer of cable protection products, voluntarily defined various supplementary in-house test procedures, which are consistently used to test PMA products to uniform criteria. This helps us safeguard the high quality and safety of PMA cable protection solutions and supply our customers with the best, most reliable products. It gives our customer the confidence that our products perform without failure or problems and meet their expectations.

The PMA test procedures apply not only to the general product properties usual for overarching standards but also to specific applications,

such as impact resistance in low-temperature rail applications, ingress protection in dynamic outdoor applications or abrasion resistance in automation applications. PMA test procedures are primarily used in areas where the market has yet to define overarching binding standards for specific applications. Many of our bespoke test procedures are geared to existing overarching standards wherever possible, and often correspond to other international standards in terms of structure, procedure and results assessment.

Scope of a PMA test procedures:

- Detailed description of the content of testing
- Definition of samples in terms of material and quantity, distinction from other products
- Definition of the test environment, e.g. climate conditions and temperature
- Definition of devices and apparatus used in testing
- Precise definition of each relevant test parameter, such as mass, temperature, time or drop height
- Exact step-by-step definition of the test procedure
- Parameters for assessing the test result, such as the onset of mechanical losses, changes in the material, number of cycles, etc.
- List of contiguous overarching standards such as UL or IEC

For more information on the PMA test procedures (DO), please contact your PMA supplier



Resistance to thermal ageing test

According to PMA DO 9.21-4360 test procedures.

This standard describes a procedure designed to evaluate the thermal stability of a conduit and its resistance to thermal ageing. The conduit is exposed to a temperature significantly above the maximum recommended continuous operating temperature for 168 hours, 160°C (PA6) or 150°C (PA12). The Flexibility at Low Temperature procedure DO 9.21-4380 is performed both before and after the thermal ageing procedure. The results are compared to detect any change in material characteristics.



Flammability tests

According to IEC EN 61386 and PMA DO 9.21-4430

test procedures. DO 9.21-4430 evaluates flammability characteristics using a defined flame from a standard burner. The time before ignition, fire propagation behaviour and extinguishing time after removal of the heat source are all factors in evaluating the flammability of conduits for a Self-Extinguishing Classification IEC 61386 uses the IEC 60695-2-11 glow wire test procedure for fittings and the IEC 60695-11-2 1 kW flame test for conduits to evaluate the flame Propagation behavior of the cable protection system allocating the classifications. Non-flame propagating or Flame Propagating.



Flammability test - Limited oxygen supply

According to EN ISO 4589-2 standard. The limited oxygen index test is a commonly used method for assessing the flammability of materials. Samples of material are exposed to a flame within a chamber. The oxygen content within the controlled environment within the chamber can be varied to within 0.1%. Through an iterative method the maximum percentage of oxygen in the air at which the sample of material extinguishes is determined. This percentage of oxygen can be used as an indication of how easily a material burns. The higher the Limited Oxygen Index % value the less flammable a material is.



Resistance to chemicals test

According to ISO 175:210 standard. In many real application cable protection systems are exposed to chemicals. Extensive data is available for the compatibility of various plastic materials with many different chemicals. This data can be used for assessment of compatibility for specific applications. PMA publishes a compatibility list for the most commonly occurring combinations of plastic and chemical. If chemicals are mixed or if no data is available for an assessment PMA recommends a compatibility test. Changes to appearance, dimensions and mechanical characteristics are assessed after long term exposure to the chemical to confirm compatibility.

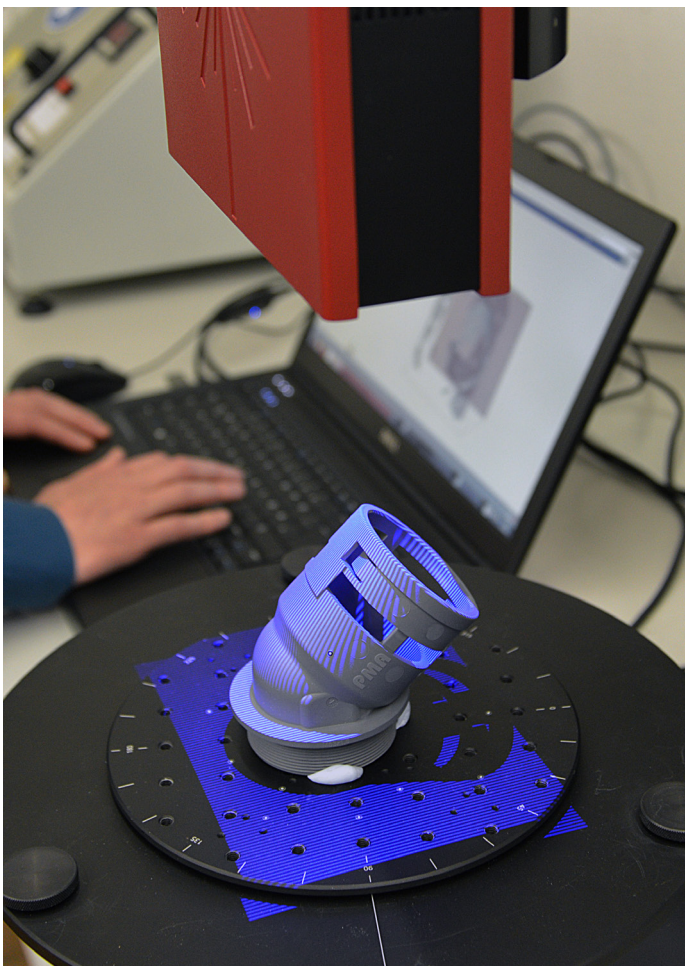


Infrared spectroscopy

For collecting high-spectral-resolution data over a wide spectral range.

Infrared spectroscopy (IR) is a technique used to characterise and identify materials. The material to be identified is exposed to a range of frequencies in the infrared band of the electromagnetic spectrum. Some frequencies will be absorbed more than others due to vibration which occurs within the molecular structure.

A measurement results in a chart for absorption as a function of wavelength. This IR spectrum serves as a characteristic "molecular fingerprint" for the material allowing comparison and identification of materials.



PMA uses latest laser technology for precision in design engineering

The 3D scanner is a high-resolution optical digital measurement system, delivering three-dimensional data quickly and precisely. The system can measure the dimensions of almost any object without contact using structured blue light and delivers precise scans with high resolution at high speed.

All individual measurements are automatically transformed into a common coordinate system and result in a complete 3D point cloud. After completion of a scan the resulting file can be compared to a reference scan or a drawing to detect differences.

Examples of application of the 3D scanner are first article inspection against drawings, fault analysis to check for damage or distortion to components not fulfilling their specification and regular checks for wear to injection moulding tools.

An innovation leader

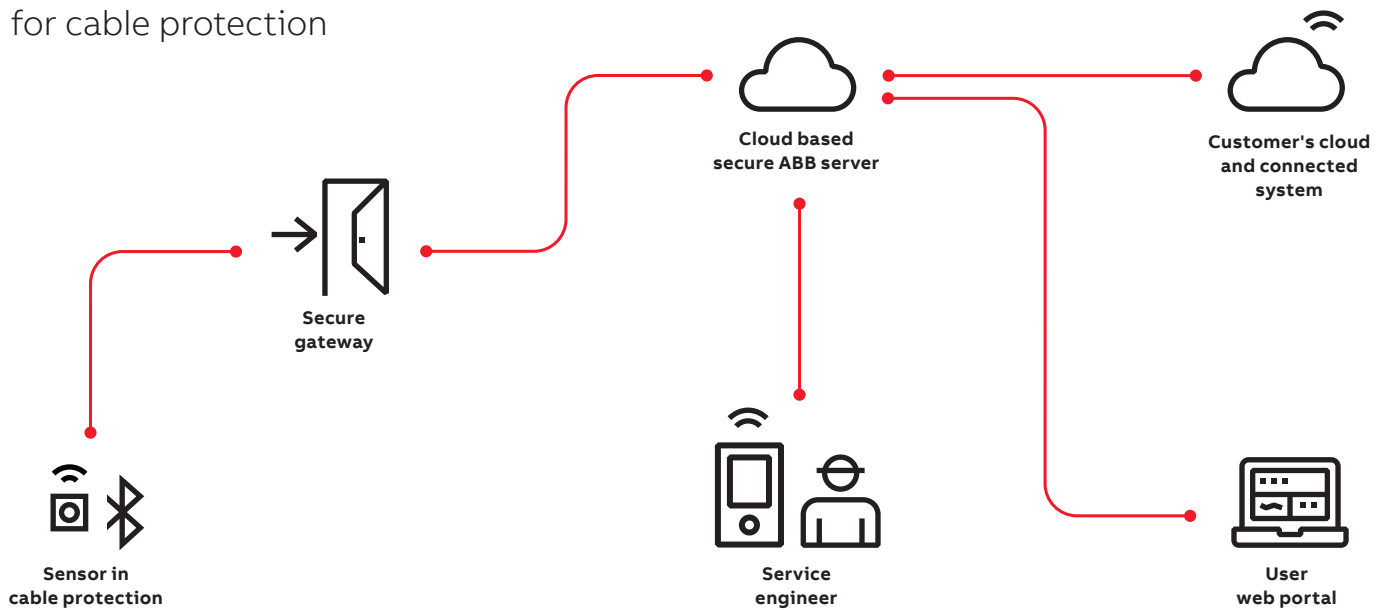
ABB to revolutionise cable protection with new technologies

“At ABB, we pride ourselves on bringing the future into the present,” said Peter Schuster, Global R&D / Technology Manager for ABB Cable Protection. “Decades of engineering work have gone into the production of liquid tight fittings and conduits that can withstand everything from chemical exposure to physical abuse. Now, we are bringing cable protection into the world of Industry 4.0 with the CPS smart sensor, a tool that will give managers levels of information and control over their electrical systems that are unheard of today. This product is the first of its kind in the world, and we are proud to be on the verge of introducing it to the market.”

Product performance and quality are influenced by many factors including design, materials, production equipment and processes. Our team of designers continuously improves component design, evolving a product range tailored to the requirements of rail applications. New designs have required the introduction of new production processes such as the two-component injection molding process required for the PMAFIX Pro fitting and the multilayer extrusion process required to manufacture the new rail conduits. Throughout its history, the PMA team has worked continuously on the formulation of ideal raw material mixtures.



ABB Ability™ platform for cable protection



— 01 Smart sensor.

— 02 Multilayer conduit.

Smart sensor solution

Research & development engineers at ABB are working to integrate sensors in cable protection systems that can remotely monitor the presence of internal liquid, undue heating and physical breaks. They are developing devices that can easily attach to a conduit, harvest data and send it wirelessly to a phone, tab or laptop, with software to analyse it for human eyes. The project is getting a boost from the two of the most powerful tools in ABB's arsenal. The first is **ABB Ability™** – a wireless, cloud-based platform that is designed to weave the threads of countless electronic inputs into the smart factory of the future. The other is the **Smart Sensor** – existing ABB devices designed to remotely monitor similar data in electric motors, bearings and pumps in similarly challenging environments.

Multilayer technology

An innovative multilayer manufacturing technology creates a corrugated conduit with two layers of material. This multilayer solution provides additional protection and safety thanks to the combination of two specially modified polyamides with different material characteristics.

The new material combinations significantly improve the overall performance of the conduits. In order to produce multilayer conduits, new extrusion equipment was required with multiple extruders feeding a single corrugating tool.

The key benefits:

- Excellent resistance to UV and weathering
- Outstanding ageing characteristics
- Wear indication through coloured inner layer

— 01



— 02





Cable Protection
you can trust

Tested and certified
under harsh conditions

The ABB PMA cable protection range offers more than 6,500 products and is tried and trusted by electrical installers, electricians and electrical contractors to protect end users critical power and data cabling. Our high-quality products have an excellent reputation, particularly for building installations, automation, railway and mechanical engineering applications. www.pma.ch

PMA

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Further information

Visit our website

Visit the PMA product web pages 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
- PMA videos
- Product brochures
- PMA tests and certificates

