

DIETZEL UNIVOLT Products are available from:

MARYLAND METRICS

P.O. Box 261 Owings Mills, MD 21117 USA

phones: (410)358-3130 (800)638-1830

faxes: (410)358-3142 (800)872-9329

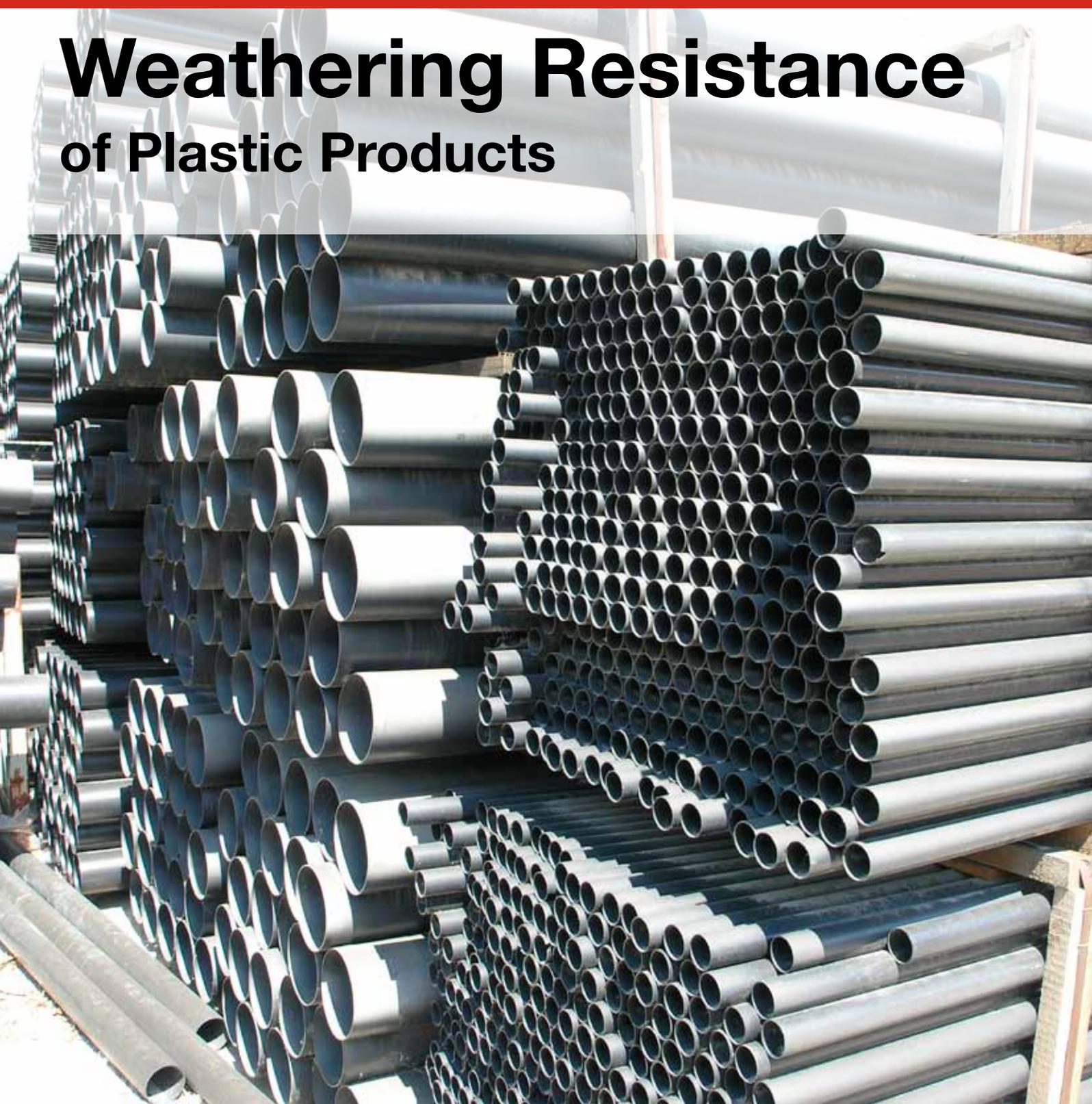
email: sales@mdmetric.com web: <http://mdmetric.com>

RFQ form: <http://mdmetric.com/rfq.htm>

DIETZEL
UNIVOLT

Cable Management Systems

Weathering Resistance of Plastic Products



Introduction

Plastic cable management systems are increasingly used in exposed applications in which the weather resistance is of particular concern. This development triggered the interest of installers in the durability and suitability of Univolt products.

The sheer multitude of influencing factors makes it difficult to give general recommendations about the weather resistance of plastics. This information serves as a guideline for users and dealers of Univolt products in order to select suitable solutions for their specific requirements and rests on our experience with applications in various climate zones and weathering conditions over many years.

Weathering

The degradation of plastics is caused by various factors commonly referred to as weathering. Typically, polymers suffer from colour changes when exposed to UV light over extended periods. Additionally, mechanical properties may change leading to reduced tensile strength and impact resistance, embrittlement, tension cracks and chalking.

The most important factors leading to degradation either individually or in combination are:

Solar radiation

Long term exposure to sunlight, particularly to UV radiation, results in breaking down of polymer chains, thus impeding physical properties, changing of colour and chalking of surfaces. In the worst case plastic products become brittle and even disintegrate after short time. To protect cable management systems against the averse effect of UV radiation, the basic compounds need to be sufficiently stabilised.

Temperature

When plastic materials are exposed to extreme heat, frost or high temperature ranges over longer periods of time the polymer structure may suffer physical damage. High temperature variations also spur chemical reactions and amplify the deterioration of plastic materials exponentially. The temperature ranges given for our cable management systems indicate the sustainment of a product's mechanical properties, particularly the compression strength and impact resistance. Weathering influences can have adverse effects on these characteristics. It is also important to consider that solar radiation can raise the temperature of directly exposed surfaces as much as 20°C higher than ambient temperature, depending on the colour of the material.

Humidity

Water is affected by UV light to produce a variety of free radicals that can both initiate and propagate the degradation process. Furthermore it may promote porosity and the colonisation of germs. Most weathering processes are considerably slower in dry climates than in wet climates.

Other atmospheric influences

Various atmospheric pollutants such as dirt or dust as well as aggressive substances like sulfur dioxide (SO₂) are inevitable in outdoor applications and can further contribute to weathering effects. Intense exposure to specific gases such as exhausts from fuel engines can accelerate material degradation considerably and lead to failure of mechanical performance.



Weathering stabilisers for plastic materials

Protection against UV radiation and weathering is usually accomplished by additives mixed to a compound used for the production of cable management systems. The selection of a suitable protection depends on the application area, climate zone, durability requirements and specific exposure. With increasing levels of UV radiation and weathering the stabilisers have to become more efficient.

UV light absorbers

Absorbers convert UV radiation into infrared radiation or thermal energy which then dissipates through the polymer matrix. The performance of light absorbers is generally not sufficient for applications with extreme weathering conditions.

Carbon black is one of the most efficient and cost effective light absorbers and is a standard additive to grey and black conduits. Hence black conduits already offer good resistance against UV radiation in moderate climate zones. On the other hand carbon black is not suitable for intense weather exposures or in case other colours than black are required.

Titanium dioxide (TiO_2) is a widely accepted light absorber especially for PVC products and offers already very good protection against UV radiation. It is mainly used for conduit systems in other colours than black.

UV stabilisers

UV stabilisers additionally interrupt the degradation process by reacting with radicals. They are developed for certain plastics and applications. The formulation of the stabiliser is specifically designed upon data about geographic location, weathering conditions, application type and expected life time. A well balanced incorporation into the compound is essential because the stabilisers can impair the flame retardancy of a product.

Weathering resistance of Univolt conduit systems

Some polymers are inherently quite resistant to weather, others less so, and some deteriorate quite rapidly. The differences are explained below.

PVC – Polyvinyl Chloride

Standard PVC conduits and fittings in black colour offer reasonable protection against UV radiation. For other colours TiO_2 is required to avoid accelerated degradation. In outdoor applications with intensive weathering other materials may offer better performance. Generally we recommend to protect PVC installations against direct weather exposure wherever possible.

PE – Polyethylene, PP – Polypropylene

Despite their chemical resistance, PE and PP have only limited outdoor lives. Reasonable resistance against weather conditions applies only to systems with high concentrations of carbon black (> 2%, not applicable for PE ductings), typical for Univolt PP conduits in black colour. For prolonged outdoor use under intense weather influences additional UV stabilisation is advised. Protection against weather influenced can also be achieved by mounting protection shades or installing conduits in concealed areas. Conduits in other colours than black are not suitable for installations outside of buildings.



PC – Polycarbonate, PPO – Polyphenylene oxide, PPE – Polyphenylene ether

Installation systems from PC and PPE/PPO in black colour offer generally good resistance against weather influences. Surface degradation may result in a matt appearance without influencing the mechanical properties. This degradation serves as a protective layer and shall not be removed. If installing PC conduits outdoors for prolonged use, an additional UV stabilisation is necessary.

PA – Polyamide

Standard PA conduits and fittings in black colour offer good protection against UV radiation but may be unsuitable for areas with rapid succession of humid and dry weather. Univolt PA conduits and fittings in black colour are generally furnished with additional UV stabilisation.

Remarks

All conduits and accessories, particularly PE ductings, shall be protected during transport and storage against UV radiation. UV stabilised plastic films, cardboard covers or closed environments are suitable means to protect the products accordingly. Outdoor storage without protection shall generally be limited to a minimum.

A common standard for testing the UV resistance is currently not available, and tests are subject to special requests if needed. In case of doubt about the applicability of our cable management systems for specific installations we advise to contact our technical department.

All information is given to our best knowledge but without further commitment. It is Dietzel's belief that information set forth in this information is accurate, Dietzel makes no warranty, expressed or implied, with respect thereto and disclaims any liability from reliance thereon. All data are subject to change without prior notice.

Dietzel GmbH

1110 Vienna, 1. Haidequerstrasse 3-5

Tel.: +43 1 76 0 76-0

Fax: +43 1 76 0 76-500