

# The Panzerbelt® Cable Protection System



PBELT051

Manufactured by Cavotec Specimas

# Cavotec Specimas Panzerbelt® System

In the following pages we illustrate the Panzerbelt® Cable Protection System manufactured by Cavotec Specimas, sold and serviced by the Cavotec Sales Companies and by a network of Cavotec Group Distributors.

## The Cavotec Group

Cavotec is the name of a group of companies specialized in power supply technology for cranes and other industrial equipment. It is formed by 6 manufacturing companies located in Australia, France, Germany, Italy, Sweden and USA, and by 18 Cavotec sales companies which, together with a network of Distributors, serve more than 30 countries in five continents. Each manufacturing company, no matter where it is located, aims at being a market leader in its field by providing innovative and reliable products to Group customers. Although they manufacture different products in different countries, they are globally supported and coordinated by the Cavotec Group in their product development and marketing activities. Each sales company, and each distributor, has a policy aiming at better serving its local market with the full support of the Cavotec Group.

## Our aim is to be local everywhere

Great emphasis is put in providing the highest quality not only in the selected products, but also in service and backing to their customers. Our philosophy in fact is to be local everywhere.

*The cover picture shows a double Panzerbelt® installation at Contship's Medcenter terminal, at Gioia Tauro, Italy.*

## Our fields of activity are



**Mining,  
tunnelling**



**Steel Mills**



**Forestry**



**Ports,  
Terminals**



**Robots,  
Automation**



**Offshore**



**Constructions**

## Cavotec Specimas

Based in Italy, Cavotec Specimas is the Cavotec production centre of motorised cable reels, slipping assemblies and Panzerbelt cable protection systems, for ports, marine, offshore and tunnelling operations. The company started in 1963 with the development and manufacture of an innovative cable reeling system which soon captured the interest of technicians in major ports throughout Europe. The good customer relationship which was established, encouraged the company to broaden its range of products in the field of power equipment. One of the early successful developments was the Panzerbelt system illustrated in the following pages. Today, more than 250 installations of Panzerbelt system are in operation at ports and shipyards around the world.

It is a trouble-free, reliable and smooth operation which adds years to the life of the expensive cables. Cavotec Specimas has today acquired the reputation of being in the forefront of its sector and the most innovative cable reel manufacturer in the world.



VAR10060

*A view of the Cavotec Specimas manufacturing plant at Nova Milanese, Milano, Italy.*

# The Panzerbelt® Cable Protection System.

"Panzerbelt®" is a patented system developed by Specimas in the mid-70s, with the aim of giving an efficient and economic protection to power cables against damages and problems caused by the increasing cross traffic in ports and terminals.

The more than 250 installations at work today (2002) around the world, since the first Panzerbelt® was put in operation back in 1976 in the Port of Leghorn, Italy, prove that the system is the right solution.

Panzerbelt® withstands cross traffic of all vehicles normally used in ports without permanent deformation. It prevents spillage of any nature from entering into the channel. It gives the highest degree of cable protection without the need of maintenance.

In the following pages we give a detailed description of the Panzerbelt® System.

Here we show some images of the conventional cable protection systems — flush steel plate covers — and a maintenance-free Panzerbelt® installation.

Yesterday: hinged metal plates



Today: Panzerbelt®



Everglades Terminal, Florida, USA



# Panzerbelt®.

## A description of the system.

Panzerbelt® is the Cavotec Specimas solution to a number of problems concerning protection of the electrical supply to mobile equipment in environments such as ports, shipyards and steel mills which have an intense traffic of haulage vehicles and heavy load transport. The Panzerbelt® System is easy to install and guarantees long term, trouble-free operation with no need of maintenance.



PBEL1005

A Panzerbelt® installation at Kawasaki Container Terminal, Tokyo, Japan.

### The background.

The traditional method of feeding electrical power to quayside cranes through contact rails has now virtually been superseded by cable systems.

However it is still necessary to provide protection for the cable from quay traffic and safety regulations in many ports require some form of housing. The simplest and most economic method is to provide an open duct, although this is a hazard to pedestrians and can easily become clogged by debris, possibly damaging the cable.

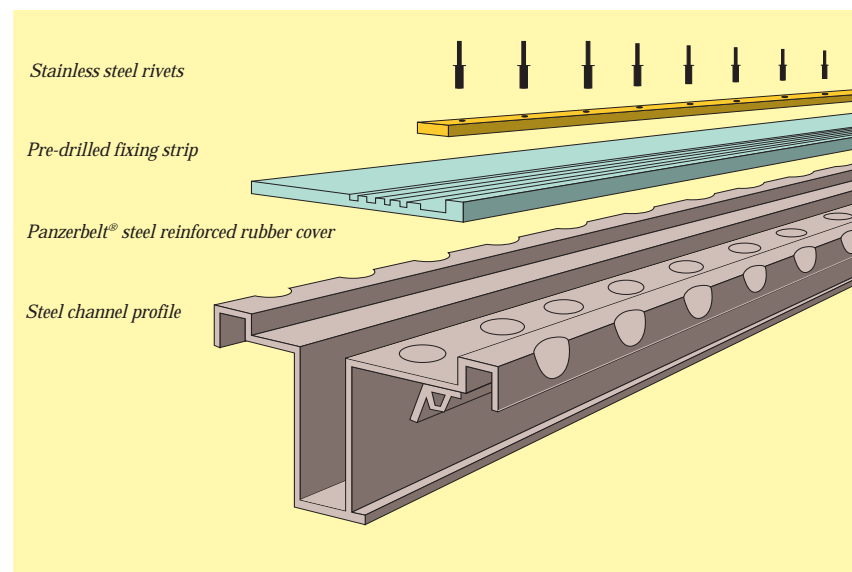
Another solution is to provide a raised cable support, but this cannot be adopted where traffic crosses the crane's path and therefore has limited application.

A more sophisticated solution is to cover the duct with hinged metal plates, as frequently used in contact rail installations. This system however, suffers from many drawbacks since maintenance requirements are considerable. Moreover, the complex design of the plate lifting mechanism slows transit speeds and can cause costly downtime.

### The solution.

Panzerbelt® is a cable protection system incorporating a continuous semi-flexible belt, fabricated from rubber with inlaid steel reinforcement, which lies over a channel cast in the quay. The belt is riveted to the quay surface along one edge, while the other remains free to be raised by a cable guide and belt lifting device fitted to the crane.

Steel reinforcement has been developed to retain flexibility of the belt in all directions, except transversely to the channel axis, so that the cable once in the channel, is totally protected from vehicles crossing the track and from objects falling into the cable duct. It is also possible to convert a hinged plate system both for conductor bars or cable reel supply to this more flexible covering system.



The main components of the Panzerbelt® System.

**Two versions:**

**Standard Panzerbelt®**  
**Super Panzerbelt®**

As a result of development, trial installations, and practical experience in close cooperation with its customers, Cavotec Specimas can now offer two versions of the Panzerbelt® System: Standard Panzerbelt® and Super Panzerbelt®.

Standard Panzerbelt® is designed to allow traffic of most vehicles used in harbours, including container carriers with small solid wheels such as Mafi wagons.

Super Panzerbelt® offers an extra advantage as it allows heavy vehicles and fork-lift trucks not only to pass over the belt, but also to have their wheels turning on top of the belt. This is a typical application for land side installation with heavy traffic.

## A number of reasons in favour of Panzerbelt®.

Panzerbelt® — a continuous flexible covering system for cable channels and conductor bars trenches — gives numerous advantages to the user.

The 10 most important reasons are:

- Total operational safety
- Low installation cost
- Full cable protection
- Maintenance free
- No load restrictions
- Channel free from spillage
- Operates under any climatic conditions
- No crane speed limitations
- No alignment problems
- Easily adaptable to existing systems

*Exologan Terminal, Buenos Aires, Argentina.*



PBELTO48

# Technical characteristics of the Panzerbelt® System.

## The belt.

The most significant feature of the Panzerbelt® System is the belt.

Its manufacture, defined after several years of testing and practical experience, allows it to perform conflicting duties; as it must have a high transversal rigidity to support all types of vehicles passing over, but it must also possess

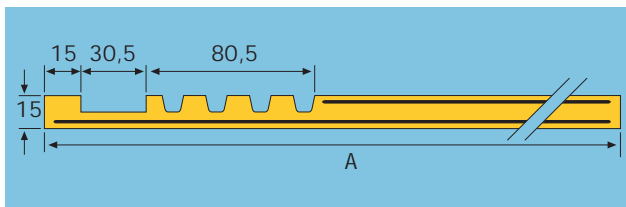
sufficient longitudinal flexibility to allow the belt to be lifted into the vertical position. In addition it is also resistant to mechanical and abrasive wear thus minimising maintenance costs. It is weather and corrosion resistant-particularly in view of normal marine environment conditions.

## General characteristics of belt.

Ambient temperature:	- 30°C...+ 80°C
Opening angle:	90° maximum
Estimated lifetime:	> 250.000 cycles (open/close)
Horizontal bending radius	with hinge profile externally: min. 30m with hinge profile internally: min. 70m
Maximum load:	The maximum load applied on a Panzerbelt® System with a 100 mm wide slot should not exceed 400 N/cm <sup>2</sup> .
Elongation:	2‰ with a load of 3000 N.
Approx. length of rolls:	50m.

## Standard Panzerbelt® type PB

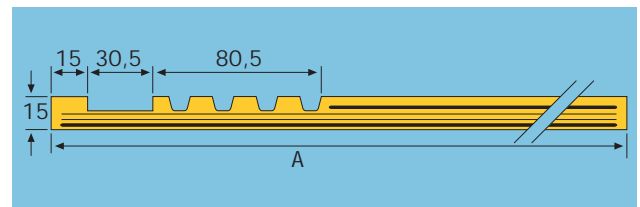
Materials:	80% SBR-Styrene Butadiene Rubber* 15% Steel cord 5% Nylon
Reinforcing:	Warp: RFL dipped nylon yarn Breaking load 12 kN
	Weft: Brass coated steel cord Breaking load 720 kN/m



Type	dimension A (mm)	Weight (kg/m)
PB 300	295	≈ 6.0
PB 400	395	≈ 7.5
PB 600	595	≈ 11.5

## Super Panzerbelt® type SPB (USA and Europe Patent)

Materials:	75% SBR-Styrene Butadiene Rubber 15% Steel cord 10% Nylon
Reinforcing:	Warp: RFL dipped nylon yarn Breaking load 12 kN Two layers specially composed of synthetical fibres Polyestere yarn – Breaking load 20 kN
	Weft: Brass coated steel cord Breaking load 720 kN/m Polyamide yarn – Breaking load 20 kN



Type	dimension A (mm)	Weight (kg/m)
SPB 300	295	≈ 6.5
SPB 400	395	≈ 8.0

\* Other types of rubber and reinforcement layers are available for special working environments.

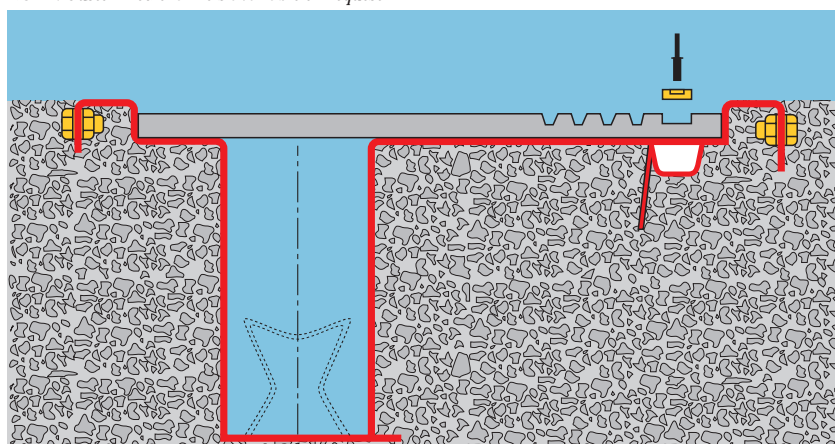
**The channel.**

The Panzerbelt® channel, made of stainless steel sheet, according to customer requirements, serves primarily as a formwork for the creation of a duct in the quay. Secondly it is shaped to provide a recess for the belt thus ensuring protection of its edges. It also carries the additional profile that ensures a firm fixing of the belt to the concrete. The standard channel comes in two meters lengths with accessories for fast and simple installation on site.

**Standard channels (for belts PB 400 and SPB 400)**

DEPTH (mm)	227,5	327,5	427,5	527,5	627,5
CODES	402	403	404	405	406

NOTE: Customized channels available on request



**The special channel.**

For the US market a special channel with interlocks and pre-drilled channel fixing holes is available.



PBELTO45

The channel interlock front view.

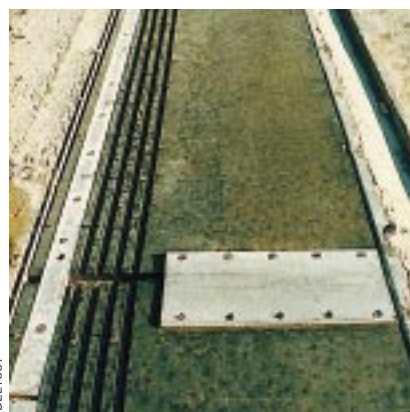


PBELTO46

The channel interlock side view.

**The belt joint.**

Belt sections are supplied with galvanized steel joints already fixed at one end. The same rivets - available for fixing the belt - are used to connect the joint to the next belt section.



PBELTO07



PBELTO47



# Panzerbelt® : simple and fast installation.

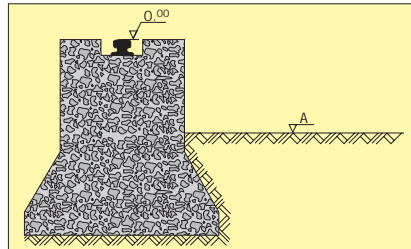
The supply of a Panzerbelt® System consists of the following components:

- The Panzerbelt® both Standard and Super reinforced belt, in rolls of approx. 50m, with a joint at one end.
- Stainless steel channel AISI 304, 1,5 mm thick, in different sizes, 2 meter long sections.
- Hot dip galvanised 30x80mm fixing strips, with 13 pre-drilled holes per meter, in 2 meter long sections.
- Stainless steel or nickel copper rivets, 13 per meter.
- Earthing copper strips with screws and nuts.
- Anti-filling and alignment system with expanded polystyrene.
- Alignment brackets for channel sections.

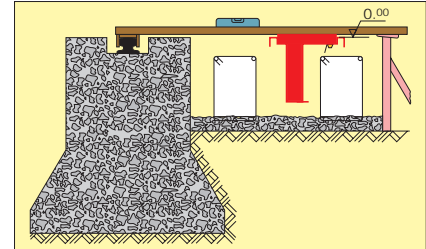
Customized components such as channels, fixing rivets, etc are available on request.

The installation of the Panzerbelt® System is a simple and fast operation. The main steps are illustrated here.

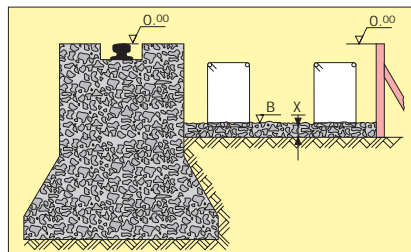
To insure correct installation Panzerbelt® should be put under tension by first fixing one end, pulling initially with a force of  $3000\text{ N} \pm 500\text{ N}$ , releasing to  $750\text{ N} \pm 250\text{ N}$ , then fixing at the other extremity. Repeat for every 50m length.



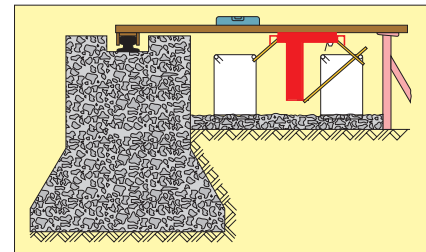
1 Section through typical quayside with crane rail beam cast.  
Depth A to be equal to depth of channel + 30 cm.



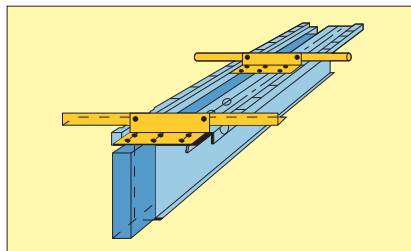
4 Positioning of the channel section.  
Adjacent sections are connected using the polystyrene block and the end brackets.



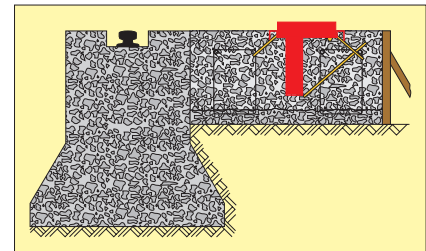
2 Positioning of a retaining wall and suitable reinforcement. Initial concrete casting fixing the steel reinforcements (dim. X = 10 cm approx.).



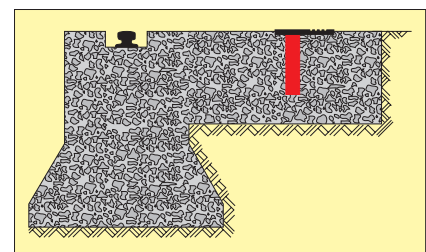
5 Final alignment and levelling of sections with respect to crane rail.  
Welding of sections to steel reinforcements.



3 Preparation of a channel section ready for installation. (Cross-members not supplied).



6 Final concrete casting.  
Removal of installation, including polystyrene blocks.



7 Positioning of belt and fixing through the pre-drilled steel strip using rivets.



Typical Panzerbelt® channel installation.  
Hupac of Switzerland, Busto Terminal.

PBELT044



# Accessories.

According to the end users' technical specifications, the Panzerbelt® system can be supplied with optionals like:

- 1 Stainless steel turnover anchor, single or double
- 2 Junction boxes for connecting the fixed cable to the mobile one
- 3 Fixed Panzerbelt® opening device
- 4 Electrical connectors, medium voltage with optical fibre
- 5 Panzerbelt® lifting device



PBELT009



PBELT042



PBELT043



PCONIN043

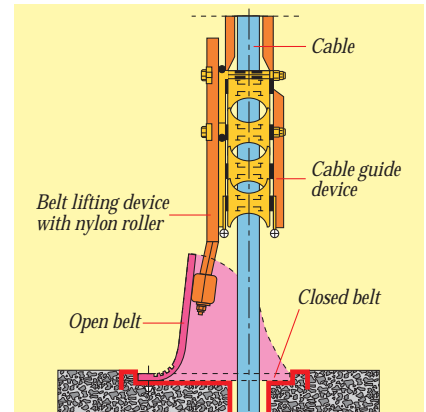
## The belt lifting device.

Thanks to the characteristics of the flexible rubber cover, the belt-lifting device is a simple and light construction.

The device is made of stainless steel with rollers in nylon charged with molybdenum and is easily adaptable to existing cable guides or pick-up systems.



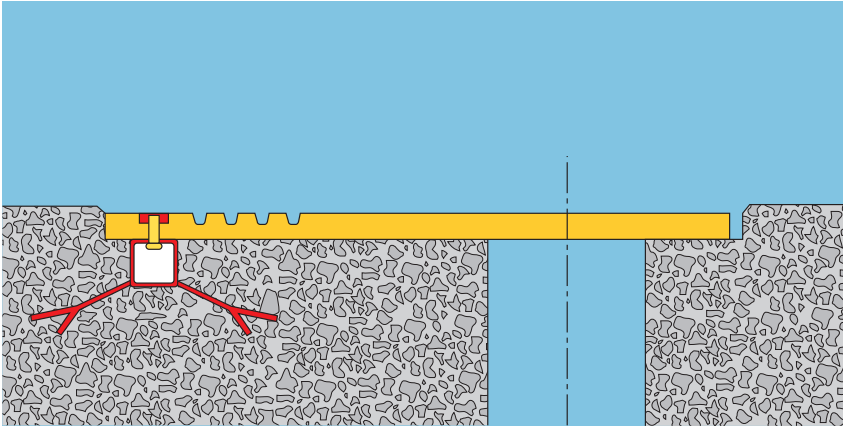
PBELT008



# Panzerbelt® retrofit.

## Retrofit.

Drawing and pictures show a typical retrofit application where the customer – Jebel Ali Port, Dubai – decided to use the Panzerbelt® without its channel in an existing slot. Our engineering staff are prepared to examine any application and propose alternative solutions utilizing the Panzerbelt® System.



PBELT010

*Jebel Ali Port - Dubai.  
The pre-existing slot used for the Panzerbelt® installation.*



PBELT011

*Jebel Ali Port - Dubai.  
The finished retrofit installation 1500 m long.*



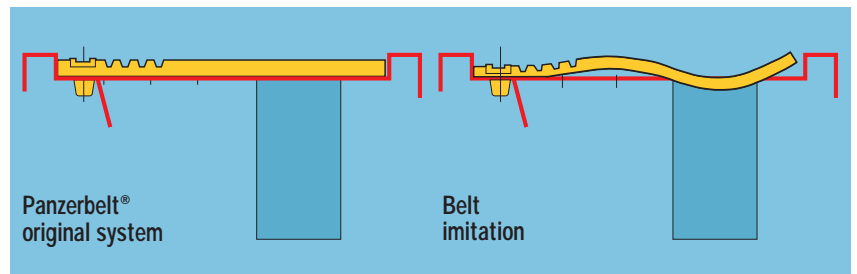
# Panzerbelt® – a unique system.

The Panzerbelt® System is covered by several patents and registration certificates. Still, as it usually happens with any innovative and successful product, imitations have recently appeared on the market. Here we can only say that the wealth of technology and experience put in the Panzerbelt® System cannot easily be copied. Take for example the belt, the most important component of the Panzerbelt® cable protection system. It consists of 13 layers of different materials, including a double layer of steel and textile cord, vulcanized together at very high temperature and pressure.

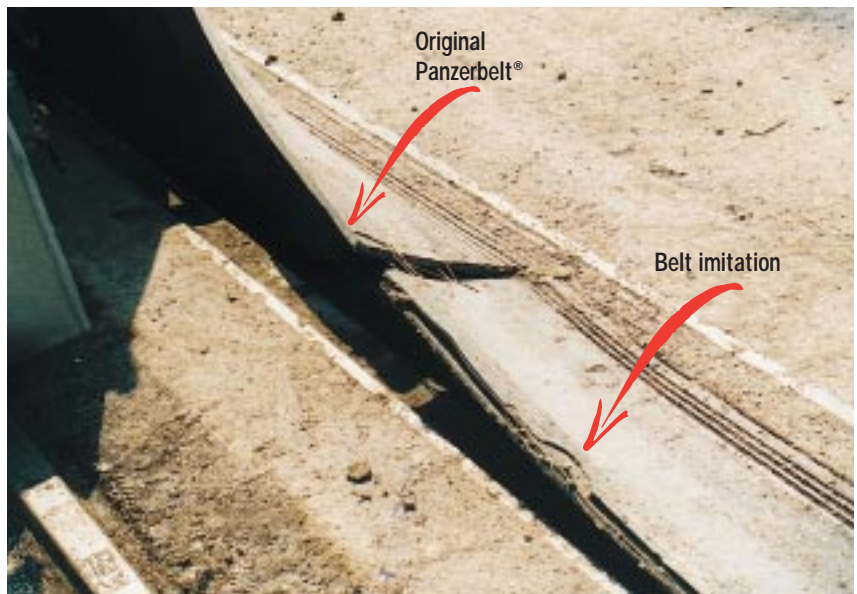
The double layer of steel cord makes the belt rigid in the transversal direction, and flexible in the longitudinal direction. This is of fundamental importance for the trouble-free operation of the system. The pictures below show an original Panzerbelt® installation followed by the installation of a belt imitation.



PBELT012



PBELT041



PBELT013

The picture proves the difference between the original Panzerbelt® and a belt imitation which shows early signs of severe belt deterioration.

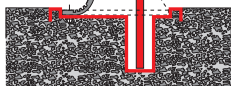
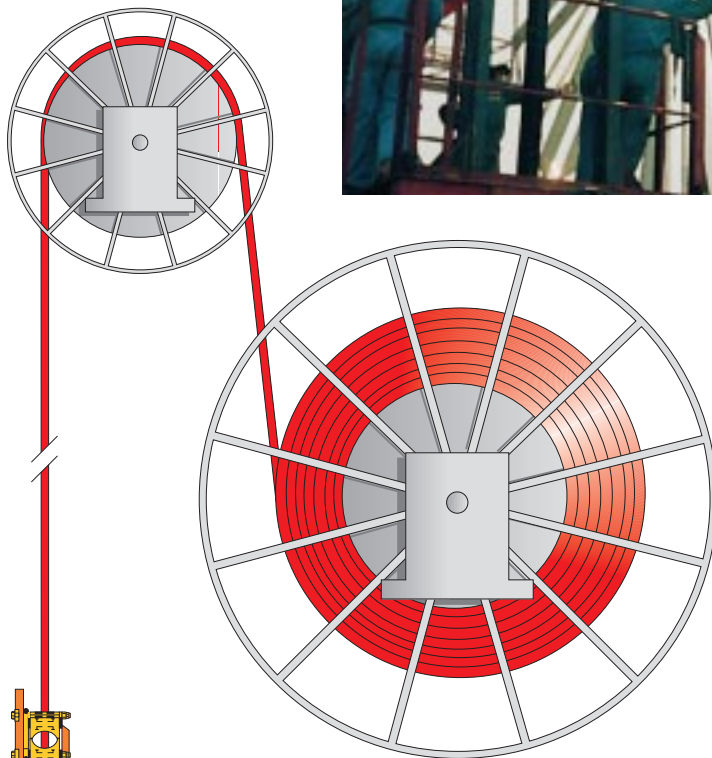


# Cable Reels to Panzerbelt®.

The Panzerbelt system described in this catalogue is a vital component of the cable management program developed by Specimas since 1963. Cable Reels manufactured by Cavotec Specimas are today at work in a number of ports, terminals, mines, tunnels and industries all over the world. The range of Cavotec Specimas motorised cable reels has been enlarged to cover almost any application and requirement. Here we give some basic information about the Cavotec Specimas cable reels. A specific publication on the cable reels technology is available on request.



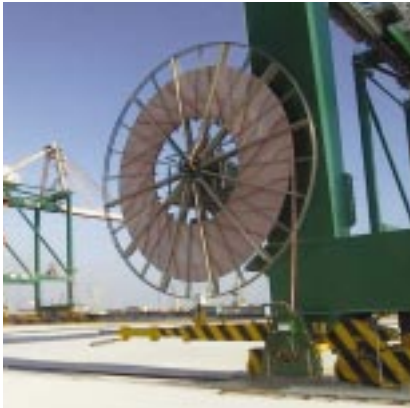
REELS059



Typical complete system supplied by Cavotec, composed of "Pull & Store" cable reel, flexible cable and Panzerbelt®.

Motorised cable reels are mainly divided in applications for Horizontal and Vertical Reeling, and a distinction is made for Intermittent Duty or Continuous Duty applications. For **Intermittent Duty** applications Cavotec Specimas normally uses the Hydrodynamic System, which is particularly suitable for these applications due to its simplicity and high reliability. Compact design, even torque output in reeling and unreeling mode, standard motor and low maintenance are some of the features of this system. More than 50.000 units have been produced by Cavotec Specimas in almost 40 years.

For **Continuous Duty** applications Cavotec Specimas uses the new family of T-series gear-boxes, which can be used with several drive systems of which the frequency inverter -CDC- is the most popular. In order to optimise costs and technique, Cavotec Specimas uses different drive systems for different applications and sizes.



PBELT030

*Evergreen Terminal, Taranto, Italy - Fantuzzi Crane*



PBELT014

*Halmstad, Sweden, Cavotec Specimas Panzerbelt® and reel working at minus 35°C*



PBELT040

*Cavotec Specimas Panzerbelt® in operation in Southampton, United Kingdom.*



PBELT052

*Cavotec Specimas cable reels with "pull and store" and Panzerbelt® in operation at Everglades Terminal, USA.*



REELS047

*Cavotec Specimas cable reels in operation on Fantuzzi, Ansaldo Reggiane container cranes at the Port of Voltri, VTE, Italy.*



# 253 Panzerbelt® installations around the world.

Innovation is a basic asset of Cavotec Specimas manufacturing.

The Panzerbelt® System fully proves such a characteristic. It is in fact a unique and exclusive system of cable protection which guarantees long term trouble-free operation.

The 253 existing installations in ports around the world, having a total length over 300 km, carried out during the years are still in operation, in hot environments as well as in extremely cold ones, like the minus 35°C in a Scandinavian port.

Here is the list of countries where Panzerbelt® is at work.

Country	N° of installations
Argentina	1
Australia	1
Brazil	3
Cyprus	1
Costa Rica	2
Denmark	2
Djibouti	2
Dubai	3
Egypt	1
England	24
Filippine	1
France	12
Germany	17
Greece	4
Holland	2
Italy	71
India	2
Indonesia	3
Israel	1
Ivory Coast	1
Yemen	1
Japan	1
Jamaica	2
Korea	2
Lituania	1
Malaysia	12
Malta	1
Martinique	2
Mexico	6
Norway	6
Oman	2
Portugal	2
Singapore	10
Slovenia	1
South Africa	4
South Korea	5
Spain	1
Sweden	6
Tanzania	2
Turkey	2
Ukraine	2
U.S.A.	28
	<b>253</b>

April 2002





PBELT015  
Kawasaki, Tokyo, Japan



PBELT031  
Oakland, USA



PBELT020  
Algeciras, Spain



PBELT036  
Hamburg, Germany



PBELT001  
Brani, Singapore



PBELT032  
Los Angeles, USA



PBELT034  
Durban, South Africa



PBELT039  
Southampton, UK



PBELT033  
Freeport, Malta



REP20004  
Salalah, Oman



PBELT022  
Pasir Panjang, Singapore



PBELT035  
Hamburg, Germany



Power supply and crane technology

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