

**GERPAAS<sup>®</sup>**

Technical

Teknik

ТЕХНИЧЕСКАЯ ИНФОРМАЦИЯ

	Prefix	Kısaltmalar	Сокращения
	EN	TR	RU
<b>HDG</b>	Hot dip galvanized	Sıcak daldırma galvaniz	Горячее цинкование
<b>EG</b>	Electro galvanized	Elektro galvaniz	Электро оцинкованный
<b>ESB</b>	Electrostatic powder coated	Elektrostatik toz boya	Электростатической порошковой краской
<b>AL</b>	Aluminum	Aluminyum	Алюминиевый
<b>APB</b>	Prime coated	Antipas boyalı	Коррозия доказательство краска
<b>CU</b>	Copper	Bakır	медь
<b>SS4</b>	AISI 304 grade stainless (A2)	304 kalite paslanmaz çelik	304 нержавеющей сталь
<b>SS6</b>	AISI 316 grade stainless (A4)	316 kalite paslanmaz çelik	316 нержавеющей сталь
<b>Mm</b>	Milimeter	Milimetre	Миллиметрические
<b>A</b>	Side height	Kenar yüksekliği	Высота борта
<b>W</b>	Width	Genişlik	ширина
<b>L</b>	Length	Uzunluk	Длина
<b>µm</b>	Micron	Mikron	Микрон
<b>SWL</b>	Safe working load	Emniyetli çalışma yükü	Грузоподъемность
<b>Def</b>	Deflection	Sehim	отклонение
<b>M</b>	Meter	Metre	Мера
<b>Pc</b>	Piece	Adet	Каждый
<b>N</b>	Nevton	Newton	Ньютон
<b>Lbs</b>	Pound	Pound	фунт
<b>Kg</b>	Kilogram	Kilogram	Килограмм
<b>UDL</b>	Uniformly distributed loads	Uniform yükler	Равномерно распределенные нагрузки
<b>F</b>	Fahrenheit	Fahrenheit	Фаренгейт
<b>C</b>	Celcius	Celcius	Цельсий



## ADVANTAGES OF GERPAAS® CABLE MANAGEMENT SYSTEMS

### GERPAAS® KABLO TAŞIMA SİSTEMLERİNİN GETİRDİĞİ AVANTAJLAR ПРЕИМУЩЕСТВА GERPAAS® КАБЕЛЬНЫЕ СИСТЕМЫ УПРАВЛЕНИЯ

#### **GERPAAS® Cable Tray Systems are;**

- Designed with standardized slot patterns enabling easy interconnections,
  - Low maintenance costs
  - Less expensive systems compared to electrical conduits and other wiring systems,
  - Very reliable and safe compared to other wiring systems,
  - Competitive pricing strategy,
  - Custom production availability upon request,
  - Offers a diverse selection of materials and finishes to meet your demanding environmental conditions,
  - Adaptable to new needs and technology
  - Fire resistance enables maximum safety
  - Can be observed, and tested practically,
  - Easy to store and protect,
  - Suitable for all types of finishing variants,
  - Available in a variety of material options.
  - Cable management systems are widely known universal systems
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#### **GERPAAS® Kablo Taşıma Sistemleri;**

- Standart delik düzeni ile uygulaması pratiktir.
  - Bakım maliyetleri düşüktür.
  - Diğer kablolama sistemlerine göre daha ekonomik çözümdür.
  - Diğer kablolama sistemlerine göre daha güvenilirdir.
  - Ekonomik fiyatlandırma yapısına sahiptir.
  - Özel ölçülerde üretim yapılma imkanı
  - Çevre koşullarına göre uygun birçok malzeme ve kaplama seçeneği
  - Yeni ihtiyaçlara ve teknolojiye göre sistem üzerinde kolayca değişiklik yapılabilir.
  - Yüksek havalandırma kapasitesiyle ve metalik yapısıyla yangına karşı dayanıklıdır
  - Sistemi gözlemleyip kontrol ve test edebilmek kolaydır.
  - Depolamak ve muhafaza etmek kolaydır.
  - İmalat sonrası tüm kaplama tekniklerine uygundur.
  - Birçok malzeme seçeneği mevcuttur.
  - Kablo taşıma sistemleri herkes tarafından bilinen, uygulanan ve tercih edilen sistemlerdir.
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#### **GERPAAS® Кабельные Системы управления;**

- Стандартный дыру дизайн
- Низкие затраты на обслуживание
- Менее дорогие системы по сравнению с другими электрическими системами
- Очень надежным и безопасным по сравнению с другими электрическими системами
- Конкурентоспособные цены
- Возможно изготовление продукции на заказ
  - Разнообразная диапазон материала и отделки параметры в соответствии с условиями окружающей среды
  - Адаптироваться к новым потребностям и технологиям
  - Пожарная устойчивость
  - Можно наблюдать и испытан легко.
  - Могут быть сохранены и охраняются легко.
  - Подходит для всех покрытий варианты.
  - Доступные в различных вариантах металлического материала.
  - Кабельные системы управления широко известны универсальные системы.

## DEFINITIONS

Cable tray system is the structure that carries the cabling of an electrical system and distributes all the cables to the intended machinery and equipment. There are sub systems within a cable tray system including the support and suspension of the cable trays and their components.

<b>Cable tray:</b>	is a rigid structure for fastening, supporting, holding or distributing cables. Cable trays are manufactured in single flanged and return flanged options in standard. Also cable trays are available in perforated and non-perforated options.
<b>Cable ladder:</b>	is a prefabricated structure consisting of two longitudinal side rails connected by pre welded at the inner side of the rails.
<b>Splice plate:</b>	is a connector piece which joins cable tray and cable ladder straight sections and fittings or both.
<b>Flat bend:</b>	is an angular connection on horizontal cable runs. Available angles in flat bends are 30, 45, 60 and 90 degrees.
<b>Tee bend:</b>	is a cable tray fitting joining cable trays in 3 directions at 90° intervals in the same plane. Tee bends are offered as "equal" and "unequal" widths.
<b>Crossing:</b>	is for joining cable trays in 4 directions at 90° intervals in the same plane.
<b>Reducer:</b>	is for joining cable trays of different widths in the same plane. Abrupt reducers, however, do not have a bottom plane or a rung to support cables but are used only to connect the cable trays of different widths just like the splice plates.
<b>Vertical bend:</b>	is for joining cable trays of the same widths in different vertical levels. Available as inside and outside types.
<b>End plate:</b>	is for ending the cable tray run.
<b>Cover:</b>	is for closing the top of the cable tray or cable ladder straight section or its component completely or partially depending on the preferred type of cover lid.

## TANIMLAR

Kablo kanalı sistemi bir elektriksel düzeninde yer alan kabloları taşıyan ve amaçlanan makineye, ekipmana veya noktaya kadarki dağıtımını sağlayan yapıdır. Kablo kanalı sisteminde sistemin kendisini taşıyan, destekleyen alt sistemlerde mevcuttur.

<b>Kablo kanalı:</b>	üzerinde kabloları bağlamak, taşıma, tutma ve/veya dağıtmayı sağlayan rijit yapıdır. Tek bükümlü ve ağır hizmet bükümlü olarak mevcuttur. Delikli ve deliksiz olarak üretilmektedir.
<b>Kablo merdiveni:</b>	paralel iki uzun profil ve aralarına belirli aralıklarla kaynaklanmış basamaklardan oluşan metal yapıdır. Basamaklar bacak denilen profillerin birbirlerine bakan iç kısımlarına kanatılır.
<b>Ek elemanı:</b>	Kablo kanallarını, kablo merdivenlerini, bağlantı parçalarını birbirlerine bağlayan birleştirme elemanıdır.
<b>Yatay dönüş:</b>	kablo hattının yönünü yatay düzlemde değiştirmek için kullanılan açılı elemandır. 30, 45, 60, 90 derecelerde üretilir.
<b>T dönüş:</b>	kablo taşıyıcı sisteminde aynı düzlem üzerinde 3 farklı yöne (açıya) dönüş elemanıdır. T elemanları "eşit" ve "farklı" olarak üretilmektedir.
<b>Dörtlü bağlantı:</b>	kablo taşıma sisteminde aynı düzlem üzerinde 2 farklı yöne 4 çıkış veren elemandır.
<b>Redüksiyon:</b>	kablo taşıma sisteminde aynı düzlem üzerindeki farklı genişliklerdeki iki kablo kanalı/merdiveninin birleştirilmesini sağlar. Ek tipi redüksiyonların farkı tabanı olmamasıdır.
<b>Düşey bükey:</b>	farklı yüksekliklerde bulunan aynı genişlikteki kablo kanallarını / kablo merdivenlerini birbirine bağlar.
<b>Sonlandırma:</b>	Kablo kanalı / kablo merdiveni hattını sonlandırır.
<b>Kapak:</b>	seçilen kapak modeline göre kablo kanalının / kablo merdiveninin üstünü kapatır.

## ОПРЕДЕЛЕНИЯ

Кабельные лотки система является структурой, которая несет в кабельной электрической системы и распределяет все кабели предназначены для машин и оборудования.

<b>Кабельный лоток:</b>	представляет собой жесткую конструкцию для крепления, поддержки, проведения или распространение кабели.
<b>Кабельные лестницы:</b>	состоит из двух продольных сторону рельсов связаны предварительно сварные на внутреннюю сторону рельсов.
<b>Сборка частей:</b>	Разъем представляет собой кусок, который соединяет кабельных лотков и кабельных лестницы прямые участки и фитинги.
<b>Секция угловая горизонтальная:</b>	это угловые соединения на горизонтальных кабельных трасс. Доступные в плоских углов поворотов на 30, 45, 60 и 90 градусов.
<b>T образное разветвление:</b>	является установка кабельного лотка кабельные лотки вступлении в 3 направлениях на 90 ° интервалом в той же плоскости. Tee поворотов предлагаются как "равные" и "неравными" ширины.
<b>Секция крестообразная:</b>	для присоединения кабельных лотков в 4 направлениях 90 ° интервалом в той же плоскости.
<b>Редукции:</b>	для присоединения кабельных лотков различной ширины в той же плоскости.
<b>Внешний угловой элемент:</b>	для присоединения кабельных лотков той же ширины в различных вертикальных уровнях. Доступен как внутри, так и за пределами типов.
<b>Единица конца:</b>	Используется в конце кабельные лотки и кабельные лестницы.
<b>Обложка для кабельных лотков / кабельного лестницы:</b>	для закрытия верхней части лотка кабеля или кабеля лестницы прямые раздела или его компонентов, полностью или частично в зависимости от предпочитаемого типа покрытия крышки.

## GENERAL INSTRUCTIONS

Cable trays, cable ladders nor any system components must be used as a walkway or support for people, this may cause personal injuries and also damage to the components, the cable support system and as well as the cables. All systems components must be controlled physically for any burrs, sharp edges and irregularities that may harm cables, other equipment or workers. Deformed system components must be repaired or must be changed with new components. Protective gloves and caps must be worn during shipping and carrying the system components. Safe working load capacities must be taken in consideration at all times. It is always recommended to set up an upgradeable support system for your requirements also in the future. External loads must be taken into account when designing a cable ladder system (e.g. Wind loads, snow loads, ice loads etc.) Cable tray and cable ladder interiors where the cables and related will be installed must have smooth surface to allow for easier cable pulling and minimize the risks of damaging the cables. All cable tray and cable ladder straight pieces must be combined at the ends by splice plates.

1. Avoid stocking and shipping in humid or wet conditions. Dry environment is required for all metal components.
2. Keep all components away from the risk of physical impacts. preferably all items be kept in original packages, and it is strongly recommended to store on pallets and/or in cardboard boxes.
3. System components must not be used as walkway or support unit for people as since such behavior may reduce the performance of the components where as it also may cause personal injury and harm the entire electrical system.
4. In case that any damage is detected in the system components, immediate precautions must be taken by repairing the components or by changing with new ones.
5. Recommended temperature ranges must be taken in consideration at all times.
6. Installation of cable tray & cable ladder systems must be performed by qualified personnel.
7. SWL diagrams must be taken in consideration in electrical projects and installations.

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## GENEL BİLGİLER

Kablo taşıyıcılar üzerinde yürünmemeli, insan yükü uygulanmamalıdır. Uygulandığı takdirde taşıma sistemine ve elektrik sistemine zarar gelebilir. Kablo taşıma sisteminde çapak, sivri uç vb gibi unsurlar bulunmamalıdır; bulunduğu takdirde derhal onarılmalı veya düzgünü ile değiştirilmelidir. Yük taşıma kapasiteleri her zaman dikkate alınmalıdır. Kablonun döneceği yüzeyler kesinlikle düzgün olmalıdır.

1. Ürünler tercihen kuru ortamda korunmalı, nemli ve ıslak şartlardan uzak tutulmalıdır.
2. Ürünler fiziksel dış etkenlere maruz bırakılmamalı, tercihen orijinal paketlerinde paletler üzerinde tutulmalıdır.
3. Kablo taşıyıcıların üzerinde insan yükü uygulanması sistemin verimini düşüreceğinden ve tehlike arz edeceğinden sistem bileşenlerine insan yükü uygulanmamalıdır.
4. Sistem bileşenlerinde hasar tespit edildiğinde derhal onarılmalı veya değiştirilmelidir.
5. Sistem bileşenleri tavsiye edilen ısı şartlarında kullanılması ve depolanması gerekir.
6. Kablo taşıyıcıların bu konuda eğitimli personel tarafından monte edilmesi gereklidir.
7. Yük taşıma kapasitelerine uyulmalıdır.

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## ОБЩИЕ ПОЛОЖЕНИЯ

Кабельные лотки, лестничные лотки и другие компоненты системы не должны использоваться как дорожки или опорные стойки для людей- это может стать причиной повреждения деталей, опорной кабельной системы, кабелей и нанести личный ущерб. Все компоненты системы должны находиться под контролем физического лица от каких-либо колющих или острых углов, которые могут повредить кабель, другое оборудование или причинить вред рабочим. Деформированные компоненты системы следует исправить или заменить новыми деталями. Во время транспортировки компонентов системы пользоваться защитными перчатками и касками. Должна быть принята во внимание безопасность грузовой нагрузки. При необходимости обеспечить подъемные опорные системы. Внешняя нагрузка должна учитываться при проектировании системы лестничных лотков. Внутренние стороны кабельных и лестничных лотков, где будет монтироваться кабель, должны иметь гладкую поверхность, чтобы облегчить проведение и уменьшить риск повреждения кабеля. Все прямые детали кабельных и лестничных лотков должны крепиться при помощи связующих элементов.

1. Избегайте хранения и транспортировки в сырых или мокрых условиях. Сухая окружающая среда обязательна для всех металлических деталей.
2. Держите все компоненты от риска физического воздействия, предпочтительно каждый отдельный предмет хранить в подлинной упаковке или картонной коробке.
3. Компоненты системы не должны использоваться как дорожка или опорная стойка для человека, поскольку это может снизить производительность деталей повредить всю электрическую систему.
4. В случае обнаружения какого-либо повреждения в системе компонентов, следует немедленно принять меры предосторожности по ремонту или замене деталей на новые.
5. Должен быть принят во внимание рекомендуемый температурный предел.
6. Монтаж систем кабельных и лестничных лотков должен выполняться квалифицированным персоналом.
7. Схемы грузовой нагрузки диаграммы должны учитываться в электрических проектах и монтажах.

## Recommended Conditions For Stocking And Shipping Of Cable Tray & Cable Ladder Systems

- 1 Avoid stocking and shipping in humid or wet conditions. Dry environment is required for all metal components.  
Keep all components away from the risk of physical impacts and construction traffic. Preferably all items be kept in original packages, and it is strongly recommended to store on pallets and/or in cardboard boxes all elevated off the ground. GERPAAS® products are palletized and generally shrink-wrapped with secure PVC straps in export packaging.
- 2 System components must not be used as walkway or support unit for people as since such behavior may reduce the performance of the components where as it also may cause personal injury and harm the entire electrical system.
- 3 In case that any damage is detected in the system components, immediate precautions must be taken by repairing the components or by changing with new ones.
- 4 Recommended temperature ranges must be taken in consideration at all times. (-20 / +105° C)
- 5 Installation of cable tray & cable ladder systems must be performed by qualified personnel.
- 6 SWL diagrams must be taken in consideration in electrical projects and installations.

## # Kablo Kanalları Ve Kablo Merdivenlerini Taşıma ve Depolama İçin Genel Tavsiyeler

- 1 Ürünleri ıslak ve nemli yerlerde muhafaza etmeyiniz. Kuru ortam metal ürünler için idealdir.
- 2 Tüm ürünleri fiziksel darbeye maruz kalabilecekleri ortamlardan uzak tutunuz. Tercihen orjinal paketlerinde depolayınız.
- 3 Ürünler üzerinde yürümek veya benzeri ağırlık uygulamak sakıncalıdır.
- 4 Ürünlerde defo tespit edildiği taktirde kullanmayınız, tamir ediniz veya yenisi ile değiştiriniz.
- 5 Ürünler tavsiye edilen sıcaklıklarda kullanılmalıdır. (-20 / +105° C)
- 6 Kablo taşıyıcıların montajı deneyimli ve bilgili yetkili personel tarafından yapılmalıdır.
- 7 Ürünlerin yük taşıma kapasitelerine uyunuz.

## # Рекомендуемые условия для хранения и перевозок кабельных лотков И Системы кабельных лестниц

- 1 Не запасов продукции на влажных.
- 2 Храните в безопасных районах, с минимальным риском физического воздействия. Храните продукты в оригинальной упаковке.
- 3 Продукция не должна быть использована в качестве ходить путями.
- 4 Если какие-либо физические недостатки обнаружены, то свяжитесь с изготовителем / поставщиком модернизировать или изменить в продукте. Не используйте поврежденные или используемых продуктов.
- 5 Рекомендуемая температура должна приниматься во внимание во все времена. (-20 / +105° C)
- 6 Монтаж кабельных лотков И лестничных кабельных систем должны выполняться квалифицированным персоналом.
- 7 Грузоподъемность диаграммы должны быть приняты во внимание во все времена.

## SAFETY

- 1- Cable trays, cable ladders or any of the system components must not be used as a walkway, or support for people; this may cause personal injuries, and also damage the components, the cable support system, and as well as the cables.
- 2- All system components must be controlled physically for any burrs, sharp edges and irregularities that may harm cables, other equipment or workers.
- 3- Deformed system components must be repaired or must be changed with new components.
- 4- Protective gloves and caps must be worn during shipping and carrying the system components.
- 5- Safe working load capacities must be taken in consideration at all times.
- 6- External loads must be taken into account when designing a cable tray or cable ladder system (e.g. wind loads, snow loads, ice loads etc.)
- 7- Cable tray and cable ladder interiors where the cables and related equipment will be installed must have smooth surface to allow for easier cable pulling and minimize the risks of damaging the cables. All cable tray and cable ladder straight pieces must be combined at the ends by splice plates.
- 8- The performance of a cable tray wiring system is dependent to its proper installation, including supports and cables. Neglecting installation and maintenance guidelines may lead to personal injury as well as damage to property.
- 9- Nonmetallic supports and hardware may require special load bearing considerations due to material composition and application temperature or other factors.

## EMNİYET

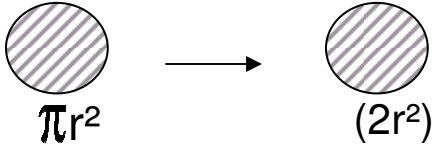
- 1- Kablo kanalları, kablo merdivenleri veya diğer sistem bileşenleri insanlar için yürüme yolu veya destek eşyası olarak kullanılmamalıdır; bu, sistemdeki ekipmanlara, ve kablolar ve çevredekilere zarar verebilir.
- 2- Tüm sistem bileşenleri çapak, sivri uç veya benzeri hatalara karşı kablolama yapılmadan önce kontrol edilmelidir.
- 3- Bozuk malzeme kullanılmamalı ve derhal tamir edilmeli veya yenisi ile değiştirilmelidir.
- 4- Taşıma sırasında koruyucu eldiven ve başlık kullanılmalıdır.
- 5- Yük taşıma kapasiteleri dikkate alınmalıdır.
- 6- Dış etkenlere bağlı yükler dikkate alınmalıdır (rüzgar yükü, kar yükü, buz yükü vb.)
- 7- Kablo taşıyıcıların iç kısımlarında kablolar zarar verebilecek yüzeyler bulunmamalıdır. Kablo taşıyıcılar birbirlerine ek parçaları ile eklenmelidir.
- 8- Kablo taşıma sisteminin performansı doğru montaj yapılmasına bağlıdır. Dikkatsiz yapılan montajlama sonucu insanlara ve ekipmanlara zarar gelebilir.
- 9- Metal olmayan bileşenler ve bağlantı elemanlarında yük taşıma kapasitelerine dikkat edilmeli ve malzeme farklılığından dolayı kaynaklanabilecek termal gerilme ve genleşme oranlarına bakılmalıdır.



## Безопасность

- 1- Кабельные лотки, кабельные лестницы или любого из компонентов системы не должны быть использованы в качестве дорожки или поддержки для людей, это может причинить телесные повреждения, а также повредить компоненты, системы поддержки кабелей, а также а также кабелей.
- 2- Все компоненты системы должны контролироваться для любого физического заусенцев, острых кромок и нарушения, которые могут повредить кабель, другого оборудования или других работников.
- 3- Деформированные компоненты системы должны быть отремонтированы или должно быть изменено с новыми компонентами.
- 4- Защитные перчатки и шапки необходимо носить во время транспортировки и реализации компонентов системы.
- 5- Безопасная рабочая нагрузка потенциала должны быть приняты во внимание во все времена.
- 6- Внешние нагрузки должны быть приняты во внимание при проектировании кабельных лотков или кабельного лестнице (например, ветровые нагрузки, нагрузки снега, льда нагрузок т.д.)
- 7- Кабельные лотки и кабельные лестницы интерьеры, где кабелей и связанных с ними будет установлено оборудование, должны иметь гладкую поверхность, облегчают закрепления кабелей и минимизации рисков повреждения кабелей. Все кабельных лотков и кабельных лестницы прямые частей должны быть объединены на концах путем сращивания пластин.
- 8- Выполнение кабельных лотков система проводки зависит его правильной установки, в том числе поддерживает и кабели. Пренебрегая установка и обслуживание руководящих принципов может привести к телесным повреждениям, а также ущерб имуществу.
- 9- Неметаллические поддерживает и оборудования могут потребоваться специальные несущие сооружения, обусловленные составом и материальной температура применения или других факторов.

## Selection Of The Correct Cable Tray Sizes Выбор правильного кабельных лотков Doğru Kablo Kanalı Seçimi



- Use  $(2r^2)$  formula to find the area of each cable.  
Используйте  $(2R^2)$ , чтобы найти кабеля области.  
Kablunun alanını  $2R^2$  ile bulun.
- Find the total area of cables required for your cable tray route.  
Определите ваши области требование для кабелей  
İhtiyacınız olan kablo kesiti alanını belirleyin.
- It is recommended to keep a +20% reserve margin for future revisions in cable route.  
Мы рекомендуем, чтобы сохранить 20% запас пространства для ваших будущих потребностей.  
Kablolama alanında %20 rezervli bırakmanız tavsiye edilir.
- Choose the corresponding size of cable tray using the table below.  
Выберите соответствующий размер кабельных лотков помощью показано ниже таблице.  
Aşağıdaki tablodan uygun kablo kanalı tipini seçiniz.
- It is highly recommended to choose the nearest higher value.  
Настоятельно рекомендуется выбирать ближайшее большее значение.  
En yakın büyük değerin seçilmesi tavsiye edilir.

Cross Sectional Area (mm²)	A			A						
	mm	15	25	40	25	40	50	60	75	100
W	50	750	1250	2000	1000	1600	2000	2400	3000	4000
	70	1050	1750	2800	1400	2240	2800	3360	4200	5600
	100	1500	2500	4000	2000	3200	4000	4800	6000	8000
	125	1800	3000	4800	2400	3840	5000	5760	7500	10000
	150	2250	3750	6000	3000	4800	6000	7200	9000	12000
	200	3000	5000	8000	4000	6400	8000	9600	12000	16000
	225	3375	5625	9000	4500	7200	9000	10800	13500	18000
	250	3750	6250	10000	5000	8000	10000	12000	15000	20000
	300	4500	7500	12000	6000	9600	12000	14400	18000	24000
	400	6000	10000	16000	8000	12800	16000	19200	24000	32000
	450	6750	11250	18000	9000	14400	18000	21600	27000	36000
	500	7500	12500	20000	10000	16000	20000	24000	30000	40000
	600	9000	15000	24000	12000	19200	24000	28800	36000	48000
	750	11250	18750	30000	15000	24000	30000	36000	45000	60000
900	13500	22500	36000	18000	28800	36000	43200	54000	72000	



## GERPAAS® standard sizes and equivalents in NEMA standards:

We use metric sizes in all calculations. However, for the enquiries listed with units including inches the nearest metric standard dimensions are taken into consideration as shown in the table below;

inches (imperial)	Conversion to mm (metric)	Adaptation to Gerpaas standards
3"	76.2	75 mm
4"	101.6	100 mm
5"	127.0	125 mm
6"	152.4	150 mm
8"	203.2	200 mm
9"	228.6	225 mm
10"	254.0	250 mm
12"	304.8	300 mm
16"	406.4	400 mm
18"	457.2	450 mm
20"	508.0	500 mm
24"	609.6	600 mm
30"	762.0	750 mm
35"	889.0	900 mm

## Anti-Corrosion

The corrosive environment of the site environment must be studied prior to determination of the material and finish options of the cable tray systems. Proper selection of the corrosion protection method lengthens the life of the steel material and provides safe and economical use.

CLASSIFICATION OF ENVIRONMENTS			
Corrosion category	Loss of thickness µm/year	Typical environment	
		Indoor	Outdoor
C1 inconsiderable	≥0,1	-	Heated buildings (offices, schools, stores etc.)
C2 Slight	>0,1 until 0,7	Little pollution Like rural areas	Not heated buildings with formation of condensate like store houses, coliseums
C3 Moderate	>0,7 until 2,1	City and industrial environments with moderate pollution	Highly humid production plants like laundry, brewery and diary
C4 Strong	>2,1 until 4,2	Industrial areas and coastlines with moderate salt impact	Chemical plants, swimming pools
C5-I Very strong (industrial)	>4,2 until 8,2	Industrial environment with high humidity and aggressive atmosphere	Buildings or areas with almost permanent condensation and pollution
C5-M Very strong (marine)	>4,2 until 8,2	Coastlines and offshore areas with high salt impact	Buildings or areas with almost permanent condensation and pollution

## Hot dip galvanize (HDG) (EN 1461 – TSE 914)

GERPAAS® offers most of the products with hot dip galvanized finishes which bring ideal anti-corrosive performance in many circumstances. In this coating method a metallic bond occurs resulting in a zinc coating that completely coats all surfaces, including edges and welds. Best advantage of this coating method is its coating thickness which exceeds 45 microns in almost all thicknesses. Hot dip galvanizing is made after manufacture of the steel products by means of dipping the items in molten zinc bath.

The layer of zinc which bonds to steel provides a dual protection against corrosion. It protects first as an overall barrier coating. If this coating happens to be scratched or gouged, zinc's secondary defense is called upon to protect the steel by galvanic action. Hot dip galvanized finish is recommended for prolonged outdoor exposure, and it protects steel for many years in outdoor environments. Zinc coatings above 85 microns available upon request.

INTERNATIONAL STANDARDS					
	Europe	Germany	Great Britain	France	U.S.A
<b>HDG</b>	ISO EN 1461	DIN ISO EN 1461	BS EN ISO 1461	EN ISO 1461	ASTM A123/A 123M
<b>PG</b>	ISO EN 10142	DIN EN 10142	BS 2989	EN ISO 10142	ASTM A653SS
<b>EG</b>	EN 12329	DIN 50961	EN 12329	EN 12329	ASTM B633

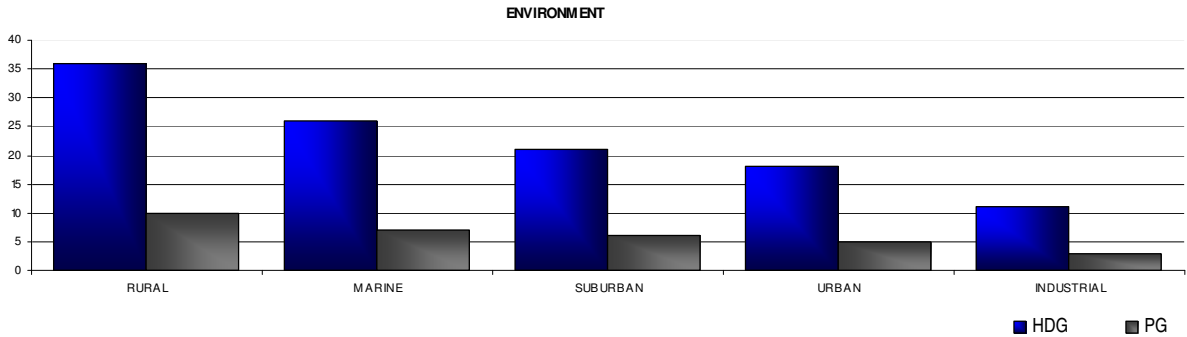
REQUIREMENTS OF HOT DIP GALVANIZATION AS PER EN ISO 1461		
ARTICLE AND ITS THICKNESS	LOCAL COATING THICKNESS (min) <sup>a</sup> µm	MEAN COATING THICKNESS (min) b
STEEL > 6 mm	70 (505)	85 (610)
STEEL > 3 mm - < 6 mm	55 (395)	70 (505)
STEEL > 1.5 mm - < 3 mm	45 (325)	55 (395)
STEEL < 1.5 mm	35 (250)	45 (325)
CASTINGS > 6 mm	70 (505)	80 (575)
CASTINGS < 6 mm	60 (430)	70 (505)



## Hot dip pregalvanize (PG) (EN 10142 – 10327, TSE 822)

Gerpaas also offers hot dip pregalvanized finish for many products. This is also known as mill galvanized or hot dip mill galvanized or continuous hot dip galvanized. Importance of the pregalvanized finish is that pregalvanized steel can repair itself on the cut edges by means of natural spreading of the zinc surrounding the cut edges. During fabrication, cut edges and welded areas are not normally zinc coated; however, the zinc near the uncoated metal becomes a sacrificial anode to protect the bare areas after a short period of time. Pregalvanized steel is easy for welding works and ideal for painting. Temperature differences should not exceed 10 C° during storage.

### COMPARISON OF HDG TO PG IN CORROSIVE ENVIRONMENTS



### ZINC COATING IN PREGALVANIZED STEEL AS PER TS 822 (min)

Steel gauge (mm)	0,35 and less	0,40	0,45	0,50	0,55	0,65	0,75	0,85	0,95	1,05	1,25	1,55	2,05
Zinc coatings as per 3 point method (gr/m)	122	153		183		214					275		
Coating class	1D	1C		1B		1A					2D		

## Electrogalvanize (EG) (DIN 50961, TSE 149)

GERPAAS supplies bolts, nuts, washers, thread rods, and such fixing & fasteners in electrogalvanized finish in standard unless otherwise stated. also known as zinc plated or electroplated) is the process by which a coating of zinc is deposited on the steel by electrolysis from a bath of zinc salts. This type of zinc coating is recommended for indoor use in relatively dry areas as it can provide 96 hours protection in salt spraying tests.

## Aluminum (grades 6063 and others)

Aluminum cable tray systems bring the advantage of light weight in the cable support systems.

- Aluminum cable trays are about 50% lighter than steel made items,
- are non-magnetic and this structural property avoids electrical disturbance in currents,
- Are highly resistant to corrosion

## Stainless Steel

Gerpaas offers 304 and 316 (L) grade stainless steel material for most of the product ranges carried. Stainless steel material provides very effective corrosion protection in acidic and humid areas and therefore it is a longlasting solution in corrosion protection. Especially, AISI 316 grade stainless steel provides ultimate anti-corrosion performance in marine and industrial environments where high levels of humidity and acidic air are prevalent: i.e. onshore and offshore applications. AISI 316 (1.4404) is a molybdenum-bearing austenitic stainless steel with high corrosion resistant properties which also has excellent welding and forming characteristics. (Used in onshore & offshore applications, oil & gas plants, petrochemical industries etc.) AISI 304 (1.4301) also has high corrosion protection properties and is used extensively in production plants, facades and in similar corrosive exterior environments.

The chromium layer on the stainless steel surface is the area that gives the corrosion resistance characteristic to the material. Unless an extra quating (finishing) it is requested, stainless steel products do not require any additional coating for corrosion protection. The stainless steel used in Gerpaas products, which are of the austenitic class, has excellent corrosion and oxidation resistance due to the high chromium content. Austenitic stainless steels incorporate nickel which strengthens the oxide layer and increases protection in aggressive environments. As a general characteristic AISI 304 and 316 grade stainless steel material is strongly durable in high and low temperatures.

### Mechanical Properties of Stainless Steel

Material Grade	Property		
	Proof Strength	Tensile strength Rm N/mm <sup>2</sup>	Elongation A 80 %
1.4404	240 Min	530 to 680	40
1.4301	240 Min	530 to 680	40

Proof strength: 0.2% Rp0.2 N/mm<sup>2</sup>

### Mechanical Properties – Austenitic Grades Bolts, Screws and Studs

Grade	Property Class	Tensile Strength Rm MPa (N/mm <sup>2</sup> ) minimum	Yield Stress R, 0.2 Mpa (N/mm <sup>2</sup> ) minimum	Elongation A Minimum	Proof Load Stress Sp Mpa (N/mm <sup>2</sup> ) minimum	Diameter Range
A2 And A4	70	700	450	0.4d	700	=<M20
	80	800	600	0.3d	800	=<M20

### Selection of Diameters

#### Tightening Torques, Loads

Guideline values for screws in steel groups A2-70 and A4-70 with standard metric threads to DIN 13

### Comparison of US and ISO Stainless Steels

A2 and A4 as compared to 304 and 316	Percent difference from US – Stainless Steel
Up to M20	44% higher
M22 and over	6% lower

Diameter	Load Force at 0.2 % yield point N	Initial stressing force N	Tightening torque Nm	Force in service N		
				Axial static	Axial dynamic	Radial static or dynamic
M3	2250	1420	0.9	610	360	120
M4	3960	2490	2.2	1070	640	210
M5	6390	4030	4.3	1730	1040	350
M6	9040	5700	7.3	2440	1470	490
M8	16470	10380	17.7	4450	2670	890
M10	26100	16440	35.5	7050	4230	1410
M12	37930	23900	61.3	10240	6150	2050
M16	70650	44510	147.1	19080	11450	3820
M20	110250	69460	285.1	29770	17860	5950

## ENVIRONMENTAL

### Thermal

Gerpaas cable trays are designed to accommodate any thermal expansion and contraction within certain temperature ranges.

### Light

GERPAAS cable trays can not be affected by artificial or natural light.

### RoHS

The cable tray and ladder system components do not include any of the materials identified in the RoHS regulations.

### Green Issues

All boxes and packs are manufactured of recyclable or biodegradable material, where practicable.

## ELECTRICAL CONTINUITY

GERPAAS earth links create connections with the required electrical continuity as per IEC 61537 on cable trays and cable ladders. Earth links (earth bonding straps) are fixed on cable tray and cable ladders at coupling regions. Each end of earth link requires 1 M8 / M10 bolt & nut.

**Cable Tray Width / CSA Table**

Width of Tray (W)	CSA
50 – 300mm	16mm <sup>2</sup>
300 – 900mm	25mm <sup>2</sup>

## CLASSIFICATION TO EN 61537

#	General Properties of <u>GERPAAS</u> Cable Tray & Cable Ladder Systems to IEC 61537
1.	Metallic material
2.	Fire resistant (non-flame propagating system component)
3.	Electrical continuity
4.	Electrical conductivity
5.	Metallic coated
6.	Ideal temperature range in stocking, shipping, and installation is -20°C / +105°C
7.	Free base area of GE-KT cable trays is C class.
8.	Free base area of GE-MC cable ladders is Y class

Material	Modulus of Elasticity (10 <sup>6</sup> Pa)	Shear Modulus (10 <sup>6</sup> Pa)	Bulk Modulus (10 <sup>6</sup> Pa)	Poisson's Ratio (10 <sup>6</sup> Pa)	Material	coefficient of linear thermal expansion $\alpha$ $\alpha$ in 10-6/C at 20 °C	coefficient of volumetric thermal expansion $\beta$ $\beta(=3\alpha)$ in 10-6/C at 20 °C
Copper	107558,2	39989,6	123416,2	0,355			
Stainless Steel	190295,3	73084,4	162716,3	0,305	Stainless steel	17.3	51.9
Steel, Cast	196500,6	77910,8	139274,1	0,265	Steel	11.0 ~ 13.0	33.0~ 39.0
Steel, C.R.	203395,3	79289,7	159268,9	0,287	Aluminium	23	69
					Copper	17	51

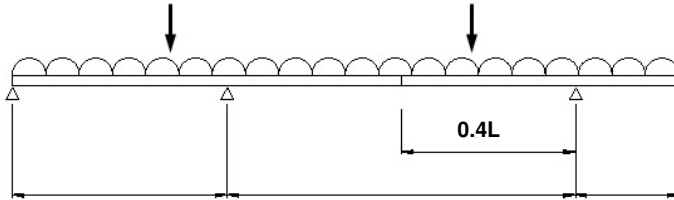
**TECHNICAL INFORMATION ON ELECTROSTATIC POWDER COATING SPECIFICATIONS**  
**ELEKTRO STATİK TOZ FIRIN BOYA TEKNİK ÖZELLİKLERİ**  
**СТАТИЧЕСКИХ ПОРОШКОВАЯ КРАСКА ХАРАКТЕРИСТИКИ**

POLYESTER PAINT (PEF) Application for outdoor use		TEST TYPE	EPOXY POLYESTER PAINT (EP/PE) Application for indoor use	
PEF	STANDARD		STANDARD	EP/PE
60	-	FILM THICKNESS (micron)	-	60
70-180	ASTM 2796 5/8 steel ball	IMPACT RESISTANCE (kg-cm)	ASTM 2796 5/8 steel ball	70-180
5-10	DIN 53106 ISO1520	ERICHSEN TEST (mm)	DIN 53106 ISO1520	5-10
3-12	DIN 53125 ISO 1520	BENDING TEST (mm)	DIN 53125 ISO 1520	3-12
80-100	DIN 53153 ISO 2815	BUCHOLZ HARDNESS (kg-cm)	DIN 53153 ISO 2815	80-100
HB-2H	ASTM D 3363	PENCIL HARDNESS	ASTM D 3363	HB-2H
1000 hours Perfect	SALT FOG TEST ASTM B 117-73	CORROSION RESISTANCE-1 (Zinc phosphate coated steel)	SALT FOG TEST ASTM B 117-73	1000 hours perfect
1200 hours	SALT FOG TEST	CORROSION RESISTANCE-2 5 micron zinc coating Top layer special chromated steel	ASTM 2796 5/8 steel ball	70-180
GTO No Adhesion loss	DIN 5315/2mm ISO 2409/2mm	ADHESION TEST	DIN 5315/2mm ISO 2409/2mm	GTO No Adhesion loss
PERFECT RESISTANCE TO ATMOSPHERIC CONDITIONS		RESISTANCE TO OUTDOOR CONDITIONS	PERFECT RESISTANCE TO OUTDOOR CONDITIONS	
-		RESIST. TO CHEM. ENVIRONMENT	GOOD	
PERFECT		U.V.RESISTANCE (Color and brightness)	GOOD	
PERFECT		HEAT RESISTANCE	GOOD	

## IMPORTANCE OF COUPLERS IN LOAD CAPACITY OF CABLE TRAYS

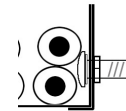
The choice of couplers is an important fact like that of their positioning in the span and a correctly placed coupler increases the load bearing performance of the cable trays and cable ladders. GERPAAS® couplers are designed and tested for high mechanical resistance as well as electrical performance.

For most of the spans, we recommend a coupling distance of  $1/4L$  in all applications. Please note that all load capacity information provided within this catalogue are for uniformly distributed loads unless otherwise stated specifically. The standard imposes a deflection of  $1/100$  of the span.



## INSTALLATION OF FIXING SETS

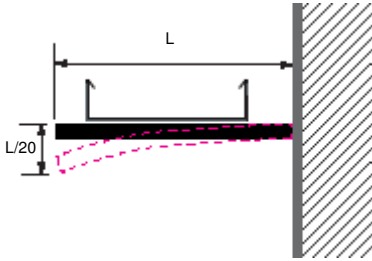
The entire GERPAAS® cable tray and cable ladder system is standardized to M8 fixings which enables the use of one standard size. All fixing sets (incl. 1 bolt, and 1 nut) are supplied in electro zinc plated finish (EG). Additionally, stainless steel made fixing sets are available upon request. It is strongly recommended to keep the rounded head of the bolts inside the cable tray to provide smooth edges inside the cable route.



## RECOMMENDED LOADS FOR STRUT CHANNELS

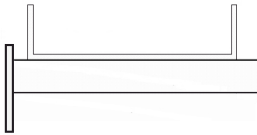
Span (mm)	41x21x2.0	41x21x2.5	41x21x2.5	41x41x2.0	41x41x2.5	41x41x2.5	41x21x2.0	41x21x2.5	41x41x2.0	41x41x2.5
	Perforated	Perforated	non-perforated	Perforated	Perforated	Non-perforated	Back-to-back	Back-to-back	Back-to-back	Back-to-back
500	210	250	270	640	780	825	610	750	1820	2300
750	105	120	145	430	520	555	415	500	1250	1500
1000	55	65	80	320	390	410	310	375	950	1100
1250	35	40	50	215	265	305	205	245	760	980
1500	25	30	35	150	180	210	140	170	635	750
1750	15	20	25	110	135	155	105	125	540	650
2000	15	15	20	80	100	120	80	95	475	570
2250	10	12	15	65	80	95	60	75	385	475
2500	10	10	10	55	65	75	50	60	315	385
2750	8	9	10	45	55	60	40	50	260	320
3000	7	8	8	35	45	50	35	40	215	265

## SUPPORTS

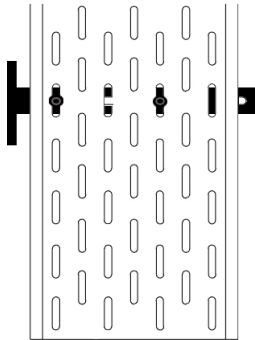


- The safe working load is limited by a maximum deflection of  $L/20$  at the end of the bracket.
- A safety factor of 1.7 must be included.

The recommended support distance is 1500 millimeters since optimum strength is achieved in spans of 1500mm. Supports for cable ladder should be spaced with the recommended span in order to suit the load capacity of the cable tray system most economically. The general rule is that the load carrying capacity of a system increases as the span decreases.



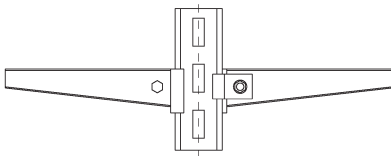
Position the cable tray or cable ladder close to the bracket head plate.



- Fix the cable tray onto the bracket through the matching slots.
- Avoid loose fixings.
- Make sure the cable tray is strongly fixed to the bracket.
- A minimum of 2 pairs of M8 bolts and nut must be used for each bracket.

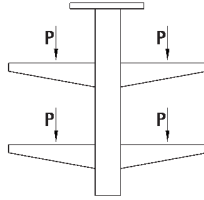
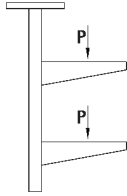
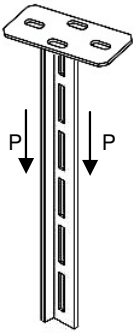
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## Application of GE-1K brackets



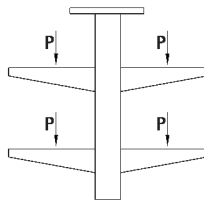
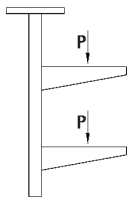
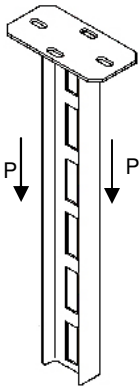


## Application of T type ceiling brackets and SWL



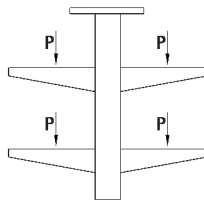
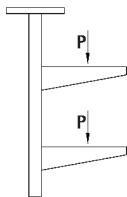
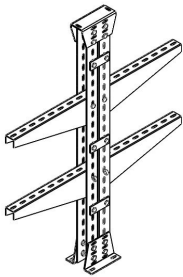
L (mm)	Load (N)
100	4315
200	3432
400	2354
600	5884

## Application of I type ceiling brackets and SWL



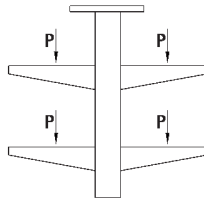
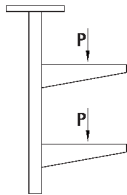
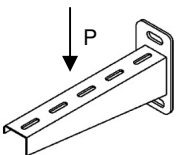
L (mm)	Load (N)
100	5900
200	5500
400	5000
600	4500

## Application of hanger brackets and SWL



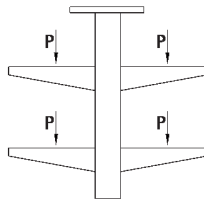
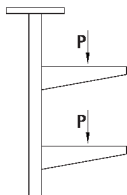
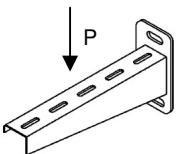
L (mm)	Load (N)
100	3500
200	2600
400	1500
600	700

## Application of GE-KD wall brackets and SWL



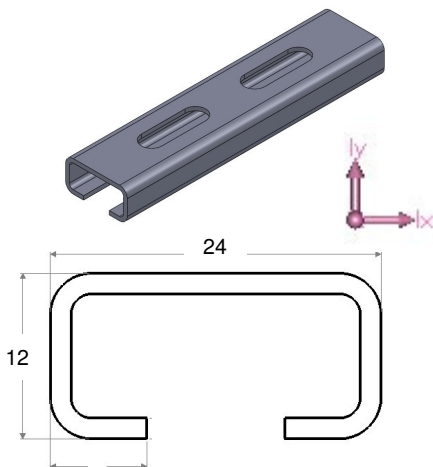
L (mm)	Load (N)
100	1800
200	1100
400	1300
600	550

## Application of GE-KDA wall brackets and SWL



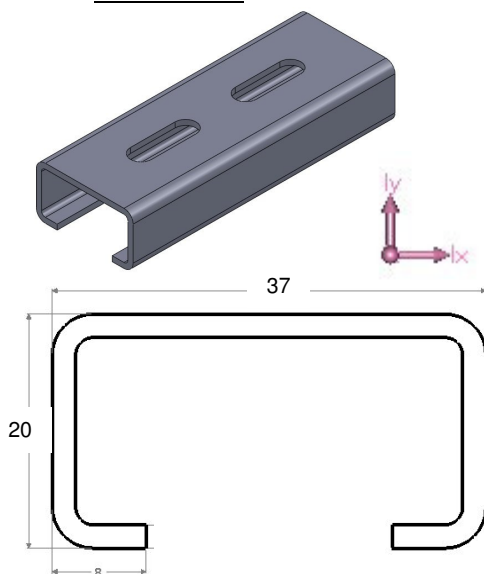
L (mm)	Load (N)
100	2300
200	1800
400	1500
600	900

**CABLE LADDER  
RUNG TYPE-1:**



W	Density	Mass	Volume	Surface Area		
mm	gr/mm <sup>3</sup>	gr	mm <sup>3</sup>	mm <sup>2</sup>		
100	0,0078	56,64	7261,78	10316,18		
150		86,42	10822,82	15325,11		
200		112,19	14383,86	20334,03		
250		139,97	17944,90	25342,96		
300		167,75	21505,94	30351,89		
400		223,30	28628,02	28628,02		
450		251,07	32189,06	40369,74		
500		278,85	35750,10	50387,60		
600		334,40	42872,17	60405,45		
$I_x$		1496,44	mm <sup>4</sup>	750	417,73	53555,29
$I_y$	5958,81	mm <sup>4</sup>	900	501,06	64238,41	90459,01

**CABLE LADDER  
RUNG TYPE-2:**



W	Density	Mass	Volume	Surface Area		
mm	gr/mm <sup>3</sup>	gr	mm <sup>3</sup>	mm <sup>2</sup>		
100	0,0078	120,09	15396,53	16355,89		
150		179,41	23001,66	24308,86		
200		238,73	30606,80	32261,82		
250		298,05	38211,93	40214,79		
300		357,37	45817,06	41867,75		
400		476,01	61027,33	64073,68		
450		535,33	68632,46	72026,65		
500		594,65	76237,59	79979,61		
600		713,29	91447,86	95885,54		
$I_x$		8317,01	mm <sup>4</sup>	750	891,25	114263,30
$I_y$	32161,30	mm <sup>4</sup>	900	1069,21	137078,65	143603,33