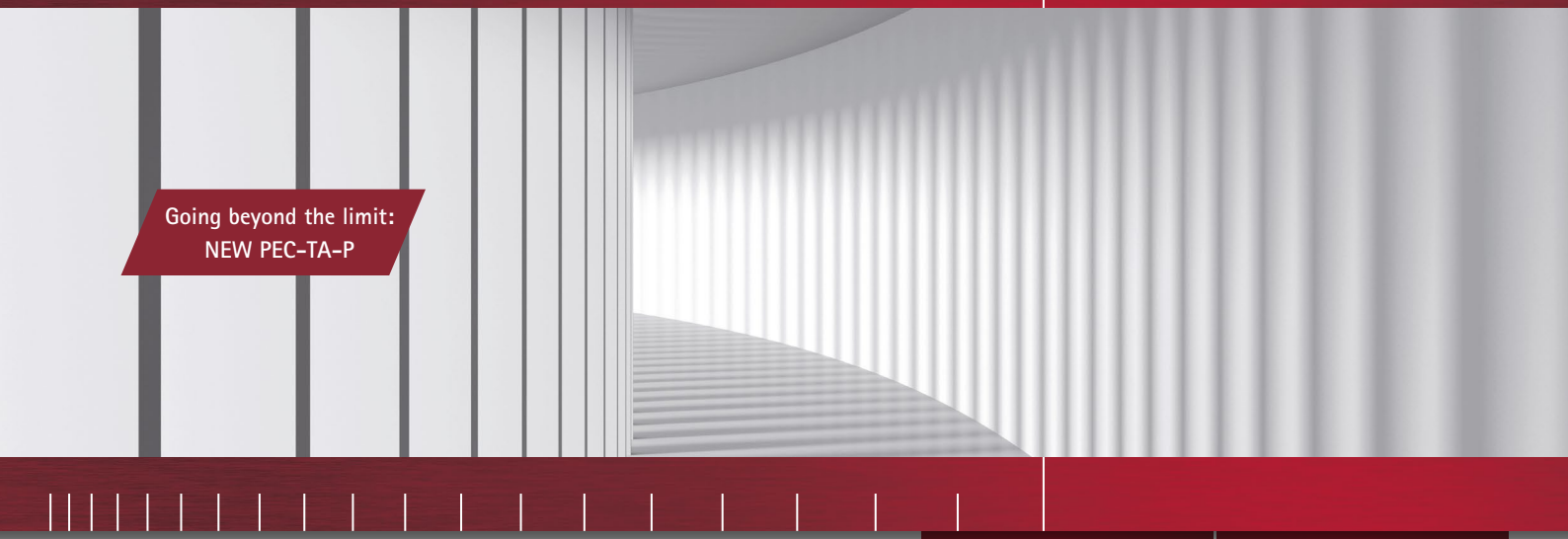
FIXING TECHNOLOGY

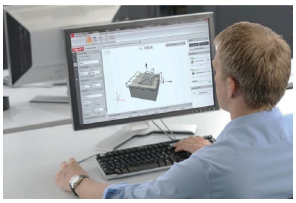


PEC Fixing Solutions

Technical Product Information and Product Range

pec EUROPE

The best of both worlds!


PEC – Your expert for high-end fixing solutions

We develop, produce and distribute technically sophisticated and approved products for the construction industry. The PEC product range includes anchoring, façade and system components as well as an extensive range of accessories. We combine German technical know-how with the advantageous production conditions in China. This benefits the customers of PEC, as we can not only realize high-end fixing solutions with a wide range of ETA approved products at highly competitive costs, but we are also flexible to optimize a product according to your needs with the support of production and engineering.

Since 2016 we belong to the Hilti Group in Liechtenstein. This gives our customers even more reliability and trust. Benefit from: optimized quality control, competent technical advice and training, worldwide sales and service support as well as simple and fast order processing through the expansion of our sales warehouses.

PEC – Quality management

A comprehensive quality management system according to European standards ensures technical high-end products

All testing of PEC cast-in channels and other products is performed in Europe according to European standards. Moreover, continuous in-house testing is conducted and recorded on a regular basis. Third party-monitoring of ongoing production procedures is done as per relevant approval specifications which results in consistently high-quality products.

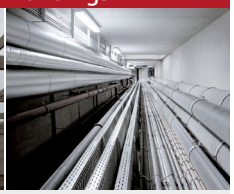
PEC – Application areas

High-end fixing solutions for various application areas in the construction industry.

Office & Apartment Buildings

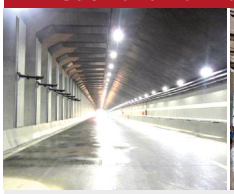
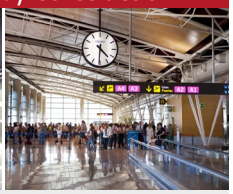

- Façade: curtain wall, concrete facades, brick facades
- Elevators fastening
- Supply lines fastening

Industrial Buildings

- Façade
- Machine and shelf fastening
- Supply lines fastening
- Elevators fastening

Sub- and Railway Construction

- Supply lines fastening in tunnels and stations
- Traffic signs fastening
- Evacuation platform fastening

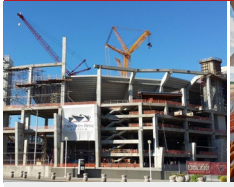
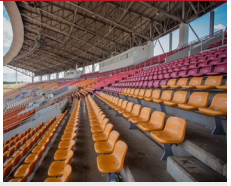
Plant & Power Plant Construction


- Supply lines fastening
- Machine fastening
- Repair plank fastening
- Transfer conveyor belt fastening

Road & Bridge Construction


- Supply lines fastening in bridges
- Traffic signs fastening
- Security fence fastening
- Noise & safety barrier fastening

Other Applications

- Stadium construction (seat fastening, fastening of precast elements & supply lines)
- Cable cars & airports
- Water treatment plants

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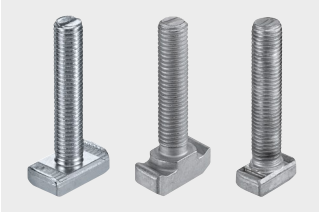
PEC Cast-in Channels and Bolts

PEC cast-in channels are ideally suited for quick, reliable and cost-efficient fixing of different construction elements. The possibility of making simple and flexible adjustments saves time and money.

PEC Europe GmbH offers a vast range of hot-rolled and cold-formed anchor channels for a variety of applications in the construction industry. The importance of professional fixing solutions has been increased enormously over the last years with a growing demand for flexible, time saving, cost-effective and reliable fixing solutions.

PEC-TA-CE cast-in channels, cold-formed

PEC-TA-CE cast-in channels, hot-rolled



PEC-HBC-T-bolts

Innovative fastening solutions according to German standards

The products of PEC Europe GmbH are certified according to European Technical Assessment (ETA). This approval was granted by the German Institute of Building Technology (DIBt) after strict testing and evaluation procedures. External monitoring of ongoing production is carried out by European auditors. This guarantees consistent, reliable product quality.

The selection of the optimal anchor channel for each project depends on the application and the ambient conditions. Depending on the requirements, PEC Europe GmbH recommends hot- or cold-formed anchor channels in galvanized or stainless steel, which are designed for use in cracked and non-cracked concrete. For dynamic forces or loads in 3 directions, our new PEC-TA-P premium channels are particularly suitable.

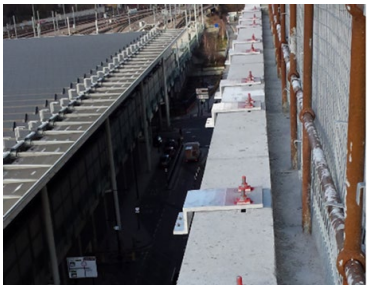
Due to the flexibility in the production and the technical competence we offer not only standard products but also customized solutions.

Deutsches Institut für Bautechnik DIBt

ETA CE

Advantages of using PEC Cast-in Channels

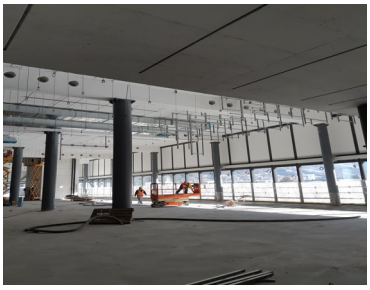
- Easy assembly without complicated tools which minimizes construction time significantly
- Pre-planning reduces construction effort considerably
- Time-saving bolted connections rather than field welding
- No damage to existing reinforcement
- Provides adjustability and flexibility while installation
- Suitable for fire resistance
- Suitable for every kind of environment due to hot-dip galvanization and stainless-steel material
- Special foam filler protects Channel from concrete intrusion
- Pull-out strip allows easy, quick and complete removal of the foam



PEC cast-in channels provide adjustability and flexibility for curtain wall applications

PEC cast-in channels are perfect for fixing car and guide rail brackets in lift / elevators

PEC cast-in channels are ideal for fixing supply lines or cables in bridges



Individual fastening solutions for a varietey of applications.

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Our strengths: Personal customer service & technical support

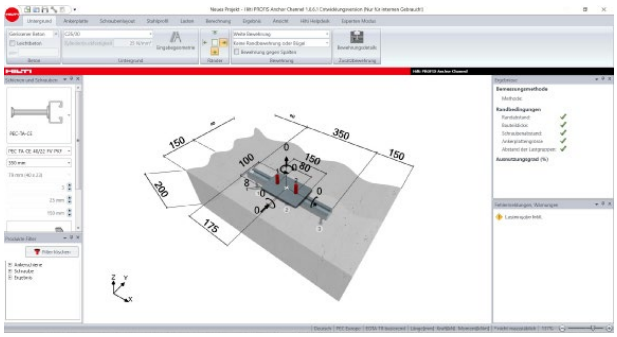
In our sales office in Duisburg we are committed to fast and personal order processing. Our experienced internal sales team reacts quickly and flexibly to your inquiries. Our technical team provides uncomplicated support for your project planning in order to find the best solution together with you.

Benefits

- Competent technical advice. Cost-optimized and future-proof dimensioning according to the new ETA-16/0929
- Uncomplicated and personal order processing
- Fast delivery service from our distribution warehouse in Duisburg
- Attractive pricing
- Optional product training

Free Design-Software

PROFIS Anchor Channel is a reliable planning tool to optimize the design of your anchor channels for the respective construction project. A user-friendly interface allows quick and easy selection of suitable anchor channels and bolts for any type of application. The calculations are based on the current design code EOTA-TR047/EN 1992-4 and the European Technical Assessment ETA-16/0929.



www.pec-europe.com/en/downloads/software.html

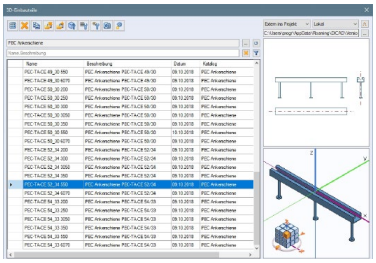
Benefits

- Fast and efficient planning of fixings with anchor channels
- Clear and concise calculation reports
- Wide range of design parameters
- Functions for automatic planning optimization

BIM/DICAD Library

Integral and digital planning with BIM is the best foundation for successful construction. A uniform and coordinated planning of all trades in a common digital model right from the start holds considerable efficiency potential for a continuous, undisturbed construction process. We support you for simple integration with object libraries. On our website under: **www.pec-europe.com/en/downloads/bim.html** you will find data for many products, which we make available to you directly in BIM exchange format (.ifc).

In addition, you will find our products in the DICAD Strakon Software 2019. If you are interested, please check the DICAD website or contact our technical team at technik@pec-europe.com.



DICAD/Strakon

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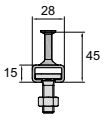
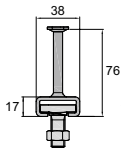
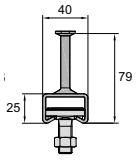
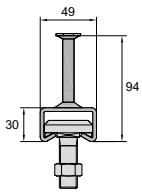
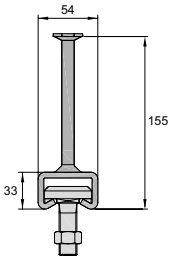
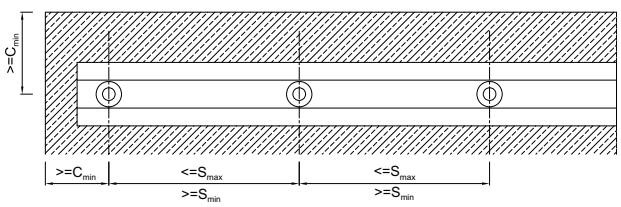
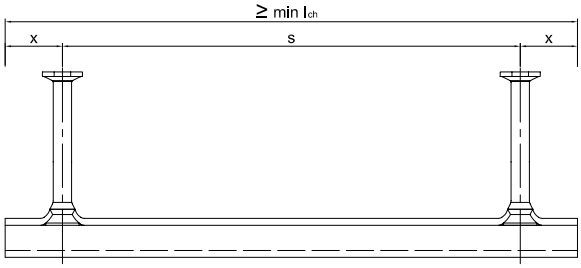
PEC-TA-CE cold-formed cast-in channels with ETA-16/0929						
Profile		PEC-TA-CE 28/15 cold-formed	PEC-TA-CE 38/17 cold-formed	PEC-TA-CE 40/25 cold-formed	PEC-TA-CE 49/30 cold-formed	PEC-TA-CE 54/33 cold-formed
Anchor		Round anchor				
						
Material	Hot-dip galvanized	●	●	●	●	●
	Stainless steel A4	●	●	●	●	●
T-Bolts [1]		28/15	38/17	40/22	50/30	50/30
Thread		M 10 - M 12	M 10 - M 16	M 12 - M 16	M 12 - M 20	M 12 - M 20
Resistance values						
The resistance values of anchor channels can be found in the technical data sheets for cold-formed anchor channels from PEC Europe GmbH at website www.pec-europe.com. For the channel design we recommend our design software "PROFIS Anchor Channels".						
Geometry						
Effective anchorage depth min.						
	$h_{ef,min}$ [mm]	45	76	79	94	155
Min. component thickness						
	h_{min} [mm]	70	100	100	120	180
Min. profile length						
	l_{min} [mm]	100	150	150	150	150
Min. edge distance						
	c_{min} [mm]	40	50	50	75	100
Min. anchor spacing						
	s_{min} [mm]	50	100	100	100	100
Max. anchor spacing						
	s_{max} [mm]	200	200	250	250	250
Overhang [2]						
	x [mm]	25	25	25	25	25

[1] Detailed technical data for our T-bolts can be found in our technical data sheets on our website

[2] The anchor end spacing can be increased from 25 mm to 35 mm





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Cold-formed Cast-in Channels

Technical Advantages

PEC cold-formed cast-in channels are the preferred solution when it comes to most economical product costs. They are suitable for 2D static loads i.e. tension or perpendicular shear:

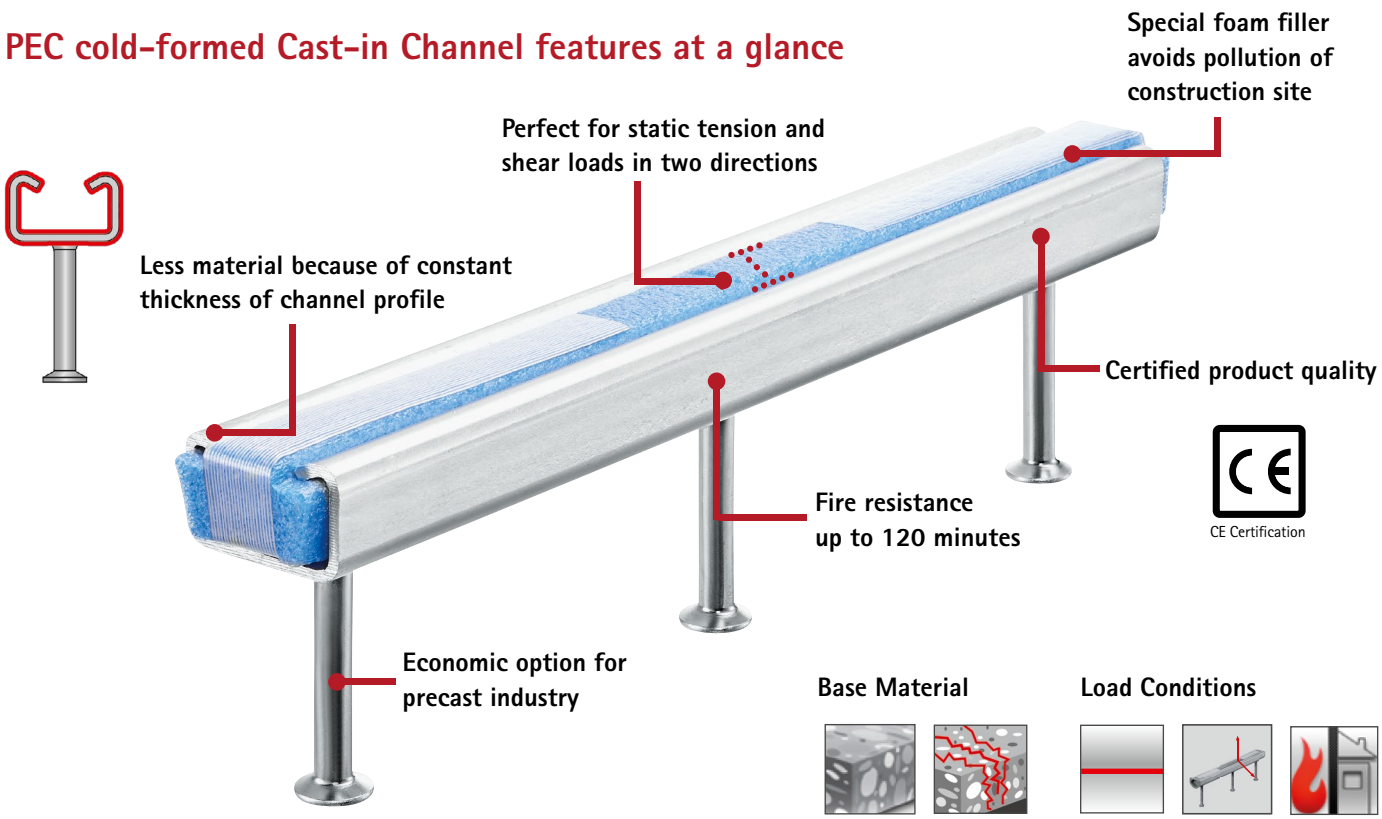
- Cold formed profiles with constant thickness of material
- Good surface finish
- Economic and environment-friendly production due to less material
- Easy and flexible installation on the construction site saves time and money

Typical Applications

We recommend the use of cold-formed cast-in channels for the following applications:

- Building appliances (e.g. ventilation, heating)
- Stadium seating
- Precast components
- Ceiling suspension

PEC cold-formed Cast-in Channel features at a glance

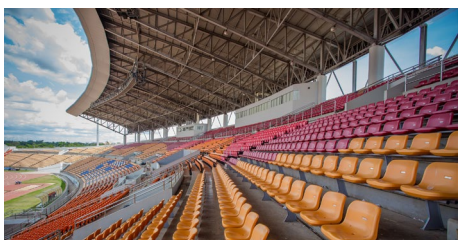


Base Material

Load Conditions

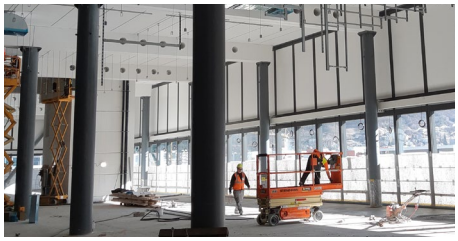
Applications

Fixing precast elements



Fastening of stadium seating

Fastening of Building appliances



Ceiling suspension

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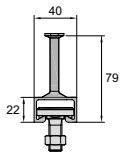
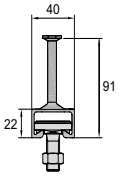
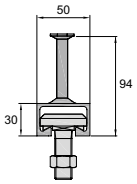
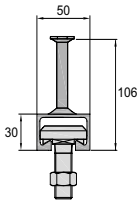
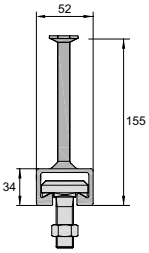
PEC-TA-CE hot-rolled cast-in channels with ETA-16/0929						
Profile		PEC-TA-CE 40/22 hot-rolled	PEC-TA-CE 40/22-P hot-rolled	PEC-TA-CE 50/30 hot-rolled	PEC-TA-CE 50/30-P hot-rolled	PEC-TA-CE 52/34 hot-rolled
Anchor		Round anchor [1]				
			NEW 		NEW 	
Material	Hot-dip galvanized	●	●	●	●	●
	Stainless steel A4	●	●	●	●	●
T-Bolts [2]		40/22	40/22-N	50/30		50/30-N
Thread		M 12 - M 16	M 16	M 12 - M 20		M 16 - M 20
Resistance values						
The resistance values of anchor channels can be found in the technical data sheets for hot-rolled anchor channels from PEC Europe GmbH at website www.pec-europe.com For the channel design we recommend our design software "PROFIS Anchor Channels"						
Geometry						
Effective anchorage depth min.						
	$h_{ef,min}$ [mm]	79	91	94	106	155
Min. component thickness						
	h_{min} [mm]	100	100	105	120	165
Min. profile length						
	l_{min} [mm]	150	100	150	100	170 [3]
Min. edge distance						
	c_{min} [mm]	50	50	75	75	75
Min. anchor spacing						
	s_{min} [mm]	100	50 [4]	100	50 [4]	100
Max. anchor spacing						
	s_{max} [mm]	250	250	250	250	250
Overhang						
	x [mm]	25 [5]	25 [5]	25 [5]	25 [5]	35 [6]

[1] I-Anchor on request

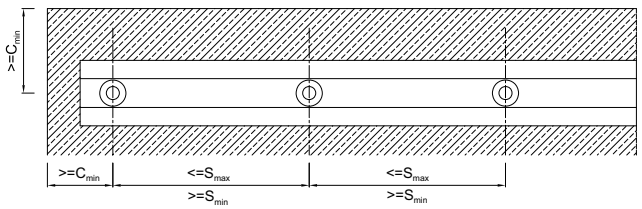
[2] Detailed technical data for PEC-HBC T-bolts can be found in our technical data sheets on our website

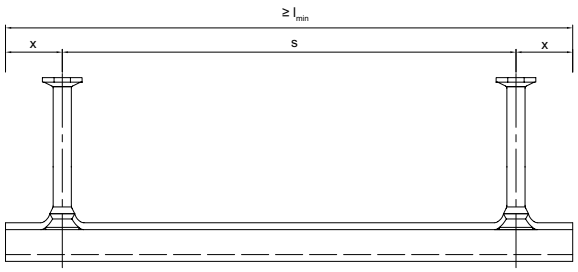
[3] l_{min} = 150 mm for welded I-Anchor

[4] 100 mm in combination with notched bolts

[5] The anchor end spacing can be increased from 25 mm to 35 mm

[6] x=25 mm for welded I-Anchor





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Hot-rolled Cast-in Channels

Technical Advantages

PEC hot-rolled anchor channels are approved according to the latest ETA-16/0929. They offer high load resistance and are the best choice when higher load capacities and fatigue resistance are required.

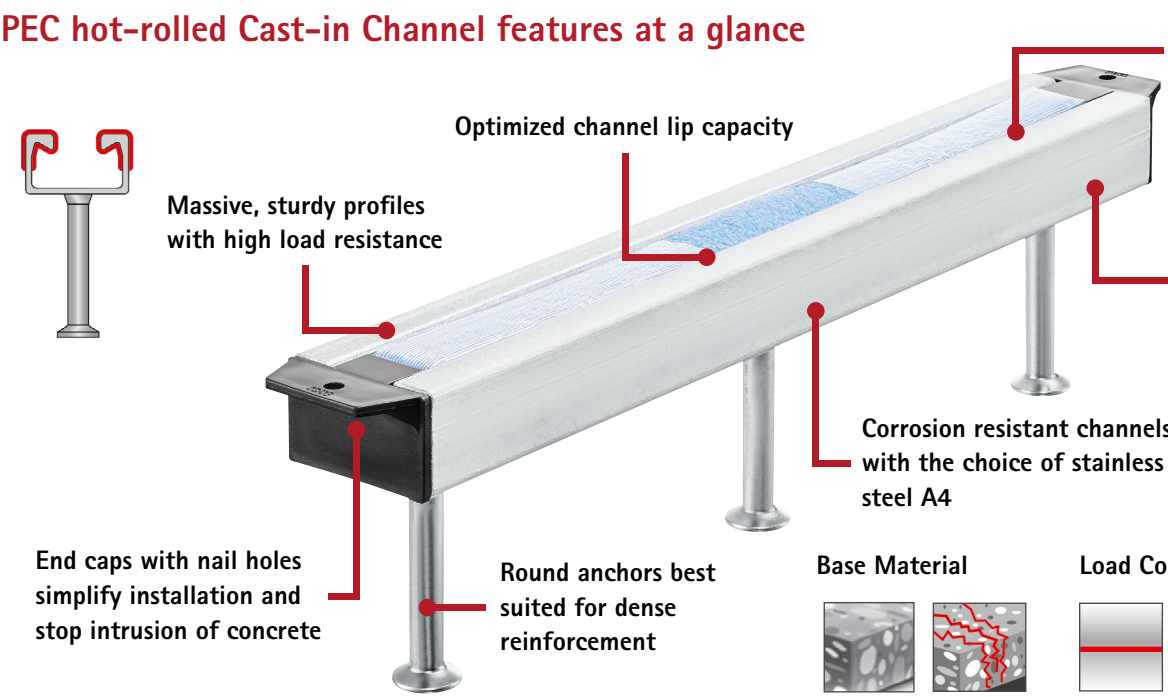
- Massive, sturdy profiles with high load resistance
- Strengthened channel lips suitable for any load direction and high installation torques
- Hot-rolling reduces residual stresses to a minimum
- Foam filler with pull-out strip avoids pollution of construction site
- PEC-TA 52/34 offers supplementary load capacity in 3 load directions as well as fatigue resistance

Typical Applications

We recommend the use of hot-rolled cast-in channels for the following applications:

- Fastening of production equipment (e.g. machines, conveyor belts)
- Metro, railway or utility tunnels (e.g. fixing of cantilever systems, supply pipes, sign boards, ventilation or support beams)
- Bridges (superstructures)

PEC hot-rolled Cast-in Channel features at a glance



CE Certification

Base Material

Concrete (non-cracked) | Concrete (cracked)

Load Conditions

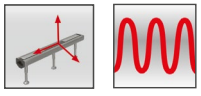
Static/ quasi-static | Static/ 2D loading | Fire resistance

Applications

Metro, railway or utility tunnels

Bridges (superstructures)

Supplementary load conditions for PEC-TA 52/34



Static/ 3D loading | Fatigue

Fastening of production equipment

Curtain Wall

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Ultimate performance with optimized profile geometry: PEC-TA-P

Technical Advantages

PEC-TA 40/22-P and PEC-TA 50/30-P channels redefine performance. With a significantly higher steel resistance of the channel lips, an optimized dimensioning and an improved anchor / channel connection, they achieve top performance.

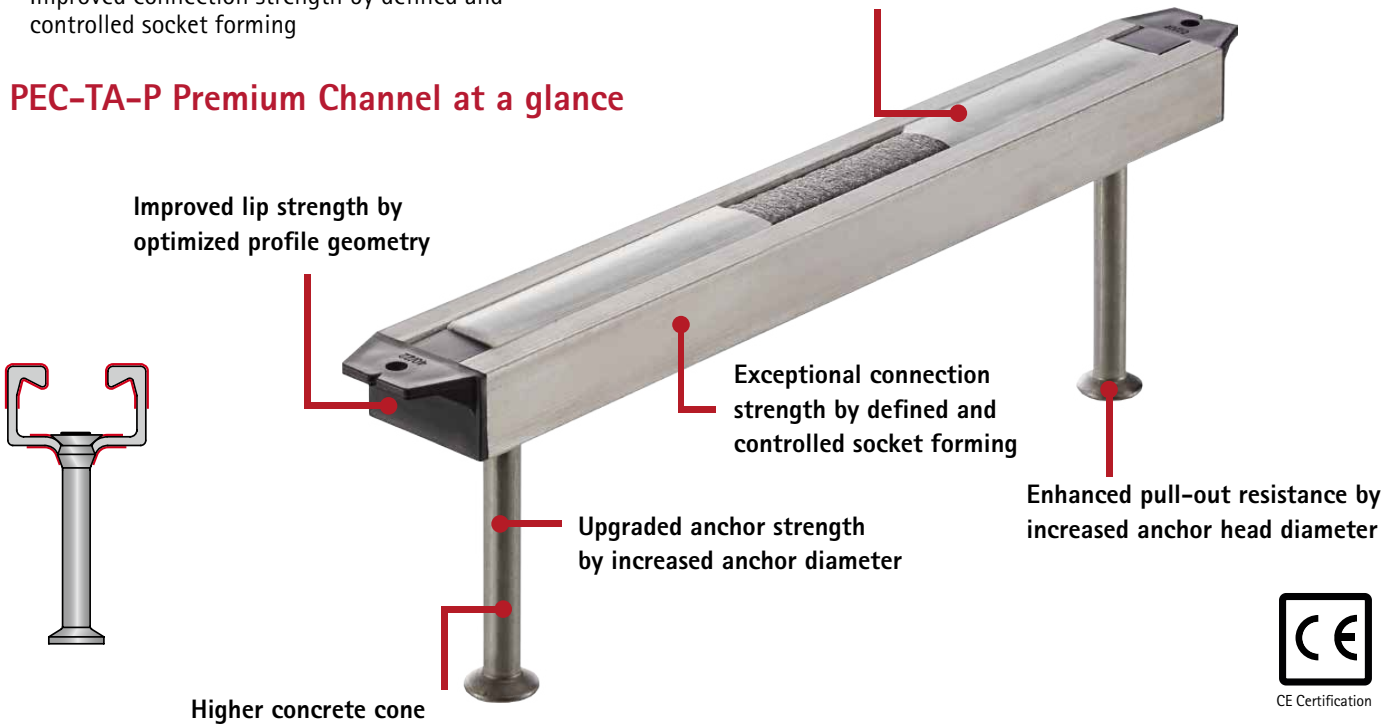
- Up to 98% higher steel connection capacity under tension load
- Up to 148 % higher steel connection capacity under shear load
- Higher concrete cone capacities by increased effective embedment depth h_{ef}
- Improved connection strength by defined and controlled socket forming

Typical Applications

We recommend the use of hot-rolled cast-in channels for the following applications:

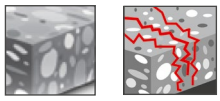
- Best solution for demanding curtain wall applications
- Fastening solutions for bridge construction
- Elevator construction with requirement for dynamic fastening solutions

PEC-TA-P Premium Channel at a glance



CE Certification

Base Material

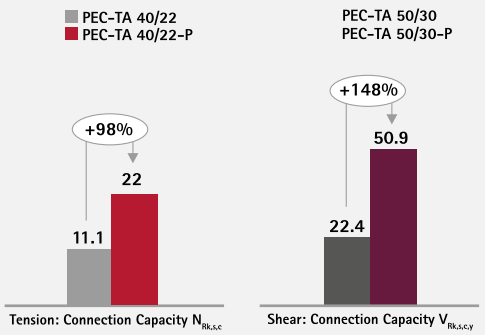


Concrete (non-cracked) | Concrete (cracked)

Load Conditions

Static/ quasi-static | Static/ 2D loading | Static/ 3D loading | Fire resistance | Fatigue

Design steel resistance [kN], examples:



Save up to 40% of material costs!

Due to an improved anchor/channel connection and significantly higher steel resistance, in many applications bigger channels can be replaced by smaller stronger PEC-TA-P channels.

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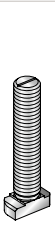
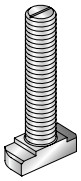
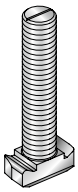
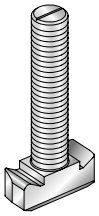
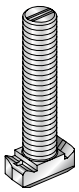
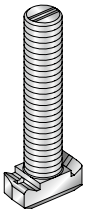
PEC-HBC bolts with ETA-16/0929							
Type		Hammer Head Bolts		Hook Head Bolts		Notched Bolts	
		PEC-HBC-28/15	PEC-HBC-38/17	PEC-HBC-40/22	PEC-HBC-50/30	PEC-HBC-40/22-N	PEC-HBC-50/30-N
All Bolts are delivered with nuts DIN 934.							
Material	HDG	●	●	●	●	●	●
	EP	●	●	●	●		
		● = In stock					
Diameter		M 8 - M 12	M 10 - M 16	M 12 - M 16	M 12 - M 20	M 16	M 16 - M 20
Matching profiles		28/15	38/17	40/22, 40/25	49/30, 50/30, 52/34, 54/33	40/22, 40/22-P	50/30, 50/30-P, 52/34
Length	(mm)	15 - 100	20 - 200	20 - 300	30 - 300	60-80	60-80

Bolt diameter Ø

Resistance values

The resistance values of T-bolts as a system with anchor channels can be found in the technical data sheets from PEC Europe GmbH at www.pec-europe.com.
For the system design we recommend our design software "PROFIS Anchor Channels".

Required Installation torque T_{inst}

HBC-T-Bolt		T_{inst} [1] [Nm]				
		General [2]	Steel-to-steel contact [3]			
		4.6, 8.8, A4-50, A4-70	4.6	8.8	A4-50	A4-70
HBC-28/15	M8	7	-	20	7	15
	M10	10	-	40	-	30
	M12	13	-	60	-	50
HBC-38/17	M10	15	13	15	-	22
	M12	25	-	45	-	50
	M16	40	-	100	-	90
HBC-40/22	M10	15	13	15	-	22
	M12	25	-	45	-	50
	M16	30	-	100	-	90
HBC-40/22-N	M16	160	-	160	-	-
HBC-50/30	M12	25	-	45	-	50
	M16	55	-	100	-	130
	M20	-	-	360	-	250
HBC-50/30-N	M16	185	-	185	-	-
	M20	320	-	320	-	-
HBC-52/34	M20	55	-	360	-	-

[1] T_{inst} must not be exceeded

[2] General: The attachment is in contact with the channel profile and concrete surface

[3] Steel-to-steel contact: The attachment part is braced to the anchor channel by a suitable steel part (e.g. washer). The attachment is only in contact with the channel profile

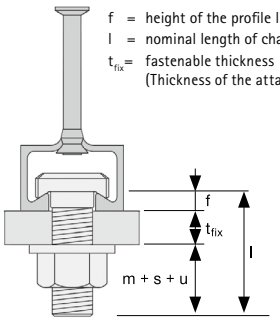
Determining of minimum T-bolt length

Profile	Type	f (mm)
28/15	cold-formed	2,3
38/17	cold-formed	3
40/25	cold-formed	5,6
49/30	cold-formed	7,5
54/33	cold-formed	8
40/22	hot-rolled	6
50/30	hot-rolled	8
52/34	hot-rolled	11,5

Bolt	(h+m+u) (mm)
M 8	11,3
M 10	13,9
M 12	17,3
M 16	21,8
M 20	27,0

m = thickness of the nut (ISO 4032)
s = thickness of the washer
u = channel bolt projection

Note: Round the bolt length to the nearest standard channel bolt length.



f = height of the profile lip
l = nominal length of channel bolt
t_{fix} = fastenable thickness (Thickness of the attached part)

Required T-Bolt length $l = t_{fix} + f + (m+s+u)$

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PEC-TU Cast-in Channels

PEC-TU cast-in channels in concrete elements like columns or beams are an ideal way of fixing, trapezoidal steel sheets, window and door frames as well as other construction elements with the help of self-taping screws. PEC-TU cast-in channels enable a safe, fast and very cost-effective installation. PEC-TU cast-in channels are available in three different channel types i.e. Type-A, Type-B and Type-C with a standard length of 3.000 mm.

The standard delivery includes a hot-dip galvanized version with zinc coating ≥ 50 µm. PEC-TU anchor channels are supplied with integrated polystyrene filler. The filler serves as a separating layer between the profile and the concrete to ensure that the screws do not hit the concrete layer.

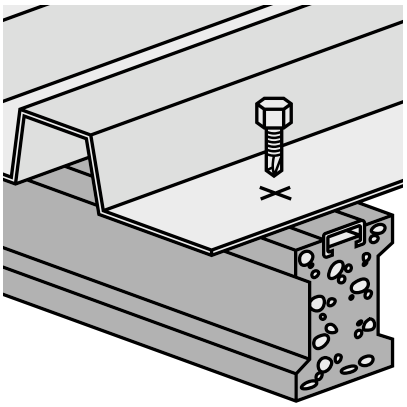
PEC-TU cast-in channels are approved by the building authorities in accordance with Z-21.4-1886.

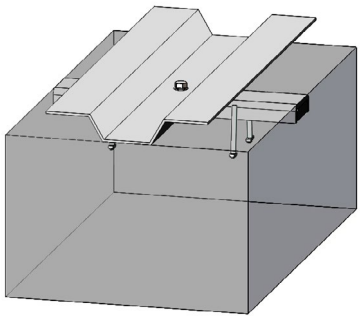
Advantages

- Easy installation in the existing reinforcement
- Load bearing capacity in all three directions
- Technically sound and slip resistant connection
- Polystyrene filler prevents the contact of the borers and screws with the concrete
- Rational steel sheet screwing
- Smoothly assembly without pre-drilling

Typical applications

- Fixing trapezoidal sheets
- Fixing door and window frames
- Fixing roof constructions





Fixing of roof constructions or door and window frames

Examples for the attachment of trapezoidal sheets with PEC-TU

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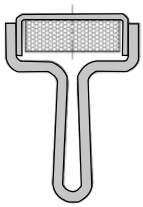
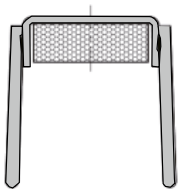
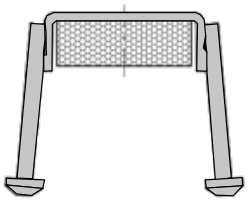
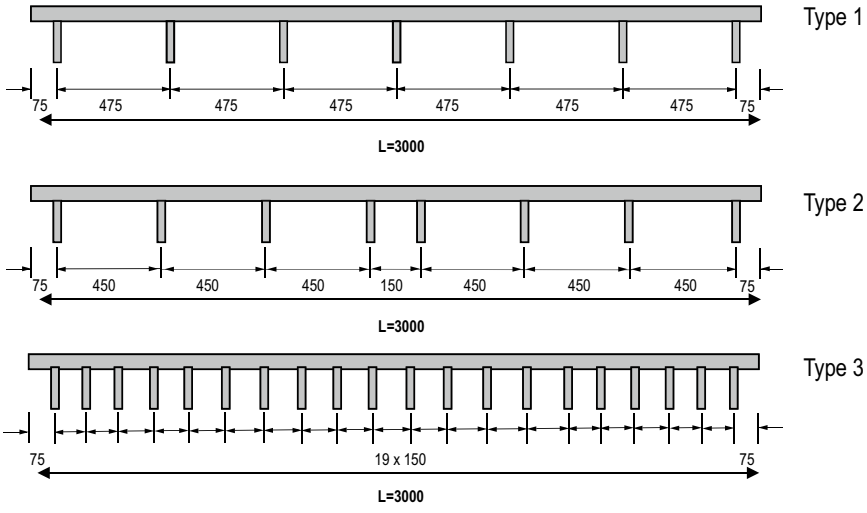
PEC-TU cast-in channels				
Profile Dimensions		PEC-TU 60/22/3 Type A	PEC-TU 60/22/3 Type B	PEC-TU 60/22/3 Type C
Deutsches Institut für Bautechnik DIBt Approval Nr. Z 21.4-1886				
Nominal embedment depth	h_{nom} [mm]	100	75	68
Section modulus	$W_{pl,y}$ [cm³]	0,71		
Moment of inertia	I_y [cm⁴]	1,13		
Material		Steel according to DIN EN 10025: S235JR (1.0038)		Steel DIN EN 10263-2 (1.0214)
Connecting screws		e.g. Hilti self-tapping screws		

For the dimensioning of your project, you will find the technical data in the DIBt approval Z-21.4-1886 at www.pec-europe.com, or you can contact our technical team at technik@pec-europe.com.

Anchor Spacing

PEC-TU cast-in channels are supplied in 3 m stock lengths with the different anchor spacing. When selecting the anchor spacing, please consult the technical requirements from the approval.



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PEC Framing Channels

PEC offers a comprehensive range of framing channels. In various steel qualities (blank, hot-dip galvanised or stainless steel) the hot-rolled and cold-rolled channel portfolio is flexible and versatile. PEC framing channels can be welded directly to the steel components.

They are suitable for low, medium and high loads and for use in a wide range of applications.
Easy and quick installation on site with PEC screws greatly facilitate the work on construction site.

PEC framing channels can be welded directly to the steel components

Product advantages

- Currently the only hot-rolled framing channel with ETA for 3D loading in combination with toothed or serrated screws
- New PEC-MZ-CE 29/20 is the first ETA-tested framing channel with teeth
- Optimized profile geometry for highest tension- or shear loads
- Flexible material selection depending on application: blank, hot-dip galvanized, stainless steel A4
- Simplified installation due to the choice of 3 installation methods (welded, partially welded and subsequently doweled)
- Corrosion protection with hot-dip galvanized or stainless steel A4 material possible

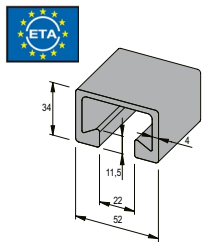
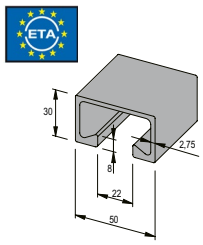
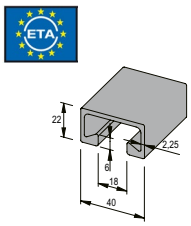
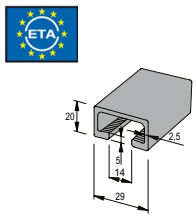
Typical applications

- Fixing air ducts, pipes and electrical lines
- Anchoring of machines and racks
- Infrastructure projects (e.g. tunnels or bridges)
- Shipbuilding
- Automotive
- Elevator construction

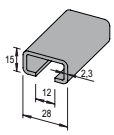
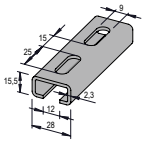
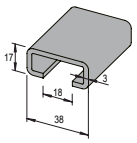
PEC-M-CE framing channels

PEC-MZ-CE toothed framing channels

Product overview

PEC framing channels, hot-rolled (suitable for welding, doweling and screwing)			
PEC-M-CE 52/34	PEC-M-CE 50/30	PEC-M-CE 40/22	PEC-MZ-CE 29/20
			
WB, FV, A4	WB, FV, A4	WB, FV, A4	WB, FV

ETA for hot-rolled framing channels

PEC framing channels, cold-formed (suitable for welding, doweling and screwing)		
PEC-M 28/15	PEC-L 28/15 (perforated)	PEC-M 38/17
		
WB, FV, A4	FV	WB, FV, A4

Material and surface finishes:

WB	Steel S235 JR - 1.0038 (St 37-2), blank
FV	Steel S235 JR - 1.0038 (St 37-2), hot-dip galvanized
A4	Stainless steel A4 1.4362 / 1.4401 / 1.4404 / 1.4571

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PEC Cable Holder System

The safe load transfer of heavy wires and cables in tunnels, shafts and other utilities requires a stable fixture and appropriate support brackets. The PEC cable holder system consisting of cable holders and cable retainer cast-in channels ensures a proper storage system for cables and power lines within a short installation time and adjustment possibility.

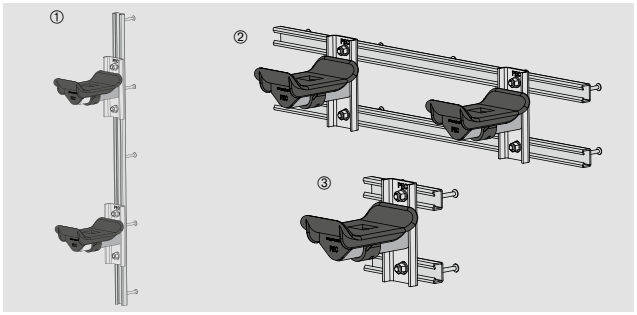
The cable holder channels are available in two versions:

- With anchors for casting into the onsite concrete or in precast elements
- Without anchors for subsequent installation with the help of post-installed anchors

Cable holder channels or cable holder brackets

The cable holders as support brackets for cables are available in three versions:

- For hooking in the cable holder cast-in channels (1)
- For fixing in the PEC cast-in channels with T-bolts (2)
- For fixing with post-installed anchors (3)



Anchor channels and cable holder brackets

Advantages of PEC Cable Holder Channels

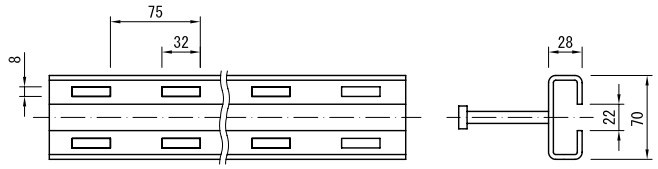
- Easy installation on existing formwork or existing walls
- Clean finish of concrete due to end caps
- The penetration of concrete into the interior of the channel is prevented by a plastic foam filler
- Easy removal of the filler by the integrated rip-liner
- High corrosion protection by galvanizing
- Can be cut onsite arranging the anchors asymmetrically
- Available in different lengths

Advantages of PEC Cable Holder Brackets

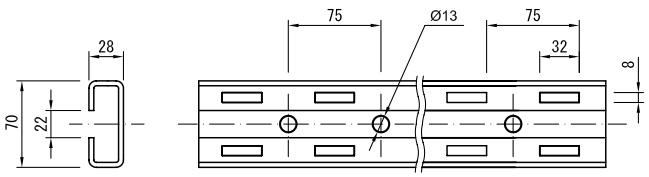
- Easy installation using the cable holder cast-in channels
- Adjustability of the support seat in the grid of 75 mm
- Individual alignment of the cable holder for post-installed anchors during assembly through the existing slotted holes
- Seat can be adjusted with in ± 45 degrees angle

Dimensions

Cast-in cable holder channels with anchors



Cable holder channels without anchors



Order Example

Cast-in cable holder channels

Description	Length (mm)	Nr. of anchors Φ10 x 75
PEC-KHB-70/28-FV-PKF-670	670 mm	7
PEC-KHB-70/28-FV-PKF-820	820 mm	8
PEC-KHB-70/28-FV-PKF-970	970 mm	9
PEC-KHB-70/28-FV-PKF-1120	1.120 mm	10
PEC-KHB-70/28-FV-PKF-1270	1.270 mm	11
PEC-KHB-70/28-FV-PKF-1345	1.345 mm	12
PEC-KHB-70/28-FV-PKF-1645	1.645 mm	14
PEC-KHB-70/28-FV-PKF-1945	1.945 mm	16
PEC-KHB-70/28-FV-PKF-2245	2.245 mm	18
PEC-KHB-70/28-FV-PKF-2545	2.545 mm	20
End Caps		
PEC-KHE-70/28-Plastic		

Cable holder channels with post-installed anchors

Description	Length (mm)
PEC-KHM-70/28-FV-1400	1.400 mm
PEC-KHM-70/28-FV-1700	1.700 mm
PEC-KHM-70/28-FV-2000	2.000 mm
PEC-KHM-70/28-FV-2300	2.300 mm
PEC-KHM-70/28-FV-2600	2.600 mm
Post-installed anchors for cable holder channel type PEC- KHM	
Hilti-HST-M12 acc. to ETA-98/0001 or equivalent, for installing in concrete. Min. concrete grade C20/25. Compound anchor M12 for concrete and masonry $_{hef}$ ≥ 90mm. Minimum 2 anchors per cable holder channel and post-installed anchor distance S_{max} = 225 mm	

Special lengths and material upon request

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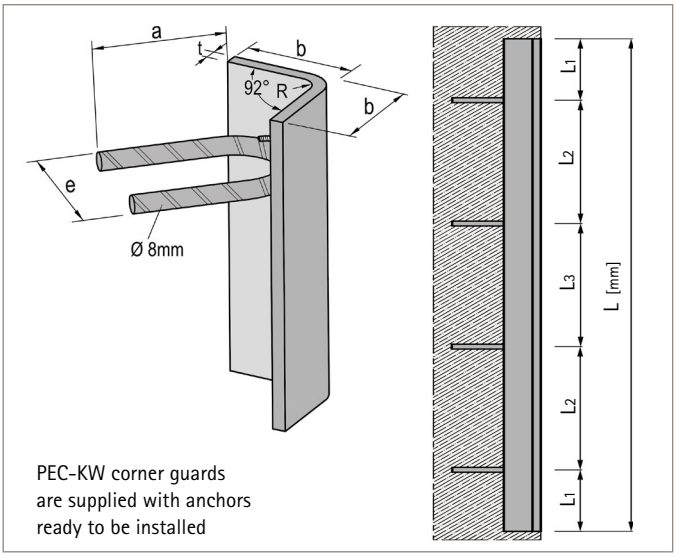
PEC Corner Guards Type KW



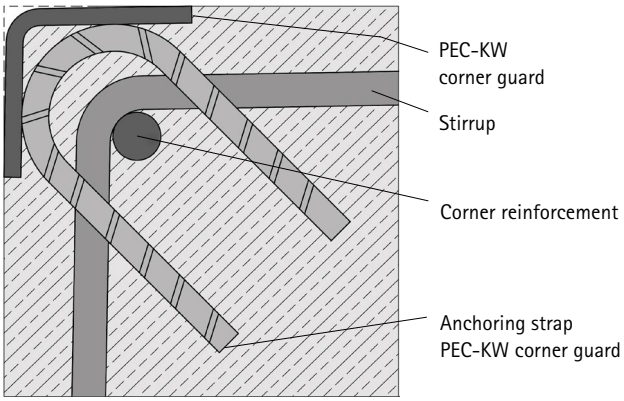
PEC-KW corner guards
are supplied with anchors
ready to be installed

Damaging of concrete columns or gates can cause lasting building damages. The installation of PEC corner guards is ideally suited to protect corners and edges of concrete elements. The PEC corner guards are available in stainless steel or hot-dip galvanized material. Special versions in other dimensions or materials are available upon request.

Advantages of using PEC Corner Guards

- The 92-degree angle prevents concrete seeping between formwork and corner profile, resulting in a smoother finish.
- The U-shaped stirrups simplify the installation in the corner edge reinforcement.
- The bent strong reinforcement anchor ensures optimal anchorage.
- The hot-dip galvanized version guarantees corrosion protection in outdoor areas.

Typical installation within a concrete column



Materials and dimensions

HDG = Angle profile: Hot-dip galvanized steel
Anchor: Reinforcement steel

A2 = Angle profile: Stainless steel A2
Anchor: Stainless reinforcement steel

Order details

Product versions of PEC-KW corner guards

Order example: PEC-KW-80/6-FV-1000				HDG Hot-dip galvanized	A2 Stainless steel*	Anchor spacings			Anchor dimensions	Radius
Type b/t [mm]	Length L [mm]	Material thickness [mm]	Number of anchors			L1 [mm]	L2 [mm]	L3 [mm]	a x e [mm]	R [mm]
PEC-KW 50/5	500	5	2	HDG	A2	150	200		75 x 55	6
	750	5	2	HDG	A2	125	500		75 x 55	6
	1.000	5	2	HDG	A2	250	500		75 x 55	6
	1.500	5	4	HDG	A2	125	500	250	75 x 55	6
	2.000	5	4	HDG	A2	250	500	500	75 x 55	6
PEC-KW 80/6	500	6	2	HDG	A2	150	200		100 x 85	8
	750	6	2	HDG	A2	125	500		100 x 85	8
	1.000	6	2	HDG	A2	250	500		100 x 85	8
	1.500	6	4	HDG	A2	125	500	250	100 x 85	8
	2.000	6	4	HDG	A2	250	500	500	100 x 85	8
PEC-KW 100/8	500	8	2	HDG	A2	150	200		110 x 85	16
	750	8	2	HDG	A2	125	500		110 x 85	16
	1.000	8	2	HDG	A2	250	500		110 x 85	16
	1.500	8	4	HDG	A2	125	500	250	110 x 85	16
	2.000	8	4	HDG	A2	250	500	500	110 x 85	16

* on request

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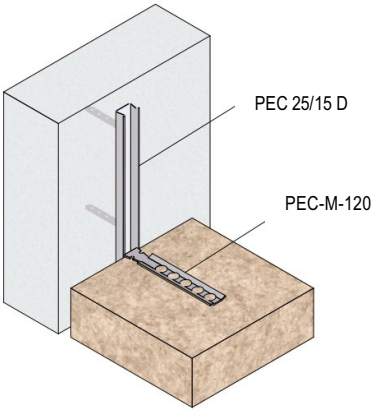
PEC Brick Tie System

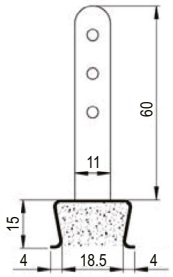
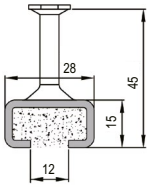
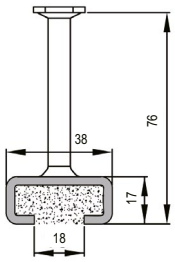
PEC brick tie systems guarantee the safe and long-term bond of masonry with concrete or steel structures.

The brick tie channels are cast into the concrete element. Our tear-resistant plastic rip-line facilitates the removal of the filling material after concreting. The corresponding brick tie anchors are inserted into the cast-in brick tie channel at spacing of 25 cm and are pressed into the masonry joint mortar.

For connections with welded framing channels on steel structures our brick tie anchors fit into the standard profiles of dimensions 28/15 and 38/17.



Composite brickwork support and reinforced concrete construction with PEC brick tie system.

PEC brick tie channels			
	Description	**Finish**	**Matching brick tie anchorr**
	PEC-MS-25/15-D with punched anchor	Sendzimir (sv) Stainless Steel A4	Typ ML Typ PB
	PEC-TA-CE 28/15 PEC-M 28/15 PEC-L 28/15	HDG Stainless Steel A4	Typ ML Typ PB
	PEC-TA-CE 38/17 PEC-M 38/17	HDG Stainless Steel A4	Typ BL

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PEC Brick Tie System

PEC brick tie anchors							
	Description	Finish	Dimensions (mm)				Matching profiles
	PEC-ML	HDG Stainless Steel A4	Typ ML	Length	Width	Size	25/15 28/15
			85	85	25	2	
			120	120	25	2	
			180	180	25	2	
	PEC-BL	HDG Stainless Steel A4	Typ BL	Length	Width	Size	38/17
			85	85	30	2	
			120	120	30	2	
			180	180	30	2	
	PEC-PB Thin-bed mortar anchor	Stainless Steel A2	Typ PB	Length	Width	Size	25/15 28/15
			120	120	30	0,80	
			150	150	30	0,80	
			180	180	30	0,80	

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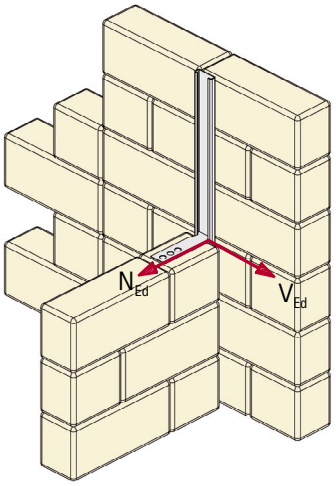
Brick Tie System PEC-TEC

Application

The PEC-TEC connection system is the ideal product to quickly, reliably and securely connect walls without any complicated tools. The system is ideally suited to connect masonry walls one with another or masonry walls with concrete walls. To ensure the secure connection of additionally installed masonry with existing walls, the PEC-TEC wall connection system is the ideal solution.
Regardless of the brick sizes the tie anchors can be inserted into the brick tie channels. The flexibility of the tie anchor remains intact even after installation in the channel and prevents the formation of uncontrolled cracks in the brickwork.

Verification:
$N_{Ed} \leq N_{Rd}$
$V_{Ed} \leq V_{Rd}$



Recommended resistance values [1] of PEC-TEC with anchor distance S = 250 mm			
		Single load [kN]	Distributed load [kN/m]
Tension capacity of anchor in:			
Concrete	$N_{Rec,p,C}$	0,51	2,1
Shear capacity of anchor in			
Concrete	$V_{Rec,C}$ (kN)	1,43	5,71
Tension steel capacity of Brick tie anchor in channel	$N_{Rec,S}$ (kN)	1,52	-
Shear steel capacity of Brick tie anchor in channel	$V_{Rec,S}$ (kN)	0,25	-

[1] Design resistance $N_{Rd} = N_{Rec} \times 1,4$ bzw. $V_{Rd} = V_{Rec} \times 1,4$
Values for masonry on request.

Delivery scope and available material

The brick tie channels and anchors are supplied in a galvanized version. The brick tie channels are supplied in packs of 20 channels with a length of each 1.25 m (25 meters).

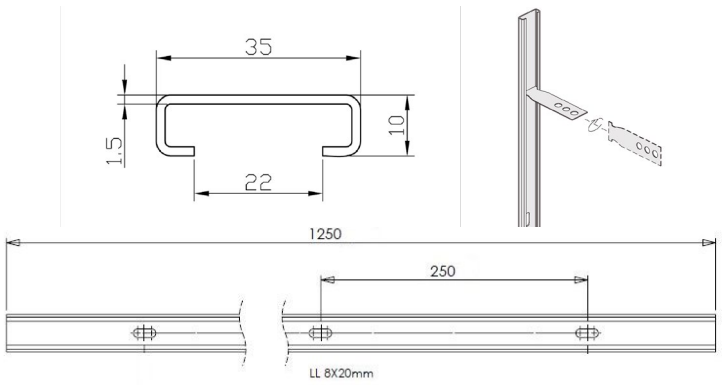
Installation Accessories

The installation accessories packet contains 20 brick tie anchors, 12 plastic dowels, 12 galvanized screws and washers with assembly instructions.

Installation

The installation of the PEC-TEC brick tie system is simple and uncomplicated and can be carried out with simple tools. The brick tie channel is screwed with three dowels onto the wall and the tie anchors are inserted into the channel and placed in the masonry joint mortar.

The gap between the old and the new wall is then filled with insulation or with a permanently elastic joint compound.



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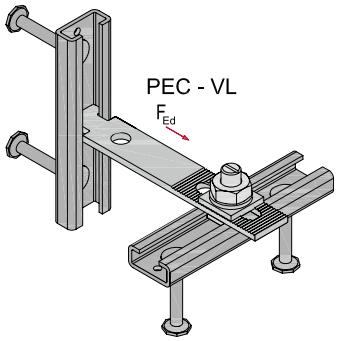
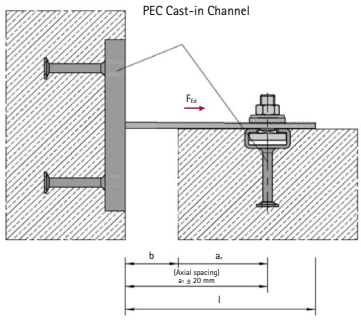
PEC Toothed Straps Type VL





Product description	Delivery scope and material type
PEC toothed straps of type VL with serrated straps and counter-plates as well as welded-on PEC bolt of only tensile forces. Two members on both sides can safely be connected with already vertically and horizontally installed PEC cast-in channels with the Toothed Straps which provide flexibility in all three directions.	**Material:** Toothed straps are available zinc-plated and in stainless steel A4 (1.4401/1.4571) **Delivery:** PEC toothed straps with counter-plates PEC Bolts for cast-in channels with nut and washers must be ordered separately **Special Versions** Special design requirements and material upon request

PEC toothed straps Type VL

Features				Dimensions			Fastening with PEC cast-in channels and PEC T-bolts
Zinc plated		Stainless Steel A4 1.4571 / 1.4401		Length	Tolerance	Slotted-holes	
Type	a_1 mm	Type	a_1 mm	mm	mm	mm	
PEC - VL 28/15 gvz - 050	50	PEC - VL 28/15 A4 - 050	50	90	a_1 ± 20	LL 11 x 55	PEC-TA-CE 28/15 Short pieces 150 - 250 mm PEC-HBC-28/15 M 10x30 Tightening Torque T_{inst}=13 Nm
PEC - VL 28/15 gvz - 075	75	PEC - VL 28/15 A4 - 075	75	115			
PEC - VL 28/15 gvz - 100	100	PEC - VL 28/15 A4 - 100	100	140		LL 11 x 55 RL 11	
PEC - VL 28/15 gvz - 125	125	PEC - VL 28/15 A4 - 125	125	165			
PEC - VL 28/15 gvz - 150	150	PEC - VL 28/15 A4 - 150	150	190			
PEC - VL 28/15 gvz - 175	175	PEC - VL 28/15 A4 - 175	175	215			
PEC - VL 28/15 gvz - 200	200	PEC - VL 28/15 A4 - 200	200	240			
PEC - VL 28/15 gvz - 225	225	PEC - VL 28/15 A4 - 225	225	265			
PEC - VL 28/15 gvz - 250	250	PEC - VL 28/15 A4 - 250	250	290			
PEC - VL 38/17 gvz - 075	75	PEC - VL 38/17 A4 - 075	75	115	a_1 ± 20	LL 13x55 RL 13	PEC-TA-CE 38/17 Short pieces 150 - 250 mm PEC-HBC-38/17 M 12x50 Tightening Torque T_{inst}=25 Nm
PEC - VL 38/17 gvz - 100	100	PEC - VL 38/17 A4 - 100	100	140			
PEC - VL 38/17 gvz - 125	125	PEC - VL 38/17 A4 - 125	125	165			
PEC - VL 38/17 gvz - 150	150	PEC - VL 38/17 A4 - 150	150	190			
PEC - VL 38/17 gvz - 175	175	PEC - VL 38/17 A4 - 175	175	215			
PEC - VL 38/17 gvz - 200	200	PEC - VL 38/17 A4 - 200	200	240			
PEC - VL 38/17 gvz - 225	225	PEC - VL 38/17 A4 - 225	225	265			
PEC - VL 38/17 gvz - 250	250	PEC - VL 38/17 A4 - 250	250	290			
PEC - VL 38/17 gvz - 275	275	PEC - VL 38/17 A4 - 275	275	315			
PEC - VL 38/17 gvz - 300	300	PEC - VL 38/17 A4 - 300	300	340			

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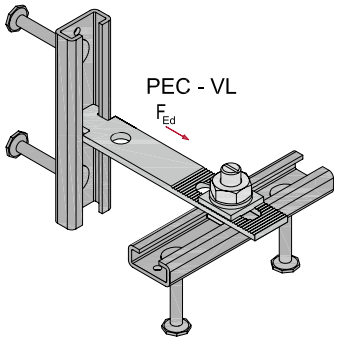
PEC Toothed Straps Type VL: Design



Resistance values PEC-VL			
Type	Characteristic resistance F_{Rk} [kN]	Design resistance F_{Rd} [kN]	Recommended resistance F_{Rec} [kN]
Material	Steel zincplated gvz		
PEC-VL 28/15	8,8	4,9	3,5
PEC-VL 38/17	14,0	7,8	5,6
Material	Stainless Steel		
PEC-VL 28/15	11,7	6,6	4,6
PC-VL 38/17	19,9	11,0	7,9

F_{Rd} with a recommended partial safety factor on the resistance side of 1.8
(according to EN1992-4 for channel lip failure, in case that no national regulation is available)
F_{Rec} with a recommended partial safety factor on the resistance side of 1.4

Anchor channel design must be done separately using "PROFIS Anchor Channel" software based on given component geometry and applied loads

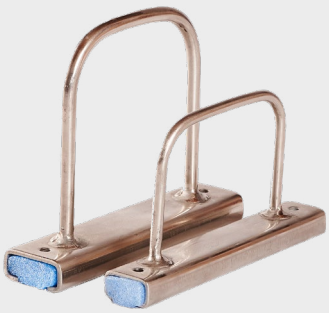
Proof: $F_{Ed} \leq F_{Rd}$

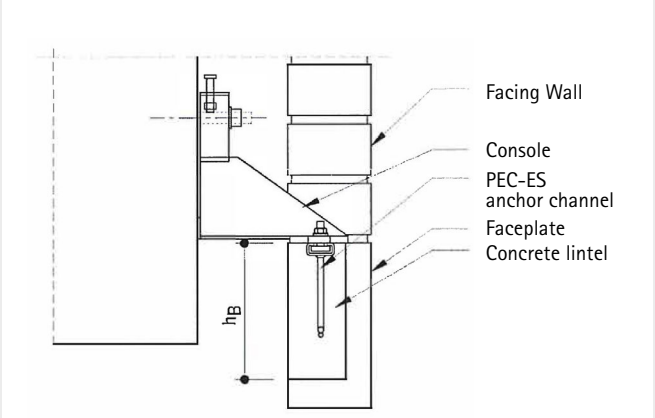
PEC-ES anchor channels for precast concrete lintels

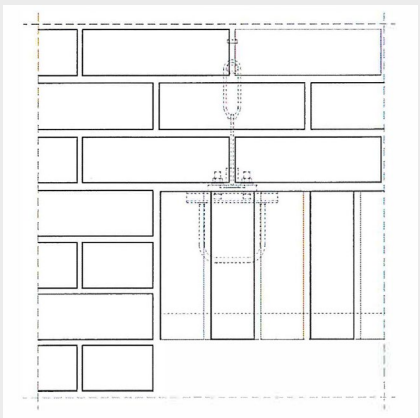
Together with a console, the PEC-ES anchor channel is ideally suited to attaching precast concrete lintels in the brickwork support system.

PEC-ES anchor channels are manufactured in the profile dimensions 28/15 and 38/17. Profile and welded stirrups as anchor are made of stainless steel. The profile is protected from the penetration of concrete by a profiled polystyrene foam together with a pull-out strip which allows quick, easy and complete removal of the foam. PEC-TA-ES are offered in delivery lengths of 150 mm.

You can find detailed technical data in the "General building approval Z-21.4-2046" on our website.







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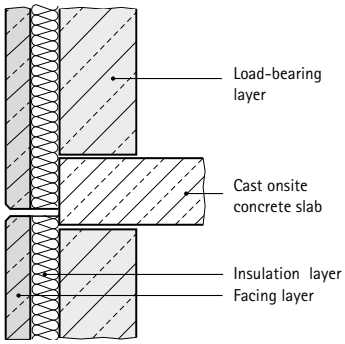
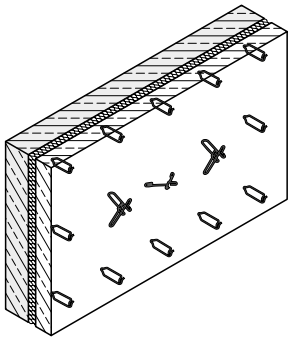
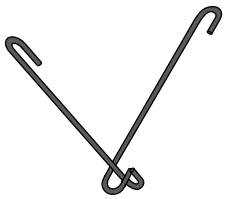
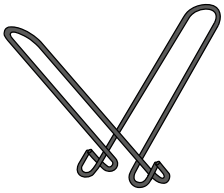
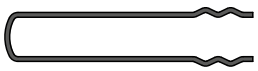
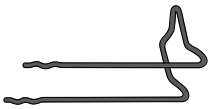
PEC Sandwich Panel Anchors for fixing concrete elements

Sandwich panels are large multilayer, reinforced concrete façade elements. They consist of a facing layer, an insulation and a load-bearing layer. The main function of the PEC sandwich anchor system is to connect the load-bearing and facing layers of sandwich panels and to transfer the forces acting on the facing layer to the load-bearing layer. In addition, restricting the expansion and contraction of the facing layer is avoided.

Typical structure of 3-layer panel	Typical application of SPAs
	

PEC-SPA Product range

SPA-1	SPA-2	Connector pin SPA-N	Stirrup SPA-B	Clip-on pin SPA-A
				

Advantages of PEC Sandwich Panel Anchors

- Quick and easy installation of anchors and pins
- Reduction of mounting and planning effort
- Safety through building authority approvals
- EnEV-compatible with minimal thermal bridges through the fastening system
- Sustainability through stainless steel (materials A4 and D4 acc. to approval Z-21.8-2053, A2 on demand)
- Allows production of sandwich panels in positive and negative procedure
- Insulation layer thickness up to 400 mm possible

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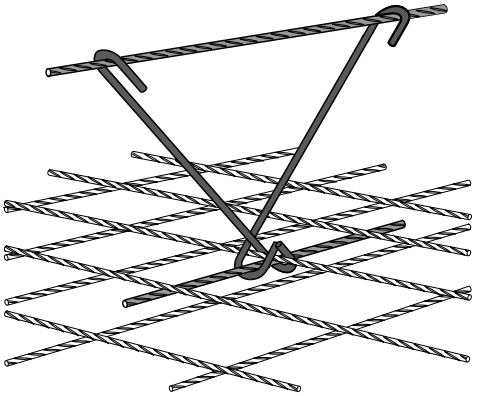
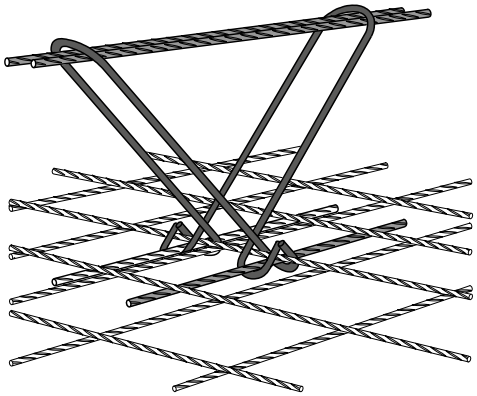
PEC Supporting and horizontal anchors: PEC-SPA-1 / PEC-SPA-2

Product description

PEC-SPA-1	PEC-SPA-2
	

General information

The sandwich panel anchors PEC-SPA-1 and PEC-SPA-2 are V-shaped anchors of round steel bars. The bent ends secure the reinforcement bar and the anchorage in the concrete. An easy distinction is ensured due to different colour marking.

PEC supporting anchors are mainly used for carrying the resulting vertical loads from the dead load of the facing layer. Planned or unplanned eccentric loads and horizontal loads due to e.g. wind and temperature deformation should also be considered.

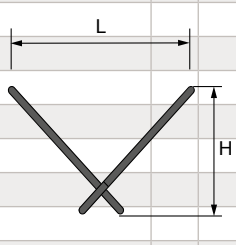
The PEC-SPA system SPA-1 can also be used as a horizontal anchor (if necessary - the PEC-SPA-2 is as well suitable as a horizontal anchor). Primarily the horizontal anchor functions as a carrier of the horizontally acting forces (e.g. impact forces during lifting, wind forces on soffits or from panels hanging askew on the crane).

To allow loads when panels are rotated for transport these anchors have to be dimensioned carefully.

Overview of available anchor heights H and lengths L (mm)

Sandwich panel anchors SPA-1 / SPA-2

Steel bars Ø (mm) 5,0			Steel bars Ø (mm) 6,5			Steel bars Ø (mm) 8,0			Steel bars Ø (mm) 8,5			Steel bars Ø (mm) 10		
Order no. SPA-1: 401-01- SPA-2: 401-02-	H	L	Order no. SPA-1: 401-01- SPA-2: 401-02-	H	L	Order no. SPA-1: 401-01- SPA-2: 401-02-	H	L	Order no. SPA-1: 401-01- SPA-2: 401-02-	H	L	Order no. SPA-1: 401-01- SPA-2: 401-02-	H	L
04-05-140	140	225												
04-05-160	160	265	04-07-160	160	260									
04-05-180	180	305	04-07-180	180	300									
04-05-200	200	345	04-07-200	200	340									
04-05-220	220	385	04-07-220	220	380	04-08-220	220	380	04-09-220	220	375			
04-05-240	240	425	04-07-240	240	420	04-08-240	240	420	04-09-240	240	415			
04-05-260	260	465	04-07-260	260	460	04-08-260	260	460	04-09-260	260	455			
			04-07-280	280	500	04-08-280	280	500	04-09-280	280	495			
			04-07-300	300	540	04-08-300	300	540	04-09-300	300	535			
			04-07-320	320	580	04-08-320	320	580	04-09-320	320	575			
						04-08-340	340	620	04-09-340	340	615	04-10-340	340	610
						04-08-360	360	660	04-09-360	360	655	04-10-360	360	650
									04-09-380	380	695	04-10-380	380	690
									04-09-400	400	735	04-10-400	400	730
									04-09-420	420	775	04-10-420	420	770
												04-10-440	440	810
												04-10-460	460	850
												04-10-480	480	890
												04-10-500	500	930
												04-10-520	520	970



Note: Additional dimensions are available on request

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PEC Restraint Ties: PEC-SPA-N/B/A

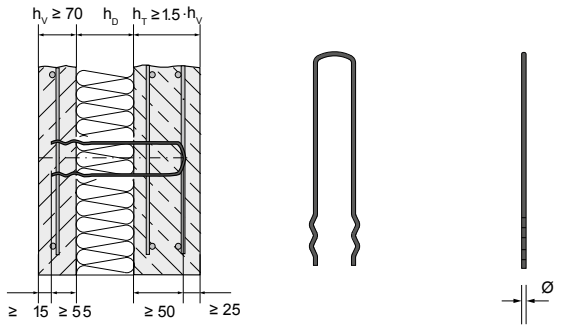
Product description

The PEC Restraint Ties are used when forces act perpendicularly to the panel surface as a result of wind, temperature deformation or adhesion to formwork. See below the available product range.

PEC Restraint Ties	
Diameter See measures next to the products **Material** Stainless steel according to approval Z-21.8-2053 - A4: 1.4571 / 1.4401 / 1.4404 - D4: 1.4362 (Lean duplex steel) Other steel types A2 on demand	**Concrete quality** Facing layer ≥ C 30/37 Load-bearing layer ≥ C 30/37 **Reinforcement** Reinforcement mesh B500A, B500B Ribbed reinforcing bars B500A, B500B **The facing layer's minimum reinforcement** Square reinforcement mesh 1,88 cm²/m

Product range of PEC Restraint Ties

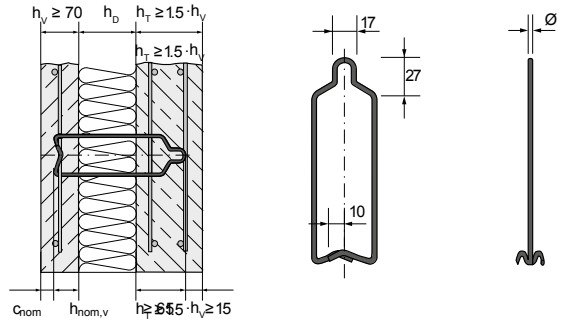
PEC Connector Pins SPA-N



Diameter
3.0 mm / 4.0 mm / 5.0 mm / 6,5 mm

PEC Connector Pins SPA-N are U-shaped bent wires. Not only the round end of the anchor, but also the corrugated ends are anchored in the concrete.

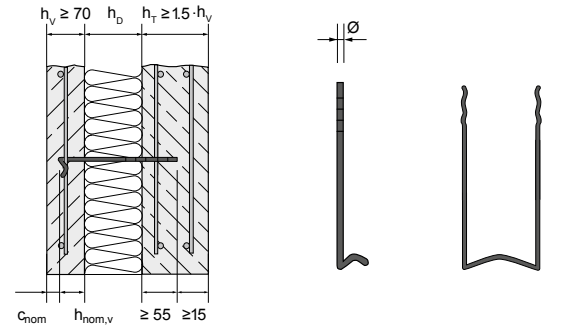
PEC Stirrup Ties SPA-B



Diameter
3.0 mm / 4.0 mm / 5.0 mm

PEC Stirrup Ties SPA-B are bent wires. They are anchored and positioned by hooking the bars around the reinforcement mat. Both ends are anchored in the concrete.

PEC Clip-on Pins SPA-A



Diameter
3.0 mm / 4.0 mm / 5.0 mm

PEC Clip-on Pins SPA-A are connector pins with the addition that the U-shaped end is bent 90 degrees. The corrugated end is anchored in the concrete. On the other side the end is hooked to bars in the reinforcement mesh.

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Selection of successfully completed projects		
Equus 333, Mexico	North America	Cast-in channels & T-Bolts
Carso 2, Mexico	North America	Cast-in channels & T-Bolts
Punta Reforma, Mexico	North America	Cast-in channels & T-Bolts
Latino, Mexico	North America	Cast-in channels & T-Bolts
Clinica Delgado, Peru	South America	Cast-in channels
Huawei, China	Asia	Cast-in channels
Opple Lighting, China	Asia	Cast-in channels
Capital Culture Arts Center, China	Asia	Cast-in channels
SIP Ecology Building, China	Asia	Cast-in channels
Pudong Tangdong, China	Asia	Cast-in channels
Office Building, Australia	Australia	Cast-in channels
Hugo Boss, Outlet City, Germany	Europe	Cast-in channels
Audi Logistic Center, Germany	Europe	Cast-in channels
Flood protection facility, Germany	Europe	Cast-in channels
Motorway Bridge, Austria/Germany	Europe	Cast-in channels
Elbe Sluice, Germany	Europe	Cast-in channels
Coca Cola, Logistic Center, Germany	Europe	Cast-in channels
Bosch, Building with Crane tracks, Germany	Europe	Cast-in channels
Buckingham Gate, UK	Europe	Cast-in channels
Yenitepe Kadiköy, Turkey	Europe	Cast-in channels

Yenitepe Kadiköy, Turkey
PEC cast-in channels

Four Seasons Hotel Tower 2, India
PEC cast-in channels

Suzhou Center, China
PEC cast-in channels

Forest Park, USA
PEC cast-in channels

6 Bevis Marks, UK
PEC cast-in channels

Clinica Delgado, Peru
PEC cast-in channels

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General Terms and Conditions of PEC Europe GmbH - Terms and Conditions of Sale and Services

Version as of 01.08.2024

Important notice The English-language version is provided for information purposes only as a translation of the original German version; in the event of a conflict, the German-language version shall therefore take precedence.

1. [1]These **General Terms and Conditions (GTC)** are an integral part of all our contracts for deliveries and other services. [2]With the allocation of a customer number upon the first conclusion of a contract, we establish a permanent business relationship with the customer; in this respect, the GTC's shall also apply to future contracts in the version current at the time of the order and e.g. published in our catalogues, price list and at www.pec-europe.com; we also accept orders placed verbally, by telephone or electronically only with the inclusion of our respective valid GTC's. [3]Our customers' **terms and conditions of purchase** shall not apply, even if we have not expressly objected to them.

2. [1] Our **offers** are **subject to change**; technical details, illustrations in our catalogues, product descriptions and the like are non-binding. [2]Individual **declarations, information, advice, recommendations, assurances or guarantees** for our products, information on **special discounts, bonuses, delivery periods** as well as any **goodwill agreements** and the conclusion of independent **consultancy agreements** require the express **written confirmation** in order to be legally effective, unless there is power of representation for verbal declarations under commercial law or principles of legal appearance.[3]We reserve the exclusive property rights, copyrights and rights of use to quotation or order-related execution documents or drawings. [4]The same applies to other documents, plans or sketches and design calculations produced by us. [5]**Disclosure** of these documents to third parties is not permitted. [6]If no contract is concluded between us and the customer, these documents must be returned to us or destroyed immediately upon our request.

3. [1]We only sell **directly** to traders within the meaning of § 14 of the German Civil Code (BGB).

4. [1]We deliver our products exclusively at the **customer's risk**, unless otherwise agreed in writing. [2]**Delivery periods and dates** are non-binding. [3]Compliance with the delivery periods and dates presupposes that all commercial and technical questions have been clarified and that the customer has fulfilled **all obligations incumbent** on him (e.g. provision of the necessary official certificates/approvals, handover of the necessary execution documents, payment of the agreed down payment). [4]If it becomes apparent even before the time stipulated for delivery that the customer has committed or will commit **a fundamental breach of contract**, we shall be entitled to withdraw from the contract in whole or in part and - if the customer is responsible for the breach - to claim damages. [5]We shall be entitled to make **partial deliveries**, each of which shall be deemed an independent transaction, to a reasonable extent; the price shall remain unaffected. [6]If we fulfil the order by partial delivery, shipping costs shall only be incurred for the first partial delivery; if the partial delivery is made at the customer's request, we shall charge shipping costs for each partial delivery. [7]If the customer wishes to call-off partial deliveries, the call-offs and scheduling of individual partial deliveries must be carried out by the customer in such a way that we are able to manufacture and deliver in accordance with the contract. [8]If the customer does not call-off or schedule deliveries or does not do so on time, we shall be entitled to withdraw from the contract and/or claim damages after setting a deadline to no avail. [9]Unless we have reached a different agreement with the customer, call-offs for call-off orders must be made by the customer within five weeks of us making the delivery available.

5. [1]The statutory VAT is added to our stated prices. [2]Our **invoices** are **due** for payment **immediately** upon receipt. **If legal dunning proceedings are initiated against our customer, all outstanding claims**, even if an extended payment term was agreed for these, **shall become due for immediate payment; any discounts granted shall then no longer apply**. [3]If an agreed payment term is exceeded, we shall be entitled, in addition to our statutory claims, to charge contractual **interest on arrears** from the date of receipt of the invoice at the usual bank debit interest rate, at least 9 percentage points above the base interest rate p.a., and to postpone or refuse further deliveries. [4]Pre-judicial costs, in particular **information, reminder and bank chargeback costs**, can be charged at a flat rate of € 40.00, irrespective of proof of higher or lower costs. [5]The date of **repayment of the debt** shall not depend on the date of dispatch, but on the date on which the amount is credited to our account. [6]In the absence of a repayment provision to the contrary, we shall initially offset **payments** against interest and costs. [7]Counterclaims may only be **offset** if they are undisputed by us or if they have been legally established or are at least ready for judgement. [8]Counterclaims may also be offset by the customer if the customer's claim and our claim are legally based on a reciprocal relationship.

6. [1]If molds and objects are to be delivered according to drawings, models or samples provided to us by the customer, the customer shall guarantee that the manufacture and delivery **does not infringe the industrial property rights of third parties**. [2]If a third party prohibits us from manufacturing and delivering items made according to drawings, models or samples provided by the customer, citing industrial property rights belonging to him, **we shall be entitled**, without being obliged to examine the legal situation, to **discontinue the manufacture and delivery and to demand reimbursement of the costs incurred**. [3]In all cases of this Section, the customer is obliged to indemnify us immediately against claims for damages by third parties. [4]Samples, drawings and other order attachments may be destroyed by us six months after execution of the contract.

7. [1]Our deliveries are subject to **retention of title** until full payment of all claims to which we are entitled from the business relationship with the customer. [2]The delivered products are to be treated with care and may only be used as intended. [3]In particular, they may not be **pledged or transferred** to third parties without disclosure of the ownership structure. [4]Excluded from this is fastening material and other consumables that are processed, in particular installed, in the ordinary course of business. [5]In each case of an authorized resale or processing of our products, the customer hereby assigns to us the resulting claims against his customers (e.g. builders, general contractors) with all ancillary rights in the amount of the value of these reserved goods **(extended retention of title**). [6]The customer shall only remain authorized to collect his claims as long as he is not in default. [7]In the event of default and in the event of **an application for insolvency** concerning the customer, we hereby prohibit the resale or processing of our goods subject to retention of title and **revoke our authorization to collect** the claims assigned to us as security.

8. [1]The customer must **check** our deliveries and invoices immediately and **notify** us immediately of any defects within the meaning of the German Civil Code (BGB) and within the meaning of § 377 of the German Commercial Code (HGB) and/or **errors** in the invoice. [2]In the event of any **defects** in the products or other services supplied by us, we shall be obliged to provide **subsequent fulfilment** - at our discretion by repair or replacement. [3]If the subsequent fulfilment fails, the customer may reduce the remuneration accordingly or withdraw from the contract. [4]Insofar as a notification of defects by the customer is unfounded, we may invoice the customer for services that we provide at the customer's request or demand on the basis of such a notification at our valid prices, as well as for the expenses incurred as a result (e.g. travel expenses). [5]The **limitation period** for claims for defects is **12 months**, calculated from the transfer of risk. In the cases of § 438 Para. 1 No. 1 and 2, § 438 Para. 3, § 634a Para. 1 No. 2 and § 634a Para. 3 of the German Civil Code (BGB), the limitation period stipulated therein shall apply. [6]A longer limitation period may also apply in the case of separate guarantees or service commitments. [7]If the customer asserts claims for damages, the limitation period shall be governed solely by the statutory provisions.

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[8]Liability for claims for damages, regardless of the legal grounds, shall be governed by Section 10 of these GTC.

9. [1]The **knowledge** of the relevant regulations for the use of our products (in particular **DIN standards**, admittances and building law) as well as the examination of any specifications of third parties (e.g. planners, builders) is in any case the responsibility of our customers, so that we are not liable for **damages** caused by non-compliance with these regulations or specifications in the absence of our own breach of duty. [2]The customer is aware that our employees are generally not state-certified structural engineers or engineers, nor are they master craftsmen or journeymen. [3]Consultancy services provided by our employees therefore do not re-place the necessary commissioning of qualified specialists. [4]If the customer fails to consult qualified specialists, we shall not be liable for any resulting damage.

10. [1]Our liability and the **liability** of our legal representatives and vicarious agents, regardless of the contractual or statutory legal basis, is **excluded** for all damages, unless the respective damage is based on an intentional or grossly negligent breach of duty or on a simple negligent breach of essential contractual obligations (i.e. obligations on the fulfilment of which the customer regularly relies and may rely for the proper execution of the contract) by our legal representatives or vicarious agents. [2]In the event of a simple negligent breach of essential contractual obligations, our liability shall be **limited** to the foreseeable, typically occurring damage. [3]These limitations and exclusions of liability shall not apply in the event of liability for culpable injury to life, limb or health, in the event of liability for non-fulfilment of a guarantee, in the event of liability for fraudulent concealment of a defect or in the event of liability under the Product Liability Act (Produkthaftungsgesetz).

11.[1]The customer is obliged to provide us upon request with all information and documents necessary to comply with export control regulations. [2]If the customer supplies products to third parties (including affiliated companies of the customer), the customer undertakes to comply with the **export control regulations**. [3]We have the right to refuse fulfilment in the event of violations of this provision.

12. [1]In our business transactions with merchants, legal entities under public law or with special funds under public law, the **place of fulfilment** for the customer's payment obligation is Duisburg. [2]German law shall apply to the exclusion of the UN Convention on Contracts for the International Sale of Goods to the interpretation, implementation and enforcement of these GTC's and to orders and individual orders placed based on these GTC's. [3]**The exclusive place of jurisdiction for all disputes between the customer and us is Duisburg**.

13. [1]Should one or more of the provisions of these GTC's be or become invalid or unenforceable, only these shall be deemed not to have been stipulated, and the **validity of the remaining provisions** shall remain **unaffected**. [2]The invalid or unenforceable provision(s) or the provision(s) that have be-come invalid or unenforceable shall be replaced by such provisions that are closest in meaning and effect to the originally intended provision(s).

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