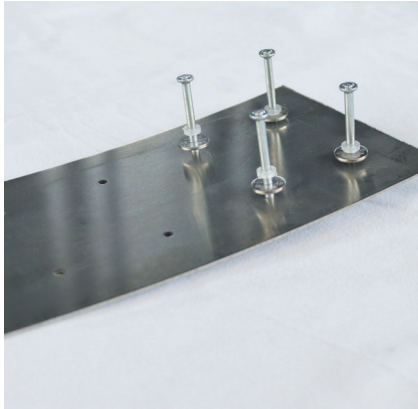


Product data sheet re-plate 120/1.5

«for statically loaded elements»



The memory®-steel strip re-plate 120/1.5 is used for minor strengthening works of slender concrete slabs in building construction (dry areas indoor). re-plate is anchored on both sides and functions as an external, unbonded tension strip. re-plate is elongated in the factory and supplied pre-punched at the ends ready to use on-site. The mechanical end anchorage is composed of a Hilti direct fastening system. For activation of the prestressing, re-plate is heated using a gas burner or infrared heater.

Plaster, paint coats and insulation must be removed from the substrate beforehand. re-plate is cleaned on both sides according to the method statement. After the installation and prestressing, re-plate is sealed on all sides with Sikaflex® PRO-3 Purform to prevent water ingress between concrete substrate and the strip. A corrosion protection (Macropoxy® EG-1 Plus, formerly SikaCor® EG-1 Plus) is applied to the cleaned surface on the outside. A corrosion protection on both sides of re-plate is possible. In this case, the protection is already applied in the factory.

Material properties	Max. tensile strength	Design value tensile strength*	Elongation at break	Modulus of elasticity (for calculation)**
re-plate 120/1.5	>700 N/mm ²	460 N/mm ²	20%	70 kN/mm ²

* Design values for 12 nails with concrete compressive strength (cube) >20 N/mm² (with safety factor 1.3).

** After heating/activation the elastic modulus is 160 kN/mm² up to a stress increase of 50 N/mm², after which it decreases to 70 kN/mm². This value is used for calculation.

Product data	Width / Thickness	Cross-section	Weight	Desing value tensile force
re-plate 120/1.5	120 mm / 1.5 mm	180 mm ²	1.37 kg/m	83.1 kN

Prestressing	Heating temperature	Prestress t_0	Prestressing force t_0	Relaxation
re-plate 120/1.5	160 °C (Infrared)	300 N/mm ² *	54.0 kN	15 % t_{00}
	300 °C (Gas)	380 N/mm ² **	68.4 kN	15 % t_{00}

* if corrosion protection was applied on both sides in the factory.

** if corrosion protection is applied on one side on site.

Advantages:

- Easy-to-install flexural strengthening of reinforced concrete
- Active and immediately load-bearing reinforcement (easy prestressing)
- Minimal space requirements
- Reduction of deflections and crack opening
- Increased serviceability
- Stress relief of the internal reinforcement

Appearance:

Steel plate with 16 pre-punched holes on both ends (12 holes for nailing, 4 extra holes), metallic grey

Storage/transport:

re-plate must be stored and transported in a dry, protected place (no mechanical or chemical damage, etc.). Condensation water (due to varying ambient temperatures and conditions) must be prevented by suitable storage and ventilation. Road transport must be carried out in closed trucks to prevent possible contamination by de-icing salts. The material must be protected from direct sunlight and temperatures above 40°C until it is installed and activated.

Information

Condition of the substrate

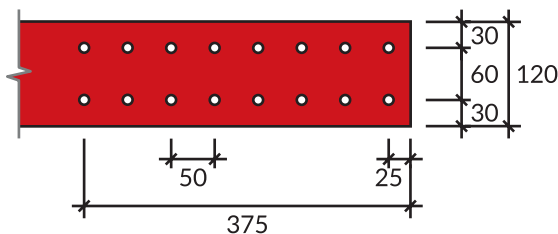
re-plate strengthening system can be used retrofitting of reinforced concrete structures. The concrete substrate must be able to transfer the load and must have a compression strength of $>20 \text{ N/mm}^2$ (cube, C16/20 acc. to EN 206-1). For lower concrete qualities, the anchorage resistance should be discussed with the re-fer engineering support. Protrusions, plaster, painting or insulation etc. around re-plate must be removed beforehand.

Geometrical arrangements

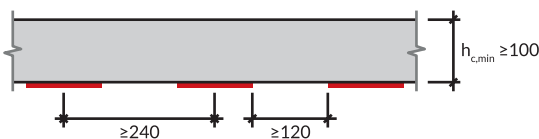
Geometrische Anordnung:

The following specifications [mm] concerning edge distance, axial spacing, and geometrical dimensions need to be respected. Special designs are necessary if these requirements cannot be met. In this case re-fer provides engineering support.

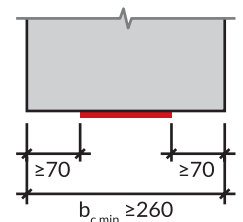
Holes in re-plate:



Plate/slab:



Slender beam/bearer:



Corrosion protection:

The memory®-steel alloy contains about 10% chromium in mass and behaves similarly to a 1.4003 alloy according to DIN EN 10088 (corrosion resistance class I). A known risk associated with prestressing steels is stress corrosion cracking in the presence of high humidity and chlorides, other salts, or acids.

The coating Macropoxy® EG-1 Plus (formerly SikaCor® EG-1 Plus) is applied as standard after the installation of re-plate. The strip is thoroughly cleaned with solvent before installation in accordance with the method statements. After heating, it is cleaned again with warm water, dried and grouted on the sides with Sikaflex® PRO-3 Purform joint sealant to prevent water ingress between concrete substrate and the strip. The coating is applied directly afterwards (two-layer, each 120 µm thick, pore-filling).

If sufficient protection cannot be guaranteed, additional measures must be taken (e.g. sealing, etc.) or the re-bar system must be used.

Fire protection:

memory[®]-steel has a similar reaction to fire to that of conventional steel, losing strength significantly from about 400°C, and reducing its prestressing to zero at about 350°C. The same applies to the anchorage with Hilti direct fastenings; separate behaviour in fire tests are available for these.

Fire protection of the strengthening measures is always required if the specific fire load for the relevant standard and country is not covered without the strengthening.

The concrete substrate and strengthening plates are cleaned and fully covered with the base coat SikaCem[®] Pyrocoat Base. A fine layer of SikaCem[®] Pyrocoat sprayed mortar is then applied over the full strengthening system. This mortar also levels any uneven areas. An E-glass mesh fabric (alkali-resistant) is fully embedded into the mortar over the re-plate. To prevent voids due to re-plate movement, the sprayed mortar is applied laterally into these gaps.

SikaCem [®] Pyrocoat «sprayed mortar» «applied by machine»	
Layer thickness: 12 mm	R30
Layer thickness: 15 mm	R60
Layer thickness: 23 mm	R90

The fire protection measures and stated layer thicknesses are guide values and must also conform and be compatible with all relevant local regulations and standards.

General notes:

- The exact conditions on site must be clarified in advance (ceiling offsets, space conditions, crossing cables, etc.).
- The end areas of different re-plates must not overlap. Otherwise, it will not be possible to set the nails correctly.
- No third-party products such as construction foam, paints or other chemicals may come into contact with re-plate (possible aggressive decomposition products when heated).
- When applying re-plate to a curved substrate, ensure that re-plate is levelled during activation (check for evenness beforehand).
- Depending on the situation, safety strips can be applied over re-plate with a spacing of approx. 1.5 m (as additional personal protection in the event of failure, e.g. mechanical damage).

Combination with Sika[®] CarboDur[®] laminates:

re-plate is often used to cover the service loads at SLS and the fire load, while Sika[®] CarboDur[®] CFRP laminates are used for the remaining ULS loads. If re-plate and CFRP strips are load bearing in the same direction, the slack CFRP laminates are always applied after the prestressed re-plate. If re-plate is applied longitudinally over pre-installed CFRP strips (transversely), an E-glass fabric tape must be inserted at the crossing points as an intermediate layer for thermal protection. The glass fabric should have a temperature resistance of approx. 450 °C (e.g. isoGLAS[®] 450, 3 mm thick). CFRP laminates cannot be bonded over re-plate, as there would be no local adhesive bond.

Application of re-plate

Information on the handling and the installation of our products can be found in the current re-fer method statement and the regulations of the supplier of corrosion coating and fire protection, respectively.

End anchoring of re-plate

A minimum of 12 nails per side (total 24 nails) are required for the re-plate end anchoring. The plate is delivered with additional extra holes to account for setting changes. Concrete must be pre-drilled through the pre-punched holes in the plate. The anchoring is done with a Hilti direct fastening system of type X-CR.

Drilling depth:

40 mm

Drilling diameter:

3.5 mm

Hilti powder-actuated fastening tool:

DX5 Kit

DX6 Kit

Hilti Powder cartridge:

DX Kartusche 6.8/11 M10 BULK rot

DX Kartusche 6.8/11 M10-X10 T titan

Hilti universal nails:

X-CR 48 P8 S15

X-CR 48 P8 S15

Activation of prestressing

Heating with gas:

To activate with the gas burner, re-plate is heated evenly to 300°C in sections of approx. 1.00 m length. The process must be supervised by a second person who checks the temperature and protocols. The engineers in charge may request a heating protocol.

The technical service of re-fer offers a check of the prestressing force.

Heating with infrared:

If corrosion protection has already been applied in the factory, activation with the infrared radiant heater is required (160°C). The IR-3000 infrared radiant heater is placed against re-plate (incl. temperature control). The heating distance in longitudinal direction of the radiant heater is around 1.30 m.

Required power supply: 3x400 V, CEE 16A, 400V, 5-pole

All necessary processing equipment, activation devices and temperature measuring devices can be purchased from re-fer. A re-fer application engineer is available for construction site assignments for a fee.

Tested Sika products

Fire protection:

- SikaCem® Pyrocoat passiv sprayed fire protection mortar, for application with machine or by hand.
- SikaCem® Pyrocoat Base, base coat for SikaCem® Pyrocoat fire protection mortar

Corrosion coating:

- Macropoxy® EG-1 Plus (formerly SikaCor® EG-1 Plus) 2-component, epoxy-based intermediate coat
- Sikaflex® PRO-3 Purform® PU-based sealant

memory®-steel has been tested in systems with these Sika products. re-fer gives no guarantee if other mortars and products are used in combination with memory®-steel.

Approvals and test reports:

- Empa, Dübendorf (CH): Determination of mechanical properties on lamellar steel sections re-plate consisting of a shape memory alloy – Test report No. 5'214'009'925, 2016 and 5'214'013'070-05, 2017
- Empa, Dübendorf (CH): Activation and Stress-relaxation of memory-steel (Fe-SMA) strips of type re-plate – Test report No. 5211.00688.100.01-2, 2018
- Empa, Dübendorf (CH): Lap-shear tests for re-plate anchorage – Test report No. 52140027302/B, 2021
- MFPA Leipzig (DE): Fire testing with re-plate and fire protection plaster SikaCem® Pyrocoat – Test report No. PB 3.2/21-032-1, 2021 and Expert statement Nr. GS 6.1/21-008-1, 2021
- Research report 2017-001: Fe-SMA Strips for Flexural Strengthening of Concrete – Beam tests, 2017

Notes

All technical values in this product data sheet are subject to the re-fer quality assurance and are based on laboratory tests. Contact us if you have any questions about the tests performed. Current measured values may deviate from the product specifications. For design purpose, re-fer provides engineering support and advice. For further information please visit us at www.re-fer.eu (references, technical data sheets, brochure, tender texts, test reports and publications can be downloaded or are available upon request) or contact our technical service directly.

The information in this product data sheet is valid for the corresponding product delivered by re-fer AG Switzerland. Please note that the data may differ in other countries and please refer to the local product data sheet abroad. The information and data in this technical data sheet are intended to ensure that the product is considered for normal use and is based on our knowledge and experience. However, they do not release the user from the obligation to check the suitability and use of the product on his own responsibility.

Product specifications are subject to change without notice. In all other respects, our terms and conditions of sale and delivery shall apply. The latest product data sheet shall apply.

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