



User manual

This user manual provides information about the use, storage, inspection and maintenance of pewag textile lashing straps.

General information

pewag textile lashing straps are designed for securing the load during its transport. If properly used, pewag textile lashing straps have a long service life and offer a high degree of safety. Nevertheless, personal injury and material damage can only be prevented by proper use. It is therefore of vital importance to read and understand this manual before the product is put into service. However, this does not exclude a responsible and attentive use of textile lashing straps when securing the load. Although pewag offers the necessary help means for the correct selection and application of lashing straps, adequate professional knowledge is required. pewag textile lashing straps must therefore only be used by competent personnel.

Modification of the original condition

A modification of the original condition of this product is not permitted – e.g. by bending, grinding, dividing parts, boring, etc. Moreover, they must not be subjected to temperature influences above 100 °C.

For safety reasons, it is not permitted to remove safety devices like triggers, safety pins, safety catches, safety bushes, etc. Surface coating procedures like hot dip galvanizing or electrogalvanizing are not permitted. Stripping and pickling are also dangerous processes and must not be carried out without the approval of pewag. In case of doubt, please contact our technical service department.

Storage

pewag textile lashing straps must be stored clean, dry and protected from corrosion.

Inspections

Before the first use, following criteria must be satisfied:

- the delivered lashing strap corresponds to the ordered product
- the information given by the marking and the lashing capacity on the label coincide with the designated application
- the lashing strap is provided with the corresponding file
- this operating manual is available and was read and understood by the user

Lashing straps must be checked before each use for visible signs of damage or wear. In the case of doubt or damage, they must be taken out of service and inspected by a competent person.

An inspection according to national regulations must be carried out at least once a year by a competent person. However, this period must be shortened in view of the conditions of use – e.g. in case of frequent or rough use.

After extraordinary events (e.g. uncontrolled temperature influence, emergency braking etc.) which could affect the safe working condition, the lashing strap must be inspected by a qualified person.

Withdrawal criteria for the visual inspection

The lashing strap must be taken out of service if one or more of the following criteria are met:

- Broken parts or broken fibres / seams
- Missing or illegible marking on the label
- Deformation of accessories
- Lashing straps must be discarded if wear has reached 10 % of the cross section
- Cuts, nicks, gouges, cracks, excessive corrosion, coating-burn off, signs of welding processes
- If the ratches, cam buckles or tighteners are not working correctly
- Lashing straps with knots
- If the safety catch is missing or not working correctly, as well as signs of enlarged throat opening of the hooks or other deformations. The enlargement of the hook opening must not exceed 10 % of the nominal size

Repair

Lashing straps must not be repaired.

Documentation

Records of inspections, especially the corresponding results, must be retained during the entire service life of the lashing strap.

Use of lashing straps

Limitations on use due to adverse environmental influences or hazardous conditions.

Edge load

The maximum lashing capacity of pewag textile lashing straps was defined under the assumption that the tension force is set in straight pull, i.e. redirected free of bending influences (edges). In case of edge load, edge protectors or intermediate layers must be used to prevent damages. Edge load appears if the edge radius is smaller than the strap thickness.

Edge load lashing strap	Reduction factor
R = bigger than strap thickness 	1
R = smaller than strap thickness 	not allowed

Impacts

If the lashing process is carried out according to the European Standard EN 12195-1, occasional impact loads do not need to be considered since they will be balanced out by the shock absorber system of the vehicle and the elasticity of the lashing strap.

Temperature influence

pewag lashing straps may not be used outside the temperature range -40 °C up to +100 °C. If this has nevertheless been the case, they must be immediately taken out of service.

Influence of acids / alkalis and chemicals

Do not subject pewag lashing straps to acids, alkalis or their vapors.

Hazardous conditions

The categorization of the maximum lashing capacity assumes the absence of extremely dangerous conditions. Such extremely dangerous conditions include securing potentially dangerous loads, such as liquid metals, caustic or nuclear material. In these cases, the extent of the risks and the correct lashing capacity are to be assessed by competent personnel.

Use of pewag textile lashing straps for other than the intended purposes

pewag textile lashing straps must only be used for lashing purposes. For other than the intended purposes, please contact our technical service. Do not use lashing straps for lifting purposes.

General information:

Lashing points

Choose lashing points so that the angles of the lashing straps are within the range given in our help tables and symmetrical to the driving direction. Only use lashing points with adequate strength. Any other applications are only permitted with prior approval of our technical service department.

Selection

The lashing strap must be selected according to the required lashing method and the load that needs to be secured. The size, form and weight of the load, as well as the intended lashing method (friction lashing, direct lashing ...) and transport environment (additional utilities, lashing points ...) are essential to enable the proper selection of the lashing strap. For friction lashing, please use only those lashing straps where a STF value is given on the label.

We recommend using direct lashing for securing heavy loads in order to use as few as possible lashing straps.

The number of lashing straps must be calculated according to EN 12195-1. In accordance with this standard, pewag has integrated commonly used lashing methods in the selection tables of this catalog. Please find more detailed information below.

For stability reasons, use at least two lashing straps for friction lashing and at least two pairs for direct lashing.

The chosen lashing strap must be strong and long enough for the intended purpose. In case of doubt, opt for safety rather than for overloading the lashing strap. The connecting parts of the lashing strap (hooks, links) must be free to move in the lashing point and be aligned in the pull direction. Bending stress on the accessories and tip loading of the hooks is not permitted.

Hooks must be loaded at their bearing point. Please use either lashing chain systems or lashing straps for securing the load because of their different performance and elongation under load (e.g. lashing chains and lashing straps made from synthetic fibre). If required, please contact our technical service department.

Use

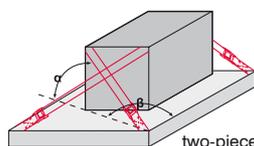
For correct lashing practice, the lashing method as well as opening of the lashing strap must be planned before the lashing process. Consider possible partial unloading during long trips.

Pay attention to overhead lines during loading and unloading. Remove possible lifting equipment before starting the lashing process. The maximum hand force of 50 daN for tightening the tension device must only be applied manually. Do not use mechanical devices such as rods or levers. Use sufficient edge protectors or edge wear pads. Please take into consideration that lashing straps could swing and rub due to winds. During transport, check the tension of the lashing strap repeatedly. Increasing temperatures can lead to a decreasing of the tension force in the lashing strap. Before opening the lashing strap, the load must be checked to ensure that it is properly supported and stable without the lashing system. It must also be guaranteed that there are no people in danger because of the load falling or toppling over. If necessary, assemble possible lifting equipment on the load before the transport to avoid falling off or toppling down. Special ratchets which allow a gradual loosening of the tension force are also very helpful in these cases. Before unloading, loose the lashing straps in such a way that the load stays on itself.

Explanation of pewag tables

Direct lashing

- The table provides information on how to use pewag textile lashing straps in an optimal way
- It also provides the maximum load which can be secured with 4 equal lashing straps using the angles and dynamic friction factors defined in the table. Additional securing methods (i.e. wedges, or similar) have not been taken into account. These could be used to secure loads with even higher weights. In such cases, please contact our customer service
- Every lashing strap has its own table
- The maximum forces occurring due to acceleration, braking and avoidance maneuvers in road traffic according to EN 12195-1 were taken into account. This table is not applicable for rail and sea transport. In such cases, please contact our customer service
- When using lashing straps, please consider if the values defined in the tables are valid for one-piece lashing straps (in strapping) or two-piece lashing straps (direct lashing) – see figures. For one-piece lashing straps, the corresponding tabular values for two-piece lashing straps of the same system can be doubled



Maximum loading weight using 4 lashing straps ZG ERGO DZ 100, direct lashing method:

Angle		Dynamic friction factor						
		0.01	0.1	0.2	0.3	0.4	0.5	0.6
α [°]	β [°]	Load that can be secured with 4 straps [daN ~ kg]						
15-35	21-30				8,800	11,700	16,050	24,750
15-35	31-40	4,000	4,850	6,150	7,950	10,500	14,450	22,350
15-35	41-50	3,350	4,150	5,300	6,950	9,050	12,500	19,400
15-35	51-60	2,600	3,300	4,350	5,600	7,300	10,200	15,950
36-50	21-30			5,900	7,850	10,750	15,650	25,400
36-50	31-40	3,150	4,050	5,350	7,200	9,950	14,550	23,800
36-50	41-50	2,650	3,450	4,700	6,400	8,950	13,250	21,800
36-50	51-60		2,800	3,950	5,500	7,800	11,600	18,900

α is the angle formed between the lashing strap and the supporting area.
 β is the angle formed between the lashing strap, if it would lay on the supporting area (angle $\alpha = 0$), and the driving direction.

How can I use the table?

Method 1:

- Determine the dynamic friction factor – for reference values, please see below
- Please verify with help of the table if the load can be secured safely with the chosen lashing strap and the determined friction factor (if not, please choose a different lashing strap or increase the friction, e.g. with anti-slide mats)
- Please verify if the lashing strap can be attached correctly using the specified angles. Use only those angles where the tabular value “load that can be secured using 4 straps” is higher than the real load

Example:

Lashing mean = lashing strap ZG ERGO DZ 100; load = steel part, 5,000 kg, loading area = steel

The dynamic friction factor is 0.2. As shown in the table, there are more angles which can be used for securing a 5,000 kg load with a ZG ERGO DZ 100 lashing strap and the mentioned dynamic friction factor. Please check now if the four lashing straps can be attached with these angles. Attention: As shown in the table, ZG ERGO DZ 100 is not enough to secure the load if the dynamic friction factor is lower. Please make sure that the load and the loading area are clean on the contact surface and that dirt does not reduce the friction factor.

Method 2:

- Determine the dynamic friction factor – for reference values, please see below
- Determine at which angles the load can be safely secured on the carrier
- Check with help of the table if the load can be safely secured with the determined dynamic friction factor and angles. If this is not the case, please choose a stronger lashing strap

Example:

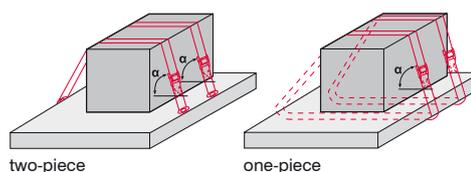
Lashing mean = lashing strap ZG ERGO DZ 100; Load = steel part, 5,000 kg; loading area = steel; two lashing points with possible angles: Lashing point 1: $\alpha = 31^\circ$, $\beta = 56^\circ$; lashing point 2: $\alpha = 21^\circ$, $\beta = 45^\circ$.

The dynamic friction factor is 0.2. At the angles from lashing point 1, the maximum loading weight with factor 0.2 is 4,350 daN. This lashing point is, therefore, not allowed to be used with ZG ERGO DZ 100 lashing straps. At lashing point 2, the max. loading weight is 5,300 daN. This lashing point can be

used. Attention: Please make sure that the lashing capacity of the lashing point is high enough!

Explanation of pewag tables Friction lashing

- This table provides information on how to use pewag textile lashing straps in an optimal way
- It also provides the maximum load which can be secured with one lashing strap and the specified angles and dynamic friction factors. Please note that for friction lashing methods, a minimum of 2 lashing systems are needed. Additional securing methods (e.g. wedges) have not been taken into account. These could be used to secure loads with even higher weights. In such cases, please contact our customer service
- The values in the table are applicable in the event that the tension force (STF) in the lashing strap is not the same on both sides of the load due to edge loading. If this can be guaranteed (e.g. using a pretensioning gauge), the values in the table may be increased by a factor of 1.3
- The maximum loading weight depends on the STF value of the tensioning system – the value is shown on the lashing system’s label. Each lashing tensioning system has its own table
- The maximum forces occurring due to acceleration, braking and avoidance maneuvers in road traffic according to EN 12195-1 were taken into account. Other tables are applicable for rail and sea transport. In such cases, please contact our customer service



ZG ERGO DZ 100 (STF = 500 daN), method friction lashing:

Angle	Dynamic friction factor					
	0.1	0.2	0.3	0.4	0.5	0.6
α [°]	Load that can be secured with 1 strap [daN ~ kg]					
90	100	250	450	750	1,250	2,250
85	100	240	440	740	1,240	2,240
80	100	240	440	730	1,230	2,210
70	100	230	420	700	1,170	2,110
60	90	210	380	640	1,080	1,940
50	80	190	340	570	950	1,720
40	60	160	280	480	800	1,440
30	50	120	220	370	620	1,120

α is the angle formed between the lashing trap and the supporting area

How can I use the table?

- Determine the dynamic friction factor – for reference values, please see below

- Please determine at which angle, α , the load can be safely secured on the carrier – the bigger the better
- For the given values (dynamic friction factor, angle), determine with help of the table the maximum loading weight that can be safely secured by a lashing strap. If the determined angle cannot be found in the table, please choose the next smallest one
- Determine how much bigger the real load in comparison with the tabular value is. This value, rounded up, constitutes the minimum number of lashing straps to be used. Please note that for friction lashing processes at least 2 lashing straps have to be used

Example:

Lashing strap = ZG ERGO DZ 100 (STF = 500 daN); load = 5,000 kg; dynamic friction factor = 0.4; the provided lashing points formed an angle $\alpha = 85^\circ$:

As seen in the table, at $\alpha = 85^\circ$ and with a dynamic friction factor of 0.4 - 740 kg can be secured with each lashing strap. I.e. for 5,000 kg ($5,000/740 = 6.8$) 7 lashing straps are needed. From this example, it can be seen that especially heavy loads should not be secured by friction lashing, since many lashing straps are required.

pewag Laser-protractor

The evaluation of the angles α and β is vital for the planning of the lashing system. With the pewag LashMate laser-protractor it's possible to determine the angles before the lashing straps are attached to the load.

The built-in laser beam simulates the connection between the load and the lashing point, the angle can now be easily seen on the scale of the protractor.

Tables with lashing capacities for all pewag lashing straps are integrated to determine the right amount and type of lashing straps.

Dynamic friction factors of some usual goods

Combination of materials on the contact surface	Friction factor μ_D
Sawn wood	
Sawn wood against fabric base laminate / plywood	0.35
Sawn wood against grooved aluminium	0.30
Sawn wood against steel sheets	0.30
Sawn wood against shrinkage foils	0.20
Crimped foils	
Shrinkage foils against fabric base laminate / plywood	0.30
Shrinkage foils against grooved aluminium	0.30
Shrinkage foils against grooved aluminium steel sheets	0.30
Shrinkage foils against shrinkage foils	0.30
Cardboard boxes	
Cardboard box against cardboard box	0.35
Cardboard box against wood pallet	0.35
Large bags	
Large bags against wood pallet	0.30
Steel and metal sheets	
Oiled metal sheets against oiled metal sheets	0.10
Flat steel bars against sawn wood	0.35
Unpainted rough steel sheets against sawn wood	0.35
Painted rough steel sheets against sawn wood	0.35
Unpainted rough steel sheets against unpainted rough steel sheets	0.30
Painted rough steel sheets against painted rough steel sheets	0.20
Painted steel barrel against painted steel barrel	0.15
Concrete	
Wall on wall without intermediate layer (concrete / concrete)	0.50
Finished part with wooden intermediate layer on wood (concrete / wood / wood)	0.40
Ceiling on ceiling without intermediate layer (concrete / lattice girder)	0.60
Steel frame with wooden intermediate layer (steel / wood)	0.40
Ceiling on steel frame with wooden intermediate layer (concrete / wood / steel)	0.45
Pallets	
Resin bonded plywood, smooth – Europallet (wood)	0.20
Resin bonded plywood, smooth – box pallet (steel)	0.25
Resin bonded plywood, smooth – plastic pallet (PP)	0.20



Combination of materials in the contact surface	Friction factor μ_D
Pallets	
Resin bonded plywood, smooth – wooden pressboard pallets	0.15
Resin bonded plywood, sieve structure – Europallet (wood)	0.25
Resin bonded plywood, sieve structure – box pallet (steel)	0.25
Resin bonded plywood, sieve structure – plastic pallet (PP)	0.25
Resin bonded plywood, sieve structure – wooden pressboard pallets	0.20
Aluminium beams in the load-carrying platform (punched bars) – Europallet (wood)	0.25
Aluminium beams in the load-carrying platform (punched bars) – box pallet (steel)	0.35
Aluminium beams in the load-carrying platform (punched bars) – plastic pallet (PP)	0.25
Aluminium beams in the load-carrying platform (punched bars) – wooden pressboard pallets	0.20

- Friction coefficients according to the standard EN 12195-1, values are valid for clean surfaces under optimal conditions
- Warning: dirty, wet or icy surfaces reduce friction factors. Please consider that this can also happen during the transport depending on the season
- Please choose only those values which you can really guarantee. In case of doubt, choose the lower value – it is your own safety

User manual

This user manual provides information about the use, storage, inspection and maintenance of pewag textile webbing slings and round slings.

Conditions of use

pewag webbing slings and round slings are designed only for slinging and lifting loads according to the pertinent, European and national norms with exception of the limitations of use specified below. This product must only be used by qualified, competent personal in accordance with the European standard EN 1492, Part 1, Annex D or Part 2, Annex C, as well as with national regulations. Reading and understanding the operating manual is a precondition for putting this product into service.

Limitations on use

Due to adverse environmental influences or hazardous conditions

- Use with chemicals: the use with alkalis is not permitted (leaches). In case of suspicion of high concentrations of acids or alkalis (even in form of vapors), take the product out of service. In case of doubt, please contact the manufacturer, also for cleaning processes. Metal fitting elements must not be subjected to acid influences
- Permitted operating temperature: -40 °C up to +100 °C. Do not use humid webbing slings/round slings at low temperatures if there is danger of freezing
- When using round slings/webbing slings for lifting loads with sharp edges or rough surfaces, please consider sufficient protection (edge protection corners when edge radius < webbing sling/round sling width; protective sleeves for rough surfaces)
- Avoid exposure to ultraviolet light and direct sunlight during use and storage

Before the first use

- Check that the delivered webbing sling/round sling corresponds to the ordered product
- Check that the manufacturer's certificate is provided with the product
- Check that the information given by the marking and the working load limit coincide with the certificate
- Check that this operating manual is available to the user and was read and understood by the corresponding personnel

Before each use

Visual check: during the visual inspection, pay attention to visible signs of damage and marking. In the case of doubt or if one or more of the following criteria are met, take the webbing sling/round sling out of service.

- Worn and rubbed parts, especially if they are localised
- Cuts
- Broken seams
- Visible core or damaged sheath of the round sling
- Softened or brittle fibers
- Shiny appearance because of overheating or melting
- Deformed or damaged end fittings
- Illegible or missing label

Selection and use

- Determine the loading weight (mass) and centre of gravity. Choose the correct lashing points and type of sling
- The maximum working load limit (WLL) must not be exceeded. When using multi-leg slings, please use finished assemblies or contact the manufacturer for information about inclination angles and the working load limit of the entire assembly. When using pewag round slings/webbing slings under other circumstances than those described in Conditions of use (e.g. asymmetrical load distribution or choke hitch), a reduction of the WLL must be applied
- Round slings and webbing slings must be attached in a way so that the load is carried by the whole width of the textile sling (also on the crane hook). Pay special attention to crane hooks and sling parts: the angle formed with the loop of the sling must not exceed 20°. In case of doubt, do not use loop slings type B2 or too wide textile slings, use metal end fittings instead
- Use adequate lifting points with sufficient strength. Webbing slings/round slings must not be knotted, twisted or extended by means of a choke hitch. The opening angle of the end loop must not exceed 20°. Use only approved lifting techniques and take the max. WLL specified on the label into consideration, e.g. when using a choke hitch
- Seams and labels must be positioned on the straight part of the sling, never on the supporting area. Protect sensible loads against rubbing or pressure by using webbing slings/round slings. Do not pull loads with webbing slings and round slings over the ground or rough surfaces
- Ensure that the load is secured against falling down, sliding or tilting. Attach the webbing sling/round sling in a way so that the center of gravitation lays direct below the center of the hook bow
- Round slings/webbing slings must not be twisted or knotted
- Avoid shock loading
- Workers must abandon the danger zone during the lifting process. Hands and other parts of the body must be kept away to prevent injury as the slack webbing sling/round sling is taken up. The preparation and management of the lifting process, as well as safety work systems must be according to ISO 12480-1. The load must be raised slightly. In the cases where the load begins to tilt, set down the load, remove the fault and perform a new lifting test. Avoid rotation or collision with other objects

- Protect delicate loads against pressure by the webbing slings/round slings. Pay special attention to the acting forces when using a choke hitch
- The load must be set down carefully; it must not be set down directly on the webbing sling/round sling
- Do not pull out webbing slings/round slings under the load with the load lying on them
- Webbing slings/round slings must be stored clean, dry, correctly aired, far away from heat sources and in racks. Avoid contact with chemicals, flue gases, corroded surfaces, direct sun light and sources of ultraviolet light (also when stored). Do not store damaged webbing/round slings. After being in contact with acids and alkalis, neutralise them with water or other adequate means before storage. Hang wet webbing/round slings to dry down

Inspections and repair

- The webbing sling / round sling must be put out of service if one or more of the criteria described in the section “before each use” are met. In case of doubt, discard the sling. Inspections must be carried out by a competent person. The period between the inspections has to be defined by an expert under consideration of the conditions of use. However, an inspection must be done at least once a year
- Records of inspections and inspection protocols must be retained during the entire service life of the webbing sling/round sling
- In no case must webbing slings/round slings be repaired by the user