



Instructions for use and maintenance, part 1

(Translation of the original German instructions for use and maintenance, AWA)

All Lifting Accessories (part 1)



Machinery directive 2006/42/EC
§ 1.d and .e, annex I, art. 1.7, 1.7.4, 1.7.4.2, 4

EASA CS-27./29.865 / ED Decision 2014/018/R, AMC/GM to Part-SPO – Amendment 9, AMC1 SPO.SPEC.HESLO.100

as well as all lifting accessories, slings and their components, load securing devices and anchor points which are not in conformity with machinery directive 2006/42/EC or EASA CS-27./29.865 (used with/on Annex I helicopters/MIL)

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	Index	Definitions	Maintenance: steel	Maintenance: textiles	Use of the specific product

Revision E – what is new or has been modified? Watch this symbol:

All «EG» or «EU» indications in front of «Machinery Directive» have been removed



Please make sure you have the latest version of these instructions AWA. Check www.air-work.swiss, Documents for the latest updated version.

This AWA provides the basis for the instruction of marshallers, pilots, technicians and all other personnel working for helicopter companies.

This AWA is divided in 4 parts and describes AirWork & Heliseilerei GmbH (A&H) products as well as their correct use and maintenance (MRO). All 4 parts of the AWA must be read, understood and instructed.



AirWork & Heliseilerei GmbH products are destined exclusively for professional use. Adequate user training is compulsory.

Only reading this AWA does not replace adequate training or instructions by qualified persons.

Before using AirWork & Heliseilerei GmbH products, the specific applications (AWA, part 4) and the maintenance procedures (AWA, parts 2 and 3) related to these products must be instructed.



AirWork & Heliseilerei GmbH products are designed and constructed exclusively for external cargo transport by helicopter. Any other use deviating from the correct use in conformity with AWA parts 1 and 4 constitutes a misuse and leads to the immediate disclaiming of any responsibility by the producer.

No kind of instructions for use and maintenance, including this AWA, can ever be complete or exhaustive. In case of any doubts please contact the producer.

1. Definitions: judicial aspects to consider

1.1 User training *Part-SPO, AMC1 SPO.SPEC.HESLO.100(e) Task specialists, Marshaller Syllabus (FH_SY, FOCA 1996)*

Employers must ensure that adequate instruction regarding all 4 parts of this AWA is carried out by a qualified person or the producer. Such in-depth training must take place prior to the first use of the product or whenever necessary, especially in the case of particular conditions (such as the modification or amplification of the product's intended use, after occurrences, etc.).

- Part 1 Definitions all users, personnel responsible for maintenance, qualified persons
- Part 2 Maintenance: steel personnel responsible for maintenance, qualified persons
- Part 3 Maintenance: textiles personnel responsible for maintenance, qualified persons
- Part 4 Use all users



Personnel assigned to using this device must have adequate instruction and training prior to its first use. During the introduction to its use and subsequent in-depth training, particular stress should be placed on gaining a good knowledge of the present instructions for its use and maintenance.

Training has to be repeated at least once a year and proof of this must be demonstrable. Please abide by relevant national specifications for all EU member states (Germany: BGV A1; Switzerland: VUV/OPA/OPI; Austria: ArbVO) or other states bound by contract (Switzerland, Liechtenstein etc.).

Please document the type, amount and the date of training in an appropriate way.

For such training and the necessary training check we recommend the Marshaller-Syllabus issued by the Federal Office of Civil Aviation (FOCA, Marshaller-Syllabus, 1996; order: <http://www.bazl.admin.ch>, portal for specialists/air transport/operation/helicopter companies/Marshaller-Syllabus)



In the case of lending, demonstration, display, sale, discount trading or user training, all 4 parts of these instructions for use and maintenance (AWA) must be enclosed/present.



Only the producer can instruct people to the degree of "qualified persons". Ask A&H Engineering about training offers, especially when purchasing work equipment.



Expert knowledge does neither include the repair of work equipment nor the assessment of their efficiency after expiry.

1.2 Conditions for product use

The products described in these AWA instructions have been manufactured in compliance with EC council directive 2006/42/EC. These instructions (AWA), parts 1 – 4, in accordance with machinery directive 2006/42/EC, annex I, section 1.7.4.1 and 1.7.4.2, as well as the EC declaration of conformity, in accordance with annex II of the same directive, are an integral part of these products.



In absence of valid instructions for use and maintenance (AWA) or without adequate training prior to use of the product, the latter cannot be considered safe.

1.3 Definition of lifting accessories (LA) (EC machinery directive 2006/42/EC)

* "Lifting accessory": "a component or equipment not attached to the lifting machinery, allowing the load to be held, which is placed between the machinery and the load or on the load itself, or which is intended to constitute an integral part of the load and which is independently placed on the market; slings and their components are also regarded as lifting accessories;" * (art. 2d)

:: *Lifting equipment: winch, crane trolley, chain hoist, crane; in the broader sense also helicopter¹. [...]*

:: *Lifting accessories (LA): shock absorbers, ropes (short or long lines), nets, buckets, platforms, vehicle hoists, IBC, FIBC; equipped with hook and connecting links, oval rings.*

:: *Secondary cargo hooks and low-torque swivels (electric or manual) belong to the category of "load suspending devices/suspension elements" and, as in DIN 15 002, will be listed jointly with the lifting accessories.*

:: *Slings equipment, or simply "slings" (SL), are devices developed for the lifting of loads. They can either be coiled directly around the cargo or attached to an eye or a support bar. Examples: round slings, round steel chains, shackles, joker hooks, lifting straps, wire rope chokers with or without hooks and connecting links.*

* "Chains, ropes and webbing": chains, ropes and webbing designed and constructed for lifting purposes as part of lifting machinery or lifting accessories;" * (art. 2e)

:: *This article applies only if the chain, rope or strap is an in-built part of a machine, e.g. the steel rope of a winch.*

The descriptions of lifting accessories given in EC machinery directive 2006/42/EC, art. 1.d) and annex I, art. 4, are also precisely defined in DIN 15 002 and 15 003 on "load suspending devices". These DIN standards also provide the basis for the definitions contained in the Marshaller Syllabus (FOCA, 1996), as well as for the technical documents and instructions for use and maintenance issued by A&H EQU.

PS: "flight operations equipment" is commonly used as a synonym for lifting accessories.



Regarding product safety, the development and the manufacturing of work equipment, the national laws of the EU member states (including Switzerland) are harmonised on the basis of bilateral contracts and EC directives.

1.3.a Lifting accessories excluded from Machinery Directive 2006/42/EC

In accordance with the list issued in December 2009 by the "Machinery Working Group", set up by the Machinery Committee of the European Commission, the following work equipment is excluded from the scope of Machinery Directive 2006/42/EC:

- Cargo/lift nets	no applicable standard
- FIBC, class 6 (Reusable big bag)	EN ISO 21989:2005-12
- FIBC, class 5 (Single use big bag)	EN ISO 21989:2005-12
- Concrete buckets (unless they are powered)	no applicable standard
- Debris buckets und containers	no applicable standard

The introduction of the document states as follows:

Quotation: "This classification was approved by the Machinery Working Group as a basis for a consistent application of the term 'lifting accessory' as defined in Article 2 (d) of the Machinery Directive 2006/42/EC. The document gives examples of equipment that are considered as lifting accessories and other examples of equipment used for lifting loads that are not considered as lifting accessories." End of quotation.

As a result, such equipment is not allowed to bear a CE marking and not subject to any harmonised laws and must therefore be manufactured in accordance with national regulations and standards.

CH: SR 930.11 Swiss law on product safety (PrSG), Swiss ordinance on product safety SR 930.111

DE: German Product Safety Act (ProdSG), 9th Regulation pertaining to the ProdSG

1.3.b Slings equipment labelled with CE-marking, but not subject to Machinery Directive 2006/42/EC

Disposable lifting straps made of polyester (PES), polyamide (PA) or polypropylene (PP), recognizable by an orange-red label, fall under the category of slinging equipment in conformity with DIN standard 60005 (DIN = German Industrial Standard). A harmonized EU standard does not exist; nevertheless, these disposable lifting straps are allowed to carry the CE-marking.

- Disposable lifting straps	DIN 60005
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Comment by A&H Expert

Disposable lifting straps DIN 60005 are simple, extremely cheap slinging equipment destined for single use only. Such straps are made of cheap, unprotected one-layer fabric, frequently of the worst quality. This is why A&H Expert considers disposable lifting straps unsuitable for slinging purposes.

Notwithstanding the CE-marking, disposable lifting straps are contrary to any acknowledged rule of technology. Their limited safety characteristics (safety factor 5, no protection, simple and cheap) are diametrically opposed to the policy of helicopter transport requiring enhanced safety.

Even on common building sites, the use of disposable straps for lifting simple cargo crosses the threshold of unacceptability. Their employment for lifting loads by helicopter must be considered wantonly negligent.

Practical experience clearly shows that these lifting straps frequently are not only used more than once, but are also often employed in an incorrect and abusive way. Usually, helicopter companies encounter such straps when reaching job sites, as they are often already slung to the cargo by the client's workers. The moment helicopter companies accept disposable lifting straps as slinging points, all risks and liability devolves upon them.

A&H Expert strongly discourages the use of disposable lifting straps. For possible risks, misuse and prohibitions, see points 1.12, 1.13, 5.6 as well as AWA part 3, A6. 

¹ :: Additional or specific information regarding helicopter operations, added by A&H Engineering, are indicated by :: and written in blue colour and italicised. Legislative texts (copies of the original texts) are indicated by *text*.



We gladly assist you in finding workable solutions.

1.4 Classification of LA (in accordance with the EC directives on product safety, work equipment and machinery)

Products > subcategory: work equipment > subcategories according to EC directive 2009/104/EC on work equipment, art. 2: "any machine (lifting accessories, as well as chains, webbings, etc.), apparatus, tool or installation used at work".

Term	Subcategory	Subcategory	EU law	CH law	EKAS	others
Product	Work equipment		2001/95/EC	PrSG, PrSV		
			2009/104/EC	UVG, VUV	6512	Suva 67017
		Machinery	2006/42/EC	PrSG, MaschV	6512	DGUV I 214-911
		Personal Protective Equipment	EU-Regulation 2015/425 on PPE	PSAV	65122	
		Tools, etc.				

EC law

As stated in EU Council Directive 2001/95/EC, art. 2,

a) "product" shall mean any product — including in the context of providing a service — which is intended for consumers or likely, under reasonably foreseeable conditions, to be used by consumers even if not intended for them, and is supplied or made available, whether for consideration or not, in the course of a commercial activity, and whether new, used or reconditioned.

As stated in EU Council Directive 2009/104/EC, art. 2

a) 'work equipment' refers to 'any machine, apparatus, tool or installation used at work';

and in art. 4

(2) The employer shall take the measures necessary to ensure that, throughout its working life, work equipment is kept, by means of adequate maintenance, at such a level that it complies with point (a) or (b) of paragraph 1 as applicable.

CH law

Swiss ordinance on accident prevention (VUV/OPA) art. 32.b

¹ Work equipment must undergo adequate maintenance in accordance with the producers' instructions. Such maintenance must take into account both purpose and site of the operation to be performed. All maintenance procedures must be documented.

1.5 Part-SPO²

EU regulation 2014/018/R, Annex VIII (Part-SPO), "Acceptable Means of Compliance (AMC) and Guidance Material (GM)" categorises and defines lifting accessories as follows:

EU law	Annex	AMC/GM	Subpart	Section	Subsection	Title
2014/018/R ³	Annex VIII (Part-SPO)	AMC / GM to Annex VIII	Subpart E – Specific requirements	1 HESLO	AMC1 SPO.SPEC.HESLO.100	Standard operating procedures

AMC1 SPO.SPEC.HESLO.100

(b) Nature and complexity	* (1) Nature of the activity and exposure: Helicopter flights for the purpose of transporting external loads by different means, e.g. under slung, external pods or racks. These operations are usually performed at low height.
	(2) Complexity of the activity: The complexity of the activity varies with the size and the shape of the load, the length of the rope and characteristics of the pick-up and drop-off zones, the time per load cycle, etc.
(c) Equipment	Table 1: HESLO types
	HESLO 1 Short line, 20 m or less
	HESLO 2 Long line, more than 20 m
	HESLO 3 Specialised sling load, such as Logging, insulators and pullers, traverse mounting, spinning of fibre cable, ice and snow removal from power lines, sawing, geophysical surveys, cable laying onto the ground or into ditches, avalanche control, landside control
HESLO 4 Advanced sling load such as tower erecting, wire stringing, disassembly of masts and towers	
(3) All additional equipment used, e.g. ropes, cables, mechanical hooks, swivel hooks, nets, buckets, chainsaws, baskets, containers, should be manufactured according to applicable rules or recognised standards. The operator should be responsible for maintaining the serviceability of this equipment.*	

Applicable regulations are: Machinery Directive 2006/42/EC and the related national laws (CH: Swiss law on product safety n. SR 930.11, Swiss council ordinance n. SR 819.14 regarding machinery safety) or EASA CS-27 and CS-29.

1.6 Wording

Term	EN	DE	FR	IT
AMC:	Acceptable Means of Compliance	Zulässige Nachweisverfahren	Moyens acceptables de conformité	Metodi accettabili di rispondenza
GM:	Guidance Material	Leitfaden	Documents d'orientation	Materiale guida
HESLO:	Helicopter external sling load operation	Helikoptereinsätze mit angeschlagenen Aussenlasten	Opérations de chargement externe en hélicoptère	Operazioni con elicotteri con carichi esterni sospesi
SOP:	Standard operation procedures	Standardverfahren	Procédures d'exploitation standard	Procedure operative standard

1.7 Groups of lifting accessories and slinging equipment

The EC machinery directive 2006/42/EC distinguishes 3 groups, dependent on the material they are made of and their type of design (annex I, section 4.1.2.5).

1. Metallic components: chains, hooks, swivel devices, rings, connecting links, shackles, etc. as parts of lifting accessories or slinging equipment. If used for lifting operations, these components must be of class 8 quality or higher.
2. Steel ropes:
 - a. used as lifting accessories: low-torque rope constructions (crane ropes)
 - b. used as slinging equipment: laid ropes, except for lengths of over 5 m, in this case 2.a would apply.
3. Textile ropes:
 - a. used as lifting accessories: low-torque rope constructions (braided, laid)

² Published at: <https://www.easa.europa.eu/document-library/agency-decisions/ed-decision-2017012r>. Legislative texts (copies of the original texts) are indicated by *text*.

³ Modified by ED Decision 2017/012/R, AMC/GM to Part-SPO - Amendment 9. The mixing of logging operations with other types of applications is problematic since there is the risk that the special requirements for logging are neglected.

- b. used as slinging equipment: woven (lifting straps) or laid (round slings), etc.

1.8 Standardisation of lifting accessories and slinging equipment

The EC Machinery directive 2006/42/EC makes a distinction between standardised and non-standardised components. Harmonised EN standards are referred to as "non-binding technical specifications". (*Mach. dir. 2006/42/EC, art. 21*)

Only lifting straps in accordance with EN 1492-1 and round slings in accordance with EN 1492-2 feature a uniform codification (material, tag, colour, bar code, text on label), the same applies to the so-called "joker hook" (colour codification conforms to lifting straps/round slings). In all other components, neither the colour nor the size allow any judgement regarding their presumed WLL or quality class.



A&H Engineering refers to the EASA "Certification Specifications", Part 27. or 29. (EASA CS-27./29.), E☒ the DGV Information 214-911 (best practice)☒ and to the Marshaller Syllabus as best available technology, as well as to the relevant EN and DIN standards.

1.9 Suitability and correct use of work equipment (*2009/104/EC art. 8 and 9, Swiss PrSG art. 3.4, Swiss VUV art. 32.a*)

The suitability and the correct use of work equipment depend on its designated use.

Often, the deployment of **lifting accessories for the transport of cargo by helicopter** requires specific provisions (e.g. calculations, choice of materials). Sometimes, the choice of equipment and its range of applications may be limited (e.g. angle of inclination < 45°, temperatures allowed).



The correct use is described in part 4: "Use". The producer's specifications must be observed.

1.10 Configurations allowed

If used according to the regulations, all components by A&H are designed to withstand the indicated maximum load (WLL) even in the worst case scenario (worst case: all of the calculated weight factors appear at the same time). In particular, A&H product designs take into account the fact that load peaks during flight operations can be higher than has been assumed by the acknowledged rules of technology (EN, DIN, CS-27./29.865 and other). Moreover, A&H considers the fact that the ageing process of materials differs depending on their material properties, usage and loading (life time).

For a diagram on load peaks see chapter "Construction-related definitions; Operational limits"



The calculations may vary according to the user's needs and assignment type. Specific calculations can be found in the documents issued by the producer. In any case, the WLL indicated on the label must be respected.

1.11 Definition of misuse

Definition by law (CH): Federal law on safety of products (PrSG, SR 930.11, art. 3); Ordinance on safety of machines (MaschV SR 819.14, Art. 2.a); Machinery directive (2006/42/EC, Preamble (12) and annex I, General Principles):

PrSG: *¹ Products must only be placed on the market, if their **normal or reasonably foreseeable use** does not or only slightly put at risk the safety and health of their users or of third parties.

MD, Preamble (12): * The putting into service of machinery within the meaning of this Directive can relate only to the use of the machinery itself for its **intended purpose or for a purpose which can reasonably be foreseen [...]***

MD., Annex I, 1: * The manufacturer of machinery or his authorised representative must ensure that a risk assessment is carried out in order to determine the health and safety requirements which apply to the machinery. The machinery must then be designed and constructed taking into account the results of the risk assessment.

By the iterative process of risk assessment and risk reduction referred to above, the manufacturer or his authorised representative shall

- determine the limits of the machinery, which include **the intended use and any reasonably foreseeable misuse thereof**;
- identify the hazards that can be generated by the machinery and the associated hazardous situations;
- estimate the risks, taking into account the severity of the possible injury or damage to health and the probability of its occurrence;
- evaluate the risks, with a view to determining whether risk reduction is required, in accordance with the objective of this Directive;*



These rules apply to any producer as well as to any in-house production by the users.

1.12 Normal, reasonable, correct, foreseeable use/incorrect use/misuse

It is **normal** that lifting accessories and slings, as well as any other product made by AirWork & Heliseilerei GmbH (A&H), are used for external cargo transport by helicopter. The specific, correct use of a product is described in part 4 of the instructions for use and maintenance AWA (so-called normal operation mode or correct use).

Thus, it is **reasonably foreseeable** that lifting accessories and slings, as well as any other product made by A&H, are used for external cargo transport by helicopter.

The **correct use** implies the precise abidance by the designated use of a product, which is described in part 4 of the instructions AWA. Inversely, any other use represents an incorrect use/a misuse.

In our opinion, **incorrect uses** are not always reasonably foreseeable. Like any other production company, even with the best of risk analyses, A&H can neither predict what people's "creativity" might bring forth or what types of actions may be performed spontaneously or in the heat of the moment.

Instead of the term "incorrect use" A&H applies the terms "inappropriate use" or "**misuse**".

However long the list, no enumeration of "misuses" will ever be complete or exhaustive.



In our opinion, incorrect uses are not always reasonably foreseeable.

1.13 Practical consequences

The legal prescriptions oblige every producer to describe all kinds of "reasonably foreseeable inappropriate uses (misuses)", even when talking of supposedly self-evident actions such as "depositing the rope in front of the helicopter within the pilot's view field" or "not landing on the rope, avoiding contact with helicopter skids".

1.14 Misuse, other possible risks

The inappropriate uses of a product and other possible risks are listed in part 4 of the instructions AWA.



Any use of a product or its individual components that is not in conformity with the regulations is considered an inappropriate use (misuse) and can lead to evident or hidden damage and, therefore, compromise its safety characteristics. In the event of misuse, the producer disclaims all responsibility.

2. Limit states / limits of definition

Even minimal modifications to a well-proven product may have serious consequences on its functioning and thus on its safety characteristics. Moreover, other systems may be negatively influenced.

Example 1: Wire rope chokers made of a 6-strand right-laid steel rope, constitute well-proven slinging equipment. For logging purposes, they usually don't exceed 6 m in length. If such a steel rope, however, is extended to 15 m, endowed with a cargo hook and a low-torque swivel and put under traction, the rope will start to untwist. This may damage the rope and have negative consequences on the cargo hook system (kinematic energies). If used correctly, this type of application requires a low-torque rope construction.



Transitions between acceptable and unacceptable applications can be smooth; hence it is indispensable that producers and/or users perform thorough risk analyses (choice of a different product or change of procedure).

The basic principle that a product is not safe and must be withdrawn from service when its label is missing (see "prohibitions") can be countered by the fact that it is possible to tag products permanently!

Example 2: Due to the very primitive labelling of round slings and hoisting belts (simple plastic tags) it may happen that the tag is already missing after the first flight operation. From a purely legal point of view, these round slings/hoisting belts would now have to be withdrawn from service. Since these products, however, have standardised identifying features (3 features for the carrying capacity alone), the person in charge of material within the helicopter company can decide in favour of or against the further use of such products.



Advices for product repair see part 3, "Maintenance: textiles".



Before expanding the range of correct usage of a product, please contact the product's manufacturer.

2.1 Employment of components not distributed by A&H, but used in combination with A&H products.

The use of self-made components or of components which are manufactured by other producers and not placed on the market by A&H Equipment will result in the immediate loss of all claims for damages, replacement or any other responsibilities.

In the above-mentioned case, the users themselves are considered manufacturers and distributors and thus are subject to all legal consequences, such as responsibility, liability and compensation. (Mach. dir. 2006/42/EC, art. 2.i "Manufacturer").

2.2 General prohibitions

"Forbidden" is a disagreeable word but, as manufacturers, we have to dissociate ourselves from some practices. The following list derives from the acknowledged rules of technology (standards), negative experiences (accident reports) and basic principles of physics.

The enlisted prohibitions serve the unique purpose of guaranteeing safety and they apply to all products and all types of applications.

FORBIDDEN:

E&H Sym bol	Content, explanation	Reference AWA
	<p>... Covering, removal or modification of labels or other identification marks on all components.</p> <p>> A product and its specific characteristics must be recognizable by its label. If the label is missing or not legible the product cannot be considered safe.</p>	Part 2 and 3, A6
	<p>... Application of shrink hoses on textile components.</p> <p>> The heat development, especially the heat accumulation under the shrink hose, can lead to immediate, massive and often hidden damage of the textile components.</p>	Part 3, 4
	<p>... Employment of lifting accessories without the use of a low-torque swivel.</p> <p>> Rotating cargo can "kill" even a new rope within just one work cycle.</p>	Part 1, 3.1, 3.10
	<p>... Replacing accessories with products that are not certified or which are of a different quality class as was their condition upon delivery.</p> <p>> Within the same sizes, the differences in the WLL can amount up to 25%. Some so-called Far East merchandise on the market doesn't fulfil the required quality standards.</p>	Part 1, 1.8 Part 2, 9
	<p>... Mounting of accessories or bolts which are not certified.</p> <p>> If the screws connecting the low-torque swivel with the lifting hook, or their shaft are too short or if their quality class is not sufficient, the bolt may break or be deformed.</p>	Part 1, 3.6 Part 2, 6.1, A4
	<p>... Leaving of textile ropes on metallic or tarmac surfaces under the boiling sun.</p> <p>> Under the gleaming sun, bitumen and metal can easily develop temperatures of over 100°C; the temperature tolerances of most textile materials, however, are below 100°C.</p>	Part 1, 5.2.1 Part 3, 12 und 13.2
	<p>... Making knots, loops, formation of splices or other joints in the middle part of ropes, chains, lifting straps, round slings.</p> <p>> Knots, clamps, etc. inhibit the flow of forces and can reduce, partly even in an extreme manner, the carrying capacity or the breaking load of the devices. A simple knot may cause a reduction of up to - 50%. (Mach. dir. 2006/42/EC, annex I, art. 4.1.2.5.a) and c)</p>	Part 1, 5.2, 5.6 Part 3, 12, A6
	<p>... Attachment of loads by E&H tying any type of rope directly around the cargo.</p> <p>> Due to the ropes' material, the "tying" slinging technique and subsequent rigging to the safety hook is not possible and not intended, especially because in this case it wouldn't be possible to attach a low-torque swivel to the lower rope extremity.</p>	Part 1, 5.6
	<p>... Tying the single legs of multiple-leg slinging devices, such as 2-leg slings (TWLS), 3-leg slings (THLS), 4-leg slings (FLS).</p> <p>> Due to the slings' material, the "tying" slinging technique and rigging to the safety hook is not possible and not intended.</p>	Part 1, 5.6

<p>E...Using unsuitable slinging points, for example attachment of four-leg slings to IBC or to wood screws.</p> <p>> Most devices and auxiliary equipment or components are not designed and calculated for helicopter transport operations. The manufacturers of such devices decline all responsibility.</p>	Part 1, 5.6
<p>... Throwing or dropping lifting accessories (shock absorbers, transport ropes, multiple-leg slings, slinging equipment, lanyards, etc.) from a height of more than 2 m above the ground. Parts could be damaged and persons put at risk.</p> <p>> These actions would damage the accessories, ropes, thimbles in particular, as well as the outlets of steel ropes near to the pressings. Moreover, persons could be put at risk.</p>	Part 1, 5.3.3
<p>... E... Dropping of cargo</p> <p>> Dropping of cargo puts people at risk, destroys the cargo and damages lifting accessories and slinging equipment.</p>	Part 1, 5.3.3
<p>E... Lifting of loads exceeding the admissible payload (WLL)</p> <p>> Lifting of payloads exceeding the indicated maximum payload (WLL) is forbidden and instantly annuls all guarantee and claims of liability.</p>	Part 1, 1.8, 1.10, 6 AWA Part 4 (all)
<p>E... Dropping payloads together with the transport rope from the cabin, when the rope is attached to the primary cargo hook.</p> <p>> With a rope length of 20 m, the shock load provoked by the dropping of 50 kg of payload reaches peaks of 5.8 tons [sic] and may damage the cargo hook system, the helicopter structure and the lifting accessories!</p>	Part 1, 5.3.4
<p>... Dragging, lugging, pulling of loads over the ground (forest, open terrain, construction sites, etc.) by helicopter, as the forces acting on the rope (impacts, twitching, cracking, whipping) could damage the rope or the accessories attached to it.</p> <p>> Shock loads can generate forces which may exceed a rope's breaking load.</p>	Part 1, 5.3.5
<p>... Uncontrolled low-level flights in open terrain or uncontrolled depositing of heavy, and in particular of vertically transported loads (tree trunks, rods) when there is the risk of colliding with obstacles.</p> <p>> When a load is deposited without control on the ground, the shock load can generate forces which may exceed a rope's breaking load. Such impacts can also damage the helicopter.</p>	Part 1, 5.3.2
<p>E... Employment of ropes which are not suitable for the intended purpose, e.g. the use of TLDS⁺, TLDP, TL, TLE, TLM, TLME ropes for logging</p> <p>> Due to their design, construction, material properties, etc., these ropes are not designed to withstand the high load forces occurring during logging operations.</p>	Part 1, 4.2, 4.3, 5.3.2, AWA Leinen_T4
<p>E... Transport of persons directly attached to ropes or lifting accessories, such as load nets, concrete buckets, etc.</p> <p>> The helicopter transport of persons as external cargo falls under the special regulations for Human External Cargo (HEC). It is forbidden to transport persons attached to cranes or winches or generally external to helicopters.</p>	Part SPO
<p>E... Cleaning lifting accessories and/or lifting equipment with high pressure cleaners, regardless of whether they are made of steel or textiles</p> <p>> The high water pressure damages the yarns' structure and increases the risk of pressing dirt particles into the fabric /wire netting/ bearing structure.</p>	Part 2 und 3, 6.2
<p>E... Driving over load nets with pneumatic tyre vehicles or caterpillars</p> <p>> The combination of pressure and movement generated by running tyres destroys the nets' cords (press power, kneading, clamping).</p>	n/a
<p>E... Violent tearing apart of cargo into smaller parts (especially during logging operations)</p> <p>> The violent division of cargo (e.g. tree trunks/branches) creates enormous forces which might suddenly be released. Such «dynamic logging», where heavy pieces of wood are torn out of a piled-up cargo, can damage lifting accessories and slinging equipment. If the external cargo subsequently collides with or gets caught between obstacles, a helicopter crash might occur.</p>	Part 1, 5.3.5



In the above-mentioned cases, the carrying capacity of the working tools can be annulled and, therefore, prevent single components from functioning.



This list is incomplete. Therefore, avoid similar situations that deviate from appropriate use.



Pay careful attention to other **E**safety advice, unsuitabilities, limitations and prohibitions indicated, for example, in the instructions for use and maintenance of other products, in advertising brochures of round sling producers, **E**in DGUV information 214-911, pages 82, 96, as well as in the Marshaller Syllabus, pages 3.2.7-6 and 3.2.8.

2.3 Other possible risks

"Other possible risks" are those which might lead to dangerous situations and must therefore be avoided at all costs. In any case, the supervision of a task specialist (marshaller) or another qualified person on the ground is strictly required:

E Symbol	Content, explanation	AWA reference
	<p>Flying in loads without the help of a marshalling task specialist implies high risks. In the event of uncontrolled ground contact and resulting damages to the lifting accessories and the helicopter, the producer declines any responsibility.</p> <p>> Hard, uncontrolled impacts can generate forces which may exceed a rope's breaking load and cause damages to the helicopter structure.</p>	Part 1, 5.3.2
	<p>Rigging objects by tying a rope around them.</p> <p>> The entwining and contemporary lifting of objects causes damages due to frictional and torsional strain.</p>	n/a
	<p>Slings/ropes getting caught in rocks, walls, trees, etc.</p> <p>> Whenever a rope gets clamped, the part below the jamming point will be compressed while the above is torn. This may lead to sudden rope breakage.</p>	n/a
	<p>Wrong positioning of the accessories during the working phase.</p> <p>> Wrongly positioned accessories, such as a safety hook jammed into an eye which is too small, can be severely damaged due to the deviation of the force flow.</p>	Part 1, 5.6
	<p>Pressing and rubbing against cutting edges, sharp corners or other materials.</p> <p>> Both actions generate forces which can damage the slinging equipment mechanically or as a result of the development of heat.</p>	Part 1, 4.10
	<p>Contact with power lines.</p> <p>> Touching current can be lethal (induced and discharged voltage), components can get locally overheated and hence be damaged.</p>	n/a
	<p>Electrostatic discharges.</p> <p>> Usually, the current is within the milliampere range, but the potential also seems to depend on the helicopter's or its main rotor's size (surface). Getting</p>	n/a

in touch with the current can lead to perilous vegetative damages (heart fibrillations, joint pains, etc.)

Shock load forces exceeding the dynamic safety factor of 2.5 (CS 27.865, E☒DGUV 214-911, page 88 et seq.☒, Marshaller Syllabus, chapter 3.2.4 et seq.)

> Hard, uncontrolled impacts on the rope may be caused by the dropping of cargo attached to the rope, by sudden hoisting of a loose rope, by the breakage of loads (tree trunks) during their depositing on the ground, etc.

Part 1, 4.2, 4.3

Dysfunctional swivel joints, which do not rotate when a load is attached (without lubricant, with polluted lubricants, etc.).

> Dysfunctional swivel joints must be instantly repaired or replaced, as torsion can damage any type of rope within seconds.

Part 2, 6.2, A4

Depositing of ropes and landing of the helicopter on ropes; danger caused by rope nooses when the tail rotor draws near the rope; rope movement caused by down wash.

> Any rope can form nooses, but textile ropes in particular can be moved by the down wash effect, since the tail rotor gets quite close to the ground during landing.

Part 1, 5.2 and all AWA instructions, «End of operation procedure»

E☒ Disposable DIN 60'005 lifting straps

> Notwithstanding the CE-marking, disposable lifting straps are contrary to any acknowledged rule of technology. Even on common building sites, the use of disposable straps for lifting simple cargo crosses the threshold of unacceptability. Therefore, their employment for lifting loads by helicopter must be considered wantonly negligent. A&H strongly discourages the use of disposable lifting straps and, if used, declines all responsibility.

Part 1, 3.15☒

E☒ Newer generation of HMPE (Dyneema) round slings and lifting slings

> Notwithstanding their small cross-section, round slings and lifting slings made of Dyneema are able to carry high loads. For heavy duty transport operations, however, it is important to place the round and lifting slings between a suitable slinging point and the crane hook and employ them at straight lift (with or without angle of inclination) instead of tying them around the cargo. The use of choker hitches, which are the most common slinging technique for flying operations (almost 100%), is NOT recommended, since it creates deflections (around edges, at the tying point), friction, pressure and torsion; moreover, the slings' material has a low temperature tolerance.

Part 1, 3.15☒

E☒ Transport of cargo or pieces of cargo with the help of unsuitable lifting accessories or slinging equipment

> Round slings or other slinging equipment, when employed on smooth surfaces such as PVC pipes, or logging chokers, when employed on small wood with small diameters, but also load nets with a mesh width of 40, 60 or 100 mm, when charged with small parts, tubes, drilling rods, etc. are not suitable to safely carry loads or parts of cargo. Adequate countermeasures must be taken or auxiliary equipment used.

n/a☒

E☒ Skeleton containers charged with lightweight loads, such as pieces of wood, bags, plastic foil, metal sheets, empty jerrycans, etc.

> The incoming air flow can «blow» parts of the cargo out of the skeleton container

n/a☒



In the above-mentioned cases, the carrying capacity of the working tools can be annulled and, therefore, prevent single components from functioning.



This list is incomplete. Therefore, avoid similar situations that deviate from appropriate use.



Pay careful attention to other prohibitions indicated, for example, in the instructions for use and maintenance of other products, in advertising brochures of round sling producers, as well as in the Marshaller Syllabus, pages 3.2.7-6 und 3.2.8.

When adopting the "tying" slinging technique, only slinging equipment such as round slings, wire rope chokers, round steel chains and lifting straps must be used.

2.4 Residual risk

All types of lifting accessories (textile or steel) hold the residual risk of internal damage that cannot be seen from the outside. Hence, handling of such devices requires special attention, thoroughly trained maintenance personnel and task specialists on the ground.

2.5 Special operation modes

The term "special operation modes" implies all operations necessary to guarantee safe handling within the normal operation mode, in particular:

• Planning, construction	• Production
• Testing, function control	• Assembly, disassembly
• Transport, storage	• Lifting and depositing of rope (takeoff and landing)
• Preliminary procedures, repackaging (restoring)	• Installation and removal, connection with other components of a E☒ ShortLine☒ or LongLine
• Control, maintenance, repair	• Disposal

All of the above mentioned special operation modes influence the device's functioning during its correct use. All persons involved in special operation modes must undergo specific training (technical experts).



A&H Service offers an extensive testing service for all its in-house products.

2.6 The necessary inspection and maintenance (2009/104/EC, art. 4 and 5, Swiss VUV/OPI/OPA art. 32.b)

All work equipment must be regularly inspected, using suitable methods, throughout its entire operative life and its intended original conditions must be appropriately maintained.

Before and after every assignment, the single structural components must be checked visually to make sure they are working perfectly and that there is no damage. All work equipment must be properly maintained according to the producer's indications. The maintenance procedures must take into account the work equipment's intended use and the sites where it will be put into operation. The regular maintenance procedures must be documented.

After occurrences, such as accidents, natural phenomena, modifications of work equipment or longer periods of time in which it has not been used which might have compromised the safety of work equipment, extra inspections must be performed by qualified persons who are experts in the field.

Most commonly, national prescriptions request inspections performed by qualified persons at least once a year.



Work equipment must be inspected at least once every year by a qualified person.

3. Definitions: technical aspects

Here follow some definitions regarding technical, constructive and applicational aspects of lifting accessories and slinging equipment:

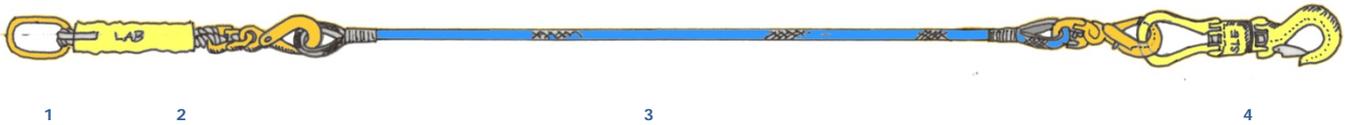
3.1 Lifting accessories (LA) for helicopters (Part-SPO, AMC1 SPO.SPEC.HESLO.100(c) (3); FH-SY 3.2.7-4)

Lifting accessories by A&H Equipment fulfil all the specific characteristics and requirements of helicopter operations.

Generally speaking, a complete lifting accessory consists of the following components:

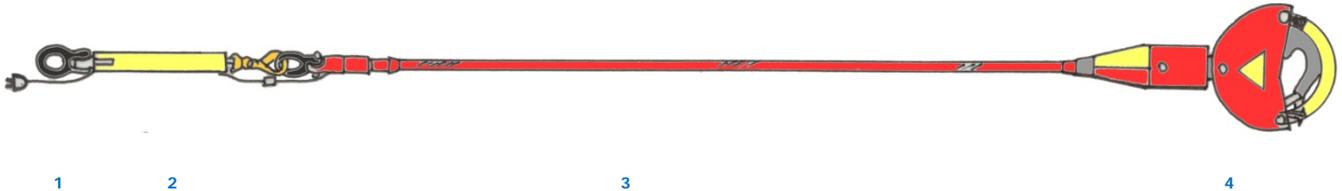
	Product	P/N at A&H	Category	Description
1	Accessories or special fittings for cargo hooks	AM	LA	Depending on the requirements indicated by the primary cargo hook producer.
2	Shock absorber	VM-DP	LA	A kind of big "spring" with 10–15% of elongation which protects rope and helicopter from impacts.
3	Transport rope	TLDS, TLL, TLP, etc.	LA	Rope, length from 5 to 100 m, payload from 200 kg to 12 tons, manual or electric.
4	Low-torque swivel with cargo hook	SLE	LA	Attached at the bottom, directly above the cargo hook. Protects the rope from torsion and acts as ballast.
5	Multiple-leg sling	ZGH, DGH, VGH	SL	Used for containers, mast components, equipment units and IBC with suitable slinging points.
6	Containers, sacks, baskets, nets	FIBC, LN	LA	Contain the payload, particularly suitable for piece goods and small parts (FIBC).
7	Sling	RS, HB, RSK, CS	SL	☒ Usually slung around the cargo by using the choker hitch technique, but sometimes also attached directly to the load (with the help of a shackle or a choker hook to create an extension). ☒

Lifting accessory with manual cargo hook release (example)



Lightweight TLDS transport rope, equipped with shock absorber (VM-DP) and load element model 1 (SLE1) with integrated low-torque swivel. Shock absorber with protective sheathing and AW-13 fitting (standard). Manual cargo hook release.

Lifting accessory with electric cargo hook release (example)



Heavy logging longline with monofilament protective sheathing, shock absorber (VM-DP) and cargo hook endowed with low-torque swivel. Both rope and shock absorber are equipped with AM_KAU_MIL, a special design fitting. Electric.

The descriptions below approximately follow the same order.

3.2 Accessories or special fittings for primary cargo hooks

The requirements of accessories for primary cargo hooks are quite simple: their size and quality must be sufficient (calculation), any unintended unscrewing or slipping out of the lifting hook must be excluded and they must not become wedged or get caught when the lifting hook is released.

Some helicopter or cargo hook producers enlist specific requirements (dimensions) which can be found in the Aircraft Flight Manual (AFM) or the corresponding supplement. Any issued alert telex must also be taken into consideration.

☒	Universal	BELL 429	H135-M	H145-MC1	H145-M	universal	universal	AS332/H225, KA 32	NH90	
PIC										
P/N	AM_KAU_x	AM_KAU_B429	AM_KAU_H135-M	AM_KAU_H145-MC(1)	AM_KAU_H145	AM_BW20	AM_AW13	EH-SL_14_TOP	AM_KAU_MIL	AM_KAU_NH90
WLL	0 - 50 kN	14 kN	14 kN	16 kN	16 kN	30 kN	20 kN	14 kN	50 kN	40 kN
HESLO	n/a	6 kN	8 kN	8 kN	8 kN	n/a	n/a	n/a	n/a	16 kN ☒
WLL HEC										



For further details, check data sheet DB Sonderbeschläge (Special design fittings).



A&H Equipment offers a wide range of special design fittings. Ask us for "special design fittings for primary cargo hooks", indicating model and part number of the primary cargo hook in question.

As a rule, primary cargo hook producers prohibit the rigging of textile loops and webbings and/or the simultaneous rigging of more than one accessory. A&H Equipment also adheres to this rule, as it is defined as a basic principle in both the DIN/EN standards and the Marshaller Syllabus.

3.3 Shock absorber

A shock absorber must be fit to cushion strong impacts which could damage not only the rope, but also parts of the helicopter cell or equipment. Furthermore, it has been empirically verified that the use of shock absorbers prolongs the life span of ropes.

While the employment of shock absorbers for logging operations is accepted procedure, at times it isn't used in daily transport flights. In the case of highly precise construction work assignments it might even make sense to operate without a shock absorber, since the load oscillations range between 3 and 5 cm.

A shock absorber should have an elongation of approximately 10 – 12% at a WLL of x 1.5.

"Shock absorber" for all types of cargo. HESLO 1, 2, 3 and 4 or HESLO 3 (Logging)	
PIC	
P/N	VM-DP_14_1.5, etc.



A&H Equipment explicitly recommends the use of a shock absorber. Also check Annex B, A&H-SB 2013-01

The use of load ropes not endowed with shock absorbers may lead to damages to the lifting accessory and/or to the helicopter.

3.4 Rope types

Whatever the choice of material (steel or textile ropes), it is compulsory for lifting operations to employ no-torque or low-torque rope constructions. Amongst steel ropes, the so-called crane ropes (internally left-laid and externally right-laid) or braided rope constructions fulfil this requirement. The lower extremity of every rope or of a chain of ropes must be equipped with a low-torque swivel. (*Laufende Drahtseile, Klaus Feyrer, exportVerlag, pages 104 and 105, Berner Fachhochschule Biel*)

Ropes employed for lifting operations must have a very low elongation (< 1 % under payload) and should be as round as possible (the profile of straps/belts is aerodynamically rather unsuitable).

Various rope models covering a wide range of applications (examples)	
PIC	
P/N	TLME, 76 kN load capacity, suitable for firefighting ropes ☒



Ropes by A&H Equipment fulfil all requirements for external load transports by helicopter.

Ropes with too high elongation and/or unsuitable air flow profile can provoke ungovernable oscillations of the rope, of the cargo and even of the helicopter, which might cause damages both to the rope and/or the helicopter. Moreover, the strong swinging of inappropriate ropes can cause impacts on the suspension system (jerking) or the ropes can start flapping and thus end up in the main and/or in the tail rotor.

3.5 Lengths of ropes and/or slings (FH-SY 3.2.7-3 (Part-SPO, AMC1 SPO.SPEC.HESLO.100, (b)(2)))

The rope length depends on the requirements of the flight operation (obstacle clearance) and on the working practices of the helicopter company (1 rope length for all applications or different rope lengths). Ropes up to 20 m are considered shortlines, ropes over 20 m longlines. It must be considered, however, that the overall length of a lifting accessory, consisting of a shock absorber, a 20 m long transport rope and a low-torque swivel/cargo hook will obviously exceed 20 m.

Part-SPO, AMC1 SPO.SPEC.HESLO.100

- HESLO 1 short line, 20 m or less
- HESLO 2 long line, more than 20 m

When working with multiple-leg slings, the length of the single legs depends on the dimensions of the biggest foreseeable load and on the general rule that the angle of inclination should never exceed 45°.

The length of the single ropes of multiple-leg slings has a direct influence on the handling of the cargo and its behaviour during flight.

Short sling legs, < 3 m	Long sling legs, > 4 m - < 6 m
Strong slanting of cargo, difficult to rule in flight	Slight slanting of cargo, easy to rule in flight



A&H Equipment provides a wide range of models in all lengths up to 100 m and weight classes up to 120 kN. Please check our offers!

3.6 Ratio between rope length and rope turn-up behaviour *(Berufsgenossenschaft für Verkehr und A&H Engineering, Hamburg 2006 and 2008)*

The risk of ropes flying up appears in the event of sudden breakages of unqualified connections (shackles) or slinging points on the cargo, as well as in the case of rope breakage due to a very strong impact (e.g. uncontrolled dashing of the cargo against obstacles or on the ground during flight).

The bounce height of a rope depends on its material and manufacture, as well as on the extent of the load factor (shock load).

When speaking in terms of absolute meters, the same triggering force (load factor) will cause ropes of different lengths to fly up nearly to the same extent but great differences can be observed in terms of the percentage of rope length. This means that short ropes will reach the 100% limit (i.e. the helicopter) much easier than long ones.

The various ropes put to the test, all featuring a length of 20 m, behaved very differently: steel ropes (TLS) and kernmantel ropes (TLK) produced similar values, but ropes made of polyamide and polypropylene proved totally unsuitable, since they bounced up in such an extreme manner as to exceed the 100% limit already far below the pre-established payload weight. The best result was achieved by A&H Equipment's TLL rope which touched the 100% limit only when applying 2.5-fold the pre-established payload.

Up to 2017 it was generally assumed that any considerations on load factors above 2.5 are superfluous, as all relevant standards exclude higher values. With the publication of DGVV information 214-911 "Sichere Einsätze von Hubschraubern bei der Luftarbeit" ("Safe operation of helicopters during aerial work") issued by the German Social Accident Insurance¹, an additional factor with regard to abrupt acceleration has been introduced. This additional factor equals 1.2 [-] for HESLO 1, 2, 3 and 4, and 1.4 [-] for HESLO 3 (Logging). This additional factor is based on the specifications described in EASA CS-27./29.865 and increases load factor 2.5 [-] (NHEC) to 3 [-] in the elastic or dynamic range for HESLO 1, 2, 3 and 4 and to 3.5 [-] for HESLO 3 (Logging).

It is therefore reasonable to fix the operational limit at a load factor of approximately 2.5 [-]. Also see "Operational limits" later in these instructions.

☞ For diagram „Rope turn-up behaviour“, see Annex A ☞



A&H Equipment provides a wide range of models in all lengths up to 100 m and weight classes up to 120 kN. Please check our offers!



Ropes by A&H Equipment fulfil all requirements for external load transports by helicopter.



The use of a shock absorber can have an influence on the height of bounce of ropes. For a detailed graphic see annex A

3.7 Extensions/lengthenings *(FH-SY 3.2.7-5)*

It is possible to extend transport ropes, multiple-leg slings and slinging equipment, but only when abiding by this basic rule: extensions must be made appropriately and only using certified connecting devices.

All rope types (LA) except TLL and TLP with cast end fitting	TLL, TLP with cast end fitting	Slinging equipment	
Rope extensions connected with thimbles and a safety hook self-securing	Extension piece (example) for cast rope end fittings cables exposed at the lower end	Shackle, joker hook must be secured	Connecting link, connex suitable for round slings self-securing

Also see "General prohibitions" earlier in these instructions AWA, as well as "Forbidden slinging techniques" following later on.

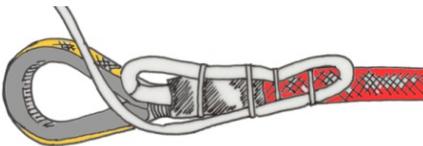


A&H Equipment offers a wider range of certified standard and/or special connections.

3.8 Rope end connections and their necessary dimensions

Rope ends can either be spliced and strengthened with NIRO thimbles or feature cast headpieces with drilled round washers. The drillings are custom-fit to ensure a safe connection with the electric low-torque swivel (VM-DG_14 or VM-DG_50), hence only the bolts of the swivel's protective casing (VM-GO_14 or VM-GO_50) or other qualified connection devices must be used.

Thimbles, especially the thimbles on steel ropes, must be sufficiently large to ensure that the attached safety hook can move freely without becoming wedged.

<p>☒ TLDS*, TLDP, TLM, TLME ☒</p>	<p>TLS, TLSS</p>	<p>☒ TLL, TLP, TLCE, TLME (electric) ☒</p>
		
<p>TLD, TLDS_14_x with thimble RW16, LHW-7/8</p>	<p>TLS, TLSS with special "Swiss Army thimble" RW11 (above)</p>	<p>Cast (on one or both rope end) with custom-fit bolt for connection to the swivel's protective casing (VM-GO), 16 or 26 mm</p>
<p>TLL, TLP ☒ TLCE, TLME ☒ (electric)</p> 	<p>Quick connection piece for all types of ropes < 20 kN, TLL, TLP, TLME, ☒ TLCE ☒ or similar models</p> 	
<p>Thimble on one or both rope ends, can be connected by means of a safety hook (like rope models TLD, etc.).</p>	<p>No more hooks, joints or protruding cables! EH-St_14 suitable for all electrically operated ropes.</p>	

<p>☒ LHW</p>	<p>OBK</p>	<p>BKD</p>	<p>HUB</p>
			
<p>LHW EN 1677 safety hook, grade 10</p>	<p>OBK EN 1677 safety hook, grade 8 or 10</p>	<p>BKD Offshore EN 1677 safety hook, grade 10 (from size 13 upward)</p>	<p>HUB safety hook, limited to a WLL of 1400 kg</p>
<p>Self-locking but might open in the event of impacts</p>	<p>Self-locking but might open in the event of impacts</p>	<p>In the event of involuntary opening, the aperture stays locked. Correct handling is of the utmost importance.</p>	<p>Involuntary opening impossible. ☒</p>

3.9 Ratio between rope weight and weight of lifting hook plus low-torque swivel

The transport rope should be much lighter than the lifting hook equipped with swivel device. A heavy lifting hook remains steady during flight and can thus be easily controlled by the pilot.



Cargo hooks which are too lightweight start "banging" during flight. This can lead to material fatigue at the rope pressing (steel rope) or to damages at the joints (connectors) or the electric connections.

It is also proved that banging movements of cargo hooks on steel ropes (strong oscillations) can lead to an opening of the safety hook and thus to an involuntary cargo hook release.



Best practice: the TLL and TLP transport and logging longlines made by A&H Equipment!

Comparison of long line behaviour (F+W, Emmen, 1991; adaptation by A&H ENG 2007; DGV I 214-911, 4.3.3 pages 35, 36)

grey: steel rope, red: textile rope

supposed WLL: 14 kN



ROTEX FE crane rope, 50 m, Ø 1 x 11 mm with conductor and protective hose of about 22 mm	Dyneema SK 75, 50 m, Ø 6 x 5 mm, with protective sheathing 18 mm (TLL_14_50)
Weight per meter without accessories: 0.486 kg	Weight per meter without accessories: 0.216 kg
Entire rope plus protective hose: ~ 34 kg	Entire rope, all included: 21 kg
Lifting hook TM-MC_601_Assy, low-torque swivel with protective casing: 24.4 kg	

Comparison	
Ratio lifting hook - rope: 0.7 - 1	Ratio lifting hook - rope: 1.13 - 1
Oscillation and flapping due to internal stress	Calm and smooth behaviour in flight



! Data collected in 1991. In the meantime, materials, manufacturing processes and the mass ratio between ropes and cargo hooks have undergone considerable change, hence the indications might not apply to all cases. In particular, the behaviour of ropes without payload attached strongly depends on a pilot's personal flying style.

3.10 Low-torque swivels

Suspended cargo can rotate (asymmetric cargo, approaching wind flow, torsion of cargo due to wind flow, surface profile of cargo, etc.). If the torsion force caused by the twisting of cargo is directly transmitted to the rope, it will be destroyed in a short time (torsion damage). (Laufende Drahtseile, Klaus Feyrer, exportVerlag, pages 104 and 105, Berner Fachhochschule Biel) EVDI 2358, 13.1.1, 13.2.2.1

Manual swivels, usable also as load elements (SLE), different models		Electric low-torque swivel, available sizes 14 kN and 50 kN	
SLE1	SLE2	VM-DG_14 VM-DG_20 or _50 (exemplified illustration)	EH-St_DG_14
flexible	individual	reliable and resistant	

There are exceptions to the rule, such as the transport of containers filled with fire extinguishing agents (for example "Bambi Buckets"). The producers of these containers often prohibit the employment of low-torque devices, because the swivelling movement would damage the electric and pneumatic supply conductors necessary for steering the bucket. It must be considered, however, that these containers, due to their round and symmetric shape, don't even tend to rotate.



Lifting accessories by A&H Equipment are only available with swivels.

3.11 Choice and correct size of the cargo hook

Manually operated cargo hooks (FH-SY 3.2.2-2, 3.2.2-5)

For safety reasons, A&H Equipment employs only and exclusively self-locking safety hooks for ropes (TLDS*, TLDP, VM-DP) and multiple-leg slings (TWLS, THLS, FLS). We furthermore recommend the use of an oversized hook endowed with a swivel element, which serves several purposes: it improves the geometry of the load lifting device, acts as a load element (SLE) or as a counterweight on an unloaded rope and allows the rigging of several slinging devices (up to 4 round slings) to the hook. Example: WLL 14 kN = nominal hook size 7/8; we recommend = size 13 or 16 (according to the requirements; maybe an additional weight is needed).

Electric cargo hooks with low-torque swivels

A&H Equipment distributes electric cargo hooks only for lack of an alternative and under the explicit reserve that these cargo hooks fail to meet the standards required by Council directive 2006/42/EC regarding machinery safety.

Electric low-torque swivel with up to 3 pins are available in the sizes 14 kN and 50 kN. They are proven components and almost maintenance-free.

3.12 Connection of electric low-torque swivels to remote cargo hooks

The remote cargo hook models available on the market are not designed to fit the electric low-torque swivels 14 kN and 50 kN, so maybe adjustments have to be made or the use of an adapter may be necessary.

The bolts provided for the connection with low-torque swivels often are not state-of-the-art. The same applies to "home-made" solutions devised within the flight company.

The following essential deficiencies have been ascertained over the years:

- bolt screws are too short (thread reaching only into the nut)
- shafts of bolt screws are too short (transition from shaft to thread is positioned in the area of the carrying zone)
- bolt screws' quality is insufficient (M16 8.8 is not enough for the generated load forces at WLL 14 kN)
- too much clearance between bolt screw and the drilling of the low-torque-swivel



Bolt screws of inadequate size or based on erroneous calculations represent a dangerous defect!

3.13 Electric power supply of the helicopter

In order to operate the secondary lifting hook via a shortline/longline with a low-torque swivel, sufficient power must be guaranteed. Generally, lifting hooks need from 10 to 15 ampere, exceptionally up to 24 ampere. Pay careful attention to the fact that the helicopter's on board power system is sufficiently protected and that it has sufficient power.

3.14 Loads allowed; usable limits

The working load limit (WLL) is only valid when the device is rigged using the "straight lift" slinging technique. If used according to the regulations, this device is designed to withstand the indicated maximum load (WLL) even in the worst case (Worst Case: all of the calculated load factors appear at the same time).



The calculation for lifting accessories may vary according to the user's needs and assignment type. Specific calculations can be found in the documents issued by the producer.



Like ropes, the shock absorbers must be adjusted depending on the intended use (size, safety margins).

3.15 Interfaces to other systems and/or components of a lifting accessory

E Please abide by the requirements of the cargo hook manufacturer and the specific helicopter flight manuals regarding geometry and configuration.



Particular risks: „dynamic rollover“, damage of the cargo hook structure, fitting becoming wedged during cargo hook release or in the event of the cargo hook getting caught, especially when the hook can be opened only 35° instead of 90°.

Interface between shock absorber and rope

The dimension of the fittings of the transport ropes must be chosen according to the dimension of the fitting on the shock absorber. Excessively small thimble radii can lead to thimble or hook damage (notch effect). The clamp effect, resulting from excessively small radii, can lead to an increase in force transmission and thus damage the hook.

Interface to extension

It is possible to extend the rope by connecting another rope with the same or similar performance characteristics.



Before lifting loads, please pay attention to all the component connections and make sure that these are not misaligned, distorted and/or shut/locked.

Interface to secondary cargo hook

The lifting accessories can be rigged to any appropriate secondary cargo hook.

To avoid damage caused by torsion (rotating cargo) the lifting accessories must be used only in combination with a swivel joint.

Swivel joint P/N: SLE1_x (manually operated) and all remote cargo hooks (electrical) delivered by **A&H Equipment** are specifically designed and built for the combined use with A&H ropes.

Other swivel joint models may be used, provided the specifications given by A&H are observed, especially regarding their size and quality.



The employment of lifting accessories without a swivel joint can cause torsion in the rope and thus already damage lifting accessories irreparably during one flight cycle.

Interfaces between slinging equipment

The breaking strength of slinging equipment (disposable lifting straps EN 1492-1, round slings EN 1492-2, slinging chains and accessories EN 818/EN 1677) and of assemblies of slinging equipment (e.g. multiple-leg slings) must meet the requirements of the intended type of application (see chapter 4). The eligibility of slinging equipment, however, is a completely different matter: due to their geometric design, lifting straps in conformity with EN 1492-1, for example, are totally unsuitable for flying operations.



The air flow during flight makes flat straps oscillate strongly and can damage them irreparably.

Unsuitable slinging equipment

Notwithstanding their small cross-section, round slings and lifting slings made of Dyneema are able to carry high loads. For heavy duty transport operations, however, it is important to place the round and lifting slings between a suitable slinging point and the crane hook and employ them at straight lift (with or without angle of inclination) instead of tying them around the cargo. The use of choker hitches, which are the most common slinging technique for helicopter operations (almost 100%), is NOT recommended, since it creates deflections (around edges, at the tying point), friction, pressure and torsion; moreover, the slings' material has a low temperature tolerance.



Round slings and lifting slings made of Dyneema are NOT recommended for helicopter operations: Such slinging equipment is mostly used for choker hitches, creating deflections (around edges, at the tying point), friction, pressure and torsion; moreover, the slings' material has a low temperature tolerance.

Unqualified slinging equipment

Of all unsuitable and unqualified slinging equipment, disposable lifting straps in conformity with DIN 60005 are considered the most dangerous by **A&H Engineering**. Although contrary to every regulation of the Machinery Directive (basic requirements: harmonized standard, working coefficient of 7), disposable lifting straps may carry a CE-marking and thus suggest a completely false sense of "safety". **Notwithstanding the CE-marking, disposable lifting straps DIN 60005 are contrary to any**

acknowledged rule of technology. Even on common building sites, the use of disposable straps for lifting simple cargo crosses the threshold of unacceptability. Therefore, their employment for lifting loads by helicopter must be considered wantonly negligent. A&H strongly discourages the use of disposable lifting straps and, if used, declines all responsibility.



Notwithstanding the CE-marking, disposable lifting straps DIN 60005 are contrary to any acknowledged rule of technology. Even on common building sites, the use of disposable straps for lifting simple cargo crosses the threshold of unacceptability. Therefore, their employment for lifting loads by helicopter must be considered wantonly negligent. A&H strongly discourages the use of disposable lifting straps and, if used, declines all responsibility. ☒

4. Construction-related definitions

4.1 Calculation (all components for helicopter external load transport; FH-SY 3.2.4 et seq.) (Part 21, CS-27.865 or CS-29.865 and related articles)

After extensive flight tests and measurements performed between 2011 and 2014, A&H Engineering has decided to change the calculation factors for all of their lifting accessories.

The minimum requirements described in EC Machinery Directive 2006/42/EC, EASA CS-27. or CS-29., the Marshaller Syllabus (FOCA 1996, chapter 3.2.4 et seq.) or related EN standards are not always sufficient. Moreover, manufacturers take production-specific and material-related factors into consideration.



A&H Engineering has long-term experience, in-depth knowledge and innovative ideas in the field of lifting accessories for helicopter operations.

4.2 Operational limits (all components for helicopter external load transport)

On the basis of experience (practical use as well as testing by means of measurement flights with external cargo), A&H ENG has adjusted the operational limits.

☒ The operational limits apply to all types of lifting accessories and slinging equipment. These limits amount to:

- 3 g for HESLO 1, 2, 3, 4 – no logging
- 3.5 g for HESLO 3 – logging only

Also check AWA instructions for ropes, part 4



These operational limits apply only to lifting accessories and slinging equipment. The operational limits of the helicopter in use must also be considered. ☒

References:

- * General load transport operations, mounting work, wire stringing, cable laying, etc.: Part-SPO, AMC1 SPO.SPEC.HESLO.100(b)(2): HESLO 1, 2, 3 and 4
- * Logging (also mixed operations including cargo transport. The higher requirement applies.): Part-SPO, AMC1 SPO.SPEC.HESLO.100(b)(2): HESLO 3
- * Calculation based on EASA CS-27.865 or CS-29.865 and related articles: EASA CS-27./29.865 = 2.5 [-] (no differentiation between ELO or LOG)

Out-of-date:

- * Marshaller Syllabus, chapter 3.2.4-1, 1.1 ELO = 2.5 and 1.2 LOG = 3 [-]
- * Meanwhile, the DGUV information 214-911 “Safe operation of helicopters during aerial work”) has become the authoritative text, in particular annex 3 on “Slinging techniques”.

4.3 Calculation of safety margins

The operational limits (maximum load allowed in the elastic range, Safe Load or Design Load Limit) for components by A&H Equipment differ from the above mentioned regulations and are defined as follows:

* HESLO 1, 2, 3 and 4: General load transport operations, mounting work, wire stringing, cable laying, etc.

Safe Load	2.5 [-]	EASA CS-27./29.865 NHEC, EN 1677-A1, Marshaller Syllabus 3.2.4 et seqq.
Additional factor related to impacts	1.2 [-]	DGUV information 214-911, Annex 3
Safe Load, adjusted	3.0 [-]	in compliance with EASA CS-27./29.305(a), Design Load Limit
Safety against breaking	1.5 [-]	EASA CS-27./29.303, EN 1677-A1, Marshaller Syllabus 3.2.4 et seqq.
Minimum failure load (ULmin)	4.5 [-]	for ALL components

Additional safety factors, such as resistance against yielding of metals or ageing/wear of textiles, as well as coefficients related to materials used and method of manufacturing (splicing, casting, welding, etc.), must be applied and documented by the producer on the basis of a risk analysis and/or experience.



Lifting accessories for HESLO 1, 2, 3 and 4, which are not suitable for logging, bear the indication “RESTRICTION: NO LOGGING”.

* HESLO 3: Logging

Safe Load	2.5 [-]	EASA CS-27./29.865 NHEC, EN 1677-A1, Marshaller Syllabus 3.2.4 et seqq.
Additional factor related to impacts	1.4 [-]	DGUV information 214-911, Annex 3
Safe Load, adjusted	3.5 [-]	in compliance with EASA CS-27./29.305(a), Design Load Limit
Safety against breaking	1.5 [-]	EASA CS-27./29.303, EN 1677-A1, Marshaller Syllabus 3.2.4 et seqq.
Minimum failure load (ULmin)	5.25 [-]	for ALL components

Additional safety factors, such as resistance against yielding of metals or ageing/wear of textiles, as well as coefficients related to materials used and method of manufacturing (splicing, casting, welding, etc.), must be applied and documented by the producer on the basis of a risk analysis and/or experience.



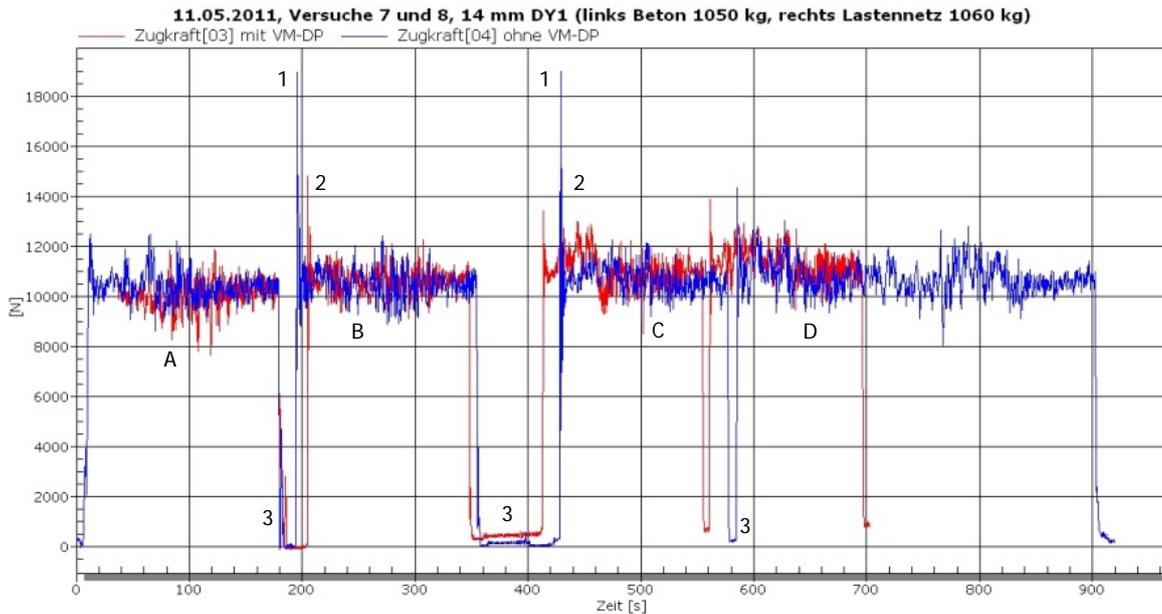
Lifting accessories which are suitable for HESLO 3 (logging) can also be employed for any other application. ☒ Suitable ropes are the TLP and TLL+ models, while TLL model can be used if taking appropriate additional measures. ☒



☒ “HESLO 3, logging only”: The term “logging” indicates the transport of single or several vertically hanging tree trunks. Cargo of this type, especially in the case of single, heavy tree trunks, can produce high shock loads in the event of abrupt lifting, uncontrolled, sudden depositing, trunk breaking, etc. Whenever «logging» is concerned, it doesn't matter if only one or a hundred load cycles are flown per day. Also check AWA instructions for ropes, part 4, and AWA part 1, 5.3.2

Not all ropes by A&H Equipment are eligible for logging operations. In such cases, their labels (LAB) carry the additional indication NO LOGGING. ☒

4.4 Diagram: Effect of shock loads (load peaks) with and without shock absorber



Caption

A – B: Block of concrete, slung at a centrally positioned lifting eye, 1050 kg.

C – D: Cargo net filled with sand bags, 1060 kg

1 – 2: Dynamic load peaks (impacts) acting upon the cargo are reduced by the lifting accessory “shock absorber”; hence the helicopter is less affected by them. Strong, but short-term load peaks (< 20/100 sec) cause less acceleration on the helicopter (due to its greater mass) than on the load.

3 Depositing of cargo or dislocation of helicopter



The list is not exhaustive and provides no indication regarding the overall safety factor of the construction.



Components used exclusively for logging operations are appropriately dimensioned.

- * In order to obtain a licence for intervention helicopters, for load hook-up systems and flight parameters, etc., one must apply to the aircraft navigation authority concerned.
- * The abidance by the parameters is the helicopter operator's responsibility.

4.5 Ageing

The ageing of materials depends on:

Material	Ageing	Elongation	Workmanship	Finishing	Dimensions	Outside influences	Utilisation	Storage
Steel	not measurable	low	homogeneous, forged	drilled, milled, shaped by stock removal	standardised	heat > 200 °C	tolerant	tolerant
Steel rope	~ 2 % pa	0.5 -2 %	low-torque, laid	pressed, spliced	various	water, dirt	tolerant	tolerant
PA	3 – 10 % pa	> 15 %	laid	spliced, sewn	various	water, dirt	tolerant	becomes hard
PES	3 % pa	2 – 4 %	laid	spliced, sewn	standardised		tolerant	tolerant
PP/PE	~ 30% pa	~10 %	woven	spliced, sewn	thin-walled	cuts, UV, heat	not tolerant	not tolerant, becomes brittle
HMPE	~3 % pa	< 0.5 %	braided, laid	spliced	various	particulates, chafing, heat	not tolerant	tolerant



- Steel is sensitive to buckling and falls from a height, as well as in the area of the bolts and clamping sleeves.
- Steel ropes are sensitive to corrosion, buckling and the resulting material fatigue in the area around the pressing (rope end), as well as to friction caused by rings under high tension.
- Polyamides (PA), when used for slinging purposes, are sensitive to wear and heat development caused by friction.
- Polyester is sensitive to wear and heat development caused by friction, which happens when one round sling is directly drawn into another D or when the slings are positioned on excessively small radii (see definition of sharp edges).
- Polypropylene/Polyethylene (PP/PE) are sensitive to UV-rays, heat, cuts and seam breakages (FIBC); rapid ageing under weathering.
- High modulus polyethylene (HMPE) is sensitive to heat > 65 °C, to particulates and strong impacts.



A&H Equipment is specialised in the working of various materials specifically designed for helicopter operations.

4.6 Life time

The life time of a product depends on the choice of materials, the design, the type of use, the customer profile, the storage, the mode of transportation (on trucks or other), its handling by the pilot, marshallers and third persons, as well as on external influences.

A&H divide their customers into various categories and the granted life time depends on the above-mentioned factors.

As a general rule, it can be stated that:

- * The life time of a product covers the duration between the indicated "Prod:" (production) and "Exp:" (expiry) dates.
- * The granted life time is between 4 and a maximum of 10 years and/or covers a pre-defined number of flight hours.



Prolongations of the maximum life can only be granted after an inspection by the producer. To achieve prolongation, the operator must provide thorough documentation on the runtimes of every rope/low-torque swivel/cargo hook indicating each product's serial number (S/N), the number of minutes/work cycles and, if any, incidents that have occurred.

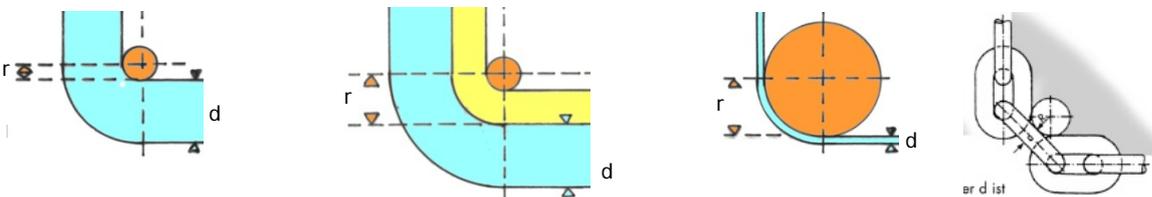
4.7 Assessment of a sharp edge

A sharp edge is formed when the diameter (d) of a slinging device is bigger than the radius (r) of the edge on the payload.

Or, to express it conversely, when the radius of the edge on the payload is smaller than the slinging device's diameter.

How to assess a sharp edge when using chains: the horizontal chain link touching the edge is stressed by buckling forces. Only in very few cases will the sole presence of a sharp edge cause failure.

A slinging device is only damaged or destroyed when additional energy takes effect: friction caused by elongation, slipping, as well as longitudinal and/or transverse sliding movement of the device, bending of chains or steel ropes under load.



Caption: sharp edge

sharp edge mitigated by edge protection

no sharp edge

chain on sharp edge, normal edge (Illustration: BGI 672)

4.8 How to eliminate a sharp edge

The principle is simple: increase the radius of the sharp edge!

Practical advice: Usually it is sufficient to significantly increase the radius, even if it still remains smaller than the slinging device's diameter.

4.9 Sharp edges: unproblematic and risky slinging devices

A sharp edge is defined by the ratio between the slinging device's diameter (d) and the radius (r) of the payload ($d < r$ or $r > d$). Various types of slinging devices react differently to sharp edges. Considering a relatively sharp edge (e.g. a stack of wood, a pallet) the following evaluation can be made:

Product	Round sling (RS)	Lifting strap (LS)	Round steel chain (RSC)	Wire rope choker (WR)
Rating	unproblematic	from unproblematic to slightly risky	relatively unproblematic	risky
Reason	Round slings are very flat, the polyester fabric very flexible and the protective sheathing separates the bearing fabric. High bearing pressure. Even in the case of lateral displacement/deflections, the fibre strands keep their alignment.	Lifting straps are flat and the polyester fabric is relatively flexible. High bearing pressure. Lateral stress due to torsion or shearing can be problematic, since the fabric's adaptation capacity is limited.	A chain can incise the wood by indentation and thus increase the radius. Flexible. Very low bearing pressure (small and round profile).	Due to their rigidity, steel ropes are always risky when strong deflections are to be expected. Very low bearing pressure (small and round profile).

Attention: Sharp edges are always risky at the occurrence of longitudinal and/or transverse movements of the slinging device (i.e. chafing, slipping, sliding)



The employment of a slinging device on a sharp edge leads to an immediate decline of responsibility by any producer.

4.10 Edge protection

Sharp edges always represent a risk. Moreover, the increased material stress (mechanical friction = abrasion, heat development) can reduce the slinging device's life span. There are, however, simple countermeasures to avoid these inconveniences:

Product	Round sling (RS)	Lifting strap (LS)	Round steel chain (RSC)	Wire rope choker (WR)
Procedure	Edge protection provided by PP Velcro fastening strips *			
Alternative	Additional sheathing on the round sling	Additional sheathing on the lifting strap	Choose a bigger chain	Choose another slinging device
Illustration				

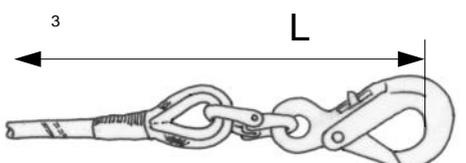
* don't use loose parts, as these could be lost

4.11 Assessment of length (all textile and steel components; examples)

L = usable length (also called L₁ by some producers), LS = length of sling leg without accessories

1

L



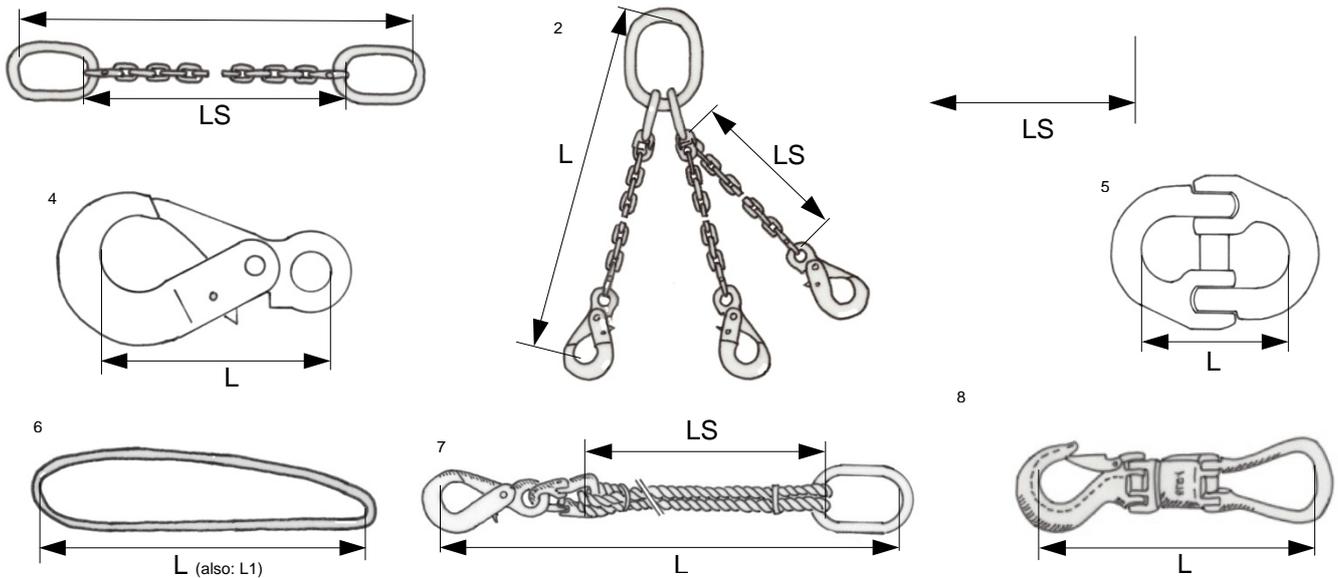


Fig. 1 Round steel chain; Fig. 2 Three-leg sling; Fig. 3 Rope; Fig. 4 Safety hook; Fig.5 Connecting link (Connex); Fig. 6 Round sling; Fig. 7 Shock absorber (here without sheathing); Fig. 8 Load element (SLE) consisting of several parts, with integrated low-torque swivel.

4.12 Predetermined breaking points

Lifting accessories and slinging equipment are not allowed to have predetermined breaking points.

4.13 Length tolerances

The lengths of spliced, laid or pressed ropes or of rope configurations with shock absorbers can be slightly different from those indicated on the labels. These tolerances are due to the production or finishing processes.

General tolerances (*L = overall length; LS = length of a rope/sling leg without accessories*)

Construction type	Material elongation at WLL	Length tolerance < 20 m	Length tolerance > 20 m	Overall length (L)	Combinations (slings)
Ropes of any suitable material and workmanship	TLDS, TLL, TLP, TLS < 0.5%	< 5%	1 – 2%	< 5%	n/a
Legs of three-leg and four-leg slings (standard length 5 m)	E ⊗ [...] ⊗ E ⊗ TLM < 0.5% ⊗ E ⊗ [...] ⊗	< 2% // < 10 cm	n/a	< 3% // < 15 cm	+/- 2 cm, 0.4 – 0.5%
Shock absorbers	VM-DP 10 – 12%	< 5%	n/a	n/a	n/a

4.14 Assessment of the number of carrying legs (FH-SY 3.2.2, 3.2.3-2)

The number of carrying legs depends on the number of slinging points available and on the load behaviour. During flight, loads are never symmetric, static or steady, but, quite the contrary, they swing, bang, flap, seesaw, etc. at speeds of up to 200 km/h.

Lifting accessories and slinging equipment by A&H Equipment are designed and calculated with regard to the maximum loading condition possible and according to the acknowledged rule of technology. When using 1 and 2-leg slings, 1 leg always bears the entire load, in the case of 3 and 4-leg slings the load is distributed on 2 legs up to a maximum angle of inclination of 45°.

This leads to the following basic applications:

Device	1 leg		2-leg sling (TWLS)*		3-leg sling (THLS)*		4-leg sling (FLS)*			
carrying leg	1	1	1	1	2	2	2	2	2	
Illustration										
Slinging points (SP)	1	1	2	1	3	2	4	3	2	2**
WLL	1	1	1	0.5	1	0.5	1	1	0.5	0.7

* the maximum angle of inclination allowed for multiple-leg slings by A&H Equipment is 45°;

** Only allowed if the slinging point (SP) is big enough to accommodate 2 hooks per side.

Legend: A 4-leg sling can be used as a 3-leg sling while maintaining the complete WLL (1), because the load is still distributed on 2 legs. If, however, a 4-leg sling is used as a 2-leg sling by uniting 2 legs to each slinging point, the cargo attached must only weigh a maximum of 70% of the WLL. This might sound strange, but there is a reason: the single legs of a sling are never equally long, and even the slightest differences cause a reduction of the WLL.

5. Application-technical definitions

5.1 Uncoiling and coiling, lifting and depositing of transport ropes by helicopter

How it should be ...

Transport ropes by A&H Equipment, models TLL, TLP (textile) and TLS, TLSS (steel) are rather unwieldy and difficult to coil. They should be treated like steel ropes: usually they are loosely coiled by hand or onto a coiling device and fixed with elastic straps.

The lightweight transport lines, models TLM, TLDS E[⊗][...]⊗ and TLME, can be looped on one arm as done with alpine ropes.

By hand over the ground	Use of a decoiler	By helicopter	
1 - 2 persons, depending on rope	Always 2 persons needed	Lifting and depositing in front of the helicopter	Lifting and depositing behind the helicopter only if ...
Diameter ca. 40 – 80 cm It's easier in pairs!	Diameter ca. 40 – 60 cm	Always in the pilot's field of vision Always: surveillance/help by a ground handler!	... the terrain is sloping!



These (foreseeable) inappropriate uses are considered "misuses" which lead to the immediate loss of liability or any other claims.

... and how it definitely shouldn't be!

Any type of transport rope (textile or steel) and textile slinging equipment can move involuntarily under certain conditions. Depending on their manufacturing and tension force, transport ropes can form loops, which might be caused by:

By hand over the ground	By helicopter	Landing
Inappropriate uncoiling of ropes	Lifting by helicopter without uncoiling first	Landing on the rope
Bends/loops caused by incorrect uncoiling	Bends/loops caused by the direct lifting by helicopter	Rope can "fly up" due to the down wash and end up in the tail rotor / main rotor / under the skid. Rope under wheel or skid, not within the pilot's view field.
Forming of loops over the ground, risk of contact with the tail rotor.		

5.2 Lifting and depositing of lifting accessories by helicopter

Roll out the rope on a flat surface until it is fully extended, then connect the accessories. During this procedure, make sure that it is not tense and that sharp bends can not be formed during lifting. Do not drag the rope over the ground more than necessary.

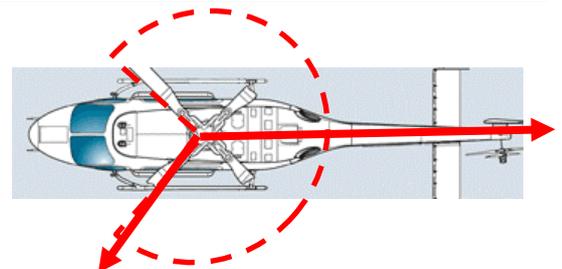
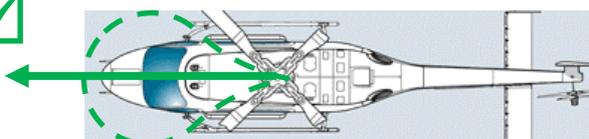
On ending the flying operation, an instructed person must help the pilot to deposit the rope on the ground. Usually the rope is deposited in a forward direction, within the pilot's field of vision.

In case the pilot is obliged to deposit the rope without the help of an instructed person, make sure that the landing site is big enough (or sufficiently sloping in a rearward direction) to avoid the rope getting caught under the helicopter (skids, wheels, tail rotor).

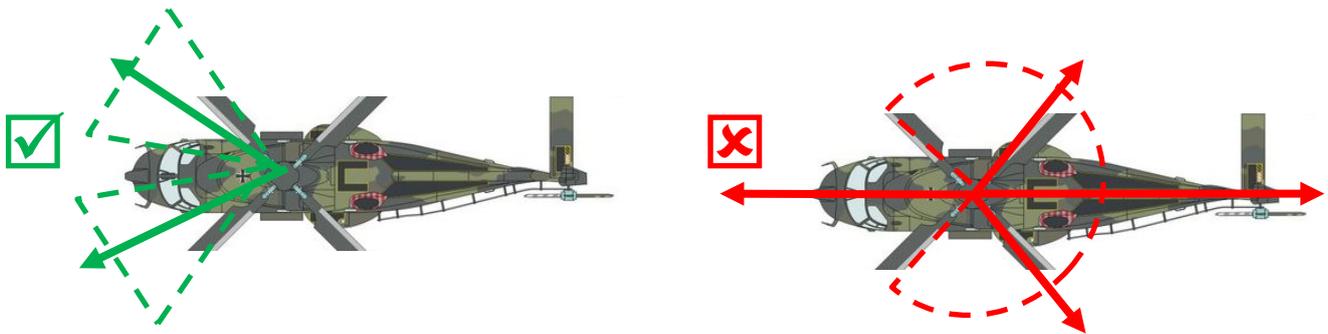
Depositing the rope and landing the helicopter on the rope:



- danger caused by rope nooses when the tail rotor draws near the rope;
- rope movement caused by down wash.
- be careful with skids and landing gear/undercarriages.



Helicopter with skids: Depositing of rope on take-off or landing area (symbolic illustration of a BELL 429, free picture from the web)



Helicopter with undercarriage: Depositing of rope on take-off or landing area (symbolic illustration of a NH90, free picture from the web)



Avoid sharp bends, knots or overtorquing of the rope.

5.2.1 Leaving of lifting accessories on TARMAC surfaces or freight vehicle loading ramps

Under the gleaming sun, bitumen and metal can easily develop temperatures of over 100°C; the temperature tolerances of most textile materials, however, are below 100°C.



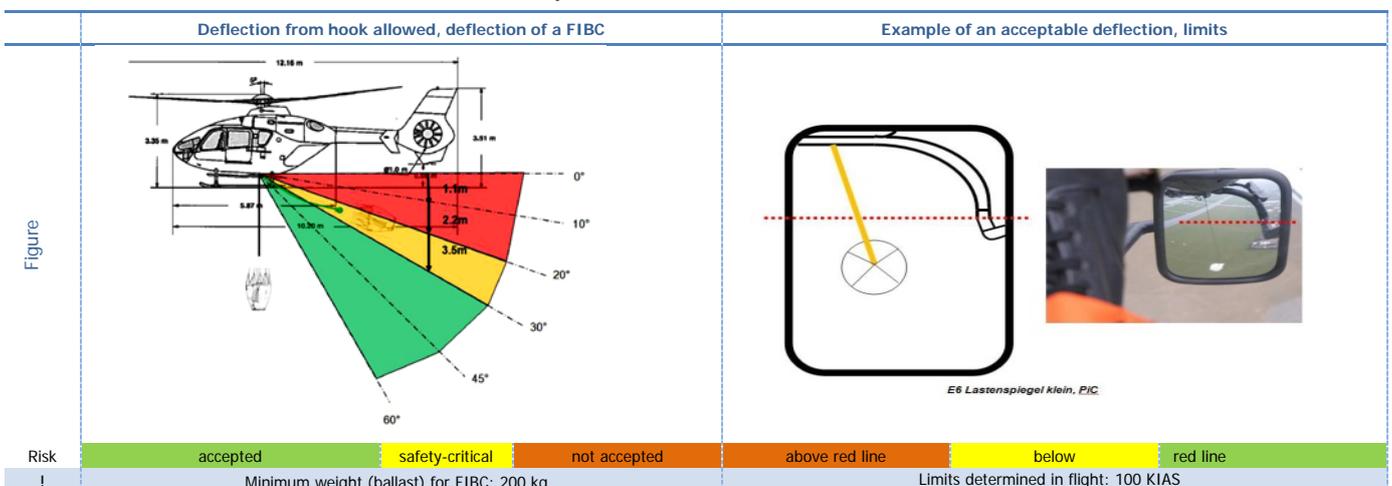
5.3 Tactical applications (tactical flying) relevant for Part-SPO, AMC1 /GM 1 SPO.SPEC.HESLO.100(b)(2): HESLO 1 - HESLO 4

Depending on the type of cargo, external load transports require different tactical procedures which will cause different effects. Possible cargo types are (examples, list not exhaustive):

Cargo type	Shape properties	Aerodynamic properties	Response to hard or uncontrolled depositing/rough lifting during load depositing and pick-up
Load nets	soft, elastic, round or square, compact	unproblematic	unproblematic
FIBC		unpredictable; empty FIBCs can be perilous	unproblematic
Boards, stacks of construction timber	cubic, compact, asymmetric - symmetric	can rotate, boards can slip out of the stacks	possibly medium-sized to heavy load peaks
Buckets, water containers	compact, heavy, symmetric	unproblematic	possibly light to medium-sized load peaks
Wall panels, panels	asymmetric	tend to seesaw, rotate and flap due to the large surface exposed to the current.	possibly medium-sized to heavy load peaks
Rods, lamp posts	range between light-weight and heavy, can be hollow	when rigged vertically, the pendular movements of the load can be safety-critical	possibly light to medium-sized load peaks
PVC tubes	movable/flexible, slippery	tend to rotate and to slip out	unproblematic
Tree trunks, several	cylindrical, rigged only at one side	unproblematic	possibly medium-sized to heavy load peaks
Single, heavy tree trunks	cylindrical, rigged only at one side	unproblematic	possibly heavy to very heavy load peaks

5.3.1 Example 1: Flexible intermediate bulk containers FIBC (EN ISO 21'898)

Part-SPO, AMC1 /GM 1 SPO.SPEC.HESLO.100: HESLO 1 and 2; Marshaller Syllabus 3.2.4-2, Note 1



Source of graph and data: armasuisse, ERFA-meeting Marshaller Syllabus 2013. With kind permission.

5.3.2 Example 2: single, heavy tree trunks (no logging)

Part-SPO, AMC1 /GM 1 SPO.SPEC.HESLO.100: HESLO 3, EASA Part-SPO, AMC1 SPO.SPEC.HESLO.100(e) Task specialists; Marshaller Syllabus 3.2.6-7; Suva booklet 44005 "Safe wood transport by helicopter", 1989.

External load operations always require the assistance of marshalls. Especially in the case of heavy single loads, experienced ground handlers must give instructions to the helicopter pilot, otherwise heavy cargo can uncontrollably touch the ground, generating very heavy load peaks which can damage the lifting accessory, the helicopter and put third persons at risk.

For system-inherent reasons, during logging operations vertical slinging of loads is unavoidable. For all other types of assignments, the load peak problem can be solved in different ways.

What	vertical slinging			horizontal slinging		
Picture						
ST	accepted	safety-critical	not accepted	not accepted	safety-critical	accepted
!	Vertical slinging such as during logging operations In the event of uncontrolled ground contact hard impacts will occur, with a load factor of > 4 g.			Horizontal slinging with 2-leg sling In the event of uncontrolled ground contact the load can give way, hence only a few hard impacts will occur. Load factor up to 2 g.		

5.3.3 Not this way! ...

5.3.5 ...

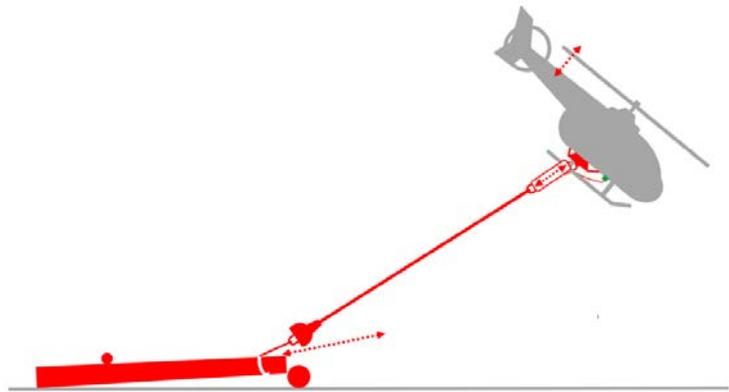
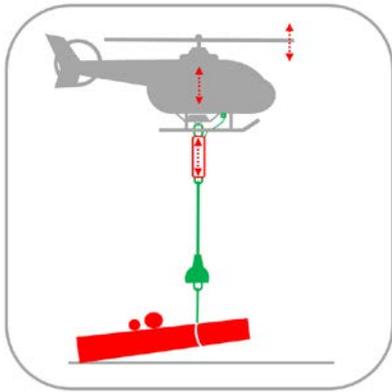
Depositing of lifting accessories	Dropping of cargo	Dropping of attached cargo
Dropping of lifting accessories from heights exceeding 2 m	Dropping of cargo with lifting accessory attached	Dropping of cargo attached to the helicopter
Accessories/fittings may be damaged when falling on the ground. Persons on the ground may be injured.	Persons might be fatally injured	Helicopter structure and lifting accessories may be significantly damaged

5.3.6 And not that way! ...

Dragging, tugging, pulling

Dragging, tugging and pulling generates high forces

Dragging, diagonal pull



The resulting impacts and any abrupt, strong or whiplash-like movements can significantly damage the lifting accessories and the helicopter structure.

Persons might be fatally injured ☒

5.4 Allowed slinging techniques (FH-SY 3.2, DGUV I 214-911 Annex 3)

Type	All LLA*	All slinging equipment (SE)		TWLS		THLS	FLS	
Illustration								
ST	straight lift	straight, up to < 45°	tied, double	two legs	TWLS straight	three legs	four legs	FLS as THLS
WLL	1			1	1	1	1	1

* LLA: all transport ropes (TLDS, TLL, TLP, TLS, etc.); ** SE: all slinging devices (round slings, round steel chains, lifting straps, wire rope chokers, etc.)

5.5 Slinging techniques with restricted use

Type	THLS	FLS		TWLS, THLS and FLS allowed
Illustration				
ST	THLS as TWLS	FLS as TWLS	FLS as TWLS*	AI > 45° to ≤ 60°
WLL	0.5 of WLL	0.5 of WLL	0.7 of WLL	0.5 of WLL

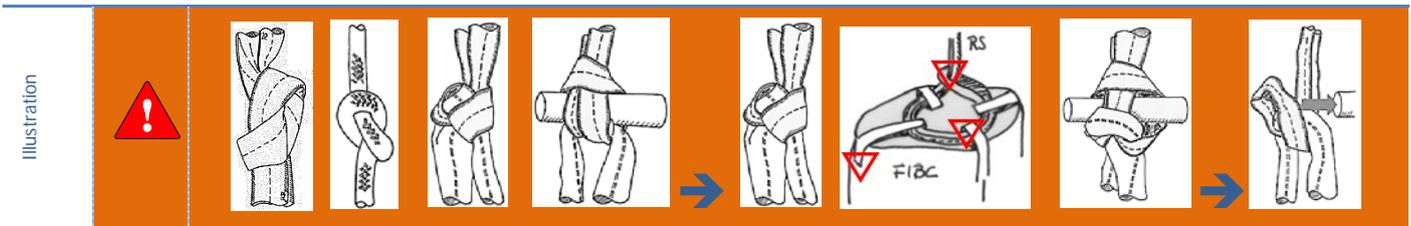
* Only allowed if the slinging point (SP) is big enough to accommodate 2 hooks per side.

5.6 Forbidden slinging techniques

Type	ALL LLA	All slinging equipment	All multiple-leg slings (TWLS, THLS, FLS)		
Illustration					
ST	tied	looped around, double, AI > 60°	tied	AI > 45°, if with restricted use (see above)	AI > 60° applies to all
WLL	--	--	--	--	--

☒ »Forbidden slinging techniques» applies to all types of materials and design: straps, steel ropes, textile ropes and chains, with or without protective sheathing. ☒

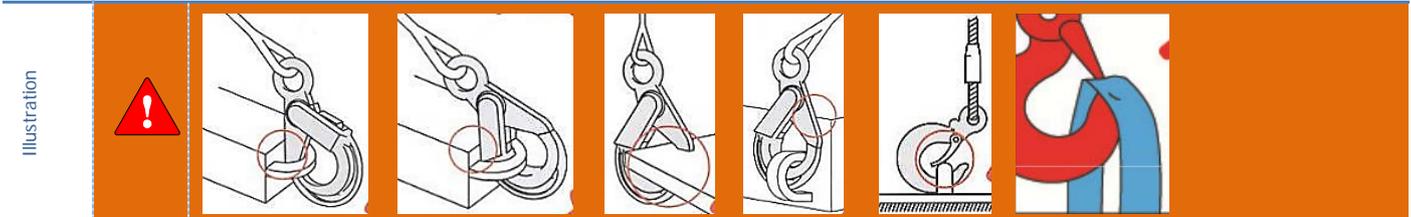
Type	All types of connections/extensions (source: FH-SY, page 3.2.7-6)
------	-------------------------------------------------------------------



ST -- Knots of any kind inadmissible connections which might cause the formation of knots or cause the loss of cargo
 WLL --

☒ »Knots are forbidden!« applies to all types of materials and design: straps, steel ropes, textile ropes and chains, with or without protective sheathing. ☒

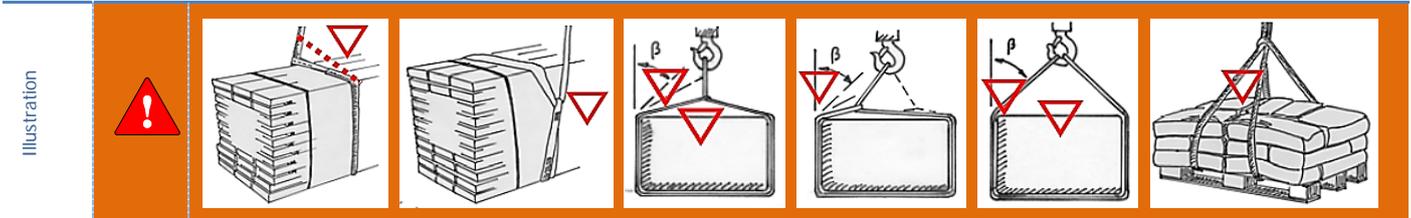
Type Direct attachment of slinging points to self-locking hooks or hooks with safety catches and/or direct rigging of lifting accessories onto self-locking hooks or hooks with safety catches (source: SBV)



ST Self-evident!
 WLL --

☒ »Unsuitable slinging points: wood screws, makeshift welded clamps, eyes and hooks, eyes of insufficient size, eyes and slinging points of unknown origin, condition and quality. ☒

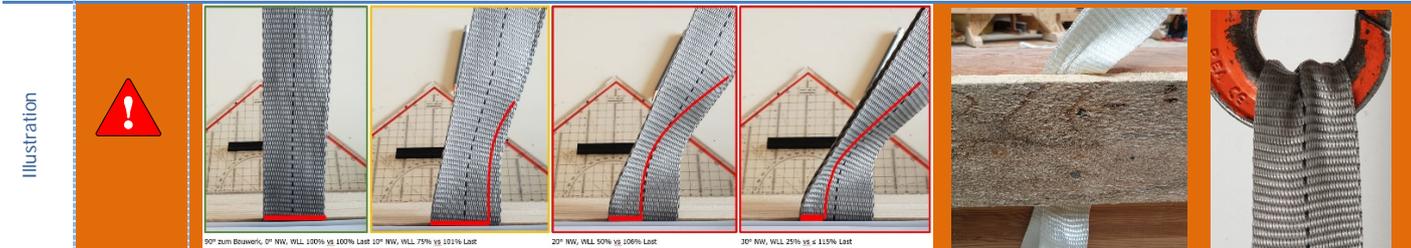
Type Some examples of slinging techniques which are problematic, inadequate or forbidden (source: FH-SY 3.2.14-1 und -2)



ST Self-evident!
 WLL --

☒ »Forbidden slinging techniques« applies to all types of cargo. ☒

Type Problematic, unsuitable or forbidden slinging techniques with disposable lifting straps (Quelle: GA_2018_Seite_8-13, HelicoSkyhell_04-2019_SUST-2324)



AT With every degree of angle of inclination, the bearing cross section is reduced while the force increases „nailed“ disposable lifting straps Folds =>30% strength loss
 WLL --

☒ Any type of misuse creates damage and puts yourself and others at risk. See AWA instructions, part 3, A6 ☒



The non-observation of these rules implies the risk of serious damages to the lifting accessories and the slinging equipment

6. Regulations

6.1 Label reference codes (examples)

☒ WWW.AIR-WORK.SWISS	web address of the manufacturer
P/N: TLDS+_14_xx_x	part number: rope model_payload_length_colour
S/N: KZK-001	serial number: client code - consecutive number
PROD: xx/xxxx	manufacturing date: month/year
EXP: xx/xxxx	expiry date: month/year
Length:	length in meters
WLL MAX: xx kN	maximum payload, highlighted
FOR HESLO ONLY NO LOGGING	intended use limitations
MD 2006/42/EC CS-27./29 NHEC	conformity and standards applied
KUNDE	name of client, written out
KZK AD: 200101-1111	client code order number (also written on our tender, the order confirmation, the delivery receipt, the invoice and the EC declaration of conformity; maybe also on other documents).



Label design may vary according to customer's wishes. For example, the SAP-code can be added. ☒



Labels must not be removed. If you have any questions, please contact the producer.

6.2 Legal assumptions

This product is in conformity with the minimum requirements of the law regarding safety and regarding its use with helicopters:

- EASA CS-27./29.865 External Loads
- Federal law on safety of products (PrSG, SR 930.11)
- Ordinance on safety of products (PrSV, SR 930.111)
- Ordinance on safety of machines (MaschV, SR 819.14)
- Swiss council ordinance VUV on accident prevention, art. 32.a and b (VUV, SR 832.30)
- EU Council directive n. 2001/95/EC regarding product safety
- EU Council directive n. 2006/42/EC regarding machinery safety (MD)
- EU Council directive n. 2009/104/EEC regarding the use of work equipment

6.3 Further reading

- DGUV publication 214-911 "Sichere Einsätze von Hubschraubern bei der Luftarbeit", www.bg-verkehr.de
- 9 essential rules for survival www.suva.ch
- Marshaller Syllabus, <https://www.bazl.admin.ch>
- EASA CS-27 and CS-29, www.easa.europa.eu

The products' manufacturing and the compilation of the instructions for use and maintenance were state-of-the-art at the moment of production/publication.



All products by AirWork & Heliseilerei GmbH (A&H) meet the requirements of the EU regulations regarding operation (ED Decision 2014/018/R, Annex VIII Part-SPO) and manufacturing (EU Decision 748/2012 EASA Part 21 G).

As a helicopter operator, the use of AirWork & Heliseilerei GmbH (A&H) products always puts you on the legal, up-to-date and safe side.

6.4 Technical documentation

The present instructions for use and maintenance (AWA) are an integral part of the technical documentation compiled by the producer in conformity with Machinery Directive n. 2006/42/EC, annex I and annex V. The EC declaration of conformity issued by the producer in accordance with annex V is an integral part of the technical documentation and an original copy of it will be given to the customer.

The producer depends on your detailed feedback in the case of unexpected events or dysfunctions. Technical documentations are "Living Documents" which have to be updated by the producer when necessary.

6.5 Engineering & manufacturer

AirWork & Heliseilerei GmbH (A&H)

A&H Engineering and A&H Equipment

Bahnhofweg 1, CH-6405 Immensee

FON 0041 41 420 49 64

E-Mail: office@air-work.com, Internet: www.air-work.swiss

ISO 9001:2015, SQS Nr. 32488

EASA Part 21 G POA, CH.21.G.0022

NATO NCAGE SAC17



6.6 Rights of sale

All rights of sale and all of the resulting rights and obligations: AirWork & Heliseilerei GmbH (A&H) or their representatives.

These instructions for use and maintenance are protected by copyright. **Please consult the producer if you have any questions.**

6.7 Rights of images

All drawings, graphics and photos: Enrico Ragoni, AirWork & Heliseilerei GmbH © 2012 – 2020. Wherever other sources have been used, these are indicated below the illustrations.

6.8 Guarantee

If used for the purposes for which it was designed (AWA, part 4) and if both use and storage (AWA, parts 2 and 3) are carried out according to the regulations, the producer guarantees the product against material and production defects for a period of 2 years.

The guarantee is null and void: after two years of normal use; immediately in the event of misuse, modifications to the structure or other parts, inappropriate use etc.

The producer disclaims all responsibility for any direct or indirect consequences, accidents or any other type of damage caused by the use of its products.

Disclaimer



With the exception of 3 models, all cargo hooks available on the market (primary, secondary and remote) fail to meet the standards required by EU Council directive 2006/42/EC regarding machinery safety, i.e. they have no CE conformity approval.

The lifting accessories (transport ropes) and slinging devices manufactured by AirWork & Heliseilerei GmbH (A&H) can also be operated with other cargo hook models, nonetheless AirWork & Heliseilerei GmbH (A&H) disclaims all responsibility, guarantees or other liabilities for damage caused by cargo hooks not provided with CE conformity, regardless of producer. This applies also for cargo hooks distributed by A&H Equipment.



Pay careful attention to the instructions regarding the use of other components and especially to other risks indicated therein but not included in the present instructions.

6.9 Recall

The producer reserves the right to recall the product at any time. The producer will take care of the product's disposal directly or supervise its disposal in accordance with the regulations in force for the protection of the environment.

6.10 How to continue

These instructions AWA, parts 1 – 4, must be the subject of appropriate training performed by the producer or their representative (qualified person) in the presence of the user and the company employee responsible for training.

6.11 Question to the person responsible for training

Have you read, understood and given instructions on parts 1 and 2?



A&H Service offers an extensive testing service for all its in-house products.

7. Appeal



If you have questions, if a component is damaged, seems to have changed or might be damaged, whenever you have any observations or suggestions to make, please take a photograph and send it to us via email, MMS or SMS (no messages via WhatsApp, Facebook or similar).

In 90% of all cases we can answer immediately, thus saving you time and postal charges. Having an image will help us greatly and, together with your short description of the problem, it can usually be identified very quickly.

Annex A Diagram Rope turn-up behaviour

Annex B A&H-SB 2013-01 Use of shock absorbers during all types of assignments

Member of ...



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