Instructions for use and maintenance, part 4

(Translation of the original instructions for use and maintenance AWA, part 4)

All transport lines (short and longlines)

CE

Machinery Directive 2006/42/EC
§ 1 (1) d), annex I, 1.7, 1.7.4, 1.7.4.2

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

First Issue - Revision x⌦ ⌫ - what is new or has been modified?

Part	0	1	2	3	4
	Index	Definitions	Maintenance: steel	Maintenance: textiles	Use of specific product

Swiss Air Force AS 332l1 SU/CU, with TLE tactical shortline from A&H EQU - photo: Eugen Bürgler © 2018

Classification of line types

A&H offers a wide range of lines which are subdivided according to their designated use and customers' needs

Manual lines	are exclusively designed for manual operation (manual attachment/release of cargo) and cannot be operated electrically.
Hybrid lines	can be operated manually, but can also be equipped with power connection. The letter "E" at the end of a product's name indicates lines equipped with power connection.
Electric lines	allow electric release of cargo and must be operated in combination with an electric cargo hook. Manual operation of such lines is not reasonable.

Product codes and names

TLDS+	Light transport line	TLM	Medium transport line	TLL	Line for transport and assembly
TLDP	Special transport line	TLME	Medium transport line, electric	TLP	Line for logging
TLS	Steel transport line	TL	Tactical line	TLL+	Universal line
TLSS	Steel transport line with protective sheathing	TLE	Tactical line, electric	TLCE	Multipurpose transport line

For the definition of short and longlines and HESLO types 1 to 4, please check AWA part 1, 1.5 and 3.1

Introduction

This document is an abstract of the texts pertaining to every single product. For reasons of clarity and to simplify matters in the event of revisions, we have concentrated all information in the present document.

For the employment of transport lines, the AWA instructions for use and maintenance, parts 0 to 4 (including this document) are authoritative.

Please also check the following documents:

- AWA, part 0 (Index), page 8, Application and certification codes
- Data sheet DB SL-LL (Short and LongLines)
- DB Lines-electric_KSL and DB Lines-manual_KSL
- For other data sheets, see www.air-work.com, Equipment

For more detailed information on lines, please check this document's appendix or data sheet DB SL-LL.

If the answer to your specific question is missing, don't hesitate to contact us.

All texts relevant to our quotations, including application and certification codes[1*], are displayed in a text field like this one. The given information is binding for the compilation of tenders, order confirmations, delivery notes and invoices.

1* The «Certification code» proves a product's qualification by means of an EC-declaration of conformity issued by the manufacturer (EC DoC), an EC type examination certificate issued by an acknowledged certification body (EC-TEC), an EASA STC with EASA Form 1, a certificate of conformance (COC) or other type approvals. For more detailed information, please check AWA, part 0.

Conformity

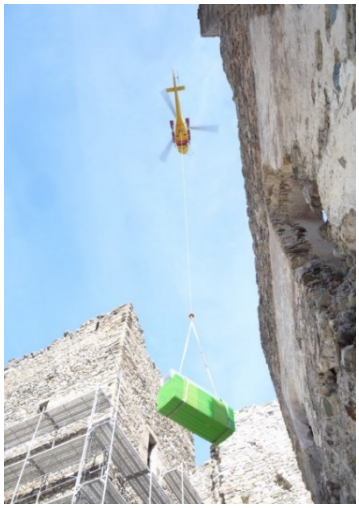
Lines by A&H EQU are compliant with machinery directive 2006/42/EC and manufactured following the safety requirements of the best demonstrated available technology. The German DGUV information 214-911 «Sichere Einsätze von Hubschraubern bei der Luftarbeit» (Safety during helicopter aerial work) has also been implemented.

Our product deliveries include an EC declaration of conformity (EC DoC). The instructions for use and maintenance (AWA) can be downloaded from our website www.air-work.swiss and are usually available in 4 languages.

Special fittings, such as thimbles, rings and shackles, can be delivered with a Certificate of Compliance (COC) in conformity with EASA CS-27.865 / EASA CS-29.865 and with the requirements stated in the Flight Manual Supplements (FMS) of the specific helicopter model.

On request, we also grant compliance with other standards, such as EASA CS, EASA Part SPO, MIL, STANAG or others. For more information, see AWA part 0, application and certification codes which can be downloaded from the abovementioned website.

Puch of the Swiss Army on vehicle hoist



TLDS+ transport LongLine attached to AS 350 B3e

German Armed Forces CH-53 with TLM line 90 kN

Assembly work: K-MAX with TLP_30_55 line

Use

Correct use

Lifting of loads, in combination with a shock absorber and a swivel lifting hook.

The line's payload (Working Load Limit, WLL) corresponds to both the helicopter's maximum carrying capacity and the maximum mass (weight) of the cargo allowed. The indicated payload (WLL) must not be exceeded.

Limits, inappropriate uses and other possible risks can be found below in this AWA or in the general instructions AWA, part 1.

If used in the correct way, the lines guarantee safe handling.

They are designed to be used only and exclusively in the above mentioned way, that is, as a lifting device for the external load transport by helicopter.

Also check AWA, part 1, 1.9 (Suitability and correct use of work equipment) and 1.12 (Normal, reasonable, correct, foreseeable use/incorrect use/misuse).

Suitability

Lines by A&H Equipment are designed and calculated to fulfil a variety of requirements.

Application / type of use	TLDP	TLDS+	TLS	TLSS	TL	TLE	TLM	TLME	TLL	TLP	TLCE	TLL+
HESLO 1 (shortline < 20 m)	x	x	x	x	x	x	x	x	x		x	
HESLO 2 (longline > 20 m)	x	x	x	x	x	x	x	x	x	x	x	x
HESLO 3 (logging excluded)	x	x	x	x	x	x	x	x	x	x	x	x
HESLO 3 (logging only)										x		x
HESLO 4	x	x	x	x			x	x	x	x	x	x
Firefighting (governmental)						x		x	x	x	x	x
Annex I (military operations)		x	x	x	x	x	x	x	x	x	x	

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, part 1,

- 1.5 (HESLO classification),
- 1.9 (Suitability and correct use of work equipment)
- 5.3.2 (Single, heavy tree trunks)

Qualification

All lines are approved lifting accessories (§ 1.d) in conformity with machinery directive 2006/42/EC and thus classified as machinery; they carry a CE-marking and are delivered with an EC declaration of conformity issued by the manufacturer. Exceptions from this rule are specifically indicated and delivered with a certificate of conformity (COC) or other certificates of compliance according to customer wishes.

Also check AWA, part 1, 1.3 Definition of lifting accessories (LA)

User training

Personnel assigned to using this type of equipment 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 document the type, amount and the date of training in an appropriate way.

Also check AWA, part 1, 1.1 User training

Your line (description of the single components)

Design, construction and technical data which apply to all line types

All lines

- are designed and built to carry the maximum external load possible for the type of helicopter used, that is, for its corresponding weight class (for example: load transport in general, logging, etc. with helicopter model AS 350 B3 = max. WLL 1400 kg; AS 332C = 4500 kg, CH-53 = 9000 kg, etc.)
- type of application: all types, **logging excluded** (HESLO 1 - 4; Annex VIII Part-SPO; AMC1 SPO.SPEC.HESLO.100)
- type of application: **logging only or other uses combined with logging** (HESLO 3; Annex VIII Part-SPO; AMC1 SPO.SPEC.HESLO.100)

or

- are designed and built to carry the maximum external load possible for the intended type of intervention. Types of intervention can be military or tactical, disaster control/protection, etc.. The lines are designed to withstand the maximum load possible of the equipment used (firefighting bucket, Daisy Belly ®, etc.)
- type of application: firefighting, disaster control/protection, avalanche dispersion (governmental)

Basis of calculation

- For all types of HESLO: DGUV Information 214-911, EASA CS-27./29.865 External Loads
- For military operations: CS-27.865 or CS-29.865 and corresponding articles, STANAG 5342

Nowadays, calculations based on DGUV Information 214-911, CS27./29.865 et seqq. and STANAG 5342 are nearly identical. Lines intended for military purposes might require further assessments, such as durability in the presence of fungi, salt water, sand, humidity, etc.

Also check AWA, part 1, 4.1 „Calculation“ and following chapters.

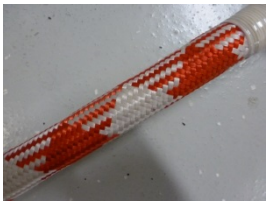
Equipment

- For information on lengths, colours, combinations and equipment available, please check the “Line properties” chart.
- All lines can be equipped with a great variety of fittings.
- We also offer a wide choice of thimbles.

Also check AWA, part 1, 3.2 “Accessories or special fittings for primary cargo hooks” and 3.4 “Rope types”


Takling mit Etikette, geharzt


Mantel PES TLDS und TLM, TLME und VGH


Mantel PES TLL


Mantel PA TLP


Mantel PES TLK und VGH

Life span

The service life of A&H EQU lines depends on their type of design, their intended use and the customer profile; generally, it amounts to 6 years.

- All line types have a life span of up to 6 years.
- Depending on the customer profile and thorough documentation (run times and cycles), the life span of lines can be prolonged to a maximum of 10 years.
- The service life of heavy-duty lines, such as TLL/TLP models or the allrounder TLL+model, is limited to 2500 h.
- Fittings: depending on condition; in exceptional cases the fittings display an expiry date (EXP).
- Crucial information on the service life of your line is printed on the label (PROD: = manufacturing date; EXP.: = expiry date).
- Any prolonging of a line's life span can only be granted on the basis of thorough documentation and after an inspection of the line by A&H SER.
- The decisive criterion for withdrawal from service prior to the date of expiry (EXP) or to achieve life span prolongation is the line's condition.

Also check AWA, part 1, 4.5 „Ageing“ and 4.6 „Life time“

Alle Bauteile sind qualifiziert und unterliegen während der Beschaffung und Verarbeitung einer wiederkehrenden Überprüfung durch den Hersteller (QS).

Specific line properties

For the characteristics of the individual lines, please check the chart in **annex A**.


aiRtelis France's EC 225 with A&H EQU longline equipment - photo: Julien Botella © 2019

Manual lines

TLDP – the slim line

The TLDP model is suitable for occasional use when the probability of reaching the maximum payload (WLL) is very low. The model is particularly appropriate when special line lengths exceeding 50 m are required.

The load-bearing element consists of high module polyethylene fibres (HMPE) of SK99 quality. The rope is spliced at its ends and enclosed in a braided PES sheathing. The line's performance is quasi-static (elongation at WLL = ~ 0.5%). For special applications, it is possible to include a fibrous membrane able to keep off micropollutants down to 5 µm size. The thimbles are made of high quality, high tenacity, stainless steel V4A and welded at the joint. Special designs for drones (WLL 1 – 5 kN) or light helicopters (WLL 5 – 9 kN) can be manufactured.

Fig.: The TLDP and the TLDS⁺ model differ in diameter and performance values.

Basic configuration: lower rope end with thimble, LHW safety hook and CW connex; upper rope end with thimble and tag. Sheathing colour: red, yellow, green or blue.

Options on request (not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook
- Accessories other than LHW safety hook and/or CW connex. Different sheathing colour.

Limitations: **NO LOGGING**

Load factor limited to 3.0 g

- Application code: A, F
- Certification code i, ix, xi, xiv, xvii

For HMPE lines of SK99 quality, no long-term experience data is available. The material's high performance values usually lead to a decrease in life span, especially if the lines are designed and calculated to tight margins (safety factor 7 [-] or slightly higher).

TLDS⁺ - the classic line

The robust TLDS⁺ model for everyday use is suitable for almost all types of cargo and applications, from supply flights in mountainous areas to assignments on construction sites. The main features are its excellent flight behaviour and the hard-wearing sheathing.

The load-bearing element consists of high module polyethylene fibres (HMPE) of SK78 quality. The rope is spliced at its ends and enclosed in a braided PES sheathing. The line's performance is quasi-static (elongation at WLL = ~ 0.5%). For special applications, it is possible to include a fibrous membrane able to keep off dirt particles down to 5 µm size. The thimbles are made of high quality, high tenacity, stainless steel V4A and welded at the joint.

Basic configuration: lower rope end with thimble, LHW safety hook and CW connex; upper rope end with thimble and tag. Sheathing colour: red, yellow or blue.

Options on request (not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook.
- Accessories other than LHW safety hook and/or CW connex. Different sheathing colour.

Limitations: **NO LOGGING**

Load factor limited to 3.0 g

- Application code: A, F
- Certification code i, ix, xi, xiv, xvii

TLS – the steel line

The TLS is the progenitor of all our transport lines. Small in diameter but heavy, especially when it comes to higher weight classes. Nevertheless customers rarely ask for it. This model is suitable for the helicopter transport of concrete buckets, for reduced attachment lengths and short but frequent flight cycles.

The line consists in a non-rotating steel wire rope (category A) of steel-grey colour. The line's performance is quasi-static (elongation at WLL = ~ 0.5%). Equipped with standard thimbles and C Z11-type Talurit ferrules (with tapered ending). On request, we can produce custom-shaped milled thimbles (e.g. for H135/H135M cargo hooks).

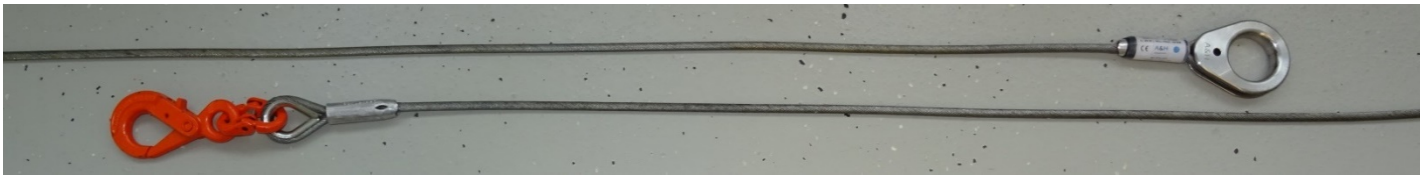


Fig.: The progenitor of transport lines. Small in diameter but heavy, especially when it comes to the higher weight classes.

Basic configuration: lower rope end with thimble, LHW safety hook and CW connex; upper rope end with thimble and tag.

Options on request (not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook.
- Accessories other than LHW safety hook and/or CW connex.

Limitations: **NO LOGGING**

Load factor limited to 3.0 g

- Application code: A, F
- Certification code i, ix, xi, xiv, xvii

Long steel lines have the tendency to oscillate (swinging of the line), especially if the weight of the load element is inferior to the line weight.

The rope lubrication, aimed at keeping pollution to a minimum, gradually disintegrates.

TLSS – the steel line in signal colour

The line consists in a non-rotating steel wire rope (category A), the PVC protective sheathing is colourless translucent or yellow. The line's performance is quasi-static (elongation at WLL = ~ 0.5%). Equipped with standard thimbles and C Z11-type Talurit ferrules (with tapered ending). On request, we can produce custom-shaped milled thimbles (e.g. for H135/H135M cargo hooks).

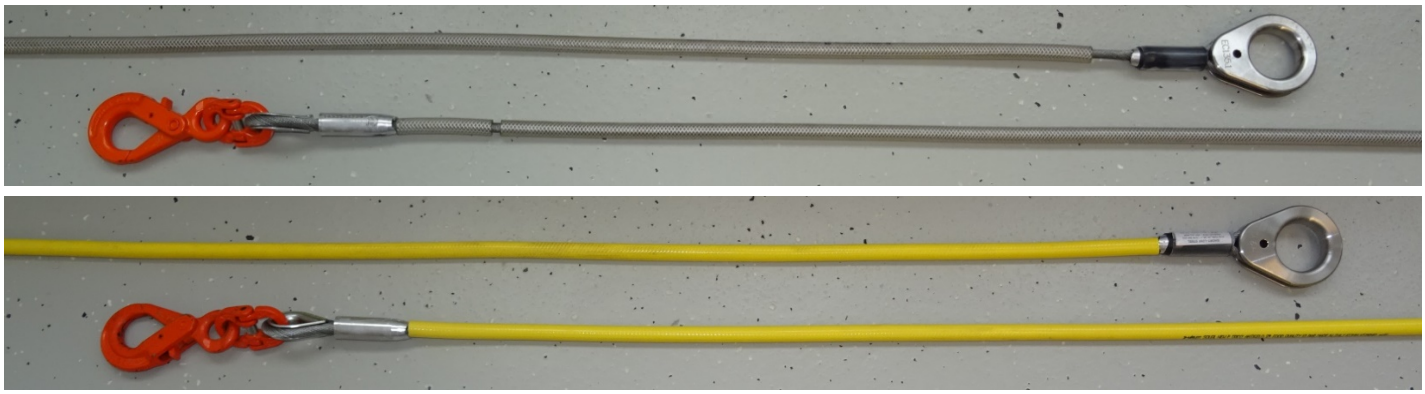


Fig.: TLSS, equipped with protective sheathing in order largely to maintain rope lubrication.

Basic configuration: lower rope end with thimble, LHW safety hook and CW connex; upper rope end with thimble and tag. Yellow protective sheathing.

Options on request(not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook.
- Accessories other than LHW safety hook and/or CW connex.

Limitations: **NO LOGGING**

Load factor limited to 3.0 g

- Application code: A, F
- Certification code i, ix, xi, xiv, xvii

All manually operated lines can be equipped with an SKLI low-torque swivel including a safety hook of the SKN/OBK/BKD type.

Steel lines have a tendency to oscillate (swinging of the line), especially if the weight of the load element is inferior to the line weight.

Airbus H225, aiRtelis France using TLL_50_30 (WLL 50 kN)
© Foto Julien Botella

Transport LongLine, TLDS+ model, attached to AS 350 B3e

German Armed Forces CH-53 with TLM transport line 90 kN

Hybrid lines

TL – the line for tacticians

This line model is made of EN 1492-2 round slings with grey PES protective sheathing. The line's performance is comparatively high (elongation at WLL = ~ 2 - 3 %). The loops can be equipped with a protective sheathing.

Fig.: The absolute classic among tactical lines. A striking feature in this combination is the lemon-yellow OBK safety hook: Gunnebo Industries started their range with grade 8 products compliant with EN 1677, but then began replacing and amplifying their assortment piece by piece with grade 10 products.

Basic configuration: round slings EN 1492-2 with protective sheathing; lower rope end with OBK safety hook, SKLI low-torque swivel and SKR/SKT connex; upper rope end with SKT/SKR connex and long SKO suspension link. Individual tagging. Sheathing colour: grey

Options on request (not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook.
- Accessories other than OBK safety hook (e.g. LHW, BKD-Offshore [from size 13 upward]).
- Different protective sheathing made of inflammable fabric (black) for firefighting lines.

Limitations: **NO LOGGING**

Load factor limited to 3.0 g

- Application code: A, F
- Certification code i, ix, xi, xiv, xvii

The profile of TL and TLE line models is flat, not circular. Aircraft speed without cargo attached must therefore be limited to 80 kts.

TLE – the line for electrified tacticians

This line model is made of EN 1492-2 round slings, the PES protective sheathing is available in grey or in the colour of the payload. The line's performance is quite high (elongation at WLL = ~ 2 - 3 %). The loops can be equipped with a protective sheathing.

TLE lines are equipped with a LHW safety hook and a grade 8 or 10 CARW roundsling connex. As upper fitting we recommend long SKO or SKG suspension links (as shown in photo, narrow part with horizontal joint).

The electric conductor is integrated into the protective sheathing and secured against shifting.

Fig.: Tactical line, TLE_14_2 model, size and manufacturing according to customer wishes.

Standard: round slings EN 1492-2 with protective sheathing; lower rope end with OBK safety hook, SKLI low-torque swivel and SKR/SKT connex; upper rope end with SKT/SKR connex and long SKO suspension link. Individual tagging. Sheathing colour: grey. Electric conductor and plug in accordance with customers' wishes (indicated separately in the quotation).

Options on request (not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook.
- Accessories other than OBK safety hook (e.g. LHW, BKD-Offshore [from size 13 upward]).
- Different protective sheathing made of inflammable fabric (black) for firefighting lines.
- Electric conductor with 2 to 9 conductors featuring 1 mm^2 AWG 18, 1.25 mm^2 AWG 16, 2.0 mm^2 AWG 14 or 3 mm^2 AWG 12 wires. Other configurations on request.
- Mounting of different plug types according to customer wishes.

Limitations: **NO LOGGING**

Load factor limited to 3.0 g

- Application code: A, F
- Certification code i, ix, xi, xiv, xvii

The profile of TL and TLE line models is flat, not circular. Aircraft speed without cargo attached must therefore be limited to 80 kts.

TLM – the versatile, hard-wearing line

The load-bearing element consists of high module polyethylene fibres (HMPE) and is enclosed in a braided PES sheathing. The line's performance is quasi-static (elongation at WLL = ~ 0.5%). Rope core protected against micropollutants. The thimbles are made of high quality, high tenacity, stainless steel V4A and welded at the joint. Customized rope end finishes available, e.g. special-design accessories or loops (soft link without metal thimble).

TLM lines are equipped with an LHW safety hook and a CW connex, grade 10.

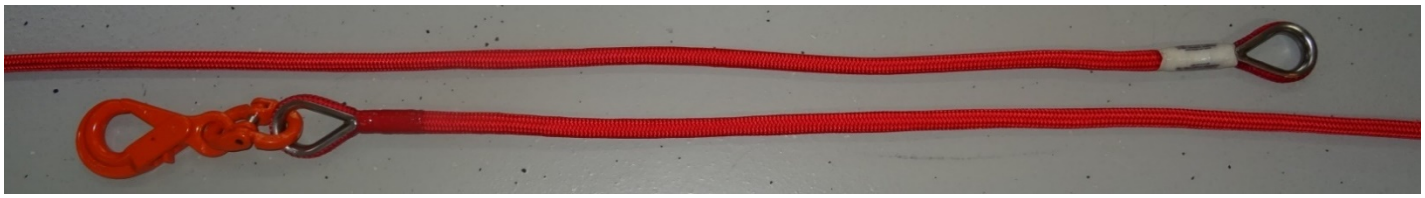


Fig.: Due to its special construction, the TLM model isn't rounded to the touch but very compact.

Standard: lower rope end with thimble, LHW safety hook and CW connex; upper rope end with thimble and tag. Rope core protected against micropollutants. Sheathing colour: red.

Options on request (not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook.
- Accessories other than LHW safety hook and/or CW connex.
- Different sheathing colours (blue, green, yellow, grey).

Limitations: **NO LOGGING**

Load factor limited to 3.0 g

- Application code: A, F
- Certification code i, ix, xi, xiv, xvii

TLME – the versatile, hard-wearing electric line

Line properties and equipment included are identical to TLM model.

Of all lines, the TLME model is the most versatile. Almost all types of design are possible which are especially suitable for small, medium and, in particular, heavy-weight firefighting lines (WLL up to 76 kN). From 1 kN WLL for drones up to 120 kN WLL for heavy-lift helicopters, with line lengths from 0.5 m up to > 50 m.

Fig.: TLME_76_20 firefighting line with 76 kN WLL for CH-53 helicopters. Rope core fully protected against pollution.

Fig. on the far right: TLME_14_20 model with Goggel, suitable for remote cargo hooks or as connecting device for firefighting buckets.

Fig. below: TLME_10_30 model with push-pull plug and thimble for H135-M helicopters, size and manufacturing according to customer wishes

Fig.: TLME_25_1_SL model for firefighting buckets including plugs and fitting in compliance with the primary cargo hook

Fig.: TLME_10_20_REGA model for firefighting buckets with integrated cable harness

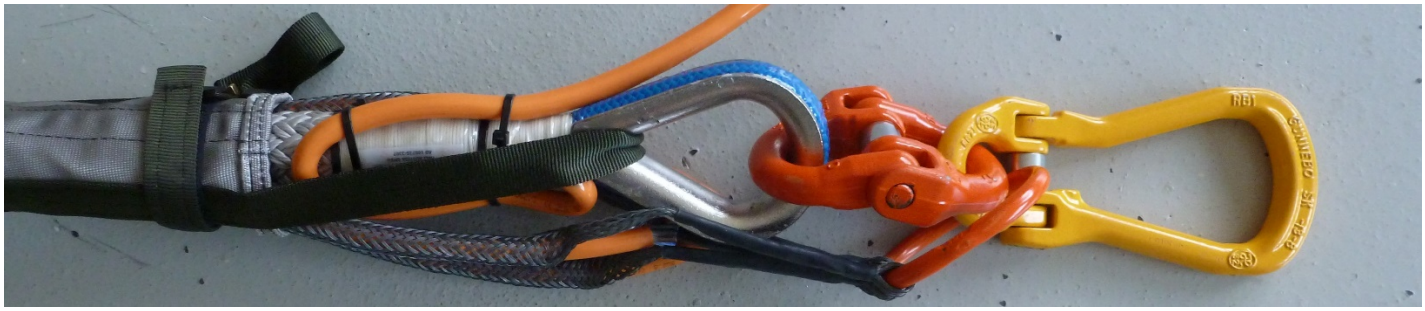


Fig.: TLME_50_20 or 30 m HAG, including cable sleeves for additional conductors and reversible protective sheathing with retaining system.

Basic configuration: lower rope end with thimble, LHW safety hook and CW connex; upper rope end with thimble and tag. Rope core protected against micropollutants. Sheathing colour: red. Electric conductor 4 x 1.25 mm² AWG 16.

Options on request (not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook.
- Accessories other than LHW safety hook and/or CW connex
- Different sheathing colours (blue, green, yellow, grey)
- Electric conductor with 2 to 9 conductors featuring 1 mm2 AWG 18, 1.25 mm2 AWG 16, 2.0 mm2 AWG 14 or 3 mm2 AWG 12 wires. Other possibilities on request.
- Different conductor types (number of stranded wires, other cross sections, etc.).
- Mounting of different plug types according to customer wishes

Limitations: **NO LOGGING**

Load factor limited to 3.0 g

- Application code: A, F
- Certification code i, ix, xi, xiv, xvii

- Electrically operated hybrid lines (TLE, TLME) employed for firefighting usually do not require the use of a low-torque swivel.
- If necessary, the installed electric conductor can be exchanged but its replacement requires a certain amount of work.
- Line lengths exceeding 50 m on request.

Fig.: Heli Austria's AS 32 SuperPuma with TLME_50_10 line (photo: Daniel Liebel/Heli Austria)

Electric lines

TLL – the classic electric line

The load-bearing element consists of high module polyethylene fibres (HMPE) cased in several protective layers. The rope is spliced at its ends and covered 2 times with a braided PES sheathing. Rope core protected against micropollutants. The line's performance is quasi-static (elongation at WLL = ~ 0.5%). The thimbles are made of high quality, high tenacity, stainless steel V4A and welded at the joint.

If connection to a Goggel swivel is required, the line is equipped with a cast headpiece made of PUR with a drilled round washer to ensure perfect fitting inside the Goggel casing and with the swivel interface.

If thimbles are required on both ends, the TLL model includes an LHW safety hook and a CW connex link of grade 10 quality.

The electric conductor inside the line is encased in a tube.

Fig.: TLL model with cast rope end on both extremities and AM_KAU_MIL special-design fitting.

Basic configuration

Standard equipment: lower rope end with round washer cast in the end fitting, quick release connection to protective casing containing low-torque swivel; upper rope end with thimble and tag. Rope core protected against micropollutants. Sheathing colour: white/red, made of multifil PES.

Alternative version with 2 cast end fittings

Upper and lower rope ends with round washer cast in the end fittings. Lower rope end with quick release connection to protective casing containing low-torque swivel; upper rope end with tag, can be equipped with special-design fittings. Rope core protected against micropollutants. Sheathing colour: white/red, made of multifil PES.

Alternative version with 2 thimbled end fittings (line extension)

Lower rope end with thimble, LHW safety hook and CW connex; upper rope end with thimble and tag. Rope core protected against micropollutants. Sheathing colour: white/red, made of multifil PES.

All versions

Standard electric conductor 4 x 1.25 mm^2 AWG 16

Options on request (not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook.
- Different conductor types (number of stranded wires, other cross sections, etc.).
- Mounting of different plug types according to customer wishes

Limitations: LOGGING is allowed only when equipped with additional protective sheathing (made of a tube, tape or similar; alternatively, choose the TLL+ model).

Load factor limited to 3.5 g

- Application code: A, B, F
- Certification code i, ix, xi, xiv, xvii

TLP – the logging line

Line properties and equipment are identical to TLL model. Usually, the TLP is equipped with cast rope end fittings on both sides. For weight classes from 30 to 50 kN, our cast headpieces can be equipped with special thimbles allowing bolt connection.

Fig.: the logging line with its extra-strong PA monofilament «panzer» sheathing: hard-wearing and durable.

Basic configuration

Standard equipment: lower rope end with round washer cast in the end fitting, quick release connection to protective casing containing low-torque swivel; upper rope end with thimble and tag. Rope core protected against micropollutants. Sheathing colour: red, made of monofil PA6.6.

Alternative version with 2 cast end fittings

Upper and lower rope ends with round washer cast in the end fittings. Lower rope end with quick release connection to protective casing containing low-torque swivel; upper rope end with tag, can be equipped with special-design fittings. Rope core protected against micropollutants. Sheathing colour: red, made of monofil PA6.6.

Alternative version with 2 thimbled end fittings (line extension)

Lower rope end with thimble, LHW safety hook and CW connex; upper rope end with thimble and tag. Rope core protected against micropollutants. Sheathing colour: red, made of monofil PA6.6.

All versions

Standard electric conductor 4 x 1.25 mm^2 AWG 16

Options on request (not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook.
- Different conductor types (number of stranded wires, other cross sections, etc.).
- Mounting of different plug types according to customer wishes

Limitations: Load factor limited to 3.5 g

- Application code: A, B, F
- Certification code i, ix, xi, xiv, xvii

TLCE – the multipurpose electric transport line

The TLCE line is a new design combining the advantageous properties of several rope models. It is compact to the touch but less stiff than TLP or TLL models. The electric conductor of TLL, TLL+ and TLP models is encased in a cable conduit and thus limited to 4 x AWG16, but the new TLCE has no cable conduit, so it can be equipped with (almost) every type of electric conductor (max. external diameter of cable: 13 mm). Due to its compact sheathing, the grip on the line is similar to TLDS+ or TLM/TLME models. An RFID tag is a standard feature.

Fig.: Upper rope end with thimble for H135/H135M helicopters and RFID tag for electronic tracking.

These lines are custom-made. According to your needs, we agree upon a design and manufacture your specific product.

Standard electric conductor 4 x 1.25 mm² AWG 16

Options on request (not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook.
- Electric conductor with 2 to 9 conductors featuring 1 mm2 AWG 18, 1.25 mm2 AWG 16, 2.0 mm2 AWG 14 or 3 mm2 AWG 12 wires. Other possibilities on request.
- Mounting of different plug types according to customer wishes

Limitations: **NO LOGGING**

Load factor limited to 3.0 g

- Application code: A, F
- Certification code i, ix, xi, xiv, xvii

TLL+ - the allrounder

Rope properties and equipment are a combination of TLL and TLP models. Rope core protected against micropollutants.

Lower rope end with cast headpiece made of PUR encasing a drilled round washer, red PA6.6 monofil protective sheathing (TLP).

Upper rope end with thimble or cast headpiece made of PUR encasing a drilled round washer, white/red PES multifil sheathing (TLL).

Example: line length of 50 m: 20 m of lower rope length made of monofil PA6.6, 30 m of upper rope length made of multifil PES.

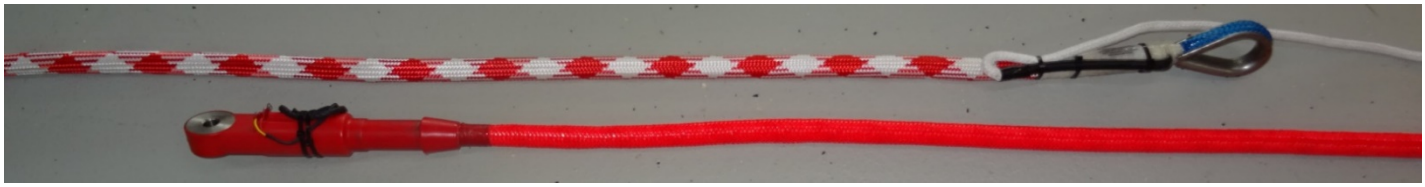


Fig.: TLL+ line (in this photo without Goggel swivel)

Basic configuration

Standard equipment: lower rope end with round washer cast in the end fitting, quick release connection to protective casing containing low-torque swivel; upper rope end with thimble and tag. Rope core protected against micropollutants. Sheathing and colour: one-third of the lower rope length made of monofil PA6.6, red; two-thirds of the upper rope length made of PES, red/white.

Alternative version with 2 cast end fittings

Upper and lower rope ends with round washer cast in the end fittings. Lower rope end with quick release connection to protective casing containing low-torque swivel; upper rope end with tag, can be equipped with special-design fittings. Rope core protected against micropollutants. Sheathing and colour: one-third of the lower rope length made of monofil PA6.6, red; two-thirds of the upper rope length made of PES, red/white.

All versions

Standard electric conductor 4 x 1.25 mm² AWG 16

Options on request (not included in the price, additional costs might occur):

- On request and after consultation, we can install a suitable/compliant ring serving as a connection to the cargo hook (welded into the thimble or linked with a connex). In this case, we need the Flight Manual Supplement (FMS) referring to the primary cargo hook.
- Different conductor types (number of stranded wires, other cross sections, etc.).
- Mounting of different plug types according to customer wishes

Limitations: Load factor limited to 3.5 g

- Application code: A, B, F
- Certification code i, ix, xi, xiv, xvii

- Electrically operated hybrid lines (TLL, TLP, TLL+, TLCE, TLE, TLME) employed for firefighting usually do not require the use of a low-torque swivel.
- If necessary, the installed electric conductor can be replaced with a certain amount of work.
- Line lengths exceeding 50 m on request.

Please contact us and ask for information! We are able to meet most of your special requirements!

Special features

Custom-made and/or special-design products

We also manufacture products according to customer wishes meeting your individual requirements or the specific conditions of your type of application. Don't hesitate to contact us for further information – we are always pleased to meet your needs!

Here are some examples: lines with fire-resistant core and protective sheathing (flame-retarding as requested by FAR/EASA 25.853), lines in camouflage colour complying with the Environmental Engineering Considerations and Laboratory Tests of MIL STD 810F (saltwater, fungi, humidity, et al.), extra-long (> 50 m) or extra-light lines with extra-precise measurements (accuracy of up to 10 mm), equipped with special devices (retainer plate for the instalment of measuring tools and special electric conductors), etc..

Fig.: Special-design line with flame-retarding sheathing and position marking.

Fig. left: ACTOS sensor package designed by TROPOS/Leibniz Institute. ∅ 8 mm rope, 170 m in length. Centre: customized LA for measuring sensor of the German BGR (Federal Institute for Geosciences and Natural Resources)

Fig. right: special-design line with 4 slinging points for the transport of radomes (radar antenna enclosures).

Cable harnesses

Custom-made and/or special-design products

We also design and manufacture complete cable harnesses which can be either integrated into the lines or used as single components (as replacement or additional equipment). According to customer specifications, this includes the installation of a plug connection (plug [M] and/or socket [F]), pull-off device and strain relief.

By means of continuity checks, A&H ENG ensures that the pin configuration complies with customer specifications.

Electric conductors include standard cables or in-house designs featuring 2 – 9 conductors (strand configuration). Usually, we employ AWG (American Wire Gauge) tinned wire conductors, sizes AWG 18, 16, 14, 12 or 10, with diameters from +/- 0.823 to 5.26 mm^2.

We offer a great choice of connectors (plug [M] and/or socket [F]) ranging from MIL-STD plugs to XLR outdoor connectors. A&H EQU can solder and screw pins, usually crimping is also possible.

One of our specialties is the splicing of 2 conductors with identical or different diameters. In this case as well, A&H EQU has all the means available to assemble MIL-conforming and crimped connections.

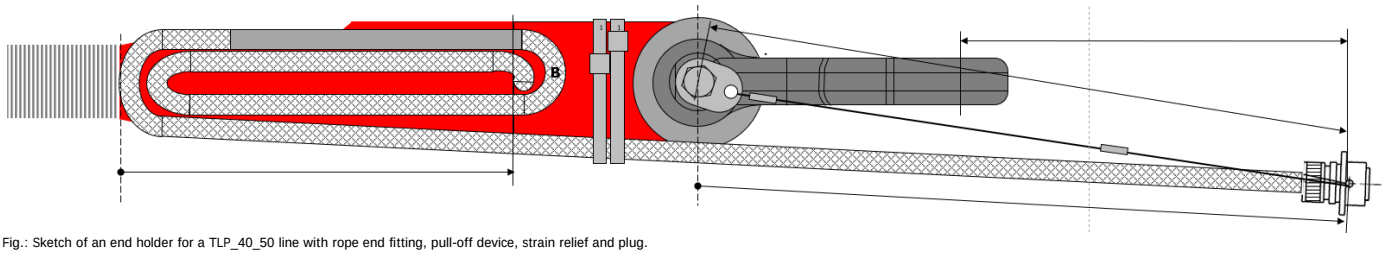


Fig.: Sketch of an end holder for a TLP_40_50 line with rope end fitting, pull-off device, strain relief and plug.

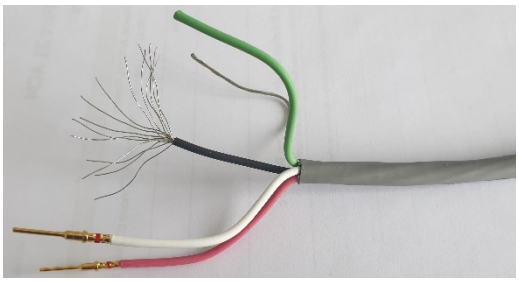


Fig.: 4 x AWG18 electric conductor including a ground wire (A = 0.823 mm2) and crimped pins

Fig. complex cable harnesses; design and size manufactured precisely according to customer specifications.

Parameters, limit conditions, interfaces

Configurations allowed

Lines manufactured by AirWork & Heliseilerei GmbH (A&H), including all their single components, are specifically designed for external load transport by helicopter.

Load element (SLE1_x) | Safety hook with Connex link | Line (symbolic illustration) | Thimble | Shock absorber (VM-DP_xx_1.5)

Also check DB Lines-electric_KSL and DB Lines-manuell_KSL data sheets.

Shock absorber

The use of a shock absorber (VM-DP) is optional. Here's a short chart to help you decide:

Line application type	Load nets	All types of construction material	Concrete buckets	Assembly work	Logging	Cable pulling	Concrete members	Firefighting buckets
Shock absorber strongly recommended					X		X	
Shock absorber recommended		X	X					x
Shock absorber not necessary	X			X		X		

This list is not exhaustive. Please carry out your own risk analysis to assess the necessity of a shock absorber.
Also check AWA, part 1, 4.4 „Diagram: Effect of shock loads (load peaks) with and without shock absorber"
A&H strongly recommends the use of a shock absorber. See also A&H-SB_2013-1 on www.air-work.swiss.

For the lifting and transport of loads, it is compulsory to place a low-torque swivel between the line and the cargo (rule of technology).
Without a low-torque swivel, due to load rotation, the line can be already irreparably damaged during one flight cycle.

The use of other components by other producers, mainly secondary or remote cargo hooks, can compromise the aforementioned characteristics or lead to dysfunctions (see also AWA, part 1, "Disclaimer" and "Warranty").

Helicopter service for professional load transport

- The employment of lifting accessories,
- the requirements regarding vocational education, responsibilities and recurrent training of "task specialists",
- the specifications for maintaining the serviceability of equipment

are regulated by EASA ED Decision 2014/018/R, Annex VIII, Part-SPO, AMC1 SPO.SPEC.HESLO.100.
The authorisation for helicopter external sling load operations (HESLO 1 to 4) must be obtained by the helicopter operator.

The transport of persons by means of lifting accessories and slinging equipment intended for HESLO 1 to 4 is FORBIDDEN!

For the employment of lines (but also of slinging devices and other lifting accessories), the following chapters of AWA, part 1, must be given particular consideration:

- 5.2 "Lifting and depositing of lifting accessories by helicopter"
- 5.3 "Tactical applications (tactical flying)"
- 5.3.1 "Example 1: Flexible intermediate bulk containers FIBC"
- 5.3.2 "Example 2: single, heavy tree trunks"

Loads allowed; usable limits

The loads allowed for transport line systems are defined in the helicopter approval certificate. The basic principle is:

- The operating load factor amounts to a maximum of 2.5 g (CS-27./29.865)
- For additional information, please check AWA, part 1, 3.6 and 4.2 et seqq.

Interfaces to other systems and/or components of a load lifting device

Slinging of loads to a secondary cargo hook

See www.air-work.swiss

Manually operated lines (without electric conductor)

The cargo must be hooked and unhooked manually to the load element with integrated swivel joint (SLE). The correct slinging of the load is obtained by using a suitable slinging point on the cargo or by employing suitable slinging equipment.

Electrically operated lines (with electric conductor)

Hooking of cargo to the electric cargo hook (TM) is done manually; hook opening and cargo release is done electrically by the pilot. Only in exceptional cases should the cargo hook be opened manually. The correct slinging of the load is obtained by using a suitable slinging point on the cargo or by employing suitable slinging equipment.

For more information, also check AWA, part 1, technical definitions

Preliminary and start-up procedures

Before starting flying operations, the single components must be assembled and checked to make sure they are perfectly functional (mechanics).

Cargo hook: attach the cargo hook to the swivel joint (permanent connection) and secure the bolt.

Line: connect the rope end with a Connex link and a hook (permanent connection).

Shock absorber: make sure that the shock absorber fittings are compatible with the upper rope end and with the primary cargo hook of the helicopter.

NEVER without a low-torque swivel! Exceptions to this rule must be founded and their outcome predictable (e.g. firefighting buckets, sensors guided by air current).

Check list for first-time operation

- Do all components have the same performance values (WLL in kN or kg)?
- Are the performance values (WLL in kN or kg) of all LLD components compatible with the helicopter's maximum carrying capacity?
- Do all the connecting links fit with their appropriate connection points (safety hooks with thimbles, etc.)?
- Do the line lengths meet the requirements (obstacle clearance)?
- Do all accessories of the slinging equipment meet the requirements of the cargo hook manufacturer?
- Are all people involved in the operation adequately instructed regarding the use of the product?

Start-up procedure

Roll out the line 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 cannot be formed during lifting. Do not drag the line over the ground more than necessary.

Before hoisting the line, please make sure that a marshaller guides the line until the secondary cargo hook leaves ground contact.

A marshaller must guide the line!

Operation

Apart from the max. operating load factor of 2.5 g, also the flight behaviour and the length of A&H EQU lines, as well as the dead weight attached to the lines, must be taken into account.

As a general rule, the flight behaviour of A&H EQU lines is excellent and they are not subordinate to speed limits.

In the case of line models TLL, TLP, TLL+, TLCE, TLE, TLME which are equipped with electric cargo hook and low-torque swivel, the latter are usually heavy enough to prevent the line from flying up.
Also check AWA, part 1, 3.9 „Ratio between rope weight and weight of lifting hook plus low-torque swivel“

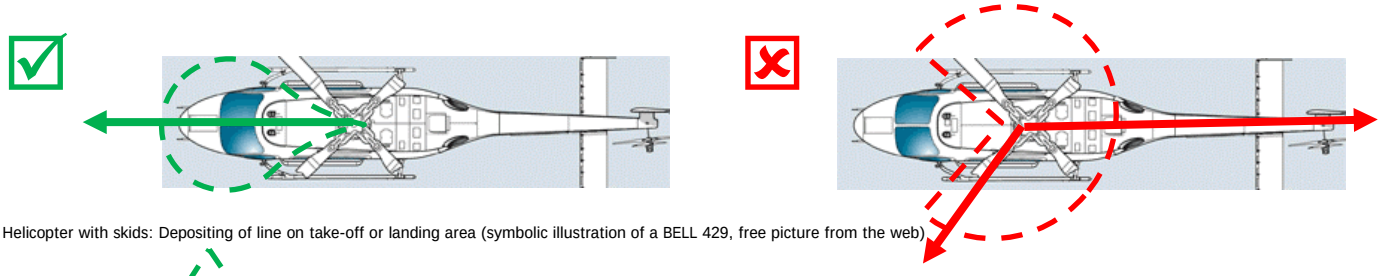
Line models TLDP, TLDS+, TL, TLM must be equipped with a sufficiently heavy load element and a low-torque swivel.

When operated without external cargo, line models TL/TLE (tactical lines) are subordinate to a speed limit of 60 kts.

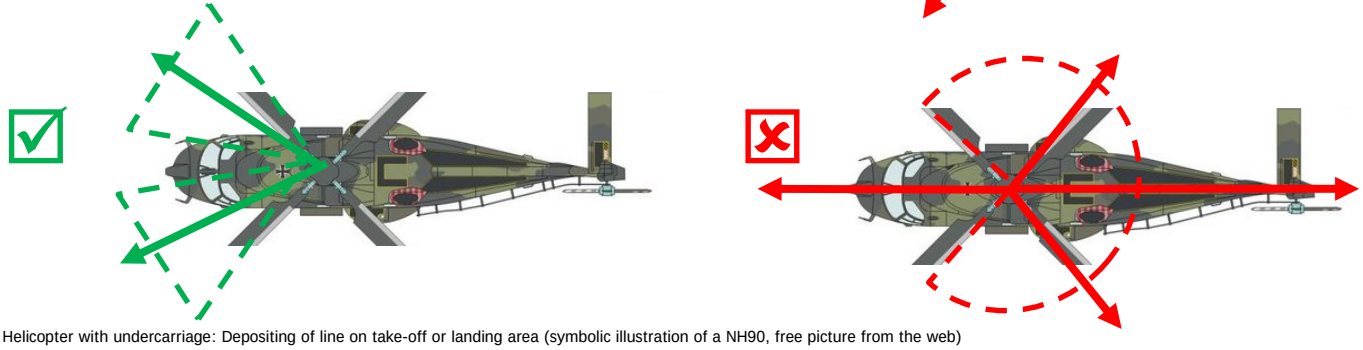
End of operation procedure

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

In case the pilot is obliged to deposit the line 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 line getting caught under the helicopter (skids, wheels, tail rotor).



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



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

Avoid sharp bends, knots or overtorquing of the line.

Depositing the line and landing the helicopter on the line:

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

Restoration / repackaging of lines

Before return transport by lorry or helicopter, first check the line, then – depending on line model – coil it up by hand or with a coiling device, flake it as you would for an alpine rope or in a figure of eight and subsequently fold it in the middle (TLS/TLSS). Accessories have to be secured or connected (e.g. safety hook to thimble). See illustrations.

Fig. left: TLP_40_50 line and shock absorber on coiling device with all-terrain wheels

Fig. centre: stackable transport bag with 4 handles for lines up to 50 kg/50m.

Fig. right: loosely flaked TLDS_14_30 line

For the evaluation of the condition of lines, anomalies and instructions for maintenance, see AWA, part 2, MRO steel and part 3 MRO textiles.

Fig. TLLS steel line with yellow protective sheathing. Steel lines must be flaked in a figure of eight (to distribute the tension), then folded up to a ring.

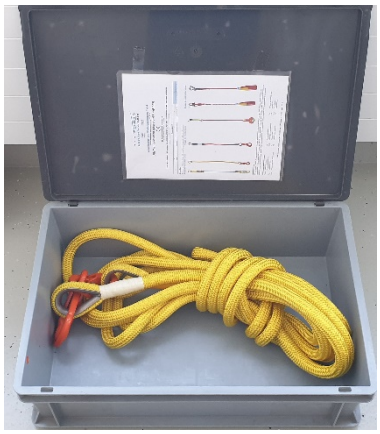


Fig. left: transport and storage box Fig. centre: bag in camouflage colour, capacity 45 l Fig. right: self-standing bag, capacity 30 l

Do not use elastic straps with metal hooks, since they may damage the protective sheathing or the bearing element.

Transport and storage

Transport and storage

During transport by helicopter or lorry, the line must be stored in a bag, case or hung up on a hook and kept far from other equipment or dangerous substances which might damage it.

For storage in a warehouse, please let the line hang loose from a hook or place it in a cardboard box.

Lines must always be stored dry in a well-ventilated room.

Possible inappropriate uses

(Ways of using lines that are inappropriate and for which they are not designed)

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

Possible inappropriate uses are described in AWA, part 1, 2.2.

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

Be careful to avoid other possible risks

The following factors could lead to dangerous situations and, therefore, must absolutely be avoided or supervised by a marshaller or another skilled person:

Possible inappropriate uses are described in AWA, part 1, 2.3.

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

For more information, also check AWA, part 1.

Residual risk

All types of ropes (textile and steel) run the residual risk of internal damage that cannot be seen from the outside. Hence, handling of such ropes requires special attention.

Maintenance and repair

For maintenance and cleaning instructions of steel components, please consult AWA, part 2, MRO steel, 6.2

For serviceability/criteria for withdrawal from service of steel components, please consult AWA, part 2, MRO steel, annex 4

For repair procedures of steel components, please consult AWA, part 2, MRO steel, annex 5

For maintenance and cleaning instructions of textile components, please consult AWA, part 3, MRO textiles, 6.2

For serviceability/ criteria for withdrawal from service of textile components, please consult AWA, part 3, MRO textiles, annex 4

For repair procedures of textile components, please consult AWA, part 3, MRO textiles, annex 5

Never remove or cover the product label, never write over it or alter it beyond recognition. Lifting accessories without a label cannot be considered safe and as manufacturer A&H instantly disclaims all responsibility, guarantees or other liabilities.

Engineering & manufacturer

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A&H Engineering und A&H Equipment

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ISO 9001:2015, SQS n° 32488

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

NATO NCAGE SAC17

Conditions for product use

This product has been manufactured in compliance with machinery directive 2006/42/EC, § 1 (1) d).

These instructions (AWA), in accordance with machinery directive 2006/42/EC, annex I, sections 1.7.4.1 and 1.7.4.2, as well as the EC declaration of conformity in accordance with 2006/42/EC, annex II, are an integral part of this product and must be compiled in the user's or a generally accepted common language. However, only the original German version is legally binding. 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.

Gaining a good knowledge of the present AWA, including all its subparts, must be part of user training carried out by the producer, its authorised representative (qualified person) and the person responsible for training in the user's company.

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

For a list of relevant legislation and suggestions for further reading, please consult AWA, part 1, 6.2 and 6.3.

Picture credits

Question to the persons responsible for training and work materials:

Have you read, understood and given instructions on parts 1 to 4?

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

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.

Member of ...

Internation Commission or Alpine Rescue

DE Bundesverband des Seiler- und Netzmacherhandwerks

Schweizer Textilfachschule

Swiss Textiles Textilverband Schweiz

Hubschraubermuseum Bückeburg e.V

Swiss Aerospace Cluster

Swiss Helicopter Association

Schwyz Next

www.air-work.swiss

Annex A Line properties

Categories	Manual lines				Hybrid lines				Electric lines			
Line properties / model	TLDP	TLDS+	TLS	TLSS	TL	TLE	TLM	TLME	TLL	TLP	TLCE	TLL+
Textile fibres (Dyneema®)	X	X					X	X	X	X	X	X
Textile fibres PES					X	X						
Steel line (low torque, cat A)			X	X								
WLL 1 – 5 kN (drones)	X							X				
WLL 6 – 9 kN (light helicopters)	X							X			X	
WLL 10 – 30 kN	X	X	X	X	X	X	X	X	X	X	X	X
WLL 30 – 60 kN					X	X	X	X	X	X	X	X
WLL 60 – 120 kN					X	X	X	X				
L1 5 – 50 m	X	X	X	X	X	x	X	X	X		X	
L1 30 m minimum length										X		X
Different length on request: < 5 m					X	X	X	X			X	
Different length on request: > 50 m	X	X	X	X	X	X	X	X	X	X	X	X
Without electric conductor	X	X	X	X	X		X					
Electric conductor 2, 4, 6 x 0.80 mm²								X			X	
Electric conductor 2, 4, 6 x 1.00 mm² AWG18								X			X	
Electric conductor 4 x 1.25 mm² AWG16						X		X	X	X	X	X
Electric conductor 9 x 1.25 mm² AWG16						X		X				
Electric conductor 4 x 1.5 mm²						X		X				
Electric conductor 5 x 1.5 mm²						X		X				
Electric conductor 4 x 2.0 mm² AWG14						X		X	X	X	X	X
Electric conductor 2, 4 x 5.25 mm² AWG10						X		X				
Plug / 2 – 9 pins, screwed/soldered						X		X	X	X	X	x
Plug/ 2 – 9 pins, crimped (MIL STD)						X		X	X	X	X	X
Cable harnesses (custom-made)						X		X	X	X	X	X
Individual labelling (P/N and S/N)	X	X	X	X	X	X	X	X	X	X	X	X
RFID or NFC tracking	(X)	(X)			(X)	(X)	(X)	(X)	(X)	(X)	X	(X)
Thimbles on both ends	X	X	X	X	X		X	X	X		X	
Loops on both ends (soft link)					X	X	(X)	(X)				
Special-design thimble on upper end (e.g. for H135-M helicopters)	X	X	X	X			X	X	X	X	X	X
Thimble on upper end, cast headpiece on lower								X	X	X	X	X
Cast headpiece on both ends									X	X	X	X
Steel end holder (EH-ST up to 20 kN)								X	X	X	X	X
Connections with safety hook and manual low-torque swivel (SLE)	X	X	X	X	X	X	X					
Connection with electric low-torque swivel (VM-DF, VM-DG)						X		X	X	X	X	X
Extension (safety hook – thimble)	X	X	X	X	X	X	X	X	X	X	X	X
Extension, electric (VM-VL)					X			(X)	X	X	X	X
PES multifil cover, braided	X	X					X	X	X		X	X
PA6.6 monofil cover, braided										X		X
Cover in PES fabric, sleeving					X	X						
Cover in PES/PA fabric, velcro or zip fastener	X				X	x		X				
Special cover for additional cable harness	X							X				
PVC cover (clear or yellow)				X								
Equipped with fibrous membrane >5 my	(X)						X	X			X	
Colour red (R)	X	X					X	X	X W	X	X	X W
Colour green (G)	X	X					(X)	(X)				
Colour blue (B)	X	X					(X)	(X)				
Colour yellow (Y)	X	X					(X)	(X)				
Colour black (BK)		X					(X)	(X)				
Colour grey (GR)		X			X	X	(X)	(X)				
Line without protective sheathing	2*	2*	X1*									
Line, very soft and flexible	X				X	X						
Line, a little less flexible		X					X					
Line, rather stiff			X	X				X			X	
Line, stiff (but easy to “guide”)									X	X		X
Best aerodynamic profile (no limits)	X	X	X	X					X	X	X	X
... limited profile (slightly non-round)							X	X				
... suboptimal profile (non-round, limits)					X	X						
Our products are compliant with:												
Machinery directive 2006/42/EC	X	X	X	X	X	X	X	X	X	X	X	X
EASA CS-27./29.865 ff	X	X	X	x	X	X	X	X	X	X	X	X
EN 1492-2 on round slings					X	X						
EN 1677-1 to 4 Forged steel components for slings, grade 8/10	X	X	X	X	X	X	(X)	(X)	(X)	(X)	(X)	(X)
STANAG 3542					X	X	X	X	X	X	X	X
DGUV information 214-911	X	X	X	X	X	X	X	X	X	X	X	X

1* The use of steel lines without protective sheathing is possible, but not recommended. The sheathing maintains the ropes' lubrication and keeps pollution to a minimum.

2* Lines without protective sheathing only in exceptional cases and only if the absence of sheathing is required by the type of application (e.g.: special-design line, 200 m in length, for stratospheric research)

(X) Available, but with reserve (only after prior consulting with customers)

X W Also available in white (W