Kromberg & Schubert GmbH Cable & Wire

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Handling, processing, transport and storage of spools and cables

We expressly refer to these instructions (FB_QM-11-02) on proper handling, transport, storage and further processing of spools and cables. These instructions are part of all offers and order confirmations of Kromberg & Schubert GmbH Cable & Wire and must be observed by all customers. Any warranty or liability for defects or damage resulting from non-observance of these instructions is excluded.

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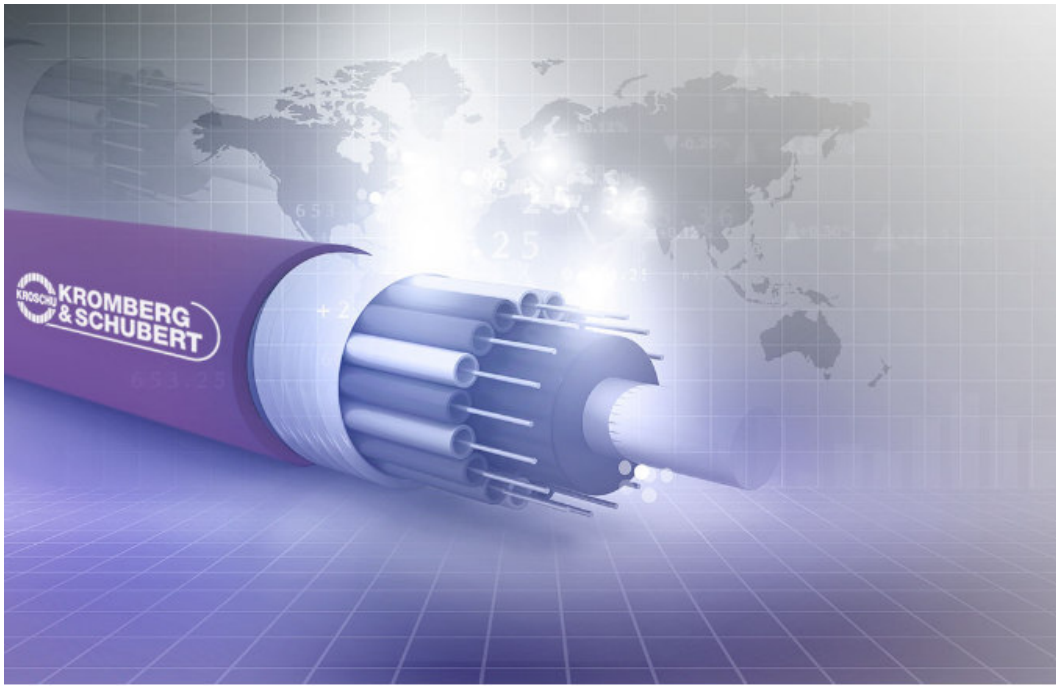
1. Content & Area of Application

The content of this guideline includes the handling, processing, transport and storage of spools and cables from Kromberg & Schubert GmbH Cable & Wire.

The products of Kromberg & Schubert are in line with IATF 16949, ISO 9001 and ISO 14001. The area of application of this guideline contains automotive cables as well as cables for industrial applications. For the automotive sector, the cables also comply with ISO 19642.



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2. Characteristics of application

- Cables and wires supplied by Kromberg & Schubert must be used in accordance with the given specifications and the applicable standards and relevant norms.
- Both mechanical and electrical forces must be applied in accordance with the cable and must not cause premature ageing or damage to cable components through incorrect use.
- Furthermore, all types of contacts and connections must be fitted in accordance with the specifications.
- The specifications given in the data sheets, which concern temperatures, mechanical and electrical loads, must be followed.
- The improper handling of cables and wires can cause electric shocks, that can result in injury or death.

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2. Characteristics of application

Mechanical Stress & Tensile Load

To avoid high mechanical stress on the cable the tension on the cable should be as low as possible.
With the following working steps the cable conductors must not be stressed with more than **50 N/mm²** nominal cross-section (**copper conductors**) and not with more than **20 N/mm²** for **aluminium conductors**:

- cutting,
- stripping,
- wrapping,
- laying, etc.

Improper tensile loads on the cables and wires can cause extrem stress on the conductor of the cables and causes damage to the wires.

- Do not wind a cable without load limitation and do not create loops in the cables in order to pull in the wire.
- Tensile forces over some windings around a mandreal with a diameter of at least 20 times the cable diameter.

Installation Temperature

The temperature of the environment has a big impact on the plastics of the cables.

- Improperly applied too high or too low temperature can cause the plastic to become too hard, brittle, soft or bendable in the cable.
- It is very important to consider the installation temperature and to observe it.
- You can find the installation temperature in the technical data sheet of the cable.

2. Characteristics of application

Bending

Improper bending of the cables and wires can lead to numerous defects of the cables and causes damage to the wires.
For example:

- changed insulation resistance,
- disruptive discharge or
- increased line attenuation.

To avoid these failures, please:

- prevent kinks and loops in the cables (use kink protection) and use bend protection,
- do not pull or bend the cable s around sharp objects,
- and if necessary, the minimum bending radius must be determined as part of the initial sampling.

Lateral pressure

- The conductor surfaces must not be subjected to high pressure both on the wound coil and during further processing.
- Do not fix the cables with hose clamps or cable ties and do not clamp them between sharp object.
- Stress on the cables, caused by heavy objects etc. should be avoided.

Marking & Re-Marking

An additional marking after the production is not possible for every insulation material. Please clarify this topic upfront. Very long storage periods or unsuitable storage temperatures can limit the ability to mark/remark the cable, as well as the contact of the jacket material with oil or grease.

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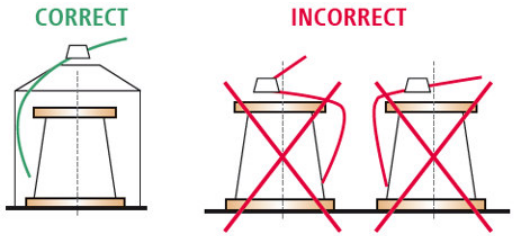
3. Processing*

Decoiling the cables

In the case of single-core cables, the tensile strength must be limited. A decoiling hood shall be used for cable packs, through which the cable is drawn loop-free overhead. In the case of NPS reels, the cable should be decoiled across the middle of the NPS. The use of a decoiling hood is recommended. As a matter of principle, the cables shall, unil they are stripped, be fe din such a way that damage and forming of loops is prevented. Consequently, sufficient tension must be selected when cables are pulled off. After processing the required quantities, the loose cable end must be fixed tightley to the upper flange before storage. Powered processes must be used for larger cross sections (e.g. >10 mm²).



Decoiling of multi-core and data cables without twist

Reels and drums shall be decoiled in a tension-controlled and as gentle as possible manner. Protective layers that are fixed on the inside bottom on the drums as a single layer shall not be decoiled or used. When drums are machine-processed, the recommendation is to use a tangential pay-off as this prevent knotting in the bundle and guarantee seemless further processing.

*adopted from: „ZVEI – Technical Guideline – TLF 0100 Version 1.1“ February 2021

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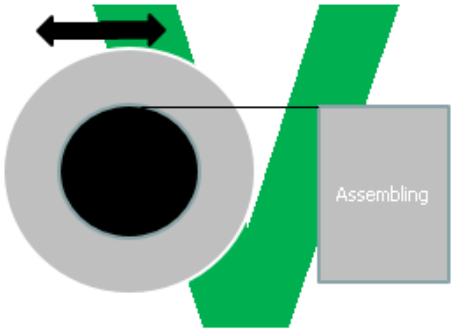
3. Processing

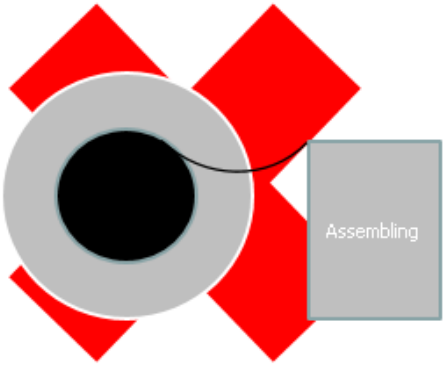
Cable handling before usage in assembling prozess

Never cut the white fixing band, when the reel is laying, many cable layers will fall down and you won't be able to rewind it!

Cut the white fixing band before you use the reel in your assembling process. The reel must be fixed in the decoiler and the cable must be under tension when the cable is winded/ rewinded.



Avoid cables without tension, when you wind / rewind the cable.



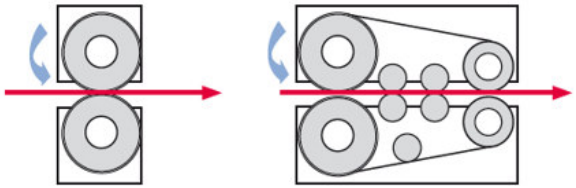
3. Processing*

Straighteners

Straightening devices must be set in such a way that the cable‘s rollers are straight, but do not cause damage due to excessive pressure, which could for instance, change the adhesion or the length of the insulation on a conductor.

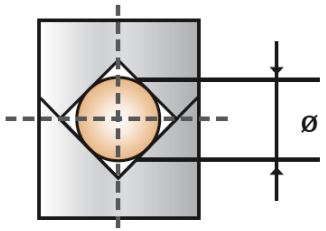
Cable pull-off

The clamping force must be big enough to ensure the cable does not slip but must not damage it or alter ist shape (oval). Care must be taken that the order of single cores or of the conductor is not altered.



Cable stripping

The stripping depth and the blade shape must be selected in each case in such a way that the insulated coverings are cut without damaging the substructure (stranded conductor or twisted assembly). Processing must avoid distending/cupping of the insulated covering of individual wires or the single cores while stripping a multi-core cable.



Check of opening distance of the cutting/stripping blade.

*adopted from: „ZVEI – Technical Guideline – TLF 0100 Version 1.1“ February 2021

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3. Processing - Bending

To provide the cable from damage, the inner bending radius has to be taken in account.
The parameters below apply for cables in fixed installations, have to be considered during the assembly and must be determined for every cable in a case-by-case scenario. The calculated radius is limited by a multiple of the outer diameter of the cable.

	minimum permissible bending radius (mm)	
Cable Type	**one-off bend (d=diameter)**	**repeated bending (max. 10 bends, D=Diameter)**
Single Core Cables (nominal cross section <= 6,00 mm²)	2 x d	6 x d
Single Core Cables (nominal cross section > 6,00 mm²)	3 x d	10 x d
Twisted, multi-core cables (without jacket)	5 x d	15 x d
Multi-core, unshielded and shielded cable with jacket • standard strand A or B • high flex strand (e.g. single wire D of 0,5 mm²) • flat cable (D=width x thickness)	 5 x d 3 x d 5 x d	 15 x d 10 x d 15 x d

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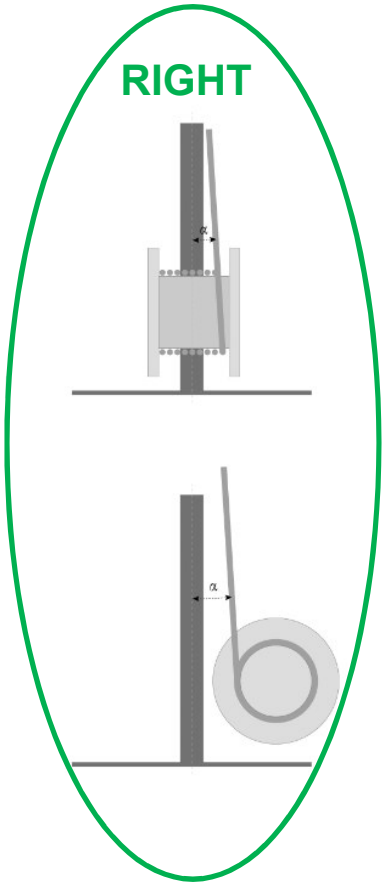
4. Processing - Commissioning



Removal of the packaging

In case of existing transport and packaging devices, these have to be removed before the processing of the cables. Please do not use sharp instruments for the removal, it can damage the wire and proceed with caution.

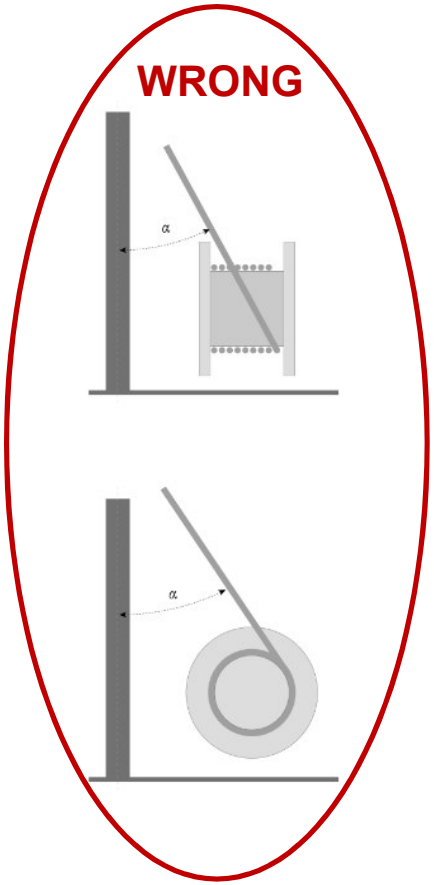
Winding and unwinding reels

Failure to follow the points below may result in damage to the cable:

- The angle between the cable and the installation object has to be as small as possible.
- If the cable sections are long, they must be laid with roller devices, positioned in regular intervals along the entire cable.
- In the winding and unwinding process a suitable winding device has to be used.
- Cables should be unwinded in the same direction like the cable winding.

Lifting Gear

The commissioner has to make sure, that only appropriate and inspected lifting gears are used for lifting the reels!



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4. Processing – Fixing

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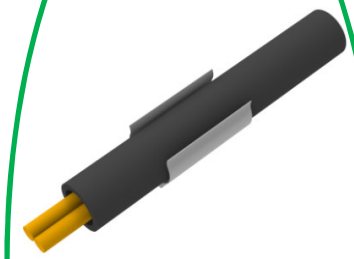

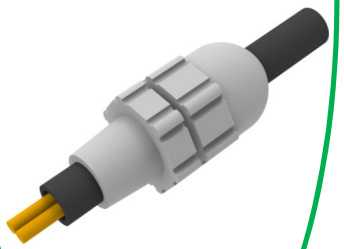

Cable fastening

Using of proper cable fastening by fixing the cable is indispensable, otherwise it can cause extrem loads on the cables. Improper use can lead to:

- permanent damage to the cable
- increased line attenuation
- altered insulation resistance
- disruptive discharge

To avoid these failures, please consider these hints during the fixing process:

- cable clamps have to withstand the applied fixing forces
- high forces should not act on the cables, this has to be maken sure with the fixing
- cable should not be restricted by the cable gland
- Special cable clamps should be used, so that the cable will be hold in a proper way
- no forces have to be applied onto the cable housing/harness by the cable
- a smoothing of the wire ends with the fingers should be avoided. Please take care of an absolute proper process.
- **cable ties and hose clamps must not be used**

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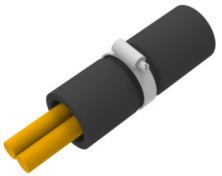
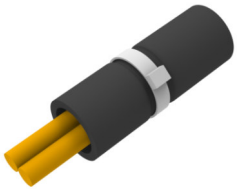
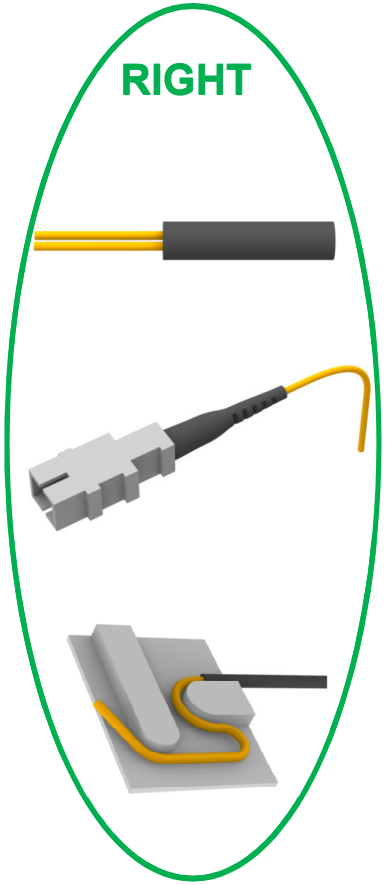




4. Processing – Fixing

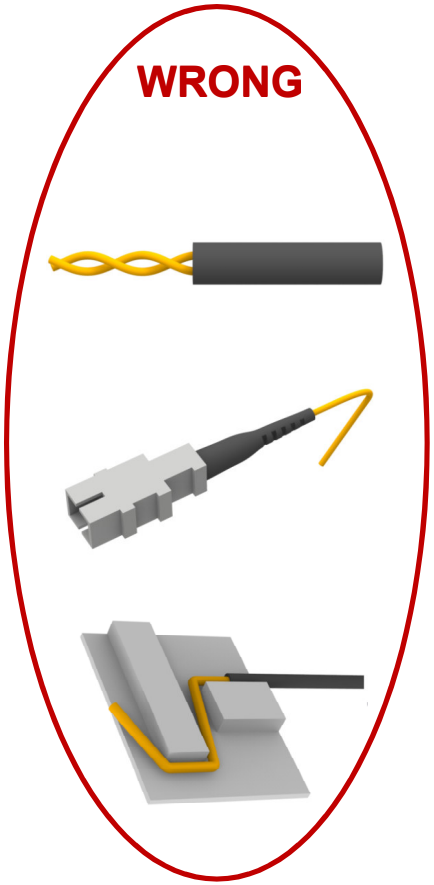


Laying of the cables cores

As explained in the previous points, the cables have to be protected against extreme loads. Improper laying of cables can cause failures, that can result in injuries or death.

The following points should be exploited to avoid these failures:

- cable cores should not be twisted
- lay the cores without applying tensile force and right along the cable duct
- the radii of the cable duct should be at least the minimum bending radii, which is specified for the cable cores
- in case of changes of the environmental conditions, the length of the cable cores should be sufficient long dimensioned
- in the fixing process of the cores with the connectors direct the cable in a straight position or with a sufficient bending at the back of the connectors



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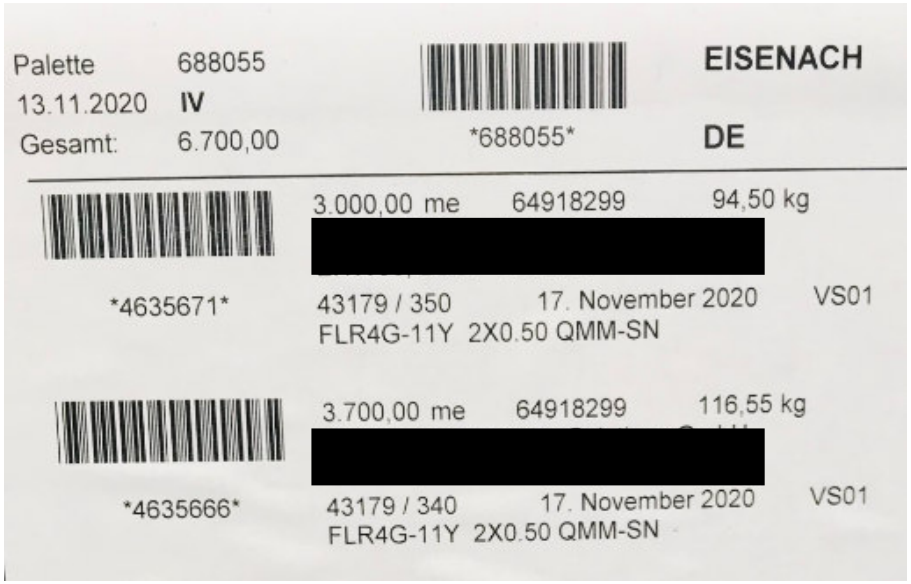
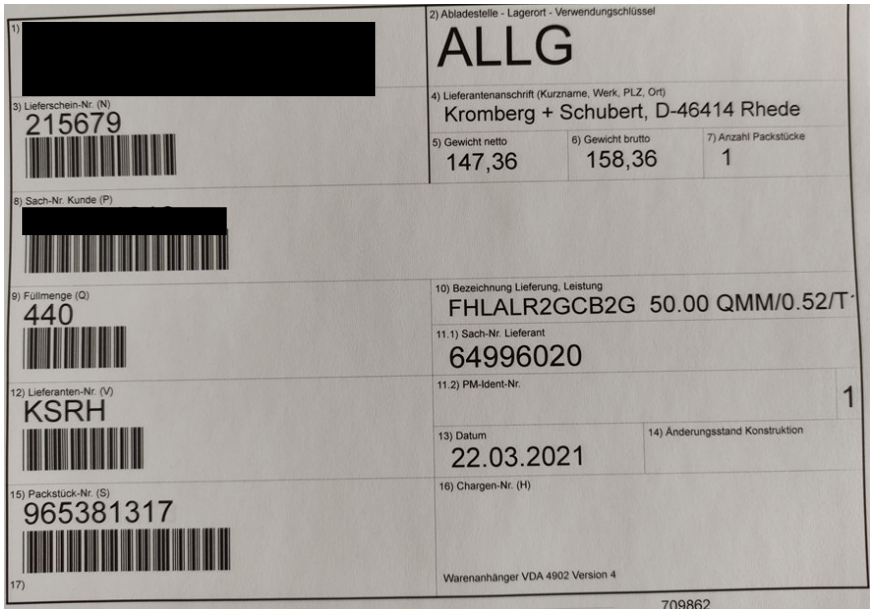
5. Packaging, storage and handling/transport

Labelling

Pallet bill



VDA Label



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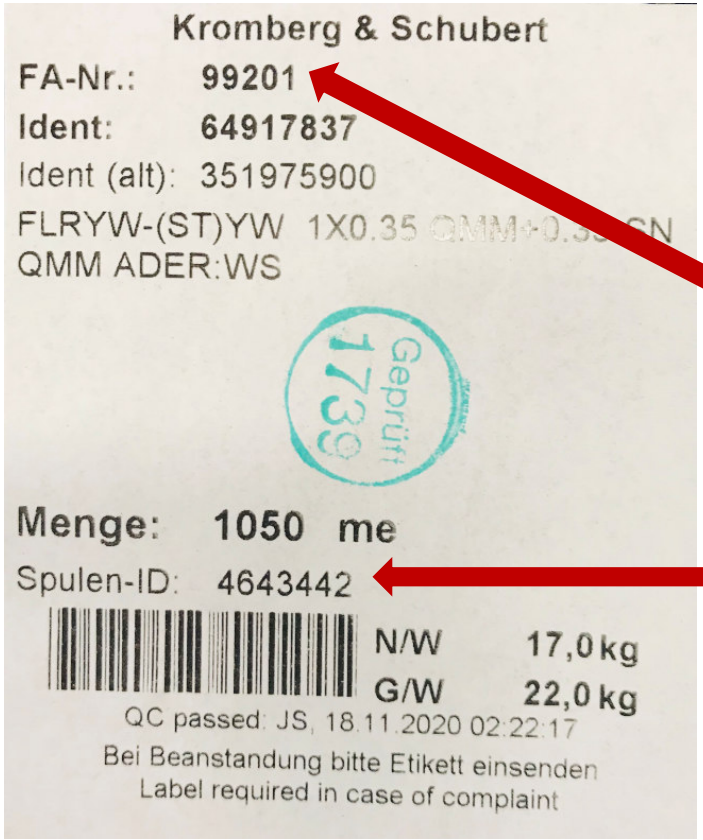
5. Packaging, storage and handling/transport

Labelling

Production Label:



Attention, this label is absolutely necessary for traceability!

5. Packaging, storage and handling/transport

Packaging

The cables from Kromberg and Schubert are securely and professionally packed by us for transport and storage. Altering the packaging and destroying it can lead to safety risks and quality defects. Damaged packaging must be reported by the supplier immediately after delivery. The customer is responsible for the proper and safe further transport and storage of the goods. The appropriate tools for relocation, transport and further processing are to be used for this purpose.Especially for the lifting of the spools, special equipement is necessary.

Kromberg und Schubert GmbH Cable & Wire reserves the right to deliver up to 10% of the contractual quantity in short lengths or as excess or short quantities, provided this is reasonable for the purchaser. Excess and short deliveries customary in the industry shall not be considered as defects and shall be accepted by the purchaser. Invoicing shall be based on the quantities actually delivered. In order to ensure optimum spool filling, this may be achieved by attaching line connections.

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5. Packaging, storage and handling/transport

In the table below you can find the Kroschu packaging standards. Special packaging and customer requirements can be carried out after consultation between Kroschu and the customer.

spool	number of layers	number per layer	pallet	max. number/pallet	storage/flange
KSP 40	4	6	120 x 80	24	horizontal
KSP 50	4	3	120 x 80	12	horizontal
KSP 80		2	120 x 80*	2	standing
KTSP 5	3	3	120 x 80	9	horizontal
KTSP 7		2	120 x 80	2	standing
KTSP 10		1	120 x 120	1	standing
HSP 6	3	2	120 x 80	6	horizontal
HSP 75	3	1	75 x 75	3	horizontal
HSP 75	1	2	120 x 80	2	horizontal
HSP 8		2	120 x 80*	2	standing
HSP 10		1	120 x 120	1	standing
NSP 400	1	6	120 x 80	6	horizontal

*** In case of pallet 120x80 and arrangement marked with * the type of pallet is selected according to the coil weight.**

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5. Packaging, storage and handling/transport

Sustainability of packaging and products

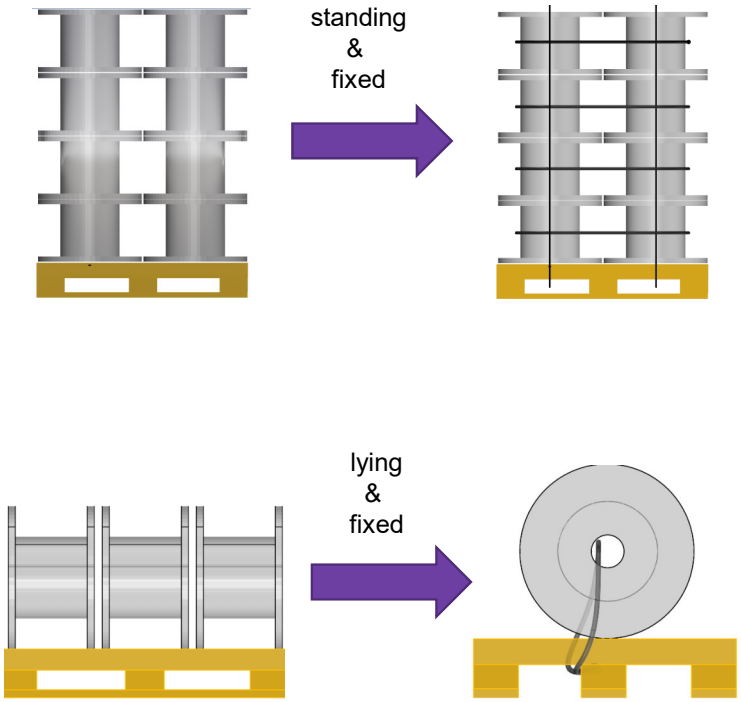
The cables contain valuable components that can be passed on to the recycling economy. In line with the sustainability concept, we recommend using a recycling company for this purpose.

Reusable containers should remain in the recycling system as long as possible. A high reuse rate conserves resources. To prevent reusable containers from being damaged during the transport, they should be secured on pallets or placed on loading units with a large standing area. The stackability of the loading units is at the discretion of the shipper. Suitable measures must be taken to prevent the load from shifting during transport.

Disposable containers and **other packaging materials** contain valuable raw materials and can therefore be returned to the circular economy. In keeping with the concept of sustainability, we recommend that a recycling company be commissioned for this purpose.

Laws and country-specific regulations along the entire transport route must be complied with by the shipper.

Possibilties for returning



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5. Packaging, storage and handling/transport

Storage*

Regardless of the insulation material used, a storage period of several years may be assumed given correct and proper storage conditions. The following are some of the storage conditions to be observed, with failure to do so potentially impairing the quality of the finished cables in their respective make-up. They must be stored at temperatures between +15°C and +35°C in a dry location protected against influences from weathering. *(In addition to these specifications, the product-specific processing instructions and storage apply. These can be found in the technical data sheet of the article from Kromberg & Schubert.)*

The recommendation is to not exceed a maximum relative humidity of 75 percent. The location should be protected against direct sunlight and UV exposure to prevent the cable jacket from damage and colour fading. Prior to processing, the cables must be stored in closed spaces for at least 24 hours so they can reach room temperature. The floor should be clean (clear of metal parts, wooden boards or pieces, nails, stones, etc.) to ensure the product are not damaged.

The cables must not be brought into contact with chemicals or corrosive agents. Reels (NPS) and drums must not interlock in storage because the reel flange might otherwise damage the material.

The cables should remain on the packaging units used for shipping until their final processing. Rewinding should be avoided.

The cables must be protected against water penetration (rain/condensation). The storage period may be limited by certain requirements associated with subsequent processing steps.
For cables dedicated to ultrasonic welding, it is recommended to limit the storage time to six month after delivery under outlined storage conditions. The process owner must define any restrictions.

Stripped cables must be processed immediately ! Attention oxidation. The formation of an oxide layer must be avoided.

*adopted from: „ZVEI – Technical Guideline – TLF 0100 Version 1.1“ February 2021

5. Packaging, storage and handling/transport

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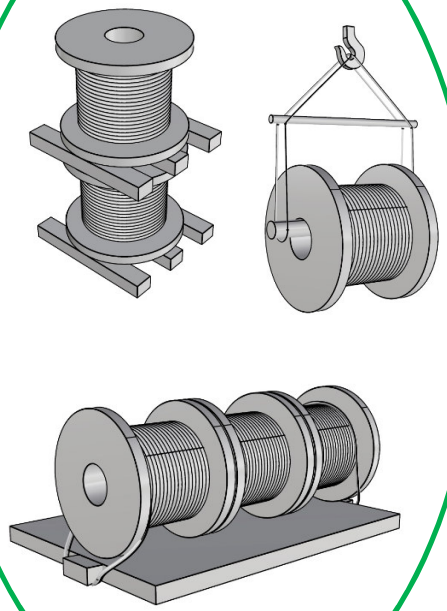

Transport & Storage*

“The cables must be protected against all risk of damage during transport.
Incorrect storage and transport of cable will affect the material properties and may have an adverse effect on the subsequent processing. Extended storage periods beyond normal conditions can result in accelerated ageing.
In such cases (like ultrasonic welding, molding, bonding) excessive storage periods, excessive storage temperatures or contamination of the cable or conductor (e.g. with grease and oils) can result in curtailing of material properties or impairing of processability.“*

The temperature during transportation and stocking should be +15°C to +35°C*. Especially at low temperatures mechanical stress by vibration, shock, bending or twisting has to be avoided.

*adopted from: „ZVEI – Technical Guideline – TLF 0100 Version 1.1“ February 2021

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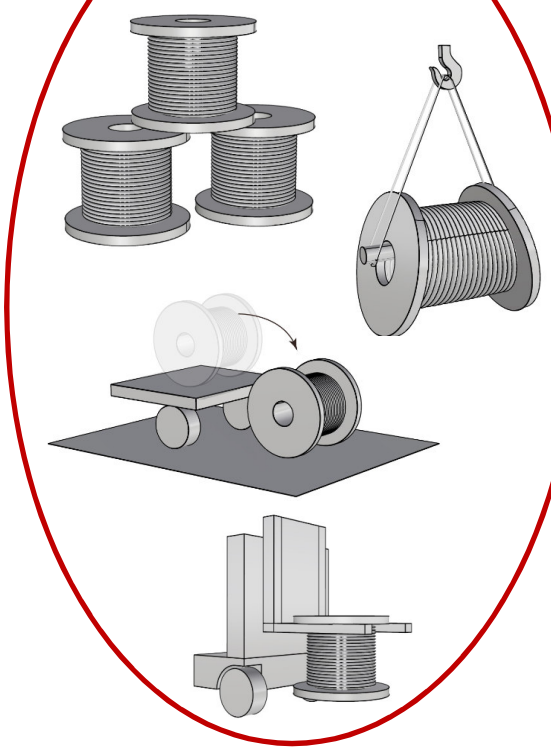

6. Assembly*

The cable‘s design must be considered when selecting the bonding method so that the cable properties are not compromised. For example, staying too long time in a solder bath can result in insulation shrinkage. The contact areas at the terminal lug must be free of oils, grease, dust and flakes, because these could have an adverse effect on the connection between the terminal and the conductor. The terminal must not have any damage that could harm the cable (either the conductor or the insulation) and adversely affect the connection.

The contact geometry must be set in such a way that neither the individual wires nor the insulation are damaged.

To counteract possible contact corrosion, the contact materials used must have a Standard Potential E that is similar to the conductor. Furthermore, the connecting surface must be kept free of agents that facilitate corrosion.

The conductor must be kept clean during handling, storage and processing; in other words, contamination by such foreign materials as metal dust must be avoided. The welding parameters depend on the surface cleanliness and the material characteristics of the parts to be connected. Correct dimensioning of the welding machine and the optimum service condition of the tools must be ensures. The welding parameters must be adjusted to the nature of the contact terminal and equipment.
Different strand constructions (even with the same conductor cross section) must also be considered when setting the welding parameters. The standard parameter settings of equipment manufacturers can only serve as a guide and must be adjusted to the parts to be processed. Care must be taken when soldering so that no solder penetrates from the soldering area further into the inside of cable (e.g. by capillary action) as this would impair the cable properties. The rule for special cables is that, to preserve the cables‘ electrical properties and particularly to maintain good crosstalk attenuation, the cable pair or quads must not be unnecessarily torsioned. In the case of shielded cables, the shield must reach into the connector as far as possible for the EMC properties not be unnecessarily lowered.

*adopted from: „ZVEI – Technical Guideline – TLF 0100 Version 1.1“ February 2021

Kromberg & Schubert GmbH
Cable & Wire

Innovation connects!

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