

# Electrical Equipment & Lighting Cables

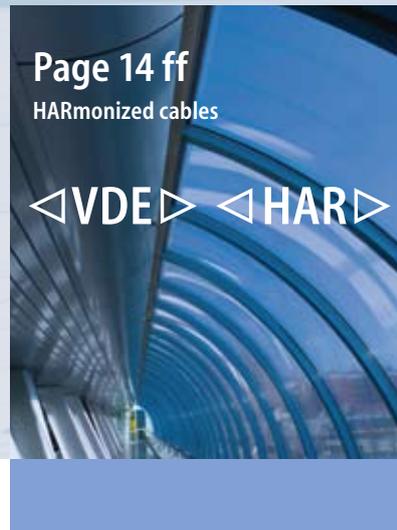
The Quality Connection

**LEONI**

# Contents

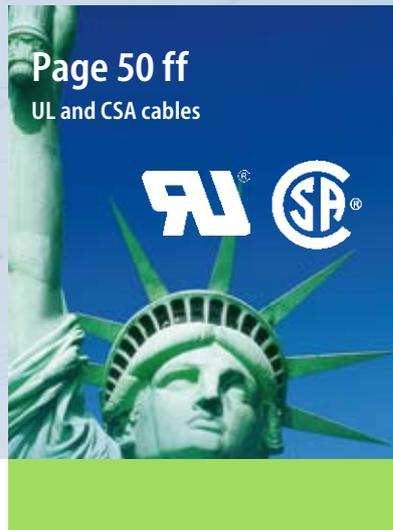
## The Quality Connection

Where to find the right connections	3
Quality and environmental management	4
LEONI is conform to RoHS	5
Conductor materials	6
Insulation material properties	8
Approved UL standards	10
Packaging	12



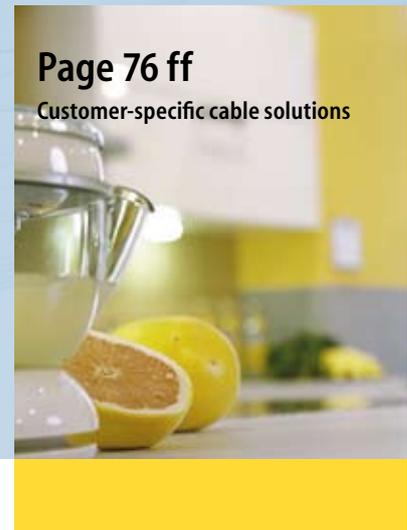
**Page 14 ff**  
HARmonized cables

◁VDE▷ ▷HAR▷



**Page 50 ff**  
UL and CSA cables

UL® CSA®



**Page 76 ff**  
Customer-specific cable solutions

### HARmonized cables

We offer approved quality worldwide	14
VDE standards	15
Mechanical characteristics	16
Electrical properties	17
CE marking	18
Harmonization markings	19
Type codes	20
Cable codes	22
Color code /	
Abbreviations of the core colors	23
Conductor classes/construction	24
HARmonized cables	25
<b>Product range single-core cables</b>	<b>26</b>
<b>Product range multi-core cables</b>	<b>37</b>

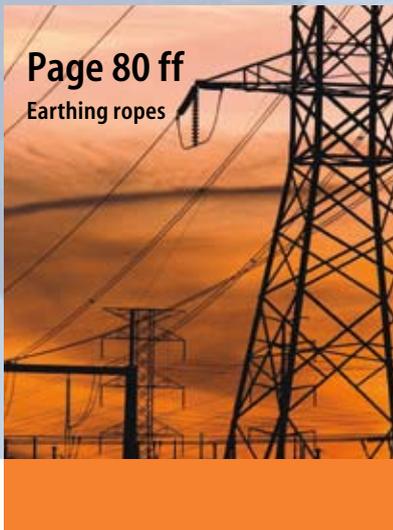
### UL and CSA cables

Quality connects –	
people, markets, companies	50
The significance of UL and CSA approvals	51
Marking	52
Type classification	53
AWG sizes	54
Standard constructions	
for copper conductors	55
UL and CSA flame tests	56
Product overview UL 758 AWM	58
Style pages	59
UL approved styles at LEONI	60
Approvals by CSA International	62
Coding key	63
<b>Single-cores according to</b>	
<b>UL 758 AWM / CSA C22.2</b>	<b>64</b>
Single-core cables	65
Multi-core cables	71
<b>Multi-core sheathed cables</b>	
<b>according to UL 62</b>	<b>73</b>
Multi-core cables	74

### Customer-specific cable solutions

Cables according to customer requirements and special cables	76
<b>Customer-specific cable solutions</b>	<b>77</b>

# Where to find the right connections



## Earthing ropes

The cable solution – when safety is required	80
<b>Earthing ropes</b>	<b>81</b>

## Service

LEONI keeps you up-to-date	83
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LEONI Kabel GmbH has accumulated decades of experience in the production of power cables. It is this experience and our commitment to continuous further development in all areas which make us a partner you can rely on.

We offer you:

- **Advice on product optimization**
- **Development of system solutions**
- **Laboratory and testing facilities**
- **Development of prototypes and series**
- **Manufactured and documented quality**

This current catalogue – designed to serve you as both a daily tool and a reference work– should be able to answer the majority of your questions.

If you fail to find the cable you need, please do not hesitate to get in touch with your contact in the sales department or our Product Manager. We will be glad to help you find a solution, e.g. by making a cable to your specifications.

# Quality and environmental management

## LEONI quality management

The high quality of LEONI products was and still is one of the most important factors behind the company's success.

It receives special attention from us in the exactness with which we conduct our planning, testing and documenting. Without this attention we would be unable to satisfy the exceptionally high standards of our customers. The quality management at all the LEONI Wire and Cable locations throughout the world is certified as complying with ISO9001:2000; locations producing automotive cables are also certified according to ISO/TS 16949:2002.

Our efforts are concentrated on preventive quality assurance involving fault-inhibiting instruments such as FMEA or machine and process capability analysis.



*The Quality Conn*

We use state-of-the-art systems to continuously measure, monitor and control the diameter and dielectric strength of our cables and wires during the production process. Regular testing of random samples (statistical process control methods) guarantees product compliance with the required limit values. With these tests conducted directly alongside the production line it is possible to respond quickly to any faults. The physical and electrical properties of our products are monitored by scheduled product audits in the laboratory.

Product properties are tested in accordance with our customers' own specifications and/or German and international standards. They include:

- cable and wire behavior under extreme temperature conditions
- functionality after artificial ageing
- resistance to fuels, lubricants and environmental influences
- resistance of the insulated covering to stretching, abrasion and tearing
- mechanical and electrical properties of the conductor
- alternate bending strength and resistance to torsion

Through the combined efforts of these quality assurance activities we are able to continuously optimize our ambitious quality goals.

## LEONI environmental management

For us, business success with ecological responsibility is not a contradiction in terms. As a globally active producer we acknowledge our co-responsibility in protecting the world's natural resources and basis of life. It is our concern to strike a harmony between nature's needs and our company's interests. As such, environmental protection is an intrinsic element of our corporate activities.

We motivate our contractual partners to follow environmental guidelines that are equivalent to our own, and we advise our customers on how to use and dispose of our products in an environmentally responsible manner.

Our environmental management system is certified as complying with ISO 14001:2004, confirming that our environmental policy is effectively implemented.

# LEONI is conform to RoHS



**RoHS** summarizes EU Directive 2002/95/EG that bans certain substances in production and processing of electrical and electronic equipment and components, as well as its respective implementation in national legislation.

The EU standard was passed on 1 January 2003. This EU Directive was supposed to have been adopted in the national legislation of the EU member states by the end of 2004. Yet the situation in the individual countries differs. In Germany, the Electrical and Electronic Equipment Act came into effect on 16 March 2005, which, along with the RoHS, also adopted EU Directive WEEE (disposal of Waste Electrical and Electronic Equipment) in German law. The transition period for the affected manufacturers and sectors ran until 1 July 2006.

The objective in the wake of the huge spread of disposal electronics is to ban highly problematic components from these products. In addition, the components used must themselves be free of substances such as

- cadmium    → mercury    → lead    → chrome (VI)
- polybrominated biphenyl (PBB)    → polybromodiphenylether (PBDE)

## What does RoHS stand for?

**RoHS** (Restriction of the use of certain hazardous substances in electrical and electronic equipment)

The original directive banned these substances as a matter of principle. As it would, for production-related reasons, have been impossible to meet this requirement and because it could not have been analytically proven, a revision of the directive dated 18 August 2005 stipulated specific limits:

- maximum 0.01 weight percent cadmium
- maximum 0.1 weight percent each of lead, mercury, chrome VI, PBB and PBDE

Exempt for the time being from this directive are medical devices as well as monitoring and control instruments, and, by fulfilling the End-of-Life Vehicle Directive, also automotive electronics as well as the defense sector.



# Conductor materials

The lion's share of our conductor material is copper (Cu). For the production of our wires we mainly use **Cu-ETP 1** (oxygenic copper) and **Cu-OF 1** oxygen-free copper for special applications (e.g. hydrogen resistance). In addition to pure copper we also process a variety of copper alloys for special applications.

Extract from EN 1977 "Copper and copper alloys – raw wire made of copper"

Symbol	Material No.	Composition in % by weight	Density g/cm <sup>3</sup>	Melting point	% IACS min.	Notes on properties and use
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### Oxygenic copper

Cu-ETP1 (E-Cu)	CW 003 A	Cu ≥ 99.90 Oxygen max. 0.040	8.9	1083 °C	101	Oxygenic (tough-pitch) copper with an electrical conductance in the soft state of ≥ 58.58 m/Ωmm <sup>2</sup> at 20 °C
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### Oxygen-free copper, non-deoxidized

Cu-OF1 (OF-Cu)	CW 007 A	Cu 99.95	8.9	1083 °C	101	High-purity copper, largely free of elements which evaporate in vacuum, with an electrical conductance in the soft state of ≥ 58.58 m/Ωmm <sup>2</sup> at 20 °C. Intermediate material meeting high requirements on hydrogen resistance; welding and hard soldering capability. For vacuum systems and electronics.
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International **A**nnealed **C**opper **S**tandard = **IACS**

Electrical conductance of Copper = min. 58 m/Ωmm<sup>2</sup> = 100 % IACS



**Tin (Sn)**



**Silver (Ag)**



**Nickel (Ni)**

**Galvanic coatings**

The metal materials used for galvanically refined copper wires are tin, silver or nickel, depending on the requirements.

Designation	Tin 99.90
Density	7.29 g/cm <sup>3</sup>
Melting point	232 °C
Criteria for use	
<ul style="list-style-type: none"> <li>■ <b>Good solderability</b></li> <li>■ <b>Effective protection from corrosion</b></li> </ul>	

Designation	Fine silver 99.97
Density	10.5 g/cm <sup>3</sup>
Melting point	960 °C
Criteria for use	
<ul style="list-style-type: none"> <li>■ <b>High temperature resistance</b></li> <li>■ <b>High conductance</b></li> </ul>	

Designation	Nickel 99.90
Density	8.9 g/cm <sup>3</sup>
Melting point	1450 °C
Criteria for use	
<ul style="list-style-type: none"> <li>■ <b>High resistance to corrosion and temperature</b></li> </ul>	

**Temperature limits for the use of conductor materials**

Directive CSA-C22.2 No. 210.2 assigns conductor materials to the following temperature limits:

<p><b>Temperature range max. +150 °C</b></p> <ul style="list-style-type: none"> <li>■ Plain and tin-coated copper with single wire <math>\varnothing &lt; 0.38</math> mm</li> <li>■ Copper-coated steel wire (e.g. Staku) with single-wire <math>\varnothing \leq 0.38</math> mm</li> </ul>
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<p><b>Temperature range max. +200 °C</b></p> <ul style="list-style-type: none"> <li>■ Plain and tin-coated copper with single-wire <math>\varnothing \geq 0.38</math> mm</li> <li>■ Copper-coated steel wire (e.g. Staku) with single-wire <math>\varnothing \leq 0.38</math> mm</li> <li>■ Silver-coated copper</li> </ul>
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<p><b>Temperature range max. +250 °C</b></p> <ul style="list-style-type: none"> <li>■ Nickel-coated copper</li> <li>■ Silver-coated alloys of cadmium-chrome-copper</li> <li>■ Nickel-coated steel wires</li> <li>■ Pure nickel wires for flexible applications and nickel alloys</li> </ul>
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# Insulation material properties

## Selection criteria

- Service temperatures
- Electrical values
- Flexibility/hardness
- Mechanical stability under load
- Abrasion resistance
- Resistance to oil, fuels, brake fluid, acids/alkalines, organic agents
- Flame-retardant
  - halogen-free/low halogen
- Lead free

Symbol	Name	Code e.g.	Density	Halogen content	Hardness Shore A/D	Tensile strength	Elongation at break
			g/cm <sup>3</sup>	approx. %		MPa	%

## Thermoplastics

<b>PVC-P</b>	Polyvinyl chloride (plasticized)*	Y	1.30–1.45	35	85A–95A	>10	>150
<b>SR-PVC</b>	Polyvinyl chloride, semi rigid	Y	1.24–1.34	40	85A–95A	>15	>150
<b>PE</b>	Polyethylene	2Y	0.92–0.95	0	50D–62D	>15	>300
<b>PA</b>	Polyamide	4Y	1.01	0	–/72D	>40	>300
<b>FEP</b>	Tetrafluoroethylene hexafluoropropylene	6Y	2.14	75	–/55D	>15	>200
<b>ETFE</b>	Ethylen tetrafluoroethylene	7Y	1.70	60	–/75D	>30	>200
<b>PP</b>	Polypropylene	9Y	0.91	0	–/70D	>15	>200
<b>PP-FR</b>	Polypropylene, flame-retardant	9Y	1.05–1.3	10	–/70D	>15	>200
<b>PFA</b>	Perfluoroalkoxy copolymer	51Y	2.15	75	–/55D	>20	>200
<b>PVDF</b>	Polyvinylidenfluorid	10Y	1.8	35	–/78D	>25	>100

## Thermoplastics

<b>TPE-U</b>	Thermoplastic polyether polyurethane	11Y	1.12	0	85A–54D	>30	>400
<b>TPE-E</b>	Thermoplastic polyether ester elastomer	12Y	1.16–1.25	0	40D–72D	>25	>400
<b>TPE-E</b>	Thermoplastic polyester elastomer	13Y	1.25–1.28	0	–/55D	>30	>300
<b>TPE-S</b>	Thermoplastic polystyrene block copolymer	31Y	1.10–1.30	0–10	55D–65D	>15	>200
<b>TPE-A</b>	Thermoplastic polyamide elastomer	41Y	1.01–1.06	0	75A–70D	>25	>400
<b>TPE-O</b>	Thermoplastic polyolefin elastomer	91Y	0.95–1.25	0–10	87A/–	>10	>300

## Elastomers / Cross-linked plastics

<b>E/VA</b>	Ethylene vinyl acetate	4G	1.30–1.40	0	80A–85A	>7	>150
<b>PVC-X</b>	Polyvinyl chloride, cross-linked	X	1.35	30	95A/–	>10	>150
<b>PE-X</b>	Polyethylene, cross-linked (XLPE)	2X	1.1	10	95A/–	>10	>200
<b>PE-X</b>	Polyethylene, cross-linked, halogen-free (XLPE)	2X	1.4	0	–/42D	>10	>200

**LEONI develops and uses insulation materials that provide high reliability and durability under operating conditions.**

**Requirements and quality**

- Material testing and development according to customer specifications and/or national and international standards
- Optimization of properties to meet changed or new requirements
- Regular quality control in the form of product audits

**Thermoplastics**

- Plasticized or semi-crystalline polymers
- Viscoplastic properties in the service temperature range
- Plastically ductile at temperatures above the yield limit

**Thermoplastic elastomers**

- Polymer soft and hard segments
- Rubber-like elastic properties in the service temperature range
- Plastically ductile at temperatures above the yield limit

**Elastomers / Cross-linked plastics**

- Cross-linked polymer soft and hard segments
- Rubber-like elastic properties with high reversible deformability in the service temperature range
- No thermoplastic flow properties
  - the cross-linked structure is retained up to decomposition temperature, i.e. well above service temperature

Service Temperatures		Resistance to								
Temperature index**	Cold winding test	Specific volume resistance	Dielectric strength	Abrasion	Flame retardation	Oil	Fuels	Brake fluid	Acids/Alkalines	Organic agents
°C/3000h	°C	Ω · cm	kV/mm							
105*	-25/-40*	>10 <sup>12</sup>	>10	+	+	+	+	-	+	-
80	-30	>10 <sup>12</sup>	>10	+	+	+	+	-	+	-
90	-40	>10 <sup>16</sup>	>30	+	--	-	+/-*	--	+	-
105	-50	>10 <sup>12</sup>	>10	++	-	++	++	+	+	+
210	-65	>10 <sup>15</sup>	>30	++	++	++	++	++	++	++
180	-65	>10 <sup>15</sup>	>30	++	++	++	++	++	++	++
125	-40	>10 <sup>16</sup>	>30	+	--	+	+	-	+	+
125	-40	>10 <sup>14</sup>	>20	+	+	+	+	-	+	+
260	-80	>10 <sup>15</sup>	>30	++	++	++	++	++	++	++
150	-30	>10 <sup>14</sup>	>30	++	++	++	++	++	+	+
125	-40	>10 <sup>9</sup>	>10	++	-	++	++	+	+	+
90	-40	>10 <sup>9</sup>	>10	++	-	++	++	+	-	+
150	-40	>10 <sup>9</sup>	>10	++	+/-*	++	++	+	+	+
125	-40	>10 <sup>10</sup>	>10	-	+/-	+	+	-	+	-
90	-50	>10 <sup>10</sup>	>10	++	-	++	++	+	-	+
125	-40	>10 <sup>14</sup>	>20	-	+/-*	-	-	-	+	-
140	-40	>10 <sup>10</sup>	>10	-	-	-	-	-	-	-
105	-40	>10 <sup>12</sup>	>10	++	+	+	+	-	+	+
125	-40	>10 <sup>14</sup>	>20	+	+	+	+	-	+	+
125	-40	>10 <sup>14</sup>	>10	+	+	+	+	-	+	+

++ Excellent  
 + Good  
 - Fair  
 -- Poor

\* depends on recipe, as required  
 \*\* criterion: residual elongation at break > 50 %



## Approved UL standards

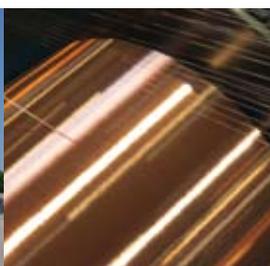


UL Approvals			Production plants				
UL standard	UL No.	UL code	Germany	China	Poland	Mexico	Turkey
Appliance Wiring Material	758	AVLV2/ AVLV8 (CUR)	E47543	E47543	E47543	E47543	
Flexible Cords	62	ZJCZ	E179483	E179483			
CSA standard	CSA No.	CSA class	Germany	China	Poland	Mexico	Turkey
WIRES – Appliance	C22.2 No.210	5851-01	64163	64163	64163	64163	
WIRES – Equipment	C22.2 No.127	5835-01	35844	35844	35844	35844	
WIRES – Radio Circuit Wires	C22.2 No.127	5854-01	34123	34123	34123	34123	
WIRES – Flexible Cord	C22.2 No.49	5831-01	33119				
HD standard	VDE No.		Germany	China	Poland	Slovakia	Turkey
HD21.3	0281 Part 3		VDE 94447H	VDE 139147	BBJ PL/01/2006 BBJ PL/02/2006		TSE 144/145
HD21.7	0281 Part 7		VDE 97036	VDE 139145	BBJ PL/03/2006 BBJ PL/04/2006		TSE 140/141
HD21.9	0281 Part 9		VDE 94450				
HD22.7	0282 Part 7		VDE 40016176				
HD22.9	0280 Part 9		VDE 101837				
HD21.5	0281 Part 5		VDE 94448	VDE 107661		40011465	TSE 142/143
HD21.12	0281 Part 12		VDE 96266	VDE 40010253		40011464	
HD21.13	0281 Part 13		VDE 106447				
HD359	0283 Part 2		VDE 125503H				
HD359	0281 Part 404		VDE 58639H				
HD22.10	0282 Part 10		VDE 115555				



- Germany** → LEONI Kabel GmbH, Roth
- China** → LEONI Cable (Changzhou) Co. Ltd., Changzhou
- Poland** → LEONI Kabel Polska S.p.z.o.o., Kobierzyce
- Mexico** → LEONI Cable Mexico S.A. de C.V., Chihuahua
- Turkey** → LEONI Kablo ve Teknolojileri San ve. Tic. Ltd. Sti., Gemlik
- Slovakia** → LEONI Slovakia spol. s.r.o., Nová Dubnica

**LEONI Cable plants with Approvals**





Our power cables can be supplied in all standard forms of packaging to suit the customer's further processing needs:

- barrels
- drums
- coils
- cable packs



## Packaging

### Drums

Single-core cables of large cross section and multi-core cables are generally supplied on wooden drums from the drum pool of KTG Kabeltrommel GmbH & Co. KG · Neusser Str. 617 · 50737 Cologne, Germany. Drum rental is governed by KTG's terms and conditions. A copy is available upon request. If requested, we can supply LEONI drums at a charge

Popular drum Types are:

#### KTG-Drums (re-usable)

- Type **KT050** plastic
- Type **KT080** plastic

#### LEONI-Drums (re-usable)

- Type **K3502** plastic
- Type **K5000** plastic
- Type **K8002** plastic

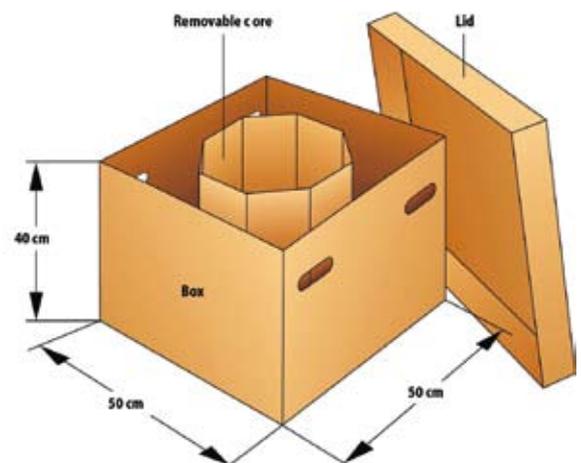
#### LEONI-Drums (non re-usable)

- Type **H6008** wood
- Type **H7601** wood

### The LEONI-BOX

The LEONI-BOX is a practical and environmentally friendly, re-usable cardboard package for conductors. The corrugated cardboard is made of organic, recyclable and environmentally friendly materials.

Full LEONI-BOXES are shipped with closed lids on pallets 103x103 cm. The pallets are taken back on request. A maximum of 12 LEONI-BOXES can be stacked on a pallet.





### Cable Packs

The Niehoff re-usable cable pack is a particularly advanced form of packaging. It consists of a re-usable, high-grade plastic spool which can be combined into an upper flange with core and a lower, removable flange.

The cable pack is moved by means of a hoist inserted in holes on the flange. A pay-off device is used to feed cable from the pack.

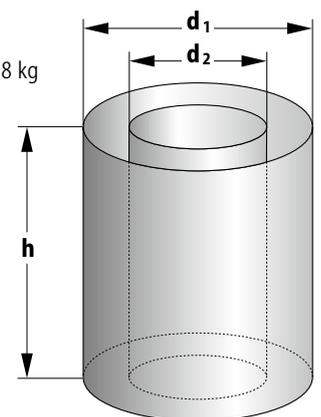
Partly used packs can be moved and re-stacked with ease. As many as 100 re-usable packs can be stacked inside one another on one pallet for return shipment.

### Barrels

To protect the environment and to conform with legislation, our barrels are re-usable cardboard barrels almost without exception. The most popular barrel types:

Type <b>F 5000</b>	Outer-Ø $d_1$	500 mm
	Core-Ø $d_2$	315 mm
	Height $h$	410 mm
	Weight empty	approx. 9.0 kg

Type <b>F 5001</b>	Outer-Ø $d_1$	500 mm
	Core-Ø $d_2$	320 mm
	Height $h$	710 mm
	Weight, empty	approx. 10.8 kg



# HARmonized cables

LEONI Kabel GmbH has accumulated decades of experience in the production of power cables. It is this experience and our commitment to continuous further development in all areas which make us a partner you can rely on.

Our high voltage cables are insulated with PVC, thermoplastic elastomer and fluorocarbon plastics among other materials.

**We offer approved  
quality worldwide**



# VDE standards

The types of insulated power cables listed in the catalogue are designed solely for conducting and distributing electrical energy.

**Note:** The standards listed below are available from the following address: VDE-Verlag GmbH · Bismarckstrasse 33 · 10625 Berlin · Phone (030) 34 80 01-0 · Fax (030) 3 41 70 93

DIN VDE...	Specifications
<b>DIN VDE 0100</b>	Specifications for installing power systems with nominal voltage up to 1000 V
<b>DIN VDE 0113</b>	Electrical equipment of industrial machines
<b>DIN VDE 0165</b>	Installing electric plants in areas subject to explosion hazards
<b>DIN VDE 0207</b>	Insulation and sheathing compounds for insulated cables
<b>DIN VDE 0250</b>	Insulated power cables
<b>DIN VDE 0281</b>	PVC insulated power cables as described in harmonization document HD 21. 1 S3
<b>DIN VDE 0282</b>	Rubber-insulated power cables as described in harmonization document HD 22. 1 S3
<b>DIN VDE 0293</b>	Color coding of the cores of power cables and insulated power cables with nominal voltages up to 1000 V
<b>DIN VDE 0295</b>	Conductors for cables and insulated cables for power installations
<b>DIN VDE 0298</b>	Use of cables and insulated cables for power installations (Part 3, "General information about cables", and Part 300, "Guidelines for harmonized cables")
<b>HD22.7</b>	VDE 0282 Part 7
<b>HD22.9</b>	VDE 0280 Part 9
<b>DIN VDE 0298</b>	Recommended values for current carrying capacity of cables (Part 4)
<b>DIN VDE 0472/0473</b>	Testing of cables and insulated cables
<b>DIN VDE 0700</b>	Safety of electrical equipment for home use and similar purposes
<b>DIN VDE 0710</b>	Regulations for lamps and operating voltages under 1000 V
<b>DIN VDE 0720</b>	Specifications for electrical heating equipment for home use and similar purposes
<b>DIN VDE 0730</b>	Specifications for equipment with electric motors for home use and similar purposes
<b>DIN VDE 0740</b>	Safety of hand-held electrical tools

The PVC, TPE and elastomer insulated power cables listed in this catalogue are designed for nominal voltages  $U_0/U$  up to 450/750 V. The set-up data and conditions under which the safety of these products and their compliance with the prevailing standards are tested and governed solely by the VDE regulations and the harmonization documents HD 21/22 and HD 516 S2.

The harmonization, i.e. alignment, of standards issued by different committees or countries for the same scopes of application continues to make progress. Its primary purpose is to prevent or eliminate technical barriers to trade. National standards can be brought in line with international documents:

- by adopting the harmonization documents without change
- by adopting the technical content of the harmonization documents.

To comply with the rules laid down by CENELEC (Comité Européen de Normalisation Electrotechnique), countries are obliged to adopt certain IEC standards (IEC = International Electrotechnical Commission), European standards (EN) and the harmonization documents (HD) issued by CENELEC into their national specifications. This is in the interest of European and global harmonization.

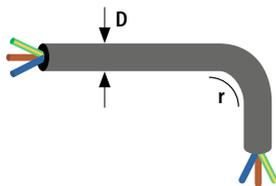
Listed above are the most important standards published as VDE specifications for the selection and use of insulated power cables. These standards can be consulted to ascertain any special rules governing installation, equipment and operation.

# Mechanical characteristics

## Minimum permissible bending radii of cables at temperatures of +20 °C ±10 °C.

Whenever cables have to be bent you should select an inner bending radius (*r*) which ensures that the cable does not suffer any damage. The inner bending radii for the different types of cable shown on the following pages are listed in the table below.

Use	Outer diameter of cable or thickness of flat cable in mm			
	D ≤ 8 mm	D > 8 mm ≤ 12 mm	D > 12 mm ≤ 20 mm	D > 20 mm
<b>PVC and rubber insulated cables for fixed installation according to HD 21 and HD 22</b>				
in normal use	4 D	5 D	6 D	6 D
with careful bending	2 D	3 D	4 D	4 D
<b>PVC insulated flexible cables according to HD 21</b>				
fixed installation	3 D	3 D	4 D	4 D
free movement	5 D	5 D	6 D	6 D
at the entrance to movable appliances and equipment with no mechanical loading of the cable	5 D	5 D	6 D	6 D
mechanical loading	9 D	9 D	9 D	10 D
garland-shaped as on gantry cranes	10 D	10 D	11 D	12 D
with repetitive coiling operations	7 D	7 D	8 D	8 D
deflected over guide rollers	10 D	10 D	10 D	10 D



### Notes

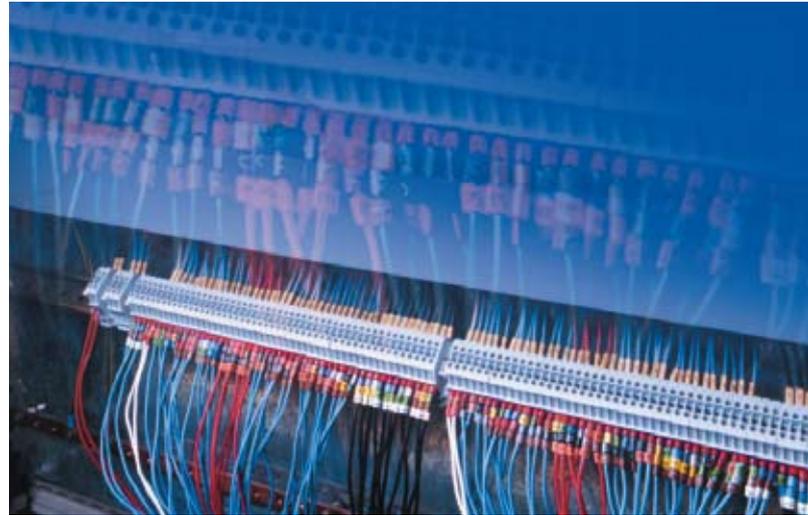
- D = Outer diameter of round cables and thickness of flat cables
- r = inner bending radius

## Permissible tensile stress on cables

The following tensile stress values per copper conductor should not be exceeded:

Conductor cross section	Use	Examples	Calculation of tensile force
50 N per mm <sup>2</sup>	when fitting cables for fixed installation	H07V-U 1×4	4 · 50 N/mm <sup>2</sup> = 200 N max. tensile force
15 N per mm <sup>2</sup>	with static tensile stress on flexible cables and on cables for fixed installation used in permanently installed circuits	H05VV-F 4 G 2.5	4 · 2.5 = 10 mm <sup>2</sup> · 15 N/mm <sup>2</sup> = 150 N max. tensile force

# Electrical Properties



## Explanation of terms (extract from DIN VDE 0298)

A cable's **nominal voltage** is the voltage on which its construction and the testing of its electrical characteristics are based. The nominal voltage is expressed by 2 values for  $U_0/U$  in volts.

In a system with AC voltage, a cable's nominal voltage must equal at least the system's  $U_0$  and  $U$  values.

In a system with DC voltage, the system's nominal voltage must not exceed the nominal voltage of the cable by a factor of more than 1.5.

**$U_0$**  r.m.s. voltage between an outer conductor and "earth" (metal covering of the cable or surrounding medium)

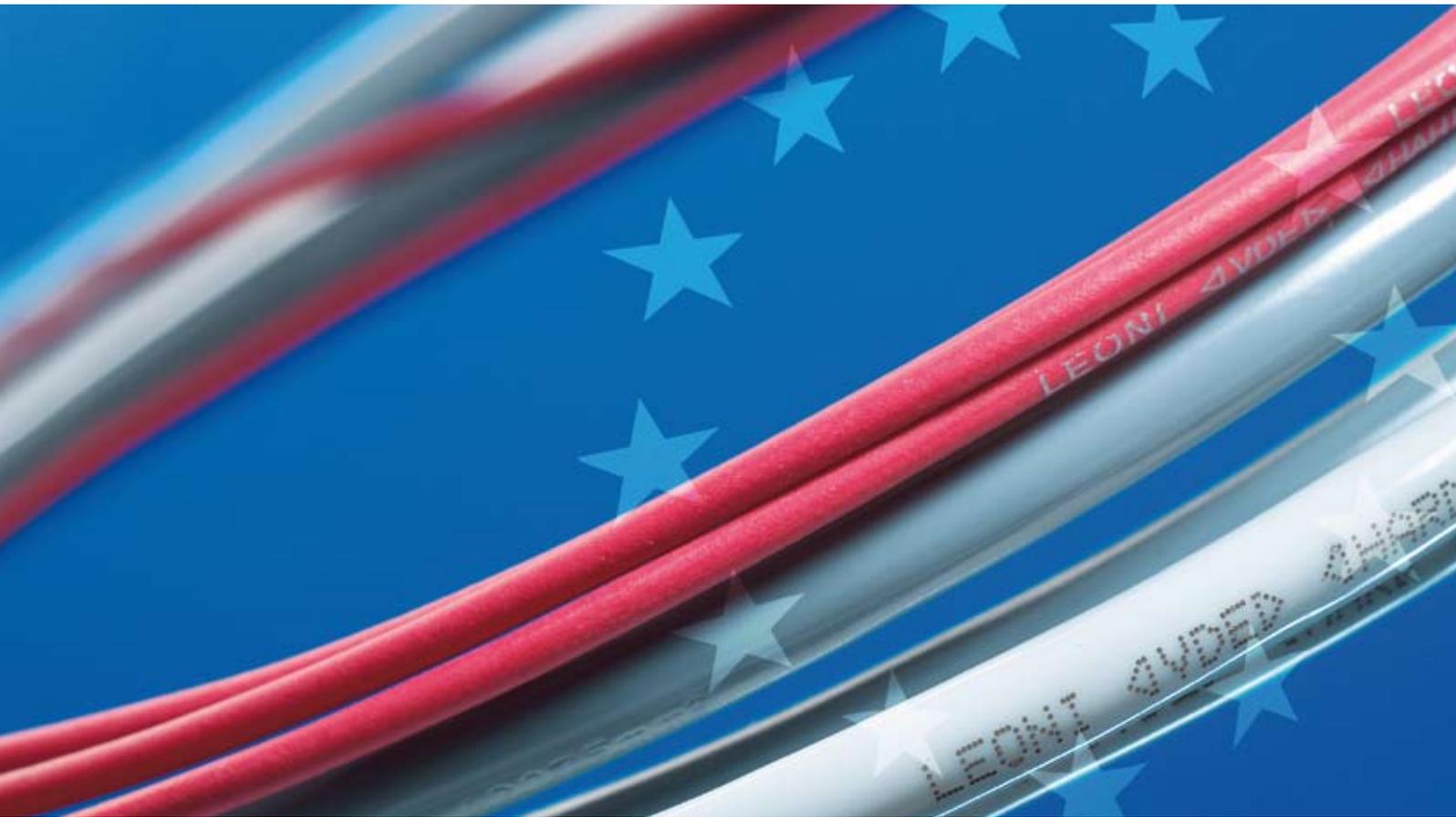
**$U$**  r.m.s. voltage between two outer conductors of a multi-core cable or a system of single-core cables.

**Operating voltage** is the voltage which exists locally and temporarily between the conductors of an electrical power installation or between a conductor and earth during undisturbed operation. A system's maximum operating voltage may continuously exceed the nominal voltage of the cable by 10 %.

Cables approved for safety class II are covered with either a thicker insulation, e.g. H03VH-H, or a two-layer insulation consisting of core insulation and a sheath, e.g. H05VV-F.

When planning a system you should select a nominal conductor cross section which will ensure that the temperature of the conductor never rises above the permissible operating temperature at any point when operated with the specific current carrying capacity. For detailed planning you can consult DIN VDE 0298, Part 4, for the current carrying capacity values of PVC and rubber-insulated cables according to DIN VDE 0250/0281/0282 Part 4. Values for trouble-free operation are listed in relation to different operating and short-circuit conditions.

A cable's current carrying capacity depends on its nominal cross section and conductor material, the ambient temperature, the type of cable (permissible operating temperature of the insulation), and the type of installation (different thermal resistances of the environment).



## CE marking



**The CE mark is a product's "passport" for unrestricted movement within the European Union.**

EC directives are statutory regulations of the European Union. Certain requirements have to be met when marketing a product in Europe.

Our products are manufactured in compliance with the harmonized European standards HD and EN and with German VDE standards. This is confirmed by our Manufacturer's Declaration of Conformity.

When we apply the CE mark to packings or delivery documents (not to the product itself!) we are confirming that the product in question complies with the requirements of the Low Voltage Directive.

The CE mark (CE = Communautés Européennes) is not a quality mark, nor is it a safety mark or a mark of conformity with a particular standard.

**Use of the CE mark has been compulsory since 1st January 1997 on products with a nominal AC voltage >50 to 1000 V or DC voltage >75 to 1500 V if they are to comply with the Low Voltage Directive 72/73/EEC.**

This provision applies, because of the nominal voltage of >50 V, to all cables contained in this catalogue.



European countries with their respective national codes in conjunction with the HAR mark.



## Harmonization markings

To comply with the rules laid down by CENELEC<sup>1</sup>, countries are obliged to adopt certain IEC<sup>2</sup> standards, EN<sup>3</sup> standards and the harmonization documents (HD) issued by CENELEC into their national specifications. This is in the interest of European and global harmonization. No technical deviations or additions are permitted.

The following table includes all those member countries known to have recognized the harmonization documents HD 21 and 22. The use of HAR-coded cables is thus possible in these countries without further national certification.

Country	Certification office	HARmonization mark printed or embossed
Spain	AENOR	<b>AENOR</b> <HAR>
Great Britain	BASEC	<b>BASEC</b> <HAR>
Northern Ireland		
Poland	BBJ-SEP	<b>BBJ</b> <HAR>
Portugal	CERTIF	<CERTIF> <HAR>
Switzerland	Electrosuisse	<SEV> <HAR>
Greece	ELOT	<b>ELOT</b> <HAR>
Czech Republic	EZÚ	<EZU> <HAR>
Italy	IMQ	<b>IEMMEQU</b> <HAR>
Sweden	Intertek Semko	<b>SEMKO</b> <HAR>
Netherlands	KEMA	<b>KEMA-KEUR</b> <HAR>
France	LCIE	<b>USE</b> <HAR>
Hungary	MEEI	<b>MEEI</b> <HAR>
Norway	NEMKO	<NEMKO> <HAR>
Ireland	NSAI	<NSAI> <HAR>
Belgium	SGS Belgien	<b>CEBEC</b> <HAR>
Finland	SGS Fimko	<b>FIMKO</b> <HAR>
Turkey	TSE	<b>TSE</b> <HAR>
Denmark	UL Int'l DEMKO	<b>DEMKO</b> <HAR>
Germany	VDE	<VDE> <HAR>
Austria	ÖVE	<ÖVE> <HAR>

<sup>1</sup> Comité Européen de Normalisation Electrotechnique

<sup>2</sup> International Electrotechnical Commission

<sup>3</sup> European standards

# Type codes

**Harmonized and recognized national power cables to DIN VDE 0281 and 0282 are coded as follows in accordance with the “System of codes for harmonized power cables” laid down in the CENELEC harmonization document HD 361 and in DIN VDE 0292.**

The design code consists of three parts providing information about a cable’s major features.

## Application examples

### H05V-K 1X1 BK

PVC insulated cable for internal wiring, 1 mm<sup>2</sup>, with finely stranded conductor, nominal voltage U<sub>0</sub>/U 300/500 V, core color black

### S03VV-F 3G0.75

PVC flexible cord with VDE registration (round version) and fine 0.75 mm<sup>2</sup> wire conductor, nominal voltage U<sub>0</sub>/U 300/300 V, triple core with green/yellow-coded core

### L05VV-F 3x1.0

LEONI specific PVC flexible cord (round version) with fine 1.0 mm<sup>2</sup> wire conductor, nominal voltage U<sub>0</sub>/U 300/500 V, three cores

## Type of specification and nominal voltage

Part 1 stipulates the type of specification and the permissible nominal voltage. The letter H indicates that the cable’s characteristics comply fully with the harmonized specifications. Hence the cable is approved for use in the countries listed on page 19 without any additional certification. Cables with the letter A are permitted in certain countries only, depending on the harmonized rules.

## Cable design

Part 2 provides information about the insulating material and sheath material, about special design features, and about the type of conductor (following a hyphen).

## Cable design

Part 3 indicates the number of cores and the conductor’s nominal cross section. The code “G” or “X” (formerly “J” or “O” in VDE 0250) is used in addition to show whether there is a green-and-yellow protective conductor.

H05VVH2-F 2 X 0.75 (example)

**Specification code**

harmonized specification  
 recognized national specification  
 special LEONI type<sup>1</sup>

**Nominal voltage U<sub>0</sub>/U**

300/300 V  
 300/500 V  
 450/750 V

**Insulating material**

PVC standard up to +70 °C  
 PVC heat resistant up to +90 °C  
 PVC cold resistant to -25 °C  
 PVC cross-linked  
 natural and/or synthetic rubber up to +60 °C<sup>3</sup>  
 synthetic rubber (EVA) up to +110 °C  
 Ethylene-propylene rubber up to +90 °C  
 halogen-free cross-linked compound (polyolefin basis)  
 halogen-free thermoplastic compound (polyolefin basis)

**Sheath material**

PVC standard up to +60 °C  
 PVC heat resistant up to +90 °C  
 PVC cold resistant to -25 °C  
 PVC cross-linked  
 PVC oil resistant  
 Polyurethane  
 natural and/or synthetic rubber up to +60 °C<sup>3</sup>  
 Chloroprene rubber up to +60 °C<sup>3</sup>  
 synthetic rubber (EVA) up to +110 °C  
 glass fibre braid  
 textile braid

**Special design features**

flat, separable cable<sup>2</sup>  
 flat, inseparable cable<sup>2</sup>  
 flat cable to HD 359 with ≥3 cores<sup>2</sup>  
 two-layer extruded cable for interlinked light sets  
 spiral cable  
 supporting structure (textile or metal)  
 non-strain-bearing center  
 Cu-braided shield over stranded conductors

**Type of conductor**

single-wire  
 multi-wire  
 finely stranded for cables for fixed installation  
 finely stranded for flexible cables  
 extra finely stranded for flexible cables  
 tinsel conductor

**Number of cores**

**Protective conductor**

without protective conductor  
 with green-yellow grounding conductor

**Nominal cross section of the conductor in mm<sup>2</sup>**

- H
- A
- S
- 03
- 05
- 07
- V
- V2
- V3
- V4
- R
- G
- B
- Z
- Z1
- V
- V2
- V3
- V4
- V5
- Q
- R
- N
- G
- J
- T
- H
- H2
- H6
- H7
- H8
- D3
- D5
- C4
- U
- R
- K
- F
- H
- Y
- ...
- X
- G
- ...

<sup>1</sup> With design elements or characteristics which deviate from the harmonized and national types.

<sup>2</sup> Harmonized cable designs:



<sup>3</sup> For information only; no longer in the LEONI product range

## Cable codes



### Origin code

The origin code provides information about the cable's manufacturer. It can be embossed or printed on the surface of the sheath or core and may also take the form of an identification thread inside the cable. Products from our company are marked with the LEONI code.



### Conformity/test code

For nationally recognized cables to VDE standards DIN VDE 0250, either the VDE identification is printed or embossed on the cables.



### HARmonized cable code

To mark cables according to the harmonized rules HD 21 and HD 22 or DIN VDE 0281 and 0282, the code <HAR> is either printed or embossed on the cables with the test agency and origin code.



### VDE register number code

It is possible to apply for expert testing and production monitoring for regularly manufactured cables whose properties differ from the VDE rules. A control symbol in the form of a VDE register number is then assigned instead of a VDE test mark.



The halogen-free sheathed flexible cable type S05Z1Z1-F (see page 45) is marked on either the core or sheath surface as follows:

### Customer-specific code

Customer-specific codes provide not only essential information for connecting the cables correctly but also important data concerning their range of application.

## Color code

Core markings for insulated power cables for nominal voltages  $U_0/U$  up to 0.6/1 kV are laid down in the standard DIN VDE 0293 in accordance with the harmonization documents.

### Multi-core flexible cables with 2 to 5 cores

design	color code with GNYE	
3 cores	GNYE/BU/BN	
4 cores	GNYE/BN/BK/GY	
5 cores	BK/BN/GNYE/GY/BU	
	<b>without GNYE</b>	
2 cores	BU/BN	
3 cores	BK/BU/BN	
4 cores	BK/GY/BU/BN	
5 cores	BK/GY/BK/BU/BN	

According to the HD 308 S2: 2001 harmonization document, three to five-core cables may be fitted with or without a green/yellow earthed conductor.

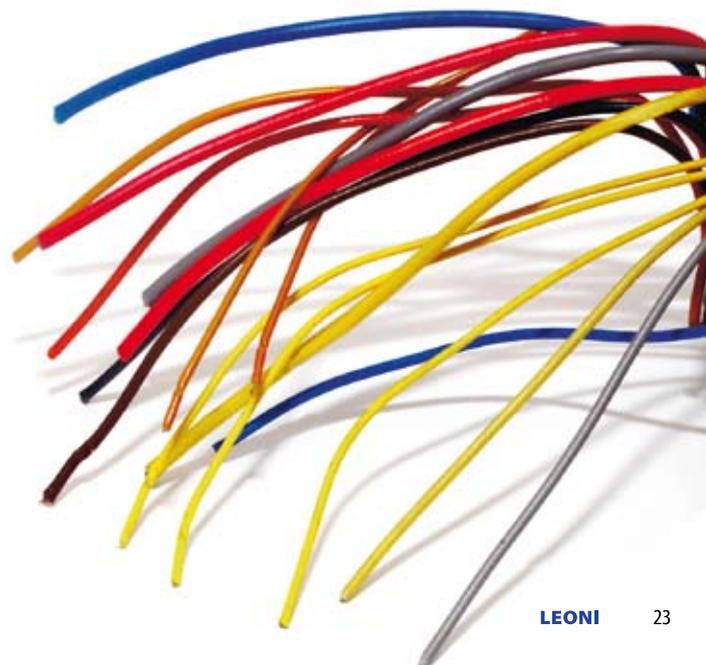
In the case of cables with six and more cores, VDE 0293 Section 334 stipulates that all cores, apart from the green/yellow core if present, must have a uniform base color and be printed with a consistent, highly contrasting color. The colors green and yellow may not be used as a base color. Nor may the green/yellow core be numbered, and it must also be located in the outer layer.

## Abbreviations of the core colors

### Abbreviations (according to DIN IEC 757)

Color abbreviations are laid down in the CENELEC harmonization document HD 457 for use when ordering single-core cables.

color English	abbreviation new acc. to DIN IEC 757	abbreviation so far acc. to DIN 47002	
black	BK	sw	
brown	BN	bn	
red	RD	rt	
orange	OR	or	
yellow	YE	ge	
green	GN	gn	
blue	BU	bl	
violet (purple)	VT	vi	
gray (slate)	GY	gr	
white	WH	ws	
pink	PK	li	
gold	GD	–	
turquoise	TQ	tk	
silver	SR	–	
green-and-yellow	GNYE	gnge	
transparent	–	tr	
nature	–	nt	



# Conductor classes/construction

Allocation of conductor designs (excerpts) to the various classes laid down in DIN VDE 0295, in the publication IEC 228, and in the CENELEC harmonization document HD 383 S2.

## Class 1 and 2 for cables for fixed installation

nominal cross section mm <sup>2</sup>	max. conductor diameter mm	min. number of single-wires in the conductor mm	conductor resistance at 20 °C max.	
			round copper conductor plain Ω/km	round copper conductor metal-clad Ω/km
<b>Single-wire copper conductor for single- and multi-core cables – class 1</b>				
0.5	0.9	–	36.0	36.7
0.75	1.0	–	24.5	24.8
1	1.2	–	18.1	18.2
1.5	1.5	–	12.1	12.2
2.5	1.9	–	7.41	7.56
4	2.4	–	4.61	4.70
6	2.9	–	3.08	3.11
10	3.7	–	1.83	1.84
16	4.6	–	1.15	1.16
<b>Multi-wire copper conductor for single- and multi-core cables – class 2</b>				
0.5	1.1	7	36.0	36.7
0.75	1.2	7	24.5	24.8
1	1.4	7	18.1	18.2
1.5	1.7	7	12.1	12.2
2.5	2.2	7	7.41	7.56
4	2.7	7	4.61	4.70
6	3.3	7	3.08	3.11
10	4.2	7	1.83	1.84
16	5.3	7	1.15	1.16
25	6.6	7	0.727	0.734
35	7.9	7	0.524	0.529
50	9.1	19	0.387	0.391
70	11.0	19	0.268	0.270
95	12.9	19	0.193	0.195
120	14.5	37	0.153	0.154
150	16.2	37	0.124	0.126

## Class 5 and 6 for flexible cables with finely stranded conductors

nominal cross section mm <sup>2</sup>	max. conductor diameter mm	max. diameter of single cores mm	conductor resistance at 20 °C max.	
			single-wires plain Ω/km	single-wires metal-clad Ω/km
<b>Finely stranded copper conductor for single- and multi-core cables – class 5</b>				
0.5	1.1	0.21	39.0	40.1
0.75	1.3	0.21	26.0	26.7
1	1.5	0.21	19.5	20.0
1.5	1.8	0.26	13.3	13.7
2.5	2.3	0.26	7.98	8.21
4	2.9	0.31	4.95	5.09
6	3.9	0.31	3.30	3.39
10	5.1	0.41	1.91	1.95
16	6.3	0.41	1.21	1.24
25	7.8	0.41	0.780	0.795
35	9.2	0.41	0.554	0.565
50	11.0	0.41	0.386	0.393
70	13.1	0.51	0.272	0.277
95	15.1	0.51	0.206	0.210
120	17.0	0.51	0.161	0.164
150	19.0	0.51	0.129	0.132
<b>Finely stranded copper conductor for single- and multi-core cables – class 6 *</b>				
0.5	1.1	0.16	39.0	40.1
0.75	1.3	0.16	26.0	26.7
1	1.5	0.16	19.5	20.0
1.5	1.8	0.16	13.3	13.7
2.5	2.3	0.16	7.98	8.21
4	2.9	0.16	4.95	5.09
6	3.9	0.21	3.30	3.39
10	5.1	0.21	1.91	1.95
16	6.3	0.21	1.21	1.24
25	7.8	0.21	0.780	0.795
35	9.2	0.21	0.554	0.565
50	11.0	0.31	0.386	0.393
70	13.1	0.31	0.272	0.277
95	15.1	0.31	0.206	0.210
120	17.0	0.31	0.161	0.164
150	19.0	0.31	0.129	0.132

\* Class 6 conductors are more flexible than class 5 conductors on account of their finer single-wires.

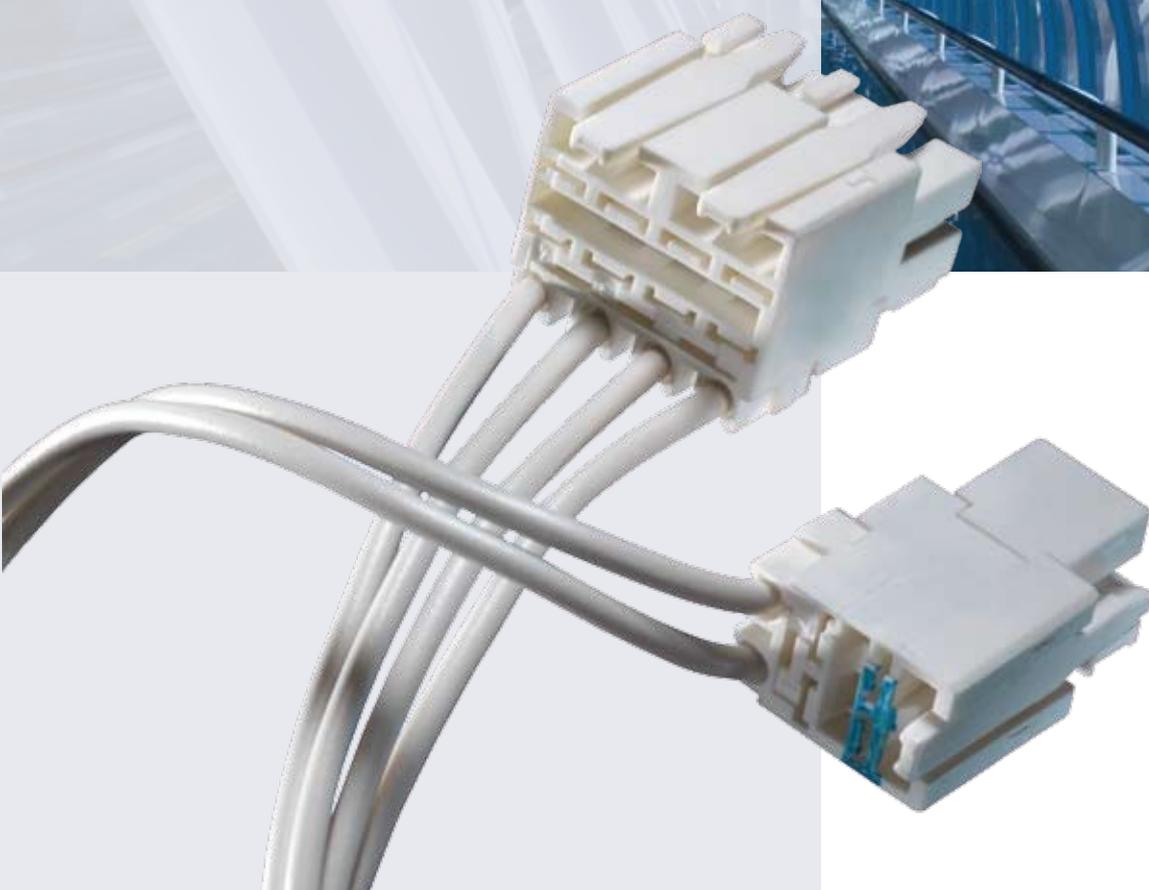
# HARmonized cables

## Single-core cables

	page
Product range single-core cables	26
H05V-U / H07V-U	27
H05V-R / H07V-R	28
H05V-K / H07V-K	29
H05V2-U / H07V2-U	30
H05V2-R / H07V2-R	31
H05V2-K / H07V2-K	32
H07V3-U / H07V3-K	33
H05G-U / H07G-U	34
H05G-K / H07G-K	35
S05Z1-K / S07Z1-K	36

## Multi-core cables

	page
Product range multi-core cables	37
H03VVH2-F / H03VV-F	38
H05VVH2-F / H05VV-F	39
S03VV-F / S03VV-R	40
H03V2V2H2-F / H03V2V2-F	41
H05V2V2H2-F / H05V2V2-F	42
S03V2V2-F	43
S03Z1Z1H2-F / S03Z1Z1-F	44
S05Z1Z1H2-F / S05Z1Z1-F	45
H05BQ-F / H07BQ-F	46
H05VV5-F	47
H05VVC4V5-K	48
H05VVH6-F / H07VVH6-F	49



# Product range single-core cables

Overview of single-core cables  
for fixed installation and internal wiring

Conductor type	cold resistant heat resistant halogen-free	Code	Standards		Nominal voltage U <sub>0</sub> /U	No. of cores	Range of cross section mm <sup>2</sup>	Temperature range at	
			HD	VDE				Cont. load max.	Installation/ Handling
PVC cable for internal wiring		H05V-U H05V-R H05V-K	21.3	0281/T3	300/500 V	1	0.5 – 1	+70 °C	+5 °C
PVC cable for internal wiring		H05V2-U H05V2-R H05V2-K	21.7	0281/T7	300/500 V	1	0.5 – 1	+90 °C	+5 °C
PVC insulated single-core cable		H07V-U H07V-R H07V-K	21.3	0281/T3	450/750 V	1	1.5 – 6 1.5 – 2.5 1.5 – 120	+70 °C	+5 °C
PVC insulated single-core cable		H07V2-U H07V2-R H07V2-K	21.7	0281/T7	450/750 V	1	1.5 – 2.5 1.5 – 2.5 1.5 – 35	+90 °C	+5 °C
PVC insulated single-core cable		H07V3-U H07V3-K	21.9	0281/T9	450/750 V	1	1.5 – 6 1.5 – 16	+70 °C	-25 °C
Rubber-sheathed cable for internal wiring		H05G-U H05G-K	22.7	0282/T7	300/500 V	1	0.5 – 1	+110 °C	-25 °C
Rubber-sheathed single-core cable		H07G-U H07G-K	22.7	0282/T7	450/750 V	1	1.5 – 2.5 1.5 – 10	+110 °C	-25 °C
TPE insulated cable for internal wiring		S05Z1-K	—	VDE-ÜG	300/500 V	1	0.5 – 1	+70 °C	+5 °C
TPE insulated single-core cable		S07Z1-K	—	VDE-ÜG	450/750 V	1	1.5 – 16	+70 °C	+5 °C

Through suitable modification of the strand construction and the PVC insulation it is possible to use the IDC technology for pitch 2.5 and 5.0 mm in the range of cross sections 0.5 to max. 1.5 mm<sup>2</sup>.



cold resistant



heat resistant



halogen-free

# H05V-U

# H07V-U

&lt;VDE&gt; &lt;HAR&gt;

**PVC wire**

according to HD21.3 / DIN VDE 0281, part 3

Temperature at continuous load acc. to HD

**+70 °C**

Temperature range (3000 hrs)

**-30 °C to +80 °C****Construction / Materials****Conductor**

E-Cu wire, bare, solid, according to DIN VDE 0295, conductor category 1

**Insulation**

PVC compound TI1 according to HD 21.1

**Recommended application**

For internal wiring of appliances as well as installation in an electrical conduit pipe either on or underneath plaster.

	<b>Test voltage</b>	<b>Nominal voltage</b>
<b>H05V-U</b>	2 kV	300/500 V U <sub>0</sub> /U
<b>H07V-U</b>	2.5 kV	450/750 V U <sub>0</sub> /U



Nominal cross section	No. of individual wires	Diameter of conductor nom.	Resistance at 20 °C max.	Wall thickness of insulation	Outer diameter nom.	Weight approx.
mm <sup>2</sup>		mm	Ω/km	mm	mm	kg/km
<b>H05V-U</b>						
0.5	1	0.8	36.0	0.6	2.0	8.5
0.75	1	1.0	24.5	0.6	2.2	11.5
1	1	1.2	18.1	0.6	2.4	14.0
<b>H07V-U</b>						
1.5	1	1.4	12.1	0.7	2.9	21
2.5	1	1.8	7.41	0.8	3.5	32
4	1	2.3	4.61	0.8	4.0	48
6	1	2.8	3.08	0.8	4.5	68

# H05V-R

# H07V-R

&lt;VDE&gt; &lt;HAR&gt;

**PVC wire**

according to HD21.3 / DIN VDE 0281, Part 3

Temperature at continuous load acc. to HD  
**+70 °C**Temperature range (3000 hrs)  
**-30 °C to +80 °C****Construction / Materials****Conductor**E-Cu wire, bare, stranded rigid, according to  
DIN VDE 0295, conductor category 2**Insulation**

PVC compound T11 according to HD 21.1

**Recommended application**For internal wiring of appliances as well  
as installation in an electrical conduit pipe  
either on or underneath plaster.

	<b>Test voltage</b>	<b>Nominal voltage</b>
<b>H05V-R</b>	2 kV	300/500 V U <sub>0</sub> /U
<b>H07V-R</b>	2.5 kV	450/750 V U <sub>0</sub> /U

<b>Nominal cross section</b>	<b>No. of individual wires</b>	<b>Diameter of conductor nom.</b>	<b>Resistance at 20 °C max.</b>	<b>Wall thickness of insulation</b>	<b>Outer diameter nom.</b>	<b>Weight approx.</b>
mm <sup>2</sup>		mm	Ω/km	mm	mm	kg/km
<b>H05V-R</b>						
0.5	7	0.9	36.0	0.6	2.2	9
0.75	7	1.1	24.5	0.6	2.4	12
1	7	1.3	18.1	0.6	2.6	15
<b>H07V-R</b>						
1.5	7	1.6	12.1	0.7	3.0	21
2.5	7	2.0	7.41	0.8	3.6	32
4	7	2.6	4.61	0.8	4.2	48
6	7	3.1	3.08	0.8	4.7	68

# H05V-K

# H07V-K

&lt;VDE&gt; &lt;HAR&gt;

**PVC wire**

according to HD21.3 / DIN VDE 0281, part 3

Temperature at continuous load acc. to HD

**+70 °C**

Temperature range (3000 hrs)

**-30 °C to +80 °C****Construction / Materials****Conductor**

E-Cu wire, bare, flexible, according to DIN VDE 0295, conductor category 5

**Insulation**

PVC compound T11 according to HD 21.1

**Recommended application**

For internal wiring of appliances as well as installation in an electrical conduit pipe either on or underneath plaster.

	<b>Test voltage</b>	<b>Nominal voltage</b>
<b>H05V-K</b>	2 kV	300/500 V U <sub>0</sub> /U
<b>H07V-K</b>	2.5 kV	450/750 V U <sub>0</sub> /U



Nominal cross section	No. of individual wires	Diameter of conductor nom.	Resistance at 20 °C max.	Wall thickness of insulation	Outer diameter nom.	Weight approx.
mm <sup>2</sup>		mm	Ω/km	mm	mm	kg/km
<b>H05V-K</b>						
0.5	0.21	0.9	39.0	0.6	2.2	8.5
0.75	0.21	1.1	26.0	0.6	2.4	11.5
1	0.21	1.3	19.5	0.6	2.6	14.0
<b>H07V-K</b>						
1.5	0.26	1.6	13.3	0.7	3.0	20
2.5	0.26	2.1	7.98	0.8	3.7	32
4	0.31	2.6	4.95	0.8	4.2	47
6	0.31	3.2	3.3	0.8	4.9	68
10	0.41	4.0	1.391	1.0	6.3	108
16	0.41	5.1	1.21	1.0	7.4	160
25	0.41	6.2	0.78	1.2	8.9	258
35	0.41	7.7	0.554	1.2	10.6	358
50	0.41	9.2	0.386	1.4	12.5	494
70	0.51	10.8	0.272	1.4	14.1	703
95	0.51	12.5	0.206	1.6	16.3	928
120	0.51	16.0	0.161	1.6	19.6	1250

# H05V2-U

# H07V2-U

&lt;VDE&gt; &lt;HAR&gt;



## PVC wire

according to HD21.3 / DIN VDE 0281, part 7

Temperature at continuous load acc. to HD

**+90 °C**

Temperature range (3000 hrs)

**-40 °C to +105 °C**



### Construction / Materials

#### Conductor

E-Cu wire, bare, solid, according to DIN VDE 0295, conductor category 1

#### Insulation

PVC compound T11 according to HD 21.1

### Recommended application

For internal wiring and protected fixed installation in appliances and lamps.

	Test voltage	Nominal voltage
<b>H05V2-U</b>	2 kV	300/500 V U <sub>0</sub> /U
<b>H07V2-U</b>	2.5 kV	450/750 V U <sub>0</sub> /U

Nominal cross section	No. of individual wires	Diameter of conductor nom.	Resistance at 20 °C max.	Wall thickness of insulation	Outer diameter nom.	Weight approx.
mm <sup>2</sup>		mm	Ω/km	mm	mm	kg/km
<b>H05V2-U</b>						
0.5	1	0.8	36.0	0.6	2.0	8.5
0.75	1	1.0	24.5	0.6	2.2	11.5
1	1	1.2	18.1	0.6	2.4	14.0
<b>H07V2-U</b>						
1.5	1	1.4	12.1	0.7	2.9	21
2.5	1	1.8	7.41	0.8	3.5	32

# H05V2-R

# H07V2-R

&lt;VDE&gt; &lt;HAR&gt;



## PVC wire

according to HD21.7 / DIN VDE 0281,  
part 7

Temperature at continuous load acc. to HD

**+90 °C**

Temperature range (3000 hrs)

**-40 °C to +105 °C**



### Construction / Materials

#### Conductor

E-Cu wire, bare, stranded rigid, according to  
DIN VDE 0295, conductor category 2

#### Insulation

PVC compound T13 according to HD 21.1

### Recommended application

For internal wiring of appliances as well  
as installation in an electrical conduit pipe  
either on or underneath plaster.

	Test voltage	Nominal voltage
<b>H05V2-R</b>	2 kV	300/500 V U <sub>0</sub> /U
<b>H07V2-R</b>	2.5 kV	450/750 V U <sub>0</sub> /U



Nominal cross section	No. of individual wires	Diameter of conductor nom.	Resistance at 20 °C max.	Wall thickness of insulation	Outer diameter nom.	Weight approx.
mm <sup>2</sup>		mm	Ω/km	mm	mm	kg/km
<b>H05V2-R</b>						
0.5	7	0.9	36.0	0.6	2.2	9
0.75	7	1.1	24.5	0.6	2.4	12
1	7	1.3	18.1	0.6	2.6	15
<b>H07V2-R</b>						
1.5	7	1.6	12.1	0.7	3.0	21
2.5	7	2.0	7.41	0.8	3.6	32

# H05V2-K

# H07V2-K

&lt;VDE&gt; &lt;HAR&gt;



## PVC wire

according to HD21.7 / DIN VDE 0281, part 7

Temperature at continuous load acc. to HD

**+90 °C**

Temperature range (3000 hrs)

**-40 °C to +105 °C**



### Construction / Materials

#### Conductor

E-Cu wire, bare, flexible, according to DIN VDE 0295, conductor category 5

#### Insulation

PVC compound T13 according to HD 21.1

### Recommended application

For internal wiring of appliances as well as installation in an electrical conduit pipe either on or underneath plaster.

	Test voltage	Nominal voltage
H05V2-K	2 kV	300/500 V U <sub>0</sub> /U
H07V2-K	2.5 kV	450/750 V U <sub>0</sub> /U

Nominal cross section	No. of individual wires	Diameter of conductor nom.	Resistance at 20 °C max.	Wall thickness of insulation	Outer diameter nom.	Weight approx.
mm <sup>2</sup>		mm	Ω/km	mm	mm	kg/km
<b>H05V2-K</b>						
0.5	0.21	0.9	39.0	0.6	2.2	8.5
0.75	0.21	1.1	26.0	0.6	2.4	11.5
1	0.21	1.3	19.5	0.6	2.6	14.0
<b>H07V2-K</b>						
1.5	0.26	1.6	13.3	0.7	3.0	20
2.5	0.26	2.1	7.98	0.8	3.7	32
4	0.31	2.6	4.95	0.8	4.2	47
6	0.31	3.2	3.3	0.8	4.9	68
10	0.41	4.0	1.391	1.0	6.3	110
16	0.41	5.1	1.21	1.0	7.4	162
25	0.41	6.2	0.78	1.2	8.9	261
35	0.41	7.7	0.554	1.2	10.6	362

# H07V3-U

# H07V3-K

&lt;VDE&gt; &lt;HAR&gt;



## PVC wire

nach HD21.7 / DIN VDE 0281, part 7

Temperature at continuous load acc. to HD

**+70 °C**

Temperature range (3000 hrs)

**-40 °C to +105 °C**

### Construction / Materials

#### Conductor

E-Cu wire, bare, solid or flexible,  
according to DIN VDE 0295, conductor category 1 or 5

#### Insulation

Cold-resistant PVC compound TI4 according to HD 21.1

### Recommended application

For internal wiring and fixed protected  
installation in appliances and lamps.

	Test voltage	Nominal voltage
<b>H07V3-U</b>	2.5 kV	450/750 V U <sub>0</sub> /U
<b>H07V3-K</b>	2.5 kV	450/750 V U <sub>0</sub> /U



Nominal cross section	No. of individual wires	Diameter of conductor nom.	Resistance at 20 °C max.	Wall thickness of insulation	Outer diameter nom.	Weight approx.
mm <sup>2</sup>		mm	Ω/km	mm	mm	kg/km
<b>H07V3-U</b>						
1.5	1	1.4	12.1	0.7	2.9	21
2.5	1	1.8	7.41	0.8	3.5	32
4	1	2.3	4.61	0.8	4.0	48
6	1	2.8	3.08	0.8	4.5	68
<b>H07V3-K</b>						
1.5	0.26	1.6	13.3	0.7	3.0	20
2.5	0.26	2.1	7.98	0.8	3.7	32
4	0.31	2.6	4.95	0.8	4.2	47
6	0.31	3.2	3.3	0.8	4.9	68
10	0.41	4.0	1.391	1.0	6.3	108
16	0.41	5.1	1.21	1.0	7.4	160

# H05G-U

# H07G-U

&lt;VDE&gt; &lt;HAR&gt;



## Rubber-sheathed cable for internal wiring

according to HD22.7 / DIN VDE 0282, part 7

Temperature at continuous load acc. to HD  
**+110 °C**Temperature range (3000 hrs)  
**-40 °C to +105 °C**

### Construction / Materials

#### Conductor

E-Cu wire, tinned, solid, according to DIN VDE 0295,  
conductor category 1

#### Insulation

Rubber compound EI3 according to HD 22.1

### Recommended application

For internal wiring of electrical and electronic  
appliances in dry areas only.For fixed installation such as in exposed or  
embedded conduit pipes.

	Test voltage	Nominal voltage
<b>H05G-U</b>	2 kV	300/500 V U <sub>0</sub> /U
<b>H07G-U</b>	2.5 kV	450/750 V U <sub>0</sub> /U

Nominal cross section	No. of individual wires	Diameter of conductor nom.	Resistance at 20 °C max.	Wall thickness of insulation	Outer diameter nom.	Weight approx.
mm <sup>2</sup>		mm	Ω/km	mm	mm	kg/km
<b>H05G-U</b>						
0.5	1	0.8	36.7	0.6	2.1	9
0.75	1	1.0	24.8	0.6	2.3	12
1	1	1.2	18.2	0.6	2.5	15
<b>H07G-U</b>						
1.5	1	1.4	12.2	0.8	3.1	22
2.5	1	1.8	7.56	0.9	3.7	34

# H05G-K

# H07G-K

&lt;VDE&gt; &lt;HAR&gt;



## Rubber-sheathed cable for internal wiring

according to HD22.7 / DIN VDE 0282,  
part 7

Temperature at continuous load acc. to HD

**+110 °C**

Temperature range (3000 hrs)

**-40 °C to +105 °C**



### Construction / Materials

#### Conductor

E-Cu wire, tinned, flexible, according to DIN VDE 0295,  
conductor category 5

#### Insulation

Rubber compound E13 according to HD 22.1

### Recommended application

For internal wiring of electrical and electronic  
appliances in dry areas only.

For fixed installation such as in exposed or  
embedded conduit pipes.

	Test voltage	Nominal voltage
H05G-K	2 kV	300/500 V U <sub>0</sub> /U
H07G-K	2.5 kV	450/750 V U <sub>0</sub> /U



Nominal cross section	No. of individual wires	Diameter of conductor nom.	Resistance at 20 °C max.	Wall thickness of insulation	Outer diameter nom.	Weight approx.
mm <sup>2</sup>		mm	Ω/km	mm	mm	kg/km
<b>H05G-K</b>						
0.5	0.21	0.9	40.1	0.6	2.2	9
0.75	0.21	1.1	26.7	0.6	2.4	12
1	0.21	1.3	20.0	0.6	2.6	15
<b>H07G-K</b>						
1.5	0.26	1.6	13.7	0.8	3.3	23
2.5	0.26	2.1	8.21	0.9	4.0	34
4	0.31	2.6	5.09	1.0	4.8	53
6	0.31	3.2	3.39	1.0	5.4	74
10	0.41	4.2	1.95	1.2	6.9	121

# S05Z1-K

# S07Z1-K

&lt;VDE&gt; &lt;HAR&gt;



## Cable for internal wiring

in accordance with VDE expertise  
No. 9915 / 9917

Temperature at continuous load acc. to HD

**+70 °C**

Temperature range (3000 hrs)

**-30 °C to +70 °C**



### Construction / Materials

#### Conductor

E-Cu wire, bare, flexible, according to DIN VDE 0295,  
conductor category 5

#### Insulation

Halogen-free polymer compound TPE-O

### Recommended application

For internal wiring of appliances as well  
as installation in an electrical conduit pipe  
either on or underneath plaster; especially  
for applications that require minor release of  
smoke or corrosive gases in the event of fire.

	Test voltage	Nominal voltage
H05Z1-K	2 kV	300/500V U <sub>0</sub> /U
H07Z1-K	2.5 kV	450/750V U <sub>0</sub> /U

Nominal cross section	No. of individual wires	Diameter of conductor nom.	Resistance at 20 °C max.	Wall thickness of insulation	Outer diameter nom.	Weight approx.
mm <sup>2</sup>		mm	Ω/km	mm	mm	kg/km
<b>S05Z1-K</b>						
0.5	0.21	0.9	39.0	0.6	2.2	8.5
0.75	0.21	1.1	26.0	0.6	2.4	11
1	0.21	1.3	19.5	0.6	2.6	15
<b>S07Z1-K</b>						
1.5	0.26	1.6	13.3	0.7	3.0	21
2.5	0.26	2.1	7.98	0.8	3.7	30
4	0.31	2.6	4.95	0.8	4.2	49
6	0.31	3.2	3.3	0.8	4.9	71
10	0.41	4.0	1.91	1.0	6.3	105
16	0.41	5.1	1.21	1.0	7.4	166

# Product range

## multi-core cables

Overview of multi-core, flat and round cables  
for flexible application

Conductor type	oil resistant heat resistant halogen-free	Code	Standards		Nominal voltage $U_0/U$	No. of cores	Range of cross section mm <sup>2</sup>	Temperature range at cont. load max.
			HD	VDE				
PVC sheathed flex. cable flat round		H03VVH2-F H03VV-F	21.5	0281/T5	300/300 V	2 2 – 4	0.5 – 0.75	+60 °C
PVC sheathed flexible cable	 	H03V2V2-F H03V2V2H2-F	21.12	0281/T12	300/300 V	2 – 4 2	0.5 – 0.75	+90 °C
PVC sheathed flex. cable flat round		H05VVH2-F H05VV-F	21.5	0281/T5	300/500 V	2 2 – 5	0.75 – 1 0.75 – 4	+60 °C
PVC sheathed flexible cable	 	H05V2V2-F H05V2V2H2-F	21.12	0281/T12	300/500 V	2 – 5 2	0.75 – 4 0.75 – 1	+90 °C
PVC insulated control cable unshielded		H05VV5-F	21.13	0281/T13	300/500 V	2 – 60	0.5 – 2.5	+60 °C
PVC insulated control cable shielded		H05VVC4V5-K	21.13	0281/T13	300/500 V	2 – 60	0.5 – 2.5	+60 °C
Flat PVC insulated cable		H05VVH6-F	359	0283/T2	300/500 V	4 – 24	0.75 – 1	+70 °C
Flat PVC insulated cable		H07VVH6-F	359	0281/T404	450/750 V	3–12/4	1.5 – 2.5/ – 16	+70 °C
Sheathed flexible cable with EPR insulated cores and polyurethane sheath	 	H05BQ-F	22.10	0282/T10	300/500 V	2 – 5	0.75 – 1	+90 °C
Sheathed flexible cable with EPR insulated cores and polyurethane sheath	 	H07BQ-F	22.10	0282/T10	450/750 V	2 – 5	1.5 – 4	+90 °C
TPE sheathed flex. cable	 	S05Z1Z1-F S05Z1Z1H2-F	—	VDE-ÜG	300/500 V	2 + 3 2	0.75 – 2.5 0.75 – 1	+70 °C
PVC sheathed flex. cable		S03VV-F	—	VDE-ÜG	300/300 V	2	0.35	+70 °C
PVC sheathed flex. cable		S03VV-F	—	VDE-ÜG	300/300 V	2 – 4	0.5 – 0.75	+60 °C
PVC sheathed flex. cable		S03VV-R	—	VDE-ÜG	300/300 V	2 – 4	0.5 – 0.75	+60 °C
PVC sheathed flex. cable		S03V2V2-F	—	VDE-ÜG	300/300 V	2 – 4	0.35	+60 °C
TPE sheathed flex. cable		S03Z1Z1-F	—	VDE-ÜG	300/300 V	2 – 4	0.5 – 0.75	+60 °C
TPE sheathed flex. cable		S03Z1Z1H2-F	—	VDE-ÜG	300/300 V	2	0.5 – 0.75	+60 °C

Through suitable modification of the strand construction and the PVC insulation for the individual cores it is possible to use the IDC technology for pitch 2.5 and 5.0 mm on sheathed flexible cables H03.../H05... in the range of cross sections 0.5 to max. 1.5 mm<sup>2</sup>



oil resistant



heat resistant



halogen-free

# H03VVH2-F

## H03VV-F

&lt;VDE&gt; &lt;HAR&gt;

### PVC sheathed flexible cable flat and round

according to HD 21.5

Temperature at continuous load acc. to HD

**+60 °C**

Temperature range (3000 hrs)

**-20 °C to +80 °C**

#### Construction / Materials

##### Conductor

Finely stranded copper conductor, bare or tinned, according to DIN VDE 0295, conductor category 5

##### Insulation

PVC compound with characteristics TI 2 according to HD 21.1

##### Sheath

PVC compound with characteristics TM2 according to HD 21.1

#### Recommended application

For internal wiring and connecting small electrical appliances involving limited mechanical load.

#### Nominal voltage

300/300 V U<sub>0</sub>/U



Construction No. of cores × nominal cross section	Conductor construction			Insulation		Cable	
	Diameter of single-wire	Diameter of conductor	Electrical resistance at 20 °C plain max.	Wall thickness	Diameter of core	Wall thickness of sheath	Outer dimen- sion or outer diameter
	max.	nom.	max.	nom.	nom.	nom.	nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm
<b>H03VVH2-F</b>							
2×0.5	0.21	0.9	39.0	0.5	1.9	0.6	3.2×5.2
2×0.75	0.21	1.1	26.0	0.5	2.1	0.6	3.4×5.6
<b>H03VV-F</b>							
2×0.5	0.21	0.9	39.0	0.5	1.9	0.6	5.1
2×0.75	0.21	1.1	26.0	0.5	2.1	0.6	5.5
3G0.5	0.21	0.9	39.0	0.5	1.9	0.6	5.4
3G0.75	0.21	1.1	26.0	0.5	2.1	0.6	5.9
4G0.5	0.21	0.9	26.0	0.5	1.9	0.6	6.0
4G0.75	0.21	1.1	26.0	0.5	2.1	0.6	6.5

Further versions on request

# H05VVH2-F

## H05VV-F

&lt;VDE&gt; &lt;HAR&gt;

**PVC sheathed flexible cable  
flat and round**

according to HD 21.5

Temperature at continuous load acc. to HD

**+60 °C**

Temperature range (3000 hrs)

**-20 °C to +80 °C**



### Construction / Materials

#### Conductor

Finely stranded copper conductor, bare or tinned, according to DIN VDE 0295, conductor category 5

#### Insulation

PVC compound with characteristics T1 2 according to HD 21.1

#### Sheath

PVC compound with characteristics TM2 according to HD 21.1

### Recommended application

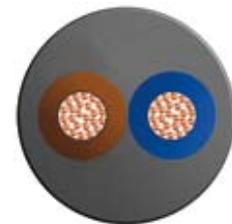
For internal wiring and connecting of domestic appliances involving medium mechanical load also in humid spaces.

### Nominal voltage

300/500 V U<sub>0</sub>/U



Construction No. of cores × nominal cross section	Conductor construction			Insulation		Cable	
	Diameter of single-wire	Diameter of conductor	Electrical resistance at 20 °C plain max.	Wall thickness	Diameter of core	Wall thickness of sheath	Outer dimen- sion or outer diameter
	max. mm	nom. mm	Ω/km max.	nom. mm	nom. mm	nom. mm	nom. mm
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm
<b>H05VVH2-F</b>							
2×0.75	0.21	1.1	26.0	0.6	2.3	0.8	4.0×6.3
<b>H05VV-F</b>							
2×0.75	0.21	1.1	26.0	0.6	2.3	0.8	6.4
2×1	0.21	1.3	19.5	0.6	2.5	0.8	6.7
2×1.5	0.26	1.6	13.3	0.7	3.0	0.8	7.6
2×2.5	0.26	2.1	7.98	0.8	3.7	1.0	9.5
2×4	0.31	2.6	4.95	0.8	4.2	1.1	10.8
3G0.75	0.21	1.1	26.0	0.6	2.3	0.8	6.8
3G1	0.21	1.3	19.5	0.6	2.5	0.8	7.1
3G1.5	0.26	1.6	13.3	0.7	3.0	0.9	8.2
3G2.5	0.26	2.1	7.98	0.8	3.7	1.1	10.4
3G4	0.31	2.6	4.95	0.8	4.2	1.2	11.7
4G0.75	0.21	1.1	26.0	0.6	2.3	0.8	7.4
4G1	0.21	1.3	19.5	0.6	2.5	0.9	7.9
4G1.5	0.26	1.6	13.3	0.7	3.0	0.8	9.2
4G2.5	0.26	2.1	7.98	0.8	3.7	1.1	11.3
4G4	0.31	2.6	4.95	0.8	4.2	1.2	12.7
5G0.75	0.21	1.1	26.0	0.6	2.3	0.9	8.3
5G1	0.21	1.3	19.5	0.6	2.5	0.9	8.7
5G1.5	0.26	1.6	13.3	0.7	3.0	1.1	10.4
5G2.5	0.26	2.1	7.98	0.8	3.7	1.1	12.6
5G4	0.31	2.6	4.95	0.8	4.2	1.4	14.4



Further versions on request

# S03VV-F

# S03VV-R

&lt;VDE&gt; &lt;HAR&gt;

**PVC sheathed flexible cable**

acc. to HD 21.5 S3 or DIN VDE 0245, part 202

Temperature at continuous load acc. to HD

**+60 °C** (8025/8013) or**+70 °C** (7572)

Temperature range (3000 hrs)

**-20 °C to +80 °C****Construction / Materials****Conductor**

Finely stranded respectively stranded rigid copper conductor, bare or tinned, according to DIN VDE 0295, conductor category 5 (8025) and conductor category 2 (8013/7572)

**Insulation**

PVC compound with characteristics TI 2 according to HD 21.1

**Sheath**

PVC compound with characteristics TM2 according to HD 21.1

**Recommended application**

7-wire strand construction is particularly suited for insulation displacement connectors.

**Nominal voltage**300/300 V U<sub>0</sub>/U**Use according to VDE certificate of conformity****S03VV-F (8025)**

For internal wiring and protected installation inside appliances, partly external use for fixed installation, but not as cord sets.

**S03VV-R (8013)**

For internal wiring and protected installation inside appliances, partly external use for fixed installation without mechanical load.

**S03VV-F (7572)**

For protected installation inside appliances.

Construction	Conductor construction			Insulation		Cable		
	No. of cores × nominal cross section	Ø of single-wire or No. of wires × Ø of single-wire	Diameter of conductor	Electrical resistance at 20 °C plain	Wall thickness	Diameter of core	Wall thickness of sheath	Outer dimension or outer diameter
	max.	nom.	max.	nom.	nom.	nom.	nom.	nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm	mm
<b>S03VV-F in dependence on HD 21.5 acc. to VDE certificate of conformity no. 8025</b>								
2×0.5	0.21	0.9	36.0	0.5	1.9	0.6	5.0	
2×0.75	0.21	1.1	26.0	0.5	2.1	0.6	5.4	
3G0.5	0.21	0.9	36.0	0.5	1.9	0.6	5.3	
3×0.75	0.21	1.1	26.0	0.5	2.1	0.6	5.7	
4×0.5	0.21	0.9	36.0	0.5	1.9	0.6	5.8	
4×0.75	0.21	1.1	26.0	0.5	2.1	0.6	6.3	
<b>S03VV-R in dependence on HD 21.5 acc. to VDE certificate of conformity no. 8013</b>								
2×0.5	7×0.30	0.9	36.0	0.5	1.9	0.6	5.0	
2×0.75	7×0.30	1.1	26.0	0.5	2.1	0.6	5.4	
3×0.5	7×0.30	0.9	36.0	0.5	1.9	0.6	5.3	
4×0.5	7×0.30	0.9	36.0	0.5	1.9	0.6	5.8	
<b>S03VV-F in dependence on DIN VDE 0245 part 202 acc. to VDE certificate of conformity no. 7572</b>								
2×0.35	7×0.254	0.8	59.0	0.3	1.4	0.8	4.4	

# H03V2V2H2-F

## H03V2V2-F

&lt;VDE&gt; &lt;HAR&gt;



**PVC sheathed flexible cable  
flat and round**

according to HD 21.12

Temperature at continuous load acc. to  
HD

**+90 °C**

Temperature range (3000 hrs)

**-40 °C to +105 °C**



### Construction / Materials

#### Conductor

Finely stranded copper conductor, bare or tinned, according to DIN VDE 0295, conductor category 5

#### Insulation

PVC compound with characteristics TI 3 according to HD 21.1

#### Sheath

PVC compound with characteristics TM3 according to HD 21.1

### Recommended application

For internal wiring and connecting small electrical appliances exposed to high ambient temperatures and involving minor mechanical load.

### Nominal voltage

300/300 V U<sub>0</sub>/U



Construction	Conductor construction			Insulation		Cable	
	Diameter of single-wire	Diameter of conductor	Electrical resistance at 20 °C plain	Wall thickness	Diameter of core	Wall thickness of sheath	Outer dimension or outer diameter
	max.	nom.	max.	nom.	nom.	nom.	nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm
<b>H03V2V2H2-F</b>							
2×0.5	0.21	0.9	39.0	0.5	1.9	0.6	3.2×5.2
2×0.75	0.21	1.1	26.0	0.5	2.1	0.6	3.4×5.6
<b>H03V2V2-F</b>							
2×0.5	0.21	0.9	39.0	0.5	1.9	0.6	5.1
2×0.75	0.21	1.1	26.0	0.5	2.1	0.6	5.5
3G0.5	0.21	0.9	39.0	0.5	1.9	0.6	5.4
3G0.75	0.21	1.1	26.0	0.5	2.1	0.6	5.9
4G0.5	0.21	0.9	39.0	0.5	1.9	0.6	6.0
4G0.75	0.21	1.1	26.0	0.5	2.1	0.6	6.5

Further versions on request



# H05V2V2H2-F

## H05V2V2-F

&lt;VDE&gt; &lt;HAR&gt;

**PVC sheathed flexible cable****flat and round**

according to HD 21.12

Temperature at continuous load acc. to HD

**+90 °C**

Temperature range (3000 hrs)

**-40 °C to +105 °C****Construction / Materials****Conductor**

Finely stranded copper conductor, bare or tinned, according to DIN VDE 0295, conductor category 5

**Insulation**

PVC compound with characteristics TI 3 according to HD 21.1

**Sheath**

PVC compound with characteristics TM3 according to HD 21.1

**Recommended application**

For internal wiring and connecting of domestic appliances involving medium mechanical load and high ambient temperatures also in humid spaces.

**Nominal voltage**300/500 V U<sub>0</sub>/U

Construction	Conductor construction			Insulation		Cable		
	No. of cores × nominal cross section	Diameter of single-wire max.	Diameter of conductor nom.	Electrical resistance at 20 °C plain max.	Wall thickness nom.	Diameter of core nom.	Wall thickness of sheath nom.	Outer dimension or outer diameter nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm	
<b>H05V2V2H2-F</b>								
2×0.75	0.21	1.1	26.0	0.6	2.3	0.8	4.0×6.3	
2×1	0.21	1.3	19.5	0.6	2.5	0.8	4.2×6.7	
<b>H05V2V2-F</b>								
2×0.75	0.21	1.1	26.0	0.6	2.3	0.8	6.4	
2×1	0.21	1.3	19.5	0.6	2.5	0.8	6.7	
2×1.5	0.26	1.6	13.3	0.7	3.0	0.8	7.6	
2×2.5	0.26	2.1	7.98	0.8	3.7	1.0	9.5	
2×4	0.31	2.6	4.95	0.8	4.2	1.1	10.8	
3G0.75	0.21	1.1	26.0	0.6	2.3	0.8	6.8	
3G1	0.21	1.3	19.5	0.6	2.5	0.8	7.1	
3G1.5	0.26	1.6	13.3	0.7	3.0	0.9	8.2	
3G2.5	0.26	2.1	7.98	0.8	3.7	1.1	10.4	
3G4	0.31	2.6	4.95	0.8	4.2	1.2	11.7	
4G0.75	0.26	1.1	26.0	0.6	2.3	0.8	7.4	
4G1	0.21	1.3	19.5	0.6	2.5	0.9	7.9	
4G1.5	0.26	1.6	13.3	0.7	3.0	1.0	9.2	
4G2.5	0.26	2.1	7.98	0.8	3.7	1.1	11.3	
4G4	0.31	2.6	4.95	0.8	4.2	1.2	12.7	
5G0.75	0.21	1.1	26.0	0.6	2.3	0.9	8.3	
5G1	0.21	1.3	19.5	0.6	2.5	0.9	8.7	
5G1.5	0.26	1.6	13.3	0.7	3.0	1.1	10.4	
5G2.5	0.26	2.1	7.98	0.8	3.7	1.2	12.6	
5G4	0.31	2.6	4.95	0.8	4.2	1.4	14.4	



Further versions on request

&lt;VDE&gt; &lt;HAR&gt;



# S03V2V2-F



## PVC sheathed flexible cable for IDC technology

according to HD 21.12 S1: 1994

according to VDE expertise No. 7757

Temperature at continuous load acc. to HD

**+90 °C**

Temperature range (3000 hrs)

**-40 °C to +105 °C**

### Construction / Materials

#### Conductor

Finely stranded copper conductor, tinned, according to DIN VDE 0295, conductor category 2, 5 or 6 IDC technology possible (Insulation Displacement Connection).

#### Insulation

PVC compound with characteristics TI 3 according to HD 21.1

#### Sheath

PVC compound with characteristics TM3 according to HD 21.1

### Application pursuant to VDE certificate

Flexible junior service cord for control units.

### Nominal voltage

300/300 V U<sub>0</sub>/U



Construction	Conductor construction			Insulation		Cable	
	No. of cores × nominal cross section	No. of wires × Diameter of single-wire nom.	Diameter of conductor nom.	Electrical resis- tance at 20 °C plain max.	Wall thickness nom.	Diameter of core nom.	Wall thickness of sheath nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm
2×0.35	7×0.254	0.8	59.0	0.3	1.4	0.8	4.4
3×0.35	7×0.254	0.8	59.0	0.3	1.4	0.8	4.6
4×0.35	7×0.254	0.8	59.0	0.3	1.4	0.8	5.0

# S03Z1Z1H2-F

## S03Z1Z1-F

&lt;VDE&gt; &lt;HAR&gt;



### Sheathed flexible cable

according to HD 21.14 S1: 2003

according to VDE expertise No. 7907

(S03Z1Z1) and 7908 (S05Z1Z1)

Temperature at continuous load acc. to HD

**+70 °C**

Temperature range (3000 hrs)

**-20 °C to +80 °C**

### Construction / Materials

#### Conductor

Finely stranded copper conductor, bare or tinned, according to DIN VDE 0295, optional conductor category 5 or 6

#### Insulation

Halogen-free polymer compound with characteristics TI 6 according to HD 21.14

#### Sheath

Halogen-free polymer compound FRNC (= Flame Retardant Non Corrosive) with characteristics TM 7 according to HD 21.14 ageing

### Application according to VDE certificate of conformity

Especially for applications that require minor release of smoke and corrosive gases in the event of fire.

### Nominal voltage

300/300 V U<sub>0</sub>/U

Construction	Conductor construction			Insulation		Cable		
	No. of cores × nominal cross section	No. of wires × Diameter of single-wire	Diameter of conductor  nom.	Electrical resistance at 20 °C plain max.	Wall thickness  nom.	Diameter of core  nom.	Wall thickness of sheath  nom.	Outer dimen- sion or outer diameter  nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm	
<b>S03Z1Z1H2-F</b>								
2×0.5	0.21	0.9	39.0	0.5	1.9	0.6	3.2×5.2	
2×0.75	0.21	1.1	26.0	0.5	2.1	0.6	3.4×5.6	
<b>S03Z1Z1-F</b>								
2×0.5	0.21	0.9	39.0	0.5	1.9	0.6	5.1	
2×0.75	0.21	1.1	26.0	0.5	2.1	0.6	5.5	

Further versions on request

# S05Z1Z1H2-F

## S05Z1Z1-F

&lt;VDE&gt; &lt;HAR&gt;

**Sheathed flexible cable**

according to HD 21.14 S1: 2003

according to VDE expertise

No. 7907 (S03Z1Z1) and 7908 (S05Z1Z1)

Temperature at continuous load acc. to HD

**+70 °C**

Temperature range (3000 hrs)

**-20 °C to +80 °C****Construction / Materials****Conductor**

Finely stranded copper conductor, bare or tinned, according to DIN VDE 0295, optional conductor category 5 or 6

**Insulation**

Halogen-free polymer compound with characteristics TI 6 according to HD 21.14

**Sheath**

Halogen-free polymer compound FRNC

(= Flame Retardant Non Corrosive)

with characteristics TM 7 according to HD 21.14 ageing

**Application according to VDE certificate of conformity**

Specially for applications requiring little development of smoke and corrosive gases in a fire.

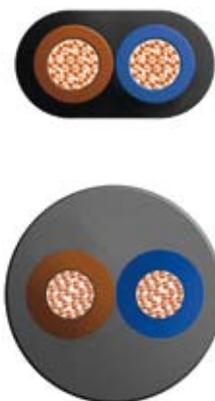
**Nominal voltage**

300/500 V U<sub>0</sub>/U



Construction	Conductor construction			Insulation		Cable	
	Diameter of single-wire	Diameter of conductor	Electrical resistance at 20 °C plain	Wall thickness	Diameter of core	Wall thickness of sheath	Outer dimension or outer diameter
	max.	nom.	max.	nom.	nom.	nom.	nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm
<b>S05Z1Z1H2-F</b>							
2×0.75	0.21	1.1	26.0	0.6	2.3	0.8	4.0×6.3
2×1	0.21	1.3	19.5	0.6	2.5	0.8	4.2×6.7
<b>S05Z1Z1-F</b>							
2×0.75	0.21	1.1	26.0	0.6	2.3	0.8	6.4
3G0.75	0.21	1.1	26.0	0.6	2.3	0.8	6.8
3G1	0.21	1.3	19.5	0.6	2.5	0.8	7.1
3G1.5	0.26	1.6	13.3	0.7	3.0	0.9	8.2
3G2.5	0.26	2.1	7.98	0.8	3.7	1.1	10.4
5G1.5	0.26	1.6	13.3	0.7	3.0	1.1	10.4
5G2.5	0.26	2.1	7.98	0.8	3.7	1.1	12.6

Further versions on request



# H05BQ-F

# H07BQ-F

&lt;VDE&gt; &lt;HAR&gt;



**EPR insulated flexible cable  
with polyurethane sheath**

according to HD 22.10

Temperature at continuous load acc. to HD  
**+90 °C**

Temperature range (3000 hrs)  
**-40 °C to +105 °C**



## Construction / Materials

### Conductor

Finely stranded copper conductor, tinned, according to DIN VDE 0295, conductor category 5

### Insulation

Rubber compound with characteristics EI6 according to VDE 0282, Part 1

### Sheath

Polyurethan compound with characteristics TMPU according to VDE 0282, Part 10

## Recommended application

Power cord for machineries, motors used on construction sites and in shipyards as well as in agriculture; in dry, humid or wet areas subjected to medium mechanical damage. Use in the area of refrigeration also possible.

## Nominal voltage

**H05BQ-F** 300/500 V U<sub>0</sub>/U<sub>i</sub>  
**H07BQ-F** 450/750 V U<sub>0</sub>/U<sub>i</sub>

Construction No. of cores × nominal cross section	Conductor construction			Insulation		Cable	
	Diameter of single-wire max.	Diameter of conductor nom.	Electrical resis- tance at 20 °C plain max.	Wall thickness nom.	Diameter of core nom.	Wall thickness of sheath nom.	Outer dimen- sion or outer diameter nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm
<b>H05BQ-F</b>							
2×0.75	0.21	1.1	26.7	0.6	2.3	0.8	6.5
2×1	0.21	1.3	20.0	0.6	2.5	0.9	7.2
3G0.75	0.21	1.1	26.7	0.6	2.3	0.9	7.1
3G1	0.21	1.3	20.0	0.6	2.5	0.9	7.5
4G0.75	0.21	1.1	26.7	0.6	2.3	0.9	7.7
4G1	0.21	1.3	20.0	0.6	2.5	0.9	8.1
5G0.75	0.21	1.1	26.7	0.6	2.3	1.0	8.5
5G1	0.21	1.3	20.0	0.6	2.5	1.0	9.1
<b>H07BQ-F</b>							
2×1	0.21	1.3	20.0	0.8	2.9	0.9	8.1
2×1.5	0.26	1.6	13.7	0.8	3.2	1.0	8.7
2×2.5	0.26	2.1	8.21	0.9	3.9	1.1	10.4
2×4	0.31	2.6	5.09	1.0	4.6	1.2	12.0
3G1	0.21	1.3	20.0	0.8	2.9	0.9	8.6
3G1.5	0.26	1.6	13.7	0.8	3.2	1.0	9.2
3G2.5	0.26	2.1	8.21	0.9	3.9	1.1	11.0
3G4	0.31	2.6	5.09	1.0	4.6	1.2	12.7
4G1	0.21	1.3	20.0	0.8	2.9	1.0	9.5
4G1.5	0.26	1.6	13.7	0.8	3.2	1.1	10.3
4G2.5	0.26	2.1	8.21	0.9	3.9	1.2	12.2
4G4	0.31	2.6	5.09	1.0	4.6	1.3	14.1
5G1	0.21	1.3	20.0	0.8	2.9	1.1	10.7
5G1.5	0.26	1.6	13.7	0.8	3.2	1.1	11.3
5G2.5	0.26	2.1	8.21	0.9	3.9	1.3	13.5
5G4	0.31	2.6	5.09	1.0	4.6	1.4	15.6

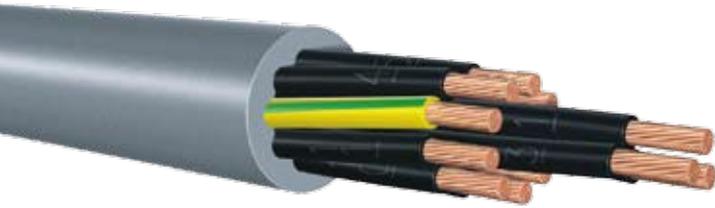
Further versions on request



&lt;VDE&gt; &lt;HAR&gt;



# H05VV5-F



## PVC insulated control cable

according to HD 21.13 and to UL Style 2464

Temperature at continuous load acc. to HD

**+60 °C**

Temperature range (3000 hrs)

**-15 °C to +80 °C**

### Construction / Materials

#### Conductor

Finely stranded copper conductor, bare or tinned, according to DIN VDE 0295, conductor category 5

#### Insulation

PVC compound with characteristics TI 2 according to HD 21.1

#### Sheath

PVC compound, oil-resistant with characteristics TM5 according to HD 21.1

### Recommended application

For connecting production and machine tool components as well as interconnecting these components.

### Nominal voltage

300/500 V U<sub>0</sub>/U

Construction No. of cores × nominal cross section	Conductor construction			Insulation		Cable	
	Diameter of single-wire	Diameter of conductor	Electrical resistance at 20 °C plain	Wall thickness	Diameter of core	Wall thickness of sheath	Outer dimension or outer diameter
	max.	nom.	max.	nom.	nom.	nom.	nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm
2×0.5	0.21	0.9	39.0	0.6		0.8	6.0
2×0.75	0.21	1.1	26.0	0.6		0.8	6.3
3G0.5	0.21	0.9	39.0	0.6		0.8	6.3
3G0.75	0.21	1.1	26.0	0.6		0.8	6.7
3G1	0.21	1.3	19.5	0.6		0.8	7.0
4G0.5	0.21	0.9	39.0	0.6		0.8	6.9
4G0.75	0.21	1.1	26.0	0.6		0.8	7.3
4G1	0.21	1.3	19.5	0.6		0.8	7.6
5G1	0.21	1.3	19.5	0.6		0.9	8.5
6G0.75	0.21	1.1	26.0	0.6		0.9	8.8
7G1	0.21	1.3	19.5	0.6		1.0	10.4

Further versions on request



&lt;VDE&gt;

&lt;HAR&gt;



# H05VVC4V5-K



## Shielded PVC insulated control cable

according to HD 21.13 and to UL Style 2464

Temperature at continuous load acc. to HD

**+60 °C**

Temperature range (3000 hrs)

**-15 °C to +80 °C**

### Construction / Materials

#### Conductor

Finely stranded copper conductor, bare or tinned, according to DIN VDE 0295, conductor category 5

#### Insulation

PVC compound with characteristics TI 2 acc. to HD 21.1

#### Inner sheath

PVC compound with characteristics TM2 acc. to HD 21.1

#### Sheathing

Braid made of tinned copper wires

#### Outer sheath

PVC compound, oil-resistant with characteristics TM5 according to HD 21.1

### Recommended application

For interconnecting production and machine tool components. The sheathed type should be used to guard against electromagnetic influences.

### Nominal voltage

300/500 V U<sub>0</sub>/U

Construction No. of cores × nominal cross section	Conductor construction			Insulation		Cable		
	Diameter of single-wire	Diameter of conductor	Electrical resistance at 20 °C plain max.	Wall thickness	Diameter of core	Inner sheath wall thickness	Outer sheath wall thickness	Outer dimen- sion or outer diameter
	max.	nom.	max.	nom.	nom.	nom.	nom.	nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm	mm
2×0.75	0.21	1.1	26.0	0.6		0.7	0.9	8.5
2×2.5	0.21	2.1	7.98	0.8		0.7	1.1	11.6
3×0.75	0.21	1.1	26.0	0.6		0.7	0.9	8.9
4×0.75	0.21	1.1	26.0	0.6		0.7	1.0	9.7
4G2.5	0.21	2.1	7.98	0.8		0.8	1.2	13.5
7G1	0.21	1.3	19.5	0.6		0.8	1.2	12.8

Further versions on request

# H05VVH6-F

# H07VVH6-F

◁VDE▷ ▷HAR▷



## Flat PVC insulated cable

according to HD 359

according to VDE expertise No. 7757

Temperature at continuous load acc. to HD

**+70 °C**

Temperature range (3000 hrs)

**-20 °C to +80 °C**

### Construction / Materials

#### Conductor

Finely stranded copper conductor, bare or tinned, according to DIN VDE 0295, conductor category 5

#### Insulation

PVC compound with characteristics T12 according to HD 21.1

#### Sheath

PVC compound with characteristics TM2 according to HD 21.1

### Special versions

To ease fitting, a tear strip may be laid inside the individual core groups to split open the PVC jacket.

### Nominal voltage

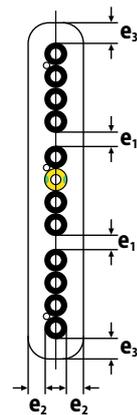
**H05VVH6-F** 300/500 V U<sub>0</sub>/U

**H07VVH6-F** 450/750 V U<sub>0</sub>/U



Construction No. of cores × nominal cross section	Conductor construction			Insulation		Cable				
	Diameter of single-wire max.	Diameter of conductor nom.	Electrical resistance at 20 °C plain max. Ω/km	Wall thickness nom.	Diameter of core nom.	Sheath wall thickness nom.			No. of groups	Outer dimension or outer diameter nom. mm
						e1	e2	e3		
<b>H05VVH6-F</b>										
24G1	0.21	1.3	19.5	0.6		1.0	0.9	1.5	6×4	4.5×71.0
<b>H07VVH6-F</b>										
4G1.5	0.26	1.6	13.3	0.7	3.0	1.0	1.0	1.5	1×4	5.2×15.5
4G2.5	0.26	2.1	7.98	0.8	3.7	1.5	1.0	1.8	1×4	5.9×19
4G4	0.31	2.6	4.95	0.8	4.2	1.5	1.2	1.8	1×4	6.9×21.2
4G6	0.31	3.2	3.3	0.8	4.8	1.5	1.2	1.8	1×4	7.5×24.0
4G10	0.41	4.2	1.91	1.0	6.2	1.5	1.4	1.8	1×4	9.4×29.5
4G16	0.41	5.6	1.21	1.0	7.6	1.5	1.5	2.0	1×4	11.1×35.8
12G1.5	0.26	1.6	13.3	0.7	3.0	1.0	1.0	1.5	3×4	5.2×41.3

Further versions on request



## UL and CSA cables

Special approvals of UL (Underwriters Laboratories) as well as CSA (Canadian Standards Association) are required for the production and sale of products for the North American market. This applies not only to final products but also to the components which go into them.

LEONI thus offers an extensive range of wires and cables compliant with UL and CSA standards, enabling its customers to meet US and Canadian standards as well as European requirements.

**Quality connects –  
people, markets,  
companies**



# UL and CSA approvals

Before electrical products are allowed onto the North American market they have to be tested and approved as to their hazard potential in respect of combustibility, electric shock and – for certain equipment – electromagnetic compatibility.

To comply with product liability laws a manufacturer has to ensure by the testing and certification of his components that they fully satisfy national statutory requirements.



The two organizations, UL and CSA International, are recognized in Canada and in the USA. They issue various test marks according to validity.



The test mark (UR) identifies products which are integrated as components in electrical equipment (test mark recognized).

### Approval for the USA

Approvals have to be issued by a **N**ationally **R**ecognized **T**esting **L**aboratory (NRTL). NRTL status is awarded by the **O**ccupational **S**afety and **H**ealth **A**dministration (OSHA).

- e.g.
- UL (Underwriters Laboratories)
  - CSA International (Canadian Standards Association)
  - ITSNA (Intertek Testing Service NA, Inc.)
  - TUV Rheinland of North America

### Approval for Canada

Approvals have to be issued by a certification office recognized by the **S**tandards **C**ouncil of **C**anada (SCC).

- e.g.
- CSA International
  - UL
  - ITSNA

# Marking

The type of marking used on cables depends on the governing standard. For AWM cables compliant with UL 758 it is sufficient for each unit of delivery to be given an ID tag. Which items of data need to be

quoted are specified in the standard. For easier identification, the key data can also be applied to the surface of the insulation.

## Marking of UL and CSA approved Appliance Wiring Material (AWM)

	<b>AWM</b>	<b>STYLE 1061</b>	<b>80C</b>	<b>300V</b>	<b>VW-1</b>	<b>LEONI</b>	<b>CSA</b>	<b>T2</b>	<b>90C</b>	<b>FT-1</b>
<b>UL recognized mark</b> = compliant with UL 758	<b>Appliance Wiring Material</b>	Applicable style page	Max. service temperature according to UL	Max. operating voltage according to UL	UL flame test	Manufacturer (production location or E... file number)	CSA International approval	Type according to CSA	Max. service temperature according to CSA	CSA flame test

(example)

## Marking of UL and CSA approved Flexible Circuit Cables

Cables are marked according to the standard in question. A space of max. 610 mm is left between the markings.

	<b>ST</b>	<b>18/4</b>	<b>105C</b>	<b>300V</b>	<b>VW-1</b>	<b>LEONI</b>		<b>ST</b>	<b>18/4</b>	<b>105C</b>	<b>FT-2</b>
<b>UL-listed mark</b> = compliant with UL 62	Type	AWG size and number of cores	Max. service temperature according to UL	Max. operating voltage according to UL	UL flame test	Manufacturer (production location or E... file number)	<b>UL-listed certified for Canada</b> mark = compliant with UL 62 or CSA symbol	Type according to CSA	AWG size and number of cores	Max. service temperature according to CSA	CSA flame test

(example)



### “Non-denominational Labelling”

LEONI has been working closely for over 30 years with Underwriters Laboratory (UL) in the USA and CSA International (CSA) for Canada, in order to have the product range manufactured specially for these markets approved and subsequently checked by means of the “follow-up service”.

The two testing institutes referred to above have decided to simplify the complicated designation of approved products. In this way, an approval designated by a number (SJ -173 230) can dispense with the UL labels. At the same time new specifications for the labelling of the products have been issued in the revised edition of UL 758 AWM-Material and the “label licensing service” was set off with CSA. We have applied these changes and have designed a new label.

# Type classification

## Appliance Wiring Material (AWM)

This standard describes conductors for appliance wiring applications. All imaginable constructions can be entered on style pages provided they have not been recorded. AVL2 conductors compliant with UL 758 are valid for the American market. AVL8 conductors have been tested by UL in accordance with the Canadian standard and are approved for Canada.

## Flexible Cord (ZJCZ) – Art. 400 NEC

This standard covers wiring products for flexible as well as permanent installation. All the various types of cord are constructed solely from stranded conductors. The maximum voltage in this standard is 600 V.

Jacketed cords:

**SJT, ST, SVT, SPT-1, SPT-2, SPT-3**  
(also cUL approval)

## National Electrical Code (NEC)

The NEC is published by the National Fire Protection Association (NFPA) to provide practical protection for persons and property from the risks of using electricity (see also [www.nfpa.org](http://www.nfpa.org)). Instructions on how to use cables and wires in various areas (e.g. inside and outside buildings, factories and other premises) are set out in nine chapters.

NEC type IDs are abbreviations consisting of a prefix and a suffix.

The prefix describes the type of cable, e.g.:

MP = Multi-Purpose

CM = Communications Metallic

CATV = Community Antenna Television

OF = Optical Fiber

The suffix indicates the type of mandatory flame test and the area of use, e.g.:

P = Plenum

R = Riser

X = limited use



# AWG sizes

AWG size of conductor	diameter of solid conductors				cross sectional area of conductor - minimum acceptable					
	nominal value		minimum acceptable		nominal value		0.98 × nominal *		0.97 × nominal value **	
	mils	mm	mils	mm	cmil	mm <sup>2</sup>	cmil	mm <sup>2</sup>	cmil	mm <sup>2</sup>
44	2.0	0.051	1.98	0.050	4.0	0.00203	3.92	0.00198	–	–
41	2.8	0.071	2.77	0.070	7.84	0.00397	7.68	0.00389	–	–
40	3.1	0.079	3.07	0.078	9.61	0.00487	9.42	0.00477	–	–
38	4.0	0.102	3.96	0.101	16.0	0.00811	15.7	0.00796	–	–
36	5.0	0.127	4.95	0.126	25.0	0.0127	24.5	0.0124	–	–
34	6.3	0.160	6.24	0.158	39.7	0.020	38.9	0.0197	–	–
32	8.0	0.203	7.92	0.201	64	0.0324	62.7	0.0318	–	–
30	10.0	0.254	9.9	0.251	100	0.0507	98	0.0497	–	–
29	11.3	0.287	11.2	0.284	128	0.0647	125	0.0633	–	–
28	12.6	0.320	12.5	0.318	159	0.0804	156	0.0790	–	–
27	14.2	0.361	14.1	0.358	202	0.102	198	0.100	–	–
26	15.9	0.404	15.7	0.399	253	0.128	248	0.126	–	–
25	17.9	0.455	17.7	0.450	320	0.162	314	0.159	–	–
24	20.1	0.511	19.9	0.506	404	0.205	396	0.201	392	0.199
23	22.6	0.574	22.4	0.568	511	0.259	501	0.254	496	0.251
22	25.3	0.643	25.0	0.637	640	0.324	627	0.318	621	0.314
21	28.5	0.724	28.2	0.717	812	0.412	796	0.404	788	0.400
20	32.0	0.813	31.7	0.805	1020	0.519	1000	0.509	989	0.503
19	35.9	0.912	35.6	0.904	1290	0.653	1264	0.641	1251	0.633
18	40.3	1.02	40.0	1.016	1620	0.823	1588	0.807	1571	0.798
17	45.3	1.15	44.9	1.140	2050	1.04	2009	1.02	1989	1.01
16	50.8	1.29	50.3	1.278	2580	1.31	2528	1.28	2503	1.27
15	57.1	1.45	56.5	1.435	3260	1.65	3195	1.62	3162	1.60
14	64.1	1.63	63.5	1.613	4110	2.08	4028	2.04	3987	2.02
13	72.0	1.83	71	1.81	5180	2.63	5076	2.58	5025	2.55
12	80.8	2.05	80	2.03	6530	3.31	6399	3.24	6334	3.21
11	90.7	2.30	90	2.28	8230	4.17	8065	4.09	7983	4.04
10	101.9	2.588	101	2.56	10380	5.261	10172	5.16	10069	5.103
9	114.4	2.906	113	2.88	13090	6.631	12828	6.50	–	–
8	128.5	3.264	127	3.23	16510	8.367	16180	8.20	–	–
7	144.3	3.665	143	3.63	20820	10.55	20404	10.34	–	–
6	162.0	4.115	160	4.07	26240	13.30	25715	13.03	–	–
5	181.9	4.620	180	4.57	33090	16.77	32428	16.43	–	–
4	204.3	5.189	202	5.14	41740	21.15	40905	20.73	–	–
3	229.4	5.827	227	5.77	52620	26.67	51568	26.14	–	–
2	257.6	6.543	255	6.48	66360	33.62	65033	32.95	–	–
1	289.3	7.348	286	7.27	83690	42.41	82016	41.56	–	–
1/0	324.9	8.252	322	8.17	105600	53.49	103488	52.42	–	–
2/0	364.8	9.266	361	9.17	133100	67.43	130438	66.08	–	–
3/0	409.6	10.40	406	10.30	167800	85.01	164444	83.31	–	–
4/0	460.0	11.68	455	11.56	211600	107.2	207368	105.1	–	–

\* The minimum values in this column apply to conductors for permanent installation or flexible use with strand constructions made of single-wires from AWG 29 to AWG 20 (= 0.287 to 0.813 mm)

\*\* The minimum values in this column apply to conductors for permanent installation or flexible use with strand constructions made of single-wires from AWG 36 to AWG 30 (= 0.127 to 0.254 mm)

# Standard constructions for copper conductors

Typ I (solid copper conductors, extract from ASTM B286)

AWG size designation	nominal cross section		diameter nominal		maximum DC resistance at 20 °C			
	cmils	mm <sup>2</sup>	in.	mm	annealed tin coated		plain or annealed silver coated	
					Ω/1000 ft	Ω/km	Ω/1000 ft	Ω/km
10	10.380	5.260	0.1019	2.588	1.06	3.477	1.02	3.346
12	6.530	3.309	0.0808	2.052	1.69	5.544	1.62	5.315
14	4.110	2.083	0.0641	1.628	2.68	8.792	2.58	8.464
16	2.580	1.307	0.0508	1.290	4.26	13.976	4.10	13.451
18	1.620	0.821	0.0403	1.024	6.78	22.244	6.52	21.391
20	1.020	0.517	0.0320	0.813	10.7	35.105	10.3	33.792
22	640	0.324	0.0253	0.643	17.2	56.430	16.5	54.133
24	404	0.205	0.0201	0.511	27.2	89.238	26.2	85.958
26	253	0.128	0.0159	0.404	44.5	145.997	41.9	137.467
28	159	0.081	0.0126	0.320	70.8	232.283	66.8	219.160
30	100	0.051	0.0100	0.254	114.0	374.015	106.0	347.769

Typ II (stranded copper conductors, extract from ASTM B286)

LEONI stand- ard- con- ductors	size designation	conductor construction					maximum DC resistance at 20 °C					
		no. of wires	diameter of each wire		calculated cross sectional area		max. allowable diameter		annealed tin coated		plain or annealed silver coated	
			in.	mm	cmils.	mm <sup>2</sup>	in.	mm	Ω/1000 ft	Ω/km	Ω/1000 ft	Ω/km
	0000–2109	2109	0.0100	0.254	210.900	106.86	0.635	16.13	0.0576	0.1890	0.0537	0.1762
	000–1672	1672	0.0100	0.254	167.200	84.72	0.545	13.84	0.0727	0.2385	0.0677	0.2221
	00–1330	1330	0.0100	0.254	133.000	67.39	0.486	12.34	0.0914	0.2999	0.0851	0.2792
	0–1064	1064	0.0100	0.254	106.400	53.91	0.435	11.05	0.114	0.3740	0.106	0.3478
	0–1045	1045	0.0100	0.254	104.500	52.95	0.431	10.95	0.116	0.3806	0.108	0.3543
	1–836	836	0.0100	0.254	83.600	42.36	0.386	9.80	0.145	0.4757	0.135	0.4429
	1–817	817	0.0100	0.254	81.700	41.40	0.382	9.70	0.149	0.4888	0.139	0.4560
✓	2–665	665	0.0100	0.254	66.500	33.70	0.342	8.69	0.183	0.6004	0.170	0.5577
	4–133	133	0.0179	0.455	42.615	21.59	0.274	6.96	0.280	0.9186	0.263	0.8629
✓	4–420	420	0.0100	0.254	42.000	21.28	0.275	6.99	0.289	0.9482	0.270	0.8558
	6–133	133	0.0142	0.361	26.818	13.59	0.217	5.51	0.444	1.456	0.418	1.371
✓	6–266	266	0.0100	0.254	26.600	13.48	0.220	5.59	0.457	1.499	0.426	1.397
	8–133	133	0.0113	0.287	16.983	8.61	0.173	4.39	0.701	2.299	0.661	2.168
✓	8–168	168	0.0100	0.254	16.800	8.51	0.177	4.50	0.724	2.375	0.674	2.211
✓	10–105	105	0.0100	0.254	10.500	5.32	0.130	3.30	1.15	3.773	1.07	3.510
	10–104	104	0.0100	0.254	10.400	5.27	0.130	3.30	1.16	3.805	1.08	3.543
	10–49	49	0.0142	0.361	9.880	5.01	0.132	3.35	1.21	3.969	1.14	3.740
	10–37	37	0.0159	0.404	9.354	4.74	0.115	2.92	1.26	4.133	1.19	3.904
✓	12–65	65	0.0100	0.254	6.500	3.29	0.099	2.52	1.85	6.069	1.73	5.675
	12–37	37	0.0126	0.320	5.874	2.98	0.091	2.31	2.01	6.595	1.89	6.201
	12–19	19	0.0179	0.455	6.088	3.085	0.093	2.36	1.92	6.299	1.81	5.938
✓	14–41	41	0.0100	0.254	4.100	2.078	0.081	2.06	2.94	9.646	2.74	8.990
	14–19	19	0.0142	0.361	3.831	1.941	0.073	1.85	3.05	10.007	2.87	9.416
✓	16–26	26	0.0100	0.254	2.600	1.317	0.062	1.57	4.59	15.059	4.27	14.009
✓	16–19	19	0.0113	0.287	2.426	1.229	0.059	1.50	4.82	15.814	4.54	14.895
✓	18–16	16	0.0100	0.254	1.600	0.811	0.048	1.23	7.68	25.20	6.88	22.56
	18–19	19	0.0100	0.254	1.900	0.963	0.052	1.32	6.22	20.407	5.79	18.996
	18–7	7	0.0159	0.404	1.770	0.897	0.050	1.27	6.54	21.457	6.16	20.210
	20–19	19	0.0080	0.203	1.216	0.616	0.042	1.07	9.76	32.021	9.10	29.856
	20–10	10	0.0100	0.254	1.000	0.507	0.040	1.02	11.8	38.714	11.0	36.089
✓	20–7	7	0.0126	0.320	1.111	0.563	0.039	0.99	10.4	34.121	9.81	32.185
	22–19	19	0.0063	0.160	754	0.382	0.033	0.84	15.9	52.165	14.8	48.556
✓	22–7	7	0.0100	0.254	700	0.355	0.031	0.79	16.7	54.790	15.6	51.181
	24–19	19	0.0050	0.127	475	0.241	0.027	0.69	25.4	83.333	23.6	77.428
✓	24–7	7	0.0080	0.203	448	0.227	0.025	0.64	26.2	85.958	24.5	80.381
	26–19	19	0.0040	0.102	304	0.154	0.022	0.56	40.1	131.56	37.3	122.37
✓	26–7	7	0.0063	0.160	278	0.141	0.020	0.51	42.6	139.76	39.7	130.24
	28–19	19	0.0031	0.079	183	0.093	0.017	0.43	67.7	222.11	63.1	207.02
✓	28–7	7	0.0050	0.127	175	0.089	0.016	0.40	68.2	223.75	63.6	208.66
✓	30–7	7	0.0040	0.102	112	0.057	0.013	0.33	108.0	354.33	100.0	328.08
✓	32–7	7	0.0031	0.079	67	0.034	0.011	0.28	182.0	597.11	170.0	557.74

## UL and CSA flame tests

Wooden buildings are widespread in the USA and Canada. Wiring material must therefore undergo special flame tests. The following listed UL and CSA standards indicate which individual type of cable has to undergo which test.



## Flame test for AWM applications

Name/class	Standard	Range of application
<b>Horizontal Flame Test</b>	UL 1581 Sec. 1090	Use I (internal wiring) previously: UL 758 page 31
<b>Horizontal Flame Test / FT-2</b>	CSA No. 3 / UL 1581 Sec. 1100	Class I / Class II (internal/external wiring)
<b>Cable Flame Test</b>	UL 1581 Sec. 1061	Use II (external wiring) previously: UL 758 page 95
<b>Vertical Flame Test / FT-1</b>	CSA No. 3 / UL 1581 Sec. 1060	Class I / Class II (internal/external wiring)
<b>Vertical Wire Flame Test / VW-1*</b>	UL 1581 Sec. 1080	For special applications

\* VW-1 is the most severe flame test for single cables. AWM cables bearing the VW-1 mark must have undergone the more severe test even if this is not required in the corresponding style page.

Flame tests for AWM applications (UL 758 and CSA C22.2 No. 210.2-M90) are described in the standards UL 1581 and CSA C22.2 No. 3-92. A characteristic of these tests is the periodic exposure of the test specimen to flames. At the same time tests are conducted to see whether any glowing or burning constituents of the test specimen will ignite neighboring combustible materials.

## Flame test according to NEC, article 725

Name/class	Standard	Range of application
<b>Vertical Tray Flame and Smoke Test / FT-4</b>	UL 1685	Vertical flame test in buildings <b>except</b> risers and plenums (General purpose)
<b>RISER FLAME TEST</b>	UL 1666	Flame propagation height in vertical shafts (Riser)
<b>Horizontal Flame and Smoke Test / FT-6</b> (Steiner-Tunnel-Test)	UL 910 / NFPA 262	Horizontal flame propagation and smoke generation in ducts or plenums

Cables and wires whose range of application is defined by the NEC are required to undergo multi-cable flame tests (exceptions are cables for limited use in dwellings – in these cases FT 1 or VW-1 is required). These tests are described in detail in the standards UL 910, UL 1581, UL 1666, UL 1685 and CSA C22.2 No. 3. Common to all of them is a

relatively long period of exposure to flames (20 and 30 minutes). Depending on the type of application, several specimens are exposed to flames from burners of various power ratings (20 to 154.5 kW). The flame tests are listed below in increasing order of severity.

## Flammability of plastic materials

Name/class *	Standard	Range of application
<b>94HB</b>	UL 94	Horizontal flame test
<b>94V-2</b>	UL 94	Vertical flame test
<b>94V-1</b>	UL 94	Vertical flame test
<b>94V-0</b>	UL 94	Vertical flame test

\* Plastics are assigned to a UL 94 class according to their degree of flammability. HB is the least severe and V-0 the most severe flame test.

Plastics used in cables can be recognized as "Plastics Components" compliant with UL 94. The flame tests described in UL 94 are performed on solid plastic rods. The properties of a finished cable are **not** described. The use of recognized plastics components as insulation materials for cables makes it easier for a cable to obtain UL approval, i.e. for it to be listed as a finished product.



## Product overview UL 758 AWM

Over the years, LEONI has acquired numerous UL approvals to meet the most diverse requirements of its customers.

Number groups	Class
1...	Single-Conductor Thermoplastic-Insulated Wire
2...	Multi-Conductor Thermoplastic-Jacketed Cable
3...	Single-Conductor Thermoset-Insulated Wire
4...	Multi-Conductor Thermoset-Jacketed Cable
5...	Miscellaneous Wire

Verification of approval used to take the form of a "Yellow Card" which could be submitted to customers on request.

Today all the manufacturers of UL AWM cables and wires are listed in the Internet (see [www.ul.com](http://www.ul.com)). At the moment LEONI has over 600 styles listed in the UL Table of Authorized Styles (see page 60 and 61). A summary of the key data to be found on a style page is set out below. If you have any further questions, please ask our product specialists.





# UL approved styles at LEONI

operating voltage	AWM style number				for single-core cables								
<b>60 °C</b>													
30 V	1354 10056	1375 10104	1478 10139	1589	1594	1596	1598	1605	1967	1997	10025	10049	10051
48 V	1575												
60 V	1948 10130												
150 V	1379 10105												
300 V	1003 1353 10029	1037 1365 10057	1038 1380 10106	1062 1387 10253	1063 1466	1066 1506	1107 1511	1158 1518	1159 1520	1160 1546	1184 1556	1211 1663	1348 1970
600 V	1002 1919	1064 1920	1065 10029	1113 10162	1161	1162	1287	1289	1352	1381	1443	1479	1480
20 kV	10225												
35 kV	10285												
not specified	1375 1475 1968												
<b>75 °C</b>													
300 V	10558												
<b>80 °C</b>													
30 V	1354 1375 1589 1598 1692 1766 1957 1967 10036 10104 10268 10298												
60 V	10150												
150 V	1379 1429 1460 1568 10105												
300 V	1001 1124 1309 1521 1662	1007 1185 1326 1522 1729	1039 1186 1347 1438 1816	1040 1195 1349 1439 1921	1061 1208 1380 1477 1970	1095 1255 1382 1493 10042	1096 1269 1386 1495 10106	1099 1281 1420 1545 10113	1100 1288 1435 1555 10189	1108 1295 1436 1569 10233	1115 1297 1437 1581 10467	1122 1298 1497 1582 10484	1123 1299 1519 1642 10864
500 V	1825												
600 V	1011 1234 1381 10674	1012 1237 1498 10865	1017 1238 1507	1018 1300 1541	1019 1301 1576	1020 1302 1647	1021 1303 1758	1022 1304 1922	1023 1305 10162	1054 1325 10232	1116 1326 10239	1186 1341 10240	1233 1350 10263
1000 V	1030 1031 1613 1836 10264 10492 10559 10675 10863												
not specified	1004 1114 1226 1351 1534 1536 1692 1968												
<b>90 °C</b>													
30 V	1571 1692 10036 10104												
60 V	10150												
150 V	10105												
250 V	1599												
300 V	1109 1118 1177 1446 1569 10106 10108 10413 10479												
600 V	1013	1014 1758	1024 10162	1025 10258	1026 10324	1027 10411	1119 10694	1207	1265	1266	1366	1499	1647
1000 V	1032 1033 1444 10258 10253 10726												
not specified	1692 5073 5074 5075 10280												
<b>105 °C</b>													
30 V	1508 1692 1905 10036												
60 V	10150												
125 V	1612 1538 1609												
150 V	1988 10059												
300 V	1110 1296 1430 1569 1674 1989 3317 10725												
600 V	1015 1431 1328	1016 1447 5058	1028 1500 5137	1029 1647 1344	1060 1650 1345	1120 1758 1346	1235 1990 3291	1236 1316	1239 1317	1240 1318	1283 1319	1284 1320	1308 1321
1000 V	10012 10271												
15000 V	3239												
not specified	1227 1327 1371 1422 1423 1426 1513 1516 1517 1523 1557 1586 1610												
1646	1686 1687 1688 1689 1692 1951												
<b>125 °C</b>													
90V	1645 1649												
150 V	1862												
300 V	1863												
600 V	1864												
not specified	1587												
<b>150 °C</b>													
150 V	1716 1814 1857												
300 V	1333 1591 1643 1671 1858 1886 1999 10009												
600 V	1331 1644 1859 1887												
1000 V	10203												
not specified	1670												
<b>200 °C</b>													
30 V	1707												
300 V	1332 1592 1709 1900												
600 V	1330 1710 1901												
1000 V	10203												
not specified	1708												
<b>250 °C</b>													
150 V	1882 10129												
300 V	1726												
600 V	1727												
not specified	1933												

**N.B.: To be able to select the correct wiring material for you, we need to know at least the required temperature and voltage ranges.**

operating voltage	AWM style number		for multi-core cables										
<b>60 °C</b>													
30 V	2384	2385	2386	2387	2388	2448	2552	2558	2560	2668	2704	2709	2726
	2731	2735	2789	2805	2833	2835	2841	2879	2912	2920	2921	2960	2969
	2993	2994	20041	20112	20170	20175	20254	20350	20578	20579	20912	20276	
50 V	2659												
60 V	20745		20402										
90 V	2912		20912										
125 V	2628		20060										
150 V	2582	2778	2912	20531	20912								
300 V	2089	2090	2091	2092	2093	2094	2262	2263	2264	2462	2464	2486	2534
	2548	2573	2591	2598	2606	2674	2738	2739	2777	2785	2944	20042	20200
	20241	20351	21036										
600 V	2106	2107	2108	2317	2486	2563	2739	20201	20352				
not specified	2445	2477	2490	2493	2660	2786	20084	20353	20433	20695	21001	21067	21068
	5277												
<b>75 °C</b>													
30 V	2912		20912										
90 V	2912		20912										
150 V	2912		20912										
300 V	21036												
600 V	2486												
<b>80 °C</b>													
30 V	2448	2502	2532	2535	2626	2841	2842	2879	2897	2906	2912	2919	2969
	2990	2897	4437	20041	20042	20063	20082	20121	20236	20912	20963	21283	21284
	20401	20276											
60 V	2912		20761										
90 V	2912		20912										
125 V	2584												
150 V	2576	2934	2936	2912	2961	20912	21282	21285					
300 V	2095	2096	2097	2265	2266	2267	2268	2269	2270	2338	2352	2353	2405
	2414	2444	2461	2464	2476	2480	2509	2518	2536	2555	2610	2629	2655
	2661	2667	2697	2732	2882	2935	2937	2944	20063	20083	20233	20234	21198
	21281	21286	20366	2200	21036								
600 V	2112	2113	2114	2115	2116	2117	2321	2351	2354	2355	2446	2463	2473
	2570	2656	2698	20233	20253	21267	21279	21287					
1000 V	5396		20940	21280	21288								
not specified	2343	2344	2345	2346	2428	2508	2571	2665	2876	2905	20235	5277	21001
	21161	21090	5422										
<b>90 °C</b>													
30 V	2637	2879	2912	20041	20669	20671	20320						
60 V	20669	20671	20761										
90 V	2912	20669	20671										
125 V	2630												
150 V	2912	20669	20671	20689									
300 V	2093	2098	2099	2100	2486	2549	2610	2654	2661	20042	20132	20950	20668
	20669	21023											
600 V	2121	2122	2123	2124	2125	2126	2319	2325	2486	2526	2550	2587	2653
	2839	20669	20802										
1000 V	21276												
not specified	2631	20670											
<b>105 °C</b>													
30 V	2551	2574	2589	2614	2879	2912	2991	2992	5271	20041	20042	20330	20378
60 V	20761												
90 V	2912												
125 V	20066												
150 V	2678												
300 V	2101	2102	2103	2339	2517	2651	2661	3291	20042	20106	20326	20327	20375
	21301	21036											
600 V	2127	2128	2129	2501	2516	2586	2662	2907	20000	20155	20328	20376	20503
	2733												
not specified	2507	20090	20329	20377	20448	20487	20500	4354					

**For single-core cables**

All the styles with UL 758 approval are listed in the table on page 60. Many different styles may satisfy a specific combination of temperature and operating voltage. Styles are often stipulated from specifications. An alternative style may be selected from the table to make allowance for the material and the service conditions (please ask our product specialists).

**For multi-core cables**

All the approved styles from LEONI are listed in the table above as per classification of the single-core wires according to temperature and operating voltage. Unfortunately, further differentiation is impossible on account of the individual nature of each style. Each style page contains details of the cable's construction, the number of conductors, conductor type, shield, sheath material and mandatory wall thickness values.

# Approvals by CSA International

## Approvals for the Canadian market

CSA International issues a file number (LL XXXXX) for each AWM item which is awarded approval. The table lists those LEONI locations which hold CSA approvals. Combinations of UL and CSA approvals are required in many cases. The ID codes used by CSA for wires and cables are listed in a CSA brochure (TN-014). They correspond to NEC's ID codes published in Article 400 (National Electrical Code):

- P** parallel
- T** thermoplastic
- W** "wet usage" or "wire"
- O** oil resistant
- S** service
- J** junior
- H** heat resistant

- Class:** **I** for use inside equipment  
**II** for use outside equipment
- Group:** **A** without mechanical loading  
**B** with mechanical loading

Operating voltage	LEONI Kabel GmbH Roth, Germany	LEONI Cable (Changzhou) Co. Ltd., China	LEONI Cable Mexico S.A. de C.V., Mexico	LEONI Kabel Polska S.p.z.o.o., Poland
<b>for single-core cables</b>				
<b>90 °C</b>				
300 V	✓	✓	✓	✓
600 V	✓	✓	✓	✓
<b>105 °C</b>				
300 V	✓	✓	✓	✓
600 V	✓	✓	✓	✓
<b>for multi-core cables</b>				
<b>80 °C</b>				
150 V	✓	✓	✓	✓
300 V	✓	✓	✓	✓
<b>105 °C</b>				
150 V	✓	✓	✓	✓
300 V	✓	✓	✓	✓

## UL approvals for USA and Canada

The mark  is a special UL approval and indicates wires which are produced according to American and Canadian Standard.

LEONI supplies a wide range of AWM (Appliance Wiring Material) products approved by the American UL standard 758 and the Canadian standard C22.2 No. 210. These cables can be sold with only one mark both in USA and Canada.



### Power cords

see page 70.

### Communication cables

CSA-C22.2 No. 214-M90 Type PCC (= Premises Communication Cable), i.e. multi-core cables for applications in buildings.

# Coding key

The type designation provides information on the type of wire, the insulation and sheath materials used and the principle design features in abbreviated and simplified form. A type designation is made up of several groups. The type of wire is specified first and then its construction from inside to outside.

## 1. Type of wire

LI	Stranded conductor
none	Solid conductor

## 2. Special conductor materials

M	Materials other than E-Cu or resistance conductors (e. g. aluminium, steel, steel copper, etc.)
W	Resistance conductors (usually copper alloys with Ni, Cr, Mn, etc.)

## 3. Codes for the dielectrics

Code for the dielectrics used for the insulation and sheath.

Y	Soft-PVC (polyvinyl chloride)
YW	Soft-PVC, heat resistant, hot-pressure resistant
YK	Soft-PVC, cold resistant
2Y	PE (polyethylene)
4Y	PA (polyamide)
6Y	FFEP (tetrafluoroethylene/hexafluoropropylene)
7Y	E/TFE (ethylene/tetrafluoroethylene)
9Y	PP (polypropylene)
11Y	TTPE-U (thermopl. elastomer on polyurethane basis)
12Y	TPE-E (thermopl. polyester elastomer on polyether ester basis)
13Y	TPE-E (thermopl. polyester elastomer on polyester ester basis)
31Y	TPE-S (thermopl. polyester elastomer on polystyrene basis)

41Y	TPE-A (thermopl. polyester elastomer on polyamide basis)
51Y	PFA (perfluoroalkoxy copolymer)
91Y	TPE-O (thermopl. polyester elastomer on polyolefin basis)
X	PVC-X (polyvinyl chloride cross-linked)
2X	PE-X (polyethylene cross-linked)
4G	EVA (ethylene/vinyl acetate)
10Y	PVDF (polyvinylidene fluoride)

In foamed materials, the code is preceded by a "zero": e. g. **02Y** = foamed or cellular PE.

## 4. Codes for constructional elements

Codes for further constructional elements and non-extruded coverings (where applicable).

B	Foil shield
C	Copper wire braiding
D	Copper wire spiral shield
G	Glass fiber braiding
P	Insulation foil
T	Textile braiding

**5. The number of cores** (except in the case of single-core wires) and the nominal cross section in mm<sup>2</sup> are specified. Especially flexible or highly flexible stranded conductors are identified by additional specification of the nominal cross section of the single-wire.

In some cases the type of metal plating is specified for metal-plated copper wires as follows:

SN	tin-plated
NI	nickel-plated
AG	silver-plated
	Bare copper has no special code

Examples:

### LI YW 0.82 AWG18-16

Stranded conductor  
heat resistant PVC insulation  
nom. cross section 0.82 mm<sup>2</sup>  
corresponds to AWG 18  
16 fold stranded

### LI Y (C) Y 2x0.35

Stranded conductor  
PVC insulation for single-core  
copper wire braiding surrounding  
the single-cores  
PVC as sheath  
2 conductors with nom. cross section  
0.35 mm<sup>2</sup>

### 6Y 0.4 SN AWG26-1

FFEP insulation  
nom. cross section 0.4 mm<sup>2</sup>  
tin-plated  
corresponds to AWG 26  
solid conductor

### LI Y Y 0.82 4x0.38 SN AWG22-19

Stranded conductor  
PVC insulation for single-cores  
PVC as sheath  
4 conductors with nom. cross section 0.38 mm<sup>2</sup>  
tin-plated  
corresponds to AWG 22  
19 fold stranded

# UL and CSA cables

Single-cores according to UL 758 AWM / CSA C22.2

Single- and multi-core cables according to UL 758 and CSA 22.2 standards are used as Appliance Wiring Material (AWM) in many home appliances all over the world. The style pages form the basis for the construction and usage, showing the temperature range, the operating voltage and the insulation material.

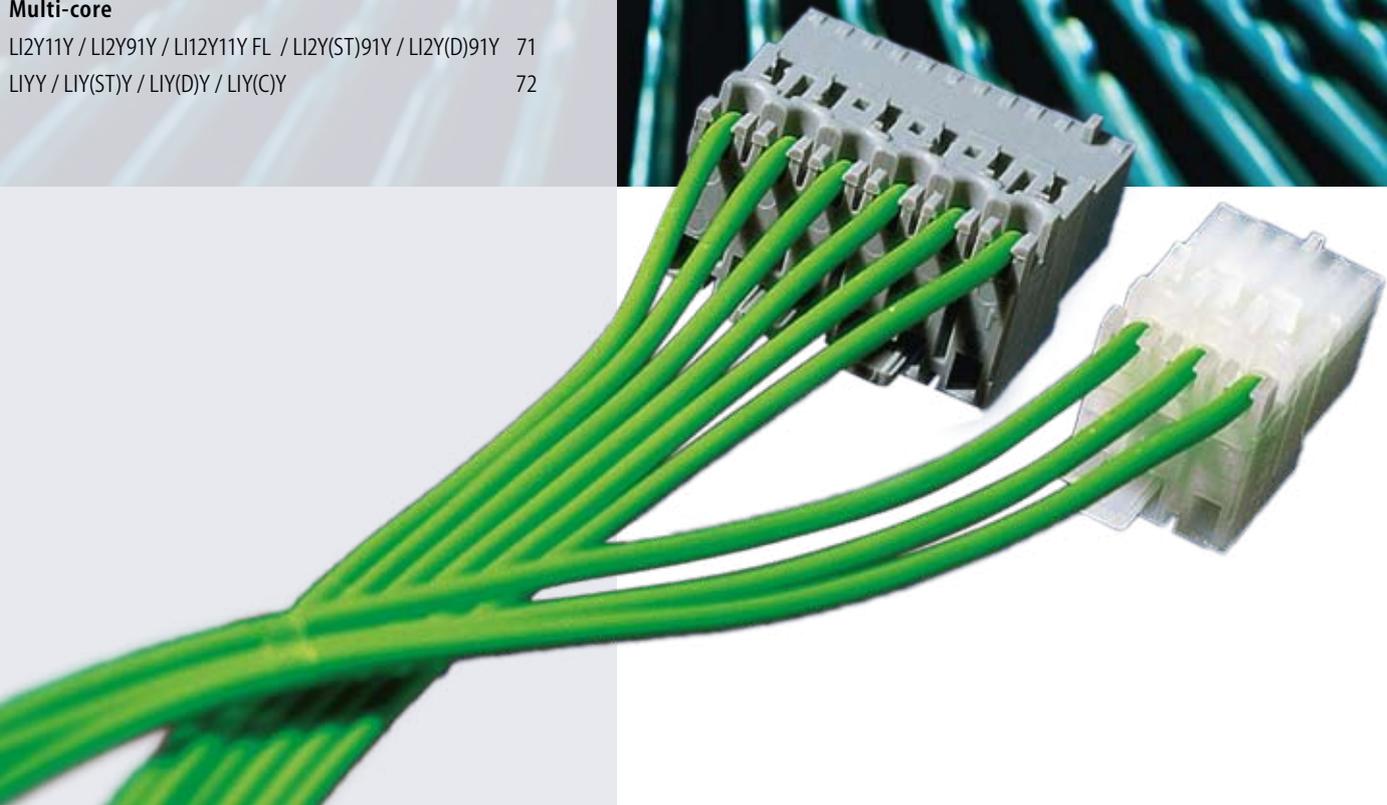
LEONI produces and sells several hundred different types of harmonized single- and multi-core cables with varied insulation materials. Cables are produced according to the UL/CSA regulations. With an additional CENELEC approbation the multi standard cables are also approved in Europe. The popular harmonized cables are going to be modified to fulfill the requirements of the standards.

This catalogue provides an overview of our standard cables – customer-specific designs regarding insulation materials, cross section diameters and operating voltage can be provided on request.

UL and CSA cables	page
<b>Single-core</b>	
LIYW UL 1007/CSA TR 64 / LIYW UL 1011/CSA TR 32	65
LIYW UL 1061/CSA T2 / LIYW UL 1095/CSA	66
LIYW UL 1015/CSA TEW / LIYW UL 1028/CSA TEW /	
LIYW UL 1569/CSA T1	67
LIX UL 1430	68
LI6Y (FEP) UL 1887 / LI7Y (ETFE) UL 1671	69
H05V2-K UL 1569/CSA T1 / H07V2-K UL 1015/CSA TEW	70
<b>Multi-core</b>	
LI2Y11Y / LI2Y91Y / LI12Y11Y FL / LI2Y(ST)91Y / LI2Y(D)91Y	71
LIYY / LIY(ST)Y / LIY(D)Y / LIY(C)Y	72



In global use.



# LIYW UL 1007/CSA TR 64

## LIYW UL 1011/CSA TR 32



### PVC wire

according to UL 758 AWM / CSA C22.2

Rating

**+80 °C UL**

**+90 °C CSA**



### Construction / Materials

#### Conductor

bare or tinned, according to DIN EN 13602,  
conductor construction according to UL/CSA

#### Insulation

PVC compound according to UL/CSA

### Standards

Appliance Wiring Material UL 758 AWM (USA)  
Radio Circuit Wire CSA C22.2 (Canada)

### Authorization number

UL 47543/CSA LL 34123



### nominal voltage max.

**LIYW UL 1007/CSA TR 64** 300 V AC

**LIYW UL 1011/CSA TR 32** 600 V AC

Nominal cross section		Conductor construction No. of wires × wire Ø		Diameter of conductor	Outer diameter	Electrical resistance at 20 °C plain max.	Weight
mm <sup>2</sup>	AWG	mm <sup>2</sup>	AWG	nom. mm	nom. mm	Ω/km	approx. kg/km
<b>LIYW UL 1007/CSA TR 64</b> Minimum wall thickness 0.4 mm / 15 mils							
0.03	32	7×0.079	7/40	0.25	1.1	597.11	1.5
0.09	28	7×0.127	7/36	0.4	1.25	223.75	2.5
0.22	24	7×0.203	7/32	0.6	1.45	85.96	4
0.56	20	7×0.320	7/28	1.0	1.8	34.12	8
1.32	16	26×0.254	26/30	1.5	2.35	15.06	15
<b>LIYW UL 1011/CSA TR 32</b> Minimum wall thickness 0.8 mm / 30 mils							
0.06	30	7×0.102	7/38	0.3	1.9	354.33	4
0.14	26	7×0.160	7/34	0.5	2.1	139.76	5.5
0.35	22	7×0.254	7/30	0.75	2.4	54.79	9
0.82	18	16×0.254	16/30	1.2	2.8	25.2	14
2.1	14	41×0.254	41/30	1.9	3.6	9.65	28
5.3	10	105×0.254	105/30	3.0	4.8	3.54	61

Additional cross sections and conductor constructions can be supplied upon request.

# LIYW UL 1061/CSA T2

## LIYW UL 1095/CSA



### PVC wire

according to UL 758 AWM / CSA C22.2

Rating

**+80 °C UL**

**+90 °C CSA**



### Construction / Materials

#### Conductor

bare or tinned, according to DIN EN 13602,  
conductor construction according to UL/CSA

#### Insulation

PVC compound compliant with UL/CSA

### Standards

Appliance Wiring Material UL 758 AWM (USA)

Radio Circuit Wire CSA C22.2 (Canada)

### Authorization number

UL 47543/CSA LL 34123

### nominal voltage max.

LIYW UL 1061/CSA T2	300 V AC
LIYW UL 1095/CSA	300 V AC

Nominal cross section		Conductor construction No. of wires × wire Ø		Diameter of conductor	Outer diameter	Electrical resistance at 20 °C plain max.	Weight
mm <sup>2</sup>	AWG	mm <sup>2</sup>	AWG	nom. mm	nom. mm	Ω/km	approx. kg/km
<b>LIYW UL 1061/CSA T2</b>		<b>Minimum wall thickness 0.25 mm / 9 mils</b>					
0.09	28	7×0.127	7/36	0.4	0.95	223.75	1.5
0.22	24	7×0.203	7/32	0.6	1.15	85.96	3
0.56	20	7×0.320	7/28	1.0	1.5	34.12	7
1.32	16	26×0.254	26/30	1.5	2.05	15.06	14
<b>LIYW UL 1095/CSA</b>		<b>Minimum wall thickness 0.3 mm / 12 mils</b>					
0.06	30	7×0.102	7/38	0.3	1.0	354.33	1.5
0.14	26	7×0.160	7/34	0.5	1.2	139.76	2.5
0.35	22	7×0.254	7/30	0.75	1.45	54.79	5
0.82	18	16×0.254	16/30	1.2	1.9	25.2	10

Additional cross sections and conductor constructions can be supplied upon request.

# LIYW UL 1015/CSA TEW

# LIYW UL 1028/CSA TEW

# LIYW UL 1569/CSA T1



## PVC wire

according to UL 758 AWM / CSA C22.2

Rating

**+105 °C UL**

**+105 °C CSA**



### Construction / Materials

#### Conductor

Soft-annealed electrolytic copper CU-ETP1, bare or tinned, according to DIN EN 13602, conductor construction according to UL/CSA

#### Insulation

PVC compound compliant with UL/CSA

### Standards

Appliance Wiring Material UL 758 AWM (USA)

Radio Circuit Wire CSA C22.2 (Canada)

### Authorization number

UL 47543/CSA LL 34123

### nominal voltage max.

LIYW UL 1015/CSA TEW	600 V AC
LIYW UL 1028/CSA TEW	600 V AC
LIYW UL 1569/CSA T1	300 V AC



Nominal cross section		Conductor construction No. of wires × wire Ø		Diameter of conductor	Outer diameter	Electrical resistance at 20 °C plain max.	Weight
mm <sup>2</sup>	AWG	mm <sup>2</sup>	AWG	nom. mm	nom. mm	Ω/km	approx. kg/km
<b>LIYW UL 1015/CSA TEW Minimum wall thickness 0.8 mm / 30 mils</b>							
0.14	26	7×0.160	7/34	0.5	2.1	139.76	5.5
1.0 *	18	19×0.254	19/30	1.3	2.85	20.4	12
0.82	18	16×0.254	16/30	1.2	2.8	25.2	14
2.1	14	41×0.254	41/30	1.8	3.6	9.65	28
5.3	10	105×0.254	105/30	3.0	4.8	3.54	61
<b>LIYW UL 1028/CSA TEW Minimum wall thickness 1.2 mm / 45 mils</b>							
0.35	22	7×0.254	7/30	0.75	3.3	54.79	13
0.82	18	16×0.254	16/30	1.2	3.7	25.2	20
2.1	14	41×0.254	41/30	1.8	4.5	9.65	36
5.3	10	105×0.254	105/30	3.0	5.6	3.77	70
8.2	8	168×0.254	168/30	3.8	6.5	2.375	101
<b>LIYW UL 1569/CSA T1 Minimum wall thickness 0.4 mm / 15 mils</b>							
0.06	30	7×0.102	7/38	0.3	1.15	354.33	2
0.09	28	7×0.127	7/36	0.4	1.25	223.75	2.5
0.22 *	24	7×0.203	7/32	0.6	1.45	85.96	4
0.38 *	22	12×0.203	12/32	0.8	1.6	55.0	5.5
0.56 *	20	19×0.195	19/32	1.0	2.05	34.6	9
1.32 *	16	26×0.254	26/30	1.5	2.4	15.06	15
2.1	14	41×0.254	41/30	1.9	2.8	9.65	24
5.3	10	105×0.254	105/30	3.1	4.0	3.77	55

Additional cross sections and conductor constructions can be supplied upon request.

### \* Cables with UL and CSA approbation for IDC technology (SKT)

The marked cable types are suited for use in IDC (insulation displacement connection) for the common pitch 2.5 or 5 mm connector systems due to specially selected materials with an insulation material hardness of at least 90 Shore A and corresponding strand construction.



# LIX UL 1430

## X-PVC wire

according to UL 758 AWM

Rating

**+105 °C UL**



### Construction / Materials

#### Conductor

Soft-annealed electrolytic copper CU-ETP1, bare or tinned, according to DIN EN 13602, conductor construction according to UL

#### Insulation

Irradiated cross-linked PVC compound compliant with UL

**nominal voltage max.** 300 V AC

### Standards

Appliance Wiring Material UL 758 AWM (USA)

### Authorization number

UL 47543

Nominal cross section		Conductor construction No. of wires × wire Ø		Diameter of conductor	Outer diameter	Electrical resistance at 20 °C plain max.	Weight
mm <sup>2</sup>	AWG	mm <sup>2</sup>	AWG	nom. mm	nom. mm	Ω/km	approx. kg/km
0.09	28	7×0.127	7/36	0.4	1.25	223.75	2.5
0.15	26	19×0.102	19/38	0.5	1.35	131.56	3
0.22 *	24	7×0.203	7/32	0.6	1.45	85.96	4
0.38 *	22	12×0.203	12/32	0.8	1.6	55.0	5.5
0.56 *	20	19×0.195	19/32	1.0	2.05	34.6	9
0.96	18	19×0.254	19/30	1.25	2.2	20.4	12
1.32 *	16	26×0.254	26/30	1.5	2.4	15.06	15

Additional cross sections and conductor constructions can be supplied upon request.

### \* Cables with UL and CSA approbation for IDC technology (SKT)

The marked cable types are suited for use in **IDC** (insulation displacement connection) for the common pitch 2.5 or 5 mm connector systems due to specially selected materials with an insulation material hardness of at least 90 Shore A and corresponding strand construction.



# LI6Y (FEP) UL 1887

# LI7Y (ETFE) UL 1671

## FEP/ETFE hock-up wire

according to UL 758 AWM / CSA C22.2

Rating

**+150 °C UL**



### Construction / Materials

#### Conductor

Soft-annealed electrolytic copper CU-ETP1, bare or tinned, according to DIN EN 13602, conductor construction according to UL

#### Insulation

FEP/ETFE compound compliant with UL

### Standards

Appliance Wiring Material UL 758 AWM (USA)

### Authorization number

UL 47543

### nominal voltage max.

LI6Y (FEP) UL 1887	600 V AC
LI7Y (ETFE) UL 1671	300 V AC



Nominal cross section		Conductor construction No. of wires × wire Ø		Diameter of conductor	Outer diameter	Electrical resistance at 20 °C plain max.	Weight
mm <sup>2</sup>	AWG	mm <sup>2</sup>	AWG	nom. mm	nom. mm	Ω/km	approx. kg/km
<b>LI6Y UL 1887 Minimum wall thickness 0.35 mm / 14 mils</b>							
0.22	24	7×0.202	7/32	0.6	1.3	85.96	4.5
0.56	20	7×0.32	7/28	0.95	1.65	34.18	8.5
1.31	16	26×0.254	26/30	1.5	2.2	14	17
5.32	10	105×0.254	105/30	3.0	3.7	3.77	57
<b>LI7Y UL 1671 Minimum wall thickness 0.25 mm / 10 mils</b>							
0.35	22	7×0.254	7/30	0.75	1.25	54.79	4.5
0.82	18	16×0.254	16/30	1.2	1.7	25.2	10
2.1	14	41×0.254	41/30	1.8	2.3	9.65	22
5.3	10	105×0.254	105/30	3.0	3.5	3.77	54
8.2	8	168×0.254	168/30	3.8	4.3	2.375	83

Additional cross sections and conductor constructions can be supplied upon request.

# H05V2-K UL 1569/CSA T1

# H07V2-K UL 1015/CSA TEW



## PVC wire

according to UL 758 AWM / CSA C22.2 / VDE

Rating

**+105 °C UL/CSA**

**+90 °C VDE**



## Construction / Materials

### Conductor

Soft-annealed electrolytic copper CU-ETP1, bare or tinned, according to DIN EN 13602, conductor construction according to UL/CSA

### Insulation

Heat resistant PVC compound compliant with UL/CSA

## Standards

Appliance Wiring Material UL 758 AWM (USA)

Radio Circuit Wire CSA C22.2 (Canada)

H05V2-K and H07V2-K acc. to HD21.7 (Europe)

## Authorization number

UL 47543/CSA LL 34123

	test voltage min.	nom. voltage max.	nom. voltage max.
		UL/CSA	VDE
<b>H05V2-K UL 1569/CSA T1</b>	2 kV AC	300 V AC	300/500 V U <sub>0</sub> /U
<b>H07V2-K UL 1015/CSA TEW</b>	2.5 kV AC	600 V AC	450/750 V U <sub>0</sub> /U

Nominal cross section	Diameter of single-wire	Diameter of conductor	Wall thickness of insulation	Outer diameter	Electrical resistance at 20 °C	Net weight
		nom.	nom. value	nom.	max.	nom.
mm <sup>2</sup>	mm	mm	mm	mm	Ω/km	kg/km
<b>H05V2-K UL 1569/CSA T1</b>						
0.5	0.21	0.9	0.6	2.2	39.0	9
0.75	0.21	1.1	0.6	2.4	26.0	11
1	0.21	1.3	0.6	2.6	19.5	14
<b>H07V2-K UL 1015/CSA TEW</b>						
1.5	0.26	1.6	0.8	3.0	13.3	20
2.5	0.26	2.1	0.8	3.7	7.98	32
4	0.31	2.6	0.8	4.2	4.95	47
6	0.31	3.2	0.8	4.9	3.3	68
10	0.41	4.0	1.15	6.3	1.91	110
16	0.41	5.1	1.55	7.4	1.21	162
25	0.41	6.2	1.55	8.9	0.78	261
35	0.41	7.7	1.55	10.6	0.554	362



# LI2Y11Y / LI2Y91Y / LI12Y11Y FL LI2Y(ST)91Y / LI2Y(D)91Y

PVC sheathed flexible cable

according to UL 758



## Construction / Materials

### Conductor

Soft-annealed electrolytic copper Cu-ETP1, bare or tinned, according to DIN EN 13602, conductor construction according to UL

### Insulation

Halogen-free materials according to UL 1581

### Sheathing (optional)

Foil shield (ST), spirally wrapped overlapping aluminium-coated foil; design also available with drain wire of tinned copper wires to contact the shield.

Spiral shield for copper wires (D-shielding); braiding of copper wires (C-shielding) as well as combined shieldings.

### Sheath

Halogen-free and flame-retardant materials according to UL 1581

### Application

#### UL 21198 – 21023:

Internal wiring of electrical appliances

#### UL 21287:

External connection of electrical appliances



UL styles	Properties (excerpt standard styles)			
	Operating temperature acc. to UL max.	Operating voltage acc. to UL max.	Standard cross section	Core style
UL 21198	80 °C	300 V	AWG 26 – 16	UL 10864
UL 21287	80 °C	600 V	AWG 26 – 16	UL 10865
UL 21023	90 °C	300 V	AWG 22 – 18	UL 10106

Other style possible according to chart on page 61

Construction No. of cores × nominal cross section	Conductor construction			Insulation		Cable	
	No. of wires × diameter of single-wire	Diameter of conductor	Electrical resistance at 20 °C	Wall thickness	Diameter of core	Wall thickness of sheath	Outer dimen- sion or outer diameter
		nom.	max.	nom.	nom.	nom.	nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm
<b>UL 21198 with core style 10864</b>							
3×0.35	7×0.254	0.75	54.79	0.40	1.55	0.80	5.00
4×0.56	7×0.320	1.00	34.12	0.40	1.80	0.80	7.40
<b>UL 21287 with core style 10865</b>							
3×0.56	7×0.320	1.00	34.12	0.40	1.80	0.80	5.50
2×0.82	16×0.254	1.20	25.20	0.40	2.00	0.80	5.60
<b>UL 21023 with core style 10106</b>							
2×0.5	64×0.100	1.0	39.00	0.25	1.50	0.80	3.30×4.60

Chart only shows construction examples – please ask for further designs.

# LIYY / LIY(ST)Y LIY(D)Y / LIY(C)Y



## PVC insulated control cable

according to UL 758



### Construction / Materials

#### Conductor

Soft-annealed electrolytic copper Cu-ETP1, bare or tinned, according to DIN EN 13602, conductor construction according to UL

#### Insulation

PVC compound compliant with UL 1581

#### Sheathing (optional)

Foil shield (ST), spirally wrapped overlapping aluminium-coated foil; design also available with drain wire of tinned copper wires to contact the shield.

Spiral shield for copper wires (D-shielding); braiding of copper wires (C-shielding) as well as combined shieldings.

#### Sheath

PVC compound compliant with UL 1581

#### Application

External and internal wiring of appliances

#### Further designs

Cables according to UL 2464 and 2517 are also with CSA I/II A approbation available

UL styles	Properties (excerpt standard styles)			
	Operating temperature acc. to UL max.	Operating voltage acc. to UL max.	Standard cross section	Core style
UL 2464	80 °C	300 V	AWG 26 – 16	UL 1061
UL 2517	105 °C	300 V	AWG 26 – 10	UL 1569
UL 2586	105 °C	600 V	AWG 26 – 10	UL 10012

Other style possible according to chart on page 61

Construction No. of cores × nominal cross section	Conductor construction			Insulation		Cable	
	No. of wires × diameter of single-wire	Diameter of conductor	Electrical resistance at 20 °C	Wall thickness	Diameter of core	Wall thickness of sheath	Outer diameter
		nom. mm	max. Ω/km	nom. mm	nom. mm	nom. mm	nom. mm
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm
<b>UL 2464 with core style 1061</b>							
2×0.22	7×0.203	0.60	85.96	0.25	1.10	0.80	3.80
3×0.35	7×0.254	0.75	54.79	0.25	1.25	0.80	4.30
4×0.56	7×0.320	1.00	34.12	0.25	1.50	0.80	5.20
2×0.82	16×0.254	1.20	25.20	0.25	1.70	0.80	5.00
3×1.32	26×0.254	1.50	15.06	0.25	2.00	0.80	5.90
<b>UL 2517 with core style 1569</b>							
3×0.22	7×0.203	0.60	85.96	0.40	1.4	0.80	4.60
4×0.35	7×0.254	0.75	54.79	0.40	1.55	0.80	5.30
5×0.56	7×0.320	1.00	34.12	0.40	1.80	0.80	6.50
2×0.82	16×0.254	1.20	25.20	0.40	2.00	0.80	5.60
<b>UL 2586 with core style 10012</b>							
2×0.35	7×0.254	0.75	54.79	0.55	1.85	0.80	5.30
3×0.56	7×0.320	1.00	34.12	0.55	2.10	0.80	6.10
4×0.82	16×0.254	1.20	25.20	0.55	2.30	0.80	7.10

Chart only shows construction examples – please ask for further designs.

## UL and CSA multi-core cables according to UL 62

The range of application and the variety of flexible cord types is described in Article 400 of the National Electrical Code (NEC).

The construction and safety-relevant features are set out in standards UL 62 and CSA 22.2 No.49.

### UL and CSA cables – multi-core

H05V2V2-F/SJT

SJT / ST / SVT

### page

74

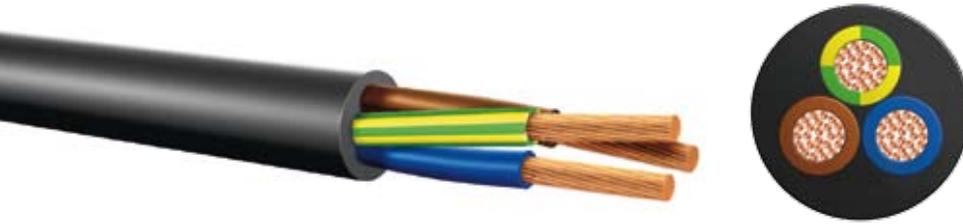
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# H05V2V2-F/SJT



**Multi-core multi standard cable**  
**Heat resistant PVC sheathed cable**  
 according to VDE, UL, CSA



## Construction / Materials

### Conductor

Soft-annealed electrolytic copper Cu-ETP1, bare or tinned, according to DIN EN 13602, conductor construction according to UL

### Insulation

Heat resistant PVC compound compliant with VDE 0281 part 1 and UL 62

### Sheath

Heat resistant PVC compound compliant with VDE 0281 part 1 and UL 62

Properties (excerpt standard styles)					
Operating temperature acc. to UL/CSA max.	Operating voltage acc. to UL/CSA max.	Operating temperature acc. to VDE max.	Operating voltage acc. to VDE $U_0/U$ max.	Standard cross section	No. of cores
up to 105 °C	300 V	up to 90 °C	300 V/500 V	AWG 18 – 12	3 – 5

Construction	Conductor construction			Insulation		Cable	
	No. of cores × nominal cross section	No. of wires × diameter of single-wire	Diameter of conductor nom.	Electrical resistance at 20 °C plain max.	Wall thickness nom.	Diameter of core nom.	Wall thickness of sheath nom.
mm <sup>2</sup>	mm	mm	Ω/km	mm	mm	mm	mm
3×1.50	29×0.254	1.60	13.30	0.80	3.20	0.80	8.50
4×1.50	29×0.254	1.60	13.30	0.80	3.20	1.00	9.70

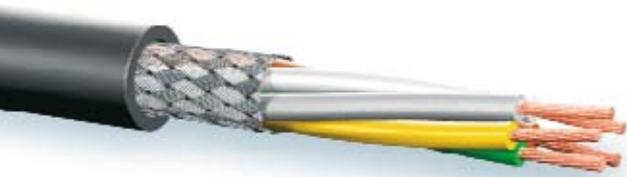
Chart only shows construction examples – please ask for further designs.

# SJT / ST SVT



## PVC sheathed flexible cable

according to UL 62 / cUL



### Construction / Materials

#### Conductor

Soft-annealed electrolytic copper Cu-ETP1, bare or tinned, according to DIN EN 13602, conductor construction according to UL

#### Insulation

PVC compound compliant with UL/CSA

#### Sheathing (optional)

Foil shield (ST) of aluminium-coated foil with and without drain wire; Spiral shield of copper wires (D-shielding), braiding of copper wires (C-shielding) as well as combined shieldings

#### Sheath

PVC compound compliant with UL/CSA

### Application

**SJT:** Service cord for portable electrical appliances

**ST:** In trailers, wiring of lighting, connection of movable lighting, lifts, cranes and hoisting gear, supply of movable devices, in display windows and on stages

**SVT:** Service cord for vacuum cleaners

#### Other versions

The ST and SVT cords are also available with CSA approval



Cable type	Properties				
	Operating temperature nach UL max.	Operating voltage nach UL max.	Sheathing	Standard cross section	No. of cores
SJT	up to 105 °C	300 V	optional	AWG 18 – 10	2 – 6
ST	up to 105 °C	600 V	C- or ST-sheath	AWG 18 – 10	2 – 7
SVT	up to 105 °C	300 V	–	AWG 18 – 16	2 – 3

Cable type	Construction No. of cores × nominal cross section mm <sup>2</sup>	Conductor construction			Insulation		Cable	
		Diameter of single-wire max.	Diameter of conductor nom.	Electrical resistance at 20 °C plain max. Ω/km	Wall thickness nom. mm	Diameter of core nom. mm	Wall thickness of sheath nom. mm	Outer dimension or outer diameter nom. mm
		mm	mm		mm	mm	mm	mm
SJT	3×0.82	16×0.254	1.20	22.40	0.80	2.80	0.80	7.70
	4×0.82	16×0.254	1.20	22.40	0.80	2.80	0.80	8.40
ST	3×1.32	26×0.254	1.50	14.1	0.80	3.10	1.52	9.80
SVT	2×0.86	49×0.15	1.25	22.40	0.40	2.05	0.80	5.70

Chart only shows construction examples – please ask for further designs.

# Customer-specific cable solutions

Implementing customer-specific standards in high quality products accounts for a large proportion of product management's work in the area of special cables.

Adherence to the required special properties of the cable material is assured by means of sample orders and spec sheets. You will at the same time also receive suggestions to optimise your products. As a special service, we offer our specialist knowledge of cables as early as the new development stage of your products. This service helps to reduce development time in your company.

## Single-core

SKT / IDC for IDC technology

with cross-linked insulation materials

highly flexible

## page

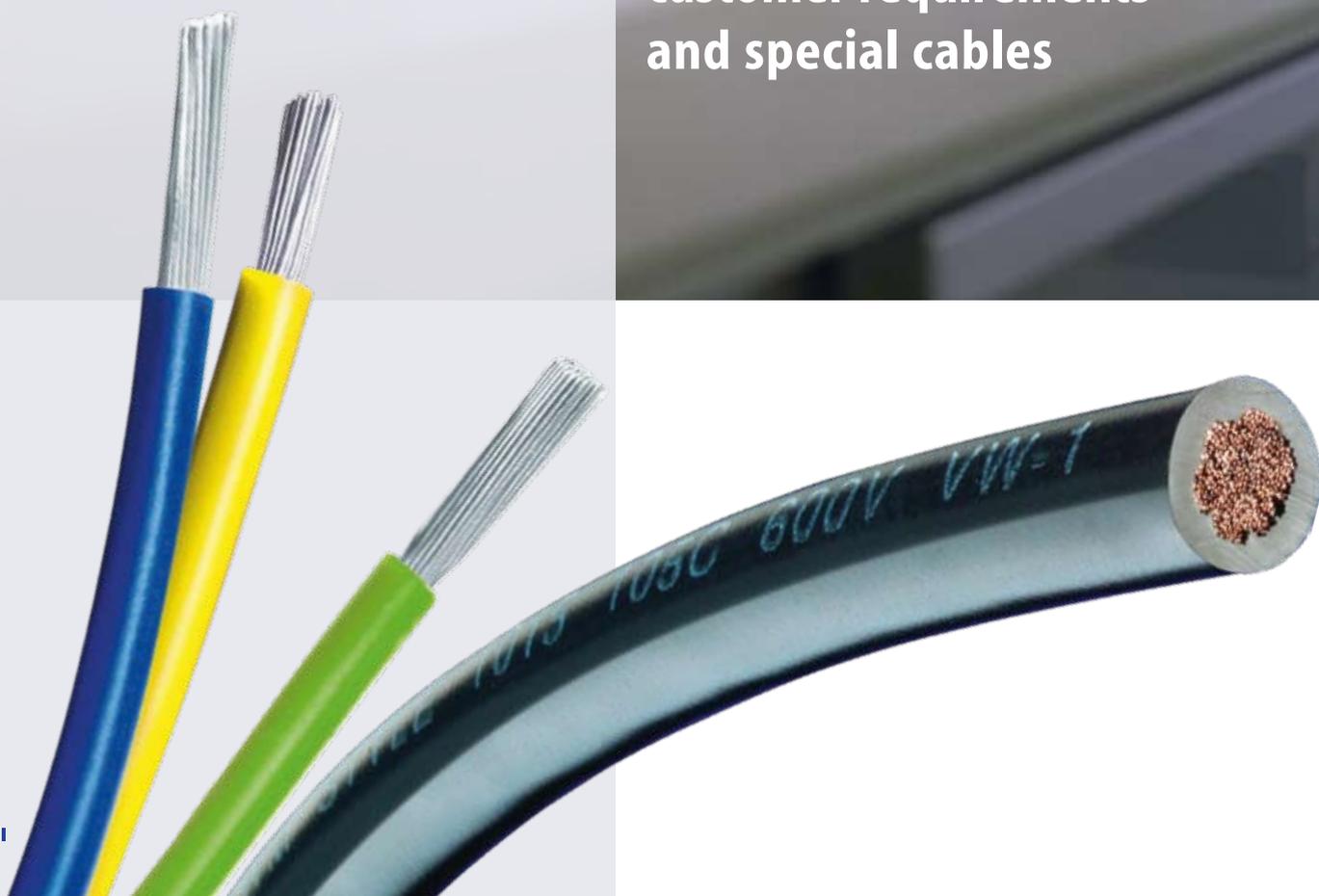
77

78

79



Cables according to customer requirements and special cables



# SKT / IDC

## Single-core for IDC technology



### Single-core

according to customer specifications

Rating

up to max. **+260 °C**

### Construction / Materials

#### Conductor

Soft-annealed electrolytic copper CU-ETP1, bare or tinned, according to DIN EN 13602

#### Insulation

PVC, XLPE

### Standards

Customer-specific solutions with approval of the component manufacturer (contact)



Excerpt from our current product portfolio

Nominal cross section	No. of single-cores	Diameter of conductor	Electrical resistance at 20 °C max.	Wall thickness insulation sheath	Outer diameter	Weight
		Ref. value			Ref. value	
mm <sup>2</sup>		mm	Ω/km	mm	mm	kg/km
<b>LIY 70 °C</b>						
0.38	12	0.8	54.5 plain	0.3	1.4	5
0.5	16	0.9	38.2 tinned	0.4	1.8	7
0.75	26	1.1	26.7 tinned	0.4	2.0	10
<b>LIYW 105 °C</b>						
0.38	12	0.8	54.5 plain	0.3	1.4	5
0.5	16	0.9	38.2 tinned	0.45	1.9	7
<b>LI2X 110 °C</b>						
0.38	12	0.8	52.0 plain	0.3	1.4	5
0.5	19	0.9	37.1 plain	0.6	2.1	8

Other cross sections, cable constructions and insulation materials (up to +260 °C) upon request.

# Single-core

## with cross-linked insulation materials

### Single-core

according to customer specifications

Rating

up to max. **+110 °C**



### Construction / Materials

#### Conductor

Soft-annealed electrolytic copper CU-ETP1, bare or tinned, according to DIN EN 13602

#### Insulation

X-PVC, XLPE

Irradiated and chemical cross-linked materials

### Standards

UL 758

customer-specific solutions

### Cross section

up to 6 mm<sup>2</sup>

Excerpt from our current product portfolio

Nominal cross section		Conductor construction No. of wires × Diameter of wire		Diameter of conductor  Ref. value	Outer diameter  Ref. value	Electrical resistance at 20 °C plain max.  Ω/km
mm <sup>2</sup>	AWG	mm	AWG	mm	mm	
0.09	28	7×0.127	7/36	0.4	1.25	223.75
0.15	26	19×0.102	19/38	0.5	1.35	131.56
0.22	24	7×0.203	7/32	0.6	1.45	85.96
0.38	22	12×0.203	12/32	0.8	1.6	55.0
0.56	20	19×0.195	19/32	1.0	2.05	34.6
0.96	18	19×0.254	19/30	1.25	2.2	20.4
1.32	16	26×0.254	26/30	1.5	2.4	15.06

Other cross sections, cable constructions and insulation materials (up to +260 °C) upon request.

### Crosslinking

Crosslinking changes the properties of the plastics in a targeted way.

Cables with cross-linked insulation can thus take higher thermal load and are more dimensionally stable. Resistance to chemicals is also improved.

# Single-core

## highly flexible



### Single-core

according to customer specifications

#### Rating

PVC	<b>+105 °C</b>	TPE-E	<b>+105 °C</b>
PUR	<b>+110 °C</b>	ETFE	<b>+180 °C</b>
FEP	<b>+210 °C</b>	PFA	<b>+260 °C</b>

### Construction / Materials

#### Conductor

Soft-annealed electrolytic copper CU-ETP1, bare or tinned, according to DIN EN 13602, Conductor construction according to UL / CSA / HD, Diameter of single conductor to 0.05 mm

### Standards

Appliance Wiring Material UL 758 AWM (USA)  
Radio Circuit Wire CSA C22.2 (Canada)  
HD / DIN VDE (Europe)  
Customer-specific solutions



Construction possibilities for fine and ultra-fine conductors

Cross section mm <sup>2</sup>	Cable construction		
	Diameter of wire 0.05 mm (AWG 44)	Diameter of wire 0.07 mm (AWG 41)	Diameter of wire 0.10 mm (AWG 38)
0.14	72×0.05	36×0.07	18×0.10
0.25	128×0.05	66×0.07	32×0.10
0.34	173×0.05	88×0.07	42×0.10
0.38	192×0.05	88×0.07	48×0.10
0.5	256×0.05	130×0.07	64×0.10
0.75	385×0.05	196×0.07	96×0.10
1.0	511×0.05	259×0.07	128×0.10
1.5	770×0.05	392×0.07	189×0.10
2.5	1274×0.05	651×0.07	320×0.10
4.0	2016×0.05	1036×0.07	511×0.10

Other cross sections, cable constructions and insulation materials (up to +260 °C) upon request.

### Insulation materials

Thermoplastics, thermoplastic elastomers or elastomers may be used as insulation materials. Along with being especially flexible, these highly flexible and round strands or ropes boast a very long flex life.

# Earthing ropes

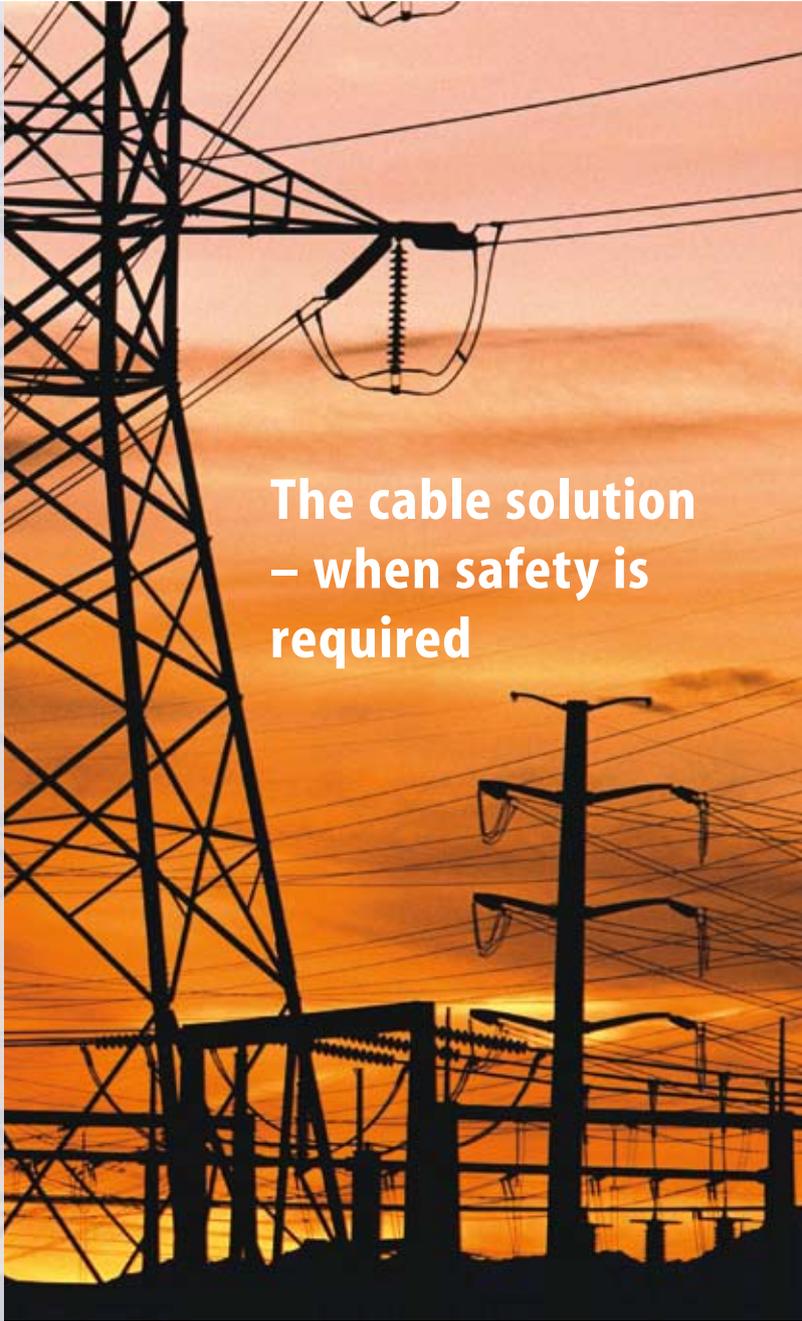
For many decades LEONI earthing ropes have stood for outstanding quality. High-quality products are especially important in safety-related applications.

Earthing ropes are used above all to temporarily earth or short-circuit current-carrying components in the high voltage plant of power companies during repair, cleaning or maintenance work, as well as while carrying out maintenance work on power rails and lines of railways and trams.

Another area of application involves earthing installations and potential equalisation for machinery and IT equipment.

**Our earthing ropes are subject to ongoing optimisation and testing to the present IEC 1138 standard for cables used with non-stationary earthing and short-circuiting equipment.**

Earthing ropes	page
ESUY	81
ESY	81
ESTPR	82



**The cable solution  
– when safety is  
required**



# ESUY

Earthing rope with support braiding



## Construction / Materials

### Conductor ESUY

Conductor with support braiding, soft-annealed electrolytic copper Cu-ETP1 according to DIN EN 13602, bare.

### Sheath ESUY

Special soft PVC compound TM2 according to VDE 0281 Part 1  
Transparent sheath

### Conductor ESY

Soft-annealed electrolytic copper Cu-ETP1 according to DIN EN 13602, bare; Rope construction according to DIN/VDE 0295/05.86 chart 5, end-of-wire stranding of 7 strands

### Sheath ESY

Special soft PVC compound TM2 acc. to VDE 0281 Part 1  
black sheath

# ESY

Earthing rope according to IEC 1138



## Electrical properties

### Resistance

Max. resistance at a basic temperature of 20 °C, an end-of-rope temperature 250 °C and a resistance duration of max. 0.5 s in machines operating on alternating and three-phase current – see table

### Electric strength

Min. 10 kV/mm

### Chemical resistance

Resistant to diluted acids and bases solutions

## Thermal properties

### Operating temperature

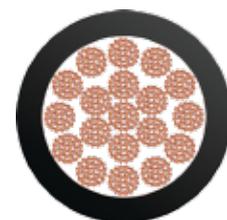
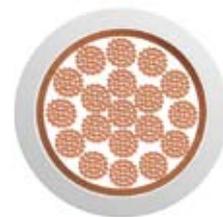
Permitted continuous operating temperature on conductor max. 70 °C

### Low temperature resistance

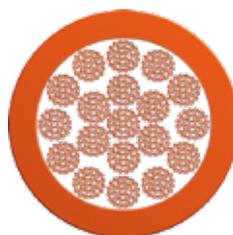
In passive state –40 °C  
On installation/in operation –30 °C

Nominal cross section	No.* of single-wires Ref. value	No. of single-wires braid Ref. value	Diameter of conductor nom.	Wallthickness of insulation sheath nom.	Outer diameter nom.	Resistance kA	Electrial resistance at 20 °C max. Ω/km	Weight approx. kg/km
mm <sup>2</sup>		mm	mm	mm	mm	kA	Ω/km	kg/km
<b>ESUY</b>								
16	4116	240	6.1	1.3	8.6	4.5	1.21	220
25	3234	288	7.8	1.3	10.4	7.0	0.78	325
35	4473	288	9.0	1.8	12.6	10.0	0.554	460
50	6370	432	11.1	1.8	14.6	14.0	0.386	640
70	8820	432	13.0	2.2	17.4	19.5	0.272	875
95	12348	432	15.5	2.4	20.3	26.5	0.206	1180
<b>ESY</b>								
16	525	–	5.7	1.3	8.4	4.5	1.160	182
25	800	–	7.1	1.3	9.8	7.0	0.758	265
35	1120	–	8.6	1.4	11.4	10.0	0.536	365
50	1615	–	10.1	1.8	13.8	14.0	0.379	537
70	2250	–	12.2	1.8	15.8	19.5	0.268	747
95	3085	–	14.2	2.0	18.2	26.5	0.198	996
120	3820	–	16.0	2.0	20.1	33.5	0.155	1220
150	4800	–	18.0	2.0	22.0	42.0	0.125	1520

\* ESUY: Diameter of single-wire nom. 0.10 mm (for cross section 16 mm<sup>2</sup> diameter of single-wire nom. 0.07 mm).  
ESY: Diameter of single-wire max. 0.21 mm for all cross sections.



# ESTPR



## Earthing rope

according to IEC 1138



### Construction / Materials

#### Conductor

Soft-annealed electrolytic copper Cu-ETP1 according to DIN EN 13602, rope construction acc. to DIN/VDE 0295/05.86 chart 5, end-of-wire stranding of 7 strands

#### Insulation

TPE-0

### Electrical properties

#### Resistance

Max. resistance at a basic temperature of 20 °C, an end-of-rope temperature 250 °C and a resistance duration of max. 0.5 s in machines operating on alternating and three-phase current – see table

#### Electric strength

min. 10 kV/mm

#### Conductor resistance

at 20 °C max. in  $\Omega$ /km

### Chemical resistance

Resistant to diluted acids and bases, copper stabilized

### Thermal properties

#### Operating temperature

Permitted continuous operating temperature on conductor max. 90 °C

#### Low temperature resistance

In passive state -50 °C  
On installation/in operation -50 °C

Nominal cross section	No.* of single-wires	Diameter of conductor	Wallthickness of insulation sheath	Outer diameter	Resistance	Electrial resistance at 20 °C max.	Weight
	Ref. value	nom.	nom.	nom.			approx.
mm <sup>2</sup>		mm	mm	mm	kA	$\Omega$ /km	kg/km
25	800	7.2	1.3	9.8	7.0	0.758	270
35	1120	8.7	1.3	11.4	10.0	0.536	370
50	1615	10.2	1.8	13.2	14.0	0.379	530
70	2250	12.3	1.8	15.8	19.5	0.268	760
95	3085	14.3	1.8	18.0	26.5	0.198	990
120	3820	16.1	1.8	19.8	33.5	0.155	1190
150	4800	18.2	1.8	21.8	42.0	0.125	1540
185	5880	20.0	2.0	24.0	51.5	0.102	1900

\* Diameter of single-wire max. 0.21 mm for all cross sections.

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**[www.leoni-cable.com](http://www.leoni-cable.com)**



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