



A comprehensive program high flexible cables for a wide variety of applications, such as:

- hand, spring and motor driven reels;
- cable chains;
- festooning;
- extremely high or low temperatures;
- under water

There's a perfect cable for every application!



Insulated Power Cables

In accordance with DIN 57 250/VDE 0250 as well as DIN 57 281/VDE 0281 and DIN 57 282/VDE 0282

Introduction

Insulated power cables

The cable types described in this catalogue represent the current state of the art of cable technology within the context of the applicable VDE requirements. The selection presented here has proved to be virtually ideal for practical applications. Where not otherwise noted in the order tables, all models and varieties are available from stock on short notice.

Those cables which comply with the VDE requirements DIN 57 250/VDE 0250 carry the red and black VDE identification thread or the VDE mark $\text{\textcircled{E}} \text{ VDE e}$ on at least one core or on the sheath. Even for cables for which no VDE regulations have been formulated yet, the safety guidelines of the VDE regulations have been taken into consideration so that all types comply with the "generally recognised standards of electrical engineering" within the meaning of German legislation governing power installations (VDE 0050).

Harmonization

Regulations

For the cables described in this catalogue, the obligatory "Final Harmonization Documents" HD 21 and HD 22 were taken into consideration; these are mandatory for power cables.

These Harmonization Documents are regulations promulgated by CENELEC (European Committee for Electrotechnical Standardization), which is responsible for harmonizing all national standards. With a view to the greatest possible recognition world wide, these documents are based on the corresponding regulations of the International Electrotechnical Commission (IEC), and must be implemented by all EC member states in national standards, without deviations or amendments.

In the Federal Republic of Germany, these have been published and implemented as
DIN 57 281/VDE 0281
PVC cables, wires and flexible cords for power installations and
DIN 57 282/VDE 0282
Rubber cables, wires and flexible cords for power installations.

The national requirements set forth in VDE 0250 for those cable types which have been superseded by cables which conform to the above harmonized regulations are no longer valid.

Identification and marking

The harmonization requirements initially affect the most widely used flexible cables as well as wiring cable and general-purpose insulated wire.

The letter sequence **< HAR >**
or
an identification thread with the colour sequence **black-red-yellow** has been adopted as a unique identification feature.

This is printed on at least one of the cores or on the sheath together with the marks of the testing authority and origin.

When identification threads are used, the nationality of the testing authority can be recognised from the differing lengths of the colour bands, e.g. for Federal Republic of Germany:



Scale 1 : 1

This method of identification has been adopted by all EC member nations, so that the use of marked cables in these nations is permissible without further approval. At present, these include

B	Belgium
D	Federal Republic of Germany
DK	Denmark
F	France
I	Italy
IrI	Ireland
NL	Netherlands
UK	Great Britain

Austria and Sweden have also recognised the HAR regulations and the approval process without reservation, so that in these countries as well, the use of marked cables is permissible without further approval.

The countries	
N	Norway
SF	Finland
P	Portugal
CH	Switzerland

recognise the harmonized cable regulations; however, their deployment still requires individual approval.

Type program

Tables 1 and 2 below summarise the types presently harmonized, as a supplement to the data contained in this catalogue.

Harmonized cables with PVC insulation
Table 1

No.	acc. to VDE 0281	Type code	Related voltage	Number of cores	Nominal cross-section	Superseded types acc. to VDE 0250
1	PVC wiring cables with single-wire conductor fine-wire conductor	H05V-U H05V-K	300/500	1	0.5 to 1	NYFA, NYA NYFAF, NYAF
2	PVC insulated wires with single-wire conductor multiple-wire conductor fine-wire conductor	H07V-U H07V-R H07V-K	450/750	1 1 1	0.5 to 16 6 to 400 1.5 to 240	NYA NYA NYAF
3	Flat twin tinsel cords	H03V-U	300/300	2	~ 0.1	NLYZ
4	Flat twin flexible cords	H03VH-H	300/300	2	0.5 and 0,75	NYZ
5	PVC cables 03VV for light mechanical strains - round type - flat type	H03VV-F H03VVH2-F	300/300 300/300	2 and 3 2	0.5 and 0.75 0.5 and 0.75	NYLHY rd NYLHY fl
6	PVC cables 05VV for medium mechanical strains - round type - flat type	H05VV-F H05VVH6-F	300/500 300/500	2 to 5 2	0.75 and 2.5 0.75	NYLHY rd NYMHY fl
7	PVC flatform cables 05VVH6	H05VVH-6-F	300/500	3 to 24	0.75 and 1	–
8	PVC flatform cables 07VVH6	H07VVH-6-F	450/750	3 to 24	1.5 to 16	–

Harmonized rubber-insulated cables
Table 2

No.	acc. to VDE 0282	Type code	Related voltage	Number of cores	Nominal cross-section	Superseded types acc. to VDE 0250
1	Heat-resistant silicone-rubber insulated wire	H05SJ-K	300/500	1	0.5 to 16	N2GAFU
2	Braided flexible cords	H03RT-F	300/300	2 and 3	0.75 to 1.5	NSA
3	Rubber cables 05RR Rubber cables 05RN for light mechanical strains	H05RR-F H05RN-F	300/500 300/500	2 to 5 2 and 3 4	0.75 to 2.5 0.75 and 1 0.75	NLH, NMH NMHöu NMHöu
4	Rubber cables 07RN for medium mechanicals strains	H07RN-F H05RN-F	450/750 300/500	1 2 and 5 3 and 4	1.5 to 500 1 to 25 1 to 300	NMH, NMHöu and NSHöu
5	Rubber-insulated elevator control cables 05RT2D5 and 05RND5	H05RT2D5-F H05RND5-F	300/500	4 to 24	0.75	NFLG, NFLGöu, NFLGFm, NFLGFmöu
6	Rubber-insulated elevator control cables 07RT2D5 and 07RT2D5	H07RT2D5-F H07RND5-F	450/750	4 to 24	1	–

In addition to the cables listed in tables 1 and 2, a series of national types still exist. These are:

1. The so-called "recognised national types", which are classified in two groups:

a) Recognised national types which represent an extension of the harmonized cable types, e.g. with respect to the number of cores and conductor cross-section. In all other respects, these comply fully with the harmonization regulations.

b) Recognised national types which deviate from the harmonized types.

2. National types which are not affected by harmonization, e.g. cables with a rated voltage ≥ 1 kV, as well as multiple-core cables for fixed installation, for which harmonization has not yet been completed.

All cable types mentioned in 1. and 2. are still constructed according to VDE regulations, carry the VDE mark and are only approved in the Federal Republic of Germany.

Rated voltage

The rated voltage is expressed by specifying two AC voltages V_o/V , whereby:

V_o RMS value between an outer conductor and earth (non-insulated environment).

V RMS value between two outer conductors of a multicore cable or a system of single-conductor cables.

Insulated Power Cables

In accordance with DIN 57 250/VDE 0250 as well as DIN 57 281/VDE 0281 and DIN 57 282/VDE 0282

Type codes

To prevent misunderstandings in communication, a common type code convention has been established. It is used initially solely for harmonized cables and recognised national supplementary types according to point 1 a) and is organised into three parts according to the following overview. The first section specifies the regulation according to which a cable is manufactured, and the rated voltage.

The letter **H** indicates that the cable conforms to the harmonized standards in all respects and thus may be used in the countries named on page 1 / 2.

The letter **A** indicates that the conductor complies with reference to the harmonized regulations, but its use is only permissible in a specific country.

The second section contains the codes for the structural elements.

The data in the third section indicate the number of cores and the nominal conductor cross-sections and also whether or not a green-yellow core is present. In harmonized cables, therefore, it is no longer necessary to indicate the presence of a green-yellow core by adding "J" or "O" to the letter code.

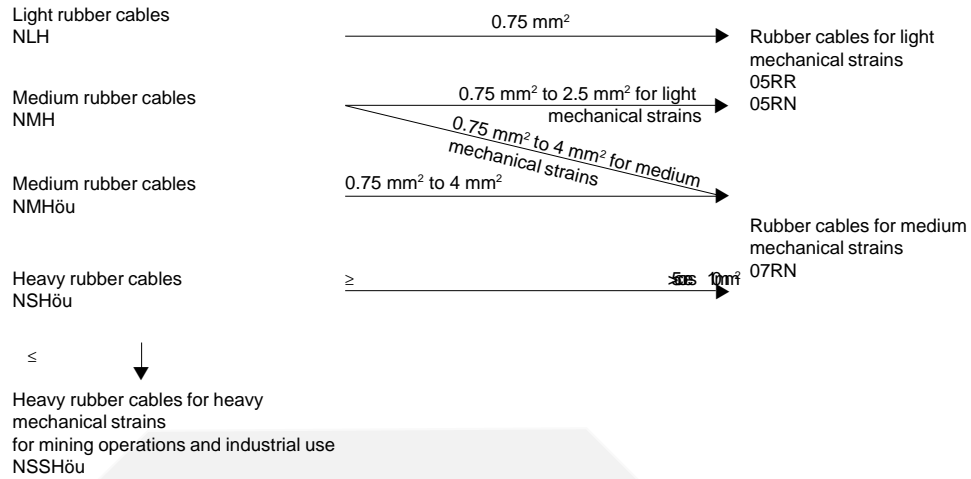
Key to designations

	1 st part	2 nd part	3 rd part
Designation for regulation			
Harmonized regulation _____	H		
Recognised national type _____	A		
Rated voltage V⁰/V			
300/300 V _____	03		
300/500 V _____	05		
450/750 V _____	07		
Insulation material			
PVC _____	V		
Natural and/or styrene-butadiene rubber _____	R		
Silicone rubber _____	S		
Sheath material			
PVC _____	V		
Natural and/or styrene-butadiene rubber _____	R		
Polychloroprene rubber _____	N		
Fiberglass fabric _____	J		
Textile weave _____	T		
Textile weave with flame-retardant mass _____	T2		
Special structural features			
Flat fan-out cable _____	H		
Flat, non-fan-out cable _____	H6		
Centre element (not load-bearing) _____	D5		
Conductor type			
Single-wire _____	-U		
Multiple-wire _____	-R		
Fine wire for cables for fixed installation _____	-K		
Fine wire for flexible cables _____	-F		
Extra-fine wire for flexible cables _____	-H		
Tinsel conductor _____	-Y		
Number of conductors _____	...		
Protective conductor			
With protective conductor _____	X		
Without protective conductor _____	G		
Nominal cross-section of conductor _____	...		

Examples of type designations

1. PVC general-purpose insulated wire 1.5 mm², black with single-wire conductor
2. Rubber cable 07RN for medium mechanical strains, three cores, 2.5 mm², with green-yellow protective conductor
3. PVC cable 03VV for light mechanical strains, two cores, 0.75 mm²

H07V-U 1,5 sw
H07RN-F 3G2.5
H03VV-F 2X0.75



The German national type NSSHöu remains available for heavy strains, e.g. at construction sites and in industry.

Core colour codes

In accordance with international requirements, the core coding for insulated power cables according to DIN 57 0293/VDE 0293 has been established as follows:

	Number of cores	Cables with green-yellow core (with designator J acc. to VDE 0250 resp. G acc. to VDE 0281/0282)	Cables without green-yellow core (with designator O acc. to VDE 0250 resp. X acc. to VDE 0281/0282)
Cables for fixed installation ¹⁾	1	g-y, lbl, other colours ²⁾	blk ³⁾
	2	–	blk/lbl
	3	g-y/blk/lbl	blk/lbl/br
	4	g-y/blk/lbl/br	blk/lbl/br/blk
	5	g-y/blk/lbl/br/blk	blk/lbl/br/blk/blk
Flexible cables ¹⁾	1	–	blk ²⁾
	2	–	br/lbl
	3	g-y/br/lbl	blk/lbl/br ⁴⁾
	4	g-y/blk/lbl/br	blk/hbl/br/blk ⁴⁾
	5	g-y/blk/lbl/br/blk	blk/hbr/br/blk/blk ⁴⁾
	6	g-y/other cores blk with printed numbers, consecutive from the inside starting with 1, g-y in the outside position	Cores blk with printed numbers, consecutive from the inside starting with 1

¹⁾ The colour codes are: g-y=green-yellow, blk = black, lbl = light blue, br = brown

²⁾ The colours green and yellow alone and all multiple-colour combinations besides green-yellow are prohibited. However, cables for wiring of current consuming apparatus and factory-built assemblies can be marked green and yellow or use any two-colour combination except with green or yellow.

³⁾ The core colour of single-core cables with sheath is always black.

⁴⁾ Three to five-core cables without green-yellow conductors have not yet been harmonized.

Where flexible cables have a core with a smaller conductor cross-section, this core must be coded green-yellow in cables with protective conductor and light blue in others.

Where required, the individual cable types presented in this catalogue are preceded by corresponding explanations. The notes on application given represent typical examples. When selecting cables, the VDE installation and equipment regulations and, where applicable, special regulations of supervi-

sory authorities shall be authoritative in addition to the VDE regulations governing cables.

Where not otherwise specified, the values given in VDE 0100 shall apply for the maximum loads of cables and assignment of overcurrent-protection devices; cf. the values in the technical tables on page 12/2. A new VDE regulation is currently in preparation.

Conductors

The conductors consist of soft-annealed copper wires constructed in conformance with DIN 57 250/VDE 0250, DIN 57 281/VDE 0281, DIN 57 282/VDE 0282, DIN 57 295/VDE 0295 on the basis of IEC 228.

The conductor cross-section (nominal cross-section) specified here is the "electrically effective cross-section", i.e. the cross-section determined through measurement of the resistance.

Important VDE regulations

1.	DIN 57 100/VDE 0100	Erection of power installations with rated voltages below 1000 V (VDE regulation)
2.	VDE 0101	Erection of power installations with rated voltages exceeding 1 kV
3.	DIN 57 108/VDE 0108	Power installations and safety power supply in communal facilities - Working and business premises (VDE regulation)
4.	DIN 57 113/VDE 0113	Safety of machinery; electrical equipment of machines with rated voltages below 1000 V
5.	VDE 0118	Erection of electrical installations in mines
6.	DIN 57 165/VDE 0165	Installation of electrical apparatus in hazardous areas (VDE regulation)
7.	VDE 0168	Erection of electrical installations in open-cast mines, quarries and similar works
8.	VDE 0190	Use of conduits in protective measures of power installations with rated voltages below 1000 V
9.	DIN 57 207/VDE 0207	Insulating and sheathing compounds for cables and flexible cords (VDE regulation)
10.	DIN 57 /57 250/VDE 0250	Cables, wires and flexible cords for power installation (VDE regulation)
11.	DIN 57 281/VDE 0281	PVC cables, wires and flexible cords for power installations (VDE regulation)
12.	DIN 57 /VDE 0282	Rubber cables, wires and flexible cords for power installations (VDE regulation)
13.	DIN 57 289/VDE 0289	Definitions for cables, wires and flexible cords for power installation (VDE regulation)
14.	DIN 57 293/VDE 0293	Identification of cores in cables and flexible cords used in power installations with nominal voltages up to 1000 V (VDE regulation)
15.	DIN 57 295/VDE 0295	Conductors of cables, wires and flexible cords for power installation (VDE regulation)
16.	DIN 57 /VDE 0298, Parts 3 and 4	Application of cables and flexible cords in power installations (VDE regulation)
17.	DIN 57 472/VDE 0472	Testing of cables, wires and flexible cords (VDE regulation)
18.	VDE 0720	Regulations for electric heating appliances for domestic use and similar purposes
19.	VDE 0730	Regulations for devices with electromotive drive for domestic use and similar purposes

Overview: flexible cables and cables for industry and mining

Type designation	Type code	Product program		Rated voltage	Maximum permissible operating voltage in				
		Number of cores	Nominal cross-section		Three-phase	AC installation		DC installation	
			mm ²	V ₀ /V V resp. kV		V V	V V	V ₀ V	V V
2. Flatform cables	XYFLY	16 4 5 7 8 12 18	1 1.5-70 1.5- 6 1.5-25 1.5-4 1.5-2.5 1.5	300-500 V	550 V	550 V	330 V	825 V	495 V
	H05VVH6-F	4.8 12, 18, 24	0.75 and 1	300-500 V	550 V	550 V	330 V	825 V	495 V
	H07VVH6-F (H) 07VVH6-F	4 7 8, 12 4	1.5 to 16 2.5 1.5 and 2.5 35 to 70	450/750 V	825 V	825 V	495 V	1238 V	743 V
	W05VVH6-F	8, (4x3)	1.5	300/500 V	550 V	550 V	330 V	825 V	495 V
	W07VVH6-F	3 4 5 (6x7) 7 8 10 12	25/16 1.5/35 1.5-2.5 1.5 1.5-4 1.5-2.5 1.5 1.5-2.5	450/750 V	825 V	825 V	495 V	1238 V	743 V
	YFLC... YFLT...	5, (5x4) (8x7) (4x4) 6	0.5 1 2.5	250 V	250 V		250 V		250 V
	KYFL... KYFLT...	12, 18 16, 18, 24 (6x5) 22x1+2x0.5 5x5x1+1x3x1+2x0.5	0.75	500 V					
	NGFLGÖU	4 5 7 8 10 12 24	1.5-120 1.5-25 1.5-35 1.5-2.5 1.5-2.5 1.5-2.5 1.5-2.5	300/500 V	550 V	550 V	330 V	825 V	495 V
	M(StD)HÖU	4x2 4, 8, 12 4, 6, 6x2, 12 4 4	1.0 1.5 2.5 4 16	300/500 V	550 V	550 V	330 V	825 V	495 V

Test voltage AC kV	Max. permissible operating temp. at conductor °C	Total insulation	Purpose	Application
2	70	yes	As power and control cable, especially in hoisting equipment, handling systems, machine tools etc. For medium mechanical strains and routine sharp bending in only one plane. Particularly suitable for crane systems.	In dry, damp, cold and wet rooms.
2	70	yes	As power and control cable, especially in hoisting equipment, handling systems, machine tools etc. For medium mechanical strains and routine sharp bending in only one plane.	In dry, damp and wet rooms.
2.5	70	yes		
2	70	yes	As power and control cable, especially in hoisting equipment, handling systems, machine tools etc. For medium mechanical strains and routine sharp bending in only one plane. Particularly suitable for crane systems.	In dry, damp, cold and wet rooms.
2.5	70	yes		
1.2	70	yes	As control cable for instrumentation and control applications, communications and data-transmission systems. Particularly suitable for crane systems, high-bay warehousing systems, industrial television with movable cameras, and for machine tools in conjunction with spring cable reels.	In dry, damp and wet rooms.
3.0	70	yes	As control cable for great suspension heights and/or greater tensile loads.	In dry, damp and wet rooms.
2	90	yes	As power and control cable, especially in hoisting equipment, handling systems, machine tools etc. For medium mechanical strains and routine sharp bending in only one plane.	In dry, damp and wet rooms and in outdoor areas.
2	60	yes	As power and control cable, especially in hoisting equipment, handling systems, machine tools etc. For medium mechanical strains and routine sharp bending in only one plane and wherever electrical interference is to be expected.	In dry, damp and wet rooms and in outdoor areas.

Overview: flexible cables and cables for industry and mining

Type designation	Type code	Product program		Rated voltage	Maximum permissible operating voltage in				
		Number of cores	Nominal cross-section		Three-phase	AC installation		DC installation	
			mm ²	V ₀ /V V resp. kV		V V	V V	V ₀ V	V V
3. Control cables with suspensions strands	FLGÖU	2-61	1	300-500 V	550 V	550 V	330 V	825 V	495 V
		2-42	1.5						
		2-37	2.5						
		4+5	4						
		4+5	6						
		4+5	10						
		4+5	16						
	STCN	6	0.5, 0.75, 1.5	750 V					
		4-24	1						
	YMHY-KT	4, 6, 7, 8	1.5	300/500 V	550 V	550 V	330 V	825 V	495 V
		10, 12, 18							
		24, 30							
		4, 7, 8	2.5						
	FYMYTW	12, 18, 25	1	300/500 V	550 V	550 V	330 V	825 V	495 V
		30							
		8, 12, 20	1.5						
4. Reeling cables	NSHTÖU-TROMMELFLEX (K)	4	1.5 to 185	0.6/1	1.20	1.20	0.69	1.80	0.9
		5 to 42	1.5						
		4 to 42	2.5						
		5	4 to 16						
		19/25	2.5/1.5+5x1,5(c)						
		NSHTÖU CORDAFLEX (K)	4	2.5 to 120	0.6/1	1.20	1.20	0.69	1.80
		5 to 24	1.5						
		7 to 44	2.5						
		25+5	1.5/1(C)						
		19+5 and	2.5/1(C)						
		25+5							
		3+3	50 to 185+ 25/3 to 95/3						
	NTSWÖU	3+3	120 and 150	0.6/1 1.7/3	1.15 3.45	1.15 3.45	0.69 1.7	1.73 5.18	1.04 2.9
		4	4 to 16						
		3+3	25 to 185+ 25/3 to 95/3						
	NTSCGEWÖU	3+3	25 and 35	3.5/6 6/10	6.9 11.5	6.9 11.5	4.03 6.9	10.35 17.25	6.05 10.35
	NTMCGCWÖU	1	25, 50 and 95	12/20	23	23	13.8	34.5	20.7
	NTSCGERLWÖU (SM)	3+.../3E	25 to 95	6/10 12/20	11.5 23	11.5 23	6.9 13.8	17.25 34.5	10.35 20.7

Test voltage AC kV	Max. permissible operating temp. at conductor °C	Total insulation	Purpose	Application
3	60	yes	As power and control cable, especially in elevator and handling systems, machine tools and hanging control panels, for medium mechanical strains.	In dry, damp and wet rooms and in outdoor areas.
3	80	yes	As power and control cable in elevator and handling systems, machine tools and hanging control panels, for medium mechanical strains and wherever induced currents resp. switching or transmission errors are to be expected.	In dry, damp and wet rooms and in outdoor areas.
2	70	yes	As control cable for hoisting equipment, crane and handling systems, for medium mechanical strains.	In dry, damp and wet rooms.
2	70	yes	As control cable for crane and hoisting equipment, handling systems and hanging control panels, as self-supporting control cable in mining operations over long travel distances and great suspension heights.	In dry, damp and wet rooms and in outdoor areas.
3	90	yes	As power and control cable for regular reeling and unreeling, and forced guidance for travel speeds of up to 120 m/min, in transport and handling systems where high mechanical strains occur.	In dry, damp and wet rooms and in outdoor areas.
3	90	yes	As reelable and forced-guided cables in transport and handling systems where high mechanical strains occur.	In dry, damp and wet rooms and in outdoor areas.
3	90	yes	For high dynamic loads, e.g. operation of electrohydraulic grabs, electric hoisting magnets or similar equipment.	In dry, damp and wet rooms and in outdoor areas.
4 6	80 80	yes yes	For connecting large-scale hoisting and handling equipment, for power supply at construction sites, bypassing faulty power supply units and similar situations.	In dry, damp and wet rooms and in outdoor areas.
11 17	80	–		
29	80	–		
17 29	80	–		

Overview: flexible cables and cables for industry and mining

Type designation	Type code	Product program		Rated voltage	Maximum permissible operating voltage in				
		Number of cores	Nominal cross-section		Three-phase	AC installation		DC installation	
			mm ²	V ₀ /V V resp. kV		V V	V V	V ₀ V	V V
5. Industrial rubber cables	H05RR-F	2 to 4 2 to 5	0.75 and 1 1.5 and 2.5	300/500 V	550 V	550 V	330 V	825 V	495 V
	H05RN-F	2	0.75 and 1						
	H05RN-F	3 and 4 3	0.75 1						
	H07RN-F	1 2 3 4 5	10 to 150 1.5 to 4 1 to 95 1.5 to 120 1.5 to 35	450/750 V	825 V	825 V	495 V	1238 V	743 V
	A07RN-F	3 4 1-36	1.5 to 120 1.5 to 95 1.5 and 2.5						
	NSSHÖU	1 2 3 4 5 7, 12 and 19	16 to 20 1.5 1.5 to 6 1.5 to 50, 70/35 and 90/50 1.5 to 25 2.5	0.6/1 kV	1.15 kV	1.15 kV	0.69 kV	1.73 kV	1.04 kV
	NSSHÖU.../...kon	3 and 5	2.5 to 6						
	H01N2-D (NSLFFÖU)	1	16 to 120	200 V	–	200 V	–	200 V	–
	NSGAFÖU	1	1.5 to 240	1.7/3 kV	–	3.45 kV	1.69 kV	5.18 kV	2.9 kV
	6. Plastic control cables	Ö-ZJ	3-100 3-61 3-61 2-61 3-50 4, 5, 7 4	0.5 0.75 1 1.5 2.5 4-16 25, 35	300/500 V	350 V	550 V	330 V	825 V
ÖSY-ZJ		3-80 3-61 3-61 3-61 3-61 4, 5, 7	0.5 0.75 1 1.5 2.5 4-16						

Test voltage AC kV	Max. permissible operating temp. at conductor °C	Total insulation	Purpose	Application
2	60	yes	For light hand-held and electrical heating appliances where light mechanical strains occur.	In dry rooms.
			For yard equipment and other light appliances, where light mechanical strains occur.	In dry, damp and wet rooms and in outdoor areas.
2.5	90	yes	For tools, movable motors, track motors and agricultural equipment, as well as at construction sites at medium mechanical strains.	In dry, damp and wet rooms; in outdoor areas, in agricultural workplaces and operational areas subject to fire hazards.
			Also for fixed surface installation for special purposes, e.g. temporary structures and dormitories.	In operational areas subject to explosion hazards acc. to VDE 0165
			For protected fixed installation in conduits or equipment and as rotor connection cable for motors with a maximum permissible voltage of 1000 V.	
3	80	yes	At heavy mechanical loads for heavy equipment and tools at construction sites, in industrial use, in open-cast mines and quarries, and in underground mining operations.	In dry, damp and wet rooms; in outdoor areas, in agricultural workplaces and operational areas subject to fire hazards. In operational areas subject to explosion hazards acc. to VDE 0165
3	80	yes	For connection to distribution installations as well as electrical machines and equipment in underground mining operations. The protective conductor provided in the form of a jacket over the individual cores or concentrically over all cores respectively complies with order No. 115.21/5565 of the superior mines authority (OBA), Dortmund, Germany, of 26 February 1962.	In dry, damp and wet rooms as well as in outdoor areas under heavy mechanical strains. In underground mining operations in all mine structures.
1	80	–	As cable for machines and hand welding equipment.	In dry, damp and wet rooms as well as in outdoor areas; in dry rooms.
6	100	–	For rail vehicles as well as busses with overhead power lines.	Acc. to VDE 0115, as well as in dry rooms.
2	70	yes	As power and interconnecting cables for machine tools, production lines, control units, etc.	In dry, damp and wet rooms, but not in outdoor areas.
2	70	yes	As power and interconnecting cables for machine tools, production lines, control units, etc. with heavy mechanical strains.	In dry, damp and wet rooms, but not in outdoor areas.

Overview: flexible cables and cables for industry and mining

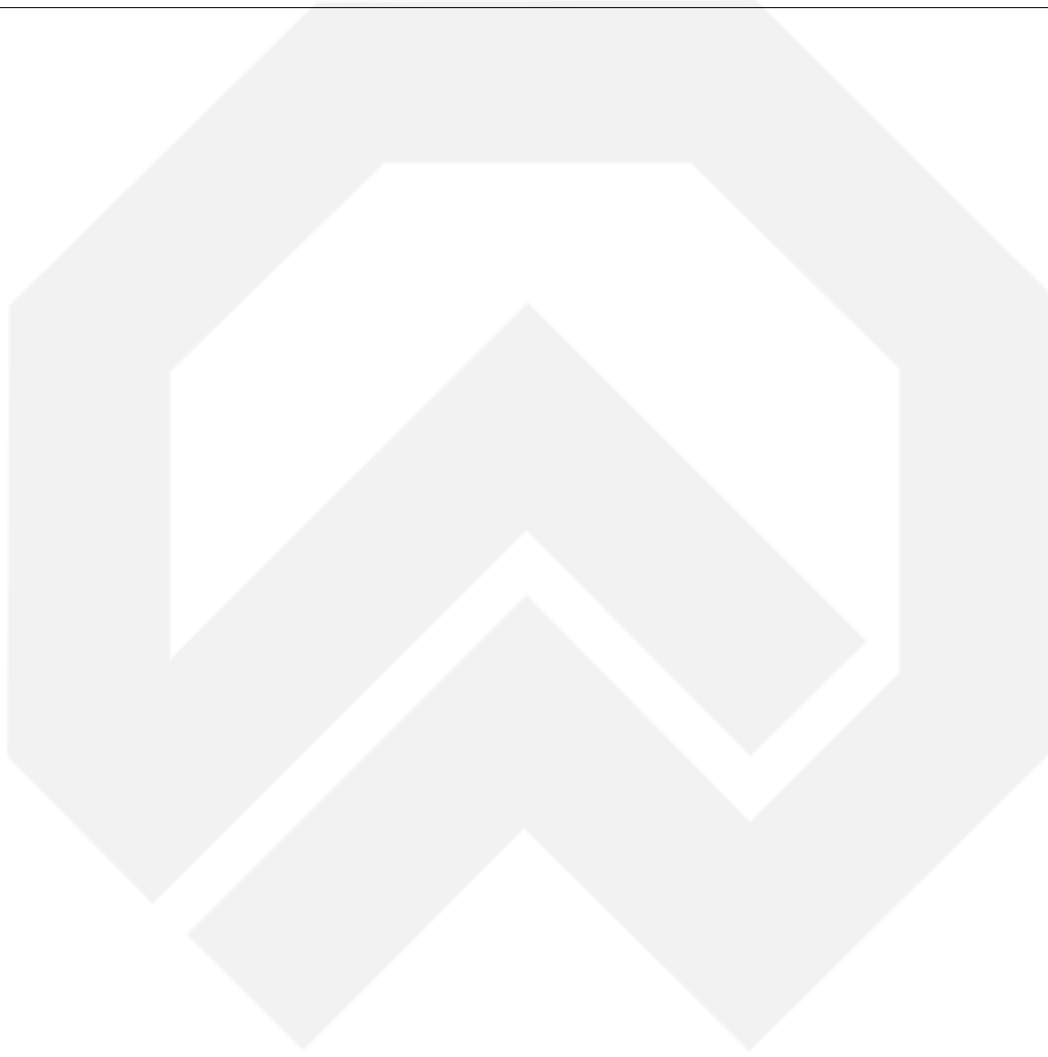
Type designation	Type code	Product program		Rated voltage	Maximum permissible operating voltage in				
		Number of cores	Nominal cross-section		Three-phase	AC installation		DC installation	
			mm ²	V ₀ /V V resp. kV		V V	V V	V ₀ V	V V
6. Plastic control cables	H05VV5-F (NYSLYÖ)	3 to 60 3 to 18	0.75 to 1.5 2.5	300/500 V	550 V	550 V	330 V	825 V	495 V
	(H)05VV5-F (YSLYÖ-JZ)	4.5 and 7	4 and 6						
	H05VVC4V5-K (H)05VVC4V5-K (NYSLYCYÖ) (YSLYCYÖ)	3 to 25 4,5 and 7 3,4 3,4 and 5 5	0.75, 1, 1.5, 2.5 4 and 6 0.75 1.5 and 2.5 4 and 6	300/500 V					
6. PUR control cables	11YMHY	2-5 2-5 3-12 3-5 4	0.75 1 1.5 2.5 4-6	300/500 V	550 V	550 V	330 V	825 V	495 V
6. PUR control cables	H05/H07BQ-F	2-5 3, 4, 5 3, 4	0.75, 1, 1.15 2.5 4 and 6						
7. Electronic cables									
	LIY(C)Y	3-50 1-50 1-30 2-70 2-7	0.14, 0.25, 0.34 0.5, 0.75 1.0, 1.5 2.5 4, 6, 10	250 V 500 V	380 V 550 V	380 V 550 V	– 330 V	270 V 825 V	– 495 V
8. Silicone cables	WASIF	1	0.14 to 150	300/500 V	550 V	550 V	330 V	825 V	495 V
	H05SJ-K A05SJ-K	1	0.25 to 120	300/500 V					
	WASID	1	0.20 to 16						
	H05SJ-U A05SJ-U	1 1	0.50 to 10 25 to 95						
	WASIHf	2-7 2-33 2-7 2-4 3	0.75-1.0 1.5 2.5-6 10-25 35-40						
	WASIHf-P	2-7 2-5 4	0.75-1, 1.5, 2.5 4-6 10, 16, 25						

Test voltage AC kV	Max. permissible operating temp. at conductor °C	Total insulation	Purpose	Application
2	70	yes	As power and interconnecting cables for machine tools, production lines, control units, etc.	In dry, damp and wet rooms, but not in outdoor areas.
2	70	yes	As power and interconnecting cables with and to manufacturing and processing machines, data-processing systems, etc. with medium mechanical strains, for fixed installation and flexible use in free motion without tensile strain.	
2	70	yes	As connection cable wherever high abrasion and notching resistance are required, particularly for hand-held equipment in industrial situations and for manufacturing spiral cables.	In dry, damp and wet rooms, temporarily in outdoor areas as well. Direct installation on components of hoisting equipment, machines, etc.
2	80	yes	As equipment power cable for high mechanical strains, in particular chafing or grinding. For connecting power tools, portable machines, motors, luminaires etc.	In dry and damp rooms, as well as in outdoor areas. At construction sites, in agricultural operations. Also for fixed surface installation.
1.2 2	70 70	yes yes	As control cable in electronics as well as instrumentation and control technology, for signal and speech transmission in call and intercom systems.	In dry, damp and wet rooms.
1.2 2	70 70	yes yes	As control cable in electronics as well as instrumentation and control technology, for signal and speech transmission in call and intercom systems, particularly wherever induced currents resp. switching or transmission errors are to be expected.	
2	180	no	For high and low ambient temperatures in high-performance luminaires, floodlights, heaters of all types, in the chemical industry, in casting plants and metallurgical works, as all-purpose cable. For medium mechanical strains and high and low ambient temperatures in high-performance luminaires, floodlights, heaters of all types, in the chemical and ceramics industries, in casting plants and metallurgical works, as all-purpose cable, sturdy construction. For high and low ambient temperatures in high-performance luminaires, heaters of all types, in the chemical and ceramics industries, in casting plants and metallurgical works, as wiring cable. For medium mechanical strains and high and low ambient temperatures in high-performance luminaires, heaters of all types, in the chemical and ceramics industries, in casting plants and metallurgical works, as wiring cable.	In switchgear and distribution installations acc. to VDE 0165.
2	180	yes	For high and low ambient temperatures and light mechanical strains. For high and low ambient temperatures and high mechanical strains.	In dry, damp and wet rooms as well as in outdoor areas.

Overview: flexible cables and cables for industry and mining

Type designation	Type code	Product program		Rated voltage	Maximum permissible operating voltage in				
		Number of cores	Nominal cross-section mm ²		Three-phase	AC installation		DC installation	
				V V	V V	V ₀ V	V V	V ₀ V	
10. Battery charging cable	WYBLYK	2	2.5-95	300/500 V secondary 80 V	–	–	–	825 V	495 V
11. Submarine cable WAQUAFIRM	WO7RR-F rd WO72XR-F rd WO7RR-F fi WO72XR-F fi	1 3+4 3+4	6 -95 1.5-95 1.5-95	450/750 V	825 V	825 V	495 V	1238 V	743 V

Test voltage AC kV	Max. permissible operating temp. at conductor °C	Total insulation	Purpose	Application
2	70	yes	For connection of mobile current consuming apparatus, e. g. battery chargers, as connection from charging unit to the batteries (accumulators) of the apparatus, such as forklifts, industrial trucks or other battery-powered vehicles or devices.	In dry, damp and wet rooms.
3	90	yes	For connection of electrically powered underwater equipment down to a submerged depth of 250 m, at medium mechanical strains.	In industrial and drinking water, in dry, damp and wet rooms and in outdoor areas.



Notes on the tables

Term	Note	Regulation
Rated voltage	The rated voltage of a cable is the voltage to which the design and the testing of the cable refer with respect to its electrical properties. The maximum permissible operating voltages are specified in column 9.	DIN 57 250 / VDE 0250 DIN 57 281 / VDE 0281 DIN 57 282 / VDE 0282 DIN 57 298 / VDE 0298
Type code	The type code specifies the type of cable, number of cores and conductor cross-section. Multiple-core cables according to VDE 0250 with green-yellow core carry the identifier "J", those without green-yellow core carry the code letter "O". Multiple-core cables according to VDE 0281/0282 with green-yellow core carry the code letter "G" between the number of cores and the cross-section, those without green-yellow core carry the identifier "X".	DIN 57 250 / VDE 0250 DIN 57 281 / VDE 0281 DIN 57 282 / VDE 0282 DIN 57 293 / VDE 0293
Conductor	The conductor cross-section is a nominal value. The effective cross-section is the electrical value determined through measurement of the resistance. For the construction of multiple-wire conductors, the VDE regulations require a minimum number of individual wires; however, for fine wire and extra-fine wire conductors the maximum diameter of the individual wires is regulated.	DIN 57 250 / VDE 0250 DIN 57 281 / VDE 0281 DIN 57 282 / VDE 0282 DIN 57 295 / VDE 0295
Core	With respect to the outer diameters of the cores, the manufacturing tolerances for wall thicknesses specified in the VDE regulations must be taken into consideration.	DIN 57 250 / VDE 0250 DIN 57 281 / VDE 0281 DIN 57 282 / VDE 0282
Cable	The outer dimensions of the cables are given as approximate values.	DIN 57 250 / VDE 0250 DIN 57 281 / VDE 0281 DIN 57 282 / VDE 0282
Weight	The weight represents an average value.	
Total insulation	The cables described as having total insulation have a "reinforced" insulation, e.g. H03VH-H, or a protective covering which qualifies as an "insulating jacket", e.g. NYRUZY.	DIN 57 100 / VDE 0100
Permissible operating temperature	The permissible operating temperature ϑ the temperature increase ϑ_n occurring at full load on the conductor. For rubber-insulated cables, for example, this value is: $\vartheta_g = \vartheta_u + \Delta\vartheta_n = 25 + 35 = 60\text{ }^\circ\text{C}$	
Maximum permissible operating voltage	In accordance with the type of deployment in three-phase, single-phase AC or DC installations, the highest sustained permissible operating voltage in fault-free operation may exceed the rated voltage by 10% resp. 15% in cables which comply with VDE 0250, VDE 0281 and VDE 0282.	DIN 57 250 / VDE 0250 DIN 57 281 / VDE 0281 DIN 57 282 / VDE 0282
Permissible sustained load	The load values apply for individual cables at an ambient temperature of 25 °C and an installation configuration as described on page 12/2. For different ambient temperatures and cable concentrations, the load current must be corrected as described on page 12/2. For control cables, the permissible current applies for a load on three conductors simultaneously. When more conductors are under load, the current must be reduced as shown in the diagram on page 12/3. Conductors with higher permissible operating temperatures: 100 °C NSGAFöu 120 °C N4GA, N4GAF, 4GMH4G, H07G-K 180 °C SiA, SiAF	DIN 57 100 / VDE 0100 DIN 57 298 / VDE 0298
Overcurrent protection devices	Overcurrent protection devices are assigned to the conductor cross-sections at ambient temperatures (acc. to column 10). At higher ambient temperatures, the rated current of the protection devices must be decreased in accordance with page 12/2. For flexible cables with cross-sections of less than 1.5 mm ² , VDE 0100, table 41-1 (or equivalent) must be observed.	DIN 57 100 / VDE 0100
Conductor resistance	The maximum value of the conductor resistance at 20 °C is specified in the VDE regulations. It differs for the various conductor types and for conductors with tinned and untinned wires.	DIN 57 250 / VDE 0250 DIN 57 281 / VDE 0281 DIN 57 282 / VDE 0282 DIN 57 295 / VDE 0295 DIN 57 472 / VDE 0472

Notes on the room types

In accordance with DIN 57 100/VDE 0100

Room type	Description of room type	Examples
Electrical operating areas	These rooms are used primarily for the operation of electrical installations and are generally entered only by trained personnel.	Switchrooms, switching control centres, distribution installations in separate rooms, separate electrical testing facilities and laboratories, machine rooms of power stations and comparable facilities containing machines which are operated by trained personnel only.
Closed electrical operating areas	These rooms are intended exclusively for the operation of electrical installations and are kept closed and locked. These rooms may only be opened by authorised persons. Access is permitted for trained personnel only.	Closed switching and distribution installations, transformer cells, switchgear cells, distribution installations in steel-plate enclosures or in other closed plants, tower-type substations, drive rooms of elevators.
Dry rooms	As a rule, water does not condense here and the air is not saturated with moisture.	Inhabited rooms (including hotel rooms), offices; this category can also include: business premises, sales showrooms, attics, stairways, heated and ventilated basements. Kitchens in dwellings and bathrooms in dwellings and hotels are regarded as dry rooms for installation purposes, as moisture occurs here only temporarily.
Damp and wet rooms	The safety and reliability of operating equipment can be impaired by moisture, condensation, chemical or other influences.	Dishwashing kitchens, grain silos, manure sheds, dairies, feed kitchens, canteens, laundries, bakeries, walk-in refrigerators, pump rooms, unheated or unventilated basements, outdoor sites. Where floors, walls and possibly also equipment are sprayed with water as part of cleaning, this type also includes: beer and wine cellars, wet workplaces, car wash facilities, greenhouses, also rooms of public bathing and swimming facilities, cheese-dairies, creameries, breweries, butcher shops, tanneries, chemical plants, electroplating plants.
Operational areas subject to fire hazards	In these rooms, there is a risk that due to the characteristics of the location and the nature of the operation, hazardous quantities of highly flammable materials can come into such close proximity with electrical equipment that the higher temperatures of this equipment or electrical arcing represent a danger of fire.	Workrooms, drying or storage rooms or parts of such rooms as well as places of this type outdoors, e.g. paper, textile or wood processing operations, hay, straw, jute or flax warehouses, garages and their auxiliary rooms for parking combustion-engine motor vehicles. Rooms for oil-burning furnaces in central heating systems.
Operational areas subject to explosive hazards	Depending on the characteristics of the location and the nature of the work, gases, vapours, mists or dust which can form an explosive mixture with air can collect in dangerous quantities.	Workrooms, drying or storage rooms or parts of such rooms, containers and apparatus as well as outdoor operating areas.
Electrical installations at construction sites	These are the electrical installations and equipment required for performing work at construction, excavation or public-works sites as well as for the erection of steel structures.	Construction works and parts thereof which are being built, remodelled refurbished or demolished. Construction sites do not include sites at which only hand-held lamps, soldering irons, welding equipment or power tools within the meaning of VDE 0740 are used, e.g. drills, disk grinders, polishers and other equipment.
Agricultural operating areas	The effects of dampness, dust, chemically highly reactive vapours, acids or salts on the insulation of electrical equipment can represent an accident risk for livestock (large animals) as well; an increased risk of fire can exist where highly flammable materials are present..	Stalls (also coops for poultry), barns, silos, hay and straw lofts, sheds (vestibules), grain drying facilities, coarse-grinding rooms and similar; these rooms are also considered to be damp and wet rooms and operating areas subject to fire hazards.