Additional Information

THINK CONNECTED.

Test marks

	Lightning current-tested
	Lightning current-tested, Class H (100 kA)
	ELEKTROTECHNICKÝ ZKUŠEBNÌ ÚSTAV, Czech Republic
	ATEX certificate for explosive areas
	Russia, GOST The State Committee for Standards
	KEMA-KEUR, Netherlands
	Indication of metric products
	MAGYAR ELEKTROTECHNIKAI ELLENŐRZŐ INTÉZET Budapest, Hungary
	Österreichischer Verband für Elektrotechnik, Austria
	Underwriters Laboratories Inc., USA
	Eidgenössisches Starkstrominspektorat, Switzerland
	Underwriters Laboratories Inc., USA
	Verband der Elektrotechnik, Elektronik, Informationstechnik e.V., Germany
	German Association of Electricians, tested safety
	5-year warranty
	Halogen-free; without chlorine, fluorine and bromine

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Pictogram explanation

Lightning protection classes

Type 1	Protection device to DIN EN 61643-11 or IEC 61643-11
Type 1+2	Combination protection device made of type 1 and type 2
Type 2	Protection device to DIN EN 61643-11 or IEC 61643-11
Type 2+3	Protection device to DIN EN 61643-11 or IEC 61643-11
Type 3	Protection device to DIN EN 61643-11 or IEC 61643-11

Lightning protection zone

LPZ 0→1	Transition from LPZ 0 to LPZ 1
LPZ 0→2	Transition from LPZ 0 to LPZ 2
LPZ 0→3	Transition from LPZ 0 to LPZ 3
LPZ 1→2	Transition from LPZ 1 to LPZ 2
LPZ 1→3	Transition from LPZ 1 to LPZ 3
LPZ 2→3	Transition from LPZ 2 to LPZ 3

Applications

FS	Remote signalling
FS-SÜ	Remote signalling with fuse monitoring
AS	Acoustic signalling
ISDN	Integrated Service Digital Network, ISDN applications
DSL	Digital Subscriber Line, DSL applications
Analog TK	Analogue telecommunication
Cat 5	Category 5 TwisterPair
Cat 6_A	Channel Performance to American EIA/TIA standard
MSR	Measuring, controlling and regulating systems
TV	TV applications
SAT	SAT-TV applications
Mu	Multibase base
	LifeControl
EX	Intrinsically safe protection device for areas with a risk of explosions
Class E_A	Channel Performance to ISO / IEC 11801
PoE	Power over Ethernet
230/ 400 V System	230/400 V system
M	Metric

Applications

IP 65	Degree of protection of enclosure IP 65

Metals

Alu	Aluminium
VA	Stainless steel, grade 304
VA	Stainless steel, grade 316
VA	Stainless steel, grade 316 L
VA	Stainless steel, grade 316 Ti
Cu	Copper
CuZn 37	Brass
St	Steel
TG	Cast iron
Zn	Die-cast zinc

Plastics

GFK	Fibre-glass-reinforced plastic
P	Petrolatum
PA	Polyamide
PC	Polycarbonate
PE	Polyethylene
PP	Polypropylene
PS	Polystyrene

Surfaces

FS	Strip-galvanised
F	Hot-dip galvanised
G	Electro-galvanised
FT	Hot-dip galvanised
Cu	Copper-plated
N	Nickel-plated
ZD	Galvanised, Deltatone 500

Metallic materials

Alu — Aluminium

VA (1.4301) — Stainless steel, grade 304

VA (1.4401) — Stainless steel, grade 316

VA (1.4404) — Stainless steel, grade 316 L

VA (1.4571) — Stainless steel, grade 316 Ti

Cu — Copper

CuZn — Brass

St — Steel

TG — Cast iron
Electrogalvanised

Zn — Die-cast zinc

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Plastic materials

GFK — Fibre-glass-reinforced plastic

Temperature resistance:
-50 to 130 °C.

Resistant to

High chemical resistance
Corrosion resistance
UV light resistance

PETR — Petrolatum

PA — Polyamide

Temperature resistance:
permanently up to approx. 90 °C, briefly up to about 130 °C and to about minus 40 °C*.
Chem. resistance generally as for polyethylene.

Resistant to

Petrol, benzene, diesel oil, acetone, solvents for paints and lacquers, oils and greases.

Unstable with

Bleach, most acids, chlorine.

Risk of tension cracking

Low in air-humid conditions; only with some aqueous salt solutions. Highly desiccated parts (high temperature and extremely low air humidity) are highly sensitive to fuels and various solvents.

PA/PP — Polyamide/Polyethylene

PC — Polycarbonate

Temperature resistance:
permanently up to approx. 110 °C (in water 60 °C), briefly up to 125 °C, and to below minus 35 °C.

Resistant to

Petrol, turpentine, most weak acids.

Unstable with

Acetone, benzene, chlorine, methylene chloride, most concentrated acids.

Risk of tension cracking

Relatively low.
Media which can cause tension cracking include benzene, aromatic hydrocarbons, methanol, butanol, acetone, turpentine.

PE — Polyethylene

Temperature resistance:
hard types permanently up to about 90 °C, briefly up to about 105 °C, soft types permanently up to about 80 °C, briefly up to about 100 °C and to about minus 40 °C*.

Resistant to

Alkalis and inorganic acids.

Conditionally resistant to

Acetone, organic acids, petrol, benzene, diesel oil, most oils.

Unstable with

Chlorine, hydrocarbons, oxidising acids.

Risk of tension cracking

Relatively high.
Stress cracks can be caused by, among other things, acetone, various alcohols, formic acid, ethanol, petrol, benzene, butyric acid, acetic acid, formaldehyde, various oils, petroleum, propanol, nitric acid, hydrochloric acid, sulphuric acid, soap solutions, turpentine, trichloroethylene, citric acid.

PP — Polypropylene

Temperature resistance:
permanently up to approx. 90 °C, briefly up to about 110 °C and to about minus 30 °C*.
Chem. resistance generally as for polyethylene.

Resistant to

Alkalis and inorganic acids.

Conditionally resistant to

Acetone, organic acids, petrol, benzene, diesel oil, most oils.

Unstable with

Chlorine, hydrocarbons, oxidising acids.

Risk of tension cracking

Low, only with some acids such as chromic acid, hydrofluoric acid and hydrochloric acid, as well as nitrogen oxide.

PS — Polystyrene

Temperature resistance:
Because of its relatively high sensitivity to the effects of chemicals, its use is not recommended at temperatures above normal room temperature, about 25 °C.
Resistance to cold: to about minus 40 °C*.

Resistant to

Alkalis, most acids, alcohol.

Conditionally resistant to

Oils and greases.

Unstable with

Butyric acid, concentrated nitric acid, concentrated acetic acid, acetone, ether, petrol and benzene, solvents for paints and lacquers, chlorine, diesel fuel.

Risk of tension cracking

Relatively high.
Stress cracks can be caused by, amongst other things, acetone, ether, petrol, cyclohexane, heptane, methanol, propanol and the softeners used in some PVC cable mixes.

*The minus values apply only for parts in the quiescent condition with no severe impact stress.
There is no plastic that is resistant to every chemical. The agents listed are only a small selection. Plastic parts are especially at risk in the presence of chemicals and high temperatures. Stress cracks may occur. If in doubt, please consult us and/or ask for a detailed chemical resistance table.
Stress crack formation: stress cracks may occur if plastic parts under tension are exposed to chemicals at the same time. Parts made of polystyrene and polyethylene are particularly susceptible. Stress cracks may even be caused by agents to which the plastic in question is resistant in the absence of stress. Typical examples of parts under constant stress when used as intended: grip clips, intermediate supports of cable glands, ribbon clips.

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Tested lightning protection components

Tightening torques

M5 = 4 Nm

M6 = 6 Nm

M8 = 12 Nm

M10 = 20 Nm

Detailed data can be provided on request.

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Brief glossary of overvoltage protection

100% response lightning impulse voltage

The 100% response lightning impulse voltage is the value of the lightning impulse voltage 1.2/50 µs, causing the arrestor to switch. With this testing voltage, the surge protection device must respond ten times to ten loads.

Arrestor

Arrestors are resources, which primarily consist of voltage-dependent resistors and/or spark gaps. Both elements can be switched in series or in parallel or used individually.
Arrestors are used to protect other electrical resources and electrical systems against surge voltages.

Arrestor measured voltage Vc

For arrestors without a spark gap, the measured voltage is the maximum permitted effective value of the mains voltage on the arrestor terminals. The measured voltage may constantly be applied to the arrestor without changing its operational characteristics.

Back-up fuse before the arrestors

There must be a back-up fuse before the arrestors. If the upstream fuse is greater than the maximum approved back-up fuse of the arrestor elements (see technical data of the device), the arrestor must be protected selectively with the required value.

Cut-off unit

The cut-off unit cuts the arrestor off from the mains or the earthing system if it is overloaded, thus preventing a fire risk and also signalling the switch-off of the protection device.

Equipotential bonding

Electrical connection, which brings the bodies of electrical resources and other conductive parts to the same or almost the same potential.

Equipotential bonding rail (PAS)

A terminal or rail, intended to connect the protective conductor, the equipotential bonding conductor and, if necessary, the conductor for function earthing with the earthing cable and the earthers.

Error current protection unit (RCD)

Resource for protection against electric shocks and fire protection (e.g. FI protection switches).

Lightning protection equipotential bonding system

The lightning protection equipotential bonding is a key measure in reducing the risk of fire and explosion on the room or building to be protected. The lightning protection equipotential bonding is achieved using equipotential bonding cables or arrestors, which connect the external lightning protection system, metallic parts of the building or room, the installation, the other conductive parts and the electrical energy and telecommunications systems.

Lightning protection system (LPS)

A lightning protection system (LPS) is considered as the entire system used to protect a room or building against the impact of a lightning strike. This includes both internal and external lightning protection.

Lightning protection zone (LPZ)

Lightning protection zones are those areas in which the electromagnetic environment of the lightning is to be defined and mastered. At the zone transitions, all cables and metallic parts must be integrated into the equipotential bonding system.

Lightning surge current (Iimp)

A lightning surge current (lightning current carrying capacity per path) is a standardised surge current curve of the shape 10/350 µs. With its parameters
- Peak value
- Charge
- Specific energy

it represents the load from natural lightning currents. Type 1 lightning current arrestors (previously requirement class B) must be able to arrest such lightning currents without being destroyed.

Line follow current quenching (If)

The follow current – also called network follow current – is the current which flows through the surge protection device after an arresting operation and is supplied by the network. The follow current is considerably different from the continuous operating current. The level of the network follow current is dependent on the feed line from the transformer to the arrestor.

Nominal current (In)

The nominal current is the maximum permitted operating current which may be run continually through the appropriately labelled connection terminals.

Nominal discharge surge current (In)

Peak value of the current flowing through the arrestor with the wave shape 8/20. It is used to classify the testing of surge arrestors of type 2 (formerly requirements Class C).

Nominal frequency (fn)

The nominal frequency is that frequency for which a resource is measured, by which it is called and upon which other nominal parameters refer.

Nominal voltage (Vn)

The rated voltage is the voltage value for which a resource is designed. In so doing it might be a direct voltage value or the effective value of a sine-form alternating voltage.

Surge protection device (ÜSG)

A device intended for the limitation of transient surge voltages and arresting of surge voltages. It contains at least one non-linear construction element. In general speech, surge protection devices are also termed arrestors.

Protection level (Up)

The protection level is the highest current voltage value on the terminals of the surge protection device before response.

Residual voltage (Vres)

The peak voltage value, occurring via the terminals of the surge protection device during or immediately after the arresting surge current has flowed.

Short-circuit resistance

The surge protection device must be able to conduct the short-circuit current, until it is either interrupted by the device itself or by an internal or external cut-off unit or by mains-side over-current protection (e.g. back-up fuse).

Response time (ta)

The response time primarily characterises the response behaviour of the individual protection elements used in arrestors. Depending on the slope du/dt of the surge voltage or di/dt of the surge current, the response times may vary within specific limits.

SPD

Surge protection device.

Surge arrestor, type 1

Arrestors, which, due to their special structure, are able to arrest lighting currents or partial lightning currents during direct strikes.

Surge arrestor, type 2

Arrestors, which are able to arrest surge voltages cause by remote or nearby strikes or switching actions.

Surge arrestor, type 3

Arrestors, used for surge protection of individual consumers or consumer groups and are employed directly on sockets.

Surge voltage

A surge voltage is a voltage occurring briefly between conductors or between a conductor and the earth, which exceeds the highest permissible operating voltage value by a long way, but does not have the operating frequency. It can be created by storms or by earthing or short-circuits.

Temperature range

The operating temperature specifies within which temperature limits the perfect function of the surge protection device is guaranteed.

Transient surge voltage (TOV)

Temporary surge voltages are short-term (i.e. temporary) surge voltages, which may occur due to errors within the medium and low-voltage network.

Transmission frequency (fg)

The transmission frequency specifies up to which frequency the insertion damping of the employed resource is less than 3 dB.

Volume resistance per path, series resistance

The volume resistance per path specifies the ohmic resistance increase of the conductor path per wire caused by the use of the surge protection device.

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Conversion table, cable material

Conversion table, cable material

Designation	Item number	Weight approx. (kg/m)	Weight approx. (kg/100 m)	Length approx. (m/kg)
Flat conductor St/FT, 20x2.5	5019340	0.41	41	2.44
Flat conductor St/FT, 25x3	5019342	0.60	59.7	1.68
Flat conductor St/FT, 30x3	5019344	0.71	70.65	1.42
Flat conductor St/FT, 30x3.5	5019345/5019347	0.84	84	1.19
Flat conductor St/FT, 30x4	5019350	0.97	97	1.03
Flat conductor St/FT, 40x4	5019355	1.28	128	0.78
Flat conductor St/FT, 40x5	5019360	1.62	162	0.62
Flat conductor copper, 20x2.5	5021804	0.45	44.5	2.25
Flat conductor VA, 30x3.5	5018501 (V2A) 5018706 (V4A) 5018730 (V4A)	0.83	82.5	1.21
St/FT round cable, 8 mm	5021081	0.40	40	2.50
St/FT round cable, 10 mm	5021103	0.63	63	1.59
Aluminium round cable, 8 mm	5021286 5021294	0.14	13.5	7.41
Aluminium round cable, 10 mm	5021308	0.21	21	4.76
Copper round cable, 8 mm	5021480	0.45	45	2.22
Copper round cable, 10 mm	5021502	0.70	70	1.43
VA round cable, 8 mm	5021235 (V2A) 5021644 (V4A)	0.40	40	2.50
VA round cable, 10 mm	5021227 (V2A) 5021239 (V2A) 5021642 (V4A) 5021647 (V4A)	0.63	63	1.59
St/FT round cable with PVC jacket, 10 mm	5021162	0.67	67.2	1.49
Aluminium round cable with PVC jacket, 8 mm	5021332	0.20	20	5.00
Copper cable, 9 mm	5021650	0.45	44.5	2.25
Copper cable, 10.5 mm	5021654	0.59	58.6	1.71

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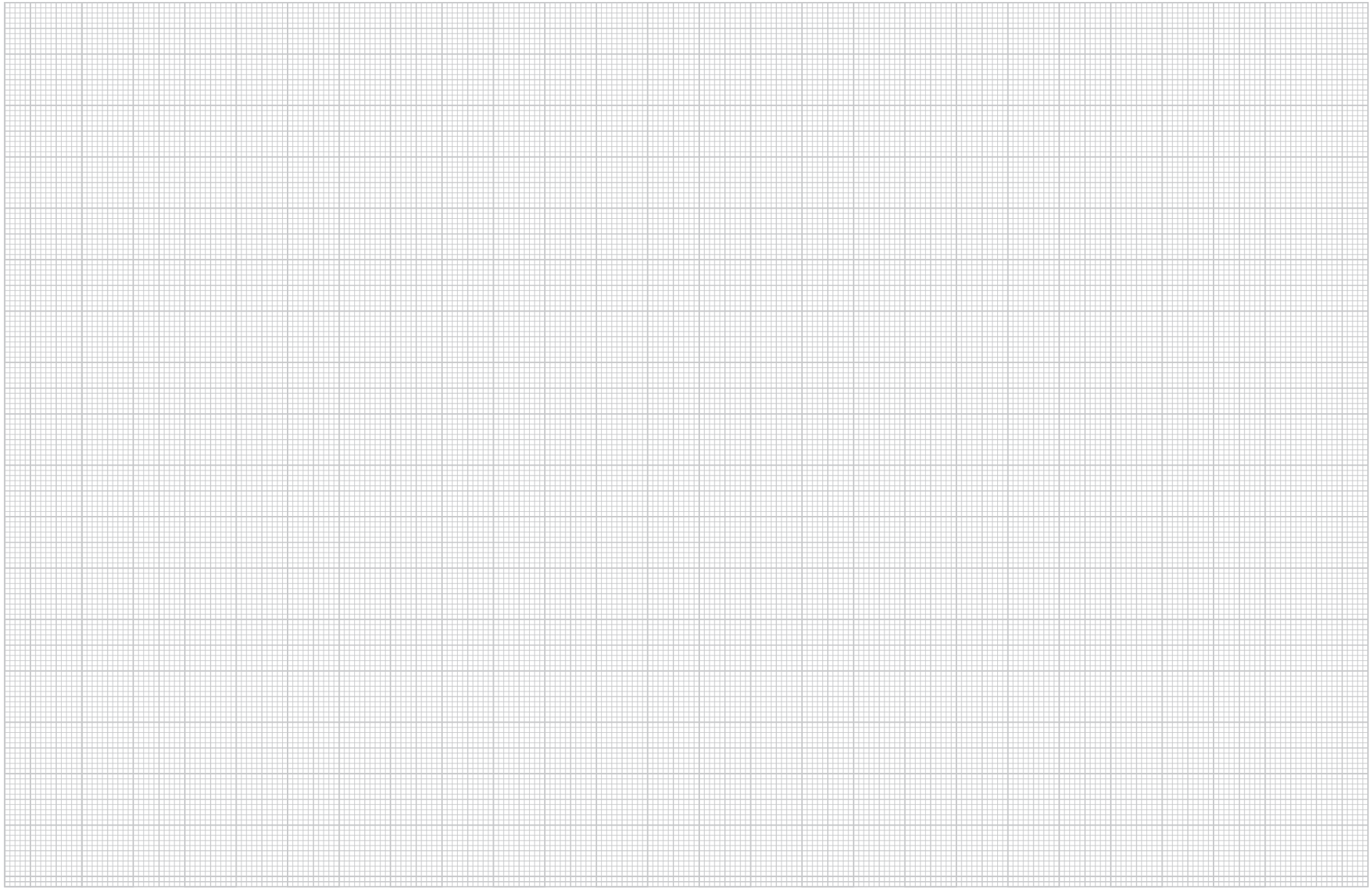

Test marks

	AENOR, Producto Certificado, Spain
	STOWARZYSZENIE ELEKTRYKÓW POLSKICH, Poland
	CEBEC, Belgium
	DEMKO, Danmarks Elektriske Materielkontrol, Denmark
	Det Norske Veritas
	ATEX certificate for explosive areas
	ELEKTROTECHNICKÝ ZKUŠEBNÌ ÚSTAV, Czech Republic
	FIMKO, Finland
	Russia, GOST The State Committee for Standards
	KEMA-KEUR, Netherlands
	Indication of metric products
	NEMKO, Norway
	AFNOR Quality symbol of the French standardisation institute
	Underwriters Laboratories Inc., USA + CSA, Canada
	Österreichischer Verband für Elektrotechnik, Austria
	INSTITUTO ITALIANO DEL MARCHO DI QUALITÁ, Italy
	Underwriters Laboratories Inc., USA
	SEMKO An Inchcape Testing Services Company, Sweden
	Eidgenössisches Starkstrominspektorat, Switzerland
	Underwriters Laboratories Inc., USA
	Underwriters Laboratories Inc., USA
	Verband der Elektrotechnik, Elektronik, Informationstechnik e.V., Germany

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Pictogram explanation

Surfaces

FS	Strip-galvanised
st	Strip-galvanised/plastic-coated
BK	Bright
F	Hot-dip galvanised
G	Electro-galvanised
El	Electrogalvanised/plastic-coated
GGP	Electrogalvanised, yellow passivated
GTP	Electrogalvanised, transparently passivated
FT	Hot-dip galvanised
Cu	Copper-plated
N	Nickel-plated
ZD	Galvanised, Deltatone 500
ZDM	Galvanised, MAGNI 565
FT	Hot-dip galvanised/SOMY
DD	Zinc-aluminium coated, double-dip
GA	Zinc-aluminium coated, Galfan

Conformity symbol

CE	Communautés Européennes, EC declaration of conformity according to EC directives
RoHS	RoHS-conformant

Quality marks

	Halogen-free; without chlorine, fluorine and bromine
650°	Flame resistant 650 °C
750°	Flame resistant 750 °C
960°	Flame resistant 960 °C
UV RESISTANT	UV-RESISTANT

Nominal cross-section

1,5 mm²	Nominal cross-section 1.5 mm²
1,5-2,5 mm²	Nominal cross-section 1.5–2.5 mm²
2,5 mm²	Nominal cross-section 2.5 mm²
2,5-4 mm²	Nominal cross-section 2.5–4 mm²
4 mm²	Nominal cross-section 4 mm²
4-6 mm²	Nominal cross-section 4–6 mm²

Nominal cross-section

6 mm²	Nominal cross-section 6 mm²
10 mm²	Nominal cross-section 10 mm²
16 mm²	Nominal cross-section 16 mm²

Nominal voltage

400 V	Nominal voltage 400 V
500 V	Nominal voltage 500 V
660 V	Nominal voltage 660 V

Protection rating

IP 20	Protection rating IP 20
IP 30	Protection rating IP 30
IP 31	Protection rating IP 31
IP 44	Protection rating IP 54
IP 54	Protection rating IP 54
IP 55	Protection rating IP 55
IP 65	Protection rating IP 65
IP 66	Protection rating IP 66
IP 67	Protection rating IP 67
IP 68	Protection rating IP 68

Entries

4	4 cable entries
6	6 cable entries
7	7 cable entries
8	8 cable entries
9	9 cable entries
10	10 cable entries
12	12 cable entries
10	10 cable entries ECO
12	12 cable entries ECO
14	14 cable entries ECO
16	16 cable entries
18	18 cable entries ECO
24	24 cable entries

Pictogram explanation

Polarity

3	3-pole
5	5-pole
7	7-pole
8	8-pole
10	10-pole
12	12-pole

Clamp clip base shapes

N	Cable clip for C profile rail with slot width 11–12 mm
H	Cable clip for C profile rail with slot width 16–17 mm
U	Clamp clip for C profile rail with slot width 18–22 mm

Slot widths

7,5	Slot width 7.5 mm
11	Slot width 11 mm
11-12	Slot width 11–12 mm
12	Slot width 12 mm
15	Slot width 15 mm
16	Slot width 16 mm
16,5	Slot width 16.5 mm
16-17	Slot width 16–17 mm
17	Slot width 17 mm
18	Slot width 18 mm
22	Slot width 22 mm
35	Slot width 35 mm

Diameter

Ø 60	Diameter 60 mm
Ø 68	Diameter 68 mm
Ø 70	Diameter 70 mm
Ø 74	Diameter 74 mm

Gland thread

M	Thread metric
Pg	Thread Pg

Screw heads

	Philips screw
	Torx screw
	Phillips screw
	Pozidrive

Entry size

M20	M20 entry
M25	M25 entry
M32	M32 entry
M40	M40 entry

Materials

	Flat steel
	Angular steel
	U steel
	Round material

Firing devices

	Bolt-firing tool
	Nail device

BSS test marks/material class

E30	Function maintenance class E30
E90	Function maintenance class E90

KTS side heights

	Cable tray, side height 35 mm
	Cable tray, side height 60 mm
	Cable tray, side height 85 mm
	Mesh cable tray, slant height 35 mm
	Mesh cable tray, slant height 55 mm

BSS function maintenance installation

	Escape route ceiling mounting with pressure clip
	OBO Grip, wall routing type
	OBO Grip, ceiling routing type
	Pressure clip, function maintenance, ceiling mounting

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Pictogram explanation

BSS anchor

	Fire protection anchor
	Fire protection bolt tie

Metals

Alu	Aluminium
VA	Stainless steel, grade 304
VA	Stainless steel, 1.4307
VA	Stainless steel, grade 301
VA	Stainless steel, grade 316
VA	Stainless steel, grade 316 L
VA	Stainless steel, grade 354/1
VA	Stainless steel, grade 316 Ti
CuZn 37	Brass
St	Steel
TG	Cast iron
Zn	Die-cast zinc

Plastics

ABS/ ASA	Acrylonitrile butadiene styrene
UF	Duroplast, Aminoplast, type 131.5
MF	Duroplast, melamine resin, type 150
EVA	Ethylene vinyl acetate
FA	Fibre-proof material DIN 28091
NBR SBR	Rubber mixture
NBR	Nitrile rubber
PA	Polyamide
PA/ GF	Polyamide, fibre-glass reinforced
PBPT	Polybutylene terephthalate
PC	Polycarbonate
PE	Polyethylene
PP/GF	Polypropylene, fibre-glass reinforced
PS	Polystyrene
PVC	Polyvinylchloride
ZELL PE	Cellular polyethylene

Metallic materials

Alu — Aluminium

VA (1.4301) — Stainless steel, grade 304

VA (1.4307) — Stainless steel, 1.4307

VA (1.4310) — Stainless steel, grade 301

VA (1.4401) — Stainless steel, grade 316

VA (1.4404) — Stainless steel, grade 316 L

VA (1.4529) — Stainless steel, grade 354/1

VA (1.4571) — Stainless steel, grade 316 Ti

CuZn — Brass

TG — Cast iron
Electrogalvanised

St — Steel

Zn — Die-cast zinc

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ABS/ASA — Acrylonitrile butadiene styrene

Temperature resistance: permanently up to 70 °C, briefly up to 85 °C and to about minus 40 °C.

Resistant to

Formic acid, citric acid, lactic acid.

Conditionally resistant to

Hydrochloric acid, sulphuric acid.

Unstable with

Acetone, petrol, benzene, solvents for paints and butyric acid, chlorine, acetic acid, nitric acid.

Risk of tension cracking

Relatively high, similar to polystyrene.

UF — Duroplast, Aminoplast, type 131.5

for boxes, glands and clips

Temperature resistance:
permanently up to 65 °C, briefly up to 90 °C and to about minus 40 °C.

Resistant to

Alcohol, ester, ether, benzene, petrol, mineral oils, greases, weak alkalis, water.

Conditionally resistant to

Weak acids.

Unstable with

Strong acids, strong alkalis.

Risk of tension cracking

Low risk of stress cracks.

MF — Duroplast, melamine resin, type 150

For terminal blocks

Temperature resistance:
permanently up to 80 °C, briefly up to 110 °C and to about minus 40 °C.

Resistant to

Alcohol, ester, ether, benzene, petrol, mineral oils, greases, weak alkalis, water.

Conditionally resistant to

Weak acids.

Unstable with

Strong acids, strong alkalis.

Risk of tension cracking

Low risk of stress cracks.

EVA — Ethylene vinyl acetate

FA — Fibre-proof material DIN 28091

To DIN 28091, asbestos-free

Temperature resistance:
up to 300 °C.

NBR/SBR — Rubber mixture

NBR — Nitrile rubber

Temperature resistance:
permanently up to 120 °C, briefly up to 150 °C, and to about minus 30 °C.

Resistant to

Oils and petrol.

PA — Polyamide

Temperature resistance:
permanently up to approx. 90 °C, briefly up to about 130 °C and to about minus 40 °C*.
Chem. resistance generally as for polyethylene.

Resistant to

Petrol, benzene, diesel oil, acetone, solvents for paints and lacquers, oils and greases.

Unstable with

Bleach, most acids, chlorine.

Risk of tension cracking

Low in air-humid conditions; only with some aqueous salt solutions. Highly desiccated parts (high temperature and extremely low air humidity) are highly sensitive to fuels and various solvents.

PA/GF — Polyamide, fibre-glass reinforced

Temperature resistance:
permanently up to 100–110 °C, briefly up to 160 °C and to about minus 40 °C*.

Resistant to

Petrol, benzene, diesel oil, acetone, solvents for paints and lacquers, oils and greases.
Slightly susceptible to stress-cracking.

Unstable with

Bleach, most acids, chlorine.

Risk of tension cracking

Low in air-humid conditions; only with some aqueous salt solutions. Highly desiccated parts (high temperature and extremely low air humidity) are highly sensitive to fuels and various solvents.

PBPT — Polybutylene terephthalate

Thermoplastic polyester

Temperature resistance:
permanently up to 120 °C, briefly up to 140 °C and to approx. minus 40 °C.

Resistant to

Petrol, diesel oil, most weak acids, oils and greases.

Conditionally resistant to

Acetone, ammonia, benzene.

Unstable with

Strong acids, chlorine, fluorine, bromine vapour, bleach, trichloroethylene, methylene chloride.

Risk of tension cracking

Low.

PC — Polycarbonate

Temperature resistance:
permanently up to approx. 110 °C (in water 60 °C), briefly up to 125 °C, and to below minus 35 °C.

Resistant to

Petrol, turpentine, most weak acids.

Unstable with

Acetone, benzene, chlorine, methylene chloride, most concentrated acids.

Risk of tension cracking

Relatively low.
Media which can cause tension cracking include benzene, aromatic hydrocarbons, methanol, butanol, acetone, turpentine.

PE — Polyethylene

Temperature resistance:
hard types permanently up to about 90 °C, briefly up to about 105 °C, soft types permanently up to about 80 °C, briefly up to about 100 °C and to about minus 40 °C*.

Resistant to

Alkalis and inorganic acids.

Conditionally resistant to

Acetone, organic acids, petrol, benzene, diesel oil, most oils.

Unstable with

Chlorine, hydrocarbons, oxidising acids.

Risk of tension cracking

Relatively high.
Stress cracks can be caused by, among other things, acetone, various alcohols, formic acid, ethanol, petrol, benzene, butyric acid, acetic acid, formaldehyde, various oils, petroleum, propanol, nitric acid, hydrochloric acid, sulphuric acid, soap solutions, turpentine, trichloroethylene, citric acid.

PP — Polypropylene, fibre-glass reinforced

Temperature resistance:
permanently up to approx. 90 °C, briefly up to approx. 110 °C and to approx. minus 30 °C*.
Chem. resistance generally as for polyethylene.

Resistant to

Alkalis and inorganic acids.

Conditionally resistant to

Acetone, organic acids, petrol, benzene, diesel oil, most oils.

Unstable with

Chlorine, hydrocarbons, oxidising acids.

Risk of tension cracking

Low, only with some acids such as chromic acid, hydrofluoric acid and hydrochloric acid, as well as nitrogen oxide.

Plastic materials

PS — Polystyrene

Temperature resistance:
Because of its relatively high sensitivity to the effects of chemicals, its use is not recommended at temperatures above normal room temperature, about 25 °C.
Resistance to cold: to about minus 40 °C*.

Resistant to

Alkalis, most acids, alcohol.

Conditionally resistant to

Oils and greases.

Unstable with

Butyric acid, concentrated nitric acid, concentrated acetic acid, acetone, ether, petrol and benzene, solvents for paints and lacquers, chlorine, diesel fuel.

Risk of tension cracking

Relatively high.
Stress cracks can be caused by, amongst other things, acetone, ether, petrol, cyclohexane, heptane, methanol, propanol and the softeners used in some PVC cable mixes.

PVC — Polyvinylchloride

Temperature resistance:
permanently up to 65 °C, briefly up to 75 °C and to about minus 30 °C.

Resistant to

Weak acids, alkalis, oils and greases, petrol.

Unstable with

Strong acids, benzene, acetone, iodine, toluene, trichloroethylene.

Risk of tension cracking

Low, only with some solvents such as benzene and acetone.

ZPE — Cellular polyethylene

*The minus values apply only for parts in the quiescent condition with no severe impact stress.
There is no plastic that is resistant to every chemical. The agents listed are only a small selection. Plastic parts are especially at risk in the presence of chemicals and high temperatures. Stress cracks may occur. If in doubt, please consult us and/or ask for a detailed chemical resistance table.
Stress crack formation: stress cracks may occur if plastic parts under tension are exposed to chemicals at the same time. Parts made of polystyrene and polyethylene are particularly susceptible. Stress cracks may even be caused by agents to which the plastic in question is resistant in the absence of stress. Typical examples of parts under constant stress when used as intended: grip clips, intermediate connectors of cable glands, ribbon clips.

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Chemical resistances of hard PVC

A = very good resistance
B = average resistance
C = not resistant

Medium	Temp. °C	Resistance
1.3-benzole disulphonic acid	20	A
1.3-butadiene	20	A
2.4-chlorobenzoyl chloride	20	A
2-amino-2.2-diphenylacetic acid	20	A
4-chlorine-2-nitroaniline	20	C
4-chlorobenzaldehyde-2-sulphonic acid	20	A
5-amino-2-hydroxybenzoic acid	20	A
Abietic acid	20	A
Acetaldehyde 100%	20	C
Acetaldehyde 40%	20	A
Acetaldehyde 40%	40	B
Acetaldehyde, acetic acid ratio 90:10	20	B
Acetanilide 100%	20	A
Acetates (ammonium-, Na- and others)	50	A
Acetic acid 10%	60	A
Acetic acid 100%	20	A
Acetic acid 100%	60	B
Acetic acid 25%	40	A
Acetic acid 25–70%	40	A
Acetic anhydride	20	C
Acetone	20	C
Acetophenone (methyl phenyl ketone)	20	C
Acetylacetone (2.4-pentanedione)	20	C
Acetylene 100%	20	B
Acetylsalicylic acid	20	A
Adipic acid	20	A
Adipic acid	60	B
Alcoholic drinks	< 40	A
Alizarin 100%	20	A
Alkanoic sulphonic acids	50	A
Allyl alcohol 100%	20	B
Allyl alcohol 100%	60	C
Allyl chloride	20	C
Aminobenzene (p-)	20	A
Aminobenzenesulphonic acid (m-, o-, p-)	20	A
Aminosalicylic acid (p-)	20	A
Ammonia (vapours of all concentrations)	40	A
Ammonia (vapours of all concentrations)	60	B
Ammonia, anhydrous, liquid	< 60	B
Ammonium hydroxide	60	A
Aniline 100%	20	A
Aniline chloride, saturated solution	20	C
Apple juice	60	A
Ascorbic acid	20	A
Aspartic acid	20	A
Beer	60	A
Benzine, containing benzole	20	C
Benzine, free from aromatic hydrocarbons	60	A
Benzoic acid	40	A
Benzoic anhydride	30	A
Benzole	20	C
Benzophenone 100%	20	C
Benzosulphonic acid	60	A
Benzotrichloride	20	C
Benzotrifluoride	20	C
Benzoylbenzoic acid	20	A
Benzyl chloride	20	C
Betene	20	A
Bleaching liquor, 12% active chlorine	40	A
Bleaching liquor, 12% active chlorine	60	B
Blood	40	A
Boiled oil	60	C
Borates (NA-)	20	A
Borax	40	A
Boric acid	20	A
Brewer's wort	20	A
Brine	60	A
Bromates (K-, Na-)	40	A
Bromic acid	20	A
Bromides (K-, Na- and others)	60	A
Bromine water	20	A
Bromine, gaseous, dry	20	A
Bromine, liquid	20	C
Bromobenzene	20	C
Bromochloromethane	20	C
Bromochloropropane	20	C
Bromoform 100%	20	C
Butane, gaseous, 30%	20	A
Butanediole over 60%	40	B
Butanediole over 60%	20	C
Butanediole to 10%	20	A
Butanol	60	A
Buttermilk	20	A
Butyl acetate	20	C
Butyl butyrate	20	C
Butyl chloride	20	C
Butyl glycolate	20	C

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Medium	Temp. °C	Resistance
Butyl phenoles	20	C
Butyric acid 100%	20	C
Butyric acid 20%	20	A
Butyric acid 20%	60	C
Carbon dioxide	60	A
Carbon disulphide 100%	20	B
Carbon monoxide	60	A
Castor oil	60	A
Chlorates (K-, Na- and others)	20	A
Chlorates (K-, Na- and others)	60	B
Chlorates (K-, Na- and others)	60	A
Chloric acid to 20%	40	A
Chloric acid to 20%	60	B
Chlorides (ammonium-, Na- and others)	20	A
Chlorine cyanide	20	A
Chlorine water (saturated solution)	20	B
Chlorine, gaseous, dry 0.5%	20	A
Chlorine, gaseous, dry 100%	20	B
Chlorine, gaseous, moist 5%	20	B
Chlorine, liquid	20	C
Chloroacetaldehyde	20	C
Chloroacetic acid	20	A
Chloroacetones	20	C
Chloroacetylchloride	20	C
Chloroanilines	20	C
Chlorobenzaldehyde	20	C
Chlorobenzene	20	C
Chlorobenzotrifluoride	20	C
Chlorobenzoylchloride	20	C
Chlorocresoles	20	C
Chloroethylbenzene	20	C
Chloroform	20	C
Chloronaphthalines	20	C
Chloronitrobenzoic acid	20	A
Chromates (K-, Na- to 50%)	50	A
Chrome alum	60	A
Chromic acid	30	A
Chromic acid to 50%	40	A
Citrates (ammonium-, Na)	20	A
Citric acid	20	A
Citric acid	60	B
Cresol	20	C
Cumene	20	C
Cyanacetic acid	20	C
Cyanamide	20	A
Cyanides (K-, Na- to 50%)	60	A
Cyclohexanol	20	C
Cyclohexanone	20	C
Developer	40	A
Dextrose	50	A
Dibromomethylene	20	C
Dibutyl phthalate	20	C
Dibutyloxalate	20	C
Dichloroethylene	20	C
Dichloropropylene	20	C
Dichromates (K-, Na-)	50	C
Diethyl ether	20	C
Diethylamine 100%	20	C
Diethylene glycol	60	C
Dimethylether	20	C
Di-n-butylether	20	C
Diotylphthalate	20	C
Dioxan	20	C
Diphenyl	20	C
Diphenylamine	20	C
Ethane	20	A
Ethanol	40	A
Ethanolamine	20	B
Ethyl acetate	20	C
Ethyl acrylate	20	C
Ethyl chloride	20	C
Ethylbenzene	20	C
Ethylene glycol	20	A
Fish oil	20	A
Fixing bath	60	A
Fluorides (ammonium-, K-, Na- and others)	60	A
Fluorine	20	B
Fluorine	60	C
Formaldehyde	60	A
Formamide 100%	20	C
Formiates (ammonium- and others)	20	A
Formic acid 100%	20	B
Formic acid 100%	60	C
Formic acid 50%	40	A
Furfural	20	C
Furfuryl alcohol	20	C
Gelatine	60	A

Chemical resistances of hard PVC

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Medium	Temp. °C	Resistance
Gluconic acid	20	A
Glucose	60	A
Glutamic acid	20	A
Glycerine	60	A
Glycine	40	A
Glycol	60	A
Heptanes	20	A
Hexachloroethane	20	C
Hexacyanoferrates-II (Na-)	40	A
Hexacyanoferrates-III (K-)	40	A
Hexafluorosilicates (ammonium-, K- and others)	60	A
Hexafluorosilicic acid 32%	60	A
Hexamethylenetetramine (urotropine) 40% aqueous solution	60	A
Humic acids	20	A
Hydrazine, diluted solution 100%	20	C
Hydrazine, diluted solution 30%	20	A
Hydrobromic acid to 40%	60	A
Hydrochloric acid to 30%	20	A
Hydrochloric acid to 30%	60	B
Hydrochloric acid to 37%	20	A
Hydrochloric acid to 37%	40	B
Hydrofluoric acid to 40%	40	A
Hydrofluoric acid to 60%	60	B
Hydrogen bromide 100%	20	A
Hydrogen bromide 100%	60	B
Hydrogen chloride (gaseous, dry and moist)	40	A
Hydrogen cyanide	40	A
Hydrogen peroxide to 30%	60	A
Hydrogen peroxide to 90%	20	A
Hydrogen sulphide	60	A
Hydroxides (alkaline-earth metal)	60	A
Hydroxides (K-, Na-)	60	A
Hypochlorites (K-, Na- and others)	60	A
hypochlorous acid	60	A
Illuminating gas	20	A
Iodates (K-, Na- and others)	60	A
Iodides (K-, Na-)	60	A
Iodine	20	C
Isobutylphosphate	20	C
Lactic acid 10%	20	A
Lactic acid 10%	60	C
Lactic acid 100%	20	C
Lard	20	A
Linoleic acid	60	A
Linseed oil	60	A
Malic acid	20	A
Material characteristics		
Methanol 100%	40	A
Methanol 100%	60	B
Methyl bromide	20	C
Methyl chloride	20	C
Methyl methacrylate	20	C
Methylamine	20	B
Methylene dichloride	20	C
Milk	20	A
Mineral oils	60	C
N,N-diethyl aniline	20	C
Naphthalene	20	C
Nitrates (ammonium-, K-, Na- and others)	60	A
Nitric acid 25%	20	A
Nitric acid 25%	60	B
Nitric acid 50%	20	A
Nitric acid 50%	50	B
Nitric acid 95%	20	C
Nitrites (K-, Na- and others)	60	A
Nitrobenzene	20	C
Nitrogen oxide	20	C
Nitroglycerine	20	B
Nitrous acid to 50%	50	A
Nitrous acid to 98%	20	C
Oleic acid	60	A
Oxalates (ammonium-, K-, Na- and others)	60	A
Oxalic acid	40	A
Oxygen	60	A
Ozone 10%	30	A
Ozone 10%	60	B
Palmitic acid	20	A
Paraffin	40	A
Pentyl laurate	20	C
Pentylacetate	20	C
Pentylalcohol	60	A
Pentylchloride	20	C
Perbonate (K-)	60	A
Perchlorate	40	A
Perchloric acid 70%	20	A

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Medium	Temp. °C	Resistance
Permanganate (K-) 6 to 15%	40	A
Permanganate (K-) 6 to 15%	60	B
Permanganate (K-) to 6%	60	A
Peroxymonosulphuric acid (Caro's acid)	20	A
Persulphate (Ammonium-, K-, Na- and others)	40	A
Petroleum	60	A
Phenol 1%	20	A
Phenol 90%	45	B
Phenylhydrazine	20	C
Phenylhydrazine chloride	20	B
Phenylhydrazine chloride	60	C
Phosgene, gaseous	20	A
Phosgene, gaseous	60	B
Phosgene, liquid	20	C
Phosphates (ammonium-, K-, Na- and others)	60	A
Phosphoric acid	40	A
Phosphoric acid	60	B
Phosphorus pentoxide	20	A
Propane	20	A
Propanol	60	A
Pyridine	20	A
Rhodanides (ammonium-, K-, Na- and others)	60	A
Salicylic acid	20	A
Silicates (K-)	20	A
Soap solution	40	A
Stearic acid	60	A
Sulphates (ammonium-, K-, Na- and others)	60	A
Sulphites (ammonium-, K-, Na- and others)	60	A
Sulphur dioxide, gaseous, dry and moist 100%	60	A
Sulphuric acid to 40%	20	C
Sulphuric acid to 50%	50	A
Sulphuric acid to 50%	60	A
Sulphuric acid to 80%	40	C
Sulphuric acid to 80%	60	B
Sulphuric acid to 96%	20	A
Sulphuric acid to 96%	60	B
Sulphuric acid, fuming (10% oleum)	20	C
Sulphurous acid	60	A
Tallow	60	A
Tan bark	20	A
Tar, free from aromatic hydrocarbons	20	A
Tartaric acid	60	A
Tetraethyl lead	60	A
Tetrafluoroboric acid	20	A
Tetrahydrofurane	20	C
Thickness	60	A
Toluene	20	A
Transformer oil	60	A
Trichloroethylene	20	C
Turpentine	20	A
Urea	60	C
Vegetable oils	40	A
Vinyl acetate	20	C
Viscose spinning solutions	60	A
Water	40	A
Water	60	B
Wine	40	A
Wine vinegar	50	A
Wood tar	20	C
Xylenes	20	C

Material properties of the hard PVC used
Material description according to DIN 7748 PVC-U-E-D-080-04-28
Tensile strength according to DIN 53 455 min. 40 N/mm²
Elongation at tear according to DIN 53 455 min. 65%
Puncture strength according to DIN 53 481 min. 20 KV/mm
Surface resistance according to DIN 53 482 min. 10 10
Thermoforming resistance according to DIN 53 460/B min. 75 °C
Temperature resistance in the application max. 65 °C
Flammability according to UL 94 Level V-0
Material classification to DIN EN 4102, Class B1 and B2-tested

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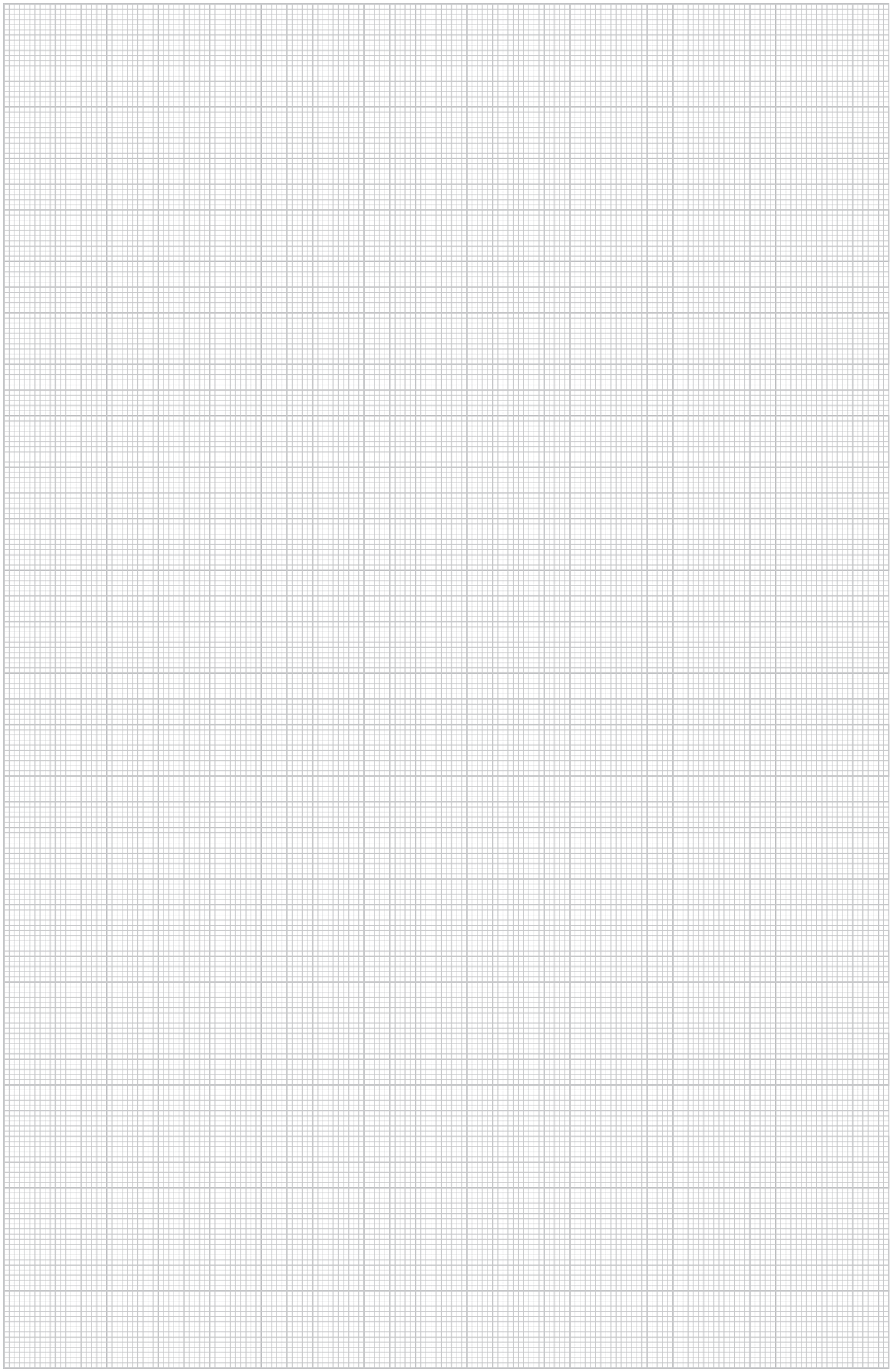

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