

TBS | Catalogue 2010/2011



# Transient voltage and lightning protection systems

THINK CONNECTED.

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### **OBO TBS seminars: First-hand knowledge**

With a comprehensive programme of training courses and seminars on the subject of surge voltage and lightning protection systems, OBO is able to support its customers with specialist knowledge from a single source. Alongside the basic theoretical principles, the programme also deals with practical implementation in everyday applications. Special calculation and application examples round off the comprehensive programme of knowledge transfer.

### **Invitations to tender, product information and datasheets**

We can make life easier for you: With our comprehensive selection of materials designed for practical applications, which provide you with effective support with the planning and calculation of a project. These include:

- Invitations to tender
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## Minor cause, major effect: Damage caused by surge voltages



Our dependency on electrical and electronic equipment continues to increase, in both our professional and private lives. Data networks in companies, for auxiliary equipment in hospitals and fire departments for example, are vital for the real time transfer of information that has long since been indispensable. Sensitive databases, e.g. in banks or media publishers, need reliable transmission paths. It is not only lightning strikes that pose a latent threat to these systems. More and more frequently, today's electronic aids are damaged by surges caused by remote lightning discharges or switching operations in large electrical systems. During thunderstorms, too, high volumes of energy are instantaneously released. These voltage peaks can penetrate a building through all - manner of conductive connections and cause enormous damage.





### What are the consequences of damage caused by surges in our daily lives?

The most obvious one is the destruction of electrical equipment. In private households, these are specifically:

- TV/entertainment systems
- Telephone system
- Computer systems, stereo systems
- Kitchen appliances
- Monitoring systems
- Fire alarm systems

The failure of such equipment certainly incurs great expense. What happens when the following suffer outage times/ and the possible consequential damage:

- Computers (loss of data),
- Heating/hot water systems,
- Lift, garage door and roller shutter drives,
- Triggering or destruction of fire/burglar alarm systems (costs from a false alarm)?

A vital topic perhaps, particularly in

office buildings, because:

- Can work continue in your company without a central computer/server?
- Was all the important data backed up "in time"?

### Growing sums of damage

Current statistics and estimates of insurance companies show: Damage levels caused by surges – excluding consequential or outage costs – long since reached drastic levels due to the growing dependency on electronic "aids". It's no surprise, then, that property insurers are checking more and more claims and stipulating the use of devices to protect against surges. Information on protection measures is contained, e.g. in Directive VDS 2010.





## Creation of lightning discharges



Creation of lightning discharges: 1 = approx. 6,000 m, approx.  $-30\text{ }^{\circ}\text{C}$ , 2 = approx. 15,000 m, approx.  $-70\text{ }^{\circ}\text{C}$

### Discharge types

Some 90% of all lightning discharges between a cloud and the ground are negative cloud-earth strikes. The lightning begins in a negatively charged area of the cloud and spreads to the positively charged surface of the earth. Additional discharges are divided into:

- Negative earth-cloud strikes
- Positive cloud-earth strikes
- Positive earth-cloud strikes.

The most common discharges actually occur within a cloud or between different clouds.

### Creation of lightning discharges

When warm, damp air masses rise, the air humidity condenses and ice crystals are formed at great heights. Storm fronts can occur when the clouds expand to heights of up to 15,000 m. The strong upwind of up to 100 kilometres per hour causes the light ice crystals to enter the higher area and the sleet particles enter the lower area. Knocks and friction cause electrical discharge.

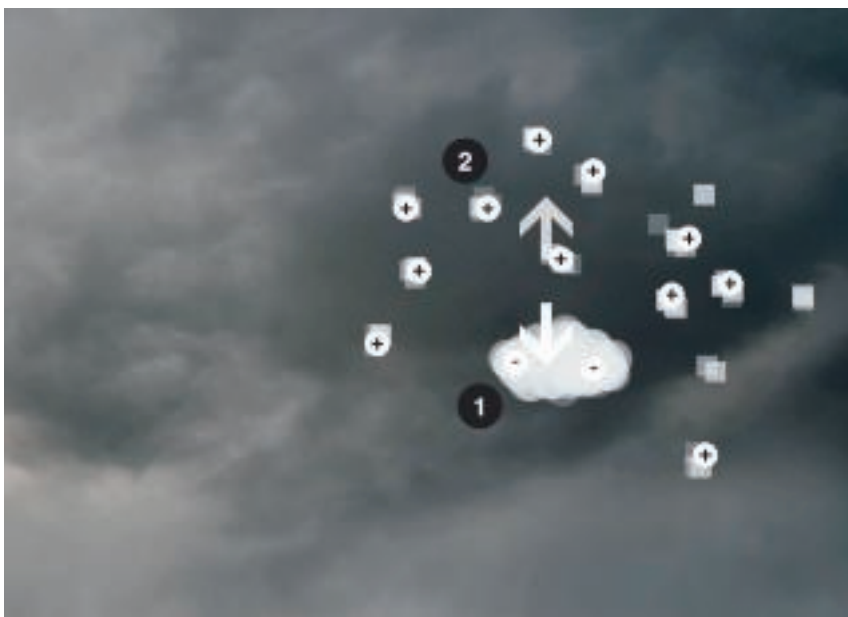


### Negative and positive charges

Studies have proved that the sleet falling down (area warmer than  $-15\text{ }^{\circ}\text{C}$ ) has a negative charge and the ice crystals being thrown upwards (area colder than  $-15\text{ }^{\circ}\text{C}$ ) has a positive charge. The light ice crystals are carried into the upper areas of the cloud by the upwind and the sleet falls to the central areas of the cloud. This divided the clouds into the three areas:

- Top: Positively charged zone
- Centre: Weakly negative charged zone
- Bottom: Weakly positive charged zone

This separation of charges forms a voltage in the cloud.



Negative and positive charges: 1 = Sleet, 2 = Ice crystals

### Load distribution

Typical load distribution:

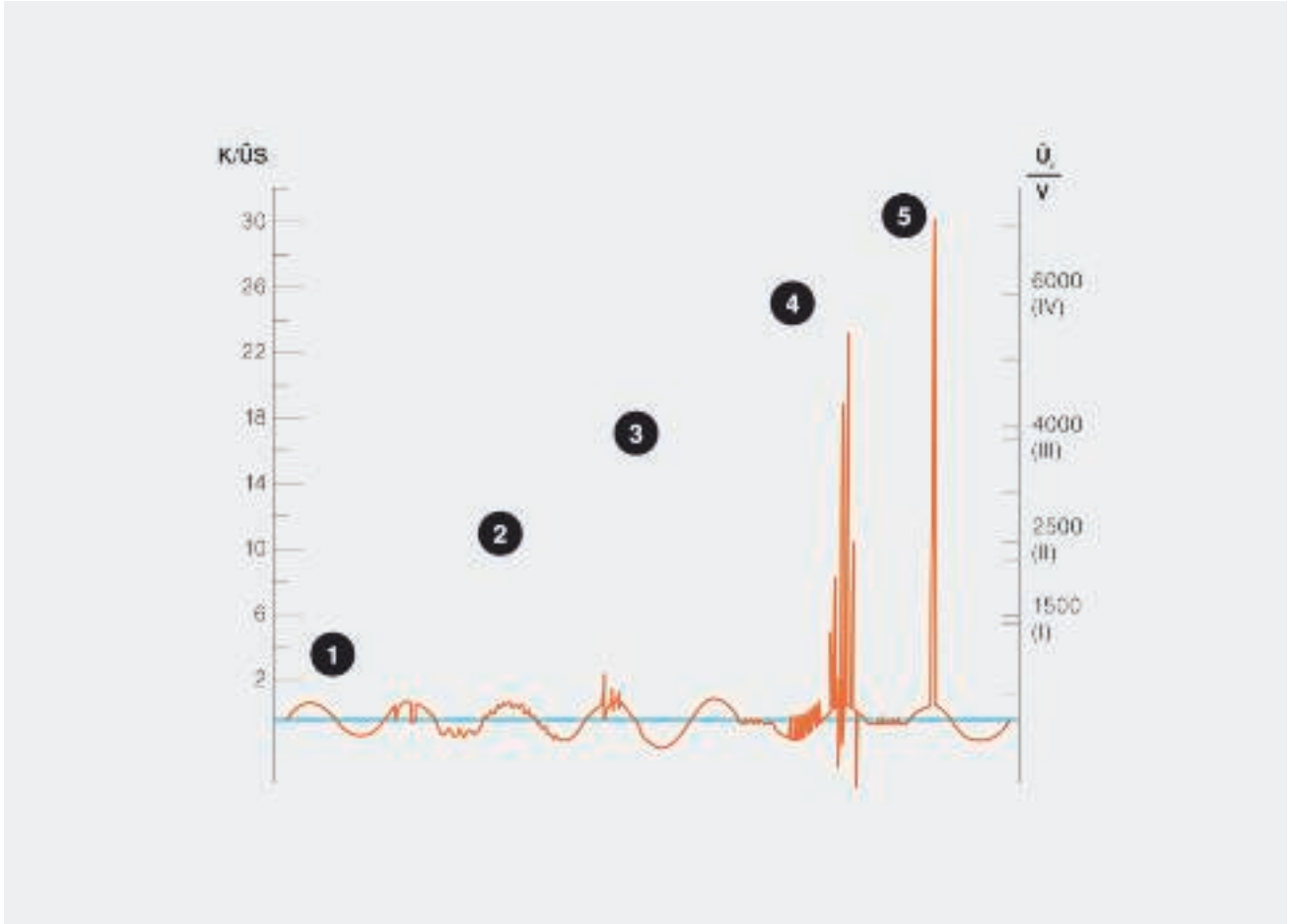
- Positive at the top, negative in the centre and weakly positive at the bottom.
- Positive charges can also be found in the area near the - ground.
- The field strength required to trigger lightning is dependent on the insulating ability of the air and is between 0.5 and 10 kV/cm.



Charge distribution: 1 = approx. 6,000 m, 2 = Electrical field



## What are transient surges?



Transient surge voltages: 1 = Voltage drops/short interruptions, 2 = Harmonic waves due to slow and fast voltage changes, 3 = Temporary voltage increases, 4 = Switching surges, 5 = Lightning surges

Transient surge voltages are brief voltage peaks lasting microseconds, which may be a multiple of the attached mains nominal voltage.

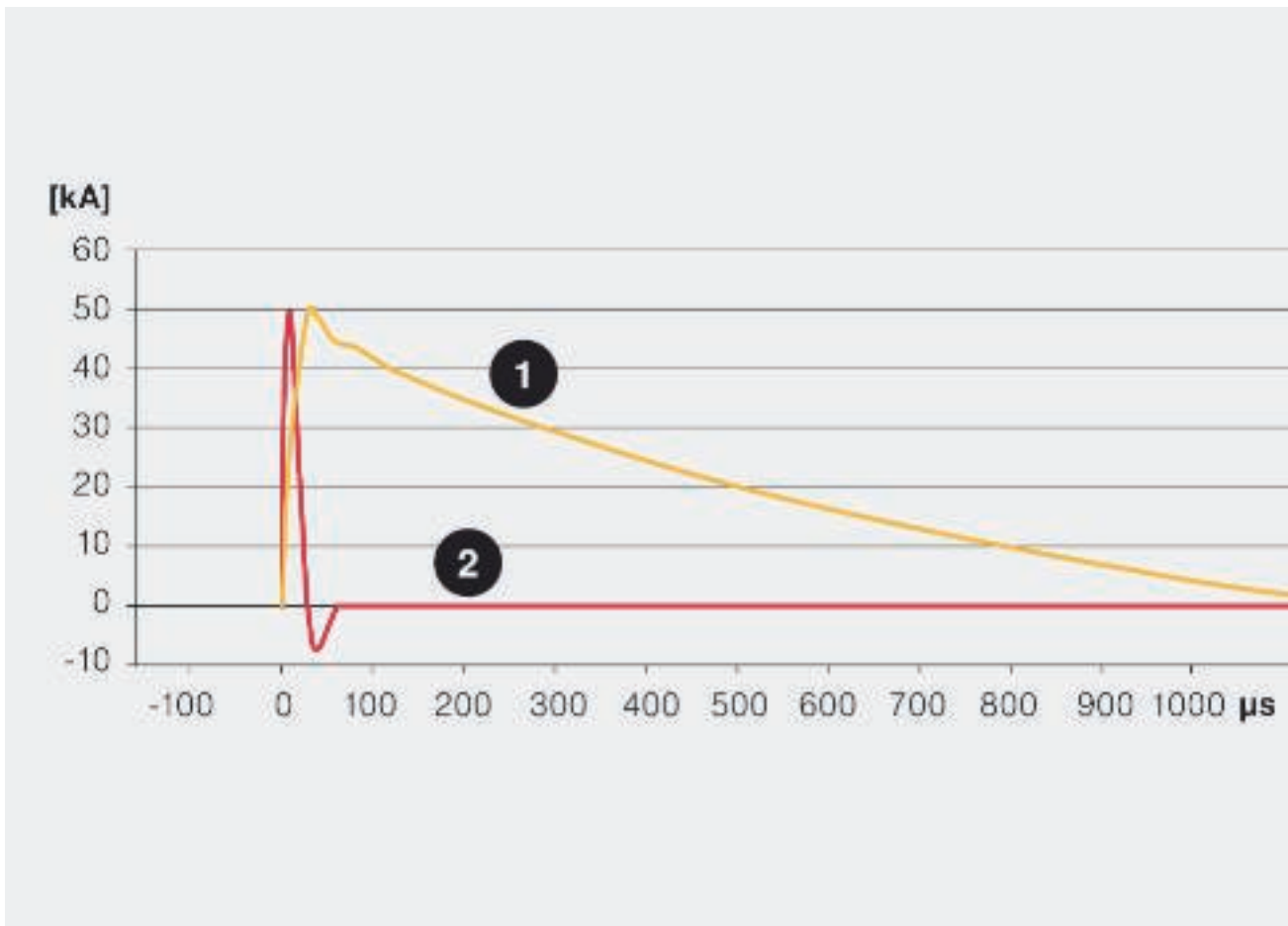
The largest voltage peaks in the low-voltage consumer network are caused by lightning discharges. The high energy content of lightning surges when a direct strike hits the external lightning protection system or a low-voltage open-wire line usually causes – without internal lightning and surge protection – total outage of the connected consumers and damage to the insulation. Yet induced voltage peaks in building installations and

energy or data cable supply cables can also reach many times the nominal operating voltage. Switching surges, too, which in fact do not cause such high voltage peaks as lightning discharges but occur much more frequently, can result in immediate system failure. As a rule, switching surges amount to twice to three times the operating voltage, lightning surges, on the other hand, can sometimes reach 20 times the nominal voltage value and transport a high energy content. Often, failures occur only after a time delay as the aging process of electronic components in the affected devices triggered by smaller transient surges

causes insidious damage. A number of different protection measures are required. These depend on the exact cause and/or impact point of the lightning discharge.



## What pulse forms are there?



Pulse types and their characteristics: Yellow = pulse shape 1, direct lightning strike, 10/350 μs simulated lightning pulse, red = pulse shape 2, remote lightning strike or switching operation, 8/20 μs simulated lightning pulse (Surge)

High lightning currents can flow to the ground during a storm. If a building with external lightning protection receives a direct hit, a voltage drop occurs on the earthing resistor of the lightning protection equipotential bonding system, which represents a surge voltage against the distant environment. This rise in potential poses a threat to the electrical systems (e.g. voltage supply, telephone systems, cable TV, control cables, etc.) that are routed into the building. Suitable test currents for testing different lightning and surge protectors have been defined in national and international standards.

### Direct lightning strike: Pulse shape 1

Lightning currents that can occur during a direct lightning strike can be imitated with the surge current of wave form 10/350 μs. The lightning test current imitates both the fast rise and the high energy content of natural lightning. Lightning current arrester Type 1 and external lightning protection components are tested using this current.

### Remote lightning strikes or switching operations: Pulse shape 2

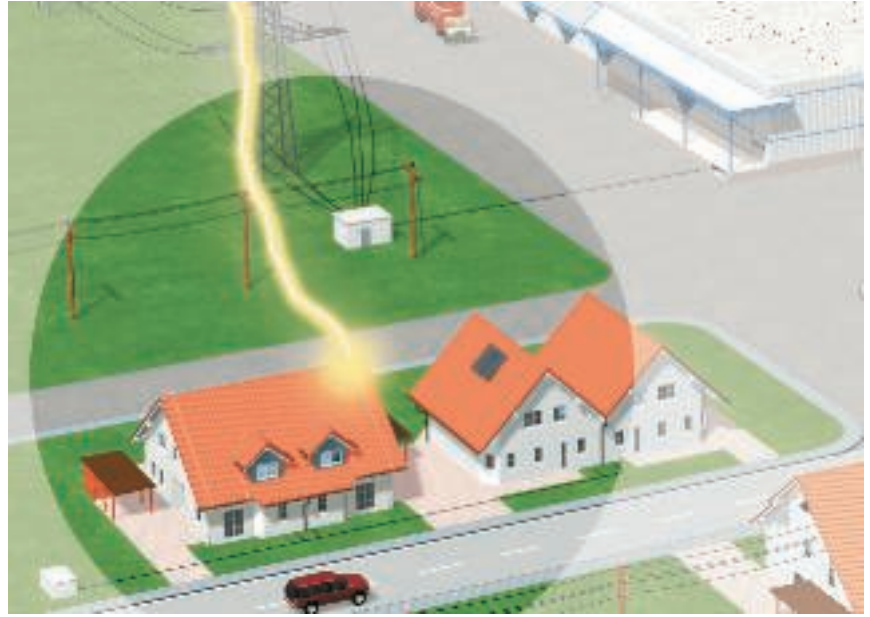
The surges created by remote lightning strikes and switching operations are imitated with test impulse 8/20 μs. The energy content of this impulse is significantly lower than the lightning test current of surge current wave 10/350 μs. Surge arrester Type 2 and Type 3 are impacted with this test impulse.



## Causes of lightning currents

### Direct lightning strike into a building

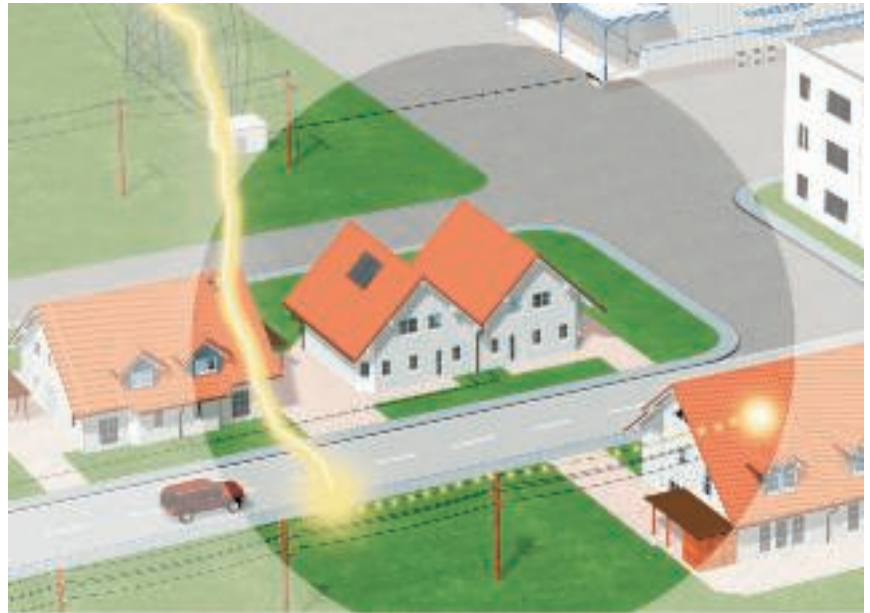
If a lightning strike hits the external lightning protection system or earthed roof structures capable of carrying lightning current (e.g. roof aerial), then the lightning energy can be arrested to the ground in advance. However, a lightning protection system on its own is not enough: Due to its impedance, the building's entire earthing system is raised to a high potential. This potential increase causes the lightning current to spill over the building's earthing system and also over the power supply systems and data cables to the adjacent earthing systems (adjacent building, low-voltage transformer).



**Threat value: Up to 200 kA (10/350)**

### Direct lightning strike into a low-voltage open-wire line

A direct lightning strike into a low-voltage open wire line or data cable can couple high partial lightning currents in an adjacent building. Electrical equipment in buildings at the end of the low-voltage open-wire line are at particular risk of damage caused by surges.



**Threat value: Up to 100 kA (10/350)**

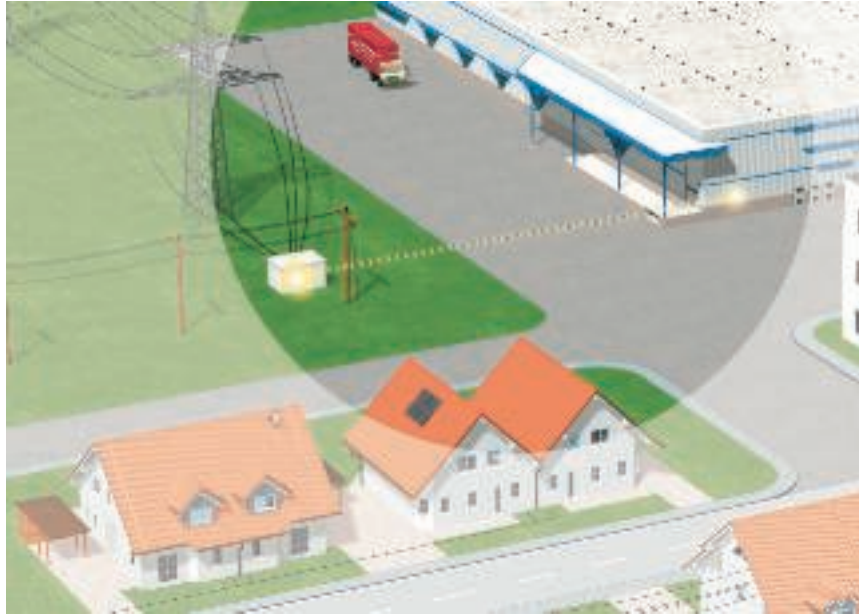


## Causes of surges

### Switching surges in the low-voltage system

Switching surges are caused by switch-on and switch-off operations, by switching inductive and capacitive loads and by interrupting short-circuit currents. Particularly when production plants, lighting systems or transformers are switched off, electrical equipment located in close proximity can be damaged.

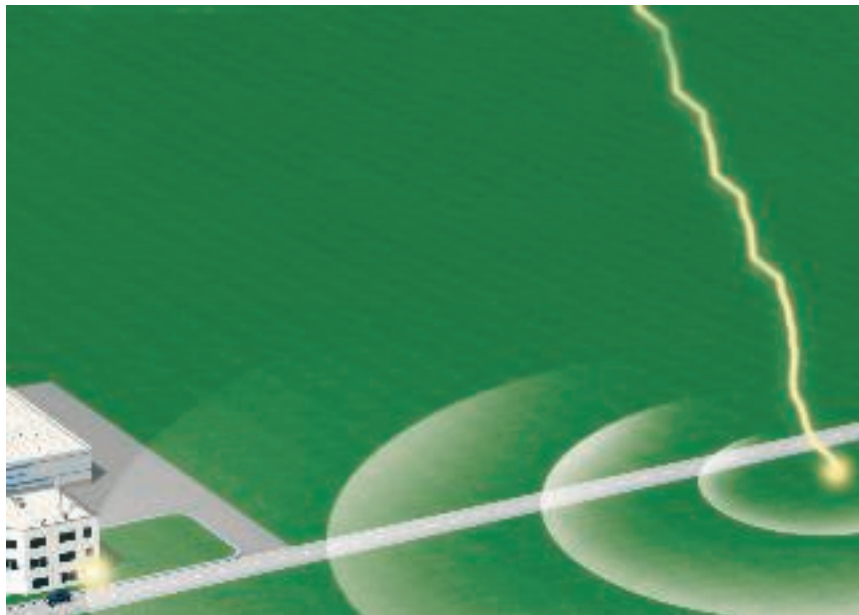
**Threat value: Several kA (8/20)**



### Coupling of surges through local or remote lightning strike

Even if lightning protection and surge protection measures are already installed: A local lightning strike creates additional high magnetic fields, which in turn induce high voltage peaks in line systems. Inductive or galvanic coupling can cause damage within a radius of up to 2 km around the lightning impact point.

**Threat value: Several kA (8/20)**





## Gradual surge reduction with lightning protection zones



### Lightning protection zone concept

The lightning protection zone concept described in international standard IEC 62305-4 (DIN VDE 0185 Part 4) has proved to be practical and efficient. This concept is based on the principle of - gradually reducing surges to a safe level before they reach the terminal device and cause damage. In order to achieve this situation, a building's entire energy network is split into lightning protection zones (LPZ = Lightning Protection Zone). Installed at each transi-

tion from one zone to another is a surge arrester for equipotential bonding. These arrestors correspond to the requirement class in question.

### Lightning protection zone

<b>LPZ 0 A</b>	Unprotected zone outside the building. Direct lightning impacts, no shielding against electromagnetic interference pulses LEMP (Lightning Electromagnetic Pulse)
<b>LPZ 0 B</b>	Zone protected by external lightning protection system. No shielding against LEMP.
<b>LPZ 1</b>	Zone inside the building. Low partial lightning energies possible.
<b>LPZ 2</b>	Zone inside the building. Low surges possible.
<b>LPZ 3</b>	Zone inside the building (can also be the metal housing of a consumer). No interference pulses through LEMP or surges present.



## Zone transitions and protective devices

### Benefits of the lightning protection zone concept

- Minimisation of the couplings into other cable systems through arresting the energy-rich, dangerous lightning currents directly at the point the cables enter the building.
- Malfunction prevention with - magnetic fields.
- Economic, well-plannable individual protection concept for new and old buildings and reconstructions.

### Type classes of the surge protection devices

OBO surge protection devices are classified in accordance with DIN EN 61643-11 into three type classes – Type 1, Type 2 and Type 3 (previously B, C and D). These standards contain building regulations, requirements and tests for surge arrestors used in AC networks with nominal voltages of up to 1,000 V and nominal frequencies of between 50 and 60 Hz. This classification enables arrestors to be matched to different requirements with regard to location, protection level and current-carrying capacity. The table below provides an overview of the zone transitions. It also shows which OBO surge protectors are to be installed in the energy supply network and their respective function.

### Zone transitions

<b>Zone transition LPZ 0 B to LPZ 1</b>	Protection device for lightning protection equipotential bonding in accordance with DIN VDE 0185-3 for direct or close lightning strikes. <ul style="list-style-type: none"> <li>• Devices: Type 1 (Class I, requirements class B), e. g. MC50-B VDE</li> <li>• Max. protection level according to standard: 4 kV</li> <li>• Installation e.g. in the main distributor/at building entry</li> </ul>
<b>Zone transition LPZ 1 to LPZ 2</b>	Protection device for surge protection to DIN VDE 0100-443 for surge voltages arriving through the supply network due to remote strikes or switching operations. <ul style="list-style-type: none"> <li>• Devices: Type 2 (Class II, requirements class C), e.g. V20-C</li> <li>• Max. protection level according to standard: 2.5 kV</li> <li>• Installation e.g. in the power distributor, subdistributor</li> </ul>
<b>Zone transition LPZ 2 to LPZ 3</b>	Protection device, intended for surge protection of portable consumers at sockets and power supplies <ul style="list-style-type: none"> <li>• Devices: Type 3 (Class III, requirements class D), e.g. FineController FC-D</li> <li>• Max. protection level according to standard: 1.5 kV</li> <li>• Installation e.g. on end consumer</li> </ul>



## BET – testing centre for lightning protection, electrical engineering and support systems



*Lightning current test*

### **BET with countless tasks**

If only lightning current, environmental and electrical testing was possible at BET up to now, the BET Test Centre is now a competent partner for testing of cable support systems. This combination has made it necessary to revise the meaning of the name. If BET previously stood for "Blitzschutz- und EMV-Technologiezentrum" (Lightning protection and EMC technology centre), since 2009 these letters have meant BET Test centre for lightning protection, electrical engineering and support systems.

### **Test generator for lightning current tests**

The test generator, planned in 1994 and built in 1996, allows the execution of lightning current tests of up to 200 kA. The generator was planned and constructed in conjunction with the Soest Technical College. Due to the intensive

planning and scientific consultation required in the construction of the testing system, this system has worked without fault for 12 years and still meets the current standard testing requirements.

The main load of the test generator is generated by the testing of products from the TBS product unit. Here, tests to accompany development are carried out on new developments, modifications of existing OBO products and also comparison tests on competing products. These include lightning protection components, surge protection devices and lightning current arrestors. Tests of lightning protection components are carried out according to DIN EN 50164-1, those for spark gaps according to DIN EN 50164-3 and those for lightning and surge protection devices according to DIN EN 61643-11. This is just a small portion of the testing standards used for tests in the BET Test Centre.



Lightning current generator

### Testing types for lightning and surge protection

Both lightning current tests and surge voltage tests can be carried out at up to 20 kV. A hybrid generator is used for these tests, which was also developed as part of a cooperation with the Soest Technical College. EMC testing of cable support systems can also be carried out using this test generator. All kinds of cable routing and cable support systems of up to 8 m length can be tested without any difficulties. Tests for electrical conductivity according to DIN EN 61537 are also carried out.



Salt spray trough

### Simulation of real environmental conditions

To carry out standardised tests on components intended for external use, they must be pretreated under real environmental conditions. This takes place in a salt spray trough and a sulphur dioxide testing chamber. Depending on the test, the test length and the concentration of the salt spray or sulphur dioxide in the testing chambers may vary. This means that it is possible to conduct tests according to IEC 60068-2-52, ISO 7253, ISO 9227 and EN ISO 6988.



Load test

### Testing cable support systems

The well-known KTS testing system, newly installed in the BET Test Centre, allows the investigation of the load capacities of any cable support system manufactured by OBO. The basis for this is DIN EN 61537 and VDE 0639. In the BET Test Centre, OBO Bettermann has a testing department in which products can be tested according to standards, even during the development phase.





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## Measuring and test systems



Life Control testing unit

### Testing surge protection devices within data cables

Often, it is necessary to check the functionality of the surge protection devices within the data cable. Of particular importance is that the actual testing of the protection devices has no negative impact on the data signal.

The Life Control testing unit, developed by OBO Bettermann, allows testing of the protection devices when installed, without influencing the data signal. A thin testing pin creates the contact with the integrated lightning barrier. The integrated microprocessor displays the test result on the OLED display and also emphasises it with acoustic signals. A connectable LED within the testing pin is an additional feature, allowing orientation, even in the darkest switchgear cabinet.

A high-quality testing case for safe transport and the documentation of the testing results are a component part of this innovation from OBO Bettermann.

### Testing of the arrester covers V50, V25, V20 and V10

The ISOLAB testing unit allows the checking of the arrester covers V50, V25, V20 and V10. A rotary controller allows the selection of

the appropriate OBO Bettermann arrester. Then, the cover of the appropriate combination and/or surge arrester is placed in the appropriate opening in the device. The function of the varistor is then checked by pressing the test button. Besides arrester testing, the ISOLAB also allows insulation testing according to VDE 0100-610.



ISOLAB testing device





### Testing of lightning protection systems with the PCS system

















The peak current sensor (PCS) records and stores pulsed currents in the form of a magnetic card. This is a method of monitoring whether lightning has hit the lightning protection and which maximum lightning current has occurred.

If the PCS system is mounted between the interface from equipotential bonding to earthing system, the coupled lightning current in a building can also be measured. The results can provide information on potential damage in the electrical installation. The PCS card is mounted by snapping a card holder onto the round conductor at a defined distance. The measuring range of the card is between 3 and 120 kA. The magnetic card reader offers the option of evaluating peak current sensors. The appropriate peak current value is shown on the display. Alternatively, OBO Bettermann can

read it off for you. In this case please contact your OBO Bettermann agency or subsidiary.





## Test marks

	Lightning current-tested
	Lightning current-tested, Class H (100 kA)
	ELEKTROTECHNICKÝ ZKUŠEBNÍ 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









# Pictogram explanation




















## Lightning protection classes

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











## Lightning protection zone

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








## Applications

	Remote signalling
	Remote signalling with fuse monitoring
	Acoustic signalling
	Integrated Service Digital Network, ISDN applications
	Digital Subscriber Line, DSL applications
	Analogue telecommunication
	Category 5 TwisterPair
	Channel Performance to American EIA/TIA standard
	Measuring, controlling and regulating systems
	TV applications
	SAT-TV applications
	Multibase base
	LifeControl
	Intrinsically safe protection device for areas with a risk of explosions
	Channel Performance to ISO / IEC 11801
	Power over Ethernet
	230/400 V-system
	Protection rating IP 54
	Protection rating IP 65








## Metals

	Aluminium
	Stainless steel, 1.4301
	Stainless steel, 1.4401
	Stainless steel, 1.4404
	Stainless steel, 1.4571
	Copper
	Brass
	Steel
	Cast iron
	Die-cast zinc

## Plastics

	Fibreglass-reinforced plastic GFK
	Petrolatum
	Polyamide
	Polycarbonate
	Polyethylene
	Polypropylene
	Polystyrene

## Surfaces

	Strip-galvanised
	Hot-dip galvanised
	Electro-galvanised
	Hot-dip galvanised
	Copper-plated
	Nickel-plated
	Galvanised, Deltatone 500



## Metallic materials

**Alu — Aluminium**

**VA (1.4301) — Stainless steel, 1.4301**

**VA (1.4401) — Stainless steel, 1.4401**

**VA (1.4404) — Stainless steel, 1.4404**

**VA (1.4571) — Stainless steel, 1.4571**

**Cu — Copper**

**CuZn — Brass**

**St — Steel**

**TG — Cast iron**

Electrogalvanised

**Zn — Die-cast zinc**



# Plastic materials

## GFK — Fibreglass-reinforced plastic GFK

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.

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.

## 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.

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.

Relatively high.

Stress cracks can be caused by, among others, 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.

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

## PC — 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.

Relatively high.

Stress cracks can be caused by, among 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.



# 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.

# The little A to Z of surge protection

## 100% response lightning impulse voltage

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

## Arrester

Arresters 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.

Arresters are used to protect other electrical resources and electrical systems against surge voltages.

## Arrester measured voltage $V_c$

For arresters without a spark gap, the measured voltage is the maximum permitted effective value of the mains voltage on the arrester terminals. The measured voltage may constantly be applied to the arrester 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 arrester elements (see technical data of the device), the arrester must be protected selectively with the required value.

## Cut-off unit

The cut-off unit cuts the arrester 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  $\mu$ s. 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 arrester.

## 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 arrester 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 arrester, Type 1

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

## Surge arrester, Type 2

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

## Surge arrester, Type 3

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



# The little A to Z of surge protection

## 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.







## Measuring and test systems

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## ISOLAB measuring system arrester tester

Type	Country version	Nominal voltage V	Measuring range	Pack. pcs	Weight kg/100 pcs.	Item No.
ISOLAB	D/GB	6	0 V 999 V	1	165.000	5096 81 2

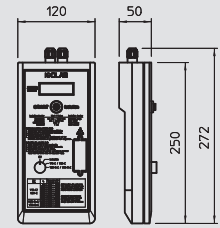
/pc.

To test the insulation resistance to DIN VDE 0100 Part 610 and the characteristic curve behaviour of the following surge voltage and lightning current arrestors:

- V10-C and V20-C:**

Uc	Tolerance range
75 V	-> 110 V - 130 V
150 V	-> 215 V - 265 V
280 V	-> 385 V - 475 V
320 V	-> 460 V - 560 V
335 V	-> 460 V - 560 V
385 V	-> 560 V - 680 V
440 V	-> 645 V - 785 V
550 V	-> 820 V - 1,000 V
- V25-B+C and V50-B+C:**

Uc	Tolerance range
150 V	-> 215 V - 265 V
280 V	-> 385 V - 475 V
320 V	-> 460 V - 560 V
385 V	-> 560 V - 680 V
- Varistor arrestors of other manufacturers can be tested for 1 or 3 mA characteristic curve behaviour
- Battery operation
- Measuring cables contained in the scope of delivery.

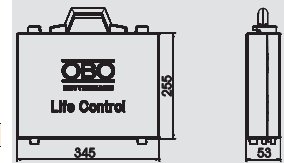


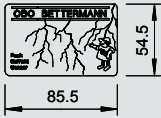
## Testing unit for lightning barriers

Type	Pack. pcs	Weight kg/100 pcs.	Item No.
LFC	1	164.500	5096 78 6

/pc.

OBO Life Control allows function control of the MDP lightning barriers. The lightning barriers can be checked while installed. Life Control will not have any influence on the measuring signal. Life Control possesses an integrated OLED with visual and acoustic defect signalling. A separate LED inside the testing pin is also integrated. Life Control is delivered in a case, complete with a CD and instructions.





## Magnetic card PCS



Type

Pack.	Weight	Item No.
PU	kg/100 PUs	

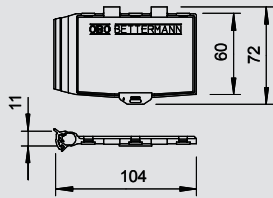
<b>PCS</b>	1	8.000	<b>5091 43 8</b>
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Magnetic card for recording pulsed/lightning currents.

- Contents = 10 pieces

/VPE



## Magnetic card holder PCS-H

Type

Pack.	Weight	Item No.
PU	kg/100 PUs	

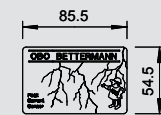
<b>PCS-H</b>	1	31.000	<b>5091 52 7</b>
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Magnetic card holder for mounting PCS cards.

- Sealable holder
- For installing on round conductor Rd 8-10
- Simple holder installation by means of clamp
- 1 PU = 10 pieces

/VPE



## Magnetic card and holder MK-B

Type

Pack.	Weight	Item No.
PU	kg/100 PUs	

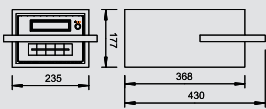
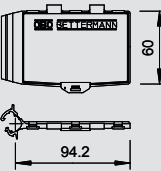
<b>MK-B</b>	1	31.000	<b>5091 32 2</b>
-------------	---	--------	------------------



PCS magnetic card to record pulse/lightning currents including holder

- Holder can be leaded
- For mounting on round conductor Rd 8-10
- Simple holder mounting through clamping
- 1 PU = 10 units

/VPE



## Card reader PCS-CS...



Type	Country version	Nominal voltage V	Measuring range	Measuring tolerances	Pack. pcs	Weight kg/100 pcs.	Item No.
<b>PCS-CS-D</b>	EN	230	3 120 kA	< 2 kA (< 2%)	1	750.000	<b>5091 68 3</b>
<b>PCS-CS-GB</b>	GB	120	3 120 kA	< 2 kA (< 2%)	1	750.000	<b>5091 69 1</b>



Magnetic card reader for reading and analysing PCS cards.






- Inc. rechargeable battery for 4 h continuous, no-mains operation
- Large, clear display

/pc.





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5046578	1117 03 3		267					5699330	5015 83 2		263	5384977	5038 15 4		265
								5699347	5015 83 6		263				
								5002260	5015 84 2		263	5385219	5040 03 5		265
5432371	1167 00 6	/100 pc.	267	5250395	3133 02 8	/100 pc.	334	5699354	5015 84 4		263	5385271	5040 05 1		265
5432432	1167 01 4		267	5250456	3133 03 6		334	5699361	5015 84 7		263	5385332	5040 07 8		265
5432494	1167 02 2		267	5250579	3133 23 0		335	5699408	5015 84 9		263	5385394	5040 09 4		265
5432555	1167 03 0		267					5002277	5015 85 4		263	5385455	5040 11 6		265
5432616	1167 04 9		267					5002284	5015 86 6		263	5385516	5040 13 2		265
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				5617358	5000 30 0		272	5379096	5016 02 9		263	5386056	5043 10 7		266
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				5018049	5000 74 2		272	5922216	5016 09 6		263	5386179	5050 05 7		265
5820215	2332 75 2		313	5814450	5000 75 0		272	5800354	5016 11 8		263	5386230	5050 07 3		265
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5228851	2349 04 3		334	5740650	5000 85 8		272	5379270	5016 14 2		281	5386353	5050 11 1		265
5228912	2349 05 1		334	5371830	5000 86 6		272					5386414	5050 13 8		265
5228974	2349 07 8		334									5386476	5050 15 4		265
5229032	2349 08 6		334	5372370	5001 21 8		283	5800415	5018 50 1	/100 m	270	5386537	5050 17 0		265
5229155	2349 10 8		334	5372431	5001 22 6		283	5800477	5018 70 6		270	5386599	5050 19 7		265
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		/pc.		5635239	5001 61 7		283	5694014	5019 34 4		270	5386896	5052 09 2		266
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5617235	3041 40 9		273	5374114	5003 28 8		276	5680529	5021 23 5		271			/100 m	264
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				5376873	5009 21 9		276	5382034	5021 48 0		271	5389057	5059 49 6		284
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5631453	3049 32 9		284	5378792	5015 73 1		258	5384557	5038 01 4		265	5684855	5082 42 0		223
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5525257	5084 01 6		217	5012825	5093 40 2		180	5406679	5094 72 7		159	5531135	5096 88 4		125
5525318	5084 02 0		217	5012832	5093 40 4		180	5240198	5094 73 1		159	5531197	5096 88 6		125
5525370	5084 02 4		218	5004660	5093 40 6		180	5240204	5094 73 4		159	5509899	5096 97 0		125
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5525493	5084 03 2		218	5382799	5093 41 8		178	5382911	5094 76 0		157	5394099	5097 05 3		141
5525554	5084 03 6		218	5478546	5093 62 3		200	5240235	5094 76 2		157	5766636	5097 06 1		141
5525615	5084 04 0		219	5709022	5093 62 5		200	5616382	5094 76 4		153	5708896	5097 06 5		209
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5709008	5088 67 6		204	5688433	5093 66 1		128	5363941	5094 93 1		178	5709121	5097 44 8		201
5709015	5088 67 8		204	5425137	5093 66 2		128	5363958	5094 93 5		179	5578116	5097 45 3		193
5023210	5088 68 6		208	5361954	5093 72 4		130					5478690	5097 45 7		201
5613701	5088 69 1		206	5708841	5093 72 6		209	5919391	5095 60 3		142	5709138	5097 45 8		201
5613718	5088 69 2		206	5962243	5093 98 8		221	5542957	5095 60 6		134	5578123	5097 60 7		193
5613725	5088 69 3		206	5805991	5093 99 6		221					5578130	5097 61 5		193
5371090	5088 69 4		206					5393191	5096 25 1		161	5578147	5097 62 3		193
5473206	5088 69 9		205	5457473	5094 40 1		133	5393252	5096 27 8		161	5578154	5097 63 1		194
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5237341	5089 65 0		177	5406563	5094 43 1		140	5393733	5096 38 3		160	5578246	5097 93 1		196
5299400	5089 65 2		177	5382836	5094 43 4		140	5393795	5096 39 1		160	5578253	5097 93 5		196
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				5239925	5094 49 0		137	5415787	5096 65 1		143	5406860	5098 42 2		242
		/VPE		5239932	5094 49 3		137	5415794	5096 65 3		143	5406877	5098 42 7		242
5461111	5091 32 2		255	5239949	5094 51 0		135	5415800	5096 65 4		143	5406884	5098 43 1		242
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5461470	5091 52 7		255	5240013	5094 55 2		138	5067498	5096 65 7		143	5406891	5098 44 2		243
		/pc.		5709077	5094 57 2		202	5067504	5096 66 5		143	5406907	5098 44 6		243
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5035176	5092 81 6		188	5240044	5094 64 1		152	5051473	5096 82 7		124	5578413	5098 64 6		238
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5390978	5093 23 6		220	5406617	5094 67 7		154	5541158	509						

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Structure of the EAN number: Country code **40**

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5708933	<b>5099 70 8</b>		209	5531791	<b>5215 87 5</b>		296	5413295	<b>5240 32 8</b>		250	5420071	<b>5316 25 1</b>		324
5397458	<b>5099 80 3</b>		251	5531852	<b>5215 87 9</b>		297	5413356	<b>5240 33 6</b>		250	5420132	<b>5316 30 8</b>		324
5570318	<b>5099 84 8</b>		169					5413417	<b>5240 34 4</b>		250	5420194	<b>5316 32 4</b>		324
5481270	<b>5099 85 0</b>		170	5902652	<b>5216 18 4</b>		296					5433682	<b>5316 45 0</b>		323
				5902539	<b>5216 19 2</b>		296					5433729	<b>5316 45 9</b>		323
				5813019	<b>5216 20 6</b>		296			/100 pc.		5433736	<b>5316 46 8</b>		324
		/kg		5813071	<b>5216 21 4</b>		296	5415695	<b>5304 00 8</b>		316	5420316	<b>5316 51 0</b>		325
5399674	<b>5101 06 9</b>		334	5813132	<b>5216 25 7</b>		296	5415879	<b>5304 10 5</b>		316	5420378	<b>5316 55 3</b>		325
				5813194	<b>5216 26 5</b>		296	5415930	<b>5304 11 3</b>		316				
		/100 pc.		5813255	<b>5216 81 8</b>		299	5817512	<b>5304 16 4</b>		317	5420439	<b>5317 01 0</b>		322
5399797	<b>5102 05 7</b>		328					5817574	<b>5304 17 2</b>		317	5420491	<b>5317 05 3</b>		322
5399858	<b>5102 07 3</b>		328	5407959	<b>5217 07 5</b>		298	5416050	<b>5304 20 2</b>		317	5420552	<b>5317 20 7</b>		322
5399919	<b>5102 08 1</b>		328					5416234	<b>5304 31 8</b>		317	5420613	<b>5317 22 3</b>		323
5399971	<b>5102 11 1</b>		328	5904274	<b>5218 31 4</b>		300	5416357	<b>5304 40 7</b>		321	5420675	<b>5317 25 8</b>		322
5400035	<b>5102 13 8</b>		328	5408734	<b>5218 67 5</b>		299	5416418	<b>5304 50 4</b>		321	5420736	<b>5317 27 4</b>		323
5400097	<b>5102 15 4</b>		328	5408796	<b>5218 68 3</b>		299	5503057	<b>5304 52 0</b>		321	5420798	<b>5317 40 1</b>		322
5400158	<b>5102 19 7</b>		328	5408857	<b>5218 69 1</b>		299	5416470	<b>5304 60 1</b>		318	5420859	<b>5317 42 8</b>		323
5400219	<b>5102 21 9</b>		328	5904519	<b>5218 74 8</b>		299	5817758	<b>5304 66 0</b>		318	5420910	<b>5317 45 2</b>		322
5400271	<b>5102 23 5</b>		328	5814634	<b>5218 75 6</b>		299	5416951	<b>5304 97 0</b>		317	5420972	<b>5317 47 9</b>		323
5400332	<b>5102 25 1</b>		328	5408918	<b>5218 81 0</b>		300	5417071	<b>5304 99 7</b>		280				
5400394	<b>5102 27 8</b>		328	5408970	<b>5218 82 9</b>		300					5421030	<b>5318 08 4</b>		322
				5409038	<b>5218 86 1</b>		300					5421092	<b>5318 14 9</b>		322
		/pc.						5417316	<b>5311 03 9</b>		319				
5400875	<b>5106 00 1</b>		333	5674580	<b>5218 88 2</b>		299	5417378	<b>5311 10 1</b>		319	5421276	<b>5320 01 1</b>		325
5400936	<b>5106 02 8</b>		333			/100 pc.		5417439	<b>5311 15 2</b>		319	5421337	<b>5320 05 4</b>		325
5900375	<b>5106 13 3</b>		333	5623052	<b>5218 88 5</b>		299	5417491	<b>5311 20 9</b>		319	5421511	<b>5320 69 0</b>		326
5900436	<b>5106 14 1</b>		333	5409090	<b>5218 92 6</b>		326	5417552	<b>5311 26 8</b>		319	5421573	<b>5320 70 4</b>		326
				5625889	<b>5218 99 7</b>		300	5417675	<b>5311 50 0</b>		316	5421634	<b>5320 71 2</b>		326
		/100 pc.													
5401599	<b>5201 10 1</b>		294	5409458	<b>5223 07 5</b>		303	5737063	<b>5311 50 3</b>		266	5421870	<b>5325 30 7</b>		325
				5409519	<b>5223 10 5</b>		303					5421931	<b>5325 31 5</b>		325
5904335	<b>5202 21 3</b>		298	5409632	<b>5223 15 6</b>		303	5417736	<b>5311 51 9</b>		316				
5402138	<b>5202 24 8</b>		298	5409755	<b>5223 20 2</b>		303	5417798	<b>5311 52 7</b>		316	5422419	<b>5326 30 3</b>		326
5403036	<b>5202 51 5</b>		295	5409939	<b>5223 60 1</b>		303	5417859	<b>5311 53 5</b>		316	5422471	<b>5326 31 1</b>		326
5902294	<b>5202 56 6</b>		295					5417910	<b>5311 55 1</b>		316	5422532	<b>5326 33 8</b>		326
5902232	<b>5202 59 0</b>		295	5410416	<b>5226 57 0</b>		304	5693789	<b>5311 57 3</b>		266				
5403814	<b>5202 83 3</b>		295					5466192	<b>5311 58 5</b>		266	5453611	<b>5328 20 9</b>		318
5902171	<b>5202 86 8</b>		295	5410539	<b>5227 07 0</b>		304					5453673	<b>5328 28 4</b>		319
				5410591	<b>5227 08 9</b>		304	5417972	<b>5312 03 5</b>		320				
5038269	<b>5203 01 5</b>		295	5410652	<b>5227 10 0</b>		304	5418030	<b>5312 13 2</b>		320	5423195	<b>5329 07 8</b>		318
5289746	<b>5203 02 3</b>		295	5410713	<b>5227 15 1</b>		304	5418092	<b>5312 31 0</b>		278				
								5700869	<b>5312 31 8</b>		277	5423379	<b>5331 01 3</b>		327
5404651	<b>5207 25 8</b>		302	5410836	<b>5228 02 6</b>		304	5418153	<b>5312 34 5</b>		278	5423430	<b>5331 50 1</b>		327
5110392	<b>5207 26 6</b>		302	5410959	<b>5228 12 3</b>		304	5418214	<b>5312 41 8</b>		278				
5404774	<b>5207 33 9</b>		301	5411017	<b>5228 13 1</b>		304	5418276	<b>5312 44 2</b>		278	5629115	<b>5334 93 4</b>		280
5404835	<b>5207 34 7</b>		301	5411079	<b>5228 22 0</b>		305	5418337	<b>5312 60 4</b>		277	5959663	<b>5334 94 2</b>		280
5069546	<b>5207 37 1</b>		301	5411192	<b>5228 32 8</b>		304	5418399	<b>5312 65 5</b>		278				
5404897	<b>5207 44 4</b>		301					5418573	<b>5312 80 9</b>		278	5890058	<b>5335 14 0</b>		329
5009726	<b>5207 45 1</b>		302	5411499	<b>5229 16 2</b>		303	5418696	<b>5312 90 6</b>		279	5890119	<b>5335 16 7</b>		329
5404958	<b>5207 46 0</b>		301	5411550	<b>5229 36 7</b>		303	5418757	<b>5312 92 2</b>		278	5423614	<b>5335 20 5</b>		329
5405016	<b>5207 48 7</b>		301	5411611	<b>5229 38 3</b>		303	5700876	<b>5312 92 5</b>		278	5423676	<b>5335 25 6</b>		329
5904991	<b>5207 74 6</b>		301	5411673	<b>5229 46 4</b>		303								
5905059	<b>5207 75 4</b>		301	5411734	<b>5229 48 0</b>		303	5740537	<b>5313 01 5</b>		279	5424215	<b>5336 00 7</b>		329
5905110	<b>5207 76 2</b>		301	5411970	<b>5229 55 3</b>		303	5740476	<b>5313 02 3</b>		279	5424277	<b>5336 02 3</b>		329
5904878	<b>5207 80 0</b>		301	5412151	<b>5229 83 9</b>		303	5543015	<b>5313 03 1</b>		279	5424338	<b>5336 05 8</b>		329
5336433	<b>5207 85 1</b>		301	5412212	<b>5229 96 0</b>		302	5806530	<b>5313 06 6</b>		279	5424390	<b>5336 07 4</b>		330
5334811	<b>5207 87 8</b>		301									5424451	<b>5336 09 0</b>		330
				5446231	<b>5230 21 7</b>		302	5418993	<b>5314 03 8</b>		320	5424635	<b>5336 30 9</b>		330
5405252	<b>5208 01 7</b>		304	5629535	<b>5230 32 2</b>		302	5419112	<b>5314 13 5</b>		320	5424758	<b>5336 34 1</b>		330
				5629474	<b>5230 36 5</b>		302					5424819	<b>5336 37 6</b>		330
5903673	<b>5215 27 7</b>		298	5739999	<b>5230 44 6</b>		281	5419174	<b>5314 51 8</b>		277	5424871	<b>5336 45 7</b>		330
5903796	<b>5215 30 7</b>		298	5740056	<b>5230 46 2</b>		281	5419235	<b>5314 53 4</b>		277	5424932	<b>5336 50 3</b>		330
5811879	<b>5215 37 4</b>		298	5959601	<b>5230 52 7</b>		305	5419297	<b>5314 61 5</b>		277				
5811930	<b>5215 38 2</b>		298					5419358	<b>5314 62 3</b>		277	5424994	<b>5340 01 2</b>		331
5407171	<b>5215 43 9</b>		297					5419471	<b>5314 65 8</b>		277				
5812111	<b>5215 47 1</b>		297			/pc.		5419532	<b>5314 66 6</b>		277	5425595	<b>5350 08 5</b>		327
5407232	<b>5215 50 1</b>		297	5450894	<b>5239 91 4</b>		251					5425656	<b>5350 09 3</b>		327
5902591	<b>5215 54 4</b>		296									5425717	<b>5350 10 7</b>		327
5407294	<b>5215 55 2</b>		296	5412571	<b>5240 03 4</b>		250	5419716	<b>5315 50 6</b>						

EAN-C.	Art. no.	Price	Page	EAN-C.	Art. no.	Price	Page	EAN-C.	Art. no.	Price	Page
5426974	5351 05 7	/100 pc.	328	5699668	5408 05 6	/pc.	311	5430339	5424 20 8	/100 pc.	275
5427032	5351 07 3		328	5674924	5408 10 1		309				
5427094	5351 25 1		328	5690733	5408 10 5		307			/pc.	
5427155	5351 28 6		328	5613206	5408 10 7		307	5901457	5430 01 1		275
5890652	5351 35 9		328	5613213	5408 10 8		307	5901570	5430 06 2		275
5890713	5351 37 5		328	5613220	5408 10 9		307			/100 pc.	
5427216	5351 45 6		328	5636731	5408 14 8		307	5430575	5430 15 1		276
5427278	5351 47 2		328	5681496	5408 15 6		307				
				5613237	5408 15 8		307				
5427575	5400 15 5		275	5895817	5408 24 5		308	6001767	5492 80 7		317
5629054	5400 62 7		275	5613244	5408 24 7		308				
				5895879	5408 29 6		307				
5901334	5401 77 1		292	5613251	5408 29 8		307			/pc.	
5427810	5401 80 1		292	5674474	5408 35 0		308	6117611	6117 46 5		191
5427872	5401 83 6		292	5613268	5408 35 2		308				
5898399	5401 85 2		292	5674412	5408 39 3		308				
5902119	5401 87 9		292	5613275	5408 39 5		308				
5034810	5401 97 0		292	5674351	5408 45 8		310				
5105619	5401 98 0		291	5674290	5408 50 4		308				
5107774	5401 98 3		291	5613282	5408 50 6		308				
5108672	5401 98 6		291	5674238	5408 55 5		308				
5108733	5401 98 9		291	5613299	5408 55 7		308				
5045359	5401 99 3		291	5674177	5408 62 8		308				
5050803	5401 99 5		291	5613312	5408 63 0		308				
				5673811	5408 68 7		308				
5428053	5402 10 7		292	5613305	5408 68 9		308				
5428176	5402 15 8		292	5673750	5408 73 3		310				
5428411	5402 80 8		292	5542773	5408 80 6		310				
5428473	5402 85 9		292	5542834	5408 81 4		310				
		/pc.		5004608	5408 84 9		310				
5674733	5402 86 4		291	5009733	5408 85 2		310				
5674740	5402 86 6		291	5670056	5408 94 2		313				
5674757	5402 86 8		291	5670063	5408 94 6		313				
5674764	5402 87 0		291	5670070	5408 95 0		314				
5674795	5402 87 2		291	5670087	5408 95 2		314				
5674801	5402 87 4		291	5670094	5408 95 4		314				
5674818	5402 87 6		291	5670100	5408 95 6		314				
5674825	5402 87 8		291	5670117	5408 95 8		314				
5674856	5402 88 0		291	5670124	5408 96 0		315				
		/100 pc.		5670131	5408 96 4		315				
5428534	5402 89 1		290	5670148	5408 96 8		290				
5897910	5402 95 6		290	5674931	5408 96 9		290				
				5674948	5408 97 1		291				
5070054	5403 10 3		293	5674979	5408 97 2		291				
5070078	5403 11 7		293	5674986	5408 97 3		291				
5070085	5403 12 4		293	5613329	5408 97 6		307				
5548713	5403 20 0		292	5613336	5408 97 8		307				
5548775	5403 21 9		293	5613343	5408 98 0		307				
5548898	5403 22 7		293	5613350	5408 98 2		307				
5548959	5403 23 5		293	5613367	5408 98 4		309				
		/pc.		5613374	5408 98 6		309				
5034872	5403 30 8		290	5613381	5408 98 8		309				
5034933	5403 32 4		290	5613411	5408 99 0		309				
5613572	5403 33 0		294	5613428	5408 99 2		309				
5670735	5403 33 5		294	5613435	5408 99 4		310				
		/100 pc.		5613442	5408 99 6		310				
5428657	5405 06 8		290			/100 pc.	306				
		/pc.		5428893	5410 09 6		306				
5428718	5405 76 9		294	5429074	5410 30 4		306				
5428770	5405 86 6		294								
		/100 m		5429616	5412 60 9		305				
5674573	5408 00 2		311	5446415	5412 63 3		305				
5674627	5408 00 4		311	5752356	5412 80 3		305				
		/pc.		5752295	5412 81 1		305				
5674634	5408 00 9		311	5429678	5416 56 6		331				
5674641	5408 01 1		311								
5674689	5408 02 2		311			/pc.	280				
5674696	5408 02 6		313	5900498	5420 00 8		280				
5674702	5408 02 8		313	5629290	5420 01 6		280				
		/100 pc.									
5674719	5408 03 6		311	5429791	5420 15 6		275				
				5751571	5420 50 4		275				
5674863	5408 04 3		313								
5674870	5408 04 7		313	5430094	5424 10 0		291				
5674887	5408 04 9		313	5430216	5424 15 1		275				
5674726	5408 05 2		312								
5674917	5408 05 4		312								

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# Type listing

Structure of the EAN number: Country code **40**

Manufacturer code **1219** (for articles beginning with **0: 1010**)

Individual EAN-C **5647589**

Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page	Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page
101 16-1500	1500 / GFK	5613213	5408 10 8	/pc.	307	101 HV-16	16 90	5613411	5408 99 0	/pc.	309
101 16-3000	3000 / GFK	5613220	5408 10 9		307	101 IAB	18 / AI	5673750	5408 73 3		310
101 16-750	750 / GFK	5613206	5408 10 7		307	101 IAG	20 107 / AI	5674290	5408 50 4		308
101 20-3000	3000 / GFK	5690733	5408 10 5		307	101 IAG-16	16 107 / AI	5613282	5408 50 6		308
101 20-6000	6000 / GFK	5636731	5408 14 8		307	101 IDK	20 125 / AI	5895817	5408 24 5		308
101 3B-4000	2000 / AI	5674733	5402 86 4		291	101 IDK-16	16 125 / AI	5613244	5408 24 7		308
101 3B-4500	2500 / AI	5674740	5402 86 6		291	101 IES	20 60 / AI	5674412	5408 39 3		308
101 3B-5000	3000 / AI	5674757	5402 86 8		291	101 IES-16	16 60 / AI	5613275	5408 39 5		308
101 3B-5500	3500 / AI	5674764	5402 87 0		291	101 IGL	20 127 / AI	5674177	5408 62 8		308
101 3B-6000	4000 / AI	5674795	5402 87 2		291	101 IGL-16	16 127 / AI	5613312	5408 63 0		308
101 3B-6500	4500 / AI	5674801	5402 87 4		291	101 IK	20 100 / AI	5895879	5408 29 6		307
101 3B-7000	5000 / AI	5674818	5402 87 6		291	101 IK-16	16 100 / AI	5613251	5408 29 8		307
101 3B-7500	5500 / AI	5674825	5402 87 8		291	101 ISP M10	110 / AI	5674351	5408 45 8		310
101 3B-8000	5500 / AI	5674856	5402 88 0		291	101 IT	20 65 / AI	5681496	5408 15 6		307
101 3-ES-16	750	5613329	5408 97 6		307	101 IT-16	16 60 / AI	5613237	5408 15 8		307
101 A-1500	1500 / St / FT	5427575	5400 15 5	/100 pc.	275	101 IV	20 60 / AI	5674238	5408 55 5		308
101 A-1500	1500 / St / FT	5427575	5400 15 5		291	101 IV-16	16 60 / AI	5613299	5408 55 7		308
101 A-16	16 60 / AI	5613268	5408 35 2	/pc.	308	101 IW-M10	20 60 / AI	5673811	5408 68 7		308
101 A-CU	1500 / Cu	5629054	5400 62 7	/100 pc.	332	101 J1000	1000 / AI	5034810	5401 97 0	/100 pc.	292
101 A-CU	1500 / Cu	5629054	5400 62 7		332	101 MA-16	16 91	5613442	5408 99 6	/pc.	310
101 A-CU	1500 / Cu	5629054	5400 62 7		275	101 R-16	16 81	5613435	5408 99 4		310
101 A-CU	1500 / Cu	5629054	5400 62 7		291	101 RH-16	Black / PA	5674924	5408 10 1		309
101 A-L100	/ St / FT	5428411	5402 80 8		292	101 ST	M16	5428534	5402 89 1	/100 pc.	290
101 A-L150	/ St / FT	5428473	5402 85 9		292	101 VL1500	1500 / AI	5105619	5401 98 0		291
101 ALU-1000	1000 / AI	5901334	5401 77 1		292	101 VL2000	2000 / AI	5107774	5401 98 3		291
101 ALU-1500	1500 / AI	5427810	5401 80 1		292	101 VL2500	2500 / AI	5108672	5401 98 6		291
101 ALU-2000	2000 / AI	5427872	5401 83 6		292	101 VL3000	3000 / AI	5108733	5401 98 9		291
101 ALU-2500	2500 / AI	5898399	5401 85 2		292	101 VL3500	3500 / AI	5045359	5401 99 3		291
101 ALU-3000	3000 / AI	5902119	5401 87 9		292	101 VL4000	4000 / AI	5050803	5401 99 5		291
101 A-M16	20 60 / AI	5674474	5408 35 0	/pc.	308	101 VRS-16	750	5613350	5408 98 2	/pc.	307
101 B-16 M16	M16	5897910	5402 95 6	/100 pc.	290	101 VS-16	750	5613336	5408 97 8		307
101 BB-16	16 40	5613381	5408 98 8	/pc.	309	101 W-16	16 60 / AI	5613305	5408 68 9		308
101 BP-16	175 40	5613367	5408 98 4		309	101 WG-16	16 110	5613374	5408 98 6		309
101 F1000	/ St / FT	5430094	5424 10 0	/100 pc.	291	108 B DIN	/ St / FT	5429678	5416 56 6	/100 pc.	331
101 F1500	/ St / FT	5430216	5424 15 1		275	112 DIN-100	/ St / F	5428893	5410 09 6		306
101 F1500	/ St / FT	5430216	5424 15 1		332	112 DIN-CU-100	/ Cu	5429074	5410 30 4		306
101 F1500	/ St / FT	5430216	5424 15 1		291	113 8-10	/ Zn / Cu	5446231	5230 21 7		302
101 F-16	16 121	5613428	5408 99 2	/pc.	309	113 B-HD-16	/ Zn / Cu	5752295	5412 81 1		305
101 F2000	/ St / FT	5430339	5424 20 8	/100 pc.	275	113 B-MS-HD 8-10	/ Zn / Cu	5629474	5230 36 5		302
101 F2000	/ St / FT	5430339	5424 20 8		332						
101 F2000	/ St / FT	5430339	5424 20 8		291						
101 FS-16	750	5613343	5408 98 0	/pc.	307						
101 G1000	/ St / FT	5428053	5402 10 7	/100 pc.	292						
101 G1500	/ St / FT	5428176	5402 15 8		292						

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Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page	Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page
113 BZ-FL	/ Zn / G	5739999	5230 44 6	/100 pc.	281	157 I-VA	/ V2A	5407355	5215 62 5	/100 pc.	296
113 B-Z-HD	/ Zn / VZ	5629535	5230 32 2		302	157 L-CU	/ Cu	5812111	5215 47 1		297
113 B-Z-HD	/ Zn / VZ	5752356	5412 80 3		305						
113 B-Z-HD-FL	/ Zn / G	5740056	5230 46 2		281	157 LK-CU	/ Cu	5811930	5215 38 2		298
113 Z-16	/ Zn / VZ	5429616	5412 60 9		305	157 LK-VA	/ V2A	5811879	5215 37 4		298
113 Z-20	/ Zn / VZ	5959601	5230 52 7		305	157 L-VA	/ V2A	5407171	5215 43 9		297
113 Z-20	/ Zn / VZ	5959601	5230 52 7		309						
						157 NB-VA	/ V2A	5903673	5215 27 7		298
113 Z8-10	/ Zn / G	5412212	5229 96 0		302	157 ND-VA	/ V2A	5903796	5215 30 7		298
113 ZN-16	/ Zn / Cu	5446415	5412 63 3		305	159 K-VA	/ V2A	5813255	5216 81 8		299
120 A	/ Zn / G	5428657	5405 06 8		290	159 VA-V	/ V2A	5407959	5217 07 5		298
				/pc.		163 100 CU	/ Cu	5409939	5223 60 1		303
128 F	/ St / FT	5428718	5405 76 9		294	163 100 FT	/ St / FT	5409519	5223 10 5		303
128 K	/ Al	5428770	5405 86 6		294						
				/100 pc.		163 150 FT	/ St / FT	5409632	5223 15 6		303
132 CU	/ Cu	5902171	5202 86 8		295	163 200 FT	/ St / FT	5409755	5223 20 2		303
132 K-CU	/ Cu	5902232	5202 59 0		295	163 70 FT	/ St / FT	5409458	5223 07 5		303
132 K-VA	/ V2A	5403036	5202 51 5		295	165 B 100	/ St / FT	5408970	5218 82 9		300
132 N-DK	/ St / FT	5902294	5202 56 6		295	165 B 60	/ St / FT	5408918	5218 81 0		300
132 U	/ V2A	5038269	5203 01 5		295	165 KR	/ PE	5409038	5218 86 1		300
132 U-CU	/ V2A / Cu	5289746	5203 02 3		295	165 MBG HFL	/ PP	5623052	5218 88 5		299
132 VA	/ V2A	5403814	5202 83 3		295	165 MBG UH	Black / PP	5674580	5218 88 2	/pc.	299
						165 MBG UH	Black / PP	5674580	5218 88 2		312
133 A	/ PA	5402138	5202 24 8		298					/100 pc.	
133 NB	/ PA	5904335	5202 21 3		298	165 MBG-10	/ PE	5408734	5218 67 5		299
						165 MBG-10 200	/ PE	5814634	5218 75 6		299
156 16	/ St / FT	5411079	5228 22 0		305	165 MBG-8	/ PE	5408857	5218 69 1		299
						165 MBG-8 200	/ PE	5904519	5218 74 8		299
156 8-10	/ St / FT	5410836	5228 02 6		304						
156 FL	/ St / FT	5411192	5228 32 8		304	165 NBK 55	55 / PA	5904274	5218 31 4		300
						165 OBG-8	/ PE	5408796	5218 68 3		299
156 K8-10 CU	/ Cu	5411017	5228 13 1		304	165 R-8-10	/ PE	5625889	5218 99 7		300
156 K8-10 ST	/ St / FT	5410959	5228 12 3		304						
157 E-CU	/ Cu	5902355	5215 80 3		297	166 LS 70	/ St / FT	5410416	5226 57 0		304
157 EK-CU	/ Cu	5902478	5215 85 4		297	168 8-10 M6	/ Zn / G	5411499	5229 16 2		303
157 EK-VA	/ V2A	5902416	5215 83 8		297	168 DIN 30	56 / Zn / G	5411734	5229 48 0		303
157 E-VA	/ V2A	5407232	5215 50 1		297	168 DIN-K-M6	/ Zn / G	5412151	5229 83 9		303
						168 DIN-K-M8	/ Zn / Cu	5411611	5229 38 3		303
157 F-CU 230	/ Cu	5902539	5216 19 2		296						
157 F-CU 280	/ Cu	5813019	5216 20 6		296	168 FL30-M6	56 / Zn / VZ	5411673	5229 46 4		303
157 F-CU 410	/ Cu	5813132	5216 25 7		296						
						168 FL40-M8	66 / TG / FT	5411970	5229 55 3		303
157 FK-CU 230	/ Cu	5902652	5216 18 4		296						
157 FK-CU 280	/ Cu	5813071	5216 21 4		296	168 ZN-M6	/ Zn / Cu	5411550	5229 36 7		303
157 FK-CU 410	/ Cu	5813194	5216 26 5		296						
						172 AR	/ Al	5409090	5218 92 6		326
157 FK-VA 230	/ V2A	5902591	5215 54 4		296						
157 FK-VA 280	/ V2A	5812296	5215 58 7		296	176 A 100	/ TG / F	5410652	5227 10 0		304
157 FK-VA 410	/ V2A	5812418	5215 60 9		296						
						176 A 150	/ TG / F	5410713	5227 15 1		304
157 F-VA 230	/ V2A	5407294	5215 55 2		296						
157 F-VA 280	/ V2A	5812234	5215 57 9		296	176 A 65	/ TG / F	5410539	5227 07 0		304
157 F-VA 410	/ V2A	5812357	5215 59 5		296						
						176 A 80	/ TG / F	5410591	5227 08 9		304
157 FX-AL	/ Al	5531791	5215 87 5		296						
						177 20 CU	/ PA	5904991	5207 74 6		301
157 FX-CU	/ Cu	5531852	5215 87 9		297						
						177 20 KL	/ PA	5009726	5207 45 1		302
157 I-CU	/ Cu	5812593	5215 74 9		296						
						177 20 M8	/ PA	5404897	5207 44 4		301
157 IK-VA	/ V2A	5812531	5215 66 8		297						
						177 20 VA M6	/ V2A	5404774	5207 33 9		301

# Type listing

Structure of the EAN number: Country code **40**

Manufacturer code **1219** (for articles beginning with **0: 1010**)

Individual EAN-C **5647589**

Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page	Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page
177 20 VA M8	/ V2A	5404835	5207 34 7	/100 pc.	301	223 O DIN MS	/ Zn / Cu	5890119	5335 16 7	/100 pc.	329
177 20 VA-VK M6	/ V2A / Cu	5904878	5207 80 0		301	223 O DIN ZN	/ Zn / G	5890058	5335 14 0		329
177 30 CU	/ PA	5905059	5207 75 4		301	226 8-10	/ St / FT	5424215	5336 00 7		329
177 30 M8	/ PA	5404958	5207 46 0		301	226 CU	/ Cu	5424277	5336 02 3		329
177 55 CU	/ PA	5905110	5207 76 2		301	226 VA	/ V2A	5424338	5336 05 8		329
177 55 M8	/ PA	5405016	5207 48 7		301	226 ZV CU	/ V2A	5424451	5336 09 0		330
177 B-HD20	/ PA	5336433	5207 85 1		301	226 ZV VA	/ Cu	5424390	5336 07 4		330
177 B-HD30	/ PA	5334811	5207 87 8		301	233 8	/ St / FT	5424635	5336 30 9		330
177 U	Light grey / PP	5069546	5207 37 1		301	233 A VA	/ V2A	5424871	5336 45 7		330
194	Grey M8 / PA	5404651	5207 25 8		302	233 A ZV	/ Cu	5424932	5336 50 3		330
194 K	Grey M8 / PA	5110392	5207 26 6		302	233 VA	/ V2A	5424758	5336 34 1		330
198 60	21 60	5399674	5101 06 9	/kg	334	233 ZV	/ V2A	5424819	5336 37 6		330
199 DIN	M8 / St / FS	5405252	5208 01 7	/100 pc.	304	237 N CU	/ Cu	5453673	5328 28 4		319
200 1500	1500 / St / FT	5429791	5420 15 6		332	237 N FT	/ St / F	5453611	5328 20 9		318
200 1500	1500 / St / FT	5429791	5420 15 6		275	239	/ Zn / G	5423195	5329 07 8		318
200 VA-1500	1500 / V4A	5751571	5420 50 4		275	244	/ Zn / G	5417316	5311 03 9		319
200 VA-1500	1500 / V4A	5751571	5420 50 4		332	245 8-10 CU	/ Cu	5417439	5311 15 2		319
204 KL-1500	/ St	5430575	5430 15 1		276	245 8-10 FT	/ St / FT	5417378	5311 10 1		319
204 KL-1500	/ St	5430575	5430 15 1		332	247 8-10 CU	/ Cu	5417552	5311 26 8		319
204 KS-2000	/ St / F	5901457	5430 01 1	/pc.	275	247 8-10 FT	/ St / FT	5417491	5311 20 9		319
204 KS-2000	/ St / F	5901457	5430 01 1		332	249 8-10 ALU	44 / Al	5417736	5311 51 9		316
204 KS-2500	/ St / F	5901570	5430 06 2		275	249 8-10 ALU-OT	/ Al	5466192	5311 58 5		266
204 KS-2500	/ St / F	5901570	5430 06 2		332	249 8-10 ALU-OT	/ Al	5466192	5311 58 5		325
205 B-M10 VA	M10 / V4A	5900498	5420 00 8		280	249 8-10 CU	40 / Cu	5417798	5311 52 7		316
205 B-M12 VA	M12 / V4A	5629290	5420 01 6		280	249 8-10 ST	40 / St / FT	5417675	5311 50 0		316
213 1000 DIN	1000 / St / FT	5373575	5003 00 8		276	249 8-10 ST-OT	/ ST / FT	5737063	5311 50 3		266
213 1000 M	1000 / St / FT	5373995	5003 25 3		276	249 8-10 ST-OT	/ ST / FT	5737063	5311 50 3		325
213 1500 DIN	1500 / St / FT	5373636	5003 01 6		276	249 8-10 VA	40 / V2A	5417910	5311 55 1		316
213 1500 F	1500 / St / FT	5374718	5003 77 6		276	249 8-10 ZV	44 / Cu	5417859	5311 53 5		316
213 1500 M	1500 / St / FT	5374053	5003 26 1		276	249 VA-OT	/ V2A	5693789	5311 57 3		266
213 2000 DIN	2000 / St / FT	5373698	5003 02 4		276	249 VA-OT	/ V2A	5693789	5311 57 3		325
213 2000 F	2000 / St / FT	5374770	5003 78 4		276	250	/ St / FT	5418696	5312 90 6		279
213 2000 M	2000 / St / FT	5374114	5003 28 8		276	250	/ St / FT	5418696	5312 90 6		320
213 2500 DIN	2500 / St / FT	5373759	5003 03 2		276	250 A-BO	/ St / F	5806530	5313 06 6		279
213 2500 M	2500 / St / FT	5374176	5003 29 6		276	250 A-FT	40 / St / FT	5740537	5313 01 5		279
213 3000 DIN	3000 / St / FT	5373810	5003 04 0		276	250 AS-FT	20 / St / FT	5543015	5313 03 1		279
213 3000 M	3000 / St / FT	5374237	5003 31 8		276	250 A-VA	40 / V2A	5740476	5313 02 3		279
219 20 BP CU	1500 / St / Cu	5371717	5000 50 5		272	250 V4A	/ V4A	5700876	5312 92 5		278
219 20 BP V4A	1000 / V4A	5740650	5000 85 8		272	250 V4A	/ V4A	5700876	5312 92 5		319
219 20 BP V4A	1500 / V4A	5371830	5000 86 6		272	250 VA	/ V2A	5418757	5312 92 2		278
219 20 OMEX FT	1500 / St / FT	5371298	5000 01 7		272	250 VA	/ V2A	5418757	5312 92 2		319
219 20 OMEX FT	2000 / St / FT	5371472	5000 20 3		272	251 8-10	/ St / FT	5417972	5312 03 5		320
219 20 ST FT	1500 / St / FT	5814450	5000 75 0		272	251 CU	/ Cu	5418030	5312 13 2		320
219 20 ST FT	1000 / St / FT	5018049	5000 74 2		272	252 8-10 CU	/ Cu	5418214	5312 41 8		278
219 25 OMEX FT	1500 / St / FT	5371359	5000 02 5		272	252 8-10 CU	/ Cu	5418214	5312 41 8		320
219 25 ST FT	1500 / St / FT	5111047	5000 76 9		272	252 8-10 FT	/ St / FT	5418092	5312 31 0		278
223 DIN MS	/ Zn / Cu	5423676	5335 25 6	/100 pc.	329	252 8-10 FT	/ St / FT	5418092	5312 31 0		321
223 DIN ZN	/ Zn / G	5423614	5335 20 5		329	252 8-10 V4A	/ V4A	5700869	5312 31 8		277
						252 8-10X16 CU	/ Cu	5418276	5312 44 2		278
						252 8-10X16 CU	/ Cu	5418276	5312 44 2		321
						252 8-10X16 FT	/ St / FT	5418153	5312 34 5		278

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Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page	Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page
252 8-10X16 FT	/ St / FT	5418153	5312 34 5	/100 pc.	321	280 VK	/ Zn	5421337	5320 05 4	/100 pc.	325
252 8-10XFL30 FT	/ St / F	5418399	5312 65 5		278						
252 8-10XFL30 FT	/ St / F	5418399	5312 65 5		320	287	/ Al	5421573	5320 70 4		326
253 10X16	/ St / F	5418573	5312 80 9		278	287 CU	/ Cu	5421511	5320 69 0		326
253 10X16	/ St / F	5418573	5312 80 9		321	288 DIN	/ Al	5421634	5320 71 2		326
253 8X8	/ St / F	5418337	5312 60 4		277	292 DIN	/ TG / F	5424994	5340 01 2		331
253 8X8	/ St / F	5418337	5312 60 4		320						
254 DIN 8-10 CU	/ Cu	5419112	5314 13 5		320	301 CU-100	/ Cu	5426370	5350 70 0		328
254 DIN 8-10 FT	/ St / FT	5418993	5314 03 8		320	301 CU-110	/ Cu	5426431	5350 71 9		328
						301 CU-120	/ Cu	5426493	5350 72 7		328
255 30	52/ St / FT	5419174	5314 51 8		277	301 CU-80	/ Cu	5426257	5350 68 9		328
255 A-FL30 FT	60/ St / FT	5419235	5314 53 4		277	301 CU-90	/ Cu	5426318	5350 69 7		328
256 A-DIN 30 FT	60/ St / FT	5419471	5314 65 8		277	301 DIN-100	/ St / FS	5425717	5350 10 7		327
256 A-DIN 40 FT	80/ St / FT	5419532	5314 66 6		277	301 DIN-110	/ St / FS	5425779	5350 11 5		327
						301 DIN-120	/ St / FS	5425830	5350 12 3		327
256 DIN 30 FT	60/ St / FT	5419297	5314 61 5		277	301 DIN-80	/ St / FS	5425595	5350 08 5		327
256 DIN 40 FT	80/ St / FT	5419358	5314 62 3		277	301 DIN-90	/ St / FS	5425666	5350 09 3		327
						301 S-100	/ St / FS	5426974	5351 05 7		328
259 8-10	/ TG / FT	5419716	5315 50 6		318	301 S-120	/ St / FS	5427032	5351 07 3		328
259 A FT	/ St / FT	5740414	5315 51 4		279	301 S-AL-100	/ Al	5890652	5351 35 9		328
259 A ST	/ St	5237198	5315 55 7		279	301 S-AL-120	/ Al	5890713	5351 37 5		328
259 A VA	/ V2A	5740353	5315 52 2		279	301 S-CU-100	/ Cu	5427216	5351 45 6		328
260 8	/ Zn / G	5419839	5315 70 0		318	301 S-CU-120	/ Cu	5427278	5351 47 2		328
260 8-10 MS	/ CuZn / Cu	5419778	5315 65 4		318	301 S-VA-100	/ V2A	5427094	5351 25 1		328
						301 S-VA-120	/ V2A	5427155	5351 28 6		328
262	/ St / FT	5419891	5316 01 4		324	301 V	/ St / FS	5426790	5350 86 7		327
262 A-DIN CU	/ Cu	5420071	5316 25 1		324	301 V-CU	/ Cu	5426851	5350 88 3		327
262 A-DIN FT	/ St / FT	5420019	5316 21 9		324	301 V-VA	/ V2A	5426912	5350 90 5		327
262 CU	/ Cu	5419952	5316 15 4		324	303 DIN-1	/ St / FT	5399971	5102 11 1		328
262 ZM	/ St / FT	5818359	5316 17 0		324	303 DIN-1 1/2	/ St / FT	5400097	5102 15 4		328
						303 DIN-1 1/4	/ St / FT	5400035	5102 13 8		328
264	/ St / F	5420316	5316 51 0		325	303 DIN-1/2	/ St / FT	5399858	5102 07 3		328
						303 DIN-2	/ St / FT	5400158	5102 19 7		328
264 CU	/ Cu	5420378	5316 55 3		325	303 DIN-2 1/2	/ St / FT	5400219	5102 21 9		328
						303 DIN-3	/ St / FT	5400271	5102 23 5		328
267	/ St / FT	5420132	5316 30 8		324	303 DIN-3 1/2	/ St / FT	5400332	5102 25 1		328
						303 DIN-3/4	/ St / FT	5399919	5102 08 1		328
267 VA	/ V2A	5420194	5316 32 4		324	303 DIN-3/8	/ St / FT	5399797	5102 05 7		328
						303 DIN-4	/ St / FT	5400394	5102 27 8		328
269 8-10	/ Zn / G	5420439	5317 01 0		322	311 N-ALU 16	/ Al	5631392	3049 34 5		284
269 MS	/ Zn / Cu	5420491	5317 05 3		322	311 N-ALU 8-10	/ Al	5631576	3049 25 6		284
270 8-10	/ St / FT	5420552	5317 20 7		322	311 N-CU 16	/ Cu	5631514	3049 30 2		284
270 CU	/ Cu	5420675	5317 25 8		322	311 N-CU 8-10	/ Cu	5631699	3049 20 5		284
						311 N-VA 16	/ V2A	5631453	3049 32 9		284
271 8-10	/ St / FT	5420798	5317 40 1		322	311 N-VA 8-10	/ V2A	5631637	3049 22 1		284
271 CU	/ Cu	5420910	5317 45 2		322	319 10	/ TG / F	5421931	5325 31 5		325
272 14	/ TG / FT	5421092	5318 14 9		322	319 8	/ TG / F	5421870	5325 30 7		325
272 8	/ TG / FT	5421030	5318 08 4		322	324 S-CU	/ Cu	5422532	5326 33 8		326
273 8-10	/ St / FT	5420613	5317 22 3		323	324 S-FT	/ St / FT	5422419	5326 30 3		326
273 CU	/ Cu	5420736	5317 27 4		323	324 S-VA	/ V2A	5422471	5326 31 1		326
274 8-10	/ St / FT	5420859	5317 42 8		323	330 K	/ PA	5401599	5201 10 1		294
274 CU	/ Cu	5420972	5317 47 9		323						
280 8-10	/ Zn / G	5421276	5320 01 1		325	356 100	100 10	5230595	2360 10 1	/pc.	284

# Type listing

Structure of the EAN number: Country code 40

Manufacturer code 1219 (for articles beginning with 0: 1010)

Individual EAN-C 5647589

Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page	Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page
356 100	100 10	5230595	2360 10 1	/pc.	334	856	/ Cu	5423430	5331 50 1	/100 pc.	327
356 50	50 10	5230533	2360 05 5		284						
356 50	50 10	5230533	2360 05 5		334	910 N 10x50 GRW	10 50/ PA	5229155	2349 10 8		334
						910 N 12x60 GRW	12 60/ PA	5229216	2349 12 4		334
364	/ St / FT	5244219	3051 01 3		335	910 N 5x25 GRW	5 25/ PA	5228851	2349 04 3		334
				/100 pc.		910 N 6x30 GRW	6 30/ PA	5228912	2349 05 1		334
366 35	35/ St / FT	5388876	5059 35 6		284	910 N 6x60 GRW	6 60/ PA	5228974	2349 07 8		334
366 50	50/ St / FT	5389057	5059 49 6		284	910 N 8x40 GRW	8 40/ PA	5229032	2349 08 6		334
370 H	55/ St / FT	5382690	5025 20 6		282	925 1	70 31,7-33,7 / St / G	5385455	5040 11 6		265
470 4-16	/ CuZn / N	5389231	5064 01 5		267	925 1 1/2	88 46,3-48,3 / St / G	5385578	5040 15 9		265
						925 1 1/4	81 40,4-42,4 / St / G	5385516	5040 13 2		265
				/pc.		925 1/2	56 19,3-21,3 / St / G	5385332	5040 07 8		265
480 180		5412571	5240 03 4		250	925 1/4	48 11,5-13,5 / St / G	5385219	5040 03 5		265
480 250		5412755	5240 07 7		250	925 3/4	62 24,9-26,9 / St / G	5385394	5040 09 4		265
480 350		5412694	5240 06 9		250	925 3/8	52 15,2-17,2 / St / G	5385271	5040 05 1		265
481		5412816	5240 08 5		250	927 0	/ CuZn / N	5388517	5057 50 7		264
482		5412632	5240 05 0		250	927 1	/ V2A	5388579	5057 51 5		264
483 SN		5450894	5239 91 4		251	927 2	/ V2A	5388630	5057 52 3		264
484 M12	13/ St / F	5412991	5240 22 0		250	927 2 6-K	/ V2A	5699651	5057 59 9		311
484 M16	17/ St / F	5413059	5240 23 9		250	927 4	/ V2A	5388692	5057 55 8		264
484 M20	21/ St / F	5413110	5240 24 7		250	927 BAND-VA	/ V2A	5805458	5057 92 2	/100 m	264
484 M24	25/ St / F	5413172	5240 25 5		250	927 SCH-K-VA	/ V2A	5805519	5057 93 0	/100 pc.	264
485 M10	11/ St / F	5413233	5240 30 1		250	928	240/ CuZn / N	5385936	5040 50 7		265
485 M12	13/ St / F	5413295	5240 32 8		250	937 50	100/ St / FT	5385998	5043 01 8		266
485 M16	17/ St / F	5413356	5240 33 6		250	939	300/ St / G	5386056	5043 10 7		266
485 M20	21/ St / F	5413417	5240 34 4		250	942 11	44 8-11 / Cu / N	5384557	5038 01 4		265
555 7.6x380 SW	7.6 x 380 102/ PA	5820215	2332 75 2	/100 pc.	313	942 15	50 13-15 / Cu / N	5384618	5038 03 0		265
708 30 HG	52/ St / G	5383659	5030 23 4		283	942 18	52 16-18 / Cu / N	5384670	5038 05 7		265
708 30 SP	52/ St / G	5383413	5030 02 1		282	942 22	55 19-22 / Cu / N	5384731	5038 07 3		265
708 40 HG	52/ St / G	5383710	5030 24 2		283	942 28	63 24-28 / Cu / N	5384793	5038 08 1		265
710 30	52/ St / G	5383055	5028 03 5		282	942 35	71 30-35 / Cu / N	5384854	5038 11 1		265
710 40	62/ St / G	5383116	5028 04 3		282	942 43	81 39-43 / Cu / N	5384915	5038 13 8		265
831 30	54/ St / FT	5383833	5032 03 2		282	942 49	86 44-49 / Cu / N	5384977	5038 15 4		265
831 30 M6	54/ St / FT	5383956	5032 23 7		282	950 Z 1	66 31,5-34,5 / Zn / G	5386353	5050 11 1		265
831 40	65/ St / FT	5383895	5032 04 0		282	950 Z 1 1/2	84 46,5-49,5 / Zn / G	5386476	5050 15 4		265
						950 Z 1 1/4	78 40,5-43,5 / Zn / G	5386414	5050 13 8		265
831 40 M6	65/ St / FT	5384014	5032 24 5		282	950 Z 1 3/4	88 51-54 / Zn / G	5386537	5050 17 0		265
832 30	55/ St / FT	5384137	5032 53 9		282	950 Z 1/2	54 20-22,5 / Zn / G	5386230	5050 07 3		265
						950 Z 1/4	45 12-14 / Zn / G	5386117	5050 03 0		265
832 40	65/ St / FT	5384199	5032 54 7		282	950 Z 2	96 58,5-61,5 / Zn / G	5386599	5050 19 7		265
833 35	60/ St / FT	5384434	5033 03 9		282	950 Z 3/4	61 25-28 / Zn / G	5386292	5050 08 1		265
835	/ St / FT	5433750	5033 20 9		281	950 Z 3/8	50 15,5-17,5 / Zn / G	5386179	5050 05 7		265
						951	120/ V2A	5386650	5051 50 9		266
853 DIN	/ St / F	5423379	5331 01 3		327	952 Z 1	77 30,5-33,5 / St / FT	5386957	5052 11 4		266

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Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page	Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page
952 Z 1 1/2	94 45,5-48,5 / St / FT	5387077	5052 15 7	/100 pc.	266	1808	/ CuZn	5378075	5015 01 4	/pc.	260
952 Z 1 1/4	87 39,5-42,5 / St / FT	5387015	5052 13 0		266	1809	Grey/ CuZn	5378259	5015 07 3		259
952 Z 1/2	65 18,5-21,5 / St / FT	5386834	5052 07 6		266	1809 A	Black/ V2A	5959427	5015 11 1		262
952 Z 2	105 57-60 / St / FT	5387190	5052 18 1		266	1809 BG	Grey/ CuZn	5378372	5015 50 2		260
952 Z 3/4	71 24-27 / St / FT	5386896	5052 09 2		266	1809 M	Grey/ CuZn	5378310	5015 08 1		260
985 M6 25	25 4,3/ St / G	5250395	3133 02 8		334	1809 UP	/ CuZn	5378198	5015 06 5		261
985 M6 35	35 4,3/ St / G	5250456	3133 03 6		334	1810	/ St / F	5378136	5015 05 7		260
985 M8 35	35/ St / G	5250579	3133 23 0		335	1811	250/ St / FT	5377894	5014 01 8		281
1801 AH	/ PS	5378617	5015 70 7	/pc.	259	1811 L	400/ St / FT	5377955	5014 02 6		281
1801 KL1	212/ CuZn	5378730	5015 72 3		259	1813 DIN	/ St / FT	5378013	5014 21 2		280
1801 KL2	430/ CuZn	5378976	5015 80 4		259	1813 KL	/ St / FT	5901938	5014 42 5		279
1801 KL3	645/ CuZn	5379034	5015 81 2		259	1814 FT	/ St / FT	5105015	5014 46 8		280
1801 RK25	/ St / G	5378853	5015 75 8		258	1814 ST	/ St	5105077	5014 47 6		280
1801 RK30	/ St / G	5378792	5015 73 1		258	1816 F-1000X1000	/ St / FT	5376996	5009 23 5		276
1801 RK40	/ St / G	5455837	5015 77 4		259	1816 F-500X1000	/ St / FT	5376934	5009 22 7		276
1801 RK95	/ St / G	5378914	5015 76 6		258	1816 F-500X500	/ St / FT	5376873	5009 21 9		276
1801 SCH	Grey/ PS	5378679	5015 71 5		259	1818	/ St / FT	5377719	5012 01 5	/100 pc.	280
1801 VDE	Grey/ CuZn	5378556	5015 65 0		258	1819 20	/ TG / FT	5242710	3041 20 4	/pc.	273
1802 10 CU	/ Cu	5002260	5015 84 2		263	1819 20BP	/ TG / FT	5242772	3041 21 2		273
1802 10 VA	/ V2A	5002284	5015 86 6		263	1819 25	/ TG / FT	5242833	3041 25 5		273
1802 12 CU	/ Cu	5699354	5015 84 4		263	1819 25BP	/ TG / FT	5242956	3041 95 6		273
1802 14 CU	/ Cu	5699361	5015 84 7		263	1820 20	/ St	5243137	3042 20 0		273
1802 20 CU	/ Cu	5699408	5015 84 9		263	1820 25	/ St	5243199	3042 25 1		273
1802 5 CU	/ Cu	5002253	5015 83 0		263	2056N SAS 12 VA	8-12 / V2A	5432432	1167 01 4	/100 pc.	267
1802 5 VA	/ V2A	5002277	5015 85 4		263	2056N SAS 16 VA	12-16 / V2A	5432494	1167 02 2		267
1802 6 CU	/ Cu	5699330	5015 83 2		263	2056N SAS 22 VA	16-22 / V2A	5432555	1167 03 0		267
1802 8 CU	/ Cu	5699347	5015 83 6		263	2056N SAS 28 VA	22-28 / V2A	5432616	1167 04 9		267
1802 AH 10	/ V2A	5033677	5015 88 4		263	2056N SAS 8 VA	4-8 / V2A	5432371	1167 00 6		267
1802 AH 5	/ V2A	5033615	5015 88 0		263	2066 2M F	/ St / F	5046516	1117 02 5	/100 m	267
1802 KL	/ V2A	5033738	5015 89 0		263	2066 2M FS	/ St / FS	5046578	1117 03 3		267
1804	/ CuZn	5378495	5015 55 3		260	2500 20	/ St	5243311	3043 20 7	/pc.	273
1804 UP	/ CuZn	5378433	5015 54 5		261	2500 25	/ St	5243373	3043 25 8		273
1805 2 FT	200/ St / FT	5379096	5016 02 9		263	2510 20	/ St	5717492	3043 31 2		273
1805 2 FT	200/ St / FT	5379096	5016 02 9		281	2520 20	/ St	5243793	3043 70 3		274
1805 2 VA	200/ V4A	5922216	5016 09 6		281	2520 25	/ St	5243854	3043 75 4		274
1805 2 VA	200/ V4A	5922216	5016 09 6		263	2530 20	/ St	5243557	3043 40 1		274
1805 4 FT	302/ St / FT	5379157	5016 03 7		263	2530 25	/ St	5243618	3043 45 2		274
1805 4 FT	302/ St / FT	5379157	5016 03 7		281	2531 20	/ St	5642312	3043 90 8		274
1805 4 VA	302/ V4A	5800354	5016 11 8		281	2535 20	/ St	5453796	3043 91 6		274
1805 4 VA	302/ V4A	5800354	5016 11 8		263	2535 25	/ St	5453970	3044 91 2		274
1805 6 FT	404/ St / FT	5379218	5016 04 5		263	1807	/ Al	5379270	5016 14 2		281
1805 6 FT	404/ St / FT	5379218	5016 04 5		281						
1805 6 VA	404/ V4A	5922278	5016 12 6		281						
1805 6 VA	404/ V4A	5922278	5016 12 6		263						

# Type listing

Structure of the EAN number: Country code 40

Manufacturer code 1219 (for articles beginning with 0: 1010)

Individual EAN-C 5647589

Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page	Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page
2536 20	/ St	5643036	3044 90 4	/pc.	274	5052 V4A 30X3.5	30 x 3,5/ V4A	5800477	5018 70 6	/100 m	288
						5052 V4A 30X3.5	30 x 3,5/ V4A	5022015	5018 73 0		270
2536 25	/ St	5642978	3044 83 1		274	5052 V4A 30X3.5	30 x 3,5/ V4A	5022015	5018 73 0		288
2710 20	/ St / FT	5372370	5001 21 8		283	5700 A DIN		5400936	5106 02 8	/pc.	333
2710 25	/ St / FT	5372431	5001 22 6		283	5700 DIN		5400875	5106 00 1		333
2730 20 FT	/ St / FT	5372554	5001 40 4		283	5800 VA	/ V2A	5900436	5106 14 1		333
2730 20 VA	/ V2A	5635475	5001 36 6		283	5800 VZ	/ St / FS	5900375	5106 13 3		333
2730 25 FT	/ St / FT	5372615	5001 41 2		283	5900	/ St	5244813	3059 00 6		335
2745 20 MS	/ CuZn / Cu	5372851	5001 56 0		283	ASP-V11E1 4		5917717	5083 08 7		228
2745 20 MS	/ CuZn / Cu	5372851	5001 56 0		331	ASP-V24T 4		5917595	5083 06 0		228
2760 20 FT	101/ St / FT	5372912	5001 64 1		283	C 25-B+C 0		5919391	5095 60 3		142
2760 20 VA	101/ V2A	5635239	5001 61 7		283	C 25-B+C 0		5919391	5095 60 3		171
2760 25 FT	110/ St / FT	5372974	5001 66 8		283	C 25-B+C 1		5542957	5095 60 6		134
5000	/ St / F	5415695	5304 00 8	/100 pc.	316	C 25-B+C 1		5542957	5095 60 6		156
5001 DIN-FT	/ St / FT	5415879	5304 10 5		316	C 25-B+C 1		5542957	5095 60 6		171
5001 N-CU	/ Cu	5817574	5304 17 2		317	CNS 3-D-D	EN Black	5952817	5092 70 1		189
5001 N-FT	/ St / FT	5817512	5304 16 4		317	CNS-D-D	EN Light grey	5314837	5092 60 4		189
5001 ZN-CU	/ Zn / Cu	5415930	5304 11 3		316	DLS-BS		5685333	5082 38 2		228
5002 DIN-FT	/ St / FT	5416050	5304 20 2		317	DS-7 16 MW		5030881	5093 17 1		222
5003	/ TG / FT	5416234	5304 31 8		317	DS-BNC M/M		5391098	5093 26 0		221
5004 DIN-FT 12	/ TG / FT	5416357	5304 40 7		321	DS-BNC M/W		5391036	5093 25 2		220
5004 DIN-FT 20	/ TG / FT	5416418	5304 50 4		321	DS-BNC W/W		5390978	5093 23 6		220
5005 DIN-FT	/ St / F	5416470	5304 60 1		318	DS-F M/W		5022732	5093 27 5		222
5005 N-FT	/ St / FT	5817758	5304 66 0		318	DS-F W/W		5022619	5093 27 2		222
5009	/ St / F	5416951	5304 97 0		317	DS-N M/W		5805991	5093 99 6		221
5010 20 FT	/ St / FT	5503057	5304 52 0		321	DS-N W/W		5962243	5093 98 8		221
5011	/ St / FT	5417071	5304 99 7		280	DS-TNC MW		5087250	5093 27 0		221
5011	/ St / FT	5417071	5304 99 7		317	EKE-V		6001767	5492 80 7	/100 pc.	317
5011 VA M10	/ V4A	5629115	5334 93 4		280	FC-D	EN Pure white	5035053	5092 80 0	/pc.	188
5011 VA M10	/ V4A	5629115	5334 93 4		317	FC-ISDN-D	EN Pure white	5047223	5092 81 2		189
5011 VA M12	/ V4A	5959663	5334 94 2		280	FC-RJ-D	EN Pure white	5047254	5092 82 8		189
5011 VA M12	/ V4A	5959663	5334 94 2		317	FC-SAT-D	EN Pure white	5035176	5092 81 6		188
5052 DIN 20X2.5	/ St / FT	5680468	5019 34 0	/100 m	270	FC-TAE-D	EN Pure white	5035237	5092 82 4		188
5052 DIN 20X2.5	/ St / FT	5680468	5019 34 0		288	FC-TV-D	EN Pure white	5035114	5092 80 8		188
5052 DIN 25X3	/ St / FT	5694007	5019 34 2		270	FDB-2 24-M	32 22	5683339	5098 38 0		246
5052 DIN 25X3	/ St / FT	5694007	5019 34 2		288	FDB-2 24-N	32 22	5683384	5098 39 0		246
5052 DIN 30X3	/ St / FT	5694014	5019 34 4		270	FDB-3 24-M	32 22	5683346	5098 38 2		246
5052 DIN 30X3	/ St / FT	5694014	5019 34 4		288	FDB-3 24-N	32 22	5683391	5098 39 2		246
5052 DIN 30X3.5	/ St / FT	5680475	5019 34 5		288	F-FIX-10		5070054	5403 10 3	/100 pc.	293
5052 DIN 30X3.5	/ St / FT	5680475	5019 34 5		270	F-FIX-132	/ V2A	5613572	5403 33 0	/pc.	294
5052 DIN 30X3.5	/ St / FT	5680482	5019 34 7		288						
5052 DIN 30X3.5	/ St / FT	5680482	5019 34 7		270						
5052 DIN 30X3.5	/ St / FT	5680499	5019 35 0		288						
5052 DIN 30X4	/ St / FT	5680499	5019 35 0		270						
5052 DIN 30X4	/ St / FT	5680499	5019 35 0		288						
5052 DIN 40X4	/ St / FT	5680505	5019 35 5		270						
5052 DIN 40X4	/ St / FT	5680505	5019 35 5		288						
5052 DIN 40X5	/ St / FT	5680512	5019 36 0		270						
5052 DIN 40X5	/ St / FT	5680512	5019 36 0		288						

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Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page	Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page
F-FIX-16		5548713	5403 20 0	/100 pc.	292	isCon cut		5674641	5408 01 1	/pc.	311
F-FIX-B10	/ PP	5070085	5403 12 4		293	isCon DH	/ GFK	5674863	5408 04 3		313
F-FIX-B16	/ PP	5548959	5403 23 5		293	isCon H VA	/ V2A	5699668	5408 05 6		311
F-FIX-BASIS	/ PP	5034933	5403 32 4	/pc.	290	isCon H280 PA	/ PA	5674887	5408 04 9		313
F-FIX-JUNIOR	1000/ AI	5034872	5403 30 8		290	isCon H280 VA	/ V2A	5674870	5408 04 7		313
F-FIX-KL	/ V2A	5548775	5403 21 9	/100 pc.	293	isCon HS PA	/ PA	5674917	5408 05 4		312
F-FIX-S10		5070078	5403 11 7		293	isCon HS VA	/ V2A	5674726	5408 05 2		312
F-FIX-S16		5548898	5403 22 7		293	isCon PAE	/ V2A	5674719	5408 03 6		311
FL 20-CU	20 x 2,5/ Cu	5382331	5021 80 4	/100 m	270	isCon stripper		5674634	5408 00 9		311
FL 20-CU	20 x 2,5/ Cu	5382331	5021 80 4		288	isFang 3000	1240/ GFK	5670056	5408 94 2		313
FLD 110	122 86,2	5578413	5098 64 6	/pc.	238	isFang 3B-100	1000/ V2A	5670148	5408 96 8		290
FLD 12	13,5 9,5	5578376	5098 60 3		237	isFang 3B-100	1000/ V2A	5670148	5408 96 8		314
FLD 2-110	122 86,2	5578512	5098 85 9		240	isFang 3B-150	1500/ V2A	5674931	5408 96 9		290
FLD 2-12	13,5 9,5	5578444	5098 80 8		239	isFang 3B-150	1500/ V2A	5674931	5408 96 9		314
FLD 2-24	27 19	5578451	5098 81 6		239	isFang 3B-G1	270/ V2A	5674948	5408 97 1		291
FLD 24	27 19	5578383	5098 61 1		237	isFang 3B-G1	270/ V2A	5674948	5408 97 1		314
FLD 2-48	53 37,5	5578468	5098 82 4		239	isFang 3B-G2	340/ V2A	5674979	5408 97 2		291
FLD 2-5	8 5,5	5578529	5098 86 7		239	isFang 3B-G2	340/ V2A	5674979	5408 97 2		314
FLD 48	53 37,5	5578390	5098 63 0		237	isFang 3B-G3	430/ V2A	5674986	5408 97 3		291
FLD 5	6 4,2	5578369	5098 60 0		237	isFang 3B-G3	430/ V2A	5674986	5408 97 3		314
FLD 60	93 66	5578406	5098 63 8		238	isFang 5000	3340/ GFK	5670063	5408 94 6		313
FRD 110	122 86,2	5578338	5098 55 7		235	isFang TR100	40/ V2A	5670100	5408 95 6		314
FRD 12	13,5 9,5	5578291	5098 50 6		234	isFang TS40-50	40/ V2A	5670117	5408 95 8		314
FRD 2-24	27 19	5578420	5098 72 7		236	isFang TS50-60	30/ V2A	5670124	5408 96 0		315
FRD 24	27 19	5578307	5098 51 4		234	isFang TS50x50	30/ V2A	5670131	5408 96 4		315
FRD 24 HF	28 19,7	5578352	5098 57 5		233	isFang TW200	/ V2A	5670094	5408 95 4		314
FRD 2-5	6 4,2	5578437	5098 79 4		236	isFang TW30	30/ V2A	5670087	5408 95 2		314
FRD 48	53 37,5	5578314	5098 52 2		234	isFang TW80	80/ V2A	5670070	5408 95 0		314
FRD 5	6 4,2	5578284	5098 49 2		234	ISO-A-500	500/ AI	5542773	5408 80 6		310
FRD 5 HF	6 4,2	5578345	5098 57 1		233	ISO-A-800	800/ AI	5542834	5408 81 4		310
FS-V20	196 x 144 x 71	5397458	5099 80 3		251	ISOLAB	D/GB	5921738	5096 81 2		254
ISAV1000R	/ GFK	5004608	5408 84 9		310	KB MB		5709350	5089 66 0		183
ISAV1000W	/ GFK	5009733	5408 85 2		310	KB MB		5709367	5089 66 2		183
isCon 1000 SW		5674573	5408 00 2	/100 m	311	KNS IS-D		5688754	5092 52 3		192
isCon 1000 SW		5674627	5408 00 4		311	KNS-D		5864851	5092 50 7		192
isCon AP1-16 VA	/ V2A	5674696	5408 02 6	/pc.	313	KOAX B-E2 MF-C		5684916	5082 41 2		223
isCon AP2-16 VA	/ V2A	5674702	5408 02 8		313	KOAX B-E2 MF-F		5684855	5082 42 0		223
isCon connect	/ V2A	5674689	5408 02 2		311	LC 63		5509899	5096 97 0		125
						LE ERDER FT	1500/ St / FT	5617358	5000 30 0		272
						LE ERDER FT	1000/ St / FT	5018001	5000 29 7		272
						LE ERDER V4A	1500/ V4A	5708834	5000 33 5		272
						LE HAMMER-AC	/ St	5111641	3043 61 8		275
						LE HAMMER-B	/ St	5087137	3043 61 4		275
						LE HAMMER-B-II	/ St	5421627	3043 62 8		275
						LE HAMMER-H	/ St	5087076	3043 61 0		275
						LE HAMMER-SDS-M	/ St	5111160	3043 60 2		275
						LE HAMMER-W	/ St	5617419	3043 60 6		275
						LE KOPF	/ St / FT	5617297	3042 30 8		273
						LE SPITZE	/ St / FT	5617235	3041 40 9		273
						LFC		5425182	5096 78 6		254

# Type listing

Structure of the EAN number: Country code **40**

Manufacturer code **1219** (for articles beginning with **0: 1010**)

Individual EAN-C **5647589**

Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page	Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page
LSA-A-LEI	Grey	5525134	5084 00 8	/pc.	217	MC 125-B NPE		5966449	5096 86 3	/pc.	122
LSA-BF-180		5525370	5084 02 4		218	MC 50-B 0 VDE		5480730	5096 82 0		124
LSA-BF-24		5525431	5084 02 8		218	MC 50-B 0-OS		5051428	5096 82 5		124
LSA-B-MAG		5525318	5084 02 0		217	MC 50-B 3		5077046	5096 87 6		123
LSA-E		5525493	5084 03 2		218	MC 50-B 3+1		5077084	5096 87 8		122
LSA-E-LEI	Red	5525257	5084 01 6		217	MC 50-B 3+1-OS		5288244	5096 83 2		122
LSA-G	Light grey/ PA	5110750	5084 04 8		219	MC 50-B 3-OS		5288237	5096 83 1		123
LSA-M	/ St	5525554	5084 03 6		218	MC 50-B U VDE		5480792	5096 83 9		125
LSA-T-LEI	White	5525196	5084 01 2		217	MC 50-B VDE		5966388	5096 84 7		123
LSA-TOOL		5525615	5084 04 0		219	MC 50-B OS		5051411	5096 85 1		123
MB 1		5415732	5096 64 8		143	MC V3	/ Cu	5531135	5096 88 4		125
MB 1		5415732	5096 64 8		172	MC V4	/ Cu	5531197	5096 88 6		125
MB 1		5415732	5096 64 8		181	MCD 125-B NPE		5541394	5096 86 5		118
MB 1+FS		5415749	5096 64 9		143	MCD 50-B		5541158	5096 84 9		119
MB 1+FS		5415749	5096 64 9		172	MCD 50-B 0		5544517	5096 82 2		124
MB 1+FS		5415749	5096 64 9		181	MCD 50-B 0-OS		5051473	5096 82 7		124
MB 1+NPE		5415770	5096 65 0		143	MCD 50-B 3		5077077	5096 87 7		119
MB 1+NPE		5415770	5096 65 0		172	MCD 50-B 3+1		5077091	5096 87 9		118
MB 1+NPE		5415770	5096 65 0		181	MCD 50-B 3+1-OS		5288299	5096 83 6		118
MB 1+NPE+FS		5415787	5096 65 1		143	MCD 50-B 3+1-VG		5362036	5096 87 5		120
MB 1+NPE+FS		5415787	5096 65 1		172	MCD 50-B 3-OS		5288282	5096 83 5		119
MB 1+NPE+FS		5415787	5096 65 1		181	MCD 50-B 3-VG		5362029	5096 87 4		121
MB 2		5415794	5096 65 3		143	MCD 50-B OS		5051466	5096 85 2		119
MB 2		5415794	5096 65 3		172	MDP-2 D-24-T		5406860	5098 42 2		242
MB 2		5415794	5096 65 3		181	MDP-2 D-48-T		5406891	5098 44 2		243
MB 2+FS		5415800	5096 65 4		143	MDP-2 D-5-T		5406839	5098 40 4		241
MB 2+FS		5415800	5096 65 4		172	MDP-3 D-24-T		5406877	5098 42 7		242
MB 2+FS		5415800	5096 65 4		181	MDP-3 D-48-T		5406907	5098 44 6		243
MB 2+NPE		5067481	5096 65 5		143	MDP-3 D-5-T		5406846	5098 40 7		241
MB 2+NPE		5067481	5096 65 5		172	MDP-4 D-24-T		5406884	5098 43 1		242
MB 2+NPE		5067481	5096 65 5		181	MDP-4 D-24-T-10		5625131	5098 43 3		244
MB 2+NPE+FS		5067498	5096 65 7		143	MDP-4 D-48-T		5406914	5098 45 0		243
MB 2+NPE+FS		5067498	5096 65 7		172	MDP-4 D-5-T		5406853	5098 41 1		241
MB 2+NPE+FS		5067498	5096 65 7		181	MDP-4 D-5-T-10		5625124	5098 41 3		244
MB 3		5067504	5096 66 5		143	MK-B		5461111	5091 32 2	/VPE	255
MB 3		5067504	5096 66 5		172	MK-B		5461111	5091 32 2		333
MB 3		5067504	5096 66 5		181	M-Quick M25 SW	20-25 / PA	5505396	2153 78 7	/100 pc.	312
MB 3+FS		5067535	5096 66 7		143	ND-CAT6A/EA		5614364	5081 80 0	/pc.	223
MB 3+FS		5067535	5096 66 7		172	PCS		5461296	5091 43 8	/VPE	255
MB 3+FS		5067535	5096 66 7		181	PCS		5461296	5091 43 8		333
MB 3+NPE		5067542	5096 66 9		143	PCS-CS-D	EN	5461654	5091 68 3	/pc.	255
MB 3+NPE		5067542	5096 66 9		172	PCS-CS-D	EN	5461654	5091 68 3		334
MB 3+NPE		5067542	5096 66 9		181	PCS-CS-GB	GB	5896111	5091 69 1		255
MB 3+NPE+FS		5067559	5096 67 1		143	PCS-CS-GB	GB	5896111	5091 69 1	/VPE	334
MB 3+NPE+FS		5067559	5096 67 1		172	PCS-H		5461470	5091 52 7		255
MB 3+NPE+FS		5067559	5096 67 1		181	PCS-H		5461470	5091 52 7		333
MB 4		5067566	5096 68 0		143	PS3-B+C TNC+FS		5405535	5089 75 6	/pc.	146
MB 4		5067566	5096 68 0		172	PS3-B+C TNC-FS		5405528	5089 75 4		146
MB 4		5067566	5096 68 0		181	PS3-VA TNC		5405566	5089 76 8		148
MB 4+FS		5067597	5096 68 2		143	PS3-VA TNC+FS		5405580	5089 77 5		148
MB 4+FS		5067597	5096 68 2		172						
MB 4+FS		5067597	5096 68 2		181						
MB 50-3+NPE		5425144	5096 67 5		131						
MB 50-3+NPE+FS		5425151	5096 67 7		131						
MB-SG	Blue/ PA	5616375	5096 69 5		142						
MB-SG	Blue/ PA	5616375	5096 69 5		183						

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Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page	Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page
PS4-B+C TNS+FS		5405559	5089 76 3	/pc.	145	RK-FIX CU	/ V2A / Cu	5433736	5316 46 8	/100 pc.	324
PS4-B+C TT+TNS		5405542	5089 76 1		145	RK-FIX VA	/ V2A	5433729	5316 45 9		323
PS4-VA TT+FS		5405597	5089 77 7		147						
PS4-VA TT+TNS		5405573	5089 77 0		147						
P-TK		5017387	5086 01 9		184	S 9-CU	9/ Cu	5382218	5021 65 0	/100 m	271
P-TK+SAT		5017448	5086 02 3		184	S 9-CU	9/ Cu	5382218	5021 65 0		289
P-TK+TV		5017509	5086 02 7		184					/pc.	
						SC-TELE 4-C-G		5834793	5081 68 8		214
						SC-TELE 4-C-G		5834793	5081 68 8		214
RD 10	/ St / FT	5381617	5021 10 3	/100 m	270	SD09-V11 9		5916277	5080 06 1		227
RD 10	/ St / FT	5381617	5021 10 3		288						
RD 10-ALU	/ Al	5381976	5021 30 8		270	SD09-V24 9		5915973	5080 05 3		226
RD 10-ALU	/ Al	5381976	5021 30 8		288	SD15-V24 15		5916031	5080 15 0		226
RD 10-CU	/ Cu	5382096	5021 50 2		271	SD25-V11 25		5916390	5080 28 2		227
RD 10-CU	/ Cu	5382096	5021 50 2		289	SD25-V24 25		5916215	5080 27 4		226
RD 10-PVC	/ St / FT	5381730	5021 16 2		271						
RD 10-PVC	/ St / FT	5381730	5021 16 2		289	SD-Fix		5670735	5403 33 5		294
RD 10-V2A	/ V2A	5801375	5021 22 7		271						
RD 10-V2A	/ V2A	5801375	5021 22 7		289						
RD 10-V2A	/ V2A	5680567	5021 23 9		271					/100 pc.	
RD 10-V2A	/ V2A	5680567	5021 23 9		289	SQ M6	M6 15/ PC	5016069	2146 50 9		312
RD 10-V4A	/ V4A	5902058	5021 64 2		289	SQ PP	6 30/ PA	5016182	2351 70 6		312
RD 10-V4A	/ V4A	5902058	5021 64 2		271						
RD 10-V4A	/ V4A	5680581	5021 64 7		289	SQ-20 SW	Jet black 29/ PP	5655367	2146 16 4		312
RD 10-V4A	/ V4A	5680581	5021 64 7		271						
RD 8-ALU	/ Al	5381914	5021 28 6		270					/pc.	
RD 8-ALU	/ Al	5381914	5021 28 6		288	S-UHF M/W		5390732	5093 02 3		220
RD 8-ALU-T	/ Al	5901273	5021 29 4		270						
RD 8-ALU-T	/ Al	5901273	5021 29 4		288	S-UHF W/W		5390671	5093 01 5		220
RD 8-CU	/ Cu	5382034	5021 48 0		271	TKS-B	170 120	5578277	5097 97 6		233
RD 8-CU	/ Cu	5382034	5021 48 0		289	TV 4+1		5022978	5083 40 0		222
RD 8-FT	/ St / FT	5381556	5021 08 1		270	ÜSM-A		5080886	5092 45 1		190
RD 8-FT	/ St / FT	5381556	5021 08 1		288	ÜSM-A-2		5247098	5092 46 0		190
RD 8-PVC	Cream / Al	5067474	5021 33 2		271	ÜSM-A-4		5613596	5092 47 2		190
RD 8-PVC	Cream / Al	5067474	5021 33 2		289	ÜSM-A-TW		5613589	5092 47 0		190
RD 8-V2A	/ V2A	5680529	5021 23 5		271						
RD 8-V2A	/ V2A	5680529	5021 23 5		289	ÜSS 45-A-ALU	Aluminium paint	5006220	6117 46 7		191
RD 8-V4A	/ V4A	5680574	5021 64 4		271	ÜSS 45-A-RW	Pure white	6117611	6117 46 5		191
RD 8-V4A	/ V4A	5680574	5021 64 4		289	ÜSS 45-O-ALU	Aluminium paint	5006213	6117 47 5		191
						ÜSS 45-O-RW	Pure white	6117673	6117 47 3		191
RJ11-TELE 4-C		5680536	5081 92 0	/pc.	214	V 10-C/1-280		5155287	5093 41 4		178
RJ11-TELE 4-C		5680536	5081 92 0		215	V 20-C 3+NPE+FS		5616382	5094 76 4		153
RJ11-TELE 4-F		5680413	5081 93 9		215	V10 COMPACT 150		5246268	5093 37 8		176
RJ45 S-ATM 8-F		5462439	5081 79 3		223	V10 COMPACT 255		5076551	5093 38 0		176
RJ45 S-E100 4-B		5239956	5081 72 6		224	V10 COMPACT 385		5126041	5093 38 4		176
RJ45 S-E100 4-C		5239895	5081 73 4		224	V10 COMPACT-AS		5299448	5093 39 1		176
RJ45 S-E100 4-F		5239833	5081 74 2		224	V10-C 0-150		5158103	5093 40 0		180
RJ45-ISDN 4-C-G		5889458	5081 54 8		216	V10-C 0-280		5012825	5093 40 2		180
RJ45S-V24T 4-F		5502630	5081 64 5		225	V10-C 0-320		5012832	5093 40 4		180
RJ45S-V24T 8-F		5502692	5081 64 7		225	V10-C 0-385		5004660	5093 40 6		180
RJ45-TELE 4-C		5791119	5081 96 3		215	V10-C 1+NPE-280		5382799	5093 41 8		178
RJ45-TELE 4-F		5791058	5081 97 1		215	V10-C 3+NPE		5363903	5094 92 0		178
						V10-C 3+NPE+FS		5363941	5094 93 1		178
RK-FIX	/ St / FT	5433682	5316 45 0	/100 pc.	323	V10-C 3+NPE-320		5363934	5094 92 4		179

# Type listing

Structure of the EAN number: Country code **40**

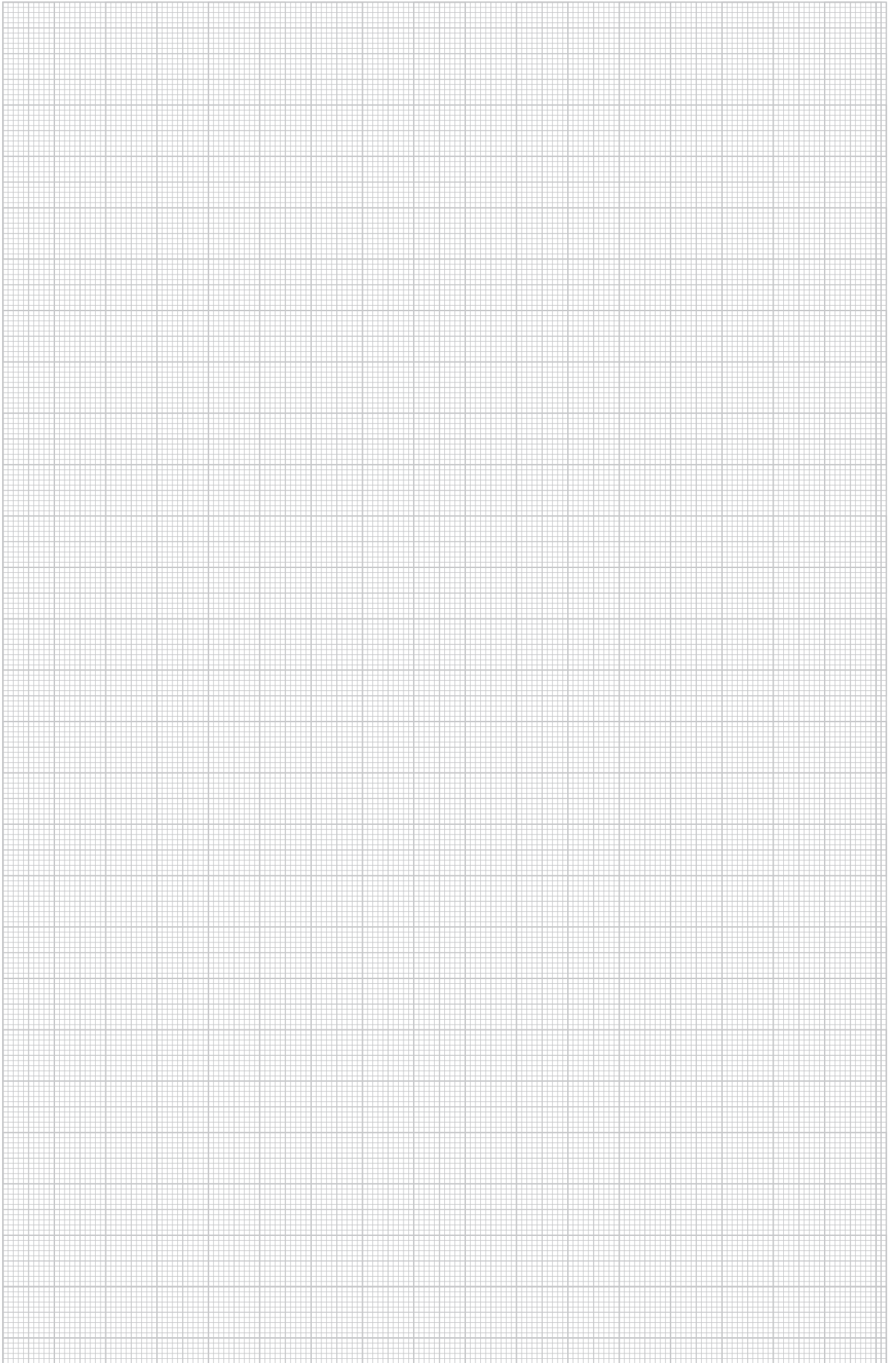
Manufacturer code **1219** (for articles beginning with **0: 1010**)

Individual EAN-C **5647589**

Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page	Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page
V10-C 3+NPEFS320		5363958	5094 93 5	/pc.	179	V20-C U-3 AS		5393917	5096 42 1	/pc.	144
V20-C 0-150	200	5519133	5096 70 7		169	V20-C U-3 AS		5393917	5096 42 1		173
V20-C 0-280	350	5396918	5099 60 9		169	V20-C U-3 AS		5393917	5096 42 1		182
V20-C 0-300PV	300	5708902	5099 61 1		209	V20-C U-3 FS-SÜ		5393559	5096 35 9		144
V20-C 0-320-SP	420	5570318	5099 84 8		169	V20-C U-3 FS-SÜ		5393559	5096 35 9		173
V20-C 0-335	420	5481270	5099 85 0		170	V20-C U-3 FS-SÜ		5393559	5096 35 9		182
V20-C 0-385	505	5396857	5099 59 5		170	V20-C U-3+NPE		5063407	5096 37 0		144
V20-C 0-440	585	5942498	5099 70 6		170	V20-C U-3+NPE		5063407	5096 37 0		173
V20-C 0-500PV	500	5708933	5099 70 8		209	V20-C U-3+NPE		5063407	5096 37 0		182
V20-C 0-550	745	5396970	5099 61 7		170	V20-C U-3+NPE-AS		5247104	5096 37 2		144
V20-C 0-75	100	5396734	5099 57 9		169	V20-C U-3+NPE-AS		5247104	5096 37 2		173
V20-C 1+FS-280		5406679	5094 72 7		159	V20-C U-3+NPE-AS		5247104	5096 37 2		182
V20-C 1+NPE+FS		5382911	5094 76 0		157	V20-C U-3PH-Y		5299455	5096 64 7		210
V20-C 1+NPE-150		5382966	5094 63 9		152	V20-C U-3PH-Y-FS		5648499	5096 64 6		210
V20-C 1+NPE-280		5382973	5094 65 0		156	V20-C U-4 AS		5393979	5096 44 8		144
V20-C 1+NPE-385		5382980	5094 66 6		162	V20-C U-4 AS		5393979	5096 44 8		173
V20-C 1-150		5406617	5094 67 7		154	V20-C U-4 AS		5393979	5096 44 8		182
V20-C 1-280		5406594	5094 61 8		158	V20-C U-4 FS-SÜ		5393610	5096 36 7		144
V20-C 1-385		5406655	5094 70 3		163	V20-C U-4 FS-SÜ		5393610	5096 36 7		173
V20-C 1-550		5406662	5094 71 3		166	V20-C U-4 FS-SÜ		5393610	5096 36 7		182
V20-C 2+AS-280		5393672	5096 37 5		160	V20-VA 0		5807612	5099 61 3		171
V20-C 2+FS-280		5374923	5094 63 2		159	V20-VA 1-385		5406716	5099 47 5		168
V20-C 2+FS-550		5374985	5094 63 6		167	V25-B+C 0-150	200	5965664	5097 08 8		141
V20-C 2+NPE+FS		5240235	5094 76 2		157	V25-B+C 0-280	350	5394099	5097 05 3		141
V20-C 2+NPE-150		5240044	5094 64 1		152	V25-B+C 0-320	420	5711551	5097 29 0		141
V20-C 2+NPE-280		5240068	5094 65 3		156	V25-B+C 0-385	505	5766636	5097 06 1		141
V20-C 2+NPEFS15		5240228	5094 75 0		153	V25-B+C 0-450PV	450	5708896	5097 06 5		209
V20-C 2-150		5382881	5094 67 9		154	V25-B+C 1+NPE		5382850	5094 45 7		134
V20-C 2-280		5382867	5094 62 1		158	V25-B+C 1+NPE+FS		5374886	5094 44 4		135
V20-C 2-385		5382898	5094 70 4		163	V25-B+C 1-150		5457473	5094 40 1		133
V20-C 2-550		5382904	5094 71 4		166	V25-B+C 1-280		5406556	5094 41 8		136
V20-C 2-PH-1000	1000	5478669	5094 61 7		203	V25-B+C 1-385		5406563	5094 43 1		140
V20-C 2PH-600	600	5708889	5094 61 3		202	V25-B+C 1NPE150		5382843	5094 44 8		132
V20-C 2PHFS-1000	1000	5709114	5094 61 5		203	V25-B+C 1NPEFS38		5374916	5094 44 6		139
V20-C 2PHFS-600	600	5709077	5094 57 2		202	V25-B+C 2+NPE		5239826	5094 46 0		134
V20-C 3+AS-280		5393733	5096 38 3		160	V25-B+C 2-150		5382812	5094 40 3		133
V20-C 3+FS-280		5240198	5094 73 1		159	V25-B+C 2-280		5382829	5094 42 1		136
V20-C 3+FS-385		5240280	5094 78 0		164	V25-B+C 2-385		5382836	5094 43 4		140
V20-C 3+FS-550		5240334	5094 79 2		167	V25-B+C 2NPE150		5239802	5094 45 1		132
V20-C 3+FS-SÜ		5393191	5096 25 1		161	V25-B+C 2-PH900	900	5478690	5097 45 7		201
V20-C 3+NPE+AS		5617471	5096 39 7		157	V25-B+C 2PHFS900	900	5709138	5097 45 8		201
V20-C 3+NPE+FS		5240242	5094 76 5		157	V25-B+C 3+AS		5945314	5097 18 5		137
V20-C 3+NPE-150		5240051	5094 64 4		152	V25-B+C 3+NPE		5239864	5094 46 3		134
V20-C 3+NPE-280		5240099	5094 65 6		156	V25-B+C 3+NPE+AS		5617532	5097 43 2		135
V20-C 3+NPE-385		5240112	5094 66 8		162	V25-B+C 3+NPE-FS		5239949	5094 51 0		135
V20-C 3+NPEFS38		5240303	5094 78 8		162	V25-B+C 3-280		5239734	5094 42 3		136
V20-C 3-150		5240129	5094 68 0		154	V25-B+C 3-385		5239758	5094 43 7		140
V20-C 3-280		5240020	5094 62 4		158	V25-B+C 3-FS280		5239925	5094 49 0		137
V20-C 3-385		5240150	5094 70 5		163	V25-B+C 3NPE150		5239819	5094 45 4		132
V20-C 3-550		5240174	5094 71 5		166	V25-B+C 3NPE385		5239888	5094 47 8		139
V20-C 3-PH-1000	1000	5478621	5094 60 8		203	V25-B+C 3NPEAS38		5542056	5097 11 1		139
V20-C 3PH-600	600	5708872	5094 60 5		202	V25-B+C 3NPEFS38		5239994	5094 52 6		139
V20-C 3PHFS-1000	1000	5648482	5094 57 4		203	V25-B+C 3-PH900	900	5478683	5097 44 7		201
V20-C 3PHFS-600	600	5709084	5094 57 6		202	V25-B+C 3PHFS900	900	5709121	5097 44 8		201
V20-C 4+AS-280		5393795	5096 39 1		160	V25-B+C 4+AS280		5394211	5097 19 3		137
V20-C 4+FS-280		5240204	5094 73 4		159	V25-B+C 4+FS-SÜ		5394396	5097 35 5		138
V20-C 4+FS-385		5240297	5094 78 3		164	V25-B+C 4-280		5239741	5094 42 6		136
V20-C 4+FS-550		5240341	5094 79 5		167	V25-B+C 4-385		5239765	5094 44 0		140
V20-C 4+FS-SÜ		5393252	5096 27 8		161	V25-B+C 4-FS280		5239932	5094 49 3		137
V20-C 4-280		5240037	5094 62 7		158	V25-B+C 4-FS-G		5240013	5094 55 2		138
V20-C 4-385		5240167	5094 70 8		163	V50-B+C 0-280	350	5361954	5093 72 4		130
V20-C 4-550		5240181	5094 71 8		166	V50-B+C 0-300PV	300	5708841	5093 72 6		209
V20-C U-2 AS		5393856	5096 41 3		144	V50-B+C 1+NPE		5688426	5093 65 3		128
V20-C U-2 AS		5393856	5096 41 3		173	V50-B+C 1+NPE+FS		5688433	5093 66 1		128
V20-C U-2 AS		5393856	5096 41 3		182	V50-B+C 2-PH600	600	5478553	5093 62 8		200
V20-C U-2 PH		5464457	5096 63 7		210	V50-B+C 2PHFS600	600	5709060	5093 62 9		200
V20-C U-2 PH+FS		5464464	5096 63 9		210	V50-B+C 3+FS280		5361916	5093 64 3		129
						V50-B+C 3+NPE		5425120	5093 65 4		128
						V50-B+C 3+NPE+FS		5425137	5093 66 2		128
						V50-B+C 3-280		5361893	5093 62 7		129
						V50-B+C 3-PH600	600	5478546	5093 62 3		200
						V50-B+C 3PHFS600	600	5709022	5093 62 5		200
						V50-B+C 4		5361909	5093 63 1		129
						V50-B+C 4+FS		5361923	5093 64 7		129

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Type	Dimensions/Colour/Div.	EAN-C.	Art. no.	Price	Page					
VB-MDP 10-MD	/ Cu	5410461	5098 47 0	/pc.	245					
VB-MULTIBASE250		5237358	5089 65 5		142					
VB-V10 COMPACT-2		5237341	5089 65 0		177					
VB-V10 COMPACT-4		5299400	5089 65 2		177					
VF110-AC DC	150	5578154	5097 63 1		194					
VF110-AC DC	150	5578154	5097 63 1		230					
VF110-AC DC-FS	150 200	5578192	5097 84 6		195					
VF110-AC DC-FS	150 200	5578192	5097 84 6		231					
VF12-AC DC	13,5	5578116	5097 45 3		193					
VF12-AC DC	13,5	5578116	5097 45 3		229					
VF2-110-AC/DCFS	150 200	5578253	5097 93 5		196					
VF2-110-AC/DCFS	150 200	5578253	5097 93 5		232					
VF2-230-AC/DC-FS	255 350	5578260	5097 93 9		196					
VF2-230-AC/DC-FS	255 350	5578260	5097 93 9		232					
VF2-24-AC/DC-FS	34 46	5578246	5097 93 1		196					
VF2-24-AC/DC-FS	34 46	5578246	5097 93 1		232					
VF230-AC/DC	255	5578161	5097 65 0		194					
VF230-AC/DC	255	5578161	5097 65 0		230					
VF230-AC/DC-FS	350 255	5578208	5097 85 2		195					
VF230-AC/DC-FS	350 255	5578208	5097 85 2		231					
VF230-AC-FS	255	5578215	5097 85 8		195					
VF230-AC-FS	255	5578215	5097 85 8		231					
VF24-AC/DC	34	5578123	5097 60 7		193					
VF24-AC/DC	34	5578123	5097 60 7		229					
VF24-AC/DC-FS	34 46	5578185	5097 82 0		195					
VF24-AC/DC-FS	34 46	5578185	5097 82 0		231					
VF48-AC/DC	60	5578130	5097 61 5		193					
VF48-AC/DC	60	5578130	5097 61 5		229					
VF60-AC/DC	80	5578147	5097 62 3		193					
VF60-AC/DC	80	5578147	5097 62 3		229					
VG 3-B TNC		5531074	5089 21 2		121					



# Terms and conditions of sale and delivery of the companies OBO BETTERMANN GmbH & Co. KG and OBO BETTERMANN Projekt und Systemtechnik GmbH, and OBO Befestigungselemente GmbH, Menden

1. All our supplies and services shall be governed exclusively by the following terms and conditions, including our additional terms and conditions for cable tray business transactions. Any terms and conditions of business and purchasing of the customer shall be valid only if we have acknowledged them in writing. Our quotations are without engagement; they are mere invitations to submit contract offers. Any and all transactions and agreements, including those entered into by our employees and agents shall only be binding upon our written confirmation or invoicing. The foregoing provision shall also apply to any modifications of the agreed formal requirements.

2. The documents and data pertaining to the quotation, such as illustrations, brochures, drawings, dimensions, loading capacity values and weight details are approximate only, unless they are expressly stipulated to be binding.

Samples are non-binding samples for inspection. Any purchase according to sample will be subject to customary deviations and deviations resulting from normal production processes. The properties of the sample shall be no guaranteed quality of the purchase object unless expressly stated otherwise in the confirmation of order. Samples must be returned to us at the latest within four weeks in perfect condition. If they are not returned within this period in proper condition, we shall be entitled to charge the purchase price for the sample in accordance with our current price list. All information on our products, in particular the illustrations, drawings, weight, dimension and performance data included in our quotations and printed matter shall be regarded as approximate average values and shall not represent any quality guarantee.

With regard to products made according to customer drawings, samples and other instructions of the customer, we will not provide any warranty nor assume any liability for the due and proper functioning of the product or for any other defects if and to the extent they are based upon the customer's specifications. The customer shall indemnify us from any third party claims, including claims for product liability as may be asserted against us for damages resulting from the products unless we have caused such damages by intent or gross negligence. The customer shall warrant that the manufacture and supply of products made in accordance with his instructions will not infringe any proprietary rights of third parties. Should any proprietary rights be asserted against us, we shall be entitled, without any legal review of the third party claims, to withdraw from the contract after hearing the customer, unless the third party withdraws the claims asserted against us under its proprietary rights within eight days by written declaration. The customer shall compensate us for any damage sustained as a result of the assertion of proprietary rights. In case of withdrawal, the work we have carried out so far shall be remunerated. Further rights under the statutory provisions shall not be affected thereby.

Any moulds, tools and design data produced by us for the execution of the order shall be our exclusive property. Unless expressly agreed otherwise, the customer shall not have any claims thereto, even if he has contributed to the costs of producing any such moulds, tools and design data.

3. The packing, shipping route and means of transportation shall be left to our discretion in the absence of any other agreements. They shall be charged at their cost price. We will take back undamaged cases, when being returned carriage paid, at 2/3 of the amount invoiced. The one-way or pool pallets used for transport shall be either exchanged upon taking delivery or returned. The smallest packing units stocked and listed may not be broken up for rationalisation reasons. In case of orders for different quantities, the nearest packing unit will be supplied.

We reserve the right to deviate from the agreed delivery quantity, in particular in the case of custom-made products, to a customary extent or in conformity with national or international standards. In case of a demand for adhering to a precise quantity, an express reference is necessary and subject to confirmation.

Master and call orders shall oblige the customer to accept the total quantity on which the master/call order is based. Where no particular call orders are specified in the contract, the total quantity of the master call order must be called within twelve months. If the customer fails to adhere to call deadlines, we shall be entitled to deliver and charge the total quantity in full after four weeks from written notice with reference to the consequences of any failure to call. Our rights arising from any default of the customer shall not be affected thereby.

4. Unless otherwise agreed, our prices are quoted ex works and do not include packing and insurance. The value added tax at the rate applicable on the date of dispatch will be added to our prices. The purchaser shall ensure the correctness of his VAT identification number, which he must notify to us immediately without being asked. He shall undertake to inform both us and the competent domestic tax authority without delay of any change in his name, address and VAT identification number.

Delivery shall be franco domicile within Germany, i.e. carriage and packing prepaid, if the net order value is in excess of € 1,200. For small orders below € 100 (net excluding value added tax), we shall invoice a lower quantity surcharge of € 10 (net) per order. Upon transfer of our supplies and services to a carrier or forwarding agent, at the latest upon their leaving our warehouse or supply plant, the risk shall pass to the recipient, even in case of deliveries free place of destination.

5. Delivery periods and delivery deadlines shall be approximate only unless we have expressly stated in writing that they are binding. Delivery periods shall commence upon receipt of our confirmation of order, but not before clarification of all execution details, ex place of delivery. The customer shall only be entitled to withdraw from the contract after having granted a reasonable extension of time. We reserve the right to make partial deliveries. Claims for damages and reimbursement of expenses - for any reason whatsoever - shall be subject to the provisions set out in article 10.

In the event of any circumstances that are beyond our control within the scope of normal operating risks and obstruct or make impracticable any delivery, we shall be entitled to suspend delivery by the duration of such obstruction plus a reasonable start-up period or to withdraw from the contract for the part not yet fulfilled. The purchaser can demand a statement from us as to whether we wish to deliver within a reasonable period or withdraw. If we fail to make such a statement, the purchaser may withdraw. Our notice to the purchaser shall be deemed to be sufficient evidence that we have been prevented from delivering.

Delivery time is extended in case of such events as labour disputes, strikes and lockouts, orders from the authorities, difficulties with the procurement of materials, spoiled work or post-processing, shutdowns and staff shortage as well as shortage of means of transport, and general occurrence of unforeseen events beyond our scope of influence, by the length of duration of these events.

6. Payments shall be made upon receipt of invoice less a 3% cash discount for payment within 10 days or net after 30 days from date of invoice. Erection work and all paid labour work must be paid within 10 days without deduction of any cash discount. In case of non-cash payments, the date of the credit note will be deemed to be the date of receipt of payment. Payments received shall always be credited first against costs, then against interest and then against the earliest liability. Cheques and bills of exchange shall only be accepted as means of payment. Any payment by bill of exchange shall be subject to a prior separate and written agreement, whereby all bill costs shall be borne by the customer and no discount can be granted. The customer shall have no right to refuse performance and no right of retention - for any legal reason whatsoever - unless we have acknowledged his claim beforehand in writing or his claim has the force of law.

The customer shall only be entitled to set off claims which have the force of law, are undisputed or acknowledged by us in writing.

7. We shall retain title to the goods supplied by us until all our claims arising from our business transactions with the customer have been satisfied - current account clause - and all bills of exchange or cheques submitted for payment by the customer have been honoured.

Any treatment or processing of goods subject to our retention of title (reserved goods) shall be carried out for us as the manufacturer in accordance with § 950 BGB (German Civil Code) without any obligation on our part. If our reserved goods are to be regarded as the main item or the main item is owned by the customer, full title to the new item shall pass to us when it is created. In other cases, we shall acquire a co-ownership interest in the new item in the proportion of the sales value of our reserved goods to the other goods used for the new item at the time of processing, intermingling, joining or mixing. The customer shall take custody of our ownership or co-ownership interest free of charge; it shall be treated as reserved goods.

Before transfer of title, our goods shall be neither pledged nor assigned as collateral without our prior consent. In addition, any third party rights or pledges shall be notified to us immediately and we shall be given all details and provided all documents necessary for intervention; otherwise the customer must bear our loss. In the latter case, our total claims against the customer shall also be immediately payable.

The customer shall be entitled to sell or to use our reserved goods in the ordinary course of business subject to the condition that the relevant claims are transferred in accordance with article 8 below. This right shall lapse upon the customer's failure to promptly meet his payment obligations towards us or in the event of any cheque or bill protests or his suspension of payments. In such cases, we shall be entitled to take back the goods provisionally at the

customer's expense and to sell them at our duly exercised discretion after a corresponding reminder has been sent to the customer. We will then pass the due amount to the customer's credit.

8. If our goods are sold before payment of our claim, the customer shall be obliged to retain our title against his purchaser until the goods have been paid for in full by the purchaser. The claim arising against the purchaser from such resale as well as any other ancillary rights or security interests of the customer resulting from the sale and any claims for compensation in case of damage to or destruction of our reserved property, including the relevant insurance sum shall hereby be assigned to us. We hereby accept this assignment. Where our co-ownership interest is sold, the relevant claims shall be assigned in the amount corresponding to the value of our interest.

The customer shall, at our request, inform us of his purchasers, notify them of the assignment made and provide us with any and all documents required to assert our rights.

As long as the customer meets his contractual obligations without delay, he shall be authorised to collect the claims assigned. He shall keep the amounts collected on our behalf separately and remit them to us immediately as soon and as far as our claims become due. The authorisation shall lapse in case of any cheque or bill protest of the customer or his definite suspension of payments. The customer shall bear the costs incurred for any action taken against third parties and shall advance them upon request.

If the security provided to us by the retention of title and the anticipatory assignment should exceed the claims to be secured by more than 20%, we shall, at the customer's request, release paid supplies of our choice. Upon payment of all our claims by the customer, assigned claims shall pass to the customer.

9. Any complaints for obvious defects regarding the quantity or quality of our supplies and services that are identifiable upon careful inspection shall without delay, but at the latest within the period of limitation of eight days from arrival of the goods at the address of the customer or the person appointed by him, be notified in writing to us, not to our representatives. Slight deviations in dimensions and designs within the scope of defined technical tolerances shall not give rise to any right of complaint. Any rejected goods may only be returned to us with our prior written authorisation.

In case of justified complaints within the prescribed period, we shall, at our option, take remedial action by way of subsequent performance, by rectifying the defect, supplying non-defective goods or providing a credit note for the lower value calculated.

We shall be entitled to refuse subsequent performance in accordance with the statutory provisions. If we refuse subsequent performance, if any subsequent performance remains unsuccessful or if the customer cannot be reasonably expected to accept any subsequent performance, the latter shall be entitled to withdraw from the contract in compliance with the provisions of the following sentences. The customer shall only be entitled to withdraw from the contract - where a withdrawal is not excluded by law - upon the unsuccessful expiry of a reasonable period for subsequent performance set by him, unless this period was not required under the statutory provisions (§§ 281 para. 2, 323 para. 2, 440, 441 para. 1 BGB (German Civil Code)).

In case of his withdrawal, the customer shall be liable for any deterioration, destruction or loss of use resulting from any negligence or intent on his part. Any claims for damages or reimbursement of expenses of the customer shall be subject to the provisions set out in article 10.

In the case of any fraudulent concealment of a defect or in the case of any provision of a quality guarantee for the goods sold at the time of the passing of risk within the meaning of § 444 BGB (German Civil Code) (seller's declaration that the object sold has a specific property at the time of the passing of risk and that the seller, regardless of any fault on his part, intends to be answerable for any and all consequences resulting from its absence), the customer's rights shall be exclusively governed by the statutory provisions.

We shall - in addition to the statutory grounds for refusal - also be entitled to refuse subsequent performance if and as long as the customer fails to send us, at our request, the rejected goods or a sample thereof, the customer shall have no right of withdrawal for any such refusal. We may further refuse any subsequent performance if the goods concerned have been altered or modified without our consent unless the customer can prove that the defect was not caused by such alteration or modification.

The limitation period for any claims arising from defects shall be one year; in the case of goods which have been used in accordance with their intended purpose for a building and have caused its defectiveness, the limitation period shall be two years. The provisions of §§ 478, 479 BGB (German Civil Code) on recourse in the chain of suppliers shall not be affected thereby.

10. In the case of a pre-contractual, contractual or non-contractual breach of duty, including unsatisfactory delivery, tortious conduct and producer's liability, we shall only be liable for compensatory damages and reimbursement of expenses - subject to further contractual or statutory liability requirements - in the case of intent, gross negligence or slightly negligent breach of a material contractual duty (contractual duty the infringement of which jeopardises the fulfilment of the object of the contract). However - except in the case of intent - our liability shall be limited to the typical contractual damage that was foreseeable at the time the contract was entered into.

The purchaser shall not be permitted to make a claim for expenses incurred in vain.

Except for any breach of material duties, our liability for slight negligence shall be excluded, but in any case be limited to the amount of the purchase price.

Any claim asserted by the customer or a third party for payment of a contractual penalty shall be excluded.

With regard to damages caused by delay, we shall only be liable for slight negligence up to the amount of 5% of the purchase price agreed with us.

The exclusions and limitations of liability set forth above shall not apply in the event that a guarantee is given with respect to the quality of the object sold within the meaning of § 444 BGB (German Civil Code) if a defect is fraudulently concealed or in the event of injury to life, physical injury or injury to health, or strict liability under the German Product Liability Act.

Any and all claims for damages against us, for any legal reason whatsoever, shall become statute-barred at the latest after one year from delivery of the goods to the customer, in the case of tortious liability from the time of knowledge, or grossly negligent ignorance, of the circumstances giving rise to the claim and the person liable to pay damages. This provision shall not apply in the case of liability for intent and in the event that a guarantee is given for the quality of the object sold, in the case of fraudulent concealment of a defect or in the event of injury to life, physical injury or injury to health, or strict liability under the German Product Liability Act. Any shorter limitation periods shall take precedence.

11. We shall be entitled to process and store any customer data obtained with regard to or in connection with the business relationship in accordance with the German Federal Data Protection Act, irrespective of whether such data is provided by the purchaser himself or by any third parties.

12. Place of performance for delivery and payment is Menden/Sauerland. The court of competent jurisdiction for any and all disputes, including disputes with regard to bills of exchange and cheques, is the Local Court (Amtsgericht) of Menden or, at our option, the District Court (Landgericht) of Arnsberg, irrespective of the value of the object in dispute. We shall, however, also be entitled to take legal proceedings against the customer at the place of his registered office.

German law shall be exclusively applicable. The application of international purchase laws is hereby excluded.

Should, for any reason whatsoever, individual provisions of our terms and conditions of sale and delivery be invalid, the validity and binding nature of the other provisions shall not be affected thereby. The customer agrees, that the invalid provision shall be replaced by a valid provision that comes as close as possible to the economic meaning of the invalid provision.

13. The prices of products made of brass and copper are subject to certain fluctuations that are based on the relevant DEL listings. The prices of our brass articles are based on a DEL listing of € 150 for Ms 58, those of our copper products on a DEL value for electrolyte copper of € 200.

In case of any increase or reduction in these prices by more than € 15, a five per cent surcharge or deduction shall be made for each 15 points. The calculation of any such surcharges or deductions shall be based on the DEL listing of the date of our receipt of the order.

Valid from August 2004



#### **QR Code**

The QR Code gives you direct access to our products on the Internet.

You can find further information on the QR Code at [www.obo-bettermann.com](http://www.obo-bettermann.com).

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