

E-MOBILITY



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MOBILITY IS CHANGING

The switch from fossil energy generation to renewable energies is underway. The new agreement of the UN climate conference COP21 on limiting global warming to max. +2 degrees and a 50% reduction in CO2 emissions by 2050 will accelerate this process and give the renewable energy market a strong upswing. The transport sector is still a CO2 giant. It accounts for 25% of emissions in Europe.

However: Our awareness of mobility is changing. Tomorrow's mobility is energy-saving and climate-friendly. Until now, only limited battery capacity and long charging times prevented e-mobility from breaking through. With new standards for charging systems with a range of 300-400 km and a charging time of 15-20 minutes, these obstacles are also a thing of the past. The electric mobility boom is imminent and the need for electric vehicles and reliable charging infrastructure will increase sharply.

In order to properly maintain and repair these electric vehicles, auto repair shops need suitable tools, consumables and well-trained specialists who are familiar with the new mobility.

As a well-known and long-standing partner to the automotive industry, Würth offers a wide range with all the necessary items and corresponding services for this area too. In addition, the Würth Academy offers the opportunity to support you in training your specialists on the subject of e-mobility through training and is also at your side with a comprehensive range of advice on the subject of charging infrastructure.

In this way we would like to prepare your specialists for the new mobility with this complete service, so that in the future you can continue to provide optimal support to your customers with a professional service.



xxxxxxx
Head of Division Auto Würth [Company]



Tino Früh
Head of Division Auto International



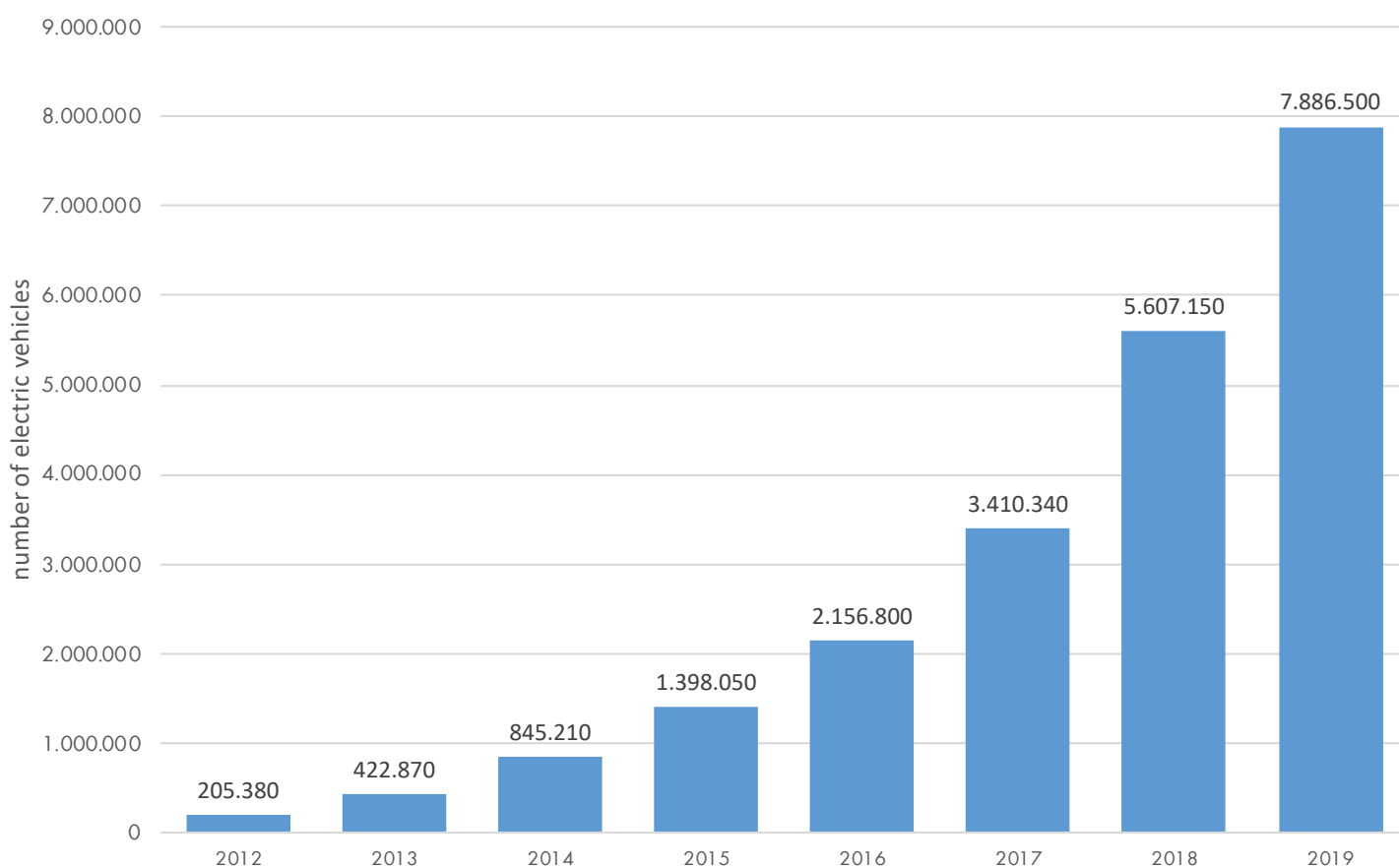
CHANGE OF MOBILITY

The electrification of the motor vehicle sector worldwide has progressed rapidly since 2010. In 2012, there were about 130,000 electric vehicles sold by 2018, that number grew to over 2 million electric vehicles being sold. Consumers were not only private individuals, but companies such as delivery services, public services such as postal services, are now relying on these electric-powered vehicles. A lot has to be done to master this change in the motor vehicle market. In many parts of the world not only does the infrastructure need to expand, but motor vehicle workshops must upgrade to accommodate this change in mobility.

By defining an electric vehicle as a vehicle that is electrically powered, regardless of the charging option (hybrid or fully electric), this worldwide statistic shows an extreme development on the automobile market.

In 2012, sales amounted to 205,380 vehicles. By 2019, the sales of electric vehicles increases nearly 4,000% to 7,886,500 in comparison to 2012. This significant development in recent years predicts an emerging displacement of internal combustion vehicles.

Global sales development of electric cars in the years 2012 to 2019



Publication date: 2020

Region: worldwide

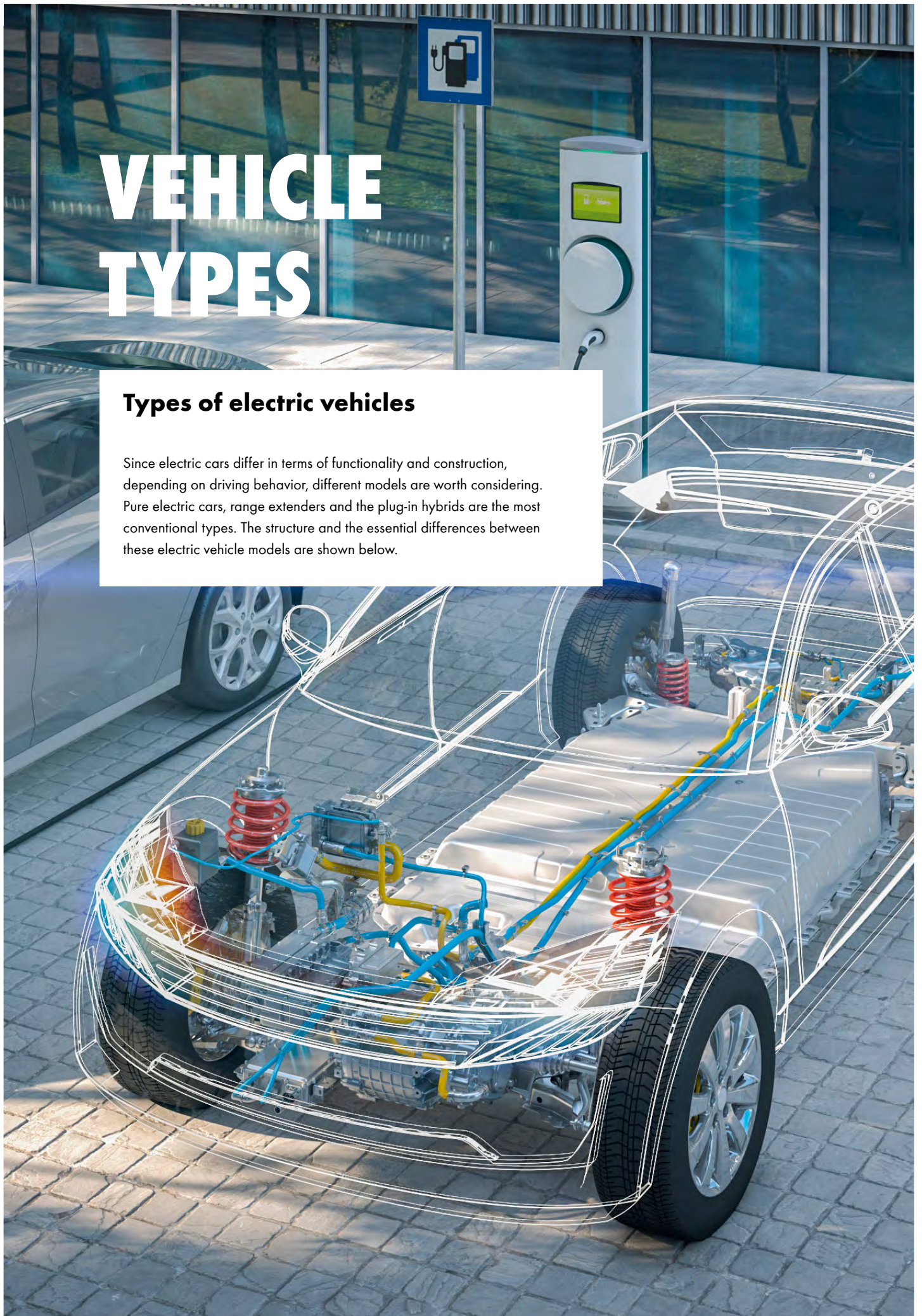
Survey period: 2012 to 2019

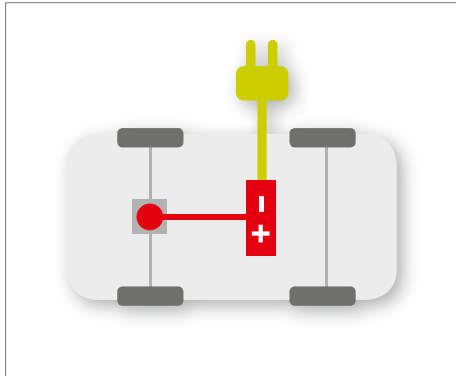
Notes and remarks: The data status refers to the beginning of the respective year.

VEHICLE TYPES

Types of electric vehicles

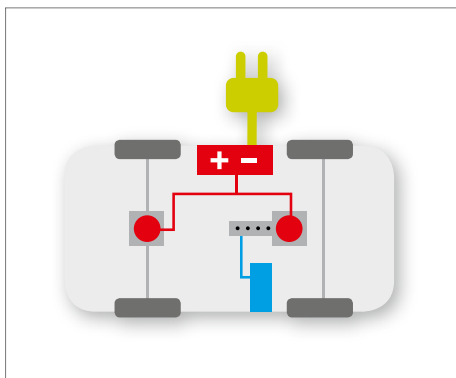
Since electric cars differ in terms of functionality and construction, depending on driving behavior, different models are worth considering. Pure electric cars, range extenders and the plug-in hybrids are the most conventional types. The structure and the essential differences between these electric vehicle models are shown below.





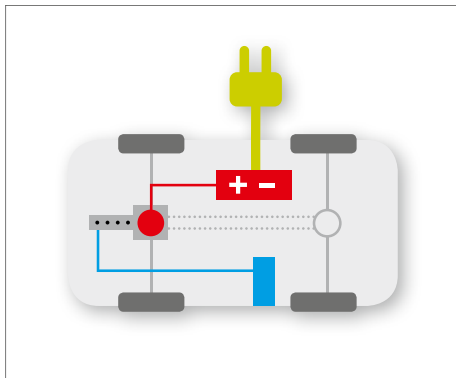
The pure electric car (BEV)

Pure electric vehicles, which are also called BEVs, an abbreviation of Battery Electric Vehicle, have only an electric motor installed. The BEV obtains the energy required for the drive from an energy source directly in the vehicle, the battery. This is charged via the power grid and stores the recovered braking energy during recuperation.



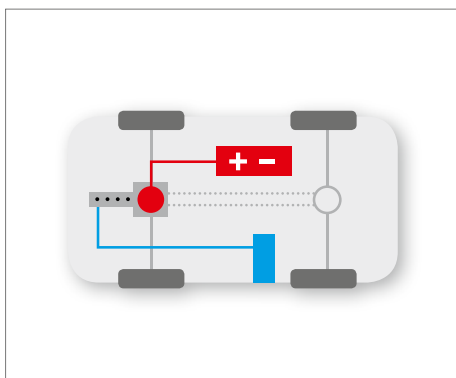
Range Extender (REEV)

Range Extended Electric Vehicles (REEVs) are electric vehicles that, in addition to the battery, are also equipped with an internal combustion engine, the so-called range extender. In contrast to PHEVs, this additional motor does not drive the vehicle directly, but only supplies electricity for the battery. The following mechanism is used to ensure that the vehicle does not come to a halt due to an empty battery while driving: The range extender is activated automatically as soon as the battery status is low and keeps it constantly low due to the charging current while driving. REEVs are offered by some car manufacturers because battery technology is currently still expensive.



Plug-in hybrid vehicle (PHEV)

Since hybrid vehicles (HEV = Hybrid Electric Vehicle) have an electric motor and internal combustion engine installed at the same time, they combine conventional and electric drive systems. With HEVs, the battery is charged via the internal combustion engine or the regenerated braking energy (recuperation). Plug-in hybrid electric vehicles (PHEVs) are vehicles that use a battery that can be charged directly from the electricity grid. A great advantage of hybrid vehicles is that they can cover shorter distances only using electricity and can also cover longer distances. As the battery technology is constantly being developed, an increase in the electrical portion is expected in the future.



Hybrid vehicle (HEV - Hybrid Electric Vehicle)

A hybrid is a vehicle that is equipped with an internal combustion engine and an electric motor. There are differences in construction and hybridization. In general, the electric motor supports the combustion engine especially when starting up, when the engine has poor efficiency. This means that fuel consumption can be reduced by 15-25%. The difference between a classic hybrid and a plug-in hybrid is that a full hybrid can only be operated electrically over very short distances.

- Fuel tank
- Combustion engine
- + - Battery
- Electric motor / generator

Source: <https://elektromobilitaet.dew21.de/arten-von-elektroautos>

TYPES OF PLUGS AND CHARGING CABLES



Charging cables for charging electric vehicles

Mode 2 charging cable

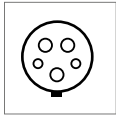
Mode 2 charging cables, of which there are many different variants, are often supplied from the factory by the respective car manufacturer. Since these cables can be connected to an ordinary household socket, the driver of an electric vehicle is able to charge at a household socket. The in-cable control box (ICCB) is connected between the vehicle connector and the connector and acts as a communicator between the electric vehicle and the charging connector.

Mode 3 charging cable

A mode 3 charging cable is a connecting cable between the electric vehicle and the charging station, which enables charging capacities of up to 43 kW. Since the type 2 plug is the standard in Europe, charging stations are often equipped with a type 2 socket. This means that both type 1 and type 2 electric vehicles can be charged. So, to charge the electric car, either a Mode 3 charging cable from type 2 to type 2 (example: Renault ZOE) or a Mode 3 charging cable from type 2 to type 1 (example: Nissan Leaf) is required.

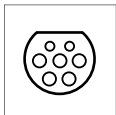
Source: https://www.mobilityhouse.com/de_de/ratgeber/elektromobilitat-ladekabelarten-und-steckertypen

Types of connectors for electric cars



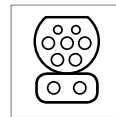
Type 1 connector

A single-phase type 1 connector enables charging powers of up to 7.4 kW (230 V, 32 A). Since this standard is primarily found in car models from Asia and is rarely used in Europe, there are hardly any charging stations where a type 1 charging cable is permanently attached.



Type 2 connector

In Europe, the widely used three-phase plug is the standard which allows charging capacities of up to 22 kW (400 V, 32 A) in private homes and up to 43 kW (400 V, 63 A) at public charging stations. Since these are usually equipped with a type 2 socket, to which each mode 3 charging cable can be connected, it is possible to charge electric vehicles with both type 1 and type 2 plugs. The so-called Mennekes connector (type 2) is attached to the charging station for all mode 3 cables.



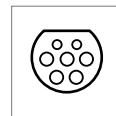
Combo plug (Combined Charging System CCS)

The combo plug (CCS) extends the type 2 plug via a quick charging function with two additional power contacts. This connector is intended to support AC and DC charging (alternating and direct current charging) with up to 170 kW, although in practice the value is more likely to be 50 kW.



CHAdeMO plug

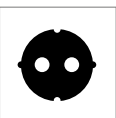
This is a fast charging system that was developed in Japan and enables charging capacities of up to 100 kW, although most public charging stations only provide a capacity of up to 50 kW. Electric vehicles that are compatible with the CHAdeMO plug are offered by the car manufacturers BD, Otomotive, Citroën, Honda, Kia, Mazda, Mitsubishi, Nissan, Peugeot, Subaru, Tesla (with adapter) and Toyota.



Tesla Supercharger

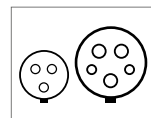
Tesla's Superchargers are a modified version of the Mennekes Type 2 plug and allow 80% charging of the Model S within 30 minutes at a charging capacity of up to 120 kW DC. While Tesla Superchargers are not yet available for other vehicle brands, charging is a free service for Tesla customers.

Plugs at home, in garages and on the go



Schuko sockets

Schuko sockets, the common household socket in most of continental Europe, are sometimes attached to public charging stations and allow all electric vehicles to be charged using a mode 2 charging cable. Although a charging power of up to 3.7 kW (230 V, 16 A) can be achieved with appropriate protection, a maximum charging power of 2.3 kW (230 V, 10 A) is recommended without checking the socket beforehand.



CEE plug

The CEE plug comes in different versions. First there is the so-called "camping" plug, which is the single-phase, blue option and allows a charging capacity of up to 3.7 kW (230 V, 16 A). There is also a three-phase, red version for industrial sockets. While the small industrial plug (CEE16) allows charging powers of up to 11 kW (400 V, 16 A), the large industrial plug (CEE32) can achieve charging capacities of up to 22 kW (400 V, 32 A).

Charging times and vehicle overview

Just as vehicles with internal combustion engines differ from one another, cars with electric motors also have to be considered differently from one another. Each vehicle manufacturer currently has its own requirements based on the properties of the vehicle.

A more important property is, for example, the vehicle charging time. This indicator is suitable for differentiating between vehicles. The following table serves as an illustrative basis in which selected, popular manufactured models are compared.

Car model	Battery capacity	Total range electric	Charging capacity AC	Charging time at the AC charging station	Charging capacity DC	Charging time at the DC charging station	Charging time at the socket	
AUDI								
e-tron 55	95 kWh	400 km	22 kW	4.5 h	n/a	n/a	42 h	Type 2
BMW								
i3 (60 Ah)	18.8 kWh	190 km	4.6 kW	4.5 h	50 kW	30 min (80%)	8.5 h	Type 2
Peugeot								
iOn	14.5 kWh	150 km	3.7 kW	5 h	50 kW	15 min (80%)	6.5 h	Type 1
Renault								
Fluence Z.E.	22 kWh	185 km	3.6 kW	6.5 h	-	-	10 h	Type 2
TESLA								
Model S 70 D	70 kWh	470 km	16.5 kW	4.5 h	n/a	n/a	31 h	Type 2
Model X 75 D	75 kWh	417 km	16.5 kW	5 h	n/a	n/a	33 h	Type 2
Toyota								
Prius Plug-In Hybrid (up to 2016)	4.4 kWh	25 km	2.8 kW	1.5 h	-	-	2.5 h	Type 1
VOLKSWAGEN								
e-up!	32.3 kWh	260 km	7.2 kW	5 h	40 kW	60 min (80%)	14 h	Type 2
e-Golf	35.8 kWh	300 km	7.2 kW	5 h	n/a	n/a	16 h	Type 2

Source: https://www.mobilityhouse.com/de_de/ratgeber/ladezeitenuebersicht-fuer-elektroautos#tesla

Voltage classes

Another characteristic for differentiating electric vehicles is the voltage classes. Among other things, working methods and safety regulations for the workshop can be derived from this. The table below shows how many different voltage classes exist and how they differ. The differences between a partially electric and a fully electric vehicle are particularly striking.

	max. EM motor capacity	max. EM motor torque	DC voltage max. (generator)	DC voltage min. (motor)	max. current DC	max. current AC	Speed ratio EM / crankshaft or max. speed EM	Capacity ratio max./ duration
Mild Hybrid								
12 V	4 kW	50 Nm	15 V	12 V	333 A	350 A	3	2
48 V	12 kW	150 Nm	60 V	36 V	333 A	500 A	1	2
HV	20 kW	150 Nm	200 V	120 V	167 A	500 A	1	2
Full Hybrid/Plugin								
mid	60 kW	200 Nm	400 V	300 V	200 A	600 A	1	2
power	100 kW	300 Nm	450 V	250 V	400 A	800 A	1	2.5
EV (Batt/RE/FC)								
Compact car	60 kW	200 Nm	400 V	300 V	200 A	250 A	10-15 rpm	1.5
medium	100 kW	300 Nm	400 V	300 V	333 A	450 A	10-15 rpm or up to 20 rpm	1.5
Sports	180 kW	500 Nm	450/800 V	300/600 V	550/280 A	1,000/500 A	up to 20 rpm	2

SAFETY

Safety steps

It is essential to follow the procedure for disconnecting the respective manufacturer's vehicle. Rescue cards from the fire brigade can be used as an aid. The following steps describe a sample scenario and illustrate the uses of the tool and the personal protective equipment. This example does not serve as a work instruction.





1 Place the vehicle in the parking position, remove the key from the vehicle and secure the vehicle against unauthorized access.



2 Attach a sign to the vehicle, which signals that the vehicle is not yet disconnected, and additionally position the triangular cap on the roof.



3 Prepare the tool and protective equipment (safety glasses, insulated tools, cable protection and insulated gloves).



4 Switch off the vehicle electrical system (12 V in this example) by disconnecting the negative pole of the battery and isolating the negative cable with a cable protector.



5 Switch off the high-voltage system at the isolating plug or isolating switch and, if possible, secure it with a lock to prevent it from being switched back on. If it is a disconnect plug, keep it in a place that is not accessible to third parties.



6 Depending on the vehicle manufacturer, the vehicle must now be checked for absence of voltage. This process can be found in the relevant documentation from the vehicle manufacturer.



7 Place a sign on the vehicle that indicates that the vehicle is now disconnected.

SAFETY

Safety signs and labels

The vehicle manufacturer's instructions must always be observed when putting signs up in the workshop. If it is a free or non-brand-specific workshop, the DGVU regulations must be consulted in Germany.



Side marking Din A4

Front:
Warning high voltage symbol
Vehicle is not disconnected
Please contact the responsible mechanic

Back:
"Open switch" symbol
Vehicle is disconnected and
de-energized Name and telephone
number of the responsible mechanic



Signal cone for vehicle roof

Signal cone which is placed on the vehicle roof to show that it is an electric vehicle.



Warning sign - dangerous electrical voltage

This sticker is suitable for affixing in the workshop, especially for marking workplaces for electric vehicles.



Further signage for the workshop

These signs serve as safety extensions for the workshop. Among other things, they can be used for electric vehicle charging boxes that have to be opened for maintenance purposes or retro-fitted fuse boxes that have to be installed, especially for electric mobility.

With our signage system our customers are fully equipped.



WARNING AND BARRIER EQUIPMENT



Barricade post with pull-out belt

Post system for a mobile, primarily visual or symbolic barrier. The pull-out belt can be attached to another post, wall cassette or wall clip.

- Portable and flexible, space-saving storage of individual parts
- 4-way belt cassette
3 belts can be attached per post
- Automatic retractor with brake function
Safe return and storage of the barrier belt
- Bottom plate with tare weight
Flexible use and secure footing
- Post and belt colours have a signalling effect
- The barrier can be flexibly configured using wall cassette with belt and wall clip



Height	1000 mm
Colour of belt	Yellow/black
Belt width	50 mm

Colour	Material	Belt length	Art. No.	P. Qty./unit
Black	Metal	9000 mm	0957 595 005	1
Yellow, Black	Metal	3000 mm	0957 595 002	2
Yellow, Black	Plastic	4000 mm	0957 595 001	2

Two-tone post, unweighted

To mark off the perimeter around an electric or hybrid vehicle

Art. No.	0997 857 607
Base plate length x base plate width	280 x 280 mm
Height	900 mm
Diameter	50 mm
Colour	Black, Yellow
Material	PVC - Polyvinyl chloride
P. Qty./unit	1



Wall cassette with belt pull-out for barriers

Alternative to a bollard if a permanent barrier is required or space is limited.

Colour: Yellow-black
Width: 50 mm
Length: 4000 mm

Art. No. 0957 595 020
P. Qty./unit 1

Colour: Yellow-black
Width: 50 mm
Length: 8000 mm

Art. No. 0957 595 025
P. Qty./unit 1

Colour: Yellow-black
Width: 50 mm
Length: 3000 mm

Art. No. 0957 595 021
P. Qty./unit 1

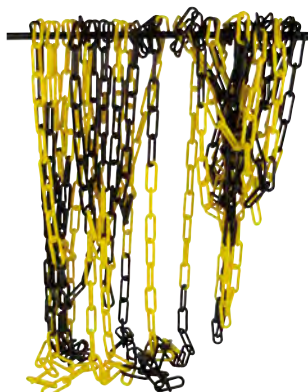


Plastic chain

For blocking off, securing and use as rain run-off chains

Diameter: 6 mm
Colour: Yellow-black
Length: 25 m

Art. No. 0997 857 608
P. Qty./unit 1



Wall clip for pull-out barrier tapes

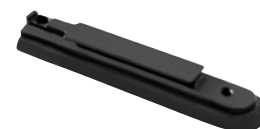
Simple placement of barrier tape end pieces in barrier post and wall cassettes with belt extraction.

Colour: Black

Art. No. 0957 595 030
P. Qty./unit 1

Colour: Black

Art. No. 0957 595 031
P. Qty./unit 1



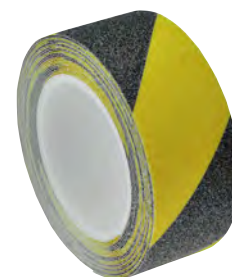


Warning adhesive tape, non-slip, standard

Slip resistance R13 according to DIN 51130

Length: 6 m
 Width: 50 mm
 Colour: Yellow-black
Art. No. 0812 44 672
 P. Qty./unit 1

Length: 6 m
 Width: 75 mm
 Colour: Yellow-black
Art. No. 0812 44 673
 P. Qty./unit 1

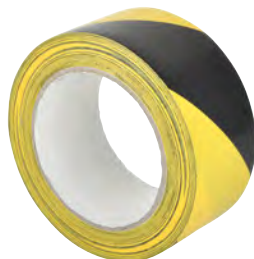


Warning marking adhesive tape

Quick and easy to apply and virtually no residue when removed

Length: 33 m
 Width: 50 mm
 Colour: Yellow-black
Art. No. 0812 44 660
 P. Qty./unit 1

Length: 33 m
 Width: 75 mm
 Colour: Yellow-black
Art. No. 0812 44 661
 P. Qty./unit 1

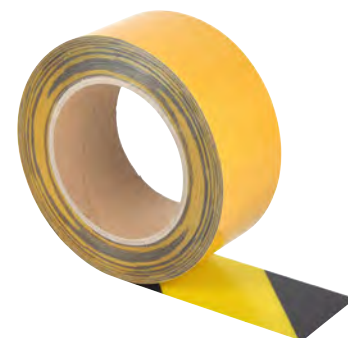


Warning marking adhesive tape Heavy Duty

Adhesive tape with thick material layer for simple, universal bonding.

Length: 10 m
 Width: 50 mm
 Colour: Yellow-black
Art. No. 0812 44 664
 P. Qty./unit 1

Length: 10 m
 Width: 75 mm
 Colour: Yellow-black
Art. No. 0812 44 665
 P. Qty./unit 1



Warning tape

To close off, secure and mark hazard zones, construction sites, construction pits, plots of land, paths etc.

Width: 80 mm
 Length: 500 m
Art. No. 0899 615 002
 P. Qty./unit 2



Plastic chain

For blocking off, securing and use as rain run-off chains

Diameter: 6 mm
 Colour: Red-white
 Length: 25 m
Art. No. 0899 610 612
 P. Qty./unit 1

Diameter: 8 mm
 Colour: Red-white
 Length: 25 m
Art. No. 0899 610 812
 P. Qty./unit 1





Tetrahedral warning sign magnetic base e-mobility

warning sign with "lightning arrow" and magnetic foot

- The warning pyramid for self-construction is equipped with a magnetic foot.
- The tetrahedronic warning sign of the lightning arrow and the pictograms "Warning of dangerous electrical voltage" according to DIN 4844 D-W008 can be seen on all three sides.

Art. no. 0967 933 501

P.Qty./unit 1

Safety and warning sign — dangerous electrical voltage

Self-adhesive

Limb length	Art. No.	P. Qty./unit
25 mm	0967 933 01	100
50 mm	0967 933 02	50
100 mm	0967 933 03	50



TEST EQUIPMENT



Infrared laser thermometer

For contact-free measurement of surface temperatures, with integrated laser pointer.



Suitable for temperature measurement of the batteries

Art. No.	0715 53 110
Min./max. temperature measuring range	-50 to 650 °C
Thermometer measuring cone	12:1
Nominal voltage	9 V/DC
Min./max. spectral range	8-14 µm
Reaction time	150 ms
Automatic switch-off	5 s
Rechargeable battery/battery designation	9 V block; PP3; F22
P. Qty./unit	1

Digital clip-on ampere meter AM 600 AC/DC

Digital clip-on ampere meter with extensive measuring options, effective value measurement (TRMS), auto-range function and LED measuring point illumination for professional use in trade and industry.

- The Würth AM 600, certified for safe use in CAT III 600 V environments, offers those functions that are essential to detecting malfunctions and numerous problems in electrical and electronic systems.
- Properties:
 - Suitable for measuring AC/DC current, AC/DC voltage, resistance, continuity, diodes, frequency and capacity
 - Can be used for AC/DC voltages up to 600 V and AC/DC currents up to 600 A
 - Resistance measurement up to 60 MΩ
 - Min/max key for displaying the maximum or minimum measured value or difference between the two values
 - Toggling between manual range switchover and auto-range
 - Display hold function
 - Automatic switch-off after 15 min
 - Fused inputs to protect the measuring instrument
 - LCD display for 6000 digits
 - Complies with standard EN 61010-2-032



Length x width x height: 210 x 80 x 35 mm

Art. No. 0715 53 715

P. Qty./unit 1



Two-pin voltage tester Multi-Tester Pro II LCD

Overvoltage category CAT IV (1000 V) – suitable for use in electrical installation and servicing work, and for testing hybrid and electric vehicles and photovoltaic systems

- Test equipment with maximum safety level (CAT IV 1000 V)
- No presetting, intuitive operation
Automatic testing range selection
- Voltages can also be displayed without battery
Visual and vibratory warning from 35 V AC/DC when operating with batteries
- FI/RCD test using two buttons
Intentional triggering of the FI switch facilitates push-button activation of the load so that the protective conductor can also be measured.
- Screwable 4-mm test probe adapter
 - Enhanced hold in safety socket and CEE socket
 - Suitable for narrow test openings
- Energy-saving
Automatic shut-off device

Two-pin voltage tester Multi-Tester Pro II LED

Overvoltage category CAT IV (1000 V) – suitable for use in electrical installation and servicing work, and for testing hybrid and electric vehicles and photovoltaic systems

- Test equipment with maximum safety level
- Indication of voltages also possible without battery
- FI/RCD test with two keys
- Enhanced hold in safety socket and CEE socket
- Suitable for narrow test openings

Art. No. 0715 53 165

P. Qty./unit 1

CAT IV 1000V



Art. No. 0715 53 175

P. Qty./unit 1

CAT IV 1000V



Mini digital multimeter

Small meter for measuring direct and alternating current, resistance testing, continuity testing, diode testing and contactless voltage testing.

- The test leads can be fastened to the rear of the device; this protects them from damage and prevents injury from the measuring tips
- Permanently attached test leads, data hold, diode testing, continuity testing, integrated LED pocket torch and automatic range detection
- With robust, splash-proof rubber housing and membrane keyboard

Art. No. 0715 53 370

P. Qty./unit 1



Automotive multimeter mm 50/20

Modern, digital multimeter, specially developed for professional applications in garages.

- Enables measurements that are specifically required in the vehicle environment
In addition to conventional measurements, measurements can also be performed for rotation speed, closing angle and duty cycle.
- Measurements possible up to 20 amperes (caution: only up 50 volts!)
Conventional multimeters measure up to 10 amperes, which is not sufficient for modern vehicles under certain circumstances.
- Scope of delivery
 - Automotive multimeter
 - Measuring cables
 - Crocodile terminals
 - Temperature sensor
 - Calibration certificate
 - On-call bag
 - User handbook

Art. No. 0715 53 440

P. Qty./unit 1



Digital multimeter MM 600 TRMS

Modern, digital multimeter with effective value measurement (TRMS), cable break detector and LED pocket torch for professional use in trade and industry.

- The Würth MM 600, certified for safe use in CAT IV 600 V environments, offers essential functions for the detection of malfunctions and numerous problems in electrical and electronic systems.
- Properties:
 - Suitable for measuring AC/DC current, AC/DC voltage, resistance, continuity and diodes
 - Can be used for AC/DC voltage up to 600 V, and also AC/DC current up to 10 A
 - Resistance measurement up to 20 MΩ
 - Contactless voltage tester (visual and acoustic) for quick detection of cable breakage
 - Display saving (hold function)
 - Automatic shut-off after 15 min
 - Fused inputs for protecting the measuring device
 - LCD display with 2000 digits
 - Conforms to EN Standard 61010-2-033

Art. No. 0715 53 415

P. Qty./unit 1



TOOL ASSORTMENTS



Tool case

32 pieces in system case 8.4.2. Especially suitable for electric and hybrid vehicles.

Contents for Art. No.	
5964 502 002	<p>2 x Electrical insulating tape 0,15 x 15 x 10 mm; 1 x Two-pin voltage tester Multi-Tester Pro II LED; 1 x Safety glasses CEPHEUS®; 1 x Voltage protective glove Gr. 10; 3 x Insulating caps 3.5 kV; 1 x VDE snipe nose pliers DIN ISO 5745, IEC 60900 200 mm; 1 x VDE combination pliers DIN ISO 5746 IEC 60900 180 mm; VDE screwdriver PH recessed head: 1 x 1, 1 x 2; VDE screwdriver Flat slotted: 1 x 0,6 x 3,5, 1 x 1,0 x 5,5; 1 x VDE 3/8 inch ratchet 200 mm; 1 x VDE 3/8 inch extension 150 mm; 3/8-inch VDE socket wrench: 1 x lang 8 mm, 1 x lang 10 mm; 1 x 3/8-inch VDE socket wrench lang 12 mm; 1 x 3/8 inch VDE socket wrench Hexagon socket 4 mm; 3/8 inch VDE socket wrench Hexagon: 1 x 8 mm, 1 x 10 mm, 1 x 12 mm, 1 x 13 mm, 1 x 14 mm, 1 x 17 mm; Box wrench VDE: 1 x 8 mm, 1 x 10 mm, 1 x 12 mm, 1 x 13 mm, 1 x 14 mm, 1 x 17 mm;</p>

Length x width x height: 500 x 380 x 140mm

Art. No. 5964 502 002

P. Qty./unit 1



Tool case

16 pieces in system case 8.4.1. Especially suitable for electric and hybrid vehicles.

- Large selection

Tool case equipped with essential VDE tools and accessories

Contents for Art. No.	
5964 502 001	<p>1 x VDE screwdriver Flat slotted 1.0 x 5.5 mm; 1 x VDE screwdriver PH recessed head 2; 1 x VDE snipe nose pliers DIN ISO 5745, IEC 60900 210 mm; 1 x VDE 3/8 inch extension 150 mm; 1 x VDE 3/8 inch ratchet 200 mm; 3/8-inch VDE socket wrench: 1 x 8 mm, 1 x 10 mm, 1 x 12 mm; 1 x Two-pin voltage tester Multi-Tester Pro II LED; 3 x Insulating caps 3.5 kV 8-14 mm; 1 x Safety glasses CEPHEUS®; 1 x Voltage protective glove Size: 10; 2 x Electrical insulating tape 15 mm, 10 m; 1 x System case 8.4.1</p>

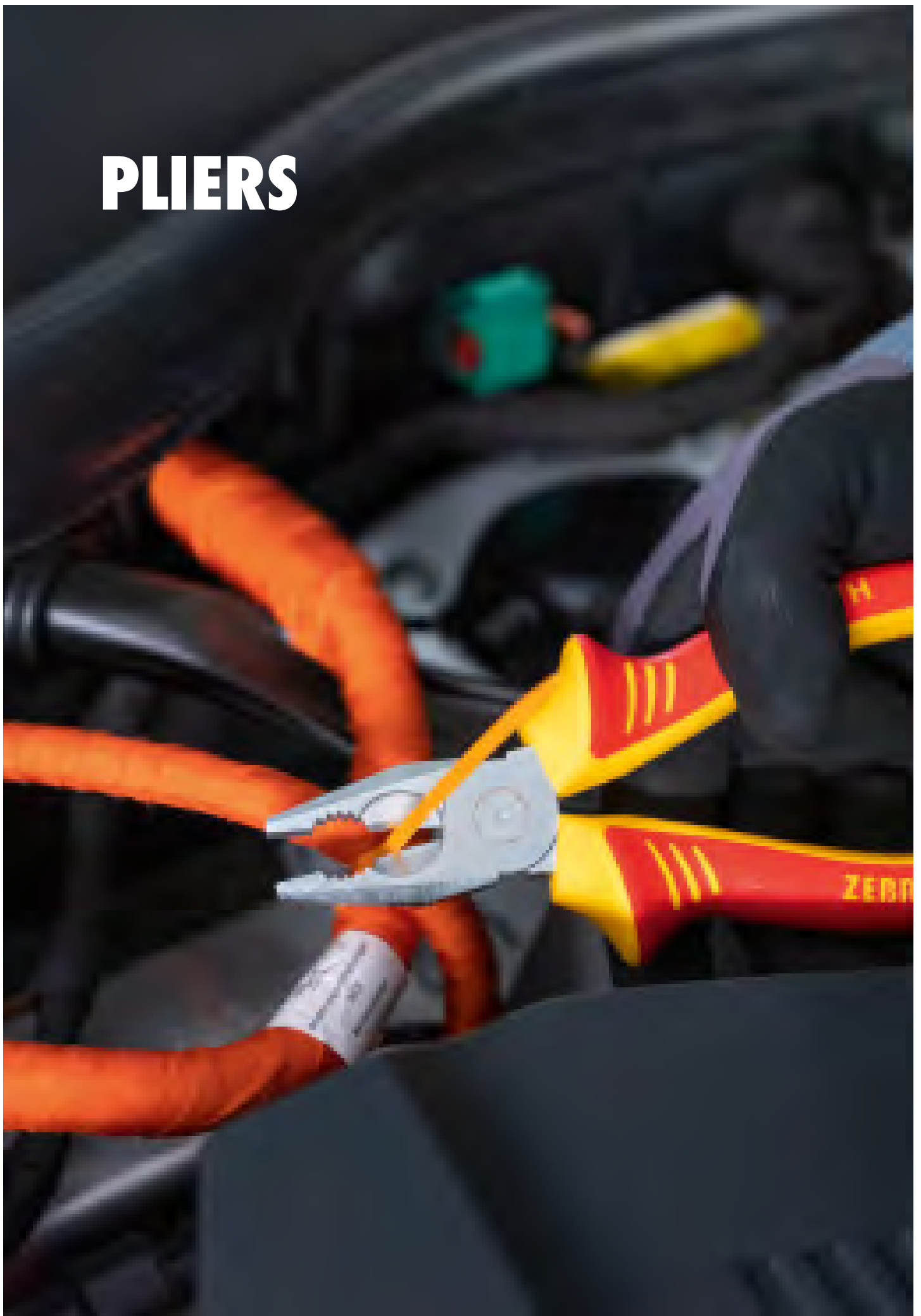
Length x width x height: 500 x 380 x 87 mm

Art. No. 5964 502 001

P. Qty./unit 1



PLIERS



VDE pliers assortment, IEC 60900

4 pieces

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- High-quality tool steel ensures long tool life and precision of gripping and cutting surfaces
- Ergonomic and slip-free 2-component comfort handle with wide VDE collar for secure working



Contents for Art. No.

0714 01 580	1 x VDE wire stripping pliers, IEC 60900; 1 x VDE side cutters DIN ISO 5749 IEC 60900; 1 x VDE combination pliers DIN ISO 5746 IEC 60900; 1 x VDE snipe nose pliers DIN ISO 5745, IEC 60900
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Art. No. 0714 01 580

P. Qty./assortment 1

- Combination pliers with extra-long blade also suitable for thicker cables
- Stripping pliers with opening spring for automatic opening
- Snipe nose pliers with tips for high bending stresses
- Side cutters with slim head shape for optimal accessibility



Contents for Art. No.

0714 01 581	1 x VDE side cutters DIN ISO 5749 IEC 60900; 1 x VDE combination pliers DIN ISO 5746 IEC 60900; 1 x VDE snipe nose pliers DIN ISO 5745, IEC 60900; 1 x VDE cable cutters with single blade
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Art. No. 0714 01 581

P. Qty./assortment 1

VDE pliers assortment, combi IEC 60900

8 pcs.

- For work on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- Pliers made from high-quality tool steel for long service life and precise gripping and cutting surfaces
- Stripping pliers with opening spring for automatic opening
- Side cutters with slim head shape for optimum accessibility
- Snipe nose pliers with tips resistant to high bending strain
- Ergonomic and slip-proof 2-component comfort handle for safe working



Contents for Art. No.

0714 01 582	VDE screwdriver Flat slotted: 1 x 0.4 x 2.5 mm, 1 x 0.8 x 4.0 mm, 1 x 1.2 x 6.5 mm; VDE screwdriver PH recessed head: 1 x PH1, 1 x PH2; 1 x VDE wire stripping pliers, IEC 60900; 1 x VDE side cutters DIN ISO 5749 IEC 60900; 1 x VDE snipe nose pliers DIN ISO 5745, IEC 60900
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Art. No. 0714 01 582

P. Qty./assortment 1

VDE pliers assortment, IEC 60900

4 pcs.

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- High-quality tool steel ensures long service life and precision of gripping and cutting surfaces
- 1-component handle with wide VDE collar for safe working
- Combination pliers with extra-long blade also suitable for thicker cables
- Round-nose pliers for bending wire eyelets
- Snipe-nose pliers with tips for high bending stresses
- Side cutters with slim head shape for optimum accessibility



Contents for Art. No.	
0715 01 92	1 x VDE combination pliers DIN ISO 5746 IEC 60900; 1 x VDE snipe nose pliers DIN ISO 5745 IEC 60900; 1 x VDE snipe nose pliers with blade DIN ISO 5745, IEC 60900; 1 x VDE side cutters, DIN ISO 5749 IEC 60900

Art. No. 0715 01 92

P. Qty./assortment 1

Contents for Art. No.	
0715 01 93	1 x VDE combination pliers DIN ISO 5746 IEC 60900; 1 x VDE snipe nose pliers with blade DIN ISO 5745, IEC 60900; 1 x VDE side cutters, DIN ISO 5749 IEC 60900; 1 x VDE cable shears, forged head

Art. No. 0715 01 93

P. Qty./assortment 1

VDE wire stripping pliers, IEC 60900

Precise, effortless stripping of cables and wires with plastic or rubber insulation.

- For working on live parts up to 1000 V (AC) and up to 1500 V (DC), observing all prescribed safety precautions
- High-quality tool steel ensures long service life and precision of cutting surfaces
- Opening spring opens pliers automatically
- Ergonomic and non-slip 2-component comfort handle with wide VDE collar for safe working
- Adjustment screw can be fixed in place with knurled locking nut
- Surface: Entirely ground and chrome-plated
- Joint: Lap joint

2-COMPONENT COMFORT HANDLE

Length: 160 mm
Art. No. 0714 01 570
 P. Qty./unit 1 / 10



1-COMPONENT HANDLE

Length: 160 mm
Art. No. 0715 01 95
 P. Qty./unit 1 / 10



VDE combination pliers DIN ISO 5746 IEC 60900

For gripping, holding and cutting hard and soft wires and cables

Art. No.	0714 01 574	0714 01 575	0714 01 576
Length (L)	160 mm	180 mm	200 mm
Length in inches (L)	6-1/4 in	7 in	8 in
Max. medium wire diameter cutting capacity	3.1 mm	3.4 mm	3.8 mm
Max. hard wire diameter cutting capacity	2 mm	2.2 mm	2.5 mm
Max. cable diameter cutting capacity in aluminium/copper	10 mm	12 mm	13 mm
P. Qty./unit	1 / 10	1 / 10	1 / 10



VDE snipe nose pliers, angled

Ergonomic pliers for gripping, cutting, bending, stripping and pressing

- For working on live parts, observing all prescribed safety precautions up to 1,000 Volt (AC), up to 1,500 Volt (DC)
- Protects joints and muscles
- Tighten screws with profiled burner port
- Pressing of wire end ferrules (low-voltage range)
- Precise and powerful cutting action
- Stripping of 1.5 and 2.5 mm² wires
- Long service life and precise gripping and cutting surfaces
- Ergonomic, non-slip 2-component comfort handle with wide VDE collar for safe working
- Inductively hardened, precision cutting edges
- Surface ground and chromium-plated all-round
- Lap joint with opening spring

Length: 210 mm

Art. No. 0714 01 594

P. Qty./unit 1 / 6



VDE combination pliers, angled

Ergonomic pliers for gripping, cutting, pulling and screwing

- For working on live parts, observing all prescribed safety precautions up to 1,000 Volt (AC), up to 1,500 Volt (DC)
- Protects joints and muscles
- Tighten screws with profiled burner port
- Grip and pull using nail groove
- Precise and powerful cutting action
- High-quality tool steel for long service life and precision
- Ergonomic, non-slip 2-component comfort handle with wide VDE collar for safe working
- Inductively hardened, precision cutting edges
- Surface ground and chromium-plated all-round
- Lap joint with opening spring

Length: 200 mm

Art. No. 0714 01 593

P. Qty./unit 1 / 6



VDE combination pliers DIN ISO 5746 IEC 60900

For gripping, holding and cutting hard and soft wires and cables

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- High-quality tool steel ensures long tool life and precision of gripping and cutting surfaces
- Extra-long blade also suitable for thicker cables
- Single-component handle with wide VDE collar for safe working
- Inductively hardened precision blades
- Burner port for gripping round materials
- Surface entirely ground and chrome-plated
- Lap joint

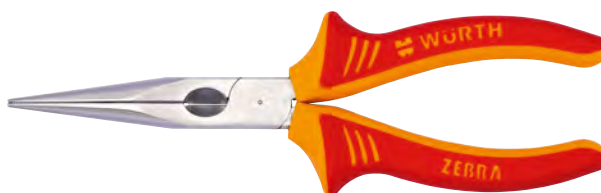


Art. No.	0715 01 81	0715 01 82	0715 01 83
Length (L)	165 mm	180 mm	200 mm
Length in inches (L)	6-1/4 in	7 in	8 in
Max. medium wire diameter cutting capacity	3.1 mm	3.4 mm	3.8 mm
Max. hard wire diameter cutting capacity	2 mm	2.2 mm	2.5 mm
Max. cable diameter cutting capacity in aluminium/copper	10 mm	12 mm	13 mm
P. Qty./unit	1 / 10	1 / 10	1 / 10

VDE snipe nose pliers DIN ISO 5745, IEC 60900

For gripping, holding and cutting soft and hard wires and cables

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- High-quality tool steel for long service life and precise gripping and cutting surfaces
- Elastic tips for high stresses, in particular under bending forces
- Ergonomic and slip-proof 2-component comfort handle with wide VDE collar for safe working
- Blades are additionally inductively hardened
- Surface entirely ground and chrome-plated
- Serrated gripping surfaces
- Lap joint



Art. No.	0714 01 577	0714 01 578	0714 01 579	0714 01 596
Length (L)	210 mm	210 mm	160 mm	160 mm
Length in inches (L)	8-1/4 in	8-1/4 in	6-1/2 in	6-1/2 in
Jaws length (L3)	76 mm	72 mm	50 mm	46 mm
Jaws width (W3)	17.5 mm	17.5 mm	16.5 mm	16.5 mm
Jaws thickness (T1)	9.5 mm	9.5 mm	9 mm	9 mm
Angle of jaws		40 Degree		40 Degree
Jaw-tips width (W4)	4 mm	4 mm	3 mm	3 mm
Jaw-tips thickness (T2)	3 mm	3 mm	2.5 mm	2.5 mm
ISO	5745	5745	5745	5749
P. Qty./unit	1 / 10	1 / 10	1 / 10	1 / 10

VDE snipe nose pliers with blade DIN ISO 5745, IEC 60900

For gripping, holding and cutting soft and hard wires and cables

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- High-quality tool steel for long service life and precise gripping and cutting surfaces
- Elastic tips for high stresses, especially under bending forces
- Single-component handle with wide VDE collar for safe working
- Inductively hardened blades
- Surface entirely ground and chrome-plated
- Serrated gripping surfaces
- Lap joint

Length (L)	200 mm
Length in inches (L)	8-1/4 in
Jaws length (L3)	74 mm
Jaws width (W3)	17.5 mm
Jaws thickness (T1)	9.5 mm
Jaw-tips width (W4)	3 mm
Jaw-tips thickness (T2)	2.5 mm
Material	Steel
Surface	Chrome plated
ISO	5745
Material of the grip handle	Plastic

Art. No.	0715 01 85	0715 01 86
Angle of jaws		45 Degree
P. Qty./unit	1 / 10	1 / 10



VDE round-nose pliers DIN ISO 5745 IEC 60900

For bending wire eyelets

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- High-quality tool steel ensures long service life of precision tips
- Ergonomic and non-slip 2-component comfort handle with wide VDE collar for safe working
- Surface: Entirely ground and chromium-plated
- Jaws: Round, smooth
- Joint: Lap joint

Length: 160 mm

Art. No. 0714 01 595

P. Qty./unit 1/10



VDE electrical installation pliers IEC 60900

3 tools in one set of pliers: For cutting, stripping and removing insulation from electrical cables.

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- Easy to use, no need to switch tools
- Side cutter function, cable and insulation stripping in ergonomic pulling motion

Length: 170 mm

Art. No. 0714 01 588

P. Qty./unit 1



VDE snipe nose pliers DIN ISO 5745

IEC 60900

For bending wire eyelets

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- High-quality tool steel ensures long service life of precision tips
- 1-component handle with wide VDE collar for safe working
- Surface entirely ground and chromium-plated
- Round, smooth jaws
- Lap joint

Length: 160 mm

Art. No. 0715 01 84

P. Qty./unit 1/10



VDE snipe nose pliers DIN ISO 5745,

IEC 60900

For gripping and holding

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- High-quality tool steel ensures long service life of gripping jaws
- 1-component handle with wide VDE collar for safe working
- Surface entirely ground and chromium-plated
- Serrated gripping surfaces
- Lap joint

Length: 160 mm

Art. No. 0715 01 91

P. Qty./unit 1/10



VDE side cutters DIN ISO 5749 IEC 60900

For cutting hard and soft wires and cables, including in hard-to-reach places

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- Strength-saving, clean cutting thanks to milled precision cutting edge
- High-quality tool steel ensures long tool life and precision of cutting surfaces

Art. No.	0714 01 571	0714 01 572	0714 01 573
Length (L)	140 mm	160 mm	180 mm
Max. medium wire diameter cutting capacity	2.5 mm	2.8 mm	3 mm
Max. hard wire diameter cutting capacity	1.8 mm	2 mm	2.5 mm
P. Qty./unit	1/10	1/10	1/10



VDE power side cutters DIN ISO 5749, IEC 60900

For cutting piano wire, hard and soft wire

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- Strength-saving, clean cutting thanks to milled precision cutting edge
- High-quality tool steel ensures long tool life and precision of blades including under maximum stresses
- Ergonomic and slip-free 2-component comfort handle with wide VDE collar for secure working
- Blades: inductively hardened precision blades
- Surface: entirely ground and chrome-plated
- Joint: Lay-on, axis forged on

Length: 200 mm

Art. No. 0714 01 597

P. Qty./unit 1/10



VDE side cutters, DIN ISO 5749 IEC 60900

For cutting hard and soft wires and cables, including in hard-to-reach places

- For working on live parts up to 1000 V (AC) and up to 1500 V (DC), observing all prescribed safety precautions
- Strength-saving, clean cutting thanks to milled precision cutting edge
- High-quality tool steel ensures long service life and precision of cutting surfaces
- Slim head shape for optimum accessibility
- 1-component comfort handle with wide VDE collar for secure working
- Cutting edges: Inductively hardened, precision cutting edges
- Surface: Entirely ground and chrome-plated
- Joint: Lap joint

Length: 140 mm

Art. No. 0715 01 87

P. Qty./unit 1/10

Length: 160 mm

Art. No. 0715 01 88

P. Qty./unit 1/10



VDE heavy-duty side cutters, DIN ISO 5749 IEC 60900

For cutting piano wire, hard and soft wire

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- Strength-saving, clean cutting thanks to milled precision cutting edge
- High-quality tool steel ensures long service life and precision of blades, even under maximum loads
- Single-component handle with wide VDE collar for safe working
- Inductively hardened precision blades
- Surface entirely ground and chrome-plated
- Lap joint with forged-on axis

Length: 180 mm

Art. No. 0715 01 89

P. Qty./unit 1/10





VDE cable shears with dual blade

For cutting copper and aluminium cable;
for precutting and recutting

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- High-quality tool steel ensures long tool life and precision of cutting surfaces
- Special blade geometry facilitates easy and distortion-free cutting action through single or multi-stranded cable
- 2-stage operation with dual blades for optimum transmission of forces
- Ergonomic and slip-free 2-component comfort handle with wide VDE collar for safe working
- Cutting: hardened precision blades
- Surface: ground and chrome-plated
- Joint: bolted and adjustable

Length: 210 mm

Art. No. 0714 01 586

P. Qty./unit 1/10



VDE cable cutters with single blade

For cutting copper and aluminium cable

- For working on live parts up to 1000 V (AC) and up to 1500 V (DC), observing all prescribed safety precautions
- Long service life and precision of cutting surfaces
- Easy and distortion-free cutting action through single- or multi-stranded cable
- Optimal power transmission
- Ergonomic and non-slip 2-component comfort handle with wide VDE collar
- Hardened, precision cutting edges
- Surface ground and chromium-plated
- Bolted and adjustable joint

Length: 160 mm

Art. No. 0714 01 585

P. Qty./unit 1/10



VDE cable shears, forged head

IEC 60900. For multi-stranded copper and aluminium cable

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions
- High-quality tool steel ensures long service life and precision of cutting surfaces
- Special blade geometry facilitates easy and distortion-free cutting action through single or multi-stranded cable
- 1-component handle with wide VDE collar for safe working
- Cutting: hardened precision blades
- Surface: ground and chromium-plated
- Joint: bolted and adjustable

Length: 170 mm

Art. No. 0715 07 55

P. Qty./unit 1/10



VDE one-hand ratchet cutters

EN 60900, IEC 900

- Handle: Insulated sleeve, Non-slip
- Blade: For multi-strand copper and aluminium cables, Works without compressing cables, Hardened, Precision-ground
- Shears can be unlocked in any cutting position
- Pivot arms: One-handed operation, optimum lever transmission
- Joint: Ratchet mechanism

Length: 280 mm

Art. No. 0715 07 56

P. Qty./unit 1



VDE cable shears

For multi-stranded copper and aluminium cable

- Standard: EN 60900. IEC 900
- Handle: Insulated with plastic, Impact-resistant, Hand slip guard
- Cutting edge: For multi-strand copper and aluminium cables, Works without compressing cables, Hardened, Precision-ground
- Joint: Adjustable screw joint
- Head: Stainless steel

Length: 230 mm

Art. No. 0715 07 50

P. Qty./unit 1/5



VDE cable shears

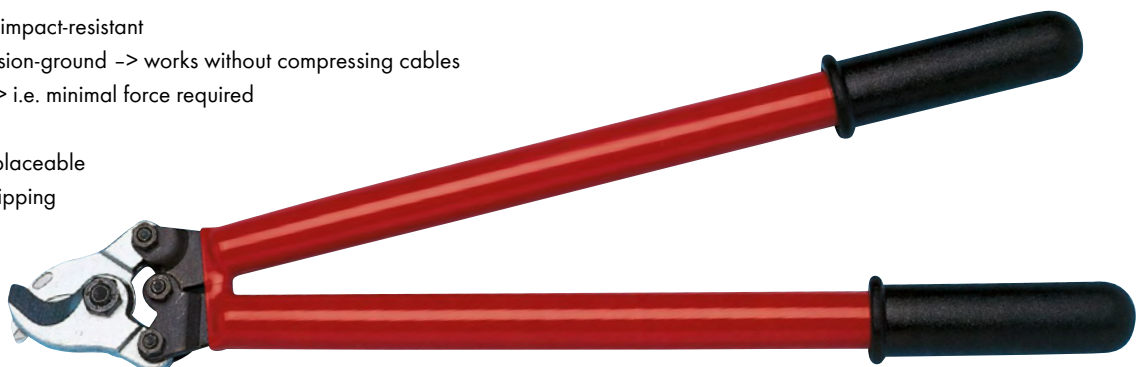
Standard: EN 60900. IEC 900.

- Handles: Dip-insulated plastic, impact-resistant
- Cutting edge: Hardened, precision-ground -> works without compressing cables
- Pivot arms: Lever transmission -> i.e. minimal force required
- Joint: Screw joint, adjustable
- Head: Forged special steel, replaceable
- Application: Cutting, sheath stripping

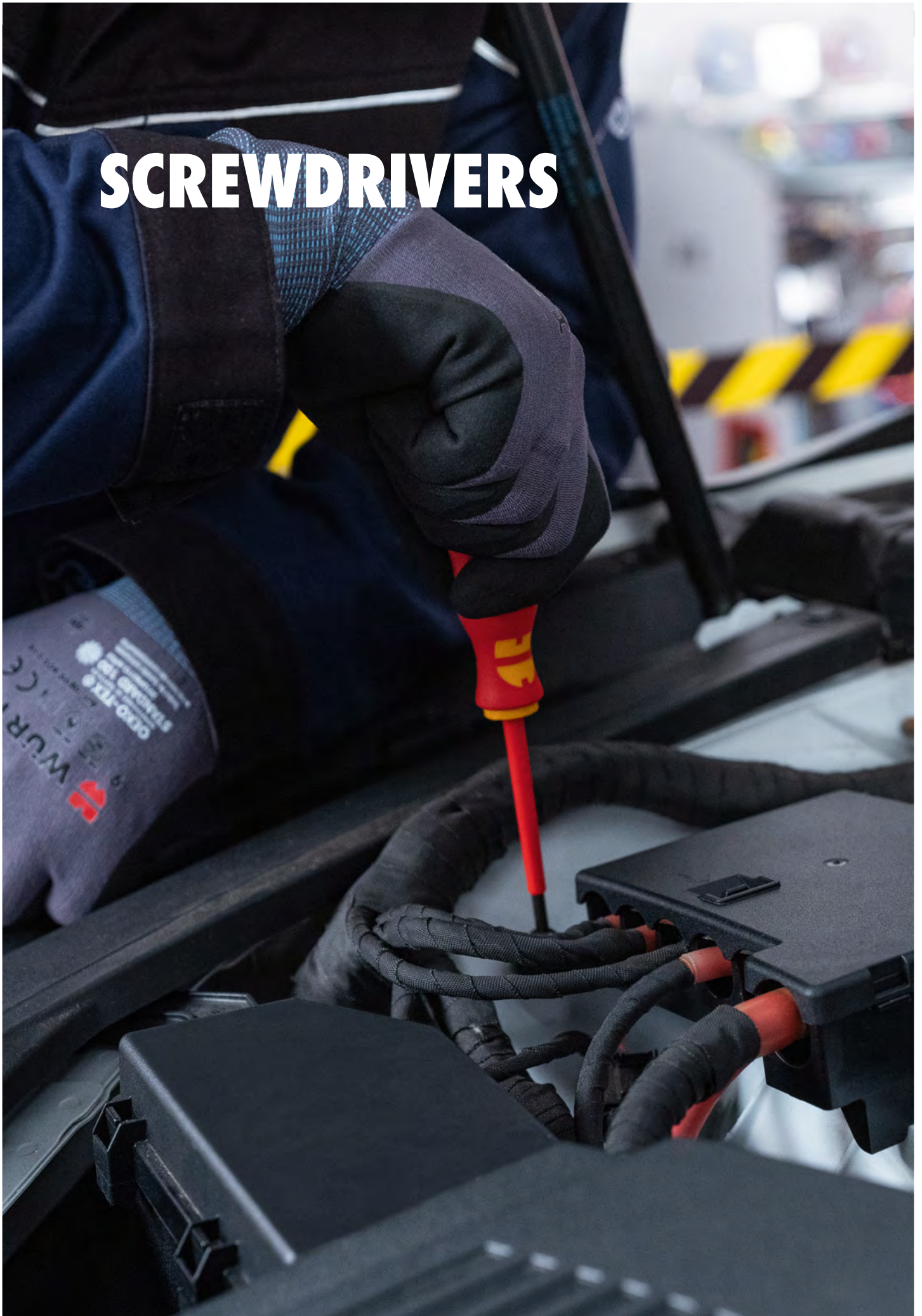
Length: 580 mm

Art. No. 0715 07 53

P. Qty./unit 1



SCREWDRIVERS



VDE precision screwdriver, flat slotted

For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC)

- Individually tested in water bath with 10 kV test voltage
- Marked with year of manufacture
- Cold impact test at -40°C (marking C)
- Blade: Circular blade insulated, burnished
- Output: DIN 5264-A, ISO 2380

Thickness of cutting edge x width of cutting edge	Blade length	Art. No.	P. Qty./unit
0.3 x 1.5 mm	40 mm	0613 486 015	1/10
0.3 x 1.8 mm	60 mm	0613 486 018	1/10
0.4 x 2 mm	60 mm	0613 486 020	1/10
0.4 x 2.5 mm	75 mm	0613 486 025	1/10
0.5 x 3 mm	75 mm	0613 486 030	1/10



VDE precision screwdriver, PH recessed head

For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC)

- Routine test in water bath with test voltage 10 kV, identification marking with the year of manufacture
- Cold impact test at -40°C (marking C)
- Blade: Circular blade, insulated, bronzed, drive: ISO 8764-PH

Art. No.	0613 487 0	0613 487 00
Tip size	PH0	PH00
Blade length	60 mm	40 mm
P. Qty./unit	1/10	1/10



VDE precision screwdriver assortment, slotted/PH

7 pieces. Consisting of five slot and two Phillips screwdrivers.

Art. No. **0613 489 4**

P. Qty./assortment 1



Contents for Art. No.

0613 489 4	VDE precision screwdriver, flat slotted: 1 x 0.3 x 1.5 mm, 1 x 0.3 x 1.8 mm, 1 x 0.4 x 2 mm, 1 x 0.4 x 2.5 mm, 1 x 0.5 x 3 mm ; VDE precision screwdriver, PH recessed head: 1 x 0, 1 x 00
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VDE screwdriver set

14-piece set comprising a handle, a precision engineering rotating cap and 12 interchangeable blades

Contents for Art. No.	
0613 900 14	1 x Handle VDE; Replacement blade VDE: 1 x Slot, 0.4 x 2.5 mm, Length: 150 mm, 1 x Slot, 0.5 x 3.0 mm, Length: 175 mm, 1 x Slot, 0.6 x 3.5 mm, Length: 175 mm, 1 x Slot, 0.8 x 4.0 mm, Length: 175 mm, 1 x Slot, 1.0 x 5.5 mm, Length: 175 mm, 1 x Slot, 1.2 x 6.5 mm, Length: 175 mm, 1 x PH1, Length: 155 mm, 1 x PH2, Length: 175 mm, 1 x PZ2, Length: 175 mm, 1 x TX10, Length: 175 mm, 1 x TX15, Length: 175 mm, 1 x TX25, Length: 175 mm

Art. No. 0613 900 14

P. Qty./assortment 1



VDE screwdriver set slotted/PZ recessed head

5 pcs: 1 x slotted 0.4 x 2.5; 1 x slotted 0.8 x 4.0; 1 x slotted 1.2 x 6.5; 1 x PZ1; 1 x PZ2

- Blade: Burnished, insulated
- Standard: Individually tested in line with IEC 60900:2004

Contents for Art. No.	
0613 963 35	VDE screwdriver Flat slotted: 1 x Slot, 0.4 x 2.5 mm, 1 x Slot, 0.8 x 4.0 mm, 1 x Slot, 1.2 x 6.5 mm; VDE screwdriver PZ recessed head: 1 x 1, 1 x 2

Art. No. 0613 963 35

P. Qty./unit 1



VDE screwdriver set, slotted/PH recessed head

5 pieces

- Blade: bronzed, insulated
- Standard: Individually tested in accordance with IEC 60900:2004

Contents for Art. No.	
0613 963 25	VDE screwdriver Flat slotted: 1 x Slot, 0.4 x 2.5 mm, 1 x Slot, 0.8 x 4.0 mm, 1 x Slot, 1.2 x 6.5 mm; VDE screwdriver PH recessed head: 1 x 1, 1 x 2

Art. No. 0613 963 25

P. Qty./assortment 1



Replacement blade VDE

For VDE screwdrivers

Length: 155 mm

Art. No. 0613 900 01

P. Qty./unit 1/12

Length: 175 mm

Art. No. 0613 900 02

P. Qty./unit 1/12



Handle VDE

For VDE replacement blades

Art. No. 0613 900 1

P. Qty./unit 1/12



VDE screwdriver set slotted/PH

5 pieces. Extra slim design.

- Blade burnished, reduced blade insulation diameter in critical working area
 - Effortless access to low-lying screw and spring elements
 - Prevents insulation from fraying
- Screw symbol on end of handle

Contents for Art. No.	
0613 963 250	VDE screwdriver, flat slotted, ultra slim: 1 x 0.4 x 2.5 mm, 1 x 0.8 x 4 mm, 1 x 1 x 5.5 mm; VDE screwdriver, PH recessed head, extra slim: 1 x PH1, 1 x PH2

Art. No. 0613 963 250

P. Qty./unit 1



Replacement blade VDE

For VDE screwdrivers

Length: 150 mm

Art. No. 0613 900 025

P. Qty./unit 1/12

Length: 175 mm

Art. No. 0613 900 030

P. Qty./unit 1/12

Length: 175 mm

Art. No. 0613 900 035

P. Qty./unit 1/12

Length: 175 mm

Art. No. 0613 900 040

P. Qty./unit 1/12



VDE screwdriver TX set

6 pieces

- Blade: Burnished, insulated
- Tip: TX socket, Black Point
- Screw symbol and handle size on end of handle for quick identification
- Standard: IEC 60900:2012

Contents for Art. No.	
0613 962 35	VDE screwdriver, TX: 1 x 8, 1 x 9, 1 x 10, 1 x 15, 1 x 20, 1 x 25, 1 x 30

Art. No. 0613 962 35

P. Qty./assortment 1



VDE screwdriver Flat slotted

For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC)

- Blade: Burnished, insulated
- Tip: Based on DIN ISO 2380-1-B
- Individually tested in water bath with 10 kV test voltage
- Marked with year of manufacture
- Stricter cold impact test



Thickness of cutting edge x width of cutting edge	Blade length (A)	Handle length/handle width (B / C)	Art. No.	P. Qty./unit
0.4 x 2.5 mm	80 mm	83/27 mm	0613 631 025	1
0.5 x 3 mm	100 mm	83/27 mm	0613 631 03	1
0.6 x 3.5 mm	100 mm	83/27 mm	0613 631 035	1
0.8 x 4 mm	100 mm	83/27 mm	0613 631 04	1
1 x 5.5 mm	125 mm	96/31 mm	0613 631 055	1
1.2 x 6.5 mm	150 mm	106/35 mm	0613 631 065	1
1.2 x 8 mm	175 mm	114/38 mm	0613 631 08	1
1.6 x 8 mm	200 mm	114/38 mm	0613 631 082	1
1.6 x 10 mm	200 mm	114/38 mm	0613 631 10	1



VDE screwdriver, flat slotted, ultra slim

Effortless access to deep-seated screw and spring elements.

- Insulation with reduction of blade diameter in critical working area
- Prevents fraying of insulation
- Screw symbol on end of handle
- Tip: DIN ISO 2380-1-A
- Blade: Burnished



Art. No.	0613 631 25	0613 631 35	0613 631 40	0613 631 55
Thickness of cutting edge x width of cutting edge	0.4 x 2.5 mm	0.6 x 3.5 mm	0.8 x 4 mm	1 x 5.5 mm
Blade length (A)	80 mm	100 mm	100 mm	125 mm
Handle length/handle width (B / C)	83 / 27 mm	83 / 27 mm	83 / 27 mm	96 / 31 mm
P. Qty./unit	1	1	1	1



VDE screwdriver PH recessed head

For working on live parts up to 1000 V (AC) and up to 1500 V (DC)

- Blade: burnished, insulated
- Tip: In accordance with DIN ISO 8764-1-PH
- Individually tested in water bath with 10 kV test voltage
- Marked with year of manufacture
- Stricter cold impact test



Tip size	Blade length (A)	Handle length/handle width (B / C)	Art. No.	P. Qty./unit
PH0	80 mm	83/27 mm	0613 632 0	1
PH1	80 mm	96/31 mm	0613 632 1	1
PH2	100 mm	106/35 mm	0613 632 2	1
PH3	150 mm	114/38 mm	0613 632 3	1
PH4	200 mm	114/38 mm	0613 632 4	1



VDE screwdriver for hexagon head

For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC)

- Blade: burnished, insulated
- Tip: DIN 475/2
- Standard: DIN 7445, IEC 60900:2012



Width across flats	Handle length/handle width	Length	Art. No.	P. Qty./unit
5.5 mm	96/31 mm	221 mm	0613 636 055	1
6 mm	96/31 mm	221 mm	0613 636 06	1
7 mm	106/35 mm	231 mm	0613 636 07	1
8 mm	106/35 mm	231 mm	0613 636 08	1
9 mm	106/35 mm	231 mm	0613 636 09	1
10 mm	106/35 mm	231 mm	0613 636 10	1
12 mm	114/38 mm	239 mm	0613 636 12	1
13 mm	114/38 mm	239 mm	0613 636 13	1

VDE screwdriver, hexagon socket

For working on live parts up to 1000 V (AC) and up to 1500 V (DC)

- Blade: Burnished, insulated
- Output: DIN 7439



Tip size	Blade length	Handle length/handle width	Art. No.	P. Qty./unit
2.5 mm	80 mm	83/27 mm	0613 635 025	1
3 mm	80 mm	83/27 mm	0613 635 03	1
4 mm	80 mm	96/31 mm	0613 635 04	1
5 mm	80 mm	106/35 mm	0613 635 05	1
6 mm	100 mm	106/35 mm	0613 635 06	1
8 mm	100 mm	114/38 mm	0613 635 08	1



VDE screwdriver, PH recessed head, extra slim

Effortless access to deep-seated screw and spring elements.

- Insulation with reduction of blade diameter in critical working area
- Prevents fraying of insulation
- Screw symbol on end of handle
- Tip: DIN ISO 8764-I-PH
- Blade: Burnished



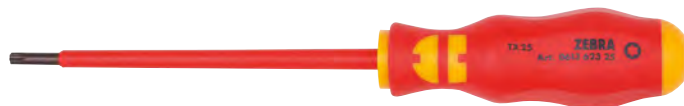
Art. No.	0613 632 10	0613 632 20
Tip size	PH1	PH2
Blade length (A)	80 mm	100 mm
Handle length/handle width (B / C)	96 / 31 mm	106 / 35 mm
P. Qty./unit	1	1



VDE screwdriver, TX

For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC)

- Blade: burnished, insulated
- Output: TX socket, Black Point
- Screw symbol and handle size on end of handle for quick identification
- Standard: IEC 60900:2012



Tip size	Blade length	Handle width (Griffb.)	Handle length	Length	Art. No.	P. Qty./unit
TX8	100 mm	27 mm	83 mm	183 mm	0613 623 08	1
TX9	100 mm	27 mm	83 mmw	183 mm	0613 623 09	1
TX10	100 mm	27 mm	83 mm	183 mm	0613 623 10	1
TX15	100 mm	31 mm	96 mm	196 mm	0613 623 15	1
TX20	125 mm	31 mm	96 mm	121 mm	0613 623 20	1
TX25	125 mm	35 mm	106 mm	231 mm	0613 623 25	1
TX30	150 mm	35 mm	106 mm	256 mm	0613 623 30	1



1000 V



VDE screwdriver PZ recessed head ultra-slim

Effortless access to deep-seated screw and spring elements.

- Insulation with reduction of blade diameter in critical working area
- Prevents fraying of insulation
- Screw symbol printed on handle end for quick identification
- Ultra-slim design



Application area

Switch cabinets and distributor boxes, circuit breakers, terminal blocks and relays.

Proof of Performance

Individually tested in accordance with IEC 60900:2004.

Tip size	Blade length (A)	Handle length/ handle width (B / C)	Art. No.	P. Qty./unit
PZ1	80 mm	96/31 mm	0613 633 10	1
PZ2	100 mm	106/35 mm	0613 633 20	1



1000 V



VDE screwdriver PZ recessed head

For working on live parts up to 1000 V (AC) and up to 1500 V (DC)

- Blade: burnished, insulated
- Tip type: ISO 8764-PZ
- Standard: DIN 7438, IEC 60900:2012



Tip size	Blade length (A)	Handle length/ handle width (B / C)	Art. No.	P. Qty./unit
PZ0	80 mm	83/27 mm	0613 633 0	1
PZ1	80 mm	96/31 mm	0613 633 1	1
PZ2	100 mm	106/35 mm	0613 633 2	1
PZ3	150 mm	114/38 mm	0613 633 3	1



1000 V



COMING SOON

THE WORKSHOP TROLLEY FOR ELECTROMOBILITY

- With a practical double door for storing face shields and other protective equipment
- Possible integration of inlays of the VDE tool case (art. no. 5964 502 002) in drawers
- Can be easily identified as an electromobility workshop trolley thanks to its orange color

Art. no. 0962 641 034

PU/qty. 1



WRENCHES



VDE 3/8 inch ratchet

Especially for electrical and hybrid vehicles

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions

Length: 200 mm

Art. No. 0715 003 038

P. Qty./unit 1



3/8-inch VDE socket wrench

Especially for electrical and hybrid vehicles

External drive	WS3/8
Length (L1)	80 mm

Width across flats	Art. No.	P. Qty./unit
8 mm	0715 003 08	1
10 mm	0715 003 10	1
12 mm	0715 003 12	1



VDE 3/8 inch extension

Especially for electrical and hybrid vehicles

- For working on live parts up to 1000 volts (AC) and up to 1500 volts (DC), observing all prescribed safety precautions

Length: 150 mm

Art. No. 0715 003 01

P. Qty./unit 1



3/8 inch VDE socket wrench Hexagon

Especially suitable for electric and hybrid vehicles

External drive	WS3/8
Length (L1)	45 mm
Standards	EN 60900
Surface	VDE insulated

Width across flats	Art. No.	P. Qty./unit
8 mm	0715 003 108	1
10 mm	0715 003 110	1
12 mm	0715 003 112	1
13 mm	0715 003 113	1
14 mm	0715 003 114	1
17 mm	0715 003 117	1



Box wrench VDE

Especially suitable for electric and hybrid vehicles

Material	Chrome-vanadium steel
EN standard	60900
Surface	VDE insulated

Width across flats	Length	External diameter of ring	Art. No.	P. Qty./unit
8 mm	164 mm	19.5 mm	0715 002 308	1
10 mm	174 mm	20.5 mm	0715 002 310	1
12 mm	184 mm	22 mm	0715 002 312	1
13 mm	205 mm	26 mm	0715 002 313	1
14 mm	205 mm	30 mm	0715 002 314	1
14 mm	221 mm	31 mm	0715 002 317	1



CONSUMABLES



Electrical insulating tape set

10 pieces Contains all relevant colours for safe insulation and labelling during electrical installation.

- VDE-tested in line with DIN EN 60454-3-1 Type 5
- Tear-proof and resistant to ageing
- Lasting material properties even with changing temperatures



Art. No. 0985 100

P. Qty./pack 10

Electrical insulating tape

Safe insulation and labelling during electrical installation

- VDE-tested, compliant with DIN EN 60454-3-1 Type 5
- Tear-resistant and resistant to aging
- High flexibility and adhesive strength
- Lasting material properties even under changing temperatures
- Largely resistant to diluted acids and alkalis

Colour	Width	Length	Art. No.	P. Qty./unit
Black	15 mm	10 m	0985 101	10
Black	30 mm	25 m	0985 101 1	5
Blue	15 mm	10 m	0985 105	10
Brown	15 mm	10 m	0985 104	10
Green	15 mm	10 m	0985 109 2	10
Grey	15 mm	10 m	0985 109 1	10
Red	15 mm	10 m	0985 103	10
White	15 mm	10 m	0985 102	10
Yellow	15 mm	10 m	0985 107	10
Yellow-green	15 mm	10 m	0985 109	10

Chemical basis	Acrylate, soft PVC foil
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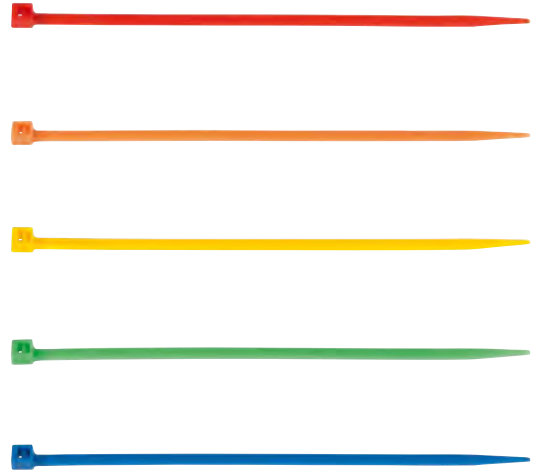


Coloured cable tie with plastic tongue closure

For quick, problem-free and reliable bundling of cables, cable harnesses, hoses etc. with colour coding

Material	PA - Polyamide
Width	3.5 mm
Length	200 mm
Min./max. bundle diameter (Bündel-Ø min./max.)	3-5.5 mm
Min./max. temperature resistance	-15 to 85 °C
Silicone-free	Yes
Halogen-free	Yes

Colour	Art. No.	P. Qty./unit
Red	0502 410	100
Orange	0502 420	100
Yellow	0502 430	100
Green	0502 440	100
Blue	0502 450	100



Neon-coloured cable ties with plastic latch closure

Coloured cable ties

Material	PA - Polyamide
Width	3.6 mm
Min./max. temperature resistance	-40 to 85 °C
Silicone-free	Yes
Halogen-free	Yes

Art. No.	0502 42	0502 43	0502 44	0502 45
Colour	Orange	Yellow	Green	Blue
Length	203 mm	203 mm	203 mm	225.4 mm
Min./max. bundle diameter (Bündel-Ø min./max.)	2-51 mm	2-51 mm	2-51 mm	2-60.3 mm
P. Qty./unit	-	-	-	-



POE oil POE 100

Special POE (polyester) air-conditioning compressor oil for vehicle air-conditioning systems using R134a/R1234yf refrigerants and electric air-conditioning compressors (hybrid, start/stop, electric)

- Excellent resistance to potential electric creepage currents in high-voltage air-conditioning systems
- Highly hydrophobic
 - Not conductive
 - Electrical components are not affected
- Excellent smoothness, thereby protecting the compressor from wear

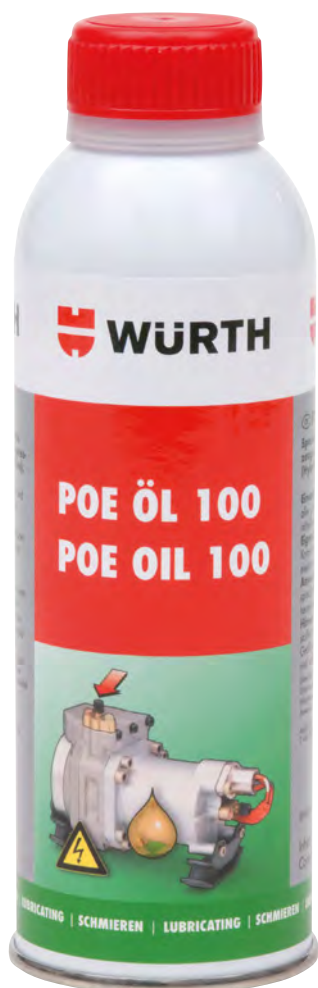
Application area

For maintaining, lubricating and cooling vehicle electric air-conditioning compressors as well as sliding and rotating parts in the R134a/R1234yf air-conditioning circuit

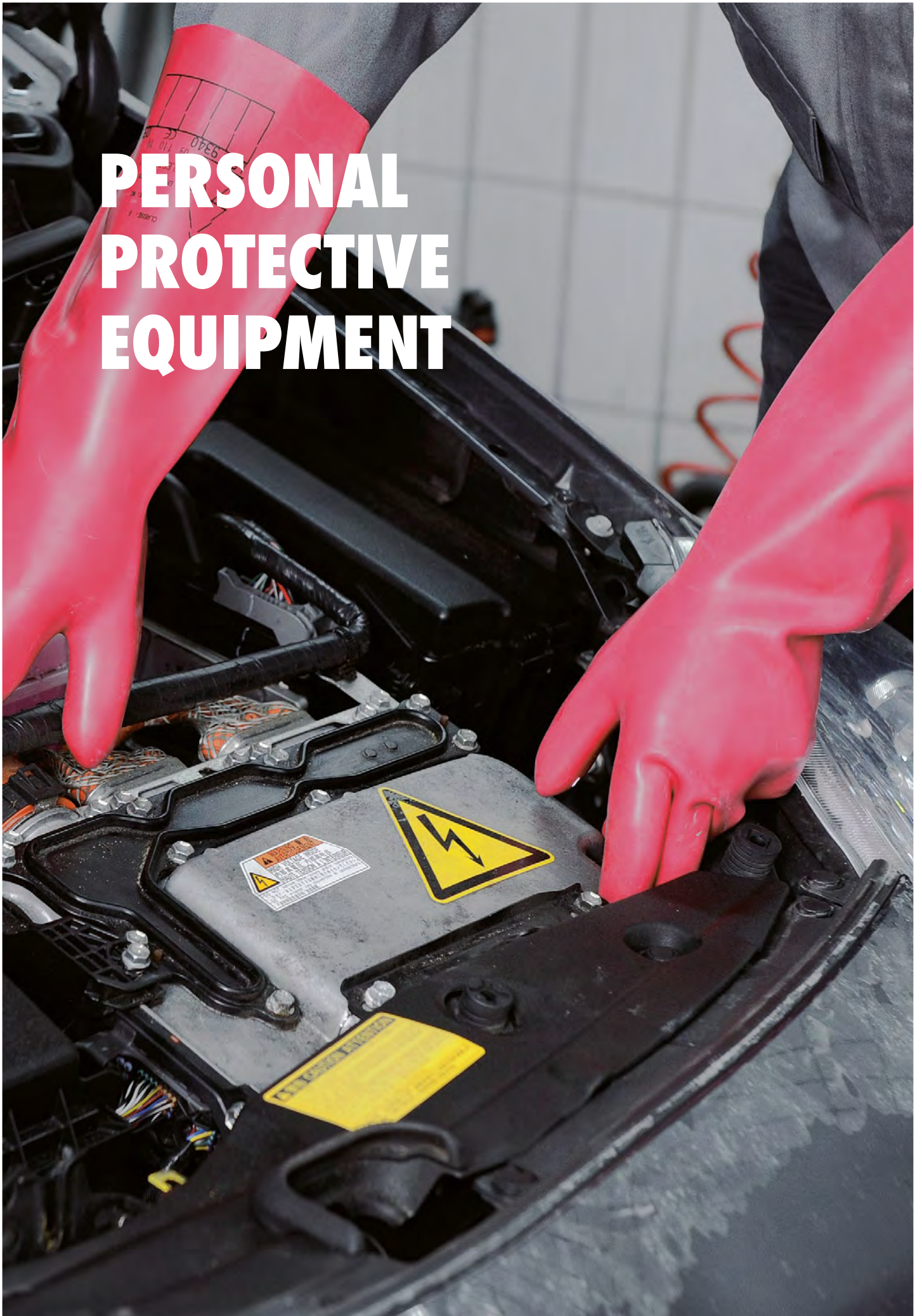
Contents: 210 ml

Art. No. 0892 764 045

P. Qty./unit 1/6



PERSONAL PROTECTIVE EQUIPMENT



Rescue hook

Rescue hook for the retrieval of electric shock victims from a live working zone

- For nominal voltages of up to 45 kV
- Weight: 1 kg
- Length: 1.65 m
- Fiberglass/polyester resin tube with hand guard
- Hook: torque tested 30 Nm
- For rescuing persons weighing up to 150 kg
- The hook can be used to pull the victim clear of the energised area by gripping the victim's waist
- Saves lives during electrical accidents



Art. No. 0899 520 901

P.Qty./unit 1

Padlock with steel shackle

DIN EN 60204

- Padlock with different locking positions suitable for locking machinery to prevent accidental restarts.
- Includes self-adhesive labels in three languages (DE, EN, ES) with blank spaces, universal pictograms to identify technicians and the prohibition sign "Do not alter the state of the switch"
- Complies with ISO EN 7010 and ASR A1.3/P031
- Body made from PA 66, shackle made from steel
- Temperature-resistant: -47°C to +177°C
- Shackle diameter: 6 mm, shackle height: 37 mm
- Dimensions: 37x89x20 mm
- Scope of delivery: Lock with 2 keys



Art. No. 0997 709 664

P.Qty./unit 1

Insulating mat

Insulating mat for work on live parts in accordance with EN 61111.

- EPDM rubber mat for work on live parts
- Anti-slip surface thanks to fine ribbing
- Resistant to oil and chemicals
- Colour coded on the reverse

Application area

Suitable for use in high-voltage areas such as high-voltage and switchgear assemblies with an open design.



Design	Customized cutting
EN standard	BS EN 61111:2009
Colour	Black
Material	Rubber

Class	Length x width x thickness	Art. No.	P. Qty./unit
0 - Operating voltage < 1000 volts	100 x 1000 x 3 mm	0957 590 230	10
2 - Operating voltage < 17000 volts	100 x 1000 x 4 mm	0957 590 231	10
4 - Operating voltage < 36000 volts	100 x 1000 x 5 mm	0957 590 232	10





Safety glasses CEPHEUS®

Lightweight, well-fitting safety glasses

Art. No. 0899 102 250

P. Qty./unit 1



Voltage protective glove

For working voltages up to 1000 V/AC

- Good flexibility
- Good sense of touch
- Layer thickness according to the standard max. 1 + 0.6 mm
- Supplied in a UV-resistant PE storage pouch

Length	410 mm
Material	Natural latex
Category	III
Class	0 - Operating voltage < 1000 volts
Utilisation voltage (AC voltage)	1000 V/AC
Utilisation voltage (DC voltage)	1500 V/DC

Size	Art. No.	P. Qty./unit
9	0899 400 929	1
10	0899 400 930	1
11	0899 400 931	1



Safety glasses Cetus®

Perfect protection with a sporty, dynamic, fashionable look

Art. No. 0899 102 320

P. Qty./unit 1



Full-vision goggles Andromeda®

Two-component technology for reliable protection and maximum comfort

Art. No. 0899 102 110

P. Qty./unit 1



Disposable nitrile glove

Liquid-proof, food-safe disposable glove

- Powder-free
- Silicone-free manufacturing process
- In practical disposable dispenser

Colour	Black
Material	Nitrile
Interior finish	Powder-free, Chlorinated
EN standard	374, 420
Category	III
Length	240 mm
Material thickness	0.1 mm
Tolerance, material thickness (+/-)	0.01 mm

Size	Art. No.	P. Qty./unit
S	0899 470 100	100
M	0899 470 101	100
L	0899 470 102	100
XL	0899 470 103	100
XXL	0899 470 104	100



Tigerflex Plus nitrile protective glove

Very comfortable to wear with maximum grip

- Skin-friendly seamless round-knit nylon/Lycra® base fabric (15 gauge)
- Nitrile foam-coated palms with additional nitrile Tiger grip
- Breathable
- Comfortable to wear
- The soft fabric and close fit ensure an excellent grip and outstanding dexterity thanks to new nylon fabric
- Elasticated cuffs

Gauge	15
Material of the liner	Nylon
Material coating	Nitrile foam
EN standard	388, 420
Category	II

Size	Art. No.	P. Qty./pair
6	0899 411 016	12
7	0899 411 017	12
8	0899 411 018	12
9	0899 411 019	12
10	0899 411 020	12
11	0899 411 021	12



Hard hat SH 2000-S Pro

Comfortable hard hat with internal dial adjustment and pre-mounted 4-point chin strap

- High-quality 4-point chin strap
- Neck protector extended downwards
- Optimum, quick width adjustment with dial system
- Unobstructed upwards view thanks to short helmet peak
- 6-point fabric lining and individually controlled ventilation openings on the front and back
- Low weight
- Good combination options
- Tested in line with EN 397 with supplementary requirements



Colour: White
Art. No. 0899 200 235
 P. Qty./unit 1

Electrician's helmet SH-E 2000-S

Comfortable electrician's hard hat with internal dial adjustment

- Helmet shell is completely closed, so suitable for use by electricians in accordance with EN 397 and EN 50365 (1000 VAC)
- Optimum, quick width adjustment with dial system
- Unobstructed upwards view thanks to short helmet peak
- 6-point textile suspension harness
- Compatible with visors and ear defenders
- Suitable for very low temperatures down to -30°C
- Protects against weld spatter (MM = molten metal)

Colour: White
Art. No. 0899 200 236
 P. Qty./unit 1



Electrician's visor SLB 1

Arc fault class 1 visor for electrician's hard hat SH-E 2000-S

Colour: Clear
Art. No. 0899 200 238
 P. Qty./unit 1



Electrician's visor SLB 2

Arc fault class 2 visor for electrician's hard hat SH-E 2000-S

Colour: Blue
Art. No. 0899 200 239
 P. Qty./unit 1



Ear defenders

For hard hat SH 2000-S

Art. No. 0899 200 259
 P. Qty./unit 1



Face shield Ultimate

Maximum safety with optimum comfort

- Special geometry for extended protection of the upper head and chin
- Large, durable polycarbonate visor with wide field of vision
- Quick and easy to replace the shield
- Multiple visor tilt positions
- Adjustable headband
- All parts that come into contact with the head are softly padded
- Tested in accordance with EN166 and 175

Art. No. 0899 101 205
 P. Qty./unit 1





High-vis vest

With Velcro fastening

- Two 5-cm wide all-round reflective strips
- Individually packed in polythene bags

Application area

Road and rail traffic, hazard zones, construction industry, road construction and surveying

Colour: Orange

Size: XL

Art. No. 0899 078

P. Qty./unit 1

Colour: Yellow

Size: XL

Art. No. 0899 078 002

P. Qty./unit 1



Multi-standard dungarees

Anti-static dungarees that can handle your day-to-day work.

- Flame retardant, anti-static, concealed zip
- Two front pockets, back pocket with flap, large thigh pocket, ruler pocket
- Reflective piping
- Adjustable straps with buckles, stretch inserts in the hip area
- Reinforced knees, double seams
- EN 1149-5, EN 13034, IEC 61482-2 class 1, EN ISO 11611 class 2, EN ISO 11612

Colour	Art. No.	P. Qty./unit
Grey, Black	M004 086...	1
Navy blue, Black	M004 087...	



EN 11612
heat protective
clothing for heat-
exposed work



EN 13034
protective clothing
against liquid
chemicals



ISO 1161
Protective clothing
for use in welding
and allied processes



EN 1149
Protective Clothing.
Electrostatic
Properties



EN 61482-2:2009
class 1 protective clothing
against the thermal hazards
due to electric arcing



Oberteile	XS = 010, S = 000, M = 001, L = 002, XL = 003, XXL = 004, 3XL = 005, 4XL = 006
Hosen	24 = 401, 25 = 403, 26 = 405, 27 = 407, 28 = 409, 29 = 411, 30 = 413, 40 = 417, 42 = 419, 44 = 321, 46 = 423, 48 = 425, 50 = 427, 52 = 429, 54 = 431, 56 = 433, 58 = 435, 60 = 439, 62 = 443, 64 = 447, 66 = 451, 90 = 457, 94 = 459, 98 = 461, 102 = 463, 106 = 465, 110 = 467, 114 = 469, 118 = 471



Multinorm jacket

The functional and anti-static jacket offers maximum protection and comfort.

- Flame-retardant, anti-static, concealed zip
- 2 front pockets, 2 breast pockets
- Reflective inserts
- Adjustable cuffs
- EN 1149-5, EN 13034, IEC 61482-2 Class 1, EN ISO 11611 Class 2, EN ISO 11612

Colour	Art. No.	P. Qty./unit
Grey, Black	M001 098...	1
Navy blue, Black	M001 099...	



EN 11612
heat protective
clothing for heat-
exposed work



Multi-standard trousers

Anti-static trousers that offer maximum protection against heat and flame.

- Flame retardant, anti-static, concealed zip
- 2 front pockets, back pocket with flap, large thigh pocket, ruler pocket
- Reflective piping
- Reinforced knees, elasticated cuffs, double seams
- EN 1149-5, EN 13034, IEC 61482-2 class 1, EN ISO 11611 class 2, EN ISO 11612

Colour	Art. No.	P. Qty./unit
Grey, Black	M003 094...	1
Navy blue, Black	M003 095...	



Stretch X Electric SB P E FO WRU safety shoe

Flexible and innovative safety shoes with comfortable stretch inserts. Ideal for activities that require frequent kneeling. Especially recommended for electricians thanks to an insulating sole.

- Breathable suede, fabric inserts
- Fabric inner lining, slip-on strap made from high-quality microfibre
- Fibreglass protective toe caps, fabric anti-perforation protection
- Slip-resistant insulating PU outsole SRC, comfort width 11
- DGUV 112-191, flexible thanks to CORDURA® stretch inserts, metal-free, made in the EU
- Approx. 570 g per shoe in size 42



Colour	Material of shoes upper	Safety category	Type description	Foot width	Art. No.	P. Qty./pair
Grey	Suede	SB	Stretch X	11 (comfort width safety shoes)	M414 011...	1

Size key	
36	...036
37	...037
38	...038
39	...039
40	...040
41	...041
42	...042
43	...043
44	...044
45	...045
46	...046
47	...047
48	...048



Energy absorption capacity in the heel area



Antistatic



Oil- and petrol-resistant outer sole



Energy absorption of the protective toe caps 200 joule



Water-repellent (not watertight)



Nature S3 ESD safety boots

These modern, comfortable safety boots feature a double-layer rubber outsole. The Air Tubeless System ensures first-class comfort.



- Breathable, ultra-lightweight microfibre
- Mesh inner lining, slip-on strap made from high-quality microfibre
- Aluminium protective toe caps, textile anti-perforation protection
- Non-slip rubber outer sole SRC, comfort width 11 (wide fit)
- ESD, air tubeless system
- Approx. 660 g/boot in size 42
- Größen: 36-47



Size key	
36	...036
37	...037
38	...038
39	...039
40	...040
41	...041
42	...042
43	...043
44	...044
45	...045
46	...046
47	...047

Colour	Material of shoes upper	Safety category	Standards	ISO	Other standard	Type description	Foot width	Art. No.	P. Qty./ pair
Brown	Microfibre	S3	ISO 20345 SRC	20345	SRC	Boots	11 (comfort width safety shoes)	M422 143...	1

Dunlop S5 rubber safety boots

Practical and functional rubber safety boots with impressive resistance to various chemicals.



- Robust PVC rubber boots
- Protective steel toe caps, steel anti-perforation protection
- Non-slip SRA PVC sole
- Resistant to special oils/greases, disinfectants, chemicals, comfort width 11 (wide fit)
- Shaft height 35 cm
- Approx. 1190 g per shoe in size 42



Size key	
38	...038
39	...039
40	...040
41	...041
42	...042
43	...043
44	...044
45	...045
46	...046
47	...047
48	...048

Colour	Material of shoes upper	Material	Safety category	Standards	ISO	Other standard	Foot width	Shaft height	Type description	Art. No.	P. Qty./ pair
Yellow	PVC	PVC - Polyvinyl chloride	S5	ISO 20345 SRA	20345	SRA	11 (comfort width safety shoes)	35 cm	Boots	M423 008...	1

E-MOBILITY

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