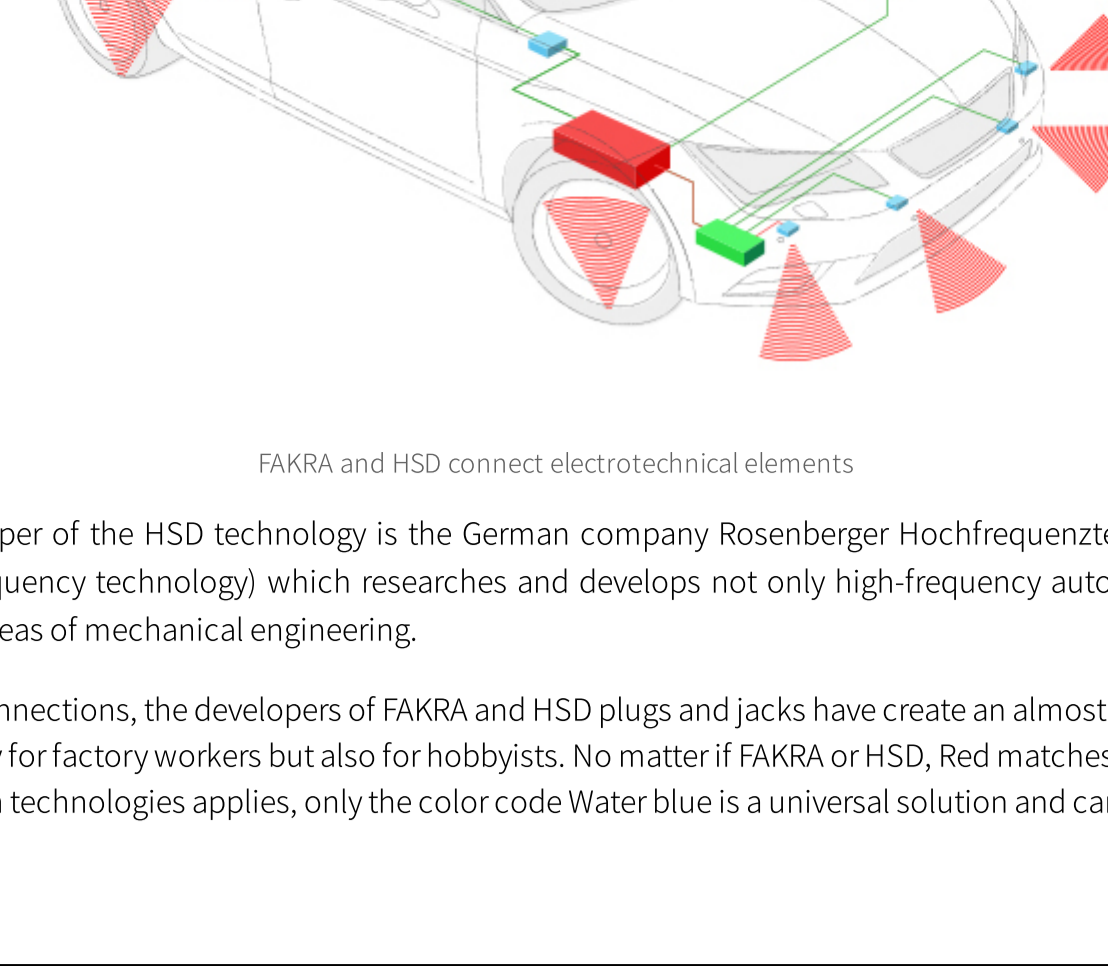


FAKRA and HSD plug connections

Introduction

Every year, the German automobile manufacturers and delivers worldwide invest billions of Euro in research and development. Today, the electrical sector and especially the automotive branch have elemental importance to manufacture internal communication connections in vehicles. In every factory, no matter if BMW, Audi or Ford, FAKRA and HSD are common technologies to connect elements of electrical engineering with each other.



FAKRA and HSD connect electrotechnical elements

Formerly and developer of the HSD technology is the German company Rosenberger Hochfrequenztechnik GmbH & Co. KG (Rosenberger High Frequency technology) which researches and develops not only high-frequency automotive connectors but also is active in other areas of mechanical engineering.

With its diverse plug connections, the developers of FAKRA and HSD plugs and jacks create an almost error-free solution to makes it easier not only for factory workers but also for hobbyists. No matter if FAKRA or HSD, Red matches only to Red, and Black only to Black... For both technologies applies, only the color code Water blue is a universal solution and can be adapted to all colors.

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FAKRA - What is it?

FAKRA is a plug connection system especially developed for car electronics. You can find it, amongst others, in the area of GSM mobile service and GPS, navigation, and it serves for transfer of camera data. The name of the specification according to DIN 72594-1 and USCAR-18 generates from **FAKRA's** Automobilspécialisierte group (automobile) of the company Rosenberger.

With up to thirteen different color-coded and appropriate mechanically coded markings, the FAKRA plug and jack are secured against plugging mistakes. The codes are made for different signal types and applications. They have guide notches and can be used only for a specific signal type. The fourteenth color **FAKRA Z** Water blue is neutrally coded and universally applicable.

Codes / colors & functions FAKRA plug & jack

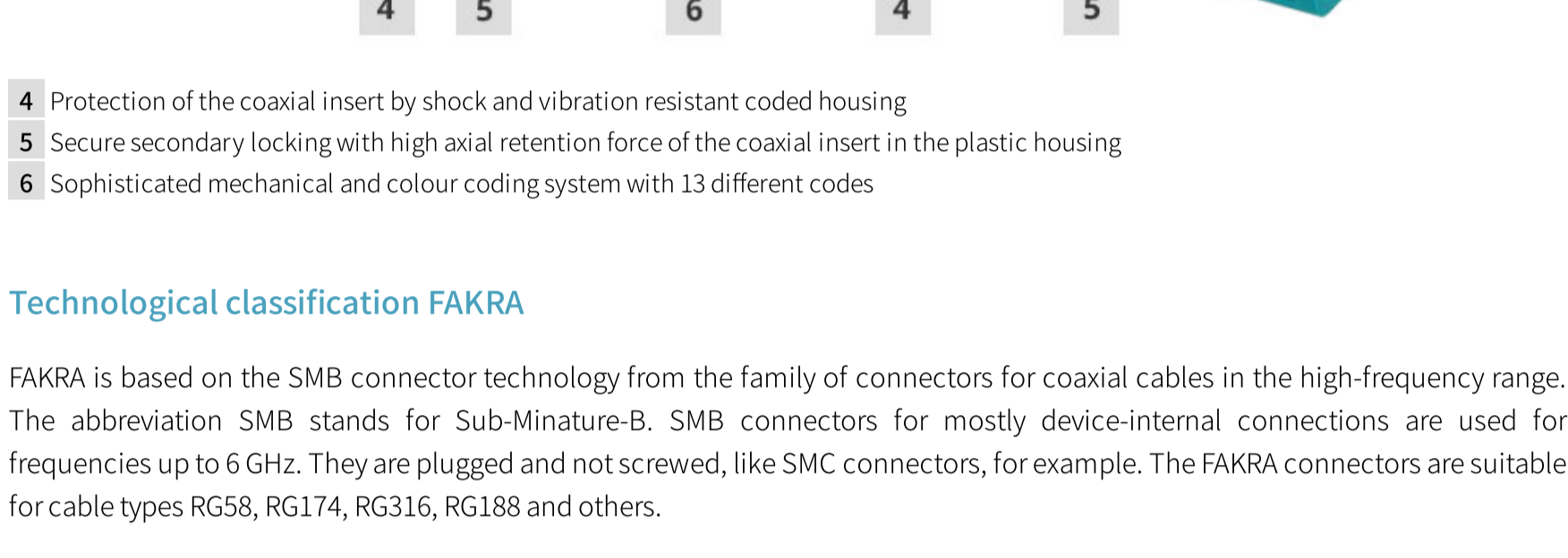
Plug / Jack	Code	Application	Color	RAL-No.
	A	Analogue radio without supply voltage	Jet black	9005
	B	Analogue radio with supply voltage	Cream	9001
	C	GPS, navigation	Signal blue	5005
	D	GSM (mobile) telephone	Claret violet	4004
	E	TV1	Leaf green	6002
	F	TV2	Nut brown	8011
	G	Radio remote control, central locking system	Blue grey	7031
	H	GPS, navigation	Heather violet	4003
	I	Radio remote control, stationary heating or Bluetooth	Beige	1001
	K	Radio with antenna Diversity	Curry	1027
	L	Not defined	Camrine red	3002
	M	Not defined	Pastel orange	2003
	N	Not defined	Pastel green	6019
	Z	Neutral	Water blue	5021

FAKRA application areas

Today, FAKRA plugs are largely used to run antennas. In modern vehicles, there are mostly several antennas which make sure that the radio or GPS reception behind trucks or in radio dead zones will not be interfered or even disrupted. If two or more antennas are installed in the vehicle - for example in the sky, on the bumper or the rear window of the vehicle - this is known as antenna diversity.

FAKRA connector in close-up view

- 1 Mounting groove for cable connectors for chassis mounting
- 2 Secure primary locking system between plug and coupler with tactile and audible locking
- 3 Protection bars and protective strips prevent unintentional opening of the primary latching arm



- 4 Protection of the coaxial insert by shock and vibration resistant coded housing
- 5 Secure secondary locking with high axial retention force of the coaxial insert in the plastic housing
- 6 Sophisticated mechanical and colour coding system with 13 different codes

Technological classification FAKRA

FAKRA is based on the SMB connector technology from the family of connectors for coaxial cables in the high-frequency range. The abbreviation SMB stands for Sub-Minature-B. SMB connectors for mostly device-internal connections are used for frequencies up to 6 GHz. They are plugged and not screwed, like SMA connectors, for example. The FAKRA connectors are suitable for cable types RG58, RG174, RG316, RG188 and others.

Product examples by Delock

Active Antenna NL-60AT GNSS GALILEO GPS - FAKRA C Jack

This GNSS antenna can be used on an existing GNSS receiver, car radio or vehicle multimedia receiver with FAKRA/C connection. The antenna is waterproof and can therefore be used temporarily outside the vehicle.

- 1 x FAKRA C Jack
- 1 x FAKRA C: RAL 5005 Signal blue
- Antenna gain: 27 dB
- Cable type: RG-174-U
- Outdoor

Item 60508 + 5 m cable length incl. connector
Item 60511 + 3 m cable length incl. connector

Antenna cable FAKRA Z plug to DIN plug

This antenna cable enables the connection between radio frequency technology components. The coaxial cable of RG-174 type has a diameter of ca. 2.9 mm. The smallest bending radius is ca. 10.5 mm.

- 1 x FAKRA Z plug
- 1 x DIN plug
- 1 x FAKRA Z: RAL 5021 Water blue
- Length incl. connectors: ca. 30 cm

Item 85720

Antenna cable FAKRA Z plug to ISO plug

This antenna cable is suitable for connections between radio frequency technology components. The coaxial cable of RG-174 type has a diameter of ca. 2.9 mm. The smallest bending radius is ca. 10.5 mm.

- 1 x FAKRA Z plug
- 1 x ISO plug
- 1 x FAKRA Z: RAL 5021 Water blue
- Cable attenuation: 0.35 dB @ 100 MHz per meter
- Length incl. connectors: ca. 30 cm

Item 85722

Antenna cable FAKRA C Jack - SMA jack bulkhead

This antenna cable enables the connection between radio frequency technology components. The coaxial cable of RG-174 type has a diameter of ca. 2.9 mm. The smallest bending radius is ca. 10.5 mm.

- 1 x FAKRA C Jack
- 1 x SMA jack bulkhead
- 1 x FAKRA C: RAL 5005 Signal blue
- Impedance: 50 Ohm
- Cable attenuation: 1.5 dB @ 1.5 GHz per meter
- Length incl. connectors: ca. 20 cm

Item 88581

Antenna cable FAKRA Z plug - FAKRA Z Jack

This antenna cable is suitable for connections between radio frequency technology components. The coaxial cable of RG-174 type has a diameter of ca. 2.9 mm. The smallest bending radius is ca. 10.5 mm.

- 1 x FAKRA Z plug
- 1 x FAKRA Z Jack
- 1 x FAKRA Z: RAL 5021 Water blue
- Impedance: 50 Ohm
- Cable attenuation: 2 dB @ 2.4 GHz per meter
- Length incl. connectors: ca. 1.8 m

Item 89652

Adapter FAKRA Z Jack to FME plug

This adapter is suitable for connecting components of radio frequency technology.

- 1 x FAKRA Z Jack
- 1 x FME plug
- 1 x FAKRA Z: RAL 5021 Water blue
- Impedance: 50 Ohm
- Pin: phosphorus bronze gold plated
- Dimensions (LxWxH): ca. 33.0 x 13.6 x 9.4 mm

Item 88527

Adapter FAKRA Z plug to SMA plug

This adapter enables the connection between radio frequency technology components.

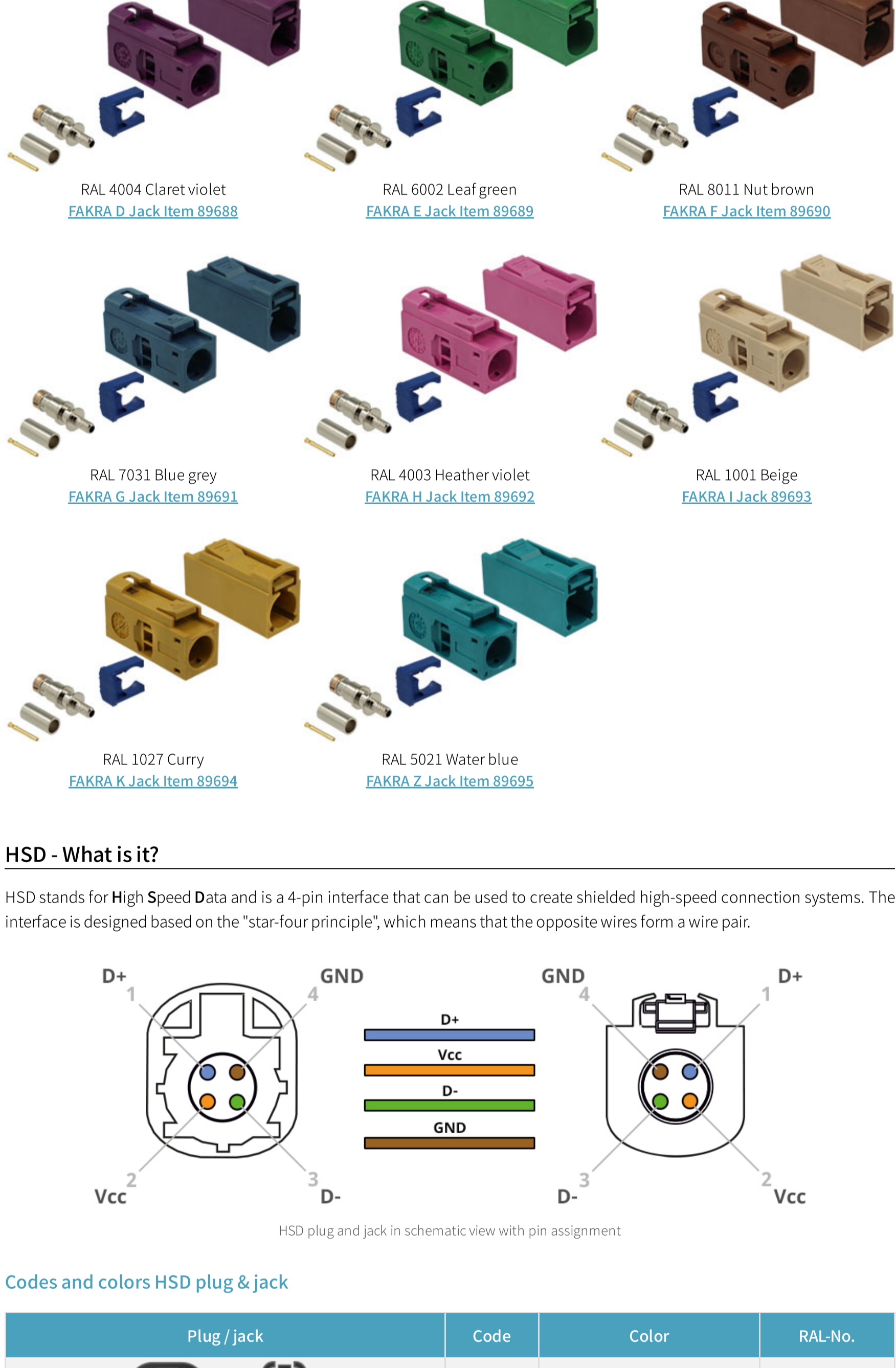
- 1 x FAKRA Z plug
- 1 x SMA plug
- 1 x FAKRA Z: RAL 5021 Water blue
- Pin: phosphorus bronze gold plated
- Impedance: 50 Ohm
- Dimensions (LxWxH): ca. 33.0 x 11.0 x 9.5 mm

Item 89661

FAKRA jacks for crimping

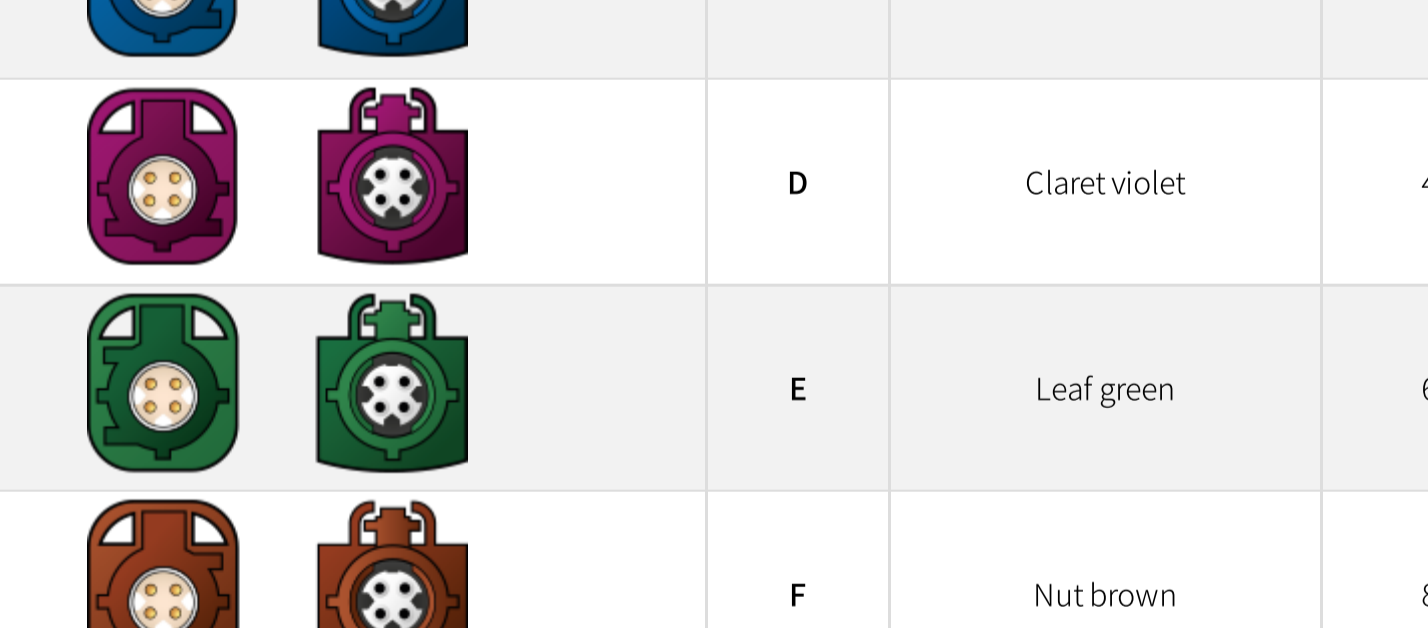
The following jacks are suitable for connecting components of radio frequency technology. A coaxial cable suitable for crimping is required. Apart from the different color codes, all jacks are specified as follows:

- Pin: beryllium copper gold plated
- Snap ring: beryllium copper
- Insulator: PTFE
- Housing: brass nickel plated
- Plastic shell: PA66 GF30
- Usable cable: RG 174, RG 316
- Dimensions (LxWxH): ca. 32.00 x 13.75 x 9.50 mm



HSD - What is it?

HSD stands for High Speed Data and is a 4-pin interface that can be used to create shielded high-speed connection systems. The interface is designed based on the "star-four principle", which means that the opposite wires form a pair.



HSD plug and jack in schematic view with pin assignment

Codes and colors HSD plug & jack

Plug / Jack	Code	Color	RAL-No.
	A	Jet black	9005
	B	Cream	9001
	C	Signal blue	5005
	D	Claret violet	4004
	E	Leaf green	6002
	F	Nut brown	8011
	G	Blue grey	7031
	H	Heather violet	4003
	J	Beige	1001
	K	Curry	1027
	L	Yellow green	6018
	M	Pastel orange	2003
	O	Pastel green	6019
	Z	Water blue	5021

Advantages of the HSD interface

Thanks to the star-four principle, HSD technology firstly creates internal error safety by preventing the so-called crosstalk. On the other hand, external interferences are avoided.

Like FAKRA shown above, HSD is also a plug-in connection system. The mounting of components and modules can be made fully automatic and so in comparably short time. The HSD module is twofold secured, primarily and secondarily. A high cable pull-off force, coding efficiency and contact safety, are further advantages of the plug system.

HSD application areas

As included in the name, HSD serves the high speed data transfer. In addition to the interference safety just described, HSD offers high signal quality, which is why its main area of application is the automotive industry.

- connects components of electrical engineering and electronics in vehicles
- offers connection solutions for vehicle infotainment modules, cameras, device connectors for vehicle occupants and screens
- creates connections for driver assistance

HSD connection systems can transmit USB signals, signals from LVDS cameras or from IEEE 1394. This makes HSD suitable for digital infotainment applications or head-up displays, HD entertainment, symmetrical networks, Ethernet data connections, telematics, video transmission via GPRS and also mobile base stations.

Technical specification HSD

For signal transmission, HSD uses the LVDS protocol (Low Voltage Differential Signaling). It is compatible with ethernet and USB protocols (as for example USCAR 30, Mini USB). With an impedance of 100 Ohm, a data transfer rate up to 1.6 Gbps is possible. In addition, long distances with cable lengths up to 30 meters are bridgeable.

The HSD connector system can be encoded with color/mechanical coding devices and is suitable for the various bus concepts in automotive technology, such as the MOST bus, LIN and CAN bus and CAN FD, as well as for Ethernet and Mobile High-Definition Link (MHL).

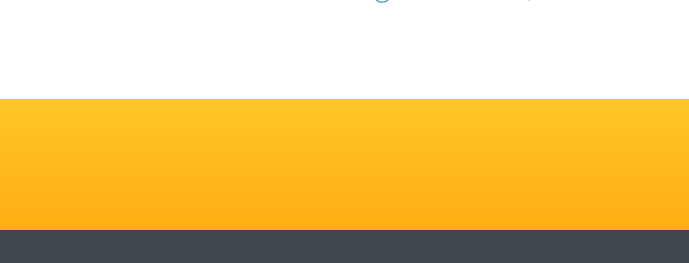
The system has more than 10 different male types which are marked by colors and so make mistakes while plugging impossible. Thanks to the guide notches, the modules cannot be interchanged. The connector is equipped with a snap lock and has a stable plastic housing. Like at FAKRA, the HSD Z code (Water blue) is universally applicable.

Product examples by Delock

The following HSD adapters are suitable for connecting components of electronic technology and electronic in vehicles.

If you are interested in further HSD encodings or project inquiries, please feel free to contact us:
E-Mail to our Product Manager: FAKRA@HSD

Adapter HSD Z male to USB 2.0 Type-A female



- 1 x HSD Z male
- 1 x USB 2.0 Type-A female
- 1 x HSD Z: RAL 5021 Water blue
- Pin: Phosphorus bronze gold plated
- Insulator: LCP
- Housing: Brass nickel plated
- Plastic shell: PA66
- Dimensions (LxWxH): ca. 45.0 x 34.0 x 22.0 mm

Item 89926

Adapter HSD B male to USB 2.0 Type-A female

- Like above, with HSD B: RAL 9001 Cream

Item 89924

Adapter HSD Z female to HSD Z male

- 1 x HSD Z female
- 1 x HSD Z male
- HSD Z: RAL 5021 Water blue
- Pin: Brass gold plated
- Insulator: LCP
- Plastic shell: PA66
- Dimensions (LxWxH): ca. 48.0 x 12.0 x 14.4 mm

Item 90284

Adapter HSD Z female to HSD Z female

- 1 x HSD Z female
- 1 x HSD Z female
- HSD Z: RAL 5021 Water blue
- Pin: Brass gold plated
- Insulator: LCP
- Plastic shell: PA66
- Dimensions (LxWxH): ca. 42.4 x 12.0 x 14.1 mm

Item 90485

Adapter HSD Z in-line to HSD Z male

- 1 x HSD Z male
- 1 x HSD Z male
- HSD Z: RAL 5021 Water blue
- Pin: Brass gold plated
- Insulator: LCP
- Plastic shell: PA66
- Dimensions (LxWxH): ca. 42.5 x 12.0 x 14.3 mm

Item 90339