

Selection of appropriate technology for a certain application is carried out in cooperation with customers based on more detailed data on each individual application. Data necessary for the selection of appropriate technology are acquired through direct communication with potential customers.

### Basic descriptions of various technologies:

#### **HIR; HRI technology**

HIR and HRI types of commutators produced at our company are available with diameters from 20mm to 40mm.

Commutator is composed of Cu bars insulated between each other, and reinforced with insulation rings. HIR and HRI commutators are without insulation bars as they are insulated with moulding compound filling the commutator and have air insulation on the surface. The most complex types of reinforced commutators are pre-stressed with insulation rings composed of glass fibres and binder (HIR) or with combined rings composed of glass fibres, binder and steel ring (HRI).

Commutators have hooks to attach rotor wires to them. Bore can be reinforced with steel or brass bushing.

HIR and HRI commutators are used with the highest mechanical and thermal loads. They are integrated into industrial hand tools, drive mechanisms, vacuum cleaners, motor saws and generators.



#### **HRK technology**

HRK types of commutators produced at our company are available with diameters from 20mm to 35mm.

Commutator is composed of Cu bars insulated between each other with insulation bars and reinforced with rings. The entire tensile load resulting from peripheral speed is born by the rings while the layer of compound between the Cu bar anchor and the ring is pressure loaded. Insulation between bars can be full or recessed with air insulation on the commutator surface.

Commutators have hooks (H) to attach rotor wires to them. Bore can be reinforced with steel or brass bushing.

HRK commutators are used with the highest mechanical and thermal loads. They are integrated into motors for professional hand tools, motor saws and vacuum cleaners.



#### **HR technology**

HR types of commutators produced at our company are available with diameters from 20 to 40mm.

Commutator is composed of Cu bars insulated between each other, and reinforced with insulation steel ring. HR commutators are without insulation bars as they are insulated with moulding compound filling the commutator and have air insulation on the surface. Commutators have hooks to attach rotor wires to them. Bore can be reinforced with steel or brass bushing.

HIR and HRI commutators are used with the highest mechanical and thermal loads. They are integrated into motors for industrial hand tools, drive mechanisms, vacuum cleaners, motor saws and generators.



#### **HIRM technology**

HIRM types of commutators produced at our company are available with diameters from 25mm to 35mm.

Commutator is composed of Cu bars insulated between each other with insulation bars, reinforced with insulation rings and moulded with phenolic compound. HIRM commutators have air insulation on the surface. The most complex types of reinforced commutators are pre-stressed with insulation rings composed of glass fibres and binder.

Commutators have hooks to attach rotor wires to them. Bore can be reinforced with steel or brass bushing.

HIRM commutators are used with the highest mechanical and thermal loads. They are integrated mainly in motors for industrial hand tools.



#### **HIRN technology**

HIRN types of commutators produced at our company are available with diameters from 25mm to 35mm.

Commutator is composed of Cu bars insulated between each other, and reinforced with insulation rings. HIRN commutators are without insulation bars as they are insulated with moulding compound filling the commutator and have air insulation on the surface. The most complex types of reinforced commutators are pre-stressed with insulation rings composed of glass fibres and binder.

Commutators have hooks to attach rotor wires to them. Bore can be reinforced with mantled bushing.

HIRN commutators are used with the highest mechanical and thermal loads. They are integrated mainly in motors for industrial hand tools.



#### **2M technology**

2 M types of commutators produced at our company are available with diameters from 20 to 42

2 M technology is upgrade of HIR, HRI, HR, HIRN, HK technologies. Commutator is produced as the basic version of individual technology but with two insulation compounds used in its structure. Compound in core has improved mechanical and thermal characteristics while the compound close by the brush track has excellent surface electrical characteristics.

HIR-2M, HK-2M.... commutators are used mainly in professional applications with hard commutation conditions or in applications where frequent change of brushes is required.



#### **HK technology**

HK types of commutators produced at our company are available with diameters from 15 mm to 45mm.

HK type has air insulation between Cu bars which spares further sawing out of insulation during production of rotors. Cu bars are freely anchored in phenolic or melamine-phenolic compound.

Commutators have hooks (H) to attach rotor wires to them. Bore can be reinforced with steel or brass bushing.

HK commutators are used of electric motors in household appliances, such as vacuum cleaners, washing machines and power hand tools.



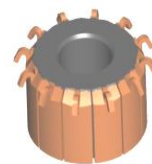
### HP technology

HP types of commutators produced at our company are available with diameters from 15mm do 22mm.

Commutator is composed of Cu bars insulated between each other with insulation bars and moulded with phenolic compound.

Commutators have hooks (H) to attach rotor wires to them. Bore can be reinforced with steel or brass bushing.

HP commutators are used for less complex motors integrated into household appliances, such as coffee grinders, food processors, meat mincing machines, sawing machines, hair driers. As they have full insulation between bars they create less radio interference therefore their additional suppression in motor is not required.



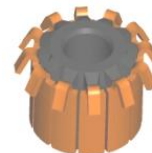
### HPP technology

HPP types of commutators produced at our company are available with diameters from 10mm to 40mm.

Cu shells are produced of cold formed copper strip. Shells are moulded with moulding compound and sawn to Cu bars thus separated by air insulation.

Commutators have hooks to attach rotor wires to them. Their form is appropriate for automatic winding of rotor wires. With HPP type, bore can be reinforced with steel or brass bushing.

HPP commutators are used for electric motors in household appliances, for 12V electric motors in cars and for power hand tools.



### C technology

C types of commutators produced at our company are available with diameters from 5 mm to 30mm.

Cu shells are produced of smooth copper strip. Shells are injection moulded with moulding compound and sawn to Cu bars thus separated by air insulation.

Commutators have hooks to attach rotor wires to them.

C commutators are used for electric motors in cars, for electric motors in household appliances and for less complex hand tools.



### HB technology

HB types of commutators produced at our company are available with diameters from 8 mm to 35mm.

Cu shells are produced of cold formed copper strip. Shells are injection moulded with moulding compound and sawn to Cu bars thus separated by air insulation.

Commutators have hooks to attach rotor wires to them.

HB commutators are used for electric motors in cars, for electric motors in household appliances and for less and medium complex hand tools.



### HBCK technology

HBCK types of commutators produced at our company are available with diameters from 15 mm to 40mm.

Cu shells are produced of cold formed copper strip. Besides standard anchoring of bars for HB technology, these shells include also additional C anchoring. Shells are injection moulded with moulding compound and sawn to Cu bars thus separated by air insulation.

Commutators have hooks to attach rotor wires to them.

HBCK commutators are used for medium loaded electric motors in household appliances and hand tools. In several versions they successfully substitute HK technology commutators.

