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## Document Revisions

| PDM Version | Date       | Description                |
|-------------|------------|----------------------------|
| 1           | 27/02/2020 | Initial release            |
| 2           | 11/03/2020 | Editorial update           |
| 3           | 14/04/2020 | Off-shore version included |

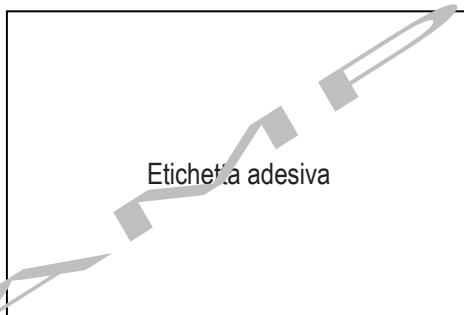
# Declaration of Incorporation Of Partly Completed Machinery

(Type 1 B statement following Annex II of the Machinery Directive)

CONDUCTIX WAMPFLER s.r.l.

Via De Capitani 14/16  
20864 AGRATE BRIANZA (MB)  
Tel. 039-60743.1 r.a. - Fax 039-60743.292

**DECLARES THAT THE MACHINE**



**COMPLIES WITH THE FOLLOWING  
Low Voltage Directive 2014/35/UE**

Harmonised standard: EN 60204-1:2006

The following harmonised standards have been applied as well, following the Machinery directive 2006/42/EC:  
EN ISO 12100:2010

**FORBIDDEN**

Starting the machine until the machine where it will be incorporated and the machine that will become component is identified and declared as complying with the Machinery Directive.

Further, it states that the following basic safety requirements have been respected: 1.1.1, 1.1.2, 1.1.3, 1.1.5, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.9, 1.5.1, 1.5.3, 1.5.4, 1.5.5, 1.5.8, 1.6.4, 1.7.1.1, 1.7.2.

The technical file of this equipment, which is established according to Annex VII, Part B, is available in our premises and could be supplied on justified request of the National Authorities.

The EU marking has been affixed because responding to the Low Voltage Directive 2014/35/EU and not to the Machinery Directive 2006/42/EC.

The technical file is made at Conductix-Wampfler s.r.l. Via De Capitani 14/16 - 20864 Agrate Brianza (MB)

Agrate Brianza, -----

Gotelli Alessandro (General Manager)



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## 1. Intended Use

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E-USR90 slip rings, are addressed to be integrated in electrical machinery. They have been designed in order to be used in horizontal or in vertical position and allow including in a unique equipment low power rings, control current rings and data rings.



The slip ring must be installed in compliance with the conditions specified on enquiry. Different installations can cause problems to its working and in particular cases can also cause damages to people (mains subjected to breaking, faults of the transmission, etc.).



It is absolutely forbidden to use the slip ring for other applications except the foreseen ones.



The slip ring is designed to work with **NO SURVEILLANCE**, anyway the operators using the machine where the slip ring is installed in must be trained in an appropriate way on the use of the slip ring itself, on residual risks and on the use of possible individual protection devices that should be necessary.



**Electrical feeding restrictions.** The plants for energy transportation must comply with the Italian Ministry Decree 37/08. The characteristics of the electric energy source must comply with the indications at paragraph 4.3.2 of CEI EN 60204-1.



**Protection against electrical risks restrictions**

The slip ring complies with the protection requirements foreseen by the CEI EN 60204-1 standard. The Customer **MUST** also install a protection system with automatic interruption, in order to get protection against indirect contacts.

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## 2. General Warnings

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The manual refers to essential aspects of the directives, norms and instructions concerning the use of the equipment and summarizes the most significant aspects. The failure in complying with warnings contained in this manual could lead to personal injuries or even to death. Furthermore, it is necessary to observe the service instructions and the general standards and directives related to the safety on workplace and on environment protection. Despite this, people can run serious risk if not qualified and trained enough to use the machine and/or not in compliance with its use. Before working with the slip ring, the charged personnel, both production and maintenance, must have read the manual's instructions.

### 2.1 Use and Care of the "Use and Maintenance manual"

#### 2.1.1 Receivers of the Manual

The use and Maintenance Manual addresses to the people in charge of the installation, maintenance, production, as well as to all operators working with the slip ring.

#### 2.1.2 Storing the Manual

The use and maintenance manual is an integral part of the equipment and must be stored until its demolition. It must be stored in a protected and dry place, far from sunrays but always near the slip ring where the product is assembled on. The User, should the manual be damaged, must ask the Manufacturer for a copy of it that the Manufacturer will supply.

#### 2.1.3 Updating the Manual

The data in the present manual are updated to the commercialized equipment. The Manufacturer reserves the right to modify the slip ring and consequently the relative manual without any obligations to update the previous releases of the manual. The user can anyway ask for information and updating which, once released and supplied, become integral part of the use and Maintenance Manual. Should the equipment be given to third parties, remember to enclose the manual in the supply. The first User has to supply to the Manufacturer the new owner's address. The Manufacturer owns the copyright of the present manual and no total or partial duplication is allowed prior written authorization of the Manufacturer

### 2.1.4 Explanation of the symbols



**Safety at the Workplace.** This symbol relates to warnings when the equipment is running in conditions which could represent a serious risk for the people.



**Electrical dangers.** Covers bearing this sign must be removed exclusively by "Trained and Qualified Personnel" only and after switching off the mains.



**Absolutely Forbidden.** This symbol means obligation. The Manufacturer does not assume any responsibility for the equipment if these prescriptions are not observed



**Limb crashing.** This symbol appears whenever operations on the equipment could lead to hands or feet crashing.



**Hanging loads.** Any stops and stays in this area could lead to personal injuries or even to death. Never walk under hanging loads or leans into the area perpendicular to the hanging loads in its immediate vicinity.

## 2.2 Safety Measures

### 2.2.1 General



All works of harness must be done by qualified electricians under observance of the common electronic directives. It is fundamental to observe all measures and warnings relating to a safe operation of the equipment and the accident prevention before, during or after the setting up of the equipment. The User assumes all responsibility, except the written consent of the Manufacturer.

The slip ring must be immediately switched off in case of anomaly.

### 2.2.2 Identification and safety plates

1- CONDUCTIX-WAMPFLER EU Plate



2- Electrical danger Plate



### 2.2.3 Installation and setting to work

Before undergoing any operation on the equipment, please read carefully this user manual which must always be easily reachable. All operations and repairs on the electrical parts under tension must be carried out only after disconnecting the main switch on the electrical panel. The symbols found in the manual call the operators attention to relevant or easily occurring dangers

### 2.2.4 Safety Rules for Use

Repairs on electrical components must be carried out only by qualified personnel (electricians) or by trained persons under the surveillance of an expert electrician, in conformity with the relevant electrical and technical norms. Any part of the slip ring which must undergo an inspection, maintenance and repair must be disconnected from the mains before starting to work on it. The electrical components of the slip ring must be inspected and controlled regularly. Faults, such as slacked electrical connections or worn cables must be replaced immediately.

### 2.2.5 Safety Rules for Maintenance and Repair

Adjustment, maintenance, and repair must be carried out in compliance with the indicated intervals, taking care of the directions concerning the substitution of components or partial parts. Moreover, these operations must be carried out only by qualified personnel.

### 2.3 Cases that relieve the Manufacturer of any Liability

The manufacturer is not responsible when:

- a) the equipment is not properly used or used by unqualified personnel
- b) use against the specific national norms
- c) not correct installation
- d) feeding faults
- e) weighty lack of foreseen maintenance
- f) unauthorized modifications or interventions
- g) non-original spare parts or non-specific for the used model
- h) total or partial nonobservance of the instructions
- i) exceptional events



the equipment cannot be used if the user:

- excludes voluntarily safety devices
- alters the slip ring's performance by changing the design data and plate
- removes or make unreadable the danger plates or signals on the machine
- uses non original spare parts

**REMARK** the text of the Italian version of this manual represents the only reference for the resolution of possible interpretative controversies due to translations in the EC languages.

## 3 General features

|                         |   |
|-------------------------|---|
| Models foreseen         | stand alone   |
| Size                    | E-USR90   |
| Current intensity       | from mA to 100A, depending on the slip ring composition |
| Data transmission speed | up to 12 Mbps (Profibus)                                |
| Max operating voltage   | 690 Vac / 600Vdc  |
| Frequency               | 50/60 Hz, sinusoidal                                    |
| Standard protection     | Slip ring body= IP65                                    |
| Max operation speed     | 100 min <sup>-1</sup>                                   |
| Assembly position       | Horizontal and vertical                                 |
| Working temperature     | -20°C ...+40°C – Derating beyond                        |
| Relative humidity       | less than 90% without condensation                      |
| Rotating direction      | Clockwise/anticlockwise                                 |
| Altitude                | less than 1.000 m                                       |
| Anti-condensation valve | included  |

## 4 Optional

|                          |  |
|--------------------------|--|
| Flange                   | Several optional flanges available, to be fixed to the universal hub shown in section 4.1. |
| Anti-condensation heater | On request   |
| Anti-rotation            | Optional fork, as per drawing  |

### 4.1 Universal hub and optional flanges

Remark: available in AISI316 upon request.

#### Universal hub

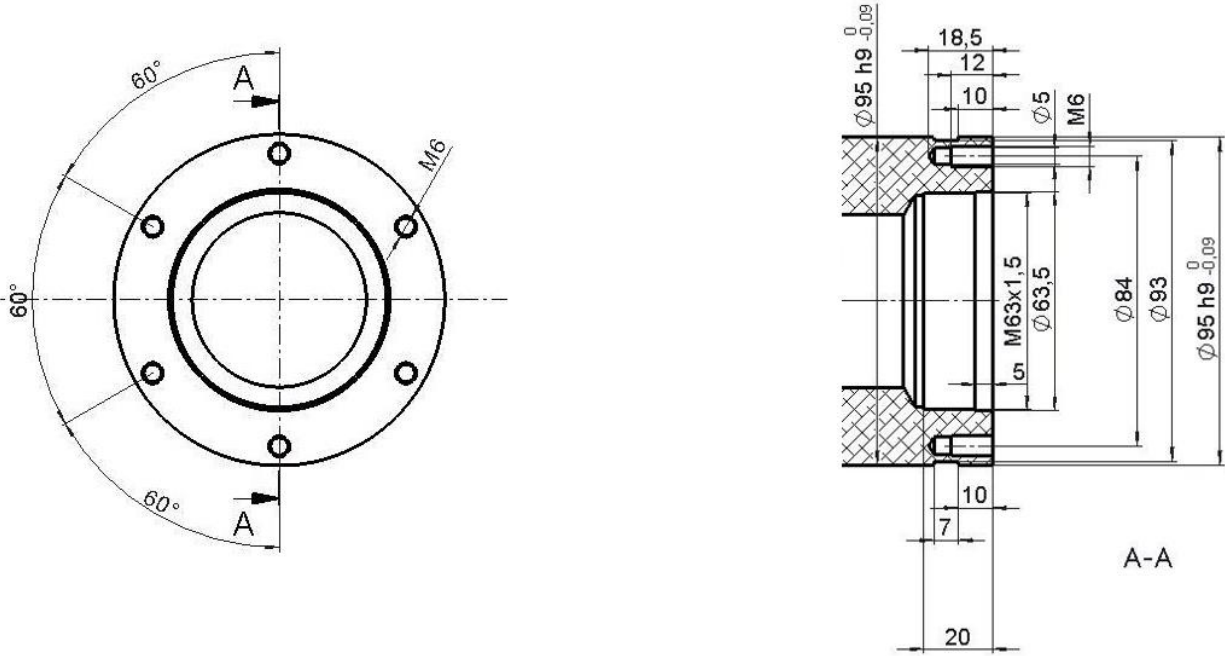


Fig. 1

#### Flange FC

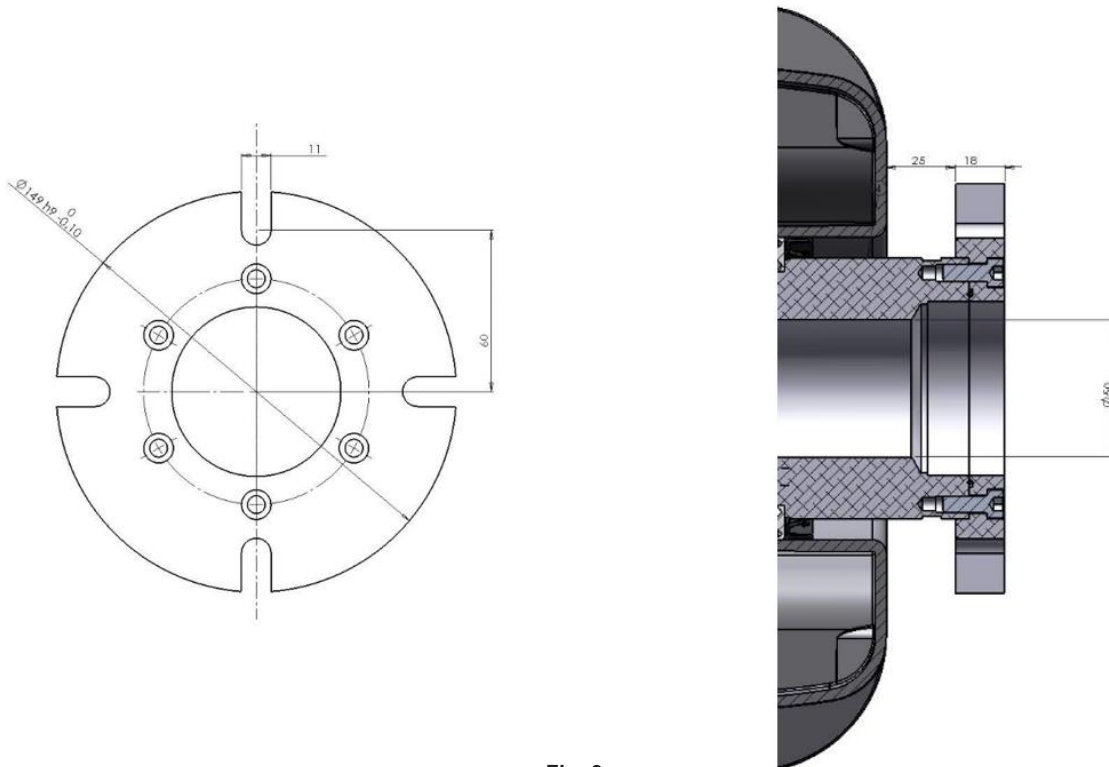


Fig. 2



Flange FW

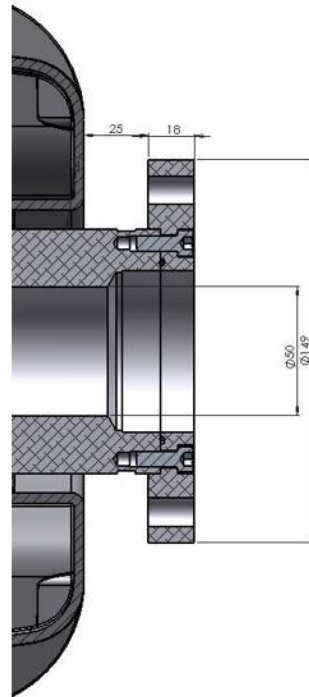
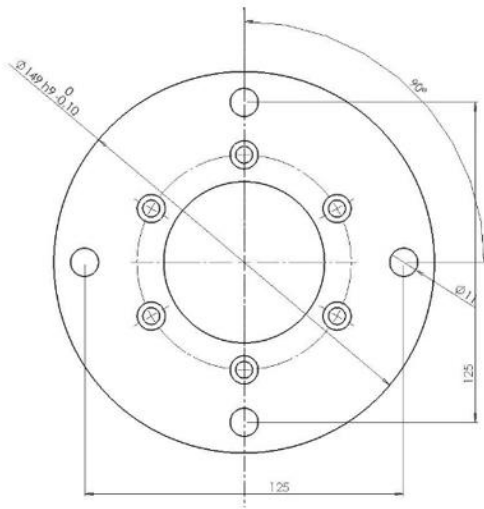


Fig. 3

Flange FW2

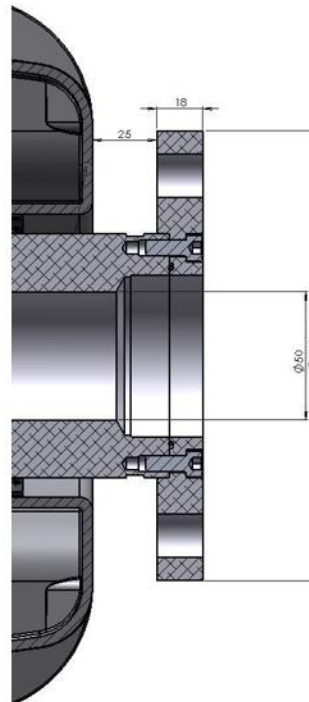
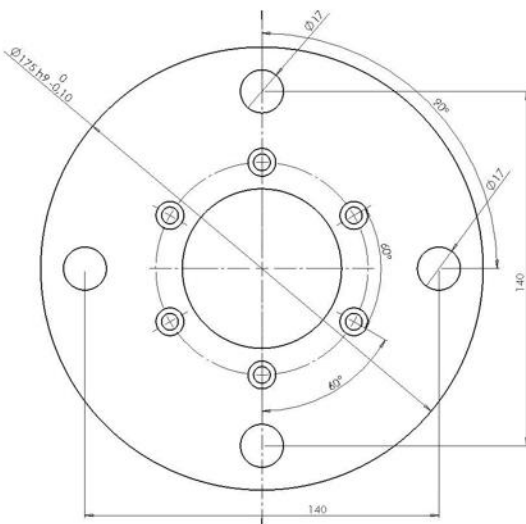


Fig. 3bis



## 4.2 Anti-rotating fastening

The rings group must be coupled to a rotating pulling element by means of the shaft, avoiding that the slip ring body rotates. Three methods can be used, as described below.

The slip ring must not be used as a pulling element for other components and only one part of its two parts (rotor or stator) must be firmly fixed.



No other mechanical part of the housing can be used for anti-rotation purposes, apart from those described in this paragraph.

FORBIDDEN !

### a) Anti-rotation pin

One of the four M6 threaded holes can be used to install an anti-rotation pin. The anti-rotation pin must not be fixed rigidly on the machine.

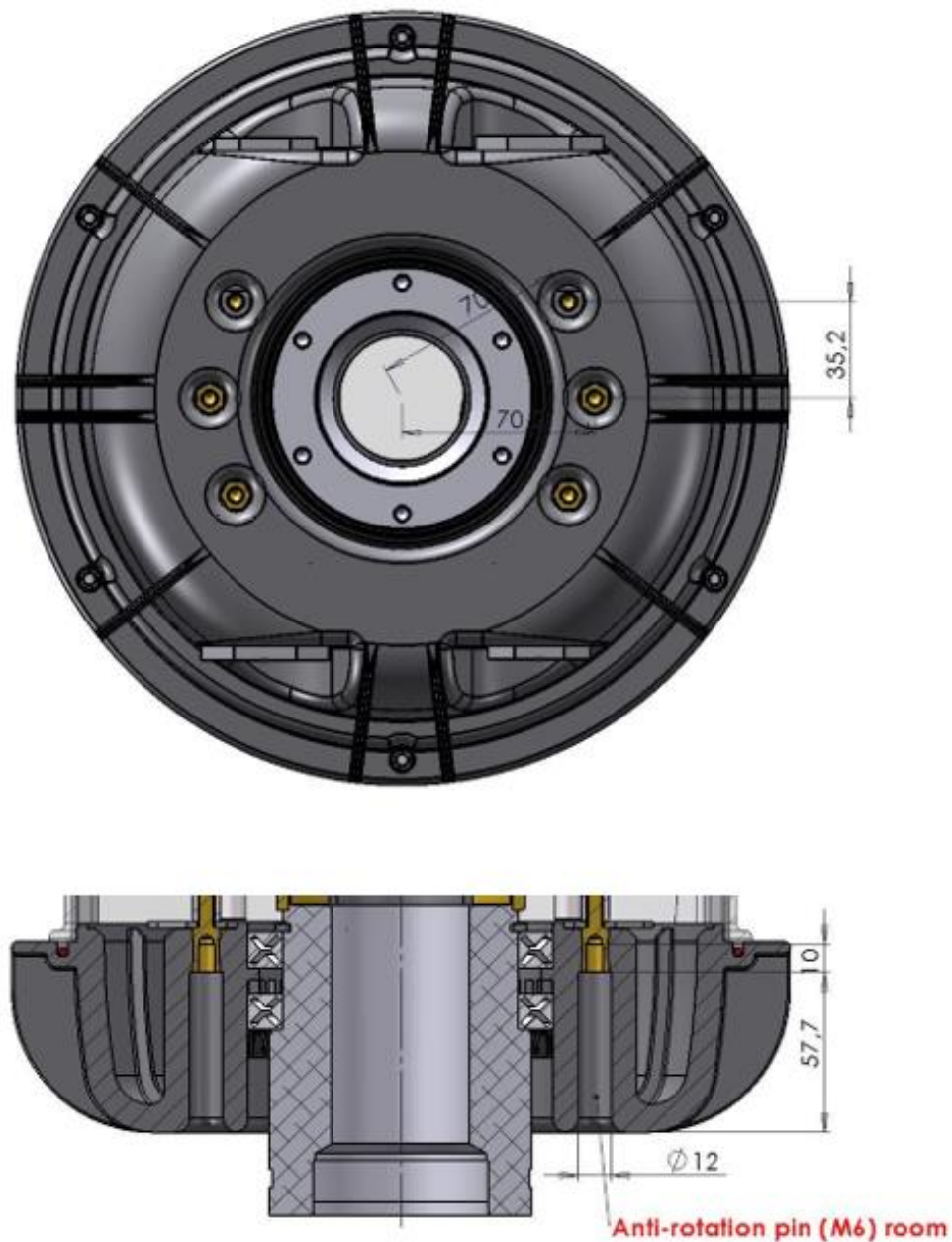


Fig. 4

**b) Ribs on the housing**

One of the four couples of ribs can be used as anti-rotation means

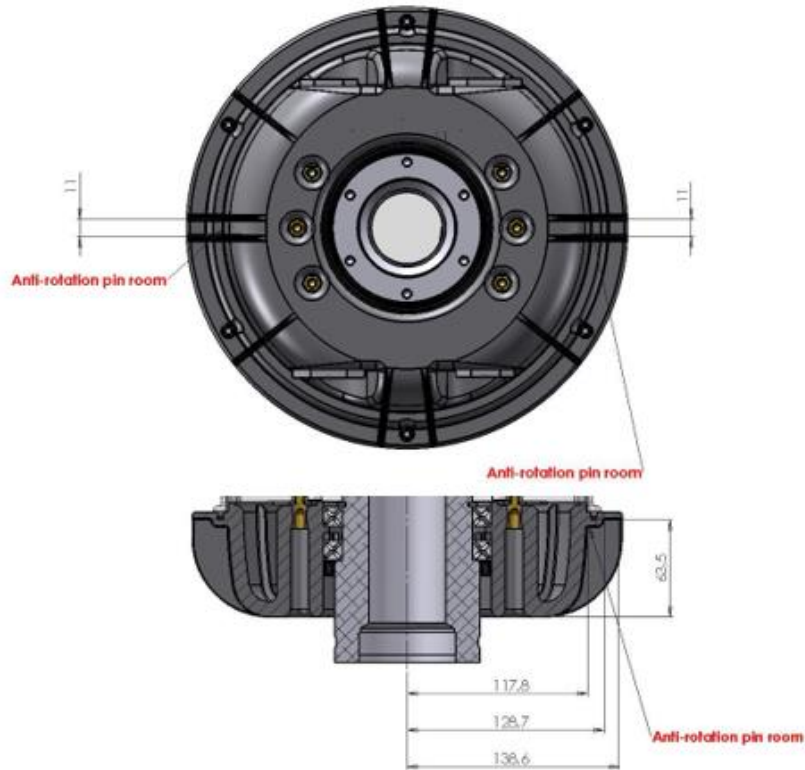


Fig. 5

**c) Additional fork** (provided by Conductix-Wampfler upon request)

Remark: available in AISI316 upon request.

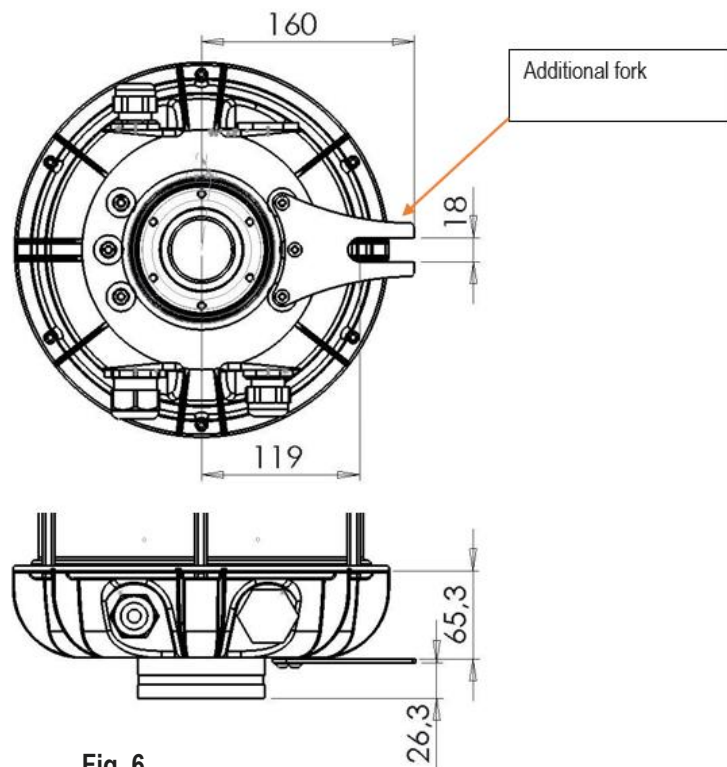
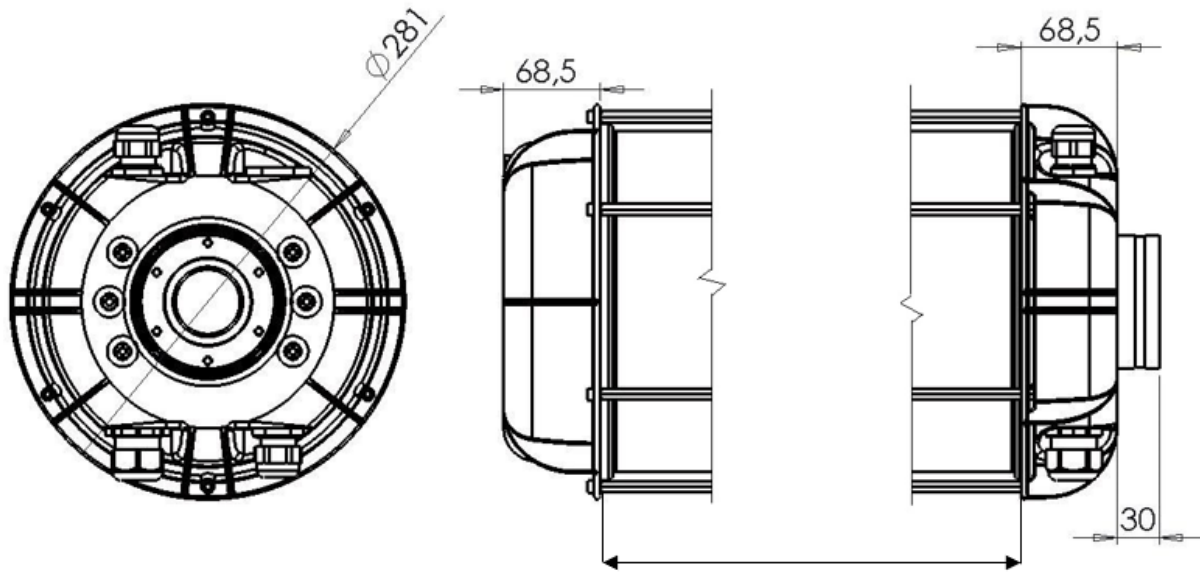


Fig. 6

## 5 Dimensions



Up to 6 modules each 100 mm long can be assembled.

Fig. 7

## 6 Use for the safety

### 6.1 Use of qualified personnel



**WARNING !**

#### ***Injury due to insufficient qualifications!***

Improper use can result in serious injury and property damage.

Therefore:

- All activities may only be performed by qualified personnel!

The slip ring must be installed, commissioned, serviced and recycled on the operating machine by qualified personnel. A qualified person is the person who, thanks to its training, experience and professionalism, has the specialized knowledge needed to test, to value and to manage equipment of work, devices, systems, installations and machines according to the general rules and the guidelines for the technologic safety.

The user is responsible for employing only people who have:

- knowledge with the basic regulations about health and safety/ prevention of accidents
- read and understood the safety guidelines indicated in this manual
- a good knowledge of the general and specialized rules applicable to the electric slip ring

### 6.2 Warranty and responsibility

All warranty rights and responsibilities will be declared not valid if:

- the slip ring is not used for the purposes which is addressed to
- a damage can be attributed to the inobservance of the guidelines indicated in this Manual and Annexes
- the service personnel is not properly qualified
- any kind of change was carried out by non-Conductix-Wampfler personnel.

### 6.3 Periodic functional test

The safety functions must be checked initially by the manufacturer of the machine where the slip ring is installed in, and later periodically by qualified personnel after the first commissioning.

### 6.4 Commissioning, use and demolition

#### 6.4.1 Setting to work of the equipment

After connection to the harness and mechanical interfaces of the final machine (if required), the slip ring is ready to operate.

##### 6.4.1.1 General Control of Machine

- Control that the slip ring has not been subjected to damages during transportation or assembly in the final machine (damage to enclosure, local dents, damages to electric parts, etc.). The slip ring must not be operated if damaged.
- Control that safety devices are complete and working.

#### 6.4.2 Information On Residual Risks



**DANGER!**

#### ***Danger – electric shocks***

Before starting any kind of work on the slip ring, disconnect all external feeding connections; alternatively, make sure the slip ring is not powered



**WARNING!**

#### ***Alarm – risk of injuries***

Before starting any kind of work on the slip ring, make sure it cannot turn by accident.

If necessary, switch the voltage off from the system in which it is inserted and make sure it does not start again



WARNING!

**Alarm – electric risk**

Check the good connection of the yellow/green cable to the earth.



WARNING!

**Alarm – risk of a possibly crushing parts of the body**

Before to remove and unlock or insert and lock the brush holders, make sure it cannot turn by accident.

If necessary, use suitable protective gloves.

## 6.5 Instruction for Use

### 6.5.1 Qualified Personnel

Generic employees may qualify to operate this type of machine by simply being trained to its usage features.

### 6.5.2 Instructions for Commissioning

Before commissioning the global machinery or plant, the User must verify that this equipment does not affect the operations.

### 6.5.3 Information on Dangers connected with use

During operations, never tamper the electrical and mechanical protections.

**The manufacturer will be waived from any liability, if the above-mentioned instructions are not observed.**

### 6.5.4 Demolition of the equipment and disposal of injurious wastes

The demolition and disposal of the equipment wastes must be carried out in compliance with the local regulations for the disposal of industrial wastes. We advise to separate different materials and then comply with the relative local disposal regulations. Plastic parts of the slip ring are made of PP GF30 V0.

If they cannot be recovered some way, it is advisable to contact a company specialised in the recovery of metallic wastes. Not recyclable materials-rubbers, plastics, or especially disposable materials such as oils and lubricants were used only in low quantity. Please avoid leaving any component or the fluids of the equipment in the environment and check the enclosed part lists and comply with the relative regulations on the materials' disposal.



**IMPORTANT NOTICE: please notice that the disposal of scraps and wastes is in charge of the owner of the machine. The manufacturer of the slip ring assumes no responsibility for it.**

## 7 Electric wiring restrictions



CAUTION!

The slip ring unit is suitable for use with earth referenced electric supply system (TN). An isolating transformer (secondary star-connected, with earthed neutral) is always required for networks that are asymmetrically grounded or not grounded (Fig. 8). Insulation among the phases inside the slipring is designed for a maximum voltage lower or equal to the nominal one (690V).

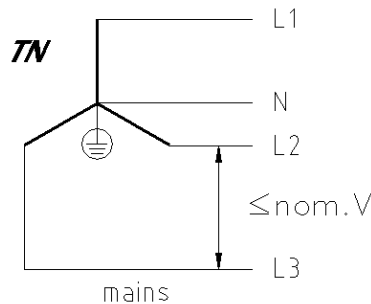


Fig. 8

### 7.1 Type of brush

| Ring code | Ring material           | Brush material  | Current in rotation (A), T.=30°C, S1 |
|-----------|-------------------------|-----------------|--------------------------------------|
| A         | Brass                   | copper graphite | 9                                    |
| B         |                         |                 | 19                                   |
| D         |                         |                 | 40                                   |
| E         |                         |                 | 70                                   |
| F         |                         |                 | 100                                  |
| U         | Brass + flash of silver | silver graphite | Low rate transfer signals (4-20mA)   |
| W         | Brass + flash of gold   | silver graphite | High rate transfer signals           |

Notes: - For each degree above, derating of 1%/°C  
-  $I = I_n \cdot (1 - (T_{amb} - 30) / 100)$

-  $I_n =$  max current at 30°C,  $T_{amb} =$  ambient temperature, Max ambient temperature = 60°C

The data about ampacity refer to individual slip rings including current collector. The actual ampacity of the complete slip ring assembly can differ significantly depending on the existing general conditions (e.g, number of rings, cable type, operating conditions).

Tab. 1 – Type of brush

### 7.2 Cable section for nominal current for the internal wiring of the terminal board on rings side

| Ring code | Cable section (mm <sup>2</sup> ) | Cable section for ground (mm <sup>2</sup> ) |
|-----------|----------------------------------|---|
| U/W       | n.1 AWG20 (0,6)                  | n.1 AWG20 (0,6)                             |
| A         | n.1 AWG16 (1,35)                 | n.1 AWG16 (1,35)                            |
| A         | n.1 AWG12 (3)                    | n.1 AWG12 (3)                               |
| D         | n.1 AWG8 (9,4)                   | n.1 AWG8 (9,4)                              |
| E         | n.2 AWG8 (2x9,4)                 | n.1 AWG8 (2x9,4)                            |
| F         | n.3 AWG8 (3x9,4)                 | n.2 AWG8 (3x9,4)                            |

Tab. 2 – Internal slip ring cable section for nominal current

Terminal board with pins (see table 8 for pin size)

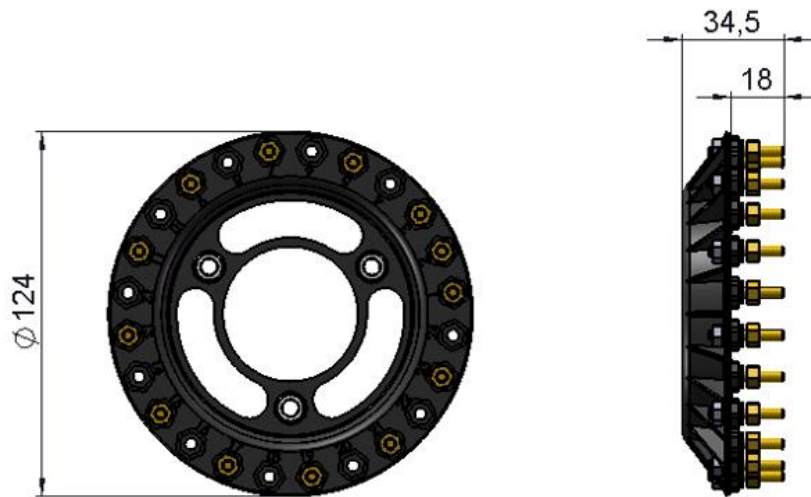


Fig. 9

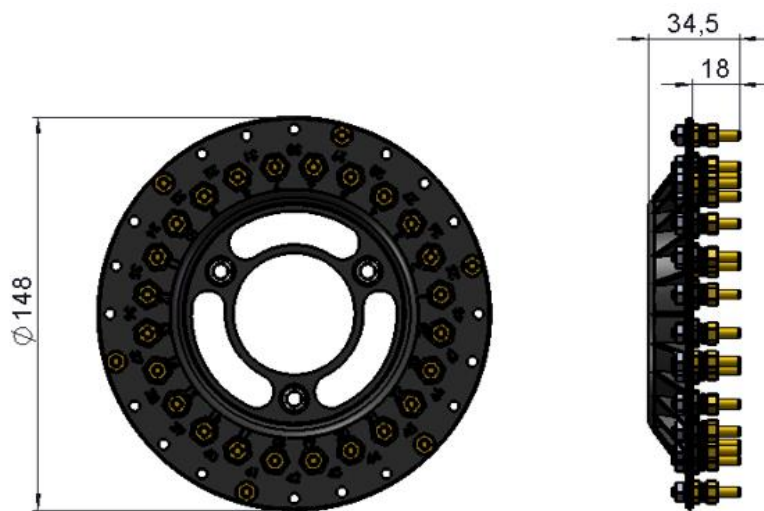


Fig. 10

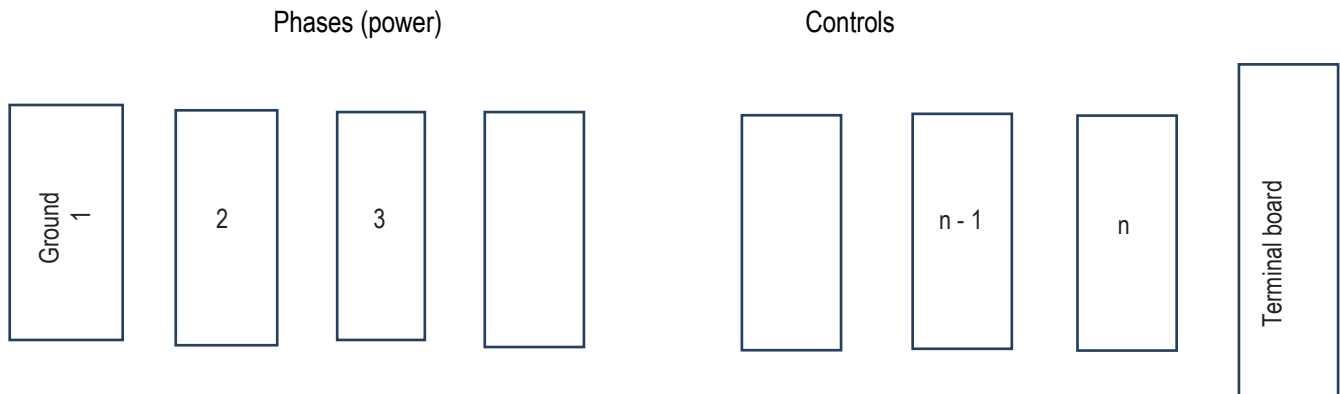


Always use insulated lugs when pins are present



### 7.4 Connection and labelling of terminal board:

See below sketch



Ground is positioned on the hub side.

The brush holders will be numbered accordingly to terminal board pins, with label rings or clips.

### 7.5 Tightening torques of the terminal board and brush holders

The tightening torques to be applied to the terminal board and brush holders screws shall be in accordance with the Tab. 3 and Tab. 4.

| Diameter of thread<br>(mm) | Tightening torque<br>(Nm) |
|----------------------------|---------------------------|
| M4                         | 1.5                       |
| M5                         | 3                         |

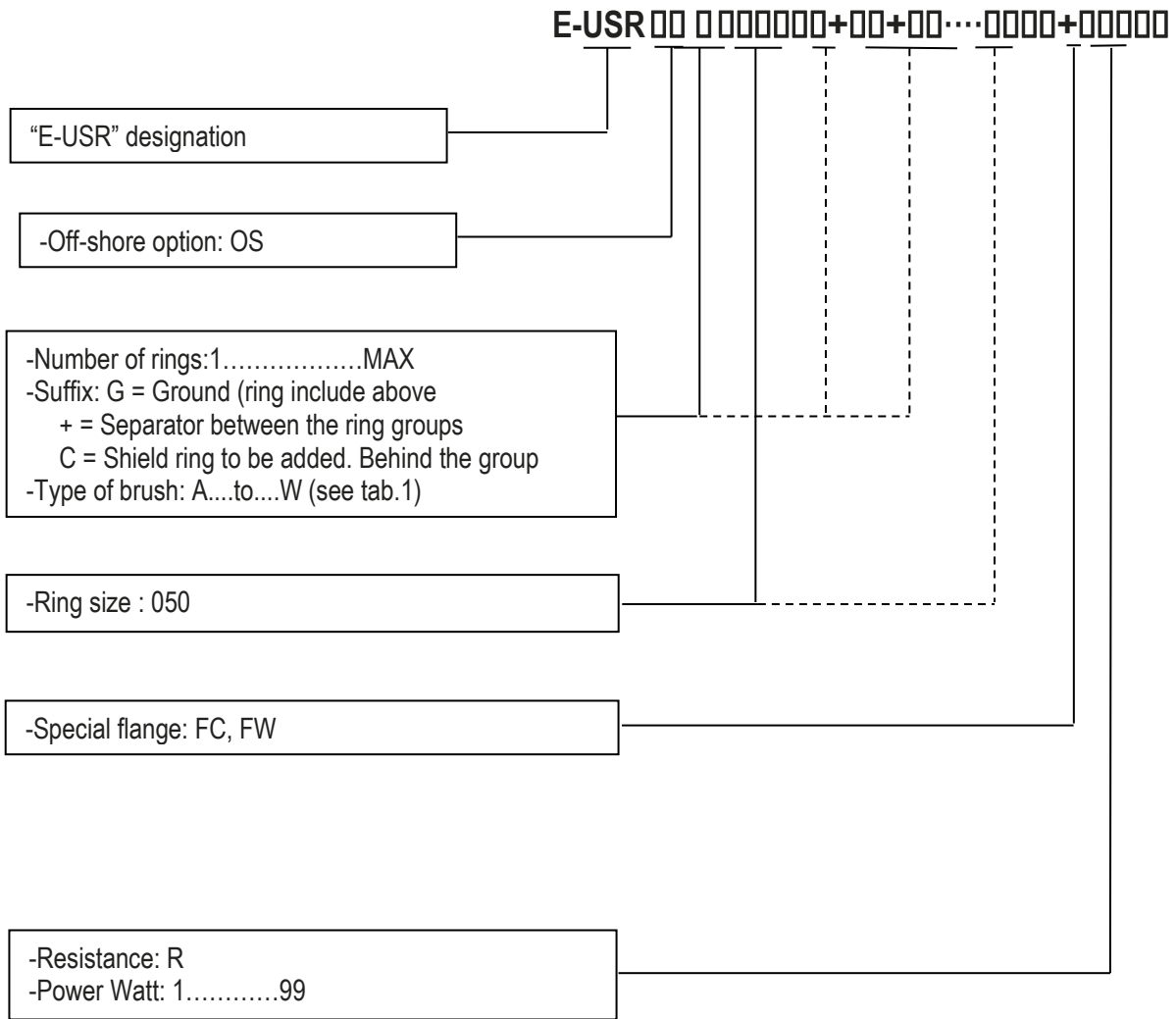
Tab. 3 – Tightening torque of terminal board.

| Diameter of thread<br>(mm) | Tightening torque<br>(Nm) (*) |
|----------------------------|-------------------------------|
| M4                         | 1.2                           |
| M5                         | 2                             |
| M6                         | 3                             |

(\*) In accordance with the CEI EN 60947-1

Tab. 4 – Tightening torque of brush holders.

## 8 Denomination of E-USR90 Series Slip Rings



**Examples:**

E-USR4GF090+4U+R30 →E-USR90 with four rings F including one ground + four silver rings U, universal hub, resistance of 30W.

E-USR4GE090+3W →E-USR90 with four rings E including one ground + three golden rings U, universal hub.

Remark: the off-shore version includes the hub, the optional special flange, the optional anti-rotating fork, the external rods and the screws made of AISI316.

## 9 Electrical installation

### 9.1 General information



All the cable lug should be crimped with the validate tools according to the cable section. We suggest inserting no more than 2 wires in a lug and no more than 4 lugs on a terminal. Rules according to the lug manufactured should be respected. Operators must be qualified.



**DANGER!**

Do never disconnect earth shunt



**DANGER!**

#### **Electric shocks**

Before starting any kind of work on the slip ring, disconnect all external feeding connections; alternatively, make sure the slip ring is not powered

### 9.2 Electrical connections on the brush holders

The brush holders are supplied with screws and washer. Cables and lugs supplied by the customer.

Four threaded holes for cable glands (provided by the customer) are implemented.

Thread dimension is M32x1,5 (two of them) and M25x1.5 (the other two).

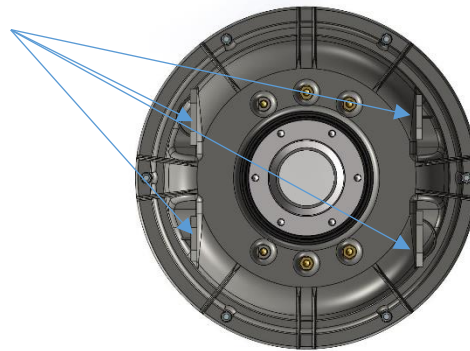


Fig. 11

A) Brush holders for earth:

- Prepare the cable yellow/green of suitable section and length with the insulated lug (see Tab. 5)
- Remove the screw (1) and the washer (2) (Fig. 12)
- Position the terminals (3) on the threaded hole
- Secure the terminals with the screw (1) and washer (2).

| Ring code | Screw (1) (mm) | Max. cable section yellow/green (mm <sup>2</sup> ) |
|-----------|----------------|--|
| A         | M4             | 1,5  |
| B         |                | 4  |
| D         | M6             | 10   |
| E         |                |  |
| F         |                |  |

Tab. 5



NOTE

Lug type: PVC insulated crimp ring terminal. Equivalent to the "F" range of CEMBRE



Fig. 12



NOTE

The first pole of the slip ring is the ground of the equipment and it is the only one having the green/yellow brush holder. It is connected to all the non-current conducting metallic parts. In case other rings are used by the customer for earthing or shielding, they are not connected to the first pole (ground) and they are not identified by green/yellow color.

B) Brush holders for control and power:

- Prepare the cable of suitable section and length with the insulated lug (see Tab. 6)
- Remove the screw (1) and the washer (2) (Fig.13)
- Position the terminals (3) on the threaded hole
- Secure the terminals with the screw (1) and washer (2).

| Ring code | Screw (1) (mm) | Suggested cable section (mm <sup>2</sup> ) |
|-----------|----------------|--|
| U or W    | M4             | 0,5  |
| A         |                | 1,5  |
| B         |                | 4  |
| D         | M6             | 10   |
| E         |                | 2x10                                       |
| F         |                | 3x10                                       |

Tab. 6

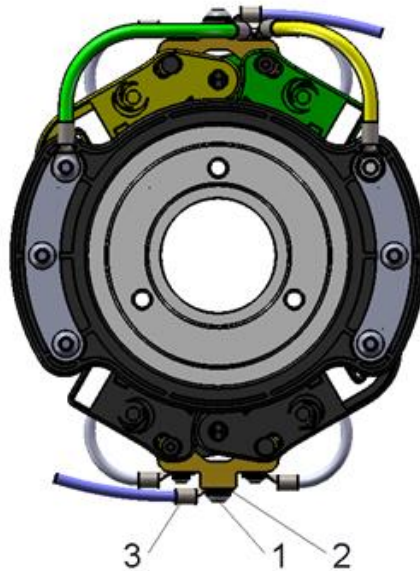


Fig. 13

### 9.3 Electrical connections on the terminal board

The cables connected by the user to the terminal board are routed through the central hole of the slipring. Hole diameter is 45,9 mm.

#### A) Terminal board for earth:

The terminal boards are supplied with nuts and washers. Cables and lugs are supplied by the customer.

a) with pins:

- Prepare the cable of suitable section and length with the insulated lug (see Tab. 7)
- Remove the nut (1) and the washer (2) (Fig.14)
- Position the terminals (3) on the pin according to the labelling of terminal board
- Secure the terminals with nut (1) and washer (2).

| Ring code | Nut (1) (mm) | Max.cable section yellow/green (mm <sup>2</sup> ) |
|-----------|--------------|---|
| U or W    | M4           | 0,5   |
| A         |              | 1,5   |
| B         |              | 4   |
| D         | M5           | 10  |
| E         | M5 (x2)      | 2x10  |
| F         | M5 (x3)      | 3x20  |

Tab. 7

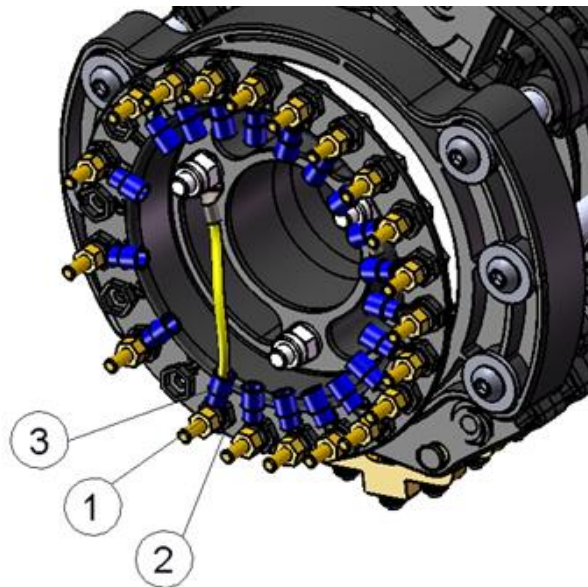


Fig. 14

b) with terminal blocks:

- Prepare the cable of suitable section and length with the insulated termination (see Tab. 7)
- Loosen the screw of the terminal blocks (1) (Fig.15)
- Position the termination (2) on the terminal blocks according the labelling of terminal board
- Secure the termination with the screw of the terminal blocks (1).

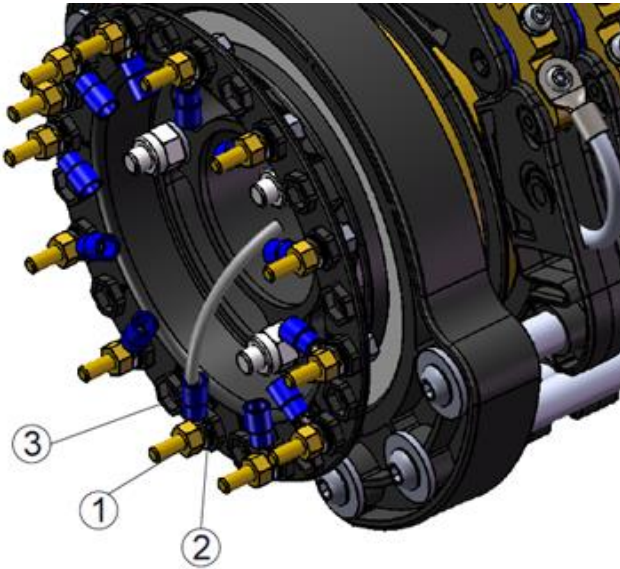


Fig. 15



Lug type: PVC insulated crimp ring terminal. Equivalent to the "F" range of CEMBRE



## 10 Periodic maintenance



**WARNING!**

### ***Danger of crushing injuries!***

Before to remove and unlock or insert and lock the brush holders, make sure that there is no relative rotation between the set port brushes and along the inner rings and terminal board.

If necessary, use suitable protective gloves.



**WARNING:** Before undergoing every kind of repairs or maintenance ALWAYS check that the equipment is out of service and that it is not dangerous. The personnel in charge of this kind of maintenance must have been previously trained.

During the maintenance, the General Disconnection Device must be positioned onto "0" and kept under strict control by the operator who is carrying out the maintenance. During the maintenance, all inspection and protection panels of the electrical parts should be removed. Ensure that at the end of the maintenance the same have been correctly replaced.

The first restart after the maintenance must be made without the cover, but without transmission of electric energy and/or signals, in order to observe the right revolution of the ring group.

Afterwards the housing must be closed, connect electrically to ground the protections, before transmitting energy and or signals.

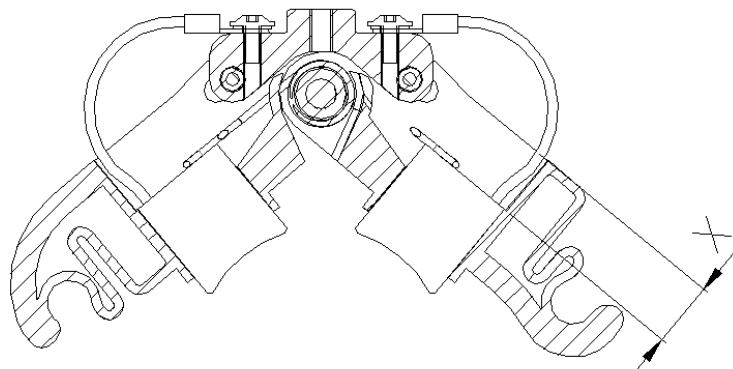
As regards indications about malfunctioning causes, please see paragraph 12.

Carry out the periodic maintenance after:

- one million revolutions;
- a year of operation;
- a stop of the machine for at least two months;
- according to the term which is reached first.

Carry out the periodic maintenance by:

- checking the ring surface (if necessary, clean them by means of a well dry cloth)
- removing the wear dust of the brushes deposited on the insulating material among the rings
- cleaning the slip ring by means of a light dry air jet
- checking the connections
- checking that the screws and threaded rods of the slip ring are well tightened
- checking the good status and the cleaning of the brushes
- checking the brushes wear: replacement if  $X \geq 20\text{mm}$  (Fig.18)



**Fig. 16**

Check the position of the brushes on the rings, by controlling the value of the X

### 10.1 Replacement of the brush holder

- Leverage to remove the brush holder (Fig. 17).

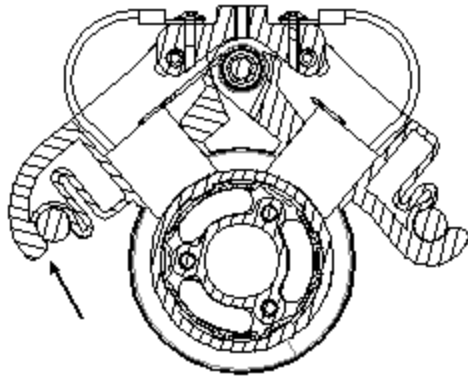


Fig.17

-Rotate the brush holder as shown Fig. 18.

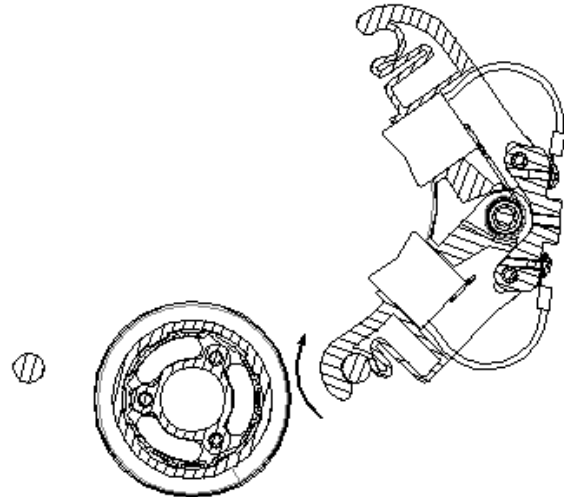


Fig. 18

-Unlock the brush holder (Fig. 19).

- Insert the new brush holder carrying out the reverse operations.

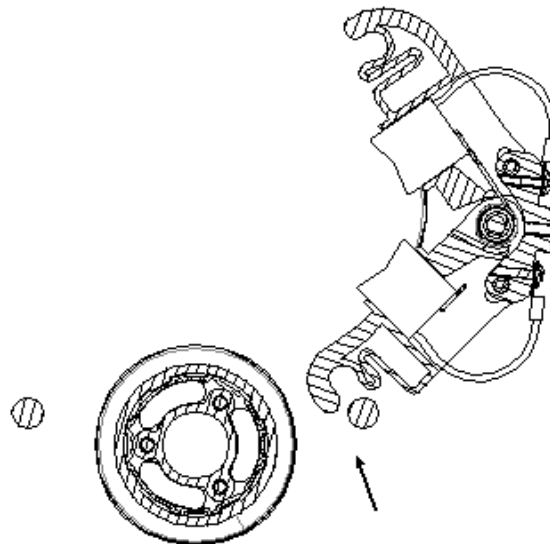


Fig. 19

Disposal of the replaced parts must be carried out in compliance with the local regulations for the disposal of industrial wastes. We advise to separate different materials and then comply with the relative local disposal regulations. Plastic parts of the slip ring are made of PP GF30 V0.

## 11 Recommended spare parts



### Safety risk due to wrong spare parts

Wrong or faulty spare parts can result in damages, malfunctions or complete failure as well as safety risks: use only original spare parts of the manufacture.

CAUTION!

The request of spare parts must be accompanied by the following information:

- type, model, serial number of the slip ring
- code number of the spare part, taken from the Tab. 9
- number of desired parts

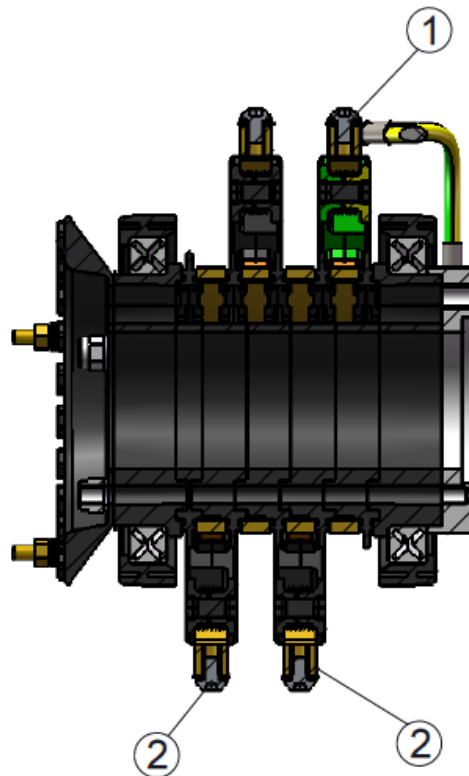


Fig. 20

| Position | Code      | Code for pole | Description                     | Qty |
|----------|-----------|---------------|---------------------------------|-----|
| 1        | BC000440  | A             | Brush holders for earth type A  | 1   |
|          | BC000436  | B             | Brush holders for earth type B  |     |
|          | BC000437  | D             | Brush holders for earth type D  |     |
|          | BC000438  | E             | Brush holders for earth type E  |     |
|          | BC000439  | F             | Brush holders for earth type F  |     |
| 2        | BC000293C | A             | Brush holders for power type A  | 1   |
|          | BC000296C | B             | Brush holders for power type B  |     |
|          | BC000297C | D             | Brush holders for power type D  |     |
|          | BC000298C | E             | Brush holders for power type E  |     |
|          | BC000300C | F             | Brush holders for power type F  |     |
| 2        | BC000294A | U             | Brush holders for signal type U | 1   |
|          | BC000295A | W             | Brush holders for signal type W |     |

Tab. 9 – Spare parts

## 12 Research of the malfunctions

In case of malfunctioning, carry out the research of the malfunction according to the indications of the following Tab.10.

| Malfunction | Possible causes                   | Solutions   |
|-------------|-----------------------------------|---|
| Electrical  | Wiring of the brush holder        | Tighten the wiring.   |
|             | Loose wiring on ring side         | Call Conductix-Wampfler representative.                                       |
|             | Brush wear                        | Check the good status of the ring surface, replace the complete brush holder. |
|             | Rings worn out or with craters    | The complete slip ring should be replaced.                                    |
|             | Short circuits or electric shocks | Call Conductix-Wampfler representative.                                       |
|             | Presence of dirt                  | Clean by means of a light dry air jet.  |
|             | Condensation                      | Check the efficiency of the anti-condensation heater, if it is present.       |
| Mechanical  | Difficult and/or noisy rotation.  | Check the status of the bearings - Replacement of the slip ring.              |

Tab. 10 – Case of the malfunctions

**Conductix-Wampfler S.r.l.**

Via de Capitani 14/16  
20864 Agrate Brianza (MB)  
Italia

Telefono +39 (039) 607431.1

Fax +39(039) 607431.292

[info.it@conductix.com](mailto:info.it@conductix.com)

[www.conductix.com](http://www.conductix.com)