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Inductive and capacitive proximity switches and sensors should remain outside the scope of the Radio Equipment Directive

Orgalime comments to the European Commission on the implementation of Directive 2014/53/EU on the making available on the market of radio equipment

EXECUTIVE SUMMARY

Proximity switches and sensors either use a magnetic field to detect objects (inductive switches) or an electrical field (capacitive switches). The switches and sensors have been used for several decades in an extremely large number of industrial applications as for example in the automation industry. In 2016 approximately 30 million proximity switches and sensors were sold by European manufacturers into the European market with a turnover of approximately 578 million euros¹.

Orgalime believes that they are appropriately covered by the requirements of the electromagnetic compatibility directive (EMCD) and their technology does not cause them to fall under the scope of the Radio Equipment Directive (RED). We believe the European Commission's advice to Member States and European Standards Organisations should follow the interpretation and market practice that has supported a very dynamic sector successfully thriving for over 25 years without safety issues or problems for the radio spectrum.

1. INTRODUCTION

Directive 2014/53/EU on Radio Equipment (RED) has been applicable since 13 June 2016. However, the European Commission, Member States and industry representatives are still discussing specific application issues that were left outside the first version of the RED Guide and are subject to further analysis.

Among these issues, the question was raised whether "inductive and capacitive proximity switches and sensors" should fall within the scope of the RED. Until now, proximity switches and sensors were covered by the EMC Directive 2014/30/EU on Electromagnetic Compatibility (EMCD) and not the Directive 1999/5/EC on Radio & Telecommunication Terminal Equipment (R&TTE), since they did not satisfy the latter's definition of "radio equipment". For proximity switches and sensors, the product standards IEC/CENELEC 60947-5-2, 60947-5-3 and 60947-5-7 on low-voltage switchgear and control-gear has offered presumption of conformity further to its listing in the Official Journal of the European Union (OJEU) under the EMCD for approximately 25 years.

¹ Data from the German Electrical and Electronic Manufacturers' Association (ZVEI) and the European Coordinating Committee of Manufacturers of Electrical Switchgear and Controlgear (CAPIEL).

Orgalime, the European Engineering Industries Association, speaks for 40 trade federations representing the mechanical, electrical, electronic, metalworking & metal articles industries of 23 European countries. The industry employs some 10.9 million people in the EU and in 2015 accounted for more than €1,900 billion of annual output. The industry accounts for over a quarter of manufacturing output and a third of the manufactured exports of the European Union.

2. WHAT ARE INDUCTIVE AND CAPACITIVE SWITCHES AND SENSORS?

Inductive and capacitive proximity switches are sensors that can detect the presence or absence of objects using magnetic or electrical fields.

- *Inductive proximity switches and sensors*

Inductive proximity switches and sensors use a small coil to generate a low-intensity alternating magnetic field (not an electromagnetic wave due to their very long wavelength compared to their physical size) in their immediate proximity (near field). If a conductive object is present in this magnetic field (ideally mild steel thicker than one millimetre), eddy currents are induced into the object. These eddy currents lead to a change of the magnetic field, it is weakened, which in turn is recognized by the electronics in the proximity switch or sensor.

- *Capacitive proximity switches and sensors*

Capacitive proximity switches use a capacitor to generate an electric field in the near field of the switch. Should the dielectric constant in the near field change owing to the presence of an object within the area in which electric field is generated, the capacitance of the capacitor changes. This change in capacitance is evaluated by a capacitive proximity switch or sensor, and the object in the immediate range is detected.

3. DEFINITIONS IN THE RED

The change in the definition of "radio equipment" under the new Radio Equipment Directive to include radiodetermination in its scope does not lead to inductive and capacitive proximity switches falling within the RED scope. According to the RED article 2, the following definitions apply:

- **"Radio equipment"** is defined as *"an electrical or electronic product, which intentionally emits and/or receives radio waves for the purpose of radio communication and/or radiodetermination, or an electrical or electronic product which must be completed with an accessory, such as antenna, so as to intentionally emit and/or receive radio waves for the purpose of radio communication and/or radiodetermination"*
- **"Radio waves"** are defined in the Directive as *"electromagnetic waves of frequencies lower than 3 000 GHz, propagated in space without artificial guide"*
- **"Radio communication"** is defined as *"communication by means of radio waves"*
- **"Radiodetermination"** is defined as *"the determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to those parameters, by means of the propagation properties of radio waves"*

Radiodetermination is characterised technically as a radio equipment capable of transmitting electromagnetic waves and in turn receiving waves that are reflected back from the object.

4. CLASSIFICATION OF INDUCTIVE AND CAPACITIVE PROXIMITY SWITCHES AND SENSORS

Inductive and capacitive proximity switches and sensors do not fall within the above definitions and consequently within the scope of the RED, since they do not intentionally transmit and/or receive electromagnetic waves but electrical or magnetic fields.

Note that electrical and magnetic fields are different in the nature from electromagnetic waves. While the electromagnetic waves continue to propagate in space also after the transmitter is turned off, electrical and electromagnetic fields do not propagate in space and disappear immediately when the current or voltage that generates the fields are turned off. The inductive and capacitive sensors do intentionally generate magnetic or electrical fields, but do not intentionally generate or receive electromagnetic waves.

As a consequence, proximity switches and sensors cannot be qualified as radio equipment in the meaning of the RED. They remain within the scope of the EMCD.

6. CONCLUSION

Capacitive and inductive proximity switches and sensors need to remain in the scope of the EMCD, taking into consideration both the technical nature and legislative definitions.

Proximity switches and sensors either use a magnetic field to detect objects (inductive switches) or an electrical field (capacitive switches). Neither of these technologies/physical principles intentionally emits and/or receives electromagnetic waves for the purpose of radio communication or radio-determination. They do not therefore constitute radiodetermination or radio communication as defined by the RED.

Therefore, we ask the European Commission to maintain the stable legislation that has supported the market for more than 25 years.

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