

## Coils for Operating Solenoids of Valves

**C\***

Size 03, 04, 06, 10



### Technical Features

- › Wide range of coil voltages
- › Wide range of connectors and electrical connection options
- › Easy replacement of coil solenoids
- › The coils can be rotated and the required connector direction can be adjusted
- › High resistance of coils against mechanical damage
- › Coils supplied with AC current, fitted with integrated rectifier
- › Coils with protection against possible damage due to induced voltage (Transil)

### Technical Data

| Quantity                        | Unit      | Value                                                            |
|---------------------------------|-----------|------------------------------------------------------------------|
| Nominal voltage ( $U_n$ )       | V         | see the list of voltages                                         |
| Allowable voltage fluctuation   |           | $U_n \pm 10\%$ , if not stated otherwise in the valve data sheet |
| Coil current at $U_n$ and 20 °C | A         | see the table of coil types                                      |
| Winding resistance at 20 °C     | $\Omega$  | by calculation $R = U_n / I$                                     |
| Input power of coil at 20 °C    | W         | by calculation $P = U_n \times I$                                |
| Max. ambient temperature        | °C (°F)   | 50 (122), if not stated otherwise in the data sheet              |
| Operation conditions            |           | see the data sheets of individual types of valves                |
| Max. winding temperature        | °C (°F)   | 155 (311)                                                        |
|                                 | Datasheet | Type                                                             |
| General information             | GI_0060   | products and general conditions                                  |
| Connectors                      | K_8008    | connectors EN 175301-803-A                                       |

### Product Description

Valves designed for a change of fluid direction, such as directional control valves and poppet-type valves, are often solenoid operated. Proportional valves are another large group controlling continuously parameters in the circuit within the defined interval. Electric current flowing through the coil winding creates a magnetic field. This field acts on the armature of the solenoid part and allows its shift which is then transferred to the valve control element (spool, poppet). The excitation winding made of copper wire placed on a plastic core is the basis. The coil is inserted into the steel housing amplifying the magnetic field and to protect it against mechanical damage. Moreover, the coil is molded into the housing by plastic material. The connector part coupled with the coil is also made of the same plastic. A silicone seal protects the coil space against moisture and dust.

### Coil Electrical Parameters

Standard control voltages are given in the table in the ordering code and coil currents are stated in the table of types. Electrical coil resistance is determined by the coil winding parameters. These along with input power of the coil can be calculated from the previous parameters. The coils are designed to be DC powered. When AC powered, it is necessary to use a coil with integrated rectifier or a connector plug with integrated rectifier.



In operation, the output power of coils is influenced both by keeping the given values of power supply and the operation conditions. Temperature rise of the winding causes an increase in its electrical resistance when exceeding operation conditions. This reduces both current flowing through the winding and generated magnetomotive force, thus magnetic field strength is also decreased. Hydraulic power of the solenoid operated valve is also decreased in an appropriate manner.

### Protection of Control Electronics

A coil is an inductive load in an electrical circuit. Any change in the current flowing through a coil (e.g. when switching off the coil circuit), voltage is induced according to Lenz's law and opposes the change that produced it. This poses a damage risk to the control electronics. Especially for proportional valves, it is appropriate to use a coil with an integrated quenching diode - or transient-voltage-suppression diode (e.g. Transil). Transil is a proven and reliable semiconductor element connected in parallel to the coil. If the threshold voltage is exceeded, electric current starts to flow through it, thereby converting overvoltage energy to heat.

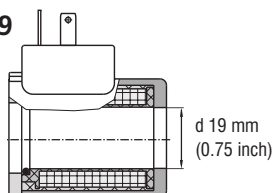
### Quick disconnect

Induced voltage originating from a quick disconnect of the coil has according to Lenz's law a negative effect on OFF switching time regarding the solenoid armature. Special electronic circuit suppresses this unwanted phenomenon.

## Coil sizes

| Coil size | Diameter d [mm (inch)] | Valve size | Directional valves with housing |           | Cartridge valves                                                                         |                        | Proportional valves                       |                         |                                                                                      |
|-----------|------------------------|------------|---------------------------------|-----------|------------------------------------------------------------------------------------------|------------------------|-------------------------------------------|-------------------------|--------------------------------------------------------------------------------------|
|           |                        |            | High performance                | Lightline | High performance                                                                         | Lightline              | Directional valves                        |                         | Pressure                                                                             |
| C14       | 13,4 (0.53)            | Dn 03      | RPEK1-03                        | RPEL1-04  |                                                                                          | SD2E-Ax/L<br>SD3E-A2/L |                                           | SD3P-A2/H               | SP4P1-B4                                                                             |
| C19       | 19,0 (0.75)            | Dn 04      | RPE2-04<br>RPE3-04              | RPEL1-06  | SD2E-Ax/H<br>SD3E-A2/H<br>SD1E-A2<br>SD1E-A3<br>ROE3<br>SR1E2-A2<br>SR4E2-B2<br>SP4E1-B3 | SD2E-B*/L<br>SD3E-B2/L | PRM2-04<br>PRM7-04                        | SD3P-B2/H               | SR1P2-A2<br>SRN1P1-A2<br>SR4P2-B2<br>SRN4P1-B2<br>SP4P2-B3<br>SPN4P1-B3<br>PVRM1-063 |
| C22       | 22,0 (0.87)            | Dn 06      | RPE3-06<br>RPEA3-06<br>RPEW4-06 |           | SD2E-B*/H<br>SD3E-B2/H<br>SD3E-C2/H                                                      |                        | PRM2-06<br>PRMR2-06<br>PRM7-06<br>PRM8-06 | SD2P-B4/H<br>SF32P-C3/H | PVRM3-10                                                                             |
| C31       | 31,0 (1.22)            | Dn 10      | RPE4-10<br>RPEW4-10             |           |                                                                                          |                        | PRM6-10<br>PRM7-10                        |                         |                                                                                      |

Example: **C19**



For different sizes and versions of the valves, the appropriate coil sizes are used. Size designation corresponds approximately to the inner diameter of the coil.

## Connector Types

Basic connectors used to connect the power supply of the coils:

- › Connector EN 175301-803-A (IP65)
- › Connector AMP JUNIOR TIMER (IP67)
- › Connector DEUTSCH DT04-2P (IP67 / IP69K)
- › Special 2-pin connector EW designed to be slipped into the wirebox
- › Loose conductors of standard length 300 mm (11.8 in)
- › Loose conductors equipped with the connector at the end

Other connector types available upon agreement with the manufacturer.



EN 175301-803-A



AMP JUNIOR TIMER



DEUTSCH DT04-2P



Connector EW

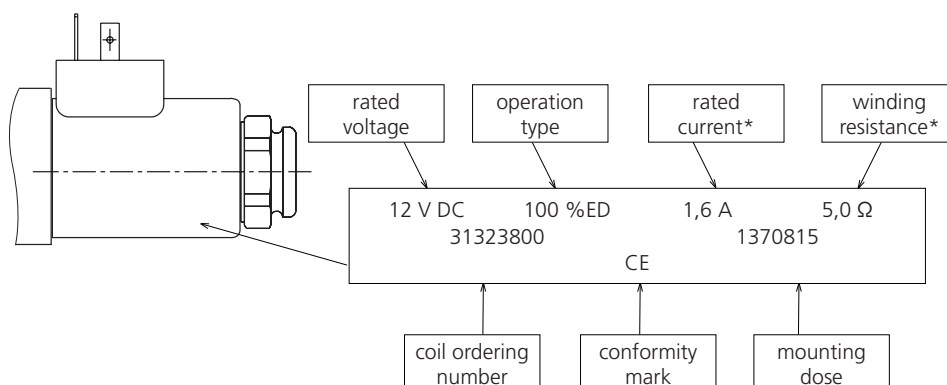


Loose Conductors

## Identification of Coils

The CE conformity mark placed on the coil steel housing indicates that the product is in accordance with the following directives:

- › 2014/30/ES for electromagnetic compatibility
- › 2014/35/ES for low voltage equipment with rated voltage higher than 50 VAC and 75 VDC, respectively.



\*Winding resistance is given only for coils used in proportional solenoids. Limit (maximum) current, which is allowed to flow continuously through the coil winding, is also stated for these coils instead of rated current.

## Ordering Code

| C                                            |  |  |  | - |  |  |  |  |  |  |  |  |  |  | /M                                                                     |  |
|----------------------------------------------|--|--|--|---|--|--|--|--|--|--|--|--|--|--|------------------------------------------------------------------------|--|
| <b>Solenoid coil</b>                         |  |  |  |   |  |  |  |  |  |  |  |  |  |  | <b>Special coil design</b>                                             |  |
| <b>Coil size</b>                             |  |  |  |   |  |  |  |  |  |  |  |  |  |  | <b>Coil for</b>                                                        |  |
| inner diameter of coil                       |  |  |  |   |  |  |  |  |  |  |  |  |  |  | switching valves                                                       |  |
| Ø 13.4 mm (0.53 in)                          |  |  |  |   |  |  |  |  |  |  |  |  |  |  | proportional valves                                                    |  |
| Ø 19.0 mm (0.75 in)                          |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| Ø 22.0 mm (0.87 in)                          |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| Ø 31.0 mm (1.22 in)                          |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| <b>Coil housing design version</b>           |  |  |  |   |  |  |  |  |  |  |  |  |  |  | <b>Type of insulating material</b>                                     |  |
| cold rolled housing                          |  |  |  |   |  |  |  |  |  |  |  |  |  |  | standard                                                               |  |
| drawn housing                                |  |  |  |   |  |  |  |  |  |  |  |  |  |  | for valves with CSA certification                                      |  |
| long drawn housing                           |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| <b>Rated voltage (on the coil terminals)</b> |  |  |  |   |  |  |  |  |  |  |  |  |  |  | <b>Housing surface treatment</b>                                       |  |
| 12 V DC                                      |  |  |  |   |  |  |  |  |  |  |  |  |  |  | A zinc coated, 240 h salt spray test acc. to ISO 9227                  |  |
| 14 V DC                                      |  |  |  |   |  |  |  |  |  |  |  |  |  |  | B zinc coated, 520 h salt spray test acc. to ISO 9227                  |  |
| 24 V DC                                      |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| 27 V DC                                      |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| 48 V DC                                      |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| 106 V DC                                     |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| 205 V DC                                     |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| 115 V AC 50 Hz                               |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| 120 V AC 60 Hz                               |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| 230 V AC 50 Hz                               |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                                                                        |  |
| <b>Connector type</b>                        |  |  |  |   |  |  |  |  |  |  |  |  |  |  | <b>Coil detent type (for type C31 only)</b>                            |  |
| see the table                                |  |  |  |   |  |  |  |  |  |  |  |  |  |  | without detent                                                         |  |
|                                              |  |  |  |   |  |  |  |  |  |  |  |  |  |  | with detent (by pin)                                                   |  |
|                                              |  |  |  |   |  |  |  |  |  |  |  |  |  |  | <b>Electrical winding resistance [Ω] at 20 °C (68 °F)</b>              |  |
|                                              |  |  |  |   |  |  |  |  |  |  |  |  |  |  | 300                                                                    |  |
|                                              |  |  |  |   |  |  |  |  |  |  |  |  |  |  | xxx                                                                    |  |
|                                              |  |  |  |   |  |  |  |  |  |  |  |  |  |  | <b>Length of loose conductors</b>                                      |  |
|                                              |  |  |  |   |  |  |  |  |  |  |  |  |  |  | standard length 300 mm (11.8 in)                                       |  |
|                                              |  |  |  |   |  |  |  |  |  |  |  |  |  |  | other length in mm (in)                                                |  |
|                                              |  |  |  |   |  |  |  |  |  |  |  |  |  |  | <b>Additional protection of conductors (only for loose conductors)</b> |  |
|                                              |  |  |  |   |  |  |  |  |  |  |  |  |  |  | non-braided                                                            |  |
|                                              |  |  |  |   |  |  |  |  |  |  |  |  |  |  | braided                                                                |  |

Not all possible combinations of parameters are produced as actual coils. If the required coil is not included in the table of the standard types, please contact our technical department to verify feasibility and identification of the specific type.

### Note explaining usage of coils:

Coils with supply voltage 21 V DC are intended for rectified supply voltage 24 V AC / 50 Hz.

Coils with supply voltage 106 V DC are intended for rectified supply voltage 120 V AC / 60 Hz.

Coils with supply voltage 205 V DC are intended for rectified supply voltage 230 V AC / 50 Hz.

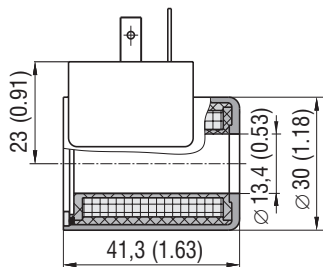
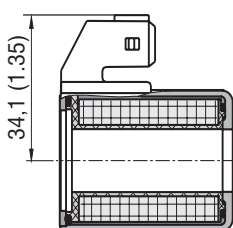
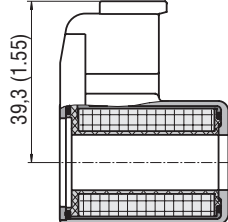
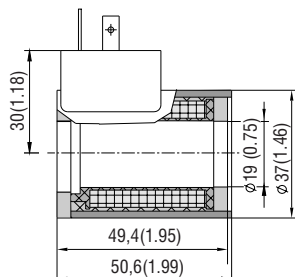
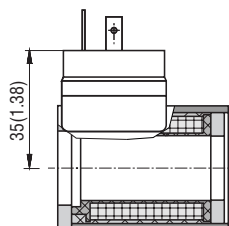
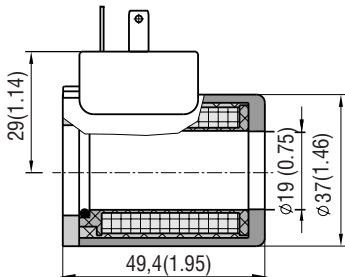
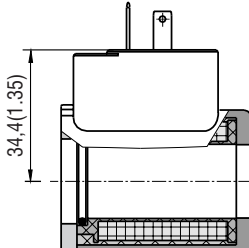
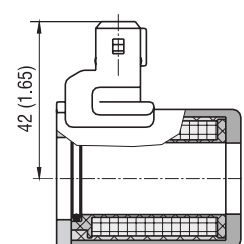
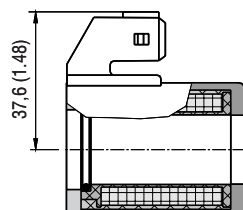
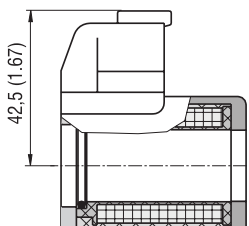
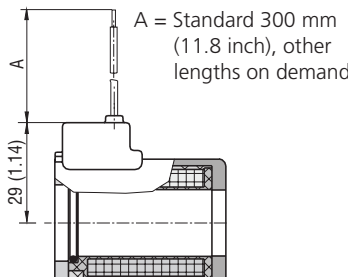
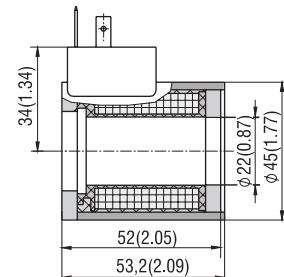
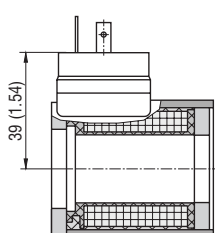
Coils 115 V AC / 50 Hz have a built-in rectifier and can be also used for supply voltage 120 V AC / 50 Hz or 60 Hz.

Coils 230 V AC / 50 Hz have a built-in rectifier.

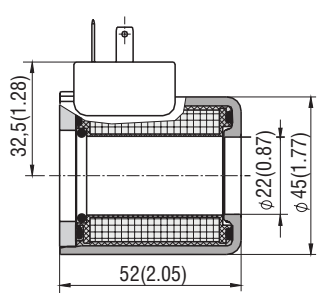
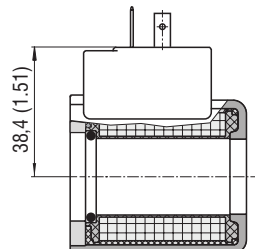
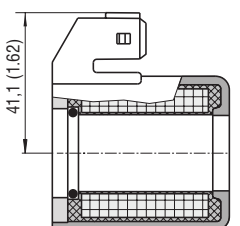
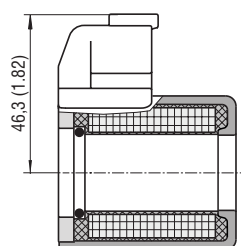
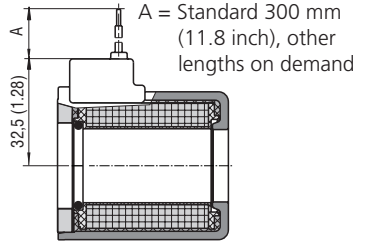
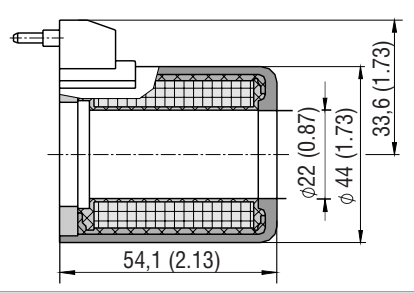
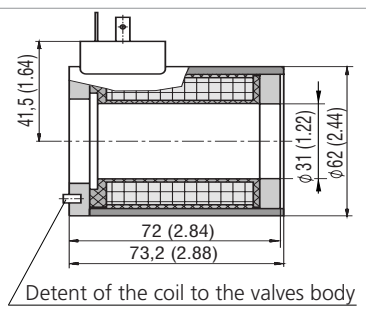
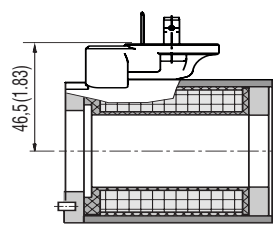
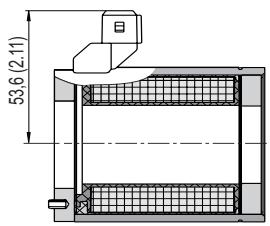
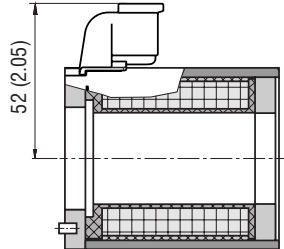
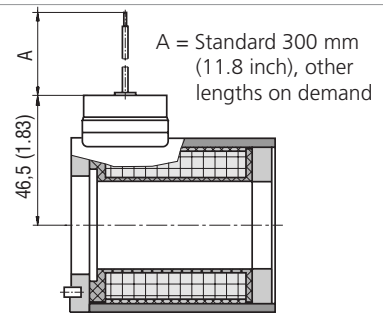
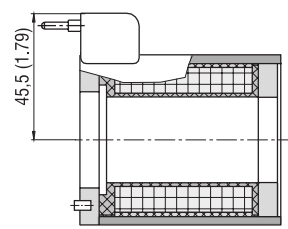
### Overview of connector types and electrical connections of coils

| Connector                         | Designation | Description                                                                       |
|-----------------------------------|-------------|-----------------------------------------------------------------------------------|
| EN 175301-803-A                   | E1          | Connector EN 175301-803-A                                                         |
|                                   | E2          | Connector EN 175301-803-A + quenching diode                                       |
|                                   | E5          | Connector EN 175301-803-A + integrated rectifier                                  |
|                                   | E51         | Connector EN 175301-803-A + integrated rectifier + quick disconnect               |
| AMP Junior Timer                  | E3          | Connector AMP Junior Timer (2 pins)                                               |
|                                   | E4          | Connector AMP Junior Timer (2 pins) + quenching diode                             |
| AMP Junior Timer axially oriented | E3A         | Axial connector AMP Junior Timer (2 pins)                                         |
|                                   | E4A         | Axial connector AMP Junior Timer (2 pins) + quenching diode                       |
| Deutsch DT04-2P axially oriented  | E12A        | Axial connector Deutsch DT04-2P (2 pins)                                          |
|                                   | E13A        | Axial connector Deutsch DT04-2P (2 pins) + quenching diode                        |
| Loose conductors                  | E8          | Loose conductors                                                                  |
|                                   | E9          | Loose conductors + quenching diode                                                |
| Loose conductors with connector   | E10         | Loose conductors with connector DT04-2P (2 pins)                                  |
|                                   | E11         | Loose conductors with connector DT04-2P (2 pins) + quenching diode                |
|                                   | E16         | Loose conductors with Metri-Pack connector, series 150 (2 pins)                   |
|                                   | E17         | Loose conductors with Metri-Pack connector, series 150 (2 pins) + quenching diode |
|                                   | E18         | Loose conductors with Weather-Pack connector (2 pins)                             |
|                                   | E19         | Loose conductors with Weather-Pack connector (2 pins) + quenching diode           |
|                                   | E20         | Loose conductors with Weather-Pack connector (2 jacks)                            |
|                                   | E21         | Loose conductors with Weather-Pack connector (2 jacks) + quenching diode          |
|                                   | E22         | Loose conductors with Econoseal connector (2 pins)                                |
|                                   | E23         | Loose conductors with Econoseal connector (2 pins) + quenching diode              |
|                                   | E24         | Loose conductors with connector AMP Junior Timer (2 pins)                         |
|                                   | E25         | Loose conductors with connector AMP Junior Timer (2 pins) + quenching diode       |
| Special connector for wirebox     | EW1         | Special connector for wirebox                                                     |
|                                   | EW2         | Special connector for wirebox + quenching diode                                   |

**Dimensions** in millimeters (inch)

| C14B                                                                                |  |      |                                                                                     |  |                                                                                       |
|-------------------------------------------------------------------------------------|--|------|-------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|
| E1, E2                                                                              |  | IP65 | E3A, E4A                                                                            |  | IP67                                                                                  |
|    |  |      |    |  |    |
| C19A                                                                                |  |      |                                                                                     |  |                                                                                       |
| E1, E2                                                                              |  | IP65 | E5                                                                                  |  | IP65                                                                                  |
|    |  |      |    |  |                                                                                       |
| C19B                                                                                |  |      |                                                                                     |  |                                                                                       |
| E1, E2                                                                              |  | IP65 | E5, E51                                                                             |  | IP65                                                                                  |
|  |  |      |  |  |  |
| E3A, EA4                                                                            |  | IP67 | E12A, E13A                                                                          |  | IP67 / IP69K                                                                          |
|  |  |      |  |  |  |
| C22A                                                                                |  |      |                                                                                     |  |                                                                                       |
| E1, E2                                                                              |  | IP65 | E5                                                                                  |  | IP65                                                                                  |
|  |  |      |  |  |                                                                                       |

**Dimensions** in millimeters (inch)

| C22B                                                                                |  |                                                                                      |  |                                                                                       |  |  |  |
|-------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|--|--|--|
| E1, E2 IP65                                                                         |  | E5, E51 IP65                                                                         |  | E3A , E4A IP67                                                                        |  |  |  |
|    |  |     |  |    |  |  |  |
| E12A , E13A IP67 / IP69K                                                            |  | E8, E9                                                                               |  |                                                                                       |  |  |  |
|    |  |    |  |                                                                                       |  |  |  |
| C22C                                                                                |  |                                                                                      |  |                                                                                       |  |  |  |
| EW1, EW2 IP65                                                                       |  |   |  |                                                                                       |  |  |  |
|                                                                                     |  |                                                                                      |  |                                                                                       |  |  |  |
| C31A                                                                                |  |                                                                                      |  |                                                                                       |  |  |  |
| E1, E2 IP65                                                                         |  | E5, E51 IP65                                                                         |  | E3, E4 IP67                                                                           |  |  |  |
|  |  |   |  |  |  |  |  |
| E12A , E13A IP67 / IP69K                                                            |  | E8, E9                                                                               |  | EW1 IP65                                                                              |  |  |  |
|  |  |  |  |  |  |  |  |