TECHNICAL AND USER REQUIREMENTS FOR
ELECTROMECHANICAL OPERATING DEVICES FOR FIRE PROTECTION EQUIPMENT

according to annex to the Regulation of the Minister of the Interior and Administration of April 27, 2007 on the list of products used for ensuring public safety or protecting health, life and property, and the principles of issuing admittance to use these products (Polish O.J. dated 2007, No. 143 position 1002) introduced by the amending regulation of July 20, 2010 (Polish O.J. dated 2010, No. 85 position 553)
On the basis of publications from Polish O.J. dated 2010, No. 85 position 553.

12.4. ELECTROMECHANICAL OPERATING DEVICES FOR FIRE PROTECTION EQUIPMENT

12.4.1. Linear drives

12.4.1.1. DIVISION

Depending on the function of the fire smoke-vent installation, the following types of line electro-mechanical drive systems are distinguished:

a) TYPE A – drive systems used for smoke and heat control systems

b) TYPE B – drive systems used for smoke and heat control and ventilation systems.

12.4.1.2. GENERAL REQUIREMENTS

12.4.1.2.1. Mechanical construction requirements

The drive system casing shall meet the requirements of at least the following classes:

- IP 21C for type A drive systems,
- IP 33C for type B drive systems

The drive systems shall be equipped with an interlocking system at limit location or the engine transmission gears shall be self-locking in a manner permitting the drive system under nominal load to maintain protrusion status for more than 30 minutes.

Furthermore, the mechanical construction of the drive system should allow the correct functioning of the drive system under real fire conditions.

12.4.1.2.2. Electrical requirements

The drive system should contain limit switches which cut-off engine power when limit location is attained.

12.4.1.2.3. Load characteristics

The drive system shall have full protrusion capacity at a pressure load equal to 1.3 of the nominal load indicated by the manufacturer.

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The drive system shall have a lack of protrusion capacity at breaking load equal to 1.3 of the nominal load indicated by the manufacturer.

Type A drive systems used for smoke-vent systems shall be able to take at least 1 000 (one thousand) start-ups.

Type B drive systems used for smoke and heat control and ventilation systems shall be able to take at least 10 000 (ten thousand) start-ups.

12.4.1.2.4. Operating time

The drive system shall guarantee protrusion time of not more than 60 seconds at $U_{n}^{\pm 10\% - 15\%}$ under nominal load.

12.4.1.2.5. Durability

Device durability and function reliability is checked by repeating the “lift-lower” function 1 000 (one thousand) times at nominal power parameters and nominal load, in keeping with the technical terms of reference. In devices used for smoke and heat control and ventilation (type B) durability is checked by repeating the “lift-lower” function 10 000 (ten thousand) times at nominal power parameters and nominal load, in keeping with the technical terms of reference.

Between the various work cycles of the drive system one shall anticipate periods which permit the stabilisation of temperature at a permissible level, agreed upon with the manufacturer’s representative. If no such information is available one shall presume the following periods - 4/6 $T$, where $T$ is the time for performing the protrusion under load conditions.

In the first and last cycles real values should be measured:

- “lifting” time,
- “lowering” time,
- current consumption,
- jump (protrusion).

The drive system meets the requirements if:

- for type A devices 1 000 (one thousand) “lift-lower” cycles are performed,

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- for type B devices 10 000 (ten thousand) “lift-lower” cycles are performed,
- “lifting” times and “lowering” times do not change more than 10%,
- jump does not change more than 5%,
- current consumption does not change more than +10% for lowering and lifting,  
  respectively.

Concerning drive systems for natural smoke exhausting used for gravitational smoke and heat removal tests should be carried out in keeping with point 7.1.1 of PN EN12101-2 for minimum Re50 class with a load declared by the manufacturer and with a 3-fold opening to the operating location with nominal load declared by the manufacturer.

Type B drive systems should additionally be tested in keeping with point 7.1.3 of PN EN12101-2 up to the declared ventilation location under the load declared by the manufacturer; next, in keeping with point 7.1.1 of PN EN 12101 -2 for minimum Re50 class and 3-fold opening to operating location with nominal load declared by the manufacturer, the drive system meets the requirements if:

- it performs an appropriate number of cycles, and at the end of each protrude/retract movement it remains in the appropriate protrude/retract position following current cut-off, irrespective of the load,
- “lifting” times and “lowering” times do not change more than 10% and do not exceed 60 seconds,
- jump does not change more than 5%,
- current consumption does not change more than +10% for lowering and lifting,  
  respectively.

### 12.4.1.3. SPECIFIC REQUIREMENTS

#### 12.4.1.3.1. Resistance to high temperature

The drive system should demonstrate capacity to operate under real fire conditions.

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Test parameters:
- load – nominal according to manufacturer details,
- start-up temperature - 70 °C (through manual start-up).

Concerning drive systems equipped with a thermal release, the start-up moment stems from the release activation temperature being exceeded.

drive system with supplied cable are subject to the following exposure:

- 0 ÷ 8 min - line increasing of temperature from surrounding temperature to 450 °C,
- 8 ÷ 30 min - stabilising of temperature at a level of 450 °C ± 20 °C.

The drive system meets the requirements if at the given start-up temperature it performs full protrusion and maintains the load for the remaining test time.

Concerning drive systems for dampers used for gravitational smoke and heat removal tests should be carried out in keeping with Annex G of the PN EN12101-2 standard for class B300 or B600 and the load directions and values declared by the manufacturer.

12.4.1.3.2. Release activation temperature (for drive systems with thermal releases)

Release with activation temperature of 70 °C

The test is performed in keeping with the PN-EN 54-5 standard for increases in temperature: 0.5 °C/min, 3 °C/min, 20 °C/min. Release activation times should take place between the upper and lower activation time limits indicated in the table below:
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Release with activation temperature of 120 °C

The test is performed in keeping with the PN-EN 54-5 standard for increases in temperature: 0.5 °C/min, 3 °C/min, and 20 °C/min. with initial temperature of 85 °C.

Release activation times should take place between the upper and lower activation time limits indicated in the table below:

<table>
<thead>
<tr>
<th>Temperature increase speed [°C/min]</th>
<th>Lower activation times limit [min]</th>
<th>Upper activation times limit [min]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[s]</td>
<td>[s]</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>20</td>
<td>59</td>
<td>2</td>
</tr>
</tbody>
</table>

The static activation threshold measured at temperature growth of 0.5 °C/min cannot be lower than 114 °C.

12.4.1.3.3. Drive systems operation at a temperature at which the release activates

The drive systems should demonstrate the capacity to operate correctly at high surrounding temperatures which may temporarily occur under anticipated operating conditions, up to the moment that the release becomes active.

Checking the requirement involves exposing the drive system to high temperatures until a stable temperature is reached permitting observations to take place, and subsequently, upon return to normal surrounding conditions, checking whether the drive system operates.

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The drive systems shall be assembled in a normal operating environment and connected to a power source. The drive system shall not operate whilst being exposed, with the exception of the end period, during which it shall perform a full “lift-lower” cycle.

Test conditions indicated in the table below shall be applied, in that the speed of temperature growth should not exceed 1 °C/min:

<table>
<thead>
<tr>
<th>Temperature</th>
<th>+75 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure time</td>
<td>4 h</td>
</tr>
<tr>
<td>Note: exposure concerns devices whose release activation time does not exceed 70 °C</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature</th>
<th>110 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure time</td>
<td>4 h</td>
</tr>
<tr>
<td>Note: exposure concerns devices whose release activation time does not exceed 93 °C</td>
<td></td>
</tr>
</tbody>
</table>

drive systems which must be powered whilst not operating should be supervised in order to establish inappropriate operation or the occurrence of fault signals during exposure. During the final exposure period when the drive system is started up (without load), the following device operating parameters shall be measured: current consumption, the time required for performing full protrusion. Following a minimum one-hour stabilisation period under normal conditions the basic operating parameters for the “lift-lower” cycle should be checked.

The drive system meets the requirements if:

1. during exposure no operating irregularities or fault signals are detected and drive system operating parameters (without load) do not change more than 5%;

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2. prior to loading and after loading the measured:
   - “lifting” times and “lowering” times do not change more than 10%,
   - current consumption does not change by more than 10%,

12.4.1.3.4. Damp Heat, Cyclic (operational)

The drive system should demonstrate capacity to operate correctly at high levels of relative humidity when water vapour condensation appears on its surface.

Checking the requirement involves exposing the device to cyclical changes in temperature ranging from 25 °C, and 40 °C or 55 °C, respectively. Relative humidity should be maintained at around 93% when there is high temperature and above 95% when there is low temperature, as well as during changes in temperature. Temperature should increase at a rate which causes water vapour condensation to appear on the surface of the device.

The drive system shall be assembled in a normal operating environment and connected to a power source.

The device shall be maintained in the quiescent state during the conditioning, with the exception of the end period, during which it shall perform a full “lift-lower” cycle.

Test conditions indicated in the table below should be applied:

<table>
<thead>
<tr>
<th>Type</th>
<th>Lower temperature value [°C]</th>
<th>Relative humidity (D w t) [%]</th>
<th>Upper temperature value [°C]</th>
<th>Relative humidity (G w t) [%]</th>
<th>Number of cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>25 ± 3</td>
<td>&gt;95</td>
<td>40 ± 2</td>
<td>93 ± 3</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>25 ± 3</td>
<td>&gt;95</td>
<td>55 ± 2</td>
<td>93 ± 3</td>
<td>2</td>
</tr>
</tbody>
</table>

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Drive systems which must be powered whilst not operating should be supervised in order to establish inappropriate operation or the occurrence of fault signals during exposure. During the final exposure period when the drive system is started up the drive system operating parameters shall be measured:

The drive system meets the requirements if:

1) during exposure no operating irregularities or fault signals are detected;

2) prior to loading and during loading exposure the measured:
   - “lifting” times and “lowering” times do not change more than 10%,
   - “lifting” times and “lowering” times do not exceed 60 s,
   - current consumption does not change by more than 10%.

12.4.1.3.5. Damp Heat, Steady State (endurance)

The drive system should demonstrate capacity to resist long-term humidity in the work environment (e.g. changes to electrical properties as a result of absorption, chemical reaction with the participation of humidity, electrochemical corrosion, etc.).

Checking the requirement involves exposing the device to the constant temperature of 40 °C and the constant relative humidity of 93% so that no water vapour condensation appears on the device.

The drive system should be assembled in a normal operating environment. During testing the device should not be powered.

Test conditions indicated in the table below should be applied.

<table>
<thead>
<tr>
<th>Type</th>
<th>Temperature [°C]</th>
<th>Relative humidity [%]</th>
<th>Exposure time [24-hour period]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A and B</td>
<td>40 ± 2</td>
<td>93 ± 3</td>
<td>21</td>
</tr>
</tbody>
</table>

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Measurements are not taken during exposure. Following a minimum one-hour stabilisation period under normal conditions the basic operating parameters for the “lift-lower” cycle should be checked.

The drive system meets the requirements if prior to loading and after loading the measured:

- “lifting” times and “lowering” times do not change more than 10%,
- “lifting” times and “lowering” times do not exceed 60 s,
- current consumption does not change by more than 10%,

12.4.1.3.6. **SO₂ corrosion (endurance)**

The drive system should demonstrate the capacity to resist the corroding effect of sulphur dioxide which pollutes the atmosphere.

Checking the requirement involves exposing the device to atmosphere containing sulphur dioxide at constant temperature and under high relative humidity conditions. Test conditions should maintain the surface temperature of the device above dew point. The presence of hygroscopic materials on the device or generated corrosive products may cause water vapour condensation.

The drive system shall be assembled in a normal operating environment. The clasps shall have attached to them non-tin-plated, copper cables with appropriate diameter, permitting operating tests to be carried out without the performance of additional connections. No power is supplied to the device during testing.
Test conditions indicated in the table below should be applied:

<table>
<thead>
<tr>
<th>Type</th>
<th>Sulphur dioxide content [ppm]</th>
<th>Temperature [°C]</th>
<th>Relative humidity (G w t) [%]</th>
<th>Number of cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>A and B</td>
<td>25 ± 5</td>
<td>25 ± 2</td>
<td>93 ± 3</td>
<td>21</td>
</tr>
</tbody>
</table>

Note: ppm – parts per million (cm³/m³)

Measurements are not taken during exposure.

Following exposure the drive system should be removed from the test chamber and dried for at least 16 hours at a temperature of 40 °C, in relative humidity below 50%; next, it should be re-conditioned for 2 hours under normal laboratory conditions. Following the stabilisation period under normal conditions the basic operating parameters for the “lift-lower” cycle should be checked.

The drive system meets the requirements if prior to loading and after loading the measured:
- “lifting” times and “lowering” times do not change by more than 10%.
- “lifting” times and “lowering” times do not exceed 60 s,
- current consumption does not change by more than 10%.

12.4.1.3.7. Shock (operational)

The drive system should demonstrate the capacity to operate correctly under mechanical shock which may occur during transport and anticipated operating conditions.

The requirement is checked by exposing the drive system to specified basic pulse shapes
The drive system should be assembled in a normal operating environment and connected to a power source.

The device should not operate whilst being exposed.

Test conditions indicated in the table below should be applied.

<table>
<thead>
<tr>
<th>Type</th>
<th>Impulse duration [ms]</th>
<th>Maximum acceleration depending on sample mass, ( M ) (kg) [m/s^2]</th>
<th>Number of impact directions</th>
<th>Number of impulses per direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>A and B</td>
<td>25 ± 5</td>
<td>( 1.0 \times (100-20M) )</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

The drive system should be supervised in order to establish inappropriate operation or the occurrence of fault signals during exposure and during the next 2 minutes.

Under normal conditions the basic operating parameters for the “lift-lower” cycle should be checked.

The drive system meets the requirements if:

a) during exposure no operating irregularities or fault signals are detected,

b) prior to loading and after exposure, whilst checking operating functions, the measured:
   – “lifting” times and “lowering” times do not change by more than 10%,
   – “lifting” times and “lowering” times do not exceed 60 s,
   – current consumption does not change by more than 10%.

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12.4.1.3.8. Furthermore, concerning operating parameters linear drives should demonstrate:

a) capacity to operate correctly at high surrounding temperatures which may temporarily occur under anticipated operating conditions.

The below parameters should be retained:

- temperature: 55 °C ± 2 °C,
- duration: 16 h.

Exposure conditions described in the PN-EN 60068-2-2 standard;

b) capacity to operate correctly at low surrounding temperatures. The below parameters should be retained:

- temperature: -10 °C ± 3 °C (for type A),
  -25 °C ± 3 °C (for type B),
- duration: 16 hours.

Exposure conditions described in the PN-EN60068-2-1 standard;

c) resistance (operational) to mechanical impact on the surface which could occur in the normal operating environment.

The below parameters should be retained:

- impact energy: (1.9 ± 0.1) J,
- number of impacts per point: 1.

Exposure conditions described in the PN-EN 60068-2-75 standard;

d) resistance (operational) to vibrations at levels which could occur in the surroundings during work.

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The below parameters should be retained:

- frequency range: 10 Hz to 150 Hz,
- acceleration amplitude: 4.905 ms\(^2\) (0.5 g),
- number of axis: 3,
- number of axle sweeping cycles: 1 per operating status.

Exposure conditions described in the PN-EN 60068-2-6 standard;

e) endurance to long-term impact of vibrations at levels appropriate to the work environment.

The below parameters should be retained:

- frequency range: 10 Hz to 150 Hz,
- acceleration amplitude: 9.81 ms\(^2\) (1 g),
- number of axis: 3,
- number of axle vibration cycles: 20 per axle

Exposure conditions described in the PN-EN 60068-2-6 standard;

f) resistance (operational) to electrostatic discharges for 8 kV test voltage limit values for discharge into the atmosphere and 6 kV for contact discharges into conductive surfaces.
Exposure conditions are described in the PN-EN 50130-4 standard and the PN-EN 61000-4-2 + A2 standard;

g) resistance (operational to conducted sinusoidal disturbances induced by radio frequency fields of 150 kHz to 200 MHz, with test voltage of 10 Vrms for AM and PM modulations.
Exposure conditions are described in the PN-EN 50130-4 standard and the PN-EN 61000-4-6 + A1 standard;

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h) resistance (operational) to a series of fast transient burst which may be generated by transmitters, contactors, the switching of inducting load, etc., and may be induced into signalling systems and network supply at the following levels:

– 2 kV to the network supply terminals clamps,
– 1 kV to the entry, signal, data and steering terminals clamps.

Exposure conditions described in the PN-EN 50130-4 standard;

i) resistance (operational) to high energy voltage surges which may be induced in power and signalling cables with the following values:

– for lines supplying alternating current:
  line to line (symmetric interference): 1 kV,
  line to ground (non-symmetric interference): 2 kV,
– for low voltage current lines and signal lines:
  line to ground (non-symmetric interference): 1 kV

Exposure conditions are described in the PN-EN 50130-4 standard and the PN-EN 61000-4-5:+ A1 standard;

j) resistance to temporary reduction in, or absence of, network power as, e.g. when caused by switching the load and the operation of securing devices in power distribution circuits. Reduction values are indicated in the table below:

<table>
<thead>
<tr>
<th>Reduction of voltage</th>
<th>Duration of reduction in half-periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>20</td>
</tr>
<tr>
<td>100%</td>
<td>10</td>
</tr>
</tbody>
</table>

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Exposure conditions described in the PN-EN 50130-4 standard;

k) resistance to the influence of electromagnetic fields generated by transmitter-receiver radio devices, radio-telephones, radio and television stations, etc., with frequencies ranging from 1 MHz to 2 000 MHz at field intensity of 10 V/m and AM and PM modulation, in that, concerning ranges of 415 ÷ 466 MHz and 890 ÷ 960 MHz at field intensity of 30 V/m.

Exposure conditions described in the PN-EN 50130-4 standard;

l) capacity to operate correctly within the anticipated range of voltage supply fluctuation of +15/-10%.

12.4.1.3.9. Marking

Each drive system must contain the following details indicated permanently:

a) the manufacturer's or supplier's name or trademark,

b) manufacturer or supplier model designation (type or number),

c) the climate class marking environmental type, i.e. type A or type B,

d) the environmental category (internal/external, special environmental conditions),

e) terminal designation,

f) the mark(-s) or code(s) (e.g. the serial number or the batch code) by which the manufacturer can identify at least, the date or batch and place of manufacture.

The marking should be visible whilst installing the drive system and should be accessible during maintenance.

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12.4.2. ROTATION DRIVES

12.4.2.1. DIVISION

Depending on environmental conditions in the place of installation two environmental category distinctions are made for rotation drives:

Environmental category I

Devices for internal use.

For this category the device should operate correctly in the following temperatures: from -10 °C to +55 °C.

Environmental category II

Devices for external or internal use in locations where they may be exposed to external temperatures.

For this category the device should operate correctly in the following temperatures: from –25 °C to +55 °C.

The manufacturer should indicate the environmental category of the device in the technical documentation.

12.4.2.2. GENERAL REQUIREMENTS

12.4.2.2.1. Marking

Each drive system must contain the following details indicated permanently:

a) the manufacturer’s or supplier’s name or trademark,

b) the model designation (type or number),

c) environmental type,

d) the environmental category (internal/external, special environmental conditions),

e) terminal designation,

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f) the mark(-s) or code(s) (e.g. the series number or the batch code) by which the manufacturer can identify at least, the date or batch and place of manufacture.

The marking should be visible whilst installing the drive and should be accessible during maintenance.

12.4.2.2.2. Performance

Rotation drives which are used in ventilation and air-conditioning systems contain spring-actuated mechanical drive, which is set by electric motor or manually. Starting up the drive system up to the safe damper position (operation of mechanical drive closing the damper) takes place as a result of disappearance of the power supply. Thanks to energy gathered in the spring it is possible to close the damper when there is a fire and in the event of a lack of electrical power. The drive system may be started up with the use of a dedicated driver, a module steering detection and fire alarm system (hereinafter “SAP”) or the thermal release. Under no circumstances can the drive system be used in the spring loading mode for starting-up fume outlets used for fire-fighting fume ventilation systems. Rotation servos used in fire-fighting fume ventilation systems are powered by electric commutator or stepper motors. The movement of the fume outlet in both directions takes place as a result of electric motor operation. The servo may be started up with the use of a dedicated driver or module steering the SAP system (with configuration guaranteeing operations under fire conditions).

The drive system, under no circumstances, may be used for starting-up the fire outlets. The drive system should be powered from a source guaranteeing correct operations under fire conditions, with the use of cables with a minimum E30 resistance.

12.4.2.2.3. Mechanical construction requirements

**Requirements for rotation drive systems cooperating with fire dampers (in ventilation and air-conditioning systems):**

a) the drive system should contain limit switches permitting the location of the damper to be identified by the corresponding devices;

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b) the drive system should have the additional possibility of manually loading the spring with the use of an appropriate device: a knob, crank;

c) the drive system should have the possibility of starting up the spring drive (closing of the damper) with the use of a temperature release with nominal temperatures of 70 °C, 90 °C, 120 °C;

d) the drive system thermal release may be installed inside the damper (requirement); it may also be a constituent part of the drive system. This device serves for checking the temperature on the outside of the ventilating duct (option);

e) the drive system should guarantee rotation time of not more than 60 seconds in terms of nominal angle under the spring drive operating mode. This concerns drive system which contain this type of declared rotation time;

f) drive system with nominal moment should have the possibility of spring load under $U_{n} + 10\% - 15\%$ supply voltage conditions (concerns servos equipped with spring load electric motors);

g) the drive system should have the capacity to maintain limit location status (closed damper) under load opening of the damper equal to 1.3 of nominal moment indicated by the manufacturer;

h) the drive system should be equipped with an interlocking system at limit location or the engine transmission gears should be self-blocking in a manner permitting the servo under nominal load to maintain damper-close status for more than 30 minutes;

i) the drive system should be able to withstand 1 000 (one thousand) start-ups concerning spring operations;

j) minimum IP 21C degree of protection.

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Requirements for rotation drives cooperating with dampers (in fire-fighting fume ventilation systems):

a) the drive system should contain limit switches permitting the location of the drive system shaft/damper by the corresponding devices (driver);

b) the manner of attaching the drive system power supply should be in keeping with figure 12.4.2.2.3:

![Diagram of power supply connections](image)

<table>
<thead>
<tr>
<th>N</th>
<th>L AC24/230V</th>
<th>L AC24/230V</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>- DC 24V</td>
<td>- DC 24V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>drive</td>
</tr>
</tbody>
</table>

b) the drive system should have the additional possibility of manually rotating the shaft with the use of an appropriate device: a knob, crank;

d) the connection between the drive system and the damper should guarantee appropriate operations at high temperatures – it should be made out of steel;

e) the drive system should contain a clearly visible shaft location indicator;

f) all elements which are important for the reliable functioning of the drive system (gear elements) should be made out of metal;

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g) the drive system should guarantee performance time of the declared angle of rotation not longer than 60 seconds under nominal load. This concerns devices with this declared time;

h) the drive system should have the possibility of operating with nominal moment load in both directions under Un^±10% supply voltage conditions;

i) the drive system should have the capacity to maintain status of both limit locations under load directed in opposite directions, equal to 1.3 of nominal moment indicated by the manufacturer;

j) the drive system should be equipped with an interlocking system at limit location or the engine transmission gears should be self-locking in a manner permitting the drive system under nominal load to maintain damper-close status for more than 30 minutes;

k) the drive system should be able to withstand 1 000 (one thousand) start-ups, of which 50% constitutes load directed in opposite directions for one direction of rotation and 50% for the other direction;

l) minimum IP 21C degree of protection;

m) the construction of the drive system should guarantee the possibility of damper drive in case of fire for a minimum 30 minutes.

12.4.2.2.4. Durability

Concerning drive systems operating in ventilation and air-conditioning systems, device durability and function reliability are checked by repeating the “open-close” function 1 000 (one thousand) times at nominal power parameters and nominal load at spring operation, in keeping with the technical terms of reference.

Concerning drive systems operating in smoke extraction systems, device durability and function reliability are checked by repeating the “open-close” function 10 000 (ten thousand) times, at nominal power parameters, in that 50% constitutes load directed in opposite directions for one direction of shaft rotation, followed by 50% for the second direction, in keeping with the technical terms of reference.

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Between the various work cycles of the drive system one should anticipate periods which permit the stabilisation of temperature at a permissible level, agreed upon with the manufacturer’s representative. If no such information is available one should presume the following periods - 4/6 T, where T is the time for performing the protrusion under load conditions.

In the first and last cycles real values should be measured:
- motor operating time,
- spring operating time (for spring-based drive systems),
- current consumption,
- angle of rotation.

The test result is positive if the following conditions are met:
- 1 000 (one thousand) or 10 000 (ten thousand) “open-close” cycles are performed,
- spring operation and motor operation times do not change more than 10% (concerns spring drive systems),
- rotation angle does not change by more than 5%,
- electricity consumption does not change by more than +10%.

12.4.2.3. SPECIFIC REQUIREMENTS

12.4.2.3.1. Resistance to high temperature

The drive system should be constructed in a manner permitting correct functioning when there is a fire.

Test parameters:
- load – nominal according to manufacturer details,
- the start-up moment stems from the release activation temperature being exceeded,
the drive system with supplied cable is subject to the following exposure:

time: 0 to 8 min - line increase in temperature from surrounding temperature to 450 °C,
time: 8 to 30 min - stabilising of temperature at a level of 450 °C ± 20 °C.

In the event of anticipated isolation of the drive system with the use of a thermal cover, the drive system exposure parameters should comply with the graph indicated in figure 12.4.2.3.1:

![Figure 12.4.2.3.1](image)

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The test result is positive if:

a) the rotation drive system designated to cooperate with the smoke dampers in the fire fighting fume ventilation system within the last 2 minutes performs three nominal angle revolutions under nominal load and:
   – drive system operating times do not change by more than 10%,
   – rotation angle does not change by more than 5%,
   – current consumption does not change by more than +10%;

b) the rotation drive system designated to cooperate with the fire damper in the ventilation and air-conditioning system, at given start-up temperature, performs a nominal angle revolution and maintains load during the remaining test time.

12.4.2.3.2 Release activation temperature (concerns drive system with thermal releases)

Release with activation temperature of 70 °C

The test is performed in keeping with the PN-EN 54-5 standard for increases in temperature: 0.5 °C/min, 3 °C/min, 20 °C/min. Release activation times should take place between the upper and lower activation time limits indicated in the table below:

<table>
<thead>
<tr>
<th>Growing temperature speed [°C/min]</th>
<th>Lower activation time limit [min]</th>
<th>[s]</th>
<th>Upper activation time limit [min]</th>
<th>[s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>7</td>
<td>13</td>
<td>18</td>
<td>40</td>
</tr>
<tr>
<td>20</td>
<td>22.5</td>
<td>3</td>
<td>37</td>
<td></td>
</tr>
</tbody>
</table>

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The static activation threshold measured at temperature growth of 0.5 °C/min cannot be lower than 65 °C, higher than 74 °C.

**Release with activation temperature of 90 °C**

The test is performed in keeping with the PN-EN 54-5 standard for increases in temperature: 0.5 °C/min, 3 °C/min, and 20 °C/min. with an initial temperature of 65 °C.

Release activation times should take place between the upper and lower activation time limits indicated in the table below:

<table>
<thead>
<tr>
<th>Growing temperature speed [°C/min]</th>
<th>Lower activation time limit [min]</th>
<th>Upper activation time limit [min]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[s]</td>
<td>[s]</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>20</td>
<td>59</td>
<td>2</td>
</tr>
</tbody>
</table>

The static activation threshold measured at temperature growth of 0.5 °C/min cannot be higher than 93 °C.

**Release with activation temperature of 120 °C**

The test is performed in keeping with the PN-EN 54-5 standard for increases in temperature: 0.5 °C/min, 3 °C/min, and 20 °C/min. with initial temperature of 85 °C.

Release activation times should take place between the upper and lower activation time limits indicated in the table below:

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The static activation threshold measured at temperature growth of 0.5 °C/min cannot be lower than 114 °C.

**12.4.2.3.3. drive system operation under release activation temperature (concerns drive systems with thermal releases)**

The drive system should demonstrate capacity to operate correctly at high surrounding temperatures which may temporarily occur under anticipated operating conditions, up to the moment that the release becomes active.

Checking the requirement involves exposing the drive system to high temperatures until a stable temperature is reached permitting observations to take place, and subsequently, upon return to normal surrounding conditions, checking whether the drive system operates.

The drive system should be assembled in a normal operating environment and connected to a power source. The device should not operate whilst being exposed, with the exception of the end period, during which it should perform a full “open-close” cycle (with nominal moment load).

Test conditions indicated in the table below should be applied, in that the speed of temperature growth should not exceed 1 °C/min:

<table>
<thead>
<tr>
<th>Growing temperature speed [°C/min]</th>
<th>Lower activation time limit [min]</th>
<th>Upper activation time limit [min]</th>
<th>Lower activation time limit [s]</th>
<th>Upper activation time limit [s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>7</td>
<td>13</td>
<td>15</td>
<td>40</td>
</tr>
<tr>
<td>20</td>
<td>59</td>
<td>2</td>
<td>55</td>
<td></td>
</tr>
</tbody>
</table>

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Temperature +75 °C

Exposure time 4 h

Note: exposure concerns devices whose release activation temperature does not exceed 70 °C

Temperature 110 °C

Exposure time 4 h

Note: exposure concerns devices whose release activation temperature does not exceed 93 °C

Drive systems which must be powered whilst not operating should be supervised in order to establish inappropriate operation or the occurrence of fault signals during exposure. During the final exposure period, when the device is started up the drive system operating parameters should be measured. Following a minimum one-hour stabilisation period under normal conditions the basic operating parameters for the “open-close” cycle should be checked.

The drive system meets the requirements if:

1) during exposure no operating irregularities or fault signals are detected and drive system operating parameters (without load) do not change by more than 5%;

2) prior to loading and after exposure, whilst checking operating functions, the measured:
   - closing time with load (spring operation) and opening time without load (motor operation) do not change by more than 10%,
   - current consumption does not change by more than 10%,
12.4.2.3.4. Damp Heat, Cyclic (Operational)

The drive system should demonstrate the capacity to operate correctly at high levels of relative humidity when water vapour condensation appears on its surface.

Checking the requirement involves exposing the device to cyclical changes in temperature ranging from 25 °C, and 40 °C or 55 °C, respectively. Relative humidity should be maintained at around 93% when there is high temperature, and above 95% when there is low temperature, as well as during changes in temperature. The temperature should increase at a rate which causes water vapour condensation to appear on the surface of the device.

The device should be assembled in a normal operating position and connected to a power source. The device should not operate whilst being exposed, with the exception of the end period, during which it should perform a full “open-close” cycle.

Test conditions indicated in the table below should be applied:

<table>
<thead>
<tr>
<th>Category</th>
<th>Lower temperature value [°C]</th>
<th>Relative humidity (D in t) [%]</th>
<th>Upper temperature value [°C]</th>
<th>Relative humidity (G in t) [%]</th>
<th>Number of cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>25 ± 3</td>
<td>&gt;95</td>
<td>40 ± 2</td>
<td>93 ± 3</td>
<td>2</td>
</tr>
<tr>
<td>II</td>
<td>25 ± 3</td>
<td>&gt;95</td>
<td>55 ± 2</td>
<td>93 ± 3</td>
<td>2</td>
</tr>
</tbody>
</table>

Drive systems which must be powered whilst not operating should be supervised in order to establish inappropriate operation or the occurrence of fault signals during exposure.

During the final exposure period when the device is started up the drive system operating parameters should be measured. The device meets the requirements if:

1) during exposure no operating irregularities or damage signals are detected,

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2) prior to loading and during loading exposure the measured:

- “opening” times and “closing” times do not change by more than 10%,
- “opening” times and “closing” times do not exceed 60 seconds,
- current consumption does not change by more than 10%,

12.4.2.3.5. Damp Heat, Steady State (endurance)

The drive system should demonstrate capacity to resist long-term humidity in the work environment (e.g. changes to electrical properties as a result of absorption, chemical reaction with the participation of humidity, electrochemical corrosion). Checking the requirement involves exposing the device to a constant temperature of 40 °C and a constant relative humidity of 93% so that no water vapour condensation appears on the device. The drive system should be assembled in a normal operating environment. During exposure the device should not be powered.

Test conditions indicated in the table below should be applied:

<table>
<thead>
<tr>
<th>Category</th>
<th>Temperature [°C]</th>
<th>Relative humidity [%]</th>
<th>Duration of exposure [24-hour periods]</th>
</tr>
</thead>
<tbody>
<tr>
<td>I and II</td>
<td>40 ± 2</td>
<td>93 ± 3</td>
<td>21</td>
</tr>
</tbody>
</table>

Measurements are not taken during exposure. Following a minimum one-hour stabilisation period under normal conditions the basic drive system operating parameters for the “open close” cycle should be checked.

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The drive system meets the requirements if prior to loading and after loading the measured:
- “opening” times and “closing” times do not change by more than 10%,
- “opening” times and “closing” times do not exceed 60 seconds,
- current consumption does not change by more than 10%,

### 12.4.2.3.6. SO₂ corrosion (endurance)

The drive system should demonstrate the capacity to resist the corroding effect of sulphur dioxide which pollutes the atmosphere.

Checking the requirement involves exposing the device to atmosphere containing sulphur dioxide at a constant temperature and under conditions of high relative humidity. Test conditions should maintain the surface temperature of the device above dew point. The presence of hygroscopic materials on the device or generated corrosive products may cause water vapour condensation. The drive system should be assembled in a normal operating environment. The clamps should have attached to them non-tin-plated copper cables with appropriate diameter, permitting operating tests to be carried out without the performance of additional connections. No power is supplied to the device during testing. Test conditions indicated in the table below should be applied:

<table>
<thead>
<tr>
<th>Class</th>
<th>Sulphur dioxide content [ppm]</th>
<th>Temperature [°C]</th>
<th>Relative humidity (G in t) [%]</th>
<th>Number of cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>I and II</td>
<td>25 ± 5</td>
<td>25 ± 2</td>
<td>93 ± 3</td>
<td>21</td>
</tr>
</tbody>
</table>

Note: ppm – parts per million (cm³/m³)

Conditions for testing resistance to the corroding effect of sulphur dioxide

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Measurements are not taken during exposure. Following testing the device should be removed from the corrosion chamber and stabilised for at least 16 hours at a temperature of 40 °C, in relative humidity below 50%; next, it should be re-conditioned for 2 hours under normal laboratory conditions. Following the stabilisation period under normal conditions the basic operating parameters for the “open-close” cycle should be checked.

The device meets the requirements if prior to loading and after loading the measured:
- “opening” times and “closing” times do not change by more than 10%,
- “opening” times and “closing” times do not exceed 60 seconds,
- current consumption does not change by more than 10%,

12.4.2.3.7. Shock (operational)

The drive system should demonstrate the capacity to operate correctly under conditions involving mechanical impact which may occur during transport and anticipated operating conditions.

The requirement is checked by exposing the device to individual mechanical shock.

The drive system should be assembled in a normal operating environment and connected to a power source.

The device should not operate whilst being exposed.

Test conditions indicated in the table below should be applied:

<table>
<thead>
<tr>
<th>Class</th>
<th>Duration of impulse [ms]</th>
<th>Maximum acceleration depending on sample mass, M (kg) [m/s²]</th>
<th>Number of impact directions</th>
<th>Number of impulses per direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>I and II</td>
<td>25 ± 5</td>
<td>1.0 x (100-20M)</td>
<td>-</td>
<td>6</td>
</tr>
</tbody>
</table>

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The drive system should be supervised in order to establish inappropriate operation or the occurrence of damage signals during exposure and during the next 2 minutes. Following exposure the basic operating parameters for the “open-close” cycle should be checked.

The device meets the requirements if:

1) during exposure no operating irregularities or damage signals are detected;

2) prior to loading and after exposure, whilst checking drive system operating functions, the measured:

   - “opening” times and “closing” times do not change by more than 10%,
   
   - “opening” times and “closing” times do not exceed 60 seconds,
   
   - current consumption does not change by more than 10%,

Furthermore, concerning operating parameters rotation drives should demonstrate:

a) capacity to operate correctly at high surrounding temperatures which may temporarily occur under anticipated operating conditions.

The below parameters should be retained:

- temperature: 55 °C ± 2 °C,

- duration: 16 hours.

Exposure conditions described in the PN-EN 60068-2-2 standard;

b) capacity to operate correctly at low surrounding temperatures.

The below parameters should be retained:

- temperature: -10 °C ± 3 °C (for environmental category I),

-25 °C ± 3 °C (for environmental category II),

- duration: 16 hours.

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Exposure conditions described in the PN-EN60068-2-1 standard;

c) resistance (operational to mechanical impact on the surface which could occur in the normal operating environment.

The below parameters should be retained:

- impact energy: (1.9 + 0.1) J,
- number of impacts per point: 1.

Exposure conditions described in the PN-EN 60068-2-75 standard

d) resistance (operational) to vibrations at levels which could occur in the surroundings during work.

The below parameters should be retained:

- frequency range: 10 Hz to 150 Hz,
- acceleration amplitude : 4.905 ms$^{-2}$ (0.5 g),
- number of axis: 3,
- number of axle sweeping cycles: 1 per operating status.

Exposure conditions described in the PN-EN 60068-2-6 standard;

e) endurance to long-term impact of vibrations at levels appropriate to the work environment.

The parameters below should be retained:

- frequency range: 10 Hz to 150 Hz,
- acceleration amplitude : 9.81 ms$^{-2}$ (1 g),
- number of axis: 3,
- number of axle vibration cycles: 20,

Exposure conditions described in the PN-EN 60068-2-6 standard;

f) resistance (operational to electrostatic discharges for 8 kV test voltage limit values for discharge into the atmosphere and 6 kV for contact discharges into conductive surfaces.

Exposure conditions are described in the PN-EN 50130-4 standard and the PN-EN 61000-4-2 + A2 standard;

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g) resistance (operational to conducted sinusoidal disturbance induced by radio frequency fields of 150 kHz to 200 MHz, with test voltage of 10 Vrms for AM and PM modulations. Exposure conditions are described in the PN-EN 50130-4 standard and the PN-EN 61000-4-6 + A1 standard;

h) resistance (operational) to series of fast transient burst which may be generated by transmitters, contactors, the switching of inducting load, etc., and may be induced into signalling systems and network supply at the following levels:

- 2 kV to the network supply terminals clamps,
- 1 kV to the entry, signal, data and steering terminals clamps.

Exposure conditions described in the PN-EN 50130-4 standard;

i) resistance (operational to high energy voltage surges which may be induced in power and signalling cables with the following values:

- for lines supplying alternating current:
  - line to line (symmetric interference): 1 kV,
  - line to ground (non-symmetric interference): 2 kV,

- for low voltage current clamp lines and signal lines:
  - line to ground (non-symmetric interference): 1 kV,

Exposure conditions are described in the PN-EN 50130-4 standard and the PN-EN 61000-4-5:+ A1 standard;

j) resistance to temporary reduction in or absence of network power as, e.g. when caused by switching the load and the operation of securing devices in power distribution circuits. Reduction values are indicated in the table below:

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Reduction of voltage | Duration of reduction in half-periods
---|---
60% | 20
100% | 10

Exposure conditions described in the PN-EN 50130-4 standard;

k) resistance to the influence of electromagnetic fields generated by transmitter-receiver radio devices, radio-telephones, radio and television stations, etc., with frequencies ranging from 1 MHz to 2,000 MHz at field intensity of 10 V/m and AM and PM modulation, in those concerning ranges of 415 to 466 MHz and 890 to 960 MHz at field intensity of 30 V/m;

Exposure conditions described in the PN-EN 50130-4 standard;

l) capacity to operate correctly within the anticipated range of voltage supply fluctuation of +15/-10%.

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CNBOP CERTIFICATION DEPARTMENT
YOUR PARTNER IN BUILDING THE QUALITY

GENERAL INFORMATION
Certification Department placed in CNBOP has a certificate of accreditation issued by Polish Centre of Accreditation No. AC 063
CNBOP is also a notified body in European Union (NB no. 1438) in the scope of:


The range of CNBOP notification covers 37 harmonized standards.

<table>
<thead>
<tr>
<th>CNBOP performs testing and European certification of:</th>
<th>CNBOP performs testing and domestic certification of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Protective clothing for firemen</td>
<td>1. Fire alarm systems</td>
</tr>
<tr>
<td>2. Fire detection and fire alarm systems</td>
<td>Service panels for fire brigade</td>
</tr>
<tr>
<td>EN 54-2 Control and Indicating Equipment</td>
<td>Remote signalling and service devices</td>
</tr>
<tr>
<td>EN 54-3 Fire alarm devices – Sounders</td>
<td>Spark extinguishing control panels</td>
</tr>
<tr>
<td>EN 54-4 Power supply equipment</td>
<td>Linear heat detector</td>
</tr>
<tr>
<td>EN 54-5 Heat detectors - Point detectors</td>
<td>Multisensor detectors</td>
</tr>
<tr>
<td>EN 54-6 Smoke detectors. Point detectors using scattered light, transmitted light or ionization</td>
<td>Detector bases</td>
</tr>
<tr>
<td>EN 54-10 Flame detectors – Point detectors</td>
<td>Detectors in wind-shields</td>
</tr>
<tr>
<td>EN 54-11 Manual call points</td>
<td>2. Control the discharge of heat and smoke exhaust fire</td>
</tr>
<tr>
<td>EN 54-12 Smoke detectors – Line detectors using an optical light beam</td>
<td>Control panel</td>
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<td>EN 54-17 Short-circuit isolators</td>
<td>Manuals buttons for smoke –vent systems</td>
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<td>EN 54-18 Input/output devices</td>
<td>Line and rotary electromechanical drivers</td>
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<td>EN 54-20 Aspirating smoke detectors</td>
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<td>EN 54-21 Alarm transmission and fault warning routing equipment</td>
<td>3. Integration systems of fire protection equipment</td>
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<td>EN 14604:2005 Smoke alarm devices</td>
<td>Incoming signal interface</td>
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<td>3. Voice alarm systems</td>
<td>4. Fixed gas firefighting systems (carbon dioxide, inert gases and their mixture, chlorinated hydrocarbons)</td>
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<td>EN 54-16 Voice alarm control and indicating equipment</td>
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<td>EN 54-24 Components of voice alarm systems – Loudspeakers</td>
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<td>EN 12101-10 Power supplies</td>
<td>Fire pumps</td>
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<td>Alarm valve assemblies (not covered by EN-12259-2 or EN 12259-3)</td>
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<tr>
<td>EN 12094-1 Control and indicating devices</td>
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<td>EN 12094-3 Manual triggering and stop devices</td>
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<td>EN 12094-4 Container valve assemblies and their actuators</td>
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<td>EN 12094-11 Mechanical weighing devices</td>
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<td>EN 12259-2 Wet alarm valve assemblies</td>
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<td>EN 12259-3 Dry alarm valve assemblies</td>
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<td>6. Fire Hydrants</td>
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<td>EN 14384 Pillar fire hydrants</td>
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