



TECHNICAL REQUIREMENTS

ELECTRICAL

Document No. **OL-TR-ER-000**

MEDIUM VOLTAGE MOTORS

Document No. **OL-TR-ER-010**

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1. SCOPE

The present document is intended to define the technical requirements of the medium voltage (MV) motors.

2. REFERENCES

The following standards, acts of law and other documents are referenced in the standards:

Galios elektros įrenginių įrengimo taisyklės

Specialiųjų patalpų ir technologinių procesų elektros įrenginių įrengimo taisyklės

OL-TR-GR-000 *General Requirements*

OL-TR-ER-000 *Electrical. General*

3. TERMS AND DEFINITIONS

DC: Direct current.

DCS: Distributed control system.

DE: Drive end.

MV: Medium voltage, the voltage from 1000V till 35000V AC.

MCC: Motor control centers.

NDE: Not drive end.

4. GENERAL

4.1 MV Motor supply voltage is 6000V, 3 phases, 50Hz.

4.2 Medium voltage motors, the capacity of which 201 kW and higher, completely enclosed, cooled using air type IC411 or IC511 is preferred, other cooling types can be used after OWNER approval.

4.3 Electric motors are designed (certified) for EU market.

4.4 Outside installed motors should be with ~230 V, 1 phase motor space anticondense heater. The bearing lubricant and enclosure heaters/preheaters can be used and should be 230 V AC 1 phase.

4.5 PT100/PTC temperature sensors of windings and bearings shall be installed mandatory.

4.6 Vibration detection devices should be installed to motors ≥ 1000 kW.

4.7 Winding overvoltage limiters (surge arresters) in motor terminal box is preferred to use for 1000 kW and higher power motors.

- 4.8** Other protection elements (like balance current transformers, etc.) should be installed if it is requirement of producer, local rules or specific conditions of motor using..
- 4.9** 3-phase squirrel-cage induction motors with direct start and winding with insulation of minimum `F` temperature class. Insulation for medium voltage motors should be executed in VPI (Vacuum Pressure Impregnation) technology.
- 4.10** Main Junction Box should be located at the top of the motor and be adapted for rotation every 90 degree. Other position shall be agreed with OL. Shall be provided the possibility to execute works of box rotation in field or OL maintenance shop.
- 4.11** The separate auxiliary junction boxes shall be used for wiring sensors of measurement of bearing / winding temperature and vibrations (according to the need).
- 4.12** Equipped with rolling bearings, excluding motors of rated power equal to or higher than 500 kW and rotational speed of rotating field equal to or higher than 3000 rpm, which should be equipped with slide bearings.
- 4.13** Maximal level of noise shouldn't exceed 85 dB, measured acc. to ISO R 1680, from distance 1 m.
- 4.14** Motors starting rated with current ratio should not exceed the following values:
a) Motors rated power lower than 1000 kW - 5.8;
b) Motors rated power higher or equal 1000 kW - 4.0.
- If motors aren't in the range as listed above further details have to be agreed with OL.
- 4.15** PT100 Temperature sensor for measurement of the DE bearing and temperature sensor for measurement of the NDE bearing should be used.
- 4.16** PT100 or PTC Temperature sensors for measuring of winding temperature should be used. Double sensors in each winding shall be used.
- 4.17** Bearing temperature sensors will co-operate with DCS/ESD systems. Explosion proof execution of temperature sensors and junction box for connection of those temperature sensors should fulfill OL requirements for instrumentation Section.
- 4.18** Sensor for temperature measurement of each phase winding (sensors for stator winding temperature measurement should withstand voltage test with voltage value of $2 \times (2 \times U_n + 1 \text{ kV})$). Connections of winding temperature sensors should be routed to separate junction box. Sensors for winding temperature measurement will co-operate with motor protection system.
- 4.19** Motor winding temperature measurement system consisting of temperature sensors, connecting cables and subsidiary junction box should be executed in accordance with requirements for "increased safety" or "flameproof" type execution.
- 4.20** Anti-condensing heaters: terminals for anti-condensing heaters should be connected to separate junction box.
- 4.21** Vibration sensors as per OL requirement for instrumentation discipline; terminals for vibration sensors should be connected to separate junction box.
- 4.22** Motors should be appropriate for operation during three year period between two subsequent scheduled maintenance activities.

- 4.23 Manufacturer is obliged to define conditions admitting any motor for 3-year operation period, i.e. indispensable periodical diagnosis possible for execution during normal operation of that motor at its normal working place.
- 4.24 Obligatory Regulations of European Union should be applied (after earlier obtaining of OWNER'S acceptance) in the case when economic reasons indicate on solutions different from above mentioned ones.
- 4.25 Motors should have effective values of own vibration velocity not higher than values of vibration level defined as reduced, in accordance with IEC 34-14 Standard "Rotating electrical machines. Mechanical vibration of certain machines with shaft heights 56 mm and higher – Measurement, evaluation and limits of vibration.
- 4.26 The motor manufacturer shall indicate the measured motor vibration root-mean-square value in shop testing certificate.
- 4.27 Motor soft start systems or frequency converters can be used if proper operation of driving motors with direct start due to starting current or proper co-operation between motor and driving machine are impossible.
- 4.28 OL reserves the right for final inspection of the motors which are important for the process at premises of motor or motor/driven machine aggregate manufacturers.
- 4.29 MV Motors should be powered from MV Switchgear through cables directly connected to the main terminal box of the motor.
- 4.30 Motor Terminal Boxes should be suitable for chosen cables and cable accessories and they should be located in such a way that easy access to terminals was assured.
- 4.31 Method of cable entering the motor terminal box should consider influence of mechanical vibrations on reliable electrical connection of the motor.
- 4.32 Cable sealing elements in Motor Terminal Boxes should provide easy cable disconnection from motor without damages of cable. The cable sealing elements should be mounted on the removable plate of terminal box.
- 4.33 Motor location should assure easy assembly and disassembly of the motor.
- 4.34 Electric motors executed in accordance with the following standards or its equivalents should not be selected for using in hazardous areas:
- | | |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LST EN 60079-15 | <i>Electrical apparatus for explosive gas atmospheres. Part 15: Construction, test and marking of type of protection "n" electrical apparatus (IEC 60079-15)</i> |
| LST EN 60079-7 | <i>Explosive atmospheres - Part 7: Equipment protection by increased safety "e"</i> |
- 4.35 All motor shall be at least IE3 efficiency class and suitable for use in C4 corrosive environment.

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- 4.36** Electrical motors shall have a possibility to connect bearings temperature sensors to “Bentley-Nevada”, DCS and ESD systems.
- 4.37** Control stations near motors must have emergency stop button with possibility to lock button in pushed state.

5. DATA SHEET

For data sheet see Table 1.

Table 1. Data Sheet

PAGRINDINIAI TECHNINIAI REIKALAVIMAI KEY TECHNICAL REQUIREMENTS		PILDO TIEKĖJAS FILL SUPPLIER
SUMONTAVIMO VIETA / LOCATION		
KIEKIS / QUANTITY		
EKSPLOATAVIMO APLINKA / OPERATING ENVIRONMENT		
EKSPLOATAVIMO TEMPERATŪRA / AMBIENT TEMPERATURE		
TIPAS / TYPE		
MONTAVIMO BŪDAS / METHOD OF INSTALLATION		
AUŠINIMAS / COOLING		
AŠIES AUKŠTIS / FRAME SIZE		
DARBO REŽIMAS / OPERATING MODE		
ĮTAMPA / VOLTAGE		
GALIA / POWER		
GREITIS / SPEED		
IP		
APVIJŲ IZOLIACIJOS KLASĖ / INSULATION CLASS		
PALEIDIMAS / START-UP		
SPROGOSAUGA / EXPLOSION SAFETY		
SUKIMOSI KRYPTIS / ROTATION DIRECTION		
KABELIŲ PRIJUNGIMO DĖŽĖ / CABLE CONNECTION BOX		
KABELIŲ SANDARIKLIŲ PLOKŠTĖ / CABLE GLAND FIXING PLATE		
KABELIŲ ĮVADAI / CABLE ENTRY		
KABELIS / CABLE		
KABELIŲ SANDARIKLIAI / CABLE GLAND		
ŠILDYTUVAS / HEATER		

6. TECHNINĖ DOKUMENTACIJA / TECHNICAL DOCUMENTATION

- 6.1** Pardavėjas/Tiekėjas pateikia dokumentus, pažymėtus „x“ simboliu. Vendor (bidder) shall furnish documents for all items indicated by an „x“.

Dokumentai pateikiami su pasiūlymu [*Documents supporting proposal*]

↓ **Dokumentai pateikiami su įranga (prietaisu)** [*Documents furnished together with equipment (device)*]

		DOKUMENTŲ APRAŠYMAS [<i>DESCRIPTION OF DOCUMENTS</i>]
X	X	1. Techniniai duomenys ir specifikacijos [<i>Technical data and specifications</i>]
	X	2. EB atitikties deklaracija (pagal ATEX (Potencialiai sprogios aplinkos) 94/9/EC) [<i>EC Declaration of Conformity (under ATEX (Potentially explosive atmospheres) 94/9/EC)</i>]
	X	3. EB tipo tyrimo sertifikatas (pagal ATEX Potencialiai sprogios aplinkos) 94/9/EC) [<i>EC-type examination certificate (under ATEX (Potentially explosive atmospheres) 94/9/EC)</i>]
	X	4. Montavimo (įrengimo, pajungimo) instrukcija [<i>Installation manual</i>]
	X	5. Techninės priežiūros (aptarnavimo ir remonto, surinkimo ir išardymo) instrukcija [<i>Maintenance (repair) manual (assembly/desassembly)</i>]
	X	6. Eksploatavimo (naudojimo) instrukcija [<i>Operation manual</i>]
	X	7. Gamyklinių bandymų ir matavimų protokolai [<i>Manufacture test reports</i>](ROUTINE TEST)
	X	8. Elektros variklio apvijų duomenys [<i>Motor windings data</i>]
	X	9. Elektros variklio veleno brėžinys [<i>Motor rotor shaft dimensional drawing</i>]
	X	10. Elektros variklio skersinio pjūvio brėžinys su išvardintomis dalimis [<i>Motor cross-section sketch with parts names</i>]
	X	11. Elektros variklio sprogosaugos elementų išdėstymo brėžinys su nurodytais leistinais tarpelių dydžiais [<i>Motor explosion protection gaps drawing/map with gaps dimensions (for eexd type)</i>]
X	X	12. Brėžiniai su matmenimis [<i>Dimensional drawing</i>]

6.2 Reikalavimai instrukcijoms [*Requirements for manuals*]:

- Instrukcijos turi būti pateikiamos lietuvių ir anglų kalba, ir, jeigu yra parengta, rusų kalba. Papildomai instrukcijos rinkmena turi būti pateikiama teksto formate (DOC (TXT)) ar PDF formate (diskelyje, kompaktiniame diske ar atsiunčiama elektroniniu paštu). [*Manuals shall be furnished in Lithuanian and English language, and in Russian if available. Manuals may be provided in electronic version in text (DOC (TXT)) or PDF format with floppy disk, compact disk.*]
- Instrukcijose turi būti pateikti įrengimui (prietaisui) naudoti, eksploatuoti, kontroliuoti, tikrinti veikimo tinkamumą, remontuoti būtini brėžiniai ir schemos kartu su naudingais nurodymais, ypač dėl saugos. [*The instructions shall contain diagrams and drawings necessary for commencing, supervising, controlling the work, checking for correct operations, information of relevant equipment repair centers, other useful instructions, especially related to safety.*]