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NEK

Krško Nuclear Power Plant
Vrbina 12
8270 Krško



TECHNICAL SPECIFICATION

Spare Charging Pump Motor

KRŠKO NUCLEAR POWER PLANT

TS34-VNMG01

Revision 1

NUCLEAR SAFETY RELATED

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RECORD OF REVISION

Revision Number	Reason for Revision and Revision Summary	Affected pages
0	First Issue	N/A
1	Correction of grammatical errors and added explanations Added reference standards Minor design correction based on original design Testing requirements corrections in paragraph 10.2.1 and 10.3.1.3 Corrosion protection clarification in paragraph 13	1,-2, 4-20, 23-27

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1 SCOPE OF WORK

1.1 General

This specification establishes the general requirements for design, performance, materials, quality assurance, testing, packing, and shipping of a horizontal, safety related, environmentally qualified induction motor which will be utilized as the spare motor for Charging Centrifugal Pump at Nuclear Power Plant KRŠKO. The original motors were supplied by Westinghouse.

This specification shall be used in conjunction with any other Purchaser documents listed in the purchase order. Any conflicts between this specification and listed references shall be brought to the Purchaser's attention for clarification and approval prior to any further action by the Supplier.

1.1.1 Scope of Work & Supply

The Supplier shall be responsible for the design, procurement of materials, safety and environmentally classification, fabrication, testing, cleaning, packing, and shipping of all items included in this Specification, including any items supplied by a subcontractors or other Supplier divisions.

The Supplier is responsible for compliance with all detailed requirements presented in this Specification. Approval of any drawings, specifications and/or tests by Purchaser shall in no way relieve the Supplier from these responsibilities. There shall be no deviations from this specification or its references without prior written approval from Purchaser.

Nothing in this Specification shall relieve the Supplier of the responsibility to perform, in addition to the requirements of this Specification, analyses, tests, inspections or other activities which the Supplier deems necessary to ensure service intended, or as may be required by common knowledge or good practice.

It is Bidder's responsibility to acquire any missing information needed to meet the requirements of this specification. Bidder shall state, in the written proposal, that will meet all provisions of this specification or shall explicitly state all exceptions in the Compliance Matrix (see Appendix A7).

The Supplier shall deliver the complete and operable motor for existing Charging Centrifugal Pump including, but not limited to, the following:

- [1] The Supplier shall design, fabricate, assemble, test, and deliver one (1) Charging Centrifugal Pump Motor, that will be fit, form and function equivalent replacement motor for any of two existing Westinghouse motors (P.O. 546-CAV-237411-BPE, S.O. #76-F-60525) on any of the two operating locations (CSAPCH01-MTR or CSAPCH02-MTR).
- [2] All electrical and mechanical critical characteristics of the motor shall remain identical to original as specified in item 6 within standard NEMA and engineering tolerances.
- [3] All electrical and mechanical interfaces shall remain as shown on original DWG 8978D73 – Outline (Charging Centrifugal Pump Motor) i.e., motor shall be suitable for installation on whichever of two CS pump locations without any modification of adjacent equipment or motor itself. Special attention shall be placed to main leads terminal lugs dimensions. A set of terminal lugs shall be supplied as a separate item if the motor leads are connected with lugs.
- [4] The Supplier shall carry out measurements on the field to confirm the dimensions provided in the drawings according to item 25.2.1.1 of this specification.
- [5] Motor shall be supplied with the half-coupling installed that will be supplied by the purchaser prior to the installation.

- [6] Motor shall be painted according to item 13 of this specification.
- [7] Quality activities shall be established per approved Production Quality Inspection & Test Plan during all stages of project according to item 20 of this specification.
- [8] The Supplier shall pack and ship the motor to NEK after successful completion of motor Factory Acceptance Testing (FAT) and shipping release. A packing list shall be provided before shipment. Shock/tilt recorders shall be utilized for the shipment.
- [9] The Supplier shall assign a single person contact (project manager) for this project to coordinate activities and to communicate with the Purchaser. The name and contact of project manager shall be provided with the proposal.
- [10] Project manager shall take part in clarifications before signing the contract.
- [11] Progress reports, in a mutually agreed format and at suitable frequency, shall be issued regularly.
- [12] The Supplier shall provide one set of spare parts as required in paragraph 18. The minimum required parts (if applicable) are:
 - a. Front bearing (1 pc)
 - b. Rear bearing (1 pc)
 - c. Oil ring (1 each)
 - d. Sight glass (1 each)
 - e. Space heaters (1 set)

Upgrades to the original motor design:

- [1] Vibration monitoring probes' brackets shall be installed as shown in Appendix A5. Vibration monitoring probes are not part of the supply.
- [2] Bearing shall have temperature monitoring. TC type E or RTD's shall be used.
- [3] Stator coil shall have temperature monitoring. PT-100 resistance temperature detectors shall be used.

1.2 Activities Excluded from Supplier's Scope of Work

The following tasks are not part of scope per this Specification:

- [1] Receiving, unloading and storage of motor in NEK.
- [2] Installation and connection.

1.3 Responsibility

The Supplier shall be responsible for:

- [1] Proper design, construction, performance, safety classification, procurement of materials, fabrication, testing, cleaning, assembling, and shipment of the motor and motor subcomponents according to this Specification; this includes all items supplied by Supplier's subcontractors or other divisions.
- [2] Preparation, approval, and submittal of equivalency evaluation for Purchaser's concurrence for the motor.
- [3] Rigid adherence to the design, arrangement and dimensions of parts and assemblies as shown on Purchaser reviewed manufacturing drawings, unless deviations are specially authorized in writing by the Purchaser.
- [4] The quality of all materials and workmanship; the suitability of all materials and apparatus for their application.
- [5] Compliance with all detailed requirements presented in this Specification.
- [6] Any damage to the motor while in Supplier's custody or during shipment.

Any drawings, specifications, procedures and/or tests approved/acknowledged by Purchaser shall in no way relieve the Supplier from above responsibilities.

1.4 Deviation from Specification

Any deviation from the requirements in this Specification shall be approved in writing by Purchaser prior to implementation.

2 DEFINITIONS

2.1 Definitions

OEM – In course of this specification this shall mean Westinghouse Electric Corporation which was the Original Equipment Manufacturer for NEK CS motors under S.O. 76-F-60525 and P.O. No. 546-CAV-237411-BPE.

Purchaser – Person(s) appointed by Purchaser requesting the equipment to which this document is applicable.

Supplier – Company performing the work per this document.

Technical Contact – The person appointed by Purchaser to resolve any technical issues that arise during the time of services.

Project manager – The person appointed by Supplier to coordinate all activities and communicate with the Purchaser.

Equivalency Evaluation – A technical evaluation performed to confirm that an alternate replacement item (not identical to the original) will satisfactorily perform its designed function. The term is synonymous with "Equal-to-or-Better-Than" evaluation.

2.2 Abbreviations

AC	-	Alternating current
AISC	-	American Institute of Steel Construction
ANSI	-	American National Standards Institute
ASME	-	American Society of Mechanical Engineers
ASTM	-	American Society for Testing and Materials
AWS	-	American Welding Society
BOM	-	Bill of Materials
CFR	-	Code of Federal Regulations
COC	-	Certificate of Compliance
CS	-	Charging System
CW	-	Clockwise
DBE	-	Design Basic Earthquake
DC	-	Direct Current
DE	-	Drive End
DMP	-	Design Modification Project
DWG	-	Drawing
EPRI	-	Electric Power Research Institute
EQ	-	Environmental Qualification
EV	-	Activation Energy
FAT	-	Factory Acceptance Test
FME	-	Foreign Material Exclusion
I&TP	-	Inspections and Test Plan
IEEE	-	Institute of Electrical and Electronics Engineers

NCR	-	Nonconformance Report
NDE	-	Non-Destructive Examination
NEK	-	Nuclear Power Plant Krško
NEMA	-	National Electrical Manufacturers Association
NPT	-	National Pipe Thread
OBE	-	Operating Basic Earthquake
ODE	-	Opposite Drive End
OEM	-	Original Equipment Manufacturer
P.O.	-	Purchase Order
PAOT	-	Post-Accident Operation Time
PF	-	Power Factor
QA	-	Quality Assurance
RMS	-	Root Means Square
RPM	-	Rotations Per Minute
RTD	-	Resistance temperature detector
S.O.	-	Shop Order
SRD	-	System Requirements Document
THD	-	Total Harmonics Distortion
TIR	-	Total Indicated Runout
TQR	-	Technical and Quality Requirement
UNC	-	Unified National Coarse
VPI	-	Vacuum pressure impregnation

3 CODES, STANDARDS AND REGULATORY REQUIREMENTS

The Supplier shall control the quality of materials and services to meet the requirements of this Specification, applicable Codes and Standards, and TQRs when specified in procurement documentation.

All items delivered by Supplier shall be designed, built, rated, tested and shall perform in accordance with applicable ANSI, IEEE, NEMA, ASTM, ASME Codes and/or Standards. The Supplier shall provide to the Purchaser a list of basic codes, standards, and specifications (identifying the effective issue by date) according to which the work will be performed.

3.1 Codes and Standards Applicable

The following standards or documents are referred to in this document:

3.1.1 NEMA (The National Electrical Manufacturers Association)

- [1] MG1-2016: "Motors and Generators"
- [2] MG2 10021-2023: "Safety Standard for Construction and Guide for Selection, Application, and Use of Electric Motors and Generators"
- [3] NEMA C50.41-2000 American National Standard for Polyphase Induction Motor for Power Generating Stations
- [4] MW 1000-2023: "Magnet Wire"

3.1.2 IEEE (Institute of Electrical and Electronics Engineers)

- [1] 43-2000: "Recommended Practice for Testing Insulation Resistance of Rotating Machinery"

- [2] 85-1973: "IEEE Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery"
- [3] 95-2002: "Insulation Testing of AC Electric Machinery with High Direct Voltage"
- [4] 112-2017: "Test Procedures for Polyphase Induction Motors and Generators"
- [5] 275-2008: "Thermal Evaluation of Insulation Systems for Alternating-Current Electric Machinery Employing Form-Wound Pre-Insulated Stator Coils for Machines Rated 6900 V and Below"
- [6] 286-2000: "IEEE Recommended Practice for Measurement of Power-Factor Tip-Up of Rotating Machinery Stator Coil Insulation"
- [7] 522-2023: "IEEE Guide for Testing Turn-to-Turn Insulation on Form-Wound Stator Coils for Alternating Current Rotating Electric Machines"
- [8] 620-2022: "Guide for the Presentation of Thermal Limit Curves for Squirrel-Cage Machines"
- [9] 1776-2008, "IEEE Recommended Practice for Thermal Evaluation of Unsealed or Sealed Insulation Systems for AC Electric Machinery Employing Form-Wound Pre-Insulated Stator Coils for Machines Rated 15000 V and Below"
- [10] 1434-2000: "IEEE Trial Use Guide to the Measurement of Partial Discharges in Rotating Machinery"
- [11] 323-1974 (or newer 2003): "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations"
- [12] 334-2006: "IEEE Standard for Qualifying Continuous Duty Class 1E Motors for Nuclear Power Generating Stations"
- [13] 344-2004: "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations"

3.1.3 CFR (Code of Federal Regulation)

- [1] 10CFR Part 21, "Reporting of Defects and Noncompliance"
- [2] 10CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants"
- [3] Regulatory Guide 1.100, "Seismic Qualification of Electric Equipment for Nuclear Power Plants", Rev. 3, September 2009.
- [4] Regulatory Guide 1.61, "Damping Values for Seismic Design of Nuclear Power Plants", October 1973
- [5] Regulatory Guide 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants", November 1974
- [6] Regulatory Guide 1.29, "Seismic Design Classification", Rev. 4, March 2007

3.1.3.1 In case of any conflict between codes, or this Technical Specification and the codes, the more stringent requirements shall apply. Conflict shall be reported to NEK. Supplier shall be responsible for compliance with all applicable codes, standards and regulations. NEK will accept only material and equipment, which meets the criteria of this Technical Specification and the referenced codes and standards.

4 SUPPLEMENTAL DATA

4.1 General

Codes and standards listed on 3.1.

5 DOCUMENT SUBMITTAL

All document submitted to NEK shall be in form of electronic media. They must include Purchase Order Number, Equipment Tag Number and Supplier Shop Order Number. Electronic media shall be in format fully compatible with the standard software. All submitted documents shall be searchable.

All drawings (including drawings, graphs, specifications, etc.) submitted shall be in the form of searchable electronic media. Four (4) hard copies with hard cover of the manuals as defined under paragraph 33 shall be delivered. All drawings shall be submitted in pdf format (original paper size). A 3-D model of the motor assembly shall be provided in a standard format that will be agreed upon.

All the manuals, reports, specifications and other document shall be submitted in English.

6 DESIGN REQUIREMENTS AND DESIGN INPUTS

6.1 General

6.1.1.1 This motor is intended as a spare for the existing Charging Centrifugal pump. The CS motor is a horizontal squirrel-cage induction motor with a Drip-Proof enclosure. It shall be designed and manufactured as electrical and mechanical “like for like” (duplicate or drop in replacement) within margins described in this specification. Motor shall be suitable for use on a 50 Hz, high resistance grounded power system having a voltage of 6300 V, with the following basic characteristics (see Appendix A1):

600 HP, 2976 rpm, 50 Hz, 6000 V, 3 phase, class F insulation or higher, 1,15 service factor.

As a minimum, it shall meet the following from original motors' outline drawing:

- all motor outline dimensions including anchor bolts size & pattern,
- main leads and cable lugs size,
- all accessories' wires size,
- grounding pads and lifting lugs relative orientation,
- shaft, coupling and key groove dimensions,
- main and auxiliary connection boxes size and orientation,
- overall envelope of the motor shall not exceed the existing one,
- the dimensions of the motor without the air inlet/exhaust box and auxiliary boxes shall not exceed the existing one. All boxes shall be detachable for installation purposes.

6.1.1.2 The motor efficiency shall not be less than of existing motors. Although the motor reliability shall be a priority prior to the efficiency. The motor shall be designed to withstand a lifetime of 40 years with preventive maintenance.

6.1.1.3 Modifications and upgrades of overall design or parts shall be presented to the Purchaser for consideration (in case a duplicate motor is offered). Only modifications and upgrades approved by Purchaser may be applied.

6.2 Mechanical details

Motor shall be mechanically fully interchangeable with existing motors on installed locations without any need for alteration of existing original equipment or installation location.

6.2.1 Enclosure

The motor enclosure shall be Drip-Proof enclosure. For enclosure details see reference DWG 8978D73 – Outline (Charging Centrifugal Pump Motor) (see Appendix A2).

The enclosure shall be designed according to the AISC handbook standards as a minimum and provide adequate strength and rigidity for support of the stator punching and windings. It shall withstand without distortion or injury the stresses associated with the motor starting, axial thrust, running power supply bus transfer and sustained operation at vibrations levels specified in MG1. Supplier shall supply drawings showing layout, welding details, material types and material thicknesses.

The enclosure design shall permit complete disassembly of all parts, accurate positioning and realignment of the parts when reassembled. The end-shield stator frame interfaces and bearings fit shall be machined rabbet-type fits. The top enclosure, cover and panels, shall be separate and easily removable.

6.2.1.1 The motor frame structural assemblies shall be cast iron or heavy welded steel construction in accordance with AWS D1.1 and AISC handbook.

In case of a heavy welded steel construction all the welds on the motor frame must be inspected by declared as acceptable per AWS D1.1 and signed off and dated in writing by a Certified Welding Inspector. If end welds made during the assembly of the frame will be rendered inaccessible after the subsequent welding or another frame component, the Welding Inspector must inspect and sign off that weld as satisfactory before it rendered inaccessible for adequate inspection. Bolted construction is not acceptable except for fastening the minimum number of structural elements required for motor disassembly. Designs in which the stator laminations form part of the enclosure or in which the stator laminations are otherwise directly exposed to external cooling are not acceptable.

6.2.1.2 Mounting footprint (fit type, bolting pattern, bolts' size, etc.) shall match installed equipment.

6.2.1.3 At least three access at each end shall be provided for measuring the air gap between the stator and the rotor.

6.2.1.4 Motor shall be equipped with lifting and alignment lugs in accordance with MG1 and the outline drawing of the installed equipment. Lifting lugs shall be designed for lifting the assembled motor with 200% capacity.

6.2.2 Main leads and auxiliary terminal boxes

6.2.2.1 Main leads and auxiliary terminal boxes shall be supplied at original size and relative orientation. All terminal boxes shall be able to rotate in steps of 90° around its rotational axis. The existing connection entry points and cable sizes shall be respected in every manner.

6.2.2.2 Main leads terminal box shall be designed in a manner, that during operation, inspection with infra-red camera of the leads is possible.

6.2.3 Cooling

The motor shall be self-ventilated. Air inlet and outlet openings shall be protected with metal guard screens to prevent entrance of foreign objects. Motor shall have inlet air filters, as original ones.

6.2.4 Bearings

The motor bearings shall be of sleeve bearings type that are oil lubricated with adequate integral self-cooled reservoirs. Sleeve bearings in the motor shall be horizontally split bearing with horizontally split bearing brackets allowing replacement without removing the lower half of the bearing bracket. The motor's bearings shall be supplied with oil rings and reservoir to allow for safe shutdown, startup and operation.

6.2.4.1 The bearing shall be designed to operate continuously for a minimum of two years between oil changes. Bearings shall be capable of bi-directional shaft rotation. As a minimum, reverse rotation shall be allowable with the shaft coupled to the driven equipment and running unloaded at rated speed.

The bearings insulation shall be provided at one side to prevent circulation of shaft currents.

6.2.4.2 Bearing temperatures shall be monitored. TC type E or RTD's shall be used and wired to the auxiliary terminal box.

6.2.5 Bearing oil reservoir

Shaft and bearing housing shall be constructed with suitable deflectors and seals to prevent oil migration either out of the motor or into the winding. Bearing reservoirs shall have oil sight glasses with oil level marked for standstill and running conditions. Oil fill and drain plugs shall be provided to drain the sump at the lowest point in the reservoir, including the settling chambers. The oil reservoir shall contain a settling chamber to capture foreign material.

6.2.6 Dimensions and Threads

- [1] Dimensions and data on all drawings incorporating an interface with Purchaser (e.g., outline, etc.) shall be shown in imperial units.
- [2] Dimensions on drawings of component parts, submitted for approval, should be in inches, but soft conversions from metric units are required.
- [3] All fastening materials shall be provided in inch-based dimensions, as per the Unified Thread Standard (UTS).

6.2.7 Shaft and Coupling

Motor shall have solid shaft per reference DWG 8978D73 – Outline (Charging Centrifugal Pump Motor) (see Appendix A2), designed with an ample margin for all stresses encountered in starting and running, including over speed operation, electrical fault conditions and considering external imposed loads carried by the motor shaft.

6.2.7.1 The Supplier shall fit and install the half-coupling that is identical to the existing one. Coupling detail drawings are available from NEK. After the fitting of the half-coupling, the

Supplier shall perform face and outside diameter run-out checks on it. The coupling driving half will be shipped to the Supplier's shop from NEK at a mutually agreed time.

6.2.8 Direction of Rotation

The direction of rotation shall remain the same as the original motors as indicated on the outline drawing.

Motor main terminal leads shall be stencilled T1, T2, and T3, or shall have tags attached for identification.

6.2.9 Vibration and noise

Vibration shall not exceed values specified by NEMA MG1 Standards for rigid mountings at no-load operation.

Factory vibration levels shall be obtained with the motor rigidly mounted to the floor, i.e.; resilient mountings are not allowed.

The motor shall be designed and manufactured to operate as quietly as possible in accordance with IEEE 85. The vendor shall state the noise level at no-load conditions.

6.3 Electrical details

Motor shall be electrically of the same characteristics as originals and suitable for connection without any alteration to originally installed equipment or mounting location.

6.3.1 Voltage Ratings

The motor shall be rated 3 phase, 6000V, 50 Hz, suitable to deliver rated output on a balanced three-phase, 50 Hz, high resistance grounded system having a voltage of 6300V.

The motor shall have a 1.15 service factor

6.3.2 Stator

The design of the stator winding shall be consistent with the requirement of long life, considering the stress associated with across-the-line starting and automatic transfer capability as specified in section 7.

6.3.2.1 The stator insulation system shall be according to the latest technology utilizing at least class F materials with Temperature Index of at least 350 kh/130 as defined in IEEE 1 (350,000 hours useful life at 130°C) or better. The Supplier shall provide a thermal life curve of the insulation system. The insulation system life shall be qualified in accordance with IEEE 275 or IEEE 429 or IEEE 1776 as applicable to the type of the system used.

6.3.2.2 The insulation system shall be made using global vacuum pressure impregnation. If after completion of the VPI process, the stator winding fails to pass the AC high potential test, the stator must be completely stripped and rewound at the Suppliers expense. The rewound stator shall be subjected to the same test as the original.

6.3.2.3 Supplier shall supply a minimum of three (3) sample stator coils from the same manufacturing lot as those used in the motor winding.

Following VPI, one of the extra stator coils shall be dissected and inspected by the Supplier for proper resin penetration and void content in the insulation system. The dissected sample shall be made available for inspection to the NEK representative. The remaining sample coils shall be destructive tested.

6.3.2.4 Motor leads shall be extra flexible copper brought out of the motor frame for connection inside the terminal box. Leads shall be rated for 130°C and 125% full load of the motor. Protective sleeving shall be installed around the leads at the frame penetration to prevent chafing against the frame edges. The penetration shall be such that the leads with the terminal lugs pass through. Leads shall be of suitable length for cut out, as measured from main lead adapter end. Terminal lugs shall be compatible for connection to the existing terminal lugs on feed in cables. The terminal lugs shall not be crimped to the leads but shall be shipped separately.

6.3.2.5 The stator and rotor laminations shall be at least M19 grade to ensure low core losses and higher efficiency. The coating grade applied to the laminations shall be at least C5 grade. The used lamination material shall be confirmed by the purchaser in the design stage of the project.

6.3.3 Stator winding

Tapes used in coil construction shall be specifically intended for use with the VPI process and shall not be film-backed.

6.3.3.1 Ground-Wall Insulation General Requirements – The use of cell wrappers is not acceptable. Tapes containing polyester, polyamide or other films are not acceptable.

6.3.3.2 Glass mat polyester for wedges material such as GPO-1 are not acceptable. NEMA grades G-5, G-9 and G-10 are examples of desired wedge material. Individual wedge portions shall be no shorter than 6 inches in length.

6.3.3.3 Six Pt-100 type dual resistance temperature detectors embedded in the stator winding and located to measure the coil temperature at its hottest points along the slot. They shall be placed in slots between coils, two per phase. The RTD's shall be wired to the auxiliary terminal box.

6.3.4 Stator End Turns

The stator end turn bracing system shall be sufficient to withstand the stresses of repetitive starts and power supply switching transient's stresses described in this specification. The bracing system shall also withstand stresses at maximum allowable steady vibration without damage or loosening of the bracing elements. The bracing system shall allow sufficient air flow to maintain end turn insulation temperature to be no greater than the temperature of the winding insulation in the slot areas.

6.3.4.1 Photographs shall be taken of the finished wound stator winding prior to undergoing VPI process to demonstrate that the tying and blocking schemes conform to the criteria in this specification.

6.3.5 Service Factor

The motor shall have a 1.15 service factor.

While the motor is not designed to operate normally in the service factor range, such operating must be available without reducing the capability of the motor to perform its design function.

6.3.6 Temperature Rise

The stator temperature rise when operated at rated voltage, frequency, and 1.15 service factor load, in an ambient of 50°C, shall not exceed 80°C when measured by resistance.

6.3.7 Rotor

Rotor shall have shaft extension per DWG 8978D73 – Outline (Charging Centrifugal Pump Motor) (see Appendix A2).

6.3.7.1 The rotor shall receive a final balance to latest NEMA vibration requirements. Balance weight locations shall be such that they can be positively fixed without causing high stresses. All balance weights shall be positively locked using a method that can be verified by visual inspection. Balance weights shall not be attached to ventilating fan blades. The use of solder or similar deposits is not acceptable for balancing.

6.3.7.2 Shaft extension, diameter and keyway shall match installed equipment. In no case shall cutting, drilling, or grinding be required to connect the motor with the driven equipment. The motor side half-coupling shall be installed on the shaft.

6.3.7.3 The magnetic center and end float shall be permanently scribed in the shaft without introducing localized residual stresses and referenced to a stationary point on the frame. The magnetic center shall be verified to be within 0.060” of the mechanical center when the motor is running.

6.3.7.4 All marking that require scribing shall be done in manner and with tooling designed to leave low residual stresses on the shaft surface.

6.3.8 Locked Rotor Current

Locked rotor current shall in no case be greater than of original motors.

6.4 Miscellaneous Requirements and Safety

The motor design shall ensure that inadvertent contact with the motor will not result in any injuries to personnel from electrical shock, rotating parts, heat, etc. There shall be adequate lifting points for both motor and major component removal and re-installation.

The vendor shall identify lifting restrictions, if any, in advance. The lifting means shall remain secure during normal operating conditions and shall not affect the operation of the motor.

6.5 Accessories

6.5.1 Space Heaters

Space heaters shall be installed in such a way to allow easy replacement in case of a failure. Heaters will be connected to 400 VAC, 50 Hz.

The heaters must be sized to maintain the temperature of the motor at minimum of 5°C above the ambient temperature to prevent condensation of moisture in its interior.

6.5.2 Vibration Monitoring

The existing motor is modified in a way that vibration monitoring is possible. The enclosure shall be modified that vibration sensor mounting is possible as described in Appendix A5. The motor shall be prepared for sensor mounting and shall not include the sensors.

7 PERFORMANCE REQUIREMENTS

Motor performance characteristics shall remain the same of original motors.

7.1 Starting requirements

Motor shall start, accelerate and run the driven equipment successfully with any variation of voltage or frequency permitted in NEMA MG1- 20.14 and this specification.

The motor shall be designed for full voltage starting. The motor shall be capable of accelerating the pump (see Appendix A1.5) to rated speed with 80 % of the motor nameplate voltage applied to the motor terminals.

Motor starting duty shall in no case be more restrictive than of original motors.

As a minimum, the starting duty shall be as follows:

- Motor cold: 2 consecutive starts.
- Motor at operating temperature: 1 consecutive start.
- Subsequent starts with motor running between starts is 15 minutes apart.
- Subsequent starts with motor standing between starts 45 minutes apart.

The motor shall be designed for a low starting current without sacrificing unduly other desirable features, such as high efficiency, good power factor and adequate torque characteristics.

Starting current magnitude and duration (starting characteristics) during acceleration and running of the load at all possible supply voltages defined by the most restrictive of MG1 20.14 and this specification shall be equal or below the existing motor. The margin between the two curves shall be equal to or greater than the existing motor.

7.2 Loading and Torque Requirements

New motor performance curves shall remain identical, within the reasonable margin, to original. A comparison between new and original curves shall be done as part of Equivalency evaluation (see also item 25.2.2 of this specification).

7.3 Operating reliability

The motor shall be designed for continuous operation however, it shall be adequate also for long periods of inactivity.

7.3.1.1 Motor shall be constructed and braced as necessary to withstand end-winding stresses, transient torques and all other stresses resulting from Fast and Slow Supply Voltage Transfer/Reclosures in accordance with ANSI C50.41 Section 14 (Motor residual V/Hz vs System supply V/Hz difference up to 90 degrees and 1.33 p.u. voltage). The Supplier shall calculate the most severe mechanical and electrical response to a full load transfer throughout the supply voltage range with a transfer time up to ten (10) cycles to verify that the design is within the allowable ANSI Section 14 limits.

- 7.3.1.2 Motor shall operate successfully under the following conditions of voltage and frequency variation, but not necessarily in accordance with standards established for operation at normal rating:
- [1] Where the variation of voltage does not exceed 10% above or below the rated value.
 - [2] Where the variation of frequency does not exceed 5% above or below the rated value.
 - [3] Where the combined variation of voltage and frequency does not exceed 10% (with the variation of frequency does not exceeding 5%) above or below the rated value.
- 7.3.1.3 Motor shall be capable of operating at rated load with 3% voltage unbalance for 24 hours.
- 7.3.1.4 Motor power factor shall be no less than 0.85 at 80% and 100% load.
- 7.3.1.5 Use of external capacitors shall not be used to improve power factor.
- 7.3.1.6 Harmonic output of the motor shall be less than 1% Voltage THD.
- 7.3.1.7 The motor shall be capable of withstanding overspeed for two minutes without mechanical or electrical injury in accordance with MG1-20.13.
- 7.3.1.8 The first critical speed of rotation of the motor rotor shall not be in the range of 80 to 125 percent or below 60 percent of the normal operating speed.

8 MATERIAL REQUIREMENTS

- 8.1.1.1 The Supplier shall be responsible for the selection of all materials and their procurement specification. The traceability of all purchased materials to material certificates is required.
- 8.1.1.2 Quality verification documents shall be submitted upon completion of the project as requested in item 25.3 of this specification.
- 8.1.1.3 All hardware including bolts, fasteners, caps, plugs and washers shall be corrosion-resistant material or be plated or treated with corrosion-resisting material. All bolts shall be free of thread debris and all bolts shall be lubricated prior to installation. All fasteners used on rotating elements or subject to loosening from vibration shall be positively locked in a manner so that no possibility of loosening in service exists.
- 8.1.1.4 The use of asbestos or products containing asbestos is specifically prohibited on all equipment and materials furnished.

9 FABRICATION AND ASSEMBLY

The Supplier shall maintain quality control and inspection program reviewed and accepted by Purchaser. This program shall include the requirements from a Production Quality Inspection & Test Plan that covers all component inspections, tests, manufacturing procedures and hold points for the motor contract.

Manufacturing of the motor shall not start until Purchaser's approval of I&TP.

Materials, processes and standard parts which are not specified herein, but which are necessary for the manufacturing of the motor, shall be new, of the best quality and shall be in accordance with the best practice typical to the manufacture of large polyphase induction motors.

Workmanship shall be in accordance with the best practice to ensure satisfactory operation and service life as requested in this specification.

10 INSPECTIONS AND TEST

10.1 General Requirements

The Supplier shall provide Project schedule and Production Quality Inspection & Test Plan. The Purchaser's representative(s) presence will be indicated in the latter as witness points.

The Supplier shall give twenty (20) working days advance notice for activities indicated as "witness". Detailed test agenda shall be attached including acceptance criteria for each test. Nevertheless, during construction and testing, the motor and all its components may be subject to inspection by Purchaser's technical representative who shall have access to the Supplier's premises at all reasonable times to the extent necessary to assess compliance with the provisions of this and any other related documents as may apply to the purchase of the product. Such inspection shall not relieve the Supplier of its obligation or responsibilities under the contract.

The Supplier shall, upon request, reveal all design and manufacturing documentation, to be reviewed by Purchaser's representative(s) during visits, however this documentation will be retained at the Supplier's facilities.

The Supplier shall submit records and reports for all tests and inspections required by this Specification and Supplier's Quality Production Inspection & Test plan. These records and reports shall be prepared promptly after each test or inspection completion and shall be collected all together as a package available for review. A copy of all records shall be transmitted to the Purchaser prior to shipment of motor to the site.

Any discrepancy of performance or operating parameters from those of original (presently operating) motors shall be investigated and explained in suitable written report.

Manufacturing deviation reports shall be provided to the Purchaser's technical representative(s) for evaluation and disposition concurrence.

10.2 Subassembly testing

The Supplier or its manufacturing subcontractors shall follow their own production and testing procedures. However, the tests and checks requested below are the minimum scope that is requested by the Purchaser.

10.2.1 Stator core tests and checklists

Once the stator core is assembled and before the stator winding is installed, the core shall be subjected to a rated flux test. This test is to be performed with an induced back-of-core flux density of around 105% of rated flux density. Coil voltage and ampere-turn requirements shall be according to IEEE Std. 432. The stator bore surface shall be monitored for hotspots with infrared test equipment for at least 60 minutes. The test data shall be recorded and submitted to Purchaser for review.

The acceptance criteria for such tests shall be as follows:

- [1] No core hotspots higher than 2°C above core coolest area
- [2] Maximum core loss of 3.0 watts/lb.

10.2.2 Stator coil testing

Stator coil surge testing in accordance IEEE 522 shall be performed on individual stator coils after final installation in the stator core, but before connection to other coils or to the winding leads in accordance with NEMA 20.35.7.b. Coils with unsatisfactory or questionable test results shall be excluded from the motor (no rework on unsatisfactory coils is allowed).

As requested in paragraph 6.3.2.3. the sample coils shall be provided and shall undergo a destructive test (AC Hi-pot) along other recommended tests. The coils shall be cut and inspected for any voids and inconsistencies.

10.2.3 Winding testing

Tests after winding process is finished but prior to VPI treatment:

- [1] Phase resistance measurement.
- [2] Phase sequence verification.
- [3] Surge comparison test.
- [4] RTD operability check.

Final tests after stator completion:

- [1] Phase resistances.
- [2] Reduced voltage stator winding current balance test.
- [3] Insulation resistance measurement of each phase separately and altogether to the ground (5kV DC).
- [4] Polarization index.
- [5] Power factor tip-up.
- [6] Dissipation Factor (tan delta) and capacitance measurement.
- [7] Surge comparison test.
- [8] Partial discharge measurement.
- [9] AC high potential test with at least 70% of final AC hi-pot test voltage (e.g. $0,7 \times (2 \times U_N + 1000)V = 9kV$).
- [10] Water immersion test (optional scope of work).

10.2.4 Rotor testing

Required rotor tests:

- [1] All brazed joints between rotor bars and shorting rings shall be ultrasonic tested. Test report shall be submitted.
- [2] Ring to rotor bar joints shall be 100% brazed and 100% NDE inspected. The joints shall be located so that they are 100% accessible for future NDE inspections.
- [3] Rotor shall be placed in a lathe for measure Total Indicated Runout (TIR) measurement of the following: rotor body, shaft journals, seal areas, coupling fit are and the coupling face runout.

10.3 Factory Acceptance Testing (FAT)

After completion the motor shall be tested per methods described in the latest revision of NEMA MG-1 and IEEE Std. 112.

The motors parameters shall be determined in accordance with IEEE 112. The Supplier shall determine the method used for the determination of the Efficiency in the proposal.

10.3.1.1 All stator and rotor test records from 10.2.1 shall be included into the FAT report or tests shall be repeated during this stage.

FAT shall include, but not be limited to:

- [1] Stator winding Insulation Resistance and Polarization Index.
- [2] Phase resistance measurement and percent imbalance.
- [3] Dissipation Factor (tan delta) and capacitance measurement.
- [4] Partial discharge measurement.
- [5] Bearings and heaters insulation resistance test.
- [6] Air gap measurement.
- [7] Auxiliary equipment testing:
 - All heaters operability check.
 - RTD and TC operability check.
- [8] No load testing:
 - No load current, voltage and power input at rated voltage.
 - No load speed.
 - No load vibrations.
 - No load noise.
- [9] Shaft voltage.
- [10] Locked rotor current and torque.
- [11] Motor load testing:
 - Speed torque characteristics.
 - Efficiency from 25 per cent to 125 per cent load.
 - Power factor from 25 per cent to 125 per cent load.
 - Rated load slip.
 - Acceleration curve at rated pump load.
- [12] Motor load testing at $0.8 U_N$:
 - Speed torque characteristics.
 - Acceleration curve at rated pump load.
- [13] Vibration testing - from horizontal, vertical and axial directions of the DE and ODE motor bearings – the data shall be continuously recorded during accelerations, running and coast down.
- [14] Rated load stator temperature rises:
 - Stator winding.
 - Bearings.
- [15] AC high potential test with at least 70% of final AC hi-pot test voltage (e.g. $0.7 \times (2 \times U_N + 1000) \text{V} = 9 \text{kV}$).

10.4 Acceptance

Acceptance of completed motor will be based on requested inspection, tests, records and reports to enable the Purchaser to determine that the equipment meets all of the specification requirements. All of the records and reports shall be traceable to Purchaser with purchase order, shop order and motor serial number.

After delivery, the Purchaser will perform the receive inspection. Upon completion Acceptance handover protocol will be signed after establishing that the motor is suitable for installation.

In case of any deficiencies discovered after motor installation and run within warranty period the Purchaser shall have the right to use it, if in serviceable condition, until the convenient time to make warranty claim correction(s).

11 QUALIFICATION, PARTS CLASSIFICATION AND DOCUMENT TRACEABILITY

11.1 Safety Classification

Safety classification of motor, motor parts and services in the scope of this Specification is classified as Nuclear Safety Related – Class 1E. The motor shall be provided under a 10 CFR 50, Appendix B, Quality program that has been approved by NEK.

11.2 Environmental Qualification

Supplier shall certify that the supplied motor is Environmentally Qualified in compliance with IEEE Standard 323-1974 (or newer version IEEE 323-2003) and in compliance with IEEE Standard 334-2006 considering following EQ conditions:

Normal operating environment (ambient):

- Temperature: 50⁰C
- Pressure: 101.3 kPa
- RH: 60 %
- 40-year gamma dose: 4.78+03 Gy

Design Basis Accident conditions: Not Applicable (normal operating conditions applies).

Required Post Accident Operating Time (PAOT): Not Applicable.

IEEE 323-1974, IEEE 323-2003 margins shall be applied to specified EQ conditions.

Required motor performance requirements shall be confirmed by Environmental Qualification.

According to IEEE 334-2006, Section 5.7, the Supplier shall consider above specified EQ conditions. Namely, 40-year gamma dose exceeds 10² Grays (10⁴ rads) radiation level for which radiation qualification is required.

Other environmental conditions are considered mild environment.

Seismic qualification requirements are defined and discussed in continuation, in Section 11.2.

Supplier shall provide the qualification documentation in accordance with IEEE 334-2006, Section 7.

The Supplier must describe in the offer how the motor will be qualified - is the motor pre-qualified or will he have to perform new qualification tests, etc. With this purpose, the Qualification Concept shall be provided in the offer.

In case that equipment has not yet been qualified to EQ conditions defined here (not pre-qualified motor), the Supplier shall prepare detailed Qualification Procedure and send it to NEK for review and approval. Qualification may be proceeded after NEK approval of Qualification Procedure.

Qualification Report shall define qualified life with following aging data for materials with significant aging mechanisms (if exists): material/parts identification and safety function description; aging time; aging temperature; activation energy. Motor target qualified life is 40 years for specified environmental conditions.

If there is any difference (material, design/construction or performance parameters) between the pre-qualified motor and subject supplied motor, the differences should not degrade original equipment qualification level in any viewpoint to accomplishing its safety function during qualified life. Accordingly, supporting similarity analysis with references shall be provided and delivered to confirm acceptability of difference.

Supplier shall state whether the item requires any periodic maintenance or replacement of parts in order to maintain the qualified life during item installed life.

Installation details (orientation, sealing, electrical and process connection etc.) required to maintain qualified configuration shall be specified and supplied with qualification records.

11.3 Seismic Qualification

The motor shall be seismically qualified in accordance with attached floor response spectra: Floor Response Spectra of Auxiliary Building, el. 100.300 figure A37, A38, A39 and A40 (see Appendix A3).

The design of the equipment shall be such that there is no loss of function during and after the prescribed seismic disturbance as defined herein. No loss of function implies that rotating equipment will not seize, pressure vessels will not rupture, support will not collapse, systems required to respond actively will response actively. For OBE (Operating Basic Earthquake) the function shall be performed without permanent deformation. For DBE (Design Basis Earthquake) permanent deformation is tolerable (localized permanent deformation) if it does not impair the equipment's function.

The motor assembly and all individual part of the motor shall be defined to operate satisfactorily during earthquake forces resulting from acceleration in the horizontal and vertical direction. The entire assembly must be designed to receive and transmit these forces through the supports to the foundation. The supports, when design weight of the equipment is included, shall be designed to have a natural frequency in excess of 35 csp.

The stresses from the normal operation conditions, when combined with the OBE stresses resulting from a $\pm 1.5g$ acceleration acting horizontally and a $\pm 1.0g$ acceleration acting vertically and occurring simultaneously, shall be maintained with the allowable material working stresses limits accepted as good practice.

In addition to the above, stresses from the normal operating conditions when combined with the DBE stresses resulting from $\pm 3.0g$ acceleration acting horizontally and a $\pm 2.0g$ acceleration acting vertically and occurring simultaneously, shall be limited to prevent loss of function of the equipment. For the purpose of calculation, the no-loss-of-function stresses shall be limited to the yield strength of the material.

12 CLEANING

FME program shall be followed during the work. All surfaces are to be, clean and free from dirt, weld spatter, slag, rust, and other foreign matter. Prior closing of any part of the motor which is going to become inaccessible a thorough visual inspection shall be performed and formally recorded (photographs shall be taken).

13 CORROSION PROTECTION / COATING

The motor finish shall consist of epoxy materials as defined in NEK Krško Specification SP-A3000; Service Level II Coatings Inside NEK Technological Area. The surface coating shall meet the following requirements:

- Identification of coating materials (including commercial names, components, if applicable, and manufacturer's contact information).
- Appropriate exposure C3-medium, high durability (ISO 12944-1/2).
- Reference to the NEK Coating Technical Specification or a Coating Specification proposal.
- The protective coating shall possess suitable characteristics for decontamination (with a historical decontamination factor defined by ANSI N5.12 and ASTM D4256: DF 5-20; the appropriate generic coating type is epoxy, and the coating must meet the chemical and physical properties stated below).
- Adhesion resistance: minimum of 200 psi (ASTM D4541 or similar).

The execution of the surface protection shall be at minimum in line with the requirements in the technical specification SP-A3000.

For more requirement details see Technical Specification SP-A3000, rev. 0 (see Appendix A4).

During the proposal, the supplier shall determine and recommend the coating material, which shall then be approved by NEK.

14 MARKING AND IDENTIFICATION

All markings and identification plates shall be of non-corrosive material, securely attached to the motor.

14.1.1.1 The nameplate information shall be according to NEMA MG1-20.25.

14.1.1.2 Additional markings and identifications required on separate plates attached to the motor at suitable locations:

- [1] Starting duty.
- [2] Total motor weight and individual weights of rotor and stator.
- [3] Center of gravity.
- [4] Heater rating and connection details.
- [5] Static and running oil levels separately for each oil pot.
- [6] Direction of shaft rotation when facing the end of motor opposite the driving end with the T1-T2-T3 leads arrangement.
- [7] Year of manufacture.

15 PACKAGING, HANDLING AND STORAGE

Packaging shall be performed in accordance with requirements of ANSI 45.2.2. Shipping containers for the equipment shall indicate the identification numbers of the units contained.

Motor shall be boxed, crated or otherwise suitably protected to prevent damage due to inclement weather and shipping conditions on the vehicle. Threaded opening shall be provided with steel caps or plugs. Flanged opening shall be provided with metal blind flanges with synthetic rubber gasket.

Motor shall be shipped without oil. The rotor shall be blocked to prevent axial and radial movement. Bearing surface shall be suitably protected against corrosion or contamination during shipping and storage.

Packaging or crating shall be such as to insure the satisfactory transportation, handling and arrival of the equipment at its destination in condition as judged by the NEK to be readily handled and placed immediately in permanent position ready for operation with a minimum of field labor.

ShockWatch and TipNTell indicators (or equivalent equipment) shall be installed on the equipment housing and each shipping crate in all three axes prior shipment. Clear receiving inspection acceptance criteria shall be identified by the Supplier before shipment.

The Supplier shall inform the NEK of any special storage requirements sufficiently in advance of shipping of the motors to allow for necessary preparation.

16 NONCONFORMING MATERIALS

Any deviations or design changes which are not fully in accordance with the technical or quality assurance requirements of the procurement documents and which the Supplier desires to accept shall be approved by NEK. Any such deviation request shall be made in writing prior to disposition by means of Deviation /Change Request Form submitted to the NEK for approval prior to continuing work.

Nonconformance with specification requirements and applicable codes and standards invoked by this specification will not be accepted until approved by NEK.

To NEK shall be reported and wait for approval those nonconformance, which cannot be brought within specification requirements by rework or replacement. When such conditions exist, Supplier shall initiate Nonconformance Report (NCR) using the Supplier's standard nonconformance document, which identifies the nonconformance and the Supplier's proposed disposition. The Supplier shall:

- [1] Segregate the nonconformance item to prevent any further processing which may result in a change of the nonconformance as identified.
- [2] Make the NCR available to the responsible NEK inspector for review to ensure the nonconformance is completely identified and accurately stated.
- [3] Transmit NCR with recommended disposition to the NEK in an expeditious manner. The supplier shall provide technical justification for the recommended dispositions.
- [4] The requirements of the specification are binding, no departures are acceptable without the prior consent of the NEK.

The NCR shall provide the method by which the Supplier shall obtain a documented response and approval from NEK when nonconformance is identified. The use of NCR will pertain to the work at the Suppliers and/or Sub-Suppliers shops. Once the item is identified with an NCR that NCR shall remain assigned to that item permanently and NEK shall be advised of the originating NCR.

17 RECORDS

17.1 Record System

A record system shall be established and maintained by the Supplier to provide documentary evidence of the quality of items and activities affecting quality. Quality assurance records shall include results of reviews, inspections, test, audits, monitoring of work performance and material analysis. Records shall at minimum identify Supplier 's name, order number, inspection and data recorder, data inspection that was performed, type of observation, procedures used, results, acceptability and action taken with deficiencies noted. Record of inspection shall also include identity of drawings and procedures utilized along with the revision level.

All quality verification records, procedures and qualifications shall be identifiable to the item or activity involved. All this record shall be sent to NEK as they are originated and shall also be included in the final documentation package delivery.

17.2 Fabrication Records

Additionally, to the requirements for manufacturing data, the Supplier shall prepare and provide all fabrication records related to NEK equipment.

18 OTHER REQUIREMENTS

The Supplier shall compile a list of all (spare) parts needed for general refurbishment of the motor according to Instruction book. The spare parts list shall be listed in the Instruction book. In addition, one set of all essential spare parts should be supplied with the motor (bearings, heaters and side glass for oil checks).

Any item from that list shall be described with P/N, detailed description and quantity required.

Any additional requirements and/or exceptions imposed beyond this specification requirements during bidding, negotiating and contracting process shall be identified as change to this specification and brought to the attention to NEK for resolution concurrence and/or approval.

19 RIGHT OF ACCESS

NEK or NEK representative shall be allowed access to the working areas and engineering offices of the Supplier and his Subcontractors during normal business hours and any time when work or testing on NEK ordered equipment will be performed outside normal business hours for the purpose of auditing:

- [1] The Supplier's accepted Quality Assurance Program.
- [2] The Subcontractor's accepted Quality Assurance Program.
- [3] Equipment qualification.
- [4] Factory acceptance testing.

Such audits will include examination of documentary, evidence of activities affecting quality and will be carried on a planned periodic basis, during the course of work.

20 QA PROGRAM REQUIREMENTS

The Supplier shall have a Quality Program that complies with 10CFR50 Appendix B and which shall assure that all materials, manufacturing practices, examinations and testing conform to the requirements of this specification and the Code. The Supplier shall submit its Quality Assurance Program for the NEK review and acceptance with the proposal and prior to commencement of any work on the design and manufacture of the component.

Accepted Production Quality Inspection and Test plan shall become a part of the contract.

NEK preserves the right to verify the suppliers control activities by using the following methods:

- [1] Documentation review (Report).
- [2] QC procedures review (audits).
- [3] QC activities witnessing (Witness), testing (Test), obligatory presence (Hold).

A Certificate of Compliance (COC) shall be supplied to NEK by Supplier to certify that provided equipment and services meet the requirements of this Specification and related purchase order. Any deviation from the Specification or repair to the equipment, which has been accepted in writing by the NEK, shall not relieve the Supplier from its responsibility for satisfactory equipment performance in according with this Specification.

21 SPECIAL HANDLING

The Supplier shall specify special handling requirements, if any are required, and provide NEK with appropriate procedure, which shall explain and emphasize them in detail. The Supplier shall also specify additional requirements necessary to maintain equipment warranties.

Adequate means for lifting and handling are to be provided for motor, its subassemblies and parts.

22 SHELF LIFE

All items supplied under this Specification shall be new (not used or refurbished). The Vendor shall provide shelf life data by one of the following methods:

- [1] Shelf life.
- [2] Cure date and material composition.

If above requirements are not met the material will be shipped back to the Supplier at his expenses.

The Supplier shall provide the in-storage maintenance instructions to assure proper care of the motor while not in service. The Supplier shall provide storage level requirements as per ANSI.

23 10CFR21 REPORTING

The deliverables per this specification or related order are subjected to the provisions of the Title 10 of the U.S. Code of Federal Regulations Part 21: Reporting of Defect and Noncompliance. All of the reporting pursuant to 10CFR21 shall be made to NEK Procurement Support (ING.PDO) Superintendent at the same time when reporting to the authority (US NRC) is done. For safety related equipment supplied outside of USA, the Vendor shall be subject to reporting pursuant to 10CFR21 to the NEK ING.PDO Superintendent, only.

24 COMMERCIAL GRADE ITEM DEDICATION

The motor supplied according to this specification is not a commercial grade item. The motor shall be designed, manufactured, tested and delivered as Safety Related Component and shall be in full compliance to this specification.

25 SUPPLIER DOCUMENTATION REQUIREMENTS

The Supplier shall furnish the documents to the NEK.

25.1 Information and Documents Required with the Proposal

Documents required with proposal:

- [1] Preliminary Project schedule.
- [2] Description of offered motor.
- [3] Reference list that include all warranty claims and if they were resolved by supplier.
- [4] Supplier shall determine what parts and works will be performed by sub-contractor, if any, their name and references.
- [5] Motor data sheet.
- [6] Preliminary outline drawing, as defined under paragraph 25.2.1.
- [7] Preliminary Calculated performance curves, as defined under paragraph 25.2.2.
- [8] Offered spare parts lists, together with part numbers and quantities.
- [9] The proposed coating of the motor (see Appendix A4).
- [10] Supplier Quality Assurance Program.
- [11] Preliminary Production Quality Inspection and Test Plan, as defined under paragraph 25.2.3.
- [12] Price of each section (fabrication of motor, Spare parts divided by item, optional scopes).
- [13] Motor Compliance Matrix (see Appendix A6).
- [14] Any deviations or exceptions to this Specification listed shall be listed on the Equipment Specification Compliance Matrix (see Appendix A7). Supplier shall send all exceptions to this specification together with the Proposal for NEK review, comment and acceptance. After that, further deviations regarding equipment or documentation shall not be accepted by NEK.
- [15] Qualification Concept (per Section 11.1).

The proposal shall include description of:

- [1] The stator coil insulation system.
- [2] The method of wedging and bracing of the stator coils.
- [3] The location of the winding temperature sensors.
- [4] The rotor bar retaining method in the slots.
- [5] The bearings, method of lubrication, recommended lubricant and the reasons for choosing the proposed bearing.

25.2 Documents requirements after signing the contract

Documents required for review and/or approval shall be submitted two (2) months after the order is placed:

- [1] Project schedule.
- [2] Production Quality Inspection and Test Plan, as defined under paragraph 25.2.3.
- [3] Motor data sheet see, as defined under paragraph 25.2.1.
- [4] Outline drawing see, as defined under paragraph 25.2.1.
- [5] Performance curves, as defined under paragraph 25.2.2.
- [6] General assembly drawing w/ itemized BOM.
- [7] Front bearings cross section drawing w/ itemized BOM.
- [8] Rear bearing cross section drawing w/ itemized BOM.
- [9] Shaft profile drawing.
- [10] Motor Loading Diagram.
- [11] Stator Factory Testing Procedure(s).
- [12] Test Procedure for Factory Acceptance Testing.
- [13] Spare parts lists, together with model numbers and quantities.
- [14] Qualification Procedure as defined under paragraphs 11.2 and 11.3.

During design, manufacturing, dedication, qualification, and assembly the following documentation shall be submitted to NEK:

- [1] Fulfilled Production Quality Inspection and Test Plan.
- [2] All procedures and documents NEK shall review and approve. Those procedures shall be available for review to NEK at least 30 working days prior beginning of the activity that the procedure is related to.
- [3] Draft version of the Installation and Operation manual.
- [4] Qualification Reports per Sections 11.2 and 11.3.

Detailed field installation instructions 6 weeks before the FAT including the following as a minimum:

- [1] Installation, Operation and Maintenance Instructions as defined under paragraph 33.
- [2] Copies of all test reports performed by the Supplier and required under paragraph 10. and Quality Assurance documents.
- [3] Copies of any applicable nonconformance reports and disposition.
- [4] Long Term In-Storage Maintenance Procedure (as part of Motor Instruction Book).

25.2.1 Drawings

The Supplier shall submit complete data for the equipment offered. This shall include, but not necessary be limited to the following:

- [1] Motor general descriptive data and shop order number.
- [2] General dimensions and clearances including interfaces' details.
- [3] Weights of assembled motor as well as stator and rotor individually.
- [4] Motor ventilation scheme.
- [5] Center of gravity of assembled motor.
- [6] Schematic diagram, terminal markings and electrical data of space heaters.
- [7] Motor base & shaft extension details.
- [8] Endplay.
- [9] Number of stator and rotor bars.
- [10] Direction of rotation.
- [11] All bearings' types and sizes, all bearings clearances as well as approximate oil quantities in both oil pots.
- [12] Motor main leads cables size and material.
- [13] Drawing of the shaft, spider and lamination construction. Details of the rotor bar retaining method within the rotor body and at connection rings shall be included.
- [14] Winding diagram showing all parallel circuits and connections points.
- [15] Stator bar fabrication dimensions, including coil cross-section dimensions (strand turn, package, groundwall, etc.) and bulk dimensions (slot length, bend radii, etc.).

The drawings and data in the proposal shall be preliminary. After the order is placed the drawings shall be completed submitted for comments and approval.

25.2.1.1 Prior to the drawing submittal the supplier shall carry out measurements of the existing motor (baseplate, coupling, external connections and motor enclosure). The Supplier shall not depend on the provided existing outline drawings in case of deviations.

25.2.2 Calculated performance curves and motor data

A comparison between new (calculated and measured, when will become available) and original motor performance curves and data, shall be performed by Supplier. Any differences shall be brought to the Purchaser's attention.

Calculated performance curves and data:

- [1] Stator winding Resistance.
- [2] Subtransient Reactance (X_d'').
- [3] Time Constants – Open-circuit AC (T_{do}'').
- [4] Short-circuit AC (T_d'').
- [5] Short-circuit DC (T_a).
- [6] X/R ratio.
- [7] Starting Power Factor (PF).
- [8] Locked Rotor Current.
- [9] Main Stator Core Loss.
- [10] Load $W K^2$.
- [11] Load vs. Efficiency.
- [12] Power Factor vs. Load.
- [13] Current vs. Speed (80% & 100% UN).
- [14] Torque vs. Speed (80% & 100% UN).
- [15] Efficiency vs. Horsepower.

- [16] Speed vs. Horsepower.
- [17] Input KW vs. Horsepower.
- [18] Starting Current and Power Factor vs. Voltage.
- [19] Current vs. Time (80% & 100% UN).

All plotted data from testing shall be also delivered in a table form (spreadsheet - excel). All calculated values shall be measured (determined by tests) on the motor after completion and compared to the calculated values. The comparison shall be presented to NEK for review.

In addition, the following data shall be provided after the FAT described in 10.3.

- [1] Inertia of rotor (uncoupled).

25.2.3 Production Quality Inspection and Test Plan

Project Production Quality Inspection and Test shall include:

- [1] Collectively indicate sequences and dates for material requisition and testing, fabrication, testing, qualification and shipment, with R (record), W (Witness) and H (Hold) points, which will be commented, fulfilled and approved by NEK. The submitted time line shall be in weeks from date of receipt of purchase order.
- [2] A copy of the production test program and acceptance criteria along with a listing of the standard to which they conform, which shall be commented and approved by NEK
- [3] Method for equipment qualification per section 11.2 and 11.3.
- [4] Types of tests, material, manufacturing procedure or sequence, or construction listed in this Specification, which are not the Supplier's standards.

25.3 Documents requirements after the completion of the project

The documents shall be submitted before the shipping of the motor to the Purchaser. The documents must be approved by the Purchaser prior to the shipping:

- [1] All documents and or records required in this specification shall be sent to Purchaser before the motor shipment from the Suppliers facility.
- [2] All additional documents and/or records not specified herein but required in the Purchase order and agreed upon in the Contract shall be submitted before the motor shipment from the Suppliers facility.
- [3] All test reports of the subassembly testing as described in 10.2 and test report of the Factory Acceptance Testing as described in 10.3.

The quality verification documents shall include but shall not be limited to the following:

- [1] Quality Release & Transmittal Letter.
- [2] Certificate of Compliance.
- [3] Certificates of Origin.
- [4] Reports per Production Quality Inspection and Test Plan.
- [5] Chemical and Mechanical Test Reports.
- [6] Material Test Reports.
- [7] Certificate of Equivalency Evaluation Report for Motor.
- [8] Documentation and Final Release Checklist.

26 NEK PROPRIETARY DATA

NEK has a proprietary interest in all of the drawings, designs, specifications, documents information or know-how which may be furnished pursuant contract execution and in any know-how improvement, discovery or invention which may be made, developed or conceived in the performance of work hereunder or which may arise or result therefrom (hereinafter collectively referred to as the "Information"). All such information shall be considered proprietary of the NEK. The right to use of all such Information shall be transmitted to the Supplier only for its personal use and shall be entirely restricted to the performance of the contract and subject to the confidentiality provision.

27 NON-CONFORMANCE REPORTS

The Supplier shall provide for approval of all nonconformance reports as repair or use-as-is disposition of material during the manufacturing process only in cases that affect environmental qualification, interchangeability, design or operating parameters generating during manufacture or processing of this order. This report shall include technical justification for nonconformance dispositions. All dispositions, which do not return an item to the conditions, stated in an approved drawing or specification shall be approved by NEK prior to the shipment of the affected item.

28 REPAIR RECORDS

Together with the documentation package shipment, the Supplier shall provide to the NEK with all generated record of repairs and they shall include as a minimum, following information:

- [1] Summary of repair/refurbishment work that has been performed on the equipment.
- [2] Brief analysis of the reason for failure of the equipment.
- [3] Details of any "special process" used during repairs that were not used in manufacture.
- [4] A list of replacement parts installed in the repaired equipment.

29 SOURCE INSPECTION / SURVEILLANCE NOTIFICATION

The Supplier shall contact NEK or NEK's designated representative at least 20 working days in advance, when a witness or hold point will be reached. Supplier shall not proceed past that point until inspection has been established or waived by NEK.

Inspections or examinations performed by NEK representatives or designated representatives do not relieve the Supplier of its responsibility to meet the requirements of this specification and purchase order.

30 SHIPPING REQUIREMENTS

Supplier shall provide packaging and shipping methods for protection from effect of temperature extremes, humidity, transit shocks and jarring during transport and storage.

Shock and tilt recorders shall be provided during the shipment.

The motor shall be shipped in accordance with ANSI 45.2.2, Level B. EPRI document 1009698 "Shipping and Storage of Electric Motors" shall be used as a guideline to ensure proper handling.

Material and all certifications or accompanying documentation supplied under this order shall be directly shipped from the Supplier to NEK. The Distributor shall not take possession of any material or documentation.

The NEK authorized source inspectors have right to hold shipment if purchase order requirements are not met.

31 DELIVERY SCHEDULE

Equipment shall be delivered to NEK according to this specification. This date includes the time to clear customs (approximately two weeks).

Expected delivery date for motor is end of year 2025.

32 WITNESS/HOLDPOINTS FOR SUBMITTAL OF SUPPLIER DOCUMENTATION

The NEK shall have the right to establish hold points and notification points for which the Supplier shall give prior notification. NEK shall identify inspection, witness or hold points which intends to participate based on submitted Production Manufacturing and Quality Plan, which shall be submitted to NEK according to mutual agreed schedule, as defined under paragraph 25.

In addition, NEK may establish hold points and temporary notification points if necessary to ensure resolution of quality problems or temporary quality problems. Predetermined hold or notification points require receipt of notification at least twenty (20) working days in advance of the scheduled time of performance.

The following hold points for which prior notification is required are mandatory:

- [1] Equipment performance Test.
- [2] Equipment qualification Tests.
- [3] Factory Acceptance Tests.
- [4] Shipping release.

33 VENDOR TECHNICAL MANUAL AND REGISTERED UPDATES

All manuals shall be provided to NEK for review, comment and acceptance prior to final issue and delivery.

Supplier shall furnish vendor technical manuals with all necessary information for operation and maintenance and updated specific data and drawings for all equipment. The manual shall include all drawings.

Bill of Material, which include all electrical and mechanical items installed in the motor, their catalog numbers, type or style designation, manufacturer name, electrical rating and replacement schedule. It shall be in form of spreadsheet.

34 TRAINING

The proposal shall include an optional scope for training of NEK maintenance personnel.

35 APPENDICES

- [1] Specification and Data, Rev. 0
- [2] DWG 8978D73 – Outline (Charging Centrifugal Pump Motor), Rev 0
- [3] Floor Response Spectra of Auxiliary Building, el. 100.300, Rev. 0
- [4] Technical Specification SP-A3000, rev. 0; Service Level II Coatings Inside NEK Technological Area, Rev. 0
- [5] Vibration sensor installation on pumps CSAPCH01 and CSAPCH02; Installation details, Rev. 0
- [6] Compliance Motor Matrix to NEK Technical Specification No. TS34-VNMG01, Rev.1
- [7] Compliance Matrix to NEK Technical Specification No. TS34-VNMG01, Rev.1



TECHNICAL SPECIFICATION

Spare Charging Pump Motor Specification and Data

KRŠKO NUCLEAR POWER PLANT

APPENDIX A1

Revision 0

NUCLEAR SAFETY RELATED

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A1. MOTOR SPECIFICATION AND DATA

A1.1. Technical Data

There are two Westinghouse CS motors utilized at Nuclear Power Plant Krško:

A1.1.1. CSAPCH01-MTR1 (S/N 1S-77)

A1.1.2. CSAPCH02-MTR1 (S/N 2S-77)

Both motors are manufactured by Westinghouse EMD and delivered under:

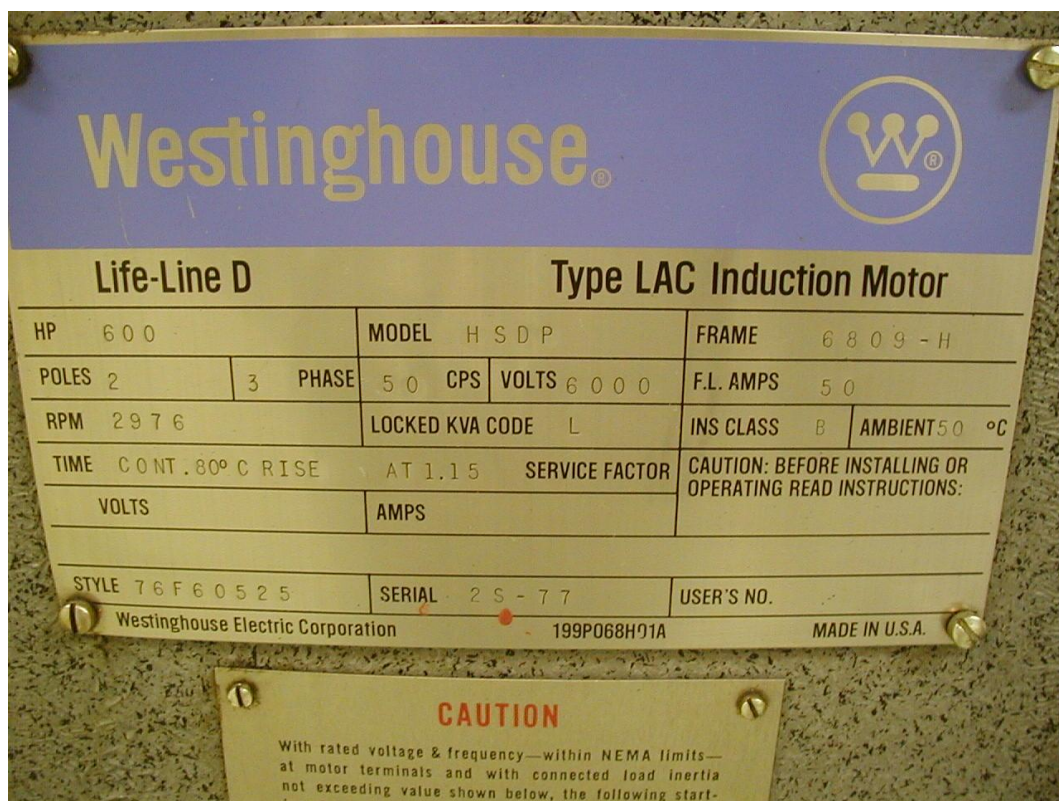
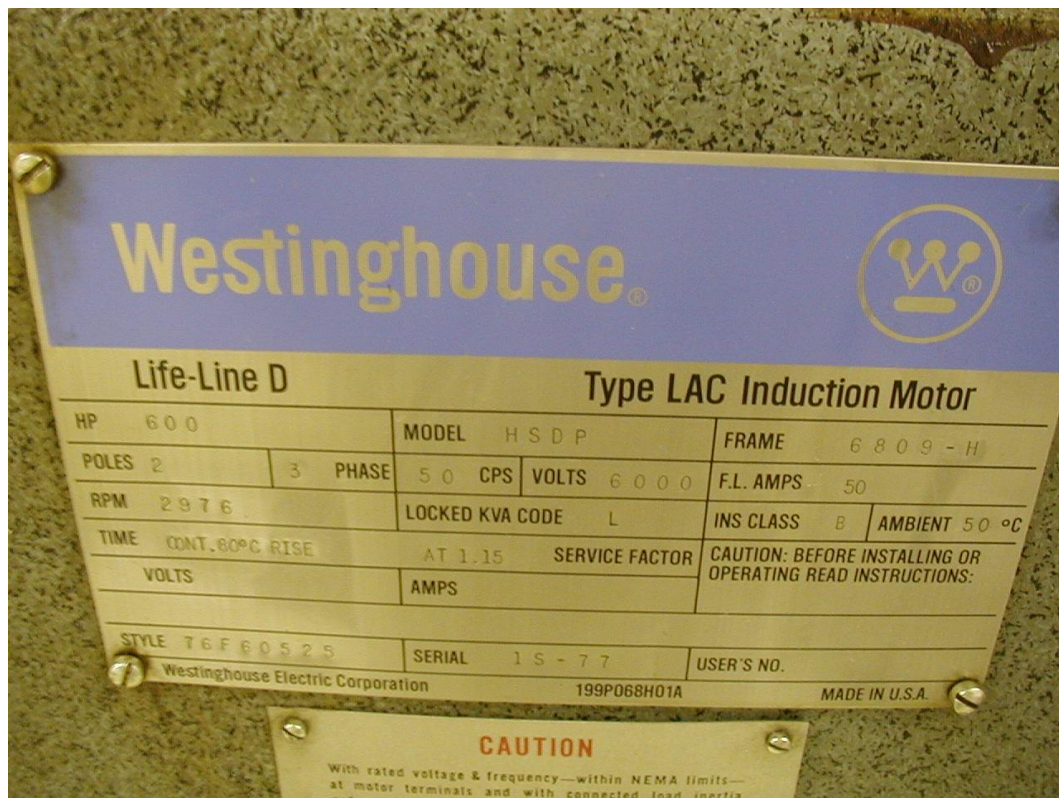
A1.1.3. General Order LA-18829-L7

A1.1.4. P.O. 546-CAV-237411-BPE

A1.1.5. S.O. 76-F-60525 (KRK 205)

The following general technical data applies to both existing motors

Model	Life Line D Motor
Frame No.	6809H
Type	Squirrel Cage
Mounting	Horizontal
Enclosure	Drip Proof
Phases	3
Frequency [Hz]	50
Nominal Power [HP]	600
Voltage [V]	6000
Service Factor	1.15
Full Load Rotation [RPM]	2976
Full Load Current [A]	50
Stator Insulation Class	B (New need upgrade to at least F)
Stator Temperature Rise [°C]	80
Space Heater	0.224 kW / 400 V
Bearing Style	3.50'' x 4.5'' Split Sleeve
Max. Load Torque at Rated speed [lb·ft]	1,185
Rotor Inertia [lb·ft ²]	350
Load Inertia referred to motor shaft [lb·ft ²]	165
Total Weight of Motor [lb]	6900

A1.2. Nameplates

A1.3. Technical Data Reference Documents

A1.3.1. Motor Data Sheet

INDUCTION MOTOR DATA SHEET
WESTINGHOUSE FORM 54082

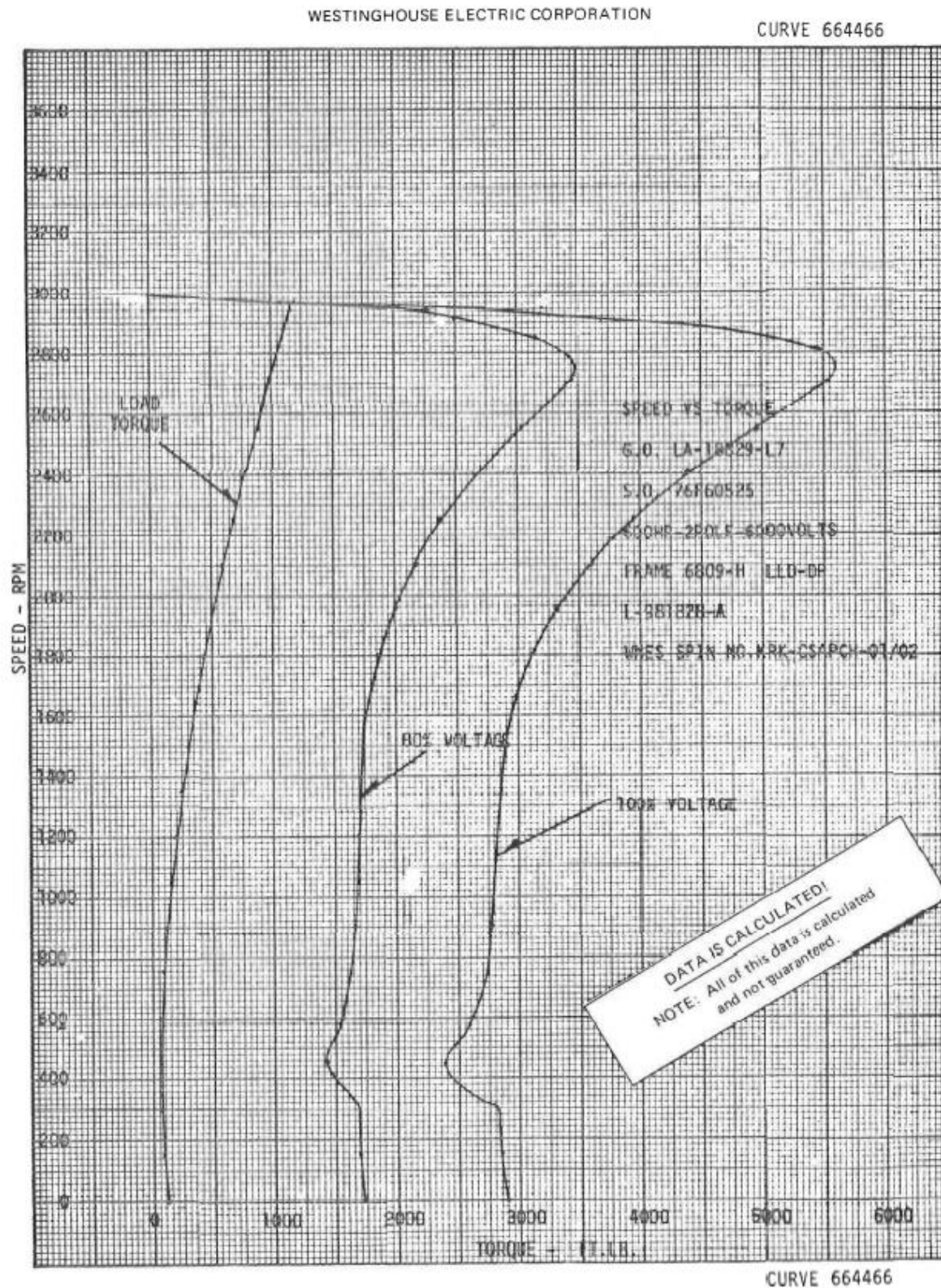
1	PROJECT	KRK	S.O. NO.	76-F-60525	G.O. LA-18829-L7
2	FURNISHED BY	Westinghouse LMD	DATE	9/3/76	BY R.T.F.
3	MARK OR ITEM NO.	KRK-CSAPCH-01/02			
4	PURCHASER'S REQUIREMENTS		DATA FURNISHED BY SELLER		
5	SERVICE	Charging Pumps	MAKE	Westinghouse	
6	TYPE	Squirrel Cage	FRAME NO.	6809H	
7	NO. OF UNITS		HORSEPOWER	600	
8	MOUNTING	Horizontal	SERVICE FACTOR	1.15	
9	ELEC. CHARACTERISTICS	6000 V. 3 PH 50 CY	FULL LOAD RPM	2976	
10	SYNCH. SPEED; RPM	3000	FULL LOAD AMP	50	
11	HORSEPOWER	600	LOCKED ROTOR AMP	555	
12	SERVICE FACTOR	1.15	STARTING TORQUE, % F.L.	278	
13	ENCLOSURE	Dripproof	PULL-OUT TORQUE, % F.L.	514	
14	INSULATION CLASS	B	EFF.-FULL LOAD, %	93.9	
15	INSULATION TREATMENT	Thermalastic Epoxy	EFF.-3/4 LOAD, %	93.2	
16	AMBIENT TEMP.-C	50	EFF.-1/2 LOAD, %	91.5	
17	STATOR TEMP RISE-C	80 by Resis. @ S.F.	P.F.-FULL LOAD, %	91.0	
18	BEARING TYPE	Split Sleeve	P.F.-3/4 LOAD, %	87.8	
19	BEARING TEMP RELAY		P.F.-1/2 LOAD, %	80.1	
20	BEARING THERMOCOUPLE		P.F.-LOCKED ROTOR	31.6	
21	HALF COUPL. OR SHEAVE MTD. BY		SPACE HTRS., TOTAL WATTS	238	
22	ROTATION*	CW	RADIAL BEARING-TYPE	Split Sleeve	
23	W.K. 2 OF DRIVEN EQUIP.	165	THRUST BEARING-TYPE	N/A	
24	BRKDY. TORQ. DRVN. EQUIP.		BEARING SERVICE-HR.	N/A	
25	OVERSIZE COND. BOX		NORMAL BRG. OPER. TEMP-C	85°C Max	
26	COND. BOX LOCATION*		NET WEIGHT-LB.	See Outline Drawing	
27	SPACE HEATERS, VOLTAGE, PHASE	400 Volts, 1 Phase	OIL COOL. SYS. REQ'D	N/A	
28	SPLIT END BELLS		BRG. OIL PRESS. RANGE, PSI	N/A	
29	TERMINAL LUGS, TYPE		BRG. OIL REQ'D EA. BRG. GPM	N/A	
30	STATOR HIGH TEMP DEVICE		NAME PLATE CODE LETTER	L	
31	ADJUSTABLE SLIDE RAILS		PERMISSIBLE STARTS PER HR:		
32	SOLEPLATES		MOTOR AT AMBIENT TEMP	See Outline Drawing	
33	PROJECT ELEV., FT.		MOTOR AT RATED TOTAL TEMP	See Outline Drawing	
34	SHAFT (HOLLOW, SOLID)		TYPE SEALED INSUL. SYS.	Thermalastic Epoxy	
35	COUPLING (SELF-RELEASE)		DESCRIPTION OF INSUL. SYS.	Class B	
36	SOLID, NONREVERSING				
37	ADJUSTABLE, FLEXIBLE		Speed-Torque Curve	664466	
38	VERT. MAX DOWNTHRUST				
39	VERT. MAX UP THRUST		Safe-Time vs. Current Curve	664467	
40	VERT. MIN UP THRUST				
41	VERT. MIN DOWNTHRUST				
42	(WITH MOTOR RUNNING)				
43	SIDE THRUST				
44	MAX REVERSE SPEED				
45	DRAIN PLUG AND VENT				
46	AIR INTAKE SCREENS YES				
47					
48					
49					
50					
51					
52	REMARKS:		REMARKS:		
53	ALL PERFORMANCE DATA BASED ON NORMAL RATED		ALL PERFORMANCE DATA BASED ON NORMAL RATED		
54	VOLTAGE AND FREQUENCY		VOLTAGE AND FREQUENCY		
55	ITEMS 34-44 APPLY TO VERTICAL MOTORS ONLY		INDICATE IF DATA IS ESTIMATED		
56					
57					
58					
59					
60	* VIEWED FROM END OPPOSITE COUPLING END				

76-F-60526

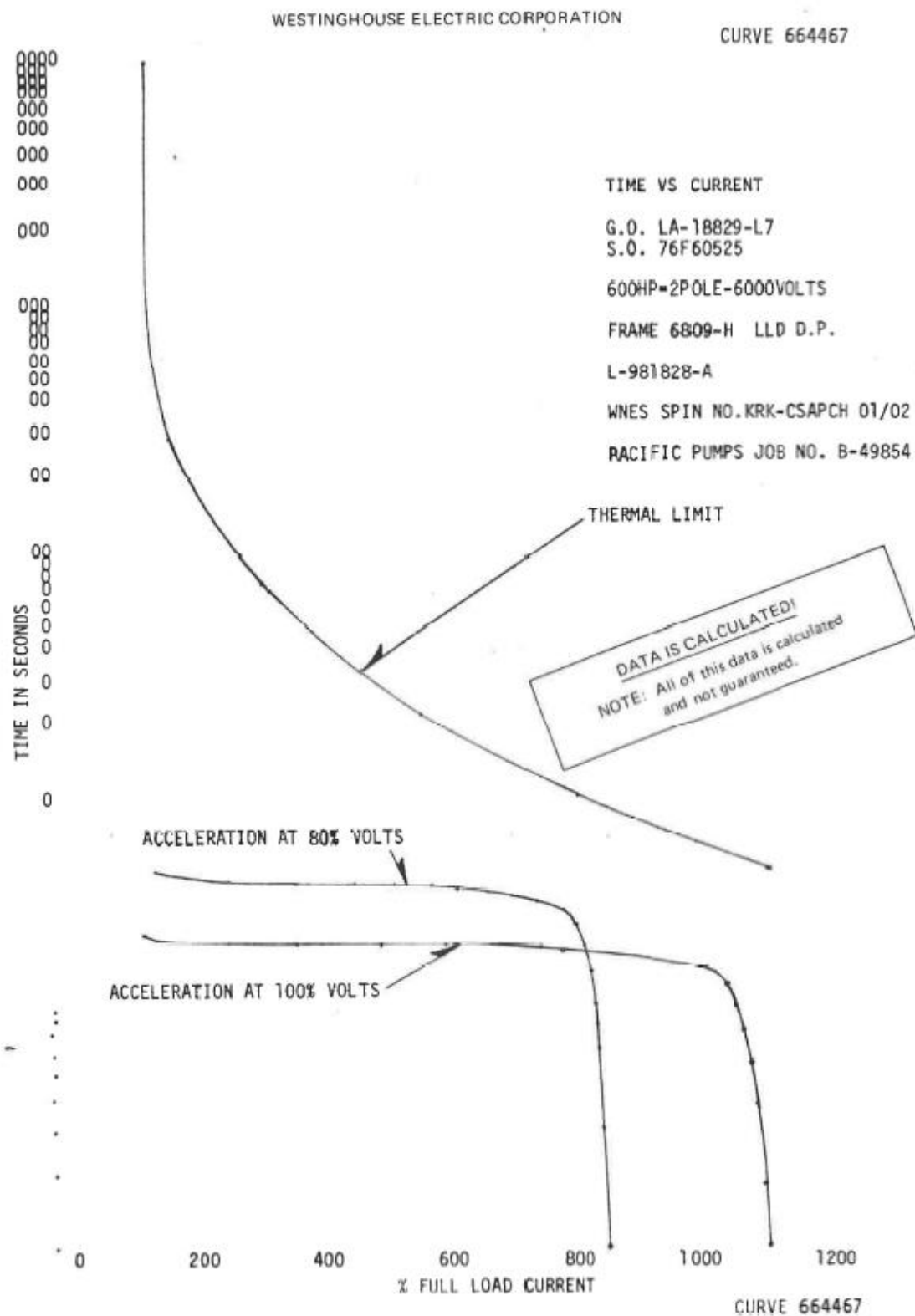
DATA IS CALCULATED!

NOTE: All of this data is calculated
and not guaranteed.

A1.3.2. Speed-Torque Curve (Curve no. 664466)



A1.3.3. Time-Current Curve (Curves no. 664467)



A1.4. Quality Control Data (FAT)

A1.4.1. Motor #1 (S/N 1S-77)

SPLN. NO. KKK-CSAPCH-01

Westinghouse Electric Corporation

BUFFALO, N.Y.

Date 8/29/77

Pacifi c Pumps/WNES

Stock Order No. 76H60525 #1

G.O. No. LA-18829-L7

H.P. 600

Volts 6000

Phase 3

Class B

Insulation

Apparatus G809H IISDP SB

Points 2

R.P.M.

2976

Cycles 50

	1	2	3	COMMENTS
Ampere Per Terminal at no load 6000 Volts	16.4			Stator Res. @ 28°C T1T2 - .9565
Watts Input at no load	14,640			T2T3 - .956
Stator Res. (T-T) at 75° C - ohms	1.128			T1T3 - .9565
Starting Winding Res. at 75° C - ohms				Vibration with 1/2 Key
Rotor Res. (bet rings) at 75° C - ohms				Front Rear
LOSSES IN WATTS AT FULL LOAD				
Stray Load Loss				Horiz. .00028 .00018
Stator I ² R Loss				Vert. .00016 .00015
Rotor I ² R Loss				Axial .000045 .00004
Core Loss				Phase Rotation
Friction and Windage Loss				L1L2L3 CW Rot. End
% Efficiency - Full Load	94.8			TST2T1 opp. shaft ext
- 1/2 Load	94.4			
- 1/4 Load	92.9			
% Power Factor Full Load	87.6			Stator Bore - 16.979
- 1/2 Load	83.9			Rotor Diam. - 16.777
- 1/4 Load	75.6			Air Gaps
				.094 .092 .092 .092
Rotor Full Load	2980			X F X R
Ampere Per Term. at full load	51.8			
KW input at full load	472.1			
Ampere per Term-Rotor locked 6000 V	536			.100 .092 .096 .102
KW input - Rotor locked	1461			
Max. Sec. Volts between rings				Heaters
Sec. Amps per ring at full load				Volts 400
Full Load Torque (F.L.T.) in lb. ft.	1057			Amps .60
Max. Torque in % of F.L.T.	509			
Starting Torque in % of F.L.T.	180			
End Play Tested	OK			
Balance Tested	OK			
Stator Ins Tested 15,000 V 60 Sec.	OK			
IIR Ins Tested 1,800 V 60 Sec.	OK			

TEMPERATURE TESTS

Length of Test in hours	6.00		
Volts	6000		
% Normal Full Load Amp.	114		
Temp. Rise Stator Copper by Res.	38		
in degrees C Stator Iron	18	Bearings (Total Temp.)	
Rotor Copper		Front	41
Rotor Iron		Rear	43
Room temperature in °C	32		

Curve Nos.

00169

The above is a true and correct record of data obtained from tests made at the works of Westinghouse Electric Corporation.

REPORT OF TESTS ON INDUCTION MOTORS
FORM 205AK

Signed J. H. Wiley 8/1/77 Engr.

LA 1882947

A. C. MOTOR INSULATION TAG
WATERHOUSE FORM 1033

SHIPING

Following items as per information:

Nameplate _____
Frame _____
Shaft Ext. _____
Connectors _____
Lead Ext. _____
Keys _____
Finish _____
Grease pipes and fittings _____
Customer mounting dimensions _____

Does information call for:

Coupling _____
Fan _____
Dowel pins _____
Shunts _____
Rotation plate _____
Brake adapter _____

Nameplate stamping _____
Covers _____
Conduit box _____
Eye Bolt _____
Assembly _____
Pins and Washers _____
Conn. Plate _____

Shims _____
Thermometers _____
Air shield _____
Shaft guard _____
Thermoguard _____
Exp. proof plate _____

Is inside of machine free from cuttings and foreign material? ☒

Are machined parts slushed? ☒

Tested by: _____

5501 correctly filled out and signed _____

Remarks: _____

Inspector: _____ Date: 8/25/77

00171

Serial: 7660825 ASSEMBLY H 1

Outline Dwg. 878073

Eyebolt tight and correct length. ☒

Winding neat and free from damage. ☒

Inside of frame clean and free from cuttings. ☒

Stator bore 16.825

Rotor bore 16.777

Bearing S# Front 16.825

Bearing S# Rear 16.825

Rotor fan for correct rotation. ☒

Assembly std. ☒ Opp. std. ☒

Oil or grease pipe fittings ok. ☒

Oil rings ☒ Oil level ☒

End play 1/32" ☒

Shaft Clearance ☒

Shaft extension per drawing 16.825

Shaft run out 0.01 ☒

Face run out 0.01 ☒

Fit run out 0.01 ☒

Collector rings eccentricity ☒

Brushes S# ☒

Brushes line up with rings 100 092 ☒

Revolving and bearing seal ok. ☒

Insulation test ☒

Lubrication ok. ☒

Explosion proof, leads spaced and sealed. ☒

Does information call for thermoguard, brake adjuster, speed switch, etc. ☒

Remarks: 1. 16.825 16.825 16.825

Pa 2. 9.650

WHES P.O. 545-CAV-23741

DWG. NO. 500 840855

SPN. NO. KRK-CCAPCH-01

SER. NO. 02693

ITEM NO.

PROGRAM ME 0501-1151 SPEED-TORQUE CURVE AND ACCELERATION TIME 101
 5.0.76F60525 5.0.1A-18829 L 981828 HP= 600. POLES= 2. RATED V.

SPIN. NO. KRK-CSAPCH-01

TEST-INPUT POINTS

RPM = -409.0 -165.0 0.0 42.0 203.0 382.0 457.0 671.0 986.0 13
 SLIP = 1.1363 1.0550 1.0000 0.9860 0.9323 0.8727 0.8477 0.7763 0.6713 0.
 AMPS = 431.1 429.9 428.9 413.0 413.0 414.5 417.8 420.2 410.4 4
 TORQUE = 1271.0 1373.0 1217.0 1689.0 1149.0 1315.0 1094.0 1267.0 1337.0 14

RPM = 2805.0 2922.0 2938.0 2965.0 2968.0 2974.0
 SLIP = 0.0383 0.0260 0.0207 0.0117 0.0107 0.0087
 AMPS = 144.0 127.0 94.8 85.0 74.0 62.5
 TORQUE = 2367.0 2115.0 1606.0 1452.0 1222.0 1048.0

SPEED-TORQUE CURVE AS PUT IN AT 4800 VOLTS

WRES P.O. 546-CAV-237411
 DWS NO. 500-58980M 5
 SPIN. NO. KRK-CSAPCH-01
 SER. NO. 61803
 ITEM NO.

INTERPOLATED TORQUE AND AMPS. AND ACCELERATING TIME FOR MOTOR WITH WKK= 3
 TOTAL INERTIA, REFERRED TO MOTOR SHAFT, USED IN THE CALCULATION BELOW IS 5
 LOAD TORQUE IS AS LISTED BELOW

RPM	SLIP	AMPS	MULT	LOAD T	ACC T	STE TIME	TOT T
0.0	1.0000	428.9	1217.0	118.0	1099.0	0.0	0.
150.0	0.1500	417.5	1190.0	89.0	1101.0	0.23	0.
300.0	0.9000	413.9	1245.6	60.1	1185.6	0.22	0.
408.0	0.8640	414.5	1339.1	60.1	1279.1	0.15	0.
450.0	0.8500	414.5	1088.3	60.1	1028.3	0.06	0.
500.0	0.8000	417.5	1252.1	60.1	1198.1	0.23	0.
750.0	0.7500	416.2	1280.8	84.1	1196.8	0.21	1.
900.0	0.7000	414.2	1312.6	108.1	1204.5	0.21	1.
1050.0	0.6500	411.7	1353.4	150.1	1203.2	0.21	1.
1200.0	0.6000	408.8	1403.2	192.2	1211.0	0.21	1.
1350.0	0.5500	407.1	1445.3	240.2	1195.1	0.21	1.
1500.0	0.5000	405.2	1525.6	300.3	1220.3	0.21	2.
1650.0	0.4500	402.6	1615.1	366.3	1248.7	0.20	2.
1800.0	0.4000	400.1	1708.6	432.4	1276.2	0.20	2.
1950.0	0.3500	395.6	1849.3	510.5	1338.8	0.19	2.
2100.0	0.3000	388.9	2053.2	588.6	1465.1	0.18	2.
2250.0	0.2500	373.4	2334.1	678.6	1655.5	0.16	3.
2400.0	0.2000	365.1	2703.5	768.7	1934.8	0.14	3.
2550.0	0.1500	343.0	3132.7	870.8	2261.9	0.12	3.
2700.0	0.1000	295.1	3517.7	972.9	2544.8	0.10	3.
2730.0	0.0900	279.8	3517.3	995.7	2521.6	0.02	3.
2760.0	0.0800	261.8	3468.5	1018.6	2450.3	0.02	3.
2790.0	0.0700	240.5	3357.1	1041.4	2315.8	0.02	3.
2820.0	0.0600	216.7	3165.5	1064.2	2101.3	0.02	3.
2850.0	0.0500	196.9	2860.5	1087.0	1773.5	0.03	3.
2880.0	0.0400	167.8	2595.2	1109.9	1485.3	0.03	3.
2910.0	0.0300	124.0	2151.9	1132.7	1019.2	0.04	3.
2940.0	0.0200	104.7	1767.1	1155.5	611.6	0.06	3.
2970.0	0.0100	71.5	1207.5	1178.3	29.2	0.16	3.

*** MOTOR WILL ACCELERATE TO 2971 RPM ***

00172

IDENT.=RS525 DATE=770826 ENGR=SPALICH
 RATED V.=6000. FREQ=50. FRAME=6809H IYPE=LLD ENC=DRP

986.0 1316.0 1698.0 2016.0 2170.0 2210.0 2476.0 2838.0
 0.6713 0.5013 0.4340 0.3280 0.2767 0.2633 0.1080 0.0540
 410.4 407.0 402.5 395.1 383.3 381.3 310.3 221.5
 1937.0 1446.0 1634.0 1932.0 2194.0 2219.0 3444.0 3087.0

WKK= 350.2 LB*FT*FT AND FOR LOAD WITH WKK= 165.0 LB*FT*FT
 LHM IS 515.2 LB*FT*FT

SE. TOT. TIME

0.0
 0.23
 0.45
 0.59
 0.66
 0.88
 1.09
 1.30
 1.51
 1.72
 1.92
 2.13
 2.33
 2.53
 2.72
 2.90
 3.06
 3.20
 3.32
 3.43
 3.45
 3.47
 3.49
 3.51
 3.54
 3.57
 3.61
 3.67
 3.83

WKS P.O.	546-CAV-237417
OWG NO	800.849614
SPN NO	KR-6809H-01
DES NO	51893
ITEM NO	

00173

A1.4.2. Motor #2 (S/N 2S-77)

FORM 24090

WESTINGHOUSE ELECTRIC CORPORATION
MOTOR DIVISION, BUFFALO, N.Y.

REPORT OF COMMERCIAL TESTS - INDUCTION MOTOR

DATE 8/29/77	STYLE NO.	S.O. NO. 76F60525	G.O. NO. 1A-18829-L7	PURCHASER'S ORDER NO.
PURCHASER Pacific Pumps/WNES				

NAME PLATE DATA											
H.P.	SPEED	PHASE	FREQ.	VOLTS	AMPS.	TYPE	FRAME	TEMP. RISE	TIME RATING	DESIGN (LETTER)	LOCKED R. CODE LETT.
600	2976	3	50	6000	50	LLD	6809H	80°C	CONT.	B	L

TEST CHARACTERISTICS													
SERIAL NO.	NO LOAD					LOCKED ROTOR					OPEN C. SUIT VOL. (WOUND ROTOR)	DIELECTRIC TEST	
	VOLTS	FREQ.	SPEED	AMPS.	WATTS	VOLTS	FREQ.	AMPS.					
2	6000	50	2999	16.2	14760								13000 V (1
				16.2									
				16.4									
Stator Resistance at 27°C = 0.955 ohms T-T													
Vibration Readings													
Front Rear													
Phase Rotation Sequence													
CW													
Front L1 L2 L3													
Hor. 0.0010 0.0010 T3 T2 T1													
Vert. 0.00046 0.00053													
Axial 0.00015 0.00030													
Air Gap Readings													
Front Rear													
Stator Bore = 16.980 .088 .092 .092 .088													
Rotor Diam. = 16.777 .092 .098 .098 .098													

WES-PO 646-CAV-237411

DWG NO. 500 849864 5

SPR NO. KRK-CSAPCH-02

SER NO. 51894

ITEM NO.

TESTS ON THIS MOTOR
DUPLICATE

APPROVED BY John J. Riley ENGINEER DATE 9/1/77

00182

LA-18829.17

SHIPPING

Following items as per information:

Nameplate	Nameplate stamping
Frame	Covers
Shaft Ext.	Conduit Box
Connectors	Eye Bolt
Lead Ext.	Assembly
Keys	Nuts and Washers
Finish	Conn. Plate
Grease pipes and fittings	
Customer mounting dimensions	

Does information call for:

Coupling	Shims
Fan	Thermometers
Dowel pins	Air shield
Shunts	Shaft guard
Rotation plate	Thermoguard
Brake adapter	Exp. proof plate

Is inside of machine free from cuttings and foreign material?

Are machined parts slushed?

Tested by:

5501 correctly filled out and signed

Remarks:

Inspector: 8/29/77 Date: 8/29/77

00184

A. C. MOTOR INFORMATION TAG
WESTINGHOUSE FORM 2-7329

6807 C25 Nuclear

S. O. 76F60585 ASSEMBLY Serial 2

Outline Dwg. 8978073 Name

Eyebolt tight and correct length

Winding neat and free from damage

Inside of frame clean and free from cuttings

Stator bore X 16.980 (16.980) (16.980)

Rotor bore 16.777

Bearing S# Front 16.777

Bearing S# Rear 16.777

Rotor fan for correct rotation

Assembly std. Opp. std.

Oil or grease pipe fittings ok

Oil rings Oil Level

End play 1/32

Shaft Clearance

Shaft extension per outline 3.376 1/2 X 5.0 615

Shaft run out 1001 16.999

Face run out 0.04 0.72 0.22 0.33

Fit run out

Collector rings eccentricity F X

Brushes S# 092 078 092 098

Brushes line up with rings

Revolving and bearing seal ok

Insulation test 2600 21 2400 2000

Lubrication ok 6.00, 7.50, 16.500 X 5.0 615

Explosion proof, let's spaced and sealed

Does information call for thermoguard, brake adapter, speed switch, etc.

Remarks: HITES 410-683

6/23/77

6/23/77

PROGRAM ME 3501-TEST SPEED-TORQUE CURVE AND ACCELERATION TIME IDE:
 S.O. 76F40525 G.O. 1A-18829 L 981828 HP= 600. POLES= 2. RATED V.

SPIN. NO. KRK-CSAPCH-01

TEST-INPUT POINTS

RPM = -409.0 -145.0 0.0 42.0 203.0 382.0 457.0 671.0 986.0 13
 SLIP = 1.1363 1.0550 1.0000 0.9860 0.9323 0.8727 0.8477 0.7763 0.6713 0.
 AMPS. = 431.1 429.9 428.9 413.0 413.0 414.5 417.8 420.2 410.4 4
 TORQUE = 1271.0 1373.0 1217.0 1689.0 1149.0 1315.0 1094.0 1267.0 1337.0 14

RPM = 2885.0 2922.0 2938.0 2965.0 2960.0 2974.0
 SLIP = 0.0383 0.0260 0.0207 0.0117 0.0107 0.0087
 AMPS. = 144.0 127.0 94.8 86.0 74.0 62.5
 TORQUE = 2367.0 2115.0 1606.0 1452.0 1222.0 1048.0

WVES P.O.	846-CAV-2374 2 2
DWG. NO.	500 849834 5
SPIN. NO.	KRK-CSAPCH-02
SER. NO.	51894
ITEM NO.	

SPEED-TORQUE CURVE AS PUT IN AT 4800. VOLTS

INTERPOLATED TORQUE AND AMPS. AND ACCELERATING TIME FOR MOTOR WITH WKK= 3
 TOTAL INERTIA, REFERRED TO MOTOR SHAFT, USED IN THE CALCULATION BELOW IS 5
 LOAD TORQUE IS AS LISTED BELOW

RPM	SLIP	AMPS	MOT. T	LOAD T	ACC. T	STP. TIME	TOT. T
0.0	1.0000	428.9	1217.0	118.0	1099.0	0.0	0.
150.0	0.9500	417.5	1120.0	89.0	1101.0	0.23	0.
300.0	0.9000	413.9	1245.6	60.1	1185.6	0.22	0.
408.0	0.8640	418.5	1339.1	60.1	1279.1	0.15	0.
450.0	0.8500	414.5	1088.3	60.1	1028.3	0.06	0.
600.0	0.8000	417.5	1258.1	60.1	1158.1	0.23	0.
750.0	0.7500	416.2	1280.8	84.1	1196.8	0.21	1.
900.0	0.7000	414.2	1312.6	108.1	1204.5	0.21	1.
1050.0	0.6500	411.7	1353.4	150.1	1203.2	0.21	1.
1200.0	0.6000	408.8	1403.2	192.2	1211.0	0.21	1.
1350.0	0.5500	407.1	1445.3	246.2	1199.1	0.21	1.
1500.0	0.5000	405.2	1520.6	300.3	1220.3	0.21	2.
1650.0	0.4500	402.8	1615.1	366.3	1248.7	0.20	2.
1800.0	0.4000	400.1	1708.6	432.4	1276.2	0.20	2.
1950.0	0.3500	395.6	1849.3	510.5	1338.8	0.19	2.
2100.0	0.3000	388.9	2053.7	588.6	1465.1	0.18	2.
2250.0	0.2500	378.4	2334.1	678.6	1655.5	0.16	3.
2400.0	0.2000	365.1	2703.5	768.7	1934.8	0.14	3.
2550.0	0.1500	343.0	3132.7	870.8	2261.9	0.12	3.
2700.0	0.1000	295.1	3517.7	972.9	2544.8	0.10	3.
2730.0	0.0900	279.8	3517.3	995.7	2521.6	0.02	3.
2760.0	0.0800	261.8	3468.9	1018.6	2450.3	0.02	3.
2790.0	0.0700	240.9	3357.1	1041.4	2315.8	0.02	3.
2820.0	0.0600	216.7	3165.5	1064.2	2101.3	0.02	3.
2850.0	0.0500	196.9	2860.5	1087.0	1773.5	0.03	3.
2880.0	0.0400	167.8	2595.2	1109.9	1485.3	0.03	3.
2910.0	0.0300	128.0	2151.9	1132.7	1019.2	0.04	3.
2940.0	0.0200	104.7	1767.1	1155.5	611.6	0.06	3.
2970.0	0.0100	71.5	1207.5	1178.3	29.2	0.16	3.

*** MOTOR WILL ACCELERATE TO 2971.0 RPM ***

00185

IDENT.=RSS25 DATE=770826 ENGR=SPALIER
 RATED V.=6000. FREQ=50. FRAME=6809H TYPE=LLD ENC=DRP

986.0 1316.0 1698.0 2016.0 2170.0 2210.0 2676.0 2838.0
 0.6713 0.5613 0.4340 0.3280 0.2767 0.2633 0.1080 0.0540
 410.4 407.0 402.5 395.1 383.3 381.3 310.3 221.5
 1337.0 1446.0 1634.0 1932.0 2194.0 2219.0 3444.0 3087.0

III WKK= 350.2 LB*FT*FT AND FOR LOAD WITH WKK= 165.0 LB*FT*FT
 LOW IS 515.2 LB*FT*FT

ME TOT. TIME

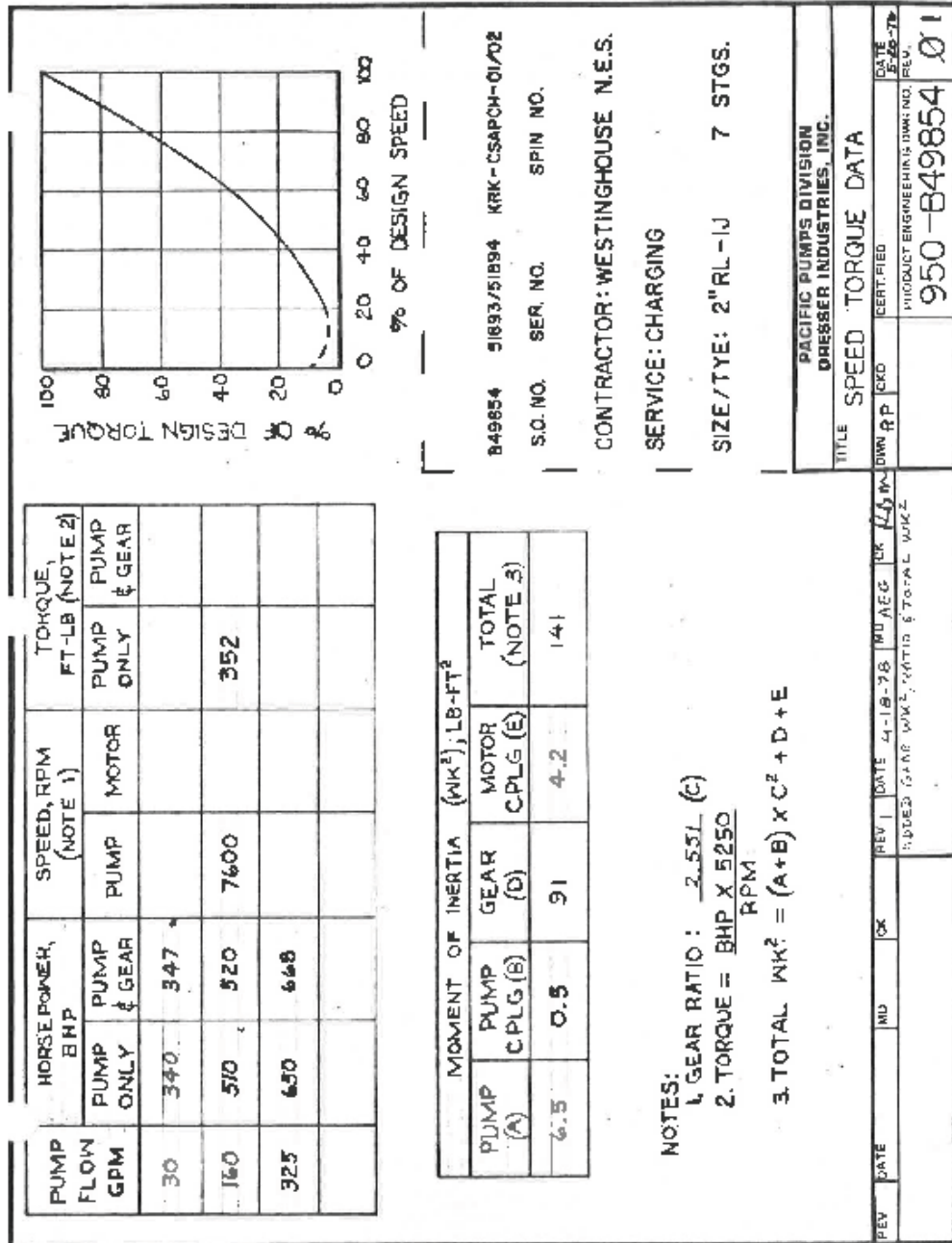
0 0.0
 3 0.23
 2 0.45
 5 0.59
 6 0.66
 3 0.88
 1 1.09
 1 1.30
 1 1.51
 1 1.72
 1 1.92
 1 2.13
 0 2.33
 0 2.53
 9 2.72
 8 2.90
 6 3.06
 4 3.20
 2 3.32
 0 3.43
 2 3.45
 2 3.47
 2 3.49
 2 3.51
 3 3.54
 3 3.57
 3 3.61
 4 3.67
 5 3.83

WRES P.D.	846-CAV-2374-1
DWG. NO.	500.81224-1
SPIN. NO.	KRK-CSARGH-02
SER. NO.	51894
ITEM NO.	

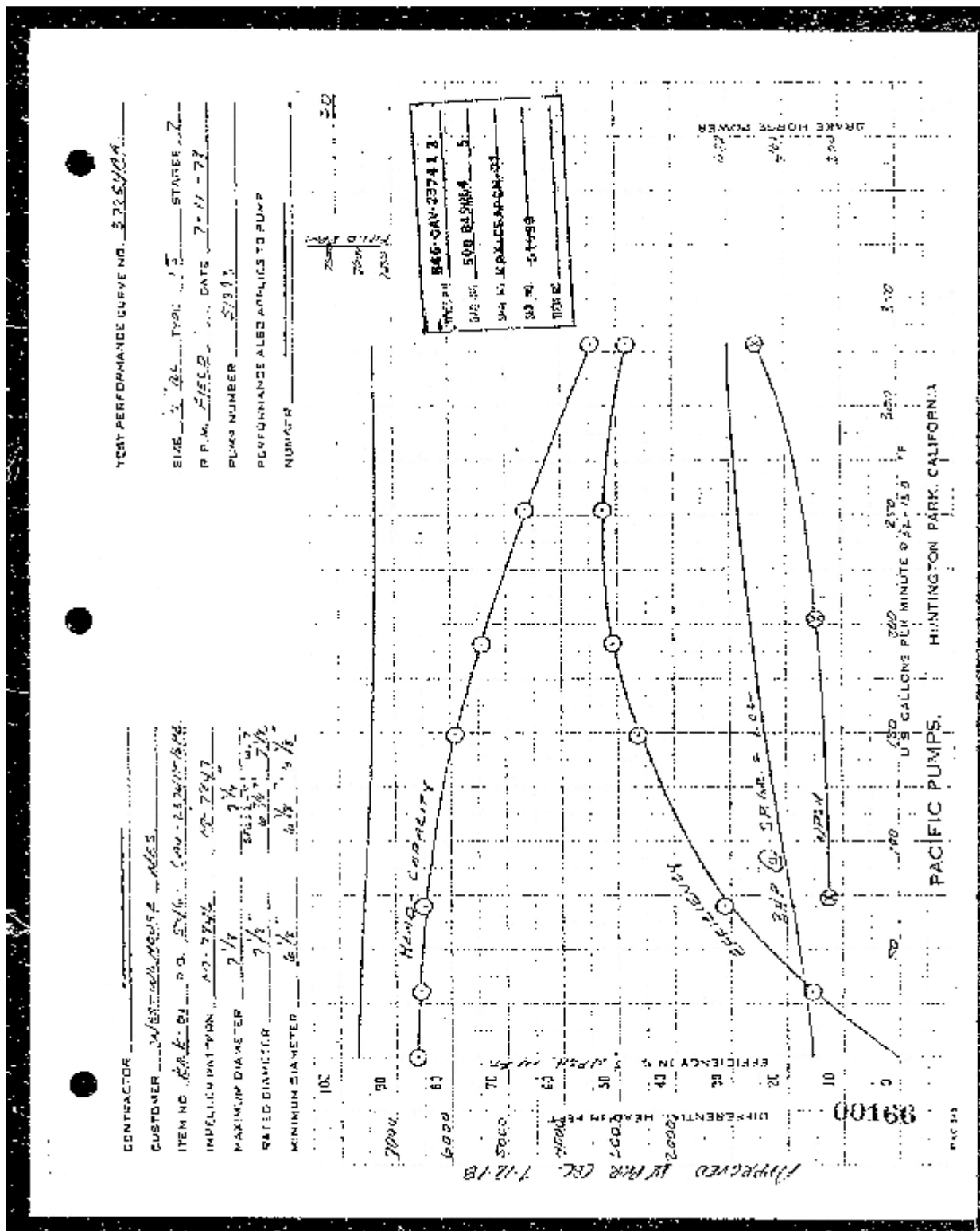
00186

A1.5. Pump characteristics

A1.5.1. Load curve – Speed-Torque data 950-B49854 rev. 1



A1.5.2. Operational Curve of Pump





NEK

Krško Nuclear Power Plant
Vrbina 12
8270 Krško



TECHNICAL SPECIFICATION

Spare Charging Pump Motor

DWG 8978D73 – Outline (Charging Centrifugal Pump Motor)

KRŠKO NUCLEAR POWER PLANT

APPENDIX A2

Revision 0

NUCLEAR SAFETY RELATED

TABLE OF CONTENT

A2.1 DWG 8978D73 – Outline (Charging Centrifugal Pump Motor).....1



TECHNICAL SPECIFICATION

Spare Charging Pump Motor

Floor Response Spectra of Auxiliary Building, el. 100.300

KRŠKO NUCLEAR POWER PLANT

APPENDIX A3

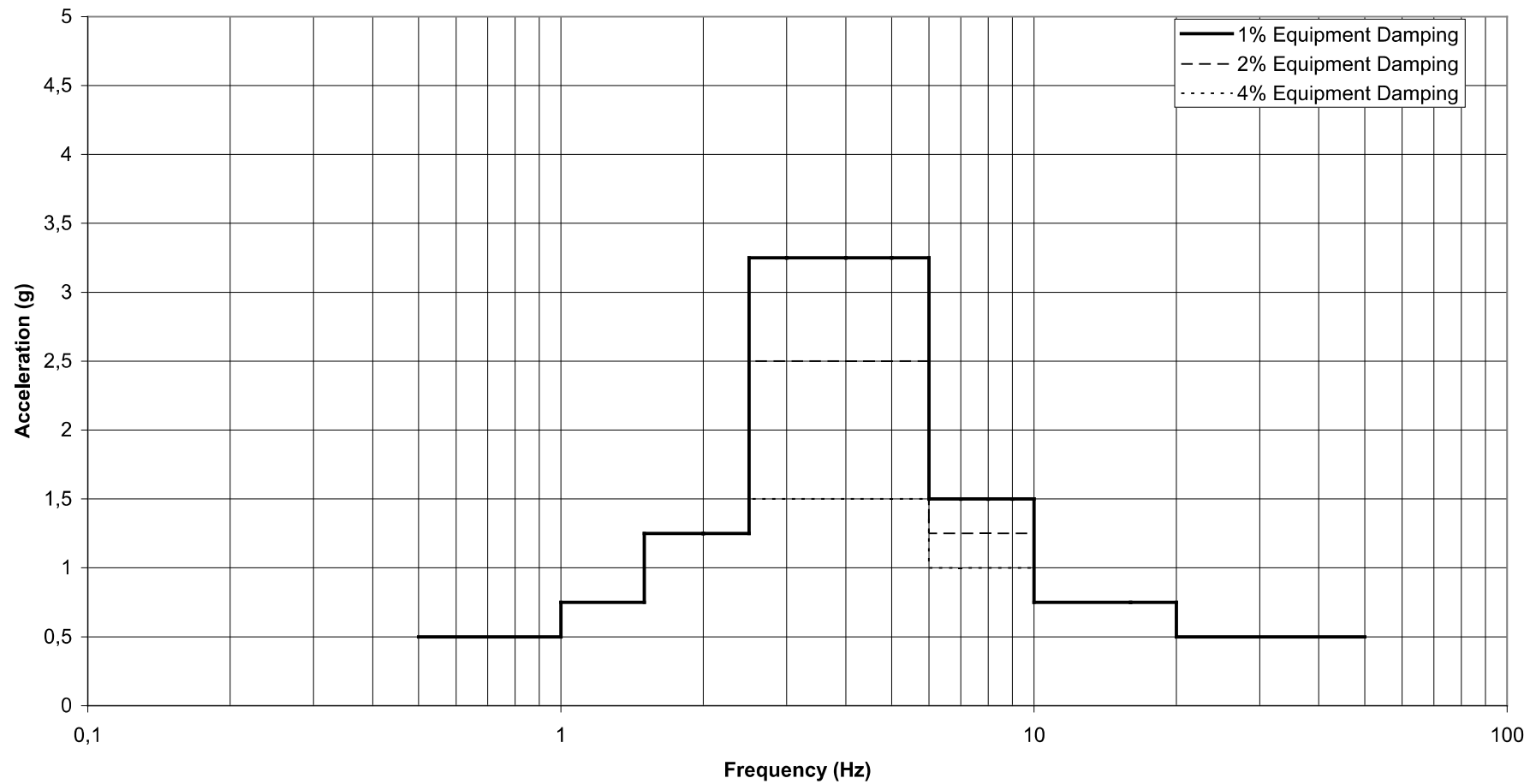
Revision 0

NUCLEAR SAFETY RELATED

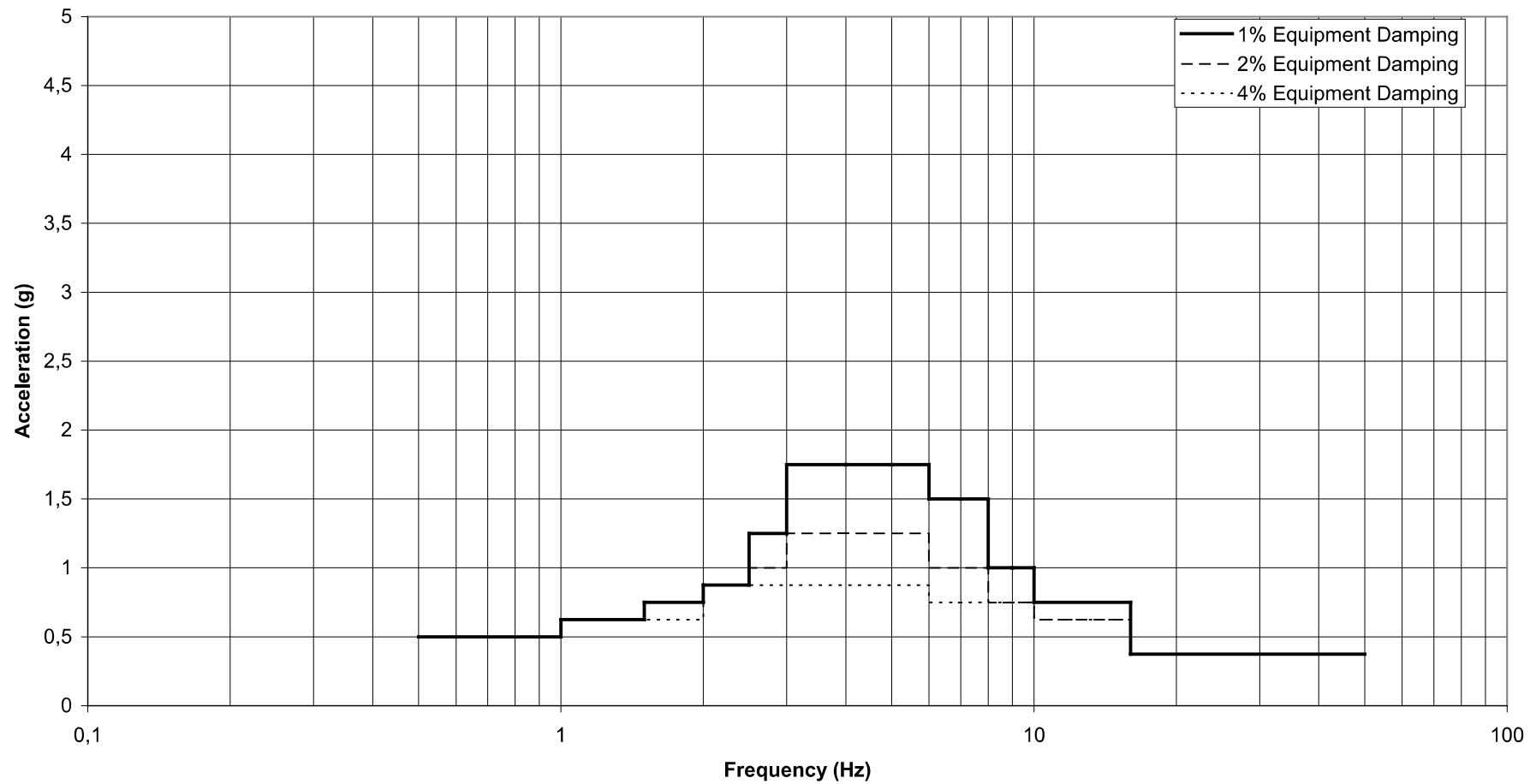
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A3.1	Floor Response Spectra, Auxiliary Building EL. 100.3 M, Horizontal OBE	1
A3.2	Floor Response Spectra, Auxiliary Building EL. 100.3 M, Vertical OBE	2
A3.3	Floor Response Spectra Auxiliary Building EL. 100.3 M Horizontal SSE	3
A3.4	Floor Response Spectra Auxiliary Building EL. 100.3 M Vertical SSE	4

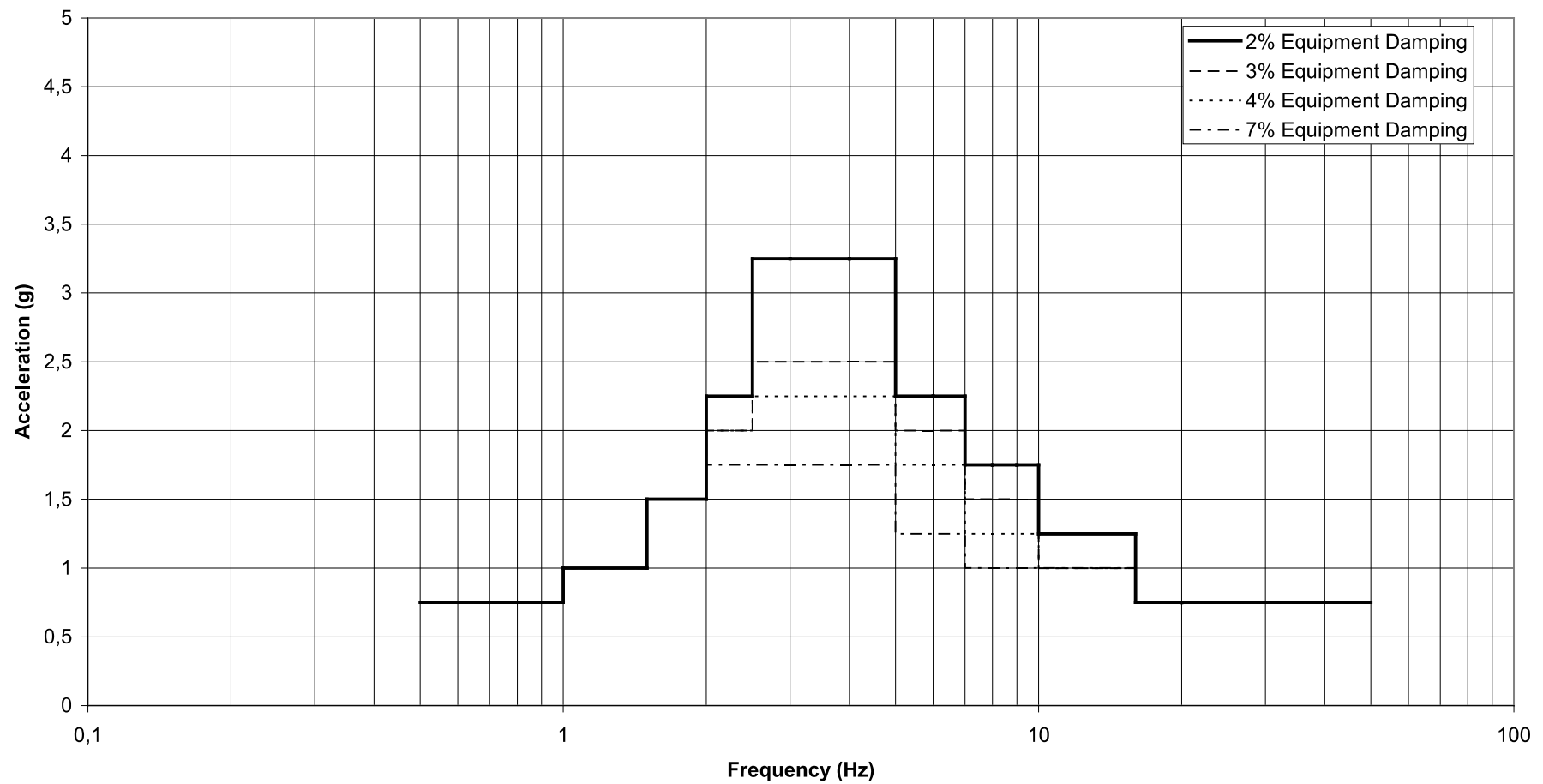
**Krsko NPP
Floor Response Spectra
Auxiliary Building EL. 100.3 M
Horizontal OBE**



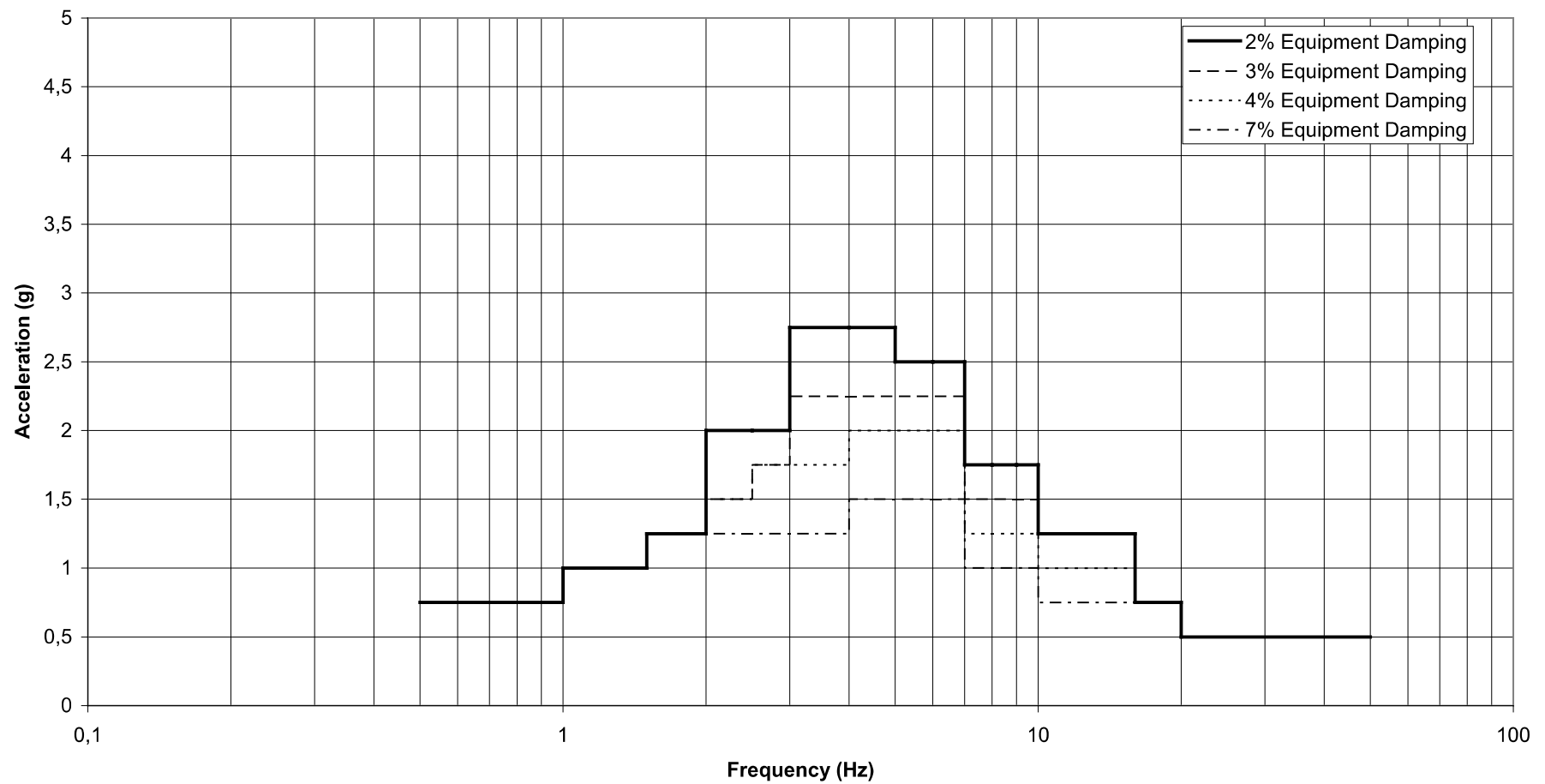
**Krsko NPP
Floor Response Spectra
Auxiliary Building EL. 100.3 M
Vertical OBE**



**Krsko NPP
Floor Response Spectra
Auxiliary Building EL. 100.3 M
Horizontal SSE**



**Krsko NPP
Floor Response Spectra
Auxiliary Building EL. 100.3 M
Vertical SSE**





TECHNICAL SPECIFICATION

Spare Charging Pump Motor

Technical Specification SP-A3000

KRŠKO NUCLEAR POWER PLANT

APPENDIX A4

Revision 0

NUCLEAR SAFETY RELATED

TABLE OF CONTENT

A4. Technical Specification SP-A3000, rev. 01

Elektroma Krško	
MASTER DOCUMENT	
Date Received:	01-03-2017
Log Number:	259815

TECHNICAL SPECIFICATION

SERVICE LEVEL II COATINGS

INSIDE NEK TECHNOLOGICAL AREA

KRŠKO NUCLEAR POWER PLANT

SP-A3000

February 2017

Revision 0


Augmented Quality

Written by:


Sanja Smiric, System Engineer

Date: 15/02/2017

Verified by:


Matjaž Gričar, Chemistry Superintendent

Date: 15/02/2017

Reviewed by:


B. Bohorč, Civil Maintenance Superintendent

Date: 21/02/2017

Reviewed by:


QA Reviewer

Date: 27.02.17

Approved by:


Janko Cerjak, EDC Superintendent

Date: 29/02/2017

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1.0 SCOPE

1.1. Scope of work

This specification defines surface protection of steel constructions, components (SCCs) and buildings in NEK areas subject to radiation exposure (Service Level II coatings) which are classified as Augmented Quality (AQ).

The selection of adequate coating and related coating work process must comply to requirements regarding Selection and Qualification of coating system, Preparation of substrates, Application of coating system(s), Testing and Inspection Requirements, Personnel Qualification Requirements and Receipt and Storage of protective coating system.

1.2. Work included

The work defines required activities for selection and qualification of adequate coating materials, technical evaluation of coating materials performance, application procedures and applicator's verification, requirements for material application, testing and inspection.

Supplier/Subcontractor shall be responsible for ordering, purchasing, receiving, storage and control of coating materials. Some coating materials may be purchased and stored by NEK (if agreed between NEK and Supplier/Subcontractor).

No change in material selection will be permitted after submittal of the Proposal without written approval of NEK.

1.3. Work not included

Coatings for the following Service Levels and specific locations are not included in this specification:

- Service Level I coatings.
- Service Level III coatings.
- BOP coatings.
- Coatings for control, instrumentation and measuring panels, and electrical boxes (covered by specification TSP 01/2015).
- Coatings outside the technological part of plant.

1.4. Coating damages and coating repairs

After application of surface protection coating system(s) no surface damages are allowed. All damaged areas shall be repaired. Repair of surface protection is responsibility of individual department that contracted service and Subcontractor performing coating application work.

2.0 DEFINITIONS

- 2.1. **Coating Service Level II (SL II)** is a term used to describe areas where coating failure could impair but not prevent normal operating performance. The functions of Service Level II coatings are to provide corrosion protection and decontaminability in those areas outside the reactor containment that are subject to radiation exposure and radionuclide contamination. Service Level II coatings are classified as Augmented Quality (AQ) at NEK site.

SL II coatings at NEK site shall be applied on SCCs and buildings outside Containment Vessel – inside Reactor Building (Annulus Area), on surfaces inside Auxiliary Building (AB), Fuel Handling Building (FHB), Radwaste Storage Area (RWS), Waste Manipulation Building (WMB), Decontamination Building (DB), Control Building on elevation 100.3 (Health Physics) and Component Cooling Building (CCB) on elevation 94.21, room 03A.

- 2.2. **Steel Constructions and Components (SCCs)** is a term used for carbon and low alloy steel constructions, pipelines, valves, pumps and any other equipment or equipment parts.
- 2.3. **Augmented Quality Coatings (AQ Coatings)** is a term used to describe a group of protective coatings applied on SCCs and buildings:
- outside Reactor Containment Vessel that are subject to radiation exposure (Service Level II coatings),
 - surfaces inside FME (Foreign Material Exclusion) zones,
 - protective coatings in heavy or demanding corrosion exposures:
 - C5-I – very heavy industrial atmospheric,
 - Im 1 – immersion in fresh/sweet water and
 - Im 3 – immersion in soil/buried SCCs,
 - Some SCCs surface protection with coatings on equipment listed on Q list (where applicable – as assessed by Nuclear Coating Specialist) and
 - Protective coatings on hard to reach areas and/or areas where condition surveillance/inspection is not often (on 5 years or even less often).
- 2.4. **Balance of Plant Coatings (BOP Coatings)** is a term used to describe a group of non safety related coatings applied on external and internal surfaces of secondary plant, buildings and equipment, including Intermediate Building (IB) and remaining parts of Component Cooling (CCB) Building and Control Building (CB).
- 2.5. **Coating and/or lining** is a protective, decorative and/or anyway different functional on surface adhered, one or multi layer film of polymer, inorganic, metal and/or composite material in solid or semisolid (viscoelastic) aggregate state.

- 2.6. **Coating material** is liquid, melt or dust, which is applied on surface to form coating due to means of solvent evaporation, chemical reaction, cooling or melting. Coating material is raw material or semi finished product which applied to the surface with proper technology.
- 2.7. **Surface protection with coatings** is a term which combines all needed activities (design, qualification, material purchasing and storage, surface preparation, material application/curing, inspection, performance monitoring and maintenance) for adequate coatings performance.
- 2.8. **Coating work** is an all-inclusive term to define all operations required to accomplish a complete coating job. The term shall be construed to include materials, equipment, labor, preparation of surfaces, control of ambient conditions, application and repair of coating systems, and inspection (Ref. 3.10).
- 2.9. **Coating work inspection** is a phase of quality control that by way of examination, observation, or measurement determines the conformance of materials, supplies, components, parts, appurtenances, systems, processes, or structures to predetermined quality requirements (Ref. 3.12).
- 2.10. **Coating Technical Specification** is a document which defines quality and qualification requirements for coating materials, coatings/linings, personnel, equipment and coating contractor on basis of NPP Krško specifications and legislation.
- 2.11. **Coating Technology** is a document which defines commercial qualities of coating materials, work activities/phases for surface preparation, coating application/curing and inspection for performance of surface protection with coatings/linings.
- 2.12. Other coating related definitions and terminology are defined in ASTM D16 and ASTM D4538.

3.0 CODES, STANDARDS, REGULATORY

- 3.1. ASTM C868-02: Test Method for Chemical Resistance of Protective Linings.
- 3.2. ASTM D16-16: Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- 3.3. ASTM D714-02 (2009): Test Method for Evaluating Degree of Blistering of Paints.
- 3.4. ASTM D3276-15e1: Standard Guide for Painting Inspectors (Metal Substrates).

- 3.5. ASTM D3843-00 (Reapproved 2008): Standard Practice for Quality Assurance for Protective Coatings Applied to Nuclear Facilities.
- 3.6. ASTM D3912-10: Standard Test Method for Chemical Resistance of Coatings and Linings for Use in Nuclear Power Plants.
- 3.7. ASTM D4060-14: Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
- 3.8. ASTM D4227-05 (Reapproved 2012): Standard Practice for Qualification of Coating Applicators for Application of Coatings to Concrete Surfaces.
- 3.9. ASTM D4228-05 (Reapproved 2012): Standard Practice for Qualification of Coating Applicators for Application of Coatings to Steel Surfaces.
- 3.10. ASTM D4286-08 (Reapproved 2015): Standard Practice for Determining Coating Contractor Qualifications for Nuclear Powered Electric Generation Facilities.
- 3.11. ASTM D4417-14: Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.
- 3.12. ASTM D4537-12: Standard Guide for Establishing Procedures to Qualify and Certify Personnel Performing Coating Work Inspection in Nuclear Facilities.
- 3.13. ASTM D4538-15: Standard Terminology Relating to Protective Coating and Lining Work for Power Generation Facilities.
- 3.14. ASTM D4541-09: Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- 3.15. ASTM D5064-16a: Standard Practice for Conducting a Patch Test to Assess Coating Compatibility.
- 3.16. ASTM D5139-12: Standard Specification for Sample Preparation for Qualification Testing of Coatings to be used in Nuclear Power Plants.
- 3.17. ASTM D5144-08: Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants.
- 3.18. ASTM D5161-04: Standard Guide for Specifying Inspection Requirements for Coating and Lining Work (Metal Substrates).
- 3.19. ASTM D5498-12a: Standard Guide for Developing a Training Program for Personnel Performing Coating Work Inspection for Nuclear Facilities.

- 3.20. ASTM D6577-15: Standard Guide for Testing Industrial Protective Coatings.
- 3.21. ASTM D6677-07 (Reapproved 2012): Test Method for Evaluating Adhesion by Knife.
- 3.22. ASTM D6943-15: Standard Practice for Immersion Testing of Industrial Protective Coatings.
- 3.23. ASTM D7108-12: Standard Guide for Establishing Qualifications for a Nuclear Coatings Specialist.
- 3.24. ASTM D7234-12: Coating Adhesion Testing – Concrete.
- 3.25. Manual of Coating Work for Light-Water Nuclear Power Plant Primary Containment and other Safety-related Facilities (ASTM Subcommittee D01.43; 1979).
- 3.26. Electric Power Research Institute, “Guideline on Nuclear Safety-Related Coatings, Revision 2,” EPRI Formerly TR-109937 and 1003102, December 2009.
- 3.27. Safety Series No. 48, Manual of Decontamination Surfaces, IAEA, 1979.
- 3.28. ANSI N45.2-1972, Quality Assurance Program Requirements for Nuclear Power Plants.
- 3.29. ANSI N45.2.2-1972, Packing, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants.
- 3.30. ANSI N101.4-1972, Quality Assurance for Protective Coatings Applied to Nuclear Facilities.
- 3.31. RG 1.54, Revision 2, Service Level I, II and III Protective Coatings Applied to Nuclear Power Plants, U.S. Nuclear Regulatory Commission, Washington, DC, July 2010.
- 3.32. 10CFR50, Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.
- 3.33. 10CFR21, Reporting of Defects and Non-compliance.
- 3.34. ISO 4628-2:2016: Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 2: Assessment of degree of blistering.

- 3.35. ISO 4628-3:2016: Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 3: Assessment of degree of rusting.
- 3.36. ISO 4628-4:2016: Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 4: Assessment of degree of cracking.
- 3.37. ISO 4628-5:2016: Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 5: Assessment of degree of flaking.
- 3.38. ISO 2409:2013: Paints and varnishes - Cross-cut test.
- 3.39. ISO 1514:2016: Paints and varnishes - Standard panels for testing.
- 3.40. ISO 4624:2016: Paints and varnishes - Pull-off test for adhesion.
- 3.41. ISO 12944 (parts 1-8) (1-4:1998, 5:2007; 6-8:1998): Paints and varnishes – Corrosion protection of steel structures by protective paint systems.
- 3.42. ISO 8501-1:2007: Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings.
- 3.43. ISO 8501-2:1994: Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 2: Preparation grades of previously coated steel substrates after localized removal of previous coatings.
- 3.44. ISO 8501-3:2006: Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 3: Preparation grades of welds, edges and other areas with surface imperfections.
- 3.45. ISO 8503-3:2012: Preparation of steel substrates before application of paints and related products, Surface roughness characteristics of blast-cleaned steel substrates.
- 3.46. NACE TM0174 Laboratory Methods for the Evaluation of Coating Materials and Lining Material on Metallic Substrates in Immersion Service.
- 3.47. NACE TM0404 Offshore Platform Atmospheric and Splash Zone New Construction Coating System Evaluation.

- 3.48. Joseph V. Koleske, Paint and Coating Testing Manual, 15th Ed., ASTM Stock Number, MNL17-2ND.
- 3.49. QS-610, rev 1: Generic Quality Assurance Program Requirements.
- 3.50. DIN 55634:2010-04: Beschichtungsstoffe und Überzüge - Korrosionsschutz von tragenden dünnwandigen Bauteilen aus Stahl.
- 3.51. ETAG 018 (Parts 1 & 3: 2013, Part 2: 2011, Part 4: 2012), Guideline for European technical approval of fire protective products.

4.0 DOCUMENT SUBMITTAL

- 4.1. Information and documentation to be supplied with the Proposal shall include but not be limited to the following (NEK Nuclear Coating Specialist shall review and evaluate submitted documentation stated bellow):

- 4.1.1 Quality Assurance

The coating and/or lining Supplier/Manufacturer shall submit declaration about QA program, which should conform to applicable contents of QS-610, rev 1: 1.6, 1.7, 3.1, 4.2, 4.4.6, 4.4.7, 4.5.1, 4.6, 4.8.1, 4.9, 4.11.7, 4.14, 4.15, 4.16 and 4.17.

- 4.1.2 Products Information and Characteristics

The coating and/or lining Supplier/Manufacturer shall provide products information and characteristics (NACE TM0404). Following information and documents shall be provided:

- Product data sheets (PDS) – Manufacturer's guidelines for Surface Preparation, Application, Curing and Storage of Coating Material.
- Material safety data sheets (MSDS) – latest revision of MSDS (in Slovenian language – if applicable) shall be prepared in compliance with Commission Directive 1272/2008/EC and REACH 1907/2006 and shall be submitted together with the Proposal.
- Manufacturer (contact information, contact persons).

- 4.1.3 Coating Technology

The coating and/or lining Supplier/Manufacturer or coating contractor shall submit proposal of Coating Technology for surface protection. Coating Technology shall at least provide:

- Limitations considering ambient and material condition.
- Required surface preparation (NACE/SSPC-SP, ISO 8501), surface profile (ASTM D4417, ISO 8503).

- Protective coatings/linings and/or any other repair composite materials (extent, range of thicknesses, commercial names).
- Application instructions with all needed data for: surface preparation, coating application, material preparation, coating curing and limitations considering coating application (Coating Supplier/Manufacturer).

4.1.4 Qualification Test Reports

A copy of the Qualification Test Reports shall be supplied with the Proposal and shall include required tests determined by NEK Nuclear Coating Specialist. Qualification Test Reports shall provide with reasonable assurance that properly applied surface protective system will provide proper performance within Coating Technology.

NOTE: Submittal of the qualification test reports is not necessary for the qualified coating systems already used and approved by NEK. Traceability to technical reports shall be notified.

- 4.2. Training program, qualification and certification of application personnel of coating work shall be in compliance with ASTM D4227 and ASTM D4228.
- 4.3. Training program, qualification and certification of inspectors of coating work shall be in compliance with ASTM D5498 and ASTM D4537 or ASTM D7108.
- 4.4. Statement of Guarantee.
- 4.5. Information and Documentation to be supplied with the Shipment
 - 4.7.1 Certificate of Conformance.
 - 4.7.2 Qualification Report(s) which certifies that Coating Material is suitable for plant-specific application.
 - 4.7.3 Design Change Documentation for alternate replacement coating – if applicable.
 - 4.7.4 Batch Attest Data (minimum requirements):
 - Name of product,
 - Batch number,
 - Date of manufacture,
 - Specific weight or density (optional),
 - Percentage of solids by volume (optional),
 - Viscosity (optional)...

5.0 GENERAL REQUIREMENTS

- 5.1. Prior to the start of coating work there shall be field meeting between NEK (representative of responsible discipline and Nuclear Coating Specialist) and Supplier/Subcontractor.
- 5.2. All phases of coating work shall be reviewed to assure complete understanding of all specific requirements and coating specifications.

6.0 DESIGN REQUIREMENTS

- 6.1. When selecting appropriate coating system(s) several factors should be considered such as:
 - Service conditions (temperature, humidity, immersion, fluid type...),
 - Type of substrates to be coated,
 - Exposure to radiation,
 - Flow conditions,
 - Thermal conductivity,
 - Surface burning characteristics,
 - Surface preparation requirements,
 - Chemical resistance,
 - Resistance to wear,
 - Coating adhesion properties,
 - Conditions/performance of existing surface protection,
 - Durability and
 - Accessibility.

7.0 PERFORMANCE REQUIREMENTS

- 7.1. Testing requirements shall provide reasonable assurance that properly applied surface protection will be suitable for the intended service for extended period of time.
- 7.2. Materials used as **SL II coatings** shall pass specific testing requirements (where applicable) as stated in Appendix A of this Specification.

8.0 STORAGE, MIXING AND PREPARATION OF PAINT

- 8.1. Coating materials shall be treated in compliance with recommendations in ANSI N45.2.2. for LEVEL B goods (Level B goods are those that are sensitive to environmental conditions and require measures for protection from the effects of temperature extremes, humidity and vapors, acceleration forces, physical damage, and airborne contamination – ref. 3.29).
- 8.2. No paint shall be used or stored after expiration of Shelf Life.
- 8.3. Mixing
 - 8.1.1 Use mixing equipment recommended by the paint Manufacturer.
 - 8.1.2 Use only originally sealed, intact, identified and undamaged paint containers.
 - 8.1.3 Materials that are mixed and not used prior to expiration of Pot Life of the coating shall be discarded.
- 8.4. Thinners and Solvents
 - 8.2.1 Catalysts, thinners and other components shall be added only in the exact quantities specified by the paint Manufacturer.
 - 8.2.2 Use only thinners specified by paint Manufacturer if required.
 - 8.2.3 Use of thinners shall not affect the final quality of protective coatings.

9.0 SURFACE PREPARATION AND COATING APPLICATION

- 9.1. Coating contractor shall meet requirements as stated in Appendix B of this Specification.
- 9.2. Surface preparation
 - 9.1.1 Surface preparation cleanliness, surface profile and other applicable prerequisites shall be consistent with Coating Technology.
 - 9.1.2 Surface preparation depends on several factors such as: type and condition of substrate, condition of existing coating and service environment.
 - 9.1.3 Design and metal finishing requirements considering accessibility, treatment of narrow gaps/blind crevices, preparation grades of welds, edges and/or other areas with surface imperfections.
 - 9.1.4 Surface preparation requirements as needed and/or applicable: surface preparation grades, surface roughness, chemical contamination removal (limits), degreasing, dust removal...
 - 9.1.5 Application of coatings by Supplier/Subcontractor signifies acceptance of the surfaces and responsibility for the performance of coatings applied.

- 9.1.6 Previously shop primed ferrous metals shall be cleaned in accordance with SSPC-SP1 (in case when shop primer is compatible with selected coating system).
- 9.1.7 Immediately report any defects which could adversely affect the quality of coating application.

9.3. Coating application

- 9.2.1 Surface temperature shall be at least 3 degrees above the dew point before painting can proceed.
- 9.2.2 Relative humidity shall not exceed 80%.
- 9.2.3 During application and curing process temperature and humidity shall be within specified limits as recommended by paint Manufacturer. This might require usage of additional climatic control equipment (heaters, dehumidifiers) to provide conformity with scheduled work plan.
- 9.2.4 In conjunction with environmental control temporary enclosure(s) may be required during the preparation, painting and curing operations.
- 9.2.5 Stainless steel, galvanized and aluminum surfaces shall not be blasted or painted unless otherwise specified. Such surfaces shall be fully protected when they are in proximity to blasting and painting operations.
- 9.2.6 Filters and openings shall be covered to avoid defilement and clogging during cleaning, blasting and painting operations.
- 9.2.7 Dry film thickness and number of coat layers shall be in accordance with Coating Technology.
- 9.2.8 Coating materials shall be compatible; finished coats shall be compatible with existing primed surfaces; coatings for repairs shall be compatible with existing coatings... Use only coating materials specified in Appendix C or defined and approved materials from NEK Nuclear Coating Specialist.
- 9.2.9 Where practical use a different color shade to identify each coat prior to the final coat.

10.0 QUALIFICATION OF APPLICATION PROCEDURES AND APPLICATOR'S VERIFICATION

- 10.1. Coating contractor shall provide application procedure in compliance with coating Manufacturer application instructions/procedures, coating material documentation and requirements of Coating Technology.
- 10.2. All additional requirements concerning execution of surface protection are defined in Appendix B of this Specification.

11.0 TESTING AND INSPECTION

- 11.1. Inspection personnel shall be qualified according to ASTM D5498 and ASTM D4537 or meet the criteria for Nuclear Coating Specialist, defined in ASTM D7108 or other equivalent standards.
- 11.2. Inspection equipment shall be regularly calibrated, verified and certified as applicable for each type of equipment.
- 11.3. All additional requirements regarding testing and inspection are defined in Appendix B of this Specification.

APPENDIX A

QUALIFICATION REQUIREMENTS FOR SURFACE PROTECTION WITH PROTECTIVE COATINGS AND LININGS IN COATING SERVICE LEVEL II AREA AT KRŠKO NUCLEAR POWER PLANT

Augmented Quality

Testing requirements shall provide reasonable assurance that properly applied surface protection will be suitable for the intended service for extended period of time. Qualification requirements are specified in Coating System Specification. Usually specified requirements are listed below:

I. General requirements:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- Appropriate for established exposure (ISO 12944-5 or for thin walled structures DIN 55634),
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below),
- Chemical resistance (ANSI N5.12, ASTM D3912 or similar) and
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar).

II. Additional requirements:

NEK Nuclear Coating Specialist shall define additional specific requirements based on protective coating system or location, for example:

- Coatings for fire protection of steel elements – R30 (ETAG 018),
- Floor coatings – flame-spreading rate max. 50 (ASTM E84) or total dry film thickness of protective coating system shall not exceed 3 mm,
- Abrasion: min. 175 (ASTM D4060 or similar),
- Impact resistance (ASTM G14 or similar),
- Verification of maintenance protective coating system for FME areas,
- Dry temperature resistance testing and
- Sustainability to moisture max. 20-70 µm/200 frictions (EN 13300).

APPENDIX B

REQUIREMENTS FOR EXECUTION OF SURFACE PROTECTION WITH PROTECTIVE COATINGS AND LININGS IN COATING SERVICE LEVEL II AREA AT KRŠKO NUCLEAR POWER PLANT

Augmented quality

These requirements shall provide reasonable assurance that coating Supplier/Subcontractor has proper competence and ability to perform surface protection in compliance with this specification.

- Evaluation of coating Supplier/Subcontractor competence (ASTM D4286 or similar),
- Coating Manufacturer and coating Supplier/Subcontractor shall have QA program in accordance with NEK QS-610, ISO 9001 or similar,
- All coating materials shall be properly verified (batch certificates, additional laboratory testing – if required),
- Full traceability of coating materials from purchase till application shall be provided,
- Qualification of personnel for protective coating application (ASTM D4227, ASTM D4228 or similar),
- Qualification of inspection personnel as required by ASTM D5498, ASTM D4537 and/or ASTM D7108,
- Approved Coating Technology by coating Supplier/Subcontractor,
- Approved inspection plan in compliance with Coating System Specification (ASTM D5498 – severe for metal, ASTM D6237 or similar for concrete).

APPENDIX C

SURFACE PROTECTION SYSTEMS WITH PROTECTIVE COATINGS AND LININGS IN COATING SERVICE LEVEL II AREA AT KRŠKO NUCLEAR POWER PLANT

Augmented quality

I. FLOORING

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below),
- Chemical resistance (ANSI N5.12, ASTM D3912 or similar),
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar),
- Abrasion: min. 175 (ASTM D4060 or similar),
- Impact resistance (ASTM G14 or similar),
- Floor coatings – flame-spreading rate max. 50 (ASTM E84) or total dry film thickness of protective coating system shall not exceed 3 mm and
- Verification of maintenance protective coating system for FME areas on elevation 107.62 and above in Fuel Handling Building (FHB).

i. Floors for heavier mechanical loads

First protection:

- proper surface preparation (sand-blasting or chemical treatment),
- 1× impregnation Amerlock Sealer,
- 1× surfacer Nu-Klad 110AAN, 3mm,
- 1-2× top-coat Amercoat 90N, total DFT 125µm.

Repair and Maintenance:

- proper surface preparation (sanding, grinding),
- 1× local impregnation Amerlock Sealer,
- 1× local surfacer Nu-Klad 110AAN, 3mm,
- 1-2× top-coat Amercoat 90N, 1-2× 60-70µm.

ii. Floors for lighter mechanical loads

First protection:

- proper surface preparation (sand-blasting or chemical treatment),
- 1× impregnation Amerlock Sealer,
- 1-2× top-coat Amercoat 90N, total DFT 125µm.

Repair and Maintenance:

- proper surface preparation (sanding, grinding),
- 1× local impregnation Amerlock Sealer,
- 1-2× top-coat Amercoat 90N, 1-2× 60-70µm.

II. WALLS AND CEILINGS

i. Walls up to 2m height (from floor)

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below),
- Chemical resistance (ANSI N5.12, ASTM D3912 or similar) and
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar).

First protection:

- proper surface preparation (sand-blasting or chemical treatment),
- 1× impregnation Amerlock Sealer,
- 1×surfacer Nu-Klad 110AAN, 1mm,
- 1-2× top-coat Amercoat 90N, total DFT 125µm.

Repair and Maintenance:

- proper surface preparation (sanding, grinding),
- 1× local impregnation Amerlock Sealer,
- 1× local surfacer Nu-Klad 110AAN, 1mm,
- 1-2× top-coat Amercoat 90N, 1-2× 60-70µm.

ii. Walls above 2m from floor, ceilings

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar) and
- Sustainability to moisture max. 20-70 µm/200 frictions (EN 13300).

First protection:

- proper surface preparation (sanding, grinding...),
- 1× impregnation Akril emulzija,
- 1-2× latex leveling putty Jubolin kit F, 1-2mm,
- 2× latex top-coat Acrylcolor.

Repair and Maintenance:

- proper surface preparation (sanding, grinding),
- 1× impregnation Akril emulzija,
- 1-2× local latex leveling putty Jubolin kit F, 1-2mm,
- 2× latex top-coat Acrylcolor.

III. STEEL CONSTRUCTIONS

i. Steel constructions, pipelines, components and equipment on atmospheric exposures

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Appropriate for exposure C3-medium, high durability (ISO 12944-1/2) in RB ("Annulus"), AB, FHB, applicable parts of CCB, CB and HP,
- Appropriate for exposure C4-medium, high durability (ISO 12944-1/2) in FHB – el. 107 and above, RWS, DB and WMB,
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below),
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar).

First protection:

- proper surface preparation (Sa 2.5 – ISO 8501-1),
- 2× red-lead primer TT-P-86 minij, 2× 35µm,
- 2× long-oil alkyd top-coat Extra Oplatin emajl, 2× 35µm.

Repair and Maintenance:

- proper surface preparation (P St3 – ISO 8501-2),
- 2× red-lead primer TT-P-86 minij, 2× 35µm
- 2× long-oil alkyd top-coat Extra Oplatin emajl, 2× 35µm.

ii. External surfaces of containment vessel (RB)

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Appropriate for exposure C3-medium, high durability (ISO 12944-1/2),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below) and
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar).

First protection:

- Grit-blasting (Sa 2.5 – ISO 8501-1),
- 1× inorganic Zinc silicate primer Dimetecote 6N, 75 µm.

Repair and Maintenance:

- proper surface preparation (P St3 – ISO 8501-2),
- 1-2× epoxy top-coat Amercoat 90N or Carboguard 890N, 1-2× 60-70µm.

iii. Internal surfaces of FHB facade sheets

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Appropriate for exposure C4-medium, high durability (DIN 55643, Zinc galvanized surfaces),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below) and
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar).

First protection:

- Degreasing,
- 1× epoxy primer Rezistol temelj E, 25µm,
- 1-2× epoxy top-coat Amercoat 66, 125µm.

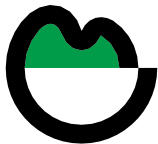
iv. Roof construction in FHB – Fire Protection

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Appropriate for exposure C4-medium, high durability (DIN 55643, Zinc galvanized surfaces),
- Coatings for fire protection of steel elements – R30 (ETAG 018),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064) and
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below).

First protection:

- Gritblasting (Sa 2.5, ISO 8501-1),
- 2× red-lead primer TT-P-86 minij, 2× 30-40µm,
- 4× intumescent coating Pirostop M, 4×250µm,
- 1-2× acrylic top-coat Vinilux, 2× 30µm.



TECHNICAL SPECIFICATION

Spare Charging Pump Motor

Vibration sensor installation on pumps CSAPCH01 and CSAPCH02

KRŠKO NUCLEAR POWER PLANT

APPENDIX A5

Revision 0

NUCLEAR SAFETY RELATED

TABLE OF CONTENT

A5. Vibration sensor installation on pumps CSAPCH01 and CSAPCH021

SCALC-M-CS-026 Attachment 9.1

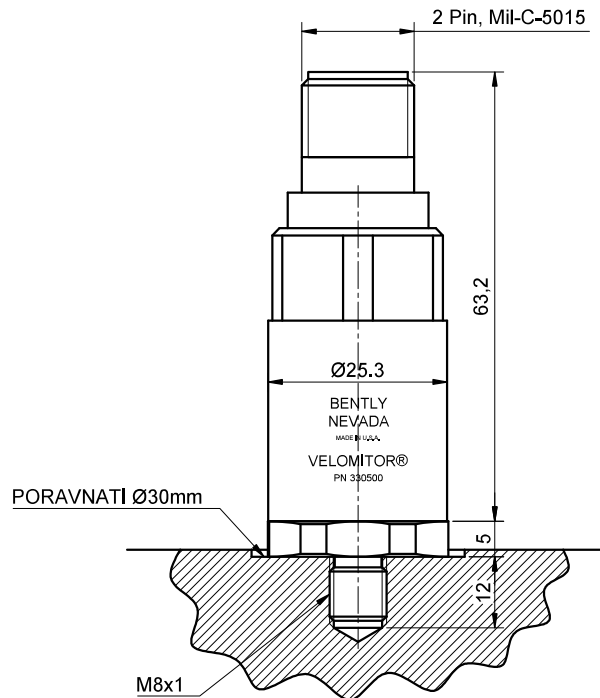
Installation details


NAČELNI DETALJ UGRADNJE SENZORA VIBRACIJA BENTLY NEVADA 330500

A4 M1:1

CSAPCH 01
CSAPCH 02

ISO - TOL



F					Kupac	Nuklearna Elektrarna Krško d.o.o. Vrbina 12, 8270 Krško, Slovenija		
						Nadzor vibracij na CSAPCH 01 i CSAPCH 02 črpalkah (mod. 700-CS-L)		
	0	05. 2021.	IZVEDBENI PROJEKT		Projekt ime	Br.	TM-17620-IZP-ELE-INS-r.0	
	Rev.	Datum	Opis	Potpis				
	Snimio	28.04.2021.	Vojo Vasiljevič, ing.el.		Črtaj ime	Br.	Načelni detalj ugradnje senzora vibracija	Dokument br.: TM.0760
	Izr.	29.04.2021.	Marin Masinović					
	Prov.	29.04.2021.	Vojo Vasiljevič, ing.el.					Stranica:
	Odob.	29.04.2021.	Igor Vasiljevič, mag.ing.el.					

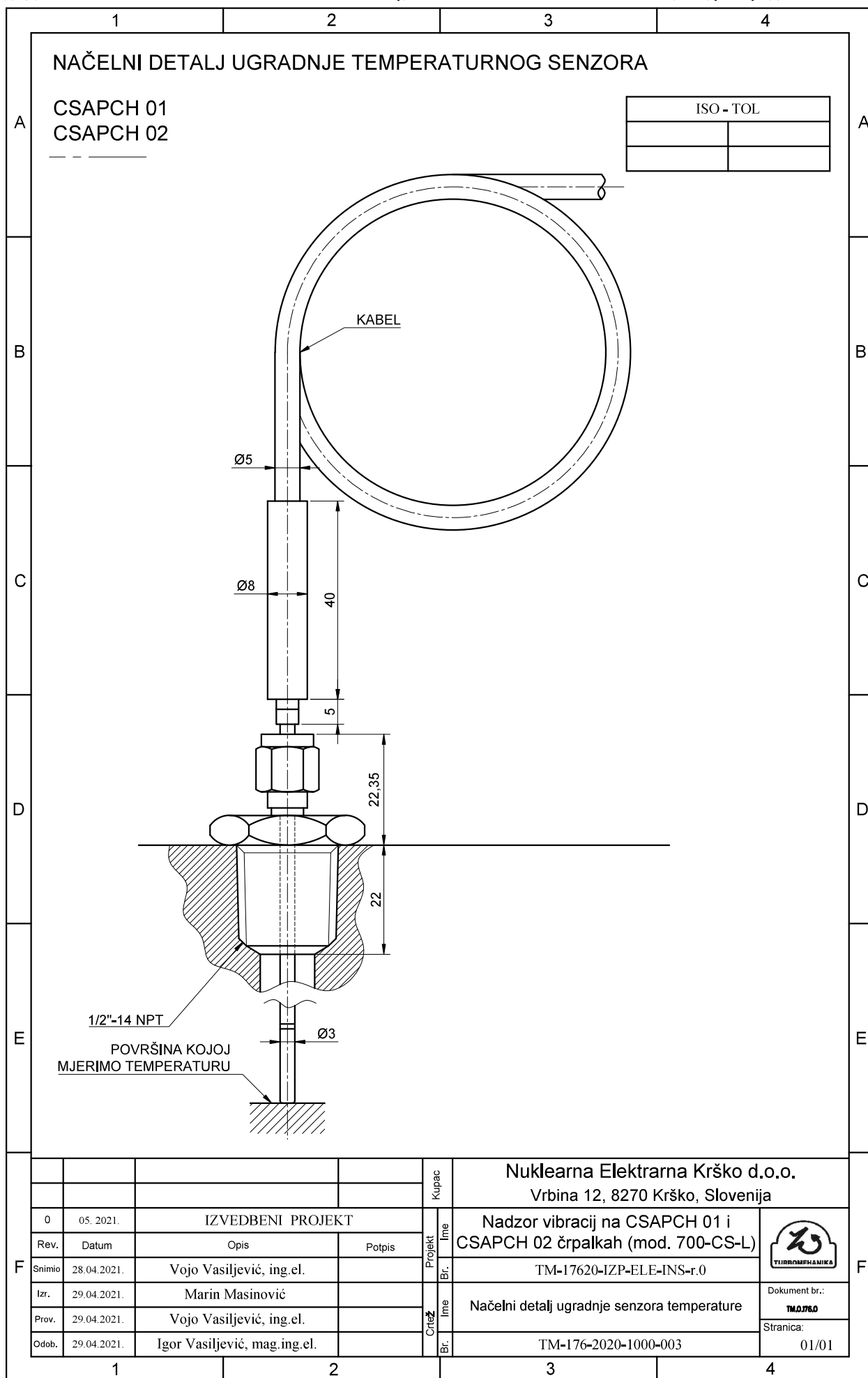


Dokument br.:

TM.0760

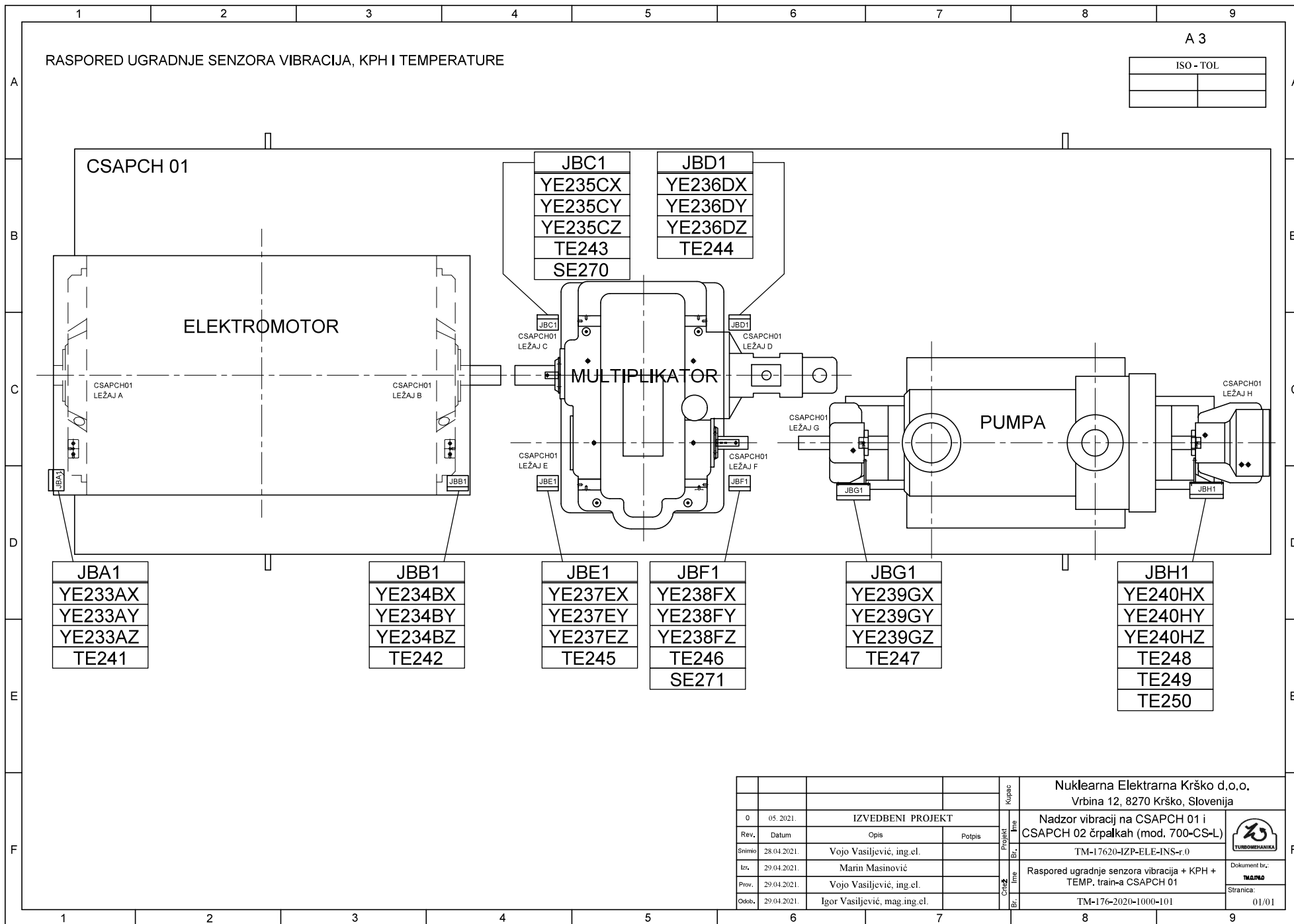
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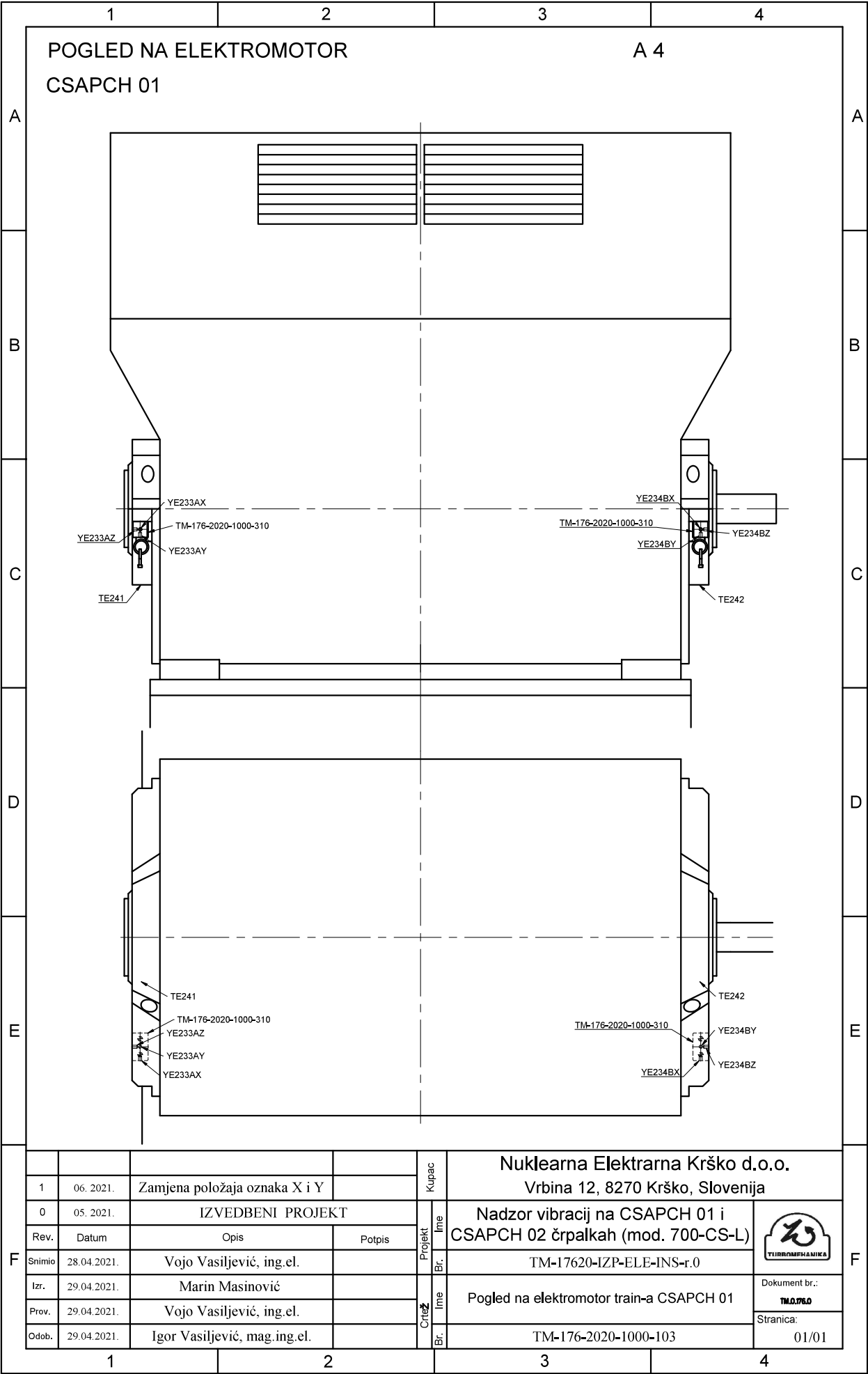
01/01



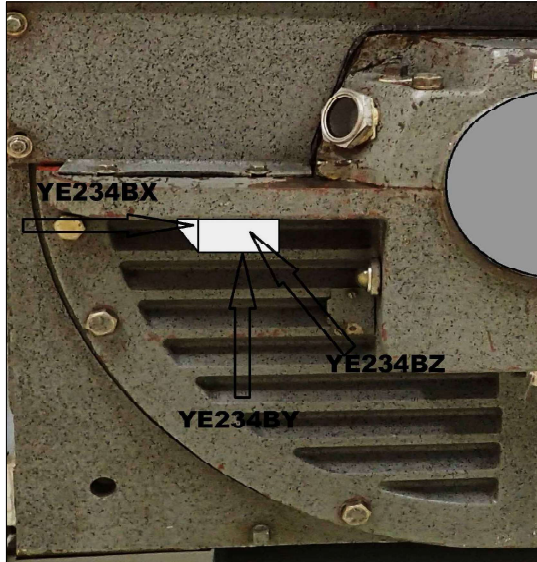
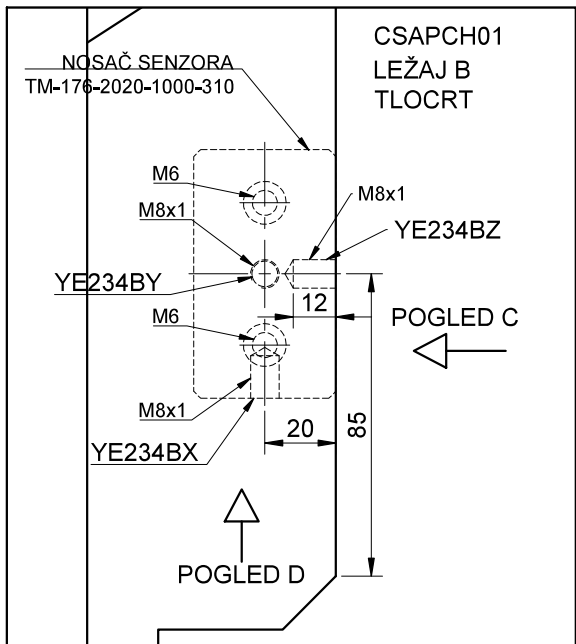
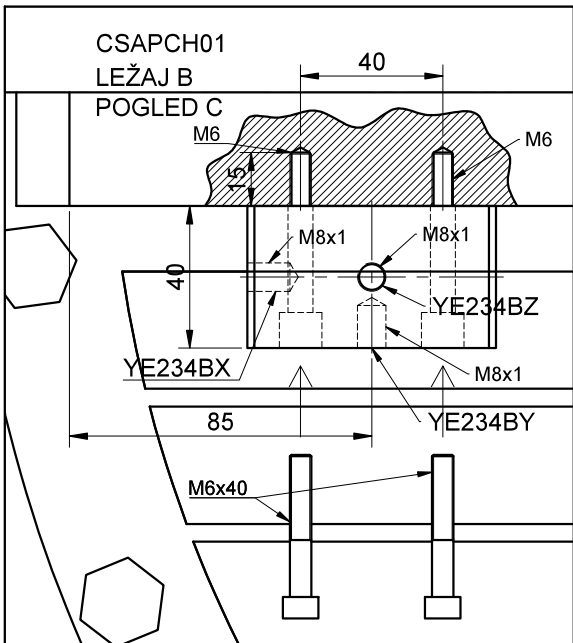
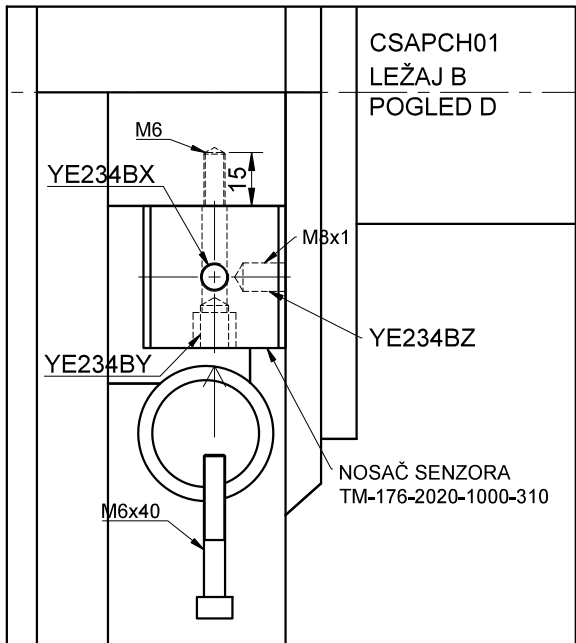
SCALC-M-CS-026 Attachment 9.2

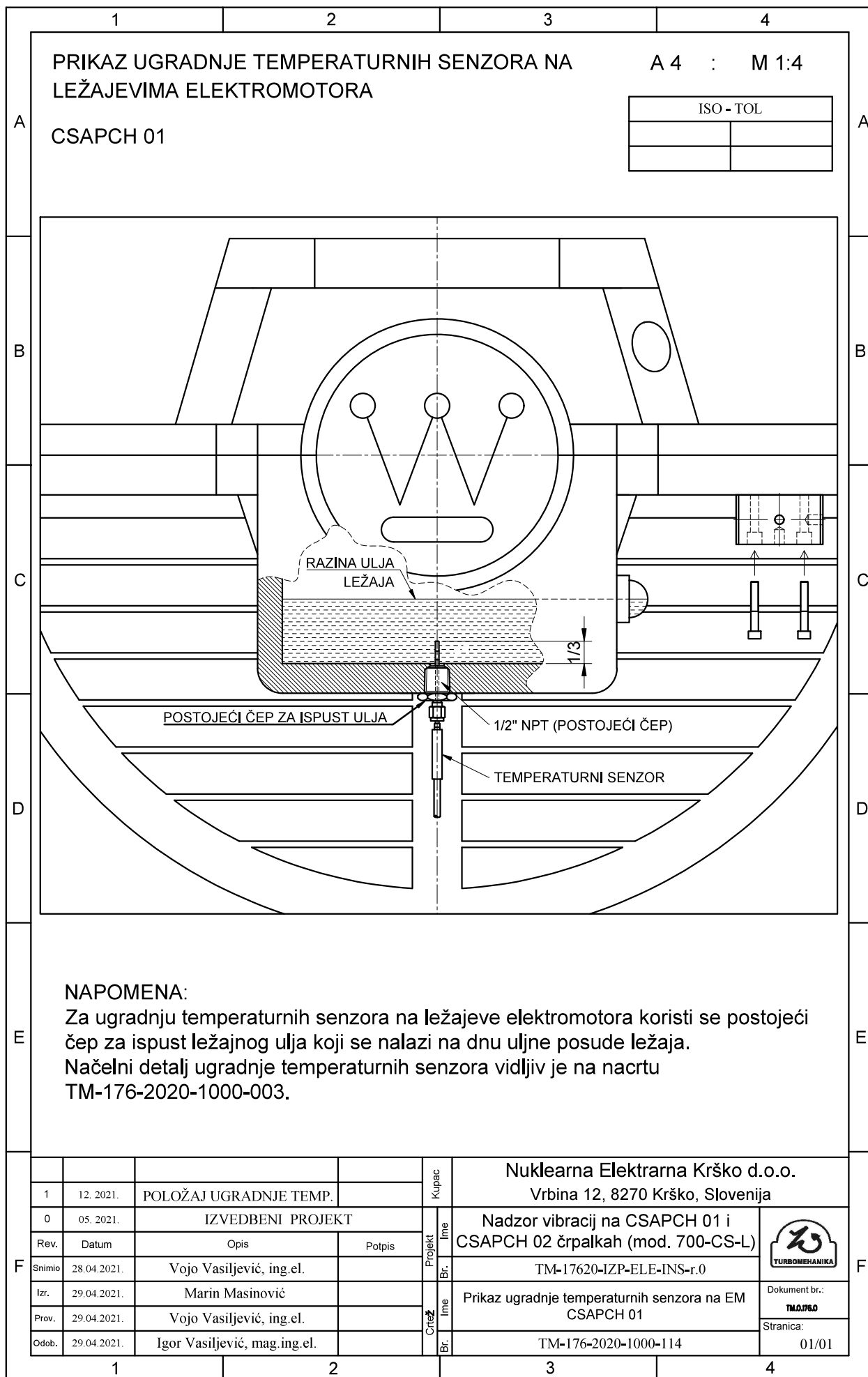
CSAPCH01 sensor location details





F

1		2		3		4	
NEK ČRPALKA CSAPCH 01 ELEKTROMOTOR - LEŽAJ B PRIKAZ NAČINA, MJESTA UGRADNJE I POLOŽAJA SENZORA						A 4 : M 1:2	
						ISO - TOL	
ELEKTROMOTOR - LEŽAJ B:							
							
							
<p>Senzori vibracija montiraju se na nosač senzora prema nacrtu TM-176-2020-1000-310 neposredno uz ležaj kojem se mjere vibracije (ležaj B). Nosač senzora montira se sa donje strane na pribornicu elektromotora pomoću 2 vijka DIN 912, M6x40.</p>							
				Kupac		Nuklearna Elektrarna Krško d.o.o. Vrbina 12, 8270 Krško, Slovenija	
1		06. 2021.		Zamjena položaja oznaka X i Y		Nadzor vibracij na CSAPCH 01 i CSAPCH 02 črpalkah (mod. 700-CS-L)	
0		05. 2021.		IZVEDBENI PROJEKT		TM-17620-IZP-ELE-INS-r.0	
Rev.		Datum		Opis		Potpis	
Snimio		28.04.2021.		Vojo Vasiljević, ing.el.		TURBOMFANIKA	
Izr.		29.04.2021.		Marin Masinović		Dokument br.: TM.0.76.0	
Prov.		29.04.2021.		Vojo Vasiljević, ing.el.		Stranica: 01/01	
Odob.		29.04.2021.		Igor Vasiljević, mag.ing.el.			
1		2		3		4	



SCALC-M-CS-026 Attachment 9.4

Supporting bracket details

