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w ramach Programu Operacyjnego Inteligentny Rozwój 2014-2020



# MANUFACTURING EQUIPMENT PURCHASE SPECIFICATION NEXTEER AUTOMOTIVE

TITLE: PROTOTYPE OPERATION FFT MACHINE FOR HWA / CEPS

NUMBER: TPCT-0015

ISSUED BY: Łukasz Stebel

DATE: 2023-01-31

APPROVED BY: Mateusz Grzegórski

REVISION: EN-005

REV. DATE: 2023-03-14

SHEET: 1 OF 29

## PROTOTYPE CENTER TYCHY EQUIPMENT

## PURCHASE SPECIFICATION TPCT-0015

## MACHINE NUMBER SD032900

## PROTOTYPE OPERATION FFT MACHINE FOR HWA / CEPS

Date, 2023-03-14

Revision EN-005



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## 1. PROJECT SCOPE

### • Project Overview

This specification details the requirements retool of the Final Function Test Machine No. TY-0329 for Electric Power Steering of several types like CEPS (Column Electric Power Steering), SbW HWA (Steer by Wire Hand Wheel Actuator) assemblies. (CPV code – 38970000 – 5) The intent is to provide Nexteer's E-Steer manufacturing site in Tychy Poland Prototype Center with a standard lean, prototype production machine to perform 100% in-process testing. The machine SD-032900 shall be quoted as a complete retool independent system including base, fixtures, production tooling, calibration tooling, data acquisition and control system. The supplier shall be responsible for complete design, build, runoff, delivery and start-up in Nexteer's facility (Nexteer Automotive Poland Sp. z o.o. 43-100 Tychy ul. Towarowa 6. This includes proper calibration of all sensors and set-up / tuning of the AC motor drive system.

### • Build Schedule

Build schedule for the FFT machine located on Prototype Center in Tychy Technical Center, Poland.

Milestone	Machine Number	Type of machine	Target Date
Offer	SD-032900	Final Function Test	MAR/APR 2023
Supplier Selection	SD-032900	Final Function Test	APR 2023
Machine Construction + MQ 1	SD-032900	Final Function Test	SEP 2023
Commissioning (MQ2)	SD-032900	Final Function Test	OCT 2023

### • Machine Destination

The application will be installed on machines located in Plant 77 Tychy, Poland.



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## • Reference

The following specifications and requirements referenced within shall apply to this equipment.

A. SD-000 - Machinery and Equipment Specifications

B. CE certification

- All included specifications were developed without consideration of patent infringement. Therefore, the supplier shall assume all patent liability.
- Compliance to this specification and the standards listed above is mandatory except for those items referred to as "should" and those items "preferred".
- The supplier is required to fully understand all details of this specification before any proposal is submitted. The supplier is responsible for discussing these requirements with the respective Nexteer engineer if there are any questions.
- In case of conflict between any specifications contained herewith, the supplier shall contact the Nexteer manufacturing engineer for resolution.
- The safety of the process and the equipment shall comply with requirements as specified in Nexteer Design-in Health and Safety Specification (SD-012). Also, the supplier may be required to participate in a formal risk assessment process during the design phase of the project.
- Compliance to these specifications does not limit the supplier's responsibility to build and warrant a safe and capable system.
- The quotation shall contain the statement: **"We agree to conform to Nexteer Specification and specifications outlined in the Manufacturing Engineering Equipment Specification T-Spec TPCT-0015";** [SD-001 §9.1]
- Any deviations to these specifications shall be approved prior to issuance of a purchase order.



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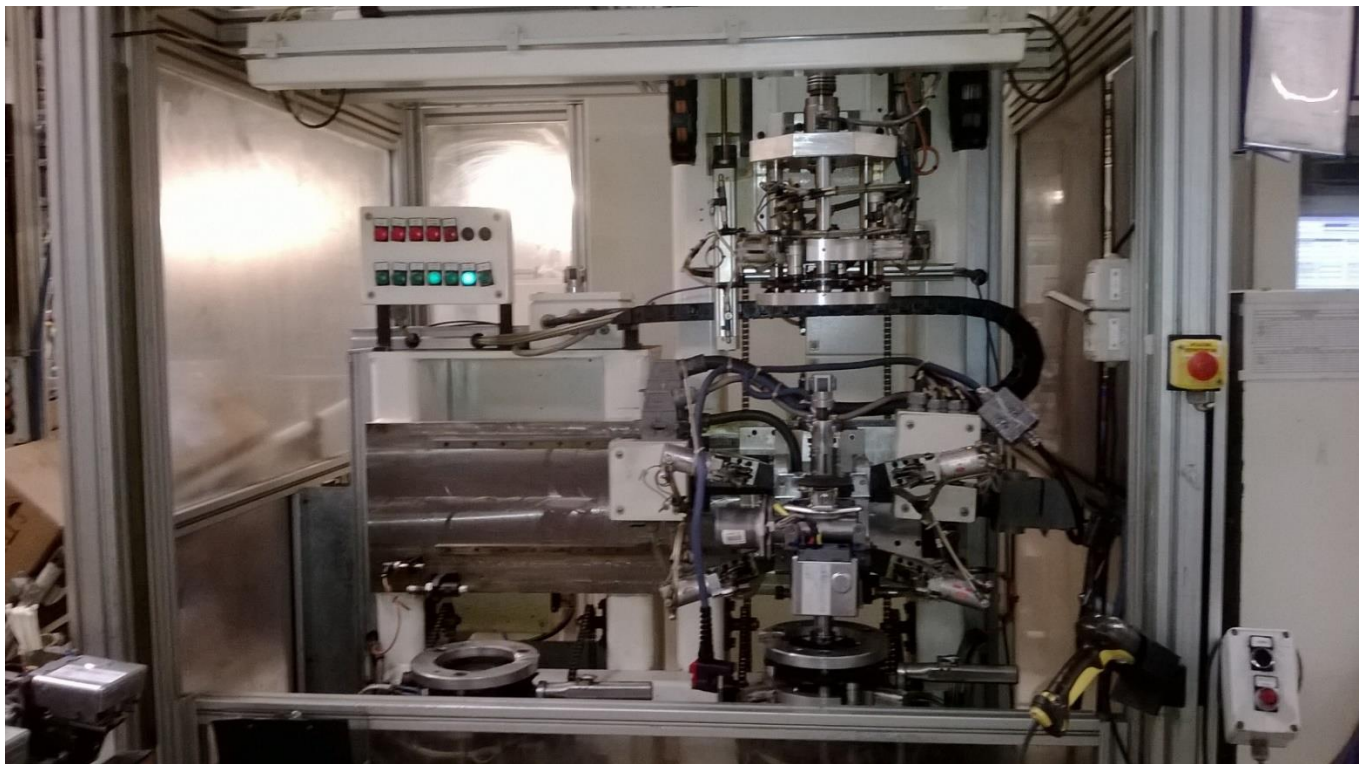
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## **2. PROCESS INFORMATION PER OPERATION**

Machine will be noted below as such:

Machine #1 TY-0329 – Final Function Test - Plant 77, Tychy, Poland



**Figure 1.** Picture of TY-0329 Final Function Test



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- Reference drawings and 3D model for the machine shown below (there is dedicated for HWA & column asm).

Assembly BOM Structure on FFT machine for			
Latest Rev	Description	Drawing number	Qty
TBD	SbW HWA, COLUMN ASM	38321747 (38308963) V1 - Manual	1
TBD	SbW HWA, COLUMN ASM	38321746 (38309763) V2 - Power	1
TBD	COLUMN ASM, SbW	38317107	1
TBD	COLUMN ASM, EPS (CEPS)	38279982	1

- Reference Test Specifications for Final Function Test for SbW HWA, CEPS project:

SD – 032900 Final Function Test	Numer Specyfikacji Testu	Rewizja
SPEC, SbW HWA - Input Turning Torque (Powered-Off)	TBD	TBD
SPEC, SbW HWA - Dynamic Effort	TBD	TBD
SPEC, SbW HWA - Static Feedback	TBD	TBD
SPEC, SbW HWA - Static Effort	TBD	TBD
SPEC, CEPS - Torque Sensor Cal. & Ver. (Long Sweep)	TBD	TBD
SPEC, CEPS - Rotational Torque Sensor Ver.	TBD	TBD
SPEC, CEPS - Backdrive	TBD	TBD
SPEC, CEPS – Dynamic Assist	TBD	TBD
SPEC, CEPS – Static Effort	TBD	TBD
SPEC, CEPS – Turning Torque	TBD	TBD



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## • Stations Description (based on current design)

The Final Function Test machine consists of a dual-station, single-fixture design. It has its own PC, data acquisition, and discrete I/O with one PLC if needed. The station is manually loaded and unloaded. Operator will manually clamp and connect connectors. It runs an automated test sequence initiated by an operator, all available tests shall be listed as a check list, which allows the operator to make choice which tests to run. By default, the last choice shall be active. The auto cycle includes coupling/decoupling. The test results are evaluated against pre-programmed limits with pass/fail information provided to the operator. The test sequence is fully programmable (loads, drive speeds, pass/fail limits, etc.). Changing part position between stations will be performed manually. Consideration for change-over ability must be given for future programs. The following tooling might be needed for change for various models.

- Part Nest, housing fixture
- Input/Output shaft tooling
- Electrical connector (Use of a Harting Quick-Change)

Tooling to be included in the quotation:

Two (2) sets of tooling shall be delivered for the acceptance of the machine: 1 for CEPS model and 1 for HWA model. Each set shall contain as minimum:

- power and signal cables
- input/output shaft tooling's
- pair of housing clamps
- part nest, housing fixture
- other elements if needed

Where feasible the tooling shall be universal for LHD/RHD variants.

Please itemize the quotation for tooling as it may be ordered separately from the machine or adopted from current production machines.





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## 3. GENERAL REQUIREMENTS

### General Instrumentation Requirements\Descriptions:

- Products to be processed on this equipment are electrostatic discharge (ESD) sensitive. The equipment shall not transfer or emit any electrical shock or electrostatic charge to the assembly. To provide a static safe environment, IEC-61340 standard (technical equivalent is ANSI/ESD S20.20) and Nexteer specification SD-1037 shall be complied with.
- The supplier shall be responsible for complete start-up machine with a new LabVIEW application.
- The station shall be quoted as a complete independent self-contained system including data acquisition and control system.
- The station has a single point connection for all required utilities.
- All machine coupling/clamping features required to attach to the part is designed to minimize their effects on process measurements.
- All basis surfaces shall be hardened and surfaces that contact the part shall not do any damage on its.
- If set-up/calibration procedures change for the new project, the supplier shall ensure update of set-up/calibration procedures for all measurement and monitoring devices.
- All instrumentation were installed with consideration for easy access and the convenience of the test operator and maintenance personnel.
- The machine utilizes a PC for data acquisition. The PC shall also be used to display fault information, test results, machine status, and to enter/edit testing parameters. The PC stores the full test results (values, pass/fail indication, graphical data and raw data) for all parts run.
- Easy accurate calibration of all instrumentation is required.

### The supply voltage requirements:

The supply voltage used for powering the electrical instrumentation is filtered to protect against line voltage fluctuations and ground differentials. Surge protection is provided to protect from AC line and load transients. Use isolation transformers, filters, and uninterruptable power supplies where applicable. An uninterruptable power supply (UPS) is provided for supplying



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power to the data acquisition PC. The time of protection against voltage drops is a minimum of 5 minutes. The computer shall have an automatic shutdown procedure before the power is removed.

All signal (low voltage) circuits are designed to minimize the influence of RFI and EMI noise on the test measurements. Therefore, the use of clean power filters, surge suppressers, and shielded cables is required. All wiring and grounding shall conform to the CE requirements for electro-magnetic compatibility.

The accuracy requirement for each test refers to the accuracy of the complete instrumentation circuit from the transducer through any signal conditioning to the final data acquisition point or display. Therefore, any signal conditioning, A/D conversion, sample rates, line noise, transducer errors, etc., must not introduce any errors beyond the required accuracies. This will be a critical design issue.

All low voltage analog signal wires, as well as communication cables, are isolated from higher voltage AC wiring. Ferrous metallic conduit is used to contain these wires where required. Routing of low voltage analog wires are separated from higher voltage AC wiring.

The test part is powered by a programmable bidirectional DC power supply unit Elektro-Automatik with the following minimal parameters: voltage range 0-20V, maximum current 100A. If necessary, equip the machine with a suitable electronic load. Maximum length of power cables to the test part: 3 m.

- **Transducers requirements:**

The machine incorporates high quality transducers for the monitoring of all test input parameters (load, angle, voltage, etc.). The transducer outputs is wired into the machine's data acquisition system for data collection and display. All data is displayed in SI units (International System of Metric Units). The transducers in this machine are rugged in construction and designed for long life and minimum maintenance. All transducers used in this machine are calibrated and supplied with up-to-date calibration certificates according to PN-EN ISO/IEC 17025:2018-02.

Transducers is calibrated to standards of at least two times greater accuracy than stated in the specification. The calibrated parameters shall be checked through a minimum of 11 points (0, 20%, 40%, 60%, 80%, 100%, 80%, 60%, 40%, 20%, 0%) to check for linearity and hysteresis.



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- **The LabVIEW application requirements:**

The LabVIEW application shall include a maintenance utility for calibration and set-up processes. Numeric readout on the PC display monitor shall be provided for all parameters. All data shall be scaled using SI units. An easy method to check calibration on these transducers, such as a shunt calibration button, shall be provided.

- **General Machine Function/Construction**

- The cycle start switch is on the right side of the operator's load position.

Cycle start switch style is Illuminated Palm Button (Banner K50APT2GRCQ/K50 CORE SERIES 50 MM ILLUMINATED PICK-TO-LIGHT TOUCH BUTTON/ equipped with TC-K50-CL/K50 Touch Clear Field Cover/ or equivalent) shall be used.

Machine will also be outfitted with a PSDI (Part Sensing Device Initiation) mode for increased efficiency. Reference SD-011, Section 3.9 and Annex A.27 for more information.

- Service points (valves, switches) are accessible from the front and back of the equipment.
- An overhead machine is mounted light to illuminate tooling/part processing areas and enabled by selection of button on HMI.
- All parts of the machine working area were designed and/or locked in such a way as to prevent the move loosen elements inside the product. All critical connections are secured against unscrewing.

If there is needed to have information for retool equipment, all schematics about construction of such equipment shall be delivered after negotiation step.

## Material

- All storage places for changeover tools, masters, calibration tools shall be in accordance with the SMED rules.

The space occupied by these machines shall not be changed.

- Each station shall be capable of performing a Final Function test sequence on a fully assembled electric power steering Column Asm.
- Machine design should fulfill Ergonomic Guideline (SD-017, section 4.2).
- The keyboard tray utilizes an existing ergonomic design. The shelf is to be located under the monitor and the HMI operator panel in front of the operator. The keyboard and mouse are connected to USB connectors on the back of the PC



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- Power supply to be enclosed to prevent from tampering with settings and to be protected from external contaminants, manufacturer's guidelines for installation and ventilation to be followed.
- The control system has a complete manual mode of operation, including individual manual control of all the pneumatic. Interlocks between motions is used only where potential exists to damage the machine or jeopardize operator safety.

### Data Acquisition Requirements:

The computer system shall be equipped with the following operation system:

- Windows 10 Pro 64-Bit version with latest service pack

Minimal hardware requirements:

- Intel Core i7 Processor
- 32 GB DDR-4 RAM
- USB Keyboard and Mouse
- (2) 512 GB Solid State Drives
- 2 x 22-inch Touch Screen Flat Panel Display
- 350 VA Un-interruptible Power Supply (USB to Computer for control)
- 1 Gigabit Ethernet Interface to communicate to machine devices
- MS Office license

The supplier may propose a different model/type of PC with similar parameters.



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The data acquisition on new computer systems shall contain the following software as:

- LabVIEW 2018 application and required drivers to perform data acquisition, analysis, and user interface to be deployed as a stand-alone executable.
- Nexteer will provide a LabVIEW license. Supplier should assure application compatibility with higher version of LabVIEW.
- Test application shall be provided as a LabVIEW project with unlimited access to whole source code as well as a stand-alone executable file.
- All hardware purchased from NI shall be registered to Nexteer Automotive

**NOTE: LABVIEW LICENSE NOT REQUIRED. Nexteer will provide a LabVIEW license**

- The machine controls through the LabView program using the data acquisition.
- National Instruments LabVIEW software and hardware shall be used for data acquisition and management of model parameters and test configuration profiles. The supplier shall be responsible for managing all software development. The supplier shall provide all source code to Nexteer. The software shall be delivered without passwords protection.

Management of all test configuration profiles and model parameters shall be done by files from separately one folder from rest of application files.

NOTE: Nexteer will provide the reference LabVIEW programming for machine control, data acquisition, and command of the MPP. Nexteer will provide for reference, the LabVIEW programming from other CEPS project. The supplier will still be responsible for implement, debug and support LabVIEW programing SbW HWA and CEPS project.

- The test software shall be developed to provide manual and automatic testing. It shall also be capable of display and plot the tables and figures as required for each test in this specification. The application shall provide the following features:
- Provide two privilege levels: 1) System Manager 2) Operator
- Create, edit, and save model parameters in a tabular index.



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- Create, edit, and save test profiles in a tabular index, with the possibility of flexible creation of sequence (test loops, copying whole code fragments, etc.)
- Acquire, display, analyze, and save test data.
- Perform post-test analysis on the stored data such as charting, graphing, etc.
- Provide status information (PASS/FAIL).
- Configurable test report generation.
- Manual and automatic testing execute tests independently or sequentially.
- Instrument Calibration and Log.
- Adjustable sample rate.
- Real-time monitoring and display of measured readings, numerically and graphically.
- Capability to export test data in text format.
- Maintenance feature to provide diagnostics of the PC digital/analog inputs and outputs.
- Back-up of all data stored on the PC's hard drive

NOTE: The LabVIEW programs shall be written using simple, easy-to-understand concepts. The program structure shall be sequential in nature. Parallel loops should be used only when necessary. The intent is to provide Nexteer plant personnel with a program that is easy to maintain. This includes the ability to easily modify the cycle sequence and quickly diagnose machine problems. The entire source code shall be provided to Nexteer freely editable and without passwords protection.

- The look and feel of this system shall be mutually agreed upon by the supplier and Nexteer. The data acquisition system shall be a complete sub-system and shall not require any modifications once received by Nexteer. Only electrical interconnection will be necessary. (This does not infer that the subsystem can be functionally independent.)
- All model parameters and test configuration profiles shall be fully programmable and shall be managed from files from separately one folder from rest of application files. The test configuration shall be initialized before each test.
- The data acquisition system shall include a method to ensure calibration of all transducers. A calibration procedure (e.g., shunt cal.) shall be provided for each transducer.



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- The calibration information will include safe operating ranges/limits for each transducer. These limits will be used as operating limits for the control system. For example, if a torque transducer has a safe operating range of 10Nm, the control system will be prevented from commanding a torque that will exceed this value. If control parameters are entered that would result in a limit being exceeded, the computer system will display a warning and require the operator to re-enter correct data.
- The system shall provide space for 25% spare analog and digital I/O. Empty PC slots can be used to fulfill this requirement.
- The data acquisition system shall provide a user-friendly way to take a "snapshot" of data (save to disk and/or plot) for diagnostics and calibration, PDF or XML report generating function is acceptable also.
- The data acquisition system shall incorporate a method of periodic self-checking for all model parameters and test configuration profiles. This is to detect if this data is inadvertently altered or corrupted which may affect the pass/fail status of the parts being tested. An example would be to include checksum fields in all model parameter lists and test configuration profiles. The checksum shall be generated when the profile is legally edited and saved by the machine application. It shall be used as part of a data-checking algorithm that shall do the following:
  1. Verify the assembly parameter and test configuration data each time it is activated and copied from the storage file into the active test buffer (computer memory).
  2. Verify the data in the active buffer once per machine cycle, preferably just before the data is used.
- The data acquisition system shall also include zero-drift compensation wherever possible. The purpose of this feature is to offset the effects of drift in the instrumentation electronics to improve measurement accuracy. This can be accomplished by monitoring the analog input signals, usually at the start of each test cycle, with their sources unloaded or at rest. The values observed are used to correct the analog signal processing calculations to minimize the impact of drift. Maximum values for this compensation shall be determined and when corrections are called for that exceed these maximum values, a fault shall be registered, and the test aborted.
- The supplier shall be responsible for obtaining all peripherals required for programming, startup, and documentation on the supplier's floor.
- All information viewed on the computer's video display shall be in the English language. LabVIEW program source code shall be provided in English, as a minimum.
- If a PLC is used, a simple watch dog signal shall be provided by the test PC to the PLC to communicate that the PC is ready and operating normally.



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- **Tool Life Management**

Machine design/logic includes monitoring lifetime and condition perishable tools.

#### 4. CONTROL SYSTEM REQUIREMENTS

All control circuits, components, and documentation shall conform to all specifications referenced in the *Machinery and Equipment Specification*, (SD-000). Any deviations from these specifications must be approved in writing and marked with reference to a specific point in the specification. The following requirements are covered by these specifications but are frequently overlooked during the quoting phase.

Section contains examples control points highlighted from SD-000 (all from SD are still required).

#### **The following Industry Standards shall be followed:**

- **IEC 60204-1** Safety of Machinery – Electrical Equipment of Machines – Part 1: General Requirements
- **ISO 4413** Hydraulic Fluid Power if needed – General Rules and Safety Requirements for Systems and their Components
- **ISO 4414** Pneumatic Fluid Power – General Rules and Safety Requirements for Systems and their Components.





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The following Nexteer Automotive Specification Addendums to the Industry Standards listed above shall be followed:

## SD-004

Electrical Specification for Industrial Machinery Addendum to IEC 60204-1

§ 9.5.1.2 10% spare I/O space shall be provided. This requirement extends to the I/O image table which shall have space reserved to accommodate these spare I/O requirements.

### § 9.5.4.3 Communication port

The PES systems shall be designed such that two communication port is always available for use with the programming equipment. The port shall not require that any other systems interface be disconnected to use the programming equipment. This programming port shall be provided at a readily accessible location on or near (within 2m) of the operator interface.

*Note: Equipment with multiple stations may require programming ports at multiple stations in order to be readily accessible.*

### § 9.5.5 Communication

All inter-device communications shall be Ethernet based. An Ethernet switch(es) shall be used to facilitate this communication. This switch shall have at least three spare ports, two for future plant network connections and one to satisfy the programming port requirement detailed above.

## SD-013

Hydraulic Fluid Power – General Rules and Safety Requirements for Systems and their Components Addendum to ISO 4413

## SD-014

Pneumatic Fluid Power – General Rules and Safety Requirements for Systems and their Components Addendum to ISO 4414

### § 5.4.9 Seals and sealing devices

(f) ADD: Self-forming extrudable material (e.g., RTV sealant) or Tape type (Teflon) sealant shall not be used. Use Loctite 56747 or equivalent only.



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DATE: 2023-01-31

APPROVED BY: Mateusz Grzegórski

REVISION: EN-005

REV. DATE: 2023-03-14

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**The following Nexteer Automotive Specifications shall be followed:**

**SD-001** In the new SD-001 General Manufacturing Equipment Specification REVISED June 4, 2020, point 3.6 regarding counters has been removed.

**SD-002** Manufacturing Equipment Statistical Qualification Requirements

**§ 4.1 Verification of Machine Cycle (Dry Cycle)**

The minimum intent of the Verification of Machine Cycle is to identify faulty switches, valves, and bearings, and confirm that the equipment can cycle over a minimum pre-determined period of time without malfunction and to ensure that the equipment will function effectively once delivered. It is recognized that some equipment cannot effectively be tested in this manner. These types of equipment may use an appropriate substitute test, which meets the minimum intent of this section. Substitute tests require the approval of the Engineer in Charge.

The equipment will be cycled, at quoted cycle rate, in automatic mode and must, as far as possible, be configured as the final installation (panel doors closed, etc.). It is preferred that this run should be performed using parts to demonstrate the material handling capability only. When using production parts, the equipment must be prevented from actually performing alterations to the parts. The equipment supplier shall maintain a log of this activity. Any malfunctions or deviations must be recorded along with the corrective action. The log shall be provided to the Engineer in Charge upon completion of the test. Major malfunctions may cause the test to be repeated. The Engineer in Charge will decide if the severity of the malfunction requires the test to be repeated. The Verification of Machine Cycle is as follows.

A. Continuous for 10 hours.

B. Overnight complete shutdown.



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C. Restart equipment and continue the run for 10 consecutive hours.

The supplier shall notify the Engineer in Charge prior to beginning this run.

Attendance of Nexteer Automotive personnel will be at the discretion of  
Nexteer Automotive.

**SD-007** Approved Components List

## § 4. Pneumatic Components

All threaded pressurized fittings shall be BSPP or G thread except for the main air  
drop which is NPT. BSPT or R threads are not permitted except for use on mufflers.

Accessories

Thread Sealant (Tapered threads only)

Loctite PST 2087067 or 577

*Note: RTV, Teflon tape and horsehair sealants shall NOT be used*

**SD-011** Specification for Safety Circuits

**SD-012** Design-in Health and Safety Specification

**SD-1020** Human Machine Interface Application Specification – HMI Template shall be used.

**§ 6.7.** The manual control functions should be organized based on the sequence of a  
normal automatic cycle of the machine.

**SD-1032** Programmable Logic Controller Application Specification – Logic Library shall be  
used.

## § B. Annex

§ B.7 The controller shall have at least 25% spare (unused) memory.

§ B.8 Forces or temporary logic used for bypassing logic shall be removed prior to  
MQ1 runoff of the equipment. Proper logic operation shall be verified at MQ1.



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SD-1045

Machine Ethernet Network Specification

**NOTE:** Equipment shall be designed and constructed in accordance with the “European Machinery Directive” and shall have a CE Mark. A declaration of conformity shall be provided with the equipment and shall include the list of standards which the machine has been evaluated against. The declaration of conformity shall be written in the language of the equipment’s destination.

**NOTE:** A single software license for the equipment installed on the machines should accompany the equipment (e.g., Atlas Copco software, etc.). Software registration will be transferred to the appropriate Nexteer Automotive manufacturing facility during MQ1. Please work with a Nexteer Controls engineer to obtain correct registration information.

## 5. TRACEABILITY REQUIREMENTS

The machine shall be required to communicate with the plant traceability fileserver over an ethernet connection. The fileserver itself is not part of this quotation. The machine shall communicate with the plant traceability fileserver using TCP/IP. The results of each cycle shall be stored in a special data directory on the hard drive. The Nexteer traceability system shall be responsible for extracting and deleting the data from this directory via the network connection. (secondary network interface card shall be supplied with the machine). Computer-based test system shall create the test data of each machine cycle in following file format:

- PDF files – contain all data of tests (values, chart, pass/fail indicators, graphs, etc. ...).

- Full – all data of tests - production report,

- Customer – only data specified by customer – customer report,

- Binary file (raw data) – contain all measurement data form all channels used in test (e.g.

TDMS file format) or other file format easily exchangeable, inherently structured, high speed streaming capable.

- CSV file – contain all results of tests.



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- Full – all results of tests.

- Customer – only results of test specified by customer.

- File name for traceability system has predefined structure:

TestName#Op#StationID#PartNumber#SerialNum#DateTime#ReportType

where:

TestName – name of test performed on the station during machine cycle, (E.g. FFT)

Op – number of operation in prototype production process, (E.g. OP0600)

StationID – ID number of machine, (E.g. SD-601100)

PartNumber – identifier of particular part assembly or subassembly in production process define

Model – read from the 2d code

SerialNum – unique identifier to part – read from the 2d code.

DateTime – date with dash separator, time without colon separator. Timestamp shall be the same for all test in one machine cycle. YYYY-MM-DD\_hhmm

ReportType – field to distinguish type of report. (e.g. numerical\_csv.csv)

Example:

Backdrive\_cf#OP100#SD12345X#1X2345#16201-010#30-12-18\_1711#pdf\_final

Backdrive\_cf#OP100#SD12345X#1X2345#16201-010#30-12-18\_1711#pdf\_customer

Backdrive\_cf#OP100#SD12345X#1X2345#16201-010#30-12-18\_1711#raw\_data\_csv

Backdrive\_cf#OP100#SD12345X#1X2345#16201-010#30-12-18\_1711#numerical\_csv

etc.



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## 6. ANDON REQUIREMENTS

The following Nexteer Automotive Specifications shall be followed:

- **SD-1020** Human Machine Interface Application Specification
- **SD-1032** Programmable Logic Controller Application Specification – Andon routines within the Logic Library are available and shall be used.

The Andon data collection application software shall be provided by Nexteer.

- The supplier may be required to be involved in a formal risk assessment process during the equipment design phase as a function of the Design-In Health and Safety Specification, (SD-012).
- The supplier is required to follow Nexteer Automotive's approach to safety circuits, as documented in the Specification for Safety Circuits, (SD-011) and SD-012. These specifications align with the European and ISO standards.
- Electrical and Pneumatic control drawings and Bill of Material must be approved for build by Nexteer's controls engineering department prior to design implementation and purchasing of components.
- The equipment's overcurrent protective devices and power distribution devices shall be suitable for use on circuits capable of delivering 50 000 amperes symmetrical (rms), 50/60 hertz of short circuit current. This SCCR value is to be documented on the electrical prints and machine template.
- All electrical receptacles external to the enclosure shall be provided with Residual Current Protection Detection (RCPD) or equivalent protection.
- Machine logic shall follow the Programmable Logic Controller Application Specification, (SD-1032) and Nexteer sample design templates.
- HMI design shall follow the Human Machine Interface Application Specification, (SD-1020) and Nexteer sample design templates.
- For systems that run custom software developed for a project and that software is compiled – it shall be noted by the equipment supplier at time of quote. Utilization of these systems requires written approval of the Nexteer's control



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systems engineer. Documentation must include the version of software that the program was compiled under and the compiler settings for the application.

- For systems that run custom developed (at Nexteer's expense) compiled programs - all source codes shall be provided to Nexteer Automotive in electronic format and will be the property of Nexteer Automotive.
- For programmable devices not listed in the Approved Components List, (SD-007) - any software required to view or change any of these devices shall be provided and the supplier shall obtain prior authorization from the controls engineer. This includes any PC based applications created by the supplier.
- All software provided with the machine shall be registered to Nexteer Automotive, if licenses are required (for example, National Instruments OPC runtime).
- Supplier shall prepare list of equipment which firmware can be updated and after approval, carry out an upgrade of the machine and connected equipment.
- The supplier will be responsible for all hardware and software needed to startup and commission the equipment through MQ1.
- A programming port shall be provided on each machine/station on or near the operator interface. Note: A receptacle for use by the programming equipment shall be provided, located adjacent to the programming port. The voltage and receptacle type shall be appropriate for the receiving plant.
- At every manual load and/or unload station, one LED Pilot Light (multi-color as detailed in SD-007) shall be provided, mounted where clearly visible to the operator and controlled by the PLC. The lights shall illuminate based on the following criteria:
  - "Green": Solid Green shall indicate a GOOD PART and stay energized until part is either unloaded, machine put into manual mode, or machine powered down.
  - "Red": Solid Red shall indicate a REJECT PART and stay energized until the reject part has been handled appropriately. Flashing Red shall indicate a machine fault.
  - "Yellow": Solid Yellow shall indicate MACHINE IN CYCLE



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## 7. OTHER MISC. REQUIREMENTS

- Shipping – (SD-001, Appendix A)

The supplier shall be responsible for machine preparation and packaging for shipment. The machine shall be shipped with suitable protective cover to protect the machine from the environment. A protective coating shall be applied to all unpainted surfaces to prevent oxidation. Appropriate shipping materials (pallets, bands, wrappings, etc.) shall be used. Special handling devices shall be provided if required to prevent damage during load, unload, and installation. Special instructions for transporting, unloading, or moving the machines must be clearly attached to the outside of the shipping package/container. A copy shall also be sent to the Nexteer project engineer prior to shipment. This includes a lifting and loading diagram. All written instructions shall be provided in both English and in the language of the country of destination.

A complete set of machine control system drawings shall be sent with the machine. This includes all hardware drawings and software listings. Copies of all software shall also be provided on portable data storage (e.g. SSD portable) and shipped with the machine. All required calibration devices shall be shipped with the machine along with its own set of documentations. All Nexteer supplied parts shall be returned to the Nexteer facility with each part clearly and uniquely identified. All corresponding run-off data and reports generated from the run-off shall accompany the parts. The vendor is responsible for packing the parts for shipment, but the shipping expenses shall be the responsibility of Nexteer.

Whole machine documentation including drawings, diagrams, parts list, manuals etc. shall be in editable format.

- Training

Prior to run-off at the supplier, a mini training session shall be held for Nexteer's runoff personnel at the supplier's facility. During the run-off and acceptance at Nexteer's facility, training shall be held for production operators, skilled trades, and engineers. Depending upon machine readiness and performance, additional technical assistance and training shall be provided during the initial startup of production, prior to the customer dry-run test.

- Replacement parts

Detailed drawings shall be provided for any non-standard machine components that are not a stock-shelf item by the supplier (or others) or that cannot be shipped within 24 hours. The supplier shall submit a list of recommended spare parts to the Nexteer project engineer prior to the final approval visit. The list shall include the part's machine drawing reference





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information, manufacturer, quantity used in the machine, recommended quantity to stock, and price. The supplier shall ship with the machine all spare parts approved and ordered by the Nexteer project engineer.

- Documentation – General Drawing and Manuals Specifications (SD-003)

Regarding the documentation, besides the specific requirements described in this specification, supplier shall follow and fulfill all the requirements described in the Nexteer's Specification SD-003. A complete set of reproducible drawings shall be provided by the supplier at the time of machine delivery. All drawings shall be updated to latest revisions. Drawings shall include tool layouts, fixtures, tools, and other perishable items. A complete set of machine control system drawings shall be shipped in the machine control enclosure. This includes all electrical, hydraulic, pneumatic, and lubrication prints, along with all software program listings. The supplier shall submit for approval the following drawings prior to build:

- A complete set of electrical drawings.
- Machine layout drawing showing all panel boxes, enclosures, operator post, incoming utilities and drains, in a plan view and frontal view. (A machine layout with a scale 20mm=1m shall be located in the lower left-hand corner of the sheet.)
- Complete hydraulic, pneumatic, and lubrication drawings.
- Foundation requirements.

All drawings shall utilize the drawing sizes listed in Section 3 of General Drawing and Manual Specifications, SD-003. All control systems documentation files including PLC and LabView programs shall be provided in editable electronic format.

Note: In addition to Nexteer's general documentation requirements, the supplier shall provide at run-off the complete set of editable 3D model files in Parasolid or STEP format for the mechanical design of the machine and the tooling.

- Language on all documentation shall be as follows:

PLC ladder logic if needed – English.

Machine manuals – English and Language of Destination Country.

PC software – English.

Drawings and part list – English.

HMI Operator Interface and panel – English and Language of Destination Country.

Operator interface device and warning labels – Language of Destination Country.

Lockout placard(s) - Language of Destination Country.

Machine device tags – English and Language of Destination Country.



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- Utilities

Any inquiries about available utilities and the need for special utilities shall be brought to the attention of the Nexteer project engineer.

No special foundations shall be provided for the machine. If special needs are required for good machine performance, vibration isolation for example, must be provided by the supplier and approved by the Nexteer project engineer. If specific requirements exist, they shall be listed as a separate line item in the quotation.

Standard utilities available at the destination floor:

- Electrical Power Supply: 400VAC 50Hz 3P+N+PE
- Compressed Air: 4.8 bar

## 8. QUOTATION INSTRUCTIONS

- The supplier shall provide a formal quotation for purchase. Budgetary quotations will not be accepted.
- The supplier shall provide their quotation in accordance with the applicable specifications.
- Prior to quote the supplier shall contact the Nexteer control system engineer concerning the following items:
  - programmable controller selection
  - motor drives
  - instrumentation equipment
  - data acquisition
  - operator interface
- The supplier's quote shall provide all information necessary to describe the proposed equipment, its components, operation, and performance.
- For billable purposes to customer by Nexteer, the supplier quote items shall include clear pricing on the following:
  - Part touching manufacturing tooling cost
  - Part touching engineering design tooling cost



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- Although concepts may be specified, suppliers should not hesitate to propose alternative ideas that may provide a better approach to the machine. The machine shall be quoted as specified, listing any alternative ideas as options.
- The quotation must include sketches of the machine, machine layout, tooling and fixture concepts. Hand drawn sketches are acceptable.
- The quotation shall reflect the full price of the equipment specified. Items indicated as “to be determined at a later date” are not acceptable. All major sub-contractors shall be listed in the quotation. Use of sub-contractors shall be discussed with Nexteer prior to submitting quotation.
- The quotation shall include a preliminary schedule addressing the project timing requirements. The supplier shall provide their best possible delivery and preferred start date.
- The supplier shall indicate their sight location for run-off, and if different, the location where the machine will be constructed.
- The quotation shall clearly state the supplier’s intent to adhere to this specification and its references. Any deviations from this specification shall be listed by section.
- Prices shall include preparation, packing and loading of equipment for transport.
- Payment terms shall be as specified by Nexteer Purchasing department.
- There will be a kick-off meeting for the successful bidder. This meeting will be conducted by the Nexteer project engineer and Nexteer Purchasing Department. The purpose will be to transmit

the latest information about the project so there are no delays due to lack of information about the parts or process. This meeting will clarify the relationship between Nexteer and the supplier as to commitment of each party to manufacture and deliver a world class machine.

### COMMERCIAL ISSUES

- Price shall be quoted in Euro.
- In the case that this purchase order has to be cancelled, Nexteer will perform an audit where the supplier will provide the necessary cost records to establish adequate charges due to the cancellation.
- All new designs are to be the property of Nexteer and matters pertaining to these designs are to be held in confidence. All designs, inventions, and improvements made by the supplier during the design and development work called for by this



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purchase order shall be the sole property of Nexteer. The supplier shall obtain the execution of any documents as may be necessary to protect ownership thereof in Nexteer.

- Modifications to the original order can only be made after the supplier's receipt of confirmation from the Nexteer purchasing department.
- Machine shall be available for acceptance at the supplier's factory not later than: *date specified in Chapter 1-Build Schedule* and available for MQ2 at the Nexteer Tychy Plant not later than: *date specified in Chapter 1-Build Schedule*.

Note: The acceptance date indicated above must not be exceeded. Failure to do so will result in charging penalties.

### WARRANTY

The Bidder must provide a two-year warranty on the equipment. The conditions of the two-year warranty must be clearly stated in the proposal. The two-year warranty will start after the approved machine qualification on Nexteer's floor and must cover the Bidder's workmanship and material. Minor repairs, defined as requiring less than 1 hour of repair time and/or \$100 of parts, will not be claimed. However, corrective action for repetitive, minor problems must be included in the warranty.

Nexteer considers the two-year warranty, at no extra charge, to be the industry standard. It is a statement of confidence and a commitment by the equipment builder to their quality of engineering, workmanship and organization. This equipment shall be designed and built with an anticipated 10-year life cycle. Equipment designed or built to a lower standard will not be accepted.

The terms of the warranty shall be based on proper operation and maintenance, as defined in the Bidder's Operation and Maintenance Manuals, performed by Bidder-trained Nexteer personnel.



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## 9. REVISIONS

REVISION	DESCRIPTION	
001	Initial specification	
002	Initial specification, layout changed	
003	The document has been revised and slightly modified	
004	The document has been revised and slightly modified	
005	The document has been revised and slightly modified	