STATEMENT OF SPECIFICATION FOR CNC HORIZONTAL TURNING CENTER

1. **SCOPE:**

1.1. Scope: This purchase description describes the minimum for the procurement for one (1) CNC, Y-axis Horizontal Turning Center (HTC) with live tooling and sub-spindle. The machine shall include all equipment, accessories, attachments, delivery, installation services and training described herein.

2. **Requirements:**

2.1. Design: The item offered shall be new and a current commercially available model. The machine shall include all components parts and features necessary to meet the performance requirements specified herein. All parts subject to wear, breakage or distortion shall be accessible for adjustment, replacement and repair.

2.1.1. Control: All electrical, mechanical, hydraulic and pneumatic operating controls shall be located convenient to operator workstation.

2.1.2. Safety and Health Requirements: All machine parts, components, mechanism and assemblies furnished on the machine whether or not specifically required herein shall comply with all of the requirements of OSHA 29 CFR 1910.

2.1.2.1. Safety Guarding: Covers, guards or other safety devices shall be provided per ANSI B11.22. Safety devices shall not interfere with the operation of the machine. The safety device shall prevent unintentional contact with the guarded part and shall be removable to facilitate inspection, maintenance and repair of the parts.

2.1.3. Lubrication: Means shall be provided to ensure adequate lubrication for all moving parts. Recirculating lubrication systems shall include a filter that is cleanable or replaceable. Each lubricant reservoir shall have at least a 24-hour capacity. Means shall be provided to indicate a low oil condition. Shall a low oil condition occur; the machine shall enter in emergency stop condition upon completion of the current operation. All oil holes, grease fittings and filler caps shall be accessible.

2.1.4. Interchangeability: All parts subject to replacement shall be manufactured to definite dimensions and tolerances. Replacement parts except for hand-fitted parts, such as ways, shall be interchangeable without requiring modification. Replacement parts are those that are subject to wear or failure such as gears, bearings shafts feed screws drive belts pumps and seals. Electrical replacements shall include but not limited to motors, relays, fuses, switches magnetics pushbutton light bulbs braking mechanisms and solid-state devices. Tooling and accessories normally supplied as standard item shall also be considered replacement parts. Foreign sourced

replacement parts shall be interchangeable with domestically supplied components or be readily available from a domestic source.

2.1.5. Power Requirement: Machine shall be built to NFPA 79 to accept 440 VAC, 3 phase, 60 Hz or quote package should include appropriate transformer to machine operation voltage.

2.2. <u>Construction</u>: The lathe shall be constructed of parts, which are new without defects, and free of repairs. The structure shall withstand all forces encountered during operation of the machine to its maximum, rating and capacity without permanent distortion. Controlled thermal displacement: Coolant circulation in machine body

2.2.1. Castings And Forgings: All castings and forgings shall be free of defects, scale, and mismatching. No processes such as welding, peening, plugging, or filling with solder or paste shall be used for reclaiming any defective part. Such processes may be used only for enhancing surface finish and appearance.

2.2.2. Components: The machine shall consist of not less than the following features:

2.2.3. Base: The base of the machine shall be constructed of material and designed in a fashion suitable to the application. The base shall be a casting not a weldment Means shall be provided for easy access to components and reservoirs located in the base for cleaning repair and replacement. Means shall be provided for leveling and securing the base to the foundation.

2.2.4. Slideways are used for all axes

2.2.5. Ways: The ways shall be hardened and ground boxed ways or heavy-duty linear guides.

2.2.6. Main Spindle: See Table I to include air purge

2.2.7. Sub-Spindle: See Table I

2.2.8. Axes: The lathe shall have C, X, Y, and Z-axes. All linear axes shall be actuated through a closed loop, high gain electrical servo mechanism driving recirculating ball screws and nuts. Infinitely variable feed drives shall be provided for all axes. The axes shall be capable of simultaneous controlled motion.

2.2.9. Linear Axis Feed Drive: All linear machine slides shall be provided with position and velocity feedback devices forming a closed loop system.

a. These shall conform to the NEMA MG-7 standard.

b. The longitudinal and traverse motion shall be accomplished under numerical control

c. The feed drive mechanism shall consist of infinitely variable AC servo motors coupled to precision, pre-loaded, hardened and ground, anti-backlash type, ball screw and nut assemblies.

d. Axes shall be machined to a precise fit to their respective ways

e. The ways shall be antifriction type and shall be provided with adjustable gibs, guides or bearings to maintain and adjust alignment of the table to the ways and to prevent causing excessive loading of the feed drive motor.

f. Antifriction, recirculating ball type liner ways are not acceptable. High Rigidity Roller Type Linear Guideway's are acceptable.

g. The servo systems provided shall control the slides in precise increments of feed and positioning with quick response from programmed commands from the numerical control.

h. Slide movements shall be controlled simultaneously and independently as programmed for various machining process.

i. Friction in the preloaded ball screw and nut assemblies shall not excessively load the feed motors under normal cutting operations for which the machine is design.

j. A positive means of lubrication shall be provided for the ball screw and nut assemblies.

k. Ball-screws and nuts shall be shielded from contaminants and cutting debris by a method of manufacturer standard practice.

2.2.10. Machine Enclosure: The machine shall be fully enclosed. The access door(s) on the enclosure shall be interlocked in order to prevent the lathe cycle from starting when the door is open and to prevent de door from being opened during operation. All components shall be designed to withstand the atmosphere within the enclosure without premature failure due to coolant contaminants.

2.2.11. Power Rapid Traverse: Powered rapid shall be provided for the movement of X, Y and Z axes. The rate of rapid traverse shall be independent of any feed adjustment.

2.2.12. Work Light: The machine shall include a cold type of work light (LED) the light shall comply with NFPA 79 requirement and have a protective shield. The machine shall have no dark areas inside the enclosure for the operator visual attendance.

2.2.13. Rigid Tapping: The machine shall perform rigid tapping.

2.2.14. Live Tooling: The machine shall have 12 stations equipped with live tooling. The live tooling shall be direct drive using a BMT (Built-in Motor Turret)

2.2.14.1. High-speed rotary tool spindle for milling: see Table I

2.2.15. Part Catcher: The machine shall have a part catcher. The part catcher shall be automated and move into position for the parting operation and out of the way when not in use with Right Spindle workpiece ejector.

2.2.16. Manual pulse generator: separated control Pendant for manual operation

2.2.17. Work Holding: The machine shall have a hollow automatic hydraulically operated chucks

2.2.17.1. Main spindle: Left Spindle, KITAGAWA 10in. Hollow Chuck BR10A821

2.2.17.2. Counter spindle: Right Spindle, KITAGAWA 6in. Hollow Chuck BR06A521E

2.2.17.3. Chuck foot switch: Double pedal for Left and Right Spindle

2.2.17.4. Grease gun: K44008 Grease gun set for Hydraulic Chuck (For KITAGAWA 6"~24" Chuck)

2.2.17.5. Soft jaw: 5234349 KITAGAWA 6-inch chuck soft jaws (SJ06A1-066)(Jaw height : 66mm (2.6 inch))(1 set)

2.2.17.6. Soft jaw: 5234372 KITAGAWA 10-inch chuck soft jaws (SJ10A1-116)(Jaw height : 116mm (4.57 inch))(1 set)

2.2.17.7. Collet Chuck (Main Spindle): Compact Royal PN#46170, QG-80 A2-8 ACCU-LENGTH. WTO PN#420125011-60, OD drill/milling unit, offset - for ER collets DIN 6499B - QuickFlex®

2.2.17.8. Collet Chuck (Sub Spindle): Ultra Compact Royal PN#65123, QG-80 MANUAL COLLET, WTO PN#QF25-DNI-MS60A-090-I-S-A, Face drill/milling unit - for ER collets DIN 6499B - QuickFlex®

2.2.18. Measuring:

2.2.18.1. (RENISHAW,OMP40M(QE-Spec)): In-machine workpiece measuring system (Left Spindle), radio signal transmission type touch sensor

2.2.18.2. Manual in-machine tool pre-setter: Swing type

2.2.18.3. Manual in-machine tool pre-setter (removable type) (Right Spindle)

2.2.18.4. SMOOTH COLLET (QTY 2): QG-80 1" ROUND

2.2.19. Controller Features: The machine controller shall consist of a CNC Controller incorporating all standard features. The CNC unit shall provide programmable

automatic control of machine functions, operating modes, linear axis movements and other part program directed functions for the machine in the English language. Movements on the C, X, Y and Z-axes shall be independent. Control features shall include Manual Data Input (MDI) simultaneous control of all axes (C, X, Y, and Z) linear and circular interpolation, programmable interface, part program and buffer edit capability, part program storage, fixed cycles and control diagnostics to a minimum of board level. The CNC shall direct machine functions from command data stored in memory. The program data shall be input by the category 6 (CAT 6) cable. The control shall initiate a halt and error signal should a faulty condition occur in the control. The control shall function in ambient temperatures ranging from 30 to 120° Fahrenheit, and humidity ranging from 5 percent to 95 percent non-condensing. The control shall automatical1y shut down when internal operating temperature exceeds safe operating temperature. The control shall have a look ahead feature. The controller shall have a program memory capacity of minimum of 6 GB. Smallest increment unit for X Y Z shall be 0.00001 controller shall be ISO programming compatible and include the following options.

a. Variable Spindle Rotation Software

b. Text Engraving Function

c. Re-Threading Function

d. Gear Hobbing Function option

e. Multitool

f. Alternating speed

g. Retraction Cycle

h. Easy Tool Monitor

i. Keyway broaching

j. Optional block skip

k. Variable speed thread cutting

2.2.20. Chip Removal: The machine shall include a chip removal system. The system shall include a Right discharge Hinge Belt Conveyor. The system shall separate the chips from the coolant, move the chips into a hopper and allow the coolant to return to the coolant reservoir with intermitted operation capability.

2.2.21. Oil skimmer: Shall posses belt type

2.2.22. High Pressure Coolant System: A high pressure and flood type coolant system shall be provided. The coolant system shall include a sump or reservoir a piston driven pump and all necessary piping. The system shall have a means for draining and cleaning. Means shall be provided to permit the operator to direct and control the amount of coolant over the entire work area. The high-pressure coolant system shall operate at a minimum of 1000 PSI with a 96.6 gallon reservoir and coolant gun for wash down

2.2.22.1. Coolant Mist Collector / Extractor: Mist Collector Interface (Duct Only, Φ 5.91 inch.) I/F for mounting the mist collector that collects, absorbs and dehydrates mist, dust particles and oily fumes generated during machining using the filter. This specification includes the duct from the duct hose outlet to the machine body only. The mist collector, duct hose, drain hose, stand, fixture and electrical components set are not included.

2.3. <u>Operating Systems/Software:</u>

2.3.1. Control: Mitsubishi_M730UM with CELOS the follow functions/abilities:

2.3.1.1. CELOS shall facilitate machine operation, shall be networked with CAD / CAM products, open to forward-looking CELOS APP extensions, uniform interface, integrated management, documentation and visualization of order, process - and machine data.

2.3.1.2. Screen / Panel: shall have 21.5 "ERGOline Touch ® control with multi touch screen and 15.6” TFT coloe LCD. Multi touch machine control panel. Stepless adjustment of screen and machine control panel. Display of access permission.

2.3.1.3. SMARTkey ®: shall allow personalized authorization of the operator, customized access rights to the control and the machine with Internal USB memory.

2.3.1.4. APP SELECTOR: shall have central selection mask for direct access by means of intuitive touch control and access to all available applications, divided into five major groups: Production, Accessories, Support, Monitoring, Configuration.

2.3.1.5. APPs "Production" CONTROL: shall be equipped with MAPPS system with touch screen operation, 6 function window-set for easy access to the machine information. Machine operation scene-based automatic window-set change.

2.3.1.6. JOBMANAGER: shall have the ability for systematic planning, managing and preparing orders, machine-related creation and configuration of new

orders, structured storage of all production-relevant data and documents, simple visualization of jobs including NC programs and resources.

2.3.1.7. JOB ASSISTANT: shall posses the ability to show and have complete jobs / processing of orders, menu driven set-up of the machine and processing of production orders in the dialog, reliable error prevention through notes with binding acknowledgement function.

2.3.1.8. APPs " accessories" TECH CALCULATOR: shall have calculating technology data, dimensions and values, material - and process-dependent calculation process optimized, data for example for speed, feed, or spindle load, standards-conforming discovery defined dimensions, providing data/dimensions as required by the standards for example, for Fits or thread with Scientific calculator.

2.3.1.9. CAD-CAM-VIEW: shall be able to visualize workpieces and be able to optimize program data, direct remote access to external CAD/CAM-computer, central master data as the basis of the part visualization, immediate change options for processing steps NC programs and CAM strategies directly to the control.

2.3.1.10. DOCUMENTS: shall have a digital library of full-text search, clear library structure for easy and quick orientation, digital storage of all machine-relevant manuals, documentations and customer data, full text search and bookmark feature for recurring lookup fields.

2.3.1.11. ORGANIZER: shall have calendar, and memo functions, user-defined messaging functions, individual messages with SMART key ® Identification.

2.3.1.12. APPs " support" NETSERVICE: shall posses the ability to obtain qualified support through Web-based remote diagnosis, remote communication with the service of DMG MORI SEIKI directly at the control unit, online troubleshooting and technical support via Internet highest data security through VPN access.

2.3.1.13. MACHINE CHECK: shall have controlled maintenance and repair of the machine, process-based login system for maintenance with control function and preventative service and maintenance planning.

2.3.1.14. APPs "Monitoring" STATUS MONITOR: shall have machine status in real time, visualization of machine condition (spindle load,...), displaying job information with quantity, lot size and term to maturity, maintenance messages and warnings and energy return feed display.

2.3.1.15. APPs " configuraton" ENERGY SAVING: shall have automated energy management, categorized balance display for different machine States (Hold, ready for operation, processing), Programmatic Shutdown, WarmUp and StandBy functions for machine, pneumatic, screen and lighting of workroom utilization - and time-based process analysis as base of the consumption optimization.

2.3.2. USB Connections: The machine shall include a minimum of one (1) functional USB port. The port shall be configured so as to transfer machine programs to and from the control.

2.3.3. Network Interface for EtherNet/IP: An Ethernet network interface utilizing a CAT 6 cable Connection shall be provided to allow machine to be connected to DNC system. To include Interface for bar feeder (EtherNet/IP Interface) with terminal block for power supply, TYPE5

2.3.4. Signal lamp 4 colors (Red, yellow, green, blue)

2.4. <u>Size and Capacity</u>: The size and capacity of the CNC machine shall be not less than specified in table 1.

TABLE I

CAPACITIES (Minimum)	
O.D. Cutting Diameter (max) For35mm(1.4in.) overhang of O.D. cutting tool	14.4 inches
O.D. Cutting Diameter (max) For40mm(1.5in.) overhang of O.D. cutting tool	14.0
Turning length max	27.7 inches
Standard bar capacity	2.5 inches
X Axis Rapid Traverse Rate	1181.1 ipm
Y Axis Rapid Traverse Rate	393.7 ipm
Z Axis Rapid Traverse Rate	1181.1 ipm
B Axis Rapid Traverse Rate (forward/backward)	270 / 780 ipm
Second Spindle	1181.1 ipm
MAIN SPINDLE (Left)	
Chuck size	10 inches
Speed	4000 RPM
Min. spindle indexing angle	0.001°
Spindle drive motor cont	30 HP
Torque cont	300 ft-lbf. Min.
Spindle bore	3.58 inches
Spindle nose	JIS A2-8
C axis Spindle	Infinite programmable control of the axis
C Axis	0.001°
C axis Spindle	Infinite programmable control of the axis
C Axis resolution	0.001”

SWING DIAMETER	
Maximum swing bed	36.2 inches
Swing over cross slide	29.2 inches
TAILSTOCK	
Right Spindle tailstock specifications	
Feedrate forward / retract	275.6/787.4 ipm
Tailstock travel	28.9 inches
SECOND SPINDLE (Right)	
Chuck size	6 inches
Speed	6000 RPM
Motor rating cont	10 HP
Min. spindle indexing angle	0.001°
Through-spindle hole diameter	1.69 inches
Tool Spindle Torque	39ft-lbf. Min.
Spindle nose	JIS A2-5
TRAVELS	
X Axis	10.2 inches
Y Axis	2.0 inches
Z Axis	31.3 inches
B Axis right spindle	28.9 inches
C Axis	360 continuous programmable
TOOL TURRET "Y"-axis	
Turret Stations	12
Tool shank	1 inch
Rotary tool machining ability	drill Φ (dia.1.02 inch.), tap M20
Rotary tool spindle output	5 HP cont
Rapid traverse rate	393 ipm
Travel	1.97 inches
Rotary tool Spindle	10,000 RPM
Rotary Tool Spindle	10.33 ft·lbf cont
Air Blast	Equipped
Overhang of O.D. cutting rotary tool	Equipped

2.5. <u>Alignment And Accuracy Tolerances</u>: The alignment and accuracy tolerances of the CNC machine shall be as specified in table II

TABLE II

Characteristic	Accuracy
Positioning X,Y,Z	±0.0001" inches full travel
Repeatability X,Y,Z	±0.0001" inches

2.6. <u>Tooling</u>: The following additional equipment shall be provided with the machine

2.6.1. Tool Holders(Bolt On Type): Machine shall be provided with the following tool holders.

l. Turning Holder (2 ea.)
m. Facing Tool Holder (2 ea.)
n. Cut Off Tool Holder (2 ea.)
o. Boring Bar Holder 1-1/2" I.D (1 ea.)
p. U-Drill Holder 40 MM ID (1 ea.)
q. Offset V-Type Mill Holder :(1-2 Ratio) 10,000 RPM Thru Coolant (1 ea.)
r. H-Type Milling Holder: :(1-2 Ratio) 10,000 RPM Thru Coolant (1 ea.)

2.6.2. Probing: Machine shall be provided with radio signal transmission type touch sensor, Renishaw RMP40M/LP2 Probe Kit

2.7. <u>Additional Requirements</u>:

2.7.1. <u>Lubrication Plate</u>: Lubrication plate shall be permanently and securely attached to each machine. The information provided on the plate shall be as 1isted below.

a. Points of lubricate application
b. Type of lubricant
c. Servicing interval
d. Military or Federal specification for each lubricant (if applicable)
e. Size and type of each lubricant filter

2.7.2. <u>Nameplate</u>: A nameplate shall be permanently and securely attached to each machine the information provided on the plate shall be as 1isted below.

a. Nomenclature
b. Manufacturer's name
c. Manufacturer's model designation
d. Manufacturer's serial number
e. Power input (volts, total amps, phase, frequency)
f. Amp rating of 1argest motor
g. Short circuit/over-current protection rating
h. Contract Number or Order Number
i. National Stock Number or Plant Equipment Code
j. Date of manufacture

2.7.3. <u>Technical Manuals</u>: Three (3) complete sets of technical manuals covering operation, service and maintenance, and part-listing shall be provided.

2.7.4. Training: The contractor shall provide training to familiarize Norfolk Naval Shipyard personnel with the equipment and to help ensure reliable performance and maximum service life, during normal usage. The training shall be performed at customer facility between 7:20 am and 3:50 pm excluding any federal holidays.

2.7.4.1. Operator / Programmer On-Site Training: Training shall be provided at the receiving activity. Training shall include preparation of part programs, and preparation of equipment for safe operation. The trainees shall be provided instruction for all aspects of machining operations. Trainees shall be provided instruction for the care, use and operation of all attachments and accessories. Training shall be provided for four (4) operators/programmers. The training period shall not be less than four (4) consecutive, eight (8) hour work days. A training manual (which could be an additional operator's manual) shall be provided for each student

2.7.4.2. Maintenance Personnel: Maintenance training shall include trouble-shooting and methods of correction if the equipment malfunctions, with particular emphasis on minimizing equipment down time. Training shall cover troubleshooting and maintain the machine. The training period shall be incorporated into Operator / Programmer On-Site Training.

2.8. INSTALLATION

2.8.1. Installation/Foundation Drawings: Not later than sixty (60) calendar days after effective date of contract; installation requirements and drawings shall be provided to Norfolk Naval Shipyard TPOC.

2.8.2. Location: Machine shall be installed inside Bldg.171 3rd floor NNSY (Norfolk Naval Shipyard, Portsmouth, VA 23709).

2.8.3. Mechanical Installation: The Contractor shall provide all labor, fluids, (with the exception of coolant) piping, interconnecting hoses, and any other materials to move, locate, set level, align, lubricate, and make ready to operate all equipment required by this contract. All machinery shall be installed to original manufacturer's tolerances.

2.8.4. Electrical Installation: The Contractor shall provide all labor, wiring, cables, disconnects, connectors, breakers and any other materials for complete installation of any necessary electrical equipment and electrically connect machine to building.

2.8.5. Installation Coordination - The contractor shall coordinate the proposed installation schedule with the Technical Point of Contact within 10 days after award of contract. The installation schedule shall be subject to approval of the receiving

activity. Approval of the installation schedule shall not relieve the contractor of any responsibility for performance.

3. QUALITY ASSURANCE PROVISIONS – Inspection and acceptance of the supplies, performed at destination by Code 983 and shall consist of type and kind; condition; operability, if readily determinable; preservation; packaging.

4. FACILITIES ENTRY REQUIREMENTS:

4.1. **Initial Entry:** Contractor provide a SECNAV 5512 and a CNRMA Installation Access Screening Request form that will be provided by the technical point of contact. These documents will be endorsed by the TPOC and forwarded to the NNSY Pass Office. Contractor shall submit documents approximately two weeks before arrival.

4.2. **Vehicle Entry:** The company name shall be displayed on each door of the Contractor's vehicles in a manner and size that is clearly visible. All vehicles shall display a valid state license plate that complies with State Vehicle Code. Vehicles shall meet all other requirement of the State Vehicle Code, such as safety standards, and shall carry proof of insurance and state registration. Passes will be issued for vehicles to enter the shipyard. A separate pass is required for entering the Controlled Industrial Area (CIA).

4.3. **Portable Electronic Device (PED):** In accordance with COMSUBLANT/COMSUBPACINST 2075.1C, the use of Portable Electronic Devices (PEDs) while in or on Department of Navy Controlled Industrial Areas are prohibited. A portable electronic device (PED) is defined as any non-stationary electronic apparatus with singular or multiple capabilities of, but not limited to recording, storing, and/or transmitting data, voice, video, or photo images e.g.: cell phones, laptops, tablets and wearable devices such as fitness bands and smart watches.

4.4. **TECHNICAL POINT OF CONTACT:**

4.4.1. To Be Determined (TBD)

INSTALLATION RESPONSIBILITIES

Government	Contractor	
(XX)	( )	a. Provide machine foundation in accordance with the manufacturer's design requirements.
( )	(XX)	b. Furnish labor and material handling equipment for off-loading and placing item on foundation.
( )	(XX)	c. Provide and install anchor bolts and nuts.

( )	(XX)	d. Set and rough level the machine on its foundation.
( )	(XX)	e. Level and align machine.
( )	(XX)	f. Connect machine to the provided utilities hook-up.
( )	(XX)	g. Provide all necessary tools, gages, and instrumentation necessary to perform the required tests.
( )	(XX)	h. Provide and charge all systems with fluids in accordance with manufacturer's instructions.
(XX)	( )	i. Material for performance testing at Government facility.
( )	(XX)	j. Material for performance testing at Contractor's facility.

GOVERNMENT RESPONSIBILITIES

( )	(XX)	Provide utilities hook-up within 20 feet of the machine