

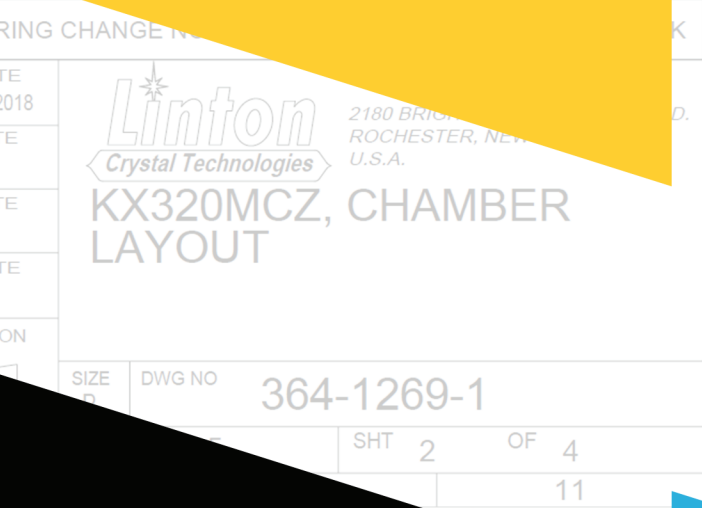


KX320MCZ

Semiconductor Crystal Growing Furnace

MACHINE SPECIFICATION

DOCUMENT #374-9320L-1



2180 BRIGHTON HENRIETTA TOWN LINE ROAD
ROCHESTER, NEW YORK 14623
U.S.A.

KX320MCZ, CHAMBER LAYOUT

SIZE	DWG NO	364-1269-1
	SHT	2 OF 4
		11



LCT CONFIDENTIAL MATERIAL



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1. General Machine Specifications

- All piping is labeled for flow direction and material within.
- The machine can be purchased with one of the following configurations:
 - KX320 MCZC – Magnet capable which allows for future addition of a magnet and magnet lift system
 - KX320 MCZR – Magnet ready which includes all magnet lift components – only the magnet and magnet power supply are not included
 - KX320 MCZ – Machine complete with magnet and magnet lift system

Note: *A throat cooling tube is not included. This can be a future retrofit*

- The machine can be supplied with the following options (please consult LCT sales for additional information)
 - Cathetometer
 - Maintenance platform and ladder for accessing seed lift
 - Hot zone design
 - Oxide filters
 - Vacuum pumps
 - Throat cooling tube
 - Internal feeder
 - Maintenance kit
 - This kit can include various alignment and service tools for maintaining and installing the machine and hot zone. Configurations can be customized to suit customer needs and requirements.
 - Spare parts kit
 - This kit can be configured in many levels to suit customer needs and requirements

****Note:** *Specifications denoted with "TBD" indicate that the data is "To Be Determined" and will be verified at a later date.*

2. Physical and Performance Specifications

Features of Systems and Major Assemblies

2.1. GROWTH CHAMBERS

All growth chambers are constructed of 304L and 316L stainless steel, and they are double-walled for water jacket cooling. All chamber welds are inspected for defect-free condition and are dye penetrant tested. Chamber water jackets are leak checked with a helium mass spectrometer and are hydrostatically pressure tested. See Section 3.0 for drawings.

2.1.1. BASEPLATE

The baseplate is the flat bottom of the growth chamber. It has a center bore for the crucible shaft, four (4) ports for evacuation and one (1) for pressure sensors, and six (6) electrode feedthroughs.

Electrodes.....	(4) main heater (2) bottom heater
Electrode port diameter	78 mm (3.07")
Electrode material	OF Copper, water-cooled
Vacuum ports	(4) 150 mm (5.91")
Center bore	164 mm (6.45")

2.1.2. FURNACE TANK

The furnace tank is an open cylinder with flanged ends. The tank has one (1) pyrometer port for heater temperature measurement. There are no tabs on the I.D. of the furnace tank.

Furnace Tank I.D.	1275 mm (50.2")
Furnace Tank height	1364 mm (53.7")
Pyrometer port location.....	836 mm (32.9") above baseplate

2.1.3. FURNACE TANK COVER

The furnace tank cover has a domed shape, making a transition between the furnace tank and the receiving chamber. Two argon inlet ports are provided in the cylindrical neck of the cover (located opposite of each other in the throat area).

Inside diameter	1275 mm (50.2")
Tank cover throat I.D.....	420 mm (16.5")
	(other sizes available on request)
Camera viewport.....	75 mm (2.95") round
Operator viewport.....	64 mm x 350 mm oval
Feeder port	150 mm (5.9") round
Shield lift ports	(2) 70 mm (2.75") round

2.1.4. COOLING TUBE

A throat cooling tube is not included with this machine configuration, but can be added as an option or retrofitted at a later date.

2.1.5. ISOLATION VALVE

A pendulum style valve is located in a separate isolation chamber, to isolate the receiving chamber from the growth chamber. The isolation valve maintains furnace tank pressure and temperature conditions while allowing operator access to the receiving chamber.

There is a hinged rear door for access and cleaning.

The valve plate is lifted, lowered, and rotated using pneumatic actuators. The lift cylinder applies a positive force to the valve plate when in the down position.

Ports	(1) Ø60 mm viewport in front
Isolation Valve Throat I.D.....	400 mm (15.75")

2.1.6. RECEIVING CHAMBER

The receiving chamber is a cylindrical enclosure above the isolation valve. There is a hinged access door located at the lower portion of the chamber.

Receiving Chamber I.D..... 400 mm (15.75")

Receiving Chamber Height 3700 mm (145.7")

Ports..... (2) Seed sensing ports
(1) 38mm viewport in access door

Lower Door opening..... 350 mm square (13.8")

Upper Door opening 200 mm round (7.9")

2.1.7. LEVELING ADAPTER

The leveling adapter is the assembly that closes the top of the upper receiving chamber and supports the seed lift. The top flange is adjustable to allow the seed rotation axis to be plumbed vertical. The leveling adapter has one port where argon is introduced, one for the melt pyrometer, and one port for the auxiliary vacuum. A 0-1000 torr manometer is connected to report chamber pressure above the isolation valve when the valve is closed.

2.2. CHAMBER LIFT APPARATUS

Operators can raise chamber sections off the furnace baseplate (for furnace charging and maintenance) using the grower lift controls. Column mounted hydraulic cylinders vertically move the chambers for service and access.

Chamber lift equipment includes a dedicated hydraulic pumping unit and connecting hoses, collectively referred to as the Hydraulic System, providing power to the lift cylinders. Flow fuses stop hydraulic oil flow if rate is excessive.

See **Section 3.0** for drawings and schematics.

2.2.1. RECEIVING CHAMBER LIFT

The receiving chamber lift raises either the receiving chamber or the receiving chamber and tank cover (when the tank cover is coupled using the user selectable locking ring).

The receiving chamber lift is rotated to the side by an electric motor, controlled from an operator pendant.

Receiving Chamber Lift, Total Vertical Travel 810 mm (31.9")

2.2.2. FURNACE TANK LIFT

The Furnace Tank Lift is rotated to the side by an electric motor, controlled from an operator pendant.

Furnace Tank Lift, Total Vertical Travel..... 1450 mm (57.0")

2.3. CRUCIBLE LIFT MECHANISM

This lift mechanism utilizes a slide way and Acme lead screw for vertical motion of the rotating parts, assuring rigidity and accuracy and eliminating back-drive effects. A stepper motor drives the lead screw through a gear reducer and reinforced-belt drive train for both jog and process speeds. A stainless steel bellows maintains a vacuum seal through the full range of vertical motion.

Electrical limit switches inhibit operation of the lift motor at the extremes of lift travel.

A DC servomotor rotates the crucible shaft through a gearbox and multi-V-belt drivetrain, providing high torque without introducing vibration. The shaft rotation seal is a magnetic fluid type. Jacking screws are provided to center the crucible shaft in the baseplate.

A pneumatic brake is supplied to lock the shaft for hot zone removal needs.

2.3.1. OPERATING SPECIFICATIONS

Load Rating (at crucible lift shaft)..... 800 kg (1,763 lbs)

Lift Speed and Accuracy... 0-127 mm/hr (0-5.0 in/hr) \pm 1% of reading,
or \pm 0.25 mm/hr (0.01 in/hr),
whichever is greater

Jog Speed (nominal)..... 127 mm/min (5 in/min)

Total Vertical Travel..... 850 mm (33.5")

Rotation Rate and Accuracy0-12 RPM \pm 1% of reading, or
 \pm 0.03 RPM, whichever is greater

2.3.2. CRUCIBLE SHAFT

The crucible shaft is a hollow, water-cooled, rigid spindle constructed of 303 stainless steel. Its end mount is specially designed to eliminate loosening of the loaded graphite pedestal when hot. The coolant supply to the shaft comes through a rotary union.

Cylindrical diameter above rotation seal 120 mm (4.72")

2.4. SEED LIFT MECHANISM

This lift mechanism is an evacuated aluminum enclosure that houses a translating spool, and a pulley suspended from a loadcell to measure the weight on the cable. The lift housing rotates about a hollow vertical shaft; its on-board circuitry connects with the rest of the system through a slip ring assembly. The load cell signal is digitized before being transmitted through the slip ring to minimize signal losses. The mechanism is statically balanced to provide vibration-free operation throughout its range of rotation rates. The lift spool driveshaft and housing rotation seals are a magnetic fluid type.

A stepper motor coupled to a gear reducer drives the cable spool for both process and jog speeds. A DC servomotor rotates the lift housing through a gearbox and multi-V-belt drive train, providing high torque without introducing vibration.

The seed lift limit switches and encoder are located outside of the vacuum.

Remote operation of the lift motor is provided on the same operator pendant used for the receiving chamber motion.

2.4.1. OPERATING SPECIFICATIONS

Load rating (at seed cable interface).....	600 kg (1,322 lbs)
Lift Speed and Accuracy	0-508 mm/hr (0-20 in/hr) \pm 1% of reading, or \pm 0.51 mm/hr (0.02 in/hr), whichever is greater
Jog Speed (nominal).....	400 mm/min (15.7 in/min)
Total Usable Vertical Travel	8700 mm (342") (based on using maximum cable length)
Rotation Rate and Accuracy	0-20 RPM \pm 1% of reading, or \pm 0.05 RPM, whichever is greater

2.4.2. SEED CABLE

The machine is supplied with a counter-wound tungsten cable assembly. The cable, ball ends meet military specifications, and are proof load tested to 653 kg (1440 lb).

Nominal diameter	4 mm (.157")
Maximum cable length	10,546 mm (415.2")
Supplied cable length	Per customer requirements

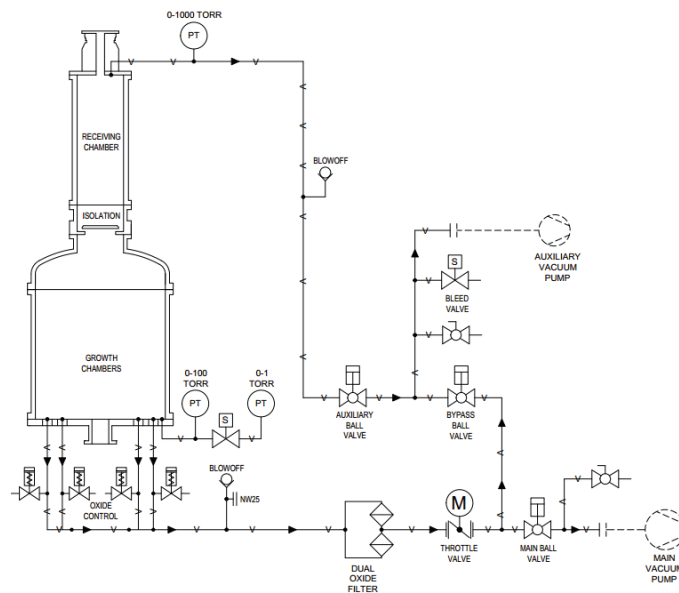
NOTE: Cable load capacity decreases with use.

2.5. SHIELD LIFT

The machine is designed to accommodate a two-point shield lift mechanism on the tank cover. The position of the shield can be controlled via the touchscreen in manual mode, and also via the computer in automatic mode. A ramp table is used to control the motion in automatic mode. The two shield lift ports are 180 degrees apart on the furnace tank cover.

Lifting capacity 200 kg (441 lbs)
Nominal Speed 68 mm/min (2.68 in/min)
Max. Stroke 400 mm (15.7 in)

2.6. VACUUM SYSTEM



System components are constructed of stainless steel. The system valves are high vacuum, pneumatic-driven ball valves.

2.6.1. MAIN VACUUM SYSTEM

The main vacuum system provides the tubing and valves to evacuate from the baseplate to the leveling adapter or, if the isolation valve is closed, the growth chambers only. The system includes a throttle valve for chamber pressure control that is independent of gas flow. An NW25 flange and blank off have been added to the main vacuum line at the back of the grower for leak checking and vacuum cleaning. The flange for the main vacuum pressure relief (blowoff) is designed to be above the operator floor for easier access for cleaning. The four (4) vacuum lines are water cooled where they attach to the baseplate to preserve the o-ring seals.

Line size O.D.....	152.4 mm (6.0")
Line size O.D.-After the first tee	101.6 mm (4.0")
Line size O.D. at connection point.....	101.6 mm (4.0")
Valve size (Full port ball valve)	100 mm (4.0")
Throttle Valve bore	63 mm (2.48")

2.6.2. AUXILIARY (RECEIVING CHAMBER) VACUUM SYSTEM

The auxiliary vacuum system provides the tubing and valves to evacuate the receiving chamber and to equalize its pressure with furnace tank pressure during isolation.

The flange for the auxiliary vacuum pressure relief (blowoff) is designed to be above the operator floor for easier access for cleaning

The system features a stainless steel flex line, maintaining a flexible connection to the receiving chamber when raised and rotated.

Auxiliary system line O.D.	38.1 mm (1.5")
Valve size (Full port ball valve)	38.1 mm (1.5")

2.6.3. BYPASS BALL VALVE

A bypass valve is installed in order to provide vacuum to the growth chambers if the main vacuum pump is not operational.

Valve size (Full port ball valve)	76.2 mm (3.0")
---	----------------

2.6.4. VACUUM GAUGES

Two (2) electronic manometers report chamber pressure below the isolation valve within the ranges of 0-1 torr, and 0-100 torr. The connecting tubing for the gauges below the isolation valve is 3/4" [19.1 mm] diameter to help prevent clogging.

A 0-1000 torr manometer is connected to the leveling adapter to report chamber pressure above the isolation valve when the valve is closed.

2.6.5. OXIDE CONTROL SYSTEM

The main vacuum system is equipped with four (4) air injection valves for oxide control. Actuation of the valves can be controlled by the recipe. The valves are located on the vacuum lines below the baseplate.

Flow rate:.....	Fixed at approximately 5 liters/min or less from each injector
-----------------	---

2.6.6. OXIDE FILTER

A dual canister oxide filter assembly will be provided with the system.

2.6.7. MAIN VACUUM PUMP

Optional – consult with LCT sales for available options.

2.6.8. AUX. VACUUM PUMP

Optional - consult with LCT sales for available options.

2.6.9. VACUUM INTEGRITY

The system passes testing with a helium mass spectrometric leak detector at a sensitivity of 1×10^{-8} cm³ (standard atmosphere)/sec. The control system automatically performs a rate-of-rise test of the furnace after each pumpdown state before proceeding with heater turn-on and charge meltdown.

All static chamber seals are Viton O-rings.

Rotation seals for the seed lift and crucible lift assemblies are a magnetic fluid type.

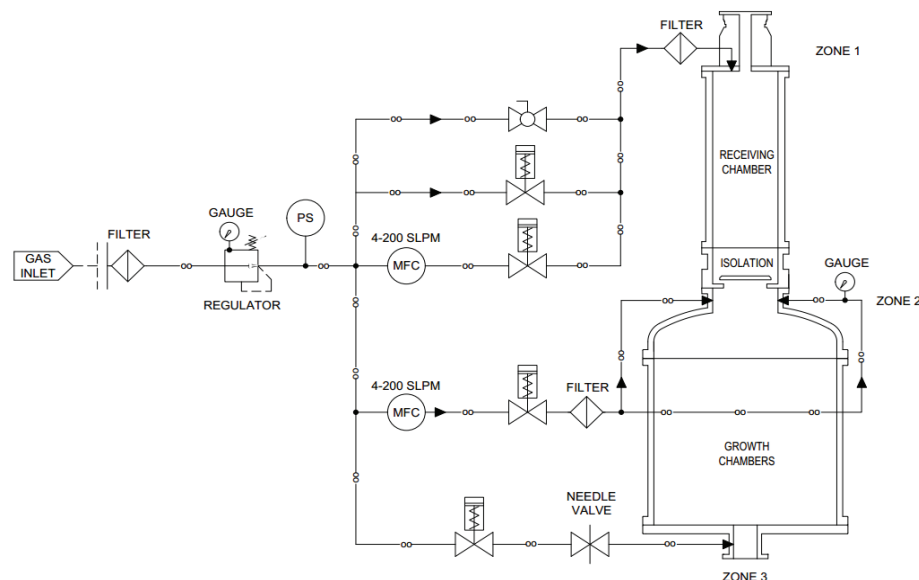
Nominal vacuum..... 25 mtorr typical

(Value is a function of the pump as well as the grower vacuum system)

Leak rate (rate of pressure rise).....50 mtorr / hr

2.7. ARGON SYSTEM

The system introduces process gas through a mass flow controller into the furnace at several points during growth runs.



The Argon distribution points are as follows:

2.7.1. ZONE 1: LEVELING ADAPTER

Argon that is distributed from the leveling adapter issues from an annular baffle, minimizing turbulence in the chamber. There are (3) valves that allow flow to this entry point.

Valve 1: Manually actuated

Valve 2: Automatically actuated, non-mass flow controlled

Valve 3: Automatically actuated with mass flow control

2.7.2. ZONE 2: TANK COVER THROAT

Diffusers are incorporated into the two (2) argon connection points located 180° apart on the neck of the tank cover.

Valve 4: Automatically actuated with mass flow control

2.7.3. ZONE 3: BASEPLATE NECK

An automatic valve and needle valve are provided in the line to supply controlled argon flow to the connection on the neck of the baseplate center port.

Valve 5: Automatically actuated, non mass flow controlled.

2.7.4. COMPONENTS

2.7.4.1. Argon Filters

An argon filter is provided at the facility inlet to capture potential contamination in facility lines before it enters the grower.

Argon filters are also provided at the (2) chamber entry points to reduce line contamination in the event of a backfill event.

2.7.4.2. Mass Flow Controller (MFC)

There are two (2) mass flow controllers in the argon system. They precisely control flow of argon gas into the growth chambers.

Gas flow range..... 4–200 slpm

2.7.4.3. Pressure Switch (PS)

A pressure switch monitors for a low pressure condition after the pressure regulator.

2.7.4.4. Valves and Regulators

Four (4) automatic valves in the argon panel assembly open and close the distribution lines that feed the various argon zones (see diagram below). A manual valve allows the operator to bypass the automatic valve and supply argon to the connections in the leveling adapter in the event of a power outage. A regulator is used before the mass flow controllers to ensure consistent gas flow at each machine.

2.7.4.5. Seals and Tubing

The argon system is constructed of stainless steel tubing and flexible stainless steel lines. The integrity of the argon system passes testing with a helium mass spectrometric leak detector at a sensitivity of 1×10^{-8} cm³ (standard atmosphere)/sec.

2.8. SUPERCONDUCTING MAGNET SYSTEM

The magnet system consists of (5) major components, the Magnet Coil, the Magnet Power Supply, Magnet Lift System and (2) Helium compressors.

The magnet coil contains superconducting skewed solenoid coils housed in a supporting enclosure that is attached to a lift mechanism.

The magnet encircles the furnace tank and provides a magnetic field that is focused on the melt during crystal growth. The focus level of the opposing fields is set to optimize crystal growing conditions just above the melt surface where the crystal is continually forming at the transition from liquid to solid crystalline state.

The operator varies the field strength by adjusting the magnet current using touch screen controls at the KICCS™ console. To control field strength during automatic growth KICCS™ adjusts current flow in the magnet coils per the SOP.

2.8.1. MAGNET COIL (MC)

Magnetic Field rating4,000 Gauss

Field Type Transverse

2.8.2. MAGNET COOLING (MHC)

Magnet cooling is achieved using two (2) closed loop helium compressors and (2) cold heads

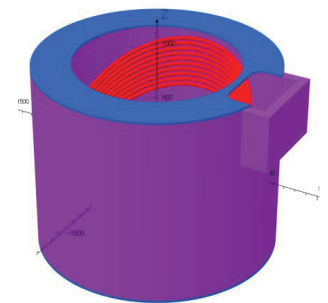
2.8.3. MAGNET POWER SUPPLY (MPSU)

The magnet power supply is a 19" rack mounted supply cabinet

2.8.4. MAGNET LIFT SYSTEM

The grower frame is designed to accept a magnet lift system. The lift system is supplied with the MCZ and MCZR configurations. It can be added later to MCZC configurations.

The magnet coil is raised up into position during growth. The magnet can only be operated within the range



2.9. PNEUMATIC SYSTEM

The machine requires clean compressed dry air to actuate several air-operated valves. Due to the fact that all of the pneumatic components (except the optional vacuum pump) only require small quantities of compressed air for short periods of time, the average flow rate is very small. A pressure switch (PS) monitors for low pressure conditions. See **Section 3.0** for pneumatic schematic.

2.10. PNEUMATIC SYSTEM

The system removes excess heat from grower components. Outlet sensors monitor coolant temperature and flow conditions. Heater power supply output will be disabled if minimum coolant flow conditions are not met. Surface sensors monitor the external temperature of the furnace and set off an alarm in case of malfunction. The main inlet manifold has a pressure relief for system overpressure.

Outlet coolant temperature sensor.....	Resistive device, triggering visible/audible warnings
Outlet coolant flow sensor.....	Normally open, interlocked with heater power supply control
Surface temperature sensors	bi-metal switches; 60° C (140° F) activation, triggering visible/audible warnings
System pressure relief.....	4.5 bar (65 psig)

2.10.1. COOLANT SYSTEM CONSTRUCTION

Inlet and outlet manifolds are constructed of stainless steel. Connecting hoses are terminated with brass fittings. Shutoff valves are included on all branch circuits to allow for easy maintenance and to reduce the flow of individual circuits, if desired. The cooled port covers on the tank cover are constructed of stainless steel.

2.11. CONTROL SYSTEM

The control system hardware is distributed in various points on the grower, and in a compact, caster-mounted unit known as the operator console. Grower operators control all signal processing and machine functions from the console.

The control system can run the entire crystal growth process automatically from pump-down to shutdown. When a situation requires operator intervention, audible and visible signaling draws attention and prompts specific actions.

Manual switches retain control over the on/off state of such safety critical elements as the power supply unit(s), vacuum pumps, and the hydraulic pump. The control system monitors the status of all process-related manual switches.

An un-interruptible power supply (UPS) is required to ensure control of the grower and a safe shutdown in case of a power failure.

2.11.1. COMPUTING HARDWARE

The main controller is a Siemens ® 300-series PLC. Complex control algorithms and recipe interpretation are performed by a separate fan-less, all-solid-state embedded computer. All program and data storage resides in flash memory.

The Krystal Vision diameter control system also resides in the embedded computer with hardware for communication and video acquisition. All program and data storage resides in flash memory.

A Microsoft Windows® compatible ancillary PC is provided for operation of the Windows based support programs.

2.12.2. MAGNET POWER SUPPLY (MPSU)
Output Power – Upper Coil 875 Amps @ 105 VDC

Output Power – Upper Coil 866 Amps @ 145 VDC

2.11.2. OPERATOR INTERFACE

Two LCD touch-panel displays are included in the operator console.

The first display provides the control interface and Krystal Vision. All control of the process and furnace hardware is performed at this interface. Operator interaction is via touch screen integrated with the display.

The second display is used for the Windows-based recipe editing software and ancillary programs. Operator interaction is also available via a separately mounted keyboard and pointing device.

2.11.3. CONTROL SOFTWARE

All system control is performed by custom software resident in the PLC and the main embedded computer, which also provides operator interface functions. Execution of the process recipe is also performed by the main embedded computer, using recipes loaded from the ancillary PC.

The ancillary PC is not directly responsible for any control functions.

2.11.4. ANCILLARY SOFTWARE

Software Interfaces:

Software supplied in the ancillary computer includes recipe editing and data collection capabilities.

Recipe Editing:

Recipes can be stored on an optional central WINGS server, with local editing and data monitoring functions provided at the ancillary computer. For stand-alone operation, a WINGSLite recipe editor is provided standard on the ancillary computer.

2.11.5. PROCESS TEMPERATURE CONTROL

An optical pyrometer measures temperature of the heater, providing for closed loop heat control.

Control loop performance: Heater temperature shall remain within $\pm 0.5^{\circ}$ C of any preset temperature after achieving control set point.

2.11.6. SEED POSITION SENSOR

The sensor assembly consists of optical and electronic equipment that sets up an object detection range across the lower part of the receiving chamber. When seed or crystal breaks the infrared beam, the sensor transmitter sends a digital input to the control system.

2.11.7. SEED TO MELT CONTACT SYSTEM

System circuitry monitors the seed during the entire growth process and senses when the seed is in contact with the melt. Process control algorithms use this signal for process sequencing and operator alerts.

2.11.8. KRYSTALVISION™ DIAMETER CONTROL SYSTEM

The diameter system uses a high-resolution camera assembly to watch a target range across the surface of the silicon melt. Video is transmitted to the Krystal

Vision computer via Gigabit Ethernet. Krystal Vision software performs measurements and preprocessing and communicates results to the process controller. Video display of crystal growth and measurement is provided.

Resolution of the measurement system is approximately ± 0.05 mm.

The diameter control system performance specifications are as follows (divided according to crystal section):

Shoulder	± 6 mm for the initial 40 mm over shoulder
Full body	± 2.5 mm over full length of straight body growth (Excluding initial 40 mm over shoulder)
Short term body	± 1 mm over 100 mm of straight body growth, measured between facets or perturbations through a uniform cross section.

NOTE: exceptions to the above specifications will occur when factors other than control loop functions cause straight body tapering in excess of 2 mm/m.

2.12. HEATER POWER SUPPLY

Power-regulated outputs provide unfiltered DC from a water cooled IGBT-controlled power supply. The system is designed for (4) live electrodes on the main heater and (2) live electrodes on the bottom heater.

Output power	200 kw @ 55 VDC 60 kw @ 40 VDC
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2.13. MACHINE AND COMPONENT WEIGHTS

2.13.1. MACHINE

Machine (less items in 2.13.3)	17,350 kg (38,240 lbs)
--------------------------------------	------------------------

2.13.2. RIGGING WEIGHTS OF ASSEMBLIES ON MACHINE

Below are the uncrated weights of assemblies that will need to be handled during installation. The values below are included in the total weight of the machine section listed above.

Main Frame assembly**	3780 kg (8,331 lbs)
Frame supports***	4300 kg (9,500 lbs)

Column assembly	4900 kg (10,800 lbs)
FT lift arm	394 kg (868 lbs)
Tank Cover/ ISO valve assembly	1016 kg (2,240 lbs)
Receiving Chamber	486 kg (1,071 lbs)
Furnace tank.....	825 kg (1,818 lbs)
Leveling adapter	78 kg (172 lbs)
Seed Lift	240 kg (529 lbs)

*** Main Frame assembly weight includes frame, chamber stand, baseplate, crucible lift, main vacuum system and magnet lift components.*

****Frame supports will consist of multiple pieces and will be assembled to the frame upon installation.*

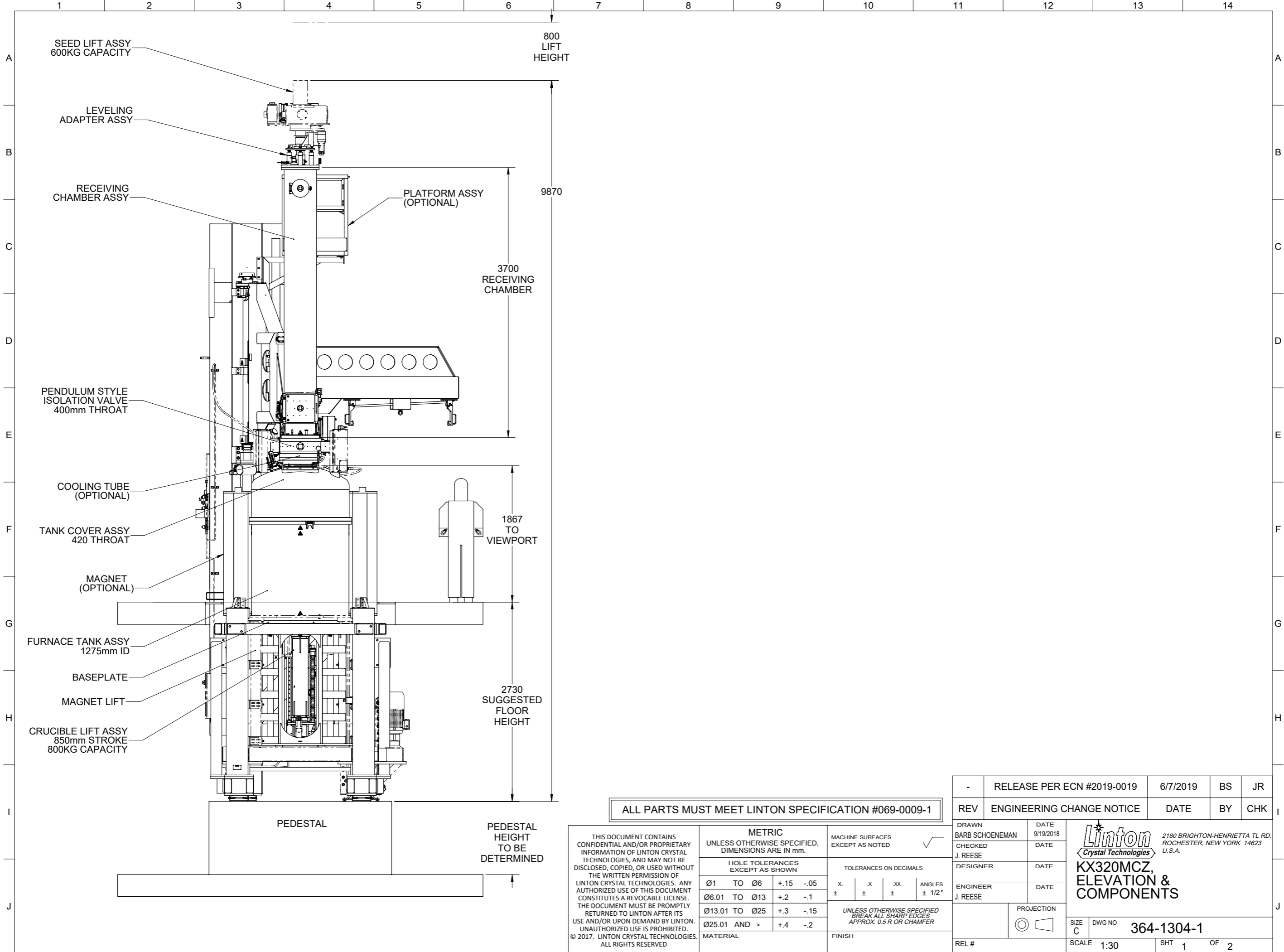
2.13.3. COMPONENTS (NOT INCLUDED IN MACHINE WEIGHT ABOVE)

Heater Power Supply	1405 kg (3,096 lbs)
Hydraulic Pump (w/ oil)	68 kg (150 lbs)
Main Contactor box.....	13 kg (29 lbs)
Control console.....	100 kg (220 lbs)
Magnet Coil.....	15,000 kg (33,060 lbs)
Magnet Power Supply Cabinet.....	200 kg (440 lbs)
Magnet Helium Compressor	(x2) 100 kg (220 lbs)
Cooling Manifold skid	122 kg (270 lbs)
Vacuum Valve skid.....	138 kg (304 lbs)
Dual Filter arrangement	440 kg (970 kg)

3. Drawings

Drawing Number

Elevation / Components KX170MCZ (sheet 1).....	364-1216-1
Elevation / Components KX170MCZ (sheet 2).....	364-1216-1
Chamber Layout, KX170 MCZ	364-1217-1
Electrode Layout KX170MCZ	364-1218-1
Pedestal and Floor Opening, KX170MCZ	364-0965-1
Control Console	364-1251-1



-	RELEASE PER ECN #2019-0019	6/7/2019	BS	JR
REV	ENGINEERING CHANGE NOTICE	DATE	BY	CHK
DRAWN	BARB SCHOENEMAN	DATE	9/19/2018	
CHECKED	J. REESE	DATE		
DESIGNER	J. REESE	DATE		
ENGINEER	J. REESE	DATE		
REL #		PROJECTION		
SIZE	C	DWG NO	364-1304-1	
SCALE	1:30	SHT	1	OF 2

ALL PARTS MUST MEET LINTON SPECIFICATION #069-0009-1

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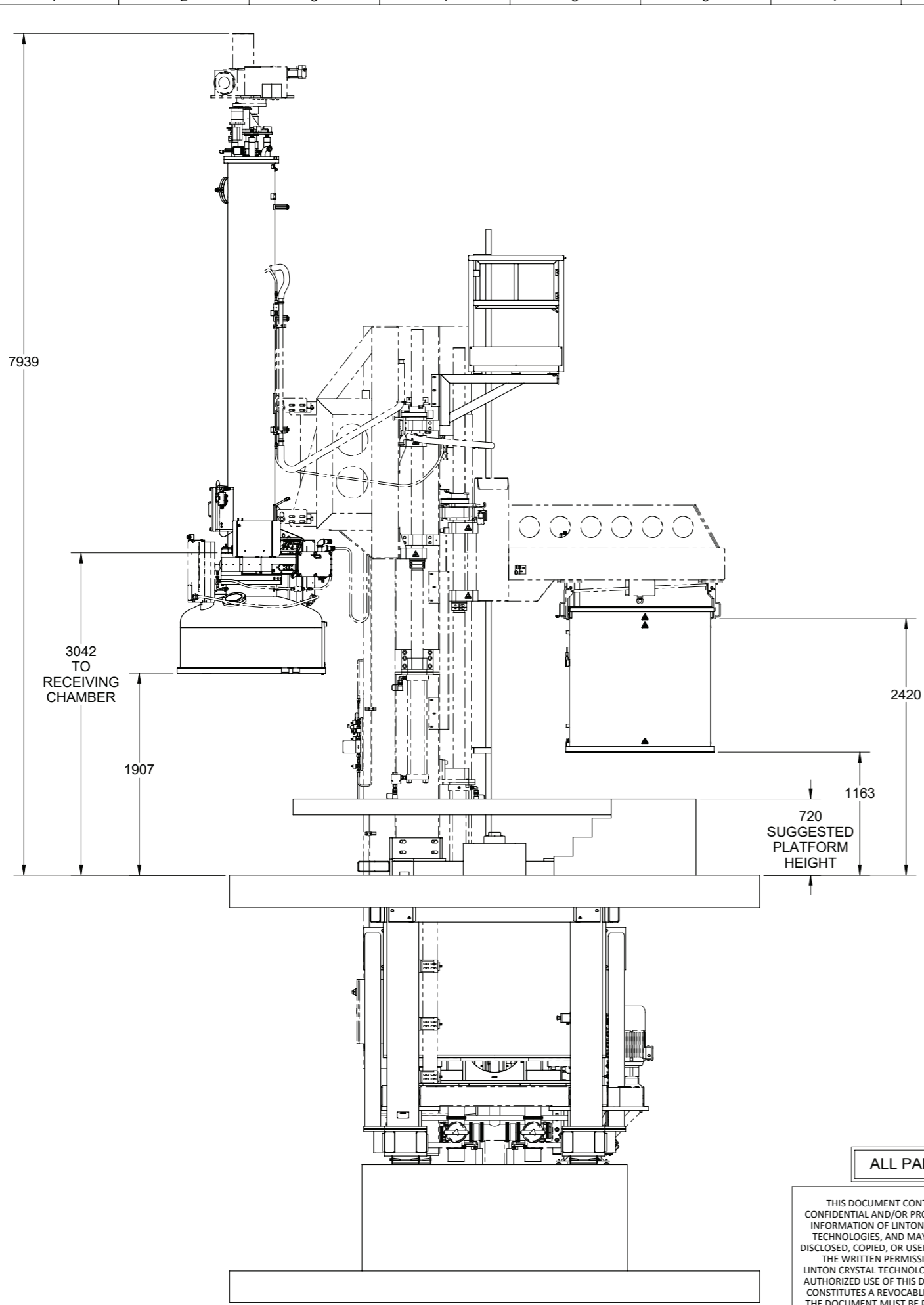
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HOLE TOLERANCES EXCEPT AS SHOWN			
Ø1 TO Ø6	+0.15	-0.05	
Ø6.01 TO Ø13	+0.2	-0.1	
Ø13.01 TO Ø25	+0.3	-0.15	
Ø25.01 AND >	+0.4	-0.2	
MATERIAL			

MACHINE SURFACES EXCEPT AS NOTED				<input checked="" type="checkbox"/>
TOLERANCES ON DECIMALS				
x	x	.xx	ANGLES	
±	±	±	± 1/2°	
UNLESS OTHERWISE SPECIFIED BREAK ALL SHARP EDGES APPROX. 0.5 R OR CHAMFER				
FINISH				

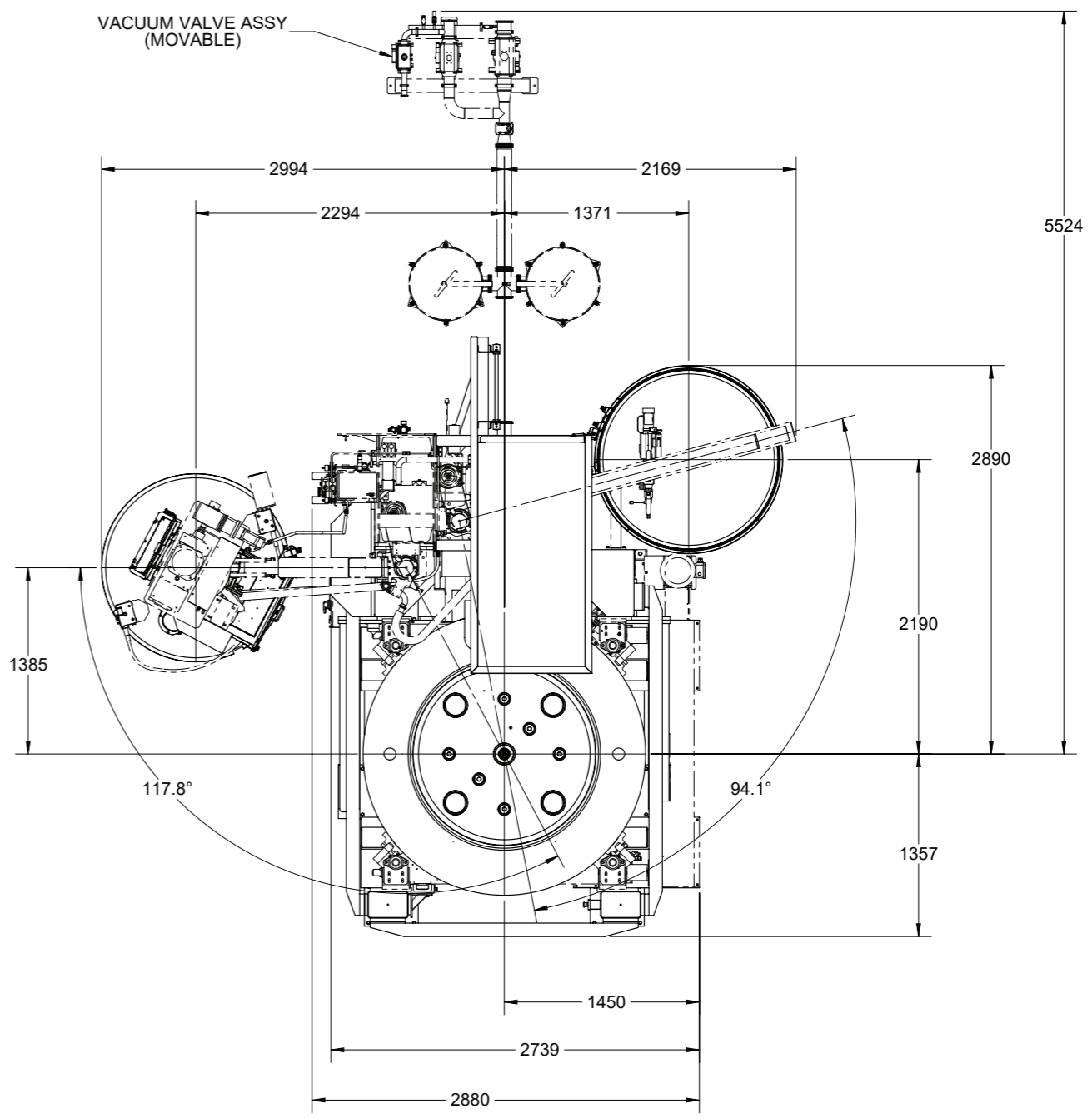
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U.S.A.

**KX320MCZ,
ELEVATION &
COMPONENTS**

A
B
C
D
E
F
G
H
I
J



FRONT VIEW
CHAMBERS OPEN



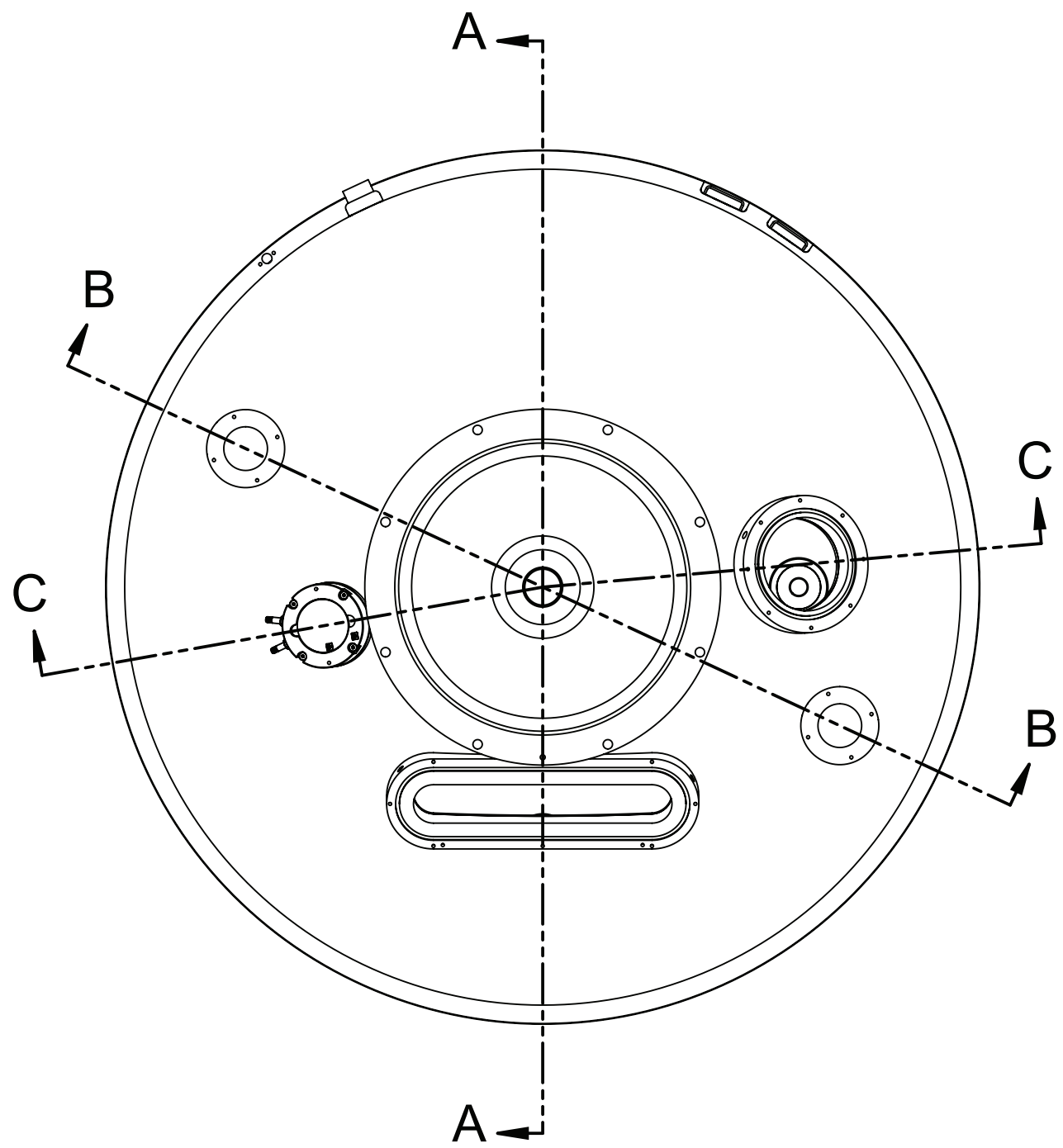
TOP VIEW
CHAMBERS OPEN

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METRIC		MACHINE SURFACES EXCEPT AS NOTED	
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN mm.		✓	
HOLE TOLERANCES EXCEPT AS SHOWN		TOLERANCES ON DECIMALS	
Ø1 TO Ø6	+0.15 -0.05	x.	x
Ø6.01 TO Ø13	+0.2 -0.1	±	±
Ø13.01 TO Ø25	+0.3 -0.15	xx	± 1/2°
Ø25.01 AND >	+0.4 -0.2	UNLESS OTHERWISE SPECIFIED BREAK ALL SHARP EDGES APPROX. 0.5 R OR CHAMFER	
MATERIAL	SEE BOM	FINISH	

REV	ENGINEERING CHANGE NOTICE	DATE	BY	CHK
DRAWN	DATE	 KX320MCZ, ELEVATION & COMPONENTS		
BARB SCHOENEMAN	9/19/2018			
CHECKED	DATE			
J. REESE		2180 BRIGHTON-HENRIETTA TL RD. ROCHESTER, NEW YORK 14623 U.S.A.		
DESIGNER	DATE			
J. REESE				
ENGINEER	DATE			
J. REESE				
REL #	PROJECTION	SIZE	DWG NO	
		C	364-1304-1	
		SCALE	SHT	OF
		1:30	2	2



-	RELEASE PER ECN #01659-66	12/21/2018	BS	JR
REV	ENGINEERING CHANGE NOTICE	DATE	BY	CHK
DRAWN	BARB SCHOENEMAN	DATE	8/2/2018	
CHECKED	J. REESE	DATE		
DESIGNER		DATE		
ENGINEER	J. REESE	DATE		
REL #	PROJECTION	SIZE	DWG NO	
		B	364-1269-1	
	SCALE	1:10	SHT	1 OF 4

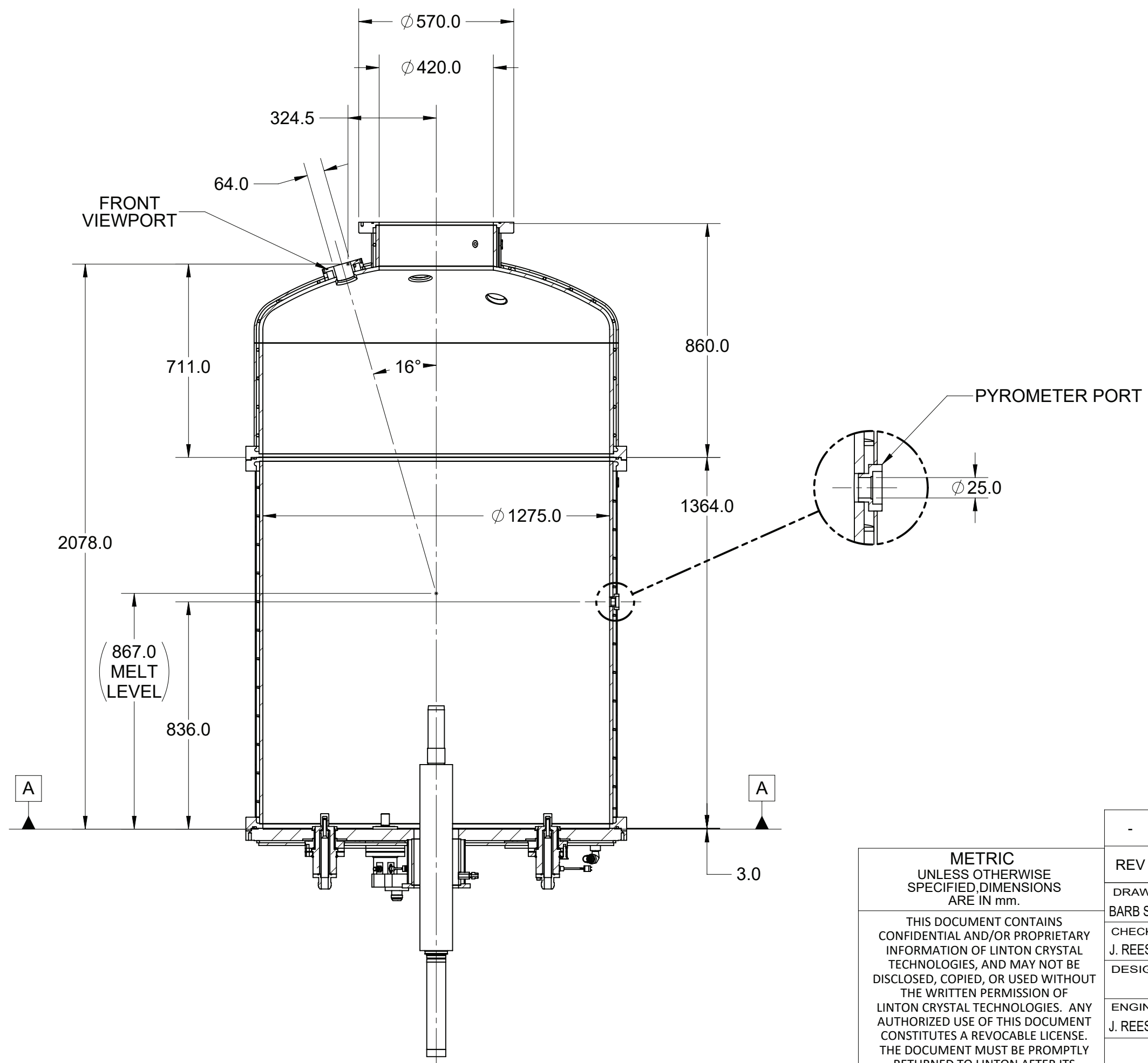
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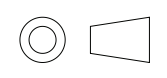
KX320MCZ, CHAMBER LAYOUT

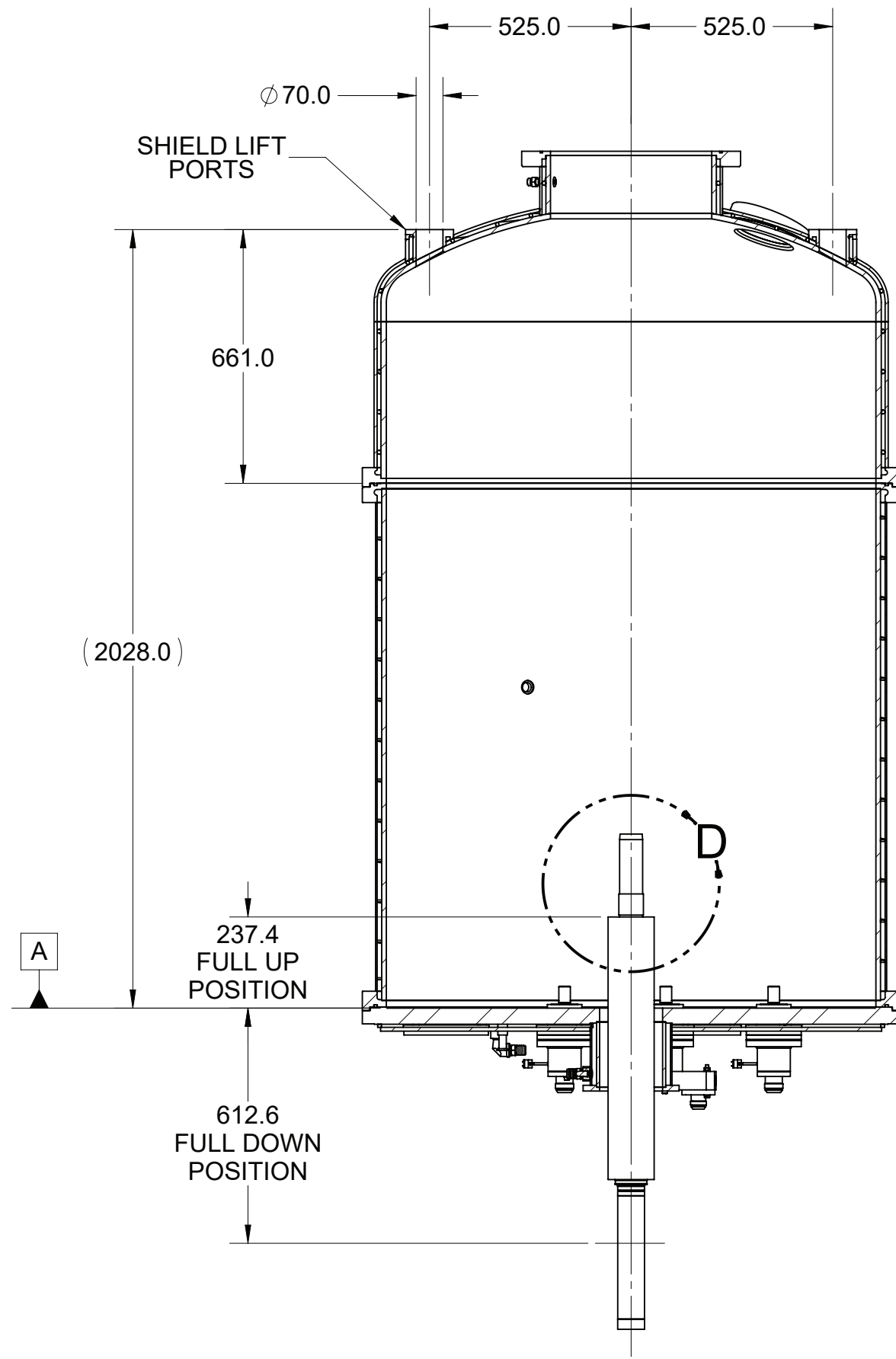


SECTION A-A

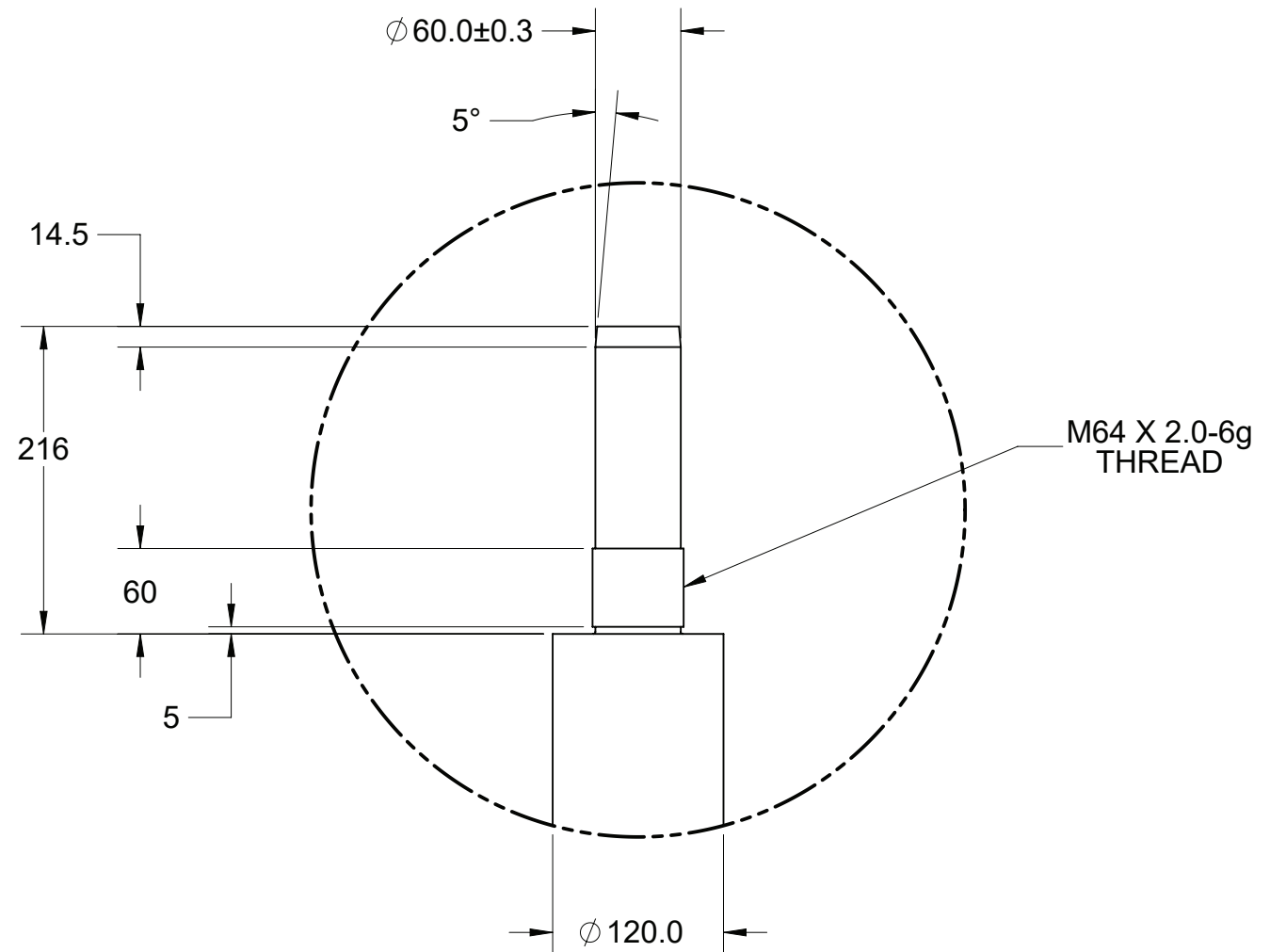
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-	ENGINEERING CHANGE NOTICE			DATE	BY	CHK
DRAWN	BARB SCHOENEMAN	DATE	8/2/2018	 KX320MCZ, CHAMBER LAYOUT <small>2180 BRIGHTON-HENRIETTA TL RD. ROCHESTER, NEW YORK 14624 U.S.A.</small>		
CHECKED	J. REESE	DATE				
DESIGNER		DATE				
ENGINEER	J. REESE	DATE				
REL #	PROJECTION	SIZE	DWG NO	SCALE		
		B	364-1269-1	1:15	SHT 2	OF 4




SECTION B-B

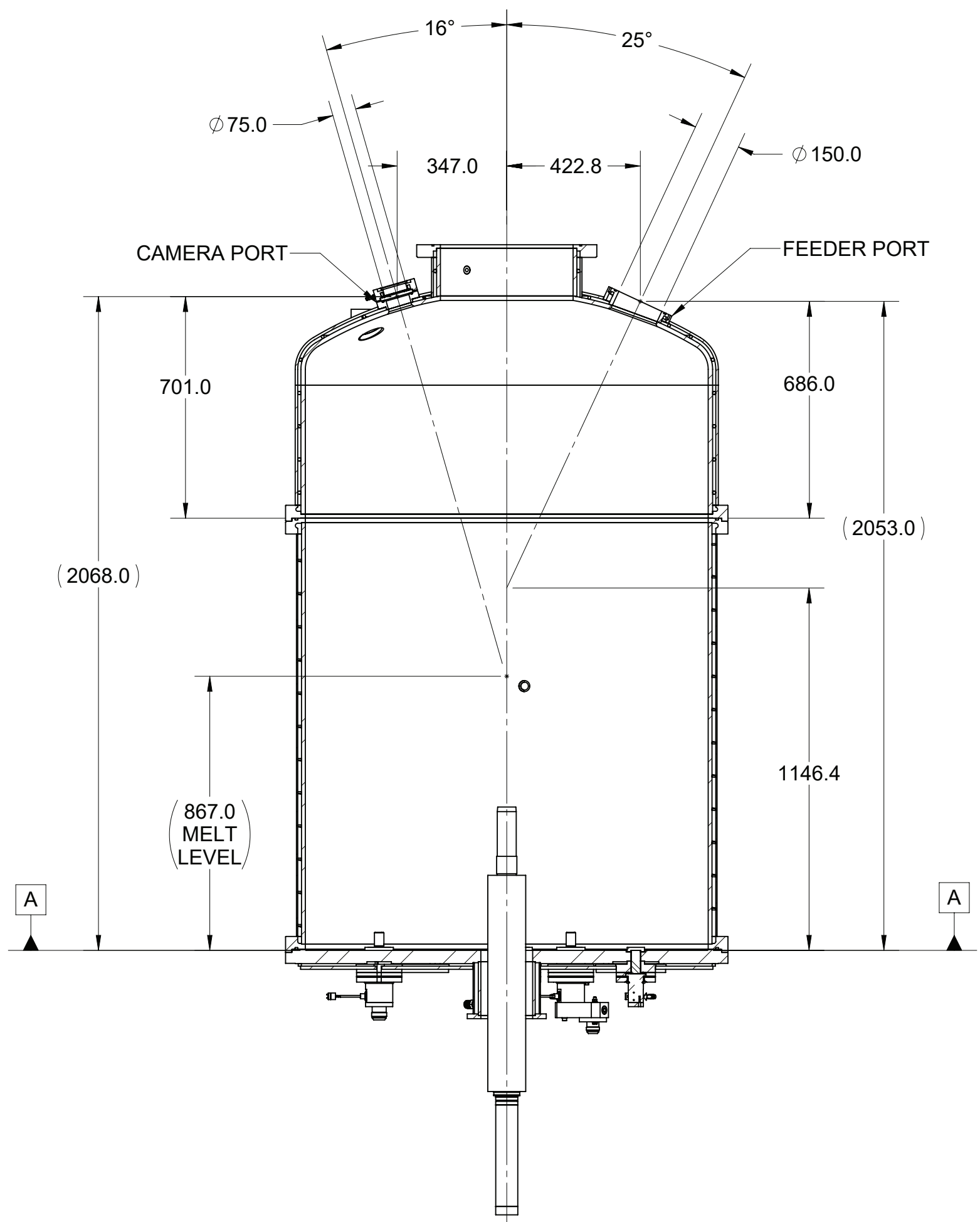


DETAIL D
SCALE 1 : 5
CRUCIBLE SHAFT
INTERFACE

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-						
REV	ENGINEERING CHANGE NOTICE		DATE	BY	CHK	
DRAWN BARB SCHOENEMAN	DATE 8/2/2018	 2180 BRIGHTON-HENRIETTA TL RD. ROCHESTER, NEW YORK 14624 U.S.A. KX320MCZ, CHAMBER LAYOUT				
CHECKED J. REESE	DATE					
DESIGNER	DATE					
ENGINEER J. REESE	DATE					
REL #	PROJECTION	SIZE B	DWG NO 364-1269-1	SCALE 1:15	SHT 3	OF 4

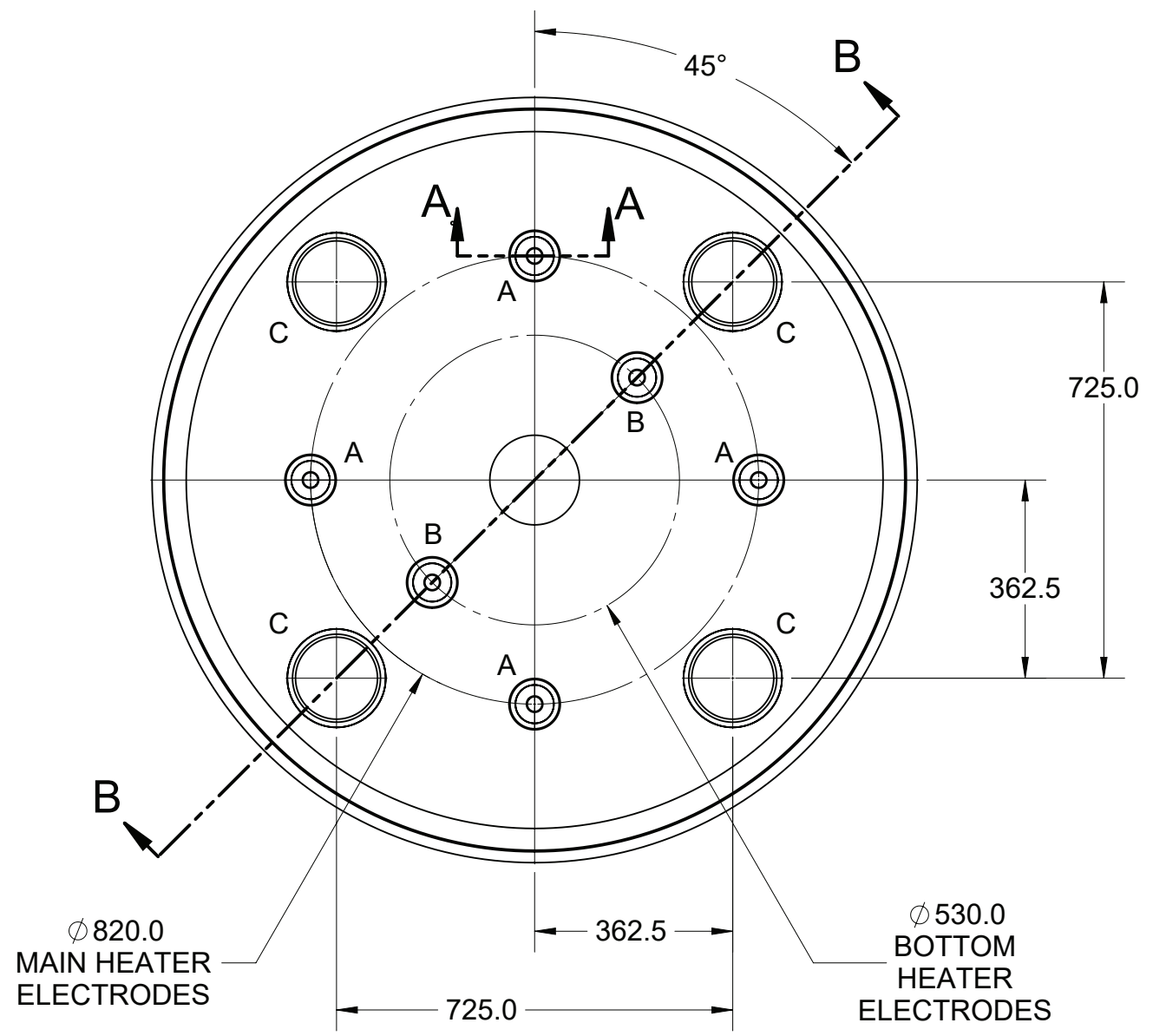


SECTION C-C

METRIC
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SPECIFIED, DIMENSIONS
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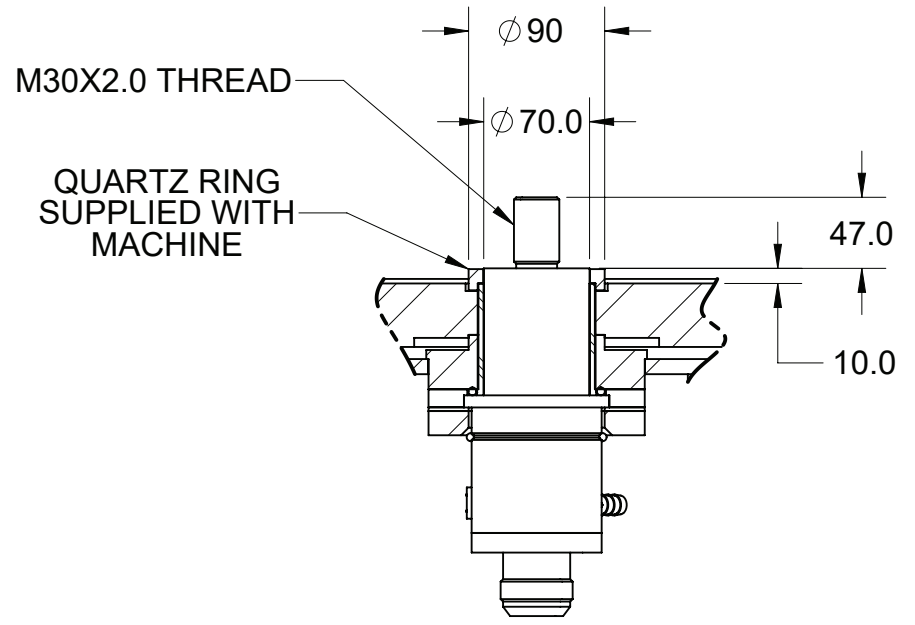
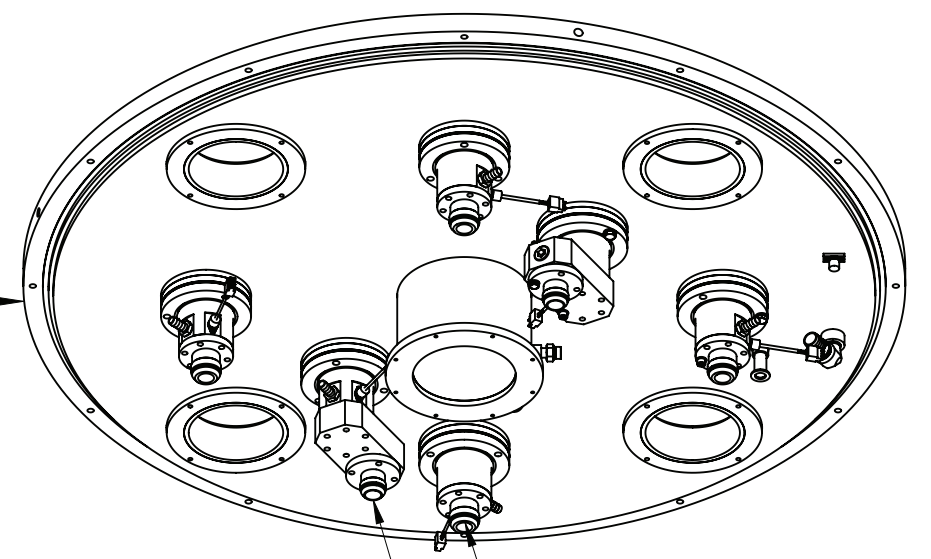
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DRAWN	BARB SCHOENEMAN	DATE	8/2/2018	 KX320MCZ, CHAMBER LAYOUT <small>2180 BRIGHTON-HENRIETTA TL RD. ROCHESTER, NEW YORK 14624 U.S.A.</small>		
CHECKED	J. REESE	DATE				
DESIGNER		DATE				
ENGINEER	J. REESE	DATE				
REL #	PROJECTION	SIZE	DWG NO	SCALE	SHT	OF
		B	364-1269-1	1:15	4	4

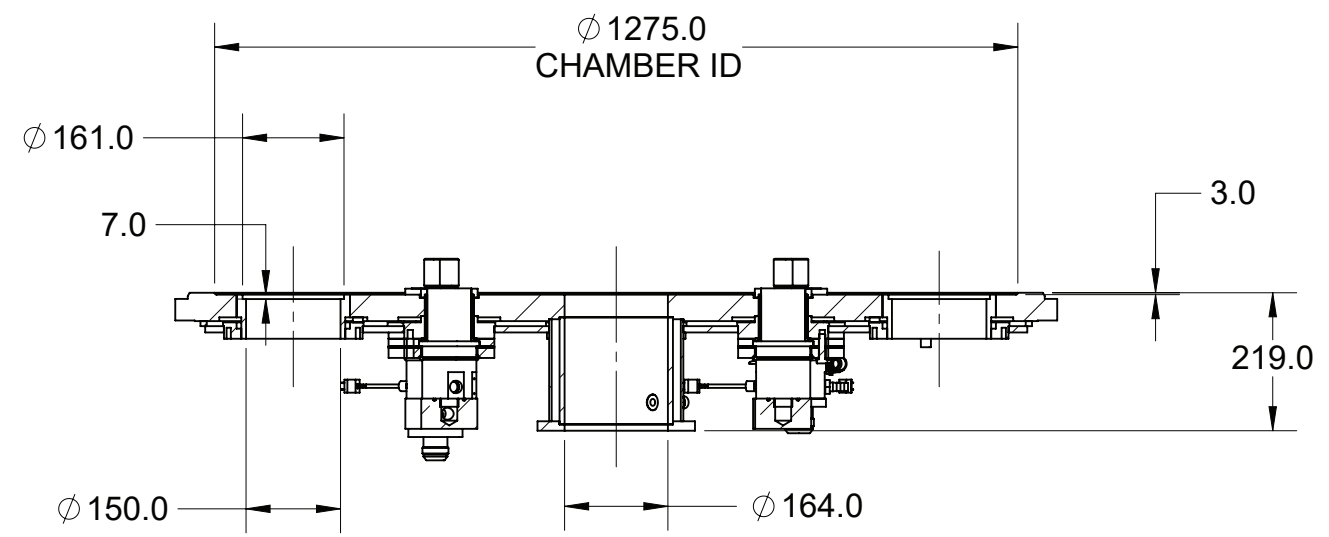


TOP VIEW
FRONT OF MACHINE

KEY
 A = MAIN HEATER ELECTRODE PORTS
 B = BOTTOM HEATER ELECTRODE PORTS
 C = VACUUM PORTS



SECTION A-A
 SCALE 1 : 5
 DIMENSIONS TYP
 FOR ALL ELECTRODES

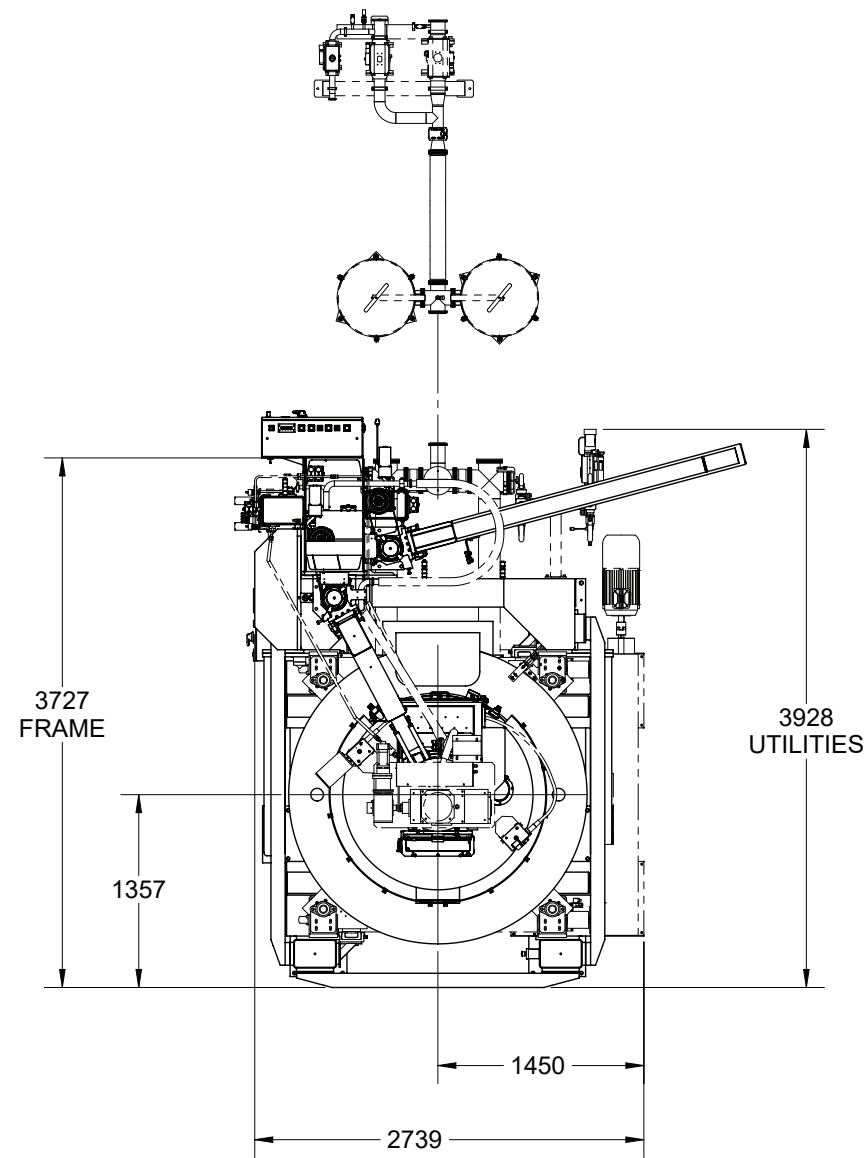


SECTION B-B

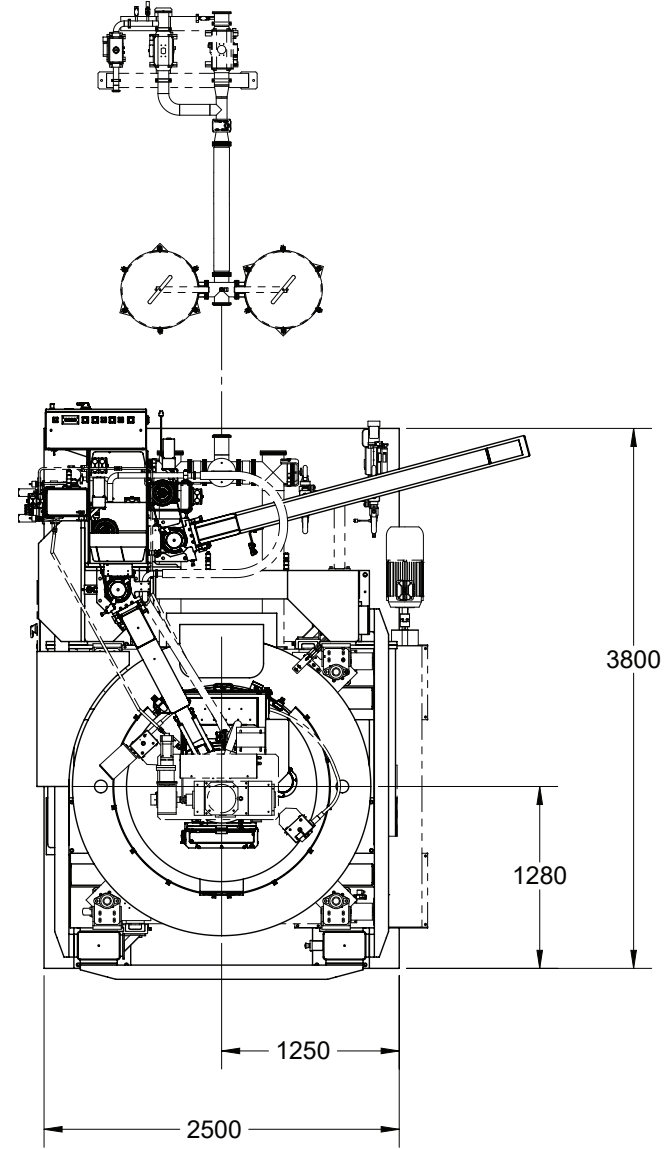
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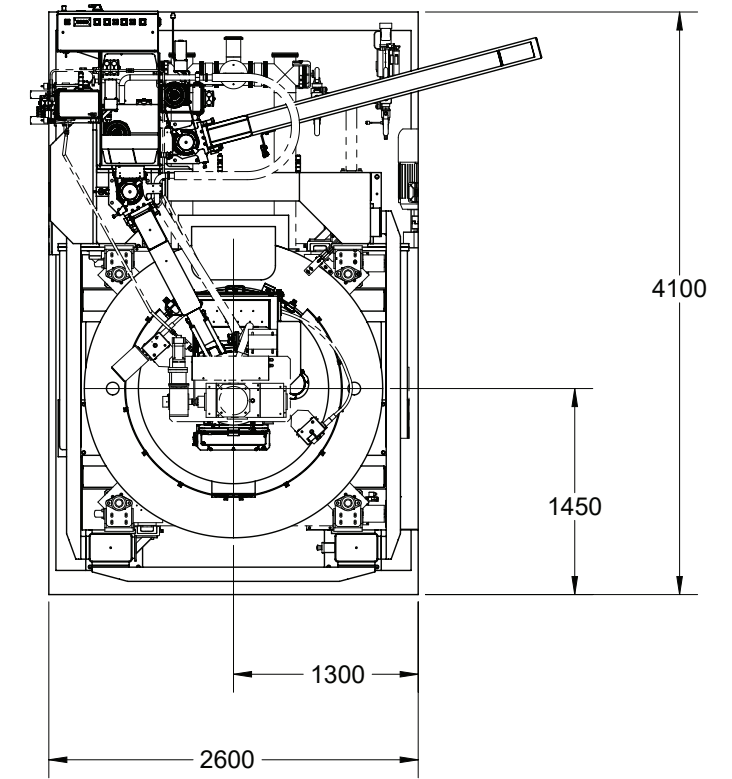
-	RELEASE PER ECN #01659-66	12/21/2018	BS	JR
REV	ENGINEERING CHANGE NOTICE	DATE	BY	CHK
DRAWN	DATE	 2180 BRIGHTON-HENRIETTA TL RD. ROCHESTER, NEW YORK 14624 U.S.A. KX320MCZ, BASEPLATE LAYOUT		
BARB SCHOENEMAN	8/2/2018			
CHECKED	DATE			
J. REESE				
DESIGNER	DATE	PROJECTION 		
ENGINEER	DATE	SIZE	DWG NO	
J. REESE		B	364-1270-1	
REL #	SCALE	1:12	SHT	1 OF 1



TOP VIEW
MACHINE ONLY



TOP VIEW
SUGGESTED PEDESTAL



TOP VIEW
SUGGESTED FLOOR OPENING

ALL PARTS MUST MEET LINTON SPECIFICATION #069-0009-1

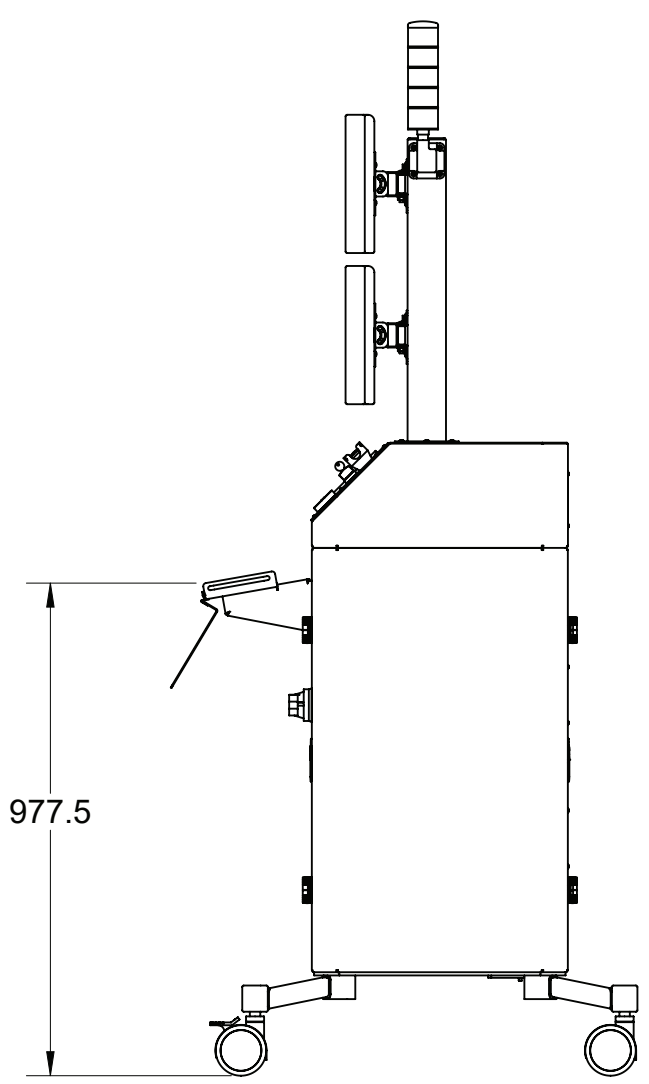
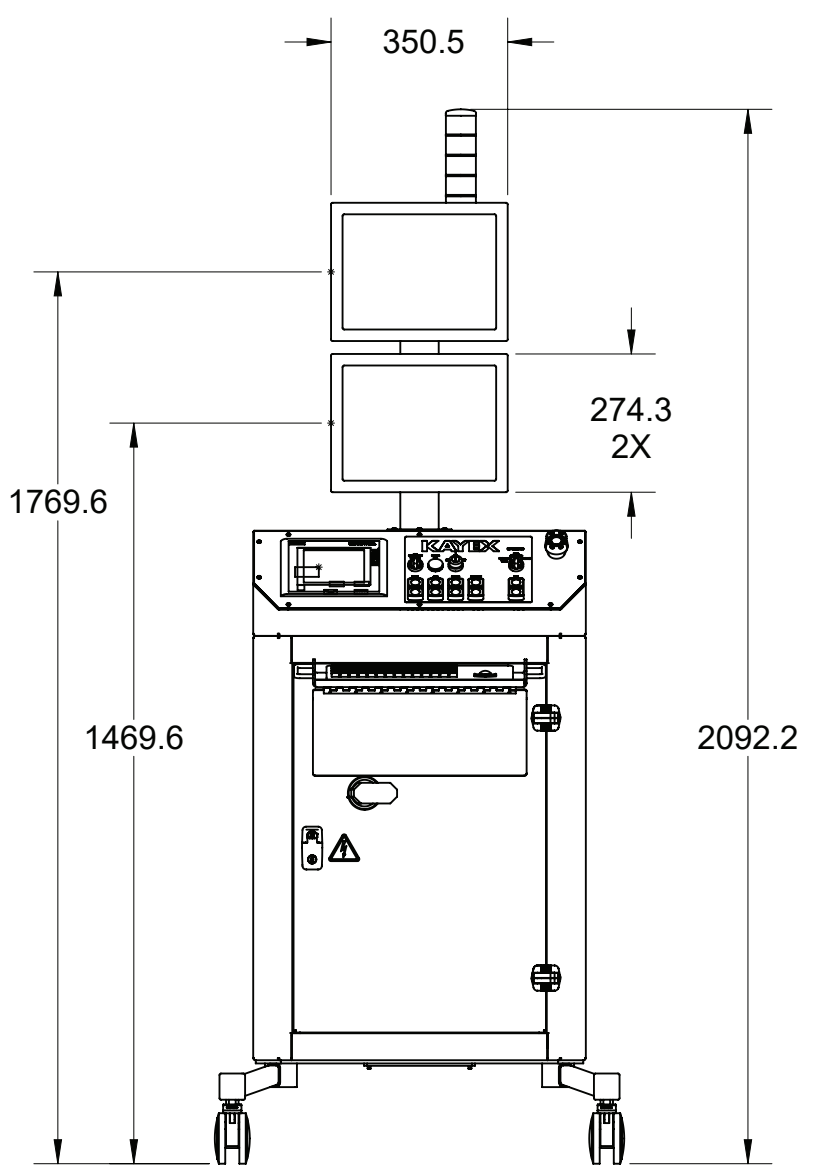
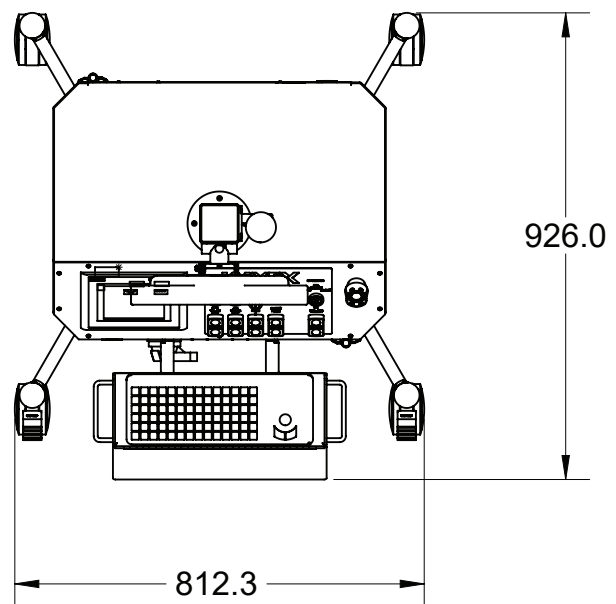
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METRIC UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN mm.			
HOLE TOLERANCES EXCEPT AS SHOWN			
Ø1 TO Ø6	+0.15	-0.05	
Ø6.01 TO Ø13	+0.2	-0.1	
Ø13.01 TO Ø25	+0.3	-0.15	
Ø25.01 AND >	+0.4	-0.2	
MATERIAL			

MACHINE SURFACES EXCEPT AS NOTED			
TOLERANCES ON DECIMALS			
x.	.x	.xx	ANGLES
±	±	±	± 1/2°
UNLESS OTHERWISE SPECIFIED BREAK ALL SHARP EDGES APPROX. 0.5 R OR CHAMFER			
FINISH			

-	RELEASE PER ECN #01659-66	12/21/2018	BS	JR
REV	ENGINEERING CHANGE NOTICE	DATE	BY	CHK
DRAWN	BARB SCHOENEMAN	DATE	12/13/2018	
CHECKED	J. REESE	DATE		
DESIGNER	J. REESE	DATE		
ENGINEER	J. REESE	DATE		
REL #		PROJECTION		
		SIZE	DWG NO	
		C	364-1289-1	
		SCALE	1:40	SHT 1 OF 1

2180 BRIGHTON-HENRIETTA TL RD.
 ROCHESTER, NEW YORK 14623
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**KX320MCZ, PEDESTAL
 AND FLOOR OPENING**



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-	RELEASE PER ECN #01607-49	8/5/2015	BS	JR
REV	ENGINEERING CHANGE NOTICE	DATE	BY	CHK
DRAWN	BARB SCHOENEMAN	DATE	2/4/2015	
CHECKED	J. REESE	DATE		
DESIGNER		DATE		
ENGINEER	J. REESE	DATE		
REL #		PROJECTION		
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		SCALE	1:15	SHT 1 OF 1

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**CONTROL CONSOLE,
KICCS,
(REF 122-9028-2, 9037, &
9038)**



374-9320L-1(-) Machine Outline KX320MCZ.docx

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