Addendum No.	03
Date:	October 21, 2025
Project:	MSU Barnard 111 – Lithography Lab
Contractor:	TBD
Architect:	Cushing Terrell 411 East main St. Suite 101, Bozeman, MT and 59715
To:	All Plan Holders of Record
Pages:	30 – (28) 8 ½ x 11, (0) 11 x 17, and (2) 24 x 36 (If you did not receive correct # of pages, please notify us immediately)

Acknowledge receipt of this Addendum by inserting its number and date in the Proposal Form. Failure to do so may subject Bidder to disqualification. This Addendum forms a part of the Contract Documents. It modifies them as follows:

GENERAL

1. ACM material testing is underway now by MSU.
2. Last day to submit questions is October 24th at 4:00pm.
3. Bid opening is October 28th at 2:30pm.
4. Pre-bid conference attendees list is attached.
5. Owner provided equipment installation prep guide is attached for reference.

QUESTIONS

1. Where is the laydown area located? The laydown area will be determined between GC and MSU after bid is awarded.
2. What is the level of flatness required, and does it need to be tested? See revised A101 for additional information on floor flatness.
3. Please confirm that all Owner Provided Equipment is also Owner Installed? Does this include final electrical connections or do those need to be completed by electrical subcontractor? The manufacturer will install the equipment from the tool to the UPS. The GC will need to complete the preinstall check list and coordinate installation timing with MSU.
4. Are there any parameters around the start date for construction? Construction is anticipated to start after the bid is awarded. The building will be occupied during construction.
5. Please provide insight on exterior access point that contractor will be allowed to use during construction. The construction entrance will be off of 6th street.

6. Please confirm that contractor will have access to Room 110 for the scope of work required in this room? Yes, access to Room 110 will be accessible for the scope of the work required in this room.
7. Please confirm that flooring is NOT to be removed at Room 110? Demo Note 1 only pertains to Lab 111 space? Flooring in room 110 will remain. Demo note 1 only pertains to Room 111.
8. It is mentioned that wall blocking is required for all wall mounted equipment. Please provide list of all wall mounted equipment occurring in Room 111 and 111A. Wall blocking is required to mount both the cylinder tanks and the humidifier depending on the stud spacing of the wall.
9. The existing wall where Alternate #1 is indicated contains a Fire Extinguisher Cabinet, Thermostat and Electrical outlet which are not indicated on the drawings. Please confirm location of this window will not interfere with these. The thermostat is called out to be demoed on sheet M200. The electrical outlets on this wall are shown as existing to remain on sheet E300. The window should not interfere with existing electrical items or the fire extinguisher but can move a couple of inches if inwall items are conflicting.
10. Is a specification available for the existing acoustical ceiling tiles? See revised A901 for the ACT basis of design (BOD).
11. Please confirm that entirety of Room 111 and 111A should be painted? Yes, all walls are called out to be painted in Rooms 111 and 111A.
12. Please confirm height of new wall W1 at the Server Room. Should this go to deck? Yes, this wall should go to deck.
13. Please confirm that Fire Sprinkler modifications in Room 111 are not necessary. Fire sprinkler modifications are necessary in Room 111 to meet the spacing requirements of NFPA 13. See keynote 15 on M200. The intent is to reuse the existing sprinkler while the head remains attached to existing piping and to modify the piping as necessary.
14. Please confirm the data cabling scope that Contractor is responsible for just raceways? This is correct.
15. Is there a specific structural member where grounding should occur? Or is this left to contractors' option? This is left to the contractors' option.
16. Please confirm that the following scope is really tied to Alternate #2 and not supposed to be part of the base bid?
    a. Keynote 3 - Condensate Piping – This is not noted to be a part of Alternate #2. The dashed lines in this area are showing equipment clearances.
    b. Keynote 4 - Lab Cold Water Pipe – This is tied to Alternate #2.
17. Is there an engineer's estimate for the value of this project? An estimate has been prepared for the project; however, it is internal to the owner and not available for distribution.
18. Liquidated damages are mentioned, but no clear rate is provided. Can a rate be provided per calendar day? The project does not have liquidated damages, only actual damages.
19. Can you please confirm if the field office in section 015000, and its requirements, are required for this project? The extent of the field office is up to contractors' discretion.
20. Are there locations on site for power & water hook-ups? If so, are there associated fees and where are the hook-ups accessed? Contractor to define the power and water needs. MSU will assist with access and locations. No charge for utilities.

Prior Approvals

Item	Approved Manufacturer
Flow Control	Nexus Valve
Humidifier	Dri-Steem
Manual Volume Dampers	Nailor Industries
Flexible Ductwork	Flexmaster USA
High Efficiency Takeoffs	Flexmaster USA
Grilles, Registers, and Diffusers	Nailor Industries
Vibration and Seismic	Mason Industries
Spiral Ductwork and Fittings	Omni Duct

END OF ADDENDUM #3

MONTANA STATE UNIVERSITY | Planning, Design & Construction

Sign-in Sheet

Date: 10.14.2025

PPA No.: 25-1223

Project Name: Barnard 111 Lithography Lab Renovation

Meeting Time & Location: October 14, 2025, 2 – 2:30 p.m. Barnard Building

Pre-Con Meeting Sign-in Sheet:

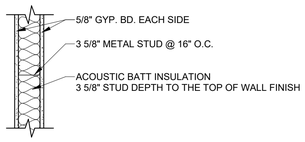
NAME	COMPANY	PHONE	E-MAIL
Thomas McCarthy	Forged Custom Work Construction	406.595.0103	forgedcustomworks@yahoo.com
Ryan Blankenship	BMY Const.	406.239.6069	Rblankenship@BMYINC.com
Robert Kamienski	Demo Pros	406.920.1113	estimates@demopros.us
Ashley Vesely	Haselden	406.946.1950	ashleyvesely@haselden.com
Tyler Carson	Central Plumbing & Heat	860.810.0206	Tyler.carson@centralph.com
Kodie Miller	CPHE	406.223.1864	Kodie.miller@centralph.com
Ben Hommen	The Third Element	406.451.3363	benh@3econtractors.com
Colby Peterson	Cp Controls Inc	406.600.8482	Colby.j.peterson@gmail.com
Brandon Karrell	JCI	406.223.0253	Brandon.fillon.karrol@jci.com
Monte Weiner	Rotherham Construction	406.220.8050	monte@rothconst.com
Sam Barnes	RR Taylor Construction	661.623.4988	sam@rrtaylorconst.com
Hunter Clark	Jackson Contractor	208.315.0041	hunter@jacksoncontractorgroup.com
Tony Soddy	Haselden MC	303.990.0824	tonysoddy@haselden.com
Patrick Kessler	Environmental Controls	406.671.3142	patrick@envct.com
Jack Haley	Standard Electric	805.284.2308	jhaley@standardelectricmt.com
Levi Clark	CS Structures	406.561.5611	levi@csstructuresmt.com
Mitch Musgrave	Assured Plumbing	406.570.3044	Mitchell.musgrave2014@gmail.com
Jacob Carter	PRG Commercial	406.579.1519	jcarter@prgcommercialmt.com
Brodie Bergeson	Certa Pro	406.920.9020	bbergeson@certapro.com

WALL TYPE LEGEND

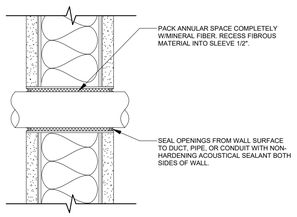
SCALE: 1" = 1'-0"

GENERAL WALL TYPE NOTES:
A. PROVIDE BLOCKING AS REQUIRED TO SECURE WALL HUNG COMPONENTS.
B. EXTEND WALL FRAMING TO UNDERSIDE OF DECK, UNLESS NOTED OTHERWISE.

WALL TYPE MODIFIERS:
1. NOT USED.



W1 **INTERIOR STUD WALL**

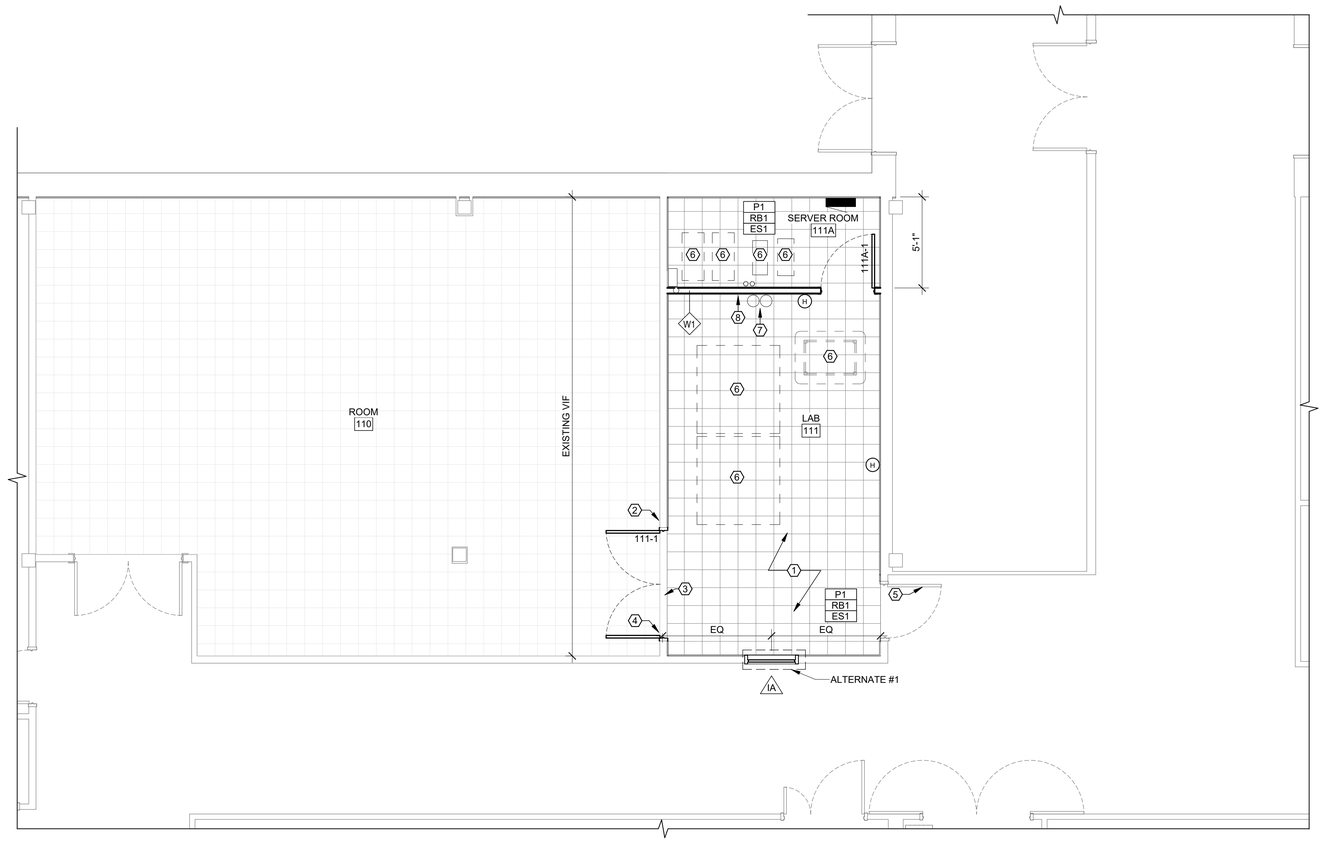


5 / A101 WALL PENETRATION
3" = 1'-0"

MATERIALS LIST

ITEM NO	PRODUCT TYPE	MANUFACTURER	DESCRIPTION	COLOR	SIZE	NOTES
BASE						
RB1	RESILENT BASE	JOHNSONITE	STANDARD RUBBER COVE BASE	PEWTER	4" HIGH	BASIS OF DESIGN. OTHER MANUFACTURERS TO BE CONSIDERED. MITERED CORNERS. ROLLED GOODS.
FLOOR						
ES1	ELECTRIC STATIC FLOOR	STATICWORX	AMERIWORX CLASSICS ESD SOLID VINYL TILE	ADIRONDACK RIDGE	12X12	BASIS OF DESIGN. OTHER MANUFACTURERS TO BE CONSIDERED. COORDINATE GROUNDING FOR COPPER WIRE WITH ELECTRICAL. GC TO PROVIDE SELF-LEVELING COMPOUND COMPLIANT WITH ESD SYSTEM. BASIS OF DESIGN: ARDEX RAPID MC. MOISTURE TESTING REQUIRED. SUBTRATE MUST WITHSTAND 1250 KG/SQM. THE FLOOR MUST BE FLAT WITHIN 1.3 MM AND LEVEL TO WITHIN 3 MM OVER THE AREA OF THE TOOL FOOTPRINT. GC TO PRIVIDE/COORDINATE TESTING TO OBTAIN FLATNESS LEVEL SPECIFIED. PROVIDE REPORT STATING RESULTS ARE MEETING THE SPECIFIED FLATNESS.
TRANSITIONS						
TR1	TRANSITION PROFILE	SCHLUTER SYSTEMS	STAINLESS STEEL	N/A	GC TO DETERMINE SIZE/HEIGHT	GC TO VERIFY PROFILE SIZE AND HEIGHT ON SITE FOR HEIGHT OF ADJACENT EXISTING MATERIALS AND NEW FLOORING
WALL						
P1	PAINT	SHERMIN WILLIAMS	ZERO VOC HARMONY INTERIOR LATEX PAINT	MATCH COLOR TO EXISTING WHITE PAINT ON SITE	N/A	BASIS OF DESIGN. OTHER MANUFACTURERS TO BE CONSIDERED. CEILINGS: FLAT FINISH. WALLS EGG-SHELL FINISH

2



1 / A101 FIRST FLOOR PLAN
1/4" = 1'-0"

NORTH REF

PLAN LEGEND

- W## / 1 — ASSEMBLY TYPE (SEE ASSEMBLIES SHEET) / ASSEMBLY MODIFIER, PER TYPE
- NAME / 101 — ROOM NAME AND NUMBER
- X — WINDOW TYPE (SEE A600s)
- X — KEYNOTE
- 1 / X000 — DIRECTION OF VIEW, IF APPLICABLE / SIM — DRAWING NUMBER / SHEET WHERE DRAWN
- 101 — DOOR NUMBER (SEE SHEET A601)
- DIMENSION TO FACE OF FRAMING
- DIMENSION TO GRID LINE
- ℄ — DIMENSION TO CENTER LINE
- WALL FINISH / BASE FINISH / FLOOR FINISH

GENERAL NOTES

A. VERIFY ALL CONDITIONS AND DIMENSIONS IN FIELD PRIOR TO FABRICATION.
B. ALL PRODUCTS ARE TO BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS, USING MANUFACTURER'S ADHESIVES, TOOLS, AND METHODS.
C. REFER TO SPECIFICATIONS ON DRAWINGS AND MATERIAL FINISH LIST FOR ALL FINISH MATERIAL PRODUCT INFORMATION.
D. FOR CEILING HEIGHTS AND ADDITIONAL FINISHES SEE: A901.
E. ALL FLOOR TRANSITIONS ARE TO OCCUR DIRECTLY BENEATH DOORS OR CENTERED IN OPENING. TRANSITIONS ARE TO BE ADA COMPLIANT.
F. ALL NEW WALLS TO BE PAINTED TO MATCH EXISTING WALL UNLESS OTHERWISE NOTED. BLEND AND MATCH EXACT TO ADJACENT WALL COLOR, TEXTURE, SHEEN AND FINISH.
G. ALL GYPSUM CEILINGS AND SOFFITS TO BE PAINTED 'P1' UNLESS OTHERWISE NOTED ON REFLECTED CEILING PLAN.
H. ALL HOLLOW METAL FRAMES TO BE PAINTED TO MATCH ADJACENT WALL COLOR.
I. ALL METAL ACCESS PANELS, COVER PLATES, VENTS, AND GRILLES TO BE PAINTED TO MATCH THE SURFACE IT IS LOCATED ON.

FLOOR PLAN KEYNOTES

1 LEVEL SUBFLOOR PRIOR TO NEW FLOORING INSTALLATION. PROVIDE SELF LEVELING SUBSTRATE OVER EXISTING SUBFLOOR TO LEVEL OUT ALL UN-EVENNESS ACROSS THE ROOM. SEE FINISH SCHEDULE.
2 PATCH AND REPAINT AS NECESSARY ON ROOM 110 SIDE OF WALL FOR NEW DOOR INSTALL. MATCH PAINT WITH EXISTING.
3 PROVIDE METAL FLOORING TRANSITION PROFILE 'TR1' BETWEEN MATERIALS. TRANSITION TO BE ADA COMPLIANT.
4 MODIFY/ADD NEW STUD FRAMING TO ACCOMODATE NEW OPENING.
5 EXISTING DOOR/FRAME TO REMAIN.
6 EQUIPMENT PROVIDED BY OWNER'S VENDOR. COORDINATE EQUIPMENT INFORMATION AND SCHEDULE OF INSTALLATION WITH OWNER.
7 WALL BLOCKING AS REQUIRED FOR TANK MOUNTING. PROVIDE GAS CYLINDER WALL BRACKET. BOD: GAS CYLINDER WALL BRACKET - 2 CYLINDER CAPACITY, MODEL H-10677. COORDINATE EXACT LOCATION WITH ARCHITECT AND OWNER.
8 WALL PENTRATION FOR EQUIPMENT HOSES AND CONDUIT. APPROXIMATE SIZE WILL VARY PENDING ON GROUPED ITEMS. COORDINATE FINAL LAYOUT AND ACTUAL SIZE IN THE FIELD WITH OWNER & ARCHITECT FOR ALL REQUIRED PENETRATIONS RELATED TO OWNER PROVIDED EQUIPMENT. SEE 5/A101 DETAIL FOR WALL PENTRATIONS.

MONTANA STATE UNIVERSITY

MSU-CPDC
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BOZEMAN, MONTANA
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FAX: 406.994.5665

BARNARD HALL 111 LITHO LAB RENOVATION MONTANA STATE UNIVERSITY

Cushing Terrell
cushingterrell.com
800.757.9522

DRAWN	SLEVIN
REVIEWED	COOK

REV	DESCRIPTION	DATE
2	ADDENDUM #2	10.21.25

LICENSED ARCHITECT — BOZEMAN — SKYANN COOK — ARC-ARC-LIC-5549 — STATE OF MONTANA — MONTANA

SHEET TITLE
FIRST FLOOR PLAN

SHEET
A101

DATE
07.15.2025

REFLECTED CEILING LEGEND

CEILING MATERIAL → ACT
CEILING HEIGHT → VARIES
ADDITIONAL NOTES → NOTES

ACT1 - 2X4 ACOUSTICAL LAY-IN CEILING

LIGHTING - SEE ELECTRICAL

HVAC REGISTERS - SEE MECHANICAL

ADDITIONAL NOTES

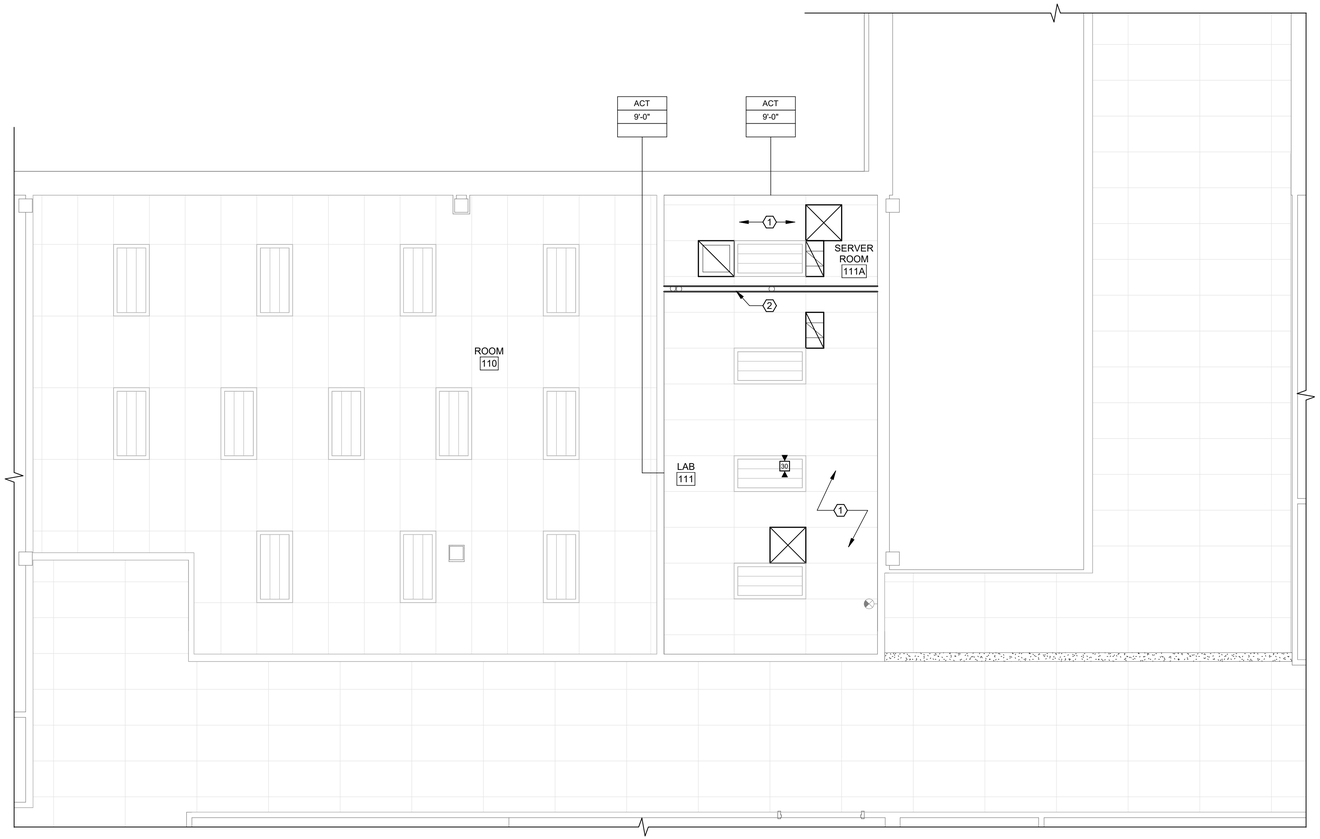
1. NOT USED.

REFLECTED CEILING GENERAL NOTES

A. EXISTING LIGHTING TO REMAIN - SEE ELECTRICAL.
B. EXISTING CEILING GRID TO REMAIN - EXCEPT AS NEEDED FOR NEW WALL WITHIN THE ROOM.
C. COORDINATE WITH MECHANICAL AND ELECTRICAL DRAWINGS FOR ADDITIONAL ITEMS TO BE PROVIDED AT THE CEILING PLANE.
D. SEE A101 MATERIALS LIST FOR AC1 CEILING TILE BASIS OF DESIGN.

(#) KEYNOTES

1 PROVIDE NEW CEILING TILE IN EXISTING GRID, TYP. ACT BOD: CERTAINTEED, SYMPHONY m 80 Rx, SIZE: 24" x 48", OR APPROVED EQUAL. EDGE OF TILE TO MATCH EXISTING.
2 EXTEND WALL FINISH 8" ABOVE ACT GRID HEIGHT.



1 / A901 FIRST FLOOR REFLECTED CEILING PLAN
1/4" = 1'-0"

NORTH REF

MONTANA STATE UNIVERSITY

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DRAWN	SLEVIN
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2	ADDENDUM #2	10.21.25

LICENSED ARCHITECT
BOZEMAN
SKYANN COOK
ARC-ARC-LIC-5549
MONTANA
STATE OF MONTANA

SHEET TITLE
FIRST FLOOR REFLECTED CEILING PLAN

SHEET
A901

DATE
07.15.2025

RAITH
NANOFABRICATION

Site preparation Guide

VOYAGER

High performance e-beam Writer with innovative architecture for efficient time to result

FAST – SMART – INNOVATIVE - ECONOMICAL

Site preparation guide

Product: VOYAGER

Customer

Order number

Document number: SPG_ VOYAGER _V6

Date generated: Thursday, July 20, 2023

Advancements and improvements to the instrument and available options are an ongoing process. As a result, some specifications and some information regarding the product are subject to change or modification without notice.

This document is meant to aid in preparing the laboratory room for installation of the instrument. We have included a comprehensive list of gas, water and electricity specifications for all customer-installed components. The utility requirements are within responsibility of the customer and shall be provided latest at the time of installation. Please review the specifications carefully to see whether the provided hose and cable lengths are sufficient for your room layout.

All statements, information, and recommendations in this document have been carefully prepared and are believed to be accurate and complete. If doubts exist about any detail or additional information is necessary, please inquire Raith GmbH or their accredited representative.

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44263 Dortmund
Germany

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Fax.: +49 231 95 004 – 460
Web: www.raith.com

Table of contents

1 Room requirements

Dimension (L x W)	4.6 m x 4.31 m (different setups possible on request)
Height for system	≥ 2.5 m (way into lab might be just 2m)
Floor	Even and closed
Floor load capacity	More than 1250 kg/m^2. The EBL system has a weight of 1250 kg and rests on 4 machine feet, each with a diameter of 100 mm. Consider additional possible floor load during installation due to transportation and lifting tools.
Temperature	20°C to 25°C controlled to ± 2°C (short term temperature change must be below ± 0.5°C/hour).
Air handling	The heat dissipation of the electronics is led to the environment. The output is less than or equal to 1.2 kW. The produced heat of the EBL system will be partly led away by the system chillers, thus the chillers have to be placed in an environment where the air handling is capable to remove the waste heat of approximately 3 kVA.
Relative humidity	Above 30% but below 65%
Further Requirements	Landline phone and internet connection for service and support from a remote location
Floor vibrations (1)	The velocity of floor vibrations measured in a 1/3-octave RMS amplitude spectrum has to be less than 0.8 µm/sec for frequencies between the 1.6-Hz band and the 16-Hz band (including them). For frequencies above the 16-Hz band the maximum velocity should not exceed 1.0 µm/sec
Magnetic fields (1,2)	The RMS value of the magnetic flux density over the entire frequency span from 0 to 625 Hz has to be less than 0.5 mG. Also avoid locations subject to varying fields, e.g. near an elevator or trains.
Acoustic noise (1,2)	The sound pressure level measured in a 1/3-octave RMS amplitude spectrum should not exceed 70 dBC for frequencies between the 31.5-Hz band and the 80-Hz band (including them). For frequencies above the 80-Hz band the sound pressure level has to be less than 60 dBC. The dBC values are referenced to the standardized 20µPa.
(1)	Special note concerning vibration, magnetic, and acoustic specifications. The performance of the system can be adversely affected if these limits are exceeded. In this case,

special equipment may need to be added, e.g. anti-vibration platform. In addition special equipment may also be needed, if the measurement results get close to the specifications in more than one band without exceeding them. See the document "Site Survey Rules" for detailed information about measuring these quantities.

(2) The specifications apply for the third octave amplitudes inside the stated frequency bands avoiding different results due to different spectrum analyzers.

Above mentioned dimensions are considered to be the minimum

If the pre vac pump, water chiller or any other options are to be installed in another room it is the customer's responsibility to provide a wall breakthrough.

The customer should also provide a minimum of two chairs to facilitate the installation and the following acceptance test.

1.1 Radiation Safety

The local X-Ray Supervisor has to be informed about the setup of the machine. Detailed information about a potential radiation hazard can be found the Appendix to this site preparation guide.

2 System description

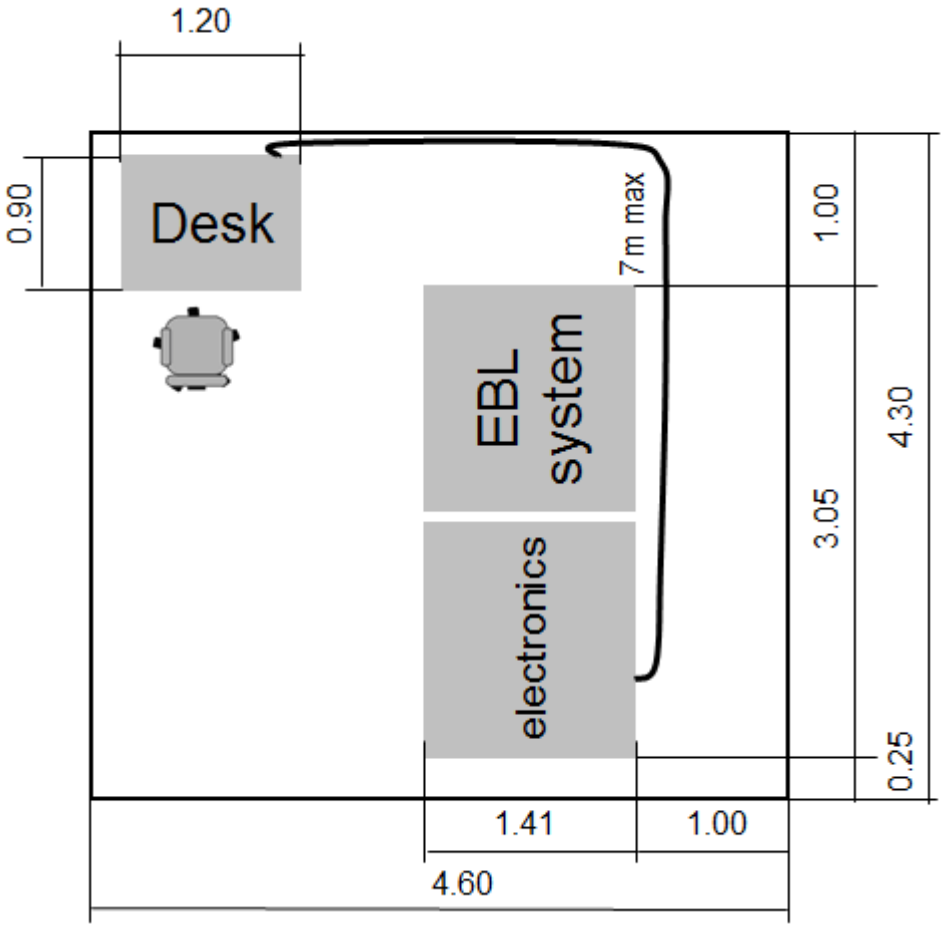
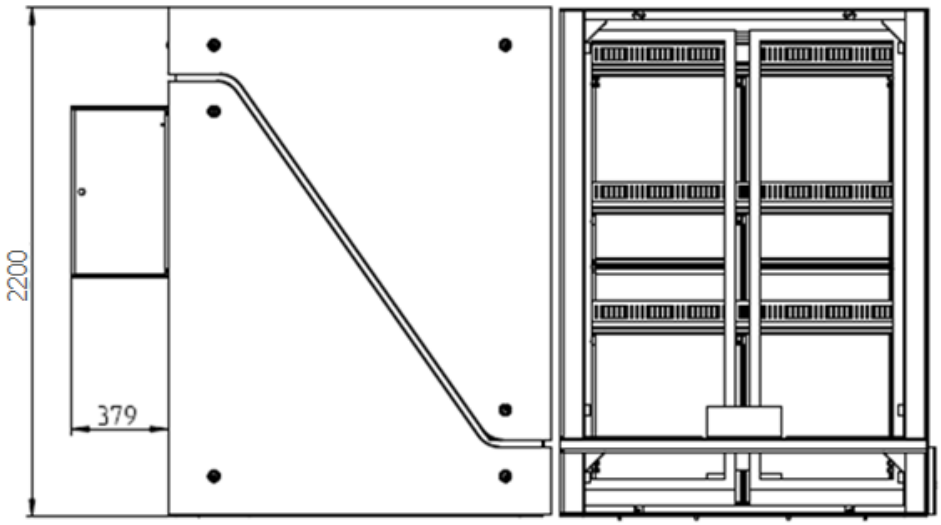


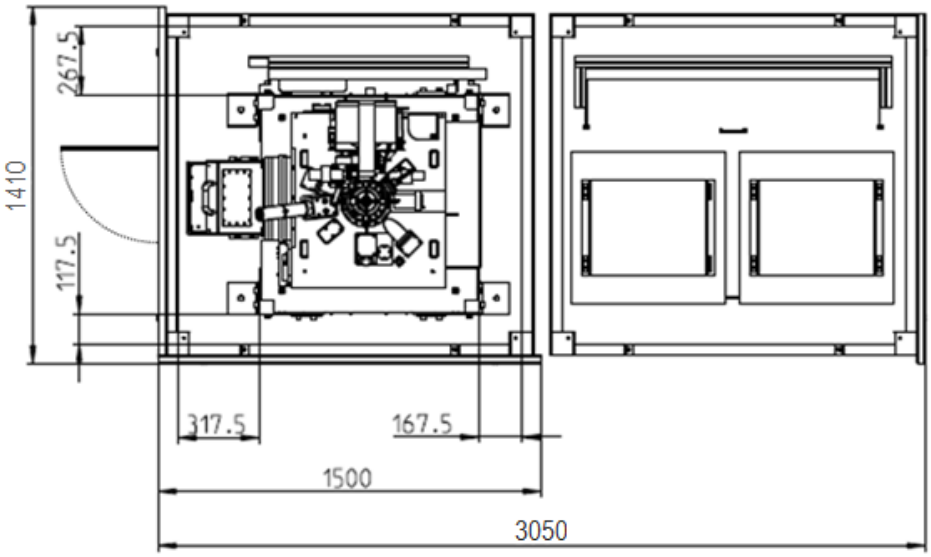
Image 1 (all dimension in meter)

VOYAGER top view. For dimensions of the different parts refer to the corresponding chapter. Suggested layout, other layouts possible, please inquire.

2.1 Main System

Dimension (LxWxH)	3050mm (120.1'') x 1446mm (56.9'') x 2243mm (88.3'') incl. handles on top



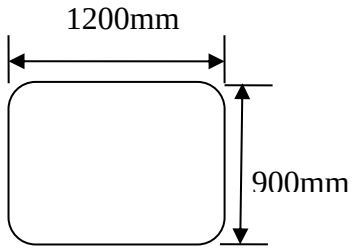


(draw dimension excluding panel handles)

comment	The *VOYAGER main system* is divided into two functional units, each housed in a separated enclosure: The EBL system is placed within a thermal and acoustic shielding, while electronics are situated in two racks, within an exclusive enclosure.

2.2 Table

Dimension



height: 700 -1100mm

Weight 40 kg

Comment Used for monitor, keyboard, mouse

2.3 System Chiller 1

Chiller 1 maintains the temperature of the system.

The system comes with a chiller of the below specified type (see table) to remove waste heat generated by the system.

It is recommended to place the chiller outside the clean room to avoid mechanical vibrations caused by the chiller and to make sure that the heat is not released into the cleanroom.

The heat released by the chiller is the sum of the absorbed heat plus the heat generated by the pump and the compressor of the chiller and adds up to about 1.5 kVA. This heat will be exchanged with the environment (air or water).

The maximum distance to the system should not exceed 10 meters (33ft) – The temperature stability of the cooling water is also depending on the distance from the main system. The water flow is monitored by the main system.

Model Type 2-R102, Water to air

PVC Water Lines See chapter “Main System connections” (Water lines W1)

Chiller requires 2 waterlines which will be delivered with the system.

Dimensions (LxWxH)	430 mm x 470 mm x 695 mm
Weight	55 kg
Cooling capacity	1000 Watt
Power consumption	620 Watt (max)
Ambient operating temperature	+ 5°C to + 28°C
Required preparation	If the chiller is placed in another room a wall break through has to be made wide enough for the power cable and water lines. **Special arrangements concerning different height levels of the system and the chillers need special investigations and possibly additional investments.** **Customer must supply: Distilled water** For explanation: the chiller always needs a mixture of 70% VE-water and 30% normal tap water + 1 drop (ml) of Thermoclean per each litre of water – for the first filling and for refilling! Pure VE-water is too aggressive and pure tap water contains too much chalk! The Thermoclean is necessary to avoid algs, but too much of it destroys the sealings! A half-yearly check of the cooling water is necessary! If the water is not completely clear (with a slight blue touch due to the Thermoclean) algs already grew and therefore the water has to be exchanged completely and maybe even the whole circuit has to be cleaned. The Thermoclean just prevents the growing of algs, it cannot kill/remove them!

2.4 System Chiller 2

Electron Optics and Pattern Generator are cooled with an additional chiller to provide stable thermal conditions.

It is recommended to place the chiller outside the clean room to avoid additional waste heat and vibrations.

The heat released by the chiller is the sum of the absorbed heat plus the heat generated by the pump and the compressor of the chiller and adds up to about 1.5 kVA. This heat will be exchanged with the environment (air or water).

The maximum distance to the system should not exceed 10 meters (33ft) – The temperature stability of the cooling water is also depending on the distance from the main system. The water flow is monitored by the main system.

Model	Type 2-R102, Water to air
PVC Water Lines	See chapter “Main System connections” (Water lines W1) Chiller requires 2 waterlines which will be delivered with the system.
Dimensions (LxWxH)	430 mm x 470 mm x 695 mm
Weight	55 kg
Cooling capacity	1000 Watt
Power consumption	620 Watt (max)
Ambient operating temperature	+ 5°C to + 32°C
Required preparation	If the chiller is placed in another room a wall break through has to be made wide enough for the power cable and water lines. **Special arrangements concerning different height levels of the system and the chillers need special investigations and possibly additional investments.** **Customer must supply: Distilled water** For explanation: the chiller always needs a mixture of 70% VE-water and 30% normal tap water + 1 drop (ml) of Thermoclean per each litre of water – for the first filling and

for refilling!

Pure VE-water is too aggressive and pure tap water contains too much chalk!

The Thermoclean is necessary to avoid algs, but too much of it destroys the sealings!

A half-yearly check of the cooling water is necessary! If the water is not completely clear (with a slight blue touch due to the Thermoclean) algs already grew and therefore the water has to be exchanged completely and maybe even the whole circuit has to be cleaned.

The Thermoclean just prevents the growing of algs, it cannot kill/remove them!

2.5 Pre- Pump

Provided Cable	See chapter “Main System connections”
Provided Vacuum line	See chapter “Main System connections” Fittings for the connection between tube and pump are included
Dimension (LxWxH)	486mm (19.2’’) x 227mm (9’’) x 294mm (11.6’’)
Weight	24 kg
Required preparation	If the pump is placed in another room, a wall break through has to be made wide enough for the power cable, the signal line and Vacuum line.

2.6 UPS- uninterrupted power supply (Optional)

Uninterrupted Power Supplies (UPS) are meant to enable a controlled shutdown of the system in case of a building power failure.

The UPS comes in two separate units. Unit 1 is the electronic and unit 2 the battery pack.

Model	L6000 (incl. Battery Pack BM-3-20)
Power requirements	230 V, 32 A, 1/N/PE, 50Hz
Fuse / MCB	Type K 32A
Main unit dimensions (LxWxH)	590 mm x 260 mm x 700 mm
Main unit weight	100 kg
Battery unit dimensions (LxWxH)	630 mm x 280 mm x 680 mm
Battery unit weight	120 kg
Decibel level	<52 dBa
Provided cable length (UPS to building power supply)	5 m
Provided cable length (main unit to battery unit)	1.2 m
Required preparation	Provided cable length from the system to the UPS is 10 m. Thus the UPS should not be further away than 10 m (extension is possible, please inquire). If the UPS is placed in another room a wall breakthrough has to be made wide enough for the power cable. Please see section “Main Power Line” for further information.

Due to generated noise, it is recommended to place the units in grey room area.

2.7 Air compressing unit (Optional)

Model	Kaeser Premium Silent 130/10 W
Dimensions (LxWxH)	410 mm x 370 mm x 650 mm
Decibel level	66 dB(A)
Power consumption	750 Watt (max)
Weight	27 kg
Hose/tube connection	6 mm

Please take care of regular maintenance!!!

2.8 Active Vibration Cancellation Platform (Optional)

Connections	230V power connection will be connected to the rack
Weight	Approx. 355kg (780lbs)
Dimensions	1124mm (44.25'') x 896mm (35.35'') x 160mm (6.31'')

3 Power connections

Risk of electrocution

The electrical connection has to comply with national regulations.

Only qualified professional electricians are allowed to work on the main power supply line

3.1 Main Power line

Voltage	230 V (+6% and -10%), 1/N/PE AC 32A, 50Hz Be aware that the total capacity of the UPS is slightly reduced if input voltage of 230 cannot be met.
Connector Type	CEE 32 A, 6h, 230 V, 2P + PE, type male connector#

Circuit breaker	32 A (type K)
Provided cable	CAROL 10/3 90C FT-2p-7K-123033 MSHA, length 4 m
Required preparation	The main power line needs to be protected with a K 32A circuit breaker. A connector of the specified type (female plug) has to be present close to the final location of the system. A RCD (residual current device) in front of the UPS is not required. If one is installed it has to have a current rating of at least 300mA. RAITH recommends not to install an RCD and to mark the plug so that it will only be used to connect this machine.

3.2 Protective Earth

High leakage currents are present in the system. Therefore, the system has to be connected to an equipotential bonding bar. An exclusive grounding connection to earth must be provided, i.e. the grounding terminal must not be common to other electrical equipment. This is important to avoid noise coming into our system and influencing the performance.

The additional protective ground should have a diameter of at least 10mm² for copper and 16mm² for Aluminium according to EN 60204-1.

3.3 Earthing

To avoid offset current between both protective earth connections of the workstation, a Separate Protective Earth connection is required. It is an auxiliary earth wire between the potential equalization bar/equipotential bonding bar (PA) and the protective ground (PE) of the facility installation close to the microscope`s mains connection.

This drawing shows two different possibilities to connect the Separate Protective Earth according to the country's supply voltage. The Separate Protective Earth connection is shown in red.

This auxiliary equipotential conductor is in accordance with the German Standard DIN V VDE V 0800-2:2011-06; VDE V 0800-2:2011-06 – Part 2: Equipotential bonding and earthing (additional specifications).

4 Gas services

4.1 Nitrogen

Nitrogen is used during the sample exchange and maintenance. The connection must be equipped with an appropriate pressure reducer and a shut-off valve that is secured against accidental re-activation.

Specification	Dry nitrogen, purity about 99.996%.
Flow Rate	2 litres/minute at 20 kPa (2.9 PSI) over atmospheric pressure (during ventilation).
Pressure	30 kpa (4.4 PSI) maximum, precise pressure reducer required.
Provided tube	See chapter “Main System connections”
Connector Type	Quick disconnect coupling DN 2.7, AF
Required preparation	The customer must supply the ports and fittings for the connection of the specified tubes. The customer must install precise pressure reducer (0 – 50 kPa) before installation of the main system.

4.2 Compressed air

CDA is required for the air suspension system and to operate pneumatic valves. The connection must be equipped with an appropriate pressure reducer and a shut-off valve that is secured against accidental re-activation.

Gas specification	Recommended 1 - 4 - 1 (particles/water/oil) based on ISO8573-1, but absolute minimum is 5 - 4 - 3
Customer maintenance	The customer is responsible for a regular maintenance of the compressor and filter units (e.g. water), either on a central house unit or a local compressor unit.
Pressure	1MPa (145 PSI) maximum, pressure reducer required
Provided tube	See chapter “Main System connections”
Connector Type	Quick disconnect coupling DN 2.7, AF 14
Flow rate (consumption)	Less than 30 l/min during initialization and sample exchange, about 1 l/min under normal operating
Dew point	Quality 1-3 of the ISA-7.0.01-1996
Required preparation	The customer must supply the ports and fittings for the connection of the specified tubes. The customer must install a pressure reducer (0 – 1MPa) before installation of the main system.

5 Delivery / Storage (to be defined)

The system comes in up to 7 boxes depending on the ordered options.

If the system needs to be stored until installation takes place one has to take following precautions:

1. Do not unpack the system.
2. Storage room temperature has to be above 0°C
3. System must be stored in a dry environment

Item	Description	Gross weight	Dimensions (L x B x H)
1	Crate: Electron Beam Lithography System with Plinth	1470 kg	1400 mm x 1400 mm x 2200 mm
2	Crate: Cover frame, Table, Monitor, HT Supply	950 kg	2350 mm x 1480 mm x 1650 mm
3	Crate: Cover panels	700 kg	2400 mm x 2100 mm x 1950 mm
4	1 (one) Carton on a Palette: Electronic RACK 1	187 kg	850 mm x 2000 mm x 870 mm
5	1 (one) Carton on a Palette: Electronic RACK 2	160 kg	850 mm x 2000 mm x 870 mm
6	1 (one) Carton on a palette: Chiller (2 units)	260 kg	800 mm x 1200 mm x 1150 mm
(7) optional	2 (two) Carton on one palette: UPS units	222 kg	800 mm x 1200 mm x 1100 mm

Table 1

6 Way into the lab

The system comes in several boxes. For dimensions and size see chapter Delivery/Storage. It will be unpacked at a suitable location that should not be too far from the final location.

It is customer's responsibility to ensure that the floor at the final location as well as on the way to that place is able to carry the weight of the system.

All door clearances from loading deck into the room should be wider or equal to 0.95 m and higher or equal to 1.92m.

Enough space for unpacking and handling of the crates is necessary. If installation does not happen immediately after the delivery the boxes have to be stored in a safe and dry environment.

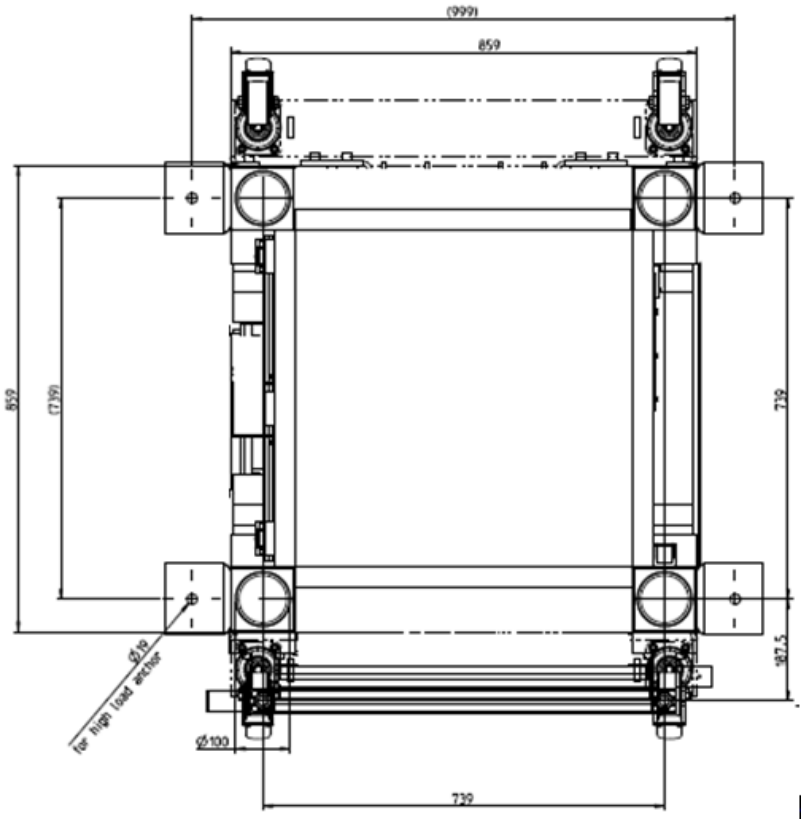
The system does not have any castors, rolls or wheels. It can only be moved by means of a forklift truck or a manual forklift.

It is customer responsibility to provide a forklift truck for unloading and unpacking of the system and a manual forklift to move the system to the final location (**according to DAP loading bay INCOTERM 2020**). The equipment has to meet the requirements listed below:

Requirements	Quantity: 1
Forklift Truck	Max. distance of the forks (outside dimensions): 685mm Minimum Length of the fork: 2000mm Load capacity: 2 t (minimum 1.5 t)

Requirements	Quantity: 2
Manual forklift	Max. distance of the forks (outside dimensions): 685mm Minimum Length of the fork: ~1100mm Maximum height of the fork at the lowest position: 85mm (otherwise the additional height will be needed also for the door clearance)

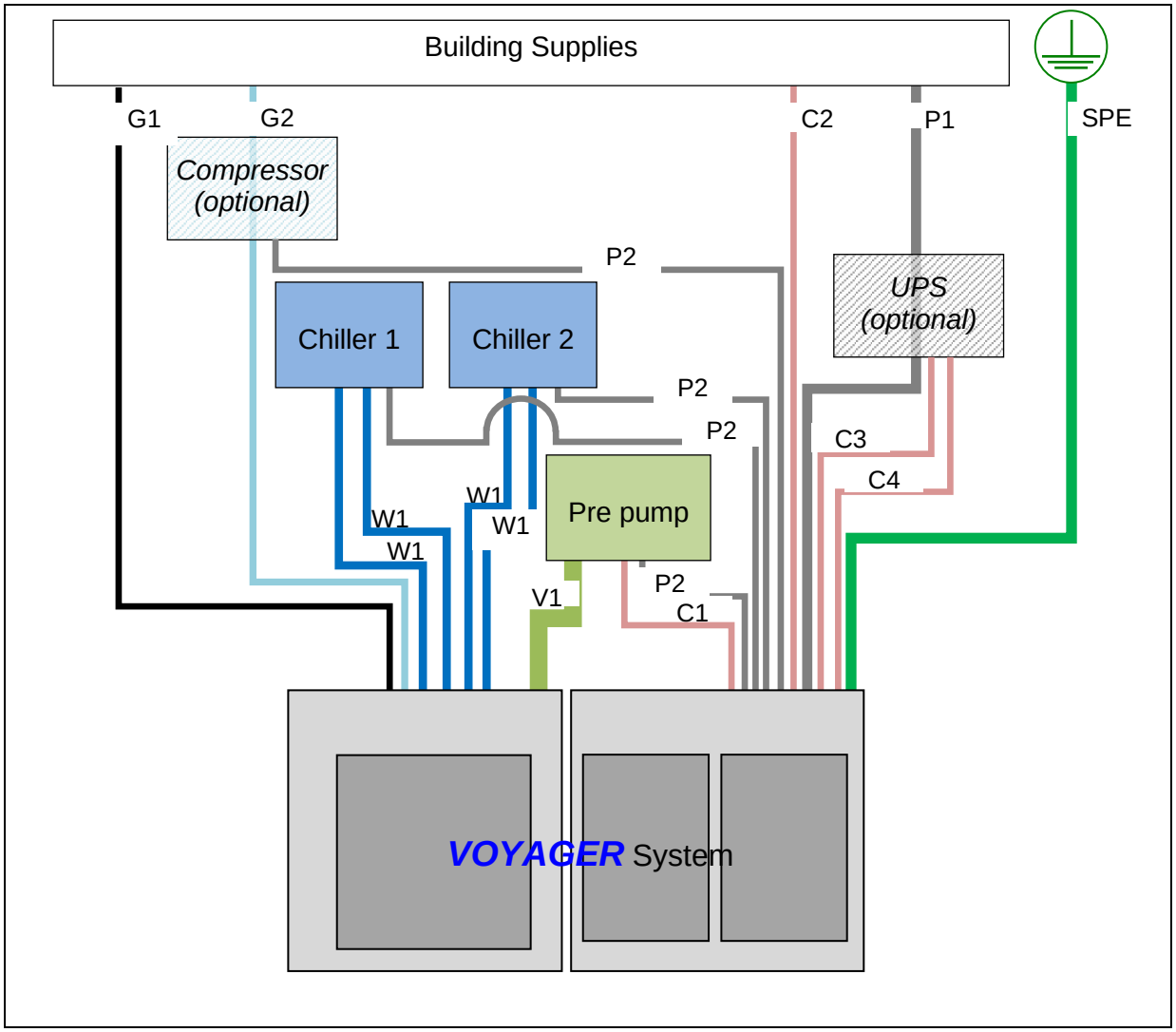
EBL system footprint (unpacked)	Dimension (LxWxH): 1025mm x 910mm x 1900mm



Bottom view of main system

EBL system weight (unpacked)	1250 kg

7 Inter Connections



7.1 Main System connections

Table 2 lists the cables, tubes and hoses that connects the accessories (placed in the chase, building supplies) with the main system

Cable/Hose	Comment	Dimension (hose /tube)				connector or fitting	
		length [m]	Outer ⌀ [mm]	Inner ⌀ [mm]	Type	Dimension	Type
P1	Main power line	10 (13 max)	≈ 17		CEE 32 A, 6h, 230 V, 2P + PE		1/N/PE AC 32A
P2	Standard power line	as Cable/hose	≈ 9			30mm * 21mm	IEC 60320-C13 (C14)
SPE	Separated Protective Ground	10	≈ 9				
V1	Vacuum line	5	≈ 32			40mm ⌀	DN 25 ISO QF (KF)
W1	Water hose	10	≈ 17	9		30 mm Outer ⌀ at hose clam	
G1	Nitrogen Gas line	10	8	6		Quick disconnect coupling DN 2.7	
G2	CDA Gas line	10	8	6		Quick disconnect coupling DN 2.7	
C1	Communication line	7	≈ 5			9pin Sub-D	
C2	Communication line	5			LAN RJ45	RJ-45 plug	
C3	Communication line	10	≈ 5			9pin Sub-D	
C4	Communication line	10	≈ 5			9pin Sub-D	

Table 2 Overview of Connections

8 Customer declaration

The customer has to confirm that all mentioned preparations have been finished prior to installation. Raith reserves the right to charge for additional costs in case that the listed preparations have not been completed at the time of installation.

Please confirm each item on the list with your initials, sign the paper and fax it to Raith GmbH: +49 231 95004 - 460 or Raith USA: +1 631 738 2055

Topic	Specification	Confirmed
Room	Meets the stated requirements (see chapter Room requirements)	
Way into lab	All door clearances from loading deck into the room should be wider or equal to 1 m and higher or equal to 2 m. If the lab level differs from loading deck level, a transportation lift is required. It has to be ensured that the floor and lifts are able to carry the load of the system (1250kg) and that of transport device. Enough space for unpacking and handling of the crates is available.	
Equipment	Forklift truck and two manual forklifts will be provided and meet the required specification	
Main power	230 V; 32 A, 50Hz	
Nitrogen	30 kPa (0.3 bar) pressure regulated, dry nitrogen, purity about 99.996%. Connection for 6(4) mm outer (inner) diameter tube is prepared.	
CDA (compressed dry air)	1 MPa (10 bar) max. Connection for 8(6) mm outer (inner) diameter tube is prepared.	
Separated Protected Earth	Ideally < 0.1 Ω resistance, separated	
Communication	Telephone is installed / internet connection available	

Customer :

Order number :

Date: ---------- Signature: ----------

Apendix

A1. Important Notice

For the Operation of RAITH E-BEAM-Lithography-Systems

Warning: Radiation Hazard !

X-rays are generated in the column and specimen chamber during operation of the E-BEAM-Lithography-System.

The acceleration voltage is limited to 50 kV and the system design limits the dose rate of less than 1µSv/h at a distance of 0.1m of the surface of the E-BEAM-Lithography-System.

Each individual instrument is routinely tested for X-rays by RAITH and the result is certified on the Test Certificate for each instrument. This Certificate is only valid for the delivered system configuration.

According to German Law (X-ray Protection Directive revised April 30, 2003) the operation of this E-BEAM-Lithography-System is subject to official permission. Outside Germany, the user of this E-BEAM-Lithography-System must observe the specific regulations of the country where the system is installed.

Notice:

- Any modifications on the instrument, in particular those on the electron optic column, the specimen chamber with flanges, vacuum parts and the high voltage generator may reduce the radiation shielding.
- It is in the responsibility of the owner of the instrument to check the dose rate around the instrument immediately after those modifications. This can be done by an authorised person or an approved institute or agency and depends on the specific local regulations.