

TSS
Technical Site Specification
Fraunhofer IPMS-MRR

Location: Maria-Reiche-Straße 2, 01109 Dresden

Changes to the version:

Version	Change of position	Reason for the change	Description of the change
001	all	new creation	site specifications
002	3.5	missing information added	chemical details

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1 Purpose and scope of application

The purpose of the document is to specify the general technical requirements that the supplier must fulfil and that must comply with the basic valid (commercial) contracts. It describes the requirements for a machine application at the Fraunhofer IPMS facility.

This specification is valid for the following location:

FhG IPMS MRR (Building 04)

Maria-Reiche-Straße 2, 01109 Dresden, Germany",

based on the regulations and documents of the Fraunhofer IPMS.

2 General information

2.1 Technical definitions

Recipe	Editing programme
FEoL	Front-end-of-line: Structuring of the electrically active components (transistors, capacitors, etc.).
BEoL	Back-end-of-line: Level of the (metallic) conductor tracks, wiring level.
CL5	Contamination class 5, highest (most restrictive) level of contamination management with the most critical but known materials (e.g. germanium, strontium, tellurium)
UC	Unclassified materials, for unknown materials/processes

Table 1: Technical definitions

2.2 List of abbreviations

Acronym Abbreviation	/	Explanation
ABW		(Process) waste water
AKZ		System labelling
CDA / DRL		Ultrapure compressed dry air
CHE		Chemistry
CoA		Certificate of analysis
DIW		Deionised water
DRL		Compressed air
ELT		Electricity
EMO		Emergency stop switch
EPS		Equipment and process specification
ESH		Occupational health and safety
GSG		Basic gas supply
GSP		Gas supply process gases
ID		Identification
KBE		Colony-forming units
KF		Vacuum sealing system (small flange)
KLT		Cold
MTBF		Mean-time between failure

Acronym / Abbreviation	Explanation
MTTR	Mean time to repair
n. s.	not specified
N/A	not applicable
OEM	Original equipment manufacturer
PE	Poly-Ethylene
PFA	Perfluoroalkoxy polymers
PO	order
POU	Point of use, place of use
PP	Polypropylene
psi	Pounds per square inch
PVDF	Polyvinylidene fluoride
RAA	Smoke extraction system
RLT	Ventilation technology
SECS	SEMI communication standard
SEMI	Semiconductor Equipment and Materials International
SI	International System of Units
SS	Stainless steel
tbs	To be specified
TSS	Technical Site Specification
UPS	Uninterruptible power supply
VAK	Vacuum
VCR	Vacuum seal

Table 2: Abbreviations

2.3 AKZ - system labelling system

	Designation -new	Remark	AKZ	System no.
Bulk gases	Compressed air		DRL	100
	Vacuum		VAK	100
	N2-HP		GSG	121
	Ar-UHP		GSP	321
	He-UHP		GSP	322
	H2-UHP		GSP	511
	O2-medical (5.0)		GSG	111
	Propane gas		GSG	113
Chemicals	H2O2-31%		CHE	114
	Isopropanol		CHE	211
	PGMEA		CHE	213
	H2SO4-96%		CHE	113
	H3PO4-85%		CHE	112
	HCl-36%		CHE	115
°	NMP	°	CHE	215
°	BOE	°	CHE	111

	NH4OH-25%		CHE	121
	EKC	°	CHE	212
	Developer	°	CHE	122
	TMAH-2.38% DIL		CHE	123
°	NaOH	°	CHE	124
°	Slurry1	°	CHE	131
°	Slurry2	°	CHE	132
°	Slurry3	°	CHE	133
Waste water	ABW-Neutra		ABW	100
	ABW-HF-containing		CHE	311
°	ABW - Reclaim	°	DIW	200
	CHE-EKC		CHE	322
	CHE solvent mixture		CHE	321
°	CHE photoresists	°	CHE	333
Electricity	3P 20kV	(medium voltage)	ELT	010
	3P 230V / 400V	(normal network)	ELT	020
	3P 230V / 400V	(Mains replacement	ELT	030
°	3P 230V / 400V	(UPS)	ELT	040
	3P 110V / 208V	(208V mains)	ELT	050
Exhaust air	PFO-neutral		RLT	152
	Contains PFO solvent		RLT	151
	PFO corrosive		RLT	153
	Smoke extraction		RAA	100
Liquids	DIW		DIW	190
	Soft water	°	DIW	130
	CAR VL		KLT	121
	City water		SAN	100
	Drinking water		SAN	100
	Humidifier water		RLT	100
	CO2		GSP	327
Speciality gases	Purge gas 1 (He/Ar)	°	GSP	101
°	Purge gas 2 (He/Ar)		GSP	201
	Purge gas 3		GSP	301
	Purge gas 4		GSP	401
	NF3		GSP	216
	NH3		GSP	213
	GeH4		GSP	113
	SiH4		GSP	411
	SiH2Cl2	°	GSP	112
	C4F8		GSP	314
	SF6		GSP	311
	CF4		GSP	313

	CHF3		GSP	312
	C2F6	°	GSP	315
	H2	°	GSP	511
	N2O		GSP	326
	BCl3		GSP	215
	HBr		GSP	214
	Cl2		GSP	211
	HCl gas	Out of service	GSP	212
	B2H6		GSP	114
	CH2F2		GSP	111
	Kr/Ne	°	GSP	325
	Kr/Ne	°	GSP	221
	Laser gas (F2/LG1)	°	GSP	224
	Laser gas (F2/LG3)	°	GSP	222

3 Available facilities

3.1 Power supply

3.1.1 Standard power supply and mains quality

The following networks are available

Type, frequency	Voltage level [V]	System	Manager	Colour code	quality	
AC 50Hz	400/230	TN-S, parts as mains replacement	L1	bn	$\Delta U \pm 10\%$ $\Delta f \pm 1\%$	
			L2	sw		
			L3	gr		
	208/120		N	bl		
			PE	gn/ge		
DC	24	2-wire	L+, L-	k. A.	$\Delta U \pm 10\%$	

Table 3: Electrical energy supply

3.1.2 Current electricity, performance and quality requirements

The system must fulfil all requirements for voltage drops defined in the SEMI F47 standard.

a) Requirements for the electrical current

Maximum nominal current: 630A
 Maximum inrush current: 6 x I_n
 Maximum inrush current duration: 20 s
 Maximum asymmetry of the phase currents: 15 %

b) Requirements for voltage drops according to the SEMI F47 standard!

Process plants must tolerate voltage drops on their AC line as per the following specification:

- Voltage drops of up to 50% for up to 200 ms
- Voltage drops of up to 70% for up to 500 ms
- Voltage drops of up to 80% for up to one second

3.1.3 Requirements for the connection cable

Connecting cables must be installed on agreed cable tray systems. Free laying directly on the floor is not permitted. This applies to all installation levels.

The cables must be converted to the actual length. Exceptions are permitted for HF cables with a fixed length. The winding of cables is not permitted.

3.1.4 Uninterruptible power supply (UPS) for devices

The power consumption of the Fraunhofer IPMS UPS system for devices is strictly limited. The maximum current value at the point of connection (POC) for the switch/fuse size is 16A.

The UPS is reserved exclusively for the device controls and must be agreed with Fraunhofer IPMS.

3.2 Process cooling water (PCW)

This section describes quality, pressure and temperature conditions as well as installation details for process cooling water.

Process cooling water specifications for cars	Specifications	Value	Unit of measurement
	Pressure flow	5,6 ($\pm$ 0,25)	bar(g)
	Differential pressure	4,3 ($\pm$ 0,25)	cash
	Pressure return	1,3 ($\pm$ 0,1)	cash
	Temp. flow	17 (+1,0/-1,0)	°C
	Temp. return	<21	°C
	Conductivity	$\leq$ 1100 ($\pm$ 700)	μ S
	pH	$\leq$ 8,0 (+0,5 / -0,5)	
Materials	Heat exchanger		Stainless steel
	Pipe		PP
	Valves		PP
Connection interfaces	Connection types (equipment):		Swagelok™ flexible hose with hose lock quick connector
	Component on hookup side		Shut-off valve, pressure regulator
	Component on equipment side		Flow meter

Table 4: Process cooling water specification

All locations of flow switches, including the flow values in cooling water pipes, must be specified by the supplier.

3.3 Exhaust air

- The exhaust air ducts must be designed to suit the operation and remove pollutants as close as possible to the emission source.
- Airflow requirements shall be specified and shall ensure control of chemical emissions at each workplace in accordance with SEMI S2.
- Systems in which toxic gases are used must have exhaust air ducts equipped with exhaust air failure alarms. Activation of the exhaust air failure alarm must switch off the gas supply and trigger a visual alarm.
- Electrostatic separators, ductless bonnets, laminar flow bonnets, etc. must not be used in place of local exhaust ventilation.
- Suitable test points are provided for flow measurement.
- Mixing of the exhaust air is prohibited.
- All exhaust air parts must be manufactured as described in Table 5.

Exhaust air type	Neutral	corrosive	Solvent-based
Material Compressive Strength	$\Delta p_{(stat)} = 1.3 \text{ kPa}$	$\Delta p_{(stat)} = 1.3 \text{ kPa}$	$\Delta p_{(stat)} = 1.3 \text{ kPa}$
Negative pressure at point of connection	$\Delta p_{(stat)} = 0.6 \text{ kPa}$	$\Delta p_{(stat)} = 0.6 \text{ kPa}$	$\Delta p_{(stat)} = 0.6 \text{ kPa}$
Materials for pipes and flaps	RR stainless steel otherwise galvanised	PPs	Stainless steel
Connections	Type (on the equipment)		Flange
	Components in the hook up		Flaps
	Components in the equipment		n.s.

Table 5: exhaust specifications

In addition to the vacuum connection type, overpressures (e.g. for pump exhaust lines) must also be accepted.

3.4 In-house vacuum

The use of the in-house vacuum is restricted. The in-house vacuum should primarily be used for handling wafers. The following table shows specifications and installation instructions for house vacuum systems:

	Specification	Value	Unit
	Pressure	< 800	mbar (abs)
Materials	n.s.		
Connections	Type (on the equipment)	Flexible PFA cable, Swagelok™	
	Components in the hook up	Shut-off valve	
	Components in the equipment	n.s.	

Table 6: House vacuum

3.5 Chemicals

The following chemicals are made available at the hook-up valve with at least 1 slm (quality to be agreed with IPMS):

Chemical	Installation material		Media available	
	PFA	Stainless steel electropolished, explosion-proof	Clean room	Service zone
Ammonia water 25%	x		x	
Hydrochloric acid 36%	x		x	
BOE	x		x	
Hydrogen peroxide 31%	x		x	
Isopropanol		x	x	
PGMEA		x	x	
NMP		x	x	
EKC 265		x		
TMAH 2.38% (developer)	x		x	
TMAH 25%	x			
Phosphoric acid 85%	x		x	
Sulphuric acid 96%	x		x	
Caustic soda technical 45%	x			x
Caustic soda technical 22,5%	x			x
Slurry1 Klebosol	x			x
Slurry2 Optiplane	x			x
Slurry3 Cabot	x			x
Connection type (equipment)	Flare Tec for PFA hose			
	VCR- or Swagelok – Connection for stainless steel systems			
	The hook-up valve is the connection and transfer point			

Table 7: Chemicals

Systems available for continuous pressure and in the HockUp:

Stub:

- Ammonia solution NH₄OH 25%
- Hydrogen peroxide H₂O₂ 31%
- Hydrochloric acid HCL 36%

Loop systems:

- Slurry 1 Klebosol
- Slurry 2 Optiplane
- Slurry 3 Cabot

Systems available for continuous pressure and not in the HockUp:

Stub:

- TMAH 25% (continuous pressure only in the supply cabinet >> request signal required)

All other chemicals require a request signal from the tool.

3.6 Ultra-pure water (UPW)

Wherever possible, circulating constructions should be used within the system, especially under standby conditions. All outlets must have a trickle flow when the system is in standby mode.

There will be a reflux system for the standby mode of the system/tool.

The following table shows the specifications for DIW:

Element	Warning limit (ppt)	"SPEC" limit (ppt)
K, Ca, Na, Mg, Li, Al Fe, Cr, Cu, Ni, Mo, V, Co, W, Ti, Pt, Au, Ag	5	10
Ba, Pb, Sn, Sr, Sb, Zr, In, As, Be, Bi, Ga, Ge, Cd, Ta, Se, Nb	10	20
Boron	1.000	10.000

Table 8: DIW specification

Material	Supply Line PVDF	Return Line PVDF / PP
Connections	Type (on the equipment)	screwed (female) or flanged (>50mm)
	hook up	Shut-off valve
	equipment	Pressure regulator, flow meter

Table 9: DIW installation

3.7 Bulk gases

Gas type		N2-HP 6.0	Ar-HP 6.0	H2-UHP 6.0	He-HP 6.0	O2-S 2.5
Pressure bar (g)		7,5	6,59	0,0	6,28	6,1
Impurities (ppb)	N ₂	n.s.	n.s.	n.s.	< 50	
	O ₂	< 200	< 1	< 1	< 50	> 99,5%
	Ar	n.s.	n.s.	n.s.	< 50	
	H ₂	< 200	< 2	n.s.	< 50	
	He	n.s.	n.s.	n.s.	n.s.	
	CO	< 500	< 1	< 1	< 20	
	CO ₂	CO+CO ₂	< 1	< 1	< 20	
	NM	< 500	n.s.	n.s.	< 50	
	H ₂ O	< 100	< 1	< 1	< 100	
	0.1µm part/ft ³	10	1	1	1	n.s.
Material	Tubes	Stainless steel 316L / 304				
	Valves					
Connections		Connection type (equipment):		Screwed VCR or Swagelok™		
		Connections in the hook up		Isolation valve		
		Components in the equipment		Pressure reducer		

Table 10: Base supply gas specifications

3.8 Speciality gases

Specifications			
Pressure bar (g)		follows the gas specifications	
Material	Pipework	Stainless steel 316L	
	Valves		
Connections		Connection type (equipment):	1/4" screwed VCR
		Components in the hook up	Isolation valve
		Components in the equipment	Pressure reducer, inlet manual valve

Table 11: Speciality gases

3.9 Compressed Dry Air (CDA)

		Parameters	Value
		Dew point	-70°C at 7.8 bar or less
Material	Pipework	Stainless steel 316L / 304	
	Valves		
Connections		Connection type (equipment):	Swagelok™
		Components in the hook up	Isolation valve
		Components in the equipment	Pressure reducer, inlet manual valve
Particles		Size	Number per ft³
		0.1 µm	28
		0.2 µm	7
		0.3 µm	3
		0.5 µm	1
		> = 1.0 µm	0

Table 12: CDA specifications

3.10 Waste water

Possible wastewater drains:

ABW - Neutra	- only acids / alkalis, none: HF, abrasives, complexing agents
ABW - HF - containing	- dto., HF up to 1% permissible
ABW - Reclaim	- only unencumbered
ABW-Cu-CMP	- Abrasive, Cu ²⁺ permissible
CHE solvent mixture	- IPA, acetone, photoresists, EKC solvents, PGME/PGMEA

Material	Pipework	PP (< 60°C) or PVDF (> 60 °C) PVDF for O ₃ -containing process wastewater	
	Valves		
Connections		Connection type (equipment)	Screwed or flange larger than 50mm
		Components in the hook up	If necessary, siphon
		Components in the equipment	Isolation valve

Table 13: Waste water

3.11 Introduction of chemicals

- All systems using wet chemicals must have internal secondary containment systems to contain 100% of the volume of the largest container.

- It must be ensured that a communication link can exist between the process system(s) and the disposal system in order to guarantee that the emptying of the process system is stopped if the disposal systems fail.
- Drains are limited to PP or PVDF or stainless steel.
- Systems with hazardous chemicals must have internal leakage detection systems with the appropriate alarm indicators.
- **Different drains are required for different chemicals. The decision on the connection of a tool to one of the drainage systems is made by Fraunhofer IPMS.**

The discharge of chemicals and/or chemical mixtures must generally be discussed with the FRAUNHOFER IPMS Waste Management Department before the system is dispatched.

3.12 Discharge of solvents

Isopropanol, resist mixture, acetone, EKC solvents can be introduced into the solvent disposal system at a temperature <25°C.

Material	Pipework	Stainless steel	
	Valves		
Connections		Connection type (equipment)	Flange or Swagelok™
		Components in the hook up	n.s.
		Components in the equipment	Isolation valve

Table 14: Solvent disposal Installation

The discharge of solvents and/or solvent mixtures not listed in the text must be discussed with the FRAUNHOFER IPMS Waste Management Department before the system is dispatched.

3.13 Exhaust gas cleaning

- It must be ensured that there is a communication link between the process equipment and the flue gas cleaning system (i.e. scrubber, etc.). An "exhaust gas on/off" signal must be provided for each individual process chamber. An additional "*high fire/low fire*" signal is required for each individual process chamber.
- These signals must be available at potential-free contact points on the process control unit.

3.14 Integrated systems

All pressure regulators, filters, check valves and flow meters that are required for the SYSTEM(S) to function correctly after installation of the system must be integrated into the SYSTEM. These components are not provided by Fraunhofer IPMS; FACILITY department.

4 Cleaning and packaging

As a minimum requirement, all parts are packaged in accordance with ISO class 4 as per DIN EN ISO 14644. Each part or unit is wrapped in a double layer of antistatic plastic film. Each layer is individually sealed. The film must be sufficiently strong to withstand damage, e.g. during transport.

5 Installation

5.1 Connection

- System connections and joints will be made from the underside of the system. With the exception of large extraction ducts for equipment installed by mutual agreement with Fraunhofer IPMS.
The supplier shall draw attention to possible problems that may arise from the installation situation!
- The connections (interconnects) between the system(s) and its supply units (sub-tools) can be up to 20 metres long, measured from the point at which the connection enters or leaves the respective units.
- Fraunhofer IPMS may require that all connections are made to the exact length to ensure a safe and professional installation. It may therefore be necessary to modify the connections on site.
- The supplier's personnel will connect the connections. They are first connected on the side of the system(s). The supplier is responsible for the technically correct installation/routing of the connections. Fraunhofer IPMS personnel will provide support.
- All necessary cable glands and other feed-through materials are supplied with the system(s)-
- A safety inspection is carried out before the systems are supplied with media. The supplier is responsible for bringing the system(s) into the correct condition to start the supply safely.
- Fraunhofer IPMS reserves the right to reject system(s) that violate safety, environmental and health regulations:
 - on delivery: rejection of the system(s) in the event of obvious violations on the system(s)
 - during installation / commissioning: documentation of the violations in the acceptance report & rectification by the supplier.
- The switching on of the systems must be clearly indicated in the supplier's schedule for the commissioning of the system. A corresponding request to switch on the system(s) must be sent to the responsible Fraunhofer IPMS employee from the "Facility Cleanroom" department with 3 days' notice. The request must specify to Fraunhofer IPMS in detail when the respective supply is required.

5.2 Hardware start-up

- The hardware commissioning of the system(s) must include a safety inspection consisting of at least a leak test (vacuum system(s)), an emergency stop test (EMO) and an interlock test. The test results must be documented and handed over to Fraunhofer IPMS.
- Fraunhofer IPMS will provide the required test and dummy wafers as far as possible. The required wafers will be registered with Fraunhofer IPMS as described in the project planning.

5.3 Supplier - Support and special equipment

- The supplier must provide all necessary tool sets and measuring equipment. Furthermore, the supplier must provide all necessary special and calibration equipment required for installation and commissioning. These must be verifiably and timely calibrated.

6 Standards

- It is the responsibility of the manufacturer of the semiconductor product(s) (supplier) to ensure that the design, construction and interfaces of its product(s) comply with all SEMI, Sematech and other standards (including safety) and guidelines.

- At the request of Fraunhofer IPMS, the supplier must be able to demonstrate in detail and prove that all standards and regulations are complied with.

7 ESH aspects (environment, safety and health protection)

- Delivered goods and services must comply with the legal requirements applicable at the respective location receiving the goods or services. The state of the art must be complied with, unless stricter legal regulations are to be observed.
- Any deviations from ESH requirements must be agreed with the customer in writing in advance.
- Any additional requirements, if necessary, must be detailed in the system-specific order conditions.
- New safety-relevant information about the system(s) after delivery that becomes known to the supplier must be communicated to the customer immediately.

8 Documentation

All documents that the supplier should provide before the system(s) is/are on site are

- Supply and disposal connections,
- requirements for the equipment and the installation plan
- Detailed system layouts
- side view drawings
- all necessary detailed information for the connection of the system(s)
- maximum and average consumption
- the factory UPS requirements

All documentation should be provided in an electronic format. Fraunhofer IPMS may require the written form (cleanroom or normal paper). The CE Declaration of Conformity should be provided in written form prior to installation.

The following table lists the entire documentation package that the supplier should provide.

Safety / environmental protection required	The original of the CE certificate declaration (not a copy)
	Environmental declaration (WEEE, RoHS, ...)
	Information on emission sources, emission assessments, disposal of emissions
Structure and construction	Packing list
	Test list
	Exploded drawing incl. individual part designations
	Technical drawings of the consumables
	Technical drawings of the vacuum systems
	Technical drawings of the gas systems
	OEM parts lists
	Spare parts list
	Spare parts catalogue (priced)
	Exploded view of the spare parts
Operation and maintenance	Installation and assembly procedures
	Start-up preparation documents
	Acceptance documents
	Functional description
	Programme description
	Process description
	Operating instructions
	OEM operating instructions
	Maintenance instructions

	Plans for preventive maintenance incl. list of required parts
	Spare parts kits
	Troubleshooting guide
	Backup copies of the system software
	ditto for EEPROM

Table 18: Documentation specification

8.1 Documentation - Before installation

All documentation should be provided in an electronic format, Fraunhofer IPMS may require the written form (cleanroom or normal paper). The CE declaration of conformity should be handed over in written form before moving into the building.

The following table shows the documents that should be delivered before moving in:

Description	Number of copy(s) (normal paper)	Number of copy(s) (cleanroom paper)	Number of copy(s) (digital)	Latest due date
Fraunhofer IPMS Toolbook	(1)	-	1	-16 weeks
Media requirements	(1)	-	1	-16 weeks
System configuration	(1)	(1)	1	-16 weeks
Connection drawings	(1)	(1)	1	-16 weeks
Installation drawings	(1)	(1)	1	-16 weeks
Connection drawings	(1)	(1)	1	-16 weeks
Load distribution drawing	(1)	(1)	1	-16 weeks
Floor plans	(1)	(1)	1	-16 weeks
Resource planning installation (Gantt chart)	(1)	(1)	1	-16 weeks
Installation and commissioning schedule	-	-	1	-16 weeks

Table 19: Documentation - Pre-Move-In

8.2 Documentation - Language, units and dimensions

- All documentation is available in English and German.
- All safety and user-related instructions should be provided in both English and German.
- Units and dimensions are given in the metric system (SI), with the exception of process pressure measurement, which can also be carried out in Torr or PSI.

9 RAM - Reliability, availability, maintenance - (SEMI E10)

9.1 General

Fraunhofer IPMS will use the recognized industry standard SEMI-E10-0221 (SEMI E10 - Specification for Definition and Measurement of Equipment Reliability, Availability, and Maintainability (RAM) and Utilization) to monitor the reliability, availability and maintainability of the system(s). It contains definitions of condition categories and methods for calculating system performance.

In cases of doubt, the provisions of SEMI-E10-0221 are used to clarify questions.

9.2 Plant acceptance metrics

Fraunhofer IPMS can and may use any of the metrics contained in the SEMI E10 to define the conditions and deliverables for the final acceptance of the system(s) in the Technical Tender Specification.

10 FAB construction, design and specifications

The basic Fab cross-section below shows exemplary dimensions:

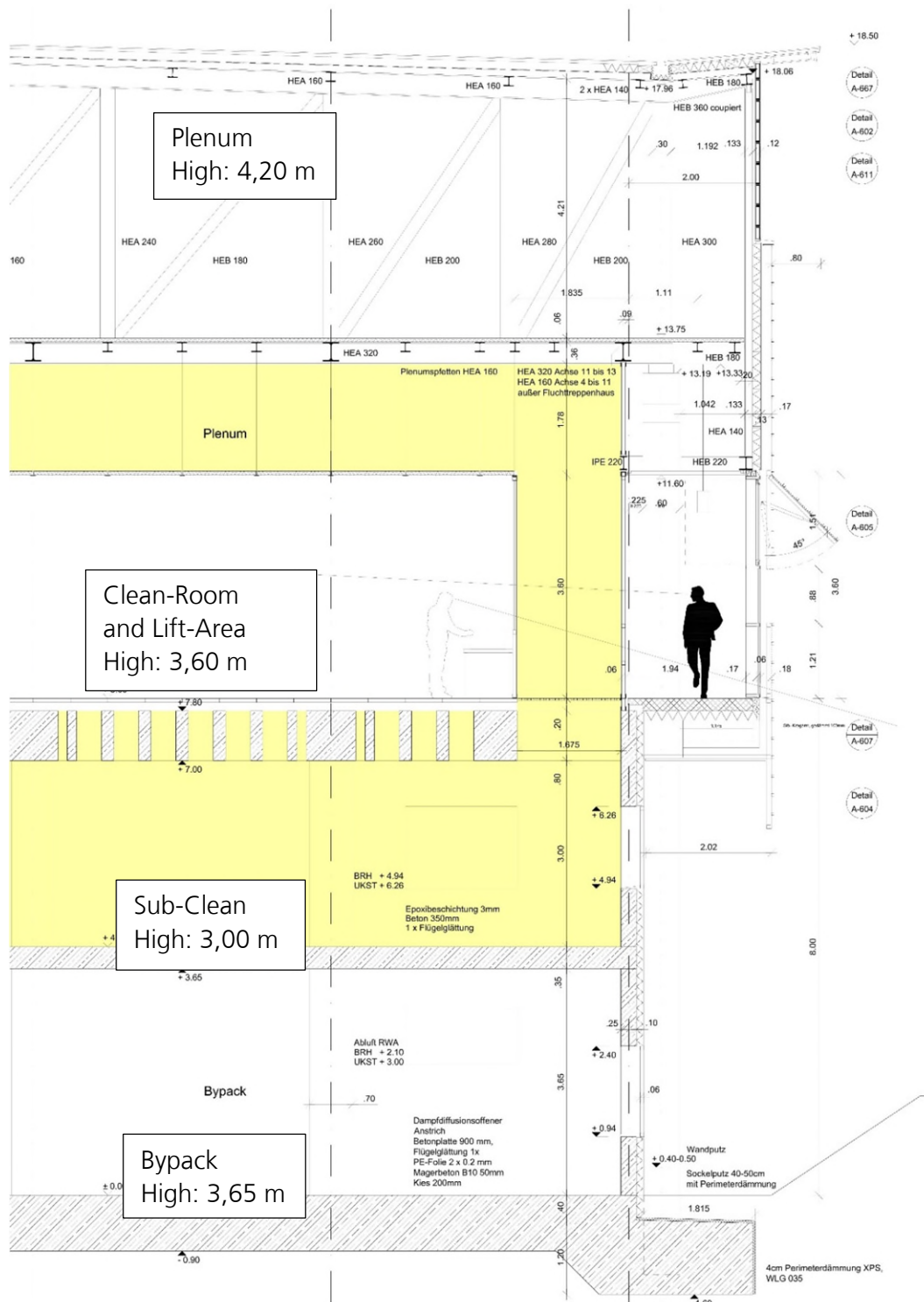
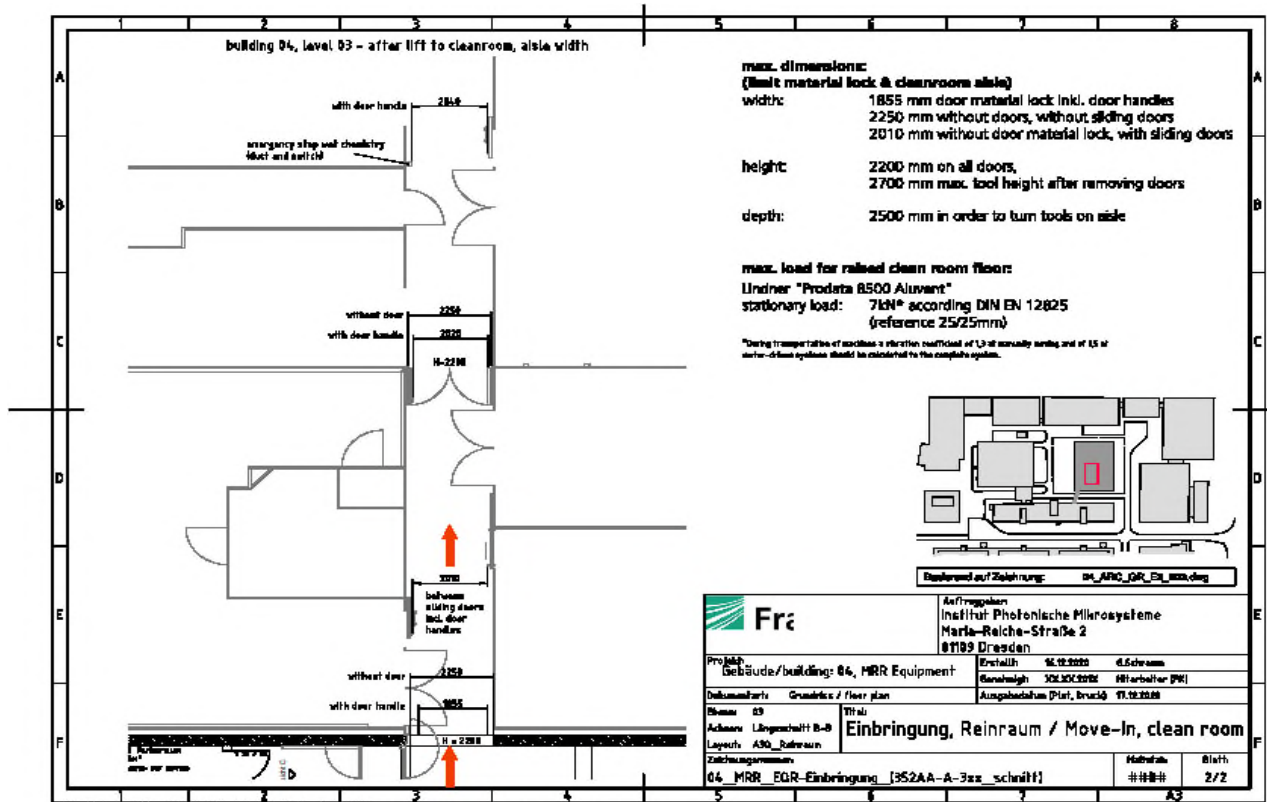
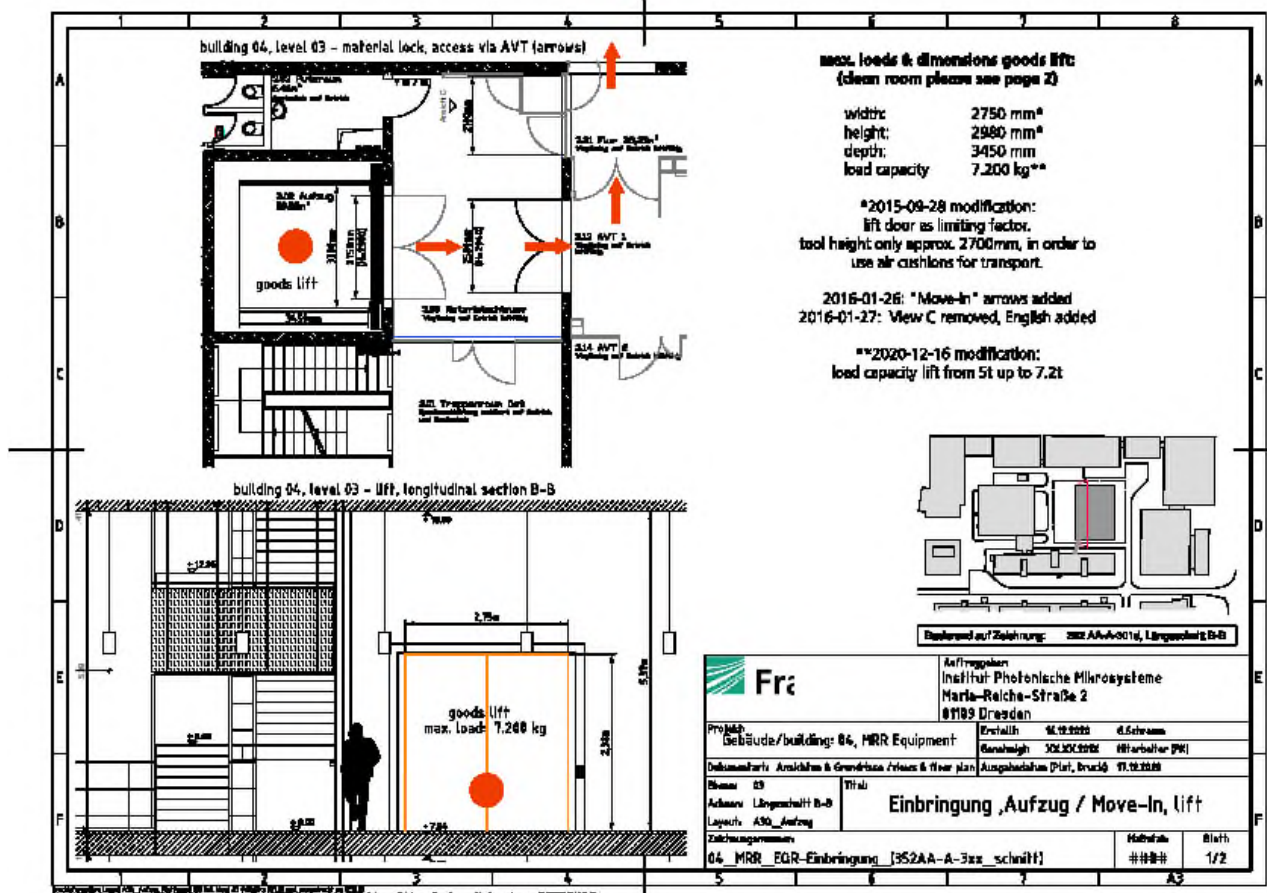


Figure 1: Fab cross-section

10.1 Cleanroom specifics



Application route and RR-specific data

10.2 Vibration from devices

All equipment and submodules brought onto or into the Fraunhofer IPMS cleanroom facility must ensure that all vibrating sources are fitted with suitable damping devices.

Heavy rotating equipment, pumps and motors must be installed away from the air return level.

10.3 Vibration specification

The graph below shows the upper limit of the vibration velocity in the range of 4 - 100 Hz for vibration class E, for which the FAB floor is designed. This design takes into account internal and external stimulation caused by the location and infrastructure.

Different vibration classes are represented by different levels but identical curve shapes in the graph below:

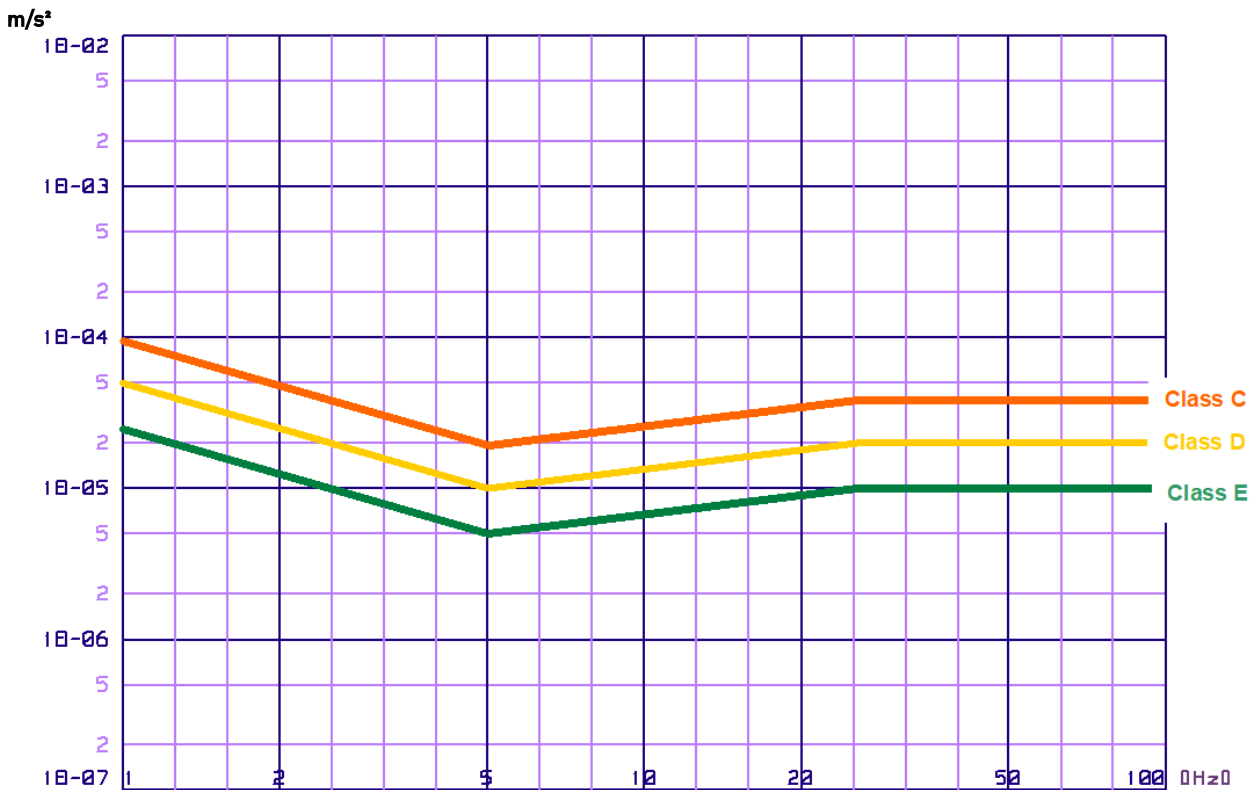


Figure 2: Vibration curves

10.4 Integrated environments

- The integrated environment refers to the ISO class 2 standard - EN ISO 14644-1 (2015).
- It is required that the equipment(s) manufactured by the supplier is capable of maintaining an ISO Class 2 cleanroom environment around all substrate process paths and process chambers.

11 signatures

To become effective, this document must be signed by both Fraunhofer IPMS and the supplier.

Any deviations necessary to ensure the operational capability of the tool to be delivered must be communicated before the final offer is submitted and the above document is signed. A solution must be worked out in mutual consultation, leading to an agreement on the above document.

Subsidiary agreements and contractual amendments to this document must be made in writing to be effective and must be mutually agreed between Fraunhofer IPMS and the supplier.

Date:

Date:

Fraunhofer IPMS

Supplier name