

Price list NorFab

The vision of NorFab is to be a robust and competent backbone consortia supporting and enabling research and innovation within micro-and nanotechnology (MNT) in Norway. NorFab will be an enabling resource for both academic and industrial R&D.

The members of the NorFab consortium are NTNU NanoLab, UiO MiNaLab, SINTEF MiNaLab and MSTLab at HiVe. More information about the national infrastructure NorFab can be found at www.norfab.no.

This document introduces the common price system for NorFab. In general, the three university/university college cleanrooms* are hands-on and open-access, meaning that the users will carry out the research themselves after an initial training process. However, for some instruments an operator is required.

SINTEF MiNaLab has an-ISO certified semi-production line with strong requirements regarding access and cleanliness. Therefore, the infrastructure requires an operator for all processing carried out in the lab and the prices follow a different system than for the university NorFab nodes.

The presented prices are based on the intention to share the costs of the infrastructure among users. Prices for academic activities are subsidised through basic funding from the universities. Prices for industrial activities are based on a full-cost approach; no cross-subsidies between the user groups are given.

User categories

NorFab distinguishes between academic, start-up and industry activities that use the infrastructure. The corresponding users are defined as follows.

Academic users are defined as:

- Bachelor, Master and PhD students.
- Post docs/researchers
- Fully internally-financed research within non-profit research institutes.
- Public funded and co-funded projects (i.e. NFR, EU).

Users from start-up companies are defined as:

- Companies following the EU definition for micro enterprises. The reduced fee is paid for the first 24 months after start-up.
- Research projects financed by start-up companies

Industrial users are defined as:

- Any other company/users
- Research projects fully financed by industry

Academic activities are considered as knowledge building with a pronounced aim to contribute to the general scientific knowledge base. There is therefore a strong ambition that processes developed during the course of academic activities will be documented and to a large extent made available to NorFab.

* hereafter called "university cleanrooms"

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Prices

NorFab's price structure is based on the costs for use of the infrastructure and is divided into four parts:

- Instrument costs, paid per booked hour for more expensive instruments with running costs >100 NOK/hour
- Operator costs, paid per hour of use of personnel for operating machines
- Task costs, for a fully performed task within the infrastructure (only applicable for SINTEF)
- Costs for basic infrastructure, paid per working hour in the cleanroom; includes standard chemicals and small instruments (only applicable for NTNU NanoLab)

Table 1: Price list of NorFab (in NOK)

	Academia	Start-up	Industry
<i>Instrument prices (a list of available equipment and pricing is given in appendix 1)</i>			
Instrument type A (/h)	100	125	150
Instrument type B (/h)	300	375	450
Instrument type C (/h)	500	625	750
Instrument type D (/h)	800	1000	1200
Instrument type E (/h)	1000	1250	1500
Instrument type F (/h)	1250	1580	1900
Basic Infrastructure* additional fee /h (only NTNU NanoLab)	250	300	350

* Fee for using the basic infrastructure (including standard chemicals and small instruments – see instrument list in appendix 1) is charged per working hour in the cleanroom. Fees for use of instruments type A-F are charged in addition.

Table 2: Flat rate prices of NorFab (in NOK)

	Academia	Start-up	Industry
<i>Flat rate (only available at university cleanrooms)</i>			
Flat rate / full infrastructure (free use of the entire NorFab infrastructure)	15% of the research project funding*; PhD students/post docs: 125.000/year	40.000 /month/person	50.000/month/person
Flat rate / basic infrastructure (only NTNU NanoLab)	25.000/semester/project	6000/month/person	7.500/month/person
Training costs	0	0	0

*The total funding of the project is reduced by the amount for consumables and running costs for equipment used in laboratories outside NorFab.

General rules for flat rates

Flat rates are based on average cost estimations and the purpose of flat rate is to facilitate project planning. The following rules apply:

- PhD students are charged for a maximum of 3 years
- Instrument booking rules apply
- No operator service included

Other conditions

The following conditions apply:

- Users of the institute sector are charged after the following rules:

o all public funded and co-funded projects (ie NFR, EU)	academia
o projects fully financed by industry	industry/start-up
o internal projects*	academia

*Requires project and budget description accepted by the institute management and access to cleanroom process descriptions.
- Training costs (to become a user) are currently covered by NorFab, for any user involved in a proposed activity in NorFab.
- To enable easy calculation of prices for long-term use of the infrastructure, NorFab also offers flat rates, with full use of the university cleanrooms within the infrastructures on a monthly, semester, or year.
- Furthermore, NorFab offers both opportunities and space for own instruments and more permanent set-ups. To utilise this and evaluate possibilities please contact NorFab for further discussions.
- The prices listed in Appendix 1 may vary for users originating from NorFab infrastructures due to local subsidies given by NorFab partners to their employees. For information regarding local subsidises, contact your local laboratory.

Tasks performed by operator

The following operator prices are charges in addition to the fees given above:

NFR/EU projects

SINTEF*	based on SINTEF hourly rates depending on operator qualification and project type	
Universities	750	NOK/h

Start-up/Industry projects

SINTEF*	based on SINTEF hourly rates depending on operator qualification and project type	
Universities	1100	NOK/h

The university infrastructures have limited capacity for operator services. SINTEF offers operator services at NTNU NanoLab. Here SINTEF operator prices apply, based on SINTEF hourly rates.

All prices are given exclusive VAT.

The price system including the prices given in this document will be enforced from 01.07.2012 and subjected to annual revision.

Appendix 1

Price matrix

For readability the price matrix is repeated here:

	Academia	Start up	Industry
A	100	125	150
B	300	375	450
C	500	625	750
D	800	1000	1200
E	1000	1250	1500
F	1250	1580	1900

Price per hour in NOK excl. VAT

For NTNU NanoLab an hourly fee is charged per working hour in the cleanroom:

	Academia	Start up	Industry
all cleanroom areas	250	300	350

Price per hour in NOK excl. VAT

List of instruments

Tool Nr.	Tool name	Model	Category	Price group
NL	NTNU NanoLab			
NL0001	STM, Nanosurf (4 pcs)	easyScan2	Characterization	A
NL0003	AFM, Nanosurf	easyScan2	Characterization	A
NL0096	Nanosight	LM10	Characterization	A
NL0101	Particle size analyser	Beckman coulter N5	Characterization	A
NL1410	AFM, Veeco	diMultimodeV	Characterization	A
NL2331	Wire bonder	Leica/tpt S6	Packaging	A
NL3010	Dicing Saw	Disco DAD- 2H/6	Other	A
NL3021	Scriber	Dynatex DXIII	Other	A
NL0004	AFM, Nanosurf Flex	easyScan2	Characterization	A
NL0120	Rapid Thermal Processing (RTP) oven	Jipelec Jetfirst 200mm	Thermal Processes	B
NL1461	Sputter coater and Thermal Evaporator	Cressington 308R	Deposition	B
NL5010	Student photolithography	Karl Suss MJB3 + Wet stations	Lithography	B
NL1101	Photolithography	Karl Suss MA56 + Wet stations	Lithography	C
NL1105	Nanoimprinter	EVG620	Lithography	C
NL1207	Reactive Ion Etch (RIE)	Oxford Instruments	Etching, dry and wet	C
NL1512	S(T)EM	Hitachi S-5500	Characterization	C
NL1103	Electron Beam Lithography	Hitachi 4300SE Raith stage	Lithography	D
NL1205	E-beam evaporator	Pfeiffer Vacuum Classic 500	Deposition	D

NL1225	PECVD	Oxford Instruments, PlasmaLab System 100-PECVD	Deposition	D
NL1230	Inductive Coupled Plasma RIE	Oxford Instruments, PlasmaLab System 100-ICP180	Etching, dry and wet	D
NL1405	Focussed Ion Beam (FIB)	FEI	Characterization	E
NL0010	SECM	Princeton Applied Research 370	Characterization	incl.
NL0020	Drying Oven	Termaks TS 8056	Thermal Processes	incl.
NL0021	Drying Oven	Termaks TS 8056	Thermal Processes	incl.
NL0022	Drying Oven	Termaks TS 8056	Thermal Processes	incl.
NL0023	Binder vacuum Oven	Binder VD23	Thermal Processes	incl.
NL0024	Binder vacuum Oven	Binder VD23	Thermal Processes	incl.
NL0030	Heidolph Rotary Evaporator	Laborota 4000/ G4 bath	Other	incl.
NL0031	Heidolph Rotary Evaporator	Laborota 4000/ G4 bath	Other	incl.
NL0040	Glove Box Ar	MBraun Unilab MB-20-G	Other	incl.
NL0041	Glove Box N2	MBraun Unilab MB-20-G	Other	incl.
NL0050	Centrifuge (Table top)	Heraeus Labofuge 400R	Other	incl.
NL0051	Ultracentrifuge	Thermo Electron Corporation, WX Ultra 100	Other	incl.
NL0070	Microwave Oven	Anton Paar Multiwave 3000	Thermal Processes	incl.
NL0098	Syringe pump	KDScientific KDS-200-CE	Other	incl.
NL0110	WTW pH-meter	inoLab pH 730	Other	incl.
NL0130	Ultrasound desintegrator	450 CE Digital	Other	incl.
NL0150	Autoclaves	Parr 4560 Mini Bench Top Reactor	Thermal Processes	incl.
NL0160	Dip Coater	Nima Technology Dip Coater DC Mono 75	Deposition	incl.
NL0163	Spin coater (not litho)	WS-400B-6NPP-LITE/ AS	Deposition	incl.
NL0230	Calcination (gold) furnace	Thermcraft	Thermal Processes	incl.
NL1120	Yellow light microscope 2	Nikon LV150 eclipse	Characterization	incl.
NL1130	DIC microscope 2	Zeiss AxoScope A1	Characterization	incl.
NL1131	Stereomicroscope 4	Nikon SMZ460/C-PS	Characterization	incl.
NL1435	DIC microscope 1	Zeiss AxoScope A1	Characterization	incl.
NL1436	Stereomicroscope 2	Nikon SMZ800/C-PS	Characterization	incl.
NL1450	Plasma cleaner	Diener Electronics, Femto	Etching, dry and wet	incl.
NL1470	UV/Ozone cleaner	novascan PSDPro-UVT6	Other	incl.
NL1500	Reflectometer 1	Filmetrics F20	Characterization	incl.
NL1501	Reflectometer 2	Filmetrics F20	Characterization	incl.
NL1510	Carbon coater	Cressington 208 Carbon	Deposition	incl.
NL1720	Profilometer	Veeco Dektak 150	Characterization	incl.
NL1735	Stereomicroscope 3	Nikon SMZ460/C-PS	Characterization	incl.
NL1920	Fluorescence microscope	Zeiss AxoScope A1	Characterization	incl.
NL1922	SEM (Table top)	Hitachi TM3000	Characterization	incl.

NL2008	PDMS/silanes area	Fume hood, spinner, oven	Other	incl.
NL2314	Curing Oven for PDMS	Termaks TS 8024	Thermal Processes	incl.
NL2315	Safety bench	Kojair Biowizard silver	Other	incl.
NL2326	Syringe pump	Chemyx Fusion 400	Other	incl.
NL2327	Syringe pump	Chemyx Nexus 3000	Other	incl.
NL2330	Stereomicroscope 1	Nikon SMZ460/C-PS	Characterization	incl.
NL3012	Surface Plasmon Resonance	Reichert Life Sciences SR 7000 DC	Other	incl.
NL5012	Oven for lithography	Memmert U26	Thermal Processes	incl.
NL5013	Yellow light microscope 1	Nikon LV150 eclipse	Characterization	incl.
NL5014	Oven for lithography	Memmert U26	Thermal Processes	incl.
NL1460	Sputter coater for SEM Sample Prep.	Cressington 208HR	Deposition	incl.
UIO	UiO MinaLab			
UIO001	Warm cabinet		Thermal Processes	A
UIO002	4-point probe	Jandel KM3-AR	Characterization	A
UIO003	Ellipsometer	Rudolf Research / AutoEL	Characterization	A
UIO004	Stylus profilometer	Veeco Dektak 8	Characterization	B
UIO005	CV/IV characterization; probe station	Agilent 4284A, Keithley 617, Keithley 2440	Characterization	A
UIO006	Solar simulator	Newport 91160 Full Spectrum Solar Simulator	Characterization	B
UIO007	Wet etch	Manual wet station	Etching, dry and wet	B
UIO008	Spectrophotometer	Shimadzu SolidSpe-3700 DUV	Characterization	C
UIO009	Hall/TDH	LakeShore EM4 HGA	Characterization	C
UIO010	SEM	Scanning electron microscope (SEM)	Characterization	B
UIO011	FTIR	Bruker IFS 125HR	Characterization	C
UIO012	Photolithography	Karl Suss MH56 + wet etch + spinner	Lithography	C
UIO013	Photolithography	Karl Suss MJB55 + wet etch + spinner	Lithography	C
UIO014	High temp tube furnace	Gero 1 75242	Thermal Processes	B
UIO015	High temp tube furnace	Gero 2	Thermal Processes	B
UIO016	Tube furnace	Lindberg 59544	Thermal Processes	B
UIO017	Thermal evaporation	Balzers BAE 250	Deposition	B
UIO018	E-beam evaporation	BioRad	Deposition	C
UIO019	XRD	Bruker AXS D8 Discover	Characterization	D
UIO020	Tube furnaces	4-stack ThermCo	Thermal Processes	B
UIO021	Tube furnaces	GSL1100X	Thermal Processes	B
UIO022	Rapid Thermal Processing	AnnealSys AS-Micro	Thermal Processes	C
UIO023	Rapid Thermal Processing	AnnealSys AS-One	Thermal Processes	C
UIO024	Magnetron sputtering	CVC type AST-601, DC system	Deposition	C

UIO025	Magnetron sputtering	Semicore TriAxis	Deposition	C
UIO026	E-beam evaporation	Leybold L 560 K	Deposition	D
UIO027	PECVD	Advanced Vacuum Vision 310 MK II	Deposition	D
UIO028	RIE	Advanced Vacuum Vision 310 MK II	Etching, dry and wet	C
UIO029	Doping – Ion Implantation	NEC Tandem accelerator	Other	D*
UIO030	ALD	Beneq TFS 200- 148	Deposition	E*
UIO031	MOCVD	Titan (EMF) reactor	Deposition	E*
UIO032	Optical Microscope	Olympus BX 41 M	Other	incl.
UIO033	RBS		Characterization	D*
MST	MSTLab HiVE			
MST101	Thermal cycling	Weiss- Weiss Technik 64	Characterization	A
MST102	Interferometer	Veeco - Wyko NT9100	Characterization	A
MST103	IR camera	PL-B741E 1.3MP monochrome camera	Characterization	incl.
MST104	Microscopes	Leica - DM 4000M Carl Zeiss Jena Neophot 32	Characterization	incl.
MST106	Probe station	PWS - Probe II	Characterization	A
MST107	Profilometer	Veeco- Dektak 150 Stylus ProfilerScan	Characterization	B
MST109	Shear tester	F&K- Delvotec 5600	Characterization	A
MST201	Tube furnace (Oxidation) Oven	HarmbridgeHitech Furnace	Thermal Processes	A
MST301	Student photolithography	Karl Suss: MA56	Lithography	B
MST302	Photolithography	EVG -AL6 / 620	Lithography	C
MST303	Plasma cleaner	March Plasmod	Lithography	incl.
MST305	UV Cleaner	UVOCS (Ultra-Violet Ozone Cleaning System)	Lithography	incl.
MST401	Au sputter	Fison Instruments Polaron SC500	Deposition	incl.
MST402	Electroplating (wafer and pieces)	Heimerle + Meule - PGG 20	Deposition	C
MST403	Thermal evaporator	MiniLab T25M	Deposition	C
MST501	RIE	PlasmaTherm - SLR series	Etching, dry and wet	B
MST502	Wet Etching	General wet-benches	Etching, dry and wet	B
MST602	Wafer bonding (Anodic, Fusion and Metallic)	EVG 501 Wafer bonder EVG 620 Bond aligner	Wafer bonding	B
MST701	Die attach	Laurier Incorporated	Packaging	A
MST702	Flip-chip bonder	MAT- MAT 6400	Packaging	B
MST703	Dicing SI-wafer	Disco- DAD-2H/6T	Packaging	A
MST703	Dicing ceramik ++	Disco- DAD-2H/6T	Packaging	B
MST704	Wirebonder	F&K- Delvotec 5610	Packaging	A

*operator required

SINTEF MiNaLab

The price list applies only to single processes at SINTEF MiNaLab and cannot be used to price projects including integrated processes. The indicated prices are exclusive operator cost. Activities at SINTEF MiNaLab will be performed by SINTEFs operators. For any binding quotation please contact SINTEF MiNaLab at norfab-minalab@sintef.no as most of the indicated prices are volume sensitive and as some processes might require pre- and/or post processes. Please observe that most of the equipment includes automatic or semi-automatic wafer handling, and as such yields a more industry-compatible process and capacity.

The price groups used at SINTEF MiNaLab refer to the prices listed in the "industry" column of the price matrix and will be used independently of user types and project types. User types and projects will, however, be reflected in the operators hourly rates.

Price list for process steps at SINTEF MiNaLab

	Process step	Equipment type	Price group
SI 001	Lithography		E
	Priming, coating, aligning, baking		
	Primer	YES	
	Resist Coater	Suss ACS 200	
	Resist Coater	ATMsse Maximus 804	
	Mask Aligner (two)	Suss MA 150e	
	Baking Chamber	Different brands	
SI 002	ICP-equipment		F
	RIE, PECVD		
	Reactive Ion Etch	Alcatel AMS 200 SE I-speeder	
	Reactive Ion Etch, non-silicon etching	Alcatel AMS 200 SE I-speeder	
	Reactive Ion Etch, electrostatic chuck	Alcatel AMS 200 SE I-Productivity	
	PECVD deposition	Alcatel AMS 200 PECVD	
SI 003	Wafer bonding line		B
	wafer stack aligning, bonding		
	Bond Aligner	Suss Microsystems MA6/BA6	
	Wafer Bonder	Suss Microsystems SB6e	
SI 004	Thin Film (ex. material costs)		C
	Al. + noble metals sputtering		
	<u>Sputter for Al, Ti, TiN and W</u>	MRC 643	
	Sputter for Au, NiCr, TiW and Al	MRC 603	

SI 005	Surface Characterization		B
	SEM, Zygo, EDX		
	SEM, Scanning Electron Microscope	FEI Quanta FEG 600 with EDAX	
	Interferometer (white light)	Zygo NewView 6300	
	Energy Dispersive X-ray analysis (EDX)	EDAX	
SI 006	Electrical Characterisation		C
	Automatic probing		
	Automatic probing station (two)	ACCRETECH TSK A-PM-90A	
SI 007	Wet processing		B
	Wet chemistry		
	Manual etching of Si, SiO ₂ and Al	Stangl wet benches	
	Manual RCA cleaning	Stangl wet benches	
SI 008	Gold process line		D
	priming, coating, aligning, baking		
	Primer	YES	
	Resist Coater	Suss Gyrset RC8	
	Mask Aligner	Suss MA 150 KWS	
	Baking Chamber	Different brands	
SI 009	TMAH, KOH (etching), RCA cleaning		C
	Manual wet benches for etch and clean	Stangl wet benches	
SI 010	Packaging		B
	Wafer dicing	Disco DAD 321 wafer saw	
	Post dicing cleaning	Disco DSC 141 spin rinse dryer	
	Wire bonding	Kulicke & Soffa 4522	
SI 011	RTP	Annealsys AS-Master 2000 RTP	B
SI 012	Thermal processes		
SI 013	Standard diffusion tubes		A
SI 014	Boron and phosphorous deposition tubes		B
SI 015	SiC high temperature tube		B

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Referanse

SI 016	Poly-Si and Silicon nitride LPCVD tubes		4615 kr /time*
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*Price exclusive VAT

Supplement to Price list NorFab: Local rules for NTNU NanoLab

From 01.07.2012 NTNU NanoLab introduces a new price system. This price system is valid for all university nodes within NorFab and is described in the document "Price list NorFab".

NTNU NanoLab charges two types of prices for working in the cleanroom:

1. **Basic fee** (charged per working hour in the cleanroom)
This fee covers the use of the basic cleanroom infrastructure and gives access to more than 40 smaller instruments, standard chemicals and targets.
2. **Instrument fee** (charged per booked instrument hour in addition to the basic fee)
This fee covers the running costs for larger cleanroom tools. For details see price list.

Flat rate

Flat rates give the possibility to cover these costs using an easy-to-plan and easy-to-use approach. Two different types of flat rates are available:

1. **Flat rate / basic infrastructure** (covers the basic fee, including cleanroom access, standard chemicals and small instruments)
2. **Flat rate / full infrastructure** (covers basic and instrument fee, valid in the entire NorFab infrastructure)

For details please consult the document "Price list NorFab".

For NTNU-affiliated users some local rules apply for the use of the infrastructure:

- **SO/KD PhD-students/post docs**
As long as these users do not receive sufficient funding to cover the running costs in a cleanroom a discount of 80% is given. The users pay thus only 20% of the basic infrastructure fee and the instrument fee. This rule applies also for the flat rates.
Furthermore, these users should apply for support from NorFab to cover this discounted fee.
- **Project / Master students**
Project and master students may use the infrastructure for free within the framework of their master/ project work.
- **Projects started before 01.10.2009**
These projects use the infrastructure at a 90 % discount. Only 10% of the basic infrastructure fee and the instrument fees are charged. This rule applies also for the flat rates.
- **Supervisors/co-advisors**
Supervisors/co-advisors to students (PhD or master) are not charged upon entry, as long as the student (PhD) is charged. However, the status as supervisor/co-advisor must be made clear in the activity document and he/she is not allowed to carry out other work in the cleanroom during supervision.
- **Pre-project activities**
Short pre-investigations in NTNU NanoLab (up to 4 hours in total) can be carried out by NTNU NanoLabs staff or by an appointed user of the infrastructure free of charge. Please contact the NanoLab administration for permission.

If you have any questions regarding the price system, please contact NTNU NanoLab (nanolab@ntnu.no) to resolve how your activity should be charged.

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