

Memorandum of Understanding
19071/05/NL/CP



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PILOT PLANT INVENTORY AND GENERAL DOCUMENTATION

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1. Introduction

The MELiSSA Pilot Plant, located at Universitat Autònoma de Barcelona, is the laboratory where the terrestrial integration and demonstration of the MELiSSA loop concept will be performed.

Since its inception the laboratory was located at the European Space Research and Technology Centre (ESTEC) premises of the European Space Agency. Due to internal reorganization this laboratory was moved to Universitat Autònoma de Barcelona in 1995, more precisely at the 'Departament d'Enginyeria Química' on the Bellaterra campus, which became an ESA external laboratory. The laboratory has been operated since then by UAB under the framework of a co-financing agreement between ESA and the Spanish MCyT (Ministerio de Ciencia y Tecnología), CDTI (Centro para el Desarrollo de la Tecnología Industrial) and Catalan CIRIT (Comissió Interdepartamental de Recerca i Innovació Tecnològica).

As part of the initial agreement the equipment initially located at the ESTEC laboratory was transferred to UAB. Since, then and as a result of the operation under the financial agreement, the laboratory has been incorporating the required equipment for its proper operation.

Therefore as a result of its origin, two different inventories have been maintained. On one side the equipment originally provided by ESTEC, (this equipment remains property of ESTEC and is still listed in its inventory). On the other hand the new equipment that has been purchased along the time, in some cases to replace the out of order or the obsolete one.

This report reviews the status of the equipment at January 2005 and the lists the existing documentation describing the installed main hardware.

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2. Hardware Originally From ESTEC

As explained in the introduction, part of the hardware used in the Pilot Plant was provided by ESTEC in 1995. This hardware remains ESA property. Pilot Plant inventory number beginning with E reflect ESTEC property. The following table lists this hardware and its present status. Items labelled 'ER' have been recently requested by ESTEC and will be returned as soon as possible. UAB does not know its date of purchase. Nevertheless it has remained under UAB custody for more than 10 years and therefore its residual value is considered negligible.

PP_Number	Type of equipment	Supplier	Num. ESTEC Invent.	Cost New (Euro)	Localization	Remarks
E00001	Gas Pump	KNF	1	250	Storeroom	
E00002	Gas Pump	KNF	2	250	Storeroom	
E00003	Gas Pump	KNF	3	250	Storeroom	
E00004	Gas Pump	KNF	4	250	Storeroom	
E00005	Gas Pump	KNF	5	250	Storeroom	
E00006	Gas Pump	Memmigen	6	200	Storeroom	
E00007	Gas Pump	VDO	7	200	Storeroom	
E00008	Gas Pump	VDO	8	200	Storeroom	
E00009	Peristaltic Pump	Alitea	9	1320	Storeroom	
E00010	Peristaltic Pump	Alitea	10	1320	Storeroom	
E00011	Peristaltic Pump	WATSON	12	1320	Storeroom	
E00012	Peristaltic Pump	ISMATEC	13	1320	Lab	
E00013	Peristaltic Pump	ISMATEC	14	1320	C-IVa	
E00014	Peristaltic Pump	ISMATEC	15	1320	C-IVa	
E00015	Tube Shaker	Labinco	16	233	Lab	Vortex
E00016	Sample holder	KONTRON	17	2997	Storeroom	
E00017	Stirrer	LABINCO	18	518	Storeroom	
E00018	Stirrer	LABINCO	19	518	Storeroom	
E00019	Stirrer	LABINCO	20	518	Storeroom	Out of Order (ER)
E00020	Stirrer	LABINCO	21	518	Lab	Out of Order (ER)
E00021	Water Bath	Nickel Electro	22	380	Lab	
E00022	Stirrer	LABINCO	23	518	Storeroom	
E00023	Stirrer	Snijders	24	400	Storeroom	Multiagit
E00024	Peristaltic Pump	Autoclude	25	2000	Storeroom	Out of order
E00025	Lamp Support	ESTEC	26	250	C-II-Bench	
E00026	Steam Generator	Bioengineering	27	2000	Storeroom	Out of Order
E00027	Incubator	Jouan	28	650	Lab	
E00028	Power Supply	Delta	29	1050	C-II	
E00029	Power Supply	Delta	30	1050	C-II	

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E00030	Bioreactor	Applicon	31	4000	C-II-Bench	
E00031	motor controller	Applicon	32	587	C-II-Bench	
E00032	motor	Applicon	33	326	C-II-Bench	
E00033	cables	Applicon	34	200	C-II-Bench	
E00034	Support	Applicon	35	0	C-II-Bench	
E00035	Peristaltic Pump	Masterflex	36	268	Storeroom	
E00036	Peristaltic Pump	Masterflex	37	268	Storeroom	
E00037	O2 Amplifyer	Ingold	38	1024	Storeroom	In a box (ER)
E00038	pH amplifyer	Ingold	39	1024	Storeroom	In a box (ER)
E00039	pH preamplifyer	Ingold	40	1024	Storeroom	
E00040	Fan	KLIMA	41	1000	Storeroom	
E00041	Stirrer	Janke&KUNKEL	42	400	Storeroom	
E00042	Light sensor	LICOR	43	5357	C-II	
E00043	Lamp support	ESTEC	44	250	C-II	
E00044	Pump	ISMATEC	45	975	Storeroom	
E00045	Gas Pump	KNF	46	250	Storeroom	
E00046	Control Rack	Bioengineering	47	2000	Lab	
E00047	Flow controller	MKS	48	2430	Storeroom	In a box (ER)
E00048	Flow controller	MKS	49	2430	Storeroom	In a box (ER)
E00049	pH probe	Ingold	50	600	-	Out of Order
E00050	pH probe	Ingold	51	600	-	Out of Order
E00051	pH probe	Ingold	52	600	-	Out of Order
E00052	pH probe	Ingold	53	600	-	Out of Order
E00053	pH probe	Ingold	54	180	-	Out of Order
E00054	pH probe	Ingold	55	180	-	Out of Order
E00055	pCO2 probe	Ingold	56	963	Storeroom	In a box
E00056	pCO2 probe	Ingold	57	963	Storeroom	In a box
E00057	pH probe	Ingold	58	180	-	Out of Order
E00058	pH probe	Ingold	59	180	-	Out of Order
E00059	biomass probe	MONITEK	60	5552	Storeroom	In a box
E00060	pO2 probe	Ingold	61	963	Storeroom	
E00061	pH probe	Ingold	62	180	-	Out of Order
E00062	pH probe	Ingold	63	180	-	Out of Order
E00063	pO2 probe	Ingold	64	963	Storeroom	In a box (ER)
E00064	pO2 probe	Ingold	65	963	Storeroom	In a box (ER)
E00065	pO2 probe	Ingold	66	963	Storeroom	
E00066	Printer Support	ESTEC	67	0	Storeroom	
E00067	Flowmeter	GILMONT	68	350	Storeroom	In a box (ER)
E00068	Flowmeter	teflon	69	350	Storeroom	In a box (ER)
E00069	Filtration Probe	TECH-SEP	70	8401	Storeroom	Out of Order (ER)
E00070	Filtration Probe	TECH-SEP	71	8401	Storeroom	Out of Order (ER)
E00071	Flowmeter	teflon	72	350	Storeroom	In a box (ER)
E00072	Flowmeter	teflon	73	350	Storeroom	In a box (ER)

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E00073	NO3-Probe	ORION	74	600	Storeroom	In a box
E00074	Ref. Electrode	ORION	75	180	Storeroom	NO ₃ -ref
E00075	current converter	VDO	76	450	C-II	
E00076	Flow controller	MKS	77	2430	Storeroom	spare
E00077	Flow controller	MKS	78	2430	Storeroom	spare
E00078	VCC100	SENSYCON	48328	3571	Storeroom	Out of order spare (Christel)
E00079	Arcnet Board	SMC	79	315	-	Out of order
E00080	Arcnet Board	SMC	80	315	-	Out of order
E00081	CCU Board	Toptools	81	1750	-	Out of order
E00082	pH preamplifier	Ingold	82	1024	Storeroom	
E00083	pH amplifier	Ingold	83	1024	Storeroom	
E00084	O2 Amplifier	Ingold	84	1024	Storeroom	
E00085	O2 Amplifier	Ingold	85	1024	Storeroom	
E00086	Flowmeter	KDG	86	350	Storeroom	
E00087	NH3 probe	ORION	87	750	Storeroom	
E00088	CO2 meter	Bioengineering	88	3500	Storeroom	
E00089	Magnetic stirrer	HANNA	89	100	Storeroom	
E00090	Magnetic stirrer	HANNA	90	100	Storeroom	
E00091	pump	MEREDOS	91	0	Storeroom	
E00092	Power Supply	PHOENIX	92	100	Storeroom	
E00093	Power Supply	PHOENIX	93	100	Storeroom	
E00094	Converter	VDO	94	450	Storeroom	
E00095	Converter	VDO	95	450	Storeroom	
E00096	Protection	Bioengineering	96	250	Lab	
E00097	Grinder	Wheaton	97	260	Storeroom	
E00098	Pump	ISMATEC	98	1320	C-III	Rack-Nitro
E00099	Flow controller	MKS	100	2430	C-III	Rack-Nitro
E00100	Flow controller	MKS	101	2430	C-III	Rack-Nitro
E00101	Flow controller	MKS	102	2430	C-III	Rack-Nitro
E00102	Pump	KNF	103	250	C-III	Rack-Nitro
E00103	pH-probe	INGOLD	104	180	-	Out of Order
E00104	Flowmeter	KDG	105	350	Storeroom	Rack-Nitro
E00105	Microscope	ZEISS	106	11201	Alter-Lab	
E00106	RACK	RITTAL	106	45000	Lab	cost with controllers?
E00107	RACK	RITTAL	107	1000	Lab	
E00108	RACK	ESTEC	108	3000	Lab	
E00109	VCC interface	SENSYCON	109	3571	C-II	
E00110	Screen	KONTRON	665	0	Alter-Lab	
E00111	Printer	KONTRON	666	2007	Alter-Lab	
E00112	Screen	COMPAQ	668	0	Lab	
E00113	Vac Pump	GENEVAC	10466	500	Storeroom	Out of Order

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E00114	Hoven	Heraeus	13450	500	Alter-Lab	Fermentation Pilot Plant
E00115	Freezer	Westinghouse	17866	500	-	Out of order
E00116	Power Supply	Fontaine	18730	1500	C-II-Bench	Rubrum bench test
E00117	Power Supply	Fontaine	18733	1500	C-IVa-Bench	spiru bench
E00118	Power Supply	Fontaine	28126	1500	Storeroom	RACK extern
E00119	Power Supply	Fontaine	28127	1500	Storeroom	RACK extern
E00120	Power Supply	Fontaine	28131	1500	C-II-Bench	Rubrum bench test
E00121	Power Supply	Fontaine	28132	1500	Storeroom	RACK extern
E00122	Power Supply	Fontaine	28137	1500	C-IVa-Bench	spiru bench
E00123	Power Supply	Fontaine	28144	1500	Storeroom	RACK extern
E00124	Thermostatic bath	HAAKE	45551	2019	C-II-Bench	
E00125	pH Meter	Shott	45996	1200	Storeroom	Out of order
E00126	Spectrophotometer	Dr. Lange	46094	10354	-	Out of order- Dec-2003
E00127	O2 Analyser	SERVOMEX	46177	10285	-	Returned to ESTEC
E00128	Regulateur	VDO	46202	8500	Lab	Rack-106 (rub)
E00129	Regulateur	VDO	46203	8500	Lab	Rack-108 (Nitro)
E00130	CO2 Analyser	MAIHAK	46298	9650	Lab	rack Spir.
E00131	control unit	Applicon	46484	4837	C-II-Bench	
E00132	pH-Meter	ORION	46581	2667	Storeroom	conductiv. meter
E00133	Thermostatic Bath	Haake	46606	2019	C-III-Bench	
E00134	Control unit	ORION	46727	1125	Storeroom	
E00135	Control Unit	VDO	46728	100	Storeroom	metter pH/ISE
E00136	Power Supply	Delta	46950	1050	C-II	
E00137	Power Supply	Delta	46953	1050	C-II	
E00138	Peristaltic Pump	ISMATEC	47032	1320	-	Out of Order Feb-2000
E00139	NO3-Analyser	Dr.Lange	47113	14245	Lab	Rack-Nitro
E00140	Centrifuge	BECKMAN	47123	22000	Alter-Lab	0
E00141	Regulateur	VDO	47294	8500	Lab	Rack-108 (Nitro)
E00142	Regulateur	VDO	47295	8500	Lab	Rack-108 (Nitro)
E00143	Regulateur	VDO	47296	8500	-	Out of Order
E00144	Regulateur	VDO	47297	8500	-	Out of Order
E00145	Regulateur	VDO	47298	8500	Lab	Rack-108 (Nitro)
E00146	PC	Compaq	47299	4760	Lab	
E00147	printer	EPSON	47300	1200	Storeroom	
E00148	Peristaltic Pump	ISMATEC	47301	975	Lab	47021?
E00149	PC	COMPAQ	47301	4760	Lab	
E00150	Thermostatic Bath	HAAKE	47334	2019	Lab	
E00151	Filtration unit	TECH-SEP	47369	8401	Lab	Rack-Nitro Out of Order (ER)
E00152	Peristaltic Pump	ISMATEC	47400	975	-	Out of Order Feb-2000

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E00153	Peristaltic Pump	ISMATEC	47438	975	-	Out of Order Feb-2000
E00154	Biomass analyzer	MONITEK	47452	8328	C-II	
E00155	Dish Washer	Nertz	47458	5500	-	Out of Order
E00156	Freezer	BOSCH	47459	750	Lab	
E00157	AirLift 7L	Bioengineering	47602	18000	Lab	
E00158	Peristaltic Pump	ISMATEC	47608	1320	C-III	Rack-Nitro
E00159	Peristaltic Pump	ISMATEC	47699	1320	Lab	
E00160	Peristaltic Pump	ISMATEC	47700	975	-	Out of Order Feb-2000
E00161	BOD	VOITH	47775	19289	-	Out of order
E00162	Filtration Unit	Tech Sep	48209	8401	-	Out of Order
E00163	Sampler	TECH-SEP	48210	8401	-	Out of Order (ER)
E00164	Thermostatic Bath	HAAKE	48308	2019	Lab	only heater
E00165	PC	Compaq	48320	4760	Lab	
E00166	regulator	VDO	48321	8500	C-II	RACK 106
E00167	VCC interface	VDO	48323	3571	Lab	Rack- Airlift-Loop
E00168	Printer	Epson	48326	1100	-	Out of order- Dec-2003
E00169	NO3 Analyzer	Dr.Lange	48371	14245	Lab	
E00170	NH4-Analyzer	Dr.Lange	48408	14862	Lab	Rack-Nitro
E00171	Sampler	PHARMACIA	48512	1753	Storeroom	Fraction collector
E00172	TIC/TOC	OI Incorporation	49756	30000	-	Out of order
E00173	Autoclave	SANOCLAV	50073	3000	-	Out of order (USIB)
E00174	Balance	METTLER	50316	3320	-	Out of Order
E00175	Push Syringe	KD Scientific	51043	5171	Storeroom	
E00176	Spectrophotometer	KONTRON	51313	16257	Alter-Lab	
E00177	Fixed Bed reactor	HEUSER	51349	50000	C-III	Rack-Nitro
E00178	Peristaltic Pump	ISMATEC	51399	1320	Lab	
E00179	Peristaltic Pump	ISMATEC	51400	1320	Lab	
E00180	Sonifyer	Vibra Cell	51420	2050	Alter-Lab	
E00181	PC	Compaq	51766	4760	Lab	PC-486
E00182	Sampler	TECH-SEP	51815	8401	Storeroom	Out of Order (ER).
E00183	Stirrer	LABINCO	52357	518	-	Out of order (USIB)
E00184	Freeze Dryer	VIRTIS	52381	10120	Alter-Lab	
E00185	Autoclave	VARIOKLAV	52458	10120	Alter-Lab	
E00186	Peristaltic Pump	ISMATEC	52638	1320	Lab	Rack-Nitro
E00187	Peristaltic Pump	ISMATEC	52639	1320	Lab	Rack-Nitro

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3. Hardware Purchased Under The ESA-Pilot Plant Agreement

As explained in the introduction since its installation the MELISSA Pilot Plant has been incorporating a number of hardware items necessary for its operation. At time of purchase each item is incorporated in the UAB inventory as laboratory equipment. The following is a download of the UAB database. Pilot Plant inventory number beginning with E reflect ESTEC property. Actual value was calculated assuming a 10% devaluation per year.

PP Number	Property	Supplier	UAB Inventory number	Date of purchase	Purchase value	Actual value	Localization	Description
U00189	UAB	Lombardini	M950007	28/03/1995	9736.3	0.0	Lab	Diessel power generator APS+ suport and enclosure
U00190	UAB	Telstar	M950009	28/03/1995	8012.7	0.0	Lab	HEPA filters
U00191	UAB	Local	M950010	28/03/1995	8125.9	0.0	Lab	Lab Steam Line+pipng+ceiling connectors
U00192	UAB	Air-Liquide	M950002	11/07/1995	10885.8	0.0	Lab	Tecnical gas lines
U00193	UAB	Panasonic	M950006	11/07/1995	4496.8	0.0	Lab	Lab air conditioning
U00194	UAB	Sartorius-Braun	M950005	09/09/1995	27142.4	342.1	Lab	Bench Bioreactor Biostat-B+ gas mix unit
E00195	ESTEC	Edwards	M950003	25/09/1995	2227.0	37.8	Lab	Vacuum Pump freeze drier RV-5
U00196	UAB	Local	M950004	27/11/1995	1107.0	37.9	Lab	Lab table
E00197	ESTEC	Li-Cor	M950001	29/11/1995	1715.0	59.7	Lab	Radiometer + Sensor (LI-189+LI190)
E00198	ESTEC	Local	M960001	13/12/1996	4870.0	676.5	C-III	CIII Stainless Steel body
E00199	ESTEC	PAYRA (Local)	M960002	13/12/1996	4810.0	668.1	C-III	PAYRA fix bed body
E00200	ESTEC	Mettler Toledo	959071/00	19/02/1997	3597.8	566.8	Lab	Dissolved oxygen meter
E00201	ESTEC	Ismatec	958820/00	26/02/1997	1578.4	251.7	Storeroom	Variable speed peristaltic pump
E00202	ESTEC	Ismatec	958957/00	26/02/1997	617.7	98.5	C-III-Bench	Peristaltic pump one speed
U00203	UAB	Local	956652/00	11/04/1997	1232.5	211.4	Lab	Personal computer (Pentium 133 ATX DFI, 1)

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PP Number	Property	Supplier	UAB Inventory number	Date of purchase	Purchase value	Actual value	Localization	Description
U00204	UAB	Local	960067/00	11/04/1997	1603.3	275.0	C-III-Bench	Bioreactor lid
U00205	UAB	Local	960104/00	11/04/1997	1603.3	275.0	C-III-Bench	Bioreactor lid
E00206	ESTEC	Local	960241/00	11/04/1997	1603.4	275.0	C-III-Bench	Bioreactor lid
U00207	UAB	Merlin Gerin	958783/00	05/05/1997	2837.5	505.3	Lab	UPS Merlin Gerin
U00208	UAB	Selecta	959419/00	18/06/1997	337.7	64.2	C-III-Bench	Magnetic Stirrer
U00209	UAB	Selecta	959556/00	18/06/1997	337.7	64.2	C-III-Bench	Magnetic Stirrer
E00210	ESTEC	Selecta	959693/00	18/06/1997	337.7	64.2	C-III-Bench	Magnetic Stirrer
U00211	UAB	Local	962061/00	30/06/1997	685.5	132.6	Lab	Lab bench
E00212	ESTEC	Selecta	960863/00	02/08/1997	264.0	53.4	C-II-Bench	Thermostatic bath
E00213	ESTEC	Ismatec	962372/00	01/09/1997	2774.4	584.5	C-IVa	Gear Pump C-IVa
E00214	ESTEC	Ismatec	962409/00	01/09/1997	2774.4	584.5	C-IVa	Gear Pump C-IVa
E00215	ESTEC	Local	1637467/00	09/10/1997	6877.1	1520.5	C-III	Stainless steel nitrification reactor
E00216	ESTEC	Avery Berkel	1636383/00	23/10/1997	2011.6	452.5	C-IVa	Platform Balance (Scale C-IVa)
E00217	ESTEC	Avery Berkel	1636420/00	23/10/1997	2011.6	452.5	C-IVa	Platform Balance (Scale C-IVa)
E00218	ESTEC	Bioengineering	M970001	11/11/1997	56183.0	12929.8	C-IVa	Airlift Bioreactor C-IVa
U00219	UAB	HP	1636694/00	12/11/1997	4782.6	0.0	Lab	Personal Computer Desk4000 P/II, 3,2Gb
E00220	ESTEC	Mettler Toledo	1637330/00	26/11/1997	1961.0	459.4	C-II	pH transmitter PHROCON 18
E00221	ESTEC	Mettler Toledo	1637778/00	26/11/1997	2916.8	683.2	C-IVa	Oxygen amplifier
U00222	UAB	DFI	1635958/00	28/11/1997	1785.1	0.0	Storeroom	Personal computer (DFI PENTIUM MMX200)
E00223	ESTEC	Bronkhorst	1637641/01	30/12/1997	536.2	130.6	C-IVa	Gas flow controller C-IVa

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PP Number	Property	Supplier	UAB Inventory number	Date of purchase	Purchase value	Actual value	Localization	Description
U00224	UAB	Local	1637504/00	06/02/1998	493.6	125.4	Lab	Bench Metallic supor(t 315x100x165)
E00225	ESTEC	Bronkhorst	1637641/00	12/02/1998	10675.1	2728.7	C-IVa	Gas flow controller central unit C-IVa 4 Units
U00226	UAB	Prominent	1707912/00	27/04/1998	665.2	183.5	Storeroom	Piston Pump (1601 PP1)
U00227	UAB	Prominent	1708026/00	27/04/1998	665.2	183.5	Storeroom	Piston Pump (1601 PP1)
U00228	UAB	Local	1706791/00	05/05/1998	228.9	63.7	Lab	Lab cupboard
E00229	ESTEC	Watson-Marlow	1706828/00	06/05/1998	2054.7	571.9	C-IVa	Peristaltic pump (Output C-IVa)
U00230	UAB	Local	1707564/00	22/05/1998	40.5	11.5	Lab	Chair (LANA-2 PINT.)
U00231	UAB	Local	1707601/00	22/05/1998	40.5	11.5	Lab	Chair(LANA-2 PINT.)
E00232	ESTEC	Li-Cor	3605341/00	30/06/1998	1519.8	446.0	Lab	Spherical Quantum light Sensor
U00233	UAB	ASCON	3608904/00	30/06/1998	3594.5	1054.7	Lab	Programmable digital controller (ASCON C-IVa)
U00234	UAB	ASCON	3609018/00	30/06/1998	3594.5	1054.7	Lab	Programmable digital controller (ASCON C-IVa)
E00235	ESTEC	DINKO	3606388/00	30/06/1998	641.1	188.1	Storeroom	Vacuum pump (600 MMHG, REG. 60L D-9)
E00236	ESTEC	Bronkhorst	3606699/00	08/07/1998	6132.8	1812.9	C-III-Bench	Gas flow controller central unit
E00237	ESTEC	Ismatec	3606873/00	08/07/1998	1429.9	422.7	Storeroom	Peristaltic pump (MS2/6, 160 RPM)
E00238	ESTEC	Ismatec	3606910/00	08/07/1998	1429.9	422.7	C-II-Bench	Peristaltic pump (MS2/6, 160 RPM)
E00239	ESTEC	Crison	3608108/00	29/09/1998	1286.7	409.6	C-III-Bench	pH transmitter module 2100,
E00240	ESTEC	MAIHAK	3608245/00	29/09/1998	11991.4	3817.5	C-IVa	CO2 gas analyzer MAIHAK C-IV
E00241	ESTEC	MAIHAK	3608245/01	29/09/1998	3275.9	1042.9	C-IVa	O2 gas analyzer (complement MAIHAK) C-IV
E00242	ESTEC	MAIHAK	3608245/02	29/09/1998	938.8	298.9	C-IVa	flow and condensation monitor (complement MAIHAK)

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PP Number	Property	Supplier	UAB Inventory number	Date of purchase	Purchase value	Actual value	Localization	Description
E00243	ESTEC	Ismatec	3609155/00	29/09/1998	1429.9	455.2	Lab	Peristaltic pump
E00244	ESTEC	Ismatec	3609292/00	29/09/1998	1429.9	455.2	Lab	Peristaltic pump
U00245	UAB	Selecta	3608382/00	28/10/1998	2186.7	713.5	Storeroom	Cooler Bath (-10 + 100) (ALCO)
E00246	ESTEC	ASTARE	M980001	10/11/1998	13769.0	4541.9	Lab	ASTARE software upgrade
U00247	UAB	Delta Elektronika	3610462/00	23/11/1998	1622.7	541.0	Lab	Bench Power supply
E00248	ESTEC	Bronkhorst	3610325/00	23/11/1998	1551.9	517.4	C-III-Bench	Gas Flow controller
E00249	ESTEC	MTA SER	3610599/00	23/11/1998	6306.8	2102.8	Lab	External Cooler C-IVa
E00250	ESTEC	Relsa	3610636/00	23/11/1998	11770.0	3924.4	C-IVa	C-IVa lamp intensity regulator
E00251	ESTEC	Relsa	3610636/01	23/11/1998	10723.9	3575.6	C-IVa	C-IVa lamp wiring
E00252	ESTEC	Relsa	3610810/00	23/11/1998	2301.3	767.3	C-IVa	C-IVa lamp Support
E00253	ESTEC	Relsa	3610947/00	23/11/1998	2301.3	767.3	C-IVa	C-IVa lamp Support
E00254	ESTEC	Crison	3611235/00	22/12/1998	1234.6	421.5	Lab	pH transmitter module with control
E00255	ESTEC	Ismatec	3611546/00	05/03/1999	1342.9	485.3	C-III	Peristaltic pump (ISMATEC REGLO ANALOG)
E00256	ESTEC	Ismatec	3611683/00	12/03/1999	1602.4	582.1	C-II	Peristaltic pump (Ecoline VC MS/CA)
E00257	ESTEC	Ismatec	3611720/00	17/03/1999	1373.8	500.9	Lab	Peristaltic pump (Reglo Analog 4/8)
E00258	ESTEC	Ismatec	3611857/00	17/03/1999	1373.8	501.0	Storeroom	Peristaltic pump (Reglo Analog 4/8)
U00259	UAB	Ismatec	3612145/00	19/04/1999	1602.4	598.8	Lab	Peristaltic pump (Ecoline VC MS/CA)
U00260	UAB	Ismatec	3612282/00	19/04/1999	1602.4	598.8	Lab	Peristaltic pump (Ecoline VC MS/CA)
E00261	ESTEC	Ismatec	3612319/00	19/04/1999	1602.4	598.8	C-IVa	Peristaltic pump Ecoline VC MS/CA

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E00262	ESTEC	Bronkhorst	3612456/00	19/04/1999	3452.3	1290.1	Lab	Gas flow meters + controller (Iberfluid)
U00263	UAB	DINKO	4282800/00	01/12/1999	636.4	277.2	Storeroom	Compressor ALCO F5143 (VAC60mmHg)
U00264	UAB	Local	4282589/00	20/12/1999	244.0	107.6	Lab	wood lab drawer
U00265	UAB	Local	4282626/00	20/12/1999	244.0	107.6	Lab	wood lab drawer
E00266	ESTEC	Local	4278726/00	15/05/2000	1917.2	922.4	C-II	Bioreactor Stirrer
U00267	UAB	Delta Elektronika	4423108/00	06/10/2000	2563.5	1334.4	C-II-Bench	Power supply (15-100)
U00268	UAB	TecFluid	4422161/00	29/12/2000	180.2	98.0	Storeroom	Rotameter
E00269	ESTEC	Monitek	4422472/00	29/12/2000	13930.2	7571.9	C-IVa	Monitek biomass sensor
E00270	ESTEC	Aquatec AGBAR	4722697/00	03/06/2002	14363.5	9857.7	C-III	On-line Analyzer Aquammonia
E00271	ESTEC	Aquatec AGBAR	4722734/00	03/06/2002	15427.7	10588.0	C-III	On-line Analyzer Aquanitra
U00272	UAB	Dr LANGE	4423904/00	18/07/2002	3467.8	2422.7	Lab	Espectrophotometer Dr LANGE
E00273	ESTEC-NTE	RiTTAL-Telemecanique	M030001	01/12/2003	0.0	0.0	C-IVa	Control Rack C-Iva + Controllers (Modicon-Quantum)
E00274	ESTEC-NTE	RiTTAL-Telemecanique	M030002	02/12/2003	0.0	0.0	C-III	Control Rack C-III + Controllers (Modicon-Quantum)
E00275	ESTEC-NTE	Dell	M030003	03/12/2003	0.0	0.0	Lab	Dell Workstation computer
E00276	ESTEC-NTE	Dell	M030004	04/12/2003	0.0	0.0	Lab	Dell Computer Server
U00277	UAB	Shimadzu	8515261/00	18/12/2003	11875.0	9981.5	C-II	Gas Chromatograph Option PAL GCI RAL MIR S2010
U00278	UAB	Shimadzu	8515398/00	18/12/2003	11925.0	10023.5	C-II	Gas Chromatograph (Ref. 641221-477)
U00279	UAB	Shimadzu	M930001	18/12/2003	16770.0	14096.0	C-II	Gas chromatograph software

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4. Technical Documentation Related To The Pilot Plant Hardware And Software

The integrated approach followed the development of the Pilot Plant requires the particular combination of different hardware items. The description of the detailed equipment together with its physical and electrical interconnection is reported in dedicated technical notes. The following is a list of the existing documentation where a detailed description of the different items and the different interconnections (liquid, gas, electric, control) can be found.

Compartment II

1. Photoheterotrophic Compartment Set-up. Cabello F. ; Albiol J. ; Gòdia F. ESA, ESTEC/CONTRACT11549/95/NL/FG TN 37.6: 1998.
2. Redesign of Compartment II Pilot Reactor. Cabello F. ; Albiol J. ; Gòdia F.. ESA, ESTEC/CONTRACT 13292/98/NL/MV TN 47.1. 2000.

Compartment III

3. MELISSA: Development of a fixed bed pilot reactor for a continuous axenic co-culture of Nitrosomonas/Nitrobacter Forler C. YGT ESA X-997 1994.
4. Nitrifying compartment studies. Starting of the nitrifying reactor. Step 1. Pérez J, Montesinos JL, Gòdia F. ESA Contract number ESTEC/CONTRACT11549/95/NL/FG TN 25.310 / 1-83 , 1996 (control loops)
5. Nitrifying compartment studies. Starting of the nitrifying reactor. Step 2. Pérez J, Montesinos JL, Gòdia F. ESA Contract number ESTEC/CONTRACT11549/95/NL/FG TN 25.320 / 1-27 , 1996 (Data acquisition software)
6. Nitrifying compartment studies. Starting of the nitrifying reactor. Step 3. Pérez J, Montesinos JL, Gòdia F. ESA Contract number ESTEC/CONTRACT11549/95/NL/FG TN 25.330 / 1-31 , 1996 (Dimensions and Physical characterization)
7. Utilización de Nitrosomonas/Nitrobacter en forma de biopelícula para la nitrificación biológica de lecho fijo. Perez J. PhD Thesis. Univ. Autònoma de Barcelona. 2001

Compartment IVa

8. Set Up of the Photosynthetic Pilot Reactor. Vernerey A. ; Albiol J. ; Gòdia F. ESA, ESTEC/CONTRACT11549/95/NL/FG, TN 37.2, 1998.

Common control system documentation

9. Definition of the control requirements for the MELISSA Loop. J. Duatis, A.Tomàs, J. Ariño, S. Ferrer J. Mas ESTEC/CONTRACT: 15671/01/NL/ND TN 72.2. Version 1. Issue 1. July 2002.

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10. MELISSA Control System Architecture and Trade-off. J. Duatis, A.Tomàs, J. Ariño, S. Ferrer J. Mas ESTEC/CONTRACT: 15671/01/NL/ND TN 72.3. Version 1. Issue 0. December 2002.
11. Test Control System Software Design Document, J. Duatis, A.Tomàs, J. Ariño, S. Ferrer J. Mas ESTEC/CONTRACT: 15671/01/NL/ND.

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