

About Thermal Desorption Plant

The plant has been used to treat contaminated soil with difficult pollutants. It consists of a rotation drum and indirect introduction of heat. The gas is burned in an after-burning unit at high temperature. Exhaust gases are used for pre-heating and drying.

- Plant has been in use since 2002.
- It is transportable. (advantage and enables in situ treatment where contaminated soil masses don't need to be relocated).
- Currently located at Mustankorkea landfill area at Jyväskylä, Finland.
- Re-installation of the apparatus takes one week after transportation to the new target site.
- The plant and all its accessories require about 35-50 square-meters of open space.
- The plant is capable of treating 10-40 tons of contaminated soil per hour.
- Design and construction of this plant was ~5 million euros in 2002.

Thermal Desorption – An Environmentally Sound Process for Treating Contaminated Soils.

In thermal desorption process contaminated soil is heated to a temperature, in which the pollutant is volatilized or decomposed. The gas from the process containing the contaminant is treated by an after-combustion process or by some other effective method.

Thermal purification methods are useful in removing weakly biodegradable matter. Most suitable soil types for thermal desorption are sand and gravel. Cohesive soil types might be inconvenient to treat with this method. Water content has a great effect on heating process and energy consumption increases with water content. Drying of soil prior to treatment might be necessary. Fine-grained soil types have a high sorption capacity due to its great surface area and they can behave in a plastic manner.

Soils contaminated with volatile (VOCs) or semi-volatile (SVOCs) organic compounds are suitable for low-temperature thermal desorption (~100-300 Celsius). VOCs and SVOCs are typical in soils contaminated with different types of fuels. Cyanides, Mercury (Hg), Cadmium (Cd), lead (Pb) and Arsenic (As) are also quite easily evaporating substances (vaporization in low-temperature burning). Volatile heavy metals may render the purification of the burning gases.

Chlorinated organic compounds (such as PCBs and dioxins) and polycyclic aromatic hydrocarbons (PAHs) require higher temperatures. Intermediate (400-800 °C) temperature burning process is suitable for soil contaminated with the substances above. High-temperature processes (~1000 °C) are used for waste treatment, rarely for contaminated soil.

The heat may be brought directly into contact with the soil in the form of combustion gas from the energy source. In an indirect method the transportation equipment (a rotating drum, screw conveyor or chain conveyor) and the surrounding structures are heated.

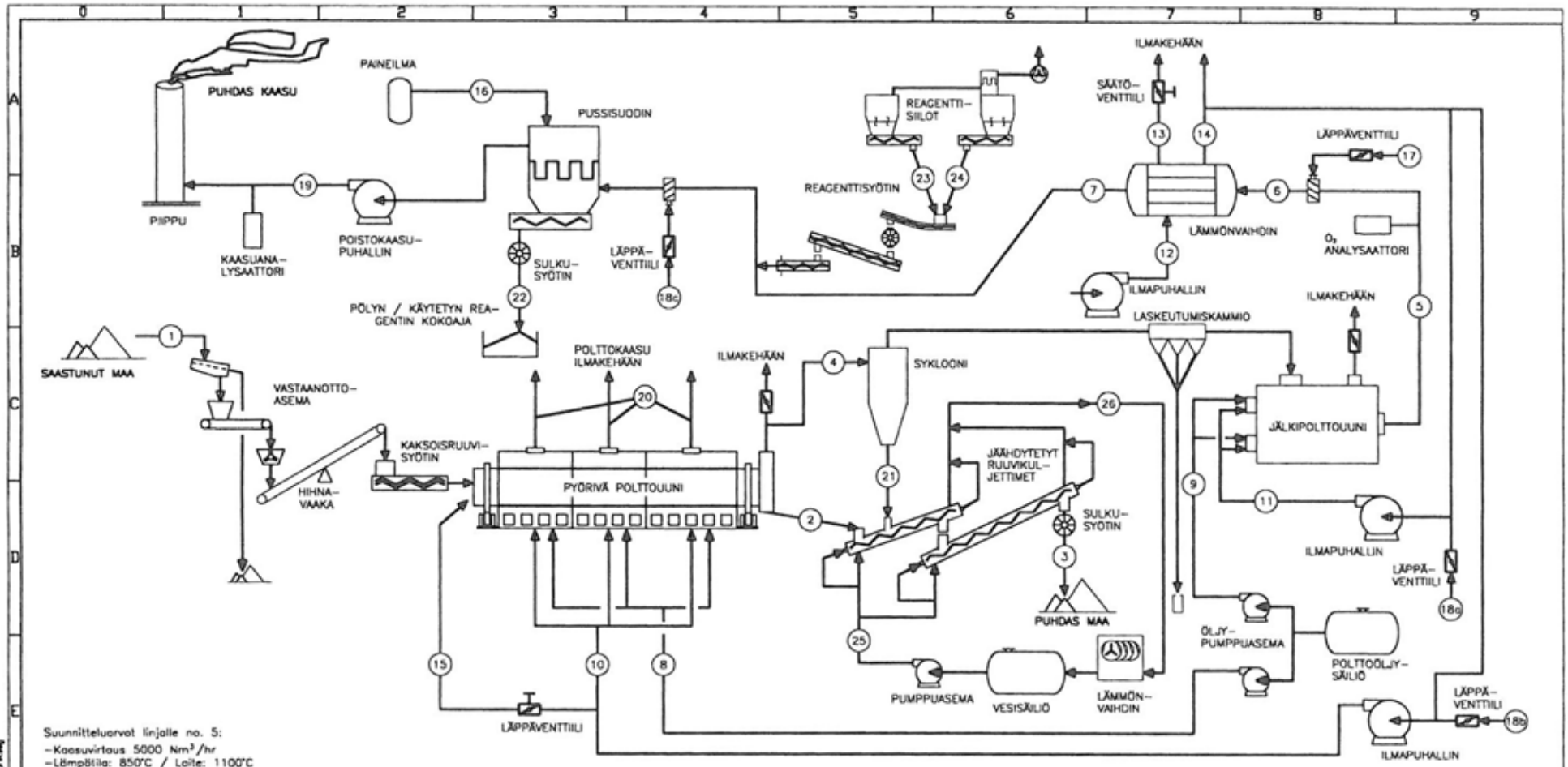
The most critical stage in the process is the collection and treatment of the gases brought about by heating. Gas purification may include after-burning (at high temperature), catalytic burning, use of active carbon, neutralizing substances or corresponding. Particles must be mechanically filtered or washed out of the gas stream.











Suunnitteluvarot linjalle no. 5:
 -Kaasuvirtaus 5000 Nm³/hr
 -Lämpötila: 850°C / Loite: 1100°C

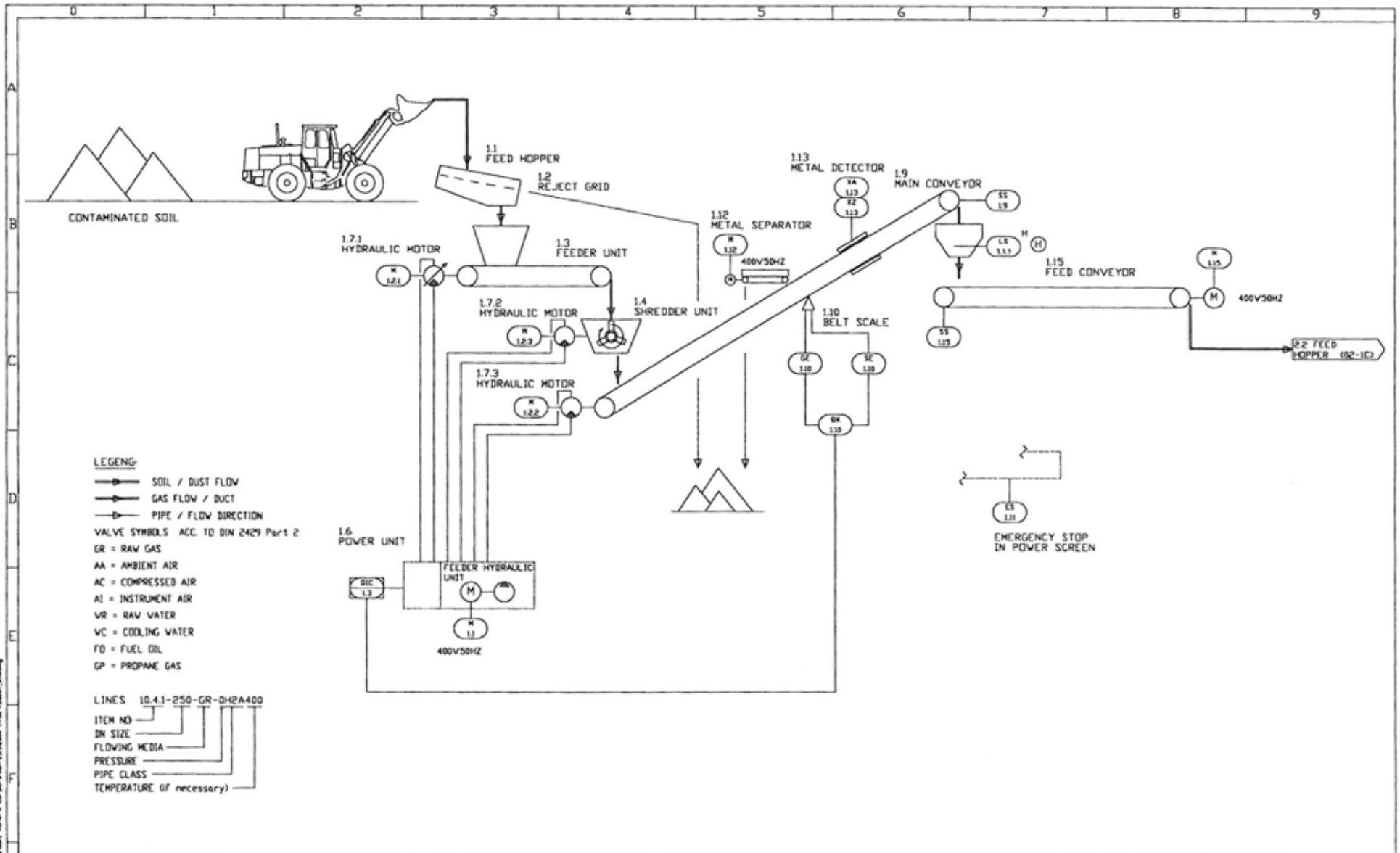
PERUSTAPUS 12.11.2001	maa			kasa				polttoöljy					ilma					kasa			pöly	pöly- raostet- hiili	oksiidi- hili	NaHCO ₃ / Co(OH) ₂	kylmä	vesi											
	määrä	kuiva	kuuma	raaka	raaka	raaka	raaka	uuni	jälkipoltti	uuni	ilkipoltti	kylmä	kuuma	suko	poisa	laimennus / iäpöhdytä	hätä	poisto	polo																		
MASSAVIRTAUS	kg/hr	10000	8750	8750				484	142	6289	3011	27720	27720			100	52	0-2000	0-1300	0-2000	5100	6614															
TILAVUUSVIRTAUS	Nm ³ /hr				1660	5000	5000	5000																													
KOSTEUSPITOISUUS	wt %	12.5	0	0																																	
LÄMPÖTILA	°C	1	400	260	408	850	850	120	ymp.	ymp.	300	300	ymp.	80	300	300	ymp.	ymp.	ymp.	ymp.	ymp.	120	665	400	120	ymp.	ymp.	ymp.	ymp.	80							
LÄMPÖTILA - MAKSIMI	°C		800	490	810	1100	1100	250			300	300	30	80	300	300						250	920	800	250												
PÖLTÖTÖISUUS	g/m ³																					<5															
KAASUN KOOSTUMUS	vol %																																				
CO ₂	vol %					5.07	5.07	5.07																													
H ₂ O	vol %				93.96	37.96	37.96	37.96																													
N ₂	vol %				4.77	50.65	50.65	50.65		79		79	79	79	79	79																					
O ₂	vol %				1.27	6.32	6.32	6.32		21		21	21	21	21	21																					

10.4.2003	Jsi		Lisätty laskeutuslaskentaa	C
9.9.02	ake		Reagentin syöttöön lisätty ruuvikuljettimet	B
8.10.02	ake		Reagentin syöttö muutettu	A
Date	Drawn	Appr.	Change	Rev.



Client	NISKA & NYSSÖNEN OY
Project	
Drawing title	PILAANTUNEEN MAAN PUHDISTUSLAITOS VIRTAUSKAAVID

Date	12.09.01	Drawn	Checked	Approved
Sign.	SH/ake			
Drawing	333850	Sheet		Rev.
				C



LEGEND:

- SOIL / DUST FLOW
 - GAS FLOW / DUCT
 - PIPE / FLOW DIRECTION
- VALVE SYMBOLS ACC. TO DIN 2429 Part 2
- GR = RAW GAS
 - AA = AMBIENT AIR
 - AC = COMPRESSED AIR
 - AI = INSTRUMENT AIR
 - VR = RAW WATER
 - VC = COOLING WATER
 - FD = FUEL OIL
 - GP = PROPANE GAS

- LINE: 10.4.1-250-GR-DH2A400
- ITEM NO.
 - DN SIZE
 - FLOWING MEDIA
 - PRESSURE
 - PIPE CLASS
 - TEMPERATURE (if necessary)

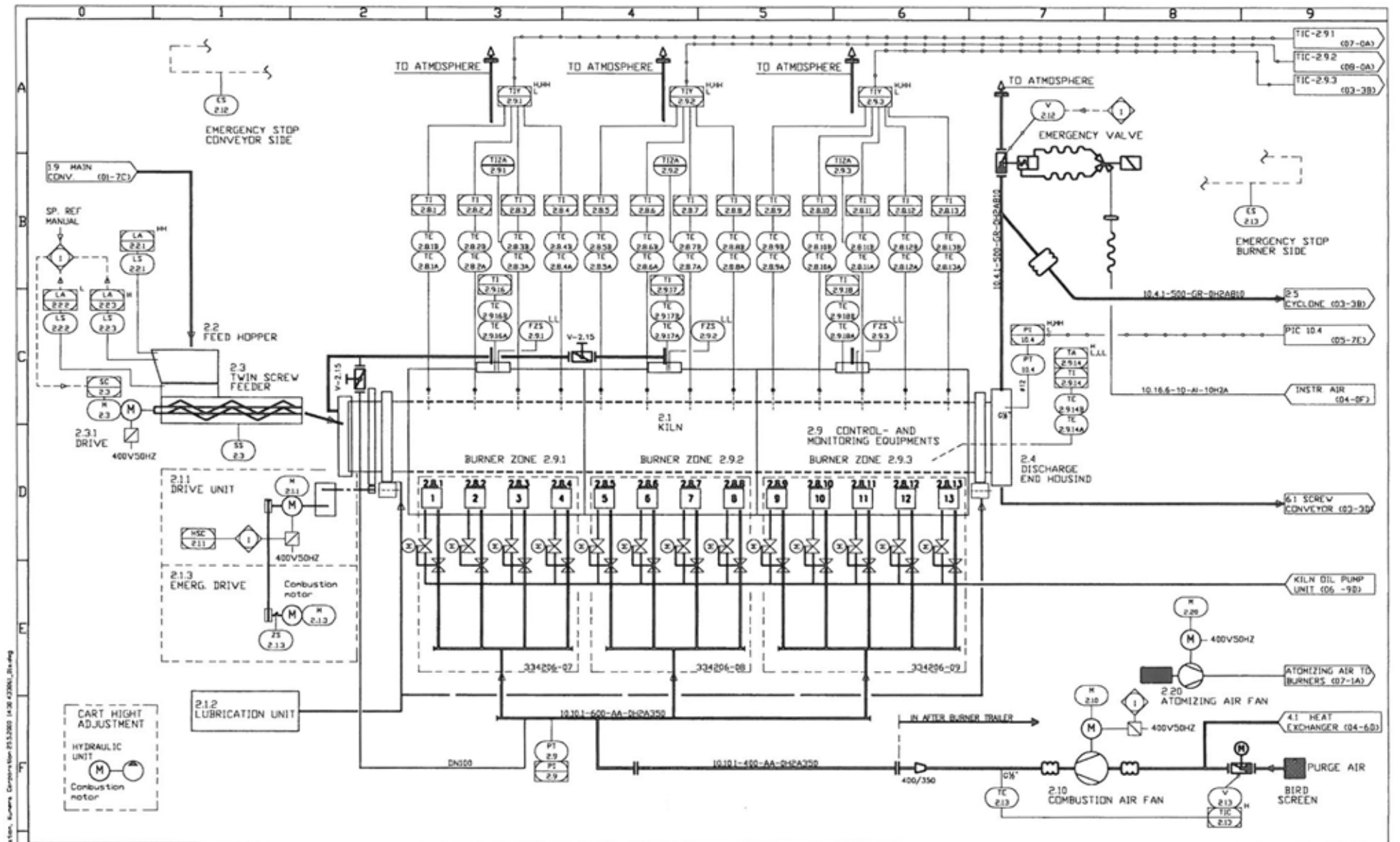
23.8.05	MSR	LEVEL SWITCH NAME LS-2.1	H
14.3.2003	jsi	Hittäis muutettu takaisin ES-1.11	G
28.2.2003	jsi	Välkiläjetin 1.15 lisetty	F
18.2.2003	jsi	Metallierotin 1.12 ja metallinoinin 1.13 lisetty	E
Date	Drawn	Appr.	Change



Client	Project
Drawing title	
POWER SCREEN P & I - DIAGRAM	

Drawn	Checked	Approved
Date 4.9.00		
Sign. MSR/ake		
Drawing	Sheet	Rev.
334206	01	H

Kumera Corporation, Kumpulainen Pk 1000 04200, Finland



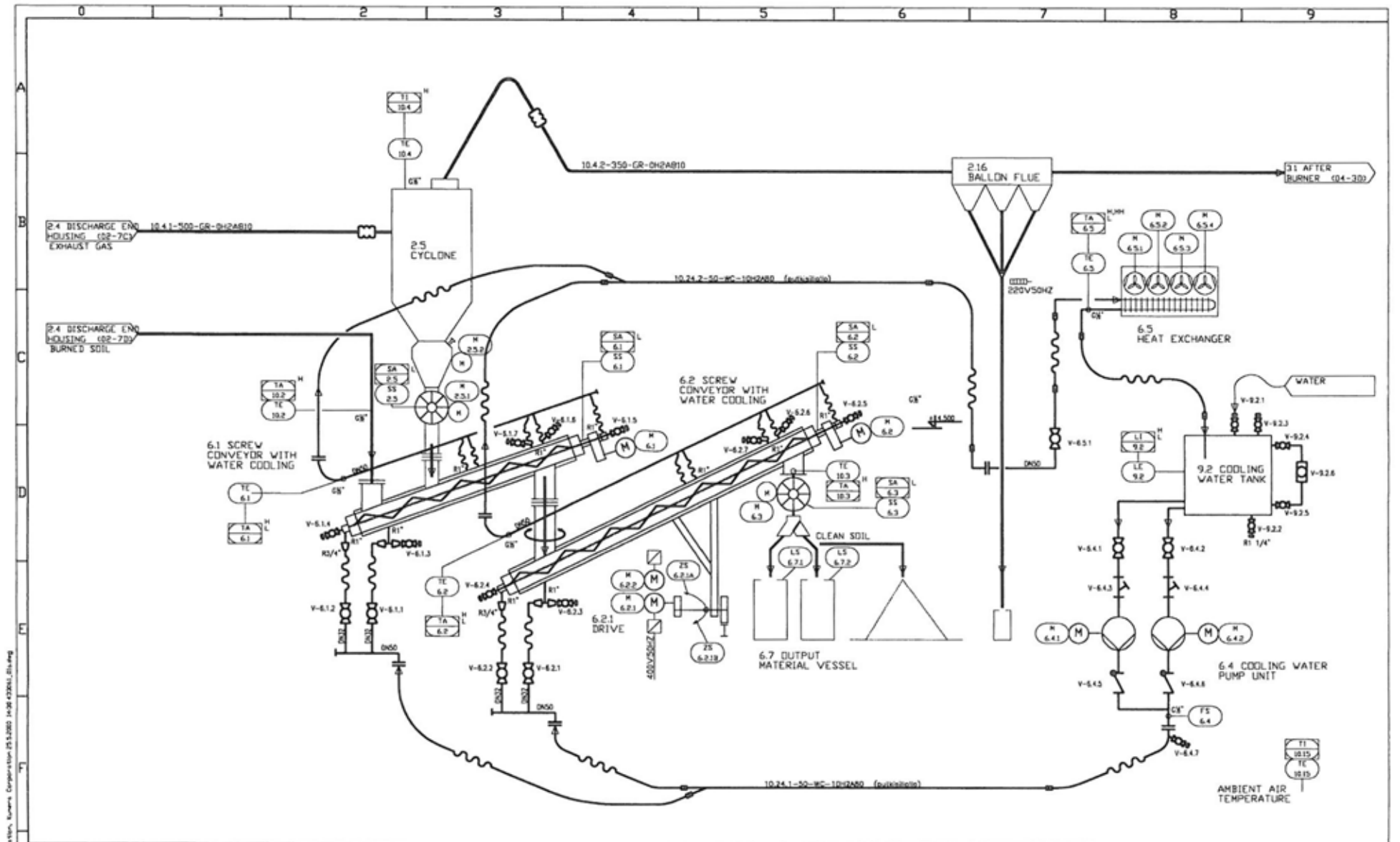
Kumera Corporation, Kumera Corporation P152002 1436 432801_01_04

1.9.05	MSR	LS-2.21 YLITYTTORAJAKSI	L
2.5.05	MSR	PINTA-ANTURIT SYÖTTÖSUPILOON	K
14.9.2003	jsi	Pöytäkirjasta muutoksia (alustava)	J
2.7.02	jsi	TIC-2.9.3 muutettu, PI-2.9 lisätty, korkeussäätö muutettu	I
Date	Drawn	Appr.	Change
			Rev.


KUMERA CORPORATION
 Technology Center

Client Project
 Drawing title
 CALCINER UNIT
 P & I - DIAGRAM

Drawn	Checked	Approved
Date 4.9.00		
Sign. MSR/ako		
Drawing	Sheet	Rev.
334206	02	L



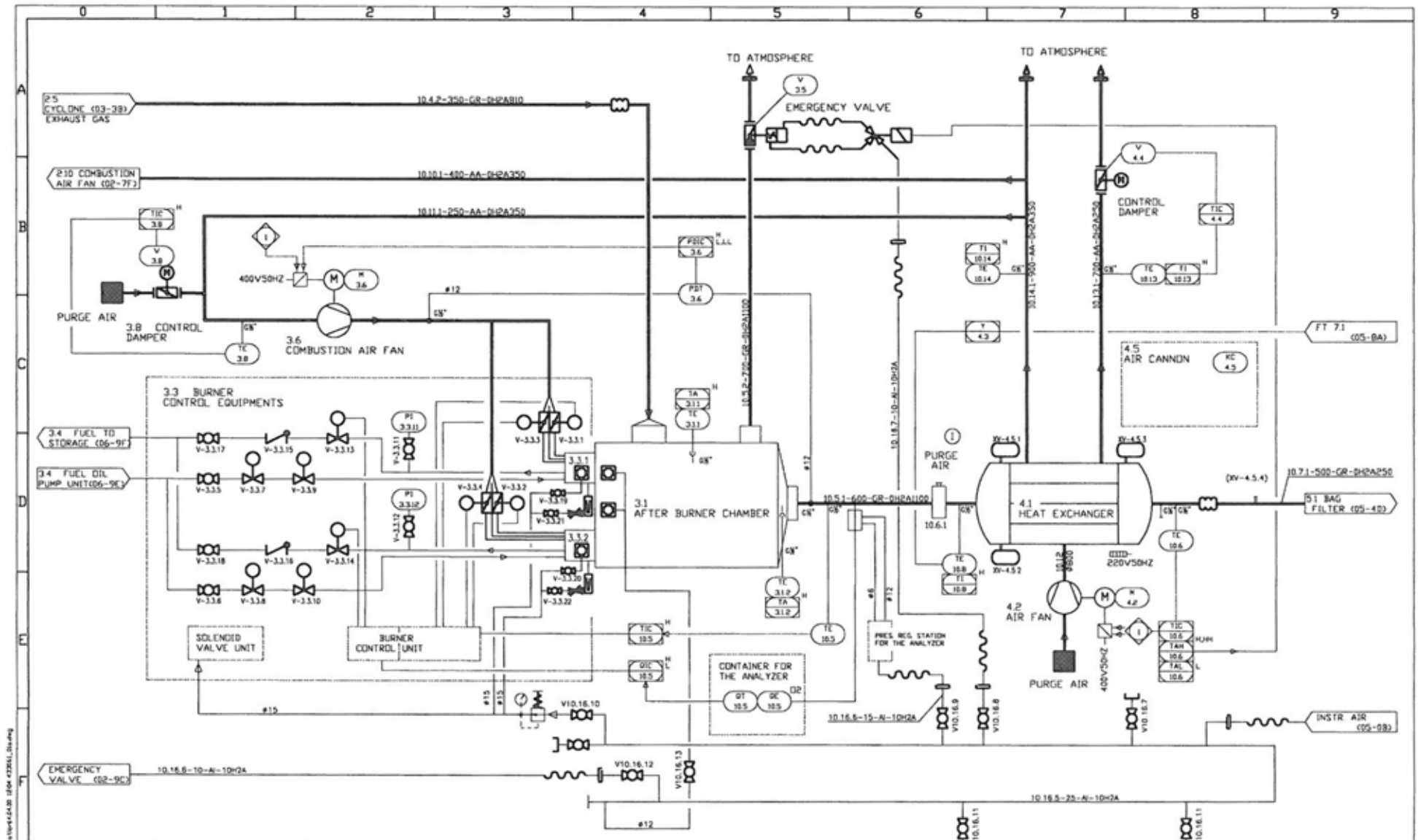
Kumera Corporation, Kumera Corporation (P) Ltd. 1030 43206-01-01

19.05	MSR		TARY M2.5.2 LISATTY	M
12.5.05	MSR		SULKUSYÖTTIMET M-2.5 JA M-6.3 LISATTY	L
9.4.2003	Jsi		216 Laskeuskaavio ja kourjenkaava lisätty	K
11.3.2003	Jsi		PT-10.4 siirretty polttouunin peräpäähän (334206-02)	J
Date	Drawn	Appr.	Change	Rev.


KUMERA CORPORATION
 Technology Center

Client Project
SOIL AND GAS HANDLING
 P & I - DIAGRAM

Drawn	Checked	Approved
Date 13.4.00		
Sign. MSR/alc		
Sheet 03	Rev. M	



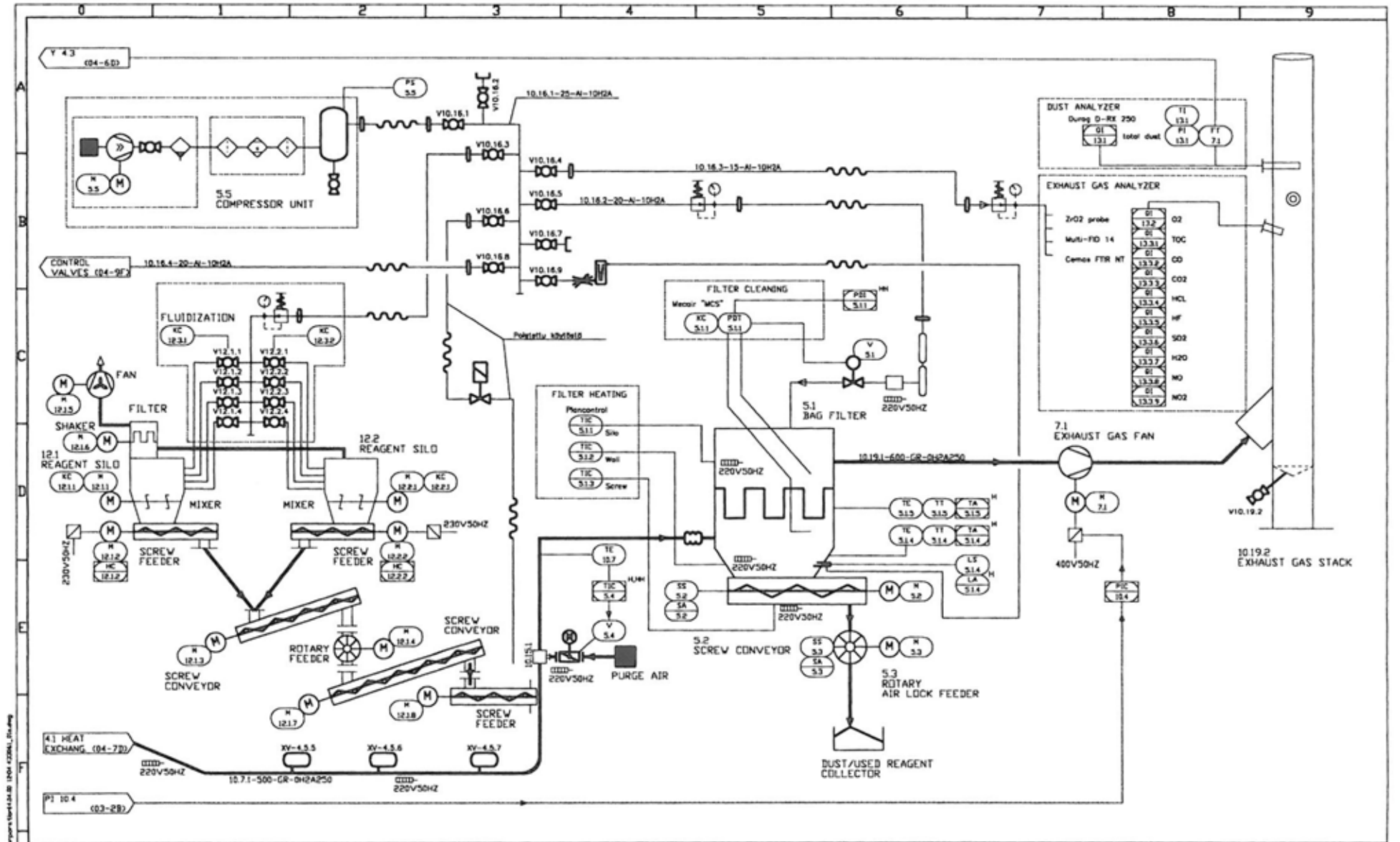
KTC: Kumera Corporation/04.00 334206 4/2004/04.00

1.9.05	MSR		V-4.3 POISTETTU	I
13.2.2003	jsi		Painelinautit ja lämmityksis lisäty	H
6.9.02	AKE		Purkisto ja venttiilit päivitetty	G
4.3.02	jsi		Lisäty TIC-3.8	F
28.2.02	jsi		PD-3.6 muutettu PDI-3.6, PBC-3.6 lisäinstrumentiksi	E
Date	Drawn	Appr.	Change	Rev.

KUMERA CORPORATION
Technology Center

	Client	
	Project	
	Drawing title	AFTER BURNER AND HEAT EXCHANGER P & I - DIAGRAM

Date	Drawn	Checked	Approved
4.9.00	MSR/ake		
Sheet	Rev.		
334206	04	I	



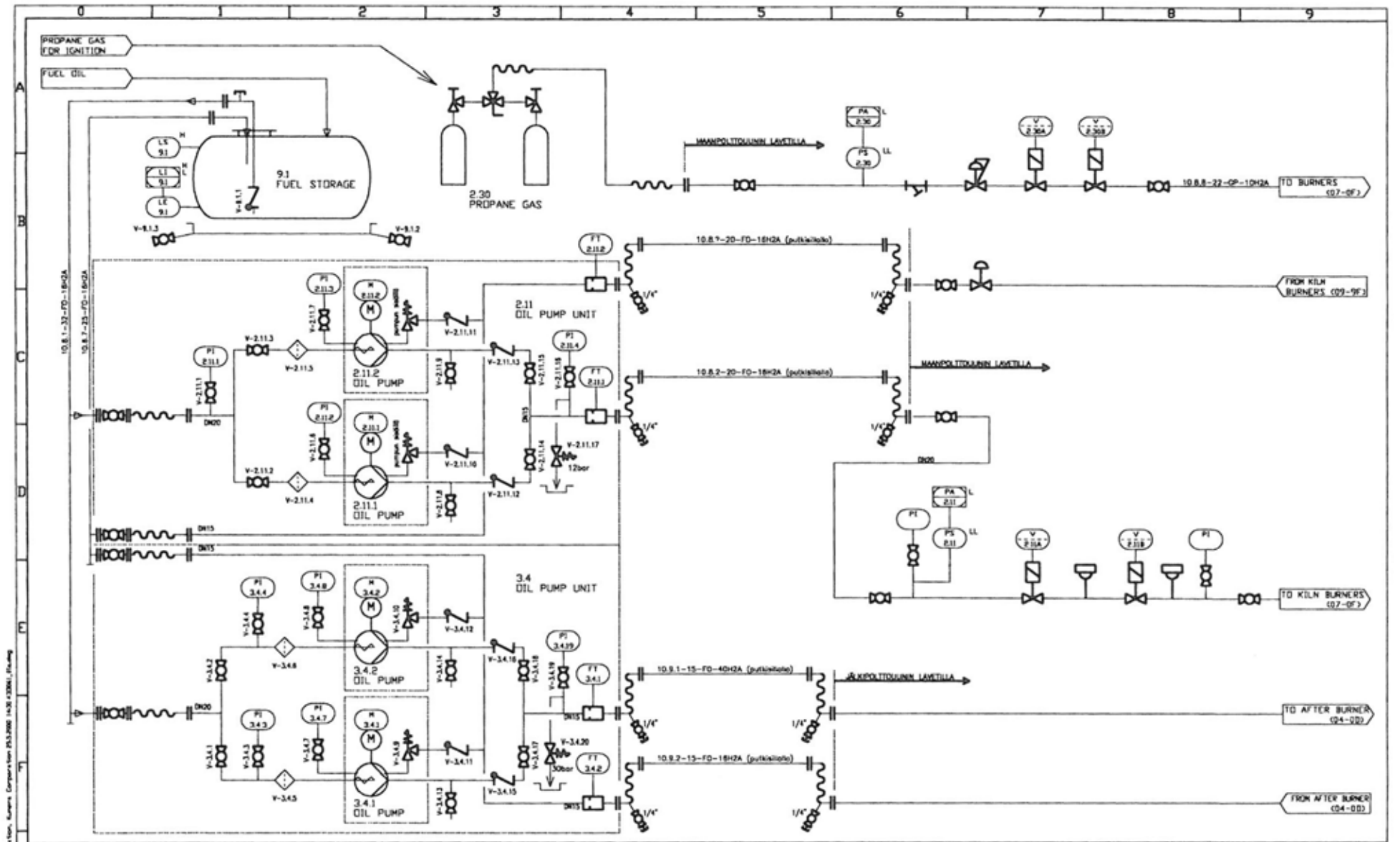
KTC, Kumera Corporation 1041-34-00 1041-22041, Rev. 04

Date	Drawn	Appr.	Change	Rev.
20.2.2003	Jsi		Reagenssikaiteistoa muutettu, painetykit lisätty	K
29.8.02	AKe		Lisälineen syöttö, putkisto ja venttiilit päivitetty	J
6.8.02	Jsi		Pölysuodatin päivitetty	I

KUMERA CORPORATION
Technology Center

Client Project
Drawing title
DUST HANDLING AND EXHAUST GAS P & I - DIAGRAM

Drawn	Checked	Approved
Date 4.9.00		
Sign. MSR/gike		
Sheet 334206	05	Rev. K



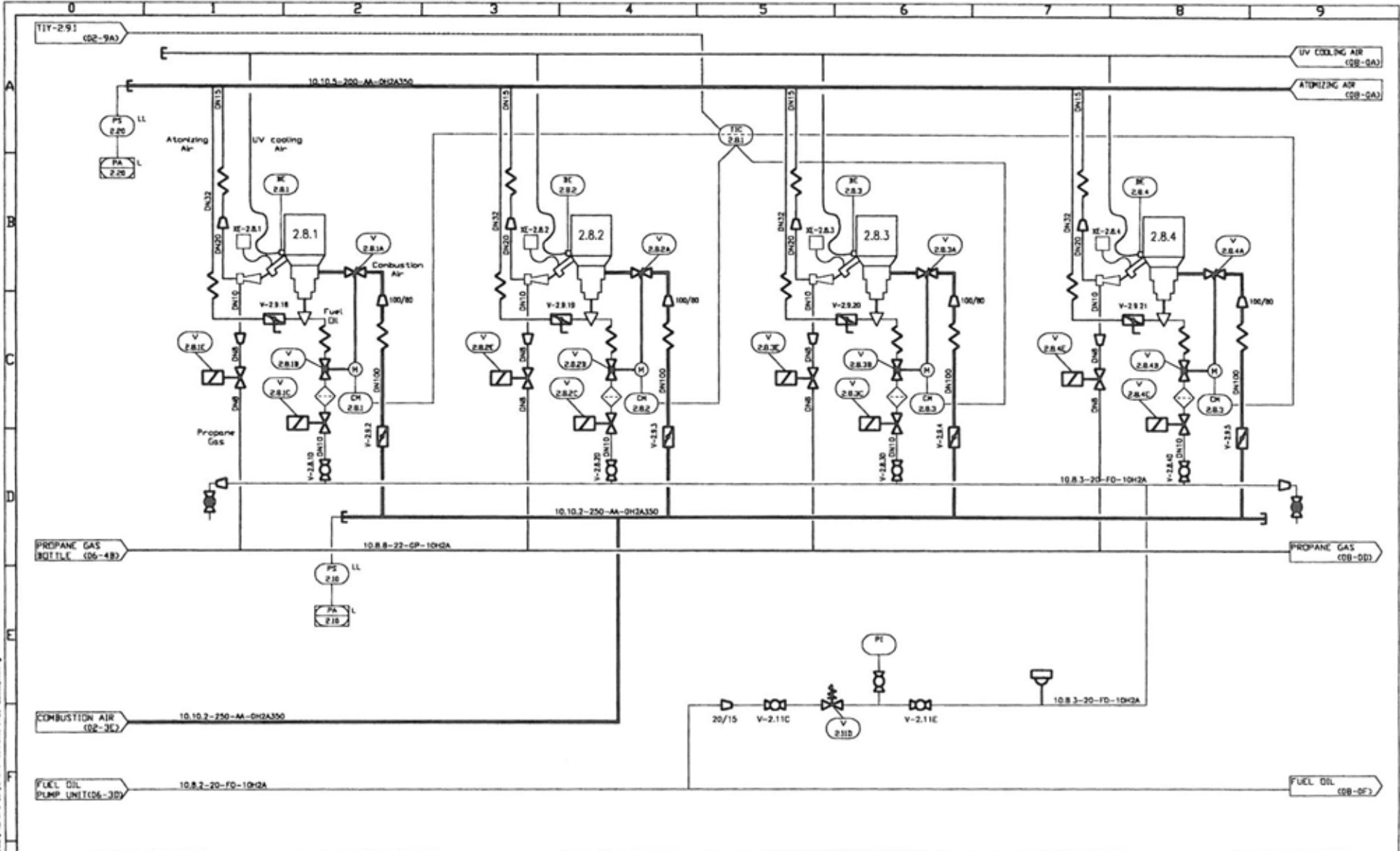
Kumera Corporation, Kuumera Corporation PLS-2000, MSR-132000, Drawing

9.4.2003	jsi		Poltinjärjestelmämuutoksia (alustava)	G
28.8.02	Ake		Putkisto ja venttiilit päivitetty	F
6.8.02	jsi		Öljyn virtausmittaukset lisätty	E
22.4.02	jsi		Öljy- ja propankisäsuinjojen signaalit korjattu	D
Date	Drawn	Appr.	Change	Rev.



Client	MSR/ake
Project	FUELS
Drawing title	P & I - DIAGRAM
Rev.	

Drawn	Checked	Approved
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Drawing	334206	Sheet 06 Rev. G



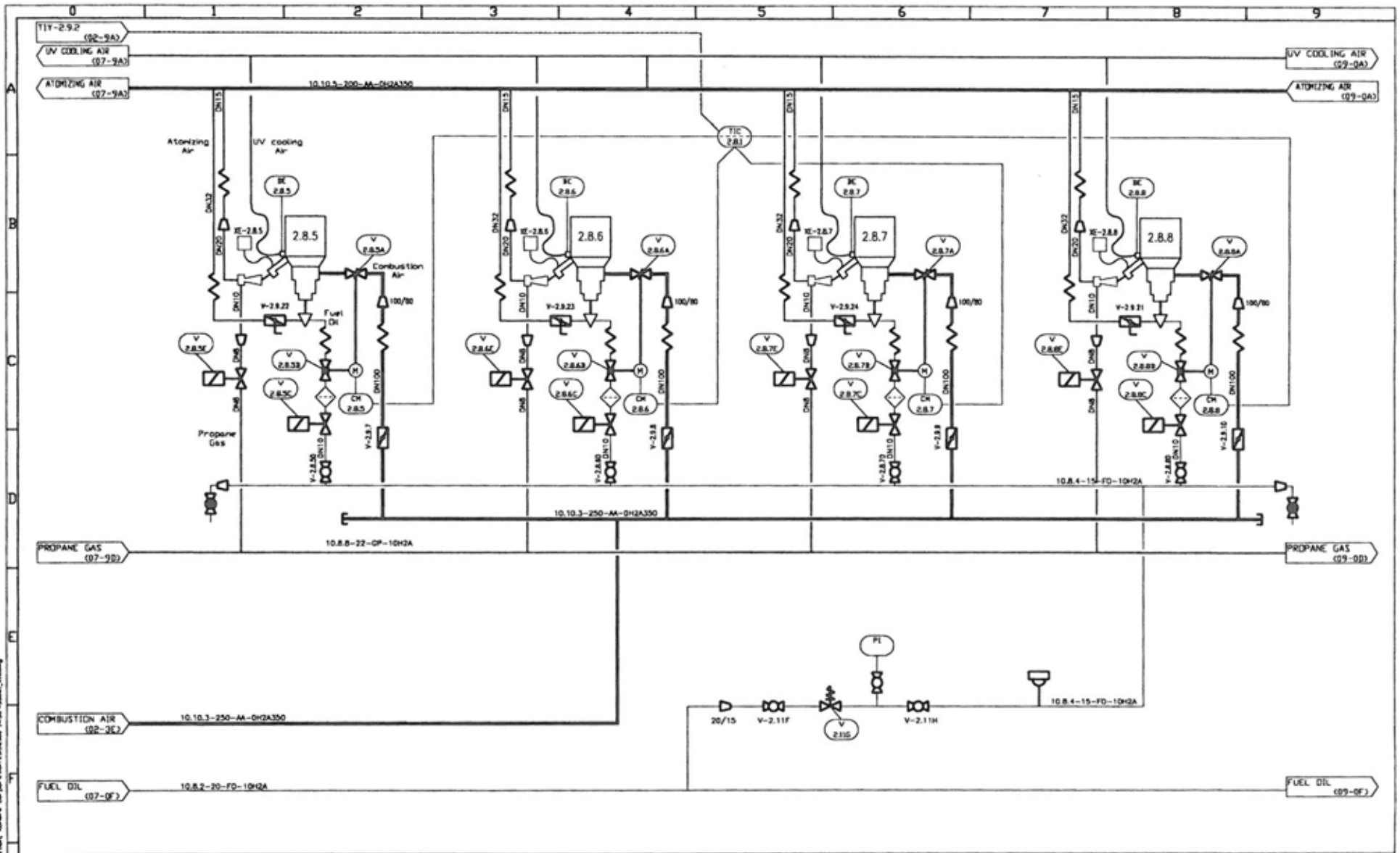
Kumera Corporation, Suomen Korvauskeskus P.O. Box 10200, Helsinki, Finland

Date	Drawn	Appr.	Change	Rev.
9.4.2003	jsi		Poltinjärjestelmämuutoksia (alustava)	E
22.4.02	jsi		Venttiikoodeja lisätty ja ohjaussignaalit korjattu	D
23.1.02	ake			C


 Technology Center

Client: **BURNERS FOR ZONE 1**
 Project: **P & I - DIAGRAM**

Drawn	Checked	Approved
Date: 4.9.00		
Sign: MSR/ake		
Sheet: 334206	07	Rev: E

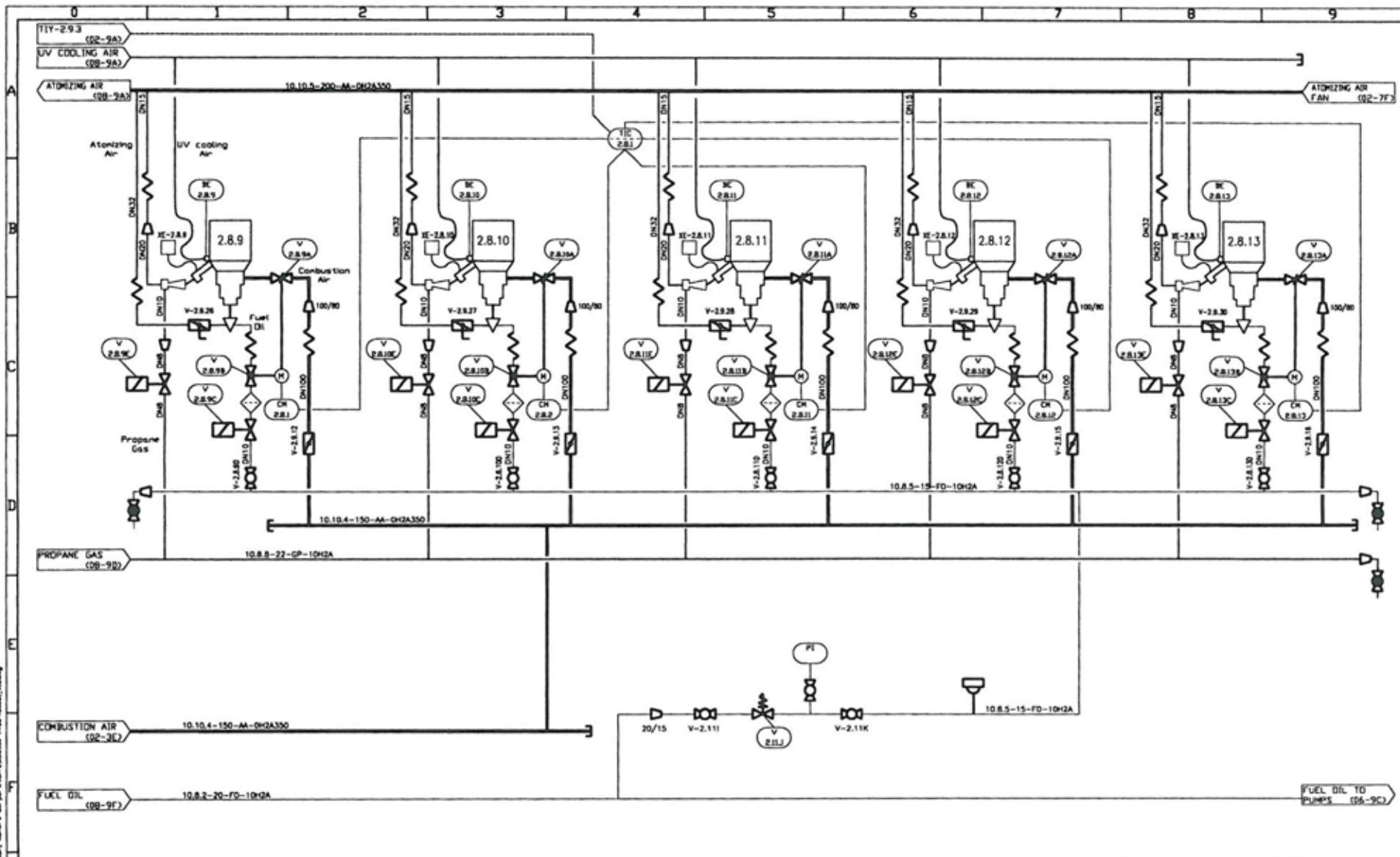


Kumera Corporation, Suomen Korvauskeskus P.O. Box 143200, Helsinki, Finland

9.4.2003	jai		Poltinjärjestelmämuutoksia	E
22.4.02	jai		Polttoöljylinjan venttiilikoodit lisätty	D
23.1.02	ake			C
Date	Drawn	Appr.	Change	Rev.



Client	Project	Drawn	Checked	Approved
	BURNERS FOR ZONE 2	4.9.00		
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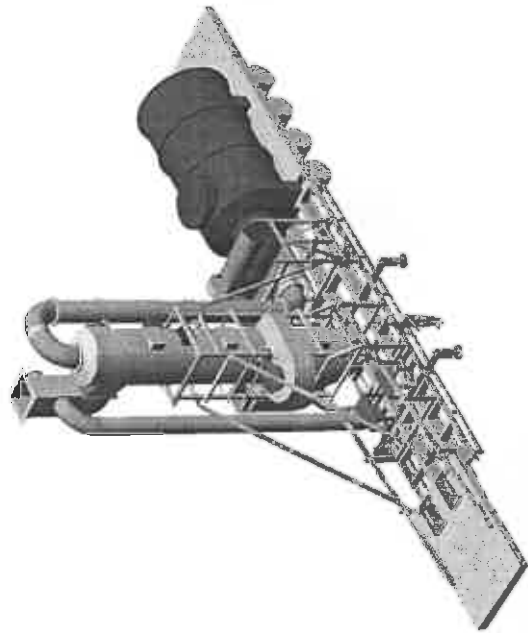


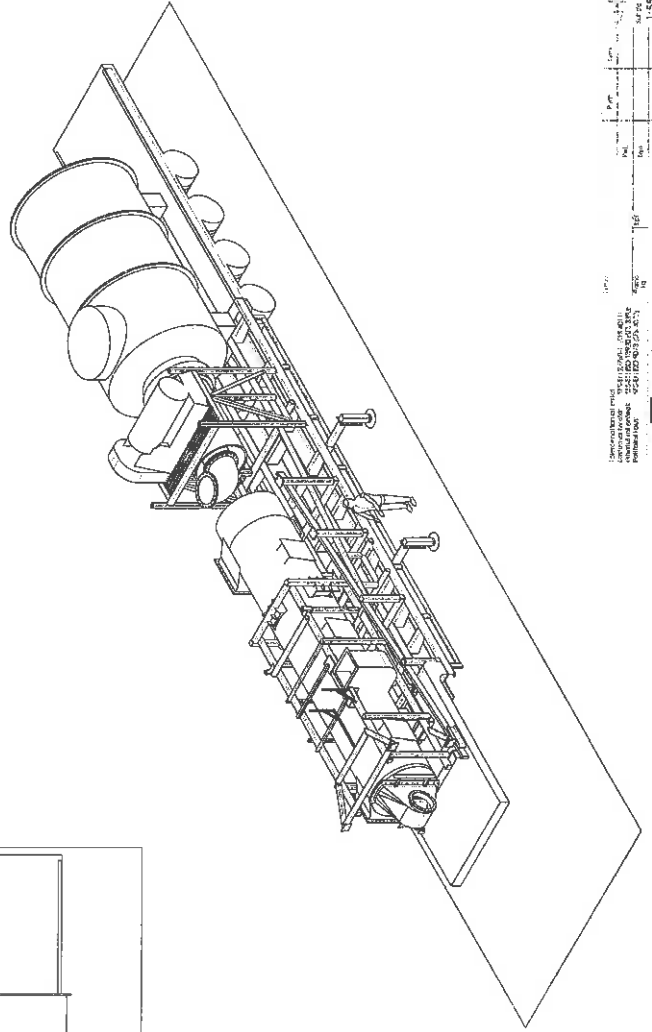
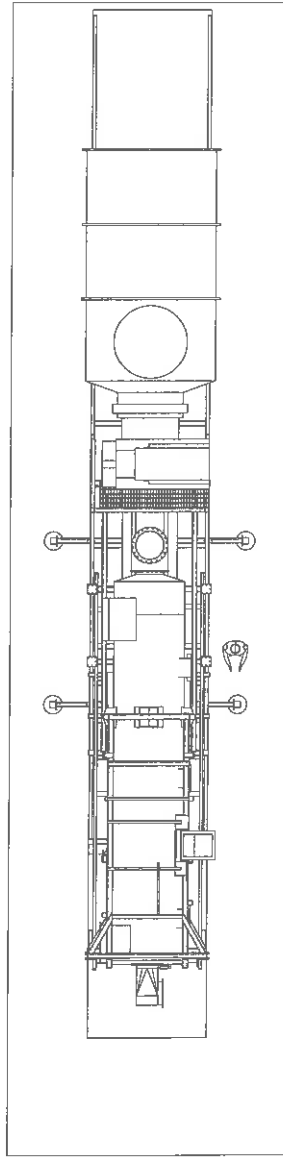
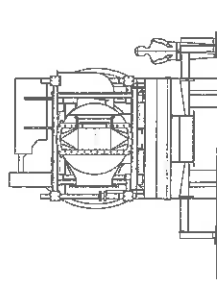
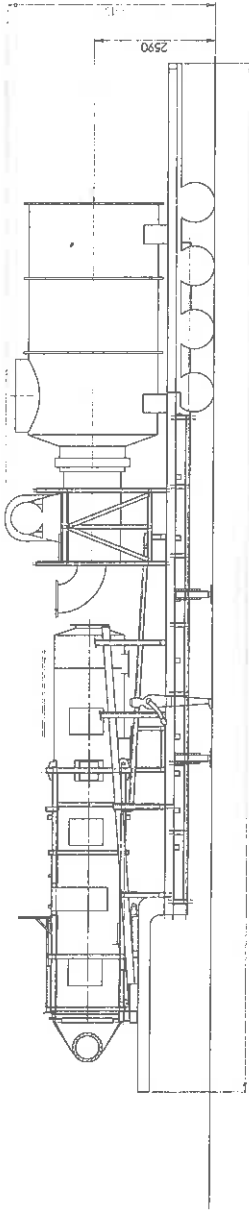
Kumera Corporation, Suomen Korvaus AS, 00500 Helsinki, Finland

9.4.2003	jsi		Poltin_jrjesteinmuutos	E
22.4.02	jsi		Polttoilijylinjan venttiilikoodit lisätty	D
23.1.02	ake			C
Date	Drawn	Appr.	Change	Rev.



Client	Project	Date	Drawn	Checked	Approved
	BURNERS FOR ZONE 3	4.9.00	MSR/ake		
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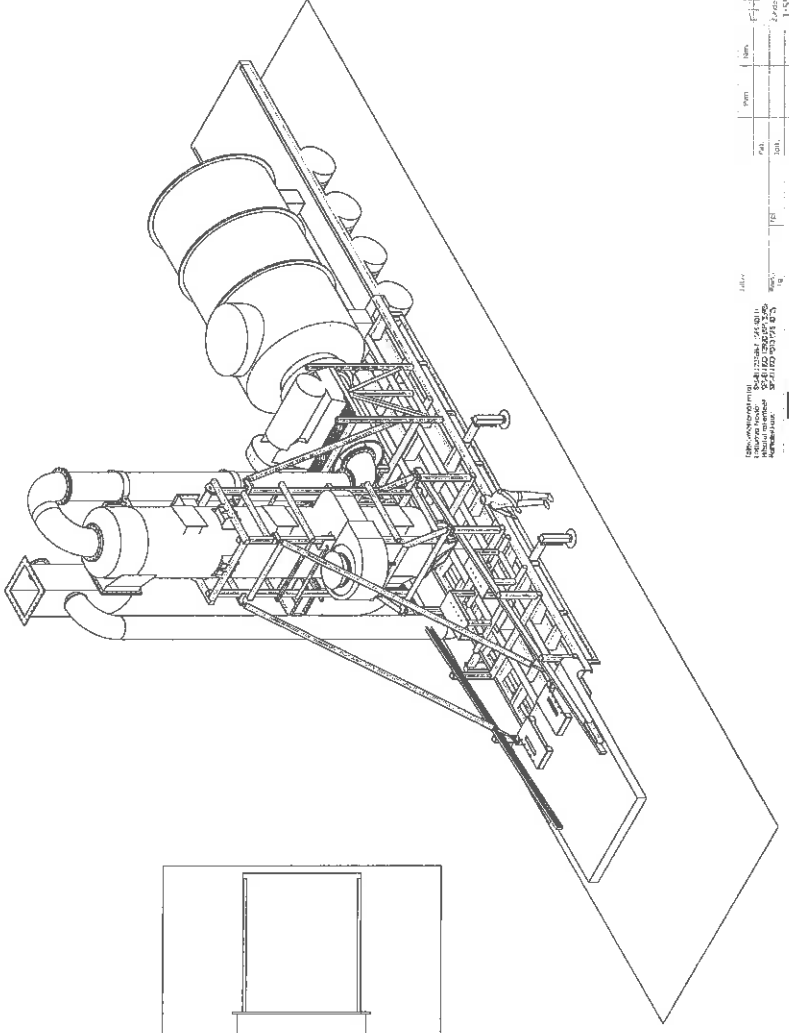
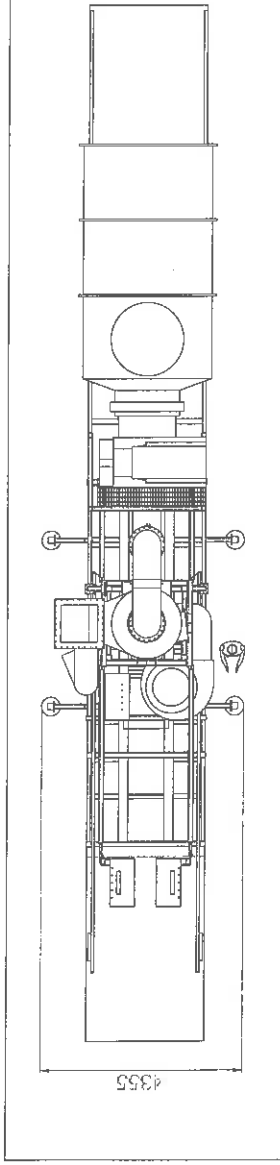
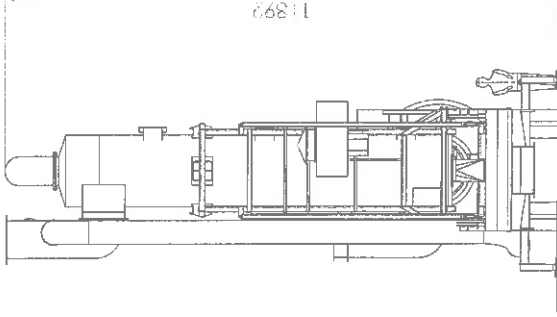
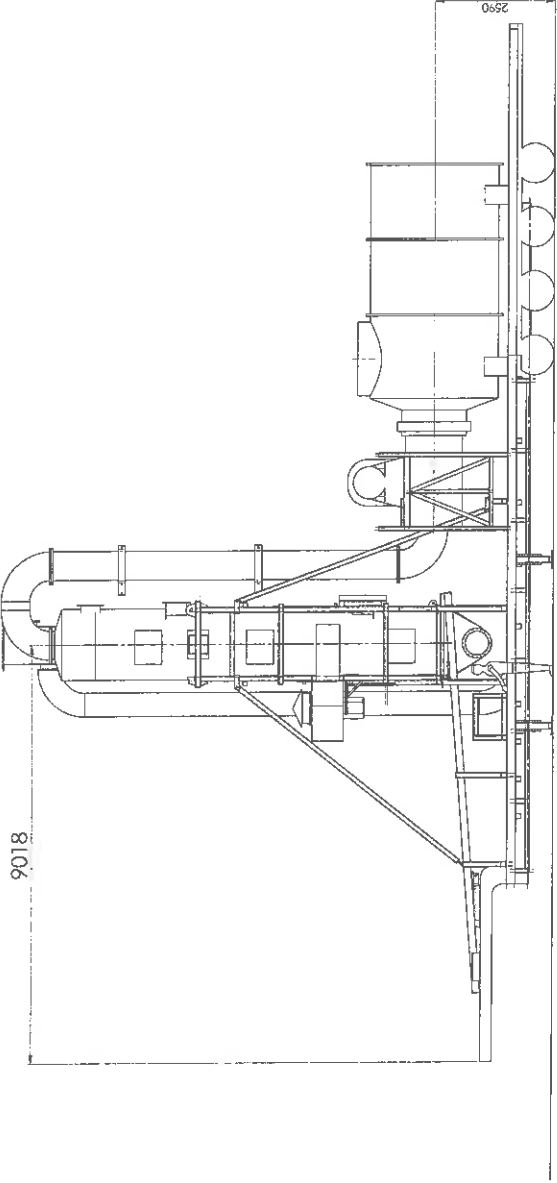


DIMENSIONI IN mm
 UNITA DI MISURA
 SCALE
 1:1
 1:2
 1:5
 1:10
 1:20
 1:50
 1:100
 1:200
 1:500
 1:1000



Perm	Mod	Disegn	Area

Nota: in caso di modifiche, l'ingegnere è responsabile della
 consultazione e approvazione delle modifiche.



100% GARANZIA PER
 QUALITÀ E DURATA
 INFORMATICA
 ASSISTENZA
 MANUTENZIONE

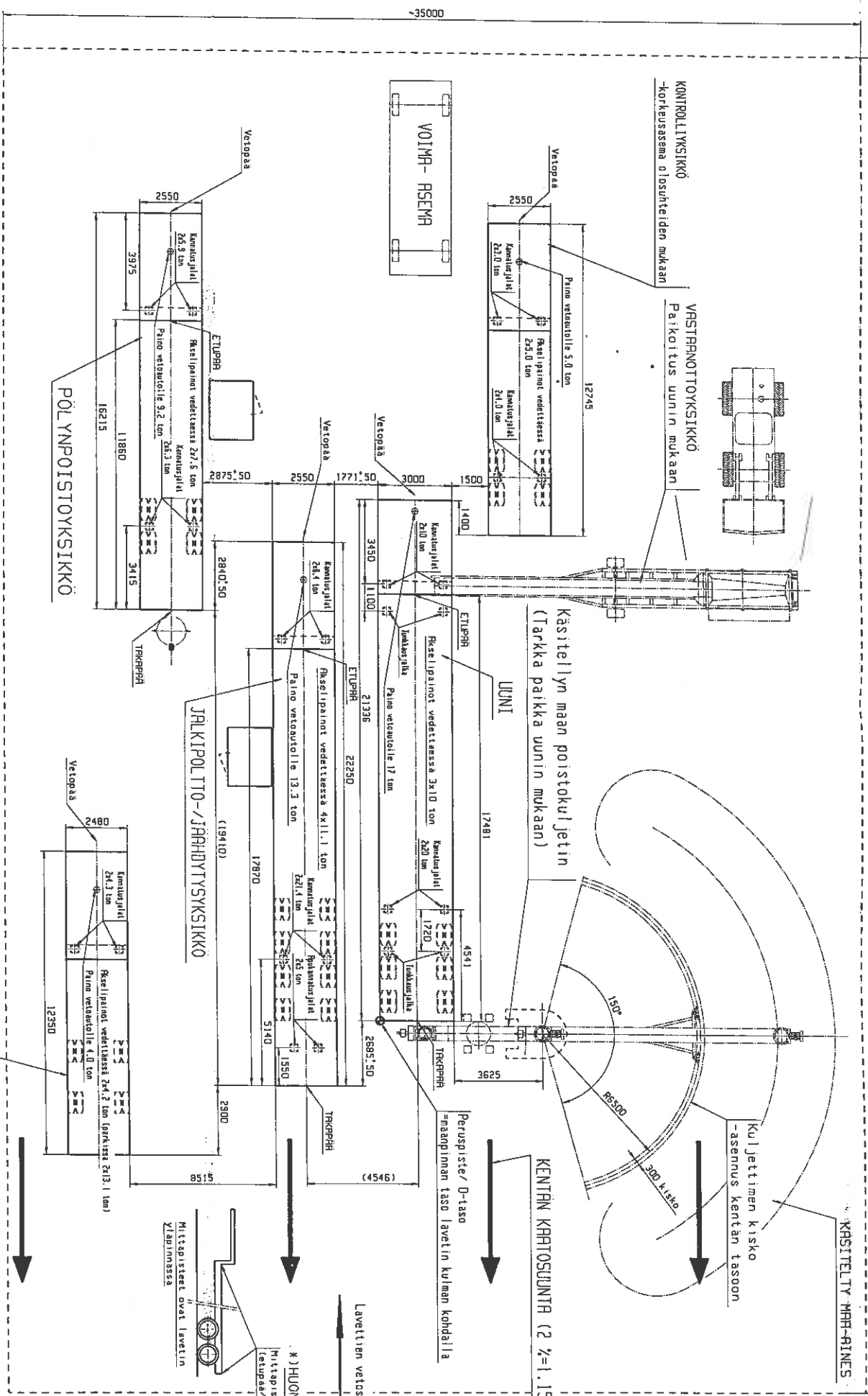


Prodotto da:	ENMAC
Modello:	
Versione:	
Colore:	
Materiali:	
Accessori:	
Garanzia:	
Prezzo:	
Spese di trasporto:	
Spese di installazione:	
Spese di smaltimento:	
Spese di manutenzione:	
Spese di trasporto e installazione:	
Spese di smaltimento:	
Spese di manutenzione:	
Spese di trasporto e installazione:	
Spese di smaltimento:	
Spese di manutenzione:	

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-35000



LAVETTIIEN KORKEUDET (perustasosta) mitat millimetreinä

*) ETUPÄÄN KORKEUS *) TAKAPÄÄN KORKEUS KESKIIVELLÄ KESKIIVELLÄ POIKITTISSUUNNASSA

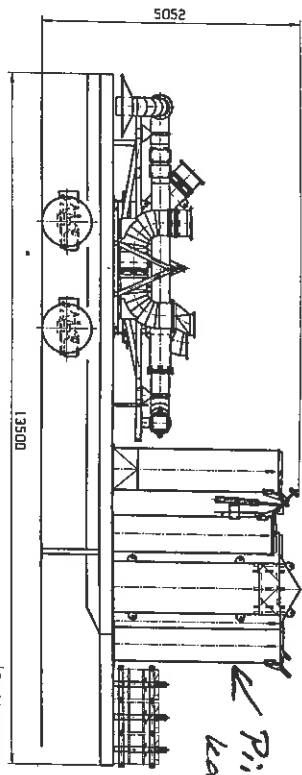
Asento A. UUNI (kallistus 1.5°)	+1485 ±15	+1015 ±15	10
Asento B. UUNI (kallistus 0.3°)	+1290 ±15	+1015 ±15	10
JÄLKIPOLTO-/JÄRHÖITYSYKSIKKÖ (kallistus 2 x ±1.15°)	+1300 ±15	+945 ±15	10
POLYMOISTOYKSIKKÖ (kallistus 2 x ±1.15°)	+1570 ±10	+1335	10

VEDEN- / POLTTORINEEN KÄSITELY-YKSIKKÖ

NO	1	2	3	4	5	6	7	8	9	10	11	12
NO	1	2	3	4	5	6	7	8	9	10	11	12
NO	1	2	3	4	5	6	7	8	9	10	11	12

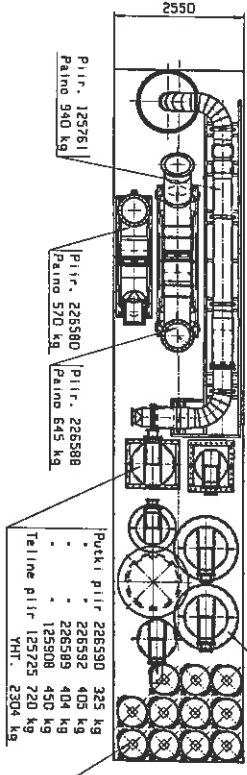
KUMERA
 Technology Center
 GEOTEKNINEN HIRN POLTTOLUUKKI
 125947
 125979
 1/1

No. 1 KUORRH YHT. 8138 kg



Piiput
 kaadetaan

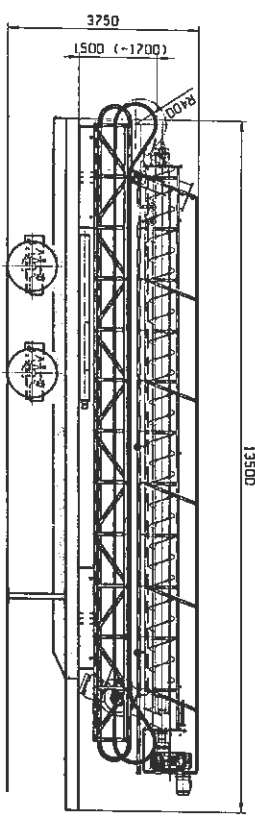
Ironkivannon savuripput, 3 kpl
 3 kpl, yht. 500 kg



Piir. 125761
 Paino 940 kg
 Piir. 226580
 Paino 570 kg
 Piir. 226588
 Paino 645 kg
 Pötkki piir. 226590 325 kg
 : : 226592 405 kg
 : : 226595 404 kg
 : : 125808 450 kg
 Teline piir. 125723 720 kg
 YHT. 2304 kg

Betoniottu tyynyri ja kannake
 11x400 kg = 4400 kg

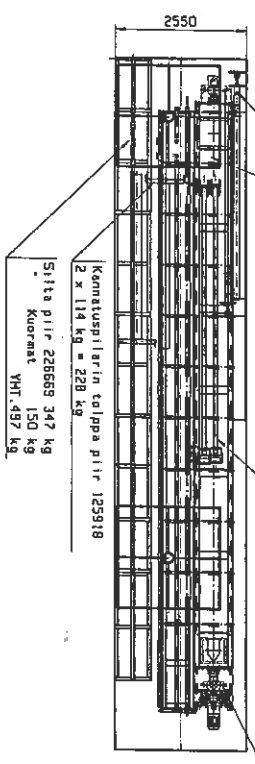
No. 2 KUORRH YHT. 6517 kg



13500

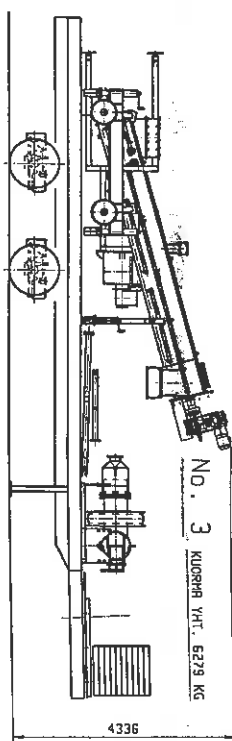
Kannatuspiiri piir. 226665
 2x64 kg = 128 kg
 Kannatuspiirien jalusta piir. 125918
 2x390 kg = 780 kg
 Sivestuki piir. 226666 ja 226667
 6x114 kg = 684 kg

Ruuvikuljetin
 ilman kannattuksia 3800 kg



Kannatuspiirien talppa piir. 125918
 2 x 114 kg = 228 kg
 Sivite piir. 226668 347 kg
 Kuormat 150 kg
 YHT. 497 kg

No. 3 KUORRH YHT. 6279 kg

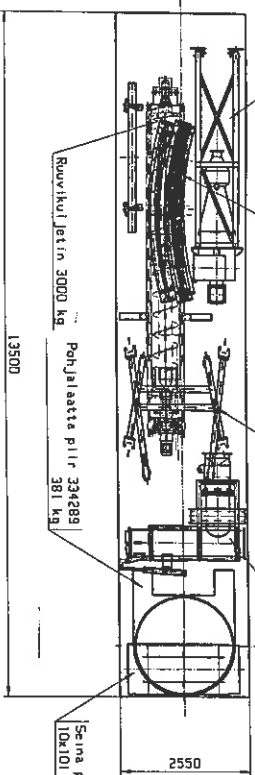


Syklotri 645 kg

Pohjaltaetta piir. 334274
 3x76 kg = 380 kg

Ruuvikuljetin
 kannatuset 300 kg

Pötkki piir. 123795 413 kg
 Teline piir. 226675 150 kg
 YHT. 563 kg



Ruuvikuljetin 3000 kg

Pohjaltaetta piir. 334289
 381 kg

Seina piir. 334279
 10x101 = 1010 kg

KORVAUS		KORVAUS		KORVAUS		KORVAUS		KORVAUS		KORVAUS		KORVAUS		KORVAUS	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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ALOH.
 VAIN LÄSTIN No 1 PRINOISSA
 kuivastuot mukana

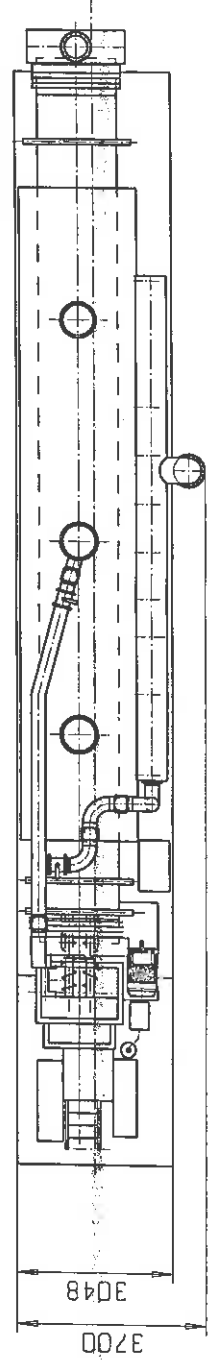
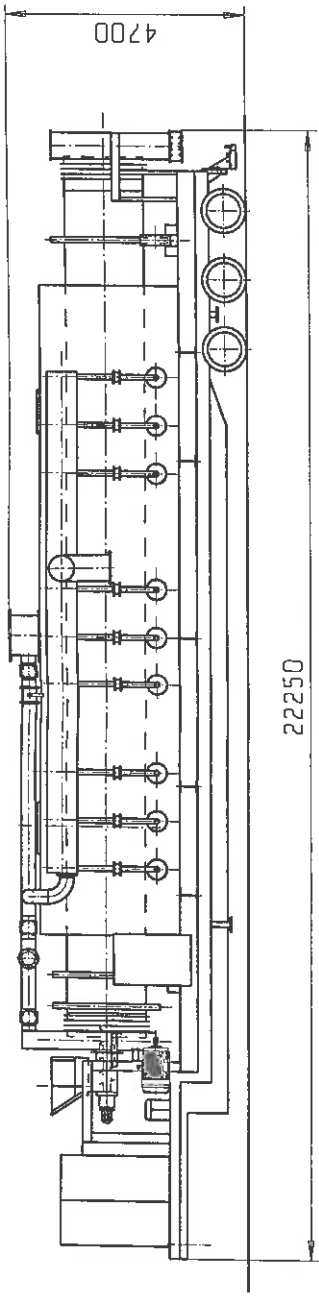
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KULJETUSTIEDOT

- kokonaispaino: 47000 kg
- akselipaino: 3x10000 kg
- paino vetoautolle: 17000 kg
- kuljetuskorkeus: 4,7 m
- kuljetusleveys: 3,7 m
- kuljetuspituus: 22,25 m

-EI KÄÄNTYVIÄ PYÖRIÄ



REVISION		Tolerances													
Length	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±4	±5	±6	±10	±12	±14	±16
Machined constr. DIN 7168 BL medium															
Welded constr. DIN 8570 BL 5															

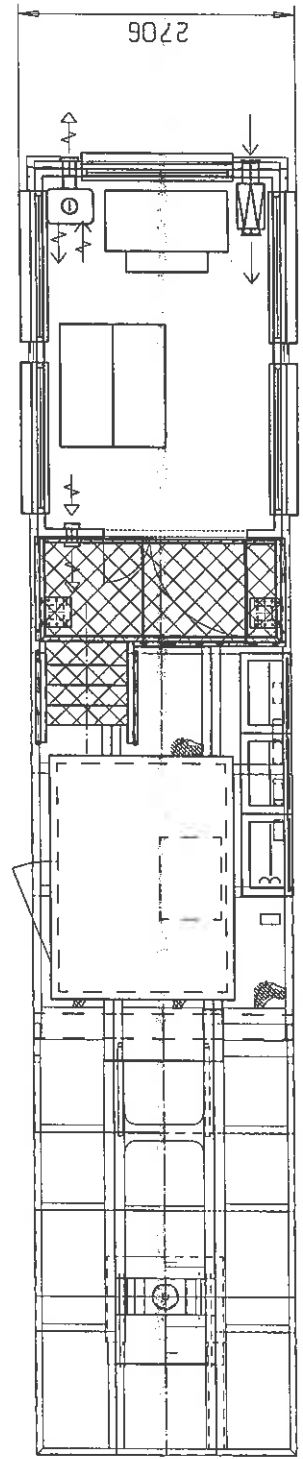
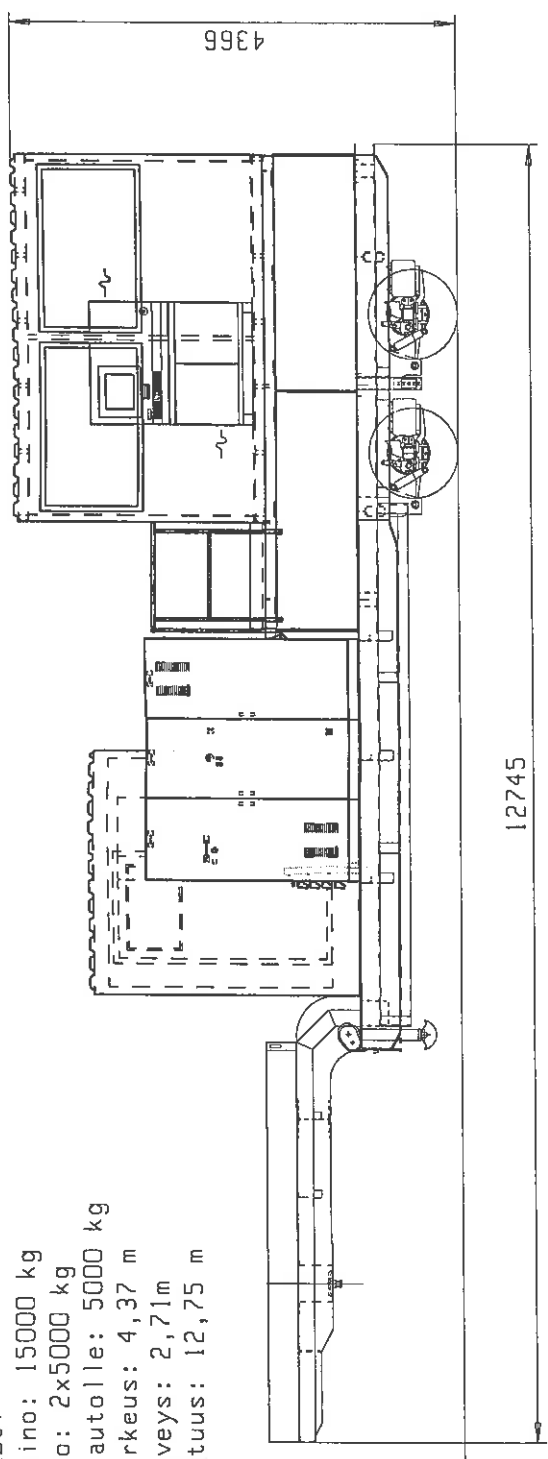
KUMERA Technology Center FIN-11100 RIIHIMÄKI-FINLAND	Scale 1:100	Assigned 2002-06-19	Checked rpa	Approved	Net weight (kg) Replaces the drawing	Registry Included in 125947	Sheet 1/1	Drawing title Pyörivä polttouuni, kuljetus	334337	334337	Revision 1/1	Project/Product SARSTUNEEN MAAN POLTTOUUNI
												Page no.

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KULJETUSTIEDOT

- kokonaispaino: 15000 kg
- akselipaino: 2x5000 kg
- paino vetoautolle: 5000 kg
- kuljetuskorkeus: 4,37 m
- kuljetusleveys: 2,71m
- kuljetuspituus: 12,75 m

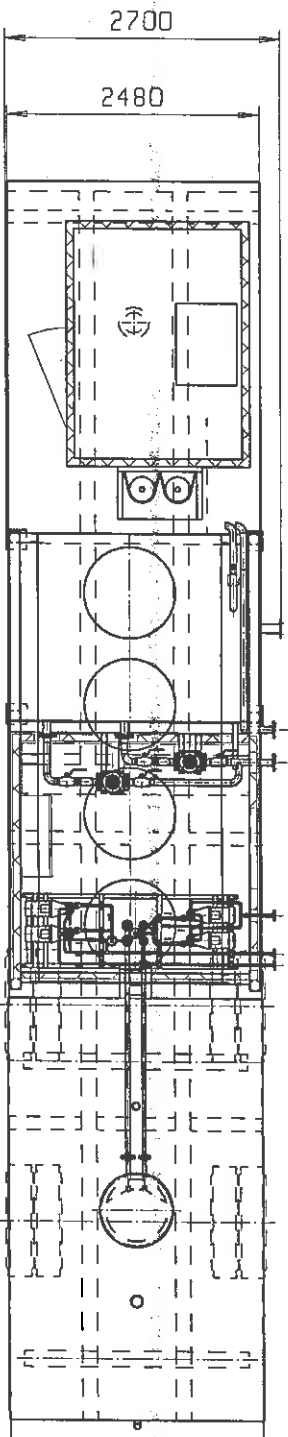
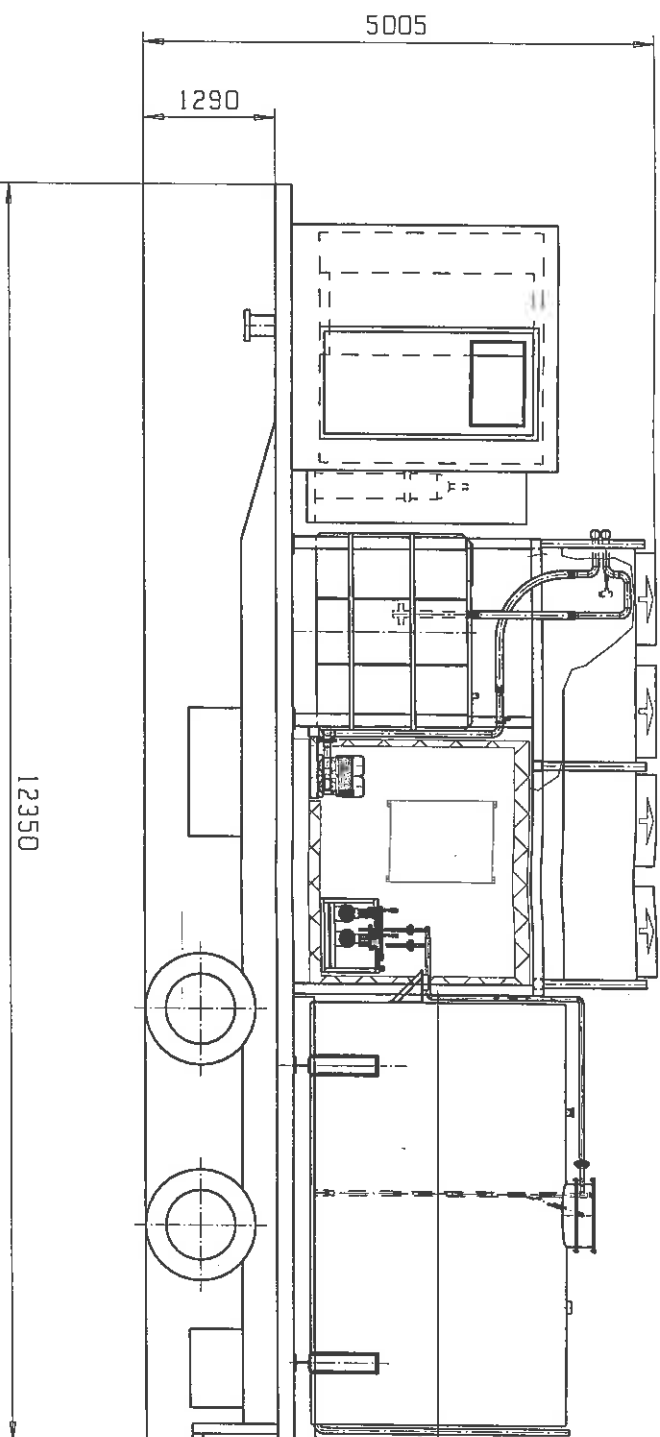


REVISION		Tolerances											
Length		±0.5	±0.30	±0.120	±0.315	±1.000	±2.000	±4.000	±8.000	±12.000	±16.000	±20.000	±20.000
Machined constr. DIN 7168 B/L medium		±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±4	±5	±6	±6
Milled constr. DIN 8570 B/L B			±2	±2	±3	±4	±6	±8	±10	±12	±14	±16	±16

 KUMERA Technology Center FIN-11100 RIIHIMÄKI-FINLAND	Scale 1:50	Assigned 2002-06-19 rpa	Checked	Approved	Net weight (kg) Registry
	Project/Product ECOCLEANING SARASTUNEEN MAAN POLTTOUUNI	Included in 125947 Sheet	Replaces the drawing	Drawing title 334341	Revision 1/1

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- KULJETUSTIEDOT**
- kokonaispaino: 12400 kg
 - akselipaino: 2x4200 kg
 - paino vetoautolle: 4000 kg
 - kuljetuskorkeus: 5,005 m
 - kuljetusleveys: 2,7 m
 - kuljetuspituus: 12,35 m

*-Nestesäiliö ei ole vähenne.
-Ennen kuljetusta pyyhkiä
säiliöihin jäävät nestemäärät
minimimäärään.
-Öljysäiliöissä öljyä (polttoöljyä)*

REVISION

Tolerances

Length	≤ 30	30 - 120	120 - 315	315 - 1000	1000 - 2000	2000 - 4000	4000 - 8000	8000 - 12000	12000 - 16000	16000 - 20000	20000 - 24000
Machined const. DIM 7-188 3D1 medium	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±4	±5	±6
Milled const. DIM 85/0 3D1	±2	±2	±3	±4	±5	±8	±10	±12	±14	±16	

KUMERA
Technology Center
FIN-11100 RIIHIMÄKI-FINLAND



Scale

1:50

Designed
2002-06-19
RPA

Created

Approved

Net weight (kg) Registry
Replaces the drawing

Project/Product: COCCLEANING
SRASTUNEEN MARN POLITOUUNI

Included in
125947

Drawing title
Nestesäiliö yksikkö, kuljetus

Fig. no.
334340

Sheet
1/1

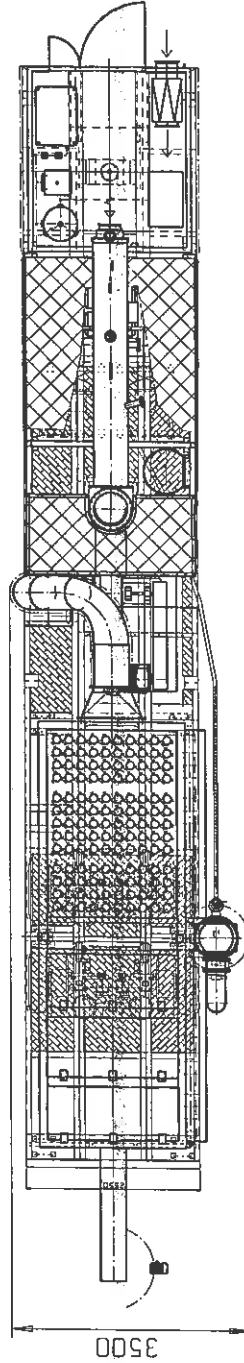
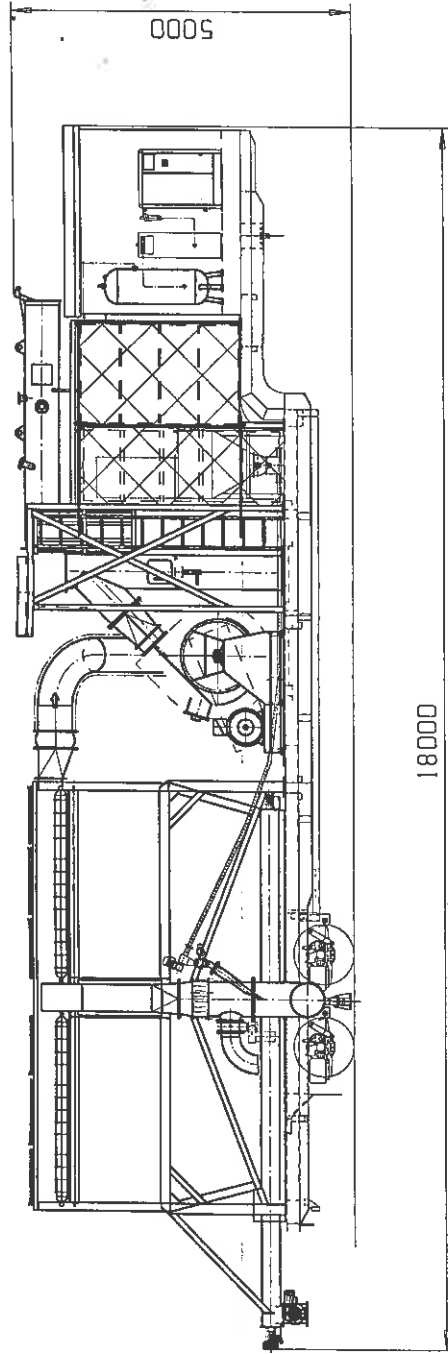
Revision

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KULJETUSTIEDOT

- kokonaispaino: 24400 kg
- akselipaino: 2x7600 kg
- paino vetoautolle: 9200 kg
- kuljetuskorkeus: 5,0 m
- kuljetusleveys: 3,5 m
- kuljetuspituus: 18,0 m



KUMERA Technology Center FIN-11100 RIIHIMÄKI-FINLAND	Scale	Designed	Checked	Approved	Net weight [kg]	Registry
	1 : 75	2002-06-19	rpa		Replaces the drawing	
Project/Product: ECOCLEANING SAASTUNEEN MAAN POLTTOJUONI		Drawing title		Included in 125947		
				Sheet 334339		Revision 1/1

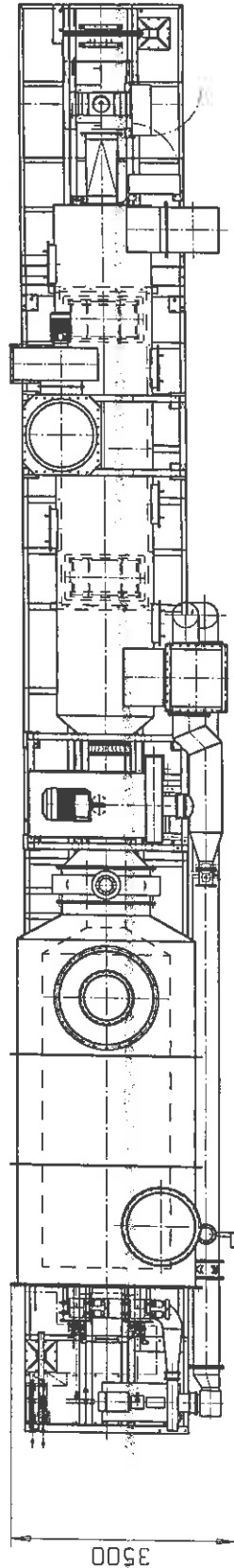
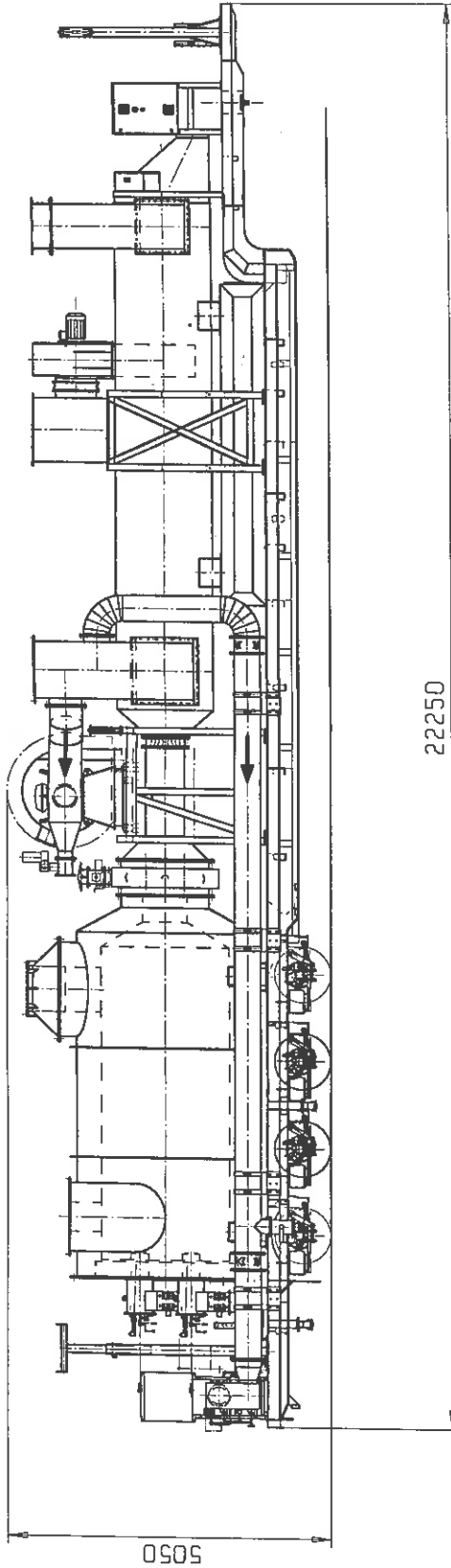
	REVISION										
	Tolerances										
Length	±0.5	±0.3	±0.2	±0.15	±0.1	±0.08	±0.06	±0.04	±0.03	±0.02	±0.01
Machined constr. DIN 7169 BL medium	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±4	±5	±6
Milled constr. DIN 8570 BL 8		±0.2	±0.3	±0.4	±0.5	±0.8	±1.0	±1.2	±1.4	±1.6	

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KULJETUSLIEBOT

- kokonaispaino: 57700 kg
- akselipaino: 4x11100 kg
- paino vetoautolle: 13300 kg
- ku|jetuskorkeus: 5,05 m
- ku|jetusleveys: 3,5 m
- ku|jetuspituus: 22,25 m

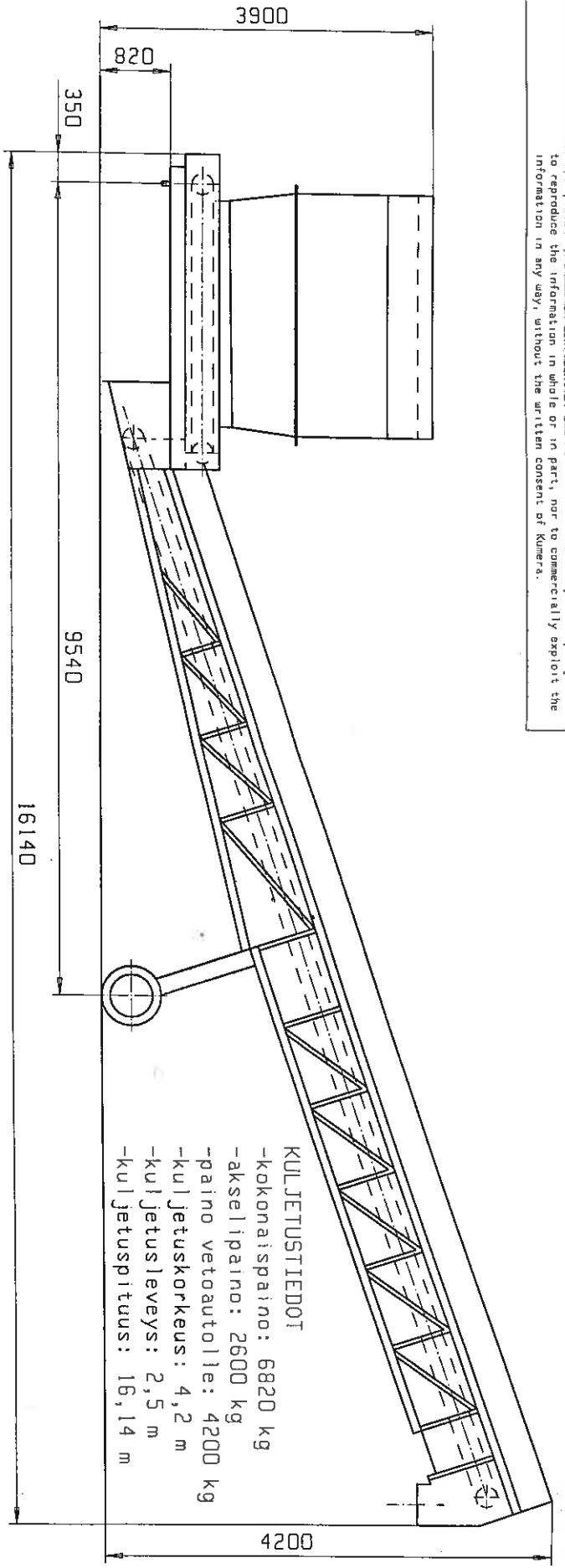


<p>KUMERA Technology Center FIN-11100 RIIHIMÄKI-FINLAND</p>	<p>Scale 1 : 75</p>	<p>Assigned 2002-06-19</p>	<p>Checked</p>	<p>Approved</p>	<p>Net weight (kg) Registry 57640</p>
					<p>Project/Product ECO-CLEANING SARSTUNEEN MAAN POLTTOUUNI</p>
<p>Drawing title Jälkipolttö-/jaahdytysyksikkö</p>					<p>Sheet 1 / 1</p>
<p>334338</p>					

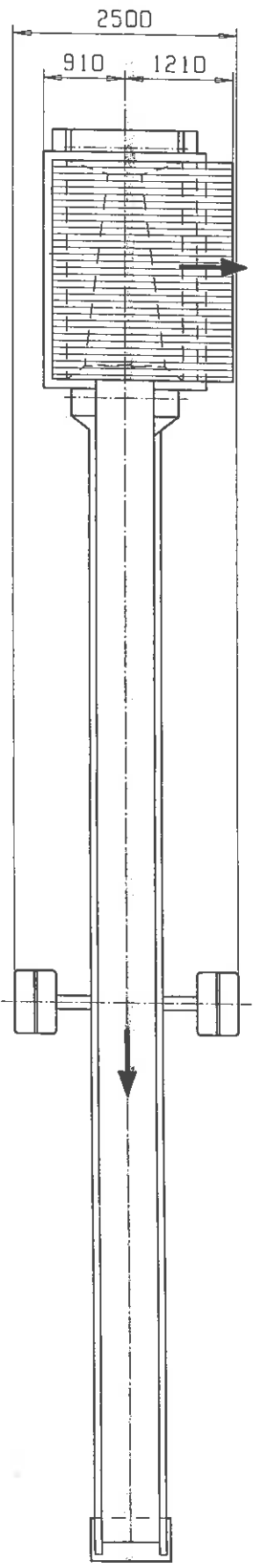
	REVISION										
	Tolerances										
Length	±.6	±.30	±.120	±.315	±.1000	±.2000	±.4000	±.6000	±.12000	±.20000	>±20000
Machined constr. DIN 7168 BL medium	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±4	±5	±6
Welded constr. DIN 8570 BL B			±.2	±.2	±.3	±.4	±.6	±.8	±.10	±.12	±.14
											±.16

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- KULJETUSTIEDOT**
- kokonaispaino: 6820 kg
 - akselipaino: 2600 kg
 - paino vetoautolle: 4200 kg
 - kuljetuskorkeus: 4,2 m
 - kuljetusleveys: 2,5 m
 - kuljetuspituus: 16,14 m



REVISION

Length	1/5	1/6	1/20	1/15	1/1000	1/2000	1/4000	1/8000	1/12000	1/16000	1/20000	1/20000
Machine const. DIN 7188 B.L1 medium	0,1	0,2	0,3	0,5	0,8	1,2	2	3	4	5	6	
Machine const. B DIN 8570 B.L1			2	2	3	4	6	8	10	12	14	16

Tolerances

Length	1/5	1/6	1/20	1/15	1/1000	1/2000	1/4000	1/8000	1/12000	1/16000	1/20000	1/20000
Machine const. DIN 7188 B.L1 medium	0,1	0,2	0,3	0,5	0,8	1,2	2	3	4	5	6	
Machine const. B DIN 8570 B.L1			2	2	3	4	6	8	10	12	14	16

KUMERA Technology Center
 FIN-11100 RIIHIMÄKI-FINLAND

Scale: 1:50
 Designed: 2002-06-19
 Checked: _____
 Approved: _____
 Net weight (kg): 6820
 Replaces the drawing: _____

Project/Product: COCCLEARNING
 SAARSTUNEEN MARRN POLTTOLUUNI

Drawing title: Vastaanottoasema, kuljetus

334336

Included in Sheet: 1/1
 Revision: _____