Antares Power Systems

Summary of Antares Line 5 and Antares SL

Reasons of choice of the present power system

Detailed description of the present power system

Comparison between AC and DC long transports

Alain Calzas CPPM (Marseille) 6 octob. 2003

Some specific issues for submarine detectors energy systems

Power: n'x 10 kw : rather small for electrical cables
rather high for telecom cables

Pretty long transport: n x 10 km (for so small a power)

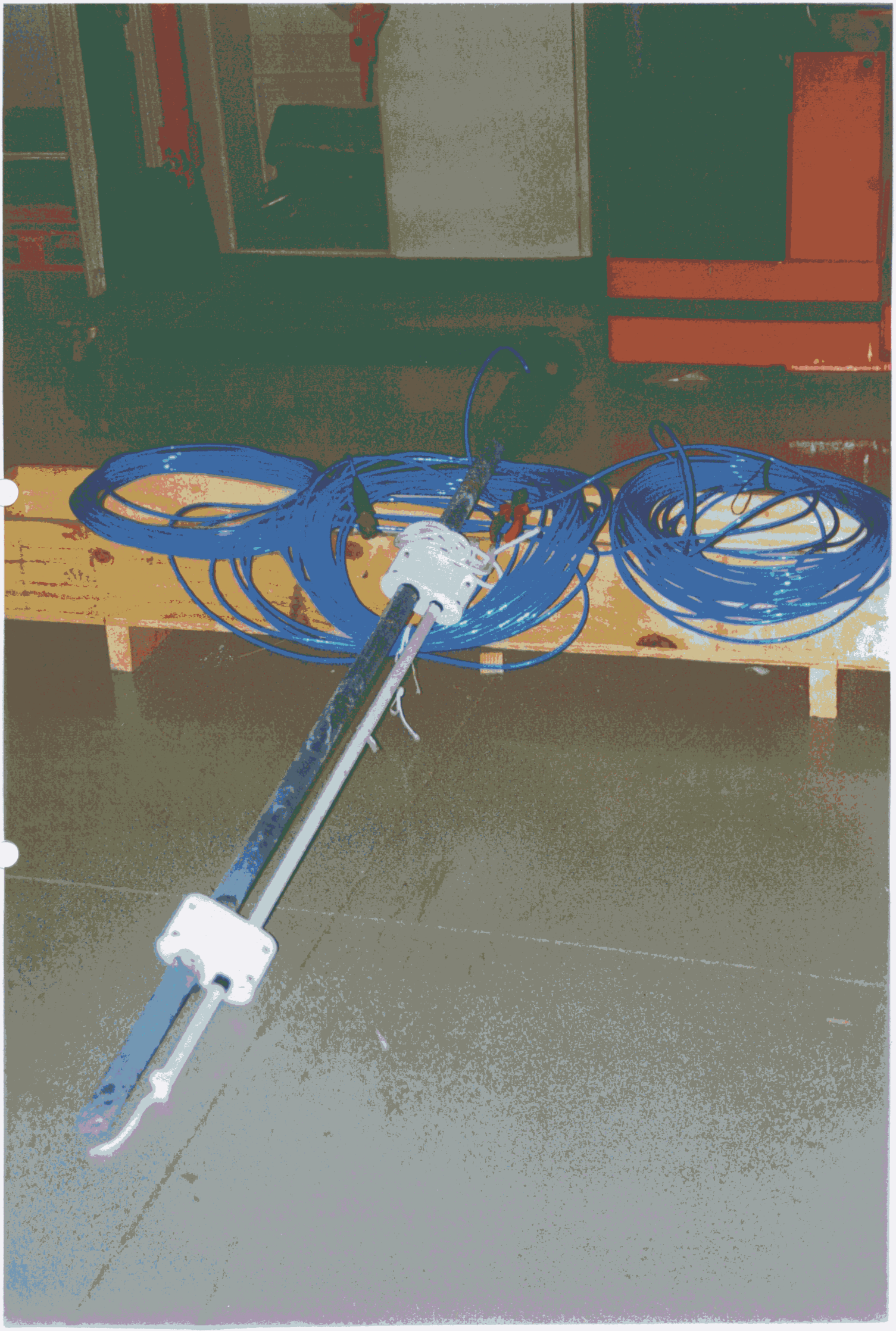
Variable load: 0 to max, max to 0 without notice

Seawater (benefits to cooling and return)

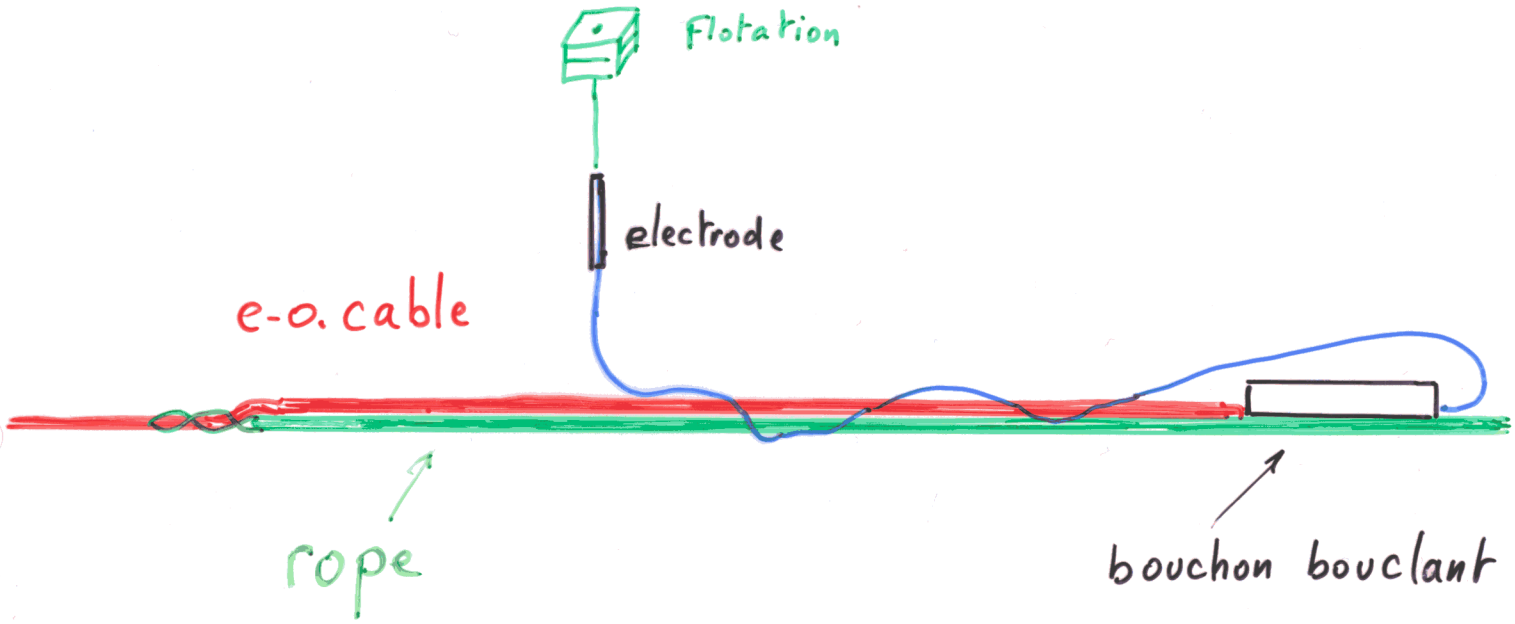
Reliability

Power Systems
Summary of Antares Line 5 and Antares SL

	for Line 5	for Sector Line (+MIL)
Commissioning	Winter 1999	Winter 2002
Shore Power Supply (max)	1250v DC	5000v AC
Main cable (1 wire) U	400v DC	4400v AC
Main cable max I planned	4A	12A
Cable and sea connector qualification	2500v, 12A	6000v, 32A
Current return	Electrodes + seawater	Electrodes + seawater
Horizontal cable	n.a.	500v AC
Vertical cable	180v DC	400v DC
Resist to failure	3 out of 4 DCDC converters redundancy	16 equivalent outputs
Result	success	success



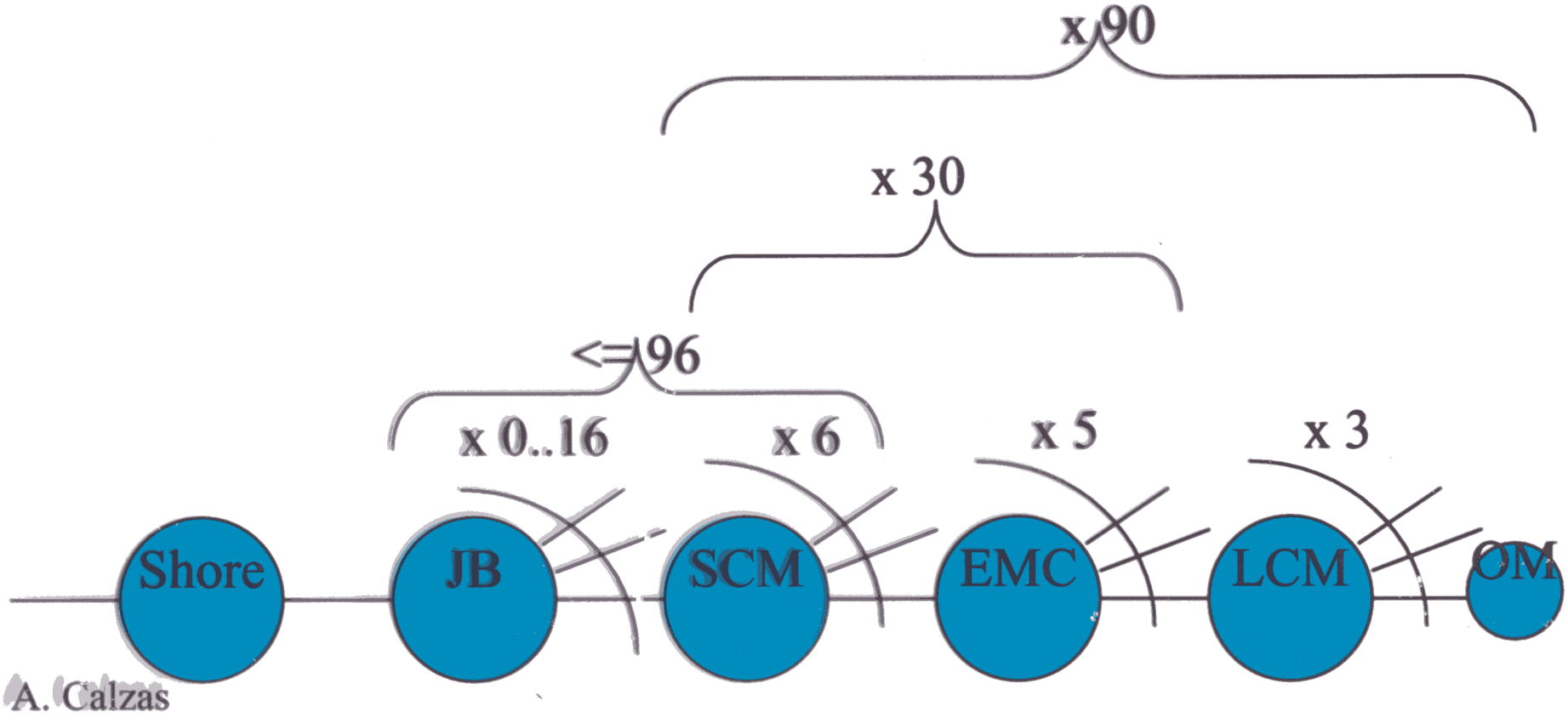
done may 98



SEA TERMINATION of the CABLE

A. Calzas

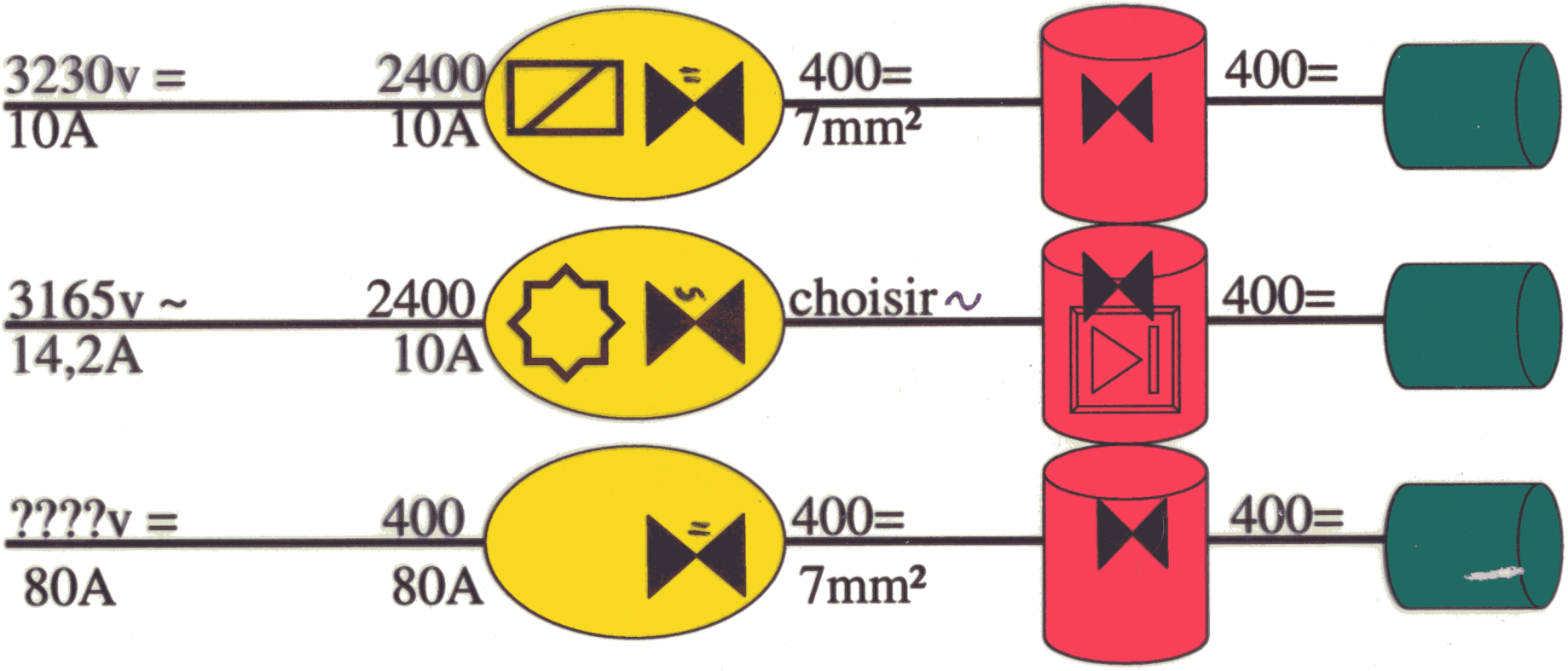
Détecteur ANTARES
Arborescence



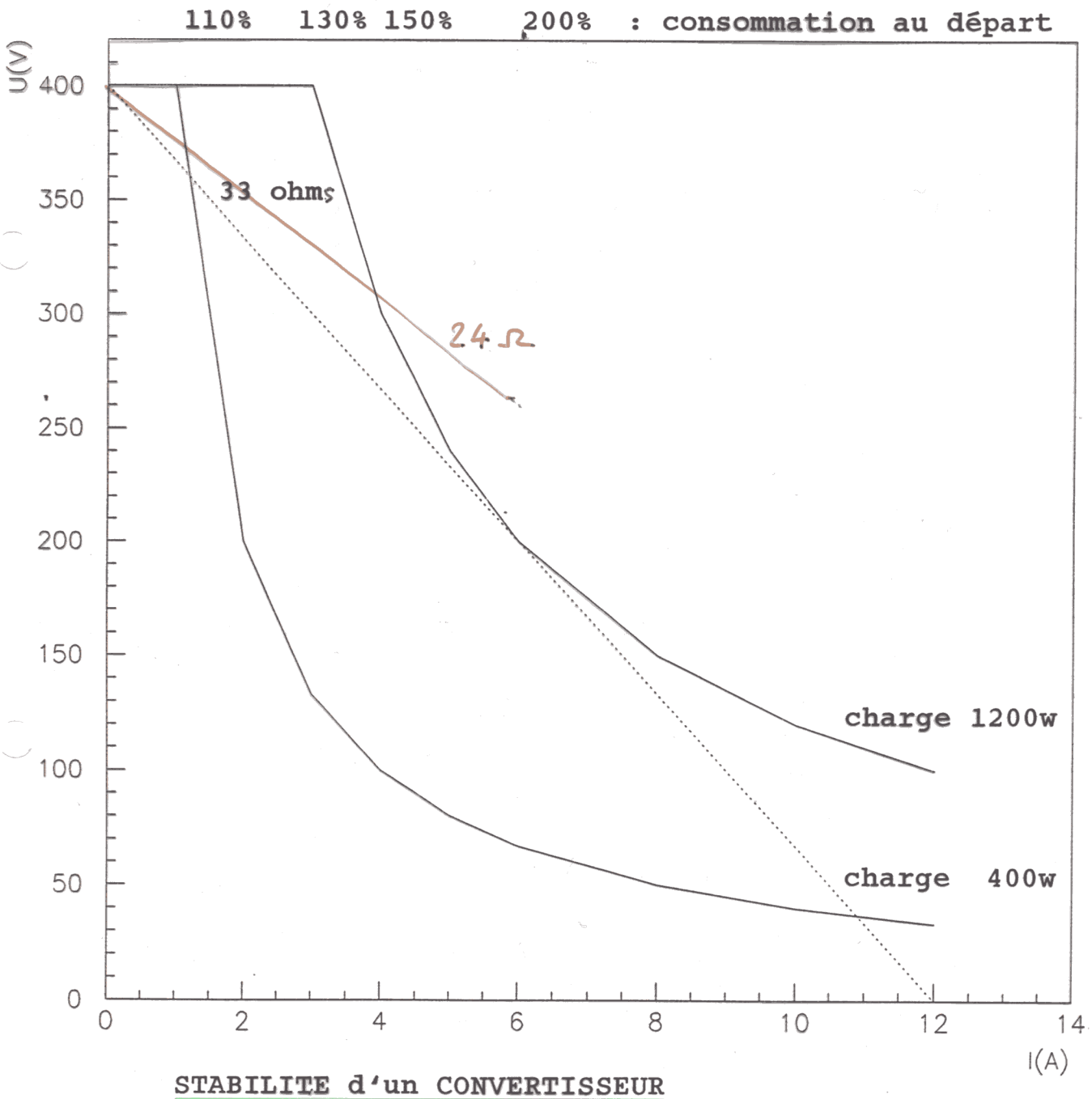
A. Calzas

VALEURS de TENSION USUELLES

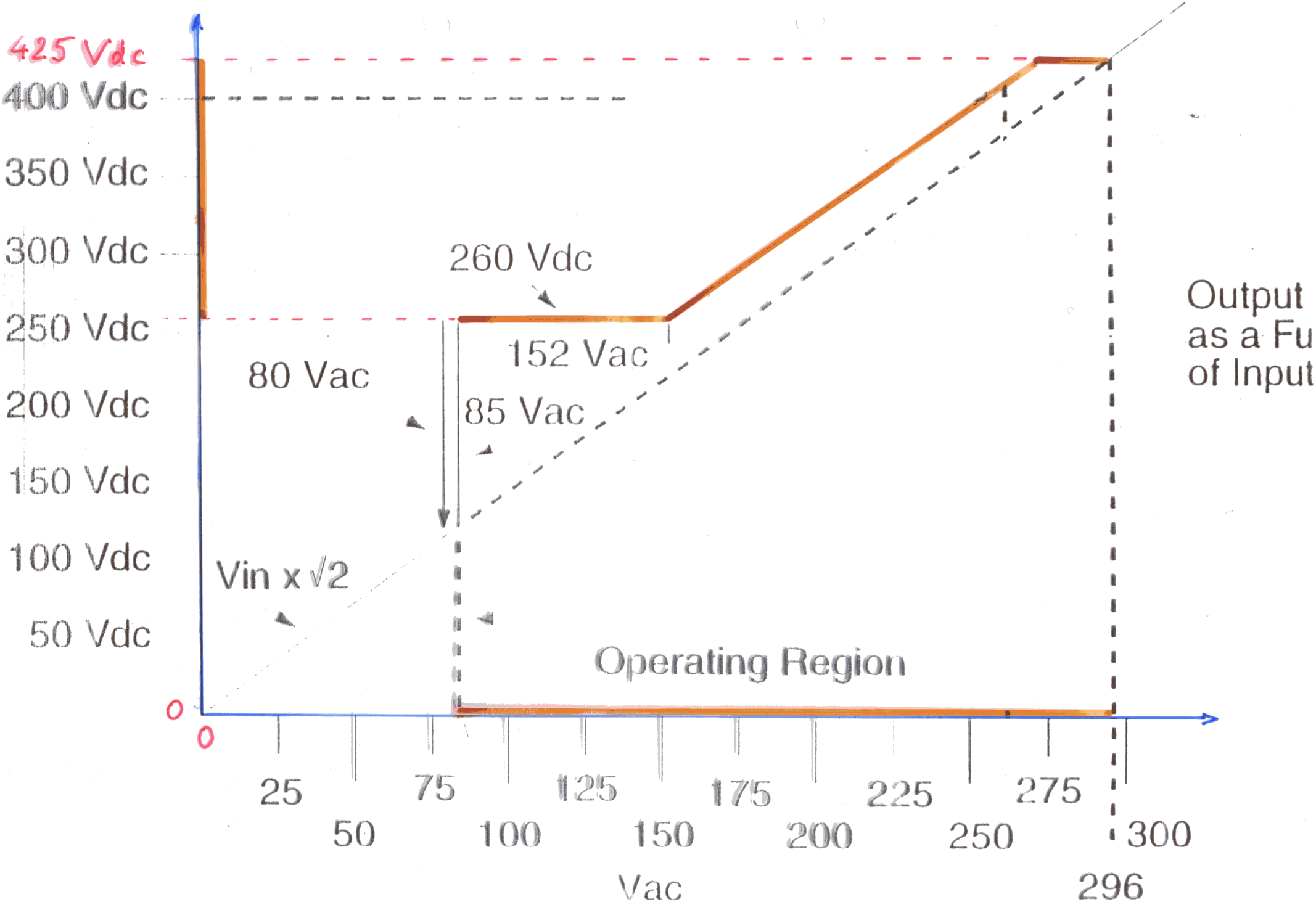
- 2 kv: limite du constructeur NSW
- 3,3 kv: limite du constructeur JdR
- 6 kv:tension de service du câble Geo Toc
- 10 kv: habituel pour les télécoms(R.Salvador)
- 600 kv: habituel pour l 'énergie

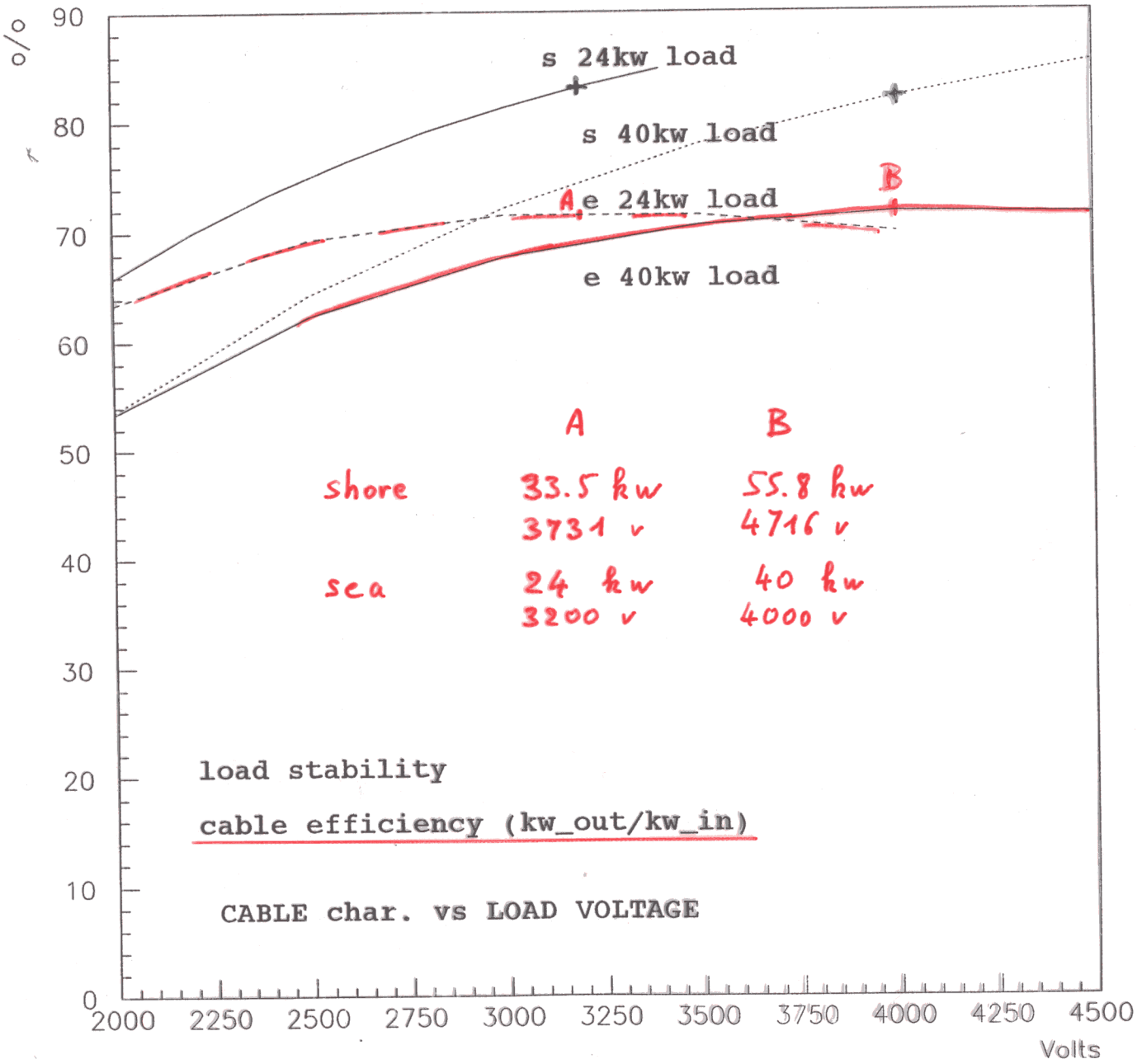


Base	JB	SCM	LCM
x1	x1	x16	x96

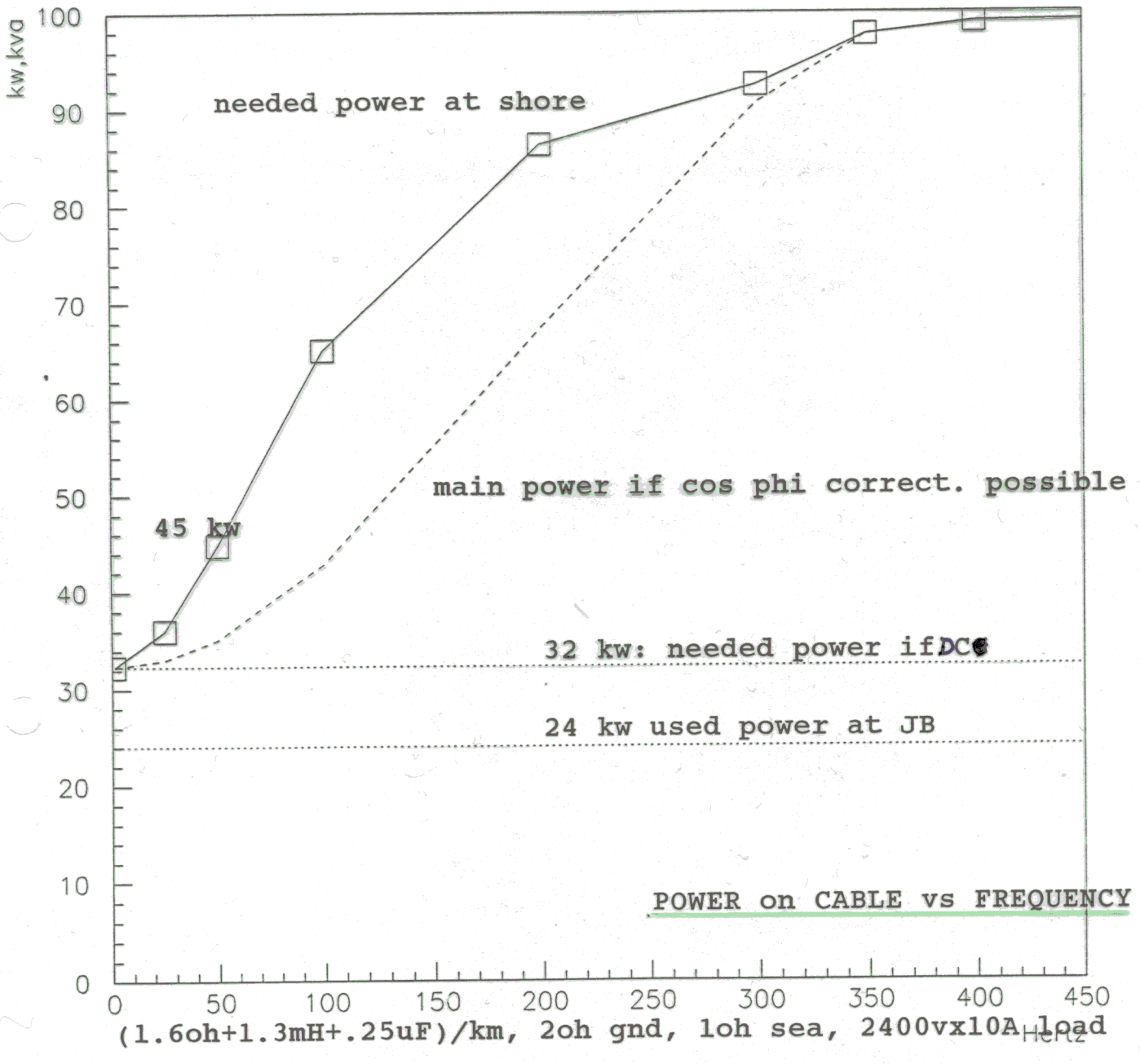


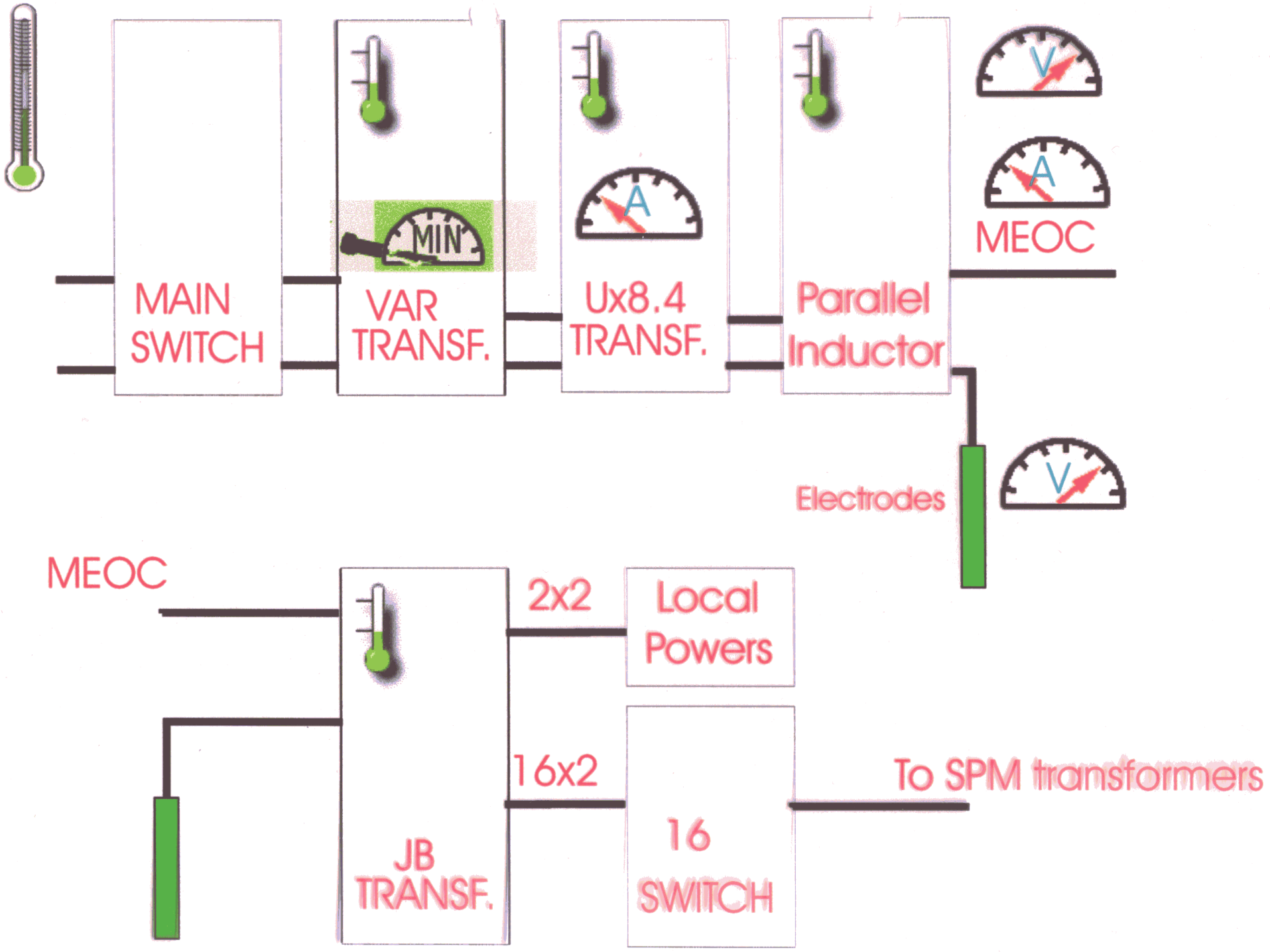
STABILITE d'un CONVERTISSEUR


425 Vdc
400 Vdc
350 Vdc
300 Vdc
250 Vdc
200 Vdc
150 Vdc
100 Vdc
50 Vdc
260 Vdc
152 Vac
80 Vac
85 Vac
Vin x √2
Operating Region
Output
as a Fu
of Input
0
0
25
50
75
100
125
150
175
200
225
250
275
300
296
Vac



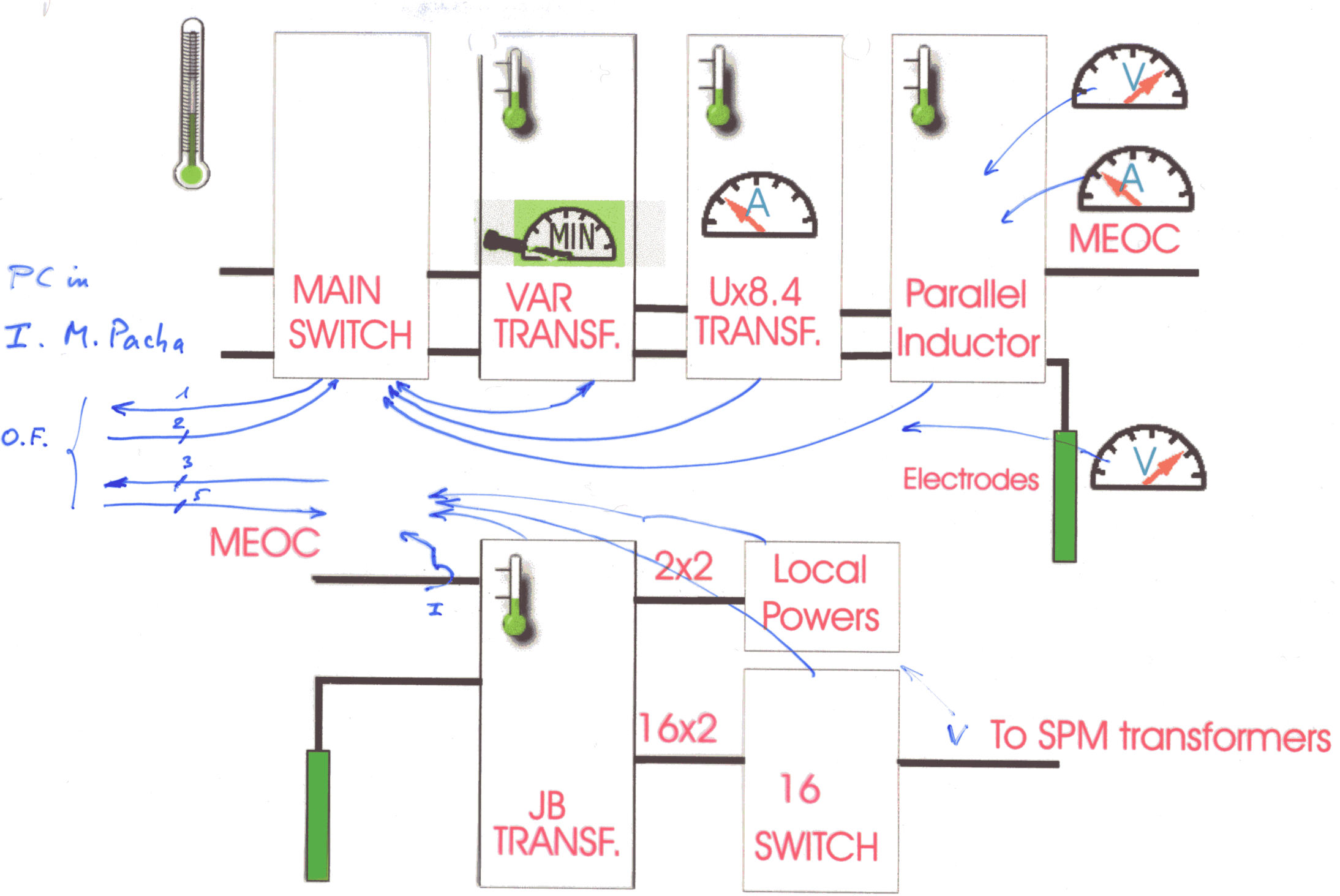
(1.6oh+1.3mH+.25uF)/km, 2oh gnd, 1oh sea, 50km , 50Hz


kw,kva
100
90
80
70
60
50
40
30
20
10
0
needed power at shore
main power if cos phi correct. possible
45 kw
32 kw: needed power if DC
24 kw used power at JB
POWER on CABLE vs FREQUENCY
0
50
100
150
200
250
300
350
400
450
(1.6oh+1.3mH+.25uF)/km, 2oh gnd, 1oh sea, 2400vx10A load
Hertz



Energy System Synopsis

Alain Calzas CPPM



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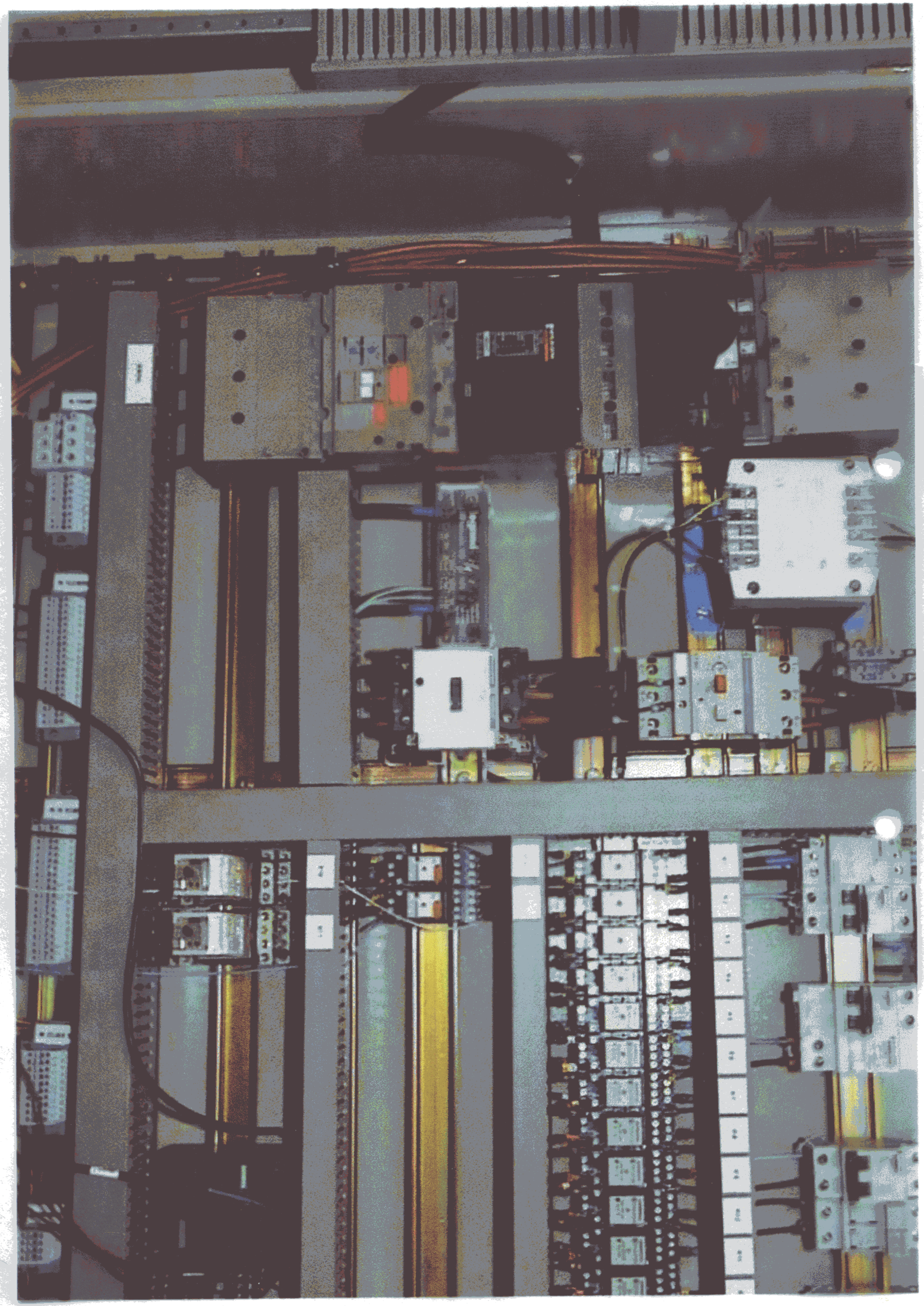

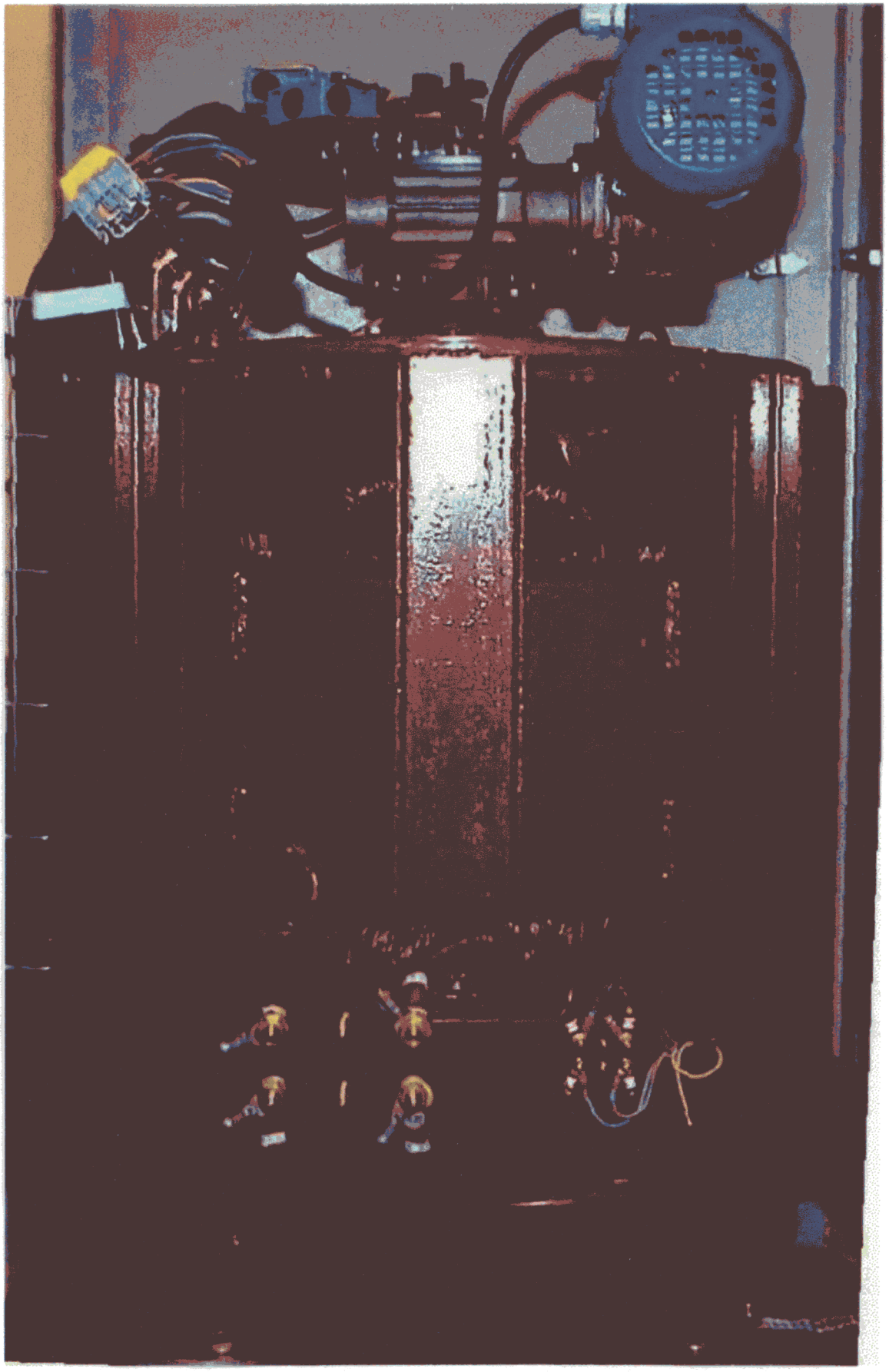

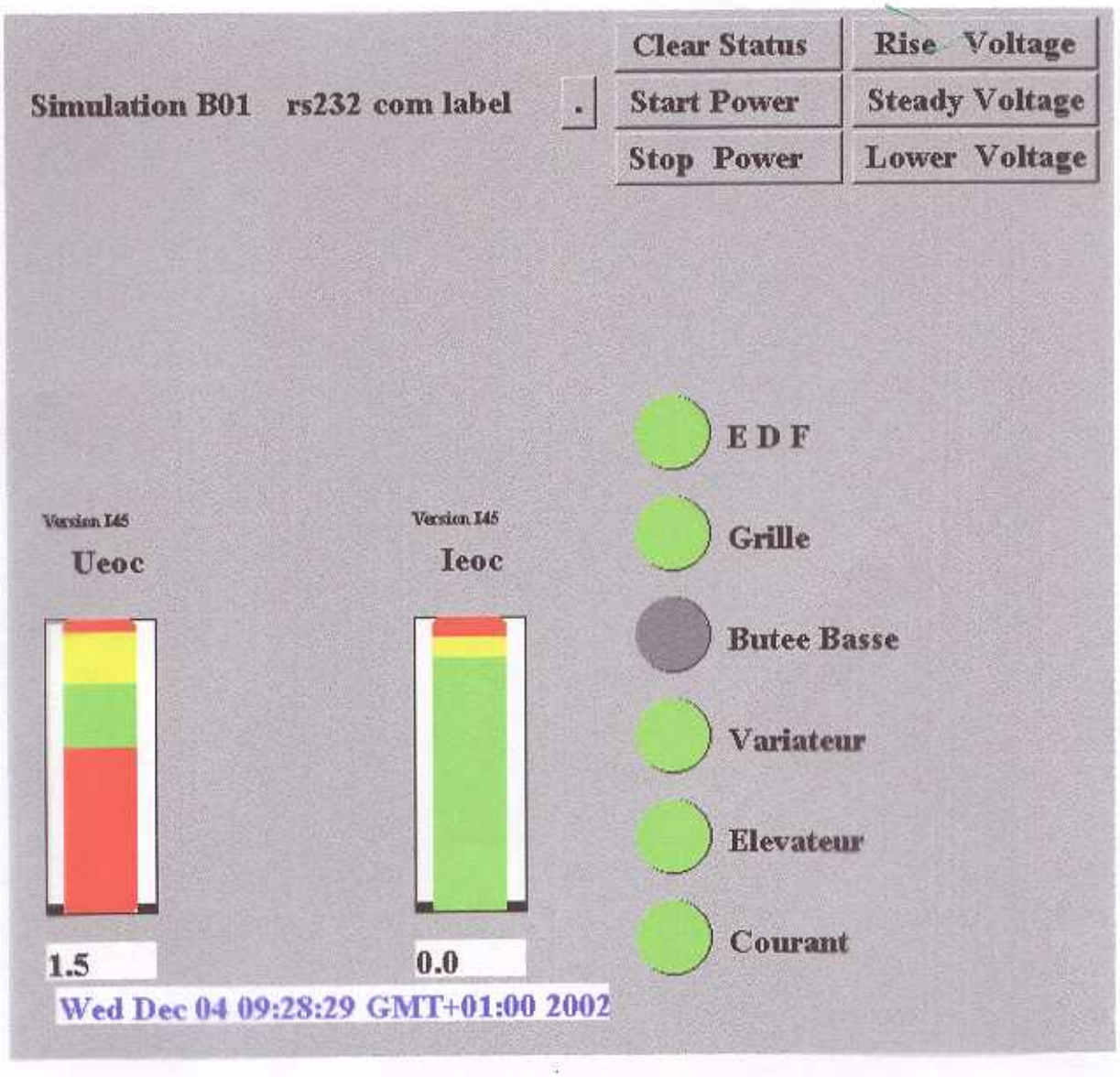
Simulation B01 rs232 com label
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Clear Status
Rise Voltage
Start Power
Steady Voltage
Stop Power
Lower Voltage
Version I45
Ueoc
Version I45
Ieoc
E D F
Grille
Butee Basse
Variateur
Elevateur
Courant
1.5
0.0
Wed Dec 04 09:28:29 GMT+01:00 2002

Power Systems
Comparison between AC and DC long transports

Efficiency
AC need (approx) 10% higher voltage

Special needs
AC needs an inductor on shore,

"Last moment" scalability
A transformer can be scaled with minimum design

Container needs
Equipressure transformers are in used (IFREMER...)

Response to momentary stress
A transformer resists more than a transistor (or any solid state device)

Reliability
MTBF for transformers are some centuries

Arguable
Electrode corrosion is less with AC
Telecom cablemanufacturers / users have less expererience with AC

Myths
Sharks favour AC cables for chewing