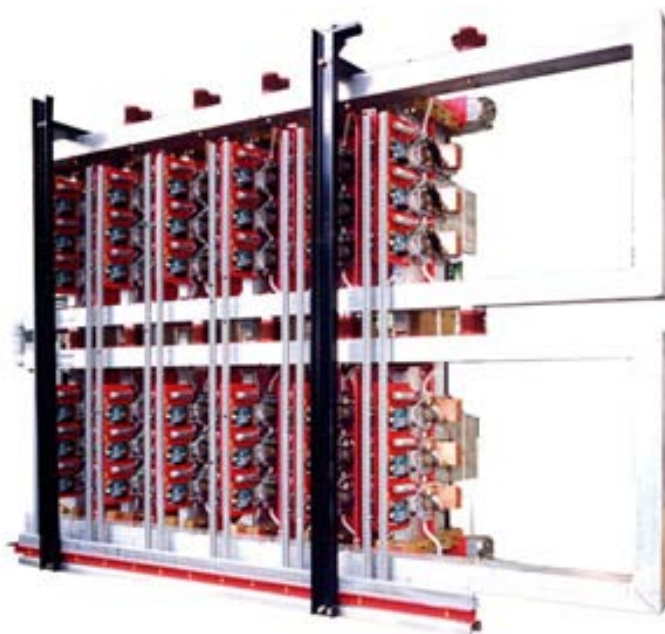


Выпрямители постоянного тока для электродуговых печей

Серии SilcoMAX





Области применения



- Электродуговые печи постоянного тока

Silcomax



- Электрометаллургия (алюминий, магний, цинк, медь..)
- Электрохимия (хлор, хлорид..)

- Оборудование для проведения исследований в атомной отрасли (термоядерный реактор) и космической отрасли



Типовая однолинейная схема преобразователя

Сеть

110-220 кВ – 3 фазы

Автотрансформатор

Первичная обмотка: 110-220 кВ

Регулировочная обмотка: 66 кВ
(ном. значение)

Третичная обмотка: 20 кВ

Преобразовательный трансформатор

Первичная обмотка: 66 кВ

Вторичная обмотка: 880 В (ном. значение)

Тиисторный выпрямитель

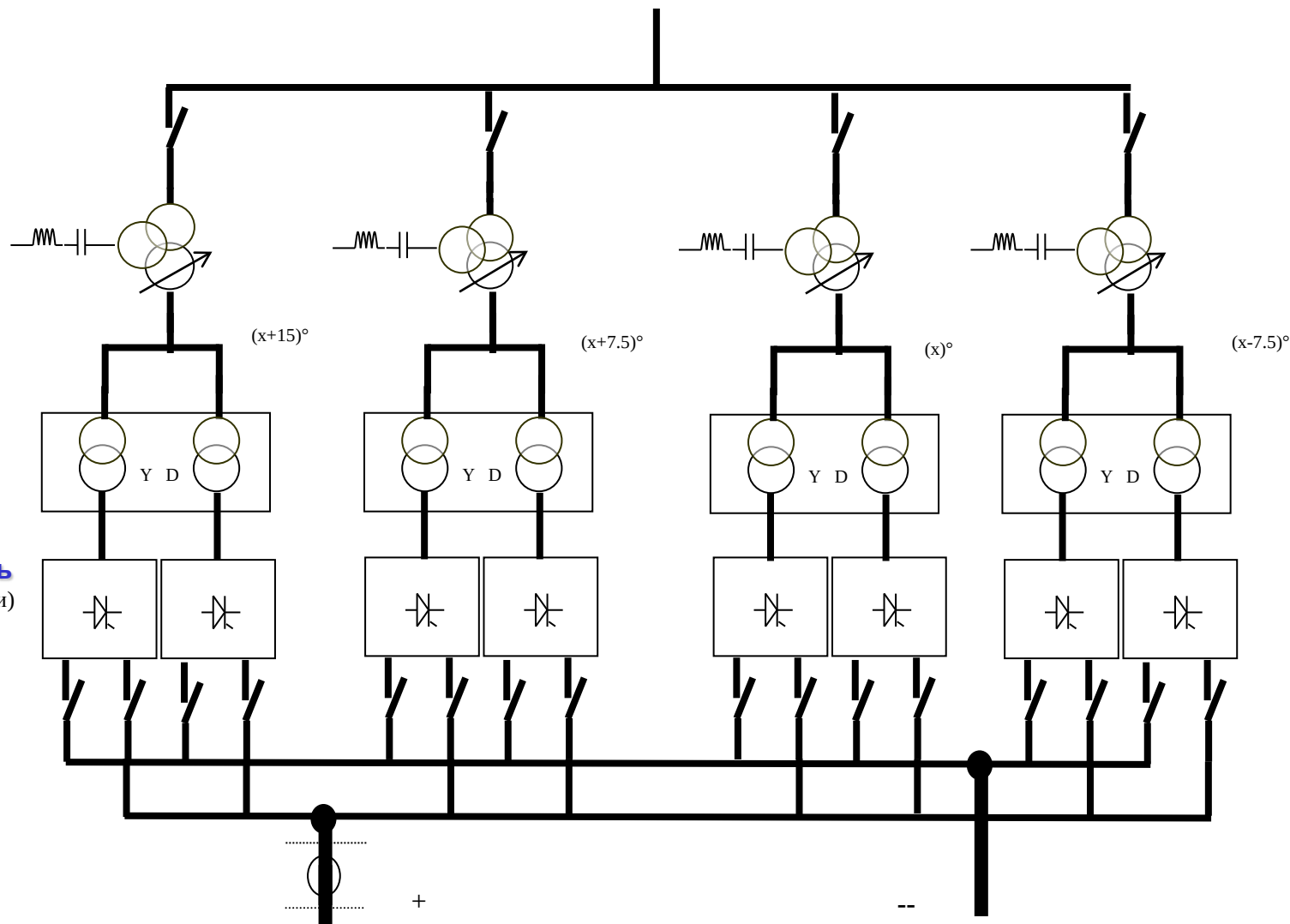
1000 Vdc (при номинальной ступени)

2х 56 kAdc

Выходные параметры преобразователя:

1000 В (пост. ток)

336 кА (пост. ток)



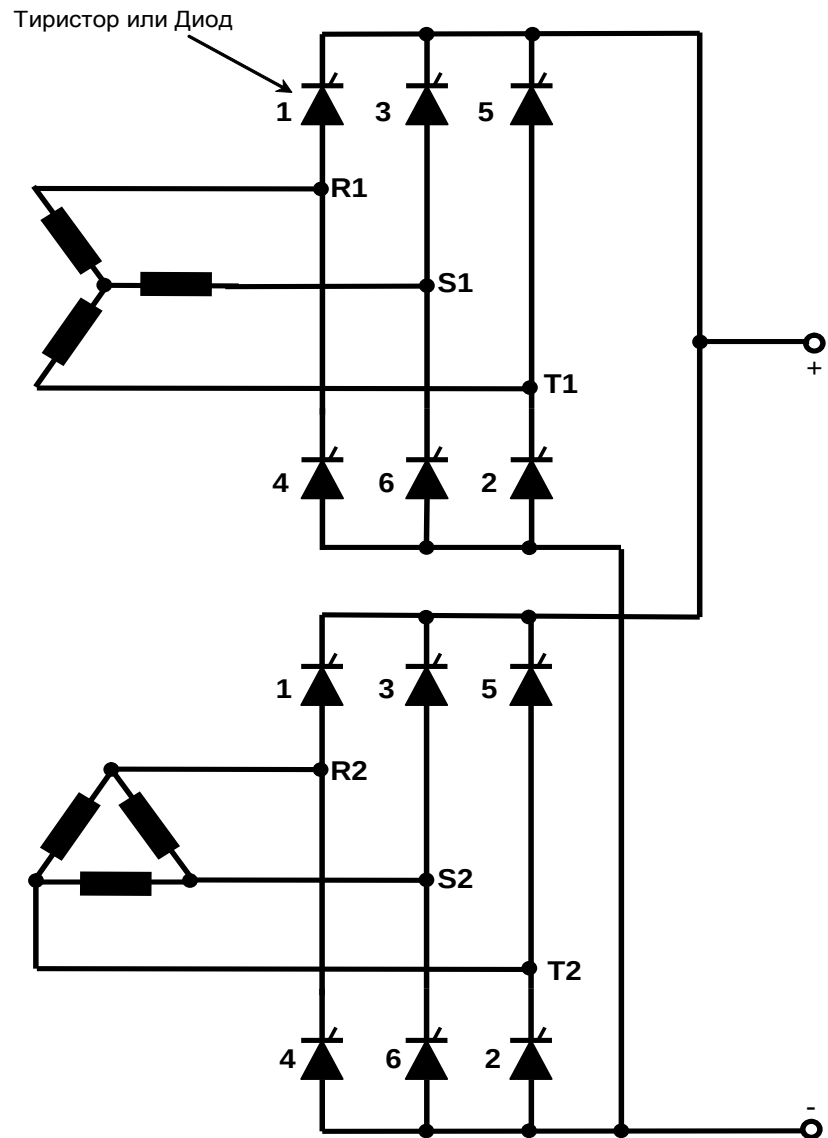
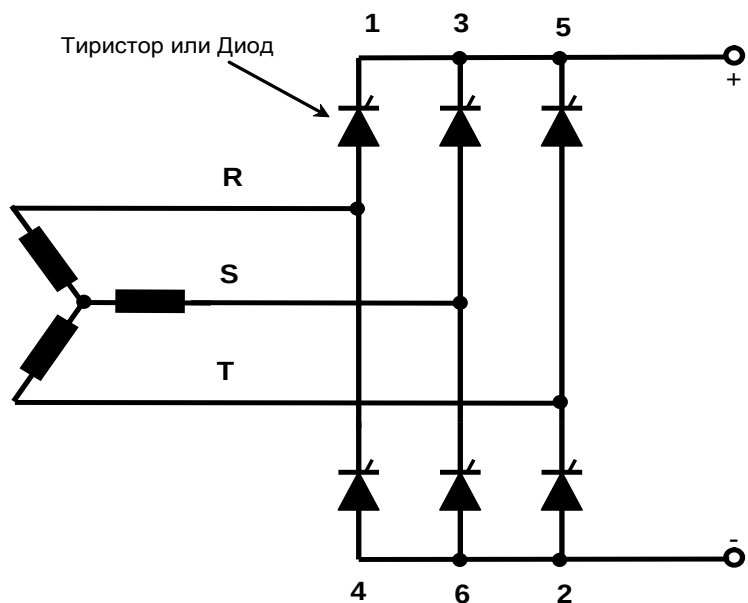


Характеристики преобразователей

- Ключевые элементы: диоды или тиристоры
- Преобразователь состоит из 6-ти или 12-ти пусных мостов
- Конфигурация преобразователя 12-48 пульсная
- Выходное напряжение и ток отдельного моста: 200-2000V, 10-100 кА
- Выходной ток преобразователя : 20 – 500 кА



6-ти и 12-ти импульсная конфигурация

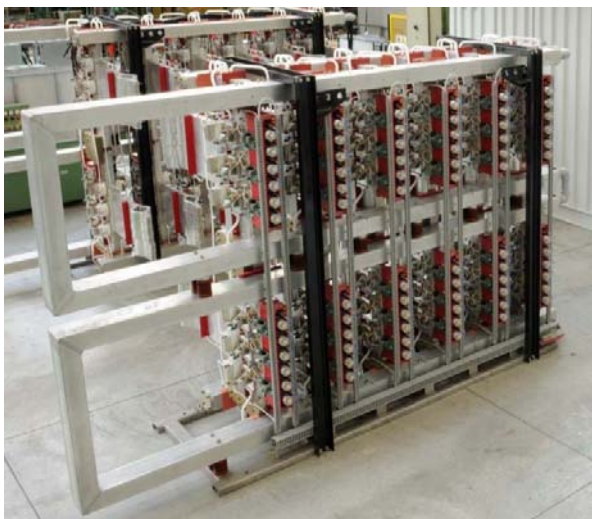




Типы выпрямителей



- **SILCOMAX Light** : Средний ток
(от 8 до 50 кА)



- **SILCOMAX Large** : Большие токи
(от 40 до 120 кА)



Silcomax вид спереди



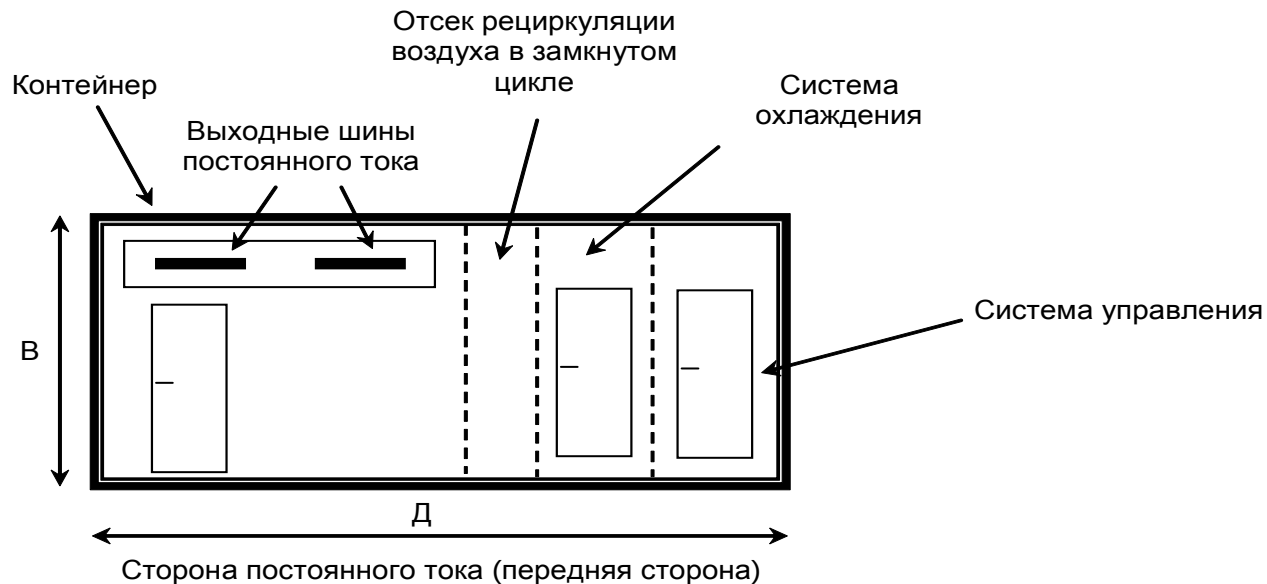
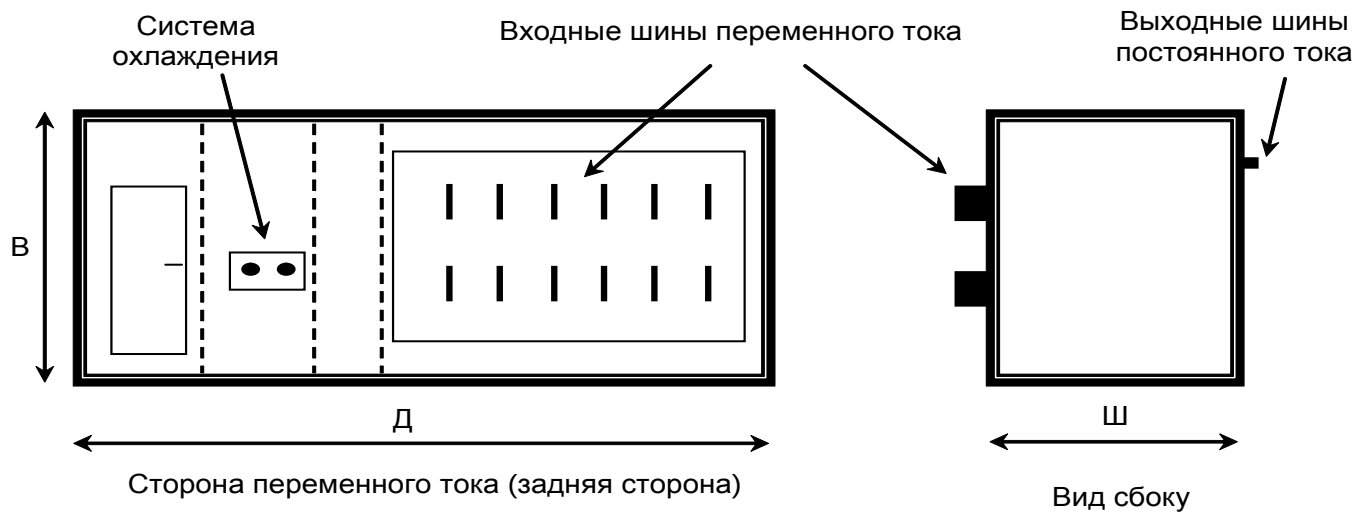


Silcomax вид сзади



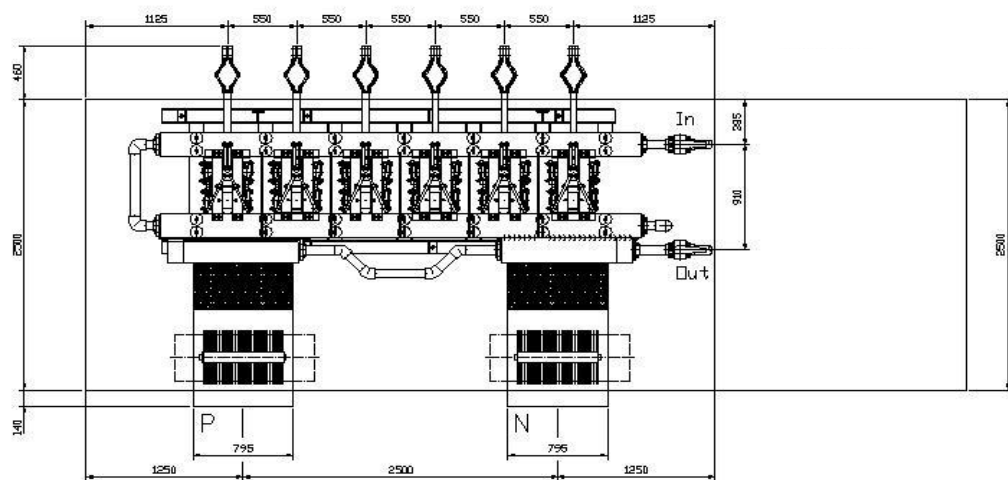
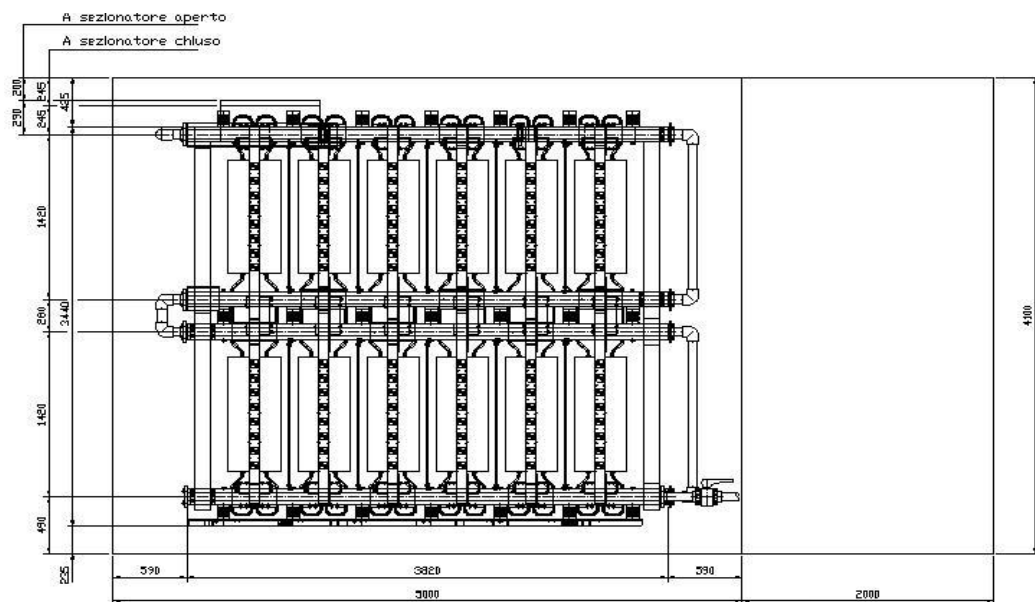


Расположение *Silcomax* в контейнере



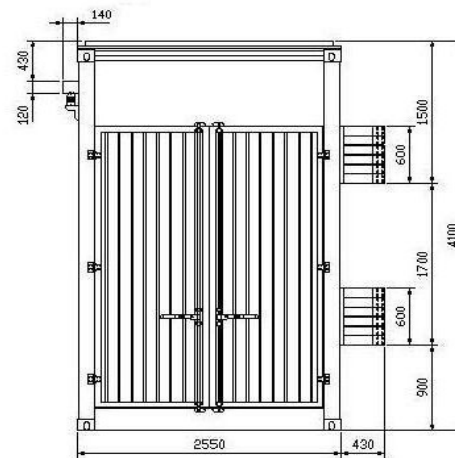
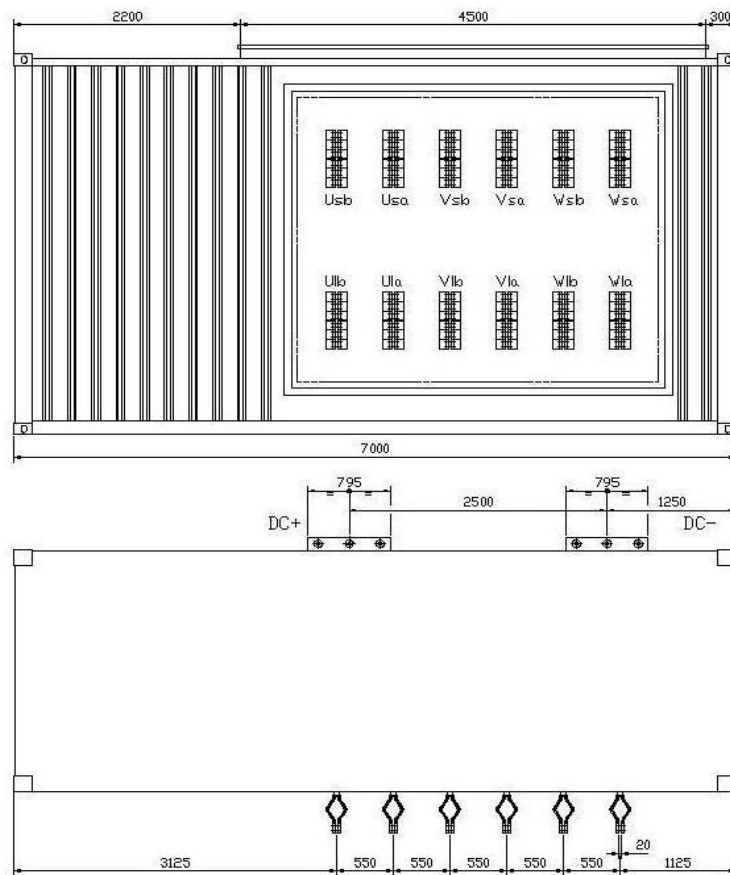


Габаритные размеры 12-ти пульсного моста





Конфигурация в контейнере



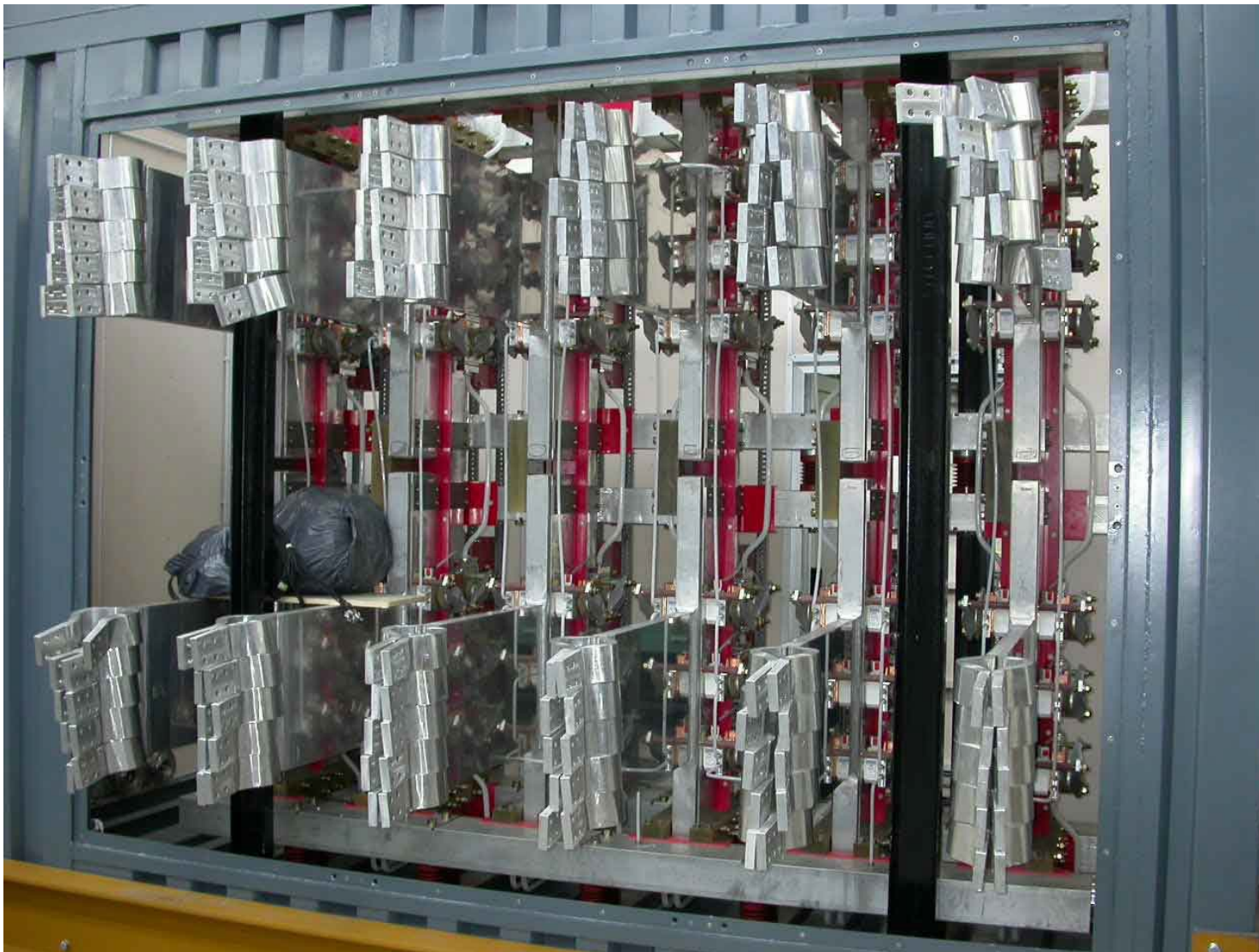


Преобразователь в контейнере





Сторона переменного тока





Сторона переменного тока



Сторона постоянного тока





Система управления в контейнере





Соединение выпрямителя с трансформатором





Выпрямитель с трансформатором на объекте



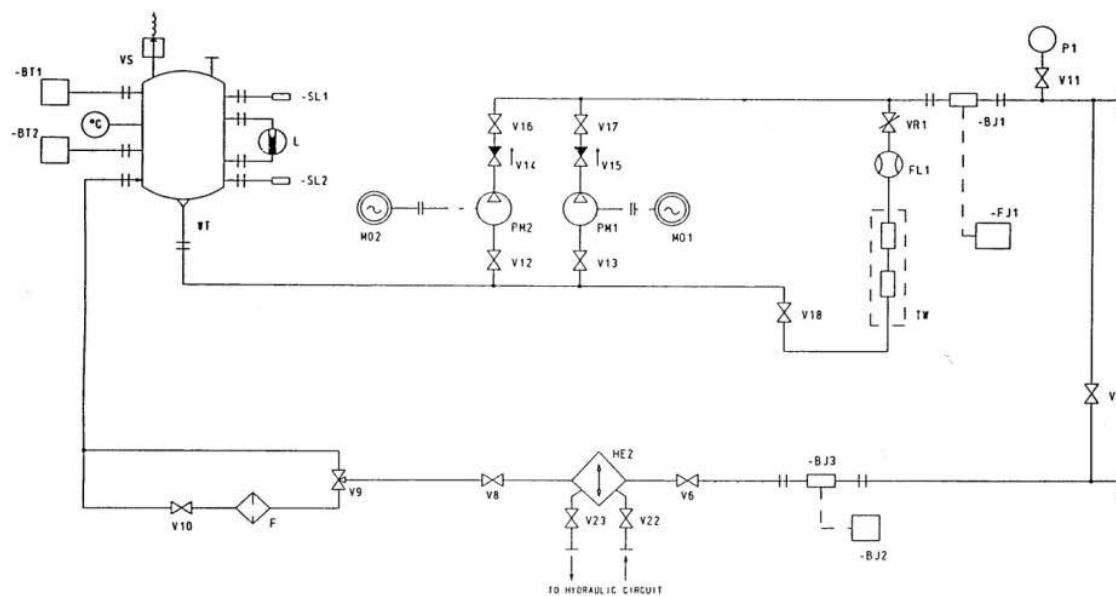


Выпрямитель с трансформатором на объекте





Система охлаждения



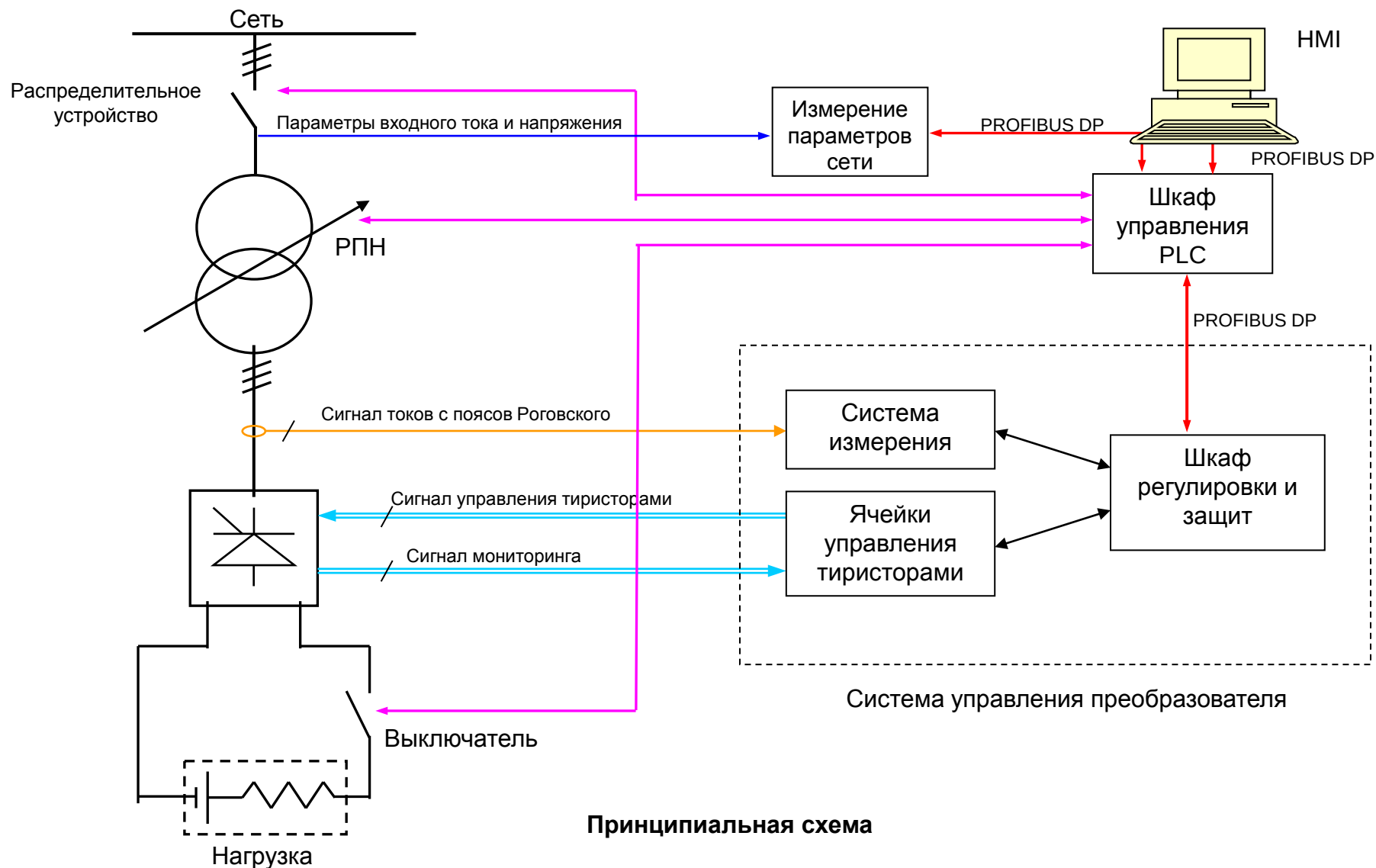


- Выпрямитель с 12 тиристорами в плече
- Испытания при токе до 100 кА
- Максимальный коэффициент несимметрии токов: 1,3
- Максимальная температура алюминиевой шины постоянного тока: 60 °C



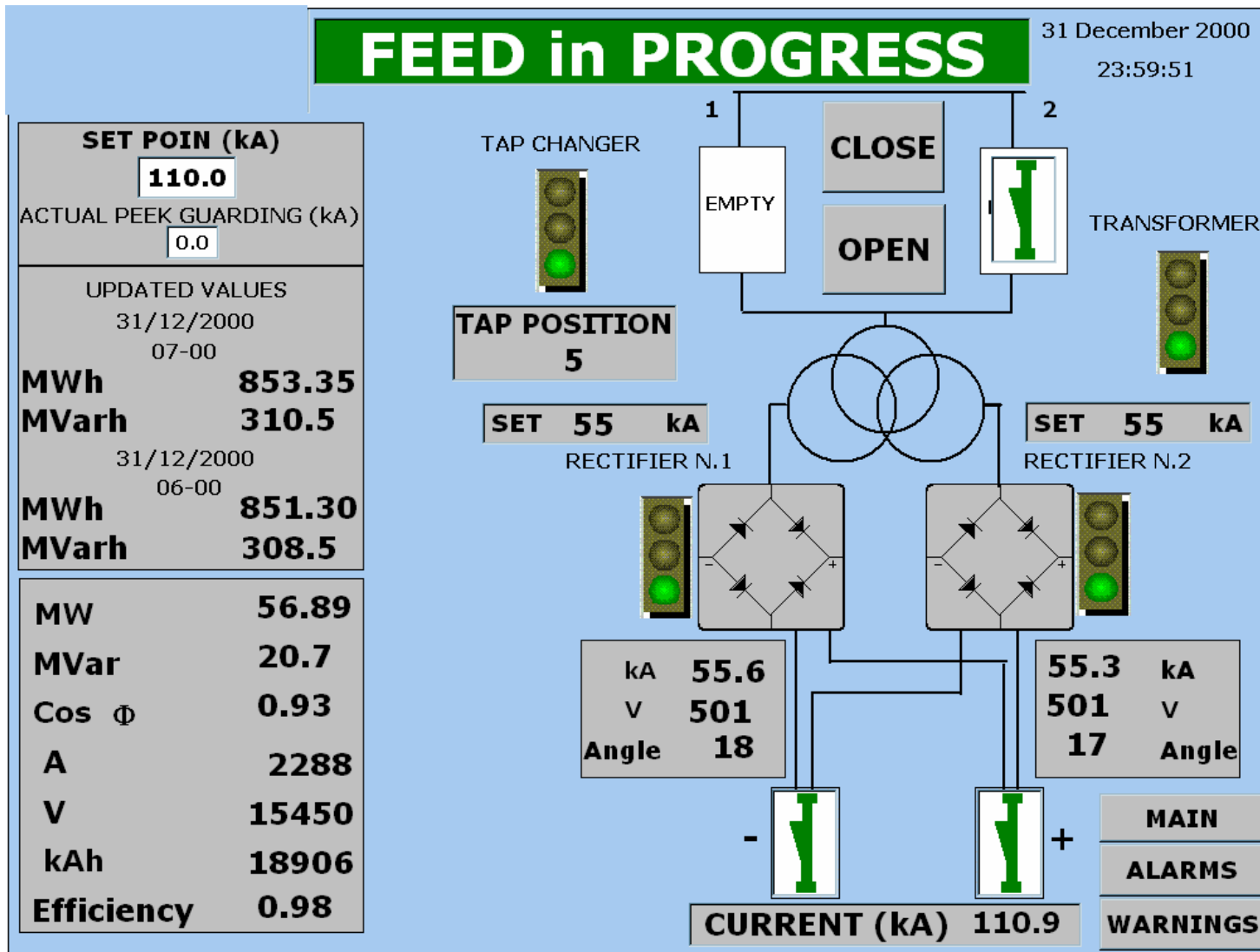


Функциональная схема управления преобразователем



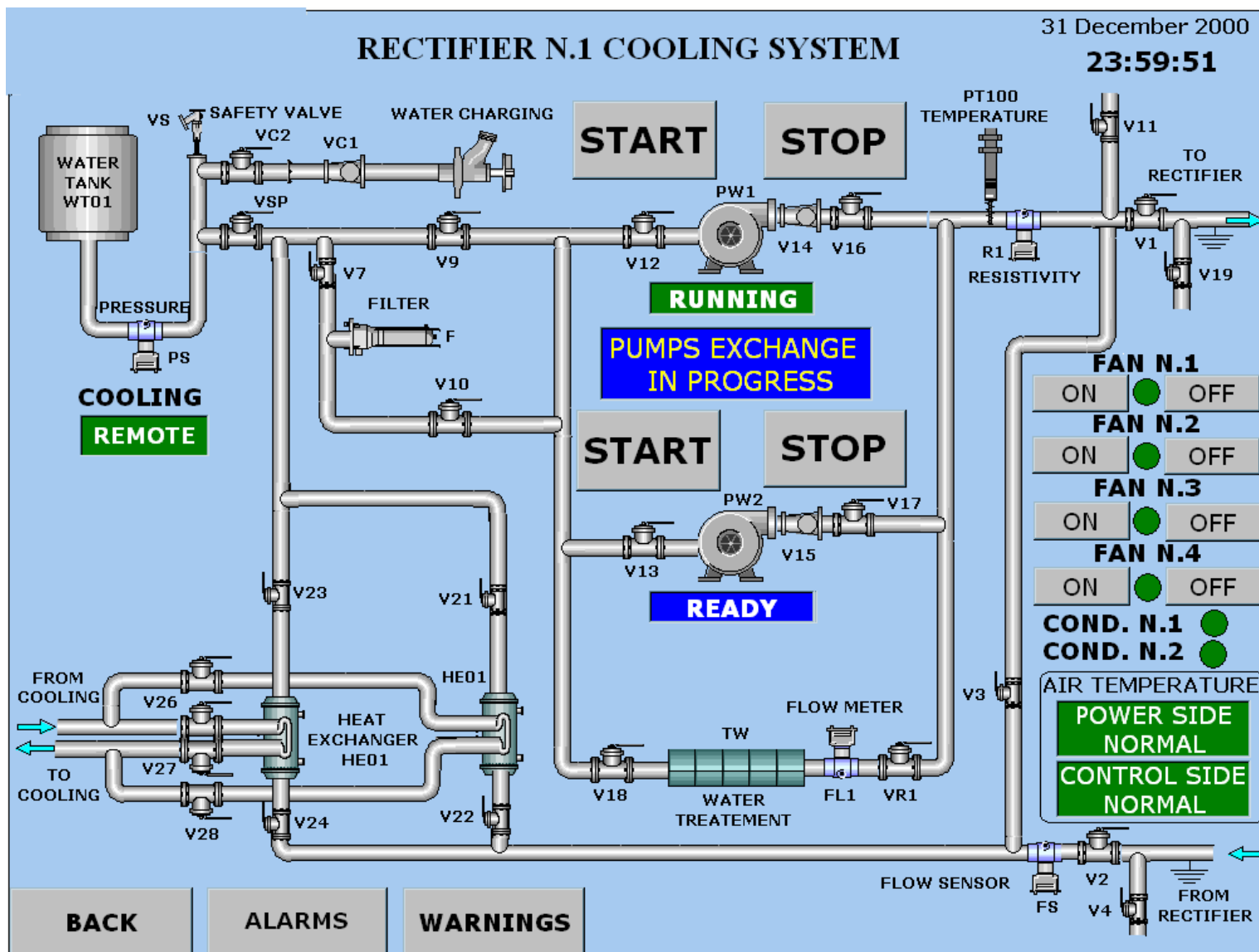


Интерактивное окно APM оператора





Интерактивное окно АРМ оператора





- Для электрометаллургии (алюминий, магний, цинк, медь) –
34 предприятия, 3740 МВт
- Электрохимия –
91 предприятие, 1687 МВт
- Для дуговых печей постоянного тока –
22 предприятия, 1709 МВт
- Преобразователи для испытательных установок –
20 предприятий, 1855 МВт



Заводы по производству алюминия и магния

Customer	Location	Application	Technology	Output	Year
Stanwell Magnesium Project	Quensland, Aus.	E-Chem - Magnesium	DC SCR	220,000kW, 185000A, 950Vdc	2002
Magnola	Quebec	E-Chem - Magnesium	DC SCR (D)	179,400kW, 690Vdc,260kAdc	1998
Safronics	So. Africa	DC Arc - Aluminum Dross Process	DC Harmony	1333kW, 400 Vdc,4.2 kAdc	1998
Alcan	Quebec	E-Chem - Aluminum	DC Diode (D)	68,250 kW,650Vdc,105 kAdc	1997
THT Presses	US / OH	DC Supply - Magnesium Melting	DC Darlington	200kWdc	1997
Noranda	Missouri	E-Chem - Aluminum	DC SCR (D)	880kW, 40Vdc,22kAdc	1994
Lauralco Aluminum	Quebec	E-Chem - Aluminum	DC SCR	1750 kW, 70 Vdc,25kAdc	1991
PEC (Callidus) - PPC, WVA	US / OK	Plasma Torch - Aluminum Reclamation	DC SCR	2700 kW,540Vdc,5kAdc	1990
Alcan (Phase III)	Quebec	E-Chem - Aluminum	DC Diode	298,200 kW, 1065 Vdc, 260kAdc	1989
Alcan (Phase I)	Quebec	E-Chem - Aluminum	DC Diode	298,200 kW, 1065Vdc, 260kAdc	1988
Portland Smelter Serv.	Australia	E-Chem - Aluminum	DC Diode	336,455 kW, 920 Vdc, 366kAdc	1987
Almino S.A. de C.V.	Mexico	E-Chem – Aluminium	DC Diode	7776kW,700Vdc,3.8kAdc	1984
Reynolds Metals	Quebec	E-Chem – Aluminium	DC Diode	268,800kW,1120Vdc,240kAdc	1984
Reynolds Metals	Quebec	E-Chem – Aluminium	DC Diode	268,800kW,1120Vdc,240kAdc	1984
Reynolds Metals	Quebec	E-Chem - Aluminum	DC Diode	140,000 kW,700Vdc,200kAdc	1981
Intalco Aluminum	US / WA	E-Chem - Aluminum	DC Diode	25,000 kW,1000Vdc,25kAdc	1981
Kaiser Aluminum	US / LA	E-Chem - Aluminum	DC Diode	18,560 kW, 580 Vdc, 32 kAdc	1981
Alcan	Quebec	E-Chem - Aluminum	DC Diode	136,500 kW, 650Vdc, 210 kAdc	1981
Kurri Kurri	Australia	E-Chem - Aluminum	DC Diode	1500 kW, 50 Vdc, 30 kAdc	1980
Alcan	Quebec	E-Chem - Aluminum	DC Diode	144,000 kW, 1000 Vdc, 144 kAdc	1980
Alcan	Quebec	E-Chem - Aluminum	DC Diode	144,000 kW, 50 Vdc, 280 kAdc	1980
Alcan	Quebec	E-Chem - Aluminum	DC Diode	136,500 kW, 650 Vdc,210	1980
Alcan	Quebec	E-Chem - Aluminum	DC Diode	144,000 kW, 1000Vdc, 144 kAdc	1979
Alcan	Quebec	E-Chem - Aluminum	DC Diode	11,200 kW, 700 Vdc, 16 kAdc	1979
Alcan	Quebec	E-Chem - Aluminum	DC Diode	136,500 kW, 650 Vdc, 210kAdc	1978
Alcan	Quebec	E-Chem - Aluminum	DC Diode	108,000 kW, 750 Vdc, 144kAdc	1978
Alcan	Quebec	E-Chem - Aluminum	DC Diode	108,000 kW, 750 Vdc, 144kAdc	1978
Alcan	Quebec	E-Chem – Aluminium	DC Diode	100,800kW,700Vdc,144kAdc	1975
Alcan	Quebec	E-Chem – Aluminium	DC Diode	153,600kW,800Vdc,192kAdc	1974
Alcan	Quebec	E-Chem – Aluminium	DC Diode	158,400kW,825Vdc,192kAdc	1974
Alcan	Quebec	E-Chem – Aluminium	DC Diode	12,800kW,1000Vdc,12.8kAdc	1973
Alcan	Quebec	E-Chem – Aluminium	DC Diode	32,000kW,1000Vdc,32kAdc	1973
Alcan	Quebec	E-Chem – Aluminium	DC Diode	64,000kW,800Vdc,80kAdc	1973
Alcan	Quebec	E-Chem – Aluminium	DC Diode	11,775kW,785Vdc,15kAdc	1973



Электрохимия и металлургия

Customer	Location	Application	Technology	Data	Year
Doe Run Peru	Lima, Peru	E-Chem - Zinc	DC IGBT	23,800kW, 800Vdc, 28,000Adc	2002
Umicore	Belgium	E-Chem – Zinc	DC SCR	66,000kW,600Vdc,110kAdc	2002
West Coast PaperIndia	India	E-Chem – Chlorine	DC-SCR	1,800kW, 80Vdc, 22,5kAdc	2002
National Jordan Chlorine	Jordan	E-Chem - Chlorine	DC-SCR	2,940kW, 210dc,14,0kAdc	2002
Grupo Mexico	Mexico	DC Supply - EW-SX	DC Harmony	8,400kW, 280Vdc,30kAdc	2000
CE Minerals	US / TN	DC Supply - Quartz	DC SCR	1750kW,1000Vdc,2.5kAdc	2000
Wright Patterson AFB / HVM	US / OH	DC Supply - Static Exciter	DC IGBT	37,5kW, +/-250Vdc, +/-150 Adc	1999
Wright Patterson AFB / HVM	US / OH	DC Supply - Static Exciter	DC IGBT	37,5kW, 250Vdc, 150 Adc	1999
GW Associates (Doe Run)	Peru	E-Chem - Zinc	DC IGBT	3 x 300Adc & 1 x 1000Adc	1999
CXY Chemicals	US / BC	E-Chem - Chlorate	DC SCR (D)	14,880kW,310Vdc,48kAdc	1998
Met-Mex Penoles	Mexico	E-Chem - Zinc	DC Diode (D)	72,000kW, 360Vdc,200kAdc	1998
Met-Mex Penoles	Mexico	E-Chem - Zinc	DC Diode (D)	72,000kW, 360Vdc, 200kAdc	1998
Eisenmann (FORD)	US/ IL	DC Supply - E-Coat	DC Harmony	(2) 600kW, 500Vdc,1,2kAdc	1998
Kvaerner Chemetics	Indonesia	E-Chem	DC SCR (D)	5920kW,74Vdc,80kAdc	1997
Kvaerner Chemetics	Indonesia	E-Chem	DC SCR (D)	14,720kW,160Vdc,92kAdc	1997
Kvaerner Chemetics	Delaware	E-Chem	DC SCR (D)	12,288kW,96Vdc,128kAdc	1997
Unifrax, Inc. (Carborundum)	US / IN	DC Supply - Industrial Insulation	DC SCR / Autotap	2500kW, 4.5kAdc	1997
Kerr McGee /	Mississippi	E-Chem - Chlorate	DC SCR (D)	28,00kW,1000Vdc,28kAdc	1997
Kayex Corp	US / NY	Crystal Grower	DC SCR	3-Output, 300kW, 100kW, 10kW	1997
Name Confidential /	Alabama	E-Chem	DC SCR (D)	5950kW, 700Vdc, 8.5kAdc	1997
Huron Tech /	USA	E-Chem - Chlorate	DC SCR (D)	13,700kW, 685Vdc,20kAdc	1997
Trilogia Engineering Pte.	Asia	DC Supply - Heat Treat	DC Darlington	100kWdc, 1 kHz	1997
Phelps Dodge Mining Co.	US / AZ	DC Supply - EW-SX	DC Harmony	1.1 MW,185Vdc,6kAdc	1997
Oster Magnetics	US / CA	DC Supply - Magnet Supply	DC Darlington	300kW,143Vdc, 2.1kA	1996
Mexicana de Cobre	Mexico	DC Supply - EW-SX	DC SCR (D)	2640kW,110Vdc,24kAdc	1996
LaRoche Industries	Louisiana	E-Chem - Chlorine	DC SCR (D)	28,000kW,560Vdc,50kAdc	1996
Name Confidential	Illinois	E-Chem	DC SCR (D)	7000kW,100Vdc,70kAdc	1996
Mexicana de Cobre	Mexico	E-Chem - Copper	DC SCR (D)	8360kW,220Vdc,38kAdc	1996
Name Confidential	Illinois	E-Chem	DC SCR (D)	7000kW, 100Vdc,70kAdc	1996
Bettis Advanced Power Syst.	US / PA	DC Supply - Test Equipment	DC Harmony	500kW,1600Vdc	1996
Glencore/Samin	Sardinia,Italy	E-Chem – Zinc	DC Diode	55,000kW,275Vdc,200kAdc	1995
Huron Tech	USA	E-Chem - Chlorate	DC SCR	27,400kW,685Vdc,40kAdc	1995
Huron Tech	USA	E-Chem - Chlorate	DC SCR	13,700kW,685Vdc,20kAdc	1995



Электрохимия и металлургия

Customer	Location	Application	Technology	Data	Year
Name Confidential	Alabama	E-Chem	DC SCR	10,500kW,1000Vdc,10.5kAdc	1995
Centromin	Peru	E-Chem - Copper	DC SCR (D)	22,400kW, 800Vdc,28kAdc	1995
GE Plastics	US / IN	E-Chem - Chlorine	DC SCR (D)	30,624kW,348Vdc,88kAdc	1995
CXY Chemicals	Alberta	E-Chem - Chlorate	DC SCR (D)	12,558kW, 483Vdc,26kAdc	1995
CXY Chemicals	Manitoba	E-Chem - Chlorate	DC SCR (D)	10,06kW,503Vdc,20kAdc	1995
Mex Penoles	Mexico	E-Chem - Zinc	DC Diode (D)	12,240kW,510Vdc,24kAdc	1995
Kerr McGee	Mississippi	E-Chem - Chlorate	DC SCR (D)	2800kW,1000Vdc,28kAdc	1995
Fluor Daniel Wright	Peru	E-Chem - Copper	DC SCR	7500kW, 250Vdc, 30kAdc	1994
Controlled Power Corp/ New York	US/OH	DC Substation - NYC Transit	DC Diode	6000kW,625Vdc,9.6kAdc	1994
Alcoa Aluminum	US / PA	DC Supply - Anodizing	DC Darlington	250kW,100Vdc,2.5kAdc	1994
GE Plastics	US/IN	E-Chem – Chlorine	DC SCR (D)	30,624kW,348Vdc,88kAdc	1994
Extrude Hone Co.	US/PA	DC Supply - Electrochemical Mac	DC Darlington	50kW, 30Vdc,2.5kAdc	1994
Met-Mex Penoles	Mexico	E-Chem – Zinc	DC Diode	24,480kW,510Vdc,48kAdc	1993
Viking	US / MN	E-Chem	DC SCR	5950kW, 700Vdc,8.5kAdc	1993
Met-Mex Penoles	Mexico	E-Chem - Zinc	DC Diode	36,000kW, 510Vdc, 24kAdc	1993
Kennecott Copper	US / UT	E-Chem - Copper	DC SCR	9936kW, 360Vdc,27.6kAdc	1993
Kennecott Copper	US / UT	E-Chem - Copper	DC SCR	14,849kW, 269Vdc,54.2kAdc	1993
Kennecott Copper	US / UT	E-Chem - Copper	DC SCR	2142kW, 84Vdc, 25.5kAdc	1993
Huron Tech /	USA	E-Chem - Chlorate	DC SCR	27,400kW,685Vdc,40kAdc	1993
General Electric Co.	US / OH	Melting - Silica	DC SCR	(6) 480Vdc, 1.6kAdc	1992-1985
Kayex Corp.	US / NY	DC Supply - Crystal Grower	DC Darlington	250kW, 60Vdc,4.2kAdc	1992
Noram E&C Co.	BC	DC Supply - Chlorine Dioxide Mfg.	DC SCR	1950kW, 50Vdc,39kAdc	1992
Noram E&C Co.	BC	DC Supply - Chlorine Dioxide Mfg.	DC SCR	1550kW, 50Vdc, 31kAdc	1992
Kayex Corp.	US / NY	DC Supply - Crystal Grower	DC Darlington	150kW, 60Vdc, 2.5kAdc	1992
Industrial Minera Mexico	Mexico	E-Chem - Zinc	DC SCR	60,900kW, 725Vdc, 84kAdc	1992
Controlled Power Corp / BC	US / OH	DC Substation - BC Transit	DC Diode	(2 x 2.5kAdc); 600Vdc	1991
Federal Pioneer	BC	DC Substation - BC Transit	DC Diode	(2 x 3.33 kA); 600Vdc	1991
Controlled Power Corp /New York	US / OH	DC Substation - NYC Transit	DC Diode	(8 x 7.2kA); (1 x 9.6 kA) ; 625Vdc	1991
Controlled Power Corp/Metro North R.R.	US / OH	DC Substation	DC Diode	(2 x 4.7kAdc);700Vdc	1990
N.Y.City Transit Authority	US / NY	DC Substation – NY Transit	DC Diode	(6x4,8kAdc); (4x6,4kAdc); 625Vdc	1990
Chemetics International/ICI	BC	E-Chem - Chlorate	DC SCR	12,825kW, 225Vdc, 57kAdc	1990
Alby Chlorates	Quebec	E-Chem - Chlorates	DC SCR	18,600kW, 310Vdc, 60kAdc	1989
Alby Chlorates	Quebec	E-Chem – Chlorates	DC SCR	18,600kW,310Vdc,60kAdc	1989



Электрохимия и металлургия

Customer	Location	Application	Technology	Data	Year
Albright and Wilson	BC	E-Chem - Chlorate	DC SCR	46,200kW, 420Vdc, 110kAdc	1989
N.Y. City Transit Authority	US / NY	DC Substation - NY Transit	DC Diode	(4 x 4.8kAdc); (3 x 6.4kAdc), 625Vdc	1989
N.Y. City Transit Authority	US / NY	DC Substation - NY Transit	DC Diode	(7 x 4.8kAdc); 625Vdc	1989
A.T.&T. Technologies	US / PA	DC Supply - Crystal Grower	DC SCR	(10)100kWdc	1988-1984
Johnson Controls	US / WI	DC Supply - Battery Energy Storage	DC SCR	450kW, 500Vdc, 900 Adc, Dual	1988
N.Y. City Transit Authority	US / NY	DC Substation - NY Transit	DC Diode	(8 x 4.8kAdc); 625Vdc	1988
N.Y. City Transit Authority	US / NY	DC Substation - NY Transit	DC Diode	(8 x 4.8kAdc); 625Vdc	1987
N.Y. City Transit Authority	US / NY	DC Substation - NY Transit	DC Diode	(7 x 4.8kAdc); 625Vdc	1987
ERCO	Quebec	E-Chem - Chlorate	DC SCR	30,800kW, 308Vdc, 100kAdc	1987
AVCO Corp.	US / MA	DC Supply - Magnet - Laser	DC SCR	15 kVdc, 7.5 kA	1986
Electrolyser / Air Liquide	Quebec	E-Chem - Hydrogen	DC SCR	7300kW, 73Vdc, 100kAdc	1986
Quenord, Inc.	Quebec	E-Chem - Chlorate	DC Diode	1890kW, 525Vdc, 36kAdc	1986
Met-Mex Penoles	Mexico	E-Chem - Zinc	DC Diode	72,000kW, 510Vdc, 48kAdc	1986
Met-Mex Penoles	Mexico	E-Chem - Zinc	DC Diode	72,000kW, 510Vdc, 48kAdc	1985
CIL	Ontario	E-Chem - Chlorine	DC Diode	11,250kW, 300Vdc, 37.5kAdc	1985
GE Plastics	US / AL	E-Chem - Chlorine	DC SCR (D)	22,400kW, 280Vdc, 80kAdc	1985
Quenord, Inc.	Quebec	E-Chem - Chlorate	DC Diode	1890kW, 525Vdc, 36kAdc	1985
Alby Chlorates	Quebec	E-Chem - Chlorates	DC SCR	33,550kW, 305Vdc, 110kAdc	1985
Metro Canada	BC	DC Substation	DC Diode	(5x2kAdc); (7x1,5kAdc); 600Vdc	1984
ERCO	Quebec	E-Chem - Chlorate	DC SCR	21,200kW, 265Vdc, 80kAdc	1984
HO.Process Co.	US / AL	E-Chem - Chlorate	DC Diode	11,900kW, 595Vdc, 20kAdc	1983
Carborundum Werke	Germany	DC Supply - Industrial Insulation	DC SCR/Autotap	2,000kW, 500Vdc, 4kAdc	1983
N.Y. City Transit Authority	US / NY	DC Substation - NY Transit	DC Diode	(6x4.8kAdc); 625Vdc	1983
Great Lakes Carbon	Quebec	DC Supply - Graphite	DC Diode	28,980kW, 230Vdc, 126kAdc	1982
Dow Chemical	Ontario	E-Chem - Chlorine	DC Diode	29,900kW, 460Vdc, 65kAdc	1981
General Abrasive Co.	Ontario	DC Supply - Mfg. Silicon Carbide	DC SCR / Autotap	20,000kW, 400Vdc, 70kAdc	1981
Dept of Transport	Ontario	DC Substation	DC Diode	(6 x 5.5kAdc); 900Vdc	1980
Diamond Shamrock	US / TX	E-Chem - Chlorine	DC SCR	26,000kW, 650Vdc, 40kAdc	1980
Argonne Nat'l Lab	US / IL	DC Supply - Battery Charge/Discharge	DC SCR	250Vdc, +300 A., -1200 A.	1980
Union Carbide	Ontario	DC Supply - Graphite	DC Diode	12,760kW, 116Vdc, 110kAdc	1980
ERCO	Quebec	E-Chem - Chlorate	DC SCR	16,500kW, 275Vdc, 60kAdc	1980
F.M.C Co.	BC	E-Chem - Chlorine	DC Diode	35,000kW, 125Vdc, 280kAdc	1980
Cominco	BC	E-Chem - Zinc	DC SCR	58.080kW, 484Vdc, 120kAdc	1980



Электрохимия и металлургия

Customer	Location	Application	Technology	Data	Year
ERCO	Argentina	E-Chem - Chlorate	DC SCR	9600kW, 160Vdc, 60kAdc	1980
Glencore (ex Samim)	Italy	E-Chem – Zinc	DC Diode	55,000kW, 275Vdc, 200kAdc	1980
Convent Chemical	US / LA	E-Chem - Chlorine	DC SCR	11,475kW, 425Vdc, 270kAdc	1979
Avondale Shipyard	US / US	DC Substation	DC Diode	(2 x 4kAdc); 750Vdc	1979
Cominco	BC	E-Chem – Zinc	DC SCR	58.080kW, 484Vdc, 120kAdc	1979
ERCO	Ontario	E-Chem - Chlorate	DC SCR	20,520kW, 285Vdc, 72kAdc	1978
St. Anne Chemicals	N.B.	E-Chem - Chlorine	DC SCR	8000kW, 160Vdc, 50kAdc	1978
PPG Stanchem	Quebec	E-Chem - Chlorine	DC Diode	33,750kW, 150Vdc, 225kAdc	1978
Quenord, Inc.	Quebec	E-Chem - Chlorate	DC Diode	20,000kW, 400Vdc, 50kAdc	1978
Texasgulf	Ontario	E-Chem - Copper	DC SCR	13,200kW, 150Vdc, 88kAdc	1978
ERCO	Ontario	E-Chem - Chlorate	DC SCR	15,000kW, 1000Vdc, 15kAdc	1977
Rio Algom	Ontario	DC Substation	DC Diode	(10x400Adc); 250Vdc	1977
Dept. of Transport	Ontario	DC Substation	DC Diode	(6x5.5kAdc); 900Vdc	1976
NY City Transit Authority	US / NY	DC Substation – NY Transit	DC Diode	(7x3.33kAdc); 600Vdc	1976
BC Hydro Authority	BC	DC Substation	DC Diode	(3x2608kAdc); 575Vdc	1976
ERCO	Quebec	E-Chem – Chlorine	DC SCR	11,625kW, 775Vdc, 15kAdc	1976
Dept. of Transport	Ontario	DC Substation	DC Diode	(6x5.5kAdc); 900Vdc	1976
GLENCORE/Samin	Sardinia, Italy	E-Chem – Zinc	DC Diode	275V, 200kAdc	1976
Can. Electrolytic Zinc	Quebec	E-Chem – Zinc	DC Diode	41,250kW, 625Vdc, 66kAdc	1975
NY City Transit Authority	US / NY	DC Substation – NY Transit	DC Diode	(6x3.33kAdc); 600Vdc	1975
Algoma Steel	Ontario	DC Substation	DC Diode	1250kW, 380Vdc, 3.3kAdc	1975
Salgema Industries	Brazil	E-Chem – Chlorine	DC Diode	94,875kW, 575Vdc, 165kAdc	1975
Sider Peru	Peru	DC Supply – Tinning	DC Diode	2688kW, 24Vdc, 112kAdc	1975
Bethlehem Steel	US / NY	DC Substation	DC Diode	6000kW, 250Vdc, 24kAdc	1975
Union Carbide	Ontario	DC Supply – Graphite	DC Diode	12,760kW, 116Vdc, 110kAdc	1975
SNC/Cinco Kersun	Turkey	E-Chem – Zinc	DC Diode	25,245kW, 765Vdc, 33kAdc	1974
Hecla Mining	US / AZ	E-Chem – Copper	DC Diode	11,232kW, 390Vdc, 28.8kAdc	1974
Canadian Industries Ltd.	Quebec	E-Chem – Chlorine	DC Diode	52,700kW, 620Vdc, 85kAdc	1974
General Motors	Ontario	DC Supply – Induction heating	DC SCR	3250kW, 250Vdc, 13kAdc	1974
Sydney Steel	N.S.	DC Substation	DC Diode	1250kW, 250Vdc, 5kAdc	1974
Dravo/Cartech	US / PA	DC Supply – ESR	DC SCR	2400kW, 80Vdc, 30kAdc	1974
BC Chemicals	BC	E-Chem – Chlorine	DC Diode	14,718kW, 446Vdc, 33kAdc	1974
ERCO	Quebec	E-Chem – Chlorine	DC SCR	5920kW, 160Vdc, 37kAdc	1974



Электрохимия и металлургия

Customer	Location	Application	Technology	Data	Year
ERCO	Quebec	E-Chem – Chlorine	DC Diode	4320kW, 360Vdc, 12kAdc	1973
Boston Engineering	Kenya	E-Chem – Chlorine	DC Diode	2400kW, 80Vdc, 30kAdc	1973
B.F.Goodrich	US / KY	E-Chem – Chlorine	DC Diode	14,775kW, 197Vdc, 75kAdc	1973
ERCO	Quebec	E-Chem – Chlorine	DC SCR	25,500kW, 750Vdc, 34kAdc	1973
Canadian Industries Ltd.	Quebec	E-Chem – Chlorine	DC Diode	2536kW, 317Vdc, 8kAdc	1972
Cominco	BC	E-Chem – Zinc	DC SCR	27,000kW, 600Vdc, 45kAdc	1972



Электродуговые печи постоянного тока

Customer	Location	Application	Technology	Data	Year
American Cast Iron Pipe Co.	US / AL	DC Arc Furnace	DC Harmony	65,000 kW, 650Vdc,130kA dc	2000
Titania	Italy	DC Arc Furnace	DC SCR	5,700kW,95vdc,2x30kA dc	1999
Danieli/AHLI Steel	UAE	DC Arc Furnace	DC SCR	59,960kW,916Vdc,2x30kA dc	1999
Aimco Products	Ontario	DC Supply - Metal Holding Furnace	DC Harmony	540kW, 54Vdc,10kA dc	1998
DEMAG/Halivourgia	Greece	DC Arc Furnace	DC SCR	51,780kW,863Vdc,2x30kA dc	1997
DANIELI/Acc.Bertoli-Safau	Italy	DC Arc Furnace	DC SCR	191,088kW,1053Vdc,2x48kA dc	1997
ITAM	US / PA	DC Arc - Metals Reclamation	DC Harmony	5000 kW,365 Vdc,14 kA dc	1997
COSIM	China	DC Arc Furnace	DC SCR (D)	81,000kW,900Vdc,90kA dc	1996
Gulf Chemical	US / TX	DC Arc - Smelting Process	DC Harmony	10,000kW, 235Vdc,42.5 kA dc	1996
CLECI/Yan Shan	China	DC Arc Furnace	DC SCR	85,500kW,855Vdc,4x25kA dc	1995
CLECI/Jiang Yin	China	DC Arc Furnace	DC SCR	85,500kW,855Vdc,4x25kA dc	1995
CLESIM/Chang Chen	China	DC Arc Furnace	DC SCR	132,000kW,1000Vdc,4x43kA dc	1995
Clecim / China	France	DC Arc Furnace	DC SCR (D)	93,960kW, 870Vdc,108 kA dc	1995
DEMAG/IPSCO	USA	DC Arc Furnace	DC SCR	144,900kW,1035Vdc,4x35kA dc	1994
CLESIM/Vitcaya	Spain	SC Arc Furnace	DC SCR	172,200kW,1148Vdc,4x37,5kA dc	1994
Inverpow er / Lasco	Ontario/Canada	Arc Furnace - AC Line Controller	DC SCR	3-ph, 46 kV, 2.8Ka	1994
SVERDRUP DLR, Germany	US/TN	DC Arc - Arc Heater- Testing Reentry Vehic	DC SCR	(4) 3600 kW,1200Vdc,3kA dc	1994
CLECI/UNIMetal	France	DC Arc Furnace	DC SCR	144,900kW,1035Vdc,4x35kA dc	1993
DEMAG/ARBED	Luxembourg	DC Arc Furnace	DC SCR	152,760kW,1273Vdc,4x30kA dc	1993
Danieli/Balboa	Spain	DC Arc Furnace	DC SCR	99,600kW,830Vdc,4x30kA dc	1993
Duetsche Voest Alpine / North Sta	Germany	DC Arc Furnace	DC SCR	115,920 kW, 966 Vdc, 120kA dc	1993
ILSERV s.r.l.	Italy	DC Arc - Ferroalloy Recovery	DC SCR / Autotap	9000 kW	1992
Meadow Material Co. (DOW)	Manitoba	DC Arc - Silicon Process	DC SCR / Autotap	11,000kW, 220Vdc,50kA dc	1990
Duetsche Voest Alpine	Germany	DC Arc Furnace	DC SCR	44,520 kW, 530Vdc,84kA dc	1989
Whiting Corp.	US / IL	DC Supply - Metal Holding Furnace	DC SCR/SPS	(10)540 kW,54Vdc,10kA dc	1980-88
So. Carolina Research	US/SC	DC Arc - Ferrochrome Process	DC SCR / Autotap	12,000kW,300Vdc,40 kA dc	1993
International Mill Service	US / AR	DC Arc - EAF Dust Processing	DC SCR / Autotap	2000kW, 400Vdc,5kA dc	1988
ELMET	Mexico	DC Arc - Mfg. Silicon Carbide	DC SCR / Autotap	9200 kW, 37 kA dc	1980



Оборудование для проведения исследований в атомной отрасли

Customer	Location	Application	Technology	Output	Year
ОАО «ОКБМ Африкантов»	Россия	АЭС - водяной обогрев	DC-SCR	7500Kw , 4 x 12,5kA-150Vdc	2010
Consorzio RFX	Padua,Italy	Research – Fusion	IGCT	200,000kW,3000Vdc,12x6kAdc	2001
Consorzio RFX	Padua,Italy	Research – Fusion	DC SCR	170,000kW,1350Vdc,12x12,5kAdc	2001
University of Princeton / GA	US / CA	DC Supply - Magnet - Fusion	DC IGBT	(3)1500 kW,300 Vdc,5 kAdc	1999
CIRA (Centro Italiano Ricerche Aerospaziale)	Capua,Italy	Research – Plasma Windtunnel	DC SCR	70,000kW,16200Vdc,9.2kAdc	1995
Pennsylvania State Univ.	US/PA	DC Supply - Reactor Fuel Testing	DC Darlington	720 kW, 60 Vdc,12.6 kAdc	1995
Atomic Energy of Canada	Ontario	DC Supply - Test Fuel Bundles	DC Harmony	1700 kW, 145 Vdc,12 kAdc	1995
Mass. Institute of Technology	US / MA	DC Supply - Solid State Ckt. Breakers - Fusion	DC SCR	2 kV./4 kV.; 50 kA, 25 kA & 15kA	1992
Mass. Institute of Technology	US / MA	DC Supply - Magnet - Fusion	DC SCR	12-Pulse, +/- 50 kA Circulating, Current Dual Conv.	1991
Mass. Institute of Technology	US / MA	DC Supply - Magnet - Fusion	DC SCR	12-Pulse, +/- 50 kAdc Lock-Out Dual Conv.	1991
GE Nuclear Energy	US / CA	DC Supply - Test Unit	DC SCR	19,000 kW,190Vdc,100kAdc	1991
Mass. Institute of Technology	US / MA	DC Supply - Magnet - Fusion	DC SCR	12-Pulse, +15 kA, -10 kA	1991
Mass. Institute of Technology	US / MA	DC Supply - Magnet - Fusion	DC SCR	400,000 kW,1500V,260kAdc	1990
Consorzio RFX	Padua,Italy	Research – Fusion	DC SCR	170,000kW,1350Vdc,12x12,5kAdc	1987
Consorzio RFX	Padua,Italy	Research – Fusion	DC SCR	55,000kW,1350Vdc,8x6,25kAdc	1987
Princeton University	US/NJ	DC Supply – Magnet – Fusion	DC SCR	Multiple Units,5kAdc thru 20kAdc	1986
General Atomic	US / CA	DC Supply-Magnet Supply – Fusion	DC SCR	600V,14kAdc-&-1200V,20kAdc,12-pulse	1985
Los Alamos Nat'l Lab	US / NM	DC Supply - Magnet - Superconductor	DC SCR	13,750 kW, 2500V,5.5kAdc	1983
General Atomic	US / CA	DC Supply -Magnet Supply - Fusion	DC SCR	1000 V., 21 kAdc, 12-Pulse, High Reflected dv/dt	1982
Mass. Institute of Technology	US / MA	DC Supply - Magnet - Fusion	DC SCR	150,000 kW, 750 V,200 kAdc	1980
Oak Ridge Nat'l Lab	US / TN	DC Supply - Magnet - Superconductor	DC SCR	+/- 300 V., +/- 2 kAdc, 0.1 % Ripple	1979
General Electric Co.	US / NY	DC Supply - Magnet - Superconductor	DC SCR	15 V. 7.5 kAdc	1978
Oak Ridge Nat'l Lab	US / TN	DC Supply – Magnet- Fusion	DC SCR	120,000kW,100V,120kAdc	1977
Atomic Energy of Canada	Ontario	DC Supply – Test Fuel Bundles	DC SCR	250V,75kAdc,12-pulse	1976



IPSCO IOWA США, 2 электродуговые печи постоянного тока по 150 тонн





Выпрямитель на 50 кА





«MAGNOLA» Квебек, Канада, Завод по производству магния





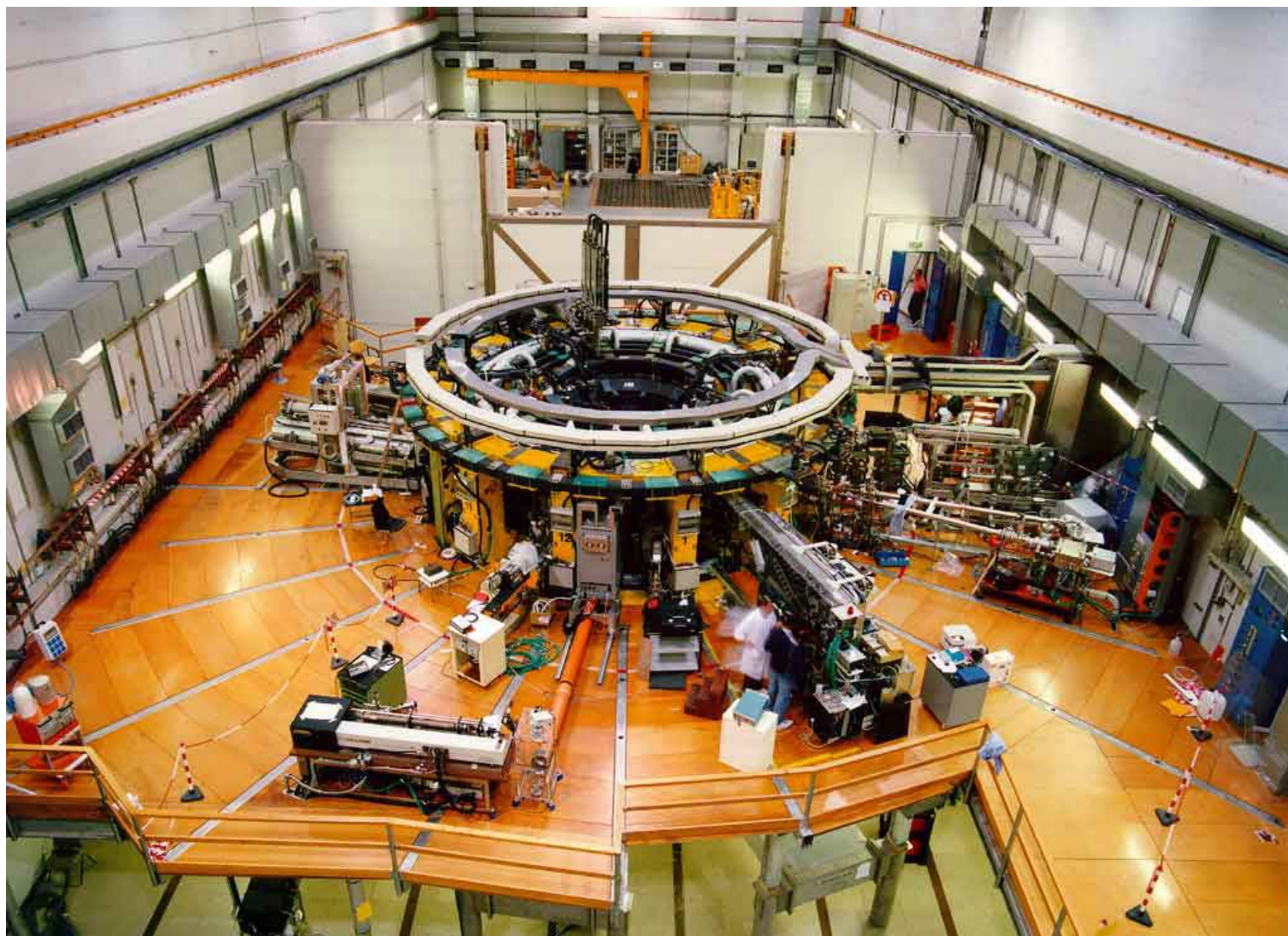
Преобразователь 700 В, 65 кА





«ALCAN GRAND BAIE» Квебек, Канада, производство алюминия







Спасибо за внимание!



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