

CHLORIDE INDUSTRIAL SYSTEMS

Secure Power Always

Oil and gas power protection solutions



Secure power for upstream, midstream and downstream sectors

How we operate

Chloride is a world leader in protecting mission-critical systems and processes from the damaging effects of poor quality electrical power and power interruptions.

Our mission

Chloride has a comprehensive range of secure power products, utilising the latest technology which is designed and tailored to the customer's applications. Underpinning Chloride's total solutions approach, is a commitment to providing customers with industry-leading service and support through our global network of highly qualified engineers and technical support staff.

Chloride's Industrial Systems division focuses on power protection solutions and services for the high demanding industrial sectors such as power, oil and gas, transport and manufacturing.

Our aim is to provide the best possible service to our customers. This challenge, which drives everything we do, is met by our continual investment in staff training as well as in technology.

Our focus on innovation, flexibility and reliability, our integrity and our respect for our customers, combined with our 24/7-manned service centres, make us the supplier of choice for many leading organisations, worldwide.

Our values

Customer focus

- We anticipate our customer's needs to find the best solution
- We strive to exceed our customer's expectations in the performance of our people, technology and solutions

Service and support

- We seek to support customers in the long term
- We anticipate and respond to customer's concerns

Integrity and reliability

- We keep our promises and fulfil our commitments
- We offer exceptional reliability through our people, technology and solutions

Core to our success are



Secure power always - through leading technology and exceptional customer support.

Secure power for oil and gas projects is a core competence of Chloride

Chloride Industrial Systems' power protection solutions cover the complete oil and gas value chain.

Your requirements

Safety, risk management, business continuity and operational excellence are at the forefront for both our customers and Chloride.

Whether you are an oil company, a project management consultant, or an engineering and construction services provider, you need to talk to a power protection company that is equipped to deal with large international engineering projects.

Chloride Industrial Systems provides seamless solutions for:

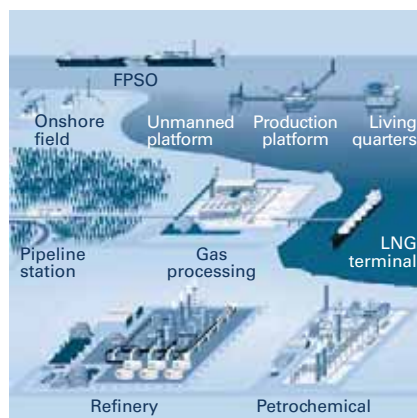
End-users

For industrial projects, Chloride Industrial Systems advises on technical issues, autonomies, environmental conditions, international standards and undertakes comprehensive feasibility studies.

Contractors:

For FEED (Front End Engineering and Design) contracts, Chloride Industrial Systems helps define specifications to suit customers' applications.

For EPC (Engineering, Procurement and Construction) or LSTK (Lump Sum Turn Key) contracts, Chloride Industrial Systems offers the best technical and commercial solutions to meet customers' power protection needs.



Your applications

Oil and gas projects need reliable and uninterrupted power to secure several mission-critical applications. Chloride Industrial Systems can help you to determine the appropriate power protection solution for:

Safety devices

- Fire and gas detection devices
- Emergency shutdown devices (ESD)
- Emergency lighting
- Helideck signalling
- Telecommunication systems (aeronautical radio, telephone, hot line, PABX, LAN...)
- Navigational instruments
- Onboard weather stations

Process devices

- Process control systems
- Instrumentation
- Motor Starting
- Lube oil pump power supply
- Data processing (control rooms, SCADA systems)

Power devices

- Power generation turbine process control systems
- High voltage switchgears.

Our experience

For 60 years, Chloride Industrial Systems has worked closely with oil and gas companies to provide innovative solutions and services that meet the strictest requirements in these areas.

Today, Chloride Industrial Systems is one of the leading providers of power protection solutions for the oil and gas industry.

Our competences

Our global capabilities mean:

- We work alongside our customers to design a power protection solution that best fits the technical and commercial requirements of both end-users and engineering contractors.
- We design power protection solutions for the complete oil and gas value chain, from upstream offshore field development to downstream petrochemical units.
- We provide lifelong support, no matter how remote your location may be

Secure Power facts:

- 60 years experience** in the oil and gas sector
- 20 MVA** of oil and gas AC and DC loads protected over the last 2 years
- 1700** tailored solutions delivered to the oil and gas sector over the last 2 years



Some of our recent projects achievements around the world



Upstream		
Project name	Client	Country
Abu Cluster field	Petronas	Malaysia
Akpo field	NNPC, Total	Nigeria
Attahaddy Gas Field	Sirte Oil Co.	Lybia
Bab field	ADNOC	UAE
Bonga field	Shell	Nigeria
Buzzard Field	Nexen	UK
Cendor field	Petrovietnam	Vietnam
Darquain Oil Field	NIOC, ENI	Iran
Espirito Santo basin	Petrobras	Brazil
Fula field	CNPC	China
G-1 & GS-15 Fields	ONGC	India
Haban field	PDO	Oman
KG-D6 block field	Reliance	India
Kuito	ChevronTexaco	Angola
Ku-Maloob-Zaap field	PEMEX	Mexico
Ledong field	CNOOC	China
Rosa Lirio	Total	Angola
Vostochno Kolva & Dyusushev fields	ConocoPhillips	Russia
Yetagun North field	Petronas	Malaysia





Midstream

Project name	Client	Country
AGT pipeline	BP	Azerbaijan, Georgia, Turkey
Banias-Homs pipeline	SOTC	Syria
Bejaia Marine terminal	Sonatrach	Algeria
Caspian pipeline	CPC	Russia
Chilean LNG	ENAP	Chile
Dragon LNG terminal	BG Group, Petronas, 4Gas	UK
East-West pipeline	Reliance	India
Fujian LNG terminal	CNOOC	China
Grain LNG	National Grid	UK
Guangdong LNG	BP, CNOOC	China
MAF-Sohar crude pipeline	OMC	Oman
Pearl GTL pipeline	Shell	Qatar
Peru LNG	Peru LNG Co.	Peru
Reganosa LNG terminal	Reganosa	Spain
Sakhalin Island pipeline	Sakhalin Energy Investment Co.	Russia
Songkhla pipeline	PTT	Thailand
South Hook LNG terminal	South Hook LNG Co.	UK
Wesfarmers LNG	Wesfarmers Gas Ltd	Australia
Yemen LNG	Total	Yemen



Downstream

Project name	Client	Country
Antwerp refinery	ExxonMobil	Belgium
Cardon refinery	PDVSA	Venezuela
Dung Quat refinery	PetroVietnam	Vietnam
Jamnagar refinery	Reliance	India
Jilin Petrochemical	Jilin Corp.	China
KB Methanol	CNOOC	China
Kharg Olefin complex	PIDEC	Iran
Kirikkale Refinery	Tupras	Turkey
Lindsey Oil refinery	Total	UK
Mathura refinery	IOCL	India
Mongstad refinery	Statoil	Norway
Notre Dame de Gravenchon refinery	ExxonMobil	France
Petrochemical Ethylene	Tasnee	Saudi Arabia
PIC Aromatic	PIC	Kuwait
Ras Laffan Olefin	Qatar Petroleum	Qatar
Shanul, Varav, Homa Gas Refinery	NIOC	Iran
Sohar Aromatic	PDO	Oman
Thai Ethanolamines	TEA	Thailand
Yanbu Petrochemical plant	SABIC	Saudi Arabia

Our total solutions approach

From project conceptual study to the procurement stage, you need special skills for the power protection part of your project.

Chloride Industrial Systems has a highly qualified and experienced team to assist in conceptualizing your needs and formulating competitive financial proposals to meet your performance requirements and budget.

A customized UPS solution for each oil and gas project:

- Reduced footprint
- Explosion-proof protection
- Spare space for fire detectors
- Communication field bus and software
- Black start
- Automated UPS operation for unmanned platforms
- Management of battery charging modes



System design

Our consulting engineers work alongside you, from FEED to EPC, to analyze your oil and gas project data:

- Existing technical specification, if any
- Low voltage electrical distribution network analysis
- Load flow studies and load shedding
- Short-circuit analysis
- Power quality analysis
- Noise rejection analysis (Harmonic current and voltage distortion)
- Grounding/Neutral networking
- Failure analysis
- Emergency and stand-by power requirements
- Battery type and configuration under all load, environmental and aging conditions
- Electrical environment
- Mechanical environment
- Health and safety



Project Management

Our project management teams are situated in various geographical areas to ensure full understanding and long term support for our customers. Our task forces are fully accountable for:

- Acting as a single contact point for customer engineers
- Submitting timely drawings as per agreed supplier document schedule
- Providing timely documentation as per customer specifications
- Ensuring adjustments are fulfilled accordingly with customer's expectations and defined scope of supply
- Providing the best technical advice for revised requirements
- Ensuring factory acceptance tests are 100% compliant with our customer's requests
- Handling packing and logistics issues
- Delivering 100% equipment on-time
- Understanding the project's commissioning requirements
- Ensuring correct resource allocation for trouble-free installations

Throughout the operating life of your equipment, you need to maximize performance and reliability.

Our extensive service network, highly qualified engineers and advanced service management systems ensure that we are able to fulfil our commitment to providing life-long service and technical support for your mission critical system.

A service offering to meet oil and gas requirements:

- Maintenance contracts with guaranteed on-site response time
- Service engineers with offshore "survival" habilitation
- Continuous technical hotline
- Regular preventive maintenance
- Installation supervision
- Commissioning
- On-site specific tests
- Troubleshooting training



Project services

Our service delivery team schedules commissioning logistics to ensure system start-up is achieved on-time. Once on-site, our service engineer may supervise the UPS installation, by assisting you in:

- Installing the systems in the technical rooms
- Interconnecting all parts of the systems (UPS, distribution, by-pass...)
- Fitting (on stand or in cabinet) and filling the battery cells
- Interconnecting all the battery cells
- Connecting the battery to the UPS via the battery protection box (if any)
- Cabling the auxiliaries (battery room temperature sensor, battery monitoring system, if any)

Once the UPS system is installed, our service engineers perform commissioning operations through:

- Checking environmental conditions
- Inspecting connections
- Starting-up UPS systems
- Checking operating parameters
- Testing control and signalling units
- Assessing battery performances under mains failure conditions (partial battery discharge).

Life cycle services

We ensure that installed systems are reliable through our commitment to life-long service and technical support. We tailor our maintenance, service and call-out programmes to suit specific needs. Our ability to do that, combined with our 24/7 remote monitoring and diagnostics capabilities, provides total solutions to blue-chip clients around the world.

Our service team offers several customer support packages to ensure lifelong UPS service:

- Training for UPS operation and/or maintenance
- Hotline
- Preventive maintenance plans
- Corrective maintenance operations
- Service contracts
- Spare parts kits
- Revamping solutions

Key competencies

One single provider for a total industrial power protection solution:

- Single-phase AC UPS
- Battery and battery protection (MCCB) box
- Connectivity and monitoring solution
- Three-phase AC UPS
- Battery monitoring system
- Project-specific documentation
- DC UPS systems
- AC and DC distribution panels



Strong technical support

Leveraging our long, expert history in the field of power protection, we are well positioned to recommend various solutions that best fit the project.

Our experts can advise you on:

- System design philosophy according to the critical level of the loads to be protected
- Battery technology, type, autonomy and lifetime
- Operation modes (permanent, emergency, maintenance)
- Voltage levels (3 phases, 1 phase, DC, AC...)
- Harmonic husbandry
- Necessary initial investments
- Maintainability and maintenance costs
- Long-term spare part requirements
- International rules and regulations
- Health and Safety requirements

Tailor-made UPS systems

Our UPS systems are designed according to our customers' specifications and expectations. Each oil and gas project is treated as unique so that the delivered solution exactly fits the application requirement.

Our solutions are tailor-made according to the client's requirements for:

- Mechanical design: Specific frame colour, painting thickness, system noise reduction (dB), anti-seismic structure (from 0.5 to 5g), ingress protection (up to IP54 for AC UPS; up to IP 65 for battery chargers)...
- Power electronics design: specific battery charger ratings for high battery capacity or reduced recharge time, specific voltages and frequencies...
- Electrical design: Special cables for harsh environmental conditions, specific cable identification, wrap-around bypass systems, specific distribution panels...
- Monitoring and Control design: special fieldbus, special monitoring features, battery monitoring systems (block by block or cell by cell), additional volt-free contacts, coordination of UPS operational modes with environmental data...

Specific documentation

After initial engineering, drawings and datasheets of the proposed solution are issued to the client for comment and approval before production is launched. This provides our customers with full flexibility during the design, in line with their own project dynamics.

Each solution is delivered with its own specific documentation:

- Project quality plan
- Project schedule
- Single Line diagram
- General arrangement drawings
- Technical drawings with modules and cables identification
- Test report and witness tests report (if any)
- Operation and Maintenance (O&M) manual

More specific and specialist documentation is also available on request to precisely match the demands of the project:

- Complete UPS system engineering data book
- Documentation with customized layout (drawing corners with customers' logo)
- Documentation with specific numbering according to client's own numbering system

Rigorous factory testing

Prior to dispatch each and every system is rigorously tested by our test engineers who conduct an in-depth visual and electrical inspection of each cubicle. This inspection includes:

- Visual inspection: conformity with requirements, mechanical frame, cabling quality...
- System calibration: device specific calibration settings stored in firmware with a back-up kept in our after-sales department, ensuring future replacement parts are shipped ready to fit, thus minimizing MTTR
- Electrical testing: testing of each UPS standard function (charge, discharge, overload...), measurement recordings and testing of each project-specific device.
- Issuing of a dedicated test report with detailed serial and tag number



AC solutions

Industrial AC UPS systems

Excor Apodys - Single-phase output

RATINGS (kVA)	2.5	5	7.5	10	15	20	25	30	40	50	60	80	100	120
Input voltage (VAC)	3 x 400 (3 x 380, 3 x 415)													(up to
Intermediate DC voltage (VDC)	110		110		220		220		400		400		250 kVA	
Output voltage (VAC)	1 x 110		1 x 230		1 x 110		1 x 230		1 x 110		1 x 230		on request)	
Range of ratings (kVA)	2.5 - 60		2.5 - 60		10 - 100		10 - 120		40 - 120		40 - 120			

Excor Apodys - Three-phase output

RATINGS (kVA)	2.5	5	7.5	10	15	20	25	30	40	50	60	80	100	120
Input voltage (VAC)	3 x 400 (3 x 380, 3 x 415)													(up to
Intermediate DC voltage (VDC)	110		110		220		220		400		400		500 kVA	
Output voltage (VAC)	3 x 220		3 x 400		3 x 220		3 x 400		3 x 220		3 x 400		on request)	
Range of ratings (kVA)	5 - 50		5 - 50		15 - 100		15 - 100		40 - 120		40 - 120			

Excor Apodys - AC UPS key options for oil and gas

Rectifier / charger

12-pulse rectifier to reduce THDi

Extended charger sizing to increase battery autonomy and reduce recharge time

Reserve supply

By-pass transformer to fully isolate the output from the input

By-pass stabiliser to fully control the output voltage within load tolerance, in by-pass mode

System

Parallel configurations for redundancy to increase availability of the load

AC distribution panel to fully protect the load

Analogue meters on front panel for quick visualisation

Mechanical

Up to IP 54 external protection level to meet the harshest environmental conditions

H2S treatment program to operate the UPS system in hydrogen sulphide atmosphere

Halogen-free wiring

Specific frame colour for on-site homogeneity



Features and benefits

- Full isolation of battery circuit from the mains and the output through input and output transformers
- Perfect and immediate load sharing between paralleled UPS thanks to digital vector control
- Full compliance with oil and gas standards, e.g. Shell DEP for AC UPS systems
- Design life of 20 years (UPS and batteries) to meet oil and gas process lifetime

DC solutions

Industrial DC UPS systems (rectifiers - chargers)



Excel Apodys - Single-phase input

RATINGS (A)	25	60	100	160	250
Input voltage (VAC)	1 x 230				
Output voltage (VDC)	24		48	110	220
Available range of ratings (A)	25 - 250		25 - 250	25 - 250	25 - 250

Excel Apodys - Three-phase input

RATINGS (A)	16	25	40	60	80	100	125	160*
Input voltage (VAC)	3 x 400 (3 x 380, 3 x 415)							
Output voltage (VDC)	24		48	110	220			
Available range of ratings (A)	25 - 2500		25 - 1200	16 - 1200	16 - 1000			

*Available in 200, 250, 320, 400, 500, 600, 800, 1000, 1200, 1500, 2000, 2500.

Excel Apodys - AC UPS key options for oil and gas

Rectifier / charger

12-pulse rectifier to reduce THDi

output dropping diodes to control the output voltage within DC load tolerance

System

Parallel configurations for redundancy to increase availability of the load

DC distribution panel to fully protect the load

Analogue meters on front panel for quick visualisation

Mechanical

Up to IP 65 external protection level to meet the harshest environmental conditions

H2S treatment program to operate the UPS system in hydrogen sulphide atmosphere

Halogen-free wiring

Specific frame colour for on-site homogeneity

Features and benefits

- Natural cooling on most of the range to increase systems' reliability
- Full isolation of battery circuit from the mains through an input transformer
- Full compliance with oil and gas standards, e.g. Shell DEP for DC UPS systems
- Design life of 20 years (UPS and batteries) to meet oil and gas process lifetime

Distribution solutions

Low voltage AC and / or DC distribution panels

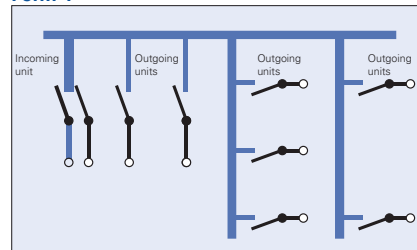
LV distribution panels

Technical characteristics	
Rated operational voltage	690 V AC / DC (50-60Hz)
Rated insulation voltage (UI)	1000 V
Compartmentalisation	Form 1, 2a, 2b, 3a, 3b, 4a, 4b
Type of Feeder	Circuit breaker or fuse according to specification (2, 3 or 4 poles)

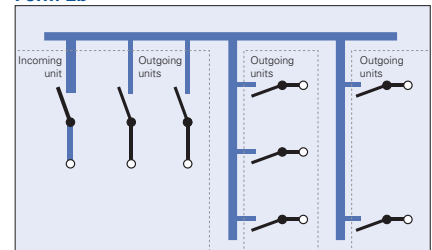
Key options for oil and gas

Electrical
Volt-free contact
Lockable feeder
Earth fault leakage measurement per outgoing feeder
Mechanical
Up to IP 54 external protection
Top cable entry

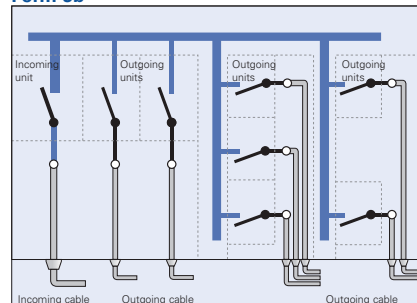
Form 1



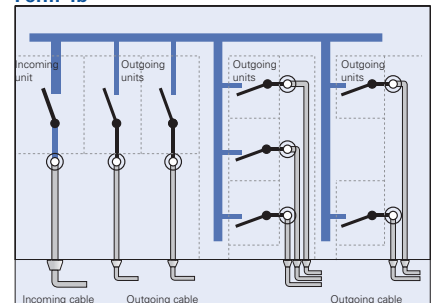
Form 2b



Form 3b



Form 4b



Features and benefits

- In-house expertise to help you with selectivity calculation for both AC and DC distribution boards
- Design of both UPS and distribution panels ensures selectivity and clearance capacity for any load event

- High customization level to meet the diverse needs of oil and gas applications
- Designed at engineering stage to provide a fully homogeneous drawing package (UPS and distribution)

Battery solutions

Battery and battery-related solutions



Battery - Main requirements for oil and gas

Lead Acid		
Battery types		Recombination
Battery design life		12 to 20 years
Recommended number of cells	110 VDC	60
(according to DC voltage for AC UPS)	220 VDC	114
	400 VDC	192

Nickel Cadmium		
Battery types		Recombination or Vented
Battery design life		20 to 25 years
Recommended number of cells	110 VDC	90
(according to DC voltage for AC UPS)	220 VDC	170
	400 VDC	293

Battery - Key options for oil and gas

Container
Flame retardant battery containers available for recombination batteries

Installation
On standard or shock-proof rack according to the application
In cabinet for space saving (recombination only)

Electrical protection
Protection of the battery through circuit breaker (MCCB) to allow remote shutdown of the battery circuit (also available: fuse or fuse-switch)

Installation of battery protection
Wall-mounted box, standard or EEx"d" (ATEX)

Features and benefits

- Wide choice of batteries from the world's leading battery manufacturers
- Self-made battery calculation thanks to Chloride's long experience in the battery field
- Selective approach according to application and environmental conditions
- Pre-sales recommendations for battery installation (for civil works, air flow...)

Battery monitoring system



Battery monitoring system

System architecture

CCB unit to interface with system sensors and pickups

Data Logger to coordinate multiple CCB units and to store and relay systems data

Software for user interface

Monitoring

Local or remote via PC, permanently or temporarily connected

Software

Windows based

View and storage of real time data

Review systems events and historical files

Production of hard copy reports

Setting of alarm thresholds and event-driven output actions

Features and benefits

- Continuous monitoring of battery to allow automatic detection of a potential failure before damage occurs
- Permanent monitoring of battery blocks or cell, Lead acid or Nickel Cadmium, to reduce maintenance or replacement costs
- Remote access to live and historical data thanks to integrated data logger
- Multiple site supervision possible via interface panels or remote SCADA systems with enabled telemetry
- Compatible with any new or existing system

Battery Black Start



Battery Black Start - System description

Definition

Black Start refers to an electric service that can be provided on short notice without supplemental electric power

Black-start units provide a start-up service only in the event of a system-wide shutdown (blackout or Emergency Shutdown ESD)

System description

The black-start system is based on the battery protection circuit breaker, usually installed in a EEX"d" box

An externally accessible key switch allows supplying the coil of the MCCB

Once the coil energised, the MCCB is switched on to power the turbine control system thanks to the battery current

Features and benefits

- Restart of on-site power generation turbine after an ESD thanks to batteries from UPS system
- Start-up of the UPS (inverter part) thanks to the battery current
- Load supplied when mains power is not available
- Manual action locally required (via key-switch) to avoid inappropriate remote action

Communication solutions

Connectivity solutions



Technical characteristics		
Serial connections available with Apodys range	RS232	RS485
Max length	15 m	1200 m
Interfacing type	point-to-point	multipoint
Number of UPS to supervise	1	up to 31
Cabling	serial subD 9 points	6 points screw-clamps connector (standard) or serial subD 9 points (on request)
Data transmission	reference to ground	differential

STANDARD CHLORIDE MODBUS/JBUS RTU PROTOCOL CONFIGURATION

Speed	19200 baud	
Messaging	8 data bits, 1 stop bit, parity None (odd or even on request)	
Function code	03 (Read Holding registers) or 04 (Read Input registers)	
PROTOCOLS AVAILABLE	TRANSFER MODE	CONNECTION
Modbus RTU	serial	sub D9 (RS232) or 6 points connector RS485 (2 or 4 wires)
Jbus RTU	serial	subD9 (RS232) or 6 points connector RS485 (2 or 4 wires)
Profibus DP	serial	Special subD9
Modbus/TCP (Open Modbus)	Ethernet	RJ-45
EtherNet / IP	Ethernet	RJ-45
DF1	serial	subD9 (RS232)
SNMP	Ethernet	RJ-45

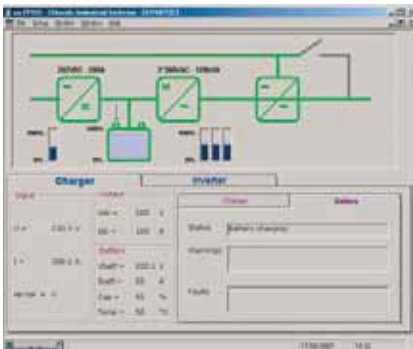
Other protocols or other configuration consult us.



Features and benefits

- RS232, RS485 and volt-free contacts available to provide remote information to SCADA systems
- Modbus is easily made accessible for the remote monitoring of UPS systems
- Wide range of converters available to monitor UPS systems for industrial protocols most in demand

Monitoring software



PPVis Monitoring software

Functions available with PPVis

- Colour coded synoptic view
- Status, warning and fault indication of each module
- Oscilloscope function to visualize inverter or UPS output measured values
- Input and output measured values

Communication protocol

USS serial

Connection

Isolated 6 point connector

Minimum hardware requirements

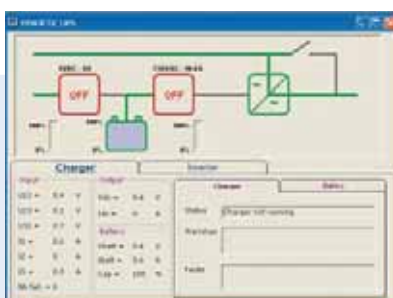
Pentium 200MHz or higher, 64MB RAM, 15MB hard disk free space, serial & USB interface, CDROM drive, SVGA graphic card, mouse

Operating environment

MS Windows 98 / 2000 SP1 / XP

Options

- Monitoring of equipment via Ethernet (UPS must include the Chloride recommended serial to Ethernet converter)
- Event memory function (permanent connection of equipment to PPVis)



Features and benefits

- Remote monitoring of Apodys UPS, chargers and inverters by a single monitoring software
- Immediate visualisation of systems and components status for rapid corrective action

- Event memory function (option) for later analysis
- Display of measured values (voltage, current...) and number of mains failures for permanent checking

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CHLORIDE
INDUSTRIAL SYSTEMS

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Chloride offers global service cover

Chloride operates through a worldwide network of Chloride sales and service offices and joint-ventures, with operations across 80 countries including:

Almaty, Kazakhstan

Bangkok, Thailand

Beijing, China

Makati City, Philippines

Bologna, Italy

Buenos Aires, Argentina

Chicago, USA

Dubai, UAE

Erlangen, Germany

Ho Chi Minh City, Vietnam

Lisbon, Portugal

Istanbul, Turkey

Madrid, Spain

Moscow, Russia

Paris, France

Pune, India

Sao Paulo, Brazil

Shanghai, China

Singapore

Southampton, UK

Sydney, Australia

Warsaw, Poland



Chicago, USA
ONEAC® manufacturing,
R&D centre North America HQ



London, UK
Group HQ
Chloride Group plc



Erlangen, Germany
R&D centre



Dubai, UAE
Middle East HQ



Sao Paulo, Brazil
Latin America HQ



Lyon, France
Industrial UPS manufacturing
R&D centre



Bologna, Italy
UPS manufacturing, R&D centre
International sales HQ



Singapore
SE Asia HQ

For a full list of contacts please visit our website at www.chloridepower.com



ISO 9001
FM 12385
ISO 14001
EMS 86301