Proven Technology and Total Solution for Energy Management

Harmonic Filter System

Innovative Solution for Power Measurement
INDUSTRIAL Controls & Drives (I) Private Limited

ICD established in the year 1980 has a strong customer reputation in the design and manufacture of Power Measurement Products and Power Quality solutions.

ICD has diversified its line of activities in the area of Energy Management Systems (EMS), Real Time Power Factor Correction Panels, Substation Automation Systems, Energy Saving Products viz, Thyristorized Heater Controllers, Lighting Energy Savers and Harmonic Filter Systems and custom designed systems.

With strong in-house technical expertise and Excellent customer / product support ICD has won the confidence and established rapport with the end users of Various Industries, Project Consultants, System Integrators, EPC Contractors, Panel builders and OEMs. The emphasis on complete customer support has resulted in a large number of loyal customers across range of industries.

Industrial Controls & Drives (India) Pvt. Ltd. is promoted by Mr. G.Chandra Sekaran Managing Director, Post Graduation in Electronics, having 35 years of experience in the field of design, manufacture, Marketing and efficient entrepreneur.

He has been associated with Mr. K.Jayaraman Head R&D, who is a highly knowledgeable technocrat in the field of electronic design & product development having an overall experience of 18 years.

Infrastructure

ICD Manufacturing Facility is located in Chennai with 20000 sq.ft. built up area housing manufacturing, development and testing facilities. ICD has excellent highly accurate calibration facility for meter production and single phase & three phase test benches for utility meter manufacturing.

ICD has overall work strength of about 100 well trained professionals. ICD has well qualified R&D engineers, Software professionals and trained engineers in every activity of Product Development, Marketing, Production, Quality Control, Supply Chain & Customer Service team.

Quality Certification

ISO 9001:2008 certified by M/s. RINA & M/s. IQNET

Enterprise Resource Planning (ERP) implemented from April 2010 with licensed SAP software for speedy process of inward/request/issue of materials and planning across all the department.

Our Products are Type Tested at
- CPRI, Bangalore
- ERDA, Baroda
- Yadav Measurements Lab, Udaipur
- Electronic Test & Development Centre, Chennai
- Central Electrical Testing Laboratory, Thiruvallur

Our Vision

To become the most preferred source for power measurement, Energy saver products & power quality solutions
To reach utility customers with Prepayment meters and Single & Three phase direct connected tariff meters.
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### MFM 9500 / MFM 9501 / MFM 9502 FEATURES

#### METERING:
- Voltage Vr, Vy, Vb, Vln Avg, Vry, Vyb, Vbr, Vll Avg
- Current Ir, Iy, Ib, In, Avg
- Active Power P1, P2, P3, Psum
- Reactive Power Q1, Q2, Q3, Qsum
- Apparent Power S1, S2, S3, Ssum
- Power Factor PF1, PF2, PF3, PFtotal, PFavg
- Frequency
- Active Energy kWh Import, kWh Export
- Reactive Energy kVarh Import Lag, kVarh Import Lead, kVarh Export Lag, kVarh Export Lead
- Apparent Energy kVArh Import, kVArh Export
- Demand kVA, kW, kVAr and Average Current

#### ALARMS:
- Over / under limits can be set for up to 24 indicated parameters along with a specified time delay. If any of the indicated parameter is over or under its setting limit and remains over the specified time interval, the event will trigger an alarm output and also recorded with time stamp. The history of last occurred 10 alarms are retained.

#### DATA LOGGING:
- Power genius offers 1 MB of on board data logging memory for the recording of majority of the metering parameters with date and time stamp. The time interval for recording can be selected up to 60 minutes in steps of 5 minutes. The recorded data's can be transferred to a PC and viewed in a Excel format by a user friendly menu driven software supplied by ICD along with the meter.

#### I/O MODULE OPTIONS:
- Digital Input, Relay Output, Digital Output, Pulse Output, Analog Input and Analog Output are provided as I/O option modules to extend the utility of the Power Genius. The extension module allows easy expansion of the I/O functions. Maximum of 3 modules can be provided in a single meter.

#### USER PROGRAMMABLE FEATURES:
- Primary Value of PT and CT
- PT Secondary 415V / 110V AC
- CT Secondary 5A / 1A
- Three phase delta or Three Phase Star measurement
- Favourite display page selection
- Communication Settings

#### APPLICATIONS:
- Medium and Low Voltage Systems
- Panel Metering of distribution feeders, Generators, Transformers and Motors
- Power Quality Analysis and Data Logging
- Metering for Industries and utilities

### MONITORING:
- Voltage Harmonics 2nd to 31st and THD
- Current Harmonics 2nd to 31st and THD
- Voltage Unbalance factor
- Current Unbalance Factor
- Voltage crest factor
- Current k factor
- Maximum and Minimum statistics with time stamp

### DISPLAY:
- Custom made clear and large LCD screen with white / orange / blue backlight
- Supports graphics like Load percentage, 4 quadrant power, Load nature, I/O status and Communication status

### COMMUNICATION:
- Isolated RS485 with industry standard MODBUS-RTU Protocol
- Ethernet module available as option
- Profinbus-DP module available as option
- Dual communication ports option
## TECHNICAL SPECIFICATION

### RATINGS

**Voltage Inputs (Each channel)**
- Full Scale Voltage: 300V AC L-N, 520V AC L-L
- Frequency Range: 30 - 70 Hz
- Starting Voltage: 25V AC L-N
- Burden: 0.2VA at 240V AC

**Current Inputs (Each channel)**
- Full Scale Current: 6A AC
- Withstand Capability: 10A RMS Continuous, 100A RMS for 1 second Non-Recurring
- Starting Current: 0.2% of Full Scale
- Burden: 0.1VA at 5A AC
- Accuracy: Class 0.5, Class 0.2(Optional)

### COMMUNICATION

- Rs485 (Standard): MODBUS-RTU Protocol, 2 Wire Connection up to 38400 Baud rate
- Ethernet (Optional): MODBUS-TCP Protocol, RJ45 Jack, 10 / 100 Mbps self adaptable
- Profibus (Optional): Profibus-DPV0 Slave protocol, 2 Wire connection, Baud rate adaptable up to 12 Mbps, Profibus standard according to EN50170

### AUXILIARY SUPPLY

- Operating Range: 90 - 270V AC, 50 / 60 Hz, 100 - 300V DC
- Burden: 4VA at 240V AC

### I/O OPTION

- Digital Input: 4 No's, 24V DC Self Excited
- Relay Output: 2 No's, 5A at 240V AC
- Digital Output: 2 No's Open Collector Transistor Output
- Pulse Output: 1 No, Pulse frequency 25 Hz, 50% duty Cycle
- Analog Input: 2 No's, 4 - 20mA / 0 - 1V, 0.2% OFS Accuracy, 1KV Isolation
- Analog Output: 1 No, 4 - 20mA, 0.5% OFS Accuracy, 1KV Isolation

### OPERATING ENVIRONMENT

- Operating Temperature: -10°C to +55°C
- Storage Temperature: -25°C to +75°C
- Relative Humidity: 5% to 95% non-condensing

### CASE AND DIMENSIONS

- Enclosure: Polycarbonate
- Dimension: 96 x 96 x 55 mm

### STANDARDS APPLICABLE

- Measurement Standard: IEC 62053-22, IS 14697
- EMI / EMC standard: IEC 61000-4 / -2 -3 -4 -5 -6 -11, CISPR 22
- Safety Standard: IEC 61010-1
- Environmental Standard: IEC 60068-2
- Outlines Standard: DIN 43700

### PRODUCT SELECTION GUIDE

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* Statistics, Alarm and Data logging functions are available in MFM 9502
MULTI FUNCTION METER
Single Meter suitable for all load conditions LT / HT, 5A / 1A, 4Wire / 3Wire

FEARURES
- True RMS Measurement
- Simultaneous sampling of voltage and current
- Confirms IS14697 for Accuracy Class 1 and Class 0.5
- Direct reading without multiplication factor
- Accurate on Harmonic Conditions
- 10 year back up for integrated energy data
- Available in both LCD and LED Model
- Measures 4 quadrant power and 2 quadrant energy
- Run hour Indication
- Built in phase analyzer for proper connection
- Low PT, CT burden (Less than 0.2 VA)
- Digital Calibration ensures drift free operation for long time
- High reliability and user friendly to configure and operate
- Sealed dust proof Poly Carbonate Enclosure
- Touch safe terminals
- Wide range of Auxiliary supply (90 to 270V AC or DC)

DISPLAY FEATURES
LCD
- 2 Row 16 Character LCD with Backlight
- Character Size 4.35 (H) x 2.95 (W) mm
- LCD Power save mode provided. When no key is pressed for 3 minutes, the LCD backlight is switched OFF to save power and enhance the life of LCD. The LCD is switched ON when any key is Pressed
LED
- 16 Digit 0.56” Hi bright Red LED Display
- Facility to view 4 parameters at a time

USER PROGRAMMABLE FEATURES
- Primary value of PT and CT
- CT Secondary 5A / 1A
- PT Secondary 415 V / 110V AC
- Single phase, 3 phase Delta and 3 phase Star measurement
- Favourite display page selection
- Communication settings like baud rate, parity and stop bit

OPTIONAL FEATURES (Value Line)
- Optically isolated RS485 Communication output with MODBUS - RTU protocol
- Accuracy Class 0.5 (IS14697)
- Total Harmonic distortion (THD) display of 3 phase voltage and current

OPTIONAL FEATURES (Power Line)
- Optically isolated RS485 Communication output with MODBUS - RTU protocol
- Accuracy Class 0.5 / 0.2 (IS14697)
- Separate energy register for export energy recording
- Total Harmonic distortion (THD) display of 3 phase voltage and current
- 2 number digital input for user defined function
- 1 number digital output for user defined function
- Energy pulse output for kWh
- Current day and previous day energy and Run hour register

STANDARDS APPROVED
- Type test approved as per IS14697 Class 1 and Class 0.5
- Confirms EMI, EMC Regulations as per IS14697 standards

MONITORING FEATURES (Value Line)
MFM9212, MFM9213
- kVA or kW, kWh or kWh, PF, Run hour

MFM9112, MFM9113
- Voltage, Current, Frequency, kVA or kW, kVAh or kWh, PF, Run hour

MFM9101, MFM9013
- Voltage, Current, Frequency, kVA, kVAr, PF, kWh or kWh, Run hour

MONITORING FEATURES (Power Line)
MFM9014, MFM9015
- Voltage, Current, Frequency, kVA, kW, kVAr, PF, kWh, Lag kWArh, Lead kWArh, Run hour

PCM9011, PCM9010
- Voltage, Current, Frequency, kVA, kW, kVAr, PF, kWh, Lag kWArh, Lead kWArh, Run hour, Demand kW, Demand kVA, MD kVA, MD kW, RTC

DUAL SOURCE METER
EM9024, MFM9022, MFM9023
- Voltage, Current, Frequency, kW, PF, kWh, Run hour
- Separate kWh and run hour register are provided for EB/DG
- EB/DG Indication by LED
- 240V AC supply or potential free contact for EB/DG Selection
- Suitable to generate separate billing for EB/DG Selection

APPLICATIONS
- Energy management systems and Energy billing systems
- Panel metering in sub stations, Distribution panels and Genset Panels
- Pumps, Motors, Compressors and Individual Equipments
- Original equipment manufacturers
- Control panels and Test benches
MULTI FUNCTION METER

TECHNICAL SPECIFICATION

RATINGS
Voltage Inputs (Each channel):
- Full Scale Voltage: 300V AC L-N, 520V AC L-L
- Frequency Range: 30 - 70 Hz
- Starting Voltage: 25V AC L-N
- Burden: 0.02VA at 240V AC

Current Inputs (Each channel):
- Full Scale Current: 6A AC
- Withstand Capability: 10A RMS Continuous, 100A RMS for 1 second Non-Recurring
- Starting Current: 0.2% of Full Scale
- Burden: 0.1VA at 5A AC

COMMUNICATION
RS485 (Optional):
- MODBUS-RTU Protocol, 2 Wire Connection up to 38400 Baud rate

Ethernet (Optional)*:
- MODBUS-TCP Protocol, RJ45 Jack, 10 / 100 Mbps self adaptable

Profibus (Optional)*:
- Profibus-DPv0 Slave protocol, 2 Wire connection, Baud rate adaptable up to 12 Mbps, Profibus standard according to EN50170

AUXILIARY SUPPLY
Operating Range:
- 90 - 270V AC, 50 / 60 Hz
- 100 - 300V DC
- Burden: 4VA at 240V AC

PRODUCT SELECTION GUIDE

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<td>★★★</td>
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<td>★★★</td>
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<td>★</td>
<td>★</td>
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<td>★</td>
<td>★</td>
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<td>RTC - Date, Month, Year, Hour, Min., Sec.</td>
<td>★★</td>
<td>★★</td>
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<td>RS485 Port MODBUS-RTU Protocol, Baud rate configurable up to 19.2 kbps</td>
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<td>Voltage THD - THD Vr, THD Vy, THD Vb, THD Vavg</td>
<td>★★★</td>
<td>★★★</td>
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<td>Current THD - THD Ir, THD Iy, THD Ib, THD Iavg</td>
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<td>★★★</td>
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<td>Export Energy Recording</td>
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*Available in 96 x 96 x 80mm LCD

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★ Available  ★ User Selectable kVArh / kWh  ★ Optional
ENERGY MANAGEMENT SYSTEM

INTRODUCTION
In Industries, commercial establishments, manufacturing plants etc. where the electrical system is huge and complex, it requires centralised monitoring of power, energy and control. ICD ENERGY MANAGEMENT SYSTEM is having such a facility and deals with “Demand side Management”.

The Energy Management System helps an organization to achieve energy efficiency through well laid out procedures and methods and in over all cost savings. This savings vary from savings in energy bills, maximum demand charges, controlling energy wastages, better utilization of man power and avoidance of critical break down in the electrical systems etc.

BENEFITS OF ENERGY MANAGEMENT SYSTEM
1. Do SWOT analysis of your plant energy with our EMS package to have awareness about the energy consumption, pattern of different production equipments, true energy cost for your different product. Energy cost allocation is made possible for various products and fix Energy saving formula. Evolve a typical Energy Cost Centre pattern.
2. Know your Plant Energy Efficiency, predict the Maximum Demand with your varying load profile and even out the varying demands to save Maximum Demand charges.
3. Improve your Plant Energy Efficiency by identifying the areas of wastage. Monitoring the trend of power factor, suitable power factor control scheme is made possible which not only avoids the penalty for poor factor, but also results in maximizing the incentive from EB.
4. Reduce Specific Energy Consumption for your Product by monitoring it on real time basis identifying the low productivity and wrong scheduling.
5. Even out the Demand and Energy will help you to achieve Optimum Utilization of your Transformers, Switch gears, Cables etc.
6. Know your potential for expansion or upgradation, thereby avoid unnecessary capital investment by analyzing the trend of all power parameters such as KW, kVA, kVar, PF etc and knowing how close the operation is to the maximum ratings of the equipments.
7. Know the quality of your power and the pollution taking place with your loads using special meters (Harmonic Indicators-HAR 9000) at critical locations.
8. Assess your distribution losses accurately as a percentage of power transmitted and compare with the standards and bench marks to enable you to improve by suitable design / operational changes.
9. Since all the measuring devices are plus minus 0.5% accuracy and data acquisition is on real time basis, all the information are highly reliable. Hence right action can be taken without hesitation to achieve the desired results.
10. Compute energy bills yourselves, compare with that from EB and check your EB bills
11. Assured return on investment with low payback period and it is an investment and not an expense.

ENERGY MANAGEMENT SYSTEM ARCHITECTURE
EMS consists of Power measurement Products, Data Loggers, Data Concentrators, Media Converters, Networking Cables, EMS Server PC, Client PC and EMS Software Package.

POWER MEASUREMENT PRODUCTS
Energy meters, Multi Function Meters, Load Managers and Trivector Meters can be selected depending on the customer requirement and application. Any third party meters with RS485 output supporting MODBUS RTU Protocol can also be used.

DATA LOGGER
Required for interfacing with pulse output type meters. Each Data Logger has Provision to connect 60 / 30 meters.

DATA CONCENTRATOR
Required for interfacing meters with RS485 output. Each Data concentrator can support 30 individual meters. The Data Concentrators can be provided with RS485 output, Ethernet output or can be interfaced to a Fibre Optic Converter, RF Modem and GSM/GPRS Modem. The use of Data Concentrators make the communication connections / grouping easier and also improves the speed of data collection.

NETWORK CONNECTION OPTIONS

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<td>Option 5:</td>
<td>RF Modem and Zigbee Network for short range wireless communication</td>
</tr>
<tr>
<td>Option 6:</td>
<td>GSM / GPRS based wireless communication for long distance and remote data access</td>
</tr>
</tbody>
</table>

MEDIA CONVERTORS
RS485 to RS232 Converters, Repeaters, Fibre Optic Converters, Ethernet Converters, RF Modem and GSM / GPRS Modem depending upon the type of network used. The PROFIBUS Master Card (COMSOFT or HILSCHER make) is used in the PCI slot of the EMS Server PC for data collection through PROFIBUS network.

NETWORK CABLES
RS485 Cables, LAN Cables, Fibre Optic Cables and suitable other connection accessories

Minimum System Configuration For Implementing EMS.

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Single User</th>
<th>Multi User Server</th>
<th>Multi User Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>Dual Core</td>
<td>Dual Core</td>
<td>Dual Core</td>
</tr>
<tr>
<td>Ram</td>
<td>2 GB</td>
<td>4 GB or Above</td>
<td>2 GB</td>
</tr>
<tr>
<td>HDD</td>
<td>500GB</td>
<td>500 GB or Above x 2 SATA</td>
<td>500 GB</td>
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<tr>
<td>Ethernet</td>
<td>10/100/1000</td>
<td>10/100/1000 x 2</td>
<td>10/100/1000</td>
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<td>Serial Port</td>
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<td>2</td>
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<tr>
<td>USB Port</td>
<td>2</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Operating System</td>
<td>XP / Win7</td>
<td>Server 2003 or above</td>
<td>XP / Win7</td>
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<tr>
<td>Database Tools</td>
<td>Access</td>
<td>SQL Server</td>
<td>SQL Server</td>
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<tr>
<td>Office Tools</td>
<td>MS Office</td>
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<td>DVD</td>
<td>52 X Writer</td>
<td>52 X Writer</td>
<td>52 X Writer</td>
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<tr>
<td>Anti Virus</td>
<td>Any Original</td>
<td>Any Original</td>
<td>Any Original</td>
</tr>
<tr>
<td>PC Type</td>
<td>Normal PC</td>
<td>Server Configuration</td>
<td>Normal PC</td>
</tr>
</tbody>
</table>
SOFTWARE PACKAGE

- ICD EMsoft is a totally indigenous Software Package designed for logging data from Data Concentrator, Data Logger and individual instruments. The software package runs on Windows XP / Windows 2000 / Vista / Windows 7 and has all standard features for basic Energy Management.
- It has 4 Versions namely Micro, Compact, Professional, and Business with various different features to suit the customer requirements.
- The software is capable to collect data through one or multiple com ports and through one or multiple ethernet ports.
- EMsoft client software is an optional software used to view the datas in client PC connected in the LAN.

APPLICATION

- Planning and Scheduling of Energy Resources
- Energy Audit Applications and to create Management Information Report
- Root Cause Analysis of Electrical Breakdown
- Predictive Maintenance
- Helps in Achieving Energy Efficiency
- Optimization of Genset Running Hours

FEATURES OF EMsoft

- GUI Based Application
- User friendly menu driven configuration and operation
- Multi user environment, Multi tier architecture and high level of security
- Faster data collection time with the help of multiple ports and data concentrators.
- Supports data collection through RS485, Ethernet and RF Modem.
- No limitation of tag. All the parameter in the meter can be seen.
- Online data representation, graphical representation, historical data representation and wide range of facilities for report generation and billing are available.
- Displays instant data in real time trends.
- Facility to view minimum and maximum values for power parameters.
- Generation of customized log sheets for production cost analysis and power cost analysis.
- Reports can be converted to different formats like word, excel, pdf, csv etc...
- Data can be logged from Third party meters, if the meter is provided with MODBUS RTU protocol.

Optional Features

- Automatic E-mailing
- Alarm reporting through SMS
**ENERGY MANAGEMENT SYSTEM**

**CONFIGURATION**
- User level Security and Privileges
- Alarm Configuration
- Flexible and Easy to configure Meters
- Day, Shift Time Configuration
- Flexible Grouping of Meters
- Data storing interval (1 to 60 minutes)

**GRAPHICAL PRESENTATION**
- Mimic View
- Online Data view in Tree Structure
- Single Line Diagram
- Bar Graphs
- Real time and Historical Trends

**REPORTS**
- Daily Report - Available as Month Energy Report
- Periodic Report - Selected for any periodic duration
- Groupwise Energy Report
- Instant Report - One minute duration with min. and max. values.
- Daily log book and billing information

**ALARM AND EVENTS**
- Min, Max alarm for processing value
- Alarm Event storage and display through pop up screen

**ADVANCED OPTIONAL FEATURES**
- Automatic E-mailing
- Alarm reporting through SMS
The report generated will be helpful to analyse the quantity of process variable required for the specific energy consumption and arrive costing of the products.

In addition to energy logging, Process parameters like temperature, humidity, flow, speed, pressure can also be logged in the same software package by collecting data from suitable process measurement products.

**APPLICATION**

Most ideal for Energy Billing in Commercial Complexes, IT Parks, Residential Apartments and Industrial Housing Colonies etc.

---

**INTRODUCTION**

ICD Energy Billing System is totally indigenous Software Package designed for Energy Billing purpose. The software package runs on Windows XP / Windows 2000 / Vista / Windows 7 and has all standard features for Energy Billing Functions.

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**FEATURES OF EBS**

- Data collection from meters are done through powerful Software package
- User level security and privileges
- Flexible and easy to configure meters and grouping of meters
- EBS users and occupants configuration
- Online data view in Tree structure
- Daily, Periodical Trends and Reports
- Alarm features for communications failure
- Automated process for bill generation
- Creation of bills from anytime to anytime on a click of a mouse button

- Provision to get data from BMS like chillers, AHU operation time etc.
- Manual data entry for MD Charges, DG Charges and common area charges
- Provision for combined billing for EB / DG
- Calculation of Transmission and distribution losses by monitoring the incoming & outgoing power
- Secondary backup for the Energy and other useful data (useful for data recovery)

**APPLICATION**

Most ideal for Energy Billing in Commercial Complexes, IT Parks, Residential Apartments and Industrial Housing Colonies etc.

---

**GRAPHICAL PRESENTATION**

- Substation single line diagram in mimic form
- Feeders, Breakers and Switches ON/OFF status are displayed in mimic form
- When the cursor is pointed to a particular component data pertaining to the component is displayed
- Buttons are provided for remote operation of ACB / MCCBs

**REPORTS**

- Voltage, Current, Power, Demand and PF Reports of various feeders
- Energy Report (Hourly, Shift wise, Daily and Monthly)
- Minimum and Maximum Values Recording

- Number of Operations ON/OFF of each breaker
- Recording of Breaker Tripping date and time (Reason to be entered manually)
- Customized Log Sheets and Maintenance Data Recording

---

**FEATURES OF LOAD MANAGEMENT**

ICD Load Management system is a powerful SCADA Package which help the user to Monitor and Control the Load Demand Response effectively. The Load management function is carried with sophisticated load analysis in which models are built in for Production Planned, Available Demand, Power and Energy in certain time periods. The real time data is compared with built in models and suitable feedback is given to the users for Load Management.

---

**GRAPHICAL PRESENTATION**

- Substation single line diagram in mimic form

**REPORTS**

- Voltage, Current, Power, Demand and PF Reports of various feeders
- Energy Report (Hourly, Shift wise, Daily and Monthly)
- Minimum and Maximum Values Recording

- Number of Operations ON/OFF of each breaker
- Recording of Breaker Tripping date and time (Reason to be entered manually)
- Customized Log Sheets and Maintenance Data Recording
**COMMON FEATURES**

- True RMS measurement
- Simultaneous sampling of voltage and current
- Confirms IS14697 for Accuracy Class 0.5
- Confirms EMI/EMC Standards (CISPR 14, IEC 61000-4-1, IEC 61000-4-2, IEC 61000-4-4, IEC 61000-4-5)
- Direct reading without multiplication factor
- Accurate under harmonic conditions
- Measures 4 quadrant power and 2 quadrant energy
- Low PT, CT burden. (Less than 0.2 VA)
- Suitable for all kind of Balanced & Unbalanced Loads
- Energy storage in EERAM with 10 Years backup
- Built in voltage and current phase analyser for proper connection
- Auto scrolling of displayed parameters
- MD Reset through keypad
- Precision RTC with 10 years backup
- 15 / 30 Minutes selectable for Rising Demand
- Total Harmonic Distortion (THD) display of 3 phase voltage and current
- Optically Isolated RS485 communication output with MODBUS RTU protocol
- RJ45 Ethernet port with MODBUS- TCP protocol (optional)
- Export energy recording (optional)
- 144(H) x 144(W) x 80(D) Sealed dust proof Enclosure
- Panel mounting

**User Programmable Features**

- Primary value of PT and CT
- CT Secondary 5A / 1A
- PT Secondary 415 / 110V AC
- Three phase delta and Three phase star measurement
- Communication settings like baud rate, parity and stop bit

**Time Of The Day (TOD) Meter**

- Built in Time of the Day (TOD) Function
- 24 hours 8 slots with 8 individual zones
- Facility to register all the energy consumption kWh, kVAh and maximum demand for 8 time zones separately

**System Input**

- Voltage Input : 30 - 520V AC line to line
- Current Input : 0 - 6A
- Over load capability : 10 times Ib for 5 seconds,
  1.5 times Ib continuous
- Starting current : 0.1% of basic current
- Frequency range : 40.00 to 60.00Hz
- Operating PF : 0.00Lag to 0.00 Lead
- Auxiliary supply : 90-270V AC/DC

**APPLICATIONS**

- Main LT and HT Incoming Feeders
- Sub-Stations, Power Stations and Captive Gensets
- Wind mill application
- Energy data logging using PC
- Electronic billing system
- Energy Audit application
VLT 9053
- True RMS measurement
- 3 Voltage readings in a single meter
- 4 Digit 0.5” 7 segment Red LED
- Displays Phase & Line Voltages
- R, Y, B, RY, YB, BR voltage display selection by push button
- Phase indication by LEDs
- Accuracy ±1% on reading
- Accuracy ±0.5% on reading (Optional)
- LT / HT Application
- Voltage Resolution (0.01KV for HT & 1V for LT)
- Voltage input (110V AC for HT and 415V AC for LT)
- PT Primary voltage selection through keypad
- Auxiliary supply 90-270V AC/DC
- Poly carbonate enclosure
- Panel Mounting
- Single Phase Volt Meter
  Model No. VLT 9051 available (Voltage range 300V AC)
- DC Volt Meter
  Model No. VLT 9059 available (Voltage range 10-300V DC)

AMM 9043
- True RMS measurement
- 3 Current readings in a single meter
- Accurate under Harmonic conditions
- 4 digit 0.5” 7 segment Red LED
- Displays 3 Phase Current
- R, Y, B display selection by push button
- Phase indication by LEDs
- Accuracy ±1% on reading +1 LSD
- Accuracy ±0.5 % on reading +1 LSD (Optional)
- Current Resolution (1A upto 1000A / 0.01KA above 1000A)
- Current input 1A / 5A AC
- CT Primary current selection through keypad
- Auxiliary supply 90-270V AC/DC
- Poly carbonate enclosure
- Panel Mounting
- Single Phase Ammeter
  Model no. AMM 9041 available
- DC Ammeter
  - Input 75mV from DC shunt (Model no. AMM 9049)
  - Input from External hall effect sensor (Model no. AMM 9049H)

CNF 240
- 4 Digit 0.5” 7 segment Red LED
- Range 40.00 to 60.00Hz
- Resolution 0.01Hz
- Accuracy ±0.05% on reading
- Voltage Input 110V AC / 230V AC
- Auxiliary supply 90-270V AC/DC
- Poly carbonate enclosure
- Panel mounting

APPLICATIONS
- Panel Metering in Sub Stations
- Power Generation Plants, Genset Panels
- Control Panels
- Test Benches
- Switch Boards
- Power Distribution Panels
VAF 9000
- Replaces Volt Meter, Ammeter and Frequency Indicator in an electrical panel
- True RMS measurement
- LT / HT Application
- 12 digit 0.5” 7 segment red LED
- Displays 12 parameters in a single instrument
- Parameter displayed includes R, Y, B, RY, YB, BR voltage, R, Y, B current and frequency
- Parameter selection through Front Panel Keypad
- Phase indication and parameter indication through LED
- Accuracy:
  ±1% on reading for voltage and current
  ±0.05% on reading for frequency
- Resolution:
  Voltage 0.1V for LT,
  0.01 KV for HT
  Current 0.1A up to 100A,
  1A (more than 100A)
  Frequency (0.01HZ)
- Voltage Input: 100 - 520V AC line to line for LT
  30 - 140V AC line to line for HT
- Current Input: 5A / 1A AC
- PT/CT setting through keypad with password facility
- Auxiliary supply: 90 to 270V AC/DC
- Dimension 96 x 96 x 45 mm
- Poly Carbonate enclosure
- Panel Mounting

APPLICATIONS
- Panel Metering in Sub Stations
- Power Generation Plants, Genset Panels
- Control Panels
- Test Benches
- Switch Boards
- Power Distribution Panels

ENERGEN
- True RMS Measurement
- LT / HT Application
- 18 Digit .39 inch 7 Segment LED
- Confirms IS14697 for Accuracy Class 1 for energy
- Direct reading without multiplication factor
- Accurate on Harmonic Conditions
- 10 year back up for integrated energy data
- Parameter displayed includes R, Y, B, RY, YB, BR voltage, R, Y, B current, frequency, kW or kVA, kWh or kVAh
- Parameter selection through Front Panel Keypad
- Phase indication and parameter indication through LED
- Accuracy:
  ±1% on reading for voltage, current, kW or kVA
  ±0.05% on reading for frequency
- Resolution:
  Voltage 0.1V for LT,
  0.01 KV for HT
  Current 0.1A up to 100A,
  1A (more than 100A)
  Frequency (0.01HZ)
- Voltage Input: 100 - 520V AC line to line for LT
  30 - 140V AC line to line for HT
- Current Input: 5A / 1A AC
- PT/CT setting through keypad with password facility
- Auxiliary supply: 90 to 270V AC/DC
- Dimension 96 x 96 x 45 mm
- Poly Carbonate enclosure
- Panel Mounting

OPTIONAL FEATURES
- Optically isolated RS485 Communication output with MODBUS - RTU protocol
- Accuracy Class 0.5 (IS14697)
PWR 9070
- True RMS Measurement
- LT / HT Application
- 12 digit 0.5" 7 segment red LED
- Displays all instant parameters in a single instrument
- Direct reading without multiplication factor
- Accurate on Harmonic Conditions
- Accuracy class 1
- Display parameter: kW, kVA, PF, kVAr, 3 Phase Voltage, 3 Phase Current, Frequency, RPM, Power ON hours, Load ON hours and Number of interruptions
- Low PT, CT burden (Less than 0.2 VA)
- Digital Calibration ensures drift free operation for long time
- High reliability and user friendly to configure and operate
- Wide range of Auxiliary supply (90 to 270V AC or DC)
- Sealed dust proof Poly Carbonate Enclosure
- Touch safe terminals
- 96(H) x 96(W) x 45(D) mm
- Panel Mounting

APPLICATIONS
- Panel Metering in Sub Stations
- Power Generation Plants, Genset Panels
- Control Panels
- Test Benches
- Switch Boards
- Power Distribution Panels

DEM 9004F
- Parameter Shown: DC Voltage, DC Current, kW, kWh, Run hour
- Voltage Range: 20 - 100V DC (One/Two Voltage channels)
- Current Input: 50 mV / 75 mV from shunt (OR) 0 - 4 V from Split core Hall effect CTs
- Four DC Current Channels
- Current measurement through Shunt or Hall Sensors
- Power Supply for Hall Sensors Provided in the meter
- Programmable CT primary current individually for 4 channels
- Displays DC Voltage, Current, kW, kWh and Run hour
- Separate energy and run hour register provided for all the four channel
- Digital Calibration by software
- Energy & Run hour storage in EEPROM back up
- kWh range 999999.99 kWh
- Run hour range 9999.59 hours

APPLICATIONS
- Telecom Tower Monitoring systems
- Railway Power systems that uses DC supply
- Solar Power System
- DC Panel Meter, UPS
- Any DC Plants that Needs Monitoring with PC Support

OPTIONAL FEATURES
- Optically isolated RS485 communication port with MODBUS RTU protocol
- Split core Hall effect CTs suitable for mounting on load cable without disturbing the load

APPLICATIONS
- Suitable for low cost applications
- Captive Gensets
- Individual Machines & Equipments
- Pumps, Motors & compressors
- Energy Data Logging using PLC/DCS

PANEL METERS
**AC VOLTAGE TRANSDUCER**

**PWT 9060V**
- Measuring Quantity: AC Voltage
- Measuring Range: (-40% to +20%)
- Single (4-20mA) (0-10V)
- Load Resistance 750Ω max.@ 20mA
- Accuracy class 0.5 as per IEC688
- Ripple less than 1% (P-P)
- Response time less than 500ms
- Low voltage burden (less than 1VA)
- Galvanic Isolation Provided (4kV)
- Dual output option available
- Self powered / External 48V DC / 110V DC 110V AC / 240V AC auxiliary
- DIN Rail enclosure for easy onsite mounting
- Dimension 70(H) x 55(W) x 110(D)mm

**AC CURRENT TRANSDUCER**

**PWT 9060A**
- Measuring Quantity: AC Current
- Nominal Input Current: 1A / 5A AC
- Measuring Range: 0.2% to 120% of I<sub>b</sub>
- Single (4-20mA) (0-10V)
- Load Resistance 750Ω max.@ 20mA
- Accuracy class 0.5 as per IEC688
- Ripple less than 1% (P-P)
- Response time less than 500ms
- Low CT Burden (less than 0.2VA)
- Galvanic Isolation Provided (4kV)
- Dual output option available
- Self powered / External 48V DC / 110V DC 110V AC / 240V AC auxiliary
- DIN Rail enclosure for easy onsite mounting
- Dimension 70(H) x 55(W) x 110(D)mm

**FREQUENCY TRANSDUCER**

**PWT 9060F**
- Measuring Quantity: Frequency
- Measuring Range: 45 to 55 Hz
- Single (4-20mA) (0-10V)
- Load Resistance 750Ω max.@ 20mA
- Accuracy class 0.5 as per IEC688
- Ripple less than 1% (P-P)
- Response time less than 1 second
- Power consumption (less than 2VA)
- Galvanic Isolation Provided (4kV)
- Dual output option available
- Self powered / External 48V DC / 110V DC 110V AC / 240V AC auxiliary
- DIN Rail enclosure for easy onsite mounting
- Dimension 70(H) x 55(W) x 110(D)mm

### APPROVED STANDARDS

- IEC688/IS12784 - Electrical measuring transducers for converting AC electrical variables to analog and digital signals
- IEC1010 / EN61010 - Safety regulations for electrical measuring, control and laboratory equipment
- IEC 1000-4 -2, 3, 4, 6 - Electromagnetic compatibility for industrial process measurement and control equipment
- UL94 - Tests for flammability of plastic materials for parts in devices and appliances

### APPLICATIONS

- Power Transmission and Generation Plants
- Suitable to measure power system variable in high voltage / high current system
- Remote Power Indicating Systems
- Remote Large Size Display Systems
- Data Logging using PLC / DCS
MULTI FUNCTION TRANSDUCERS

POWER TRANSDUCER

PWT 9060P

- Nominal Input Voltage: 110V/3/110V/415V/415V AC 3 Phase
- Nominal Input Current: 1A / 5A AC
- Measuring Quantity: kW/kVA/kVAR/PH
- Measuring Range: 0.2% I, to 120% of I, for kW/kVA/kVAR and 0.5 lag - 0.5 Lead for PF
- Single (4-20mA) (0-10V)
- Load Resistance 750 ohms maximum
- Accuracy class 0.5 as per IEC688
- Ripple less than 1% (P-P)
- Response time less than 500ms
- Power consumption: 2VA
- Galvanic Isolation Provided (4kV)
- Dual output option available
- Self powered / External 48V DC / 110V DC 110V AC / 240V AC auxiliary
- DIN Rail enclosure for easy onsite mounting
- Dimension 70(H) x 100(W) x 110(D)mm

MULTI FUNCTION TRANSDUCER

PWT 9060

- 5A / 1A AC Input
- Overload 10 times Ib for 5 Seconds and 2 times Ib Continuous
- Low CT burden. (Less than 0.2 VA)
- Single 4-20 mA / Dual/Triple 4-20 mA output
- Load Resistance 750 ohms maximum
- Response time less than 500ms
- Galvanic Isolation Provided (4kV)
- External 90 to 270V AC Auxiliary supply
- 75(H) x 150(W) x 110(D)mm
- Din Rail Mounting

Programmable Features

- Single phase, Three phase delta and 3 phase star measurement
- Primary value of CT and PT
- PT Secondary 415 / 110V AC
- CT Secondary 1A / 5A
- Programmable analog outputs (Voltage, Current, Frequency, kW, kVA, kVAR & PF)
- Output can be configured for any of the measured variable

Specifications

- Voltage Input : 25 - 520V AC L-L
- Current Input : 5A / 1A AC
- Over load capability : 10 times Ib for 5 seconds, 1.5 times Ib continuous
- Starting current : 0.2% of basic current
- Frequency range : 40.00 to 60.00Hz
- Operating PF : 0.00 Lag to 0.00 Lead
- Auxiliary supply : 48V DC / 90V - 270V AC/DC
- Measured Variables : RMS voltage, RMS current, Active, Reactive, Apparent power (imp/exp) Power factor, frequency and energy
- Communication : Optically isolated Rs485 communication supporting MODBUS RTU Protocol
- Rs232 Port is available for configuration menu driven windows based software package is given at free of cost for configuration
- Mounting : Din Rail / Wall Mounting

APPLICATIONS

- Power Generation Plants
- Suitable to measure power system variable in high voltage / high current system
- Remote Power Indicating Systems
- Remote Large Size Display Systems
- Data Logging using PLC / DCS

APPROVED STANDARDS

- IEC688 - Electrical measuring transducers for converting AC electrical variables to analog and digital signals
- IEC1010 / EN61010 - Safety regulations for electrical measuring, control and laboratory equipment
- IEC 1000 -4 -2, 3, 4, 6 - Electromagnetic compatibility for industrial process measurement and control equipment
- IEC 1036 - Solid state AC watt hour meters for active power (Classes 1 and 2)
- UL94 - Tests for flammability of plastic materials for parts in devices and appliances
**TARIFF METERS**

**SALIENT FEATURES**

- State-of-the-art SMD Technology
- Wide range of input voltage
- Whole current operation (5A and 10A Ib with 600% operating range)
- Accuracy class 1.0 as per IS 13779, IEC 62053-21, CBIP88
- Accuracy class 0.5 as per IS 14697, IEC 62053-22 (CT operated meters)
- Accurate under Harmonic conditions
- Custom-made LCD with backlit
- Simultaneous sampling of voltage and current
- Very low voltage and current burden
- Instantaneous start and records energy for low starting current (0.2% of Ib)
- Built in transient protection
- Higher meter constant for faster testing
- High quality poly carbonate enclosure with sealing arrangements
- Tamper indication for current reversal, earth load tamper, neutral missing, magnetic tamper and cover open tamper
- Tamper details are shown in the LCD icon
- Tamper data for last 200 events are recorded
- Immune to signals emitted by mobile phones
- Capability to withstand 35kV for spark discharge test

**APPLICATIONS**

- Residential meters for housing colonies and buildings
- Billing systems for shopping malls, IT Parks and other commercial establishments
- Secondary metering
- Windmill AMR

**DISPLAY**

- **INSTANTANEOUS PARAMETERS**
  - True RMS Voltages
  - True RMS Currents
  - Instantaneous kW
  - Instantaneous signed kW, kVAR
  - Instantaneous Power Factor with lag and lead indication
  - Rising Demand in kW / kVA
  - Demand Time
  - RTC

- **BILLING PARAMETERS**
  - Cumulative kWh and kVAR
  - Cumulative kWh and kVAR
  - Average Power Factor
  - MD kW and kVA
  - MD Reset Date & Time
  - Cumulative MD
  - MD Reset Count
  - Power OFF hours
  - Load OFF hours

**BCS FEATURES**

- User friendly and menu driven
- Secured user login
- Facility to upload / download data from CMRI
- Facility to communicate directly with meter via optical port
- Load Survey data analysis
- Information about tamper events with date and time
- Graphical representation of captured data
- Customized report generation
- Facility to export data in MS Excel and PDF Format

**MAXIMUM DEMAND**

- MD Calculation Method fixed or sliding window
- Integration time 15/30 minutes
- Both the functions are Selectable through CMRI using BCS

**DATA COLLECTIONS**

- Billing Data, Load Survey Data, Tamper Data stored in the meter are transferred to CMRI
- A menu driven CMRI Software is supplied along with the meter for data collection
- The CMRI Software also has facility to set RTC, Sequence of Display Parameters, Demand Integration period, Reset Date and Time (odd /even billing months) and MD Type (kW, kVA)

**LOAD SURVEY**

- Load survey record is stored in the meter for a maximum of 45/90 days with 15/30 minutes interval
- The load survey record stored are cumulative kWh, kWh, consumption kWh, kVARh at 00.00 hours on daily basis
- Demand kWh, kWh for 96/48 integrated values with max/min of the day
- Daily average VI profile for every 15/30 minutes with high/low of the day
- No supply period and no load period on daily basis in hours and minutes

**COMMUNICATION CAPABILITY**

- Data Collection through Optical Port / IrDA with IEC 62056-21 protocol (standard)
- Data Collection through Optical Port with DLMS (Optional)
- Isolated RS232 / RS485 with MODBUS RTU protocol (Optional)
- Data Collection through Low Power RF / GPRS networks for AMR applications

**TOD**

- 8 TOD Time zones are provided for energy and demand
- Number of zones and timings of zones are programmable
- Changing of time zones through optical port is possible with password protection through CMRI

**APPLICATIONS**

- Residential meters for housing colonies and buildings
- Billing systems for shopping malls, IT Parks and other commercial establishments
- Secondary metering
- Windmill AMR
SMART METERS

RF Based Remote Connect
Disconnect Meter

- Metering system offers automated meter reading through RF communication by using ZigBee Module
- Remote connect / disconnect facility available
- Latching relay is used to connect / disconnect the meter from the electrical network
- Measured information is shown in 6 digit LCD display with backlit
- 2 no’s push buttons are provided to scroll / battery backup

Prepaid Meter

- Metering system offers flexible and reliable revenue management technique to present bill less, revenue cycle using keypad based prepayment metering.
- The measured information is shown on an 8 digit LCD display with backlit.
- 3x4 matrix keypad is provided on the front panel of the meter to type 20 digits token and 2 digit short codes.

FEATURES

- ZigBee Network is used for collecting data through wireless communications
- Mesh network is formed with multiple hopping feature
- RF Transceiver is used transmit and receive the data from meter to DCU
- From DCU the data is uploaded to the billing server through GPRS communication
- Web enabled software can be provided for viewing the meter data and also to operate the connect / disconnect facility of the meter from remote location

APPLICATIONS

- Billing systems for shopping malls, IT Parks and other commercial establishments
- Residential Buildigns and Townships

CONCEPTS

GPRS Network

CONCEPTS

APPLICATIONS
BENEFITS
- 10% - 20% direct energy savings on lighting loads
- Reduced heat - hence cooler lamp operation
- Reduced Air-conditioner cost - Because of cooler lamp operation
- Increases the life of the lamp, hence reduced maintenance and replacement cost
- Blackening of Florescent lamps and color shifting in metal halide lamps are reduced
- Reduction in maximum demand due to reduced energy consumption
- Improves the power factor
- Harmonics injected by electronic lighting ballasts to the line and spikes produced by lighting circuits are reduced, hence power quality is improved
- Tax benefits available for energy saving investment
- Pay back period is normally less than 12 months

FEATURES
- In manual selection mode user selectable switch to select energy saving percentage (Approximately 10% - 20% according to site conditions)
- Auto selection mode Appropriate energy saving percentage is selected automatically depending on the site conditions
- Power and energy meter provided for monitoring the output power and energy to check the savings
- LED status indication with alarm relay output for low and high output voltage - useful in guiding the user to select the appropriate energy saving percentage
- Manual bypass provision available for direct connection without energy saver
- Short circuit and over load protection provided through MCB or MCCB of suitable rating depending on the capacity

OPTIONAL FEATURES
- RS485 port with MODBUS RTU protocol can be provided in the power and energy monitor to log the power, energy savings data through standard SCADA package
- GPRS modem can be interfaced with power and energy monitor and load control can be done from remote location through GSM network
- Load ON time and OFF time, fixed percentage saving during a particular interval can be programmed through SCADA package
- Power factor Improvement capacitors and passive harmonic filters can be provided depending on the load conditions

APPLICATIONS
- Campus Lighting in Large Industries and Commercial Establishments
- Shopping Malls, Hotels, Hospitals, IT Parks and Commercial Complexes, Indoor and Outdoor Stadiums
- Educational Institutions, Auditoriums
- Campus Lighting in Public Sectors like Railways and Power generation plants
- Textiles, Refineries and all major Process Industries

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Supply</th>
<th>Single Phase two wire</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>220 - 260V L-N for Single Phase</td>
<td>a) R, Y, B power ON LED indication</td>
</tr>
<tr>
<td></td>
<td>380 - 450V L-L for Three Phases</td>
<td>b) LED status indication for low, normal and high output voltage</td>
</tr>
<tr>
<td>Rating</td>
<td>5kVA - 100kVA for Single Phase</td>
<td>c) LED status indication for bypass and save mode</td>
</tr>
<tr>
<td></td>
<td>15kVA - 300kVA for Three Phases</td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>Short circuit and overload protection through MCB/MCCB</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Floor</td>
<td></td>
</tr>
</tbody>
</table>

ENERGY SAVING & PAYBACK CALCULATIONS

- Load => 50 kW of florescent Lamps and metal halide lamps
- Duration of load => 16 Hours in a day
- Number of days load operation in a year => 300 days
- Cost per unit => Rs. 4.50
- Energy Savings on lighting => 15%
- Cost of 60 kVA Energy Saver => Rs. 1,15,000 /-
- Units Consumed without Savelite Energy Saver => 50 kW
- Units Consumed with Savelite Energy Saver => 42.5 kW
- Energy Savings Units / hour => 7.5 kW (50 - 42.5)
- Energy Savings Units / day => 120 kW (7.5 x 16)
- Energy Savings Units / Annnum => 36,000 kW (120 x 300)
- Total Savings = 1,62,000/- Rs. (36,000 x 4.50)
- Payback period = 1,15,000 / 1,62,000 (Less than 9 months)
POWER FACTOR CONTROLLER

Display of True RMS voltage and current
THD in % of voltage
THD in % of current
Individual Harmonic Amplitude and in % of voltage spectrum
Individual Harmonic Amplitude and in % of current spectrum
Displays up to 31st harmonic
Total demand distortion (TDD) display
Continuous harmonic monitoring

Communication port RS485 with MODBUS-RTU to PC
Derating of Transformer, cables, breakers can be decided.
Effects of the mitigating devices / filters can be quantified
Voltage: 100 - 520V AC L-L for LT | 30 - 140V AC L-L for HT
Current: 5A / 1A AC
Accuracy: +1% +1 LSD for magnitude +2% over full scale for % values (for loads more than 20%)

APPLICATIONS
Load distribution centers for PCs, UPS, light loads
Control panels used in drives rectifiers, power converters.
VAR compensation panels
**POWER FACTOR CONTROL PANEL**

### BENEFITS OF POWER FACTOR IMPROVEMENT
- Substantial reduction in kVA demand and avoids penalty for low PF
- Considerable reduction of Transformer and line losses
- Reduction in voltage drop resulting in better system voltage regulation
- Reduction in maintenance, capital cost and longer life of distribution equipments due to lesser current carried in the system
- Reduction in voltage drop resulting in better system voltage regulation
- Reduction in maintenance, capital cost and longer life of distribution equipments due to lesser current carried in the system
- Reduction in reactive Power Demand from the supply system since PFC Panel compensates the reactive power of inductive loads
- Reduced I/R losses
- Payback for the PF Panel is normally within 8 to 12 months

### TECHNICAL SPECIFICATION
- System Voltage: 440V AC 3 Phase
- Panel Rating: 50 kVAR to 800 kVAR
- Number of Steps: 4 / 6 / 8 / 12 / 16
- Type of capacitor: Heavy Duty gas filled MPP/APP
- Switching Device: Thyristor / Capacitor duty contactor
- Panel Mounting: Indoor Application
- Protection Class: IP42
- Standard: IEC 60831
- Panel Construction: Cubicle / Compartmentalized

### ICD SOLUTIONS FOR REACTIVE POWER COMPENSATION SYSTEM
- Calculated fixed capacitor banks with manual ON/OFF switch with or without de-tuned reactor
- Contactor switched Power Factor Correction Systems (APFC) - RPC 9520
- Thyristor switched Power Factor Correction Systems (DPFC) - RPD 9520
- Special type DPFC Panel to correct individual phases separately for unbalanced system either line to line or line to neutral - RPD9550

**APF Panel:**
- Here automatic Power Factor correction takes place with respect to load requirements through PF Controller and contactor switching
- Use of Capacitor duty contactors limit the inrush current during switching and enhance the life of the capacitor

**DPF Panel:**
- Power Factor correction takes place using fast PF controller and Thyristor Switching modules
- Most effective power factor correction takes place for fast fluctuating and dynamically varying loads

**DFP Panel for Unbalanced System:**
- Here Power Factor Correction takes place by use of ultra fast PF Controller and Thyristor Modules for capacitor switching along with suitable de-tuned reactor
- Most suitable for 2 phase welding machines, furnace and unbalanced loads and compensation is possible even load is operated for few cycles

### ADVANTAGES OF USING THYRISTOR SWITCHING MODULES
- Real time Power Factor correction is possible
- Thyristor switching ensures nearly zero current through capacitors during switching, avoiding system transients thus improving power quality
- Capacitor lifetime is very much extended
- Infinite number of switching operations since no mechanical moving contacts are involved
- Switching at zero voltage difference between Thyristor and Capacitor facilitates immediate re-connection of capacitor banks ensuring fast correction
- Fast response time of 5 - 20 ms.
- Cycle to cycle compensation is possible

### APPLICATIONS
- 1Ø and 3Ø Welding Equipments
- Wind Turbine Generators
- Robotic Machinery
- Steel Rolling Mills
- Elevators, Cranes, Presses
- IT Companies, Hospitals
- Water Treatment Plants
- Air-conditioning etc.
HARMONIC FILTERS

HARMONICS
Any device with non-linear operating characteristics, draw current from the source which does not follow the voltage wave form and introduce wave form distortion in current. These wave form distortion in current are called current harmonics. The harmonic current produced by the non linear loads flow through the system impedances and generate voltage harmonics.

SOURCES OF HARMONICS
- Variable Speed AC/DC Drives, UPS Systems, Rectifiers
- SMPS, Static Converters, Thyristor controlled systems Frequency controlled Induction furnaces
- Arcing equipment, Arc furnaces, Welding, Lighting
- When saturation is reached in Transformers, Motors, Generators

PROBLEMS CREATED BY HARMONICS
- Reduced energy efficiency in the network
- Excessive Heating and failure of Capacitors, Fuses, Motors, Transformers, Cables, Switch gears and Lighting Ballast etc
- Nuisance Tripping of Circuit Breaker or frequent blowing of fuses
- Erroneous operation of control system equipments
- Damages to sensitive electronic equipments and Communication interferences

PASSIVE HARMONIC FILTERS
When the harmonics present in the system is more, simple capacitor is not suitable for Power Factor improvement because,
- Capacitor reactance \( X_c \) decreases with the increase of frequency. Hence it offers low impedance for Harmonic frequencies. So even smaller amplitudes of the harmonic voltages result in higher currents through the capacitors which are detrimental to the capacitors and power system
- More critical is that the connected capacitors and the transformer inductance may cause a parallel resonant circuit. If this frequency matches the harmonic frequency, the resulting circuit amplifies the harmonics and lead to very high over voltage and over currents which is detrimental to the system
- Under these conditions de-tuned passive filter system of suitable tuning frequency is the solution for the improvement of Power Factor
- De-tuned capacitor banks consist of a series circuit of capacitor and a specific filter reactor. The resonance frequency of the de-tuned bank does not match close to any of the existing harmonic. It is normally lower than the lowest harmonic frequency present in the system, usually 5th harmonic
- De-tuned system ensures no resonant condition and no amplification of harmonic currents
- De-tuned system ensures a partial harmonic filtering effect reducing the level of harmonic voltage distortion on the supply

TYPES OF PASSIVE HARMONIC FILTERS
- Contactor switched De-tuned Harmonic Filter System RPC 9530
- Thyristor switched De-tuned Harmonic Filter System RPD 9530
- Tuned Harmonic Filter System

BENEFITS OF HARMONIC FILTER SYSTEMS
- Reduction of harmonic currents in the electrical network
- Eliminates resonance condition, Improvement of True Power Factor
- No derating of the transformers and motors due to harmonic losses
- Better utilisation of the electrical system and system efficiency at its best
- Good life expectancy for all the electrical and electronic components
- Penalty by EB authorities for poor PF is avoided and hence reduced electricity bills

SELECTION GUIDE FOR PASSIVE HARMONIC FILTER SYSTEM

<table>
<thead>
<tr>
<th>TYPES OF LOADS</th>
<th>Harmonic Level less than IEEE 519 Standards</th>
<th>THDV&lt;3% &amp; THDI&lt;5%</th>
<th>THDV&lt;5% &amp; THDI&lt;10%</th>
<th>THDV&lt;10% &amp; THDI&lt;20%</th>
<th>THDV&lt;20% &amp; THDI&lt;25%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady Load</td>
<td>Fixed Capacitors</td>
<td>Fixed De-tuned Filter Banks</td>
<td>Fixed Tuned Filter Banks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slow Varying Loads</td>
<td>APFC Systems RPC 9520</td>
<td>Contactor Switched De-tuned Filter Banks RPC 9530</td>
<td>Variable Tuned Filter Banks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fast Fluctuating Loads</td>
<td>DPFC Systems RPD 9520</td>
<td>Thyristor Switched De-tuned Filter Banks RPD 9530</td>
<td>Active Harmonic Filter</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ACTIVE HARMONIC FILTER

Features
- IGBT-PWM Voltage source converter technology with DSP based digital controller
- Harmonic current cancellation better than IEEE519-1992 standards
- Advanced control strategy to realize simultaneous cancellation of different harmonics
- Programmable task priorities for power factor correction and harmonic cancellation
- Response time less than 1 ms
- Tested by CPRI, Bangalore
- Proven technology from CDAC, Trivandrum
- Rating 30 kVar to 250 kVar for 415/440V AC 3 Phase 4 wire

APPLICATIONS
- Harmonic Filtering for AC / DC Motor Drives
- Rectifiers used for battery charging applications
- Welding Machines and Furnace applications
- Power Factor improvement for all kind of loads in the presence of harmonics

SERVICES PROVIDED IN THE AREA OF POWER FACTOR / POWER QUALITY IMPROVEMENT BY ICD
- Load Flow studies, Harmonic studies and Power Quality studies are conducted at site
- Harmonics, Load Pattern, Single Line Diagram of the Network, Network Components are analyzed by our panel of experts to understand the problem accurately
- Based upon the type of application requirement and location, appropriate Power Factor / Harmonic Filter Solution of suitable rating is designed and proposed along with the payback and annual saving calculations
- Commissioning and Testing of ICD Power Factor / Harmonic Filter Systems
- The Performance of the Systems are monitored and validated to prove its impact after installation
Services

Harmonic Analysis Study

Objective
The objective of the study is to measure the Total Harmonic Distribution, Order of individual harmonics, Power Factor at the Distribution Transformer and Outgoing Feeders to give solution for Power Factor Improvement and Harmonic Mitigation.

Methodology of the study
- Phase 1: Site study and Audit Plan
- Phase 2: Data collection and Field Monitoring Program
- Phase 3: Data Analysis & Report Preparation

Audit Planning
Based on the information obtained, a comprehensive work method would be developed for carrying out the power quality audit. Provision required for field measurement and depth of review at load centre would also be planned along with the client electrical / energy engineers prior to measurement.

Data Collection
The following information collected from the client resource personnel during the visit for Harmonic Audit.
1. Details of transformers and its connected load
2. List of non-linear loads across the Distribution Transformer
3. Capacity of installed capacitor bank / APFC panel and its location
4. Energy Management procedures
5. Single line Diagram of the Distribution System

Data Analysis and Report Preparation
Based on the audit findings and detailed analysis, the power quality audit report is prepared and verified to be in accordance with IEEE - 519 : 1992 standards. Also the power quality issues if observed is high-lightened and the audit findings is submitted. Based on the final observed data across the measured feeders, the recommendations / proposal for the harmonic filter implementations are derived and submitted.

Installation and Commissioning
ICD caters meter installation & commissioning services for Energy Management System which covers
- Taking panel cutouts for new meters
- Net working of meters using RS485 communication cable or RJ45 Ethernet CAT6 cable
- Laying of Armoured or Unarmored cable
- PT & CT wiring to meters
- Laying of Fiber optic cable
- Development, supply & installation of SCADA software package for Energy Management System

Customized Jobs
- Apart from the standard Manufacturing products ICD provides solutions to industries for their process needs by doing the customized jobs
- With our detailed experts in design and development ICD can provide Industries the best optimized solutions

Our Clients
- Automobiles
- Cement Factories
- Steel Industries
- Power Plants
- Tyre Industries
- IT Parks
- Railways
- Townships
- Aluminium Industries
- Petro Chemical Industries
- Paper Mills
- Wind Mills
- OEM
- Commercial Complex - Malls
- Textile Industries