In A State Of Pleasant Surprise!
When we promise, we deliver.

We change with the changing markets; we bring in changes that change the markets.

We respond to customer feedback.

No wonder our customers remain in a permanent state of pleasant surprise!

We are Minilec

Starting operations in 1965 as a manufacturer of single phasing preventors (phase failure relays), Minilec is today a leading group involved in 100% indigenous production, marketing and export of reliable industrial electronic products for protection, control and monitoring.

Our insistence on quality has resulted in customer insistence for our products. Our continuous effort to introduce new features to enhance product performance, adapt new technology to bring in greater sophistication and evolve new products in anticipation of market needs gives our customers many reasons to remain in a permanent state of pleasant surprise!
THE MINILEC GROUP

ORGANISATION
The Minilec Group is a progress-oriented organisation incorporating four group companies. Group companies work on niche areas to ensure an ‘activity focus’. The group is very well-knit and works together keeping the larger picture in sight.

Minilec (India) Pvt. Ltd. – A world-class manufacturer and exporter of microprocessor-based alarm annunciators, pre-programmed logic controllers, diesel level controllers, motor/pump protection relays, thermistor-based winding protection relays etc.

Minilec Protective Relays Pvt. Ltd. – Manufacturer of a variety of protection relays

Minilec Singapore Pte. Ltd. – The S-E Asia marketing wing

Shalaka Electronics Pvt. Ltd. – For export of Minilec products

NETWORK & CUSTOMER SUPPORT
Minilec has a strong sales and service network in the country which, along with an extensive dealer network, ensures reliable and prompt after-sales service. We also have a wide base internationally.
Minilec’s benchmark developments have shaped the markets since 1965. For instance, in the year 2002, responding to customer feedback, we introduced multiple options in enclosures of relays, in addition to the existing D1-D2, P1-P2 and F3 enclosures. This product enhancement gave our customers the much needed flexibility in terms of size and started a trend. Another interesting product development came anticipating a market need, the MBAS 9400 with front replaceable windows, which gave us the edge to win a major tender from Indonesian Electricity Authority against American and Japanese competitors in 1994. This updation in MBAS 9400 has also ensured a continuous flow of orders from the Malaysian Electricity Authority since 1994.

**BENCHMARK DEVELOPMENTS 1965-2007**

1965:
First to design and manufacture single phasing preventors in India and fulfill an emerging market requirement innovatively.

1982:
First to launch micro-processor based alarm annunciator. (Redesigned as Microwarn 9000 in 1990), this was, and remains the most beautiful alarm annunciator attracting customers across the globe.

1984:
First to introduce super bright LEDs for facia of alarm annunciators.

1987:
First to launch prodless dry run protection device pump guard. This innovation alone, won us several new customers globally.

1994:
First company in our segment to get ISO 9001.

1997:
First company to introduce RS232 communication port to alarm annunciators.

1997:
Millennium Series (P1 & P2 enclosures) products launched

2000:
MBAS 9700 expanded up to 128 channels.

2005:
MBAS 9700 expanded up to 128 channels.

2006:
Microcontroller based relays replacing existing relays (D1 & D2 series) introduced.

2007:
S2 (Sleek) Series products with microcontroller & SMD technology launched. This technology has the powerful advantage of added intelligence. State of art SMD technology & microprocessor based design gives higher reliability, multi purpose functionality, reduced size & more value.

2007-08:
Innovative and upgraded new products with latest technology are poised to change the face of the emerging market in India and abroad.

2007:
Innovative and upgraded new products with latest technology are poised to change the face of the emerging market in India and abroad.
**PROGRESS**

Every small change or a big expansion that serves the customer better is progress. To us at Minilec, one more pleasant surprise for our customers is progress. This progress is evident in every area, be it figures of turnover and exports or developments in infrastructure, products and R&D.

**INFRASTRUCTURE**

- **40,000 sq.ft Premises**
  - Located in clean, green and environment friendly location at Pirangoot Industrial Estate near Pune, includes 10,000 sq.ft of recent addition.

- **200+ Employees**
  - Highly qualified engineers, R&D experts, quality control technicians and administrative staff, all very well-trained to ensure high quality results.

- **Sophisticated R&D laboratory**
- **Well-calibrated testing equipments**

- **Manufacturing facility to cater ever-growing customer demands**
- **Innovative designs are made here.**
QUALITY SYSTEMS
Stringent quality checks by carefully selected vendors, extensive inward inspection and proven production processes continuously improve product quality at Minilec. Minilec’s Quality Systems are verified by BVQI to be as per ISO 9001 requirement of international quality standards. The products are also thoroughly type tested at reputed test houses in India, Singapore, Malaysia and Russia as per the IEC standards.

ACCREDITATIONS
The Models of phase failure relays and alarm annunciators carry CE mark and CSA Certification.

QUALITY FOCUS
'Timely supply of reliable products with innovative features for customer satisfaction.'

– Quality Policy of Minilec
PRODUCTS

WIDEST RANGE
Minilec is the only company in the world offering the widest range of products in all three product segments viz. protection, control and monitoring.
Our products cater to every agro. and industrial segment and provide for the needs of small scale industries as well as corporate giants like Siemens and Reliance.

PRODUCT CATEGORIES
- Phase Failure Relays
- Voltage / Current / Frequency /
  Power Monitoring Relays
- Motor/Pump Protection Relays
- Level Controllers
- Timers
- Alarm Annunciators
- Power Line Transducers
- Pump Automation Products
- Soft Starters
- Process & Plant Controllers
- SCADA Systems

TREND-SETTING DESIGNS
Our product designs today set the trends for the markets in India. Minilec’s quality is a standard that even competitors aspire for. Our products are approved by leading industrial project consultants. Growing demand for our products world-wide is a proof of customer acceptance for our products globally. Our products are rated as ‘being the best’ on the three criteria of Quality, Product Features and Delivery Schedules.

SECTOR DIVERSIFICATION
Omnipresence of our products across agro and industrial sectors.

- 20% Farm Irrigation
- 15% Air Conditioning & Refrigeration
- 15% Power Generation, Transmission & Distribution
- 10% Water Supply & Sewerage
- 10% Process Industry
- 5% Material Handling
- 15% Telecommunication

THOROUGH APPROACH TO PRODUCT RELATED EDUCATION
We update our customers & dealers about our latest product range and breakthrough technology through various seminars, training sessions and regular product literature. This ensures optimum utilization of the latest features and technology used in products.
Turnover has shown a steady increase. Even in times of market lows, Minilec has never found it difficult to keep a growing turnover trend.

EXPORTS:
Exports rose steadily in the initial years, and are now showing a rapid growth fueled by a very encouraging reception of our products globally. Minilec has traditionally exported to S.E. Asia, Europe and the Middle-East. Exports to North and South America are now increasing substantially.

CUSTOMERS
Minilec’s customers span a wide spectrum of segments and scale. Repeat orders from customers for decades is a very big confirmation of customer delight with our products.
These relays are suitable for monitoring incoming 3-phase supply from Mains (Electricity distribution line). Being independent of load, they can be used for any HP/KW rating of load.

**MODELS**
- VSP D1, VSP D2,
- P1PF S1, P1PF S2,
- P2PF S1, S2 VMR1,
- S2 VMR2, HLS D2,
- HLV D2, ALV D2,
- VST D1, P2 PFV1,
- F3 PFV1, D2 VMR1,
- D2 VMR2, S2 VMR3

**FEATURES**
- Fixed/adjustable unbalance settings
- Fixed/adjustable under-voltage/over-voltage settings
- Fixed/adjustable trip delays
- Built-in or external power supply
- Resetting Auto or Manual
- Output contacts (1 CO or 2 CO)
- Choice of enclosures (DIN-Rail, Plug-in, Flush)
- Models with Micro-Controller based design
- Use of SMD Technology
- User-friendly LED indications

**PROTECTIONS / FUNCTIONS**
- Phase Failure (Phase Loss / Single Phasing)
- Phase sequence reversal
- Voltage Unbalance
- Under Voltage
- Over Voltage

**Ordering Instructions**
- Product Family Name
- Model Name
- System Supply Voltage
- Aux. Supply / Control supply voltage
### PHASE FAILURE RELAYS

<table>
<thead>
<tr>
<th>Relay Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP D1</td>
<td>Phase Failure, Unbalance, Phase Sequence, Auto Reset, Fixed Unbalance Setting, 1 CO output Relay</td>
</tr>
<tr>
<td>VSP D2</td>
<td>Phase Failure, Unbalance, Phase Sequence, Auto / Manual / Remote Reset, Adjustable Unbalance setting, 2 CO output relay</td>
</tr>
<tr>
<td>P1 PFS1</td>
<td>Phase Sequence, Phase Loss Auto Reset, 1 CO output relay</td>
</tr>
</tbody>
</table>

#### Supply Voltage
- **System**: 110 / 240 / 380 / 415 V AC ±20% / 50 / 60 Hz
- **Auxiliary**: 110 / 240 / 380 / 415 / 440 V AC ±50%

#### Output Contacts
- **VSP D1**: 1 CO
- **VSP D2**: 2 CO
- **P1 PFS1**: 1 CO (Pick-up on correct phase sequence)

#### Trip Setting [Volts]
- **Phase Sequence**: Yes / N.A.
- **Phase Unbalance**: 40 V ± 5 V (fixed) / 30 V ± 10 V ± 6 V (adjustable)

#### Trip Time Delay
- **On Phase Failure/Sequence**: 3.5 sec. ± 1.5 sec.

#### Mounting
- **Dimensions (mm)**: 76 x 30.5 x 117.5
- **Supply Voltage**: 110 / 240 / 380 / 415 V AC ±20%
- **Output Contacts**: 2 CO
- **Resetting Mode**: Auto / Manual / Remote

#### Weight
- **VSP D1**: 320 gms.
- **VSP D2**: 400 gms.
- **P1 PFS1**: 175 gms.

#### Dimensions (mm)
- **Mounting (L x W)**: 67 x 46 / 35 mm rail Mounting

#### Relay Contact Position
- Contact Rating: 5A @ 230 V AC (resistive)
- Available on request.

---

*Wherever not specified*
- Contact Rating *N.A.*
- Mounting (L x W) *N.A.*
- Weight *N.A.*
- *Available on request.*

---

Bottom view

Relay contact position shown in ‘Power on’ (Healthy) condition
### Phase Failure Relays

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 PFS2</td>
<td>Phase Failure Relay</td>
<td>±10% / 80 / 240 / 380 / 415 V ±10% / 50 Hz</td>
</tr>
<tr>
<td>P2 PFS1</td>
<td>Phase Failure Relay</td>
<td>±70% / 80 / 240 / 380 / 415 V ±70% / 60 Hz</td>
</tr>
<tr>
<td>S2 VMR1</td>
<td>Phase Failure Relay</td>
<td>±10% / 80 / 240 / 380 / 415 V ±10% / 60 Hz</td>
</tr>
<tr>
<td>S2 VMR2</td>
<td>Phase Failure Relay</td>
<td>±70% / 80 / 240 / 380 / 415 V ±70% / 60 Hz</td>
</tr>
</tbody>
</table>

- **Phase Failure, Unbalance, Phase Sequence, Auto reset, Adjustable Unbalance setting, 1 CO output relay**
- **Microcontroller design, SMD Technology, Phase Failure, Unbalance, Phase Sequence, Auto reset, Adjustable Unbalance setting, 2 CO output relay**
- **Microcontroller design, SMD Technology, Phase Failure, Unbalance, Phase Sequence, under voltage, Over Voltage, Auto reset, Fixed Unbalance setting, Fixed UV/OV settings, 2 CO output relay**

**Specifications:**
- **Input Voltage:** 110 V / 220 V / 380 V / 415 V ±10% / 50 Hz
- **Load:** 20 A
- **Contact Rating:** 1,000 VA / 1,000 VA
- **Contact Life:** 100,000 cycles
- **Contact Form:** SPST-NO
- **Relay Type:** Power failure relay
- **Relay Design:** SMD technology
- **Phase Sequence:** Auto reset, Adjustable Unbalance setting
- **Unbalance Setting:** Adjustable
- **Output Relays:** 2 CO output relays

**Additional Features:**
- Auto reset
- Adjustable unbalance setting
- Built-in 1 CO output relay
- Built-in 2 CO output relay
- Built-in 3 CO output relay
- Built-in 4 CO output relay

**Physical Specifications:**
- **Dimensions:** 80 x 35 x 95 mm
- **Weight:** 110 g

**Relay Contact Position:**
- Power on (Healthy) condition
- Power off (Faulty) condition

**Relay Position:**
- Bottom view

---

**Bottom View Images:**
- Relay contact position shown in 'Power on' (Healthy) condition
- Relay position shown in 'Power off' condition
**PHASE FAILURE RELAYS**

**HLS D2**  Phase Failure with UV / OV Relay

- Phase Failure, Unbalance, Phase Sequence, under voltage, Over Voltage
- Auto reset, Fixed Unbalance setting, Fixed UV/OV settings, 2 CO output relay

**HLV D2**  Phase Failure with UV / OV Relay

- Phase Failure, Unbalance, Phase Sequence, under voltage, Over Voltage
- Manual reset, Fixed Unbalance setting, Adjustable UV/OV settings, 2 CO output relay

**ALV D2**  Phase Failure with UV / OV Relay

- Phase Failure, Unbalance, Phase Sequence, under voltage, Over Voltage
- Auto Reset, Fixed Unbalance setting, Adjustable UV/OV settings, 2 CO output relay

**Supply Voltage**
- HLS D2: 240 / 380 / 415 / 440 V AC ±20% 50 / 60 Hz
- HLV D2: 240 / 380 / 415 / 440 V AC ±20% 50 / 60 Hz
- ALV D2: 240 / 380 / 415 / 440 V AC ±20% 50 / 60 Hz

**Output Contacts**
- HLS D2: 2 CO
- HLV D2: 2 CO
- ALV D2: 2 CO

**Trip Setting (Volts)**

<table>
<thead>
<tr>
<th>Relay</th>
<th>Phase Sequence</th>
<th>Phase Unbalance</th>
<th>Under Voltage</th>
<th>Over Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLS D2</td>
<td>Yes</td>
<td>40 V ±6 V (fixed)</td>
<td>80% to 95% (adjustable)</td>
<td>105% to 120% (adjustable)</td>
</tr>
<tr>
<td>HLV D2</td>
<td>Yes</td>
<td>40 V ±6 V (fixed)</td>
<td>80% to 95% (adjustable)</td>
<td>105% to 120% (adjustable)</td>
</tr>
<tr>
<td>ALV D2</td>
<td>Yes</td>
<td>40 V ±6 V (fixed)</td>
<td>80% to 95% (adjustable)</td>
<td>105% to 120% (adjustable)</td>
</tr>
</tbody>
</table>

**Dimensions (mm)**

<table>
<thead>
<tr>
<th>Relay</th>
<th>Overall (L x W x D)</th>
<th>Mounting (L x W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLS D2</td>
<td>76 x 56.5 x 117.5</td>
<td>61 x 48</td>
</tr>
<tr>
<td>HLV D2</td>
<td>76 x 56.5 x 117.5</td>
<td>61 x 48</td>
</tr>
<tr>
<td>ALV D2</td>
<td>76 x 56.5 x 117.5</td>
<td>61 x 48</td>
</tr>
</tbody>
</table>

**Weight**
- HLS D2: 400 gms
- HLV D2: 430 gms
- ALV D2: 400 gms

**Wherever not specified:**
- Contact Rating: 5A @ 230 V AC (resistive)
- CE marked products available on request.

Relay contact position shown in ‘Power on’ (Healthy) condition
## Phase Failure Relays

### VST D1

Phase Failure with Under Voltage

- Phase Failure, Phase Sequence, Under voltage, Auto Reset, Adjustable UV setting, 1 CO output relay
- Selectable range of supply voltage

<table>
<thead>
<tr>
<th>Supply Voltage</th>
<th>240 / 415 / 575 V AC (±15% selectable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Load</td>
<td>380 / 415 V ± 15%, 50/60 Hz</td>
</tr>
<tr>
<td>CO</td>
<td>1 CO</td>
</tr>
<tr>
<td>Auto</td>
<td>Yes</td>
</tr>
<tr>
<td>UV</td>
<td>40 V ± 6 V (fixed)</td>
</tr>
<tr>
<td>SP</td>
<td>80% - 95% (adjustable)</td>
</tr>
<tr>
<td>ST</td>
<td>105% - 115% (adjustable)</td>
</tr>
<tr>
<td>Weight</td>
<td>250 gms</td>
</tr>
<tr>
<td>Dimensions</td>
<td>80 x 35 x 95</td>
</tr>
<tr>
<td>Units</td>
<td>11 - Pin Plug-in</td>
</tr>
</tbody>
</table>

### P2 PFV1

Phase Failure with UV/OV Relay

- Phase Failure, Unbalance, Phase Sequence, Under voltage, Over Voltage
- Auto Reset, Fixed Unbalance setting, Adjustable UV/OV settings, 2 CO output relay

<table>
<thead>
<tr>
<th>Supply Voltage</th>
<th>240 / 380 / 415 V AC ± 20%, 50 / 60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Load</td>
<td>110 / 240 / 380 / 415 / 440 V AC ± 20%</td>
</tr>
<tr>
<td>CO</td>
<td>Yes</td>
</tr>
<tr>
<td>UV</td>
<td>40 V ± 6 V (fixed)</td>
</tr>
<tr>
<td>SP</td>
<td>85% to 95% (adjustable)</td>
</tr>
<tr>
<td>ST</td>
<td>105% to 115% (adjustable)</td>
</tr>
<tr>
<td>Weight</td>
<td>430 gms</td>
</tr>
<tr>
<td>Dimensions</td>
<td>96 x 96 x 76 (Flush mounting)</td>
</tr>
<tr>
<td>Units</td>
<td>92 x 92 (cutout)</td>
</tr>
</tbody>
</table>

### F3 PFV1

Phase Failure with UV/OV Relay

- Phase Failure, Unbalance, Phase Sequence, Under voltage, Over Voltage
- Auto Reset, Fixed Unbalance setting, Adjustable UV/OV settings, 1 CO output relay

<table>
<thead>
<tr>
<th>Supply Voltage</th>
<th>240 / 415 / 575 V AC 3 Phase (±15% selectable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Load</td>
<td>380 / 415 V ± 15%, 50/60 Hz</td>
</tr>
<tr>
<td>CO</td>
<td>2 CO</td>
</tr>
<tr>
<td>Auto</td>
<td>Yes</td>
</tr>
<tr>
<td>UV</td>
<td>40 V ± 6 V (fixed)</td>
</tr>
<tr>
<td>SP</td>
<td>80% to 95% (adjustable)</td>
</tr>
<tr>
<td>ST</td>
<td>105% to 115% (adjustable)</td>
</tr>
<tr>
<td>Weight</td>
<td>800 gms</td>
</tr>
<tr>
<td>Dimensions</td>
<td>80 x 35 x 95</td>
</tr>
<tr>
<td>Units</td>
<td>11 - Pin Plug-in</td>
</tr>
</tbody>
</table>

Relay contact position shown in ‘Power on’ (Healthy) condition
### D2 VMR 1
**Phase Failure with UV / OV (3Ø-3W)**
- Suitable for 3 Ph-3W system,
- Microcontroller design,
- Absolute values of UV/OV settings,
- Phase Failure, Unbalance, Phase Sequence, under voltage, Over Voltage,
- Auto/Manual reset, Adjustable settings for Unbalance, UV/OV and trip delays,
- 2 CO output relay

### D2 VMR 2
**Phase Failure with UV / OV (3Ø-4W)**
- Suitable for 3 Ph-4W system,
- Microcontroller design,
- Absolute values of UV/OV settings,
- Phase Failure, Unbalance, Phase Sequence, under voltage, Over Voltage,
- Auto/Manual reset, Adjustable settings for Unbalance, UV/OV and trip delays,
- 2 CO output relay

### S2 VMR 3
**Phase Failure with UV / OV Relay**
- Microcontroller design,
- SMD Technology,
- Absolute values of UV/OV settings,
- Phase Failure, Unbalance, Phase Sequence, under voltage, Over Voltage,
- Auto/Manual reset, Adjustable settings for Unbalance, UV/OV and trip delays,
- 2 CO output relay

---

#### Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>D2 VMR 1</th>
<th>D2 VMR 2</th>
<th>S2 VMR 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply Voltage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Auxiliary</strong></td>
<td>Built-in 9V battery</td>
<td>Built-in 9V battery</td>
<td>Built-in 9V battery</td>
</tr>
<tr>
<td><strong>Output Contacts</strong></td>
<td>2 CO</td>
<td>2 CO</td>
<td>2 CO</td>
</tr>
<tr>
<td><strong>Trip Setting (Vac)</strong></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Phase Sequence</strong></td>
<td>4% - 20% (Variable)</td>
<td>4% - 20% (Variable)</td>
<td>4% - 30% (Variable)</td>
</tr>
<tr>
<td><strong>Under Voltage</strong></td>
<td>285-420V AC (Variable)</td>
<td>285-430V AC (Variable)</td>
<td>285-420V AC (Variable)</td>
</tr>
<tr>
<td><strong>For</strong></td>
<td></td>
<td>105-250V AC (Variable)</td>
<td>165-225V AC (Variable)</td>
</tr>
<tr>
<td><strong>Trip Delay</strong></td>
<td>1 To 10 Sec (Variable)</td>
<td>1 To 10 Sec (Variable)</td>
<td>1 To 10 Sec (Variable)</td>
</tr>
<tr>
<td><strong>Resetting Mode</strong></td>
<td>Auto/Manual Reset (For NC Push Buttons)</td>
<td>Auto/External Manual Reset (For NC Push Buttons)</td>
<td>Auto/Manual Reset (Selectable)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>330 gms.</td>
<td>330 gms.</td>
<td>110 gms (Approx.)</td>
</tr>
<tr>
<td><strong>Dimensions (mm)</strong></td>
<td>76 x 56 x 117.5</td>
<td>76 x 56 x 117.5</td>
<td>35 x 40 x 50</td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td>87 x 48 + 30 mm rail Mounting</td>
<td>87 x 48 + 30 mm rail Mounting</td>
<td>35 mm Rail Mounting</td>
</tr>
</tbody>
</table>

---

**Notes:**
- Wherever not specified, Contact Rating: 5A @ 230 V AC (switched).
- CE Marked products available on request.

---

**Relay position shown in 'Power off' condition**
These relays are best suitable for monitoring balanced or unbalanced supplies, either of single phase, 3-phase 3-wire or 3-phase 4 wire loads powered by generators, UPS, stabilizers, inverters, or Mains (by Electricity Boards / Utilities); in AMF panels, PCCs, distribution boards and for power monitoring of individual loads / motors / pumps.

**MODELS**
VCR D2, D1 VCR1
UVT D1, UVF D1,
VCT D2, VCF D2, D2 VCT1,
S2 VMR 4, S2 VMR 5,
D2 EFR1, CCSD2, OCS D1,
S2 CRM2, S2 CRM3, S2 CRM4,
FC5 D2, OFS D1, S2 FMR2,
RPT D2, RPF D2,
PMR D2 + PTS D1,
F3 VSR1, F3 VSR2, F3 VSR3

**FEATURES**
- Fixed/adjustable under/Over trip settings for parameters.
- Fixed/adjustable trip delays and Power On delays
- Built-in or external power supply
- Resetting – Auto or Manual
- Output contacts : 1 CO or 2 CO
- Choice of enclosures (DIN-Rail, Plug-in, Flush)
- Models with Micro-Controller based design
- 2 line alpha-numeric LCD display (for F3 VSR1/2)
- Serial Communication (RS232) port (for F3 VSR1/2 models)
- Use of SMD Technology
- User-friendly LED indications

**PROTECTIONS / FUNCTIONS**
- Under/over Voltage
- Under/Over Current
- Under/Over Frequency
- Under/Over Power
- Reverse Power
- Earth Fault/Ground Fault
- Earth leakage

**Ordering Instructions**
- Product Family Name
- Model Name
- System Supply Voltage & frequency
- Aux. Supply/Control supply voltage
- Current input (1A or 5A)
**VOLTAGE MONITORING RELAYS**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>1 Phase</th>
<th>3Ø-3W</th>
<th>3Ø-4W</th>
<th>3Ø-3W</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1 VCR 1</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-4W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
</tr>
<tr>
<td>VCT D2</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-4W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
</tr>
<tr>
<td>VCF D2</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
</tr>
<tr>
<td>P2 SMV1</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
<td>Voltage Monitoring Relay, 3Ø-3W</td>
</tr>
</tbody>
</table>

**System Supply**
- 110/240 V AC (+20%,-25%) 50/60Hz
- 220-240 (+20% -30%), 50/60 Hz ±
- 240/380/415 V AC ±15% 50/60Hz

**Output Relay Contact**
- 5A @ 230 V AC (resistive)

**Relay Contact Position** shown in ‘Power on’ (Healthy) condition
### Voltage Monitoring Relays

#### UVT D1
- Under Voltage Relay 3Ø-3W
- 3-Phase 3-Wire Under voltage
- Auto Reset, Adjustable under voltage settings, adjustable trip delay, 1 CO output relay

#### UVF D1
- Under Voltage Relay 3Ø-4W
- 3-Phase 4-Wire Under voltage
- Auto Reset, Adjustable under voltage settings, adjustable trip delay, 1 CO output relay

#### D2 VCT1
- Voltage Monitoring Relay
- 3-Phase 3-Wire Under voltage settings, Adjustable under voltage settings, adjustable trip delay, 1 CO output relay

#### S2 VMR4
- Voltage Monitoring Relay, 3Ø-3W
- 3-Phase 3-Wire Under & Over voltage, 4-Wire (selectable) Under & Over voltage, Adjustable under/over voltage settings, Absolute values for UV/OV, adjustable trip delay & ON delay, 2 CO output relay (or selectable 1CO for UV, 1CO for OV)

#### S2 VMR5
- Voltage Monitoring Relay, 3Ø-4W
- 3-Phase 4-Wire Under & Over voltage, Microcontroller based design, SMD Technology, Auto / Manual Reset, Adjustable under/over voltage settings, Absolute values for UV/OV, adjustable trip delay & ON delay, 2 CO output relay for selectable TOC for UV, TOC for OV

### Specifications
- **UVT D1**
  - Nominal voltage: 100-120 / 220-240 / 380-440V AC ± 20%, 50/60 Hz
  - ON delay: 1-10 Sec (Variable)
  - Relay position shown in ‘Power on’ (Healthy) condition

- **UVF D1**
  - Nominal voltage: 100-120 / 220-240 / 380-440V AC ± 20%, 48-63 Hz
  - ON delay: 1-10 Sec (Variable)
  - Relay position shown in ‘Power off’ condition

### Dimensions
- **UVT D1**: 76 x 30.5 x 117.5 mm
- **UVF D1**: 76 x 56.5 x 117.5 mm
- **D2 VCT1**: 3.5 secs ±1.5 secs
- **S2 VMR4**: 35 X 60 X 90
- **S2 VMR5**: 35 X 60 X 90

### Ratings
- **UVT D1**: 1 CO output relay
- **UVF D1**: 1 CO output relay
- **D2 VCT1**: 2 CO output relay
- **S2 VMR4**: 1 CO output relay
- **S2 VMR5**: 1 CO output relay
## Current Monitoring Relays

### CCS D2
1 Phase Current Monitoring Relay

- Single phase under & over current
- Auto/Manual reset
- Input 1A or 5 A through CT
- Adjustable under/over current trip settings
- Adjustable trip delay & ON delay
- 2 CO output relay

### OCS D1
1 Phase Over Current Relay

- Single phase over current
- Auto reset
- Input 1A or 5 A through CT
- Adjustable over current trip settings
- Adjustable trip delay
- 1 CO output relay

### S2 CMR2
1 Phase Current Monitoring Relay

- Single phase under & over current
- Microcontroller based design
- SMD technology
- Auto/Manual reset
- Input 1A or 5 A through CT
- Adjustable under / over current trip settings
- Adjustable trip delay & ON delay
- 2 CO output relay (or selectable 1CO for UC, 1CO for OC)
- Failsafe-non-failsafe mode selectable

### Specifications

<table>
<thead>
<tr>
<th>CCS D2</th>
<th>OCS D1</th>
<th>S2 CMR2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply Voltage</strong></td>
<td><strong>System</strong></td>
<td><strong>System</strong></td>
</tr>
<tr>
<td>110 / 240 / 380 / 415 V AC ±10%</td>
<td>110 / 240 / 380 / 415 V AC ±10%</td>
<td>110 / 240 / 380 / 415 V AC ±10%</td>
</tr>
<tr>
<td><strong>Auxiliary</strong></td>
<td><strong>Input</strong></td>
<td><strong>Input</strong></td>
</tr>
<tr>
<td>1 Amp or 3 Amp (Selectable) E.T.</td>
<td>1 Amp or 3 Amp (Secondary) E.T.</td>
<td>1 Amp or 3 Amp (Secondary) E.T.</td>
</tr>
<tr>
<td><strong>Output Contact</strong></td>
<td><strong>Output Contact</strong></td>
<td><strong>Output Contact</strong></td>
</tr>
<tr>
<td>2 CO</td>
<td>1 CO</td>
<td>1 CO + 1 CO</td>
</tr>
<tr>
<td><strong>Trip Setting</strong></td>
<td><strong>Trip Setting</strong></td>
<td><strong>Trip Setting</strong></td>
</tr>
<tr>
<td>Under Current</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>Over Current</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td><strong>Power On Delay</strong></td>
<td><strong>Power On Delay</strong></td>
<td><strong>Power On Delay</strong></td>
</tr>
<tr>
<td>1 - 10 sec (adjustable)</td>
<td>1 - 10 sec (adjustable)</td>
<td>1 - 10 sec (adjustable)</td>
</tr>
<tr>
<td><strong>Trip Time Delay</strong></td>
<td><strong>Trip Time Delay</strong></td>
<td><strong>Trip Time Delay</strong></td>
</tr>
<tr>
<td>1 - 10 sec (adjustable)</td>
<td>1 - 10 sec (adjustable)</td>
<td>1 - 10 sec (adjustable)</td>
</tr>
<tr>
<td><strong>Resetting</strong></td>
<td><strong>Resetting</strong></td>
<td><strong>Resetting</strong></td>
</tr>
<tr>
<td>Manual / Auto</td>
<td>Manual / Auto</td>
<td>Manual / Auto</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td><strong>Weight</strong></td>
<td><strong>Weight</strong></td>
</tr>
<tr>
<td>550 gms.</td>
<td>250 gms.</td>
<td>140 gms.</td>
</tr>
<tr>
<td><strong>Dimensions (External)</strong></td>
<td><strong>Dimensions (External)</strong></td>
<td><strong>Dimensions (External)</strong></td>
</tr>
<tr>
<td>Overall (L x W x D)</td>
<td>26 x 56.5 x 117.5</td>
<td>26 x 30 x 117.5</td>
</tr>
<tr>
<td>Mounting (L x W)</td>
<td>67 x 46</td>
<td>68 centre to centre</td>
</tr>
</tbody>
</table>

### Notes

- Whenever not specified
- Contact Rating: 5A @ 230 V AC (resistive)
## GROUND FAULT MONITORING RELAYS

<table>
<thead>
<tr>
<th>D2 EFR1</th>
<th>S2 CMR3</th>
<th>S2 CMR4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Earth Fault Relay</strong></td>
<td><strong>Ground Fault Relay</strong></td>
<td><strong>Earth Leakage Relay</strong></td>
</tr>
<tr>
<td>Earth fault/Ground fault monitoring of 3 phase systems, Microcontroller based design, SMD technology, Manual Reset, Input 1A or 5A through CBCT, Adjustable earth fault trip setting, Adjustable trip delay &amp; ON delay, 2 CO relay output</td>
<td>Earth fault/Ground fault monitoring of 3 phase systems, Microcontroller based design, SMD technology, Manual Reset, Input 1A or 5A through CBCT, Adjustable earth fault trip setting, Adjustable trip delay &amp; ON delay, 2 CO relay output</td>
<td>Earth leakage monitoring of 3 phase systems, Microcontroller based design, SMD technology, Manual Reset, Input through CBCT, Adjustable trip setting, Adjustable trip delay &amp; ON delay, 2 CO relay output</td>
</tr>
<tr>
<td>100-110/240/380/415 V AC ± 20%, 48-63 Hz</td>
<td>100-110/240/380/415 V AC ± 20%, 48-63 Hz</td>
<td>100-110/240/380/415/440 V AC ± 20%, 48-63 Hz</td>
</tr>
<tr>
<td>1A or 5A (Selectable) CBCT</td>
<td>1A or 5A (Selectable) CBCT</td>
<td>1A or 5A (Selectable) CBCT</td>
</tr>
<tr>
<td>1 CO (2 CO) (Pick-up on Fault)</td>
<td>1 CO (2 CO) (Pick-up on Fault)</td>
<td>1 CO (2 CO) (Pick-up on Fault)</td>
</tr>
<tr>
<td>10% - 100% (adjustable) of CT sec</td>
<td>10% - 100% (adjustable) of CT sec</td>
<td>10% - 100% of Rated Current Input (Variable)</td>
</tr>
<tr>
<td>500gms</td>
<td>500gms</td>
<td>500gms</td>
</tr>
<tr>
<td>50 x 45 x 130</td>
<td>50 x 45 x 130</td>
<td>50 x 45 x 130</td>
</tr>
<tr>
<td><em>Use either 3 x 5A Ext. CTs or 3 x 1A Ext. CTs or 1 x 5A or 1A CBCT</em></td>
<td><em>Use either 3 x 5A Ext. CTs or 3 x 1A Ext. CTs or 1 x 5A or 1A CBCT</em></td>
<td><em>Use either 3 x 5A Ext. CTs or 3 x 1A Ext. CTs or 1 x 5A or 1A CBCT</em></td>
</tr>
</tbody>
</table>

Relay position in ‘Power on’ (Healthy) condition

Relay position shown in ‘Power off’ condition
**FREQUENCY MONITORING RELAYS**

<table>
<thead>
<tr>
<th></th>
<th>FCS D2 Frequency Monitoring Relay</th>
<th>OFS D1 Over Frequency Relay</th>
<th>S2 FMR1 Frequency Monitoring Relay</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single phase under &amp; over frequency</strong></td>
<td>Auto reset, Adjustable under/over frequency trip settings, Adjustable trip delay &amp; ON delay, 2 CO output relay</td>
<td>Single phase over frequency Auto reset, Adjustable over frequency trip settings, Adjustable trip delay, 1 CO output relay</td>
<td>Single phase under &amp; over frequency, Microcontroller based design, SMD technology, Auto reset, Adjustable under/over frequency trip settings, Adjustable trip delay &amp; ON delay, 2 CO output relay, Failure-safe/failsafe mode selectable</td>
</tr>
</tbody>
</table>

**Supply Voltage**
- **System**: 110/240/380/415 V AC ± 20%
- **Auxiliary**: 110-110/240V AC ± 20%

**Output contact**
- 2 CO
- 1 CO
- 1 CO + 1 LD

**Trip setting**
- Under Current
- Over Current
- Under Frequency
- Over Frequency
- Under Power
- Over Power
- Reverse Power
- *Power on* Delay
- *Trip Time* Delay
- Resetting

**Weight**
- 450 gms
- 450 gms
- 450 gms

**Dimensions**
- Overall (L x W x D): 76 x 56.5 x 117.5
- Mounting (L x W): 76 x 30.5 x 117.5
- 67 x 46
- 68 centre to centre

**Frequency Monitoring Relay Over Frequency Relay Frequency Monitoring Relay**

- Relay contact position shown in ‘Power on’ (Healthy) condition
- Relay position in ‘Power off’ condition

*Whenever not specified Contact Rating: 5A @ 230 V AC (maximal)*
POWER MONITORING RELAYS

**RPT D2**
Reverse Power Relay (3Ø-3W)
- 3-phase 3-wire generators reverse power monitoring
- Auto/Manual reset
- Reverse power (current) trip settings adjustable
- ON delay and trip delay adjustable
- 2 CO output relay

**RPF D2**
Reverse Power Relay (3Ø-4W)
- Single phase or 3-phase 4-wire generators reverse power monitoring
- Auto/Manual reset
- Reverse power (current) trip settings adjustable
- ON delay and trip delay adjustable
- 2 CO output relay

**PMR D2 + PTS D1**
Motor Power Monitoring Relay
- Under Power & Over Power Monitoring
- Auto/Manual Reset
- Adjustable UP/DP settings
- Adjustable On delay and trip delay
- 2 CO output relays

---

### Technical Specifications

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RPT D2</td>
<td>RPF D2</td>
<td>PMR D2 + PTS D1</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>Power</td>
<td>Power</td>
<td>Power</td>
</tr>
<tr>
<td>CT &amp; R, Y, B</td>
<td>CT &amp; R, Y, B</td>
<td>CT &amp; R, Y, B</td>
<td>CT &amp; R, Y, B</td>
</tr>
<tr>
<td>2 CO</td>
<td>2 CO</td>
<td>2 CO</td>
<td>2 CO</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>---</td>
<td>10% - 100% (adjustable)</td>
<td>10% - 100% (adjustable)</td>
<td>10% - 100% (adjustable)</td>
</tr>
<tr>
<td>2% - 20%</td>
<td>2% - 20% (adjustable)</td>
<td>2% - 20% (adjustable)</td>
<td>2% - 20% (adjustable)</td>
</tr>
<tr>
<td>1 - 10 secs</td>
<td>1 - 10 secs (adjustable)</td>
<td>1 - 10 secs (adjustable)</td>
<td>1 - 10 secs (adjustable)</td>
</tr>
<tr>
<td>1 - 10 secs</td>
<td>1 - 10 secs (adjustable)</td>
<td>1 - 10 secs (adjustable)</td>
<td>1 - 10 secs (adjustable)</td>
</tr>
<tr>
<td>Net Price</td>
<td>Net Price</td>
<td>Net Price</td>
<td>Net Price</td>
</tr>
<tr>
<td>76 x 66.5 x 117.5</td>
<td>76 x 66.5 x 117.5</td>
<td>76 x 66.5 x 117.5</td>
<td>76 x 66.5 x 117.5</td>
</tr>
<tr>
<td>For Use</td>
<td>For Use</td>
<td>For Use</td>
<td>For Use</td>
</tr>
<tr>
<td>35 mm Rail Mounting</td>
<td>35 mm Rail Mounting</td>
<td>35 mm Rail Mounting</td>
<td>35 mm Rail Mounting</td>
</tr>
</tbody>
</table>

---

Relay contact position shown in ‘Power on’ (Healthy) condition
## Voltage Scanners & Controllers

### F3 VSR1
- **Voltage Scanner 3Ø-3W**
- 3-Phase 3-Wire voltage monitoring & display, Phase Failure, Unbalance, Phase Sequence, under voltage, Over Voltage, Auto / Manual Reset, Adjustable unbalance trip setting, Adjustable under/over voltage settings, adjustable trip delay, RS232 communication port, 2 CO output relay

### F3 VSR2
- **Voltage Scanner 3Ø-4W**
- 3-Phase 4-Wire voltage monitoring & display, Phase Failure, Unbalance, Phase Sequence, under voltage, Over Voltage, Auto / Manual Reset, Adjustable unbalance trip setting, Adjustable under/over voltage settings, Adjustable trip delay, RS232 communication port, 2 CO output relay

### F3 VSR3
- **Voltage Scanner & Phase Selector**
- 3-phase 4-wire system voltage monitor with phase selector
- Under voltage and over voltage monitoring Auto reset, Adjustable UV/OV trip settings, Adjustable trip delay, 5 CO output relays.

### Specifications
- **Supply Voltage**
  - System: 380 / 415 V AC (3 Ph - 3 W)
  - Auxiliary: 90-270 V AC/DC Self Powered (Neutral & any Phase)
- **Output Relay Contacts**
  - 2 CO & RS 232 (optional)
- **Trip Setting**
  - Phase Sequence: Yes
  - Phase Unbalance: 1 - 10 % (Adj.)
  - Under Voltage: 1 - 80V below nominal voltage
  - Over Voltage: 1 - 60V above nominal voltage
- **Trip Time Delay**
  - 1 - 60 secs. or 1-5 mins select.
- **Reset**
  - Manual
- **Display**
  - Backlit LCD (16 x 2 character)
- **Monitoring**
  - Phase to Phase
  - Phase to neutral
- **Weight**
  - 800 gms.
- **Dimensions**
  - Overall (L x W x D): 96 x 96 x 130
  - Mounting (L x W): 92 x 92

### Notes
- Whenever not specified
- **Contact Rating**: 5A @ 230 V AC (resistive)
- **UV/SP UB Protection override facility provided**
- **On-Delay**: 3 mins ± 10%

### Relay Contact Position
- Relay contact position shown in ‘Power on’ (Healthy) condition.
These relays are useful for protection of 3-phase AC induction motors against various hazards. With their unique advantages they eliminate use of a thermal/bimetal relay for motor protection. Being current sensing, they are to be selected according to motor rating and are available for practically all ranges of motors. These relays are ideally suitable for Air-conditioning Compressor motor protection, as also for motors in machines, conveyors, cranes/hoists and lifts, and for pumps.

**MODELS**
- MPR D2, SPG D2, F3 DRC1
- D2 MPR1, D2MPR2, S2 CMR1
- CTS5, CTS10, CTS20, CTS40, CTS80, CTS120, S2 CTS,
- MBMPR, M-Commander,
- WTR D1, S2 WTR1,

**FEATURES**
- Fixed/adjustable unbalance settings
- Fixed/adjustable settings for under/over voltage, current, load
- Fixed/adjustable trip delays
- Resetting Auto or Manual
- Output contacts: 1 CO or 2 CO
- Choice of enclosures [DIN-Rail, Flush]
- Models with Micro-Controller based design
- Serial Communication [RS485] port
- 2 line alpha-numeric LCD display
- Use of SMD Technology
- User-friendly LED indications

**PROTECTIONS / FUNCTIONS**
- Phase Failure (Phase
  - Loss/Single Phasing)
- Phase sequence reversal,
- Voltage Unbalance,
- Under Voltage,
- Over Voltage,
- Overload protection as per motor characteristics
- No-load/dry running
- Motor Winding overheating
- Over-current/Short circuit/Blocked rotor
- Earth Fault,
- Moisture/leakage

**PROTECTIONS / FUNCTIONS**
- Phase Failure (Phase
  - Loss/Single Phasing)
- Phase sequence reversal,
- Voltage Unbalance,
- Under Voltage,
- Over Voltage,
- Overload protection as per motor characteristics
- No-load/dry running
- Motor Winding overheating
- Over-current/Short circuit/Blocked rotor
- Earth Fault,
- Moisture/leakage

**Ordering Instructions**
- Product Family Name
- Model Name
- System Supply Voltage & Frequency
- Aux. Supply/Control supply voltage
- Motor/Pump rating (HP/KW) & duty
- Overload characteristics required
- No. of PTCs & Temp. graph
### Motor / Pump Protection Relays

#### MPR D2
**Overload Protection Relay with Phase Failure**
- Phase Failure, Unbalance, Phase sequence and overloading
- Auto / Manual Reset, Adjustable current trip settings, selectable characteristics, 1CO/2CO output relay
- Adjustable current trip settings, Auto/Manual Reset, selectable overload characteristics, 1CO/2CO output relay

#### SPG D2
**Dry Run & Overload Protection Relay with Phase Failure**
- Phase Failure, Unbalance, Phase sequence, Overloading & Dry running
- Auto/Manual Reset, Adjustable current trip settings, selectable overload characteristics, 1CO/2CO output relay

#### F3 DRC1
**Dry Run & Overload Protection Relay with Phase Failure**
- Phase Failure, Unbalance, Phase sequence, overloading and dry running
- Auto/Manual Reset, Adjustable current trip settings, Adjustable overload characteristics, 1CO output relay

#### Specifications
- **Supply Voltage (System):** 380/415/440 V AC ±3%
- **Supply Voltage (Aux):** 110/240/380/415 V AC ±20% 50/60 Hz, ±3%
- **Output Relay Contact: 1 CO / 2 CO**
- **Output Relay Rating: From CTS From CTS From CTS**
- **Dimensions (Panel mounting):** 67 x 46 / 35 mm Rail Mounting
- **Dimensions (Submersible):** 96 x 96 x 76
- **Weight:** 425 gms.

**Other features:**
- Adjustable current trip settings, Auto/Manual Reset, selectable overload characteristics, 1CO output relay
- Link at 17, 18 for relay with Phase Failure
- As per selectable inverse time Characteristics
- Above 120% of set current (IDMTL)
- 5.5 secs. ± 1.5 secs.

**Contact Rating (SA @ 230 V AC (resistive)):** N/A

**Contact Rating (For Motor):**
- **3 Ph:** 13
- **3 Phase:** 13
- **5 Amp. Sec. CT:** 14
- **400 V AC:** 15
- **50% of Motor Current:** 16
- **100% of Motor Current:** 17
- **2 CO:** 18
- **3 Ph:** 19
- **200% of Motor Current:** 20
- **700% of Motor Current:** 21
- **10% of Motor Current:** 22
- **50% of Motor Current:** 23
- **IDMTL:** 24
- **50% / 75% of set current:** 25
- **10%:** 26
- **0%:** 27

**Auto / Manual / Remote Reset:**
- **Link:**
  - 1
  - 2
  - 3
  - 4
  - 5
  - 6
  - 7
  - 8
  - 9
  - 10
  - 11
  - 12

**Link Options:**
- **ROC:** 2
- **NO:** 3
- **BO:** 4
- **BI:** 5
- **4 to 7 sec. (variable):** 6
- **50% of I FLA:** 7
- **100% of I FLA:** 8
- **200% of I FLA:** 9
- **400% of I FLA:** 10
- **600% of I FLA:** 11
- **Phase Fail:** 12
- **DOL Start:** 13
- **SPG D2:** 14
- **DRC1:** 15
- **2/10 sec:** 16
- **4 to 7 sec.:** 17
- **4 to 7 sec.:** 18
- **10 sec.:** 19
- **50% of I FLA:** 20
- **50% / 75% of I FLA:** 21
- **10% of I FLA:** 22
- **Auto / Manual / Remote:** 23
- **Inv. Time Character: As per selectable inverse time Characteristics:** 24
- **2 / 5 secs (10 secs.):** 25
- **2 to 10 secs. (variable):** 26
- **Phase Fail & Overload Protection:** 27
- **3 CO:** 28
- **4 CO:** 29
- **5 CO:** 30
- **6 CO:** 31
- **7 CO:** 32
- **8 CO:** 33
- **9 CO:** 34
- **10 CO:** 35
- **11 CO:** 36
- **12 CO:** 37
- **13 CO:** 38
- **14 CO:** 39

**Relay contact position shown in ‘Power on’ (Healthy) condition**
### M O T O R / P U M P P R O T E C T I O N R E L A Y S

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>AUD (Motor)</th>
<th>CTS5</th>
<th>CTS20, CTS40, CTS60</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2 MPR1</td>
<td>Dry Run &amp; Overload Protection Relay with Phase Failure</td>
<td>380-440V AC ± 20%, 50/60 Hz</td>
<td>180-277VAC ± 20%</td>
<td>Current sensor suitable for load current of 20A (for CTS 20), 60A (for CTS 40), &amp; 100A (for CTS 60) to be used with Minilec relays only.</td>
</tr>
<tr>
<td>D2 MPR2</td>
<td>Dry Run &amp; Overload Protection Relay with Phase Failure &amp; UV/DV</td>
<td>100-240V AC ± 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2 CMR1</td>
<td>Dry Run &amp; Overload Protection Relay with Phase Failure</td>
<td>4 Sec ± 1 Sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTS5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTS10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTS20, CTS40, CTS60</td>
<td>Current sensor suitable for full load motor current of 20A (for CTS 20), 60A (for CTS 40), &amp; 100A (for CTS 60) to be used with Minilec relays only.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Motor Primary current carrying cables for full phases

- 100-120/220-240/380-440V AC ± 20%, 48-63 Hz

#### Time-Minutes-Seconds Selection Chart for CTS

<table>
<thead>
<tr>
<th>HP</th>
<th>KW</th>
<th>Amp</th>
<th>CTS Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3</td>
<td>&lt;2.25</td>
<td>2-5</td>
<td>CTS 06</td>
</tr>
<tr>
<td>&lt;6</td>
<td>&lt;4.5</td>
<td>4-10</td>
<td>CTS 10</td>
</tr>
<tr>
<td>&lt;10.5</td>
<td>&lt;6.4</td>
<td>8-20</td>
<td>CTS 20</td>
</tr>
<tr>
<td>&lt;30</td>
<td>&lt;22.5</td>
<td>16-40</td>
<td>CTS 40</td>
</tr>
<tr>
<td>&lt;60</td>
<td>&lt;45</td>
<td>32-80</td>
<td>CTS 80</td>
</tr>
<tr>
<td>&lt;75</td>
<td>&lt;56</td>
<td>48-120</td>
<td>CTS 120</td>
</tr>
</tbody>
</table>

---

**Relay position shown in ‘Power off’ condition**
MICROPROCESSOR BASED MOTOR PROTECTION RELAY

MBMPR

Comprehensive Motor Protection Relay

S2 CTS1

Current Sensor

Microcontroller based.
Sensing voltage, current and temperature
Phase Failure, Unbalance, Phase sequence, Under/over voltage,
overloading, winding over temperature,
Over current/Short circuit, locked rotor
Auto/Manual resetting.
Adjustable trip settings for UV/OV, UC/OC,
O/L, Locked rotor & earth fault,
On delay & start-up delay adjustable,
2xCO output relays

Current sensor available for
Full load motor current of SA 10A & 20A. To be used with
MiniAc relays only.

Supply Voltage

415V AC ±20%, 3Ø, 50 / (60)Hz ± 3%

Auxiliary

90-135V AC / DC

Output Relay Contact

1 CO for Trip & 1 CO for Alarm
RS 232/485 Port

Input

External CTS (CT20/50)

Power Consumption

8 VA

Current Settings

<table>
<thead>
<tr>
<th>Settings</th>
<th>Trip Level</th>
<th>Trip Delay</th>
<th>LED</th>
<th>Reset Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power On</td>
<td>0% – 5%</td>
<td>1-10 Secs.</td>
<td></td>
<td>Auto / Manual</td>
</tr>
<tr>
<td>Under Voltage</td>
<td>5% – 50%</td>
<td>1-10 Secs.</td>
<td></td>
<td>Auto / Manual</td>
</tr>
<tr>
<td>Over Voltage</td>
<td>100% – 150%</td>
<td>1-10 Secs.</td>
<td></td>
<td>Auto / Manual</td>
</tr>
<tr>
<td>Over Current</td>
<td>200% – 600%</td>
<td>1-10 Secs.</td>
<td></td>
<td>Multi Attempt</td>
</tr>
<tr>
<td>Over Load</td>
<td>50% – 100%</td>
<td>1-10 Secs.</td>
<td></td>
<td>Multi Attempt</td>
</tr>
<tr>
<td>Over Temperature</td>
<td>100% – 150%</td>
<td>1-10 Secs.</td>
<td></td>
<td>Multi Attempt</td>
</tr>
<tr>
<td>Winding Overheat</td>
<td>100% – 150%</td>
<td>1-10 Secs.</td>
<td></td>
<td>Multi Attempt</td>
</tr>
</tbody>
</table>

Dimensions

Unit Circuit x L x W 186 x 91 x 56
Package 230 x 230
Approx Weight 600 gms

CT Selection Chart

Model | Current |
S2 CTS 5   | 2-5 |
S2 CTS 10  | 8-15 |
S2 CTS 20  | 8-30 |

CT MODULAR (CT10/50)
Motor protection includes
- Over/Under voltage protection
- Single/Reverse phasing protection
- Voltage / Current unbalance
- Overload trip
- Over current protection
- Dry running protection
- Earth fault protection
- PTC based winding overheating protection

Pump Management System Features
- Auto Change over between two pumps
- Intelligent resetting facility
- On-site programming facility
- Password protection for programming
- Pump On-Off timer programmable for 10 times a day, with advance programming of 7 days
- Provision for water level control
- Run-time compensation
- Ideal for Pump Automation & Unmanned Pumping Stations.

For more detailed specifications, refer table on page No. 26 (MBMPR)
WINDING OVER-TEMPERATURE PROTECTION RELAYS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTR D1</td>
<td>Winding Protection Relay</td>
</tr>
<tr>
<td>S2 WTR1</td>
<td>PTC Thermistor Relay</td>
</tr>
<tr>
<td>PTC</td>
<td>Thermistor</td>
</tr>
</tbody>
</table>

PTC Thermistors are semiconductor sensors. These have typical characteristics that change their resistance instantly at a specified pre-defined response temperature (NRT). As soon as the surrounding temperature of PTC reaches its NRT value the body resistance of PTC Thermistor rises sharply from 200 / 250 Ohms to more than 5000 Ohms. The PTC Thermistors are embedded in the overhang location of the motor windings.

Wherever not specified, contact rating 5A at 250 V AC (resistive).

**Typical Characteristics of PTC Thermistors**

<table>
<thead>
<tr>
<th>NRT (°C)</th>
<th>Cable Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>White - Brown</td>
</tr>
<tr>
<td>90</td>
<td>White - White</td>
</tr>
<tr>
<td>100</td>
<td>Red - Red</td>
</tr>
<tr>
<td>110</td>
<td>Brown - Brown</td>
</tr>
<tr>
<td>120</td>
<td>Grey - Grey</td>
</tr>
<tr>
<td>130</td>
<td>Blue - Blue</td>
</tr>
<tr>
<td>140</td>
<td>White - Grey</td>
</tr>
<tr>
<td>150</td>
<td>Black - Black</td>
</tr>
<tr>
<td>160</td>
<td>Blue - Red</td>
</tr>
<tr>
<td>170</td>
<td>White - Green</td>
</tr>
<tr>
<td>180</td>
<td>Red - Red</td>
</tr>
<tr>
<td>190</td>
<td>Orange - Black</td>
</tr>
</tbody>
</table>

**Selection Chart for NRT of PTC Thermistors**

Supply Voltage

- WTR D1: 24 / 40 / 110 / 240 / 415 / 460 V AC / 24 V DC ± 10%
- S2 WTR1: 12 / 24 V DC / 110 / 230 / 415 V AC, 50 Hz (60 Hz)
- PTC: 12 / 24 V DC / 110 / 230 / 415 V AC, 50 Hz (60 Hz)

Output Contacts

- 1 CO
- 1 CO
- 1 CO

**Trip Settings**

- WTR D1: Thermistor Sensor Healthy 40 Ω – 4 K Ω, Thermistor Sensor Trip 4.1 K Ω – 5.5 K Ω, Thermistor Sensor Short 0 – 39 Ω
- S2 WTR1: Thermistor Sensor Healthy 40 Ω – 4 K Ω, Thermistor Sensor Trip 4.1 K Ω – 5.5 K Ω, Thermistor Sensor Short 0 – 39 Ω

**Dimensions**

- WTR D1: 76 x 30.5 x 117.5, 90 x 60 x 35, 360 gms.
- S2 WTR1: 35 mm Rail Mounting, 250 gms.

**Reset Mode**

- Auto / Manual (optional)

**Weight**

- 300 gms.
Minilec offers timers for various functions and applications, in various enclosures/sizes and with multi voltage options.

MODELS
ETS D1, ETA D1, P1 STS1, P1 STM1, ESD D1, ESR D1, D1 ETM1, S2ETM1, ETR D2, D2 ETR1, S2 ETM2

FUNCTIONS
• On Delay
• Interval Delay
• Cyclic ON/OFF
• Multi-Attempt (for Engine Starting)
• Star-Delta changeover

FEATURES
• Single voltage & Multi-voltage
• Single function and multi-function
• Wide time range
• Better repeat Accuracy
• Choice of enclosures (DIN-Rail, & Plug-in)
• Models with Micro-Controller based design
• Use of SMD Technology (S2 Series models)

Ordering Instructions
✓ Product Family Name
✓ Model Name
✓ Aux. Supply/Control supply voltage
✓ Application
## On Delay Timers

<table>
<thead>
<tr>
<th></th>
<th>ETS D1</th>
<th>ETA D1</th>
<th>P1 STS1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On Delay Timer</strong></td>
<td><strong>On Delay Timer</strong></td>
<td><strong>On Delay Timer</strong></td>
<td><strong>On Delay Timer</strong></td>
</tr>
<tr>
<td><strong>On Delay, time range upto 3 hours,</strong> 2 CO output relay</td>
<td><strong>On Delay, time range 30 Minutes, Multi-voltage supply,</strong> 2 CO output relay</td>
<td><strong>On Delay, time range upto 60 seconds,</strong> 1 CO output relay</td>
<td></td>
</tr>
</tbody>
</table>

### Specifications

**Supply Voltage**
- **24/110 / 240 / 380 / 415 V AC ± 20%**
- **12 / 24 V DC ±50%**
- **24-240 V AC / DC**
- **12 / 24 V DC ±20%**
- **12/24 V DC+10%, –20%**

**Output Contacts**
- 2 CO
- 1 CO

**Time Range**
- 0.3 - 3, 0.6 - 6 secs.
- 1 - 10, 3 - 30, 6 - 60, 18 - 180 (secs. or mins.)
- 0.7 secs. - 30 mins.
- 0.3-10, 0-30, 0.6-60 secs.

**Operating Modes**
- On Delay
- On Delay

### Additional Details

- **Weight**
  - 300 gms.
  - 175 gms.
  - 160 gms.

- **Dimensions**
  - Overall (L x W x D): 76 x 30.5 x 120
  - 50 x 40 x 80
  - 76 x 30.5 x 117.5

- **Mounting (L x W)**
  - 68 mm centre to centre / 35 mm Rail Mounting
  - 8 - pin plug-in

- **Contact Rating**
  - 5A @ 230 V AC (resistive)

### Contact Diagrams

- Relay contact position shown in 'Time Elapsed' condition

---

**Diagram:**

[Diagram showing relay contact positions]
## SPECIAL FUNCTION TIMERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 STM1</td>
<td>On Delay Timer (Minutes)</td>
<td>- 1 NO output relay</td>
</tr>
<tr>
<td>ESD D1</td>
<td>Star Delta Timer</td>
<td>- Time range 50 / 100 msecs.</td>
</tr>
<tr>
<td>ESR D1</td>
<td>Multi Attempt Timer</td>
<td>- Start time &amp; pause time selectable, 2xNO output relays</td>
</tr>
<tr>
<td>D1 ETM1</td>
<td>Multi-Function Timer</td>
<td>- Microcontroller based, SMD technology</td>
</tr>
<tr>
<td>S2 ETM1</td>
<td>Multi-Function Timer</td>
<td>- Multi-function timer (On Delay, Interval Delay, cyclic, Star-Delta)</td>
</tr>
</tbody>
</table>

### Specifications

- **On Delay, time range:** upto 60 minutes, 1 CO output relay
- **Star to Delta Changeover:** Time range upto 60 seconds, 2xNO output relays
- **Generator Engine starting relay:** Upto 15 attempts, start time & pause time selectable, 2xNO output relays
- **Microcontroller based Multi-function timer:** (On delay, interval delay, cyclic, Star-Delta, Engine starting), time range upto 100 Hrs, 2xCO output relays
- **Microcontroller based, SMD technology Multi-function timer:** (On delay, interval delay, cyclic, Star-Delta, Engine starting) time range upto 100 Hrs, 2xCO output relays

### Additional Features

- **On Delay Timer:**
  - 1 NO output relay
  - Time range 0.5 to 1000 minutes

- **Star Delta Changeover Timer:**
  - Time range 50 to 1000 msecs.

- **Multi Attempt Timer:**
  - Time range 1 to 15 seconds
  - Pause time 2 to 16 seconds

### Physical Specifications

- **Weight:** 175 gms.
- **Dimensions:** 76 x 30.5 x 117.5
- **Mounting:** 68 mm centre to centre / 35 mm Rail Mounting

### Additional Specifications

- **31-3**
- **D1 ETM1 S2 ETM1**
- **Microcontroller based, SMD technology Multi-function timer:** (On delay, interval delay, cyclic, Star-Delta, Engine starting) time range upto 100 Hrs, 2xCO output relays

### Relays

- **Auxiliary Supply (AUX.)**
- **Auxiliary Contacts:**
  - 2xNO, 1xDO

### Diagrams

- **Relay Contact Position shown in ‘Time Elapsed’ condition**
- **Relay Position shown in ‘Power Off’ condition**

### Notes

- *CE/CSA Not available for 110VAC models*
- +24/10/24/415VAC, ± 20%, 12/24 VDC
**CYCLIC TIMERS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Features</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ETR D2</strong></td>
<td>Cyclic Timer</td>
<td>Unequal cyclic function, on time and pause time selectable, 2x1CO output relays</td>
<td>Supply Voltage: 110/240/415 V AC ±20% 24 V DC&lt;br&gt;Output Contacts: 1 CO + 1 CO&lt;br&gt;Time Range: 0.7 secs. – 30 mins., in 4 diff. ranges&lt;br&gt;Operating Modes: Mode 1: Unequal Cyclic Operation Mode 2: Forward Reverse Cyclic Operation&lt;br&gt;Dimensions (H x W x D): 76 x 56.5 x 117.5&lt;br&gt;Mounting (L x W): 35 x 90 x 60</td>
</tr>
<tr>
<td><strong>D2 ETR1</strong></td>
<td>Cyclic &amp; Forward-Reverse Timer</td>
<td>Unequal cyclic and forward-reverse functions, on time and pause time selectable, 2x1CO output relays</td>
<td>Supply Voltage: 24/110/240/415 VAC, ± 20%, 12/24 VDC&lt;br&gt;Output Contacts: 1 CO + 1 CO&lt;br&gt;Time Range: On Time: 0.1 Sec. To 100 Hrs., Pause Time: 0.1 Sec. To 100 Hrs.&lt;br&gt;Operating Modes: Mode 1: Unequal Cyclic Operation&lt;br&gt;Mode 2: Forward Reverse Cyclic Operation&lt;br&gt;Dimensions (H x W x D): 76 x 56.5 x 117.5&lt;br&gt;Mounting (L x W): 35 x 90 x 60</td>
</tr>
<tr>
<td><strong>S2 ETM2</strong></td>
<td>Cyclic &amp; Forward-Reverse Timer</td>
<td>Microcontroller based, SMD technology Unequal cyclic and forward-reverse functions, on time and pause time selectable, 2x1CO output relays</td>
<td>Supply Voltage: 24/110/240/415 VAC, ± 20%, 12/24 VDC&lt;br&gt;Output Contacts: 1 CO + 1 CO&lt;br&gt;Time Range: On Time: 0.1 Sec. To 100 Hrs., Pause Time: 0.1 Sec. To 100 Hrs.&lt;br&gt;Operating Modes: Mode 1: Unequal Cyclic Operation&lt;br&gt;Mode 2: Forward Reverse Cyclic Operation&lt;br&gt;Dimensions (H x W x D): 76 x 56.5 x 117.5&lt;br&gt;Mounting (L x W): 35 x 90 x 60</td>
</tr>
</tbody>
</table>

*CE/CSA mark not available for 110VAC models

**Notes:**
- Wherever not specified, Contact Rating: 5A @ 230 V AC (resistive)
- Contact Rating: 5A @ 230 V AC (resistive)

**Diagram:**
- Relay position in ‘Power on’ (Healthy) condition
- Relay position shown in ‘Power off’ condition
LIQUID LEVEL CONTROLLERS

These are suitable for conductive liquids like water and for non-conductive liquids like Diesel/Oil. Models for either one level monitoring or two level monitoring.

MODELS
- WLC D1, Electrodes, P1 LCW1, P2 LCW1, S2 WLC1, P2 ALT1
- DLC D1 + FRKP 1, FRKP4

FEATURES
- Can be used for potable water, water with impurities and for diesel/oil
- Cable size & length no restriction for water level monitoring
- Suitable for variety of electrodes
- Optical sensing for diesel/oil level monitoring
- Open collector output (for FRKP4)
- Choice of enclosures (DIN-Rail & Plug-in)
- Models with Micro-Controller based design
- Use of SMD Technology (S2 Series models)

FUNCTIONS
- Level monitoring of conductive and non-conductive liquids
- One level or two level monitoring
- One tank or two tank level monitoring

Ordering Instructions
- Product Family Name
- Model Name
- System Supply Voltage
- Aux. Supply/Control supply voltage
- Type of liquid & its specifications
LEVEL CONTROLLERS - CONDUCTIVE LIQUIDS

**WLC D1**
Water Level Control Relay Two Level Single Tank

- Single tank - 2 level control relay, suitable for conductive liquids, sensitivity adjustment, 1CO output relay
- Auxiliary Supply: 24 / 110 / 240 / 415 V AC ±10%, 50 / 60 Hz, 12 / 24 V DC
- Input Sensors: 3 Electrodes
- Sensitivity: 1KΩ to 200 KΩ (adjustable)
- Trip Time Relay: Less Than 1 sec
- Weight:
  - Unit: 500 gms
  - Sensor (each): 50 gms
- Dimensions (mm):
  - Overall (L x W x D): 76 x 30.5 x 117.5
  - Mounting (L x W): 68 centre to centre
- Sensor:
  - Overall: 24 (Dia) x 76 (L)

**P1 LCW1**
Water Level Control Relay Two Level Single Tank

- Single tank - 2 level control relay, suitable for conductive liquids, 1CO output relay
- Auxiliary Supply: 24 / 110 / 240 / 415 V AC ±10%, 50 / 60 Hz, 12 / 24 V DC
- Input Sensors: 3 Electrodes
- Sensitivity: N.A.
- Trip Time Relay: Less Than 1 sec
- Weight:
  - Unit: 125 gms
  - Sensor (each): 50 gms
- Dimensions (mm):
  - Overall (L x W x D): 50 x 40 x 80
  - Mounting (L x W): 8 - pin plug-in
- Sensor:
  - Overall: 24 (Dia) x 76 (L)

**Relay position in ‘Power on’ [Healthy] condition**

---

**Bottom view**

- DC
- AC
- Aux. SUPPLY
- E3
- E1
- E2
### P2 LCW1
**Water Level Control Relay Two Level Two Tanks**
- Two tanks - 2 level control relay, suitable for conductive liquids, 1CO output relay.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aux Supply</td>
<td>110/220/240/380/415 V AC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 Hz / 60 Hz ±3%</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>5 VA max.</td>
</tr>
<tr>
<td>Indication</td>
<td>ON: Power ON (Green), RLY: Relay ON (Red)</td>
</tr>
<tr>
<td>Operations</td>
<td>30 Operation/Min. (max.)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>85 x 35 x 90mm</td>
</tr>
<tr>
<td>Mounting</td>
<td>11 pin plug-in base mounting</td>
</tr>
<tr>
<td>Weight</td>
<td>250 gms. (approx.)</td>
</tr>
</tbody>
</table>

### S2 WLC1
**Single tank 2 level control relay, operates on 24 V AC supply, sensitivity adjustment, suitable for conductive liquids, 1CO output relay.**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aux Supply</td>
<td>24 V AC / DC</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Adjustable</td>
</tr>
<tr>
<td>Output Relay Contact</td>
<td>1 CO</td>
</tr>
<tr>
<td>Dimensions</td>
<td>90 x 35 x 60 mm</td>
</tr>
<tr>
<td>Mounting</td>
<td>11 pin plug-in enclosure</td>
</tr>
<tr>
<td>Weight</td>
<td>200 gms.</td>
</tr>
</tbody>
</table>

### P2 ALT1
**Alternating Relay**
- This is a simple 'Step Relay' to achieve alternating duty of two pumps or compressors. Operation of two pumps or compressors is achieved in alternating sequence as per either pressure switch or level control or thermostat contact. Product is available in 11 pin (P2) plug-in enclosure.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aux Supply</td>
<td>110/220/240/380/415 V AC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 Hz / 60 Hz ±3%</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>5 VA max.</td>
</tr>
<tr>
<td>Indication</td>
<td>ON: Power ON (Green), RLY: Relay ON (Red)</td>
</tr>
<tr>
<td>Operations</td>
<td>15 Operation/Min. (max.)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>85 x 35 x 90mm</td>
</tr>
<tr>
<td>Mounting</td>
<td>11 pin plug-in base mounting</td>
</tr>
<tr>
<td>Weight</td>
<td>250 gms. (approx.)</td>
</tr>
</tbody>
</table>

---

**Relay position in ‘Power on’ (Healthy) condition**

**Relay position shown in ‘Power off’ condition**
LEVEL CONTROLLERS - NONCONDUCTIVE LIQUIDS

**DLC D1 + FRKP 1**
Diesel Level Control Relay Single Level

- One level switch for diesel/oil, optical sensing principle, 1 CO output relay

**FRKP 4**
Diesel Level Sensor Switch Single Level

- Either high level or low level switch (selectable), open collector output

---

**Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>DLC D1 + FRKP 1</th>
<th>FRKP 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary Supply</td>
<td>110 / 200 / 415 V AC / 12 V / 24 V DC / AC</td>
<td>12 V / 24 V DC</td>
</tr>
<tr>
<td>Output Contacts</td>
<td>1 CO</td>
<td>N. A.</td>
</tr>
<tr>
<td>Input Sensors</td>
<td>1 (FRP P1)</td>
<td>Roll-in sensor</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>N. A.</td>
<td>N. A.</td>
</tr>
<tr>
<td>Top Trim Relay</td>
<td>Less than 5 sec</td>
<td>Less than 1 sec</td>
</tr>
<tr>
<td>Weight</td>
<td>300 gms.</td>
<td>100 gms.</td>
</tr>
<tr>
<td>Sensor (each)</td>
<td>100 gms.</td>
<td>100 gms.</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall (L x W x D)</td>
<td>76 x 30.5 x 117.5</td>
<td></td>
</tr>
<tr>
<td>Mounting (L x W)</td>
<td>68 centre to centre</td>
<td></td>
</tr>
<tr>
<td>Sensor Overall</td>
<td>18 (Dia) x 75 (L)</td>
<td>18 (Dia) x 75 (L)</td>
</tr>
</tbody>
</table>

**Electrical Diagrams**

- Relay position in 'Power on' (Healthy) condition
POWER LINE TRANSUCERS

Power line transducers are suitable for measuring electrical parameters like AC voltage, current, frequency, PF, KW, KVAR and also for DC signal isolation. They are best suited for MCC and PCC panels, AMF panels, SCADA systems, PLCs for data acquisition and metering.

MODELS
D2 PTIV, D2 PTC1, D3 PTE1, D5 PTA1, D5 PTW1, D5 PTW2, D3 IST1, D5 IST1

FEATURES
- Fully solidstate electronic design.
- Rugged to withstand harsh environments.
- Load independent outputs.
- Galvanically isolated signals.
- Accuracy class: 0.5% (Optional 0.2%).
- Self or auxiliary powered.
- CT burden less than 0.5VA.

FUNCTIONS
- Convert high value AC signal to low value DC signals.
- Inputs: voltage, current, frequency or power factor, power.
- Outputs: DC signals single or dual (optionally 3 or 4 for isolation transducers).

Ordering Instructions
- Product Family Name
- Model Name
- System Supply Voltage
- Aux. Supply/Control supply voltage

CT burden less than 0.5VA.
### D2 PTV1
**AC Voltage Transducer**
- Voltage transducer, Input AC voltage, Output (DC) single or dual, accuracy 0.5%

### D2 PTC1
**AC Current Transducer**
- Current transducer, Input AC Current, Output (DC) single or dual, accuracy 0.5%

### D3 PTF1
**Line Frequency Transducer**
- Frequency transducer, Output (DC) single or dual, accuracy 0.5%

#### Auxiliary Supply
- **Input Value**: 0-1 A AC / 0-5 A AC
- **Frequency Range**: 45 to 55 Hz / 40 - 60 Hz / 55 - 65 Hz / 48 - 52 Hz
- **Nominal Input Voltage**: 110 / 240 / 415 V N.A.

#### DC Output (Single / Dual)
- 0 - 1 mA, 0 - 5 mA, 0 - 10 mA, 0 - 20 mA, 4 - 20 mA, 0 - 5 V, 0 - 10 V
- Available options: single or dual output

#### Power Consumption
- **AC**: 3.5 VA
- **DC**: 4 VA

#### Weight
- **AC**: 440 gms
- **DC**: 575 gms

#### Dimensions
- **(L x W x D) (mm)**: 75 x 56.5 x 117.5
### POWER TRANSDUCERS

<table>
<thead>
<tr>
<th>D5 PTA1</th>
<th>D5 PTW1</th>
<th>D5 PTW2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Factor Transducer</strong></td>
<td><strong>Reactive Power Transducer</strong></td>
<td><strong>Active Power Transducer</strong></td>
</tr>
<tr>
<td>Input 3-phase voltage &amp; current, output Single or Dual (DC), Accuracy 0.5%</td>
<td>Input 3-phase voltage &amp; current, output Single or Dual (DC), Accuracy 0.5%</td>
<td>Input 3-phase voltage &amp; current, output Single or Dual (DC), Accuracy 0.5%</td>
</tr>
<tr>
<td>3.5 VA - AC, 4 VA - DC</td>
<td>3.5 VA - AC, 4 VA - DC</td>
<td>3.5 VA - AC, 4 VA - DC</td>
</tr>
<tr>
<td>1 A / 5 A</td>
<td>1 A / 5 A</td>
<td>1 A / 5 A</td>
</tr>
<tr>
<td>110 / 415 V</td>
<td>110 / 415 V</td>
<td>110 / 415 V</td>
</tr>
<tr>
<td>0 - 1 mA, 0 - 5 mA, 0 - 10 mA, 0 - 20 mA, 4 - 20 mA, 0 - 5 V, 0 - 10 V</td>
<td>0 - 1 mA, 0 - 5 mA, 0 - 10 mA, 0 - 20 mA, 4 - 20 mA, 0 - 5 V, 0 - 10 V</td>
<td>0 - 1 mA, 0 - 5 mA, 0 - 10 mA, 0 - 20 mA, 4 - 20 mA, 0 - 5 V, 0 - 10 V</td>
</tr>
<tr>
<td>Single (Optional Dual Output)</td>
<td>Single (Optional Dual Output)</td>
<td>Single (Optional Dual Output)</td>
</tr>
<tr>
<td>Galvanic</td>
<td>Galvanic</td>
<td>Galvanic</td>
</tr>
<tr>
<td>0 ° C to + 55 ° C</td>
<td>0 ° C to + 55 ° C</td>
<td>0 ° C to + 55 ° C</td>
</tr>
<tr>
<td>Up to 95% RH non-condensing</td>
<td>Up to 95% RH non-condensing</td>
<td>Up to 95% RH non-condensing</td>
</tr>
<tr>
<td>73 x 150 x 113</td>
<td>73 x 150 x 113</td>
<td>73 x 150 x 113</td>
</tr>
<tr>
<td>1200 gms.</td>
<td>1200 gms.</td>
<td>1200 gms.</td>
</tr>
</tbody>
</table>

---

For 3 Phase 4 Wire Network

[Diagram of 3 Phase 4 Wire Network]

**For 3 Phase 4 Wire Network**

DC OUTPUT 1

[Diagram of DC OUTPUT 1]
### ISOLATION TRANSCLUDERS

<table>
<thead>
<tr>
<th><strong>D3 IST1</strong></th>
<th><strong>D5 IST1</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DC Signal Isolation Transducer</strong></td>
<td><strong>DC Signal Isolation Transducer</strong></td>
</tr>
<tr>
<td>Signal Isolation transducer, Input &amp; output DC signals, Single or dual outputs, accuracy 0.5%</td>
<td>Signal Isolation transducer, Input &amp; output DC signals, upto 4 outputs, accuracy 0.5%</td>
</tr>
</tbody>
</table>

#### Auxiliary Supply
- Self Powered: 110/240 V AC, 24 / 48 / 110 / 220 V DC ± 20 %

#### Power Consumption
- 3.5 VA – AC, 4 VA – DC
- 3.5 VA – AC, 4 VA – DC

#### Input Value
- ± 0.05 %, ± 0.1%, ± 0.2%, ± 0.5%, ± 1.0% of full scale
- ± 0.05 %, ± 0.1%, ± 0.2%, ± 0.5%, ± 1.0% of full scale

#### DC Output (Single / Dual)
- 0 – 1 mA, 0 – 5 mA, 0 – 10 mA, 0 – 20 mA, 4 – 20 mA, 0 – 5 V, 0 – 10 V
- 0 – 1 mA, 0 – 5 mA, 0 – 10 mA, 0 – 20 mA, 4 – 20 mA, 0 – 5 V, 0 – 10 V

#### No of Signal Output
- Single (Optional Dual/Dual)
- Single (Optional Dual/Dual or 3 or 4)

#### Temperature
- Galvanic

#### Humidity
- Up to 95% RH non-condensing
- Up to 95% RH non-condensing

#### Dimensions (L x W x D) (mm)
- 73 x 83.5 x 117.5
- 73 x 150 x 113

#### Weight
- 1200 gms.
- 1200 gms.

---

**mA or mV of V**

**DC Signal Input**

![DC Signal Input Diagram]

**DC Signal Output**

![DC Signal Output Diagram]
Minilec offers variety of controllers for plant/process automation and data logging PLCs with dedicated softwares, Flexible SCADA systems (with hardware) and with communication features, these are easily adoptable to varying customer needs.

MODELS:
- BPC CARD
- PLC
- SCADA Systems - MINISCADA

FEATURES:
- Digital / Analogue inputs
- Digital outputs
- RS232 / RS485 Serial communication link
- MODBUS ASCII / RTU protocol
- PC side software

FUNCTIONS:
- Continuous monitoring of input parameters
- Control of process through outputs & software
- Data acquisition & communication
- Data Storage & records through PC

Ordering Instructions
- Product Family Name
- Model Name
- Aux. Supply / Control Supply Voltage
- Input & output details
- Process / Application details
**LOGICON SERIES** single chip microprocessor custom built dedicated programs as per logic sequence user panel flush mounting facility, 8 way/16 way digital inputs & outputs, built-in timers, open collector / relay output key board and display and battery back up.

### Auxiliary Supply
- 90 - 270 V AC / DC

### Input Signal
- (Digital)
- 12 Numbers
- 4 Numbers (8 to 5 VDC, Non-isolated) or 2 NOS (4-20 mA) + 2 NOS (0-5 V)

### Output Signal
- (Digital)
- 12 Numbers (NO Contacts)
- 3 Amps 230 VAC (Resistive)

### Operating Temperature
- 0°C - 50°C

### Dimensions
- Overall (L x W x D) 166 x 216 x 147 mm
- Mounting (L x W) 153 x 203 mm

### Weight
- 1200gms

### Features
- User defined custom - Built operating logic
- Keyboard - 4 Keys - Menu, Up, Down, Enter
- 4 Keys - Function Keys
- Display - LCD display 16x2 char backlit
- Serial communication (RS - 232C)
- Password protection for programming
- Inbuilt buzzer with alarm indication
- Programmable LED indication

### Input Signal (Analog)
- 4 Numbers (0 to 5 VDC, Non-isolated) or 2 NOS (4-20 mA) + 2 NOS (0-5 V)

### Output Signal (Analog)
- 2 Nos. (4-20 mA) + 2 Nos (0-5V)

### Some Examples
- **F5 PLC2**
  - R/o Plant Controller
  - 8 Digital Inputs
  - 6 Digital Outputs
  - 2 Keys & 13 stage Mimic diagram

- **F5 CHL 1**
  - Chiller Plant Controller
  - 7 Digital Inputs
  - 1 Analog Inputs
  - 4 Digital Outputs
  - 6 Keys & LCD Display

- **F5 CMP 1**
  - Compressor Plant Controller
  - 8 Digital Inputs
  - 5 Digital Outputs
  - 6 Keys & LCD Display

- **F5 BLR 1**
  - Boiler Plant Controller
  - 11 Digital Inputs
  - 2 Analog Inputs
  - 6 Digital Outputs
  - 8 Keys & LCD Display
BOOSTER PUMP CONTROLLER - BPC

Sequencing of Booster Pumps according to the pressure switch, duty cycle is a necessity in a Booster Pump Control System. Minilec Booster Pump Controller Card fulfills all the requirements of a Booster Pump Control Panel. Suitable for 2 / 3 Pumps or 4 / 5 Pumps.

Input:
- 2, 3, 4, 5 Pressure Switches, Over load relay contacts, Water Level Electrodes & Auto / Manual switches

Outputs:
- 2 Relay outputs for 2 Pump System OR 3 relay outputs for 3 pump System and respectively for 4 & 5 pump systems. Common Alarm Relay output for Buzzer.

Open Collector output:
- For LED indications for RUN / Trip on the panel door For LED indications for LL, HL, O/L on the panel door

Operating Sequence:
The key of the Booster Pumps is the Pressure Switches, which are preset according to the different pressure levels in the Pressure Tank. The water pressure in the Pressure Tank is to be maintained so that the consumers get constant pressure irrespective of the variations in the demand. As the user demand increases the respective Pressure switches activate & Booster Pumps are switched ON sequentially.

- *Pumps are switched off Sequentially as per decrease in demand. Role of Stand-by pump is rotated in each next cycle to ensure equal running of all pumps.

Technical Specifications:
- **Auxiliary Supply Voltage**: 20 V AC ± 10 %, 50 / 60 Hz ± 3 %
- **Inputs**
  - 2 Pump System
  - 3 Pump System
  - 4 Pump System
  - 5 Pump System
  - Pressure Switch Contacts (Potential Free)
  - Trip Contacts (Potential Free)
  - Auto / Manual Selection
  - Water Level Inputs (4 Electrodes)
- **Outputs**
  - 2 Relay outputs
  - Alarm 1
  - Open Collector Output
- **Abbreviations Used**
  - HL: High Level
  - LL: Low Level
  - RST: Restart Level
  - TRP: Trip
  - PS: Pressure Switch
  - PMP: Pump
  - AIC: Alarm Indication (Cancel)

Note:
- The open collector transistor capacity: 24 V DC, 40 MA
- LED indications are available on BPC for HL, LL, Pump Trip, AIC
P R O C E S S / P L A N T M O N I T O R I N G & C O N T R O L

MINISCADA

SCADA system is useful for Remote Monitoring and control of various equipments used in building or factories or manufacturing plants. Suitable software is developed considering input - output signals & functions

Remote Monitoring For Building Facilities
- Customized Solutions for Pump Houses, DG Sets, Mains supply
- Single Source for SCADA Hardware & Software
- Secured Access by Passwords
- Supervision & commissioning services

Status Monitoring & Intelligent Control of
- AC Plants, Power Houses
- Multiple 3 phase Air Conditioning Units
- Multiple Single phase Air Conditioning Units
- Diesel Generator Sets & AMF Control

Application areas
- Pump Automation & Remote Monitoring
  - Local time based pump operations & remote control function
  - Time based event logging
  - Interlinking of multiple pump controllers through RS 485 communication
  - Optional Modem base dial up interlinking through PC
  - Windows based OU software

Power Consumption - 30 W max.
keyboard & Display - 4 Keys
Dimensions (mm) 19” Rack - 436.88 x 132.50 x 260
Weight - 7200 gms (approx.)
Communication Protocol - Modbus ASCII
Communication Port - RS 232 / RS 485

Standard configuration of MINISCADA has following basic specifications:
Control Supply - 380 - 270 V AC / DC
Digital Inputs - 92 max.
Digital Outputs - 48 max.
Analog Inputs - 8 max.
- Room Temp. - PT 100 / RTD
- DC Current (4-20 mA)
- DC Voltage (0-10 V)
- DC Voltage (0-140 V DC)
- DC Short Current (5 - 10 A)

Remote Monitoring For Building Facilities
- Customized Solutions for Pump Houses, DG Sets, Mains supply
- Single Source for SCADA Hardware & Software
- Secured Access by Passwords
- Supervision & commissioning services

Application areas
- Pump Automation & Remote Monitoring
  - Local time based pump operations & remote control function
  - Time based event logging
  - Interlinking of multiple pump controllers through RS 485 communication
  - Optional Modem base dial up interlinking through PC
  - Windows based OU software

Power Consumption - 30 W max.
keyboard & Display - 4 Keys
Dimensions (mm) 19” Rack - 436.88 x 132.50 x 260
Weight - 7200 gms (approx.)
Communication Protocol - Modbus ASCII
Communication Port - RS 232 / RS 485

Standard configuration of MINISCADA has following basic specifications:
Control Supply - 380 - 270 V AC / DC
Digital Inputs - 92 max.
Digital Outputs - 48 max.
Analog Inputs - 8 max.
- Room Temp. - PT 100 / RTD
- DC Current (4-20 mA)
- DC Voltage (0-10 V)
- DC Voltage (0-140 V DC)
- DC Short Current (5 - 10 A)

Remote Monitoring For Building Facilities
- Customized Solutions for Pump Houses, DG Sets, Mains supply
- Single Source for SCADA Hardware & Software
- Secured Access by Passwords
- Supervision & commissioning services

Application areas
- Pump Automation & Remote Monitoring
  - Local time based pump operations & remote control function
  - Time based event logging
  - Interlinking of multiple pump controllers through RS 485 communication
  - Optional Modem base dial up interlinking through PC
  - Windows based OU software

Power Consumption - 30 W max.
keyboard & Display - 4 Keys
Dimensions (mm) 19” Rack - 436.88 x 132.50 x 260
Weight - 7200 gms (approx.)
Communication Protocol - Modbus ASCII
Communication Port - RS 232 / RS 485

Standard configuration of MINISCADA has following basic specifications:
Control Supply - 380 - 270 V AC / DC
Digital Inputs - 92 max.
Digital Outputs - 48 max.
Analog Inputs - 8 max.
- Room Temp. - PT 100 / RTD
- DC Current (4-20 mA)
- DC Voltage (0-10 V)
- DC Voltage (0-140 V DC)
- DC Short Current (5 - 10 A)

Remote Monitoring For Building Facilities
- Customized Solutions for Pump Houses, DG Sets, Mains supply
- Single Source for SCADA Hardware & Software
- Secured Access by Passwords
- Supervision & commissioning services

Application areas
- Pump Automation & Remote Monitoring
  - Local time based pump operations & remote control function
  - Time based event logging
  - Interlinking of multiple pump controllers through RS 485 communication
  - Optional Modem base dial up interlinking through PC
  - Windows based OU software

Power Consumption - 30 W max.
keyboard & Display - 4 Keys
Dimensions (mm) 19” Rack - 436.88 x 132.50 x 260
Weight - 7200 gms (approx.)
Communication Protocol - Modbus ASCII
Communication Port - RS 232 / RS 485

Standard configuration of MINISCADA has following basic specifications:
Control Supply - 380 - 270 V AC / DC
Digital Inputs - 92 max.
Digital Outputs - 48 max.
Analog Inputs - 8 max.
- Room Temp. - PT 100 / RTD
- DC Current (4-20 mA)
- DC Voltage (0-10 V)
- DC Voltage (0-140 V DC)
- DC Short Current (5 - 10 A)

Remote Monitoring For Building Facilities
- Customized Solutions for Pump Houses, DG Sets, Mains supply
- Single Source for SCADA Hardware & Software
- Secured Access by Passwords
- Supervision & commissioning services

Application areas
- Pump Automation & Remote Monitoring
  - Local time based pump operations & remote control function
  - Time based event logging
  - Interlinking of multiple pump controllers through RS 485 communication
  - Optional Modem base dial up interlinking through PC
  - Windows based OU software

Power Consumption - 30 W max.
Minilec Microprocessor Based Alarm Annunciators are designed to keep an alert & watchful eye on your plant & processes. The entire range has been designed with an insight into the modern day manufacturing plant & its future requirements. Minilec Alarm Annunciators are equipped with microprocessor-based design, super bright LED facia windows, site selectable, programmed sequences as per ISA standard & thoughtful provisions for troubleshooting & maintenance. Dynamic, Alert & Responsive... These unique advantages have helped the Minilec Annunciators to be an icon in the power T & D industry & engineering establishments in India. The world class Minilec Annunciator has made its presence felt in Overseas markets.

### Models:
- MICROWARN 0600,
- MBAS 0600,
- MBAS 9700,
- MBAS 9900,
- Accessories,
- Annunciation Panels

### Features
- 4 windows to 128 windows
- Integral & Split models
- Microprocessor based
- Super bright LEDs for facia
- Standard operating sequences
- Any other custom-made sequences
- NO-NC & Trip Non-Trip site selectable
- Repeat relays
- Supply fail annunciation / Indication
- Choice of 3 window sizes
- Choice of five colours

### Ordering Instructions
- Product Family Name
- Model Name
- Aux. Supply / Control supply voltage
- No. of Inputs (Windows)
- Operating sequence
The Undisputed Leader
Many pioneering advancements have been introduced for the first time by Minilec in the Indian market. The Minilec range is equipped with well-researched and innovative features highly appreciated by consultants and customers (and imitated by competitors!)
Some of the trend setting technologies and features initiated by Minilec are as follows.

Microprocessor based system operation:
- For robust design and easier troubleshooting.
- ISO 9001 standards: For high standards of quality assurance and reliability.
- LEDs for facia: For lower maintenance costs, long life and low energy consumption.
- Multi-coloured windows: For simplified fault differentiation.
- Standard modules: For seamless integration and better aesthetics.
- Moulded enclosure: For space savings and improved aesthetics.
- Easily accessible DIP switches: For faster programming by eliminating the need to open the unit.
- Any operating sequence: For added flexibility and convenience.
- Serial communication: For computerised fault detection and automatic documentation.

Solutions for Varying Needs
The Minilec range of annunciators is highly diversified and adaptable to a wide spectrum conditions. Be it a Power station, Sub station, Sugar factory, Steel plant, Fertilizer / Petrochemical plant, ships and dockyards, railways or for that matter, any process plant. Be it in the hot summers of Rajasthan, Egypt of Indonesia or the humid atmosphere of Calcutta, Chennai or Malaysia, Minilec takes it all in its stride!

The Product Range
MICROWARN 0600: Standard models for 6, 8, 12 points
MBAS 0600: Standard models for 4-16 points
MBAS 9700: Standard models for 16, 32, 48, 64, 80, 96 points
MBAS 9900: Standard models for 4, 6 & 8 points

The Advantages of Microprocessor Based Alarm Annunciators over solid state version
- Less components hence high reliability.
- Compact size, light weight.
- Low power consumption.

- Flexibility: any operating sequence can be provided.
- Bringing the latest in technology, can be configured easily with any other advanced system.

The Unique Features
- Powerful microprocessor based circuit.
- Built in system watch dog.
- First fault identification.
- Optically isolated fault inputs.
- Wide range of site selectable alarm sequences (ISA standards).
- facia with super bright LEDs instead of high power consuming short life filament lamps.
- Site selectable fault contact filament lamps. Site selectable fault contact configuration (NO/NC).
- Special SMPS power supply.
- Sleek, modern, aesthetic design.

Additional Features
- Grouping feature for differentiation between Trip / Non - Trip type faults.
- Repeat relays for parallel annunciation. For added flexibility and convenience.
- Serial communication: For computerised fault detection and automatic documentation.
- Manned / Unmanned feature.
- Paralleling of units.
- Group fault alarm.

Solutions for Varying Needs
- Choice of three window colours: Red, Green, Amber (Yellow).

Reliability
Minilec annunciators have been tested satisfactorily at CPRI (Bangalore), SISIR Singapore, ERLT, ETDC for environmental and functional tests as per relevant standards.
Upon request available with CE marking.

All Alarm Annunciators carry 5 yrs. warranty.

The Highlights
- MBAS series with replaceable windows, 2 window sizes, DIP switches outside for easy programming.
- Common power supply 90-270 AC/DC and DIP switches outside for Microwarn 0600 models.
- Split architecture - economic/cost saving, for 19" rack concept for MBAS 9700 models.
- Serial port - RS232C / RS485 for MBAS 9700 models.
This is a modified version of earlier Microwarn 9600 model which has been discontinued. Microwarn 0600 consists of 3 basic sections:

A) The Power Pack

The Microwarn 0600 is powered by a highly reliable and noise free, specially designed power supply. It converts the available power source (AC/DC voltage supply) into a regulated and filtered DC output, which is fed to the annunciator unit.

B) The CPU

This is the Central Processing Unit of Microwarn 0600 which scans and processes the incoming fault signals from the various potential free field contacts and drives the corresponding LED windows and the audible devices in order to announce the fault, according to the operating sequence selected.

C) The Facia:

This section consists of facia windows illuminated by "Super Bright LEDs" on occurrence of any fault. The Super Bright LEDs ensure a long and absolutely maintenance free window life along with a good visibility, and have very low power consumption.

NO/NC or sequence selection DIP switches are located outside, hence programming is now possible without opening the unit.

Models of 12, 8, 6 windows are available. 8 and 6 window models are with built-in push buttons.
MBAS 0600 is an improved version of earlier MBAS 9400, and is available for 4 to 24 windows.

### The Functional Features
- Fixed Sequence (S1/S2/S3/S4)
- Sequence as per ISA standard
- Potential free dry contact inputs
- NO/NC inputs grouping selectable configuration
- Relay output for external Audible Hooter
- 3 relay optional for either of below mentioned features
  - a) Ring back hooter
  - b) Supervisory control

### The Design Features
- Single chip microcontroller logic
- Opto isolated inputs and outputs
- Super bright LED window illumination
- High noise immunity / isolation
- Switch mode power supply
- Self surveillance watchdog LED

### The Constructional Flexibility
- Conforming to DIN panel cutouts
- Replaceable snap-on window capsules
- Two different window size
- Expandable modules
- Moulded enclosures

### System Enclosures
The MBAS 0600 annunciation systems is configured in multiples of four basic ABS moulded enclosures.

### Optional Features
- Site Selectable sequences (S1, S2, S3, S4)
- Pre-programmed Custom built operating sequences
- Trip & Non-Trip grouping facility for MBAS 0600
- Manned/ Unmanned function
- Fault Follower contact output per fault Input (NO or NC)
- Ringback sequence with optional 3 relay output for Ringback hooter, with Trip & Non-Trip grouping facility
- Supply fail indication / annunciation
- External and / or built-in control push buttons

---

**Part names & locations**

**Functional Block Diagram**

**Back view showing Terminal details**
Wherever not specified Contact Rating: 5A @ 230 V AC (resistive) * CE marked products available on request.

Supply Voltage: 24 / 30 / 48 / V DC  - 90 - 270 V AC / DC

Windows: 4 / 6 / 8 / 12 / 16 / 24 / 28

Window Sizes: 50 x 50mm  /  50 x 65 mm

Display Device: Super bright high efficiency low power consuming LEDs

Facia Type: Individual windows front removable windows / Front Replaceable

Window LED Color: Standard colour available RED. Optional colour Yellow / Amber, Green

Flash Rate: Fast - 60 flashes/min. Slow - 30 flashes/min.

Response Time: 25 ms ± 10 ms.

Input Signal: Potential free contacts (NO or NC site selectable)

Interrogation Voltage: + 12 V DC

Output Contacts: 1 NC + 1 NO (optional) + INO (optional)

Architecture: Hospital

Operational Seq.: ISA Standards sequences - Auto/Manual/First-up/Ringback (optional) OR any other sequence on request

Operational Temp.: 0-60 degrees C

Power Consumption: 1.5 Watts per Window (Max)

Optional: Grouping / AC-DC fail Annunciation / Repeat Relay cards

Dimensions (mm):

<table>
<thead>
<tr>
<th>1D</th>
<th>2D</th>
<th>3D</th>
<th>4D</th>
</tr>
</thead>
<tbody>
<tr>
<td>138 x 68</td>
<td>138 x 138</td>
<td>138 x 210</td>
<td>138 x 282</td>
</tr>
<tr>
<td>144 x 72 x 215</td>
<td>144 x 144 x 215</td>
<td>144 x 216 x 215</td>
<td>144 x 288 x 215</td>
</tr>
</tbody>
</table>

Dimensioal & Panel Cutout Details

Connection Diagram (FOR MAX. 24 POINT MBAS 0600)
ALARM ANNUNCIATORS

MBAS 9700

Integral Model: 16 Pts. Small

Integral Model: 16 Pts. Big

MINILEC offers its unique alarm Annunciator based on the latest single chip micro-controller technology with serial communication facility. Now available in both 19” rack type enclosure as well as in moulded enclosure. MBAS 9700 annunciators have split architecture for 16, 24, 32, 48, 64, 80, 96, 112 & 128 windows and integral type of architecture for 16 small or big window models. 24, 32, 48, 64, 80, 96, 112, & 128 window models are housed in 19” rack type enclosures, separate for MCU & for PSU. Here choice of facia (DFU) is of 3 types (a) Small size i.e. 30 x 30 mm and (b) Big size is 30 x 65 mm / 50 x 70 mm. (c) Facia is available in multiples of 16 windows. In addition to all other standard features, MBAS 9700 has additional facility of computer linking. A serial port (RS232C / RS485) output is available which can be supported by an IBM compatible PC of minimum 386 configuration. Minilec can supply the standard software with every model or can develop suitable software as per customer requirements or can provide source coding / protocol details to enable client to develop their own suitable software.

STANDARD FEATURES
• Single chip micro-controller logic
• Super bright LED’s for window illumination
• Site selectable NO/NC type fault contacts
• Site selectable trip / Non trip (Grouping)
• Easy card replacement & hence fault diagnosis
• Switch Mode Power Supply (Suitable for Both AC/DC Supply)
• High noise immunity and wide input supply variation
• Opto-isolated Inputs and Outputs
• Site Selectable sequences
• Potential free dry input contacts
• Two different window sizes
• Replacable windows & window legends
• Computer linking for fault logging with printer facility
• report.Self-surveillance
• watch dog LED
• Relay output for external audible hooter
• Diagnostics Menu
• Redundant Power Supply (Only in 19” Rack Model)
• CPU fail & PSU fail indication with relay output contact (Only in 19” Rack)
• User Friendly terminal Connectors

OPTIONAL FEATURES
• Different colored LED’s in each window for easy differentiation of critical faults
• Customized preprogrammed operating sequence
• Multi channel serial communication (8 Annunciators & single computer)

CONSTRUCTIONAL DETAILS
MBAS 9700 consists of four basic sections (in 16 point moulded enclosure these are inbuilt)
1) The Power Supply Unit (PSU Module)
2) The Main Control Unit (CPU + IOU Module)
3) The Display Facia Unit (DFU Module)
4) Computer interface

THE MAIN CONTROL UNIT (MCU)
CPU module is the Main Processing Unit of MBAS 9700 which scans and processes the incoming fault signals from the various potential field contacts through IOU module, and drives the corresponding LED windows and the audible device in order to annunciate the fault through IOU module. The IOU module is the input & output interfacing unit. To each IOU module 16 input contacts (potential free) & 16 window LED’s can be connected.

THE DISPLAY FACIA UNIT (DFU)
The Facia block is accessible from front (in moulded enclosure) and constitutes of window capsules. The sandwiched photo film window inscriptions are press fitted on the window capsules. For 16 to 128 points system the SFUs are given separately, except 16 point (moulded Enclosure) where it is in built.

THE POWER SUPPLY UNIT (PSU)
PSU converts the available power source into a regulated and filtered DC output, which is fed to the MCU Module & SFUs. The power supply can accept Specified AC or DC (P) supply, depending upon the application.

STANDARD FEATURES
• Single chip micro-controller logic
• Super bright LED’s for window illumination
• Site selectable NO/NC type fault contacts
• Site selectable trip / Non trip (Grouping)
• Easy card replacement & hence fault diagnosis
• Switch Mode Power Supply (Suitable for Both AC/DC Supply)
• High noise immunity and wide input supply variation
• Opto-isolated Inputs and Outputs
• Site Selectable sequences
• Potential free dry input contacts
• Two different window sizes
• Replaicable windows & window legends
• Computer linking for fault logging with printer facility
• report.Self-surveillance
• watch dog LED
• Relay output for external audible hooter
• Diagnostics Menu
• Redundant Power Supply (Only in 19” Rack Model)
• CPU fail & PSU fail indication with relay output contact (Only in 19” Rack)
• User Friendly terminal Connectors

OPTIONAL FEATURES
• Different colored LED’s in each window for easy differentiation of critical faults
• Customized preprogrammed operating sequence
• Multi channel serial communication (8 Annunciators & single computer)
COMPUTER INTERFACE

The MCU unit transmits fault information to computer serially. RS 232C/RS 485 standard is used for serial communication. Communication protocol modbus ASCII / RTU can be offered. In computer user-friendly software is written. This software offers on-line Date & Time setting, Legend setting, Display window & also it gives fault report with on demand printing facility.

TECHNICAL SPECIFICATIONS:

1.0 Supply voltage
  20 - 60VDC, 90 - 270VAC/DC

2.0 Supply frequency
  50 / 60 Hz. (±3%) for AC

3.0 Input
  3.1 Fault Alarm Inputs. Actuation Through Fault Contacts
  3.2 Fault contacts. Potential free (volt free) type
  3.3 Input interimation voltage + 12V DC(60)
  3.4 Input isolation Opto isolating device (2 KV)
  3.5 Response Time 40 mS.
  3.6 Site selectable DIP for
    Fault type NO/NC
    Grouping Trip/Nom Trip
    Sequence selection Manual/Auto/Ringback/Firstup

4.0 Output
  4.1 Output contacts for grouping 1NO+ 1NO
  4.2 Output contact for CPU & PSU fail 1NC  (In 19” Rack Only)
  4.3 Contact Rating 5 amp at 240 VCA (Resistive)

5.0 No. of windows
  In 19” rack
  16/24 Big/32/40 Big/48/64/80/96/112/128
  In 9400 enclosure 16 points

5.1 Windows dimensions
  30 mm x 30 mm For small windows
  65 mm x 30 mm For big windows

5.2 Colour
  Red / (Yellow - Amber) / Green

5.3 Flash rates
  50-60 flashes / Min
  25-30 flashes / Min.
  For Ring Back Sequence or other seq.

5.4 Power Consumption
  1.5 W per Window. (Max)

6.0 Sequence
  Manual Reset, Auto Reset, Ring back, Firstup
  (Any Other Sequences On Request)

7.0 Serial communication
  RS232C / RS485 with modbus ASCII / RTU
DIMENSIONAL DETAILS - MCU & PSU

Overall Dimensions (DFU)

<table>
<thead>
<tr>
<th>MODELS</th>
<th>Big Windows</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W</td>
<td>L</td>
<td>D</td>
<td>W</td>
<td>L</td>
<td>D</td>
</tr>
<tr>
<td>128 POINTS</td>
<td>144m.m.</td>
<td>1152m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>1152m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>112 POINTS</td>
<td>144m.m.</td>
<td>1008m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>1008m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>96 POINTS</td>
<td>144m.m.</td>
<td>864m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>864m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>80 POINTS</td>
<td>144m.m.</td>
<td>720m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>720m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>64 POINTS</td>
<td>144m.m.</td>
<td>576m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>576m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>48 POINTS</td>
<td>144m.m.</td>
<td>432m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>432m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>32 POINTS</td>
<td>144m.m.</td>
<td>288m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>288m.m.</td>
<td>70m.m.</td>
</tr>
</tbody>
</table>

Small Windows

<table>
<thead>
<tr>
<th>MODELS</th>
<th>W</th>
<th>L</th>
<th>D</th>
<th>W</th>
<th>L</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 POINTS</td>
<td>144m.m.</td>
<td>2304m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>2304m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>112 POINTS</td>
<td>144m.m.</td>
<td>2016m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>2016m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>96 POINTS</td>
<td>144m.m.</td>
<td>1728m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>1728m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>80 POINTS</td>
<td>144m.m.</td>
<td>1440m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>1440m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>64 POINTS</td>
<td>144m.m.</td>
<td>1152m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>1152m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>48 POINTS</td>
<td>144m.m.</td>
<td>864m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>864m.m.</td>
<td>70m.m.</td>
</tr>
<tr>
<td>32 POINTS</td>
<td>144m.m.</td>
<td>576m.m.</td>
<td>70m.m.</td>
<td>144m.m.</td>
<td>576m.m.</td>
<td>70m.m.</td>
</tr>
</tbody>
</table>

PANEL CUTOUT DETAILS - DFU

EXTERNAL WIRING DIAGRAM WITH REPEAT RELAY
MBAS 9900 screens Annunciator accepts 12 / 24 V DC potential input & also provides control relay output. Added built-in buzzer & push buttons makes it complete Annunciator with control output. This output is interlocked until all fault input resets. MBAS 9900 is presently available in 4 point & 6 point small window (30 x 30mm) configuration. Both 4 point & 6 point systems come with built-in push buttons.

Technical Specifications:
- **Parameters**: 230 V AC / 110 V AC, 12 V / 24 V DC ±10% - 15%
- **Windows**: 4 / 6 / 8
- **Display Device**: Super bright LED's
- **Facia Type**: Individual Windows Front Replaceable
- **Window/LED Colour**: RED, Amber / Yellow, Green
- **Flash Rate**: Fast - 60 flashes/min. Slow - 30 flashes/min.
- **Response Time**: 25 msec. ± 10 msec.
- **Input Signal**: +12 V or 24 V DC Contact
- **Output Contacts**: 1 CO + 1 CO
- **Architecture**: Integrated
- **Operational Seq.**: Sequence as mentioned in text
- **Operational Temp.**: 0-60°C
- **Power Consumption**: 1.5 Watts per Window

These are LED Facia windows with Potential input or potential free inputs. Microfacia is available in either 4 Big or 8 Small windows size. Standard models available for 12V/24V DC and 110V/230V AC.

Microfacia are LED window assemblies for RUN, TRIP or FAULT indications. With microfacia windows the panel designers can improve aesthetic value to the panel indications in a Row / Column format. Microfacia is useful for direct operation with AC or DC voltage.

**Technical Specifications**:
- **Auxiliary Supply**: 12 / 24 / 110 / 220 V AC / DC
- **Input**: Potential Free Contacts or Potential Contact
- **Output**: Window Facia LEDs on front
- **Window/LED Colour**: RED, Amber / Yellow, Green
- **Power Consumption**: 1.5 Watts per Window
- **Dimensions (mm) Unit**: Overall (L x W x D) (w/o PSU 144 x 72 x 80)
- **Dimensions (mm) Window**: for Small 30 x 30, for Big 62 x 30
- **Weight (Approx.)**: 700 gms. (With PSU) 250 gms. (W/o PSU)

*Applicable only for Microfacia with potential free inputs.*
Often Alarm Annunciators are required assembled housed in a suitable control cubical. The control panel consists of only Alarm Annunciators.

Minilec offers Alarm Annunciators along with control panels. This includes design of control panel, fabrication, painting, assembly of Alarm Annunciators and assistance during installation and commissioning.

Retrofitting work by replacing old annunciation system with latest design and for expansion in power stations, substations, process plants as also standard Annunciation Panels for plants and equipments can be catered to.

The Minilec Panel Advantages
- Complete in-house design, assembly of Annunciator Panels.
- Software capability for automation to meet project specifications.
- Component layout as per standards & safety requirements.
- Powder coated MS or Aluminum Rack Panels with quality panel wiring.
The MINILEC Annunciation systems are programmed to operate as per following operating sequences confirming to ISA standards. Other sequences / non standard sequences are given as per customer’s requirement.

### STANDARD OPERATING SEQUENCES

<table>
<thead>
<tr>
<th>MINILEC Code</th>
<th>Operating Sequence Title</th>
<th>ISA Std Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Manual Reset</td>
<td>A1</td>
</tr>
<tr>
<td>S2</td>
<td>Auto Reset</td>
<td>A1</td>
</tr>
<tr>
<td>S3</td>
<td>Ringback (R1-12)</td>
<td>R1-12</td>
</tr>
<tr>
<td>S4</td>
<td>First Out Manual Reset</td>
<td>P26A-1</td>
</tr>
</tbody>
</table>

#### SEQUENCE S1: Manual Reset (M1)

1. Test, Silence Accept, Reset Push Buttons are external.
2. Audible alarm can be silenced by pressing Silence (Mute) Push button.
3. Manual reset of Accepted faults after process conditions return to normal.
4. Operation test provided.

#### SEQUENCE S2: Auto Reset (A1)

1. Test, Silence Accept, Reset Push Buttons are external.
2. Audible alarm can be silenced by pressing Silence (Mute) Push button.
3. Automatic reset of Accepted faults after process conditions return to normal.
4. Operation test provided.

#### SEQUENCE S3: Ringback (R1-12)

1. Test, Silence Accept, Reset Push Buttons are external.
2. Audible & Ringback Audible alarm can be silenced by pressing Silence (Mute) Push button.
3. Automatic reset of Accepted faults after process conditions return to normal.
4. Operation test provided.

#### SEQUENCE S4: First Out Manual Reset

1. Test, Silence Accept, Reset Push Buttons are external.
2. Audible & Ringback Audible alarm can be silenced by pressing Silence (Mute) Push button.
3. Manual reset of Accepted faults after process conditions return to normal.
4. Operation test provided.

---

### OPTIONAL ACCESSORIES

**Repeat Relay Card**

External Repeat Relay Cards can be connected for remote annunciation or interfacing with SCADA or DCS hardware. These cards are connected by plug-in type pre-fab cables.

**Supply Fail Annunciation**

This feature enables the annunciator to operate on alternate stand-by power supply in case of mains supply failure. External relays with separate power supply module is supplied. If mains supply and stand-by supply are of same voltage level the power supply module is not required.

**Manned / Unmanned Facility**

This feature allows disabling the audio & visual indication on fault occurrence if the station is unmanned. The annunciator registers & records all faults occurring during unmanned mode and displays again manned mode.

**RS 232 / 485 Converter**

This is a universal converter for converting RS 232 serial port to RS 485 serial port or vice versa. It operates on 230 AC supply and is to be used with Minilec make interconnecting cables for Minilec annunciators & for PC.

**d) Electronic / Industrial Hooter**

Electronic Hooters with tone & volume control are supplied. Suitable for AC or DC supply Standard 96 x 96 enclosure.
**PROTOCOM-1** Twin AC Controller

**SYSTEM SPECIFICATIONS**

- **System supply**: 240 V AC, ±20%, 1 Ph
- **Frequency**: 50 (60) Hz, ±3%
- **Supply**: 240 V AC, ±20%, 1 Ph
- **Aux**: 120 V AC, ±10%, 1 Ph
- **Current Setting**: 0 – 1000 A
- **Current**: 8-16 Amp (Variable)
- **Current setting**: 100%, 600%
- **Auto reset**: 3 C
- **Auto reset gap**: 6 VA
- **Frequency**: 50 (60) Hz, ±3%
- **Hysteresis for 6 VAC ± 3 VAC**: 6 VAC ± 3 VAC
- **N. A.**: 1 C - 5 C
- **Power On**: Green
- **AC 1 On**: Red
- **AC 2 On**: Green
- **Overall (LxWxD)**: 141 x 193.9 x 72
- **Mounting (L x W)**: 117 x 169.5
- **Weight**: 1000 gms.
- **Dimensions (approx.)**: Overall (L x W x H): 141 x 193.9 x 72
- **Mounting (L x W)**: 117 x 169.5
- **Weight**: 1000 gms.

**SETTING KEYS**

- 1 NO + 1 NO + 1 NO
- **Setting time delay and readings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Display Settings</th>
<th>Trip Time Delay</th>
<th>Over Load</th>
<th>Over Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Voltage</td>
<td>-</td>
<td>4 Sec ± 0.5 Sec</td>
<td>UV</td>
<td>N/C</td>
</tr>
<tr>
<td>Over Volt Age</td>
<td>-</td>
<td>4 Sec ± 0.5 Sec</td>
<td>UV</td>
<td>N/C</td>
</tr>
<tr>
<td>Over Load</td>
<td>-</td>
<td>4 Sec ± 0.5 Sec</td>
<td>UV</td>
<td>N/C</td>
</tr>
<tr>
<td>Over Temperature</td>
<td>-</td>
<td>4 Sec ± 0.5 Sec</td>
<td>UV</td>
<td>N/C</td>
</tr>
<tr>
<td>Hydrostatic at Auto Reset</td>
<td>-</td>
<td>4 Sec ± 0.5 Sec</td>
<td>UV</td>
<td>N/C</td>
</tr>
<tr>
<td>Trip Time Delay</td>
<td>-</td>
<td>4 Sec ± 0.5 Sec</td>
<td>UV</td>
<td>N/C</td>
</tr>
<tr>
<td>Message on Display</td>
<td>-</td>
<td>4 Sec ± 0.5 Sec</td>
<td>UV</td>
<td>N/C</td>
</tr>
</tbody>
</table>

**Logic Setting**

- **Logic Setting**
  - **Fault Buzzer**: BUZZER
  - **Alarm RLY**: 1 TO 12 hours.
  - **AC1 RLY**: 1 TO 12 hours.
  - **AC2 RLY**: 1 TO 12 hours.

**Faults**

- **Under Voltage (UV)**
- **Over Voltage (OV)**
- **Over Load (OL)**
- **Over Temperature (OT)**
- **Fault Buzzer**

**Operation**

1. **Normal Cyclic Operation**
   - After power ON POWER LED indication glows steady. Display will show programmed AC voltage, AC1 & AC2 current and frame temp with a rising time of 5 sec. AC1 will become ON and will remain ON for next set time cycle. After completion of timing cycle, AC1 will be OFF and second AC will ON. Second AC will remain ON for next set time cycle. This operation will be repeated in cyclic mode. When AC1 is unmonitored, respective LED glows steady. Internal timer will retain timing cycle (with resolution of 1 Hr.) in case of power failure with built-in memory retention facility. Every time an AC will be made ON after ON delay of 2 minutes.

2. **Normal Cyclic Operation with built-in protection against UV, OV & OL for both AC units.**

3. **Logic Setting**
   - **Logic Setting**
   - **Logic # 1 Single ac operation only in alternate mode.**
   - **Logic # 2 single or both ac operation based on trip time delay.**

**OTHER PRODUCTS**

**PROTOCOM-1** is useful for two AC installations in small offices / businesses, ATM centers, residential houses, for AC units of 1 or 1.5 Tons. One or both ACs can be started, at any time and running of each AC is ensured during continuous operation. In Second logic, one or both ACs will run as per Demand built-in protection against UV, OV & OL for both AC units.
Three phase asynchronous motors are used in industry due to its simple construction and low maintenance operation. However, torque and motor current during the starting of a three-phase asynchronous squirrel-cage motor is usually not very favorable. Therefore electronic controllers, like EMS 2000, are used to reduce the high from excessively high starting currents. By limited the accelerating torque, mechanical stress on the material to be conveyed or processed, and consequently on all mechanical parts of drive and driven machine, is reduced.

By starting motor at low voltage and avoiding large current peaks during starting with current limit feature the cost of electricity may also be reduced.

**MODELS:**
- D3 EMS1
- EMS2000
- EMS-MMI

**FEATURES**
- Suitable for Motors up to 5 HP and 10 to 75 HP
- Soft Start and Soft Stop
- Current Control
- Various Starting options
- MMI Functions with PC communication
- Equipped with important motor protection functions

**Ordering Instructions**
- Product Family Name
- Model Name
- System Name
- System Supply Voltage
- Aux. Supply / Control supply voltage
- Motor rating (HP / kW)
- Motor applications
Minilec introduces a new range of Electronic Motor Starter - EMS-2000. These newly introduced Electronic Soft Starter are packed with unique features and are designed for stand-alone applications.

### Features
- **Soft Start** - Adjustable soft start time (range: 1 - 60 sec).
- **Soft Stop** - Tuned stop time.
- **Normal High Volt start**
- **Kick start**
- **Adjustable kick duration 400-999 ms.**
- **Current limit**
  - Adjustable range: 100% - 110% of FLA
  - (100% = 5A, i.e. secondary of external CT)
- **Energy save (PFC)**

### Power Range
- **Nominal Current (Amps)**: 50 Amp.
- **System Supply**: 3 Phase 3 wire: 415V AC (-20% + 15%)

### Overload Protection
- **External Overload relay**
  - Adjustable range: 40% - 100% Overload
  - Locked rotor (for current above 500% to trip within 5 Sec.)
- **Under voltage / overload Flashing**

### Controls
- **External / Remote**
- **Emergency stop / system reset (free run to stop)**
  - Drives with long periods of operation under no-load condition.
- **Mains with transmission systems, belt or chain drives.**

### Faults and Indications
- To understand the fault indications refer following table.

---

**Typical fields of application for “EMS 2000” include.**
- Electrical drives for processing materials which are sensitive to jerking and pulling.
- Drives with large moments of inertia.
- Drives with large start/stop cycles.
- Drives with large motors.

**Typical equipment used with the EMS 2000 are:**
- **Fans**
- **Bowers**
- **Compressors**
- **Conveyor belts**
- **Cranes**
**SOFT STARTERS**

**EMS-MMI**

This is an advanced version of EMS 2000 with features like display, protections and communications.

<table>
<thead>
<tr>
<th>Power Range (KW / HP)</th>
<th>7.5 KW / 10 HP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral Current (Amp)</td>
<td>16 Amps</td>
</tr>
<tr>
<td>Aux. Supply Voltage</td>
<td>30-480V AC / DC</td>
</tr>
<tr>
<td>System Voltage</td>
<td>415V AC (-20% + 15%)</td>
</tr>
<tr>
<td>Ranges</td>
<td>50 Hz ± 3%</td>
</tr>
<tr>
<td>Repass facility</td>
<td>External Contact</td>
</tr>
<tr>
<td>Short Mode</td>
<td>Normal High Volt Start</td>
</tr>
<tr>
<td></td>
<td>Normal Low Volt Start</td>
</tr>
<tr>
<td></td>
<td>Kick Low Volt Short duration start</td>
</tr>
<tr>
<td></td>
<td>Kick Low Volt long duration start</td>
</tr>
<tr>
<td></td>
<td>Kick High Volt Short duration start</td>
</tr>
<tr>
<td></td>
<td>Kick High Volt long duration start</td>
</tr>
<tr>
<td>Current Limit % In (FLA)</td>
<td>Range: 100% to 350% of In Selectably (Digital)</td>
</tr>
<tr>
<td>Ramp Up Time (Sec.)</td>
<td>1, 5, 10, 15, 20, 30, 45, 60 Selectably (DIP Switch)</td>
</tr>
<tr>
<td>Ramp Down Time (Sec.)</td>
<td>Twice of start time</td>
</tr>
<tr>
<td>Protections</td>
<td>Single Phase, Reverse Phase</td>
</tr>
<tr>
<td></td>
<td>OCV Start / Speed, Unit overload</td>
</tr>
<tr>
<td></td>
<td>Overload (IDMTL) Class 2 (Pot), 50% to 100% of FLA</td>
</tr>
<tr>
<td></td>
<td>Under Voltage</td>
</tr>
<tr>
<td></td>
<td>Lock Rotor 5 x IL &lt; 5ms</td>
</tr>
<tr>
<td></td>
<td>0 to 45 Deg. ° C</td>
</tr>
<tr>
<td>Operating Temp</td>
<td>0 to 45 Deg. ° C</td>
</tr>
<tr>
<td>Weight in Kgs (Approx)</td>
<td>10 Kg.</td>
</tr>
<tr>
<td>Device Dimensions</td>
<td>220 x 210 x 170 mm</td>
</tr>
<tr>
<td>Weight in Kgs (Approx)</td>
<td>10 Kg.</td>
</tr>
<tr>
<td>Communication</td>
<td>RS 232 &amp; RS 485</td>
</tr>
<tr>
<td>Protocol</td>
<td>ASCII &amp; RTU</td>
</tr>
</tbody>
</table>

![Diagram of Soft Starters](image)

![Diagram of Wiring](image)
**FEATURES**

1. Reduced current rush and mechanical shock
2. Soft, smooth, step-less acceleration & deceleration
3. Soft Start Time, Soft Stop Time, Initial Torque independently settable by means of potentiometer
4. Built-in bypass relay (for bypassing SCR)
5. Millions of switching cycles
6. Compact, lightweight
7. DIN-Rail mounting feature
8) DIN-rail mounting (35mm)
9) LED indications for 3-ph ON, Ramp up / Ramp down and Run

**FUNCTIONAL DESCRIPTION**

- Set Ramp-up time and Initial Torque such that motor will start without jerk and humming noise.
- Soft Start Time, Soft Stop Time, Initial Torque independently settable by means of potentiometer.
- Soft, smooth, step-less acceleration & deceleration.
- Reduced current in rush and mechanical shock. This is a compact starting device for small motors and hence there is room for more products on a given mounting platform.
- It is easy to install and to adjust because access for connections and adjustments is from the front. The device is snapped on to a DIN mounting profile. Starting and stopping time as well as initial torque can be independently adjusted by built-in potentiometers.

**APPLICATIONS**

- Typically used in motor applications where a speed control / or a step in advantageous, for example: from idle to full load, for conveyors, water pumps, and other similar applications.
- Also used on pumps, fans, belt conveyors, washers, grinders, slicers, conveyors, bottle washers, pump-bore, slicer, etc.

**SPECIAL USES**

- This unit does not provide any protection. Hence user has to take care of necessary protections.
Minilec offers a range of products for protection of water pumps used by farmers. These are primarily to monitor incoming 3-phase supply for Single Phasing, Reverse Phasing and unbalanced supply and stop the pump in case of any fault. Additional features in some models include low water level monitoring (for borewell pumps) and auto restarting.

The products are specifically produced for marketing and use in India only.

**MODELS**
- VSP2, VSP3, VPGD1
- Autoswitch-2, Autoswitch-4
- Autoswitch-5, Autoswitch-6

**FEATURES**
- Monitor incoming 3-phase supply
- Models with pre-wired connections
- Easy to fit inside most motor starters
- Switch for Auto-Manual operations
- Switch provision either built-in or external
- Adjustable on time delay
- All protections in auto & manual modes
- Built-in timer for star-delta operation
- Low level monitoring of borewell pumps

**PROTECTIONS / FUNCTIONS**
- Single Phasing
- Reverse Phasing
- Unbalanced supply (dry running)
- Low water level
- On Delay to avoid immediate re-starting of pumps during auto mode
**PRODUCTS FOR AGRICULTURE SECTOR**

**VSP2**
- Smallest size of single phasing preventor
- Single phasing, reverse phasing, unbalanced supply
- Auto reset, 1 NO output contact
- Suitable for any HP/kW rating moboblock pumps

**VSP3**
- Single phasing, reverse phasing, unbalanced supply
- Auto reset, 1 NO output contact
- Suitable for any HP/kW rating moboblock pumps
- Pre-wired terminals for easy connections

**VPGD1**
- Single phasing, reverse phasing, unbalanced supply
- Auto reset, 1 CO output contact
- Suitable for any HP/kW rating submersible pumps
- Low water level guard for dry running protection

<table>
<thead>
<tr>
<th>Feature</th>
<th>VSP2</th>
<th>VSP3</th>
<th>VPGD1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>415 VAC ± 2%, 50 Hz ± 3%</td>
<td>415 VAC ± 2%, 50 Hz ± 3%</td>
<td>415 VAC ± 2%, 50 Hz ± 3%</td>
</tr>
<tr>
<td>Output Relay Contact</td>
<td>1 NO</td>
<td>1 NO</td>
<td>1 NO</td>
</tr>
<tr>
<td>Output Contact Rating</td>
<td>3 Amp, 240 VAC (RESISTIVE)</td>
<td>3 Amp, 240 VAC (RESISTIVE)</td>
<td>3 Amp, 415 VAC (RESISTIVE)</td>
</tr>
<tr>
<td>Unbalance Trip Setting</td>
<td>40 V ± 5 V</td>
<td>55 V ± 10 VAC</td>
<td>40 V ± 5 V</td>
</tr>
<tr>
<td>Trip Time Delay</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>Auto Reset</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>Panel Mounting</td>
<td>103 x 66 x 43 mm</td>
<td>91 x 48 mm</td>
<td>76 x 30.5 x 117.5 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>260g</td>
<td>250g</td>
<td>300g</td>
</tr>
<tr>
<td>Temperature</td>
<td>-5°C TO + 60°C</td>
<td>-5°C TO + 60°C</td>
<td>-5°C TO + 60°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>Upto 95% RH</td>
<td>Upto 95% RH</td>
<td>Upto 95% RH</td>
</tr>
</tbody>
</table>

**Diagram**
- VSP2 Diagram
- VSP3 Diagram
- VPGD1 Diagram
**PRODUCTS FOR AGRISCTOR**

<table>
<thead>
<tr>
<th>Auto switch - 2</th>
<th>Auto switch - 4</th>
<th>Auto switch - 5</th>
<th>Auto switch - 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single phasing, reverse phasing, unbalanced supply</td>
<td>Single phasing, reverse phasing, unbalanced supply</td>
<td>Single phasing, reverse phasing, unbalanced supply</td>
<td>Single phasing, reverse phasing, unbalanced supply</td>
</tr>
<tr>
<td>Auto reset, 1 NO output contact, On time delay 1 to 10 Minutes</td>
<td>Auto reset, 1 NO output contact, On time delay 1 to 10 Minutes</td>
<td>Auto reset, 1 NO output contact, On time delay 1 to 10 Minutes</td>
<td>Auto reset, 1 NO output contact, On time delay 1 to 10 Minutes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Auto switch - 2</th>
<th>Auto switch - 4</th>
<th>Auto switch - 5</th>
<th>Auto switch - 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage (Vac)</td>
<td>415 ± 20%, 50 Hz ± 3%</td>
<td>415 ± 20%, 50 Hz ± 3%</td>
<td>200 - 450 Vac, 50 Hz ± 3%</td>
<td>415 ± 20%, 50 Hz ± 3%</td>
</tr>
<tr>
<td>Current (Amp)</td>
<td>5</td>
<td>1 NO</td>
<td>5</td>
<td>1 NO</td>
</tr>
<tr>
<td>Power (Vac)</td>
<td>50 V ± 10 V</td>
<td>50 V ± 10 V</td>
<td>50 V ± 10 V</td>
<td>50 V ± 10 V</td>
</tr>
<tr>
<td>On Time Delay</td>
<td>4 Sec ± 2 Sec</td>
<td>4 Sec ± 2 Sec</td>
<td>4 Sec ± 2 Sec</td>
<td>2 to 3 minutes (on auto mode)</td>
</tr>
<tr>
<td>Auto Reset</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Footprint</td>
<td>102 X 35 X 81 mm</td>
<td>90 mm Centre to Centre</td>
<td>102 X 35 X 81 mm</td>
<td>90 mm Centre to Centre</td>
</tr>
<tr>
<td>Panel Mounting</td>
<td>Panel Mounting</td>
<td>Panel Mounting</td>
<td>Panel Mounting</td>
<td>Panel Mounting</td>
</tr>
<tr>
<td>Weight (gms)</td>
<td>300g (Approx.)</td>
<td>300g (Approx.)</td>
<td>300g (Approx.)</td>
<td>300g (Approx.)</td>
</tr>
<tr>
<td>Temperature</td>
<td>-5 °C TO  + 60 °C</td>
<td>-5 °C TO  + 60 °C</td>
<td>-5 °C TO  + 60 °C</td>
<td>-5 °C TO  + 60 °C</td>
</tr>
<tr>
<td>Humidity</td>
<td>Upto 95% Rh</td>
<td>Upto 95% Rh</td>
<td>Upto 95% Rh</td>
<td>Upto 95% Rh</td>
</tr>
</tbody>
</table>

**Diagram:**

- Auto switch - 2
- Auto switch - 4
- Auto switch - 5
- Auto switch - 6
Pune - The City of Minilec

Pune has the sixth largest metropolitan economy and the highest per capita income in India, with the least income disparity between the rich and poor. This city is often addressed with the twin title of 'Oxford of the east' and 'Detroit of India'. Besides being a cultural capital of Western India, Pune is also an industrial and IT hub.

Pune is well connected by road, rail, and air to all major cities in India. Pune has an international airport, two important railway junctions and three major state and inter-state bus junctions. Pune has a light rail, skybus, light metro rail proposal for implementation.

The Pirangoot Industrial estate is located to the west of the city of Pune. It is a clean and green area blessed with picturesque mountains. Minilec is located in the heart of green Pirangoot, about 15 Km. from Pune.

Minilec (India) Pvt. Ltd.
S. No. 1073/1-2-3, At Post : Pirangoot - 412 111.
Tal - Mulshi, Dist. Pune (India)
Tel. : (020) 22922162 / 22922354 -57  Fax : ( 020) 22922134
E-mail : mkt1@minilecgroup.com

Factory & Head Office : Branch Offices :

Mumbai - Pune -

Associate companies

The Intech Group

Statfield Equipments Pvt. Ltd.: Pioneers in India in surface finishing equipments.

Intech Surface Coating Pvt. Ltd: Involved in industrial paint-shop technology and products.

Intech Auto-Stores and Conveyors Pvt. Ltd: Industrial products for material-flow management.

The Mint Group

Mint Biofuels Pvt. Ltd.: Manufacturers of biodiesel and its bi-products.

Yashaprabha Agro Pvt. Ltd.: Cultivation & management of biofuel plantations.

Intech Energy Pvt. Ltd.: Manufacture and erection of biofuel plants and machinery.

Suyash Charitable Trust: Working for social and financial upliftment of tribals in India.