

April 2009



POWR-GARD



Littelfuse Technologies: Power Thyristors • Protection Arrays • Fuses • PTCs • Varistors • TVS Diodes • GDTs • ESD Suppressors • SIDACtor Devices



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Photovoltaic Energy

CIRCUIT
PROTECTION
SOLUTIONS



Photovoltaic (PV) Systems

- 3 configurations
 - Utility Grid-Tied System
 - Utility Grid-Tied System with Battery Backup
 - Off-Grid System – In remote locations

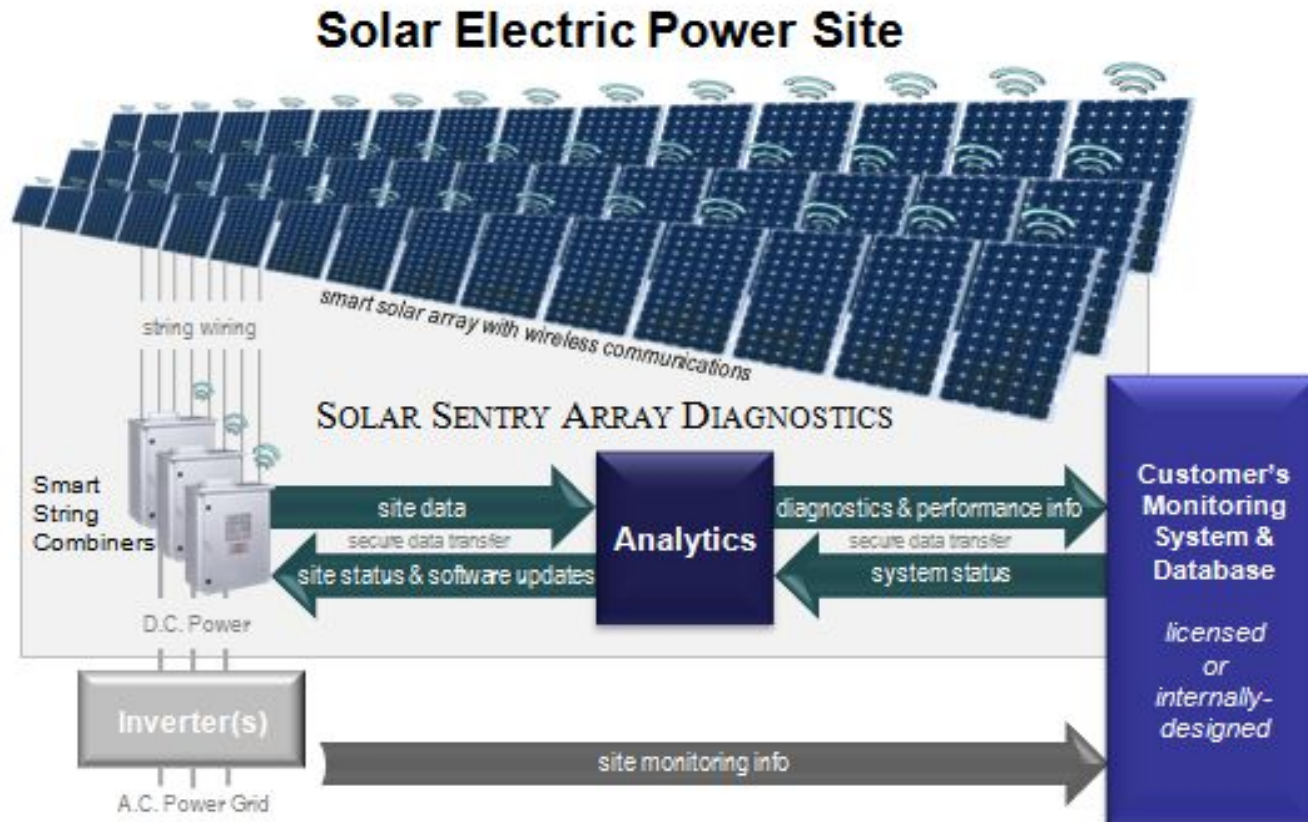
- NEC allows residential systems up to 600 VDC
- Commercial can higher voltage with qualified personnel.
- Europe moving towards 1000 VDC for improved efficiency



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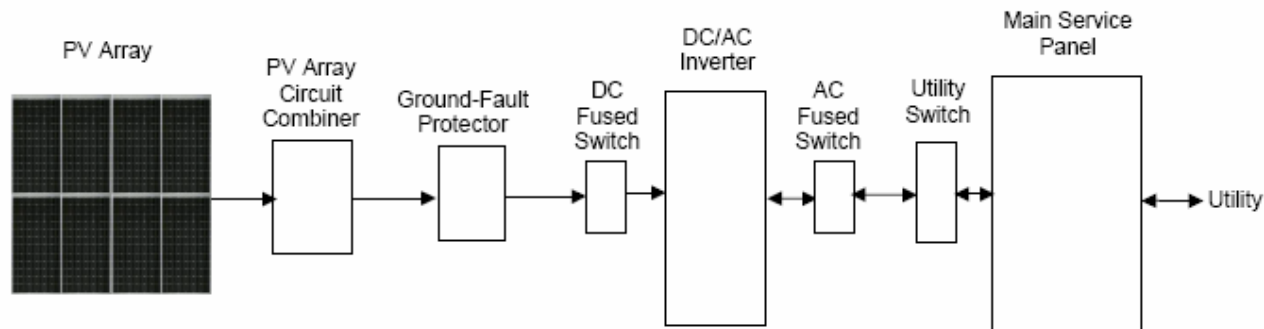
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Grid – Tied System

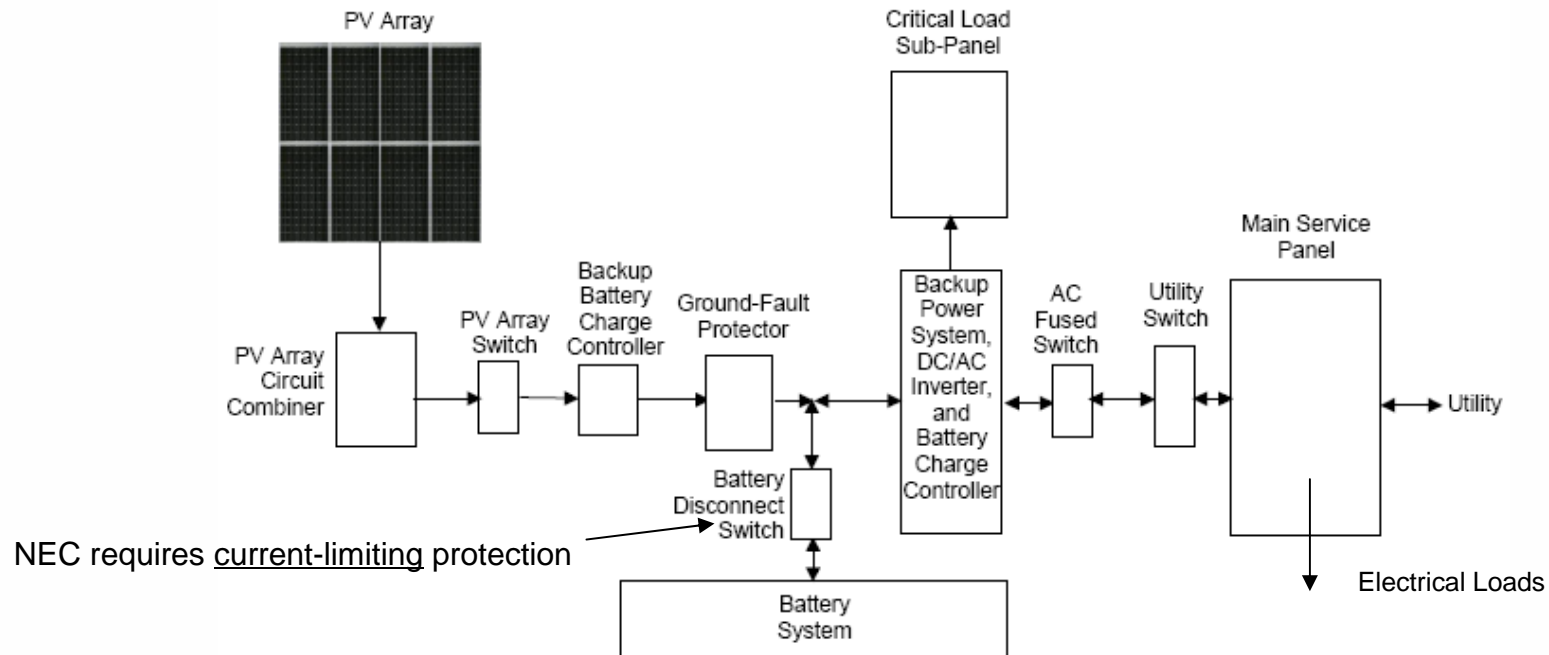


- 1. Combiner Box
 - KLKD / SPF 600VDC-1000VDC
 - Mostly midget style (10X38mm) and some larger amp fuses
- 2. GFCI – All grounded systems
- 3. DC Fuse Switch (above 150volts)
 - IDSR 600VDC and below
- 4. Inverter
 - Need 1000VDC rating for Europe
- 5. AC fuse switch or CB
 - assuming most are circuit breakers with

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Grid –Tied System with Battery Backup



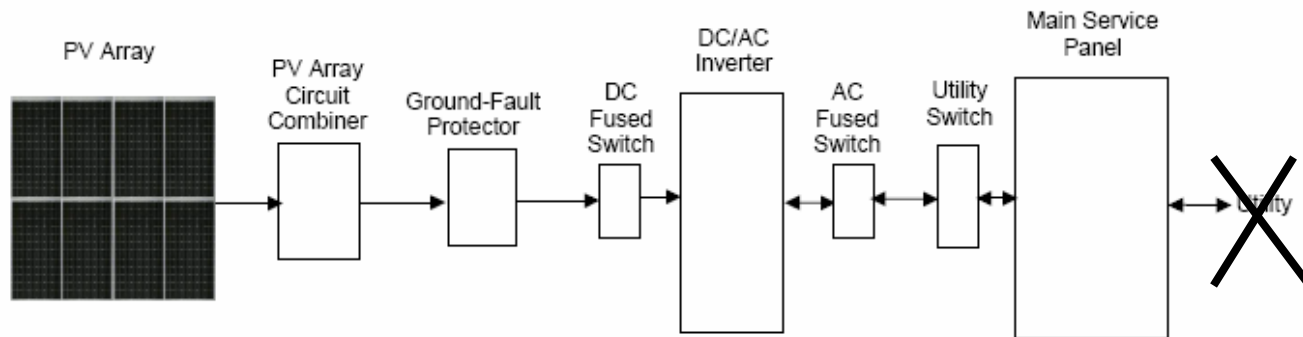
Not as common because of additional cost of battery system

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Off-Grid Systems



Not as common, but used in remote locations.



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Littelfuse offers circuit protection for

- Combiner Box
- Ground Fault Protection
- DC fused switch – Standard DC rated fuses or breakers, especially on battery back up systems (high fault current)
- Inverter



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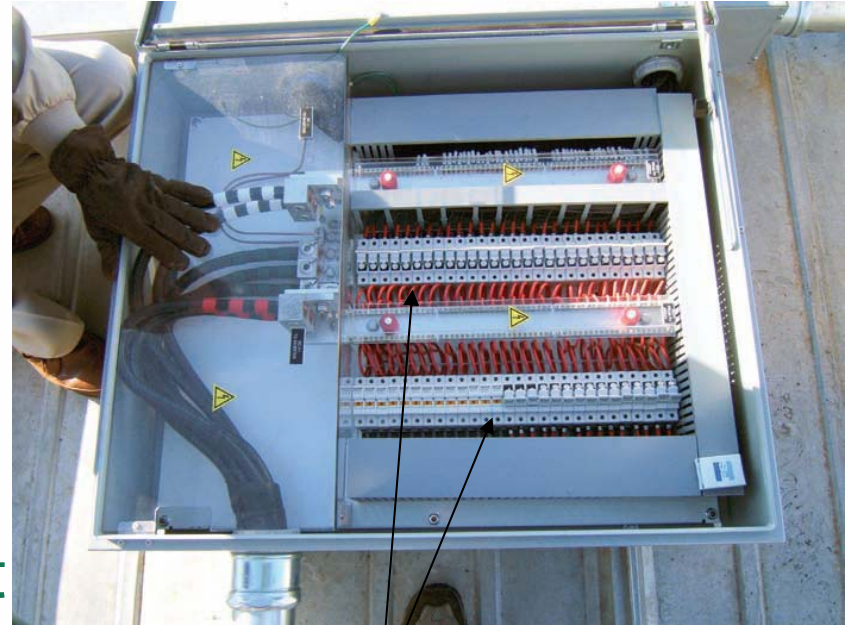
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Photovoltaic Energy – Combiner box

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This panel essentially does what a distribution block does but in reverse – multiple PV panel input conductors with one output



LPSM style fuse holders
Up-LINK would also work



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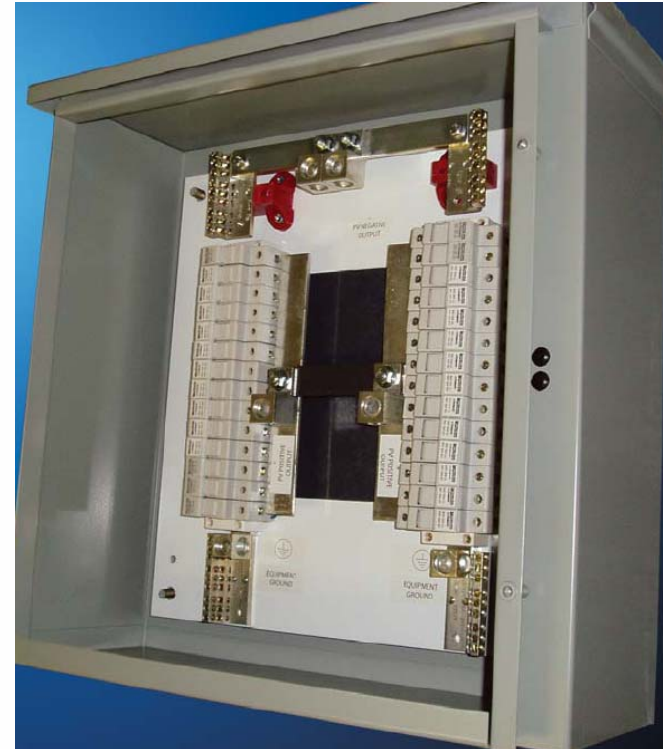
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Photovoltaic Energy – Combiner box

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- 600 VDC fuses KLKD's, IDSR's
- 1000 VDC midget – new SPF series
- Up-LINK Technology
- Standard deadfront fuse holders
- Distribution blocks or busbar
- Surge protection (MOV)



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Photovoltaic Energy - Inverter

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- Over 50 manufacturers worldwide
- 9 make up 99% worldwide marketshare



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PGSBU Solar Energy

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Product Line	Littelfuse
600 VDC Midget	Yes
Deadfront holders	Yes
600 VDC High amp fuse	Yes
Distribution Blocks	Yes
Fuseholder Busbar	2 nd qtr
LINK	Yes
1000VDC Midget(SPF)	Yes
1000VDC High amp fuse	Development
GFCI Breakers	No
Combiner Box	No
Surge Suppression	MOV



Introducing...Up-LINK[®]

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Littelfuse Technologies: Power Thyristors • Protection Arrays • Fuses • PTCs • Varistors • TVS Diodes • GDTs • ESD Suppressors • SIDACTor Devices

AGENDA:

- What is Up-LINK[®]?
- Why is this product important?
- What advantage Up-LINK[®] bring to you ?
- Fuse & other available products



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What is Up-LINK[®]?

Up-LINK at the High Level

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1. Fuseholder

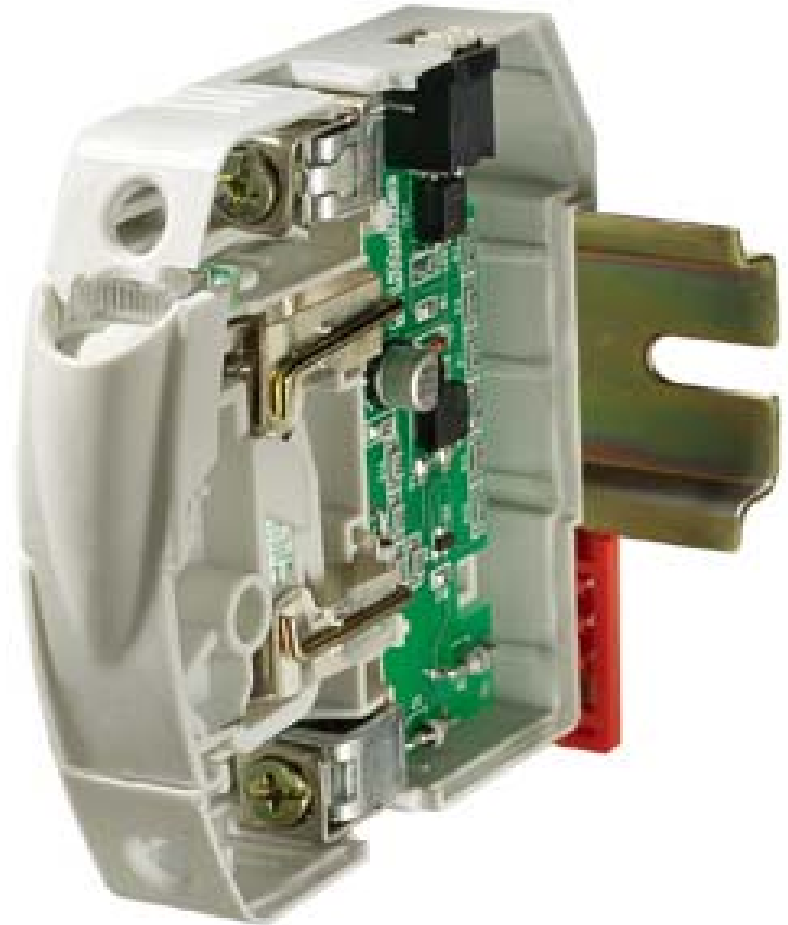
- Dead-front, touch safe
- Solid State switch
- CC, Midget style fuses

2. Indication Providing

- Remote – more to come
- Local – LED lights up

3. Modular

- 1,2,3-Pole
- Gangable



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Up-LINK is...

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- Safe
 - Dead front
 - High SCCR
 - Uses current-limiting fuses
- Reliable
 - Solid state switch
 - Integrates into existing PLC or system
 - Dependable Class CC or Midget fuses
- Productive
 - Local and remote indication
 - Immediate communication of information



Exactly what your customers are asking for...
Reduced downtime and increased productivity!



It's Worth Repeating...

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Up-LINK[®]...the answer to your problems!

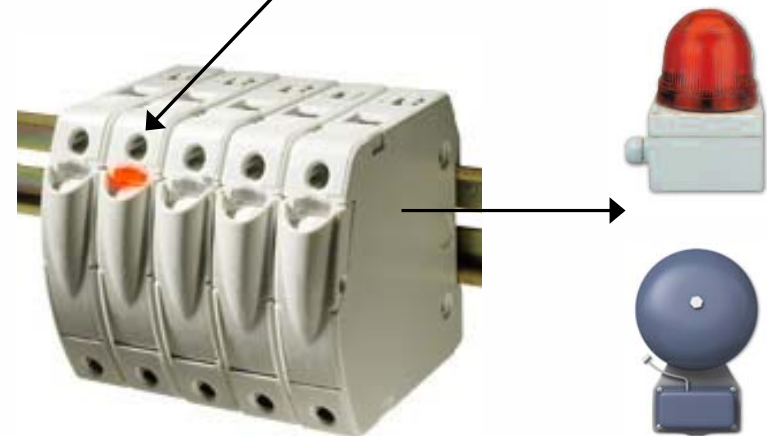
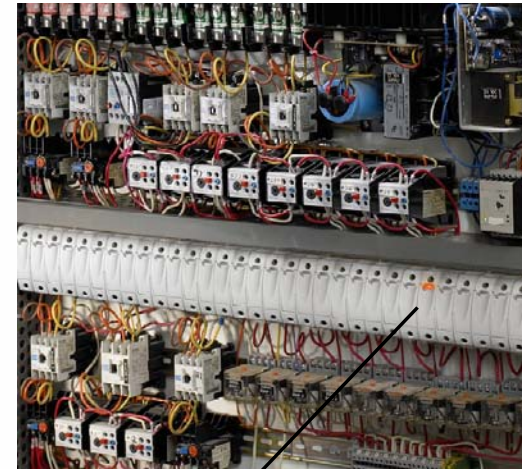


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Remote Indication? How it Works



- Most customers will already be monitoring other technologies in their facility - typically via PLC
- Fuseholder is connected to a PLC I/O port
- When fuse opens, a signal is generated
- The PLC reads the signal
- Notification is sent through the system's network to signal the end user
- Relay



Specific Information and Approvals

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- Equipped for customer desired voltage
 - 100-600V AC/DC
- High SCCR Ratings to enhance safety
 - 200kA (Class CC)
 - 100kA (Midget)
- Current limiting fuse protection
 - High interrupting rating
 - Not offered with most circuit breakers
- Din Rail makes for easy mounting



Specific Information and Approvals

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- Approvals:
 - UL-Listed (CC), UL-Recognized (Midget)
 - IEC and UL Touch Safe standards
- Current Sink Amperage
 - 25mA enough to power an LED
- See data sheet for more info



**Underwriters
Laboratories**





Part Numbers and Availability

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■ Part Numbers

– Midget Style

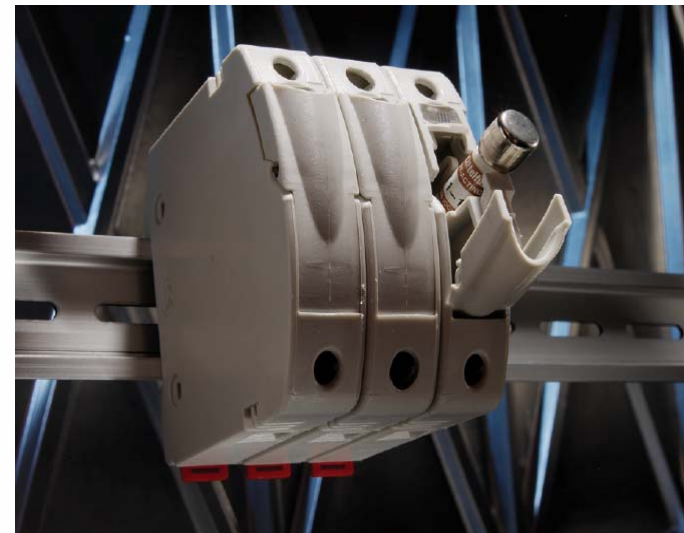
- LINK001M (1-pole)
- LINK002M (2-pole)
- LINK003M (3-pole)

– Class CC

- LINK001C (1-pole)
- LINK002C (2-pole)
- LINK003C (3-pole)

■ Available **NOW!**

- 1-pole option has four- six week lead time
- 2 and 3-pole options have six-eight week lead time



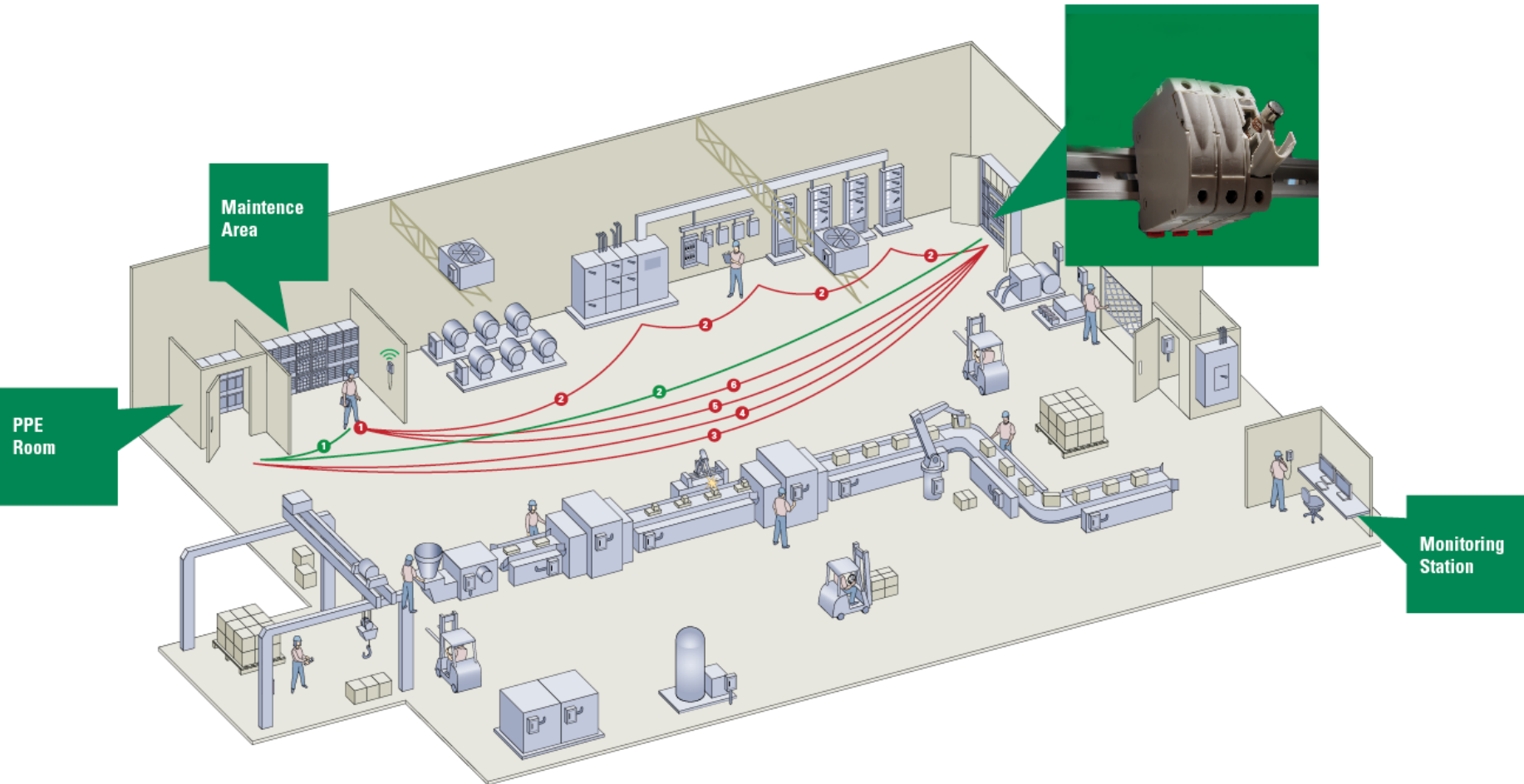
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What advantage Up-LINK[®] bring to you ?

The End-User's World

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Time Savings Using Up-LINK

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WITHOUT UP-LINK® TECHNOLOGY



- | | | |
|---|--|--------|
| 1 | Receive notification from the factory floor that a production line is down | 4 min |
| 2 | Locate the exact panel containing the blown fuse and find out PPE requirements | 12 min |
| 3 | Walk to PPE room to put on appropriate PPE | 9 min |
| 4 | Walk back to panel to find the size, type and part number of the blown fuse | 8 min |
| 5 | Walk back to maintenance room to retrieve replacement fuse | 8 min |
| 6 | Walk back to panel | 5 min |
| 7 | Diagnose Problem and Replace Fuse | 6 min |

total: **52 min**

WITH UP-LINK® TECHNOLOGY



- | | | |
|---|--|-------|
| 1 | User-programmed PLC sends a message with exact location, size, type and part number of opened fuse, also replacement bin number and required PPE | 1 min |
| 2 | Gather the necessary equipment, put on required PPE and walk to panel | 9 min |
| 3 | Diagnose Problem and Replace Fuse | 6 min |

total: **16 min**



The Mindset of the End User

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- Downtime = \$\$ Lost
- Is already monitoring other technologies
- Does not want to hassle with back and forth trips to the supply room – wants answers quick!
- Is looking for technology that will save money in the long run



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Fuse & Other available products

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1000 Vdc fuse

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- UL recognized 1000VDC maximum
- 13 ampere ratings for flexible design
- 20,000 kA interrupting rating
- High performance in compact midget size
- RoHS and lead free
- Touch safe Din rail holder available
- PCB leaded version also available

Specifications

Voltage Rating: 1000 VDC

Amperage Ratings: 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30

Max. Interrupt Rating: 20,000 amperes; L/R < 2mS

Min. Interrupt Rating: 1-12 amperes, 200%;
15-30 amperes, 135%

Approval: UL Rec. File No. E10480

Fuseholder: LPSM series
Self certified 1000VDC



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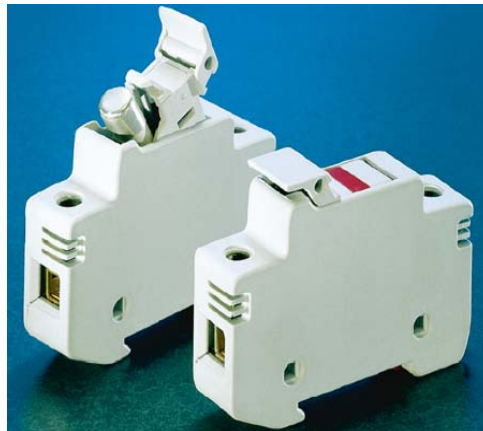
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Other available products

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- Fuse – Miget series (600 VAC/VDC)
- Holder – LPSM/LPSC





Product Development

LPSM / LPSC holder busbar – save space over standard distribution blocks in combiner boxes. Available 2 nd quarter





Thank You!



ISO 9001

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