LISTEN.
THINK.
SOLVE.®

CENTERLINE® 2100 Motor Control Centers with ArcShield™

Addressing Today's Electrical Safety Requirements

CENTERLINE 2100 Motor Control Centers Have Always Offered Safety By Design

Design

- CENTERLINE 2100 MCCs have safety advantages over other types of enclosures

Operation

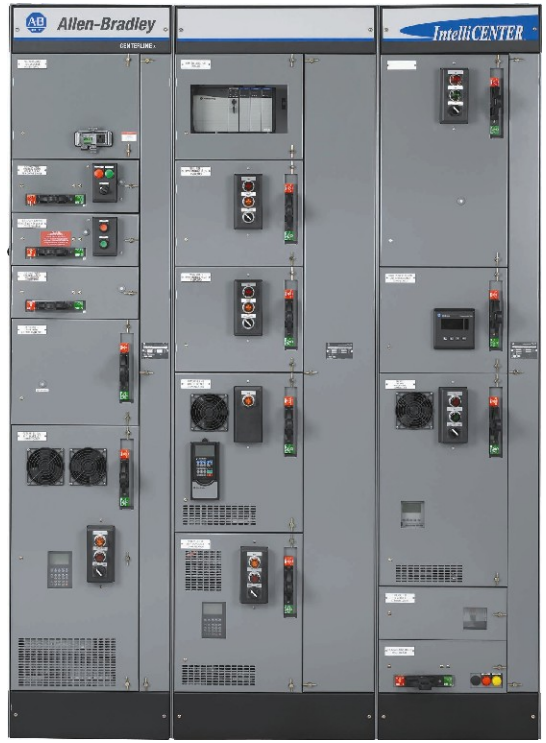
- Dependable CENTERLINE 2100 MCCs help prevent unplanned outages

Service and Maintenance

- CENTERLINE 2100 MCCs help provide a safer working environment when service and maintenance is needed

Fault Containment

- CENTERLINE 2100 MCCs robust design helps contain arc flash events

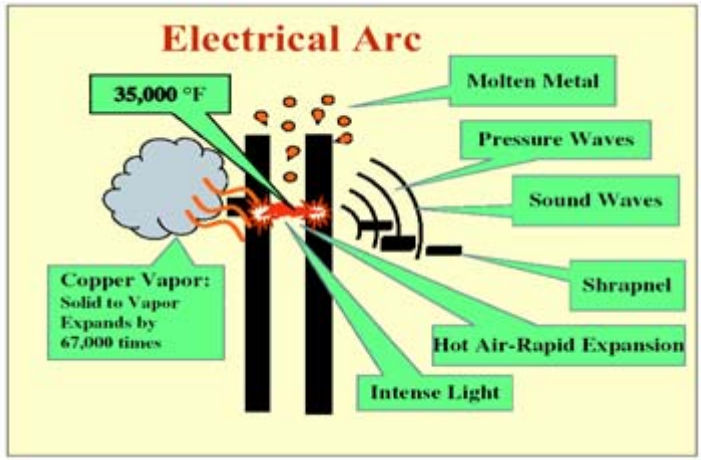


Why is Arc Flash a Concern?

A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn or blast.

What is an Arc Flash?

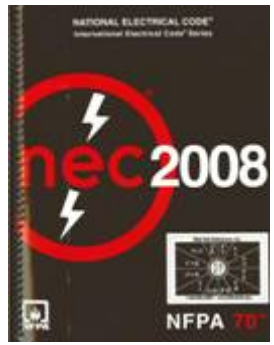
The Nature of Electrical Arcs



- Luminous discharge of current that is formed when a current jumps a gap (through air or gas) in a circuit or between two conductors
- Electric arcs produce some of the highest temperatures known to occur on earth – up to 35,000^{0} F
  - Energy released is a function of system voltage, fault current magnitude and fault duration.
  - Intense heat causes sudden expansion of air, resulting in very strong air pressure
  - Copper and other materials vaporize and expand in volume (Copper – 67,000 times, Water–1670 times)
- The air blast can spread molten metal to great distances with force
- Inside an enclosure, the enclosure could magnify blasts and transmit energy as the blast is forced to the open side of the enclosure and toward the worker.

Increased Focus on Arc Flash Safety

- Historically, electric codes/safety codes have been primarily concerned with protection from fire, electrocution and shock hazard – arc flash hazards were not directly addressed
- In 2002, NEC added Article 110.16 and reinforced the flash protection marking of equipment
- NFPA 70E "Standard for Electrical Safety in the Workplace"
  - Intended to help protect employees from electrical hazards in the workplace
    - Not a standard for the design, installation, modification or construction of electrical systems or equipment
  - In 2004, underwent extensive revision, including emphasis that arc flash hazards are a focus of all users
- In 2007, IEEE C37.20.7 "IEEE Guide For Testing … Metal-enclosed Switchgear … For Internal Arcing Faults" was revised. Scope expanded to include low voltage switchgear



OSHA considers the NFPA standard a recognized industry practice

Arc Flash Safety Importance

- Prevent potential loss to organizations through loss of skilled manpower, litigation fees, higher insurance costs, and loss of morale
- Increase process uptime by reducing accidents
- Occupational Safety and Health Administration (OSHA) refers to keeping workers safe around electrical equipment without referencing any specific standard
  - NFPA 70E provides guidelines on employee electrical safety
- UL 845 – "Standard for Motor Control Centers" does not address **arc fault performance** of low voltage motor control centers
  - Specific performance criteria is mandated under bolted fault, short circuit conditions

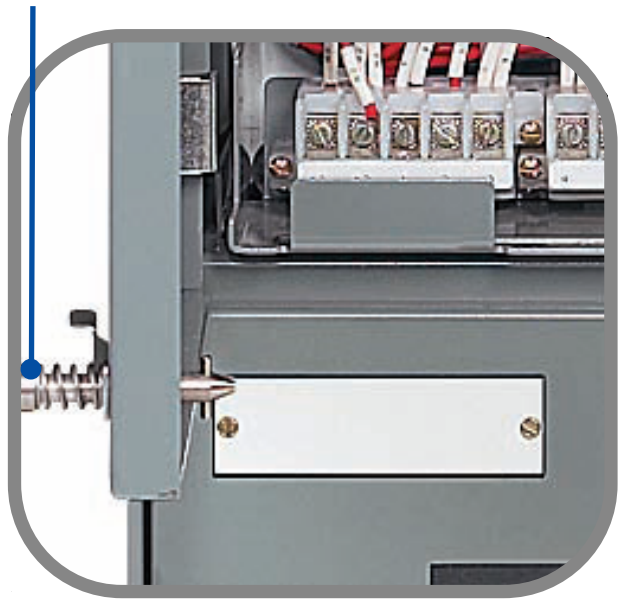
CENTERLINE 2100 MCC with ArcShield Helps Reduce Arc Flash Hazards

- An enhanced version of the industry-leading CENTERLINE 2100 Motor Control Center
  - Offers improved personnel protection against internal arcing faults when all doors and covers are closed and secured
  - Provides Type 2 accessibility as defined by IEEE C37.20.7-2007
    - Helps protect personnel at front, sides and rear of enclosure from the effects of an internal arcing fault
- The first Low Voltage NEMA Motor Control Center offering arc-resistant features

CENTERLINE 2100 MCC with ArcShield is the only low voltage NEMA/UL MCC to provide Type 2 Accessibility

CENTERLINE 2100 MCC with ArcShield Features

- Arc-resistant latches on all doors
  - Provide pressure relief and helps keep the door latched to the MCC during an arcing fault
  - Provides Type 2 accessibility and improved personnel protection against effects of internal arcing faults
    - Type 2 accessibility helps shield personnel at the front, sides, and rear of the enclosure



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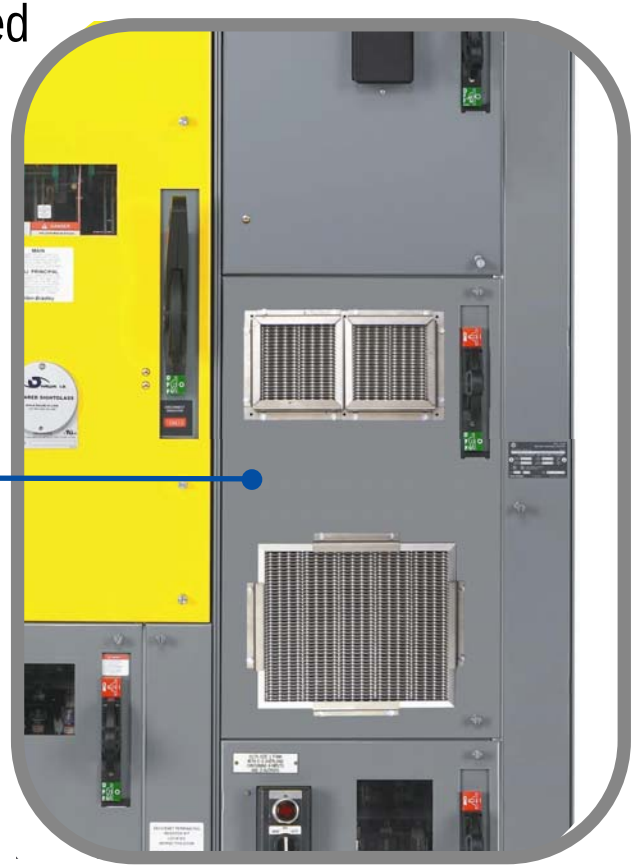
- Arc resistant baffles
  - Vented units with arc resistant baffles are available to allow for a wider range of MCC equipment for NEMA Type 1 Enclosures – Maintains Type 2 Accessibility



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- Arc resistant baffles
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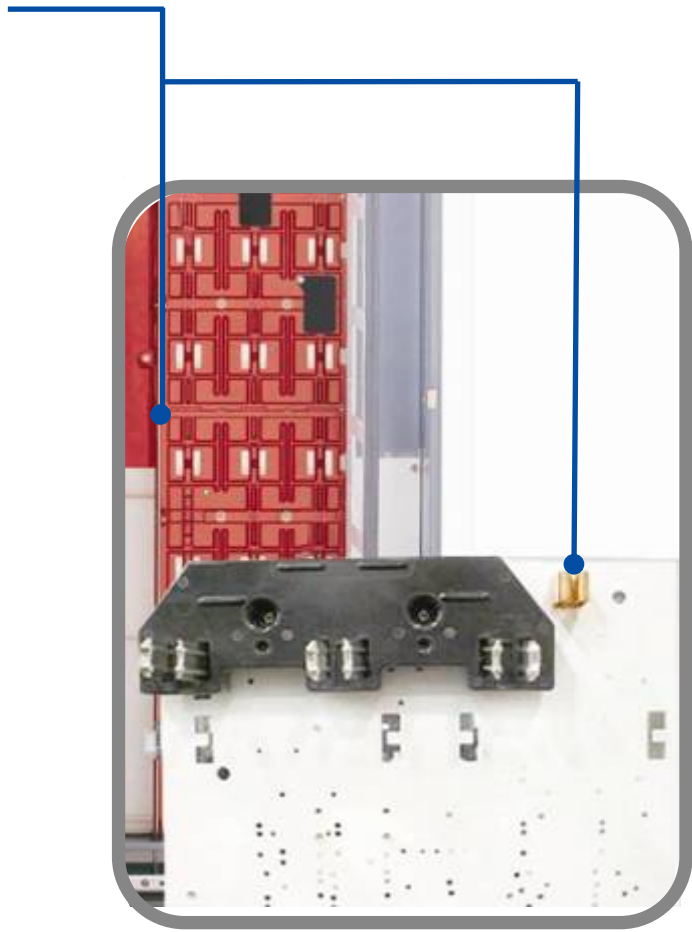
- Maximum 1200 ampere bus with specific current-limiting protection
  - Helps to minimize arc fault incident energy
  - Helps achieve Type 2 accessibility requirements

CENTERLINE 2100 MCC with ArcShield Features

- Copper vertical ground bus on plug-in structures and heavy duty ground stab on plug-in units
  - Provides an effective path for ground fault currents which helps to minimize fault clearing times of overcurrent protective devices



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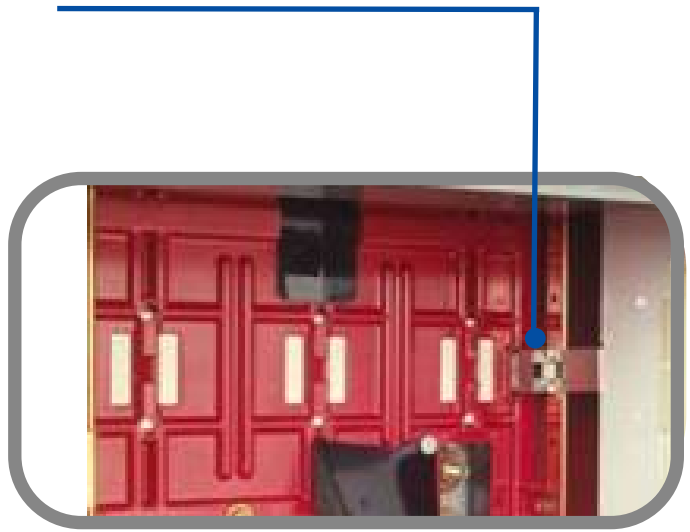
  - Help to protect against potential electrical shock hazards from unused plug-in stab openings



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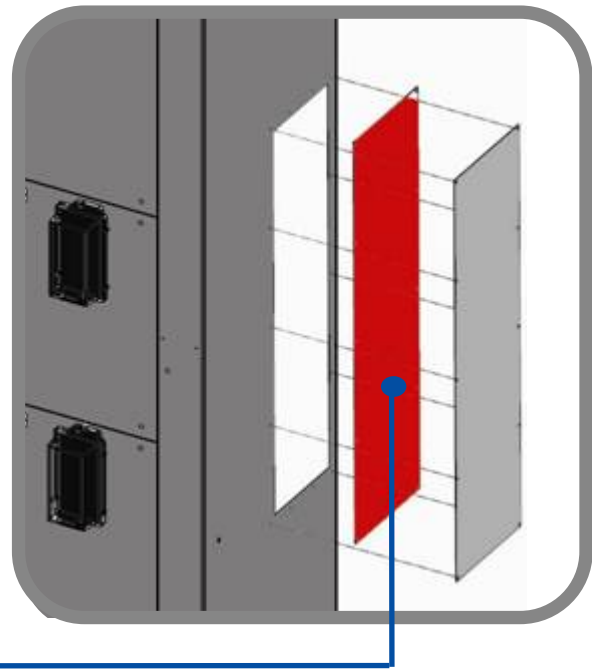
- Insulating covers on horizontal bus closing plates
  - Help prevent "burn through" which may result from arcing faults in the horizontal bus compartment



Minimize Exposure to Arc Flash Hazards with ArcShield and IntelliCENTER Technology

Monitor, configure & troubleshoot without opening unit doors

- Available DeviceNet port-in-door allows connection to the network at the MCC without having to open enclosure doors
- IntelliCENTER software allows remote monitoring, configuring and troubleshooting of all units on the network

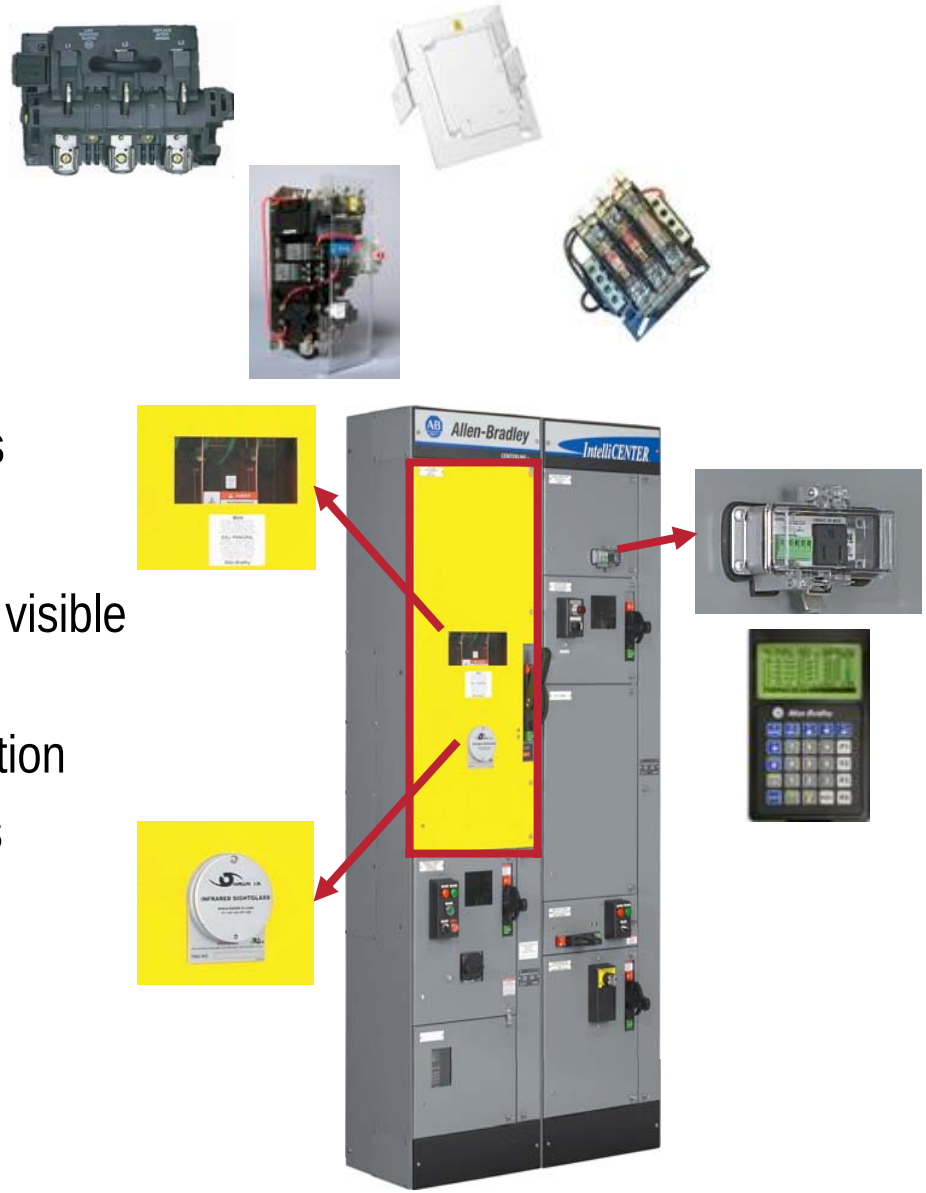
Monitor, Configure & Troubleshoot with MCC Doors Closed

	CENTERLINE LV and MV with ArcShield and IntelliCENTER Technology	
Maintenance/Troubleshooting Activities	Unit Door Position	Personnel Location
Overload detection (monitor warning/trip)	Closed	Outside Flash Boundary
Change overload relay setting (FLA and Trip Class)		
Measure/monitor phase currents		
Measure baseline motor current		
Ground fault detection (monitor warning/trip)		
Monitor motor thermistor		
Time to trip, Time to reset		
Reset overload relay		
Event history		
Verify control power		
Verify starter operation		
Unit documentation		

Remote maintenance and troubleshooting helps keep personnel safe from electrical and arc flash hazards

Other Safety Features Available for CENTERLINE 2100 with ArcShield

- Covers and barriers
  - Line side terminal guards
  - Fuse covers
  - Starter/contactor barrier
  - Finger-safe terminal blocks
  - Finger-safe control circuit transformers
- Keep doors closed
  - Through the door viewing windows for visible blade disconnect inspection
  - Infrared windows allow thermal inspection
  - Through the door network connections
  - DeviceNet programmer: 193-DNCT
- Awareness
  - High visibility yellow door for Main



Other Safety Features Available for CENTERLINE 2100 with ArcShield

- SafeZone™ laser scanner
  - Senses presence of personnel within defined arc flash boundary
  - Coordinate with upstream circuit breaker to enable and disable “Maintenance Mode”
  - By eliminating the time delay of the upstream breaker, available energy at the MCC is reduced
  - Prevents “Maintenance Mode” from being left on when not needed, reducing nuisance faults
- Arc flash detection system
  - Detection of arc flash in bus compartment
    - Fiber optics and control module
  - Operation
    - Shunt trip upstream circuit breaker
    - Activate crowbar device (speeds trip of CB and significantly reduces energy at point of arc fault)

CENTERLINE 2100 MCCs with ArcShield

- CENTERLINE 2100 MCCs offer an extensive list of features to address safety
- With an increased focus on arc flash safety, CENTERLINE 2100 with ArcShield can help reduce Arc Flash Hazards
  - The first LV MCC offering arc-resistant features
  - Addresses the specific accessibility and labeling requirements defined by IEEE C37.20.7-2007
    - Type 2 accessible enclosure provides extra protection for personnel at front, sides and rear
- IntelliCENTER Technology helps enhance safe operation
  - Remote monitoring, configuration and troubleshooting
    - Keeps doors closed
    - Keeps personnel out of arc flash boundary

VAMP Arc Flash Protection for CENTERLINE MCCs

VAMP Arc Flash Protection for CENTERLINE MCCs

The VAMP 221 Arc Flash Protection System takes action when there is light (an arc flash) AND current (2x rating of CT). Action may consist of opening a circuit breaker via shunt trip or operating an arc quenching device to crowbar the 3-phase bus.

Figure 1.1-1 VAMP 221 Arc Protection System

VAMP 221 is a modular system consisting of a central unit, I/O units, arc sensors and possible multiplying relays.

VAMP Arc Flash Protection for CENTERLINE MCCs

Central Unit
VAMP 221

The central unit VAMP 221 contains the following functions:

- 3-phase overcurrent and arc stage
- Alternatively, 2-phase overcurrent, earth-fault and arc stage
- Circuit breaker failure protection stage (CBFP)
- Optional trip criteria (I>&L>, I_0>&L> or L>)
- Two mutually independent tripping groups
- Four output trip relays
- Four protection zones
- BI/O bus for light and overcurrent information
- Status, fault and trip indications
- Accommodates up to 16 I/O units
- System self-supervision

Supply Voltage =
48-265 Vac / Vdc

VAMP Arc Flash Protection for CENTERLINE MCCs

VAM 3L Fiber Sensor I/O Unit

NOTE:

- Maximum of 3 Fiber Sensors per VAM 3L Fiber Sensor I/O Unit
- Maximum of 16 Sensors per MCC Lineup

- Auxiliary supply and communication via modular cable
- Three supervised fiber arc sensor connections
- Connection of portable arc sensor
- Indication of the sensor channel and trip relay activation
- One heavy duty trip relay
- Two communication ports for central unit and I/O Unit Interconnection

VAMP Arc Flash Protection for CENTERLINE MCCs

Arc Fiber Sensor ARC-SLx

- The fibre sensor is a durable glass fibre, which is manufactured in lengths of 10, 15, 20, 25, 30 and 35 metres
- The first 2.5 metres of the fibre are insulated against light
- The detected light information is transferred to the VAM 3L /VAM 3LX unit inside the fibre
- The fibre will be installed to go through the supervised compartments
- Monitoring the light information with a fibre system is a cost-effective solution e.g. in low voltage switchgears with several compartments
- Self-supervised arc sensor

VAMP Arc Flash Protection for CENTERLINE MCCs

Modular Cable
VX001

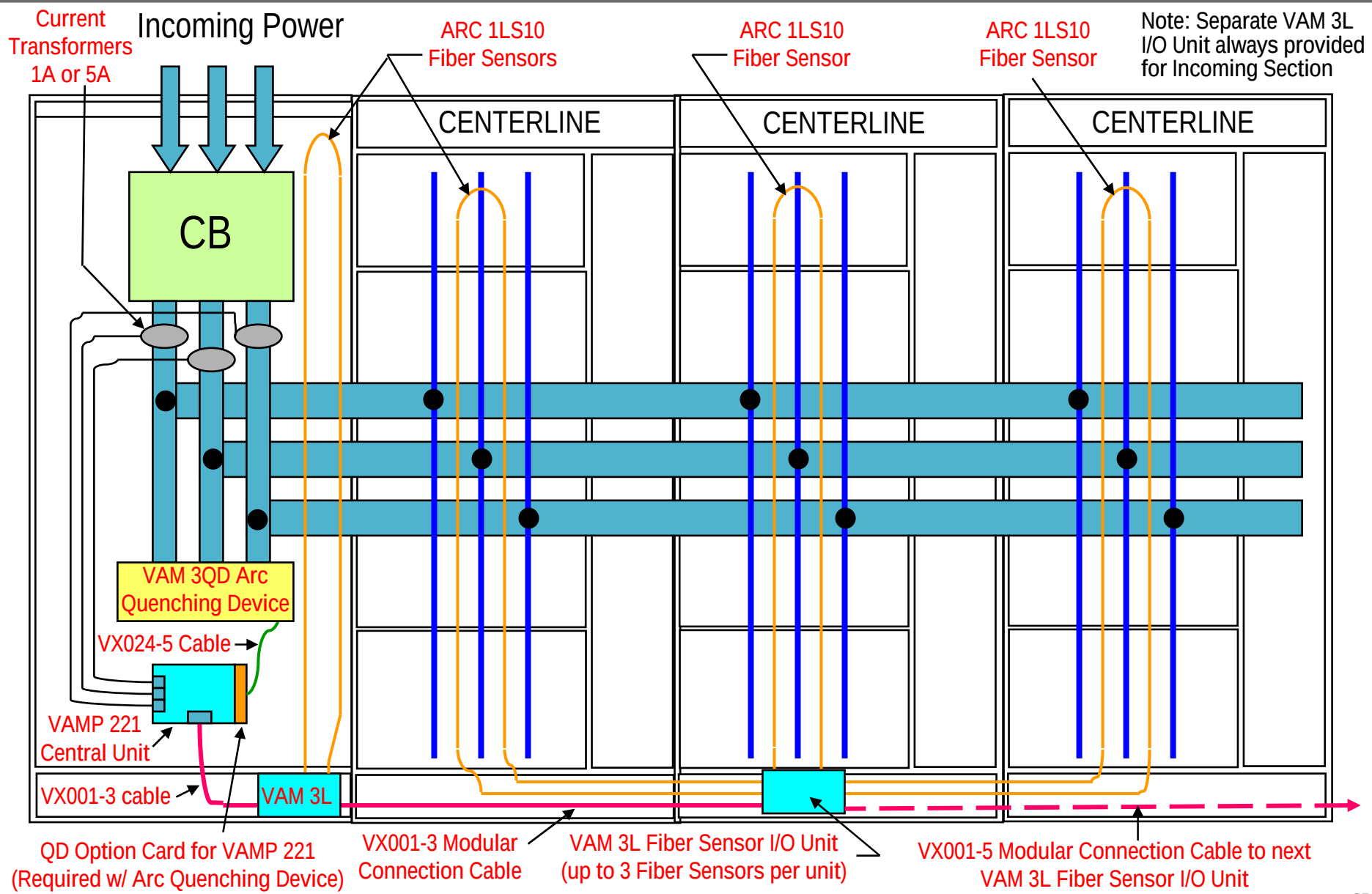
The I/O and master units are to be connected to each other using a modular cable approved by the manufacturer. The cable is equipped with quick- disconnect connectors.

You can also use an instrumentation cable, in which case the connection is made via the screw terminals in the central unit and the I/O units.

Modular cables are available in lengths of 1, 3, 5, 7, 10, 15, 20, 25, 30, 40 and 50 metres. If necessary, custom lengths exceeding 10 metres can also be provided.

NOTE! The total length of the modular or instrumentation cables of the system, measured from the central unit to the furthest I/O unit, may not exceed 100 metres.

VAMP Arc Flash Protection for CENTERLINE MCCs



Questions?