Infeed Line, Terminals and Devices for the Disconnection and Isolation of Electric Energy

- Main Disconnecting Means
- Interlocking of Main Disconnecting Means
- Infeed Systems
- Power Distribution Blocks
- Busbar Systems

UL guidelines, Chapter 6.1
Connection of the Infeed Line

**General:**

- **One** infeed line should be generally used
- Further supply points (e.g. for electronics, magn. coupling) should be tapped off within the machine (e.g. transformers, converters)
- The infeed line should be directly connected to the main disconnecting means
- Connection to upstream terminals only for special circuits (lighting, maintenance, etc.) or further infeed lines
- Terminals for more than one conductor must be marked (**Attention**: field wiring!)
- N-conductors must be marked and connected to a separate terminal
- Input terminals must be marked in a readable manner and must correspond to the documentation
Caution:
Disconnection of the infeed line generally must effect the disconnection of all circuits, including all control circuits

Exceptions:
The following circuits need not be disconnected together with the main disconnecting means:

- Lighting circuits for maintenance works
- Connectors and receptacles for exclusive connection of maintenance tools and equipment (e.g. hand drill, test equipment)
- Undervoltage protection for automatic disconnection in case of supply faults
- Operational processes (e.g. measuring devices for temperature control, memory elements, running heaters)
Assembly of excluded circuits:

(1) **Separate main disconnecting means, isolation transformer, overcurrent protection**
Installation in separate enclosure or in the actual industrial control panel close to the actual main disconnecting means

(2) Wires on the input side must be **routed separately** within the enclosure; with wire lengths ≥ 460 mm (18 in.), an (additional) cable duct must be used

**Note:**
The circuit for the doors' interlocking circuit must be disconnectable in the respective industrial control panel via which it is supplied
Caution:
With the exception of connectors and receptacles, main disconnecting means must always be mounted inside or adjacent to the industrial control panel.

Exception:
Main disconnecting means outside the industrial control panel for machines with max. 2 hp may be mounted in a distance of up to max. 6 m (20 ft) or in sight of, irrespective of interlocking with the industrial control panel.
Disconnection of the Infeed Line (Main Disconnecting Means)

The following devices may be used as main disconnecting means:

- Switch disconnectors with HP rating (UL98)
- Circuit breakers (UL489)
- Molded-case circuit breakers (UL489)
- Circuit breakers (UL489) with adjustable short-circuit release (instantaneous trip circuit breaker) as part of a tested assembly
- "Molded case switch" disconnectors (UL489)
- "Type E" motor starters (UL508) when only 1 motor is controlled
- Plug connection for cord connections
Main Disconnecting Means Portfolio ≤ 70 A

- 3RV27 /28 acc. to UL489
- 3RV20 acc. to UL508 "type E"
- 3RA6 compact starters acc. to UL508 "type E"
- 5SJ...HG4 "MCBs" acc. to UL489

Type E motor starter protector only with max. 1 motor per panel!
Main Disconnecting Means Portfolio ≥ 70 A

3VL acc. to UL489
20A….1600A

3WL5 acc. to UL489
1000A….5000A
Disconnection of the Infeed Line (Main Disconnecting Means)

Requirements for Industrial Control Equipment

(1) Disconnection of the supply and "ON-OFF" position; circuit breakers and type E starters may feature a "tripped" position

(2) External operating handle
   Exception: Power-driven industrial control equipment (e.g. with motorized drive)

(3) Lockable only in the "OFF" position, independent of the door position

(4) Simultaneous switching of all ungrounded supply wires

(5) Operability by qualified persons, independent of the door position and without auxiliary means

(6) Dimensioning
   a) Rated current at least 115% of the total FLC (simultaneity!)
   b) HP rating – dimensioning according to NEC Table 430.251(B) for LRC /430.250 for FLC:
      LRC/FLC of the main disconnecting means ≥ LRC of all motors which can be simultaneously started
      FLC of remaining motors and loads
   c) Rated voltage ≥ supply voltage of the infeed

(7) The "ON" and "OFF" positions must be clearly marked
Infeed Systems
Example

Main disconnecting means
e.g.: In = 250A

Power supply system
SIRIUS 3RV29

alternatively

Power distribution blocks

Busbar system
(Siemens 8US system)
Load Feeder on Busbar
Infeed systems - SIRIUS 3RV2917 infeed system

**SIRIUS infeed system - technology**

- Up to 63A for S00/S0
- IEC: up to 500V
- UL: up to 600V
- Motor branch circuit up to 25A (without derating)
- UL/CSA
  - Approval as „self protected combination motor controller“ according UL 508 Type E
- IEC: short-circuit capacity, tested assembly up to a breaking capacity of 150kA (400V)
- UL: **65 kA** at 480V

**System**

- Modules with 2 or 3 load feeders in 45 mm grid
- Easy, fault-free installation, plug&play
- Easy disassembling, applicable as visible isolation gap
UL508A treats busbar systems consisting of copper or aluminum busbars and retainers as standard busbar systems due to a missing UL report – see SB4.1

This results in:

→ Max. current load
  = 1000 A per sqinch
  = 1000 A for 654 mm²
  = 1,55 A per 1 mm²

→ Short-circuit strength
  $\text{SCCR} = 10kA$
Busbar System
Infeed systems – 8US busbar system

8US system ➔ tested and listed system acc. to UL ➔ technical values specified in the UL report are applicable

- Up to approx. 600A / 600V
- 40 mm busbar distance for branch circuits
- 60 mm busbar distance for feeder and branch area
- Adapter for 3VL are short-circuit proof up to 100kA (depending on installation)
- IEC and UL/CSA
- IEC: short-circuit proof, tested assembly up to 153kA (400V), up to 690V
- SCCR in acc. with UL up to 100kA (480V) depending on devices busbar testing and distance between supports

Required considerations of BCPD for:
- infeed area (feeder)
- motor branch circuit (branch)
**Busbar Systems**

**Infeed systems - SIRIUS 3-phase busbars**

**SIRIUS 3-phase busbars**
- Up to approx. 63A for S00/S0 and up to 108A only for S2
- Up to 690V
- IEC and UL/CSA
- Short-circuit proof, tested assembly, same as breaking capacity of the circuit breaker

**System**
- Applied with machines for infeed with motor branch circuits
- For 2-, 3-, 4- and 5 Circuit Breakers
- Infeed with 3-phase busbars 3RV19 .5

For this purpose, the below-listed 3-phase feeder terminal has to be used. This terminal complies with the distances through air and over surfaces required in acc. with UL508 for types E / F

3-phase feeder terminal
3RV19 35-5E (S2)
3RV29 25-5EB (S00/S0)
Power Distribution Blocks
**Case 1:** Overcurrent protection at the supply shall not be required *if all of the following conditions are met:*

- The current-carrying capacity of each of the conductors is at least *equal to that required for their respective load*
- Each connecting conductor to the overcurrent protective devices is *no longer than 3 m (10 ft).*
- The conductor is *suitably protected from physical damage* (e.g. conduit)
- The conductor *does not extend beyond the control panel enclosure.*
- The conductor *terminates* in a single *branch circuit rated protective device.*

**Note:** Applicable within the control panel enclosure only!
Case 2: Overcurrent protection at the supply shall not be required if all of the following conditions are met:

- The conductor has an ampacity of at least one-third that of the conductor from which it is supplied.
- The conductor is suitably protected from physical damage. (e.g. conduit or duct)
- The conductor is not over 7.5 m (25 ft) long, and the conductor terminates in a single branch circuit–rated protective device

Note: Applicable also beyond the control panel enclosure!
Questions?

Note / Disclaimer

The circuit examples and interpretations of the standard are non-binding and do not claim completeness concerning configuration, equipping and contingencies. They do not represent customized solutions but merely provide support for typical tasks.

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