MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

SIEMENS

6RY1707-0AA08

PARALLEL CONNECTION CABLE

Used with the applicable PLC System configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Siemens official manufacturer documentation

10.25 Connecting units in parallel and in series

Topology overview

Several SINAMICS DCM converters can be arranged in various topologies. The following topologies are supported:

- 6-pulse parallel connection
  This topology is used in order to realize converter power ratings that are above the highest available SINAMICS DCM rating.
- 12-pulse parallel connection
  This topology is especially used at higher power ratings to achieve lower line harmonics. In addition, by using this circuit, a lower DC current ripple is obtained when compared to a 6-pulse connection. One or several 6-pulse converters can be connected in parallel to each of the two 12-pulse converters connected in parallel.
- 6-pulse series connection
  This topology is used to achieve a higher no-load DC voltage.
  The following versions are available:
  - Both converters are operated with the same firing angle.
  - Sequence control (one of the two converters is always at a control limit, the other converter controls the armature current)
  - Series connection of a controlled converter with an uncontrolled converter (thyristor bridge B2 + diode rectifier)

  One or several converters can be connected in parallel to each of the converters connected in series to increase the power rating.
- 12-pulse series connection
  The topology corresponds to a 6-pulse series connection. In addition, a lower DC current ripple is obtained when compared to a 6-pulse connection. One or several converters can be connected in parallel to each of the converters connected in series to increase the power rating.

Note

- All of the topologies listed here are only permissible in the restricted line frequency range from 20 Hz to 65 Hz.
- For all of the topologies listed here, only power units with the same rated DC current, the same commutating reactors, and the same wiring/busbars may be used!
- For all of the topologies listed here, only devices with the same software version may be used.

Note

More information about design is given in the associated application notes (see link in preface).

Communication

Note

Before activating the parallel interface (i.e. before setting p51800 > 0), a unique station address must be set at p51806 on all SINAMICS DCMs. Otherwise, the parallel interface will not work property.

Remedy in this case: Switch the electronic power supply off and then on.

- In the particular topology, communication between all converters is established via the parallel interface. The CUDs of all converters should be connected with one another.
- The parallel interface allows a maximum of 16 nodes to communicate.
- The devices are connected using 8-core shielded patch cables, type UTP CAT5 according to ANSI/EIA/TIA 568, such as those that are used to network PCs. A standard 5 m long cable can be directly purchased from Siemens (article number: 6RY1707-0AA08). (n-1) cables are required to connect n devices. The bus termination must be activated at the devices at the start of the bus and at the end of the bus (p51805=1).

  Note:

  A patch cable according to TIA568A (European) or TIA568B (American) can be used. However, both cable ends must be wired according to the same standard (patch cable = 1:1). A crossover cable is **not** suitable.
- The parallel interface also enables any BICOs (that can be parameterized by the user) to be exchanged between nodes. See function diagrams 9352 and 9355. Exchanging data in this way is not required for closed-loop control of the firing pulses or for generating them, and is available for the user for any purpose.
  Remark: For a 12-pulse series connection, it is not permissible that the parallel interface is used to transfer BICOs, i.e. p51801 = 0 must be set. Failure to comply with this remark can result in sporadic current peaks.
- For additional details on how devices are connected in parallel, please refer to function diagrams 9350, 9352, and 9355.

Controller

- For all of the topologies, a SINAMICS DCM is used as the master converter. The other converters are called slave converters.
- The control commands - switch-on/stop, operating enable, quick stop, etc. are fed to the master converter for all topologies.
  At the slave converters, terminals 12 and 13 must be permanently connected to terminal 9. If, in spite of this, a control command is entered at a slave converter, then it has the following consequences:

OFF1	Has no effect, as long as n<nmin has not been reached, then the current is reduced to zero at the slave and the slave goes into operating state o7.0 or o7.1
OFF2	The current is reduced to zero at the slave, then the slave goes into operating state o10.1 or o10.2
OFF3	no effect, as long as n<nmin has not been reached, then the current is reduced to zero at the slave and the slave goes into operating state o9.1 or 9.2
E-STOP	The current is reduced to zero at the slave, then the slave goes into operating state o10.3
Operating enable	The current is reduced to zero at the slave, then the slave goes into operating state o1.1 or o1.

  As long as the master does not receive a switch-on command, the slaves stay in operating state o10.0 (wait for switch-on from the master).

  If the master receives a switch-on command, then it automatically transfers this to the slaves. Then, all devices carry out their switch-on sequence, i.e. they attempt to go into operating state o0. However, the master waits in operating state o1.7 until all slaves have reached operating state o0 (exception: n+m operation for a 6-pulse parallel connection)

  If a slave leaves operating state o0, then the master outputs fault message F60044 (exception: n+m operation for a 6-pulse parallel connection)
- The speed setpoint and the actual speed value should be entered at the master converter.
- The optimization runs should be started at the master converter. The slave converters must be connected and ready for operation at this point.

Miscellaneous

Note

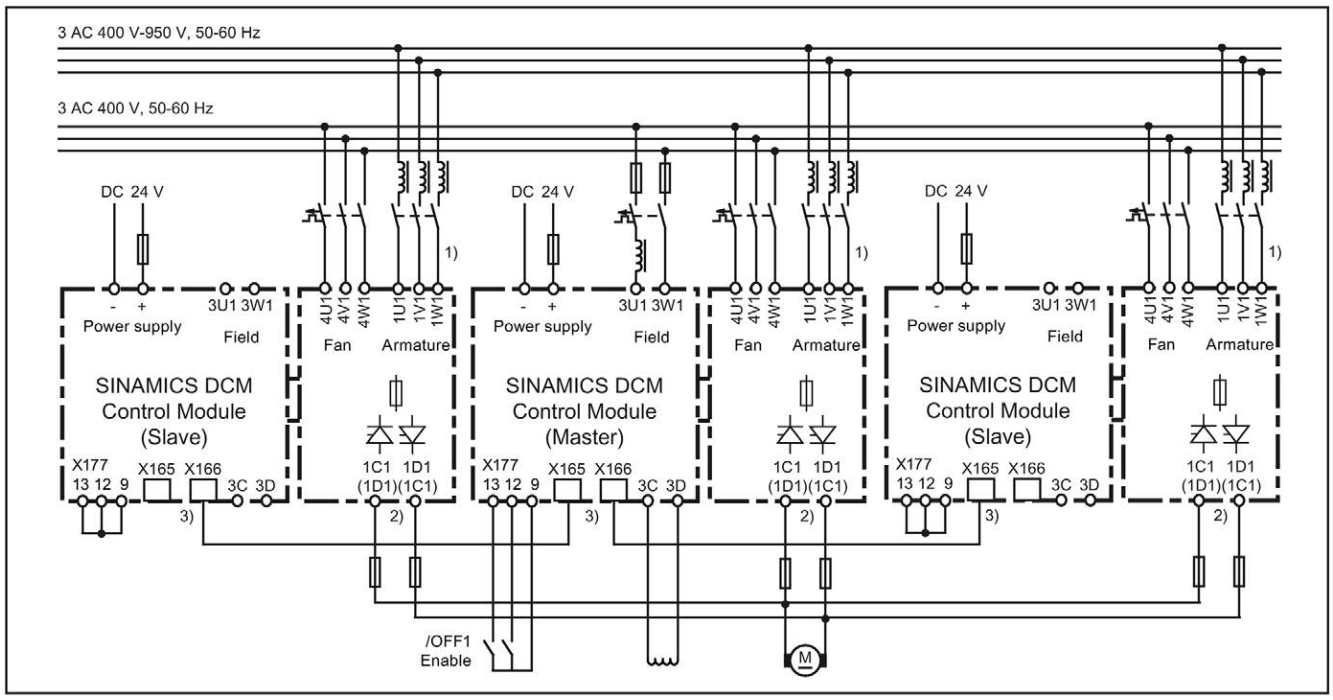
For a slave converter the i^2t monitoring of the motor should be deactivated (p50114=0), because for a non-symmetrical current, this would then respond at the slave.

10.25.1 6-pulse parallel connection

Topology

Basic topology

The topology of a 6-pulse parallel connection, comprising a master converter and two slave converters is shown in the following diagram.



1) The same phase sequence is required between 1U1/1V1/1W1.

2) The same phase sequence is required between 1C1/1D1.

3) The devices are connected using (8-pin) shielded patch cables of type UTP CAT5 in acc. with ANSI/EIA/TIA 568, such as those that are used in PC network technology.
A standard, 5 m cable can be obtained directly from Siemens (article number: 6RY1707-0AA08).
(n-1) cables are required for connecting n devices in parallel.
The bus terminator must be activated for each device positioned at the start or end of the bus (p51805 = 1).

Figure 10-77 Parallel connection

- Up to six devices can be connected in parallel.
- When connecting several devices in parallel, the master device should be positioned centrally due to the signal runtimes. Maximum cable length of the parallel-connection interface cable between master and slave devices at each bus end: 15 m.
- Separate line reactors of the same type are required for each power unit for current splitting purposes. The difference in reactor tolerances determines the current splitting. For operation without derating (current reduction), a tolerance of 5% or less is recommended.

Extended topology

The topology of a 6-pulse parallel connection, comprising a master converter, one substitute master, two slave converters, as well as an independent converter is shown in the following diagram.

The converters SINAMICS DCM 1, DCM 2, DCM 3 and DCM 4 are operated in the n+m operating mode. The SINAMICS DCM 5 converter is, regarding its power unit, independent of the others. It only exchanges BICOs with them via the parallel interface.

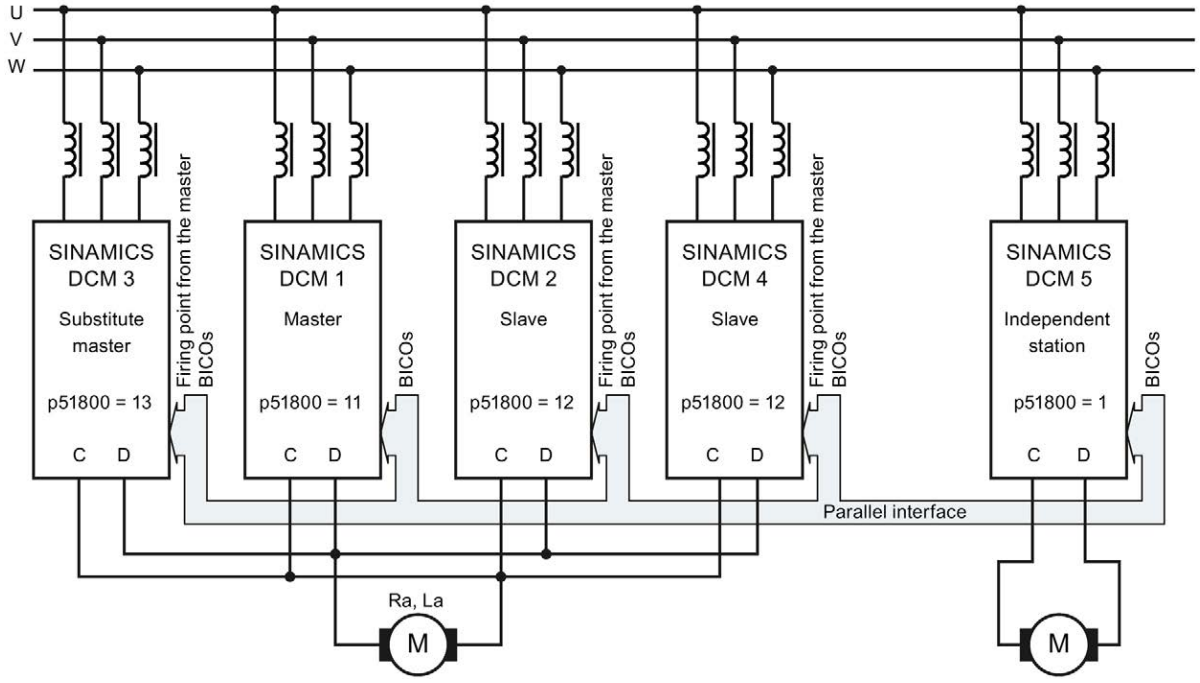


Figure 10-78 6-pulse parallel connection, extended topology

Operating modes of the 6-pulse parallel connection

There are two operating modes:

Standard mode:

A SINAMICS DCM is defined as the master. This device carries out the closed-loop speed control, the closed-loop armature-current control, the line synchronization tasks and determines the firing points. The firing points and the thyristor pair to be fired are transferred to the slave devices; all the slaves then fire the thyristor pairs at these points.