

SIEMENS

SINAMICS DCM

Base Drive panel instructions — version 3.0

High-performance drives

Converter software version:

As these Operating Instructions went to print, SINAMICS DCM converters were being delivered from the factory with **software version 1.4 installed**.

These Operating Instructions also apply to *other software versions*.

Earlier software versions: *Some parameters described in this document might not be available in the software* (i.e. the corresponding functionality is not available on the converter) or some parameters will have a restricted setting range. Sinamics DCM Base Drive Panel series requires software version 1.3 or later.

Later software versions: *Additional parameters might be available* on the SINAMICS DCM (i.e. extra functions might be available which are not described in these Operating Instructions) or some parameters might have an extended setting range. In this case, leave the relevant parameters at their factory setting, or do not set any parameter values which are not described in these Instructions!

The latest software version of the SINAMICS DCM can be read in parameter r500060_0.

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1 Safety information



WARNING



Hazardous voltages and moving parts are present in this electrical equipment during operation. Non-observance of the safety instructions can result in death, severe personal injury or substantial property damage.

Only qualified personnel should work on or around the equipment after first becoming thoroughly familiar with all warning and safety notices and maintenance procedures contained herein. The successful and safe operation of this equipment is dependent on proper handling, installation, operation and maintenance.

Definitions

QUALIFIED PERSONNEL

For the purpose of this Instruction Manual and product labels, a “Qualified Person” is someone who is familiar with the installation, construction and operation of the equipment and the hazards involved. He or she must have the following qualifications:

1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
3. Trained in providing first aid.

DANGER

For the purpose of this Instruction Manual and product labels, “**Danger**” indicates that death, severe personal injury or substantial property damage will result if proper precautions are not taken.

WARNING

For the purpose of this Instruction Manual and product labels, “**Warning**” indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

CAUTION

For the purpose of this Instruction Manual and product labels, “**Caution**” indicates that minor personal injury or property damage can result if proper precautions are not taken.

NOTE

For the purpose of this Instruction Manual, “**Note**” indicates information about the product or the respective part of the Instruction Manual which requires particular attention.

NOTE

These operating instructions do not purport to cover all details or variations in equipment, or to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens Sales Office.

The contents of these operating instructions shall not become part of or modify any prior or existing agreement, commitment or relationship. The Sales Contract contains the entire obligations of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.



DANGER

Converters contain hazardous electrical voltages, Death, severe bodily injury or significant material damage can occur if the safety measures are not followed.

1. Only qualified personnel, who are knowledgeable about the converters and the provided information, can install, start up, operate, troubleshoot or repair the converters.
2. The converters must be installed in accordance with all relevant safety regulations (e.g. NEC, DIN, VDE) as well as all other national or local regulations. Operational safety and reliability must be ensured by correct grounding, cable sizing and appropriate short-circuit protection.
3. All panels and doors must be kept closed during normal operation.



4. Before carrying out visual checks and maintenance work, ensure that the AC power supply is disconnected and locked out. Before the AC supply is disconnected, both converters and motors have hazardous voltage levels. Even when the converter contactor is open, hazardous voltages are still present.
5. When making measurements with the power supply switched on, electrical connections must not be touched under any circumstances. Remove all jewelry from wrists and fingers. Ensure that the test equipment is in good condition and operationally safe.
6. When working on units that are switched on, stand on an insulating surface, i.e. ensure that you are not grounded.
7. Carefully follow the relevant instructions and observe all danger, warning and cautionary instructions.
8. This does not represent a full listing of all the measures necessary for safe operation of the equipment. If you require other information or if certain problems occur which are not handled in enough detail in the information provided in the Instruction Manual, please contact your local Siemens office.

1 Safety information (continued)

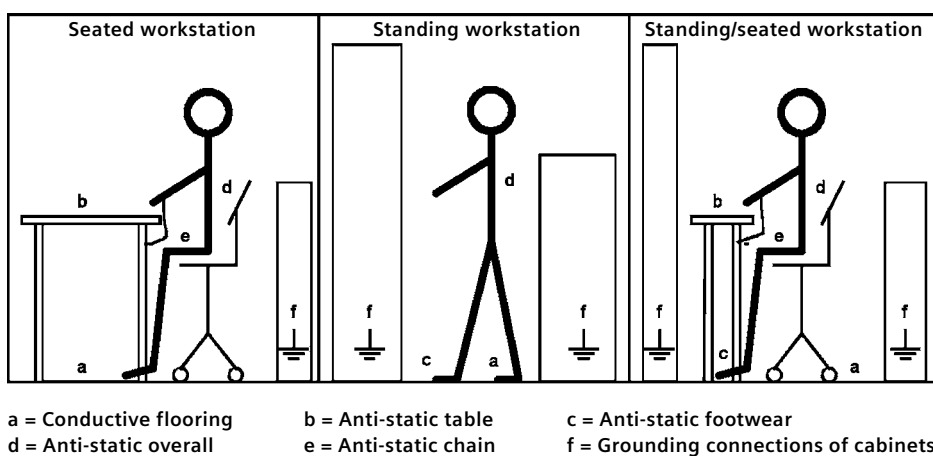


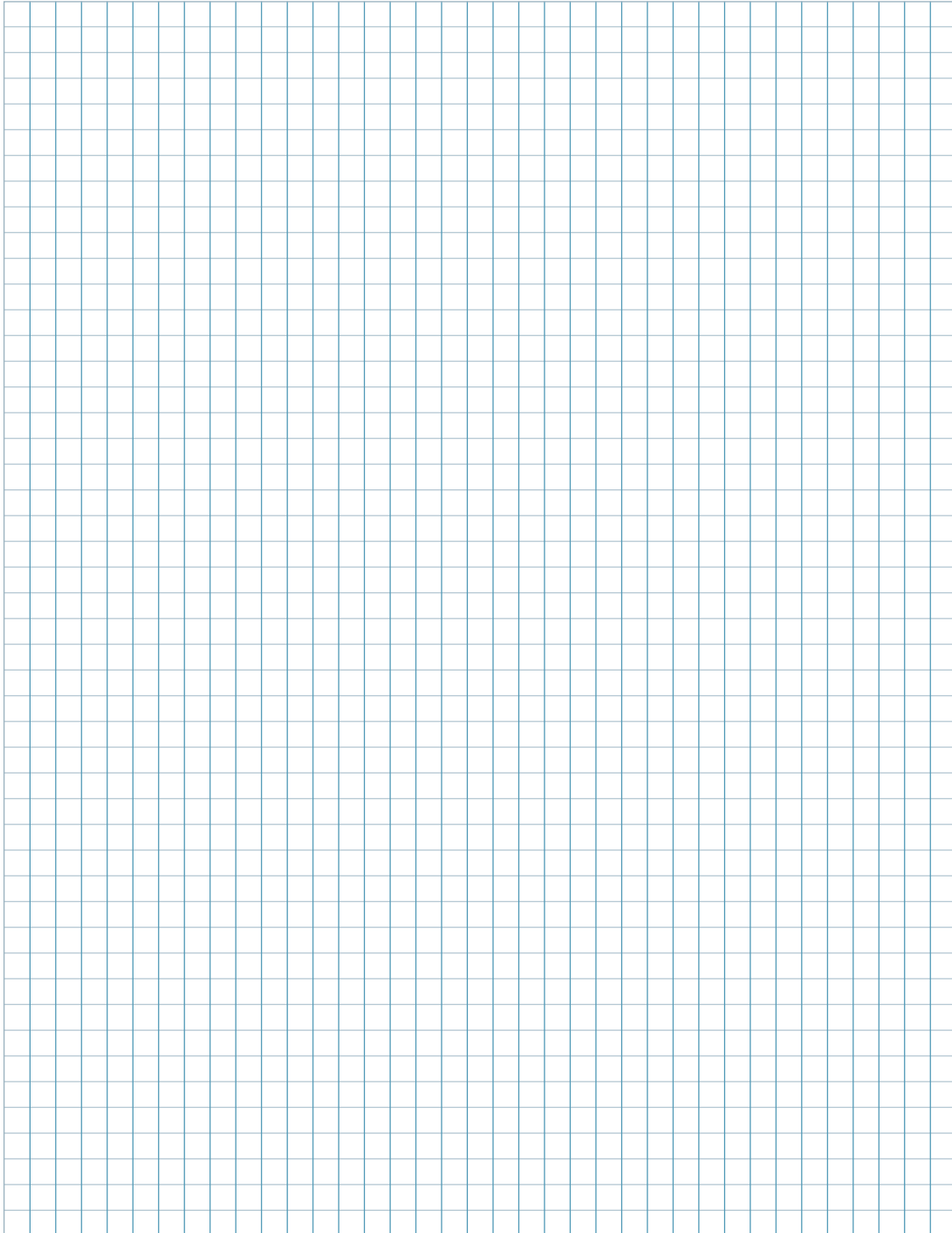
CAUTION Electro-statically sensitive devices

The converter contains electro-statically sensitive devices. These can easily be destroyed if they are not handled correctly. If, however, it is absolutely essential for you to work on electronic modules, please pay careful attention to the following instructions:

- Electronic modules (PCBs) should not be touched unless work has to be carried out on them.
- Before touching a PCB, the person carrying out the work must himself be electro-statically discharged. The simplest way of doing this is to touch an electrically conductive ground object, e.g. socket outlet ground contact.
- PCBs must not be allowed to come into contact with electrically insulating materials * plastic foil, insulating table tops or clothing made of synthetic fibers *
- PCBs may only be set down or stored on electrically conducting surfaces.
- When carrying out soldering jobs on PCBs, make sure that the soldering tip has been grounded.
- PCBs and electronic components should generally be packed in electrically conducting containers (such as metallized-plastic boxes or metal cans) before being stored or shipped.
- If the use of non-conducting packing containers cannot be avoided, PCBs must be wrapped in a conducting material before being put in them. Examples of such materials include electrically conducting foam rubber or household aluminum foil.

For easy reference, the protective measures necessary when dealing with sensitive electronic components are illustrated in the sketches below.





2 Introduction

2.1 Base Drive panel description

SINAMICS DCM Base Drive panels are complete drive assemblies ready to be installed into an enclosure. Base Drive Panels are fully digital, compact units which supply the armature and field of variable-speed DC motors with rated armature currents from 15 Amps to 1200 Amps. The motor field circuit can be supplied with DC currents of up to 40 Amps (current levels depend on the armature rated current). Each Base Drive panel includes the following components and factory installed converter options.

- 3-phase Armature Converter
- 1-phase Field Converter
- Main Contactor or DC Output Contactor (Frame Size Dependent)
- Protective Semiconductor Fuses (Frame Size Dependent since may be internal to converter)
- Control Power Transformer
- Power and Control Terminals
- Advanced CUD – G00 Option
- PROFINET, EtherNet/IP Communication CBE20 – G20 Option
- Micro Memory Card – S01 Option
- Single phase fan (230V AC) – L21 Option, 450A – 1200A Base Drives

Providing the Advanced CUD, provides several customer advantages.

- DRIVE-CLiQ connectivity allows for the connection of Terminal Modules (TM15, TM31, TM150) plus the SMC30 Encoder Module. This gives the customers flexibility for future expansion of additional Input/Outputs by simply adding DRIVE-CLiQ modules rather than adding another Advanced CUD board to add additional Inputs/Outputs.
- Option Slot allows the CBE20 to be installed in the Advanced CUD. The CBE20 allows the drive to utilize ProfiNet or Ethernet-IP communications. The CBE20 can alternatively be used to provide high speed peer to peer communications with the drives.

2.2 General information

SINAMICS DCM converters are characterized by their compact, space-saving construction. Their compact design makes them particularly easy to service and maintain since individual components are readily accessible.

All SINAMICS DCM units are equipped with a BOP20 “Basic operator panel” mounted in the converter cover. The BOP20 has a backlit two-line display area and 6 keys. It may be used to acknowledge faults, set parameters and read diagnostic information.

The AOP30 optional advance operator panel can be mounted externally, e.g., in the cubicle door. When mounted remotely, the AOP30 can be connected to the converter with cables up to 50 meters (164 feet) in length. Cables up to 200 meters (600 feet) in length can be used if a separate 24V DC power supply is available. The AOP30 connects to the SINAMICS DCM through connector X178 using the RS485 interface. The AOP30 can be installed as an economic alternative to conventional door mounted metering devices (i.e., voltmeters, ammeters, and speed indicator).

The AOP30 features a liquid crystal display (240 × 64 pixels) with backlighting for plain-text display and a bar-type display for process variables. English, German, French, Spanish, Italian and Chinese can be selected as the display languages.

The converter can also be parameterized on a standard PC with appropriate software connected to the serial interface on the basic unit. This PC interface is used during start-up, for maintenance during shutdown and for diagnosis in operation.

On 2-quadrant converters, a fully controlled three-phase bridge supplies the armature. On 4-quadrant converters, two fully controlled three-phase bridges are connected in an inverse-parallel connection to allow both positive and negative armature current. For the field converter, a single-phase, half-controlled 2-pulse bridge supplies the motor shunt field.

The armature and field converters can operate with AC line frequencies from 45–65 Hz. If required for a specific application, the frequency of the armature and field AC supplies can be different. The power section cooling system is monitored by means of temperature sensors.

The power section for the armature and field converters is constructed of isolated thyristor modules for converters rated from 15A–1200A at 480V AC line voltage. The heat sink in this case is electrically isolated and at ground potential. The housing and terminal covers on power connections provide protection against accidental contact for operators working in the vicinity. All connecting terminals are accessible from the top.

All open and closed-loop drive control and communication functions are performed by powerful microprocessors. Drive control functions are implemented in the software as program modules that can be “wired up” and changed by parameters.

2.3 Rated DC current

- The rating plate of the SINAMICS DCM Base drive panel has the rated Armature current listed of the output rating for IEC DC I constant duty rating.
- The Base Drive Panels are designed using the DC I rating which means that fuses, contactors and terminal blocks are sized for the full continuous DC I current.
- The DC I rating is the maximum current the power module can supply continuously with no overload. Because an overload is not possible, the DC I rated current is higher than the continuous DC II rating.
- The microprocessor calculates the current I_{2t} value of the power section cyclically to ensure that the thyristors are not damaged in overload operation.
- The DC II rated current allows operation by an overload of 150% for 60 seconds in a 40° C ambient. The overload can be applied no sooner than every 15 minute intervals.

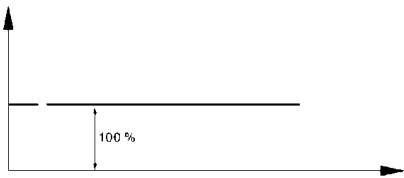
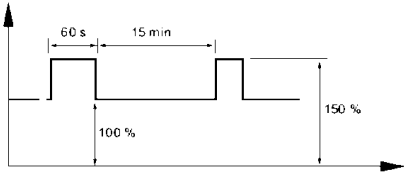
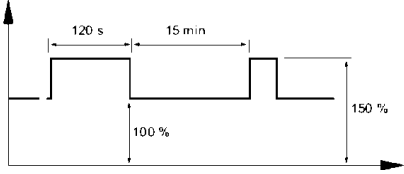
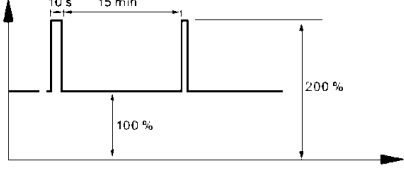
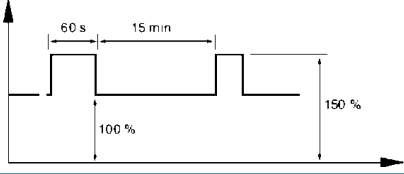
Overload capability

The rated DC current specified on the unit rating plate (maximum permissible continuous DC current) may be exceeded in operation. The extent to which this value is exceeded and how long this lasts are subject to certain limits. The absolute upper limit for the value of the overload currents is 1.8x the rated DC current. The maximum overload duration depends on the time characteristic of the overload current, as well as on the load history of the unit, and also depends on the specific unit. Each overload must be preceded by an under load (load phase with load current < rated DC current). Once the maximum permissible overload duration has elapsed, the load current must return to at least an absolute value ≤ the rated DC current. The SINAMICS DCM Base drive may be operated with five different overload settings configured in the drive parameters.

2 Introduction (continued)

DC I through DC IV rated at 40 °C

- **DC I** — Continuous Duty without no overloads possible
- **DC II** — Continuous rating with 150% overload for 60 seconds with a 15 minute cool down below base load current setting
- **DC III** — Continuous rating with 150% overload for 120 seconds with a 15 minute cool down below base load current setting
- **DC IV** — Continuous rating with 200% overload for 10 seconds with a 15 minute cool down below base load current setting
- **US Rated** — Continuous rating with 150% overload for 60 seconds with a 15 minute cool down below base load current setting — ambient temp at 45 °C

Load class (parameter)	Load for the converter	Load cycle
DC I	$I_{DC I}$ continuous (I_{dN})	
DC II	$I_{DC II}$ for 15 min. and $1.5 \times I_{DC II}$ for 60 s	
DC III	$I_{DC III}$ for 15 min. and $1.5 \times I_{DC III}$ for 120 s	
DC IV	$I_{DC IV}$ for 15 min. and $2 \times I_{DC IV}$ for 10 s	
U.S. rating	I_{US} for 15 min and $1.5 \times I_{US}$ for 60 s Note: with this setting, for all unit types, an ambient and / or cooling medium temperature of 45 °C is permissible.	

2.4 Expandable functionality using SINAMICS components

One of the many features of the SINAMICS DCM Base Drive is its ability to expand its functionality modularly through the use of coupling supplementary modules from the SINAMICS drives family to the DRIVE-CLiQ interface. Modules include digital, analog I/O, external encoder and communications options. As a result, the flexibility, when engineering the plant or system is increased, costs are optimized at the same time. A complete list of the option modules can be found in the SINAMICS DCM catalog available from your local Siemens sales office.

The SINAMICS DCM Base Drive contains one advanced CUD (left) microprocessor board with the CBE20 installed, and one additional bay for another advanced or standard CUD (right).

In order to optimally fulfill the requirements relating to interfaces and computational performance for technology functions, a standard or advanced CUD or a combination can be selected. It is also possible to use two CUDs to increase the performance for technological open-loop and closed-loop control tasks. This allows optimum adaptation to the wide range of requirements relating to drive technology and complementary markets — both technically and economically.

3 Parts and service

3.1 Base Drive panel catalog numbers

DC1 rating (Amps DC)	2-quad type (Catalog No.)	4-quad type (Catalog No.)	Horsepower (240V DC ¹)	Horsepower (500V DC)
15	N/A	6RA80132FV620AA0	3 HP	7.5 HP
30	N/A	6RA80182FV620AA0	7.5 HP	15 HP
60	6RA80252FS220AA0	6RA80252FV620AA0	15 HP	30 HP
90	6RA80282FS220AA0	6RA80282FV620AA0	20 HP	40 HP
125	6RA80312FS220AA0	6RA80312FV620AA0	30 HP	60 HP
210	6RA80752FS220AA0	6RA80752FV620AA0	50 HP	100 HP
280	6RA80782FS220AA0	6RA80782FV620AA0	75 HP	150 HP
450	6RA80822FS220AA0	6RA80822FV620AA0	100 HP	200 HP
600	6RA80852FS220AA0	6RA80852FV620AA0	150 HP	300 HP
850	6RA80872FS220AA0	6RA80872FV620AA0	200 HP	400 HP
1200	6RA80912FS220AA0	6RA80912FV620AA0	300 HP	600 HP

¹ All horsepower ratings above are calculated with the continuous rating used with (DC II) and 150% overload for one minute. *Amp ratings for the 6RA80 SINAMICS DCM Base Drive are based upon DC I ratings. No overload capability. Standard voltage configuration as shipped is 480V AC. See Technical application note for 240V AC connection.

NOTE

All SINAMICS DCM base drives are provided with the Advanced CUD and CBE20 cards installed. The CBE20 allows for Ethernet programming capability as standard. Take advantage of Siemens' progressive developments in Industrial Ethernet technology and open connectivity. With direct network connectivity to PROFINET, EtherNet/IP™ and standard Ethernet TCP/IP, SINAMICS base drives fit comfortably within your plant's network, providing you with maximum productivity and capacity planning.

3.2 Service

Spare parts

An excellent stock of drive products and spare parts are maintained at the distribution center in Southaven, Mississippi. Same day, after hour shipments can be serviced from this stock, including weekends and holidays.

To contact Customer Service, call our Customer Service Group Hotline:

1-888-454-4704

Technical assistance

Should you need technical assistance (other than ordering a part), a reliable answering service ensures that your request is relayed immediately to one of our technical support engineers 24-hours a day.

To contact the Technical Support and Field Service groups, simply call:

1-800-333-PIC1 (7421)

3.3 Option part numbers

Options	Order No.
Standard CUD coated in right slot (Possible with Advanced CUD in left)	6RY18030AA200AA1
Standard CUD	6RY18030AA000AA1
Advanced CUD coated in right slot (Possible with Advanced CUD in left)	6RY18030AA250AA1
Advanced CUD	6RY18030AA050AA1
Advance Operator Panel AOP30	6SL30550AA004CA5
RS485 connecting cable for connecting the AOP30 to one CUD; 3m	6RY18070AP00
RS485 connecting cable for connecting the AOP30 to two CUDs; 3m	6RY18070AP10
Sensor Module Cabinet-Mounted SMC30 (Incremental Encoder)	6SL30550AA005CA2
CBE20 PROFINET left (Possible with Advanced CUD in left)	6SL30550AA002EB0
CBE20 PROFINET right (Possible with Advanced CUD in right)	6SL30550AA002EB0
Terminal Module TM15	6SL30550AA003FA0
Terminal Module TM31	6SL30550AA003AA1
Terminal Module TM150	6SL30550AA003LA0

¹ A pulse encoder evaluation circuit is a standard component of the basic SINAMICS DCM converter. The SM30 only needs to be ordered in configurations requiring evaluation of a second pulse encoder.

3.4 Spare parts

Cables

Description	Where used US rating 480V	Part number	Recommended spare
Ribbon cable Basic Operator Panel BOP20 (Allocation board A7126 -X111)	All Ratings	6RY18070AA00	1
Ribbon cable Power interface X108 (to Allocation board A7126 -X108)	15–850 Amp	6RY18070AA02	1
Ribbon cable Power interface X108 (to Allocation board A7126 -X108)	1200 Amp	6RY18070AA05	1
Ribbon cable Power interface -XF1 (Q4 Only)(to Field supply -XF1)	15–30 Amp	6RY18070AA01	1
Ribbon cable Power interface -XF1 (Q2 and Q4)(to Field supply -XF1)	60–280 Amp and 1200 Amp	6RY18070AA03	1
Ribbon cable Power interface -XF1 (Q2 and Q4)(to Field supply -XF1)	450–600 Amp	6RY18070AA04	1
Ribbon cable Power interface -XF1 (Q2 and Q4)(to Field supply -XF1)	850 Amp	6RY18070AA10	1

3 Parts and service (continued)

Printed circuit boards

Description	Where used US rating 480V	Part number	Recommended spare
Advanced CUD (C98043-A7100-L4)	All Ratings	6RY18030AA050AA1	1
Memory card (C98130-A7100-B1)	All Ratings	6RX18000AS01	1
Connector board (C98043-A7125-L1)	All Ratings	6RY18030GA00	1
Allocation board* (C98043-A7126-L1)	All Ratings	6RY18030GA01	1
Power Interface board (2Q Only) (C98043-A7105-L1)	All 2Q Ratings	6RY18030DA01	1
Power Interface board (4Q Only) (C98043-A7105-L4)	All 4Q Ratings	6RY18030DA02	1
Basic Operator Panel BOP20 (ASE00111019)	All Ratings	6SL30550AA004BA0	1
Field Supply/Power Section +RC (4Q Only) (C98043-A7111-L1)	15 Amp	6RY18030CA01	1
Field Supply/Power Section +RC (4Q Only) (C98043-A7111-L2)	30 Amp	6RY18030CA02	1
Field Supply board (2Q and 4Q) (C98043-A7120-L6)	60 to 125 Amp	6RY18030CA03	1
Field Supply board (2Q and 4Q) (C98043-A7115-L12)	210 to 850 Amp	6RY18030CA04	1
Field Supply board (2Q and 4Q) (C98043-A7116-L1)	1200 Amp	6RY18030CA05	1
Snubber board (RC) (C98 043-A7007-L4)	60 to 280 Amp	6RY18030FA05	1
Snubber board (RC) (C98043-A7011-L6)	450 and 600 Amp	6RY17030FA10	1
Snubber boards (RC) (C98043-A7011-L1)	850 Amp and 1200 Amp	6RY17030FA06	2
Fuse for Power Supply, 1 amp F1, F2 Mounted on Power Interface board	All Ratings	6RY17020BA00	2
Heat Sink Temperature Sensor (C98 043-A7010-L2)	All Ratings	6RY18060AB00	1

*When ordering please indicate the units order No. (MLFB) and Serial Number.