Operating Instructions Edition: AM

simovert masterdrives

Motion Control

SIEMENS

Frequency Inverter (DC-AC) Compact PLUS Type

Contents

1 Definitions and Warnings

Qualified personnel

For the purpose of this documentation and the product warning labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up, operation and maintenance of the product. He or she must have the following qualifications:

- Trained or authorized to energize, de-energize, ground and tag circuits and equipment in accordance with established safety procedures.
- Trained or authorized in the proper care and use of protective equipment in accordance with established safety procedures.
- Trained in rendering first aid.

DANGER

indicates an **imminently** hazardous situation which, if not avoided, will result in death, serious injury and considerable damage to property.

WARNING

indicates a **potentially** hazardous situation which, if not avoided, could result in death, serious injury and considerable damage to property.

CAUTION

used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

used without safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

NOTICE used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesirable result or state.

NOTE

For the purpose of this documentation, "Note" indicates important information about the product or about the respective part of the documentation which is essential to highlight.

WARNING

Hazardous voltages are present in this electrical equipment during operation.

Non-observance of the warnings can thus result in severe personal injury or property damage.

Only qualified personnel should work on or around the equipment

This personnel must be thoroughly familiar with all warning and maintenance procedures contained in this documentation.

The successful and safe operation of this equipment is dependent on correct transport, proper storage and installation as well as careful operation and maintenance.

NOTE

This documentation does not purport to cover all details on all types of the product, nor 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 this documentation shall not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of SIEMENS AG. The warranty contained in the contract between the parties is the sole warranty of SIEMENS AG. Any statements contained herein do not create new warranties or modify the existing warranty.

Proper use of Siemens products

WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be adhered to. The information in the relevant documentation must be observed.

CAUTION

Components which can be destroyed by electrostatic discharge (ESD)

The board contains components which can be destroyed by electrostatic discharge. These components can be easily destroyed if not carefully handled. If you have to handle electronic boards, please observe the following:

Electronic boards should only be touched when absolutely necessary.

The human body must be electrically discharged before touching an electronic board.

Boards must not come into contact with highly insulating materials - e.g. plastic parts, insulated desktops, articles of clothing manufactured from man-made fibers.

Boards must only be placed on conductive surfaces.

Boards and components should only be stored and transported in conductive packaging (e.g. metalized plastic boxes or metal containers).

If the packing material is not conductive, the boards must be wrapped with a conductive packaging material, e.g. conductive foam rubber or household aluminium foil.

The necessary ESD protective measures are clearly shown again in the following diagram:

- a = Conductive floor surface
- b = ESD table
- c = ESD shoes
- d = ESD overall
- e = ESD chain
- f = Cubicle ground connection

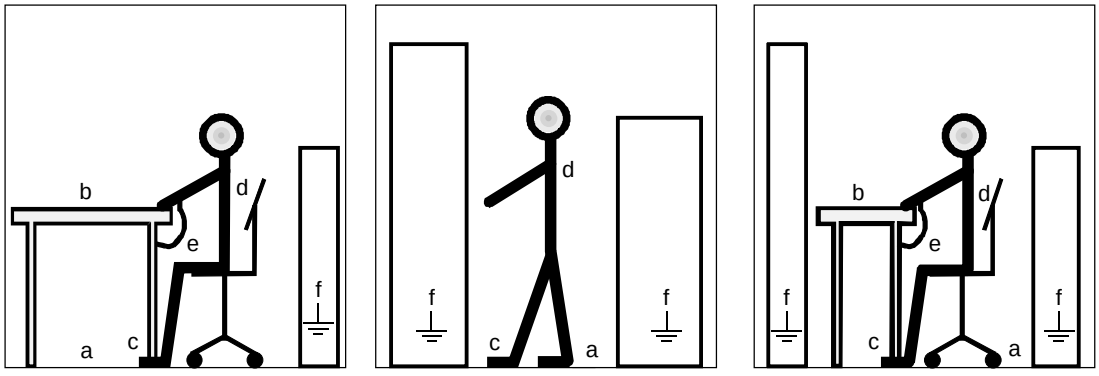


Fig. 1-1 ESD protective measures

Safety and Operating Instructions for Drive Converters

(in conformity with the low-voltage directive 73/23/EEC)

1. General

In operation, drive converters, depending on their degree of protection, may have live, uninsulated, and possibly also moving or rotating parts, as well as hot surfaces.

In case of inadmissible removal of the required covers, of improper use, wrong installation or maloperation, there is the danger of serious personal injury and damage to property.

For further information, see documentation.

All operations serving transport, installation and commissioninng as well as maintenance are to be carried out by **skilled technical personnel** (Observe IEC 60364 or CENELEC HD 384 or DIN VDE 0100 and IEC 60664 or DIN VDE0110 and national accident prevention rules!).

For the purposes of these basic safety instructions, "skilled technical personnel" means persons who are familiar with the installation, mounting, commissioning and operation of the product and have the qualifications needed for the performance of their functions.

2. Intended use

Drive converters are components designed for inclusion in electrical installations or machinery.

In case of installation in machinery, commissioning of the drive converter (i.e. the starting of normal operation) is prohibited until the machinery has been proved to conform to the provisions of the directive 98/37/EG (Machinery Safety Directive - MSD). Account is to be taken of EN 60204.

Commissioning (i.e. the starting of normal opertion) is admissible only where conformity with the EMC directive (89/336/EEC) has been established.

The drive converters meet the requirements of the low-voltage directive 73/23/EEC.
They are subject to the harmonized standards of the series EN 50178 / DIN VDE 0160 in conjunction with EN 60439-1 / DIN VDE 0660 part 500 and EN 60146 / VDE 0558.

The technical data as well as information concerning the supply conditions shall be taken from the rating plate and from the documentation and shall be strictly observed.

3. Transport, storage

The instructions for transport, storage and proper use shall be complied with.

The climatic conditions shall be in conformity with EN 50178.

4. Installation

The installation and cooling of the appliances shall be in accordance with the specifications in the pertinent documentation.

The drive converters shall be protected against excessive strains. In particular, no components must be bent or isolating distances altered in the course of transportation or handling. No contact shall be made with electronic components and contacts.

Drive converters contain electrostatic sensitive components which are liable to damage through improper use. Electric components must not be mechanically damaged or destroyed (potential health risks).

5. Electrical connection

When working on live drive converters, the applicable national accident prevention rules (e.g. BGV A3) must be complied with.

The electrical installation shall be carried out in accordance with the relevant requirements (e.g. cross-sectional areas of conductors, fusing, PE connection). For further information, see documentation.

Instructions for the installation in accordance with EMC requirements, like screening, earthing, location of filters and wiring, are contained in the drive converter documentation. They must always be complied with, also for drive converters bearing a CE marking. Observance of the limit values required by EMC law is the responsibility of the manufacturer of the installation or machine.

6. Operation

Installations which include drive converters shall be equipped with additional control and protective devices in accordance with the relevant applicable safety requirements, e.g. Act respecting technical equipment, accident prevention rules etc. Changes to the drive converters by means of the operating software are admissible.

After disconnection of the drive converter from the voltage supply, live appliance parts and power terminals must not be touched immediately because of possibly energized capacitors. In this respect, the corresponding signs and markings on the drive converter must be respected.

During operation, all covers and doors shall be kept closed.

7. Maintenance and servicing

The manufacturer's documentation shall be followed.

Keep these safety instructions in a safe place!

Residual risks of Power Drive Systems (PDS)

DANGER

The components for the controller and drive of a Power Drive System (PDS) are authorized for industrial and commercial use in industrial networks. Their use in public networks requires a different planning and/or additional measures.

It is only permissible to operate these components in enclosed housings or in superordinate control cabinets and when all protective devices and protective covers are used.

These components may only be handled by qualified and trained specialist persons who are familiar with and observe all the safety instructions on the components and in the relevant technical user documentation.

The machine manufacturer must take into account the following residual risks resulting from the components for the controller and drive of a Power Drive System (PDS) when evaluating the risk of his machine in accordance with the EC machinery guideline.

1. Undesired movements of driven machine components during commissioning, operation, maintenance and repair, e.g. as a result of
   - HW and/or SW errors in the sensors, controller, actuators and connection system
   - Reaction times of the controller and the drive
   - Operation and/or ambient conditions not compliant with the specification
   - Errors in parameterization, programming, wiring and installation
   - Use of radio units/mobile phones in the direct vicinity of the controller
   - External influences/damage.
2. Extraordinary temperatures and emissions of light, noises, particles and gases, e.g. as a result of
   - Component failure
   - Software errors
   - Operation and/or ambient conditions not compliant with the specification
   - External influences/damage.
3. Dangerous contact voltages, e.g. as a result of
   - Component failure
   - Influence upon electrostatic charging
   - Induction of voltages in the case of moving motors
   - Operation and/or ambient conditions not compliant with the specification
   - Condensation/conductive contamination
   - External influences/damage.
4. Operational electrical, magnetic and electromagnetic fields that may pose a risk to people with a pacemaker, implants or metallic items if they are too close.
5. Release of pollutants and emissions if components are not operated or disposed of properly.

For additional information on the residual risks emanating from the components of the PDS, please refer to the relevant chapters of the technical user documentation.

DANGER

Electrical, magnetic and electromagnetic fields (EMF) that occur during operation can pose a danger to persons who are present in the direct vicinity of the product – especially persons with pacemakers, implants, or similar devices.

The relevant directives and standards must be observed by the machine/plant operators and persons present in the vicinity of the product. These are, for example, EMF Directive 2004/40/EEC and standards EN 12198-1 to -3 pertinent to the European Economic Area (EEA), as well as accident prevention code BGV 11 and the associated rule BGR 11 "Electromagnetic fields" of the German employer's liability accident insurance association pertinent to Germany.

These state that a hazard analysis must be drawn up for every workplace, from which measures for reducing dangers and their impact on persons are derived and applied, and exposure and danger zones are defined and observed.

The safety information in the Storage, Transport, Installation, Commissioning, Operation, Maintenance, Disassembly and Disposal sections must also be taken into account.

2 Description

Range of application

The inverter is a power electronics component for feeding highly dynamic three-phase drives in the output range from 0.75 kW to 37 kW.

The unit can be operated from a DC system with voltages from 510 V to 650 V.

The inverter enables a three-phase system with a variable output frequency between 0 Hz and 400 Hz to be generated from the DC link voltage with the pulse width modulation method (PWM).

The unit is controlled by the internal closed-loop control electronics which consists of a microprocessor and a digital signal processor (DSP). The functions are provided by the unit software.

The unit can be operated via the PMU operator control panel, the user-friendly OP1S operator control panel, the terminal strip or via the bus system. For this purpose, the unit has a number of interfaces and three slots for the use of optional boards.

Resolvers, encoders, pulse encoders and multiturn encoders can be used as encoders on the motor.

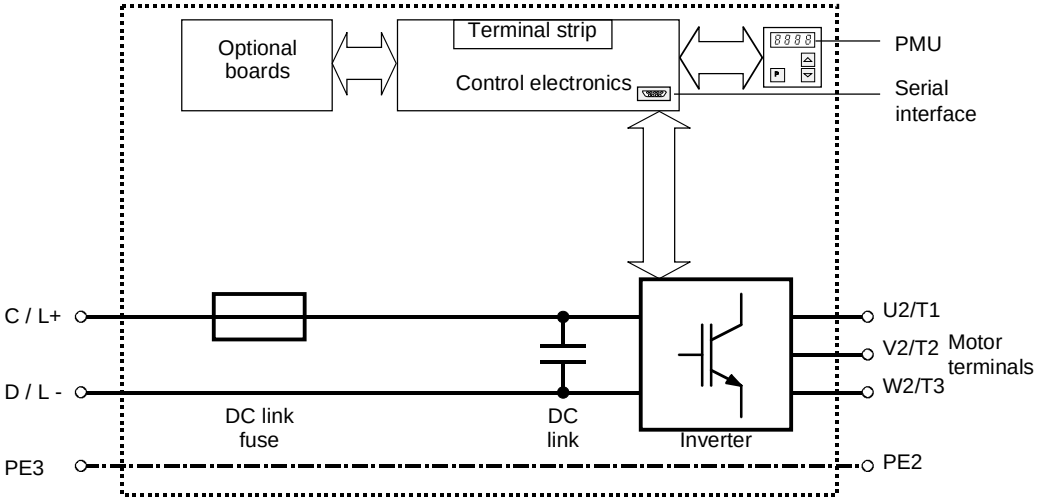


Fig. 2-1 Circuit principle of the inverter

3 Transport, Storage, Unpacking

The units and components are packed in the manufacturing plant corresponding to that specified when ordered. A packing label is located on the outside of the packaging. Please observe the instructions on the packaging for transport, storage and professional handling.

Transport

Vibrations and jolts must be avoided during transport. If the unit is damaged, you must inform your shipping company immediately.

Storage

The units and components must be stored in clean, dry rooms. Temperatures between -25 °C (-13 °F) and +70 °C (158 °F) are permissible. Temperature fluctuations must not be more than 30 K per hour.

CAUTION

If the storage period of two years is exceeded, the unit must be newly formed. See Section ”Forming".

Unpacking

The packaging comprises board and corrugated paper. It can be disposed of corresponding to the appropriate local regulations for the disposal of board products. The units and components can be installed and commissioned after they have been unpacked and checked to ensure that everything is complete and that they are not damaged.

4 First Start-up

Unpack and check the units

After removing the packaging, check that the unit is intact and undamaged. Only intact units may be started up. Please also check that the unit is complete, that the correct optional boards are fitted, and that the technology option has been released, if ordered.

See section "Transport, Storage, Unpacking"

Mount the unit and install optional boards which have not yet been fitted

Retrofit any optional boards which have not yet been installed, if necessary. Then install the units taking into account the requirements at the point of installation and the EMC instructions.

See section "Installation" and "Installation in Conformance with EMC Regulations"

Form the DC link capacitors, if necessary

If the DC link of the unit was de-energized for more than two years, you have to newly form the DC link capacitors

See section "Forming"

Connect the protective conductor, the power cables or buses and, if present, the ext. 24 V supply

Please connect, starting with the protective conductor, the power cables or DC link buses and the external 24 V supply. Pay attention to EMC instructions when laying the cables. Please do not at this stage connect any control, communication, encoder and motor cables (exception: cable for connecting up an OP1S, if parameterization is to be effected via the OP1S).

See section "Connecting-up" and "Installation in Conformance with EMC Regulations"

Connect the control cables, communication cables, encoder cables and motor cables

Please connect the remaining control, communication, encoder and motor cables. Pay attention to the EMC instructions when laying the cables.

WARNING

The device must be **disconnected** from its voltage supplies (24 V DC electronics supply and DC link / mains voltage) before the control and encoder leads are connected or disconnected!
Failure to observe this advice can result in encoder defects, which may in turn cause uncontrolled axis movements.

See section "Connecting-up" and "Installation in Conformance with EMC Regulations"

Power up the external 24 V supply

After checking that the cabling has been correctly connected and that it sits properly, power up the external 24 V supply. After the electronics power supply has been started, the unit initializes itself. The action can take several seconds. The drive status is subsequently shown on the PMU.

If necessary, carry out parameter reset to factory setting

If the PMU does not show status °005 after completion of the unit initialization, or if the unit has already been parameterized before, you should carry out a parameter reset to factory setting.

See section "Parameterization"

Parameterizing by download or with parameter modules

See section "Parameterization"

Function test

After checking the unit and the cabling once more, power up the line voltage and perform a function test according to your parameterization.

WARNING **It must be ensured that no danger for persons and equipment can occur by energizing the power and the unit. It is recommended not to couple the driven machine until the function test has been successfully completed.**

Further start-up and parameterization according to your specific requirements

5 Installation

5.1 Installing the units

WARNING

Safe converter operation requires that the equipment is mounted and commissioned by qualified personnel taking into account the warning information provided in these Operating Instructions.

The general and domestic installation and safety regulations for work on electrical power equipment (e.g. VDE, UL) must be observed as well as the professional handling of tools and the use of personal protective equipment.

Death, severe bodily injury or significant material damage could result if these instructions are not followed.

NOTE

MASTERDRIVES components are designed in accordance with degree of protection IP20 or IPXXB in accordance with EN 60529 and as open-type devices to UL 50, thus providing protection against electrical shocks. In order to also ensure protection against mechanical and climatic stresses the components have to be operated in housings/cabinets/rooms that are designed according to the requirements of' EN 60529 and classified as enclosure type to UL 50.

Clearances

When you install the equipment, make sure that the DC link connection is at the top and the motor connection is at the bottom.

The devices must be mounted side by side in close physical contact.

In order to ensure an adequate supply of cooling air, a clearance of 100 mm must be left at the top of the unit and at the bottom of the unit respectively to components which may considerably affect the flow of cooling air.

When mounting in cabinets, the cabinet cooling must be designed according to the power loss. Please refer to the Technical Data in this regard.

Requirements at the point of installation

- Foreign particles
  The units must be protected against the ingress of foreign particles as otherwise their function and operational safety cannot be ensured.
- Dust, gases, vapors
  Equipment rooms must be dry and dust-free. Ambient and cooling air must not contain any electrically conductive gases, vapors and dust which could diminish the functionality. If necessary, filters should be used or other corrective measures taken.
- Cooling air
  The units must only be operated in an ambient climate in accordance with DIN IEC 721-3-3 Class 3K3. For cooling air temperatures of more than 45 °C (113 °F) and installation altitudes higher than 1000 m, derating is required.

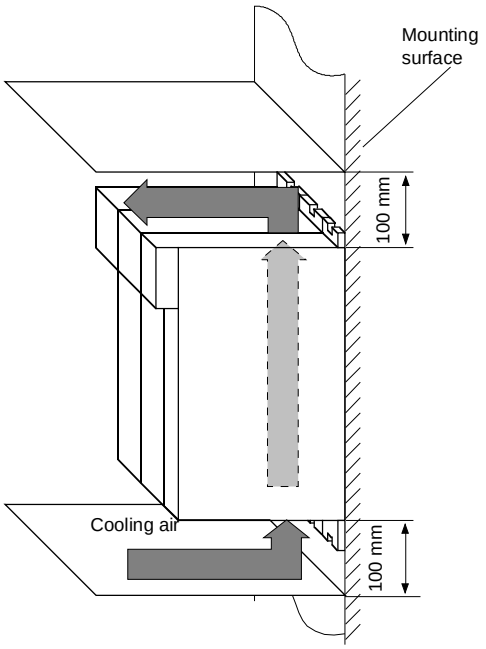


Fig. 5-1 Minimum clearances for cooling

Installation

The unit is mounted directly to a mounting surface. Fixing is by means of two or four M5 screws.

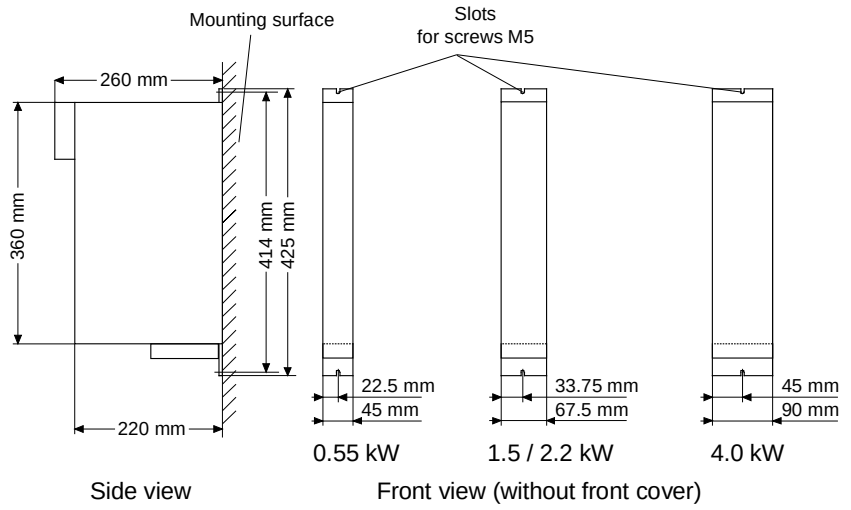


Fig. 5-2 Dimension drawings for housings up to 90 mm wide

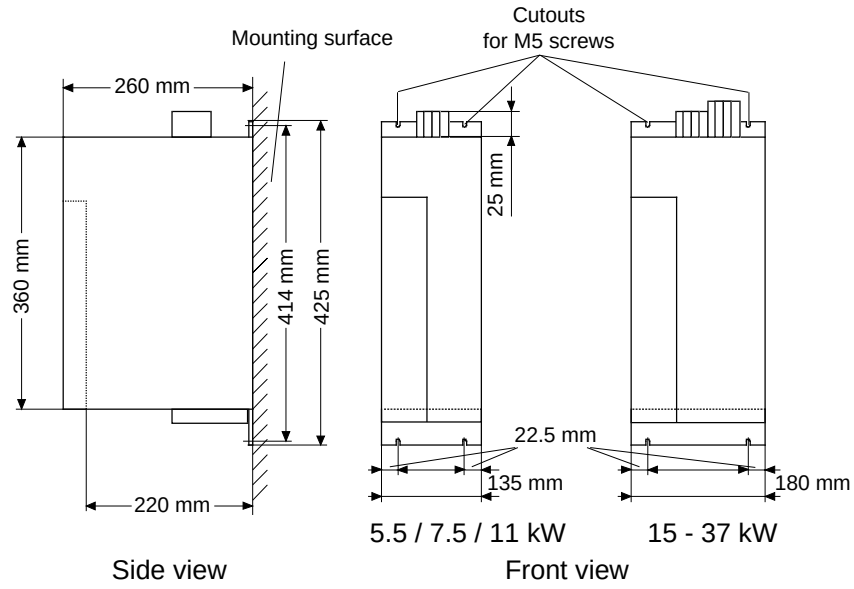


Fig. 5-3 Dimension drawings for housings 135 mm and 180 mm wide

5.2 Installing the optional boards

DANGER

The unit has hazardous voltage levels up to 5 minutes after it has been powered down due to the DC link capacitors. The unit or the DC link terminals must not be worked on until at least after this delay time.

5.2.1 Installing optional boards on units with a width up to 90 mm

Disconnect unit from power supply

DANGER

Disconnect the rectifier unit or the converter from the power supply and switch OFF the unit. Remove the 24V power supply for the electronics. Take off all connecting leads.

Dismantling the unit

Dismantle the unit as follows:

- Open the terminals of the DC link bus module.
- Remove the fixing screws by means of which the unit is fixed to the mounting surface.
- Pull the unit down until the DC link bus module is completely exposed.
- Pull the unit out towards you.
- Lay the unit on its left side.

Opening the unit

- Unscrew the four fixing screws of the right-hand side wall. The fixing screws are on the unit at the top on the right and at the bottom on the right.
- You do not have to remove the four fixing screws completely, as the wall of the unit is provided with a cutout to enable you to swing out the cover once the screws have been loosened.
- Open the right-hand side wall. To open the side wall use a slotted screwdriver to lever out the front panel from its latches. The front panel only has to be loosened on one side of the side wall and can stay on the unit housing. Now the side wall can be removed upwards.

Removing the slot cover

- Remove the cover of the selected slot on the front panel.
- To do so, you must carefully cut through the four connecting points of the cover on the front panel with a thin knife.

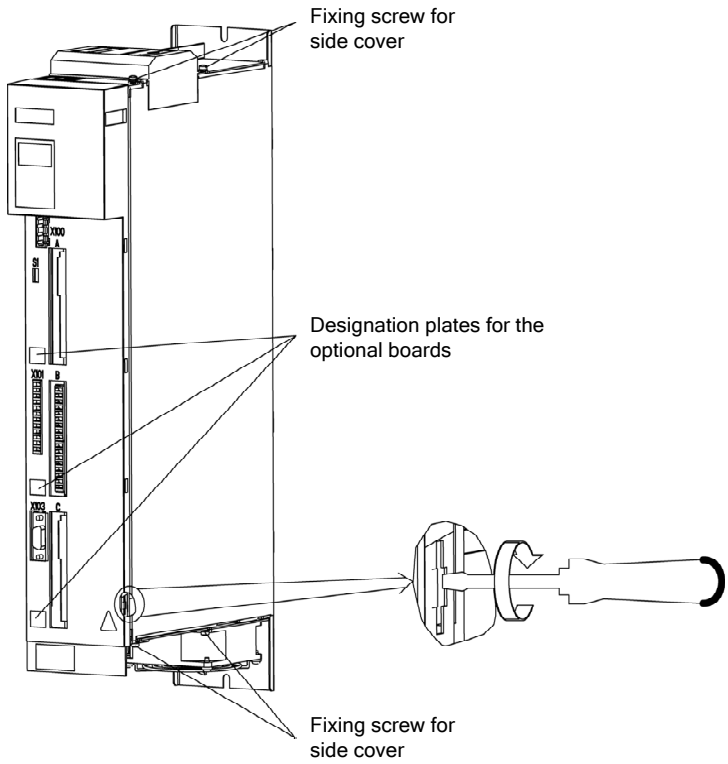


Fig. 5-4 Position of the fixing screws on the right-hand side wall

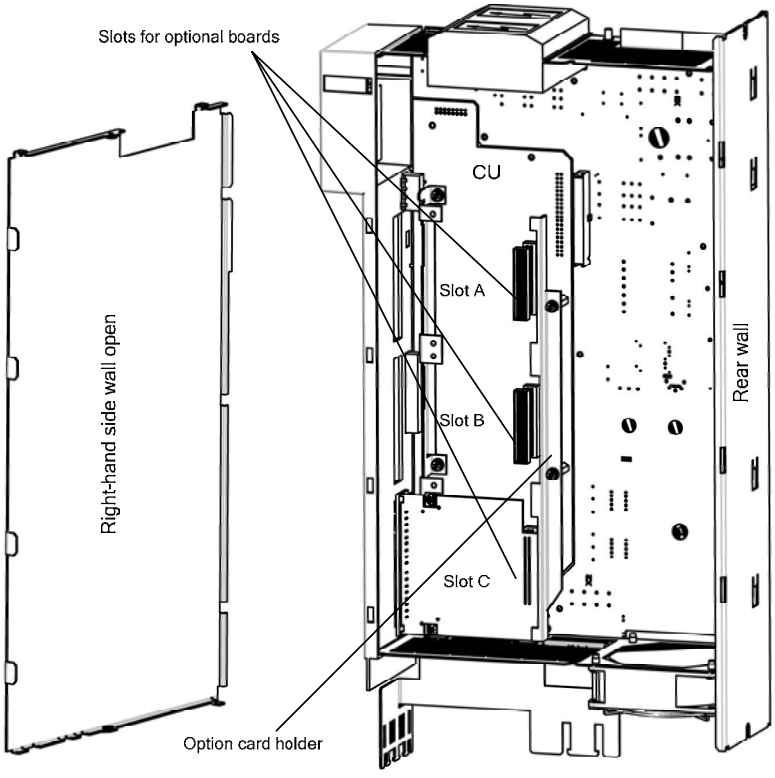


Fig. 5-5 Removing the right-hand side wall

Removing the option card holder

Remove the fixing screws of the option card holder from the pins and lift the option card holder from the device.

Installing the optional board

- Push the optional board from behind into the opening on the front cover (①) until the position of the 64-pole system connector on the main board corresponds with the position of the socket.
- Insert the optional board from the right onto the 64-pole system connector on the main board (②). The view shows the installed state.
- Screw the optional board tight at the fastening points in the front section of the optional board (③).

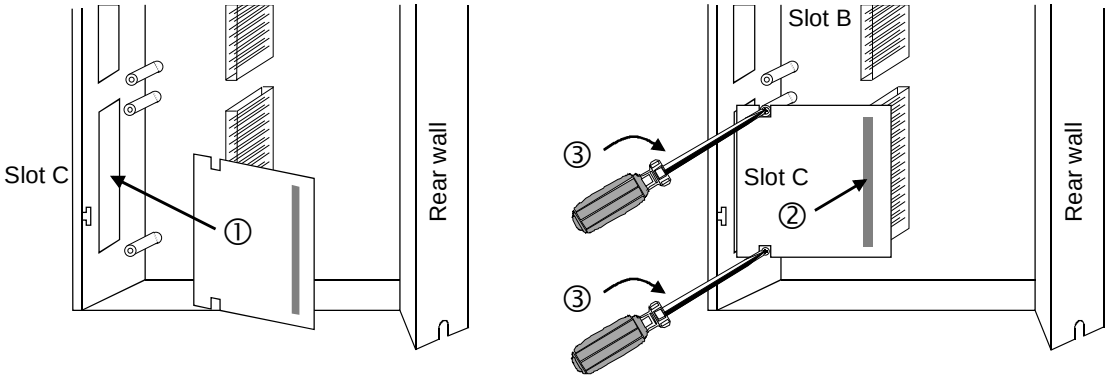


Fig. 5-6 Installing the optional board

Mounting the option card holder

Place the option card holder horizontally on the rear edge of all fitted option cards and tighten the previously removed screws at the fixing points.

Assembling and mounting the unit

Close the right-hand side wall of the unit as follows

- Press the front panel slightly to the side and insert the side wall from above into the unit. Make sure after inserting the side wall that the fixing lugs mounted at the top and bottom of the side wall are on the outside.
- Screw the side wall tight again by means of the four fixing screws.
- Place the unit on its rear wall.
- Press the front panel from above onto the now closed unit so that you can hear its latches engaging.

Mount the unit as follows:

- Insert the unit into its mounting position from the front underneath the DC link bus module.
- Lift the unit upwards until the DC link bus module is completely in its original position again.
- Screw the unit tight to the mounting surface with the fixing screws.
- Interlock the DC bus module.
- Re-connect all previously removed connecting cables.
- Check all connecting cables and the shield to make sure they sit properly and are in the correct position.

Designating the optional board

- To designate the optional board, insert the relevant designation plate into the envisaged position on the front of the unit.
- After powering up the voltage, you can log on the optional boards in the software of the unit and commence start-up.

5.2.2 Installing optional boards on units with a width of 135 mm and 180 mm

Disconnect unit from power supply

DANGER

Disconnect the rectifier unit or the converter from the power supply and switch OFF the unit. Remove the 24V power supply for the electronics. Take off all connecting leads.

NOTE

Optional boards are mounted when the power section is already installed.

Disassemble device

- Open up the clamps of the DC link busbars.
- Remove the fixing screws which hold the device on the mounting surface.
- Pull the device down until the DC link busbars are fully exposed.
- Pull the device out toward the front.
- Place the device on an ESD compatible work station, rear panel down.

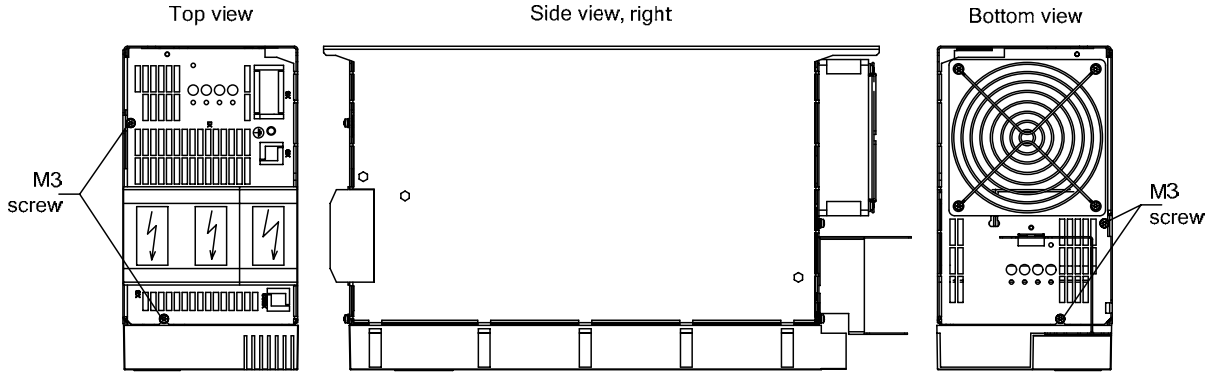


Fig. 5-7

Opening the unit

- For simpler disassembly, start with levering out the left one of the two housing chambers of the DC link terminals from the unit using a slot-head screwdriver.
- Unscrew the four fixing screws from the bottom and topside of the device. Carefully lever out the front cover from the five detent lugs on the right-hand side of the device using a slot-head screwdriver (see Detail A, Fig. 5-8). The front cover needs to be loosened only on one side, the right-hand side panel. Front cover and left-hand side panel remain as one unit.

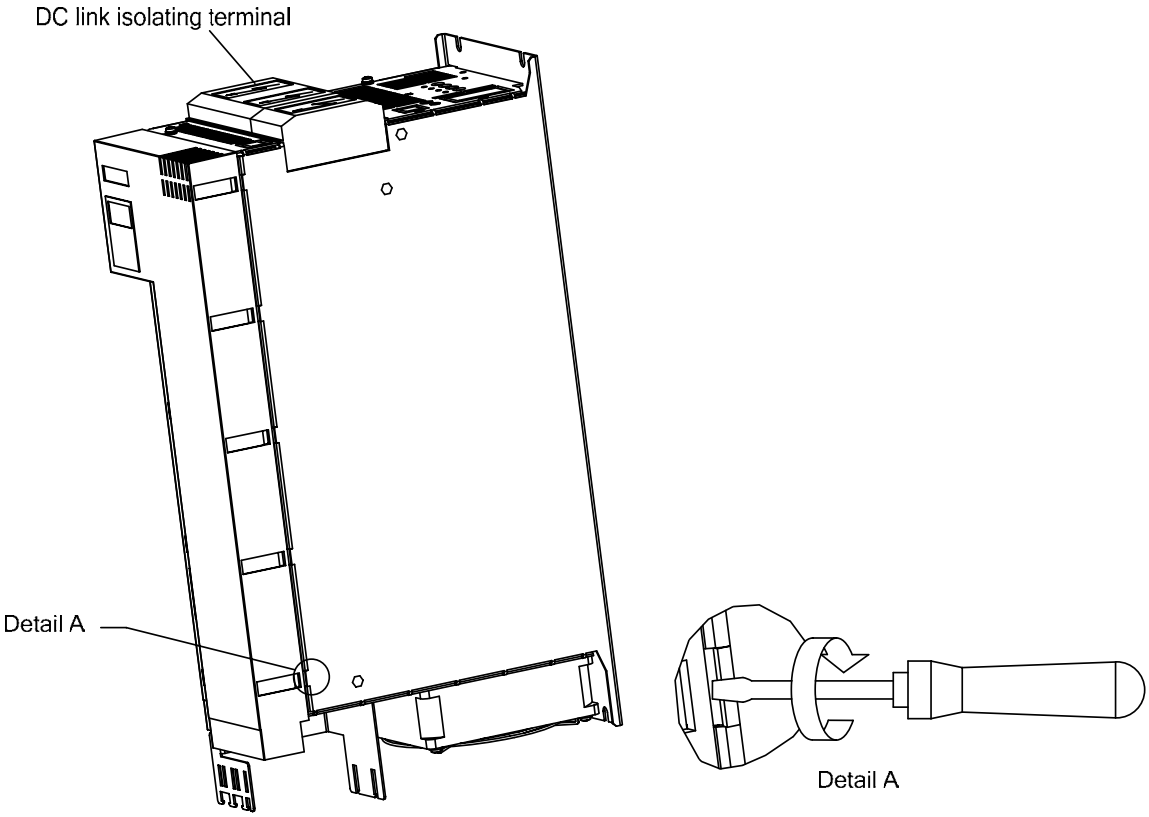


Fig. 5-8

- Carefully pull the device front including left side panel forward to the front (approx. 1 cm) so that the rear fold on the left-hand side panel can be loosened from the rear panel of the device as well as the front cover on the right-hand front panel from the housing (Fig. 5-9).
- You can then fold out the unit – consisting of front cover and left-hand side panel – to the left (Fig. 5-9).
- Open the locking levers of the ribbon cable on the power section which connects to the control electronics.
- Remove the front of the device together with electronics board and any additional options from the device.

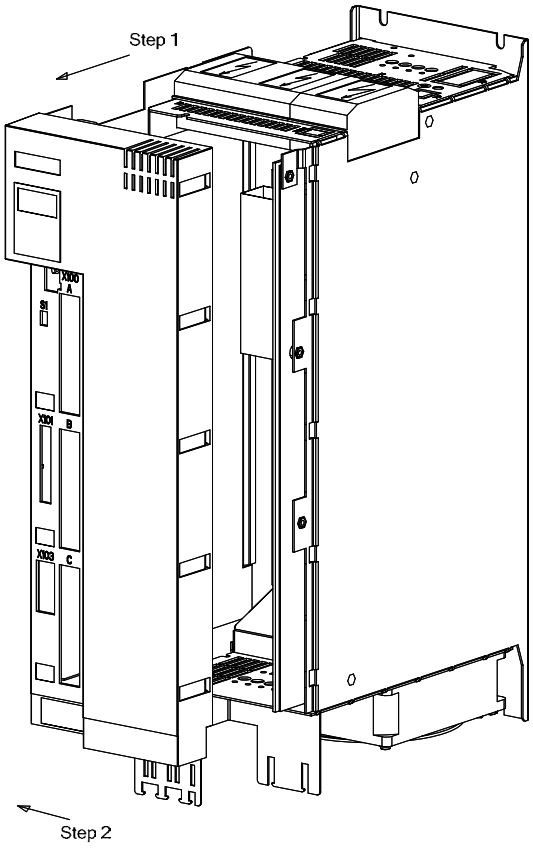


Fig. 5-9

Removing the slot cover

- Remove the cover of the selected slot on the front panel.
- To do so, you must carefully cut through the four connecting points of the cover on the front panel with a thin knife or remove the existing blind caps.

Removing the option card holder

- Remove the fixing screws of the option card holder from the pins and lift the option card holder from the device.

Removing the optional board

- Undo the two optional board screws by about one turn each.
- Loosen the connection between the system connector and the board so as to prevent any mechanical tension arising when the screws are fully unscrewed.
- Take out the optional board screws and remove the board.

Mounting the optional board

- Insert the optional board from the behind the broken-out slot cover (①) until the position of the 64-pole system connector on the electronic board corresponds with the position of the socket.
- Insert the option board into the 64-pole system connector on the electronic board (②).
- Screw the optional board tight at the fastening points in the front section of the optional board with the two screws (③).

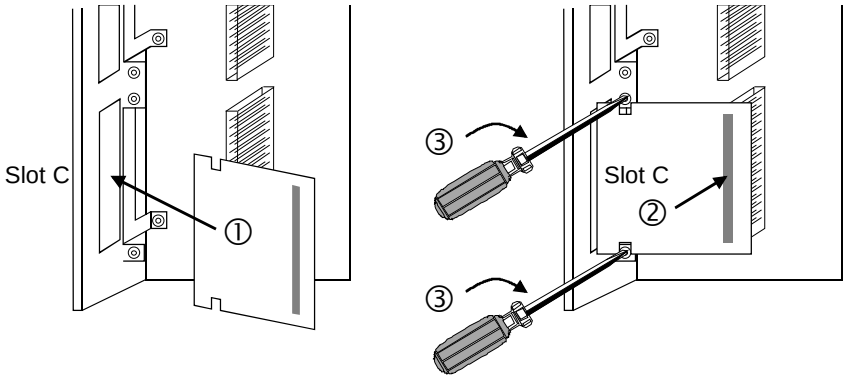


Fig. 5-10 Installing the optional board

Mounting the option card holder

Place the option card holder horizontally on the rear edge of all fitted option cards and tighten the previously removed screws at the fixing points.

Reassemble device

- Place the front of the device with the electronics board to the left next to the device. Connect the ribbon cable again with the electronics board and the power section and close the lock on the connector.
- To start with, hold the front of the device with the left-hand side panel tilted to the right at an angle of approx. 30° and place this unit on the front of the device. Be careful not to damage the insulating film on the right-hand inner side panel and to position the left-hand side panel through the fixing lug correctly on the left housing side. Applying little pressure, you can then insert the front cover and the side panel in the housing, in parallel to the right-hand side panel. The fold on the left-hand side panel as well as the detent lugs on the right-hand side of the housing noticeably snap in.
- For less load on the connection points, put the device down on the right-hand side and screw in the two screws each on the top and bottom-side of the device for some turns only. Now tighten all four screws.
- Now replace the housing of the DC link busbars until it noticeably snaps in.

Mount device

- Push the device from the front, below the DC link busbars, to its mounting position.
- Lift the device until the DC link busbars are fully connected again.
- Screw in the fixing screws to firmly tighten the device onto the mounting surface.
- Lock in the DC link busbars.

Connecting up the unit

- Re-connect all previously removed connecting cables.
- Check all connecting cables and the shield to make sure they sit properly and are in the correct position.

Designating the optional board

- To designate the optional board, insert the relevant designation plate into the envisaged position on the front of the unit.
- After powering up the voltage, you can log on the optional boards in the software of the unit and commence start-up.

6 Installation in Conformance with EMC Regulations

Basic EMC rules

Rules 1 to 13 are generally applicable. Rules 14 to 20 are particularly important for limiting noise emission.

Rule 1 All of the metal cabinet parts must be connected through the largest possible surface areas (not paint on paint). If required, use serrated washers. The cabinet door must be connected to the cabinet through grounding straps which must be kept as short as possible.

NOTE Grounding installations/machines is essentially a protective measure. However, in the case of drive systems, this also has an influence on the noise emission and noise immunity. A system can either be grounded in a star configuration or each component grounded separately. Preference should be given to the latter grounding system in the case of drive systems, i.e. all parts of the installation to be grounded are connected through their surface or in a mesh pattern.

Rule 2 Signal cables and power cables must be routed separately (to eliminate coupled-in noise). Minimum clearance: 20 cm. Provide partitions between power cables and signal cables. The partitions must be grounded at several points along their length.

Rule 3 Contactors, relays, solenoid valves, electromechanical operating hours counters, etc. in the cabinet must be provided with quenching elements, for example, RC elements, diodes, varistors. These quenching devices must be connected directly at the coil.

Rule 4 Non-shielded cables associated with the same circuit (outgoing and incoming conductor) must be twisted, or the surface between the outgoing and incoming conductors kept as small as possible in order to prevent unnecessary coupling effects.

Rule 5 Eliminate any unnecessary cable lengths to keep coupling capacitances and inductances low.

Rule 6 Connect the reserve cables/conductors to ground at both ends to achieve an additional shielding effect.

Rule 7 In general, it is possible to reduce the noise being coupled-in by routing cables close to grounded cabinet panels. For this reason the wiring should not be installed freely in the cabinet but should be routed close to the mounting plate. The same applies for reserve cables/conductors.

Rule 8 Tachometers, encoders or resolvers must be connected through a shielded cable. The shield must be connected to the tachometer, encoder or resolver and at the SIMOVERT MASTERDRIVES through a large surface area. The shield must not be interrupted, e.g. using intermediate terminals. Pre-assembled cables with multiple shields should be used for encoders and resolvers (see Catalog DA65).

Rule 9

The cable shields of digital signal cables must be connected to ground at both ends (transmitter and receiver) through the largest possible surface area. If the equipotential bonding is poor between the shield connections, an additional equipotential bonding conductor with at least 10 mm² must be connected in parallel to the shield, to reduce the shield current. Generally, the shields can be connected to ground (= cabinet housing) in several places. The shields can also be connected to ground at several locations, even outside the cabinet.

Foil-type shields are not to be favoured. They do not shield as well as braided shields; they are poorer by a factor of at least 5.

Rule 10

The cable shields of **analog** signal cables can be connected to ground at both ends if the equipotential bonding is good. Good equipotential bonding is achieved if Rule 1 is observed.

If low-frequency noise occurs on analog cables, for example: speed/measured value fluctuations as a result of equalizing currents (hum), the shields are only connected for analog signals at one end at the SIMOVERT MASTERDRIVES. The other end of the shield should be grounded through a capacitor (e.g. 10 nF/100 V type MKT). However, the shield is still connected at both ends to ground for high frequency as a result of the capacitor.

Rule 11

If possible, the signal cables should only enter the cabinet at one side.

Rule 12

If SIMOVERT MASTERDRIVES are operated from an external 24 V power supply, this power supply must not feed several consumers separately installed in various cabinets (hum can be coupled-in!). The optimum solution is for each SIMOVERT MASTERDRIVE to have its own power supply.

Rule 13

Prevent noise from being coupled-in through the supply.

SIMOVERT MASTERDRIVES and automation units/control electronics should be connected-up to different supply networks. If there is only one common network, the automation units/control electronics have to be de-coupled from the supply using an isolating transformer.

Rule 14

The use of a radio interference suppression filter is obligatory to maintain limit value class "First environment" or "Second environment", even if sinusoidal filters or dv/dt filters are installed between the motor and SIMOVERT MASTERDRIVES.

Whether an additional filter has to be installed for further consumers, depends on the control used and the wiring of the remaining cabinet.

Rule 15

A noise suppression filter should always be placed close to the fault source. The filter should be connected to the mounting plate etc. over a large surface area. A bare metal mounting panel (e.g. manufactured from stainless steel, galvanized steel) is best, as electrical contact is established through the entire mounting surface. If the mounting panel is painted, the paint has to be removed at the screw mounting points for the frequency converter and the noise suppression filter to ensure good electrical contact.

To limit the interference emission the cables between the filter output, the line commutating reactor and the converter should be shielded.

The incoming and outgoing cables of the radio interference suppression filter have to be spatially separated/isolated.

Rule 16

In order to limit the noise emitted, all variable-speed motors have to be connected-up using shielded cables, with the shields being connected to the respective housings at both ends in a low-inductive manner (through the largest possible surface area). The motor feeder cables also have to be shielded inside the cabinet or at least shielded using grounded partitions. Suitable motor feeder cable e.g. Siemens PROTOFLEX-EMV-CY (4 x 1.5 mm^2 ... 4 x 120 mm^2) with Cu shield. Cables with steel shields are unsuitable.

A suitable PG gland with shield connection can be used at the motor to connect the shield. It should also be ensured that there is a low-impedance connection between the motor terminal box and the motor housing. If required, connect-up using an additional grounding conductor. **Do not use plastic motor terminal boxes!**

Rule 17

A line reactor has to be installed between the radio interference suppression filter and the SIMOVERT MASTERDRIVES.

Rule 18

The line supply cable has to be spatially separated from the motor feeder cables, e.g. by grounded partitions.

Rule 19

The shield between the motor and SIMOVERT MASTERDRIVES must not be interrupted by the installation of components such as output reactors, sinusoidal filters, dv/dt filters, fuses, contactors. The components must be mounted on a mounting panel which simultaneously serves as the shield connection for the incoming and outgoing motor cables. Grounded partitions may be necessary to shield the components.

Rule 20

In order to limit the radio interference (especially for limit value class "First environment "), in addition to the line supply cable, all cables externally connected to the cabinet must be shielded.

Examples of these basic rules:

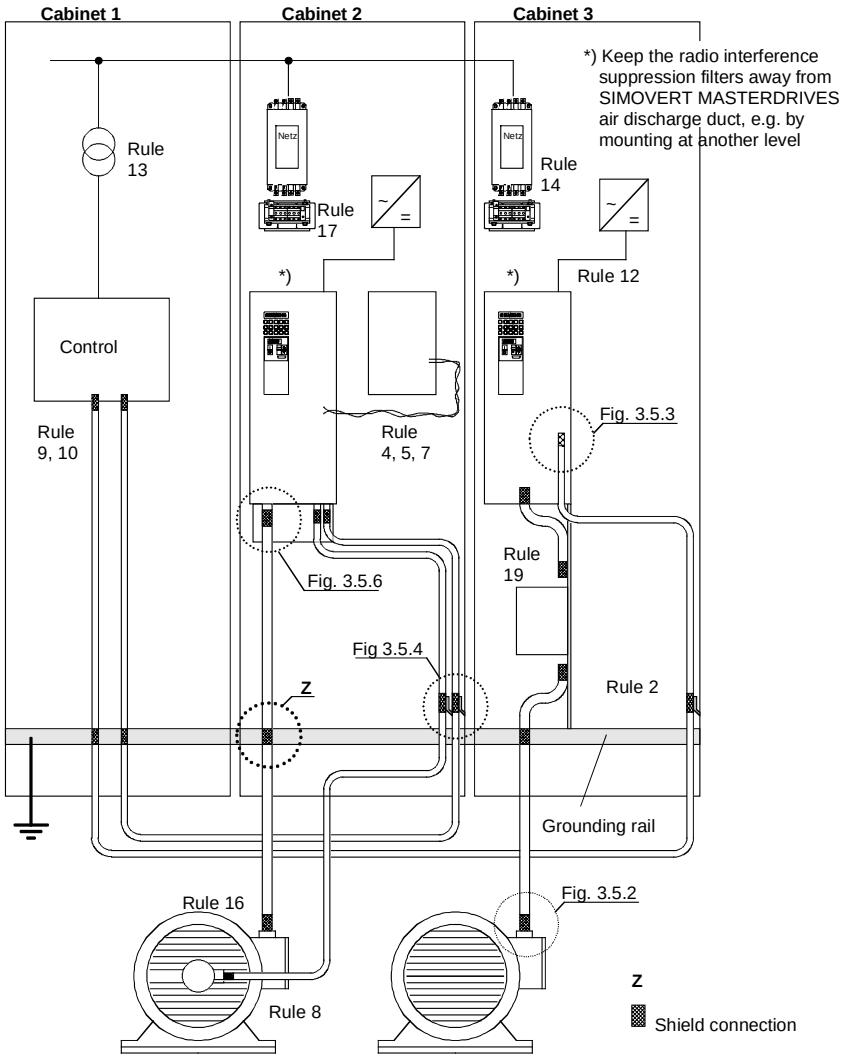


Fig. 6-1 Examples for applying the basic EMC rules

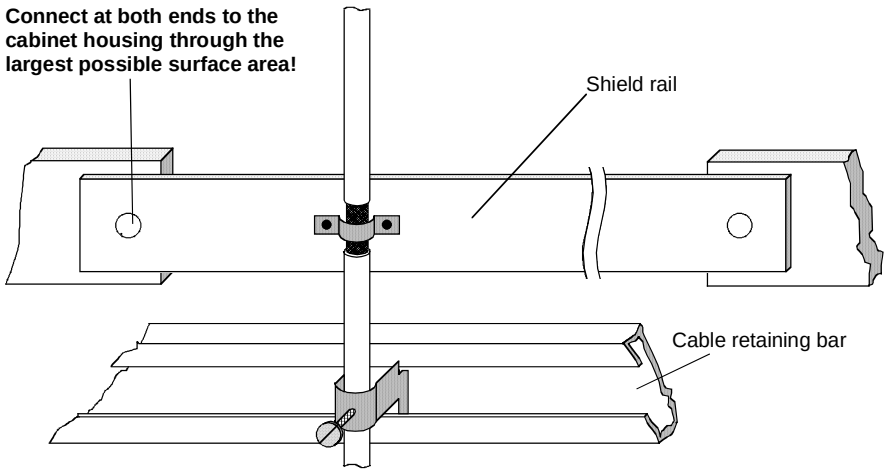


Fig. 6-2 Connecting the motor cable shield where the cable enters the cabinet

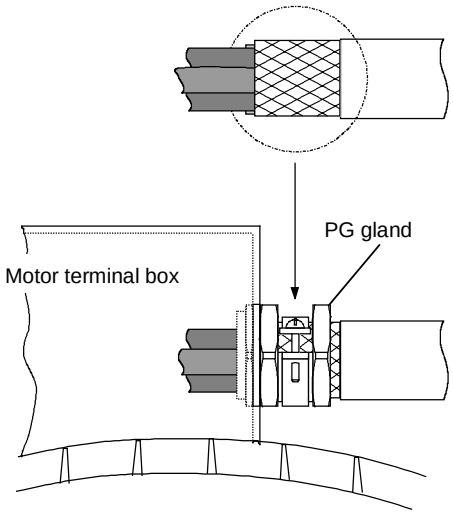


Fig. 6-3 Shield connection at the motor

The shield can be connected through a PG or metric gland (nickel-plated brass) with a strain relief bar. Thus, the degree of protection IP 20 can be achieved.

For higher degrees of protection (up to IP 68), there are special PG glands with shield connection, e.g.:

- SKINDICHT SHVE, Messrs. Lapp, Stuttgart
- UNI IRIS Dicht or UNI EMV Dicht, Messrs. Pflitsch, Hückeswagen

It is not permissible to use plastic motor terminal boxes!

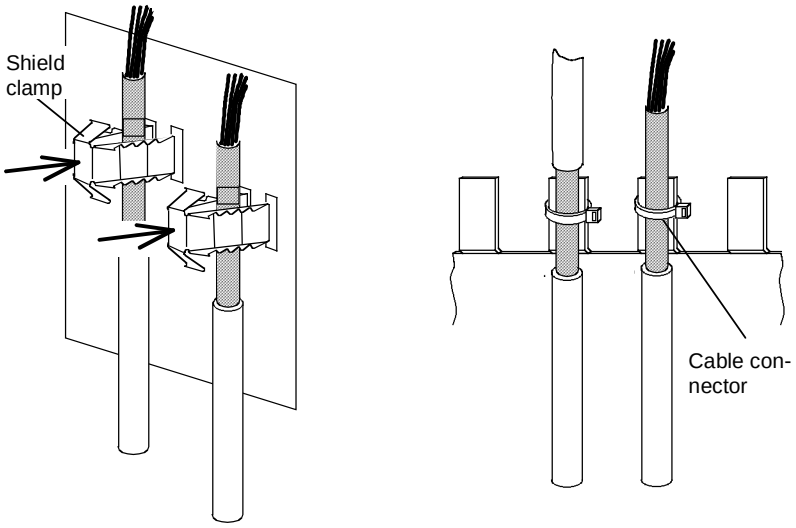


Fig. 6-4 Connecting the signal cable shields for SIMOVERT MASTERDRIVES

- Every SIMOVERT MASTERDRIVES has shield clamps to connect the signal cable shields.
- For chassis units (sizes ≥ E), the shields can be additionally connected using cable connectors at the shield connecting locations.

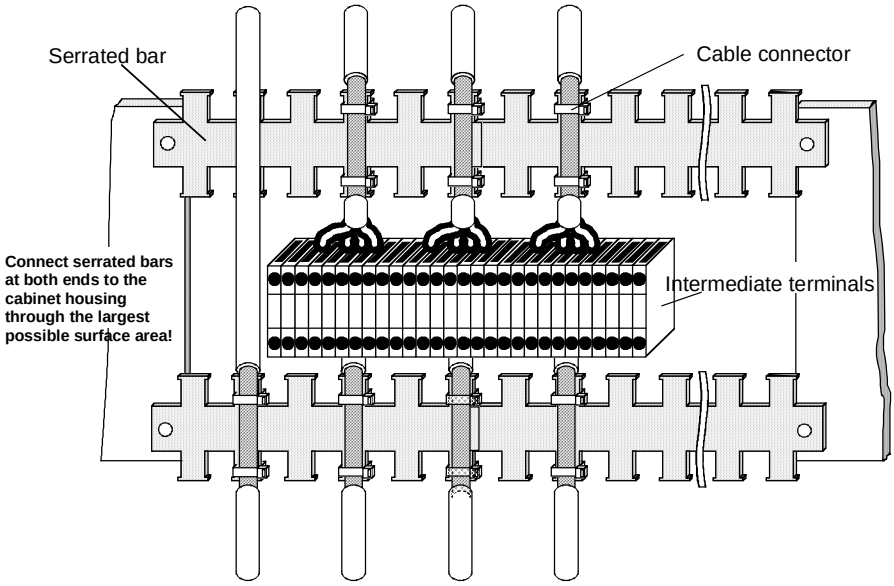


Fig. 6-5 Connecting signal cable shields in the cabinet

Wherever possible, intermediate terminals should not be used as they reduce the shielding effect!

7 Connecting-up

DANGER

SIMOVERT MASTERDRIVES units are operated at high voltages.
The equipment must be in a no-voltage condition (disconnected from the supply) before any work is carried out!
Only professionally trained, qualified personnel must work on or with the units.
Death, severe bodily injury or significant property damage could occur if these warning instructions are not observed.

Hazardous voltages are still present in the unit up to 5 minutes after it has been powered down due to the DC link capacitors. Thus, the appropriate delay time must be observed before working on the unit or on the DC link terminals.

The power terminals and control terminals can still be live even when the motor is stationary.
If the DC link voltage is supplied centrally, the converters must be reliably isolated from the DC link voltage!

When working on an opened unit, it should be observed that live components (at hazardous voltage levels) can be touched (shock hazard).

The user is responsible that all the units are installed and connected-up according to recognized regulations in that particular country as well as other regionally valid regulations. Cable dimensioning, fusing, grounding, shutdown, isolation and overcurrent protection should be particularly observed.

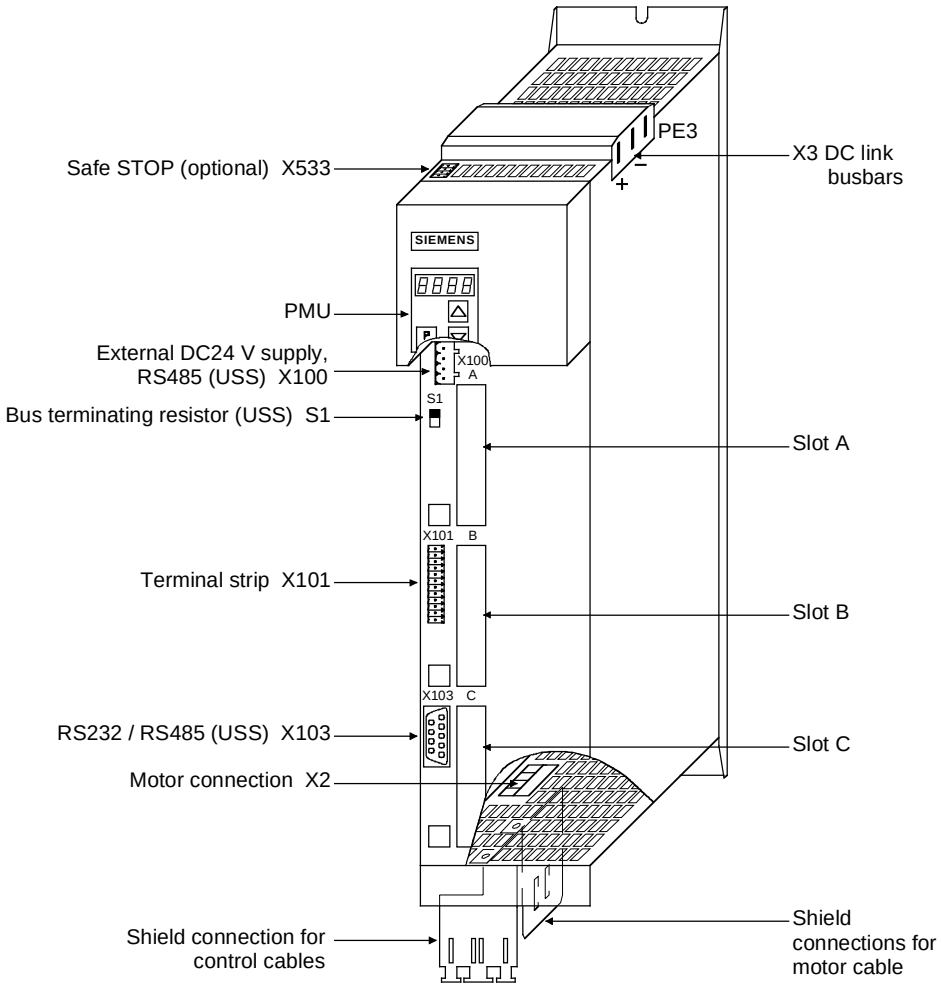


Fig. 7-1 Connection overview of units up to 90 mm wide

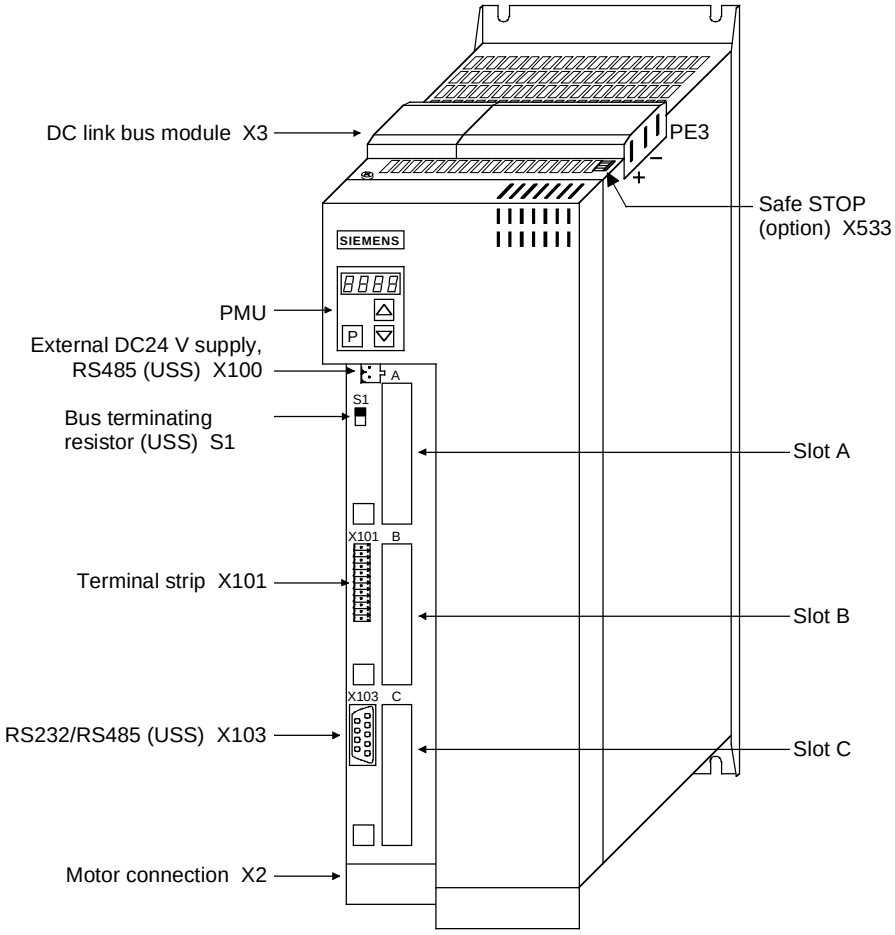


Fig. 7-2 Connection overview of units 135 mm wide

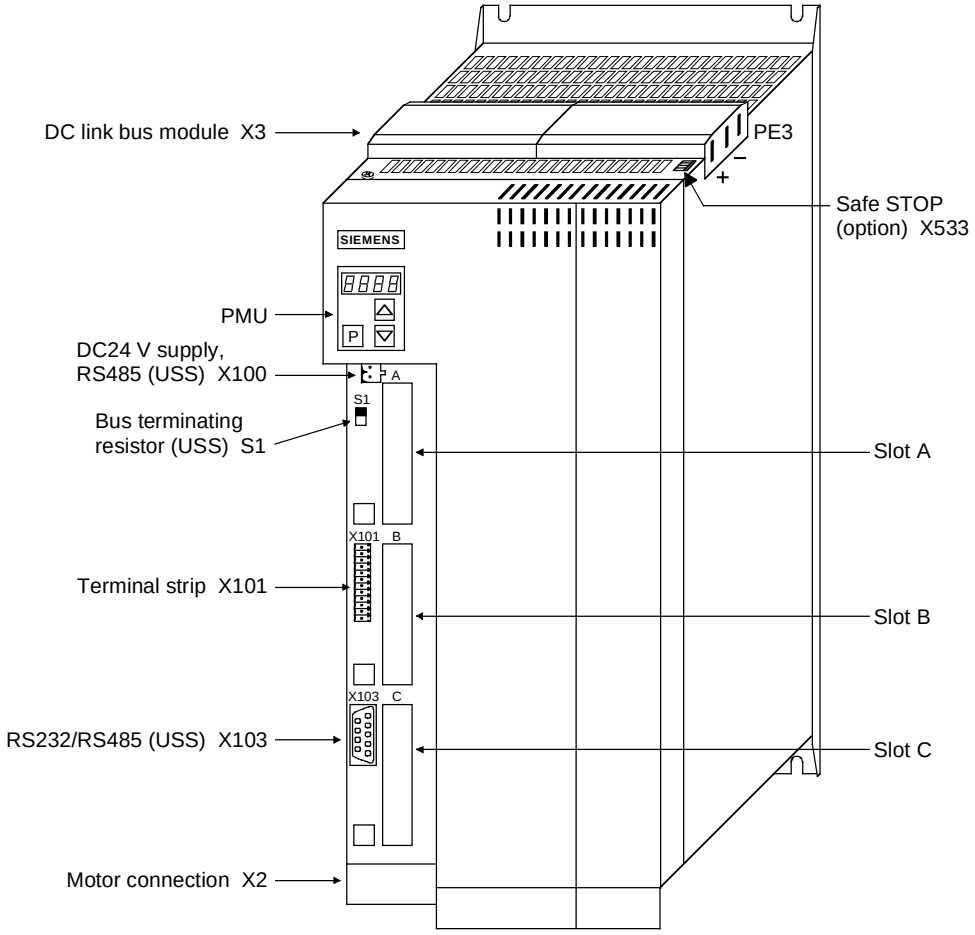


Fig. 7-3 Connection overview of units 180 mm wide

7.1 Power connections

WARNING

Protective conductor

The protective conductor must be connected up both on the mains side and on the motor side.

On account of leakage current through the interference-suppression capacitors the following must be observed as per EN 50178

- A minimum cross-section of 10 mm^2 Cu must be used or
- If supply connections with cross-sections less than 10 mm^2 are used, two protective conductors have to be connected up. The cross-section of each of the protective conductors corresponds to the cross-section of an outer conductor.

NOTE

If the unit is mounted on a grounded mounting surface via a conductive connection, the protective conductor cross section can be the same as that of the phase conductor. The function of the second protective conductor is afforded by the grounded mounting surface.

7.1.1 Power connections for units with a width up to 90 mm

Protective conductor

On top of the unit behind the DC link connection X3 is an extra protective conductor connection in the form of a threaded M4 bolt. It is used for connecting a protective conductor for units in isolated connection.

X3 - DC link bus module

The DC link bus module serves to supply the unit with electrical energy.

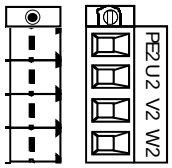
Bar	Designation	Meaning	Range
3	PE3	Protective conductor connection	
2	D / L-	DC link voltage -	DC 510 - 650 V
1	C / L+	DC link voltage +	DC 510 - 650 V

Connectable cross-section: "Electro-plated copper" 3x10 mm, rounded off according to DIN 46433

Bar 1 is at the front when installed.

Table 7-1 DC link busbars

X2 – Motor connection



The motor connection is located at the lower section of the unit.

Terminal	Meaning	Range
PE2	Protective conductor connection	
U2	Phase U2 / T1	3 AC 0 V - 480 V
V2	Phase V2 / T2	3 AC 0 V - 480 V
W2	Phase W2 / T3	3 AC 0 V - 480 V

Connectable cross-section: 4 mm^2 (AWG 10), stranded

Terminal PE2 is at the front when installed.

Table 7-2 Motor connection

CAUTION

The connector has to be screwed firmly to the housing (providing resistance to vibration and protecting against being inadvertently withdrawn).

The motor cables must be dimensioned in accordance with VDE 298, Part 2.

After installation of the connector, the shield of the motor cable must be fixed to the shield plate through a large surface area.

7.1.2 Power connections for units with a width of 135 mm and 180 mm

X3 - DC link bus module

The DC link bus module serves to supply the unit with electrical energy.

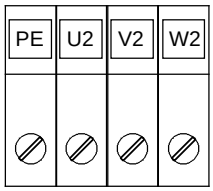
Bar	Designation	Meaning	Range
3	PE3	Protective conductor connection	
2	D / L-	DC link voltage -	DC 510 - 650 V
1	C / L+	DC link voltage +	DC 510 - 650 V

Connectable cross-section: "Electro-plated copper" 3x10 mm, rounded off according to DIN 46433

Bar 1 is at the front when installed.

Table 7-3 DC link busbars

X2 – Motor connection ≤ 18.5 kW



The motor connection is to a terminal block at the bottom of the unit.

Terminal	Meaning	Range
PE	Protective conductor connection	
U2 / T1	Phase U2 / T1	3AC 0 V - 480 V
V2 / T2	Phase V2 / T2	3AC 0 V - 480 V
W2 / T3	Phase W2 / T3	3AC 0 V - 480 V

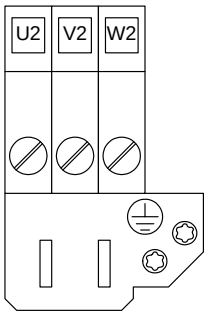
Connectable cross-section:
Housing width 135 mm: 10 mm² (AWG 8), stranded
Housing width 180 mm: 16 mm² (AWG 6), stranded

Viewed from the front, Terminal PE is at the left.

Table 7-4 Motor connection

The motor cables must be dimensioned in accordance with VDE 298, Part 2.
After installation of the connector, the shield of the motor cable must be fixed to the shield plate through a large surface area.

X2 – Motor connection ≥ 22 kW



The motor connection is to a terminal block at the bottom of the unit.

Terminal	Meaning	Range
⏚	Protective conductor connection	
U2 / T1	Phase U2 / T1	3AC 0 V - 480 V
V2 / T2	Phase V2 / T2	3AC 0 V - 480 V
W2 / T3	Phase W2 / T3	3AC 0 V - 480 V

Connectable cross-section:
Maximum cross-section: 50 mm² (AWG 1/0),
Minimum cross-section: 10 mm² (AWG 6)

PE terminal is at the bottom right of the shield plate.

Table 7-5 Motor connection

The motor cables must be dimensioned in accordance with VDE 298, Part 2.
After installation of the connector, the shield of the motor cable must be fixed to the shield plate through a large surface area.

7.2 Control connections

Standard connections

The basic version of the unit is provided with the following control connections:

- external 24V supply, USS bus connection (RS485)
- serial interface for PC or OP1S
- control terminal strip.

WARNING

The device must be disconnected from its voltage supplies (24 V DC electronics supply **and** mains voltage) before the control and encoder leads are connected or disconnected!

Failure to observe this advice can result in encoder defects, which may in turn cause uncontrolled axis movements.

WARNING

The external 24 V infeed and all circuits connected to the control terminals must meet the requirements for safety separation as stipulated in EN 50178 (PELV circuit = Protective Extra Low Voltage).

CAUTION

The external 24 V supply must be protected by an m.c.b. in order to prevent the overloading of printed conductors / components in the event of a device defect (e.g. a short circuit in the control electronics or a wiring fault).

Fuse –F1,F2 m.c.b. 6 A , tripping characteristic C,
Siemens 5SX2 106-7.

(For wiring information, see supplementary sheet supplied with rectifier unit or converter and Fig. 7-4).

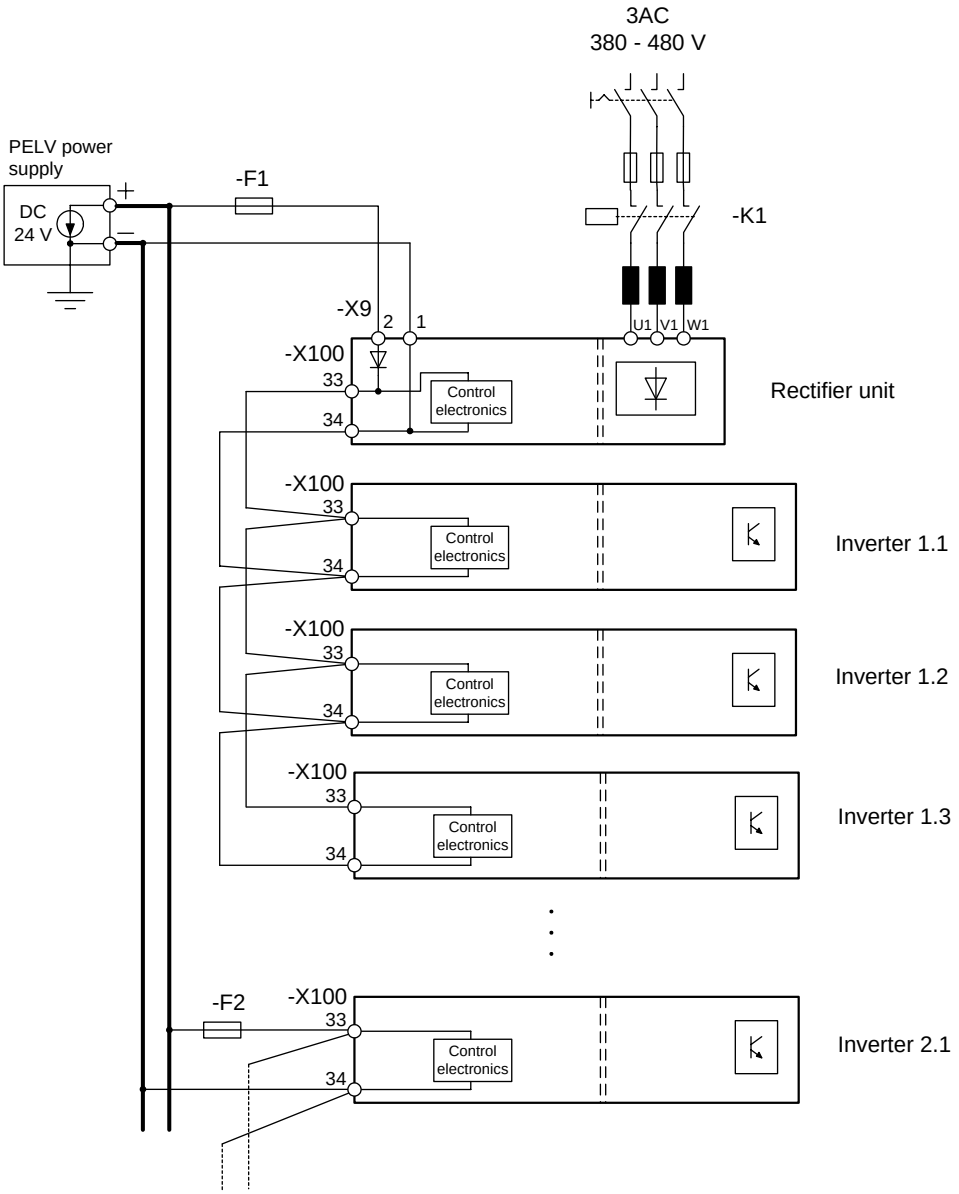


Fig. 7-4 Sectional drive with rectifier unit and inverters

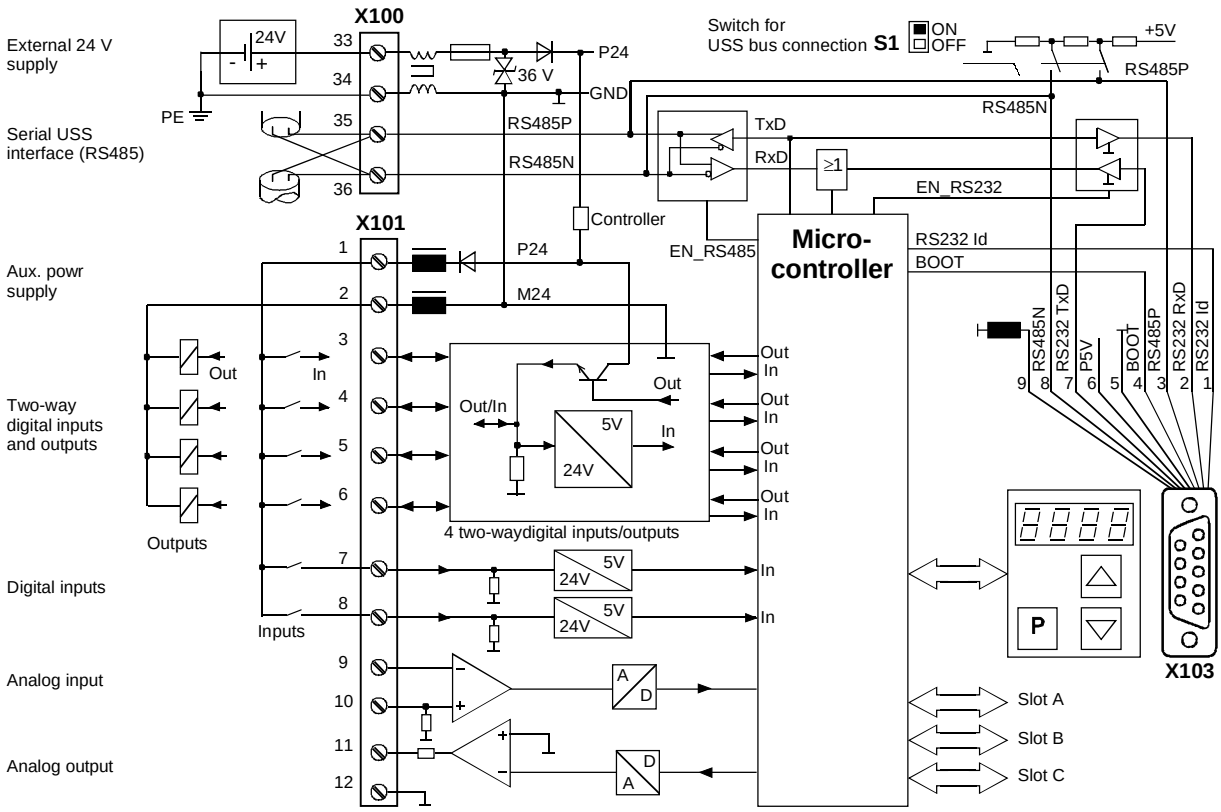


Fig. 7-5 Overview of the standard connections

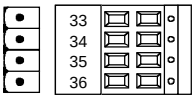
X100 - external DC24 V supply, USS bus

The 4-pole terminal strip serves to connect the external 24 V DC power supply (supply from the supply unit or an AC/AC converter) and for connecting a USS bus.

The USS bus connection is linked to the control electronics and the 9-pole Sub-D socket of the serial interface X103.

The bus terminating resistor can be switched in via switch S1 as required. In the lower position, the bus termination is switched off.

The termination has to be switched in whenever the unit is located at one end of the USS bus.



Terminal	Designation	Significance	Range
33	+24 V (in)	24 V DC power supply	DC 20-30 V
34	0 V	Reference potential	0 V
35	RS485P (USS)	USS bus connection	RS485
36	RS485N (USS)	USS bus connection	RS485

Connectable cross-section: 2.5 mm² (AWG 12)

Terminal 33 is at the top when installed.

Table 7-6 External 24 V supply, USS bus

The unit draws a current of 1 A from the 24 V power supply. When optional boards are plugged in, this increases to a maximum of 1.6 A.

NOTICE

The RS485 interface can be operated either via –X100 or –X103.

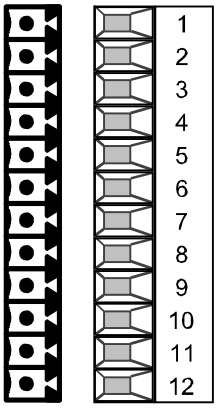
X101 - Control terminal strip

The following connections are provided on the control terminal strip:

- 4 combined digital inputs and outputs
- 2 additional digital inputs
- 1 analog input
- 1 analog output
- 24 V auxiliary voltage supply (max. 60 mA, output only!) for the inputs.

CAUTION

If the digital inputs are supplied from an external 24 V supply, this must be referenced to frame X101.2. Terminal X101.1 (P24 AUX) may **not** be connected with the 24V supply.



Terminal	Designation	Meaning	Range
1	P24 AUX	Aux. voltage supply	DC 24 V / 60 mA
2	M24 AUX	Reference potential choked	0 V
3	DIO1	Digital input/output 1	24 V, 10 mA / 20 mA
4	DIO2	Digital input/output 2	24 V, 10 mA / 20 mA
5	DIO3	Digital input/output 3	24 V, 10 mA / 20 mA
6	DIO4	Digital input/output 4	24 V, 10 mA / 20 mA
7	DI5	Digital input 5	24 V, 10 mA
8	DI6	Digital input 6	24 V, 10 mA
9	AI–	Analog input –	11 bit + sign differential input:
10	AI+	Analog input +	± 10 V / Ri = 40 kΩ
11	AO	Analog output	8 bit + sign ± 10 V / 5 mA
12	M AO	Ground analog output	

Connectable cross-section: 0.14 mm² to 1.5 mm² (AWG 16)

Terminal 1 is at the top when installed.

Table 7-7 Control terminal strip

NOTE

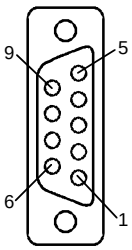
The outputs of the customer terminal can assume undefined states during power up/board initialization/execution time overflow, unless a specific response has been expressly defined (and implemented in the hardware) for these periods.

X103 - Serial interface

It is possible to connect either an OP1S or a PC with RS232 or RS485 serial interface via the 9-pole SUB D socket. There are different connecting cables for the PC for the various transmission protocols.

The 9-pole SUB D socket is internally coupled with the USS bus, thus enabling data exchange with other nodes linked via the USS bus.

This interface is also used for loading software.



Pin	Designation	Meaning	Range
1	RS232 ID	Changeover to RS232 protocol	Low active
2	RS232 RxD	Receive data via RS232	RS232
3	RS485 P	Data via RS485 interface	RS485
4	Boot	Control signal for software update	Low active
5	M5 AUX	Reference potential to P5V	0 V
6	P5V	5 V aux. voltage supply	+5 V, max. 200 mA
7	RS232 TxD	Transmit data via RS232	RS232
8	RS485 N	Data via RS485 interface	RS485
9	M_RS232/485	Digital ground (choked)	

Table 7-8 Serial interface

X533 - Safe stop option

Using the "safe stop" option, it is possible to interrupt the gating signals to the power section by means of a safety relay. This ensures that the unit will definitely not generate a rotating field in the connected motor.

Even if the control electronics generates trigger commands, the power section cannot move the motor.

The "safe stop" function is a "device for the prevention of unexpected starting" in accordance with EN 60204-1, Section 5.4, and meets the requirements of Safety Category 3 to EN 954-1 by virtue of appropriate external protective circuitry.

DANGER

The "safe stop" function does not electrically isolate the motor from the power section, i.e. the motor terminals are still at hazardous voltage when the function is active!

The safe stop option is not suitable for bringing a rotating motor to a quick halt as by de-energizing the trigger signals, the motor is only braked by the connected load.

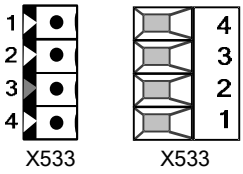
The motor cannot produce a torque when the "safe stop" function is activated. Where external forces are applied to the drive axes or with drives that are not self-arresting (e.g. vertical axes), additional holding devices, e.g. brakes, are required.

A residual risk cannot be precluded in the case of two simultaneous errors in the power section. In this case, the drive can be aligned by a small angle of rotation (asynchronous motors: Max. 1 slot pitch in the remanence range, corresponding to about 5° to 15°).

NOTE

The products described here have been developed to perform safety-related functions as part of a complete system or machine. A complete, safety-related system generally includes sensors, evaluation units, signaling devices and strategies for safe shutdown. The manufacturer of an installation or machine is responsible for providing an appropriate overall safety system. Siemens AG, its regional offices and associated companies (referred to as "Siemens" below) cannot guarantee all the characteristics of a complete installation or machine that has not been designed by Siemens.

Siemens shall not be liable for recommendations that are made or implied as a result of the following description. No new warranty or liability claims over and above those stated in the Siemens general delivery conditions can be inferred from the following description.



The safe stop option comprises the safety relay and the connecting terminals for relay triggering and a checkback contact.

Terminal	Designation	Meaning	Range
1	Contact 1	Checkback "safe stop"	DC 20 V – 30 V
2	Contact 2	Checkback "safe stop"	1 A
3	Control input "safe stop"	Rated resistance of field coil ≥ 823 Ω ± 10 % at 20 °C	DC 20 V – 30 V max. operating frequency: 6/min
4	P24 DC	Supply voltage "safe stop"	DC 24 V / 30 mA

Connectable cross-section: 1.5 mm² (AWG 16)

When installed, terminal 4 is situated at the top front of the unit (see Fig. 7-1 to 7-3).

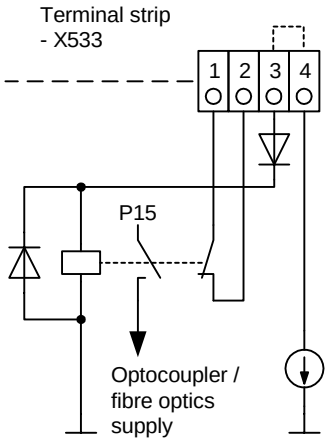
Table 7-9 Terminal assignment for the "safe stop" option

Exception: On units ≥ 22 kW (6SE7024-7TP_0, 6SE7026-0TP_0, 6SE7027-2TP_0) terminal 1 is at the top front when installed (see Fig. 7-1 to 7-3).

The field coil of the safety relay is connected at one end to the grounded electronics frame. When the field coil is supplied via an external 24 V supply, its negative pole must be connected to ground potential. The external 24 V supply must comply with the requirements for PELV circuits to EN 50178 (DIN VDE 0160).

In the shipped state, a jumper is inserted between terminals 3 and 4. The jumper must be removed before the "SAFE STOP" function can be used and an external control for selecting the function connected.

If the safety relay is supplied via the internal supply at X533:4, the external 24 V supply must deliver at least 22 V at terminal X9:1/2 to ensure that the relay picks up reliably (internal voltage drop).



The checkback contacts of the safety relay are capable of at least 100,000 switching cycles at the specified load (30 V DC / 1 A). The mechanical service life is about 10^6 switching cycles. The safety relay is an important component in ensuring reliability and availability of the machine. For this reason, the pcb with the safety relay must be replaced in the case of malfunction. In this case, the unit must be returned for repair or replaced. Function checks must be carried out at regular intervals, which must be defined in compliance with Employer's Liability Insurance Regulation BGV A3 §39, para. 3. Accordingly, function checks must be performed as required by the relevant service conditions, but at least once a year and additionally after initial commissioning and any modification and/or maintenance work.

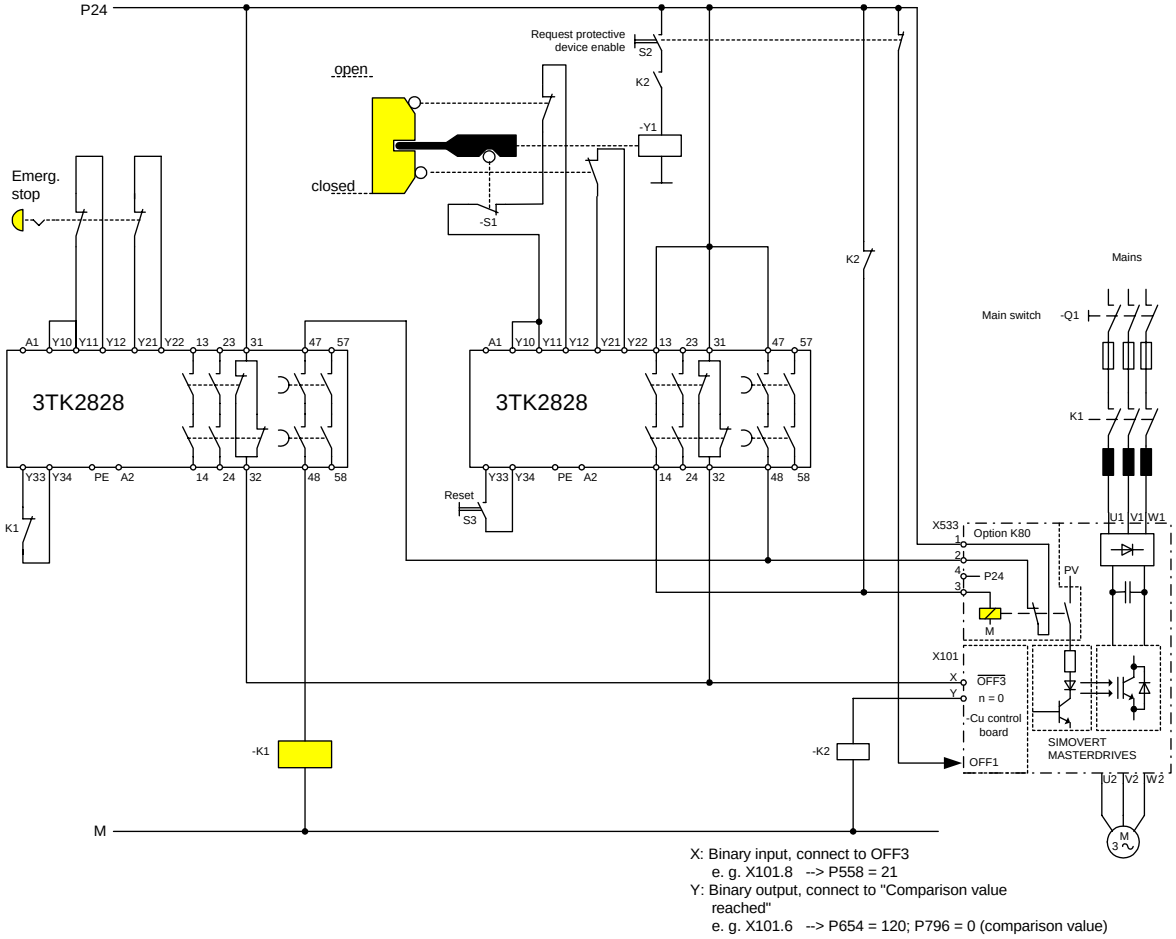


Fig. 7-6 Sample application of "safe stop" function with contactor safety combination for monitoring a moving protective device in Safety Category 3 to EN 954-1

All external cables relevant to the safety function are protected, e.g. installed in cable ducts, to preclude the possibility of short circuits. Cables must be installed in compliance with the requirements of EN 60204-1, Section 14.

In the circuit shown in Fig. 7-6, the tumbler does not release the moving protective device until the drive has stopped. It may be possible to omit the tumbler if the risk assessment of the machine deems this to be safe. In this case, the NC contact of the protective device is connected directly to terminals Y11 and Y12 and electromagnet Y1 is omitted.

Binary input X is negated with signal "OFF3", i.e. at 24 V, the converter decelerates the motor to zero speed along the parameterized deceleration ramp. The converter signals zero speed via binary output Y, thus energizing relay K2.

Once the motor has stopped, the safety relay in the converter is opened and the coil of main contactor K1 remains at 24 V via the checkback contact. If contacts in the safety relay are sticking, the checkback contacts do not close and the safety combination on the right deenergizes main contactor K1 via delayed contacts 47/48 when the set delay period expires.

7.3 Conductor cross-sections

Protective conductor

If the unit is mounted conductively on a grounded mounting surface, the cross section of the protective conductor can be the same as that of the phase conductor.

WARNING

In the case of insulated installation on **units up to 90 mm** wide, a second protective conductor (with the same cross section as the line conductor) must be connected to ground (M4 threaded bolts on the top of the unit next to the mains terminal).

Motor cable

For cross-sections and leads, see catalog Motion Control SIMOVERT MASTERDRIVES MC or IEC 60 204-1: 1997/1998.

7.4 Combinations of units

For simple configuration of multi-axis drives, one or several Compact PLUS DC/AC inverters can be fed from the DC link of the Compact PLUS AC/AC converters.

WARNING

The total drive power of the **inverters** must not exceed the drive power of the **converter**. A simultaneity factor of 0.8 applies here.

For example, a 4 kW inverter and a 1.5 kW inverter can be connected to a converter with a drive power of 5.5 kW by a common DC bus.

The line-side components are rated according to the total power of all converters and inverters. In the case of a multi-axis drive from one 5.5 kW converter, one 4 kW inverter and one 1.5 kW inverter, the line-side components must be rated for an 11 kW converter. If the total power does not exactly equal that of one converter, then the line-side components must be dimensioned according to the next-higher converter power.

NOTICE

If more than two inverters are connected to the DC bus of a converter, an external DC 24 V supply must be provided for these inverters. Only one further inverter can be connected to the 24 V voltage output in the case of a converter with a housing width of 45 mm.

8 Parameterization

It is possible to parameterize the units of the SIMOVERT MASTERDRIVES series by various methods of parameter input. Every unit can be set via the dedicated parameterizing unit (PMU) without the need to use additional components.

Each unit is supplied with the user software DriveMonitor and comprehensive electronic documentation on a DVD. In the case of installation on a standard PC the units can be parameterized via the serial interface of the PC. The software provides extensive parameter aids and a prompted start-up function.

The unit can be further parameterized by entering parameters with the OP1S manual operator panel and via a controller at the field bus level (e.g. Profibus).

NOTE

In firmware V.20 (for performance 2 units) BICO parameters can also be changed in the "Run" drive status (see also parameter list "Changeable in"). In contrast to firmware v1.x in which BICO parameters could only be changed in the "Ready" drive status, structural changes can also be made on performance 2 units with firmware V2.0 during running operation.

WARNING

Unintentional axis movements may occur as a result of undesired changes to BICO parameters in the "Run" drive status.

8.1 Parameter menus

Parameters with related functions are compiled in menus for structuring the parameter set stored in the units. A menu thus represents a selection out of the entire supply of parameters of the unit.

It is possible for one parameter to belong to several menus. The parameter list indicates which individual menus a parameter belongs to. Assignment is effected via the menu number allocated to each menu.

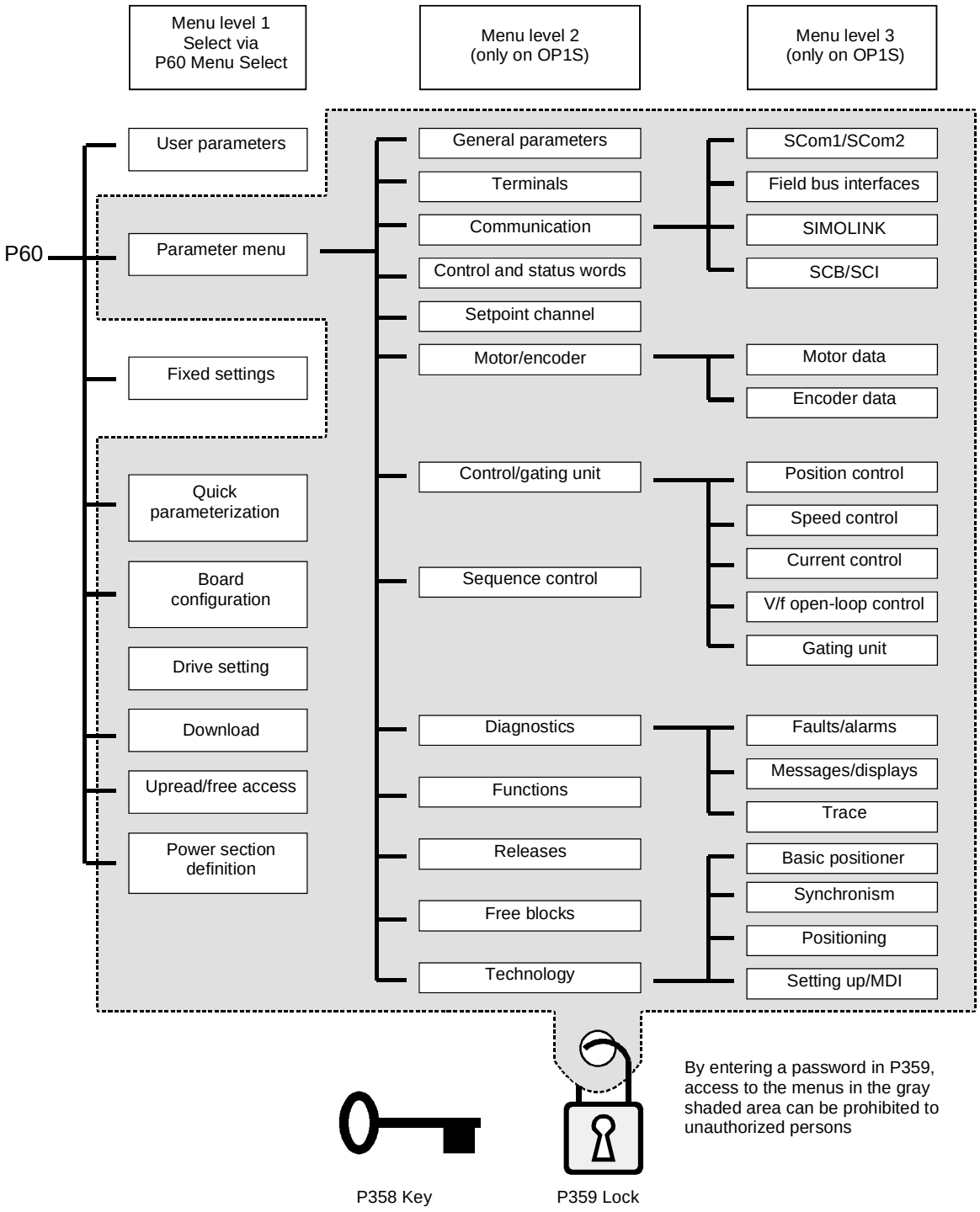


Fig. 8-1 Parameter menus

Menu levels

The parameter menus have several menu levels. The first level contains the main menus. These are effective for all sources of parameter inputs (PMU, OP1S, DriveMonitor, field bus interfaces).

The main menus are selected in parameter P60 Menu Selection.

Examples:
P060 = 0 "User parameters" menu selected
P060 = 1 "Parameter menu" selected
...
P060 = 8 "Power section definition" menu selected

Menu levels 2 and 3 enable the parameter set to be more extensively structured. They are used for parameterizing the units with the OP1S operator control panel.

Main menus

P060	Menu	Description
0	User parameters	• Freely configurable menu
1	Parameter menu	• Contains complete parameter set • More extensive structure of the functions achieved by using an OP1S operator control panel
2	Fixed settings	• Used to perform a parameter reset to a factory or user setting
3	Quick parameterization	• Used for quick parameterization with parameter modules • When selected, the unit switches to status 5 "Drive setting"
4	Board configuration	• Used for configuring the optional boards • When selected, the unit switches to status 4 "Board configuration"
5	Drive setting	• Used for detailed parameterization of important motor, encoder and control data • When selected, the unit switches to status 5 "Drive setting"
6	Download	• Used to download parameters from an OP1S, a PC or an automation unit • When selected, the unit switches to status 21 "Download"
7	Upread/free access	• Contains the complete parameter set and is used for free access to all parameters without being restricted by further menus • Enables all parameters to be upread/upload by an OP1S, PC or automation unit
8	Power section definition	• Used to define the power section (only necessary for units of the Compact and chassis type) • When selected, the unit switches to status 0 "Power section definition"

Table 8-1 Main menus

User parameters

In principle, parameters are firmly assigned to the menus. However, the "User parameters" menu has a special status. Parameters assigned to this menu are not fixed, but can be changed. You are thus able to put together the parameters required for your application in this menu and structure them according to your needs. The user parameters can be selected via P360 (Select UserParam).

Lock and key

In order to prevent undesired parameterization of the units and to protect your know-how stored in the parameterization, it is possible to restrict access to the parameters by defining your own passwords with the parameters:

- P358 key and
- P359 lock.

8.2 Parameter input via the PMU

The PMU parameterizing unit enables parameterization, operator control and visualization of the converters and inverters directly on the unit itself. It is an integral part of the basic units. It has a four-digit seven-segment display and several keys.

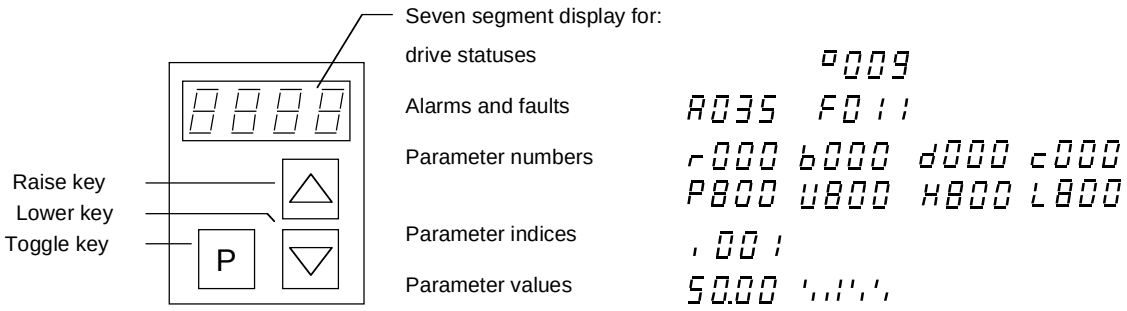


Fig. 8-2 PMU parameterizing unit

Key	Significance	Function
P	Toggle key	• For switching between parameter number, parameter index and parameter value in the sequence indicated (command becomes effective when the key is released). • If fault display is active: Acknowledge the fault
△	Raise key	For increasing the displayed value: • Short press = single-step increase • Long press = rapid increase
▽	Lower key	For lowering the displayed value: • Short press = single-step decrease • Long press = rapid decrease
P + △	Hold toggle key and press raise key	• If parameter number level is active: For jumping back and forth between the last selected parameter number and the operating display (r000) • If fault display is active: For switching over to parameter number level • If parameter value level is active: For shifting the displayed value one digit to the right if parameter value cannot be displayed with 4 figures (left-hand figure flashes if there are any further invisible figures to the left)
P + ▽	Hold toggle key and press lower key	• If parameter number level is active: For jumping directly to the operating display (r000) • If parameter value level is active: For shifting the displayed value one digit to the left if parameter value cannot be displayed with 4 figures (right-hand figure flashes if there are any further invisible figures to the right)

Table 8-2 Operator control elements on the PMU

Toggle key (P key)

As the PMU only has a four-digit seven-segment display, the 3 descriptive elements of a parameter

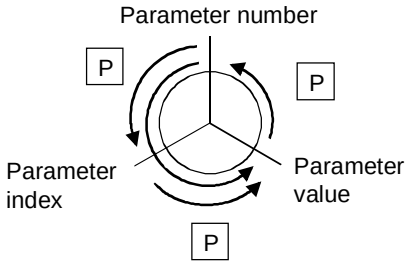
- ♦ Parameter number,
- ♦ Parameter index (if the parameter is indexed) and
- ♦ Parameter value

cannot be displayed at the same time. For this reason, you have to switch between the individual descriptive elements by depressing the toggle key. After the desired level has been selected, adjustment can be made using the raise key or the lower key.

With the toggle key, you can change over:

- from the parameter number to the parameter index
- from the parameter index to the parameter value
- from the parameter value to the parameter number

If the parameter is not indexed, you can jump directly from the parameter number to the parameter value.



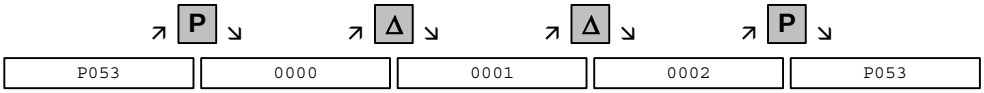
NOTE

If you change the value of a parameter, this change generally becomes effective immediately. It is only in the case of acknowledgement parameters (marked in the parameter list by an asterisk ‘ * ’) that the change does not become effective until you change over from the parameter value to the parameter number.

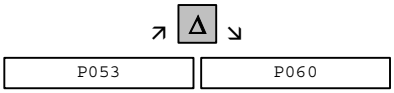
Parameter changes made using the PMU are always safely stored in the EEPROM (protected in case of power failure) once the toggle key has been depressed.

Example The following example shows the individual operator control steps to be carried out on the PMU for a parameter reset to factory setting.

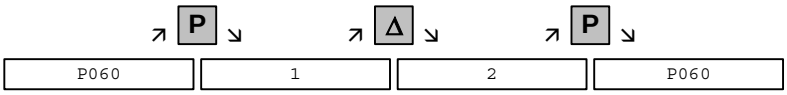
Set P053 to 0002 and grant parameter access via PMU



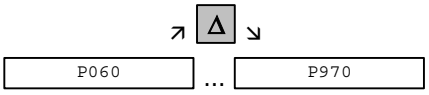
Select P060



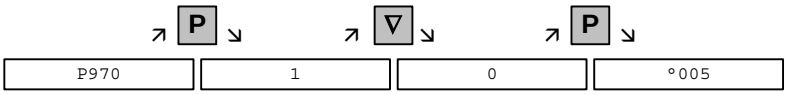
Set P060 to 0002 and select "Fixed settings" menu



Select P970



Set P970 to 0000 and start parameter reset



8.3 Parameter input via the OP1S

The operator control panel (OP1S) is an optional input/output device which can be used for parameterizing and starting up the units. Plain-text displays greatly facilitate parameterization.

The OP1S has a non-volatile memory and can permanently store complete sets of parameters. It can therefore be used for archiving sets of parameters. The parameter sets must be read out (upread) from the units first. Stored parameter sets can also be transferred (downloaded) to other units.

The OP1S and the unit to be operated communicate with each other via a serial interface (RS485) using the USS protocol. During communication, the OP1S assumes the function of the master whereas the connected units function as slaves.

The OP1S can be operated at baud rates of 9.6 kBd and 19.2 kBd, and is capable of communicating with up to 32 slaves (addresses 0 to 31). It can therefore be used both in a point-to-point link (e.g. during initial parameterization) and within a bus configuration.

The plain-text displays can be shown in one of five different languages (German, English, Spanish, French, Italian). The language is chosen by selecting the relevant parameter for the slave in question.

Order numbers

Components	Order Number
OP1S	6SE7090-0XX84-2FK0
Connecting cable 3 m	6SX7010-0AB03
Connecting cable 5 m	6SX7010-0AB05
Adapter for installation in cabinet door incl. 5 m cable	6SX7010-0AA00

NOTE

The parameter settings for the units connected to the OP1S are given in the corresponding documentation of the unit (Compendium).

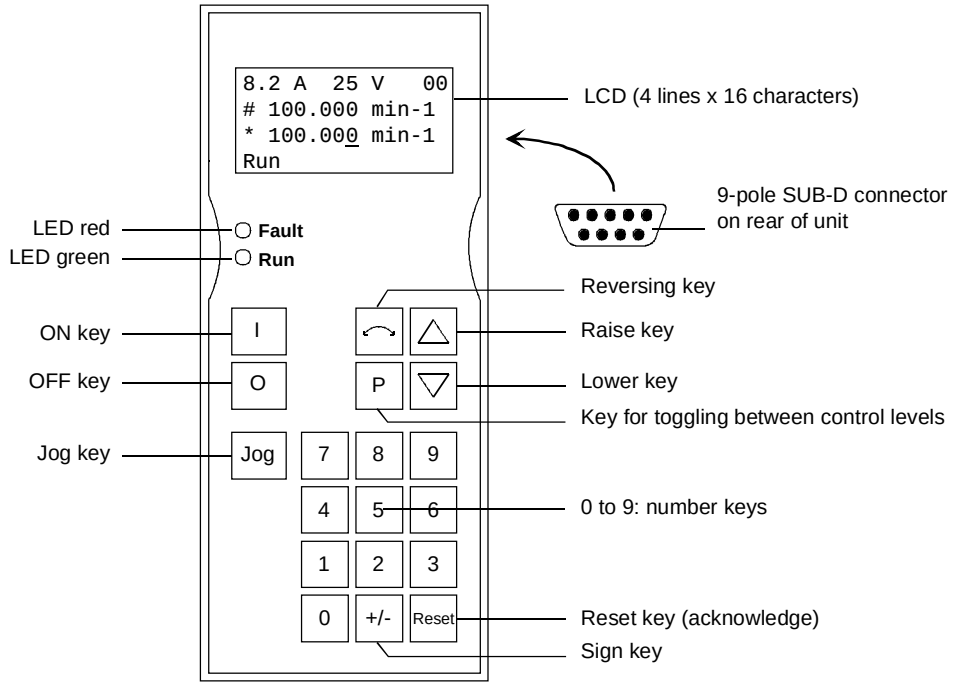


Fig. 8-3 View of the OP1S

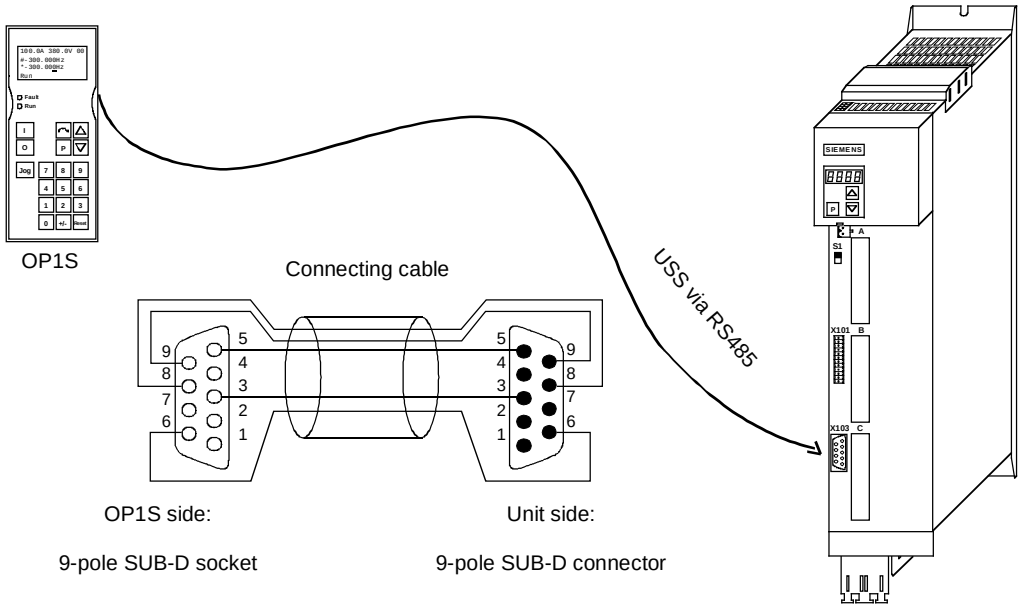


Fig. 8-4 Example: The OP1S in a point-to-point link with the Compact PLUS unit

NOTE

In the as-delivered state or after a reset of the parameters to the factory setting, a point-to-point link can be adopted with the OP1S without any further preparatory measures and parameterization can be commenced.

Key	Significance	Function
I	ON key	• For energizing the drive (enabling motor activation). The function must be enabled by P554.
O	OFF key	• For de-energizing the drive by means of OFF1, OFF2 or OFF3, depending on parameterization. The function must be enabled by P554 to P560.
Jog	Jog key	• For jogging with jogging setpoint 1 (only effective when the unit is in the "ready to start" state). This function must be enabled by P568.
⌒	Reversing key	• For reversing the direction of rotation of the drive. This function must be enabled by P571 and P572.
P	Toggle key	• For selecting menu levels and switching between parameter number, parameter index and parameter value in the sequence indicated. The current level is displayed by the position of the cursor on the LCD display (the command comes into effect when the key is released). • For conducting a numerical input
Reset	Reset key	• For leaving menu levels • If fault display is active, this is for acknowledging the fault. This function must be enabled by P565.
△	Raise key	For increasing the displayed value: • Short press = single-step increase • Long press = rapid increase • If motorized potentiometer is active, this is for raising the setpoint. This function must be enabled by P573.
▽	Lower key	For lowering the displayed value: • Short press = single-step decrease • Long press = rapid decrease • If motorized potentiometer is active, this is for lowering the setpoint. This function must be enabled by P574.
+/-	Sign key	• For changing the sign so that negative values can be entered
9 to 0	Number keys	• Numerical input

Table 8-3 Operator control elements of the OP1S

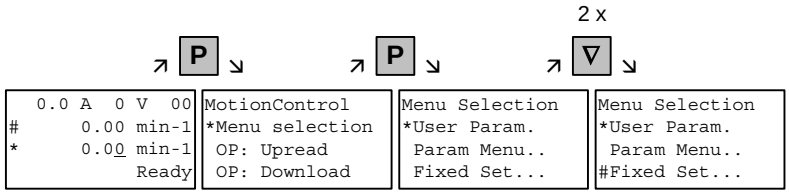
NOTE

If you change the value of a parameter, the change does not become effective until the toggle key (P) is pressed.

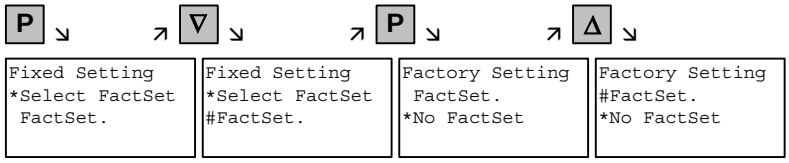
Parameter changes made using the OP1S are always stored safely in the EEPROM (protected in case of power failure) once the toggle key (P) has been pressed.

Some parameters may also be displayed without a parameter number, e.g. during quick parameterization or if "Fixed setting" is selected. In this case, parameterization is carried out via various sub-menus.

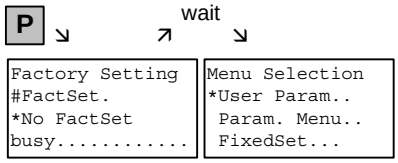
Example of how to proceed for a parameter reset.



Selection of fixed setting



Selection of factory setting



Start of factory setting

NOTE

It is not possible to start the parameter reset in the "Run" status.

8.4 Parameter input with DriveMonitor

NOTE

Please refer to the online help for detailed information on DriveMonitor (button or F1 key).

8.4.1 Installation and connection

8.4.1.1 Installation

A DVD is included with the devices of the MASTERDRIVES Series when they are delivered. The operating tool supplied on the DVD (DriveMonitor) is automatically installed from this DVD. If "automatic notification on change" is activated for the DVD drive on the PC, user guidance starts when you insert the DVD and takes you through installation of DriveMonitor. If this is not the case, start file "Autoplay.exe" in the root directory of the DVD.

8.4.1.2 Connection

There are two ways of connecting a PC to a device of the SIMOVERT MASTERDRIVES Series via the USS interface. The devices of the SIMOVERT MASTERDRIVES Series have both an RS232 and an RS485 interface.

RS232 interface

The serial interface that PCs are equipped with by default functions as an RS232 interface. This interface is not suitable for bus operation and is therefore only intended for operation of a SIMOVERT MASTERDRIVES device.

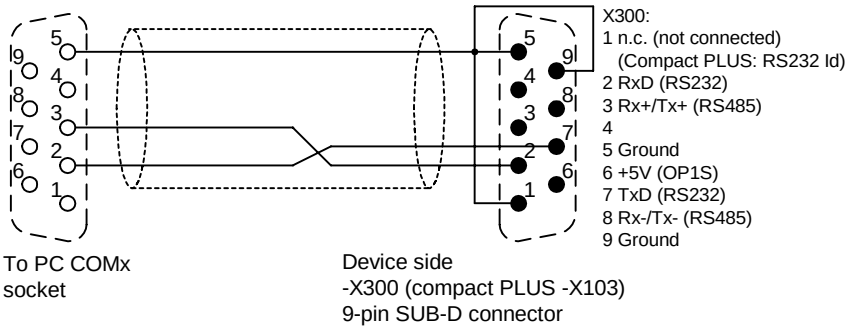


Fig. 8-5 Connecting cable for connecting PC COM(1-4) to SIMOVERT MASTERDRIVES X300

NOTICE

DriveMonitor must not be operated via the Sub-D socket X300 if the SST1 interface parallel to it is already being used for another purpose, e.g. bus operation with SIMATIC as the master.

RS485 interface

The RS485 interface is multi-point capable and therefore suitable for bus operation. You can use it to connect 31 SIMOVERT MASTERDRIVES with a PC. On the PC, either an integrated RS485 interface or an RS232 ↔ RS485 interface converter is necessary. On the device, an RS485 interface is integrated into the -X103 connection. For the cable: see pin assignment -X300 and device documentation of the interface converter.

8.4.2 Establishing the connection between DriveMonitor and the device

8.4.2.1 Setting the USS interface

You can configure the interface with menu *Tools → ONLINE Settings*.

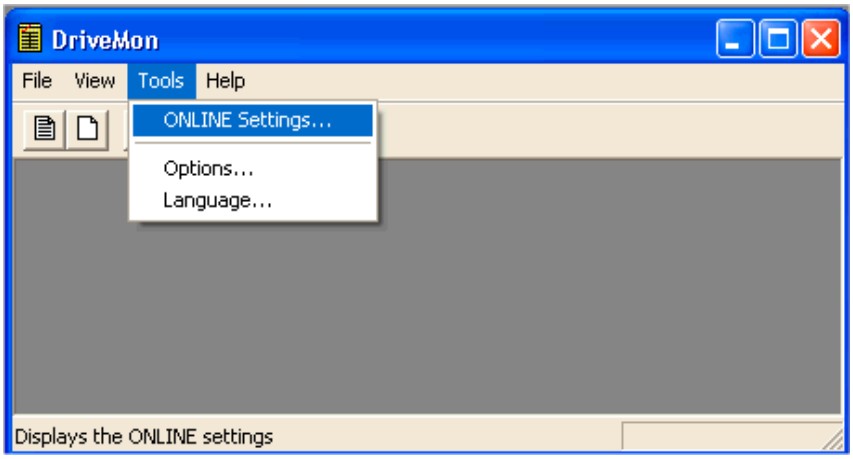


Fig. 8-6 Online settings

The following settings (Fig. 8-7) are possible:

- **Tab card "Bus Type",** options
  USS (operation via serial interface)
  Profibus DP (only if DriveMonitor is operated under Drive ES).
- **Tab card "Interface"**
  You can enter the required COM interface of the PC (COM1 to COM4) and the required baudrate here.

NOTE

Set the baudrate to the baudrate parameterized in SIMOVERT MASTERDRIVES (P701) (factory setting 9600 baud).

Further settings: operating mode of the bus in RS485 operation; setting according to the description of the interface converter RS232/RS485

- **Tab card "Extended"**
  Request retries and Response timeout; here you can increase the values already set if communication errors occur frequently.

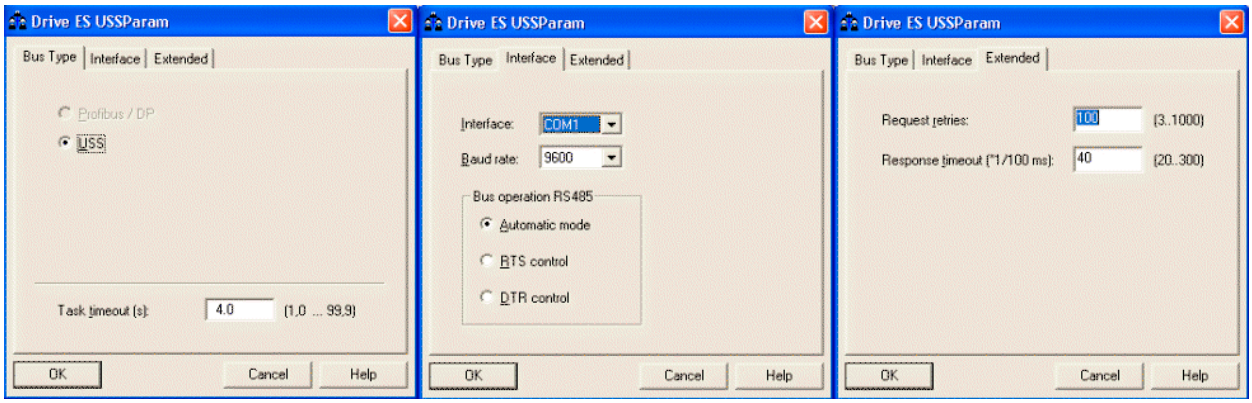


Fig. 8-7 Interface configuration

8.4.2.2 Starting the USS bus scan

DriveMonitor starts with an empty drive window. Via the menu "*Set up an ONLINE connection*..." the USS bus can be scanned for connected devices:

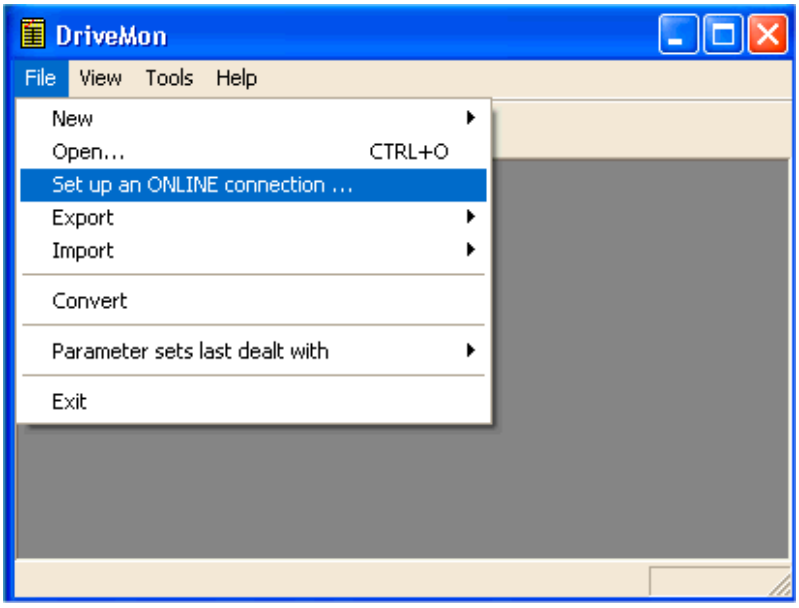


Fig. 8-8 Starting the USS bus scan

NOTE

The "Set up an online connection" menu is only valid from Version 5.2 onwards.

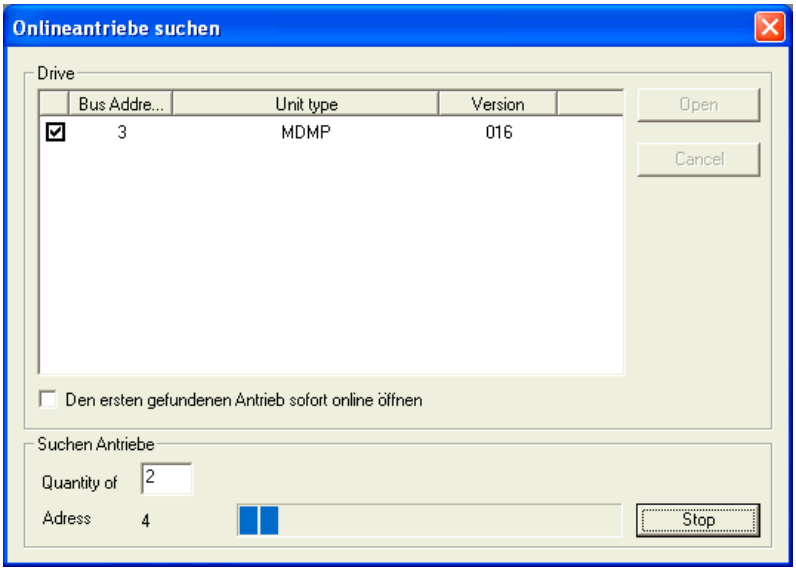


Fig. 8-9 Search for online drives

During the search the USS bus is scanned **with the set baudrate only**. The baud rate can be changed via "*Tools → ONLINE Settings",* see section 8.4.2.1.

8.4.2.3 Creating a parameter set

With menu *File → New →...* you can create a new drive for parameterization (see Fig. 8-10). The system creates a download file (*.dnl), in which the drive characteristic data (type, device version) are stored. You can create the download file on the basis of an empty parameter set or the factory setting.

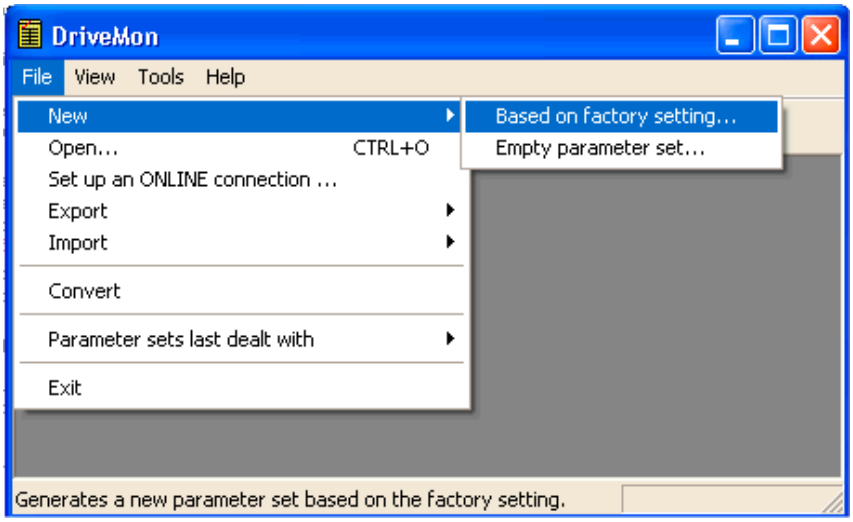


Fig. 8-10 Creating a new drive

Based on factory setting:

- The parameter list is preassigned with the factory setting values

Empty parameter set:

- For compilation of individually used parameters

If the parameters of a parameter set that has already been created have to be changed, this can be done by calling the corresponding download file via the "*File → Open"* menu function. The last four drives can be opened via *"Parameter sets last dealt with"*.

When you create a new drive, the window "Drive Properties" (Fig. 8-11) opens. Here you must enter the following data:

- In dropdown list box "Device type", select the type of device (e.g. MASTERDRIVES MC). You can only select the devices stored.
- In dropdown list box "Device version", you can select the software version of the device. You can generate databases for (new) software versions that are not listed when you start online parameterization.
- You must only specify the bus address of the drive during online operation (switchover with button Online/Offline)

NOTE

The specified bus address must be the same as that of the parameterized SST bus address in SIMOVERT MASTERDRIVES (P700).

No bus address is assigned to the drive with the button "Disconnect network connection".

NOTE

Field "Number of PCD" has no special significance for the parameterization of MASTERDRIVES and should be left at "2".

If the value is changed, it must be/remain ensured that the setting value in the program matches the value in parameter P703 of the drive at all times.

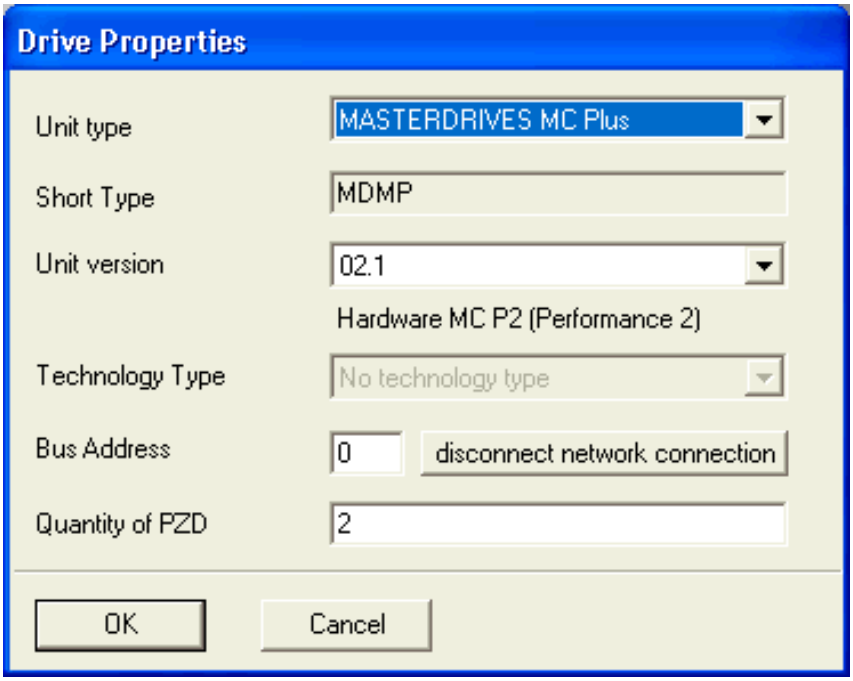


Fig. 8-11 Create file; Drive properties

After confirming the drive properties with *ok* you have to enter the name and storage location of the download file to be created.

8.4.3 Parameterization

8.4.3.1 Structure of the parameter lists, parameterization with DriveMonitor

Parameterization using the parameter list is basically the same as parameterization using PMU (See Chapter 6 "Parameterizating Steps"). The parameter list provides the following advantages:

- Simultaneous visibility of a larger number of parameters
- Text display for parameter names, index number, index text, parameter value, binectors, and connectors
- On a change of parameters: Display of parameter limits or possible parameter values

The parameter list has the following structure:

Field No.	Field Name	Function
1	P. Nr	Here the parameter number is displayed. You can only change the field in menu *Free parameterization*.
2	Name	Display of the parameter name, in accordance with the parameter list
3	Ind	Display of the parameter index for indexed parameters. To see more than index 1, click on the [+] sign. The display is then expanded and all indices of the parameter are displayed
4	Index text	Meaning of the index of the parameter
5	Parameter value	Display of the current parameter value. You can change this by double-clicking on it or selecting and pressing *Enter*.
6	Dim	Physical dimension of the parameter, if there is one

With buttons *Offline, Online (RAM), Online (EEPROM)* (Fig. 8-12 [1]) you can switch modes. When you switch to online mode, device identification is performed. If the configured device and the real device do not match (device type, software version), an alarm appears. If an unknown software version is recognized, the option of creating the database is offered. (This process takes several minutes.)

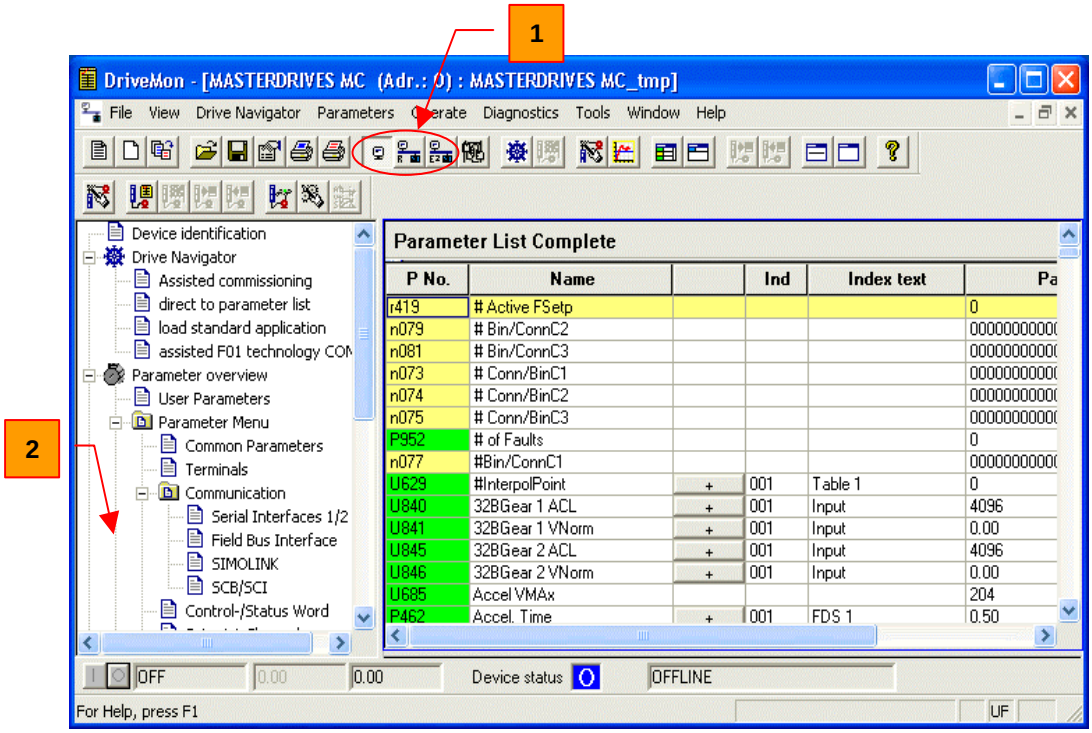


Fig. 8-12 Drive window/parameter list

The DriveMonitor drive window has a directory tree for navigation purposes (Fig. 8-12 [2]). You can deselect this additional operating tool in menu V*iew - Parameter selection*.

The drive window contains all elements required for the parameterization and operation of the connected device. In the lower bar, the status of the connection with the device is displayed:

Connection and device ok

Connection ok, device in fault state

Connection ok, device in alarm state

Device is parameterized offline

No connection with the device can be established (only offline parameterization possible).

NOTE

If no connection with the device can be established because the device does not physically exist or is not connected, you can perform offline parameterization. To do so, you have to change to offline mode. In that way, you can create an individually adapted download file, which you can load into the device later.

Drive Navigator This is used to quickly access important functions of the DriveMonitor. Settings for Drive Navigator under *Tools -> Options* (Fig. 8-14):

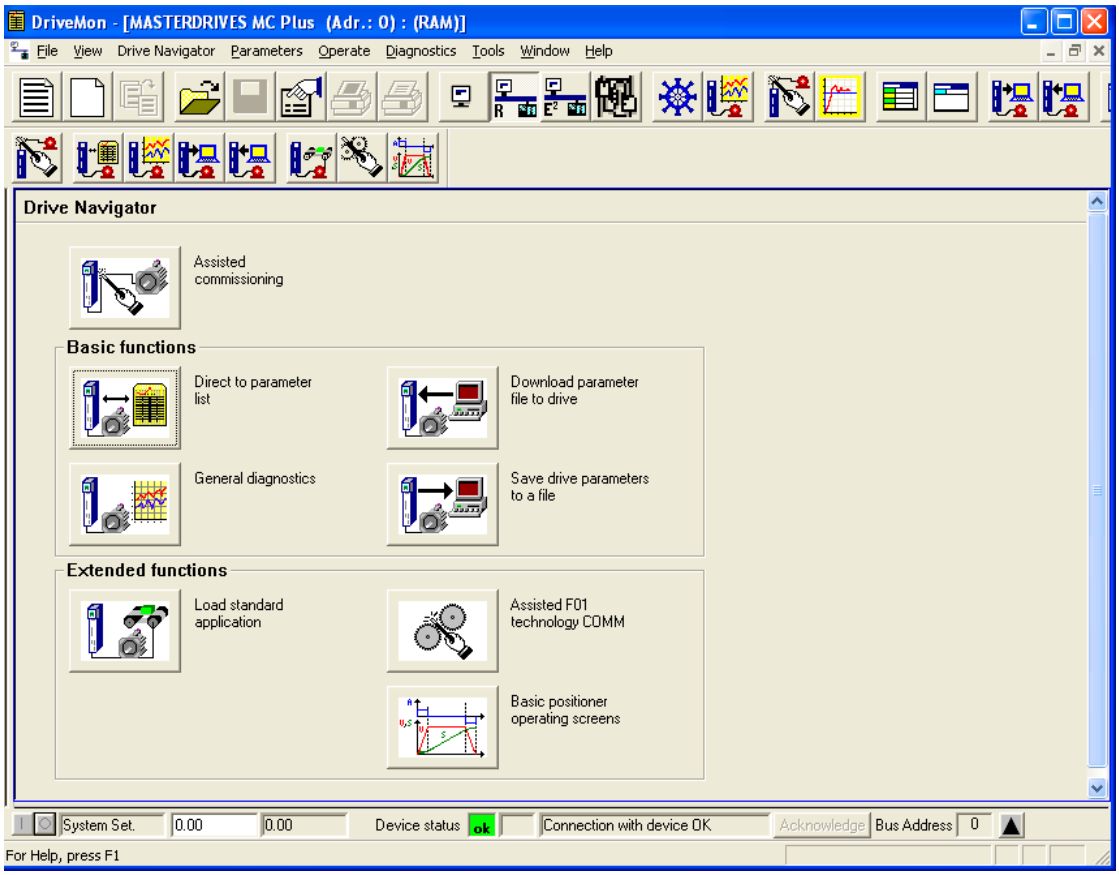


Fig. 8-13 Drive Navigator

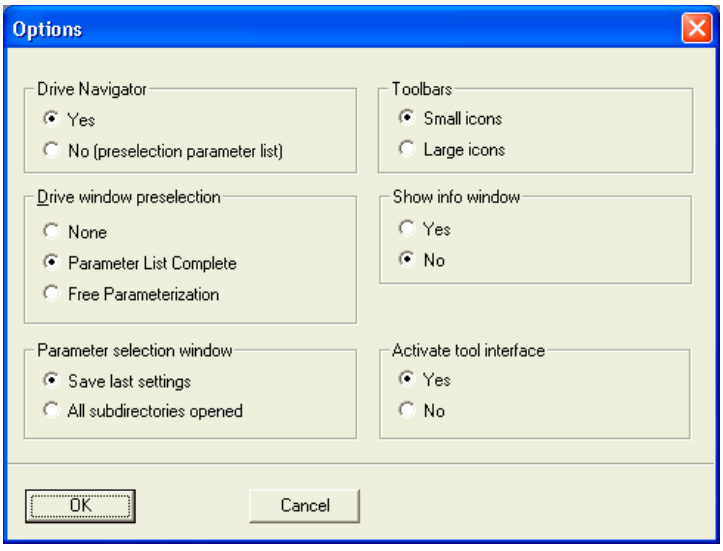
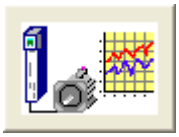


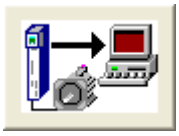
Fig. 8-14 Options menu display

Toolbar of the Drive Navigator

 =  Assisted commissioning

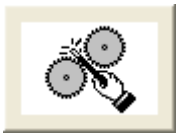
 =  Direct to parameter list

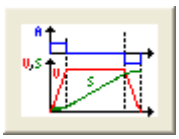
 =  General diagnostics

 =  Save drive parameters to a file

 =  Download parameter file to drive

 =  Load standard application

 =  Assisted F01 technology COMM

 =  Basic positioner operating screens

8.4.3.2 General diagnostics

Via the *Diagnostics → General diagnostics* menu the following window opens. This window gives a general overview of the active warnings and faults and their history. Both the warning and the fault number as well as plain text are displayed.

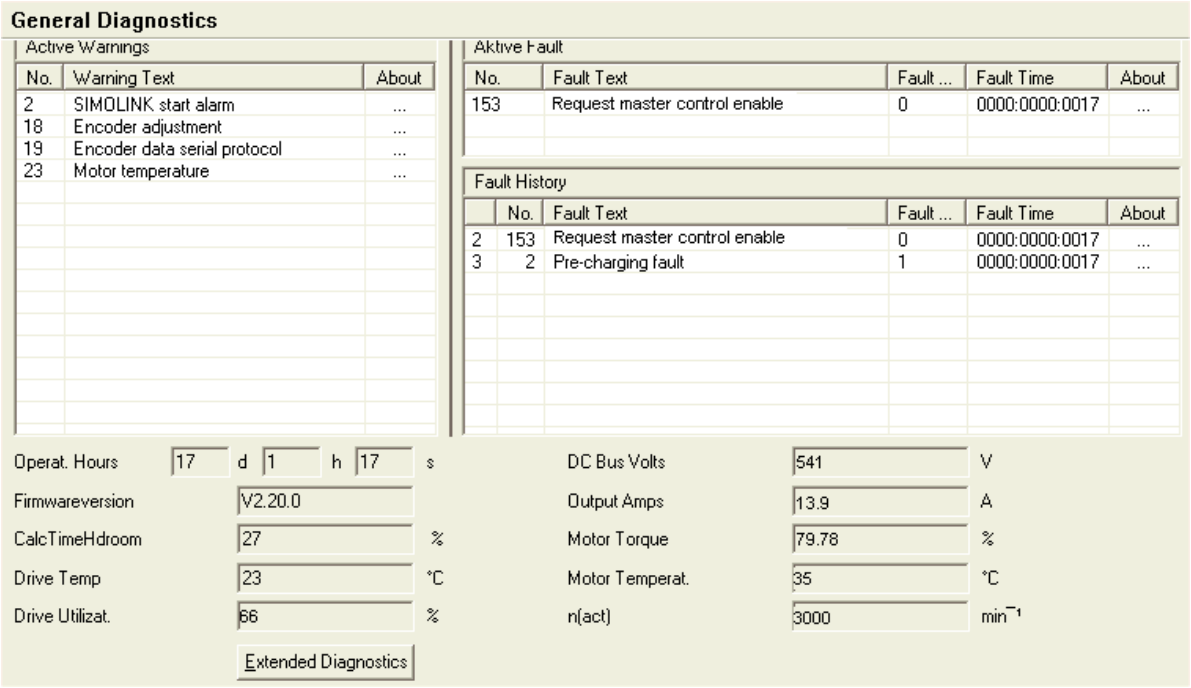


Fig. 8-15 General diagnostics

Via the *Extended Diagnostics* button you can reach the next diagnostics window.

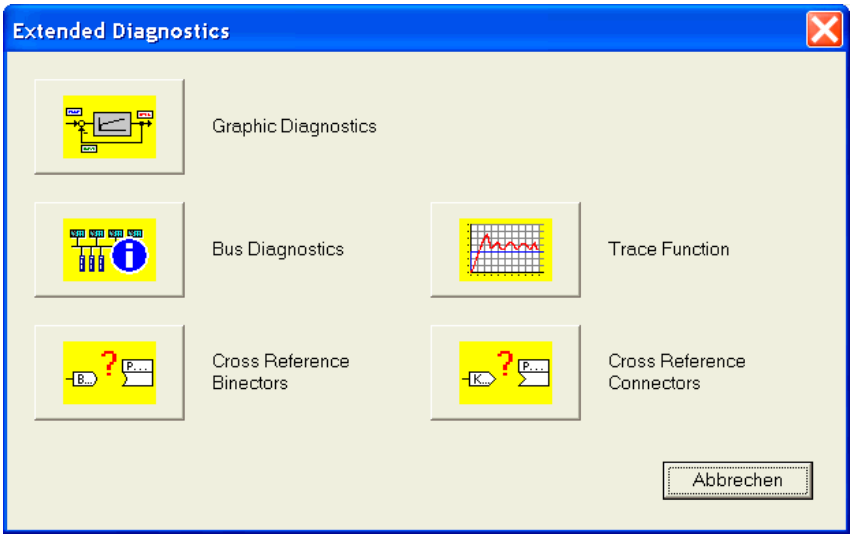
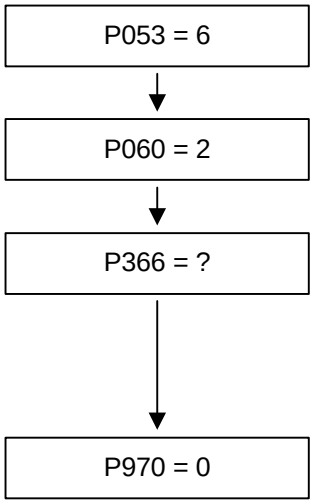


Fig. 8-16 Extended diagnostics

8.5 Parameter reset to factory setting

The factory setting is the defined initial state of all parameters of a unit. The units are delivered with this setting.

You can restore this initial state at any time by resetting the parameters to the factory setting, thus canceling all parameter changes made since the unit was delivered.



Grant parameter access
6: Parameter changes permitted via PMU and serial interface SCom1 (OP1S and PC)

Menu selection "Fixed settings"

Select desired factory setting
0: Standard

Note: This parameter was correctly set prior to despatch of the unit and only needs to be changed in exceptional cases.

Start parameter reset
0: Parameter reset
1: No parameter change

Fig. 8-17 Sequence for parameter reset to factory setting

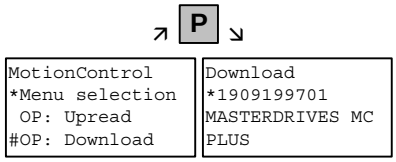
8.6 Parameterizing by download

Downloading with OP1S

The OP1S operator control panel is capable of upreading parameter sets from the units and storing them. These parameter sets can then be transferred to other units by download. Downloading with the OP1S is thus the preferred method of parameterizing replacement units in a service case.

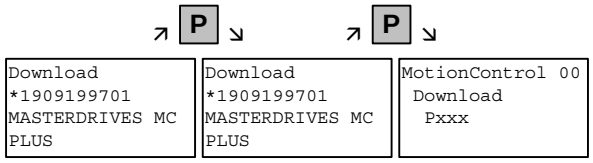
During downloading with the OP1S, it is assumed that the units are in the as-delivered state. The parameters for the power section definition are thus not transferred (see section "Detailed parameterization, power section definition"). If a PIN has been entered to release optional technology functions, this is also not overwritten during downloading.

With the "OP: Download" function, a parameter set stored in the OP1S can be written into the connected slave. Starting from the basic menu, the "OP: Download" function is selected with "Lower" or "Raise" and activated with "P".



Example: Selecting and activating the "Download" function

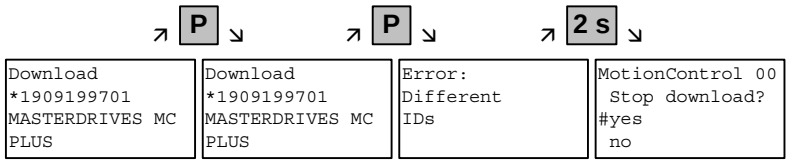
Now one of the parameter sets stored in the OP1S has to be selected using the "Lower" or "Raise" keys (displayed in the second line). The selected ID is confirmed with the "P" key. Now the slave ID can be displayed with "Lower" or "Raise". The slave ID contains various characteristic features of the unit such as rated output, order number, software version, etc.
The "Download" procedure is then started with the "P" key. During download, the OP1S displays the parameter currently being written.



Example: Confirming the ID and starting the "Download" procedure

With "Reset", the procedure can be stopped at any time. If downloading has been fully completed, the message "Download ok" appears and the display returns to the basic menu.

After the data set to be downloaded has been selected, if the identification of the stored data set does not agree with the identification of the connected unit, an error message appears for approximately 2 seconds. The operator is then asked if downloading is to be discontinued.



Yes: Downloading is discontinued.

No: Downloading is carried out.

8.7 Parameterizing with parameter modules

Pre-defined, function-assigned parameter modules are stored in the units. These parameter modules can be combined with each other, thus making it possible to adjust your unit to the desired application by just a few parameter steps. Detailed knowledge of the complete parameter set of the unit is not required.

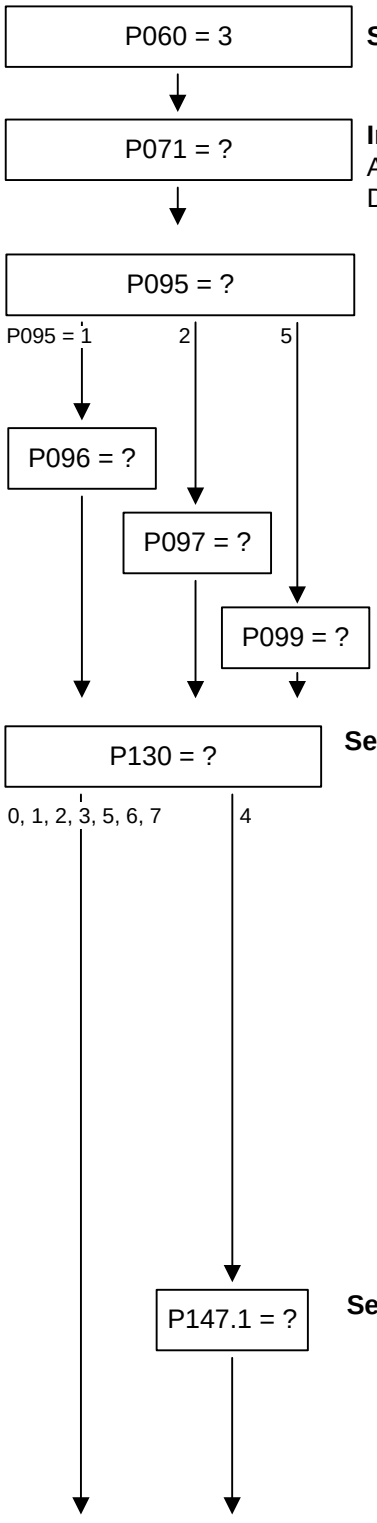
Parameter modules are available for the following function groups:

1. Motors
2. Motor encoders
3. Control types
4. Setpoint and command sources

Parameterization is effected by selecting a parameter module from each function group and then starting quick parameterization. A parameter reset to the factory setting is performed and then, according to your selection, the required device parameters are set to achieve the required control functionality. The parameters necessary for fine adjustment of the control structure are automatically adopted in the user menu.

NOTE

If parameter changes have already been carried out on the unit, it is recommended that you carry out a parameter reset to the factory setting prior to performing "Quick parameterization".



Select "Quick Parameterization" menu

Input of unit line voltage in V
AC Units: RMS value of AC voltage
DC Units: DC link voltage

Input of motor type
0: No motor connected
1: 1FT6/1FK6 synchronous servo-motor
2: 1PH7(=1PA6)/1PL6/1PH4 induction servo-motor
5: Torque motor 1FW3

Input the code number for the connected 1FK6/1FT6 motor (For list see Chapter 8.8)

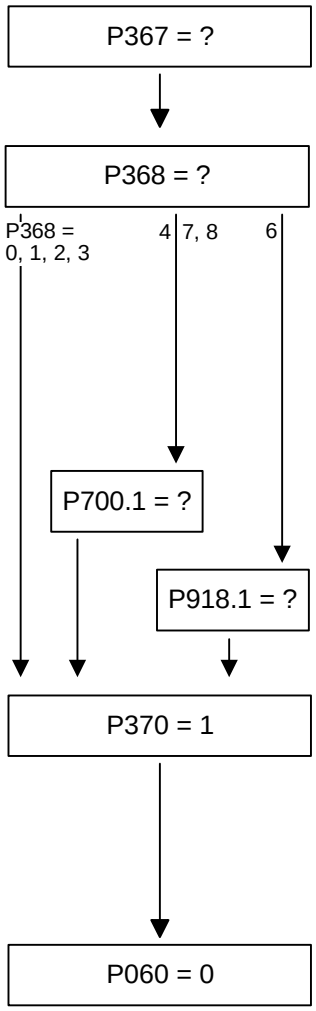
Input the code number for the connected 1PH7(=1PA6), 1PH4, 1PL6 motor (For list see Chapter 8.8)

Input the code number for the connected 1FW3 motor (For list see Chapter 8.8)

Select motor encoder
0: automatic encoder detection
1: 2-pole resolver
2: Resolver with pole pair number of motor
3: Encoder 2048/rev.
4: Multiturn encoder 2048/rev.
5: Pulse encoder 1024/rev.
7: Encoders without C/D track 2048/rev (SW V1.30 and later)

The absolute initial position is not set on encoders without a C/D track. These can only be used on asynchronous machines. The position is corrected via a zero pulse (if connected).
1PA6, 1PL6, 1PH4 and 1PH7 asynchronous motors with encoder:
These motors are normally supplied with an ERN1381 encoder without C/D track.

Selection of a multiturn enocder
1: EQN1325 (2048 lines)
2: ECN1313 (2048 lines)
6: EnDat
7: EQI1325 (32 lines)
8: EQN1125 (Heidenhain) EnDat
9: ECN1113 (Heidenhain) EnDat



Select type of control
0: V/f open-loop control
2: Torque control
3: Speed control

Select setpoint and command source
0: not used
1: Analog input and terminal strip
2: Fixed setpoints and terminal strip
3: MOP and terminal strip
4: USS
5: not used
6: PROFIBUS (CBP2)
7: OP1S and fixed setpoints via SCom1
8: OP1S and MOP via SCom1

Input the USS address

Input the PROFIBUS address

Start of quick parameterization
0: No parameter change
1: Parameter change according to chosen combination of parameter modules

Note:
After start-up an automatic factory setting of P366 = 0 takes place, followed by the associated parameterization.

Return to user menu

Fig. 8-18 Sequence for parameterizing with parameter modules

Function diagram modules

Function diagram modules (function diagrams) are shown after the flow chart for parameter modules stored in the unit software. On the first few pages are the:

- setpoint and command sources, on the following pages are the
- analog outputs and the display parameters and the
- open-loop and closed-loop control types.

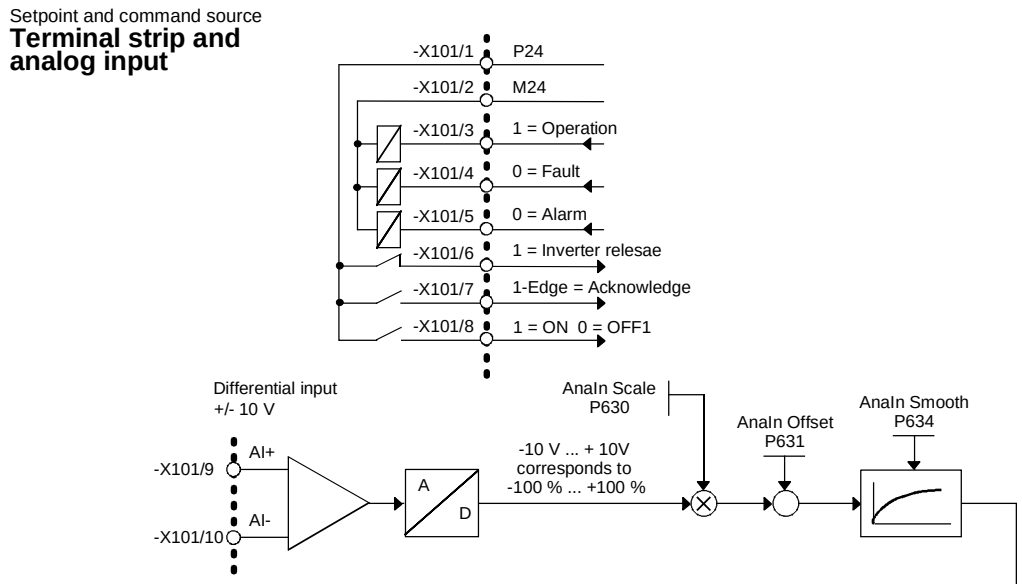
It is therefore possible to put together the function diagrams to exactly suit the selected combination of setpoint/command source and open/closed-loop control type. This will give you an overview of the functionality parameterized in the units and of the necessary assignment of the terminals.

The function parameters and visualization parameters specified in the function diagrams are automatically adopted in the user menu and can be visualized or changed there.

The parameter numbers of the user menu are entered in P360.

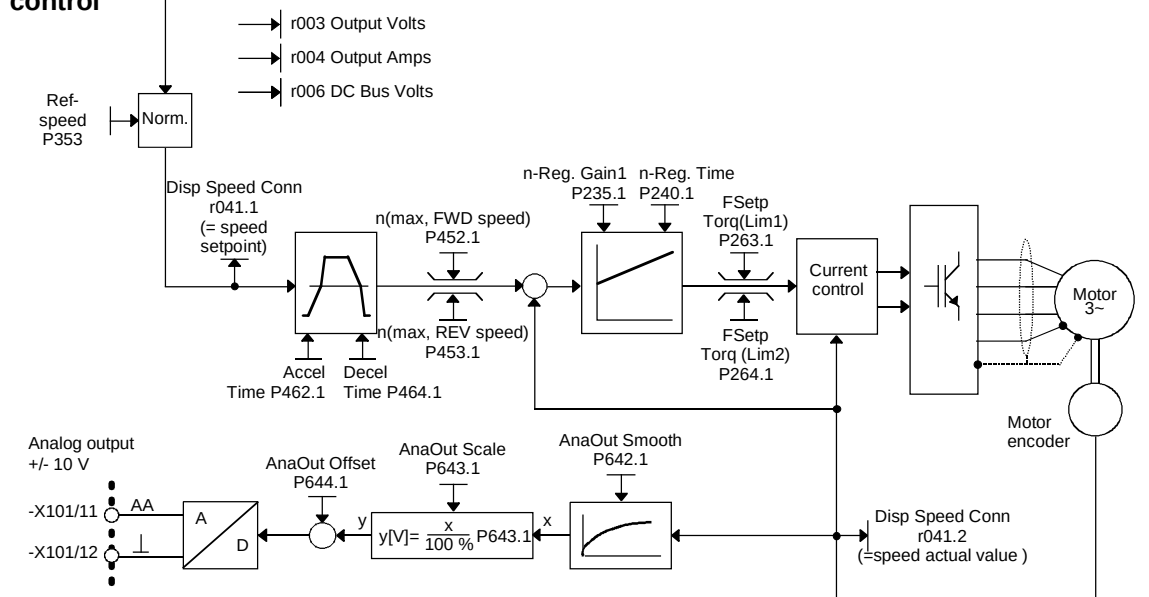
Setpoint and command source

Terminal strip and analog input



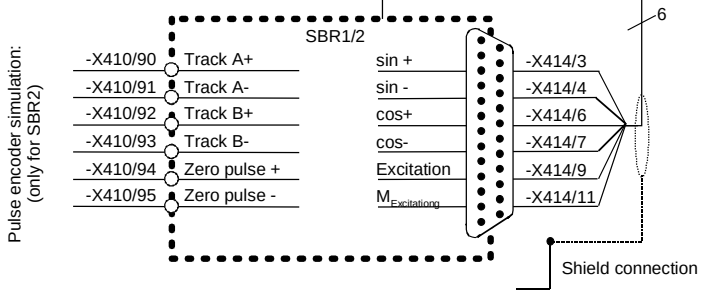
Control type:

Speed control



Type of encoder:

Resolver

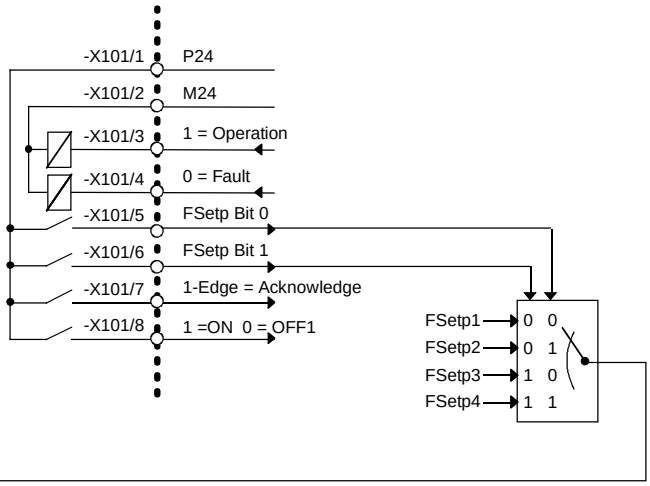


Data of resolver to be connected:
- 2-pole

Data of pulse encoder simulation:
- 1024 pulses/revolution

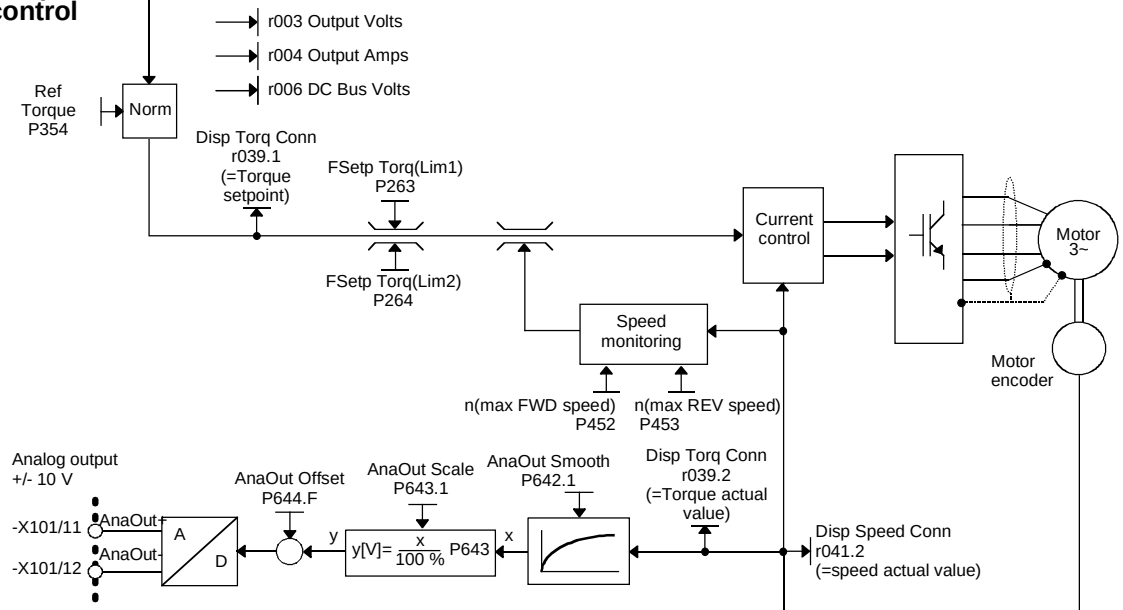
Setpoint and command source:

Terminal strip and fixed setpoints (FSetp)



Control type:

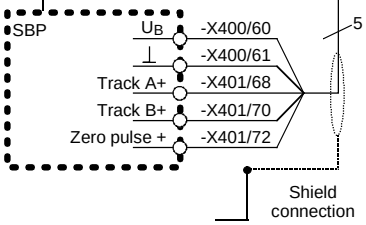
Torque control



Type of encoder:

Pulse encoder

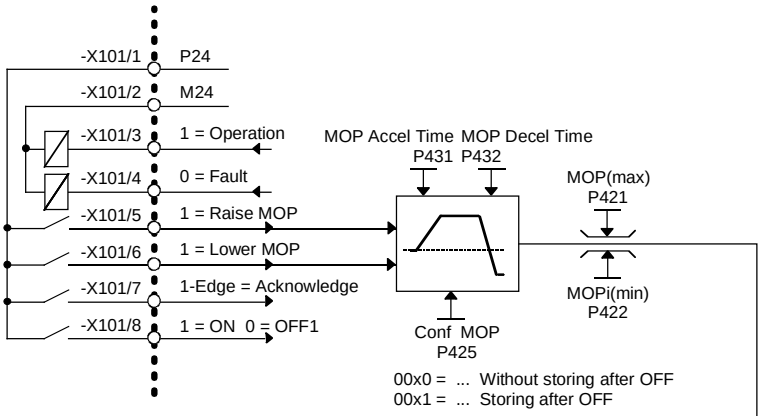
Full information on pulse encoder connection is given in the SBP operating instruction (Order No. 6SE7087-6NX84-2FA0).



Data of pulse encoder to be connected:
- HTL encoder (15 V)
- 1024 Inc.
- without control track

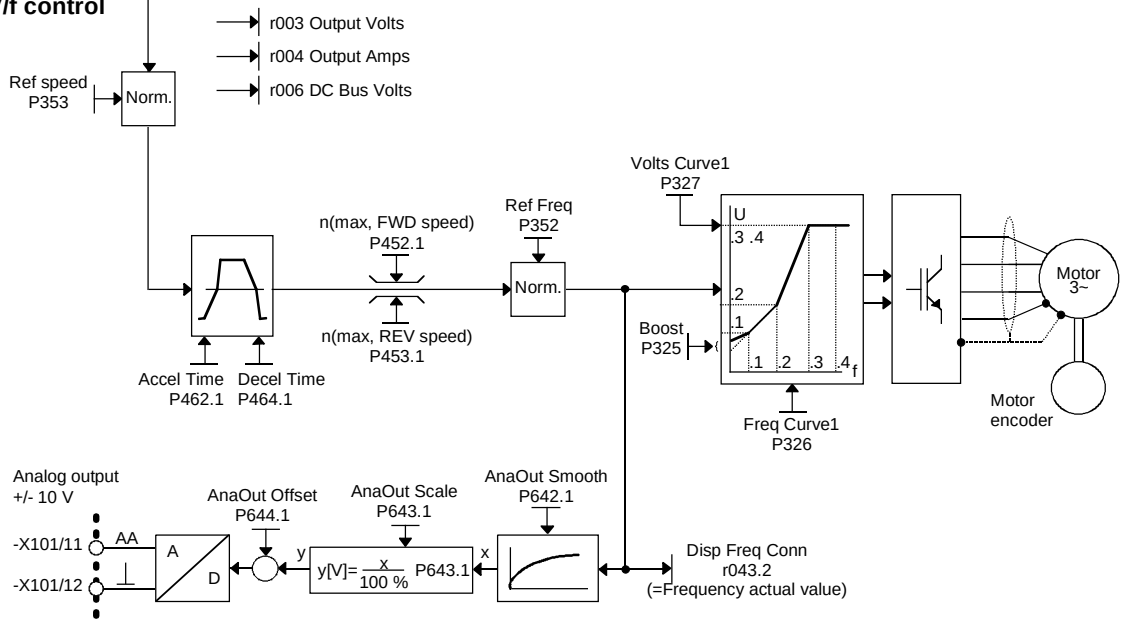
Setpoint and command source

Terminal strip and motorized potentiometer



Type of control

V/f control



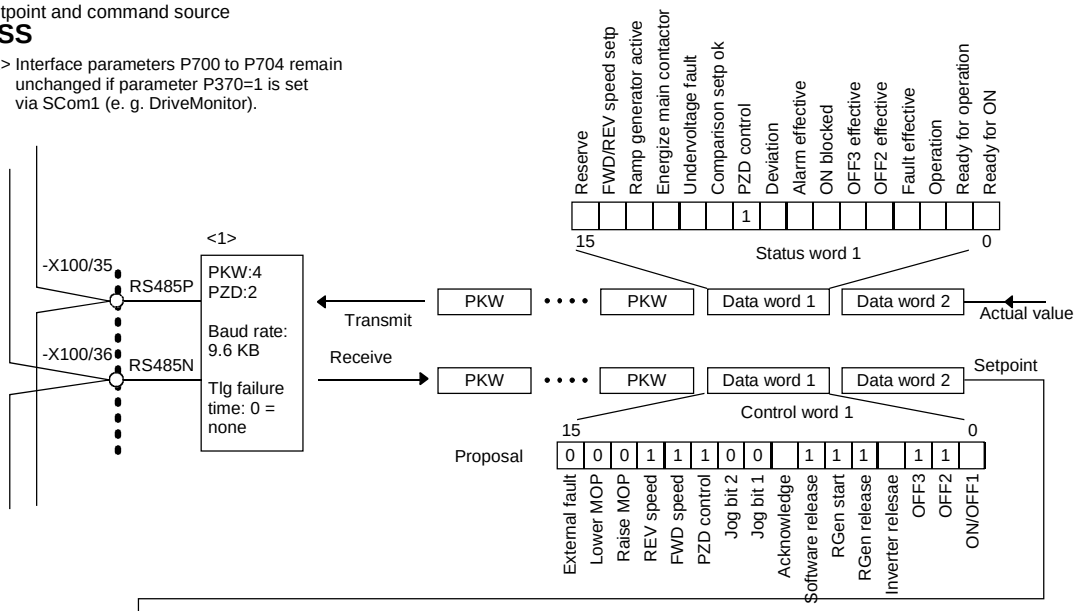
Type of encoder:

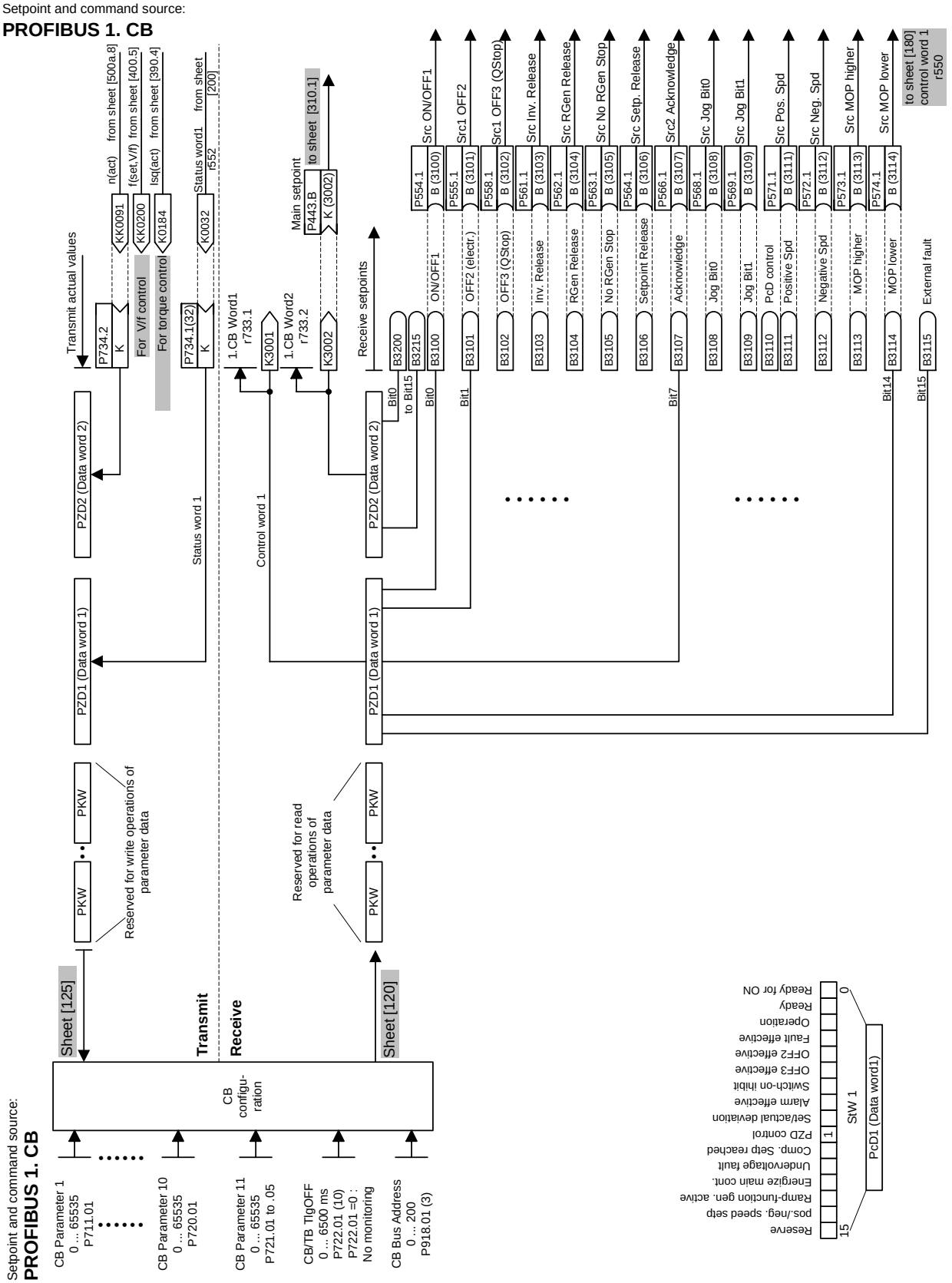
Without encoder

Setpoint and command source

USS

<1> Interface parameters P700 to P704 remain unchanged if parameter P370=1 is set via SCom1 (e. g. DriveMonitor).




Setpoint and command source:
PROFIBUS 1. CB
Transmit actual values
n(act) from sheet [500a.8]
f(set,V/f) from sheet [400.5]
Isq(act) from sheet [390.4]
Status word1 from sheet [200]
r552
P734.2
K
KK0091
KK0200
K0184
K0032
For V/f control
For torque control
P734.1(32)
PZD2 (Data word 2)
PZD1 (Data word 1)
Status word 1
Control word 1
1.CB Word1
r733.1
K3001
1.CB Word2
r733.2
K3002
Main setpoint
P443.B
K (3002)
to sheet [310.1]
Receive setpoints
B3200
B3215
B3100
B3101
B3102
B3103
B3104
B3105
B3106
B3107
B3108
B3109
B3110
B3111
B3112
B3113
B3114
B3115
Bit0
to Bit15
Bit0
Bit1
Bit7
Bit14
Bit15
ON/OFF1
OFF2 (electr.)
OFF3 (QStop)
Inv. Release
RGen Release
No RGen Stop
Setpoint Release
Acknowledge
Jog Bit0
Jog Bit1
PcD control
Positive Spd
Negative Spd
MOP higher
MOP lower
External fault
P554.1
B (3100)
P555.1
B (3101)
P558.1
B (3102)
P561.1
B (3103)
P562.1
B (3104)
P563.1
B (3105)
P564.1
B (3106)
P566.1
B (3107)
P568.1
B (3108)
P569.1
B (3109)
P571.1
B (3111)
P572.1
B (3112)
P573.1
B (3113)
P574.1
B (3114)
Src ON/OFF1
Src1 OFF2
Src1 OFF3 (QStop)
Src Inv. Release
Src RGen Release
Src No RGen Stop
Src Setp. Release
Src2 Acknowledge
Src Jog Bit0
Src Jog Bit1
Src Pos. Spd
Src Neg. Spd
Src MOP higher
Src MOP lower
to sheet [180]
control word 1
r550
Sheet [125]
Sheet [120]
PKW
Reserved for write operations of parameter data
Reserved for read operations of parameter data
Transmit
Receive
CB configu-ration
CB Parameter 1
0 ... 65535
P711.01
CB Parameter 10
0 ... 65535
P720.01
CB Parameter 11
0 ... 65535
P721.01 to .05
CB/TB TIgOFF
0 ... 6500 ms
P722.01 (10)
P722.01 =0 :
No monitoring
CB Bus Address
0 ... 200
P918.01 (3)
Setpoint and command source:
PROFIBUS 1. CB
Reserve
pos./neg. speed setp
Ramp-function gen. active
Energize main cont.
Undervoltage fault
Comp. Setp reached
PZD control
Setactual deviation
Alarm effective
Switch-on inhibit
OFF3 effective
OFF2 effective
Fault effective
Operation
Ready
Ready for ON
15
1
0
StW 1
PcD1 (Data word1)

8.8 Motor lists

Synchronous motors 1FK6 / 1FK7 / 1FT6 / 1FS6

NOTE

1FK7xxx HD (High Dynamic, P096=82-92) are new AC servo motors based on the 1FK6 series. The data of 1FK7xxx HD (High Dynamic) and 1FK6xxx therefore tally.

Input in P096	Motor order number (MPRD)	Speed n_n [rpm]	Torque M_n [Nm]	Current I_n [A]	Number of pole pairs
1	1FK6032-6AK7	6000	0.8	1.5	3
2	1FK6040-6AK7	6000	0.8	1.75	3
3	1FK6042-6AF7	3000	2.6	2.4	3
4	1FK6060-6AF7	3000	4.0	3.1	3
5	1FK6063-6AF7	3000	6.0	4.7	3
6	1FK6080-6AF7	3000	6.8	5.2	3
7	1FK6083-6AF7	3000	10.5	7.7	3
8	1FK6100-8AF7	3000	12.0	8.4	4
9	1FK6101-8AF7	3000	15.5	10.8	4
10	1FK6103-8AF7	3000	16.5	11.8	4
11	1FT6031-4AK7_	6000	0.75	1.2	2
12	1FT6034-1AK7_-3A 1FT6034-4AK7_	6000	1.4	2.1	2
13	1FT6041-4AF7_	3000	2.15	1.7	2
14	1FT6041-4AK7_	6000	1.7	2.4	2
15	1FT6044-1AF7_-3A 1FT6044-4AF7_	3000	4.3	2.9	2
16	1FT6044-4AK7_	6000	3.0	4.1	2
17	1FT6061-6AC7_	2000	3.7	1.9	3
18	1FT6061-1AF7_-3A 1FT6061-6AF7_	3000	3.5	2.6	3
19	1FT6061-6AH7_	4500	2.9	3.4	3
20	1FT6061-6AK7_	6000	2.1	3.1	3
21	1FT6062-6AC7_	2000	5.2	2.6	3
22	1FT6062-1AF7_-3A 1FT6062-6AF7_	3000	4.7	3.4	3
23	1FT6062-1AH7_ 1FT6062-6AH7_	4500	3.6	3.9	3
24	1FT6062-6AK7_	6000	2.1	3.2	3
25	1FT6064-6AC7_	2000	8.0	3.8	3

Input in P096	Motor order number (MPRD)	Speed n_n [rpm]	Torque M_n [Nm]	Current I_n [A]	Number of pole pairs
26	1FT6064-1AF7_-3A 1FT6064-6AF7_	3000	7.0	4.9	3
27	1FT6064-6AH7_ 1FT6064-1AH71	4500	4.8	5.5	3
28	1FT6064-6AK7_	6000	2.1	3.5	3
29	1FT6081-8AC7_	2000	7.5	4.1	4
30	1FT6081-8AF7_	3000	6.9	5.6	4
31	1FT6081-8AH7_	4500	5.8	7.3	4
32	1FT6081-8AK7_	6000	4.6	7.7	4
33	1FT6082-8AC7_	2000	11.4	6.6	4
34	1FT6082-1AF7_-1A 1FT6082-8AF7_	3000	10.3	8.7	4
35	1FT6082-1AH7_ 1FT6082-8AH7_	4500	8.5	11.0	4
36	1FT6082-8AK7_	6000	5.5	9.1	4
37	1FT6084-8AC7_	2000	16.9	8.3	4
38	1FT6084-1AF7_-1A 1FT6084-8AF7_	3000	14.7	11.0	4
39	1FT6084-8AH7_ 1FT6084-1AH71	4500	10.5	12.5	4
40	1FT6084-8AK7_ 1FT6084-1AK71	6000	6.5	9.2	4
41	1FT6084-8SC7_	2000	23.5	12.5	4
42	1FT6084-8SF7_	3000	22.0	17.0	4
43	1FT6084-8SH7_	4500	20.0	24.5	4
44	1FT6084-8SK7_	6000	17.0	25.5	4
45	1FT6086-8AC7_	2000	22.5	10.9	4
46	1FT6086-1AF7_-1A 1FT6086-8AF7_	3000	18.5	13.0	4
47	1FT6086-8AH7_ 1FT6086-1AH71	4500	12.0	12.6	4
48	1FT6086-8SC7_	2000	33.0	17.5	4
49	1FT6086-8SF7_	3000	31.0	24.5	4
50	1FT6086-8SH7_	4500	27.0	31.5	4
51	1FT6086-8SK7_	6000	22.0	29.0	4
52	1FT6102-8AB7_	1500	24.5	8.4	4
53	1FT6102-1AC7_-1A 1FT6102-8AC7_	2000	23.0	11.0	4
54	1FT6102-8AF7_	3000	19.5	13.2	4
55	1FT6102-8AH7_	4500	12.0	12.0	4

Input in P096	Motor order number (MPRD)	Speed n_n [rpm]	Torque M_n [Nm]	Current I_n [A]	Number of pole pairs
56	1FT6105-8AB7_	1500	41.0	14.5	4
57	1FT6105-1AC7_-1A 1FT6105-8AC7_	2000	38.0	17.6	4
58	1FT6105-8AF7_	3000	31.0	22.5	4
59	1FT6105-8SB7_	1500	59.0	21.7	4
60	1FT6105-8SC7_	2000	56.0	28.0	4
61	1FT6105-8SF7_	3000	50.0	35.0	4
62	1FT6108-8AB7_	1500	61.0	20.5	4
63	1FT6108-8AC7_	2000	55.0	24.5	4
64	1FT6108-8SB7_	1500	83.0	31.0	4
65	1FT6108-8SC7_	2000	80.0	40.0	4
66	1FT6132-6AB7_	1500	62.0	19.0	3
67	1FT6132-6AC7_	2000	55.0	23.0	3
68	1FT6132-6AF7_	3000	36.0	23.0	3
69	1FT6132-6SB7_	1500	102.0	36.0	3
70	1FT6132-6SC7_	2000	98.0	46.0	3
71	1FT6132-6SF7_	3000	90.0	62.0	3
72	1FT6134-6AB7_	1500	75.0	24.0	3
73	1FT6134-6AC7_	2000	65.0	27.0	3
74	1FT6134-6SB7_	1500	130.0	45.0	3
75	1FT6134-6SC7_	2000	125.0	57.0	3
76	1FT6134-6SF7_	3000	110.0	72.0	3
77	1FT6136-6AB7_	1500	88.0	27.0	3
78	1FT6136-6AC7_	2000	74.0	30.0	3
79	1FT6136-6SB7_	1500	160.0	55.0	3
80	1FT6136-6SC7_	2000	150.0	72.0	3
81	1FT6108-8SF7_	3000	70.0	53.0	4
High Dynamic					
82	1FK6033-7AK71 1FK7033-7AK71	6000	0.9	1.5	3
83	1FK6043-7AK71 1FK7043-7AK71	6000	2.0	4.4	3
84	1FK6043-7AH71 1FK7043-7AH71	4500	2.6	4.0	3
85	1FK6044-7AF71 1FK7044-7AF71	3000	3.5	4.0	3
86	1FK6044-7AH71 1FK7044-7AH71	4500	3.0	4.9	3

Input in P096	Motor order number (MPRD)	Speed n_n [rpm]	Torque M_n [Nm]	Current I_n [A]	Number of pole pairs
87	1FK6061-7AF71 1FK7061-7AF71	3000	5.4	5.3	3
88	1FK6061-7AH71 1FK7061-7AH71	4500	4.3	5.9	3
89	1FK6064-7AF71 1FK7064-7AF71	3000	8.0	7.5	3
90	1FK6064-7AH71 1FK7064-7AH71	4500	5.0	7.0	3
91	1FK6082-7AF71 1FK7082-7AF71	3000	8.0	6.7	4
92	1FK6085-7AF71 1FK7085-7AF71	3000	6.5	7.0	4
Water cooling					
100	1FT6132-6WB7	1500	150.0	58.0	3
101	1FT6132-6WD7	2500	135.0	82.0	3
102	1FT6134-6WB7	1500	185.0	67.0	3
103	1FT6134-6WD7	2500	185.0	115.0	3
104	1FT6136-6WB7	1500	230.0	90.0	3
105	1FT6136-6WD7	2500	220.0	149.0	3
106	1FT6138-6WB7	1500	290.0	112.0	3
107	1FT6138-6WD7	2500	275.0	162.0	3
108	1FT6163-8WB7	1500	450.0	160.0	4
109	1FT6163-8WD7	2500	450.0	240.0	4
110	1FT6168-8WB7	1500	690.0	221.0	4
111	1FT6168-8WC7	2000	550.0	250.0	4
112 to 119	for future applications				
120	1FT6062-6WF7	3000	10.1	7.5	3
121	1FT6062-6WH7	4500	10.0	11.0	3
122	1FT6062-6WK7	6000	9.8	15.2	3
123	1FT6064-6WF7	3000	16.1	11.4	3
124	1FT6064-6WH7	4500	16.0	18.5	3
125	1FT6064-6WK7	6000	15.8	27.0	3
126	1FT6082-8WC7	2000	22.1	13.6	4
127	1FT6082-8WF7	3000	21.6	19.1	4
128	1FT6082-8WH7	4500	20.8	28.4	4
129	1FT6082-8WK7	6000	20.0	32.6	4
130	1FT6084-8WF7	3000	35.0	27.0	4
131	1FT6084-8WH7	4500	35.0	39.0	4
132	1FT6084-8WK7	6000	34.0	51.0	4

Input in P096	Motor order number (MPRD)	Speed n_n [rpm]	Torque M_n [Nm]	Current I_n [A]	Number of pole pairs
133	1FT6086-8WF7	3000	46.0	37.0	4
134	1FT6086-8WH7	4500	45.0	53.0	4
135	1FT6086-8WK7	6000	44.0	58.0	4
136	1FT6105-8WC7	2000	82.0	60.0	4
137	1FT6105-8WF7	3000	78.0	82.0	4
138	1FT6108-8WB7	1500	116.0	43.0	4
139	1FT6108-8WC7	2000	115.0	57.0	4
140	1FT6108-8WF7	3000	109.0	81.0	4
141 to 149	for future applications				
Other types					
150	1FT6108-8AF7	3000	37.0	25.0	4
151	1FT6105-8SH7	4500	40.0	41.0	4
152	1FT6136-6SF7	3000	145.0	104.0	3
153	1FT6021-6AK7	6000	0.3	1.1	3
154	1FT6024-6AK7	6000	0.5	0.9	3
155	1FT6163-8SB7	1500	385.0	136.0	4
156	1FT6163-8SD7	2500	340.0	185.0	4
157	1FT6168-8SB7	1500	540.0	174.0	4
158 to 159	for future applications				
Compact					
160	1FK7022-5AK71	6000	0.6	1.4	3
161	1FK7032-5AK71	6000	0.75	1.4	3
162	1FK7040-5AK71	6000	1.1	1.7	4
163	1FK7042-5AF71	3000	2.6	1.9	4
164	1FK7042-5AK71	6000	1.5	2.4	4
165	1FK7060-5AF71	3000	4.7	3.7	4
166	1FK7060-5AH71	4500	3.7	4.1	4
167	1FK7063-5AF71	3000	7.3	5.6	4
168	1FK7063-5AH71	4500	3.0	3.8	4
169	1FK7080-5AF71	3000	6.2	4.4	4
170	1FK7080-5AH71	4500	4.5	4.7	4
171	1FK7083-5AF71	3000	10.5	7.4	4
172	1FK7083-5AH71	4500	3.0	3.6	4
173	1FK7100-5AF71	3000	12.0	8.0	4
174	1FK7101-5AF71	3000	15.5	10.5	4
175	1FK7103-5AF71	3000	14.0	12.0	4
176	1FK7042-5AH71	4500	2.2	2.2	4

Input in P096	Motor order number (MPRD)	Speed n_n [rpm]	Torque M_n [Nm]	Current I_n [A]	Number of pole pairs
177	1FK7105-5AC7	2000	37.0	16.0	4
178	1FK7105-5AF7	3000	26.0	18.0	4
179 to 199	for future applications				
Explosion-proof					
200	1FS6074-6AC71	2000	7.2	3.4	3
201	1FS6074-6AF71	3000	6.3	4.4	3
202	1FS6074-6AH71	4500	4.5	5.0	3
203	1FS6074-6AK71	6000	1.9	3.2	3
204	1FS6096-8AC71	2000	20.0	9.8	4
205	1FS6096-6AF71	3000	17.0	12.0	4
206	1FS6096-8AH71	4500	11.0	11.5	4
207	1FS6115-8AB73	1500	37.0	13.0	4
208	1FS6115-8AC73	2000	34.0	16.0	4
209	1FS6115-8AF73	3000	28.0	20.0	4
210	1FS6134-6AB73	1500	68.0	22.0	3
211	1FS6134-6AC73	2000	59.0	24.0	3
212	1FS6134-6AF73	3000	34.0	22.0	3
213 to 253	for future applications				

Table 8-4 Motor list 1FK6 / 1FK7 / 1FT6 / 1FS6

Torque motors 1FW3

Input in P099	Motor order number (MPRD)	Speed n_n [rpm]	Torque M_n [Nm]	Current I_n [A]	Number of pole pairs
1	1FW3201-1.H	300	300	22	14
2	1FW3202-1.H	300	500	37	14
3	1FW3203-1.H	300	750	59	14
4	1FW3204-1.H	300	1000	74	14
5	1FW3206-1.H	300	1500	117	14
6	1FW3208-1.H	300	2000	152	14
7	1FW3AH150 gen.	General template for customer-specific 1FW3			7
8	1FW3AH200 gen.	General template for customer-specific 1FW3			14
9	1FW3AH280 gen.	General template for customer-specific 1FW3			17
10	1FW3281-1.G	250	2400	153	17

Input in P099	Motor order number (MPRD)	Speed n_n [rpm]	Torque M_n [Nm]	Current I_n [A]	Number of pole pairs
11	1FW3283-1.G	250	3400	222	17
12	1FW3285-1.G	250	4800	306	17
13	1FW3288-1.G	250	6700	435	17
14	1FW3281-1.E	150	2500	108	17
15	1FW3283-1.E	150	3500	150	17
16	1FW3285-1.E	150	5000	207	17
17	1FW3288-1.E	150	7000	292	17
18 to 30	for future applications				
31	1FW3150-1.H	300	100	7	7
32	1FW3150-1.L	500	100	11	7
33	1FW3150-1.P	800	100	17	7
34	1FW3152-1.H	300	200	14	7
35	1FW3152-1.L	500	200	22	7
36	1FW3152-1.P	800	200	32	7
37	1FW3154-1.H	300	300	20	7
38	1FW3154-1.L	500	300	32	7
39	1FW3154-1.P	800	300	47	7
40	1FW3155-1.H	300	400	28	7
41	1FW3155-1.L	500	400	43	7
42	1FW3155-1.P	800	400	64	7
43	1FW3156-1.H	300	500	34	7
44	1FW3156-1.L	500	500	53	7
45	1FW3156-1.P	800	500	76	7
46 to 60	for future applications				
61	1FW3201-1.E	150	300	12	14
62	1FW3201-1.L	500	300	37	14
63	1FW3202-1.E	150	500	21	14
64	1FW3202-1.L	500	500	59	14
65	1FW3203-1.E	150	750	30	14
66	1FW3203-1.L	500	750	92	14
67	1FW3204-1.E	150	1000	40	14
68	1FW3204-1.L	500	1000	118	14
69	1FW3206-1.E	150	1500	65	14
70	1FW3206-1.L	500	1400	169	14
71	1FW3208-1.E	150	2000	84	14
72	1FW3208-1.L	500	1850	226	14
73 to 253	for future applications				

Table 8-5 Motor list 1FW3

Asynchronous motors 1PH7 / 1PL6 / 1PH4

For 1PH7, 1PH4, and 1PL6 motors, the up-to-date calculation data have been stored in the unit. These might differ from the rating plate slightly. Always use the data stored. The magnetization current is determined by automatic parameterization.

NOTE

1PH7xxx is the new designation of what were formerly 1PA6xxx motors. The 1PH7xxx and 1PA6xxx data therefore tally.

Input in P097	Motor order number (MPRD)	Rated speed n_n [rpm]	Pole pair number Z_p	Current I_n [A]	Voltage U_n [V]	Torque M_n [Nm]	Frequency f_n [Hz]
1	1PH7101-2_F	1750	2	9.7	398	23.5	60.0
2	1PH7103-2_D	1150	2	9.7	391	35.7	40.6
3	1PH7103-2_F	1750	2	12.8	398	34.1	61.0
4	1PH7103-2_G	2300	2	16.3	388	31.1	78.8
5	1PH7105-2_F	1750	2	17.2	398	43.7	60.0
6	1PH7107-2_D	1150	2	17.1	360	59.8	40.3
7	1PH7107-2_F	1750	2	21.7	381	54.6	60.3
8	1PH7131-2_F	1750	2	23.7	398	70.9	59.7
9	1PH7133-2_D	1150	2	27.5	381	112.1	39.7
10	1PH7133-2_F	1750	2	33.1	398	95.5	59.7
11	1PH7133-2_G	2300	2	42.4	398	93.4	78.0
12	1PH7135-2_F	1750	2	40.1	398	117.3	59.5
13	1PH7137-2_D	1150	2	40.6	367	161.9	39.6
14	1PH7137-2_F	1750	2	53.1	357	136.4	59.5
15	1PH7137-2_G	2300	2	54.1	398	120.4	77.8
16	1PH7163-2_B	400	2	28.2	274	226.8	14.3
17	1PH7163-2_D	1150	2	52.2	364	207.6	39.2
18	1PH7163-2_F	1750	2	69.1	364	185.5	59.2
19	1PH7163-2_G	2300	2	77.9	374	157.8	77.4
20	1PH7167-2_B	400	2	35.6	294	310.4	14.3
21	1PH7167-2_D	1150	2	66.4	357	257.4	39.1
22	1PH7167-2_F	1750	2	75.3	398	223.7	59.2
23	1PH7184-2_B	400	2	51.0	271	390	14.2
24	1PH7184-2_D	1150	2	89.0	383	366	39.2
25	1PH7184-2_F	1750	2	120.0	388	327	59.0
26	1PH7184-2_L	2900	2	158.0	395	265	97.4
27	1PH7186-2_B	400	2	67.0	268	505	14.0
28	1PH7186-2_D	1150	2	116.0	390	482	39.1
29	1PH7186-2_F	1750	2	169.0	385	465	59.0

Input in P097	Motor order number (MPRD)	Rated speed n_n [rpm]	Pole pair number Z_p	Current I_n [A]	Voltage U_n [V]	Torque M_n [Nm]	Frequency f_n [Hz]
30	1PH7186-2_L	2900	2	206.0	385	333	97.3
31	1PH7224-2_B	400	2	88.0	268	725	14.0
32	1PH7224-2_D	1150	2	160.0	385	670	38.9
33	1PH7224-2_U	1750	2	203.0	395	600	58.9
34	1PH7224-2_L	2900	2	274.0	395	490	97.3
35	1PH7226-2_B	400	2	114.0	264	935	14.0
36	1PH7226-2_D	1150	2	197.0	390	870	38.9
37	1PH7226-2_F	1750	2	254.0	395	737	58.9
38	1PH7226-2_L	2900	2	348.0	390	610	97.2
39	1PH7228-2_B	400	2	136.0	272	1145	13.9
40	1PH7228-2_D	1150	2	238.0	390	1070	38.9
41	1PH7228-2_F	1750	2	342.0	395	975	58.8
42	1PH7228-2_L	2900	2	402.0	395	708	97.2
43	1PL6184-4_B	400	2	69.0	300	585	14.4
44	1PL6184-4_D	1150	2	121.0	400	540	39.4
45	1PL6184-4_F	1750	2	166.0	400	486	59.3
46	1PL6184-4_L	2900	2	209.0	400	372	97.6
47	1PL6186-4_B	400	2	90.0	290	752	14.3
48	1PL6186-4_D	1150	2	158.0	400	706	39.4
49	1PL6186-4_F	1750	2	231.0	400	682	59.3
50	1PL6186-4_L	2900	2	280.0	390	494	97.5
51	1PL6224-4_B	400	2	117.0	300	1074	14.2
52	1PL6224-4_D	1150	2	218.0	400	997	39.1
53	1PL6224-4_F	1750	2	292.0	400	900	59.2
54	1PL6224-4_L	2900	2	365.0	400	675	97.5
55	1PL6226-4_B	400	2	145.0	305	1361	14.0
56	1PL6226-4_D	1150	2	275.0	400	1287	39.2
57	1PL6226-4_F	1750	2	350.0	400	1091	59.1
58	1PL6226-4_L	2900	2	470.0	400	889	97.4
59	1PL6228-4_B	400	2	181.0	305	1719	14.0
60	1PL6228-4_D	1150	2	334.0	400	1578	39.2
61	1PL6228-4_F	1750	2	470.0	400	1446	59.0
62	1PL6228-4_L	2900	2	530.0	400	988	97.3
63	1PH4103-4_F	1500	2	20.2	350	48	52.9
64	1PH4105-4_F	1500	2	27.3	350	70	53.1
65	1PH4107-4_F	1500	2	34.9	350	89	52.8
66	1PH4133-4_F	1500	2	34.1	350	95	51.9

Input in P097	Motor order number (MPRD)	Rated speed n_n [rpm]	Pole pair number Z_p	Current I_n [A]	Voltage U_n [V]	Torque M_n [Nm]	Frequency f_n [Hz]
67	1PH4135-4_F	1500	2	51.2	350	140	51.6
68	1PH4137-4_F	1500	2	60.5	350	172	51.6
69	1PH4163-4_F	1500	2	86.3	350	236	50.9
70	1PH4167-4_F	1500	2	103.3	350	293	51.0
71	1PH4168-4_F	1500	2	113.0	350	331	51.0
72	1PH7107-2_G	2300	2	24.8	398	50	78.6
73	1PH7167-2_G	2000	2	88.8	350	196	67.4
74 to 99	for future applications						
100	1PL6284-..D.	1150	2	478.0	400	2325	38.9
101 to 253	for future applications						

Table 8-6 Motor list 1PH7 / 1PL6 / 1PH4

For information about motor ratings and availability please see Catalog DA65.3 "Synchronous and asynchronous servomotors for SIMOVERT MASTERDRIVES".

The data stored under the motor numbers describe the design point of the motor. In Chapter 3 "Induction servo motors" of Catalog DA65.3 two operating points are indicated for operation with MASTERDRIVES MC. The operating points are calculated for 400 V and 480 V AC line voltage on the converter input side.

The data for the 480 V line voltage are stored in the control system as the rated motor current is slightly lower for a few motors in this operating point.

P293 "Field weakening frequency" is always decisive for the actual field weakening operating point. The field weakening frequency P293 is automatically calculated for a line voltage of 400 V.

8.9 Motor identification

From Version V1.30 onwards, automatic motor identification is available. In the case of Siemens motors (P095 = 1 or 2) the motor type is first selected in P096 or P097. In the case of non-Siemens motors (P095 = 3 or 4), the rating plate data and number of pole pairs have to be entered, and then automatic paramterizing is called with P115 = 1.

After exit from the "drive initial start-up" status with P060 = 1, P115 = 2 is set and hence motor identification is selected. The converter must now be switched in within 30 s so that measuring can start. The alarm A078 is set during the 30 s.

CAUTION

The motor shaft can move slightly during the measurement operation. The motor cables are live. Voltages are present at the converter output terminals and hence also at the motor terminals; they are therefore hazardous to touch.

WARNING

It must be ensured that no danger for persons and equipment can occur by energizing the power and the unit.

If measurement is not started within 30 s or if it is interrupted by an OFF command, error F114 is set. The converter status during measurement is "Motid-Still" (r001 = 18). Measurement is ended automatically, and the converter reverts to the status "Ready for start-up" (r001 = 009).

In current-controlled mode (P290 = 0), automatic motor indentification should **always** be performed during initial start-up.

8.10 Complete parameterization

To make full use of the complete functionality of the inverter/converter, parameterization must be carried out in accordance with the "Compendium". You will find the relevant instructions, function diagrams and complete lists of parameters, binectors and connectors in the Compendium.

Language	Compendium order number
German	6SE7080-0QX70
English	6SE7087-6QX70
French	6SE7087-7QX70
Spanish	6SE7087-8QX70
Italian	6SE7087-2QX70

9 Maintenance

DANGER

SIMOVERT MASTERDRIVES units are operated at high voltages.
All work carried out on or with the equipment must conform to all the national electrical codes (BGV A3 in Germany).
Maintenance and repair work may only be carried out by properly qualified personnel and only when the equipment is disconnected from the power supply.

Only spare parts authorized by the manufacturer may be used.
The prescribed maintenance intervals and also the instructions for repair and replacement must be complied with.
Hazardous voltages are still present in the drive units up to 5 minutes after the converter has been powered down due to the DC link capacitors. Thus, the unit or the DC link terminals must not be worked on until at least after this delay time.
The power terminals and control terminals can still be at hazardous voltage levels even when the motor is stationary.

9.1 Replacing the fan

A fan is mounted at the lower section of the inverter for cooling the power section.

The fan is fed by the 24 V supply voltage and switched in and off by the device software.

The fan is designed for a service life of $L_{10} \geq 35{,}000$ hours and an ambient temperature of $T_u = 45$ °C. It must be exchanged in good time to ensure the availability of the unit.

It may be necessary to disassemble the unit for this purpose.

DANGER

To replace the fan the inverter has to be disconnected from the supply and removed if necessary.

9.1.1 Replacing the fan in units up to 45 mm wide

Removal

- After removing the four cover screws and dismantling the cover (see chapter 5.2 "Installing the optional boards"), the X20 connector which is protected against polarity reversal can be disconnected and the fan can be removed.

Installation

- Fit the fan in the reverse order, making sure that the arrow indicating the direction of air flow points to the inside of the unit.

NOTICE

Make sure that the leads to the fan are connected the right way round. Otherwise the fan will not operate!

9.1.2 Replacing the fan in 67 mm and 90 mm wide units

Removal

- After removing the two cover screws and dismantling the cover, the X20 connector which is protected against polarity reversal can be disconnected and the fan can be dismantled by pushing out the internals of the insert rivets. The insert rivets can be re-used.

Installation

- Fit the fan in the reverse order, making sure that the arrow indicating the direction of air flow points to the inside of the unit.

NOTICE

Make sure that the leads to the fan are connected the right way round. Otherwise the fan will not operate!

9.1.3 Replacing the fan in units 135 mm wide

Removal

- You can remove the fan by undoing the four mounting screws or sliding out the internal parts of the insert rivets. The insert rivets can be re-used.
- Disconnect the leads on the fan.

Installation

- Fit the new fan in the reverse order.
- Make sure that the arrow indicating the direction of air flow points to the inside of the unit.

NOTICE

Make sure that the leads to the fan are connected the right way round. Otherwise the fan will not operate!

9.1.4 Replacing the fan in units up to 180 mm wide

Two fans are mounted on the lower side of the inverter, an **internal fan** for cooling the control electronics and a **unit fan** for cooling the power section.

Internal fan

- Opening the unit:
  - Loosen the 2 mounting screws in the front at the top of the unit. There is no need to take the screws right out. Slots are provided in the housing to allow the front of the unit to be released when the screws have been loosened.
  - Carefully swing the front of the unit forwards (to an angle of about 30°) away from the housing.
  - On the power section, open the locking lever on the ribbon cable connector to the control electronics.
  - Move the cover forwards and take it off.
- Remove the fan connection on the power section.
- Undo the four mounting screws or slide out the internal parts of the insert rivets. Then remove the fan. The insert rivets can be re-used.
- Fit the new fan by reversing this sequence of operations. Make sure that the arrow indicating the direction of rotation is pointing to the inside of the unit.

Unit fan

- Undo the four mounting screws or slide out the internal parts of the insert rivets. Then remove the fan. The insert rivets can be re-used.
- Disconnect the leads on the fan.
- Fit the new fan in the reverse order.
- Make sure that the arrow indicating the direction of air flow points to the inside of the unit.

NOTICE

Make sure that the leads to the fan are connected the right way round. Otherwise the fan will not operate!

10 Forming

CAUTION

If a unit has been non-operational for more than two years, the DC link capacitors have to be newly formed. If this is not carried out, the unit can be damaged when the line voltage is powered up.

If the unit was started up within two years of manufacture, the DC link capacitors do not have to be re-formed. The date of manufacture of the unit can be read from the serial number.

How the serial number is made up

(Example: F2UD012345)

Position	Example	Meaning
1 to 2	F2	Place of manufacture
3	X	2009
	A	2010
	B	2011
	C	2012
	D	2013
	E	2014
	F	2015
4	1 to 9	January to September
	O	October
	N	November
	D	December
5 to 10		Not relevant for forming

The following applies for the above example:
Manufacture took place in December 2006.

During forming a defined voltage and a limited current are applied to the DC link capacitors and the internal conditions necessary for the function of the DC link capacitors are restored again.

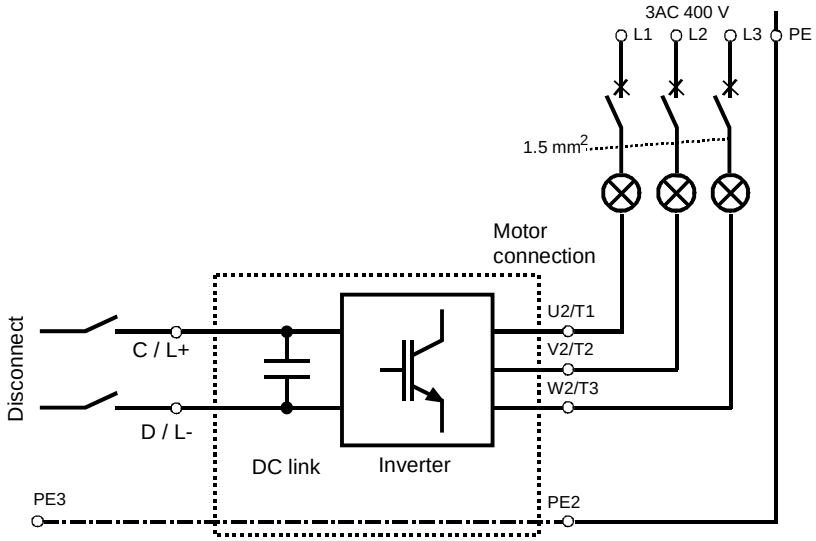


Fig. 10-1 Forming circuit

Components for the forming circuit (suggestion)

- 1 fuse-switch triple 400 V / 10 A
- 3 incandescent lamps 230 V / 100 W
- Various small parts e.g. lamp holders, 1.5 mm^2 cable, etc.

DANGER

The unit has hazardous voltage levels up to 5 minutes after it has been powered down due to the DC link capacitors. The unit or the DC link terminals must not be worked on until at least after this delay time.

Procedure

- Before you form the DC link capacitors the unit or the front and middle bar of the DC link bus module have to be removed (C/L+ and D/L-).
- When the unit has been removed, connect PE2 to earth. Installed units are earthed through the bar connection PE3.
- The unit is not permitted to receive a switch-on command (e.g. via the keyboard of the PMU or the terminal strip).
- The incandescent lamps must burn darker / extinguish during the course of forming. If the lamps continue to burn, this indicates a fault in the unit or in the wiring.
- Connect the required components in accordance with the circuit example.
- Energize the forming circuit. The duration of forming is approx. 1 hour.

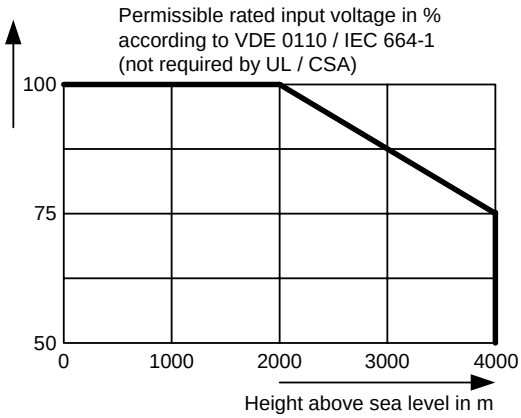
11 Technical Data

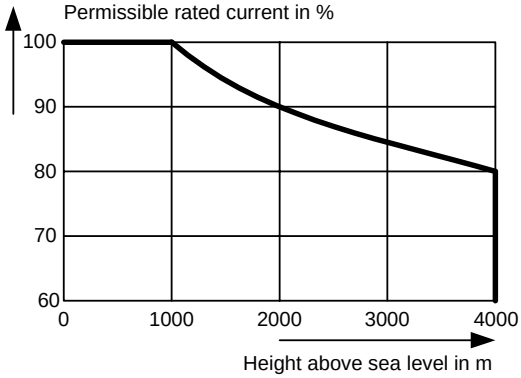
EC Low-Voltage Directive 73/23/EEC and RL93/68/EEC	EN 50178
EC EMC Directive 89/336/EWG	EN 61800-3
EC Machinery Safety Directive 89/392/EEC	EN 60204-1
Approvals	UL: E 145 153 CSA: LR 21 927 cULus: E 214113 (≥ 22 kW)
Type of cooling	Air-cooled with installed fan
Permissible ambient or coolant temperature • During operation • During storage • During transport	 0° C to +45° C (32° F to 113° F) (to 50° C, see fig. “Derating curves”) -25° C to +55° C (-13° F to 131° F) -25° C to +70° C (-13° F to 158° F)
Installation altitude	≤ 1000 m above sea level (100 per cent loadability) > 1000 m to 4000 m above sea level (Loadability: see fig. “Derating curves”)
Permissible humidity rating	Relative air humidity ≤ 95 % during transport and storage ≤ 85 % in operation (condensation not permissible)
Environmental conditions to DIN IEC 721-3-3	Climate: 3K3 Chemically active substances: 3C1
Pollution degree	Pollution degree 2 to IEC 664-1 (DIN VDE 0110, Part 1), Moisture condensation during operation is not permissible
Overvoltage category	Category III to IEC 664-1 (DIN VDE 0110, Part 2)
Type of protection	IP20 EN 60529
Protection class	Class 1 to EN 536 (DIN VDE 0106, Part 1)
Shock-hazard protection	EN 60204-1 and to DIN VDE 0106 Part 100 (BGV A3)
Radio interference level • Standard • Options	According to EN 61800-3 No radio interference suppression Radio interference suppression filter for class A1 to EN 55011
Noise immunity	Industrial sector to EN 61800-3
Paint	Indoor duty
Miscellaneous	The devices are ground-fault protected, short-circuit-proof and idling-proof on the motor side

Mechanical strength - Vibration	According to DIN IEC 68-2-6	
During stationary duty: const. amplitude		
• deflection	0.15 mm	in frequency range 10 Hz to 58 Hz (housing width ≤ 90 mm)
	0.075 mm	in frequency range 10 Hz to 58 Hz (housing width ≥ 135 mm)
• acceleration	19.6 m/s²	in frequency range > 58 Hz to 500 Hz (housing width ≤ 90 mm)
	9.8 m/s²	in frequency range > 58 Hz to 500 Hz (housing width ≥ 135 mm)
During transport:		
• deflection	3.5 mm in frequency range 5 Hz to 9 Hz	
• accleration	9.8 m/s² in frequency range > 9 Hz to 500 Hz	
- Shocks	According to DIN IEC 68-2-27 / 08.89 30 g, 16 ms half-sine shock	
- Drop	According to DIN IEC 68-2-31 / 04.84 onto a surface and onto an edge	

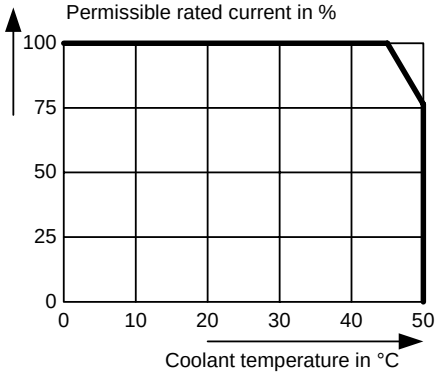
Table 11-1 General data

Derating curves





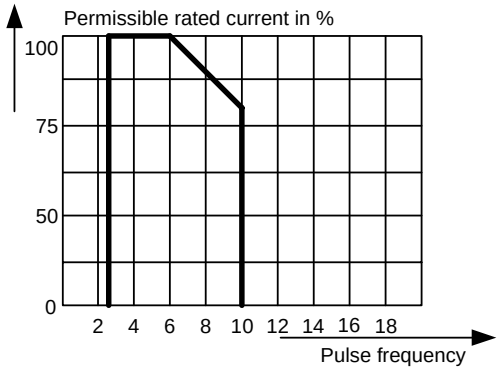
Height [m]	Derating factor K_1
1000	1.0
2000	0.9
3000	0.845
4000	0.8



Temp [°C]	Derating factor K_2
50	0.879
45	1.0
40	1.125
35	1.25 *
30	1.375 *
25	1.5 *

*See note below

Derating for units of ≥ 22 kW



Pulse frequency kHz	Derating factor K_3
6	1.00
7	0.95
8	0.90
9	0.85
10	0.80

Fig. 11-1 Derating curves

The derating of the permissible rated current for installation altitudes of over 1000 m and at ambient temperatures below 45 °C is calculated as follows:

Total derating = $\text{Derating}_{\text{altitude}}$ x $\text{Derating}_{\text{ambient temperature}}$

$K = K_1 \times K_2$

NOTE

It must be borne in mind that total derating must **not be greater** than 1!

Example: Altitude: 3000 m $K_1 = 0.845$
Ambient temperature: 35 °C $K_2 = 1.125$
→ Total derating = 0.845 x 1.125 = 0.95

Rating plate

Fig. 11-2 Example of rating plate (applies only <22 kW)

Date of manufacture

The date of manufacture can be derived as follows:

Character	Year of manufacture	Character	Month of manufacture
U	2006	1 to 9	January to September
V	2007	O	October
W	2008	N	November
X	2009	D	December

Table 11-2 Assignment of characters to the month and year of manufacture

Option codes

Option	Meaning	Option	Meaning
	SBP: Pulse encoder evaluation		**CBP2:** PROFIBUS (sync freq possible)
C11	Slot A	G91	Slot A
C12	Slot B	G92	Slot B
C13	Slot C	G93	Slot C
	SBR1: Resolver evaluation without pulse encoder simulation		**CBC:** CAN bus
		G21	Slot A
C23	Slot C	G22	Slot B
	SBR2: Resolver evaluation with pulse encoder simulation	G23	Slot C
			EB1: Expansion Board 1
C33	Slot C	G61	Slot A
	SBM2: Encoder and absolute encoder evaluation	G62	Slot B
		G63	Slot C
C41	Slot A		**EB2:** Expansion Board 2
C42	Slot B	G71	Slot A
C43	Slot C	G72	Slot B
	SLB: SIMOLINK	G73	Slot C
G41	Slot A	K80	"Safe STOP" option
G42	Slot B	F01	Technology software
G43	Slot C		

Table 11-3 Meaning of the option codes

Designation		Value				
Order No.	6SE70...	12-0TP□0	14-0TP□0	16-0TP□0	21-0TP□0	21-3TP□0
Rated voltage • Input • Output	[V]	DC 510 (- 15 %) to 650 (+ 10 %) 3 AC 0 up to rated input voltage x 0.64				
Rated frequency • Input • Output	[Hz]	 --- 0 ... 400				
Rated current • Input • Output	[A]	 2.5 2.0	 5.0 4.0	 7.5 6.1	 12.5 10.2	 15.7 13.2
Motor rated power	[kW]	0.75	1.5	2.2	4.0	5.5
Auxiliary power supply	[V]	DC 24 (20 - 30)				
Max. aux. current requirement • Standard version at 20 V • Maximum version at 20 V	[A]	 0.8 1.5				
Pulse frequency fp	[kHz]	2.5 to 10.0 Pulse frequencies <5 kHz and >8 kHz are available only with Performance II units (60SE70_ _-_TP70)				
Load class II to EN 60 146-1-1						
Base load current	[A]	0.91 x rated output current				
Overload cycle time	[s]	300				
Overload current ***)**	[A]	1.6 x rated output current				
Overload duration	[s]	30				
Extra short-time loading						
Short-time current (fp = 5 kHz)	[A]	3 x rated output current				
Short-time current (fp = 10 kHz)	[A]	2.1 x rated output current				
Short-time cycle	[s]	1				
Short-time duration	[ms]	250				
Loses, cooling						
Efficiency η (rated operation)						
Power loss (fp = 10 kHz)	[kW]	0.066	0.086	0.116	0.156	0.240
Cooling air requirement	[m³/s]	0.002	0.009	0.009	0.018	0.018
Pressure drop Δp	[Pa]	10	20	20	15	15
Sound pressure levels, types of construction, dimensions, weights						
Sound pressure level	[dB(A)]	35	40	40	37	37
Dimensions • Width • Height • Depth	[mm]	 45 360 260	 67.5 360 260	 67.5 360 260	 90 360 260	 135 360 260
Weight approx.	[kg]	3	4	4	5	9.1

□ = 5 corresponds to MASTERDRIVES Motion Control
= 7 corresponds to MASTERDRIVES Motion Control Performance 2

***)** With a 1.6-fold overload in field weakening, the torque quality is reduced due to a ripple of 300 Hz.

Table 11-4 Technical data of inverter (Part 1)

Designation		Value				
Order No.	6SE70...	21-8TP□0	22-6TP□0	23-4TP□0	23-8TP□0	
Rated voltage • Input • Output	[V]	DC 510 (- 15 %) to 650 (+ 10 %) 3 AC 0 up to rated input voltage x 0.64				
Rated frequency • Input • Output	[Hz]	--- 0 ... 400				
Rated current • Input • Output	[A]	 20.8 17.5	 30.4 25.5	 40.5 34.0	 44.6 37.5	
Motor rated power	[kW]	7.5	11.0	15.0	18.5	
Auxiliary power supply	[V]	DC 24 (20 - 30)				
Max. aux. current requirement • Standard version at 20 V • Maximum version at 20 V	[A]	 0.8 2.1		 1.1 2.7		
Pulse frequency fp	[kHz]	2.5 to 10.0 Pulse frequencies <5 kHz and >8 kHz are available only with Performance II units (60SE70_ _-_TP70)				
Load class II to EN 60 146-1-1						
Base load current	[A]	0.91 x rated output current				
Overload cycle time	[s]	300				
Overload current ***)**	[A]	1.6 x rated output current				
Overload duration	[s]	30				
Extra short-time loading						
Short-time current (fp = 5 kHz)	[A]	3 x rated output current				
Short-time current (fp = 10 kHz)	[A]	2.1 x rated output current				
Short-time cycle	[s]	1				
Short-time duration	[ms]	250				
Loses, cooling						
Efficiency η (rated operation)						
Power loss (fp = 10 kHz)	[kW]	0.300	0.410	0.550	0.660	
Cooling air requirement	[m³/s]	0.041	0.041	0.061	0.061	
Pressure drop Δp	[Pa]	30	30	30	30	
Sound pressure levels, types of construction, dimensions, weights						
Sound pressure level	[dB(A)]	48	48	59	59	
Dimensions • Width • Height • Depth	[mm]	 135 360 260	 135 360 260	 180 360 260	 180 360 260	
Weight approx.	[kg]	9.2	9.3	13.8	14.0	

□ = 5 corresponds to MASTERDRIVES Motion Control
= 7 corresponds to MASTERDRIVES Motion Control Performance 2

***)** With a 1.6-fold overload in field weakening, the torque quality is reduced due to a ripple of 300 Hz.

Table 11-5 Technical data of inverter (part 2)

Designation		Value				
Order No.	6SE70...	24-7TP□0	26-0TP□0	27-2TP□0		
Rated voltage • Input • Output	[V]	DC 510 (- 15 %) to 650 (+ 10 %) 3 AC 0 up to rated input voltage x 0.64				
Rated frequency • Input • Output	[Hz]	--- 0 ... 400				
Rated current • Input • Output	[A]	 55.9 47.0	 70.2 59.0	 85.7 72.0		
Motor rated power	[kW]	22.0	30.0	37.0		
Auxiliary power supply	[V]	DC 24 (20 - 30)				
Max. aux. current requirement • Standard version at 20 V • Maximum version at 20 V	[A]	 1.3 1.8	 1.7 2.1			
Pulse frequency fp	[kHz]	2.5 to 10 kHz (see fig. "Derating curves") Pulse frequencies <5 kHz and >8 kHz are available only with Performance II units (60SE70_ _-_TP70)				
Load class II to EN 60 146-1-1						
Base load current	[A]	0.91 x rated output current				
Overload cycle time	[s]	300				
Overload current ***)**	[A]	1.6 x rated output current				
Overload duration	[s]	30				
Loses, cooling						
Efficiency η (rated operation)						
Power loss (fp = 6 kHz)	[kW]	0.58	0.65	0.85		
Cooling air requirement	[m³/s]	0.041	0.061	0.061		
Pressure drop Δp	[Pa]	30	30	30		
Sound pressure levels, types of construction, dimensions, weights						
Sound pressure level	[dB(A)]	48	59	59		
Dimensions • Width • Height • Depth	[mm]	 180 360 260	 180 360 260	 180 360 260		
Weight approx.	[kg]	14.1	14.5	14.7		

□ = 5 corresponds to MASTERDRIVES Motion Control
= 7 corresponds to MASTERDRIVES Motion Control Performance 2

***)** With a 1.6-fold overload in field weakening, the torque quality is reduced due to a ripple of 300 Hz.

Table 11-6 Technical data of inverter (part 3)

12 Faults and Alarms

12.1 Faults

General information regarding faults

For each fault, the following information is available:

Parameter	r947	Fault number
	r949	Fault value
	r951	Fault list
	P952	Number of faults
	r782	Fault time

If a fault message is not reset before the electronic supply voltage is switched off, then the fault message will be present again when the electronic supply is switched on again. The unit cannot be operated without resetting the fault message.

Number / Fault	Cause	Counter-measure
F001 Main contactor checkback	The monitoring time of the main contactor checkback (P600) has expired.	- Check main contactor checkback - Clear main contactor checkback (P591.B = 0) - Increase monitoring time (P600)
F002 Pre-charging fault	The monitoring time of pre-charging has expired, i.e. the DC link voltage has not reached the setpoint within 3 secs.	- Check voltage connection (AC or DC) - Unit-dependent: Check fuses - Compare value in P070 and unit MLFB
F006 DC link overvoltage	Due to excessive DC link voltage, shutdown has occurred. The rated value of the shutdown threshold is 819 V. Due to component tolerances shutdown can take place in the range from 803 V to 835 V. In the fault value the DC link voltage upon occurence of the fault is indicated (normalization 0x7FFF corresponds to 1000V)	Check the line voltage (AC-AC) or the input direct voltage (DC-AC). Compare value with P071 (Line Volts)
F008 DC link undervoltage	The lower limit value of 76% of the DC link voltage has been fallen short of. In the fault value the DC link voltage upon occurence of the fault is indicated (normalization 0x7FFF corresponds to 1000V)	- Check the line voltage (AC-AC) or the input direct voltage (DC-AC). Compare value with P071 (Line Volts) - Check input rectifier (AC-AC) - Check DC link
F011 Overcurrent not Compact PLUS	Overcurrent shutdown has occurred. The shutdown threshold has been exceeded. The phase in which an overcurrent has occurred is indicated in a bit-coded manner in the fault value (see P949). Phase U --> Bit 0 = 1--> fault value = 1 Phase V --> Bit 1 = 1--> fault value = 2 Phase W--> Bit 2 = 1--> fault value = 4 If an overcurrent occurs simultaneously in several phases, the total of the fault values of the phases concerned is the resulting fault value.	- Check the converter output for short-circuit or earth fault - Check the load for an overload condition - Check whether motor and converter are correctly matched - Check whether the dynamic requirements are too high

Number / Fault	Cause	Counter-measure
F015 Motor blocked	Motor is blocked/overloaded (current control), or has stalled (v/f characteristic): Static load is too high The fault is not generated until after the time entered in P805. Binector B0156 is set, in status word 2 r553 Bit 28. Whether the drive is blocked or not can be detected at P792 (Perm Deviation) and P794. P806 enables detection to be limited to "at standstill" (P806 = 1, only for current control) or to be completely de-activated (P806 = 2). In the case of current control, the precondition for this fault is that the torque limits (B0234) have been reached. In the case of slave drive, detection is de-activated. In the case of v/f control, the I(max) controller must be active.	- Reduce the load - Release the brake - Increase current limits - Increase P805 Blocking Time - Increase the response threshold for the permissible deviation P792 - Increase torque limits or torque setpoint - Check connection of motor phases including correct phase assignment/sequence v/f characteristic only: - Reduce rate of acceleration - Check characteristic setting.
F017 SAFE STOP Compact PLUS only	SAFE STOP operating or failure of the 24 V power supply during operation (only for Compact PLUS units)	Jumper applied for SAFE STOP? SAFE STOP checkback connected? On Compact PLUS units: check 24 V supply
F020 Excess temperature of motor	The motor temperature limit value has been exceeded. r949 = 1 Motor temperature limit value exceeded r949 = 2 Short-circuit in the motor temperature sensor cable or sensor defective r949 = 4 Wire break of motor temperature sensor cable or sensor defective	- Temperature threshold adjustable in P381! - P131 = 0 -> fault de-activated - Check the motor (load, ventilation etc.) - The current motor temperature can be read in r009 (Motor Temperat.) - Check the sensor for cable break, short-circuit
F021 Motor I2t	Parameterized limit value of the I2t monitoring for the motor (P384.002) has been exceeded	Check: Thermal time constant of motor P383 Mot ThermT-Const or motor I2t load limit P384.002. The I2t monitoring for the motor is automatically activated if P383 >=100s (=factory setting) and P381 > 220°C is set. Monitoring can be switched off by setting a value <100s in P383.
F023 Excess temperature of inverter	The limit value of the inverter temperature has been exceeded	- Measure the air intake and ambient temperature (Observe minimum and maximum ambient temperature from 0°C to 45°C!) - Observe the derating curves at theta > 45 °C (Compact PLUS) or 40 °C - Check whether the fan is running - Check that the air entry and discharge openings are not restricted - In the case of units >= 22 kW acknowledgement is only possible after 1 minute
F025 UCE upper switch/UCE Phase L1	For Compact PLUS units: UCE upper switch For chassis type units: UCE Phase L1	- Check the converter outputs for earth fault - Check the switch for "SAFE STOP" on Compact units

Number / Fault	Cause	Counter-measure
F026 UCE lower switch/UCE Phase L2	For Compact PLUS units: UCE lower switch For Compact and chassis type units: UCE Phase L2	- Check the converter outputs for earth fault - Check the switch for "SAFE STOP" on Compact units
F027 Pulse resistor fault / UCE Phase L3	For Compact PLUS AC/AC units: Pulse resistance fault For chassis type units: UCE Phase L3	- Check the converter outputs for earth fault - Check the switch for "SAFE STOP" on Compact DC/DC units and chassis units with the option "SAFE STOP"
F029 Meas. value sensing Compact PLUS only	A fault has occurred in the measured value sensing system: - (r949 = 1) Offset adjustment in phase L1 not possible - (r949 = 2) Offset adjustment in phase L3 not possible. - (r949 = 3) Offset adjustment in phases L1 and L3 not possible. - (r949=65) Autom. Adjustment of the analog inputs is not possible	Fault in measured value sensing Fault in power section (valve cannot block) Fault on CU
F035 External fault 1	Parameterizable external fault input 1 has been activated.	- Check whether there is an external fault - Check whether the cable to the corresponding digital output is interrupted - P575 (Src No ExtFault1)
F036 External fault 2	Parameterizable external fault input 2 has been activated.	- Check whether there is an external fault - Check whether the cable to the corresponding digital output is interrupted - P576 (Src No ExtFault2)
F038 Voltage OFF during parameter storage	A voltage failure has occurred during a parameter task.	Re-enter the parameter. The number of the parameter concerned is indicated in fault value r949.
F040 Internal fault of sequence control	Incorrect operating status	Replace the control board (CUMC) or the unit (Compact PUS).
F041 EEPROM fault	A fault has occurred during the storage of values in the EEPROM.	Replace the control board (CUMC) or the unit (Compact PLUS)
F042 Time slot overflow	The available calculating time of the time slot has been exceeded. At least 10 failures of time slots T2, T3, T4 or T5 (see also parameter r829.2 to r829.5)	- Reduce pulse frequency - Calculate individual blocks in a slower sampling time - The technology functions Synchronization (U953.33) and Positioning (U953.32) must not be enabled at the same time.

Number / Fault	Cause	Counter-measure
F043 DSP link	The link to the internal signal processor is interrupted	- Reduce pulse frequency (perhaps caused by calculating time overflow) - If fault re-occurs, replace the board/unit The pulse frequency P340 should not be adjusted to values larger than 7.5 kHz (for 60MHz - DSP) or 6 kHz (for 40MHz - DSP). If higher values are set, indices 12 to 19 have to be checked on visualization parameter r829. The indicated free calculating time of the DSP time slots always have to be greater than zero. If the calculating time is exceeded, this is also displayed by fault F043 (DSP coupling). Remedy: Reduce pulse frequency (P340)
F044 BICO manager fault	A fault has occurred in the softwiring of binectors and connectors	Fault value r949: >1000: Fault during connector softwiring >2000: Fault during binector softwiring - Voltage OFF and ON - Factory setting and new parameterization - Exchange the board 1028:Link memory is full. The link area between the two processors is full. No further connectors can be transferred. - Reduction of the linked connections between the two processors. Interface between the two processors is position control/setpoint conditioning i.e.softwires from and to the setpoint conditioning, position controller, speed controller, torque interface and current controller which are not necessary should be dissolved to reduce the link (value 0).
F045 HW fault on optional boards	A hardware fault has occurred during access to an optional board.	- Replace CU board (Compact, chassis units) - Replace the unit (Compact PLUS) - Check the connection betewen the subrack and the optional boards - Replace optional boards.
F046 Parameter coupling fault	A fault has occurred during the transfer of parameters to the DSP.	If fault re-occurs, replace the board/unit

Number / Fault	Cause	Counter-measure
F051 Encoder fault	- Signal amplitude of resolver or encoder is below the tolerance threshold - Power supply faults in the case of encoders and multiturn encoders - In the case of multiturn encoders (SSI/Endat), connection fault of the serial protocol	Fault value r949: 10th and 1st position: 9 = Resolver signal missing (sin/cos track) 20 = Position error: Alarm A18 was generated during the change to the "operation" state. (For remedial action see 29) 21 = A/B track undervoltage: Root(A^2+B^2)<0.01V (For remedial action see 29) 22 = A/B track overvoltage: Root(A^2+B^2)>1.45V (For remedial action see 29) 25 = Encoder initial position not recognized (C/D track missing) - Check encoder cable (faulty / interrupted)? - Correct encoder type parameterized? - Is the correct cable used for encoder or multiturn encoder? Encoders and multiturn encoders need different cables! - Encoder faulty? 26 = Encoder zero pulse outside the permitted range 27 = No encoder zero pulse has occurred 28 = Encoder/multiturn Voltage supply Encoder fault - Short-circuit in encoder connection? - Encoder faulty? - Encoder incorrectly connected up? !!!Power off/on or in drive settings and back to new initialization of the starting position!!! 29 = A/B track undervoltage: In the zero passage of one track the amount of the other track was less than 0.025 V - Check encoder cable (faulty/torn off)? - Is shield of encoder cable connected ? - Encoder faulty? - Replace SBR/SBM - Replace unit or basic board - Is the correct cable being used in each case for the encoder/multiturn encoder?`Encoders and multiturn encoders require different encoder cables! !!!Power off/on or in drive settings and back to new initialization of the starting position!!! Multiturn (SSI/EnDat): 30: Protocol fault CRC/Parity Check (EnDat) 31: Timeout Protocol (EnDat) 32: No-load level error, data line (SSI/EnDat) 33: Initialization of timeout - Check parameterization (P149) - Check encoder cable (faulty / torn off? - Encoder cable shield connected ? - Encoder faulty? - Replace SBR/SBM - Replace unit or basic board

Number / Fault	Cause	Counter-measure
		34: Address wrong (only EnDat) - Writing or reading of parameters not successful, check address and MRS code (P149) 35: The difference between the serial protocol and the pulse counter is greater than 0xFFFF (2^16). A possible fault may be a jump in the serial protocol. The fault can only be generated if an absolute encoder with incremental tracks (P149.01/.06 = X1XX) and multiturn portion is concerned. (EnDat) 40: Alarm, lighting, EnDat encoder 41: Alarm, signal amplitude, EnDat encoder 42: Alarm. position value, EnDat encoder 43: Alarm, overvoltage, EnDat encoder 44: Alarm, undervoltage, EnDat encoder 45: Alarm, overcurrent, EnDat encoder 46: Alarm, battery failure, EnDat encoder 49: Alarm, check sum error, EnDat encoder 60: SSI protocol faulty (see P143) 100th position: 0xx: Motor encoder faulty 1xx: External encoder faulty 1000th position: (from V1.50) 1xxx: Frequency exceeded, EnDat encoder 2xxx: Temperature, EnDat encoder 3xxx: Control reserve, light, EnDat encoder 4xxx: Battery charge, EnDat encoder 5xxx: Home point not reached
F054 Encoder board initialization fault	A fault has occurred during initialization of the encoder board.	Fault value r949: 1: Board code is incorrect 2: TSY not compatible 3: SBP not compatible 4: SBR not compatible 5: SBM not compatible (from V2.0 only the SBM2 board is supported; see also r826 function diagram 517) 6: SBM initialization timeout 7: Board double 20: TSY board double 21: SBR board double 23: SBM board three-fold 24: SBP board three-fold 30: SBR board slot incorrect 31: SBM board slot incorrect 32: SBP board slot incorrect 40: SBR board not present 41: SBM board not present 42: SBP board not present 50: Three encoder boards or two encoder boards, none of them on Slot C 60: internal fault
F056 SIMOLINK telegram failure	Communication on the SIMOLINK ring is disturbed.	- Check the fiber-optic cable ring - Check whether an SLB in the ring is without voltage - Check whether an SLB in the ring is faulty - Check P741 (SLB TlgOFF)

Number / Fault	Cause	Counter-measure
F058 Parameter fault Parameter task	A fault has occurred during the processing of a parameter task.	No remedy
F059 Parameter fault after factory setting/init.	A fault has occurred in the initialization phase during the calculation of a parameter.	The number of the inconsistent parameter is indicated in fault value r949. Correct this parameter (ALL indices) and switch voltage off and on again. Several parameters may be affected, i.e. repeat process.
F060 MLFB is missing during initial loading	Is set if parameter P070 is at zero when INITIAL LOADING is exited.	Enter correct MLFB after acknowledging the fault (power section, initial loading)
F061 Incorrect parameterization	A parameter which has been entered during drive setting is in the non-permissible range.	The number of the inconsistent parameter is indicated in fault value r949 (e.g. motor enocder = pulse encoder in the case of brushless DC motors) -> correct this parameter.
F063 PIN is missing	The synchronization or positioning technology functions have been activated without an authorization being present (PIN)	- Deactivate synchronization or positioning - Enter the PIN (U2977) If technology functions are inserted in the time slots without enabling the technology function through the PIN, the message F063 is generated. This fault can only be cleared by putting in the correct PIN at U977.01 and U977.02 and switching the power off and on again, or by disabling the technology functions (put U953.32 = 20 and U053.33 = 20).
F065 SCom telegram failure	No telegram has been received at an SCom interface (SCom/USS protocol) within the telegram failure time.	Fault value r949: 1 = Interface 1 (SCom1) 2 = Interface 2 (SCom2) Check the connection of PMU -X300 or X103 / 27,28 (Compact, chassis unit) Check the connection of X103 or X100 / 35,36 (Compact PLUS unit) Check "SCom/SCB TlgOff" P704.01 (SCom1) or P704.02 (SCom2)
F070 SCB initialization fault	A fault has occurred during initialization of the SCB board.	Fault value r949: 1: Board code incorrect 2: SCB board not compatible 5: Error in configuration data (Check parameterization) 6: Initialization timeout 7: SCB board double 10: Channel error
F072 EB initialization fault	A fault has occurred during initialization of the EB board.	Fault value r949: 2: 1st EB1 not compatible 3: 2nd EB1 not compatible 4: 1st EB2 not compatible 5: 2nd EB2 not compatible 21: Three EB1 boards 22: Three EB2 boards 110: Fault on 1st EB1 120: Fault on 2nd EB1 210: Fault on 1st EB2 220: Fault on 2nd EB2
F073 AnInp1SL1 not Compact PLUS	4 mA at analog input 1, slave 1 fallen short of	Check the connection of the signal source to the SCI1 (slave 1) -X428: 4, 5.

Number / Fault	Cause	Counter-measure
F074 AnInp2 SL1 not Compact PLUS	4 mA at analog input 2, slave 1 fallen short of	Check the connection of the signal source to the SCI1 (slave 1) -X428: 7, 8.
F075 AnInp3 SL1 not Compact PLUS	4 mA at analog input 3, slave 1 fallen short of	Check the connection of the signal source to the SCI1 (slave 1) -X428: 10, 11.
F076 AnInp1 SL2 not Compact PLUS	4 mA at analog input 1, slave 2 fallen short of	Check the connection of the signal source to the SCI1 (slave 2) -X428: 4, 5.
F077 AnInp2 SL2 not Compact PLUS	4 mA at analog input 2, slave 2 fallen short of	Check the connection of the signal source to the SCI1 (slave 2) -X428: 7, 8.
F078 AnInp3 SL2 not Compact PLUS	4 mA at analog input 3, slave 2 fallen short of	Check the connection of the signal source to the SCI1 (slave 2) -X428: 10, 11.
F079 SCB telegram failure not Compact PLUS	No telegram has been received by the SCB (USS, peer-to-peer, SCI) within the telegram failure time.	- Check the connections of the SCB1(2). - Check P704.03"SCom/SCB Tlg OFF" - Replce SCB1(2) - Replace CU (-A10)
F080 TB/CB initialization fault	Fault during initialization of the board at the DPR interface	Fault value r949: 1: Board code incorrect 2: TB/CB board not compatible 3: CB board not compatible 5: Error in configuration data 6: Initialization timeout 7: TB/CB board double 10: Channel error Check the T300/CB board for correct contacting, check the PSU power supply, check the CU / CB / T boards and check the CB initialization parameters: - P918.01 CB Bus Address, - P711.01 to P721.01 CB parameters 1 to 11
F081 OptBrdHeartbeat-Counter	Heartbeat-counter of the optional board is no longer being processed	Fault value r949: 0: TB/CB heatbeat-counter 1: SCB heartbeat-counter 2: Additional CB heartbeat-counter - Acknowledge the fault (whereby automatic reset is carried out) - If the fault re-occurs, replace the board concerned (see fault value) - Replace ADB - Check the connection between the subrack and the optional boards (LBA) and replace, if necessary
F082 TB/CB telegram failure	No new process data have been received by the TB or the CB within the telegram failure time.	Fault value r949: 1 = TB/CB 2 = additional CB - Check the connection to TB/CB - Check P722 (CB/TB TlgOFF) - Replace CB or TB

Number / Fault	Cause	Counter-measure
F085 Add. CB initialization fault	A fault has occurred during initialization of the CB board.	Fault value r949: 1: Board code incorrect 2: TB/CB board not compatible 3: CB board not compatible 5: Error in configuration data 6: Initialization timeout 7: TB/CB board double 10: Channel error Check the T300 / CB board for correct contacting and check the CB initialization parameters: - P918.02 CB Bus Address, - P711.02 to P721.02 CB Parameters 1 to 11
F087 SIMOLINK initialization fault	A fault has occurred during initialization of the SLB board.	- Replace CU (-A10), or replace the unit (Compact PLUS type) - Replace SLB
F099 Friction characteristic record	Recording of the friction characteristic was interrupted or not done at all.	Fault value r949 gives the cause (bit coded): Bit Meaning Value displayed 0 Pos. speed limit 1 1 Neg. speed limit 2 2 Releases missing: direction of rotation, inverter, controller 4 3 Speed controller connecting 8 4 Interrupt through cancellation of the record command 16 5 Illegal dataset changover 32 6 Time exceeded 64 7 Measuring error 128
F109 Mld R(L)	The rotor resistance determined during measurement of the direct current deviates too greatly.	- Repeat measurement - Enter data manually
F111 MId DSP	A fault has occurred during the Mot Id. r949=1 The current does not build up when voltage pulses are applied r949=2 (only for P115=4) The difference between speed setpoint and actual value is too large during measurement r949=3 (only for P115=4) The magnetizing current determined is too high. r949=121 The stator resistance P121 is not determined correctly r949=124 The rotor time constant P124 is parameterized with the value 0 ms r949=347 The valve voltage drop P347 is not determined correctly	- Repeat measurement - When r949=1: Check motor cables - When r949=2: Avoid mechanical stressing of the motor during the measurement; if the fault occurs directly after the start of the motor identification check the encoder and motor cables. - When r949=3: Check the motor rating plate data stored (ratio Vrated / Irated does not correspond with the measured inductance
F112 Mid X(L)	A fault has occurred during measurement of the motor inductances or leakages.	- Repeat measurement
F114 MId OFF	The converter has automatically stopped the automatic measurement due to the time limit up to power-up having been exceeded or due to an OFF command during the measurement, and has reset the function selection in P115.	Re-start with P115 function selection = 2 "Motor identification at standstill".The ON command must be given within 20 sec. after the alarm message A078 = standstill measurement has appeared. Cancel the OFF command and re-start measurement.

Number / Fault	Cause	Counter-measure
F116 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F117 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F118 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F119 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F120 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F121 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F122 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F123 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F124 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F125 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F126 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F127 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F128 Technology board fault not Compact PLUS	See TB documentation	See TB documentation

Number / Fault	Cause	Counter-measure
F129 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F130 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F131 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F132 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F133 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F134 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F135 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F136 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F137 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F138 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F139 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F140 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F141 Technology board fault not Compact PLUS	See TB documentation	See TB documentation

Number / Fault	Cause	Counter-measure
F142 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F143 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F144 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F145 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F146 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F147 Technology board fault not Compact PLUS	See TB documentation	See TB documentation
F148 Fault 1 Function blocks	An active signal is present at binector U061 (1).	Examine cause of fault, see function diagram 710
F149 Fault 2 Function blocks	An active signal is present at binector U062 (1).	Examine cause of fault, see function diagram 710
F150 Fault 3 Function blocks	An active signal is present at binector U063 (1).	Examine cause of fault, see function diagram 710
F151 Fault 4 Function blocks	An active signal is present at binector U064 (1).	Examine cause of fault, see function diagram 710
F152 Signs of life repeatedly invalid.	After an appropriate number of invalid signs of life, the sign of life monitoring block has gone into fault status.	Check cause of fault, see function diagram 170
F153 No valid sign-of-life tool interface	Within the monitoring time of the tool interface no valid sign-of-life has been received from the tool interface.	Cyclically execute write tasks from the tool interface within the monitoring time whereby the sign-of-life has to be increased by 1 for every write task.
F255 Fault in EEPROM	A fault has occurred in the EEPROM.	Switch off the unit and switch it on again. If the fault re-occurs, replace CU (-A10), or replace the unit (Compact PLUS).

Table 12-1 Fault numbers, causes and their counter-measures

12.2 Alarms

The alarm message is periodically displayed on the PMU by A = alarm/ alarm message and a 3-digit number. An alarm cannot be acknowledged. It is automatically deleted once the cause has been eliminated. Several alarms can be present. The alarms are then displayed one after the other.

When the converter is operated with the OP1S operator control panel, the alarm is indicated in the lowest operating display line. The red LED additionally flashes (refer to the OP1S operating instructions).

Number / Alarm	Cause	Counter-measure
A001 Time slot overflow	The calculating time work load is too high. a) At least 3 failures of time slots T6 or T7 (see also parameter r829.6 or r829.7) b) At least 3 failures of time slots T2, T3, T4 or T5 (see also parameter r829.2 to r829.5)	- Reduce pulse frequency - Calculate individual function blocks in slower time slots (parameter U950 ff.)
A002 SIMOLINK start alarm	Start of the SIMOLINK ring is not functioning.	- Check the fiber-optic cable ring for interruptions - Check whether there is an SLB without voltage in the ring - Check whether there is a faulty SLB in the ring
A003 Drive not synchronous	Although synchronization has been activated, the drive is not synchronous. Possible causes are: - Poor communication connection (frequent telegram failures) - Slow bus cycle times (in the case of high bus cycle times or synchronization of slow time slots, synchronizing can last for 1-2 minutes in the worst case). - Incorrect wiring of the time counter (only if P754 > P746 /T0)	SIMOLINK (SLB): - Check r748 i002 and i003 = counters for CRC faults and timeout faults - Check the fiber-optic cable connection - Check P751 on the dispatcher (connector 260 must be softwired); Check P753 on the transceiver (corresponding SIMOLINK connector K70xx must be softwired).
A004 Alarm startup of 2nd SLB	Startup of the 2nd SIMOLINK ring does not function.	- Check the fiber optic cable ring for any disconnections - Check whether an SLB in the ring is without voltage - Check whether an SLB in the ring is faulty
A005 Couple full	The closed-loop electronic system of MASTERDRIVES MC consists of two microprocessors. Only a limited number of couple channels are provided for transferring data between the two processors. The alarm displays that all couple channels between the two processors are busy. An attempt has, however, been made to interconnect another connector requireing a couple channel.	None
A014 Simulation active alarm	The DC link voltage is not equal to 0 when the simulation mode is selected (P372 = 1).	- Set P372 to 0. - Reduce DC link voltage (disconnect the converter from the supply)
A015 External alarm 1	Parameterizable external alarm input 1 has been activated.	Check - whether the cable to the corresponding digital input has been interrupted. - parameter P588 Src No Ext Warn1

Number / Alarm	Cause	Counter-measure
A016 External alarm 2	Parameterizable external alarm input 2 has been activated.	Check - whether the cable to the corresponding digital input has been interrupted. - parameter P589 Src No Ext Warn2
A017 Safe Stop alarm active	Safe Stop is detected in the READY states.	See F017 for causes/counter-measures.
A018 Encoder adjustment	Signal amplitude Resolver/encoder in the critical range.	See F051 for causes/counter-measures. As a general rule, it is necessary to initialize the starting position again => power OFF/ON or switch to the drive settings and back again!!! If alarm A18 occurs in the"Ready" status (r001 = 009) while an encoder is in use, the amplitude of the CD track signal is too small, or the connection to CD_Track may be interrupted, or an encoder without CD-Track is in use. In the case of an encoder without CD track, the P130 must be correctly set.
A019 Encoder data serial protocol	Connection fault of the serial protocol on multiturn encoders (SSI/Endat)	Serial protocol is defective on multiturn encoders. See F051 for causes/counter-measures. As a general rule, it is necessary to initialize the starting position again => power OFF/ON or switch to the drive settings and back again!!!
A020 Encoder adjustment, external encoder	The amplitude of an external encoder lies in the critical range.	Cause/remedies see F051 As a general rule, it is necessary to initialize the starting position again => power OFF/ON or switch to the drive settings and back again!!!
A021 Encoder data of external multiturn encoder faulty	A fault has occurred during processing of the serial protocol to an external code rotary encoder (SSI- or Endat-Multiturn).	Faulty serial protocol in the case of an external multiturn encoder. Cause/remedies see F051 As a general rule, it is necessary to initialize the starting position again => power OFF/ON or switch to the drive settings and back again!!
A022 Inverter temperature	The threshold for tripping an alarm has been exceeded.	- Measure intake air and ambient temperature. - Observe derating curves at theta > 45°C (Compact PLUS) or 40°C derating curves - Check whether the fan is operating - Check whether the air entry and discharge openings are restricted.
A023 Motor temperature	The parameterizable threshold (P380) for tripping an alarm has been exceeded.	Check the motor (load, ventilation, etc.). Read off the current temperature in r009 Motor Temperat.
A025 I2t converter	If the current load state is maintained, a thermal overload of the converter occurs. The converter will lower the max. current limit (P129).	- Reduce converter load - Check r010 (Drive Utiliz)

Number / Alarm	Cause	Counter-measure
A028 Diagnostics counter	The position of an encoder (motor encoder or external encoder) was incorrect for one or more samplings. This can result from EMC faults or a loose contact. When faults start to occur at a certain rate, fault message F51 is triggered by the corresponding fault variable.	For test purposes, fault message F51 can be triggered with the setting P847=2 in order to obtain more information about fault variable r949. All indices can also be monitored in r849 in order to find out which diagnostics counter counts the fault. If alarm A28 is hidden for this fault, then the corresponding index in P848 can be set to 1.
A029 I2t motor	The parameterized limit value for the I2t monitoring of the motor has been exceeded.	Motor load cycle is exceeded! Check the parameters: P382 Motor Cooling P383 Mot Tmp T1 P384 Mot Load Limits
A032 PRBS Overflow	An overflow has occurred during recording with noise generator PRBS	Repeat recording with lower amplitude
A033 Overspeed	The positive or negative maximum speed has been exceeded.	- Increase relevant maximum speed - Reduce regenerative load (see FD 480)
A034 Setpoint/actual value deviation	Bit 8 in r552 status word 1 of the setpoint channel. The difference between freqeuncy setpoint/actual value is greater than the parameterized value and the control monitoring time has elapsed.	Check - whether an excessive torque requirement is present - whether the motor has been dimensioned too small. Increase values P792 Perm Deviation Frq/ set/actual DevSpeed and P794 Deviation Time
A036 Brake checkback "Brake still closed"	The brake checkback indicates the "Brake still closed" state.	Check brake checkback (see FD 470)
A037 Brake checkback "Brake still open"	The brake checkback indicates the "Brake still open" state.	Check brake checkback (see FD 470)
A042 Motor stall/block	Motor is stalled or blocked. The alarm cannot be influenced by P805 "PullOut/BlckTime", but by P794 "Deviation Time"	Check - whether the drive is blocked - Whether the drive has stalled
A049 No slave not Compact PLUS	At serial I/O (SCB1 with SCI1/2), no slave is connected or fiber-optic cable is interrupted or slaves are without voltage.	P690 SSCI AnaIn Conf - Check slave. - Check cable.
A050 Slave incorrect not Compact PLUS	At ser. I/O the slaves required according to a parameterized configuration are not present (slave number or slave type): Analog inputs or outputs or digital inputs or outputs have been parameterized which are not physically present.	Check parameter P693 (analog outputs), P698 (digital outputs). Check connectors K4101...K4103, K4201...K4203 (analog inputs) and binectors B4100...B4115, B4120...B4135, B4200...B4215, B4220...B4235 (digital inputs) for connecting.
A051 Peer baud rate not Compact PLUS	In a peer-to-peer connection a baud rate has been selected which is too high or too different.	Adjust the baud rate in conjunction with the SCB boards P701 SCom/SCB Baud Rate
A052 Peer PcD L not Compact PLUS	In a peer-to-peer connection, a PcD length has been set which is too high (>5).	Reduce number of words P703 SCom/SCB PcD #

Number / Alarm	Cause	Counter-measure
A053 Peer Lng f. not Compact PLUS	In a peer-to-peer connection, the pcD length of transmitter and receiver do not match.	Adjust the word length for transmitter and receiver P703 SCom/SCB PcD #
A057 TB Param not Compact PLUS	Occurs when a TB is logged on and present, but parameter tasks from the PMU, SCom1 or SCom2 have not been answered by the TB within 6 seconds.	Replace TB configuration (software)
A061 Alarm 1 Function blocks	An active signal is present at binector U065 (1).	Check cause of alarm (see FD 710)
A062 Alarm 2 Function blocks	An active signal is present at binector U066 (1).	Check cause of alarm (see FD 710)
A063 Alarm 3 Function blocks	An active signal is present at binector U067 (1).	Check cause of alarm (see FD 710)
A064 Alarm 4 Function blocks	An active signal is present at binector U068 (1).	Check cause of alarm (see FD 710)
A072 Frict Char Init	Automatic initiation of the friction characteristic has been selected, but the drive has not yet been switched on. Note: If the ON command is not given within 30 seconds, the automatic initiation of the friction characteristic is stopped with fault F099.	Energize drive. (Drive status "Operation" 014)
A073 Interr InitFric	Automatic initiation of the friction characteristic has been interrupted (OFF command or fault). Note: If the drive is not switched on again within 5 minutes, the automatic initiation of the friction characteristic is stopped (F099).	Rectifiy any causes of the fault. Re-energize the drive.
A074 Incompl FricChar	Incomplete initiation of friction characteristic. As there is a lack of enables or due to limitations, complete initiation of the friction characteristic is not possible in both directions.	Grant enable for both directions of rotation. Set the speed limitations for both directions such that all characteristic points can be approached.
A075 Ls,Rr Dev.	The measured values of the leakage measurement or of rotor resistance deviate significantly.	If individual measured values significantly deviate from the average values, they are automatically disregarded in the calculation (for RI) or the value of the automatic parameterization remains (for Ls). It is only necessary to check the results for their plausibility in the case of drives with high requirements on torque or speed accuracy.
A078 Stands. Meas	The standstill measurement is executed when the converter is powered up. The motor can align itself several times in a certain direction with this measurement.	If the standstill measurement can be executed without any danger: - Power up the converter.
A081 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see operating instructions for CB board. The ID byte combinations which are being sent from the DP master in the configuration telegram are not in conformance with the permissible ID byte combinations. (See also Compendium, Chapter 8, Table 8.2-12). Consequence: No connection is made with the PROFIBUS master.	New configuration necessary

Number / Alarm	Cause	Counter-measure
A082 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. No valid PPO type can be identified from the configuration telegram of the DP master. Consequence: No connection is made with the PROFIBUS master.	New configuration necessary.
A083 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. No net data or invalid net data (e.g. complete control word STW1=0) are being received from the DP master. Consequence: The process data are not passed on to the dual port RAM. If P722 (P695) is not equal to zero, this will cause the fault message F082 to be tripped.	See operating instructions of the CB board
A084 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. The telegram traffic between the DP master and the CBP has been interrupted (e.g. cable break, bus cable pulled out or DP master powered down). Consequence: If P722 (P695) is not equal to zero, this will cause the fault message F082 to be tripped.	See operating instructions of the CB board
A085 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. The CBP does not generate this alarm!	See operating instructions of the CB board
A086 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. Failure of the heartbeat counter on the basic unit. The heartbeat counter on the basic unit is no longer being incremented. The communication between the CBP and the basic board is disturbed.	See operating instructions of the CB board
A087 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. Fault in the DPS manager software of the CBP.	See operating instructions of the CB board
A088 CB alarm	See user manual for CB board	See user manual for CB board
A089 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A81 of the 1st CB board	See user manual for CB board
A090 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A82 of the 1st CB board	See user manual for CB board
A091 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A83 of the 1st CB board	See user manual for CB board
A092 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A84 of the 1st CB board	See user manual for CB board

Number / Alarm	Cause	Counter-measure
A093 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A85 of the 1st CB board	See user manual for CB board
A094 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A86 of the 1st CB board	See user manual for CB board
A095 CB alarm	Alarm of the 2nd CB board. Corresponds to A87 of the 1st CB board See operating instructions for CB board	See user manual for CB board
A096 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A88 of the 1st CB board	See user manual for CB board
A097 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A098 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A099 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A100 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A101 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A102 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A103 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A104 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A105 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A106 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A107 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board

Number / Alarm	Cause	Counter-measure
A108 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A109 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A110 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A111 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A112 TB alarm 1 not Compact PLUS	See user manual for TB board	See user manual for TB board
A113 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A114 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A115 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A116 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A117 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A118 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A119 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A120 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board

Number / Alarm	Cause	Counter-measure
A121 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A122 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A123 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A124 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A125 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A126 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A127 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A128 TB alarm 2 not Compact PLUS	See user manual for TB board	See user manual for TB board
A129 Axis does not exist - machine data 1 = 0	Machine data 1 (position encoder type/axis type) is 0 (axis does not exist). Effect: Operation of the axis is inhibited and the position controller is deactivated.	You must assign a valid value to machine data 1 in order to operate the axis.
A130 Operating conditions do not exist	The "in operation [IOP]" checkback signal was missing when a traversing command was initiated. The following causes inhibit the "in operation" checkback signal (status bit No.2, refer to function diagram sheet 200) : -Control signals [OFF1], [OFF2], [OFF3] and/or "enable controller" [ENC] are not activated. -Checkback signals [OFF2] and/or [OFF3] are not activated. -A fault [FAULT] is active. Effect: The traversing command is inhibited.	Activate control signals [OFF1], [OFF2], [OFF3] and "enable controller" [ENC]. -If checkback signals [OFF2] and/or [OFF3] are missing, check the supply of control word 1 (MASTERDRIVES function diagram, sheet 180). -Analyze the queued fault number [FAULT_NO], remedy the fault, and then cancel the fault using the acknowledge fault [ACK_F] control signal. Note: To activate the "in operation" [IOP] status again, you must deactivate [OFF1] and then activate it again.

Number / Alarm	Cause	Counter-measure
A131 OFF1 missing	Control signal [OFF1] was deactivated while a traversing command was being executed. Effect: The drive is brought to a standstill via a ramp (P464 Deceleration Time). There is a subsequent pulse disable. This also valid if P443 =0 (function diagramm 310) and the ramp generator bypass (function diagramm 320) is used.	Check the activation of control signal [OFF1] from the user program.
A132 OFF2 missing	-Control signal [OFF2] was deactivated while a traversing command was being executed. -Checkback signal [OFF2] was deactivated while a traversing command was being executed. Effect: The pulse disable is initiated immediately. If the motor is not braked, it coasts down.	-Check the activation of control signal [OFF2] from the user program. -If checkback signal [OFF2] is missing, check the supply of control word 1 (MASTERDRIVES function diagram, sheet 180). Note: To activate the "in operation" [IOP] status again, you must deactivate [OFF1] and then activate it again.
A133 OFF3 missing	-Control signal [OFF3] was deactivated while a traversing command was being executed. -Checkback signal [OFF3] was deactivated while a traversing command was being executed. Effect: The motor decelerates at the current limit. There is a subsequent pulse disable.	-Check the activation of control signal [OFF3] from the user program. -If checkback signal [OFF3] is missing, check the supply of control word 1 (MASTERDRIVES function diagram, sheet 180). Note: To activate the "in operation" [IOP] status again, you must deactivate [OFF1] and then activate it again.
A134 Enable Controller ENC missing	The "enable controller" [ENC] control signal was deactivated while a traversing command was being executed (control bit No.3 "Inverter Enable", refer to function diagram, sheet 180) Effect: The pulse disable is initiated immediately. If the motor is not braked, it coasts down.	Check the activation of the "enable controller" [ENC] control signal from the user program.
A135 Actual position value not o.k	Actual position value not o.k. from position sensing (B0070 / B0071)	-Check interconnection of B0070 and B0071, -check position encoder and evaluation board, -check encoder cable.
A136 Machine data 1 changed - RESET necessary	Machine data 1 (position encoder type/axis type) was changed. Effect: The activation of traversing commands is inhibited.	If machine data 1 has been changed, the "reset technology" [RST] control signal must be activated. Alternatively switch the MASTERDIVES electronic power supply off and on again
A137 Axis assignment incorrect	The same axis assignment (machine data 2) was entered for several axes (M7 only, not significant for the F01 technology option). Effect: The activation of traversing commands is inhibited.	A unique axis assignment must be entered for all axes on an M7-FM. For example, it is not allowed to define two X axes.

Number / Alarm	Cause	Counter-measure
A138 Axis assignment of roll feed incorrect	The NC block contains an axis number which is defined as a roll feed axis but the axis type is defined as an incremental or absolute position encoder (machine data 1 = 1 or 2). (M7 only, not significant for the F01 technology option) . The NC block for a roll feed axis type (machine data 1 = 3) contains: -No axis number (X, Y, Z...) -An incorrect axis number Effect: NC program execution is inhibited or aborted.	-Axis type 1 or 2:The block is not allowed to contain an axis number which is defined as a roll feed (M7 only). -Axis type 3:The axis number of the roll feed must be specified in every NC block.
A139 Incorrect parameterization PosTrack MotorEnc	Alarm is tripped only for rotary axis of motor encoder. The bit width of the product of the gear denominator (U810.2 * P116.2) must not be greater than the difference of the 32 bit data width of the flipflop and the multiturn resolution of the encoder. Example: Torque motor with EQN1325 MT: Multiturn resolution = 12 P116: 2/7 U810.2max = 2^(32 - MT)/P116.2 U810.2max = 149796	In accordance with the adjacent formula reduce the gear denominator of P116 and/or U810 respectively.
A140 Following error in standstill	The following error limit for standstill was exceeded at standstill: -Following error monitoring - at standstill (machine data 14) was entered incorrectly. -The value entered for "in position - exact stop window" (machine data 17) is greater than the value in "following error monitoring - at standstill" (machine data 14). -The axis was pushed out of position mechanically. Effect: The position control system is deactivated and the axis decelerates via "deceleration time during errors" (machine data 43).	-Check and correct the machine data. -Optimize the speed/current controller, -Rectify mechanical problem.
A141 Following error in motion	The following error limit for motion was exceeded during a traversing movement: -Following error monitoring - in motion (machine data 15) was entered incorrectly. -The mechanical system cannot follow the commands of the position controller. -Actual position value invalid -Incorrect optimization of the position controller or speed controller. -The mechanical system is sluggish or blocked. Effect: The position control system is deactivated and the drive decelerates via "deceleration time during faults" (machine data 43).	-Check and correct the machine data. -Check the actual position value (speed-controlled operation); check position encoder, evaluator module and encoder lead. -Optimize the position controller or the speed controller. -Check the mechanical system.

Number / Alarm	Cause	Counter-measure
A142 In position - timer monitoring	The "in position - exact stop window" was not reached within the time specified in "in position - timer monitoring": -In position - exact stop window (machine data 17) too small -In position - timer monitoring (machine data 16) too short -Position controller or speed controller not optimized -Mechanical causes Effect: The position control system is deactivated.	-Check and correct the machine data. -Optimize the position controller or speed controller. -Check the mechanical system.
A145 Actual-value disable not allowed - axis standstill	The "digital input" with the "disable actual value" function was actuated while the roll feed was running. Effect: The axis movement is stopped via the deceleration ramp, the "disable actual value" function is not executed.	The "digital input" for "disable actual value" can only be actuated when the axis is stationary.
A146 Direction of movement not allowed	A positioning movement was aborted. When attempting to resume the movement at the point of interruption, the roll feed would have had to travel in the opposite direction to reach the programmed target position. This is inhibited by the setting of machine data 37 "response after abort". There are various possible reasons for the axis crossing the target position when a positioning movement is aborted: -Motor coastdown -The axis was moved intentionally, e.g. in setup mode. Effect: The axis movement is inhibited.	Move the axis in front of the target position in setup mode before continuing.
A148 Deceleration = 0	The current deceleration value is 0, e.g. because of a RAM storage error or an error in the technology firmware. Effect: The position control system is deactivated and the drive is decelerated via the "deceleration time during errors" (machine data 43).	This fault should not normally occur. It is used as an emergency stop feature for the technology software. Replace the hardware (M7; MCT).
A149 Distance to go negative	Internal error in the technology software. Effect: The position control system is deactivated and the drive is decelerated via the "deceleration time during errors" (machine data 43).	This fault should not normally occur. It is used as an emergency stop feature for the technology software.

Number / Alarm	Cause	Counter-measure
A150 Slave axis already allocated to other master axis	The selected NC program contains a slave axis which is already being used by another master axis (M7 only, not significant for the F01 technology option). Example: NC program 1, started in axis X, contains NC blocks for axes X and Y. NC program 2 is started in axis Z and contains NC blocks for axes Z and Y. This program is denied with warning 150, because axis Y is already being used by program 1. Effect: NC program execution is inhibited or aborted.	The same slave axis cannot be used simultaneously by several NC programs.
A151 Slave axis operating mode not allowed	The slave axis required by the master axis is not in "slave" mode (M7 only, not significant for the F01 technology option). Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	The slave axis must be switched to "slave" mode.
A152 Slave axis operating mode changed	The "slave" mode was deselected in the slave axis during the traversing movement (M7 only, not significant for the F01 technology option). Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	The slave axis must remain switched to "slave" mode.
A153 Error in slave axis	A warning is active in the slave axis required by the master axis (M7 only, not significant for the F01 technology option). Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	The NC program will only run if all of the axes it needs are error-free. To clear this warning, you must first clear all the warnings in the slave axis.
A154 Follow-up mode in slave axis active	The "follow-up mode" [FUM] control signal is active in the slave axis required by the master axis. A slave axis which is switched to follow-up mode cannot be operated by the master axis (M7 only, not significant for the F01 technology option). Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Deactivate follow-up mode in the slave axis.
A155 Reset in slave axis active	The "reset" [RST] control signal is active in the slave axis required by the master axis. A slave axis with an active reset cannot be used by the master axis (M7 only, not significant for the F01 technology option. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Cancel the "reset" [RST] control signal in the slave axis.

Number / Alarm	Cause	Counter-measure
A156 Axis type (MD1) of slave axis not allowed	An NC program was started in which a slave axis is defined as a roll feed axis type (M7 only, not significant for the F01 technology option). The warning is output in the master axis and indicates an illegal axis type in the slave axis. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Axes defined as roll feed axes can only be used in dedicated NC programs.
A160 Setup speed = 0	The value entered in level 1 or level 2 for the [F_S] velocity level in setup mode is zero. Effect: The axis movement is inhibited.	Define a permissible velocity level for level 1 and/or level 2. The permissible value range is between 0.01 [1000*LU/min] and "traversing velocity - maximum (machine data 23).
A161 Reference approach velocity = 0	The velocity value entered for "reference point - approach velocity" (machine data 7) is zero. Effect: The axis movement is inhibited.	Enter a permissible value for the approach velocity. The permissible value range is between 0.01 [1000*LU/min] and "traversing velocity - maximum (machine data 23).
A162 Reference point - reducing velocity = 0	The velocity value entered for "reference point - reducing velocity" (machine data 6) is zero. Effect: The axis movement is inhibited or stopped.	Enter a permissible value for the reference point -reducing velocity. The permissible value range is between 0.01 and 1000 [1000*LU/min].
A165 MDI block number not allowed	The MDI block number [MDI_NO] specified in the control signals is greater than 11. Effect: The axis movement is inhibited.	Define an MDI block number [MDI_NO] between 0 and 10.
A166 No position has been programmed in MDI mode	The "start" [STA] control signal was activated in MDI mode without initially transferring a positional value to the selected MDI block. Effect: The axis movement is inhibited.	Use the correct sequence: data transfer followed by axis start.
A167 No velocity has been programmed in MDI mode	The "start" [STA] control signal was activated in MDI mode without initially transferring a velocity value to the selected MDI block. Effect: The axis movement is inhibited.	Use the correct sequence: data transfer followed by axis start.
A168 G91 not allowed with MDI on the fly	G91 (incremental dimensions) was defined in the MDI block as the 1st G function for the MDI on-the-fly function. Effect: The axis movement is inhibited or stopped via the deceleration ramp.	The MDI on-the-fly function only allows G90 (absolute dimensions) as the 1st G function.
A169 Start conditions for flying MDI do not exist	-Control signal "reset technology" [RST] activated -Control signal "follow-up mode" [FUM] activated Effect: The "MDI on-the-fly" function is not executed.	Ensure that the control signals are activated correctly.
A170 Single block mode block does not exist	An NC block was started in single-block mode although a block has not yet been transferred. Effect: NC block execution is inhibited.	Transfer the block.

Number / Alarm	Cause	Counter-measure
A172 Program with this number does not exist	The program number specified in [PROG_NO] for automatic mode is not stored in the memory of the technology. Effect: NC program execution is inhibited.	-Transfer the program to the technology. -Select the correct program number.
A173 Program number not allowed	The program number specified in [PROG_NO] for automatic mode is not allowed. Effect: NC program execution is inhibited.	The permissible range for program numbers is between 1 and 200.
A174 Program number changed during traversing	The program number [PROG_NO] was changed while the program was running. Effect: NC program execution is aborted and the axis or axes are brought to a standstill via the deceleration ramp.	The program number must not be changed while the program is running.
A175 No block end programmed	The decoded NC block is not terminated with the following block identifier "0". You can use the "output actual values - decoder error location" task to read out the program number and block number where the block decoder detected an error. Effect: NC program execution is inhibited or aborted. Moving axes are stopped via the deceleration ramp.	Correct the block. The last block in the sequence must contain the following block identifier "0".
A177 Prog. number of block search forwd. does not exist	The program number for the main program (level 0), which was transferred with the block search function, does not exist. Effect: NC program execution is inhibited.	Specify an existing main program number.
A178 Program number of block search forward not allowed	-The program number for the main program (level 0), which was transferred with block search, is different from the selected program number. -No breakpoint is known for the "automatic block search" function (a program abort has not yet occurred). -A different program number is stored as the breakpoint for the "automatic block search" function. Effect: NC program execution is inhibited.	For the block search function, the selected program number [PROG_NO] must be specified as the program number for the main program.
A179 Prog.No.of block srch fwd level 1/2 does not exist	The subprogram number specified with block search for level 1 or level 2 does not exist. Effect: NC program execution is inhibited.	For the block search function, an existing program number must be specified as the subprogram number for level 1 or level 2.
A180 Prog.no. of block search forward level 1 <> cmd.	The subprogram number transferred with block search for level 1 is not the same as the subprogram number in the NC block. Effect: NC program execution is inhibited.	For the block search function, the subprogram number specified in the NC block must be specified as the subprogram number for level 1.
A181 Prog.no. of block search forward level 2 <> cmd.	The subprogram number transferred with block search for level 2 is not the same as the subprogram number in the NC block. Effect: NC program execution is inhibited.	For the block search function, the subprogram number specified in the NC block must be specified as the subprogram number for level 2.

Number / Alarm	Cause	Counter-measure
A183 Block no. of block search fwd l. 0 does not exist	The block number for the main program (level 0), which was transferred with block search, does not exist in the main program. Effect: NC program execution is inhibited.	For the block search function, an existing block number must be specified as the block number for the main program.
A184 Block no. of block search forward is no UP call	The block number for the main program (level 0), which was transferred with block search, does not contain a subprogram call for subprogram level 1. Effect: NC program execution is inhibited.	For the block search function, a block number with a subprogram call must be specified as the block number for the main program (level 0) if a block search is to be performed in subprogram level 1.
A185 Block no. of block search forward does not exist	The block number for subprogram level 1, which was transferred with block search, does not exist in the subprogram. Effect: NC program execution is inhibited.	For the block search function, a block number which exists in this subprogram must be specified as the block number for subprogram level 1.
A186 Block no of block search fwd lev 1 is no SP call	The block number for subprogram level 1, which was transferred with block search, does not contain a subprogram call for subprogram level 2. Effect: NC program execution is inhibited.	For the block search function, a block number with a subprogram call must be specified as the block number for subprogram level 1 if a block search is to be performed in subprogram level 2.
A187 Block no of block search fwd lev 2 does not exist	The block number for subprogram level 2, which was transferred with block search, does not exist in the subprogram. Effect: NC program execution is inhibited.	For the block search function, a block number which exists in this subprogram must be specified as the block number for subprogram level 2.
A188 Rem. loop count bl. search fwd lev1/2 not allowed	The remaining loop count transferred with block search for subprogram level 1 or 2 is greater than the programmed loop count. Effect: NC program execution is inhibited.	For the block search function, it is only allowed to specify a remaining loop count between 0 and the programmed loop count-1.
A190 Digital input not programmed	The NC block which was read in contains the "inprocess measurement" or "set actual value on-the-fly" function, although a digital input has not been programmed for this function (machine data 45). Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Program the digital input for the desired function.
A191 Digital input not actuated	Although the "external block change" function was programmed, the digital input was not actuated in order to trigger the external block change. Effect: The NC program is interrupted, the axis is brought to a standstill via the deceleration ramp.	-Correct the program. -Check the actuation of the digital input.

Number / Alarm	Cause	Counter-measure
A195 Negative overtravel reached	-Negative software limit switch position approached -"Software limit switches - negative" (machine data 12) entered incorrectly -The programmed position is less than the negative software limit switch. -"Reference point - coordinate" (machine data 3) is less than the negative software limit switch. -Incorrect encoder actual value Effect: The axis movement is stopped via the deceleration ramp.	-Check the machine data and the NC program. -Check the encoder actual value.
A196 Positive overtravel reached	-Positive software limit switch position approached -"Software limit switches - positive" (machine data 13) entered incorrectly¨ -The programmed position is greater than the positive software limit switch -"Reference point - coordinate" (machine data 3) is greater than the positive software limit switch -Incorrect encoder actual value Effect: The axis movement is stopped via the deceleration ramp.	-Check the machine data and the NC programs. -Check the encoder actual value.
A200 No position has been programmed in Automatic mode	No position has been programmed in the NC block for the roll feed version, although the axis number of the roll feed is specified. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	The axis number and the positional value must be specified in every NC block for the roll feed version.
A201 No velocity has been programmed in Automatic mode	The decoded NC block needs a path or axis velocity. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	When using linear interpolation with path velocity (G01), a path velocity must be defined with F. When using chaining with axis velocity (G77), the axis velocities must be defined with FX, FY, etc. When using roll feed with axis velocity (G01), the velocity must be defined with F.

Number / Alarm	Cause	Counter-measure
A202 Axis unknown	An axis which does not exist was detected in the decoded NC block. A logical name (X, Y, Z, A, B, C) must be assigned to each axis with machine data 2 (axis assignment). Only these logical axis names can be used in the NC block. These errors cannot normally occur, since the logical axis names are verified when the NC blocks are entered. Exception: Machine data 2 (axis assignment) is changed afterwards. The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values – decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.
A203 1st G-function not allowed	The NC block which was read in contains an illegal 1st G function. The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: The axis movement is inhibited or stopped via the deceleration ramp.	-MDI mode:Only G90 (absolute dimensions) or G91 (incremental dimensions) can be entered as the 1st G function. Only G91 is allowed for the roll feed version. -Automatic/single-block mode:Define a legal 1st G function according to the table (see the Programming Guide).
A204 2nd G-function not allowed	The NC block which was read in contains an illegal 2nd G function. The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: The axis movement is inhibited or stopped via the deceleration ramp.	-MDI mode:Only G30 to G39 (acceleration override) can be entered as the 2nd G function. -Automatic/single-block mode:Define a legal 2nd G function according to the table (see the Programming Guide).
A205 3rd G-function not allowed	The NC block which was read in contains an illegal 3rd G function. The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: The axis movement is inhibited or stopped via the deceleration ramp.	-MDI mode:No 3rd G function is allowed. -Automatic/single-block mode:Define a legal 3rd G function according to the table (see the Programming Guide).

Number / Alarm	Cause	Counter-measure
A206 4th G-function not allowed	The NC block which was read in contains an illegal 4th G function. The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: The axis movement is inhibited or stopped via the deceleration ramp.	-MDI mode:No 4th G function is allowed. -Automatic/single-block mode:Define a legal 4th G function according to the table (see the Programming Guide).
A208 D-number is not allowed	A D number greater than 20 was found in the decoded NC block. The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: The axis movement is inhibited or stopped via the deceleration ramp.	Correct the NC block.
A210 Interpolation of 3 axes not allowed	The decoded NC block contains an interpolation of 3 or more axes. The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block. Only 2D interpolation is allowed.
A211 Shortest distance G68 and G91 not allowed	G function G68 (shortest path for rotary axis) was detected in the decoded NC block, although G91 (incremental dimensions) is active. Example: N10 G91 G68 X20.000 The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.Function G68 can only be programmed in association with G90 (absolute dimensions).

Number / Alarm	Cause	Counter-measure
A212 Special function and axis combination not allowed	A different axis was programmed in the NC block following a special function (M7 only). Example: N10 G50 X100 F1000 N15 G90 Y200 incorrect N15 G90 X200 correct The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC program.The axis used in the NC block with the special function must also be programmed in the next NC block.
A213 Multiple D-number not allowed	The decoded NC block contains several D numbers. Example: N1 G41 D3 D5. The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.
A214 Multiple acceleration behaviour not allowed	The decoded NC block contains several mutually exclusive G functions from the acceleration override group (G30 to G39). Example: N1 G34 G35 The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.
A215 Multiple special functions not allowed	The decoded NC block contains several mutually exclusive G functions from the special function group (G87, G88, G89, G50, G51). Example: N1 G88 G50 The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.

Number / Alarm	Cause	Counter-measure
A216 Multiple block transition not allowed	The decoded NC block contains several mutually exclusive G functions from the block transition group (G60, G64, G66, G67). Example: N1 G64 G66 X1.000 FX100.00 The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.
A217 Multiple axis programming not allowed	The decoded NC block contains the same axis more than once. Example: N1 G90 G01 X100.000 X200.000 F100.00 The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.
A218 Multiple path condition not allowed	The decoded NC block contains several mutually exclusive G functions from the preparatory function group (G00/G01/G76/G77). Example: N1 G01 (linear interpolation) G77 (chaining) X10 F100. The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.
A219 Multiple dimensions specification not allowed	The decoded NC block contains several mutually exclusive G functions from the dimensional notation group (G90/G91). Example: N1 G90 G91. The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.

Number / Alarm	Cause	Counter-measure
A220 Multiple zero offset selection not allowed	The decoded NC block contains several mutually exclusive G functions from the zero offset group (G53 to G59). Example: N1 G54 G58 The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.
A221 Multiple tool offset selection not allowed	The decoded NC block contains several mutually exclusive G functions from the tool offset selection group (G43/G44). Example: N1 G43 G44 D2 The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.
A223 Subprogram number does not exist	The decoded NC block contains a subprogram call, however the NC program which was called does not exist in the memory of the technology. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.
A224 Subprogram nesting depth not allowed	The permissible nesting depth of subprograms was exceeded. Recursive calling of subprograms. The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC program. The permissible nesting depth for subprograms is 2 subprogram levels.

Number / Alarm	Cause	Counter-measure
A225 Status of collision monitoring select. not allowed	The decoded NC block contains simultaneous selection and deselection of collision monitoring (G96/G97). Example: N1 G96 G97 X100 The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC block.
A227 Negative overtravel violated	The look-ahead function of the decoder has detected that the negative software limit switch will be crossed. See also error message "A195: Negative overtravel reached". The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC program. Check the machine data.
A228 Positive overtravel violated	The look-ahead function of the decoder has detected that the positive software limit switch will be crossed. See also error message "A196: Positive overtravel reached". The NC program number and NC block number in which the NC block decoder detected the error can be read out with the "output actual values - decoder error location" task. Effect: NC program execution is inhibited or aborted, the axis is brought to a standstill via the deceleration ramp.	Correct the NC program. Check the machine data.
A241 Table assignment changed	The table assignment has been changed. Effect: NC tables cannot be processed.	Load the table again. Note: A table can only be loaded again if it is not selected. The warning is cleared automatically when the table has been successfully loaded.
A242 Table 1 invalid	Table 1 was not loaded correctly or has been reset. Effect: Table 1 cannot be processed.	Load table 1 again. Note: Table 1 can only be loaded again if it is not selected. The warning is cleared automatically when table 1 has been successfully loaded.
A243 Table 2 invalid	Table 2 was not loaded correctly or has been reset. Effect: Table 2 cannot be processed.	Load table 2 again. Note: Table 2 can only be loaded again if it is not selected. The warning is cleared automatically when table 2 has been successfully loaded.

Number / Alarm	Cause	Counter-measure
A244 Travel table 3 not valid	Travel table 3 has not been correctly adopted or has been reset. Consequence: Travel table 3 cannot be processed.	Adopt travel table 3 again. Note: Travel table 3 can only be newly adopted if it is not selected. When travel table 3 has been successfully adopted, the alarm message is automatically canceled.
A245 Travel table 4 not valid	Travel table 4 has not been correctly adopted or has been reset. Consequence: Travel table 4 cannot be processed.	Adopt travel table 4 again. Note: Travel table 4 can only be newly adopted if it is not selected. When travel table 4 has been successfully adopted, the alarm message is automatically canceled.
A246 Travel table 5 not valid	Travel table 5 has not been correctly adopted or has been reset. Consequence: Travel table 5 cannot be processed.	Adopt travel table 5 again. Note: Travel table 5 can only be newly adopted if it is not selected. When travel table 5 has been successfully adopted, the alarm message is automatically canceled.
A247 Travel table 6 not valid	Travel table 6 has not been correctly adopted or has been reset. Consequence: Travel table 6 cannot be processed.	Adopt travel table 6 again. Note: Travel table 6 can only be newly adopted if it is not selected. When travel table 6 has been successfully adopted, the alarm message is automatically canceled.
A248 Travel table 7 not valid	Travel table 7 has not been correctly adopted or has been reset. Consequence: Travel table 7 cannot be processed.	Adopt travel table 7 again. Note: Travel table 7 can only be newly adopted if it is not selected. When travel table 7 has been successfully adopted, the alarm message is automatically canceled.
A249 Travel table 8 not valid	Travel table 8 has not been correctly adopted or has been reset. Consequence: Travel table 8 cannot be processed.	Adopt travel table 8 again. Note: Travel table 8 can only be newly adopted if it is not selected. When travel table 8 has been successfully adopted, the alarm message is automatically canceled.

Table 12-2 Alarm numbers, causes and their counter-measures

12.3 Fatal errors (FF)

Fatal errors are serious hardware or software errors which no longer permit normal operation of the unit. They only appear on the PMU in the form "FF<No>". The software is re-booted by actuating any key on the PMU.

Number / Fault	Cause	Counter-measure
FF01 Time slot overflow	A time slot overflow which cannot be remedied has been detected in the high-priority time slots. At least 40 failures of time slots T2, T3, T4 or T5 (see also parameter r829.2 to r829.5)	- Reduce pulse frequency (P340) - Replace CU
FF03 Access fault Optional board	Serious faults have occurred while accessing external option boards (CB, TB, SCB, TSY ..).	- Replace CU, or replace the unit (Compact PLUS type) - Replace the LBA - Replace the option board
FF04 RAM	A fault has occurred during the test of the RAM.	- Replace CU, or replace the unit (Compact PLUS type)
FF05 EPROM fault	A fault has occurred during the test of the EPROM.	- Replace CU, or replace the unit (Compact PLUS type)
FF06 Stack overflow	Stack has overflowed	For VC: Increase sampling time (P357) For MC: Reduce pulse frequency (P340) - Replace CU, or replace the unit (Compact PLUS type)
FF07 Stack Underflow	Stack underflow	- Replace CU, or replace the unit (Compact PLUS type) - Replace firmware
FF08 Undefined Opcode	Invalid processor command should be processed	- Replace CU, or replace the unit (Compact PLUS type) - Replace firmware
FF09 Protection Fault	Invalid format in a protected processor command	- Replace CU, or replace the unit (Compact PLUS type) - Replace firmware
FF10 Illegal Word Operand Address	Word access to uneven address	- Replace CU, or replace the unit (Compact PLUS type) - Replace firmware
FF11 Illegal Instruction Access	Jump command to uneven address	- Replace CU, or replace the unit (Compact PLUS type) - Replace firmware
FF13 Wrong firmware version	A version conflict between the firmware and the hardware has occurred.	- Replace firmware - Replace CU, or replace the unit (Compact PLUS type)
FF14 FF processing	Unexpected fatal error (During processing of the fatal errors, a fault number has occurred which is unknown to date).	Replace the board
FF15 CSTACK_OVERFLOW	Stack overflow (C-Compiler Stack)	Replace the board
FF16 NMI error not Compact PLUS	NMI	- Replace firmware - Replace CU, or replace the unit (Compact PLUS type)

Table 12-3 Fatal errors

13 Environmental Friendliness

Environmental aspects during the development

The number of components has been significantly reduced over earlier converter series by the use of highly integrated components and the modular design of the complete series. Thus, the energy requirement during production has been reduced.

Special significance was placed on the reduction of the volume, weight and variety of metal and plastic components.

Plastics components used

ABS:	PMU board, Siemens logo
PC / ABS:	Front cover MC Large
PA6:	Front cover MC, terminal strips, spacer bolts, fan impeller
PA6.6:	DC link terminal cover, through terminals, terminal strips, terminal blocks
Pocan (PBT):	Optional card covers
PP:	PMU covers
PBTP:	Fan housing
Hostaphan (Makrofol):	Insulating plates
Formex:	Insulating foils
NOMEX:	Insulating paper
FR4:	Printed circuit boards

Halogen-containing flame retardants were, for all essential components, replaced by environmentally-friendly flame retardants.

Environmental compatibility was an important criterium when selecting the supplied components.

Environmental aspects during production

Purchased components are generally supplied in recyclable packaging materials (board).

Surface finishes and coatings were eliminated with the exception of the galvanized sheet steel side panels.

ASIC devices and SMD devices were used on the boards.

The production is emission-free.

Environmental aspects for disposal

The unit can be broken down into recyclable mechanical components as a result of easily releasable screw and snap connections.

The plastic components are to DIN 54840 and have a recycling symbol.

After the service life has expired, the product must be disposed of in accordance with the applicable national regulations.

Bisher sind folgende Ausgaben erschienen:
The following versions have been published so far:

Ausgabe Version	interne Sachnummer Internal item number
AA	475 901 4170 76 J AA-74
AB	475 901 4170 76 J AB-74
AC	475 901 4170 76 J AC-74
AD	475 901 4170 76 J AD-74
AE	A5E00082116
AF	A5E00082116
AG	A5E00082116
AH	A5E00812606
AI	A5E00812606
AK	A5E00812606
AL	A5E00812606
AM	A5E00812606

Ausgabe AM besteht aus folgenden Kapiteln:

Kapitel		Änderungen	Seiten-zahl	Ausgabe-datum
1	Definitionen und Warnungen	überarbeitete Ausgabe	6	08.2008
2	Beschreibung	überarbeitete Ausgabe	1	02.2005
3	Transportieren, Lagern, Auspacken	überarbeitete Ausgabe	1	02.2005
4	Erstinbetriebsetzung	überarbeitete Ausgabe	2	02.2005
5	Montage	überarbeitete Ausgabe	12	08.2009
6	EMV-gerechter Aufbau	überarbeitete Ausgabe	6	02.2008
7	Anschließen	überarbeitete Ausgabe	19	08.2008
8	Parametrierung	überarbeitete Ausgabe	49	08.2009
9	Wartung	überarbeitete Ausgabe	3	08.2008
10	Formieren	überarbeitete Ausgabe	2	08.2009
11	Technische Daten	überarbeitete Ausgabe	8	08.2008
12	Störungen und Warnungen	überarbeitete Ausgabe	38	06.2006
13	Umweltverträglichkeit	überarbeitete Ausgabe	1	06.2006

Version AM consists of the following chapters:

Chapter		Changes	Pages	Version date
1	Definitions and Warnings	reviewed edition	6	08.2008
2	Description	reviewed edition	1	02.2005
3	Transport, Storage, Unpacking	reviewed edition	1	02.2005
4	First Start-up	reviewed edition	2	02.2005
5	Installation	reviewed edition	12	08.2009
6	Installation in Conformance with EMC Regulations	reviewed edition	6	02.2008
7	Connecting-up	reviewed edition	19	08.2008
8	Parameterization	reviewed edition	49	08.2009
9	Maintenance	reviewed edition	3	08.2008
10	Forming	reviewed edition	2	08.2009
11	Technical Data	reviewed edition	8	08.2008
12	Faults and Warnings	reviewed edition	36	06.2006
13	Environmental Friendliness	reviewed edition	1	06.2006

Änderungen von Funktionen, technischen Daten, Normen, Zeichnungen und Parametern vorbehalten.

We reserve the right to make changes to functions, technical data, standards, drawings and parameters.

Wir haben den Inhalt der Druckschrift auf Übereinstimmung mit der beschriebenen Hard- und Software überprüft. Dennoch können Abweichungen nicht ausgeschlossen werden, so dass wir für die vollständige Übereinstimmung keine Garantie übernehmen. Die Angaben in dieser Druckschrift werden jedoch regelmäßig überprüft und notwendige Korrekturen sind in den nachfolgenden Auflagen enthalten. Für Verbesserungsvorschläge sind wir dankbar.

We have checked the contents of this document to ensure that they coincide with the described hardware and software. However, differences cannot be completely excluded, so that we do not accept any guarantee for complete conformance. However, the information in this document is regularly checked and necessary corrections will be included in subsequent editions. We are grateful for any recommendations for improvement.

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Contents

1 Definitions and Warnings

Qualified personnel

For the purpose of this documentation and the product warning labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up, operation and maintenance of the product. He or she must have the following qualifications:

- Trained or authorized to energize, de-energize, ground and tag circuits and equipment in accordance with established safety procedures.
- Trained or authorized in the proper care and use of protective equipment in accordance with established safety procedures.
- Trained in rendering first aid.

DANGER

indicates an **imminently** hazardous situation which, if not avoided, will result in death, serious injury and considerable damage to property.

WARNING

indicates a **potentially** hazardous situation which, if not avoided, could result in death, serious injury and considerable damage to property.

CAUTION

used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

used without safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

NOTICE used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesirable result or state.

NOTE

For the purpose of this documentation, "Note" indicates important information about the product or about the respective part of the documentation which is essential to highlight.

WARNING

Hazardous voltages are present in this electrical equipment during operation.

Non-observance of the warnings can thus result in severe personal injury or property damage.

Only qualified personnel should work on or around the equipment

This personnel must be thoroughly familiar with all warning and maintenance procedures contained in this documentation.

The successful and safe operation of this equipment is dependent on correct transport, proper storage and installation as well as careful operation and maintenance.

NOTE

This documentation does not purport to cover all details on all types of the product, nor 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 this documentation shall not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of SIEMENS AG. The warranty contained in the contract between the parties is the sole warranty of SIEMENS AG. Any statements contained herein do not create new warranties or modify the existing warranty.

Proper use of Siemens products

WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be adhered to. The information in the relevant documentation must be observed.

CAUTION

Components which can be destroyed by electrostatic discharge (ESD)

The board contains components which can be destroyed by electrostatic discharge. These components can be easily destroyed if not carefully handled. If you have to handle electronic boards, please observe the following:

Electronic boards should only be touched when absolutely necessary.

The human body must be electrically discharged before touching an electronic board.

Boards must not come into contact with highly insulating materials - e.g. plastic parts, insulated desktops, articles of clothing manufactured from man-made fibers.

Boards must only be placed on conductive surfaces.

Boards and components should only be stored and transported in conductive packaging (e.g. metalized plastic boxes or metal containers).

If the packing material is not conductive, the boards must be wrapped with a conductive packaging material, e.g. conductive foam rubber or household aluminium foil.

The necessary ESD protective measures are clearly shown again in the following diagram:

- a = Conductive floor surface
- b = ESD table
- c = ESD shoes
- d = ESD overall
- e = ESD chain
- f = Cubicle ground connection

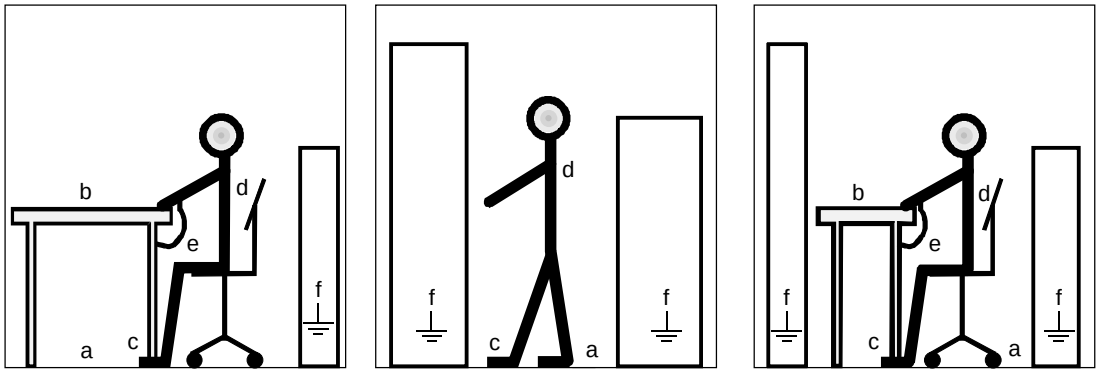


Fig. 1-1 ESD protective measures

Safety and Operating Instructions for Drive Converters

(in conformity with the low-voltage directive 73/23/EEC)

1. General

In operation, drive converters, depending on their degree of protection, may have live, uninsulated, and possibly also moving or rotating parts, as well as hot surfaces.

In case of inadmissible removal of the required covers, of improper use, wrong installation or maloperation, there is the danger of serious personal injury and damage to property.

For further information, see documentation.

All operations serving transport, installation and commissioninng as well as maintenance are to be carried out by **skilled technical personnel** (Observe IEC 60364 or CENELEC HD 384 or DIN VDE 0100 and IEC 60664 or DIN VDE0110 and national accident prevention rules!).

For the purposes of these basic safety instructions, "skilled technical personnel" means persons who are familiar with the installation, mounting, commissioning and operation of the product and have the qualifications needed for the performance of their functions.

2. Intended use

Drive converters are components designed for inclusion in electrical installations or machinery.

In case of installation in machinery, commissioning of the drive converter (i.e. the starting of normal operation) is prohibited until the machinery has been proved to conform to the provisions of the directive 98/37/EG (Machinery Safety Directive - MSD). Account is to be taken of EN 60204.

Commissioning (i.e. the starting of normal opertion) is admissible only where conformity with the EMC directive (89/336/EEC) has been established.

The drive converters meet the requirements of the low-voltage directive 73/23/EEC.
They are subject to the harmonized standards of the series EN 50178 / DIN VDE 0160 in conjunction with EN 60439-1 / DIN VDE 0660 part 500 and EN 60146 / VDE 0558.

The technical data as well as information concerning the supply conditions shall be taken from the rating plate and from the documentation and shall be strictly observed.

3. Transport, storage

The instructions for transport, storage and proper use shall be complied with.

The climatic conditions shall be in conformity with EN 50178.

4. Installation

The installation and cooling of the appliances shall be in accordance with the specifications in the pertinent documentation.

The drive converters shall be protected against excessive strains. In particular, no components must be bent or isolating distances altered in the course of transportation or handling. No contact shall be made with electronic components and contacts.

Drive converters contain electrostatic sensitive components which are liable to damage through improper use. Electric components must not be mechanically damaged or destroyed (potential health risks).

5. Electrical connection

When working on live drive converters, the applicable national accident prevention rules (e.g. BGV A3) must be complied with.

The electrical installation shall be carried out in accordance with the relevant requirements (e.g. cross-sectional areas of conductors, fusing, PE connection). For further information, see documentation.

Instructions for the installation in accordance with EMC requirements, like screening, earthing, location of filters and wiring, are contained in the drive converter documentation. They must always be complied with, also for drive converters bearing a CE marking. Observance of the limit values required by EMC law is the responsibility of the manufacturer of the installation or machine.

6. Operation

Installations which include drive converters shall be equipped with additional control and protective devices in accordance with the relevant applicable safety requirements, e.g. Act respecting technical equipment, accident prevention rules etc. Changes to the drive converters by means of the operating software are admissible.

After disconnection of the drive converter from the voltage supply, live appliance parts and power terminals must not be touched immediately because of possibly energized capacitors. In this respect, the corresponding signs and markings on the drive converter must be respected.

During operation, all covers and doors shall be kept closed.

7. Maintenance and servicing

The manufacturer's documentation shall be followed.

Keep these safety instructions in a safe place!

Residual risks of Power Drive Systems (PDS)

DANGER

The components for the controller and drive of a Power Drive System (PDS) are authorized for industrial and commercial use in industrial networks. Their use in public networks requires a different planning and/or additional measures.

It is only permissible to operate these components in enclosed housings or in superordinate control cabinets and when all protective devices and protective covers are used.

These components may only be handled by qualified and trained specialist persons who are familiar with and observe all the safety instructions on the components and in the relevant technical user documentation.

The machine manufacturer must take into account the following residual risks resulting from the components for the controller and drive of a Power Drive System (PDS) when evaluating the risk of his machine in accordance with the EC machinery guideline.

1. Undesired movements of driven machine components during commissioning, operation, maintenance and repair, e.g. as a result of
   - HW and/or SW errors in the sensors, controller, actuators and connection system
   - Reaction times of the controller and the drive
   - Operation and/or ambient conditions not compliant with the specification
   - Errors in parameterization, programming, wiring and installation
   - Use of radio units/mobile phones in the direct vicinity of the controller
   - External influences/damage.
2. Extraordinary temperatures and emissions of light, noises, particles and gases, e.g. as a result of
   - Component failure
   - Software errors
   - Operation and/or ambient conditions not compliant with the specification
   - External influences/damage.
3. Dangerous contact voltages, e.g. as a result of
   - Component failure
   - Influence upon electrostatic charging
   - Induction of voltages in the case of moving motors
   - Operation and/or ambient conditions not compliant with the specification
   - Condensation/conductive contamination
   - External influences/damage.
4. Operational electrical, magnetic and electromagnetic fields that may pose a risk to people with a pacemaker, implants or metallic items if they are too close.
5. Release of pollutants and emissions if components are not operated or disposed of properly.

For additional information on the residual risks emanating from the components of the PDS, please refer to the relevant chapters of the technical user documentation.

DANGER

Electrical, magnetic and electromagnetic fields (EMF) that occur during operation can pose a danger to persons who are present in the direct vicinity of the product – especially persons with pacemakers, implants, or similar devices.

The relevant directives and standards must be observed by the machine/plant operators and persons present in the vicinity of the product. These are, for example, EMF Directive 2004/40/EEC and standards EN 12198-1 to -3 pertinent to the European Economic Area (EEA), as well as accident prevention code BGV 11 and the associated rule BGR 11 "Electromagnetic fields" of the German employer's liability accident insurance association pertinent to Germany.

These state that a hazard analysis must be drawn up for every workplace, from which measures for reducing dangers and their impact on persons are derived and applied, and exposure and danger zones are defined and observed.

The safety information in the Storage, Transport, Installation, Commissioning, Operation, Maintenance, Disassembly and Disposal sections must also be taken into account.

2 Description

Range of application

The inverters are power electronics components for feeding three-phase motors.

The inverters can be operated from a DC system with voltages from 510 V to 650 V.

The inverter enables a three-phase system with a variable output frequency between 0 Hz and maximum 500 Hz to be generated from the DC link direct voltage with the pulse width modulation method (PWM).

The unit is controlled by the internal control electronics which consists of a microprocessor system. The functions are provided by the unit software.

The inverter always requires an external 24 V DC voltage for supplying the control electronics.

The unit can be operated via the PMU operator control panel, the user-friendly OP1S operator control panel, the terminal strip or via a bus system. For this purpose, the unit has a number of interfaces and two slots for the use of optional boards.

Pulse encoders can be used as motor-specific encoders.

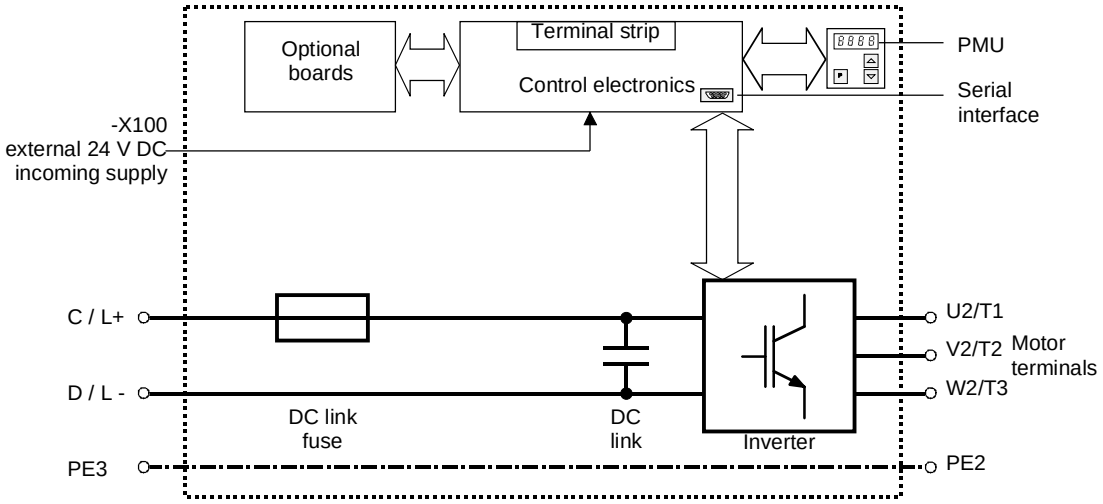


Fig. 2-1 Circuit principle of the inverter

3 Transport, Storage, Unpacking

The units and components are packed in the manufacturing plant corresponding to that specified when ordered. A packing label is located on the outside of the packaging. Please observe the instructions on the packaging for transport, storage and professional handling.

Transport

Vibrations and jolts must be avoided during transport. If the unit is damaged, you must inform your shipping company immediately.

Storage

The units and components must be stored in clean, dry rooms. Temperatures between -25 °C (-13 °F) and +70 °C (158 °F) are permissible. Temperature fluctuations must not be more than 30 K per hour.

CAUTION

If the storage period of two years is exceeded, the unit must be newly formed. See Section ”Forming".

Unpacking

The packaging comprises board and corrugated paper. It can be disposed of corresponding to the appropriate local regulations for the disposal of board products. The units and components can be installed and commissioned after they have been unpacked and checked to ensure that everything is complete and that they are not damaged.

4 First Start-up

Unpack and check the units	After removing the packaging, check that the unit is intact and undamaged. Only intact units may be started up. Please also check that the unit is complete and that the correct optional boards are fitted.	See section "Transport, Storage, Unpacking"
Mount the unit and install optional boards which have not yet been fitted	Retrofit any optional boards which have not yet been installed, if necessary. Then install the units taking into account the requirements at the point of installation and the EMC instructions.	See section "Installation" and "Installation in Conformance with EMC Regulations"
Form the DC link capacitors, if necessary	If the DC link of the unit was de-energized for more than two years, you have to newly form the DC link capacitors	See section "Forming"
Connect the protective conductor, the power cables or buses and, if present, the ext. 24 V supply	Please connect, starting with the protective conductor, the power cables or DC link buses and the external 24 V supply. Pay attention to EMC instructions when laying the cables. Please do not at this stage connect any control, communication, encoder and motor cables (exception: cable for connecting up an OP1S, if parameterization is to be effected via the OP1S).	See section "Connecting-up" and "Installation in Conformance with EMC Regulations"
Connect the control cables, communication cables, encoder cables and motor cables	Please connect the remaining control, communication, encoder and motor cables. Pay attention to the EMC instructions when laying the cables. **WARNING**  The device must be **disconnected** from its voltage supplies (24 V DC electronics supply and DC link / mains voltage) before the control and encoder leads are connected or disconnected! Failure to observe this advice can result in encoder defects, which may in turn cause uncontrolled axis movements.	See section "Connecting-up" and "Installation in Conformance with EMC Regulations"
Power up the external 24 V supply	After checking that the cabling has been correctly connected and that it sits properly, power up the external 24 V supply. After the electronics power supply has been started, the unit initializes itself. The action can take several seconds. The drive status is subsequently shown on the PMU.	

If necessary, carry out parameter reset to factory setting

If the PMU does not show status °009 after completion of the unit initialization, or if the unit has already been parameterized before, you should carry out a parameter reset to factory setting.

See section "Parameterization"

Parameterizing by download or with parameter modules

See section "Parameterization"

Function test

After checking the unit and the cabling once more, power up the line voltage and perform a function test according to your parameterization.

WARNING **It must be ensured that no danger for persons and equipment can occur by energizing the power and the unit. It is recommended not to couple the driven machine until the function test has been successfully completed.**

Further start-up and parameterization according to your specific requirements

5 Installation

5.1 Installing the units

WARNING

Safe converter operation requires that the equipment is mounted and commissioned by qualified personnel taking into account the warning information provided in these Operating Instructions.

The general and domestic installation and safety regulations for work on electrical power equipment (e.g. VDE, UL) must be observed as well as the professional handling of tools and the use of personal protective equipment.

Death, severe bodily injury or significant material damage could result if these instructions are not followed.

NOTE

MASTERDRIVES components are designed in accordance with degree of protection IP20 or IPXXB in accordance with EN 60529 and as open-type devices to UL 50, thus providing protection against electrical shocks. In order to also ensure protection against mechanical and climatic stresses the components have to be operated in housings/cabinets/rooms that are designed according to the requirements of' EN 60529 and classified as enclosure type to UL 50.

Clearances

When you install the equipment, make sure that the DC link connection is at the top and the motor connection is at the bottom.

The devices must be mounted side by side in close physical contact.

In order to ensure an adequate supply of cooling air, a clearance of 100 mm must be left at the top of the unit and at the bottom of the unit respectively to components which may considerably affect the flow of cooling air.

When mounting in cabinets, the cabinet cooling must be designed according to the power loss. Please refer to the Technical Data in this regard.

Requirements at the point of installation

- Foreign particles
  The units must be protected against the ingress of foreign particles as otherwise their function and operational safety cannot be ensured.
- Dust, gases, vapors
  Equipment rooms must be dry and dust-free. Ambient and cooling air must not contain any electrically conductive gases, vapors and dust which could diminish the functionality. If necessary, filters should be used or other corrective measures taken.
- Cooling air
  The units must only be operated in an ambient climate in accordance with DIN IEC 721-3-3 Class 3K3. For cooling air temperatures of more than 45 °C (113 °F) and installation altitudes higher than 1000 m, derating is required.

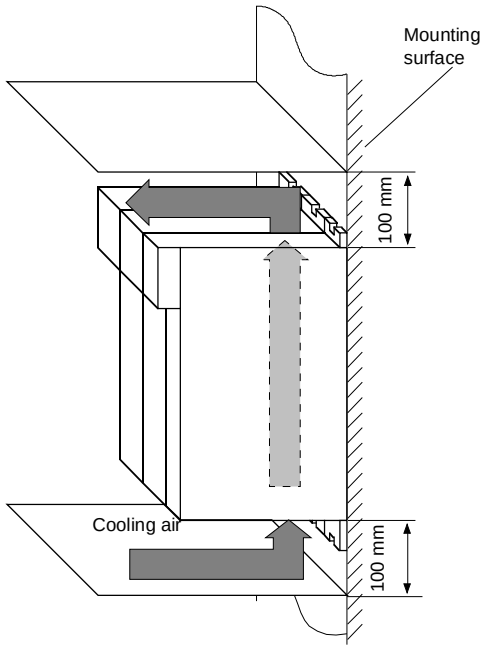


Fig. 5-1 Minimum clearances for cooling

Installation

The unit is mounted directly to a mounting surface. Fixing is by means of two or four M5 screws.

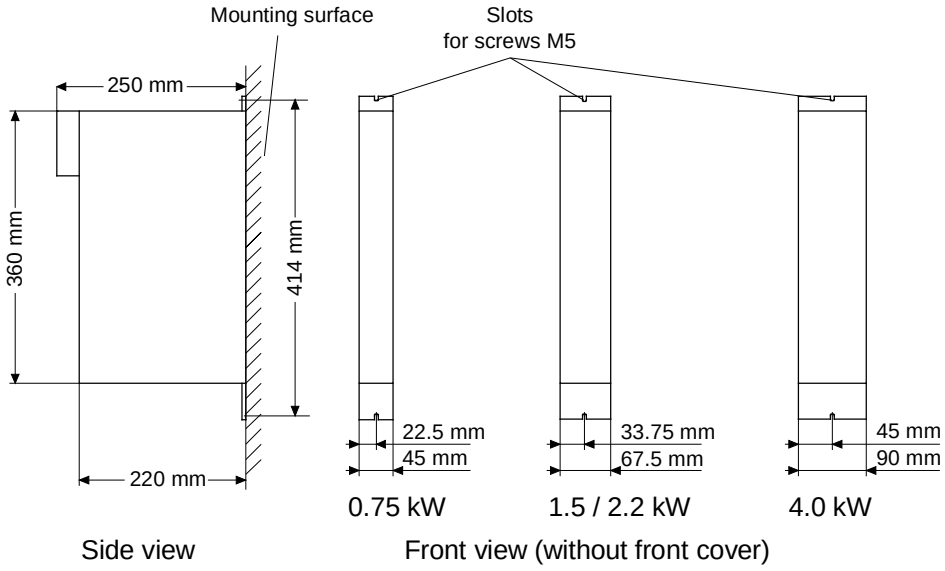


Fig. 5-2 Dimension drawings for housings up to 90 mm wide

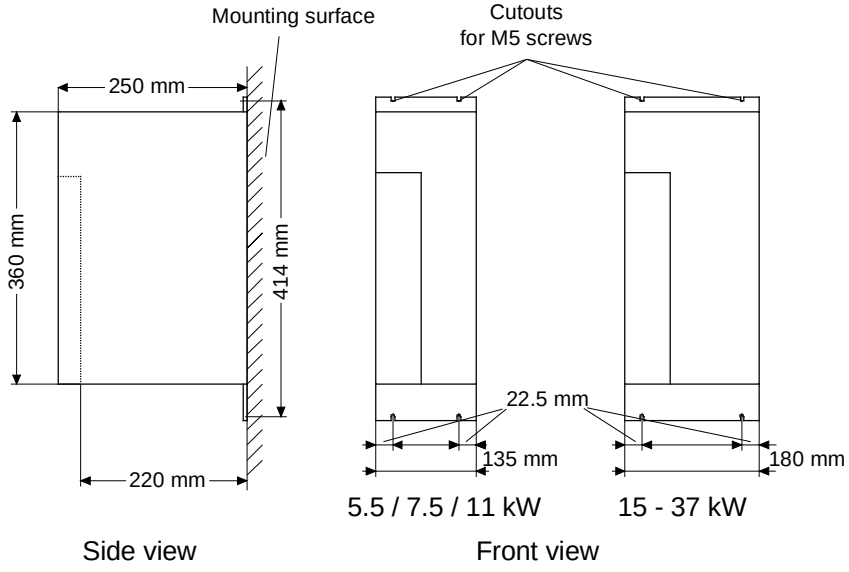


Fig. 5-3 Dimension drawings for housings 135 mm and 180 mm wide

5.2 Installing the optional boards

DANGER

The unit has hazardous voltage levels up to 5 minutes after it has been powered down due to the DC link capacitors. The unit or the DC link terminals must not be worked on until at least after this delay time.

5.2.1 Installing optional boards on units with a width up to 90 mm

Disconnect unit from power supply

DANGER

Disconnect the rectifier unit or the converter from the power supply and and switch OFF the unit. Remove the 24V power supply for the electronics. Take off all connecting leads.

Dismantling the unit

Dismantle the unit as follows:

- Open the terminals of the DC link bus module.
- Remove the fixing screws by means of which the unit is fixed to the mounting surface.
- Pull the unit down until the DC link bus module is completely exposed.
- Pull the unit out towards you.
- Lay the unit on its left side.

Opening the unit

- Unscrew the four fixing screws of the right-hand side wall. The fixing screws are on the unit at the top on the right and at the bottom on the right.
- You do not have to remove the four fixing screws completely, as the wall of the unit is provided with a cutout to enable you to swing out the cover once the screws have been loosened.
- Open the right-hand side wall. To open the side wall use a slotted screwdriver to lever out the front panel from its latches. The front panel only has to be loosened on one side of the side wall and can stay on the unit housing. Now the side wall can be removed upwards.

Removing the slot cover

- Remove the cover of the selected slot on the front panel.
- To do so, you must carefully cut through the four connecting points of the cover on the front panel with a thin knife.

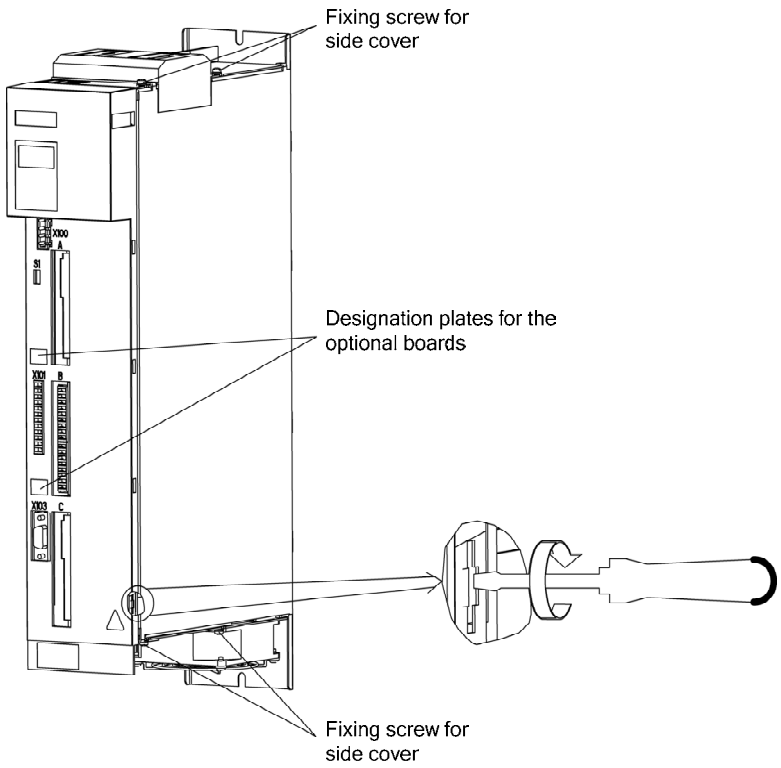


Fig. 5-4 Position of the fixing screws on the right-hand side wall

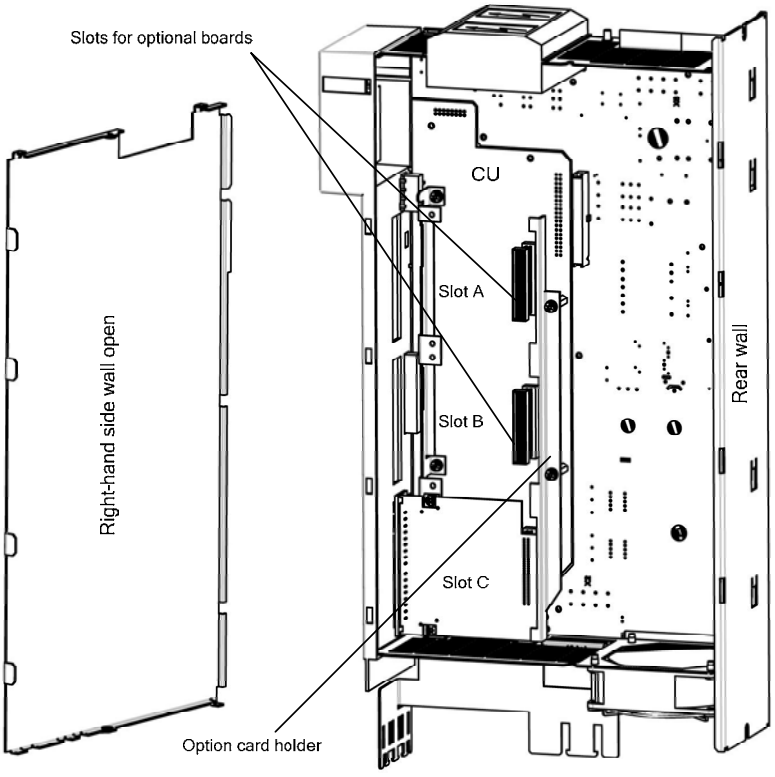


Fig. 5-5 Removing the right-hand side wall

Removing the option card holder

Remove the fixing screws of the option card holder from the pins and lift the option card holder from the device.

Installing the optional board

NOTICE

Optional boards can only be inserted in slot A and slot B. Slot C of the unit is permanently pre-assigned for the terminal module EBV.

- Push the optional board from behind into the opening on the front cover (①) until the position of the 64-pole system connector on the main board corresponds with the position of the socket.
- Insert the optional board from the right onto the 64-pole system connector on the main board (②). The view shows the installed state.
- Screw the optional board tight at the fastening points in the front section of the optional board (③).

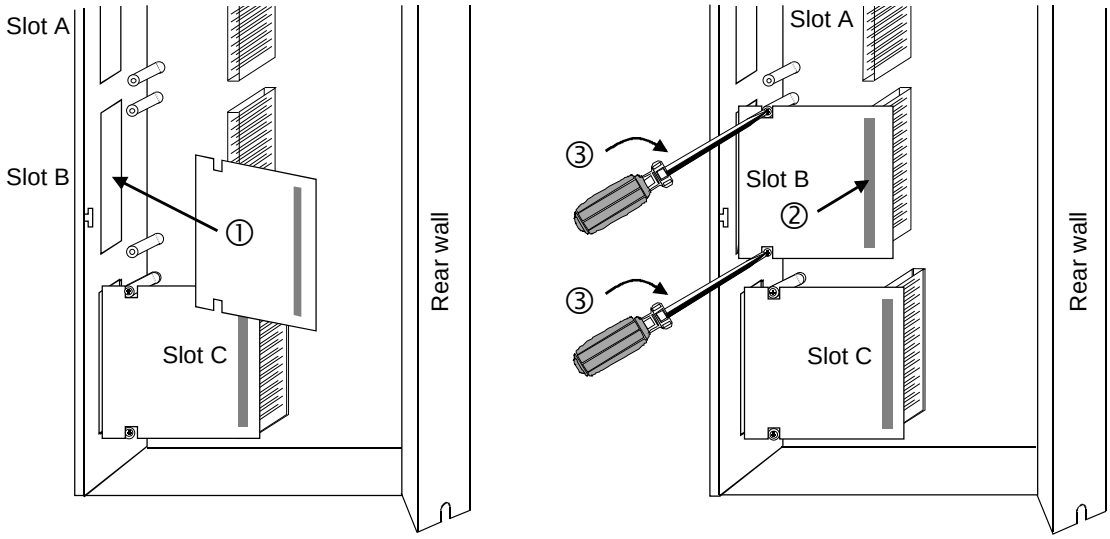


Fig. 5-6 Installing the optional board

Mounting the option card holder

Place the option card holder horizontally on the rear edge of all fitted option cards and tighten the previously removed screws at the fixing points.

Assembling and mounting the unit

Close the right-hand side wall of the unit as follows

- Press the front panel slightly to the side and insert the side wall from above into the unit. Make sure after inserting the side wall that the fixing lugs mounted at the top and bottom of the side wall are on the outside.
- Screw the side wall tight again by means of the four fixing screws.
- Place the unit on its rear wall.
- Press the front panel from above onto the now closed unit so that you can hear its latches engaging.

Mount the unit as follows:

- Insert the unit into its mounting position from the front underneath the DC link bus module.
- Lift the unit upwards until the DC link bus module is completely in its original position again.
- Screw the unit tight to the mounting surface with the fixing screws.
- Interlock the DC bus module.
- Re-connect all previously removed connecting cables.
- Check all connecting cables and the shield to make sure they sit properly and are in the correct position.

Designating the optional board

- To designate the optional board, insert the relevant designation plate into the envisaged position on the front of the unit.
- When the voltage has been switched in, the software of the unit recognizes which optional boards have been installed and you can then commence start-up.

5.2.2 Installing optional boards on units with a width of 135 mm and 180 mm

Disconnect unit from power supply

DANGER

Disconnect the rectifier unit or the converter from the power supply and and switch OFF the unit. Remove the 24V power supply for the electronics. Take off all connecting leads.

NOTE

Optional boards are mounted when the power section is already installed.

Disassemble device

- Open up the clamps of the DC link busbars.
- Remove the fixing screws which hold the device on the mounting surface.
- Pull the device down until the DC link busbars are fully exposed.
- Pull the device out toward the front.
- Place the device on an ESD compatible work station, rear panel down.

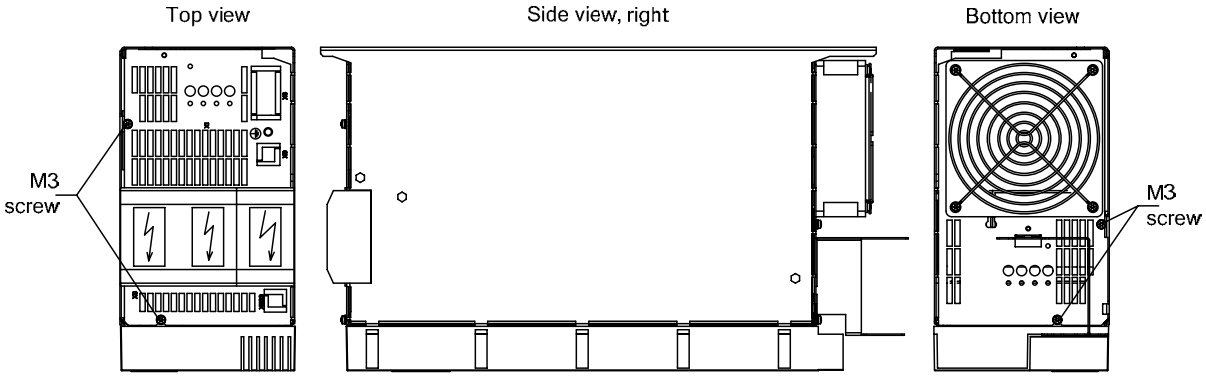


Fig. 5-7

Opening the unit

- For simpler disassembly, start with levering out the left one of the two housing chambers of the DC link terminals from the unit using a slot-head screwdriver.
- Unscrew the four fixing screws from the bottom and topside of the device. Carefully lever out the front cover from the five detent lugs on the right-hand side of the device using a slot-head screwdriver (see Detail A, Fig. 5-8). The front cover needs to be loosened only on one side, the right-hand side panel. Front cover and left-hand side panel remain as one unit.

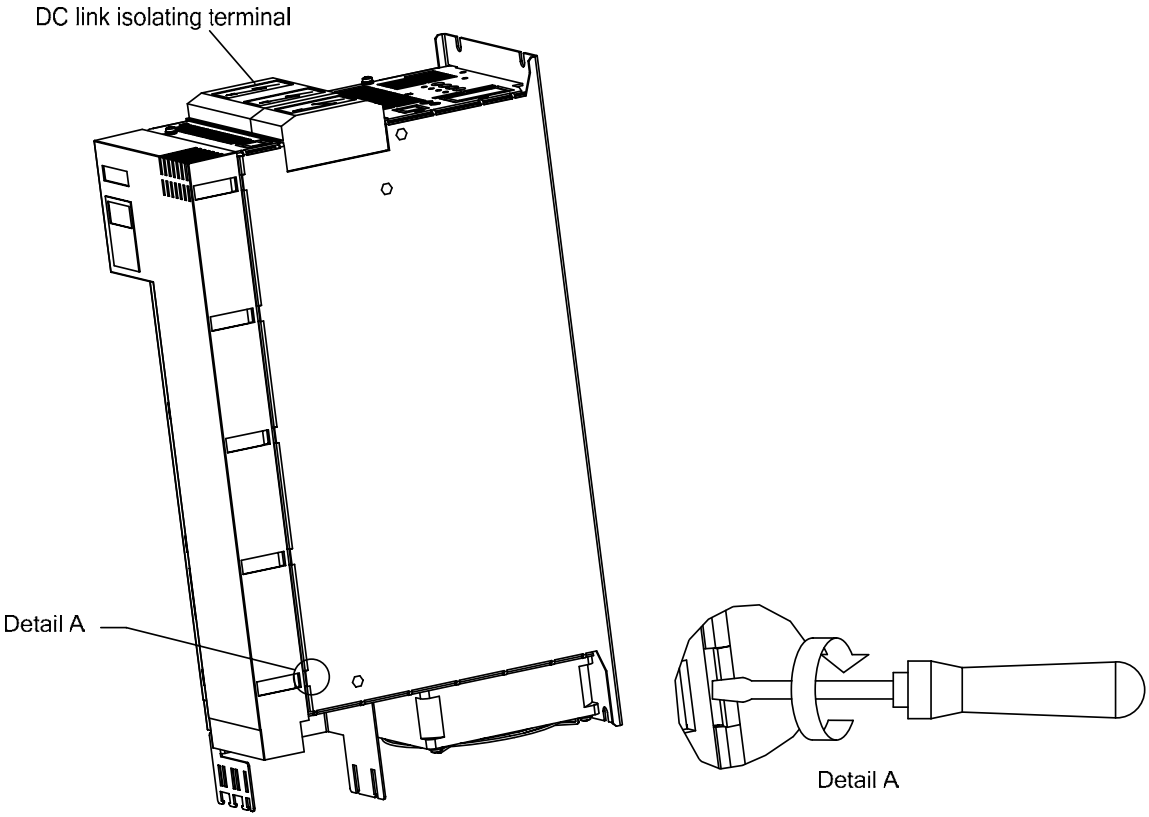


Fig. 5-8

- Carefully pull the device front including left side panel forward to the front (approx. 1 cm) so that the rear fold on the left-hand side panel can be loosened from the rear panel of the device as well as the front cover on the right-hand front panel from the housing (Fig. 5-9).
- You can then fold out the unit – consisting of front cover and left-hand side panel – to the left (Fig. 5-9).
- Open the locking levers of the ribbon cable on the power section which connects to the control electronics.
- Remove the front of the device together with electronics board and any additional options from the device.

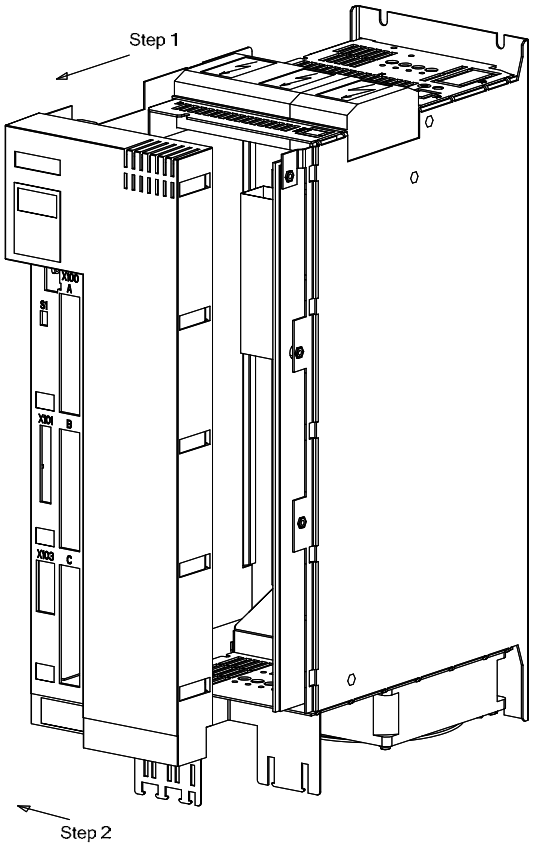


Fig. 5-9

Removing the slot cover

- Remove the cover of the selected slot on the front panel.
- To do so, you must carefully cut through the four connecting points of the cover on the front panel with a thin knife or remove the existing blind caps.

Removing the option card holder

- Remove the fixing screws of the option card holder from the pins and lift the option card holder from the device.

Removing the optional board

- Undo the two optional board screws by about one turn each.
- Loosen the connection between the system connector and the board so as to prevent any mechanical tension arising when the screws are fully unscrewed.
- Take out the optional board screws and remove the board.

Mounting the optional board

NOTICE

Optional boards can only be inserted in slot A and slot B. Slot C of the unit is permanently pre-assigned for the terminal module EBV.

- Insert the optional board from the behind the broken-out slot conver (①) until the position of the 64-pole system connector on the electronic board corresponds with the position of the socket.
- Insert the option board into the 64-pole system connector on the electronic board (②).
- Screw the optional board tight at the fastening points in the front section of the optional board with the two screws (③).

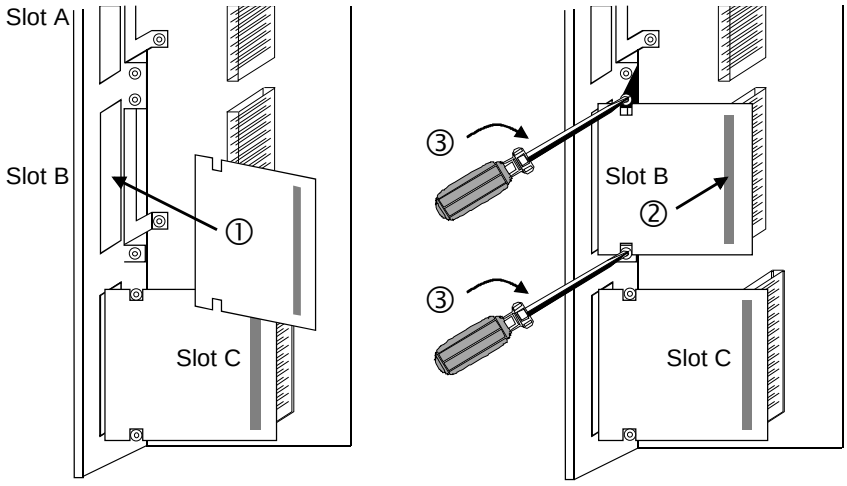


Fig. 5-10 Installing the optional board

Mounting the option card holder

- Place the option card holder horizontally on the rear edge of all fitted option cards and tighten the previously removed screws at the fixing points.

Reassemble device

- Place the front of the device with the electronics board to the left next to the device. Connect the ribbon cable again with the electronics board and the power section and close the lock on the connector.
- To start with, hold the front of the device with the left-hand side panel tilted to the right at an angle of approx. 30° and place this unit on the front of the device. Be careful not to damage the insulating film on the right-hand inner side panel and to position the left-hand side panel through the fixing lug correctly on the left housing side. Applying little pressure, you can then insert the front cover and the side panel in the housing, in parallel to the right-hand side panel. The fold on the left-hand side panel as well as the detent lugs on the right-hand side of the housing noticeably snap in.
- For less load on the connection points, put the device down on the right-hand side and screw in the two screws each on the top and bottom-side of the device for some turns only. Now tighten all four screws.
- Now replace the housing of the DC link busbars until it noticeably snaps in.

Mount device

- Push the device from the front, below the DC link busbars, to its mounting position.
- Lift the device until the DC link busbars are fully connected again.
- Screw in the fixing screws to firmly tighten the device onto the mounting surface.
- Lock in the DC link busbars.

Connecting up the unit

- Re-connect all previously removed connecting cables.
- Check all connecting cables and the shield to make sure they sit properly and are in the correct position.

Designating the optional board

- To designate the optional board, insert the relevant designation plate into the envisaged position on the front of the unit.
- After powering up the voltage, you can log on the optional boards in the software of the unit and commence start-up.

6 Installation in Conformance with EMC Regulations

Basic EMC rules

Rules 1 to 13 are generally applicable. Rules 14 to 20 are particularly important for limiting noise emission.

Rule 1 All of the metal cabinet parts must be connected through the largest possible surface areas (not paint on paint). If required, use serrated washers. The cabinet door must be connected to the cabinet through grounding straps which must be kept as short as possible.

NOTE Grounding installations/machines is essentially a protective measure. However, in the case of drive systems, this also has an influence on the noise emission and noise immunity. A system can either be grounded in a star configuration or each component grounded separately. Preference should be given to the latter grounding system in the case of drive systems, i.e. all parts of the installation to be grounded are connected through their surface or in a mesh pattern.

Rule 2 Signal cables and power cables must be routed separately (to eliminate coupled-in noise). Minimum clearance: 20 cm. Provide partitions between power cables and signal cables. The partitions must be grounded at several points along their length.

Rule 3 Contactors, relays, solenoid valves, electromechanical operating hours counters, etc. in the cabinet must be provided with quenching elements, for example, RC elements, diodes, varistors. These quenching devices must be connected directly at the coil.

Rule 4 Non-shielded cables associated with the same circuit (outgoing and incoming conductor) must be twisted, or the surface between the outgoing and incoming conductors kept as small as possible in order to prevent unnecessary coupling effects.

Rule 5 Eliminate any unnecessary cable lengths to keep coupling capacitances and inductances low.

Rule 6 Connect the reserve cables/conductors to ground at both ends to achieve an additional shielding effect.

Rule 7 In general, it is possible to reduce the noise being coupled-in by routing cables close to grounded cabinet panels. For this reason the wiring should not be installed freely in the cabinet but should be routed close to the mounting plate. The same applies for reserve cables/conductors.

Rule 8 Tachometers, encoders or resolvers must be connected through a shielded cable. The shield must be connected to the tachometer, encoder or resolver and at the SIMOVERT MASTERDRIVES through a large surface area. The shield must not be interrupted, e.g. using intermediate terminals. Pre-assembled cables with multiple shields should be used for encoders and resolvers (see Catalog DA65).

Rule 9

The cable shields of digital signal cables must be connected to ground at both ends (transmitter and receiver) through the largest possible surface area. If the equipotential bonding is poor between the shield connections, an additional equipotential bonding conductor with at least 10 mm² must be connected in parallel to the shield, to reduce the shield current. Generally, the shields can be connected to ground (= cabinet housing) in several places. The shields can also be connected to ground at several locations, even outside the cabinet.

Foil-type shields are not to be favoured. They do not shield as well as braided shields; they are poorer by a factor of at least 5.

Rule 10

The cable shields of **analog** signal cables can be connected to ground at both ends if the equipotential bonding is good. Good equipotential bonding is achieved if Rule 1 is observed.

If low-frequency noise occurs on analog cables, for example: speed/measured value fluctuations as a result of equalizing currents (hum), the shields are only connected for analog signals at one end at the SIMOVERT MASTERDRIVES. The other end of the shield should be grounded through a capacitor (e.g. 10 nF/100 V type MKT). However, the shield is still connected at both ends to ground for high frequency as a result of the capacitor.

Rule 11

If possible, the signal cables should only enter the cabinet at one side.

Rule 12

If SIMOVERT MASTERDRIVES are operated from an external 24 V power supply, this power supply must not feed several consumers separately installed in various cabinets (hum can be coupled-in!). The optimum solution is for each SIMOVERT MASTERDRIVE to have its own power supply.

Rule 13

Prevent noise from being coupled-in through the supply.

SIMOVERT MASTERDRIVES and automation units/control electronics should be connected-up to different supply networks. If there is only one common network, the automation units/control electronics have to be de-coupled from the supply using an isolating transformer.

Rule 14

The use of a radio interference suppression filter is obligatory to maintain limit value class "First environment" or "Second environment", even if sinusoidal filters or dv/dt filters are installed between the motor and SIMOVERT MASTERDRIVES.

Whether an additional filter has to be installed for further consumers, depends on the control used and the wiring of the remaining cabinet.

Rule 15

A noise suppression filter should always be placed close to the fault source. The filter should be connected to the mounting plate etc. over a large surface area. A bare metal mounting panel (e.g. manufactured from stainless steel, galvanized steel) is best, as electrical contact is established through the entire mounting surface. If the mounting panel is painted, the paint has to be removed at the screw mounting points for the frequency converter and the noise suppression filter to ensure good electrical contact.

To limit the interference emission the cables between the filter output, the line commutating reactor and the converter should be shielded.

The incoming and outgoing cables of the radio interference suppression filter have to be spatially separated/isolated.

Rule 16

In order to limit the noise emitted, all variable-speed motors have to be connected-up using shielded cables, with the shields being connected to the respective housings at both ends in a low-inductive manner (through the largest possible surface area). The motor feeder cables also have to be shielded inside the cabinet or at least shielded using grounded partitions. Suitable motor feeder cable e.g. Siemens PROTOFLEX-EMV-CY (4 x 1.5 mm^2 ... 4 x 120 mm^2) with Cu shield. Cables with steel shields are unsuitable.

A suitable PG gland with shield connection can be used at the motor to connect the shield. It should also be ensured that there is a low-impedance connection between the motor terminal box and the motor housing. If required, connect-up using an additional grounding conductor. **Do not use plastic motor terminal boxes!**

Rule 17

A line reactor has to be installed between the radio interference suppression filter and the SIMOVERT MASTERDRIVES.

Rule 18

The line supply cable has to be spatially separated from the motor feeder cables, e.g. by grounded partitions.

Rule 19

The shield between the motor and SIMOVERT MASTERDRIVES must not be interrupted by the installation of components such as output reactors, sinusoidal filters, dv/dt filters, fuses, contactors. The components must be mounted on a mounting panel which simultaneously serves as the shield connection for the incoming and outgoing motor cables. Grounded partitions may be necessary to shield the components.

Rule 20

In order to limit the radio interference (especially for limit value class "First environment "), in addition to the line supply cable, all cables externally connected to the cabinet must be shielded.

Examples of these basic rules:

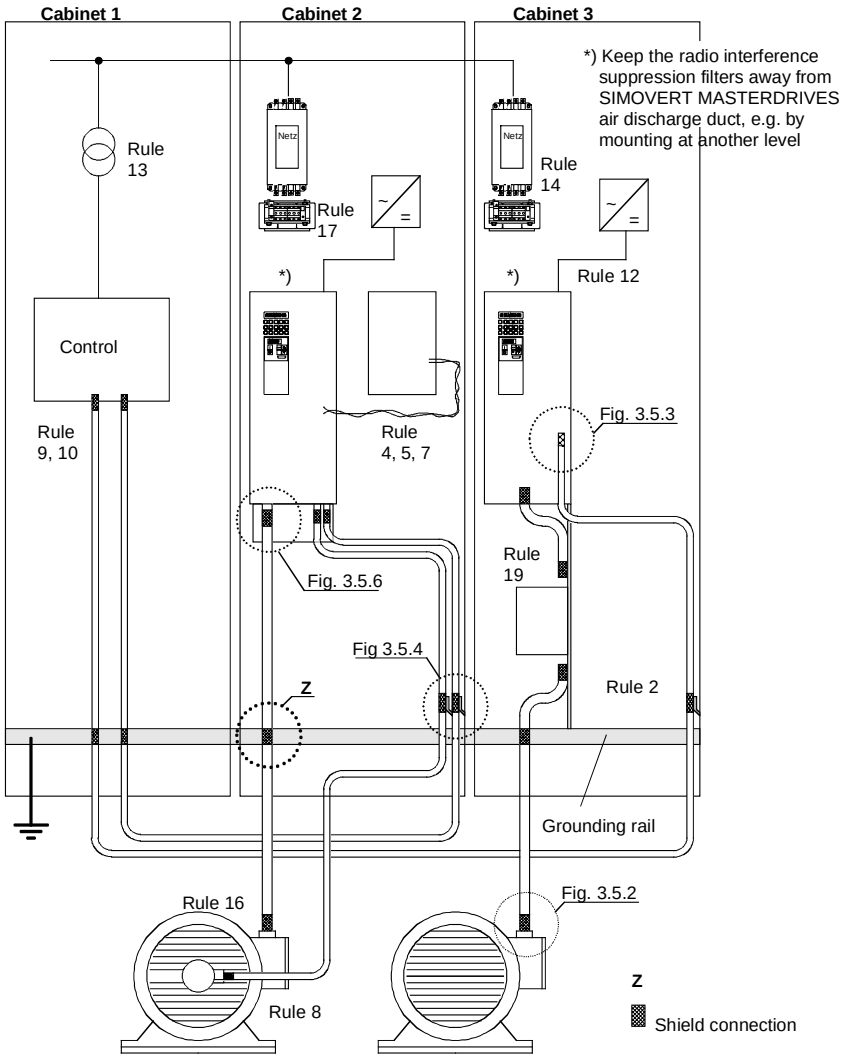


Fig. 6-1 Examples for applying the basic EMC rules

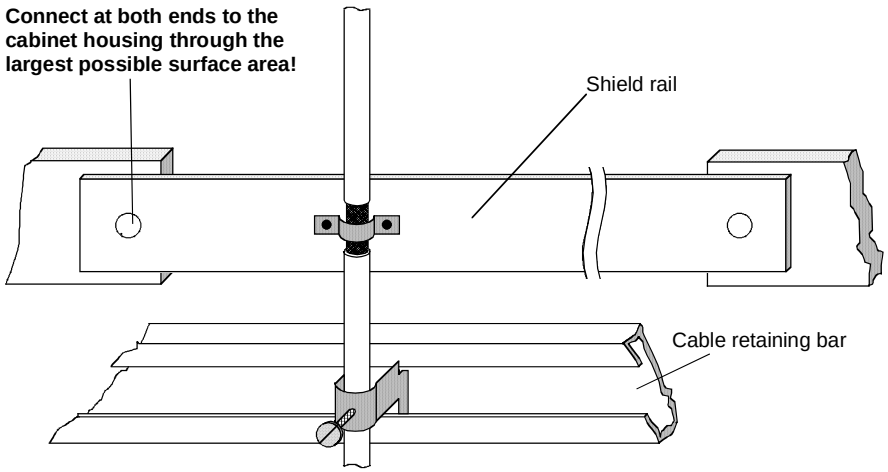


Fig. 6-2 Connecting the motor cable shield where the cable enters the cabinet

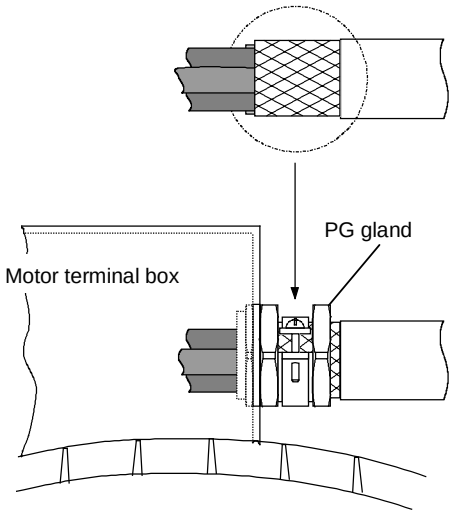


Fig. 6-3 Shield connection at the motor

The shield can be connected through a PG or metric gland (nickel-plated brass) with a strain relief bar. Thus, the degree of protection IP 20 can be achieved.

For higher degrees of protection (up to IP 68), there are special PG glands with shield connection, e.g.:

- SKINDICHT SHVE, Messrs. Lapp, Stuttgart
- UNI IRIS Dicht or UNI EMV Dicht, Messrs. Pflitsch, Hückeswagen

It is not permissible to use plastic motor terminal boxes!

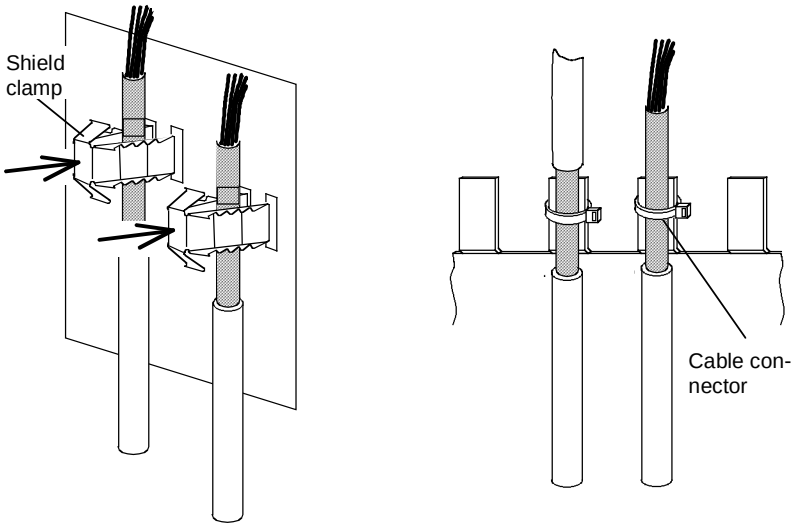


Fig. 6-4 Connecting the signal cable shields for SIMOVERT MASTERDRIVES

- Every SIMOVERT MASTERDRIVES has shield clamps to connect the signal cable shields.
- For chassis units (sizes ≥ E), the shields can be additionally connected using cable connectors at the shield connecting locations.

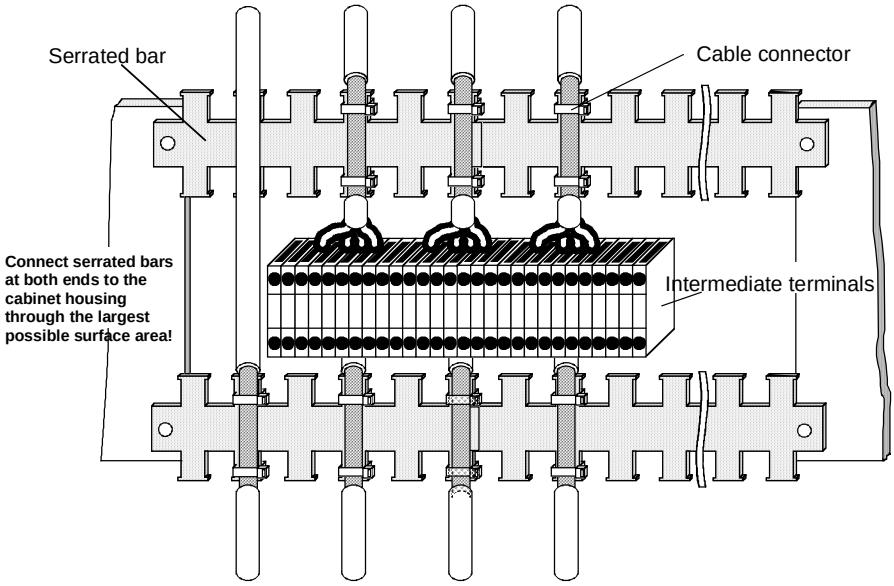


Fig. 6-5 Connecting signal cable shields in the cabinet

Wherever possible, intermediate terminals should not be used as they reduce the shielding effect!

7 Connecting-up

DANGER

SIMOVERT MASTERDRIVES units are operated at high voltages.
The equipment must be in a no-voltage condition (disconnected from the supply) before any work is carried out!
Only professionally trained, qualified personnel must work on or with the units.
Death, severe bodily injury or significant property damage could occur if these warning instructions are not observed.

Hazardous voltages are still present in the unit up to 5 minutes after it has been powered down due to the DC link capacitors. Thus, the appropriate delay time must be observed before working on the unit or on the DC link terminals.

The power terminals and control terminals can still be live even when the motor is stationary.
If the DC link voltage is supplied centrally, the converters must be reliably isolated from the DC link voltage!

When working on an opened unit, it should be observed that live components (at hazardous voltage levels) can be touched (shock hazard).

The user is responsible that all the units are installed and connected-up according to recognized regulations in that particular country as well as other regionally valid regulations. Cable dimensioning, fusing, grounding, shutdown, isolation and overcurrent protection should be particularly observed.

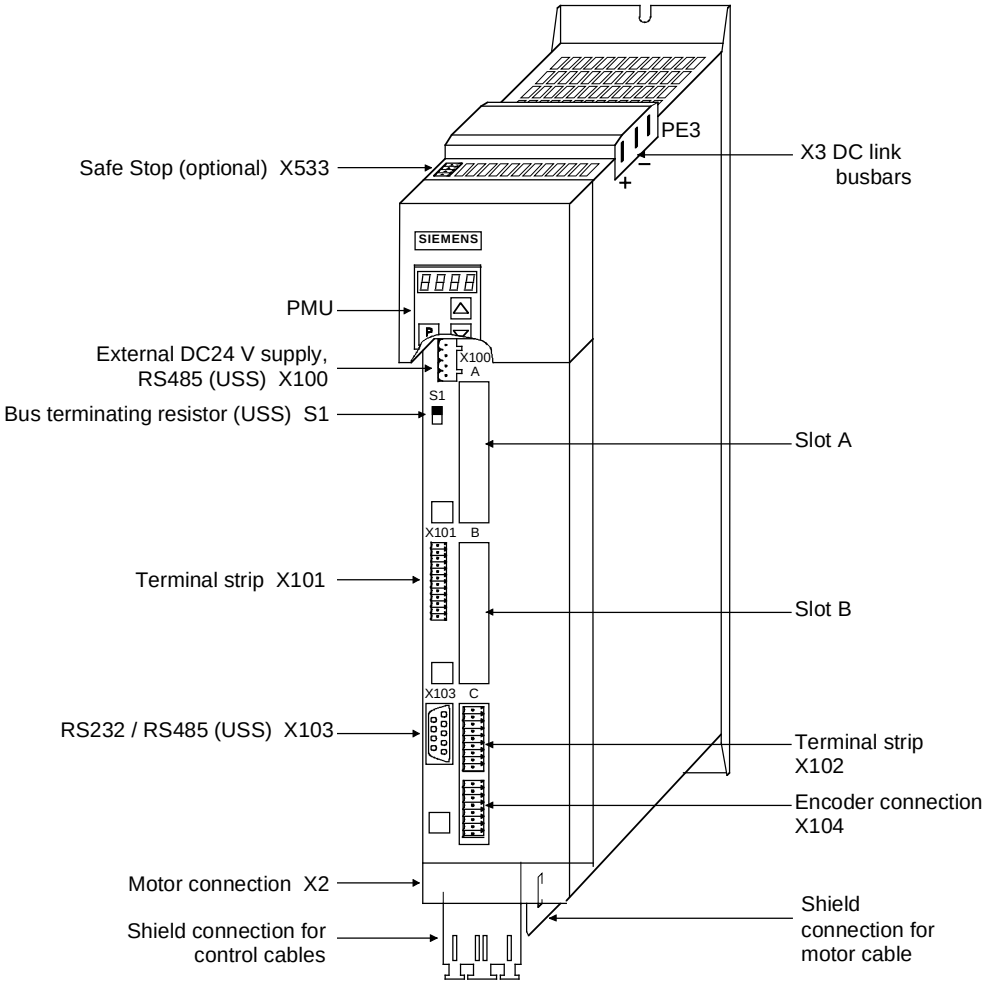


Fig. 7-1 Connection overview of units up to 90 mm wide

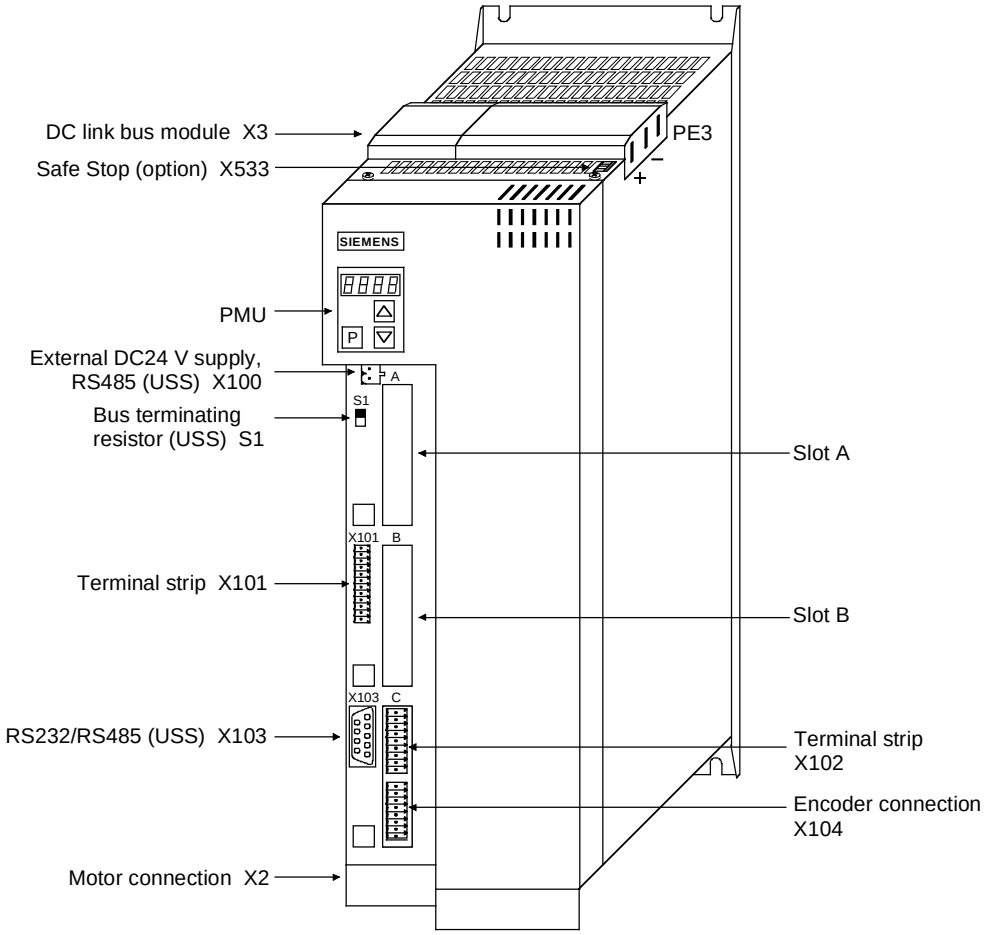


Fig. 7-2 Connection overview of units 135 mm wide

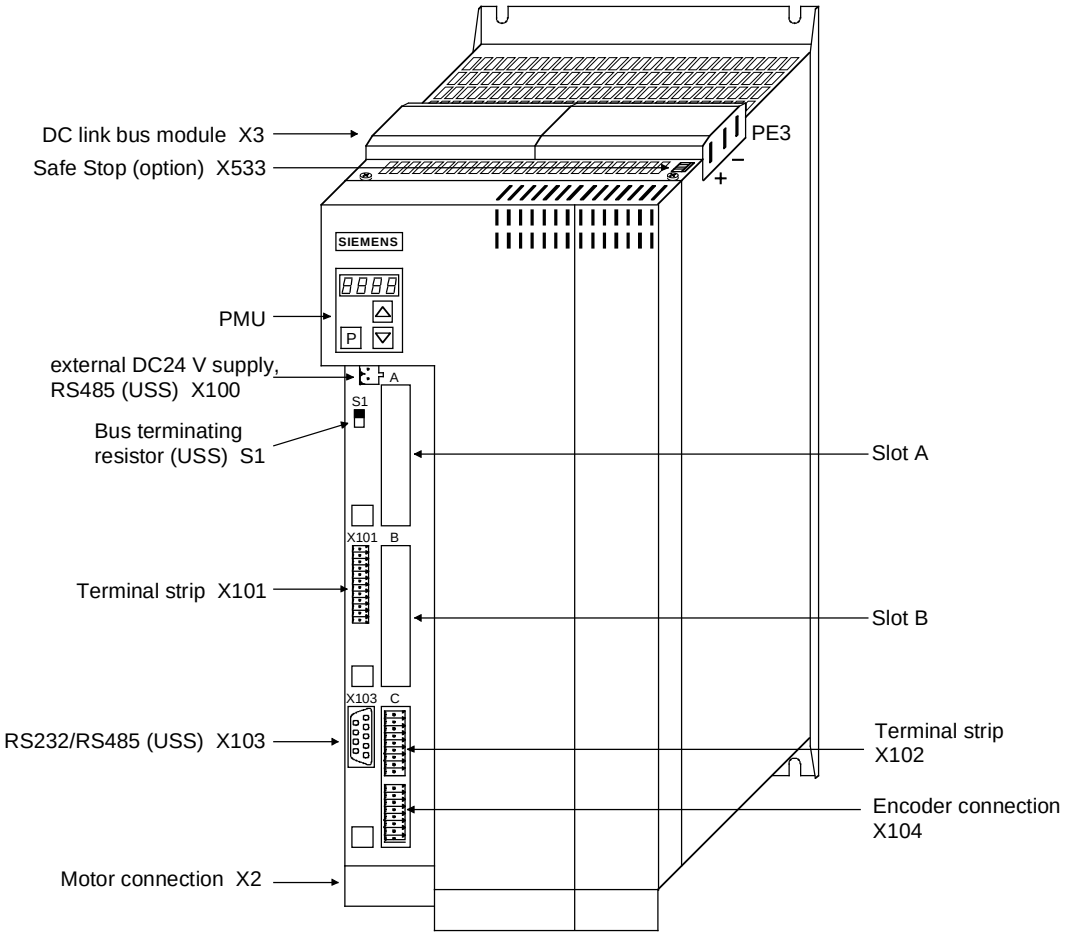


Fig. 7-3 Connection overview of units 180 mm wide

7.1 Power connections

WARNING

Protective conductor

The protective conductor must be connected up both on the mains side and on the motor side.

On account of leakage current through the interference-suppression capacitors the following must be observed as per EN 50178

- A minimum cross-section of 10 mm^2 Cu must be used or
- If supply connections with cross-sections less than 10 mm^2 are used, two protective conductors have to be connected up. The cross-section of each of the protective conductors corresponds to the cross-section of an outer conductor.

NOTE

If the unit is mounted on a grounded mounting surface via a conductive connection, the protective conductor cross section can be the same as that of the phase conductor. The function of the second protective conductor is afforded by the grounded mounting surface.

7.1.1 Power connections for units with a width up to 90 mm

Protective conductor

On top of the unit behind the DC link connection X3 is an extra protective conductor connection in the form of a threaded M4 bolt. This is used for connecting up the second protective conductor in accordance with EN 50178.

X3 - DC link bus module

The DC link bus module serves to supply the unit with electrical energy.

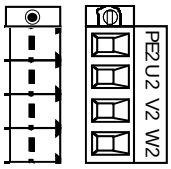
Bar	Designation	Meaning	Range
3	PE3	Protective conductor connection	
2	D / L-	DC link voltge -	DC 510 - 650 V
1	C / L+	DC link voltage +	DC 510 - 650 V

Connectable cross-section: "Electro-plated copper" 3x10 mm, rounded off according to DIN 46433 (EN 13601)

Bar 1 is at the front when installed.

Table 7-1 DC link busbars

X2 – Motor connection



The motor connection is located at the lower section of the unit.

Terminal	Meaning	Range
PE2	Protective conductor connection	
U2	Phase U2 / T1	3 AC 0 V - 480 V
V2	Phase V2 / T2	3 AC 0 V - 480 V
W2	Phase W2 / T3	3 AC 0 V - 480 V

Connectable cross-section: 4 mm^2 (AWG 10), stranded

Terminal PE2 is at the front when installed.

Table 7-2 Motor connection

The motor cables must be dimensioned in accordance with VDE 298, Part 2.

After installation of the connector, the shield of the motor cable must be fixed to the shield plate through a large surface area.

CAUTION

The connector has to be screwed firmly to the housing (providing resistance to vibration and protecting against being inadvertently withdrawn).

7.1.2 Power connections for units with a width of 135 mm and 180 mm

X3 - DC link bus module

The DC link bus module serves to supply the unit with electrical energy.

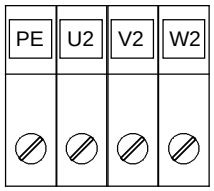
Bar	Designation	Meaning	Range
3	PE3	Protective conductor connection	
2	D / L-	DC link voltge -	DC 510 - 650 V
1	C / L+	DC link voltage +	DC 510 - 650 V

Connectable cross-section: "Electro-plated copper" 3x10 mm, rounded off according to DIN 46433 (EN 13601)

Bar 1 is at the front when installed.

Table 7-3 DC link busbars

X2 – Motor connection ≤ 18 kW



The motor connection is to a terminal block at the bottom of the unit.

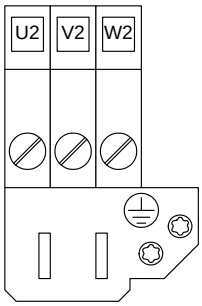
Terminal	Meaning	Range
PE	Protective conductor connection	
U2 / T1	Phase U2 / T1	3AC 0 V - 480 V
V2 / T2	Phase V2 / T2	3AC 0 V - 480 V
W2 / T3	Phase W2 / T3	3AC 0 V - 480 V

Connectable cross-section:
Housing width 135 mm: 10 mm² (AWG 8), stranded
Housing width 180 mm: 16 mm² (AWG 6), stranded

Viewed from the front, Terminal PE is at the left.

Table 7-4 Motor connection

X2 – Motor connection ≥ 22 kW



The motor connection is to a terminal block at the bottom of the unit.

Terminal	Meaning	Range
⏚	Protective conductor connection	
U2 / T1	Phase U2 / T1	3AC 0 V - 480 V
V2 / T2	Phase V2 / T2	3AC 0 V - 480 V
W2 / T3	Phase W2 / T3	3AC 0 V - 480 V

Connectable cross-section:
Maximum cross-section: 50 mm² (AWG 1/0),
Minimum cross-section: 10 mm² (AWG 6)

Terminal PE is at bottom right on the shield.

Table 7-5 Motor connection

The motor cables must be dimensioned in accordance with VDE 298, Part 2.
After installation of the connector, the shield of the motor cable must be fixed to the shield plate through a large surface area.

7.2 Control connections

Standard connections

The basic version of the unit is provided with the following control connections:

- external 24V supply, USS bus connection (RS485)
- serial interface for PC or OP1S
- control terminal strip.

WARNING

The device must be disconnected from its voltage supplies (24 V DC electronics supply **and** mains voltage) before the control and encoder leads are connected or disconnected!

Failure to observe this advice can result in encoder defects, which may in turn cause uncontrolled axis movements.

WARNING

The external 24 V infeed and all circuits connected to the control terminals must meet the requirements for safety separation as stipulated in EN 50178 (PELV circuit = Protective Extra Low Voltage).

CAUTION

The external 24 V supply must be protected by an m.c.b. in order to prevent the overloading of printed conductors / components in the event of a device defect (e.g. a short circuit in the control electronics or a wiring fault).

Fuse –F1,F2 m.c.b. 6 A , tripping characteristic C, Siemens 5SX2 106-7.

(For wiring information, see supplementary sheet supplied with rectifier unit or converter and Fig. 7-4).

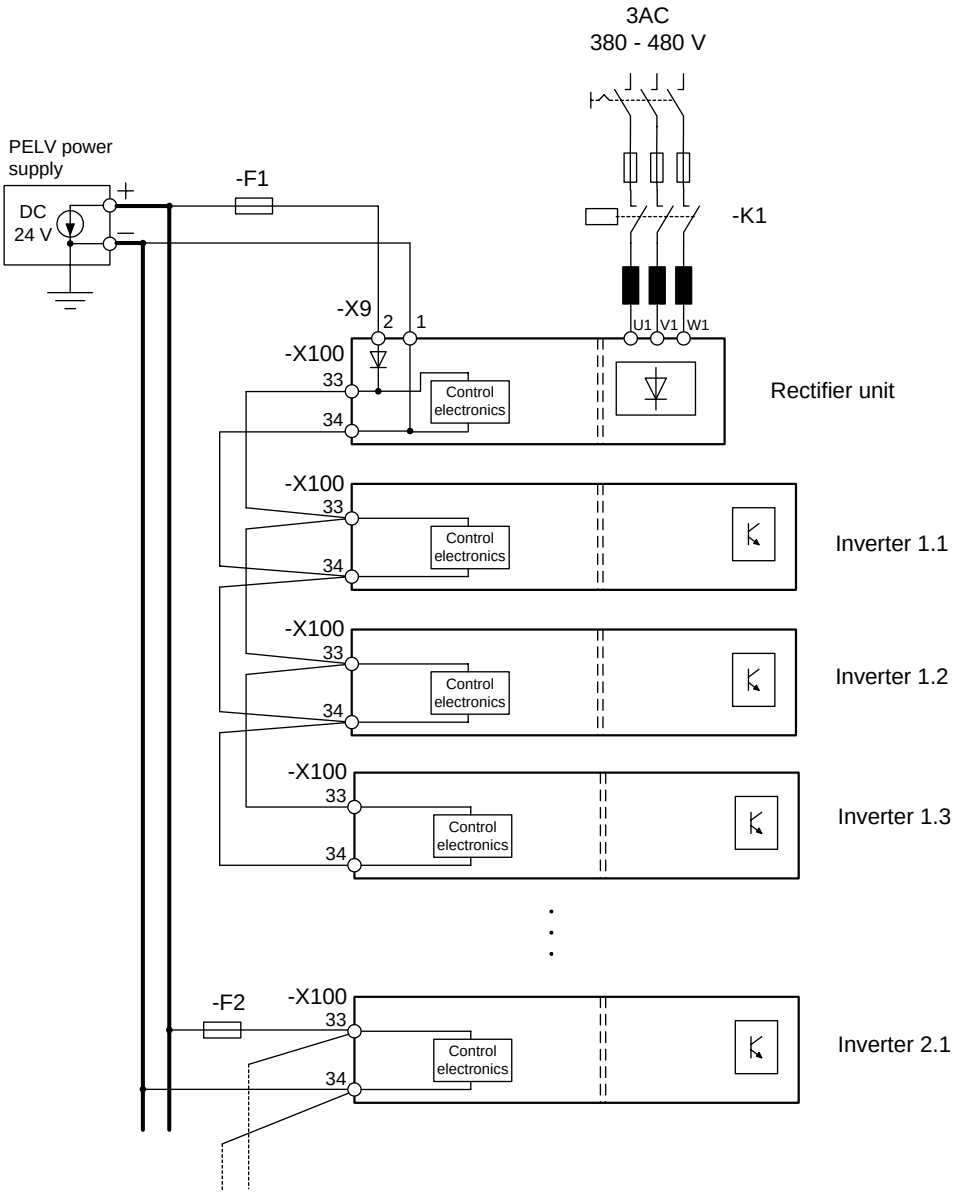


Fig. 7-4 Sectional drive with rectifier unit and inverters

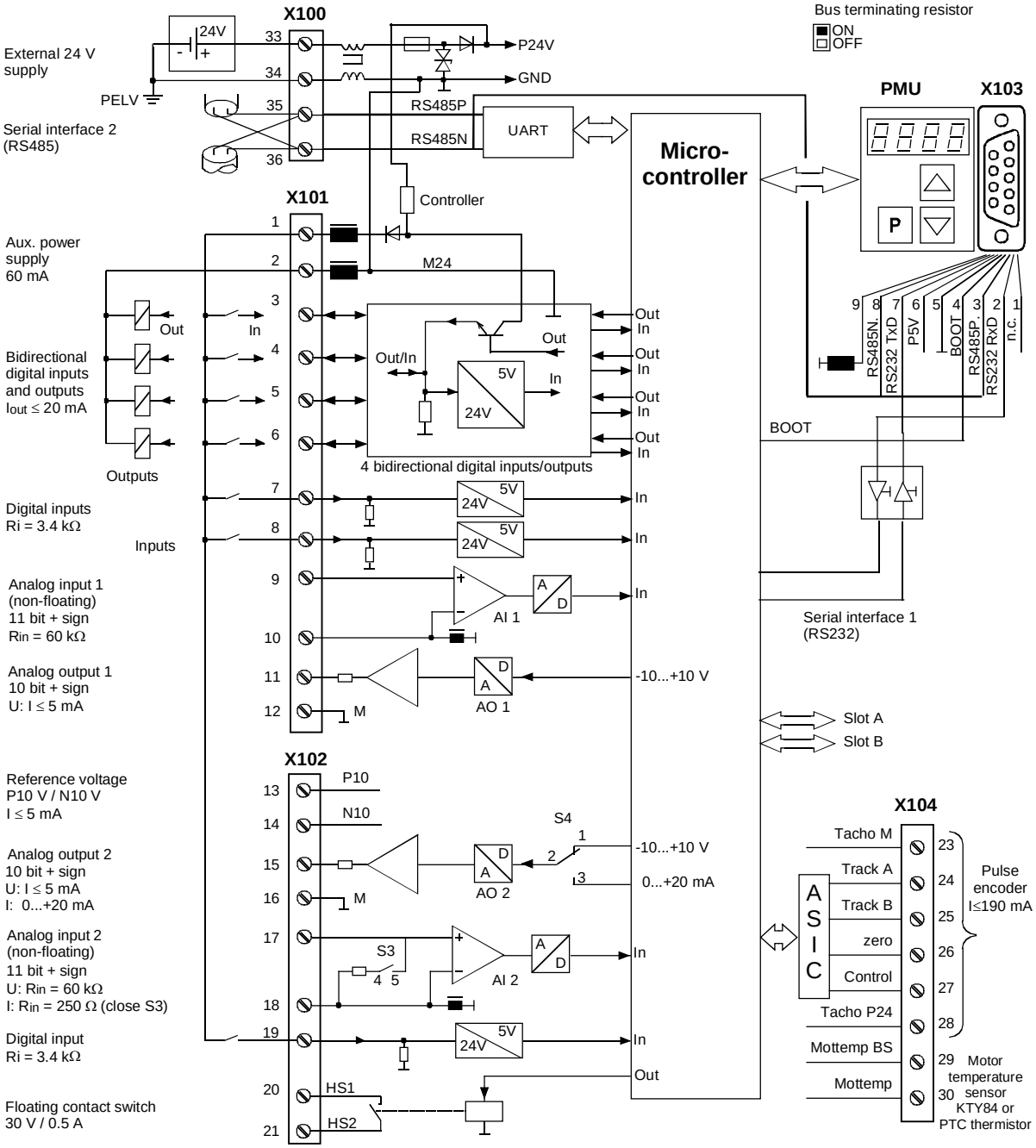


Fig. 7-5 Overview of the standard connections

Switch settings

Switch	Meaning
S3 (4,5,6)	**AI2: Switching between current/voltage input**
• Jumper 5,6	• Voltage input (default setting)
• Jumper 4,5	• Current input
S4 (1,2,3)	**AO2: Switching between current/voltage output**
• Jumper 1,2	• Voltage output (default setting)
• Jumper 2,3	• Current output

To set switches S3 and S4 on units with a width of up to 90 mm, the side wall has to be removed; on units with a width of more than 90 mm, the front cover has to be removed. See Chapter 5.2 "Installing the optional boards".

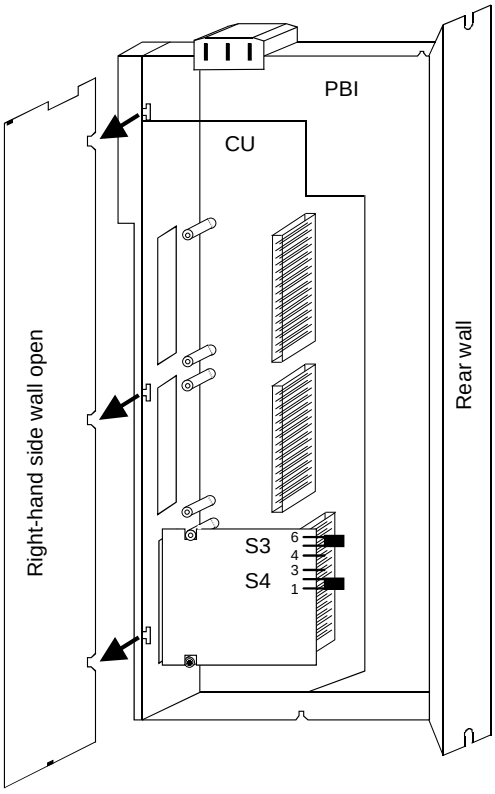


Fig. 7-6 Setting of switches S3 and S4

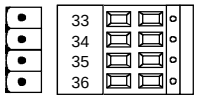
X100 - external DC24 V supply, USS bus

The 4-pole terminal strip serves to connect the external 24 V DC power supply (supply from the supply unit or an AC/AC converter) and for connecting a USS bus.

The USS bus connection is linked to the control electronics and the 9-pole Sub-D socket of the serial interface X103.

The bus terminating resistor can be switched in via switch S1 as required. The bus termination is inactive when the switch is in the lower position.

The termination has to be switched in whenever the unit is located at one end of the USS bus.



Terminal	Designation	Significance	Range
33	+24 V (in)	24 V DC power supply	20 - 30 V
34	0 V	Reference potential	0 V
35	RS485P (USS)	USS bus connection	RS485
36	RS485N (USS)	USS bus connection	RS485

Connectable cross-section: 2.5 mm² (AWG 12)

Terminal 33 is at the top when installed.

Table 7-6 External 24 V supply, USS bus

The unit draws a current of 1 A from the 24 V power supply. When optional boards are plugged in, this increases to a maximum of 1.6 A.

NOTICE

The RS485 interface can be operated either via -X100 **or** -X103.

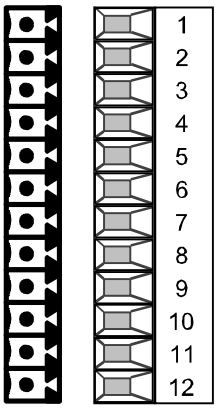
X101 - Control terminal strip

The following connections are provided on the control terminal strip:

- 4 combined digital inputs and outputs
- 2 additional digital inputs
- 1 analog input
- 1 analog output
- 24 V auxiliary voltage supply (max. 60 mA, output only!) for the inputs.

WARNING

If the digital inputs are supplied by an external 24 V voltage supply, it must be referred to ground terminal X101.2. Terminal X101.1 (P24 AUX) **must not** be connected to the external 24 V supply.



Terminal	Designation	Meaning	Range
1	P24 AUX	Aux. voltage supply	DC 24 V / 60 mA
2	M24 AUX	Reference potential	0 V
3	DIO1	Digital input/output 1	24 V, 10 mA / 20 mA
4	DIO2	Digital input/output 2	24 V, 10 mA / 20 mA
5	DIO3	Digital input/output 3	24 V, 10 mA / 20 mA
6	DIO4	Digital input/output 4	24 V, 10 mA / 20 mA
7	DI5	Digital input 5	24 V, 10 mA
8	DI6	Digital input 6	24 V, 10 mA
9	AI+	Analog input +	11 bit + sign differential input:
10	AI–	Analog input –	± 10 V / Ri = 40 kΩ
11	AO	Analog output	10 bit + sign ± 10 V / 5 mA
12	M AO	Ground analog output	

Connectable cross-section: 0.14 mm² to 1.5 mm² (AWG 16)

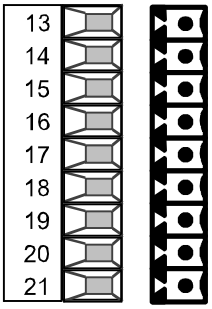
Terminal 1 is at the top when installed.

Table 7-7 Control terminal strip X101

In the case of digital inputs, levels below 3 V are interpreted as low and levels above 13 V as high.

X102 - Control terminal strip

- 10 V auxiliary voltage (max. 5 mA) for supplying external potentiometers
- Analog output, suitable for use as current or voltage output
- 1 analog input, suitable for use as current or voltage input
- 1 additional digital input
- 1 floating NO contact



Terminal	Designation	Meaning	Range
13	P10 V	+ 10 V supply for ext. potentiometers	+ 10 V ± 1.3 % I_{max} = 5 mA
14	N10 V	– 10 V supply for ext. potentiometers	– 10 V ± 1.3 % I_{max} = 5 mA
15	AO2	Analog output 2	10 bit + sign Voltage:
16	M AO2	Ground for analog output 2	± 10 V / I_{max} = 5 mA Current: 0...20 mA R ≤ 500 Ω
17	AI2	Analog input 2	11 bit + sign Voltage:
18	M AI2	Ground for analog input 2	± 10 V / Ri = 60 kΩ Current: Rin = 250 Ω
19	DI7	Digital input 7	24 V, 10 mA
20	HS1	NO contact	DC 30 V / max. 0.5 A
21	HS2	(floating)	Minimum load 7 mA

Connectable cross-section: 0.14 mm^2 to 1.5 mm^2 (AWG 16)

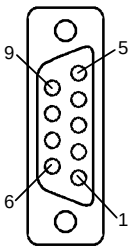
Table 7-8 Control terminal strip X102

X103 - Serial interface

It is possible to connect either an OP1S or a PC with RS232 or RS485 serial interface via the 9-pole SUB D socket. There are different connecting cables for the PC for the various transmission protocols.

The 9-pole SUB D socket is internally coupled with the USS bus, thus enabling data exchange with other nodes linked via the USS bus.

This interface is also used for loading software.



Pin	Designation	Meaning	Range
1	RS232 ID	Changeover to RS232 protocol	Low active
2	RS232 RxD	Receive data via RS232	RS232
3	RS485 P	Data via RS485 interface	RS485
4	Boot	Control signal for software update	Low active
5	M5 AUX	Reference potential to P5V	0 V
6	P5V	5 V aux. voltage supply	+5 V, max. 200 mA
7	RS232 TxD	Transmit data via RS232	RS232
8	RS485 N	Data via RS485 interface	RS485
9	M_RS232/485	Digital ground (choked)	

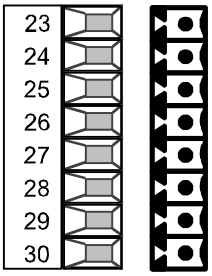
Table 7-9 Serial interface

NOTICE

The RS485 interface can be operated either via -X100 or -X103.

X104 – Control terminal strip

The control terminal strip includes a connection for a pulse generator (HTL unipolar) and the motor temperature evaluation circuit with KTY or PTC.



Terminal	Designation	Meaning	Range
23	$-V_{PP}$	Ground for power supply	
24	Track A	Connection track A	HTL unipolar; $L \leq 3$ V, $H \geq 8$ V
25	Track B	Connection track B	
26	Zero pulse	not evaluated	
27	CTRL	Connection control track	
28	$+V_{PP}$	Pulse generator power supply	24 V I_{max} = 190 mA
29	– Temp	Minus (–) terminal KTY84/PTC	KTY84: 0...200 °C PTC: $R_{cold} \leq 1.5$ kΩ
30	+ Temp	Plus (+) terminal KTY84/PTC	

Connectable cross-section: 0.14 mm^2 to 1.5 mm^2 (AWG 16)

Table 7-10 Control terminal strip X104

X533 - Safe stop option

Using the "safe stop" option, it is possible to interrupt the gating signals to the power section by means of a safety relay. This ensures that the unit will definitely not generate a rotating field in the connected motor.

Even if the control electronics generates trigger commands, the power section cannot move the motor.

The "safe stop" function is a "device for the prevention of unexpected starting" in accordance with EN 60204-1, Section 5.4, and meets the requirements of Safety Category 3 to EN 954-1 by virtue of appropriate external protective circuitry.

DANGER

The "safe stop" function does not electrically isolate the motor from the power section, i.e. the motor terminals are still at hazardous voltage when the function is active!

The safe stop function is not suitable for bringing a rotating motor to a quick halt as by de-energizing the trigger signals, the motor is only braked by the connected load.

The motor cannot produce a torque when the "safe stop" function is activated. Where external forces are applied to the drive axes or with drives that are not self-arresting (e.g. vertical axes), additional holding devices, e.g. brakes, are required.

A residual risk cannot be precluded in the case of two simultaneous errors in the power section. In this case, the drive can be aligned by a small angle of rotation (asynchronous motors: Max. 1 slot pitch in the remanence range, corresponding to about 5° to 15°).

NOTE

The products described here have been developed to perform safety-related functions as part of a complete system or machine. A complete, safety-related system generally includes sensors, evaluation units, signaling devices and strategies for safe shutdown. The manufacturer of an installation or machine is responsible for providing an appropriate overall safety system. Siemens AG, its regional offices and associated companies (referred to as "Siemens" below) cannot guarantee all the characteristics of a complete installation or machine that has not been designed by Siemens.

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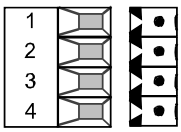
X533



The safe stop option comprises the safety relay and the connecting terminals for relay triggering and a checkback contact.

Terminal	Designation	Meaning	Range
1	Contact 1	Checkback "safe stop"	DC 20 V – 30 V
2	Contact 2	Checkback "safe stop"	1 A
3	Control input "safe stop"	Rated resistance of field coil ≥ 823 Ω ± 10 % at 20 °C	DC 20 V – 30 V max. operating frequency: 6/min
4	P24 DC	Supply voltage "safe stop"	DC 24 V / 30 mA

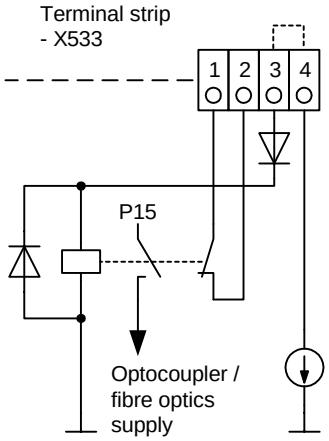
Connectable cross-section: 1.5 mm² (AWG 16)

Table 7-11 Terminal assignment for the "safe stop" option

The field coil of the safety relay is connected at one end to the grounded electronics frame. When the field coil is supplied via an external 24 V supply, its negative pole must be connected to ground potential. The external 24 V supply must comply with the requirements for PELV circuits to EN 50178 (DIN VDE 0160).

In the shipped state, a jumper is inserted between terminals 3 and 4. The jumper must be removed before the "SAFE STOP" function can be used and an external control for selecting the function connected.

If the safety relay is supplied via the internal supply at X533:4, the external 24 V supply must deliver at least 22 V at terminal X9:1/2 to ensure that the relay picks up reliably (internal voltage drop).



The checkback contacts of the safety relay are capable of at least 100,000 switching cycles at the specified load (30 V DC / 1 A). The mechanical service life is about 10^6 switching cycles. The safety relay is an important component in ensuring reliability and availability of the machine. For this reason, the pcb with the safety relay must be replaced in the case of malfunction. In this case, the unit must be returned for repair or replaced. Function checks must be carried out at regular intervals, which must be defined in compliance with Employer's Liability Insurance Regulation BGV A3 §39, para. 3. Accordingly, function checks must be performed as required by the relevant service conditions, but at least once a year and additionally after initial commissioning and any modification and/or maintenance work.

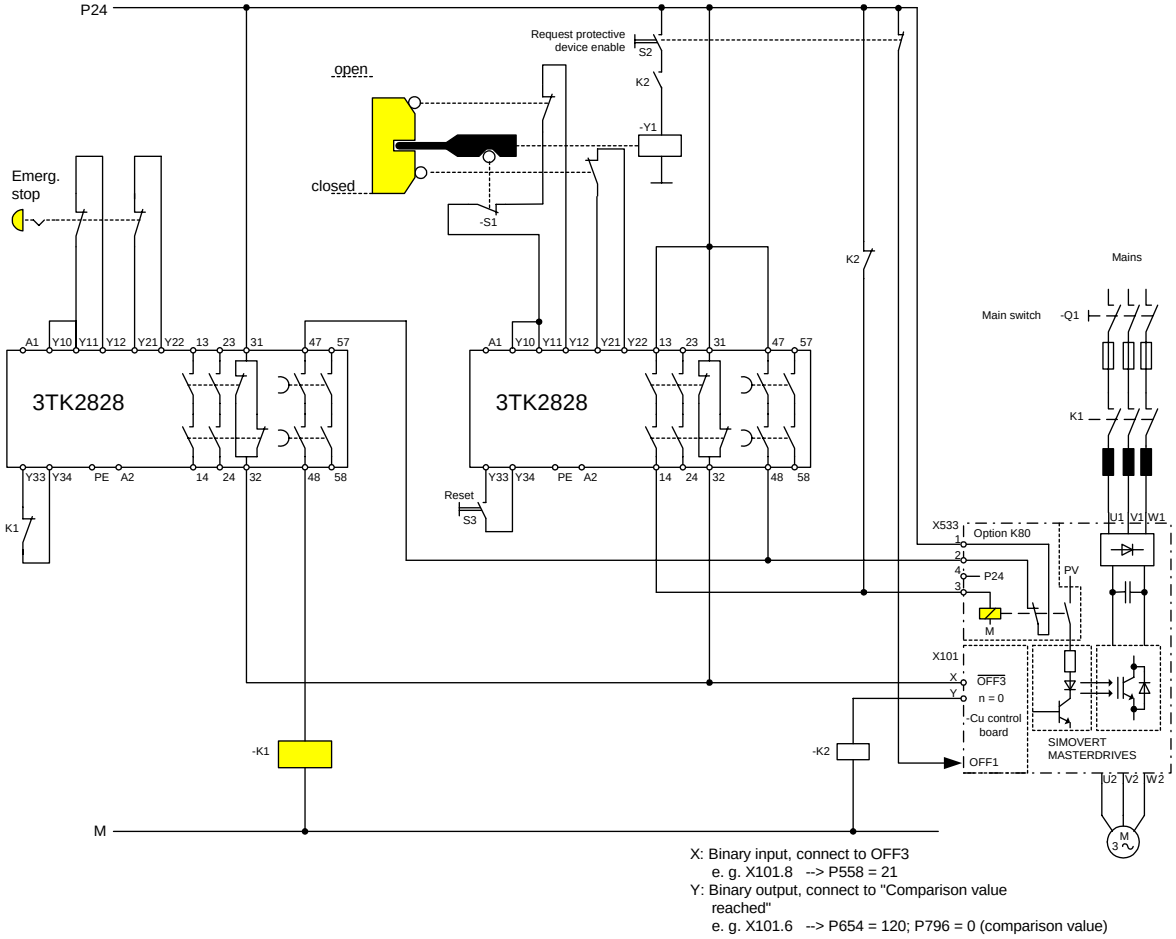


Fig. 7-7 Sample application of "safe stop" function with contactor safety combination for monitoring a moving protective device in Safety Category 3 to EN 954-1

All external cables relevant to the safety function are protected, e.g. installed in cable ducts, to preclude the possibility of short circuits. Cables must be installed in compliance with the requirements of EN 60204-1, Section 14.

In the circuit shown in Fig. 7-7, the tumbler does not release the moving protective device until the drive has stopped. It may be possible to omit the tumbler if the risk assessment of the machine deems this to be safe. In this case, the NC contact of the protective device is connected directly to terminals Y11 and Y12 and electromagnet Y1 is omitted.

Binary input X is negated with signal "OFF3", i.e. at 24 V, the converter decelerates the motor to zero speed along the parameterized deceleration ramp. The converter signals zero speed via binary output Y, thus energizing relay K2.

Once the motor has stopped, the safety relay in the converter is opened and the coil of main contactor K1 remains at 24 V via the checkback contact. If contacts in the safety relay are sticking, the checkback contacts do not close and the safety combination on the right deenergizes main contactor K1 via delayed contacts 47/48 when the set delay period expires.

7.3 Conductor cross-sections, fuses, reactors

Protective conductor

If the unit is mounted conductively on a grounded mounting surface, the cross section of the protective conductor can be the same as that of the phase conductor.

WARNING

In the case of insulated installation on **units up to 90 mm** wide, a second protective conductor (with the same cross section as the line conductor) must be connected to ground (M4 threaded bolts on the top of the unit next to the mains terminal).

Motor cable

For cross-sections and leads, see catalog Vector Control SIMOVERT MASTERDRIVES VC or IEC 60 204-1: 1997/1998.

7.4 Combinations of units

For simple configuration of multi-axis drives, one or several Compact PLUS DC/AC inverters can be fed from the DC link of the Compact PLUS AC/AC converters.

WARNING

The total drive power of the **inverters** must not exceed the drive power of the **converter**. A simultaneity factor of 0.8 applies here.

For example, a 4 kW inverter and a 1.5 kW inverter can be connected to a converter with a drive power of 5.5 kW by a common DC bus.

The line-side components are rated according to the total power of all converters and inverters. In the case of a multi-axis drive from one 5.5 kW converter, one 4 kW inverter and one 1.5 kW inverter, the line-side components must be rated for an 11 kW converter. If the total power does not exactly equal that of one converter, then the line-side components must be dimensioned according to the next-higher converter power.

NOTICE

If more than two inverters are connected to the DC bus of a converter, an external DC 24 V supply must be provided for these inverters. Only one further inverter can be connected to the 24 V voltage output in the case of a converter with a housing width of 45 mm.

8 Parameterization

It is possible to parameterize the units of the SIMOVERT MASTERDRIVES series by various methods of parameter input. Every unit can be set via the dedicated parameterizing unit (PMU) without the need to use additional components.

Each unit is supplied with the user software DriveMonitor and comprehensive electronic documentation on a DVD. In the case of installation on a standard PC the units can be parameterized via the serial interface of the PC. The software provides extensive parameter aids and a prompted start-up function.

The unit can be further parameterized by entering parameters with the OP1S manual operator panel and via a controller at the field bus level (e.g. Profibus).

8.1 Parameter menus

Parameters with related functions are compiled in menus for structuring the parameter set stored in the units. A menu thus represents a selection out of the entire supply of parameters of the unit.

It is possible for one parameter to belong to several menus. The parameter list indicates which individual menus a parameter belongs to. Assignment is effected via the menu number allocated to each menu.

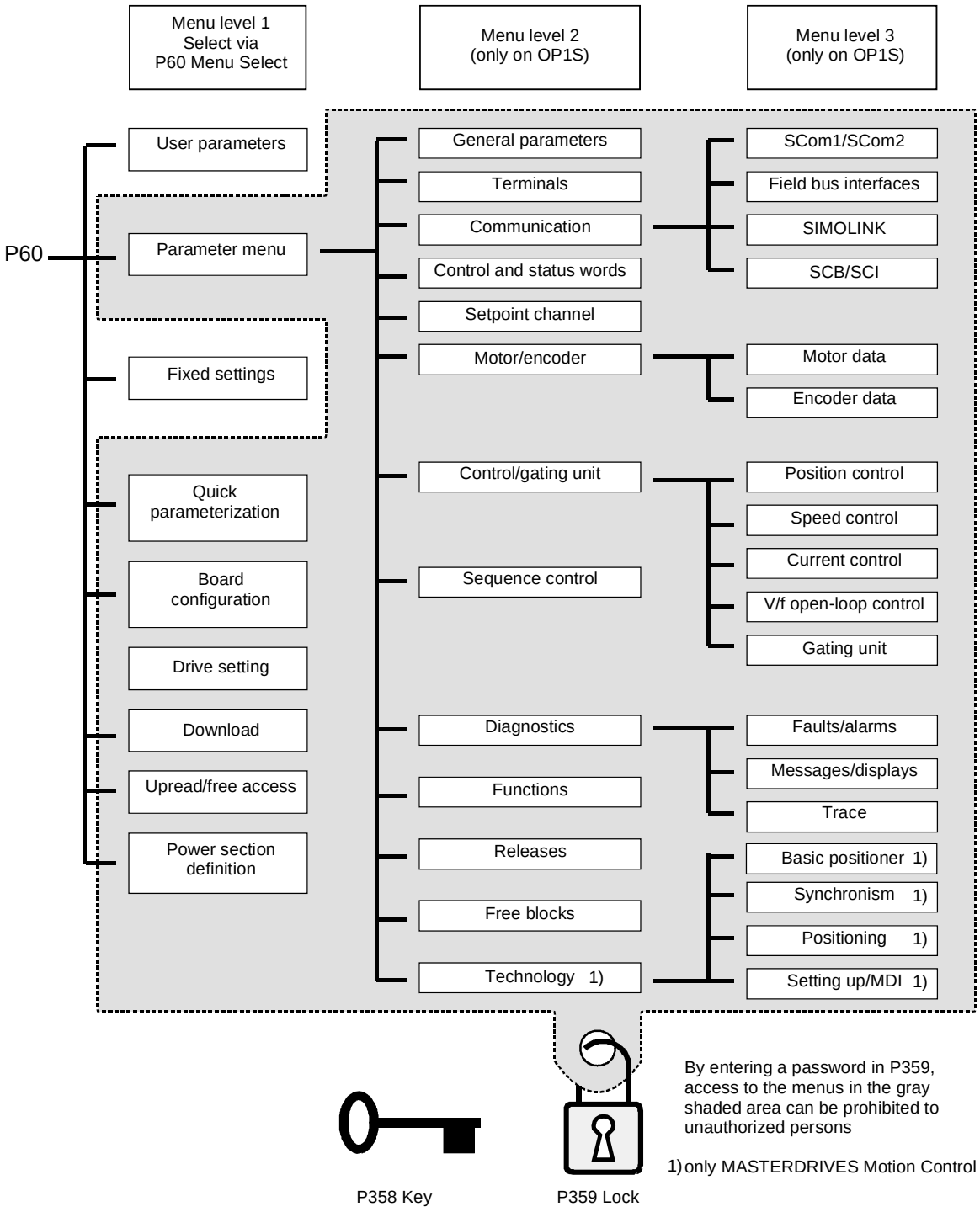


Fig. 8-1 Parameter menus

Menu levels

The parameter menus have several menu levels. The first level contains the main menus. These are effective for all sources of parameter inputs (PMU, OP1S, DriveMonitor, field bus interfaces).

The main menus are selected in parameter P60 Menu Selection.

Examples:
P060 = 0 "User parameters" menu selected
P060 = 1 "Parameter menu" selected
...
P060 = 8 "Power section definition" menu selected

Menu levels 2 and 3 enable the parameter set to be more extensively structured. They are used for parameterizing the units with the OP1S operator control panel.

Main menus

P060	Menu	Description
0	User parameters	• Freely configurable menu
1	Parameter menu	• Contains complete parameter set • More extensive structure of the functions achieved by using an OP1S operator control panel
2	Fixed settings	• Used to perform a parameter reset to a factory or user setting
3	Quick parameterization	• Used for quick parameterization with parameter modules • When selected, the unit switches to status 5 "Drive setting"
4	Board configuration	• Used for configuring the optional boards • When selected, the unit switches to status 4 "Board configuration"
5	Drive setting	• Used for detailed parameterization of important motor, encoder and control data • When selected, the unit switches to status 5 "Drive setting"
6	Download	• Used to download parameters from an OP1S, a PC or an automation unit • When selected, the unit switches to status 21 "Download"
7	Upread/free access	• Contains the complete parameter set and is used for free access to all parameters without being restricted by further menus • Enables all parameters to be upread/upload by an OP1S, PC or automation unit
8	Power section definition	• Used to define the power section (only necessary for units of the Compact and chassis type) • When selected, the unit switches to status 0 "Power section definition"

Table 8-1 Main menus

User parameters

In principle, parameters are firmly assigned to the menus. However, the "User parameters" menu has a special status. Parameters assigned to this menu are not fixed, but can be changed. You are thus able to put together the parameters required for your application in this menu and structure them according to your needs. The user parameters can be selected via P360 (Select UserParam).

Lock and key

In order to prevent undesired parameterization of the units and to protect your know-how stored in the parameterization, it is possible to restrict access to the parameters by defining your own passwords with the parameters:

- P358 key and
- P359 lock.

8.2 Changeability of parameters

The parameters stored in the units can only be changed under certain conditions. The following preconditions must be satisfied before parameters can be changed:

Preconditions	Remarks
• Either a function parameter or a BICO parameter must be involved (identified by upper-case letters in the parameter number).	Visualization parameters (identified by lower-case letters in the parameter number) cannot be changed.
• Parameter access must be granted for the source from which the parameters are to be changed.	Release is given in P053 Parameter access.
• A menu must be selected in which the parameter to be changed is contained.	The menu assignment is indicated in the parameter list for every parameter.
• The unit must be in a status which permits parameters to be changed.	The statuses in which it is possible to change parameters are specified in the parameter list.

Table 8-2 Preconditions for being able to change parameters

NOTE

The current status of the units can be interrogated in parameter r001.

Examples

Status (r001)	P053	Result
"Ready for ON" (09)	2	P222 Src n(act) can only be changed via the PMU
"Ready for ON" (09)	6	P222 Src n(act) can be changed via the PMU and SCom1 (e.g. OP1S)
"Operation" (14)	6	P222 Src n(act) cannot be changed on account of the drive status

Table 8-3 Influence of drive status (r001) and parameter access (P053) on the changeability of a parameter

8.3 Parameter input with DriveMonitor

NOTE **Please refer to the online help for detailed information on DriveMonitor (button or F1 key).**

8.3.1 Installation and connection

8.3.1.1 Installation

A DVD is included with the devices of the MASTERDRIVES Series when they are delivered. The operating tool supplied on the DVD (DriveMonitor) is automatically installed from this DVD. If "automatic notification on change" is activated for the DVD drive on the PC, user guidance starts when you insert the DVD and takes you through installation of DriveMonitor. If this is not the case, start file "Autoplay.exe" in the root directory of the DVD.

8.3.1.2 Connection

There are two ways of connecting a PC to a device of the SIMOVERT MASTERDRIVES Series via the USS interface. The devices of the SIMOVERT MASTERDRIVES Series have both an RS232 and an RS485 interface.

RS232 interface The serial interface that PCs are equipped with by default functions as an RS232 interface. This interface is not suitable for bus operation and is therefore only intended for operation of a SIMOVERT MASTERDRIVES device.

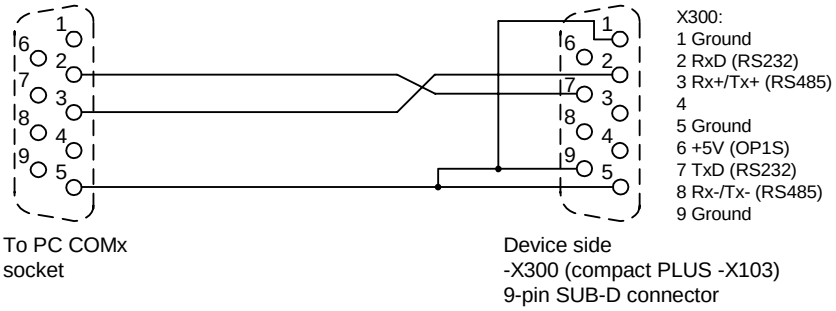


Fig. 8-2 Connecting cable for connecting PC COM(1-4) to SIMOVERT MASTERDRIVES X300

NOTICE DriveMonitor must not be operated via the Sub-D socket X300 if the SST1 interface parallel to it is already being used for another purpose, e.g. bus operation with SIMATIC as the master.

RS485 interface

The RS485 interface is multi-point capable and therefore suitable for bus operation. You can use it to connect 31 SIMOVERT MASTERDRIVES with a PC. On the PC, either an integrated RS485 interface or an RS232 ↔ RS485 interface converter is necessary. On the device, an RS485 interface is integrated into the -X300 (compact PLUS -X103) connection. For the cable: see pin assignment -X300 and device documentation of the interface converter.

8.3.2 Establishing the connection between DriveMonitor and the device

8.3.2.1 Setting the USS interface

You can configure the interface with menu *Tools → ONLINE Settings.*

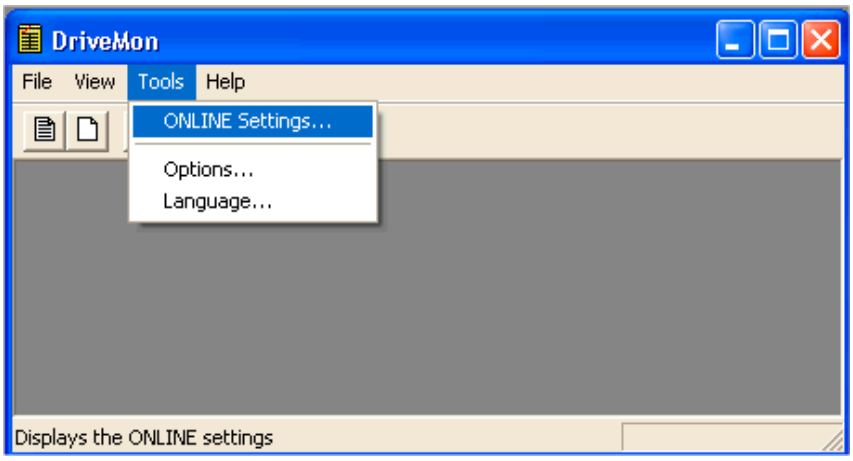


Fig. 8-3 Online settings

The following settings (Fig. 8-6) are possible:

- **Tab card "Bus Type",** options
  USS (operation via serial interface)
  Profibus DP (only if DriveMonitor is operated under Drive ES).
- **Tab card "Interface"**
  You can enter the required COM interface of the PC (COM1 to COM4) and the required baudrate here.

NOTE

Set the baudrate to the baudrate parameterized in SIMOVERT MASTERDRIVES (P701) (factory setting 9600 baud).

Further settings: operating mode of the bus in RS485 operation; setting according to the description of the interface converter RS232/RS485

- **Tab card "Extended"**
  Request retries and Response timeout; here you can increase the values already set if communication errors occur frequently.

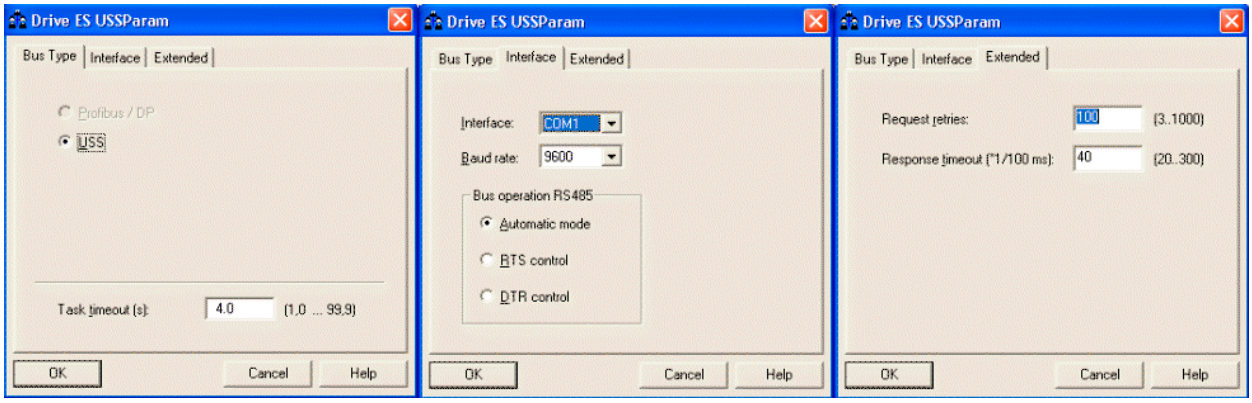


Fig. 8-4 Interface configuration

8.3.2.2 Starting the USS bus scan

DriveMonitor starts with an empty drive window. Via the menu "*Set up an ONLINE connection*..." the USS bus can be scanned for connected devices:

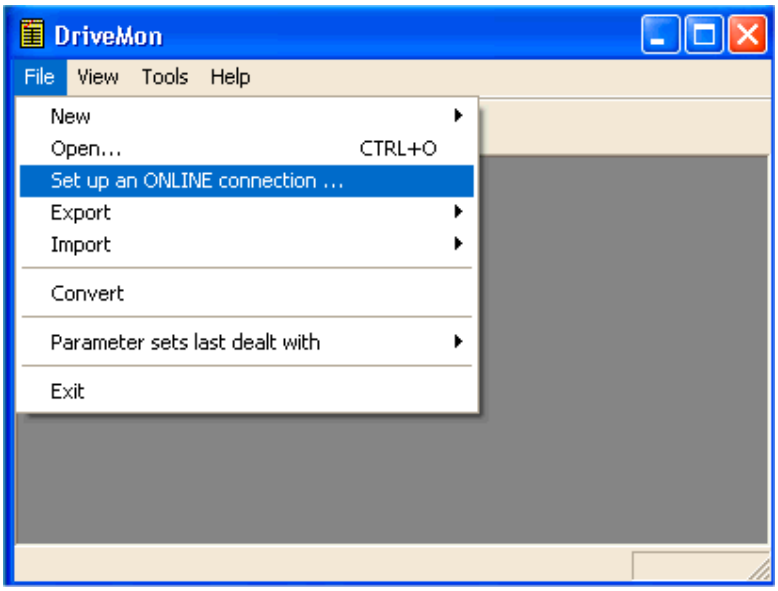


Fig. 8-5 Starting the USS bus scan

NOTE

The "Set up an online connection" menu is only valid from Version 5.2 onwards.

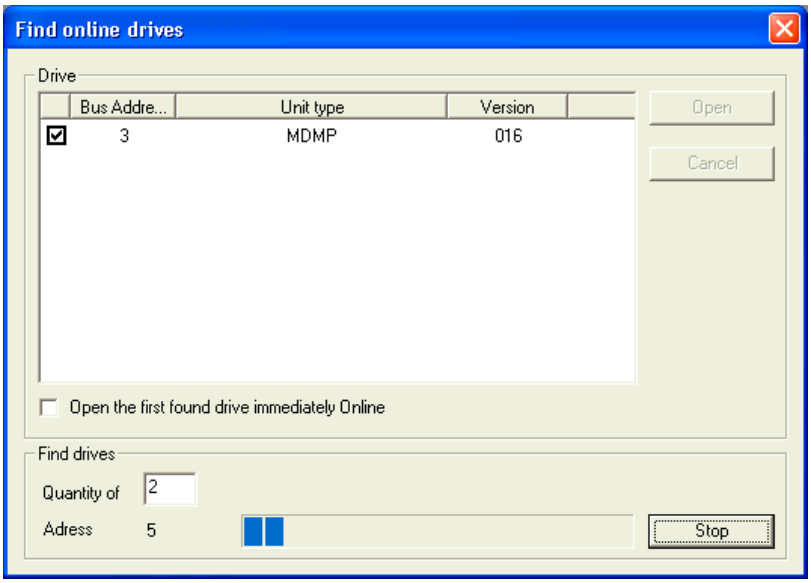


Fig. 8-6 Search for online drives

During the search the USS bus is scanned **with the set baudrate only**. The baud rate can be changed via "*Tools → ONLINE Settings*", see section 8.3.2.1.

8.3.2.3 Creating a parameter set

With menu *File → New →...* you can create a new drive for parameterization (see Fig. 8-7). The system creates a download file (*.dnl), in which the drive characteristic data (type, device version) are stored. You can create the download file on the basis of an empty parameter set or the factory setting.

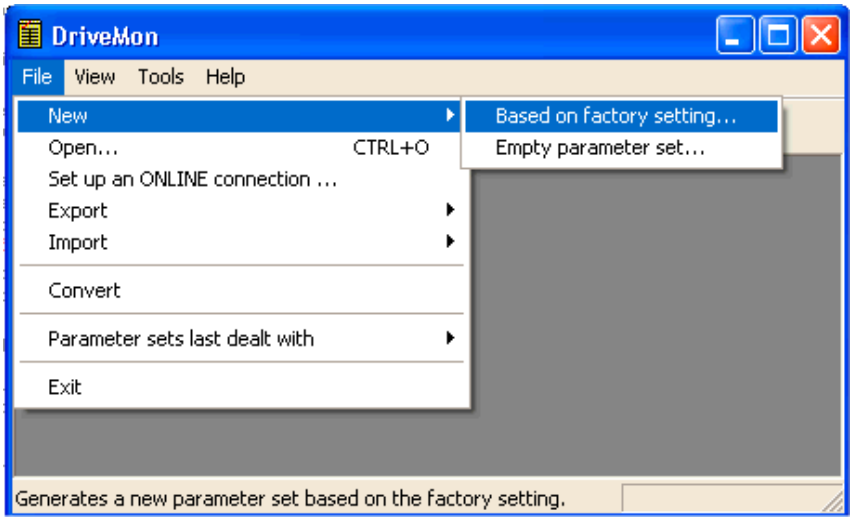


Fig. 8-7 Creating a new drive

Based on factory setting:

- The parameter list is preassigned with the factory setting values

Empty parameter set:

- For compilation of individually used parameters

If the parameters of a parameter set that has already been created have to be changed, this can be done by calling the corresponding download file via the "*File → Open"* menu function. The last four drives can be opened via *"Parameter sets last dealt with"*.

When you create a new drive, the window "Drive Properties" (Fig. 8-8) opens. Here you must enter the following data:

- In dropdown list box "Device type", select the type of device (e.g. MASTERDRIVES MC). You can only select the devices stored.
- In dropdown list box "Device version", you can select the software version of the device. You can generate databases for (new) software versions that are not listed when you start online parameterization.
- You must only specify the bus address of the drive during online operation (switchover with button Online/Offline)

NOTE

The specified bus address must be the same as that of the parameterized SST bus address in SIMOVERT MASTERDRIVES (P700).

No bus address is assigned to the drive with the button "Disconnect network connection".

NOTE

Field "Number of PCD" has no special significance for the parameterization of MASTERDRIVES and should be left at "2".

If the value is changed, it must be/remain ensured that the setting value in the program matches the value in parameter P703 of the drive at all times.

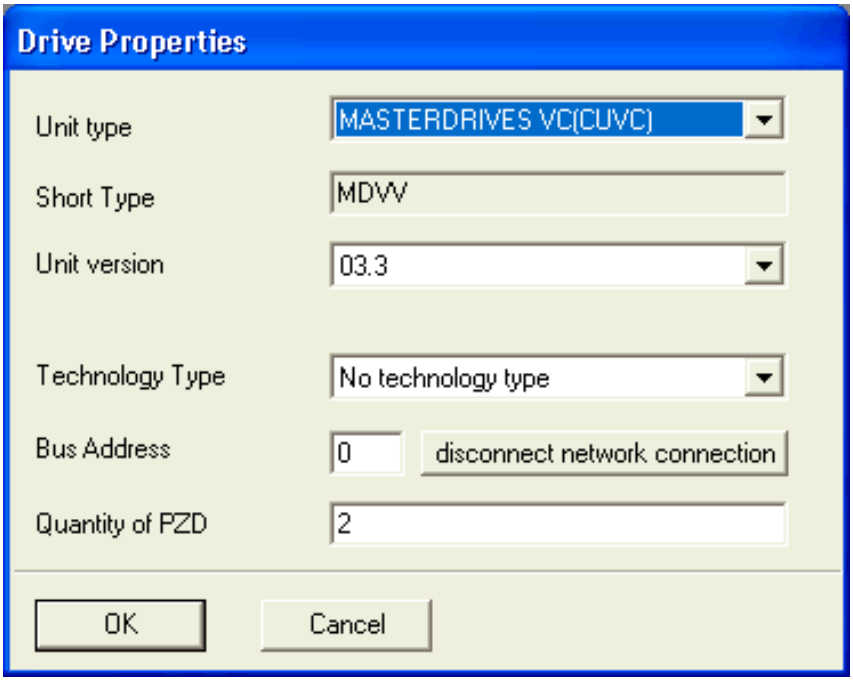


Fig. 8-8 Create file; Drive properties

After confirming the drive properties with *ok* you have to enter the name and storage location of the download file to be created.

8.3.3 Parameterization

8.3.3.1 Structure of the parameter lists, parameterization with DriveMonitor

Parameterization using the parameter list is basically the same as parameterization using PMU (See Section 8.4). The parameter list provides the following advantages:

- Simultaneous visibility of a larger number of parameters
- Text display for parameter names, index number, index text, parameter value, binectors, and connectors
- On a change of parameters: Display of parameter limits or possible parameter values

The parameter list has the following structure:

Field No.	Field Name	Function
1	P. Nr	Here the parameter number is displayed. You can only change the field in menu *Free parameterization*.
2	Name	Display of the parameter name, in accordance with the parameter list
3	Ind	Display of the parameter index for indexed parameters. To see more than index 1, click on the [+] sign. The display is then expanded and all indices of the parameter are displayed
4	Index text	Meaning of the index of the parameter
5	Parameter value	Display of the current parameter value. You can change this by double-clicking on it or selecting and pressing *Enter*.
6	Dim	Physical dimension of the parameter, if there is one

With buttons *Offline, Online (RAM), Online (EEPROM)* (Fig. 8-9 [1]) you can switch modes. When you switch to online mode, device identification is performed. If the configured device and the real device do not match (device type, software version), an alarm appears. If an unknown software version is recognized, the option of creating the database is offered. (This process takes several minutes.)

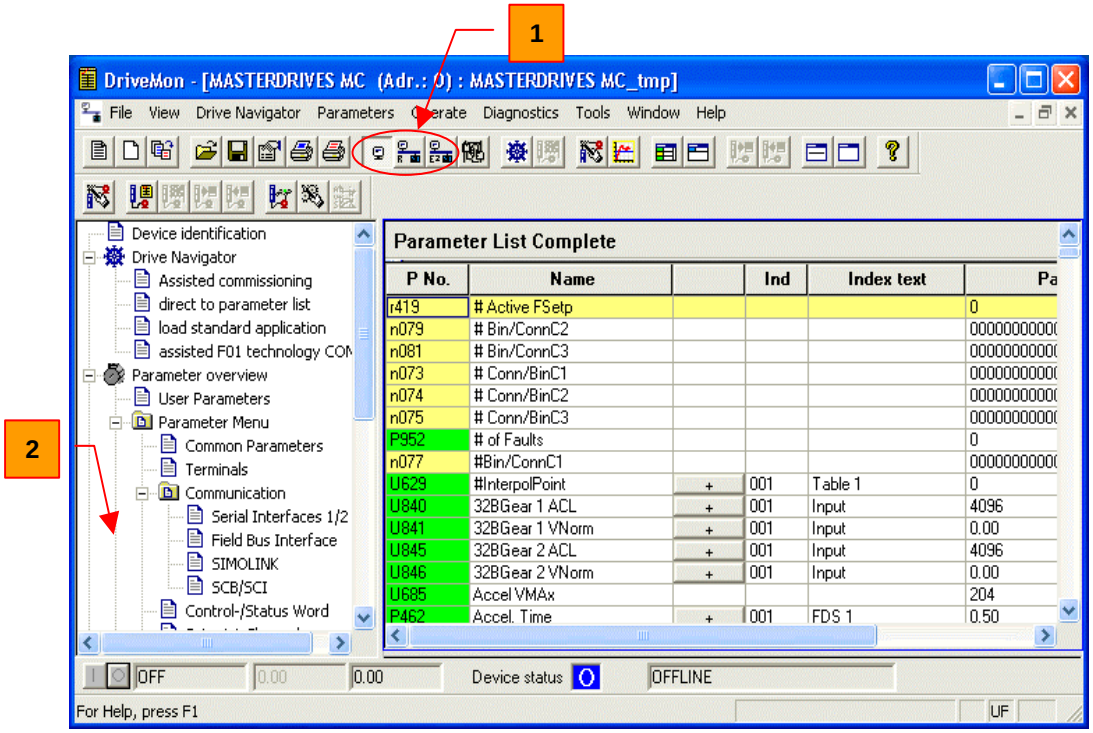


Fig. 8-9 Drive window/parameter list

The DriveMonitor drive window has a directory tree for navigation purposes (Fig. 8-9 [2]). You can deselect this additional operating tool in menu *View - Parameter selection*.

The drive window contains all elements required for the parameterization and operation of the connected device. In the lower bar, the status of the connection with the device is displayed:

Connection and device ok

Connection ok, device in fault state

Connection ok, device in alarm state

Device is parameterized offline

No connection with the device can be established (only offline parameterization possible).

NOTE

If no connection with the device can be established because the device does not physically exist or is not connected, you can perform offline parameterization. To do so, you have to change to offline mode. In that way, you can create an individually adapted download file, which you can load into the device later.

Drive Navigator This is used to quickly access important functions of the DriveMonitor. Settings for Drive Navigator under *Tools -> Options* (Fig. 8-11):

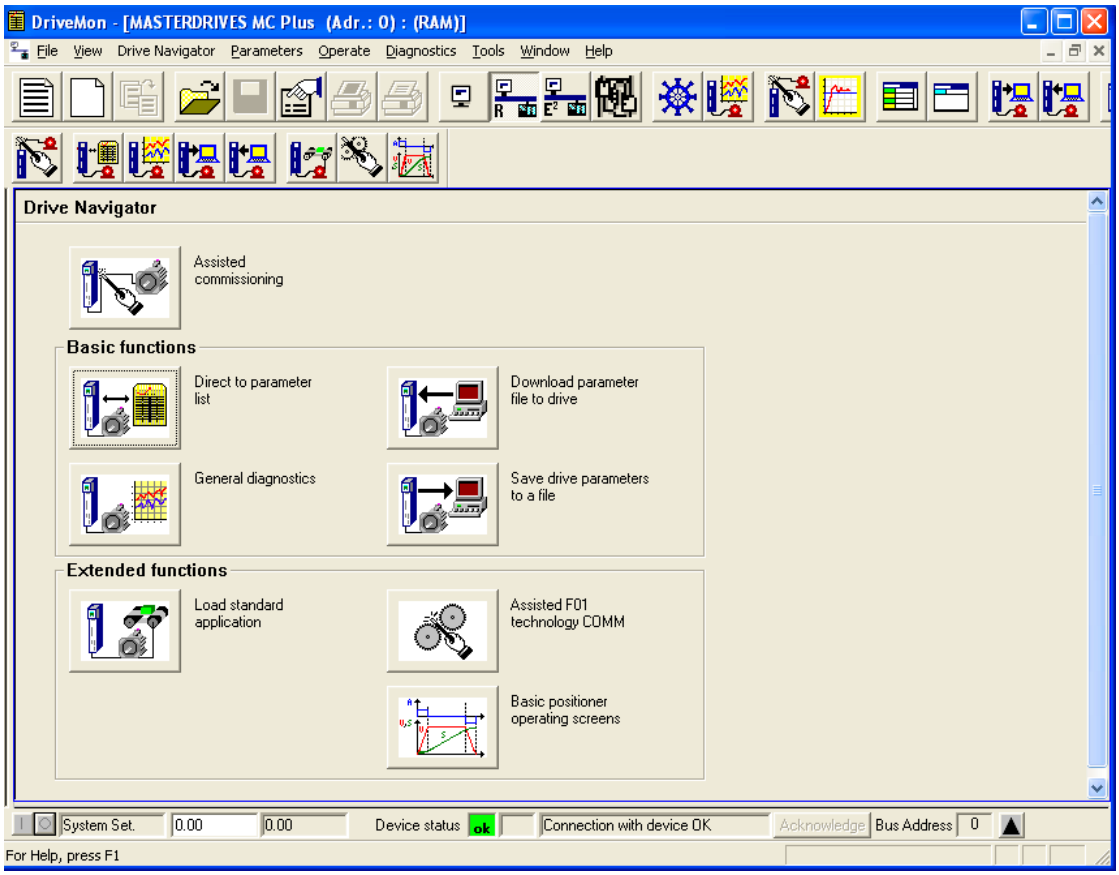


Fig. 8-10 Drive Navigator

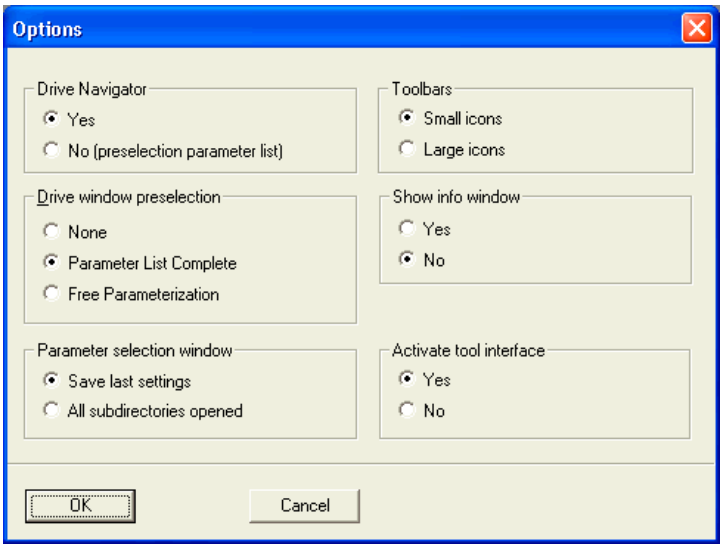
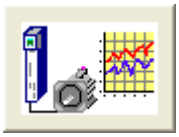


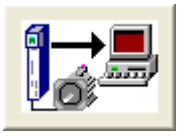
Fig. 8-11 Options menu display

Toolbar of the Drive Navigator

 =  Assisted commissioning

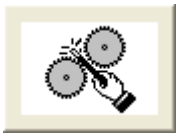
 =  Direct to parameter list

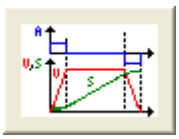
 =  General diagnostics

 =  Save drive parameters to a file

 =  Download parameter file to drive

 =  Load standard application

 =  Assisted F01 technology COMM

 =  Basic positioner operating screens

8.3.3.2 General diagnostics

Via the *Diagnostics → General diagnostics* menu the following window opens. This window gives a general overview of the active warnings and faults and their history. Both the warning and the fault number as well as plain text are displayed.

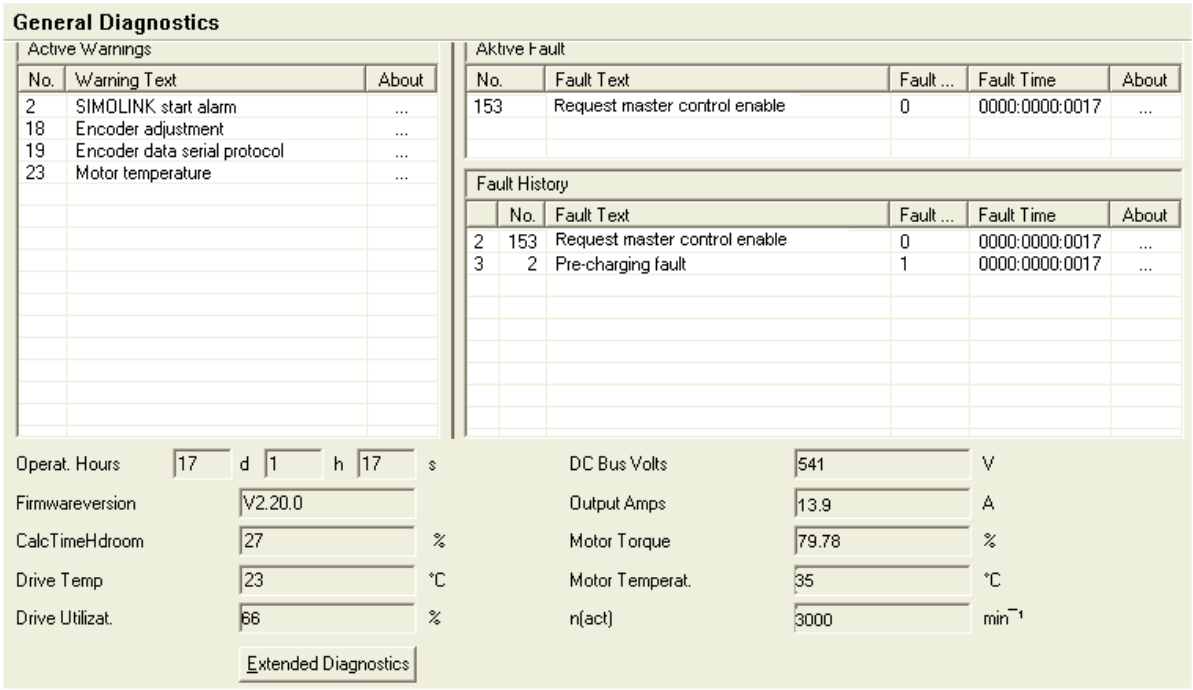


Fig. 8-12 General diagnostics

Via the *Extended Diagnostics* button you can reach the next diagnostics window.

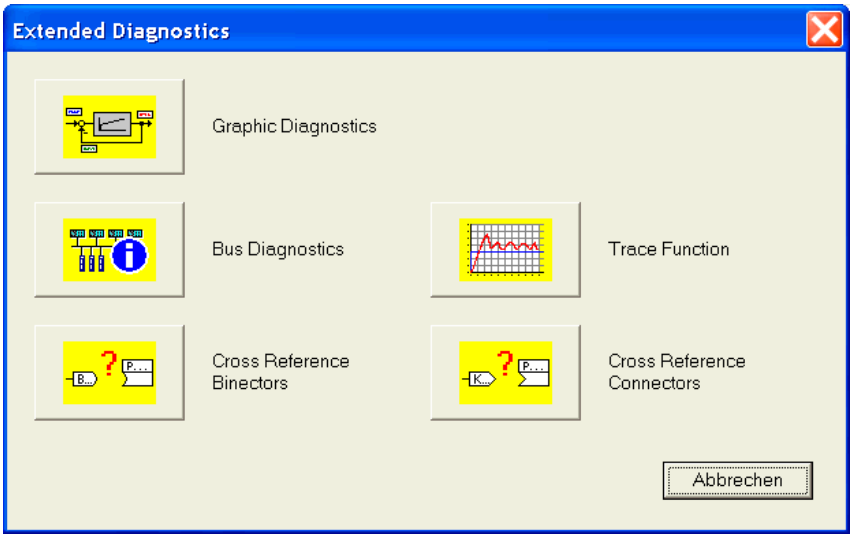


Fig. 8-13 Extended diagnostics

8.4 Parameter input via the PMU

The PMU parameterizing unit enables parameterization, operator control and visualization of the converters and inverters directly on the unit itself. It is an integral part of the basic units. It has a four-digit seven-segment display and several keys.

The PMU is used with preference for parameterizing simple applications requiring a small number of set parameters, and for quick parameterization.

PMU in units of the Compact PLUS type

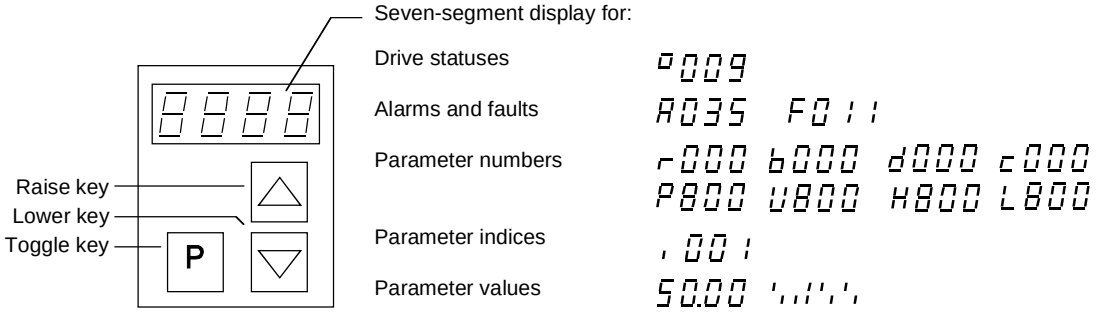


Fig. 8-14 PMU in units of the Compact PLUS type

Key	Significance	Function
P	Toggle key	• For switching between parameter number, parameter index and parameter value in the indicated sequence (command becomes effective when the key is released) • If fault display is active: For acknowledging the fault
△	Raise key	For increasing the displayed value: • Short press = single-step increase • Long press = rapid increase
▽	Lower key	For lowering the displayed value: • Short press = single-step decrease • Long press = rapid decrease
P + △	Hold toggle key and depress raise key	• If parameter number level is active: For jumping back and forth between the last selected parameter number and the operating display (r000) • If fault display is active: For switching over to parameter number level • If parameter value level is active: For shifting the displayed value one digit to the right if parameter value cannot be displayed with 4 figures (left-hand figure flashes if there are any further invisible figures to the left)
P + ▽	Hold toggle key and depress lower key	• If parameter number level is active: For jumping directly to operating display (r000) • If parameter value level is active: For shifting the displayed value one digit to the left if the parameter value cannot be displayed with 4 figures (right-hand figure flashes if there are any further invisible figures to the right)

Table 8-4 Operator control elements of the PMU (Compact PLUS type)

Toggle key (P key)

As the PMU only has a four-digit seven-segment display, the 3 descriptive elements of a parameter

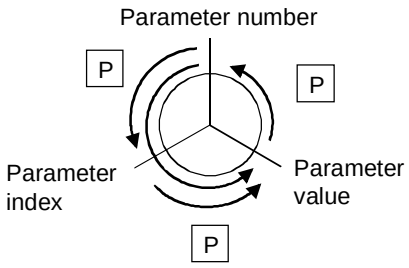
- Parameter number,
- Parameter index (if the parameter is indexed) and
- Parameter value

cannot be displayed at the same time. For this reason, you have to switch between the individual descriptive elements by depressing the toggle key. After the desired level has been selected, adjustment can be made using the raise key or the lower key.

With the toggle key, you can change over:

- from the parameter number to the parameter index
- from the parameter index to the parameter value
- from the parameter value to the parameter number

If the parameter is not indexed, you can jump directly from the parameter number to the parameter value.



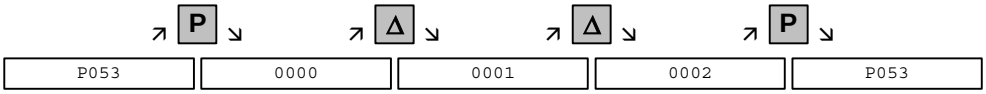
NOTE

If you change the value of a parameter, this change generally becomes effective immediately. It is only in the case of acknowledgement parameters (marked in the parameter list by an asterisk ‘ * ’) that the change does not become effective until you change over from the parameter value to the parameter number.

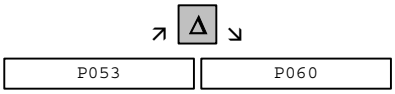
Parameter changes made using the PMU are always safely stored in the EEPROM (protected in case of power failure) once the toggle key has been depressed.

Example The following example shows the individual operator control steps to be carried out on the PMU for a parameter reset to factory setting.

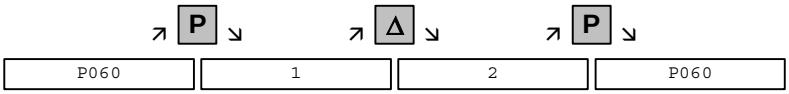
Set P053 to 0002 and grant parameter access via PMU



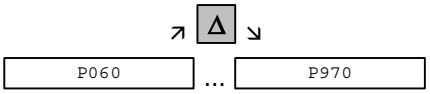
Select P060



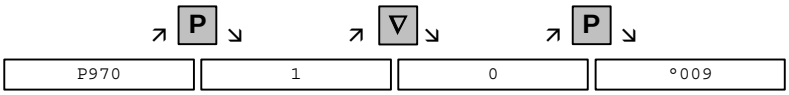
Set P060 to 0002 and select "Fixed settings" menu



Select P970



Set P970 to 0000 and start parameter reset



8.5 Parameter input via the OP1S

8.5.1 General

The operator control panel (OP1S) is an optional input/output device which can be used for parameterizing and starting up the units. Plain-text displays greatly facilitate parameterization.

The OP1S has a non-volatile memory and can permanently store complete sets of parameters. It can therefore be used for archiving sets of parameters. The parameter sets must be read out (upread) from the units first. Stored parameter sets can also be transferred (downloaded) to other units.

The OP1S and the unit to be operated communicate with each other via a serial interface (RS485) using the USS protocol. During communication, the OP1S assumes the function of the master whereas the connected units function as slaves.

The OP1S can be operated at baud rates of 9.6 kBd and 19.2 kBd, and is capable of communicating with up to 32 slaves (addresses 0 to 31). It can therefore be used both in a point-to-point link (e.g. during initial parameterization) and within a bus configuration.

The plain-text displays can be shown in one of five different languages (German, English, Spanish, French, Italian). The language is chosen by selecting the relevant parameter for the slave in question.

Order numbers

Components	**Order Number**
OP1S	6SE7090-0XX84-2FK0
Connecting cable 3 m	6SX7010-0AB03
Connecting cable 5 m	6SX7010-0AB05
Adapter for installation in cabinet door incl. 5 m cable	6SX7010-0AA00

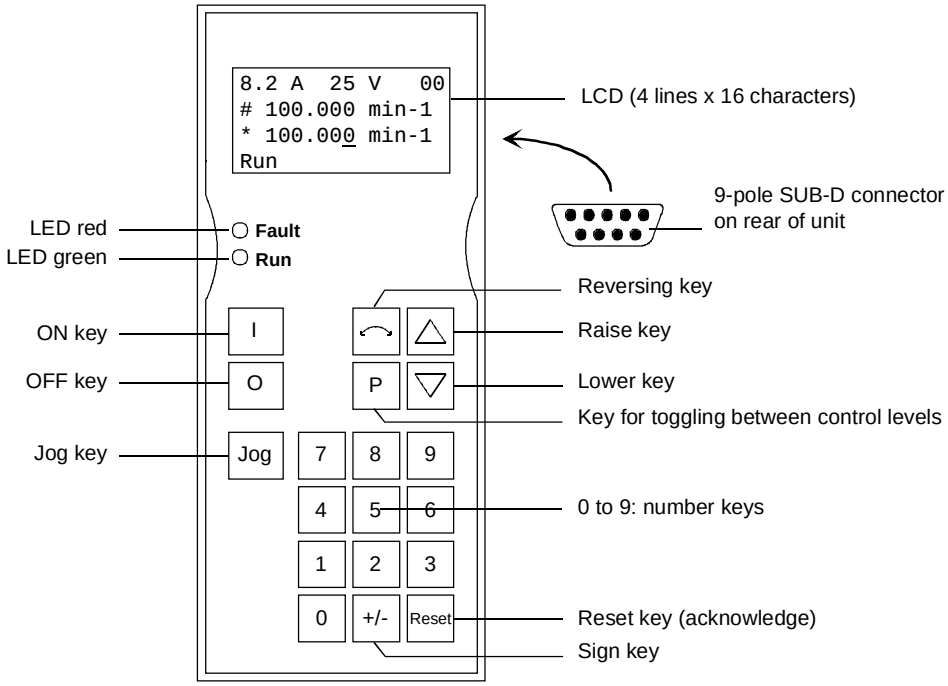


Fig. 8-15 View of the OP1S

8.5.2 Connecting, run-up

8.5.2.1 Connecting

The OP1S can be connected to the units in the following ways:

- Connection via 3 m or 5 m cable (e.g. as a hand-held input device for start-up)
- Connection via cable and adapter for installation in a cabinet door
- Plugging into MASTERDRIVES Compact units (for point-to-point linking or bus configuration)
- Plugging into MASTERDRIVES Compact PLUS units (for bus configuration)

Connection via cable

The cable is plugged into the Sub D socket X103 on units of the Compact PLUS type and into Sub D socket X300 on units of the Compact and chassis type.

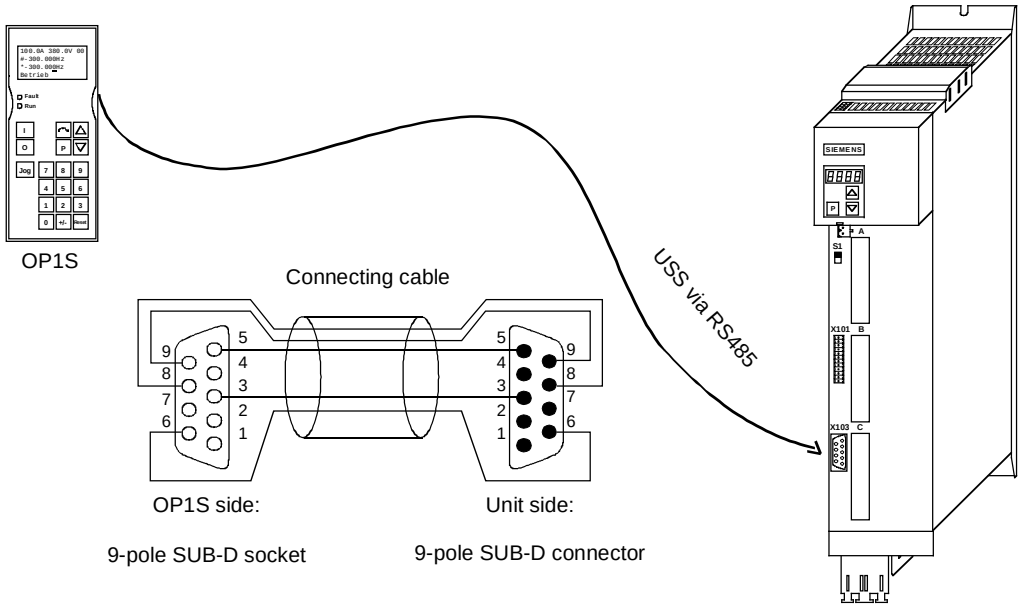


Fig. 8-16 Example: The OP1S in a point-to-point link with the Compact PLUS unit

Plugging onto Compact PLUS rectifier unit

On the Compact PLUS rectifier unit, you can plug the OP1S onto the Sub D socket X320 and lock it in place on the front cover.

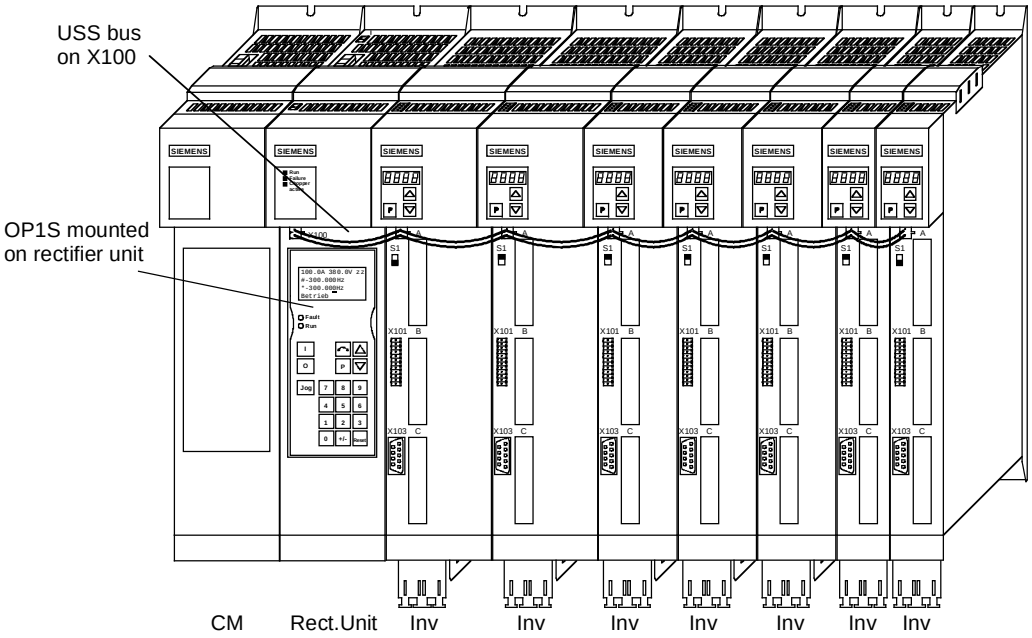


Fig. 8-17 Example: The OP1S during bus configuration with Compact PLUS units

NOTE

During bus operation, the Compact PLUS rectifier unit is only for mechanically restraining the OP1S and for connecting the bus to the inverters. It does not function as a slave.

8.5.2.2 Run-up

After the power supply for the unit connected to the OP1S has been turned on or after the OP1S has been plugged into a unit which is operating, there is a run-up phase.

NOTICE

The OP1S must not be plugged into the Sub D socket if the SCom1 interface parallel to the socket is already being used elsewhere, e.g. bus operation with SIMATIC as the master.

NOTE

In the as-delivered state or after a reset of the parameters to the factory setting with the unit's own control panel, a point-to-point link can be adopted with the OP1S without any further preparatory measures.

When a bus system is started up with the OP1S, the slaves must first be configured individually. The plugs of the bus cable must be removed for this purpose.

9 Parameterizing Steps

NOTE

For a detailed description of the parameters of the unit, please refer to Section 6 "Parameterizing steps" of the Compendium.

Detailed parameterization

Detailed parameterization should always be used in cases where the exact application conditions of the units are not known beforehand and detailed parameter adjustments need to be made locally, e.g. on initial start-up.

1. Power section definition (P060 = 8)
2. Board definition (P060 = 4, see Compendium, section 6.3.2)
3. Drive definition (P060 = 5)
4. Function adjustment.

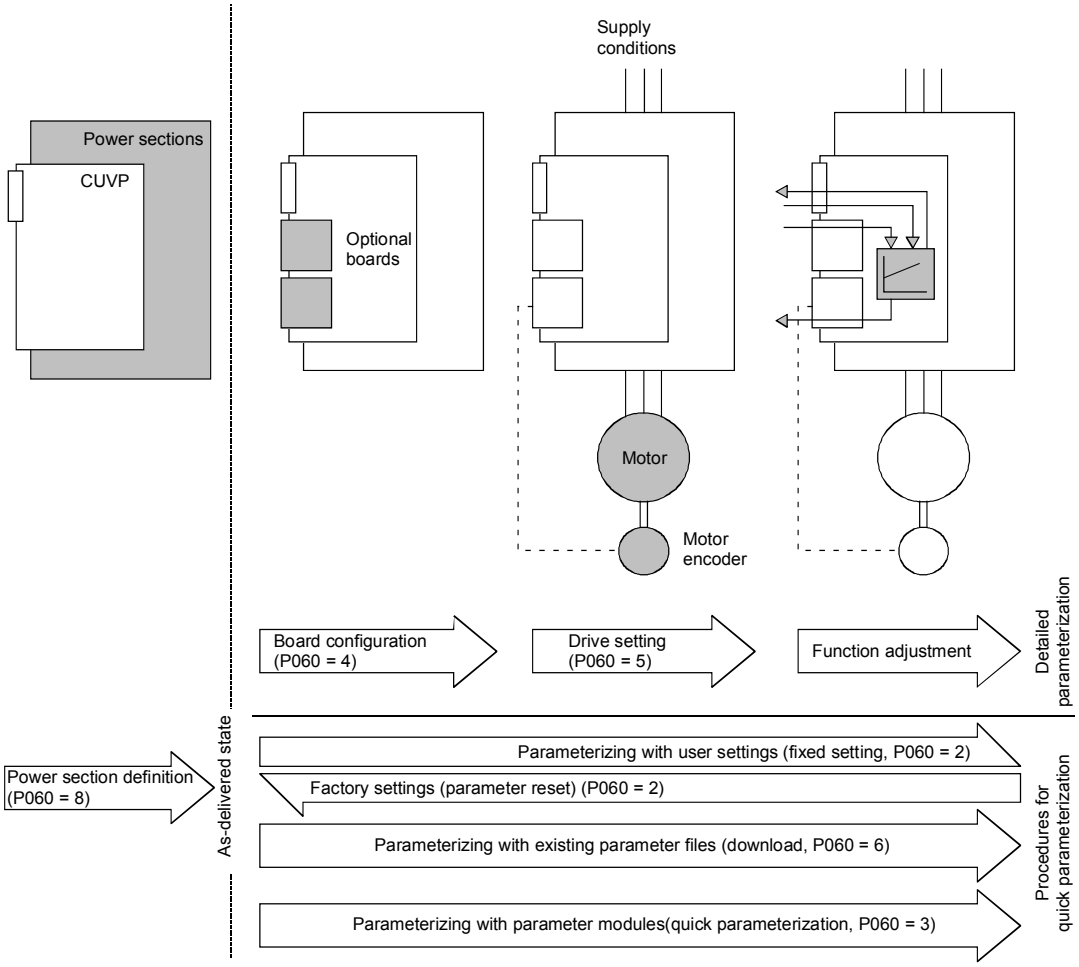


Fig. 9-1 Detailed and quick parameterization

9.1 Parameter reset to factory setting

The factory setting is the defined initial state of all parameters of a unit. The units are delivered with this setting.

You can restore this initial state at any time by resetting the parameters to the factory setting, thus canceling all parameter changes made since the unit was delivered.

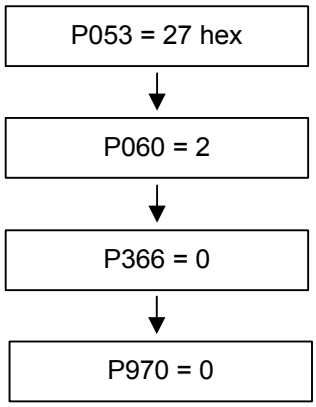
The parameters for defining the power section and for releasing the technology options and the operating hours counter and fault memory are not changed by a parameter reset to factory setting.

Parameter number	Parameter name
P070	Order No. 6SE70..
P072	Rtd Drive Amps
P073	Rtd Drive Power
P366	Select FactSet

Table 9-1 Parameters which are not changed by the factory setting

NOTE

Parameter factory settings which are dependent on converter or motor parameters are marked with '(~)' in the block diagrams.



Grant parameter access
27 hex: Changing parameters is permitted via PMU, serial interface SCom1 / SCom2 (OP1S) and Communication Board (e.g. CBP2 - PROFIBUS).

Select "Fixed settings" menu

Select desired factory setting
0: Standard with PMU, setpoint via MOP (BICO1)

Start parameter reset
0: Parameter reset
1: No parameter change

Fig. 9-2 Sequence for parameter reset to factory setting

Factory settings dependent on P366

Parameters dependent on P366	Designation of the parameter on the OP1S (Src = Source)	Factory setting with PMU			
		P366 = 0			
		BICO1 (i001)		BICO2 (i002)	
P443	Src MainSetpoint	MOP (Input)	(KK058)	Current fixed setpoint	(KK040)
P554	Src ON/OFF1	DigIn 7 X102.19	(B0022)	DigIn 7 X102.19	(B0022)
P555	Src1 OFF2	Fixed binector 1	(B0001)	DigIn 6 X101.8	(B0020)
P556	Src2 OFF2	Fixed binector 1	(B0001)	Fixed binector 1	(B0001)
P565	Src1 Fault Reset	SCom1 Word1 Bit1	(B2107)	SCom1 Word1 Bit1	(B2107)
P566	Src2 Fault Reset	Fixed binector 0	(B0000)	Fixed binector 0	(B0000)
P567	Src3 Fault Reset	Fixed binector 0	(B0000)	DigIn 5 X101.7	(B0018)
P568	Src Jog Bit0	Fixed binector 0	(B0000)	Fixed binector 0	(B0000)
P571	Src FWD Speed	Fixed binector 1	(B0001)	Fixed binector 1	(B0001)
P572	Src REV Speed	Fixed binector 1	(B0001)	Fixed binector 1	(B0001)
P573	Src MOP UP	PMU MOP UP	(B0008)	Fixed binector 0	(B0000)
P574	Src MOP Down	PMU MOP DOWN	(B0009)	Fixed binector 0	(B0000)
P575	Src No ExtFault1	Fixed binector 1	(B0001)	Fixed binector 1	(B0001)
P588	Src No Ext Warn1	Fixed binector 1	(B0001)	Fixed binector 1	(B0001)
P590	Src BICO DSet	DigIn 3 X101.5	(B0014)	DigIn 3 X101.5	(B0014)
P651	Src DigOut1	No fault	(B0107)	No fault	(B0107)
P652	Src DigOut2	Operation	(B0104)	Operation	(B0104)
P653	Src DigOut3	Fixed binector 0	(B0000)	Fixed binector 0	(B0000)
P704.3	SCom TlgOFF SCB	0 ms		0 ms	
P796	Compare Value	100.0		100.0	
P797	Compare Hyst	3.0		3.0	
P049.4	OP OperDisp	r229		r229	

Table 9-2 Factory setting dependent on P366

All other factory setting values are not dependent on P366 and can be taken from the parameter list or from the block diagrams (in the Compendium).

The factory settings for Index 1 (i001) of the respective parameter are displayed in the parameter list.

9.2 Power section definition

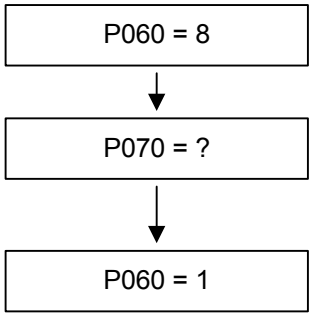
The power section definition has already been completed in the as-delivered state. It therefore only needs to be carried out if the CUVP needs replacing, and is not required under normal circumstances.

During the power section definition, the control electronics is informed which power section it is working with. This step is necessary for all Compact, chassis and cabinet type units.

WARNING

If CUVP boards are changed over between different units without the power section being re-defined, the unit can be destroyed when it is connected up to the voltage supply and energized.

The unit has to be switched to the "Power section definition" state for carrying out the power section definition. This is done by selecting the "Power section definition" menu. The power section is then defined in this menu by inputting a code number.



Select "Power section definition" menu

Input the code number for the unit concerned
The code number is allocated to the order numbers (MLFB).
The order number can be read off the unit's rating plate.
The list of units is on the following pages.

Return to parameter menu

Fig. 9-3 Sequence for performing the power section definition

NOTE

To check the input data, the values for the converter supply voltage in P071 and the converter current in P072 should be checked after returning to the parameter menu. They must tally with the data given on the unit rating plate.

PWE: Parameter value P070
In [A]: Rated output current in Ampere (P072)

Order number	kW	In [A]	PWE
6SE7012-0TP60	0.8	2.0	2
6SE7014-0TP60	1.5	4.0	4
6SE7016-0TP60	2.2	6.0	6
6SE7021-0TP60	4.0	10.0	8
6SE7021-3TP60	5.5	13.2	12
6SE7021-8TP60	7.5	17.5	14
6SE7022-6TP60	11.0	25.5	16
6SE7023-4TP60	15.0	34.0	18
6SE7023-8TP60	18.5	37.5	20

9.2.1 Parameterizing with parameter modules (quick parameterization, P060 = 3)

Pre-defined, function-assigned parameter modules are stored in the units. These parameter modules can be combined with each other, thus making it possible to adjust your unit to the desired application by just a few parameter steps. Detailed knowledge of the complete parameter set of the unit is not required.

Parameter modules are available for the following function groups:

1. Motors (input of the rating plate data with automatic parameterization of open-loop and closed-loop control)
2. Open-loop and closed-loop control types
3. Setpoint and command sources

Parameterization is effected by selecting a parameter module from each function group and then starting quick parameterization. In accordance with your selection, the necessary unit parameters are set to produce the desired control functionality. The motor parameters and the relevant controller settings are calculated using automatic parameterization (P115 = 1).

NOTE

Parameterizing with parameter modules is carried out only in BICO data set 1 and in function and motor data set 1.

Quick parameterization is effected in the "Download" converter status. Since quick parameterization includes the factory settings for all parameters, all previous parameter settings are lost.

Quick parameterization incorporates an abridged drive setting, (e.g. pulse encoder always with pulse number/revolution 1024).

Function diagram modules

Function diagram modules (function diagrams) are shown after the flow chart for parameter modules stored in the unit software. On the first few pages are the :

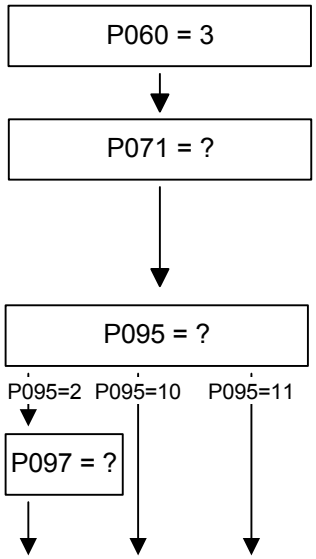
- setpoint and command sources (sheets s1 ... s83), on the following pages are the
- analog outputs and the display parameters (sheet a0) and the
- open-loop and closed-loop control types (sheets r0 to r5).

It is therefore possible to put together the function diagrams to exactly suit the selected combination of setpoint/command source and open/closed-loop control type. This will give you an overview of the functionality parameterized in the units and of the necessary assignment of the terminals.

The function parameters and visualization parameters specified in the function diagrams are automatically adopted in the user menu (P060 = 0) and can be visualized or changed there.

The parameter numbers of the user menu are entered in P360.

Reference is made in the function diagrams to the respective function diagram numbers (Sheet [xxx]) of the detail diagrams (in the Compendium).

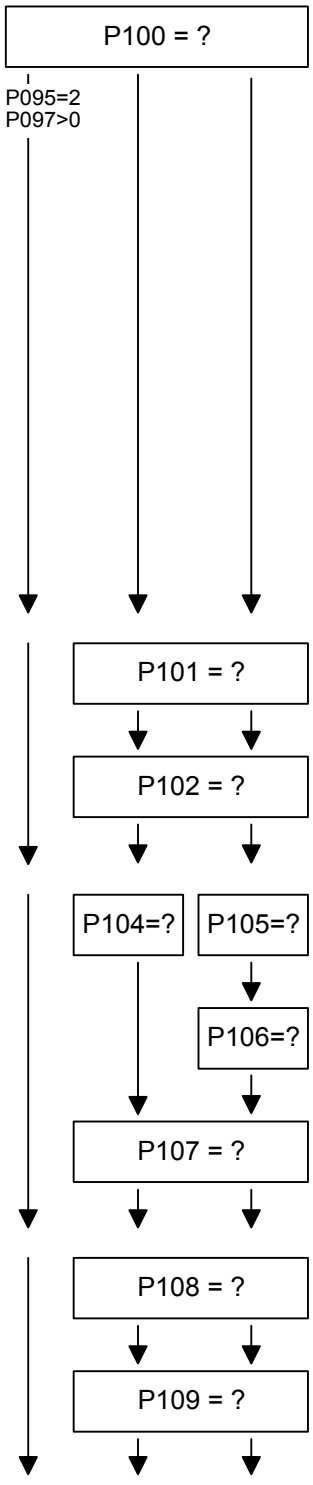


Menu selection "Quick parameterization"

Input unit line voltage in V
AC units: r.m.s. alternating voltage
DC units: DC link voltage
The input is important, e.g. for voltage limitation control (Vdmax control, P515 = 1)

Enter the motor type
2: Compact asynchronous motor 1PH7 (=1PA6)/1PL6/1PH4
10: Async./Sync. IEC (international Norm)
11: Async./Sync. NEMA (US-Norm)

Enter the code number for the connected motor of type 1PH7(=1PA6)/1PL6/1PH4
(For list see Quick Parameterization)
(Automatic parameter assignment is implemented as soon as the settings P095 = 2 and P097 > 0 have been made)



Enter the open/closed-loop control type (sheet r0 to r5)

0: v/f open-loop control + n-controller with pulse encoder (P130 = 11)
1: v/f open-loop control
2: v/f open-loop control, textile
3: Vector control without tachometer (f-control)
4: Vector control with tachometer (n-speed)
with pulse encoder (P130 = 11)
5: Torque control (M control)
with pulse controller (P130 = 11)

For v/f control (0..2) a linear curve is set in P330 (P330 = 1: parabolic).
The pulse encoder has a pulse number of P151 = 1024 per revolution.
The following inputs of motor data are necessary if the motor deviates from the converter data, if one of the vector control types (P100 = 3, 4, 5) has been selected or if speed feedback is used (P100 = 0). In the case of motor outputs higher than approx. 200 kW one of the vector control types should be used.

Enter the rated motor voltage in V
as per rating plate

Enter the rated motor current in A
as per rating plate
(group drives: total of all motor currents)

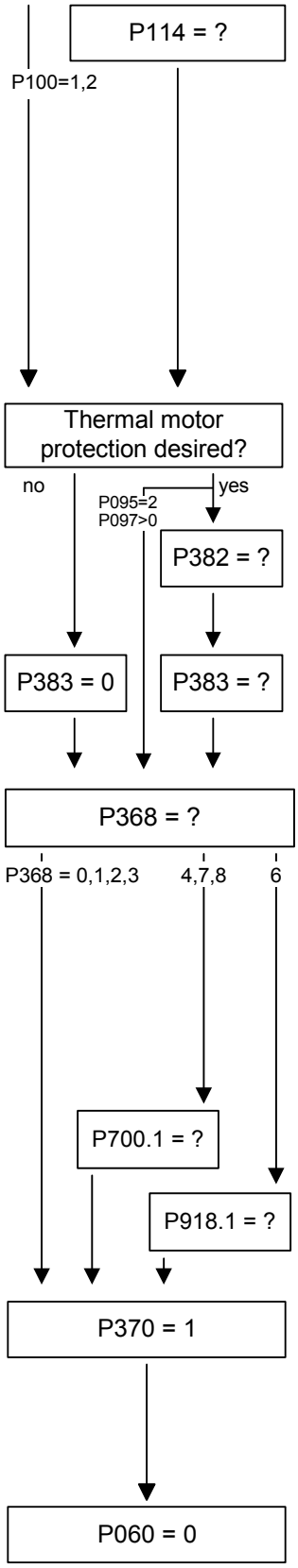
IEC motor: Cos (phi) as per rating plate
NEMA motor: nominal rating [Hp]
(group drives: total of all ratings)

NEMA motor: Enter the motor efficiency in %
as per rating plate

Enter the rated motor frequency in Hz
as per rating plate

Enter the rated motor speed in rpm
as per rating plate

Enter the motor pole pair number
(is automatically calculated)



WARNING!

INCORRECT SETTINGS CAN BE DANGEROUS!

For vector control only:

Process-related boundary conditions for control

0: Standard drives (default)
1: Torsion, gear play
2: Acceleration drives
3: Load surge
4: Smooth running characteristics
5: Efficiency optimization
6: Heavy-duty starting
7: Dynamic torque response in field-weakening range

See "Drive setting" section for description

System with motor protection according to UL regulation?

The motor temperature is calculated via the motor current.
(In the pre-setting, motor overload protection in accordance with UL regulation is activated!)

Specify motor cooling

0: self-ventilated
1: forced-ventilated
(automatically pre-set for P095 = 2, P097 > 0)

Enter the thermal time constant of the motor in s

automatically pre-set for P095 = 2, P097 > 0
The motor load limit (P384.2) is pre-assigned to 100 %.

Select setpoint and command source (sheet s1...s4, s6, s71, s72, s82, s83)

0: PMU + MOP
1: Analog and digital inputs on the terminal strip
2: Fixed setpoints and digital inputs on the terminal strip
3: MOP and digital inputs on the terminal strip
4: USS1 (e.g. with SIMATIC)
5: not used
6: PROFIBUS (CBP) (without fig.)
7: OP1S and fixed setpoints via SCom2
8: OP1S and MOP via SCom2 (X103: PMU)

Enter the USS bus address

Enter the PROFIBUS address

Start of quick parameterization

0: No parameter change
1: Parameter change in acordance with selected combination of parameter modules
(automatic factory setting according to P366)
(followed by automatic parameterization as for P115 = 1)

Return to the user menu

End of quick parameterization

The selection of setpoint sources (P368) may be restricted by the type of factory setting (P366).

Factory setting P366	Setpoint source P368
0 = PMU	0 ... 8 = All sources possible
1 = OP1S	7 = OP1S
2 = Cabinet unit OP1S	7 = OP1S
3 = Cabinet unit PMU	0 = PMU
	8 = OP1S

P383 Mot Tmp T1 Thermal time constant of the motor

Reference quantities Reference variables are intended as an aid to presenting setpoint and actual value signals in a uniform manner. This also applies to fixed settings entered as a "percentage". A value of 100 % corresponds to a process data value of 4000h, or 4000 0000 h in the case of double values.

All setpoint and actual value signals (e.g. set speed and actual speed) refer to the physically applicable reference variables. In this respect, the following parameters are available:

P350	Reference current	in A
P351	Reference voltage	in V
P352	Reference frequency	in Hz
P353	Reference speed	in rpm
P354	Reference torque	in Nm

In quick parameterization mode and in automatic parameter assignment mode (P115 = 1(2,3)), these reference variables are set to the motor ratings. In case of automatic parameter assignment, this occurs only if the "Drive setting" converter status is activated.

Speed and frequency reference values The reference speed and reference frequency are always connected by the pole pair number.

$$P353 = P352 \times \frac{60}{P109}$$

If one of the two parameters is changed, the other is calculated using this equation.

Since this calculation is not made on download (see section 6.2.2), these two quantities must always be loaded in the correct relationship.

If the setpoint and actual control signals are related to a desired reference speed in rpm, P353 must be set accordingly (P352 is calculated automatically). If a rotational frequency in Hz is to be used as the reference (calculated using the pole pair number P109), P352 must be set.

Torque reference value

Since the torque signals and parameters in the control system are always specified and displayed as a percentage, the ratio of the reference torque (P354) to the rated motor torque (P113) is always important for accuracy. If both values are the same, a display value of 100 % corresponds exactly to the rated motor torque, irrespective of the values actually entered in P354 and P113.

For purposes of clarity, however, it is advisable to enter the true rated torque of the drive in P113 (e.g. from catalog data).

$$P113 = \frac{P_{W\,(mot,\,rated)}}{\frac{2 \cdot \pi \cdot n(mot,rated)}{60}}$$

Reference power value

The reference power (in W) is calculated from the reference torque and reference speed:

$$P_{W,ref} = \frac{P354 \cdot P353 \cdot 2 \cdot \pi}{60}$$

Power values for the control system are also always specified as a percentage referred to the specified reference power. The ratio of $P_{W,ref}$ / $P_{mot,rated}$ can be used for conversion to the rated motor power.

$$P_{mot,rated} = \frac{P113 \cdot 2 \cdot \pi \cdot P108}{60}$$

Reference current value

If the reference torque P354 is increased, for example, the reference current P350 must be increased by the same factor, because the current increases at higher torque.

NOTE

Setting and visualization parameters in engineering units (e.g. Imax in A) must also be no more than twice the reference value.

If the reference quantities are changed, the physical value of all parameters specified as a percentage also changes; that is all the parameters of the setpoint channel, as well as the maximum power for the control system (P258, P259) and the static current for frequency control (P278, P279).

If the reference values and the rated motor values are identical (e.g. following quick parameterization), signal representation (e.g. via connectors) up to twice the rated motor values is possible. If this is not sufficient, you must change to the "Drive setting" menu (P060 = 5) to change the reference quantities.

Example

P107 = 52.00 Hz	Rated motor frequency
P108 = 1500.0 rpm	Rated motor speed
P109 = 2	Motor pole pair number

Pre-assignment:

P352 = 52.00 Hz	Reference frequency
P353 = 1560 rpm	Reference speed

For a maximum speed of four times the rated motor speed you must set the reference speed to at least 3000 rpm. The reference frequency is adjusted automatically (P352 = P353 / 60 x P109).

P352 = 100.00 Hz
P353 = 3000 rpm

A setpoint speed of 1500 rpm corresponds to a setpoint frequency of 50.00 Hz or an automation value of 50.0 %.

The representation range ends at 6000 rpm (2 x 3000 rpm).

This does not affect the internal representation range of the control system. Since the internal control signals refer to the rated motor quantities, there is always sufficient reserve control capacity.

The reference speed should normally be set to the desired maximum speed.

Reference frequencies of P352 = P107, P352 = 2 x P107, P352 = 4 x P107 are favorable for the calculating time.

For a maximum torque of three times the rated motor torque (P113) it is advisable to set the reference torque to between twice and four times the value of parameter P113 (for four to eight times the representation range).

Automatic motor identification

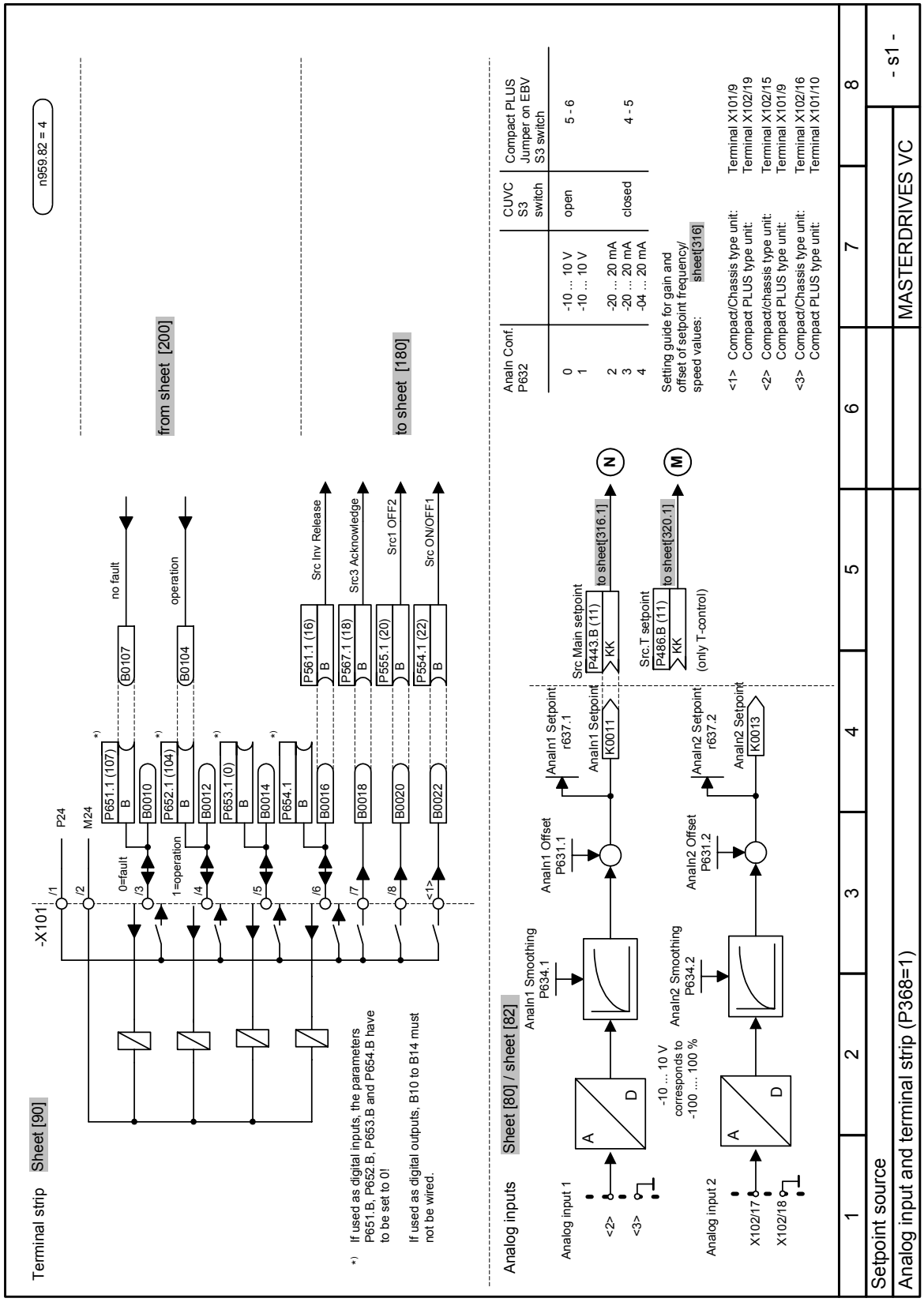
For exact determination of the motor parameters, it is possible to carry out automatic motor identification and speed controller optimization.

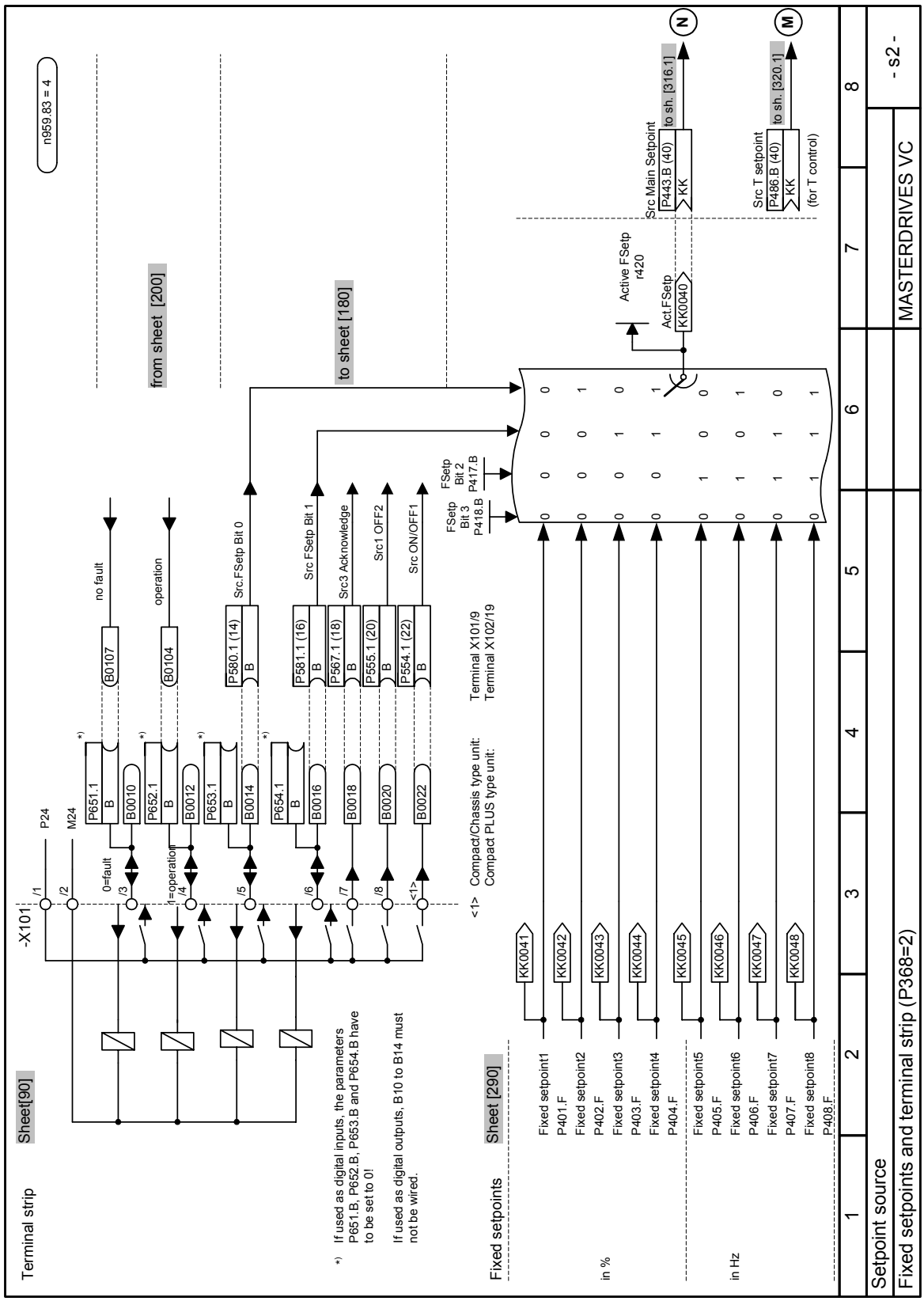
For this purpose, the procedures of the "Drive setting" have to be observed. If one of the vector control types (P100 = 3, 4, 5) of a converter without a sinusoidal output filter and of an induction motor without an encoder or with a pulse encoder (correct number of pulses in P151) is used, the motor identification procedure can be shortened. In this case, "Complete motor identification" has to be selected (P115 = 3) and the converter has to be powered up accordingly if the alarms A078 and A080 appear.

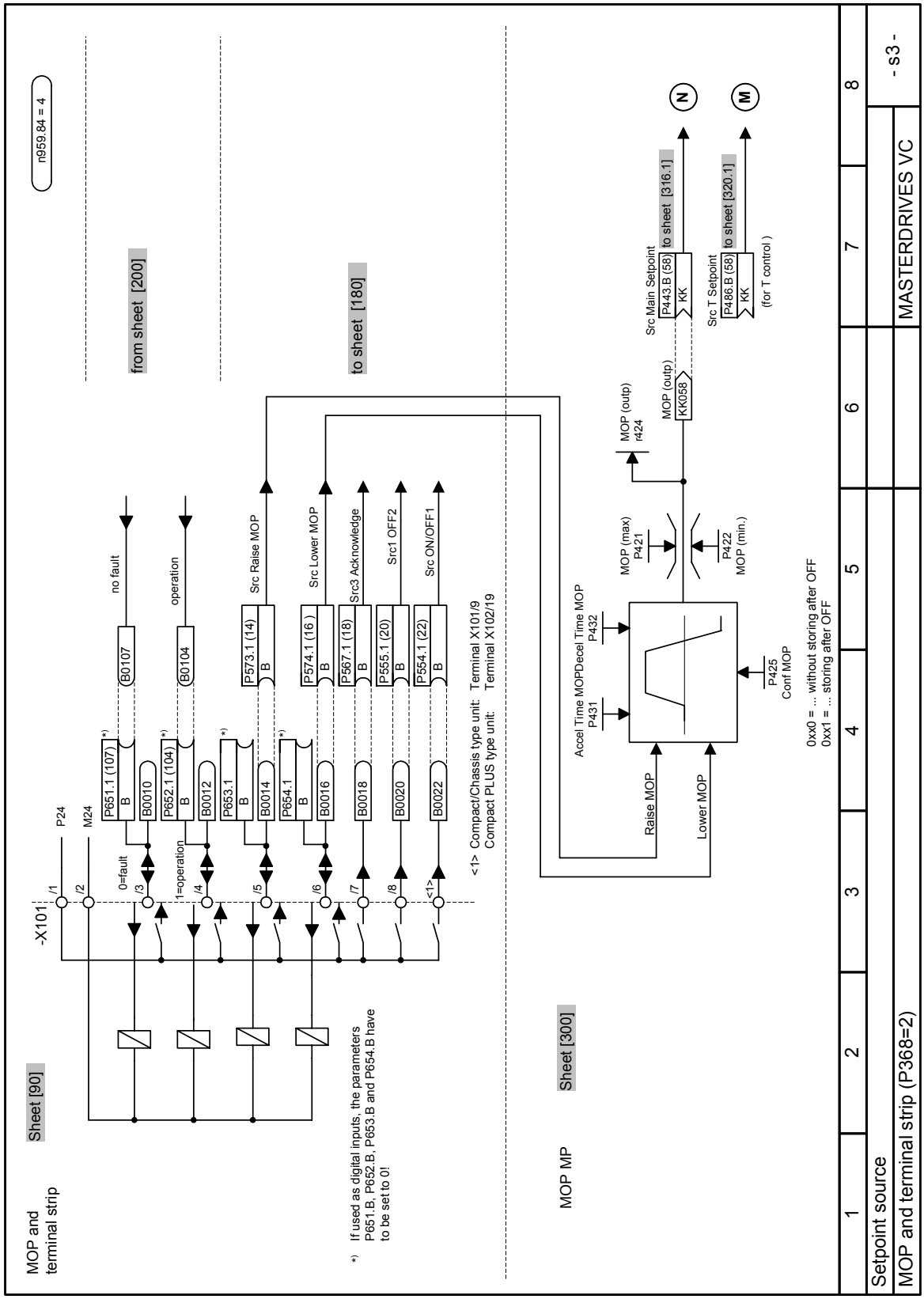
WARNING

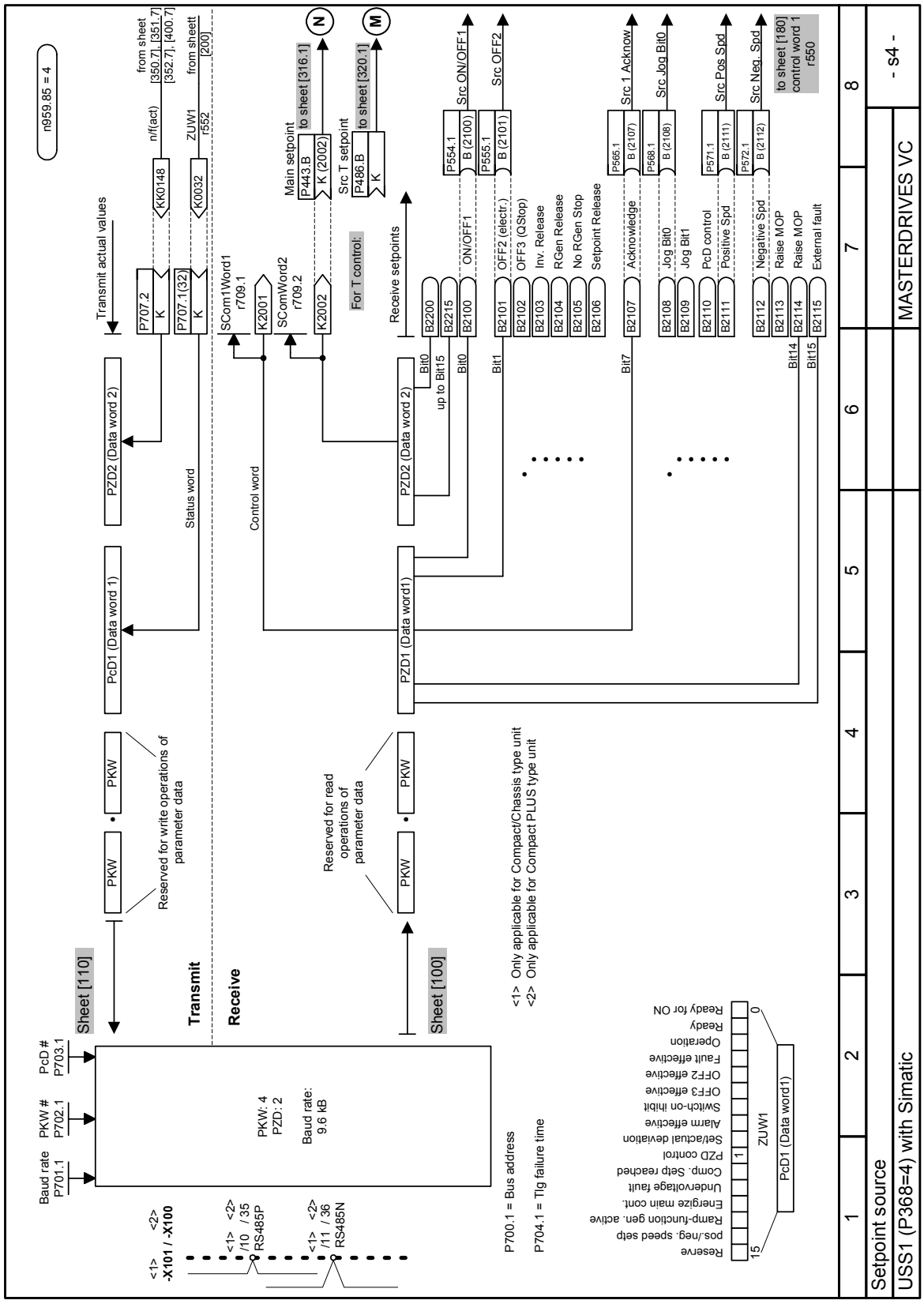
During motor identification inverter pulses are released and the drive rotates!

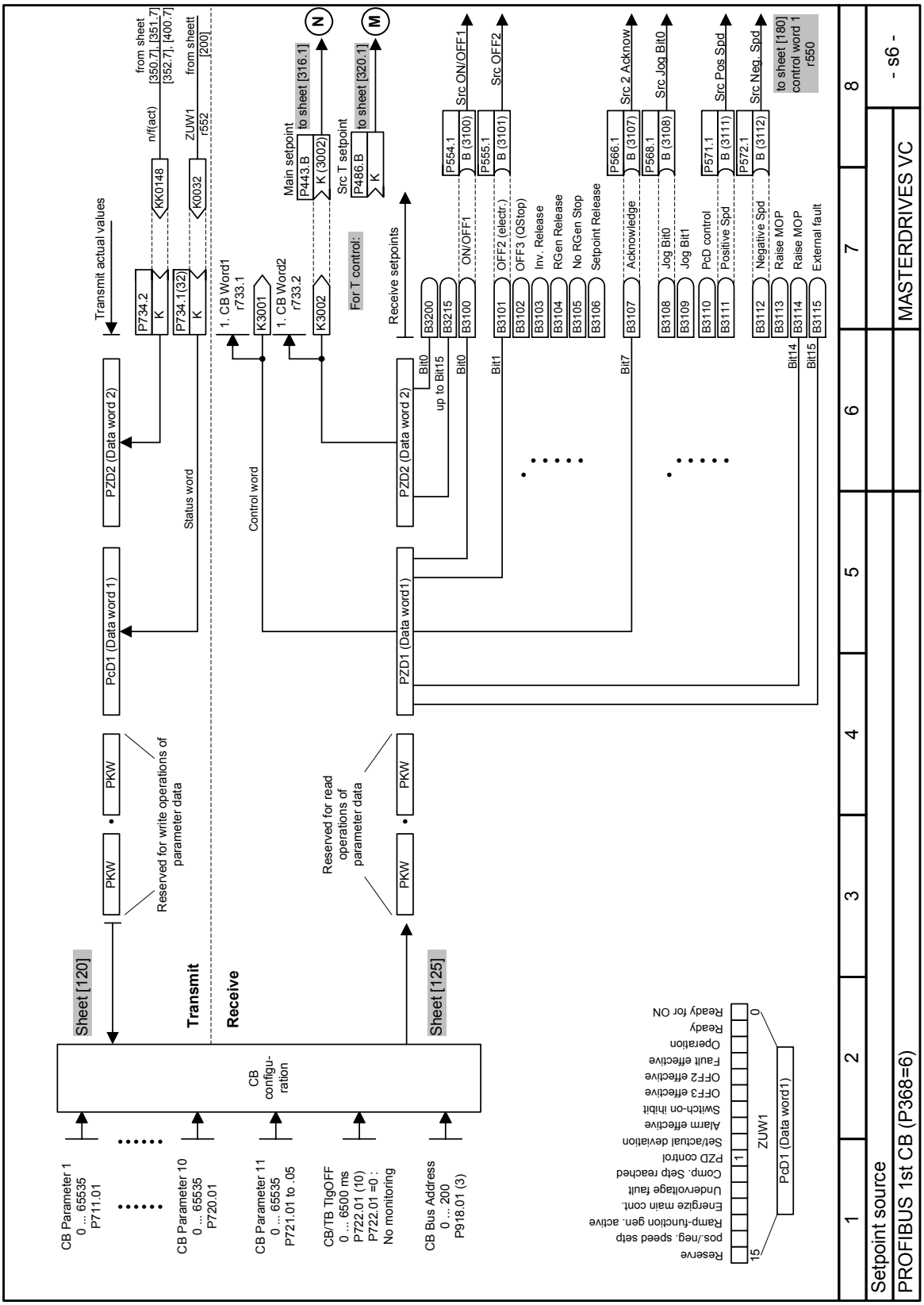
For reasons of safety, identification should first be carried out without coupling of the load.

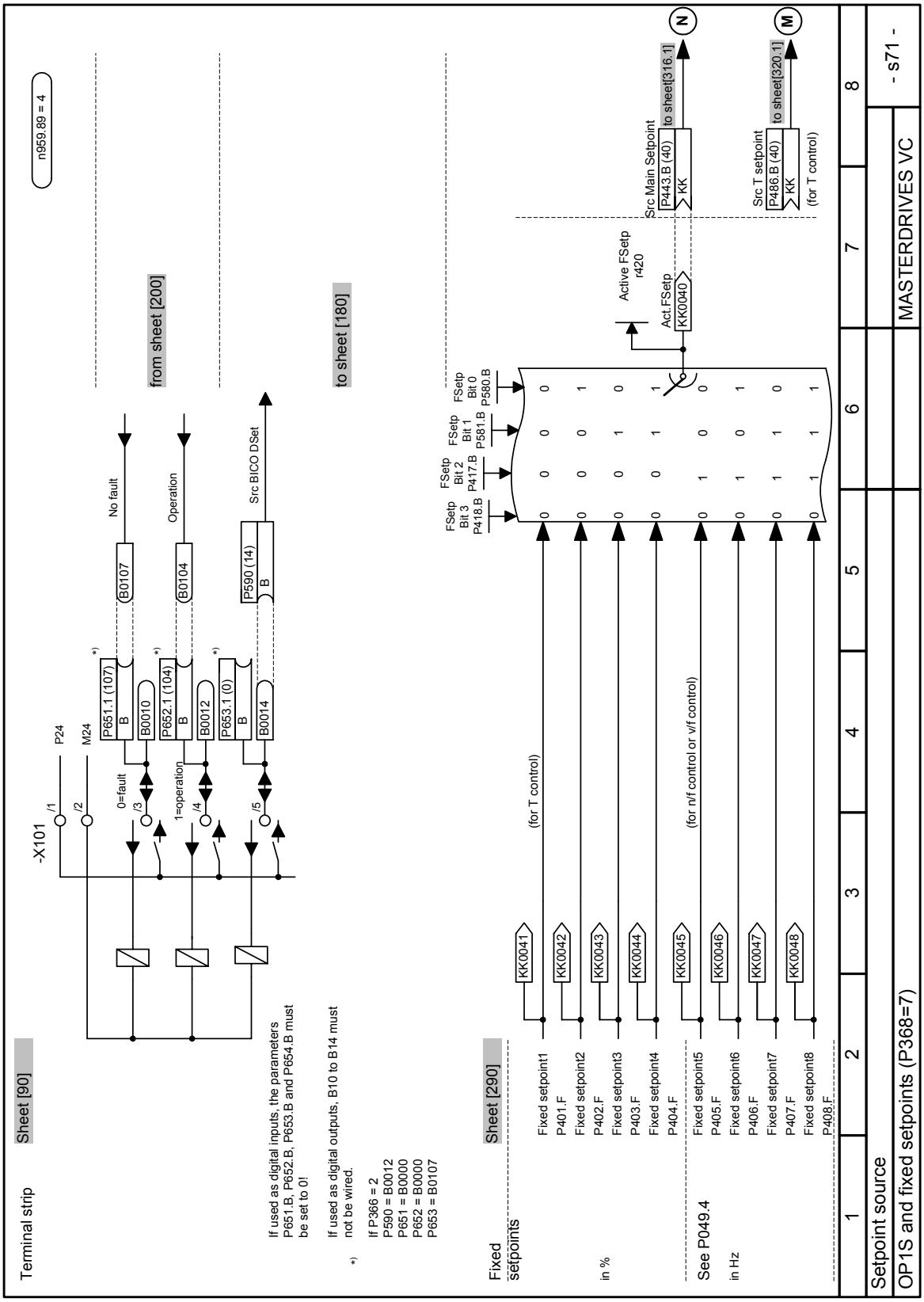

Terminal strip Sheet [90]
n959.82 = 4
from sheet [200]
to sheet [180]
-X101
P24
M24
/1
/2
/3
/4
/5
/6
/7
/8
<1>
0=fault
1=operation
P651.1 (107)
P652.1 (104)
P653.1 (0)
P654.1
B0010
B0012
B0014
B0016
B0018
B0020
B0022
B0107
B0104
no fault
operation
P561.1 (16)
P567.1 (18)
P555.1 (20)
P554.1 (22)
Src Inv Release
Src3 Acknowledge
Src1 OFF2
Src ON/OFF1
*) If used as digital inputs, the parameters P651.B, P652.B, P653.B and P654.B have to be set to 0!
If used as digital outputs, B10 to B14 must not be wired.
Analog inputs Sheet [80] / sheet [82]
Analog input 1
Analog input 2
X102/17
X102/18
<2>
<3>
A
D
-10 ... 10 V corresponds to -100 .... 100 %
Analn1 Smoothing P634.1
Analn2 Smoothing P634.2
Analn1 Offset P631.1
Analn2 Offset P631.2
Analn1 Setpoint r637.1
Analn2 Setpoint r637.2
Analn1 Setpoint K0011
Analn2 Setpoint K0013
Src Main setpoint P443.B (11) KK
Src.T setpoint P486.B (11) KK
(only T-control)
to sheet[316.1]
to sheet[320.1]
N
M
Analn Conf. P632
CUVC S3 switch
Compact PLUS Jumper on EBV S3 switch
0 -10 ... 10 V open 5 - 6
1 -10 ... 10 V
2 -20 ... 20 mA closed 4 - 5
3 -20 ... 20 mA
4 -04 ... 20 mA
Setting guide for gain and offset of setpoint frequency/ speed values: sheet[316]
<1> Compact/Chassis type unit: Terminal X101/9
Compact PLUS type unit: Terminal X102/19
<2> Compact/chassis type unit: Terminal X102/15
Compact PLUS type unit: Terminal X101/9
<3> Compact/Chassis type unit: Terminal X102/16
Compact PLUS type unit: Terminal X101/10
1 2 3 4 5 6 7 8
Setpoint source
Analog input and terminal strip (P368=1)
MASTERDRIVES VC
- s1 -

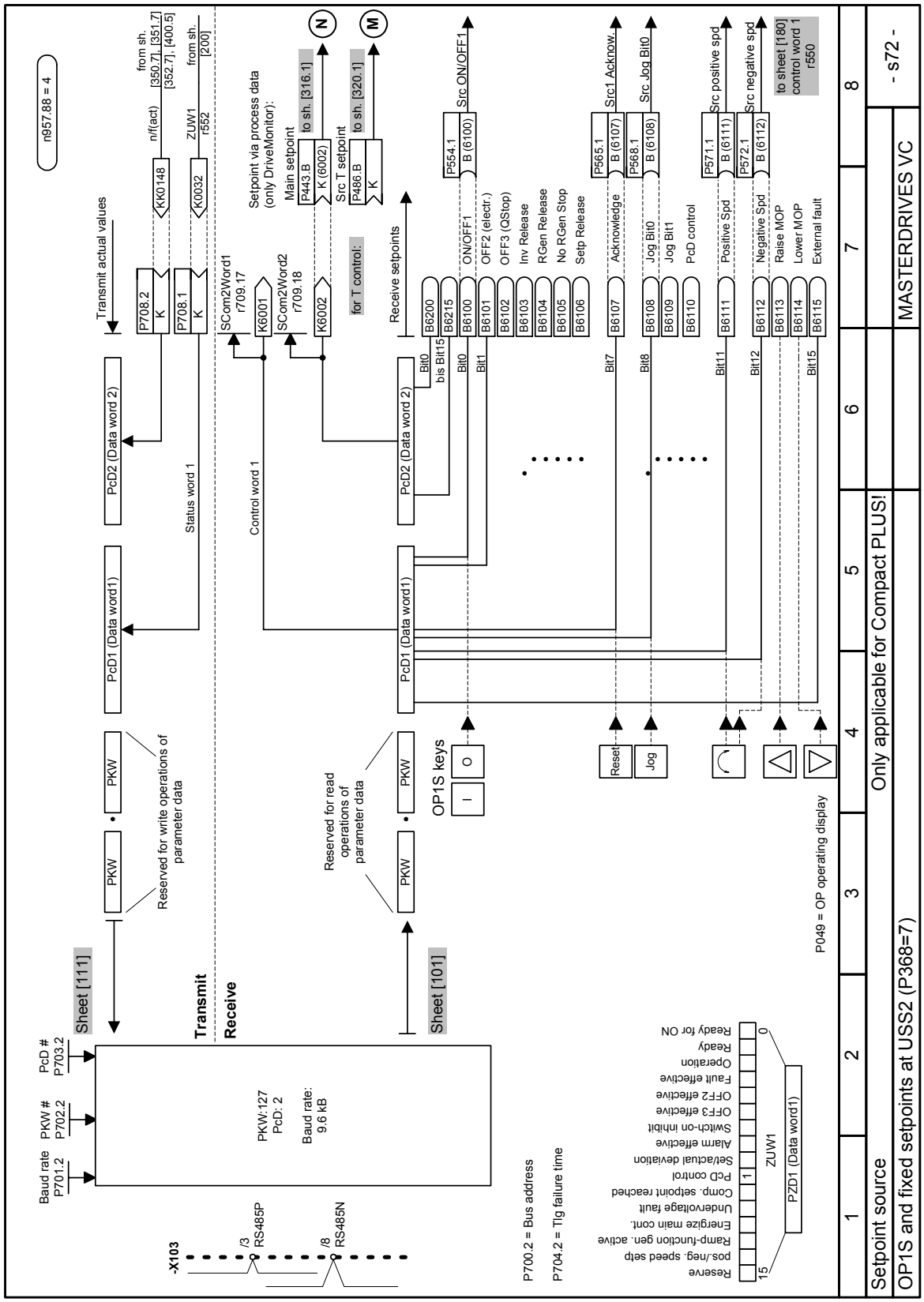

Terminal strip
Sheet[90]
-X101
P24
M24
/1
/2
/3
/4
/5
/6
/7
/8
<1>
0=fault
1=operation
P651.1
B
B0010
P652.1
B
B0012
P653.1
B
B0014
P654.1
B
B0016
B0018
B0020
B0022
B0107
B0104
no fault
operation
P580.1 (14)
B
P581.1 (16)
B
P567.1 (18)
B
P555.1 (20)
B
P554.1 (22)
B
Src.FSetp Bit 0
Src.FSetp Bit 1
Src3 Acknowledge
Src1 OFF2
Src ON/OFF1
n959.83 = 4
from sheet [200]
to sheet [180]
*) If used as digital inputs, the parameters P651.B, P652.B, P653.B and P654.B have to be set to 0!
If used as digital outputs, B10 to B14 must not be wired.
<1> Compact/Chassis type unit: Terminal X101/9
Compact PLUS type unit: Terminal X102/19
FSetp Bit 2 P417.B
FSetp Bit 3 P418.B
Fixed setpoints
Sheet [290]
KK0041
KK0042
KK0043
KK0044
KK0045
KK0046
KK0047
KK0048
Fixed setpoint1 P401.F
Fixed setpoint2 P402.F
Fixed setpoint3 P403.F
Fixed setpoint4 P404.F
Fixed setpoint5 P405.F
Fixed setpoint6 P406.F
Fixed setpoint7 P407.F
Fixed setpoint8 P408.F
in %
in Hz
Active FSetp r420
Act.FSetp KK0040
Src Main Setpoint P443.B (40) KK
to sh. [316.1]
Src T setpoint P486.B (40) KK
to sh. [320.1]
(for T control)
N
M
1 2 3 4 5 6 7 8
Setpoint source
Fixed setpoints and terminal strip (P368=2)
MASTERDRIVES VC
- s2 -

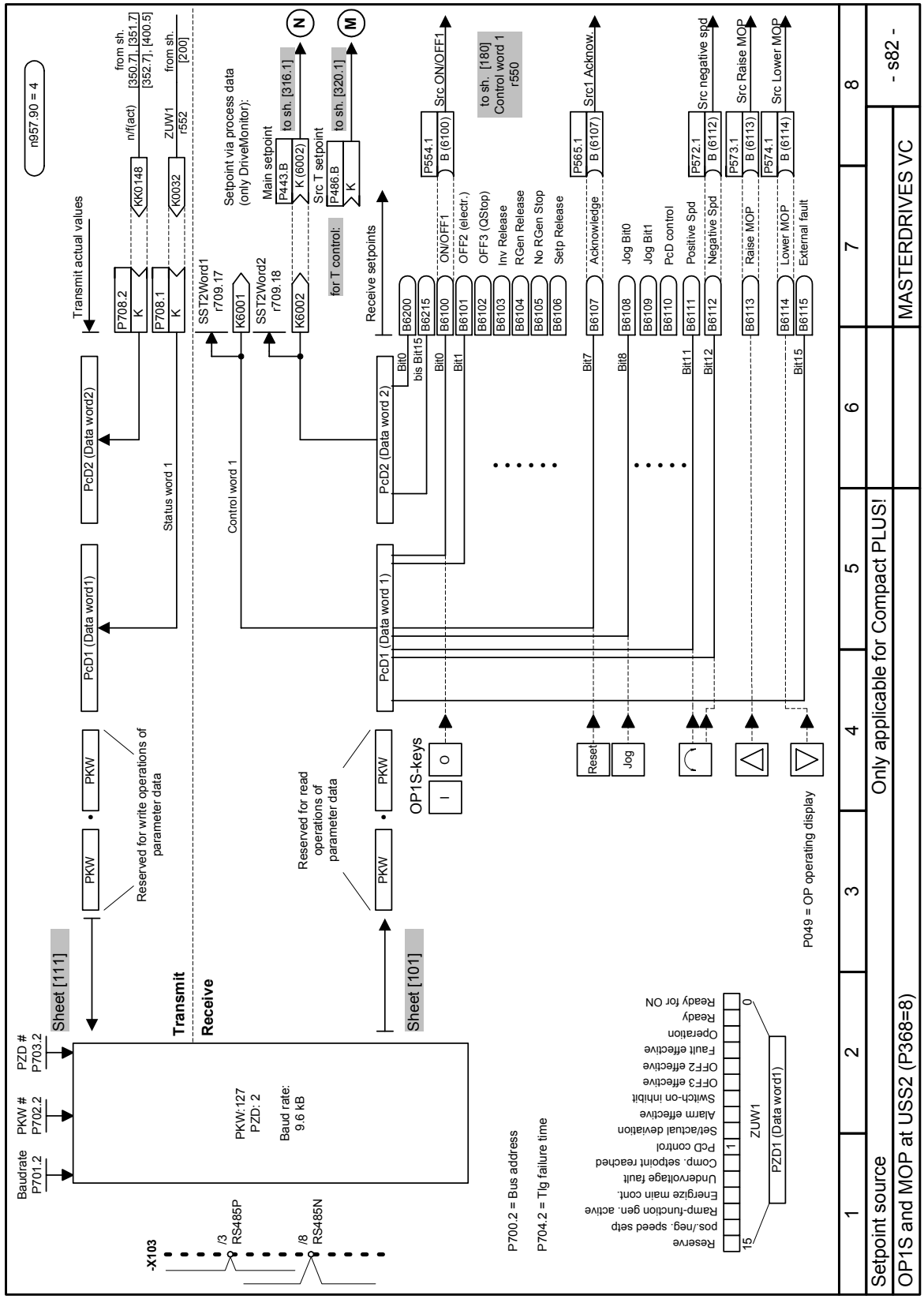

n959.84 = 4
MOP and terminal strip
Sheet [90]
-X101
P24
M24
/1
/2
/3
/4
/5
/6
/7
/8
<1>
0=fault
1=operation
P651.1 (107)
B0010
P652.1 (104)
B0012
P653.1
B0014
P654.1
B0016
B0018
B0020
B0022
B0107
B0104
no fault
operation
P573.1 (14)
P574.1 (16)
P567.1 (18)
P555.1 (20)
P554.1 (22)
Src Raise MOP
Src Lower MOP
Src3 Acknowledge
Src1 OFF2
Src ON/OFF1
from sheet [200]
to sheet [180]
*) If used as digital inputs, the parameters P651.B, P652.B, P653.B and P654.B have to be set to 0!
<1> Compact/Chassis type unit: Terminal X101/9
Compact PLUS type unit: Terminal X102/19
MOP MP
Sheet [300]
Accel Time MOP
P431
Decel Time MOP
P432
Raise MOP
Lower MOP
MOP (max)
P421
MOP (min.)
P422
P425
Conf MOP
0xx0 = ... without storing after OFF
0xx1 = ... storing after OFF
MOP (outp)
r424
MOP (outp)
KK058
Src Main Setpoint
P443.B (58)
KK
to sheet [316.1]
Src T Setpoint
P486.B (58)
KK
to sheet [320.1]
(for T control)
N
M
1
2
3
4
5
6
7
8
Setpoint source
MOP and terminal strip (P368=2)
MASTERDRIVES VC
- s3 -

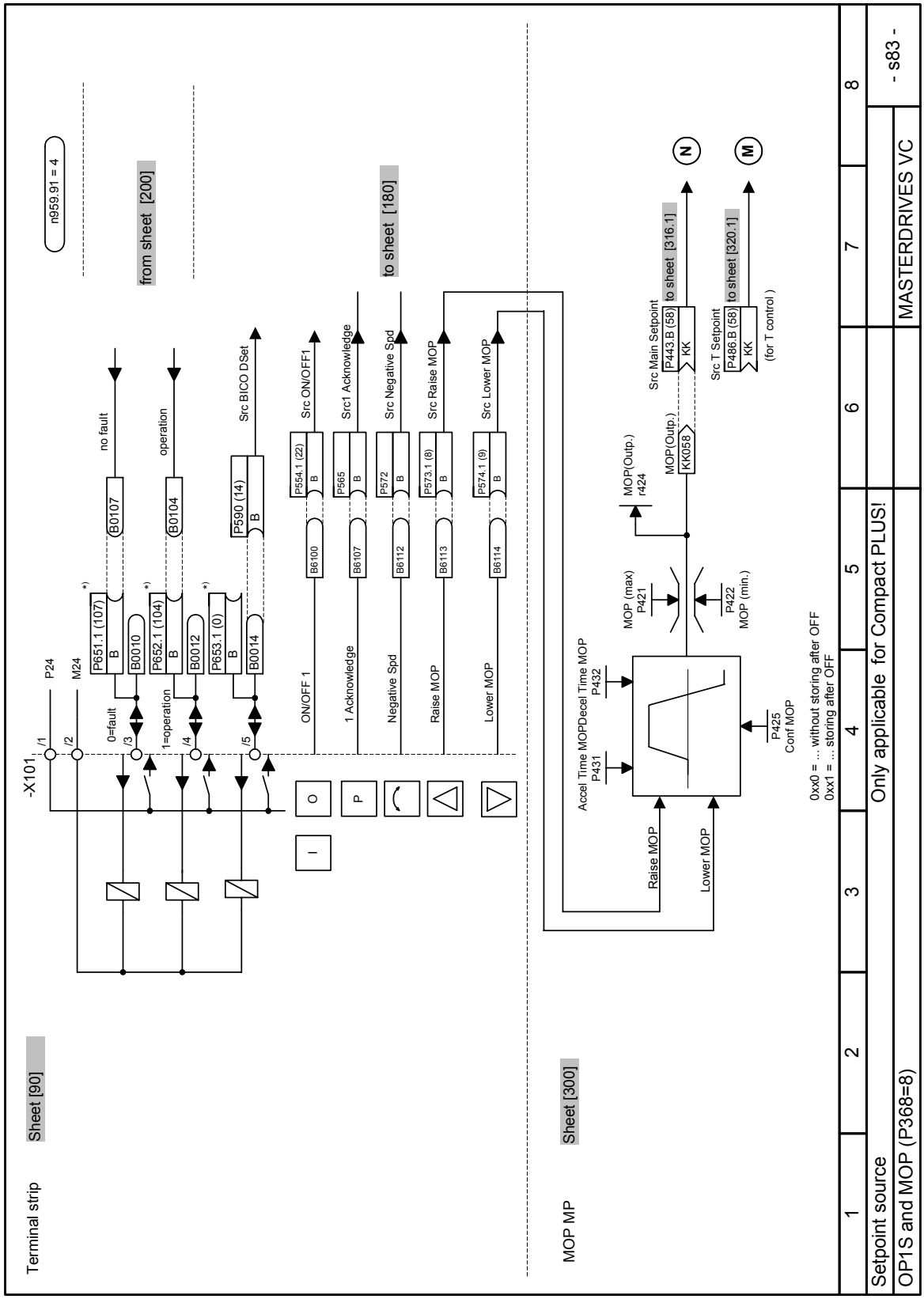

n959.85 = 4
Transmit actual values
P707.2
K
KK0148
n/f(act)
from sheet [350.7], [351.7] [352.7], [400.7]
P707.1(32)
K
K0032
ZUW1 r552
from sheet [200]
PZD2 (Data word 2)
PcD1 (Data word 1)
Status word
Control word
SCom1Word1 r709.1
K2001
SComWord2 r709.2
K2002
Main setpoint
P443.B
K (2002)
to sheet [316.1]
N
Src T setpoint
P486.B
K
to sheet [320.1]
M
For T control:
Receive setpoints
PZD2 (Data word 2)
Bit0
up to Bit15
Bit0
Bit1
PZD1 (Data word1)
B2200
B2215
B2100
B2101
B2102
B2103
B2104
B2105
B2106
B2107
B2108
B2109
B2110
B2111
B2112
B2113
B2114
B2115
ON/OFF1
OFF2 (electr.)
OFF3 (QStop)
Inv. Release
RGen Release
No RGen Stop
Setpoint Release
Acknowledge
Jog Bit0
Jog Bit1
PcD control
Positive Spd
Negative Spd
Raise MOP
Raise MOP
External fault
P554.1
B (2100)
Src ON/OFF1
P555.1
B (2101)
Src OFF2
P565.1
B (2107)
Src 1 Acknow
P568.1
B (2108)
Src Jog Bit0
P571.1
B (2111)
Src Pos Spd
P572.1
B (2112)
Src Neg. Spd
to sheet [180] control word 1 r550
Bit7
Bit14
Bit15
Transmit
Receive
Sheet [110]
Sheet [100]
PKW
PKW
Reserved for write operations of parameter data
Reserved for read operations of parameter data
<1> Only applicable for Compact/Chassis type unit
<2> Only applicable for Compact PLUS type unit
Baud rate P701.1
PKW # P702.1
PcD # P703.1
PKW: 4
PZD: 2
Baud rate: 9.6 kB
P700.1 = Bus address
P704.1 = Tlg failure time
<1> -X101 / -X100
<2> /10 / 35 RS485P
<1> <2> /11 / 36 RS485N
Reserve
pos./neg. speed setp
Ramp-function gen. active
Energize main cont.
Undervoltage fault
Comp. Setp reached
PZD control
Set/actual deviation
Alarm effective
Switch-on inhibit
OFF3 effective
OFF2 effective
Fault effective
Operation
Ready
Ready for ON
15
1
0
ZUW1
PcD1 (Data word1)
1 2 3 4 5 6 7 8
Setpoint source
USS1 (P368=4) with Simatic
MASTERDRIVES VC
- s4 -

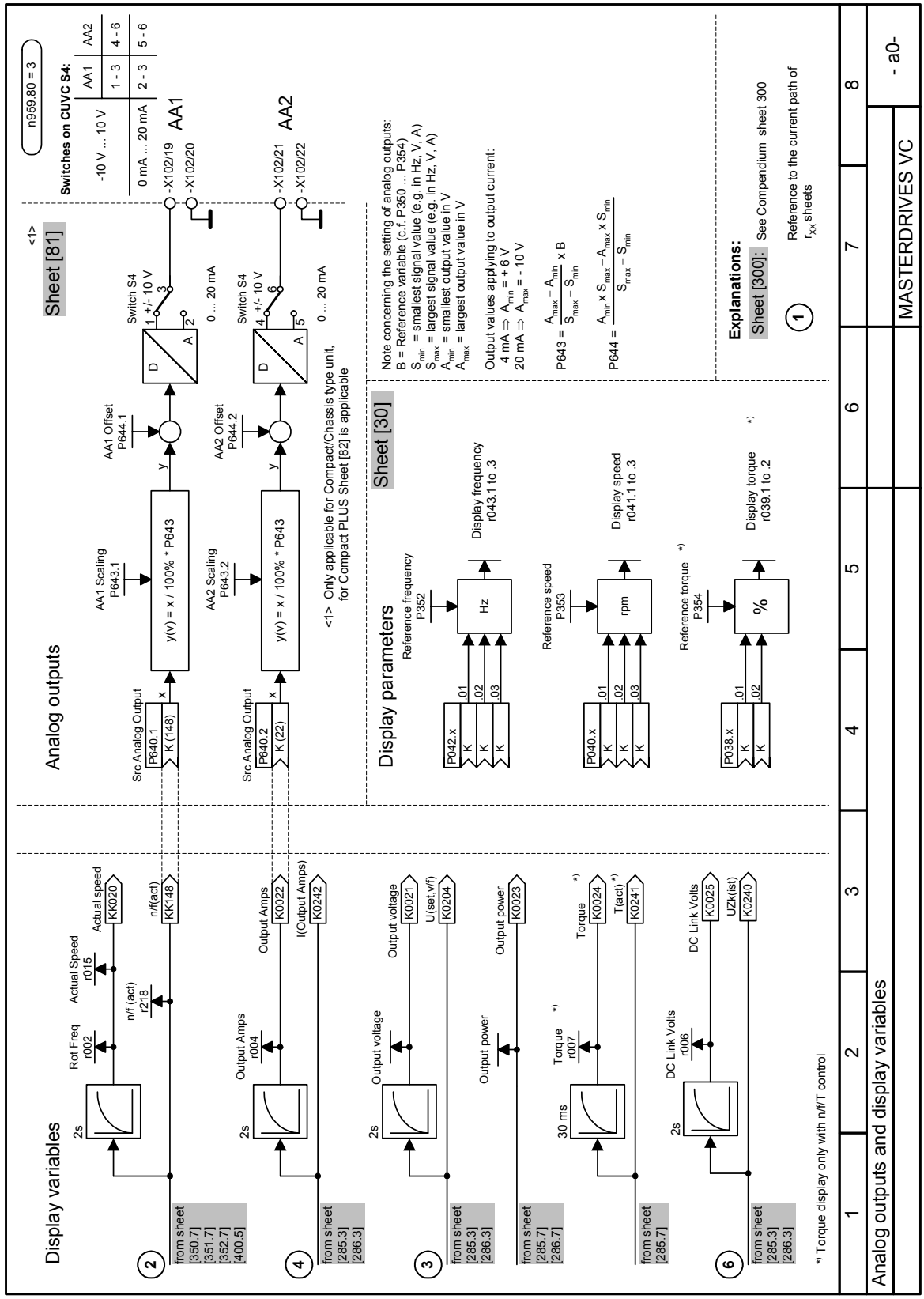

Setpoint source
PROFIBUS 1st CB (P368=6)
MASTERDRIVES VC
- s6 -
Sheet [120]
Sheet [125]
Transmit
Receive
CB configu-ration
CB Parameter 1
0 ... 65535
P711.01
CB Parameter 10
0 ... 65535
P720.01
CB Parameter 11
0 ... 65535
P721.01 to .05
CB/TB TigOFF
0 ... 6500 ms
P722.01 (10)
P722.01 =0 :
No monitoring
CB Bus Address
0 ... 200
P918.01 (3)
PKW
Reserved for write operations of parameter data
Reserved for read operations of parameter data
PcD1 (Data word 1)
PZD2 (Data word 2)
Transmit actual values
Status word
Control word
P734.2
P734.1(32)
KK0148
K0032
n/f(act)
ZUW1
r552
from sheet [350.7], [351.7] [352.7], [400.7]
from sheet [200]
1. CB Word1
r733.1
1. CB Word2
r733.2
K3001
K3002
Main setpoint
P443.B
K (3002)
to sheet [316.1]
Src T setpoint
P486.B
to sheet [320.1]
For T control:
Receive setpoints
PZD1 (Data word1)
B3200
B3215
B3100
B3101
B3102
B3103
B3104
B3105
B3106
B3107
B3108
B3109
B3110
B3111
B3112
B3113
B3114
B3115
Bit0
up to Bit15
Bit1
Bit7
Bit14
Bit15
ON/OFF1
OFF2 (electr.)
OFF3 (QStop)
Inv. Release
RGen Release
No RGen Stop
Setpoint Release
Acknowledge
Jog Bit0
Jog Bit1
PcD control
Positive Spd
Negative Spd
Raise MOP
Raise MOP
External fault
P554.1
B (3100)
P555.1
B (3101)
P566.1
B (3107)
P568.1
B (3108)
P571.1
B (3111)
P572.1
B (3112)
Src ON/OFF1
Src OFF2
Src 2 Acknow
Src Jog Bit0
Src Pos Spd
Src Neg. Spd
to sheet [180]
control word 1
r550
ZUW1
PcD1 (Data word1)
15
0
Reserve
pos./neg. speed setp
Ramp-function gen. active
Energize main cont.
Undervoltage fault
Comp. Setp reached
PZD control
Setp/actual deviation
Alarm effective
Switch-on inhibit
OFF3 effective
OFF2 effective
Fault effective
Operation
Ready
Ready for ON
1
2
3
4
5
6
7
8

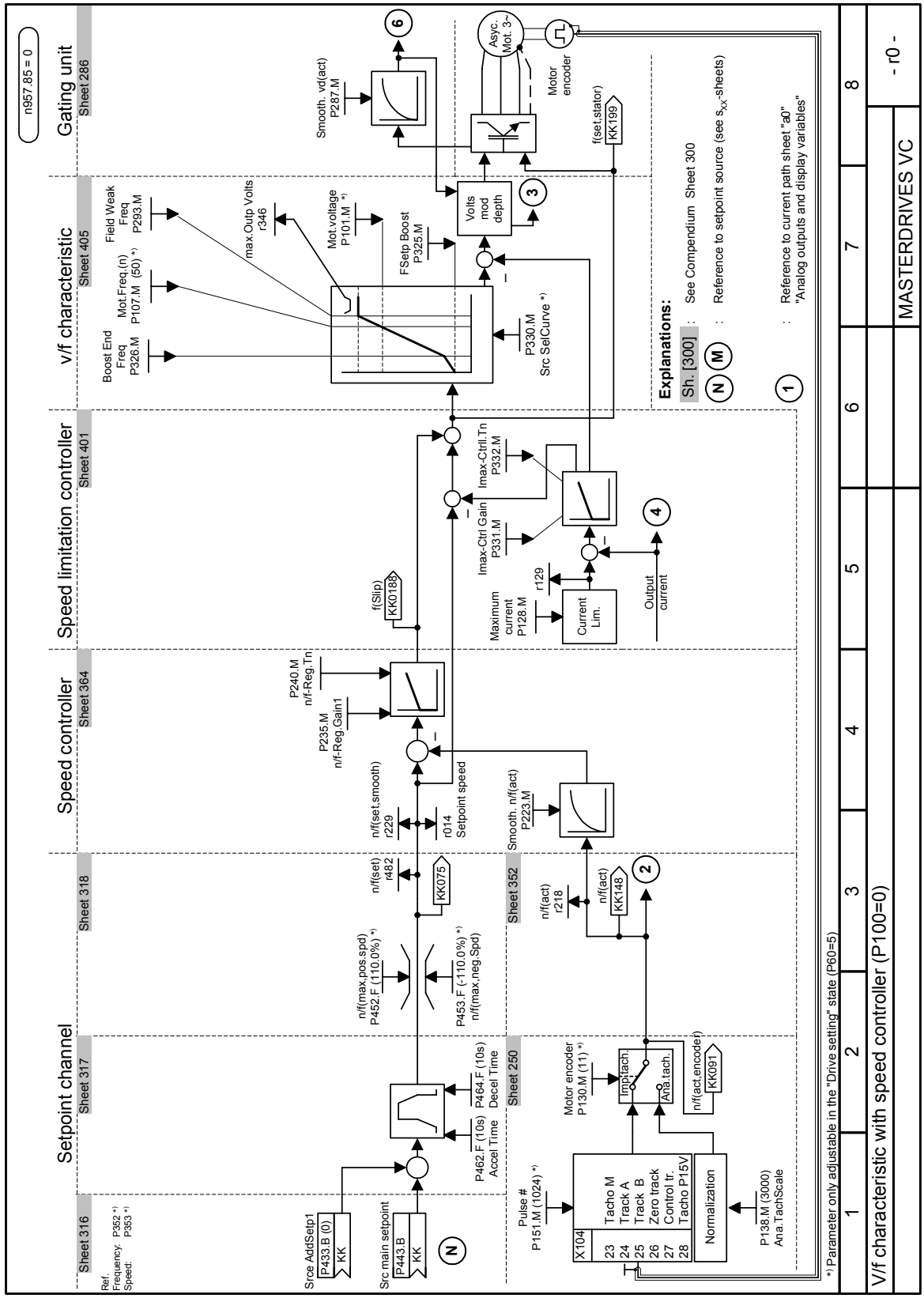

Terminal strip
Sheet [90]
n959.89 = 4
-X101
P24
M24
/1
/2
/3
/4
/5
0=fault
1=operation
P651.1 (107)
B0010
P652.1 (104)
B0012
P653.1 (0)
B0014
No fault
B0107
Operation
B0104
Src BICO DSet
P590 (14)
from sheet [200]
to sheet [180]
If used as digital inputs, the parameters P651.B, P652.B, P653.B and P654.B must be set to 0!
If used as digital outputs, B10 to B14 must not be wired.
*) If P366 = 2
P590 = B0012
P651 = B0000
P652 = B0000
P653 = B0107
Fixed setpoints
Sheet [290]
FSetp Bit 3 P418.B
FSetp Bit 2 P417.B
FSetp Bit 1 P581.B
FSetp Bit 0 P580.B
(for T control)
(for n/f control or v/f control)
KK0041
KK0042
KK0043
KK0044
KK0045
KK0046
KK0047
KK0048
Fixed setpoint1
P401.F
Fixed setpoint2
P402.F
Fixed setpoint3
P403.F
Fixed setpoint4
P404.F
Fixed setpoint5
P405.F
Fixed setpoint6
P406.F
Fixed setpoint7
P407.F
Fixed setpoint8
P408.F
in %
See P049.4
in Hz
Active FSetp r420
Act.FSetp
KK0040
Src Main Setpoint
P443.B (40)
KK
to sheet[316.1]
Src T setpoint
P486.B (40)
KK
to sheet[320.1]
(for T control)
N
M
1 2 3 4 5 6 7 8
Setpoint source
OP1S and fixed setpoints (P368=7)
MASTERDRIVES VC
- s71 -

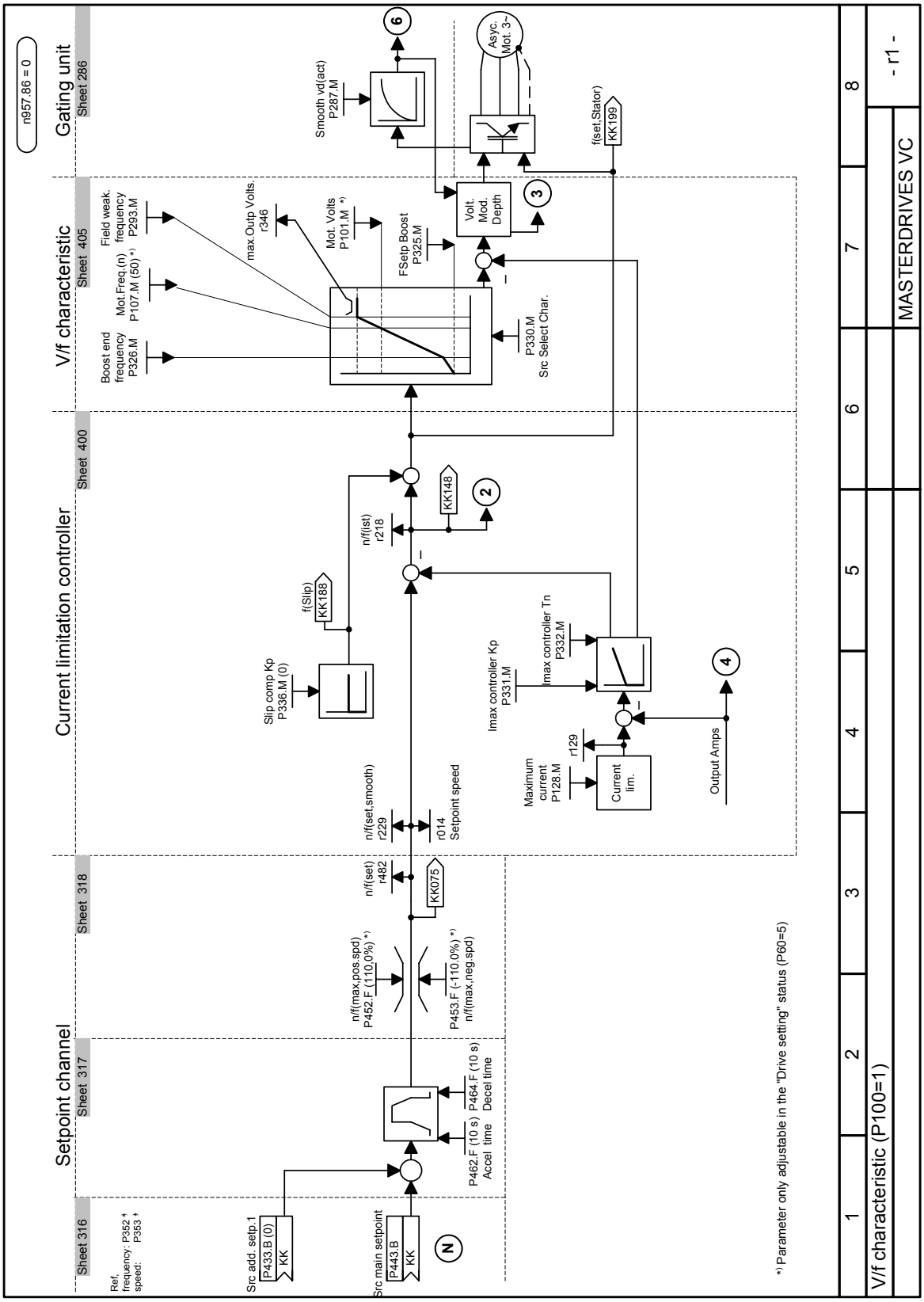

n957.88 = 4
Transmit actual values
PcD2 (Data word 2)
PcD1 (Data word1)
Status word 1
Control word 1
Transmit
Receive
Sheet [111]
Sheet [101]
PKW
Reserved for write operations of parameter data
Reserved for read operations of parameter data
P708.2
P708.1
KK0148
K0032
n/f(act)
ZUW1
from sh. [350.7], [351.7] [352.7], [400.5]
from sh. [200]
SCom2Word1 r709.17
SCom2Word2 r709.18
K6001
K6002
Setpoint via process data (only DriveMonitor):
Main setpoint
Src T setpoint
for T control:
P443.B
P486.B
K (6002)
to sh. [316.1]
to sh. [320.1]
Receive setpoints
B6200
B6215
B6100
B6101
B6102
B6103
B6104
B6105
B6106
ON/OFF1
OFF2 (electr.)
OFF3 (QStop)
Inv Release
RGen Release
No RGen Stop
Setp Release
P554.1
B (6100)
Src ON/OFF1
P565.1
B (6107)
Src1 Acknow.
Acknowledge
P568.1
B (6108)
Src Jog Bit0
Jog Bit0
Jog Bit1
PcD control
P571.1
B (6111)
Src positive spd
Positive Spd
P572.1
B (6112)
Src negative spd
Negative Spd
Raise MOP
Lower MOP
External fault
to sheet [180] control word 1 r550
OP1S keys
Reset
Jog
P049 = OP operating display
Baud rate P701.2
PKW # P702.2
PcD # P703.2
PKW:127
PcD: 2
Baud rate: 9.6 kB
-X103
/3 RS485P
/8 RS485N
P700.2 = Bus address
P704.2 = Tlg failure time
PZD1 (Data word1)
ZUW1
Reserve
pos./neg. speed setp
Ramp-function gen. active
Energize main cont.
Undervoltage fault
Comp. setpoint reached
PcD control
Setp/actual deviation
Alarm effective
Switch-on inhibit
OFF3 effective
OFF2 effective
Fault effective
Operation
Ready
Ready for ON
Setpoint source
OP1S and fixed setpoints at USS2 (P368=7)
Only applicable for Compact PLUS!
MASTERDRIVES VC
- s72 -

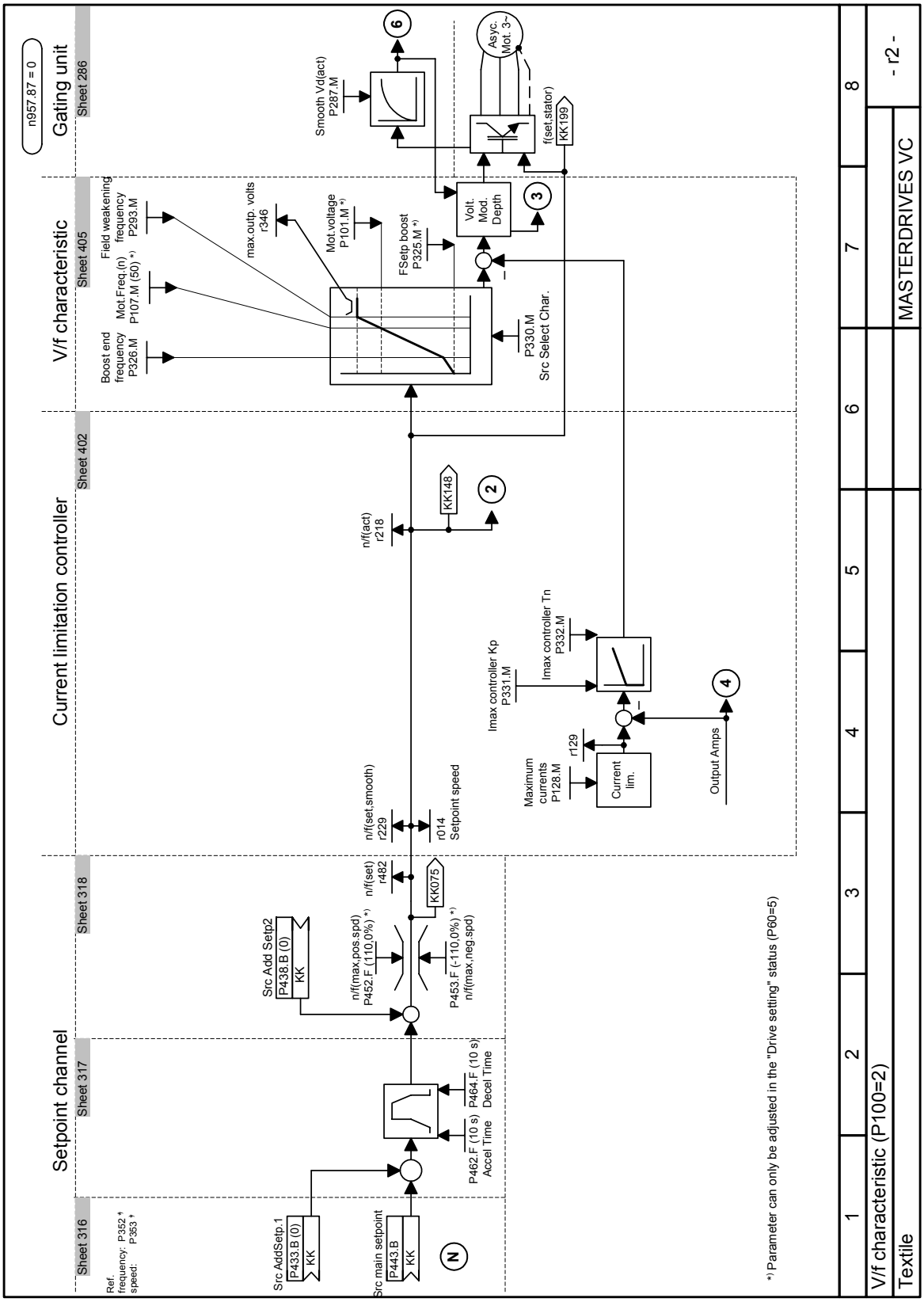

Setpoint source
OP1S and MOP at USS2 (P368=8)
Only applicable for Compact PLUS!
MASTERDRIVES VC
- s82 -
n957.90 = 4
Transmit actual values
PcD2 (Data word2)
PcD1 (Data word1)
Status word 1
Control word 1
PcD2 (Data word 2)
PcD1 (Data word 1)
Receive setpoints
Setpoint via process data (only DriveMonitor):
Main setpoint
Src T setpoint
for T control:
to sh. [316.1]
to sh. [320.1]
to sh. [180] Control word 1 r550
Src ON/OFF1
Src1 Acknow.
Src negative spd
Src Raise MOP
Src Lower MOP
ON/OFF1
OFF2 (electr.)
OFF3 (QStop)
Inv Release
RGen Release
No RGen Stop
Setp Release
Acknowledge
Jog Bit0
Jog Bit1
PcD control
Positive Spd
Negative Spd
Raise MOP
Lower MOP
External fault
Reset
Jog
OP1S-keys
Reserved for write operations of parameter data
Reserved for read operations of parameter data
Transmit
Receive
Sheet [111]
Sheet [101]
Baudrate P701.2
PKW # P702.2
PZD # P703.2
PKW:127
PZD: 2
Baud rate: 9.6 kB
-X103
/3 RS485P
/8 RS485N
P700.2 = Bus address
P704.2 = Tlg failure time
P049 = OP operating display
ZUW1
PZD1 (Data word1)
Reserve
pos./neg. speed setp
Ramp-function gen. active
Energize main cont.
Undervoltage fault
Comp. setpoint reached
PcD control
Set/actual deviation
Alarm effective
Switch-on inhibit
OFF3 effective
OFF2 effective
Fault effective
Operation
Ready
Ready for ON

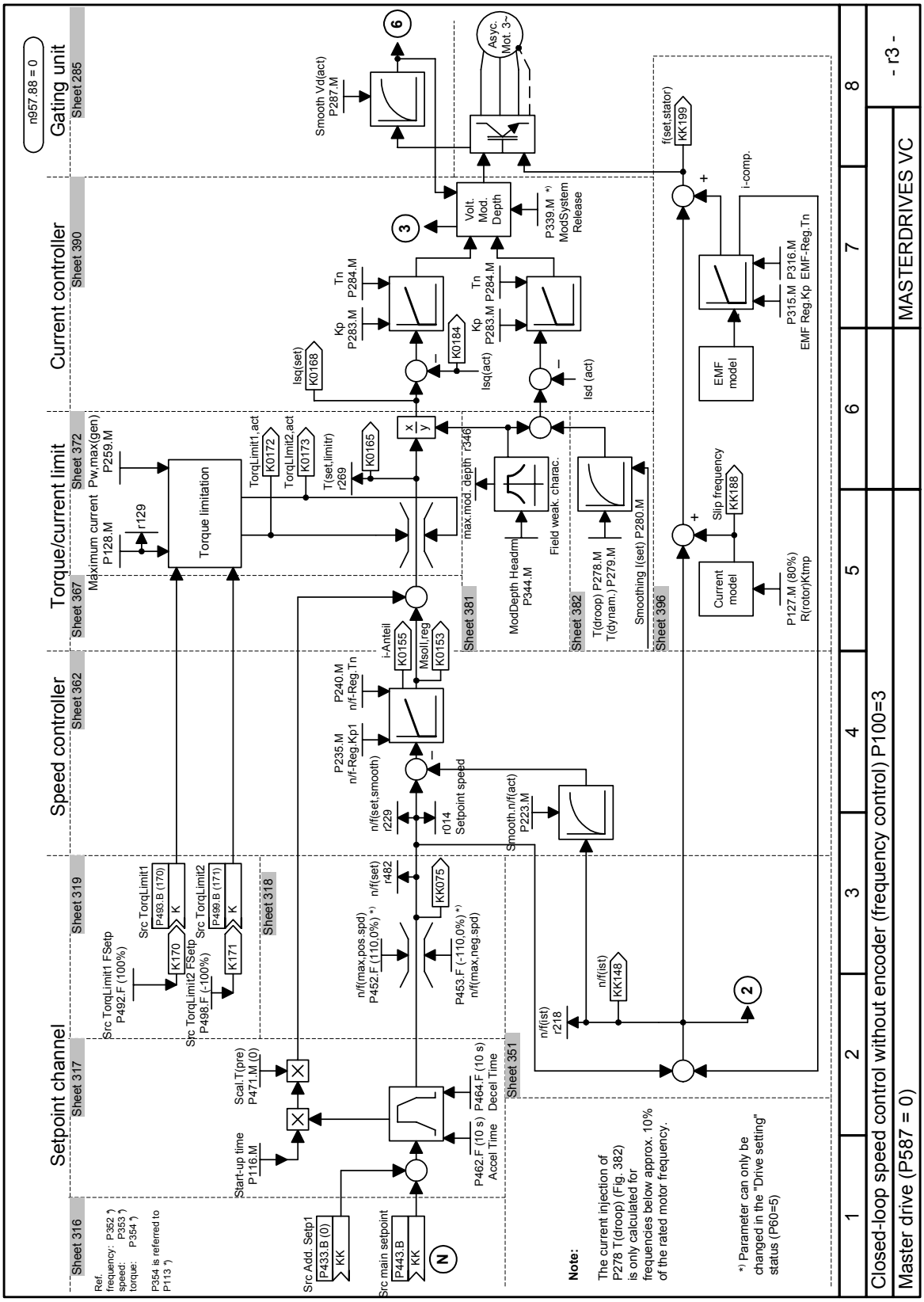

Terminal strip
Sheet [90]
MOP MP
Sheet [300]
-X101
/1
/2
/3
/4
/5
P24
M24
0=fault
1=operation
P651.1 (107)
P652.1 (104)
P653.1 (0)
B0010
B0012
B0014
B0107
B0104
P590 (14)
no fault
operation
Src BICO DSet
n959.91 = 4
from sheet [200]
to sheet [180]
ON/OFF 1
1 Acknowledge
Negative Spd
Raise MOP
Lower MOP
Src ON/OFF1
Src1 Acknowledge
Src Negative Spd
Src Raise MOP
Src Lower MOP
P554.1 (22)
P565
P572
P573.1 (8)
P574.1 (9)
B6100
B6107
B6112
B6113
B6114
Accel Time MOP
Decel Time MOP
P431
P432
Raise MOP
Lower MOP
MOP (max)
P421
MOP (min.)
P422
P425
Conf MOP
MOP(Outp.)
r424
MOP(Outp.)
KK058
Src Main Setpoint
P443.B (58)
KK
to sheet [316.1]
Src T Setpoint
P486.B (58)
KK
to sheet [320.1]
(for T control)
N
M
0xx0 = ... without storing after OFF
0xx1 = ... storing after OFF
1 2 3 4 5 6 7 8
Setpoint source
Only applicable for Compact PLUS!
OP1S and MOP (P368=8)
MASTERDRIVES VC
- s83 -

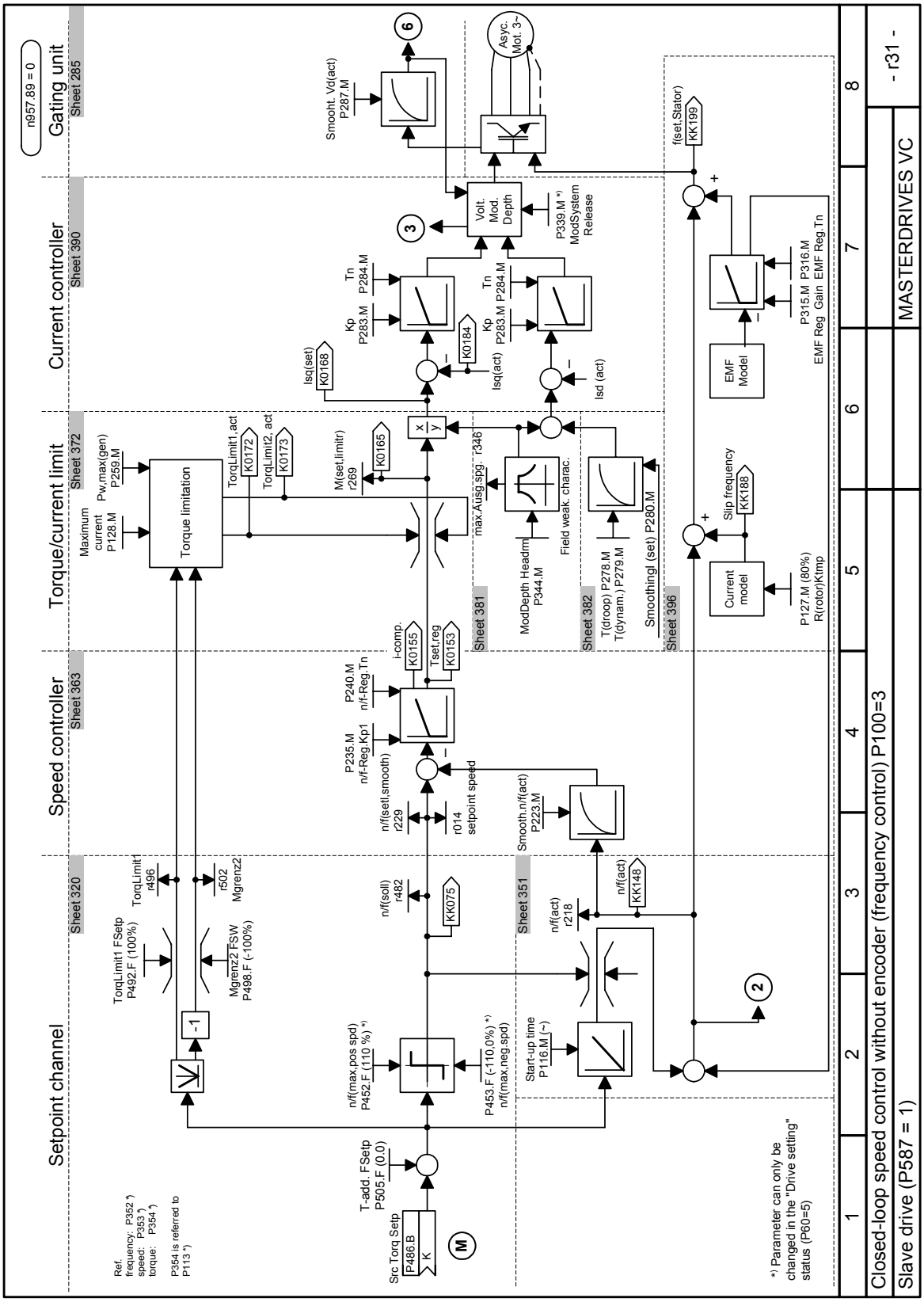

Analog outputs and display variables
MASTERDRIVES VC
- a0-
Display variables
Analog outputs
Sheet [81]
Sheet [30]
Display parameters
n959.80 = 3
Switches on CUVC S4:
-10 V ... 10 V
0 mA ... 20 mA
AA1
AA2
Switch S4
AA1 Offset P644.1
AA2 Offset P644.2
AA1 Scaling P643.1
AA2 Scaling P643.2
Src Analog Output P640.1
Src Analog Output P640.2
y(v) = x / 100% * P643
-X102/19
-X102/20
-X102/21
-X102/22
0 ... 20 mA
<1> Only applicable for Compact/Chassis type unit, for Compact PLUS Sheet [82] is applicable
Note concerning the setting of analog outputs:
B = Reference variable (c.f. P350 ... P354)
Output values applying to output current:
4 mA ⇒ Amin = + 6 V
20 mA ⇒ Amax = - 10 V
Explanations:
Sheet [300]: See Compendium sheet 300
Reference to the current path of rXX sheets
Rot Freq r002
Actual Speed r015
Actual speed KK020
n/f (act) r218
n/f(act) KK148
Output Amps r004
Output Amps K0022
I(Output Amps) K0242
Output voltage
Output voltage K0021
U(set,v/f) K0204
Output power
Output power K0023
Torque r007
Torque K0024
T(act) K0241
DC Link Volts r006
DC Link Volts K0025
UZk(ist) K0240
2s
30 ms
from sheet [350.7] [351.7] [352.7] [400.5]
from sheet [285.3] [286.3]
from sheet [285.7] [286.7]
Reference frequency P352
Reference speed P353
Reference torque P354
Display frequency r043.1 to .3
Display speed r041.1 to .3
Display torque r039.1 to .2
P042.x
P040.x
P038.x
Hz
rpm
%
*) Torque display only with n/f/T control

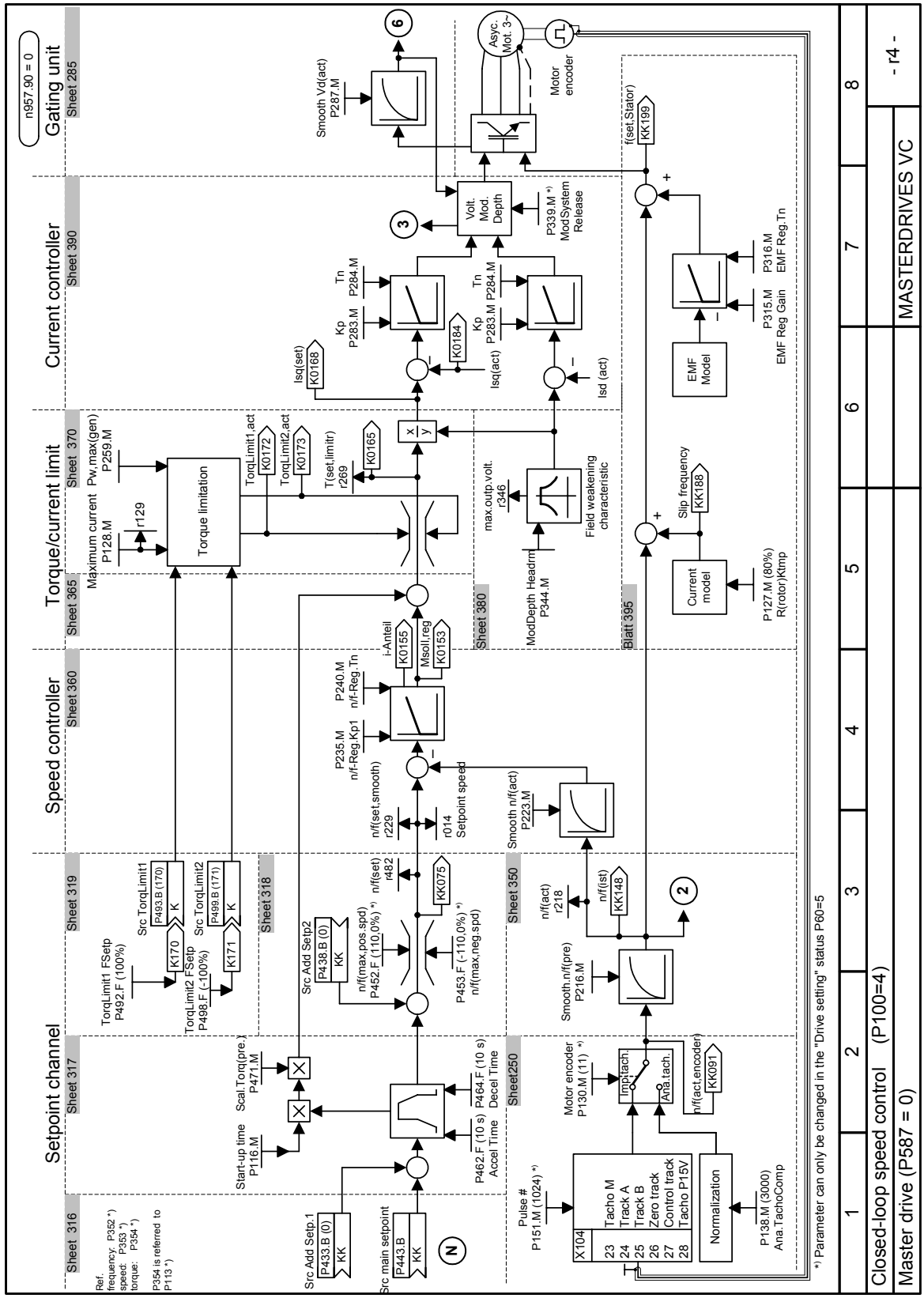

n957.85 = 0
Setpoint channel
Speed controller
Speed limitation controller
v/f characteristic
Gating unit
Sheet 316
Sheet 317
Sheet 318
Sheet 364
Sheet 401
Sheet 405
Sheet 286
Sheet 250
Sheet 352
Ref. Frequency: P352 *) Speed: P353 *)
Srce AddSetp1
P433.B (0)
KK
Src main setpoint
P443.B
KK
P462.F (10s) Accel Time
P464.F (10s) Decel Time
n/f(max.pos.spd) P452.F (110.0%) *)
P453.F (-110.0%) *) n/f(max.neg.Spd)
n/f(set) r482
KK075
P240.M n/f-Reg.Tn
P235.M n/f-Reg.Gain1
n/f(set,smooth) r229
r014 Setpoint speed
f(Slip) KK0188
Imax-Ctrl.Tn P332.M
Imax-Ctrl Gain P331.M
Maximum current P128.M
r129
Current Lim.
Output current
Smooth. n/f(act) P223.M
n/f(act) r218
n/f(act) KK148
Pulse # P151.M (1024) *)
X104
23 Tacho M
24 Track A
25 Track B
26 Zero track
27 Control tr.
28 Tacho P15V
Normalization
P138.M (3000) Ana.TachScale
Motor encoder P130.M (11) *)
Impl.tach.
Ana.tach.
n/f(act,encoder)
KK091
Smooth. vd(act) P287.M
Asyc. Mot. 3~
Motor encoder
f(set,stator) KK199
Boost End Freq P326.M
Mot.Freq.(n) P107.M (50) *)
Field Weak Freq P293.M
max.Outp Volts r346
Mot.voltage P101.M *)
FSetp Boost P325.M
Volts mod depth
P330.M Src SelCurve *)
Explanations:
Sh. [300] : See Compendium Sheet 300
N M : Reference to setpoint source (see sXX-sheets)
1 : Reference to current path sheet "a0" "Analog outputs and display variables"
*) Parameter only adjustable in the "Drive setting" state (P60=5)
V/f characteristic with speed controller (P100=0)
MASTERDRIVES VC
- r0 -

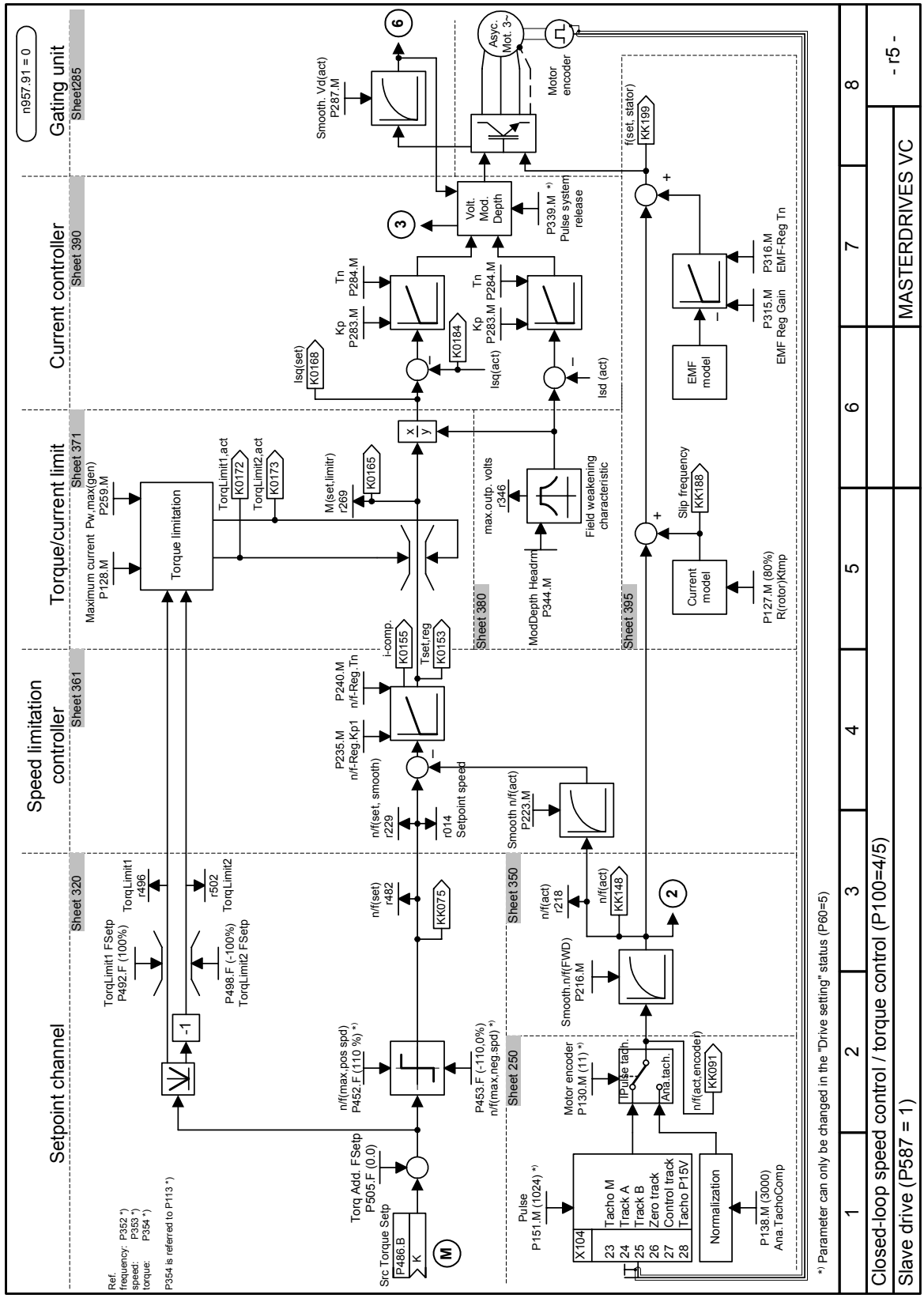

n957.86 = 0
Sheet 316
Sheet 317
Sheet 318
Sheet 400
Sheet 405
Sheet 286
Setpoint channel
Current limitation controller
V/f characteristic
Gating unit
Ref. frequency: P352 *
speed: P353 *
Src add. setp.1
P433.B (0)
KK
Src main setpoint
P443.B
KK
N
P462.F (10 s)
Accel time
P464.F (10 s)
Decel time
n/f(max.pos.spd)
P452.F (110.0%) *)
P453.F (-110.0%) *)
n/f(max.neg.spd)
n/f(set)
r482
KK075
n/f(set,smooth)
r229
r014
Setpoint speed
Slip comp Kp
P336.M (0)
f(Slip)
KK188
n/f(ist)
r218
KK148
2
Imax controller Kp
P331.M
Imax controller Tn
P332.M
Maximum current
P128.M
r129
Current lim.
Output Amps
4
Boost end frequency
P326.M
Mot.Freq.(n)
P107.M (50) *)
Field weak. frequency
P293.M
max.Outp Volts.
r346
Mot. Volts
P101.M *)
FSetp Boost
P325.M
P330.M
Src Select Char.
Volt. Mod. Depth
3
Smooth vd(act)
P287.M
6
Asyc. Mot. 3~
f(set.Stator)
KK199
*) Parameter only adjustable in the "Drive setting" status (P60=5)
1
2
3
4
5
6
7
8
V/f characteristic (P100=1)
MASTERDRIVES VC
- r1 -


Setpoint channel
Current limitation controller
V/f characteristic
Gating unit
n957.87 = 0
Sheet 316
Sheet 317
Sheet 318
Sheet 402
Sheet 405
Sheet 286
Ref. frequency: P352 *
speed: P353 *
Src AddSetp.1 P433.B (0) KK
Src main setpoint P443.B KK
N
P462.F (10 s) Accel Time
P464.F (10 s) Decel Time
Src Add Setp2 P438.B (0) KK
n/f(max.pos.spd) P452.F (110.0%) *)
P453.F (-110.0%) *) n/f(max.neg.spd)
n/f(set) r482
KK075
n/f(set,smooth) r229
r014 Setpoint speed
n/f(act) r218
KK148
2
Imax controller Kp P331.M
Imax controller Tn P332.M
Maximum currents P128.M
r129
Current lim.
Output Amps
4
Boost end frequency P326.M
Mot.Freq.(n) P107.M (50) *)
Field weakening frequency P293.M
max.outp. volts r346
Mot.voltage P101.M *)
FSetp boost P325.M *)
P330.M Src Select Char.
Volt. Mod. Depth
3
Smooth Vd(act) P287.M
6
Asyc. Mot. 3~
f(set,stator) KK199
*) Parameter can only be adjusted in the "Drive setting" status (P60=5)
1
2
3
4
5
6
7
8
V/f characteristic (P100=2)
- r2 -
Textile
MASTERDRIVES VC


Setpoint channel
Speed controller
Torque/current limit
Current controller
Gating unit
Sheet 316
Sheet 317
Sheet 318
Sheet 319
Sheet 362
Sheet 367
Sheet 372
Sheet 381
Sheet 382
Sheet 390
Sheet 396
Sheet 285
n957.88 = 0
Ref. frequency: P352 *) speed: P353 *) torque: P354 *)
P354 is referred to P113 *)
Src Add. Setp1 P433.B (0) KK
Src main setpoint P443.B KK
Start-up time P116.M
Scal.T(pre) P471.M (0)
P462.F (10 s) Accel Time
P464.F (10 s) Decel Time
Src TorqLimit1 FSetp P492.F (100%)
Src TorqLimit2 FSetp P498.F (-100%)
Src TorqLimit1 P499.B (170) K
Src TorqLimit2 P499.B (171) K
K170
K171
n/f(max.pos.spd) P452.F (110.0%) *)
P453.F (-110.0%) *) n/f(max.neg.spd)
n/f(set) r482
KK075
n/f(set.smooth) r229
P235.M n/f-Reg.Kp1
P240.M n/f-Reg.Tn
i-Anteil K0155
Msoll.reg K0153
r014 Setpoint speed
Smooth.n/f(act) P223.M
n/f(ist) r218
n/f(ist) KK148
Maximum current P128.M
Pw.max(gen) P259.M
r129
Torque limitation
TorqLimit1.act K0172
TorqLimit2.act K0173
T(set.limitr) r269
K0165
x y
max.mod. depth r346
ModDepth Headrm P344.M
Field weak. charac.
T(droop) P278.M
T(dynam.) P279.M
Smoothing I(set) P280.M
Isq(set) K0168
Isq(act) K0184
Kp P283.M
Tn P284.M
Isd (act)
Volt. Mod. Depth
P339.M *) ModSystem Release
Smooth Vd(act) P287.M
Asyc. Mot. 3~
f(set.stator) KK199
Slip frequency KK188
Current model
EMF model
i-comp.
P315.M P316.M
EMF Reg.Kp EMF-Reg.Tn
P127.M (80%) R(rotor)Ktmp
Note:
The current injection of P278 T(droop) (Fig. 382) is only calculated for frequencies below approx. 10% of the rated motor frequency.
*) Parameter can only be changed in the "Drive setting" status (P60=5)
1 2 3 4 5 6 7 8
Closed-loop speed control without encoder (frequency control) P100=3
Master drive (P587 = 0)
MASTERDRIVES VC
- r3 -


Setpoint channel
Speed controller
Torque/current limit
Current controller
Gating unit
n957.89 = 0
Sheet 320
Sheet 363
Sheet 372
Sheet 390
Sheet 285
Sheet 381
Sheet 382
Sheet 396
Sheet 351
Torque limitation
Maximum current P128.M
Pw.max(gen) P259.M
TorqLimit1.act K0172
TorqLimit2. act K0173
M(set.limitr) r269
K0165
max.Ausg.spg. r346
Field weak. charac.
ModDepth Headrm P344.M
T(droop) P278.M T(dynam.) P279.M
Smoothingl (set) P280.M
i-comp. K0155
Tset.reg K0153
P240.M n/f-Reg.Tn
P235.M n/f-Reg.Kp1
n/f(setl.smooth) r229
r014 setpoint speed
Smooth.n/f(act) P223.M
n/f(act) r218
n/f(act) KK148
n/f(soll) r482
KK075
TorqLimit1 r496
r502 Mgrenz2
TorqLimit1 FSetp P492.F (100%)
Mgrenz2 FSW P498.F (-100%)
-1
n/f(max.pos spd) P452.F (110 %) *)
P453.F (-110.0%) *) n/f(max.neg.spd)
Start-up time P116.M (~)
T-add. FSetp P505.F (0.0)
Src Torq Setp P486.B K
Ref. frequency: P352 *) speed: P353 *) torque: P354 *)
P354 is referred to P113 *)
*) Parameter can only be changed in the "Drive setting" status (P60=5)
Isq(set) K0168
Isq(act)
Kp P283.M
Tn P284.M
K0184
Isd (act)
Volt. Mod. Depth
P339.M *) ModSystem Release
Smooht. Vd(act) P287.M
Asyc. Mot. 3~
f(set.Stator) KK199
EMF Model
P315.M P316.M EMF Reg Gain EMF Reg.Tn
Slip frequency KK188
Current model
P127.M (80%) R(rotor)Ktmp
1 2 3 4 5 6 7 8
Closed-loop speed control without encoder (frequency control) P100=3
Slave drive (P587 = 1)
MASTERDRIVES VC
- r31 -


Setpoint channel
Speed controller
Torque/current limit
Current controller
Gating unit
Sheet 316
Sheet 317
Sheet 319
Sheet 318
Sheet 360
Sheet 365
Sheet 370
Sheet 390
Sheet 285
Sheet 250
Sheet 350
Sheet 380
Blatt 395
n957.90 = 0
Ref. frequency: P352 *) speed: P353 *) torque: P354 *)
P354 is referred to P113 *)
Src Add Setp.1 P433.B (0) KK
Src main setpoint P443.B KK
Start-up time P116.M
Scal.Torq(pre.) P471.M
P462.F (10 s) Accel Time
P464.F (10 s) Decel Time
Src Add Setp2 P438.B (0) KK
TorqLimit1 FSetp P492.F (100%)
TorqLimit2 FSetp P498.F (-100%)
Src TorqLimit1 P493.B (170) K
Src TorqLimit2 P499.B (171) K
K170
K171
n/f(max,pos.spd) P452.F (110,0%) *)
P453.F (-110,0%) *) n/f(max,neg.spd)
n/f(set) r482
KK075
n/f(set,smooth) r229
r014 Setpoint speed
P235.M n/f-Reg.Kp1
P240.M n/f-Reg.Tn
i-Anteil K0155
Msoll.reg K0153
Smooth n/f(act) P223.M
n/f(act) r218
n/f(ist) KK148
Smooth.n/f(pre) P216.M
Motor encoder P130.M (11) *)
Impl.tach.
Ana.tach.
n/f(act,encoder) KK091
Pulse # P151.M (1024) *)
X104
23 Tacho M
24 Track A
25 Track B
26 Zero track
27 Control track
28 Tacho P15V
Normalization
P138.M (3000) Ana.TachoComp
Maximum current P128.M
r129
Pw.max(gen) P259.M
Torque limitation
TorqLimit1.act K0172
TorqLimit2.act K0173
T(set,limitr) r269
K0165
max.outp.volt. r346
ModDepth Headrm P344.M
Field weakening characteristic
Isq(set) K0168
Kp P283.M
Tn P284.M
K0184
Isq(act)
Isd (act)
Volt. Mod. Depth
P339.M *) ModSystem Release
Smooth Vd(act) P287.M
Asyc. Mot. 3~
Motor encoder
f(set,Stator) KK199
Slip frequency KK188
Current model
P127.M (80%) R(rotor)Ktmp
EMF Model
P315.M EMF Reg Gain
P316.M EMF Reg.Tn
*) Parameter can only be changed in the "Drive setting" status P60=5
1 2 3 4 5 6 7 8
Closed-loop speed control (P100=4)
Master drive (P587 = 0)
MASTERDRIVES VC
- r4 -


n957.91 = 0
Setpoint channel
Speed limitation controller
Torque/current limit
Current controller
Gating unit
Sheet 320
Sheet 361
Sheet 371
Sheet 390
Sheet285
Sheet 380
Sheet 395
Sheet 350
Sheet 250
Ref. frequency: P352 *)
speed: P353 *)
torque: P354 *)
P354 is referred to P113 *)
Torq Add. FSetp P505.F (0.0)
Src Torque Setp P486.B K
TorqLimit1 FSetp P492.F (100%)
TorqLimit1 r496
P498.F (-100%) TorqLimit2 FSetp
r502 TorqLimit2
n/f(max.pos spd) P452.F (110 %) *)
P453.F (-110.0%) n/f(max.neg spd) *)
n/f(set) r482
KK075
Pulse P151.M (1024) *)
X104
23 Tacho M
24 Track A
25 Track B
26 Zero track
27 Control track
28 Tacho P15V
Normalization
P138.M (3000) Ana.TachoComp
Motor encoder P130.M (11) *)
TPulse tach.
Ana.tach.
n/f(act,encoder)
KK091
Smooth.n/f(FWD) P216.M
n/f(act) r218
n/f(act) KK148
Smooth n/f(act) P223.M
n/f(set, smooth) r229
r014 Setpoint speed
P235.M n/f-Reg.Kp1
P240.M n/f-Reg.Tn
i-comp. K0155
Tset.reg K0153
Torque limitation
Maximum current Pw,max(gen) P259.M
P128.M
TorqLimit1.act K0172
TorqLimit2.act K0173
M(set,limitr) r269
K0165
max.outp. volts r346
ModDepth Headrm P344.M
Field weakening characteristic
Isq(set) K0168
Kp P283.M
Tn P284.M
K0184
Isq(act)
Isd (act)
Volt. Mod. Depth
P339.M *) Pulse system release
Smooth. Vd(act) P287.M
Asyc. Mot. 3~
Motor encoder
f(set. stator) KK199
Slip frequency KK188
Current model
P127.M (80%) R(rotor)Ktmp
EMF model
P315.M EMF Reg Gain
P316.M EMF-Reg Tn
*) Parameter can only be changed in the "Drive setting" status (P60=5)
1 2 3 4 5 6 7 8
Closed-loop speed control / torque control (P100=4/5)
Slave drive (P587 = 1)
MASTERDRIVES VC
- r5 -

10 Maintenance

DANGER

SIMOVERT MASTERDRIVES units are operated at high voltages.
All work carried out on or with the equipment must conform to all the national electrical codes (BGV A3 in Germany).
Maintenance and repair work may only be carried out by properly qualified personnel and only when the equipment is disconnected from the power supply.

Only spare parts authorized by the manufacturer may be used.
The prescribed maintenance intervals and also the instructions for repair and replacement must be complied with.
Hazardous voltages are still present in the drive units up to 5 minutes after the converter has been powered down due to the DC link capacitors. Thus, the unit or the DC link terminals must not be worked on until at least after this delay time.
The power terminals and control terminals can still be at hazardous voltage levels even when the motor is stationary.

10.1 Replacing the fan

A fan is mounted at the lower section of the inverter for cooling the power section.

The fan is fed by the 24 V supply voltage and switched in and off by the device software.

The fan is designed for a service life of $L_{10} \geq 35{,}000$ hours and an ambient temperature of $T_u = 45$ °C. It must be exchanged in good time to ensure the availability of the unit.

It may be necessary to disassemble the unit for this purpose.

DANGER

To replace the fan the inverter has to be disconnected from the supply and removed if necessary.

10.1.1 Replacing the fan in units up to 45 mm wide

Removal

- After removing the four cover screws and dismantling the cover (see chapter 5.2 "Installing the optional boards"), the X20 connector which is protected against polarity reversal can be disconnected and the fan can be removed.

Installation

- Fit the fan in the reverse order, making sure that the arrow indicating the direction of air flow points to the inside of the unit.

NOTICE

Make sure that the leads to the fan are connected the right way round. Otherwise the fan will not operate!

10.1.2 Replacing the fan in 67 mm and 90 mm wide units

Removal

- After removing the two cover screws and dismantling the cover, the X20 connector which is protected against polarity reversal can be disconnected and the fan can be dismantled by pushing out the internals of the insert rivets. The insert rivets can be re-used.

Installation

- Fit the fan in the reverse order, making sure that the arrow indicating the direction of air flow points to the inside of the unit.

NOTICE

Make sure that the leads to the fan are connected the right way round. Otherwise the fan will not operate!

10.1.3 Replacing the fan in units 135 mm wide

Removal

- You can remove the fan by undoing the four mounting screws or sliding out the internal parts of the insert rivets. The insert rivets can be re-used.
- Disconnect the leads on the fan.

Fitting the new fan

- Fit the new fan in the reverse order.
- Make sure that the arrow indicating the direction of air flow points to the inside of the unit.

NOTICE

Make sure that the leads to the fan are connected the right way round. Otherwise the fan will not operate!

10.1.4 Replacing the fan in units up to 180 mm wide

Two fans are mounted on the lower side of the inverter, an **internal fan** for cooling the control electronics and a **unit fan** for cooling the power section.

Internal fan

- Opening the unit:
  - Loosen the 2 mounting screws in the front at the top of the unit. There is no need to take the screws right out. Slots are provided in the housing to allow the front of the unit to be released when the screws have been loosened.
  - Carefully swing the front of the unit forwards (to an angle of about 30°) away from the housing.
  - On the power section, open the locking lever on the ribbon cable connector to the control electronics.
  - Move the cover forwards and take it off.
- Remove the fan connection on the power section.
- Undo the four mounting screws or slide out the internal parts of the insert rivets. Then remove the fan. The insert rivets can be re-used.
- Fit the new fan by reversing this sequence of operations. Make sure that the arrow indicating the direction of rotation is pointing to the inside of the unit.

Unit fan

- Undo the four mounting screws or slide out the internal parts of the insert rivets. Then remove the fan. The insert rivets can be re-used.
- Disconnect the leads on the fan.
- Fit the new fan in the reverse order.
- Make sure that the arrow indicating the direction of air flow points to the inside of the unit.

NOTICE

Make sure that the leads to the fan are connected the right way round. Otherwise the fan will not operate!

11 Forming

CAUTION

If a unit has been non-operational for more than two years, the DC link capacitors have to be newly formed. If this is not carried out, the unit can be damaged when the line voltage is powered up.

If the unit was started-up within two years after having been manufactured, the DC link capacitors do not have to be re-formed. The date of manufacture of the unit can be read from the serial number.

How the serial number is made up

(Example: F2UD012345)

Position	Example	Meaning
1 to 2	F2	Place of manufacture
3	X	2009
	A	2010
	B	2011
	C	2012
	D	2013
	E	2014
	F	2015
4	1 to 9	January to September
	O	October
	N	November
	D	December
5 to 14		Not relevant for forming

The following applies for the above example:
Manufacture took place in December 2006.

During forming a defined voltage and a limited current are applied to the DC link capacitors and the internal conditions necessary for the function of the DC link capacitors are restored again.

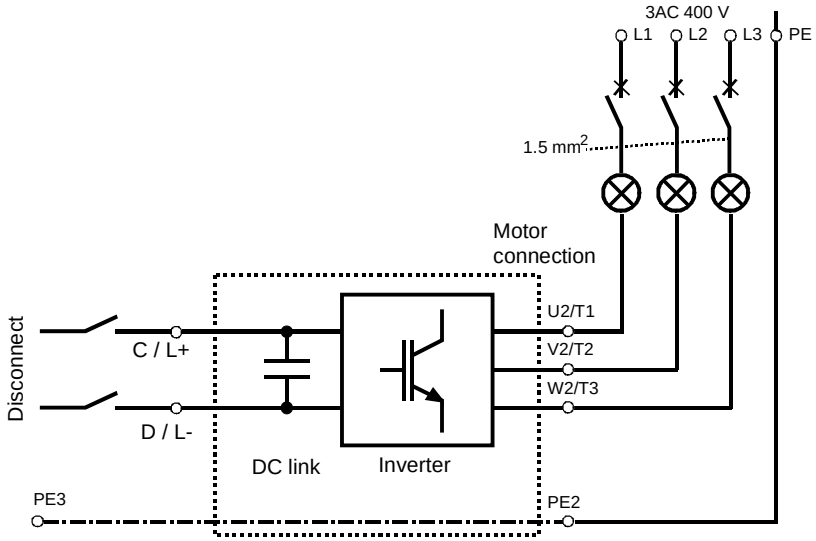


Fig. 11-1 Forming circuit

Components for the forming circuit (suggestion)

- 1 fuse-switch triple 400 V / 10 A
- 3 incandescent lamps 230 V / 100 W
- Various small parts e.g. lamp holders, 1.5 mm^2 cable, etc.

DANGER

The unit has hazardous voltage levels up to 5 minutes after it has been powered down due to the DC link capacitors. The unit or the DC link terminals must not be worked on until at least after this delay time.

Procedure

- Before you form the DC link capacitors the unit or the front and middle bar of the DC link bus module have to be removed (C/L+ and D/L-).
- When the unit has been removed, connect PE2 to earth. Installed units are earthed through the bar connection PE3.
- The unit is **not** permitted to receive a switch-on command (e.g. via the keyboard of the PMU or the terminal strip).
- The incandescent lamps must burn darker / extinguish during the course of forming. If the lamps continue to burn, this indicates a fault in the unit or in the wiring.
- Connect the required components in accordance with the circuit example.
- Energize the forming circuit. The duration of forming is approx. 1 hour.

12 Technical Data

EC Low-Voltage Directive 73/23/EEC and RL93/68/EEC	EN 50178
EC EMC Directive 89/336/EWG	EN 61800-3
EC Machinery Safety Directive 89/392/EEC	EN 60204-1
Approvals	UL: E 145 153 CSA: LR 21 927 cULus: E 214113 (≥ 22 kW)
Type of cooling	Air-cooled with installed fan
Permissible ambient or coolant temperature • During operation • During storage • During transport	 0° C to +45° C (32° F to 113° F) (to 50° C, see fig. “Derating curves”) -25° C to +55° C (-13° F to 131° F) -25° C to +70° C (-13° F to 158° F)
Installation altitude	≤ 1000 m above sea level (100 per cent loadability) > 1000 m to 4000 m above sea level (Loadability: see fig. “Derating curves”)
Permissible humidity rating	Relative air humidity ≤ 95 % during transport and storage ≤ 85 % in operation (condensation not permissible)
Environmental conditions to DIN IEC 721-3-3	Climate: 3K3 Chemically active substances: 3C2
Pollution degree	Pollution degree 2 to IEC 664-1 (DIN VDE 0110, Part 1), Moisture condensation during operation is not permissible
Overvoltage category	Category III to IEC 664-1 (DIN VDE 0110, Part 2)
Type of protection	IP20 EN 60529
Protection class	Class 1 to EN 536 (DIN VDE 0106, Part 1)
Shock-hazard protection	EN 60204-1 and to DIN VDE 0106 Part 100 (BGV A3)
Radio interference level • Standard • Options	According to EN 61800-3 No radio interference suppression Radio interference suppression filter for class A1 to EN 55011
Noise immunity	Industrial sector to EN 61800-3
Paint	Indoor duty

Mechanical strength - Vibration	According to DIN IEC 68-2-6	
During stationary duty: const. amplitude		
• deflection	0.15 mm	in frequency range 10 Hz to 58 Hz (housing width ≤ 90 mm)
	0.075 mm	in frequency range 10 Hz to 58 Hz (housing width ≥ 135 mm)
• acceleration	19.6 m/s²	in frequency range > 58 Hz to 500 Hz (housing width ≤ 90 mm)
	9.8 m/s²	in frequency range > 58 Hz to 500 Hz (housing width ≥ 135 mm)
During transport:		
• deflection	3.5 mm in frequency range 5 Hz to 9 Hz	
• accleration	9.8 m/s² in frequency range > 9 Hz to 500 Hz	
- Shocks	According to DIN IEC 68-2-27 / 08.89 30 g, 16 ms half-sine shock	
- Drop	According to DIN IEC 68-2-31 / 04.84 onto a surface and onto an edge	

Table 12-1 General data

Designation		Value				
Order No.	6SE70...	12-0TP_0	14-0TP_0	16-0TP_0	21-0TP_0	21-3TP_0
Rated voltage • Input • Output	[V]	DC 510 (- 15 %) to 650 (+ 10 %) 3 AC 0 up to rated input voltage x 0.75				
Rated frequency • Input • Output	[Hz]	 --- 0 ... 500				
Rated current • Input • Output	[A]	 2.4 2.0	 4.8 4.0	 7.3 6.1	 12.1 10.2	 15.7 13.2
Motor rated power	[kW]	0.75	1.5	2.2	4.0	5.5
Auxiliary power supply	[V]	DC 24 (20 - 30)				
Max. aux. current requirement • Standard version at 20 V • Maximum version at 20 V	[A]	 1.3	 1.3	 0.8 1.3	 1.3	 1.5
Pulse frequency fp	[kHz]	1.7 to 16.0 (see fig. “Derating curves”)				
Load class II to EN 60 146-1-1						
Base load current	[A]	0.91 x rated output current				
Overload cycle time	[s]	300				
Overload current	[A]	1.36 x rated output current				
Overload duration	[s]	60				
Extra short-time loading						
Base load current	[A]	0.91 x rated output current				
Overload cycle time	[s]	300				
Overload current ***)**	[A]	1.6 x rated output current				
Overload duration	[s]	30				
Loses, cooling						
Efficiency η (rated operation)						
Power loss (fp = 2.5 kHz)	[kW]	0.05	0.06	0.07	0.09	0.14
Cooling air requirement	[m³/s]	0.002	0.009	0.009	0.018	0.041
Pressure drop Δp	[Pa]	10	20	20	15	30
Sound pressure levels, types of construction, dimensions, weights						
Sound pressure level	[dB(A)]	18	40	40	37	37
Dimensions • Width • Height • Depth	[mm]	 45 360 260	 67.5 360 260	 67.5 360 260	 90 360 260	 135 360 260
Weight approx.	[kg]	3.0	3.4	3.4	3.8	8.8

***)** With a 1.6-fold overload in field weakening, the torque quality is reduced due to a ripple of 300 Hz.

Table 12-2 Technical data of inverter (Part 1)

Designation		Value				
Order No.	6SE70...	21-8TP_0	22-6TP_0	23-4TP_0	23-8TP_0	
Rated voltage [V] • Input • Output		DC 510 (- 15 %) to 650 (+ 10 %) 3 AC 0 up to rated input voltage x 0.75				
Rated frequency [Hz] • Input • Output		--- 0 ... 500				
Rated current [A] • Input • Output		20.8 17.5	30.3 25.5	40.5 34.0	44.6 37.5	
Motor rated power	[kW]	7.5	11.0	15.0	18.5	
Auxiliary power supply	[V]	DC 24 (20 - 30)				
Max. aux. current requirement [A] • Standard version at 20 V • Maximum version at 20 V		0.8 1.5		1.1 2.0		
Pulse frequency fp	[kHz]	1.7 to 16.0 (see fig. “Derating curves”)				
Load class II to EN 60 146-1-1						
Base load current	[A]	0.91 x rated output current				
Overload cycle time	[s]	300				
Overload current	[A]	1.36 x rated output current				
Overload duration	[s]	60				
Extra short-time loading						
Base load current	[A]	0.91 x rated output current				
Overload cycle time	[s]	300				
Overload current ***)**	[A]	1.6 x rated output current				
Overload duration	[s]	30				
Loses, cooling						
Efficiency η (rated operation)						
Power loss (fp = 2.5 kHz)	[kW]	0.17	0.22	0.30	0.35	
Cooling air requirement	[m³/s]	0.041	0.041	0.061	0.061	
Pressure drop Δp	[Pa]	30	30	30	30	
Sound pressure levels, types of construction, dimensions, weights						
Sound pressure level	[dB(A)]	48	48	59	59	
Dimensions [mm] • Width • Height • Depth		 135 360 260	 135 360 260	 180 360 260	 180 360 260	
Weight approx.	[kg]	8.9	9.0	12.7	12.9	

***)** With a 1.6-fold overload in field weakening, the torque quality is reduced due to a ripple of 300 Hz.

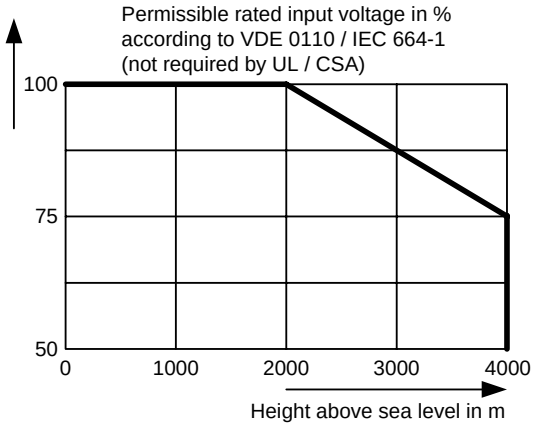
Table 12-3 Technical data of inverter (part 2)

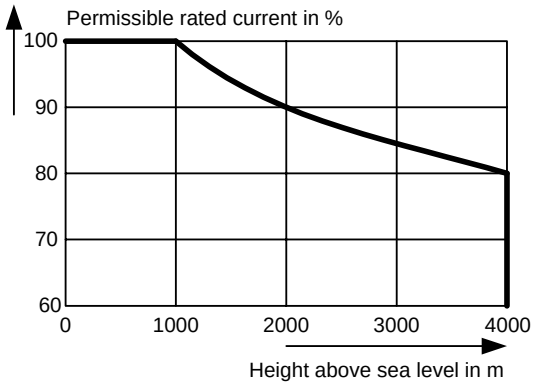
Designation		Value				
Order No.	6SE70...	24-7TP_0	26-0TP_0	27-2TP_0		
Rated voltage [V] • Input • Output		DC 510 (- 15 %) to 650 (+ 10 %) 3 AC 0 up to rated input voltage x 0,75				
Rated frequency [Hz] • Input • Output		 --- 0 ... 500				
Rated current [A] • Input • Output		 55.9 47	 70.2 59	 85.7 72		
Motor rated power	[kW]	22	30	37		
Auxiliary power supply	[V]	DC 24 (20 - 30)				
Max. aux. current requirement [A] • Standard version at 20 V • Maximum version at 20 V		 1.3 1.8	 1.7 2.1			
Pulse frequency fp	[kHz]	1.7 to 16.0 (see fig. “Derating curves")				
Load class II to EN 60 146-1-1						
Base load current	[A]	0.91 x rated output current				
Overload cycle time	[s]	300				
Overload current	[A]	1.36 x rated output current				
Overload duration	[s]	60				
Extra short-time loading						
Base load current	[A]	0.91 x rated output current				
Overload cycle time	[s]	300				
Overload current ***)**	[A]	1.6 x rated output current				
Overload duration	[s]	30				
Loses, cooling						
Efficiency η (rated operation)						
Power loss (fp = 2.5 kHz)	[kW]	0.41	0.49	0.61		
Cooling air requirement	[m³/s]	0.041	0.061	0.061		
Pressure drop Δp	[Pa]	30	30	30		
Sound pressure levels, types of construction, dimensions, weights						
Sound pressure level	[dB(A)]	48	59	59		
Dimensions [mm] • Width • Height • Depth		 180 360 260	 180 360 260	 180 360 260		
Weight approx.	[kg]	14.1	14.5	14.7		

***)** With a 1.6-fold overload in field weakening, the torque quality is reduced due to a ripple of 300 Hz.

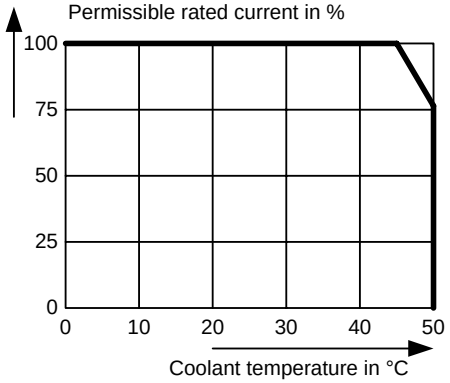
Table 12-4 Technical data of inverter (part 3)

Derating curves



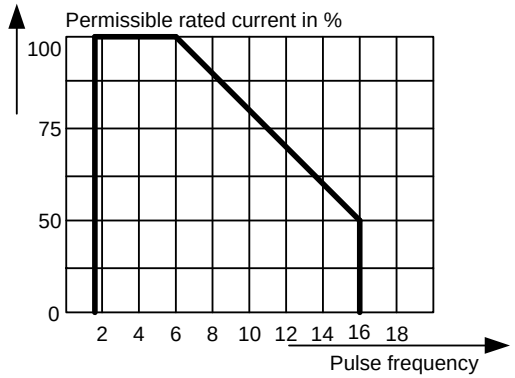


Height [m]	Derating factor K_1
1000	1.0
2000	0.9
3000	0.845
4000	0.8



Temp [°C]	Derating factor K_2
50	0.80
45	1.0
40	1.125
35	1.25 *
30	1.375 *
25	1.5 *

*See note below



Pulse frequency kHz	Derating factor K_3
6	1.0
8	0.9
10	0.8
12	0.7
14	0.6
16	0.5

Fig. 12-1 Derating curves

The derating of the permissible rated current for installation altitudes of over 1000 m and at ambient temperatures below 45 °C is calculated as follows:

Total derating = $\text{Derating}_{\text{altitude}}$ x $\text{Derating}_{\text{ambient temperature}}$

$K = K_1 \times K_2$

NOTE

It must be borne in mind that total derating must **not be greater** than 1!

Example: Altitude: 3000 m $K_1 = 0.845$
Ambient temperature: 35 °C $K_2 = 1.25$

→ Total derating = 0.845 x 1.25 = 1.056 (= 1)

Rating plate

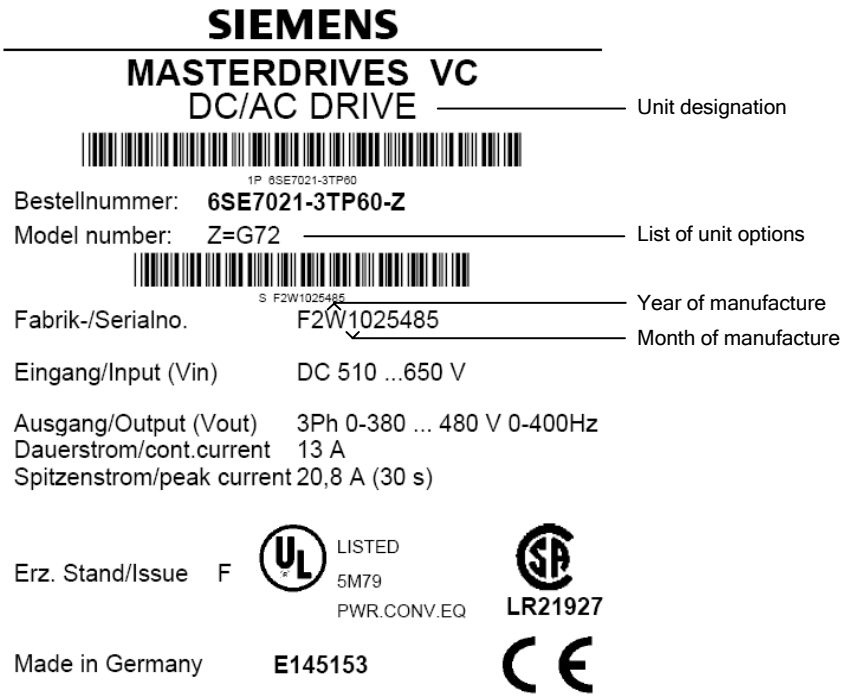


Fig. 12-2 Example of rating plate (applies only < 22 kW)

Date of manufacture

The date of manufacture can be derived as follows:

Character	Year of manufacture	Character	Month of manufacture
U	2006	1 to 9	January to September
V	2007	O	October
W	2008	N	November
X	2009	D	December

Table 12-5 Assignment of characters to the month and year of manufacture

Option codes

Option	Meaning	Option	Meaning
	SBP: Pulse encoder evaluation		**CBC:** CAN bus
C11	Slot A	G21	Slot A
C12	Slot B	G22	Slot B
	SLB: SIMOLINK		**EB1:** Expansion Board 1
G41	Slot A	G61	Slot A
G42	Slot B	G62	Slot B
	CBP2: PROFIBUS		**EB2:** Expansion Board 2
G91	Slot A	G71	Slot A
G92	Slot B	G72	Slot B
		K80	“Safe Stop” option

Table 12-6 Meaning of the option codes

13 Faults and Alarms

13.1 Faults

General information regarding faults

For each fault, the following information is available:

Parameter	r947	Fault number
	r949	Fault value
	r951	Fault list
	P952	Number of faults
	r782	Fault time

If a fault message is not reset before the electronic supply voltage is switched off, then the fault message will be present again when the electronic supply is switched on again. The unit cannot be operated without resetting the fault message. (Exception: Automatic restart has been selected, see P373.)

Number / Fault	Cause	Counter-measure
F001 Main contactor checkback	If a main contactor checkback is configured, no checkback occurs within the time set in P600 after the power-up command. In the case of externally excited synchronous motors (P095 = 12), there is no checkback for the excitation current unit.	P591 Src Contactor Msg Parameter value must be in conformance with the connection of the main contactor checkback. Check the checkback loop of the main contactor (or the checkback of the excitation current unit in the case of synchronous motors).
F002 Pre-charging	When pre-charging, the minimum DC link voltage (P071 Line Volts x 1.34) of 80 % has not been reached. The maximum pre-charging time of 3 seconds has been exceeded.	Check the supply voltage, Compare witth P071 Line Volts (Compare P071 with the DC link voltage on DC units). Check the rectifier/regenerative unit on DC units. The rectifier/regenerative unit must be switched on before the inverter is switched on.
F006 DC link overvoltage	Shutdown has occurred due to excessive DC link voltage. Line voltage I DC voltage range I Shutdown value --- 200 V - 230 V I 270 V - 310 V I appr. 410 V 380 V - 480 V I 510 V - 650 V I appr. 820 V 500 V - 600 V I 675 V - 810 V I appr. 1020 V 660 V - 690 V I 890 V - 930 V I appr. 1220 V For parallel-connected converters (BF M,N) r949 = 1: Overvoltage in the DC link of the master r949 = 2: Overvoltage in the DC link of the slave.	Check the supply voltage or input DC voltage. Converter is operating in regenerative mode without feedback possibility. If the converter supply voltage is at the upper tolerance limit and it is operating at full load, F006 can also be caused by a line phase failure. Possibly - Increaase P464 Decel Time, - Activate P515 DC Bus Volts Reg (check P071 beforehand) - Reduce P526 Fly Search Speed. - Reduce P259 Max Regen Power (only for P100 = 3, 4 or 5)

Number / Fault	Cause	Counter-measure
F008 DC link undervoltage	The lower limit value of 76 % of the DC link voltage (P071 Line Volts), or of 61 % when kinetic buffering has been enabled, has been fallen short of. Undervoltage in the DC link in 'normal' operation (i.e. no SIMULATION). Undervoltage in the DC link with active kinetic buffering and speed less than 10 % of the rated motor speed. It was a 'brief power failure' which was not detected until system recovery (auto restart flag).	Check - Input DC voltage - DC link
F010 DC link overvoltage	Due to excessive DC link voltage, shutdown has taken place: Line voltage DC link range Shutdown value 380 V - 480 V 510 V - 650 V 740 V Note: Only at U800 = 1 and f(Pulse) > f(derating) Lower threshold value than F006 !	Check the supply voltage Check the braking resistor Converter operates regeneratively without a feedback possibility. Braking unit must be set to the lower response threshold (673 V)
F011 Overcurrent	Overcurrent shutdown has occurred. The shutdown threshold has been exceeded.	- Check the converter output for short-circuit or earth fault - Check the load for an overload condition - Check whether motor and converter are correctly matched - Check whether the dynamic requirements are too high
F012 I too low	During excitation of the induction motor, the current did not rise above 12.5 % of the setpoint magnetizing current for no-load operation.	Only for closed loop n/f/T control (P100 = 3, 4 or 5) If no motor is connected, go into the simulation mode P372. Check current detection, check power section.
F014 I too low	During excitation of the motor, the current component is less than 25 % of the motor no-load current. Note: Only for U800 = 1 Irrespective of the type of control (Difference to F012)	Check the output contactor Check the motor cable

Number / Fault	Cause	Counter-measure
F015 Motor stall	Motor has stalled or is locked: - if the static load is too high - if the acceleration or deceleration time is too fast, or if load change is too fast and too great, - due to incorrect parameterization of the pulse encoder pulse number P151 or of the analog tachometer scaling P138 - due to disturbed speed signals (tachometer shield not connected) The fault is only generated after the time set in P805. The binector B0156 is set in the status word 2 r553 Bit 28. To detect whether the drive is blocked, see P792 (Perm Deviation) and P794. With n/f control, this fault is tripped if the torque limits have been reached (B0234). With speed control (P100 = 4) and master drive (see P587), the fault can also point to an interruption in the encoder cable. This case has the same significance as if the drive is locked. With v/f control, the I(max) controller has to be activated (P331). The monitor does not operate with v/f textile applications (P100 = 2). Motor has stalled or is locked: In the case of synchronous motors (P095 = 12, 13): by reaching the maximum frequency In the case of externally excited synchronous motors (P095 = 12): as a result of missing or excessively high excitation current (flux is too small or too great). When the maximum frequency (including control reserves) (B0254) has been reached on synchronous motors, the fault is generated immediately. If the deviations in the rotor flux are too great, first of all, the converter current is switched to zero, the excitation current is reduced and, after some time, the fault message is tripped at the level of the double damping time constant (2*r124.1). During this wait time, the status word bit B0156 (r553.28) is set already.	- Reduce load - Release brake - Increase current limits - Increase P805 PullOut/BlckTime - Increase P792 response threshold for set/actual deviation Only for f/n/T control (P100 = 3, 4, 5) - Increase torque limits or torque setpoint Only n/T control or v/f control with speed controller: (P100 = 0, 4, 5) - Check tachometer cable break - Check pulse encoder pulse number - Check analog tachometer scaling - Connect shield of tachometer cable on motor side and converter side - Reduce smoothing of speed pre-control P216 (only n/T control) only frequency control:(P100 = 3) - Slow down acceleration time (see also P467 ProtRampGen Gain) - Increase current in the lower frequency range (P278, P279, P280) - Switch in speed controller pre-control (P471>0) - Set EMF controller more dynamically (315) to max. approx. 2 - Increase changeover frequency for the EMF model (P313) - Replace by speed control with pulse encoder in the case of overmodulated n/f controller - Track speed setpoint with the speed actual value so that the set/actual deviation is always less than that set in P792. Only for synchronous motor: (P095 = 12) - Check current limits of the excitation unit. - Check excitation current setpoint and actual value (incl. wiring) - Check voltage limits of the excitation unit during dynamic current changes. - Check drive system for resonance oscillations.
F017 SAFE STOP Compact PLUS only	SAFE STOP operating or failure of the 24 V power supply during operation (only for Compact PLUS units)	Jumper applied for SAFE STOP? SAFE STOP checkback connected? On Compact PLUS units: check 24 V supply

Number / Fault	Cause	Counter-measure
F018 F set fly	The found set frequency could not be implemented. Reasons: - Additional setpoint 2 too high - Speed actual-value at standstill negative (signal ripple) and negative direction of rotation locked.	- Check additional setpoint 2 - Release negative directions of rotation with low maximum speed.
F019 Motor not found	During flying restart without tachometer: Search in both directions of rotation not possible (one direction blocked) and motor has not been found.	Power up after coasting. Possibly increase P525 Fly Search Amps. Enable both directions of rotation (P571, P572)
F020 Motor temperature	The motor temperature limit value has been exceeded. r949 = 1 limit value of motor temperature exceeded r949 = 2 short-circuit in the cable to the motor temperature sensor or sensor defective r949 = 4 wire break in the cable to the motor temperature sensor or sensor defective r949 = 5 wire break and limit value exceeded	Check the motor (load, ventilation, etc.). The current motor temperature can be read in r009 Motor Temperature. Check P381 Mot Tmp Fault - check the KTY84 input at connector -X103:29,30, or X104:29,30 (Compact PLUS) for short-circuit.
F021 Motor I2t	Parameterized limit value of the I2t monitoring for the motor has been exceeded.	Check: P383 Mot Tmp T1
F023 Inverter temperature	The limit value of the inverter temperature has been exceeded. Alarm: (r949): Bit0 Inverter overtemperature Bit1 Wire break of cable to temperature sensor Bit4 Number of the temperature sensor Bit5 Bit6 Bit8 Multiparallel circuit: Slave number Bit9 Bit10 Examples: r949 = 1: Limit value of inverter temperature has been exceeded. r949 = 2: Sensor 1: wire break of sensor cable or sensor defective r949 = 18: Sensor 2: wire break of sensor cable or sensor defective r949 = 34: Sensor 3: wire break of sensor cable or sensor defective r949 = 50: Sensor 4: wire break of sensor cable or sensor defective.	- Measure the air intake and ambient temperature (Observe minimum and maximum ambient temperature!) - Observe the derating curves at theta >45°C (Compact PLUS type) or 40°C. - On Compact PLUS units: ≥ 22 kW acknowledgement is only possible after 1 minute Check: - whether the fan -E1 is connected and is rotating in the correct direction - that the air entry and discharge openings are not restricted - temperature sensor at -X30
F025 UCE upper switch/ UCE Ph. L1	UCE upper switch (Compact PLUS) / or UCE has tripped in phase L1	Check: - phase L1 for short-circuit or ground fault (-X2:U2 - including motor) - that CU is correctly inserted - that the switch for "SAFE STOP" (X9/5-6) is open (only for units with order No. ...-11, ...-21,...-31, ...-61).

Number / Fault	Cause	Counter-measure
F026 UCE lower switch / UCE Ph. L2	UCE lower switch (Compact PLUS) / or UCE has tripped in phase L2	Check: - phase L2 for short-circuit or ground fault (-X2:V2 - including motor) - that CU is correctly inserted - that the switch for 'SAFE STOP' (X9/5-6) is open (only for units with order Nos....-11, ...-21,...-31, ...-61)
F027 Fault pulse resistor / UCE Ph. L3	Fault pulse resistor (Compact PLUS) / or UCE has tripped in phase L3	Check: - phase L3 for short-circuit or ground fault (-X2:W2 - including motor) - that CU is correctly inserted - that the switch for 'SAFE STOP' (X9/5-6) is open (only for units with order Nos....-11, ...-21,...-31, ...-61)
F028 Supply phase	The frequency and the amplitude of the DC link ripple indicate a single-phase power failure.	Check the supply voltage.
F029 Meas. value sensing	A fault has occurred in the measured value sensing system: The measured variable at which a fault occurred during offset adjustment is bit-coded and stored in r949 : Bit 0: Current phase L1 Bit 1: Current phase L2 Bit 2: DC link voltage Bit 3: Inverter temperature Bit 4: Motor temperature Bit 5: Analog input 1 Bit 6: Analog input 2 Examples: - (r949 = 1) Offset adjustment in phase L1 not possible - (r949 = 2) Offset adjustment in phase L3 not possible. - (r949 = 3) Offset adjustment in phases L1 and L3 not possible.	Causes in phase L1 and L2: - Fault in measured value sensing system - Fault in power section (valve cannot block) - Fault on CU Causes on all other measured variables: - Fault on CU (SIMA) -> replace CU
F035 Ext. Fault 1	Parameterizable external fault input 1 has been activated	Check: - whether there is an external fault - whether the cable to the appropriate digital input has been interrupted - P575 Src No ExtFault1
F036 Ext. Fault 2	Parameterizable external fault input 2 has been activated	Check: - whether there is an external fault - whether the cable to the appropriate digital input has been interrupted - P585 Src No ExtFault2

Number / Fault	Cause	Counter-measure
F037 Analog input	An analog input is taking place in operating mode 4..20 mA and a wire break has occurred. The number of the analog input concerned is shown in fault value (r949).	Check the connection to - Analog input 1 -X102:15, 16, or -X101:9,10 (Compact PLUS). - Analog input 2 -X102: 17, 18. Check parameters - P632 CU AnaIn Conf - P634 CU AnaIn Smooth - P631 CU AnaIn Offset
F038 Voltage OFF during parameter storage	During a parameter task, a voltage failure has occurred on the board.	Re-enter the parameter. The number of the parameter concerned can be seen in fault value r949.
F040 AS internal	Incorrect operating status	Replace CU (-A10), or replace the unit (Compact PLUS type)
F041 EEPROM fault	A fault has occurred when storing the values in the EEPROM.	Replace CU (-A10), or replace the unit (Compact PLUS)
F042 Calculating time	Calculating time problems At least 10 failures of time slots T2, T3, T4 or T5 (see also parameters r829.2 to r829.5)	Reduce the calculating time load: - Increase P357 Sampling Time - Calculate individual blocks in a slower sampling time Observe r829 CalcTimeHdroom.
F044 BICO manager fault	A fault has occurred during the softwiring of binectors and connectors.	Fault value r949: >1000 : Fault during softwiring of connectors >2000 : Fault during softwiring of binectors - Voltage OFF and ON - Factory setting and new parameterization - Replace the board
F045 Opt. Board HW	A hardware fault has occurred when accessing an option board	- Replace CU (-A10), or replace the unit (Compact PLUS) - Check connection of the board subrack to the option boards and replace if necessary.
F046 Par. Task	A fault has occurred during the transfer of parameters to the gating unit processor.	Power the unit down and up again. Replace CU (-A10), or replace the unit (Compact PLUS type)
F047 Gating Calc Time	The calculating time in the gating unit computer is not sufficient	Replace CU (-A10), or replace the unit (Compact PLUS) In case of synchronous motors (P095 = 12): Pulse frequency set too high (P340>2kHz).
F048 Gating Pulse Freq	The pulse frequency set in P340 is not permissible.	Change P340 Pulse Frequency.
F049 SW version	The firmware versions on the CU have different firmware release.	Use uniform firmware
F050 TSY Init.	Error when initializing the TSY board	Check: - Whether the TSY is correctly inserted

Number / Fault	Cause	Counter-measure
F051 Speed encoder	Digital tachometer or analog tachometer sensing are faulty	Check the parameters: - P130 Src SpdActV - P151 Pulse # - P138 AnalogTachScale - P109 Motor #PolePairs The product of P109 and P138 must be smaller than 19200. Check or replace tachometer. Check connection to tachometer. - Replace CU (-A10), or replace the unit (Compact PLUS type)
F052 n-Cntr.Input	Control track input (-X103/27, or -X104/27 Compact PLUS) is not high: - Tachometer line broken - Tachometer fault The fault input on the TSY was activated.	Unselect tachometer with control track (P130 select motor encoder) Check control track connection (-X103/27, or X104/27 Compact PLUS) Exchange TSY
F053 Tachometer dn/dt	The permissible change value of the speed encoder signal P215 dn(act,perm) has been doubly exceeded.	Check tachometer cables for interruptions. Check earthing of tachometer shield. - The shield must be connected both at the motor and the converter side. - The encoder cable must not be interrupted. - The encoder cable must not be laid together with the power cables. - Only recommended encoders should be used. - In the case of a signal fault, the DT1 board may have to be used. If necessary, change P215 - With P806 (observe parameter description) it is possible during operation to switch over to encoder-free operation.
F054 Sensor board initialization fault	A fault has occurred during initialization of the encoder board.	Fault value r949 1. Board code incorrect 2. TSY not compatible 3. SBP not compatible 7. Board double 20: TSY board double 60: Internal error
F056 SIMOLINK telegram failure	Communication on the SIMOLINK ring is disturbed.	- Check the fiber-optic cable ring - Check whether an SLB in the ring is without voltage - Check whether an SLB in the ring is faulty - Check P741 (SLB TlgOFF)

Number / Fault	Cause	Counter-measure
F057 Brake does not open	The brake has not opened, the output current of the converter has exceeded the parameterized current threshold (U840) for longer than one second (with the rotor locked) Note: Only with U800 = 1	Check brake Check I(max) brake (U840). The set threshold must be at least 10% above the maximum possible acceleration current.
F058 Parameter fault Parameter task	A fault has occurred during the processing of a parameter task.	No remedy
F059 Parameter fault after factory setting/init.	A fault has occurred in the initialization phase during the calculation of a parameter.	The number of the inconsistent parameter is indicated in fault value r949. Correct this parameter (ALL indices) and switch voltage off and on again. Several parameters may be affected, i.e. repeat process.
F060 MLFB is missing	This is set if the MLFB = 0 after exiting INITIALIZATION (0.0 kW). MLFB = order number.	After acknowledgement, in INITIALIZATION enter a suitable MLFB in parameter P070 MLFB (6SE70..). (Only possible with the corresponding access stages to both access parameters).
F061 Incorrect parameterization	A parameter entered during drive setting (e.g. P107 Mot Rtd Freq, P108 Mot Rtd Speed, P340 Pulse Frequency) is not in a permissible range (depending on control type)	Acknowledge the fault and change the corresponding parameter value. The missing parameter is indicated in r949 as a fault value.

Number / Fault	Cause	Counter-measure
F062 Multi-parallel circuit	Fault in connection with the multi-parallel circuit or board ImP1 has been detected.	r949 = 10: Communications card does not reply. When writing the control word, BUSY is not active if CSOUT is inactive. Communications card is probably not inserted. R949 = 11,12: Timeout during BUSY during initialization. BUSY does not become active within 1 sec. R949 = 15: Timeout during BUSY during normal communication. BUSY does not become active within 1 sec. R949 = 18: Timeout when reading out the fault information from the ImPIs. Within one second after activation of FAULT no fault cause can be supplied by the IMP1. R949 = 20+i: HW conflict. This is set if bit HWCONF is set in status word of slave i. (Fault in the configuration of the multi-parallel circuit) r949 = 30+i: HW version of ImPI isnot compatible. The relevant slave number is contained in i. R949 = 40: Number of slaves does not tally with the setpoint number of slaves of the unit. R949 = 50+i Inconsistency in the number of slaves. The number of slaves notified by the ImPI is not in conformance with the number of status words or with the setpoint number of slaves of the MLFB. Counter-measure: - Check ImPI or communications card and replace, if necessary. - Check configuration of multi-parallel circuit. - Check parameterization. - Replace CU. - Replace ImPI.
F065 Scom Telegram	No telegram was received at an Scom interface (Scom/USS protocol) within the telegram failure time.	Fault value r949: 1 = interface 1 (SCom1) 2 = interface 2 (SCom2) - Check the connection CU -X100:1 to 5 and check the connection PMU -X300. - Check the connection CU -X103, or X100/ 35,36 (Compact PLUS type) - Check "SCom/SCB TLG OFF" P704.01 (SCom1) and P704.02 (SCom2) - Replace CU (-A10), or replace the unit (Compact PLUS type)

Number / Fault	Cause	Counter-measure
F070 SCB initialization fault	A fault has occurred during initialization of the SCB board.	Fault value r949: 1: Board code incorrect 2: SCB board not compatible 5: Error in configuration data (Check parameterization) 6: Initialization timeout 7: SCB board double 10: Channel error
F072 EB initialization fault	A fault has occurred during initialization of the EB board.	Fault value r949: 2: 1st EB1 not compatible 3: 2nd EB1 not compatible 4: 1st EB2 not compatible 5: 2nd EB2 not compatible 21: Three EB1 boards 22: Three EB2 boards 110: Fault on 1st EB1 (Analog input) 120: Fault on 2nd EB1 (Analog input) 210: Fault on 1st EB2 (Analog input) 220: Fault on 2nd EB2 (Analog input)
F073 AnInp1SL1	4 mA at analog input 1, slave 1 fallen short of	Check the connection of the signal source to the SCI1 (slave 1) -X428: 4, 5.
F074 AnInp2 SL1	4 mA at analog input 2, slave 1 fallen short of	Check the connection of the signal source to the SCI1 (slave 1) -X428: 7, 8.
F075 AnInp3 SL1	4 mA at analog input 3, slave 1 fallen short of	Check the connection of the signal source to the SCI1 (slave 1) -X428: 10, 11.
F076 AnInp1 SL2	4 mA at analog input 1, slave 2 fallen short of	Check the connection of the signal source to the SCI1 (slave 2) -X428: 4, 5.
F077 AnInp2 SL2	4 mA at analog input 2, slave 2 fallen short of	Check the connection of the signal source to the SCI1 (slave 2) -X428: 7, 8.
F078 AnInp3 SL2	4 mA at analog input 3, slave 2 fallen short of	Check the connection of the signal source to the SCI1 (slave 2) -X428: 10, 11.
F079 SCB telegram failure	No telegram has been received by the SCB (USS, peer-to-peer, SCI) within the telegram failure time.	- Check the connections of the SCB1(2). - Check P704.03"SCom/SCB Tlg OFF" - Replce SCB1(2) - Replace CU (-A10)
F080 TB/CB initialization fault	Fault during initialization of the board at the DPR interface	Fault value r949: 1: Board code incorrect 2: TB/CB board not compatible 3: CB board not compatible 5: Error in configuration data 6: Initialization timeout 7: TB/CB board double 10: Channel error Check the T300/CB board for correct contacting, check the PSU power supply, check the CU / CB / T boards and check the CB initialization parameters: - P918.01 CB Bus Address, - P711.01 to P721.01 CB parameters 1 to 11

Number / Fault	Cause	Counter-measure
F081 OptBrdHeartbeat-Counter	Heartbeat-counter of the optional board is no longer being processed	Fault value r949: 0: TB/CB heatbeat-counter 1: SCB heartbeat-counter 2: Additional CB heartbeat-counter - Acknowledge the fault (whereby automatic reset is carried out) - If the fault re-occurs, replace the board concerned (see fault value) - Replace ADB - Check the connection between the subrack and the optional boards (LBA) and replace, if necessary
F082 TB/CB telegram failure	No new process data have been received by the TB or the CB within the telegram failure time.	Fault value r949: 1 = TB/CB 2 = additional CB - Check the connection to TB/CB - Check P722 (CB/TB TlgOFF) - Replace CB or TB
F085 Add. CB initialization fault	A fault has occurred during initialization of the CB board.	Fault value r949: 1: Board code incorrect 2: TB/CB board not compatible 3: CB board not compatible 5: Error in configuration data 6: Initialization timeout 7: TB/CB board double 10: Channel error Check the T300 / CB board for correct contacting and check the CB initialization parameters: - P918.02 CB Bus Address, - P711.02 to P721.02 CB Parameters 1 to 11
F087 SIMOLINK initialization fault	A fault has occurred during initialization of the SLB board.	- Replace CU (-A10), or replace the unit (Compact PLUS type) - Replace SLB
F090 Mld Param.	An error occurred when attempting to change a parameter from the standstill measurement or the rotating measurement (Mot ID).	Power down and power up again. If it reoccurs, replace CU (-A10), or replace the unit (Compact PLUS type)
F091 Mld Time	The rotating measurement takes longer than programmed in a measured status. The relevant measuring interval is encrypted in parameter r949. Possible causes: Load torque too high Load torque not uniform Ramp-function generator disabled	Eliminate the cause and re-start the measurement (power up the converter again). If it re-occurs, replace CU (-A10), or replace the unit (Compact PLUS type).
F095 Mld n(set)	Due to entries for - Permissible phase sequence - Maximum frequency, - Minimum speed, - Changeover frequency between V and I model, - Start of field-weakening frequency, - Frequency suppression bandwidth it was not possible to determine a permissible frequency range for the rotating measurement.	There must be a 10 % frequency range which lies above 1.1 times the changeover frequency and below 0.9 times the start of field-weakening frequency. Possible counter-measures - Permit both phase sequences - Increase maximum frequency - Reduce minimum speed, - Reduce changeover frequency between the V and I model. - Reduce or remove the frequency suppression bandwidth.

Number / Fault	Cause	Counter-measure
F096 Mld abort	The rotating measurement was aborted due to the inadmissible external intervention.	The fault value in r949 defines the type of intervention: 4 Setpoint inhibit 5 Changeover, setpoint channel 8 Unexpected change in the converter status 12 Motor data set changeover (for function selection "Compl. Mot ID") 13 Changeover to slave drive 14 Motor data set changeover to data set with v/f_charac 15 Controller inhibit is set 16 Ramp-function generator is disabled 17 Selection "Tacho test" for F controller 18 Ramp-function generator stopped Eliminate cause 22 Inverter inhibit: Check inverter release (P561)
F097 Mld meausred value	The measured values for the nominal ramp-up time when optimizing the controller deviate too greatly. Cause: very unsteady load torque	If necessary, increase the torque limit values to 100 percent
F098 Mld Tachof	The rotating measurement has detected a fault in the speed actual value signal. The fault value defines the type of fault. The fault measurement may have been erroneously generated if the drive speed is externally forced (e.g. completely locked drive generates the "no signal" message)	The fault value in r949 defines the type of intervention 4 No speed signal present 5 Sign of the signal is incorrect 6 A track signal is missing 7 Incorrect gain 8 Incorrect pulse number Checking the measurement cables. Checking the parameters - P130 Src Speed ActV - P1151 Encoder Pulse #
F100 GRND Init	During the ground fault test, a current not equal to zero has been measured, or an UCE or overcurrent monitoring has responded, although no value has yet been triggered.	The cause of the fault can be read out from r376 "GrdFltTestResult". Check the converter output for short-circuit or ground fault (-X2:U2, V2, W2 - including motor). Check that the CU is inserted correctly. Sizes 1 and 2: - Check the transistor modules on the PEU board -A23 for short-circuit. Size 3 and 4: - Check the transistor modules -A100, -A200, -A300 for short-circuit

Number / Fault	Cause	Counter-measure
F101 GRND UCE	During the ground fault test, the UCE monitoring has responded in a phase in which no valve has been triggered.	Check valves in the power section for short-circuit, and on converters with fiber-optic gating, check the gating unit wiring and the UCE checkbacks for correct assignment. R376 can be interrogated to indicate which UCE monitoring has responded.
F102 GRND Phase	During the ground fault test, a current flows in a phase in which no valve has been triggered or the UCE monitoring has responded in the phase in which the valve has been triggered.	The fault value can be read out from r949. The digit of the xth position indicates the valve where the fault occurred at power-up. X O O O x = 1 = V+ x = 2 = V- x = 3 = U+ x = 4 = U- x = 5 = W+ x = 6 = W- The figure of the xth digit indicates the phase in which I is 0 and thus a valve must be defective (always conductive). O O O X x = 1 Phase 1 (U) x = 3 = Phase 3 (W) x = 4 = Phase 1 (U) or 3 (W) Examine phase for defective valves (always conductive).
F103 Ground fault	There is a ground fault or a fault in the power section. During the ground fault test, a current flows from the phase in which a valve has been triggered, the overcurrent comparator has responded, or a UCE monitoring has responded in a phase in which a valve has been triggered.	Read out fault value from r949. The digit of the xth position indicates the valve where the fault occurred at power-up. X O O O x = 1 = V+ x = 2 = V- x = 3 =U+ X O O O x = 4 = U- x = 5 = W+ x = 6 = W- Check the motor including the feeder cable for short-circuit. If no ground fault is present, check the power section for defective valves (always conductive). The digit of the xth position indicates the phase in which I is 0 and therefore a valve must be defective (always conductive). O O O X 1 = Current in phase 1 (U) 2 = UCE in phase 2 (V) 3 = Current in phase 3 (W) 4 = Only overcurrent occurred The speed of the motor shaft during the ground-fault test should be less than 10 % of the rated speed! 1) In phase V there is a ground fault or a defective valve or the "SAFE STOP" switch (X9/5-6) is open (only for units with Order No. ...-11, ...-21, ...-31).

Number / Fault	Cause	Counter-measure
F107 MLd = 0	A fault has occurred during the test pulse measurement	Read out fault value from r949. The figures of the grey shaded areas indicate which fault has occurred. O O X X xx = 01: Both current actual values remain 0 xx = 02: Motor-converter cable phase U interrupted xx = 03: Motor converter phase V interrupted xx = 04: Motor-converter phase W interrupted xx = 05: Current actual value I1 remains 0 xx = 06: Current actual value I3 remains 0 xx = 07: Valve U+ does not trigger xx = 08: Valve U- does not trigger xx = 09: Valve V+ does not trigger xx = 10: Valve V- does not trigger xx = 11: Valve W+ does not trigger xx = 12: Valve W- does not trigger xx = 13: Sign I1 incorrect xx = 14: Sign I3 incorrect xx = 15: Sign I1 and I3 incorrect xx = 16: Sign I1 confused with I3 xx = 17: I1 confused with I3 and both currents have an incorrect sign The digit of the xth digit indicates where the fault has occurred. X O O O x = 0 = Single converter x = 1 = Inverter 1 x = 2 = Inverter 2 x = 3 = Inverters 1 and 2 Check that all 3 motor feeder cables and the motor windings do not have any interruption. Check the connection between the current converter and the electronics and check the current converter itself. Check the correct input of the rating plate data for the motor data set valid during the measurement.
F108 Mld Unsym	During the DC measurement, the measurement results for the individual phases differ significantly. The fault value indicates which quantity(ies) is(are) concerned and in which phase the greatest deviation occurred.	Read out fault value from r949. The digit of the xth position indicates; O O O X Transverse voltage too high x = 1 = phase R x = 2 = phase S x = 3 = phase T O O X O Dev. stator resistance (1, 2, 3 as above) X O O O Dev. dead-time compensation (1, 2, 3 as above) X O O O O Dev. valve voltage (1, 2, 3 as above) The motor, power section or actual-value sensing are significantly non-symmetrical.
F109 Mld R(L)	The rotor resistance determined during DC measurement deviates too significantly from the value which was calculated by the automatic parameterization from the rated slip.	- Incorrect input of rated speed or rated frequency - Pole pair number incorrect

Number / Fault	Cause	Counter-measure
F110 Mld di/dt	During test pulse measurement, the current has increased significantly faster than was expected. Thus for the 1st test pulse, an overcurrent condition occurred within the first half of the minimum switch-on time	- There may be a short-circuit between two converter outputs. - The motor rating plate data have not been correctly parameterized. - The motor leakage is too low.
F111 Fault e_Func	A fault has occurred while calculating the equalization function.	
F112 Unsym I_sigma	The individual leakage test results deviate too significantly.	
F114 MId OFF	The converter has automatically stopped the automatic measurement due to the time limit up to power-up having been exceeded or due to an OFF command during the measurement, and has reset the function selection in P115.	Re-start with P115 function selection = 2 "Motor identification at standstill". The ON command must be given within 20 sec. after the alarm message A078 = standstill measurement has appeared. Cancel the OFF command and re-start measurement.
F115 KF internal	A fault has occurred during calculations in the context of the MotID.	Power-down the converter and electronics and power-up again.
F116 Technology board fault	See TB documentation	See TB documentation
F117 Technology board fault	See TB documentation	See TB documentation
F118 Technology board fault	See TB documentation	See TB documentation
F119 Technology board fault	See TB documentation	See TB documentation
F120 Technology board fault	See TB documentation	See TB documentation
F121 Technology board fault	See TB documentation	See TB documentation
F122 Technology board fault	See TB documentation	See TB documentation
F123 Technology board fault	See TB documentation	See TB documentation
F124 Technology board fault	See TB documentation	See TB documentation
F125 Technology board fault	See TB documentation	See TB documentation
F126 Technology board fault	See TB documentation	See TB documentation
F127 Technology board fault	See TB documentation	See TB documentation
F128 Technology board fault	See TB documentation	See TB documentation
F129 Technology board fault	See TB documentation	See TB documentation

Number / Fault	Cause	Counter-measure
F130 Technology board fault	See TB documentation	See TB documentation
F131 Technology board fault	See TB documentation	See TB documentation
F132 Technology board fault	See TB documentation	See TB documentation
F133 Technology board fault	See TB documentation	See TB documentation
F134 Technology board fault	See TB documentation	See TB documentation
F135 Technology board fault	See TB documentation	See TB documentation
F136 Technology board fault	See TB documentation	See TB documentation
F137 Technology board fault	See TB documentation	See TB documentation
F138 Technology board fault	See TB documentation	See TB documentation
F139 Technology board fault	See TB documentation	See TB documentation
F140 Technology board fault	See TB documentation	See TB documentation
F141 Technology board fault	See TB documentation	See TB documentation
F142 Technology board fault	See TB documentation	See TB documentation
F143 Technology board fault	See TB documentation	See TB documentation
F144 Technology board fault	See TB documentation	See TB documentation
F145 Technology board fault	See TB documentation	See TB documentation
F146 Technology board fault	See TB documentation	See TB documentation
F147 Technology board fault	See TB documentation	See TB documentation
F148 Fault 1 Function blocks	An active signal is present at binector U061 (1).	Examine cause of fault, see function diagram 710
F149 Fault 2 Function blocks	An active signal is present at binector U062 (1).	Examine cause of fault, see function diagram 710
F150 Fault 3 Function blocks	An active signal is present at binector U063 (1).	Examine cause of fault, see function diagram 710

Number / Fault	Cause	Counter-measure
F151 Fault 4 Function blocks	An active signal is present at binector U064 (1).	Examine cause of fault, see function diagram 710
F153 No valid sign-of-life tool interface	Within the monitoring time of the tool interface no valid sign-of-life has been received from the tool interface.	Cyclically execute write tasks from the tool interface within the monitoring time whereby the sign-of-life has to be increased by 1 for every write task.
F243 Link int.	Fault in internal linking. One of the two linked partners does not reply.	Replace CU (-A10), or replace the unit (Compact PLUS).
F244 ParaLink int.	Fault in the internal parameter linking	Release comparison of gating unit software and operating software regarding the transfer parameters. Replace CU (-A10), or replace the unit (Compact PLUS type).
F255 Fault in EEPROM	A fault has occurred in the EEPROM.	Switch off the unit and switch it on again. If the fault re-occurs, replace CU (-A10), or replace the unit (Compact PLUS).

Table 13-1 Fault numbers, causes and their counter-measures

13.2 Alarms

The alarm message is periodically displayed on the PMU by A = alarm/ alarm message and a 3-digit number. An alarm cannot be acknowledged. It is automatically deleted once the cause has been eliminated. Several alarms can be present. The alarms are then displayed one after the other.

When the converter is operated with the OP1S operator control panel, the alarm is indicated in the lowest operating display line. The red LED additionally flashes (refer to the OP1S operating instructions).

Number / Alarm	Cause	Counter-measure
A001 Calculating time	The calculating time utilization is too high a) At least 3 failures of time slots T6 or T7 (see also parameter r829.6 or r829.6) b) At least 3 failures of time slots T2, T3, T4 or T5 (see also parameter r829.2 to r829.5)	- Observe r829 CalcTimeHdroom - Increase P357 Sampling Time or - Reduce P340 Pulse Frequency
A002 SIMOLINK start alarm	Start of the SIMOLINK ring is not functioning.	- Check the fiber-optic cable ring for interruptions - Check whether there is an SLB without voltage in the ring - Check whether there is a faulty SLB in the ring
A014 Simulation active alarm	The DC link voltage is not equal to 0 when the simulation mode is selected (P372 = 1).	- Set P372 to 0. - Reduce DC link voltage (disconnect the converter from the supply)
A015 External alarm 1	Parameterizable external alarm input 1 has been activated.	Check - whether the cable to the corresponding digital input has been interrupted. - parameter P588 Src No Ext Warn1
A016 External alarm 2	Parameterizable external alarm input 2 has been activated.	Check - whether the cable to the corresponding digital input has been interrupted. - parameter P589 Src No Ext Warn2
A017 Safe Stop alarm active	The switch for blocking the inverter pulses (X9 terminal 5-6) has been opened (only for units with Order No. ...-11, ...-21, ...-31, ...61)	Close switch X9 5-6 and thus release the inverter pulses.
A020 Overcurrent	An overcurrent condition has occurred.	Check the driven load for an overload condition. - Are the motor and the converter matched? - Have the dynamic performance requirements been exceeded.
A021 Overvoltage	An overvoltage condition has occurred.	Check the supply voltage. The converter regenerates without regeneration possibility.

Number / Alarm	Cause	Counter-measure
A022 Inverter temperature	The threshold for initiating an alarm has been exceeded.	- Measure intake air or ambient temperature. - Observe the derating curves at theta >45°C (Compact PLUS) or 40°C. Check - Whether the fan -E1 is connected and is rotating in the correct direction. -The air intake and discharge openings for blockage. - The temperature sensor at -X30. - r833 indicates the maximum converter temperature of all existing measuring points (Compact/chassis type unit). - r833.01 indicates the actual converter temperature (Compact PLUS type).
A023 Motor temperature	The parameterizable threshold for initiating an alarm has been exceeded.	Check the motor (load, ventilation, etc.). The current temperature can be read in r009 Motor Tmp. Check the KTY84 input at connector -X103:29,30, or -X104:29,30 (Compact PLUS type) for short-circuit.
A024 Motor movement	The motor has moved during motor data identification.	Lock the motor.
A025 I2t Inverter	If the instantaneous load condition is maintained, then the inverter will be thermally overloaded.	Check: - P72 Rtd Drive Amps - MLFB P70 - P128 Imax - r010 Drive Utilizat
A026 Ud too high	Ud is above the continuously permissible DC link voltage for more than 30sec in a time interval of 90sec	
A029 I2t motor	The parameterized limit value for the I2t monitoring of the motor has been exceeded.	Motor load cycle is exceeded! Check the parameters: P382 Motor Cooling P383 Mot Tmp T1 P384 Mot Load Limits
A033 Overspeed	Bit 3 in r553 status word 2 of the septoint channel. The speed actual value has exceeded the value of maximum speed plus the set hysteresis.	P804 Overspeed Hys plus P452 n/f(max, FWD Spd) or P453 n/f(max, REV Spd) has been exceeded Increase the parameter for the maximum frequencies or reduce the regenerative load.
A034 Setpoint/actual value deviation	Bit 8 in r552 status word 1 of the setpoint channel. The difference between freqeuncy setpoint/actual value is greater than the parameterized value and the control monitoring time has elapsed.	Check - whether an excessive torque requirement is present - whether the motor has been dimensioned too small. Increase values P792 Perm Deviation Frq/ set/actual DevSpeed and P794 Deviation Time
A035 Wire break	The clockwise and/or the counter-clockwise rotating field is not enabled, or a wire breakage is present in the terminal wiring (both control word bits are zero).	Check whether cable(s) to the corresponding digital input(s) P572 Src FWD Spd / P571 Src REV Spd is (are) interrupted or released

Number / Alarm	Cause	Counter-measure
A036 Brake checkback "Brake still closed"	The brake checkback indicates the "Brake still closed" state.	Check brake checkback (see FD 470)
A037 Brake checkback "Brake still open"	The brake checkback indicates the "Brake still open" state.	Check brake checkback (see FD 470)
A041 Vdmax controller inhibit	The line voltage is too high or the drive line voltage (P071) is incorrectly parameterized. The Vdmax controller is disabled despite parameter access (P515), as otherwise the motor would accelerate immediately in operation to the maximum frequency.	Check - the line voltage - P071 Line Volts
A042 Motor stall/lock	Motor is stalled or blocked. The alarm cannot be influenced by P805 "PullOut/BlckTime", but by P794 "Deviation Time"	Check - whether the drive is locked - whether the encoder cable is interruped during speed control and whether the shield is connected. - Whether the drive has stalled - For synchronous motors (P095=12): excitation current injection
A043 n-act jump	The permissible change value of the speed encoder signal (P215) has been exceeded. Additionally for synchronous motors (P095=12): The motor rotates with more than 2% of the rated speed at the time of inverter release. The inverter status "Ready for operation" is not exited.	Check the tachometer cables for interruptions. Check the earthing of the tachometer shield. - The shield must be connected both on the motor and on the converter side. - The encoder cable must not be interrupted. - The encoder cable must not be laid with the power cables. - Only the recommended encoders should be used. - If there is a signal fault, use the DTI board if necessary. If required, change P215. - Additionally for synchronous motors (P095=12): Do not grant inverter release until the motor is at standstill
A044 I too low	Only for synchronous motors (P095=12) in operation: The difference smoothed with P159 between excitation current setpoint and actual value (r160 - r156) deviates from zero by more than 25 % of the rated magnetizing current.	Only for synchronous motors P095=12) Check: - whether the current limitation of the excitation current control is too small, - whether the dynamic performance of the excitation current injection is too low, - whether the excitation current injection function is operating, - whether the wiring of excitation current actual-value P155 is correct, - whether the wiring of excitation current setpoint r160 is correct, - whether there is a wire break between MASTERDRIVES and the excitation device, - whether the voltage limitation is too low for dynamic excitation current control, - whether the analog output for r160 takes place without isolating amplifiers (despite cable length > 4 m)

Number / Alarm	Cause	Counter-measure
A045 DC braking activated	The DC braking function has been activated and the motor frequency is still above the frequency at which DC braking begins (P398).	- Increase frequency at which DC braking begins
A049 No slave	At serial I/O (SCB1 with SCI1/2), no slave is connected or fiber-optic cable is interrupted or slaves are without voltage.	P690 SSCI AnaIn Conf - Check slave. - Check cable.
A050 Slave incorrect	At ser. I/O the slaves required according to a parameterized configuration are not present (slave number or slave type): Analog inputs or outputs or digital inputs or outputs have been parameterized which are not physically present.	Check parameter P693 (analog outputs), P698 (digital outputs). Check connectors K4101...K4103, K4201...K4203 (analog inputs) and binectors B4100...B4115, B4120...B4135, B4200...B4215, B4220...B4235 (digital inputs) for connecting.
A051 Peer baud rate	In a peer-to-peer connection a baud rate has been selected which is too high or too different.	Adjust the baud rate in conjunction with the SCB boards P701 SCom/SCB Baud Rate
A052 Peer PcD L	In a peer-to-peer connection, a PcD length has been set which is too high (>5).	Reduce number of words P703 SCom/SCB PcD #
A053 Peer Lng f.	In a peer-to-peer connection, the pcD length of transmitter and receiver do not match.	Adjust the word length for transmitter and receiver P703 SCom/SCB PcD #
A057 TB Param	Occurs when a TB is logged on and present, but parameter tasks from the PMU, SCom1 or SCom2 have not been answered by the TB within 6 seconds.	Replace TB configuration (software)
A061 Alarm 1 Function blocks	An active signal is present at binector U065 (1).	Check cause of alarm (see FD 710)
A062 Alarm 2 Function blocks	An active signal is present at binector U066 (1).	Check cause of alarm (see FD 710)
A063 Alarm 3 Function blocks	An active signal is present at binector U067 (1).	Check cause of alarm (see FD 710)
A064 Alarm 4 Function blocks	An active signal is present at binector U068 (1).	Check cause of alarm (see FD 710)
A065 Auto restart active	The auto restart option (P373) restarts the drive. A possibly parameterized power-up delay time (P374) expires if flying restart is not selected. During pre-charging of the DC link, there is no time monitoring i.e. with an external electronics power supply, it is also switched-in again.	Caution! Personnel could be in danger when the drive automatically restarts. Check whether the auto restart function is really required!
A066 fsyn > fmax	The measured target frequency of the external converter (or supply) is greater than the parameterized maximum frequency of the synchronizing converter.	Check: - P452 n/f(max, FWD Spd)/ P453 n/f(max,REV Spd) are correct and - correct motor data set P578 Src MotDSet Bit0 are selected
A067 fsyn < fmin	The measured target frequency of the external converter (or supply) is less than the minimum frequency required for synchronizing.	Check: - r533 Sync Target Freq - Synchronizing cable.
A068 fsyn<>fsoll	The setpoint frequency of the synchronizing converter deviates too significantly from the measured target frequency of the external converter (or supply). The permissible deviation can be set in P529.	Adjust total setpoint (main and additional setpoints) to the target frequency displayed in visualization parameter r533.

Number / Alarm	Cause	Counter-measure
A069 RGen active	Synchronizing is not started as long as the ramp-function generator in the synchronizing converter setpoint channel is active. This alarm is only output if synchronizing is selected.	Wait until acceleration has been completed. Check whether - P462 Accel Time - P463 Accel Time Unit have been correctly set.
A070 Sync error	This alarm is output if the phase difference goes outside the synchronizing window (P531) after successful synchronization.	The alarm can only be deleted after synchronization has been exited.
A071 tSY missing	An attempt has been made to start synchronization with either the synchronizing board not inserted or not parameterized.	Insert the TSY board in the subrack
A075 Ls, Rr Dev.	The measured values of the leakage measurement or of rotor resistance deviate significantly.	Usually the leakage reactance P122 is the average value resulting from the measured values in r546.1...12, and the rotor resistance r126 from the values in r542.1..3. If individual measured values significantly deviate from the average values, they are automatically not taken into account for the calculation (for RI) or the value of the automatic parameterization remains (for Ls). It is only necessary to check the results for their plausibility in the case of drives with high requirements on torque or speed accuracy.
A076 t-comp lim	The determined compensation time was limited to the value range of 0.5 µs - 1.5 µs.	Converter output and motor output are too different. Check motor data input P095 to P109.
A077 r-g limit	The measured resistance has been limited to the maximum value of 49 %.	Converter output and motor output are too different. Check motor data input P095 to P109.
A078 Stands. Meas	The standstill measurement is executed when the converter is powered up. The motor can align itself several times in a certain direction with this measurement.	If the standstill measurement can be executed without any danger: - Power up the converter.
A079 Mld Inv Stop	The rotating measurement has been aborted or cannot commence because an inverter stop command is present.	P561 Src InvRelese - Release the inverter If necessary, re-start the measurement by powering-up the converter.
A080 MotId:Dr.M	When the converter is powered up, the rotating measurement automatically accelerates the drive. The drive can then only be externally controlled in a restricted fashion.	If the rotating measurement can be executed without any danger: - Power up the converter.
A081 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see operating instructions for CB board. The ID byte combinations which are being sent from the DP master in the configuration telegram are not in conformance with the permissible ID byte combinations. (See also Compendium, Chapter 8, Table 8.2-12). Consequence: No connection is made with the PROFIBUS master.	New configuration necessary
A082 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. No valid PPO type can be identified from the configuration telegram of the DP master. Consequence: No connection is made with the PROFIBUS master.	New configuration necessary.

Number / Alarm	Cause	Counter-measure
A083 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. No net data or invalid net data (e.g. complete control word STW1=0) are being received from the DP master. Consequence: The process data are not passed on to the dual port RAM. If P722 (P695) is not equal to zero, this will cause the fault message F082 to be tripped.	See operating instructions of the CB board
A084 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. The telegram traffic between the DP master and the CBP has been interrupted (e.g. cable break, bus cable pulled out or DP master powered down). Consequence: If P722 (P695) is not equal to zero, this will cause the fault message F082 to be tripped.	See operating instructions of the CB board
A085 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. The CBP does not generate this alarm!	See operating instructions of the CB board
A086 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. Failure of the heartbeat counter on the basic unit. The heartbeat counter on the basic unit is no longer being incremented. The communication between the CBP and the basic board is disturbed.	See operating instructions of the CB board
A087 CB alarm	The following description refers to the 1st CBP. For other CBs or the TB see the operating instructions for the CB board. Fault in the DPS manager software of the CBP.	See operating instructions of the CB board
A088 CB alarm	See user manual for CB board	See user manual for CB board
A089 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A81 of the 1st CB board	See user manual for CB board
A090 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A82 of the 1st CB board	See user manual for CB board
A091 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A83 of the 1st CB board	See user manual for CB board
A092 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A84 of the 1st CB board	See user manual for CB board
A093 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A85 of the 1st CB board	See user manual for CB board
A094 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A86 of the 1st CB board	See user manual for CB board
A095 CB alarm	Alarm of the 2nd CB board. Corresponds to A87 of the 1st CB board See operating instructions for CB board	See user manual for CB board

Number / Alarm	Cause	Counter-measure
A096 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A88 of the 1st CB board	See user manual for CB board
A097 TB alarm 1	See user manual for TB board	See user manual for TB board
A098 TB alarm 1	See user manual for TB board	See user manual for TB board
A099 TB alarm 1	See user manual for TB board	See user manual for TB board
A100 TB alarm 1	See user manual for TB board	See user manual for TB board
A101 TB alarm 1	See user manual for TB board	See user manual for TB board
A102 TB alarm 1	See user manual for TB board	See user manual for TB board
A103 TB alarm 1	See user manual for TB board	See user manual for TB board
A104 TB alarm 1	See user manual for TB board	See user manual for TB board
A105 TB alarm 1	See user manual for TB board	See user manual for TB board
A106 TB alarm 1	See user manual for TB board	See user manual for TB board
A107 TB alarm 1	See user manual for TB board	See user manual for TB board
A108 TB alarm 1	See user manual for TB board	See user manual for TB board
A109 TB alarm 1	See user manual for TB board	See user manual for TB board
A110 TB alarm 1	See user manual for TB board	See user manual for TB board
A111 TB alarm 1	See user manual for TB board	See user manual for TB board
A112 TB alarm 1	See user manual for TB board	See user manual for TB board
A113 TB alarm 2	See user manual for TB board	See user manual for TB board
A114 TB alarm 2	See user manual for TB board	See user manual for TB board
A115 TB alarm 2	See user manual for TB board	See user manual for TB board
A116 TB alarm 2	See user manual for TB board	See user manual for TB board
A117 TB alarm 2	See user manual for TB board	See user manual for TB board

Number / Alarm	Cause	Counter-measure
A118 TB alarm 2	See user manual for TB board	See user manual for TB board
A119 TB alarm 2	See user manual for TB board	See user manual for TB board
A120 TB alarm 2	See user manual for TB board	See user manual for TB board
A121 TB alarm 2	See user manual for TB board	See user manual for TB board
A122 TB alarm 2	See user manual for TB board	See user manual for TB board
A123 TB alarm 2	See user manual for TB board	See user manual for TB board
A124 TB alarm 2	See user manual for TB board	See user manual for TB board
A125 TB alarm 2	See user manual for TB board	See user manual for TB board
A126 TB alarm 2	See user manual for TB board	See user manual for TB board
A127 TB alarm 2	See user manual for TB board	See user manual for TB board
A128 TB alarm 2	See user manual for TB board	See user manual for TB board

Table 13-2 Alarm numbers, causes and their counter-measures

13.3 Fatal errors (FF)

Fatal errors are serious hardware or software errors which no longer permit normal operation of the unit. They only appear on the PMU in the form "FF<No>". The software is re-booted by actuating any key on the PMU.

Number / Fault	Cause	Counter-measure
FF01 Time slot overflow	A time slot overflow which cannot be corrected has been detected in the higher-priority time slots.	- Increase sampling time (P357 or reduce pulse frequency (P340) - Replace CU, or replace the unit (Compact PLUS type)
FF03 Access fault Optional board	Serious faults have occurred while accessing external option boards (CB, TB, SCB, TSY ..).	- Replace CU, or replace the unit (Compact PLUS type) - Replace the LBA - Replace the option board
FF04 RAM	A fault has occurred during the test of the RAM.	- Replace CU, or replace the unit (Compact PLUS type)
FF05 EPROM fault	A fault has occurred during the test of the EPROM.	- Replace CU, or replace the unit (Compact PLUS type)
FF06 Stack overflow	Stack has overflowed	For VC: Increase sampling time (P357) For MC: Reduce pulse frequency (P340) - Replace CU, or replace the unit (Compact PLUS type)
FF07 Stack Underflow	Stack underflow	- Replace CU, or replace the unit (Compact PLUS type) - Replace firmware
FF08 Undefined Opcode	Invalid processor command should be processed	- Replace CU, or replace the unit (Compact PLUS type) - Replace firmware
FF09 Protection Fault	Invalid format in a protected processor command	- Replace CU, or replace the unit (Compact PLUS type) - Replace firmware
FF10 Illegal Word Operand Address	Word access to uneven address	- Replace CU, or replace the unit (Compact PLUS type) - Replace firmware
FF11 Illegal Instruction Access	Jump command to uneven address	- Replace CU, or replace the unit (Compact PLUS type) - Replace firmware
FF13 Wrong firmware version	A version conflict between the firmware and the hardware has occurred.	- Replace firmware - Replace CU, or replace the unit (Compact PLUS type)
FF14 FF processing	Unexpected fatal error (During processing of the fatal errors, a fault number has occurred which is unknown to date).	Replace the board
FF15 CSTACK_OVERFLOW	Stack overflow (C-Compiler Stack)	Replace the board
FF16 NMI error	NMI	- Replace firmware - Replace CU, or replace the unit (Compact PLUS type)

Table 13-3 Fatal errors

14 Environmental Friendliness

Environmental aspects during the development

The number of components has been significantly reduced over earlier converter series by the use of highly integrated components and the modular design of the complete series. Thus, the energy requirement during production has been reduced.

Special significance was placed on the reduction of the volume, weight and variety of metal and plastic components.

Plastics components used

ABS:	PMU board, Siemens logo
PC / ABS:	Front cover VC Large
PA6:	Front cover VC, terminal strips, spacer bolts, fan impeller
PA6.6:	DC link terminal cover, through terminals, terminal strips, terminal blocks
Pocan (PBT):	Optional card covers
PP:	PMU covers
PBTP:	Fan housing
Hostaphan (Makrofol): Formex:	Insulating plates
NOMEX:	Insulating paper
FR4:	Printed circuit boards

Halogen-containing flame retardants were, for all essential components, replaced by environmentally-friendly flame retardants.

Environmental compatibility was an important criterium when selecting the supplied components.

Environmental aspects during production

Purchased components are generally supplied in recyclable packaging materials (board).

Surface finishes and coatings were eliminated with the exception of the galvanized sheet steel side panels.

ASIC devices and SMD devices were used on the boards.

The production is emission-free.

Environmental aspects for disposal

The unit can be broken down into recyclable mechanical components as a result of easily releasable screw and snap connections.

The plastic components are to DIN 54840 and have a recycling symbol.

After the service life has expired, the product must be disposed of in accordance with the applicable national regulations.

Bisher sind folgende Ausgaben erschienen:
The following versions have been published so far:

Ausgabe Version	interne Sachnummer Internal item number
AA	A5E00128897 DE
AB	A5E00128897 DE
AC	A5E00128897 DE
AD	A5E00857374
AE	A5E00857374
AF	A5E00857374
AG	A5E00857374
AH	A5E00857374

Ausgabe AH besteht aus folgenden Kapiteln:

Kapitel		Änderungen	Seiten-zahl	Ausgabe-datum
1	Definitionen und Warnungen	überarbeitete Ausgabe	6	08.2008
2	Beschreibung	überarbeitete Ausgabe	1	05.2003
3	Transportieren, Lagern, Auspacken	überarbeitete Ausgabe	1	02.2005
4	Erstinbetriebsetzung	überarbeitete Ausgabe	2	02.2005
5	Montage	überarbeitete Ausgabe	12	09.2009
6	EMV-gerechter Aufbau	überarbeitete Ausgabe	6	02.2008
7	Anschließen	überarbeitete Ausgabe	20	08.2008
8	Parametrierung	überarbeitete Ausgabe	25	09.2009
9	Parametrierschritte	überarbeitete Ausgabe	28	05.2003
10	Wartung	überarbeitete Ausgabe	3	08.2008
11	Formieren	überarbeitete Ausgabe	2	09.2009
12	Technische Daten	überarbeitete Ausgabe	8	08.2008
13	Störungen und Warnungen	überarbeitete Ausgabe	26	02.2008
14	Umweltverträglichkeit	überarbeitete Ausgabe	1	02.2005

Version AH consists of the following chapters:

Chapter		Changes	Pages	Version date
1	Definitions and Warnings	reviewed edition	6	08.2008
2	Description	reviewed edition	1	05.2003
3	Transport, Storage, Unpacking	reviewed edition	1	02.2005
4	First Start-up	reviewed edition	2	02.2005
5	Installation	reviewed edition	12	09.2009
6	Installation in Conformance with EMC Regulations	reviewed edition	6	02.2008
7	Connecting-up	reviewed edition	20	08.2008
8	Parameterization	reviewed edition	25	09.2009
9	Parameterizing steps	reviewed edition	28	05.2003
10	Maintenance	reviewed edition	3	08.2008
11	Forming	reviewed edition	2	09.2009
12	Technical Data	reviewed edition	8	08.2008
13	Faults and Warnings	reviewed edition	26	02.2008
14	Environmental Friendliness	reviewed edition	1	02.2005

Änderungen von Funktionen, technischen Daten, Normen, Zeichnungen und Parametern vorbehalten.

We reserve the right to make changes to functions, technical data, standards, drawings and parameters.

Wir haben den Inhalt der Druckschrift auf Übereinstimmung mit der beschriebenen Hard- und Software überprüft. Dennoch können Abweichungen nicht ausgeschlossen werden, so dass wir für die vollständige Übereinstimmung keine Garantie übernehmen. Die Angaben in dieser Druckschrift werden jedoch regelmäßig überprüft und notwendige Korrekturen sind in den nachfolgenden Auflagen enthalten. Für Verbesserungsvorschläge sind wir dankbar.

We have checked the contents of this document to ensure that they coincide with the described hardware and software. However, differences cannot be completely excluded, so that we do not accept any guarantee for complete conformance. However, the information in this document is regularly checked and necessary corrections will be included in subsequent editions. We are grateful for any recommendations for improvement.

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