SIEMENS

SIMOVERT MASTERDRIVES Vector Control

Betriebsanleitung
Operating Instructions

Frequenzumrichter (AC-AC) Bauform Kompakt PLUS
Frequency Converter (AC-AC) Compact PLUS Type

Ausgabe / Edition: AB

Bestell-Nr. / Order No.: 6SE7087-6JP60

Diese Betriebsanleitung gilt für den Gerätesoftwarestand ab V3.32.

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

These Operating Instructions are valid for software release from V3.32.

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

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.

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

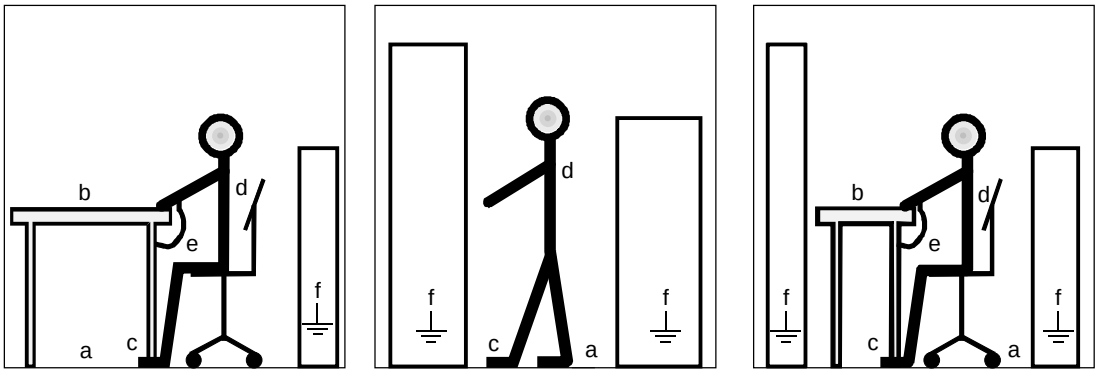


Fig. 1-1 ESD protective measures

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 commissioning as well as maintenance are to be carried out **by skilled technical personnel** (observe IEC 364 or CENELEC HD 384 or DIN VDE 0100 and IEC Report 664 or DIN VDE 0110 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 EC directive 89/392/EEC (Machinery Safety Directive - MSD). Account is to be taken of EN 60204.

Commissioning (i.e. the start of normal operation) 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 prEN 50178/DIN VDE 0160 in conjunction with EN 60439-1/DIN VDE 0660 Part 500 and EN 60146/DIN 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 prEN 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 and/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. Electronic 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. VBG 4) 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, such as screening, grounding, 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 the 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 monitoring 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 permissible.

After disconnection of the drive converters from the voltage supply, live appliance parts and power terminals must not be touched immediately because of possibly energized capacitors. In this regard, 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!

2 Description

Range of application

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

They can be operated from a three-phase system with a voltage between 380 V and 480 V and a frequency of 50/60 Hz.

The line voltage from the system is rectified and fed into the DC link.

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

The internal DC 24 V voltage is supplied through an integral power supply unit.

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

Operator control is effected 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.

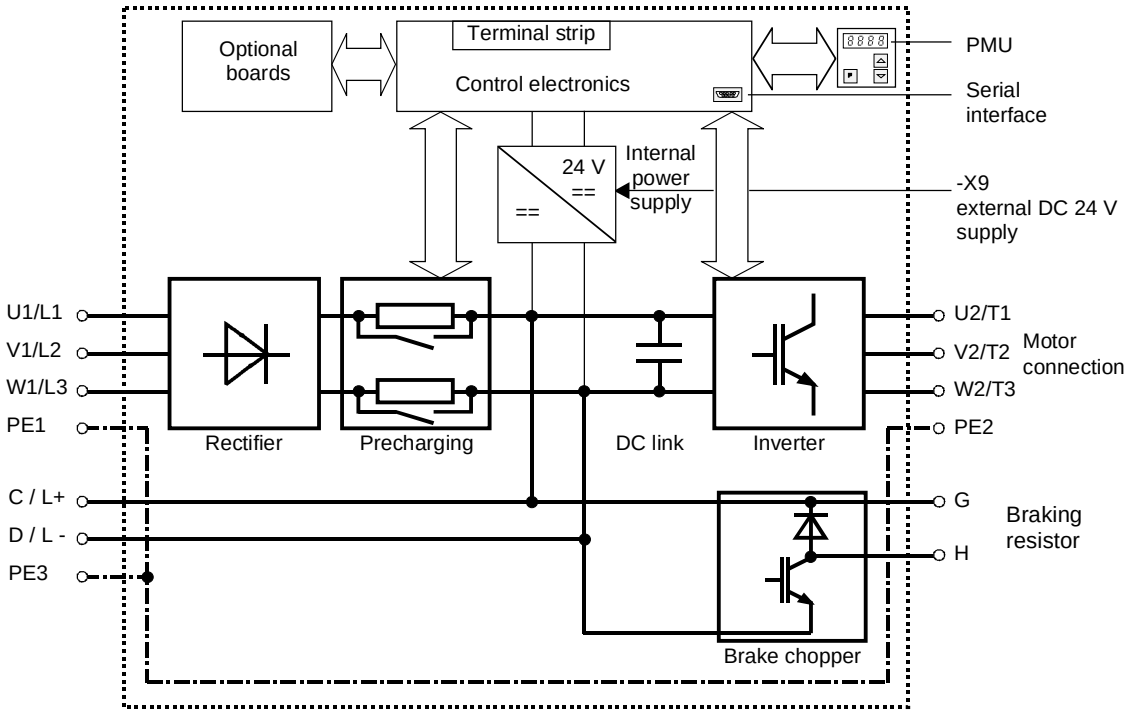


Fig. 2-1 Circuit principle of the frequency converter

3 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 one year, 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, if present, 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 or the line voltage

After checking that the cabling has been correctly connected and that it sits properly, power up the external 24 V supply or the line voltage. 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 or DC bus voltage, if you have not already done so, 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

4 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 one year 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.

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) 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.

Clearances

When installing the units, make sure that the mains connection is located at the top section and the motor connection at the lower section of the unit.

The units can be mounted flush with each other.

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.

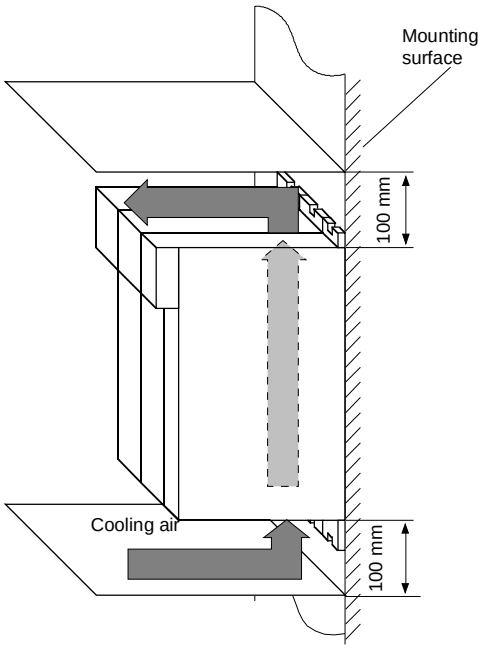


Fig. 5-1 Minimum clearances for cooling

Installation

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

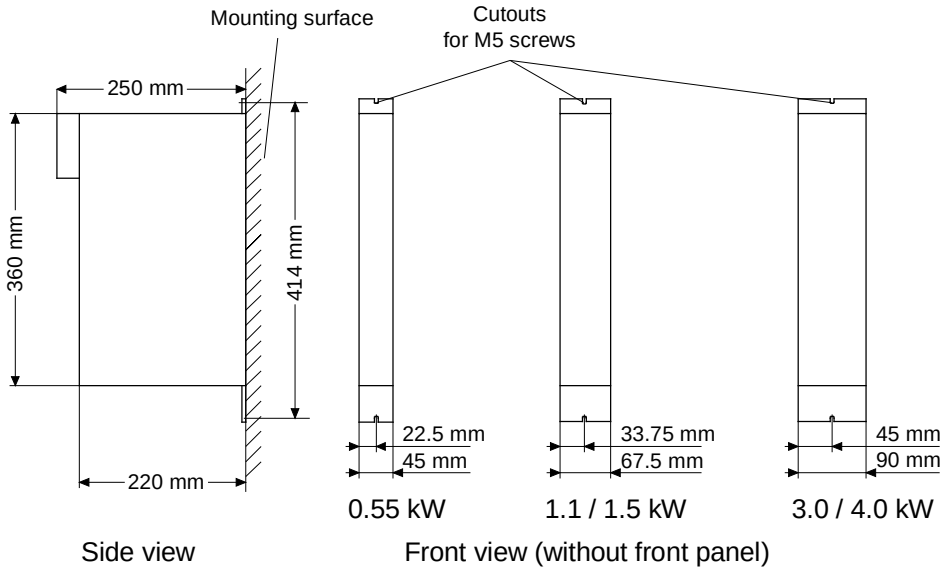


Fig. 5-2 Dimension drawings for housings up to 90 mm wide

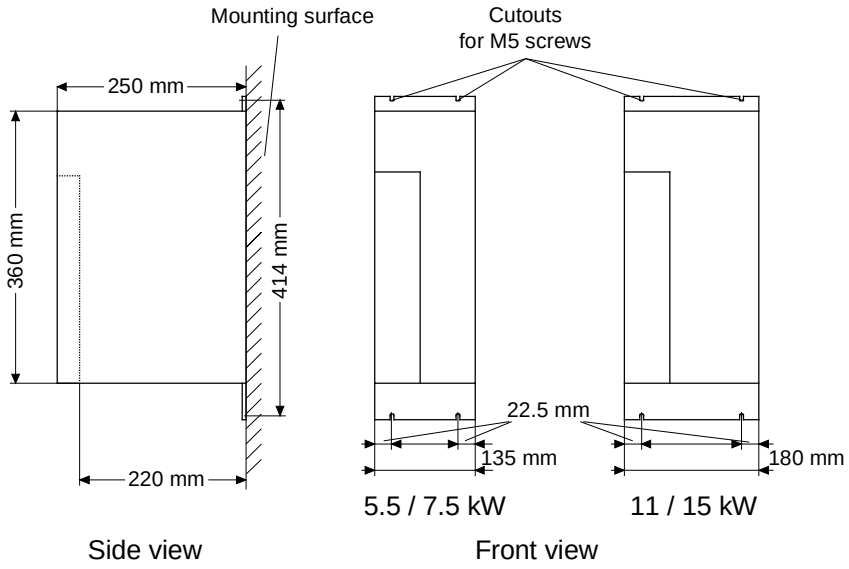


Fig. 5-3 Dimension drawings for housings 135 mm and 180 mm wide

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

Disconnecting the unit from the supply

DANGER

Disconnect the unit from the power supply and power down the unit. Remove the 24 V voltage supply for the electronics. Remove all connecting cables.

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.

If you are using an AC unit as a single drive, there is no DC link bus module. You can then withdraw the unit directly after removing the fixing screws.

Opening the unit

- Unscrew the two fixing screws of the right-hand side wall. The fixing screws are located at the top of the unit at the rear right-hand corner, and at the bottom of the unit in the middle of the right-hand side wall.
- You do not have to remove the two 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 it, swing the right-hand side wall towards you and pull it upwards out of the guide on the front edge.

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.

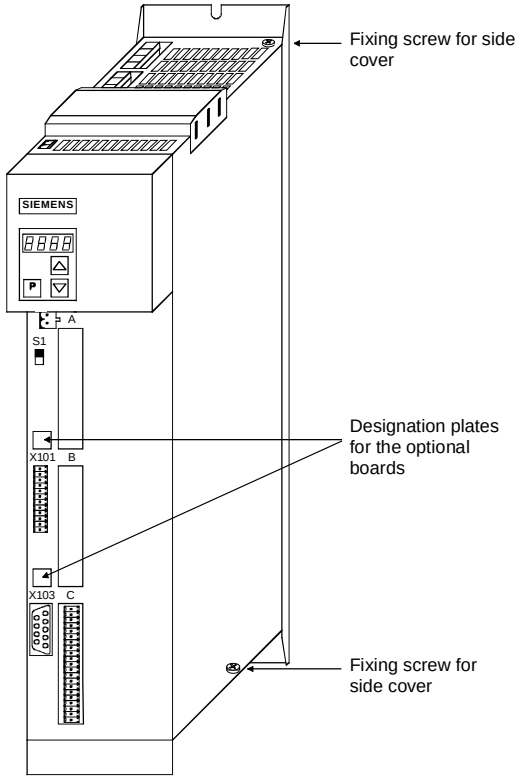


Fig. 5-4 Position of the fixing screws on the right-hand side wall

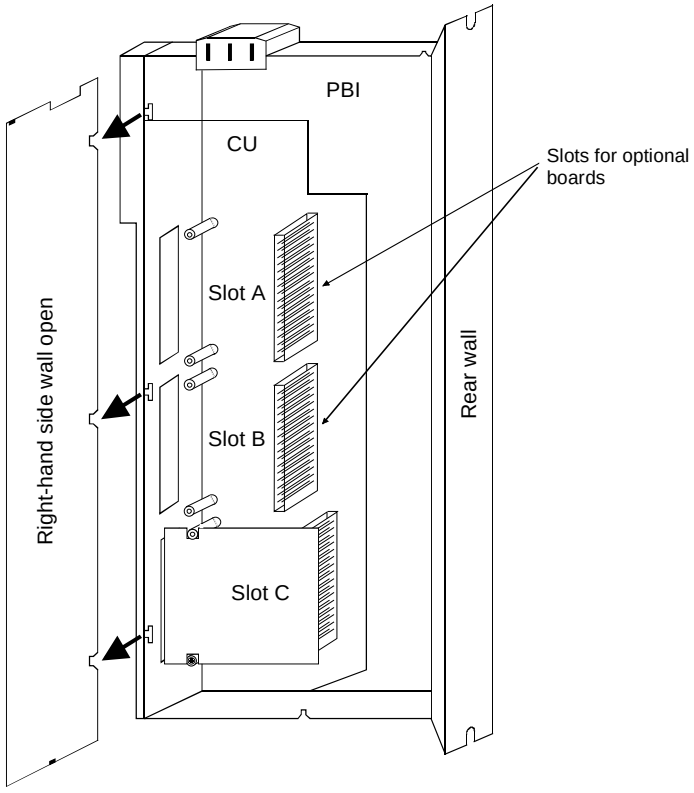


Fig. 5-5 Removing the right-hand side wall

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).

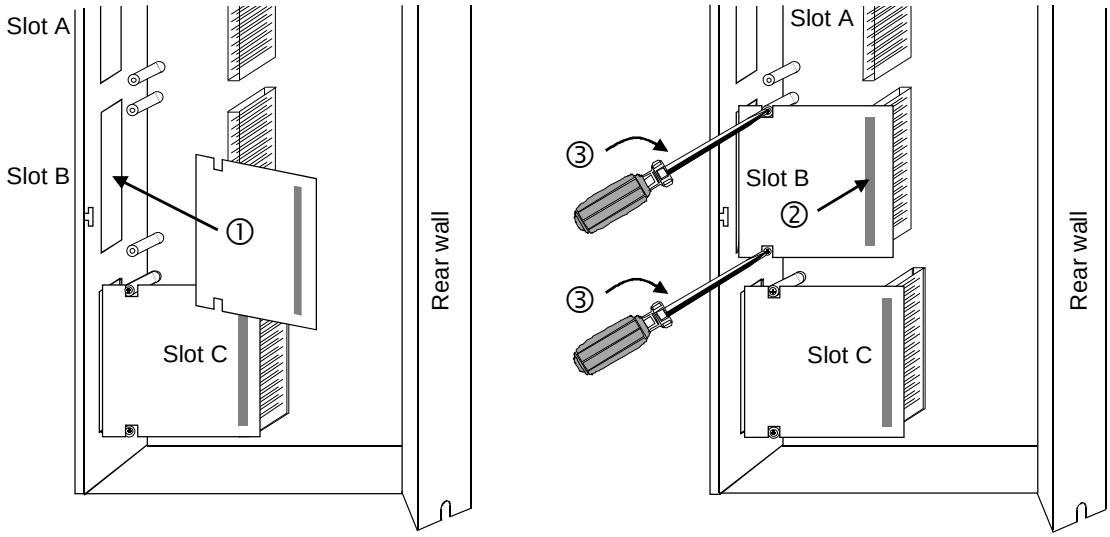


Fig. 5-6 Installing the optional board

Assembling and mounting the unit

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

- Insert the right-hand side wall from above into the guide on the front right-hand side.
- Swing back the side wall.
- Screw the side wall tight again by means of the two fixing screws.

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.

If you are using an AC unit as a single drive, you can fix the unit directly to the mounting surface.

- 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

Disconnecting the unit from the supply

DANGER

Disconnect the unit from the power supply and power down the unit. Remove the 24 V voltage supply for the electronics. Remove all connecting cables.

Opening the unit

- Loosen the 2 fixing screws on the front of the unit at the top. There is no need to remove the screws completely, since cutouts are provided in the housing to permit the front to come away after the screws have been loosened.
- Carefully swing the upper front section forwards (approx. 30 °) away from the housing.
- At the power section, open the locking lever of the ribbon cable that connects up with the control electronics.
- Take off the front of the unit by moving it forwards.

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.

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).

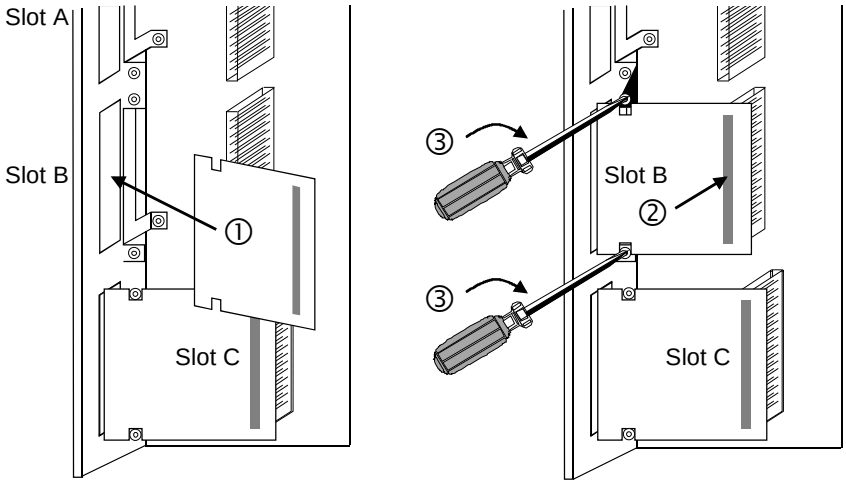


Fig. 5-7 Installing the optional board

Assembling and mounting the unit

- Keep the front of the unit tilted about approximately 30 ° forwards and insert the cutout of the lower guide plate - approaching from below - into the strip on the power section.
- Insert the connection cable plug into the power section socket and close the locking lever.
- Carefully return the front of the unit into the housing. Make sure that the guide plates on the right-hand side of the front (viewed from the front) enter the housing cutouts.
- Screw the front of the unit securely to the power section with the two fixing screws.

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.
- 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.

6 Installation in Conformance with EMC Regulations

The following contains a summary of general information and guidelines which will make it easier for you to comply with EMC and CE regulations.

- Ensure that there is a conductive connection between the housing of the converters or inverters and the mounting surface. The use of mounting surfaces with good conducting properties (e.g. galvanized steel plate) is recommended. If the mounting surface is insulated (e.g. by paint), use contact washers or serrated washers.
- All of the metal cabinet parts must be connected through the largest possible surface area and must provide good conductivity.
  If necessary, use contact washers or serrated washers.
- Connect the cabinet doors to the cabinet frame using grounding strips which must be kept as short as possible.
- For the connection between converter/inverter and motor, use shielded cables which have to be grounded on both sides over a large surface area.
  If the motor terminal box is of plastic, additional grounding strands have to be inserted.
- The shield of the motor supply cable must be connected to the shield connection of the converter and to the motor mounting panel through the largest possible surface area.
- The motor cable shield must not be interrupted by output reactors, fuses or contactors.
- All signal cables must be shielded. Separate the signal cables according to signal groups.
  Do not route cables with digital signals unshielded next to cables with analog signals. If you use a common signal cable for both, the individual signals must be shielded from each other.
- Power cables must be routed separately away from signal cables (at least 20 cm apart). Provide partitions between signal cables and power cables. The partitions must be grounded.
- Connect the reserve cables/conductors to ground at both ends to achieve an additional shielding effect.
- Lay the cables close to grounded plates as this will reduce the injection of undesired signals.
- Eliminate any unnecessary cable lengths because these will produce additional coupling capacitances and inductances.
- Use cables with braided shields. Cables with foil shields have a shielding effect which is worse by a factor of five.

- Use a noise suppression filter in the incoming powerline.
  Connect the noise suppression filter to ground and to the converter through a large surface area.
  It is best to directly mount the noise suppression filter on the same good conductive mounting surface as the converter or inverter.
  You must insert a line reactor between the noise suppression filter and the unit.
- Contactor operating coils that are connected to the same supply network as the converter or that are located in close proximity of the converter must be connected to overvoltage limiters (e.g. RC circuits, varistors).

Further information is contained in the chapter 3 "Instructions for Design of Drives in Conformance with EMC Regulations" of the Compendium. The Compendium can be found on the attached CD and can also be ordered as a hard copy (Order No.: 6SE7087-6QX60).

CAUTION

This product has limited availability in accordance with IEC 61800-3. This product can cause radio interference in residential areas. In such a case, it may be necessary for the operator to take suitable action.

NOTE

In line with the EMC product standard for variable-speed drives EN 61800-3:1996 + A11:2000 Chapter 6.3.2.3 b) drive systems (PDS = Power Drive Systems) have to comply with the limit values (in accordance with Table 11 and Table 12 *of the above-mentioned standard)*.
For technical reasons there are a number of applications in which it is not possible for PDS to comply with these limit values.
Such applications are:

- IT networks in complex systems
- Applications in which the necessary dynamic operational behavior is limited on account of filter effects.

This note must be particularly observed for option L20 (operation on non-grounded networks).

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.

NOTICE

Due to their physical characteristics, converters can produce DC residual currents. If a residual-current protective device (residual-current-operated circuit-breaker) is used on the supply side of the AC/AC converter - or of the rectifier unit in the case of multi-motor drives - for protective purposes in case of indirect touching, only type B to IEC 755 is permitted. Due to radio-interference suppression capacitors and as a result of the parasitic capacity of the motor cable, leakage currents flow which can lead to undesired responding of the residual-current protective device.

In general, operation without faults is possible only under the following conditions:

- Rated residual current of the residual-current protective device ≥ 300 mA
- Short motor cables (l < 20 m)
- No radio-interference suppression filter built in
- Only one converter connected per residual-current protective device

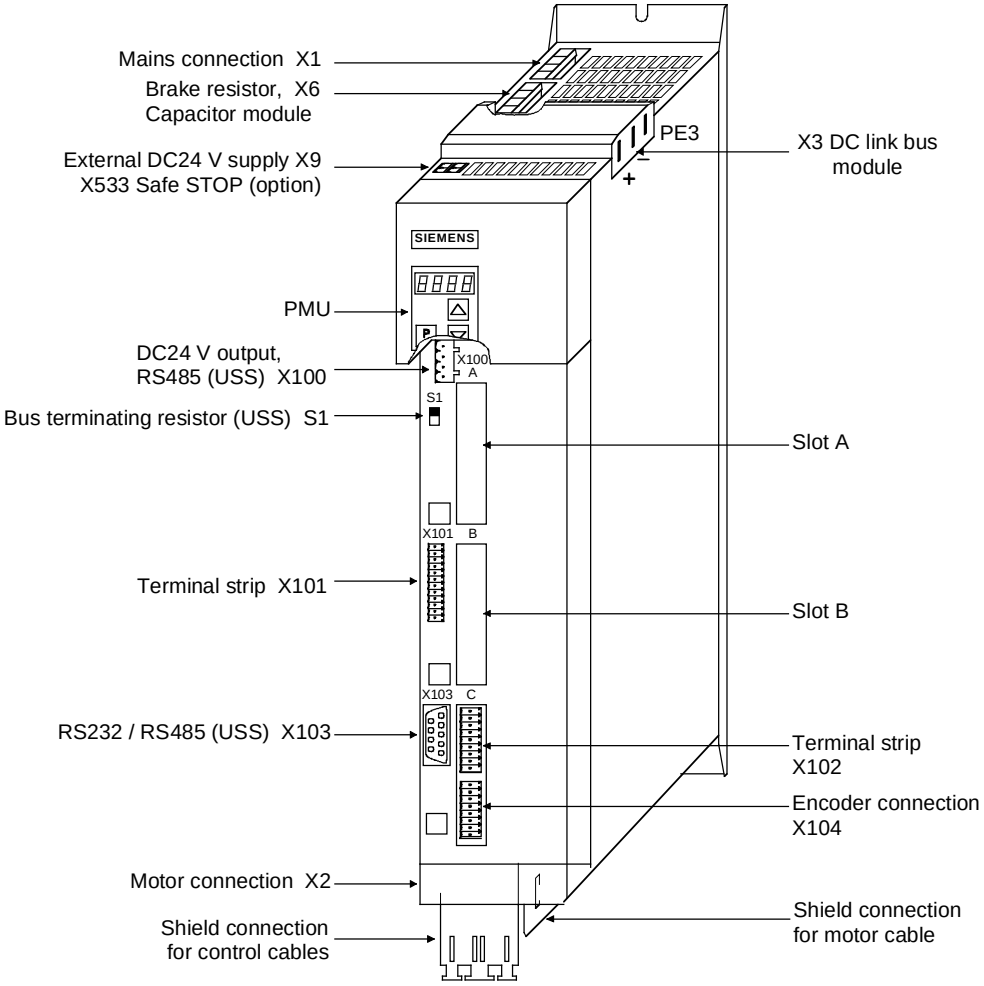


Fig. 7-1 Connection overview for units up to 90 mm wide

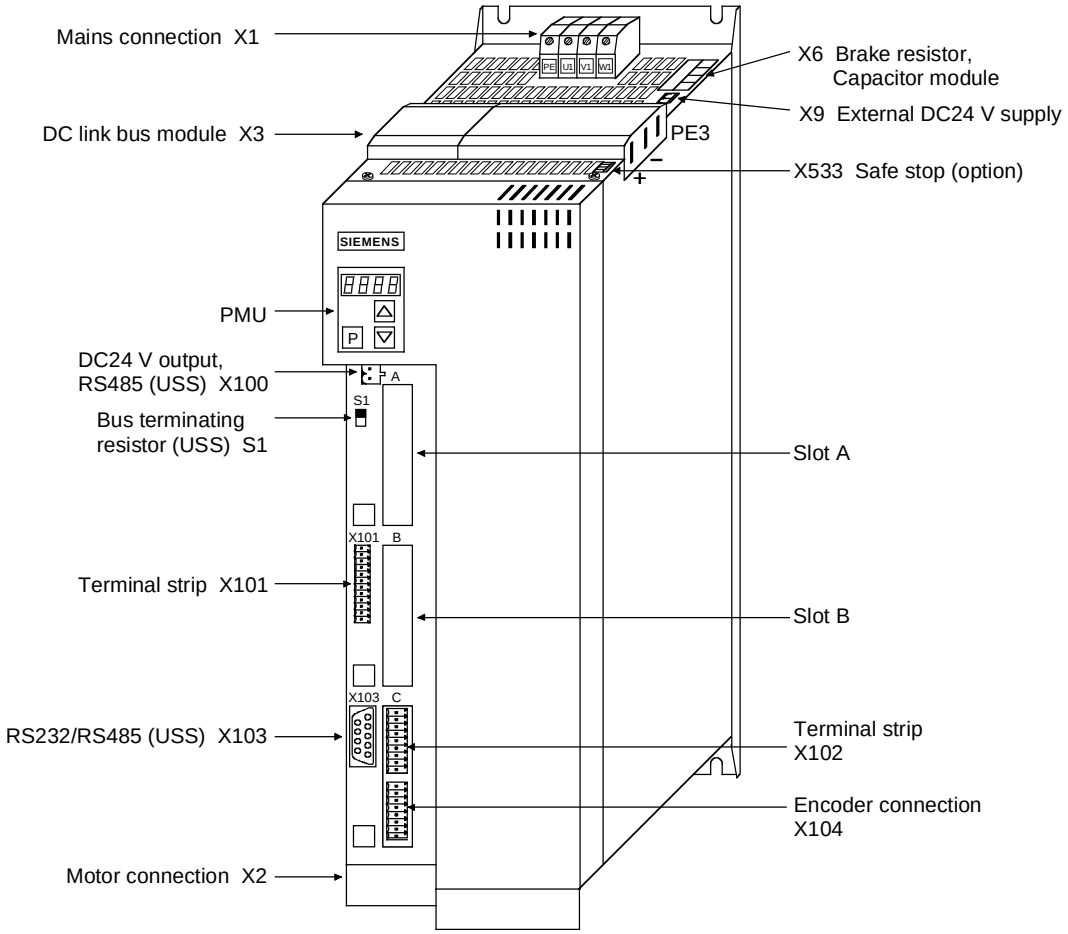


Fig. 7-2 Connection overview for units 135 mm wide

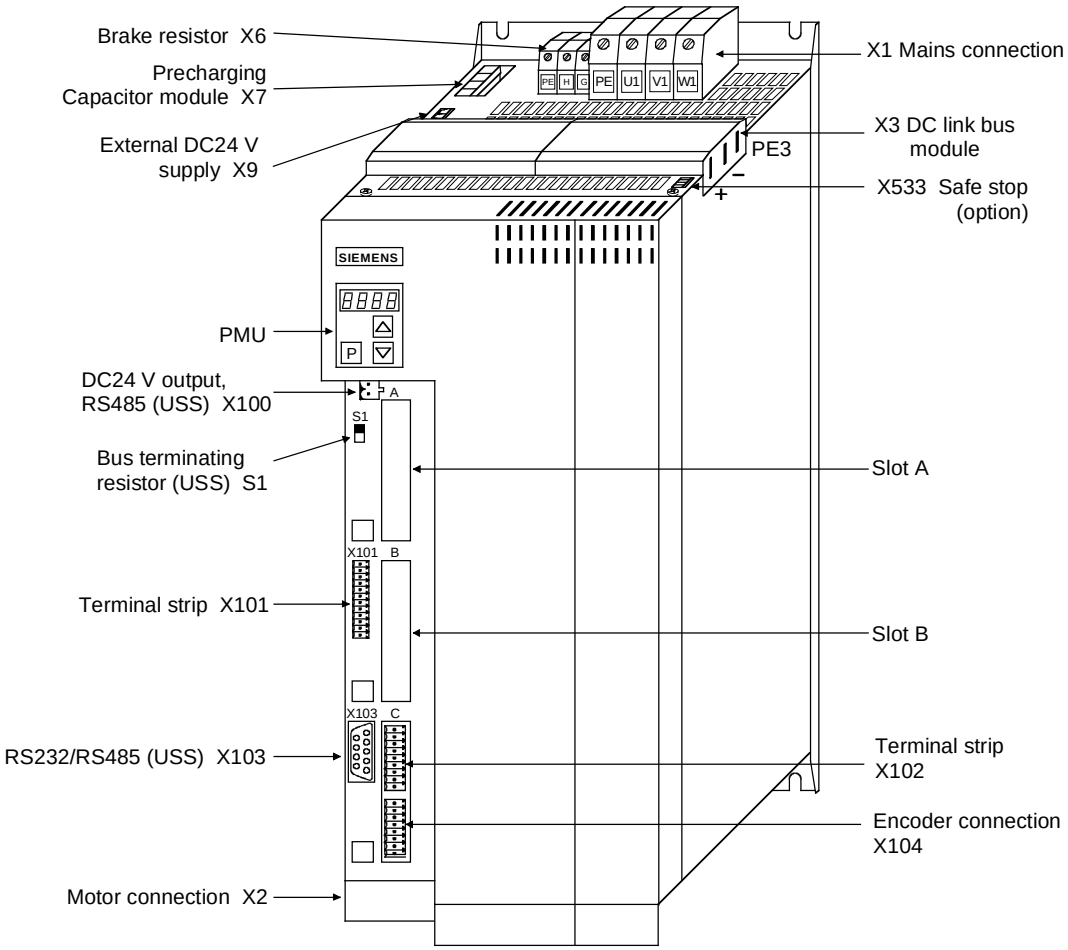


Fig. 7-3 Connection overview for units 180 mm wide

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

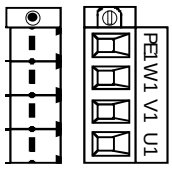
If the unit is mounted on a grounded mounting surface via a conductive connection, the protective conductor cross section can be the same as that of the phase conductor. The function of the second protective conductor is afforded by the grounded mounting surface.

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

Ground connection

There is an additional ground connection in the form of an M4 threaded bolt at the upper section of the unit located next to the X1 mains connection.
This is used for connecting up the second protective conductor in accordance with EN 50178.

X1 - Mains connection



The mains connection is situated at the top of the unit.

Terminal	Meaning	Range
PE1	Protective conductor connection	
W1	Phase W1 / L3	3 AC 380 V - 480 V
V1	Phase V1 / L2	3 AC 380 V - 480 V
U1	Phase U1 / L1	3 AC 380 V - 480 V

Connectable cross-section: 4 mm² (AWG 10)

Terminal U1 is at the front when installed.

Table 7-1 Mains connection

CAUTION

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

X3 - DC link bus module

The DC link bus module serves as the electrical connection of the individual units on the DC link side. It is of significance if further inverters also have to be fed.

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

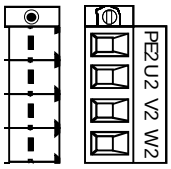
Connectable cross-section: "Electro-plated copper" 3x10 mm, rounded off according to DIN 46433 (EN 13601)

Bar 1 is at the front when installed.

Table 7-2 DC link bus module

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)

Terminal PE2 is at the front when installed.

Table 7-3 Motor connection

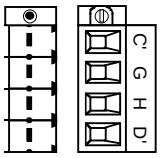
CAUTION

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.

X6 – Braking resistor and pre-charging of the capacitor module



The connection for the external braking resistor and the pre-charging of the capacitor module is provided on the top of the unit.

Terminal	Meaning
C´	Pre-charging for capacitor module
G	Braking resistor
H	Braking resistor
D´	Pre-charging for capacitor module

Connectable cross-section: 4 mm² (AWG 10)

Terminal D' is at the front when installed.

Table 7-4 Connection of the braking resistor and pre-charging of the capacitor module

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).

DANGER

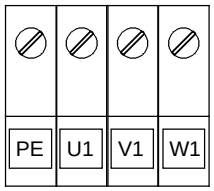
- During operation, the full DC link voltage is always present at the terminals for pre-charging the capacitor module.
- During pre-charging, the charging current of all connected capacitor modules flows via the terminals.
- For reasons of protection, cables with 4 mm² Cu should be used at connection X6!

CAUTION

Length of connecting cable between converter and external brake resistor < 15 m.

7.1.2 Power connections for units with a width of 135 mm

X1 - Mains connection



The mains connection is to a terminal block on top of the unit.

Terminal	Meaning	Range
PE	Protective conductor connection	
U1 / L1	Phase U1 / L1	3AC 380 - 480 V
V1 / L2	Phase V1 / L2	3AC 380 - 480 V
W1 / L3	Phase W1 / L3	3AC 380 - 480 V

Connectable cross-section: 10 mm² (AWG 8), stranded

Viewed from the front, Terminal W1 is at the right.

Table 7-5 Mains connection

X3 - DC link bus module

The DC link bus module serves as the electrical connection of the individual units on the DC link side. It is of significance if further inverters also have to be fed.

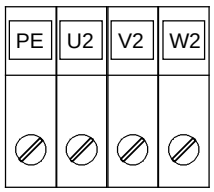
Bar	Designation	Meaning	Range
3	PE3	Protective conductor connection	
2	D / L-	DC link voltage -	DC 510 - 650 V
1	C / L+	DC link voltage +	DC 510 - 650 V

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

Bar 1 is at the front when installed.

Table 7-6 DC link bus module

X2 - Motor connection



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: 10 mm² (AWG 8), stranded

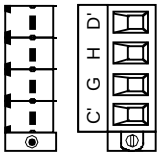
Viewed from the front, Terminal W2 is at the right.

Table 7-7 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.

X6 - Braking resistor and pre-charging of the capacitor module

The connection for the external braking resistor and the pre-charging of the capacitor module is provided on the top of the unit.



Terminal	Meaning
D´	Pre-charging for capacitor module
H	Braking resistor
G	Braking resistor
C´	Pre-charging for capacitor module

Connectable cross-section: 4 mm² (AWG 10)

Terminal C' is at the front when installed.

Table 7-8 Connection of the braking resistor and pre-charging of the capacitor module

CAUTION

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

DANGER

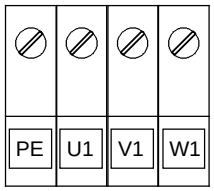
- During operation, the full DC link voltage is always present at the terminals for pre-charging the capacitor module.
- During pre-charging, the charging current of all connected capacitor modules flows via the terminals.
- For reasons of protection, cables with 4 mm² Cu should be used at connection X6!

CAUTION

Length of connecting cable between converter and external brake resistor < 15 m.

7.1.3 Power connections for units with a width of 180 mm

X1 - Mains connection



The mains connection is to a terminal block on top of the unit.

Terminal	Meaning	Range
PE	Protective conductor connection	
U1 / L1	Phase U1 / L1	3AC 380 - 480 V
V1 / L2	Phase V1 / L2	3AC 380 - 480 V
W1 / L3	Phase W1 / L3	3AC 380 - 480 V

Connectable cross-section: 25 mm² (AWG 4), stranded

Viewed from the front, Terminal W1 is at the right.

Table 7-9 Mains connection

X3 - DC link bus module

The DC link bus module serves as the electrical connection of the individual units on the DC link side. It is of significance if further inverters also have to be fed.

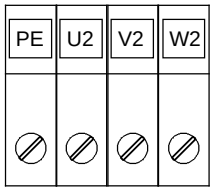
Bar	Designation	Meaning	Range
3	PE3	Protective conductor connection	
2	D / L-	DC link voltage -	DC 510 - 650 V
1	C / L+	DC link voltage +	DC 510 - 650 V

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

Bar 1 is at the front when installed.

Table 7-10 DC link bus module

X2 - Motor connection



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

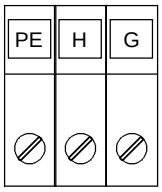
Connectable cross-section: 16 mm² (AWG 6), stranded

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

Table 7-11 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.

X6 – Braking resistor connection



The connection of the external braking resistor is to a terminal block on the top of the unit on the left next to the mains connection.

Terminal	Meaning
PE	Protective conductor connection
H	Braking resistor connection
G	Braking resistor connection

Connectable cross-section: 10 mm² (AWG 4), stranded

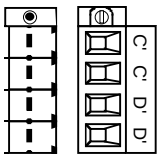
Viewed from the front, Terminal PE is at the left.

Table 7-12 Braking resistor connection

CAUTION

Length of connecting cable between converter and brake resistor < 15 m.

X7 – Pre-charging of capacitor module



The connection for pre-charging the capacitor module is on the top of the unit.

Terminal	Meaning
C´	Pre-charging of capacitor module
C´	Pre-charging of capacitor module
D´	Pre-charging of capacitor module
D´	Pre-charging of capacitor module

Connectable cross-section: 4 mm² (AWG 10)

Terminal D' is at the front when installed.

Table 7-13 Connection of precharging capacitor module

CAUTION

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

DANGER

- During operation, the full DC link voltage is always present at the terminals for pre-charging the capacitor module.
- During pre-charging, the charging current of all connected capacitor modules flows via the terminals.
- For reasons of protection, cables with 4 mm^2 Cu should be used at connection X7!

7.2 Control connections

Standard connections

In the basic version, the unit has the following control connections:

- External 24 V supply
- 24 V voltage output, USS bus connection (RS485)
- Serial interface for PC or OP1S
- Control terminal strip.

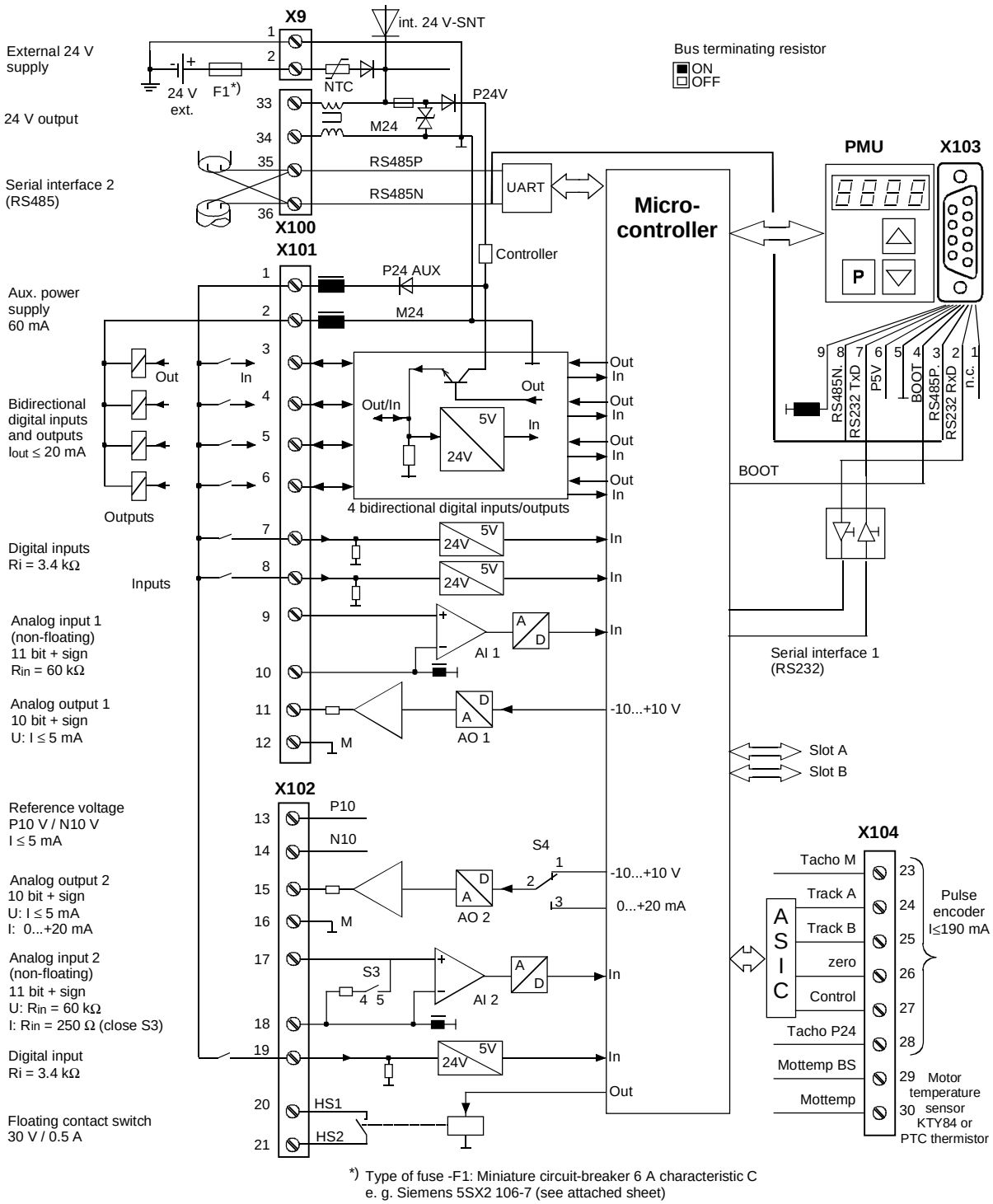
WARNING

Before the control cables and encoder cables are connected or disconnected, the unit must be disconnected from the supply (24 V electronic power supply **and** DC link/line voltage)!

If this measure is not observed, this can result in defects on the encoder. A defective encoder can 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).



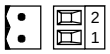
*) Type of fuse -F1: Miniature circuit-breaker 6 A characteristic C
e. g. Siemens 5SX2 106-7 (see attached sheet)

Fig. 7-4 Overview of the standard connections

X9 - External 24 V supply

In order to also enable the unit to be parameterized and monitored with the DC link discharged (e.g. line interruption), an external 24 V voltage supply is necessary. The two-pole connection required for this is situated at the top of the unit.

With the DC link charged, the voltage is supplied by an internal switch-mode power supply.



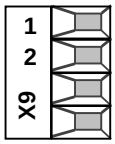
X9 for 135 mm and 180 mm wide units

Terminal	Designation	Meaning	Range
2	+24 V	External 24 V supply	DC 18 V - 30 V
1	0 V	Reference potential	DC 18 V - 30 V

Connectable cross-section: 2.5 mm² (AWG 12)

Terminal 1 is at the front when installed.

Table 7-14 External 24 V supply



X9 for 45 mm, 67.5 mm und 90 mm wide units

In standby mode, the unit has a current drain of 700 mA. This is increased if optional cards are inserted.

X100 - 24 V voltage output, USS bus

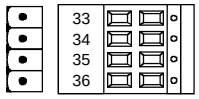
The unit is provided with a 24 V voltage output to which a maximum of two further converters can be connected.

One further inverter can be connected to the 24 V voltage output in the case of a unit with a housing width of 45 mm.

The USS bus connection is linked with the control electronics and the 9-pole SUB D socket of the serial interface.

The bus terminating resistor can, if required, be powered up by means of the switch S1 located next to the bus connection. In the upper position, the bus termination is switched in.

Power-up is necessary if the unit is located at one end of the USS bus.



Terminal	Designation	Meaning	Range
33	+24 V (out)	24 V voltage output	DC 18 V – 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 7-15 24 V voltage output, USS bus

NOTICE

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

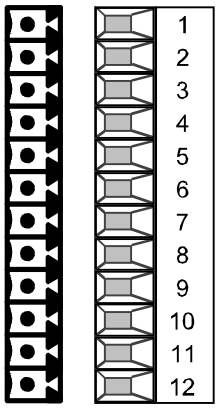
X101 - Control terminal strip

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)

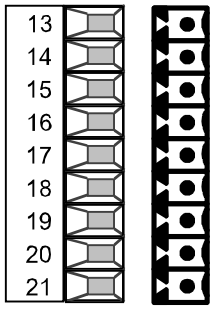
Terminal 1 is at the top when installed.

Table 7-16 Control terminal strip

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)

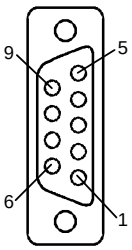
Table 7-17 Control terminal strip X102

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	NC	Not assigned	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)	

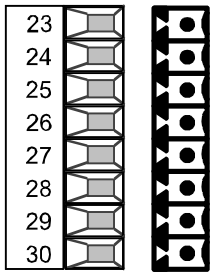
Table 7-18 Serial interface

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 ≤ 3 V, H ≥ 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} ≤ 1.5 kΩ
30	+ Temp	Plus (+) terminal KTY84/PTC	

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

Table 7-19 Control terminal strip X104

X533 - Safe stop option

With the safe stop option, the power supply for the transmission of pulses into the power section can be interrupted through 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.

This enables mechanical work to be performed on the drive or on coupled machine parts with energized line voltage and without electrical isolation of the motor to the unit.

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.

WARNING

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°).

WARNINGS

- The safe stop option does not generate electrical isolation between the motor terminals and the power section.
- In the "safe stop" state, hazardous voltages are still present at the motor terminals!

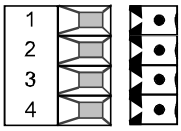
NOTE

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.

X533 - Safe stop option

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)

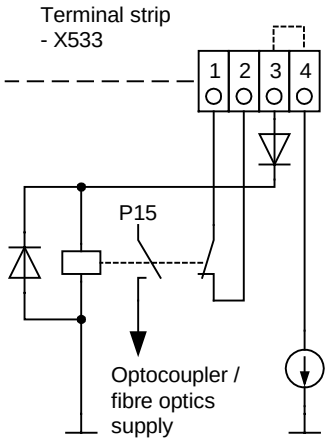
Terminal 4 is at the front when installed.

Table 7-20 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 A1 §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.

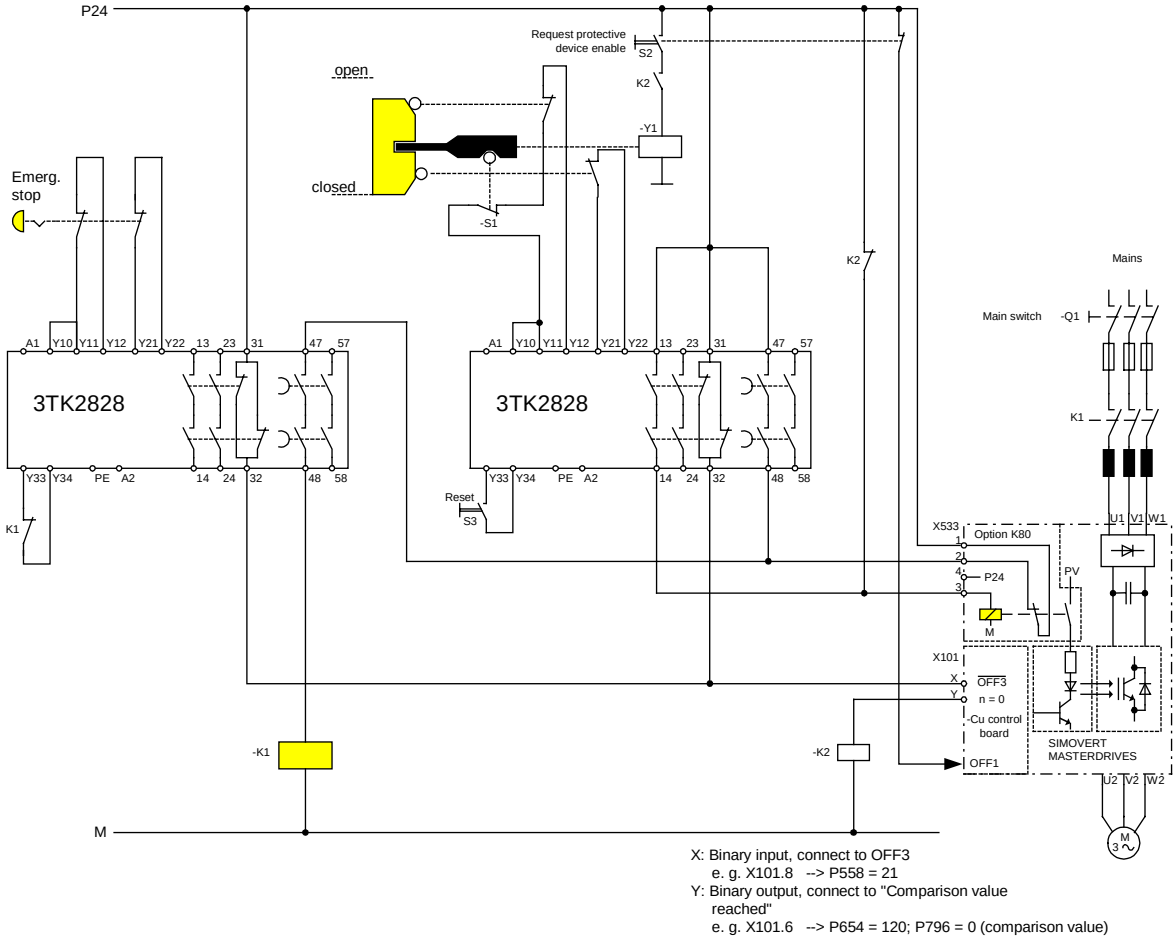


Fig. 7-5 Sample application of "safe stop" function with contactor safety combination for monitoring a moving protective device in Safety Category 3 to EN 954-1

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. 7-5, 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).

In the case of a width larger than 90 mm the cross-section of the protective conductor must be at least 10 mm^2.

Order No.	Mains connection							Main contactor	Motor connection		Braking resistor, capacitor module connection	
	Cross-section		Recommended fuses				Line		Cross-section		Cross-section	
6SE70...	VDE	AWG	gR (SITOR)		gL NH		reactor		VDE	AWG	VDE	AWG
	[mm²]		[A]	3NE	[A]	3NA	4EP	3RT	[mm²]		[mm²]	
11-5EP60	1.5	16	16	1813-0	10	3803	3200-4US	1015	1.5	16	1.5	16
13-0EP60	1.5	16	16	1813-0	10	3803	3200-5US	1015	1.5	16	1.5	16
15-0EP60	1.5	16	16	1813-0	10	3803	3200-2US	1015	1.5	16	2.5	14
18-0EP60	1.5	16	16	1813-0	16	3805	3400-2US	1015	1.5	16	2.5	14
21-0EP60	2.5	14	16	1813-0	16	3805	3400-1US	1015	1.5	16	2.5	14
21-4EP60	4	10	20	1814-0	25	3810	3500-0US	1016	2.5	14	4	10
22-1EP60	10	6	25	1815-0	25	3810	3600-4US	1016	4	10	4	10
22-7EP60	10	6	35	1803-0	35	3814	3600-5US	1025	10	6	4	10
23-4EP60	16	4	40	1802-0	40	3817	3700-2US	1034	10	6	4	10

Table 7-21 Recommended conductor cross-sections, fuses, reactors

WARNING

The dimensioning of the supply connection (conductor cross-section and fuse) is stated in Table 7-21 for use as a single drive.

NOTE

Both the cables and the semiconductors are protected by fuses with gR characteristics.

WARNING

gL fuses only provide reliable protection for the cables, but not the semiconductors.

It is not imperative to operate the units via a main contactor.

WARNING

If the units are connected to the supply system without a main contactor which can interrupt the incoming supply in the event of a fault, the unit may suffer further damage.

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.

To support the DC link circuit, a capacitor module can be connected to a Compact PLUS AC/AC converter.

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 CD. 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.

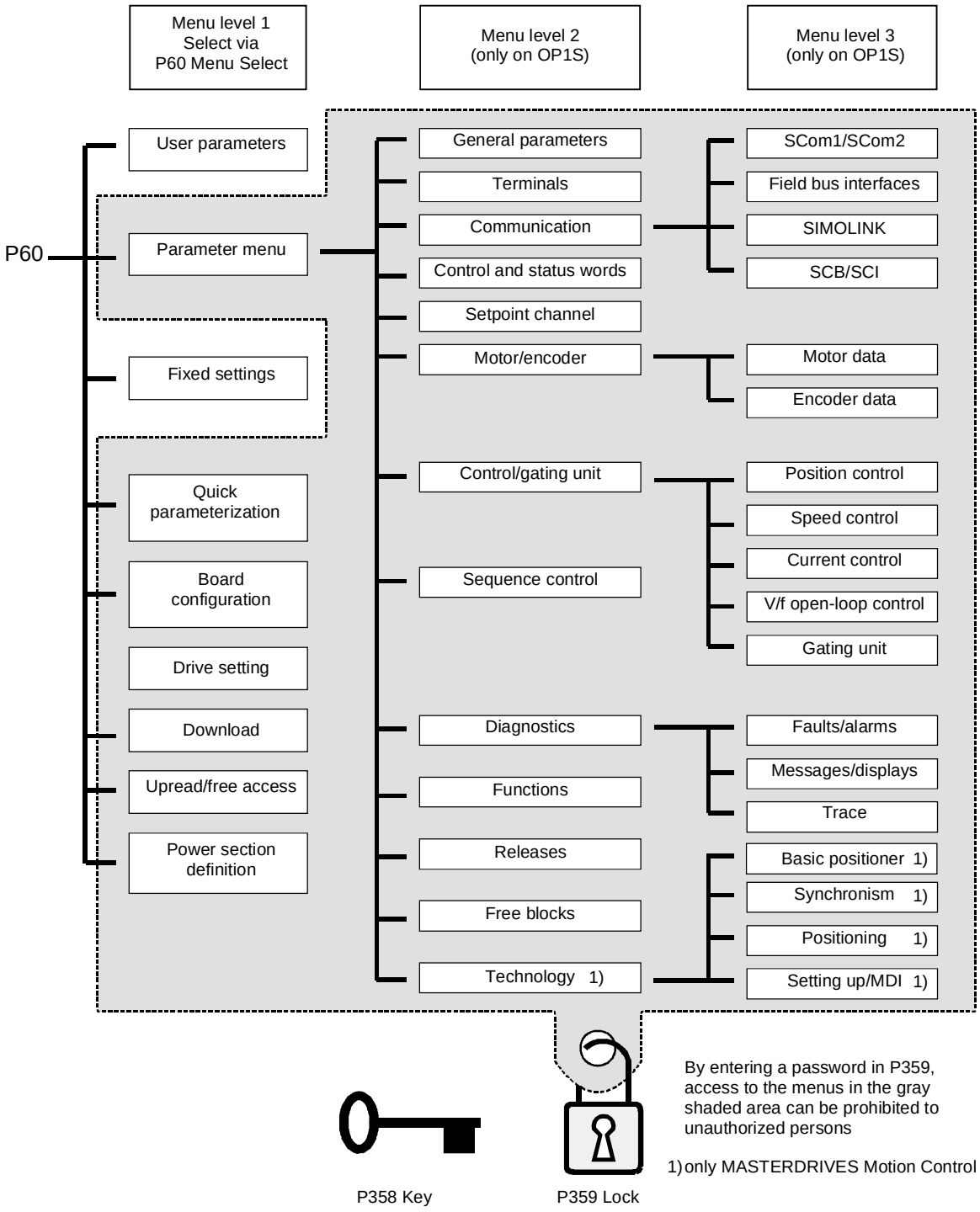


Fig. 8-1 Parameter menus

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

Operation of DriveMonitor via the PC and USS interfaces is described below.

8.3.1 Installation and connection

8.3.1.1 Installation

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

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.

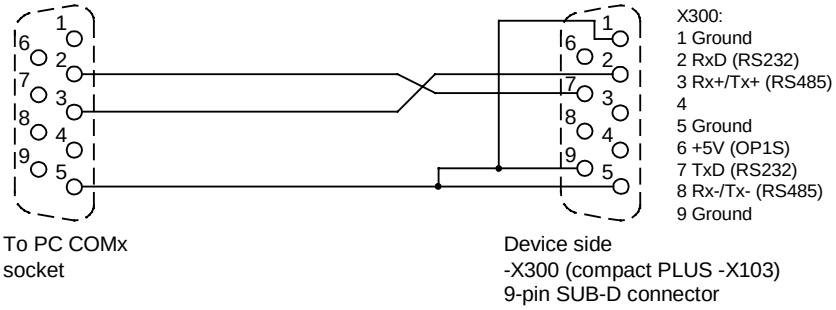


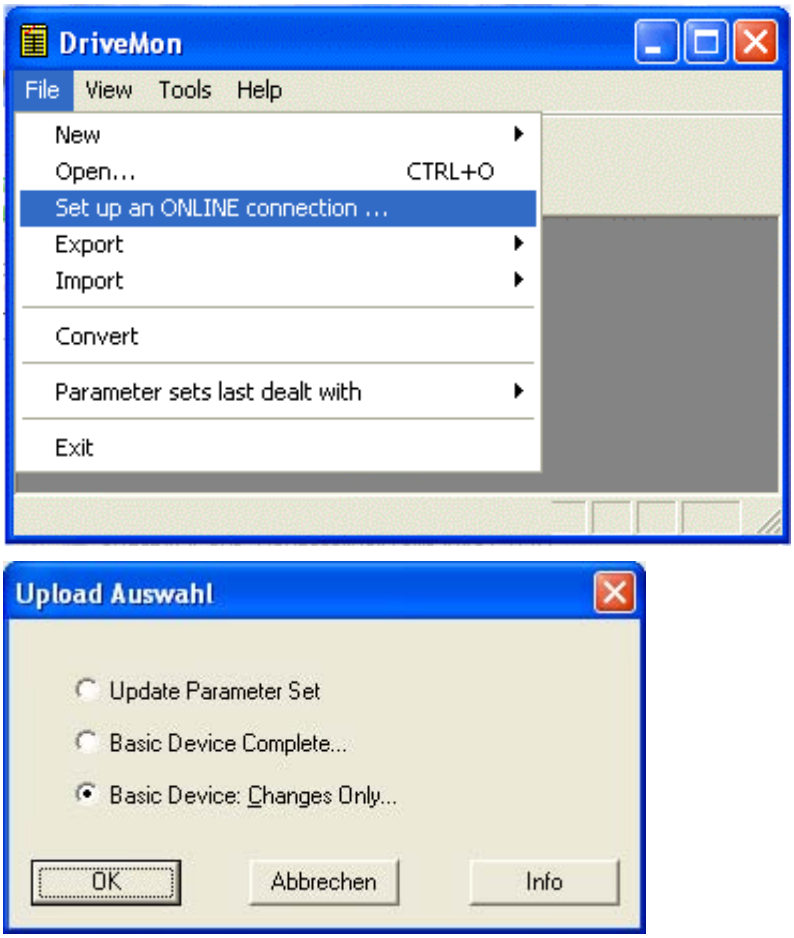
Fig. 8-2 Connecting cable for connecting PC COM(1-4) to SIMOVERT MASTERDRIVES X300

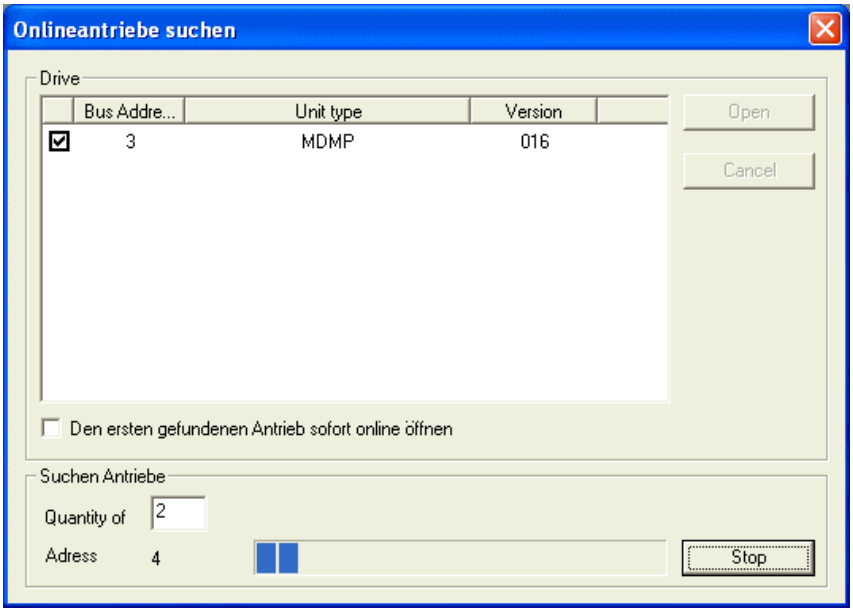
RS485 interface

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.

8.3.2 Drive configuration DriveMonitor

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





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

8.3.2.1 Setting the interface

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

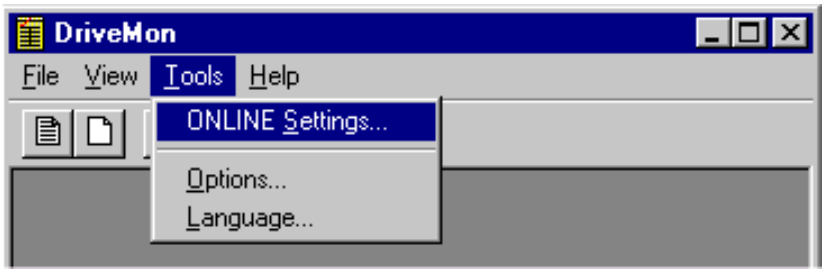


Fig. 8-3 Online settings

The following settings (Fig. 8-4) 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.

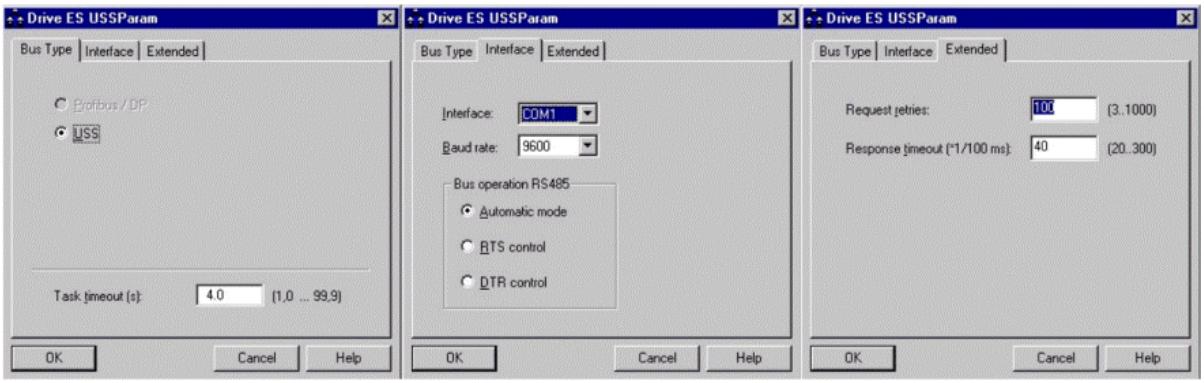


Fig. 8-4 Interface configuration

8.3.2.2 Drive settings

With menu *File → New →...* you can create a new drive for parameterization (see Fig. 8-5). The system creates a download file (*.dnl), in which the drive characteristic data (type, software version) are stored. You can create the download file on the basis of an empty parameter set or the factory setting.

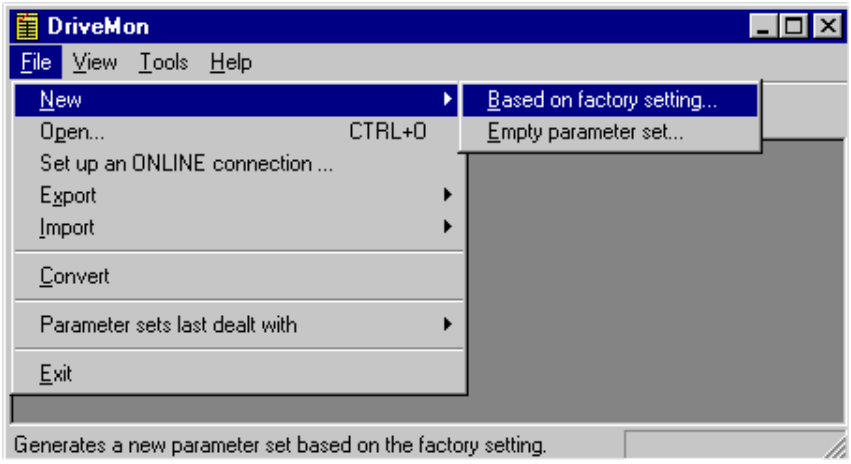


Fig. 8-5 Creating a new drive

Once you have created a drive, you can start it again with the menu function *File → Open* for parameterization by opening the download file. The last four drives can be opened via *"Parameter sets last dealt with"*.

When you create a new drive, the window "Properties - Drive" (Fig. 8-6) opens. Here you must enter the following data:

- In dropdown list box "Device type", select the type of device (e.g. MASTERDRIVES VC(Plus)). You can only select the devices stored.
- In dropdown list box "Software 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).

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.

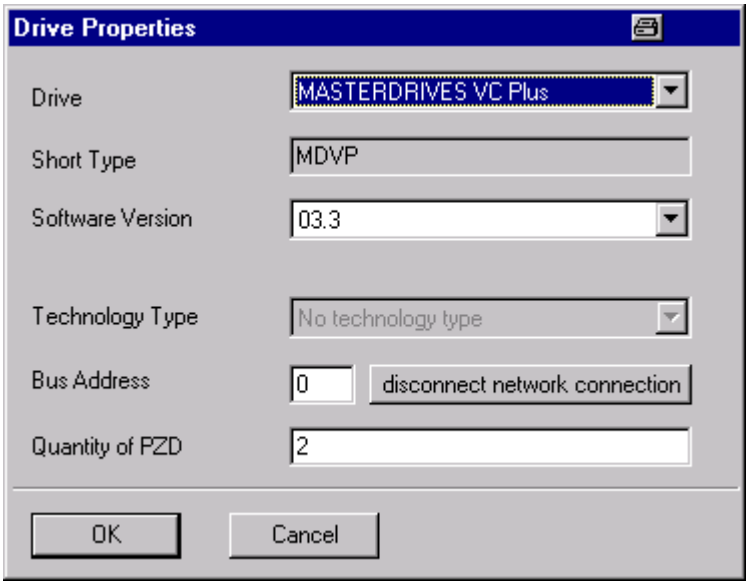
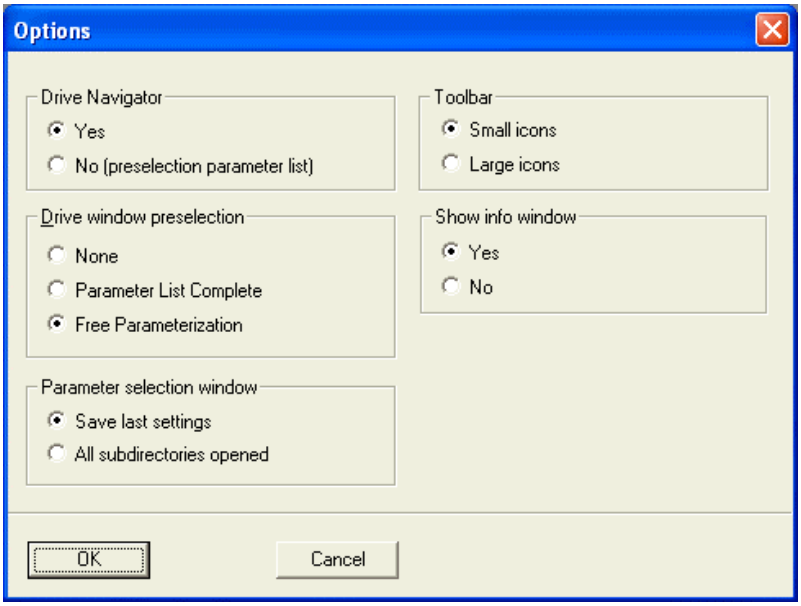


Fig. 8-6 Drive setting

Drive Navigator

Settings for Drive Navigator under *Tools -> Options*:



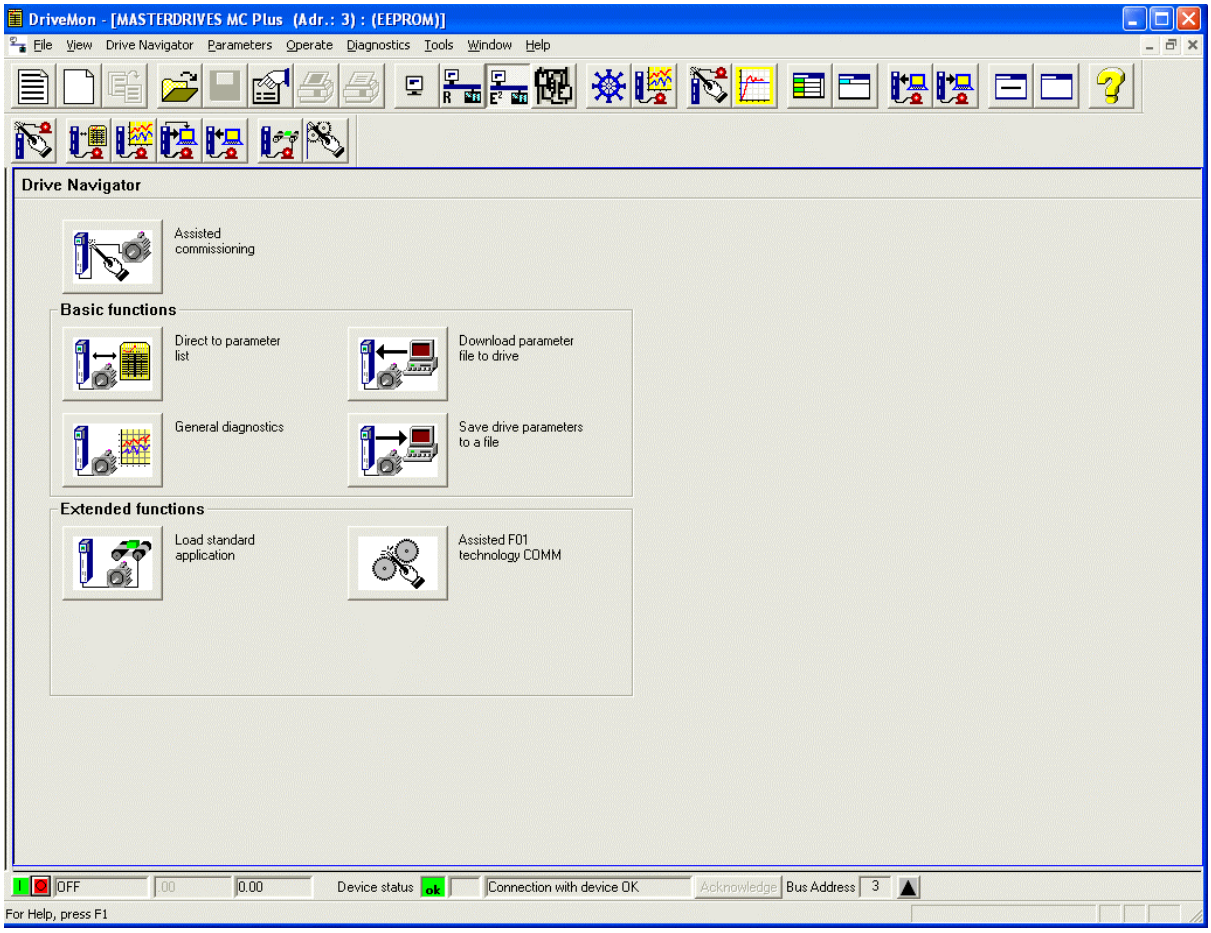
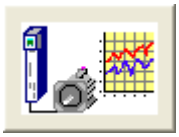


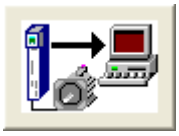
Fig. 8-7 Drive Navigator

Toolbar of the Drive Navigator

 =  Assisted commissioning

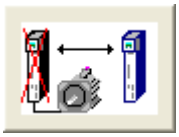
 =  Direct to parameter list

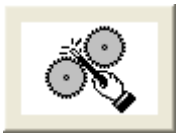
 =  General diagnostics

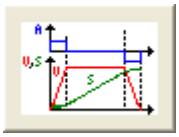
 =  Download parameter file to drive

 =  Save drive parameters to a file

 =  Load standard application

 =  1:1 device exchange

 =  Assisted F01 technology COMM

 =  Basic positioner operating screens

After you have confirmed the drive settings with *ok*, you can still specify the name and the storage location of the download file to be created. After that, the parameter list opens in offline mode (Fig. 8-8).

With buttons *Offline, Online (RAM), Online (EEPROM)* (Fig. 8-8 [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.)

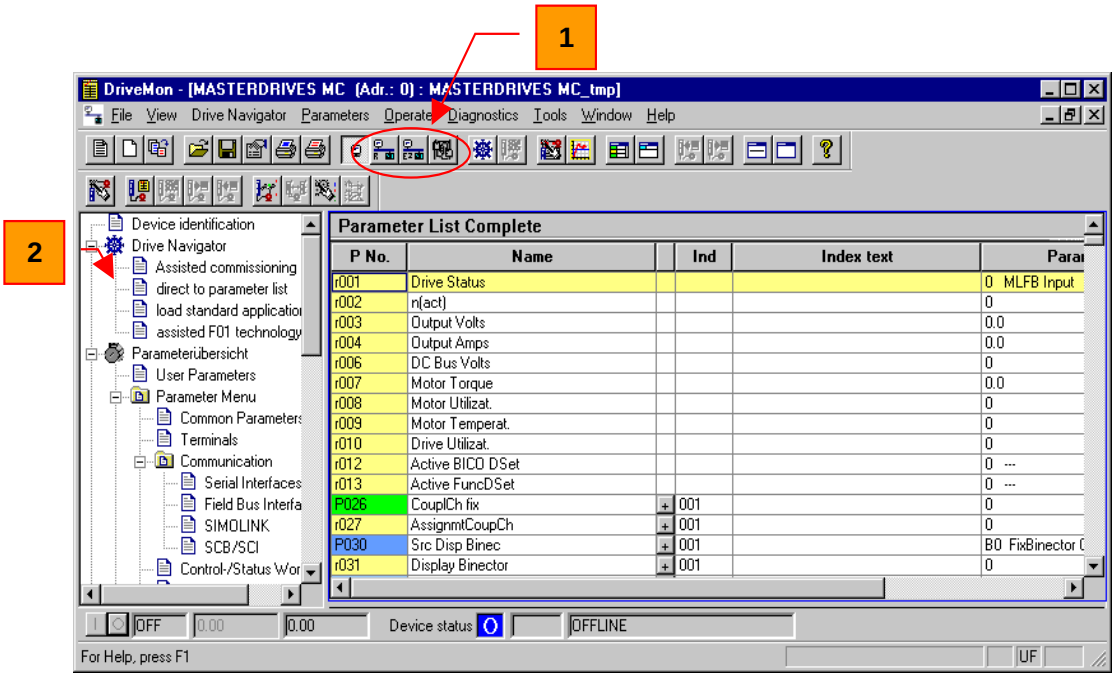


Fig. 8-8 Drive window/parameter list

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

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. First switch to offline mode. In this mode, you can edit the parameter data set on the basis of the factory setting. In that way, you can create an individually adapted download file, which you can load into the device later.

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, 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 (see Fig. 8-8):

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

8.3.3.2 Diagnostic menu

In menu *Diagnostics* on the menu bar, you can display the parameters as predefined parameter lists for diagnostic purposes.

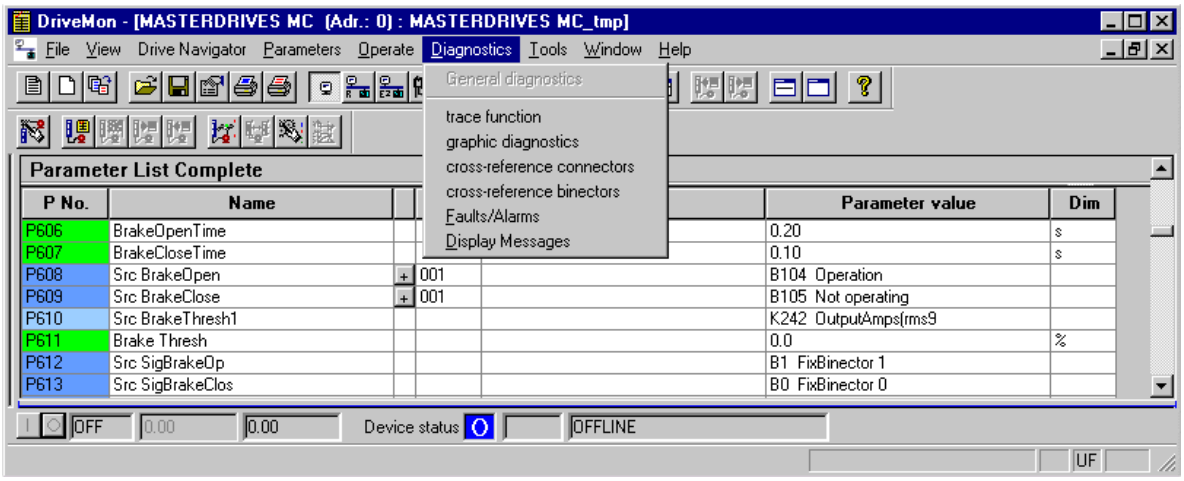


Fig. 8-9 Menu diagnostics

The parameter lists faults/alarms and messages/displays are available. In each of these, only those parameters are displayed that are relevant for the faults and alarms and for messages and displays. You can change or monitor the parameters just like in any other parameter list.

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

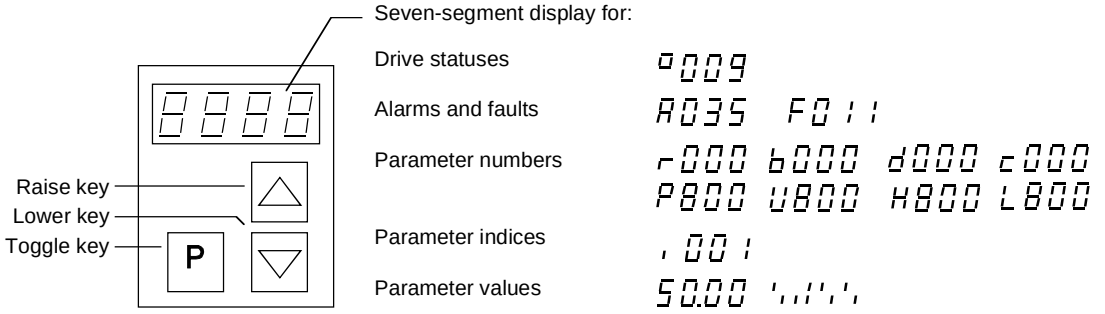


Fig. 8-10 PMU in units of the Compact PLUS type

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

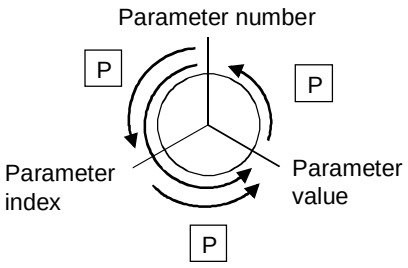
- Parameter number,
- Parameter index (if the parameter is indexed) and
- Parameter value

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.



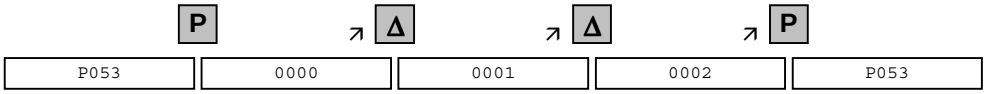
NOTE

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.

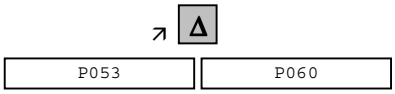
Parameter changes made using the PMU are always safely stored in the EEPROM (protected in case of power failure) once the toggle key has been depressed.

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

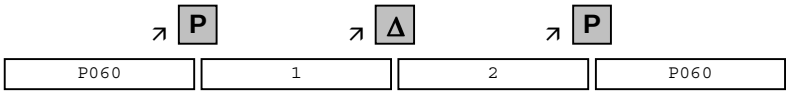
Set P053 to 0002 and grant parameter access via PMU



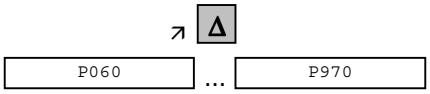
Select P060



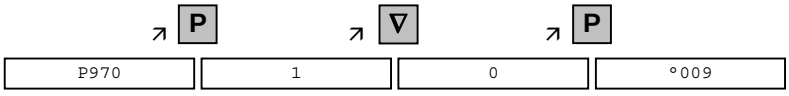
Set P060 to 0002 and select "Fixed settings" menu



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

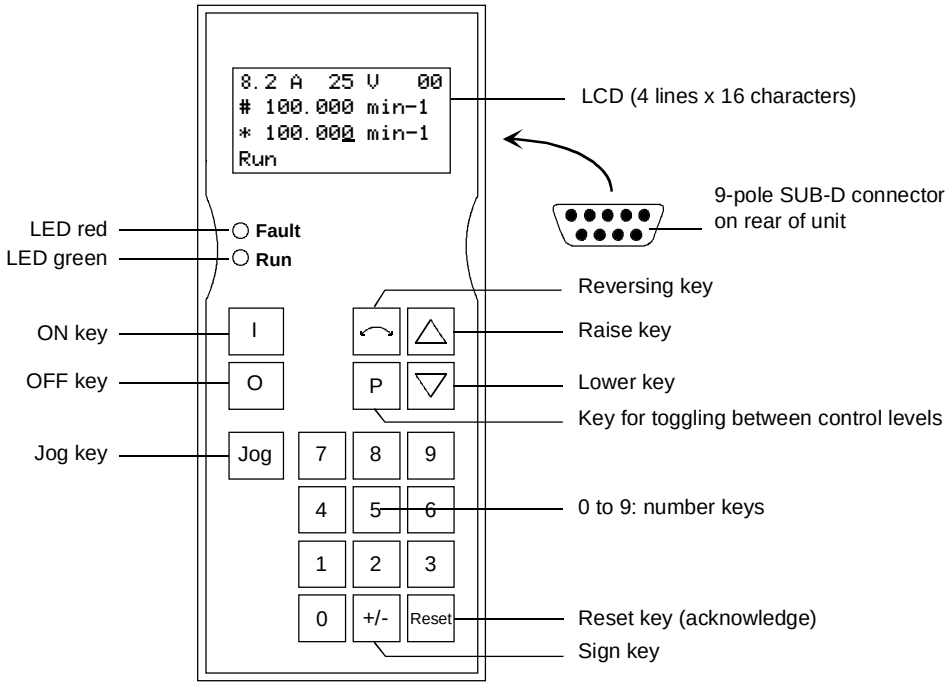


Fig. 8-11 View of the OP1S

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.

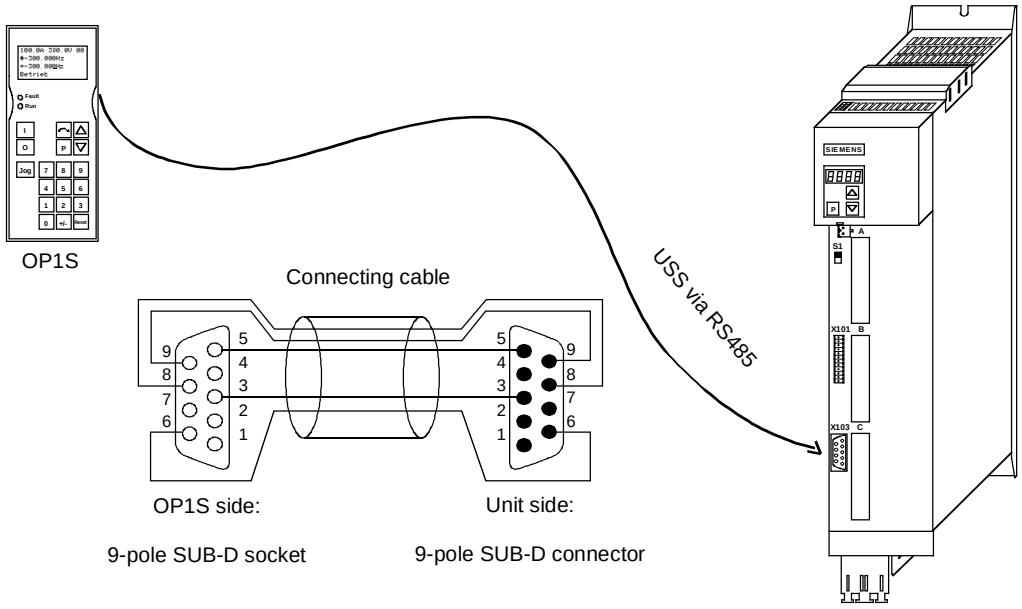


Fig. 8-12 Example: The OP1S in a point-to-point link with the Compact PLUS unit

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.

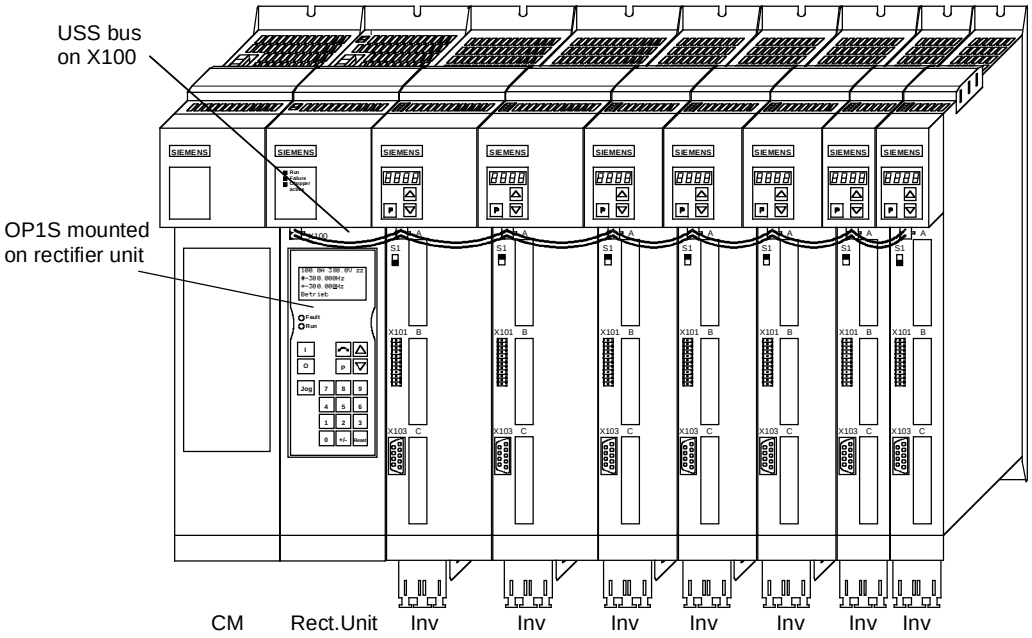


Fig. 8-13 Example: The OP1S during bus configuration with Compact PLUS units

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.

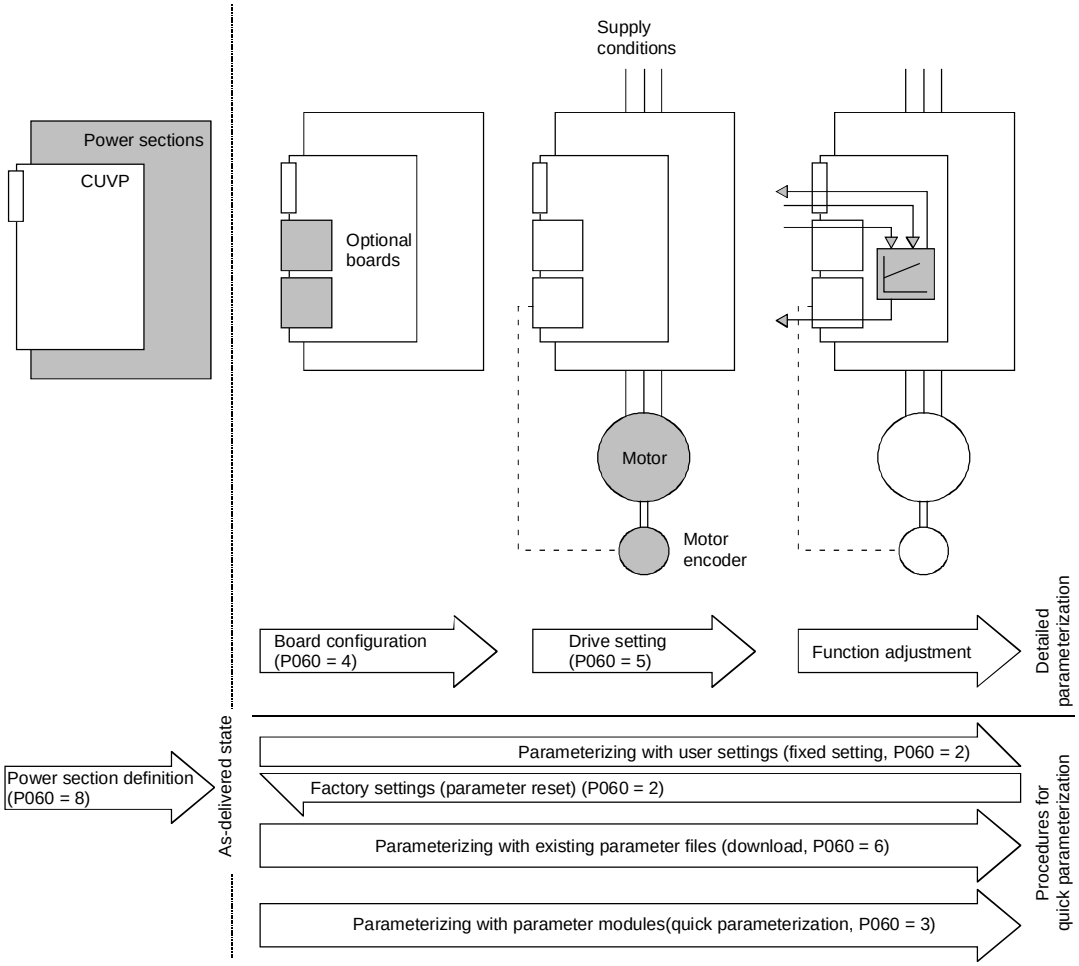


Fig. 9-1 Detailed and quick parameterization

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.

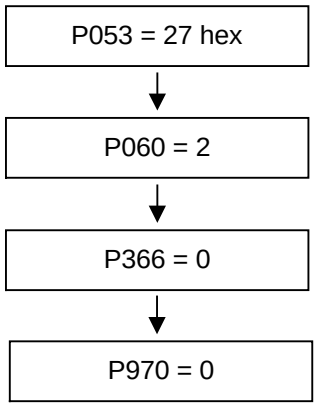
The parameters for defining the power section and for releasing the technology options and the operating hours counter and fault memory are not changed by a parameter reset to factory setting.

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

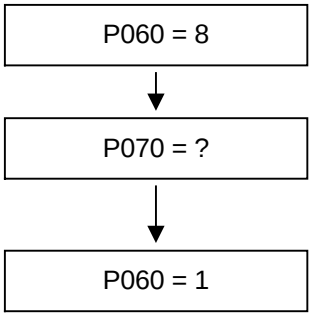
The power section definition has already been completed in the as-delivered state. It therefore only needs to be carried out if the CUVP needs replacing, and is not required under normal circumstances.

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
6SE7011-5EP60	0.5	1.5	1
6SE7013-0EP60	1.1	3.0	3
6SE7015-0EP60	1.5	5.0	5
6SE7018-0EP60	3.0	8.0	7
6SE7021-0EP60	4.0	10.0	9
6SE7021-4EP60	5.5	14.0	13
6SE7022-1EP60	7.5	20.5	15
6SE7022-7EP60	11.0	27.0	17
6SE7023-4EP60	15.0	34.0	19

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 :

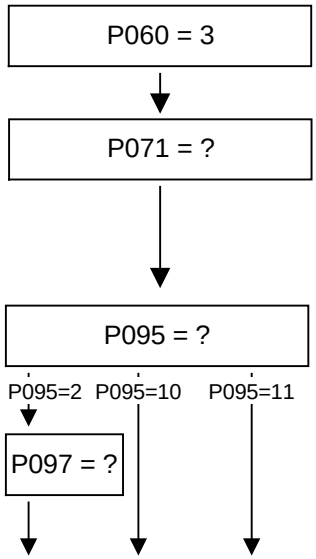
- setpoint and command sources (sheets s1 ... s83), on the following pages are the
- analog outputs and the display parameters (sheet a0) and the
- open-loop and closed-loop control types (sheets r0 to r5).

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).

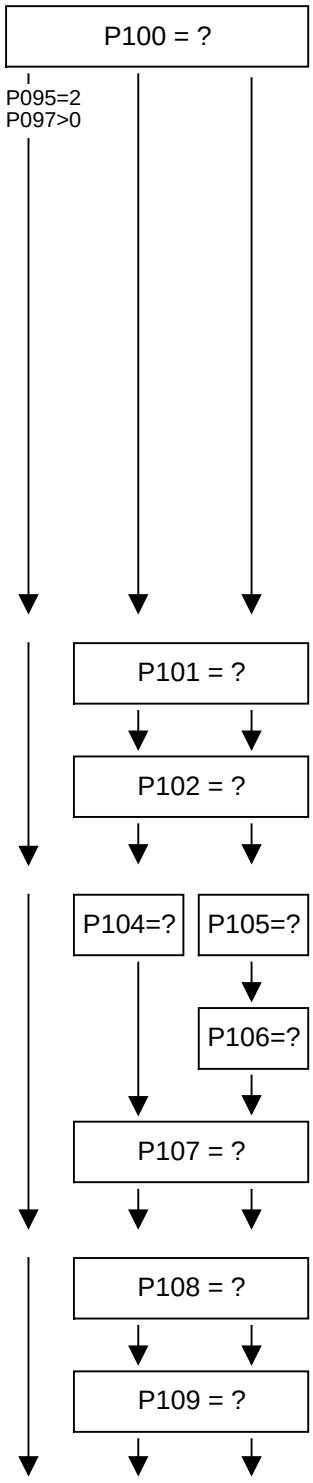


Menu selection "Quick parameterization"

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)

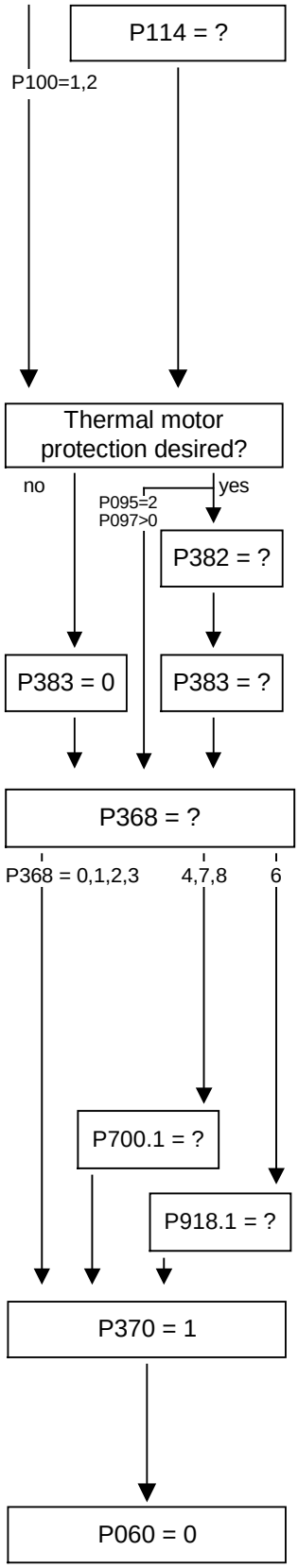
IEC motor: Cos (phi) as per rating plate
NEMA motor: nominal rating [Hp]
(group drives: total of all ratings)

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

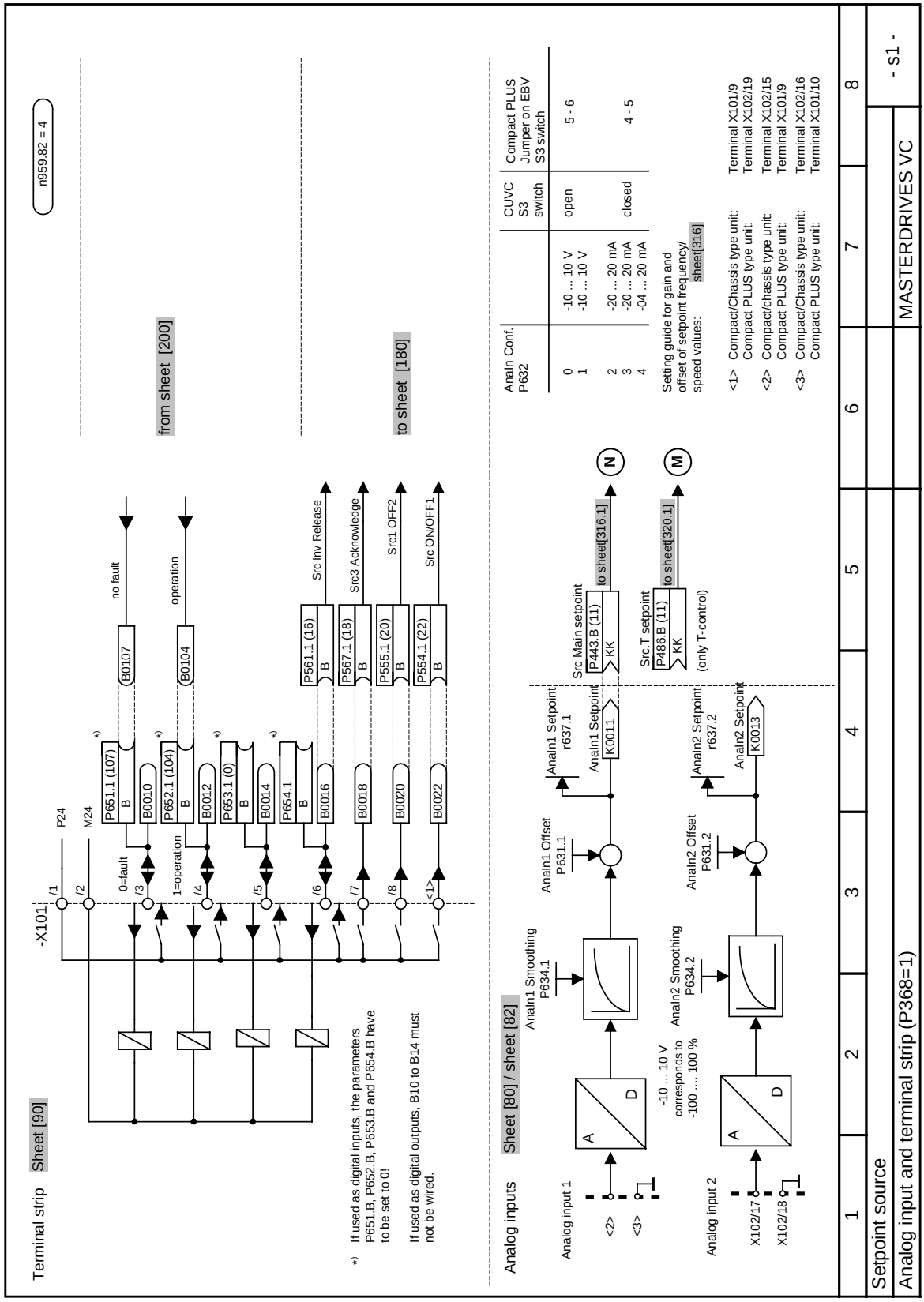
For exact determination of the motor parameters, it is possible to carry out automatic motor identification and speed controller optimization.

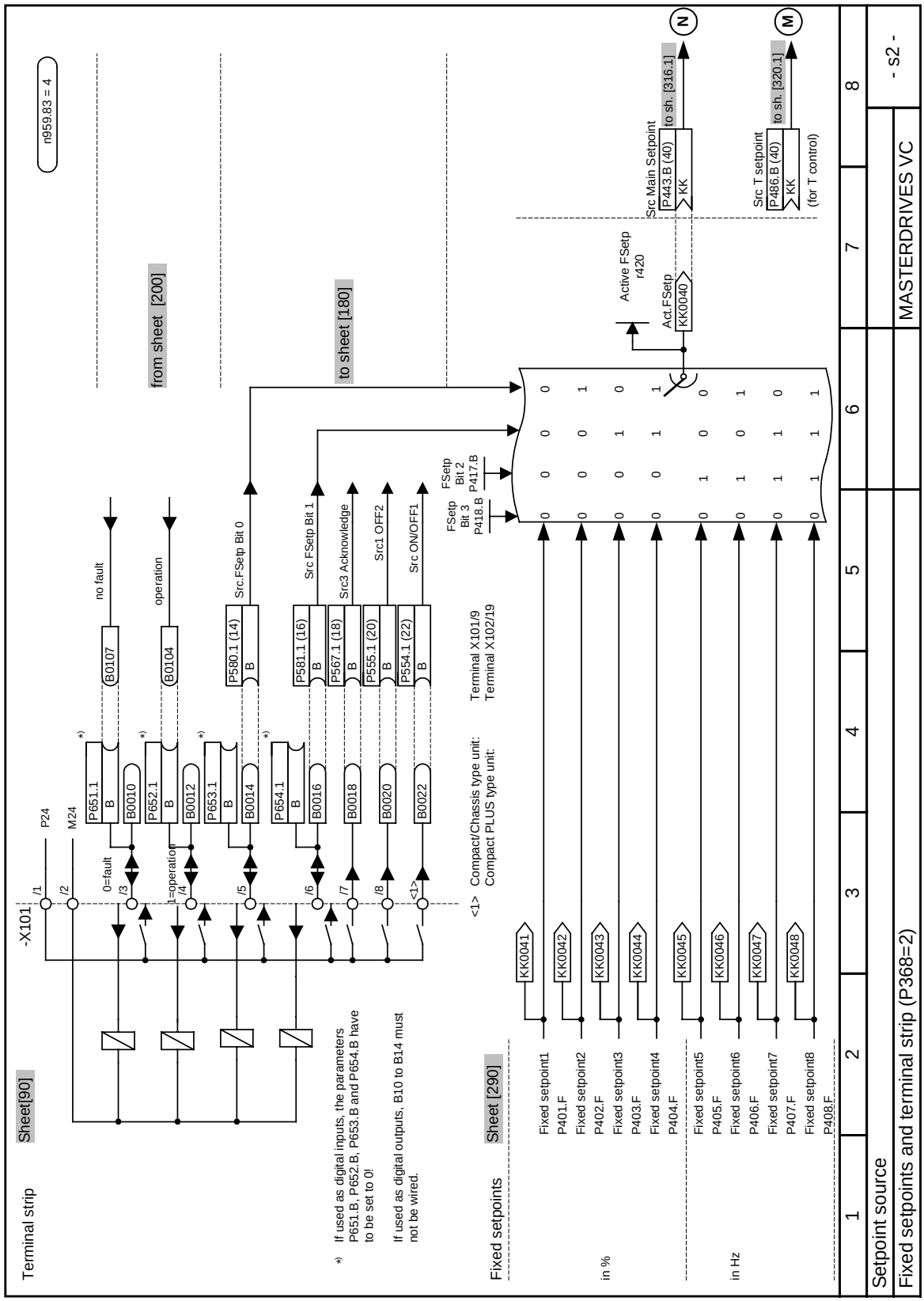
For this purpose, the procedures of the "Drive setting" have to be observed. If one of the vector control types (P100 = 3, 4, 5) of a converter without a sinusoidal output filter and of an induction motor without an encoder or with a pulse encoder (correct number of pulses in P151) is used, the motor 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.

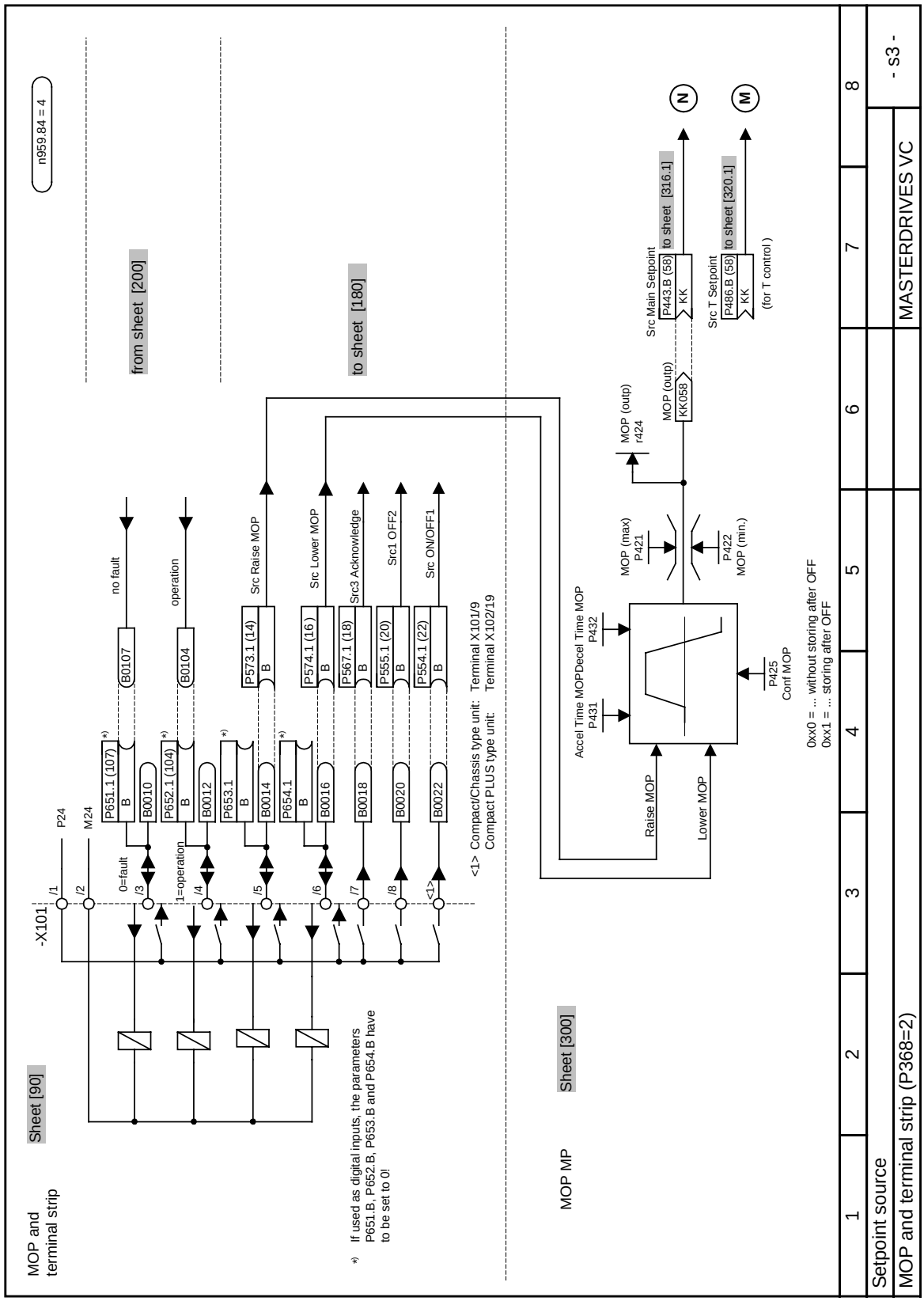
WARNING

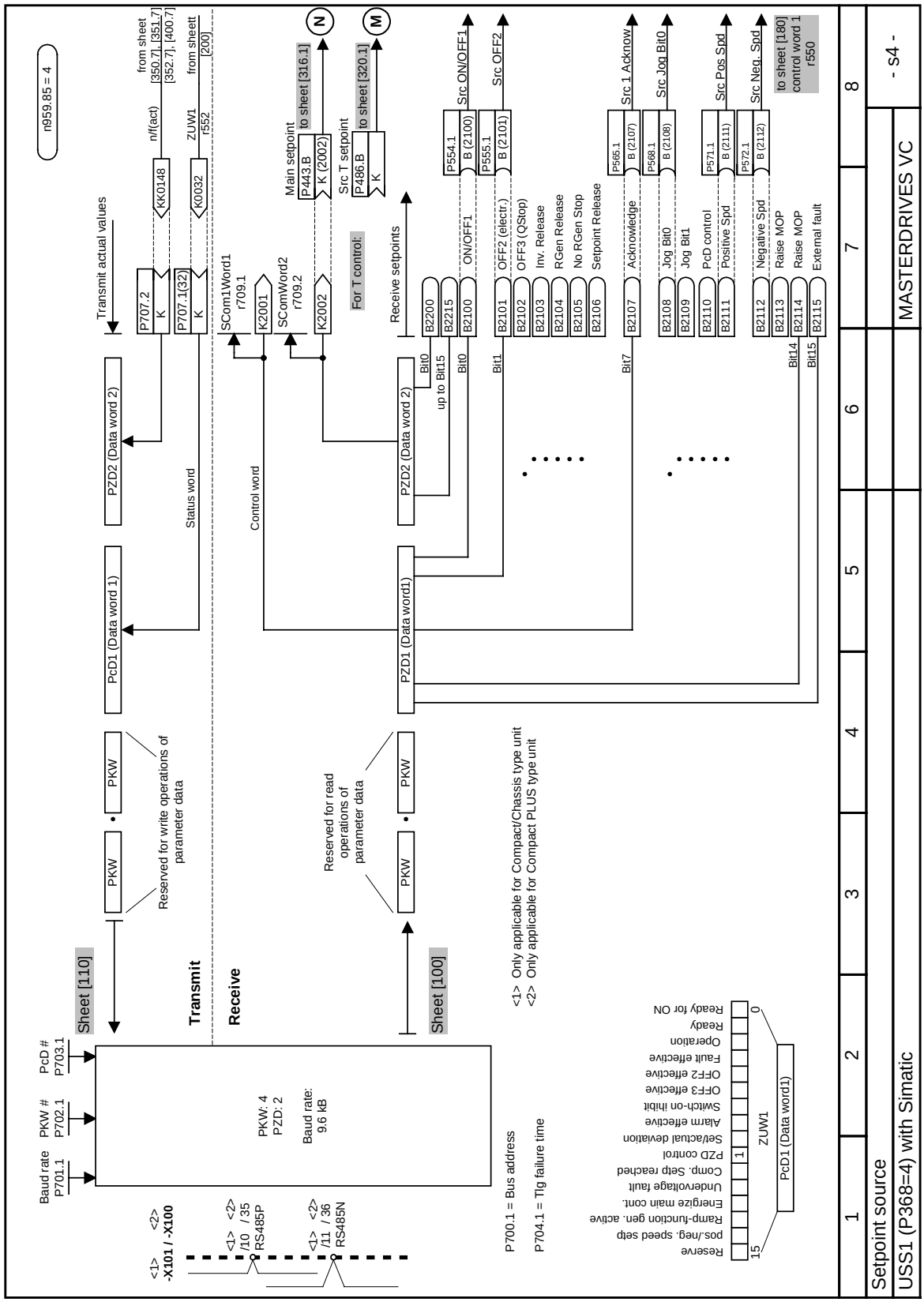
During motor identification inverter pulses are released and the drive rotates!

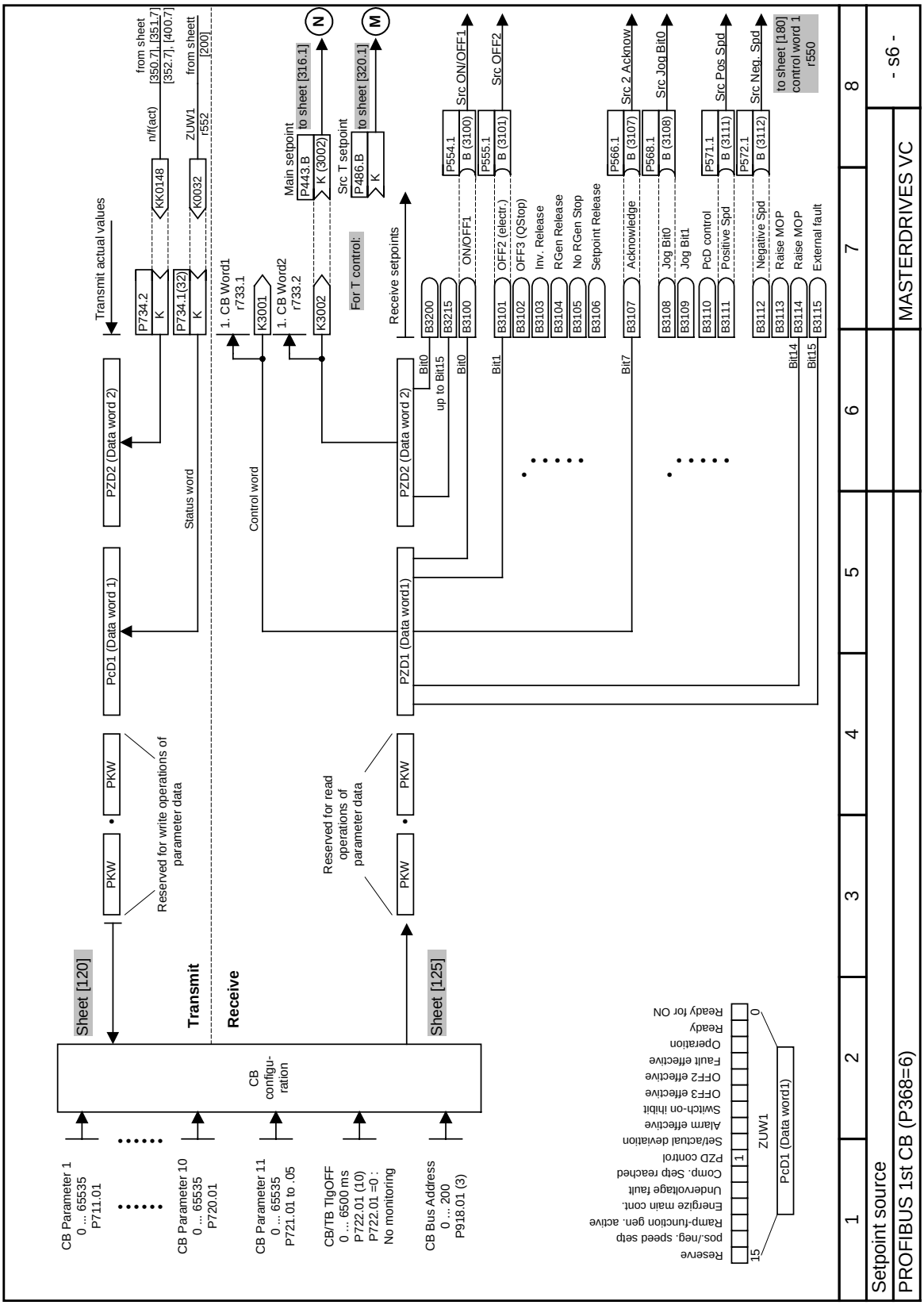
For reasons of safety, identification should first be carried out without coupling of the load.

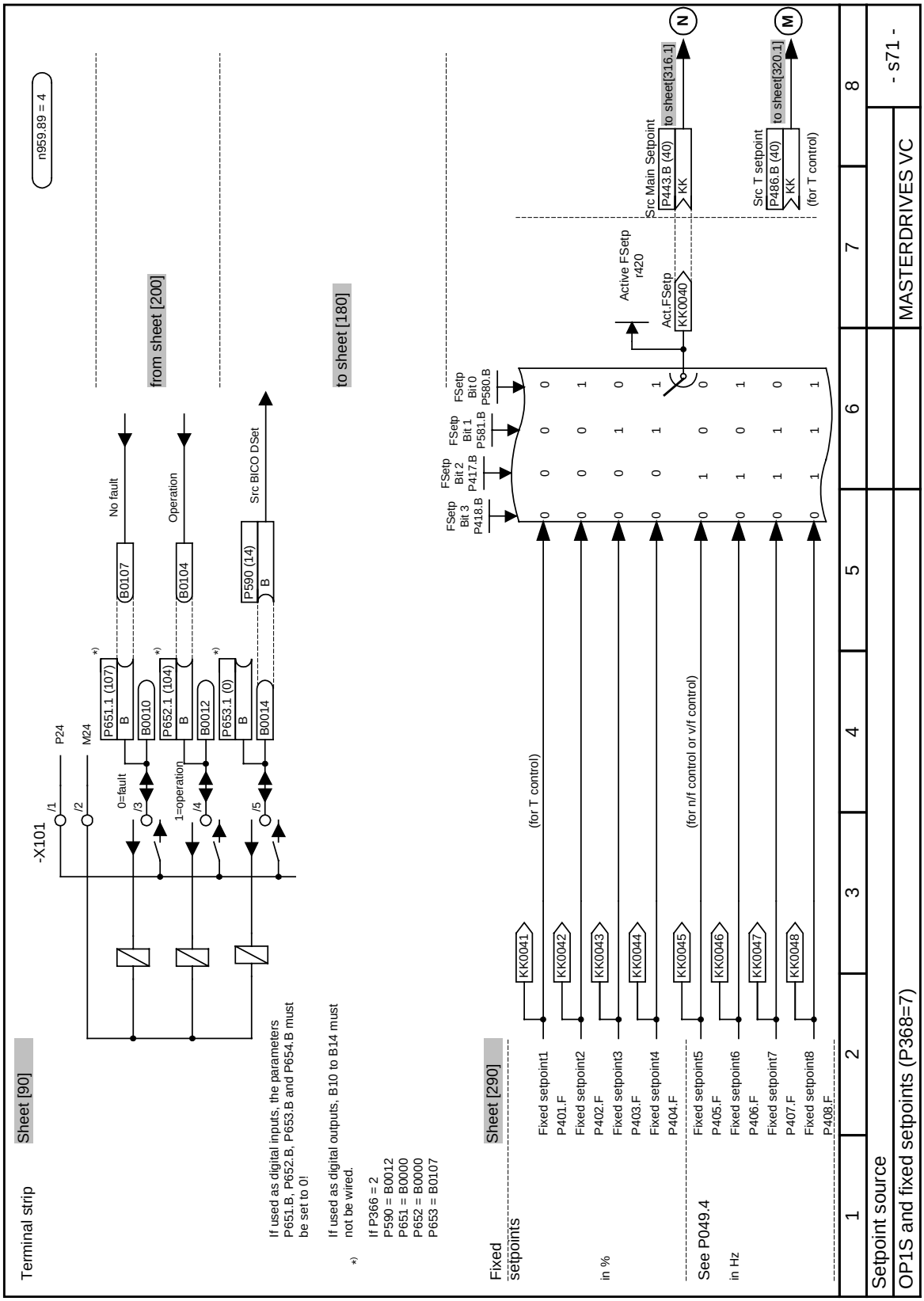

Terminal strip Sheet [90]
n959.82 = 4
from sheet [200]
to sheet [180]
-X101
P24
M24
/1
/2
/3
/4
/5
/6
/7
/8
<1>
0=fault
1=operation
P651.1 (107)
P652.1 (104)
P653.1 (0)
P654.1
B0010
B0012
B0014
B0016
B0018
B0020
B0022
B0107
B0104
no fault
operation
P561.1 (16)
P567.1 (18)
P555.1 (20)
P554.1 (22)
Src 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
<2>
<3>
X102/17
X102/18
A
D
-10 ... 10 V corresponds to -100 .... 100 %
AnaIn1 Smoothing P634.1
AnaIn1 Offset P631.1
AnaIn1 Setpoint r637.1
AnaIn1 Setpoint K0011
AnaIn2 Smoothing P634.2
AnaIn2 Offset P631.2
AnaIn2 Setpoint r637.2
AnaIn2 Setpoint K0013
Src Main setpoint
P443.B (11)
KK
to sheet [316.1]
Src.T setpoint
P486.B (11)
KK
(only T-control)
to sheet [320.1]
N
M
AnaIn 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 -

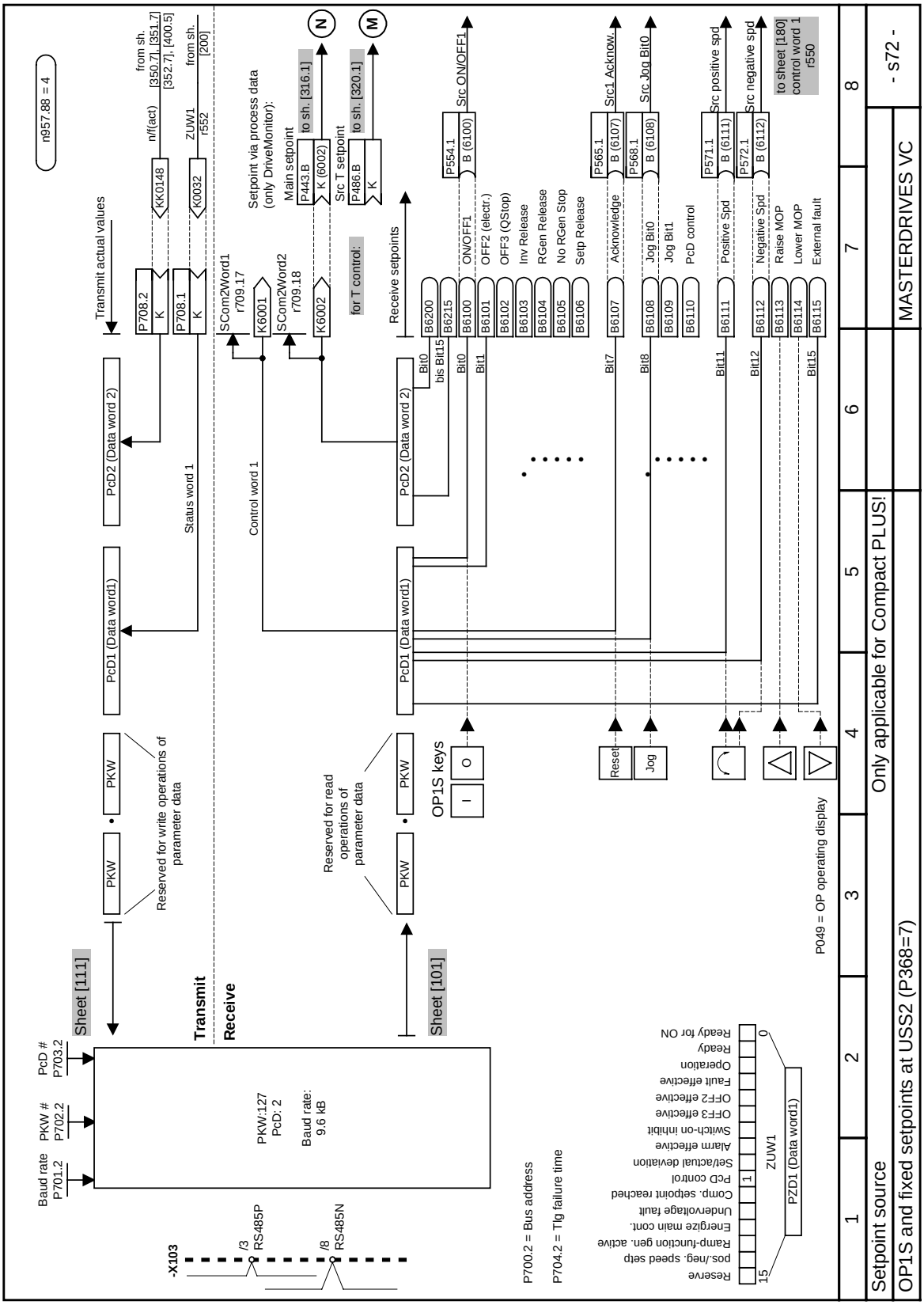

Terminal strip
Sheet[90]
n959.83 = 4
from sheet [200]
to sheet [180]
-X101
P24
M24
/1
/2
/3
/4
/5
/6
/7
/8
<1>
0=fault
1=operation
no fault
operation
P651.1
P652.1
P653.1
P654.1
B0010
B0012
B0014
B0016
B0018
B0020
B0022
B0107
B0104
Src.FSetp Bit 0
Src FSetp Bit 1
Src3 Acknowledge
Src1 OFF2
Src ON/OFF1
P580.1 (14)
P581.1 (16)
P567.1 (18)
P555.1 (20)
P554.1 (22)
*) 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 3 P418.B
FSetp Bit 2 P417.B
Active FSetp r420
Act.FSetp KK0040
Src Main Setpoint P443.B (40) KK
to sh. [316.1]
Src T setpoint P486.B (40) KK
(for T control)
to sh. [320.1]
Fixed setpoints
Sheet [290]
KK0041 Fixed setpoint1 P401.F
KK0042 Fixed setpoint2 P402.F
KK0043 Fixed setpoint3 P403.F
KK0044 Fixed setpoint4 P404.F
in %
KK0045 Fixed setpoint5 P405.F
KK0046 Fixed setpoint6 P406.F
KK0047 Fixed setpoint7 P407.F
KK0048 Fixed setpoint8 P408.F
in Hz
1 2 3 4 5 6 7 8
Setpoint source
Fixed setpoints and terminal strip (P368=2)
MASTERDRIVES VC
- s2 -

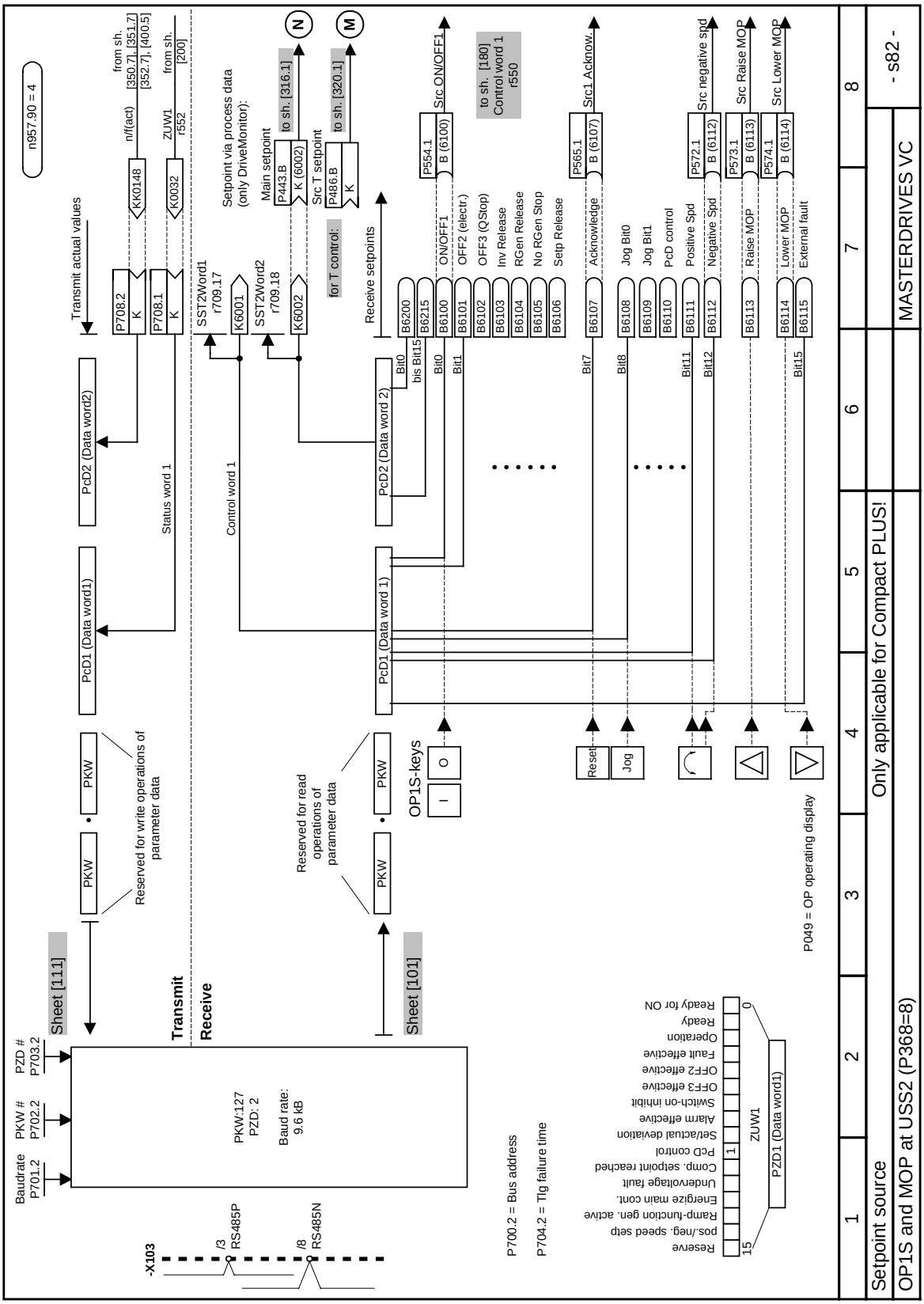

n959.84 = 4
from sheet [200]
to sheet [180]
MOP and terminal strip
Sheet [90]
-X101
P24
M24
/1
/2
0=fault
/3
1=operation
/4
/5
/6
/7
/8
<1>
P651.1 (107)
B0010
P652.1 (104)
B0012
P653.1
B0014
P654.1
B0016
B0018
B0020
B0022
B0107
B0104
P573.1 (14)
P574.1 (16)
P567.1 (18)
P555.1 (20)
P554.1 (22)
no fault
operation
Src Raise MOP
Src Lower MOP
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!
<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
P422 MOP (min.)
P425 Conf MOP
MOP (outp) r424
MOP (outp) KK058
0xx0 = ... without storing after OFF
0xx1 = ... storing after OFF
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 -

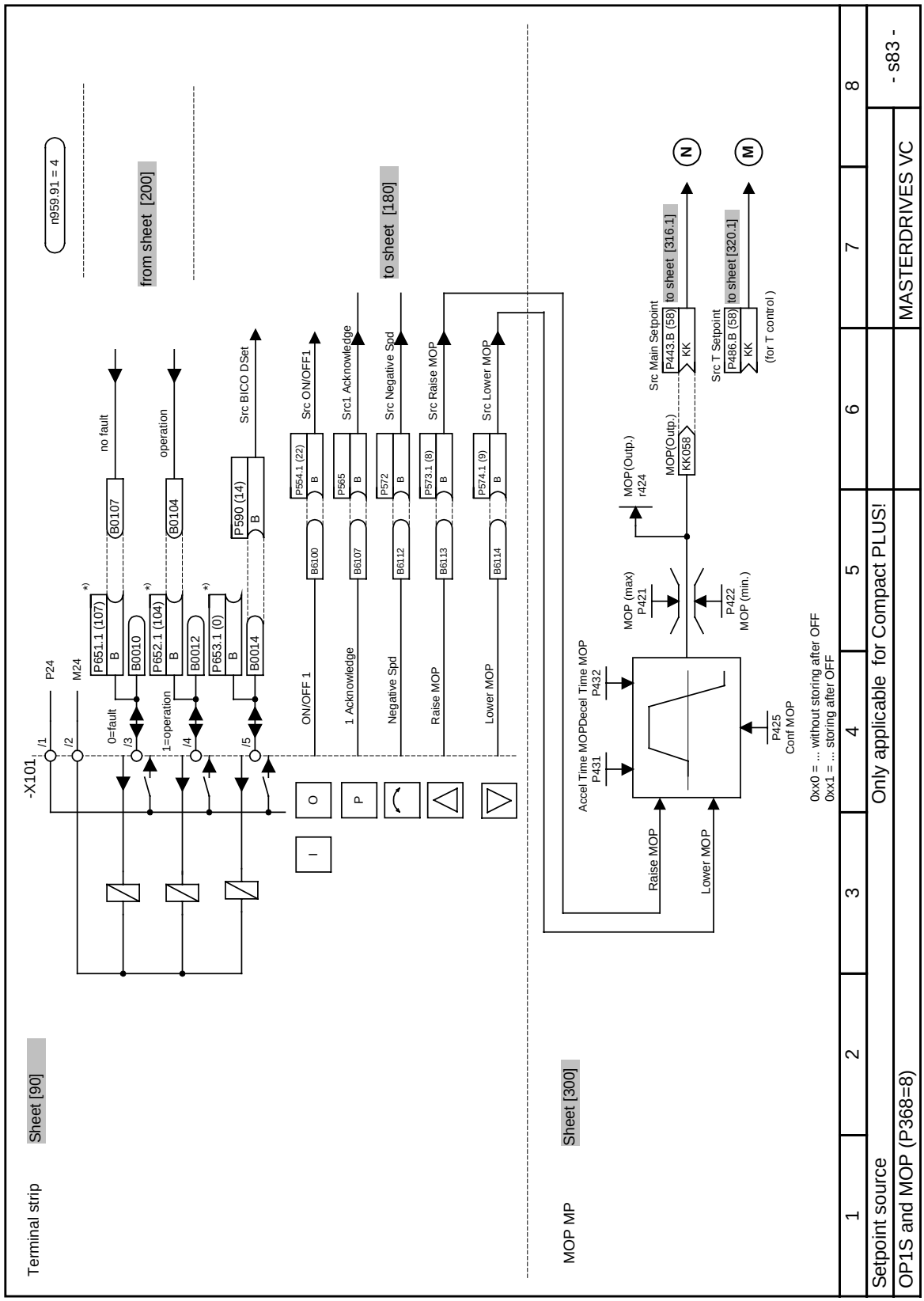

n959.85 = 4
Transmit actual values
from sheet [350.7], [351.7] [352.7], [400.7]
n/f(act)
KK0148
P707.2
K
PZD2 (Data word 2)
from sheet [200]
ZUW1
r552
K0032
P707.1(32)
K
Status word
PcD1 (Data word 1)
Transmit
Receive
SCom1Word1 r709.1
K2001
SComWord2 r709.2
K2002
Control word
Main setpoint
to sheet [316.1]
P443.B
K (2002)
Src T setpoint
to sheet [320.1]
P486.B
K
For T control:
Receive setpoints
PZD2 (Data word 2)
Bit0
up to Bit15
B2200
B2215
B2100
Bit0
PZD1 (Data word1)
Bit1
B2101
B2102
B2103
B2104
B2105
B2106
Bit7
B2107
B2108
B2109
B2110
B2111
Bit14
B2113
Bit15
B2114
B2115
P554.1
B (2100)
Src ON/OFF1
ON/OFF1
P555.1
B (2101)
Src OFF2
OFF2 (electr.)
OFF3 (QStop)
Inv. Release
RGen Release
No RGen Stop
Setpoint Release
P565.1
B (2107)
Src 1 Acknow
Acknowledge
P568.1
B (2108)
Src Jog Bit0
Jog Bit0
Jog Bit1
P571.1
B (2111)
Src Pos Spd
PcD control
Positive Spd
P572.1
B (2112)
Src Neg. Spd
Negative Spd
Raise MOP
Raise MOP
External fault
to sheet [180] control word 1 r550
PKW
PKW
Reserved for write operations of parameter data
Sheet [110]
Reserved for read operations of parameter data
PKW
PKW
Sheet [100]
Baud rate P701.1
PKW # P702.1
PcD # P703.1
PKW: 4
PZD: 2
Baud rate: 9.6 kB
<1> -X101 / -X100
<2>
<1> /10 / 35 RS485P
<2>
<1> /11 / 36 RS485N
<2>
P700.1 = Bus address
P704.1 = Tlg failure time
<1> Only applicable for Compact/Chassis type unit
<2> Only applicable for Compact PLUS type unit
15
1
0
ZUW1
PcD1 (Data word1)
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
1
2
3
4
5
6
7
8
Setpoint source
USS1 (P368=4) with Simatic
MASTERDRIVES VC
- s4 -

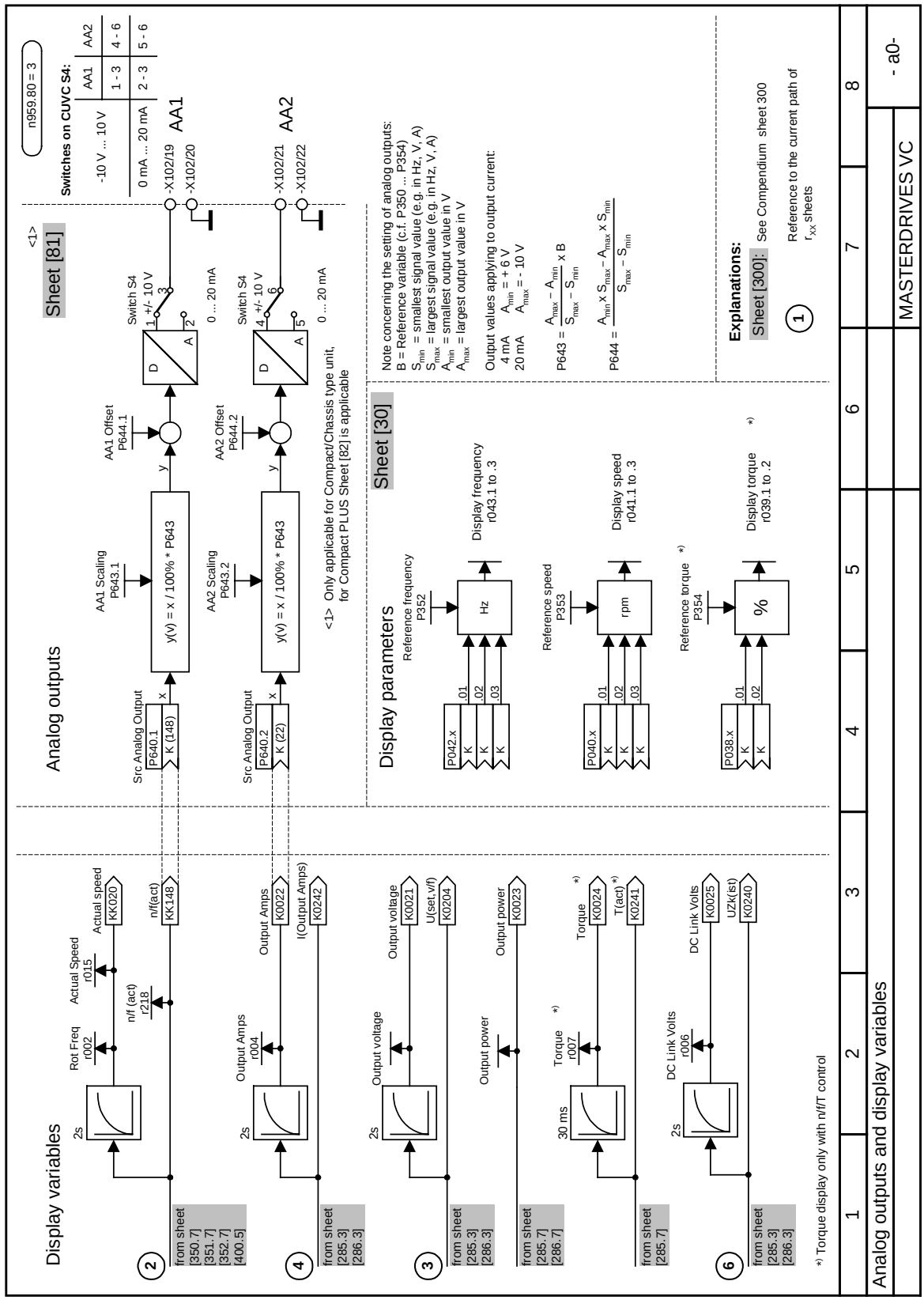

Setpoint source
PROFIBUS 1st CB (P368=6)
MASTERDRIVES VC
- s6 -
Transmit
Receive
Sheet [120]
Sheet [125]
CB configu-ration
CB Parameter 1 0 ... 65535 P711.01
CB Parameter 10 0 ... 65535 P720.01
CB Parameter 11 0 ... 65535 P721.01 to .05
CB/TB TlgOFF 0 ... 6500 ms P722.01 (10) P722.01 =0 : No monitoring
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)
PZD1 (Data word1)
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 [209]
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
For T control:
to sheet [320.1]
Receive setpoints
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
P554.1
B (3100)
Src ON/OFF1
P555.1
B (3101)
Src OFF2
P566.1
B (3107)
Src 2 Acknow
P568.1
B (3108)
Src Jog Bit0
P571.1
B (3111)
Src Pos Spd
P572.1
B (3112)
Src Neg. Spd
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
to sheet [180] control word 1 r550
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

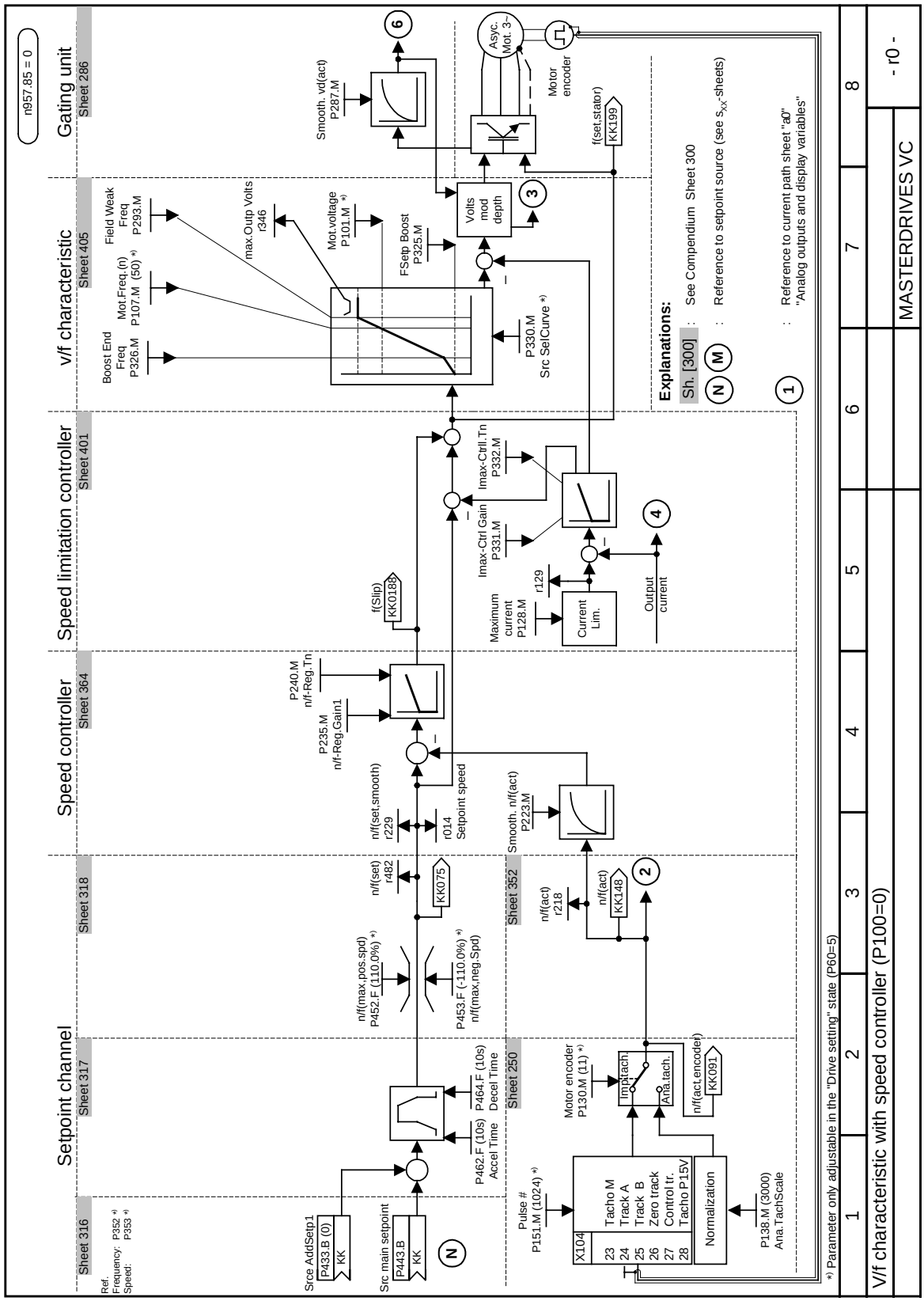

Terminal strip
Sheet [90]
n959.89 = 4
-X101
P24
M24
/1
/2
/3
/4
/5
0=fault
1=operation
P651.1 (107)
B
B0010
P652.1 (104)
B0012
P653.1 (0)
B0014
No fault
B0107
Operation
B0104
Src BICO DSet
P590 (14)
from sheet [200]
to sheet [180]
If used as digital inputs, the parameters P651.B, P652.B, P653.B and P654.B 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
Active FSetp r420
Act.FSetp
KK0040
Src Main Setpoint
P443.B (40)
KK
to sheet[316.1]
Src T setpoint
P486.B (40)
to sheet[320.1]
(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
1 2 3 4 5 6 7 8
Setpoint source
OP1S and fixed setpoints (P368=7)
MASTERDRIVES VC
- s71 -

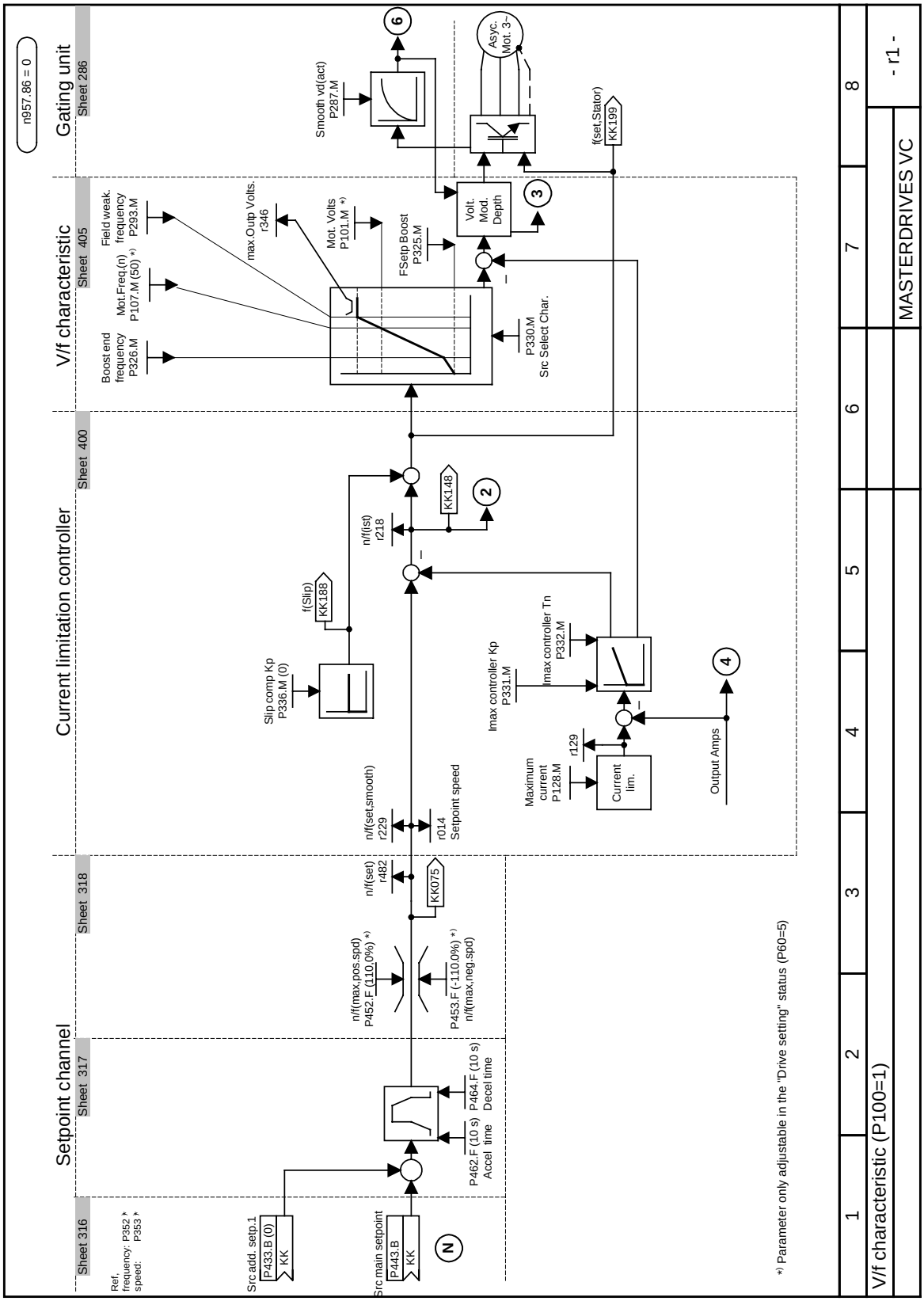

n957.88 = 4
Transmit actual values
from sh. [350.7], [351.7] [352.7], [400.5]
n/f(act)
KK0148
ZUW1 r552
K0032
from sh. [200]
P708.2
K
P708.1
K
PcD2 (Data word 2)
PcD1 (Data word1)
Status word 1
Control word 1
Setpoint via process data (only DriveMonitor):
Main setpoint
P443.B
K (6002)
to sh. [316.1]
Src T setpoint
P486.B
K
to sh. [320.1]
for T control:
SCom2Word1 r709.17
K6001
SCom2Word2 r709.18
K6002
Receive setpoints
PcD2 (Data word 2)
PcD1 (Data word1)
Bit0
bis Bit15
B6200
B6215
B6100
B6101
B6102
B6103
B6104
B6105
B6106
P554.1
B (6100)
Src ON/OFF1
ON/OFF1
OFF2 (electr.)
OFF3 (QStop)
Inv Release
RGen Release
No RGen Stop
Setp Release
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
Bit7
Bit8
Bit11
Bit12
Bit15
B6107
B6108
B6109
B6110
B6111
B6112
B6113
B6114
B6115
PKW
PKW
Reserved for write operations of parameter data
Reserved for read operations of parameter data
OP1S keys
O
I
Reset
Jog
P049 = OP operating display
Sheet [111]
Sheet [101]
Transmit
Receive
PcD # P703.2
PKW # P702.2
Baud rate P701.2
PKW:127
PcD: 2
Baud rate: 9.6 kB
-X103
/3 RS485P
/8 RS485N
P700.2 = Bus address
P704.2 = Tlg failure time
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
15
1
ZUW1
0
PZD1 (Data word1)
1
2
3
4
5
6
7
8
Setpoint source
Only applicable for Compact PLUS!
OP1S and fixed setpoints at USS2 (P368=7)
MASTERDRIVES VC
- s72 -

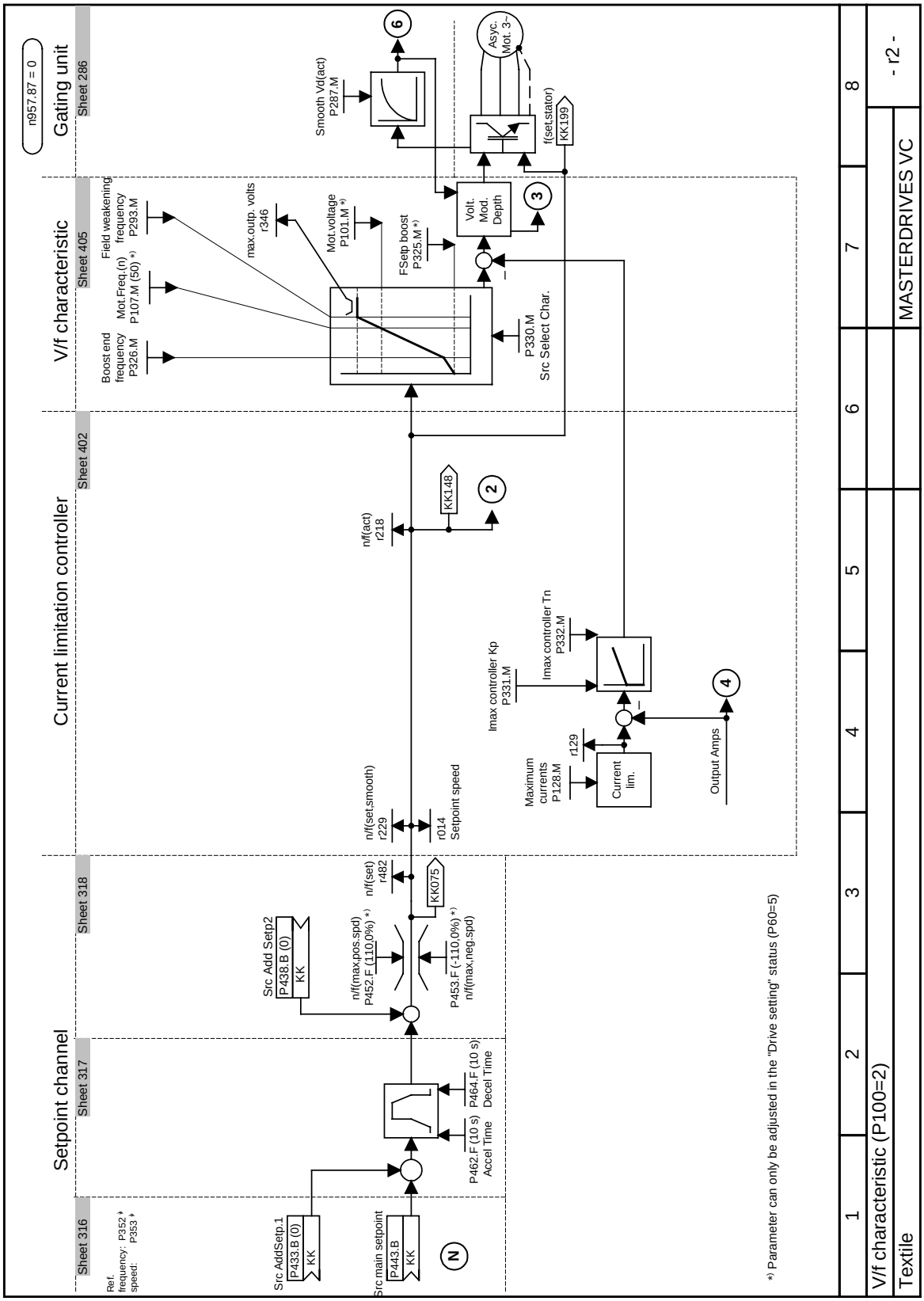

Setpoint source
OP1S and MOP at USS2 (P368=8)
Only applicable for Compact PLUS!
MASTERDRIVES VC
- s82 -
n957.90 = 4
Transmit actual values
PcD2 (Data word2)
PcD1 (Data word1)
Status word 1
Control word 1
Transmit
Receive
Sheet [111]
Sheet [101]
PKW
Reserved for write operations of parameter data
Reserved for read operations of parameter data
PZD #
P703.2
PKW #
P702.2
Baudrate
P701.2
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
OP1S-keys
P708.2
P708.1
KK0148
K0032
n/f(act)
ZUW1
r552
from sh. [350.7], [351.7] [352.7], [400.5]
from sh. [200]
SST2Word1 r709.17
SST2Word2 r709.18
K6001
K6002
Setpoint via process data (only DriveMonitor):
Main setpoint
P443.B
K (6002)
to sh. [316.1]
Src T setpoint
P486.B
to sh. [320.1]
for T control:
Receive setpoints
PcD2 (Data word 2)
PcD1 (Data word 1)
B6200
B6215
B6100
B6101
B6102
B6103
B6104
B6105
B6106
B6107
B6108
B6109
B6110
B6111
B6112
B6113
B6114
B6115
Bit0
bis Bit15
Bit1
Bit7
Bit8
Bit11
Bit12
Bit15
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
P554.1
B (6100)
Src ON/OFF1
to sh. [180] Control word 1 r550
P565.1
B (6107)
Src1 Acknow.
P572.1
B (6112)
Src negative spd
P573.1
B (6113)
Src Raise MOP
P574.1
B (6114)
Src Lower MOP
Reset
Jog
O
I
ZUW1
PZD1 (Data word1)
15
1
0
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
1
2
3
4
5
6
7
8

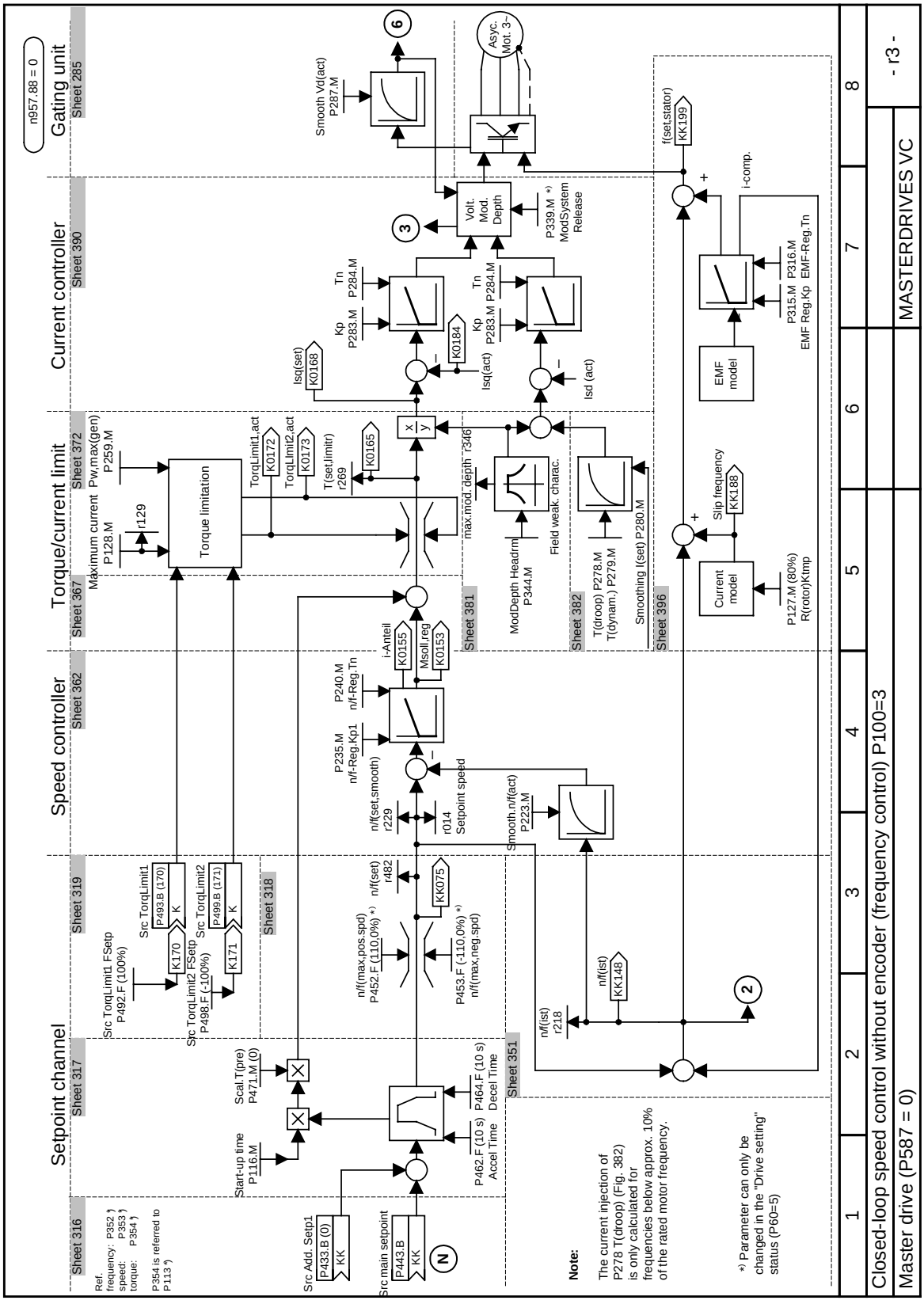

Terminal strip
Sheet [90]
MOP MP
Sheet [300]
-X101
P24
M24
/1
/2
/3
/4
/5
0=fault
1=operation
P651.1 (107)
B0010
P652.1 (104)
B0012
P653.1 (0)
B0014
B0107
B0104
P590 (14)
no fault
operation
Src BICO DSet
n959.91 = 4
from sheet [200]
to sheet [180]
ON/OFF 1
1 Acknowledge
Negative Spd
Raise MOP
Lower MOP
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
P431
Decel Time MOP
P432
Raise MOP
Lower MOP
MOP (max)
P421
P422
MOP (min.)
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
OP1S and MOP (P368=8)
Only applicable for Compact PLUS!
MASTERDRIVES VC
- s83 -

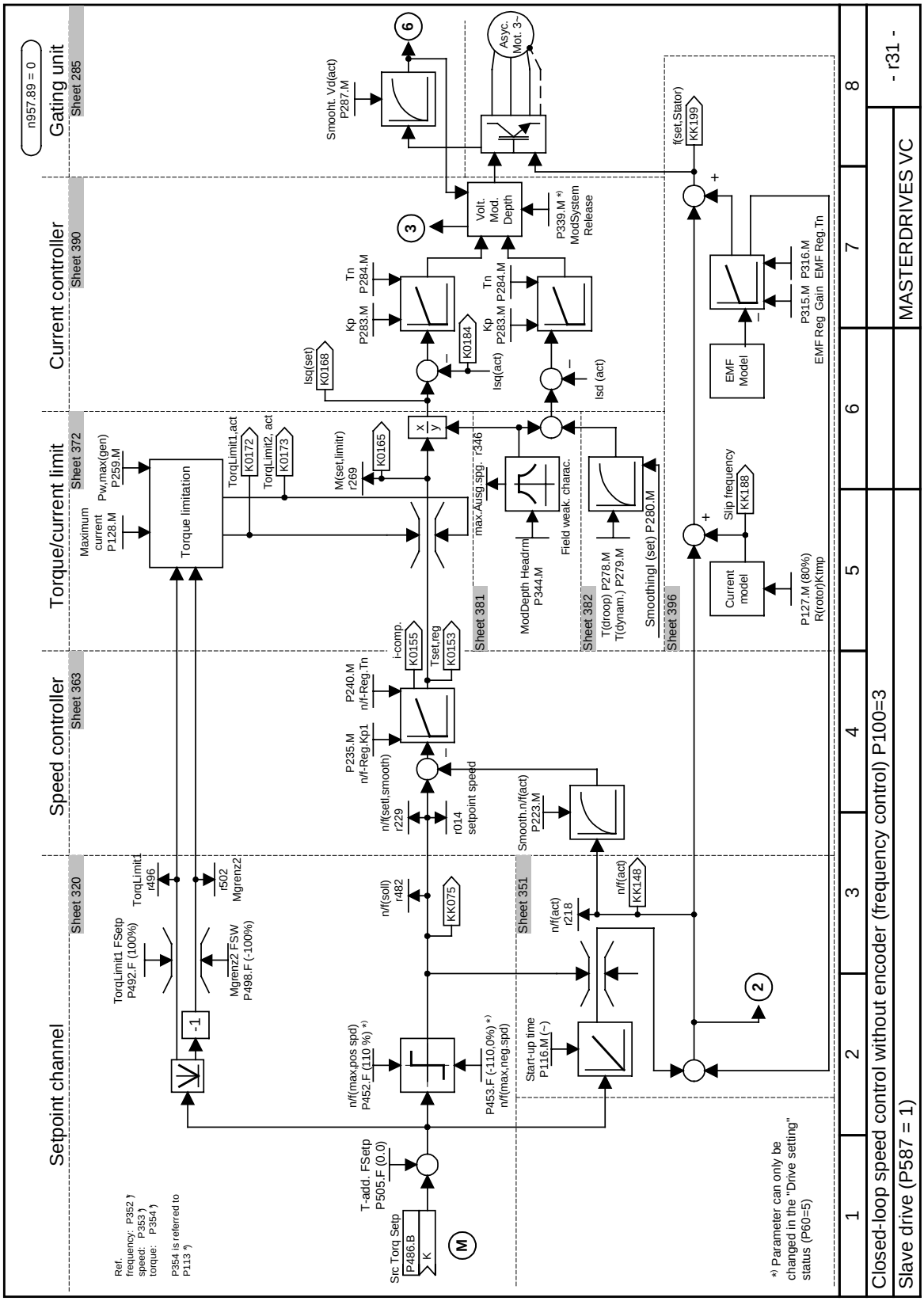

Analog outputs and display variables
MASTERDRIVES VC
- a0-
Display variables
Rot Freq r002
Actual Speed r015
Actual speed KK0020
n/f (act) r218
n/f(act) KK148
Output Amps r004
Output Amps K0022
I(Output Amps) K0242
Output voltage
Output voltage K0021
U(set.vf) K0204
Output power
Output power K0023
Torque 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]
*) Torque display only with n/f/T control
Analog outputs
Sheet [81]
<1>
n959.80 = 3
Switches on CUVC S4:
-10 V ... 10 V | AA1 1 - 3 | AA2 4 - 6
0 mA ... 20 mA | 2 - 3 | 5 - 6
AA1 Scaling P643.1
AA2 Scaling P643.2
AA1 Offset P644.1
AA2 Offset P644.2
Src Analog Output P640.1 K (148)
Src Analog Output P640.2 K (22)
y(v) = x / 100% * P643
Switch S4 1 +/- 10 V 3
Switch S4 4 +/- 10 V 6
D/A
0 ... 20 mA
-X102/19
-X102/20
-X102/21
-X102/22
AA1
AA2
<1> Only applicable for Compact/Chassis type unit, for Compact PLUS Sheet [82] is applicable
Display parameters
Sheet [30]
Reference frequency P352
Reference speed P353
Reference torque *) P354
Hz
rpm
%
Display frequency r043.1 to .3
Display speed r041.1 to .3
Display torque *) r039.1 to .2
P042.x
P040.x
P038.x
Note concerning the setting of analog outputs:
B = Reference variable (c.f. P350 ... P354)
Smin = smallest signal value (e.g. in Hz, V, A)
Smax = largest signal value (e.g. in Hz, V, A)
Amin = smallest output value in V
Amax = largest output value in V
Output values applying to output current:
4 mA Amin = + 6 V
20 mA Amax = - 10 V
P643 = (Amax – Amin) / (Smax – Smin) x B
P644 = (Amin x Smax – Amax x Smin) / (Smax – Smin)
Explanations:
Sheet [300]: See Compendium sheet 300
1 Reference to the current path of rXX sheets

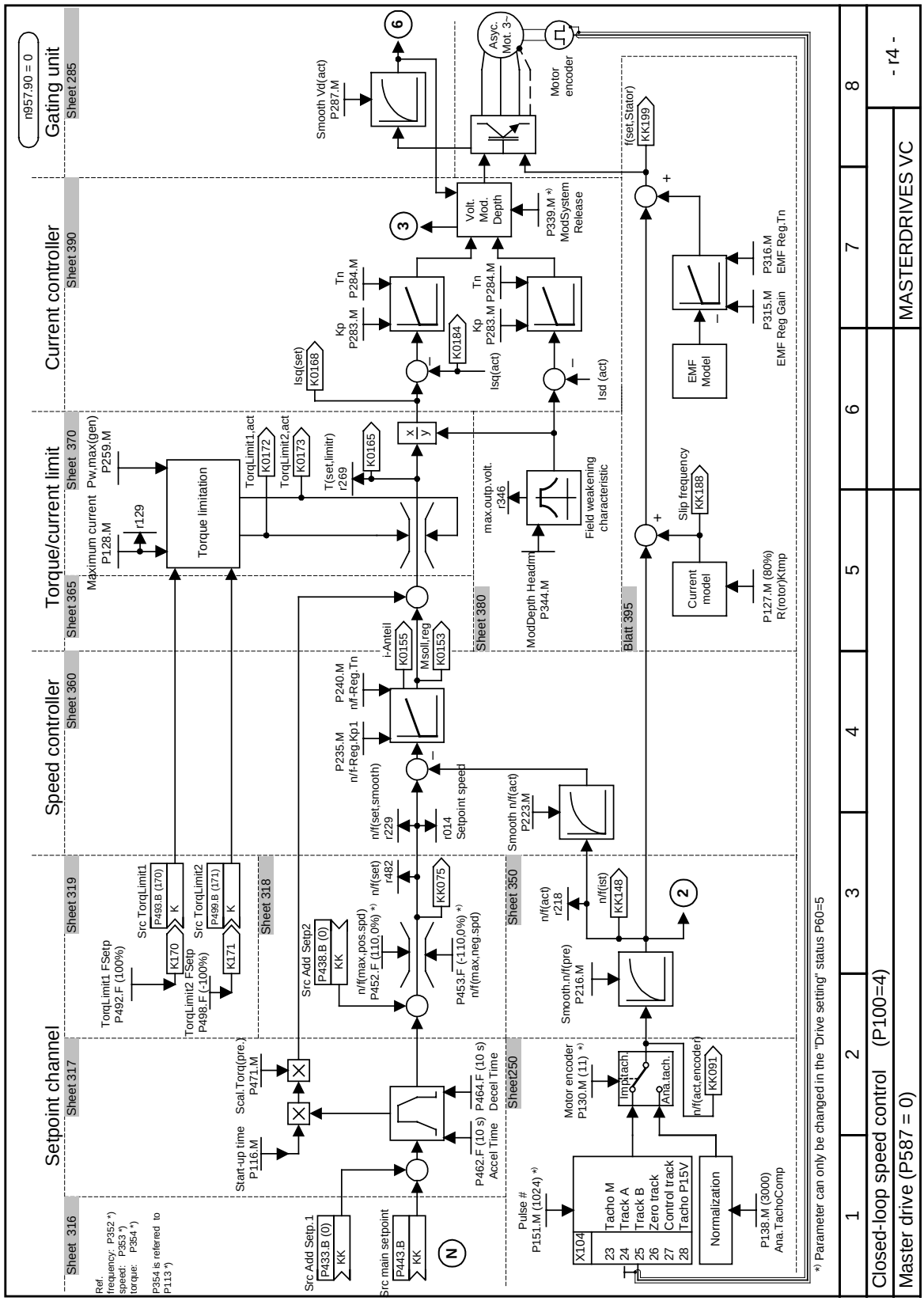

V/f characteristic with speed controller (P100=0)
MASTERDRIVES VC
- r0 -
*) Parameter only adjustable in the "Drive setting" state (P60=5)
Setpoint channel
Speed controller
Speed limitation controller
v/f characteristic
Gating unit
Sheet 316
Sheet 317
Sheet 318
Sheet 364
Sheet 401
Sheet 405
Sheet 286
Sheet 250
Sheet 352
n957.85 = 0
Ref. Frequency: P352 *) Speed: P353 *)
Srce AddSetp1
P433.B (0)
Src main setpoint
P443.B
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
n/f(set,smooth) r229
r014 Setpoint speed
P240.M n/f-Reg.Tn
P235.M n/f-Reg.Gain1
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) *)
Motor encoder P130.M (11) *)
X104
23 Tacho M
24 Track A
25 Track B
26 Zero track
27 Control tr.
28 Tacho P15V
Normalization
Impl.tach.
Ana.tach.
n/f(act,encoder)
KK091
P138.M (3000) Ana.TachScale
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 *)
Smooth. vd(act) P287.M
Asyc. Mot. 3~
Motor encoder
f(set,stator) KK199
Explanations:
Sh. [300] : See Compendium Sheet 300
N M : Reference to setpoint source (see s_{xx}-sheets)
1 : Reference to current path sheet "a0" "Analog outputs and display variables"

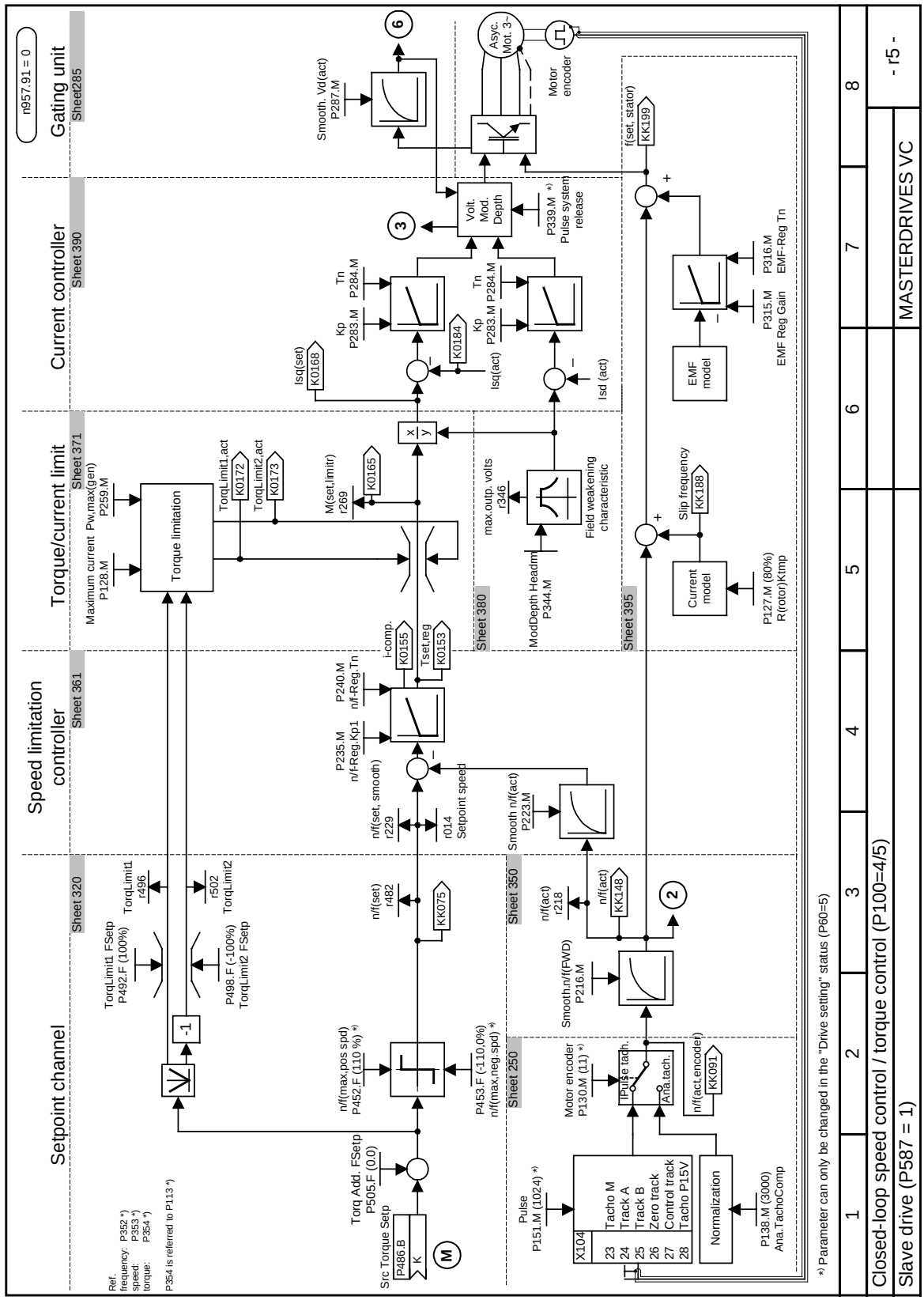

n957.86 = 0
Setpoint channel
Sheet 316
Sheet 317
Sheet 318
Current limitation controller
Sheet 400
V/f characteristic
Sheet 405
Gating unit
Sheet 286
Ref. frequency: P352 *)
speed: P353 *)
Src add. setp.1
P433.B (0)
KK
Src main setpoint
P443.B
KK
N
P462.F (10 s) Accel time
P464.F (10 s) Decel time
n/f(max.pos.spd) 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
n957.88 = 0
Sheet 316
Sheet 317
Sheet 318
Sheet 319
Sheet 362
Sheet 367
Sheet 372
Sheet 381
Sheet 382
Sheet 390
Sheet 396
Sheet 285
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 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(ist) r218
n/f(ist) KK148
P235.M n/f-Reg.Kp1
P240.M n/f-Reg.Tn
n/f(set,smooth) r229
r014 Setpoint speed
Smooth.n/f(act) P223.M
i-Anteil K0155
Msoll.reg K0153
Maximum current P128.M
Pw,max(gen) P259.M
r129
Torque limitation
TorqLimit1.act K0172
TorqLimit2.act K0173
T(set,limitr) r269
K0165
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
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~
f(set.stator) KK199
i-comp.
EMF model
P315.M EMF Reg.Kp
P316.M EMF-Reg.Tn
Slip frequency KK188
Current model
P127.M (80%) R(rotor)Kmp
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
Sheet 320
Sheet 363
Sheet 372
Sheet 390
Sheet 285
Sheet 351
Sheet 381
Sheet 382
Sheet 396
n957.89 = 0
Ref. frequency: P352 *)
speed: P353 *)
torque: P354 *)
P354 is referred to P113 *)
T-add. FSetp P505.F (0.0)
Src Torq Setp P486.B
TorqLimit1 FSetp P492.F (100%)
TorqLimit1 r496
Mgrenz2 FSW P498.F (-100%)
r502 Mgrenz2
n/f(max.pos spd) P452.F (110 %) *)
P453.F (-110.0%) *) n/f(max.neg.spd)
n/f(soll) r482
KK075
n/f(act) r218
n/f(act) KK148
Start-up time P116.M (~)
Smooth.n/f(act) P223.M
n/f(set,smooth) r229
P235.M n/f-Reg.Kp1
P240.M n/f-Reg.Tn
i-comp. K0155
Tset.reg K0153
r014 setpoint speed
Maximum current P128.M
Pw,max(gen) P259.M
Torque limitation
TorqLimit1.act K0172
TorqLimit2. act K0173
M(set,limitr) r269
K0165
max.Ausg.spg. r346
ModDepth Headrm P344.M
Field weak. charac.
T(droop) P278.M T(dynam.) P279.M
SmoothingI (set) P280.M
Isq(set) K0168
Kp P283.M
Tn P284.M
K0184
Isq(act)
Isd (act)
Volt. Mod. Depth
P339.M *) ModSystem Release
Smooht. Vd(act) P287.M
Asyc. Mot. 3~
f(set.Stator) KK199
Slip frequency KK188
Current model
P127.M (80%) R(roton)Ktmp
EMF Model
P315.M P316.M EMF Reg Gain 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 without encoder (frequency control) P100=3
Slave drive (P587 = 1)
MASTERDRIVES VC
- r31 -


Setpoint channel
Speed controller
Torque/current limit
Current controller
Gating unit
n957.90 = 0
Sheet 316
Sheet 317
Sheet 318
Sheet 319
Sheet 360
Sheet 365
Sheet 370
Sheet 380
Sheet 390
Sheet 285
Sheet250
Sheet 350
Blatt 395
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
TorqLimit1 FSetp P492.F (100%)
TorqLimit2 FSetp P498.F (-100%)
Src TorqLimit1 P493.B (170) K
Src TorqLimit2 P499.B (171) K
K170
K171
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)
KK0075
n/f(set) r482
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
Pulse # P151.M (1024) *)
Motor encoder P130.M (11) *)
X104
23 Tacho M
24 Track A
25 Track B
26 Zero track
27 Control track
28 Tacho P15V
Impl.tach.
Ana.tach.
n/f(act.encoder) KK091
Normalization
P138.M (3000) Ana.TachoComp
Maximum current P128.M
r129
Torque limitation
Pw.max(gen) P259.M
TorqLimit1.act K0172
TorqLimit2.act K0173
T(set.limitr) r269
K0165
max.outp.volt. r346
ModDepth Headm 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
Closed-loop speed control (P100=4)
Master drive (P587 = 0)
MASTERDRIVES VC
- r4 -


Setpoint channel
Speed limitation controller
Torque/current limit
Current controller
Gating unit
Sheet320
Sheet361
Sheet371
Sheet390
Sheet285
Sheet380
Sheet395
Sheet350
Sheet250
n957.91 = 0
Torque limitation
Maximum current Pw,max(gen) P259.M
Motor encoder
Asyc. Mot. 3~
Volt. Mod. Depth
Pulse system release
Smooth. Vd(act) P287.M
Isq(set) K0168
Isq(act)
Isd (act)
Kp P283.M
Tn P284.M
EMF model
EMF Reg Gain P315.M
EMF-Reg Tn P316.M
f(set. stator) KK199
Slip frequency KK188
Current model
P127.M (80%) R(rotor)Ktmp
ModDepth Headrm P344.M
max.outp. volts r346
Field weakening characteristic
TorqLimit1.act K0172
TorqLimit2.act K0173
M(set,limitr) r269
K0165
i-comp. K0155
Tset.reg K0153
P240.M n/f-Reg.Tn
P235.M n/f-Reg.Kp1
n/f(set, smooth) r229
r014 Setpoint speed
Smooth n/f(act) P223.M
n/f(act) r218
n/f(act) KK148
Smooth.n/f(FWD) P216.M
n/f(set) r482
KK075
TorqLimit1 FSetp P492.F (100%)
TorqLimit1 r496
r502 TorqLimit2
P498.F (-100%) TorqLimit2 FSetp
-1
n/f(max.pos spd) P452.F (110 %) *)
P453.F (-110.0%) n/f(max.neg. spd) *)
Torq Add. FSetp P505.F (0.0)
Src Torque Setp P486.B K
Ref. frequency: P352 *) speed: P353 *) torque: P354 *)
P354 is referred to P113 *)
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) *)
Pulse tach.
Ana.tach.
n/f(act,encoder) KK091
*) 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 (VBG 4 in Germany).
Maintenance and service work may only be executed by qualified personnel.

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.

If it is absolutely necessary that the drive converter be worked on when powered-up:

- Never touch any live parts.
- Only use the appropriate measuring and test equipment and protective clothing.
- Always stand on an ungrounded, isolated and ESD-compatible pad.

If these warnings are not observed, this can result in death, severe bodily injury or significant material damage.

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 on and off by electronic control according to the heat sink temperature.

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.

10.1.1 Replacing the fan in units up to 45 mm wide

Removal

DANGER

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

After removing the X20 connector which is protected against polarity reversal and undoing the two cover screws, unscrew the fan and withdraw the connector.

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.

DANGER

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 units up to 90 mm wide

Removal

DANGER

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

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

DANGER

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

DANGER

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

- Before you exchange the fan, the converter must be disconnected from the power supply and removed.
- Undo the four fan mounting screws and take out the fan.
- 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.

DANGER

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 converter, an **internal fan** for cooling the control electronics and a **unit fan** for cooling the power section.

Both fans are fed by the 24 V voltage supply; the unit fan is switched on and off by electronic control according to the heat sink temperature.

The fans are designed for a service life of $L_{10} \geq 35\,000$ hours at an ambient temperature of $T_u = 45$ °C. They must be replaced in good time to ensure the availability of the unit.

Internal fan

DANGER

Before removing the old fan and fitting a new one, make sure that the inverter is disconnected from the power supply.

- 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 X20 on the power section.
- Undo the four fan mounting screws and take out the fan.
- 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

DANGER

Before removing the old fan and fitting a new one, make sure that the inverter is disconnected from the power supply.

- The converter must be disconnected from the power supply and removed before the fan can be replaced.
- Undo the four fan mounting screws and take out the fan.
- 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.

DANGER

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 one year, 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 one year 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: F2ND0147512345)

Position	Example	Meaning
1 to 2	F2	Place of manufacture
3	N	2001
	P	2002
	R	2003
	S	2004
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 2001.

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.

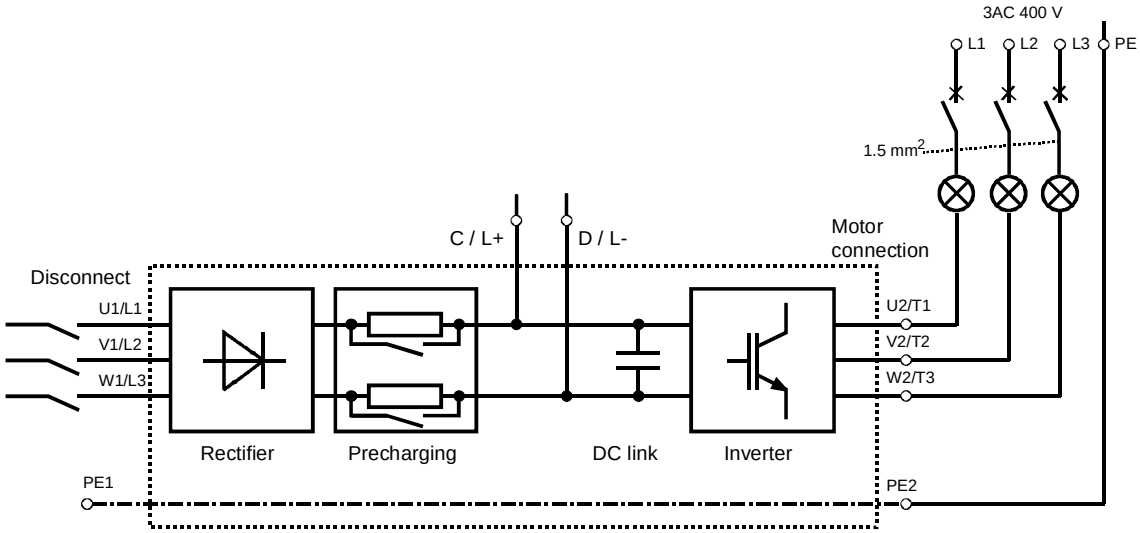


Fig. 11-1 Forming circuit

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 forming the unit, all the line and DC link connections must be disconnected.
- 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 depends on the idle time of the converter.

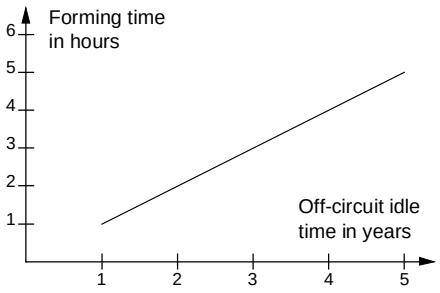


Fig. 11-2 Forming time as a function of converter idle time

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 / CSA
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 (VBG4)
Radio interference level • Standard • Options	According to EN 61800-3 No radio interference suppression Radio interference suppression filter for class B1 or 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	0.15 mm in frequency range 10 Hz to 58 Hz (housing width ≤ 90 mm)
• deflection	0.075 mm in frequency range 10 Hz to 58 Hz (housing width ≥ 135 mm)
• acceleration	9.8 m/s² in frequency range > 58 Hz to 500 Hz (housing width ≥ 135 mm)
During transport:	19.6 m/s² housing width ≤ 90 mm
• deflection	3.5 mm in frequency range 5 Hz to 9 Hz
• acceleration	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...	11-5EP60	13-0EP60	15-0EP60	18-0EP60	21-0EP60
Rated voltage [V] • Input • Output	3 AC 380 (- 15 %) to 480 (+ 10 %) 3 AC 0 up to rated input voltage				
Rated frequency [Hz] • Input • Output	50 / 60 ± 6 % 0 ... 500				
Rated current [A] • Input • Output	1.7 1.5	3.3 3.0	5.5 5.0	8.8 8.0	11.0 10.0
Max. current multimotor config.[A] • Input • DC link	2.6 3.0	5.3 5.9	8.8 9.8	14.0 15.6	17.6 19.5
Max. brake chopper current [A]	10.0	10.0	10.0	20.0	20.0
DC link voltage [V]	510 (- 15 %) ... 650 (+ 10 %)				
Motor rated power [kW]	0.55	1.1	1.5	3.0	4.0
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 1.3				
Pulse frequency fp [kHz]	1.7 to 16.0 (see fig. "Derating curves")				
Switching at input	max. 2 switching operations / minute				
Load class II to EN 60 146-1-1					
Base load current [A]	0.91 x rated output current				
Base load duration [s]	240				
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				
Base load duration [s]	270				
Overload current [A]	1.6 x rated output current				
Overload duration [s]	30				
Extra short-time loading					
Power factor cosφ1N	0.97				
Efficiency η (rated operation)	> 0.90	> 0.92	> 0.93	> 0.96	> 0.97
Power loss (fp = 2.5 kHz) [kW] • Single motor drive • Multimotor configuration	0.05 0.05	0.07 0.08	0.10 0.11	0.14 0.16	0.15 0.17
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)]	18	40	40	37	37
Dimensions [mm] • Width • Height • Depth	45 360 260	67.5 360 260	67.5 360 260	90 360 260	90 360 260
Weight approx. [kg]	3.4	3.9	4.1	4.5	4.5

Table 12-2 Technical data of converter (Part 1)

Designation	Value				
Order No. 6SE70...	21-4EP60	22-1EP60	22-7EP60	23-4EP60	
Rated voltage [V] • Input • Output	3 AC 380 (- 15 %) to 480 (+ 10 %) 3 AC 0 up to rated input voltage				
Rated frequency [Hz] • Input • Output	50 / 60 ± 6 % 0 ... 500				
Rated current [A] • Input • Output	15.4 14.0	22.6 20.5	29.7 27.0	37.4 34.0	
Max. current multimotor config.[A] • Input • DC link	24.7 27.4	36.0 40.0	47.5 52.7	60.0 66.4	
Max. brake chopper current [A]	40.0	40.0	70.0	70.0	
DC link voltage [V]	510 (- 15 %) ... 650 (+ 10 %)				
Motor rated power [kW]	5.5	7.5	11.0	15.0	
Auxiliary power supply [V]	DC 24 (20 - 30)				
Max. aux. current requirement [A] • Standard version at 20 V • Maximum version at 20 V	 1.5	 1.5	 0.8 1.9	 1.9	
Pulse frequency fp [kHz]	1.7 to 16.0 (see fig. “Derating curves”)				
Switching at input	max. 2 switching operations / minute				
Load class II to EN 60 146-1-1					
Base load current [A]	0.91 x rated output current				
Base load duration [s]	240				
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				
Base load duration [s]	270				
Overload current [A]	1.6 x rated output current				
Overload duration [s]	30				
Losses, cooling, power factor					
Power factor cosφ1N	0.97				
Efficiency η (rated operation)	> 0.97	> 0.97	> 0.98	> 0.98	
Power loss (fp = 2.5 kHz) [kW] • Single motor drive • Multimotor configuration	 0.17 0.20	 0.22 0.26	 0.29 0.34	 0.39 0.46	
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]	10.8	10.9	14.7	14.9	

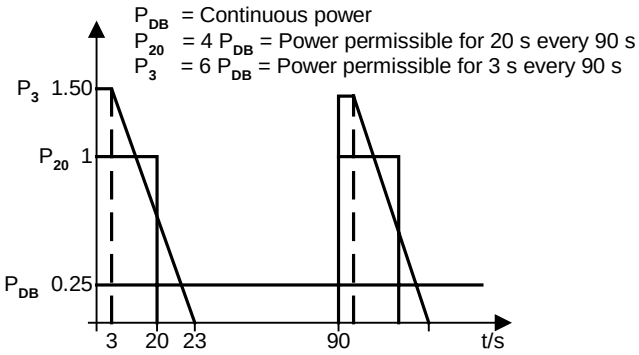
Table 12-3 Technical data of converter (Part 2)

Braking power of the integrated brake chopper:

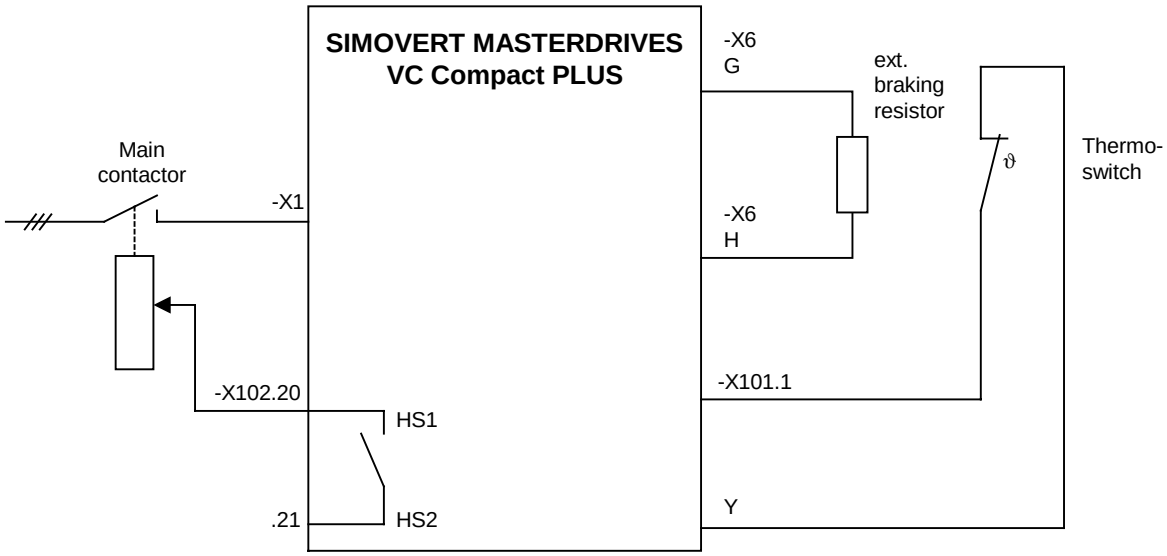
Converter							
Type power	**Rated output current I_n**	**Order No.**	**Smallest perm. resistance value for ext. braking resistor R_{min}**	**Max. brake chopper current**	**Rated braking power P20 at R_{min}**	**Short-time braking power P3 at R_{min}**	**Continuous braking power PDB at R_{min}**
[kW]	[A]		[Ω]	[A]	[kW]	[kW]	[kW]
0.55	1.5	6SE7011-5EP60	80	10	5	7.5	1.25
1.1	3.0	6SE7013-0EP60	80	10	5	7.5	1.25
1.5	5.0	6SE7015-0EP60	80	10	5	7.5	1.25
3	8.0	6SE7018-0EP60	40	20	10	15	2.5
4	10.0	6SE7021-0EP60	40	20	10	15	2.5
5.5	14.0	6SE7021-4EP60	20	40	20	30	5
7.5	20.5	6SE7022-1EP60	20	40	20	30	5
11	27.0	6SE7022-7EP60	11	70	36	54	9
15	34.0	6SE7023-4EP60	11	70	36	54	9

Regenerative operation is possible with converters if an external braking resistor is connected. The regenerative energy is converted to heat in the braking resistor. The braking resistor should be mounted outside the control cubicle in order to avoid the electronic components in the cubicle becoming overheated.
To protect the brake chopper against an overload of current, the smallest permissible resistance value of the braking resistor must not be fallen short of. The control electronic system monitors the pulse duty factor of the brake chopper and switches it off in the event of an overload.

Length of the connecting cable between the converter and the external braking resistor < 15 m.



Thermal overload of the external braking resistor must be avoided by appropriate configuration. If necessary, the converter can be switched off by a thermoswitch which monitors the temperature of the external braking resistor (see Fig. 12-1).



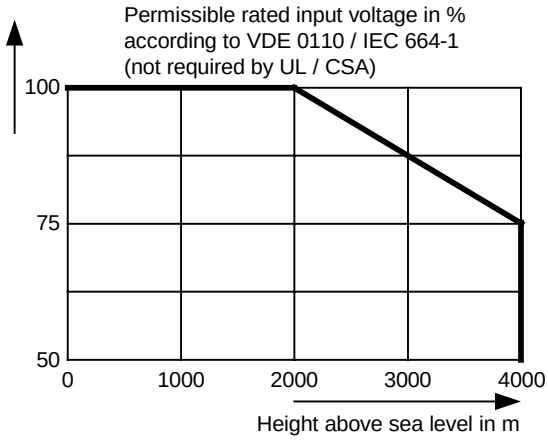
Y = Binary input which activates the fault trip of the converter,
e.g. -X101.7 (binary input 5)

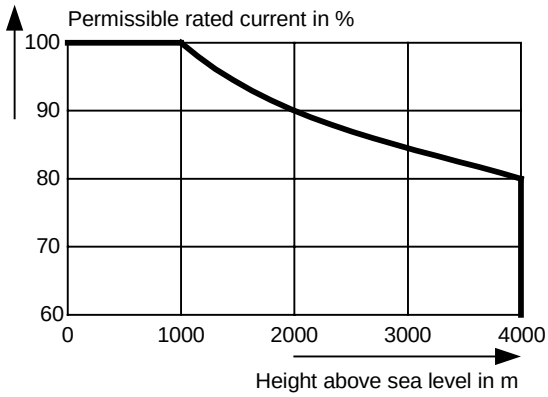
Parameterization for the possible binary inputs Y:

Terminal	Binary input	Parameterization
-101.3	1	P586 = 10
.4	2	P586 = 12
.5	3	P586 = 14
.6	4	P586 = 16
.7	5	P586 = 18
.8	6	P586 = 20
-102.19	7	P586 = 22

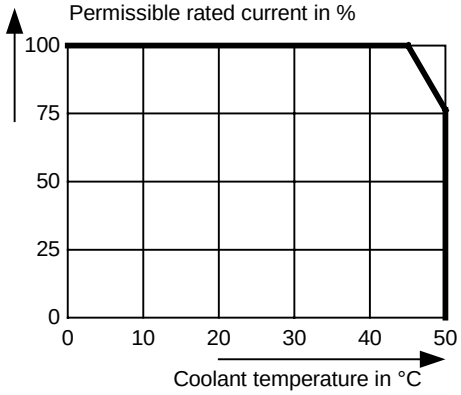
Fig. 12-1 Converter with external braking resistor and fault trip via thermoswitch

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

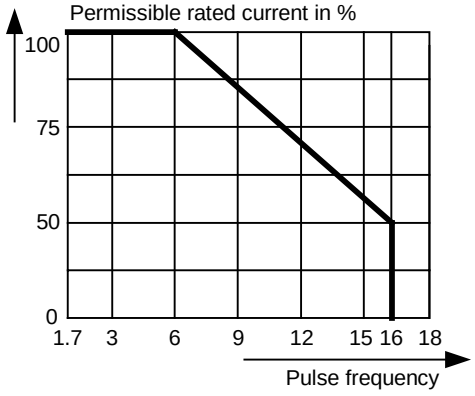


Fig. 12-2 Derating curves

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

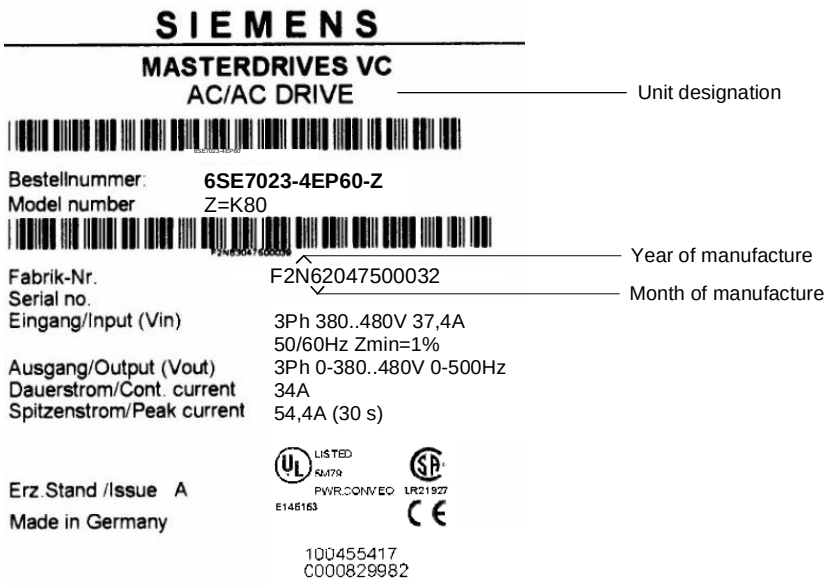


Fig. 12-3 Rating plate

Date of manufacture

The date of manufacture can be derived as follows:

Character	Year of manufacture:	Character	Month of manufacture
N	2001	1 to 9	January to September
P	2002	O	October
R	2003	N	November
S	2004	D	December

Table 12-4 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 12-5 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 voltageI 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 L) 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 actual 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 the derating curves at theta >50°C (Compact PLUS) or 40°C. 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 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 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 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: - (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 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
F037 Analog input	An analog input is taking place in operating mode 4..20mA 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.

Number / Fault	Cause	Counter-measure
F040 AS internal	Incorrect operating status	Replace CU (-A10), or replace the unit (Compact PLUS)
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	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.	Störwert 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 optional board	- Replace CU, or replace the unit (Compact PLUS) - Check connection of the board subrack to the optional 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)
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 > 2 kHz).
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. not Compact PLUS	Error when initializing the TSY board	Check: - Whether the TSY is correctly inserted
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, or replace the unit (Compact PLUS)

Number / Fault	Cause	Counter-measure
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)
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.

Number / Fault	Cause	Counter-measure
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.
F062 Multi-parallel circuit not Compact PLUS	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.

Number / Fault	Cause	Counter-measure
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) - Check "SCom/SCB TLG OFF" P704.01 (SCom1) and P704.02 (SCom2) - Replace CU (-A10), or replace the unit (Compact PLUS)
F070 SCB initialization fault not Compact PLUS	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 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.
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.

Number / Fault	Cause	Counter-measure
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
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, or replace the unit (Compact PLUS) - 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, or replace the unit (Compact PLUS)

Number / Fault	Cause	Counter-measure
F091 Mld Time	The rotating measurement takes longer than programmed in a measured status. 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, or replace the unit (Compact PLUS).
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.
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 #

Number / Fault	Cause	Counter-measure
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
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 (always conductive) 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) O X O O Dev. Rotor 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.

Number / Fault	Cause	Counter-measure
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
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 not Compact PLUS	See TB documentation	
F117 Technology board fault not Compact PLUS	See TB documentation	
F118 Technology board fault not Compact PLUS	See TB documentation	
F119 Technology board fault not Compact PLUS	See TB documentation	
F120 Technology board fault not Compact PLUS	See TB documentation	
F121 Technology board fault not Compact PLUS	See TB documentation	
F122 Technology board fault not Compact PLUS	See TB documentation	

Number / Fault	Cause	Counter-measure
F123 Technology board fault not Compact PLUS	See TB documentation	
F124 Technology board fault not Compact PLUS	See TB documentation	
F125 Technology board fault not Compact PLUS	See TB documentation	
F126 Technology board fault not Compact PLUS	See TB documentation	
F127 Technology board fault not Compact PLUS	See TB documentation	
F128 Technology board fault not Compact PLUS	See TB documentation	
F129 Technology board fault not Compact PLUS	See TB documentation	
F130 Technology board fault not Compact PLUS	See TB documentation	
F131 Technology board fault not Compact PLUS	See TB documentation	
F132 Technology board fault not Compact PLUS	See TB documentation	
F133 Technology board fault not Compact PLUS	See TB documentation	

Number / Fault	Cause	Counter-measure
F134 Technology board fault not Compact PLUS	See TB documentation	
F135 Technology board fault not Compact PLUS	See TB documentation	
F136 Technology board fault not Compact PLUS	See TB documentation	
F137 Technology board fault not Compact PLUS	See TB documentation	
F138 Technology board fault not Compact PLUS	See TB documentation	
F139 Technology board fault not Compact PLUS	See TB documentation	
F140 Technology board fault not Compact PLUS	See TB documentation	
F141 Technology board fault not Compact PLUS	See TB documentation	
F142 Technology board fault not Compact PLUS	See TB documentation	
F143 Technology board fault not Compact PLUS	See TB documentation	
F144 Technology board fault not Compact PLUS	See TB documentation	

Number / Fault	Cause	Counter-measure
F145 Technology board fault not Compact PLUS	See TB documentation	
F146 Technology board fault not Compact PLUS	See TB documentation	
F147 Technology board fault not Compact PLUS	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
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)
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, 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 of the CUVC board is too high	- 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 >50°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.
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) 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
A036 Brake checkback "Brake still closed"	The brake checkback indicates the "Brake still closed" state.	Check brake checkback (see FD 470)

Number / Alarm	Cause	Counter-measure
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

Number / Alarm	Cause	Counter-measure
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)
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 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 #
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)

Number / Alarm	Cause	Counter-measure
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.
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.

Number / Alarm	Cause	Counter-measure
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 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.	
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.	
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!	

Number / Alarm	Cause	Counter-measure
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.	
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.	
A088 CB alarm	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	
A090 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A82 of the 1st 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	
A092 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A84 of the 1st 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	
A094 CB alarm	See user manual for CB board Alarm of the 2nd CB board corresponds to A86 of the 1st CB board	
A095 CB alarm	Alarm of the 2nd CB board. Corresponds to A87 of the 1st 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	
A097 TB alarm 1 not Compact PLUS	See user manual for TB board	
A098 TB alarm 1 not Compact PLUS	See user manual for TB board	
A099 TB alarm 1 not Compact PLUS	See user manual for TB board	
A100 TB alarm 1 not Compact PLUS	See user manual for TB board	
A101 TB alarm 1 not Compact PLUS	See user manual for TB board	

Number / Alarm	Cause	Counter-measure
A102 TB alarm 1 not Compact PLUS	See user manual for TB board	
A103 TB alarm 1 not Compact PLUS	See user manual for TB board	
A104 TB alarm 1 not Compact PLUS	See user manual for TB board	
A105 TB alarm 1 not Compact PLUS	See user manual for TB board	
A106 TB alarm 1 not Compact PLUS	See user manual for TB board	
A107 TB alarm 1 not Compact PLUS	See user manual for TB board	
A108 TB alarm 1 not Compact PLUS	See user manual for TB board	
A109 TB alarm 1 not Compact PLUS	See user manual for TB board	
A110 TB alarm 1 not Compact PLUS	See user manual for TB board	
A111 TB alarm 1 not Compact PLUS	See user manual for TB board	
A112 TB alarm 1 not Compact PLUS	See user manual for TB board	
A113 TB alarm 2 not Compact PLUS	See user manual for TB board	
A114 TB alarm 2 not Compact PLUS	See user manual for TB board	

Number / Alarm	Cause	Counter-measure
A115 TB alarm 2 not Compact PLUS	See user manual for TB board	
A116 TB alarm 2 not Compact PLUS	See user manual for TB board	
A117 TB alarm 2 not Compact PLUS	See user manual for TB board	
A118 TB alarm 2 not Compact PLUS	See user manual for TB board	
A119 TB alarm 2 not Compact PLUS	See user manual for TB board	
A120 TB alarm 2 not Compact PLUS	See user manual for TB board	
A121 TB alarm 2 not Compact PLUS	See user manual for TB board	
A122 TB alarm 2 not Compact PLUS	See user manual for TB board	
A123 TB alarm 2 not Compact PLUS	See user manual for TB board	
A124 TB alarm 2 not Compact PLUS	See user manual for TB board	
A125 TB alarm 2 not Compact PLUS	See user manual for TB board	
A126 TB alarm 2 not Compact PLUS	See user manual for TB board	
A127 TB alarm 2 not Compact PLUS	See user manual for TB board	
A128 TB alarm 2 not Compact PLUS	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)
FF03 Access fault Optional board	Serious faults have occurred while making access to external optional boards (CB, TB, SCB, TSY ..).	- Replace CU, or replace the unit (Compact PLUS) - Replace the LBA - Replace the optional board
FF04 RAM	A fault has occurred during the test of the RAM.	- Replace CU, or replace the unit (Compact PLUS)
FF05 EPROM fault	A fault has occurred during the test of the EPROM.	- Replace CU, or replace the unit (Compact PLUS)
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)
FF07	Stack underflow	* Replace CU, or replace the unit (Compact PLUS) * Replace firmware
FF08	Invalid processor command should be processed	* Replace CU, or replace the unit (Compact PLUS) * Replace firmware
FF09	Invalid format in a protected processor command	* Replace CU, or replace the unit (Compact PLUS) * Replace firmware
FF10	Word access on uneven address	* Replace CU, or replace the unit (Compact PLUS) * Replace firmware
FF11	Jump command to uneven address	* Replace CU, or replace the unit (Compact PLUS) * 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)
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

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):	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:

Ausgabe	Interne Sachnummer
AA	A5E00128890 DE
AB	A5E00857370

Ausgabe **AB** besteht aus folgenden Kapiteln:

Kapitel		Änderungen	Seitenzahl	Ausgabedatum
1	Definitionen und Warnungen	Erstausgabe	4	10.2001
2	Beschreibung	überarbeitete Ausgabe	1	05.2003
3	Erstinbetriebsetzung	Erstausgabe	2	10.2001
4	Transportieren, Lagern, Auspacken	Erstausgabe	1	10.2001
5	Montage	überarbeitete Ausgabe	9	05.2003
6	EMV-gerechter Aufbau	überarbeitete Ausgabe	2	05.2003
7	Anschließen	überarbeitete Ausgabe	23	05.2003
8	Parametrierung	überarbeitete Ausgabe	24	05.2003
9	Parametrierschritte	überarbeitete Ausgabe	28	05.2003
10	Wartung	überarbeitete Ausgabe	4	05.2003
11	Formieren	Erstausgabe	2	10.2001
12	Technische Daten	überarbeitete Ausgabe	9	05.2003
13	Störungen und Warnungen	Erstausgabe	27	10.2001
14	Umweltverträglichkeit	überarbeitete Ausgabe	1	05.2003

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Version **AB** consists of the following chapters:

Chapter		Changes	Pages	Version date
1	Definitions and Warnings	first edition	4	10.2001
2	Description	reviewed edition	1	05.2003
3	First Start-up	first edition	2	10.2001
4	Transport, Storage, Unpacking	first edition	1	10.2001
5	Installation	reviewed edition	9	05.2003
6	Installation in Conformance with EMC Regulations	reviewed edition	2	05.2003
7	Connecting-up	reviewed edition	23	05.2003
8	Parameterization	reviewed edition	24	05.2003
9	Parameterizing steps	reviewed edition	28	05.2003
10	Maintenance	reviewed edition	4	05.2003
11	Forming	first edition	2	10.2001
12	Technical Data	reviewed edition	9	05.2003
13	Faults and Alarms	first edition	27	10.2001
14	Environmental Friendliness	reviewed edition	1	05.2003

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