

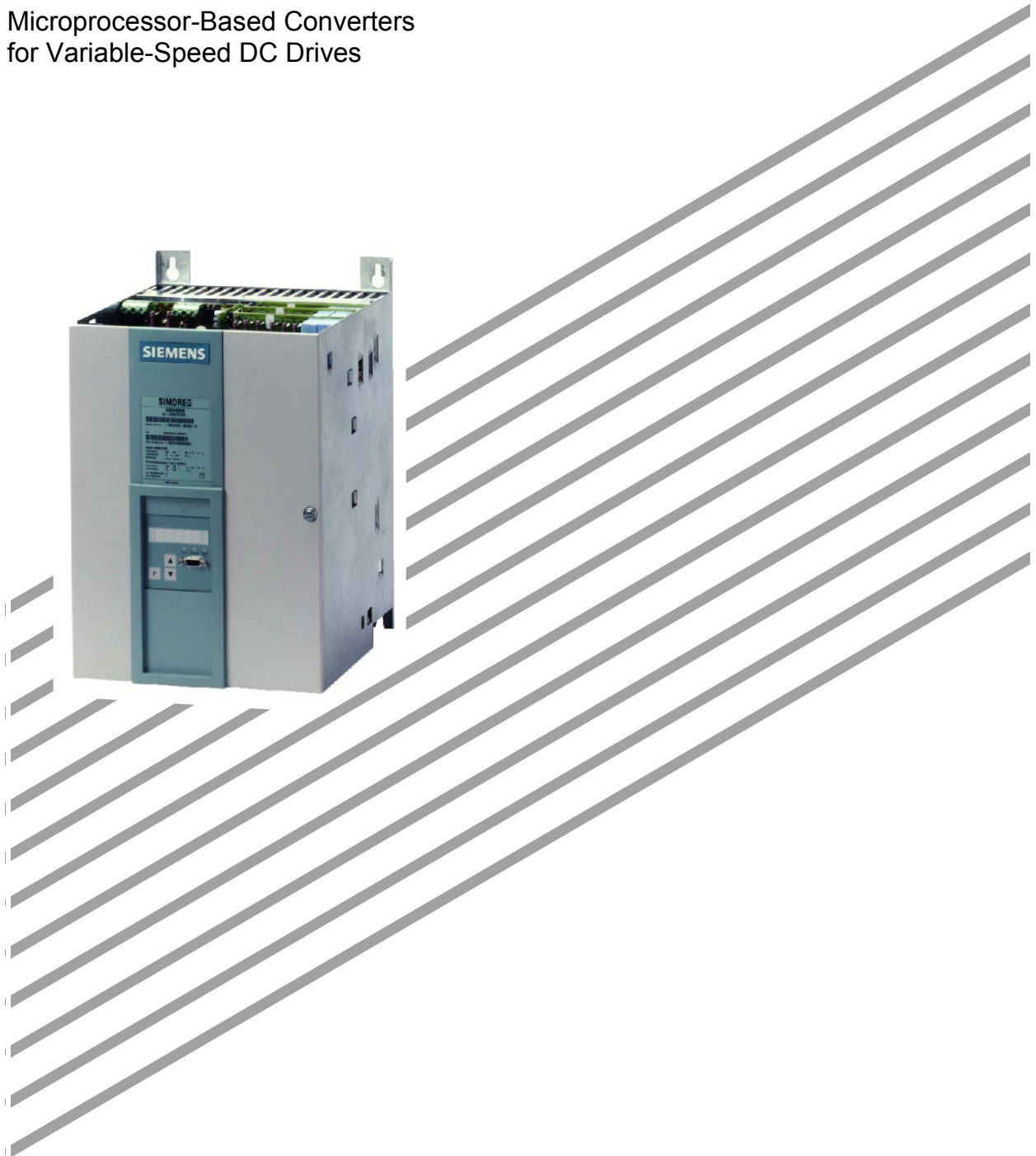
SIEMENS

SIMOREG CM

6RA70 Series

Microprocessor-Based Converters
for Variable-Speed DC Drives

Application
CM for use on
Line Voltages
higher than 1000 V



NOTE

This application documentation does not purport to handle or take into account all of the equipment details or versions or to cover every conceivable operating situation or application. If you require more detailed information, or if special problems occur, which are not handled in enough detail in this document, please contact your local Siemens office.

The contents of this application documentation are not part of an earlier or existing agreement or legal contract and neither do they change it. The actual purchase contract represents the complete liability of the I DT Variable-Speed Drives Group of Siemens AG. The warrant conditions specified in the contract between the two parties is the only warranty which will be accepted by the I DT Variable-Speed Drives Group. The warranty conditions specified in the contract are neither expanded nor changed by the information provided in this application documentation.

**WARNING**

These converters contain hazardous electrical voltages and control rotating mechanical components (drives). Death, serious bodily injury or substantial damage to property will occur if the instructions in the relevant operating manuals are not observed.

Only qualified personnel who are thoroughly familiar with all safety notices contained in the operating instructions as well as erection, operating and maintenance instructions must be allowed to work on these devices.

Successful and safe operation of this equipment is dependent on careful transportation, proper storage and installation as well as correct operation and maintenance..

**WARNING**

The electrical components of the SIMOREG CM such as the voltage detection circuit of the AC and DC power section, the pulse transformers and the fuse monitor are dimensioned for a rated line voltage of 1000 V and cannot therefore be used in systems with higher line voltage ratings. To ensure that the system design complies with safety separation standards, supplementary components must be carefully selected and integrated. The system must be installed for the intended application by properly qualified personnel who are familiar with the relevant standards and can apply them as required in the system implementation.

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We have checked that the contents of this publication agree with the hardware and software described herein. Nonetheless, differences might exist and therefore we cannot guarantee that they are completely identical. The information given in this publication is reviewed at regular intervals and any corrections that might be necessary are made in the subsequent printings. Suggestions for improvement are welcome at all times.

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1 General

The SIMOREG CM is an independent unit which includes all the components required for the closed-loop control and gating of power sections in B6C and (B6)A(B6)C connections.

The voltage detection circuit for the power section, the firing-pulse transformer insulation and the integrated fuse monitor are dimensioned for a maximum rated line voltage of 1000 V. However, this voltage level is not sufficient for some retrofit applications.

This document describes how the CM can be applied for voltages over 1000 V and specifies the components required for this type of application. A system for a line voltage of 1200 V is described in detail as an application example. This can be easily adapted for other line voltages through the integration of appropriate components.

Voltage transformers and isolating amplifiers with safety separation are needed to acquire the line and armature voltages.

Suitable components with appropriate safety separation must also be used for direct current detection via current transformers at the AC end or via shunts at the DC end with isolating amplifier.

The CM fuse monitor on the C98043-A7044 module must not be used.

Pulse transformer modules from the SITOR product range can be used as pulse transformers for thyristor gating. The CM pulse transformers cannot be used for this purpose. The ribbon cable link to X21 / X22 on the C98043-A7043 must be disconnected.

List of components for controlling a power section

- One SIMOREG CM Order number 6RA7000-0MV62-0
- Two voltage transformers or one isolation transformer (circuit arrangement: Yy0) for detecting the line voltage of the power section
- One isolating amplifier, e.g. of type LV100 made by LEM for detecting the output DC voltage of the power section. For data sheet, go to: http://www.lem.co.jp/products/list-v1_e.html
- Pulse transformer modules of type 6QN... from the SITOR product range
- External 24 V power supply for 6QN..., external +/- 15 V power supply for LV100
- Operating instructions for CM: Order number 6RX1700-0BD00 or go to: <http://support.automation.siemens.com/WW/view/de/10804967/133300>
- Application document "CM for more than three thyristors in parallel"

2 Detecting the line voltage and output voltage of the power section

For detecting power section voltages on systems connected to line voltages over 1000 V, safety separation must be provided by voltage transformers or isolation transformers. A block diagram showing the voltage detection circuits can be found in Chapter 4.

Detection of power section line voltage

The voltage is adapted via two non-grounded voltage transformers in a V circuit arrangement (Tu1; Tu2) or, alternatively, via a matching transformer in a Yy0 circuit arrangement.

The phase displacement between the transformer input and output must be exactly zero degrees.

The line voltage must be detected directly at the power section input; the use of an auxiliary transformer connected directly on the HV side of the supply system is not recommended. This is especially important because the following functions are dependent on accurate line voltage detection:

- Synchronization of the gating unit
- Evaluation of undervoltage and overvoltage and phase failure monitoring
- Detection of commutation failure
- Inclusion of current-dependent voltage drop across infeed transformer for EMF pre-control.

Implementation example:

The rated line voltage at 1U1/1V1/1W1 of the power section is, for example, 1200 V.

Voltage transformer for 1500 V to 100 V is used.

Voltage detection connection at the 85 V input: XU4/XV4/XW4 of module C98043- A7044

U819.01 = 0.067 (100 V / 1500 V, possibly fine adjustment through line voltage measurement and display r015)

U820 = 1200 V (rated supply voltage armature)

U821.01 = 85 V (85 V input used)

P78.01 = 1200 V (rated line voltage armature)

Detection of power section output DC voltage

An isolation transformer must be used for DC voltage detection.

You will find information about using the **LV100-1500** transformer supplied by LEM below. This is suitable for supply system voltages up to 1200 V +20%. An external +/- 15 V (approx. 100 mA) power supply is also required.

Implementation example:

The rated line voltage at 1U1/1V1/1W1 is, for example, 1200 V.

The isolation transformer LV100-1500 is connected to the output DC voltage of the power section 1C1/1D1: 1C1 to +HT, 1D1 to -HT.

An external power supply unit +/- 15 V, 100 mA to supply the isolation transformer must be used.

Output M of the LV100 is connected to the 0V output of the power supply unit via a load resistance R1b.

A load resistance R1b of 125 ohms ($R1b = 5 \text{ V} / 40 \text{ mA}$) is required for a transformation ratio

of 1500 V to 50 mA → 1200 V / 40 mA and a voltage drop of 5V

(as measuring voltage for the adapted voltage evaluation on the A7044).

Adaptation of the DC voltage measurement on the C98043-A7044 module of the CM:

XC4 and XD4 are used as the voltage measurement input on the A7044 (85 V input).

The measuring voltage is adapted to 5 V by the measuring resistors of the differential amplifier circuit.

Change resistances R9 and R22 from 200 kohms to 0 ohms

Change resistances R10 and R23 from 470 kohms to 39 kohms, see Chapter 5.

Parameter settings:

U819.02 = 0.071 (85 V / 1200 V, possibly fine adjustment via voltage measurement at 1C1/1D1 and display r038: actual armature voltage value)

U821.02 = 85 V (85 V input is used; the adapted resistance of the measuring circuit (see above) ensures that only 5 V is actually applied).

3 Using pulse transformer modules 6QN1022-3AD and 6QN1032-7A

The pulse transformers on module C98043-A7043 of the CM are designed for power section line voltages of up to maximum 1000 V (+10%). Pulse transformer module 6QN1022-3AD is suitable for voltages up to 1500 V, and 6QN1032-7AD for voltages up to 3000 V.

Modules of type 6QN1022-3AD include two pulse transformers and type 6QN1032-7AD one pulse transformer, each with a transistor amplifier at the input for gating two thyristors or one thyristor. When module type 6QN1022-3AD or 6QN1032-7AD is used, the additional transistor amplifier allows up to 12 thyristors to be gated in parallel (directly without intermediate amplifier SA31) via one output X21A, X22A on the module C98043-A7042 of the CM. A dedicated, separate pulse transformer is required to gate each individual thyristor.

With more than 12 thyristors in parallel, SA31 can be used as an additional amplifier (see application document "CM for more than three thyristors in parallel").

Connection example without parallel connection of thyristors:

CM - A7042: X21A / X22A	Signal	6QN1022-3AD	
X21A.20-----	Pul.1.1-----	X1.4	for thyristor 1
X21A.22-----	M-----	X1.1	
X21A.5-----	Pul.1.2-----	X1.10	for thyristor 2
X21A.7-----	M-----	X1.1	etc.

Connection example for two thyristors in parallel:

CM - A7042: X21A / X22A	Signal	6QN1022-3AD	
X21A.20-----	Pul.1.1-----	X1.4	for first parallel thyristor 1
X21A.22-----	M-----	X1.1	
X21A.20-----	Pul.1.1-----	X1.10	for second parallel thyristor 1
X21A.22-----	M-----	X1.1	etc.

Output of 6QN1022-3AD:

G1 to gate of one thyristor

H1 to auxiliary cathode of the same thyristor, etc. analogous for G2/H2

Connection of external 24 V power supply to 6QN1022-3AD / 6QN1032-7AD:

X1.13 Connection to 24 V terminal of power supply

X1.1 Connection to ground of power supply

Shield connection S of pulse transformers of 6QN1022-3AD / 6QN1032-7AD:

Connect shield S to ground

Connection of ribbon cable outputs X21A, X22A to 6QN1022-3AD:

The following ribbon cable sets can be used at outputs X21A and X22A on module A7042 (Power Interface) of the CM:

Length 3m: Order number **6RY1707-0CM01**

Length 10 m (max. permissible length): Order number **6RY1707-0CM02**

The ribbon cable can be connected to terminals for the purpose of connecting the 6QN1022-3AD via single wires with a module of type **FLK26** supplied by Phoenix Contact.

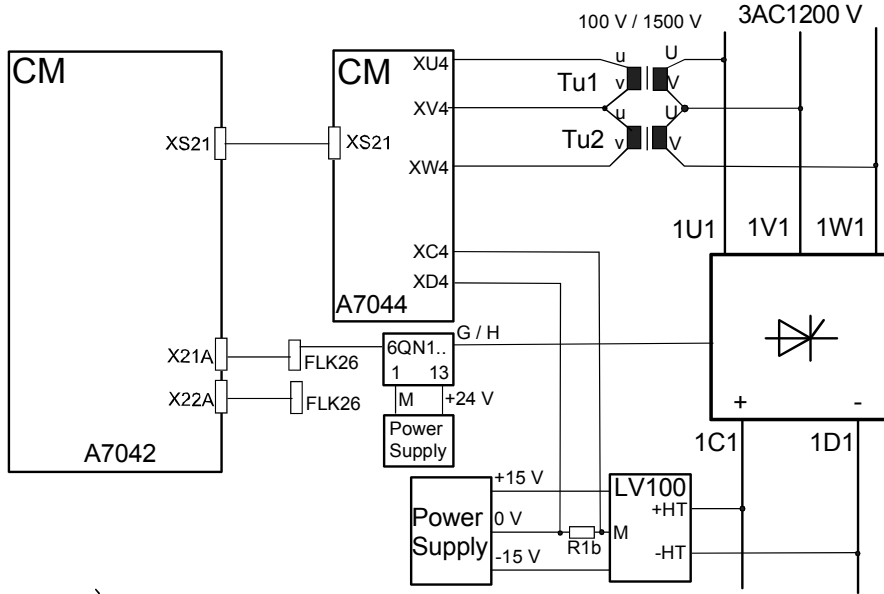
Using the pulse transformer module 6QN1032-7AD:

In contrast to the 6QN1022-3AD, the 6QN1032-7AD features only one pulse transformer channel (as a result of the higher insulation voltage required).

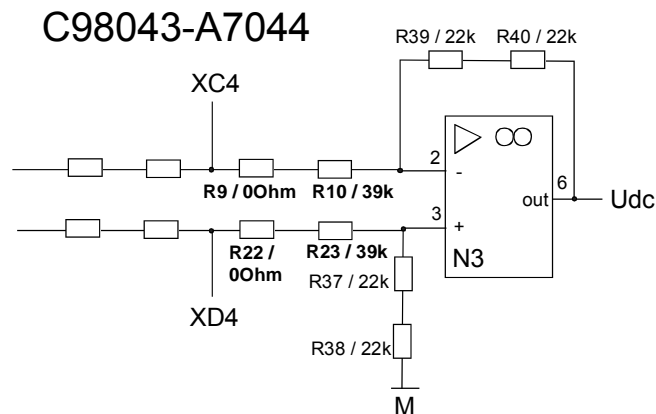
P24, M, IMP1, S are identical on both modules, G/H is like G1/H1 the output to the thyristor gate. The 6QN1032-7AD does not feature a second pulse input IMP2.

See Chapter 6 for block diagram.

4 Block diagram showing typical voltage detection connections on the power section



5 Adaptation of DC voltage measurement on A7044 of the CM



6 Block diagrams of pulse transformer modules 6QN1022-3AD and 6QN1032-7AD

