

Control Modul

Multifunction

83SR03 – E/R15..

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Application

The module is used for stored-program binary and analog control tasks on the drive and group control levels. It can be used for the following applications:

- Drive control of unidirectional drives
- Drive control of actuators
- Drive control of solenoid valves
- Binary function group control (sequential and logic)
- Continuous control
- 3-step control

The module is equipped with a specified set of memories depending on the application. This involves the following software versions:

83SR03/R1565	Drive and function group control
83SR03/R1575	Continuous control
83SR03/R1577 /R1578	3-level step control

In the application Drive and Function group control, several binary function group controls or drive controls or combinations of drive controls and group controls are possible for each module.

In the applications Continuous control and Step control, up to 8 drive control loops can be implemented for each module.

The module incorporates an interface to the control room and a binary interface to the process. These interfaces can be allocated to a binary drive control function, while the control room interface can also be allocated to a group control function. When implementing several drive controls, binary group controls or analog drive controls in one module, the drive control functions or group control functions to which no interface has been assigned, receive their information via the bus. The process is then connected by means of input and output modules, and the control room is connected via control room coupling modules.

The basic module version is described in the following module description. The capabilities of the individual versions are dealt with in the corresponding application descriptions and functional block descriptions.

Features

The module address is set automatically by plugging the module into the multi-purpose processing station.

The telegrams received via the station bus are checked by the module for error-free transfer via their parity bits.

The telegrams sent from the module to the station bus are provided with parity bits to ensure error-free transfer.

The module requires the following voltages for communication with the operator's console, the process and the switchgear:

- US Operating voltage +24 V
branched internally to supply the following elements:
 - US1 Pushbuttons, operator's console
 - US2 Process contact transmitters (e.g. limit switches)
 - US3 Torque monitors of actuator
- UV Auxiliary voltage –24 V for increasing the communication voltage for contact inputs
- UM +24 V annunciation voltage for monitoring and signaling failure of the operating or communication voltage.

The module terminals connected to UM are short-circuit-proof. Therefore, this voltage is not fuse-protected in the module.

If UM or UV fails, the function of the module remains fully effective. The voltages US2 and US3 are protected in the module by PTC resistors and, therefore, do not require separate fuses.

The operating voltage US and the external logic signals are related to conductor Z. The operating voltage UD+ is related to conductor ZD.

The following annunciations are indicated at the front of the module via light-emitting diodes:

- Simulation (SIM)
- Module disturbance (ST)
- Fuse failure for US1
- Annunciations to operator's console:
 - Annunciation OFF/MANUAL (L10)
 - Annunciation ON/AUTOMATIC (L20)
 - Annunciation MANUAL (LH)
 - Disturbance annunciation (LM)

The function of annunciation lamp LM is not affected if the voltage US fails.

One connector X1 provided at the front of the module permits connection of the following units:

- Battery pack 89NB02 (Order No. GJR2355100R0100) for backing module-internal RAM
- RAM erasing device 89PL01 (Order No. GJR2386000R0100) for erasing module-internal RAM.

Module design

The module essentially consists of the following:

- Process interface
- Control room interface
- Station-bus interface
- Processing section

Process interface

In the process interface, the process signals are adapted to the module-internal signal level.

Control room interface

In the control room interface, the pushbutton commands are adapted to the module-internal signal level, and the module-internal signal levels to the annunciation lamps in the control room.

Station-bus interface

In the station bus interface, the module signals are adapted to the bus. This essentially involves a parallel/serial conversion.

Processing Section

In order to process signals coming from the process, the control room and the bus, the module is provided with a microprocessor which works in conjunction with the following memory areas via the module-internal bus:

- Memory for operating program
- Memory for module input and output signals (shared memory)
- Memory for standard functions
- Memory for user program
- Memory for parameters and historic values
- RAM for structure list

The operating program enables the microprocessor to perform the basic operations of the module.

The exchange of information with the bus system takes place via the memory for the module input and output signals. It is used to buffer the signals.

The memory for the standard functions contains ready programs for implementing the various functions.

The set of standard functions selected determines the basic applications of the module.

The filed set of standard functions is selected in such a way that the specified task can be performed without additional modules. For instance, a superposed setpoint control can be implemented in step control function in addition to the actual control function.

All the standard functions contained in the module together with their inputs and outputs can be called by the user via the control system operator station or the PDDS.

The memory for the user program contains information as to:

- how the standard functions are interconnected
- which module inputs and outputs are allocated to the inputs and outputs of the standard functions
- which constants are specified to the individual inputs of the standard functions
- which parameters are specified to the individual inputs of the standard functions
- which plant signals are allocated to the module inputs and outputs
- which standard functions are used to serve the process and control room interfaces

This information is specified by the user according to the plant involved, in a process which is called structuring and addressing.

The user program is stored on an erasable PROM (EPROM).

The memory for parameters and historic values is used to file parameters (e.g. KP, TN, TV etc.) and important intermediate results from computing operations (e.g. setpoints). The parameters are determined by the user and specified to the corresponding inputs for the standard functions during structuring.

A RAM with an external backup is used as memory, i.e. the parameters can be altered during operation (on-line).

The RAM for the structure list serves for simultaneous filing of the structure list. This permits on-line modifications to be made to the structure list (see Operating modes: "RAM operation"). The RAM with the external backup battery in which the parameters and historic values are also stored is here used as memory.

Structuring

During structuring, module inputs and outputs are allocated to the neutral inputs and outputs of the individual standard functions, or constants and parameters or outputs of other standard functions (calculated function results) are specified to the inputs of the standard functions. Structuring is performed on the basis of the data supplied by the user in the form of a so-called structure list. These data can be taken from a function chart to be created beforehand.

The following limit values for the module should be observed when creating the function chart:

– max. no. of module inputs	255
– max. no. of module outputs	255
– max. no. of calc. function results	255
– max. no. of timers	128
– max. no. of parameters	64
– max. no. drive control functions ASE, ASS, ASM	32
– max. no. drive control functions ASI1, ASP	8
– max. no. of group control functions GSA1, GSV	8
– max. no. of lines in the structure list	3045
– Length of historic values list (bytes)	512
– Design of shared memory (see “Addressing”)	

One line means one entry on the PDDS (programming, diagnostic and display system) or control system operator station. The proper procedure to be followed for structuring the standard functions is shown in the functional block descriptions.

Addressing

General

The signal exchange between the module and the bus system takes place via a shared memory. Here, incoming telegrams to be received by the module and calculated function results which are to leave the module are buffered.

The shared memory has source registers for telegrams to be transmitted and sink registers for telegrams to be received. Register numbers 0 to 63 are defined as source registers and numbers 64 to 191 as sink registers.

The allocation of the module inputs and outputs to the shared memory registers is determined from the PDDS or the control system operator station on the basis of data supplied by the user.

The user data are in the form of address lists.

Address list for module inputs

In the address list for the module inputs, the source location address of the telegram to be received is allocated to each module input.

The following data result for one module input:

Input	Address
EG1	1, 120, 54, 13, 7
where:	1st No. System no. 2nd No. Multi-purpose processing station 3rd No. Module no. 4th No. Register no. 5th No. Bit no.

If the address list is input from the control system operator station, the process-related KKS designation (Power plant designation system) can be given instead of the complete source location address.

In the case of module inputs which receive their signal via a hardware interface or from the process operator station, special signs (V or L see Functional block catalogue) are used in place of the source location address.

The address list for module inputs thus obtained is translated by the control system operator station or the PDDS into two module-internal lists, a bus address list and an allocation list for module inputs.

The bus address list contains the source location addresses of all telegrams which are to be received by the module.

Telegrams whose addresses are not included in the bus address list are ignored by the module. Received telegrams whose addresses are included in the bus address list are written to the sink register of the shared memory.

In the allocation list, each module input is allocated the shared memory sink register number, and, in the case of binary values, also the bit position of the shared memory under which the telegram meant for it is stored.

However, the microprocessor does not work directly with the allocation list but rather with a duplicate which is stored in a random access memory.

Address list for module outputs

In the address list for module outputs, the complete source location address is specified for each calculated function result that is to leave the module.

Output	Address
AG1	1, 110, 24, 28, 11
where:	1st No. System no. 2nd No. Multi-purpose processing station 3rd No. Module no. 4th No. Register no. 5th No. Bit no.

If several information items are transferred via one output of a standard function in the form of a standard telegram, (see Functional block descriptions), the bit no. is not specified in the address list, since this is already fixed in the standard telegram. The system, station, and module addresses are the same for all module outputs. This information is not taken into account when the address list is input since it is otherwise specified to the module (see Formation of address) and is only of interest for computer-aided planning.

In this way, a module output allocation list is formed from the address list. In this allocation list, each module output is assigned a source register number and a bit number in the shared memory.

The allocation list has the following form:

Output	Address
AG10	28, 11
where:	1st No. Register no. 2nd No. Bit no.

Formation of address

The system and station address is specified jointly for all modules of a multi-purpose processing station by means of a station-bus control module.

The module address is set automatically by plugging in the module into the slot provided within the multi-purpose processing station.

Formation of event

The module is normally requested cyclically by the PROCONTROL system to transmit the information filed in the source registers of the shared memory.

If values change within the cycle time, this is treated as an "Event".

The module recognizes the following occurrences as an event:

- Change of status in the case of binary values
- Change of an analog value by a permanently set threshold value of approx. 0.4 % and elapse of a time delay of 200 ms since the last transfer (cyclic or event).

If an event occurs, cyclic operation is interrupted and the new values are transferred to the bus with priority.

Diagnosis

The received telegrams and the formation of the telegrams to be sent as well as the internal signal processing are monitored in the processing section of the module for error-free operation (Self-diagnosis).

In the event of a disturbance, the type of disturbance is filed in the diagnosis register and a disturbance annunciation is simultaneously sent to the PROCONTROL system.

The module transfers a diagnosis telegram with the data stored in the diagnosis register after the bus grant.

It is also possible to scan the current status of the module and the data at any time from the control system operator station or the 89PT01 (remote diagnosis).

The diagnosis register can be called by specifying the complete address. The diagnosis register has the register number 246 and the data type 0.

Disturbance bit

The telegrams supplied via the bus are partly provided with a fault flag on bit position 0.

This fault flag is generated by the source module on the basis of plausibility checks and the disturbance bit is set to "1" in the event that specific disturbances are present (see Functional block descriptions).

In order to be able to recognize errors during signal transfer, the module also incorporates a feature that monitors the input telegrams for cyclic renewal. If a telegram has not been renewed within a certain time, (e.g. due to failure of the source module), bit 0 is set in the allocated sink register of the shared memory. In binary value telegrams, all the binary values are simultaneously set to "0". In the case of analog values, the previous value is retained. By setting of the fault flag in analog values, the module is prevented from working with a historic value.

A set disturbance bit does not automatically involve a reaction in the sink module. If the disturbance bit of a telegram is to be evaluated, it must be allocated to an input of a standard function during structuring or to a module input during addressing.

External power supply to the RAM

The following means are available for external power supply to the RAM:

- Capacitor for short-term voltage failures (forms part of the module)
- For long-term power supply (module withdrawn), the battery pack 89NB02 can be plugged into the module front (connector X1).

Erasing of the RAM is possible by means of RAM erasing device 89PL01 which can be plugged into the module front (connector X1).

Important:

Battery backup for the RAM of the module is only effective in the event of a power failure if the battery pack 89 NB02 is in place.

Command functions

Actuation by pushbuttons

A maximum of 3 pushbutton commands can be connected to the module inputs T10, T20 and TH. These pushbutton commands can be assigned to each drive or group control function or to a pushbutton selection function using an address instruction. The internal processing of the pushbutton commands is dependent on the activated standard function.

Actuation by higher-level automatic system

A higher-level automatic system controls the module via the station-bus standard interface SS.

Release and protective commands

The logic combinations for release and protective commands are specified as required for the plant involved. Input signals are input via the station-bus standard interface.

Acknowledgement

The module determines any difference between the setpoints and actual values and indicates these through the lamps in the operator's console. Error signals can generally be acknowledged for several modules by pushbutton command TQ.

With binary control, error signals can be acknowledged individually by pressing pushbutton T10 or T20.

With analog control, error signals can be acknowledged individually by pressing pushbutton TH.

Command output

The commands of the drive control function to which the process interface was assigned are output via relay outputs B10 and B20. These actuate, in conjunction with command output BV common to both relay outputs, coupling relays on a two-pole basis.

The switching current for the command outputs is derived from voltage US1. The outputs B10 and B20 incorporate a protective circuit internal to the module.

The expected service life of the relay output stages (relay outputs B10 and B20) is approximately 20 million switching cycles.

The commands of those drive control functions to which no process interface was assigned are out-put via the bus.

Checkback signals from the process

The drive-related checkback signals from the process are connected, in the case of the drive control function to which the process interface was assigned, to the hardware inputs EO/EZ, MFO/MFZ, STA and VO of the module.

The drive control functions without process interface receive their process checkback signals via the bus.

Annunciation functions

Annunciations to the operator's console

A maximum of four lamps can be connected to the operator's console via outputs L10, L20, LM and LH through a direct connection. Output LH is only needed when the module is used as group control module. The direct connection includes input BLS to which the appropriate flashing voltage is connected for the flashing disturbance light.

The voltage for running light BLL is derived from BLS within the module.

The kind of annunciation by steady light, running light or flashing disturbance light is given for each module in the functional block descriptions. It is independent of whether these functions are implemented on the control room coupling module or on the control module itself.

Disturbance annunciations on the module

A light-emitting diode ST is located at the front of the module to indicate 'Module disturbance'. It is used to indicate module disturbances that are filed simultaneously in the diagnosis register.

The blowing of the fuse for US1 is signalled by another light-emitting diode.

The light-emitting diodes L10, L20, LM and LH are activated simultaneously with the corresponding annunciation lamps in the operator's console. They always relate to that drive or group control function to which the control room interface was allocated.

Disturbance annunciations to the alarm annunciation equipment

The alarm annunciation equipment or the facility for communication between the operator and the control system receive disturbance annunciations from the control module via the bus.

Generation of disturbance annunciations

The disturbance annunciations are generated by the microprocessor according to a program specification. This is explained in the functional block descriptions for each module task.

Operating modes

Normal operation

In normal operation, signals arriving via the bus and the process and control room interfaces are processed according to the data in the structure list.

Depending on this, commands are output to the switchgear, and checkback signals identifying the process status are sent via the bus.

Simulation

The control system operator station or the PDDS permits constant values to be specified to the module for individual module input signals arriving from the transfer system during normal operation. In this case, the information specified in the allocation list for module inputs is overwritten in the allocation list duplicate by constants which are stored in a simulation list.

Signal simulation is indicated at the front by the light-emitting diode SIM.

The light-emitting diode SIM is also set when a "1" signal is present at input VOH of a drive control function or at input S of a pushbutton selection function.

Operation with structure list on RAM memory

An instruction given via the control system operator station or the PDDS allows the structure list stored on the PROM to be duplicated onto the RAM with external power supply. The microprocessor of the control module can also be instructed to work with the RAM instead of the PROM. Modifications and amendments can then be made in the structure list via the control system operator station and the PDDS. The light-emitting diode SIM at the front of the module is also set in this operating mode.

Mechanical design

Board size: 6 units, 1 division, 160 mm deep

Connector: to DIN 41 612

1 x for station–bus connection,
48–pole, edge connector type F
(connector X11)

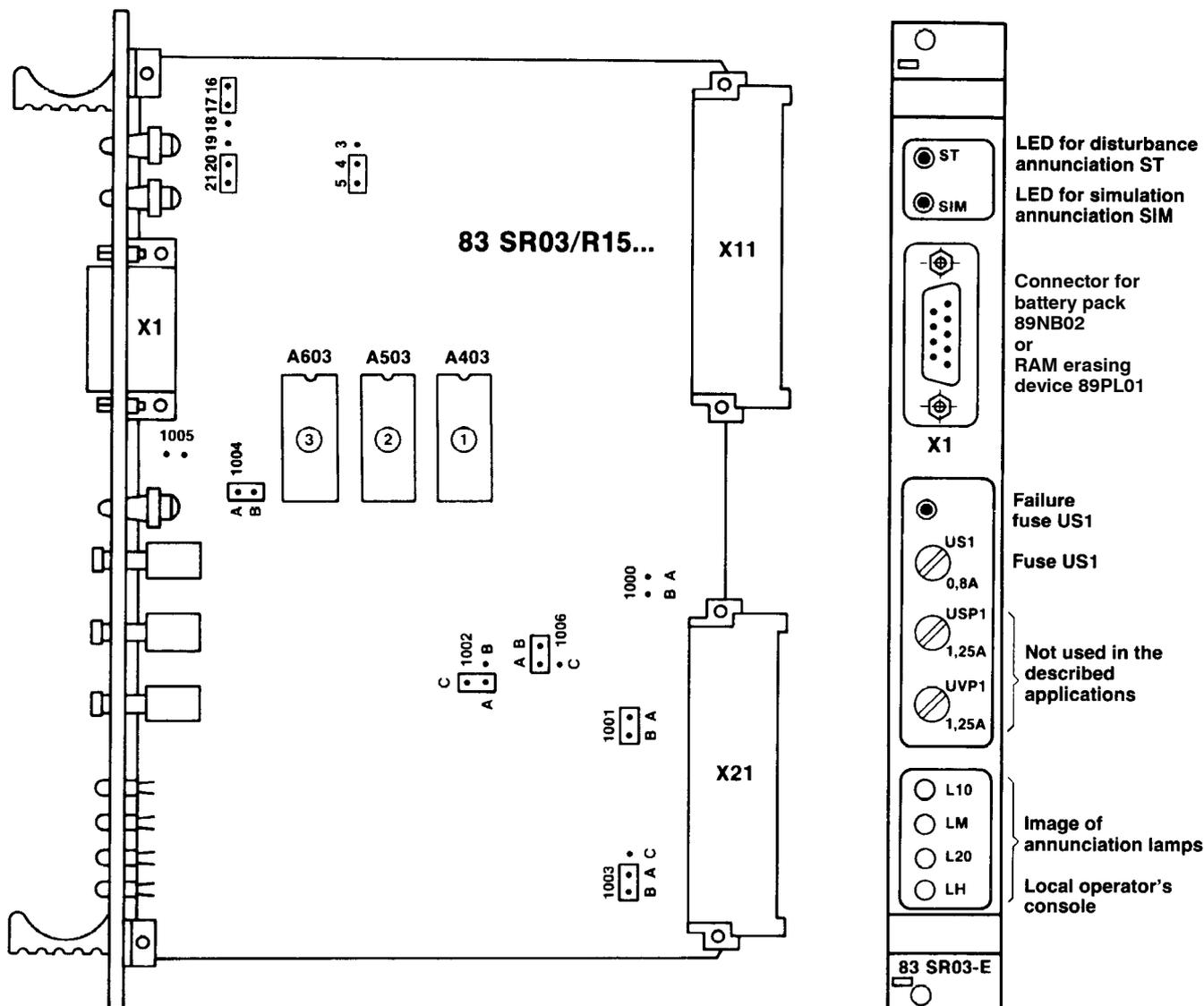
1 x for process connection,
32–pole, edge connector type F
(connector X21)

Weight: approx. 0.55 kg

View of connector side:



Positions of jumpers (As-delivered condition) and memory modules as well as the module's front panel



- ① Memory module A403 for user program (structure and addresses)
- ② Memory module A503 Standard functions
- ③ Memory module A603 Operating program and Standard functions

Notes: A PROM of type 2764 is used as memory module for the user program.
The position of the jumpers is shown on the printed circuit boards.

Technical data

In addition to the system data, the following values apply:

Power supply

Operating voltage	process section	US = +24 V
		UM = +24 V
Operating voltage	BUS section	UD+ = + 5 V
Reference potential	process signals	Z = 0 V
Reference potential	bus section	ZD = 0 V

Input values

Direct connections

BLS – Flashing alarm light		0.5 NL
E10 – Process checkback signal	OFF/CLOSED	5 mA at 48 V
E20 – Process checkback signal	ON/OPEN	5 mA at 48 V
MFZ – Torque monitor	CLOSED	5 mA at 48 V
MFO – Torque monitor	OPEN	5 mA at 48 V
STA – Disturbance in switchgear		5 mA at 48 V
T10 – Pushbutton command	OFF/CLOSE	1 NL
T20 – Pushbutton command	ON/OPEN	1 NL
TF – Pushbutton command	Release	1 NL
TH – Pushbutton command	MANUAL/AUTOMATIC	1 NL
TL – Pushbutton command	Lamp test	1 NL
UA – Reclosing device command	OFF	1 NL
UE – Reclosing device command	ON	1 NL
VO – Local intervention		5 mA at 48 V

Output values

		Power dissipation
B10 – Command output for	CLOSE	$IS \leq 0.3 \text{ A}, \leq 10 \text{ W}$
B20 – Command output for	OPEN	$IS \leq 0.3 \text{ A}, \leq 10 \text{ W}$
BV – Common command output for B10/B20 (wired returnline)		$IS \leq 0.3 \text{ A}, \leq 10 \text{ W}$
Service life of the relay output stage		20 million switching cycles
L10 – Lamp	MANUAL/OFF	100 mA
L20 – Lamp	AUTOMATIC/ON	100 mA
LM – Annunciation lamp		100 mA
LH – Lamp	MANUAL	100 mA

ORDERING DATA

Order number for complete module

Application	Type designation	Order number
Group control Drive control of unidirectional drives Drive control of actuators Drive control of solenoid valves	83SR03–E/R1565	GJR2342800R1565
Continuous control	83SR03–E/R1575	GJR2342800R1575
3–level step control	83SR03–E/R1577 83SR03–E/R1578	GJR2342800R1577 GJR2342800R1578

The differences between each module versions are given under “Application”.

The memory module for the user program has the following order number irrespective of the software version:

Memory module	Position	Type	Order number
User program	A 403	2764	GJTN160212P1

The memories for the standard functions and the operating program have the following order numbers irrespective of the software version:

Software version	Position	Order number
65 Group and drive control	A 503 A 603	GKWE 853 112Pxxxx GKWE 853 111Pxxxx
75 Continuous control	A 503 A 603	GKWE 853 122Pxxxx GKWE 853 121Pxxxx
77 3–level step control	A 503 A 603	GKWE 853 132Pxxxx GKWE 853 131Pxxxx
78 3–level step control	A 503 A 603	GKWE 856 232Pxxxx GKWE 856 231Pxxxx

Note on complete module:

The complete module is supplied with all blank PROMs for the basic and user program under type designation 83SR03–E/R1500, order number GJR2342800R1500. The blank PROMs are not plugged in.

Note on memory modules:

The mounting position of the memory modules on the printed circuit board is shown under “Mechanical design”.

Pxxxx = Position number corresponding to the appropriate revision.

Technical data are subject to change without notice!



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