Module Description

BBC BROWN BOVERI

PROCONTROL 13
Binary Control, Analog Control

Binary Control Module

GKWE 705 316 E, edition 09/86

83 SR10-E /R0100

Application

The module is used for the binary control of power switching devices by means of the IO-bus. It contains 2 function units.

Each function unit can be used for any of the following applications:

- Binary control of unidirectional drive
- Binary control of solenoid valve
- Binary control of actuator (without torque monitor)

If, in the application Binary control of actuator, it is desired to connect also the torque monitors, both function units must be used.

The function units are adapted for the intended application with the aid of module-internal plug-in jumpers.

The module is coupled to the switchgear, the process and the operator's console through cable connections. For this, a process interface and a control room interface are available on the module.

Preset automatic commands and output checkback signals are fed via the bus system. The pushbutton commands can also be preset via the bus system, instead of connecting the operator's console directly via cables.

The module is provided with one direct protective input in the OFF/CLOSED direction for each function unit. This has the same right of access as the corresponding bus input.

In the actuator application, either 2 protective inputs (SZ/SO) or 2 torque inputs (MFZ/MFO) are possible as direct inputs. Both function units are needed in this case.

Features

The module can be plugged into every multi-purpose processing station of the PROCONTROL bus system. It has slot requirement of 1 division. It incorporates a standard interface SEA to the PROCONTROL IO-bus.

The module needs 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 the following elements:
- US1 Pushbutton commands
- US3 Contact transmitters Process
- UV Auxiliary voltage to increase the communication voltage for contact inputs

UM Annunciation voltage for monitoring and annunciation of failure of the operating or communication voltages.

The module terminals connected to UM are short-circuit- proof. Therefore, this voltage is not fused in the module.
If UM fails, the control functions of the module remain fully effective.

Voltage US3 is short-circuit-proof and therefore, does not need a separate fuse.

The operating voltage US, the annunciation voltage UM and the external logic signals are related to the reference potential Z.

The following information is indicated on the front of the module with light-emitting diodes:

- Disturbance in IO-bus section of module		ST
- Disturbance in process section 1/2 of function unit		LM1/LM2
- Status signal	" " 1	L1O/L2O
- Status signal	" " 2	L1O/L2O
- Blown fuse		US1

The function of annunciation lamps LM1/LM2 is not affected if the voltage US fails.

The hex. code switches for setting the address can be set and read through a cut-out on the module front, with the module withdrawn.

Description

BASIC FUNCTIONS

The module receives directly wired signals from the process interface and control room interface. Furthermore, it receives a telegram from the station bus via bus coupling module 88 QT02. The received signals are processed according to the application adjusted by means of plug-in jumpers, and are output via the process interface, the control room interface and the IO-bus.
The signals are output to the IO-bus in the form of a telegram which is sent to the station bus via bus coupling module 88 QT02.

Module-internal processing of the received signals can be varied by means of plug-in jumpers.

DATA INPUT FROM THE IO-BUS

The module receives a telegram which is transferred under its module address n on the IO-bus. This telegram contains the following information:

TELEGRAM STRUCTURE (data type 0)

Code	Information			Bit No.
E16	Protective command or pushbutton command			
	Release FE2	OFF/CL/OP/TF12		15
E15	Release	ON/OPEN	FE2	14
E14	Release	OFF/CLOSED	FE2	13
E13	Automatic command	ON/OPEN	FE2	12
E12	Automatic command	OFF/CLOSED	FE2	11
E11	Pushbutton command	ON/OPEN	FE2	10
E10	Pushbutton command	OFF/CLOSED	FE2	9
E09	Protective command	OFF/CLOSED	FE1	8
E08	Release	ON/OPEN	FE1	7
E07	Release	OFF/CLOSED	FE1	6
E06	Automatic command	ON/OPEN	FE1	5
E05	Automatic command	OFF/CLOSED	FE1	4
E04	Pushbutton command	ON/OPEN	FE1	3
E03	Pushbutton command	OFF/CLOSED	FE1	2
E02	Pushbutton command Release	TF1	FE1	1
E01	-	-		0

The signal on bit position 15 may have several meanings. Its final meaning is determined by means of a plug-in jumper. For this, see "Operating modes".

Transfer takes place serially. Therefore, the processing section performs a serial/parallel conversion of the data.

The telegrams are received via the standard interface SEA which is incorporated in connector X11.

After correct reception of an address and data telegram, an acknowledgement signal is output via acknowledgement line QUT.

BINARY SIGNAL OUTPUT TO THE PROCESSING SECTION

The module forwards the signals of a received telegram to the processing logic only if it

- has made sure, on the basis of check characters in the telegram, that the data are transferred and received correctly.
- has made sure, by comparing the addresses, that the signal is assigned to one of its outputs.

SIGNAL OUTPUT TO THE IO-BUS

After reception of module address n-1, the module transfers a data telegram through its standard interface SEA to the IO-bus.
This telegram contains the following information:

TELEGRAM STRUCTURE (data type 0)

Code	Information		Bit No.
A16	-		15
A15	Common disturb.annunc. switchgear		14
A14	Common disturb.annunc. electronics		13
A13	Checkback sign.command ON/OPEN	FE2	12
A12	Checkback sign.protective command OFF/CLOSED/OPEN	FE2	11
A11	Checkback sign.endpos ON/OPEN	FE2	10
A10	Checkback sign.command OFF/CLOSED	FE2	9
A09	Annunciation lamp LM	FE2	8
A08	Checkback sign.endpos OFF/CLOSED	FE2	7
A07	Checkback sign.protective command OFF/CLOSED	FE1	6
A06	Checkback sign.command ON/OPEN	FE1	5
A05	Checkback sign.endpos ON/OPEN	FE1	4
A04	Checkback sign.command OFF/CLOSE	FE1	3
A03	Annunciation lamp LM	FE1	2
A02	Checkback sign.endpos OFF/CLOSED	FE1	1
A01	-		0

Setting of the module

The settings on the module are performed using address switches S1, S2 and S3, as well as plug-in jumpers (see "Operating modes").

SETTING OF ADDRESS

The module address is set on the module by means of the address switches S2 and S3.

The address is set with the module withdrawn.

The first address switch is permanently wired in the module. The position is marked by 0 imprinted on the module front above the cutouts for switches S2 and S3.

- Possible settings of the hex. code address switches:

1.Addr. switch S1 (not available)	2.Addr. switch S2	3.Addr. switch S3
always 0	adjustable 0 - F	adjustable 0 - F (even)

The address set on the address switches is the starting address of the module. It can be read on the front of the module. A telegram is received under this address from the IO-bus.

When the module is used in connection with a bus coupling module 88 QT02, value 0 must be set on the address switch S1 (it is permanently set).

By setting the first address switch to position "0", the bus coupling module 88 QT02 is notified that no specification telegrams are transferred by the module.

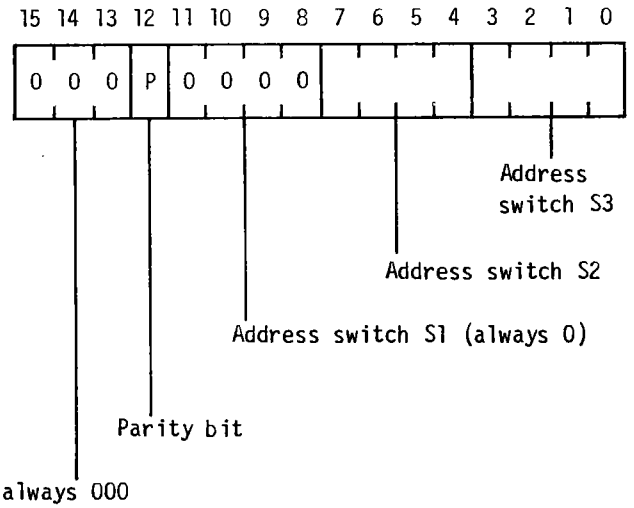
Data communication with the module

FORMATION OF ADDRESS

The bus control module transfers address telegrams of 16 bit length to cyclically call the individual modules of the IO-bus.

Every incoming address is compared by the module with its own module starting address.

The address transferred by the bus control module and required by the module for comparison is as follows:



The module responds when in the address telegram

- bit 13, 14, 15 = logic "0".
- the transferred address agrees with the address set on the module.
- the sum of all bits set to logic "1" is odd (parity check).

Telegram conversion

One data telegram is received from and one data telegram is transferred to the IO-bus by the module. The data telegram (see data input) received under the module starting address is present statically until the next data telegram intended for this address is received. The contents of the telegram is transferred to the processing logic of the module.

If the module fails to be called by the IO-bus for any time, the command outputs to the process (B11, B12, B21, B22) are set to zero (see "Operating modes" jumper 1000).

The data telegram for transfer to the IO-bus is called and transferred under module address n+1 (for contents, see signal output to the IO-bus). The data telegram is transferred by means of the data lines DAT and $\overline{\text{DAT}}$ to the IO-bus.

- Correct reception of an address and data telegram is acknowledged via acknowledgement line QUT of the IO-bus.

Command functions

The description refers to the first function unit. The second function unit operates analogously.

ACTUATION BY PUSHBUTTONS

The module is controlled from the operator's console via pushbutton inputs T11, T12, or by bus signals via inputs E03, E04.

Command output by the pushbutton inputs T11, T12 is only effective in connection with hardware input TF. Command output via inputs E03, E04 is only effective in connection with input E02.

ACTUATION BY HIGHER-LEVEL AUTOMATIC SYSTEM

Actuation by a superposed automatic system is effected via bus inputs E05 and E06.

RELEASES

The On and Off commands from pushbuttons and from the automatic system are only effective if the releases for IN and OUT are satisfied. The corresponding release signals arrive via bus inputs E07 and E08.

When the operator's console is directly connected, so that the commands arrive via inputs T11, T12, a plug-in jumper can be used to change over between release from the bus or fixed setting of a logic 1 signal.

PROTECTIVE COMMANDS

Actuation by protective commands is possible via hardware input S11 or bus input E09.

When the module is applied for Binary control of actuator, protective inputs S21 or E16 of the second function unit can be additionally used. In this case, the inputs have the following meaning:

S11/E09	Protective command OFF/CLOSED SZ
S21/E16	Protective command ON/OPEN SO

In this application, the second function unit cannot be used otherwise.

Protective commands have priority over all other commands while present and are not subject to release.

PRIORITIES

Pushbutton commands and protective commands from the hardware interface have the same priority as the corresponding bus signals E03, E04, S11 (SZ).

All OFF/CLOSED commands S11, T11, E03 have priority over the ON/OPEN commands S12, T12, E04.

COMMAND OUTPUT

Command output is via the relay outputs B11 and B12. These actuate coupling relays on a 2-pole basis, in connection with the common command output BV1. Command output BV is normally referred to the reference potential Z.

The switching current for the command outputs is normally derived from the voltage US1.

Outputs B11 and B12 are provided with a module-internal protective electric circuit in the module.

COMMAND STORAGE

The question of whether or not commands are to be stored module-internally, depends on the intended application. The desired mode can be set by means of plug-in jumpers.

DIRECT CONTROL OF SOLENOID VALVES

Instead of supplying the command outputs with voltage US1, it is also possible to feed them with the external voltage USP (+24 V). In this case, solenoid valves can be controlled directly with an operating voltage of 24 V, without coupling relays.

Additionally, the common command output BV can be supplied with the external voltage UVP (- 24 V), instead of with Z.

In this case, solenoid valves can be controlled directly with an operating voltage of 48 V without the need for coupling relays.

Voltages UVP/USP are protected external to the module. Switching-over for direct control is only possible once for each module.

Annunciation functions

ANNUNCIATIONS TO THE OPERATOR'S CONSOLE

3 Lamps L11, L12 and LM1 can be directly connected to the function unit in the operator's console. To obtain a flashing light for disturbance annunciation, the control room interface is provided with input BLS to which the corresponding flashing voltage is connected.

ANNUNCIATION TABLE

Pos.	System status	L11	LM1	L12
	Steady states			
1	Is OFF/CLOSED	●	○	⊗
2	Is ON/OPEN	⊗	○	●
3	Disturbance	○	◒	○
4	Lamp test	●	●	●

Legend:

Steady light ●

Lamp dark ⊗

Disturbance flashing light ◒

Signalling according to respective status ○

If the flashing light voltage is missing, it is also possible to switch over to steady light (UM) for signalling (see "Operating modes").

ANNUNCIATIONS ON THE MODULE

A light-emitting diode ST is arranged on the front of the module.
The red light-emitting diode ST is connected with the bus line SME.
It emits a steady light when a disturbance annunciation is transferred via bus line SME.

A blown fuse for US1 is signalled via a further light-emitting diode.

The light-emitting diodes L10, L20 and LM1 (1.FE) light simultaneously with the corresponding annunciation lamps in the operator's console.

ANNUNCIATIONS TO THE IO-BUS

The disturbance annunciation SME as well as the checkback signals A01...A16 are output via the standard interface SEA.

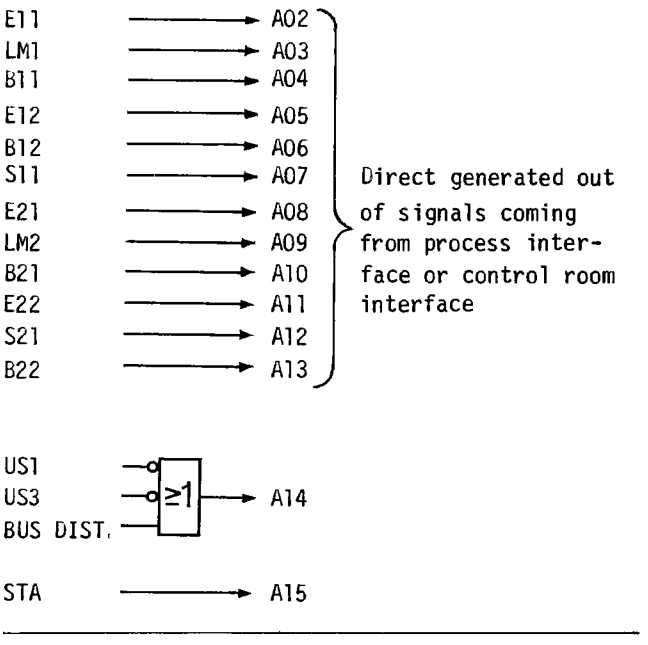
They are generated as follows:

Disturbance annunciation SME

- If the module fails to receive a valid address telegram and a faultless data telegram at least every 7 seconds.
- If one or more of the bus connecting lines are interrupted or disturbed.
- If disturbances occur in the internal sequential cycle.

In all three cases, the light-emitting diodes ST, LM1 and LM2 are activated on the front of the module in addition to the annunciation line SME to the IO-bus. The annunciations are set as long as the disturbances are present.

CHECKBACK SIGNALS TO THE IO-BUS



Operating modes

The operating modes are set by means of plug-in jumpers on the module.
The plug-in jumpers have the following meaning:

1000	Reception monitoring		AB ⟶ active	
1001	Command output power supply	B11 ... B22	AB ⟶ US1	AC ⟶ USP
1002	Actuation of relays		AB ⟶ US1	AC ⟶ USP
1003	Reference potential for	BV1/BV2	AB ⟶ Z	AC ⟶ UVP
1004	Power supply	LM1/LM2	AB ⟶ UM	AC ⟶ BLS
1005	Auxiliary voltage input	S21	AB ⟶ UV	-
1006	Auxiliary voltage input	S11	AB ⟶ UV	-
1007	Deactivation via MFO	(S21)	AB ⟶ Yes	AC ⟶ No
1008	Through connection	S21	AB ⟶ B21	AC ⟶ B12
1009	Deactivation via MFZ	(S11)	AB ⟶ No	AC ⟶ Yes
1010	Through connection S11 to B11		AB ⟶ Yes	-
1011	Storing command output	B12	AB ⟶ Yes	-
1012	Storing command output	B11	AB ⟶ Yes	-
1013	Release for ON/OPEN	(FE1)	AB ⟶ E08	AC ⟶ logic 1
1014	Release for OFF/CLO SED	(FE1)	AB ⟶ E07	AC ⟶ logic 1
1015	Pushbutton TF for	FE2	AB ⟶ E02	AC ⟶ E16
1016	Release for ON/OPEN	(FE2)	AB ⟶ logic 1	$\overline{AC}$ ⟶ E15
1017	Relase for OFF/CLO SED	(FE2)	AB ⟶ E14	$\overline{AB}$ ⟶ logic 1
1018	Deactivation of	B12 with opposite command	AB ⟶ Yes	-
1019	Deactivation via MFZ	(S21)	AB ⟶ Yes	AC ⟶ No
1020	Deactivation of	B11 with opposite command	AB ⟶ Yes	-
1021	Deactivation of	B22 with opposite command	AB ⟶ Yes	-
1022	Deactivation of	B21 with opposite command	AB ⟶ Yes	-
1023	Through connection	E16	AB ⟶ B11	AC ⟶ B21
1024	Storing command output	B22	AB ⟶ Yes	-
1025	Storing command output	B21	AB ⟶ Yes	-

According to the intended application of the module, a wide variety of defined combinations exists for the plug-in jumpers.

The following variants result for each function unit (FE), depending on the drive to be actuated and the place where the the control function is implemented (on 83 SR03 R15.. or directly on 83 SR10):

Variant	Application	Implement. of control function
1	Unidirectional drive	SR03/ASE
2	Solenoid valve	SR03/ASM
3	Actuator w/o torque monitoring	SR03/ASS
4	Actuator w torque monitoring	SR03/ASS
5	Step control	SR03/ASI
6	Unidirectional drive	SR10
7	Solenoid valve	SR10
8	Actuator w/o torque monitoring	SR10
9	Actuator w torque monitoring	SR10

Depending on the combination of the variants on both function units, the main applications of the module are as follows:

Application	Actuation of
FE1/FE2	
11	2 unidirectional drives
22	2 solenoid valves
33	2 actuators without torque monitoring
40	1 actuator with torque monitoring
50	1 motor-driven actuator
66	2 unidirectional drives
77	2 solenoid valves
88	2 actuators without torque monitoring
90	1 actuator with torque monitoring

The application numbers are also the "Software version" of the module.

The applications specified above are explained in the Application Description 83 SR10.

Apart from these main applications, the module can also be used for combined control of e.g. a unidirectional drive and an actuator without torque monitor. Depending on the combination in the function units, the follwing applications (68, 86, 13, 31) result, which are not explained in detail in this description.

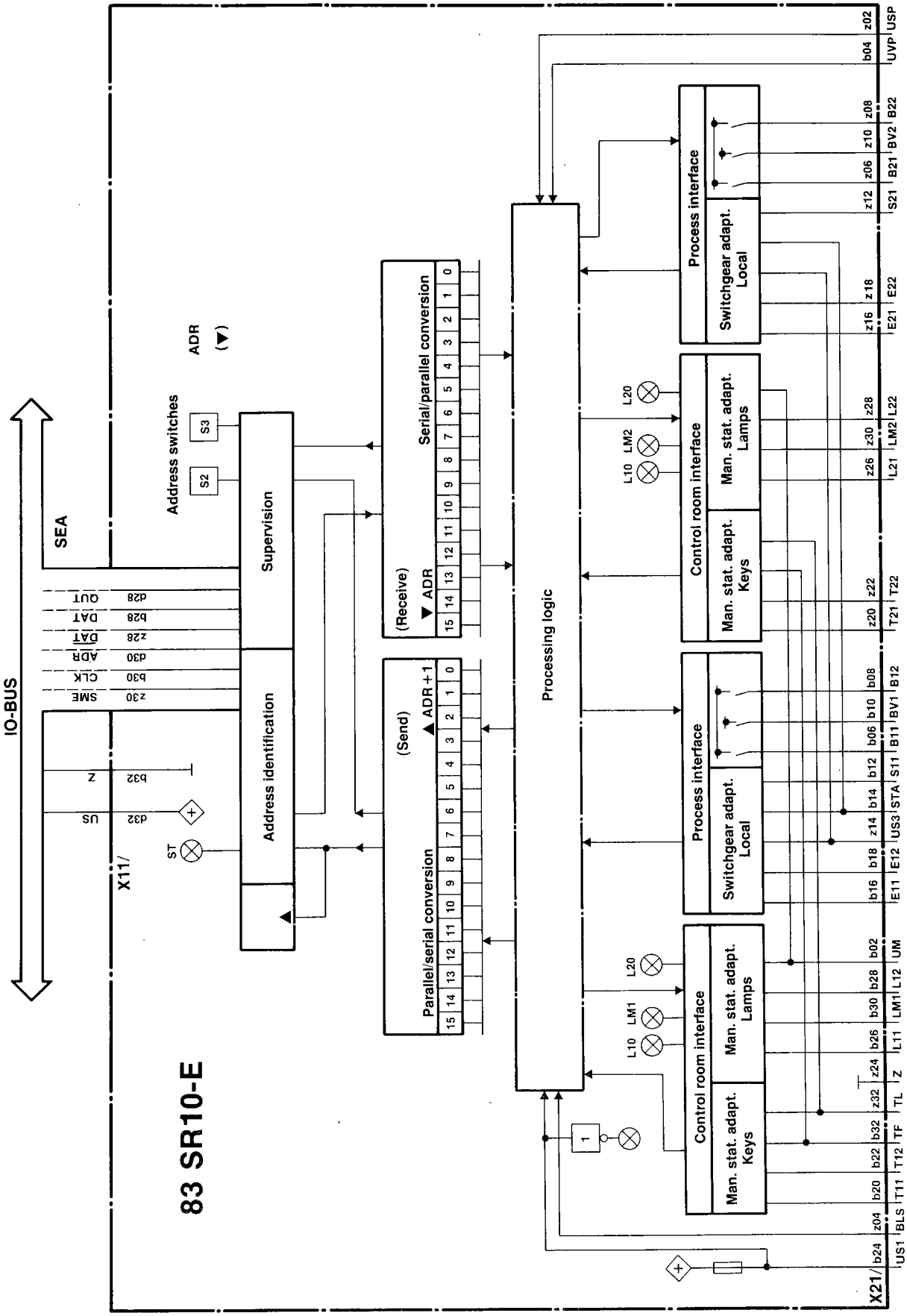
COMPLETE DESIGNATION OF THE MODULE

The designation of the module is made up of the hardware version and the designation of the application.

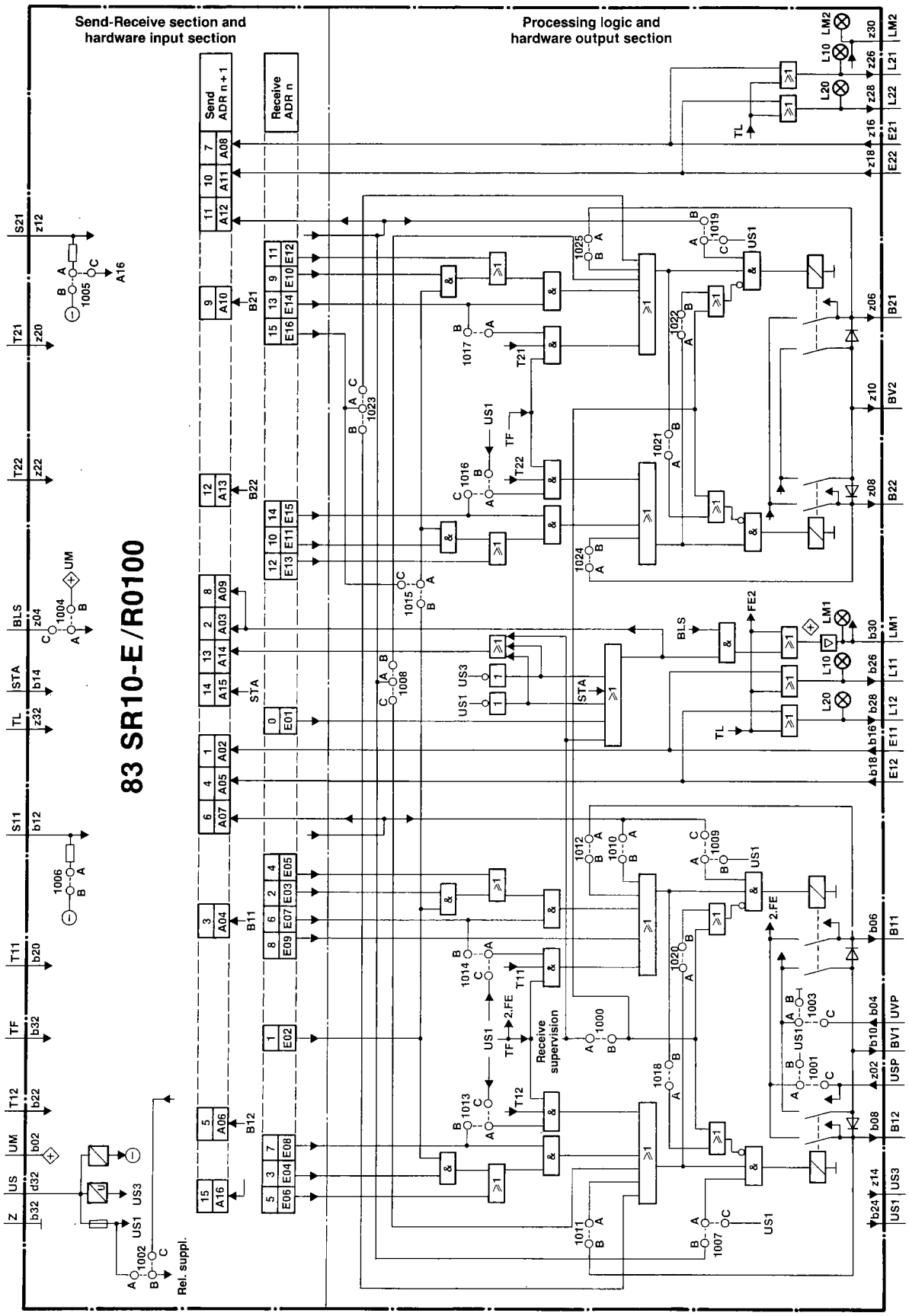
For the application "Control of unidirectional valve" in both function units, e.g. the designation 83 SR10/R0111 results.

Nevertheless, the designation 83 SR10/R0122 must always be used for addressing an intercommunication of the module with the PDAG.

Functional diagram (overview)



Functional diagram Processing logic



Mechanical design

Board size 6U, 1T, 160 mm deep

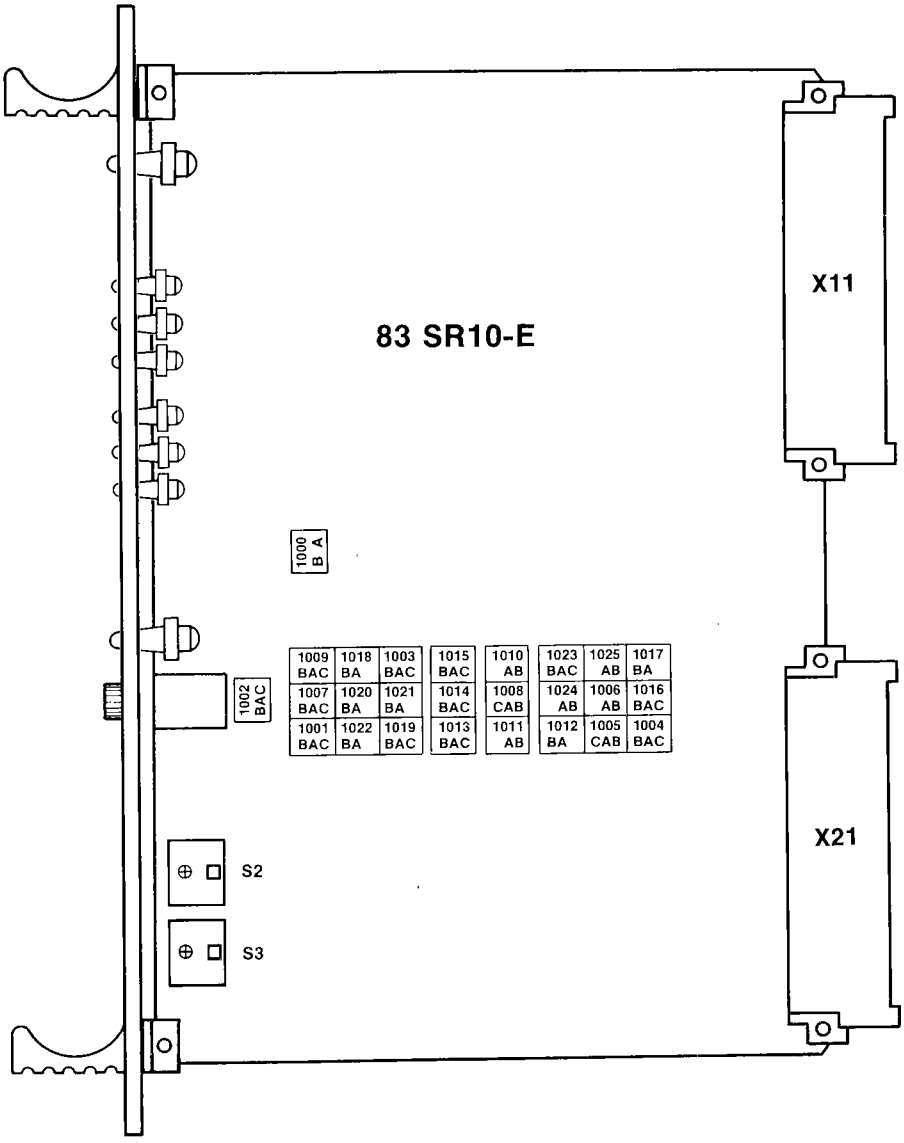
Connector according to DIN 41 612

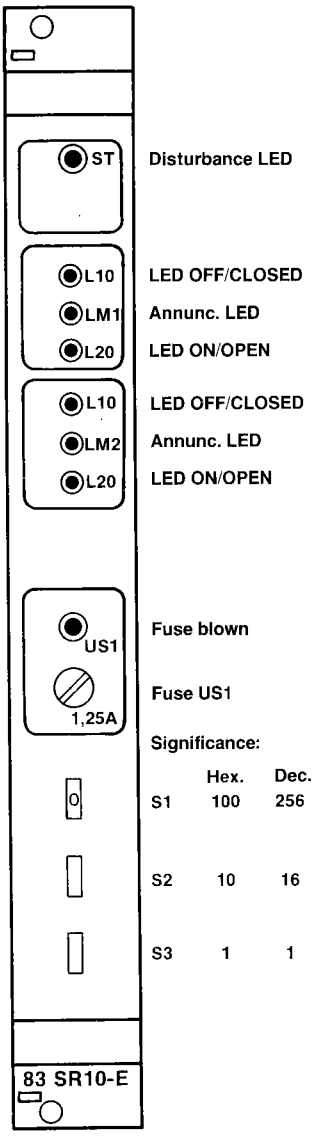
1 x for IO-bus connection and power supply
48-pole, edge connector type F
(connector X11)

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

Weight: approx. 0.45 kg

View of connector side





Technical data

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

POWER SUPPLY

Operating voltage of process side	US	= +24 V
Annunciation voltage	UM	= +24 V
For direct actuation of solenoid valves (optional)	USP	= +24 V
	UVP	= -24 V
Current consumption	I_{typ}	= 160 mA
Power dissipation	P_{vtyp}	= 3.8 W

The values specified for I_{typ} and P_{vtyp} apply for unloaded outputs. To obtain an exact value, the output loads must be added.

Reference potential IO-bus Z:	0 V
Input/output designation:	SEA - standard interface IO-bus

INPUT VALUES

Direct connections

BLS	- Flashing light		0.5 NL
E11, 21	- Process checkback signals	CLOSED OFF	5 mA at 48 V
E12, 22	- Process checkback signals	OPEN ON	5 mA at 48 V
STA	- Disturbance in switchgear		5 mA at 48 V
T11,T21	- Pushbutton command	OFF/CLOSED	1 NL
T12, 22	- Pushbutton command	ON/OPEN	1 NL
TF	- Pushbutton command	Release	1 NL
TL	- Pushbutton command	Lamp test	1 NL
S11,S21	- Protection	OFF/CLOSED	2 NL
	when used as torque monitoring input		5 mA with 48 V

OUTPUT VALUES			Load capacity
B11,B21	- Command output for	OFF/CLOSED	$I_S \leq 0.3$ A; ≤ 10 W
B21,B22	- Command output for	ON/OPEN	$I_S \leq 0.3$ A; ≤ 10 W
BV1,BV2	- Common command output for B11/B12 or B21/B22 (wired checkback line) with actuation via USP/UVP		$I_S \leq 0.3$ A; ≤ 10 W $I_S \leq 1$ A; ≤ 60 W; ≤ 60 V
L11,L21	- Lamp for	OFF/CLOSED	100 mA
L12,L22	- Lamp for	ON/OPEN	100 mA
LM1,LM2	- Annunciation lamp		100 mA

Fuse for US1	1.25 A fast-acting
Type of fuse:	Fuse link 5 x 20 mm according to XN 400.325
Short-circuit-proof output US3	
Maximum output currents permissible at US1, US3 (common to both function units)	IS1 = 0.15 A IS3 = 0.04 A with lamps L11,12 and L21,22 connected (100 mA each) otherwise, IS3 = 0.3 A

ORDERING DATA

Complete module:

Type designation: 83 SR10-E/R0100	Order number: GKWE852600R0100

Technical data are subject to change without notice!

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