Application

The protection cabinet is designed to house 3 PROCONTROL stations, each for a maximum of 50 PROCONTROL input, output or processing modules.

The arrangement of the stations is shown in Figure 7. The stations are coupled by the RS485 interface to the remote-bus connection in a separate sub-rack.

The cabinet is intended for redundant power supply (cf. Figure 4).

The connection to the redundant remote bus is established with the modules 88FT05, 88TK05 in the form of single- or double-channel circuitry.

For provision of power supply and fusing of solenoid valves, the optional supply module 89NG11 is available (version R0300 for 24 V solenoid valves, version R0400 for 48 V solenoid valves).

Description

The mechanical structure of the protection cabinet is shown in Figure 1.

For the purpose of installation, maintenance, and operation, the cabinet is accessible from the front and the rear. The cabinet is designed for natural cooling. The cooling air enters the cabinet from the front and the rear through ventilation grids with filter mats in the doors and leaves it again through the roof plate which is of grid-type design (protection type IP30).

Each cabinet has a partition wall on the left side. For single-cabinet or row-type installations, the cabinet on the left end needs an additional side wall and the one on the right end needs a partition wall and a side wall. The lock on the door is a built-in 3 mm two-way rod-type locking mechanism.

The cabinet is equipped with:

4 sub-racks, 24 inch wide, each for 26 electronic modules, utilization limited by the maximum power dissipation of the cabinet (cf. chapter on “Cabinet equipment”), a power supply module for power distribution.

Process connection is established via a signal distribution strip on the rear of the cable compartment. Below the signal distribution strip, the terminal strip for the solenoid valves is mounted.

The EMC-proven protection cabinet is intended to be installed in dry, clean and vibration-free areas of normal industrial design.

On the right side of the roof facing strips (front and rear), 4 borings are provided for attaching the cabinet designation plates. The plates are attached by means of 2.5 x 6 mm grooved drive studs.
Figure 1a: PROCONTROL PF-protection cabinet with 4 sub-racks, 24 inch wide, 160 mm deep with remote bus
Figure 1b: View of the power supply units in the protection cabinet
Remote-bus coupling

Mechanical design

Cabinet design

The protection cabinet design is based on ABB’s MNS system. The cabinet has double-wing doors in the front and in the back which are provided with ventilation slots, a roof plate made of expanded metal and a full-metal partition wall. The cabinets are suitable for row installations.

A 75 x 75 mm cable duct on the bottom frame and a 75 x 100 mm cable duct below sub-rack G on the cabinet rear allow cross-cabling from cabinet to cabinet. The partition wall is designed with suitable cutouts.

Accessory parts

For each cabinet in the case of single-cabinet installations or for each end cabinet in the case of cabinet-row installations, the following accessory parts need to be ordered additionally:

- For left-end cabinet
  1 side wall

- For right-end cabinet
  1 side wall and
  1 partition wall

- For single cabinet
  2 side walls
  1 partition wall

Cabinet installation

The cabinet is installed on a base frame where the cables are introduced from below. Floor mounting is in the form of screw-type mounting. For this purpose, there is one boring provided per corner in the transverse sections.

For cabinet ventilation, free outlet of air from the roof plate is to be ensured; 20 cm minimum space required between roof plate and ceiling.
Electrical design

Figure 4: Power supply, cabinet annunciations and remote-bus coupling
Power supply
The protection cabinet receives a redundant 24 V DC supply from two separate power supply systems. The power supply module is responsible for supply voltage monitoring, voltage limitation, circuit formation, and power distribution.

For selective cabinet connection and disconnection, 2 high-capacity m.c.b.s are provided. As protective devices, they merely fulfill a back-up function and can respond selectively with respect to the external cabinet fuses. The redundant 24 V DC power supplies are kept separate and non-interfering up to each individual electronic module.

System settings

| Module slot | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Mounting raster element | 104 | 100 | 96 | 92 | 88 | 84 | 80 | 76 | 72 | 68 | 64 | 60 | 56 | 52 | 48 | 44 | 40 | 36 | 32 | 28 | 24 | 20 | 16 | 12 | 08 | 04 |

Sub-rack A

| Address | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Address setting | 89TK05 | 88TK05 |

Sub-rack D

| Address | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Address setting | 89TK05 | 88TK05 |

Sub-rack G

| Address | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Address setting | 89TK05 | 88TK05 |

Sub-rack K

| Address | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 |
| Address setting | 89TK05 | 88TK05 |

Sub-rack Z

| Address | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Address setting | 89TK05 | 88TK05 |

*Rear view of sub-rack

Figure 5: Address setting
**Address setting**

Throughout the PROCONTROL system, each electronic module is assigned a specific module address. This module address is determined by the mounting location of the module. For each sub-rack, the module addresses are set by means of jumpers SRA and GTA5 on the identical 89IL07 station-bus p.c.b. cf. Figure 5.

The setting is done in the factory and must not be changed. The station addresses are set on station-bus coupling module 88TK05.

**Operating mode setting**

The operating mode is set on the 89JL07 station-bus printed circuit board in rack Z by means of jumpers X101 to X104. This setting is done in the factory and must not be changed.

**Remote-bus connection settings**

In the last stations, the remote bus must be provided with the remote bus termination on remote-bus junction module 88FK05. (See: Module Description 88FK05-E (R0100)

**Screen and protective conductor**

In addition to the connections of the redundant power supply, each cabinet is equipped with a screen connection for the earthing of the cable screens of the process cables, and an earth connection for the earthing of the casing.

For process cables with foil screens, screen connection elements are provided which are connected directly to the cabinet frame. The tracing wires of the screens are to be connected to these elements in the shortest possible way (max. 5 cm).

**Annunciation system**

**see Figures 1 and 4**

In the 89NG08 power supply module, the individual cabinet signals are scanned and are put out as general signals for further annunciation purposes. On the front of monitoring unit A1 of the supply module, the following annunciations are provided:

Cabinet annunciation's

- Power supply A available USA
- Power supply B available USB
- Flashing voltage available BLS
- Lamp check TL ( not used)
- Cabinet door open MTK (Optional)
- Cabinet temperature too high MTE

Station annunciation's

<table>
<thead>
<tr>
<th>Station</th>
<th>1 2 3 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Supply m.c.b. off</td>
<td>MSP1 x x x -</td>
</tr>
<tr>
<td>- Power supply disturbed</td>
<td>MSP2 - - - -</td>
</tr>
<tr>
<td>- Power supply disturbed station-bus termination 1</td>
<td>MSP3 x x x -</td>
</tr>
<tr>
<td>- Power supply disturbed station-bus termination 2</td>
<td>MSP4 x x x -</td>
</tr>
<tr>
<td>- Electronic module disturbed</td>
<td>MST x x x -</td>
</tr>
<tr>
<td>- Temperature fault optional for additional fans</td>
<td>MTE x x x -</td>
</tr>
</tbody>
</table>

x = connected
- = not used

For cabinet annunciation's, the following signal outputs are available:

- Cabinet disturbance, optional for cabinet-lamp H20 LMF
- Cabinet disturbance, optional for cabinet-row lamp H21 LMRA

For evaluation in a central annunciation system, for each of the 2 stations, the following general signals are put out on the bus via bus-coupling module 88TK05

- Cabinet door open (optional) MTKG
- Temperature fault MTEG
- Power supply okay MW (closed-circuit principle)

Bus-coupling module 88TK05 puts out signal MST to the power supply module in order to energize the cabinet and/or cabinet row lamp.

Cabinet lamp H20 and/or cabinet row lamp H21 can be activated optionally. The disturbances are annunciated by light-emitting diodes on the front of the disturbed module. Signaling for bus terminations 88TB07 is done by light-emitting diodes of monitoring unit A1 on the front of the power supply module.
Terminal assignments

**Power supply**

Supply A, terminal strip X1, (Figure 4)
- 1,2 US
- 3,4 Z

Supply B, terminal strip X1, (Figure 4)
- 7,8 US
- 5,6 Z

Protective conductor PE, screw-type connection (Figure 4)
- PE

**Remote bus**

Line A, remote bus coupling module A3 (Figure 1)
- X1.1 Screen coming
- X1.2 Signal α coming
- X1.3 Signal β coming

- X2.1 Screen going
- X2.2 Signal α going
- X2.3 Signal β going

Line B, remote bus coupling module A4 (Figure 1)

Terminal assignment see Line A

**Process cables**

The process cables are connected to signal distribution strips on the rear of the cable compartment. For this purpose, the standard version is provided with 50 rows of 8-pole connectors. The other 50 rows are used for connecting the input and output modules. Additionally, 88 terminal blocks (11 x 8) with screw-type and Terminus Point connections are available for connecting solenoid valves.

**Options**

Door contacts, connector X6 (Figure 4)
- 2 MTK
- 1 UM

Cabinet lamp, connector X7 (Figure 4)
- 10 UM
- 11 TL
- 8 LMF
- 9 Z

Cabinet row lamp, connector X7 (Figure 4)
- 7 LMRA
- 5 Z
- 4 UM

**Tests and inspections**

For quality assurance, each cabinet is inspected for completeness and proper mechanical functions.

An unequipped cabinet cannot be checked for proper electrical functions. Instead, a wiring inspection is carried out. The insulation resistance is tested according to the identical standards VDE 0160 or VDE 0660, part 500/IEC 439-1.

Fan set on sub-rack (Figure 4).
The connection is made by means of plug-in poles on station-bus p.c.b. 89IL07

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X203</td>
<td>USA</td>
</tr>
<tr>
<td>X202</td>
<td>USB</td>
</tr>
<tr>
<td>X201</td>
<td>Z</td>
</tr>
<tr>
<td>X213</td>
<td>ML2</td>
</tr>
</tbody>
</table>
Cabinet equipment

In case all available slots are used for modules of elevated power dissipation values, the limit value for the permissible power dissipation at a max. ambient temperature for the cabinet may be exceeded. Above the permissible power dissipation values, an additional ventilation facility is required, cf. “Options”.

<table>
<thead>
<tr>
<th>Slot</th>
<th>Module type</th>
<th>No. of modules station/ cabinet</th>
<th>Room temp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>TK TK</td>
<td>x x x x x x x x x x x x x x x x</td>
<td>81EU01</td>
</tr>
<tr>
<td>D</td>
<td>TK TK</td>
<td>x x x x x x x x x x x x x x x x</td>
<td>83SR04</td>
</tr>
<tr>
<td>G</td>
<td>TK TK</td>
<td>x x x x x x x x x x x x x x x x</td>
<td>81EU01</td>
</tr>
<tr>
<td>K</td>
<td>x x x x x x x x x x x x x x x x</td>
<td>81EA04</td>
<td></td>
</tr>
</tbody>
</table>

Considering plant-specific factors of simultaneous operation and considering a supply voltage of 27 V at the module terminals, the cabinet may be equipped according to the table below without additional ventilation measures being required.

In the case of any deviations from the pattern shown above, special attention is to be paid to even equipment arrangement and to the total power dissipation of the cabinet.
Options

To meet specific plant requirements optional solutions are available.

Protection type

The grid-type roof plate (IP30) can be provided with an additional full-metal protective sheet (IP31) or be replaced by another protective sheet (IP11). The height of the cabinet will then be 2,290 mm.

Door locks

The 3 mm two-way key lock can be exchanged for a 5 mm two-way key lock, catch-type or T-handle.

The rod-type lock for a 3 mm two-way key can be exchanged for a rod-type lock with a locking cylinder for 3 mm or 5 mm two-way key inserts, catch-type or T-handle.

Cabinet and cabinet row lamps

A cabinet lamp can be provided on the protection cabinet front for the annunciation of cabinet disturbances.

In addition to the cabinet lamp, a cabinet row lamp can be activated. This cabinet row lamp annunciates disturbances within a cabinet row and is mounted on the front side of a cabinet row.

Coatings

Upon request, special coatings of different shades or coat thickness may be applied.

Door contacts

The cabinet can be monitored for open doors by means of additional door limit switches. The limit switches are activated by the right door leaf of the double-wing door.

Additional ventilation

To provide for the discharge of elevated power dissipation values, the following possible additional ventilation solutions are available:

Additional ventilation with air suction facility

A roof plate allowing a ventilation duct to be attached, including various accessories, designed to connect the protection cabinet to a central ventilation system:

- Ventilation duct, complete to be attached to a cabinet row
- Ventilation duct, complete to be attached to a cabinet row including cloth nozzle in the top center for connecting a duct system
- Ventilation duct cover complete cover closing off the ventilation duct at the end of a cabinet row
- Ventilation duct cover with cloth nozzle complete cover for the ventilation duct closing off the ventilation duct at the end of a cabinet row plus connection to a duct system.

When the cabinet is retrofitted for being connected to an air suction facility, the rear cabinet doors need to either be sealed off against air inlet or replaced by closed doors with sealing strips.

Additional ventilation by means of a fan set

The fan set is designed to provide ventilation for the individual sub-racks. The fan set is installed in the air inlet area of the sub-racks. The electrical connection is established via plug-in connections at the 89IL07 station-bus p.c.b..

Solenoid-valve supply module 89NG11

For the power supply of the solenoid valves, the protection cabinet can be equipped with supply module 89NG11/R0300 (for actuators at 1 voltage supply: positive, 24 V) or 89NG11/R0400 (for actuators at 2 voltage supplies, positive and negative, 48 V).

48-pole connectors and interpolation point US/Z

When the 81AR01 relay output modules are used, sub-rack G or K (or G and K) has to be equipped with 48-pole connectors, type F.

For interpolation point US/Z of the 89NG11 for the power supply of the 81AR01 relay output modules, 0.8 x 6.3/0.8 x 2.8 mm bus bars have to be mounted on the rear of the sub-rack where the 81AR01 modules are installed.

- In the case of installation on sub-rack G or K: X111 up to X118
- In the case of installation on sub-rack G and K: X111 up to X122

Cf. Figure 6.
Interpolation point US/Z of 89NG11
for voltage supply of
relay output modules 81AR01

in case of mounting on subrack G or K

Subrack:

Rear view

Installation of 48-pole connector strips
and interpolation point US/Z acc. to: GKWD 982 589 R0100 (subrack G)
GKWD 982 589 R0200 (subrack K)

Interpolation point US/Z of 89NG11
for voltage supply of
relay output modules 81AR01

in case of mounting on subrack G and K

Subrack:

Rear view

Cable duct

Installation of 48-pole connector strips
and interpolation point US/Z acc. to: GKWD 982 589 R0300

Figure 6: Interpolation point US/Z
Application options

* Option

Figure 7: Arrangement of stations and different versions of protection cabinet 89MS04/R1200
Technical data

**Mechanical features**

**Dimensions**
- **Height**: 2200 mm (2290 mm with optional full-metal roof cover)
- **Width**: 900 mm
- **Depth**: 400 mm

**Installation**
- Single-cabinet or cabinet-row installation with free access from the front and the rear side

**Weight**
- Approx. 230 kg without modules installed

**Protection type**
- IP30 (IP11, IP31 possible with optional roof covers)

**Connections**
- **Power supply (X1)**: Screw-on terminals, 35 mm²
- **Remote bus (A3,A4)**: Screw-on terminals, 4 mm²
- **Process signals**: To process modules
  - MTP 2.4 x 0.8 flex. up to AWG 20
  - MTP = Maxi-Termi-Point
- **Cable screens**: Voltage bus ZEP
  - of the process cables 6.3/2.8 mm plug-type connection flex. up to AWG 20
- **Cabinet and cabinet rows disturbance lamp (X3)**
- **Fan set**: Plug-in connector at connection pole
  - 0.6 x 0.6 mm on station bus p.c.b.
  - 89IL07. Connecting lines and plug-in connectors are part of the fan set

**Color**
- Sheets, RAL 7032
- Profile sections, matt white

**Surface protection**
- Profiles and cable compartment zinc-coated.
- Sheets with EC standard enamel with kiln-dried top coat.
- Visible outside elements with pulverized coating in addition to EC standard enamel. Minimum coat thickness 60 ... 90µm.

**Ambient conditions**

**Bearing temperature**
- -40 ... +70 °C

**Operating temperature**
- 0 ... +40 °C, DIN VDE 0160, IEC 68–2–2

**Relative humidity**
- DIN IEC 721–3–3, code letter 3K3, 5 ... 40 °C

**Power dissipation**

- **Per cabinet**
  - when power dissipation is distributed rather evenly in the cabinet
    - Natural ventilation in the case of room temperature
      - up to 25 °C power dissipation = 640 W
      - 30 °C power dissipation = 525 W
      - 35 °C power dissipation = 420 W
      - 40 °C power dissipation = 310 W
  - Additional ventilation with air suction in the case of room temperature
    - up to 25 °C power dissipation = 950 W, 140 m³/h
    - 30 °C power dissipation = 950 W, 185 m³/h
    - 35 °C power dissipation = 950 W, 265 m³/h
    - 40 °C power dissipation = 950 W, 530 m³/h

- **Per sub-rack**
  - in the case of unsymmetrical distributed and/or higher power dissipation of the cabinet
    - Additional ventilation with fan set in naturally ventilated cabinet up to max. 300 W per sub-rack in the case of room temperature
      - from 25 °C and power dissipation > 150 W in the sub-rack
      - 30 °C and power dissipation > 125 W in the sub-rack
      - 35 °C and power dissipation > 100 W in the sub-rack
      - 40 °C and power dissipation > 75 W in the sub-rack
Electrical features

Power supply

Voltage \( U_N = 24 \text{ V DC}, \) tolerance at supply terminal 22.0 ... 30.0 V
Harmonics \( \leq 5\% \) depending on connection to an unfiltered three–phase bridge connection
Over voltage
- 35 V / 500 msec
- 45 V / 10 msec
- \( 2 \times U_N \) at \( T = 0.4 \text{ msec} \) half-value duration (over voltage-strength class 2)

DIN VDE 0160 (draft)

Voltage variation
- during connection and disconnection \( \geq 0.2 \text{ V/msec} \)
- during operation, 19.5 V up to 30.0 V Arbitrary
Admissible voltage-free interval \( \leq 1 \text{ msec} \)
Current \( I_N = 32 \text{ A}, \) depending on equipment installed
Starting current inrush \( I = 10 \times I_N, \) max. 3 msec (capacitor loading)
Back-up fuse Max. 63 A gL
Min. short-circuit current \( \geq 100 \text{ A} \) at the cabinet supply terminals
Protective measures for power supply and process connections Functional extra-low voltage with safety isolation, protective conductor connection for local equipotent bonding

Electrical environment

Electrostatic discharge 8 kV (air discharge)
- 4 kV (contact discharge)
DIN EN 61000-4-2, IEC 1000-4-2
Fast transients/pulses (burst) 2 kV
for power supply DIN EN 61000-4-4, IEC 1000-4-4
Surge voltage 2/1 kV
for power supply DIN EN 61000-4-5, IEC 1000-4-5

Scope of supplies

The Boiler protection cabinet 89MS04/R1200 (order number GKWE 982 490 R1200) is supplied tested and ready for connection.

The scope of supplies does not include:
- The electronic modules to be mounted on the sub-racks,
- Accessory parts and options according to the list given under „Ordering data”.

The scope of supplies does include:
- All fixed and wired electrical operational equipment,
- Fixing material of cabinet installation (screws, bolts, clamping straps, disks); delivered with the cabinet, separately packed.
- Bus-terminating resistors.
- Plugs in the signaling and annunciation circuit for connecting the power supply unit.

The data listed above apply to cabinets with PROCONTROL standard equipment.
ORDERING DATA

Order number: GKWD 982 490 R1200

Protection cabinet 89MS04/R1200, complete

Accessory parts
At the end of a cabinet row
and for single cabinet installations

Partition wall and mounting material GKWE 602 306 R0011
Side wall and mounting material GLBK 300 022 R0001

Options
Door contacts for right door, front and back
incl. installation and wiring GKWE 602 331 R0003
Cabinet lamp incl. mounting and wiring GKWE 602 330 R0003
Cabinet row lamp incl. mounting and wiring GKWE 602 369 R0003
Supply module 89NG11 for solenoid valves 24 V GKWN 000 339 R0300
Supply module 89NG11 for solenoid valves 48 V GKWN 000 339 R0400
48-pole connector strips on G sub-rack GKWD 982 589 R0100
48-pole connector strips on K sub-rack GKWD 982 589 R0200
48-pole connector strips on G and K sub-rack GKWD 982 589 R0300
Special enamelling (shade and layer thickness) Order in clear text

Optional exchange parts
Rod-type lock for two-way key 5 mm GLBK 470 016 R0001
Rod-type lock with catch-type handle GLBK 470 016 R0003
Rod-type lock with T-handle GLBK 470 016 R0004
Rod-type lock for lock cylinder, 3 mm two-way key GLBK 470 016 R0018
Rod-type lock for lock cylinder, 5 mm two-way key GLBK 470 016 R0017
Rod-type lock for lock cylinder, catch-type handle GLBK 470 016 R0019
Rod-type lock for lock cylinder, T-handle GLBK 470 016 R0020
Roof cover (without grid) GKWE 601 128 R0002
Spare filter mat GKWE 601 879 P0001

For optional additional ventilation with air-suction facility

Double-wing door in the back, without door lock to be exchanged for air-suction application GKWE 602 160 R0022
Roof sheet, complete for ventilation duct GKWE 602 317 R0011
Ventilation duct, complete GKWE 600 843 R0001
Ventilation duct, complete with cloth nozzle GKWE 600 843 R0002
Ventilation duct cover GKWE 600 862 R0001
Ventilation duct cover, complete with cloth nozzle GKWE 600 862 R0002
* = accessory parts for roof sheet with ventilation duct

For optional additional ventilation with fan set

Fan set GKWE 602 436 R0100

Technical data are subject to change without notice!
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