System description

ABB Procontic T300
Multiprocessor Control System
Planning

Order number
GATS 1315 11 R2001

ABB Schalt- und Steuerungstechnik GmbH

ABB
ASEA BROWN BOVERI
Regulations

Regulations concerning the setting up of installations

Apart from the basic "Regulations for the setting up of power units" VDE 0100 and for "The rating of creepage paths and air gaps" VDE 0110 the regulations "The equipment of power units with electrical components" VDE 0160 in connection with VDE 0660, part 500, have to be taken into due consideration. Further attention has to be paid to VDE 0113 in case of the control of working and processing machines. If operating elements are to be arranged near shock-hazard parts with protection against electrical shock, VDE 0106, part 100, is relevant.

The user has to ensure that the units as well as the associated components have to be installed according to these regulations. Respectively valid safety regulations, e.g. regulation for the prevention of accidents and the law concerning technical working material, are valid for machines and units connected as well.

ABB Procontic units have been built according to VDE regulation 0160. The protection against direct touching as demanded by chapter 5.5.1 of this VDE regulation has to be satisfied by the user, e.g. at installing of switch cabinet.

ABB Procontic units have been designed for operation according to insulation class A of VDE 0110. If considerable pollution is expected during operations, the units have to be installed in housings of the respective kind of protection.

* VDE stands for "Association of German Electrical Engineers".

Note: Please observe the national regulations for the installation of electrical equipments, which are valid in your country.

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The configuration manual should show the user how to install an ABB Procontic T300 system into the cabinet. The wiring is explained. The electrical installation guidelines for the system are described. 0 V wiring, protective conductors and the voltage supply of the subrack are described with the corresponding power supply unit. The connection of the fan levels, in- and outputs and the connection of the process plugs is included. Certain monitoring functions in the system, which can be important for the user, are also included in the instructions.
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1.1 Cabinet structure with a subrack

The automation system ABB Proconic T300 can be assembled in 2 ways:

Wall mounting in switch cabinets or in clean, dry electrical operating areas (see Fig. 1–2)

Front mounting (19" installation frame) as a cabinet installation in cabinets with a ventilation slot (IP20 type of protection in clean, dry rooms) or in closed cabinets (IP54 type of protection, with a heat-exchanger or cooling units, if necessary).

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**Fig. 1–1: Proconic T300 cabinet with a subrack**

**Important note:**

1. The bus bars for the "earths" (functional earth 0V, screen earth SE, protective earth PE) are installed in the bottom of the switch cabinet. The filter, power supply unit and control transformer are arranged above this and over this come the subracks for the central units and extension units.

2. There is room below the central units and the extension units for a cable duct level. The spatial requirement for the cable duct level depends on the connections to be laid and is to be taken from the cable duct level section.

3. A fan level 34 LU 31 is to be installed below the cable duct level of the central unit. This has a height of 88.7 mm (2 height units).
Access to the rear is not required to start and maintain the ABB Proconic T300 system. It is, however, required for the installation. The 0 V of the voltage Ub1 of the subrack 35 GS 91 must be connected to a faston blade on the rear (see Fig. 2-1). The connection of the subrack 35 GS 93 (see Fig. 2-5) and the fan level 34 LU 31 (see Fig. 2-3) is also on the rear or to be carried out before the installation.
1.1.2 Heat conduction

The occurring power losses and the environmental conditions must be known for the selection of the cabinet for the ABB Proconic T300 system. While the ambient conditions, such as temperature, humidity, dust, chemical influences, are derived from the location (height above sea level) and the decision for an enclosed or an open cabinet is made according to this, the power losses must be estimated at least in accordance with the data in the system description. It may be necessary to provide several fans or even a heat exchanger on the wall of the switch cabinet due to the determined power losses.

A calculation of the power loss of all the parts located in the cabinet must be carried out for the switch cabinet draft.

DIN 57 660, part 500 or VDE 0660, part 500, can be used for the calculation of the heat output over the cabinet surface.

1.1.2.1 Closed cabinets, e.g., IP54

Internal convection (up to 180 W)

Heat conduction only via the cabinet walls; only a small power loss is therefore permitted. A heat pile-up generally occurs at the top of the cabinet.

Forced circulation by the level fan (up to 380 W)

The forced circulation by an inner fan prevents a pile-up of the heat and creates an improvement of the heat exchange via the cabinet walls.

Forced circulation with a heat exchanger (up to 2000 W)

The enlarged surface of the corrugated profile wall and the forced circulation on the outside and inside enable a considerable heat output.

1.1.2.2 Open cabinets, e.g., IP20

Draft ventilation (up to 500 W)

The heat is generally output via the air moved by its own thermal behaviour (chimney effect) and also via the cabinet walls to a small extent.

Draft ventilation with an external fan (up to 1000 W)

The heat output is increased by force with a large amount of air passing through.

The following points are to be noted with all these measures concerning the heat output:

The permitted ambient temperature for the Proconic T300 of 55°C may not be exceeded. The permitted ambient temperature is defined as the entry temperature of the air below the respective subrack.

The fan belonging to the subracks must be operated correctly depending on the ventilation of the switch cabinet.

The air suction must be designed so that an "air short-circuit" does not occur.

A pile-up area must be available above the fan level. An even air current without eddies is achieved in the subrack above in this way.

An output area is to be provided above the uppermost subrack, so that the emerging air can escape freely.
Dimensional diagrams for the creation of the cable duct levels are included in the following figures.

The following table gives information concerning the number of wires, which can be laid in a cable duct of a certain size.

<table>
<thead>
<tr>
<th>Height units HU</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duct size, mm</td>
<td>60x60</td>
<td>60x100</td>
<td>60x150</td>
<td>60x200</td>
</tr>
<tr>
<td>Wire cross-section $A_{\text{max}}$ (outer diameter)</td>
<td>Number of lines, which can be laid in the cable duct (number of wires)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25mm$^2$</td>
<td>Ø 1.3mm</td>
<td>1065</td>
<td>1775</td>
<td>2662</td>
</tr>
<tr>
<td>0.50mm$^2$</td>
<td>Ø 1.8mm</td>
<td>555</td>
<td>925</td>
<td>1388</td>
</tr>
<tr>
<td>0.75mm$^2$</td>
<td>Ø 2.0mm</td>
<td>450</td>
<td>750</td>
<td>1125</td>
</tr>
<tr>
<td>1.00mm$^2$</td>
<td>Ø 2.1mm</td>
<td>408</td>
<td>680</td>
<td>1020</td>
</tr>
<tr>
<td>1.50mm$^2$</td>
<td>Ø 3.5mm</td>
<td>146</td>
<td>244</td>
<td>367</td>
</tr>
<tr>
<td>2.50mm$^2$</td>
<td>Ø 3.9mm</td>
<td>118</td>
<td>197</td>
<td>295</td>
</tr>
</tbody>
</table>

Table 1–5: Filling degree of the cable duct level

The space required below the subrack depends on the number of the modules to be wired up, on the number of connections and on the wires used (wire cross-section, outer diameter).

**Example:**
14 plug positions were occupied by input/output modules in the subrack for central units with a total of 16 plug positions (35 GS 91/93). The front plug 35 ST 90 has 40 connection points.

This results in theoretically $14 \times 40 = 560$ connection points. If these connections are all to be output on one side of the cable duct and if wires with a cross-section of 1 mm$^2$ are used, a duct size of at least 60 x 100 mm is required. 3 height units are foreseen as the spatial requirement below the subrack.

The space above the cable duct is to be used to label the plug positions (which subassembly, which address setting, etc.).
1.1.4 Front panel

Front panels are required for the assembly of cable ducts in 19" switch cabinets. They can also be produced by the operator as required. A dimensional drawing of the front panel follows.

Fig. 1-7: Front panel for the cable duct level
1.1.5 Installing the units

The units may only be connected or disconnected with the voltage switched off.

Attention is to be paid that the voltage supply of the subrack as well as that of the process is switched off.

The individual units may only be contacted at the parts shown.

Static charges caused by an unsuitable environment (e.g. statically charged carpet) or items of clothing, which favour a charge, are to be avoided.

When installing the units, attention is to be paid that the earth connectors for the front panel (behind the key-boards) are pushed into the earth connectors on the side of the subracks. If the units are inclined too much, the earth connectors are bent and the bus plug guide to the bus bar is no longer guaranteed.

The units are to be secured against accidentally becoming free, e.g., due to vibration.

If not all the plug positions are occupied in the subracks by units, dummy covers 35 FB 90 are to be put on the plug positions. It is prevented in this way that the air blown in by the fan level escapes at the front.
It is absolutely necessary (EMC and VDE regulations) to separate the total installation structure in the power unit and control unit.

The subrack of the Proconic T300 and other control elements, such as, e.g., SIGMA-tronic in- and output units, belong to the control unit.

The input signals, the current supply for I/Os, the output lines in the lower range of voltage up to 60 V, which are not connected mechanically, can be laid together in one cable duct.

It is necessary to keep voltages > 60 V, power supplies, mechanically connected lines, connected lines of inductive consumers (breaks, solenoid valves, heaters, motors) and protective conductors away from the control and to arrange them, so that they cannot be contacted in any case, in one duct. This is for reasons of interfering radiation.

Note:
In order to reduce the inductive resistance of the line, its cross-section is to be on the generous side.

Flexible lines are to be used exclusively in order to avoid interference of a high frequency.

At least 2 sockets (220 V) for the connection of the programming unit and printer are to be installed in the switch cabinet (same current circuit as the supply voltage for the control). The protective earth of these sockets must be connected to the protective conductors of the subrack supply voltages. This is required to avoid equipotential bonding currents, which can destroy the printer, programming unit, etc., interfaces under certain circumstances.

The installation of the ABB Proconic T300 control is subject to the regulations given in the system description, leaf 2, Hardware.

Special attention is to be paid when earthing the system.
Protective measures against interference cannot be rectified, if they were not carried out correctly. They should be carried out exactly according to the electrical installation guidelines for ABB Proconic T300 controls.

A main switch for the voltage supply of the subracks, signal encoders and signal receivers is to be provided in accordance with VDE 0113 or a safety isolation possibility according to VDE 0100, parts 410 and 480 (is also guaranteed by securing the outgoing cables in the low voltage distribution).

24 V DC lines may not be wired up together with lines of a greater voltage in a common cable.

Auxiliary bars or L+ and L- duplicators are recommended to distribute the current circuits for the signal encoder and the signal receiver can be isolated in groups.

L- of the current circuits for the signal encoder is to be connected with "PE" when using non-floating in-/output subassemblies.

Mounting rails for the subracks, the central units and extension units must be connected to "PE" with lines, which are larger than 4 mm² as a protection against electrical interference.

The power supply connections for the subrack, the fan and the control current circuits can be carried out with smaller line cross-sections without an additional safety precaution being necessary, if the spur lines are < 3 m and laid so that they are protected against short-circuits and with an earth.

2.1 Voltage supply
A distinction is to be made between the subrack 35 GS 91 (Un1 = 220 V AC) and 35 GS 93 (Un2 = 24 V DC) when connecting the voltage supply.

The protective conductor is to be connected to the subrack with a 6.3 mm faston plug and to the PE bus bar.
2.2 Connection and wiring for the 35 GS 91

2.2.1 35 GS 91 Voltage supply

The connection of the primary supply voltage for the 220 V AC power supply unit is carried out on the front via a supplied power supply plug. It is protected by a fuse integrated in the power supply unit and accessible by the front (3.15 A, time-lag).

2.2.2 35 GS 91 Connection of 0 V

The 0 V connection of the 35 GS 91 is located on the rear of the subrack. The connection to the 0 V bus bar is carried out via a 6.3 mm faston connection with a flexible cable with a cross-section of 6 mm² (blue or black).

2.2.3 35 GS 91 Connection of the protective conductor PE

The PE connection of the 35 GS 91 is located on the right-hand side of the subrack. The connection to the PE bus bar is carried out via a 6.3 mm faston plug with a flexible cable with a cross-section of 6 mm² (green/yellow).

Note when installing the subrack:
The 0 V faston and the PE faston are to be connected to a wall before installing the subrack into a cabinet or mounting the cabinet.

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Fig. 2-1: Rear view "35 GS 91"
2.3 Connection and wiring of the 35 GS 93

2.3.1 35 GS 93 Voltage supply

The voltage supply UN2 = 24 V DC is to be connected to the rear of the power supply unit 35 NE 93 with a 6.3 mm faston plug. +UN2 is to be connected to the 15-polar socket connector of the power supply unit 1 with terminal 28 and -UN2 with terminal 24.

The power supply unit 35 NE 93 must be supplied via a power supply unit R 503.1 (order number: GHR5030001R1) and a series-connected power supply filter (CORCOM, EMI6VV1, 220 V AC, 50–60 Hz) in order to guarantee observing the interference suppression according to VDE0871, "Curve B".

The user himself is responsible for the observance of the interference suppression degree when using other series-connected power supply units (220 V DC or AC/24 V DC).

The power supply unit 35 NE 93 is protected in the input circuit with a fuse 10 AF. The fuse can be accessed by dismantling the power supply unit and unscrewing the lower cover of the casing.

Attention:
The balancing/installation regulations must be observed when using two power supply units 35 NE 93.

2.3.2 35 GS 93 Connection of 0 V

The 0 V connection of the 35 GS 93 is located on the rear of the subrack. The connection to the 0 V bus bar is carried out via a 6.3 mm faston connection with a flexible cable with a cross-section of 6 mm² (blue or black).

2.3.3 35 GS 93 Connection of the protective conductor (PE)

The PE connection 35 GS 93 is located on the left-hand side of the subrack. The connection to the PE bus bar is carried out via a 6.3 mm faston connection with a flexible cable with a cross-section of 6 mm² (green/yellow).

![Diagram of power supply connections](attachment://diagram.png)

Fig. 2–2: Connection of the voltage supply 35 GS 93 with a filter

Note for installing the subrack:
The 0 V faston and the PE faston are to be connected before installing the subrack into a cabinet or mounting the cabinet onto a wall.
Fig. 2-3: Rear view "35 GS 93" assembled with two 35 NE 93

Attention: The wiring of the bus printed board and the power supply unit are not shown for a better clarity.

6.3 mm faston plug with a flexible cable of 6 mm² to the PE bus bar.
2.4 Connecting the fan level

The terminal block to connect the fan level is located on the rear. The terminal assignment can be taken from leaf 2, Hardware, Chapter 3.1, 35 GS 81.

If a fan level 34 LU 31 R2 is used, attention is to be paid to the fact that the power supply voltage for the fan is not laid together with the signal cable of the air outlet switch or confused with it when connecting the second air outlet switch.

The electrically isolated contacts (Nos. 1-3) of the second air outlet switch should be used for further operations of the air current signals.

If contact no. 2 is used for the evaluation via an input card, contact no. 1 must be connected to the required 1 signal (+24 V or +48 V) and contact no. 3 with the corresponding 0 signal (0 V).

The contact no. 2 has a 1 signal with an air current smaller than 50% of the max. possible air current when evaluating the second air outlet switch.

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2.5 Earthing the front panels (VDE 0160)

The front panels are connected with the protective conductor during the insertion into the sub-rack for sub-assemblies with life front panels. This occurs by earth connectors on the front panels and earth sockets, which are connected to the side of the subrack (VDE 0160).

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2.6 Connection of non-floating in-/outputs

The connection of the digital (binary) inputs is carried out for every binary input unit according to leaf 2, Hardware.

All the 0 V connections of the supply voltages of analogue and digital encoders or electrically active, non-floating setting elements are to be made with a flexible
cable with a cross-section > 4 mm² on the 0 V bus bar (e.g., 0 V (24 V digital inputs), 0 V (24 V digital outputs)). The voltage sources should be mounted in the ABB Procontic T300 cabinet.

2.7 Connection of electrically isolated in-/outputs

See the system description, leaf 2, Hardware

e.g. 35 AB 95, 35 AB 97 and 35 EB 92
The installation aid is required, if the wiring must be carried out on site and without units. The installation aid is screwed onto the upper and lower installation rails of the subrack and allows a maximum of 7 front plugs 35 ST 90 to be fixed without subassemblies being present.

Fig. 3-1: Function of the installation aid
Fig. 3-2: Installation aid for wiring the front plug
1. A supervision using the level coupler 35 EK 90/91 is not possible

2. The supervision is to be carried out for the subrack

3. All the relevant functional blocks (PLC, CNC etc.) are to be monitored.

Fig. 4-1: Supervision of the entire system
Principle:
The Master PLC is responsible for supervising the Slave PLC and the subracks. The Master PLC is monitored by a second, external logic.

Slave PLC supervision
A signal exchange is carried out between each program of the Slave PLC to be supervised and the program of the Master PLC via super global values. The Master PLC outputs a signal; this is read by the Slave PLC and output as another super global value. The Master PLC reads this signal, inverts it and outputs it again. If the two programs (Master PLC and Slave PLC) are being processed, the signal oscillates. The time of the oscillation is monitored. If a malfunction occurs, the signal remains in status "0" or "1".

Subrack supervision
At least one binary output unit (subrack 1, 2) is located in the Slave levels. 1 channel each is required from these output units for the supervision. A binary input unit (subrack 3) is located in a Slave level. As is shown in Fig. 1, an output of an output unit from subrack 1 and subrack 2 is to be connected with an input of the input unit. A signal is exchanged via the subracks to be monitored as described in section "Slave PLC supervision".

The Master level is monitored by the external logic "07 ZW 80".

Monitoring the entire system
The entire system is monitored by an external logic. The supervision is carried out by exchanging a signal within defined times. If the signal exchange does not occur, a malfunction is registered.

The control of the external logic is carried out with the "Subrack supervision". If the external logic is to be controlled separately in order to create greater clarity in the case of a malfunction, another output channel is required.

More details can be taken from the data page of the cycle supervision 07 ZW 80 R2.

PLC program
A coupling element for the programming and test software 907 PC 32 was designed in order to simplify the programming of the supervision function for the user.
Fig. 4-3: Earthing diagram of the ABB Procontic T300 system

Combine all the 0 V connections of the supplies of non-floating I/O

Earth the screens with a clip directly after introducing them into the cabinet

Steel cabinet
Rear view

6.3 faston 0 V

6 mm²

16.5 mm²

Foundation earth