Module Description

PROCONTROL
Power Supply

Power Supply Module for Generation of Station Bus Voltages

89NG03 /R0001/R0002/R0003

Application

The power supply module 89 NG03 is used for switching and generating the voltages required in a station bus subrack of a PROCONTROL multi-purpose processing station. Since each module subrack has its own voltage supply, the power supply devices are used altogether 4 times for the multi-purpose processing station.

The printed circuit board 89 IL01, although a self-contained module, is a permanent accessory to the power supply module 89 NG03. It is provided with a row of connectors for connecting cable and for forming a support point (see module description GKWE 705 445).

Features

The power supply module is fed via a plug on the front panel. The process voltage US = +24 VDC is switched depending on the internal voltage UD. The process voltage UV = -24 VDC, the reference conductor Z, the annunciation and flashing voltage are only connected through the module.

The voltages UB+ = +24 VDC and UD+ = +5 VDC (with reference conductor ZD) on the bus side and required by the modules are generated via DC/DC converters and are potential-isolated.

Caution:
The module must not be plugged or withdrawn when live, in order to prevent destruction.

The voltages US, UB+ and UD supplied to the station bus are monitored by the module. In the event of a disturbance, an annunciation and/or switchoff takes place.

Voltage supply

The following description of the essential functions of the module refers to the function diagram.

Feed in

The module is supplied with the system voltages USE (+24 VDC) and UV (-24 VDC) together with the reference potential Z via the connector X1. The power supply (USE,Z) takes place twice (once for the output US, once for UB, UD) in order to keep the voltage drop in the supply line to a minimum. The 6-pole connector is located on the front of the module.

The annunciation voltages UM and UMM as well as the flashing voltages BLS1, BLS1 and BLM1 are connected via the connector X3 on printed circuit board 89 IL01. The power supply module receives the voltage UMM (see "monitoring") via an auxiliary connector.

Preparation of the station bus voltages

The positive voltage USE supplied via the connector X1 is switched by the power supply module as a process voltage US to the station bus backplane via a switching stage (see "Monitoring"). This voltage is fused in the module. The fuse is located on the front of the module.

The negative voltage UV is supplied directly to the station bus backplane without a fuse and without a switching stage. This also applies to reference conductor Z which is shared by US and UV.

The modules on the station bus, however, additionally require the voltages UB+ = +24 VDC and UD+ = +5 VDC on the bus side with the common reference conductor ZD.

These voltages are generated potential-isolated by the power supply module 89 NG03. The module has a DC/DC converter with two separate outputs, which is supplied with a positive power supply voltage USE. The voltage UB+ (+24 VDC) is sent to the backplane via a switching stage (see "Monitoring"). The voltage UD+ (+5 VDC) is sent directly to the backplane. ZD is the common reference conductor for UB and UD.

The voltages UB and UD are regulated as a function of UD. The voltage UB is variable, i.e. the output voltage is changed within the permissible limits depending on UD and the connected load.

The module has an internal and external tap for the actual voltage value. If the sensor line is open the voltage UD is controlled to a fixed value on the module output terminals, irrespective of the connected load. If the sensor line is connected (R+ R-), the output voltage on the connection point of the sensor line is controlled to a constant value.

With PROCONTROL, the sensor line is connected in the middle of the station bus backplane. In this way, voltage drops in the supply line caused by changes in the load current (e.g. by plugging in an additional module) are stabilized.
Monitoring

The outputs US and UB are monitored for undervoltage and the output UD is monitored for overvoltage and undervoltage. If the monitoring facility responds, there is an annunciation (see "Annunciation functions"). US and UB are tapped from the module output voltage, whereas UD is tapped from the sensor line F.

In addition to the monitoring of voltages with purely an annunciation function, the module also has an overvoltage and undervoltage monitoring facility with switchoff function.

The following switchoff modalities are provided here:

a) Undervoltage of UD +:

When USE is switched on a monitoring period of 15 ms is started as soon as UD + exceeds 0.66 VDC. If 4.6 VDC has not been reached after this time, UD + is switchoff. If UD + falls again below 0.66 VDC, a new start operation is performed. The module is also switchoff if the voltage falls below 4.5 VDC during operation. When the monitoring section responds (disconnection of UD +), the voltages UB + and US are also switchoff via the appropriate switching stages and the RST output (reset signal) is set to "0".

b) Overvoltage of UD +:

Two cases must be differentiated here:

- If the voltage falls below 5.3 VDC ± 0.1 VDC on the sensor line, the module is switchoff (also UB + and US) and is restarted after the voltage has fallen below 0.66 VDC. If UD + then exceeds 5.3 VDC once more, there is a pulse action as with a).

- If 6.25 VDC (5.9 ... 6.6 VDC) on the module terminals is exceeded, a short-circuit thyristor is triggered and the module (also UB + and US) is switchoff. The module can only then be restarted by switching the power supply voltage USE off and on.

The overvoltage monitoring facility can be switchoff by means of a plug-in jumper on the contacts 1 and 2 of connector X7 on the printed circuit board 89 IL01. In this case, the following applies:

Monitoring active: Jumper AG1 to AG2 not plugged in Monitoring inactive: Jumper AG1 to AG2 plugged in

If the overvoltage monitor is switchoff, a zener diode for voltage limitation (load protection) should be installed

c) Overvoltage of UB +:

If the voltage UB + exceeds 29 ... 30.5 VDC, the module is also switchoff (also US and UD +). Also here, the power supply USE must be switchoff and on in order to restart the module.

d) Switchoff function

The module can be switchoff and on externally by means of a switch on the terminal AS1 and AS2.

Contact AS1 — AS2 closed: "Module off".
Contact AS1 — AS2 open: "Module on".

The terminals are located on the printed circuit board 89 IL01, terminal strip X7, terminal 3 + 4.

e) Overvoltage USE

If the input voltage USE exceeds USE 45 VDC, the entire converter is switchoff until the input voltage USE is below 40 VDC. The function is designed to prevent the module from being destroyed in the event of an extreme input voltage.

Test functions

Two sockets US11 and Z are located on the front of the module. A positive voltage of 24 VDC can be tapped from them for testing purposes. This voltage is protected by a fuse on the front of the module.

Annunciation functions

Annunciations on the module

Two green light emitting diodes are located on the front of the module.

The light emitting diode emits a steady light for as long as the voltage US is above 18 ... 20 VDC. It is set back if the monitoring facility detects a fall below this value.

The light emitting diode UB/UD emits a steady light for as long as both voltages are within the permissible range. It is set back as soon as one or both voltages fall below the permissible range.

Annunciations from the module

Both monitoring facilities for US and UB+/UD+ receive the annunciation voltage UMM for their annunciation contacts. If the monitoring facilities respond, the annunciation signal MSP is output as a general annunciation.

In addition, the RST signal is output from the monitoring facility for UB+/UD+. The output RST shows "0" if the voltage UD ± 4.5 VDC and maintains this condition until at least UD ± 0.6 VDC. The voltage drop across the switch is ≤ 0.4 VDC with a current of 3.5 A.

The voltage UD+ = + 5 VDC is switchoff to ZD = 0 V by means of the RST signal via a resistor of 1.8 Ω on the printed circuit board 89 IL01.
Function diagram

89 NG03

X1: Front connector at Module 89 NG03
X2, 3, 4, 6, 7: Connectors on PCB 89 IL01
89 NG03/4

Mechanical design

Board size: 6U 5T, (20 x 5.06), 220 mm deep with PCB 89 IL01

Connectors

for X1 (front) R0001, R0002: Pin connector, 6-pole, Burndy, type ME 8P2 GEO1
for X2 (rear) R0003: Pin connector, 6-pole, Harting, series HAN Q 5/0, size 3A
for lower auxiliary connector (rear) to DIN 41 612 15-pole, edge connector type H; special design with increased current load capacity
Test socket (front) to DIN 41 612 32-pole, edge connector type C
Fuse links for fine-wire fuses: 5 x 20 mm
Weight: approx. 4.6 kg

View of front panel

R0001, R0002:

Do not plug in or withdraw when voltage is present

Style of X1:

Pin assignment X1:
### Technical data

#### Input values

Rated voltage
- **USE** = +24 VDC
- **UV** = -24 VDC

**Z reference potential**

Operating range
- 18.0 ... 33 VDC

Destruction voltage limits
- 0.5 sec 35 VDC
- 10 ms 45 V

Disturbance pulses with a time integral ≤ 500 μs are permissible.

#### Output values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>UD+</th>
<th>UB+</th>
<th>US</th>
<th>UV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated voltage</strong></td>
<td>+5 VDC</td>
<td>+24 VDC</td>
<td>+24 VDC</td>
<td>-24 VDC</td>
</tr>
<tr>
<td><strong>Reference potential</strong></td>
<td>ZD</td>
<td>ZD</td>
<td>Z</td>
<td>Z</td>
</tr>
<tr>
<td><strong>Tolerance static for IN</strong></td>
<td>4.96 ... 5.05 VDC</td>
<td>23.8 ... 24.2 VDC</td>
<td>USE-2 VDC = Input voltage</td>
<td></td>
</tr>
<tr>
<td><strong>Ripple</strong></td>
<td>&lt; 100 mVpp</td>
<td>&lt; 100 mVpp</td>
<td>same as for input voltages</td>
<td></td>
</tr>
</tbody>
</table>

**Current max.**
- 20 A
- 3 A
- 4 A
- 4 A

**Power output max.**
\[ \Sigma 120 \text{ W} \]

**Influence (input voltage, temperature) in load range**
- 0 ... 100 %
- < 2 %
- < 5 %

**Correction time**
- < 1 ms
- < 1 ms

**Current limitation**
- yes
- fuse

**Short circuit peak current**
- 1.2 \( I_{\text{max}} \) at 20 °C
- \( I_{\text{max}} \) at 70 °C

**Overvoltage protection on module output**
- yes
- yes

**Potential isolation**
- yes
- yes

**Sensor line**
- yes
- yes

**Open-circuit-proof**
- yes
- yes

**Short-circuit-proof**
- yes
- yes

**Display**
- LED green
- LED green
- LED green

**Voltage failure dU/dt**
- (U = 10 ... 90 %)
- ≥ 500 mV/ms
- continuous
- ≥ 2 V/ms
- ≥ 0.5 V/ms

#### Transfer values

**Efficiency**
- USE-US ≥ 0.9
- USE-UD,UB ≥ 0.7

**Radio interference**
- to VDE 0675 (< 10 kHz)
- Interference level N
- Limit value class A

**Mains buffering**
- with 0 ... 100 % load
- ≥ 1 ms
Overvoltage-proof

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>35</td>
</tr>
<tr>
<td>10</td>
<td>45</td>
</tr>
</tbody>
</table>

Switchoff for $U_{c} > 45$ V
Disturbance pulses with a time integral
$\leq 500 \mu$Vs are permissible

Protection

Fuse for US G 4 A quick-acting
Fuse for US11 G 0.8 A quick-acting

Special functions

Switchoff of UB and US
Anti-parallel diode to US and UV
Load capacity 4 A

Ambient conditions

Ambient temperature
continuously permissible in operation
-25 °C ... +70 °C
storage temperature
-40 °C ... +85 °C

Humidity resistance
Class F
to DIN 40 000

Mechanical strength
Class Z
to DIN 40 040
For installation in stationary systems subject to vibration

Cooling
Internal convection
(without fan)

Ordering data

Order number 89 NG03: GJR4 503 506 R0001, R0002 R0003

Technical data are subject to change without notice
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