C2.1-12f

# MANUAL

## Thyristor- Motor-Controller
## Classic
## C2.1 230/180 - 12 f

galvanic isolated

UNITEK Industrie Elektronik GmbH

Hans-Paul-Kaysser-Strasse 1
D-71397 Leutenbach 3 - Nellmersbach

Tel.: 07195/9283-0
Fax 07195/928329
email info@unitek-online.de
Http:// www.unitek-online.de

Edition
1104-2

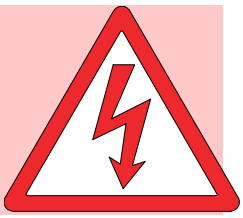
Content

**Content**:

Electronic devices always involve the risk of failure.
This manual has to be read carefully and must be understood

**Caution High Voltage**

**AC 230V~, DC 320V=**



by experts before installing or starting the device.
If there are any doubts call your trader or the manufacturer.

The C2 series is designed to regulate electrical currents;
protection standard IP00.

**Instructions and rules:**

the devices and accessory components must be set up and connected according to the local technical regulations.
In Germany they are:

| | |
|---|---|
| - EU-machine guide lines | 89/392/EWG,84/528/EWG,86/663/EWG,72/23/EWG |
| | EN60204, EN50178, EN60439-1, EN60146, EN61800-3 - |
| IEC/UL | IEC364, IEC664, UL508C, UL840 |
| - VDE-regulation | VDE100, VDE110, VDE160 |

- TÜV-regulations
- Regulations of the professional guild VGB4

**The user has to assure that:**

after
- a failure of the device
- an incorrect handling
- a failure of the control unit etc.

the drive is brought to a secure operating condition.

Machines and installations are to be provided with supervisory and safety equipment, that is independent of the device.

**Adjustment**
- only by qualified personnel
- adher to safety regulations

**Installation work**
- only when disconnected from all power lines.

**QS**
The devices are archived by the manufacturer with serial number and their test specifications.

**CE**
The EU-guide line 89/336/EWG with the EMC-Regulations EN 61000-2 and EN 61000-4 are observed.

**Thyristor-control-unit**
- for inductive and resistive devices

**Main applications**
- speed-control of direct-current motors
- 1quadrant mode, propel
- Power up to 2160 Watt
- tachometer regulation
- armature voltage regulation with I*R compensation
- torque control

**Attributes**
- cascade-control speed-current
- rectangular voltage-current characteristic
- on/off-switch logic
- direct switchable mains connection

**Compact single-circuit-board device**
- plug-in screw terminal
- galvanic isolation between control and power section
- fully isolated power semiconductor
- field rectifer

***CAUTION:***

**Tachometer regulation**

| | | |
|---|---|---|
| Device is | >>> | galvanic isolated |

**Armature voltage regulation**

| | | |
|---|---|---|
| Device is | >>> | high - resistive conection to the mains |

Control-reference (clamp 5) must not be earthed.

## *Technical data*

### Limits

| | | |
|---|---|---|
| power connection | | 230V~ +10%/-15% |
| output voltage | max. | 180V= |
| rated current | max. | 12A= |
| input current | max. | 13.2A~ |
| power (electric) | max. | 2160 W |
| field voltage | | 210 V= |
| field current | max. | 1 A= |

### Characteristic

| | | |
|---|---|---|
| contol range | (d.c. tachometer) | 1:300 |
| accuracy | (excluding feedback error) | 0.1% |
| control range | (armature voltage) | 1:50 |
| accuracy | | 3% |
| control range | (torque regulation) | 1:50 |
| accuracy | | 3% |
| command value supply | | 12V= , 10mA |
| input command value | max. | 12V= |
| actual value | max. | -180V= |
| enable logic | tipsafe | enabling time 100ms |

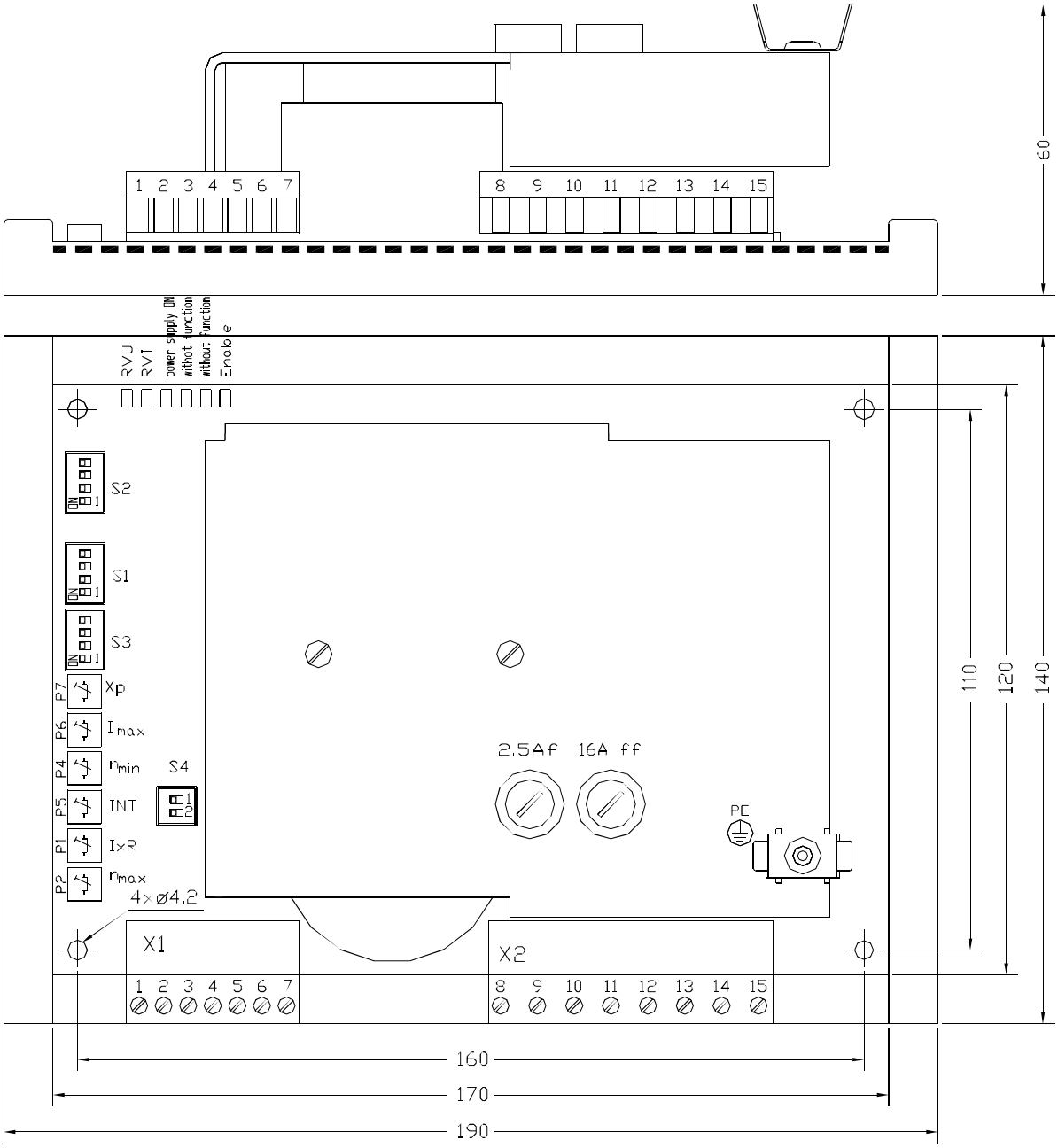
### Internal fuses

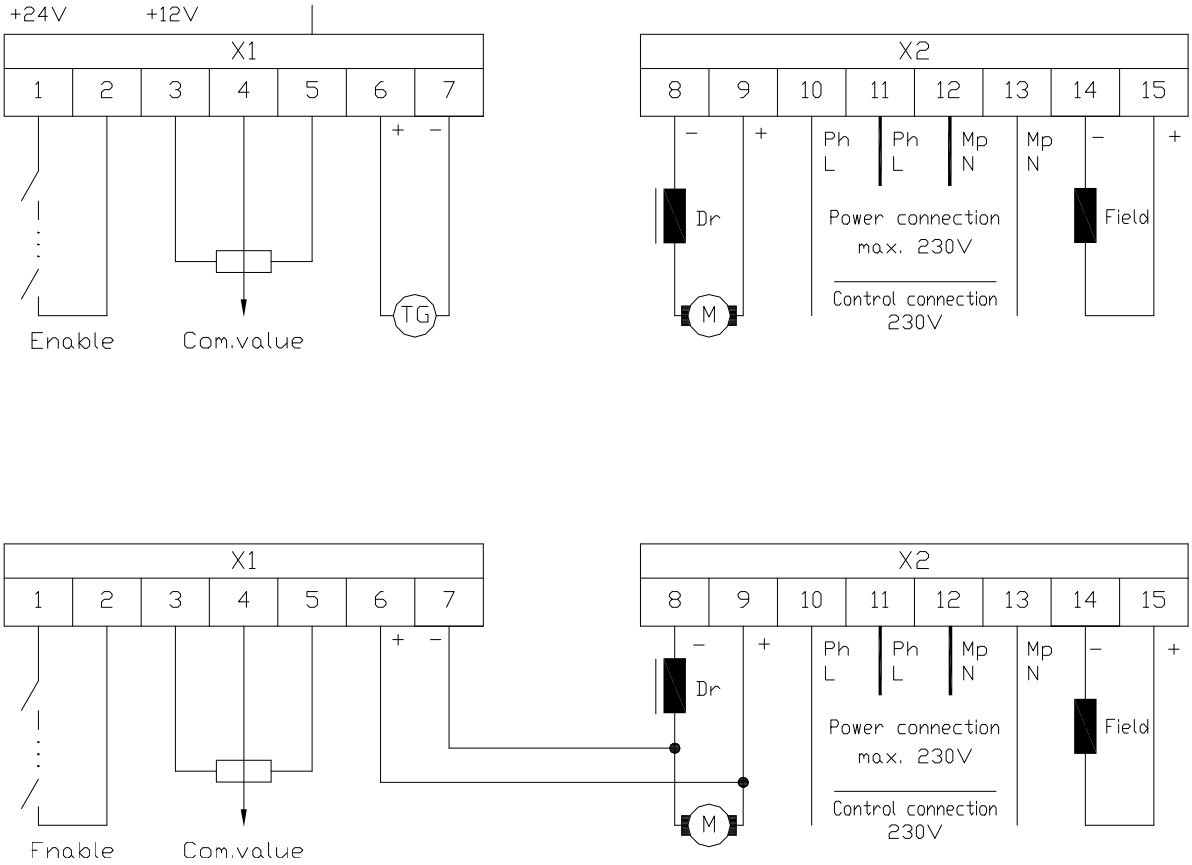
| | |
|---|---|
| F1 | 2.5Aff |
| F2 | 16Aff |

***Accessories***

| | |
|---|---|
| mains choke | K78-16 F |
| isolation transformer | TE17/3 F |
| smothing choke | EI135A-12 |

Dimensions


1 2 3 4 5 6 7
8 9 10 11 12 13 14 15
60
RVU
RV1
power supply ON
without function
without function
Enable
S2
S1
S3
P7 Xp
P6 Imax
P4 rmin
P5 INT
P1 IxR
P2 rmax
S4
4x ø4.2
2.5Af 16A ff
PE
X1
X2
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15
110
120
140
160
170
190




## *Power supply*

**Direct power supply**

| | | **Clamp - terminal** | |
|---|---|---|---|
| line | L | Clamp | X2:11 |
| neutral | N | Clamp | X2:12 |
| mains choke | | K78-16 F | |

**Supply with isolation transformer**

| | |
|---|---|
| secondary voltage | 230V~ |
| transformer type | TE16/3 (F) |
| transformer fuse16A ff | |

## *Motor connection*

**Motor- armature** clamp terminal

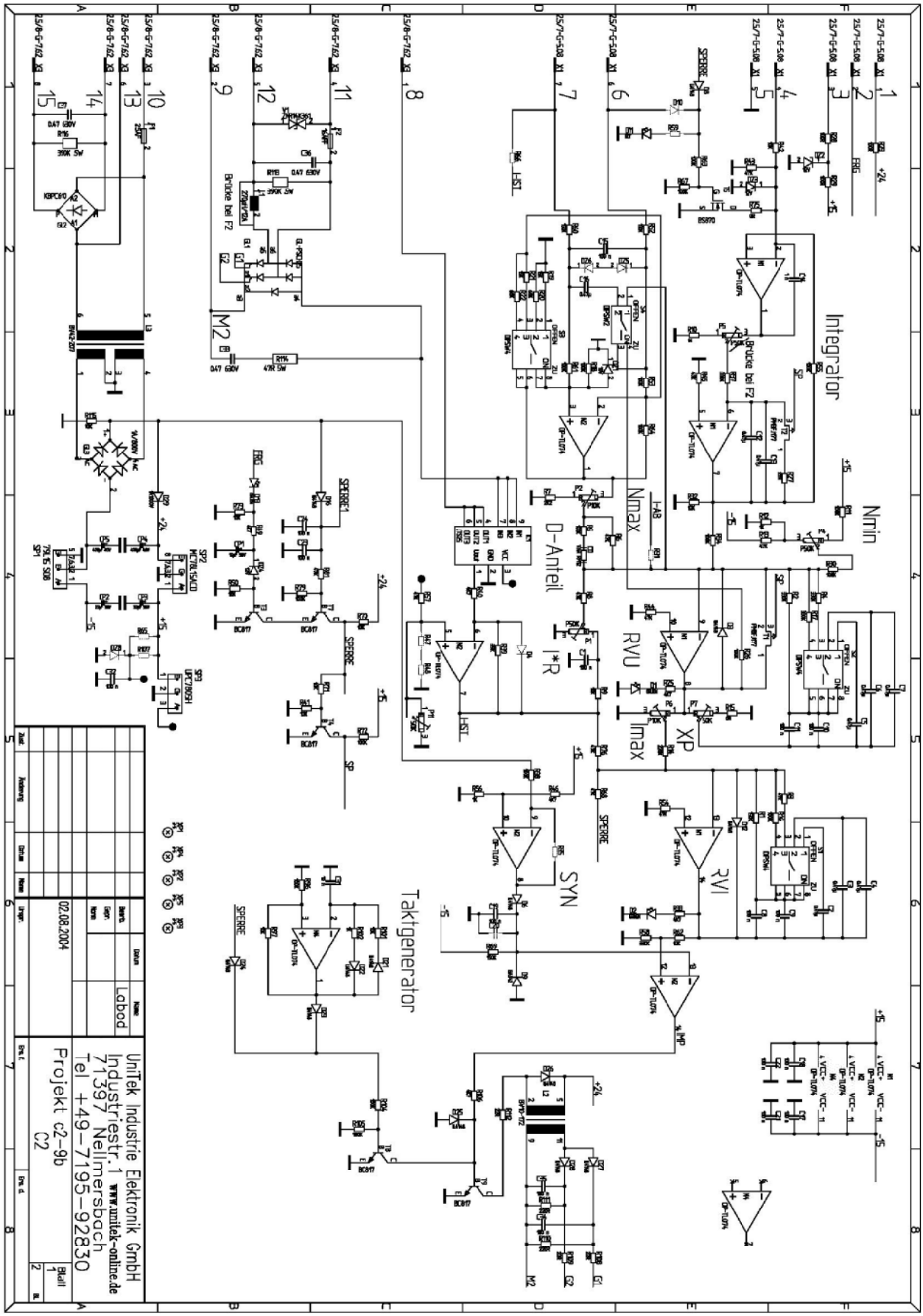
| | | |
|---|---|---|
| positive | clamp | X2:9 |
| negative | clamp | X2:8 |

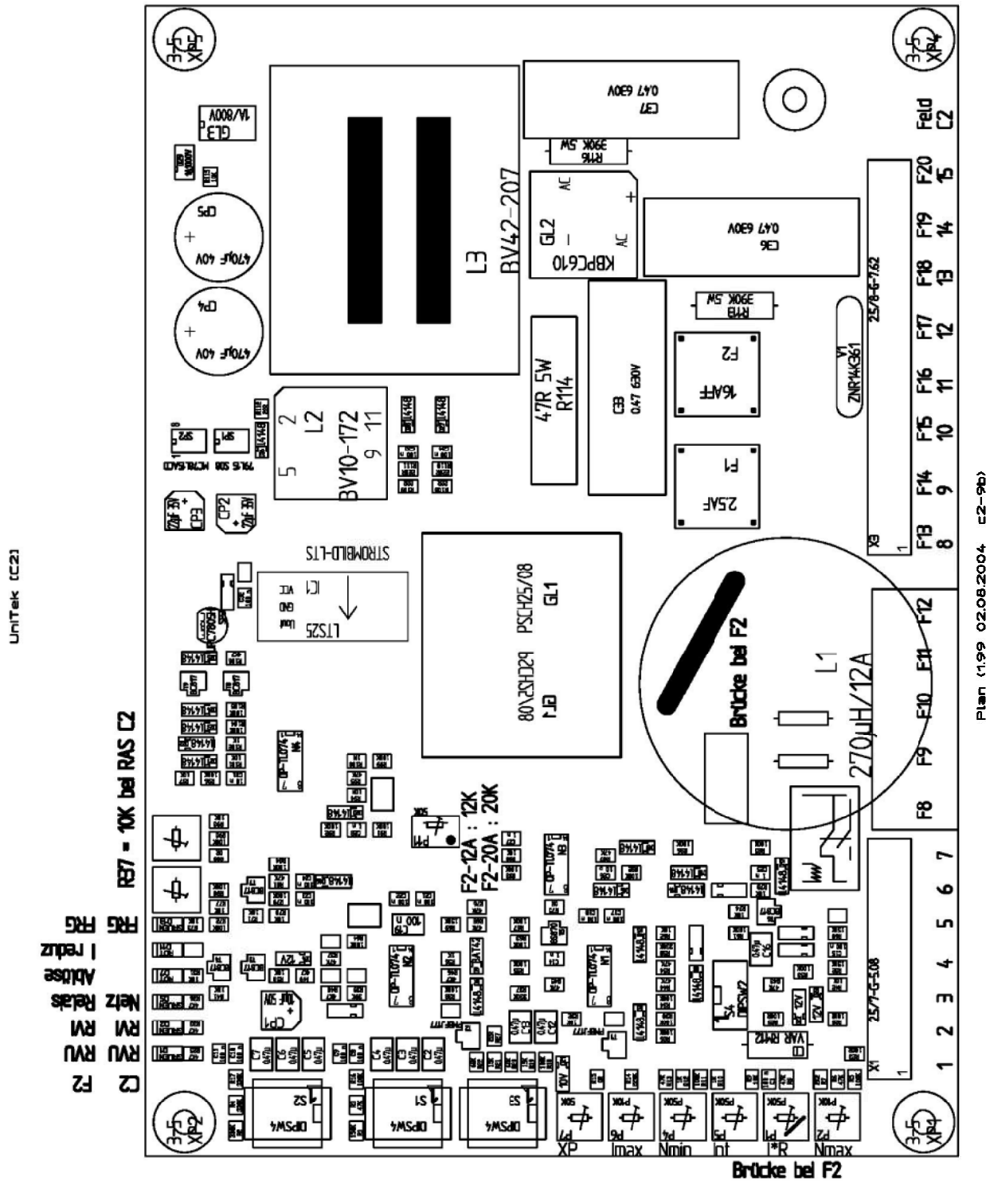
**Motor-field**

| | | |
|---|---|---|
| positive | clamp | X2:15 |
| negative | clamp | X2:14 |

smoothing choke Type EI135A-12

## Connection diagram




UniTek (C2)
R87 = 10K bei RAS C2
F2
RVL
RVL
RM
RM
Netz Relais
Abtau
Radiz
RG
RG
F2-12A : 12K
F2-20A : 20K
Brücke bei F2
L1
270µH/12A
L2
BV10-172
L3
BV42-207
GL1
PSCH25/08
GL2
KBPC610
STROMBLD-LTS
LTS25
16AT
2.5AT
47R 5W
R114
0.47 630V
Feld C2
Plan (1.99 02.08.2004 c2-9b)
Brücke bei F2

## *Trimming potentiometers*

| Nr. | Abbreviation | Function | Range |
|---|---|---|---|
| P1 | IxR | speed compensation when using armature voltage regulation | 0...40 % |
| P2 | nmax | fine adjustment maximum speed | 80...120 % |
| P5 | INT | integration time limit | 0.08 ... 5 sec. |
| P4 | nmin | minimum speed | -0.2 ... +2V |
| P6 | Imax | current limit | 0 … 100 % |
| P7 | XP | amplification | 3 … ∞ |

## *Switches*

| Nr. | Contact | Function |
|---|---|---|
| | | Current contoller |
| S1 | 1, 2 | integral- term |
| S1 | 3, 4 | proTermal- amplification |
| | | Sspeed controller |
| S2 | 1, 2 | integral- term |
| S2 | 3, 4 | proTermal- amplification |
| | | **Tachometer** |
| S3 | 1 - 4 | tachometer coarse balance |
| S4 | 2 | tachometer smoothing |

## *Default setup*

### Tachometer regulation

Switch on the position ON: S1-1, S1-4, S2-1, S2-3, S3-1 to S3-4

### Armature voltage regulation 180V=

Switch on theposition ON : S1-1, S1-4, S2-1,S2-3, S3-1 to S3-4

### Torque regulation

Switch on the position ON : S1-1, S1-4, S4-1

### All other Switches on position OFF !

## Command value

### Command value voltage

| | | |
|---|---|---|
| Command value potentiometer | resistance >1kΩ | (2.5 … 10kΩ) |
| input resistance | 50kΩ. | |
| input voltage | 0 ... max. +12V= | |

**Using a current source**

| | |
|---|---|
| external load resistance | 12V / 20mA = 0.6kΩ |

**Caution: command value input is connected to the mains**

**Integrator**

| | |
|---|---|
| Setup | range |
| trimmer INT P5 | 0.08 up to 5 sec. |
| turn clockwise to increase time - | |

## Actual Value

### Tachometer regulation

- DC-tachometer
- a.c.- or three-phase current tachometer with rectification
- tachometer voltage maximum -180V=
- IxR potentiometer **P1 anti-clockwise stop !**

### Caorse adjustment of the tachometer (switches settings)

| tacho voltage | S3-1 | S3-2 | S3-3 | S3-4 |
|---|---|---|---|---|
| 90 … 180 V | ON | ON | ON | ON |
| 60 … 140 V | ON | OFF | ON | OFF |
| 20 … 60 V | OFF | ON | OFF | OFF |
| 11 … 20 V | OFF | OFF | OFF | OFF |

***Speed fine adjustment***

| **Setup** | **range** |
|---|---|
| trimmer $n_{min}$ P4 | -0.2 ... 2V com. value |
| trimmer $n_{max}$ P2 | 50% of coarse adjustment |
| turn clockwise to increase speed | |

**Caution:** balance first $n_{min}$ secondly $n_{max}$ balance.

## *Armature voltage regulation*

**Adjustment Switch S3**

| Armature voltage | S3-1 | S3-2 | S3-3 | S3-4 |
|---|---|---|---|---|
| 90 ...180V | ON | ON | ON | ON |
| 60 ... 140V | ON | OFF | ON | OFF |
| 20 ... 60V | OFF | ON | OFF | ON |
| 11 ... 20V | OFF | OFF | OFF | OFF |

### Speed- fine adjustment

**Setup**
potentiometer $n_{min}$ P4
potentiometer $n_{max}$ P2
turn clockwise to increase speed

**Range**
- 0.2 ... 2V command value
50 of the coarse adjustment

***Caution:*** balance $n_{min}$ first, $n_{max}$ second

### IxR Compensation

- voltage drop caused by the internal resistance of the motor
- compensated by current proportional speed slope

**Setup**
potentiometer IxR P1
turn clockwise to increase compensation

**Range**
0 ...40%

- set speed to 10%
- increase load up to 100%
- increase compensation
- load speed >>> idling speed

### Torque regulation

- speed regulator amplification set to 1. Switch S4-1 closed.
- switch S2 all contacts in OFF
- jumper S9 closed. XP without function
- switch S1-1, S1-4 closed

***Current***
**Current limit**

| **Setup** | **Range** |
|---|---|
| trimmer Imax P6 | 0 ... 100% |
| turn clockwise to increase current limit | |
| measure current | >>> amperemeter in armature circuit |

**PI-settings of the current regulator**
Setup with swith S1

| **P-values** | **amplification** | **S1-3** | **S1-4** |
|---|---|---|---|
| 150KΩ | 0.68 | OFF | OFF |
| 60 KΩ | 0.27 | OFF | ON |
| 35 KΩ | 0.16 | ON | OFF |
| 26 KΩ | 0.12 | ON | ON |

| **I-values** | **S1-1** | **S1-2** |
|---|---|---|
| 0.22 µF | OFF | OFF |
| 0.8 µF | ON | OFF |
| 1.2 µF | OFF | ON |
| 1.8 µF | ON | ON |

Integral - time constant = I-value x P-Value x 4

***Speed controller***
**PI-setting of the speed regulator**
Setup with DIP switch S2

| **P-values** | **amplification** | **S3** | **S4** |
|---|---|---|---|
| 330 kΩ | 3.3 | OFF | OFF |
| 165 kΩ | 1.65 | ON | OFF |
| 110 kΩ | 1.1 | ON | ON |

| **I-values** | **S1** | **S2** |
|---|---|---|
| 0.22 µF | OFF | OFF |
| 0.69 µF | ON | OFF |
| 1.20 µF | OFF | ON |
| 1.69 µF | ON | ON |

Integral - time constant = I-value x P-Value x 4

| **Setting** | **Amplification** | **Range** |
|---|---|---|
| trimmer | XP P7 | 3 .. ∞ |
| turn clockwise to decrease amplification | | |

Device not enabled, command value zero.

## Switch on the mains

the motor must be at standstill without a torque.

## Close enable switch

LED D1 "Freigabe(=Enable)" must glow.
Slowly turn up command value potentiometer.
The motor must accelerate according to the command value voltage.
(if the motor accelerates straight up to top speed, the actual value connection clamp 6-7 must be swapped.)

## Speed adjustment

| | | |
|---|---|---|
| actual value-coarse adjustment | | switch S3 (see Page 11) |
| Using 1V command value | | |
| with Poti $n_{max}$ (P2) | >>> | setup 10% speed. |
| with Poti $n_{min}$ (P4) | >>> | setup minimum speed. |
| 10V command value | | |
| with Poti $n_{max}$ (P2) | | trim 100% speed. |

## Current adjustment

amperemeter in armature circuit
turn Poti $I_{max}$ to anti-clockwise stop.
block motor. (disconnect field)

| | | |
|---|---|---|
| with Poti $I_{max}$ (P6) | >>> | trim motor current. |

## Amplification speed regulation

| | | |
|---|---|---|
| default setup : | P-Amplification | S2-3= ON, S2-4= OFF |
| | I-term | S2-1= ON, S2-2= OFF |
| large centrifugal mass | >>> | S2-2 = closed<br>S2-3 = open |
| frictional load | >>> | S2-2 and S2-4 = closed<br>S2-1 and S2-2 = open |

| **Fine adjustment** | | **Potentiometer $X_P$ (P7)** |
|---|---|---|
| turn anti-clockwiswe | >>> | LEDD2 (RVU) flickers |
| turn clockwise | >>> | LEDD2 shines steady |

The brightness of LED D2 shows the current demand of the drive.

### *Adjustment without measuring instruments*

Connect motor,

| | |
|---|---|
| command value | = 10% |
| $X_P$ | = 50% |
| switch S2-3 | = ON |
| switch S2-4 | = OFF |

Enable controller
turn Potentiometer Xp anti-clockwise until the drive swings.
LED D1 (RVU) flickers.

**If there is no oscillation**
- switch S2-3 in position OFF
- adjust oscillation with Potentiometer $X_P$
- LED D1 (RVU) flickers
- turn Potentiometer Xp clockwise until the oscillation dies down
- LEDD1 (RVU) shines steady
- turn $X_P$-Poti 2 steps clockwise

Adjust S2-1 and S2-2 so, that the drive runs smoothly after about two oscillation when there was a command value jump off 50%.

**Response of the drive:**

**Amplification too low**
long-period oscillations 1... 0.1Hz
long overshoots

**Amplification too high**
short-period oscillations 30 ... 200Hz
vibrates during acceleration

## *Advice to EU-Regulation 89/336/EWG*

the standards EN61000-2 and EN61000-4 will be observed under the following conditions:

**Tachometer regulation**

Device, mains choke or transformer and armature choke fixed on a 500x500x2 mounting board.

Motor interference-suppressed with collector-capacitor.

Mounting board and motor frame connected to earth with 10mm² wires.

Clamp 5 connected to earth with a 2.5mm² wire

**Power supply with mains choke:**

Mains choke with filter Type K78-16F

Line length choke-device 200mm

Armature choke Type EI135A-12

Line length choke-device 200mm

**Power supply with isolation transformer:**

Transformer with filter Type TE17/3F

Line length transformer-device 200mm

Armature choke Type EI135A-12

Linelength choke-devive 200mm

**Control signals:**

all wires twisted <1.5m no shield.

**UNITEK** products have a warranty against defects in material and workmanship for a period of one year from the date of shipment. All values from the pre- and final quality control checks are archivied with the devices' serial numbers. UNITEK does not guarantee the suitability of the device for any specific application.
During the warranty period, UNITEK will, at its option, either repair or replace products that prove to be defective, this includes guaranteed functional attributes. UNITEK specifically disclaims the implied warranties or merchantability and fitness for a particular purpose. For warranty service or repair, this product must be returned to a service facility designated by UNITEK.
For products returned to UNITEK for warranty service, the Buyer shall prepay shipping charges to UNITEK and UNITEK shall pay shipping charges to return the product to the Buyer.
However, the Buyer shall pay all shipping charges, duties, and taxes for products returned to UNITEK from another country.

The foregoing warranty shall not apply to defects resulting from:

* improper or inadequate repairs effected by the Buyer or a third party,
* non-observance of the manual which is included in the all consignments,
* non-observance of the electrical standards and regulations
* improper maintenance
* acts of nature

All further claims on transformation, diminution and replacement of any kind of damage, especially damage, which does not affect the UNITEK device, cannot be considered. Follow-on damage within the machine or system, which may arise due to malfunction or defect in the device
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