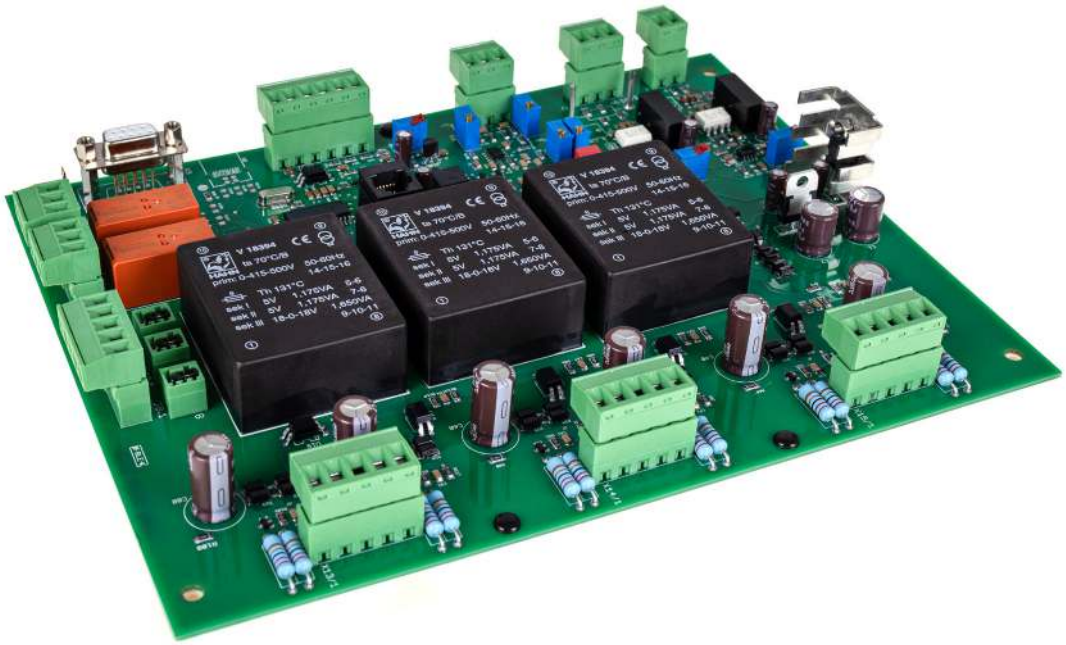
Three-phase control unit with integrated controller
and ignition transformer for thyristors

Datasheet
Control Unit ISR 06 ZL

Art.-Nr.: 9590



1. Special Features

The six-pulse control unit ISR06ZL is capable of operating all common 3-phase line-commutated converter circuits, including B6C, M3.2C, M6C, B6HC, and W3C with resistive or inductive loads.

It provides long-duration pulses, enabling W3C operation even with transformer loads.

The ISR06ZL control unit integrates all electronics and transformers on a single PCB. The controller and ignition transformers are built in. Combined with the insulating base plate, this results in a compact, ready-to-connect control device. All inputs and outputs are routed to Phoenix connectors.

Process monitoring is possible via an RS232 interface using a PC.

2. Technical Data

2.1 Input Parameters

Supply voltage	3x 400 V~ + 10% / - 15% (J6, J7, J8 on 2 and 3) 3x 480 V~ + 10% / - 15% (J6, J7, J8 on 1 and 2)
Frequency	50... 60 Hz +/- 3 Hz
Current consumption	3x 50 mA
Control voltage	0... 10 V
Control current	< 0,15 mA
Pulse lock	- 3 mA, to be discharged to ground

2.2 Output Parameters

Control range	176° el
Front pulse end position	0°... 75°vel
Rear pulse end position	90°... 176°vel
Output Pulses	6x double pulse spaced at 60 °el
Asymmetry to mains	< 2 °el
Pulse duration	max. 10 ms
Pulse current	0,33 A
Pulse voltage	8 V=
Test Voltage of the Transformers primary - secondary	5 kV_{eff}
Repeat test on control unit (all terminals short-circuited)	4 kV_{eff}
External Load 10V	20 mA

2.3 Physical Characteristics

W × D × H	180 x 235 x 50 mm
Mounting	4 x M3 screws 157 x 220 mm
Weight	1 kg
Ambient temperature	- 20 °C... + 50° C

3. Electrical Functionality

Block diagram 2 shows all important functions and the terminal assignment of the ISR06ZL. The three mains transformers are connected in delta on the primary side and can be connected directly to the three-phase mains (3×400 V, 50 Hz; or 3×480 V, 60 Hz). The transformers feed the power supply and provide the required synchronization voltages. This power supply provides the regulated voltage for operating the pulse generators and for supplying the integrated controller. Six separate windings generate the supply voltage for the ignition transformers.

The controller and pulse generation are integrated in the microcontroller. Changing the supply voltage is possible via J6, 7, 8: for 400 V, bridge from 2 to 3; for 480 V, bridge from 1 to 2.

3.1 Pulse Generator

The three mains transformers provide synchronization voltages for the pulse generator and supply power to the electronics. A left-hand phase sequence or missing phases is indicated via an LED and can optionally be evaluated at X2.

The pulse control range can be narrowed and shifted by +30°el or −30°el. These settings are configured via the interface.

When the test mode is selected via the interface, the control angle is defined by the voltage setpoint (controlled operation).

3.2 Voltage Controller

The device's positive output voltage is supplied to the voltage controller via terminal X5.1. The negative output voltage is connected to terminal X5.3. Depending on the device's output voltage, the appropriate value for resistor R1 must be soldered onto solder posts 8 and 9:

U_{out}:	5	8	10	12	15	18	24	30	40	60	80	120	220	V
R19 (0207 0,6W):	0,1	1,2	2,2	3,3	4,4	5,6	8,2	12	15	22	33	47	100	k

A fine adjustment is possible via the U potentiometer.
The Ki and Kp parameters can be configured via the interface.
The normalized actual voltage value (0–10 V) can be measured at pin X6.3 (adjustable via potentiometer U_{adj})

3.3 Current Controller

The output current of the rectifier is measured via a 60 mV shunt according to DIN 43703. This current-proportional voltage is fed to the current controller through an isolation amplifier and compared with the current setpoint. Fine adjustment of the current via the I potentiometer is possible within the range of 48 to 66 mV.

The actual current value from the 60 mV shunt must be connected to terminals X4.2 ("−" shunt) and X4.1 ("+" shunt). The latter terminal also serves as the "− Ua" connection of the device. The Ki and Kp parameters can be configured via the interface. The normalized actual current value (0–10 V) can be measured at pin X6.1 (adjustable via potentiometer Poti I_{adj})

3.4 Ignition Transformer

The circuit board contains three transformers, each with two galvanically isolated windings in full encapsulation, compliant with VDE 551, and tested at 5 kV_{eff}. The secondary auxiliary voltages are rectified and provide the gate drive power for the thyristors. The trigger signal from the pulse generator is transmitted to the thyristors via six optocouplers and six driver amplifiers.

The integrated ignition transformer is suitable for thyristors up to 250 A. For higher current thyristors, a modified ignition transformer board (type 6xZB1/10-400 or 700 mod1) can be connected downstream.

4. Interface / Software

The device features an RS232 interface (optionally RS485) using the MODBUS protocol. A software application is available for configuring and monitoring the control unit. It is a standard Windows-based program that must be installed in the usual manner. A direct 1:1 connection to a serial interface must be established. Once the correct interface is selected under CommPort → Settings and activated via CommPort → Port Open, the ComStat indicator should display "Connected".

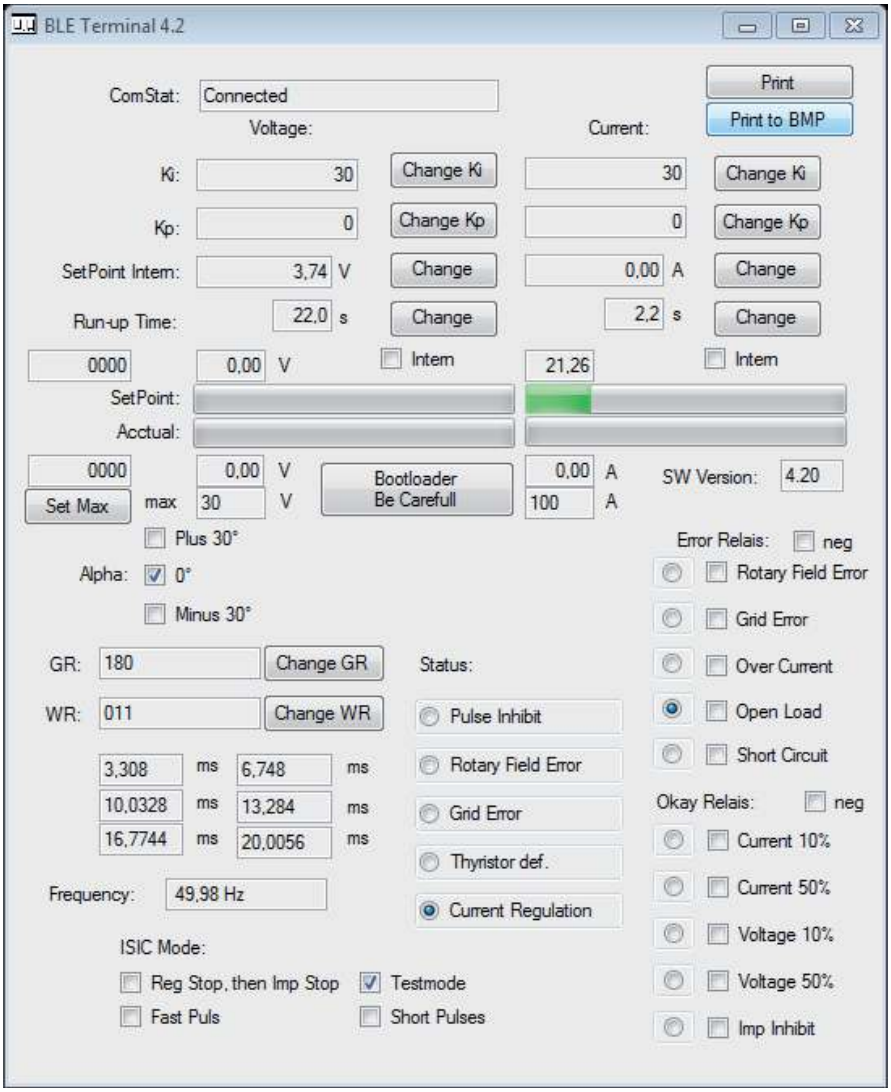


Figure 1

Software Functions:

KI, KP	Sets the parameters for the voltage and current controllers
SetPoint intern	Defines a fixed setpoint for current or voltage (activated by checking the “internal” option)
Acctual	Displays current actual and setpoint values as bar graphs, percentages, and scaled values
Setmax	Configures the scaling factor
RunUp	Sets the ramp-up time for current and voltage
WR/GR	Configures the end positions of the inverter (WR) and rectifier (GR)
Alpha	Allows phase angle adjustment by ±30°

The function of the OKAY relay can be configured. The individual functions are logically AND-linked

Neg	Inverts the behavior of the OKAY relay
10% Current	Set when the actual current exceeds 10% of the configured current setpoint.
50% Current	Set when the actual current exceeds 50% of the configured current setpoint.
10% Voltage	Set when the actual voltage exceeds 10% of the configured voltage setpoint.
50% Voltage	Set when the actual voltage exceeds 50% of the configured voltage setpoint.
ImpInhibit	Set when pulse blocking is released

The function of the error relay can be configured. The individual functions are logically OR-linked

Neg	Inverts the behavior of the error relay
RotaryFieldError	Set in case of phase sequence error
GridError	Set in case of phase failure
OverCurrent	Overcurrent in the DC branch
OverVoltage	Overvoltage in the DC branch
OpenLoad	No or very low load connected
Short Circuit	Short circuit or very low impedance load connected
Frequency	Mains frequency monitoring

ISIC Mode:

Reg Stop, then Imp Stop	Activates controller lock first, followed by pulse lock after 5 seconds when pulse blocking is enabled
Fastpuls	For applications requiring rapid pulsing. When pulse blocking is active, pulses are suppressed. If pulse blocking is released within 5 seconds, operation resumes at the operating point prior to blocking.
Short Pulses	Short-duration pulses that result in higher pulse currents.
Testmode	Controlled operation in which the firing angle is set via the U potentiometer. This mode is not stored and is only active during pulse blocking.

The bootloader allows the control unit's software to be updated. Optionally, a standalone terminal is available, which enables identical configuration of the device.

CE **The ISR06ZL control unit is designed in accordance with applicable EU directives and bears the CE conformity marking.**

5. Drawings

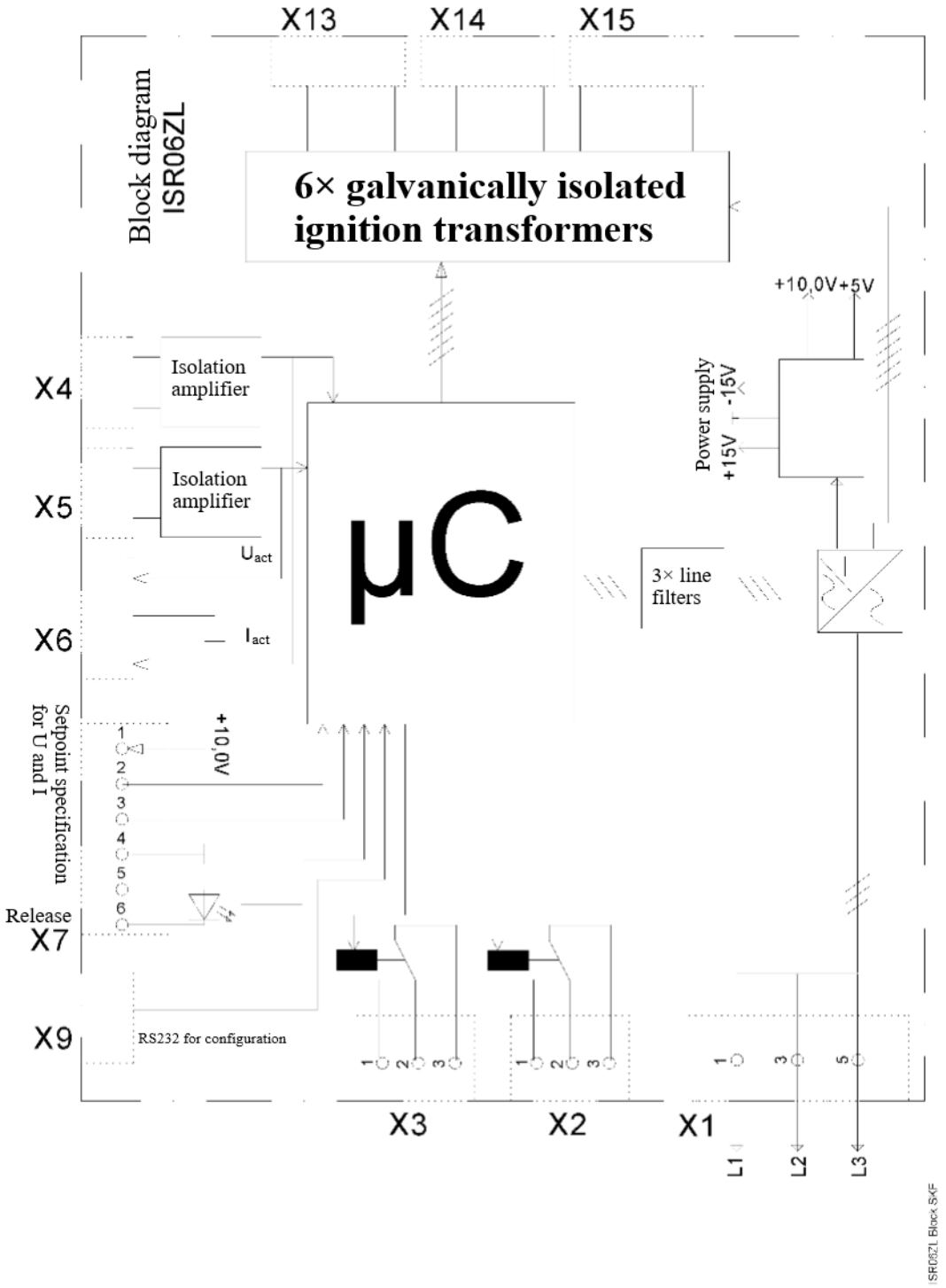


Figure 2

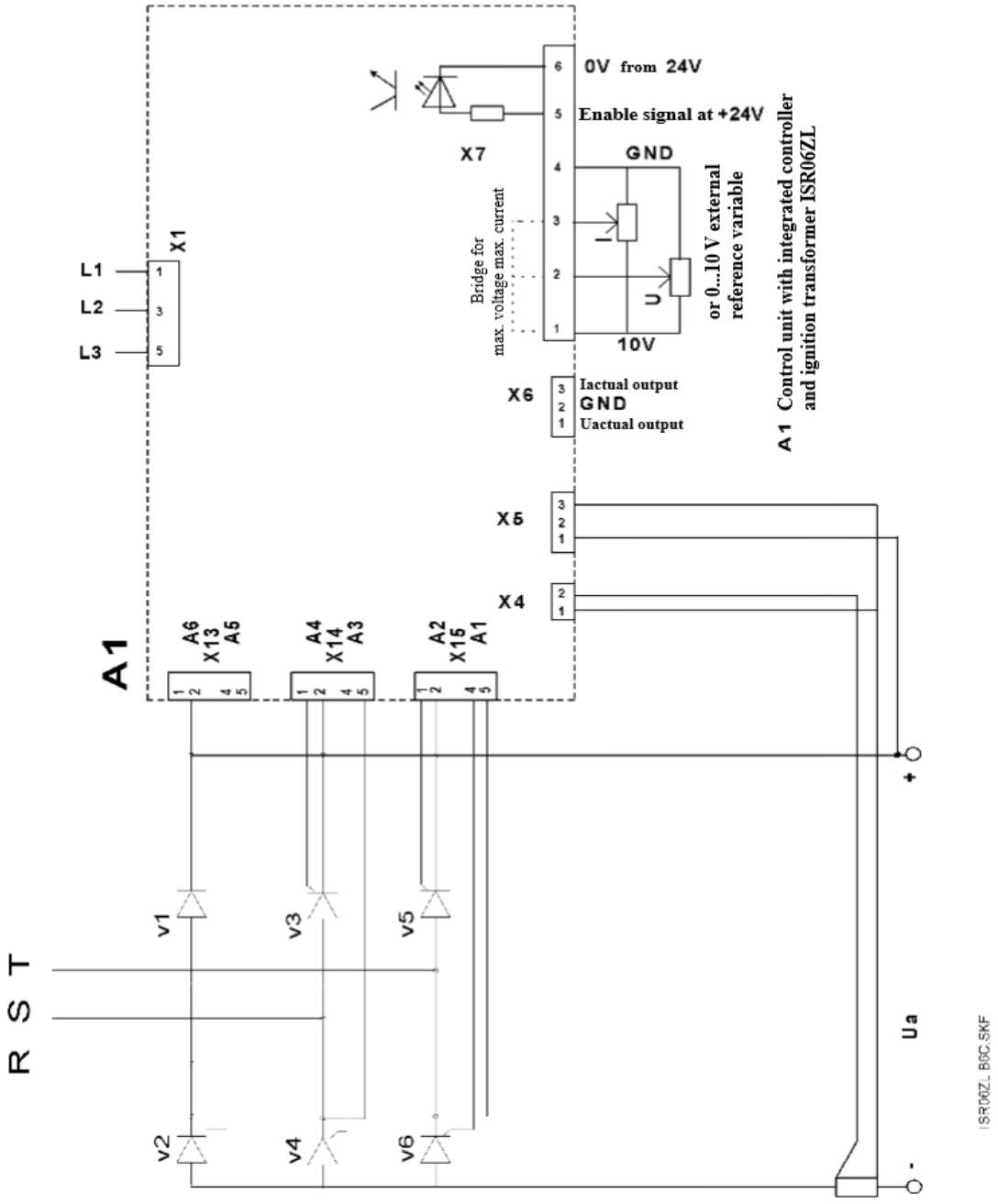


Figure 3

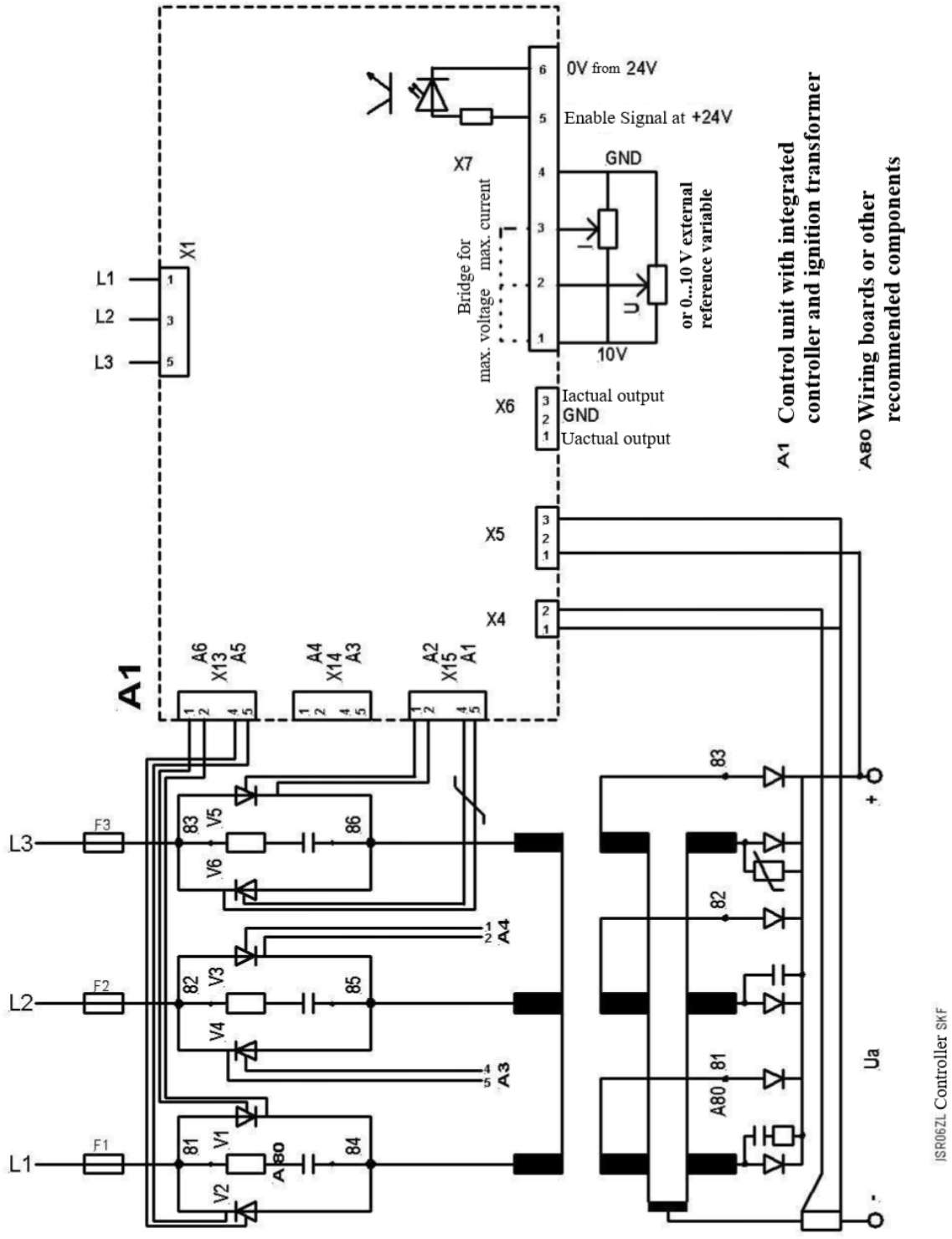


Figure 4

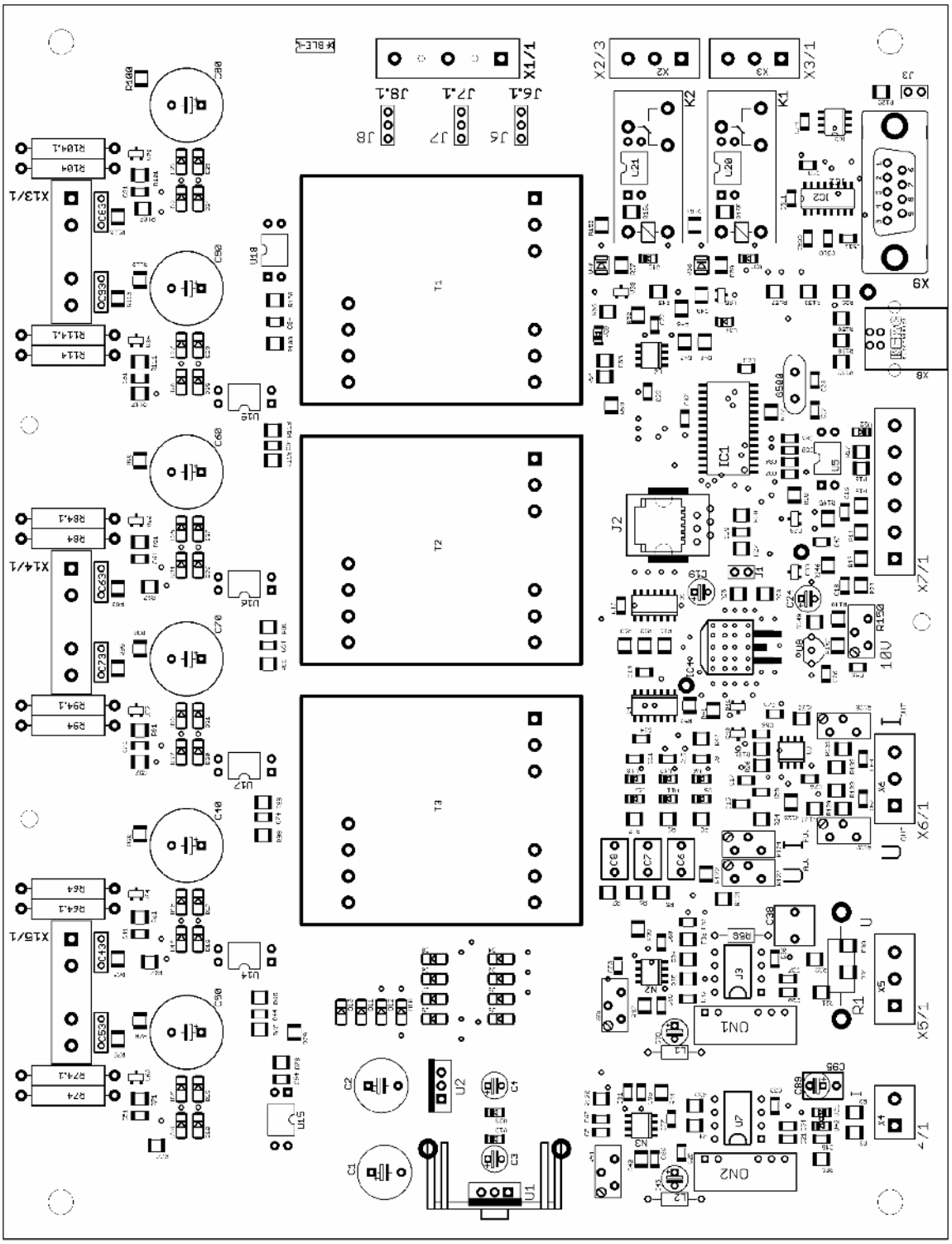


Figure 5