

This document describes the internal circuits except the electronics. We have divided it into three circuit diagrams showing controller, connector-panel and parts of hand pendant as one unit. Even the accessory "Program Selector" is included. Various internal connection points have been omitted for clarity.

The first part shows the safety circuits for emergency stop and pedal function.

A safety circuit is always redundant and monitored. We use two relays in series to break a potentially dangerous function. If one of the contacts is welded together, or if the relay gets stuck for any reason, we have "backup" by the other relay. Then we have a third relay to monitor that the first two are working as they should.

If any contact welds the circuit becomes locked in a safe state until the failing relay is replaced.

For all this to work, the relays must have positive-guided contacts conforming to EN standards. Positive-guided contacts mean that they are mechanically linked in such a way as to ensure that the normally closed and normally open contacts can never be closed at the same time.

The external contactors K1 and K2 break the 3-phase supply when you hit the emergency stop or some safety circuit detects a fault condition. K3 monitors that K1 and K2 are working properly. If we on the next page study the two circuits up from K1 and K2 via the terminals 41 and 43. We see that K3 has to be turned on, ON button must be pressed, the emergency stop not pressed and the relays R7, R13 and R14 may not be on for the K1 and K2 to be activated. K1 and K2 will be latched through their own contacts and via the terminals 42/44 and now the ON button can be released.

If you follow the circuit of K3 via the terminals 46-48 you will see that K3 is turned on when both K1 and K2 are off. You also see that K3 turns off when both K1 and K2 are turned on which is also important. The monitoring relay K3 will also need to work and it is monitored by one of its contacts located in the control chain between terminals 60 and 61. If K3 would get stuck in the on state, you cannot start the machine.

The jumpers on terminal 57/58 and 59/60 can be replaced with an external emergency stop if necessary.

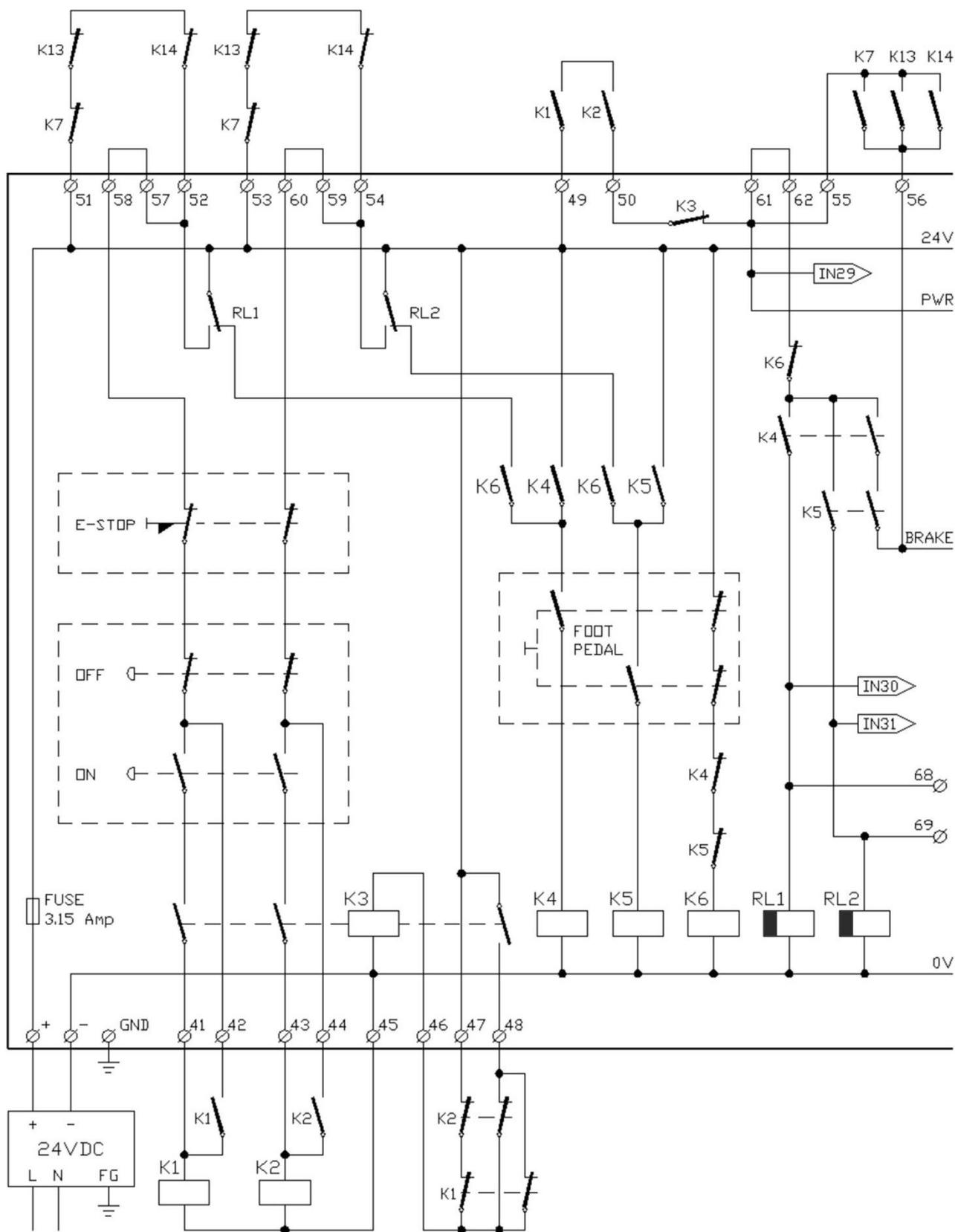
The relays RL1 and RL2 monitors that the pump contactor (K7) and brake relays K13 and K14 really turn off after the pedal is released. They turn on when the pedal is pressed and turns off about half a second after the pedal is released. The point of the delay is that the machine movements must be allowed time to brake gently. If any contact between terminals 51/52 or 53/54 does not close within this half-second an automatic emergency stop activates. RL1 and RL2 are monitored by the pedal circuit that cannot be activated unless they turn off.

The closed contacts on K7, K13 and K14 connected to terminals 55/56 provides latching for these relays during the half second after the pedal release.

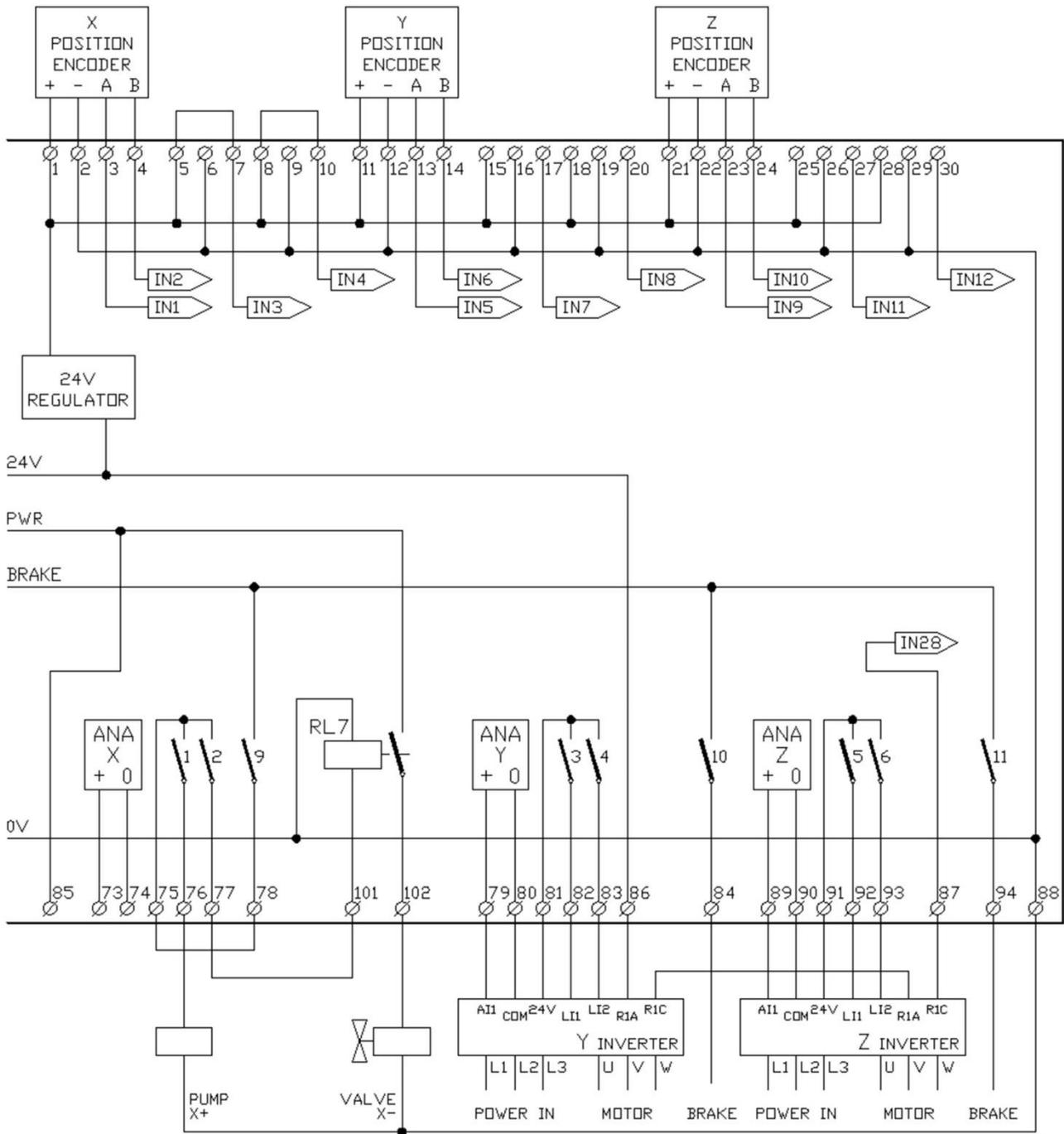
The pedal circuit with K4, K5 and monitor relay K6 work the same way as described above. Even the pedal itself is monitored that it really "spring up" by its two normally closed contacts that must return for K6 to turn on.

Controller input number 29 senses that the emergency stop circuits are ok. Input 30 and 31 detects the two pedal circuits.

Part 1 – E-stop, pedal circuit and time delay relays



Part 2 – encoder and sensor inputs and relay + analog outputs

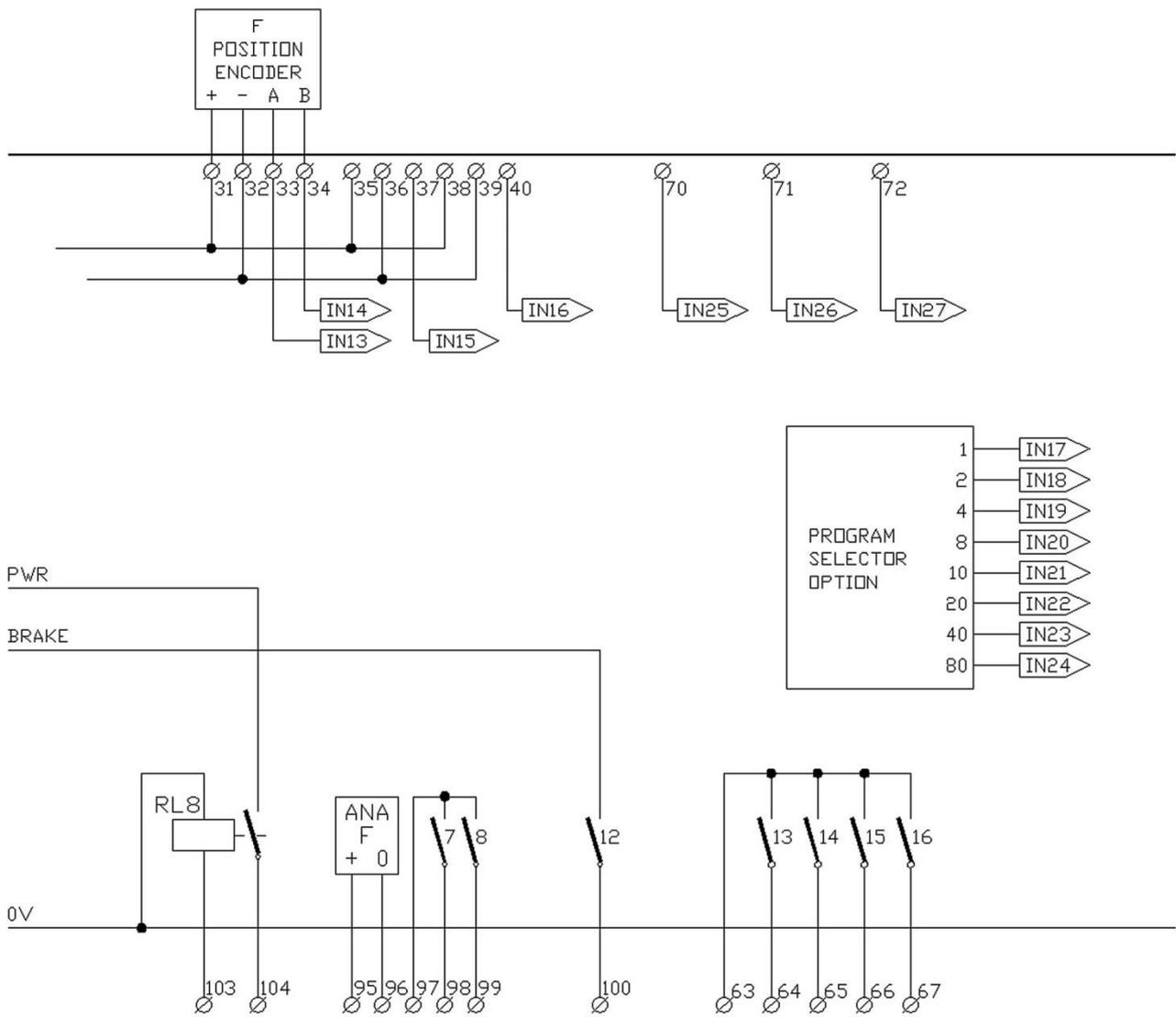


The relay contacts 1-6 and 9-11 are controller outputs. The remaining outputs can be seen on the next page.

Input 28 from terminal 87 is an alarm input from the inverter drives. RL7 is an auxiliary relay with a bit more powerful contacts.

If you want limit switches on the X axis, connect the upper limit switch to terminals 5 and 7 and the lower limit switch to 8 and 10. The contacts must break at the limit position. We normally have hydraulics on the X axis and the terminals are then bridged.

Part 3 – the remaining parts, used in some cases



Here are the inputs of the F-axis for slave mode (terminals 31-40), the outputs on 95-100 and a support relay RL8 at 103/104.

On terminals 70-72 are three inputs for special functions and terminals 63-67 four special outputs.

The inputs 17-24 detects program selector knob positions.