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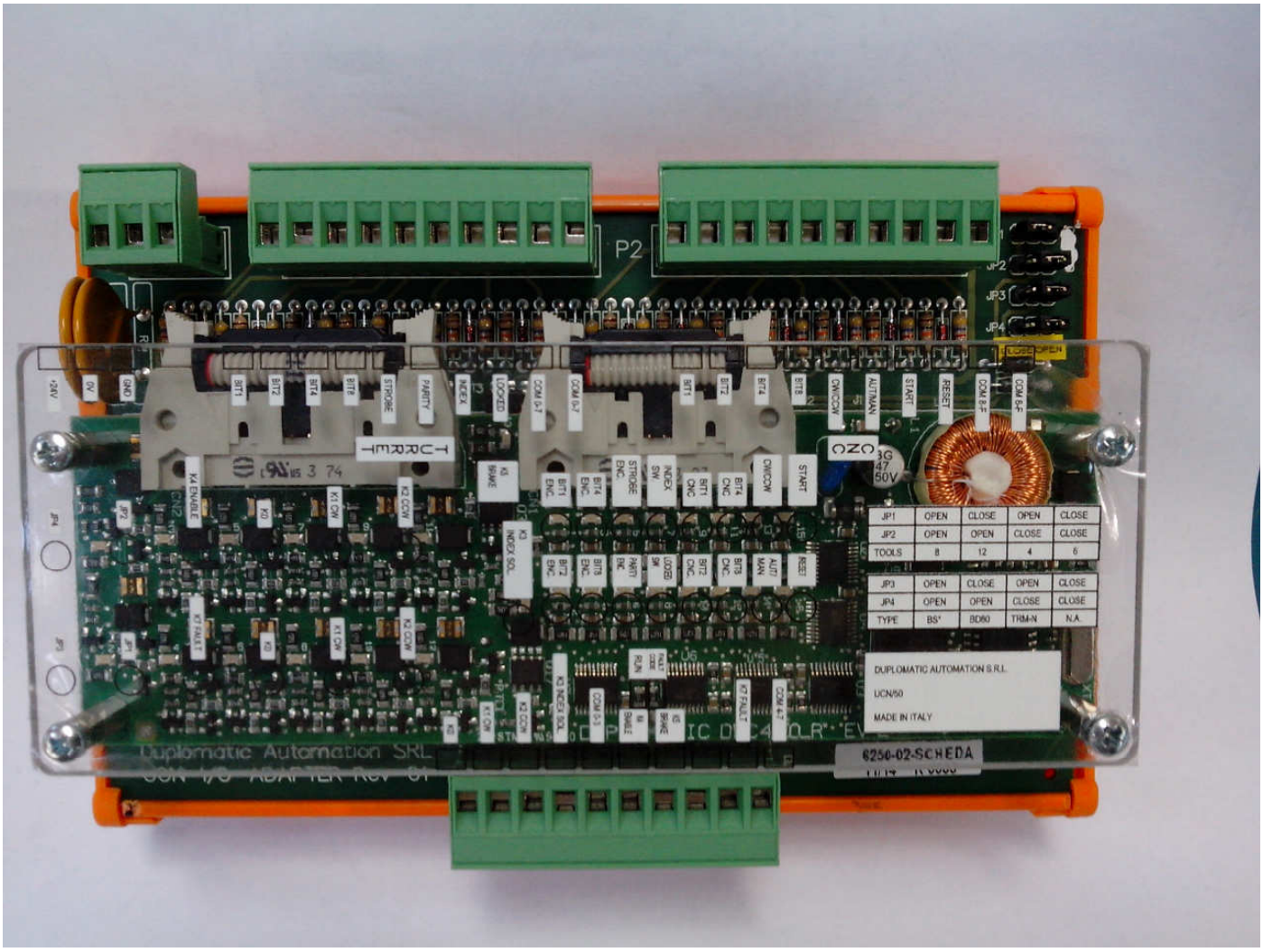

UCN * Series 50

NUMERIC CONTROL INTERFACE UNIT FOR DUPLOMATIC ELECTROMECHANICAL TURRETS

EM-UCNs50
ISSUE 14-12

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UCN - NUMERIC CONTROL INTERFACE UNIT

The DUPLOMATIC UCNs are the ideal interface between the CNC unit and the BSV-N, BSA, BD80 and TRM-N turrets. Their features are:

1. They release the CNC from managing the turret electric cycle, which requires several code lines;
2. They grant the response speed needed for a careful message control from and to the turret; such aim can not be easily reached by the CNC which is committed with the performance of other program sections;
3. They optimize the indexing time by choosing automatically the rotation direction so as to use the shortest path (only for two-direction turrets);
4. They allow to set the rotation direction;
5. They constantly control the turret functioning procedure, thus signaling any arising problem;
6. They are optimized, tested and approved by DUPLOMATIC; they grant therefore a high level of efficiency and reliability;
7. Fully compatible with the previous series of UCNs.
8. One RUN LED, one FAULT LED, one LED for each INPUT, one LED for each OUTPUT (on relay coil side);

UCN code

The UCN consists of an Hardware medium and a firmware stored in a FLASH memory.

UCN XX-YY/50

XX	TURRET
10	BD80
20	BSV-N
30	BSA
40	TRM-N
50	BSV-N100

YY	POSITIONS
04	4
06	6
08	8
12	12

SETTINGS

The unit is set on factory according to the above code for compatibility with previous releases.
By the way on the base board there are 4 jumpers: JP1 to JP4 that allow to change the configuration.
JP1 and JP2 select the number of tools while JP3 and JP4 select the kind of turret.

JP1	OPEN	CLOSE	OPEN	CLOSE
JP2	OPEN	OPEN	CLOSE	CLOSE
TOOLS	8	12	4	6

JP3	OPEN	CLOSE	OPEN	CLOSE
JP4	OPEN	OPEN	CLOSE	CLOSE
TOOLS	BS*	BD80 (x)	TRM-N (x)	N.A

x) available starting with firmware release 10 (not yet delivered).

Requirements

The DUPLOMATIC UCN are fast and optimized thus supplying response times of about 5 ms.

In order to offer their best reliable performances, the DUPLOMATIC turrets require very short delay times in the management of the electric cycle; in particular, they require the following condition to be satisfied:

TOTAL RESPONSE DELAY < 40 ms

(Period of time included between the blocking sensor detection and the motor disabling).
This condition requires the use of fast contactors above all during the opening phase (it is difficult during the indexing phase as the motor is active but the rotor is stopped) and the blocking phase in order to avoid "overlocking" conditions.

The circuit for the overvoltage reduction in the contactor controlling coil has to be chosen with particular care in order to avoid response delays and to make the life of the UCN relay contacts lasts longer.

Minimum and maximum load for output relays.

The maximum current is stated in the electrical characteristic table. Due to the high range of voltages accepted, there are not embedded spark suppressors that must be put externally and chosen according to the voltage source applied.

Sometimes, outputs connected to the PLC inputs can fail due to the extremely low current, so in case of current less than 20 mA it is suggested to put a resistive load to reach this value.

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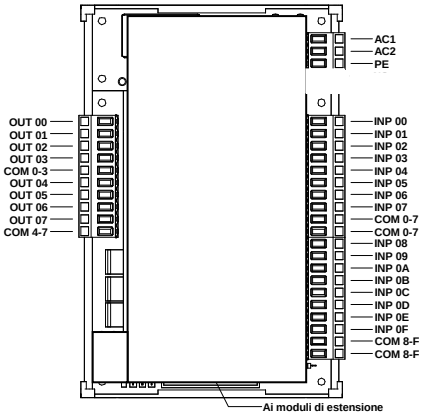
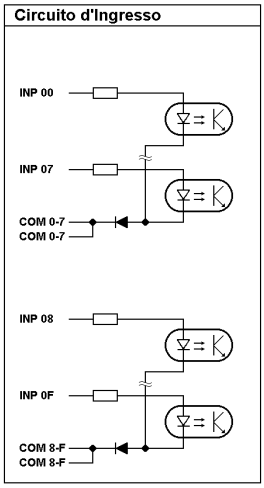
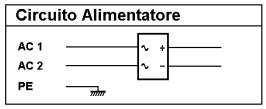
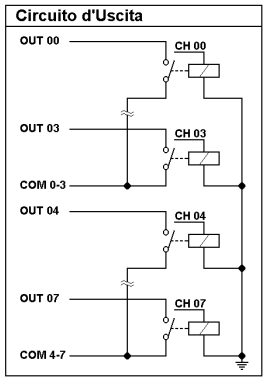
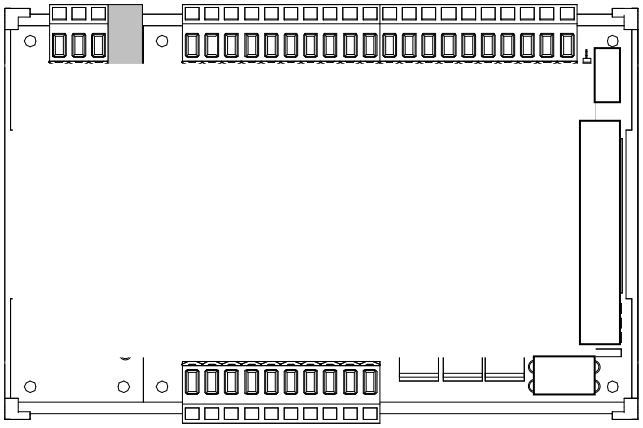
Electric and mechanical features

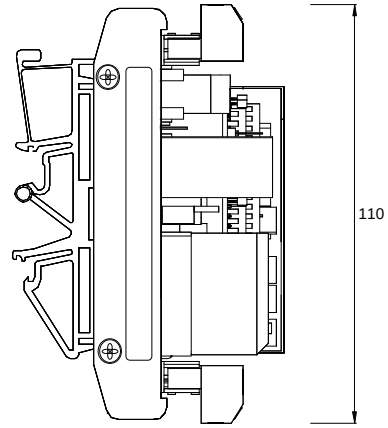












Power supply:	24 Vdc±15% 10W
Inputs:	0÷30Vdc optoisolated; from 0÷10Vdc = OFF from 12÷30dc = ON Current draw: 5 mA @ 24 Vdc
Outputs:	Relay: Max. voltage: 250 Vac, 220Vdc Max. allowed current during the opening phase (each opening): 2A@24Vdc 500mA@110Vdc 250mA@220Vdc
Dimensions:	110 x 170 x 75 mm
Weight:	0.3 Kg
Mounting:	On a DIN rail
Operating temperature:	0÷60℃
Protection degree:	IP 00

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Function features

INPUTS:

Signals from the turret

BSV-N, BSA, BD80	TRM-N
INP 00: Bit weight 1 absolute encoder;	INP 00: Switch for position n°1
INP 01: Bit weight 2 absolute encoder;	INP 01: Switch for position n°2
INP 02: Bit weight 4 absolute encoder;	INP 02: Switch for position n°3
INP 03: Bit weight 8 absolute encoder;	INP 03: Switch for position n°4
INP 04: Bit 'STROBE' absolute encoder;	INP 04: Switch for position n°5
INP 05: Bit 'PARITY' absolute encoder;	INP 05: Switch for position n°6
INP 06: Indexing switch signal;	INP 06: Indexing switch signal;
INP 07: Locking switch signal;	INP 07: Locking switch signal;

Signals from the numeric Control

INP 08: Bit weight 1 position required by CNC;
INP 09: Bit weight 2 position required by CNC;
INP 0A: Bit weight 4 position required by CNC;
INP 0B: Bit weight 8 position required by CNC;
INP 0C: Rotation direction selection;
INP 0D: Rotation direction automatic selection;
INP 0E: START rotation start;
INP 0F: RESET command: when it is low, all outputs are disabled and all possible alarms are reset;

Position coding

The required position has to be binary-coded according to the following table:

POSITION	INPUT0B	INPUT0A	INPUT09	INPUT08
non-valid	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
non-valid	1	1	0	1
non-valid	1	0	1	0
non-valid	1	0	1	1

Any requirement for a position which is not allowed by the turret is ignored.

Direction of rotation

The direction of rotation can be chosen automatically by UCN or selected externally using the following table.

Direction	INPUT0D	INPUT0C
Automatic	0	X
CW	1	0
CCW	1	1

Timings

The input signals have to be stable for at least 10 ms.
The required position has to be set at least 10 ms. before the START command is performed.

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OUTPUTS:

Turret control

OUT 00: General enabling command;
OUT 01: CLOCKWISE rotation command;
OUT 02: COUNTERCLOCKWISE rotation command;
OUT 03: INDEX solenoid command;
OUT 05: Brake command (if foreseen);

Towards the numeric Control

OUT 04 (ENABLE): Turret clamped correctly and working cycle enabling;
OUT 07 (FAULT): Turret alarm: it is impossible to continue;

- The cycle allowed time has been exceeded;
- The blocking phase allowed time has been exceeded;
- Blocked indexing stave;
- Encoder error (if present).
- Turret is moving without UCN commands.

Commissioning

1. Connect the turret to all UCN terminals and to the control contactors/relays without connecting them to the UCN;
2. Make sure that by starting K0 and K1 manually, the disk rotates in the CLOCKWISE direction; if not, two phases of the motor power supply line have been inverted,
3. Make sure that by starting K0 and K2 manually, the disk rotates in a COUNTERCLOCKWISE direction; if not, two line phases have been inverted;
4. Make sure that by starting K3 manually, the indexing latch moves;
5. Connect the UCN and power supply it: after a few seconds the green LED must be lighted while the yellow one must blink,
6. Make sure that the OUTPUT00 output is high (the corresponding LED is lighted); if not, make sure that the reset command (INPUT0F) is high;
7. Require a position from CNC and check if the system is functioning properly;
8. The commissioning is over;

Turret Position Feedback to CNC

It is possible to connect the encoder outputs to CNC digital inputs, providing that the total current consumption from the encoder does not exceeds limits (50 mA each output) and that the reference voltage is common to all equipments.

Troubleshooting

1. The turret does not rotate:
- Check the motor thermal protections (OUTPUT00 is high and K0 is de-energized);
- Check the line protections;
- Make sure that the START signal has been properly connected;
2. After requiring a fixed position, the disk goes on moving alternatively in the two directions:
- Make sure that the disk rotation direction complies with the excitation of the K1 and K2 contactors
- Make sure that the UCN code is suitable for the turret which it is connected to.
3. The turret rotates for about 10 seconds and when it stops the FAULT UCN output is active:
- Check that the indexing solenoid is energized;
- Check the encoder;
4. The disk stops in position but the cycle cannot finish:
- Check the Indexing switch.
- Check the locking switch.

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Fault LED

In case of fault, the FAULT LED flashes. for each different fault, there is different number of flashes, followed by a longer pause (to be defined).

N° of flashes	Fault description	Troubleshooting
1	Encoder Parity Error	Check encoder outputs, check wirinigs
2	Turret out of position at startup.	Reset and try again alternating CW and CCW direction
3	Index pin stay engaged without command	Check if 24V command has not been switched-off. Move a little the disk to reduce the friction.
5	Encoder Strobe is Off when turret is Locked	Check the encoder mounting position, check the encoder outputs, check if the turret is really locked.
6	Start command when the turret is already in cycle	Review the PLC logic, unstable wiring.
8	Internal interlock CW/CCW failed	If the problem happens often, , replace the UCN.
11	Cycle timeout	The index solenoid is not working, the index pin does not engage the index switch, the encoder does not work properly, the wiring is unstable, the CW/CCW power contactors are not working, the index switch is not working.
12	Clamping timeout	The clamping switch is not working, the CW/CCW power contactors are not working, the camping switch is out of position, mechanical fault…
13	At the end of cycle the turret is clamped in a wrong station.	Check the encoder wirings, check the wirings form the CNC to the UCN.

Timings, cycle behavior

The new position must be set and stable at least 10 ms before sending the START signal.
The UCN detects and stores the new position on the rising edge of the START, any other START issued while the turret is in cycle will be ignored.

In case the new position is different from the actual one and recognized as valid (from 1 to number of tools) the ENABLE is set to LOW in about 16 ms and goes high again once the LOCKED switch signal from the turret is detected. Consider that the turret cycle finishes when the index pin is released and the brake (if present) energized. So it is forbidden to ask a new tool change for about 400 ms. after the ENABLE has gone HIGH (the start signal will be ignored).

For compatibility with previous model of UCN, in case the new position is equal to the actual one or that it is not existing (0 or > of number of tools), the START signal will be ignored.

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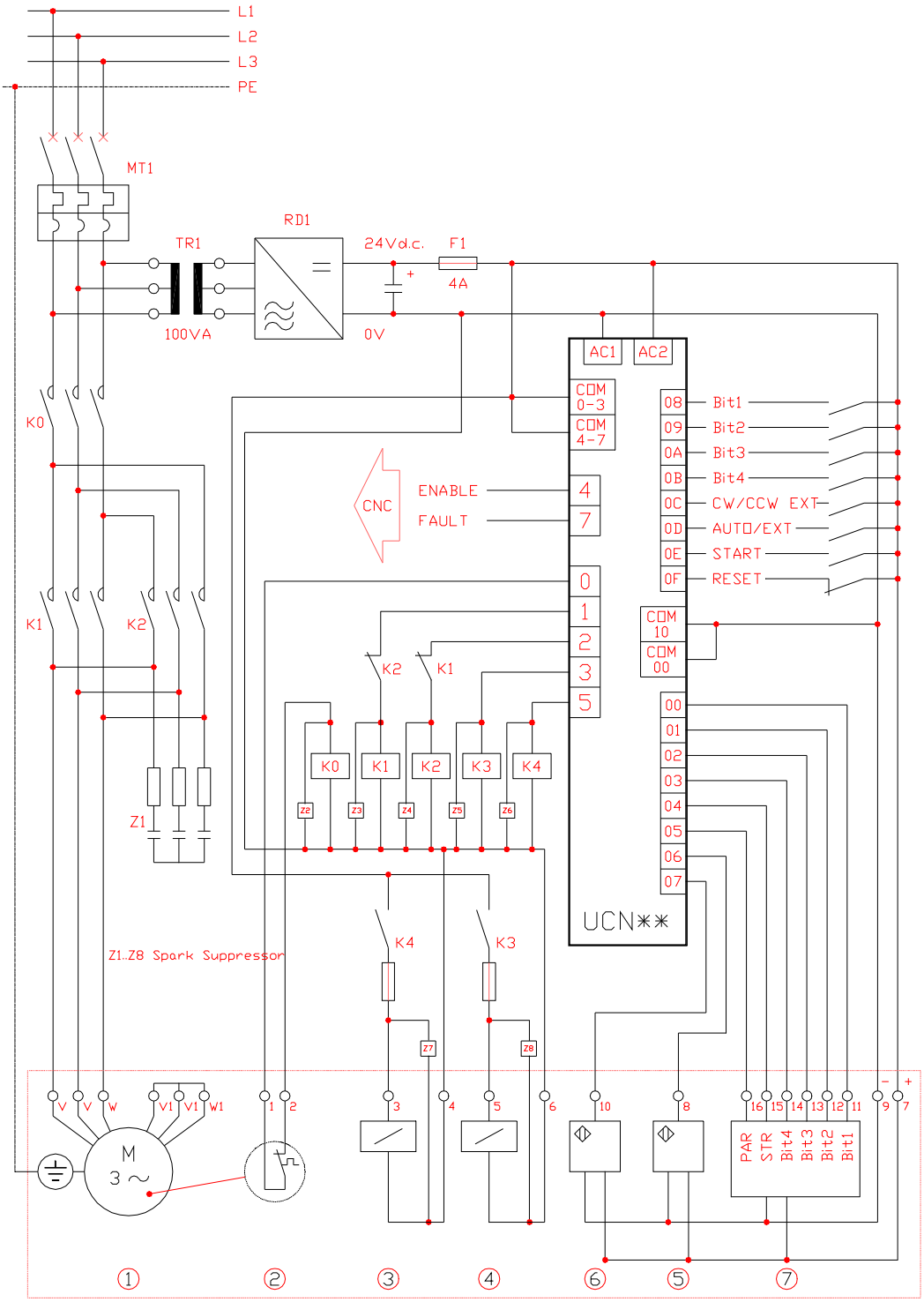
Schematic for BD 80,BSV-N,BSA with brake



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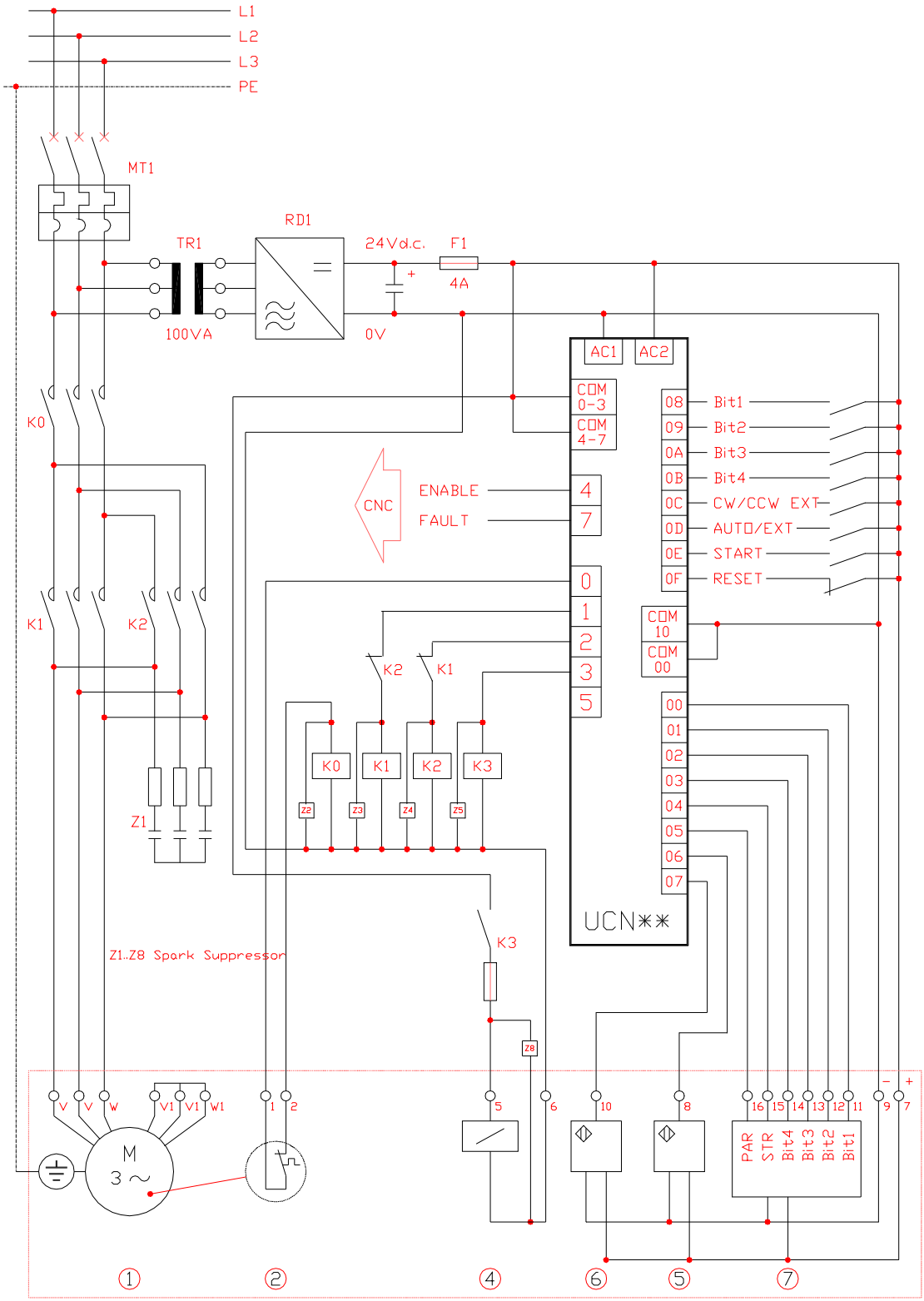
Schematic for BSV-N,BSA without brake



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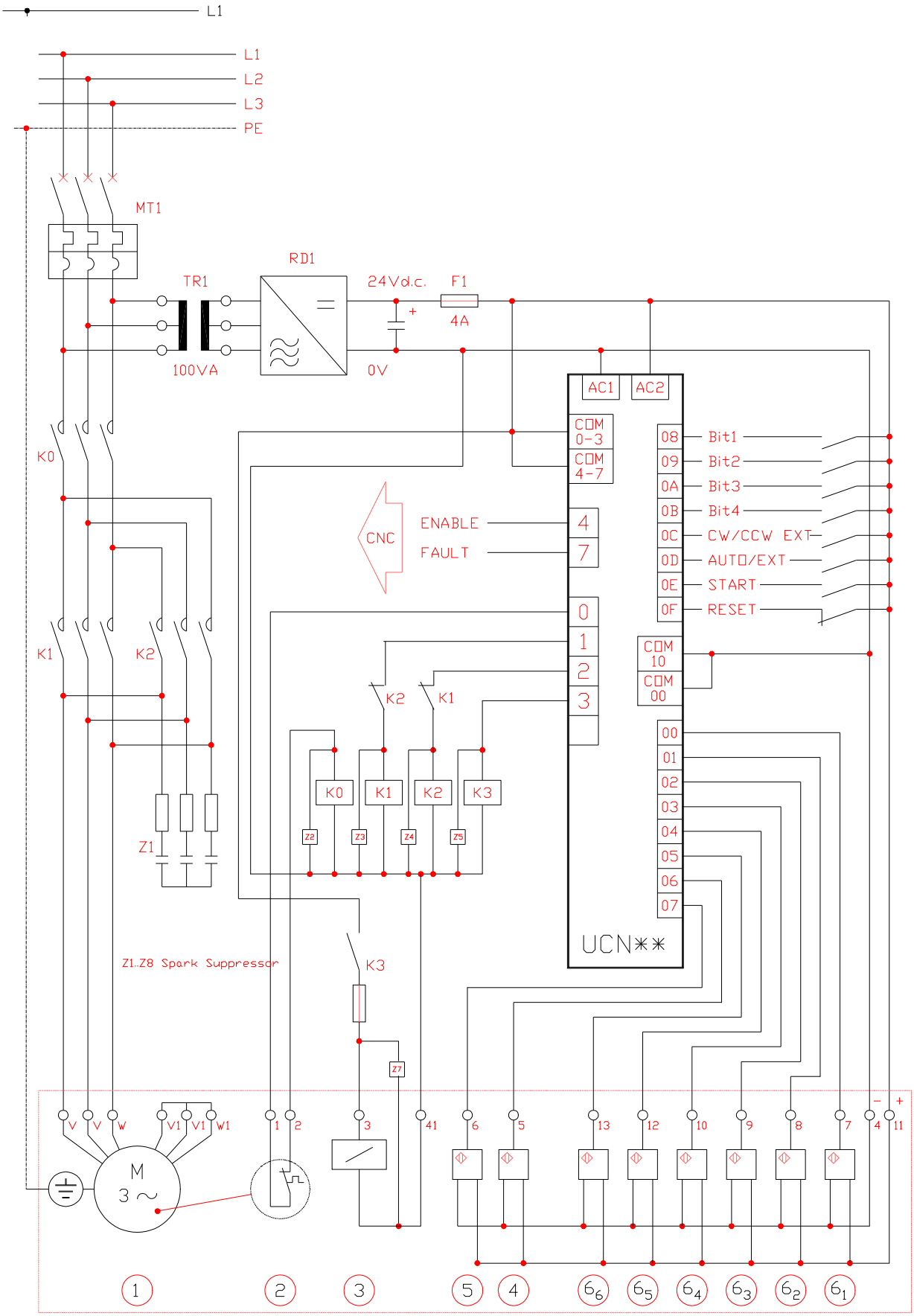
Schematic for TRM-N



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