Start-Stop Self-Holding Circuit: Power, Control and Timing Diagram

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Article address: https://drgmotor.com/en/blog/electric-motors/start-stop-self-holding-circuit

Technical assumptions

- 400 V 50 Hz three-phase supply; 230 V AC control (L-N) protected by control fuse F3.
- Direct-on-line start; power side with a Q1 motor protection breaker or F1 fuses + F2 overload relay.
- Terminal names vary by device; the device’s own wiring diagram prevails.
- Values are examples; contactor, overload relay and cable are selected from the motor nameplate and site conditions.
- S0 is an ordinary stop button; emergency stop is a separate safety function designed from the risk assessment.

Safety notice

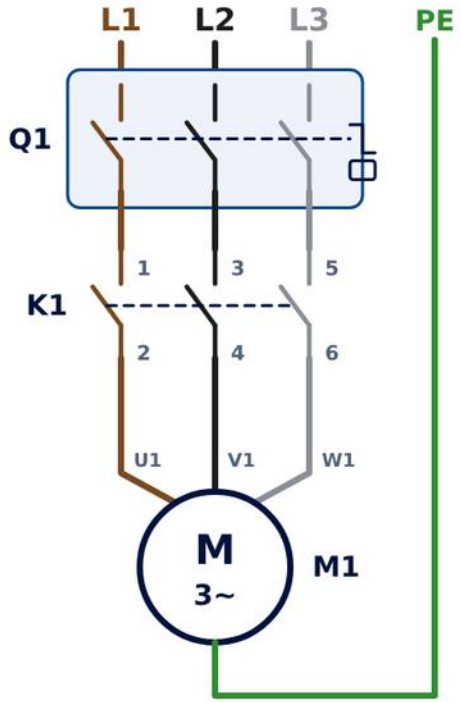
- This content is for technical information only. Wiring, measurement and commissioning must be carried out by qualified electrical personnel, following lock-out and verification of de-energised state, and in line with the motor and device manufacturer's documentation.

Suitable DRG motors and store

- DRG-90L-4 – 1,5 kW: https://drgmotor.com/en/buy-electric-motors-online/1-5-kw-1500-rpm-three-phase-motor-aluminium-drg-90l-4
- DRG-100L2-4 – 3 kW: https://drgmotor.com/en/buy-electric-motors-online/3-kw-1500-rpm-three-phase-motor-aluminium-drg-100l2-4
- DRG-132S-4 – 5,5 kW: https://drgmotor.com/en/buy-electric-motors-online/5-5-kw-1500-rpm-three-phase-motor-aluminium-drg-132s-4
- DRG-132M-4 – 7,5 kW: https://drgmotor.com/en/buy-electric-motors-online/7-5-kw-1500-rpm-three-phase-motor-aluminium-drg-132m-4
- https://drgmotor.com/en/buy-electric-motors-online

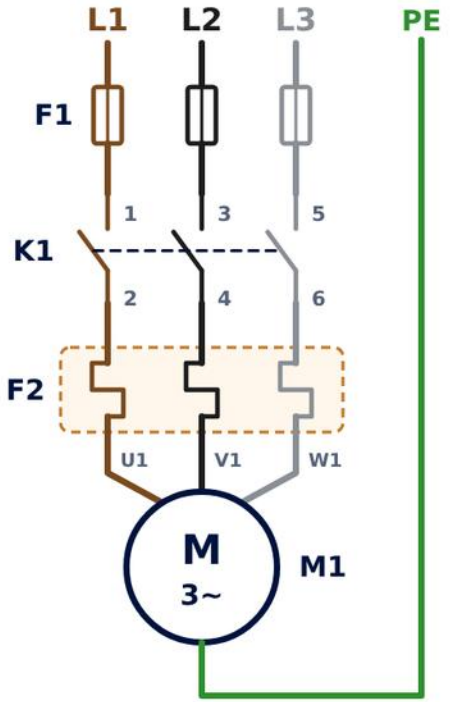
DRG MOTOR

A) With motor protection breaker



Q1: short-circuit + overload protection in one device
To control circuit: Q1 auxiliary contact

B) With fuses + overload relay



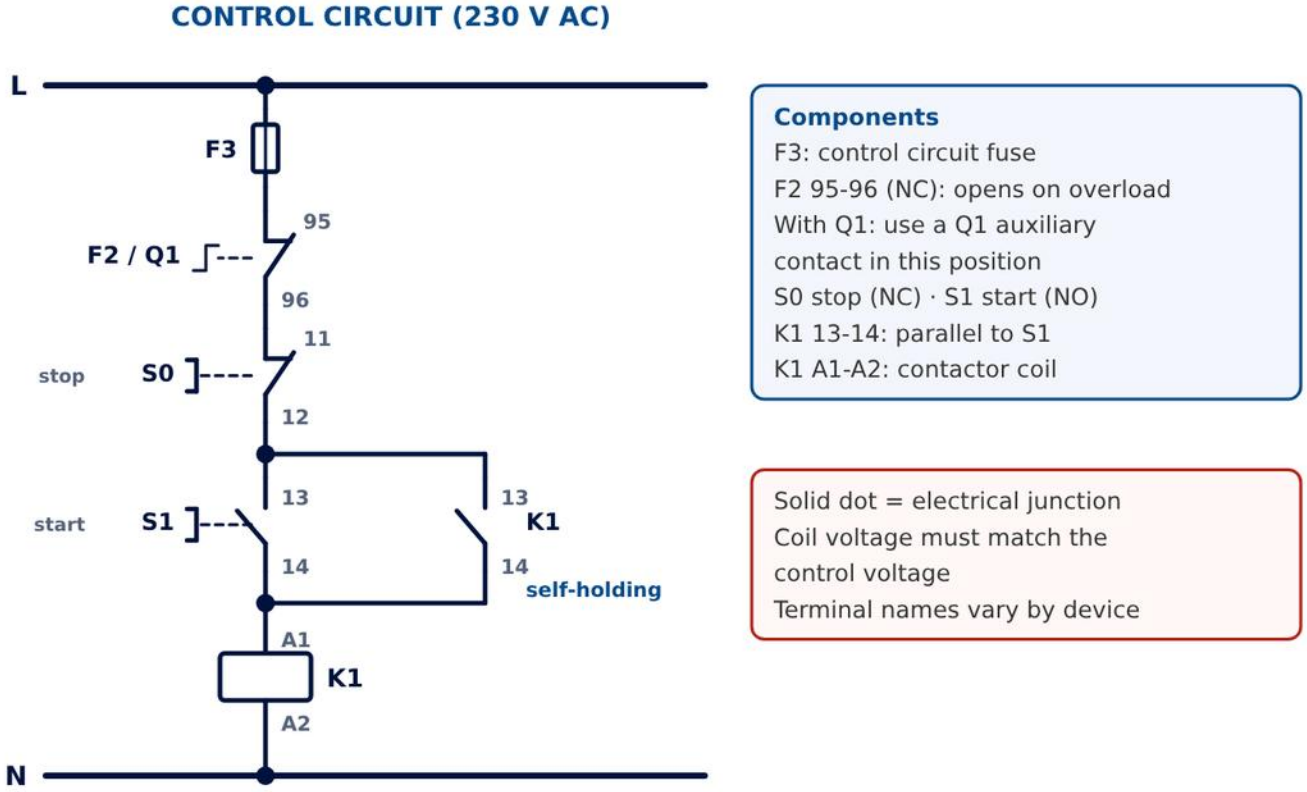
F1: short circuit · F2: overload relay
To control circuit: F2 95-96 (NC)

400 V 50 Hz · values are examples; select devices from the motor nameplate

Start-stop power circuit: two protection options

L1-L2-L3 · K1 main contacts 1-2 / 3-4 / 5-6 · M1 3~ · PE protective conductor

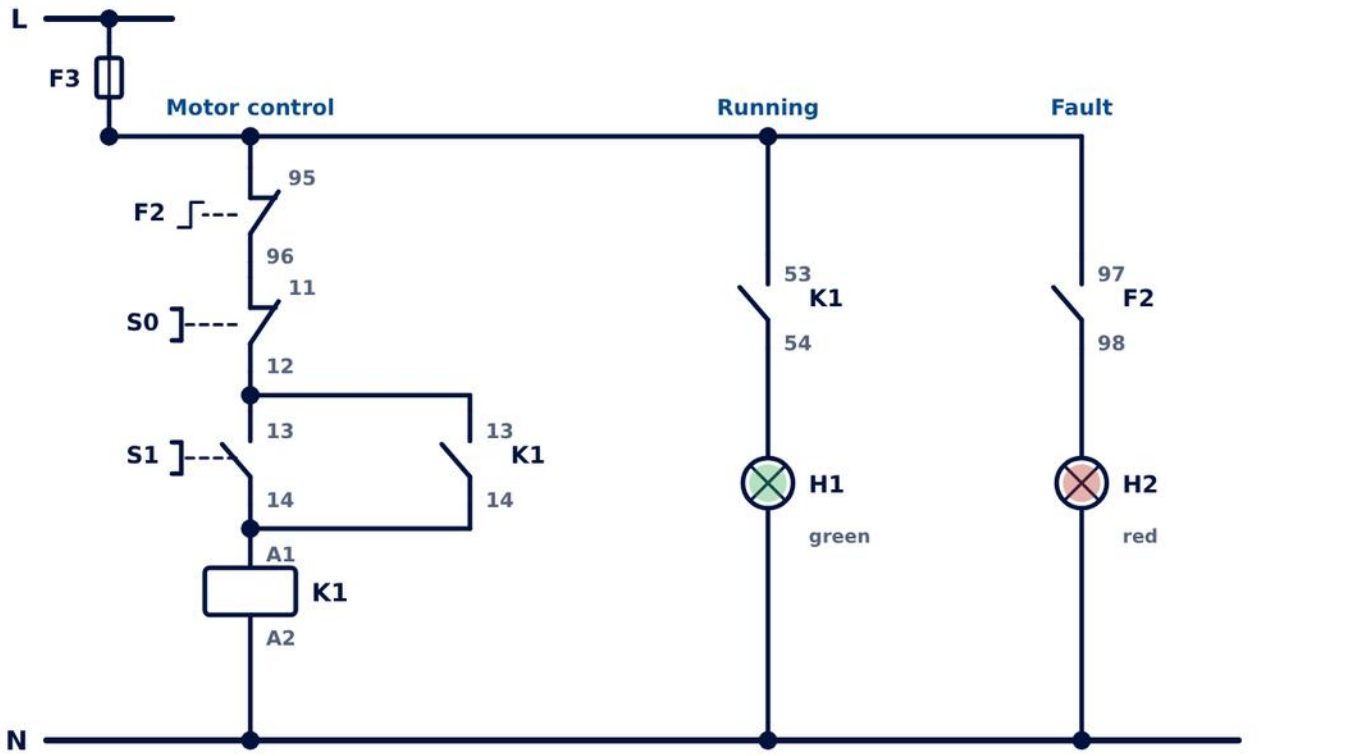
Figure 1



Start-stop self-holding control circuit

L – F3 – F2/Q1 95-96 – S0 – (S1 ‖ K1 13-14) – K1 A1-A2 – N

Figure 2



H1 lights when K1 picks up (K1 53-54 NO) · H2 lights on overload trip (F2 97-98 NO)
With Q1: use the Q1 trip-signal contact · terminal names vary by device

Start-stop circuit with running and fault lamps

Optional diagram · H1 running · H2 overload fault · common control fuse F3

Figure 3

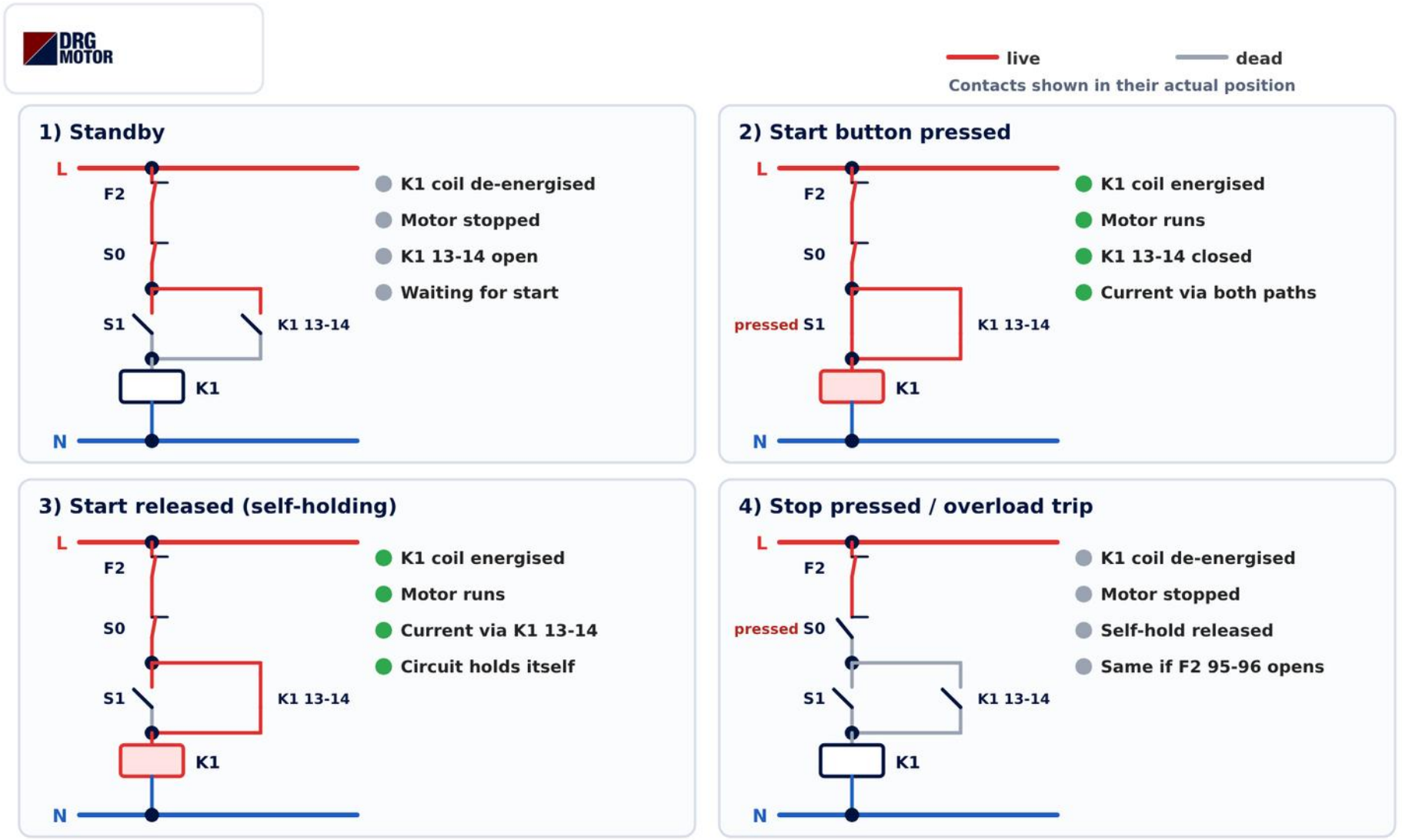

DRG MOTOR
live
dead
Contacts shown in their actual position
1) Standby
L
F2
S0
S1
K1 13-14
K1
N
K1 coil de-energised
Motor stopped
K1 13-14 open
Waiting for start
2) Start button pressed
L
F2
S0
pressed S1
K1 13-14
K1
N
K1 coil energised
Motor runs
K1 13-14 closed
Current via both paths
3) Start released (self-holding)
L
F2
S0
S1
K1 13-14
K1
N
K1 coil energised
Motor runs
Current via K1 13-14
Circuit holds itself
4) Stop pressed / overload trip
L
F2
pressed S0
S1
K1 13-14
K1
N
K1 coil de-energised
Motor stopped
Self-hold released
Same if F2 95-96 opens
The four states of the start-stop circuit
Press · release · stop · overload: the path the current takes

Figure 4

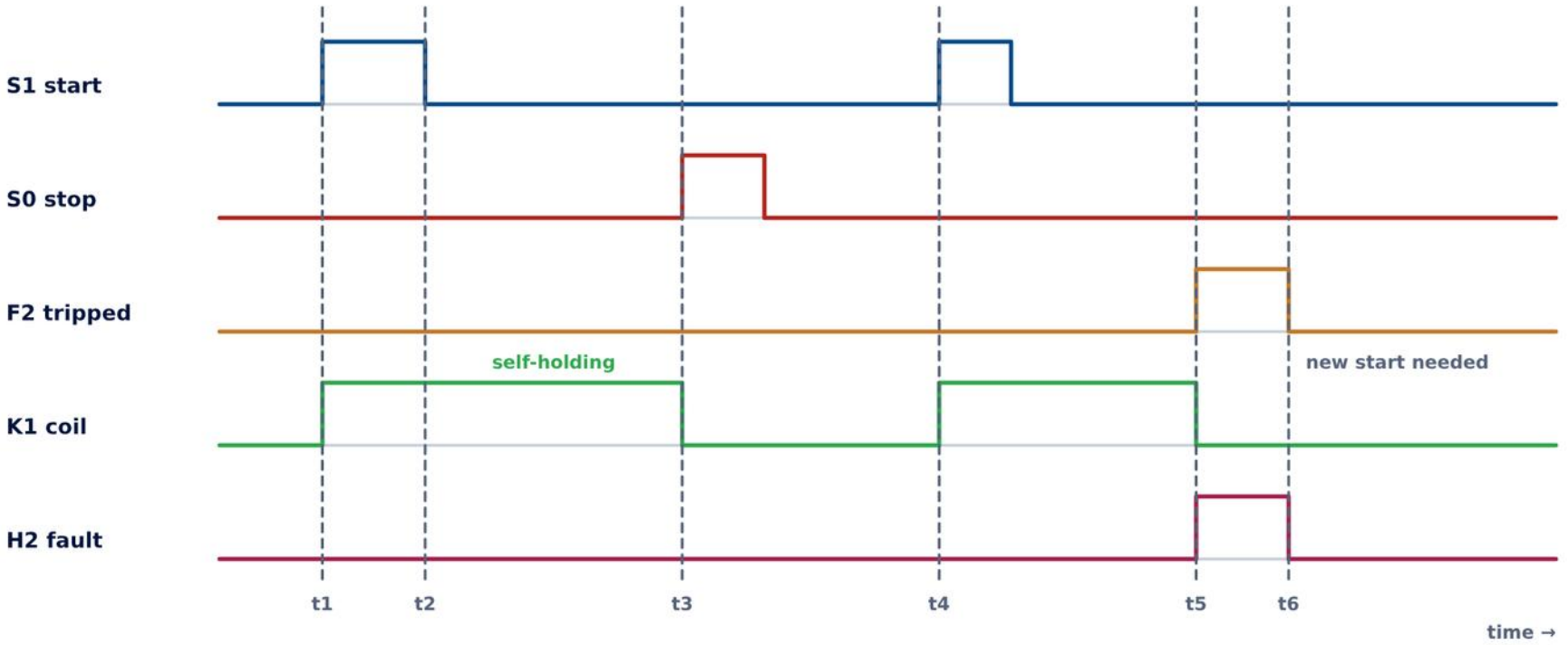
Step	S1	S0	F2 95-96	K1 coil	K1 13-14	M1
1 Standby	released	released	closed	off	open	stopped
2 Start button pressed	pressed	released	closed	energised	closed	runs
3 Start released	released	released	closed	energised	closed	runs
4 Stop button pressed	released	pressed	closed	off	open	stopped
5 Stop released	released	released	closed	off	open	stopped
6 Overload trips while running	released	released	open	off	open	stopped
7 Overload relay reset	released	released	closed	off	open	stopped

Step 7: resetting the relay does not re-energise K1; a new start command is needed (self-holding is lost).

Start-stop state table

Buttons, overload contact, coil, holding contact and motor at each step

Figure 5

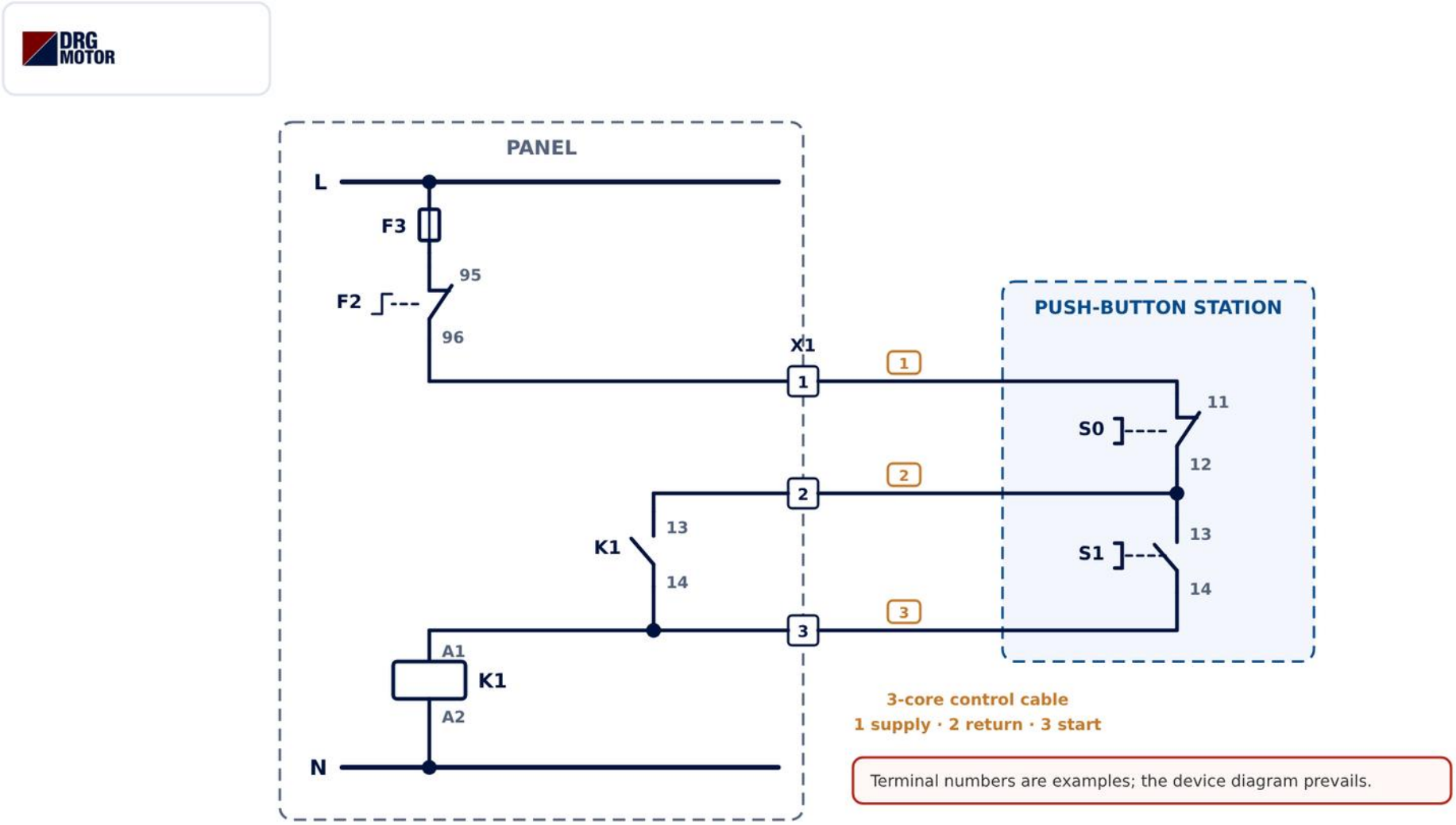


High level: button pressed / relay tripped / coil or lamp energised. t1 start → K1 picks up · t2 start released, K1 13-14 holds · t3 stop → K1 drops t4 new start · t5 overload trips → K1 drops, H2 lights · t6 relay reset → K1 does not pick up by itself

Start-stop timing diagram

S1, S0, F2 and K1 signals over time

Figure 6



3-wire connection between panel and push-button station

S0–S1 bridge in the station · K1 13-14 holding contact in the panel

Figure 7