## Technical data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Controller | | 431, 432 | 433 | 434 | 435 | 436 | |
| Output power | $P_{el}$ | 360 | 720 | 1080 | 1445 | 2210 | W |
| Mains voltage | U | 190...265 V~ 50...60 Hz | | | | | |
| Field voltage | $U_F$ | 0.9 x U | | | | | |
| Armature voltage | $U_A$ | 180 | | | 170 | | V |
| Armature current | $I_A$ | 2 | 4 | 6 | 8.5 | 13 | A |
| Form factor without choke | $F_F$ | 1.4 | 1.4 | 1.4 | | | |
| Form factor with choke | $F_F$ | | | 1.2 | 1.2 | 1.2 | |
| Armature choke Art.-no. | | | | 6 A 24 mH 318 807 | 10 A 20 mH 309 271 | 10 A 40 mH 308 579 | |
| Fuses double Art.-no. | $S_i$ | FF 6.3 A ( 5x20 ) 305 722 | FF 8 A ( 5x20 ) 305 723 | FF 10 A ( 6.3x32 ) 307 855 | FF 16 A ( 10x38 ) 309 106 | FF 25 A ( 10x38 ) 307 308 | |
| Current limit | $I_{max}$ | 0...2 | 0...4 | 0...6 | 0...8.5 | 0...13 | A |
| Set-value pot. | R | 10 kOhms 1 W lin. | | | | | |
| Nominal master voltage | $U_{LN}$ | 7 | | | | | V |
| Nominal tacho voltage | $U_{TN}$ | 12...90 | | | | | V |
| Acceleration time | $T_i$ | 1...10 | | | | | s |
| min. speed | $n_{min}$ | -0.1...0.25 | | | | | $n_N$ |
| max. speed | $n_{max}$ | 1...0.75 | | | | | $n_N$ |
| Ambient temperature | $T_u$ | 0...45 | | | | | °C |
| Plug-in board P Art.-no. Dimensions | | 308 073 100x160 x40 | | | | | mm |
| Chassis unit E Art.-no. Dimensions | | 307 949 115x170 x40 | 308 069 150x220 x40 | 308 070 150x220 x65 | 313 357 150x220 x100 | 309 168 150x220 x100 | mm |
| Encased unit G Art.-no. Dimensions | | 308 393 150x225 x105 | 308 394 215x320 x135 | 308 395 215x320 x135 | 313 358 215x320 x160 | 309 167 215x320 x160 | mm |

## Modes of operation

### 1. Speed control with armature voltage feedback

If the demands for speed accuracy and setting range are not very high, the controller can be operated without tachogenerator feedback. Depending on the motor, accuracies of approx. 3...5 % over a speed control range 1 : 20 can be obtained. The motor armature voltage drop is compensated for with the I x R trimmer.

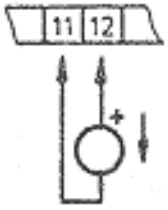
### 2. Speed control with tachogenerator feedback

A speed accuracy of approx. 1 % is obtained with tacho feedback. All units are designed for a.c. tachogenerators with d.c. voltage output. A speed control range of 1 : 30 is achieved with a tachogenerator with $U_{TN}$ = 20 V / 1000 r.p.m. at $n_N$ = 3000 r.p.m.

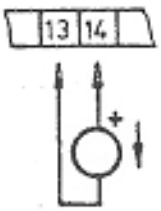
### 3. Master voltage operation

An external master voltage can be used to adjust the speed instead of the set-value potentiometer. The maximum value of the master voltage must not exceed + 7 V. The master voltage must be mains potential free.

431




$U_{LN}$ = 7V




432, 433, 434, 435, 436

Caution: All unit terminals carry mains potential. Several units can therefore only be operated from a single master voltage via galvanic isolation.

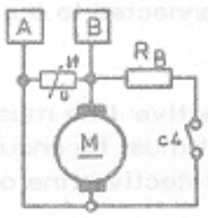
### 4. Switching operations

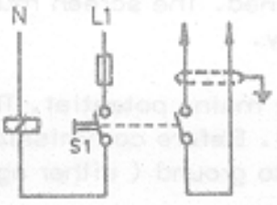
#### 4.1 Control inhibit

When the "control inhibit" switch is closed ( see connection diagram ), no firing impulses are supplied. Weak current contacts ( 12 V, 20 mA ) are used for this.

#### 4.2 Electro-dynamic braking

In order to brake the motor, the induced armature current is utilized for braking with the field excited. Before the braking resistor is connected, the control inhibit must be activated. To determine the size of the braking resistor, see our "Small collection of formulae"



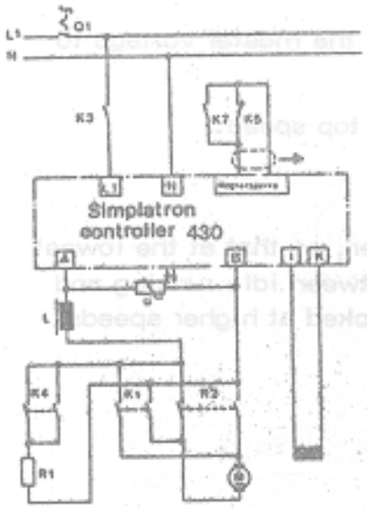

To control inhibit
see connection diagram

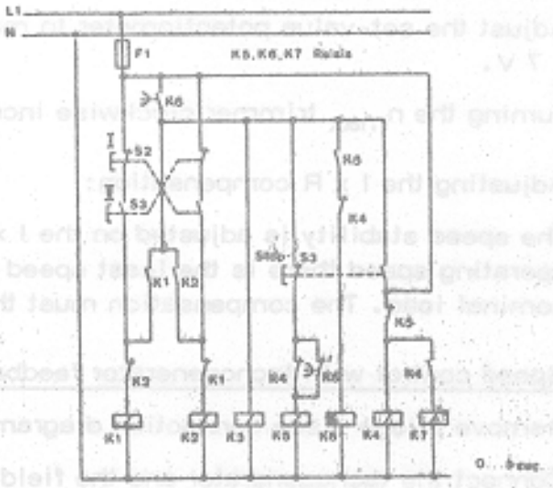
In order to limit the voltage spikes, which occur when the contacts of the contactors chatter and bounce, a voltage limiter ( e.g. a zink-oxide varistor ) must be connected in parallel to the terminals A and B of the motor. Recommended values:

| Unit | 431, 432 | 433, 434, 435, 436 |
|---|---|---|
| Varistor | S 20, K 300 | B 32, K 275 |

## 4.3 Reversing

The direction change is made by changing the poles of the armature. The motor is electro-dynamically braked to a standstill and the poles then exchanged. The braking time must be adjusted on the time-lag relay, so that the motor standstill is ensured before the armature poles are changed.



## Installation instructions

When installing the controller in a cabinet, sufficient cooling must be ensured. The ambient temperature must not exceed + 45° C.

Control cables must be screened. The screen must be connected to the protective line on the controller end only.

All controller terminals carry mains potential. The protective line must only be connected to the PE terminal. Before commissioning, it must be ensured, that the supply line has no short to ground ( either against protective line or to earth ).

## Adjusting instructions

1. Adjust the $I_{max}$, $T_i$, $n_{min}$, $n_{max}$ trimmers and the set-value potentiometer fully anti-clockwise.

2. Setting the current limit

   Connect a moving-coil ammeter into the armature. Either block the armature or disconnect the field. Switch on the mains and turn the set-value potentiometer to mid-value. Turn the $I_{max}$ trimmer to set the armature current. In order to determine the value to be set, the armature nominal current ( name-plate value ) is divided by the formfactor ( $I_{AN}/F$ ).

3. Adjusting the top and bottom speeds

3.1 Armature voltage control with I x R compensation

Connect bridge according to the connection diagram. Disconnect the field. Adjust the set-value potentiometer or the master voltage to zero. Switch on the mains.

Turning the $n_{min}$ trimmer clockwise increases the bottom speed.

Adjust the set-value potentiometer to maximum or the master voltage to + 7 V.

Turning the $n_{max}$ trimmer clockwise increases the top speed.

Adjusting the I x R compensation:

The speed stability is adjusted on the I x R trimmer, so that at the lowest operating speed there is the least speed change between idle running and nominal load. The compensation must then be checked at higher speeds.

3.2 Speed control with tachogenerator feedback

Remove bridge ( see connection diagram ).

Connect the tachogenerator and the field.

Turn the I x R trimmer fully anti-clockwise.

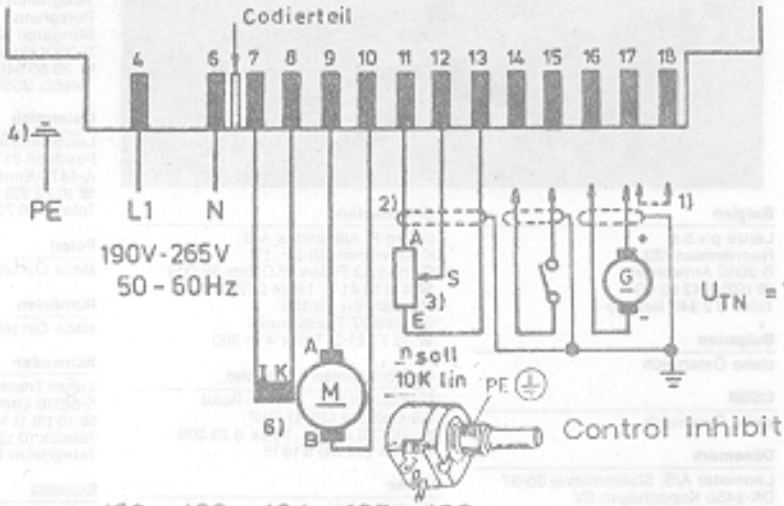
Adjust the set-value potentiometer or the master voltage to zero. Switch on the mains.

Turning the $n_{min}$ trimmer clockwise increases the bottom speed.

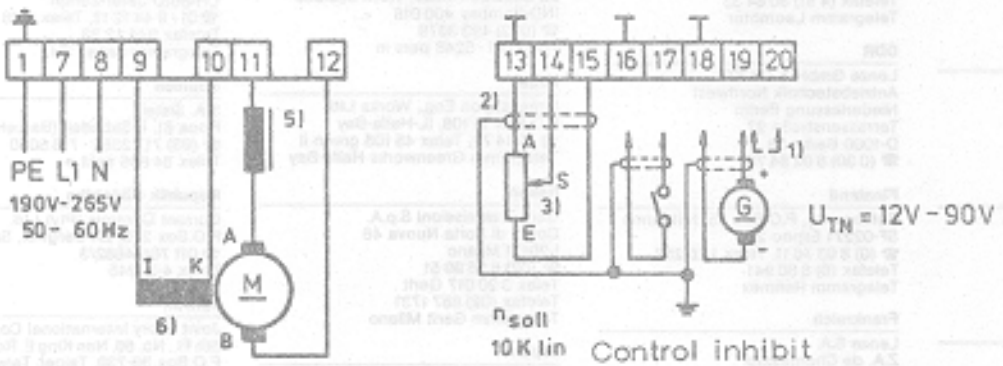
Adjust the set-value potentiometer to maximum or the master voltage to + 7 V.

Turning the $n_{max}$ trimmer clockwise increases the top speed.

Connection diagram 431




Connection diagram 432, 433, 434, 435, 436




1) With armature voltage control with I x R compensation:
With controller 431 bridge terminals 17 and 18.
With controller 432, 433, 434, 435 and 436 bridge terminals 19 and 20.

2) Connect screening to protective line at the unit end only.

3) Remove set-value potentiometer when operating with a master voltage.
Control cables must not be connected to the protective line or to earth potential.

4) Plug-in type board block Art.-no. 304 817: Connect the protective line to empty terminal 2.

5) Armature chokes are necessary with controllers 434, 435, 436.

6) When using permanent magnet motors, the connection for the field supply is not necessary.

7) Connect mechanical screw fixation of potentiometer with PE.



Änder. / modifications: