



## Instruction manual

Rü 584

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# Instruction manual

## Vareotron RÜ 584

Controller for shunt wound DC-Motors  
with isolated set point input



## 1.0 General

The range of VAREOTRON RÜ-584 control units are single phase current regulators for single quadrant DC shunt wound motors. They can operate both with separately excited field and permanent magnet motors.

The rotational speed can be regulated either from a tacho-voltage feedback or through the internal measurement of the armature voltage with additional, so called **IxR**-compensation. A ramp-up and ramp-down integrator is provided for smooth control of the unit, and this allows the ramp-up and ramp-down times to be independently adjusted.

The other available adjustments on the control unit are:

- $N_{\min}$  - Minimum rotational speed for zero set point
- $N_{\max}$  - Maximum rotational speed for maximum set point
- $I_{\max}$  - Maximum armature current
- PI - Regulation adjustment ( response )
- IxR - IxR – Compensation for armature voltage feedback

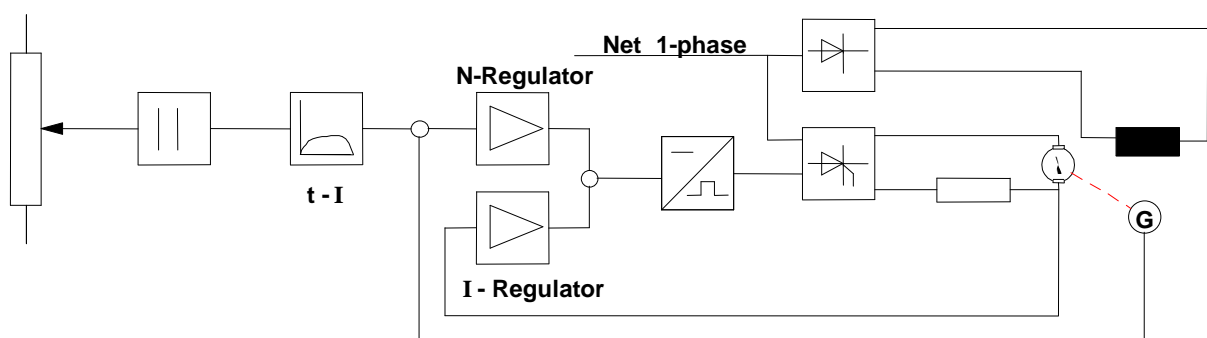
To prevent a thermal overload during continuous operation above the current limit, the motor is switched off if the current is exceeded for longer than 3 minutes.

The output of the unit can be switched off with enable contacts ( enables input is at mains potential ).

The rated power of this range of units is 540 W and 900 W.

All units have transient suppression to EN 50081-1 Standard.

## 2.0 Function Description



The unit is divided into a control section with the complete regulating electronics and a power section to drive the motor – see block schematic. The power section comprises a half-controlled rectifier bridge for the armature circuit and a non-controlled rectifier for the field supply.



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The armature voltage can be infinitely varied by the half – controlled bridge rectifier. The set point for adjusting the armature voltage , i.e. the rotational speed, can be adjusted by means of a potentiometer or a with a **0 – 10 V, DC** signal voltage – see connection drawing. The set point input is isolated from the mains potential electronics.

The generated set point is fed to a isolated amplifier which is separated from the mains voltage by a decoupler. This signal then passes to a ramp up/down integrator which controls the drive as it starts up or runs down. This is then connected to the rotational speed regulation circuit. The motor current is measured with a shunt resistor, which feeds this back to the regulator circuit and is limited to an adjustable level. If the motor reaches the current limit then the rotational speed is reduced. At the lower motor speed range the fan becomes ineffective and so the motor windings can overheat. To prevent this a power semiconductor trips after approximately 3 minutes running above the current limit. The power semiconductor is reset by switching the mains voltage OFF and then ON again.

The general set point is fed to a isolated amplifier which is separated from the mains voltage by a decoupler. This is then connected to the rotational speed regulator circuit. The motor current is measured with a shunt resistor, which feeds this back to the regulator circuit and is limited to an adjustable level. If the motor reaches the current limit then the rotational speed is reduced. At the lower motor range the fan becomes ineffective and so the motor windings can overheat. To prevent this a power semiconductor trips after approximately 3 minutes running above the current limit. The power semiconductor is reset by switching the mains voltage OFF and then ON again.

## 2.1 Operating Modes

### 2.1.1 Armature voltage regulation with IxR compensation

When there is no tacho-generator available for a feed-back signal, the unit can be controlled from the armature voltage. The IxR compensation maintains the rotational speed an loading and a constant voltage. The control accuracy achieved in this manner is approximately 4% of the rotational speed value.

### 2.1.2 Rotational Speed Control with Tachogenerator

Drives with a tachogenerator for feedback control of the effective rotational speed can achieve a regulation accuracy of 1%. Tachogenerators with a DC output should be used. The maximum tacho voltage should not exceed 180 V. The unit is factory set to operate with tachogenerators which have an output of 15 V / 1000 rpm. The resistor Rx1 can be changed to accomodate other tacho voltages.



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### 2.2 Enable

The power section of the unit can be switched off instantly, using the inhibit e.g. during inching operation while setting up the system. The mains supply is switched ON and OFF using the inhibit, for continuous switching operation of the regulator and this improves the reliability of the unit.

### 2.3 Adjusting the current limiting to the nominal motor current



**Note:** At delivery the unit is adjusted with the typical unit current

By the adjustment of the maximum current by use of a DC motor with a Thyristor Power converter please take care of the formal factor „ F „.

If the motor is running without an armature throttle, you have to work with a formal factor of approx 1,4.

The adjusting current limiting value is calculated as followed:

Nominal armature current ( described at type plate) divided through formal factor is equal the current limiting value ( measured with moving coil at the armature wire ).

I Armature

$$\frac{\text{I Armature}}{F} = I \text{ limit}$$

**Example:** Given current on the Motor type plate: 3 A

$$3 \text{ A} / 1,4 = 2,14 \text{ A}$$

Adjust the current limiting value to 2,14 A .

By use of a Smoothing choke the formal factor improves to 1,11.

$$3 \text{ A} / 1,11 = 2,70 \text{ A}$$

Adjust the current limiting value to 2,7 A.

Smoothing choke are required to:



1. improve the regulation behaviour.
2. protect the motor for unacceptable heating
3. protect the motor collector ( commutated )

### 3.0 Adjusting

Connect the unit like the sketch:

potentiometer:  $I_{max}$ ,  $N_{min}$ ,  $N_{max}$ ,  $T_{auf}$ ,  $T_{ab}$  to the left stop;  
PI and IxR to the middle adjustment.

#### 3.1 Adjustment of the current limiting

Set point adjustment in middle position. To measure the current use a moving coil at the wire. Block the armature or disconnect the field.

Switch on unit. Turn Pad trimmer  $I_{max}$  so long to the right, until the required nominal current appears



**Attention: Look for form factor**

Switch of unit, connect field.

#### 3.2 Adjustment of the minimum speed

Set point adjustment to „ Zero „. Adjust on trimmer  $N_{min}$  the required minimum speed. ( rightturns increases the speed ).

#### 3.3 Adjustment of the maximum speed

Set point adjustment to „ Max „. Adjust on trimmer  $N_{max}$  the required maximum speed.



**Attention: Do not exceed 180 V armature voltage**



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**Attention: IxR-Compensation only by use without a Tacho generator**

The IxR-Compensation can only be accommodated at the object for the dynamic ratio of the actuation. The trimmer IxR must be equilibrated in this way, that by lowest operating speed the smallest speed difference between rated load and idle running appears. Is the drive swinging, the IxR-Compensation is turn to far. Rightturns increases the influence of the IxR-Compensation ).

### 3.4 Adjustment of the speed regulation

With the trimmer PI ( Regulation amplifier ) the full stabilizing characteristic can be balanced to the actuation ratio ( inherent instability, settling time ). This can only happen at the realistic drive, because moving masses and frictional forces are decisive.

### 3.5 Adjustment of the set point integrator

With the trimmer  $T_{auf}$  or  $T_{ab}$  the time guidance of the Speed regulation can be adjusted parted from each other. By right-turn of  $T_{auf}$  the run-up time of the motor can be prolonged.



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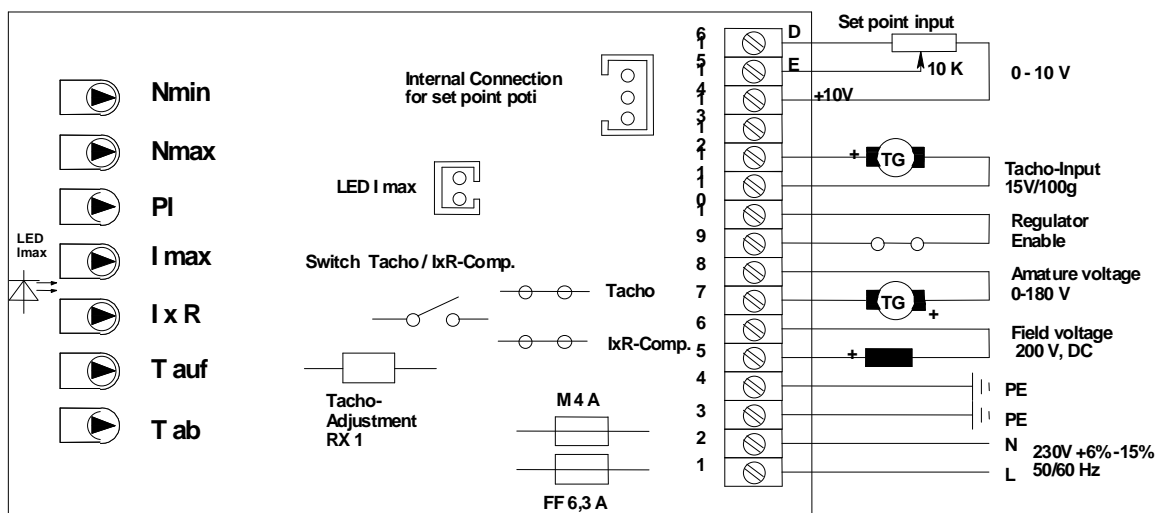
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### 4.0 Technical Data

VAREOTRON RÜ 584	3 A	5A
Supply Voltage V	230 V +6%-15% 50/60Hz	230 V +6%-15% 50/60Hz
Output Power Pel	540 W	900 W
Field voltage VF	200 V, DC	200 V, DC
Armature voltage VA	0-180 V, DC	0-180 V, DC
Armature current IA	3A	5A
Field current IF	0,8 A	0,8 A
Tacho regulation range	1 : 100	1 : 100
IxR regulation range	1 : 20	1 : 20
Set point potentiometer	10 kW	10 kW
Set point voltage	0 – 10 V,DC	0 – 10 V,DC
Ambient temperature	0 – 45°C	0 – 45°C
Protection	IP 00	IP 00
Dimensions ( W x B x H )	185 x 110 45 mm	185 x 110 45 mm

### 5.0 Connecting sketch



**Set point and control leads must be installed screened!**

### 6.0 Ordering Key

Vareotron RÜ 584 / 3 for 3 A Armature Current  
 Vareotron RÜ 584 / 5 for 5 A Armature Current

ID-Nummer 5841  
 ID-