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Applikations-
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Service

LEYBOLD VAKUUM

GA 05.214/7

TURBOTRONIK NT 151/361

Elektronischer Frequenzwandler

Electronic Frequency Converter

Kat.-Nr. / Cat. No.
857 15/16/17/18/19

Gebrauchsanleitung

Operating Instructions

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References to diagrams, e.g. (2/5) consist of the Fig. No. and the Item No. in that order.

Warning

Indicates procedures that must be strictly observed to prevent hazards to persons.

Caution

Indicates procedures that must be strictly observed to prevent damage to, or destruction of the appliance.

Safety Notes

Warning





Only qualified personnel or the Leybold Service Department may carry out work on the converter.

Potentially fatal voltages are present inside the converter.

The unit shall be disconnected from the power supply before commencing any work where the converter housing will be opened.

The converter contains components which could be damaged by electrostatic discharges.

The converter essentially requires no servicing since it contains no components which could be adjusted.

Depending on the installation particulars and the ambient conditions, the converter may collect grime (dust, moisture) on the inside. Such contamination can lead to malfunctions, overheating or short circuits and will have to be avoided to the maximum extent possible. The LEYBOLD Service Department can clean the converter. We recommend adhering to a cleaning interval of about three years.

In the interest of safety all unauthorized modifications and tampering with the converter are absolutely prohibited.

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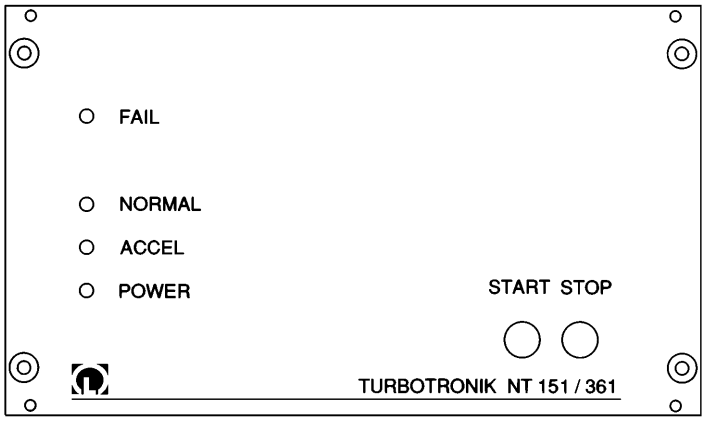


Fig. 1 Electronic frequency converter TURBOTRONIK NT 151/361, front

1 Description

1.1 Design and function

The electronic frequency converter TURBOTRONIK NT 151/361 is used to drive the turbomolecular pumps TURBOVAC150, 360, 150 CSV, 360 CSV, 150 V, 360 V,151, 361, 151 C, 361 C.

The TURBOTRONIK NT 151/361 converts the single phase mains voltage into a three-phase AC voltage for driving the asynchronous motor of the connected turbomolecular pump.

The following operational states are indicated by LEDs:

- Mains voltage applied (POWER, green),
- Acceleration (ACCEL, yellow),
- Normal (NORMAL, green),
- Failure (FAIL, red).

A relay output is also available for the NORMAL signal.

After starting the pump will run up at maximum current. This is indicated by the ACCEL LED.

Having reached approx. 80% of the nominal speed the NORMAL LED comes on and the ACCEL LED goes off.

The motor current is continuously monitored and controlled. If the speed cannot be maintained even at the maximum current due to external influences, for example because of a greater gas supply, the speed will drop but the pump will continue to operate.

When the speed drops below 150 Hz approx. the LED FAIL on the converter lights up.

The outputs are short-circuit proof and protected against no load conditions.

The TURBOTRONIK recognizes which pump is connected.

The connection line between TURBOTRONIK and TURBOVAC may be up to 100 m long.

The TURBOTRONIK is contained within a housing, and can be used as a table top instrument or for installation in a 19“ rack. Operation is by means of the START and STOP buttons on the front plate.

1.2 Standard specification

Cat. No.	Mains lead , 2 m long	Fuses
857 15	with earthed plug	2 x T 2,5 A 2 x F 5 A
857 16	with US mains plug	2 x T 2,5 A 2 x F 10 A
857 17	with US mains plug	2 x T 2,5 A 2 x F 10 A
857 18	with special mains plug	2 x T 2,5 A 2 x F 10 A 2 x F 5 A
857 19	without mains lead	2 x T 2,5 A 2 x F 5 A

4 screws and washers for rack installation.

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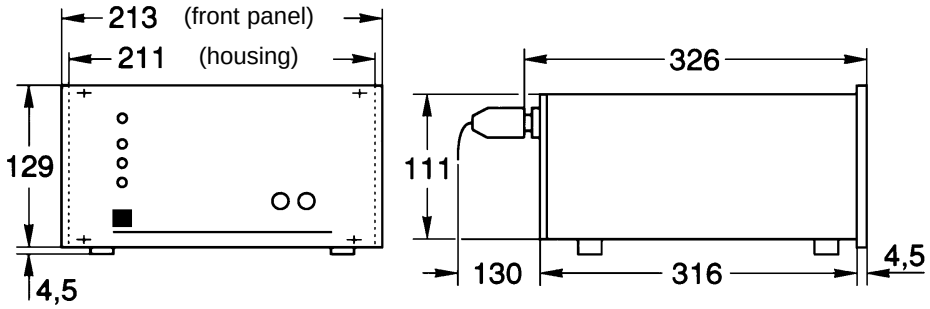


Fig. 2 Dimensional drawing, Dimensions in mm

Key to fig. 3
1 Fuse holder
2 Fuse, 6.3 x 32 mm
3 Hinged cover
4 Plug for mains cable
5 Printed circuit board

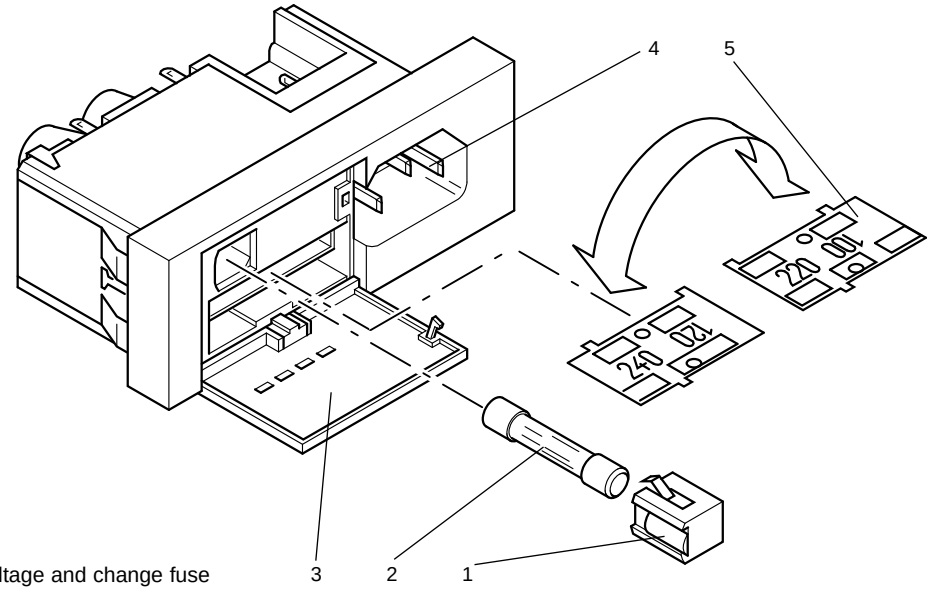


Fig. 3 Set TURBOTRONIK to the mains voltage and change fuse

1.3 Technical data

Mains voltage ranges, selectable
100/120/220/240 V, ±10%

Mains frequency 50/60 Hz

Power consumption of the TURBOVAC
- During acceleration (max. 30 min.) 680 VA
- Continuously, max. 480 VA
- Briefly (0.5 s) 750 VA

Output for the motor nominal voltage 3 x 42 V_{rms}

Current limiting (intermediate circuit current) 5 A

Nominal speed of the TURBOVAC
- 150/151 50,000 min^{-1} = 833 Hz
- 360/361 45,000 min^{-1} = 750 Hz

Max. loading of the relay contacts
50 V AC/4 A, 30 V DC/1 A

Dimensions 1/2 19“, 3 HU*

Weight 8.5 kg

Operating temperature, with sufficient convection
0 - 40°C

Storage temperature -25°C to +70°C

Electrical safety as to
IEC 1010 / EN 61010 / VDE 0411

EMV interference emission as to
EN 50081-1 / VDE 0839 Part 81-1, limit value B

EMV resistance to interference
EN 50082-2 / VDE 0839 Part 82-2, test level III

1.4 Ordering data

Electronic frequency converter TURBOTRONIK NT 151/361	Cat. No.
230 V	857 15
120 V	857 16
100 V	857 17
SH (100 V)	857 18
230 V without mains lead	857 19
Connection lead to the TURBOVAC	
3 m long	857 60
5 m long	857 61
10 m long	857 62
20 m long	857 63
19“ rack, 3 HU*	161 00

* HU = height units (modular spacings high)

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Key to fig. 4
1 Plug for the TURBOVAC connection line
2 Earth connection
3 Mains voltage settings and fuse; see fig. 3
4 Terminals for remote control; see fig. 5
5 Terminals for relays
6 Fuse
7 Plug for the mains cable

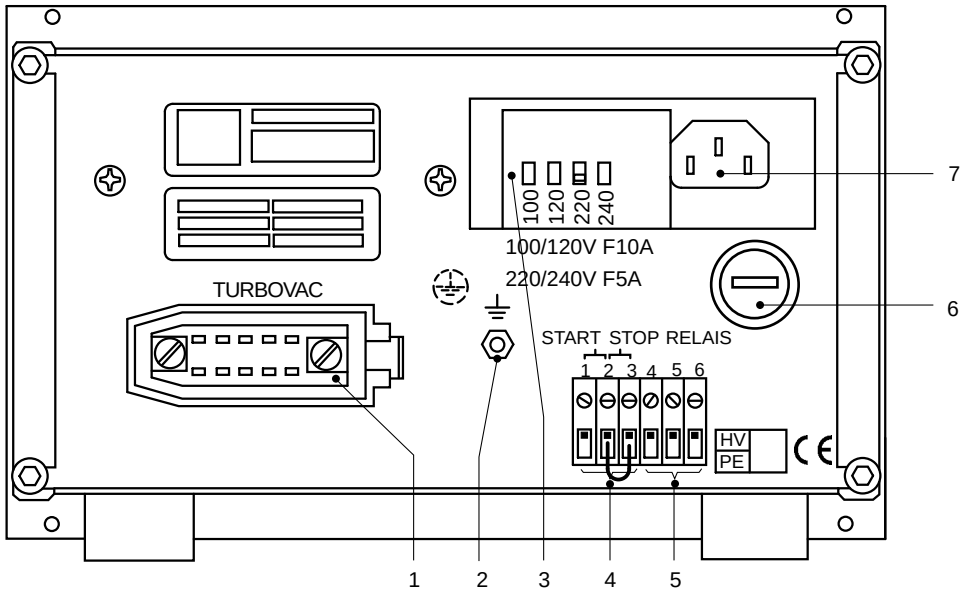


Fig. 4 Rear of the unit

2 Connection

The unit may only be connected by a qualified electrician and in accordance with the local regulations.

Warning

Inside the TURBOTRONIK there are hazardous voltages. Open the TURBOTRONIK only after disconnecting the mains.

2.1 Selecting the mains voltage (optional)

The mains voltage setting of the TURBOTRONIK can be changed; see „Technical data“.

Caution

The TURBOTRONIK is damaged when connected to the mains with an incorrect mains voltage setting.

Open the hinged cover (3/3). Remove the printed circuit board (3/5) and plug it back in such that the appropriate mains voltage value is visible.

If the voltage drops below 216 V in 230 V mains select the 220 V setting.

If necessary change the fuse.

Required fuse:	100-120 V	10 A
	220-240 V	5 A

Close the hinged cover again. The set mains voltage is visible from the outside.

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2.2 Remote control connection (optional)

The TURBOTRONIK NT 151/361 may be run in any one of 4 operating modes. They are selectable via different connection of pins 1 to 3 of the terminals (4/4) on the back of the TURBOTRONIK; see Fig. 5.

1. Operation via the START and STOP pushbuttons

Provide a link between pin 2 and pin 3 (setting as supplied).

2. Automatic start when the mains voltage is applied

Connect all 3 pins (1, 2 and 3) to each other.

When the mains voltage is applied the TURBOVAC will start up automatically.

3. Remote control via one external switch

Provide a link between pin 1 and pin 3.

When the second STOP input (pin 2) is connected to the connected pins 1-3 the TURBOVAC starts.

Removing this connection stops the TURBOVAC.

4. Remote control via 2 external pushbuttons

Provide a link between pin 2 and pin 3.

When pin 1 START is linked for at least 200 ms with connected pins 2 and 3, the TURBOVAC will start.

Removing the connection stops the TURBOVAC.

Connection of relay contacts (4/5)

Via pins 4, 5 and 6 (potential-free changeover contact) it is possible to detect the operating mode NORMAL.

5-6 closed	NORMAL
4-5 closed	not NORMAL; ACCEL or standstill

2.3 Connection of TURBOVAC

The TURBOTRONIK NT 151/361 is used to drive the turbomolecular pumps TURBOVAC 150, 360, 150 CSV, 360 CSV, 150 V, 360 V, 151, 361, 151 C, 361 C.

The TURBOVAC 150 H and 360 H may not be connected.

Plug in the connection line to the TURBOVAC at the plug (4/1) and on the motor of the TURBOVAC.

Connection lines up to 100 m long are permissible.

An earth line can be connected to (4/2).

2.4 Fitting the TURBOTRONIK and connecting the mains

The TURBOTRONIK NT 151/361 is supplied in a table top housing.

It may also be built into a rack. In this case sufficient ventilation must be ensured and the ambient temperature must not exceed 40°C during operation.

The four holes in the front panel are used for installing the unit in a 19“ rack.

Warning



If the TURBOTRONIK is built into a rack the mains plug is not within easy reach. Therefore install a separation between the TURBOTRONIK and the mains when you build it into a rack.

Plug in the mains cable at (4/7).

Warning



Do not operate the TURBOTRONIK with the standard mains lead in chemically aggressive surroundings. If you operate the TURBOTRONIK in chemically aggressive surroundings replace the mains lead by a resistant one.

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3 Operation

3.1 Start-up of the TURBOTRONIK

Plug in the mains plug. All four LEDs light up.

A number of initialisation functions and self-tests are performed within the frequency converter. The pump type connected and the length of the connection line to the TURBOTRONIK are determined.

After a few seconds, all LEDs with the exception of POWER go out.

The TURBOTRONIK is ready for operation.

3.2 Start-up of the TURBOVAC

Switch on the cooling for the TURBOVAC; refer to the Operating Instructions for the TURBOVAC.

Press the START pushbutton or start the TURBOVAC via remote control, see Section 2.2.

The pump will start to run up.

LED ACCEL (acceleration) is on.

After reaching approx. 80% of the nominal speed the NORMAL LED comes on and the ACCEL LED goes off.

At the same time, the relay switches to NORMAL.

The TURBOVAC can also be started whilst it is still turning.

Caution

The entire acceleration phase must not exceed 30 minutes, e.g. as a result of repeated starting. Once the phase has reached 30 minutes, the acceleration phase of the TURBOTRONIK may be re-initiated only after a further 25 minutes have elapsed. Acceleration phases in excess of 30 minutes result in the TURBOTRONIK overheating.

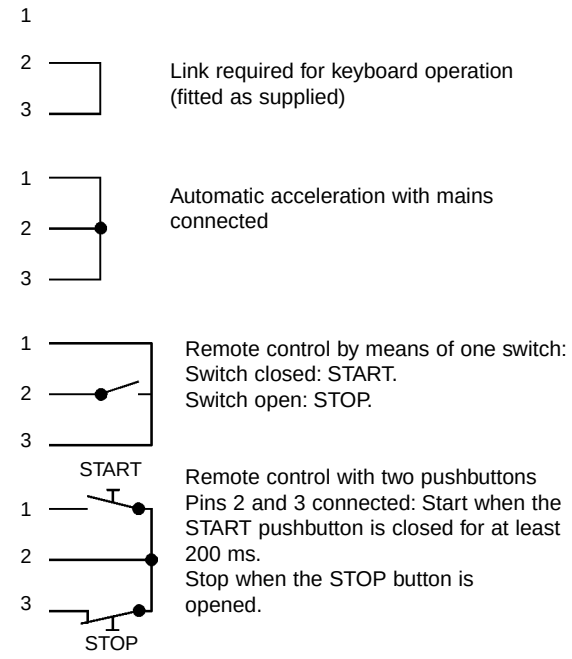


Fig. 5 Control options

3.3 Shut-down of the TURBOVAC

Press the STOP button or switch off the TURBOVAC via remote control; see Section 2.2.

Only the POWER LED remains on. The relay (4/5) switches to not NORMAL.

Switch off the TURBOVAC cooling and vent the TURBOVAC; refer to the Operating Instructions for the TURBOVAC.

It is not required to switch off the TURBOTRONIK electrically.

Having rectified a fault press STOP or switch off the TURBOVAC via remote control before starting the pump again.

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4 Troubleshooting

Symptom	Probable cause	Recommended Corrective Action
1. When the mains voltage is switched on, all LEDs fail to come on.	Mains voltage not present. Fuse malfunctioning. Probable causes of a malfunctioning fuse: -Printed circuit board for mains voltage setting plugged in incorrectly. - Incorrect fuse value. -Short circuit in the rectifier section of the frequency converter. - Short circuit in the mains transformer.	Insert the mains plug or switch on the power. Change the fuse. -Plug in the printed circuit board correctly: see Section 2.1. -Use the correct fuse: 5 A fast-blow for 220/240V mains voltage; 10 A fast-blow for 100/120 V. - Leybold Service. - Leybold Service.
2. When the mains voltage is switched on and the initialization phase has been completed, all LEDs with the exception of POWER come on cyclically in sequence.	Connection interrupted between TURBOVAC and TURBOTRONIK. Self-test not completed successfully.	Connect the connection line correctly. Leybold Service.
3. When the START pushbutton is pressed, the ACCEL LED comes on; it goes off again when the START pushbutton is released.	Link not fitted across pins 2 and 3 on the terminal block (4/4) on the rear of the unit. Circuit interrupted at the stop pushbutton (where external start/stop pushbuttons are fitted).	Connect the link. Close the stop button and start the TURBOVAC.
4. When the START pushbutton is pressed, the ACCEL LED comes on and the FAIL LED flashes at 2 Hz.	The thermal switch for the pump has opened.	Check the cooling system and repair if necessary. Press the STOP button or switch off the TURBOVAC using the remote control. Allow the TURBOVAC to cool down, then restart.
5. The ACCEL LED remains on for too long after starting, and the NORMAL LED fails to come on.	Pump speed too low, i.e. below approx. 80% of the nominal speed. Probable cause: fault in the vacuum system. Forevacuum pressure too high (>10^{-2} mbar). TURBOVAC is running sluggish.	Correct the fault in the vacuum system. Press the STOP button or switch off the TURBOVAC using the remote control, then restart. Use a larger backing pump. Leybold Service.
6. The ACCEL LED comes on, but the pump fails to accelerate.	Remote control not connected correctly.	Connect the remote control correctly to the terminals; see Fig. 5.
7. The FAIL LED comes on during acceleration or normal operation, and then remains on continuously.	Short-circuit monitoring for the TURBOTRONIK has tripped. Probable cause: internal or external short-circuit on the TURBOTRONIK, extreme electromagnetic spurious pulse.	Withdraw the mains plug from the TURBOTRONIK; check all connections; leave the TURBOTRONIK disconnected from the mains for at least 1 minute, then reconnect and restart the TURBOVAC.
8. The FAIL LED comes on during acceleration or normal operation, and then flashes at 1 Hz.	Pump overloaded,, pump speed too low (<150 Hz). Probable cause: fault in the vacuum system.	Eliminate the fault in the vacuum system. Press the STOP button or switch off the TURBOVAC using the remote control, then restart.
9. The FAIL LED comes on during acceleration or normal operation, and then flashes at 2 Hz.	The thermal switch in the TURBOVAC has opened. Probable cause: air- or water cooling system failure.	Repair the cooling system. Press the STOP button or switch off the TURBOVAC using the remote control; allow the TURBOVAC to cool down, then restart.
10. The FAIL LED comes on during acceleration or normal operation, and then flashes at 4 Hz.	TURBOTRONIK malfunctioning.	Leybold-Service.

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EEC Declaration of Conformity

We - LEYBOLD AG - herewith declare that the products defined below meet the basic requirements regarding safety and health of the relevant EEC directives by design, type and the versions which are brought in to circulation by us.

In case of any products changes made without our approval, this declaration will be void.

Designation of the products:

Electronic frequency converter

Models:

TURBOTRONIK NT 151/361

Catalogue numbers:

857 15/16/17/18

The products comply with the following guidelines:

- EC Low-Voltage Guidelines (73/23/EEC)
- EEC Directive on Elektromagnetic Compatibility (89/336/EWG)

Applicable, harmonized standards:

- EN 61010-1: 1993
- EN 50081-1: 1992
- prEN 50082-2: 1994

Applied national standards and technical specifications:

- VDE 0411 Part 1/03.94
- VDE 0839 Part 81-1/03.93
- EVDE 0839 Part 82-2/11.94

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Cologne, November 14, 1995

Beeck, Business Area Manager Instruments

Cologne, November 14, 1995

Finke, Developement Instruments

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