ENGINEERING
TOMORROW

Compact Inverter Tester User Manual

Danfoss Turbocor® **TT & TG** Series Centrifugal Compressors

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Danfoss Turbocor Compressors Inc.
1769 East Paul Dirac Drive Tallahassee,
Florida 32310
USA
Phone 1-850-504-4800
Fax 1-850-575-2126
http://turbocor.danfoss.com

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1.1 Overview

This manual serves as a general guideline for the end user of the Danfoss Turbocor® compressor products. It is the responsibility of the user of this tester to adhere to the instructions within this manual to avoid damage to persons or property. Danfoss Turbocor Compressors is not liable for any damages that occur from misuse of the Compact Inverter tester.

• • • DANGER • • •

Only personnel familiar with power electronics systems should use this unit when it is operating. Only personnel who are qualified and thoroughly familiar with this User Manual should operate the unit. The inverter should not be installed or tested without a full understanding of the information contained herein.

1.2 Purpose

The purpose of the tester is to verify switching functionality of the Inverter on Danfoss Turbocor® TT/TG compressors. The tester provides all power necessary to interface with the inverter module during testing. Due to the limitation of the tester, only static tests can be performed. This device will test the high voltage section, both top and bottom diodes of each section, and the driver board of the inverter. No testing should be performed with the compressor itself powered on.

1.3 Application

The purpose of a power converter is to produce a controllable voltage, frequency, and provide an A/C output waveform from a D/C link circuit. This D/C link is often supplied by a controllable or uncontrollable AC/DC converter.

The Insulated Gate Bipolar Transistors (IGBTs) are semiconductor switches used to control the torque (flux) and speed of the permanent magnet motor used on all Danfoss Turbocor® compressors. Speed and torque of the motor are precisely controlled by the Bearing Motor and Compressor Controller (BMCC) when a demand is given.

Inverter model types are used to operate various compressor models over a wide range of network voltages, currents, and capacities:

- SKiiP 292 & SKiiP 342 are used on Major Revision "F" and earlier TT300 compressors
- SKiiP 613 is used on Major Revision "G" TT300 compressors
- SKiiP 513 & SKiiP 613 are used on all TT350, TT400, TT500, & TT700 compressors

2.1 Compact Inverter Tester Diagram

Figure 2-1 shows the face of the Inverter Tester. Refer to Table 2-1 for component descriptions.

Figure 2-1 - Compact Inverter Tester Diagram

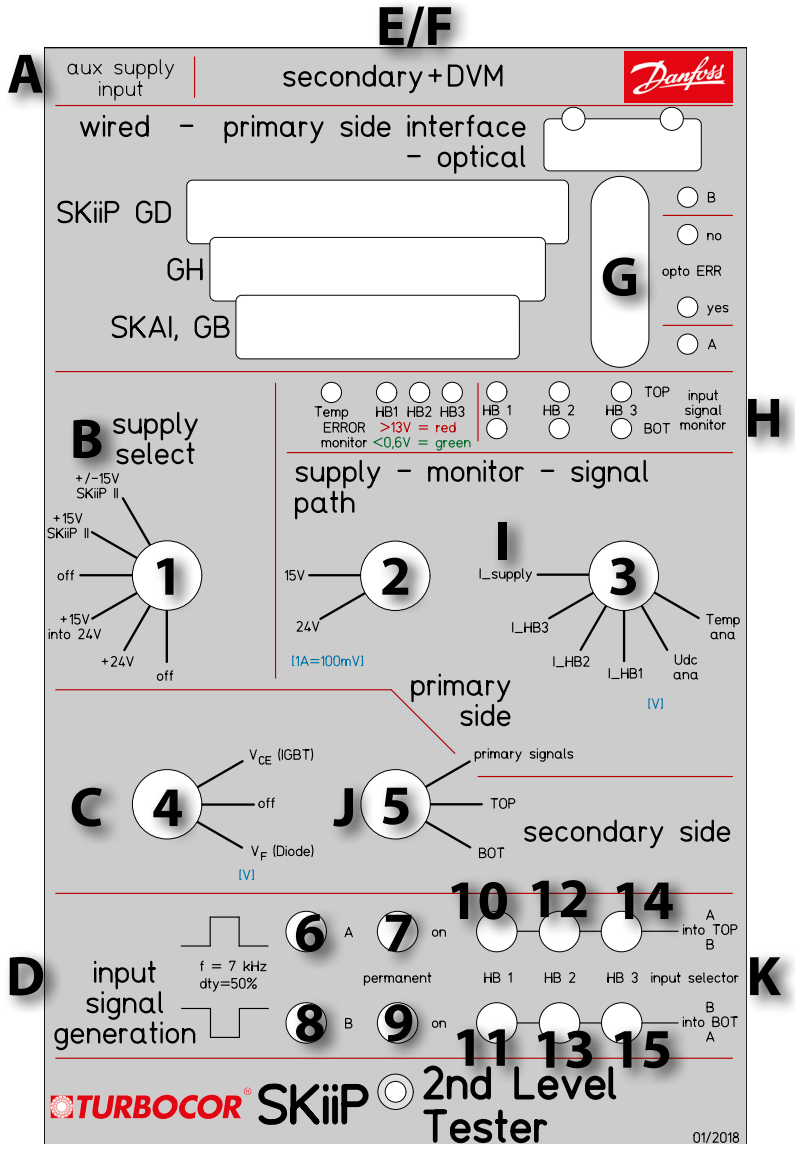

Table 2-1 - Diagram Description

Letter	Description
A	Supply input for auxiliary power supply 24 VDC
B	Selector for SKiiP supply
C	Selector for VCE (IGBT) - VF (Diode) measurement
D	PWM signal generator, ≈ 7 kHz or permanent (CW) signal
E	Interface for SKiiP secondary side power terminals
F	Connector for external DVM
G	Primary side SKiiP interface GB/GH/GD, wired or optical
H	Digital I/O status PWM SKiiP input signals
I	Selector for monitoring analog primary side SKiiP signals
J	Selector monitoring primary / secondary signal monitoring
K	PWM signal matrix 2 PWM into 6 SKiiP inputs

3.1 Instructions

1. Isolate power from the compressor in accordance with industry standards.
2. Wait 20 mins for the DC capacitors to dissipate all power.
3. Remove the top covers from the compressor.
4. Remove the Soft Start and isolate the Inverter by removing the snubber capacitors, DC link capacitors, and the motor bus bars.
5. Unplug the communication cable from the Inverter.
6. Set the SKiiP Tester Supply Select knob **[1]** in the **off** position.
7. Plug the supplied ribbon cable to the Inverter and into the**Tester** at the **SKiiP GD** connection.
8. Attach the **SKiiP AC** and **SKiiP DC +/-** test cables to section 1 of the Inverter.
    a. Alignment of the cable PCBs is identified.
9. Plug the Digital Volt Meter (**DVM**) test cable into a good quality auto ranging voltage meter.
    a. Match the + and – of the cable PCB to the + and – on the meter.
10. Knob **(2)** should always be in the **24V** position.
11. Knob **(3)** should always be in the **I supply** position.
12. Knob **(4)** starts in the **off** position.
13. Switches **10-15** must always be in the **UP** position.
14. Set the **DVM** to **DC voltage** measurement.
15. Plug the **24V power supply** cable into the back of the **Tester**.
16. Turn knob **(5)** to **TOP** position.
17. To test the **Primary VDC side** of the SKiiP, turn knob **(1)** to the **+24V** position
18. To test the **Voltage Drop-Off State**, turn knob **(4)** to **VCE (IGBT)** – record result from DVM.
    a. Expected value 170 VDC but not less than 150 VDC.
19. To test the **Forward Voltage Drop**:
    a. When knob **(5)** is in **TOP** position: push and hold button **(7)** – record result from DVM.
    b. When knob **(5)** is in **BOT** position: push and hold button **(9)** – record result from DVM.
        i. Expected value <600 mVDC
20. By releasing button **(7)**, the readout should return to the voltage level as recorded from step #18.
21. To test the Forward Voltage Drop of the **Free-Wheeling Diode**, turn knob **(4)** into **Vf (diode)** position – record result from DVM.
    a. Expected value < -600 mVDC
22. Switch knob **(4)** to **off** position.
23. Switch knob **(5)** to **BOT** position.
24. Repeat steps **17-22** using button **(9)** for the **BOT** section.
25. Turn knob **(1)** into **off** position.
26. Remove **SKiiP AC** and **SKiiP DC +/-** test cables from the inverter.
27. Repeat steps **8-25** for sections 2 and 3 of the Inverter.
28. Use the chart below to record test results.

Table 3-1 - Results Record Table

Inverter Test Results				
Step	Top	1	2	3
18	Voltage Drop-Off State			
19	Forward Voltage Drop			
21	Free Wheeling Diode			
Step	Bottom	1	2	3
18	Voltage Drop-Off State			
19	Forward Voltage Drop			
21	Free Wheeling Diode			

Appendix A: Acronyms

Acronym / Term	Definition
AC	Alternating Current
BMCC	Bearing Motor and Compressor Controller
BOT	Bottom
CW	Clockwise
DC	Direct Current
DTC	Danfoss Turbocor Compressors Inc.
DVM	Digital Volt Meter
IGBT	Insulated Gate Bipolar Transistor
I/O	Input / Output
kHz	Kilo Hertz
mVDC	Milivolts Direct Current
PCB	Printed Control Board
PWM	Pulse Width Modulation
SKiiP	SEMIKRON Intelligent Integrated Power
TG	Total-Green
TOP	Top
TT	Twin Turbo
VDC	Volts Direct Current
Vce	Voltage Collector-Emitter
Vf	Voltage Forward

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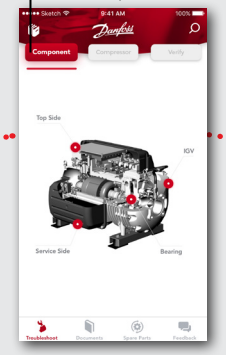
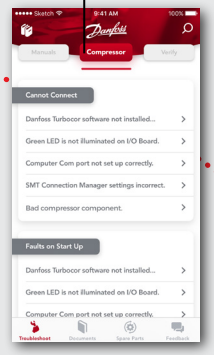
Access to Danfoss Turbocor® compressor troubleshooting on site

Troubleshoot

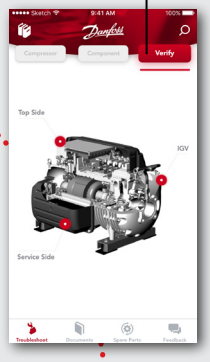
The TurboTool® app makes it easy for technicians to troubleshoot issues on Danfoss Turbocor® compressors.



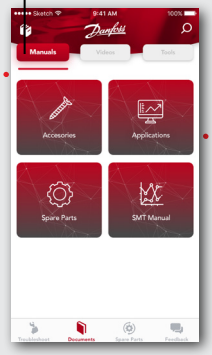
The user can select from a list of symptoms in the app that match the problems exhibited by the compressor being serviced. The app will then list potential causes, solutions to the problem, and service literature to reference for further information.



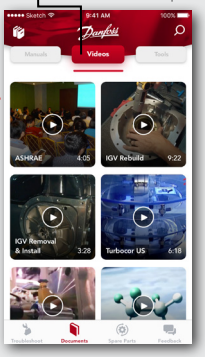
The app provides the correct operating parameters for key components: no need to keep reference documents on hand.



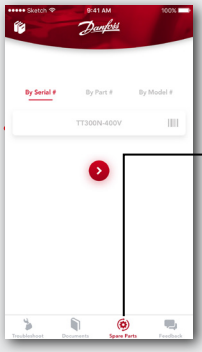
You no longer need to keep hundreds of pages of parts catalogs and training manuals. With the app, all of this information is at your fingertips on your smart device.



With the app, you can access videos made by Danfoss Turbocor® that demonstrate how to remove, install, and rebuild key components on Danfoss Turbocor® compressors.



Spare Parts



TurboTool® helps you to quickly identify the required spare parts. A quick scan of the compressor serial # using your smartphone camera or by entering the part # or model #, and the app will display potential spare parts kits.

Download the 2.0 app today!

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We have 40 years of experience within the development of hermetic compressors which has brought us amongst the global leaders in our business, and positioned us as distinct variable speed technology specialists. Today we operate from engineering and manufacturing facilities spanning across three continents.

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Danfoss Turbocor 1769 E. Paul Dirac Drive 1769, Tallahassee FL 32310 USA | +1 850 504 4800