

# **IRZ-500 Variable Frequency Drive Troubleshooting Guide**

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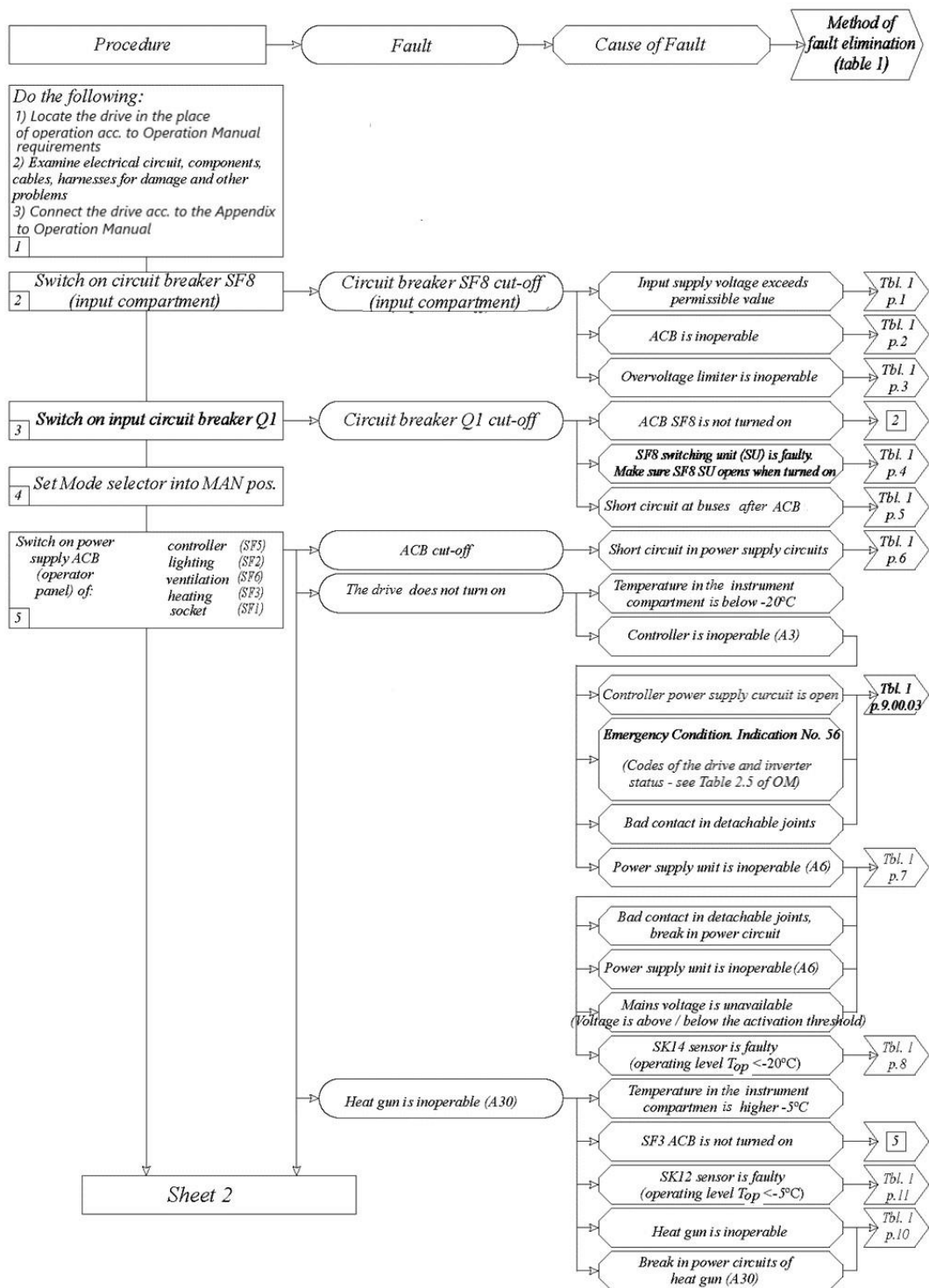
## 1. INTRODUCTION

- 1.1 This instruction applies to the IRZ-500 series Variable Frequency Drive (hereinafter referred to as the VFD) and is a troubleshooting guide.
- 1.2 Only technical personnel with electrical safety qualification level not lower than III is allowed to operate the unit.
- 1.3 Prior to start operation of the unit, the operator has to:
  - Study the design and operational documentation for VFD;
  - Examine operational documentation for the test equipment, measuring instruments and devices.
- 1.4 The VFD design is maintainable thanks to the use of individual devices and modules with detachable connections. When the doors of VFD are open and covers are removed, the drive provides free access to all its main devices and units enabling to inspect and tighten the detachable electrical connections.

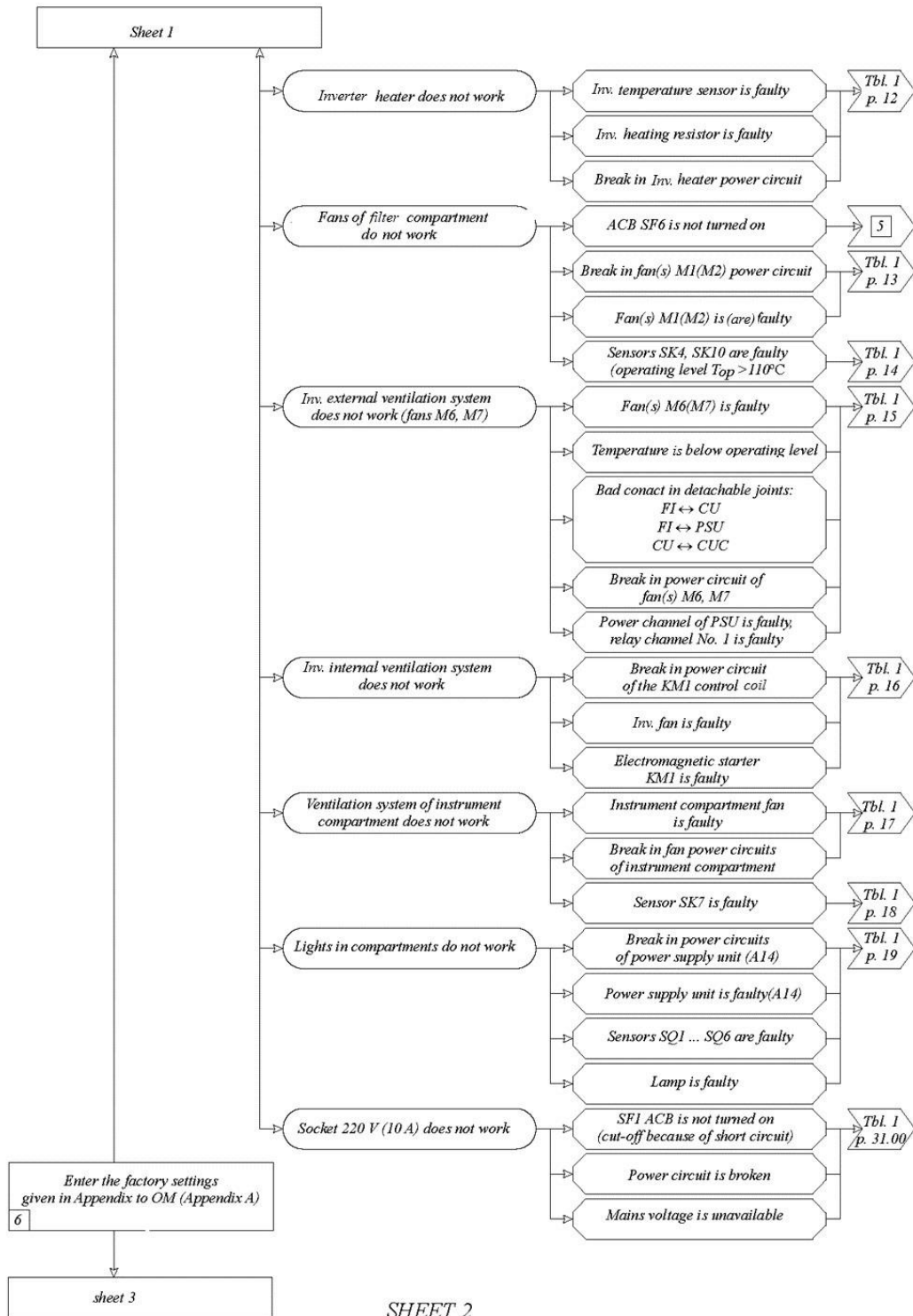
## 2. SAFETY MEASURES

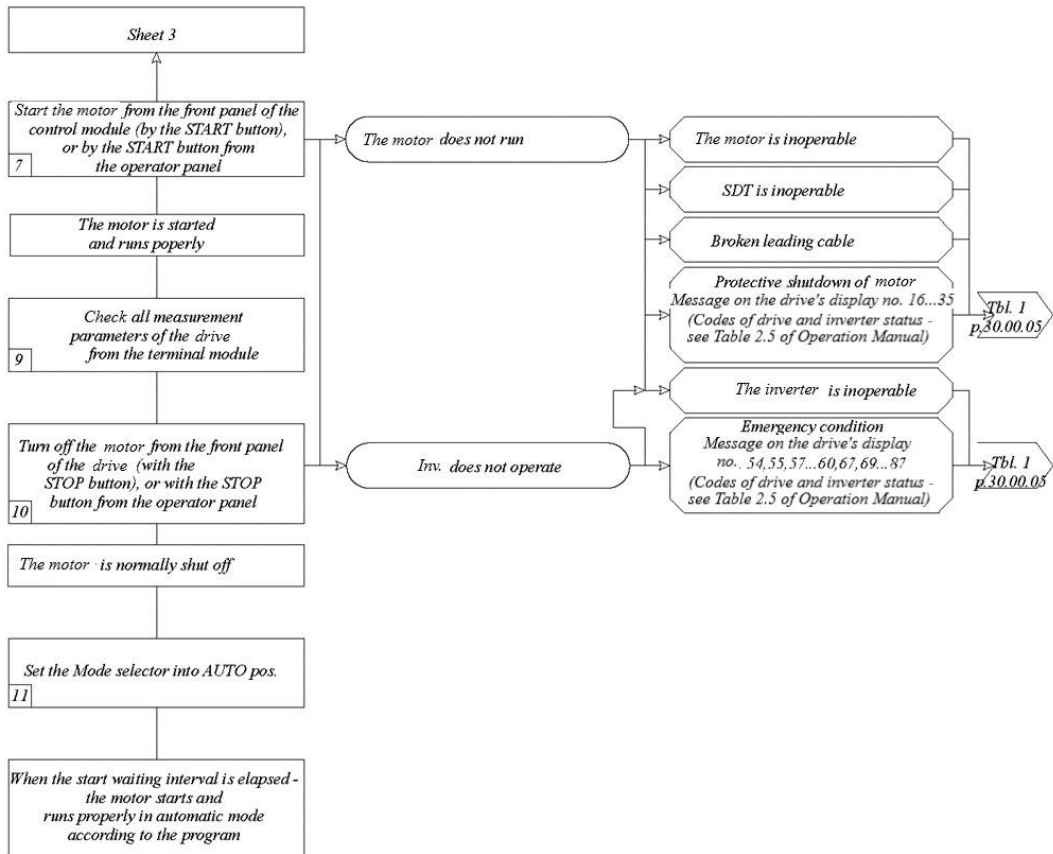
- 2.1. Works on dismantling, installation, start-up and maintenance of the drive must be carried out in accordance with the applicable “Safety Rules for Operation of Consumer Electrical Installations” and “Rules for Technical Operation of Consumer Electrical Installations”, as well as applicable departmental instructions.
- 2.2. While preparing the drive for testing and during operation, the following rules should be observed:
  - Measuring instruments as well as metal parts of electrical equipment used in operation must be grounded;
  - Grounding circuit resistance should not exceed 0.1 Ohm;
  - Assembly and disassembly of the drive must be carried out with the power supply disconnected.
- 2.3. When working inside the drive, ensure the following:
  - De-energize and disconnect the external supply cables;
  - Arrange warning posters.

### 3. ALGORITHM FOR TROUBLESHOOTING FOR THE IRZ-500 VFD



SHEET 1





SHEET 3

**TABLE 1 - ALGORITHM FOR TROUBLESHOOTING THE IRZ-500 VFD**

No.	Fault Cause	Troubleshooting Method
1	Input supply voltage is higher than the allowable	Open the cable entry compartment, measure the linear input voltage at terminals XT1 ... XT3 with a voltmeter. The voltage should not exceed 475 V.
2	ACB SF8 is faulty (incorrect triggering, self-tripping because of vibration, temperature drops, etc.)	Inspect the device visually, check for self-tripping by lightly tapping the body. Replace if a malfunction is suspected.
3	Overvoltage limiter is faulty	Measure the overvoltage limiter resistance for breakdown. Replace in case of malfunction.
4	Contact block SF8 is faulty	Check NC contact of the contact block for opening when CB SF8 is activated. Inspect the linking mechanism between the contact block and circuit breaker. Replace if a malfunction is suspected.
5	Short circuit in the buses after the input circuit breaker	Check the buses for short circuit. Measure active resistance between the phases before the frequency inverter, after the frequency inverter, and between terminals XT5 ... XT7. Check condition of the frequency inverter and sine filter visually. Measure resistance of L1 ... L3 coils.
6	Short circuit in power supply circuits	Check electrical appliances and wires coming to them for short circuit on the circuit breaker cut-off line. Replace damaged segment/node.
7	Power supply (A6) does not work	Green LED VD29 on the power supply board flashes with a frequency of 1 pulse per 2s => supply voltage delivered to the power supply is below the permissible minimum value (190 V). Measure voltage at power supply terminal XT1, measure phase voltage at the input. Eliminate causes of undervoltage.
		Red LED VD28 on the power supply board flashes with a frequency of 1 pulse per 2s => supply voltage delivered to the power supply exceeds the allowable maximum value (288 V). Measure phase voltage at the input. Eliminate causes of excessive voltage.
		LED VD14 (17) is not lighted up => possible causes: - mains voltage is unavailable, - power line cut off, - failure of the power supply unit (PSU), - incorrect operation or failure of temperature sensor SK14 (instrument compartment), - failure of fuse (F1), - short circuit in the PSU output channel No 1. Methods of elimination: - check that there is voltage at VFD input, at power supply terminal XT1, - measure PSU output voltage in channels No. 1–4, having disconnected output channel No. 1 from the load according to the VFD electrical circuit, - replace the power supply unit, if power at power supply terminal XT1 is available, the fuse (F1) is in good condition and output voltage in the channels is missing.
		LED VD14 (17) flashes => short circuit in channel No. 1.

No.	Fault Cause	Troubleshooting Method
		To eliminate the problem, perform search of short circuit in the load power supply line.
8	Temperature sensor SK14 is faulty (instrument compartment)	Check that there is voltage on the sensor; check integrity of wires; make sure the connections in the connectors are properly joined; check condition of the contact (NO contact remains open at ambient temperature above -20°C). If any improper switching is observed, replace the sensor.
9.00	Controller does not work (does not turn on)	Check that the power supply unit is in good condition (see section "PSU does not work"). Check that connectors XS19, XS3, XS4, XS5, and XP5 are well connected, check all wires for integrity, check level of supply voltage at XS19 and XT16 (contact multiplication terminal block) according to the diagram (voltage should be of 24 V). If you do not observe the above listed symptoms or if you have eliminated them and the alarm message still remains or the controller is in non-working state, replace the controller.
	There is the following message on the controller display:	
9.01	“CONTROLLER FAULT” “MISSING COMMUNICATION WITH MKTN”	Replace the controller due to malfunction of the main module.
9.02	"MISSING COMMUNICATION"	In the service menu, check correctness of setting addresses of network equipment and speed of receiving / transmitting data.
9.03	"ERROR IN DOWNLOADING SETTINGS"	Update firmware of the controller. If the error message is repeated, replace the controller.
10	The heat gun does not work (A30)	Check the condition of the ACB SF3 (operator panel). Measure voltage at the terminal block XT1 A30 (Un = 220V), if there is no voltage, check the power line – it may be cut off. If voltage is available and the heater is inoperative, replace the heater. Check condition of temperature sensor SK14.
11	Temperature sensor SK12 is faulty (instrument compartment)	Check that there is voltage at the sensor, check wires for integrity, check that the connectors are properly connected, check condition of the contact (the NC contact remains closed when ambient temperature is below -5°C). If any improper switching is observed, replace the sensor.
12	The built-in heating system of the inverter does not work	Measure voltage at the inverter terminal blocks XT7 and XT13, if there is no voltage, search for open circuit. If voltage is available, check status of the built-in temperature sensor (contacts XT7.3-XT7.4) (the NC contact remains closed when ambient temperature is below -5°C). If any incorrect switching is observed, replace the sensor. Measure resistance of the heating resistors (contacts XT7.1-XT7.2 and XT13.1-XT13.2). Repair in case of breakage / burning of resistors.
13	Ventilation system of the filter compartment does not work.	Inspect ACB SF6 (operator's panel). Measure voltage at the terminal blocks of fans M1, M2 (Un = 220V), if there is no voltage, search for a power line cut off. If voltage is



No.	Fault Cause	Troubleshooting Method
		available and fan(s) is (are) inoperative, check the capacitors and the motor(s) of the fans for operability. Check status of temperature sensors SK14 and SK10.
14	Temperature sensors SK4 and SK10 are faulty (filter compartment).	Check that there is voltage at the sensor, check wires for integrity, make sure the connections in the connectors are tight, check state of the contact (the NO contact remains open when ambient temperature is below 110°C). If any improper switching is observed, replace the sensor.
15	The external ventilation system of the inverter does not work.	Inspect ACB SF6 (operator's panel). Measure voltage at the terminal blocks of fans M1 and M2 (Un = 220V), if there is no voltage, search for a power line cut off. If there is voltage and fan(s) is (are) inoperative, check the capacitors and the motor(s) of the fans. Check the power supply unit and controller connectors for reliability of contact. Check relay channel No. 1 of the power supply unit for proper operation.
16	The internal ventilation system of the inverter does not work.	Measure voltage at the terminal blocks of the inverter fans (Un = 220V). If there is no voltage, check for a break in the power supply line. If there is voltage and the fan(s) is (are) inoperative, test the motor(s) of the fans. In the service menu of the controller (settings section of the inverter) check compliance with the settings of the minimum / maximum temperatures of the inverter radiator.
17	Ventilation of the instrument compartment is does not work.	Measure voltage at the terminal block of the instrument compartment fan (Un = 220V). If there is voltage and the fan is inoperative, check the capacitor and motor. Check the status of temperature sensor SK7.
18	Temperature sensor SK7 is faulty (instrument compartment).	Check that there is voltage at the sensor, check wires for integrity, make sure the connections in the connectors are tight, check state of the contact (the NO contact remains open when ambient temperature is below 45°C). If any improper switching is observed, replace the sensor.
19	VFD illumination does not work	Inspect ACB SF2 (operator's panel). Measure supply voltage on the FI power source (A14) terminal XT1 (220V). If there is no voltage, check if there is cut off in the line. Measure output voltage at terminals XT2.1-XT2.2 (12V). If there is no voltage Uout, make replacement. Check the door sensors (SQ1... 6) and light sources for operability; check leading wires for integrity. Replace defective parts.
20.00	The inverter does not work	Examine the processor board of the inverter for damage.
	There is the following message on the controller indicator:	
20.01	«MISSING COMMUNICATION WITH INVERTER»	Make sure the connector XS33 of the control unit (A1) and XP5 of the controller (A3) are joined reliably. Inspect the communication interface line for damage. Make sure the settings of the network address and speed in the Inverter Settings of the SERVICE MENU are correct.
20.02	«MISSING INVERTER I/F»	Inspect internal connectors and cables of the inverter for

No.	Fault Cause	Troubleshooting Method
		contact and integrity. Measure supply voltage on the interfacing board (connector XP10). If there is no voltage, measure voltage on the corresponding contacts of the multiplication terminal block, check integrity of incoming wires. If there are no visible causes of failure, replace the interfacing board of the inverter.
20.03	«INVERTER POWER LOSS»	Measure supply voltage on the matching board (connector X20). If there is no voltage, measure voltage on the corresponding contacts of the multiplication terminal block, check integrity of the incoming wires. If there are no visible causes of failure, replace the matching board of the inverter.
20.04	«HIGH INVERTER RADIATOR TEMPERATURE»	In the inverter settings of the controller service menu, make sure the settings for overheating are correct. Check the ventilation system for operability (see items 15, 16).
20.05	«HIGH U <sub>dc</sub> » «LOW U <sub>dc</sub> »	Measure input supply voltage. If it deviates from the nominal value, eliminate the causes. In the controller service menu, check the settings of the nominal voltage U <sub>dc</sub> ("basic parameters"). In the "protections" section, make sure the settings U <sub>d_min</sub> , U <sub>dc_max</sub> are correct. (In case of exceeding U <sub>dc</sub> due to intensive motor deceleration, increase the motor deceleration time in the inverter settings. If a malfunction of the voltage measurement circuit is suspected, replace the inverter processor board.
20.06	«U <sub>dc</sub> CIRCUIT FAILURE»	Inspect the KMZ contactor for faults. Check the control coil by measuring the resistance. Check the control circuit and external electrical connections circuit for continuity. Verify the switching capacity of the contactor (by measuring the voltage on the power contacts at the time of switching).
20.07	«UNSTABLE U <sub>dc</sub> »	Measure the supply voltage for fluctuations above / below acceptable limits. Replace the processor board, replace the inverter power module.
20.08	«SC TO GROUND»	Check the motor power supply cable for breaks, make sure insulation resistance complies with the requirements. Measure active resistance of motor coils. If the parameters do not comply with the requirements, make replacement.
20.09	«INVERTER OUTPUT SC»	Inspect the inverter output buses for visible short circuit. In the inverter settings section of the controller service menu, make sure the motor settings are correct. Check the motor power supply cable for short circuit and integrity of insulation. Measure resistance of the motor windings. Replace the power module if fault condition is detected.
20.10	«TEMP. SENSOR UNAVAILABLE»	Inspect the cable and plug connections between the processor board of the inverter and driver boards of the power modules being parts of the inverter power module. Check the temperature sensor for short circuit. Replace the sensor when fault is detected.
	«TEMPERATURE SENSOR SC»	
20.11	«POWER MODULE A FAULT»	Replace the power module of the inverter.
	«POWER MODULE B FAULT»	

No.	Fault Cause	Troubleshooting Method
	«POWER MODULE C FAULT»	
20.12	«INVERTER HEATING»	Operation of the inverter is allowed under the condition of internal temperature above 10°C. Check the inverter heating system for operability. See item 12.
20.13	«INVERTER EXTERNAL ALARM»	Check the alarm line at the digital input of the inverter matching module (A12), connector XS13, sensors SK1, SK2 for the absence of a false response. (NO contact remains open at the filter compartment temperature below 110°C). If any improper switching is observed, replace the sensor.
30.00	Motor does not run	Check that there is voltage at the step down transformer (SDT) and motor, check cables between the inverter and SDT and between SDT and motor for integrity and correct connection, check SDT and motor for operability.
	There is the following message on the controller indicator:	
30.01	«Rinsul STOP»	Check insulation resistance settings in the controller settings and protection parameters. Check insulation resistance of the “SDT - power cable - motor” system. Measure insulation resistance between the phases and housing of SDT and motor. Measure active resistance of coils of SDT and motor. If deviations from nominal parameters are observed, make replacement. Check power on the VR210 board for availability, check the insulation resistance measurement circuits for integrity, make sure that connectors XS10 (A1) and XS3 (A3) have reliable contact. Replace the VR210 board when a failure condition is detected.
30.02	«Uab< NORM» «Ubc< NORM» «Uac< NORM» «Uab>NORM» «Ubc> NORM» «Uac> NORM»	Measure the input voltage. In the controller input voltage parameters, make sure the protection settings for supply over/under voltage are correct.
30.03	«Uab-Ubc IMBALANCE» «Uab-Uca IMBALANCE» «Uac-Ubc IMBALANCE»	In the controller input voltage parameters, check the settings for current imbalance. Measure the input voltage. Measure resistance of coils of SDT and motor SEM. Replace if a phase cutoff or a short circuit between turns is observed. Check the power cable of SDT and motor for integrity.
30.04	«Ia-Ib IMBALANCE» «Ia-Ic IMBALANCE» «Ib-Ic IMBALANCE»	In the controller settings and protection parameters, make sure the settings for current imbalance are correct. Inspect the current transformers for damage. Measure resistance of coils of SDT and motor. Replace if a phase failure (cutoff) or turn-to-turn fault (short circuit) is observed. Check the power cable of SDT and motor for integrity.
30.05	«PHASE SEQUENCE»	In the controller settings and protection parameters, verify the phase sequence configuration setting. Make the appropriate setting, or change the phases.
31.00	Socket 220V (10A) is inoperable	Check that there is input voltage, check the circuit and

No.	Fault Cause	Troubleshooting Method
		power wires insulation of the outlet for integrity. Inspect the circuit breaker for a visible fault.