Indicator LEDs in the NINT Board

Following figure describes how to find the hottest phase or power plate by checking the LEDs of NINT-XX and NXPP-0X boards. This applies only to parallel connected phase modules and power plates of R8i – R12i modules.

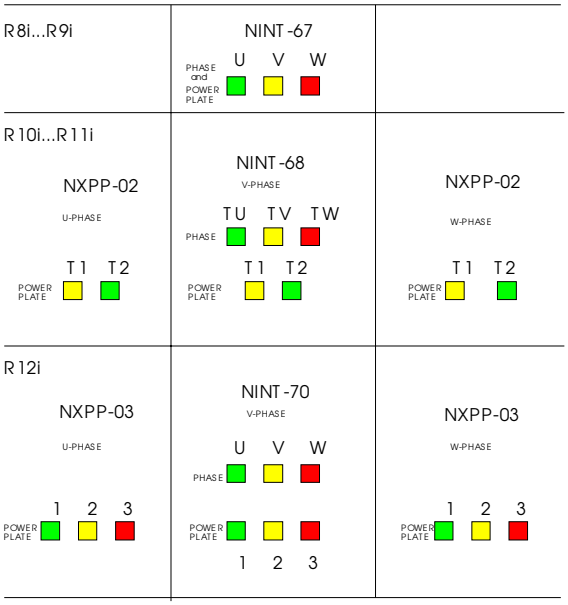


Figure 7 - 3 LED Indicators of NINT Boards.

Interpretation of the LEDs

All LEDs are unlit on NINT-XX or NXPP-0X board:

- No DC-voltage connected.
- Possibly burned fuse on the NPOW-62 board.
- Connection between NRED-61 and NPOW-62 is faulty.
- Connection between NPOW-62 (X32) and NINT-XX (X42) is faulty.

Only one LED is lit on NINT-XX or NXPP-0X board: That phase or power plate is hotter than the other ones.

One LED is brighter than other ones on NINT-XX or NXPP-0X board: That phase or power plate is hotter than the other ones.

All LEDs are lit on NINT-XX or NXPP-0X board: That phase or power plate is hotter than the other ones.

R8i – R9i modules: The *three LEDs of NINT-XX* tell the hottest *phase* and also the hottest *power plate*, because on each phase there is only one power plate.

R10i – R11i modules: The *upper three LEDs of NINT-XX* board show, which *phase* is the hottest. The *lower two LEDs of NINT-XX* indicate the hottest *power plate on V-phase* and the *two LEDs of NXPP-0X* indicate the hottest *power plate on U-phase* (left NXPP-0X) and *W-phase* (right NXPP-0X). Two power plates are connected parallel in each phase module.

R12i module: The *upper three LEDs of NINT-XX* board show, which *phase* is the hottest. The *lower three LEDs of NINT-XX* tell the hottest *power plate on V-phase* and the *three LEDs of NXPP-0X* tell the hottest *power plate on U-phase* (left NXPP-0X) and *W-phase* (right NXPP-0X). Three parallel connected power plates are placed in each phase module.

The causes of overheated power plate are usually faulty NGDR-XX boards, damaged power plates or badly installed power plates (greasing or quality of the surface).

The colors of the three LEDs and the matching phases or power plates are:

U-phase / power plate 1	Green (left)
V-phase / power plate 2	Yellow (middle)
W-phase / power plate 3	Red (right)

For two power plates per phase (R10i – R11i):

Power plate T1	Yellow (left)
Power plate T2	Green (right)

Speed Measurement Fault

Speed Measurement Fault is activated, if

- no pulses are received within the time of Parameter **(50.11) ENCODER DELAY** and the drive is simultaneously at the current or torque limit.
- measured and estimated speed differ 20 % from nominal speed of motor.
- there is no communication between the pulse encoder module and NAMC board.
- there is observed big change in the pulse frequency of the pulse encoder during 1 ms.

The Fault/Alarm function is activated by Parameter **(50.05) ENCODER ALM/FLT**. In case of a fault, **FW_2 (09.02)** bit 5 is set to 1 and a fault "**ENCODER FLT**" is given.

Switching from Measured Speed to Estimated Speed

In case of an alarm, **AW_1 (9.04)** bit 5 is set to 1 and an alarm "**ENCODER ERR**" is given. If an alarm function has been selected and the speed measurement error is detected based on derivation term the drive automatically turns to use estimated speed. Drive uses estimated speed as long as the difference between estimated and measured speed is bigger than 1%. The difference is checked every five seconds. When the difference is smaller than 1% drive turns back to use measured speed. The status of the used actual speed can be seen from the **ASW (802)** bit 12.

Overswitching Frequency Fault

If the inner control loop exceeds the maximum switching frequency, a fault "**OVER SWFREQ**" is given and **FW_2 (9.02)** bit 9 is set to 1.

System Fault

If the program on the NAMC board has failed and causes an interruption, **FW_1 (09.01)** bit 7 (SYSTEM_FAULT) is set to 1.

Short Time Overloading

The inverter section of the ACS 600 MultiDrive incorporates an IGBT-transistor power stage. Duty Cycles A and B are presented for each inverter type in the ACS 600 MultiDrive catalogue (code 3BFE 63981915). See also the environmental limits.

$I_{AC\_NOMINAL}$ = nominal current (continuous)

$I_{AC\_4/5\ min}$ = I_2 base current for Duty Cycle A

$I_{AC\_1/5\ min}$ = I_2 max current for Duty Cycle A (150% of the base current $I_{AC\_4/5\ min}$)

$I_{AC\_50/60\ s}$ = I_2 base current for Duty Cycle B

$I_{AC\_10/60\ s}$ = I_2 max current for Duty Cycle B (200% of the base current $I_{AC\_50/60\ s}$)

If the overload cycle is longer than described for Duty Cycle A or B, the inverter section is protected against the overload with a temperature measurement sensor and a software algorithm.

Overloading between $I_{AC\_Nominal}$ and $I_{AC\_1/5\ min}$

If the load current is continuously between $I_{AC\_Nominal}$ and $I_{AC\_1/5\ min}$, the temperature of the IGBT power plate(s) and the heat sink will increase further. The overloading time is limited by means of the temperature sensor.

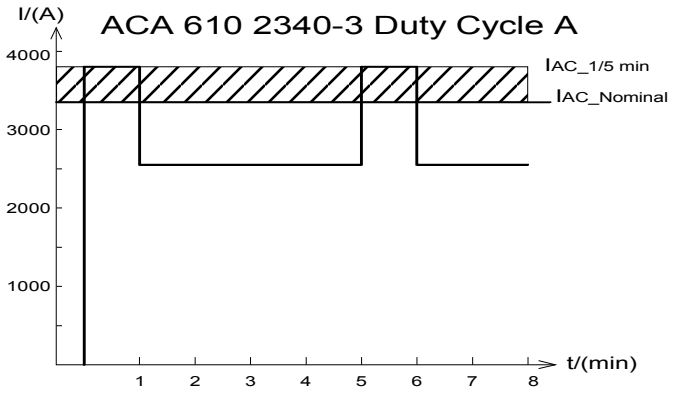


Figure 7 - 4 Overloading Range between $I_{AC\_Nominal}$ and $I_{AC\_1/5\ min}$ in ACA 610 2340-3

If the measured temperature exceeds 115 °C, a warning "**ACS 600 TEMP**" is given and **Alarm Word 1 (AW1)** bit 4 is set to 1.

If the power plate module temperature exceeds 125 °C, a fault "**ACS 600 TEMP**" is given and **Fault Word 1 (FW1)** bit 3 is set 1. The inverter pulses are blocked and the drive stops by coasting (zero torque).

Overloading between the $I_{AC\_1/5\ min}$ and Maximum Current

The maximum current is limited by parameter 20.04 **MAXIMUM CURRENT**. If the actual current exceeds the $\mathbf{I_{AC\_1/5\ min}}$ level, a software algorithm is also activated. The load cycle between $\mathbf{I_{AC\_1/5\ min}}$ and the maximum current is time-limited as a function of current by means of a software integrator and thus the areas of the A1, A2 and A3 are equal.

$A1 = 10\ s * (\mathbf{I_{AC\_10/60s}} - \mathbf{I_{AC\_1/5\ min}})$.

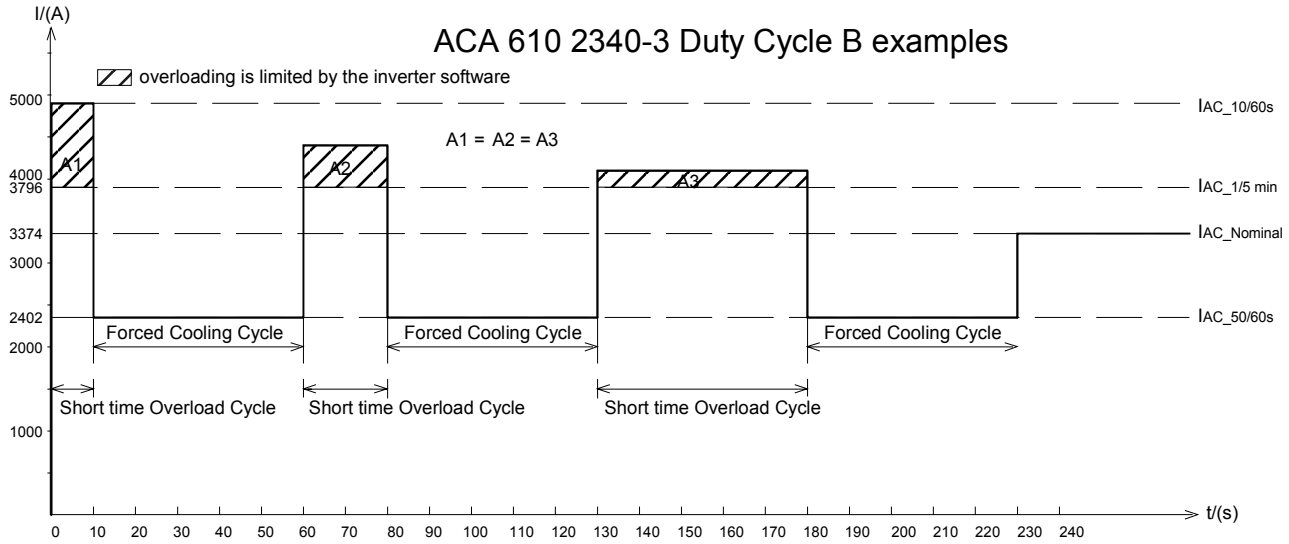


Figure 7 - 5 Overloading example when the Load Current is > $I_{AC\_1/5\ min}$

At the beginning of a forced cooling cycle, **AW_2 (9.05)** bit 2 is set to 1 and an alarm "**INV OVERLOAD**" is given.

Motor Protections

Motor Thermal Protection Functions

The motor can be protected against overheating by:

- activating the DTC motor thermal model or User Mode.
- measuring motor temperature by PT 100 or PTC sensors (1 or 2 separate measurement channels).
- by detecting the state of a thermal switch (KLIXON) inside the motor by the digital input DI6. See Parameter Group 10, selection KLIXON. If the contact opens, fault "**KLIXON**" is activated and **FW_1 (09.01)** bit 5 is set to 1

The motor thermal model can be used parallel with other temperature protections (PTC, PT100, KLIXON).

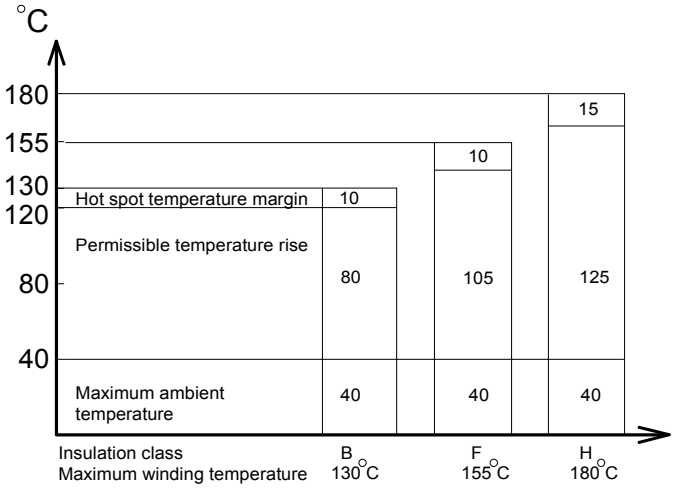


Figure 7 - 6 Motor Insulation Classes According to IEC 85

Motor Thermal Model

The ACS 600 drive calculates the temperature of the motor based on the following assumptions:

1. The motor ambient temperature is 30 °C.
2. Motor temperature is calculated using either the user-adjustable or automatically calculated Motor Thermal Time and Motor Load Curve. The load curve should be adjusted in case the ambient temperature is higher than 30 °C.

The thermal model provides protection equivalent to standard class 10, 20, or 30 overload relays by setting the Motor Thermal Time to 350, 700, or 1050 seconds respectively and parameter **30.29 THERM MOD FLT L** to value 110 °C.

There are two levels of temperature monitoring:

- alarm "**MOTOR TEMP**" is activated when the alarm temperature limit defined by Parameter **30.28 THERM MOD ALM L** is reached and **AW_1 (09.04)** bit 3 is set to 1.
- fault "**MOTOR TEMP**" is activated when the trip temperature limit defined by Parameter **30.29 THERM MOD FLT L** is reached, **FW_1 (09.01)** bit 6 is set to 1.

Usage of PT100, PTC or KTY84-1xx Temperature Sensors

Motor temperature can be measured by using the analogue inputs and outputs of the drive. The System Application program supports two measurement channels: AI1 and AI2 for motor 1 and motor 2 temperature measurements.

WARNING! According to IEC 664, the connection of the thermistor to the analogue I/O (NIOC-01 or NAIO) or to digital input DI6 of the NIOC-01 requires double or reinforced insulation between motor live parts and the thermistor. Reinforced insulation entails a clearance and creepage of 8 mm (400/500 VAC equipment). If the thermistor assembly does not fulfil the requirement, the other I/O terminals of ACS 600 must be protected against contact, or a thermistor relay must be used to isolate the thermistor from the digital input.

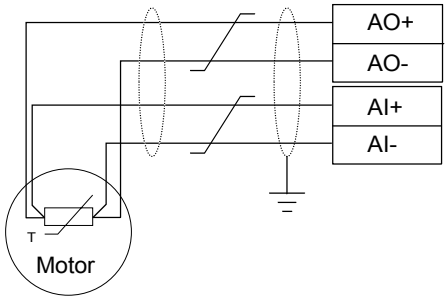


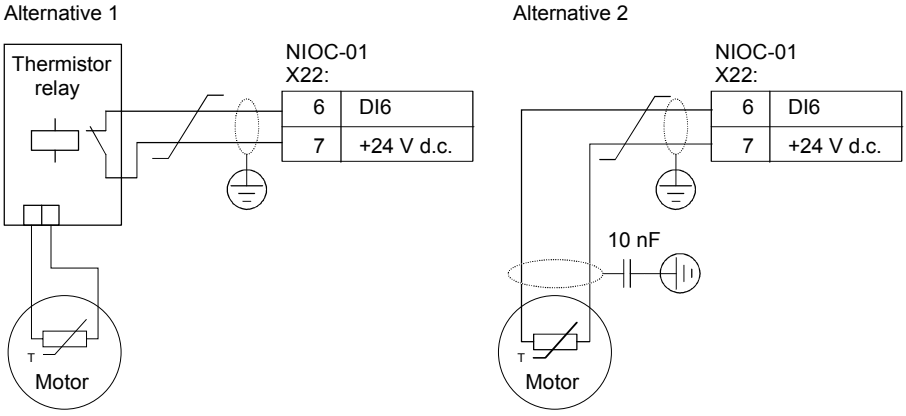
Figure 7 - 7 Thermistor Connection example using Analogue I/O.

Motor overtemperature can be detected by connecting 1...3 PTC thermistors, 1...3 PT100 elements or silicon temperature sensor

KTY84-1xx (1000Ω at 100 °C). The purpose of the analogue output is to supply a constant current to the temperature element, the analogue input measures the voltage across the element. The application program sets the correct constant current according to the sensor type selection. Alarm and trip limits are defined by Parameters 30.04 and 30.05 for the motor 1 and 30.07 and 30.08 for the motor 2.

- alarm "**MOTOR TEMP M**" is activated when the alarm temperature limit is reached. **AW_1 (09.04)** bit 2 is set to 1.
- fault "**MOTOR TEMP M**" is activated when the trip temperature limit is reached and the **FW_1 (09.01)** bit 5 is set to 1.

- **Note:** The thermistor can also be connected to digital input DI6 on the NIOC board according to the following figure. If direct thermistor connection is used, digital input DI6 goes to 0 false when resistance rises higher than 4 kΩ. As a result, the drive is tripped, fault "KLIXON" is activated and appended to the fault logger, and **FW_1 (09.01)** bit 5 is set to 1.



Alternative 2: At the motor end, the cable shield should be earthed through a 10 nF capacitor. If this is not possible, the shield is to be left unconnected.

Stall Function

The ACS 600 drive protects the motor upon a stall situation. It is possible to adjust the supervision limits (torque, frequency, time) and choose how the drive reacts to a motor stall condition (warning indication fault indication & stop; no reaction).

The protection is activated if all the following conditions are fulfilled at the same time:

1. The ACS 600 output frequency is below the Stall Frequency limit set by the user.
2. The motor torque has risen to the maximum allowed value (the value $T_{m.a}$ in the figure) calculated by the ACS 600 application program. This limit is continuously changing depending on variables such as the motor temperature calculated by the frequency converter software.
3. Conditions 1 and 2 have been fulfilled longer than the period set by the user (Stall Time Limit).

An alarm or fault function can be selected by Parameter **30.13 STALL FUNCTION**. If FAULT is selected, a stall situation produces a fault **"MOTOR STALL"** and sets **FW_2 (9.02)** bit 14 to 1. If WARNING is selected, a stall situation produces a warning **"MOTOR STALL"** and sets **AW_2 (9.05)** bit 9 to 1.

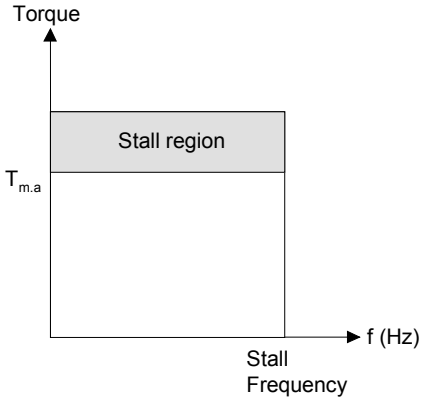


Figure 7 - 8 Stall Protection Area

Underload Function

The loss of motor load may indicate a process malfunction. The ACS 600 drive provides an Underload Function to protect the machinery and process in such a fault condition. The supervision limits (Underload Curve and Underload Time) can be chosen as well as the drive operation in an underload condition (warning indication; fault indication & stop; no reaction).

The protection is activated if all the following conditions are fulfilled at the same time:

1. The motor load is below the Underload Curve selected by the user.
2. The motor load has been below the selected Underload Curve longer than the time set by the user (Underload Time).
3. The ACS 600 drive output frequency is more than 10 % of the motor nominal frequency.

An alarm or fault function can be selected by Parameter **30.16 UNDERLOAD FUNC**. If FAULT is selected, an underload situation produces a fault **"UNDERLOAD"** and sets **FW_1 (9.01)** bit 8 to 1. If WARNING is selected, an underload situation produces a warning **"UNDERLOAD"** and sets **AW_2 (9.05)** bit 1 to 1.

Motor Phase Loss Function

The Motor Phase Loss function monitors the status of the motor cable connections. The function is most useful during motor start. The ACS 600 drive detects if any of the motor phases have not been connected and refuses to start. The Phase Loss function also supervises the motor connection status during normal operation.

The user can define the operation upon motor phase loss. The alternatives are either a fault indication and Stop, or no reaction.

The fault indication is "**MOTOR PHASE**". **FW_2 (09.02)** bit 15 is simultaneously set to a 1.

Earth Fault Protection Function

The Earth Fault protection detects earth faults in the motor, the motor cable or the inverter. The Earth Fault protection is based on earth leakage current measurement with a summation current transformer at the input of the converter. Depending on the user's selection, the Earth Fault function stops the drive and gives a fault indication, or the drive continues operation and gives an alarm.

The tripping level of inverter sizes R10i…R12i can be selected by parameter **30.25 EARTH FAULT LEVEL**. The parameter defines the unbalance trip level of sum current measured by the NINT board.

A fault function can be selected by selecting **FAULT** at parameter **30.20 EARTH FAULT**. In case of fault, "**EARTH FAULT**" is indicated and **FW_1 (09.01)** bit 4 is set to 1. If NO is selected, an alarm "**EARTH FAULT**" is given and **AW_1 (09.04)** bit 14 is set to 1.

Motor Fan Diagnostics

If the motor has an external cooling fan motor, it is possible to control the starter of the fan motor by digital output. See Parameter group 14 and 35. The diagnostics is activated by Parameter **35.01 MOTOR FAN CTRL**. The acknowledge signal to the digital input from the motor starter is selected by Parameter **10.06 MOTOR FAN ACK**.

Diagnostics

1. When first starting the motor, if the motor fan acknowledge signal is not received within the time defined by parameter **35.02 FAN ACK DELAY**, a fault is generated and the drive is tripped.
2. While running the motor:
   If the acknowledge signal is lost, an alarm "**MOTOR FAN**" is generated. If the acknowledge signal is still lost after **35.02 FAN ACK DELAY**, a fault is indicated and drive is tripped. If the acknowledge time is zero, only alarm is indicated.
3. **AW_2** bit 0 is set to 1 in case of motor fan alarm.
4. **FW_3** bit 0 is set to 1 in case of motor fan fault, if **35.01 MOTOR FAN CTRL** has selection ALARM/FAULT.

Fault and Alarm Messages

Fault Message Table

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
ACS 600 TEMP 9.01 FW_1, bit 3	The ACx 600 internal temperature is excessive. A warning is given if inverter module temperature exceeds 115 °C.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against unit power.
AI<MIN FUNC 9.02 FW_2, bit 10	I/O reference 4…20 mA is below 4mA level. (programmable fault or alarm, see Parameter 30.27).	Check for proper analogue control signal levels. Check the control wiring. Check AI < MIN FUNC Fault Function parameters.
CABIN TEMP F 9.02 FW_2, bit 7	Cabinet over- or undertemperature detected on the NIOC-01 I/O board (thermistor). Environment temperature is too high (>73 °C) or too low (<5 °C).	Boost the cooling of air.
CABLE TEMP 9.02 FW_2 bit 3	Motor cable overtemperature trip. Thermal model of cable has reached 100% temperature level.	Check the motor load. Check the motor cable and its type. Verify with the cable thermal model parameters in Parameter Group 36.
CH0 COM LOS 9.02 FW_2, bit 12	Communication break detected on CH0 receive. (programmable fault, see Parameter 70.04)	Check the optical fibres between the NAMC board and overriding system (or fieldbus adapter). Test with new optical fibres. Check that the node address is correct in the drive. Check the status of the fieldbus adapter. See appropriate fieldbus adapter manual. Check parameter settings of Group 51, if a fieldbus adapter is present. Check the connections between the fieldbus and the adapter. Check that the bus master is communicating and correctly configured.
CH2 COM LOS 9.01 FW_1, bit 11	Communication break detected on CH2 receive. (programmable fault or alarm, see parameter 70.13)	Check the optical fibres between the NAMC boards. Check that the optical fibre loop is closed. Test with new optical fibres.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
DC OVERVOLT 9.01 FW_1, bit 2	Intermediate circuit DC voltage is excessive. This can be caused by 1. Static or transient overvoltages in the mains. 2. Faulty braking chopper or resistor (if used). 3. Deceleration time being too short, if there is no braking chopper or regenerative incoming section. 4. Internal fault in the inverter unit.	Check the functioning of the braking chopper. If using a regenerative incoming section check that the diode mode is not forced during deceleration. Check the level of DC voltage and inverter nominal voltage. Replace the NINT-xx board (its voltage measurement circuit is faulty).
DC UNDERVOLT 9.02 FW_2, bit 2	Intermediate circuit DC voltage is not sufficient. This can be caused by a missing mains phase in the diode rectifying bridge.	Checks mains supply and inverter fuses. If Standard HW is used, check that digital input DI2 is on 1, when the inverter is powered.
DDF FORMAT 9.03 SFW, bit 3	File error in FLASH memory.	Replace the NAMC board.
EARTH FAULT 9.01 FW_1, bit 4	The load on the incoming mains system is out of balance. This can be caused by a fault in the motor, motor cable or an internal malfunction. (programmable fault, see parameter 30.20) Tripping level setting is too sensitive in the non parallel connected R10i…R12i inverters. Check Parameter 30.25.	Check motor. Check motor cable. Check that there are no power factor correction capacitors or surge absorbers in the motor cable.
ENCODER FLT 9.02 FW_2 bit 5	Speed measurement fault detected. This can be caused by loose cable connection, communication time-out, faulty pulse encoder, or too great a difference between the internal and measured actual speeds. (programmable fault or alarm, see Parameter 50.05)	Check settings of Parameter Group 50. Check pulse encoder and its cabling including Ch A and Ch B phasing. The sign of the signal **1.03 SPEED MEASURED** must be same as internal actual speed **1.02 MOTOR SPEED** when rotating the motor. If not, exchange channels A and B. Check fibre optic connection between the NAMC board and the NTAC-0x module. Check the proper earthing of equipment. Check for highly emissive components nearby.
FACTORY FILE 9.03 SFW bit 0	Factory macro parameter file error.	Replace the NAMC board.
FLT (xx) 8.01 MSW bit 3	There is an internal fault in the ACS 600.	Check for loose connections inside of frequency converter cabinet. Write down the Fault code (in brackets). Contact ABB Service.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
ID RUN FLT 8.01 MSW bit 3	Motor ID Run not possible due to the limits or locked rotor.	Check that no overriding system is connected to the drive. Switch off the auxiliary voltage supply from the NAMC board and power up again. Check the parameter values in Group 20. - Check that no limits prevent the ID Run. Restore factory settings and try again. Check that the motor shaft is not locked.
IO FAULT 9.02 FW_2 bit 6	I/O communication fault or error detected on CH1. This can be caused by a fault in the I/O unit, a fibre optic cable connection problem or incorrect module identification number (if I/O extension modules are present).	Check for loose connections between the NIOC-01 or extension module and NAMC board. Measure that every I/O unit receives +24 V DC auxiliary voltage. Test with new optic fibre cables. Check the identification numbers of extension I/O modules. If the fault is still active, replace the I/O board/extension unit(s).
KLIXON 9.01 FW_1 bit 5	Motor 1 or 2 overtemperature fault. A thermal switch or thermistor connected to DI6 has opened. Also PTC thermistor connected to DI6 of NIOC-01detects motor overtemperature.	Check motor ratings and load. Check cable. Check thermistor (only to DI6 of NIOC-01) or thermal switch connections to digital inputs. If the resistance of the thermistor is over 4 kΩ, real overtemperature occurs in the motor. Wait until the motor has cooled. The state of DI6 returns back to 1 when the resistance of the thermistor is between 0...1.5 kΩ. Replace the I/O board if the voltage in the selected KLIXON digital input is correct, but the state of DI6 is 0 in **1.15 DI6-1 STATUS** or **8.03 DI STATUS WORD**. Check Parameter **10.05 KLIXON**.
MOTOR TEMP M 9.01 FW_1 bit 5	Motor 1 or 2 overtemperature fault. (PT100 or PTC measurement to analogue I/O). Motor temperature has exceeded the tripping level. (programmable fault or alarm, see Parameter 30.02)	Check motor ratings, load and cooling. Check start-up data. Check MOTOR TEMP Fault Function parameters. If an NAIO module is used for temperature measurement, check its DIP switch settings as well as Parameter **98.06 AIO EXT MODULE 1**.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
MOTOR FAN 9.06 FW_3 bit 0	Acknowledge signal is missing from the external motor fan starter.	Check the acknowledge circuit connection to the selected digital input. Check Parameter 35.02. Check the overload protection device of the fan motor. If it has tripped, reset it. Check the condition of the bearings of the fan motor by rotating fan motor manually. Replace the spare part fan if faulty. Replace the spare part fan if overload trippings continue and the bearings are OK.
MOTOR PHASE 9.02 FW_2 bit 15	Fault in the motor circuit. One of the motor phases is lost. This can be caused by a fault in the motor, the motor cable, a thermal relay (if used), or an internal fault. (programmable fault or alarm, see Parameter 30.19).	Check motor and motor cable. If the motor is disconnected, this fault is activated. Check thermal relay (if used). Check MOTOR PHASE Fault Function parameters. Disable this protection. If the cable and motor is ok, this fault can appear with small motors (<30 kW) in low speed. Deactivate protection in this case.
MOTOR STALL 9.02 FW_2 bit 14	Motor or process stall. Motor is operating in the stall region. This can be caused by excessive load or insufficient motor power. (programmable fault or alarm, see Parameter 30.13)	Check motor load and the ACx 600 ratings. Check MOTOR STALL Fault Function parameters (30.13 ... 30.15).
MOTOR TEMP 9.01 FW_1 bit 6	Overtemperature fault (thermal model). Temperature has exceeded the tripping level of the thermal model. (programmable fault or alarm, see parameter 30.02)	Check motor ratings, load and cooling. Check start-up data. Check MOTOR TEMP Fault Function parameters.
NVOS ERROR 9.03 SFW bit 2	Non-volatile operating system error.	Replace the NAMC board.
OVER SWFREQ 9.02 FW_2 bit 9	Over switching frequency fault. This may be due to a hardware fault in the electronics boards.	Replace the NAMC board. Replace the NINT board. On units with parallel connected inverters, replace the NPBU board.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
OVERCURRENT 9.01 FW_1 bit 1	Overcurrent has been detected.	If the drive tripped during flying start, check that Parameter **21.01 START FUNCTION** is set to AUTO. (Other modes do not support flying start). Check motor load. Check acceleration time. Check motor and motor cable (including phasing). Check pulse encoder and pulse encoder cable. Check that there are no power factor correction capacitors or surge absorbers in the motor cable. Check the nominal motor values from Group 99 to confirm that the motor model is correct.
OVERFREQ 9.01 FW_1 bit 9	Motor is turning faster than the highest allowed speed. This can be caused by an incorrect setting of parameters, insufficient braking torque or changes in the load when using torque reference.	Check the minimum and maximum speed settings. Check the adequacy of motor braking torque. Check the applicability of torque control. Check the need for a Braking Chopper and Braking Resistor if the drive has a Diode Supply Unit DSU. Check Parameter **20.11 FREQ TRIP MARGIN**.
PANEL LOST 9.02 FW_2 bit 13	A Local Control device (CDP 312 or Drive*Window)* has ceased communicating. This can be caused by the disconnetion of the selected local control device during local control or an internal fault in the local controlling device. (programmable fault or alarm, see parameter 30.21)	Check Control Panel connector. Replace Control Panel in the mounting platform. Check PANEL LOST Fault Function parameters.
PPCC LINK 9.02 FW_2 bit 11	NINT board current measurement or communication fault between the NAMC and NINT boards. (This fault can be masked, if the DC intermediate circuit voltage has been disconnected, but the NAMC board has an external power supply and fault indication is not needed. The Fault appears only if the motor is start. See Parameter 30.24)	Check the fibre optic cables connected between the NAMC and NINT boards. In parallel connected inverters, also check the cabling on the NPBU-xx board. If the fault is still active, replace the NPBU board (only with parallel connected inverters), NAMC and NINT board (in this order) until the fault disappears. Test with new fibre optic cables in the PPCC link. Check that there is no short circuit in the power stage. The short circuit or over current can cause this message due to the possible faulty power plate. It can causes possible overloading for auxiliary power and as a result PPCC link communication failure.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
RUN DISABLD 9.02 FW_2 bit 4	External interlocking (DI2=0) circuit is open. There is a fault in the external devices.	Check the circuit connected to digital input DI2.
SAFETY SWITC	The motor is running and safety switch is opened.	Close the safety switch. Reset the fault and start the motor again.
SC (INU 1) 9.01 FW_1 bit 12	Short Circuit in (parallel connected) inverter unit 1	Short circuit detected in parallel connected inverter unit 1. Check the optic fibre connection from the NPBU-xx board channel CH1 (INT1) to the inverter. Check the motor and motor cable. Check all power plates in inverter unit 1. If a faulty power plate is detected, replace the whole phase module by another.
SC (INU 2) 9.01 FW_1 bit 13	Short Circuit in (parallel connected) inverter unit 2	Short circuit detected in the parallel connected inverter unit 2. Check the optic fibre connection from the NPBU-xx board channel CH2 (INT2) to the inverter. Check the motor and motor cable. Check all power plates in inverter unit 2. If a faulty power plate is detected, replace the whole phase module by another.
SC (INU 3) 9.01 FW_1 bit 14	Short Circuit in (parallel connected) inverter unit 3	Short circuit detected in the parallel connected inverter unit 3. Check the optic fibre connection from the NPBU-xx board channel CH3 (INT3) to the inverter. Check the motor and motor cable. Check all power plates in inverter unit 3. If a faulty power plate is detected, replace the whole phase module by another.
SC (INU 4) 9.01 FW_1 bit 15	Short Circuit in (parallel connected) inverter unit 4	Short circuit detected in the parallel connected inverter unit 4. Check the optic fibre connection from the NPBU-xx board channel CH4 (INT4) to the inverter. Check the motor and motor cable. Check all power plates in inverter unit 4. If a faulty power plate is detected, replace the whole phase module by another.
SHORT CIRC 9.01 FW_1 bit 0	Short circuit has been detected. The output current is excessive.	Check the motor and motor cable. Measure the resistances of the power plate(s). If a faulty power plate is detected, replace the power plate and the NINT and NGDR boards or the whole inverter phase module. Check that the prevention of unexpected start-up circuit has not opened during the run.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
START INH HW 9.06 FW_3 bit 1	Start Inhibit HW fault has been detected in the Prevention of Unexpected Start-Up circuit.	Check that the LED indicator is ON in the NGPS-xx power supply, when powered. If not, change the NGPS-xx power supply. Check the digital input connection in the START INHIB DI circuit according to parameter selection 10.08. Check the status of START INHIB DI in the HW by measuring the voltage between the input terminals. Check the SW status from the signal DI STATUS WORD (8.05). If there is a voltage in the input terminals of START INHIB DI, but the DI STATUS WORD (8.05) indicates state FALSE, change the I/O board / module.
SUPPLY PHASE 9.02 FW_2 bit 0	Ripple voltage in the DC link is too high. This can be caused by a missing mains phase in the diode rectifier bridge, or DC voltage oscillation by a thyristor rectifying bridge (if used in the incoming section).	Check for mains supply imbalance. Check the mains fuses.
UNDERLOAD 9.01 FW_1 bit 8	Process underload situation detected. Motor load is too low. This can be caused by a release mechanism in the driven equipment. (programmable fault or alarm, see Parameter 30.16.)	Check the driven equipment. Check UNDERLOAD Fault Function parameters.
USER MACRO 9.03 SFW bit 1	User Macro parameter file error. There is no User Macro saved or the file is defective.	Create the User Macro again.

Alarm Message Table

ALARM MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
ACS 600 TEMP 9.04 AW_1 bit 4	Power plate overtemperature alarm. The ACS 600 internal temperature is excessive.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against unit power.
AI<MIN FUNC 9.05 AW_2 bit 10	I/O reference 4…20 mA is below 4 mA. (programmable fault or alarm, see parameter 30.27).	Check for proper analogue control signal levels. Check the control wiring. Check AI < MIN FUNC Fault Function parameters.
AIO ALARM 9.04 AW_1 bit 8	Analogue I/O error detected on the Standard I/O board NIOC-01.	Replace the NIOC-01 board. Test with new fibre optic cables on CH1.
ALM (xx) 8.01 MSW bit 7	There is an internal alarm in the ACS 600.	Check for loose connections inside of frequency converter cabinet. Write down the Alarm code (in brackets). Contact ABB Service.
CABLE TEMP 8.05 AW_2 bit 3	Motor cable overtemperature alarm. Thermal model of the cable has reached 90% temperature level.	Check the motor load. Check the motor cable and its type and verify the cable thermal model parameters from the parameter group 36.
CH0 TIMEOUT 9.05 AW_2 bit 11	Communication break detected on CH0 receive. CONSTANT SPEED1 mode selected with Par. 70.05. (can be deactivated: see Parameter 70.04)	Check the fibre optic cables between the NAMC board and the overriding system (or fieldbus adapter). Test with new fibre optic cables on CH0. Check that the node address is correct for the drive. Check the status of the fieldbus adapter. See appropriate fieldbus adapter manual. Check parameter settings of Group 51 in case of FBA module and connections between control system and adapter module. Check if the bus master is not communicating or configured.
CH2 COM LOS 9.04 AW_1 bit 11	Communication break detected on CH2 receive. (programmable fault or alarm; see Parameter 70.13)	Check the fibre optic cables on CH2 between the NAMC boards. Check that the fibre optic loop is closed. Test with new fibre optic cables on CH2. Check that there is one master drive and the remainder are followers in the M/F link. See Parameter **70.08 CH2 M/F MODE**.

ALARM MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
DC UNDERVOLT 9.05 AW_2 bit 14	An undervoltage trip has been detected with the Auto Restart function. This is indicated to the AW2 diagnostics.	n.a. Only indication.
DIO ALARM 9.04 AW_1 bit 7	Digital input malfunction detected in the I/O board NIOC-01.	Check the fibre optic cables. Test with new fibre optic cables on CH1. Replace the NIOC-01 board.
EARTH FAULT 9.04 AW_1 bit 14	The load on the incoming mains system is out of balance. This can be caused by a fault in the motor, motor cable or an internal malfunction. (programmable fault or alarm; see Parameter 30.20) Tripping level setting is too sensitive in the R10i…R12i inverters. See Parameter 30.25.	Check motor. Check motor cable. Check that there are no power factor correction capacitors or surge absorbers in the motor cable.
EM STOP 9.04 AW_1 bit 1	Emergency Stop has been activated either by digital input DI1(= 0) or MAIN CONTROL WORD 7.01 bit 2 (= 0).	Emergency stop push buttons must be returned to their normal position after the emergency stop situation is over. Check that the overriding system keeps sending the MAIN CONTROL WORD to drive. See bit 2 of MCW. To get drive to ready status, the MCW bit 0 must be set to state FALSE and back to TRUE.
ENCODER ERR 9.04 AW_1 bit 5	Speed measurement alarm detected. This can be caused by a loose cable connection or faulty pulse encoder. (programmable fault or alarm, see parameter 50.05)	Check settings of Parameter Group 50. Check the pulse encoder and its cabling (including CH A and CH B phasing). The sign of signal **1.03 SPEED MEASURED** must be the same as internal actual speed **1.02 SPEED ESTIMATED**. If it is not, reverse the channels A and B. Check fibre optic connection between the NAMC board and the NTAC-0x module. Check the proper earthing of equipment. Check for highly emissive components nearby.
EXT AIO ALM 9.04 AW_1 bit 10	Analogue I/O error detected in the NAIO I/O Extension module	If the alarm is continuously active, replace the NAIO module.
EXT DIO ALM 9.04 AW_1 bit 9	Digital input error detected in the NDIO I/O Extension module.	If the alarm is continuously active, replace the NDIO module.
INV OVERLOAD 9.05 AW2_ bit 2	Forced cooling cycle for inverter is active after the overloading cycle 10/60s.	Load is too high. Check the dimensioning and process.

ALARM MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
M/F CONNECT Fault Logger	Wrong data type has been selected at parameters MASTER REF 1, 2 or 3 (70.09...70.11)	Select zero or correct data type at the following parameters: 70.09 packed boolean 70.10 real or integer 70.11 real or integer
MOTOR TEMP M 9.04 AW_1 bit 2	Motor 1 or 2 overtemperature alarm (PT100 or PTC measurement to Analogue I/O) (programmable fault or alarm; see Parameter (30.01, 30.03...30.05)	Check motor ratings and load. Check start-up data. Check PT100 or thermistor connections for AI and AO of the NIOC-01 board or NAIO extension module according to the hardware configuration. Check the DIP switches and selection of parameter **98.06 AIO EXT MODULE 1**, if an NAIO extension module is used for temperature measurement.
MOTOR FAN 9.05 AW_2 bit 0	Acknowledge signal is missing from the external motor fan and an alarm is present the time defined by Parameter 35.03 FAN ACK DELAY.	Check the acknowledge circuit on the selected digital input. See Parameter 35.02. Check the overload protection device of the fan motor. If it has tripped, reset it. Check the condition of the bearings of the fan motor by rotating the fan motor manually. Replace the spare part fan if faulty. Replace the spare part fan if overload trippings continue and the bearings are OK.
MOTOR STALL 9.05 AW_2 bit 9	Motor or process stall. Motor operating in the stall region. This can be caused by excessive load or insufficient motor power. (programmable fault or alarm; see Parameter 30.13)	Check motor load and the ACx 600 ratings. Check MOTOR STALL Fault Function parameters.
MOTOR STARTS	Motor ID Run has been selected and the drive started in the Local control mode.	Wait until the Motor ID Run is complete.
MOTOR TEMP 9.04 AW_1 bit 3	Overtemperature alarm (thermal model). Temperature has exceeded the alarm level of the thermal model. (programmable fault or alarm; see Parameter 30.02)	Check motor ratings, load and cooling. Check Parameter **30.28 THERM MOD ALM L**. If USER MODE is selected, check that Parameters 30.09 ... 30.12 are set correctly.
NO MOTOR DATA 9.02 FW_2 bit 1	Motor data is not given or motor data does not match with inverter data.	Check the motor data given by Parameters 99.02...99.06.

ALARM MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
PANEL LOST 9.05 AW_2 bit 13	A Local Control device (CDP 312 or Drive*Window)* has ceased communicating. This can be caused by the disconnection of the selected local control device during local control or an internal fault in the local controlling device. (programmable fault or alarm, see parameter 30.21)	Check Control Panel connector. Replace Control Panel in the mounting platform. Check PANEL LOST Fault Function parameters.
POWDOWN FILE 9.05 AW_2 bit 8	Error in restoring powerdown.ddf file	If the alarm keeps reappearing, replace the NAMC-xx board.
POWFAIL FILE 9.05 AW_2 bit 7	Error in restoring powerfail.ddf file.	If the alarm keeps reappearing, replace the NAMC-xx board.
RESTARTED 9.05 AW_2 bit 15	The motor has been restarted after the short net break with AUTO RESTART function. See parameter 21.09.	n.a.
SAFETY SWITC	The motor has been stopped and safety switch is opened.	Close the safety switch.
START INHIBI 9.04 AW_1 bit 0	Prevention of unexpected start-up activated from the hardware typically by operator for equipment maintenance.	The Operator must close the prevention of unexpected start-up switch. If the switch is closed and the alarm is still active, check that the “Power On” LED is lit on the NGPS board. If the LED is off but there is a voltage at the input terminals of the NGPS, replace the board.
T MEAS ALM 9.04 AW_1 bit 6	Motor temperature measurement circuit is faulty. This can be caused by a broken temperature sensor or cable.	Check the motor temperature sensor connections.
UNDERLOAD 9.05 AW_2 bit 1	Process underload situation detected. Motor load is too low. This can be caused by a release mechanism in the driven equipment. (programmable fault or alarm; see Parameter 30.16)	Check for a problem in the driven equipment. Check UNDERLOAD Fault Function parameters.

Event Messages

EVENT MESSAGES (in alphabetical order)		
Event Message	***Cause***	***Action***
SYSTEM START	Inverter Software has been started. This indicates normally an auxiliary voltage on connection.	

Other Messages

OTHER MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
NO COMMUNICATION	Control Panel CDP 312 message. The selected drive is not present on the link. The link does not work because of a hardware malfunction or problem in the cabling.	Check the fibre optic cable connections in the I/O-link.
SWC ON INHIB 8.01 MSW bit 6	Drive is in the ON INHIBIT state. See ABB Drive Profile description.	Set MAIN CONTROL WORD bit 0 first to 0, then back to 1 to proceed into the next state.
ID N CHANGED	Modbus ID number of the drive has been changed from 1 in Drive Selection Mode of CDP 312 panel (the change is not shown on the display).	To change the Modbus ID number back to 1 go to Drive Selection Mode by pressing ***DRIVE***. Press ***ENTER***. Set the ID number to 1. Press ***ENTER.***
MACRO CHANGE	A Macro is being restored or a user Macro is being saved.	Please wait.
ID MAGN REG	The ACx 600 is ready to start identification magnetisation.	This warning belongs to the normal start-up procedure. Press PAR and check Parameter 99.07.
ID MAGN	The ACx 600 is performing identification magnetisation.	Please wait 20 to 60 seconds.
ID DONE	The ACx 600 has performed the identification magnetisation and is ready to start.	-
I/O SP REF	AI1 of NIOC-01 has been selected incorrectly for speed reference and motor temperature measurement when I/O control (98.02 = NO) or HAND/AUTO function has been selected.	Use AI2 of NIOC-01 for speed reference by setting Par. 11.01 to value STD AI2 or use an NAIO Analogue I/O Extension Module. See Par. 98.06.