8 Operation

8.1 Operating statuses, parameter P000

Torque direction M0, MI or MII (= ON)

– –	No torque direction switched-in (M0)
I	Torque direction I switched-in (M I)
II	Torque direction II switched-in (M II)

o1 Wait for enable signal (= READY)

o1.0	Brake release delay time running	
o1.1	Wait for enable signal at terminal 38	
o1.2	Wait for operating enable via control word, bit 3	**from SW1.10**
o1.3	Delay time after inching command has been withdrawn running	
o1.4	Wait until field reversal has been executed.	**from SW2.00**
o1.5	Delay time for enable signal from the optimization run (the optimization run only outputs the enable signal at the end, if $n < n_{min}$ has been reached, and SHUTDOWN has been entered).	
o1.6	Wait for operating enable from the checkback signal "line contactor in" (select function: BEF55 binary input function)	

o2 Reserved

o2.0	Reserved

o3 Test phase

o3.0	Wait until the thyristor check has been completed (select function)
o3.1	Wait until the supply symmetry check has been completed.

o4 Wait for voltage (armature)

o4.0 Wait for voltage at the power connections 1U1, 1V1, 1W1.

(threshold: P071 * $\frac{P353}{100\%}$)

o5 Wait for field current

o5.0 Wait until the field current actual value is >50% of the field current setpoint and "$I_{field\ external} > I_{f\ min}$" (if BEF59 is used).

o5.1 Wait for voltage at power connections 3U1, 3W1.

(threshold: 400V * $\frac{P353}{100\%}$)

NOTE

In statuses o4 and o5, a maximum specific time is maintained, which can be selected using parameter P089. If the appropriate conditions are still not fulfilled, the associated error/fault signal is issued.

o6 **Wait status before the main contactor is switched-in** **from SW2.00**

o6.0 Wait until the auxiliaries are switched-in (delay time P093).

o6.1 Wait until a setpoint ≤ P091 is available at the ramp-function generator input.

o7 **Wait for switch-on (= READY FOR SWITCH-ON)**

o7.0 Wait for switch-on via terminal 37

o7.1 Wait for switch-on via control word, bit 0. **from SW1.10**

o7.2 Wait until the internal shutdown is removed by entering an external shutdown command or
wait for BEF58 = 0 after "braking with field reversal" (BEF58 = 1) **from SW2.00**

o7.3 Wait until "reset to default" has been completed.

o7.4 Wait for a manual start command to execute an action (e.g. "reset to default", "optimization run" or wait until "offset compensation" has been completed).

o7.5 Wait until the "read-in parameter set" has been completed.

o8 **Wait for switch-on inhibit acknowledge**

o8.0 Wait for the switch-on inhibit to be acknoweldged by entering the command SHUTDOWN (OFF 1).

o9 **Fast stop (OFF 3)**

o9.0 Fast stop was entered via terminal
(select function: Binary input function 4).

o9.1 Fast stop was input via control word, bit 2. **from SW1.10**

o9.2 Fast stop is internally stored (the memory is reset by removing the FAST STOP command and entering "SHUTDOWN").

o10 **Voltage disconnect (OFF 2)**

o10.0 Command to disconnect the voltage was entered via terminal
(select function: Binary input function 3).

o10.1 Disconnect from voltage input via control word, bit 1. **from SW1.10**

o10.2 Emergency stop was entered via terminal 105 or 107.

o10.3 Wait until a valid telegram is received from the partner drive
(only if "peer-to-peer" communication selected, parameter P780/P790).
from SW1.10

o10.4 Wait until a valid USS telegram was received at GSST1 **from SW2.00**
(only if the telegram failure time monitoring P797 < > 0).

o10.5 Wait until a valid USS telegram was received at GSST0 **from SW2.00**
(only if the telegram failure time monitoring P787 < > 0).

o11 **Fault**

o11.0 = Fxxx error message is displayed, red LED is lit.

o12 Electronics is initialized

o12.0 Supplementary board (CS5/51 or PT1) is initialized **from SW1.20**

o12.1 Basic converter electronics is initialized

o13 Electronics not under voltage

Display dark: Wait for voltage at terminals 5U1, 5W1
(electronics power supply)

8.2 Fault messages

When a fault occurs:

- The binary output function "$\overline{\text{fault}}$" (BAF3) is set to LOW, and bit 3 of the status word ZSW (K325) is set to HIGH.
- the drive is shutdown (as for "Voltage disconnect" Section 10.3.3)
  1. technology controller, ramp-function generator, speed- and current controllers are inhibited
  2. α_W (inverter stability limit) is entered
  3. the pulses are inhibited when I = 0
  4. "Close operating brake" signal (BAF14 = 0, status word ZSW1 bit 7 = 0) is output, if P080 is parameterized to 2 **from SW2.00**
  6. for operating statuses ≥ o10, a field current actual value (K265) present 13 field firing pulse cycles previously, is entered as field current setpoint upper limit, to prevent armature overvoltage in field weakening operation. This limit is removed if the operating status is ≤ o5
  5. operating status o11.0 is reached
  7. the "line contactor ON" relay drops-out
  8. the drive coasts down (or is braked by the operating brake)
  9. delay time, which can be parameterized (P258) expires
  10. the field is reduced to a value which can be parameterized (P257)
  11. if $n < n_{min}$ (P370, P371) is reached, the "close holding brake" signal (BAF14 = 0, status word ZSW1 bit 7 = 0) is output, if P080 is parameterized to 1. **from SW1.20**
- The fault is displayed on the operator control panel.

Fault display, simple operator control panel:	Fxxx (xxx = fault number) Display flashes (approx. 0.8s lit,0.2s dark) Red LED "ST" on the electronics board lit
Fault display, operator control panel:	1st line: Fault xxx (xxx = fault number) 2nd line: "fault text" Red LED "FAULT" lit on the operator control panel. Red LED "ST" lit on the simple operator control panel. o11.0 displayed on the simple operator control panel.

The fault messages only become active above a certain operating status. This operating status is specified in the description of the individual fault messages.

A new fault message can only be displayed, if the previous fault message has been acknoweldged (refer to Section 8.2.3) and

1. the "switch-on" command was entered once (positive edge) or
2. a function (e.g. "parameter print-out", "optimization run" etc. was started during a key acknowledgeprompt, by depressing the RAISE key.

The binary output function "fault" is issued independent of the fault display.

Storing the fault number when the electronics power supply fails

The fault memory, parameter P880, contains the numbers of the four faults which last occured. This at power failure, these are stored, depending on parameter P053.

P053 = 0x Process data which is not lost during voltage failure, is not stored

P053 = 1x All process data which is not lost during voltage failure (auch Störspeicherinhalt) is stored.

If the process data which is not lost when the voltage fails, is not stored (P053 = 0x), the contents of the fault memory are lost when the converter is switched-off. The converter can become operational after the supply voltage has returned, without a fault message being issued.

If the process data which is not lost during voltage failure, is stored (P053 = 1x), the contents of the fault memory are stored in the EEPROM when the converter is switched-off. If the supply voltage is switched-out with a fault message present, the converter outputs message F040 when the supply voltage returns.

Fault diagnostics memory

Additional information regarding fault causes is provided in the 16-word fault diagnostic memory, displayed at parameter P047.ii (ii = 0 to 15). The significance of the fault words (word 0, word 1, ...) is explained in Section 8.2.2 for the particular fault messages.
The contents of the fault diagnostic memory can also be printed-out, or transferred to a PG or PC (also refer to P051 in Sections 9.2 and 10.7.1).

NOTE

Although in the subsequent description of the individual fault messages, only the significance of word 0 of the fault diagnostic memory is specified, fault words up to word 14 from P047 can provide more detailed information regarding the fault cause. For all fault messages, word 15 contains the fault number in the hexadecimal notation.

8.2.1 Fault overview

Fault No.	Function	
Supply fault		
F001	Failure of the electronics power supply	
F003	Faults in parallel SITOR sets	
F004	Phase failure, armature supply	
F005	Fault in the field circuit	
F006	Undervoltage	
F007	Overvoltage	
F008	Supply frequency less than 45 Hz	
F009	Supply frequency greater than 65Hz	
Interface errors		
F010	Parity error at G-SST0	
F011	Framing error at G-SST0	
F012	Overrun error at G-SST0	
F013	Syntax error at G-SST0	
F014	USS telegram failure at G-SST0	from SW1.10
F015	Peer-to-peer error at G-SST0	from SW1.10
F020	Parity error at G-SST1	
F021	Framing error at G-SST1	
F022	Overrun error at G-SST1	
F023	Syntax error at G-SST1	
F024	USS telegram failure at G-SST1	from SW1.10
F025	Peer-to-peer error at G-SST1	from SW1.10
F028	Short-circuit at the binary outputs	
F029	Faulted connection between the basic converter and supplementary board	f. SW1.10
Drive faults		
F031	Controller monitoring, speed controller	
F032	Controller monitoring, armature current controller	
F033	Controller monitoring, EMF controller	
F034	Controller monitoring, field current controller	
F035	Drive stalled	
F036	No armature current can flow	
F037	I^2t motor monitoring responded	
F038	Überdrehzahl	
F039	I^2t monitoring of the power section responded	
F040	Electronics supply disconnected with a fault present	
F041	Parameter set or ramp-function generator selection not clear	

Fault No.	Function	
F042	Tachometer fault	
F043	EMF for braking operation too high	from SW2.00
F046	Analog input, main setpoint (terminals 4 and 5) faulted	from SW2.00
F047	Analog input, select input 1 (terminals 6 and 7) faulted	from SW2.00
F048	Fault in the measuring channel for digital pulse encoder speed sensing	
Start-up faults		
F050	Optimization run not possible	
F051	Optimization run with permanent memory inhibit not possible	
F052	Optimization run externally interrupted	
F055	Field characteristic was not recorded	
F056	Important parameters not set	
F057	Option selection incorrect	
F058	Parameter settings not consistent	
F059	Function selection for G-SST0 and G-SST1 incorrect	
F060	Modified software version	from SW1.10
Fault messages from the thyristor check function		
F061	Defective thyristor (short-circuit in module V1) (for the 15 A converter: V1 or V4)	
F062	Defective thyristor (short-circuit in module V2) (for the 15 A converter: V2 or V5)	
F063	Defective thyristor (short-circuit in module V3) (for the 15 A converter: V3 or V6)	
F064	Defective thyristor (short-circuit in module V4) (for the 15 A converter: V4 or V1)	
F065	Defective thyristor (short-circuit in module V5) (for the 15 A converter: V5 or V2)	
F066	Defective thyristor (short-circuit in module V6) (for the 15 A converter: V6 or V3)	
F068	Ground fault in the armature circuit	from SW2.00
F069	I = 0 signal defective	
F071	Thyristor unable to be triggered (X11)	
F072	Thyristor unable to be triggered (X12)	
F073	Thyristor unable to be triggered (X13)	
F074	Thyristor unable to be triggered (X14)	
F075	Thyristor unable to be triggered (X15)	
F076	Thyristor unable to be triggered (X16)	
F077	2 or more thyristors (MI) unable to be triggered	
F081	Thyristor unable to be triggered (X21)	
F082	Thyristor unable to be triggered (X22)	
F083	Thyristor unable to be triggered (X23)	
F084	Thyristor unable to be triggered (X24)	
F085	Thyristor unable to be triggered (X25)	
F086	Thyristor unable to be triggered (X26)	

Fault No.	Function
F087	2 or more thyristors (MII) unable to be triggered
F091	Thyristor unable to block (X11 or X21)
F092	Thyristor unable to block (X12 or X22)
F093	Thyristor unable to block (X13 or X23)
F094	Thyristor unable to block (X14 or X24)
F095	Thyristor unable to block (X15 or X25)
F096	Thyristor unable to block (X16 or X26)
Internal faults	
F100	Illegal microprocessor status
F101	Watchdog timer has initiated a reset
F102	EEPROM fault
F103	Parameter value outside the permitted range
F104	Incorrect EEPROM check sum
F105	Defective RAM
F107	Internal buffer overflow
F109	Defective supply voltage sensing
F110	Converter cooling faulted
F111	Defective measuring channel for the main setpoint (terminals 4 and 5)
F112	Defective measuring channel, select input 1 (terminals 6 and 7)
F113	Defective measuring channel for the main actual value (terminals 101 to 104)
Fault messages from the motor sensor system	
F115	Brush length too low
F116	Poor bearing condition
F117	Air flow monitoring
F118	Motor overtemperature (binary sensing)
F119	Motor overtemperature (analog sensing)
External faults	
F121	Fault signal at terminal 39
F122	Fault signal at terminal 40
F123	Fault signal at terminal 41
F124	Fault signal at terminal 42
F125	Fault signal at terminal 43
F126	Fault signal at terminal 36
F128 to F255	Technology board fault from SW1.10

8.2.2 Fault description

8.2.2.1 Supply faults

F001 Failure of the electronics power supply

Active in all operating statuses

Mode of operation

The electronics power supply (terminals 5U1, 5W1) fails, during "RUN" for longer than the "restart time", set at parameter P086, or the electronics is operated with an undervoltage condition (the voltage at a "discharge capacitor" is a measure of the voltage failure time).

Fault diagnostics memory

Word 0 1 Electronics power supply is interrupted in "ON" longer than the time set in P086
2 Supply failure pre-warning (alarm) responds periodically
3 Supply failure pre-warning (alarm) is present for longer than 1.28 seconds

Word 1 If word 0 = 1: Duration of the actual supply failure in 1/10 seconds

Possible fault causes

- Line contactor opened in the "ON" status
- Brief supply failure
- Supply voltage too low

F003 Faults in parallel SITOR sets

Active for operating statuses ≤ o4

Mode of operation

At least one parallel SITOR set is connected, selected via parameter p074, and provides the fault signal, phase failure, fan monitoring or undervoltage.

For "undervoltage in a parallel SITOR set" the error message is only initiated, if the error condition occurs for a time longer than the "restart time" set at P086.

Fault diagnostics memory

Word 0 1 Fuse failure
2 Fuse failure
3 Undervoltage
4 Undervoltage after the time, set at P086, has expired

Possible fault causes

- Undervoltage in the electronics power supply of a SITOR set
- A fan is not running
- Fuse failure in a SITOR set
- Cable connection between a SIMOREG converter and first SITOR set is interrupted or faulty
- No parallel SITOR set present, although selected via P074

F004 Phase failure, armature supply

Active for operating statuses ≤ o4

Mode of operation

The supply voltage RMS value, calculated from the area of each supply half wave (rectified average value x peak factor) must be greater than the response value of the phase failure monitoring.

$$(P071 * \frac{P353}{100\%})$$

The distance between two similar supply voltage zero crossovers of a phase must not exceed 450 degrees.

If one of these two conditions is not fulfilled for longer than the "restart time" set at P086, the error message is initiated.

Fault diagnostics memory

Word 0 1 Voltage failure in the armature supply (1U1, 1V1, 1W1)
2 Delay time according to parameter P089 expired in operating status o4
3 Fuse failure in the SITOR set
4 Voltage failure longer than the time set in parameter P086 (if this is > 0)

Possible fault causes

- Parameter P353 incorrectly set
- Armature phase failed
- Line contactor opened in operation
- Fuse blown on the three-phase side in the armature circuit
- Fuse failure in the SITOR set

F005 Fault in the field circuit

Active for operating statuses ≤ o5

Mode of operation

The supply voltage RMS value, calculated from the area of each supply half wave (rectified average value x peak factor) must be greater than the response value of the phase failure monitoring.

$$(P078 * \frac{P353}{100\%} \text{ from SW2.00}, \quad (400V * \frac{P353}{100\%} \leq SW1.30)$$

The distance between two similar supply voltage zero crossovers for the field rectifier must not exceed 450 degrees.

The field current actual value is < 50% of the required field current setpoint for greater than 500 ms. This monitoring function is only effective, if the field current setpoint > 2% of the rated converter field current.

The binary input $I_{field} < I_{min}$ (select function) is LOW for more than 500 ms.

The error message is initiated, if one of the described error conditions is available for a time longer than the "restart time" set at P086.

Fault diagnostics memory

Word 0 1 Voltage failure in the field supply (terminals 3U1 and 3W1) (for P086 = 0)
2 Delay time in status o5.1 expired
(delay for voltage to be established in the field power section)
3 delay time according to parameter P089 expired in operating status o5.0
(wait until $I_{Field\ act}$ > 50% of the instantaneous field current setpoint)
or
the field current actual value was < 50% of the field current setpoint in "ON" for more than 0.5 s
or
binary input I_{Field} < I_{min} (select function) is LOW for more than 500 ms)
4 Voltage failure or $I_{field\ act}$ < 50% $I_{field\ set}$ longer than that set at parameter P086 (if this > 0).

Possible fault causes

- Threshold for the phase failure (P353) incorrectly set
- Field phase failed
- Line contactor opened in operation
- Fuse failure in the field circuit
- Field current controller and/or field current controller pre-control either not optimized or badly optimized (check P112, P253 to P256; if required, carry-out current controller optimization run)

F006 Undervoltage

Active for operating statuses ≤ o4

Mode of operation

Voltage at terminals 1U1, 1V1 or 1W1 or 3U1, or 3W1 is less than the response threshold (P071 and P351) for longer than the "restart time" set at P086.

Response threshold for the armature supply voltage: $P071 * (1 + \frac{P351}{100\%})$

Response threshold for the field supply voltage: $P078 * (1 + \frac{P351}{100\%})$

$(400V * (1 + \frac{P351}{100\%})$ from SW1.30

Fault diagnostics memory

Word 0 1 Undervoltage condition
4 Undervoltage lasts longer than the time set using parameter P086 (if this > 0)

if word 0 = 1, then
Word 1 Phase number which caused the fault message
0 Phase UV
1 Phase VW
2 Phase WU
3 Phase field

Word 2 Erroneous voltage value (normalized to 16384)

Possible fault causes

- Supply undervoltage
- Monitoring set too critically or incorrectly (P351, P071)
- Gating board type (P070) incorrectly set

F007 Overvoltage

Active for operating statuses ≤ o4

Mode of operation

Voltage at terminals 1U1, 1V1 or 1W1 and 3U1, 3W1 greater than the response threshold (P071 and P352) (for longer than the "restart time" set at P086).

Response threshold for the armature supply voltage: $P071 * (1 + \frac{P352}{100\%})$

Response threshold for the field supply voltage: $P078 * (1 + \frac{P352}{100\%})$

$(400V * (1 + \frac{P351}{100\%})$ from SW1.30

Fault diagnostics memory

Word 0 1 Overvoltage condition
4 Overvoltage condition lasts longer than the time set using parameter P086 (if this > 0)

if word 0 = 1, then
Word 1 Phase number which led to the fault/error signal
0 Phase UV
1 Phase VW
2 Phase WU
3 Phase field

Word 2 Incorrect voltage value (normalized to 16384)

Possible fault causes

- Supply overvoltage
- Monitoring set too critically or incorrectly (P352, P071)
- Gating board type (P070) incorrectly set

NOTE

This monitoring function is disabled when supplied. The monitoring function is activated at parameter P850 (refer to Section 8.2.4).

F008 Supply frequency less than 45 Hz

Active for operating statuses ≤ o5

Mode of operation

This error signal is activated, if the supply frequency is < 45 Hz (for longer than the "restart time" set at P086).

Fault diagnostics memory

Word 0 1 Armature supply frequency <45Hz
2 Field supply frequency <45Hz

F009 Supply frequency greater than 65Hz

Active for operating statuses ≤ o5

Mode of operation

This fault message is activated if the supply frequency is greater than 65 Hz (for longer than the "restart time" set at P086).

Fault diagnostics memory

Word 0 1 Armature supply frequency >65Hz
2 Field supply frequency >65Hz

8.2.2.2 Interface errors

F010 Parity error at G-SST0

Active in all operating statuses, if parameter P780 = xxx1 or xxx9

Mode of operation

The bytes received at serial interface 0 (X500), are monitored for the selected parity (P780).

Possible error causes

- Check the parity set at parameter P780
- Parity incorrectly set at the transmitting unit
- EMC interference along the connecting cable

F011 Framing error at G-SST0

Active in all operating statuses, if parameters P780 = xxx1 or xxx9

Mode of operation

The bits received at serial interface 0 (X500) , are monitored for the selected number of stop bits (P780).

Possible error causes

- Check the data frame set at parameter P780
- Incorrectly set baud rate at the transmitting unit
- EMC interference along the connecting cable

F012 Overrun error at G-SST0

Active in all operating statuses, if parameter P780 = xxx1 or xxx9

Mode of operation

Each byte received at serial interface 0 (x500) must be retrieved by the software from the receive buffer, before the next character has been completely received. An error signal is initiated if this is not the case.

Possible error causes

- Incorrectly set baud rate at the transmitting unit
- EMC interference along the connecting cable

F013 Syntax error at G-SST0

Active in all operating statuses, if the "read-in parameter from the PC" function is selected (P780 = xxx1 and P051 = 23).

Mode of operation

A syntax error occurred when reading-in a parameter set via the serial interface (X500). The error signal is first initiated at the end of a transmission, and does not interrupt an actual transmission.

Fault diagnostics memory

Word 0
1 Invalid character received between two parameter declarations
2 Invalid character received within a parameter declaration
3 Too many places after the decimal point were specified for the parameter value
4 Too many digits were specified for nibble-coded parameters
5 Parameter specified which is outside the permitted limits
6 Nibble-coded parameters specified outside the setting range

Word 1 Last valid received parameter number of the complete transmission (as hexadecimal number)

Word 2 Last valid received parameter number before the last error occured (as hexadecimal number)

Word 3 Index of the last valid received parameter number before the last error occured (as hexadecimal number)

Possible fault causes

- Errors in the transferred data
- Errors occured during transfer (unlikely!)

F014 USS telegram failure at G-SST0 **from SW1.10**

This is active after the first valid protocol has been received, in all operating statuses.

Mode of operation

After a valid protocol has been received, no further telegram was received for a time longer than that set at parameter P787 (also refer to P787in Section 9.2).

Possible fault causes

- Interrupted cable
- USS master error

F015 Peer-to-peer error at G-SST0 — from SW1.10

Function partially changed from software release 2.00

Active for operating statuses ≥ o6

Mode of operation

After a valid protocol has been received, no further telegram was received for a time longer than that set at parameter P788 (also refer to P788 in Section 9.2).

Possible error causes

- Connecting cable interrupted
- EMC noise on the connecting cable
- P788 set too low

F020 Parity error at G-SST1

Active in all operating statuses, if parameters P790 = xxx1 or xxx9

Mode of operation

The bytes received at serial interface 1 (X501) are monitored for the selected parity (P790).

Possible error causes

- Check the parity set at parameter P790
- Incorrect parity set at the transmitting unit
- EMC interference along the connecting cable

F021 Framing error at G-SST1

Active in all operating statuses, if parameter P790 = xxx1 or xxx9

Mode of operation

The bytes received at serial interface 1 (X501) are monitored for the selected number of stops bits (P790).

Possible error causes

- Check the data frame set at parameter P790
- Incorrectly set baud rate at the transmitting unit
- EMC interference along the connecting cable

F022 Overrun error at G-SST1

Active in all operating statuses, if parameter P790 = xxx1 or xxx9

Mode of operation

Each bit received at serial interface 1 (X501) must be retrieved from the receive buffer by the software, before the next character is completely received.
If this is not the case, the error signal is initiated.

Possible error causes

- Incorrectly set baud rate at the transmitting unit
- EMC interference along the connecting cable

F023 Syntax error at G-SST1

Active in all operating statuses, if the "read-in parameter from the PC" function is selected (P790 = xxx1 and P051 = 23).

Mode of operation

A syntax error occurred when reading-in a parameter set via the serial interface (X501). The error signal is first initiated at the end of a transmission, and does not interrupt an actual transmission.

Error diagnostics memory

Word 0
1 Invalid character received between two parameter declarations
2 Invalid character received within a parameter declaration
3 Too many places after the decimal point were specified for the parameter value
4 Too many digits were specified for nibble-coded parameters
5 Parameter specified which is outside the permitted limits
6 Nibble-coded parameters specified outside the setting range

Word 1 Last valid received parameter number of the complete transmission (as hexadecimal number)

Word 2 Last valid received parameter number before the last error occured (as hexadecimal number)

Word 3 Index of the last valid received parameter number before the last error occured (as hexadecimal number)

Possible fault causes

- Errors in the transferred data
- Errors occured during transfer (unlikely!)

F024 USS telegram failure at G-SST1 **from SW1.10**

Active from the first reception of a valid protocol in all operating statuses

Mode of operation

After a valid protocol was received, no additional telegram was received for a time longer than that set at parameter P797 (also refer to P788 in Section 9.2).

Possible fault causes

- Defective cable
- Fault in the USS master

F025 Peer-to-peer error at G-SST1 **from SW1.10**

Function partially changed from software release 2.00

Active for operating statuses ≥ o6

Mode of operation

After a valid protocol has been received, no further telegram was received for a time longer than that set at parameter P788 (also refer to P788 in Section 9.2).

Possible error causes

- Connecting cable interrupted
- EMC noise on the connecting cable
- P788 set too low

F028 Short-circuit at the binary outputs

Active in all operating statuses

Mode of operation

Hardware monitoring as to whether the binary select outputs are short-circuited.

Possible fault causes

- Short-circuit or overload at terminals 46, 48, 50 or 52

NOTE

This monitoring function is disabled when the unit is supplied. The monitoring function is activated at parameter P850 (refer to Section 8.2.4).

F029 Faulted connection between the basic converter and supplementary board from SW1.10

Active for operating statuses ≤ o3

Mode of operation

Data transmission between the basic converter and technology- or interface board is monitored per software (also refer to P926 and P927).

Fault diagnostics memory

Word 0 (channel code)
- 1 Setpoint channel 1
- 2 Setpoint channel 2
- 3 Actual value channel 1
- 4 Actual value channel 2

Word 1 (channel code)
- 1 Buffer still in the initialized status
- 2 Supplementary board has read the buffer to be written into
- 3 Supplementary board has written into the buffer to be read
- 4 Supplementary board has not updated the buffer contents
- 5 Supplementary board has not retrieved the buffer contents
- 6 Channel not operational, although selected via P902 and P906

Possible fault causes

- Defective ribbon cable connection between X100 and the supplementary board
- Defective supplementary board
- EMC noise

8.2.2.3 Drive faults

NOTE

The following monitoring functions F031 to F037 are disabled when the equipment is supplied. The monitoring functions are activated at parameter P850 (ref. to Sec. 8.2.4).

F031 Controller monitoring, speed controller

Active for operating statuses --, I, II

Mode of operation

The monitoring responds, if the setpoint-actual value difference of the speed controller exceeds the value set at parameter P362, for a time set at parameter P363.

Possible fault causes

- Control loop interrupted
- Controller not optimized

F032 Controller monitoring, armature current controller

Active for operating statuses --, I, II

Mode of operation

The monitoring function responds, if the setpoint-actual value difference of the armature current controller exceeds the value set at parameter P364 for a time which is longer than that set at P365.

Possible fault causes

- Control loop interrupted
- Controller not optimized

F033 Controller monitoring, EMF controller

Active for operating statuses --, I, II

Mode of operation

The monitoring function responds, if the setpoint-actual value difference of the armature current controller exceeds the value set at parameter P366 for a time which is longer than that set at P367.
The monitoring function is ineffective, if the field current setpoint reaches the positive field current limit (armature control range, non-weakened field).

Possible fault causes

- Control loop interrupted
- Controller not optimized

F034 Controller monitoring, field current controller

Active for operating statuses – –, I, II

Mode of operation

The monitoring function responds if the setpoint-actual value difference of the field current controller exceeds the value set at parameter P368 for a time which is longer than that set at P369.

Possible fault causes

- Control loop interrupted
- Controller not optimized

F035 Drive stalled

Active for operating statuses – –, I, II

Mode of operation

The monitoring function responds, if the following conditions are fulfilled for a time longer than that set at parameter P355:
- Positive or negative torque or armature current limit reached
- The armature current is greater than 1% of the rated converter armature current
- The speed actual value is < 0.4% of the maximum speed

Possible fault causes

- Drive stalled

F036 No armature current can flow

Active for operating statuses – –, I, II

Mode of operation

The monitoring function responds if the armature firing angle is at the rectifier stability limit for more than 500 ms, and the armature current is less than 1% of the rated converter armature DC current.

Possible fault causes

- Armature circuit interrupted
  (e.g. DC fuses blown, cable interrupted etc.)
- Rectifier stability limit α_G (P150) incorrectly set
- Drive operates at the α_G limit (e.g. as a result of a supply undervoltage condition)
- EMF too high, as the maximum speed is set too high
  (refer to P083, P115, P143, P608)
- EMF too high, as field weakening is not selected (refer to P082)
- EMF too high, as the field current is set too high (refer to P102)
- EMF too high, as the trip voltage is set too high (refer to P101)

F037 I^2t motor monitoring responded

Active for operating statuses --, I, II

Mode of operation

The monitoring function responds, if the I^2t value reaches a value , which corresponds to the final temperature at 110% of the motor design armature current

Possible fault causes

- Parameter P114 incorrectly set
- Drive operated for an excessive time with >110% of the rated motor armature current

F038 Überdrehzahl

Active for operating statuses --, I, II

Mode of operation

This fault message is initiated, if the speed actual value (K166) has a value which exceeds the threshold + 0.5% set at parameter P354.

Possible fault causes

- Current lower limit input
- Current controlled operation
- P354 set too low
- Tachometer cable contact fault during operation in the vicinity of the maximum speed

F039 I^2t monitoring of the power section responded

Active for operating statuses --, I, II

Mode of operation

The monitoring function responds if the calculated I^2t value of the power section has reached the max. value for that particular power section (also refer to P075 in Section 9.2).

Possible fault causes

- Drive operated too long under an overload condition
- Parameter P075 incorrectly set
- Parameter P077 incorrectly set

F040 Electronics supply disconnected with a fault present

Active for all operating statuses

Mode of operation

This fault message is initiated, if the electronics power supply was switched-off, although a fault message was available and was still not acknowledged.

Fault diagnostics memory

Word 0 last available fault signal

Possible fault causes

- Not all of the fault messages have been acknowledged

F041 Parameter set or ramp-function generator selection not clear

Active for all operating statuses

Mode of operation

A software check is made as to whether parameter sets 2 or 3 or 4 have been clearly selected (parameters . P100 to . P599). If two or three parameter sets have been simultaneously selected for longer than 0.5 s, fault F041 is output. During the period where the status is not completely clear, the last clearly identified parameter set is used.

Software check, as to whether the parameter set selection remains the same during an optimization run. If a different parameter set is selected than that when the optimization runs was started, for longer than 0.5s, fault F041 is output.

A check is made per software as to whether ramp-function generator set 1 or 2 or 3 (parameter P303 to P314) are selected. If ramp-function generator parameter sets 2 and 3 are simultaneously selected for more than 0.5 s, error F041 is output. During the period that the status is not clear, the last clearly identified ramp-function generator parameter is used.

Fault diagnostics memory

Word 0 1 Parameter set selection not clear
2 The selected parameter set has changed during an optimization run
3 Ramp-function generator parameter set selection not clear

Troubleshooting

- Check parameters P761 to P766
- Check the status of the binary select inputs at parameter P010

Possible fault causes

- External short-circuit at the binary select inputs
- Incorrect activation of the binary select inputs
- Incorrect parameterization of the binary select inputs (P761 to P766)

F042 Tachometer fault

Active for operating statuses – –, I, II

Mode of operation

Every 20 ms, a check is made as to whether $\frac{\text{speed actual value}}{\text{EMF actual value}} > +5\%$ (for P224 = 0xxx)

or $\frac{-\text{speed actual value}}{\text{EMF actual value}} > +5\%$ (for P224 = 1xxx)

The fault signal is activated if this is not the case for three consecutive checks.

The following is valid:

100% speed actual value = max. speed
100% EMF actual value = ideal average DC voltage at $\alpha = 0$
i.e. when the thyristor bridge is fully gated.

The ideal average DC voltage at $\alpha = 0$ is P071 * $\frac{3 * \sqrt{2}}{\pi}$

The monitoring is only effective, if EMF > a % of P071 * $\frac{3 * \sqrt{2}}{\pi}$

a is a percentage which can be set using parameter P357 (default setting, 10%).
Monitoring is only effective, if the armature current >2% of the rated converter DC current according to P072.

Note:
Before software release 2.00, instead of K149, speed controller actual value K165 was used for monitoring.

Fault diagnostics memory

Word 0 1 Defective tachometer
2 Incorrect tachometer or pulse encoder polarity

Word 1 Speed actual value (K149) under a fault condition

Word 2 EMF actual value (K287) under a fault condition

Possible fault causes

- Tachometer or pulse encoder cable interrupted
- Tachometer or pulse encoder cable incorrectly connected
- Pulse encoder supply failed
- Incorrectly set actual value polarity for the speed controller (P224)
- Incorrectly set armature circuit data (P110 and P111) (execute current controller optimization run)
- Rated supply range of the pulse encoder incorrectly set (plug-in jumpers XJ11, XJ12, XJ13), refer to Sections 6.8.1 and 6.9.

F043 EMF for braking operation too high — from SW2.00

Active for operating statuses −−, I, II

Mode of operation

This fault message is initiated, if the following 5 conditions are fulfilled for a requested torque direction change (M I or M II is to be selected):

- P082 = 0xx (error message parameterized and not alarm + field weakening)
- A possibly parameterized additional torque-free interval (P160 ≠ 0) has expired
- The parallel drive is ready for the new torque direction to be selected (if BEF60 is active)
- The absolute value of the armature current (K118) requested in the new torque direction, is ≥0.5% of P072
- The calculated firing angle (K101) for the armature current, requested in the new torque direction is >165°.

Word 0 Calculated firing angle (aramture) before limiting (K101)

Word 1 Instantaneously measured EMF actual value (K287)

Word 2 EMF actual value (K287) under a fault condition

Possible fault causes

- Speed-dependent field weakening" (P082 = x0x) is not parameterized, although field weakening operation would have been necessary for the required maximum speed.
  Note:
  When motoring, for a firing angle α_G = 30° (rectifier stability limit P150), and low armature current, EMF values up to the peak value of the phase-to-phase supply voltage can be reached.
- Setpoint EMF for field weakening operation too high (parameter P101 set too high)
- Supply voltage interruption
- EMF controller or field current controller not optimized, which can lead to an excessive EMF when the drive accelerates.

F046 Analog input, main setpoint (terminals 4 and 5) faulted — from SW2.00

Active for operating statuses ≤ o6

Mode of operation

This fault message is initiated, if P703 = 1 x (4 to 20 mA input), and if an input current less than 3 mA flows.

Possible fault causes

- Main setpoint cable interrupted
- P703 incorrectly set

F047 Analog input, select input 1 (terminal 6 and 7) faulted — from SW2.00

Active for operating statuses ≤ o6

Mode of operation

This fault message is initiated i f P713 = 1x (4 to 20mA input) and if an input current less than 3 mA flows.

Possible fault causes

- input cable interrupted
- P713 incorrectly set

F048 Fault in the measuring channel for digital pulse encoder speed sensing

Active for all operating statuses

Mode of operation

1. Disturbance/noise on the encoder cables
The fault message is initiated, if 10 consecutive pulse encoder signal evaluations identify "direction of rotation change" at a speed ≥ 48 RPM.

2. Defective pulse encoder
The fault message is initiated, if for an EMF greater than internal threshold, over 10 consecutive pulse encoder signal evaluations, the characteristics of this signal appear erroneous (frequent speed change, edges too close together, encoder cable failure or short-circuit between two encoder cables).
Note:
With the tachometer operating correctly, at speeds in the vicinity of 0 direction of rotation change or short pulse clearances can be identified by gentle oscillation around the bright/dark transition on the speed encoder disk, therefore F048 is in this case only initiated

only initiated for EMK > 10% of P071 * $\frac{3 * \sqrt{2}}{\pi}$.

Fault diagnostics memory

Wort 0 1 Noise on the encoder cables
2 Defective pulse encoder

Possible fault causes

- EMC interference on the pulse encoder signal (terminals 28 to 31)
- Defective pulse encoder
- Encoder cable interrupted
- Encoder cable short-circuit with respect to the supply voltage or another encoder cable
- P110 or P111 incorrectly set (the EMF is then incorrectly calculated)

8.2.2.4 Start-up faults

F050 Optimization run not possible

Active for all operating statuses

Mode of operation

A fault has occurred during an optimization run.

Fault diagnostic memory and possible fault causes

Word 0 1 Fault occurred during the optimization run for the current controller and pre-control for armature and field (selected using P051 = 25)
2 Fault occurred during the speed controller optimization run (selected using P051 = 26)
3 Fault occurred during the optimization run for field weakening (selected using P051 = 27)
4 Fault occurred during the internal offset adjustments (selected using P051 = 22)
5 Fault occurred during the optimization run for the friction- and moment of inertia compensation (was selected using P051 = 28) **from SW1.10**

NOTE

Although not always specified in the subsequent text, the contents of fault word 2 to 14 of P407 can provide more detailed information regarding the fault cause than that just provided in word 1 (refer to Section10.2 for the significance of the specified connector numbers).

Word 1 1 For $\alpha = 30°$ and EMF = 0, the armature current is too low.
(Average armature current <75% of $I_{A, motor}$ or <75% of $I_{A, rated}$)

Word 2: Required current threshold (75% of P100 or P072),
Word 3: K114, word 4: K301, word 5: K302, word 6: K303

Possible cause:
- Armature circuit interrupted
- Very high ohmic load
- P150 (Alpha G limit) was set too high

2 The armature circuit resistance (P110) cannot be determined.

Possible cause:
- R_A >32.767Ω (load is extremely high-ohmic, e.g. field supply from the armature terminals)
- Armature current of 37.5% of P100 ($I_{A, motor}$) not possible

Possible remedy:
- P100 ($I_{A, motor}$) and P072 ($I_{A, rated}$) must be parameterized with a higher value using the same factor (e.g. 10, 100) (note: this parameterization must be retained even after the optimization run has been repeated) at P110 and at P111, then the actual values divided by these factors are set during the optimization run.

3 For $\alpha = 30°$ and EMF = 0, the armature current crests are too small
(Armature current peak value <50% of $I_{A, motor}$ or <50% of $I_{A, rated}$)

Word 2: Required current threshold
Words 3 to 14: First 12 armature current sampling values after the firing pulse of the armature current crest (normalization: 818 = current acc. to P072)

Possible cause:
- Armature inductance too high (e.g. field supply from the armature terminal)
- P150 (Alpha G limit) was set too high

Possible remedy:
- Reduce P100 ($I_{A, motor}$) for the duration of this optimization run

4 The armature inductance (P111) cannot be defined from the sampling values from the armature current and supply voltage of the last-generated armature current crest.

Possible cause:
- L_A >327.67mH (armature inductance too high)
- P100 ($I_{A, motor}$) far less than P072 ($I_{A, rated}$)
- Armature short-circuited

5 Offset adjustment for the actual field current sensing not possible.
(value found for P884, outside the permitted value range)

Possible cause:
- Fault in the actual field current sensing (defective gating board or A1600 electronics board)

Words 1- 6 It is not possible to adjust the offset for the "main actual value" measured value channel (value found for P885 or P886, outside the permitted value range)

Possible cause:
- Voltage <>0 at terminal block XT-100 to XT-103 (before P051 = 22: remove terminal block!)
- Defective A1600 electronics board

7 The field resistance (P112) cannot be determined (the field current actual value does not reach the specified setpoint of 95% of P102 as a result of the P112 variation)

Possible cause:
- $R_A > 3276.7\Omega$
- Fault in the field actual current sensing (defective gating board or A1600 electronics board)
- The "enter standstill field" command is input (binary input function 56)

8 80% of the rated EMF (K289 = P101 – P100 * P110) cannot be reached within 15 s (or the maximum of 3 set ramp-up times).

Word 2: Required EMF threshold (0.8*K289),
Word 3: K286, Word 4: K117, Word 5: K119, Word 6: K265,
Word 7: K167, Word 8: K168, Word 9: K304, Word 10: K301,
Word 11: K302, Word 12: K303

Possible cause:
- Ramp-up time set too low (P303, P307, P311)
- P101 does not match the selected maximum speed (V_A at n_{max} < P101) or P102 is parameterized too low
- The command "ramp-function generator enable" = 0 (binary input function BEF9) or "ramp-function generator stop" = 1 (binary input function BEF10) is entered.

9 The field current control loop is not stable enough for field characteristic plotting. (the field current actual value deviates by more than 0.39% of P102 + 0.15 % of P073 from the setpoint, 30 s after an internal field current setpoint input)

Word 2: Max. permitted field current setpoint- actual value difference
Word 3: Absolute value of the field current- setpoint- actual value difference,
Word 4: K265 (averaged over 4 values), Word 5: K265,
Word 6: Field current setpoint from the optimization run (K201),
Word 7: K268, Word 8: K304, Word 9: K117,
Word 10: Offset in the field current setpoint - or associated flux memory table
Word 11: K167, Word 12: K168

Possible cause:
- Field current controller or field current pre-control either not optimized or poorly optimized (check P112, P253 to P256 and execute the current controller optimization run (P051 = 25))

Word 1: A_H Field characteristic not uniform (i.e., in spite of the field current setpoint reduction, the flux value of this particular measured point, calculated from the EMF - and speed actual value, increases)

Word 2: Flux tabular value calculated from the EMF and speed (normalization: 20000 = rated (maximum) flux),
Word 3: Previous flux value (assigned to the next highest setpoint of the internal field current setpoint table
Word 4: Offset in the field current setpoint - or associated flux memory table,
Word 5: EMF at rated field (K286, averaged over 90 cycles)
Word 6: EMF of this field weakening measured point (K286, averaged over 90 cycles),
Word 7: n_{act} at rated field (K166, averaged over 90 cycles),
Word 8: n_{act} of this field weakening measured point (K166, averaged over 90 cycles),
Word 9: K168, Word 10: K265,
Word 11: Field current setpoint from the optimiztion run (K201),
Word 12: K117
Absolute address, flux value: Word 4 + Word 13 + 4000H * Word 14

Possible cause:
- High armature reactance and widely varying load during field characteristic plotting
- Field current controller or field current pre-control either not optimized or poorly optimized (check P112, P253 to P256, or execute current controller optimization run (P051 = 25))

B_H A lower field current limit ≥ 50% of P102 ($I_{F, motor}$) is entered.
(thus, the minimum 9 field weakening measured points cannot be plotted).

Word 2, 4, 6, 8, 9, 10, 11, 12, 13 as for Word 1 = C_H,
Word 3: K268,
Word 5: EMF from the previous field weakening measured point (K286 averaged over 90 cycles),
Word 7: n_{act} of the previous field weakening measured point (K166 averaged over 90 cycles)

Possible cause: P103 ≥ 50% of P102, check P614.0x

C_H The drive has reached the positive torque limit, although the specified field current setpoint is still ≥ 50% of P102 ($I_{F, motor}$).

Word 2: Offset in the field current setpoint - or associated flux-memory table, where the setpoint limiting occurs,
Word 3: K119, Word 4: K167,
Word 5: EMF of this field weakening measuring point (K286 averaged over 90 cycles),
Word 6: n_{act} at the rated field (K166 averaged over 90 cycles),
Word 7: n_{act} of this field weakening measured point (K166, averaged over 90 cycles),
Word 8: K168, Word 9: K265,
Word 10: field current setpoint from the optimization run (K201),
Word 11: K117
Absolute address, flux value: Word 2 + Word 12 + 4000H * Word 13

Possible cause:
- Armature current not steady, e.g., due to the high speed controller P gain P 225 (for drives with high integrating times) - a possible counter-measure is to parameterize a small speed actual value filtering P200 and re-execute the speed controller optimization run (P051 = 26)
- Check the torque limits

Word 1: D_H The drive has reached the positive armature current limit, although the entered field current setpoint is still ≥ 50% of P102 ($I_{F, motor}$).

Word 2 to word 13 as for word 1 = C_H

Possible cause:
- Armature current not steady, e.g., due to the high speed controller P gain P 225 (for drives with high integrating times) - a possible counter-measure is to parameterize a low speed actual value filtering P200 and re-execute the speed controller optimization run (P051 = 26)
- Check the torque limits

E_H The speed has changed by more than 12.5% for a constant speed setpoint, although the entered field current setpoint is still ≥ 50% of P102 ($I_{F\ motor}$).

Word 2 to word 13 as for word 1 = C_H

F_H The EMF setpoint is too low for a field characteristic plot $EMF_{set} = V_A - I_{A, motor} * R_A = P101 - P100 * P110 < 10\%$ from 1.35 * P071 (e.g. P071 = 400 . . . minimum EMF_{set} = 54V).

10_H Field weakening operation is not permitted for operation without tachometer (P083 = 3).

11_H The field current controller cannot be optimized, as the field time constant cannot be determined (the field current actual value does not decay to below 0.95 * initial value within 100 field firing pulse cycles (1s at 50 Hz), or below 0.8 * 0.95 * initial value) within 200 field firing pulse cycles (2 s at 50 Hz).

Word 2: Field current threshold (0.95 * initial value or 80% of this value),
Word 3 to word 14: The last 12 field firing pulse-synchronous measured field current actual values K265 (word 3 is the furthest back in time)

Possible cause:
- Field inductance too high
- Fault in the field current actual value sensing (defective gating board or A1600 electronics board)
- Ratio P073/P102 is too high (if required change the field load resistors)

12_H Field weakening range too high, i.e. when accelerating (with full field) to a speed setpoint of + 10% n_{max}, an |EMF| > 77% of the setpoint EMF is obtained (P101 - P100 * P110).

Word 2 to word 14 as for word 1 = 13_H

Possible cause:
- Maximum speed incorrectly set
- Pulse encoder parameter incorrect (P140 to P143)
- Tachometer adaption parameter incorrect (P706, P708)
- Setpoint EMF incorrect (P101, P100, P110)
- An excessive load torque (positive or negative direction, e.g. from a hoist load), causes the drive to rotate - it is possible that an armature current - or torque limit has been parameterized too low.

Word 1 13_H Within 3 minutes (or the maximum of 3 selected ramp-up times), a steady-state actual speed of + 10%, + 20%, + 30% . . . or + 100% of the maximum speed cannot be reached in speed-controlled operation (the speed setpoint-actual value difference, averaged over 90 firing cycles, must be $<0.1\%$ n_{max} over a specific time).

Word 2: K167, word 3: K168, word 4: K286, word 5: 0.7692 * K289,
Word 6: K117, word 7: K119, word 8: K131, word 9: K265,
Word 10: K304, word 11: K301, word 12: K302,
Word 13: K167, averaged over 90 firing cycles,
Word 14: K117 (for P170 = x0) or K142 for (P170 = x1) averaged over 90 firing cycles

Possible cause:
- The ramp-up time is set too low (P303, P307, P311)
- Drive has stalled
- An excessive load torque (positive or negative direction, e.g. hoist load), causes the drive to move, possibly an armature current limit/torque limit is parameterized too low
- Poor speed controller setting (P225, P226, P228), or the speed controller is parameterized as pure P controller or with droop
- An inhibit filter (P201, P202 or P203, P204) is switched-in (for SW1.10, this can result in a steady-state deviation between the filter input and filter output).
- The "ramp-function generator enable" command was entered for 0 (binary input function 9) or ramp-function generator stop" = 1 (binary input function 10)

14_H Current limit too low (for word 0 = 2, < 30% or 45% of P100 ($I_{A, motor}$) + the armature current required for zero speed, for word 0 = 5 <20% of P100 ($I_{a, motor}$) + the armature current required for a steady-state speed of 10% of the maximum speed.
Word 2: For word 0 = 2, current for n_{act} = 0, for word 0 = 5, current (K117) or torque (K142) for n_{act} = 10% n_{max}, averaged over 90 firing cycles
Word 3: for word 0 = 2 ⇒ 30% or 45% from P100 + word 2,
for word 0 = 5 ⇒ 20% from P100 + word 2,
Word 4: K131, word 5: K265, word 6: K167

15_H Field weakening range too wide (n_{act} < + 7% n_{max} results in |EMF| > 54% reference EMF)
(n_{act} is averaged over 6 cycles, reference EMF = K289 = P101 – P100 * P110)

Word 2: K167 (averaged over the last 6 values), word 3: K286,
Word 4: 0.54 * K289 for word 0 = 2 (or 0.77 * K289 for word 0 = 5),
Word 5: K117 (delayed by 3 cycles),
Word 6: K119, word 7: K131, Word 8: K265,
Word 9 to 14: The last 6 armature firing pulse-synchronous measured speed actual values K167 (word 9 lies the farthest back in time)

Possible cause:
- Maximum speed incorrectly set
- Pulse encoder parameter incorrect (P140 to P143)
- Parameter for tachometer adaption incorrect (P706, P708)
- Reference EMF incorrect (P101, P100, P110)
- Caution:
  Even an absolute negative speed actual value which is greater can result in |EMF| > 54% reference EMF.

Word 1 16_H Word 0 = 2: With an accelerating current of 20% or 30% of P100 ($I_{A, motor}$) + the armature current required for zero speed or
Word 0 = 5: With an accelerating current with a current magnitude required for a steady-state speed of 10% of the maximum speed + 20% of P100 ($I_{A, motor}$), cannot be reached within 45 s (at 50 Hz) + 7% of the maximum speed (speed actual value averaging over 6 firing cycles).
Words 2 to 14 as for word 1 = 15_H

Possible cause:
- Excessive moment of inertia
- Drive is stalled, load torque is either very dependent on the speed, or too high
- "Active" load attempts to keep a certain speed

Possible remedy:
- Increase P100 for the duration of the optimization run, to increase the accelerating current, specified during the optimization run (at the speed controller optimization run, word 0 = 2, max. 45% of $I_{A\ motor}$ (+ armature current for speed 0) is entered as armature current setpoint, $I_{A, motor}$ (P100) can therefore be increased to a maximum of 220 % of the value, without exceeding 100% $I_{A, motor}$ during the optimization run).

17_H Word 0 = 2: With an accelerating current of 20% or 30% of P100 ($I_{A, motor}$) + the armature current required for zero speed or
Word 0 = 5: With an accelerating current having a magnitude of the current required for a steady-state speed of 10% of the maximum speed (+ 20% of P100 ($I_{A, motor}$) cannot reach + 13% of the maximum speed within 90 s (at 50 Hz) (speed actual value averaging over 6 firing cycles), or 100% of the reference EMF.
Words 2, 3, 5 to 14 as for word 1 = 15_H
Word 4: K289

Possible cause: as for word 1 = 16_H

Possible remedy: as for word 1 = 16_H

18_H The actual speed does not fall below + 2% of the maximum speed or below the speed threshold n_{min} according to P370, within
2 minutes for word 0 = 2 or
10 minutes for word 0 = 3 or
11 or 2 minutes for word 0 = 5

Word 2: K167
Word 3: Maximum time which is exceeded in 20 ms units

Possible cause: Single-quadrant drive coasts down too slowly

19_H The average armature current, required for the speed range from + 7% to approx. + 13% of the maximum speed, to cover the friction- or steady-state load torque, cannot be calculated.

Word 2: Calculated "friction current" (8000 h signifies overflow)
Word 3: Measuring time (cycles) for accelerating from n_1 to n_2 with I_{12}
Word 4: Average armature current I_{12} in the range n_1 to n_2
Word 5: Speed difference ($n_2 - n_1$)
Word 6: Measuring time (cycles) for accelerating from n_3 to n_4 with I_{34}
Word 7: Average armature current I_{34} in the range n_3 to n_4
Word 8: Speed difference ($n_4 - n_3$)

Possible cause:
- Drive with very low friction or very low integrating time, and as a result, calculation inaccuracies during evaluation as a result of the short measuring time
- Noisy speed actual value
- High moment of inertia which is coupled to the drive through a long shaft with high tortion, possibly through a coupling/gearbox with considerable play

Possible remedy:
- Reduce P100 for the duration of the optimization run, to reduce the specified accelerating current during the optimization run, and thus increasing the measuring time.

Word 1: $1A_H$ Load torque too large (n_{set} = 0% n_{max} results in $n_{act} \geq 40\%$ n_{max})
(Speed actual value is averaged over 90 firing cycles, speed monitoring to $\geq 40\%$ n_{max}, starts only 1 s after speed setpoint input $n_{set} = 0$)

Word 2: K167, word 3: K168, word 4: K287, word 5: K132, word 6: K117,
Word 7: K119, word 8: K131, word 9: K265, word 10: K304, word 11: K301,
Word 12: K302,
Word 13: K167, averaged over 90 firing cycles
Word 14: K117, averaged over 90 firing cycles

Possible cause:
- Excessive load torque (in the positive or negative direction, e.g. a hoist load), causes the drive to rotate (the speed controller parameters are parameterized during this optimization run according to the factory setting)
- An armature current- or torque limit has been parameterized too low (maybe the motor field does not establish itself quickly enough to provide full field, so that the motor torque is too low at the start).
- Maximum speed incorrectly set
- Pulse encoder parameters incorrect (P140 to P143)
- Incorrect parameters for tachometer adaption (P706, P708)

$1B_H$ Load torque too large (n_{set} = 0% n_{max} results in |EMF| $\geq$ 100% reference EMF)
(EMF monitoring to $\geq$ (P101 – P100 * P110) first starts 1 s after speed setpoint input $n_{set} = 0$)

Words 2 to 14 as for word 1 = $1A_H$

Possible cause:
- as for Word 1 = $1A_H$
- Reference EMF incorrect (P101, P100, P110)

$1C_H$ A steady-state actual speed of 0% of the maximum speed cannot be achieved within 30 s in speed controlled operation (the speed setpoint-actual value difference, averaged over 90 firing cycles, must be a total of 4 s long $< 1.0\%$ n_{max})

Words 2 to 14 as for word 1 = $1A_H$

Possible cause: as for word 1 = $1A_H$

$1D_H$ The armature inductance (P111) is greater than 327.67mH
(when using the integrating method - for low current ripple)

Possible cause:
- e.g. field supply from the armature terminals

Possible remedy: as for word 1 = 2 (P100 and P072 are parameterized with a higher value using the same factor K)

The actual value of L_A can be calculated as follows ($I_{A,\,rated}$ is the rated converter armature DC current, for which the converter load resistors are actually dimensioned) ⇒ required factor K > (L_A in mH/327.67mH):

$$LA \text{ in mH} = \frac{(\text{Word 2} + 65536 \text{ word 3}) * P071}{4171 * \text{word 5} * I_{A,\,rated}}$$

F051 Optimization run with permanent memory inhibit not possible

Active for all operating statuses

Mode of operation

If an optimization run is started, a check is made as to whether it is permitted to store parameter values in the EEPROM (check as to whether parameter P053 = x1).

Possible fault causes

- Parameter P053 = x0

Remedy:
- Acknowledge fault
- Switch-off electronics power supply
- Set plug-in jumper XJ1 on the A1600 electronics board into position 1-2
- Switch-on power
- Set P053 = x1
- Re-start optimization run

F052 Optimization run externally interrupted

Active for all operating statuses

Mode of operation

This fault signal is initiated, if ON status is no longer available during an optimization run (status I, II or --) (thus, at each FAULT), or if FAST STOP, SHUTDOWN or STANDSTILL EXCITATION are input. The optimization run is terminated. Only those parameters, which were optimized before the fault was initiated, are changed.
Note:
From software release 2.00, when SHUTDOWN is entered, this fault message is <u>not</u> triggered, if the field weakening optimization run, is interrupted after the first field weakening measuring point has been plotted, or if the optimization run for the friction- and moment of inertia compensation is interrupted <u>after</u> the measuring point at 10% of the maximum speed has been determined. In these cases, it is possible to interrupt using SHUTDOWN, to be able to complete the optimization run with limited travel, in several stages (using repeated new start).

Fault diagnostics memory

Word 0
- 1 Fault occurred during the optimization run for current controller and pre-control for the armature and field (controller selected using P051 = 25)
- 2 Fault occurred during the optimization run for the speed controller (selected using P051 = 26)
- 3 Fault occurred during the optimization run for field weakening (selected using P051 = 27)
- 5 Fault occured during the optimization run for the friction- and moment of inertia compensation (was selected using P051 = 28) **from SW1.10**

Word 1
- 1 Terminated, because RUN status <u>no</u> longer available
- 2 Terminated, because FAST STOP was input (speed controller setpoint = 0)
- 3 Terminated, because SHUTDOWN was input (ramp-function generator setpoint = 0)
- 4 Terminated, because STANDSTILL EXCITATION was input

F055 Field characteristic was not recorded

Active for operating statuses – –, I, II

Mode of operation

The fault message is initiated, if "speed-dependent field weakening" is selected with P082 = x1x, or "closed-loop torque control", using P170 = x1, however no "valid field characteristic was plotted" (P117 = 0).

Possible fault causes

- Optimization run for field weakening (P051 = 27) has still not been executed.

F056 Important parameters not set

Active for operating statuses ≤ o6

Mode of operation

The fault signal is activated if specific parameters are still set to 0.

Fault diagnostics memory

Word 0 1 P083 still at 0
2 P100 still at 0.0
3 P102 still at 0.00 (fault message only for P082 ≠ xx0)

Possible fault causes

- Speed controller actual value still not set at P083
- Rated motor armature current still not set at P100
- Rated motor field current still not set at P102

F057 Option selection incorrect

Active for operating statuses ≤ o6

Mode of operation

This fault signal is activated if a parallel SITOR set is connected, but parameter P074 was set to 0x (parallel SITOR set not available).

Possible fault causes

- Parallel SITOR set present, but not selected

F058 Parameter settings not consistent

Active for operating statuses ≤ o6

Mode of operation

A check is made per software as to whether associated values are set in mutually-dependent parameters.

Fault diagnostics memory

Word 0
1 The nominal input voltage value for the main actual value, set at parameter P706, lies outside the range specified by parameter P708
2 Parameters were incorrectly set for the speed-dependent current limiting **from SW2.00**
(the following must be valid: P105>P107 ($I_1 > I_2$) and P104<P106 ($n_1 < n_2$))
3 Field characteristic not monotone
4 The first threshold for the speed controller P gain adaption set at parameter P556 lies above the second threshold set at parameter P559
5 The first threshold for the speed controller integral-action time adaption set at parameter P557 lies above the second threshold set at parameter P560
6 The first threshold for the speed controller droop factor adaption, set at parameter P558, lies above the second threshold, set at parameter P561
7 If P083 = 1 (analog tachometer), then P708 cannot be 0x (main actual value not used)
8 If P083 = 2 (pulse encoder), then P140 cannot be 0 (no pulse encoder present)
9 If P083 = 3 (EMF control), then P082 cannot be x1x (field weakening operation)
A P090 (supply voltage stabilizing time) ≥ P086 (time for automatic restart)
B P090 (supply voltage stabilizing time) ≥ P089 (waiting time in status o4 and o5)
C P769 is set to 1 (switch-on, shutdown and crawl acts as pushbutton), although no binary select input is parameterized as shutdown button (BEF2) **from SW2.00**

F059 Function selection for G-SST0 and G-SST1 incorrect

Active for all operating statuses

Mode of operation

A check is made per software, as to whether the function selection for the serial basic converter interfaces is correct. The check is made in all operating statuses, as soon as the value mode has been exited during parameterization.

Possible fault causes

- The one's digit of parameters P780 and P790 cannot be the same, i.e. the same functions cannot be simultaneously selected at both interfaces.
  Exception: Setting 2 (USS protocol)

F060 Modified software version — from SW1.10

Active directly after the supply voltage is applied to electronics board A1600

Mode of operation

When the A 1600 electronics board is switched-on, the EPROM software version is compared with the version number in the EEPROM (permanent memory).

Fault diagnostics memory

Word 0 Version number of the actual EPROM
Word 1 Valid version number before the A1600 electronic board was switched-off for the last time

Possible fault cause

- Software board A 1630 was replaced; the same procedure as for software replacement must be carried-out (refer to Section 11.1)

8.2.2.5 Fault messages from the thyristor check function

Active for operating statuses o3

This fault message group can only occur, if the thyristor check function is activated via parameter P860.

Mode of operation

A software check is made as to whether all thyristors can block and be triggered.

Possible fault causes

The appropriate thyristor module should be replaced if **"thyristor defective"** or **"thyristor unable to block"** is signaled. Although temporary thyristor failure is possible, re-occurring fault message indicates a possible problem in another area.

Possible causes of destruction:

- Interruption in the snubber circuitry
- Current controller and pre-control not optimized (excessive current spikes)
- Cooling not sufficient (e.g. fan doesn't run, ambient temperature too high, incorrect fan rotation of direction (incorrect phase sequence), air intake too low, heatsink dirty)
- Excessive supply voltage spikes
- External short-circuit or ground fault (check armature circuit)

If **"thyristor cannot be triggered"** is signaled, this is generally caused by a gating circuit fault, and not be a defective thyristor.

Possible causes:

- Gating pulse cable to the associated thyristor interrupted
- Ribbon cable X101 incorrectly inserted or interrupted (and ribbon cable X150 for SITOR sets connected in parallel)
- Defective electronics or gating board
- Internal interruption of the gate conductor in the thyristor module

The firing cables and associated thyristors should always be identified using the appropriate equipment circuit diagram (refer to Section 6.4, power connections).

for converters > 600A, the following is valid:
SITOR blocks A11 to A16 correspond to modules V1 to V6 of the 30A to 600A units.

F061 **Defective thyristor (short-circuit in module V1)**
(for the 15 A converter: V1 or V4)

F062 **Defective thyristor (short-circuit in module V2)**
(for the 15 A converter: V2 or V5)

F063 **Defective thyristor (short-circuit in module V3)**
(for the 15 A converter: V3 or V6)

F064 **Defective thyristor (short-circuit in module V4)**
(for the 15 A converter: V4 or V1)

F065 **Defective thyristor (short-circuit in module V5)**
(for the 15 A converter: V5 or V2)

F066 **Defective thyristor (short-circuit in module V6)**
(for the 15 A converter: V6 or V3)

F068 **Armature circuit ground fault** **from SW2.00**

Fault diagnostics memory

Word 1 Firing angle, at which current flowed to ground (K101)

F069 **I = 0 signal defective**

Possible fault causes

- Defective A1600 electronics board

F071 **Thyristor unable to be triggered (X11)**

F072 **Thyristor unable to be triggered (X12)**

F073 **Thyristor unable to be triggered (X13)**

F074 **Thyristor unable to be triggered (X14)**

F075 **Thyristor unable to be triggered (X15)**

F076 **Thyristor unable to be triggered (X16)**

F077 **2 or more thyristors (MI) unable to be triggered**

Possible fault causes

- Armature circuit interrupted

F081 **Thyristor unable to be triggered (X21)**

F082 **Thyristor unable to be triggered (X22)**

F083 **Thyristor unable to be triggered (X23)**

F084 **Thyristor unable to be triggered (X24)**

F085 **Thyristor unable to be triggered (X25)**

F086 **Thyristor unable to be triggered (X26)**

F087 **2 or more thyristors (MII) unable to be triggered**

Possible fault causes

- Parameter P074 incorrectly set

F091 **Thyristor unable to block (X11 or X21)**

F092 **Thyristor unable to block (X12 or X22)**

F093 **Thyristor unable to block (X13 or X23)**

F094 **Thyristor unable to block (X14 or X24)**

F095 **Thyristor unable to block (X15 or X25)**

F096 **Thyristor unable to block (X16 or X26)**

8.2.2.6 Internal faults

F100 **Illegal microprocessor status**

Active for all operating statuses

Mode of operation

Internal microprocessor hardware monitors the microprocessor for illegal operating statuses.

Possible fault causes

- Defective A1600 electronics board
- Excessive EMC interference present (e.g. as a result of undamped contactors, unscreened cables, loose screen connections)

F101 Watchdog timer has initiated a reset

Active for all operating statuses

Mode of operation

An internal microprocessor hardware counter monitors as to whether the program for calculating the gating pulses is executed, at least approximately every 14 ms (it is executed on the average, every 2.7 to 3.3 ms). If this is not the case, the counter initiates a reset. F101 is subsequently output.

Possible fault causes

- Defective A1600 electronics board
- Excessive EMC interference present (e.g. as a result of undamped contactors, unscreened cables, loose screen connections)

F102 EEPROM fault

Active for all operating statuses

Mode of operation

The correct functioning of the EEPROM module on the A1600 electronics board is monitored per software.
(Type: X28C64, 8192 bytes)

The EEPROM has values, which may not be lost at voltage failure (i.e., the parameter values and process data which must be stored in a non-volatile fashion).
Immediately after the electronics supply has been switched-on, the contents of the EEPROM are copied into the RAM. All programs only access this parameter image. This parameter image is also the only image changed via the parameterizing device. A program continuously modifies the EEPROM contents to follow the contents of the RAM, and more specifically, every 20 ms, 1 byte is checked and for non-equivalence between the values in the RAM and EEPROM, the RAM cell value is written into the appropriate EEPROM cell. At the same time, the written value is stored in an additional RAM cell. The EEPROM requires a maximum of 10 ms, until it has processed the value which was written into it, and during this time, it can neither be written into or read-out of. The previously written memory cell is read from the EEPROM, and compared with the additional stored cell, in the next background program cycle (i.e. after approx. 20 ms). F102 is activated if they don't match.

Using P053 = x0, the parameter value is not stored in the EEPROM (permanent memory inhibit active). Fault message F102 is also suppressed in this case.

Troubleshooting

- Determine the position of plug-in jumper XJ1 on the A1600 electronics board
- Determine the value of parameter P053

Possible fault causes

- Defective EEPROM
- An attempt was made to change a parameter, although the hardware write protection is activated (plug-in jumper XJ1 on the A1600 electronics board in position 2-3), and the software write protection is not activated (P053 = x1).

F103 Parameter value outside the permitted range

Active for all operating statuses

Mode of operation

Immediately after the electronics power supply has been switched-on, the parameter values from the EEPROM are loaded into the operating memory (RAM). A check is simultaneously made, as to whether the values lie within their permissible range. F103 is output if this is not the case. The relevant parameter value is limited.

Word 0 Number of the erroneous parameter

Word 1 Index of the erroneous parameter

Word 2 Erroneous parameter value

Possible fault causes

- "Reset to default" was never executed with this software (e.g. after software replacement).
- Excessive EMC interference present (e.g. as a result of undamped contactors, non-screened cables, loose screen connections)

Remedy:
Acknowledge fault, reset to default and re-commission the drive!

F104 Incorrect EEPROM check sum

Active for all operating statuses

Mode of operation

A check sum of the parameter values stored in the EEPROM is cyclically generated, and compared with a check sum, which is saved with the non-volatile process data. F104 is output if the last calculated check sum does not coincide with the saved check sum.

Possible fault causes

- Defective EEPROM
- The hardware write protection (plug-in jumper XJ1 on board A1600) was changed-over with the converter switched-on.
- A parameter value was changed with **active** hardware permanent memory inhibit (plug-in jumper XJ1 on electronics board A1600 in position 2-3), but **inactive** software inhibit (P053 = x1).
- Parameter P053 was changed with active hardware permanent memory inhibit (plug-in jumper XJ1 on electronics board A1600 in position 2-3), and previously **activated** software inhibit (**P053 = x0**). The software always attempts to back-up P053 in the EEPROM.
- Excessive EMC interference present (e.g. as a result of undamped contactors, non-screened cables, loose screen connections)
- "Reset to default" was never executed with this software (e.g. after software replacement)

Remedy:
Acknowledge the fault, reset to default setting and re-commission the drive!
Check the noise suppression measures and if required improve.
If F104 still occurs even with adequate noise suppression measures, replace electronics board A1600.

F105 Defective RAM

Active in all operating statuses

Mode of operation

The correct functioning of the RAM module (data memory) on electronics board A1600 is monitored per software.

A specific bit pattern is written into the complete RAM immediately after the electronics power supply is switched-on. It is then read again. F105 is output if the data contents don't match.

Possible fault causes

- Defective RAM (replace A1600 electronics board)

F107 Internal buffer overflow

Active in all operating statuses

Mode of operation

The various software buffers are monitored per software.

Possible fault causes

- Excessive EMC interference (e.g. as a result of undamped contactors, non-screened cables, loose screen connections)

F109 Defective supply voltage sensing

Active for operating statuses ≤ o4

Mode of operation

An offset > 5% was determined during the attempt to adjust the supply voltage sensing offset per software.

Possible fault causes

- Defective voltage path on the gating board (A1601 or A1603 or A1604) or on the electronics board (A1600)

F110 Converter cooling faulted

Active for operating statuses ≤ o4

Mode of operation

A check is made as to whether a thermal contact is open, and whether the fan speed of both fans lies in the range between 2160 RPM and 3300 RPM. The monitoring function is activated 3 s after the drive is in operating status ≤ o4.

Fault diagnostics memory

Word 0
- 1 Thermal contact open
- 2 Fan not running (only for 640A to 1200A converters)
- 3 Fan running too slow or too fast (only for 640A to 1200A converters)

Possible fault causes

- For the 15A converter: Defective A1608 board
- For 30A to 140A converters: Missing short-circuit jumper X6 on board A1601
- For 200A to 600A converters:
  - Thermal contact open
  - Thermal contact not connected at X6 on board A1601
  - Dirty heatsink
  - Heat accumulation
  - Incorrect fan direction of rotation (incorrect phase sequence)
- For 640A to 1200A converters:
  - Converter fan not connected to the supply
  - Defective converter fan
  - Incorrect fan direction of rotation (incorrect phase sequence)

F111 Defective measuring channel for the main setpoint (terminals 4 and 5)

Active in all operating statuses

Mode of operation

Hardware monitoring of the measuring circuit

Possible fault causes

- Defective A1600 board
- "Main setpoint" input voltage greater than approx. 11.3 V (measuring circuit saturated)

F112 Defective measuring channel, select input 1 (terminals 6 and 7)

Active in all operating statuses

Mode of operation

Hardware monitoring of the measuring circuit

Possible fault causes

- Defective A1600 board
- "Select signal 1" input voltage greater than approx. 11.3 V (measuring circuit saturated)

F113 Defective measuring channel for the main actual value (terminals 101 to 104)

Active for operating statuses ≤ o6

Mode of operation

Hardware monitoring of the measuring circuit

Possible fault causes

- Defective A1600 board

8.2.2.7 Fault messages from the motor sensor system

F115 Brush length too low

Active for operating statuses ≤ o3

Mode of operation

For parameter P145 = xxx2 (binary sensing of the brush length):
Fault message with log "0" signal at terminal strip XM, terminal 211.

For parameter P145 = xxx3 (analog sensing of the brush length):
Fault message for brush length ≤ 12mm, or if the voltage at terminal XM, terminal 202 < 1.7V.

Possible fault causes

- For parameter P145 = xxx2
  Brush length sensor responded or sensor cable interrupted
- For parameter P145 = xxx3
  Brush length ≤ 12mm or sensor cable interrupted

F116 Poor bearing condition

Active for operating statuses ≤ o6

Mode of operation

For parameter P145 = xx2x:
Fault message for a log "1" signal at terminal strip XM, terminal 212.

Possible fault causes

- Bearing condition sensor responded

F117 Air flow monitoring

Active for operating statuses ≤ o6

Mode of operation

For parameter P145 = x2xx:
Fault message, if a log "0" signal is present at terminal strip XM, terminal 213 for at least 40s.

Possible fault causes

- The fan monitoring sensor has responded or the sensor cable is interrupted

F118 Motor overtemperature (binary sensing)

Active for operating statuses ≤ o6

Mode of operation

For parameter P145 = 2xxx:
Fault message for a log "0" signal at terminal strip XM, terminal 214.

Possible fault causes

- The thermal switch for motor temperature monitoring has responded or the sensor cable is interrupted

F119 Motor overtemperature (analog sensing)

Active for operating statuses --, I, II

Mode of operation

For parameter P146 = 1 or 2:
The fault message is initiated if the motor temperature reaches or exceeds the value selected using parameter P148.

For parameter P146 = 4, 6, 8 or 10:
The fault message is initiated, if the motor temperature reaches or exceeds the response value of the selected PTC.

8.2.2.8 External faults

F121 Fault signal at terminal 39

Active for all operating statuses

Mode of operation

The fault signal is available for a time which exceeds the time set using parameter P767.

F122 Fault signal at terminal 40

Active for all operating statuses

Mode of operation

The fault signal is available for a time which exceeds the time set using parameter P767.

F123 Fault signal at terminal 41

Active for all operating statuses

Mode of operation

The fault signal is available for a time which exceeds the time set using parameter P767.

F124 Fault signal at terminal 42

Active for all operating statuses

Mode of operation

The fault signal is available for a time which exceeds the time set using parameter P767.

F125 Fault signal at terminal 43

Active for all operating statuses

Mode of operation

The fault signal is available for a time which exceeds the time set using parameter P767.

F126 Fault signal at terminal 36

Active for all operating statuses

Mode of operation

The fault signal is available for a time which exceeds the time set using parameter P767.

F128 to 255 Technology board fault **from SW1.10**

Active for all operating statuses

Mode of operation

Faults signaled from the technology board, are indicated, as for all other faults, using their fault number. If several faults are simultaneously signaled in the PT fault channel, the fault number, entered first in the buffer, is displayed. Possible additional fault numbers can be seen in the fault diagnostics memory.

Fault diagnostics memory

Word 0 Number of occured faults (can exceed 3)
Word 1 Fault number 1
Word 2 Fault number 2
Word 3 Fault number 3

Possible fault causes

- Technology board fault

8.2.3 Acknowledging fault messages

Procedure for acknowledging fault messages:

- The fault message is acknowledged by
  - Depressing the SELECT key on the simple operator control panel or
  - Depressing the R key on the converter operator control panel, or
  - A positive going edge at a binary select input, which is assigned the "fault acknowledgement" (BEF5) function
  - A positive edge at bit 7 of cotrol word STW (if P640 is appropriately parameterized)
  - A positive edge at a bit of the freely-definable control word STWF, which i s assigned the function "fault acknowledgement" (BEF5) (if P641 and P642 are appropriately parameterized)

  The drive goes into the "switch-on inhibit" operating status (o8) by acknowledging the fault message, if "switch-on" is present, and into the "wait for switch-on" operating status (o7) if "shutdown" is present.

  The binary output function "$\overline{\text{fault}}$" goes HIGH, and bit 3 of ZSW, LOW (i.e. no fault).

- Input "shutdown"

  The "switch-on inhibit" status (o8) is in this case exitted.

8.2.4 Disabling/activating monitoring functions

Monitoring functions, which are to be disabled, are entered in parameter P850 .xx in any sequence (i.e. under any index). Indices of P850.xx which are not used should be left at 0. Several monitoring functions (specifically, F007, F028, F030 to F037), are already entered, in the factory, into parameter P850, and are thus disabled. If these are to be activated, the appropriate P850.xx must be set to 0.

Example: F042 (tachometer cable interrupted) is to be disabled
→ P850.11 (or any P850.xx, which is 0) should be set to 42

Example: F035 (stall protection) is to be activated
→ set P850.07 to 0 (no other P850.xx can be 35!)

8.3 Alarms

When one or several alarms occurs:

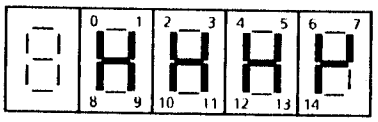
- The binary output function "$\overline{\text{alarm}}$" (BAF24) is set to LOW (select function), bit 7 of status word ZSW (K325) is set to 1.
- The alarm is displayed by the flashing "ST" LED on the electronics board (A1600), or on the converter operating control panel by the flashing "FAULT" LED.
  Flash frequency: Approx. 1 Hz (50 ms lit, 50 ms dark)

8.3.1 Alarm displays

The actual alarms are indicated using parameters P049 and P050.

Alarms W00 to W14 (= K331)

P049 display:
at the simple operator control panel



at the converter operator control panel

		P	0	4	9			W	a	r	n	i	n	g	1
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

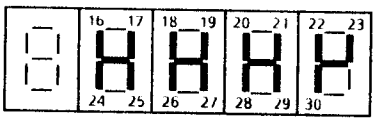
The meaning of the individual alarms can be taken from the alarm list, Section 8.3.2!

Segment lit or "1" . . . alarm present
Segment dark or"0" . . . alarm not present

Segment 0 on the simple operator control panel or bit 0 on the converter operator control panel corresponds to alarm **W00**.

Alarms W16 to W30 (= K332)

P050 display:
on the simple operator control panel



on the converter operator control panel

		P	0	5	0			W	a	r	n	i	n	g	2
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

30 29 28 27 26 25 24 23 22 21 20 19 18 17 16

The meaning of the individual alarms can be taken from the alarm list, Section 8.3.2!

Segment lit or "1" . . . alarm present
Segment dark or"0" . . . alarm not present

Segment 16 on the simple operator control panel or bit 16 on the converter operator control panel corresponds to alarm **W16**.

When using the converter operator control panel, in the OPERATING DISPLAY mode, parameters P049 and P050, and thus the current alarms, can be indicated by depressing the R key. In this case, a changeover is automatically made to the two-value display (all possible alarms at one glance).

Display on the converter operator control panel after depressing the R key.

W	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
W	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	(P049)
W	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	(P050)

30 29 28 27 26 25 24 23 22 21 20 19 18 17 16

The OPERATING DISPLAY is re-selected by depressing the R key again.

The PARAMETERIZATION mode is selected by depressing the P key.

8.3.2 Alarm list

W01 Motor overtemperature

Mode of operation

The alarm is initiated, if the calculated I^2t value reaches a magnitude, which corresponds to the final temperature at 100% of the rated motor armature current.

W02 Brush length

Mode of operation

For parameter P145 = xxx1 (binary brush length sensing):
Alarm for log "0" signal at terminal strip XM, terminal 211 (when the brush length sensor responds, or the sensor cable is interrupted).

For parameter P145 = xxx3 (analog sensing of the brush length):
Alarm when the brush length ≤ 14mm.

W03 Bearing condition

Mode of operation

For parameter P145 = xx1x:
Alarm for log "1" signal at terminal strip XM, terminal 212 (when the bearing condition sensor responds).

W04 Motor fan

Mode of operation

For parameter P145 = x1xx:
Alarm for log "0" signal at terminal strip XM, terminal 213 (when the air fow monitoring sensor responds or the sensor cable is interrupted).

W05 Motor temperature, binary

Mode of operation

For parameter P145 = 1xxx:
Alarm for log "0" signal at terminal strip XM, terminal 214 (when the thermo switch for motor temperature monitoring has responded or when the sensor cable is interrupted).

W06 Motor temperature, analog

Mode of operation

For parameter P146 = 1 or 2:
Alarm when the motor temperature reaches or exceeds the value set at parameter P147.

For parameter P146 = 3, 5, 7 or 9:
Alarm when the motor temperature reaches or exceeds the response value of the selected PTC.

W07 Short-circuit at the binary outputs

Mode of operation

Hardware monitoring as to whether one of the binary select outputs is short-circuited (also refer to F028, Section 8.2.2.2).

W08 Drive stalled

Mode of operation

The monitoring responds, if the following conditions are fulfilled for a time longer than that set at parameter P355:
- Positive or negative torque or armature current limit reached
- The armature current is greater than 1% of the rated converter armature DC current
- The speed actual value is <0.4% of the maximum speed

W09 No armature current can flow

Mode of operation

The monitoring function responds, when the armature firing angle is at the rectifier stability limit for more than 500 ms, and the armature current is < 1% of the rated converter armature DC current.

W10 I^2t value of the power section too large

Mode of operation

The alarm is initiated, if the permissible I^2t value is reached for the particular power section. Simultaneously, the current limit is limited to P077 * 100% of the rated converter DC current. This limit is only cancelled again, if the setpoint falls below 100% of the rated converter DC current. Also refer to fault F039 and parameter P075.

W12 Automatic field current reduction, if EMF in operation is too high

from SW2.00

Mode of operation

The alarm is only active for parameter P082 = 1xx and is initiated, if the following is valid for the firing angle α (armature) before limiting (K101):

$\alpha > (\alpha_W$ ((inverter stability limit acc. to P151) - 5 degrees, or for low (discontinuous) current

$\alpha >$ (165 degrees - 5 degrees)

The field is simultaneously reduced with W12. The field is reduced by controlling the armature firing angle to (α_W (or 165 degrees) - 5 degrees) using a P controller, whose output is reduced to the EMF controller setpoint. Thus, "field current setpoint input via internal EMF control" should be parameterized (P082 = x1x).

If a torque direction change is demanded, both torque directions are inhibited, until the calculated firing angle (K101) is <165 degrees, for the armature current demanded for the new torque direction, i.e. until the field, and thus the EMF, have been appropriately reduced.

Also refer to parameter P082, Section 9.2.

W16 Analog input main setpoint (terminals 4 and 5) faulted — from SW2.00

Mode of operation

The alarm is initiated, if P703 = 1x (4 to 20 mA input), and if an input current less than 3 mA flows (also refer to F046)

W17 Analog select input 1 (terminal 6 and 7) faulted — from SW2.00

Mode of operation

The alarm is initiated, if P713 = 1x (4 to 20 mA input), and if an input current less than 3 mA flows (also refer to F047)

W21 Alarm signal at binary select input 1

(when using the binary input function, BEF54)

W22 Alarm signal at binary select input 2

(when using the binary input function, BEF54)

W23 Alarm signal at binary select input 3

(when using the binary input function, BEF54)

W24 Alarm signal at binary select input 4

(when using the binary input function, BEF54)

W25 Alarm signal at binary select input 5

(when using the binary input function, BEF54)

W26 Alarm signal at binary select input 6

(when using the binary input function, BEF54)

W28 Connection between the basic converter and supplementary board faulty — from SW1.10

Mode of operation

The alarm is present, if process data transfer between basic converter and supplementary board is faulted (also refer to P911, P926, P929)

W29 Alarm on the technology board — from SW1.10

W30 Alarm on the interface board — from SW1.10