AMK   AMKASYN
VARIABLE SPEED DRIVES

Application memo   No. AP 2003/07-1

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Author: Development AMK

Range of applicability: Model series KE/KW and –KU as of installed basic computer AE-R03

Valid as of: March 2003

Subject to technical changes

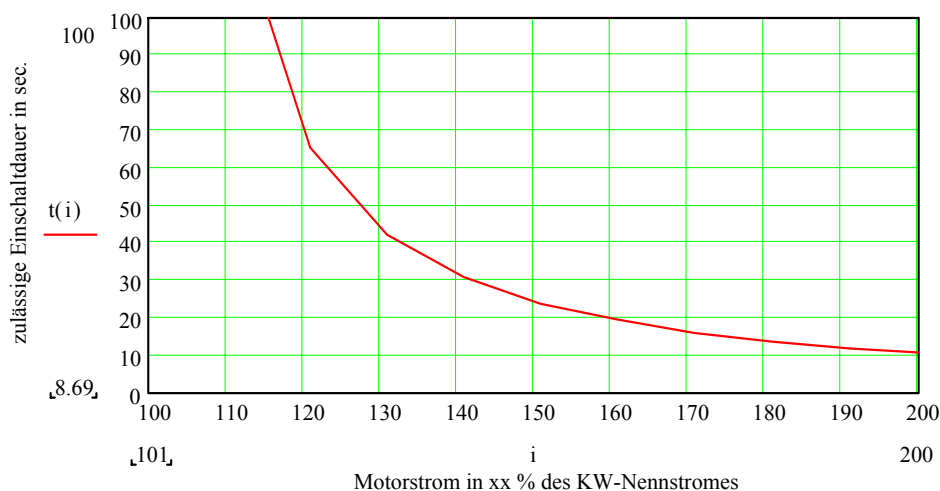## Overload operation - Inverter module device protection

1 Protection against thermal overload

1.1 PREVIOUSLY: I^2t protection inverter "AC mode"

In AC mode the devices permit a load = $i(t)/I_N$ of 200% for 10s.

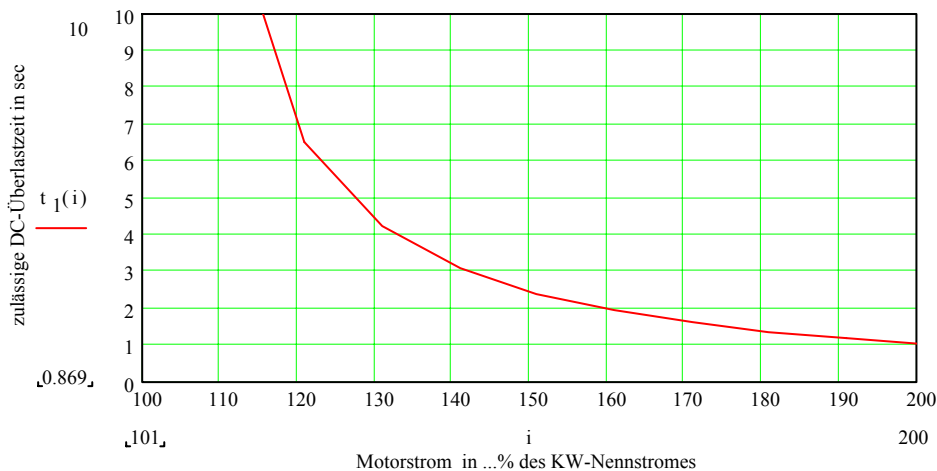I_N = current rating
$i(t)$ = output current, motor current

Motorstrom in xx% des KW-Nennstromes = Motor current in xx% of the KW current rating
zulässige Einschaltdauer in sec. = Permitted on-time in sec.

1.2 NEW: Expanded protection I²t "DC mode"

For special operational cases, e.g. "DC mode" of a synchronous machine a load of 200% is permitted for 1 sec. based on the current rating. "DC mode" is understood as the operation of the inverter with very low output frequencies (f_{out} < 0.2 Hz).

Motorstrom in …% des KW-Nennstromes = Motor current in xx% of the KW current rating
zulässige DC-Überlastzeit in sec. = Permitted CD overload time in sec.

The past approach referred to the evaluation of the effective current during AC mode. Since in DC mode this value can be greater by the factor $\sqrt{2}$, the inverter is protected by the expanded protection in all operational cases.

1.3 System reaction when breaching the overload limit

- Immediate blockage of the end levels (the motor runs down)
- Before the overload limit is reached a warning bit is signalled for the superordinate process control. The warning bit threshold can be freely programmed and permits the user to initiate necessary measures before the system switches itself off.
- The past behaviour (signalling a warning and after 4 seconds always switching off by braking the motor, then withdrawal of the inverter release) is no longer supported.

2 NEW: Protection against cyclic overload

2.1 The circumstances

Periodically re-occurring overload cases of the inverter at the output frequency $f_{out} \leq 5$ Hz put an over proportional thermal load on the power semiconductors. The monitoring of the overload cycle number / time unit recognizes this critical operational situation.

2.2 System reaction when breaching the permitted cycle number

If the critical overload cycle number / time unit is exceeded, the service life of the inverter can be reduced. A warning is signalled as a warning bit once an hour to the superordinate process control. Process control can prevent this overload operation by selecting from the following measures.

2.3 Possible measure applications

- Operation of the inverter with output frequencies $f_{out} > 5$ Hz
- Reduction of the overload cycle number / time unit
- Reduction of the overload e.g. by torque limitation
- Employing a asynchronous motor (slip)
- Employing a device with greater power

2.4 Unlimited operation range

An overload operation is possible when complying with the following operation range without reducing the device's service life:
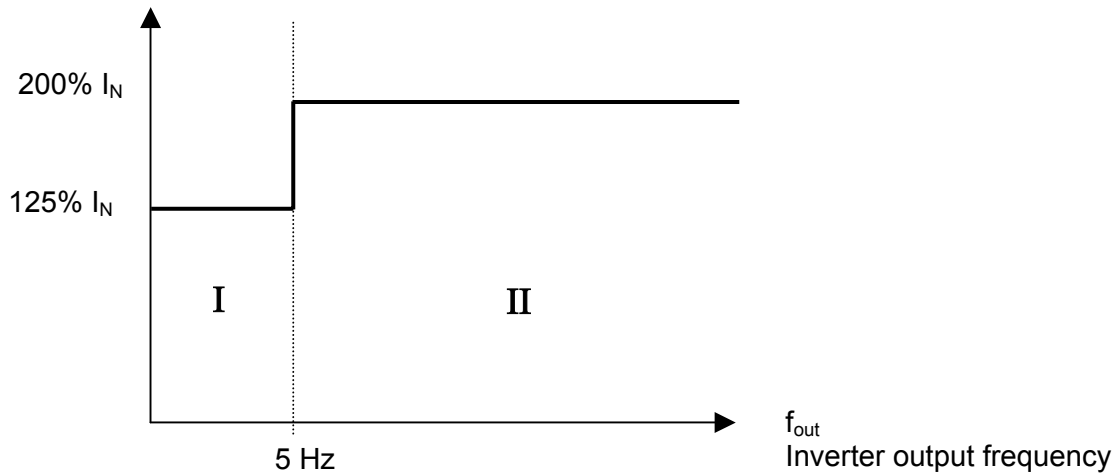
For the **operation range I** with inverter output frequencies of less than 5 Hz a maximum motor output current of 125 % of the nominal current of the KW device is permitted.

At an operation of the KW device at frequencies f_{out} of greater than 5 Hz, **operation range II**, the full leak performance, i.e. the double nominal current, of the KW device is permitted.

The operation ranges I and II permit an unlimited cycle number and are additionally thermally monitored by the I^2t protection.

3 Further documentation as of product release

- Diagnosis description (fault and warning numbers)
- Parameter description (overload and warning limits inverter, motor, description system behaviour)
- Device description (technical data)

The presented expanded protective measures are introduced as of March 2003 based on the inverter computer board mentioned above.