364 933 E

Lenze

Antriebstechnik

Technical description

Frequency inverters 8100 A Series

Art.-Nr. 364 933

This technical description is valid for the devices:

8101_A.1x.6x

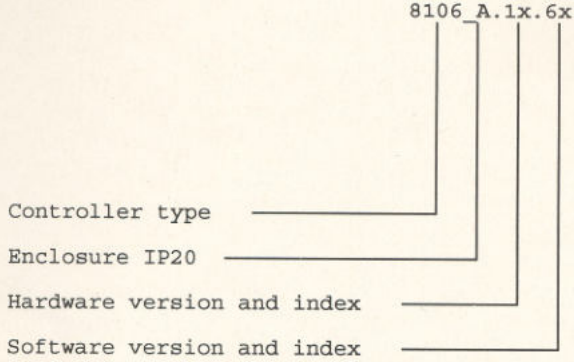
8102_A.1x.6x

8103_A.1x.6x

8104_A.1x.6x

8105_A.1x.6x

8106_A.1x.6x



1st edition of: 26.10.1993

Date of print: 08.02.1994

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SAFETY INFORMATION

The equipment described is intended for use in industrial electrical drive systems.

This equipment can endanger life through rotating machinery and high voltages, therefore it is essential that guards for both electrical and mechanical parts are not removed.

The following points should be observed for the safety of the personnel:

- **Only qualified personnel familiar with the equipment are permitted to install, operate and maintain the devices.**
- **System documentation must be available and observed at all times.**
- **All non-qualified personnel are kept at a safe distance from the equipment.**
- **The system must be installed in accordance with local regulations.**

A qualified person, is someone who is familiar with all safety notes and established safety practices, with the installation, operation and maintenance of this equipment and the hazards involved. For more detailed definitions see IEC 364.

It is recommended that anyone who operates or maintains electrical or mechanical equipment should have a basic knowledge of First Aid. As a minimum, they should know where the First Aid equipment is kept and the identity of the official First Aiders.

These safety notes do not represent a complete list of the steps necessary to ensure safe operation of the equipment. If you wish further information, please contact your nearest Lenze representative.

The information in this technical description applies only to the hardware and software versions that are indicated on the cover page. If the version of your equipment is not listed, then this manual must not be used. Lenze cannot be held responsible for any malfunction resulting from the above.

The specifications, processes and circuitry described in this manual are for guidance only and must be adapted to your own specific applications. Lenze does not guarantee the suitability of the processes and circuitry described in this technical description for individual applications.

The specifications in this manual describe the features of the products, without guarantee.

Lenze personnel have carefully checked this manual and the equipment it describes, but cannot be held responsible for any inaccuracies.

Technical alterations reserved.

The 8100_A series comprises six frequency inverters covering a power range from 0.25 kW to 2.2 kW.

1. FEATURES

- Digital control unit with 16-bit micro processor
- Inverter with space pulse width modulation
- Continuous load with up to 160% overload
  or current limitation up to 120% overload
- Inverter outputs protected against short-circuits
- Integrated brake transistor, external resistors
- Unipolar or bipolar set-value input, also with additional set-value if desired
- 13-bit resolution of the analog inputs
- Set-value input possible via digital frequency input
- 4 complete parameter sets, can be changed via terminals
- Control parameters can be changed ON-LINE
- Digital inputs and outputs for 24V-PLC level
- 8 digital inputs, 5 of them freely assignable
- 4 freely assignable digital outputs, and one relay output
- 1 freely assignable monitor output for ±10V or ±20mA
- PTC input for motor temperature surveillance
- Process control
- Speed control, closed-loop control with tachometer or incremental encoder feedback
- Linear or square V/f-characteristic
- Linear or S-shaped ramp generator characteristic
- Up to 15 JOG set-values, up to 15 additional accel. and decel. times
- Chopper frequency can be set from 1.0 kHz to 4.0 kHz
- DC bus voltage compensation
- DC injection braking
- Serial interface RS 232C/RS 485
- LCD operating unit 8102BB available as option

2 TECHNICAL DATA

2.1 INVERTER DATA

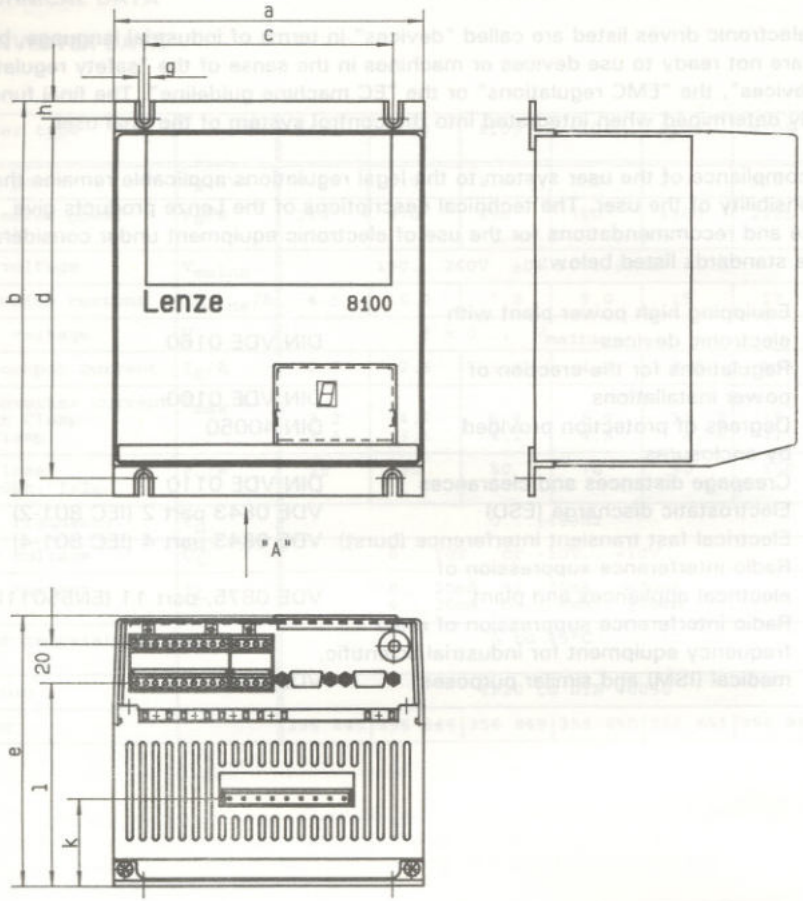
Inverter type		8101	8102	8103	8104	8105	8106
Output power	S_N/kVA	0.76	1.0	1.3	1.5	2.7	3.6
Rated motor power (4-pole)	P_N/W	250	370	550	750	1500	2200
Mains voltage	V_{mains}	190...260V ±0% 50...60Hz					
Rated mains current	I_{mains}/A	4.5	5.0	7.0	9.0	15	17
Output voltage	V	3 x 0 ... V_{mains}					
Rated output current	I_N/A	2.0	2.6	3.4	4.0	7.0	9.5
Max. inverter current without Clamp with Clamp	I_{max}/A	 3.2 2.4	 4.2 3.1	 5.4 4.1	 6.4 4.8	 11. 2 8. 4	 15. 2 11. 4
Power loss fd = 50Hz, I=I_N	P_V/W	25	35	50	70	90	150
Output frequency	f_d	0...±480Hz					
Master voltage	U_L	0...10V or -10V...+10V					
Master current	I_L	0...20mA or -20mA...+20mA 4...20mA or ± 4mA...±20mA					
Ambient temperature	T_u	0 to 45°C					
Enclosure		IP20 to DIN 40050					
Part no.		356 845	356 846	356 848	356 850	356 851	356 852

2.2 MANUFACTURER'S CERTIFICATION

The electronic drives listed are called "devices" in terms of industrial language, but they are not ready to use devices or machines in the sense of the "safety regulations for devices", the "EMC regulations" or the "EC machine guideline". The final function is only determined when integrated into the control system of the final user.

The compliance of the user system to the legal regulations applicable remains the responsibility of the user. The technical descriptions of the Lenze products give advice and recommendations for the use of electronic equipment under consideration of the standards listed below:

- Equipping high power plant with electronic devices	DIN VDE 0160
- Regulations for the erection of power installations	DIN VDE 0100
- Degrees of protection provided by enclosures	DIN 40050
- Creepage distances and clearances	DIN VDE 0110
- Electrostatic discharge (ESD)	VDE 0843 part 2 (IEC 801-2)
- Electrical fast transient interference (burst)	VDE 0843 part 4 (IEC 801-4)
- Radio interference suppression of electrical appliances and plant	VDE 0875, part 11 (EN55011)
- Radio interference suppression of radio frequency equipment for industrial,scientific, medical (ISM) and similar purposes	VDE 0871



View from direction "A"

	a mm	b mm	c mm	d mm	e mm	g mm	h mm	k mm	l mm	Weight kg
8101/8102	162	205	130	190	136	5.5	7.5	47	107	2.1
8103/8104	162	205	130	190	149	5.5	7.5	60	120	2.8
8105/8106	200	245	165	230	156	5.5	7.5	70	130	4.5

3. INSTALLATION AND OPERATION

- Install device vertically with terminals at the bottom.
- Ensure a free space of 100 mm at the top and bottom and 50 mm at either side.
- Connect the fixing screw of the reference potentiometer to PE.
- The inverters must not be connected to mains with an earth-leakage current breaker, without additional measures (e.g. zeroing) (see VDE 0160/5.88). In case of an earth fault, a DC component in the fault current can prevent the release of the earth leakage current breaker.
- Maintain a time of 3 minutes between mains disconnection and reconnection. Internal components to limit the switch-on current must cool in order to prevent a failure of internal or external fuses.
- Plug terminals for control and power connections may only be connected or disconnected when the device is without voltage.
- Model 8106_A may only be operated with the specified mains choke.
- The motor connected may not be switched via a contactor when the drive is enabled, except in emergency situations.
- Replace defective fuses only with the specified type when the device is switched off.

Warning: The device carries potential up to 30s after mains disconnection.

- The cooling air temperature must not exceed 45°C. If the cooling air contains pollutions (dust, flakes, aggressive gases) which may impair the inverter function, ensure sufficient protective measures, such as separate air ducts, installation of filters, periodical cleaning. In case of condensation, disconnect the device from the mains and wait until the visibile humidity has evaporated.
- The types 8101_A to 8105_A are designed for a continuous thermal current limit of $1.2 \cdot I_N$ and type 8106_A for $1.0 \cdot I_N$. In case of load changes make sure that these values are not exceeded, otherwise the temperature trip may become effective. The effective continuous current is permissible, if $I_{eff} \leq 1.2 \cdot I_N$ (for 8106_A: $I_{eff} \leq 1.0 \cdot I_N$) and the connected motor is not overheated.

Warning: With corresponding settings, this device generates an output frequency up to 480 Hz. If connected to an unsuitable motor, dangerous overspeed may result.

3.1 WIRING

3.1.1 SCREENING

The inputs and control terminals of the device are noise immune without screening of the connecting cables up to severity class 4 to IEC 801-4.

Additional screening is required, if the device is operated where severity class 4 is not sufficient, e.g. where power cables and control cables cannot be laid separately.

Caution:	Interferences may cause faults in the program, which immediately stop the operation via a trip fault.

SCREENING OF CONTROL CABLES

In order to avoid signal faults, we recommend to screen analog cabling, wires for digital frequency input, and for incremental encoder feedback.

To avoid PE-loops, connect the screens of the control cables at one end to PE, either via

- the provided inverter terminals or
- via insulated central points, which are connected to PE at one point (e.g. PE terminals).
- via the Sub-D plug X5 (only for digital frequency input or incremental encoder feedback).

In case of interruptions at terminal boards, relays, fuses etc. keep connections of control cable screens as short as possible.

For screening of the control wires of the serial LECOM interface see technical description LECOM A/B.

SCREENING OF MOTOR CABLES AND BRAKE CHOPPER CABLES

Motor cables and cables of the brake resistors are a source of electrical noise and must be screened if sensitive equipment is close by.

Connect the screen of the motor cable directly to PE, for wires longer than 3m, both sides, if possible.

3.1.2 GROUNDING CONTROL ELECTRONICS

Single drives

Caution! The reference potential GND (terminals 7, 40, 60) of the control electronics is connected to PE internally.

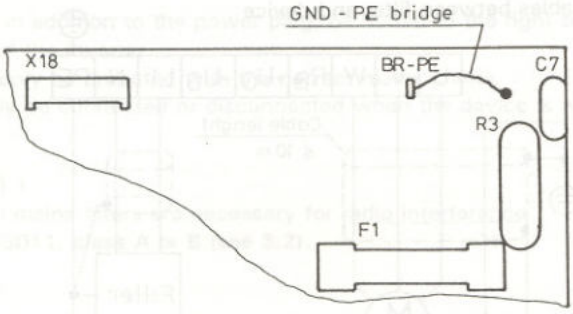
For computer networks with fixed installation, an additional potential separation between computer and inverter (e.g. Lenze Converter 2101) is necessary.

Network of several drives

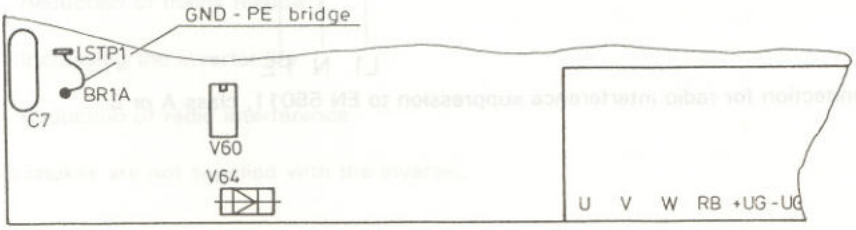
In a drive network, it is necessary to remove the GND-PE connection from every controller, to avoid GND-loops. Carry all GND-cables to external insulated central points, centralize again from there and connect to PE in the central supply. Make sure that the voltage between GND and PE does not exceed 50 V.

In case of a fixed computer installation, mains isolation must also be provided (e.g. Lenze Converter type 2101).

Inverters 8101_A - 8104_A



Inverters 8105_A - 8106_A



3.2 RADIO INTERFERENCE SUPPRESSION

For electromagnetic compatibility, local regulations apply which can be maintained when considering the recommendations given below.

Measures against radio interference suppression depend on the site of the device to be installed. Within industrial premises, which are not connected to the public low-voltage supply, the limit values to EN 55011, class A apply. Within residential areas or industrial premises which are connected to the public low-voltage supply, the limit values to EN 55011, class B apply.

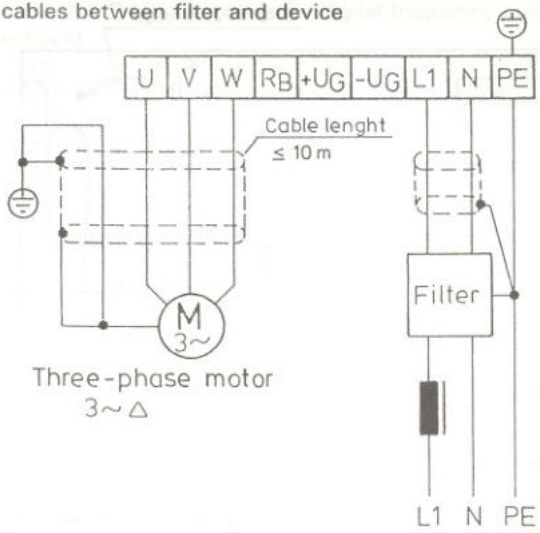
Radio interference suppression to EN 55011, class A or B, can be obtained by the following measures:

a) **Mains filter**

Type	8101_A - 8104_A	8105_A - 8106_A
Mains filter part no.	332 705	333 228

b) **Screenings**

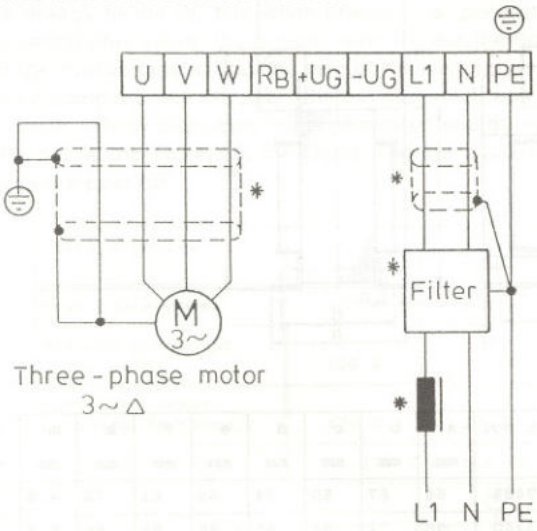
- Motor cables
- Mains cables between filter and device



Connection for radio interference suppression to EN 55011, class A or B

4. INVERTER CONNECTIONS

4.1 MAINS AND MOTOR CONNECTION



Operation without brake chopper

The PE connection can, in addition to the power plug, be bolted to the right terminal clamp at the front side of the inverter.
8106_A inverters must only be operated with the correct mains choke.
The power plug may only be connected or disconnected when the device is without voltage.

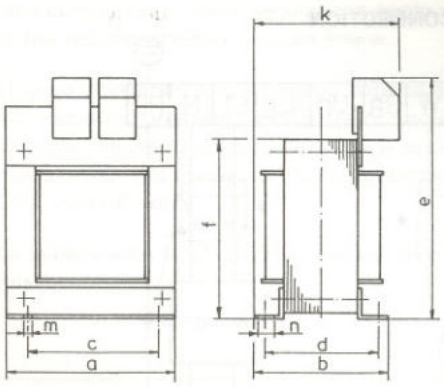
*) For screenings see 3.1
Screened cables and mains filters are necessary for radio interference suppression to EN 55011, class A or B (see 3.2).

4.1.1 MAINS CHOKE

Advantages when using a mains choke:

- Compliance with surge strength class I according to VDE 0160
- Reduction of mains feedback
- Increasing the inverter life
- Reduction of radio interference

Mains chokes are not supplied with the inverter.



Type	L mH	I A	part no.	a mm	b mm	c mm	d mm	e mm	f mm	k mm	m mm	n mm
8101-02	9	5	359485	66	67	50	54	69	61	78	4.8	9
8103-04	5	9	323330	96	77	84	61	96	86	86	5.8	9
8105	3.5	14	323331	96	77	84	61	96	86	86	5.8	9
8106	1.6	17	323361	96	77	84	61	96	86	86	5.8	9

4.1.2 FUSES

Types	8101	8102	8103	8104	8105	8106
Mains fuses F1 (internal)	M12A				FF25A	FF30A
Part no.	331 113				307 308	321 554

Replace defective fuses only with the specified type when the device is switched off.
The device carries potential up to 30 seconds after mains disconnection!

4.1.3 MOTOR CHOKE

A motor choke is only required for large motor cable lengths:

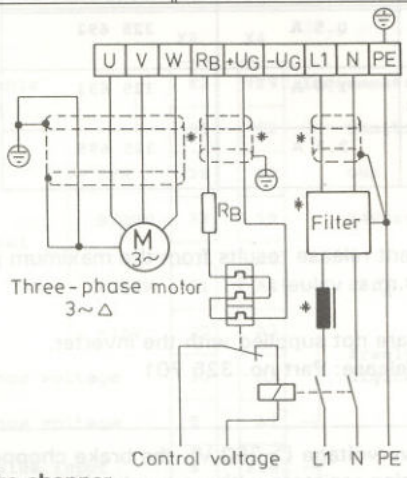
- as of 100m for unscreened motor cables
- as of 50m for screened motor cables

Type	Motor current	Inductivity per 100m/50m cable length	Part no.
8101 - 8106	up to 10 A	1.0 mH	357 869

4.2 OPERATING WITH BRAKE CHOPPER

When operating three-phase AC motors with static frequency inverters, the motor feeds back energy to the DC bus when braking, i.e. generating. If the DC bus voltage exceeds a permissible value, the inverter sets trip for the time of overvoltage. The reason for the overvoltage is that the rate of deceleration is not adapted to the load inertia. When using a brake chopper, the excessive DC bus voltage is switched across a resistor which dissipates the regenerated energy as heat until the DC bus voltage falls below the switching threshold. Therefore short deceleration times with large inertias are possible.

8100_A series	8101 8102	8103 8104	8105 8106
Peak brake power	300 W	640 W	1700 W
Maximum permanent brake power	120 W	250 W	450 W
specified brake resistor (external)	470 Ω	200 Ω	82 Ω
Threshold voltage	375 V in the DC bus		



Operation with brake chopper

The PE connection can, in addition to the power plug, be bolted to the right terminal clamp at the front side of the inverter. 8106_A inverters must only be operated with the correct mains choke. The power plug may only be connected or disconnected when the device is without voltage.

*) For screening see 3.1
Screened cables and mains filters are necessary for radio interference suppression to EN 55011, class A or B (see 3.2).

Brake resistors

R Ohm	Pn kW	Part no.	H x W x D mm
82 Ω	450 W	345 394	448 x 47 x 100
2*100 Ω	100 W	309 163	170 x 33 x 48
470 Ω	120 W	305 062	170 x 33 x 48

For these brake resistors applies:

- maximum permissible braking time: 15s
- maximum permissible duty cycle: 25%

Brake resistors are not supplied with the inverter.

Overcurrent release

R_{BR}/P_N	Overcurrent release Setting *)	 part no.
470Ω/120W 305 062	0.5 A	325 692
200Ω/200W 2x 309 163	1.0 A	325 693
82Ω/450W 345 394	2.3 A	325 695

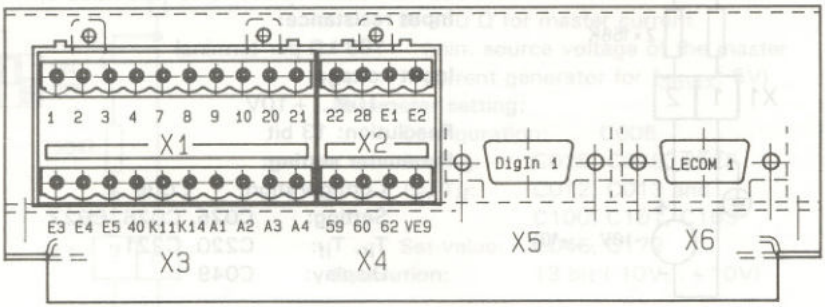
*) The setting of the overcurrent release results from the maximum permissible brake current of the resistor (r.m.s. value).

Overcurrent release and base are not supplied with the inverter.
Base for thermal overcurrent release: Part no. 325 701

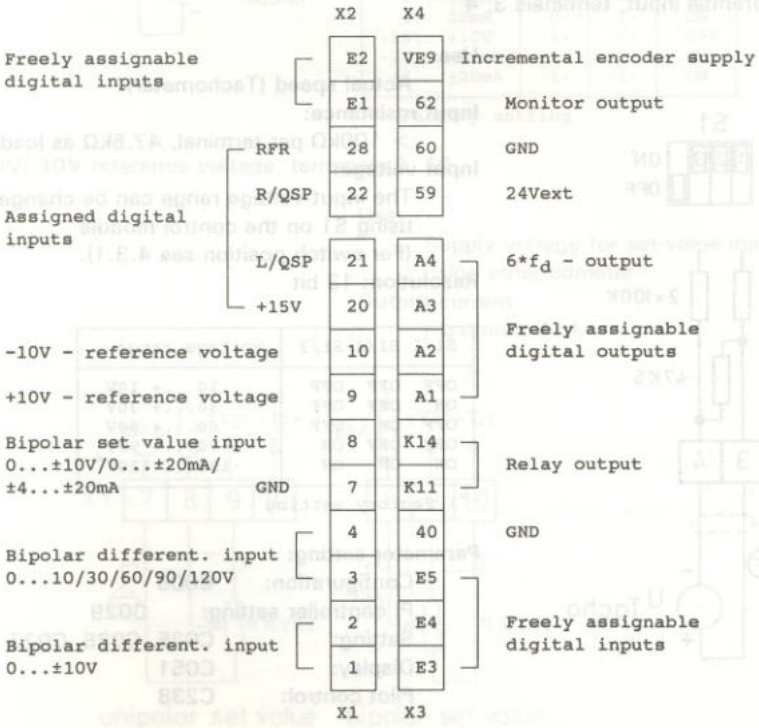
Warning: In case of mains overvoltage (>260 V), the brake chopper may be activated. When using resistors without overload protection, the resistors may burn out. Therefore, only resistors with integrated or external temperature surveillance may be used. Since the surface of the brake resistors may heat up to 350°C, the resistors must be built into a fire-proof housing.
The brake chopper output is not protected against short-circuits.

4.3 CONTROL CONNECTIONS

Caution! Reference potential GND is connected to PE (see 3.1.2).

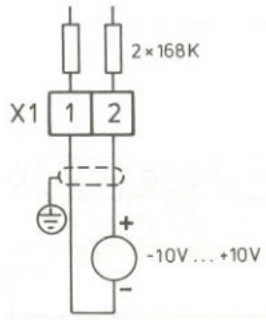


Assignment of the control terminal block



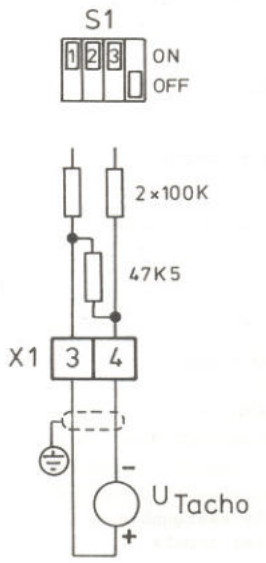
ANALOG INPUTS

Bipolar differential input, terminals 1, 2



Use:
Additional set-value (set-value 2)
Input resistance:
168 kΩ per terminal
Input voltage:
-10V... +10V
Resolution: 13 bit
Parameter setting:
Configuration: C005
Setting: C025, C026, C027
T_{ir}, T_{if}: C220, C221
Display: C049

Bipolar differential input, terminals 3, 4



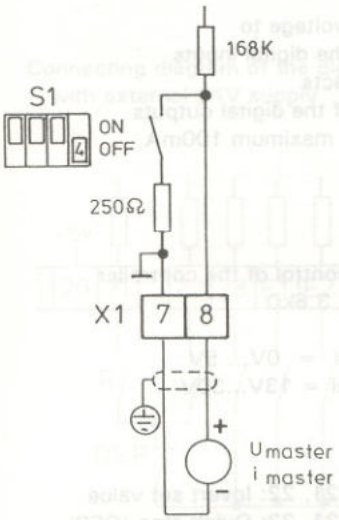
Use:
Actual speed (Tachometer)
Input resistance:
> 100kΩ per terminal, 47.5kΩ as load
Input voltage:
The input voltage range can be changed using S1 on the control module (For switch position see 4.3.1).
Resolution: 13 bit

S1/1	S1/2	S1/3	voltage range
OFF	OFF	OFF	- 10...+ 10V
ON	OFF	OFF	- 30...+ 30V
OFF	ON	OFF	- 60...+ 60V
OFF	OFF	ON	- 90...+ 90V
ON	ON	ON	-120...+120V*

*) Factory setting

Parameter setting:
Configuration: C005
PI controller setting: C029
Setting: C025, C026, C027
Display: C051
Pilot control: C238

Bipolar set-value input, terminal 8



Use:
Set-value 1

Input resistance:
a) 168 kΩ
b) 250 Ω for master current (min. source voltage of the master current generator for f_{dmax}: 5V)

Parameter setting:
Configuration: C005
Setting: C025, C026, C027
T_{ir}, T_{if}: C012, C013 and C100, C101, C103
Set-value: C046, C172

Resolution: 13 bit (-10V... + 10V)

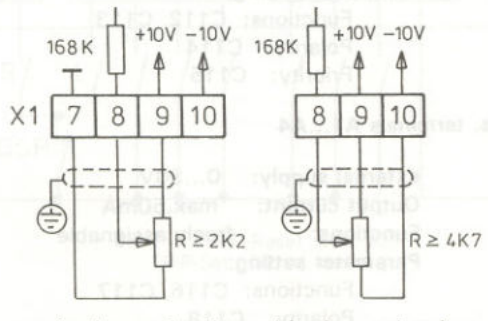
Set-value input	C005	C034	S1/4
0...10V*	-0-	-0-	OFF
0...20mA	-0-	-0-	ON
4...20mA	-0-	-1-	ON
-10...+10V	-1-	-0-	OFF
-20...+20mA	-1-	-0-	ON
±4...±20mA	-1-	-1-	ON

*) Factory setting

+10V/-10V reference voltage, terminals 9, 10

Use:
Supply voltage for set-value input using potentiometer

Output current:
maximum 7mA



unipolar set value bipolar set value

DIGITAL INPUTS AND OUTPUTS

+15V-output, terminal 20

Use:
Auxiliary voltage to
- control the digital inputs via contacts
- supply of the digital outputs

Output current: maximum 100mA

Digital inputs, terminals 21, 22, 28, E1...E5

Use:
Terminal control of the controller

Input resistance: 3.6kΩ

Input voltage:
Low signal = 0V... 5V
High signal = 13V...30V

- Assigned digital inputs

Function:
Terminals 21, 22: Invert set value
Terminals 21, 22: Quick stop (QSP)
Terminal 28: Controller enable (RFR)

Parameter setting/display:
Function: C176
Direction of rotation: C041,
Quick stop: C042,
t_{if} for QSP: C105
Display RFR: C040

- Freely assignable digital inputs

Functions:
freely assignable

Parameter setting:
Functions: C112, C113
Polarity: C114
Priority: C115

Freely assignable digital outputs, terminals A1...A4

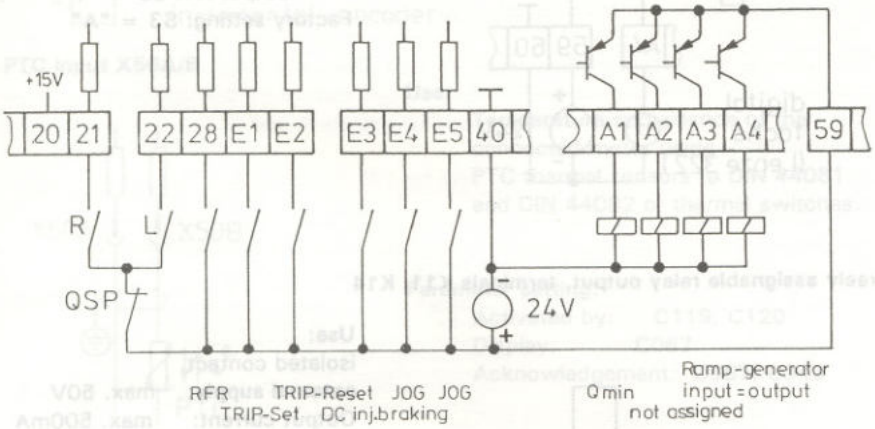
external supply: 0...30V
Output current: max.50mA
Functions: freely assignable

Parameter setting:
Functions: C116, C117
Polarity: C118

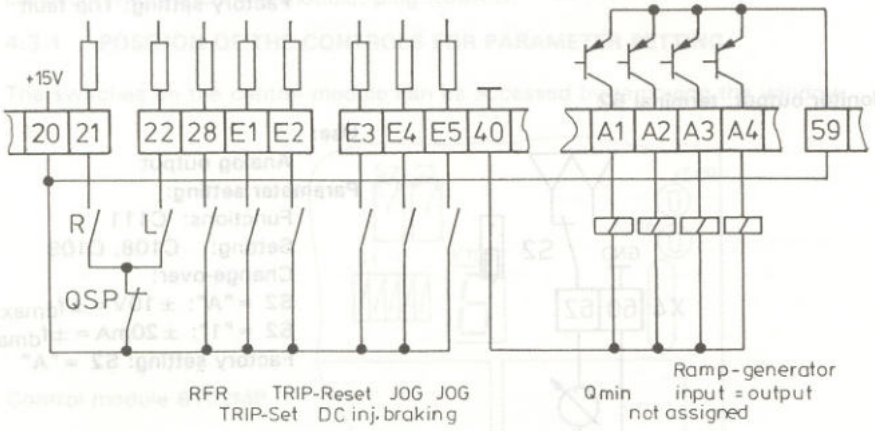
The assignments of the digital inputs and outputs shown below correspond to the factory setting. For switchign of the signal cables, only use relays with low-current contacts. Relays with gold-plated contacts are suitable (part no. 321 351).

Connecting diagram of the digital inputs and outputs

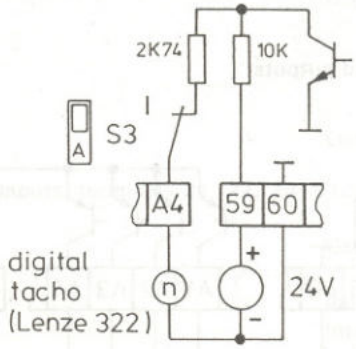
- with external 24V supply



- without external 24V supply



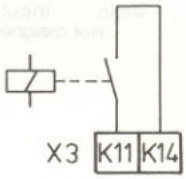
6*f_d - output using terminal A4



external supply: 0...30V
Output current: max. 2mA
Function: 6*f_d output

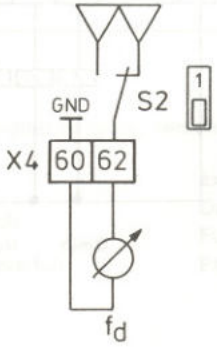
Changing to 6*f_d-output
using S3: 6*f_d-output: S3 = "A"
output A4: S3 = "1"
Factory setting: S3 = "A"

Freely assignable relay output, terminals K11, K14



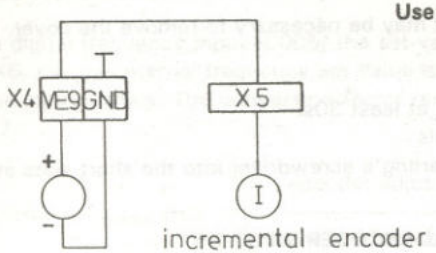
Use:
isolated contact
external supply: max. 50V
Output current: max. 500mA
Function: freely assignable
Parameter setting:
Functions: C116, C117
Polarity: C118
Factory setting: Trip fault

Monitor output, terminal 62



Use:
Analog output
Parameter setting:
Functions: C111
Setting: C108, C109
Change-over:
S2 = "A": $\pm$10V = $\pm f_{dmax}$
S2 = "1": $\pm$20mA = $\pm f_{dmax}$
Factory setting: S2 = "A"

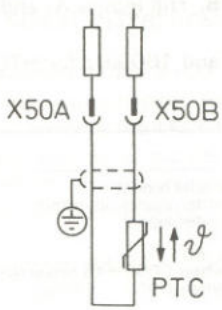
Supply of incremental encoder, terminal VE9



Use:

An incremental encoder connected via X5 for digital frequency input must be supplied from an external power supply. The required voltage/power depends on the type of encoder (TTL-/HTL-encoder). For pin assignment X5 see 4.4

PTC input X50A/B



Use:

Temperature surveillance of the connected motor using PTC thermal sensors to DIN 44081 and DIN 44082 or thermal switches.

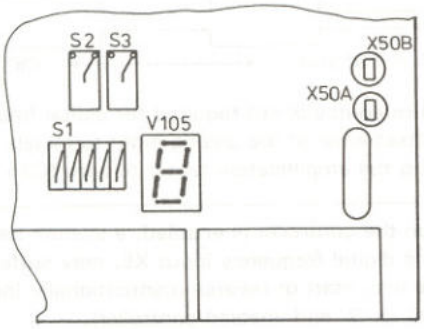
Parameter setting:

Activated by: C119, C120
Display: C067
Acknowledgement: C067, C043

Lead the connecting cable of the PTC through the passage on the front side for the connection of the control module, plug X50A/B.

4.3.1 POSITION OF THE CONTROLS FOR PARAMETER SETTING

The switches on the control module can be accessed by removing the window.



Control module 8102MP

4.3.2 OPENING THE COVER

To connect the PTC connecting cables, it may be necessary to remove the cover. For this proceed as follows:

- Disconnect mains voltage and wait at least 30s.
- Remove control and power terminals
- Carefully remove the cover, by inserting a screwdriver into the short slots at the top side of the inverter.

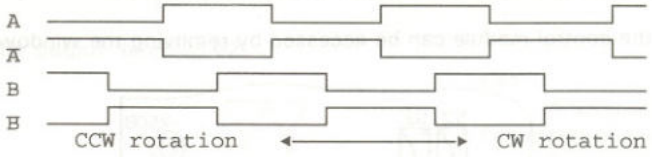
4.4 PULSE TRAIN INPUT/INCREMENTAL ENCODER INPUT X5

The 9-pole Sub-D connector X5 serves as digital frequency input and incremental encoder input, where two complementary signals shifted by 90° are provided. When using HTL encoders, it is sufficient to provice signals A and B. The inputs A\ and B\ must then be bridged with +Vcc.
The maximum input frequency is 300 kHz for TTL encoders and 100 kHz for HTL encoders.

X5: Pin	Name	Input/output	Explanation
1	B	Input	2nd pulse train/incremental encoder signal
2	A\	Input	1st pulse train/incremental encoder signal (inverted)
3	A	Input	1st pulse train/incremental encoder signal
4	+VCC	Output	Supply voltage term. VE9
5	GND		Controller reference point term. 60
6	0\	Input	single-track pulse train signal when C005=16 (inverted)
7	0	Input	single-track pulse train signal when C005 = 16
8	8V2	Output	not used
9	B\	Input	2nd pulse train/incremental encoder signal (inverted)

For the connection of a signal cable via terminals, a suitable adapter (part no. 348 922) can be supplied.

The phase position of the input signal provides the direction of rotation of the drive.



If the additional reference is not required for digital frequency input, a fault may be caused by an offset error of the analog input terminals 1, 2. This fault can be eliminated setting the amplification factor to zero (C25 = 1, C27 = 0).

Caution! When the controller is enabled, a system cable which is only connected to the digital frequency input X5, may suffer interference such that the drive may start or reverse unintentionally (only for configuration C005 = -2- and enabled controller).

PULSE TRAIN INPUT

With digital frequency input (C005) the set-value 1 is provided as absolute frequency via X5, i.e. the internal frequency set-value is directly proportional to the frequency of the input signals. The conversion factor results from the settings under C026 and C027.

$$f_{dset}\,[Hz] = f_{master}\,[Hz] \cdot \frac{\text{encoder adjustment (C027)}}{\text{encoder constant (C026)}}$$

When calculating the frequency reference f_{dset}, an error up to 1% of f_{dmax} is possible.

4.5 SERIAL INTERFACES

The inverters of the 8100_A series can communicate via the serial interface LECOM1 (X6) with superimposed hosts (PLC or PC). The LECOM1 interface (connector X6) is used to process the LECOM-A/B-protocol. The LECOM1-interface can also be used to connect devices to the RS 232C standard (LECOM-A) or to the standard RS485 (LECOM-B). The interface is suitable for parameter setting, surveillance, diagnosis and simple control tasks.

The common RS 232 C interface, simple point-to-point connection with a maximum cable length of 15 m can be achieved. Almost every personal computer (PC) or other master system has this interface. For several drives and greater distance, the RS485 interface must be used. Only two wires are used to enable the communication of up to 31 controllers via a distance of maximum 1200 m. Alternatively, the connections can also be done via optical fibres. Further information can be obtained from the technical description LECOM LI.

The LECOM A/B-protocol is based on the 1745 ISO standard and supports up to 90 controllers. It recognizes faults and therefore avoids the transmission of faulty data.

Features of the serial interface

- **Pin assignment:**

1	+VCC15	Output	Supply voltage +15V/50mA
2	RxD	Input	Data receiving line RS232C
3	TxD	Output	Data sending line RS232C
4	DTR	Output	Sending control RS232C
5	GND		Controller reference potential, term. 60
6	DSR	Input	(unused)
7	T/R (A)	Output/Input	RS485
8	T/R (B)	Output/Input	RS485
9	+VCC5	Output	Supply voltage +5V

For simple connection of the RS485 interface via terminals, a suitable adapter (part no. 348 921) can be supplied.

Baud rate: can be changed from 1200 Baud to 9600 Baud

Protocol: LECOM

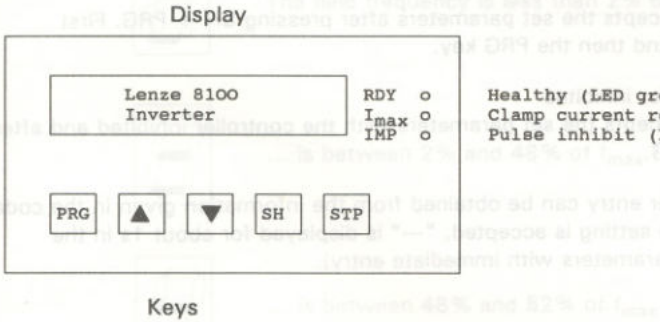
There are additional codes, which can only be accessed via LECOM (see code table 7.7).

Further information about the serial communication can be obtained from the technical description LECOM A/B.

5. OPERATIONG AND DISPLAY

5.1 OPERATING UNIT 8102BB (OPTION)

The two-line LCD operating unit 8102BB (part no. 347 642) can be installed as option. This operating and display unit is used to set the parameters of the frequency inverters directly at the device. The operating unit is not supplied with the inverter. Plugging and removing of the operating unit is only possible when the controller is switched off.

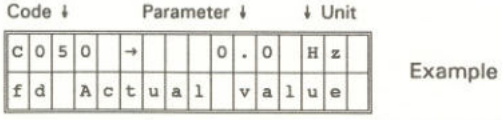


Key functions

Key	Function
PRG	Change between code and parameter level
SH + PRG	To confirm parameter change
▲	Increase displayed value
▲ + SH	Increase displayed value fast
▼	Reduce displayed value
▼ + SH	Reduce displayed value fast
STP	Inhibit controller
SH + STP	Enable controller

Display

Position of arrow marks the activated level (code-/parameter level)



5.2 PARAMETER ENTRY

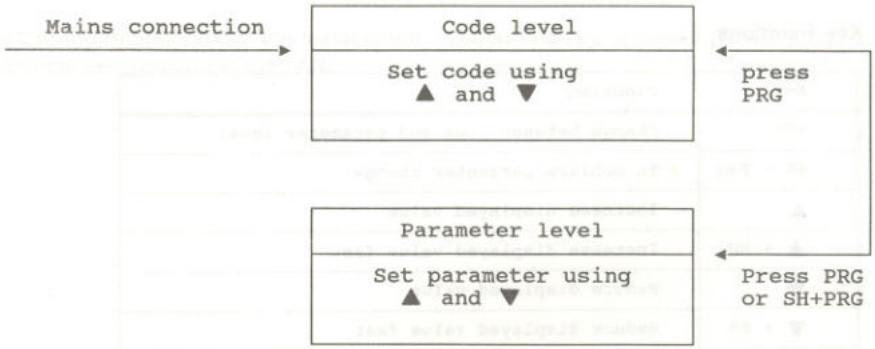
According to the selected code, parameters are entered in three different ways, when the operating unit 8102BB is used.

a) Immediate entry
The device immediately accepts the set parameters.

b) Entry after pressing SH + PRG
The device only accepts the set parameters after pressing SH + PRG. First press the SH key and then the PRG key.

c) Entry with controller inhibited
The device only accepts the set parameters with the controller inhibited and after pressing SH + PRG.

The way of parameter entry can be obtained from the information given in the code table (see 7.7). If the setting is accepted, "---" is displayed for about 1s in the display (except for parameters with immediate entry).



Please note: The inverter is factory-set for a parameter setting via the LECOM interface. To enter the parameters via the keys of the operating unit 8102 BB, the operating mode C001 must be changed first.

5.3 DISPLAY OF OPERATING STATES

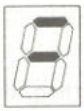
The one-line LED display in the window of the inverter allows fast information about the operating state of the frequency inverter type 8100_A.

Display of actual frequency:

The field frequency is less than 2% of f_{max} (C011)

... is between 2% and 48% of f_{max} (C011)

... is between 48% and 52% of f_{max} (C011)



... is between 52% and 98% of f_{max} (C011)

... is higher than 98% of f_{max} (C011)

Fault indications and surveillance messages see code table 7.7 (Code C067).

In case of **controller inhibit**, the decimal point in the LED is flashing.

6. COMMISSIONING

The inverters of the 8100_A series are factory-set so that a suitable four-pole three-phase standard motor with 230V rated voltage and 50Hz rated frequency can be operated without any further settings. If adjustments are required, the inverter parameters must be set via the LECOM interface or the optional operating unit 8102BB (see 7.).

All common three-phase motors can be used, which have an insulating phase separation (paper between the windings).

To run the drive, you only need to the following:

Direction of rotation
For the factory-set terminal configuration apply a voltage between 13 and 30V either

across terminal 21 for CW rotation or
across terminal 22 for CCW rotation

Reference potential is terminal 40.

Controller enable
To enable the controller, apply a voltage between 13 and 30 V across terminal 28 (RFR). This also applies for operation via the LECOM interface or via the operating unit 8102BB (see 7.3.1).

Input of set-value
The motor speed is varied via the set-value input; in factory setting, this is given by an analog signal via terminals 7 and 8 (see 4.3). For a digital set-value input, change the operating mode (see 7.1.2) and for digital frequency input change the configuration (see 7.1.6).

7. PARAMETER SETTING

7.1 PARAMETERS FOR INITIALIZING

7.1.1 CODE SET C000

Under C000 you can select the standard code set, the extended code set, or activate a "read-only-access" for the standard code set and activate the password protection under C94.

Code C000 can only be changed using the keys on the operating unit 8102BB, not using the LECOM interface. When using the LECOM interface, all parameters can be accessed, independently of C000.

7.1.2 OPERATING MODE C001

Depending on the selected operating mode, the control signals are entered via the control terminals, the operating unit 8102BB or the serial LECOM interface. Also the parameter setting depends on the operating mode, either via the operating unit or the LECOM interfaces.

7.1.3 LOAD PARAMETER SET C002

Operation via keypad or interface:
The parameter sets are changed or loaded via C002.

Operation via terminal control:
The parameter sets can also be changed and loaded via the digital input terminals E1...E5. Here C002 serves as display which parameter set is active.

- **Select parameter set:**
  A maximum of two digital input terminals can be assigned to the function "Select parameter set" (see 7.6.6). Using one input terminal, the parameter sets 1 and 2 can be selected. If the change between parameter set 3 and 4 is necessary, this must be done using two digital input terminals. If e.g. the terminals E4 and E5 are assigned to the function "select parameter set", E4 corresponds to the first terminal and E5 to the second terminal in the following table:

	dig. inputs E1 ... E5 Term. 1	Term. 2
Parameter set 1	0	0
Parameter set 2	1	0
Parameter set 3	0	1
Parameter set 4	1	1

- **Load parameter set:**
  In addition, the function "Load parameter set" must be assigned to one of the terminals E1...E5. The parameter sets are changed when the input signal changes its edge, if the controller has been inhibited before. The polarity of the edge change is set using C114.

Parameter sets after mains connection:
After mains connection, parameter set 1 is always loaded first (switch-on parameter set). Only by using the digital input terminals, the controller is able to switch immediately to another parameter set. For this, the desired parameter set must be set to the table above. The change is then automatic, without the function "Load parameter sets".

7.1.4 STORE PARAMETER SET C003

Specific parameter sets must be stored permanently using C003, otherwise your settings will be lost after mains disconnection or after changing to another parameter set. Four complete different parameter sets can be stored.

8.1.5 SWITCH-ON DISPLAY C004

Only when using the operating unit 8201BB.

Set under C004 which parameter is to be displayed after switching-on. For this, enter the code number of the desired parameter. This code can only be changed in the operating modes C001 = -0- or -1-.

7.1.6 CONFIGURATION C005

Code C005 control the internal control structure and the assignment of the analog input terminals. The following configurations can be set:

- Open-loop control with unipolar set-value input via terminal 8 with C005 = -0-. The direction of rotation is determined by terminals 21, 22.

> **Caution!** Entering negative values for offset and amplification (see 7.2.9/7.2.10) may result in inverting the set-value. With keypad and LECOM operation, negative set-values are also possible. If you safely want to prevent the drive to reverse, change the frequency setting range to unipolar operation using C239 = -1-.

- Open-loop operation with bipolar set-value input via terminal 8 (set-value 1) and with added, bipolar additional set-value (set-value 2) via the control terminals 1 and 2 using C005 = -1-. The sign of the total set-value results from the total of set-value 1 and set-value 2. Changing the terminals 21 and 22 only results in inverting set-value 1, terminal 8.

- Open-loop operation with set-value input via digital frequency input via connector X5, tracks A, A/, B, B/ (set-value 1) with C005 = -2-. The sign of the total set-value results from the total of set-value 1 and set-value 2. Changing the terminals 21 and 22 results in inverting set-value 1. In the operating modes with keypad and LECOM operation, the set-value is still entered via the digital frequency input X5.

- Closed-loop control with bipolar set-value input via terminal 8 (set-value 1), adding set-value 2 via terminals 1 and 2 (set-value 2) and tachometer feedback of the actual value via terminals 3 and 4 with C005 = 11. The sign of the total set-value results from the total of set-value 1 and set-value 2. Changing the terminals 21 and 22 only results in inverting set-value 1. The input voltage at the terminals 3 and 4 has to be adapted to the tachometer voltage by means of the switch S1 (see 4.3).

- Closed-loop control with bipolar set-value input via terminal 8 (set-value 1), adding set-value 2 via terminals 1 and 2 (set-value 2) and incremental encoder feedback via X5, tracks A, A/, B, B/ with C005 = 13. The sign of the total set-value results from the total of set-value 1 and set-value 2. Changing the terminals 21 and 22 only results in inverting set-value 1. The direction of rotation of the actual-value signal results from the phase position of the tracks A and B of the incremental encoder (see 4.4).

- Closed-loop operation with single-track digital frequency input via X5, track 0, 0/ (set-value 1), adding set-value 2 via terminals 1 and 2 (set-value 2) and incremental encoder feedback via X5, tracks A, A/, B, B/ with C005 = 16. The sign of the total set-value results from the total of set-value 1 and set-value 2. The sign of set-value 1 is determined by the input from terminals 21, 22. The direction of rotation of the actual value signal results from the phase position of the tracks A and B of the incremental encoder (see 4.4).

The setting of the PI controller is described under C029.

The set- and actual value inputs can be adjusted if there should be an offset and gain error (see 7.2.9/7.2.10). For configurations with additional set-value always check input terminals 1 and 2.

7.1.7 CONTROL MODE C006

Either Trip or Clamp can be selected as control modes.
In the control mode Trip, the inverter is inhibited, when 160% of the rated current is exceeded. A fault indication is displayed (see 8). High torque can be obtained for a short time in this mode.

In the control mode Clamp the motor current is limited to 120% of the rated current. ($I_{mot} \leq 1.2\ I_N$) due to permanent peak current limitation. In case of shock load, the controller will not set trip. The output signal I_{max} (in case of factory setting terminal A2) is set, as soon as the peak current limitation cuts in. The red LED flashes if the LCD keypad 8120 is used.

Caution: If the motor is stalled, it may overheat in the control mode "Clamp".

7.1.8 LECOM1 ADDRESS C009

For the communication via the LECOM1 interface, set the controller address under code C009 (see 4.5).

7.2 OPERATING PARAMETERS

7.2.1 MINIMUM FIELD FREQUENCY f_{dmin} C010
MAXIMUM FIELD FREQUENCY f_{dmax} C011

The set-value setting is determined via f_{dmin} and f_{dmax}. With zero set-value the drive accelerates to the minimum speed f_{dmin} after controller enable.

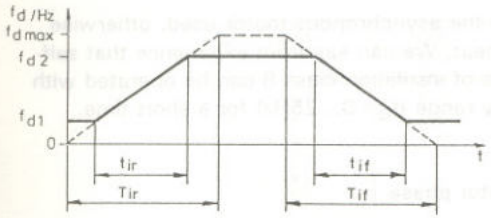
f_{dmin} is only effective with analog set-value input and unipolar set-value (C005 = -0-). f_{dmax} is a reference value for the setting of the acceleration and deceleration times T_{ir} and T_{if}.
With absolute set-value input, e.g. via the LECOM interface or JOG values, f_{dmax} is a limit value.
The chopper frequency of the output voltage set under C018, influences the effective maximum field frequency. For example, the field frequency with C018 = -0- (f_{Ch} = 1.0 kHz) is limited to 120 Hz (see 7.2.7).

Caution! f_{dmax} is an internal scaling value. Therefore, larger changes via the LECOM interface, may only be done when the controller is inhibited.

7.2.2 ACCLERATION TIME T_{IR} C012
DECELERATION TIME T_{IF} C013

Acceleration and deceleration refer to a change of the field frequency from zero to f_{dmax}.

The times T_{ir} and T_{if} can be calculated as follows:



$$T_{ir} = t_{ir} \cdot \frac{f_{dmax}}{f_{d2} - f_{d1}}$$

$$T_{if} = t_{if} \cdot \frac{f_{dmax}}{f_{d2} - f_{d1}}$$

Here, t_{ir} and t_{if} are the desired times for the change between f_{d1} and f_{d2} and T_{ir} and T_{if} the values to be set under C012, C013.

7.2.3 V/f CHARACTERISTIC

A linear or square motor voltage characteristic can be set under C014. Square characteristics are preferably used for pump and blower drives.

7.2.4 V/f NOMINAL FREQUENCY fdN

The slope of the V/f characteristic is set using the V/f nominal frequency. It is calculated from the rated motor voltage and the rated motor frequency as follows:

$$f_{dN}\ [HZ] = \frac{230\ V}{U_{N\ Motor}\ [V]} \cdot f_{N\ Motor}\ [Hz]$$

The settings of the V/f nominal frequency for the most common mains and motor combinations can be obtained from the table below. Please note that the maximum output voltage of the inverter can only be as high as the mains supply voltage.

U_{NMotor} [V]	f_{NMotor} [Hz]	f_{dN} [Hz]
230	50	50.0
220	50	52.3
230	60	60.0
240	50	47.9

Caution! During commissioning always check that the no-load current does not exceed the rated motor current. If necessary, the current consumption during idle running can be reduced by increasing the V/f nominal frequency and therefore the V/f characteristic.

7.2.5 VOLTAGE BOOST U_{min} C016

The U_{min} parameter must be adapted to the asynchronous motor used, otherwise the motor may be damaged due to overheat. We can say from experience that self-ventilated standard asynchronous motors of insulation class B can be operated with their rated current in the lower frequency range (f_d = 0...25Hz) for a short time. Adapt the U_{min} parameter as follows:

- Connect r.m.s current meter to one motor phase

- Run the motor without load at f_d = 5Hz

- Set U_{min}:

a) For short-time operation in the lower frequency range, set U_{min} such that the motor current does not exceed its rated value ($I_{Motor} \leq I_{N\ Motor}$)

b) For continuous operation in the lower frequency range, set U_{min} such that the motor current does not exceed 80% of its rated value ($I_{Motor} \leq 0{,}8 \cdot I_{N\ Motor}$) or use a force-ventilated motor or a motor with higher insulation class and set U_{min} as under a).

An internal compensation of the DC bus voltage compensates for changes in the mains voltage so that these must not be considered when setting the V/f rated frequency.

7.2.6 RESPONSE THRESHOLD Q_{MIN} C017

The Q_{min} signal shows if the field frequency (in open-loop operation) or the actual value of the PI-controller (in closed-loop operation) is smaller than or equal to the frequency set under C017. The Q_{min} signal can be assigned to a digital output terminal using codes C116, C117.

7.2.7 CHOPPING FREQUENCY f_{CH} C018

The desired chopping frequency of the output voltage can be set under C018.

Note:	The chopping frequencies limit the effective maximum field frequency f_{dmax}.

C018	fCH kHz	eff. f_{dmax} Hz
-0-	1.0	120
-1-	1.5	180
-2-	2.0	240
-3-	3.3	480
-4-	3.6	480
-5-	4.0	480

7.2.8 RESPONSE THRESHOLD AUTO DC INJECTION BRAKING C019

DC injection braking is activated when the actual frequency is less than the frequency set under C019. When setting 0.0 Hz, this function is not active. The amount of the standstill voltage can be set under C036, the time of the DC injection braking can be set under C107.

7.2.9 PRESELECTION OF ENCODER C025

Errors which may occur in the encoder or in the transmission path, can be compensated by adjusting the set- and actual value inputs.

The analog inputs can be adjusted, if offset and gain are required.

For the pulse train/incremental encoder input X5, a gain setting is provided. For open-loop operation with digital frequency input (C005 = -2-) and for the closed-loop operation with incremental encoder feedback (C005 = -13-) the input X5 is adjusted under C025 = -10-. In closed-loop operation with digital frequency input and incremental encoder feedback (C005 = -16-) the adjustment for single-track digital frequency input (via X5, track 0, 0/) is done by C025 = -11- and the adjustment of two-pulse incremental encoder feedback (via X5, tracks A, A/, B, B/) is done by C025 = -10-

First select the encoder under C025, then make the adjustment under C026, C027 for the selected input.

7.2.10 ENCODER CONSTANT C026 ENCODER ADJUSTMENT C027

A constant deviation in the encoder signal (offset) can be adjusted under C026. A gain error can be corrected under C027.
For configurations with set-value 2 (see 7.1.6), the input via terminals 1 and 2 must always be checked.
Select the incremental encoder type for the adjustment of X5 using C026. Different encoder constants can be adapted using C027.
For digital frequency input, make the adjustment as described under 4.4.

7.2.11 AUTOMATIC ADJUSTMENT FOR THE ACTUAL VALUE OF THE PI-CONTROLLER

Code C029 is used to make an automatic adjustment of the feebdback.

Preparing the adjustment:

Before adjusting the speed controller, observe the setting of the encoder constants.

- Analog actual value: If you use an analog tachometer signal, adjust the maximum tachometer voltage to be expected. You can determine this tachometer voltage from the rated tachometer voltage and the maximum motor speed. Set the corresponding switch combination of S1 on the control module, as shown in chapter 4.3.

- Digital actual value: If you use an incremental encoder as actual speed detector, select the incremental encoder input under C025 = -10- and then enter the encoder constant under C026.

Automatic gain adjustment of actual value - feedback

Conditions:
- Operate the drive in idle running.
- The set-value must be at least 10% of the maximum field frequency.
- Set the influence of the PI-controller under C074 to zero.

Activation of the automatic adjustment:
- Select a configuration with closed-loop control under C005.
- Enable the controller and wait for the acceleration time to elapse.
- Activate the automatic adjustment with C029 = -1-. The inverter confirms the adjustment by "ok". After this procedure, the gain of the actual value feedback is set automatically.
- Set the influence of the PI-controller under code C074 such that the maximum possible slip, mostly stall slip, is compensated (e.g. 10%).

Manual adjustment

If for technical reasons, automatic adjustment in no-load operation is not possible or sufficiently precise, you can enter the adjustment factor by hand following measurement of the variable to be controlled:

- Select a configuration with closed-loop control under C005.
- The set-value must be least 10% of the maximum field frequency.
- Enable the controller and wait for the acceleration time to elapse.
- Increase the influence of the PI-controller with C074 to the maximum possible slip (stall slip, approx. 10%)
- Gain (C070) and response time (C071) should be in factory-setting.
- If the drive oscillates, reduce the gain (C070) until the drive runs smoothly.
- Measure the motor shaft speed using a speed meter.
- Calculate the value for the encoder adjustment and adjust under C027:

$$\text{Encoder adjustment (C027)} = \frac{\text{Actual speed}}{\text{desired speed}} * \text{old value C027}$$

Dynamic adjustment (C070, C071)

This adjustment is necessary following both automatic and manual adjustment. By means of the dynamic adjustment the PI-controller is adapted to different inertias:

- Increase the gain of the PI-controller with C070 until the drive starts to oscillate. Then, reduce this value by approx. 10%
- If no oscillation occurs with a gain of about 10, halve the setting time in code C071 and repeat the gain adjustment procedure.
- If the system oscillates throughout the entire range, increase the setting time (C071) until the drive runs smoothly.

- **Save the settings with C003.**

Additional functions

For special applications, some auxiliary functions for the PI controller can be used.

Actual speed value of the PI controller: see C051

Monitor signals of the PI controller: see C111

Output actual value = set-value: see C240

Frequency pilot control: see C238

Frequency setting range: see C239

Input integral component = 0
Using this function the integral component of the PI controller can be reset to zero. You can activate this auxiliary function by one of the freely assignable inputs with C113.
This function is useful, for example in applications where a drive is to be brought to standstill with zero set-value and is to remain stationary and ready for operation without controller inhibit. Blanking out the I-component prevents the motor from drifting. If the drive is mechanically braked at set-value zero, blanking out the I-component prevents the drive from jerking when the brakes are released.

Output actual value = 0
The digital output function actual value = 0 indicates that the drive is stationary. The range in which the function is active is provided with a fixed window of 0.5% referenced to f_{dmax}.

This characteristic can be used for example in cases where the I-component has to be blanked out.

The signal actual value = 0 can be assigned to a digital output terminal using C117.

7.2.12 MASTER CURRENT C034

If the analog set-value must be entered as master current via terminal 8, adjust the setting range under C034 as follows:

0...20mA : C034 = -0-
4...20mA : C034 = -1-

To change from master voltage to master current, using switch S1/4 on the control module. For the position of the switch see 4.3.

Master voltage/potentiometer:	S1/4 = OFF
Master current:	S1/4 = ON
Factory setting:	S1/4 = OFF

7.2.13 BRAKE VOLTAGE C036

The brake voltage is used to set the DC component flowing in the motor. For activation of the DC brake see C048 (see 7.3.7).

7.2.14 PRESELECTION OF JOG REFERENCE C038 REFERENCE 39

The JOG frequency set-values are set using the codes C038 and C039. First, enter the JOG set-value under C038. This JOG set-value can be assigned a frequency under C039. If e.g. -2- has been selected under C038, you can enter the frequency for JOG 2 under C039.
JOG set-values which are larger than f_{dmax} are limited internally to f_{dmax}.
To activate the JOG set-values see 7.3.5. For activated JOG set-value, set-value 2 is switched off.

7.3 CONTROL PARAMETERS

Depending on the operating mode C001 (see 7.1.2), the control parameters are changed via the control terminals, the operating unit 8102BB or via the LECOM interface. For terminal control, the following codes serve as displays. If keypad or LECOM control is selected, the codes serve as operating parameters.

7.3.1 CONTROLLER ENABLE C040

Controller enable

Independently of the operating mode C001, the controller must be enabled by applying a voltage between 13 and 30 V across terminal 28. When using the operating unit 8102BB, the controller can always be inhibited using the STP key and be enabled by pressing SH + STP.

In the operating mode LECOM operation (C001 = -3-), the controller can be inhibited and enabled additionally using C040 = -1- (via the LECOM interface)

The controller can only be enabled via those input channels, which were used to inhibit the controller:

- Terminal 28
- Code C040 (in the operating modes keypad and LECOM operation)
- Stop key
- Trip fault indication

If, for example, the controller has been inhibited in LECOM operation via C040 = -0-, it can only be enabled via C040 = -1-.

Controller enable after mains connection

The controller is enabled after mains connection, if a voltage of 13 ... 30 V is applied across terminal 28. Only in the operating mode C001 = -3-, the controller must be enabled in addition via LECOM interface (C040 = -1-).

Controller enable after changing the operating mode C001

The operating mode can only be changed if the controller is inhibited first. The controller can only be enabled by the input channel, which has been used to inhibit the controller.

Controller enable when changing the parameter sets C002

Before changing the parameter sets, the controller must be inhibited. Loading another parameter set causes the controller to be initialized again. It then acts as after mains connection.

> Caution! When changing the parameter sets or loading factory setting, the drive may accelerate if it has not been inhibited via terminal 28 first.

7.3.2 INVERT SET-VALUE C041 QUICK STOP C042

Codes C041 and C042 are provided for the functions:

- Invert set-value and
- Activate quick stop

Depending on the operating mode C001, the codes have a direct effect on the functions or display the state of the control terminals 21 and 22. Also, in case of terminal control, the function of the terminals 21 and 22 can be changed using C176 (see 7.6.19).

Quick stop function
By activating quick stop, the drive is decelerated along the pre-set deceleration ramp with C105. When reaching f_d = 0 Hz, the output voltage corresponds to the value U_{min} set with C016 (see 7.2.5).
In addition, a DC brake can be activated via C019 using a holding time to be set with C107. After the holding time, the inverter changes its output voltage to 0V.

Keypad or LECOM operation:
For keypad or LECOM operation (C001 = -1-, -3-), the set-value is inverted with C041 and quick stop is activated with C042. The terminals 21 and 22 are always active in these operating modes.

Terminal control:
With terminal control (C001 = -0-, -2-) the momentary state of the terminals 21 and 22 according to the terminal configuration C176 is detected and displayed in C041 and C042.

Terminals functions with C176 = -0-				
term. 21	term. 22	Disp. C041	Disp. C042	Meaning
High	Low	- 0 -	- 0 -	Set-value not inverted
Low	High	- 1 -	- 0 -	Set-value inverted
Low	Low	- x -	- 1 -	Quick stop active

If a voltage between 13 and 30V (High signal) is applied across terminals 21 and 22 both, the direction of rotation is provided by the terminal signal, which was active first. If a HIGH signal is applied to both terminals before mains connection, the controller activates "quick stop".

Terminal function with C176 = -1-				
term. 21	term. 22	Disp. C041	Disp. C042	Meaning
High	Low	- 0 -	- x -	Set-value not inverted
Low	Low	- 1 -	- x -	Set-value inverted
x	High	- x -	- 1 -	Quick stop active
x	Low	- x -	- 0 -	Quick stop not active

Warning! With C176 = -1- in case of wire breakage at terminal 21, the drive may change its direction of rotation.

7.3.3 TRIP RESET WITH LECOM C043

Code C043 is used to reset a fault. For this, enter C043 = -0-.
Code C043 can only be reached via the LECOM interface.

7.3.4 PROCESS CONTROL C044

In the operating modes keypad or LECOM operation, the process is switched on or off using C044. In case of terminal control, the process control can be assigned to one of the digital inputs E1...E5. Here C044 is used to display whether the process control is active.

The process control sequence determines the main set-value and the Ti time of the corresponding ramp function generator in a sequence and time which can be programmed. The process control comprises a maximum of eight steps. Each step can be assigned the following parameters (see 7.6.20):

- one frequency set-value (using C211)
- one pair of acceleration and deceleration times (using C212)
- the duration (using C213)
- the following step (using C214)

If the process control is activated, each step which has been reached is displayed under C160. Each step can also be output as a signal via one of the freely programmable digital output terminals using C117.

The process control is interrupted and reset on step 1 by one of the following actions:

- controller inhibit
- quick stop
- trip fault indication

After having cancelled the interruption, the controller starts with step 1, unless the process control is inhibited first. Over- or undervoltage indications do not influence the process control.

Functions, which may influence the main reference, such as

- invert set-value
- ramp function generator input = zero
- ramp function generator stop
- DC injection braking

are available during the process control. For example, the time of the momentary step continues while the DC brake is activated. During the process control, set-value (C049) is set to zero. The deceleration time set under C221 remains active.

7.3.5 ENABLE JOG SET-VALUE C045

Terminal control:
According to the assignment of the JOG set-values to the digital input terminals, the JOG enable results from the binary coding of the input terminals (see 7.6.6).
This function can be assigned to a maximum of four digital inputs. Therefore, 1, 3, 7 or 15 binary coded JOG-set-values are possible when assigned.

If, for example, the terminals E1, E3, E4 and E5 are assigned for the JOG enable, E1 corresponds to the first terminal, E3 to the second terminal, E4 to the third terminal and E5 to the forth terminal in the following table:

	digital input terminals E1 ... E5			
	1st term.	2nd term.	3rd term.	4th term.
Set-value 1	0	0	0	0
JOG 1 active	1	0	0	0
JOG 2 active	0	1	0	0
...				
JOG 15 active	1	1	1	1

In case of operation via keypad or LECOM interface, activate the desired JOG set-value using C045.

7.3.6 SET-VALUE 1 C046

Code C046 shows the momentary set-value 1. In case of operation via keypad or LECOM interface, set the set-value using C046.
The input or display can be relative in $\%f_{dmax}$ or absolute in Hz. You can change between these two modes using C172.

7.3.7 DC BRAKING C048

The DC injection braking is activated as follows:

- in case of terminal control via the digital input terminals (to assign the function to one of the digital input terminals see 7.6.6). C048 shows here: DC injection braking active or not active.
- in case of operation via keypad 8102BB or LECOM interface (see 7.1.2) using C048 = -1-
- automatically, if the field frequency falls below the Auto DC treshold (see 7.2.8) (no display in C048).

The amount of the holding voltage is set with C036 (see 7.2.13) and the time of activation with C107 (see 7.6.3).

> Caution! Long-term operation of the DC brake may result in overheating the motor.

7.4 DISPLAY PARAMETERS

Display parameters can only be read.

7.4.1 DISPLAY SET-VALUE 2 C049

C049 shows the momentary set-value 2 (in % f_{dmax}). Independently of the operating mode, set-value 2 is always provided via the control terminals 1, 2, and not via the LECOM interface or the keypad 8102BB.

With suitable configuration (see 7.1.6) set-value 2 is added internally to set-value 1 (C046). The total is limited internally to $\pm$ f_{dmax}.

7.4.2 OUTPUT FREQUENCY C050

C050 shows the actual running frequency in Hz.

7.4.3 ACTUAL VALUE OF PI-CONTROLLER

Code C051 shows the actual value of the PI-controller. Depending on the display of set-value 1 (C046), you can select with C172 a scaled display (in % f_{dmax}) or an absolute display (in Hz).
In open-loop control, "0" is shown with C051.

7.4.4 MOTOR VOLTAGE C052

C052 shows the actual output voltage and therefore the motor voltage in Volts.

> Caution! Even when the display shows "0V", the motor terminals may carry voltage. Before working on the motor side, always disconnect the controller from mains and wait at least 30 seconds.

7.4.5 DC BUS VOLTAGE C053

C053 shows the actual DC bus voltage in Volts.

7.4.6 TRIP FAULT INDICATION C0067

Code C067 displays a momentary fault (see 8). The fault can also be reset under this code.
Reset faults are saved in the history buffer and can be read using the LECOM interface with codes C161 to C168. When using the operating unit 8102BB, they can be displayed by pressing the ▲ key. A maximum of eight fault indications can be read; the last fault is displayed first, then the one before and so on.

7.5 GENERAL PARAMETERS

7.5.1 OPERATING STATUS C068 CONTROLLER STATUS C069

The codes C068 and C069 contain information about the controller and operating status. They can only be read via the LECOM interface.

C068 Display of the operating status

Bit no.	15	14	13	12	11	10	9	8
Signal	TRIP	*)	IMAX	QSP	IMP	R/L	QMIN	RFR

Bit no.	7	6	5	4	3	2	1	0
Signal	Communication fault				Operating fault			

*) Bit no. 14: $n_{set} = n_{actual}$

C069 Display of the controller status

Bit no.	7	6	5	4	3	2	1	0
Signal	RFR	xxxx	RESET	AUTO	REMOT	PCHG	CALARM	BALARM

Bit 6 is not used.

Further information can be obtained from the technical description "LECOM A/B".

7.5.2 GAIN OF PI CONTROLLER C070 RESPONSE TIME OF PI CONTROLLER C071 INFLUENCE OF PI CONTROLLER C074

With codes C070, C071 and C074 the PI-controller is adjusted. The procedure for this is described in 7.2.11.

7.5.3 RATED MOTOR POWER C081

The power of the connected motor can be set with C081. This setting is required, to adapt the smooth running of the motor with low field frequencies.

7.5.4 CONTROLLER TYPE C093

With C093, the controller type 810x is displayed. Code C093 can only be read via the LECOM interface.

7.5.5 USER PASSWORD C094

If a password is entered with C094, the code set under C000 (see 7.1.1) can only be changed if the password has been entered.

If you do not need a password, enter C094 = -0-.

7.5.6 LANGUAGE C098

With code C098 you can enter the language of the display texts on the optional operating unit 8102BB. German, English, and French language are possible.

7.5.7 SOFTWARE VERSION C099

C099 shows the software version.

7.6 APPLICATION PARAMETERS

7.6.1 PRESELECTION ADDITIONAL RAMP TIME C100
ADDITIONAL ACCELERATION TIME C101
ADDITIONAL DECELERATION TIME C103

Apart from the acceleration and deceleration times set under C012 and C013, 15 additional values can be programmed for the main set-value (see signal flow chart).

First, preselect the desired pair of ramp times using C100, then enter the value for the additional acceleration time using C101 or the additional deceleration time using C103.
If, e.g. -2- has been selected in C102, enter the value for the additional deceleration time $T_{if}2$ in C103.

The additional acceleration and deceleration times refer to a change of the field frequency from 0 to f_{dmax} and can be calculated as described under 7.2.2.

To activate the additional acceleration and deceleration times see 7.6.12.

7.6.2 DECELERATION TIME FOR QUICK STOP C105

If the quick stop function (see 7.3.2) is activated, the drive is decelerated with a special deceleration time. This deceleration time must be set using C105.

7.6.3 HOLDING TIME FOR DC INJECTION BRAKING C107

The time of the DC injection braking can be set using C107. When setting 999s under C107, the holding time is not limited. After the holding time, the inverter switches its output voltage to 0V.

To activate the DC brake see 7.3.7.

> Caution! Long-term operation of the DC brake may result in overheating the motor.

7.6.4 AMPLIFICATION OF MONITOR OUTPUT C108 OFFSET OF MONITOR OUTPUT C109

To adapt analog output signals, e.g. to external displays, C108 and C109 are used to set the amplification and offset of the monitor output terminal 62.

These settings remain active when the function of the monitor output is changed.

7.6.5 MONITOR SIGNAL C111

The monitor output terminal 62 can be assigned to the signals which are selected under C111 and can be operated as voltage output (±10V) or as current output (±20mA). The function is changed by S2 on the control mode (see 4.3).

The following scaling of the output signals is factory-set:

for frequencies:	$+f_{dmax}$ corresponds to $V_{Monitor}$	= +10V/+20mA
	-fdmax corresponds to $V_{Monitor}$	= -10V/-20mA
for voltages:	1000 V corresponds to $V_{Monitor}$	= +10V/+20mA
	0 V corresponds to $V_{Monitor}$	= + 0V/+0mA

To adapt the display element, offset and gain can be adjusted. (see 7.6.4).

7.6.6 PRESELECTION OF FREELY PROGRAMMABLE DIGITAL INPUT C112 FUNCTION OF FREELY PROGRAMMABLE DIGITAL INPUT C113

The digital inputs E1 to E5 can be assigned to the various functions to be selected in C113. For this, first select the input to be assigned using code C112. If for example the digital input E2 is preselected with C112 = -2-, the function "Trip-Set" can be assigned to the terminal using C113 = -4-.
All functions can only be assigned once. To activate the JOG references and the additional Ti times, up to four terminals can be used. In addition, the polarity and the priority can be changed using C114 and C115 (see 7.6.7).

7.6.7 POLARITY OF DIGITAL INPUT PRIORITY OF DIGITAL INPUT

Using C114, you can choose whether HIGH or LOW signals are active for the digital inputs E1 to E5.
C115 is used to determine whether the preselected input terminal with its function is always active or, is switched off depending on the operating mode (see 7.1.1). If a digital input terminal is assigned a priority (terminal always active) with C115 = -1-, the terminal terminal signal overwrites an information entered via the keypad or the LECOM interface.

> Caution: The settings of polarity and priority refer to the selected signal. They are lost when the function of the terminal is changed, i.e. with every new assignment the factory settings are activated.

The factory setting of the polarity for "Trip-Set" (C113 = -4-) is not safe against wire breakage.

7.6.8 PRESELECTION OF FREELY PROGRAMMABLE DIGITAL OUTPUT C116 FUNCTION OF FREELY PROGRAMMABLE DIGITAL OUTPUT C117

The digital outputs A1 to A4 and the relay output can be assigned with the functions which are selected under C117. For this, first select the output to be assigned using C116. If for example the digital output A2 is selected with C116 = -2-, you can assign the indication "healthy" to the terminal using C117 = -4-.
Every function can only be assigned once. The relay output terminals K11, K14 can be assigned like the digital output terminals A1 to A4.
In addition, the assigned function can be changed in its polariy using C118.
With its factory setting, the digital output terminal A4 is assigned to the signal $6*f_d$.
If you want to use A4 as a digital output, switch S2 on the control module must be set to "A". In this case, the default setting for A4 is "Actual value = 0".

7.6.9 POLARITY OF DIGITAL OUTPUT C118

The functions assigned to the digital outputs A1 to A4 can change between HIGH active and LOW active.

> Caution: The setting of the polarity refers to the selected signal. It is lost when the function of the terminal is changed, i.e. with every new assignment, the factory-setting is activated.

7.6.10 PRESELECTION OF SURVEILLANCE C119 SURVEILLANCE FUNCTION C120

The surveillance functions "external fault" and "PTC motor protection fault" can be activated or deactivated using C120. In addition, you may select between a warning or a trip indication, in case a fault should occur (see 7.4.5). For this, first enter the desired surveillance function with C119 and then enter the function with C120.

For example, the surveillance function "external fault" is entered with C119 = -0-, then it is activated with C120 = -2- as warning.

A warning is automatically displayed, just like a Trip fault. Unlike a Trip fault, the displays (operating state display and plain text display of the operating unit 8102BB) are not flashing during a warning. During a warning, the signal "healthy" (RDY) is reset, but the operation of the frequency inverter is not interrupted. The warning is confirmed just like a Trip fault and is stored in the history buffer.

7.6.11 BAUD RATE C125

The baud rate is selected with C125.

7.6.12 ENABLE ADDITIONAL TI-TIMES C130

Terminal control:
The enable of the additional T_i times results from the binary coding of the input terminals used for this function.
A maximum of 4 digital inputs can be assigned to the function "enable of T_i times". This means that 1, 3, 7 or 15 addtional T_i times can be used.

The T_i times refer to f_{dmax} and can be calculated as described under 7.2.2.

If, for example, the terminals E1, E3, E4 and E5 are assigned for the T_i enable, E1 corresponds to the first terminal, E3 to the second terminal, E4 for the third terminal and E5 to the forth terminal in the following table:

	digital input terminals E1 to E5			
	1st term.	2nd term.	3rd term.	4th term.
T_{ir}(C012), T_{if}(C013)	0	0	0	0
$T_{ir}1$, $T_{if}1$ active	1	0	0	0
$T_{ir}2$, $T_{if}2$ active	0	1	0	0
...				
$T_{ir}15$, $T_{if}15$ active	1	1	1	1

For operation via the operating unit or the LECOM interface, you can enter the desired pair of ramp times with C130.

7.6.13 RAMP FUNCTION GENERATOR STOP C131

This function stops the ramp function generator for set-value 1.
The additional deceleration time for quick stop and the additional set-value are not affected.

In case of terminal control, C131 shows the state of the digital input. In case of operation via the operating unit 8102BB or the LECOM interface, the ramp function generator is stopped with C131.

7.6.14 RAMP FUNCTION GENERATOR INPUT = ZERO C132

This function resets the ramp function generator for set-value 1. The drive then decelerates with the activated deceleration to zero.

For terminal control, C132 shows if the function "ramp function generator input = zero" is active or not. In case of operation via the operating unit 8102BB or LECOM interface, the ramp function generator is set to zero with C132 = -1-.

7.6.15 CHARACTERISTIC OF RAMP FUNCTION GENERATOR C134

The ramp function generator characteristic - linear or S-shaped- is selected using C134.
An S-shaped characteristic enables a jerk-free acceleration for short T_i times. The S-shape is not maintained if the set-value (C046) is changed during the acceleration/deceleration and does not refer to the additional set-value.

7.6.16 THRESHOLD FOR CHOPPING FREQUENCY REDUCTION TO 1 KHZ C 143

The best smooth running with low speeds is obtained with a chopping frequency of 1 kHz. With C143, you can enter the field frequency, below which the chopping frequency is reduced automatically to this value.

7.6.17 DISPLAY OF PROCESS CONTROL STEP C160

If the process control has been activated, C160 is used to display the step which has been reached. If the process control is not activated (C044 = -0-) or finished, C160 = -0- is displayed.

7.6.18 REFERENCE INPUT C172

The display or input of the set-value 1 depends on C172, either relative to f_{dmax} (in $\%f_{dmax}$) or absolute as frequency (in Hz).

7.6.19 FUNCTION OF TERMINALS 21, 22 C176

The function of the control terminals 21, 22 depends on C176, either:

term. 21: Deactivate quick stop, do not invert set-value
term. 22: Deactivate quick stop, invert set-value

or: term. 21: Invert set-value
term. 22: Deactivate quick stop

7.6.20 PRESELECTION OF PROCESS CONTROL STEP C210 SET-VALUE C211 TI TIME C212 DURATION C213 NEXT STEP C214

To set a process control (see C044), one frequency set-value, one pair of acceleration and deceleration times, the duration and the next step can be assigned to each process control step.

First preselect the desired process control step using C210, then the required parameters can be assigned:

1) Set the frequency set-value which is valid for this step using C211. For this, set-value 1 (C046) and 15 JOG set-values are available.

2) Set the corresponding pair of acceleration and deceleration times using C212. Apart from the standard Ti times, C012/C013, you can select one of the 15 additional Ti times.

3) Set the duration of the preselected step using C213.

4) Set the next step using C214. After the process control has been activated, it always starts with step 1. You can enter any step as the next step so that loops are also possible. When entering C214 = -0-, the process control is finished, i.e. the set-value and the Ti times are controlled like before activating the process control.

7.6.21 ACCELERATION TIME FOR SET-VALUE 2 C220 DECELERATION TIME FOR SET-VALUE 2 C221

The acceleration and deceleration times for reference 2 (see 7.1.6) is set separately using C220, C221.

The T_i times refer to f_{dmax} and can be calculated as described under 7.2.2.

7.6.22 LOAD CHANGE ATTENUATION C 234

When operating with changing loads, where energy is repeatedly fed back into the DC bus of the inverter (e.g. with eccentric loads), the rise of the DC bus voltage is limited. The fed back energy is reduced so that the use of a brake chopper may not be necessary. The suppression of the load change oscillations is set using C234.

7.6.23 FREQUENCY PILOT CONTROL C 238

For closed-loop control, it is useful to keep the influence of the PI-controller low. In such applications, the output frequency can be pilot-controlled with the total set-value. (C238 = -1-). In this way the deviation in open-loop control is already very low and can be compensated by the PI-controller. The greater the system deviation, the higher the influence of the PI-controller (C074) must be set. This results in longer response times.

With closed-loop control it may be necessary for the influence to be up to 100%. In such cases, pilot control is generally not required (C238 = -0-).

Pilot control of the output frequency using the actual value (C238 = -2-) can be used in the case of particularly highly dynamic drive requirements, e.g. for the positioning of traversing drives. The output frequency is then pilot-controlled in line with the speed and the PI-controller generates the necessary slip to attain the set-value. Therefore the drive remains stable even with extremely short set-value changes.

7.6.24 Frequency setting range C 239

If working with closed-loop controlled configurations or with a second set-value in open-loop operation, it is conceivable that situations may arise in which the direction of motor rotation reverses. In pratice, this may not be desired. With code C239 = -1-, you can ensure that the drive is not able to reverse its direction of rotation.

7.6.25 WINDOW FOR DIGITAL OUTPUT ACTUAL VALUE = SET-VALUE C240

In closed-loop operation, the functions "actual value = set-value" indicates that the system deviation (difference between set-value and actual value) is within a certain specified range. The display range is designed as a window, which is positioned above and below the switching threshold. The width of this window can be specified using C240. The value is referenced to f_{dmax} (C011) and operates with a hysteresis of 0.4%.

In open-loop operation, the function "actual value = set-value" is mapped to the signal "ramp function generator input = output". The signal actual value = set-value can be assigned to one of the digital output terminals.

7.6.26 WINDOW FOR DIGITAL OUTPUT "RAMP GENERATOR INPUT = OUTPUT C241

As soon as the actual field frequency has reached the set frequency, the signal "ramp function generator input = output" is activated. For this, enter the size of a target window in per cent of the set-value with C241. The signal operates with a hysteresis of 0.4%.

The signal ramp function generator input = output can be assigned to one of the digital output terminals with C117.

7.6.27 LECOM1 - CODE BANK C249

Codes up to C255 can be processed with version 1.0 of the LECOM A/B protocol. To be able to reach codes of higher numbers with this version, the access range can be switched with code C249. Code C249 exists in all code ranges.

Further information about serial communication with the standard interface LECOM 1 (LECOM A/B) is contained in the LECOM A/B technical description, which we would be pleased to send on request.

7.6.28 SET-VALUE 1 (PROCESS DATUM) C380 TOTAL SET-VALUE (PROCESS DATUM) C381 ACTUAL VALUE OF PI-CONTROLLER (PROCESS DATUM) C382

With codes C380 to C382 it is possible to enter and read highly accurate set-values and actual values with a resolution of 14 bits and corresponding sign via the LECOM1 interface.

C380 Set-value 1:
Set-value 1 scaled to the maximum field frequency f_{dmax}, with numerical value 2^{14} corresponding to 100% f_{dmax}. The information corresponds to that in C046 with the difference that in this case you can read the controller value directly, thus excluding the possibility of any conversion error.

C381 Total set-value:
Total of set-value 1 and set-value 2, each downstream of the ramp function generator, scaled to f_{dmax}. In closed-loop control, the total set-value corresponds to the PI-controller set-value. The information corresponds to that in C050 with the difference that in this case you can read the controller value directly, thus excluding the possibility of any conversion error.
Code C381 can only be read.

C382 Actual value of PI-controller:
Actual value for the PI-controller, scaled to f_{dmax}, with numerical value 2^{14} corresponding to 100% f_{dmax}. The information corresponds to that in C051 with the difference that in this case you can read the controller value directly, thus excluding the possibility of any conversion error.

8. CODE TABLE

Code level	PRG <===>	Parameter level	Factory settings	Customer settings
	INITIALIZING			
C000 Code set		Code C00 can only be changed using the keys of the optional operating unit 810288 and not via interface. When a password is defined under C94, you can only change between -0- and -1- or -0- and -2- if you enter the password (+PW). After confirming the change with SH + PRG, enter the password using the ▲ or ▼ key and finish the entry with SH + PRG.		
	-0-	SH + PRG (+PW) Standard code set read only	-1-	
	-1-	SH + PRG (+PW) Standard code set		
	-2-	SH + PRG (+PW) Extended code set		
	-9-	Only for service		
		Password input (+PW)		
	XXX	SH + PRG Enter password according to C094		
C001 Operating mode		The operating mode can be changed via the keys of the operating unit 810288 and via the LECOM interface. The functions "controller enable" and "quick stop" can be controlled via terminals, independently of the operating mode. The same applies to terminal functions with assigned priority (C115).		
	-0-	SH + PRG Control: Terminals Param. setting: Keys	-0-	
	-1-	SH + PRG Control: Keys Param. setting: Keys		
	-2-	SH + PRG Control: Terminals Param. setting: LECOM interface (X6)		
	-3-	SH + PRG Control: LECOM interface (X6) Param. setting: LECOM interface (X6)		
		only possible when inverter is inhibited		
C002 Load parameter set	-0-	SH + PRG Factory setting	-1-	
	-1-	SH + PRG Parameter set 1		
	-2-	SH + PRG Parameter set 2		
	-3-	SH + PRG Parameter set 3		
	-4-	SH + PRG Parameter set 4		
		only possible when inverter is inhibited		
C003 Store parameter set	-1-	SH + PRG Parameter set 1	-1-	
	-2-	SH + PRG Parameter set 2		
	-3-	SH + PRG Parameter set 3		
	-4-	SH + PRG Parameter set 4		
		Parameter set 1 is loaded automatically after switching on.		

Code level	PRG <===>	Parameter level	Factory settings	Customer settings
C004 Switch-on display	xxx SH + PRG	Code number for display after switching-on	50	
		Only for optional operating unit 8102BB		
* C005 Configuration		Caution!!! When the configuration is changed, control structure and terminal assignment are changed. Change only possible when controller is inhibited!	-0-	
	-0- SH + PRG	Open-loop control, unipolar Set-value: analog via term. 8 Direc. of rot.: digital via terminals 21, 22		
	-1- SH + PRG	Open-loop control, bipolar set-value (set-value 1) and additional set-value (set-value 2) Set-value: analog via term. 8 Direc. of rot.: digital via term. 21, 22 and sign of set-value set-value 2: analog via term. 1, 2 cannot be changed to input via interface or 8102BB		
	-2- SH + PRG	Open-loop control with pulse train (set-value 1) and additional set-value (set-value 2) Set-value: Pulse train, two tracks via X5 cannot be changed to input via interface or 8102BB Direc. of rot.: digital via term. 21, 22 and phase position of pulse train tracks Set-value 2: analog via term. 1, 2 cannot be changed to input via interface or 8102BB		
	-11- SH + PRG	Closed-loop control with analog feedback Set-value 1: analog via term. 8 can be changed to input via interface or 8102BB Direc. of rot.: digital via term. 21, 22 and sign of the set-value Set-value 2: analog via term. 1, 2 cannot be changed to input via interface or 8102BB Actual value: analog via term. 3, 4 with evaluation of the sign for the direction of rotation		
	-13- SH + PRG	Closed-loop control with incremental encoder feedback Set-value 1: analog via term. 8 can be changed to input via interface or 8102BB Direc. of rot.: digital via term. 21, 22 and sign of the set-value can be changed to input via interface or 8102BB Set-value 2: analog via term. 1, 2 cannot be changed to input via interface or 8102BB Actual value: incremental encoder, 2 tracks via X5 (tracks A, A/, B, B/) detection of the direction of rotation via phase position of the tracks		

Code level	PRG <===>	Parameter level	Factory settings	Customer settings
		-16- SH + PRG Closed-loop control with pulse train set-value via X5 (tracks 0, 0/) and incremental encoder feedback via X5 (tracks A, A/, B, B/) Set-value 1: pulse train single-track via X5 (track 0, 0/) Direc. of rot.: digital via term. 21, 22 can be changed to input via interface or 8102BB Set-value 2: analog via term. 1, 2 cannot be changed to input via interface or 8102BB Actual value: incremental encoder, 2 tracks via X5 (tracks A, A/, B, B/) detection of the direction of rotation via phase position of the tracks		
C006 Control mode		-0- SH + PRG Trip -1- SH + PRG Clamp Change only possible when controller inhibited!	-1-	
* C009 LECOM1-controller address		xx SH + PRG 1...99 The controller address can only be changed in the operating modes C001 = -0- and -1-. Controller address for communication via LECOM1 "x0" is not possible; X is a group address	1	
		OPERATING PARAMETERS		
C010 minimum field frequency f_{dmin}	xxx Hz 0.0...480Hz	0,0...100Hz (0,1Hz) 100...480Hz (1Hz) f_{dmin} is only effective in case of analog set-value in configuration C005 = -0-.	0.0Hz	
C011 maximum field frequency f_{dmax}	xxx Hz 7.5...480Hz	7.5...100Hz (0,1Hz) 100...480Hz (1Hz) Caution!!! In case of parameter setting via interface, comprehensive changes must be in one step only while the controller is inhibited.	50.0Hz	
C012 Acceleration T_{if} (for set-value 1) C013 Deceleration T_{if} (for set-value 1)	xxx s 0.0...990s xxx s 0.0...990s	0.0...1s (10ms) 1...10s (100ms) 10...100s (1s) 100...990s (10s) Acceleration and deceleration times refer to a frequency change of 0Hz to the maximum field frequency set under f_{dmax}	5.0s 5.0s	
C014 V/f characteristic		-0- SH + PRG linear characteristic U - f_d -1- SH + PRG square characteristic U - f_d^2 Change only possible when controller inhibited!	-0-	
C015 V/f rated frequency f_{dN}	xxx Hz 7.5...960Hz	7.5...100Hz (0.1Hz) 100...960Hz (1Hz)	50.0Hz	
C016 Voltage boost U_{min}	xxx % 0.0...40%	(0.1%)	0.0%	
* C017 Threshold Q_{min}	xxx Hz 0.0...480Hz	0,0...100Hz (0,1Hz) 100...480Hz (1Hz) Open-loop control: If the output frequency falls below this threshold, the Qmin signal is set. Closed-loop control: If the actual value of the PI-controller falls below this threshold, the Qmin signal is set.	2.0Hz	

Code level	PRG <===>	Parameter level	Factory settings	Customer settings
* C018 Chopper frequency f_{ch}				
	-0- SH + PRG	1000 Hz	-2-	
	-1- SH + PRG	1500 Hz		
	-2- SH + PRG	2000 Hz		
	-3- SH + PRG	3300 Hz		
	-4- SH + PRG	3600 Hz		
	-5- SH + PRG	4000 Hz		
		Change is only possible when controller inhibited!		
* C019 Threshold of automatic DC brake	xxx Hz	0...480Hz 0.0...100Hz (0,1Hz) 100...480Hz (1Hz) With the setting 0.0 Hz the automatic activation of the DC brake is switched off.	0.0Hz	
C025 Preselection: Encoder		First, select the input to be adjusted via C025. Then, adjust the inputs using C026 and C027.		
	-1- SH + PRG	Analog input term. 1, 2 Set-value 2 when C005= -1- ... -16-	-4-	
	-4- SH + PRG	Actual value input term. 3, 4 Actual value wit C005 = -11-		
	-10- SH + PRG	Pulse train/Incremental encoder input X5 (Tracks A, A/, B, B/) Set-value 1 with C005 = -2- Actual value with C005 = -13-, -16-		
	-11- SH + PRG	Pulse train input X5 (Tracks 0, 0/) Set-value 1 with C005 = -16-		
C026 Constant for [C025]		For analog inputs		
	XXXX	-1000 ... +1000mV Offset correction (1mV)	term.1,2 0mV	
		For input of pulse train/ incremental encoder X5	term 8 0mV	
	-1- SH + PRG	512 pulses/Hz or increments/rev.	X5: -1-	
	-2- SH + PRG	1024 pulses/Hz or increments/rev.		
	-3- SH + PRG	2048 pulses/Hz or increments/rev.		
	-4- SH + PRG	4096 pulses/Hz or increments/rev.		
C027 Setting for [C025]		For analog inputs		
	XXXX	-2.500 ... +2.500 Signal amplification (0.001)	term.1,2 1.000	
		For input of pulse train/ incremental encoder X5	term 8 1.000	
	XXXX	-5,000 ... +5,000 Signal amplification (0.001)	X5: 1.000	
		For set-value input via pulse train: The field frequency is obtained from f_{dsoll} [Hz] = f_{Leit} [Hz] · C027/C026.		
		For actual value feedback via incremental encoder: With C026, the number of increments for one revolution of the shaft can be entered.		

Code level	PRG <===> Parameter level	Factory settings	Customer settings
C029 Auto-adjustment for actual value of the PI controller	-1- SH + PRG Make auto-adjustment		
C034 Master current	-0- SH + PRG Master voltage ± (0 to 10V) SH + PRG Master current ± (0 to 20 mA) -1- SH + PRG Master current ± (4 to 20 mA)	-0-	
C036 Voltage for DC brake	xxx % 0...40% (0.1%)	0.0% U_N	
C038 Preselection: JOG set-value	Select the desired JOG set-value with C038, then enter the JOG frequency with C039. -1- SH + PRG JOG1 set-value -2- SH + PRG JOG2 set-value .... -15 SH + PRG JOG15 set-value	-1-	
C039 Set-value for [C038]	xxx Hz -480...+480Hz 0.0...100Hz (0.1Hz) 100...480Hz (1Hz) Set-values > fdmax are limited internally to fdmax.	JOG1 50.0Hz JOG2 30.0Hz JOG3 0.0Hz JOG4 10.0Hz JOG5 0.0Hz ... JOG15 0.0Hz	
	CONTROL PARAMETERS		
C040 Controller enable	-0- SH + PRG Controller inhibited -1- SH + PRG Controller enabled Inhibit controller: term. 28 = 0V (or using 8102BB: Press STP key) Enable controller: term.28 = 13...30V (or using 8102BB: SH + STP, if STP has been pressed before)		
C041 Direction of rotation	-0- SH + PRG Set-value not inverted -1- SH + PRG Set-value inverted		
C042 Quick stop QSP	-0- SH + PRG Quick stop not active -1- SH + PRG Quick stop active		
* C043	Code C043 is used to reset a fault via the LECOM interface (see C067) Reset using C043 = -0- C043 can only be reached via the LECOM interface		
C044 Enable process control	-0- SH + PRG Process control not active -1- SH + PRG Process control active		
C045 Enable JOG set-value	-0- SH + PRG Set-value (C046) active -1- SH + PRG JOG1 set-value active .... -15 SH + PRG JOG15 set-value active		

Code level	PRG <===>	Parameter level	Factory settings	Customer settings
C046 Set-value 1	xxx	-100...+100% f_{dmax} (0.1%) for relative set value input (C172 = 1)		
	xxx	$-f_{dmax}$...$+f_{dmax}$ 0.0...100Hz (0.1Hz) 100...480Hz (1Hz) for absolute set value input (C172 = 0)		
		Absolute set values > fdmax are limited internally to fdmax.		
C048 DC brake	-0-	SH + PRG DC brake not active		
	-1-	SH + PRG DC brake active		
	DISPLAY VALUES			
C049 Display set value 2	xxx	% -100...+100% f_{dmax} (0,1%)		
C050 Output frequency f_d	xxx	Hz $-f_{dmax}$ ... $+f_{dmax}$ 0,0...100Hz (0.01Hz) 100...480Hz (0.1Hz)		
C051 Actual value of PI controller	xxx	-100...+100% f_{dmax} (0.1%) for relative set value input (C172 = 1)		
	xxx	$-f_{dmax}$...$+f_{dmax}$ 0.0...100Hz (0.1Hz) max. -480 ...+480Hz 100...480Hz (1Hz) for absolute set value input (C172 = 0)		
C52 Motor voltage V_M	xxx	V 0 ... U_{mains} (1V)		
C53 DC bus voltage	xxx	V (1V)		

Code level	PRG <===>		Parameter level	Factory settings	Customer settings
C067 Trip fault indication			In case of a fault, trip is set. This fault is indicated automatically (see 5.). The fault indication is flashing, as long as the fault is not confirmed. Trip is reset either by pressing SH + PRG or via the digital input TRIP-RESET E2 (factory setting) the operating unit 8102BB with SH+PRG or via the LECOM-interface (with C043, see 7.3.3)		
			Display in case of operation with, without operating unit 8102BB or with LECOM interface		
	---	0	No fault (LECOM-No. 0)		
	OC1	1	Short-circuit or overload (LECOM-No. 11)		
	OC3	3	Overload during acceleration (LECOM-No. 13)		
	OC4	4	Overload during deceleration (LECOM-No. 14)		
	OL	7	Overload of digital outputs (LECOM-No. 76)		
	OH	8	Overheat of heatsink (LECOM-No. 50)		
	OH3	9	Motor overheat, PTC (LECOM-No. 53)		
	EEr	A	external Trip (LECOM-No. 91)		
	U15	b	±15V-supply defective (LECOM-No. 70)		
	CCr	C	System error (LECOM-No. 71)		
	Pr	d	Parameter reset (LECOM-No. 72) Another software version was recognized. After confirmation of the fault or mains reconnection, the factory setting is loaded in all parameter sets.		
	Pr1 bis Pr4		Parameter reset (LECOM-No. 72) A fault was recognized in parameter set 1, 2, 3 or 4 and the parameter set of the factory setting was loaded. Save the loaded parameters, if necessary, after the changes, with C003, to avoid Pr1 to Pr4 appearing again.		
	PEr	7	Program fault (LECOM-No. 74)		
Warning	W51	A	Warning PTC-input (LECOM-No.203)		
	W91	9	External fault (LECOM-No.241) Warning via the digital input TRIP-Set		
			During the warning, the RDY signal is reset.		
Surveillance indication	LU	E	Undervoltage		
	OU	F	Overvoltage		
			During the surveillance indication, the inverter is inhibited (IMP) and the keys of the operating unit are out of function. The inverter and the keys are enabled automatically after the cause of the indication has been eliminated.		

Code level	PRG <===> Parameter level	Factory settings	Customer settings
	GENERAL PARAMETERS		
C068 C069	Codes C068 and C069 contain information about the controller status. They can only be read via the LECOM - interface.		
C070 Gain PI-controller	xxx 0.01...300 0.01...1.00 (0.01) 1.0 ...10.0 (0.1) 10...300 (1)	1.0	
C071 Response time PI controller	xxxx s 0.010...100s 0.01...1.00s (0.01s) 1.0 ...10.0s (0.1s) 10 ...300s (1s) When entering 9999, the I-component is switched off.	0.10s	
C074 Influence PI controller	xxx % 0 ...100% 0.0 ...100% (0.1%)	0.0%	
C081 Rated motor power P_{mot} [kW]	The rated motor power (nameplate) must be entered to adapt the motor to the inverter, in order to ensure a smooth running with low speeds. -0- SH + PRG 0.18kW -1- SH + PRG 0.25kW -2- SH + PRG 0.37kW -3- SH + PRG 0.55kW -4- SH + PRG 0.75kW -5- SH + PRG 1.1kW -6- SH + PRG 1.5kW -7- SH + PRG 2.2kW -8- SH + PRG 3.0kW -9- SH + PRG 4.0kW Change is only possible with controller inhibit.		
* C093 Controller type	-xx 810x = Controller type Only for LECOM interface.		
* C094 User password	xxx SH + PRG 0...999 If 0 is set, no password is requested under C00.	0	
C098 Languge	-0- SH + PRG German -1- SH + PRG English -2- SH + PRG French	-0-	
* C099 Software version	-0- 81 6.0		
	APPLICATION PARAMETERS		
* C100 Preselection: Additional Ti time (set-value 1)	Select the desired Ti time with C100, then set the Ti time with C101 or C103. -1- SH + PRG Acceleration $T_{if}1$ or Deceleration $T_{if}1$ -2- SH + PRG Acceleration $T_{if}2$ or Deceleration $T_{if}2$ .... -15 SH + PRG Acceleration $T_{if}15$ or Deceleration $T_{if}15$	-1-	

Code level	PRG <===>	Parameter level	Factory settings	Customer settings
* C101 Acceleration time for [C100]	xxx	0.0...990s $T_{ir}1$	2.5s	
		0.0...1s {10ms} $T_{ir}2$	10.0s	
		1...10s {100ms}		
		10...100s {1s} $T_{ir}3$	5.0s	
		100...990s {10s}		
		...		
		$T_{ir}15$	5.0s	
* C103 Deceleration time for [C102]	xxx s	0.0...990s $T_{if}1$	2.5s	
		0.0...1s {10ms} $T_{if}2$	10.0s	
		1...10s {100ms}		
		10...100s {1s} $T_{if}3$	5.0s	
		100...990s {10s}		
		...		
		$T_{if}15$	5.0s	
* C105 Deceleration time for quick stop	xxx s	0.0...990s 0.0...1s {10ms}	5.0s	
		1...10s {100ms}		
		10...100s {1s}		
		100...990s {10s}		
* C107 Holding time for DC brake	xxx s	0.0...990s 0.0...1s {10ms}	999s	
		1...10s {100ms}		
		10...100s {1s}		
		100...990s {10s}		
		When 999s is set, the holding time is not limited.		
* C108 Amplification for [C110]	xxxx	-10.00...+10.00 {0.01}	1.00	
* C109 Offset for [C110]	xxxx	-1000...+1000mV {1}	0mV	
* C111 Monitor signal	-0- SH + PRG	no signal	-5-	
	-2- SH + PRG	Set-value 1 f_{dset} (C046, JOG)		
	-5- SH + PRG	Total set-value, set-value for PI controller		
	-6- SH + PRG	Actual value PI controller		
	-7- SH + PRG	Output PI controller		
	-9- SH + PRG	Actual frequency f_d (C050)		
	-30- SH + PRG	Motor voltage		
	-31- SH + PRG	DC bus voltage		
		The monitor output (term. 62) can be adjusted additionally using C108 and C109. Change is only possible with controller inhibit.		

Code level	PRG <===>	Parameter level	Factory settings	Customer settings
* C112 Preselection: Freely assignable digital input		Select the desired input using C112, then assign the function under C113, and the polarity under C115.		
	-1- SH + PRG	digital input terminal E1	-1-	
	-2- SH + PRG	digital input terminal E2		
	....			
	-5- SH + PRG	digital input terminal E5		
		Change is only possible when controller inhibited		
* C113 Function freely assignable digital input for [C112]	-0- SH + PRG	no function	term.E1 -4-	
	-1- SH + PRG	Enable of additional Ti times	term. E2 -3-	
	-2- SH + PRG	Enable for JOG set-values	term. E3 -5-	
	-3- SH + PRG	TRIP Reset	term. E4 -2-	
	-4- SH + PRG	TRIP Set	term. E5 -2-	
	-5- SH + PRG	Enable of DC brake		
	-7- SH + PRG	I-component = zero		
	-9- SH + PRG	Ramp function generator stop		
	-10 SH + PRG	Ramp function generator input = 0		
	-13 SH + PRG	Enable process control		
	-20 SH + PRG	Select parameter set		
	-21 SH + PRG	Load parameter set		
		Change is only possible when controller inhibited		
* C114 Polarity freely assignable digital input for [C112]	-0- SH + PRG	Input HIGH active	term. E1 -0-	
	-1- SH + PRG	Input LOW active	term. E2 -0-	
		Change only possible when controller inhibited!	term. E3 -0-	
			term. E4 -0-	
			term. E5 -0-	
* C115 Priority freely assignable digital input for [C112]	-0- SH + PRG	can be switched off via C001	term. E1 -1-	
	-1- SH + PRG	cannot be switched off via C001	term. E2 -1-	
		Change is only possible when controller inhibited!	term. E3 -0-	
		The control codes of priority signals should not be changed via the operating unit 8102BB or the LECOM interfacee, because the terminal signal will overwrite these settings.	term. E4 -0-	
			term. E5 -0-	

Code level	PRG <===>	Parameter level	Factory settings	Customer settings
* C116 Preselection: Freely programmable digital output		Select the desired output with C116, then assign the functions with C117 and the polarity with C118		
	-1- SH + PRG	digital output term. A1	-1-	
	-2- SH + PRG	digital output term. A2		
	-3- SH + PRG	digital output term. A3		
	-4- SH + PRG	digital output term. A4		
	-5- SH + PRG	Relay output terminals K11, K14		
* C117 Function freely assignable digital output	-0- SH + PRG	no function	term. A1 -1-	
	-1- SH + PRG	open-loop control $fd \geq f_{dmin}$ (Q_{min}) closed-loop control $f_{ist} \geq f_{dmin}$ (Q_{min})	term. A2 -3-	
	-3- SH + PRG	Peak current limit(Imax)		
	-4- SH + PRG	healthy (RDY)	term. A3 -9-	
	-5- SH + PRG	Pulse inhibit (IMP)		
	-6- SH + PRG	Fault indication (TRIP)	term. A4 -11-	
	-9- SH + PRG	Ramp function generator input = output (HLG/A=E)	Relay output -6-	
	-10- SH + PRG	Actual value = set-value		
	-11- SH + PRG	Actual value = 0		
	-30- SH + PRG	Process control active		
	-31- SH + PRG	Process step 1 active		
	-32- SH + PRG	Process step 2 active		
	-33- SH + PRG	Process step 3 active		
	-34- SH + PRG	Process step 4 active		
	-35- SH + PRG	Process step 5 active		
	-36- SH + PRG	Process step 6 active		
	-37- SH + PRG	Process step 7 active		
	-38 SH + PRG	Process step 8 active		
		Change is only possible when controller inhibited!	-1-	
* C118 Polarity freely assignable digital output	-0- SH + PRG	Signal not inverted	term. A1 -1-	
	-1- SH + PRG	Signal inverted	term. A2 -0-	
		Change only possible when controller is inhibited	term. A3 -0-	
			term. A4 -0-	
			Relay output -1-	

Code level	PRG <===>	Parameter level	Factory settings	Customer settings
* C119 Preselection: Surveillance		Enter the desired surveillance function with C119, then set the function using C120.		
	-0- SH + PRG	External fault	-0-	
	-1- SH + PRG	PTC input		
* C120 Surveillance function for [C119]	-0- SH + PRG	Surveillance not active	external fault -1-	
	-1- SH + PRG	Surveillance active, TRIP	PTC input -1-	
	-2- SH + PRG	Surveillance active, warning		
* C125 LECOM1-Baud rate	-0- SH + PRG	9600 Baud	-0-	
	-1- SH + PRG	4800 Baud		
	-2- SH + PRG	2400 Baud		
	-3- SH + PRG	1200 Baud		
* C130 Enable additional T_i times	-0- SH + PRG	T_{ir} (C012)/T_{if} (C013) active	-0-	
	-1- SH + PRG	$T_{ir}1/T_{if}1$ active		
	-2- SH + PRG	$T_{ir}2/T_{if}2$ active		
	....			
	-15 SH + PRG	$T_{ir}15/T_{if}15$ active		
* C131 Ramp function generator stop (set-value 1)	-0- SH + PRG	Ramp function generator is enabled	-0-	
	-1- SH + PRG	Ramp function generator is stopped		
* C132 Ramp function generator input = 0 (set-value 1)	-0- SH + PRG	Input signal of ramp function generator is set-value 1	-0-	
	-1- SH + PRG	Input of ramp function generator is set to zero		
* C134 Ramp function generator characteristic (set-value 1)	-0- SH + PRG	linear characteristic	-0-	
	-1- SH + PRG	S-shaped characteristic		
		Change is only possible when controller inhibited!		
* C143 Threshold for f_{CH} reduction	XXX	0,0...10,0Hz Threshold for f_{CH} reduction to 1 kHz	0.0 Hz	
* C160 Display process step	-X-	Process step X active X = 0 Process control not active/finished	-0-	
* C161 : : C168		Codes C161 to C168 contain the eight last faults which were reset under C067. They can only be read via the LECOM interface (for LECOM numbers see C067)		
* C172 Set-value input	-0- SH + PRG	Set-value 1 (C046) is entered relative to f_{dmax}	-0-	
	-1- SH + PRG	Set-value 1 (C046) is entered absolute as frequency		
		Change is only possible when controller inhibited!		

Code level	PRG <===> Parameter level	Factory settings	Customer settings
* C176 Function terminals 21, 22	-0- SH + PRG term. 21: Remove quick stop do not invert set-value SH + PRG term. 22: Remove quick stop, invert set-value -1- SH + PRG term. 21: Inversion of set-value term. 22: Remove quick stop Change is only possible when controller inhibited!	-0-	
* C200	Code 200 contains the complete software identification. It can only be read via the LECOM interface.		
* C210 Preselection: Process control step	Preselect desired process control step using C210, then enter set-value under C211, Ti-times under C212, duration under C213, next step under C214. -1- SH + PRG Step 1 -2- SH + PRG Step 2 ... -8- SH + PRG Step 8		
* C211 Set-value for [210]	-0- SH + PRG Set-value 1 (C046) -1- SH + PRG JOG set-value 1 -2- SH + PRG JOG set-value 2 ... -15 SH + PRG JOG set-value 15	Step 1 -1- Step 2 -2- ... Step 8 -8-	
* C212 Ti time for [C210]	-0- SH + PRG Ti time C012/C013 -1- SH + PRG Ti time Tir1/Tif1 -2- SH + PRG Ti time Tir2/Tif2 ... -15 SH + PRG Ti time Tir15/Tif15	Step 1 -1- Step 2 -2- ... Step 8 -8-	
* C213 Duration for [210]	xxx s 0.0...9900s 0.0...1s (10ms) 1...10s (100ms) 10...100s (1s) 100...990s (10s) 1000...9900s (100s) 9999s = infinite	Step 1 10.0s ... Step 8 10.0s	
* C214 Next step for [C210]	-0- SH + PRG Finish process control -1- SH + PRG Step 1 -2- SH + PRG Step 2 ... -8- SH + PRG Step 8	Step 1 -2- Step 2 -3- Step 3 -4- Step 4 -5- Step 5 -0- ... Step 8 -0-	

Code level	PRG <===>	Parameter level	Factory settings	Customer settings
* C220 Acceleration time for set-value 2 (additional set-value)	xxx s	0.0...990s 0.0...1s (10ms) 1...10s (100ms) 10...100s (1s) 100...990s (10s)	5.0s	
* C221 Deceleration time for set-value 2 (additional set-value)	xxx s	0.0...990s 0.0...1s (10ms) 1...10s (100ms) 10...100s (1s) 100...990s (10s)	5.0s	
* C234 Load change attenuation	xxx	0.00...5.0 (0.01)	2.5	
* C238 Frequency pilot control		In closed-loop control, the control structure can be changed via the setting of the frequency pilot control. With frequency pilot control: Speed control Without frequency pilot control: Process control		
	-0- SH + PRG	no pilot control		
	-1- SH + PRG	with set-value pilot control	-1-	
	-2- SH + PRG	with actual value pilot control		
		Change is only possible with controller inhibit		
* C239 Frequency setting range		In all configurations, the setting range of the output frequency can be limited to only one direction of rotation.		
	-0- SH + PRG	Bipolar frequency setting range $-f_{dmax} \cdots +f_{dmax}$	-0-	
	-1- SH + PRG	Unipolar frequency setting range $0 \ldots +f_{dmax}$		
		Change is only possible with controller inhibit		
* C240 Window for digital output actual value = set-value	xxx %	0.0...100% (0.1%)	0.5%	
* C241 Window for ramp function generator output = input	xxx %	0.0...100% (0.1%)	0.5%	
* C249 LECOM1 code bank	xxx	0...7 (1)	0	
		Only for LECOM interface		

Code level	PRG <===>	Parameter level	Factory settings	Customer settings
* C380 Set-value 1 (Process datum)		-16384...+16384 (1) Set-value 1 scaled to f_{dmax} --- Only for LECOM interface		
* C381 Total set-value (Process datum)		-16384...+16384 (1) Total set-value scaled to f_{dmax} --- Only for LECOM interface; read only is possible. Write format: C000...4000 Hex (4 digits, only absol.) value or -1,634...+1,634 decimal		
* C382 Speed controller actual value (Process datum)		-16384...+16384 (1) Actual value of speed controller scaled to f_{dmax} In open-loop control, 0 is output. --- Only for LECOM interface; read only is possible. --- The number of 2^{14} corresponds to 100% f_{dmax}		

* = extended code set

SH + PRG to confirm the set parameters refer to the optional operating unit 8102BB (see 5 and 6)

{xxx} = Resolution

8. SURVEILLANCE AND PROTECTIVE FUNCTIONS

The inverters of the 8100 series incorporate various protective functions to prevent non-permissible operating conditions. When a protective function is activated, the inverter always sets pulse inhibit (IMP). In some cases, Trip is also set. After the cause of fault is removed, Trip must be reset. Pulse inhibit is reset automatically. In case of controller inhibit and Trip, the decimal point of the LED operating display is flashing.

8.1 VOLTAGE SURVEILLANCE

		Display (8102BB)	Operating state display	
Electronic supply	Vcc ≤ 12V	U 1 5	b	TRIP
Overvoltage	U_G ≥ 385V	O U	F	IMP
Undervoltage	U_G ≤ 140V	L U	E	IMP Ramp function generator stop

8.2 CURRENT SURVEILLANCE

Overload**	$I_{mot} > 1.6 I_N$	0 C 1	1	TRIP
Overcurrent during acceleration**	$I_{mot} > 1.6 I_N$	0 C 3	3	TRIP
Overcurrent during deceleration**	$I_{mot} > 1.6 I_N$	0 C 4	4	TRIP
Short-circuit at motor terminals	two- or three phase	0 C 1	1	TRIP

** only for operating mode **TRIP**

Overload of digital output terminals A1...A4	I > 50mA	0 L	7	TRIP

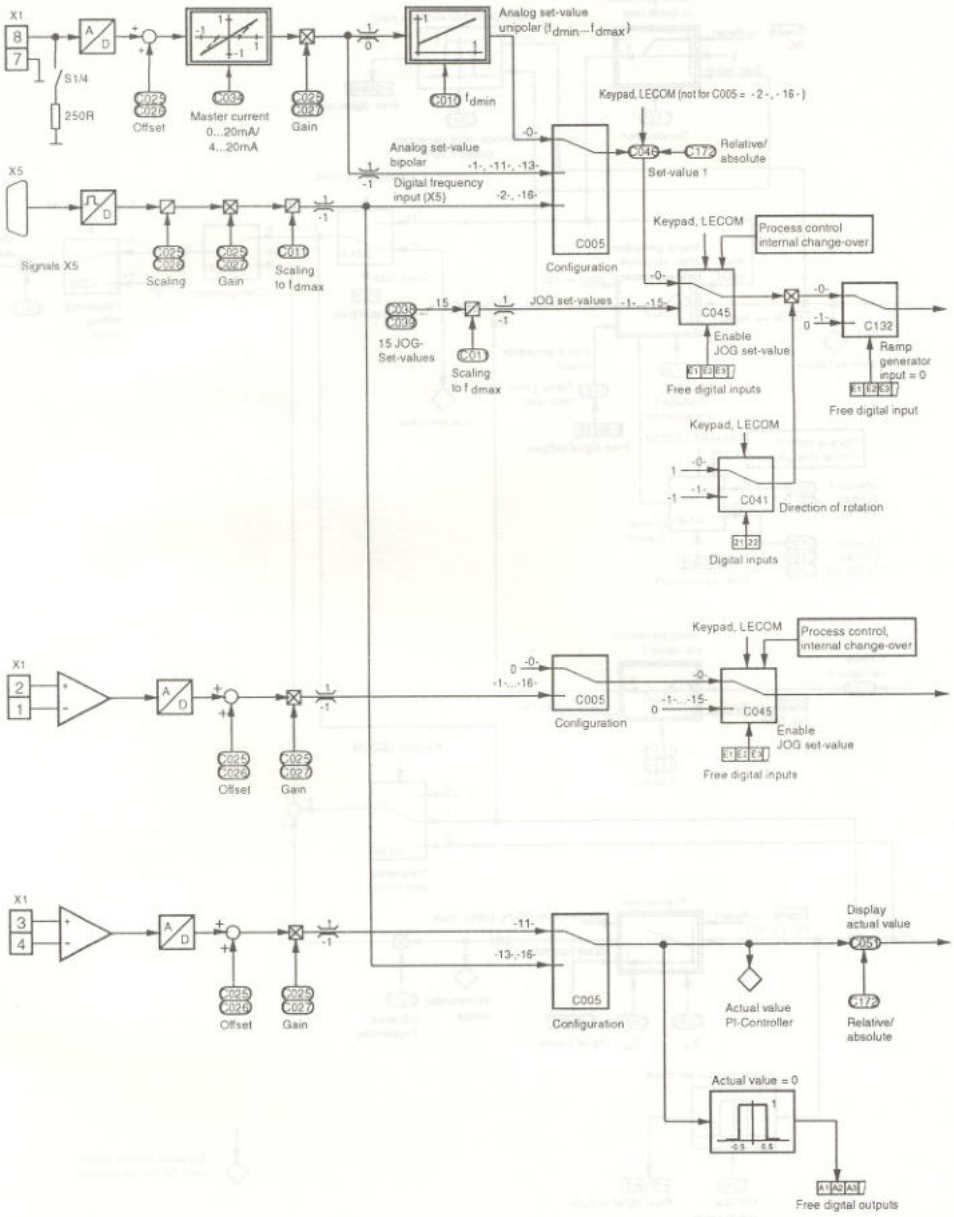
8.3 TEMPERATURE SURVEILLANCE

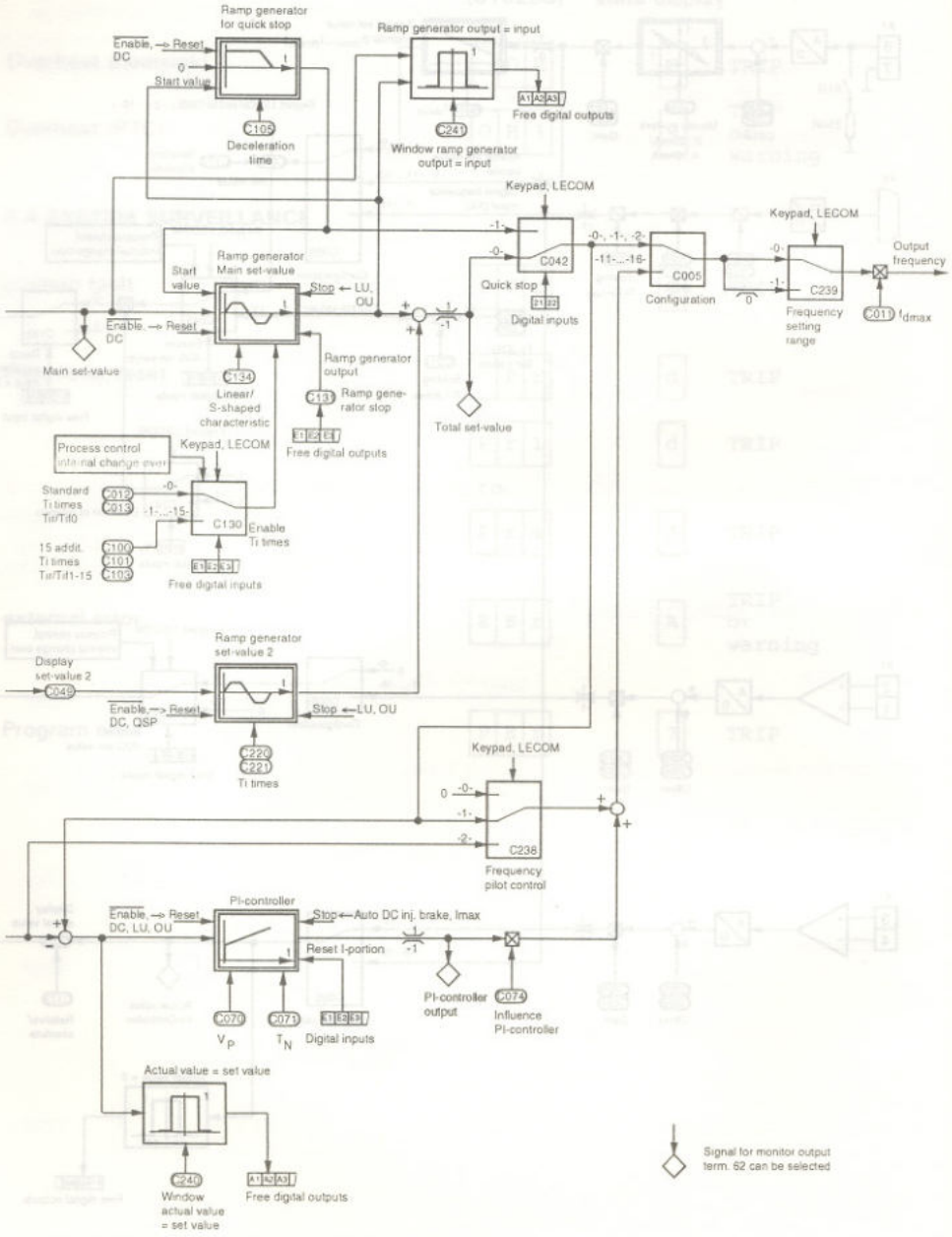
	Display (8102BB)	Operating state display	
Overheat (heatsink)	OH	8	TRIP
Overheat (PTC)	OH3	9	TRIP or warning

8.4 SYSTEM SURVEILLANCE

System fault	CCr	C	TRIP
Parameter reset	Pr	d	TRIP
	Pr1	d	TRIP
	to		
	Pr4	d	TRIP
external error	EEr	A	TRIP or warning
Program error	PEr	7	TRIP

9. SIGNAL FLOW CHART




Ramp generator for quick stop
Enable, → Reset
DC
0
Start value
C105
Deceleration time
Ramp generator output = input
C241
Window ramp generator output = input
A1 A2 A3
Free digital outputs
Keypad, LECOM
-1-
-0-
C042
-0-, -1-, -2-
-11-...-16-
C005
Configuration
Keypad, LECOM
-0-
-1-
C239
Frequency setting range
Output frequency
C011 fdmax
Start value
Ramp generator Main set-value
Stop ← LU, OU
Quick stop
E1 E2
Digital inputs
Enable, → Reset
DC
Main set-value
C134
Linear/ S-shaped characteristic
Ramp generator output
C118
Ramp generator stop
E1 E2 E3
Free digital outputs
Total set-value
Process control
Internal change over
Keypad, LECOM
Standard Ti times
Tir/Tif0
C012
C013
-0-
-1-...-15-
C130
Enable Ti times
15 addit. Ti times
Tir/Tif1-15
C100
C101
C102
E1 E2 E3
Free digital inputs
Ramp generator set-value 2
Display set-value 2
C049
Enable, → Reset
DC, QSP
Stop ← LU, OU
C220
C221
Ti times
Keypad, LECOM
0
-0-
-1-
-2-
C238
Frequency pilot control
PI-controller
Enable, → Reset
DC, LU, OU
Stop ← Auto DC inj. brake, Imax
Reset I-portion
-1
PI-controller output
C074
Influence PI-controller
C070
V_P
C071
T_N
E1 E2 E3
Digital inputs
Actual value = set value
C240
Window actual value = set value
A1 A2 A3
Free digital outputs
Signal for monitor output term. 62 can be selected