



ALSPA MV1000

1,7 kVA ... 135 kVA

Order No. 029.222 821

Issue: 09/06 AE01

Frequency converter



Operating Manual



Safety and Operating Instructions for Frequency Converters

According to Low Voltage Directive 73/23 EEC

1. General

During operation, power converters can have live, rotating or moving parts and their surfaces may become hot, depending on the protection class involved.

There is also a risk of severe physical injury or material damage if any of the covers are removed or the unit is installed, used or operated incorrectly.

Further details are given in the documentation.

All transport, installation, commissioning and maintenance work must be carried out by qualified specialist personnel (according to IEC 60364, CENELEC HD 384 or DIN VDE 0100 and IEC 60664 or DIN VDE 0110 and national safety controls).

Qualified specialist personnel in the sense of these safety instructions are persons who are experienced in the installation, erection, commissioning and operation of the product and have the qualifications required for such work.

2. Correct use

Frequency converters are intended for installation in electrical plant or machinery.

When installed in machines, the converters may not be commissioned (i.e. operation of the converter may not be started) until it is evident that the machine complies with EC directive 98/37/EC (Machine Directive) (formerly 89/392/EEC). Also EN 60204 must be observed.

Commissioning (i.e. operation) is only permitted in compliance with the EMC directive (89/336/EEC).

Our frequency converters satisfy the requirements of low voltage directive 73/23/EEC. The standards of the series EN 50178/DIN VDE 0160 in conjunction with EN 60439-1/VDE 0660 Part 500 and EN 60146/VDE 0558 are applicable to frequency converters.

The technical data and the connection conditions are shown on the rating plate and in the documentation. They must be observed.

3. Transport and storage

The instructions for transport, storage and correct handling must be observed.

Climatic conditions are to be maintained according to EN 50178.

4. Installation

The installation and cooling must be in accordance with the relevant documentation.

All converters must be protected against undue stress. In particular, components must not be bent or insulation spacing altered during transport and handling. Do not touch electronic components or contacts.

Converters contain components susceptible to electrostatic discharge (ESD) which are easily damaged if handled incorrectly. Do not damage mechanically or destroy electrical components (potential health hazard).

5. Electrical connection

Appropriate national safety controls (e.g. BGV A2) must be observed when working on converters which are connected to the electricity supply.

The electrical installation must be executed in accordance with the relevant controls (e.g. cable cross-sections, fuses, earthing). Additional instructions are given in the documentation.

Instructions on EMC-compliant installation, such as screening, earthing, filters and cable routing, are also given in the converter documentation. These also apply to converters bearing the CE mark. Compliance with the limits specified in EMC legislation is the responsibility of the plant or machinery manufacturer.

6. Operation

If necessary, plant or machinery in which converters are fitted must be equipped with additional monitoring and safety facilities in accordance with relevant controls, e.g. the law on technical equipment, the appropriate safety controls, etc.

Do not touch any parts of the equipment which may be live or any power connections even after the converter has been isolated from the electricity supply, as capacitors may remain charged. Follow the instructions given on warning labels.

All covers and doors must be kept closed during operation.

7. Service and maintenance

All instructions given in the manufacturer's documentation must be observed.

Keep these safety instructions in a safe place!

Safety and operating instructions according to UL

The following conditions must be observed, if the installation should meet the requirements according to UL:

- **MV1003 ... MV1059:** Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 480 V maximum.
- **MV1089 ... MV1171:** Suitable for use on a circuit capable of delivering not more than 10000 rms symmetrical amperes, 480 V maximum.
- Use 60/75 °C copper wire only
- Refer to the following table concerning the maximum tightening torque for screws:

Type	L ₁ , L ₂ , L ₃ , +U _G , -U _G	U, V, W	PE	Screen Strain-relief	X4, X5, X6
ALSPA MV	[Nm]	[Nm]	[Nm]	[Nm]	[Nm]
1003...1024	0.5 ... 0.6 (4.4 ... 5.3 lbin)	0.5 ... 0.6 (4.4 ... 5.3 lbin)	3.4 (30 lbin)	M4: 1.7 (15 lbin)	0.5 ... 0.6 (4.4 ... 5.3 lbin)
1032...1059	4 (35 lbin)	4 (35 lbin)	4 (35 lbin)	M5: 3.4 (30 lbin)	0.5 ... 0.6 (4.4 ... 5.3 lbin)
1089	7 (62 lbin)	7 (62 lbin)	7 (62 lbin)		0.5 ... 0.6 (4.4 ... 5.3 lbin)
1110...1171	12 (106.2 lbin)	12 (106.2 lbin)	12 (106.2 lbin)		0.5 ... 0.6 (4.4 ... 5.3 lbin)

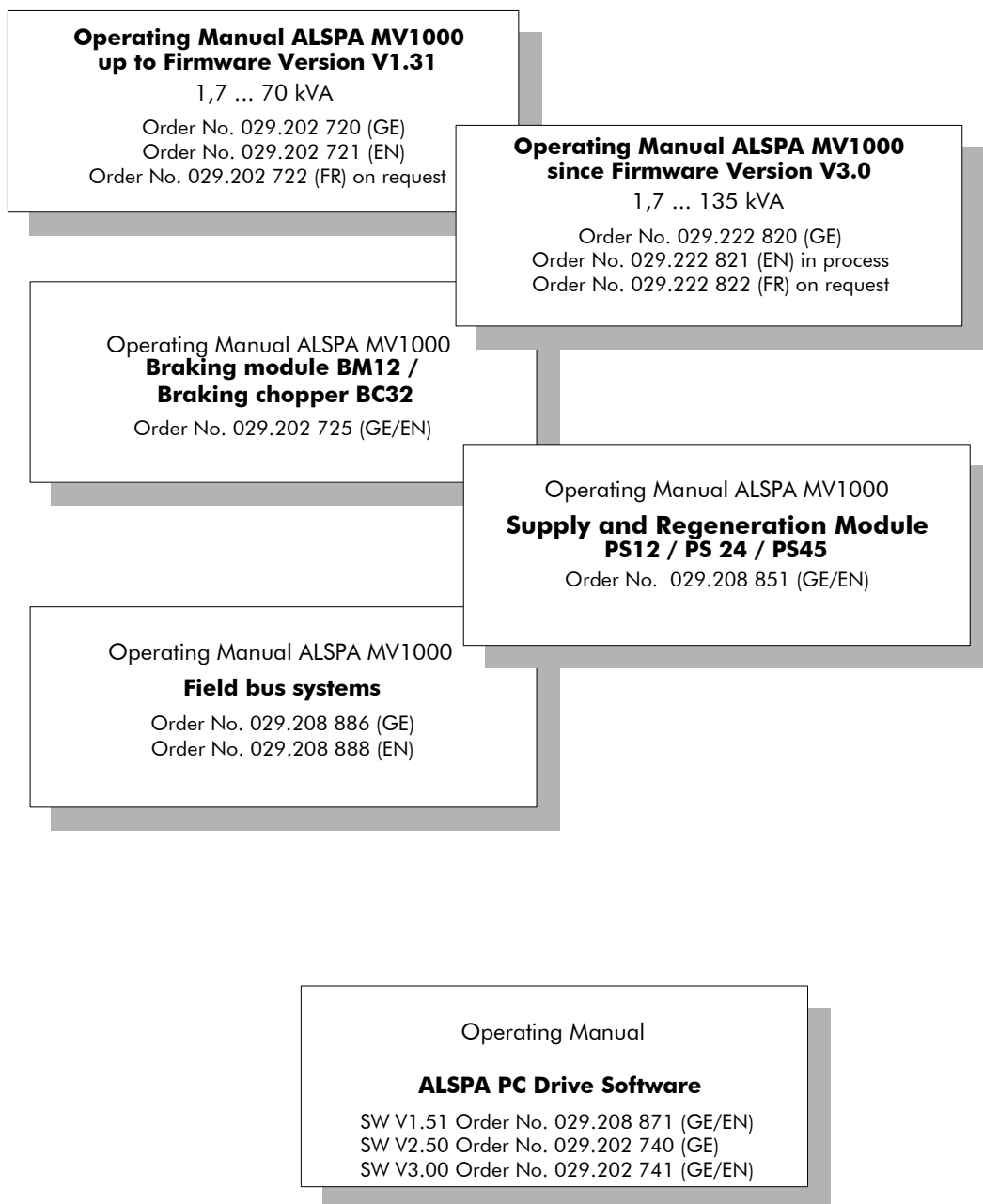
Table: Tightening torque of screws

- The devices have no overspeed protection
- Use with external or remote overload protection
- Use only UL approved components (fuses, cables etc.)

Note:

UL Approval is only valid for ambient temperatures up to 40 °C.

The following documentations for our product series ALSPA MV1000 have appeared to date:



GE = German
EN = English
FR = French

These operating instructions are intended to help you familiarize yourself with the ALSPA MV1000 frequency inverter as well as to connect, configure, and start it up in an optimal fashion.

Warranty

Converteam GmbH offers on all electronic units a warranty of 12 months from the date of delivery for design or material defects or defects of workmanship in accordance with the "General Supply Conditions for Products and Services in the Electrical Industry".

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Training programs are offered that provide a deeper understanding of the systems. These programs are offered by:

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Expressions used



Note:

Notes separate important information from the text and give additional information.



Important!

Important means that the relevant instruction must be followed exactly to avoid loss of data or damage.



Warning!

Warning means that the operator may be injured if the instructions are not followed.

1 Brief Description

1.1 General

The ALSPA MV1000 is a microprocessor-controlled PWM inverter with a field-orientated control concept for continuous, low-loss speed adjustment of AC motors with and without encoder.

The power stack consists of a diode rectifier in a 3-phase bridge circuit on the mains side and an IGBT inverter on the motor side.

Basic inverters are designed for standard applications. The units can be integrated into automation systems and can satisfy highly dynamic requirements through the addition of suitable options (e.g. field bus couplers).

Operation of the units is identical throughout the entire range. Easy operation and greatest flexibility were the main factors during development.

The inverters can be controlled and their parameters adjusted using the optional removable control unit (Keypad) or with a PC and our PC handling software.

Connection to automation systems is possible through common bus systems (see options, field bus coupler).

With a mains voltage range from 380 - 480 V the basic drive modules cover a power range from 1.7 kVA ... 135 kVA (MV1003 ... MV1171).

In conjunction with standard asynchronous motors this provides drive capacities of 0.75 kW to 90 kW at rated unit current.

This operating manual applies to the following units:

ALSPA MV1000 MV1003 ... MV1171
Unit software version: V3.01



Important!

As standard, ALSPA MV1000 units are designed for operation on earthed networks.

1.2 Operation

The link voltage is generated from the mains supply via the network rectifier. A 3-phase choke on the mains supply reduces harmonic currents and provides decoupling from other equipment on the same mains supply point.

The link voltage is smoothed using high quality electrolytic capacitors. Together with the motor inverter these provide the magnetising reactive power required by the motor and therefore relieve the mains supply.

The motor inverter generates a sinusoidal 3-phase system of variable frequency and voltage from the link voltage through optimised pulse width modulation.

Control and regulation of the ALSPA MV1000 are fully digital. In accordance with the requirements involved in the application several different control structures such as frequency control, speed control with or without encoder and torque control with or without encoder are available. Through using flux vector control concepts the control dynamics achieved are directly comparable to those of a DC drive.

Different inputs and outputs can be configured individually according to the drive application involved. Thus a drive system with the ALSPA MV1000 can easily be customised exactly to the application requirements at minimum cost. A power dump (option) in conjunction with a braking resistor allows the consumption of braking energy in regenerative operation. A 4 Quadrant regenerative unit is available as an option.

1.3 Main characteristics

- Consistent range of types for drives from 0.75 kW to 45 kW with IGBT inverter
- Supply voltage ranges:
3AC 380 V -15 % ... 480 V +10 % 45 ... 65 Hz
DC 530 V -15 % ... 666 V +10 %
For connection to networks with star point earthed (IT networks optional)
- Output frequency range: 0 ... 400 Hz
- 150 % overload capacity for 60 s every 10 minutes
Overload based on inverter rated current
(Except MV1171: 130 % overload)
- ALSPA MV1000 are resistant to idling, short circuit and earth faults
- Several ALSPA MV1000 units can be supplied via a DC system bus through a DC link to the standard unit
- 4-quadrant operation (option) through DB unit with braking resistor or Supply and Regeneration Module (option)
- Power stack heatsink can be removed (through-mounting)
Cooling can be implemented outside the cubicle
- Mains connections at top, motor connections at bottom
- Motor temperature monitoring through thermistor processing electronics (PTC)
- Simple to understand user-friendly system structure
- Consistent easily-learned operation via Keypad with plain text display (various languages available)
- Many additional convenient control facilities via PC, e.g. menu control, user-guided commissioning, oscilloscope function
- Optional RS232/RS422 serial interface
- Connection to automation systems through field bus (option):
FIP, Profibus, Modbus Plus, Modnet1/SFB (Bitbus). Interbus-S in preparation
- CAN-Bus with CANopen protocol
- CAN-Bus with CANopen protocol

- Available control structures:
 - Frequency control
 - Speed control with or without incremental encoder
 - Torque control with or without incremental encoder
- Ridethrough support on mains failure
- Flycatching spinning motor without torque surge
- Can be set for automatic restart after power failure up to 10 s
- Conventional control through clip-on terminals
 - 6 digital inputs with separate potential for control signals (e.g. Run, Stop etc.), of which 5 inputs are adjustable via selection list
 - 4 digital potential-free outputs for messages, adjustable
 - 2 freely-programmable analog outputs -10 ... +10 V
 - 2 analog scaleable reference inputs as differential inputs -10 ... +10 V, one of which also as current loop
 - Input for incremental encoder
- Comprehensive testing and diagnostics facilities:
 - Self-test of control electronics and hardware
 - Event store with time details for all binary events including first value fault message
 - Fault log with time details
 - Log for documenting all parameter adjustments
 - Oscilloscope facility (history log) with 4 analog and 8 digital channels can be processed in conjunction with the ALSPA PCS Windows PC handling program.
- Comprehensive safety and monitoring facilities
- Approved to UL (File No. E172 112)

2 Technical Data

2.1 Key to types, rating plate

The type details include the following information.
As an example, ALSPA MV1004:




		Input	3/AC 380 - 480V 3,9A 50/60Hz		
Type	ALSPA MV1004	Output	3AC 0 - 480V 3,9A 1,5kW 0-400 Hz	Prod.-No.	12345678
Id.-No.	029.203 398	Overload	1,5 x I _N for 60 s	Ser.-No.	000002
SW.-No.	029.xxx xxx	 Made in Germany		UL-Fuse 10A/600V	
				KU	
				KV	
				KZ	

Fig. 2-1: ALSPA MV1000 rating plate

2.1.1 Items supplied

IP20 Drive module, IP41 if through-mounted (higher protection classes possible)
Accessories for wall-mounting
Cable fixing kit, covers for D connections
Operating manual

Options, to be ordered separately as required:

Mains commutation choke, filter, PC handling software, brake module with
braking resistor or brake chopper, external braking resistor for brake chopper,
supply and regeneration module.
Communication interfaces: Keypad, PC interface or field bus coupler

2.2 Product data

ALSPA MV1000 for 3-phase mains supply

ALSPA MV1000 0,75 ... 90 kW, 3AC 380 ... 480 V

Micro-Processor-controlled PWM inverter with field-orientated control concept for continuous low-loss speed adjustment of standard AC motors.

Type	Order No.	Motor rating ¹⁾ [kW]	Unit input current eff [A]	Unit output current at mains voltage				Rating at mains voltage		Power loss at 480 V [W]	Frame size
				400 V		480 V		400 V	480 V		
				Rated current	max. 60 s	Rated current	max. 60 s	[kVA]	[kVA]		
ALSPA	029.										
MV1003	203 397	0.75	2.5	2.5	3.8	2.5	3.8	1.7	2	65	1
MV1004	203 398	1.5	3.9	3.9	5.9	3.9	5.9	2.7	3.2	100	2
MV1007	203 399	3	7	7	10.5	7	10.5	4.9	5.8	150	2
MV1013	203 400	5.5	12	13	19.5	13	19.5	9	10.8	210	3
MV1018	203 401	7.5	15.5	17.5	26.3	17.5	26.3	12.1	14.5	290	3
MV1024	203 402	11	20.5	23.5	35.3	22.3	33.5	16.3	18.5	360	3
MV1032	203 403	15	27	32	48	30.4	45.6	22.2	25	430	4
MV1047	203 404	22	42	47	70.5	44.7	67	32.6	37	640	4
MV1059	203 405	30	53	59	88.5	56	84	40.9	46.6	810	4
MV1089	203 406	45	78	89	134	84	126.5	61.7	69.8	1100	5
MV1110	354 197	55	100	110	165	105	157	76.2	87.3	1470	6
MV1145	354 198	75	135	145	218	125	187.5	100.5	103.9	1960	6
MV1171	354 199	90	165	171 ²⁾	221	162 ³⁾	211	118.5	134.7	2400	6

Table 2-1: Power data, ALSPA MV1000 type series

1) The rated motor power data (max. recommended rated motor power) are guideline values for 2-, 4- or 6-pole standard motors. Depending on application, the rated motor voltage may be lower than the max. inverter output voltage. The rating is dependent on a control reserve as well as on load-dependent voltage drops. For applications with less dynamic requirements, the recommended guideline value for the rated motor voltage is $0.95 \cdot \text{rated mains voltage}$. For highly dynamic requirements with a higher control reserve, $0.85 \dots 0.9 \cdot \text{rated mains voltage}$.

2) derated to 145 A at 16 kHz vector frequency

3) derated to 125 A at 16 kHz vector frequency

Note:

All values of output current are related to output frequency >5 Hz.

With lower output frequency, there is an automatic derating function in relation to the heatsink temperature.

2.2.1 Cooling-air requirement

MV1003 ... MV1024:	low
MV1032 ... MV1059:	55 m ³ /h
MV1089:	250 m ³ /h
MV1110 ... MV1171:	390 m ³ /h

2.2.2 Dimensions and Weights

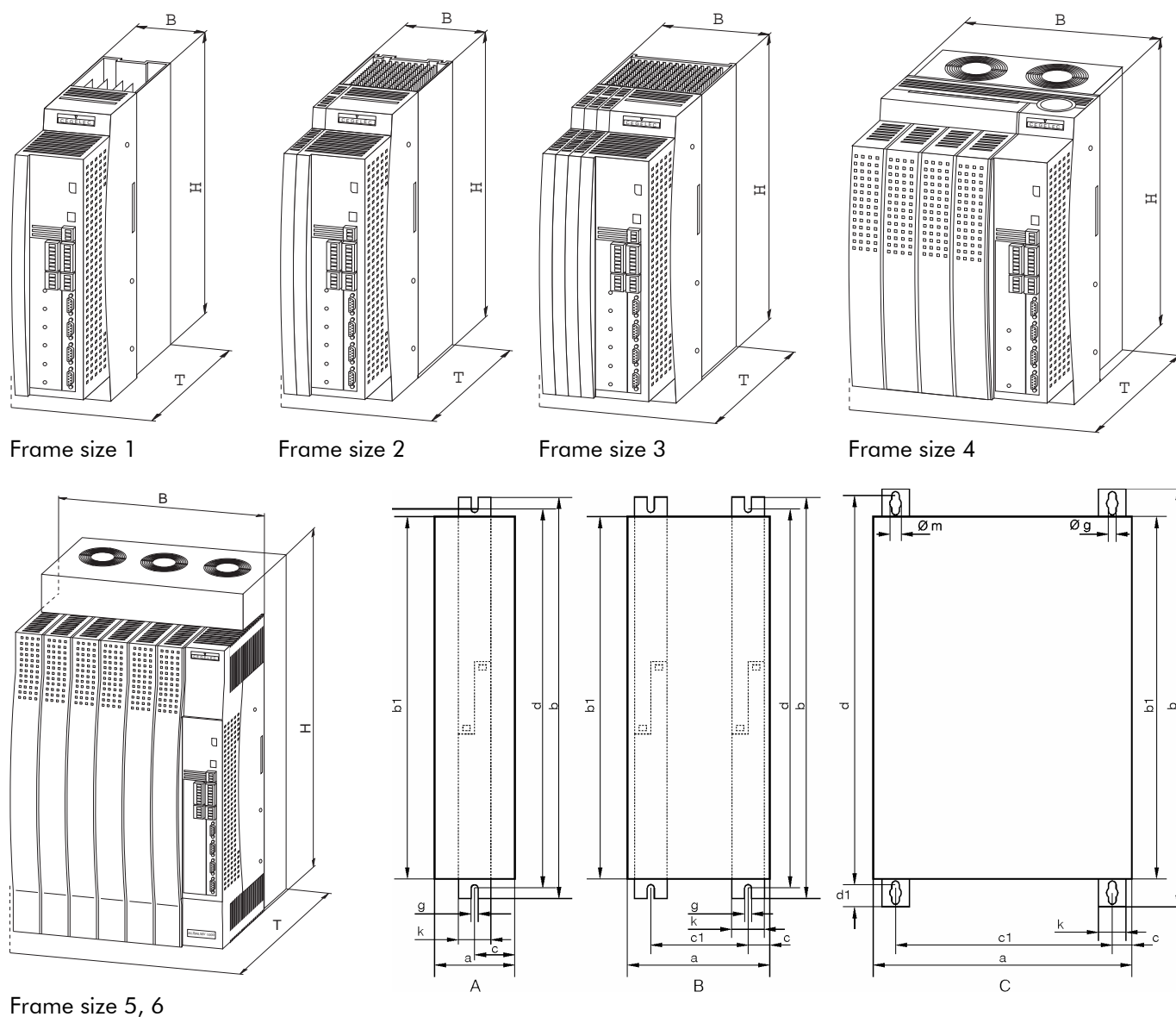


Fig. 2-2: ALSPA MV1000 dimension drawings

Frame size	Dimensions	Weight	Fig.	a	b	b1	c	c1	d	d1	g	k	m
	W x D x H [mm]	ca. [kg]		[mm]	[mm]		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
1	78 x 250 x 350	3.5	A	78	384	350	39	-	365	-	6,5	30	-
2	97 x 250 x 350	5.0	A	97	384	350	48,5	-	365	-	6,5	30	-
3	135 x 250 x 350	7.5	B	135	384	350	21,5	92	365	-	6,5	30	-
4	250 x 250 x 350	12.5	C	250	404	350	22,5	205	369	24	6,5	25	11
5	340 x 285 x 591	36.5	C	340	672	591	28,5	283	624	38	11	28	18
6	450 x 285 x 680	59.0	C	450	748,5	680	30,5	389	702	38	11	28	18

Table 2-2: Dimensions and weights, ALSPA MV1000 frame sizes 1 ... 6

2.3 Application data

• Mains voltage	3AC 380 V -15 % ... 480 V +10 % for operation on mains with star point earthed, IT-networks optional		
• Mains frequency	45 ... 65 Hz		
• Power factor	$\cos \varphi_1 \approx 0.90$		
• DC supply voltage	DC 530 V -15 % ... 666 V +10 %		
• Output voltage	3AC 0 ... Input voltage ¹⁾		
On DC connection	3AC 0 ... $U_{DC} * 0.707$ ¹⁾		
• Efficiency at rated power	>0.97 on AC supply		
• Overload factor	1.5 for max. 60 s at rated current, cycle time ≥ 10 min		
• Min. operating frequency	Without encoder	with encoder	
At speed control	0.5 Hz	0 Hz	
• Max. operating frequency	400 Hz; Output frequency >200 Hz requires commissioning with the special ALSPA PCS operating software; Field weakening >1 : 3 on request		
• Speed adjustment range	without	without	with
Refers to rated speed	encoder	encoder	encoder
	motor	regenerative	
	1:100	1:20	>1:1000
• Speed accuracy	Without encoder	with encoder	
Refers to rated speed		with digital reference preset	
	0.5 %	0.2 %	
• Torque rise times	For speed control with/ without encoder 2 ... 8 ms		
• Frequency accuracy	at frequency control <0.02 %		
• Speed encoder	Incremental encoder		
• Ambient temperature			
Operation	0 ... +40 °C up to +50 °C with power derating of 2.5 %/K		
Storage	-25 °C ... +55 °C		
• Cooling	Forced air cooling from frame size 2 upwards		
• Installation altitude	≤ 1000 m above msl, up to max. 4000 m with power derating of 5 % per 1000 m		
• Protection classesen	Basic drive module IP20 For through-mounting IP41		

1) Depending on application, the rated motor voltage may be lower than the max. inverter output voltage. The rating is dependent on a control reserve and load-dependent voltage drops. For applications with less dynamic requirements, the recommended guideline value for the rated motor voltage is $0.95 * \text{rated mains voltage}$. For highly dynamic requirements with a higher control reserve, $0.85 (\dots 0.9) * \text{rated mains voltage}$.

- Classification of environmental conditions

Transport	2K2 (according to EN60721-3-2)
Operation	3K3 ²⁾ , 3M2 ³⁾ , 3C2 ⁴⁾
	(according to EN60721-3-3)
 - Relative humidity <85 % at 28 °C, no condensation
 - Permitted switching frequency >3 minutes waiting time before reconnecting
 - Electromagnetic compatibility (EMC):

Radiated interference	To produkt standard IEC 61800-3 EN 61800-3 Graph EN 55011 Class A, B see section 2.4.1
-----------------------	--
- ²⁾ but - minimum temperature: 0 °C
 - minimum air pressure: 90 kPa
- ³⁾ but different amplitudes, frequency ranges and accellerations to Germanischer Lloyd, general conditions
- ⁴⁾ but no salt-fog

2.4 Components for supply and motor connection

The power supply to the ALSPA MV1000 can be provided by:

- Connecting the units to a 3-phase mains supply or
- Connection to a DC system bus.

The components for connecting the ALSPA MV1000 to a 3-phase supply or a DC system bus are to be selected and installed according to the ALSPA MV1000 type rating in accordance with the general installation regulations for electrical plant and equipment.

**Note:**

When using an ELCB it should be noted on rating the trip current that capacitive compensation currents occurring during operation on cable screens and the mains filters can trigger faults.

Duty-class gL fuses according to VDE are used as line protection for the power input. For ALSPA MV1003 ... MV1024, circuit breakers with characteristic B can be used as an alternative. In Systems according to UL, UL-approved fuses with characteristic H or K5 are used. With requirements according to UL, UL fuses with H or K5 characteristic are used.

Minimum cross-sections for PVC insulated cables are specified for the mains connection cable according to EN 60204-1:1992 at $\vartheta = 40\text{ °C}$ ambient temperature and laying method E.

For motor connection, the cross - section of cables must be designed according to the local standards and depending on the motor current.

Type	Mains supply		DC-supply	
	Fuse or Circuit breakers	PVC H07V-K	HL-Fuse	PVC H07V-K
ALSPA	[A]	[mm ²]	[A]	[mm ²]
MV1003	6	1	8	1,5
MV1004	10	1,5	10	1,5
MV1007	10	1,5	20	1,5
MV1013	20	4	32	4
MV1018	25	4	50	4
MV1024	32	6	63	4
MV1032	35	10	80	6
MV1047	50	16	110	10
MV1059	80	25	160	16
MV1089	100	50	250	25
MV1110	125	50	250	50
MV1145	160	70	315	70
MV1171	200	95	315	95

Table 2-3: Mains supply fuses and cable cross-sections

Semiconductor fuses (e.g. FERRAZ CC 6.621 CP gRB, size 27 x 60 respectively DIN110) are used as DC-fuses, each one in the +UG and -UG incoming lines.

The cable cross-sections for the DC input are indicated for PVC cables (H07V-K) as per EN60204, single laying as per E and as 40 °C of ambient temperature and installation type 2 m maximum line length in the cubicle.

The design of the fuses and cross sections for the DC supply was based on a regular utilization of the 150 percent overload capacity of the ALSPA MV1000.

2.4.1 Selection of EMC components and motor cable

The following table indicates what components are needed to comply with a given required level of EMC interference.

EMC interference radiation level required	Required components	Remarks
No requirements (Use in Industry as per EN 61800-3 [IEC 61800-3])	Mains choke Shielded motor cable NYCWY oder NYCY 0,6 / 1 kV	Max. motor cable length, see section 2.4.2
Limit curve EN 55011 class A, group 1	Mains filter Ferrite rings Shielded motor cable NYCWY oder NYCY 0,6 / 1 kV	Max. motor cable length, see section 2.4.2 Please note EMC installation and connection instructions in section 3.6
Limit curve EN 55011 class B, group 1	Mains filter Ferrite rings Shielded motor cable NYCWY oder NYCY 0,6 / 1 kV	Max. length of motor cable: 50 m (For ALSPA MV1003 and MV1004 a motor filter may be required, see section 2.4.2); Installation in cubicle; carefully note the EMC installation and connection instructions in section 3.6

See section 2.4.6 for the question as to whether a motor filter is required - regardless of the EMC interference level required.

2.4.2 Max. motor cable length

The length of the motor cable is limited as the capacitive recharging currents through cable capacitance load the ALSPA MV1000 and the disturb control. If the inverter is dimensioned in keeping with the rated motor current, the max. cable lengths are those to be found in Table 2-4.

With EMC requirements to limit curve EN 55011 Class B, Group 1, the motor cable length is limited to 50 m also for the MV1007 to MV1171.

Type	Max. motor cable length	
	Without motor filter	With motor filter
ALSPA	[m]	[m]
MV1003	20	50
MV1004	30	50
MV1007	50	100
MV1013	50	150
MV1018	50	150
MV1024	100	200
MV1032	100	200
MV1047	100	200
MV1059	150	200
MV1089	200	250
MV1110	200	300
MV1145	200	300
MV1171	200	300

Table 2-4: Max. motor cable length on ALSPA MV1000 at 8 kHz vector frequency

2.4.3 Mains chokes (3-phase chokes)

With the ALSPA MV1000 on a 3AC mains connection a mains choke is required in the supply cable to reduce harmonics and limit mains feedback effects. With stricter EMC requirements a mains filter is used in place of the mains choke (see section 2.4.4).

Mains chokes must be ordered separately. They are supplied loose and are to be installed outside the ALSPA MV1000 in the switchgear cubicle.

3AC 380 ... 480 V, 50 - 60 Hz, $U_k \approx 4\%$, IP00

Type	Mains choke Order No.	Frame size	Inductance	Choke rated current	Max. Cable cross-sections	a	b	b1	c	d	l	m	n	Weight Approx.
ALSPA	029.		[mH]	[A]	[mm ²]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
MV1003	203 347	1	15	2,5	4	95	82	48	56	35	115	5	9	1,15
MV1004	203 348	1	9	4	4	95	90	56	56	43	116	5	9	1,55
MV1007	203 349	1	5	7	4	119	95	63	90	49	138	5	9	2,55
MV1013	203 350	1	3	13	4	150	106	81	113	64	162	6	11	5,2
MV1018	203 351	1	1,5	24	10	180	120	86	136	67	192	7	12	8,2
MV1024	203 351	1	1,5	24	10	180	120	86	136	67	192	7	12	8,2
MV1032	203 352	1	1,1	30	10	190	125	86	136	67	190	7	12	9
MV1047	203 353	1	0,8	42	10	190	135	96	136	77	190	7	12	11
MV1059	203 354	1	0,55	60	10	230	125	125	180	96	235	7	13	14
MV1089	203 355	2	0,37	90	M8	230	179	149	180	122	210	7	13	20
MV1110	203 030	2	0,26	113	M10	242	200	200	190	118	220	11	15	23
MV1145	203 031	2	0,2	147	M10	242	220	220	190	138	220	11	15	31
MV1171	203 032	2	0,165	176	M10	242	220	220	190	138	220	11	15	31

Table 2-5: Mains chokes for ALSPA MV1000

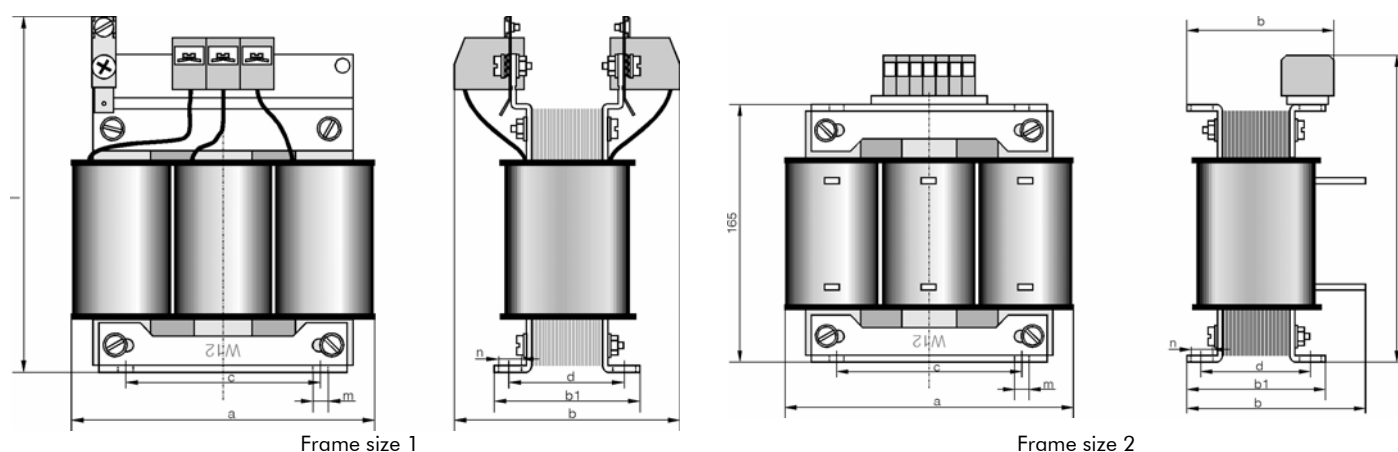


Fig. 2-3: Dimension drawing, mains choke

2.4.4 Mains filter

The mains filter is used to attenuate line-based EMC interference radiated over the mains cable. It includes amongst others a mains choke and therefore no additional mains choke is required.

The line filters for MV1089 ... MV1171 also contain a temperature-monitor (opener, T1/T2); when it responds, it should trigger a warning in the control system.

The mains filter is installed directly above the ALSPA MV1000 and connected to it via short leads.

The dimensions of the mains filter for MV1110 ... MV1171 are adapted to the inverters dimensions. The filters can be subassembled to the ALSPA MV1000.

Mains filter for ALSPA	Order No.	Frame size	Filter rated current	a	a1	b	b1	c	d	e	e1	m	n	Weight approx.
	029.		[A]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
MV1003	203 356	1	2,5	78	-	150	-	-	135	230	-	7	-	3.1
MV1004	203 357	1	4	78	-	150	-	-	135	230	-	7	-	3.2
MV1007	203 358	1	7	97	-	180	-	-	165	230	-	7	-	4.6
MV1013	203 359	1	13	135	-	260	-	92	245	230	-	7	-	11.6
MV1018	203 360	1	24	135	-	260	-	92	245	230	-	7	-	12.4
MV1024	203 360	1	24	135	-	260	-	92	245	230	-	7	-	12.4
MV1032	203 361	2	30	278	234	398	332	258	334	228	-	6,5	11	16.5
MV1047	203 362	2	42	278	234	398	332	258	334	228	-	6,5	11	17.3
MV1059	203 363	2	60	278	241	365	305	258	334	288	-	6,5	11	18.0
MV1089	203 364	2	90	368	323	516	430	345	379	285	-	11	18	32.0
MV1110	354 206	3	135	428	423.5	760	670	-	-	114	90	M8	-	53.0
MV1145	354 206	3	135	428	423.5	760	670	-	-	114	90	M8	-	53.0
MV1171	354 207	3	165	428	423.5	765	670	-	-	114	90	M8	-	53.0

Table 2-6: Mains filter for ALSPA MV1000

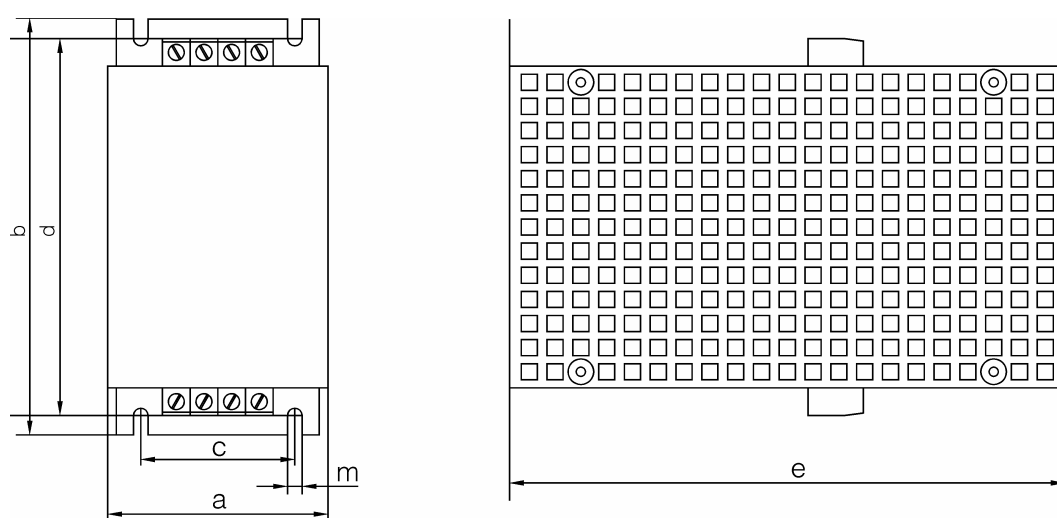


Fig. 2-4: Dimension drawing, mains filter, frame size 1

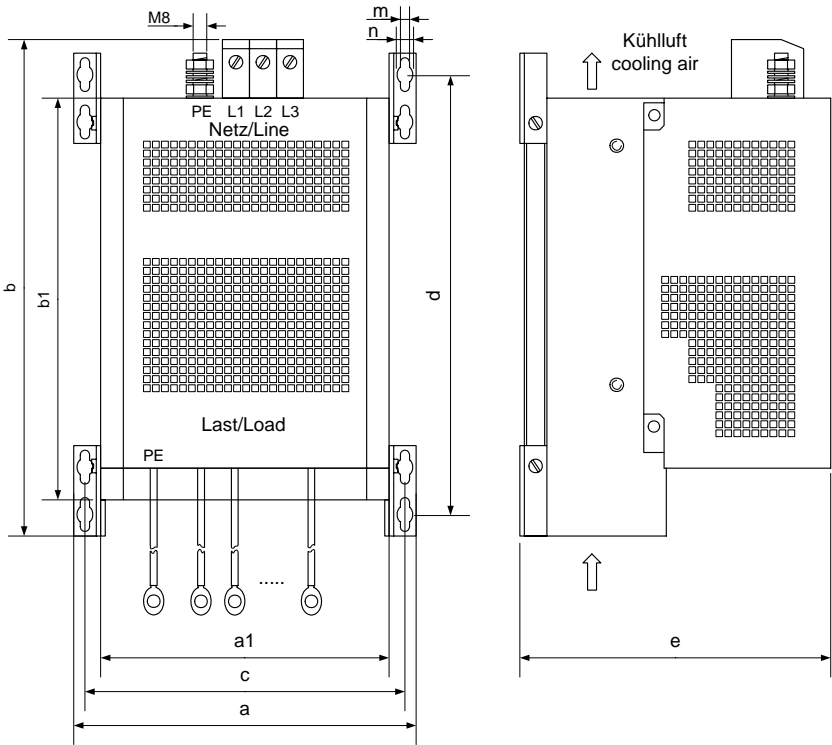


Fig. 2-5: Dimension drawing, mains filter, frame size 2

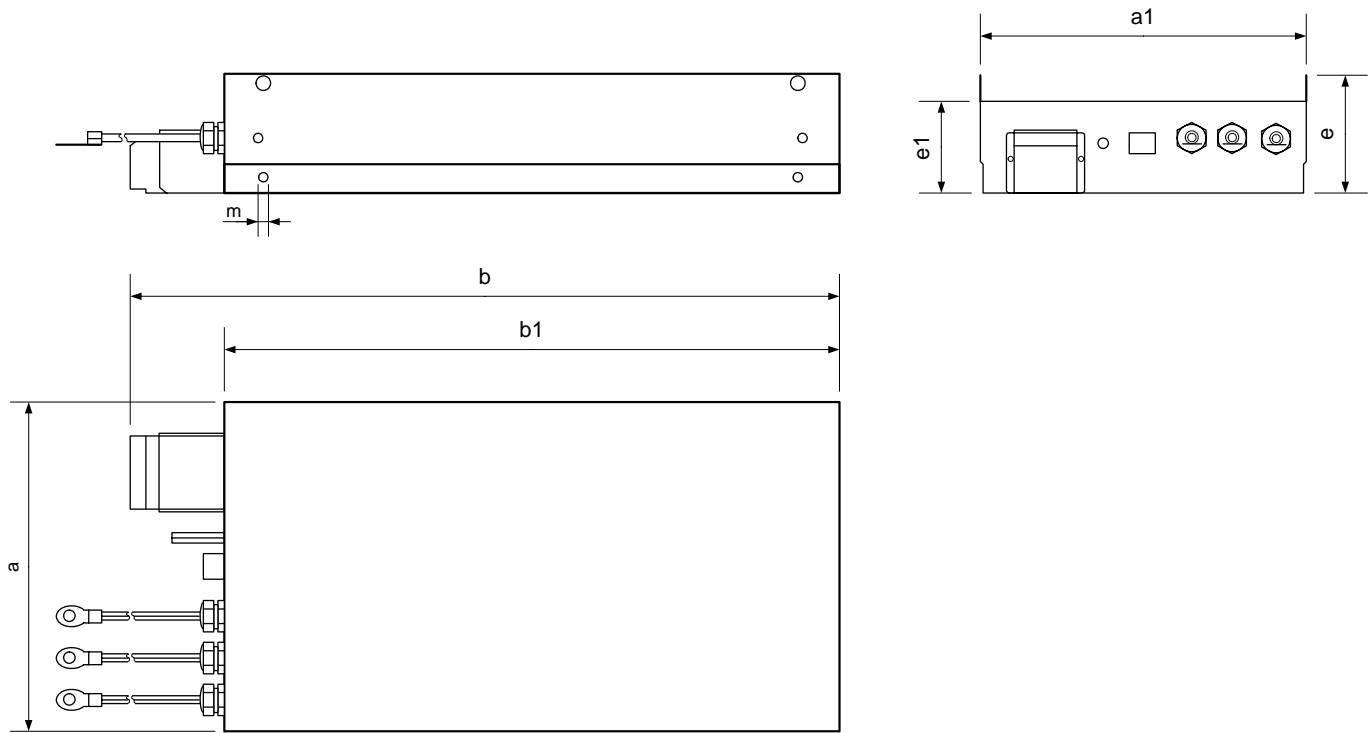


Fig. 2-6: Dimension drawing, mains filter, frame size 3

2.4.5 Ferrite-rings

Ferrite rings are used to reduce any high frequency EMC interference radiated over the motor cable. The ferrite rings are to be installed as close as possible to the inverter output and before any motor filter, using the fixing materials provided. The three conductors in the motor cable are passed once through the ferrite rings. The screen of the motor cable is to be connected with a screen clamp to the mounting plate below the ferrite rings.

Ferrite rings for ALSPA	Order No. 029.	a [mm]	b [mm]	c [mm]	d [mm]	e [mm]	Weight approx. [kg]
MV1003 bis MV1007	206 880	19	38	77	6.5	100	0.5
MV1013 bis MV1024	206 881	38	74	77	6.5	100	1.1
MV1032 bis MV1171	206 890	55	85	77	6.5	100	1.4

Table 2-7: Ferrite rings for ALSPA MV1000

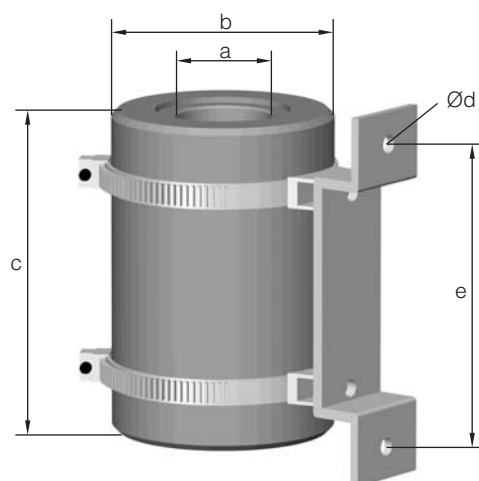


Fig. 2-7: Dimension drawing, ferrite rings for ALSPA MV1000

2.4.6 Motor filter

New motors from well known European manufacturers, rated for inverter operation and designed for a peak voltage of 1300 V and a rate of voltage rise of 3000 V/ μ s, do not require a motor filter.

The motor filter does not affect EMC interference radiation.

The motor filter is used to protect a sensitive motor against excessively high peak voltages in the motor terminal box and excessively high rates of voltage rise. It is only needed if old motors are used (e.g. when upgrading existing plants) or if the motor data is not known.

In addition, motor filters are used on long motor cables (see section 2.4.2) as well as in multiple motor applications (several motors operated simultaneously on one ALSPA MV1000; details on request). Motor chokes are also available for special applications.

2.5 Options

Optional assemblies and function modules can be used to adapt the ALSPA MV1000 to many different applications.

Standard options are available for:

- Mains connection:	Mains choke or mains filter	
- Motor connection:	Motor filter or motor choke	-
- Unit operation:	Keypad	029.203 365
- Installation in cubicle door (IP54):	Keypad door mounting kit	029.206 849
- Operation by PC:	PC Interface RS 232/RS 422	029.204 538
	Data cable, 9-pole, 2 m	029.153 484
	Parallelport-CAN-Interface	029.232 730
	Data cable, 3 m	
	CAN-Interface < - > MV1000	029.218 353
	ALSPA PCS	
	Drive software	029.351 863
	Device specific files V3.00	On request
- Bus couplers:	CAN	Installed
	FIP	029.207 789
	ALSPA F8000 (FIP)	029.214 961
	Profibus	029.207 776
	Modbus Plus	029.207 779
	Modnet 1 SFB (Bitbus)	029.207 775
	Interbus-S (in preparation)	029.207 780
- Motor braking:	Brake Module BM12	029.203 366
	BrAKE Chopper BC32	029.203 368
- Energy regeneration:	Supply and Regeneration Modules	
- IT network	ALSPA MV1000-IT	
- Secure protection against unexpected restart	ALSPA MV1000-S	

2.6 Connection, terminal wiring

2.6.1 Power stack connections

ALSPA MV1000 units can be operated on a 3AC or DC supply.

The connections L1, L2 and L3 are connected to the 3-phase supply L1, L2 and L3 via a 3-phase choke or a mains filter.

When operating on DC supply the connection is made to +UG and -UG. When several ALSPA MV1000 are used in one system, their DC-links can be interconnected to exchange energy. With up to 10 ALSPA MV1000 units and a length of < 12 m between the first and last inverter, the links of the ALSPA MV1000 units are interconnected via fuses; this does not require any DC-link reactor.

In the case of a DC busbar length > 12 m or when both ALSPA MV1000 and ALSPA MD2000 units are connected to the busbar, a special design is required.

The motor is connected to terminal U, V, W, a temperature contact is connected to terminal X103 or X8, see page 2-20 . Fig. 2-8 shows the power connection of ALSPA MV1000 for 3AC supply and for DC supply.

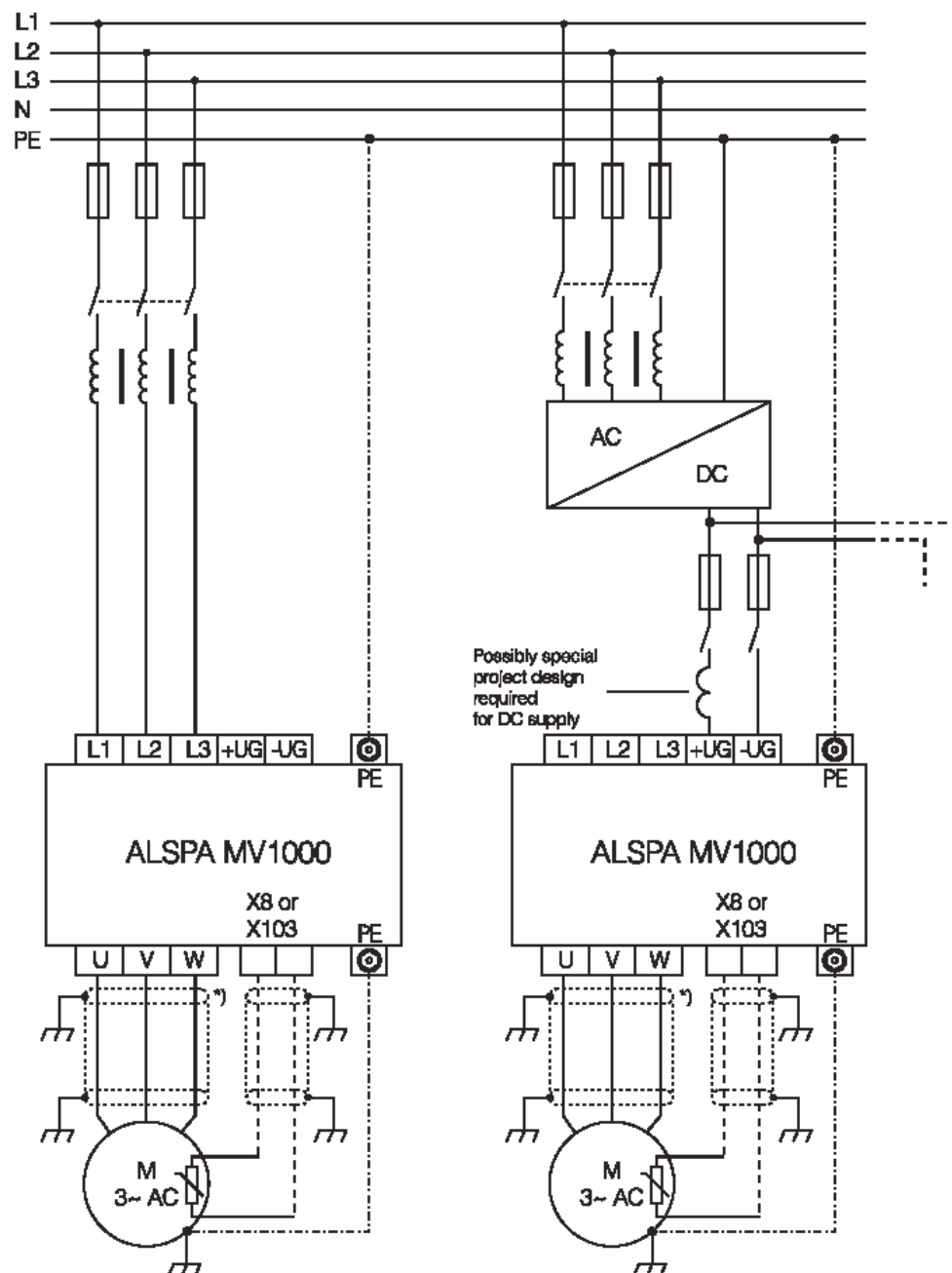
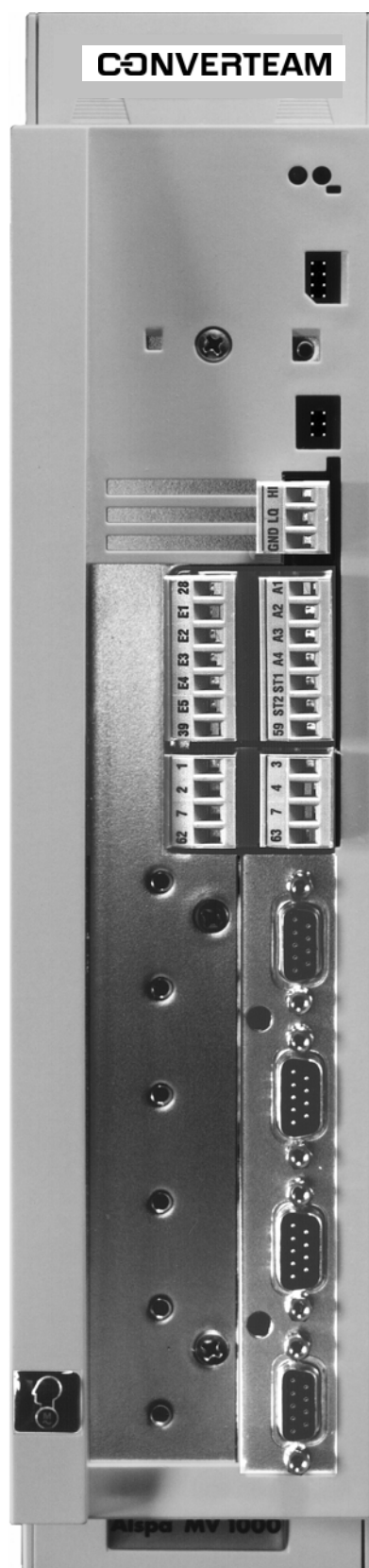


Fig. 2-8: ALSPA MV1000 3AC or DC power connection

*) Shielding the motor cable is recommend



L1, L2, L3 3AC power connection
 +U_G, -U_G DC power
 PE protection earth connection

} behind cover

Status display

X1 Interface for:
 - Keypad
 - PC Interface
 - Field bus coupler

X3 Programming interface
 Jumper reference as current loop
 0 ... 20 mA or 4 ... 20 mA

X4 CAN Bus
 Plug-in terminal strip

X5 Digital inputs/ outputs
 Plug-in terminal strip

} The terminal strips are protected against incorrect connection by coding tags on the plug and the socket. The terminal strips can only be fitted if the positions of the two tags do **not** coincide.

X6 Analog inputs/ outputs
 Plug-in terminal strip

X7 (in preparation)
 9-pin Sub-D plug female

X8 Encoder, Motor temperature measurement
 9-pin Sub-D plug male

X9 second encoder input
 9-pin Sub-D plug male

X10 Digital frequency output
 9-pin Sub-D plug female

PE protection earth connection
 X103 Motor temperature monitor T1/T2
 U, V, W Motor connection

} Behind cover

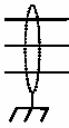
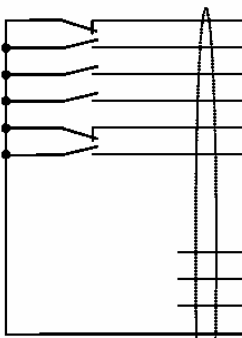
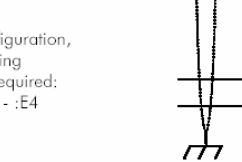


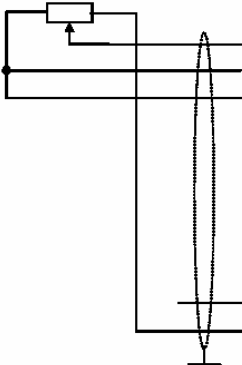

Fig. 2-9: ALSPA MV1000 terminal wiring

2.6.2 Electronics connections

The control and analog signal connections to the ALSPA MV1000 are via plug-in terminal strips. Fig. 2-9 shows the front panel of the ALSPA MV1000 with the various plug connections.

2.6.2.1 Terminal wiring

The wiring for the inputs and outputs on terminal strips X5 and X6 can be selected as required using the ALSPA MV1000 software. Table 2-8 shows the standard wiring as supplied. Fig. 2-13 ... Fig. 2-16 show the possible wiring.

	Terminal strip X4		CAN-Bus	Comments
	HI	CAN-HIGH		Internal over 100 Ω to ground
	LO	CAN-LOW		
	GND	CAN-GND		
	Terminal strip X5		Digital inputs	
	:28	ENABLE	+24 V = Pulse enable, open = TRIP ACKN.	
	:E1	DINP1	+24 V = AUTOMATIC, open = MANUAL	
	:E2	DINP2	+24 V = FORWARD	
	:E3	DINP3	+24 V = REVERSE	
	:E4	DINP4	Open = FAST STOP	
	:E5	DINP5	+24 V = RUN, open = STOP	
			Digital outputs	
	:A1	DOUT1	READY	+24 V, max. 50 mA
	:A2	DOUT2	WORKING	+24 V, max. 50 mA
	:A3	DOUT3	FAULT	+24 V, max. 50 mA
	:A4	DOUT4	Constant DC	+24 V, max. 50 mA
			State-Bus	
	:ST1	State-Bus	Monitor	
	:ST2	State-Bus	Monitor	
			External auxiliary supply	
	:59	DC +24 V ext.	External auxiliary supply for electronics	
	:39	DC 0 V	DC 0 V for digital I/O and aux. supply	
	Terminal strip X6		Reference inputs	Analog inputs
	:1	AINP1 (+)	Speed/Frequency REFERENCE1 (+)	
	:2	AINP1 (-)	Speed/Frequency REFERENCE1 (-)	
	:7	GND	DC 0 V for analog I/O	
	:3	AINP2 (+)	Speed/Frequency REFERENCE2 (+)	
	:4	AINP2 (-)	Speed/Frequency REFERENCE2 (-)	
	:7	GND	DC 0 V for analog I/O	
			Actual value outputs	Analog outputs
	:62	AOUT1	Speed/Frequency 0 ... ±10 V, 2 mA	
	:63	AOUT2	Const. +10 V int., max. 2 mA	

For standard configuration, at least the following connections are required:
X5:A4 - :28 - :E2 - :E4

Table 2-8: Standard terminal wiring

In the state as supplied, the digital inputs and outputs have the following functions.

(See Sections 2.6.2.3 and 4.3.5 for details and possible configurations.)

Terminal :E8 ENABLE

Pulse enable for the IGBTs. This terminal must have +24 V, otherwise the output transistors are immediately blocked and the motor coasts down. **This is a hardware disable, one that cannot be changed via software.**

If this terminal has 0 V, the TRIP ACKNOWLEDGE function is executed, i.e. any possible faults are acknowledged. Every fault must be acknowledged before the drive can be started again.

Terminal :E1 DINP1 MANUAL/AUTOMATIC

This terminal is used to define where the inverter is controlled from. 0 V means MANUAL operation, i.e. the Keypad is used for switching on and off and the speed reference is set via the + and - keys (software motorised potentiometer). +24 V at this terminal means AUTOMATIC operation, i.e. control via terminal strip; the speed reference is then set via analog input 1.

Terminal :E2 DINP2 FORWARD

Positive speed reference values mean that the drive will turn forward.

Terminal :E3 DINP3 REVERSE

Negative speed reference values mean that the drive will turn reverse.

If neither FORWARD nor REVERSE are under + 24 V neither direction of rotation is enabled. The motor remains magnetized, but the inverter regulates to speed zero.

If both FORWARD and REVERSE have +24 V, the first signal set has priority.

Terminal :E4 DINP4 FAST STOP

When the terminal is open, the drive goes to zero at "Ramp fast stop", the inverter is then switched off.

In normal operation this terminal must have +24 V.

Terminal :E5 DINP5 RUN/STOP

With the rising edge of this signal, the inverter is switched on. At 0 V the drive goes to zero at "ramp down"; the inverter is then switched off.

The switch-on edge can be reliably evaluated only when the ENABLE and FAST STOP terminals are already under +24 V.

Once a fault has been acknowledged, a new rising edge is required to switch on.

It is possible to automatically switch on the inverter as soon as the supply voltage is applied; this is done by connecting the RUN/STOP input with the READY output.

Terminal :A1 DOUT1 READY

The inverter outputs READY as soon as the autotest has been run through and the DC-link is charged.
To test for faults, you must also query the FAULT output.

Terminal :A2 DOUT2 WORKING

The inverter outputs WORKING when the inverter is pulsing.

Terminal :A3 DOUT3 FAULT

The inverter outputs FAULT when a fault-related switchoff has occurred.
Resumption of operation only after acknowledgement. (See section 6.1)

Terminal :A4 DOUT4 DC +24 V

This output can be used to supply the digital inputs and the switches.

Terminal :39 DC 0 V

Reference potential for all digital inputs/outputs

2.6.2.2 Technical Data of terminal strip inputs/outputs

Digital inputs

Input active on +24 V high, level in range +13 ... +30 V
Input inactive at 0 V or open, low level in range 0 ... 3 V.
Input current at 24 V: 1 mA



Note:
The control functions connected in the software to terminals DINP1 ... 5 and ENABLE can be inverted by parameter adjustment, see Fig. 2-13.

Digital outputs

Output active on +24 V
Output current max. 50 mA, min. load resistance at 24 V: 480 Ω
Do not place digital outputs under external voltage!

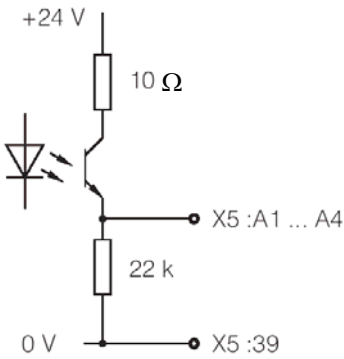


Fig. 2-10: Basic circuit diagram of digital outputs



Note:
The indicator signals can be inverted by parameter adjustment. D-output 4 is set as standard to output DC +24 V.

Analog inputs

Parameterable differential inputs for -10 ... +10 V, 0 ... 10 V
 Input resistance >100 k Ω , resolution 11 bit + sign
 AINP1 also as current loop 0 ... 20 mA, 4 ... 20 mA, 20 ... 4 mA
 Input resistance 242 Ω , resolution 10 bit
 See Fig. 2-15 and menu **04 Analogue I/Os** for parameter adjustment
 See Fig. 2-11 for hardware setting for AINP1.

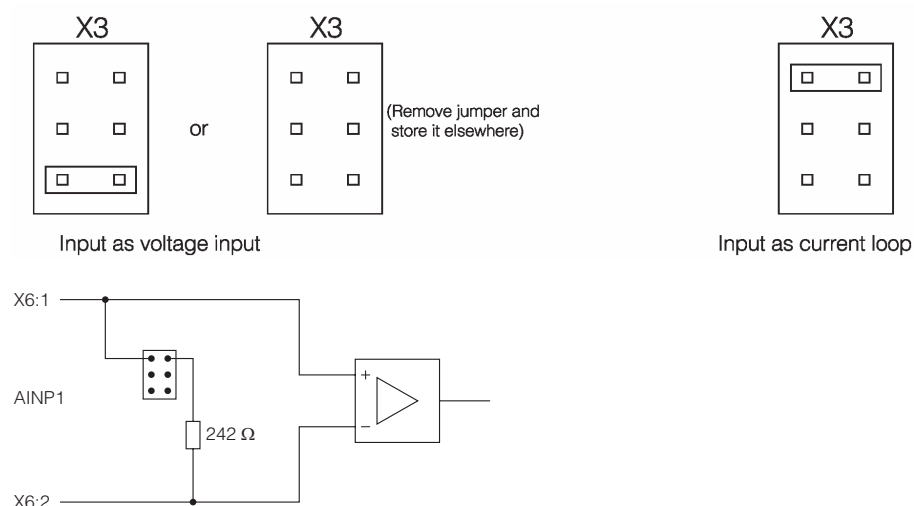


Fig. 2-11: Setting the analog input AINP1 with X3



Note:

When installing a PC interface on the ALSPA MV1000, the jumper must not be set to the middle or lower position. When using the AINP1 as a voltage input, the lower position can no longer be used to store the jumper.

Analog outputs

Wiring and scaling are adjustable.
 Output level -10 ... +10 V, max. 2 mA
 Resolution 9 Bit + sign



Note:

A-Output 2 is set as supplied to output a constant voltage of DC +10 V.

External auxiliary supply

An external 24 V supply can be connected to terminal X5 :59/:39 to power the control electronics in the event of mains failure. Then, the internal clock continues running and the drive will be ready for operation again more quickly when the mains supply returns. The ALSPA MV1000 current consumption including the Keypad is 500 mA plus the load currents of the digital outputs. Terminal X5 :59 can not supply current for external consumers even when the ALSPA MV1000 is operated on the mains supply.

Motor temperature

Two different types of temperature sensors can be connected to the ALSPA MV1000 for monitoring the motor temperature:

"Switching PTC"

The temperature resistance characteristic of the "switching PTC" has a clear knee point with a type-dependent fixed response temperature, see Fig. 2-12. If the response temperature is exceeded the PTC has high resistance. A motor thermostat can also be connected in place of the PTC. The ALSPA MV1000 shuts down on overtemperature. The connection at X103 uses screened cable. It is activated in menu **03=Configuration** under **Mon.motor T'stat**. The connection leads must be laid separately from motor cables.

"Measurement PTC"

The temperature resistance characteristic of the "measurement PTC" is almost linear, see Fig. 2-12. The characteristic is programmed with the parameters PTC-Res. (Temp x). The characteristic is preset in the factory for a PTC of type KTY 83-110. Measured motor temperature is shown in the **01=Display** menu. The ALSPA MV1000 shuts down at a motor temperature of $>150\text{ }^{\circ}\text{C}$. Connection is at X8 pin :8 and :5. It is activated in menu **03=Configuration** under **Monitor motor-PTC**. A pair of encoder cables can be used for the connection.

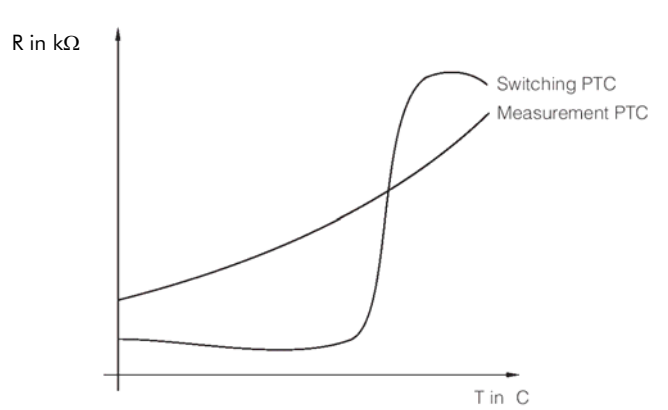


Fig. 2-12: PTC temperature resistance characteristics

Encoder

TTL, 5 V, two channel offset through 90° el. And inverted outputs.

Encoder input X8

Differential inputs, for 5 V encoder voltage, input current 6 mA.

Input frequency 100 Hz ... 500 kHz

No. of encoder lines 300 ... 10.000

**Note:**

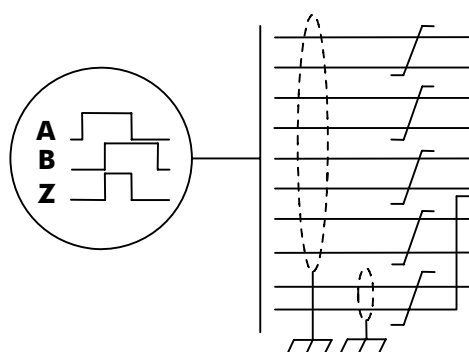
Both signal inputs per channel must always be used, the signal and the inverted signal. One twisted pair of conductors is to be used for each channel.

The marker pulse is not processed by the standard software but can be connected to X8 :6/:7.

The internal encoder supply voltage can be adjusted between 5 ... 7.5 V to compensate for voltage drops over long cables. This is set to 5 V as supplied. The current consumption of the encoder must not be more than 200 mA.

**Important!**

Note the max. permitted supply voltage for the encoder!



Plug X8	Encoder connection	Comments
:9	B inv.	Channel B inverted
:1	B	Channel B
:2	A inv.	Channel A inverted
:3	A	Channel A
:4	+V _{CC}	Encoder supply DC
:5	GND	Encoder supply DC 0 V
:6	Z inv.	Marker pulse inverted
:7	Z	Marker pulse
:8	PTC ¹⁾	Motor temperature measurement

Table 2-9: Encoder connections

- ¹⁾ Connect to X8 :8 and X8 :5 using separate, twisted and screened pairs of leads

Encoder cable: Leads twisted in pairs with common screen,
e.g. LIYCY 3 x 2 x 0,75 mm² (twisted pair)

max. encoder cable length	max. encoder frequency
l [m]	f _{max} [kHz]
100	300
200	200
300	100

Table 2-10: Guideline values for max. encoder cable length

When selecting an encoder it is important to note that the maximum cable length and maximum frequency are also determined by the technical data of the encoder.

$$n_{\min, \max} [\text{min}^{-1}] = \frac{f_{\min, \max} [\text{kHz}] * 1000 * 60}{Z [\text{Imp/U}]}$$

No. of encoder lines Z [Pulses/rev.]	n_{\max} [rpm]	n_{\min} [rpm]
1000	12,000	6
2000	6,000	3
5000	2,400	1.2

Table 2-11: Limits of speed range depending on encoder line count at $f_{\max} = 200 \text{ kHz}$ (example)

2.6.2.3 Configuration of digital inputs/outputs

The functions of the inputs on the terminal strip X5 can be configured. Menu **05=DIGITAL I/Os** can be used to determine the digital input from which a certain software function is controlled. In addition the control signal can be inverted by the relevant settings. The parameter names for inversion correspond to the function name with the suffix "... inv." The NO (not inverted) setting is shown at Fig. 2-13 by the switch position TOP and the YES (inverted) setting is shown by the BOTTOM position.

Parameter FORWARD	Parameter FORWARD inv.	Forward operation is active if
DINP2	NO	DC +24 V at terminal X5 :E2
DINP2	YES	DC + 0 V at terminal X5 :E2 Or terminal is open

Table 2-12: Table of values when inverting digital inputs. Example with the FORWARD function

If a control function is always to remain switched on, the relevant parameter, e.g. FORWARD, can be set to HIGH. If a control function is never used, the parameter, e.g. REVERSE, can be set to LOW. This saves wiring the terminal and the terminal can be used for other functions by reconfiguring the standard assignment.



Note:

Several control functions can also be activated with one terminal.

Example:

FORWARD = DINP2
FORWARD inv. = YES
REVERSE = DINP2
REVERSE inv. = NO

With a positive speed reference the drive will rotate clockwise when DC 0 V is present at terminal X5 :E2 and anticlockwise with DC +24 V.

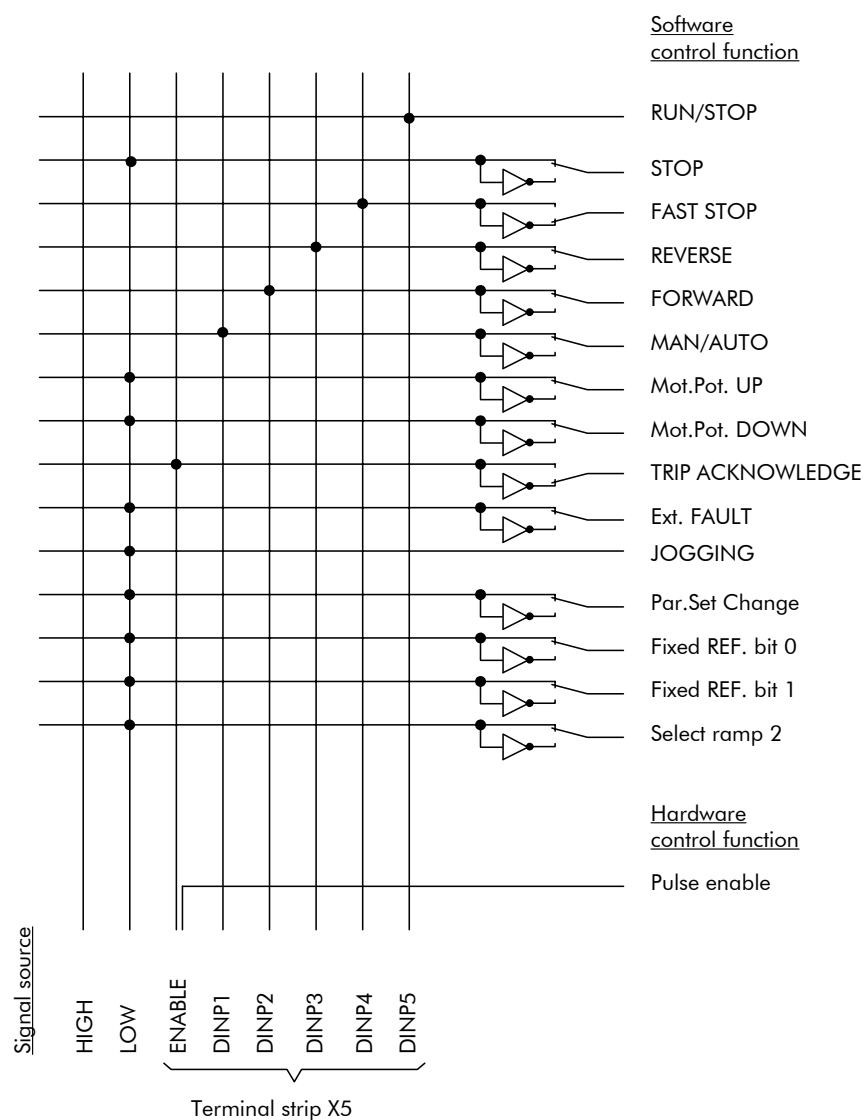


Fig. 2-13: Possible configurations of terminal X5: digital inputs (Default setting)

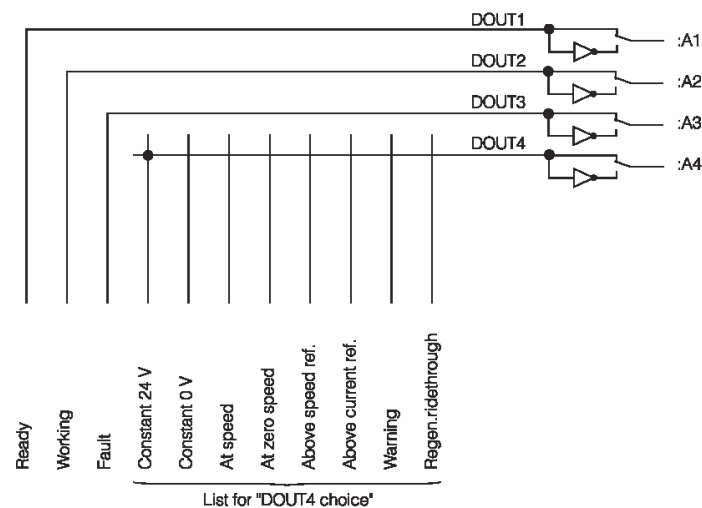


Fig. 2-14: Configuration of terminal X5: digital outputs (Default setting)

The digital outputs DOUT 1 ... 4 can be inverted in menu 05=DIGITAL I/Os using the parameter "D-Output 1 ... 4 inv.". The setting for digital output DOUT 4 can be made in menu 05=DIGITAL I/Os using the parameter "DOUT4 choice".

Other signals can be sent to the outputs using the optional PC drive software.

Note:
As supplied, D-Output 4 is set to output DC +24 V and thus provides the control voltage for the digital inputs.

2.6.2.4 Configuration of analog inputs/outputs

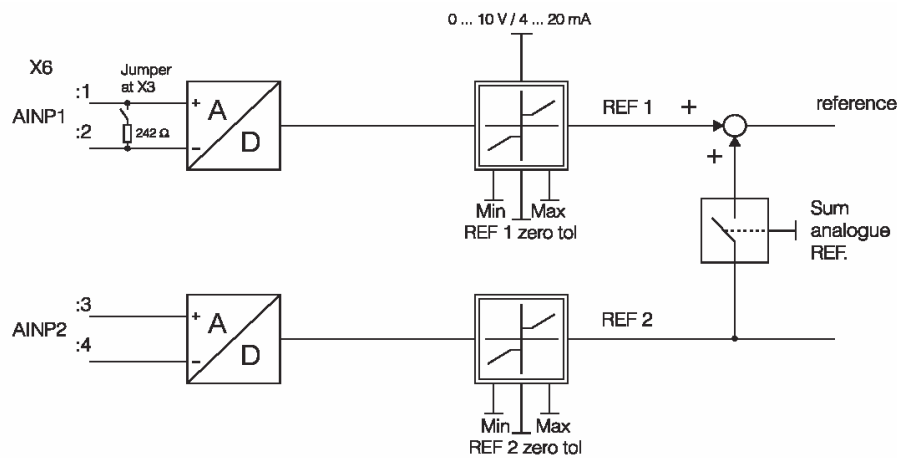


Fig. 2-15: Possible configurations of terminal X6: analog inputs (Default setting)

The wiring of the analog outputs can be set in menu 04=ANALOG I/Os using the lists for the parameters "A-output 1 pin 62" and "A-output 2 pin 63", see Fig. 2-16.



Note:

"A-output 2 pin 63" is configured as supplied to output a DC +10 V constant voltage and can be used to supply a potentiometer.

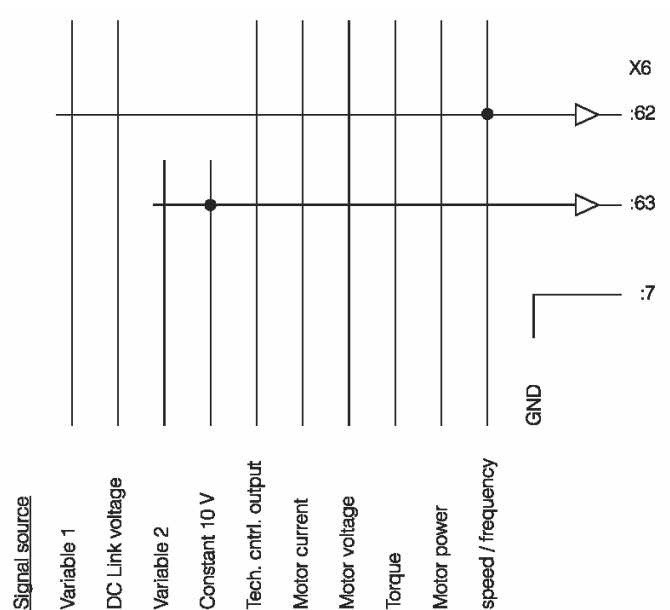


Fig. 2-16: Possible configurations of terminal X6: analog outputs (Default setting))

2.6.3 Separation of potential

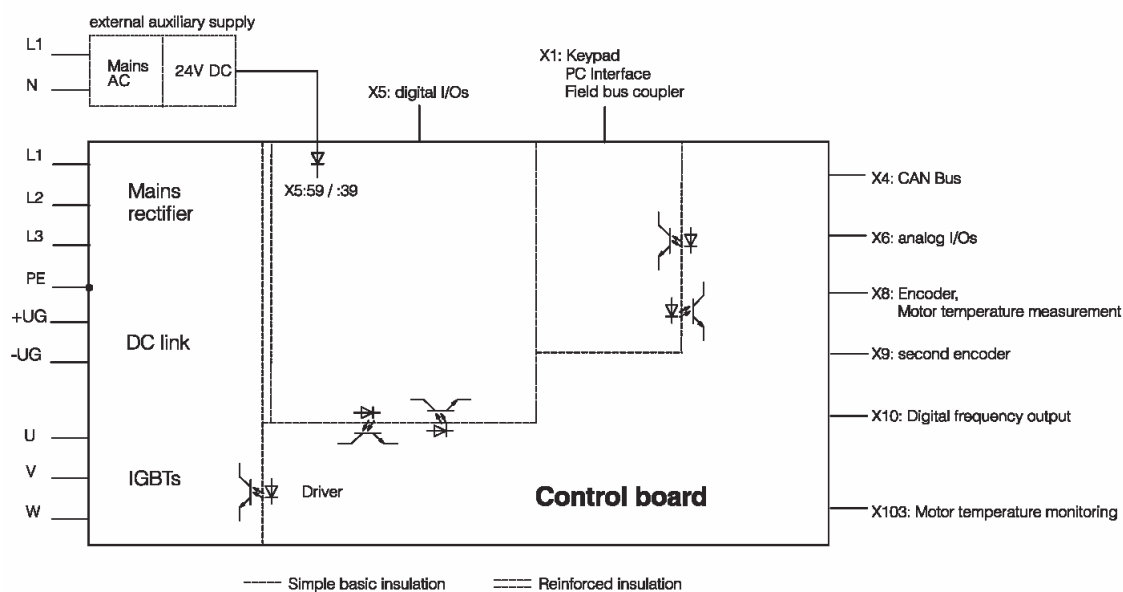


Fig. 2-17: Separation of potential inside ALSPA MV1000

3 Transport, Installation and Connection

3.1 Safety notes



The safety instructions given on the inside cover and in section 5.1 must be observed.

3.2 Transport

Heavy vibration or impacts must be avoided during transport and when lifting and lowering.

When the ALSPA MV1000 is unpacked check to ensure it is complete and undamaged.

If damage is found it must be documented and reported to the carriers immediately.

3.3 Storage

ALSPA MV1000 units can be stored for at least 2 years with no electrical supply connected, max. 5 months of which may be at storage temperatures of above 40 °C. The ALSPA MV1000 must be checked after this period has elapsed. The AL electrolytic capacitors must be reformed by suitably trained personnel before the rated voltage is applied.

3.4 Installation

ALSPA MV1000 units are to be installed in clean, dry rooms according to their protection class IP 20. The ALSPA MV1000 rated data may change in other protection classes. A clearance of 100 mm must be provided above and below the unit to ensure adequate ventilation. Several ALSPA MV1000 units can be mounted side by side without any such clearance, however.

ALSPA MV1000 units are designed for vertical wall-mounting in cubicles, booths and boxes. The screws and fixings supplied must be used to secure the drive module.

3.5 Connection and wiring

Three-phase cable with the cross-sections stated in Table 2-3 are recommended for power connections (motor and mains supply). For reasons of EMC we recommend a 3-phase cable with concentric protective conductor should be used for the motor connection. The protective conductor (screen) in the motor cable is to be earthed at both ends.

The protective earth for the unit must be connected to a good earth.



Warning!

If the inverters are not earthed their enclosures can carry dangerous voltages which can cause death, severe physical injury or extensive damage.

The user is responsible for ensuring that inverters and other equipment are installed and connected in accordance with the accepted rules of technology in the country concerned as well as any local regulations applicable. This includes cable sizes, fusing, earthing, shutdown, isolation, insulation monitoring and overcurrent protection which must be taken in particular consideration.

Carefully check that cables are connected to the correct terminals.
Refer to the following table for maximum tightening torque for screws.

Type	L ₁ , L ₂ , L ₃ , +U _G , -U _G	U, V, W	PE	Screen Strain-relief	X4, X5, X6
ALSPA MV	[Nm]	[Nm]	[Nm]	[Nm]	[Nm]
1003...1024	0.5 ... 0.6 (4.4 ... 5.3 lbin)	0.5 ... 0.6 (4.4 ... 5.3 lbin)	3.4 (30 lbin)	M4: 1.7 (15 lbin)	0.5 ... 0.6 (4.4 ... 5.3 lbin)
1032...1059	4 (35 lbin)	4 (35 lbin)	4 (35 lbin)	M5: 3.4 (30 lbin)	0.5 ... 0.6 (4.4 ... 5.3 lbin)
1089	7 (62 lbin)	7 (62 lbin)	7 (62 lbin)		0.5 ... 0.6 (4.4 ... 5.3 lbin)
1110...1171	12 (106.2 lbin)	12 (106.2 lbin)	12 (106.2 lbin)		0.5 ... 0.6 (4.4 ... 5.3 lbin)

Table 3-1: Tightening torque of screws

Mains supply cables and motor cables are to be laid separately in accordance with EMC connection instructions.

The motor star point must not be earthed.

Control and signal leads to the control electronics are to be laid and connected in accordance with the EMC connection instructions.

3.6 EMC installation and connection instructions

The following cross-sections are recommended for connections to terminal strips, for fixed indoor systems due to the mechanical strength and interference resistance:

- Single-core, multi-wire (stranded) cables of at least 1 mm², at least 0.5 mm² within switchgear cubicles
- Multi-core screened cable of at least 0.75 mm², at least 0.5 mm² within switchgear cubicles

If possible, standard uniform reference potential is to be provided and all electrical equipment is to be earthed. If the control electronics are to be earthed, check whether earthing is permitted for all equipment connected to the ALSPA MV1000.

No unconnected contactors, relays, solenoid valves, electro-mechanical counters etc. may be used in the switchgear cubicle with the ALSPA MV1000. All inductances connected to the same current circuit are to be fitted with suppressing components.

DC-activated coils are switched with a diode or Z-diode and AC-activated coils are suppressed using a varistor or RC component.

If unconnected contactors are used in an adjacent cubicle the cubicles are to be partitioned using a side panel.

Cables to the ALSPA MV1000 control electronics must be screened. The cabling should be divided into groups: Power cables, power supply cables, analog signal leads, digital signal leads, bus or data leads.

Power cables and the signal and data leads must be laid in separate ducts or bundles. Signal and data leads should preferably be kept close to grounded surfaces, for example support beams, metal rails, mounting panels or cubicle panels.

Motor cables, mains supply cables and signal leads to the control electronics are to be spaced at least 0.2 m apart inside the switchgear cubicle. This spacing can be reduced where cables cross. Outside the switchgear cubicle the motor cables are to be laid in separate bundles spaced at least 0.3 m away from other cables. No other current circuits may be fed through or with motor cables.

Cables to thermistor motor temperature monitors are to be laid separately and may not under any circumstances located with motor power circuits.

Mains and motor cables are to be PVC insulated 3-phase cables according to DIN VDE 0271.

Practical experience with EMC has shown that motor connection cables with copper armouring or concentric corrugated protective conductors should be used, for example NYCWY (3-core). The screen sleeve / PE conductor provides good damping to reduce the HF interference radiated by the motor cable through high frequency recharging currents if a low impedance screen connection is provided at both ends. The largest possible protective conductor cross-section should be used.

Motor cables with steel armouring are unsuitable from the point of view of EMC.

Metal cable screw connections (nickel plated brass) at the connection box (do not use a plastic connection box) provides a very good connection for the screen to the motor casing.

The frequency inverter should preferably be positioned close to the motor. The cable screen must always be terminated directly at the end. Separate the cables at the ALSPA MV1000 terminal strip into analog inputs and outputs and digital inputs and outputs and lay them separately using screened cables with the screen earthed at both ends.

When the ALSPA MV1000 is fed with an external 24 V auxiliary voltage (X5:59) this may not be used to supply other consumers in different cubicles. Ideally power supplies at separate potential should be used for each ALSPA MV1000.

The quality of the signal connection to the encoder is a major factor for the maximum encoder frequency possible. The cables used must always be at least screened encoder leads with the conductors twisted in pairs, for example LIYCY 3 x 2 x 0.75 mm². The screen is to be connected generously at both ends. Signal conductors should always be connected directly to the terminal strip without any intermediate terminals or separation points. Unused signal conductors are to be grounded.

Only signal leads with a tinned copper braided screen should be used. The screen should provide at least 85 % coverage. Cables with a foil screen are less suitable as the foil may fracture easily through bending or pressure.

The screen is to be continuous to peripherals such as reference potentiometers etc.

Only one additional separation point is permitted. This must be such that less than 2 cm of the cable remain unscreened. The screens at both ends of the cable are connected through the screen bus (see Fig. 3-1).

The ALSPA MV1000 scope of supply includes various mounting parts to secure the cable screens in a low impedance connection, see Fig. 3-2.

If a mains filter is used it must be installed as close to the ALSPA MV1000 mains input as possible, taking the air cooling required into consideration, to guarantee the connection leads are as short as possible. In this installation the inverter cubicle may not contain any further unfiltered current circuits to the motor, e.g. cables for external fans, as otherwise inverter interference suppression will be limited.

To avoid extraneous interference from motor cables, for example, the filtered sections of the cable between the mains filter and the supply terminals in the switchgear cubicles must be screened or laid in armoured steel pipe or metal ducting if the length is ≥ 30 cm. Under no circumstances may cables to and from mains filters be placed in the same cable duct. Mains filters generate currents and a PE connection of ≥ 10 mm² is required according to prDIN 50178/VDE 0160.

If several inverters are installed in the same cubicle the mains filters are also to be installed close to the inverters. An additional mains filter should be fitted for auxiliary current circuits.

If a mains contactor is fitted, the contactor control cables are to be kept separate from other control cables in the cubicle.

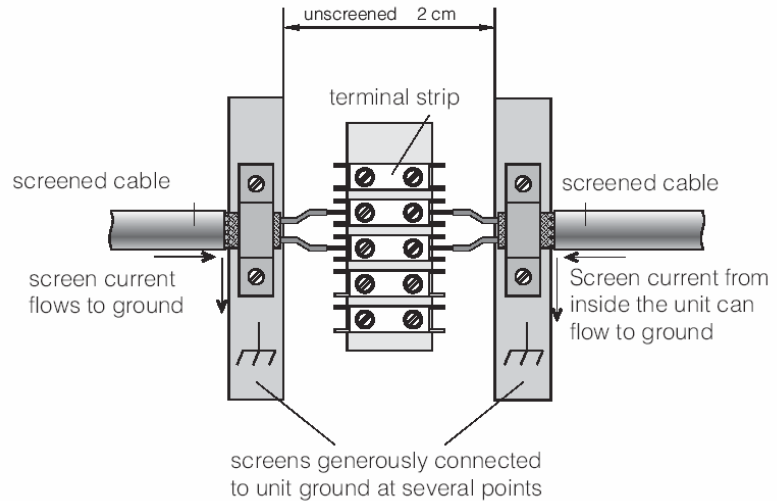


Fig. 3-1: Separation point on a screened cable

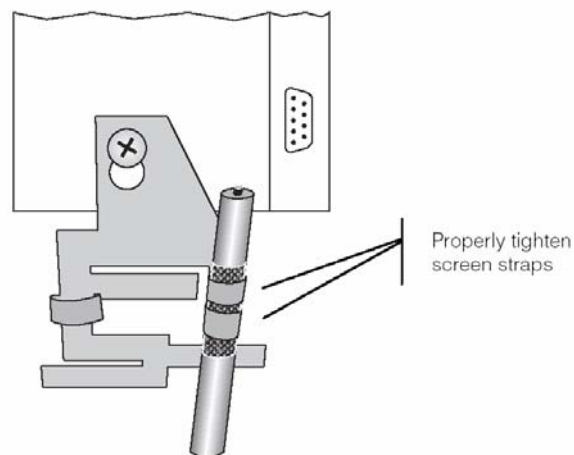


Fig. 3-2: Cable screen connection to mounting parts (signal leads)

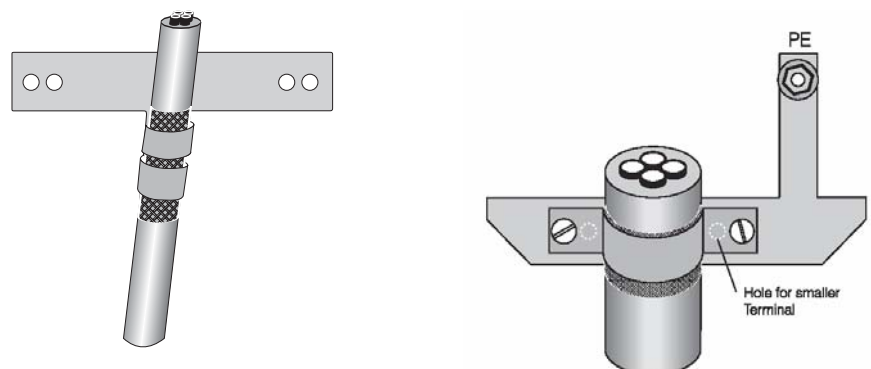


Fig. 3-3: Cable screen connection to mounting parts (mains and motor cables)

4 Operation and Software

4.1 Drive operation with Keypad

The ALSPA MV1000 is operated with the ALSPA MV1000 Keypad. Fit the Keypad on the inverter by holding it flush to the right and top edges of the enclosure. The back of the Keypad must slide left at the edge of the ALSPA MV1000 enclosure so that the Keypad is guided when pressing it into the sockets provided.



Fig. 4-1: ALSPA MV1000 control unit (Keypad), in the ON condition

The following standard terminal wiring is required for presetting the reference through the software motorised potentiometer:

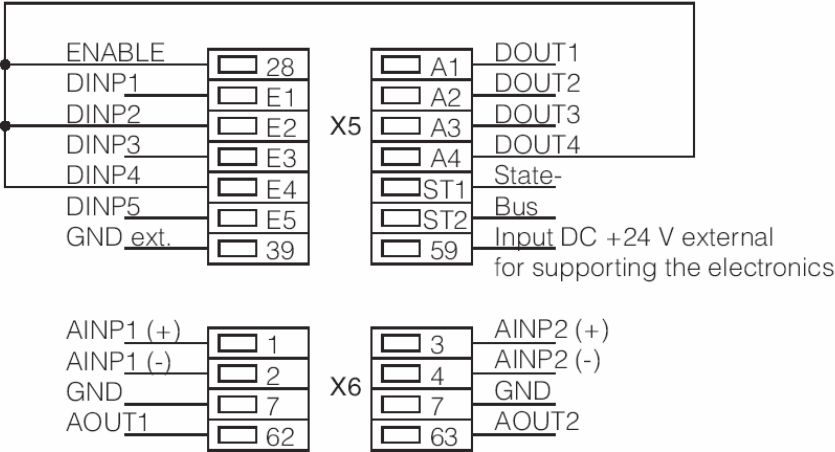


Fig. 4-2: Standard terminal wiring for motorised potentiometer

Menu selection and parameter adjustment

- ◀ Cursor left; back to active menu
- ▶ Cursor right; to first menu option, to parameter, to confirm entry
- ▲ Cursor up; to previous menu option, increase value
- ▼ Cursor lower; to next menu option, reduce value

Controlling the drive

- + Software motorised potentiometer: Increase reference
- Software motorised potentiometer: Decrease reference
- ◊ Start drive
- ▼ Stop drive; acknowledge trip messages

Status indicators



Green indicator: Ready



Green indicator: Working

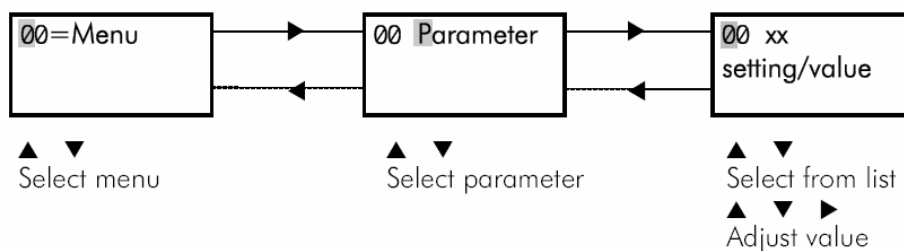


Yellow indicator: Fault

4.1.1 Using the menus

Operation of the unit with the ALSPA MV1000 Keypad is in 3 steps:

- Select menu
- Select parameter
- Select setting or enter value



- A menu or parameter is selected with the keys ▲ and ▼. Pressing the key ▼ moves you to the next menu or parameter on the menu and pressing key ▲ moves you to the previous menu or parameter.
- Move to the next lower operating level by pressing key ▶ and move back up to the next higher operating level by pressing key ◀.
- The flashing cursor indicates what can be done with the keys ▲ and ▼: Select menu, select parameter, adjust parameter or value

- Depending on the kind of parameter, its value can be
 - selected from a given list of texts
 - entered by changing each digit of a number
 - entered as text by changing each character
- Selection from list:
Select the value on the list using keys ▲ and ▼. You can cycle endlessly through the lists. The start and end of a list is indicated by a longer audible "beep". Confirm your entry by pressing key ►.
- Changing a parameter value:
The flashing cursor marks a digit of a number/a character of a text. Every pressing of a ▲ increases the digit / selects the alphabetically following character, every pressing of a ▼ decreases the digit / selects the alphabetically preceding character. The ► key moves the cursor one position towards the right. After selection of the last position on the right, confirm your entry using the ► key. If the entry is accepted the following message appears:

```
hh:mm:ss Info:
ok
```

The message disappears after 2 seconds. This message indicates that the change was save and is active.



Important!

If entry of a parameter value is not confirmed using the ► from the right-hand digit, the new value is not saved and the old value remains active. It is therefore possible to cancel an entry by pressing the ◀ key. This also applies to texts and list parameters.

4.1.2 Software structure

The user interface for the Keypad is divided into 2 menu levels. Level 1 contains the **menu**. The **parameters** are selected on level 2. Access to parameters is organised with 3 levels of Security to prevent unintentional adjustment of parameters. Protection-level 0 parameters are always visible. Higher-level parameters can be displayed only by entering the proper password.

Menu	Parameter/Variables groups
01=DISPLAY	Motor signals :
02=APPLICATION PAR.	Drive name Speed values : Ramps
03=CONFIGURATION	Reference/control sources : Operating modes Special functions
04=ANALOG I/Os	Wiring/scaling : :
05=DIGITAL I/Os	Wiring : :
06=RATINGS	Brake Motor : Encoder
07=CONTROL	Structure : : Control parameter
08=DIAGNOSTICS	Fault/First value : : Protocol log drive state
09=PASSWORD	Security level Passwords
10=LANGUAGE SELECT	Language for names and messages
11=COMMUNICATION	drive adress baud rate ... CAN-Bus Settings
12=TECHNOLOGY	

4.2 Menu structure

01=DISPLAY

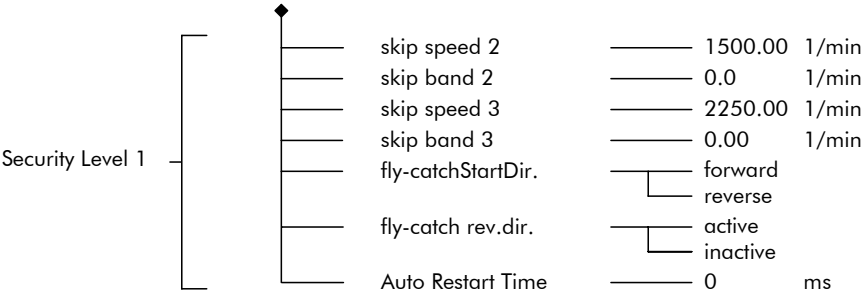
→ page 4-14

Security Level 2	[	speed	0.0	1/min
		speed digital	0.00	1/min
		reference	0.0	1/min
		output frequency	0.000	Hz
		motor current	0.0	A
		motor-voltage	0.0	V
		torque	0.00	Nm
		Motor-power	0.00	kW
		V dc-link, abs.	0.0	V
		heatsink temperatur.	0.0	°C
		motor temperature	0.0	°C
		Date, Time	dd-mm-yy	hh:mm:ss
		Software-ID	29205005	
		Software Version	MV1000 STD-ASM V3.01	
Security Level 1	[	Drive Name	20 characters text	
		user text	0.0	

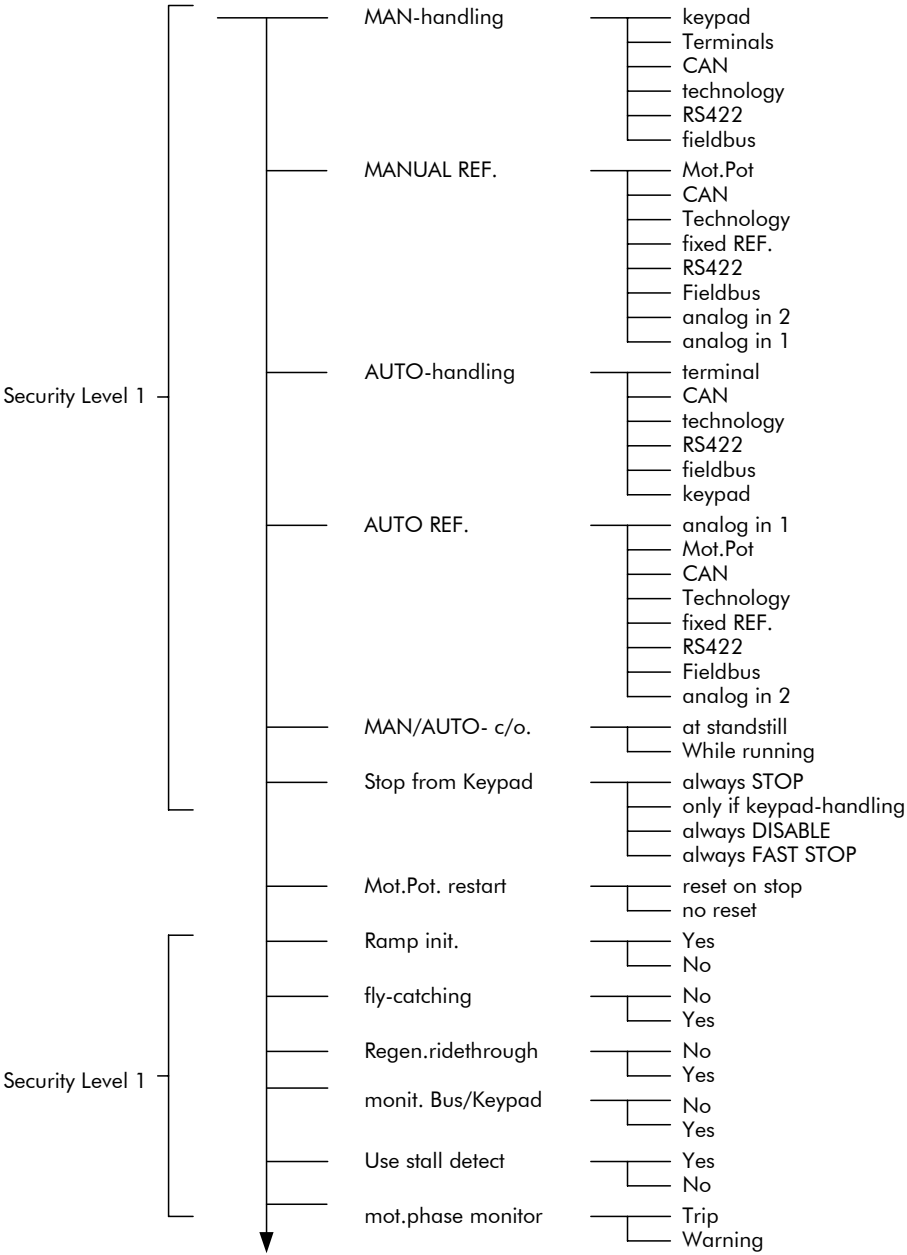
02=APPLICATION PAR

→ page 4-14

Security Level 1	[	Max. Speed	1500	1/min
		max-speed ref.	1800	1/min
Security Level 2	[	Motor.Full Load I	100	%
		Regen.Full Load I	100	%
Security Level 1	[	Motor.Peak I	150	%
		Regen.Peak I	100	%
Security Level 1	[	Ramp up	2.000	s
		Ramp down	5.000	s
		Ramp fast stop	0.200	s
		Ramp up 2	0.200	s
		Ramp down 2	0.500	s
		Mot.Pot ramp up	10.000	s
		Mot.Pot ramp down	10.000	s
		Mot.Pot max.speed	1500	1/min
		Mot.Pot min.speed	0.0	1/min
		jogging REF.	30	1/min
		fixed REF.0	150.00	1/min
		fixed REF.1	300.00	1/min
		fixed REF.2	450.00	1/min
		fixed REF.3	600.00	1/min
Security Level 1	[	skip speed 1	750.00	1/min
		skip band 1	0.00	1/min



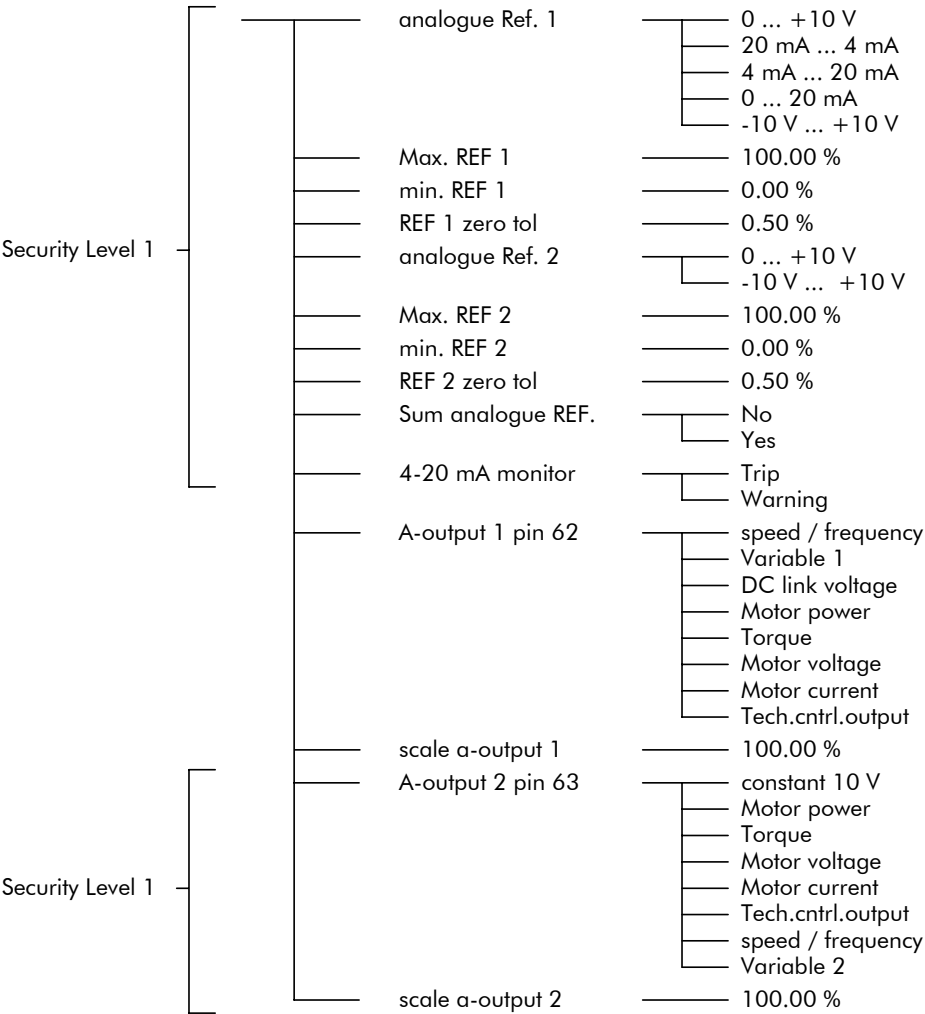
03=CONFIGURATION
→ page 4-18



Security Level 1	[	Mon. Motor T'stat X103	No
			Yes
Security Level 2	[	Monitor motor-PTC X7/8	No
			Yes
		PTC-Res. (Temp1)	557 Ω
		PTC-Res. (Temp2)	962 Ω
		PTC-Res. (Temp3)	1379 Ω
		PTC-Res. (Temp4)	1774 Ω
Security Level 2	[	PTC-Res. (Temp5)	2225 Ω
		PTC-Res. (Temp6)	2866 Ω
		Parameter Set No.	1
		Copy Source: Set	0
Security Level 2	[	Copy Target: Set	0
		Copy Parameter Set	Execute func: no
		Execute	Execute func: yes
		Par.Set change via	Keypad / PC terminals / bus
Security Level 2	[	Par.Set -> Keypad	Execute func: no
		Execute	Execute func: yes
		Keypad -> Par.Set	Execute func: no
		Execute	Execute func: yes
		PWM frequency	8 kHz
			16 kHz
	[	load Defaults	Execute func: no
			Execute func: yes
	[	Restart	Execute func: no
			Execute func: yes

04=ANALOG I/Os

→ page 4-24



05=DIGITAL I/Os

→ page 4-27 (All in Security level 1)

— RUN/STOP	— DINP5 ¹⁾
— STOP	— LOW ¹⁾
— STOP inv.	— No / Yes
— FAST STOP	— DINP4 ¹⁾
— FAST STOP inv.	— No / Yes
— REVERSE	— DINP3 ¹⁾
— REVERS inv.	— No / Yes
— FORWARD	— DINP2 ¹⁾
— FORWARD inv.	— No / Yes
— MAN/AUTO	— DINP1 ¹⁾
— MAN/AUTO inv.	— No / Yes
— Mot.Pot. UP	— LOW ¹⁾
— Mot.Pot. UP inv.	— No / Yes
— Mot.Pot. DOWN	— LOW ¹⁾
— Mot.Pot. DOWN inv.	— No / Yes
— TRIP ACKNOWLEDGE	— ENABLE ¹⁾
— TRIP ACKNOWL. inv	— No / Yes
— EXT. FAULT	— LOW ¹⁾
— EXT. FAULT inv.	— No / Yes
— JOGGING	— LOW ¹⁾
— Par.Set Change	— LOW ¹⁾
— Par.Set Change inv.	— No / Yes
— fixed REF. bit 0	— LOW ¹⁾
— fixed REF. bit 0 inv	— No / Yes
— fixed REF. bit 1	— LOW ¹⁾
— fixed REF. bit 1 inv	— No / Yes
— select rampe 2	— LOW ¹⁾
— select rampe 2 inv.	— No / Yes
— d-output 1 inv.	— No / Yes - standard setting: Ready
— d-output 2 inv.	— No / Yes - standard setting: Working
— d-output 3 inv.	— No / Yes - standard setting: Fault
— DOUT4 choice	— constant 24 V
	— Ridethrough
	— Warning
	— Above current ref
	— Above speed ref
	— At zero speed
	— At speed
	— constant 0 V
— d-output 4 inv.	— No / Yes
— at speed tol	— 30.00 1/min
— zero speed tol	— 15.00 1/min
— reference speed	— 750.00 1/min
— load-current reference	— 66 %

¹⁾ possible settings:

HIGH] constant
LOW	
DINP5] Terminal X5
DINP4	
DINP3	
DINP2	
DINP1	
ENABLE	

06=RATINGS

→ page 4-32

		HW Features	Standard
			-S
			-IT
		Inv.F.L.current	23.5 A
		Brake Module type	without
			Chopper
			DC-Bus
Security Level 1		DC-Brake	No
			on FAST STOP
Security Level 3		Mains voltage	400 V
		Inv. Ident No.	13
		Motor F.L.power	11.00 kW
		Motor base voltage	400 V
		Motor F.L.current	22.1 A
		Motor base speed	1455 1/min
		Motor base freq.	50 Hz
Security Level 1		Star / Delta	Star
			Delta
		Power Factor	0.84
		Pull out / Nom.TQ	2.9
		encod. line count	10000
Security Level 2		encoder voltage	5.00 V
		encoder mode	X8 = encoder, X10 = Dig.set output
			X9 = encoder, X10 = Dig.set output
			reserved
			X8 = encoder, X9 = Dig.set output
			X8 = Geber, X10 = X9
			X8 = encoder, X10 = X8
Security Level 1		adjust-mode	No
			Yes
		adjust to +0.5 %	0.00 %
		R-stator + R-cable	1.13 Ω

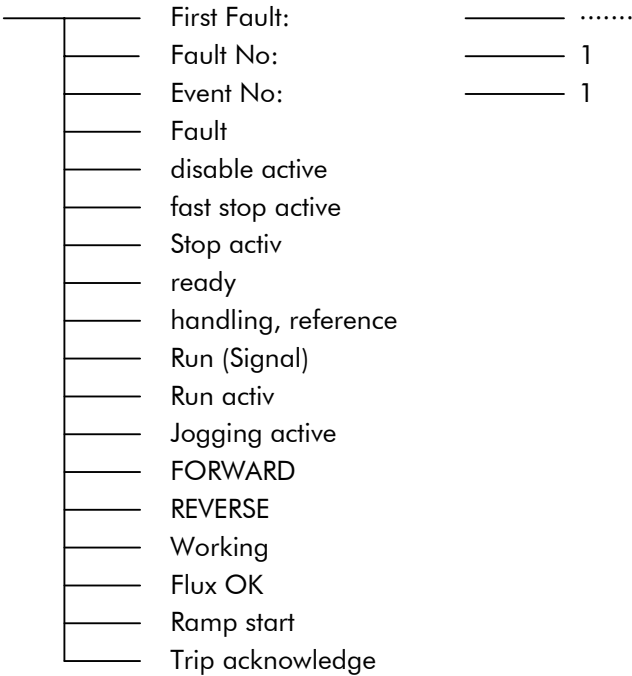
07=CONTROL

→ page 4-35

Security Level 1		control Options	speed w-out ENC
			frequency control
			torque with ENC
			speed with ENC
			torque w-out ENC
		Economy	0 %
		Economy mode	fan curve fluxing
			load current dep.
Security Level 1		speed cntrl. Kp1	10.000
		speed cntrl. Tn	200.0 ms
		Tech.Contrl. Kp	10.000
		Tech.Contrl. Tn	500.0 ms
		IL controller Kp	0.297
		IL controller Tn	18.692 ms
Security Level 2		IM controller Kp	0.297
		IM controller Tn	18.692 ms
		Or controller Kp1	0.051
		Or controller Tn	0.5 ms
		flux ctrl. Kp	10.000
		flux ctrl. Tn	246.298 ms
		level ctrl. Kp	1.000
		level ctrl. Tn	246.298 ms

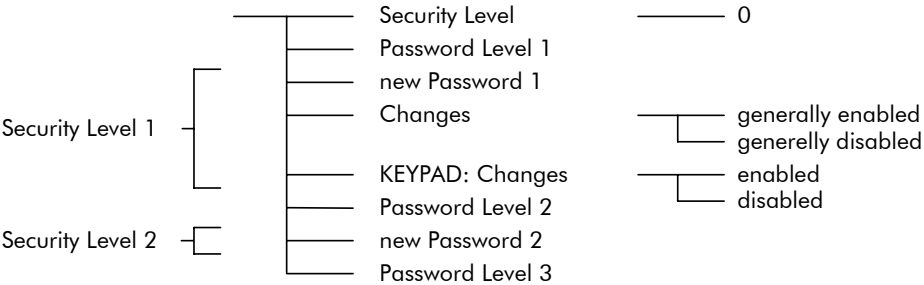
08=DIAGNOSTICS

→ page 4-38



09=PASSWORD

→ page 4-40



10=LANGUAGE SELECT

→ page 4-40



11=COMMUNICATION

→ page 4-41

		PC: Adress	0
		PC: Baudrate	57600 Baud
			38400 Baud
			19200 Baud
			9600 Baud
			4800 Baud
			2400 Baud
		CAN: SDO-ID	1
		CAN: Baudrate	1M- Baud
			500k- Baud
			250k- Baud
			125k- Baud
			50k- Baud
			20k- Baud
			10k- Baud
		CAN:Start mode	standard
			always operational
			NMT 'start all nodes'
		CAN:module state	pre-operational
		CAN:RECV1 ID	513
		CAN:RECV1 Mode	asynchronous
			synchronous
		CAN:RECV2 ID	769
		CAN:RECV2 Mode	asynchronous
			synchronous
		CAN:handling	CAN RECV2 Word 1
			CAN RECV2 Word 4
			CAN RECV2 Word 3
			CAN RECV2 Word 2
		CAN:Reference	CAN RECV1 Word 1
			CAN RECV1 Word 4
			CAN RECV1 Word 3
			CAN RECV1 Word 2
		CAN:SEND1 ID	385
		CAN:SEND1 Mode	no transmit
			event triggered
			cyclic
			event trig. cyclic
			synchronous
		CAN:SEND1 words to send	4
		CAN:SEND1 cycle time	10 ms
		CAN:SEND2 ID	641
		CAN:SEND2 Mode	no transmit
			event triggered
			cyclic
			event trig. cyclic
			synchronous
		CAN:SEND2 words to send	4
		CAN:SEND2 cycle time	20 ms
		Adapter Mode	1
		Baudrate [kBd]	0
		Adress	2
		fbus:words sending	8
		fbc:remote-address	00 00
		fbc:words to recv	4
		Restart Execute	No


12=TECHNOLOGY

→ page 4-44

13=...

14=...

15=...

Security Level 1		Tech.PAR Bit	0
		Tech.PAR Short 1	0.006 %

4.3 Description of indicators and parameters

This section contains the description of the displays and parameters accessible using the ALSPA MV1000 Keypad. Other parameters are only accessible when using the optional PC drive software.



Note:

The "normalisation frequency" parameter is a reference value for the internal representation of other parameters. Any adjustment of this parameter will affect amongst others the frequency resolution, the maximum output frequency and the speed limit.

As supplied, the normalisation frequency is set to 100 Hz. This produces the following values:

	<u>Norm. frequency</u>	
- Frequency resolution	— 16384	= 0.006 Hz
- Max. output frequency	= 2 * norm. frequency	= 200 Hz

Only when these values are not sufficient for the application is it necessary to adjust the **normalisation frequency** parameter using the optional ALSPA PCS drive software. Then the drive must be re-commissioned.

4.3.1 01=DISPLAY

speed	Display in [rpm]
speed digital	Display of encoder measurement value (if connected) in [rpm]
output frequency	Display in [Hz]
motor current	Display of effective value in [A]
motor-voltage	Display of effective value in [V]
torque	Display also in field weakening range in [Nm]
motor-power	Display also in field weakening range in [kW]
V dc-link, abs.	Display of absolute value in [V]
heatsink temperatur.	Display in [°C]
Motor temperature	If a sensor is connected to X8, display in [°C]
Reference	Display speed reference in [rpm]
Date, Time	Display of time and facility to set the internal clock in the format dd-mm-yy hh:mm:ss. The clock stops if no supply voltage is present unless an external 24 V supply is provided.
Software-ID	Display of software version reference number, e.g. "29205005" for 029.205 005
Software Version	Display of software version, e.g. "MV1000 STD-ASM V3.01"
Drive-Name	Display and input of drive designation, e.g. "FIELD 2 PUMP 14". Up to 20 alphanumeric characters are possible.
User text	Display variable: freely programmable with ALSPA PCS Software

4.3.2 02=APPLICATION PAR(AMETER)

Max. speed	Higher level reference limiter, acting after reference selection and before the ramp, see also Mot.Pot max.speed
Adjustment range:	0 ... 2 * norm. frequency * 60 / no. of pairs of poles
As supplied:	1500 rpm

max-speed ref.

Overspeed value for shutting down the ALSPA MV1000 on excessive speed, with "overspeed +" fault message. The fault message must be acknowledged before restarting.

Adjustment range: 0 ... $2 * \text{norm. frequency} * 60 / \text{no. of pairs of poles}$

As supplied: 1800 min⁻¹

Motor.Full Load I

Motor rated load current permitted continuously for the motor. **See note*!**

Adjustment range: 0 ... value limited by Inv.F.L.current and Regen.Peak I.

As supplied: 100 % (rated motor current)

Regen.Full Load I

Regenerative rated load current permitted continuously for the motor. **See note*!**

Adjustment range: 0 ... value limited Inv.F.L.current and Regen.Peak I.

As supplied: 100 % (rated motor current)

Motor.Peak I

Peak motor current for max. 60 s. After 60 s the system switches back to "Motor.Full Load I". **See note*!**

Adjustment range: 0 ... value which provides max. inverter current.

As supplied: 150 %

Regen.Peak I

Regenerative peak current for max. 60 s. After 60 s the system switches back to "Regen.Full Load I". **See note*!**

Adjustment range: 0 ... value which provides the max. inverter current.

As supplied: 100 %.

**Note*:**

The current limits are entered as a percentage of the load component of the Motor F.L. current. The max. torque of the drive in the constant-flux range is thus proportional to the current limit set.

The regenerative current limits are in effect only when a **Brake Module** (chopper or DC-Bus) has been connected to the inverter; otherwise the reduced regen.limit of 15 % ("Crnt.Lmt.gen.red") is active.

When the drive is overloaded (and with a control option other than frequency control), the inverter first limits the current to MotorPeak I. If the overload continues, the current is reduced to Motor. Full Load I after 60 s, without shutting the inverter down. The speed is reduced (depending on load).

With frequency-control selected as control option, the motor is not protected by a current limit, only the inverter is protected. An overload between 100 ... 150 % of the Inverter F.L. current is permissible for 60 s; if an overload continues, the inverter trips, outputting a fault message. With overloads > 150 % of the Inverter F.L. current, the inverter trips immediately, outputting a fault message.

**Ramp up (2)
Ramp down (2)**

Acceleration or braking time. Time for passing through a speed range of 0 ... Ramp Nom. This time applies to both directions of rotation.

Parameter for signal source: Ramp 2
 Range: 0.010 ... 600.00 s
 As supplied: 2.000 s Ramp up
 5.000 s Ramp down
 0.200 s Ramp up 2
 0.500 s Ramp down 2

As supplied, ramp up and ramp down are active.

Example:

Setting 1 s: The frequency change from 0 to 1500 1/min at the ramp takes one second.

Activating "select ramp 2" makes the second pair of ramps, "Ramp up 2" and "Ramp down 2", active instead of the standard ramps "Ramp up" and "Ramp down".

Ramp fast stop

Drive braking time for FAST STOP. See **ramp up** as an example.

When the **DC brake** is on (see menu 06=Ratings), the **Ramp fast stop** determines the length of the DC braking action.

Parameter for signal source: FAST STOP
 Adjustment range: 0.010 ... 600.00 s
 As supplied: 0.200 s

Mot.Pot ramp up

Software motorised potentiometer up integration time. See **ramp up** as an example.

Adjustment range: 0.1 ... 1,000 s
 As supplied: 10 s

**Note:**

The integration time set for the motorised potentiometer should always be longer than the effective ramp up or down.

Mot.Pot ramp down

Motorised potentiometer down integration time. See **ramp up** as an example.

Adjustment range: 0.1 ... 1,000 s
 As supplied: 10 s

Mot.Pot max.speed

Max. speed reference for motorised potentiometer function. The speed is also limited by the **Max. speed** setting.

Adjustment range: M.Pot min. speed ... $2 * \text{norm. frequency} * 60 / \text{no. of pairs of poles}$
 As supplied: 1500 min^{-1}

Mot.Pot min.speed

Min. speed reference for motorised potentiometer function.

Adjustment range: $\pm 2 * \text{norm. frequency} . 60 / \text{no. of pairs of poles}$
 As supplied: 0 rpm

jogging REF.

Jogging speed in the jogging mode.

Parameter for signal source: JOGGING, see page 4-29.
 Adjustment range: $\pm 2 * \text{norm. frequency} . 60 / \text{no. of pairs of poles}$
 As supplied: 30 rpm

fixed REF. 0 ... 3

Fixed speeds which can be selected through the digital inputs of the terminal strip.
 The AUTO reference or the MANUAL reference signal source used must be set to fixed REF..
 Parameter for signal source: fixed REF. bit 0 and fixed REF.bit 1, see page 4-30.
 Adjustment range: 0 ... 2 * norm. frequency * 60 / no. of pairs of poles
 As supplied: 150, 300, 450, 600 rpm

skip speed 1 ... 3

Speeds can be skipped to avoid mechanical resonance.
 Adjustment range: 0 ... 2 * norm. frequency * 60 / no. of pairs of poles
 As supplied: 750, 1500, 2250 rpm

skip band 1 ... 3

The bandwidth determines the range around the skip speed which is skipped. If the bandwidth is set to zero, the speed is not skipped.
 Adjustment range: 0 ... 0.1 * norm. frequency * 60 / no. of pairs of poles
 As supplied: 0 rpm

Example:

Skip speed 1 750 rpm
 Skip band 1 50 rpm
 The range from 725 ... 775 rpm is skipped.

fly-catchStartDirection

Start direction for speed capture when switching onto a rotating motor. (See "fly-catching" mode in menu 03=Configuration, page 4-20).
 Range: forward/reverse
 As supplied: forward

Fly-catch rev.direction

When set to "Yes", if no speed is detected during motor speed capture in the forward direction the capture process will continue in the opposite direction. If it is certain the motor cannot be running in the opposite direction the capture process can be shorted by using the "No" setting.
 Range: Yes/No
 As supplied: Yes

Auto restart time

This parameter sets the maximum mains interruption time after which the automatic restart facility can switch the drive on again if the ALSPA MV1000 electronics remain powered (by an external 24 V supply or kinetic support) during mains failure. If the mains supply returns within the auto restart time the unit first executes a reduced self-test and then restarts automatically if the RUN / STOP signal is still present. If the mains voltage does not return until the auto restart time has elapsed the ALSPA MV1000 must be switched on again. In that case a no ! yes edge of the RUN control signal is required for starting the drive. The auto restart function is switched off when set to 0 ms. It is activated automatically at setting above 0 ms.
 Adjustment range: 0 ... 10,000 ms
 As supplied: 0 ms

4.3.3 03=CONFIGURATION



Note:
If the drive is to be operated using the Keypad, +24 V should be applied to the following terminals:

ENABLE	(Terminal :28)	Enable the pulses
DINP2	(Terminal :E2)	Rotation FORWARD
DINP4	(Terminal :E4)	Fast stop

If the drive is to be operated using RS422, fieldbus, technology or CAN, +24 V should be applied to the following terminals:

ENABLE	(Terminal :28)	Enable the pulses
DINP4	(Terminal :E4)	Fast stop

MAN-handling
AUTO-handling

The ALSPA MV1000 can be operated in the MANUAL or AUTOmatic mode. Individual signal sources for control and for the reference values can be selected for each mode. Switching between MANUAL and AUTO mode is by a control signal at the terminal strip.

Selection list:	Terminals	
	Keypad	
	Field bus	
	RS422	
	Technology	
	CAN	
As supplied:	MAN-handling:	Keypad
	AUTO- handling:	Terminals

Keypad: The Keypad control signals RUN, STOP, + (Mot.Pot. UP), - (Mot.Pot. DOWN) and TRIP ACKNOWLEDGE are operational. All other control signals remain active via the terminal strip.

Terminals: The ALSPA MV1000 is operated only via the terminal strip. The STOP and QUIT signal also takes effect alternatively via the Keypad.

RS422: The control signals RUN, Mot.Pot. UP, Mot.Pot. DOWN, REVERSE, FORWARD and TRIP ACKNOWLEDGE are applied as parameters through the serial interface.

Field bus: The control signals RUN, Mot.Pot. UP, Mot.Pot. DOWN, REVERSE, FORWARD and TRIP ACKNOWLEDGE can be sent through the fieldbus.

Technology: The control signals RUN, Mot.Pot. UP, Mot.Pot. DOWN, REVERSE, FORWARD and TRIP ACKNOWLEDGE can be preset via technology modules; these are configured with the ALSPA PCS.

CAN: The control signals RUN, Mot.Pot. UP, Mot.Pot. DOWN, REVERSE, FORWARD, TRIP ACKNOWLEDGE can be applied through the CAN bus.

**MANUAL REF(ERENCE)
AUTO REF(ERENCE)**

Source of reference in MANUAL or AUTO mode.		
Selection list:	Mot.Pot	
	Analog in 1	
	analog in 2	
	Field bus	
	RS422	
	Fixed REF.	
	Technology	
As supplied:	CAN	
	MANUAL REF.:	Mot.Pot
	AUTO REF.:	analog in 1

MAN/AUTO-c/over

Manual/Automatic changeover		
Selection list:	At standstill:	Switching only possible with drive at a standstill (pulses disabled).
	While running:	Switching also possible while motor is running.
As supplied:	At standstill:	



Note:
Switching between manual and automatic operation is always effected via the terminal strip. The terminal is determined with the MAN/AUTO parameter in menu **05=DIGITAL I/Os**.

Stop from Keypad

Determines the effect of the Keypad Stop key when it is hit during operation.	
Selection list:	always STOP
	only if Keypad-handling
	always DISABLE
	always FAST STOP
As supplied:	always STOP
always STOP:	The Stop key is always active, even if the other control functions are operated from a different source (e.g. RUN/STOP from the terminal strip). When the key is hit, the drive brakes at the "ramp down". When it reaches a standstill, the pulses are disabled.
only if Keypad-handling:	The Stop key is only active when the handling is effected via the Keypad. (MAN-handling or AUTO-handling set to "Keypad"). When the key is hit, the drive brakes at the "ramp down". When it reaches a standstill, the pulses are disabled.
always DISABLE:	The Stop key is always active, even if the other control functions are operated from a different source. When the key is hit, the inverter disables the pulses and the motor coasts down.

always FAST STOP: The Stop key is always active, even if the other control functions are operated from a different source. When the key is hit, the drive brakes to zero at the parameterable "**Ramp fast stop**". If **DC-Brake** is accordingly set (see menu **06=Ratings**), a DC braking action is triggered.

Mot.Pot.Reset

The actual motorised potentiometer reference can be reset or stored when the unit is switched off (when the ALSPA MV1000 pulses are disabled). The value stored is used on restarting.

Selection list: reset on stop / no reset

As supplied: reset on stop

Ramp init.

The acceleration and braking ramps are delayed if in its momentary operating condition the drive cannot accelerate or brake as quickly as required.

Selection list: Yes / No

As supplied: Yes

fly-catching

This allows switching onto a rotating motor. With fly-catching = Yes the unit searches for the motor speed in the forward direction and, if the search is unsuccessful, repeats it in the reverse direction. If no speed is detected, the motor is started at zero speed. The presets for "fly-catchStartDir." and "fly-catch rev.dir" can be adjusted in menu **02=APPLICATION PARAMETERS**.



Note:

The search at the beginning of the capture process only takes place when operating without an encoder. When an encoder is used, the direction and speed are known when the pulses are enabled.

Selection list: YES / No

As supplied: No

Regen.ridethrough

On mains failure (if the DC link falls below the required voltage) the ALSPA MV1000 takes kinetic energy from the motor during braking and uses it to maintain operation until the motor reaches a standstill.

If the mains voltage returns within this time, the ALSPA MV1000 accelerates back up to the preset reference value at the ramp set.

Selection list: Yes / No

As supplied: No

Monitoring Bus/Keypad

If MAN-handling or AUTO-handling resp. have been set to "Fieldbus" or "Keypad" and this mode has been selected, with Monitoring=Yes, the inverter trips, outputting a fault message, if the bus fails or the Keypad is pulled out.

Selection list: Yes / No

As supplied: No

Use stall detect

Enable the "stall detection" feature

If the control structure = torque control and when operating at low speeds/torques, this function should be switched off.

Selection list: Yes / No

As supplied: Yes

Motor phase monitoring	Should a wire break in a motor phase, the inverter either trips, outputting a fault message, or only outputs a warning. Selection list: Trip / Warning As supplied: Trip
Mon.motor T'stat (X103) Monitor Motor PTC (X7/X8)	This indicates whether a PTC or thermostat for monitoring the motor temperature is connected to terminals X7/8 or X103 resp. To select the terminal see page 2-20.
PTC-Res. (Temp 1) ... PTC-Res. (Temp 6)	The characteristic of a motor PTC must be input with these parameters if a PTC other than KTY 83-110 is connected to X7 or X8. As supplied the resistance values for this PTC are entered for the temperatures -40 °C, +20 °C, +70 °C, +110 °C, +150 °C and +200 °C.
Parameter Set No.	The ALSPA MV1000 can store three different parameter sets which can be activated with the Parameter Set No. Thus an inverter can be operated in different modes or with different motors. Switching is only possible at a standstill. Range: 1, 2, 3 As supplied: 1
Copy source: Set	Source for the parameter set to copy. After copying, the parameter is automatically reset to zero. Range: 1, 2, 3 As supplied: 0
Copy Target: Set	Destination for the copy of the selected parameter set. After copying, the parameter is automatically reset to zero. Range: 1, 2, 3 As supplied: 0
Copy Parameter Set	Function for internal copying all settings of the parameter set selected with Copy source: Set to the parameter set selected with Copy Target: Set . Procedure for copying parameter set 1 to 2: <ul style="list-style-type: none"> - Set the "Copy source: Set number" to 1 - Set the "Copy Target: Set number" to 2 - Then immediately execute the copy parameter set function. - The value of the "Copy target: Set" parameter is automatically reset to zero.

**Note:**

If zero is set as the destination before calling the copy function, a warning is output.

Par.Set change via

Indicates the way to switch between different parameter sets. With setting "Keypad/PC", it is necessary to enter the number of the desired parameter set in "Parameter Set No.". In setting "terminals/bus" switching to parameter set 2 is effected by applying +24 V to the terminal to be configured or with a control bit of the fieldbus.

Selection list: Keypad / PC
terminals / bus

As supplied: Keypad / PC

Procedure for configuring a parameter set change via terminal strip:

- Fully commission the drive with parameter set 1. Stop the motor.
- In menu 05=Digital I/Os, configure **Par.Set Change** to the terminal to be used to switch.
- 0 V to this terminal.
- Set **Par.Set Change via** "terminals/bus".
- Copy parameter set 1 to parameter set 2 to ensure that the basic setting is the same. (See page 4-21)
- Apply +24 V to terminal configured for "Par.Set Change". This switches the inverter to parameter set 2, which takes 1 s. The number of the parameter set active can be displayed in menu 03=Configuration at **Parameter Set No.**
- The alterations in parameter set 2 must now be entered.

It is possible to switch between 3 parameter sets if two input terminals are used. The configuration is done with the special ALSPA PCS operating software.

Par.Set -> Keypad

The active parameter set is saved into the Keypad by the inverter. This can be used, for example, to set up a replacement unit with this parameter set.

Keypad -> Par.Set

The parameter set saved into the Keypad overwrites the parameter set with the same number in the inverter. Parameter set and inverter must feature the same software version.



Important:

When transferring a parameter set to a different type of ALSPA MV1000 the values for motor current, current limits etc. no longer apply as they are based on a different inverter F.L. current. To correct these references the value for motor F.L. current in menu **06=RATINGS** must be set to a random value first and then reset to the correct value according to the motor rating plate. This also resets the current limits (menu 02=APPLICATION PARAMETERS), the control parameters (menu 07=CONTROL) and motor adjustment (menu 06=RATINGS) to the default values suitable for the motor connected. These values can be readjusted if required.

PWM frequency

Inverter vector frequency

A vector frequency of 16 kHz may reduce the inverter power especially at 480 V mains voltage, see section 2.2. Changes possible only at standstill.

Selection list: 8 kHz / 16 kHz

As supplied: 8 kHz

load Defaults

The default parameter settings (as supplied) are reset using the "load Defaults" command. If a valid parameter set is present, this command must be executed twice for confirmations. All parameter sets are affected.

Communication with the Keypad is interrupted for 20 s during the loading process.

When the default values have been loaded it is necessary to restart the unit, i.e. execute a restart or switch the unit off and on again.

**Neustart****Important!**

All existing parameter settings will be lost if the default values are loaded. The passwords entered, the language selected and the drive name are **NOT** reset.

The control modules are initialised by a **restart**.

4.3.4 04=ANALOG I/Os

analogue-Ref. 1 ... 2

This selects the signal type for analog reference input 1 (X6 :1/:2) or 2 (X6 :3/:4). The jumper at X3 must also be set for analog reference 1, see Fig. 2-11, page 2-19.

Auswahlliste:	0 ... +10 V	
	-10 ... +10 V	
	0 ... 20 mA	} only at analogue Ref. 1
	4 ... 20 mA	
	20 ... 4 mA	
As supplied:	0 ... +10 V	

Max. REF 1 ... 2

This adjusts a scaling module for reference 1 or reference 2. It represents the upper limit to which the analog reference read in by terminals X6 :1/:2 (analog input 1) or X6 :3/:4 (analog input 2) is standardised and limited.

Range: "min. REF 1" ... 400 %
"min. REF 2" ... 400 %

As supplied: 100 %

If **Max. REF x** = 100 %, 10 V at the terminals represent a speed reference value for synchronous speed at half the norm. frequency, i.e. as supplied therefore 1500 rpm.

If the control structure is set for torque control and the **Max. REF 2** = 100 %, 10 V at the terminals correspond to motor rated torque.

min. REF 1 ... 2

This adjusts a scaling module for reference 1 or reference 2. It represents the lower limit of the range to which the analog reference read in by terminals X6 :1/:2 or X6 :3/:4 is limited. With 0 V at the terminals the speed reference is equal to the value of parameter **min. REF 1 ... 2** as a percentage of synchronous speed at half the norm. frequency, see Fig. 4-3 and Fig. 4-4. Together with bipolar reference values (-10 ... +10 V) this parameter is not in effect.

If the parameter is set to a value larger than "Max. REF", both are set to the value actually entered.

Range: 0 ... 400 %

As supplied: 0 %

REF 1 zero tol**REF 2 zero tol**

If the input voltage (current) falls within this zero tolerance band, then the drive applies min. REF 1 (or 2). See Fig. 4-1 and Fig. 4-2. This parameter is helpful in using a potentiometer as a reference. When the analog reference is preset through automation units, "REF 1 zero tol" and "min. REF 1" or "REF 2 zero tol" and "min. REF 2" should be set to zero to obtain a linear zero crossover.

Range: 0 ... 100 %
0.5 %

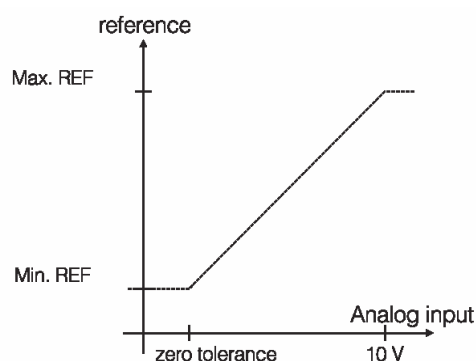


Fig. 4-3: Characteristic for unipolar reference value preset

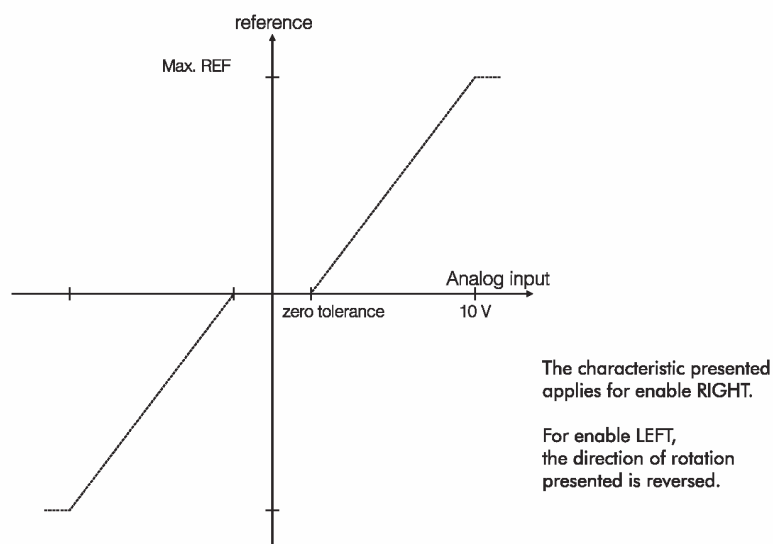


Fig. 4-4: Characteristic for bipolar reference value preset (-10 V ... +10 V)

Sum analogue REF.

When set to YES, reference 1 and reference 2 are added.

Selection list: YES / NO

As supplied: NO

4-20mA monitor.

This determines the response to wire break detection. The monitoring for analogue Ref.1 at terminals :1/:2 is active, if analogue Ref.1 has been set to 4-20 mA or 20-4 mA (current loop).

Selection list: Warning / Trip

As supplied: Trip

Warning: The wire break detection generates a warning in the event log. The motor continues to run with the 4 mA value. The signal can be output to DOUT4 (terminal :A4) through the selector switch "DOUT4 choice".

Trip: An open circuit leads to a shutdown of ALSPA MV1000, including an entry in the fault log. The drive can be restarted only after the trip has been acknowledged.

A-output 1 pin 62 A-output 2 pin63

This determines which control variable is output at analog output 1 terminal X6:62 or analog output 2 terminal X6:63. The resolution is 9 bit + sign and the range at the analog output is -10 ... +10 V.

Selection list:	Speed / Frequency	
	Tech.cntrl.output	
	Motor current	
	Motor voltage	
	Torque	
	Motor power	
	DC Link voltage	(Only for A-Output 1)
	Variable 1	(Only for A-Output 1)
	constant 10 V	(Only for A-Output 2)
	Variable 2	(Only for A-Output 2)
As supplied:	Speed/Frequency	A-Output 1)
	constant 10 V	(A-Output 2 as supply voltage for a reference potentiometer)

Speed/Frequency: The output frequency is output in the frequency control mode, otherwise the speed is output. If the direction of rotation is negative, the output voltage

Frequency:

Output 10 V at $f = \text{norm. frequency}$. As supplied, the norm. frequency is 100 Hz. At an output frequency of 50 Hz the voltage output is 5 V.

Speed:

$$\text{Output} = 10 \text{ V} * \frac{\text{speed}}{\text{synchronous speed at norm. frequency}}$$

As supplied, a 5 V output voltage with a motor with 2 pole pairs corresponds to the speed of 1500 rpm.

Motor current: Output 10 V if the motor current equals the inverter F.L. current.

Motor voltage: Output 10 V if the motor voltage equals the rated mains voltage.

Torque: Output 10 V at rated torque.

Motor power: Output 10 V at rated power.

DC link voltage: Output 10 V if the link voltage equals the peak value of the rated mains voltage.

**Variable 1,
Variable 2:** Output 10 V at 100 %
As supplied:
Variable 1 $\hat{=}$ XIL (load current)
Variable 2 $\hat{=}$ magnetising current controller output

scale a-output 1
scale a-output 2

Scaling the output at A-Output 1 or 2 (terminal X6 :62 or :63).
Scaling value resulting in an output of 10 V. Increasing the value reduces the output voltage.
Range: 0 ... 200 %
As supplied: 100 %

4.3.5 05=DIGITAL I/Os



Note:
Nearly all signal functions of the digital inputs and outputs can be inverted. They are given the suffix **(inv.)** in the description below. Two parameters are displayed on the Keypad menu, "Function name" and "Function name inv.". The parameter "Function name" determines the terminal or continuous level with which the function is operated. "Function name inv." determines whether the function is to be operated with an inverted signal level, see Table 4-1.

Function name inv.	Signal level YES or function active if:
No	DC +24 V at the terminal or continuous level HIGH
Yes	DC 0 V, terminal open or continuous level LOW

Table 4-1: Inverting functions

RUN/STOP

This determines the terminal from which the function RUN/STOP is applied if the drive is controlled from the terminal strip (see MANUAL- or AUTO-handling).

Selection list: ENABLE(Terminal 28)
 DINP1 (Terminal E1)
 DINP2 (Terminal E2)
 DINP3 (Terminal E3)
 DINP4 (Terminal E4)
 DINP5 (Terminal E5)
 LOW (Continuously inactive)
 HIGH (Continuously active)
As supplied: DINP5
Note: If the inverter is in the "Ready" status it is switched on through a rising signal edge No → Yes. Switching off with a No level brings the drive to a controlled standstill. Pulses are disabled when the motor reaches a standstill. After a trip is acknowledged a new rising edge is required. If automatic restarting is selected no rising edge is required if the mains voltage returns, provided that the signal is still at Yes.

STOP (inv.)

This determines the terminal from which an additional STOP function can be triggered. Signal level Yes activates the function, regardless of RUN/STOP signal. The drive then goes to zero speed at the "ramp down", then the pulses are disabled.

Selection list: wie EIN/HALT
As supplied: LOW
As supplied inv.: NO

FAST STOP (inv.)

This determines from which terminal the FAST STOP function is applied. The function is active at signal level YES (DC 0 V if inverted = Yes). The drive ramps the motor to rest at the adjustable "Ramp fast stop". Then the pulses are disabled.

Selection list: As RUN/STOP
As supplied: DINP4
As supplied inv.: YES
Note: This function is activated from all sources (terminal strip, fieldbus, CAN or Keypad - depending on the setting of "Stop from Keypad"; see page 4-19).

REVERSE (inv.)

This determines the terminal from which the function REVERSE is applied.

Selection list: As RUN / STOP
As supplied: DINP3
As supplied inv.: NO
Note: With REVERSE set YES, the motor will rotate counterclockwise with a positive reference. A negative reference would result in rotating clockwise. With neither REVERSE nor FORWARD set YES, the drive receives a zero reference. If both REVERSE and FORWARD set, then the signal set first takes priority.

FORWARD (inv.)

This determines the terminal from which the FORWARD function is applied.

Selection list: As RUN / STOP
As supplied: DINP2
As supplied inv.: NO
Note: With FORWARD set YES, the motor will rotate clockwise with a positive reference. A negative reference would result in rotating counterclockwise. With neither REVERSE nor FORWARD set YES, the drive receives a zero reference. If both REVERSE and FORWARD set, then the signal set first takes priority.

MAN/AUTO (inv.)

This determines the terminal from which the MANUAL/AUTO function is applied. NO results in MANUAL operation. A signal level of YES results in AUTO operation.

Selection list: As RUN / STOP
As supplied: DINP1
As supplied inv.: NO

Mot.Pot. UP (inv.)

This determines from which terminal the motorised potentiometer UP function is applied when controlling through the terminal strip (see MANUAL- or AUTO-handling).

Selection list: As RUN / STOP
 As supplied: LOW
 As supplied inv.: NO

M.Poti DOWN (inv.)

This determines the terminal from which the motorised potentiometer DOWN function is applied when controlling through the terminal strip (see MANUAL- or AUTO-handling).

Selection list: As RUN / STOP
 As supplied: LOW
 As supplied inv.: NO

TRIP ACKNOWLEDGE (inv.)

This determines the terminal from which the TRIP ACKNOWLEDGE function is applied when controlling through the terminal strip (see MANUAL- or AUTO-handling).

Selection list: As RUN / STOP
 As supplied: ENABLE
 As supplied inv.: YES

Note: Fault acknowledgement. Change from NO to YES acknowledges. As supplied the parameter TRIP ACKNOWL. inv. is set to YES. For this reason a trip is acknowledged is given by applying at ENABLE (terminal :28) the No level, i.e. DC 0 V.

Alternatively, a trip can be acknowledged at any time via the Stop key on the Keypad. Each trip must be acknowledged before the drive can be RUN again.

EXT. FAULT (inv.)

This determines the terminal from which the function EXTERNAL FAULT is applied.

Selection list: As RUN / STOP
 As supplied: LOW
 As supplied inv.: NO

Note: Function disables pulses at YES. The machine coasts down. A restart is only possible after an acknowledge.

JOGGING

This determines the terminal from which the JOGGING function is applied. When the inverter is in the "Ready" state, the drive is started with the rising edge No → Yes. The motor runs at the "jogging REF". The direction of rotation is determined by the FORWARD and REVERSE signals of the terminal strip (even if the direction of rotation is otherwise controlled differently).

With the No level of the JOGGING signal, the drive goes to zero at the Ramp down, then the inverter switches off. Only then it can be switched into normal operation with a new RUN edge.

Selection list: As RUN / STOP
 As supplied: LOW
 As supplied inv.: NO

Par.Set Change (inv.)

This determines the terminal from which the parameter set changeover function is applied. Configuration see page 4-22.

Selection list: As RUN /STOP
 As supplied: LOW
 As supplied inv.: NO

Fixed REF. bit 0 ...1 (inv.)

Determines which terminals are used to select the fixed speeds.

Selection list: As RUN /STOP
 As supplied: LOW
 As supplied inv.: NO

Input Fixed REF. bit 0	Input Fixed REF. bit 1	Selected Fixed speed
NO	NO	Fixed REF. 0
YES	NO	Fixed REF. 1
NO	YES	Fixed REF. 2
YES	YES	Fixed REF. 3

Table 4-2: Select fixed speed

The fixed speed selected only takes effect if the parameter MANUAL reference or AUTO reference is set to fixed REF. in menu **03=CONFIGURATION**.

select ramp 2 (inv.)

This determines the terminal from which the select ramp 2 function is applied. The second pair of ramps (ramp up 2 and ramp down 2) are activated with signal level Yes.

Selection list: as RUN / STOP
 As supplied: LOW
 As supplied inv.: NO

d-output 1 ... 4 inv.

The signal level at the digital output DOUT1, 2, 3, 4 (terminals A1, 2, 3, 4) can be inverted with these parameters.

Selection list: YES / NO
 As supplied: NO

As supplied, the digital outputs DOUT 1, 2, 3 are allocated the signals Ready, Working and Fault. These assignments can be altered with the ALSPA PCS drive software.

DOUT4 choice

This parameter determines which digital signal is output at digital output DOUT4 (terminal A4).

Selection list: At Speed
 At zero speed
 Above speed ref
 Above current ref
 Warning
 Ridethrough
 constant 24 V
 constant 0 V
 As supplied: constant 24 V

If "Warning" is selected, temperature warnings, motor-phase failure, bus failure, and the open-circuit monitoring of the 4-20 mA reference source (if selected) are output.

Please refer to the following for setting comparison values and tolerance bands for the above monitors:

"at speed tol"
"zero speed tol"
"reference speed"
"Load-current reference"

at speed tolerance

This parameter determines the tolerance band within which the system records that the drive is running at the preset speed. The signal can be output via the field bus and, with a suitable configuration, through the digital output DOUT4 (terminal A4) (see DOUT4 choice).

Range: $(0.001 \dots 0.1) * \text{norm. frequency} * 60 / \text{No. of pairs of poles}$
 As supplied: 30 rpm

zero speed tolerance

This parameter defines the tolerance band within which a drive standstill is registered. The zero-speed detection controls the switchoff of the inverter after STOP or FAST STOP. The signal can be output via fieldbus and, if configured correspondingly, via digital output DOUT4 (terminal A4) (see DOUT4 choice).

Range: $(0.001 \dots 0.1) * \text{norm. frequency} * 60 / \text{No. of pairs of poles}$
 As supplied: 15 rpm

reference speed

A detection level which if exceeded causes the ALSPA MV1000 to generate a signal. The signal can be output through the field bus and, with suitable configuration, through the digital output DOUT4 (Terminal A4) (see DOUT4 choice).

Range: $0 \dots 2 * \text{norm. frequency} * 60 / \text{No. of pairs of poles}$
 As supplied: 750 rpm

load-current reference

A detection level for the load current (absolute value) which if exceeded causes the ALSPA MV1000 to generate a signal. The signal can be output through the field bus and, with a suitable configuration, through the digital output DOUT4 (terminal A4) (see DOUT4 choice). The detection level is entered as a percentage of the load component of the Motor F.L. current.

Range: 0 ... value corresponding to max. inverter current.
 As supplied: ca. 130 %

4.3.6 06=RATINGS

HW Features

Indicates the inverter type:

Standard drive module

- IT -> for operation on networks with isolated transformer star point (refer to data sheet ALSPA MV1000-IT)
- S -> Inverter with integrated option "Secure protection against unexpected restart" (refer to data sheet ALSPA MV1000-S)

Inv. F.L. current

Display of rated inverter current in [A].

Brake Module type

One of the following values is to be selected according to the type of power supply used and the provision of a braking device:

Setting	Meaning:
AC: without	Inverter with 3-phase supply without braking device
AC: Chopper	Inverter with 3-phase supply with brake chopper or brake module
DC: DC-Bus	Inverter with DC supply, which also acts as a braking device

Table 4-3: Select brake module type

DC-Brake

If the drive is operated **without** any **Brake Module**, DC-braking is possible. In principle it is not as well as a brake chopper or a DC bus.

To brake, direct current is switched to the motor for a certain period, then the pulses are disabled.

Selection list: No
on FAST STOP

As supplied: No

To effect a braking action, the control function FAST STOP must be activated by the terminal strip or the Keypad: the terminal strip must have 0 V at terminal X5:E4 (as supplied), or the Stop key of the Keypad must be hit (and the parameter **Stop from Keypad** in menu 03=Configuration set to "**always FAST STOP**").

The braking current is determined by "Regen.Peak I" (or Regen.Full Load I).

If a control with encoder is used, the braking action continues until the machine has come to rest.

If a control without encoder is used, the required braking time must be determined while commissioning; it depends on the load machine connected. The time during which the drive brakes is adjusted by the Ramp fast-stop parameter in menu 02=Application parameter. The dependence of the braking time on various initial speeds is taken into account internally.

Procedure for setting the DC braking time (control without encoder):

- First set ramp fast stop to roughly 5 s.
- With load machine connected, accelerate the drive to rated speed.
- Effect DC braking action and measure time to standstill.
- Set ramp fast stop to the time measured.

Should the braking time not suffice for a complete stop, lengthen ramp fast stop.

Please make note of the permissible motor temperature in doing so.

**Important:**

The braking energy generated while DC braking causes additional motor-heating.

DC braking should for this reason only be employed for occasional braking operations, e.g. fast stop, and the ramp fast stop should not be set too long.

Mains voltage

Rated mains supply voltage (not: actual mains voltage). The operating range, the link charging monitor and the voltage at which special functions such as kinetic support take effect will depend on the value entered.

Range: 380 ... 480 V

As supplied: 400 V

Motor F.L. power

Rated power of the motor used. The value to be entered should be taken from the motor rating plate.

Range: 0.09 ... 200.0 kW

As supplied: 11 kW

Motor base voltage

Rated motor supply voltage. This is the value taken from the motor rating plate corresponding to the type of connection chosen (star or delta). If the rated motor voltage is greater than the mains voltage the rated power of the motor cannot be reached.

Range: 220 ... 690 V

As supplied: 400 V

Motor F.L. current

Rated motor current. This value should be taken from the motor rating plate corresponding to the type of connection used (star or delta).

Range: 0.25 ... 350 A

As supplied: 22.1 A

Motor base speed

Rated speed of the motor. The value should be taken from the motor rating plate.

Range: 430 ... 24000 rpm

As supplied: 1455 rpm

Motor base frequency

Rated motor frequency (Base frequency). The value should be taken from the motor rating plate.

Range: 50 ... 500 Hz

As supplied: 50 Hz

Star / Delta

Enter Star / Delta depending on how the motor is connected.

Selection list: Star / Delta

As supplied: Star

Power Factor

Rated power factor (cos phi) for the motor used, taken from the motor rating plate.

If not known the inverter suggested value can be used.

Range: 0.4 ... 0.99

As supplied: 0.84

Pull out/Nom.TQ.

Ratio between pull out torque and rated torque for the motor used. If the exact value is not known (from the motor data sheet), the value suggested by the inverter can be used.

Adjustment range: 1.1 ... 8

As supplied: Suggested value calculated from the motor data input.



Important:

To prevent motor damage, the factory default motor data have to be overwritten by the rating plate data of the connected motor **before the first start-up**.

Great differences between the inverter and motor ratings are indicated by warnings.

encoder line count

Number of lines for an incremental encoder. This entry is only required when using a control structure with encoder.

Range: 300 ... 10,000

As supplied: 10,000

encoder voltage

The internal encoder supply voltage at X8 can be adjusted between 5 ... 7.5 V to compensate for voltage drops over long cables.

Range: 5.0 ... 7.5 V

As supplied: 5.0 V

encoder mode

Alternatively, the encoder can also be connected at input X9. (More information on request.) Output X10 serves as a pilot-frequency output once it has been configured with ALSPA PCS. Here you can also loop the encoder signal from X8 or X9, resp. and output it again. Any changes made to this parameter become active only after restart of the inverter.

Selection list: X8=encoder, X10=Dig.set output

X9=encoder, X10=Dig.set output

reserved

X8=encoder, X9=Dig.set input, X10=X8

X8=encoder, X9=Dig.set input, X10=X9

X8=encoder, X10=X9

X8=encoder, X10=X8

As supplied: X8=encoder, X10=Dig.set output

adjust-mode
adjust to +0.5 %

This parameter is used to select a mode of operation which allows calibration of the motor stator and cable resistance "R stator + R cable".

Selection list: YES / NO

As supplied: NO

Calibration is only necessary if longer motor cables (>100 m) are used or if the motor otherwise does not start or come to rest smoothly. The adjustment should be performed when the motor is cold.

Procedure for adjustment:

- Switch the drive off
- Set the parameter "adjust mode" to Yes
- Switch the drive on
- The variable "adjust to +0.5%" should indicate approx. +0.5 %. If the value displayed is too high, increase the parameter "R stator + R cable" in steps - and if the value is too low reduce the parameter "R stator + R cable" in steps - until the value displayed is approx. 0.5 %. The value displayed may never be negative as this would make control unstable.
- Switch the drive off
- Reset the parameter "adjust mode" to No.

R-stator + R-cable

Total resistance of motor cable and stator for the asynchronous motor used. The value serves as a model for the replacement circuit diagram for anticipatory control of the motor voltage and for adapting the controller parameters. The value is calculated from the motor ratings entered and can be optimised if required (see "adjust mode" and "adjust to +0.5%").

Range: 0 ... 100 Ohm

4.3.7 07=CONTROL

Control options

Parameter for selecting the control structure. The control structure can only be altered with the drive at a standstill (pulses disabled).

Selection list:

- Speed control without encoder
- Speed control with encoder
- Frequency control
- Torque control without encoder
- Torque control with encoder

As supplied: Speed control without encoder

Speed w-out ENC: Speed control without encoder. Flux-orientated control model with internally calculated load-dependent speed actual value.

Characteristics:

Speed adjustment range, motor 1:100

Speed adjustment range, regenerative 1:20

Speed accuracy 0.5 %

Torque rise time 2 - 8 ms

Applications: Dynamic speed control of standard asynchronous motors.

Speed with ENC:	Speed control with encoder. Flux-orientated control model with measured speed actual value. Characteristics: Speed adjustment range > 1:1000 Speed accuracy 0,2 % Torque rise time 2 - 8 ms
Applications:	<ul style="list-style-type: none"> - Increased speed adjustment range - Torque at zero speed - Electrical stop (e.g. lifting drive)
Frequency control:	The drive is operated with frequency control at its VVVF characteristic. Acceleration and braking are according to the ramp settings. The current limits which protect the motor are not active. Only the inverter is protected.
Applications:	<ul style="list-style-type: none"> - Multiple motor drives - AC reluctance motors - AC synchronous motors (on request)
Torque w-out ENC:	<p>Torque control without encoder. In addition to the structure "speed w-out encoder", the torque reference is present via the second analog input.</p> <p>The torque set at analog input 2 (X6:3/:4) controls the limitation of the speed controller and thus the torque. As supplied, an input voltage of 10 V, corresponds to the motor's rated torque.</p> <p>The speed controller is here overridden, i.e. the speed reference value must be set higher than the max. operating speed (e.g. speed ref. = 1500 rpm preset via fixed ref.). The direction of the torque can be reversed with FORWARD and REVERSE or with the polarity of the input voltage.</p>
Torque with ENC:	Torque control with encoder for extended speed range and higher accuracy.

Economy

Parameters for setting the economy mode. In economy mode the magnetic flux is lowered in no-load and partial-load operation, which saves energy and reduces motor noise. However, this at the same time reduces the dynamic characteristics of the drive.

The parameter indicates the percentage value by which the magnetic flux is reduced in no-load operation. At 0 % the economy mode is switched off.

Range: 0 ... 50 %

As supplied: 0 %

Economy mode

The parameter defines the reduction of flux as a function of the output frequency.

"Fan curve fluxing" is used to precontrol the magnetization in keeping with the square-law course of a characteristic fan curve. With "Load-current-dependent" is used to adapt the magnetization dynamically to the torque required.

Selection list: fan curve fluxing / load current dep.

As supplied: fan curve fluxing

speed cntrl. Kp1

Proportional gain of speed controller

As supplied: 10

speed cntrl. Tn

Integral time constant of speed controller

As supplied: 200 ms

**Note:**

If the motor or the mechanical components run unevenly, it may be appropriate to adjust the parameters of the speed controller, e.g. speed-cntrl. Tn = 300 ms or/and speed-cntrl. kp1 = 5.

Tech.Ctrl.Kp	Proportional gain of technology controller	} Effective only if the technology controller has been previously configured with ALSPA PCS.
Tech.Ctrl.Tn	Integral time constant of technology controller	
IL controller Kp	Proportional gain of load or rotor current controller*, see note.	
IL controller Tn	Integral time constant of load or rotor current controller*, see note.	
IM controller Kp	Proportional gain of magnetising current controller*, see note.	
IM controller Tn	Integral time constant of magnetising current controller*, see note.	
Or controller Kp1	Proportional gain of orientation controller*, see note.	
Or controller Tn	Integral time constant of orientation current controller*, see note	
flux control. Kp	Proportional gain of flux controller*, see note.	
flux control. Tn	Integral time constant of flux controller*, see note.	
level control. Kp	Proportional gain of drive controller*, see note.	
level control. Tn	Integral time constant of drive controller*, see note.	

**Note:**

The parameters with an asterisk * are preset according to the motor data entered but can be overwritten if required. Changing the ratings will re-initialise the parameters, i.e. the values entered here will be replaced.

4.3.8 08=DIAGNOSTICS

The fault messages and events displayed in this menu are explained in detail in section 5.6.

First Fault:	Plain-text display of the fault message that has led to the latest fault shutdown (first fault). Each fault must be acknowledged with the TRIP ACKNOWLEDGE signal from the selected control source before the drive can be RUN again. This also deletes the entry in "First Fault:".
Fault No:	The plain text of a previous fault message (and its time, data if available) can be displayed by entering a number. If the number 1 is entered, the most recent fault is displayed. If 32 is entered, the oldest logged fault is displayed.
Event No:	The plain text of a previous, protocolled event (and its time, data if available) can be displayed by entering a number. If the number 1 is entered, the most recent event is displayed. If 32 is entered, the oldest logged event is displayed. Events which are logged include, for example: Mains failure, automatic restart, signal change at control te inals.

The following entries of menu 08 display the drives state. During commissioning, this may help to check out, whether a signal is present or a (HW) interlock is active.

Fault	No/Yes Is a fault still active?
Disable active	No/Yes are the pulses of the inverter disabled?
Fast stop active	No/Yes Is the fast stop command active?
Stop active	No/Yes Is the stop command (opposite of run) active?
Ready	No/Yes Is the DC link precharged and the drive ready to run?
Handling, reference	Man/Auto Shows the selected source for the drives control.
RUN	No/Yes Is the RUN signal present.
Run active	No/Yes Has the drive detected the run signal.
Jogging active	No/Yes Was Jogging activated.
FORWARD	No/Yes Is setpoint forward enabled.
REVERSE	No/Yes Is setpoint reverse enabled.
Working	No/Yes Is the drive in operation.
Flux OK	No/Yes
Ramp start	No / Yes Is the ramp enabled.
Trip acknowledge	No/Yes Is the acknowledgement command present.

4.3.9 09=PASSWORD

ALSPA MV1000 parameters are accessible to the operator on three different security levels (see section 4.2):

Level 0 No password

Level 1 Protected

Level 2 Hidden

The parameters on levels 1 and 2 are only accessible when the correct password is entered.

Security Level

This displays the Security level presently attained. A lower level can be selected by entering a lower value. A higher security level can only be set using the parameter "Password Level x".

As supplied: 0 No password

Password Level 1 Password Level 2

Enter a password to move to the next higher level. Switching to a lower security level is only possible with the parameter "Security Level".

As supplied: No password, i.e. levels are accessed with a blank entry:
Select parameter "Password Level x" and when "<" appears on the display press the key ▶ again.

new Password 1 new Password 2

Facility for individually changing "Password Level x" when the password valid for the relevant level has been input.

Password Level 3

For service purposes only.

Changes

Facility for locking all parameters (except this parameter and the passwords) in general, i.e. for all control channels. This parameter is only accessible after the "Password level 1" is entered. If the parameter is set to "Generally disabled" and the "Security level" is reset to 0, parameter changes by unauthorised personnel are barred.

As supplied: Generally enabled

KEYPAD: Changes

Facility for locking all parameters (except this parameter and the passwords) specifically for the Keypad only. This parameter is only accessible after entering the "Password level 1". If the parameter is then set to "Disabled" and the "Security level" is reset to 0, parameter changes by unauthorised personnel are barred via the Keypad.

As barred: Enabled

4.3.10 10=LANGUAGE SELECT

Language

This determines the language for text, names and messages.

Selection list: German / English / French

As supplied: German

4.3.11 11=COMMUNICATION

PC:Adress

Drive adress of ALSPA MV1000 for communication with a PC

Adjustment range: 0 ... 255

As supplied: 0

PC: Baudrate

PC-Interface transfer speed

Selection list: 2400 ... 57600 Baud

As supplied: 19200 Baud

CAN: SDO-ID

node - ID for unified identification within the CAN network.

(May only used once within the whole network)

Selection list: 1 ... 127

As supplied: 1

CAN: Baudrate

CAN - Interface (X4) transfer speed

Selection list: 10 k ... 1 MBaud

As supplied: 500 kBaud

CAN: start mode

This parameter controls the ALSPA MV1000 's behavior as a CAN node.

After power on, the drive is "pre-operational", if "standard" is selected. In this case, only an exchange of parameter data (SDO) and Network-Management-Telegrams (NMT) is possible. A CAN slave remains in that mode until he receives a NMT-command "start_remode_Node" (e.g. by the master) to change the mode into "operational". Then, SDO, NMT and PDO- Communication (exchange of process data) is possible.

The "always operational"-mode means, that during each (re-) start, the ALSPA MV1000 is set into "operational"-mode by a command given by itseif. This may be useful, if there is no master present within the network to give that command.

The "NMT'start all nodes" - mode means, that the ALSPA MV1000 sends on every (re-) start the NMT - telegram "start- remode_node" on the bus. This enables the PDO communication for all connected nodes.

Selection list: standard

always operational

NMT 'start all nodes'

As supplied: standard

**Important:**

The "NMTstart all nodes" -mode is not including a bus - monitoring and fault detection service usually done by a CAN master. This must be observed, when sending control commands, which may be related to security functions.

CAN: module state

Indicates the state of communication:

Selection list: pre-operational (only NMT and SDO active)
operational (NMT, SDO and PDO active)
As supplied: pre-operational

CAN:RECV1 ID

The receive ID or PDO ID is the identifier for the frame (address) to be received:

Selection list: 385 ... 1407
As supplied: 513

CAN:RECV1 Mode

The receive mode determines whether received data is to be accepted by the control at once (asynchronous) or after the next synchronisation frame (synchronous).

Selection list: asynchronous
synchronous
As supplied: asynchronous

CAN:RECV2 ID

Selection list: 385 ... 1407
As supplied: 769

CAN:RECV2 Mode

Selection list: asynchronous
synchronous
As supplied: asynchronous

CAN: handling

Determines which of the received dataword has to be used as controlword, if man/auto control is set to:"CAN":

Selection list: CAN RECV1 Word 1 ... 4
CAN RECV2 Word 1 ... 4
As supplied: CAN RECV2 Word1

CAN:reference

Determines which of the received dataword has to be used as reference, if man/auto reference is set to:"CAN":

Selection list: CAN RECV1 Word 1 ... 4
CAN RECV2 Word 1 ... 4
As supplied: CAN RECV1 Word1

CAN:SEND1 ID

The send ID determines the PDO ID (the Frame to be sent).

Selection list: 385...1407
As supplied: 385

CAN:SEND1 Mode	<p>The send mode determines whether and when data is transmitted for sending to the CAN controller. The CAN controller will then send this data as quickly as possible via the bus (priority scheduling).</p> <p>Selection list: no transmit event triggered cyclic event trig & cyclic synchronous</p> <p>As supplied: no transmit</p>
CAN:SEND1 Words to send	<p>The volume of data bytes to be sent can be reduced in order to achieve compatibility with other nodes or to reduce the bus traffic load. Only the words from 1 through to CAN: SENDx Words are sent.</p> <p>Selection list: 1 ... 4</p> <p>As supplied: 4</p>
CAN:SEND1 Cycle time	<p>Setting for the cycle time of CAN:SEND1 Mode = cyclic. The time means the distance between two frames.</p> <p>Selection list: 1 ... 1000 ms</p> <p>As supplied: 10 ms</p>
CAN:SEND2 ID	<p>Selection list: 385 ... 1407</p> <p>As supplied: 641</p>
CAN:SEND2 Mode	<p>Selection list: no transmit event triggered cyclic event trig & cyclic synchronous</p> <p>As supplied: no transmit</p>
CAN:SEND2 Words to send	<p>Selection list: 1 ... 4</p> <p>As supplied: 4</p>
CAN:SEND2 Cycle time	<p>Selection list: 1 ... 1000 ms</p> <p>As supplied: 20 ms</p>
Adapter Mode	<p>Parameter to preset the operation mode of a fieldbus coupler connected to the ALSPA MV1000 (e.g. Profibus)</p> <p>Selection list: refer to Operating Manual "Field bus systems"</p> <p>As supplied: 1</p>
Baudrate [kBd]	<p>Transfer speed setting for field bus communication</p> <p>As supplied: 0</p>
Adress	<p>User ID for fieldbus communication</p> <p>As supplied: 2</p>
fbus: words sending	<p>Number of data words sent by the MV1000</p> <p>Range: 0 ... 10</p> <p>As supplied: 8</p>

fb:Remote-Adress	Adress of broadcast - frame to evaluate As supplied: 00 00
fb:words to receive	Number of words to be accepted by the ALSPA MV1000. Range: 0 ... 32 As supplied: 4
Restart: Execute	Proceeds a restart of the drive, in order to ensure that all changes may take effect. Selection list: Execute? Yes/No? As supplied: No

4.3.12 12=TECHNOLOGY

Display of function modules freely programmable with ALSPA PCS software.

5 Commissioning

5.1 Safety instructions for commissioning



Before switching the mains voltage on, always check that it is safe for the drive to run and that there is no risk to man or machine. This is essential for the entire commissioning procedure.

The general safety instructions given on the front inside cover must be observed!

It is assumed that the operator is familiar with the operation of the software (section 4) before the unit is to be commissioned.

Electrical equipment represents a risk to life.

The equipment described here carries dangerous voltages and controls rotating mechanical parts. Death, severe physical injury and considerable material damage can result if the instructions given in this operating manual are not observed.

Dangerous voltages in excess of 1000 V can occur during operation of this equipment and can cause death or severe physical injury. Extreme caution is essential when working on the equipment. You must therefore note all warnings given below.

All covers must remain in place during normal operation.

The conditions of national safety regulations must be observed during adjustment work with the unit open and in operation.

Do not use any technical equipment unless you are certain it is in perfect operating condition.

If an oscilloscope is used, it must be powered through an isolating transformer to avoid earth loops. The oscilloscope casing is to be connected directly to the ALSPA MV1000 reference potential.

When using a PC via the RS422 interface, any static electricity in the body must be discharged through the earthed casing of the plug before any plug contacts are touched.

Equipment such as oscilloscope probes, meter terminals etc. may only be applied to electronic components when they are powered down and after potential compensation.

Correct, step by step commissioning according to these instructions will help to prevent damage. Please contact our service department if further information is required.

Incorrect parameter settings and ratings can damage the equipment and the entire drive. Suitable care is therefore essential when setting parameters. Note section 4.

Only insert or remove cards and plug connections when the unit involved is powered down. Only in this way is it possible to prevent the destruction of entire assemblies and risk to personnel.

Always avoid touching electronic components.

When working on the unit and any motors connected it is important to remember that a voltage may be present on the motor cables even when the pulses are disabled. The ALSPA MV1000 is to be isolated from the mains supply and the voltage is to be checked before any work is done on motor cables.

After isolating the ALSPA MV1000 from the mains supply it is important to note that link capacitor discharge times can exceed one minute. Check the voltage before starting the work.

If you are working on the motor or supply cables while they are connected, the main switch on the unit or the circuit breaker on the plant side must be secured so that it cannot be switched on.

Generally, there might be dangerous voltage present at the terminals of a rotating electrical machine, independent of the switching position of inverter and/ or power supply.

Always stand on an insulated mat (EGB-compliant) and ensure that it is not earthed when you are doing commissioning work with the unit switched on.

A detailed understanding of the systems safety aspects is required before activating the "AWE"-function (Automatic restart).

5.2 General

After the basic settings have been made on the ALSPA MV1000 the drive is ready for operation when the mains and motor are connected and the motor data settings are made (according to the motor rating name plate).

Terminals X5 :28 - X5 :E2 - X5 :E4 - X5 :A4 must be linked for operation using the ALSPA MV1000 Keypad, see Fig. 4-2 on page 4-1.

The basic parameters in the ALSPA MV1000 must be set according to the actual data to set up the ALSPA MV1000 for the mains, motor and plant involved.

Commissioning is done in 3 steps:

1.Mains and motor connection, see section 5.3

2.First commissioning with ALSPA MV1000 Keypad, see section 5.4

3.Terminal strip wiring

5.3 Mains and motor connection

Connect the unit to the mains and the motor according to sections 2 and 3. Before switching on the supply, check that the mains voltage lies within the tolerances permitted for the ALSPA MV1000 rated voltage (AC 380 ... 480 V or DC 530 ... 666 V).

Observe the notes on installation and connection in section 3.

The connection cables must have the cross-sections stated in section 2. The fuses of operating class gL as recommended in section 2 must be installed as overload protection for the power supply cables.

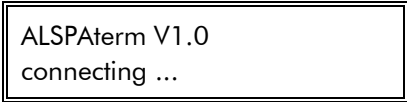
Mains chokes or mains filters are not included in the ALSPA MV1000 scope of supply and, if ordered, are supplied loose. The brake chopper and braking resistors are options and may not be needed.

Standard motors or motors with equivalent insulation characteristics can be used with the ALSPA MV1000 on mains supply voltages of $U_N \leq 460$ V. Standard 400 ... 460 V motors are designed for the voltage rates of rise and peaks of up to 1300 V which can occur during inverter operation. If other makes of motors are used it may be necessary to contact the supplier to ensure they are compatible with inverters.


Motor du/dt filters are to be used if the motor insulation resistance and maximum permitted voltage in the motor terminal box does not comply with the 1300 V required and the permitted rate of voltage rise for the winding insulation is <3 kV/ μ s.

5.4 First commissioning with ALSPA MV1000 Keypad

When the mains supply is switched on, the display on the Keypad will briefly show the following information:





ALSPAterm V1.0
connecting ...

The green LED  on the Keypad will light to indicate the ALSPA MV1000 is ready. The display shows the output speed:



01 Drehzahl
0.0 1/min

The language set ex works is "GERMAN".

If the yellow LED  , lights, the ALSPA MV1000 detected a fault. If the green LED  does not light, the unit is not ready.



In this case the operator can use the keys on the menu



08=DIAGNOSE




to obtain information about the drive status (first fault, fault, event) after selecting the language required.

5.4.1 Language

Communication with the ALSPA MV1000 via the Keypad is available in several languages. To set the language required, switch on the mains supply, press the  on the Keypad once and use the  key to select menu option **10= SPRACHAUSWAHL** (Language):






10=SPRACHAUSWAHL

Press the  twice and then press  to select the language. Confirm with .






10 Sprache
ENGLISH

5.4.2 Password entry

A password is required for setting the motor data. To enter "Password Level 1" press the  key once on the Keypad and use the  or  key to select the menu option **09=PASSWORD**:



After pressing keys ,  and  you are prompted to enter the password for level 1:



A blank password is set in the factory. Therefore complete your entry by pressing  and exit from the menu by pressing .

5.4.3 Ratings

All data determined by the mains voltage and the motor data is entered on the ratings menu.

To do this, select **06=RATINGS** on the main menu using the Keypad.



The following parameters are accessible on level 1 under "Ratings":

- Inv.F.L.current
- Brake Module type
- DC Brake
- Mains voltage
- Motor F.L. power
- Motor base voltage
- Motor F.L. current
- Motor base speed
- Motor base frequency
- Star / Delta
- Power Factor
- Pull out / Nom.TQ
- Encod. line count
- encoder voltage
- adjust-mode*)
- adjust to +0.5 %*)
- R-stator + R-cable*)

*) only if drive does not start or come to rest smoothly

The inverter F.L. current parameter indicates the type of inverter involved. This parameter is set ex works and must match the ALSPA MV1000 rating plate.

The following parameters are to be adjusted if the factory setting cannot be used:

- **Mains voltage** Rated mains voltage with which the ALSPA MV1000 is to be operated (max. 480 V).
- **Brake Module type** Default setting: without
Adjustment is only necessary if an external brake chopper is used or the power input comes from a common DC bus bar.

Motor rated data

The motor data from the rating plate is to be set:

Motor F.L. power, Motor base voltage, Motor F.L. current, Motor base speed, Motor base freq., circuit type (star/delta), Power Factor (cos phi).
If motor pull out torque/nominal torque is not known, the value suggested should be used.

The motor is ready when these settings have been made. The motor can be tested and operated with the Keypad within the range of the rated data settings.



Important!

The setting of the motor data preset by default are only to be comprehended as an example. Before the first start-up, all settings of motor data have to be done according to name plate data of the connected motor as explained above.

Wrong motor data may cause damage of drive and/ or plant.

5.4.4 Control structure

Now select the **Control options** parameter. It is located on the main menu

07=CONTROL

Possible settings for the control structure are as follows:

- Speed control without encoder: speed w-out ENC
- Frequency control (VVVF): frequency control
- Torque control with encoder: Torque with ENC
- Speed control with encoder: speed with ENC
- Torque control without encoder: torque w-out ENC

5.4.5 Speed adjustment/speed limit

The following parameters are entered as a speed value in rpm (1/min) - even if the control option "frequency control" or "torque control" is selected.

The "max. speed" (in rpm) indicates the maximum speed of the drive taking all additional references into account. The parameter is adjusted on the main menu **02=APPLICATION PAR.**

The max. and min. speeds are determined by the motorised potentiometer parameter settings.

5.4.6 Field weakening

The following parameters under **02=APPLICATION PAR.** must be set for operation with field weakening:

- Increase the max. speed
- Increase the mot. pot. max. speed
- Increase the max. speed reference

Important!

Speeds in excess of the rated motor speed are possible through field weakening. It is important to ensure that the mechanical characteristics of the motor and the system can tolerate such speeds. Inadequate speed firmness or an imbalance may result in damage or destruction of the drive and parts of the plant.



Warning!

Destruction of the drive or the plant through excessive speeds can also put personnel at risk.

5.4.7 Motorised potentiometer function

As the drive is to be operated with the motorised potentiometer in the Keypad during basic commissioning, the speed limits Mot.Pot max.speed, Mot.Pot min.speed, the acceleration time Mot.Pot ramp up and the braking time Mot.Pot ramp down are to be adjusted for the motorised potentiometer function.

After checking or adjusting the motorised potentiometer parameters the drive is put into operation using the Keypad.

- | | | | |
|---|------------|---|-------|
| + | Speed up | ◊ | Start |
| - | Speed down | ▼ | Stop |

5.5 Service

Service:

Commissioning and user support is provided by:

Converteam GmbH

Culemeyerstraße 1

D-12277 Berlin

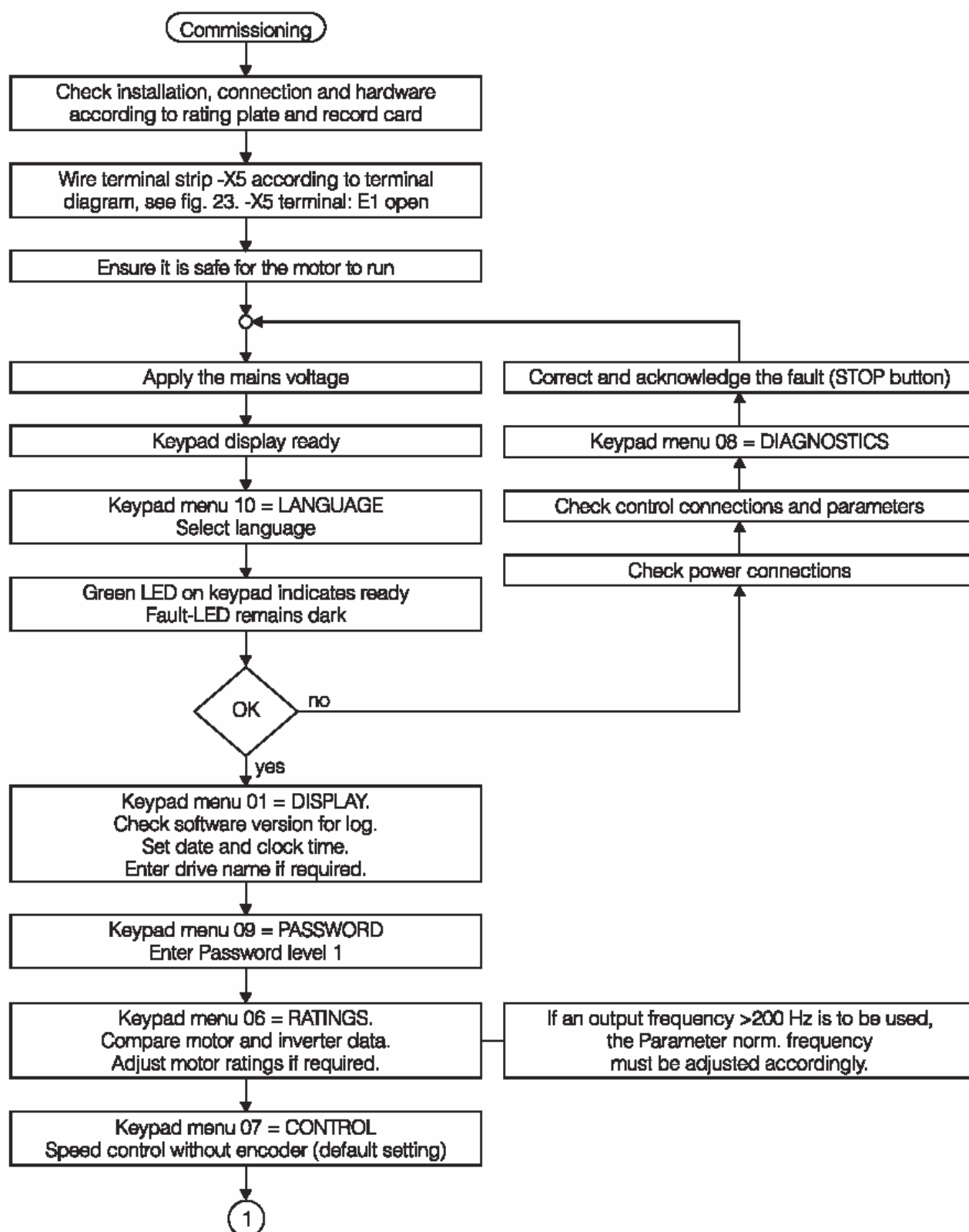
In Germany

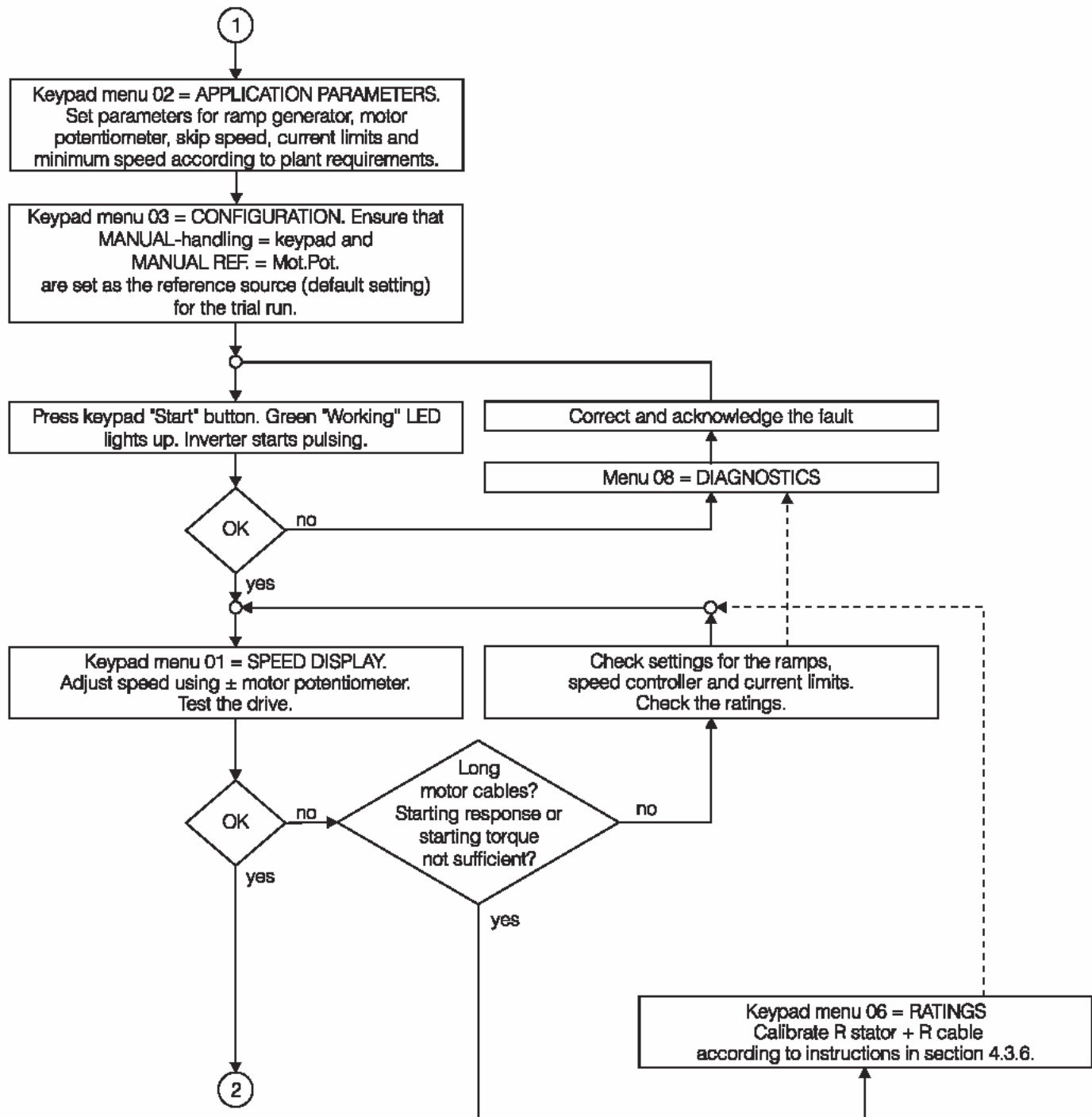
Worldwide

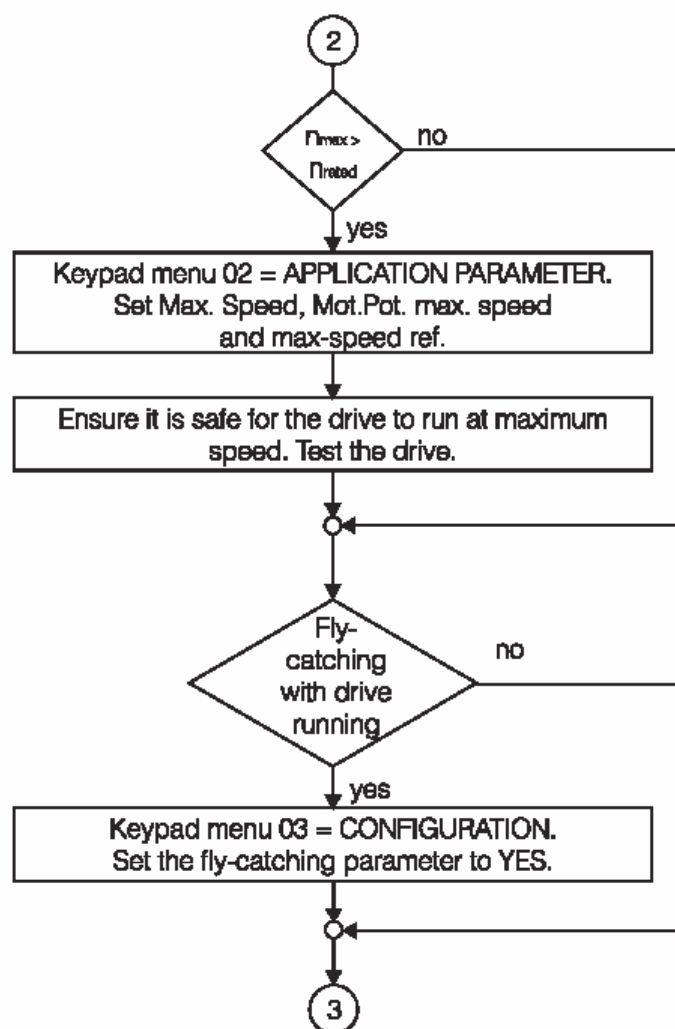
(0180) 323 4572

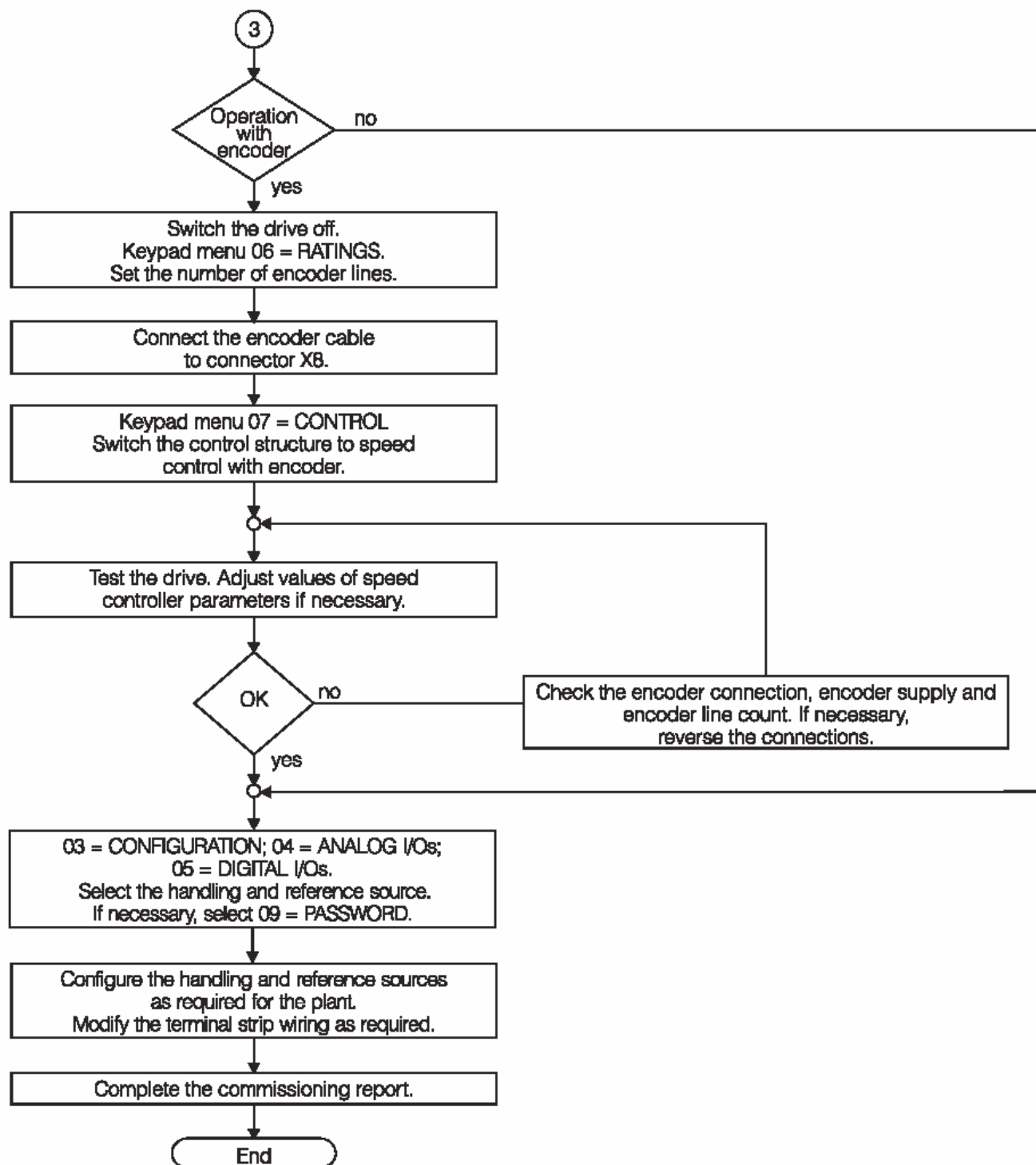
(+49 69)66125 588

5.6 Commissioning Sequence Diagram ALSPA MV1000









6 Help on Faults

The ALSPA MV1000 is protected by monitoring functions. If faults occur that might place the equipment at risk, the inverter is shut down. The cause of the fault is retained in a fault log. It can be displayed in plain text (Keypad menu 08=DIAGNOSTICS).

Also, events are logged in memory that do not immediately endanger the equipment, e.g. prewarnings. In such cases the inverter does not (immediately) shut down. The event log can be used for troubleshooting.

6.1 Fault messages on the Keypad and at the digital outputs

The operating status of the ALSPA MV1000 is indicated by the LEDs "Ready", "Working", and "Fault" on the Keypad as well as assigned digital outputs 1,2,3.

As soon as a fault occurs, the ALSPA MV1000 shuts down (pulse disable). "Fault" is switched on and "Working" off. The fault message can be displayed in menu 08=DIAGNOSTICS with parameter **First Fault**.

As long as the cause of the fault continues, it is impossible to acknowledge the fault message; "Ready" remains switched off. If the cause of the fault is not detectable or no longer present, "Ready" is switched on again (!) and "Fault" remains switched on.

The fault message can now be acknowledged at on the terminal strip or the Keypad, which switches "Fault" off again. Now the drive can be switched on again with a new RUN edge.

If the inverter is controlled by an PLC, prior to starting up you should check that the inverter is indicating "Ready" AND NOT "Fault".

6.2 Status and Fault Indicators on the inverter

Two LEDs, Fig. 2-9 on page 2-15, are provided on the front panel for monitoring the operating condition of the ALSPA MV1000 without a Keypad.

The green LED indicates readiness and operation of the ALSPA MV1000:

Inverter ready	Flashing at approx. 1 Hz frequency
Inverter bridge active	Flashing fast

The red LED indicates faults:

Continuously on:

Software fault message, diagnostics and acknowledgement with the aid of the Keypad, see section 6.3.

Flashing	● - - ●	Morse code character P	Fault in p rogram memory
	● - ●	Morse code character R	R AM defective
	● ● - ●	Morse code character F	F atal fault
	- ● ●	Morse code character D	Loss of d ata, parameter set defective

The faults P, R and F can only be corrected by the Service Department.

The fault **D** can be corrected by booting, see page 4-23 under "Load Defaults". The parameters for the unit must then be set as required or a data set previously saved is to be read in from the Keypad or a diskette.

6.3 Fault messages and their causes

The fault memory logs up to 32 past faults. These can be displayed in menu 08=DIAGNOSTICS. The time is logged together with each fault (format: hh:mm:ss). The external 24 V auxiliary supply must be supported to ensure that the clock continues running even in case of a main failure.

Every entry contains a "+" following the message text to note the occurrence of the fault (e.g. "Motor Overtemp. +"). Once the fault has vanished, the same text is entered in the event log with a "-" (e.g. "Motor Overtemp. -", i.e. the motor has cooled down again).

The following faults are detected by ALSPA MV1000:

Bus Interrupt

Cause: The fieldbus coupler has failed, a sign of life is no longer received from the fieldbus, or the Keypad has been disconnected. Only the handling source currently used is monitored.

Solution: Check the wiring of the fieldbus, the PLC, and possibly also the Keypad extension cable.

Note: The monitoring function can be disabled using the "monit. bus/Keypad" parameter in menu 03.

If in addition the "monit. sign of life fieldbus (3151H)" is active, the PLC must invert the sign of life within < 500 ms (3502H . monit. sign of life fieldbus).

Locked/encoder loss

Cause: If the speed controller is at its limit for 2 s and the actual speed value remains below the "Stall speed", this fault is detected.

Solution: Check whether the drive is blocked or starts sluggish. Check the encoder and its cable. Check the current limits set which define the limit of the speed controller.

Note: The monitoring function can be disabled off with the aid of the "Use stall detect" parameter in menu 03. This may become necessary if you want to produce torque at standstill while using the torque control structure.

Wire fault REF.1

Cause: Analog reference input 1 is set for line-current 4 ... 20 mA (or 20 ... 4 mA), but the current flowing is below 2 mA.

Solution: Check the wiring and the current source.

Note: The monitoring function can be disabled using the "4-20mA monitor" in menu 04. Then only a warning is entered into the event log.

Earth fault motor

Cause: An earth fault has been detected in the motor or the motor cable. This is checked every time the drive is switched to RUN.

Solution: Check the motor cable and the motor for an earth fault.

External fault

Cause: The external fault control signal has become active; see page 4-29.

Solution: If you have used this for setting up an external fault monitoring chain, check through the possible triggers. Check the wiring of the terminal strip.

Encoder loss

See locked/encoder loss

encoder voltage

Cause: The monitoring function of the encoder voltage supply at X8 has triggered. The measured encoder voltage differs from the set value by more than 1 V.

Solution: Check the encoder and the cable for short circuits.

Note: The monitoring function can be disabled with the "319BH . enc. voltage monitor" parameter.

Short circuit IGBT

Cause: The inverter monitor has detected that the collector-emitter voltage of an IGBT has become too high while conductive. This may indicate a short circuit in the power circuit, a faulty control or an earth fault while running.

This monitoring function is available only in MV1032 ... MV1171.

Solution: If the fault occurs repeatedly, disconnect the motor cable from the inverter and test the inverter with no load: If the "short circuit IGBT" fault reoccurs, return the inverter for repair. Otherwise, check motor and motor cable for an earth fault.

Motor-phase loss

Cause: The current in the three motor phases is unsymmetrical or too low.

Solution: Check motor and cable for open circuits in one motor phase.

Note: Even if no motor is connected, or if the motor is far smaller than the inverter (<1:5), this fault is output, too. The monitoring function can be disabled using the "Motor phase monitor" parameter in menu 03. In this case only a warning is entered into the event log.

Fault P1; Fault P2

The fault signal pointed to via object "3986H - < Fault P1" or "3987 - < Fault P2" has become active. Cause depends on pointer setting.

Internal overtemp.

Cause: The temperature on the control board of the inverter exceeds 90 °C or is below 0 °C or the temperature encoder is defective.

Solution: Check the inverters cooling air ventilation and the internal fan (MV1004 and upwards).

Heatsink temp.

Cause: The heatsink temperature exceeds 85 °C or is below 0 °C or the temperature sensor is defective.

Solution: Check the overall inverter air circulation, the incoming-air temperature and the heatsink fan (MV 1007 and upwards).

Note: As early as 5 K prior to the fault shutdown, a warning is generated and entered into the event log; it can be output via "DOUT4 choice" in menu 05.

Motor Overtemp

Cause: The PTC used to monitor the motor temperature at X103 shows high resistance ($> 1.6 \text{ k}\Omega$), or the motor temperature measured via X7/X8 exceeds 150 °C (adjustable using "3119H . max. motor-temp.") or is below .5 °C (adjustable using "311BH . min. motor-temp."), or the PTC is defective.

Solution: Check the motor cooling, the drives load cycle, and the current limits. Check the PTC connection and possibly also the PTC characteristic; see page 2-20.

Note: If the motor temperature is measured with a measuring PTC at X7/X8, a warning is generated 10 K prior to the fault shutdown; the warning is entered into the event log and can be output e.g. via "DOUT4 choice" in menu 05.

Overspeed

Cause: The actual speed value exceeds the trigger level set.

Solution: Check "Max Speed" and "max-speed ref." in menu 02.

Note: An overshoot of the speed controller can trigger this fault. Therefore, a sufficient gap between "Max Speed" and "max-speed ref." is needed.

Overload > 60 s

Cause: In frequency control mode, an output current between 100 ... 150 % of the inverter F.L. current flows for over 60 s. Since there is no current limit effective in frequency control, the inverter has to shut down.

Solution: Check the load of the drive, the settings of the motor ratings and ramp times.

DC-Link Overvolt.

Cause: The DC link voltage has exceeded 785 V.

Solution: Check the parameters "Brake Module type" and "Mains voltage" in menu 06.

If you are using a braking device (brake chopper, brake module, or supply and regeneration module): Check the braking device (wiring, switching threshold of the brake chopper/module), the dimensioning and connection of the braking resistor.

If no braking device is used: Check the motor ratings entered and possibly also the adjustment. Reduce the parameter "3109H - Crnt.lmt.gen.red." that defines the regenerative current limit for operation without a braking device.

If frequency control option selected: Extend the ramp down.

Overcurrent

Cause: The output current has exceeded 170 % of inverter F.L. current.

Solution: Check the wiring of inverter and motor for short circuit. Check the motor ratings entered.

If frequency control option selected: Check the drives load. Extend the ramp up or down, resp.

Note: This fault can be acknowledged only after 3 s have expired.

6.4 Event messages

The event log protocols up to 32 past events. They can be displayed in menu 08=DIAGNOSTICS. Each entry is followed by either "+" or "-", indicating the rising or falling edge of the control function.

(E.g. "DIGITAL I/P 2 +" and "FORWARD +" mean: the voltage at digital input 2 changed from 0 V to 24 V, which activated the FORWARD control function. "DIGITAL I/P 2 -" and "FORWARD -" accordingly mean the inverse change, from 24 V to 0 V. In addition, all fault messages with "+" and "-" are copied into the event log, too.

The following events are logged in the ALSPA MV1000:

Autorun is active

The mains voltage has failed. The timer for the Auto Restart time is now running. Should the mains return during this period, the drive restarted automatically.

Autorun is inactive

The timer for the Auto Restart time has expired (or been reset). A new RUN edge is required now to restart once mains has returned.

wire fault REF.1

The analog reference input is set for line-current 4 ... 20 mA (or 20 ... 4 mA), but the current flowing is below 2 mA.

Note: Depending on the setting of the "4-20 mA monitor" in menu 04, a fault shutdown may occur, too.

RUN

A rising edge to RUN the drive has been detected at control source selected via the MANual/AUTOmatic-changeover.

Event P3; Event P4

The event signal pointed to via object "3988H - < event P3" or "3989H - < event P4" has become active. Meaning depends on pointer setting.

Rounded to n* cycle time

Internal rounding message of oscilloscope function.

AUTOMATIC

The MANual/AUTOmatic-changeover has been operated from the terminal strip.

DIGITAL I/P 1

DIGITAL I/P 2

DIGITAL I/P 3

DIGITAL I/P 4

DIGITAL I/P 5

The signal level at terminal DIGITAL INPUT 1 (2, 3, 4, 5) has changed. Function depends on configuration in menu 05.

DIGITAL I/P ENABLE

The signal level at the ENABLE terminal has changed. The pulses for the IGBTs are enabled. Further function depends on configuration in menu 05.

EXTERNAL FAULT

The control function EXTERNAL FAULT has been operated at the terminal strip.

FORWARD

The control function FORWARD at the control source selected via MANual/AUTOmatic-changeover has changed.

Motor-phase loss

< Empty event message display >

The current in the three motor phases is unsymmetrical or too low.

Note: Even if no motor is connected, or if the motor is far smaller than the inverter < 1:5), this event is output. Depending on the setting of the parameter "Motor phase monitor" in menu 03, a fault shut down may occur.

This event does not display any English event message in the Keypad. If you change the nverters language to German, you read the actual event message "Motorphasenausfall".

Mains interrupt

The DC link voltage has fallen below 250 V.

INIT performed

The software has been restarted. This is done every time the unit is powered on or the Restart software function is executed.

TRIP ACKNOWLEDGE

The control function TRIP ACKNOWLEDGE at the control source selected via MANual/AUTOmatic-changeover or at the Keypad has changed.

FORWARD

The control function FORWARD at the control source selected via MANual/AUTOMatic-changeover has changed.

FAST STOP

The control function FAST STOP has changed at one of the control sources. The signals from the terminal strip, from the fieldbus, and possibly from the Keypad are OR-connected.

DISABLE

The control function DISABLE has changed at one of the control sources. The signals from the terminal strip (ENABLE terminal), from the fieldbus, and possibly from the Keypad are OR-connected.

STOP

The control function STOP has changed at one of the control sources. The signals from the terminal strip and possibly from the Keypad are OR-connected.

Heatsink Temp.Warn.

The heatsink temperature exceeds 80 °C. If the heatsink temperature rises another 5 K, the inverter will shut down with "Heatsink Temp.".

Check the inverter air circulation, the incoming air temperature, and the heatsink fan MV1007 upwards).

warn.temp. motor

The motor temperature measured at X7/X8 by the measuring PTC exceeds 140 °C. If the motor temperature rises another 10 K, the inverter will shut down, outputting "Motor Overtemp.". Check the motor cooling system, your drive's load cycle, and the current limits. Check the PTC connection and the PTC characteristic; see page 2-20.

DC-link Undervolt.

The voltage in the DC link has dropped below a minimum value, making further operation impossible. The unit will switch off without fault shutdown, i.e. no entry in the fault log and no need to acknowledge. The timer for the automatic restart may be started.

The switch-off threshold depends on the "Mains voltage" set in menu 06; it is at 68 % of [rated mains voltage * 1.35].

Thus e.g.

rated mains voltage (menu 06)	400 V AC	480 V AC
normal DC link voltage	540 V DC	648 V DC
switch-off threshold at link voltage	367 V DC	441 V DC

Check the incoming supply for undervoltage or phase failure.

BOOT performed

The default values (preset at the factory) have been loaded. It is necessary to re-commission the drive or to load a parameter set.

7 Maintenance and Repair

The ALSPA MV1000 is maintenance-free as long as the prescribed system data (see Section 2.3) are complied with.

If the cooling air used is polluted, the ventilation apertures of the ALSPA MV1000 may occlude and require cleaning, e.g. by using a vacuum cleaner.

If the unit is stored for a longer period of time (>2 years) with the power disconnected, the aluminium electrolytic capacitors have to be reformed prior to switching on again, in order to rebuild the insulation layers. Reforming procedure on request.

If a hardware defect is suspected after a longer period of operation, it is recommended first to save the actual parameter set into the Keypad in order to being able to reload it into a replacement drive later, if necessary (see page 4-21).

Then, load defaults (see page 4-23), enter motor data, and the inverter may be tested with the standard terminal configuration (see page 2-14) as a means of locating possible faults in the external control system.

If a hardware defect should occur in the inverter, it will be necessary to have the manufacturer repair and test it. It is not possible simply to replace boards, since once the control board or the power board has been replaced, it is necessary to recalibrate the entire inverter (voltage, current, temperature).

If a repair will be necessary, please refer to:

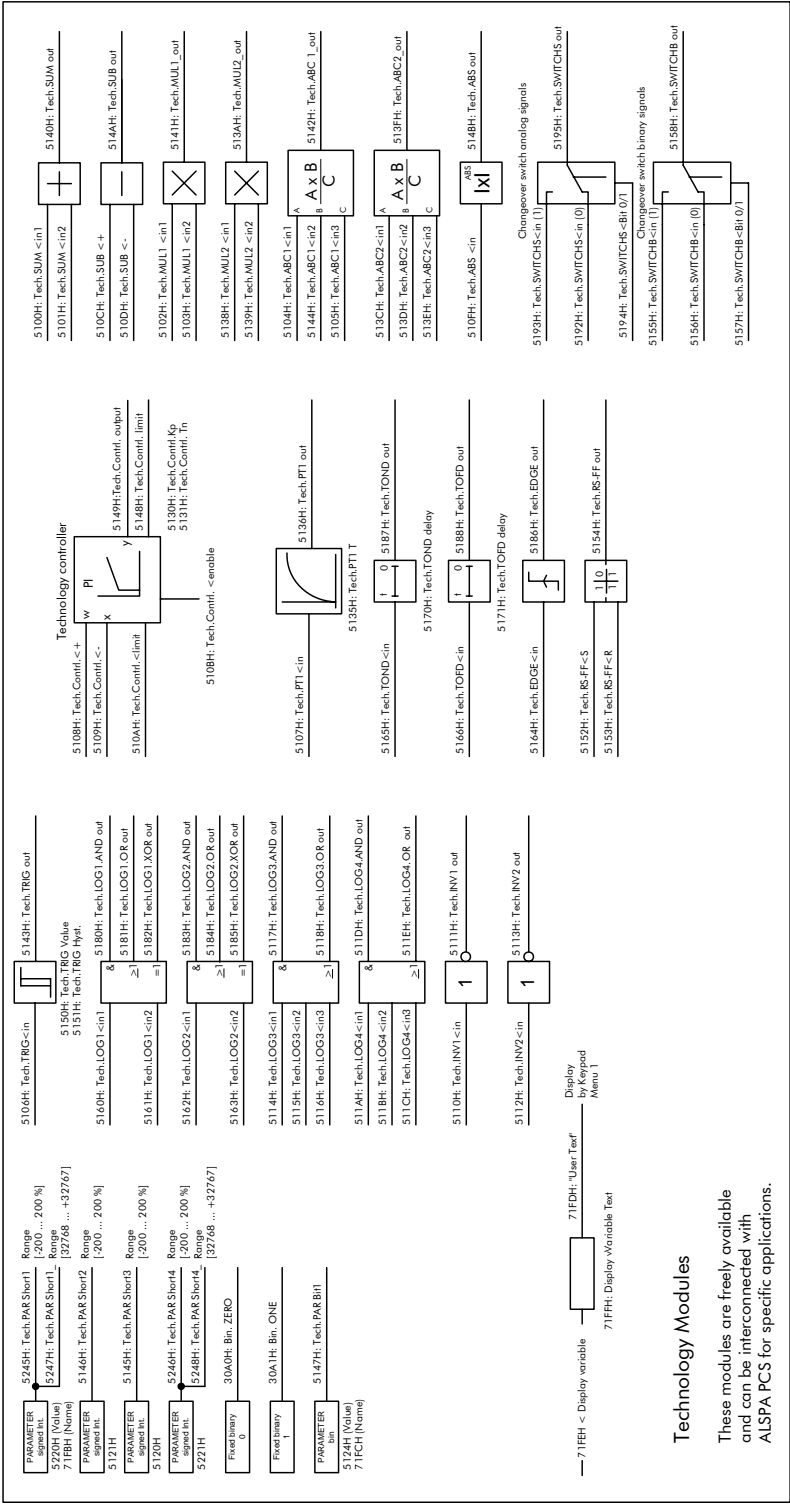
Converteam GmbH

D 87
Culemeyerstraße 1
D-12277 Berlin

Tel. +49 (0) 30 7622-2690

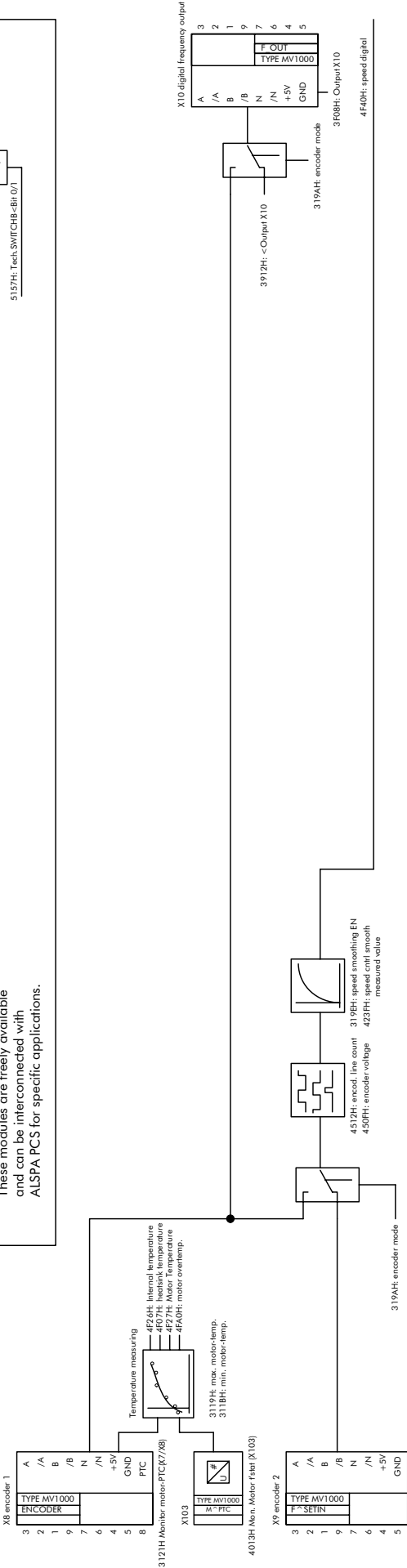
A detailed fault report facilitates the processing.

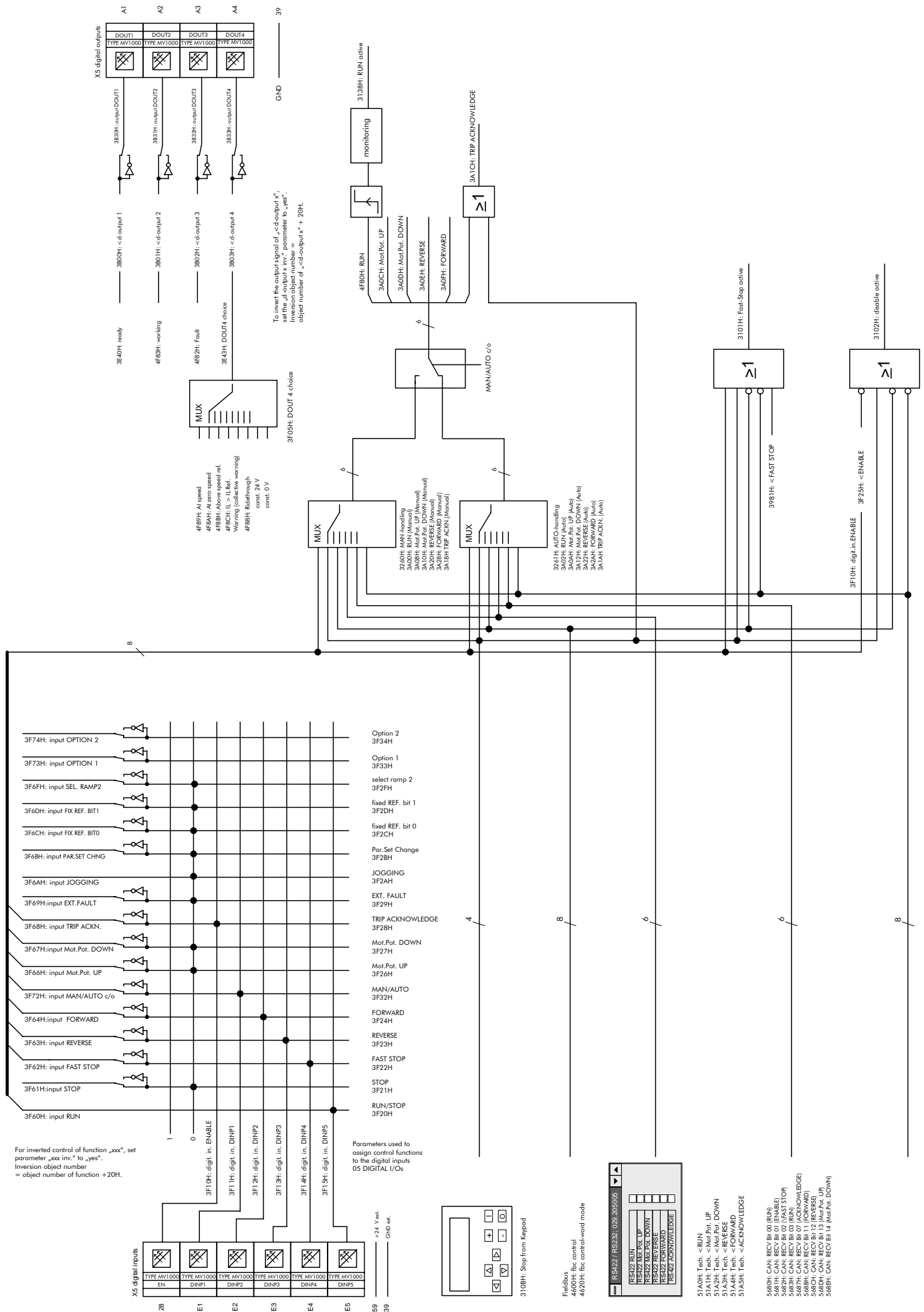
8 Software diagram, Certificate, Declaration of Conformity

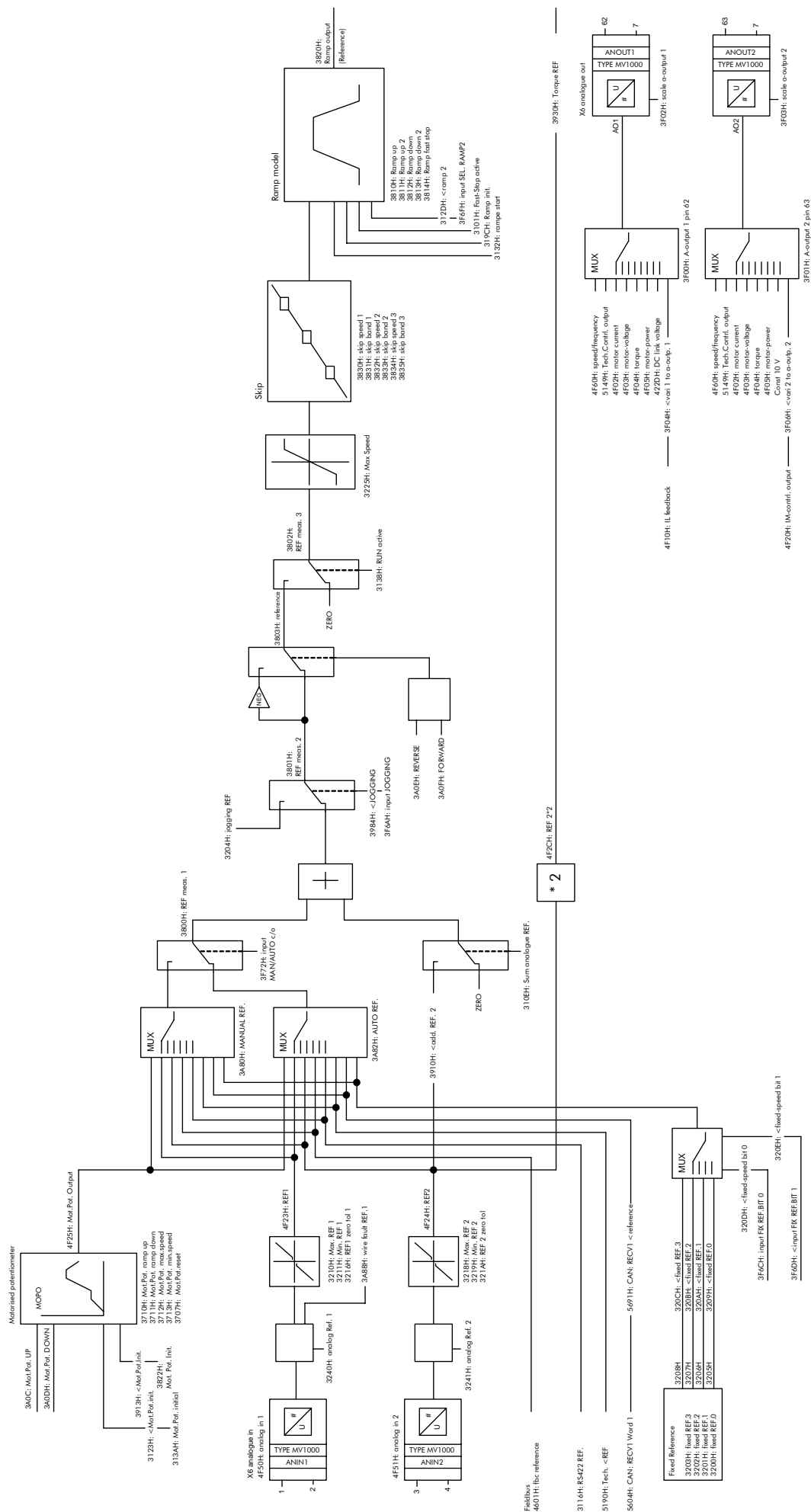


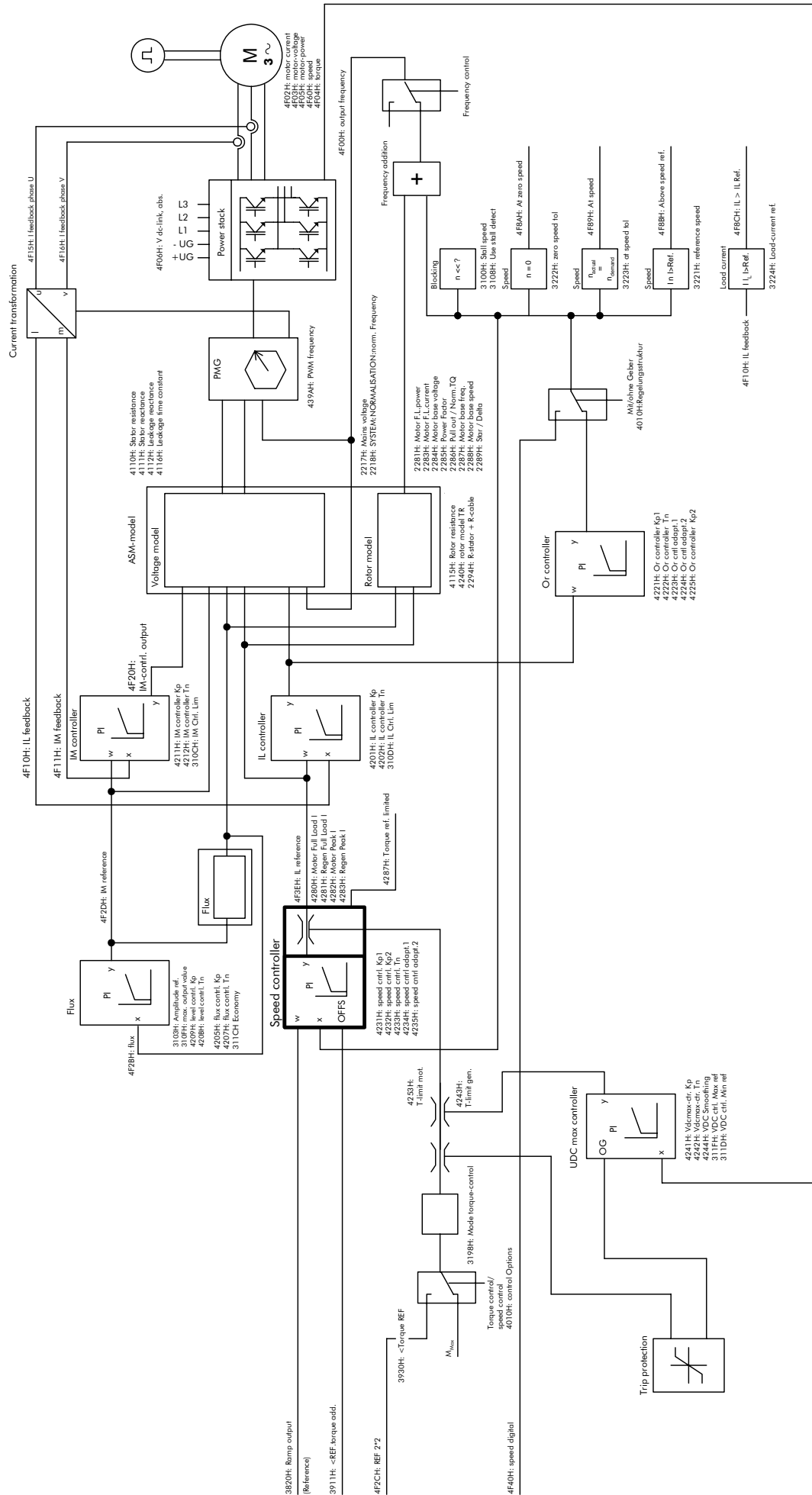
Technology Modules

These modules are freely available and can be interconnected with ALSPA PCS for specific applications.









ZERTIFIKAT ♦ CERTIFICATE ♦ 認証証書 ♦ CERTIFICADO ♦ CERTIFICAT



Management Service

CERTIFICATE

The Certification Body
of TÜV SÜD Management Service GmbH
certifies that

Converteam GmbH
Culemeyerstraße 1, D-12277 Berlin

has established and applies
a Quality Management System for

**Sales, Design, Production, Commissioning
and Service of Equipment, Systems and Plants in the
Field of Electrical Drive Systems and Industrial
Process Control Systems.**

An audit was performed, Report No. **70004245**

Proof has been furnished that the requirements
according to

ISO 9001: 2000

are fulfilled. The certificate is valid until **2008-04-24**

Certificate Registration No. **12 100 22639/01 TMS**



Munich, 2006-05-22



QMS-TGA-ZM-07-92

TÜV SÜD Management Service GmbH • Zertifizierstelle • Ridlerstraße 65 • 80339 München • Germany



EG - Konformitätserklärung Nr. KE 013/06.06
EU - Declaration of Conformity

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Hersteller / Manufacturer Converteam GmbH
 Culemeyerstr. 1
 D-12277 Berlin

Produktbezeichnung / Product description:

Diese Konformitätserklärung bezieht sich auf Frequenzumrichter der Typenreihe:
 This declaration of conformity relates to converters of the following type series:

ALSPA MV1000

(Typenreihe / type series Alspa MV10XX / MV10XX-S / MV10XX-IT / MV11XX / MV11XX-S / MV11XX-IT)
 einschließlich optionaler Zubehörteile
 including optional accessories

Die bezeichneten Produkte stimmen mit den Vorschriften folgender Europäischer Richtlinien überein:
 The above described products are in conformity with the requirements laid down in the following European Guidelines:

73/23/EWG (EEC) Elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen – Niederspannungsrichtlinie -
 Electrical equipment for use within defined voltage limits - Low Voltage Directive -

93/68/EWG (EEC) CE - Kennzeichnung
 Directive for CE marking

Weitere Angaben über die Einhaltung dieser Richtlinien enthält der Anhang.
 The appendix contains further information concerning compliance with the directives.

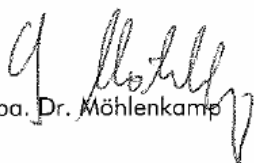
Anbringung der Kennzeichnung / CE marking in: 06

Aussteller / issued by: CVTG/C3 Dr. G. Möhlenkamp
 CVTG/S2 W. Jordan

Der Anhang ist Bestandteil dieser Erklärung.
 Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften.
 Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
 The appendix forms part of this declaration.
 This declaration confirms the compliance with the quoted directive, but it does not constitute any warranty as to properties.
 The safety information contained in the product documentation supplied must be adhered to.

Berlin, 16.06.2006

CVTG/C3


 ppa. Dr. Möhlenkamp

CVTG/S2


 i. V. Jordan

KE-013_06_06_D_E

EG - Konformitätserklärung Nr. KE 013/06.06
EU - Declaration of Conformity

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Anhang / attachment

Die oben genannten Produkte sind entwickelt und hergestellt in Übereinstimmung mit den folgenden harmonisierten europäischen, nationalen und internationalen Standards.

The products listed above have been designed and manufactured in accordance with the following European harmonized, national and international standards.

EN 50178	Ausrüstung von Starkstromanlagen mit elektronischen Betriebsmitteln Electronic equipment for use in power installations
EN 50274	Niederspannungs-Schaltgerätekombinationen - Schutz gegen elektrischen Schlag - Schutz gegen unabsichtliches direktes Berühren gefährlicher aktiver Teile Low-voltage switchgear and controlgear assemblies. Protection against electric shock. Protection against unintentional direct contact with hazardous live parts.
EN 60146-1-1	Halbleiter-Stromrichter, allgemeine Anforderungen und netzgeführte Stromrichter; Teil 1-1: Festlegung der Grundforderungen Semiconductor converters; general requirements and line commutated converters; part 1-1: specifications of basic requirements
EN 60146-1-3	Halbleiter-Stromrichter, allgemeine Anforderungen und netzgeführte Stromrichter; Teil 1-3: Transformatoren und Drosselspulen Semiconductor converters; general requirements and line commutated converters; part 1-3: transformers and reactors
EN 60204-1	Sicherheit von Maschinen, elektrische Ausrüstung von Maschinen; Teil 1: allgemeine Anforderungen Safety of machinery; electrical equipment of machines; part 1: general requirements
EN 60439-1	Niederspannungs-Schaltgerätekombinationen, Teil 1 Typgeprüfte und partiell typgeprüfte Kombinationen Low-voltage switchgear and controlgear assemblies; Part 1: Type-tested and partially type-tested assemblies
EN 60446	Grund- und Sicherheitsregeln für die Mensch-Maschine-Schnittstelle - Kennzeichnung von Leitern durch Farben oder numerische Zeichen Basic and safety principles for man-machine interface, marking and identification. Identification of conductors by colours or numerals
EN 60529	Schutzarten durch Gehäuse (IP - Code) Degrees of protection provided by enclosures (IP code)
EN 60664-1	Isolationskoordination für Betriebsmittel in Niederspannungsanlagen; Grundsätze, Anforderungen, Prüfungen Insulation coordination for equipment within low-voltage systems: principles, requirements and tests
EN 60721	Klassifizierung von Umweltbedingungen Classification of environmental conditions
EN 60947-1	Niederspannungsschaltgeräte; Teil 1: Allgemeine Festlegungen Low voltage switchgears and controlgears; Part 1: General rules
EN 61800-2	Drehzahlveränderbare elektrische Antriebe; Teil 2: Allgemeine Anforderungen Festlegungen für die Bemessung von Niederspannungs – Wechselstrom Antriebssystemen mit einstellbarer Frequenz Adjustable speed electrical power drive systems, part 2: General requirements - Rating specifications for low voltage adjustable frequency a.c. power drive systems
EN 61800-3	Drehzahlveränderbare elektrische Antriebe; Teil 3: EMV Produktnorm einschließlich spezieller Prüfverfahren Adjustable speed electrical power drive systems, part 3: EMC product standard including specific test methods
DIN VDE 0100	Bestimmungen für das Errichten von Starkstromanlagen

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