Contents

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.

Limitation of liability

Unless agreed otherwise by contract, the latest version of the “General Supply Conditions for Products and Services in the Electrical Industry” are applicable.

If software is updated or modified we are not obliged to make such updates available to users.

The operator is responsible for using the Alspa MV1000 correctly, particularly concerning programming. No liability whatsoever is accepted for incorrect handling.

Data, illustrations, modifications

Data and illustrations are approximate only. Modifications serving for technical improvement may be made without notice. If you have any suggestions toward improving the documentation please advise us accordingly. A printed form for this purpose is provided on the final pages of this document.

Training

CEGELEC provide training courses to supplement your knowledge of the system.

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 build-in units cover a power range from 1.7 kVA to 70 kVA (MV1003 ... MV1089).
In conjunction with standard asynchronous motors this provides drive capacities of 0.75 kW to 45.0 kW at rated unit current.

This operating manual applies to the following units:

Alspa MV1000	1003 ... 1089
Unit software version:	V 1.21

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 converter 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 537 V -15 % ... 678 V +10 %
  for connection to earthed networks
- Output frequency range: 0 ... 400 Hz
- 150 % overload capacity for 60 s every 10 minutes
  Overload based on unit rated current
- 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 power dump with braking resistor or mains feedback unit (option)
- Power stack heatsink can be removed (through-mounting)
  Cooling can be implemented outside the switchgear 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
- 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
- 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 V ... +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 error message
  - Error 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 AlspaPCS Windows PC handling program.
- Comprehensive safety and monitoring facilities

2.1 Key to types, rating plate

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

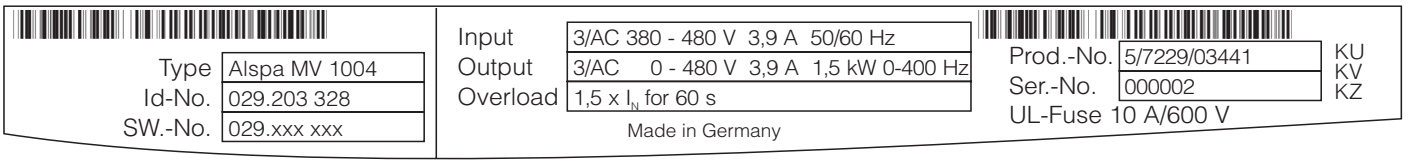


Fig. 1: Alspa MV1000 rating plate

2.1.1 Items supplied

IP20 Drive module, through-mounting IP41 (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.
Communication interfaces: Keypad, PC interface or field bus coupler

2.2 Product data

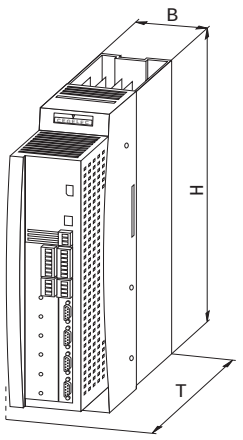
Alspa MV1000 for 3-phase mains supply

Alspa MV1000 0.75 ... 45 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.

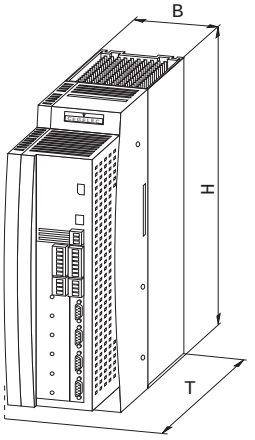
Alspa MV series	Frame size	Motor rating at rated current mains voltage 400 V [kW]	Unit input current, mains current with mains choke eff [A]	Unit output current at 400 V mains voltage Rated current [A]	Unit output current at 400 V mains voltage Peak current 60 s [A]	Rating at type voltage 400 V [kVA]	Rating at type voltage 415 V [kVA]	Rating at type voltage 480 V [kVA]	Power loss at 3AC 480 V [W]	ALSPA MV Order No. 029. 203 ...
1003	1	0.75	2.5	2.5	3.8	1.7	1.8	2.0	65	327
1004	2	1.5	3.9	3.9	5.9	2.7	2.8	3.2	100	328
1007	2	3.0	7.0	7.0	10.5	4.9	5.0	5.8	150	329
1013	3	5.5	12.0	13.0	19,5	9.0	9.3	10.8	210	330
1018	3	7.5	15.5	17.5	26.3	12.1	12.6	14.5	290	331
1024	3	11.0	20.5	23.5	35.3	16.3	16.9	18.5	360	332
1032	4	15.0	27.0	32.0	48.0	22.2	23.0	25.0	430	333
1047	4	22.0	42.0	47.0	70.5	32.6	33.8	37.0	640	334
1059	4	30.0	53.0	59.0	88.5	40.9	42.4	46.6	810	335
1089	5	45.0	78.0	89.0	133.5	61.7	64.0	69.8	1100	336

Table 1: Power data, Alspa MV1000 type series at 8 kHz vector frequency

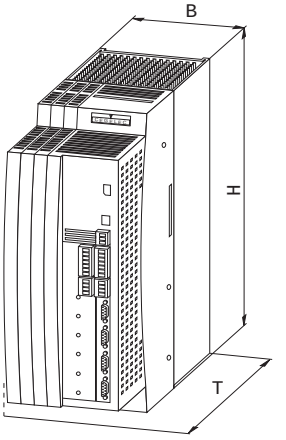
2.2.1 Dimensions and Weights



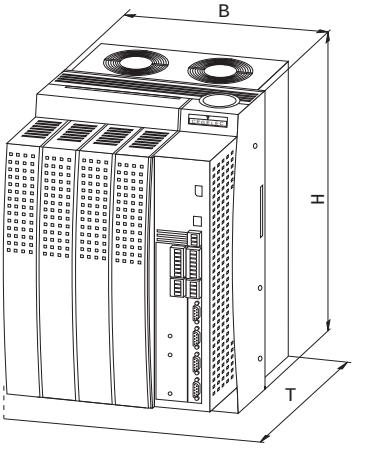
Frame size 1



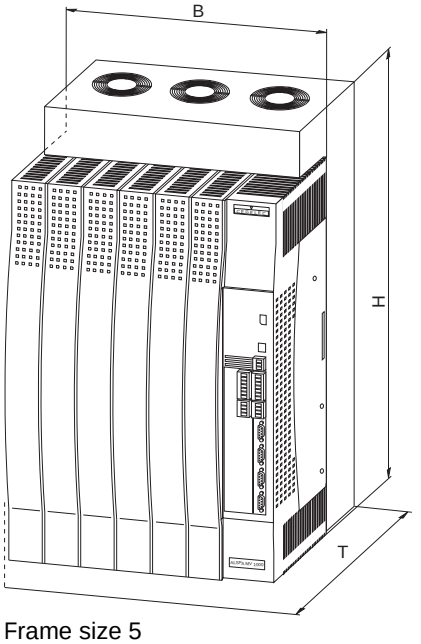
Frame size 2



Frame size 3



Frame size 4



Frame size 5

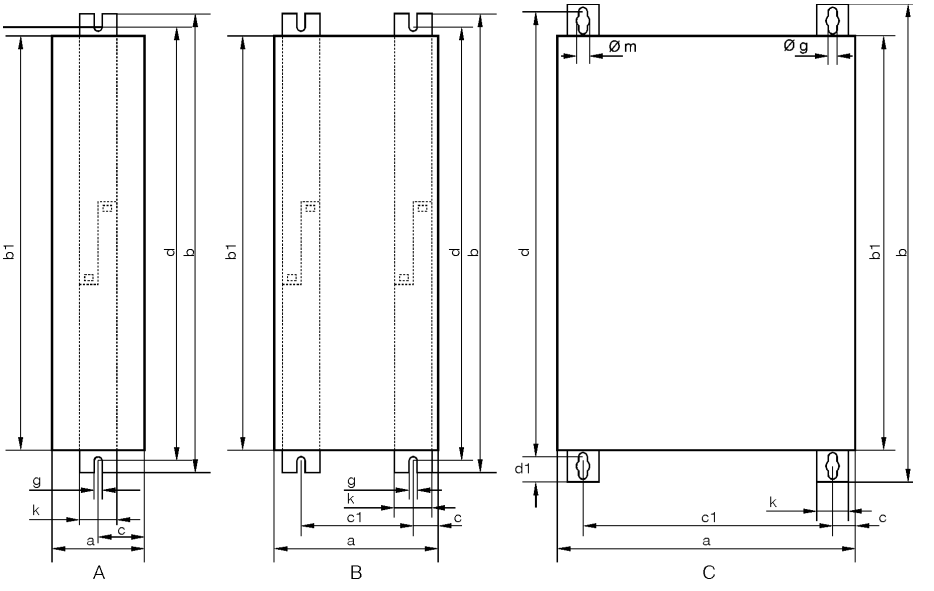


Fig. 2: Alspa MV1000 dimension drawings

Frame size	Dimensions W x D x H [mm]	Weight ca. [kg]	Fig.	a	b	b1	c	c1	d	d1	g	k	m
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

Table 2: Dimensions and weights, Alspa MV1000 frame sizes 1 ... 5

Note:
Mounting fittings for frame sizes 1 ... 3 are included in a separate pack. Fittings for frame sizes 4 ... 5 are packed in the casing.

2.3 Application data

• Mains voltage	3AC 380 V -15 % ... 480 V +10 % for connection to earthed network
• Mains frequency	45 ... 65 Hz
• Power factor	$\cos \varphi_1 \approx 0.90$
• DC supply voltage	DC 537 V -15 % ... 678 V +10 %
• Output voltage	3AC 0 ... Input voltage
on DC connection	3AC 0 ... $U_{DC} * 0.707$
• 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	With/without encoder 0 Hz / 2.5 Hz
• Max. operating frequency	400 Hz
• Speed adjustment range	For speed control Without encoder With encoder Motor Regenerative 1 : 50 1 : 5 >1 : 1000
• Speed accuracy	With speed regulation Without encoder With encoder With digital reference preset 0.5 % 0.05 %
• Torque rise times	For speed control with or without encoder 2 ... 8 ms
• Frequency accuracy for frequency control	<0.02 %
• Speed encoder	Incremental encoder
• Ambient temperature	
Operation	0 ... +40 °C up to +50 °C with power reduction 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 reduction of 5 % per 1000 m
• Protection classes	
Build-in units	IP20, for through-mounting IP41
• Relative humidity	<85 % at 28 °C, no condensation
• Contamination	Class 2 to DIN VDE 0110
• Permitted switching frequency	>3 min minutes waiting time before restarting
• Vibration resistance	to Germanischer Lloyd general conditions (for MV1089: In preparation)
• Electromagnetic compatibility (EMC): Radiated interference	To product standard IEC 1800-3 EN 61800-3 Graph EN 55011 Class A, B see section 2.4.1

2.3.1 Standards, operating conditions and certificates

2.3.1.1 Standards applicable

As per 6.1996

VDE 0100-540	Erection of heavy current systems with rated voltages up to 1000 V Selection and erection of electrical equipment; earthing, protective conductors, potential compensation
VDE 0160/pr EN50178	Heavy current systems with electronic equipment Low voltage directive and EMC
DIN EN 60146-1-1 (IEC 146-1-1)	Semiconductor converters; general requirements and mains-commutated converters; basic requirements (DIN VDE 0558 Part 11: 1994-03)
DIN EN 60146-1-3 (IEC146-1-3)	General requirements and mains-commutated converters Transformers and choke coils (DIN VDE 0558 Part 8: 1994-03)

2.3.1.2 Certification

DIN EN ISO 9001

Quality assurance model for development, design, production, assembly, testing, sales and maintenance.
TÜV-Südwest Audit QM-M-96/732
Certificate Reg. No. 70 100 M732
See appendix for the document.

2.3.1.3 Approvals

UL: MV1003 ... 1013 for the entire temperature range
MV1018 ... 1047 for ambient temperature <40 °C
MV1059 ... 1089 approval in preparation
CSA

2.3.1.4 CE mark

EC low voltage directive
See appendix for EC Certificate of Conformity.

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 errors.

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

Alspa MV1000 type	Fuse to VDE, mains supply	[mm²]	Fuse to VDE DC	[mm²]
1003	6 A	1	6.3 A	1
1004	10 A	1.5	8 A	1.5
1007	10 A	1.5	12 A	1.5
1013	20 A	4	20 A	4
1018	25 A	4	35 A	6
1024	32 A	6	40 A	6
1032	35 A	10	50 A	10
1047	50 A	16	80 A	25
1059	80 A	25	100 A	35
1089	100 A	50	160 A	95

Table 3: Mains supply fuses and cable cross-sections

2.4.1 Selection of EMC components and the motor cable

The table below shows which components are required to maintain the desired level of EMC interference radiation.

EMC interference radiation level required	Components required	Notes
No requirements Use in industry according to EN 61800-3 [IEC 1800-3])	Mains choke Screened motor cable NYCWY 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 Screened motor cable NYCWY 0.6 / 1 kV	Max. motor cable length see section 2.4.2 Note the EMC installation and connection instructions in section 3.6
Limit curve EN 55011 Class B, Group 1	Mains filter Ferrite rings Screened motor cable NYCWY 0.6 / 1 kV	Max. motor cable length: 50 m (For Alspa MV1003 and MV1004 with motor filter, if applicable, see section 2.4.2) Note with particular accuracy 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 affect the Alspa MV1000 and the control. 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 MV1089.

Alspa MV	Max. motor cable length	
	Without motor filter [m]	With motor filter [m]
1003	20	50
1004	30	50
1007	50	100
1013	50	150
1018	50	150
1024	100	200
1030	100	200
1047	100	200
1059	150	200
1089	200	250

Table 4: Max. motor cable length on Alspa MV1000

2.4.3 Mains chokes (3-phase chokes)

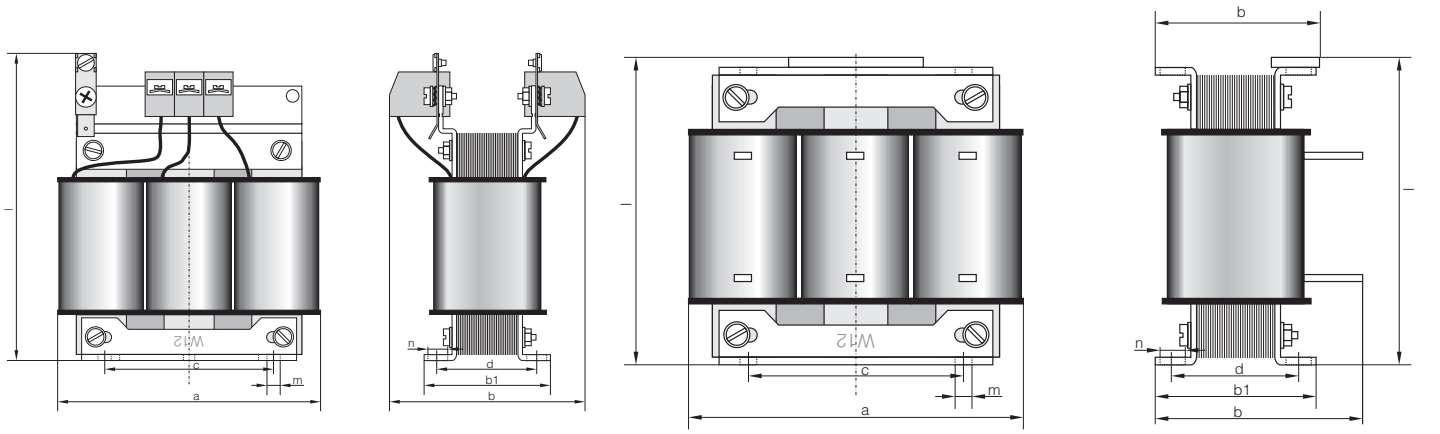
With the Alspa MV1000 on a 3AC mains connection a mains choke is required in the supply cable to reduce harmonics and limit mains feedback effects.
With stricter EMC requirements a mains filter is used in place of the mains choke (see section 2.4.4).
Mains chokes must be ordered separately. They are supplied loose and are to be installed outside the Alspa MV1000 in the switchgear cubicle.

Alspa MV1000 type	Mains choke Order No.	Type	Choke rated current [A]	Max. cable cross-sections [mm²]	a [mm]	b [mm]	b1 [mm]	c [mm]	d [mm]	l [mm]	m [mm]	n [mm]	Weight approx. [kg]
1003	029. 203 347	1	3	4	95	82	48	56	35	115	5	9	1,15
1004	029. 203 348	1	4	4	95	90	56	56	43	116	5	9	1,55
1007	029. 203 349	1	7	4	119	95	63	90	49	138	5	9	2,55
1013	029. 203 350	1	13	4	150	106	81	113	64	162	6	11	5,2
1018	029. 203 351	1	24	10	180	120	86	136	67	192	7	12	8,2
1024	029. 203 351	1	24	10	180	120	86	136	67	192	7	12	8,2
1032	029. 203 352	1	30	10	190	125	86	136	67	190	7	12	9
1047	029. 203 353	1	42	10	190	135	96	136	77	190	7	12	11
1059	029. 203 354	1	60	10	230	125	125	180	96	235	7	13	14
1089	029. 203 355	2	90	M8 bus bar	230	179	149	180	122	210	7	13	20

Table 5: Mains chokes for Alspa MV1000

Characteristics

Relative short circuit voltage	u_k = 6 % (400 V Supply voltage, rated output current)
Operating voltage	380 ... 480 V +10/-15 %, 50/60 Hz ±5 %
Protection class	IP 00
Environment class	DIN EN 60721 Part 3-3 3K3 / 3M2 / 3C2 / 2K2
Approval	UL



Type 1 Type 2

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

Mains filter for Alspa MV	Order No.	Type	Filter rated curret [A]	a [mm]	a1 [mm]	b [mm]	b1 [mm]	c [mm]	c1 [mm]	d [mm]	e [mm]	m [mm]	n [mm]	Weight approx. [kg]
1003	029.203 356	1	2.5	78	-	150	-	-	-	135	230	7	-	3.1
1004	029.203 357	1	4	78	-	150	-	-	-	135	230	7	-	3.2
1007	029.203 358	1	7	97	-	180	-	-	-	165	230	7	-	4.6
1013	029.203 359	1	13	135	-	260	-	92	-	245	230	7	-	11.6
1018	029.203 360	1	24	135	-	260	-	92	-	245	230	7	-	12.4
1024	029.203 360	1	24	135	-	260	-	92	-	245	230	7	-	12.4
1032	029.203 361	2	30	278	234	402	332	258	206	364	228	6.5	11	16.5
1047	029.203 362	2	42	278	234	402	332	258	206	364	228	6.5	11	17.3
1059	029.203 363	2	60	278	234	402	332	258	206	364	285	6.5	11	18.0
1089	029.203 364	2	90	360	331	472	475	345	283	424	287	6.5	11	34.0

Table 6: Mains filter for Alspa MV1000

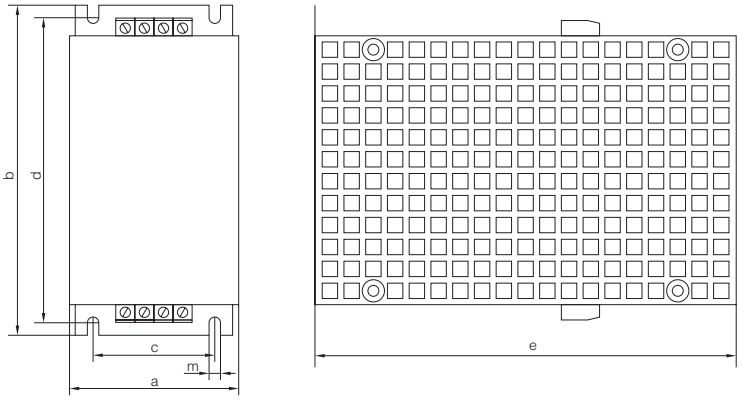


Fig. 4: Dimension drawing, mains filter, type 1

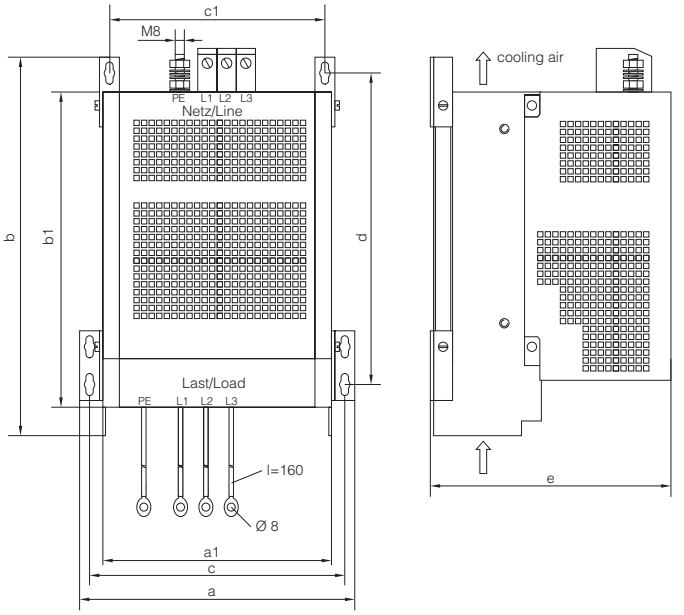


Fig. 5: Dimension drawing, mains filter, type 2

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 MV1000	Order No.	a [mm]	b [mm]	c [mm]	d [mm]	e [mm]	Weight approx. [kg]
1003 bis 1024	029.206 880	19	38	77	6.5	100	0.5
1032 bis 1089	029.206 881	38	74	77	6.5	100	1.1

Table 7: Ferrite rings for Alspa MV1000

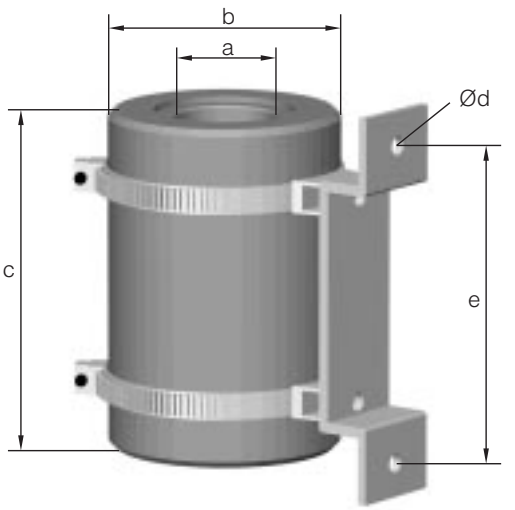


Fig. 6: Dimension drawing, ferrite rings for Alspa MV1000

2.4.6 Motor filter

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.

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/µs, do not require a motor filter.

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).

The motor filter does not affect EMC interference radiation.

Motor filter for Alspa MV	Relevant motor filter	Order No.	Filter rated curret [A]	a [mm]	b [mm]	c [mm]	d [mm]	e [mm]	f [mm]	design
1003 to 1007	MF750/7	029.203 376	7	200	125	224	149	171.5	93.5	1
1013 to 1024	MF150/24	029.203 377	24	225	175	249	199	230	110.5	2
1032 and 1047	MF065/47	029.203 378	47	250	200	287	237	-	130.5	3
1059 and 1089	MF030/90	029.203 379	90	250	200	287	237	-	130.5	3

Table 8: Motor filter for Alspa MV1000

The motor filter reduces the peak voltage at the motor to typically <1000 V and the rate of voltage rise to typically <1000 V/µs at mains voltage of 400 V and if the motor cable length is <150 m. (With 480 V mains voltage: 1200 V and 1200 V/µs.) If the motor cable length is over 150 m (Alspa MV1024 to Alspa MV1089) motors with a permitted peak voltage of 1300 V must be used.

The motor filter is designed for a vector frequency of 8 kHz and output frequency of up to 200 Hz. With a motor cable length of <30 m three marked plugs on the motor filter must be connected differently to activate the built-in capacitors.

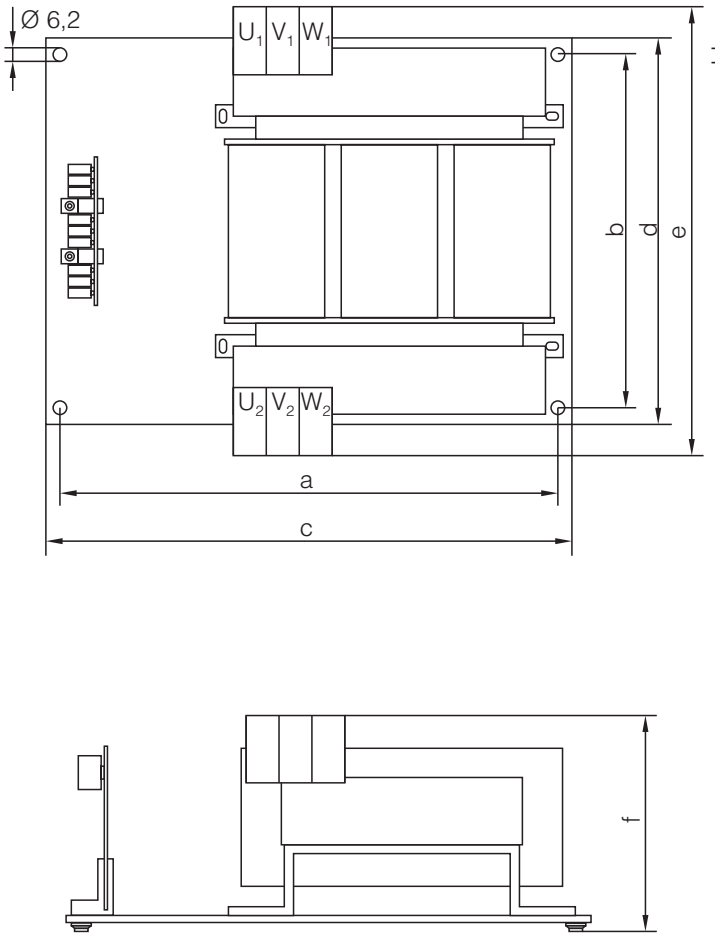


Fig. 7: Motor filter, design 1 and 2

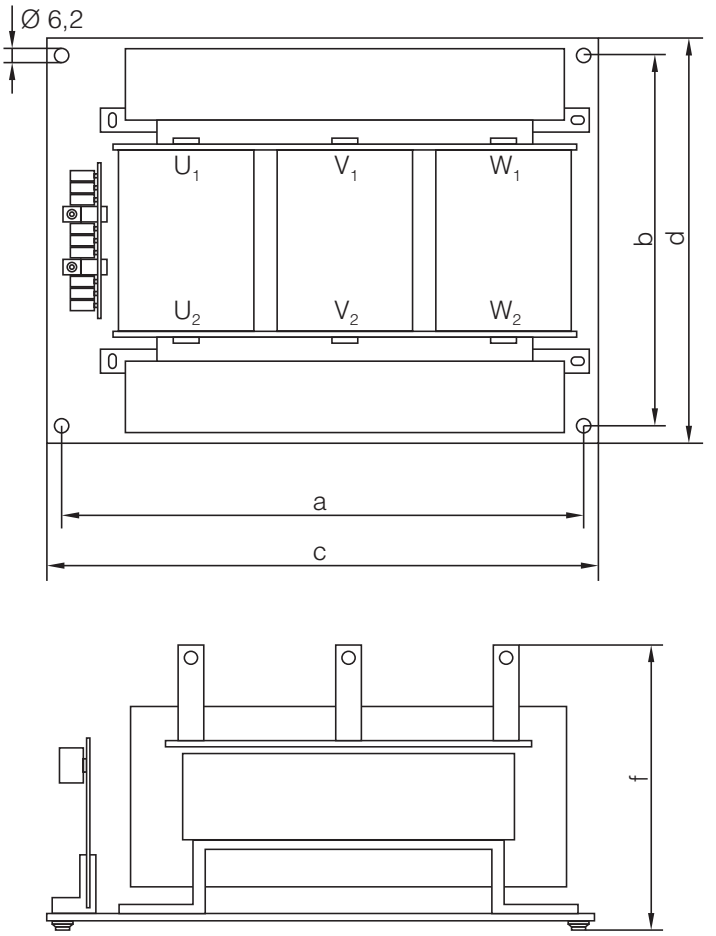


Fig. 8: Motor filter, design 3

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	
- Unit operation:	Keypad	029.203 365
- Installation in cubicle door:	Keypad door mounting kit	029.206 849
- Operation by PC:	PC Interface RS 232/RS422	029.204 538
	AlspaPCS drive software	029.152 821
	Device specific files V1.2	029.205 102
- Bus couplers:	FIP	029.207 789
	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	

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 the connection is made to +UG and -UG. Special project design work is necessary for connection to a DC system bus.

The motor is connected to terminals U, V and W. A temperature contact is connected to terminal X103.

Fig. 9 shows the power connection to the Alspa MV1000 on a 3AC and a DC supply.

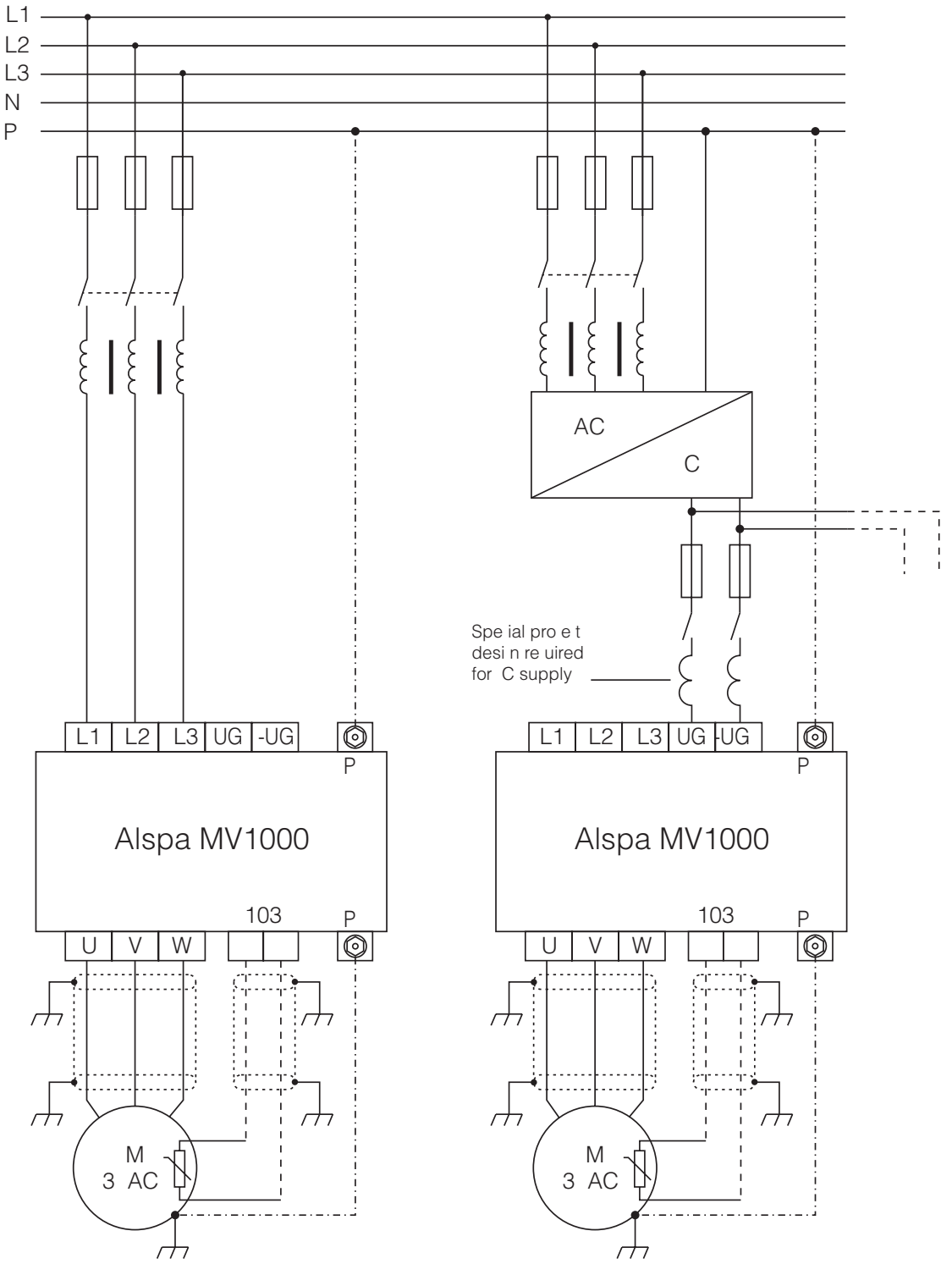
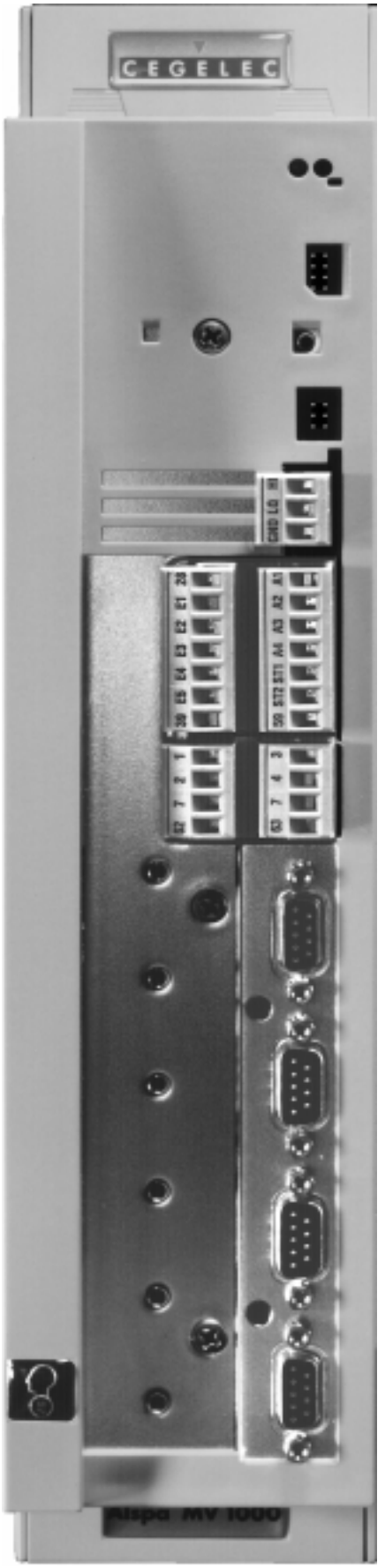


Fig. 9: Alspa MV1000 3AC or DC power connection



L1, L2, L3 3AC power connection
+UG, -UG 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 oder 4 ... 20 mA

X4 CAN Bus
plug-in terminal strip

X5 Digital inputs/ outputs
plug-in terminal strip

X6 Analog 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.

X7 Resolver
9-pin Sub-D plug female

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

X9 Digital frequency 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
U, V, W Motor connection
} behind cover

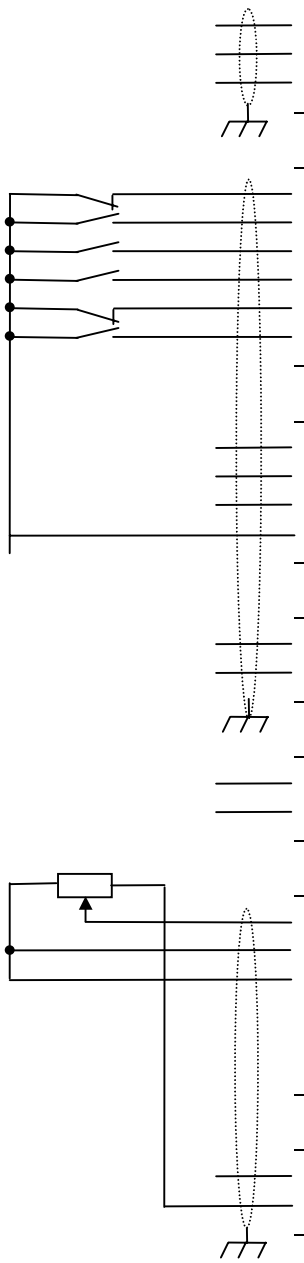
Fig. 10: Alspa MV1000 terminal wiring

2.6.2 Electronics connections

The control and analog signal connections to the Alspa MV1000 are via plug-in terminal strips. Fig. 10 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 9 shows the standard wiring as supplied. Fig. 14 ... Fig. 17 show the possible wiring.



Terminal strip X4	CAN-Bus	Comments	
HI	CAN-HIGH		
LO	CAN-LOW		
GND	CAN-GND	Over 100 Ω to ground	
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	ON	+24 V, max. 50 mA
:A3	DOUT3	ERROR	+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 supply		
:59	DC +24 V ext.	External support for electronics	
:39	DC 0 V ext.	Ref. potential for digital I/O and ext. supp.	
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	

Table 9: Standard terminal wiring

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. 14.

Digital outputs

Output active on +24 V
Output current max. 50 mA, min. load resistance at 24 V: 480 Ω

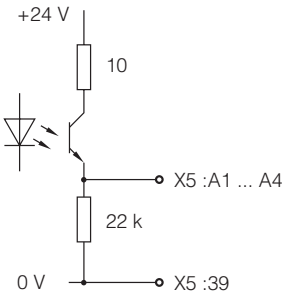


Fig. 11: Basic circuit diagram of digital outputs

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

Analog inputs

Adjustable for -10 ... +10 V, 0 ... 10 V
Input resistance >100 kΩ, 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. 16 and menu 04=ANALOG I/Os for parameter adjustment
See Fig. 12 for hardware setting for AINP1.

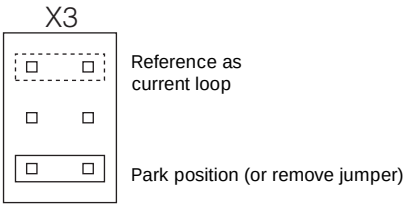


Fig. 12: Setting the analog input AINP1 with X3

Note:
When installing a PC interface in the Alspa MV1000 the jumper must be removed from the parked position and kept safe elsewhere.

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. 13. 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. 13. The characteristic is programmed with the parameters R-PTC(Tx). The characteristic is preset in the factory for a PTC of type KTY 83-110. The Alspa MV1000 shuts down at a motor temperature of >150 °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.

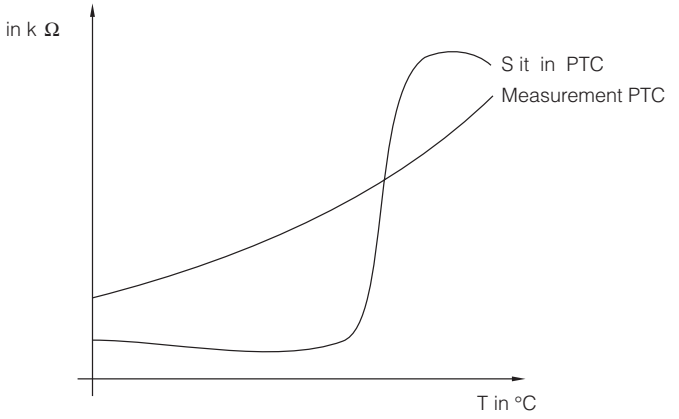


Fig. 13: PTC temperature resistance characte ristics

Encoder

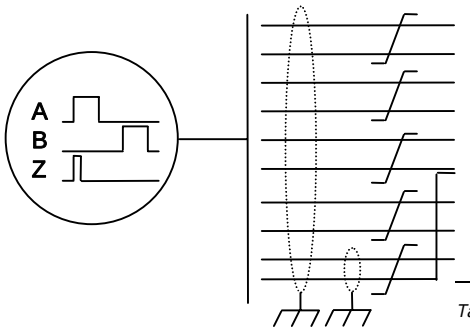
TTL, 5 V, two channel offset through 90° el. and inverted outputs.

Encoder input X8
Differential inputs, for 5 V encoder voltage, input current 6 mA.
Input frequency 100 Hz ... 500 kHz

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.

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 10: Encoder connections

[1)] Connect to X8 :8 and X8 :5 using separate, twisted and screen pairs of leads

Encoder cable: Leads twisted in pairs with common screen

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

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

Table 11: 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.

No. of encoder lines Z [Pulses/rev.]	n_{max} [rpm]	n_{min} [rpm]
1,000	12,000	6
2,000	6,000	3
5,000	2,400	1.2

Table 12: Limits of speed range depending on number of lines at f_{max} = 200 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 in Fig. 14 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 13: 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:
FOREWARD = DINP2
FOREWARD 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.

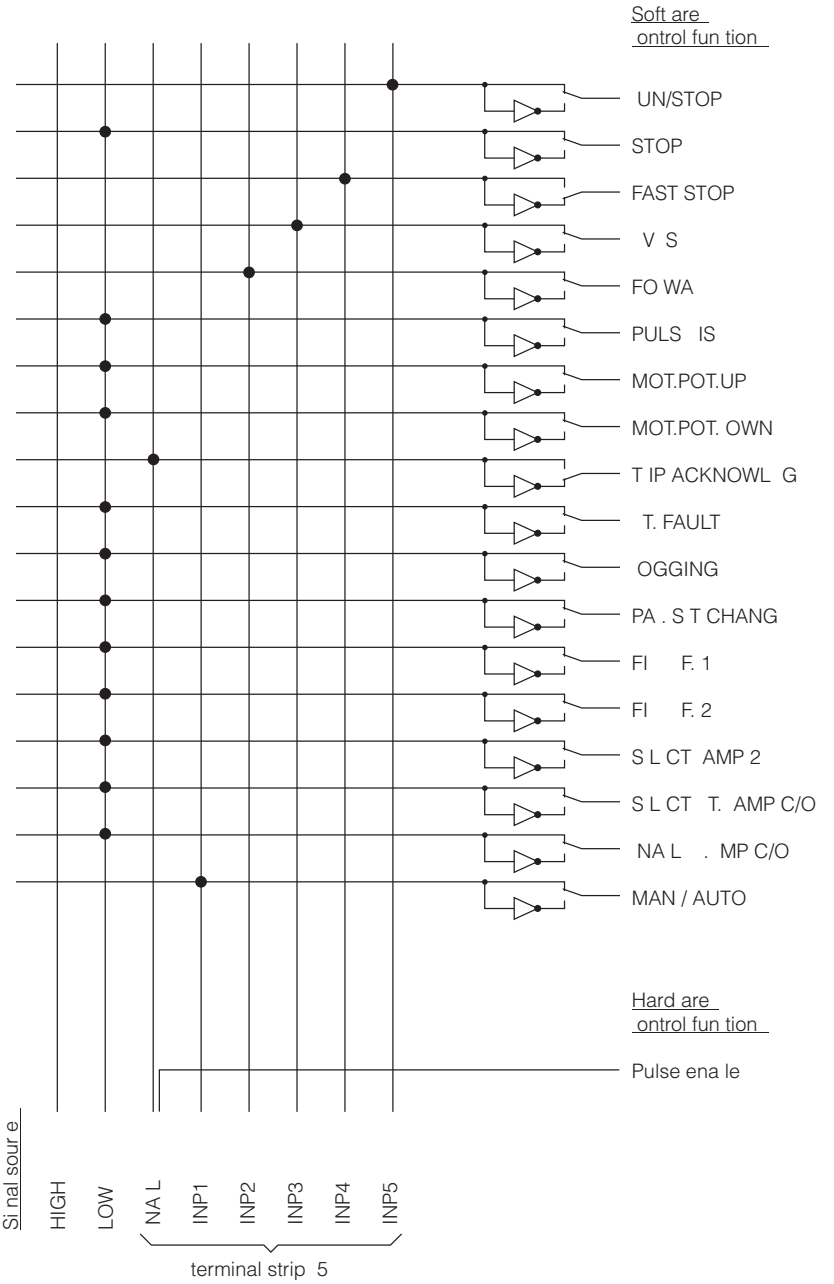


Fig. 14: Possible configurations of terminal X5 digital inputs (Default setting)

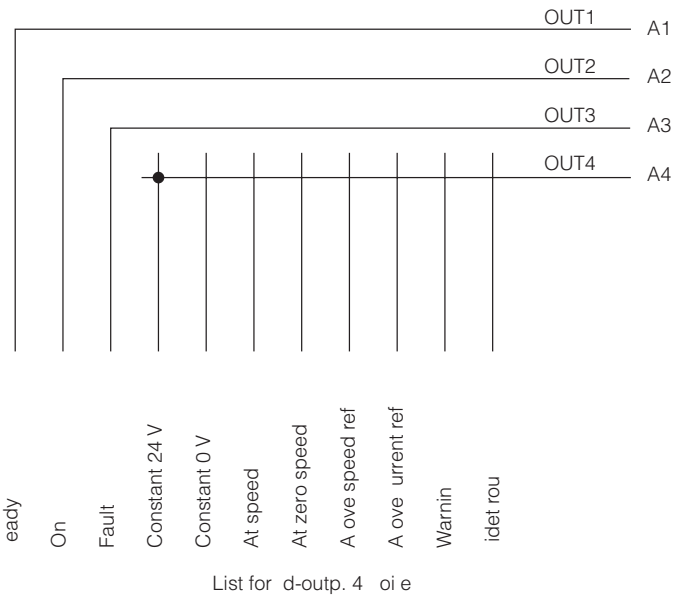


Fig. 15: Configuration of terminal X5 digital outputs (Default setting)

The digital outputs DOUT 1 ... 4 can be inverted in menu 05=DIGITAL I/Os using the parameter "D-Output 1 ... 4 inv.". The wiring for digital output DOUT 4 can be set be in menu 05=DIGITAL I/Os using the parameter “d-outp.4 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

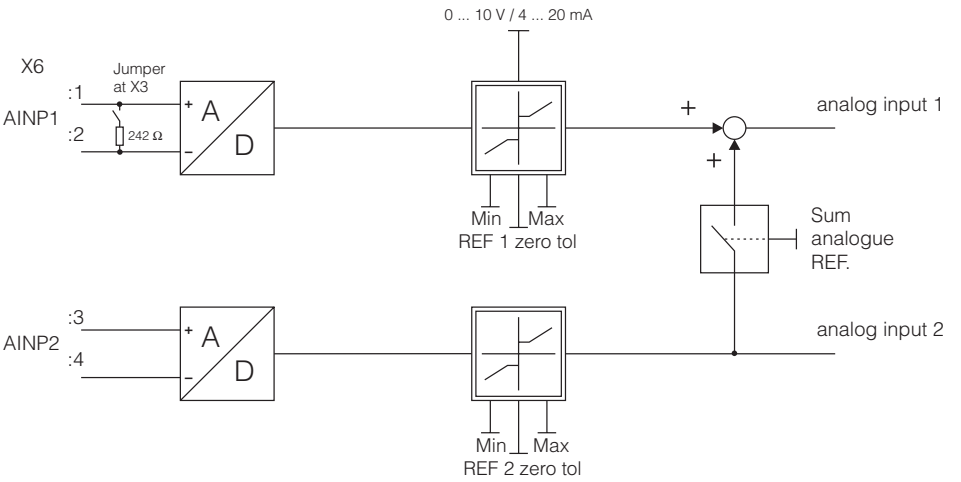


Fig. 16: Possible configurations of terminal X6 analog inputs (Default setting)

The programming 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. 17.

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.

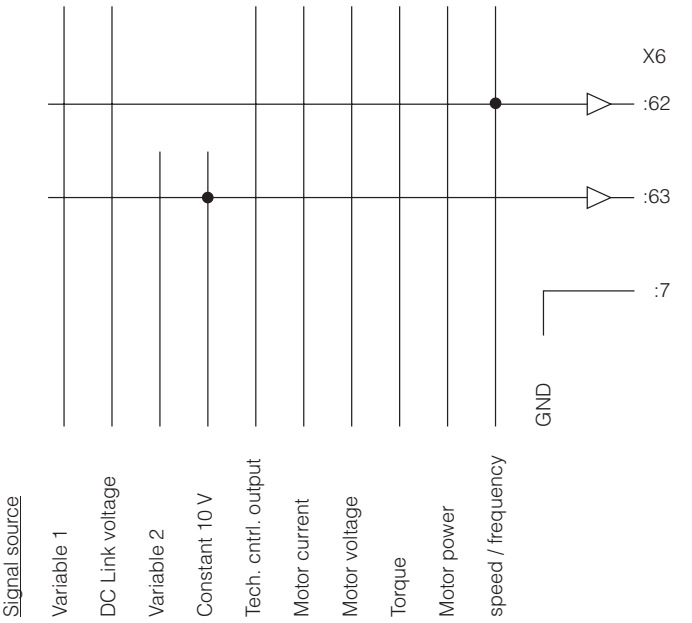


Fig. 17: Possible configurations of terminal X6 analog outputs (Default setting)

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 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.
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. 18).

The Alspa MV1000 scope of supply includes various mounting parts to secure the cable screens in a low impedance connection, see Fig. 19.

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.

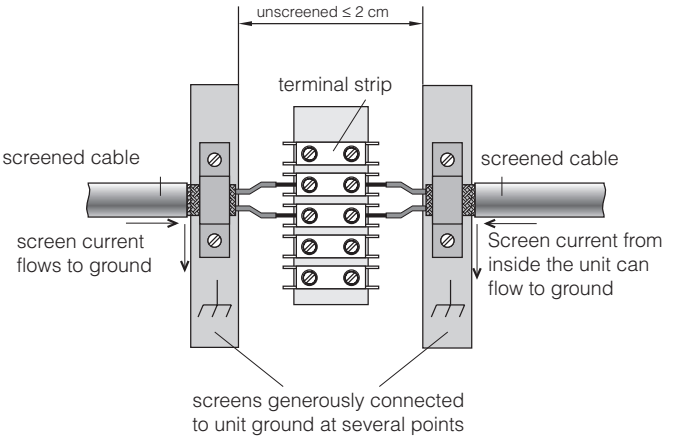


Fig. 18: Separation point on a screened cable

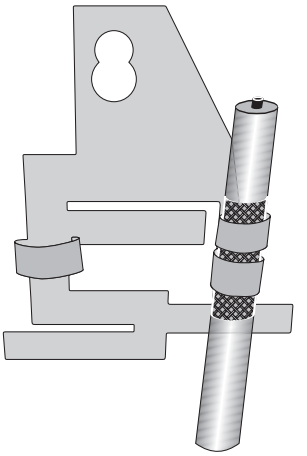


Fig. 19: Cable screen connection to mounting parts (signal leads)

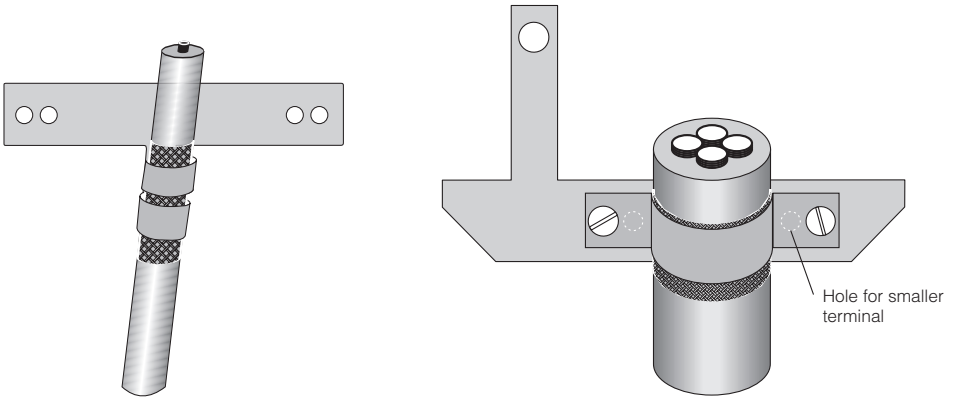


Fig. 20: Cable screen connection to mounting parts (mains and motor cables)

4.1 Unit 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.

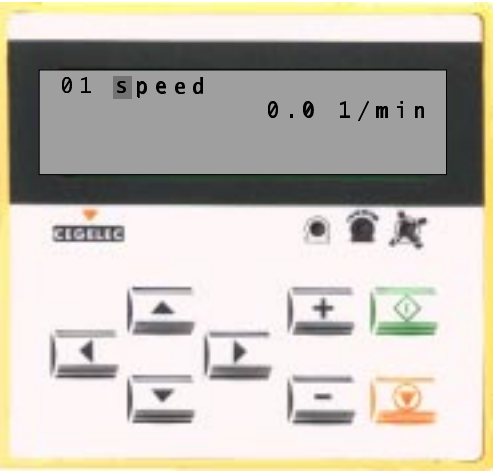


Fig. 21: Alspa MV1000 control unit (keypad), in the ON condition

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

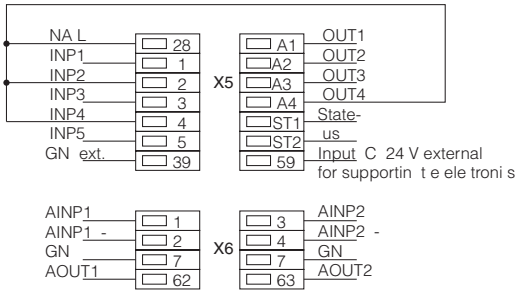


Fig. 22: Standard terminal wiring and motor potentiometer wiring

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 motor potentiometer: Increase reference
− Software motor potentiometer: Decrease reference
Start drive
Stop drive, acknowledge trip messages

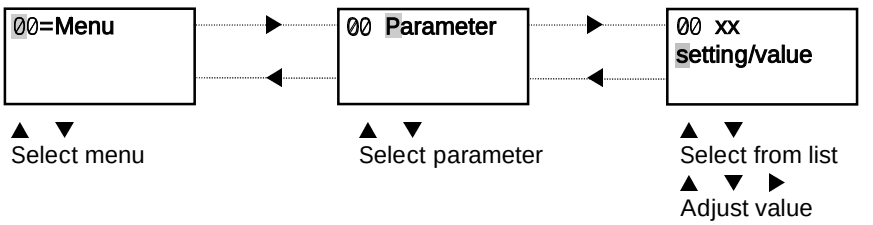
Status indicators

Green indicator: Ready
Green indicator: Drive running
Yellow indicator: Error

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 ▶.

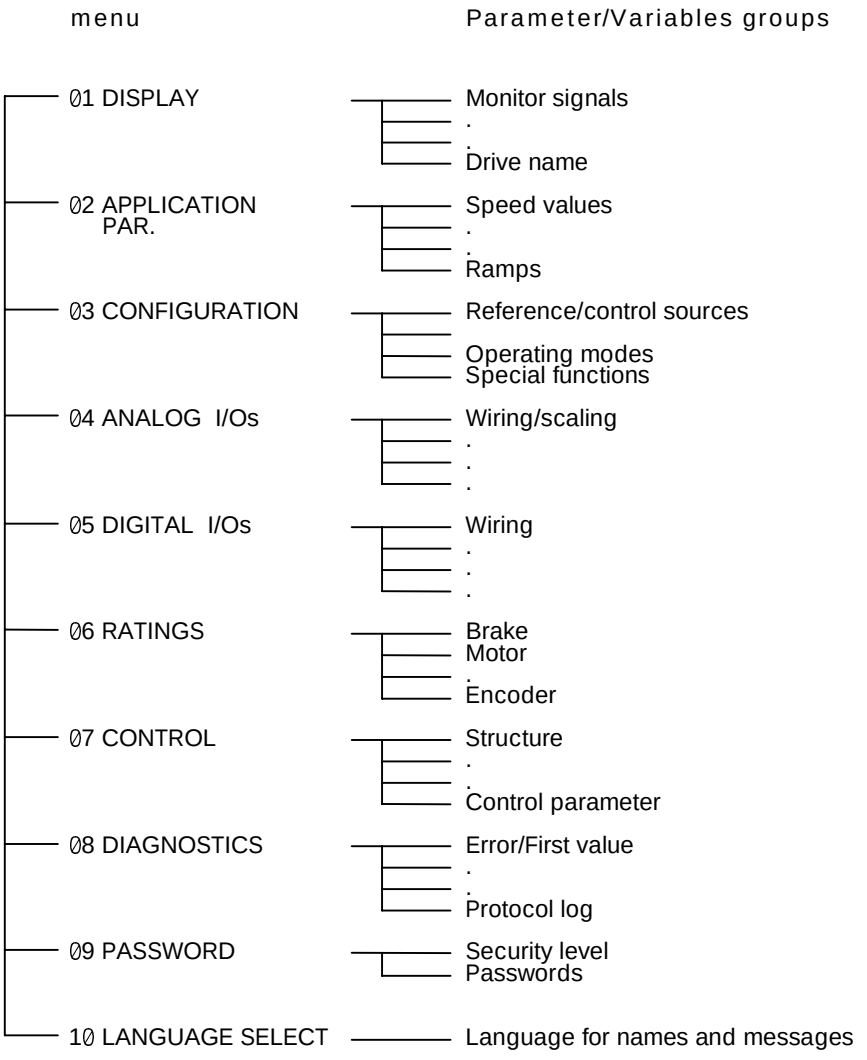
- Changing a parameter value:
  The flashing cursor marks a digit of a number/a character of a text. Every pressing of a ▲ increases the digit / selects the alphabetically following character, every pressing of a ▼ decreases the digit / selects the alphabetically preceding character. The ▶ key moves 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:

The message disappears after 2 seconds. This message indicates that the change was saved 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.

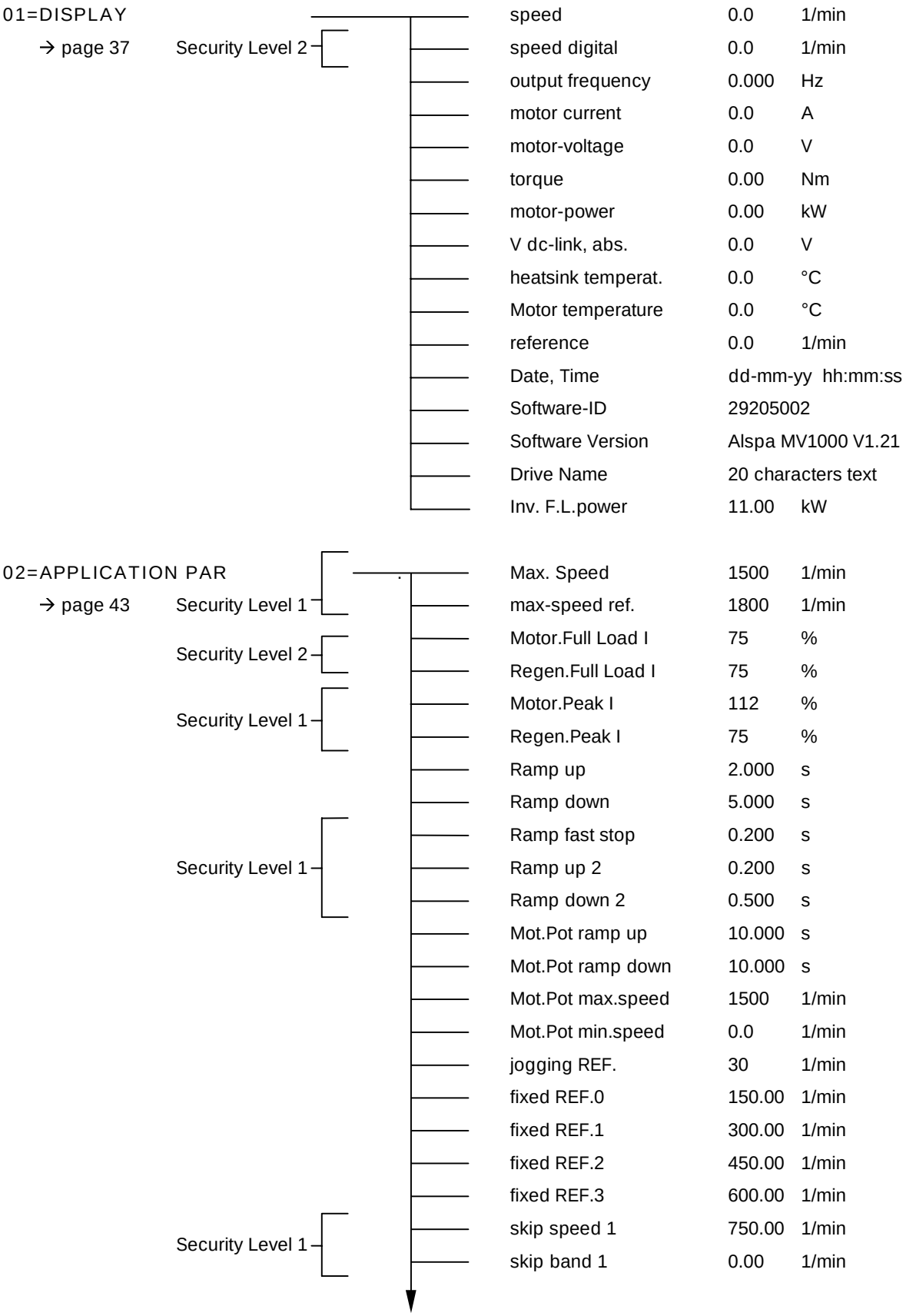
4.1.2 Software structure

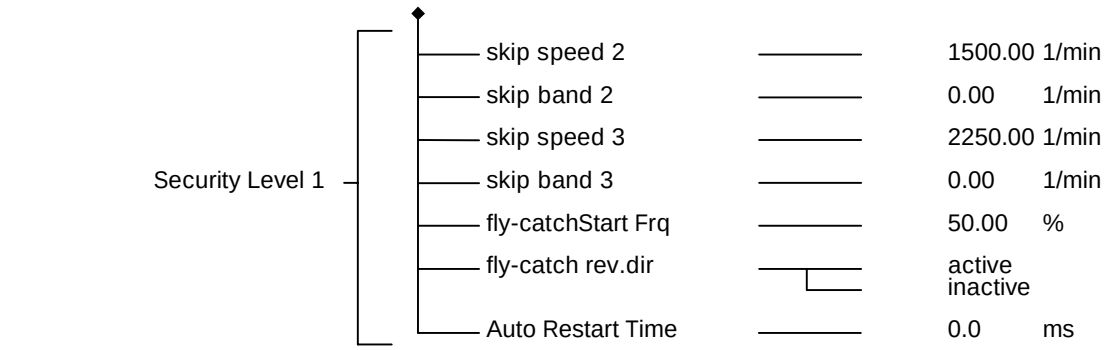
The user interface for the keypad is divided into 2 levels. Level 1 contains the menu. The parameters are selected on level 2. Access to parameters is organised with 3 levels of Security to prevent unintentional adjustment of parameters when the Alspa MV1000 is ready for operation.

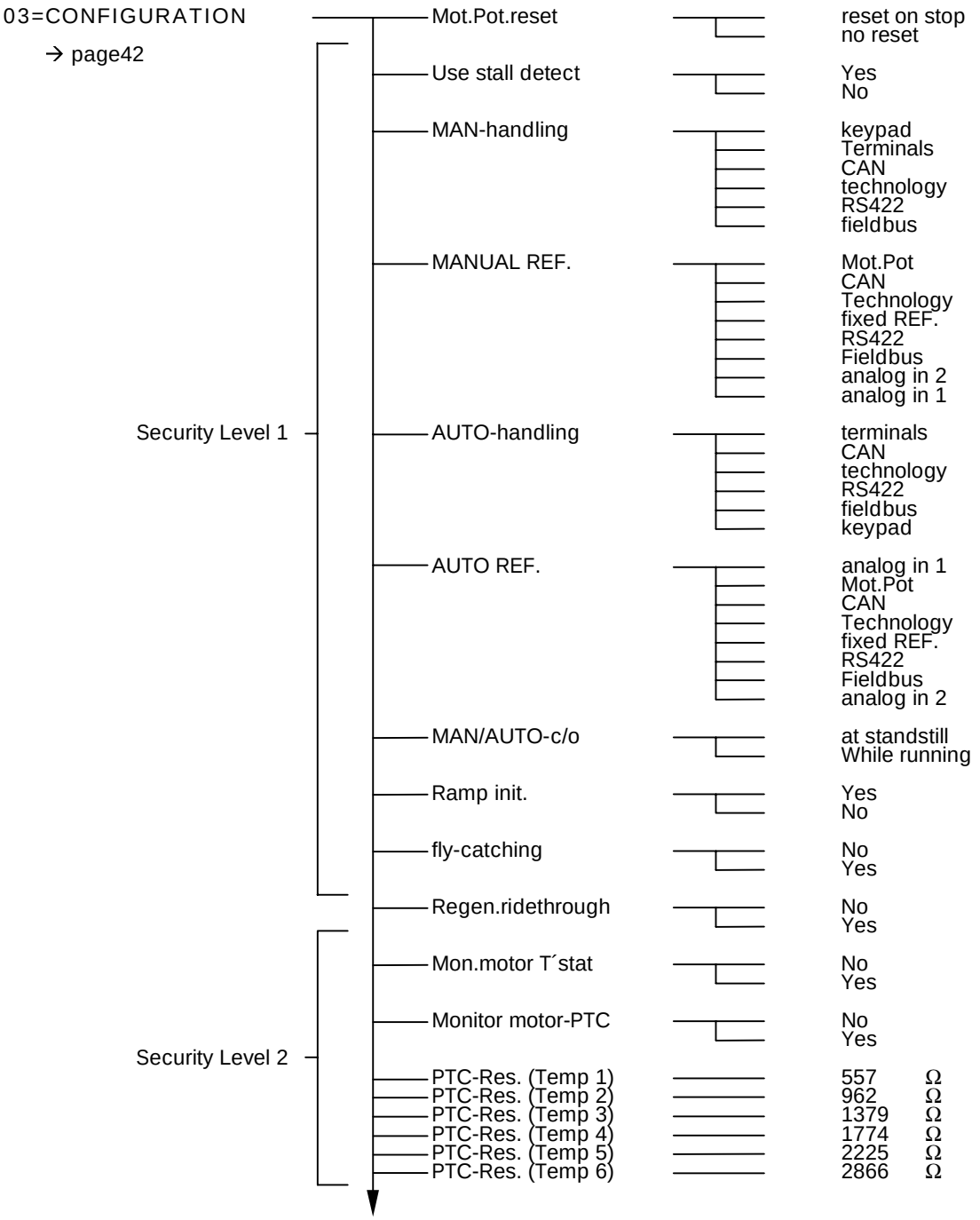


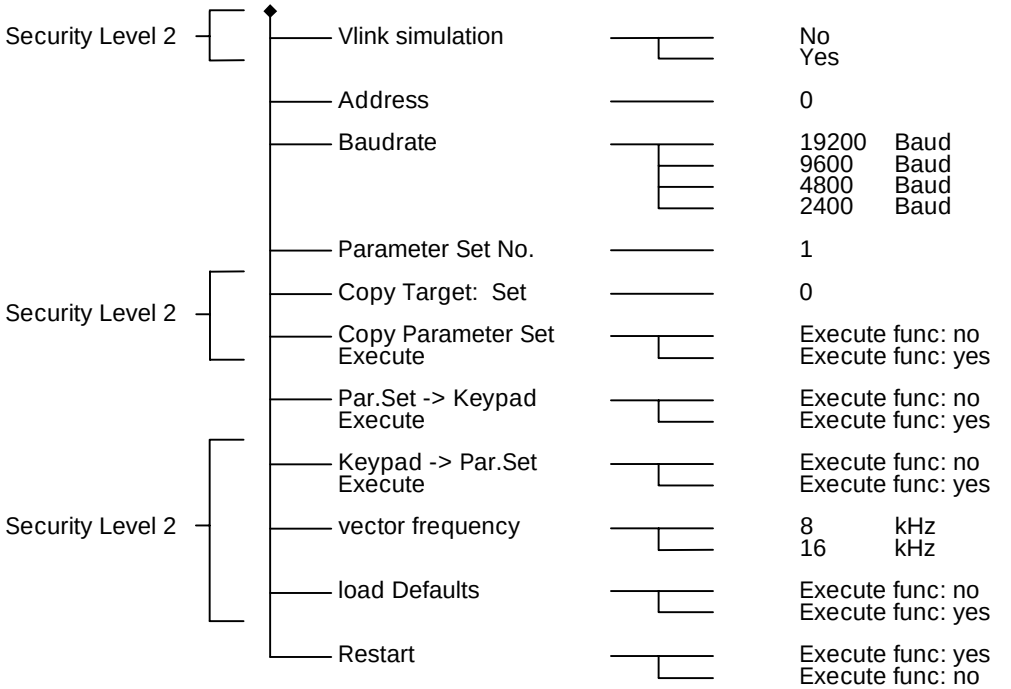
Note:
See pages 74 ... 76 for flow diagrams of the software structure, signal processing and parameter adjustment on the Alspa MV1000.

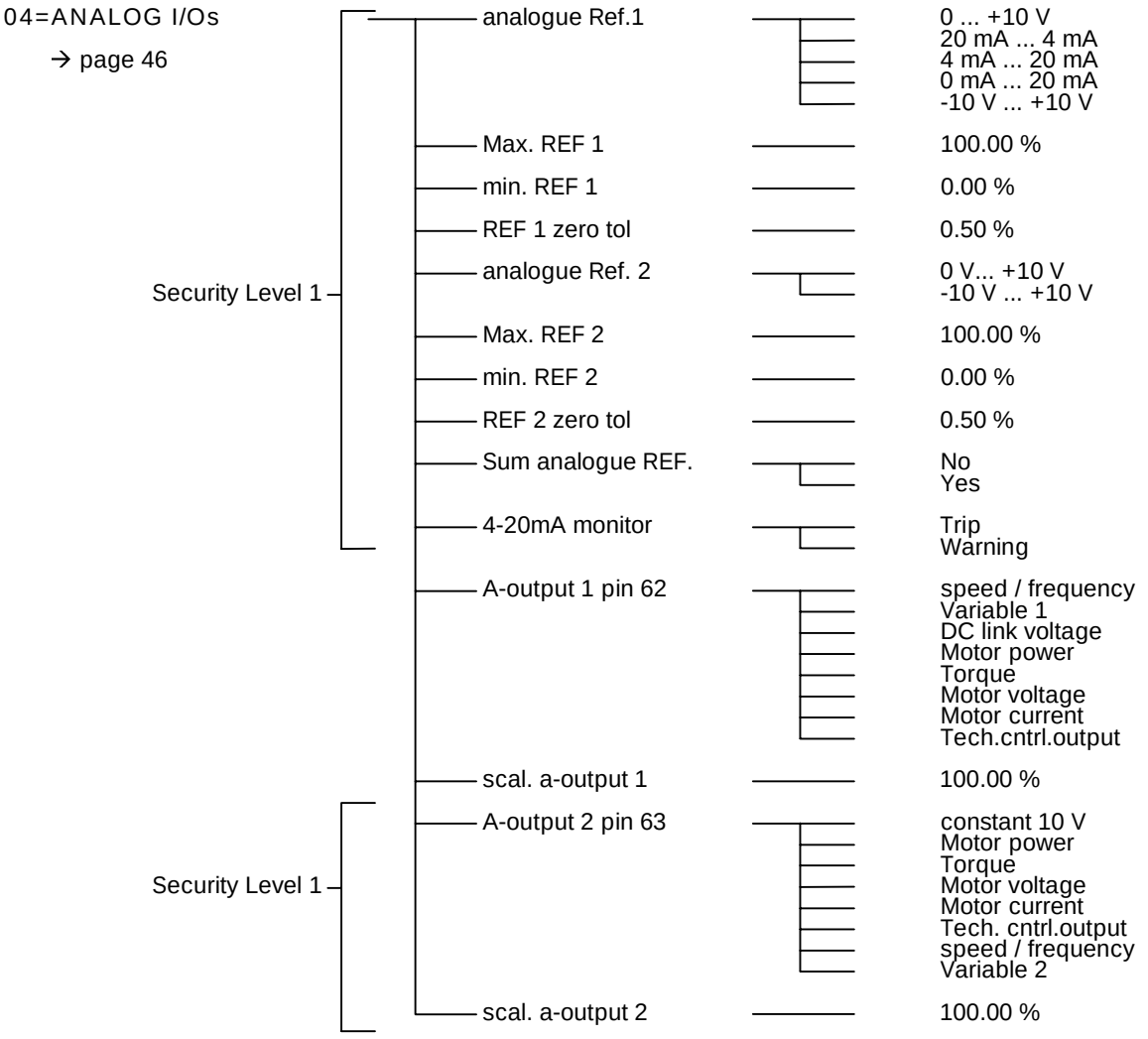
4.2 Menu Structure

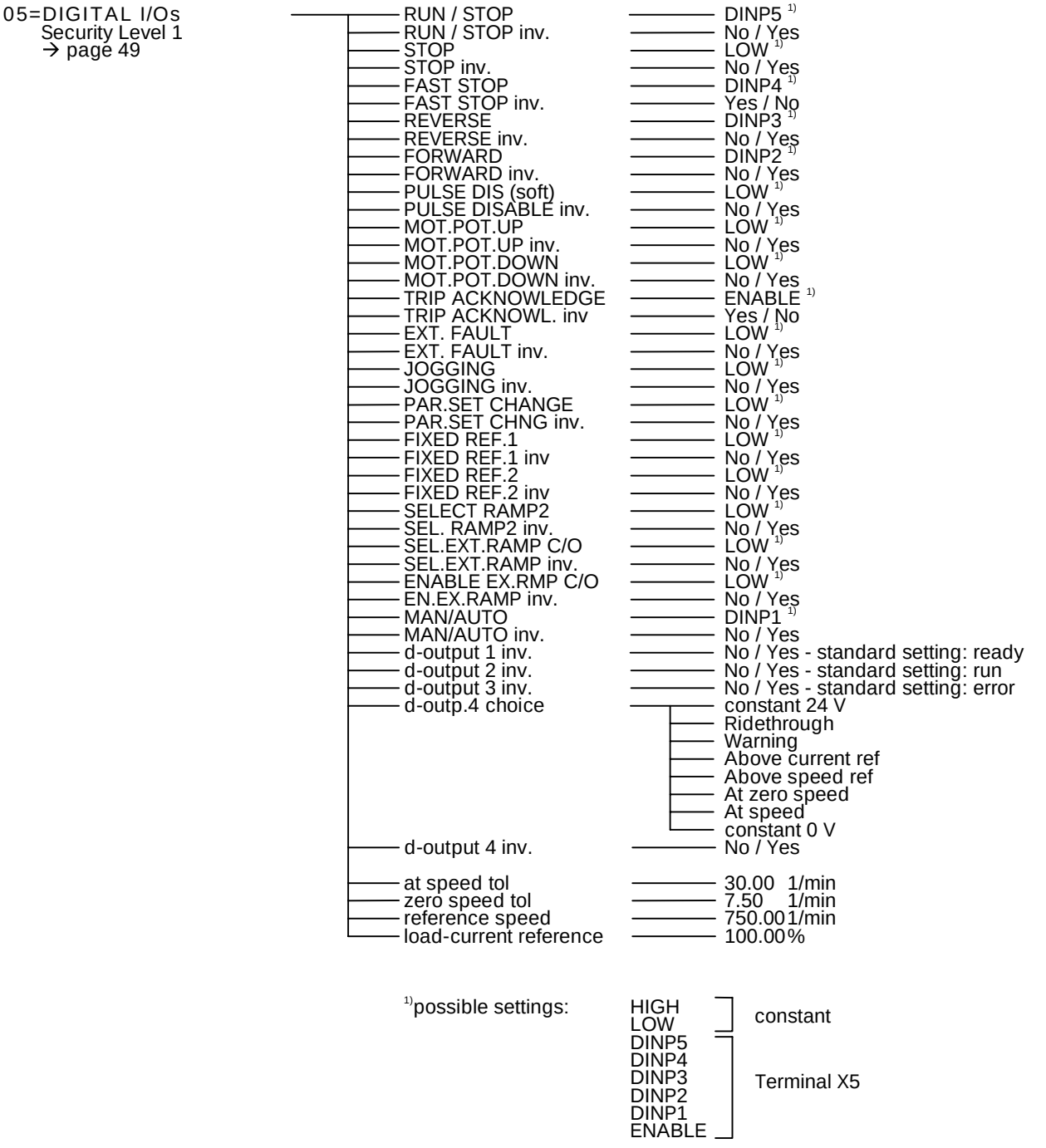


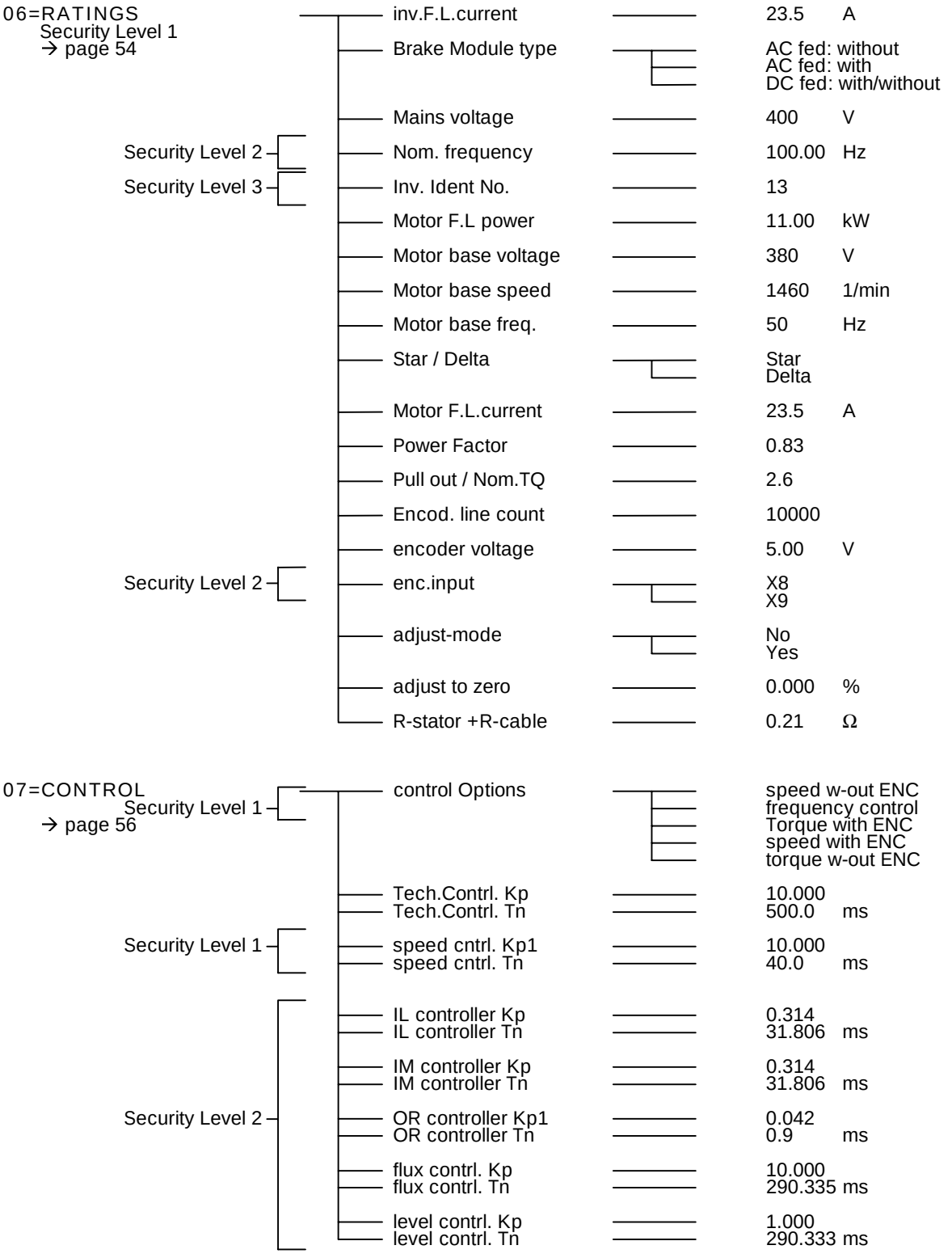

Security Level 1
skip speed 2
1500.00 1/min
skip band 2
0.00 1/min
skip speed 3
2250.00 1/min
skip band 3
0.00 1/min
fly-catchStart Frq
50.00 %
fly-catch rev.dir
active
inactive
Auto Restart Time
0.0 ms

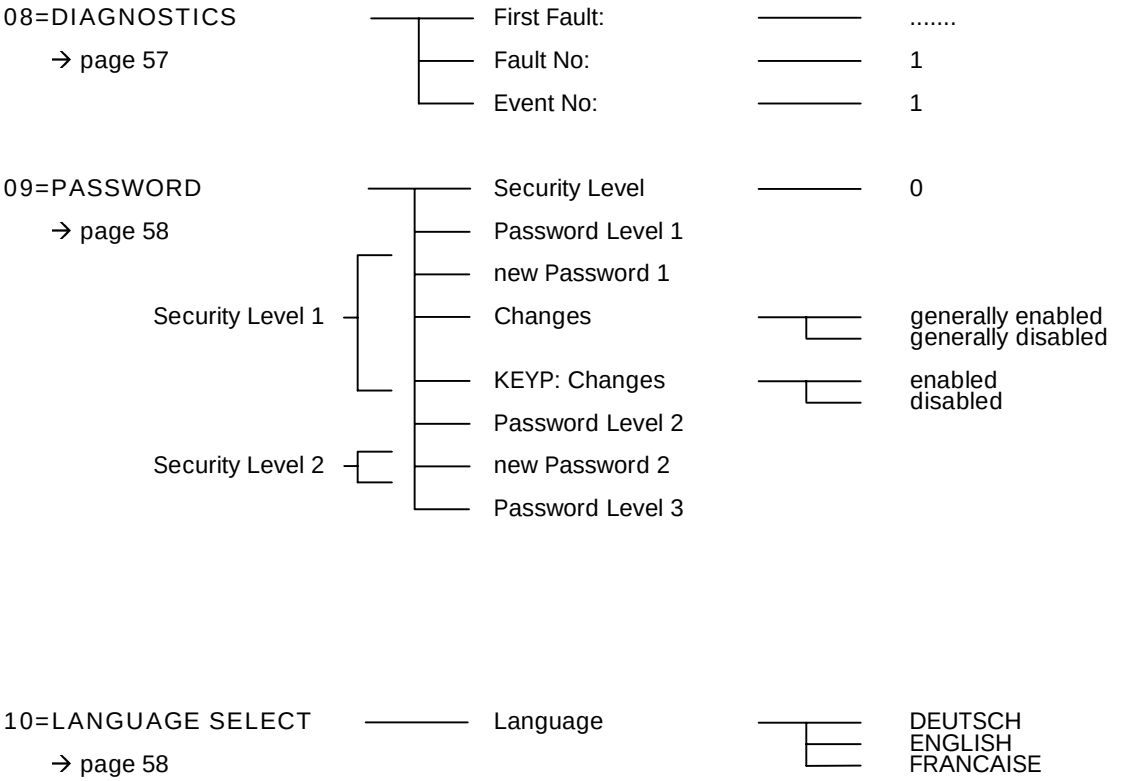

03=CONFIGURATION
→ page42
Security Level 1
Security Level 2
Mot.Pot.reset
reset on stop
no reset
Use stall detect
Yes
No
MAN-handling
keypad
Terminals
CAN
technology
RS422
fieldbus
MANUAL REF.
Mot.Pot
CAN
Technology
fixed REF.
RS422
Fieldbus
analog in 2
analog in 1
AUTO-handling
terminals
CAN
technology
RS422
fieldbus
keypad
AUTO REF.
analog in 1
Mot.Pot
CAN
Technology
fixed REF.
RS422
Fieldbus
analog in 2
MAN/AUTO-c/o
at standstill
While running
Ramp init.
Yes
No
fly-catching
No
Yes
Regen.ridethrough
No
Yes
Mon.motor T´stat
No
Yes
Monitor motor-PTC
No
Yes
PTC-Res. (Temp 1)
557 Ω
PTC-Res. (Temp 2)
962 Ω
PTC-Res. (Temp 3)
1379 Ω
PTC-Res. (Temp 4)
1774 Ω
PTC-Res. (Temp 5)
2225 Ω
PTC-Res. (Temp 6)
2866 Ω


Security Level 2
Vlink simulation
No
Yes
Address
0
Baudrate
19200 Baud
9600 Baud
4800 Baud
2400 Baud
Parameter Set No.
1
Security Level 2
Copy Target: Set
0
Copy Parameter Set Execute
Execute func: no
Execute func: yes
Par.Set -> Keypad Execute
Execute func: no
Execute func: yes
Keypad -> Par.Set Execute
Execute func: no
Execute func: yes
Security Level 2
vector frequency
8 kHz
16 kHz
load Defaults
Execute func: no
Execute func: yes
Restart
Execute func: yes
Execute func: no


04=ANALOG I/Os
→ page 46
Security Level 1
analogue Ref.1
0 ... +10 V
20 mA ... 4 mA
4 mA ... 20 mA
0 mA ... 20 mA
-10 V ... +10 V
Max. REF 1
100.00 %
min. REF 1
0.00 %
REF 1 zero tol
0.50 %
analogue Ref. 2
0 V... +10 V
-10 V ... +10 V
Max. REF 2
100.00 %
min. REF 2
0.00 %
REF 2 zero tol
0.50 %
Sum analogue REF.
No
Yes
4-20mA monitor
Trip
Warning
A-output 1 pin 62
speed / frequency
Variable 1
DC link voltage
Motor power
Torque
Motor voltage
Motor current
Tech.cntrl.output
scal. a-output 1
100.00 %
Security Level 1
A-output 2 pin 63
constant 10 V
Motor power
Torque
Motor voltage
Motor current
Tech. cntrl.output
speed / frequency
Variable 2
scal. a-output 2
100.00 %


05=DIGITAL I/Os
Security Level 1
→ page 49
RUN / STOP
RUN / STOP inv.
STOP
STOP inv.
FAST STOP
FAST STOP inv.
REVERSE
REVERSE inv.
FORWARD
FORWARD inv.
PULSE DIS (soft)
PULSE DISABLE inv.
MOT.POT.UP
MOT.POT.UP inv.
MOT.POT.DOWN
MOT.POT.DOWN inv.
TRIP ACKNOWLEDGE
TRIP ACKNOWL. inv
EXT. FAULT
EXT. FAULT inv.
JOGGING
JOGGING inv.
PAR.SET CHANGE
PAR.SET CHNG inv.
FIXED REF.1
FIXED REF.1 inv
FIXED REF.2
FIXED REF.2 inv
SELECT RAMP2
SEL. RAMP2 inv.
SEL.EXT.RAMP C/O
SEL.EXT.RAMP inv.
ENABLE EX.RMP C/O
EN.EX.RAMP inv.
MAN/AUTO
MAN/AUTO inv.
d-output 1 inv.
d-output 2 inv.
d-output 3 inv.
d-outp.4 choice
d-output 4 inv.
at speed tol
zero speed tol
reference speed
load-current reference
DINP5 1)
No / Yes
LOW 1)
No / Yes
DINP4 1)
Yes / No
DINP3 1)
No / Yes
DINP2 1)
No / Yes
LOW 1)
No / Yes
LOW 1)
No / Yes
LOW 1)
No / Yes
ENABLE 1)
Yes / No
LOW 1)
No / Yes
LOW 1)
No / Yes
LOW 1)
No / Yes
LOW 1)
No / Yes
LOW 1)
No / Yes
LOW 1)
No / Yes
LOW 1)
No / Yes
DINP1 1)
No / Yes
No / Yes - standard setting: ready
No / Yes - standard setting: run
No / Yes - standard setting: error
constant 24 V
Ridethrough
Warning
Above current ref
Above speed ref
At zero speed
At speed
constant 0 V
No / Yes
30.00 1/min
7.50 1/min
750.00 1/min
100.00 %
1)possible settings:
HIGH
LOW
constant
DINP5
DINP4
DINP3
DINP2
DINP1
ENABLE
Terminal X5


06=RATINGS
Security Level 1
→ page 54
inv.F.L.current 23.5 A
Brake Module type
AC fed: without
AC fed: with
DC fed: with/without
Mains voltage 400 V
Security Level 2
Nom. frequency 100.00 Hz
Security Level 3
Inv. Ident No. 13
Motor F.L power 11.00 kW
Motor base voltage 380 V
Motor base speed 1460 1/min
Motor base freq. 50 Hz
Star / Delta
Star
Delta
Motor F.L.current 23.5 A
Power Factor 0.83
Pull out / Nom.TQ 2.6
Encod. line count 10000
encoder voltage 5.00 V
Security Level 2
enc.input
X8
X9
adjust-mode
No
Yes
adjust to zero 0.000 %
R-stator +R-cable 0.21 Ω
07=CONTROL
Security Level 1
→ page 56
control Options
speed w-out ENC
frequency control
Torque with ENC
speed with ENC
torque w-out ENC
Tech.Contrl. Kp 10.000
Tech.Contrl. Tn 500.0 ms
Security Level 1
speed cntrl. Kp1 10.000
speed cntrl. Tn 40.0 ms
IL controller Kp 0.314
IL controller Tn 31.806 ms
IM controller Kp 0.314
IM controller Tn 31.806 ms
Security Level 2
OR controller Kp1 0.042
OR controller Tn 0.9 ms
flux contrl. Kp 10.000
flux contrl. Tn 290.335 ms
level contrl. Kp 1.000
level contrl. Tn 290.333 ms


08=DIAGNOSTICS
→ page 57
First Fault:
.....
Fault No:
1
Event No:
1
09=PASSWORD
→ page 58
Security Level
0
Password Level 1
new Password 1
Security Level 1
Changes
generally enabled
generally disabled
KEYP: Changes
enabled
disabled
Password Level 2
Security Level 2
new Password 2
Password Level 3
10=LANGUAGE SELECT
→ page 58
Language
DEUTSCH
ENGLISH
FRANCAISE

11 -

12 -

13 -

14 -

15 -

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 "Nom. 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 Nom. frequency is set to 100 Hz. This produces the following values:

- Frequency resolution $= \frac{\text{Nom. frequency}}{16384} = 0.006$ Hz
- Max. output frequency $= 2 * \text{Nom. frequency} = 200$ Hz

The Nom. frequency parameter should only be adjusted (under "Ratings") if these values are not sufficient for the application.

4.3.1 01=DISPLAY

speed	Display in [rpm]
speed digital	Display of encoder measurement values (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 temperat.	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. "29205002" for 029.205 002
Software Version	Display of software version, e.g. "Alspa MV1000 V1.21"
Drive-Name	Display and input of drive designation, e.g. "FIELD 2 PUMP 14". Up to 20 alphanumeric characters are possible.
Inv.F.L.Power	Inverter rated power Display in [kW]

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 * Nom. 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 [+] error message. The error message must be acknowledged before restarting.

Adjustment range:	0 ... 2 * Nom. frequency * 60 / no. of pairs of poles
As supplied:	1800 rpm

Motor.Full Load I

Motor rated load current permitted continuously for the motor, as a percentage of inverter rated current. See note*!

Adjustment range:	0 ... value limited by rated inverter current and max. motor current.
As supplied:	Rated motor current based on rated inverter current in %.

Regen.Full Load I

Regenerative rated load current permitted continuously for the motor, as a percentage of inverter rated current. See note*!

Adjustment range:	0 ... value limited by the rated inverter current and max. regenerative current limit.
As supplied:	Rated motor current based on rated inverter current in %.

MotorPeak 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:	Rated motor current * 1.5 based on the rated inverter current in %.

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:	Rated motor current based on the rated inverter current in %.

Note*

The setting limits the load component in the motor current and is therefore proportional to torque in the constant flux range.
In the “frequency control” structure no current limit is active to protect the motor. Only the inverter is protected.

Ramp up
Ramp down
Ramp up 2
Ramp down 2

Acceleration or braking time. Time for passing through a frequency range of half the Nom. frequency, see page 54. This time applies to both directions of rotation.

Parameter for signal source	External ramp, Ramp 2	
Range:	0.010 ... 600.00 s	
As supplied:	2.000 s	Acceleration ramp
	5.000 s	Braking ramp
	0.200 s	Acceleration ramp 2
	0.500 s	Braking ramp 2

As supplied the acceleration and braking ramps are active.

Example:
Setting 1 s: The frequency change from 0 to 50 Hz at the ramp takes one second.

Effective ramp time for Acceleration	Effective ramp time for Braking	Parameter ENABLE EXTERNAL RAMP	Control signal SELECT EXTERNAL RAMP	Control signal SELECT RAMP 2
Ramp up [1]	Ramp down [1]	LOW	Yes / No	No
Ramp up 2	Ramp down 2	LOW	Yes / No	Yes
Ramp up		HIGH	No	No
Ramp up 2		HIGH	No	Yes
Ramp down		HIGH	Yes	No
Ramp down 2		HIGH	Yes	Yes

Table 14: Possible selections for acceleration and braking ramps

[1] Default setting

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”. The internal changeover between the acceleration (up) ramp and braking (down) ramp can be replaced by an external trigger. For this, “Enable external ramp” must be active so that “Select external ramp” and “SELECT RAMP 2” determine which of the 4 ramps is effective.

Ramp fast stop

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

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

Mot.Pot ramp up

Motor 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 setting for the motor potentiometer should always be longer than the active up or down ramp.

Mot.Pot ramp down

Motor 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: Mot.Pot min.speed ... 2 ∗ Nom. frequency ∗ 60 / no. of pairs of poles

As supplied: 1500 rpm

Mot.Pot min.speed

Min. speed reference for motorised potentiometer function.

Adjustment range: ±2 ∗ Nom. frequency ∗ 60 / no. of pairs of poles

As supplied: 0 rpm

jogging REF.

Jogging speed in the jogging mode.

Adjustment range: ±2 ∗ Nom. frequency ∗ 60 / 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 speed.

Parameter for signal source: Select fixed speed 1 and select fixed speed 2, see Table 15.

Terminal (Select fixed speed 1)	Terminal (Select fixed speed 2)	Fixed speed selected
No	No	fixed reference 0
Yes	No	fixed reference 1
No	Yes	fixed reference 2
Yes	Yes	fixed reference 3

Table 15: Possible selections for fixed references

Adjustment range: 0 ... 2 ∗ Nom. 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 ∗ Nom. 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 ∗ Nom. frequency ∗ 60 / no. of pairs of poles

As supplied: 0 rpm

Example:

skip frequence 1: 750 rpm

Skip band 1: 50 rpm

The range from 725 ... 775 rpm is skipped.

Fly-catch Start Frq

Start frequency for speed capture when switching onto a rotating motor. (See "fly-catching" mode in Menu 03=Configuration, page 43). If the speed limit for the drive is increased above the setting as supplied also the capture start frequency should be increased accordingly.

Range: ±200 % of Nom. frequency

As supplied: 50 %

Fly-catch rev.dir

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

Mot.Pot. Reset

The actual motor 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

Use stall detect

Enable the "stall detection" feature
Selection list: Yes / No
As supplied: Yes

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: Terminals
Keypad
Field bus
RS422
Technology
CAN

As supplied: MANUAL control: Keypad
AUTO control: Terminals

Keypad: The keypad control signals RUN, STOP, + (MOT.POT UP), - (MOT.POT.DOWN) and ACKNOWLEDGE are operational. All other control signals remain active via the terminal strip. 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 FOREWARD
DINP4	(Terminal :E4)	Fast stop

Terminals: The Alspa MV1000 is operated only via the terminal strip. The STOP signal also takes effect alternatively via the keypad.

RS422: The control signals RUN, MOT.POT UP, MOT.POT.DOWN, REVERSE, FORWARD and ACKNOWLEDGE are applied as parameters through the serial interface. The following terminals are to be driven at +24 V for operation through the RS422:

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

Field bus: The control signals RUN, MOT.POT UP, MOT.POT.DOWN, REVERSE, FORWARD and ACKNOWLEDGE can be sent through the field bus. See RS422 for terminal connections when operating via field bus.

Technology: The control signals RUN, MOT.POT UP, MOT.POT.DOWN, REVERSE, FORWARD, ACKNOWLEDGE can be preset by technology modules. See RS422 for terminal connections when operating via technology modules.

	CAN:	The control signals RUN, MOT.POT UP, MOT.POT.DOWN, REVERSE, FORWARD, ACKNOWLEDGE can be applied through the CAN bus. See RS422 for terminal connections when operating via 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 Fieldbus RS422 fixed REF. Technology CAN	
As supplied:	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 MANUAL/AUTO parameter in Menu 05=DIGITAL I/Os.

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-catch rev.dir” and “fly-catch StartFrq.” 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 options:	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

Mon.motor T´stat
Monitor Motor PTC

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 17.

PTC-Res (Temp1) ...
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.

Vlink simulation

The existence of the link voltage is simulated. The control can therefore be operated with a 24 V supply at X5 for servicing purposes.

Address

Unit address for the Alspa MV1000 for communication with a PC
Adjustment range: 0 ... 15
As supplied: 0

Baudrate

PC interface transfer speed
Selection list: 2,400 ... 19,200 Baud
As supplied: 19,200 Baud

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 Target: Set

Destination for the copy of the active 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 currently active parameter set to the parameter set selected with Copy Target: Set.

Procedure for copying parameter set 1 to 2:
- Ensure that the currently active parameter set is the one to be copied. If necessary, choose it by entering the number in "Parameter Set No." or select it through the appropriate terminal if terminal parameter set changeover is enabled.
- 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 -> Keypad	The active parameter set is saved in 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 in the keypad overwrites the parameter set with the same number in the inverter.
	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.
vector frequency	Inverter vector frequency A vector frequency of 16 kHz reduces the inverter power. Adjustment is only possible when the pulses are disabled (X5 :28 open). 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. All parameter sets are affected. Communication with the keypad is interrupted for 15 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.
	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.
Restart	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 be set for analog reference 1, see Fig. 12, page 16.

Selection list:
- 0 ... +10 V
- -10 ... .+10 V
- 0 ... 20 mA
- 4 ... 20 mA
- 20 ... 4 mA

} only at analogue Ref. 1

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 Nom. frequency, i.e. as supplied therefore 1500 rpm. If the control structure is set for torque control and the Max. REF. x = 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 Nom. frequency. See also "REF 1 ... 2 zero tol 1 ... 2". If the parameter is set to a value greater than “Max. REF”, it is reset to the value of “min. REF”.

Range: 0 ... 400 %
As supplied: 0 %

REF 1 zero tol
REF 2 zero tol

This adjusts a scaling module for reference channel 1 or 2 which is useful for presetting the reference using potentiometers. It determines the range in which the analog reference read in by terminals X6 :1/:2 or X6 :3/:4 is limited to “min. REF 1” or “min. REF 2”. 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” are set to zero to obtain a linear zero crossover.

Range: 0 ... 20 %
0.50 %

Sum analogue REF.

When set to YES the analog values at X6 :1/2 and X6 :3/4 are added.

As supplied: NO

4-20mA monitor

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

List: Warning / Trip
As supplied: Trip

Warning: The wire break detection generates a warning signal in the event log. The signal can be output to DOUT4 (terminal :A4) through the selector switch "d-output 4 choice".

Trip: The Alspa MV1000 is shut down when the warning occurs, with a corresponding entry in the error log. The unit can only be switched on again when the fault has been acknowledged.

A-output 1 pin 62
A-output 2 pin 63

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

In the “adjust mode” the adjustment value of the Im controller is switched through to the A-Output 2 terminal 63 regardless of the selected value.

As supplied:
- speed / frequency (A-Output 1)
- Constant 10 V (A-Output 2 as voltage supply 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 is negative, too.

frequency:
Output 10 V at f = Nom. frequency. As supplied, the Nom. frequency is 100 Hz. At an output frequency of 50 Hz the voltage output is 5 V.

speed:

$$\text{Output} = 10\ \text{V} * \frac{\text{speed}}{\text{synchronous speed at Nom.Frequency}}$$

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 unit rated 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 rectified rated mains voltage value.

Variable 1, Variable 2: Output 10 V at 100 %
As supplied:
Variable 1 ≙ XIL (load current)
Variable 2 ≙ magnetising current controller output

scal. a-output 1
scal. 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:
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 16.

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 16: Inverting functions

RUN / STOP (inv.)

This determines the terminal from which the function RUN/STOP is applied for control from the terminal strip (see MANUAL or AUTO control).

Select 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	
As supplied inv.:	NO	

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. The function is active when the signal level is Yes. The drive then runs to zero speed at the "ramp down".

List:	As RUN / STOP
As supplied:	LOW
As supplied inv.:	NO
Note:	This signal overrides all sources (keypad, serial interface, field bus).

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”.

List:	As RUN / STOP
As supplied:	DINP4
As supplied inv.:	YES

REVERSE (inv.)

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

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.

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.

PULSE DIS soft (inv.)

This determines the terminal from which the DISABLE function is applied. This is a software disable, in contrast to the hardware disable for the ENABLE input.

As supplied:	LOW
As supplied inv.:	NO
Note:	PULSE DISABLE causes the pulses to be disabled immediately and the motor coast down.

MOT.POT.UP (inv.)

This determines from which terminal the motor potentiometer higher function is applied when controlling through the terminal strip (see MANUAL or AUTO control).

List:	As RUN / STOP
As supplied:	LOW
As supplied inv.:	NO

MOT.POT.DOWN (inv.)

This determines the terminal from which the motor potentiometer higher function is applied when controlling through the terminal strip (see MANUAL or AUTO control).

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 control or AUTO control).

List:	As RUN / STOP
As supplied:	ENABLE
As supplied inv.:	YES
Note:	Error acknowledgement. Change from NO to YES acknowledges. As supplied the parameter TRIP ACKNOWL. inv. is set to YES. For this reason an acknowledgement is given by applying at ENABLE (terminal :28) the No level, i.e. DC 0 V. Each error 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.

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 (inv.)

This determines the terminal from which the JOG function is applied. The jogging reference value takes effect when the inverter is in operation, the control function JOGGING = Yes and FORWARD and REVERSE = No. The direction during jogging is only determined by the sign of the jogging reference value.

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. Further configuration for parameter set changeover through the terminal strip is only possible using the PC drive software.

List:	As RUN / STOP
As supplied:	LOW
As supplied inv.:	NO

FIXED REF. 1... 2

This determines the terminal from which the select fixed speed function is applied.

List:	As RUN / STOP
As supplied:	LOW
As supplied inv.:	NO

Terminal (Select fixed speed 1)	Terminal (Select fixed speed 2)	Selected fixed speed
No	No	Fixed speed 0
Yes	No	Fixed speed 1
No	Yes	Fixed speed 2
Yes	Yes	Fixed speed 3

Table 17: Select fixed speed

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

SELECT RAMP 2 (inv.)

This determines the terminal from which the Ramp 2 function is applied. The function is active on signal level YES.

List:	As RUN / STOP
As supplied:	LOW
As supplied inv.:	NO

SEL.EXT.RAMP C/O
SEL.EXT.RAMP (inv.)

This determines the terminal from which manual switching between the acceleration and braking ramps is to take place. Condition: The parameter “Enable external ramp” must be set to HIGH.

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

ENABLE EX.RAMP
EN.EX.RAMP inv.

This allows switching between the acceleration and braking ramps either by internal detection of acceleration/braking or through a signal from the terminal strip.
For control see Table 14 page 39.

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

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.

List:	As RUN / STOP
As supplied:	DINP1
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.

List:	YES / NO
As supplied:	NO
As supplied inv.:	NO

As supplied, the digital outputs DOUT 1, 2, 3 are allocated the signals Ready, On and Error. These assignments can be altered with the PC drive software.

d-outp.4 choice

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

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, the temperature warning and the wire break monitor for the 4 - 20 mA reference source is output if selected. 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 tol

This parameter determines the band of tolerances 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 selection). A change from the rated frequency and/or rated speed affects the parameter setting in proportion to the change in the ratio between “Rated frequency” and no. of pairs of poles.

Range:	(0.001 ... 0.1) ∗ Nom. frequency ∗ 60 / No. of pairs of poles
As supplied:	ca. 25 rpm

zero speed tol

This parameter determines the band of tolerances within which the motor being at zero speed is recorded. Zero speed detection controls the STOP function in the starting interlock. The signal can be output through the field bus and, with suitable configuration, through the digital output DOUT4 (Terminal A4) (see DOUT4 selection). A change from rated frequency and/or rated speed affects the parameter setting in proportion to the change in the ratio between Rated frequency / No. of pairs of poles.

Range:	(0.001 ... 0.1) ∗ Nom. frequency ∗ 60 / No. of pairs of poles
As supplied:	ca. 7,5 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 selection). A change from the Rated frequency and/or rated speed affects the parameter setting in proportion to the change in the ratio between Rated frequency / No. of pairs of poles.

Range:	0 ... 2 ∗ Nom. frequency ∗ 60 / No. of pairs of poles
As supplied:	750 rpm

load-current reference

A detection level for the load current 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 selection). The reference value is based on inverter rated current.

Range:	0 ... value corresponding to max. inverter current.
As supplied:	100 %

4.3.6 06=RATINGS

inv. F.L. current

Display of rated inverter current in [A].

Break 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 fed: without	Inverter with 3-phase supply without braking device
AC fed: with	Inverter with 3-phase supply and braking device
DC fed: with/without	Inverter with DC supply with/without braking device

Table 18: Select braking device

Mains voltage

Rated mains supply 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

Nom. frequency

Parameter for normalising the internal frequency representation. A change in this value also influences the frequency resolution, the maximum output frequency and other speed values. As supplied, it is set to 100 Hz.

- Frequency resolution $= \frac{\text{Nom. frequency}}{16384} = 0.006$ Hz
- Max. output frequency $= 2 * \text{Nom. frequency} = 200$ Hz

The Nom. frequency parameter should only be adjusted if these values are not adequate.

Motor F.L. power

Rated power of the motor used. The value to be entered should be taken from the motor rating plate.
Range: 0.1 ... 100.0 kW
As supplied: According to the inverter type

Motor based 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: 380 V

Motor based speed

Rated speed of the motor. The value should be taken from the motor rating plate.
Range: 700 ... 24000 rpm
As supplied: Value from the parameter set for the standard 4-pole asynchronous motor suitable for the inverter type.

Motor based freq.

Rated motor frequency (Base frequency). The value should be taken from the motor rating plate.
Range: 25 ... 400 Hz
As supplied: 50 Hz

Star / Delta

Enter Star / Delta depending on how the motor is connected.
List: Star / Delta
As supplied: Star

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: 1 ... 1,000 A
As supplied: Rated current of the largest standard asynchronous motor matching the inverter type.

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: Value from the parameter set for the standard asynchronous motor suitable for the inverter type.

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.
Range: 1.1 ... 8
As supplied: Suggested value calculated from the motor data input.

Encod.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 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

enc.input

Encoder input. Alternatively the encoder can also be connected to X9. Further details available on request.
Range: X8/X9
As supplied: X8

adjust-mode
adjust to zero

This parameter (on level 2) is used to select a mode of operation which allows calibration of the motor stator and cable resistance “R stator + R cable”.
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 smoothly.

Procedure for adjustment:
- Switch the drive off
- Set the parameter “adjust mode” to Yes
- Switch the drive on
- The variable "adjust to zero” 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 zero”).
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).

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	1:50
Speed adjustment range, regenerative	1:5
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	0.05 %
Torque rise time	2 - 8 ms

Applications:
- Increased speed adjustment range
- Torque at zero speed
- Electrical stop (e.g. lifting drive)

frequency control:

If the control structure is set to “Frequency control” the drive is operated with frequency control at its V/f 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:
- Multiple motor drives
- AC reluctance motors
- AC synchronous motors (on request)

Torque w-out ENC:

Torque control without encoder. This control structure corresponds to the structure for speed control without encoder, whereby the torque reference value is applied through the second analog input X6 :3/:4. With the motor idling the value for speed is limited to the speed reference as if the speed control structure would be active. The direction of the torque can be reversed with FORWARD and REVERSE or with the polarity of the input voltage.

Torque with ENC:

Torque control with encoder for extended speed range and higher accuracy.

Tech.Contrl. Kp	Proportional gain of technology controller
Tech.Contrl. Tn	Integral time constant of technology controller
speed cntrl. Kp1	Proportional gain of speed controller As supplied: 10
speed cntrl. Tn	Integral time constant of speed controller As supplied: 40 ms
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

First Fault:	Display of the “First Fault”, i.e. the first event which resulted in the latest fault shutdown. Each error must be acknowledged with the TRIP ACKNOWLEDGE signal from the control set before the drive can be RUN again. This also deletes the entry in “First Fault:”.
Fault No:	Entering this parameter displays an earlier error message. If the number 1 is entered the most recent error is displayed. If 32 is entered, the oldest logged error is displayed.
Event No:	Entering this parameter displays a logged event. 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 terminals, but no error shutdowns.

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 presenty 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 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

KEYP: 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.

As barred: Enabled

4.3.10 10=LANGUAGE SELECT

Language

This determines the language for text, names and messages.

List: German / English / French
As supplied: German

5.1 Safety instructions for commissioning

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 VBG4 paragraph 2 (2) 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 MV 1000 reference potential.

When using a PC via the RS422 interface, potential separation must be provided and 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.

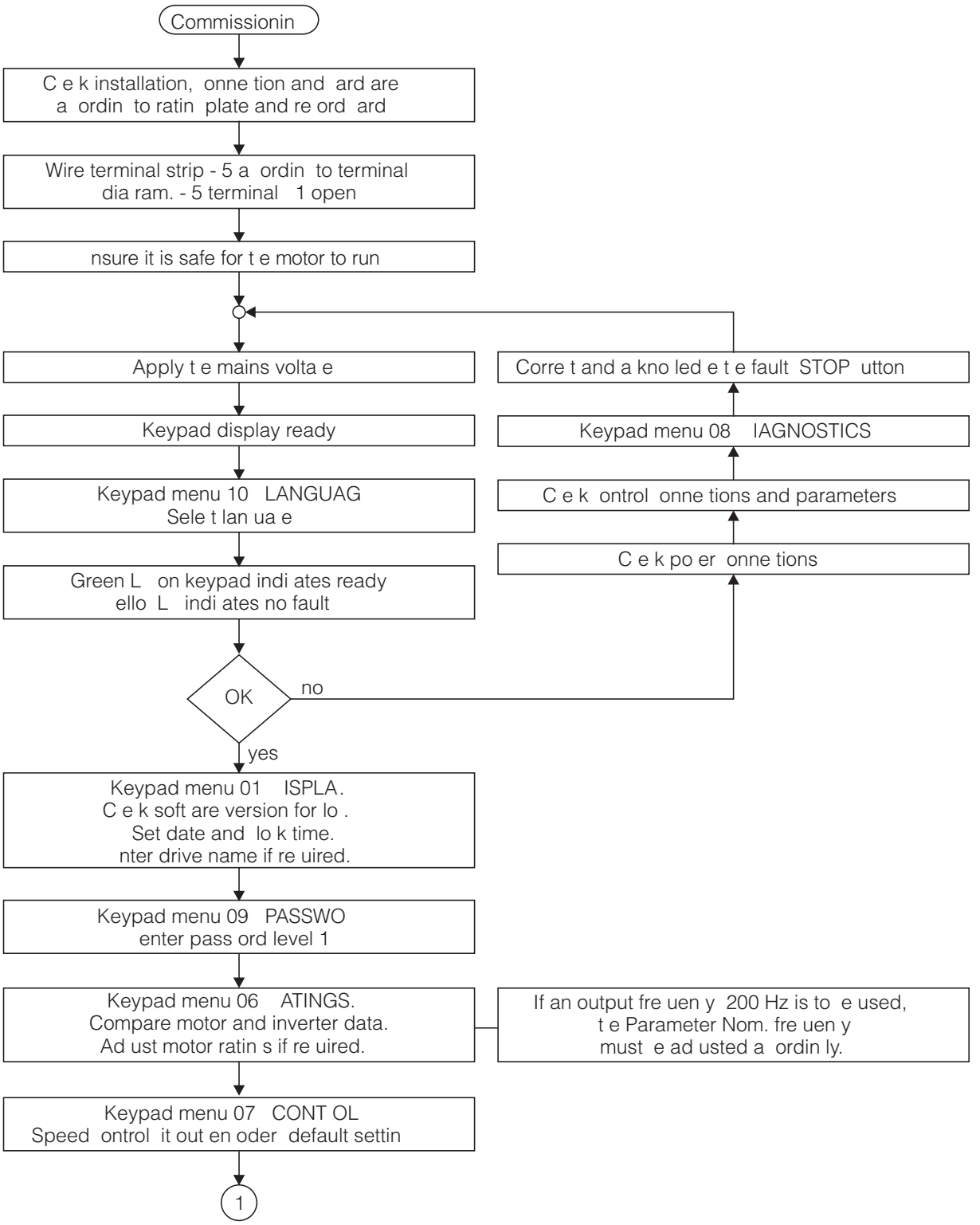
If you are working on the motor or supply cables while they are connected, the main switch on the unit or the circuit breaker on the plant side must be secured so that it cannot be switched on.

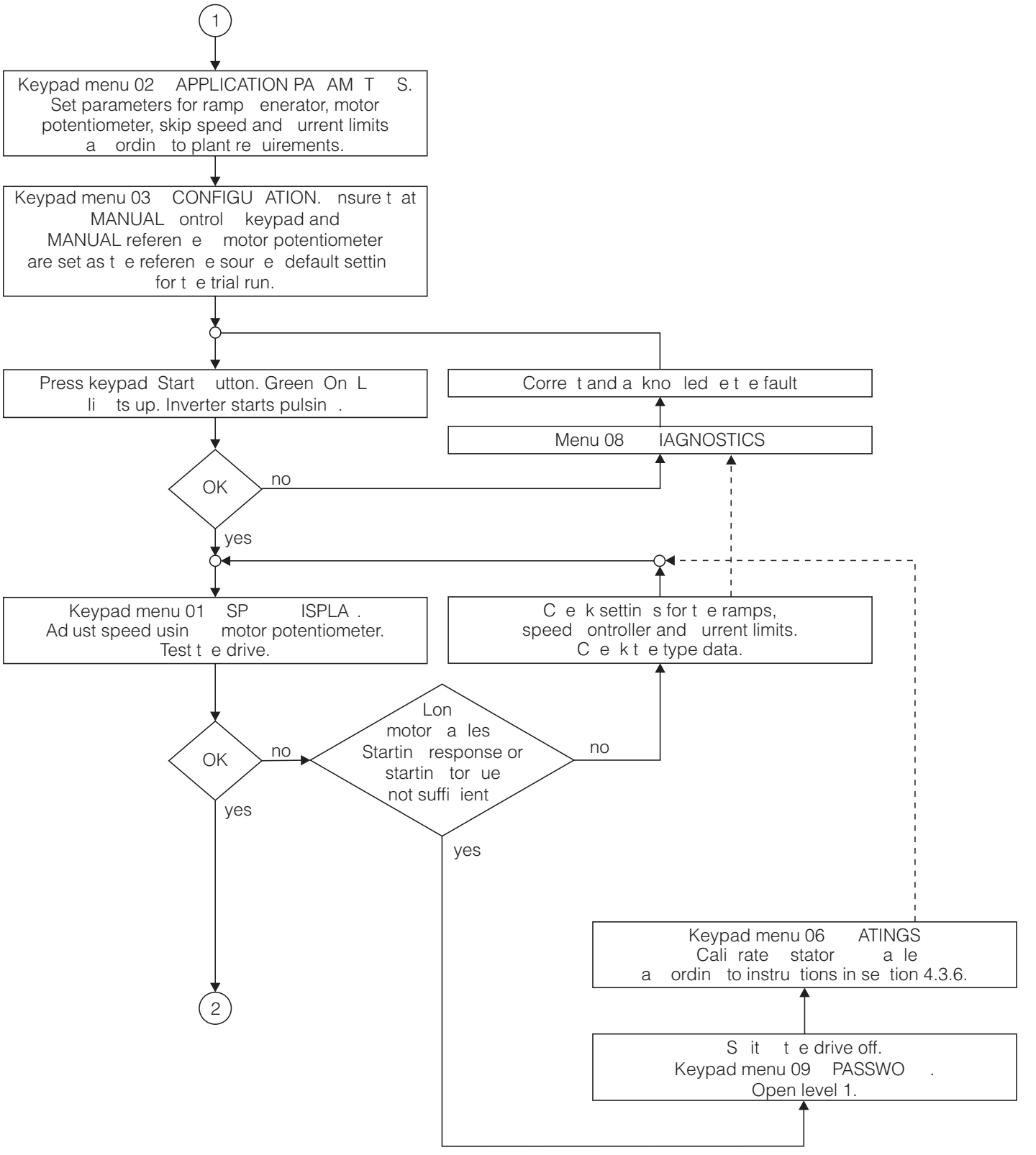
Always stand on an insulated mat (EGB-compliant) and ensure that it is not earthed when you are doing commissioning work with the unit switched on.

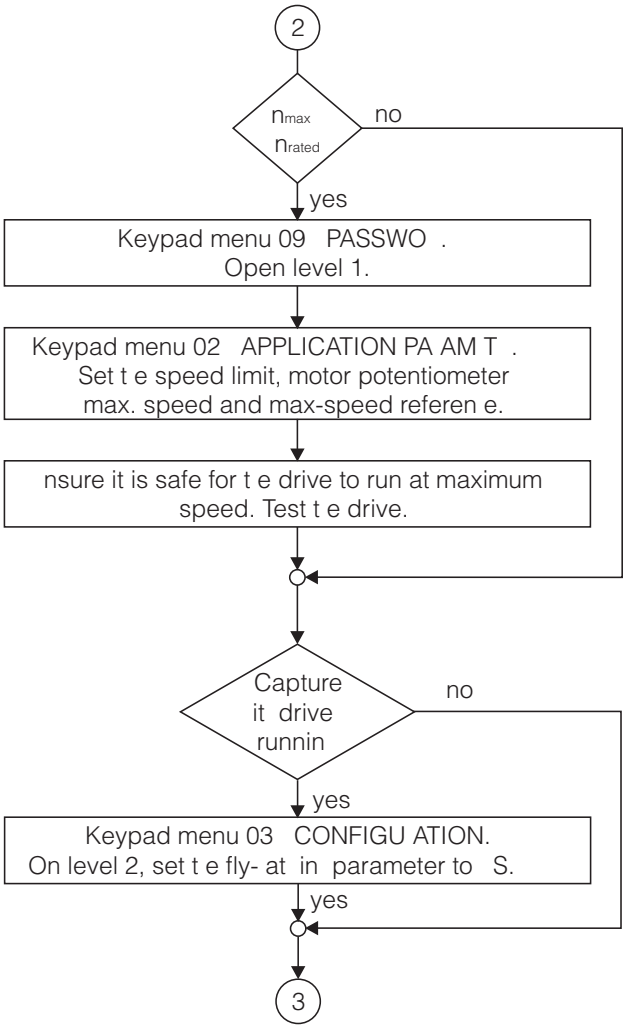
The general safety instructions given on the front inside cover must be observed!

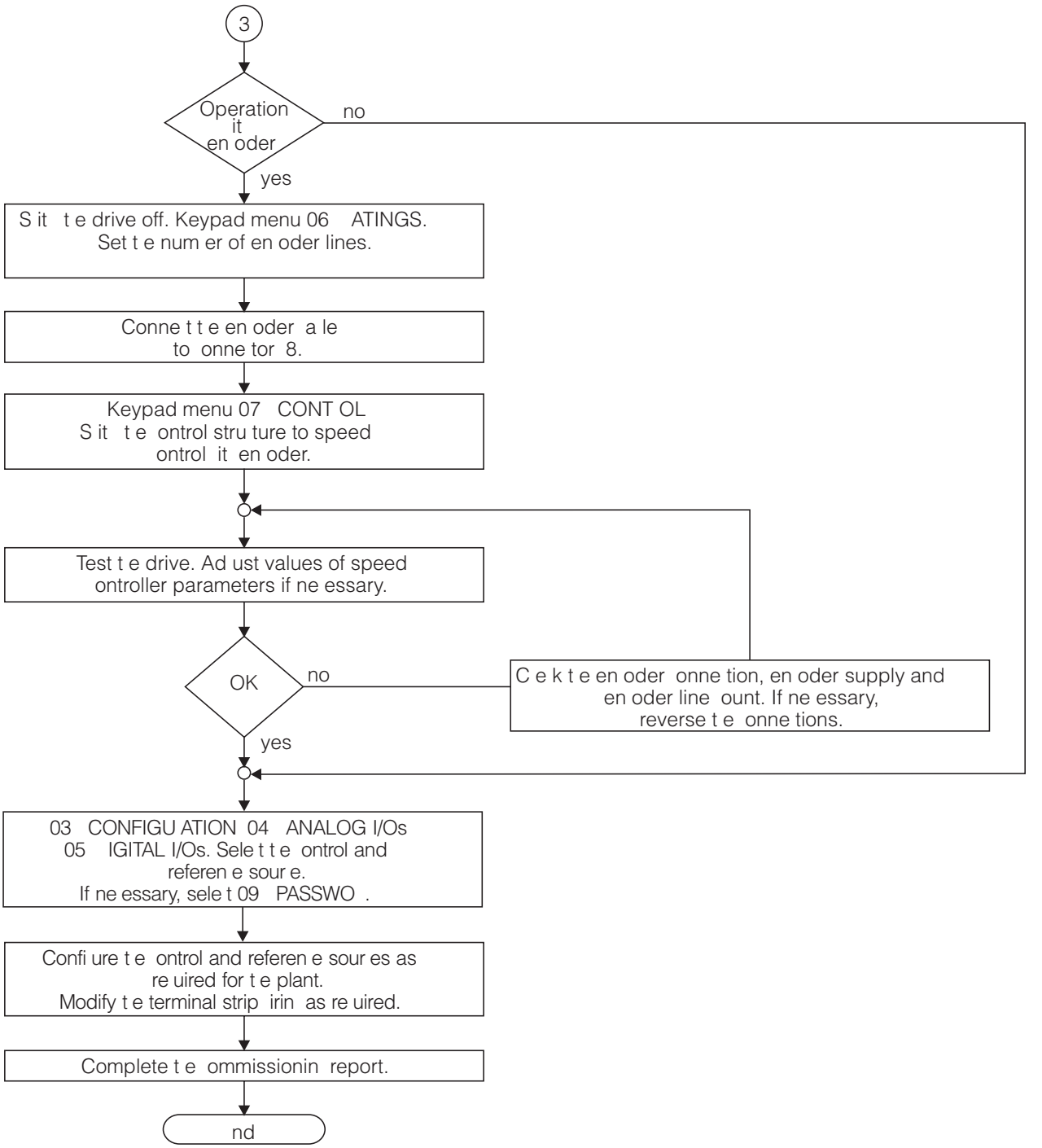
Before switching the mains voltage on, always check that it is safe for the drive to run and that there is no risk to man or machine. This is essential for the entire commissioning procedure.

5.2 Commissioning Sequence Diagram, Alspa MV1000 unit




1
Keypad menu 02 APPLICATION PA AM T S.
Set parameters for ramp enerator, motor
potentiometer, skip speed and urrent limits
a ordin to plant re uirements.
Keypad menu 03 CONFIGU ATION. nsure t at
MANUAL ontrol keypad and
MANUAL referen e motor potentiometer
are set as t e referen e sour e default settin
for t e trial run.
Press keypad Start utton. Green On L
li ts up. Inverter starts pulsin .
Corre t and a kno led e t e fault
Menu 08 IAGNOSTICS
OK
no
yes
Keypad menu 01 SP ISPLA .
Ad ust speed usin motor potentiometer.
Test t e drive.
C e k settin s for t e ramps,
speed ontroller and urrent limits.
C e k t e type data.
OK
no
Lon
motor a les
Startin response or
startin tor ue
not suffi ient
no
yes
yes
2
Keypad menu 06 ATINGS
Cali rate stator a le
a ordin to instru tions in se tion 4.3.6.
S it t e drive off.
Keypad menu 09 PASSWO .
Open level 1.


2
nmax
nrated
no
yes
Keypad menu 09 PASSWO .
Open level 1.
Keypad menu 02 APPLICATION PA AM T .
Set t e speed limit, motor potentiometer
max. speed and max-speed referen e.
nsure it is safe for t e drive to run at maximum
speed. Test t e drive.
Capture
it drive
runnin
no
yes
Keypad menu 03 CONFIGU ATION.
On level 2, set t e fly- at in parameter to S.
yes
3


3
Operation it en oder
no
yes
S it t e drive off. Keypad menu 06 ATINGS. Set t e num er of en oder lines.
Conne t t e en oder a le to onne tor 8.
Keypad menu 07 CONT OL S it t e ontrol stru ture to speed ontrol it en oder.
Test t e drive. Ad ust values of speed ontroller parameters if ne essary.
OK
no
C e k t e en oder onne tion, en oder supply and en oder line ount. If ne essary, reverse t e onne tions.
yes
03 CONFIGU ATION 04 ANALOG I/Os 05 IGITAL I/Os. Sele t t e ontrol and referen e sour e. If ne essary, sele t 09 PASSWO .
Confi ure t e ontrol and referen e sour es as re uired for t e plant. Modify t e terminal strip irin as re uired.
Complete t e ommissionin report.
nd

5.3 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.

Terminals X5 :28 - X5 :E2 - X5 :E4 - X5 :A4 must be linked for operation using the Alspa MV1000 keypad, see Fig. 22 on page 27.

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 5.4

2. First commissioning with Alspa MV1000 keypad, see section 5.5

3. Terminal strip wiring

5.4 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 (380 ... 480 V AC or 537 ... 678 V DC).

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. Alspa MV1000 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 voltage rate of rise for the winding insulation is <3 kV/µs.

5.5 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 ...
```

```
Alspa MV1000 V 1.21
```

The green LED ◎ on the keypad will light to indicate the Alspa MV1000 is ready. The display shows the output frequency:

```
01 Drehzahl
                    0.0 1/min
```

The language set ex works is “GERMAN”.

If the yellow LED ⚠ lights, the Alspa MV1000 detected an error. 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 value, error, event) after selecting the language required.

5.5.1 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
```

5.5.2 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 ◀.

5.5.3 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 control unit.

The following parameters are accessible on level 1 under “Ratings”:

inv.F.L.current
Breake Module type
Mains voltage
Motor F.L. power
Motor base voltage
Motor base speed
Motor base freq.
Star / Delta
Motor F.L. current
Power Factor
Pull out / Nom.TQ
Encod. line count
encoder voltage
enc. input
adjust-mode*)
adjust to zero*)
R-stator + R-cable*)

*) For service purposes

The inverter rated 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 — with which the Alspa MV1000 is to be operated.
- Brake Module type — Default setting AC: without
  Adjustment is only necessary if an external brake chopper is used.

Motor rated data

The motor data from the rating plate is to be set:
Motor F.L. power, Motor base voltage, Motor base speed, Motor base freq., circuit type (star/delta), Motor F.L. current, 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.

5.5.4 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: frequency control
- Torque control with encoder: Torque with ENC
- Speed control with encoder: speed with ENC
- Torque control without encoder: torque w-out ENC

5.5.5 Speed adjustment / speed limit

The "max. speed" parameter must be set regardless of the control structure used.

Note:
The "max. speed" is also to be set for the “frequency control” and “torque control” control structures.

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 motor potentiometer parameter settings.

5.5.6 Field weakening

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

- Increase the max. speed
- Increase the motor potentiometer max. speed
- Increase the reference max. speed

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 characteristics 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.

5.5.7 Motor potentiometer function

As the drive is to be operated with the motor potentiometer in the keypad during basic commissioning, the speed and frequency 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 motor potentiometer function.

After checking or adjusting the motor potentiometer parameters the drive is put into operation using the control unit.

+	Speed higher	⏀	Start
−	Speed lower	⏁	Stop

5.5.8 Status and Error Indicators

Two LEDs, see Fig. 10 on page 14, 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 errors:

Continuously on:	Software error message, diagnostics and acknowledgement with the aid of the keypad, see section 4.3.8 on page 57.

Flashing:

● ▬ ▬ ●	Morse code character P	Error in program memory
● ▬ ●	Morse code character R	RAM defective
● ● ▬ ●	Morse code character F	Fatal error
▬ ● ●	Morse code character D	Loss of data, parameter set defective

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

The error D can be corrected by booting, see section 4.3.3 on page 42 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.

TÜV CERT

ZERTIFIKAT

Deutscher AkkreditierungsRat
DAR
TGA Z Q 91002

Die TÜV-Zertifizierungsgemeinschaft e.V.
bescheinigt hiermit, daß das Unternehmen

CEGELEC AEG
ANLAGEN und ANTRIEBSSYSTEME GmbH
D-12277 Berlin

für den Geltungsbereich

Engineering und Vertrieb von elektrischen Industrieanlagen,
Produktion von Antriebssystemen und Leistungselektronik

ein Qualitätsmanagementsystem eingeführt hat
und anwendet.

Durch ein Audit, Bericht-Nr. **QM-M-96/732**
wurde der Nachweis erbracht, daß die Forderungen der

DIN EN ISO 9001

erfüllt sind.

Dieses Zertifikat ist gültig bis

Januar 1999

Zertifikat-Registrier-Nr.

70 100 M 732

Bonn, den 07. Februar 1996

TÜV CERT Präsidium

TÜV SÜDWEST

Mannheim, den 07. Februar 1996

TÜV CERT-Zertifizierungsstelle
des TÜV SÜDWEST

CEGELEC
AAS

EG - Konformitätserklärung AAS-KE 013/11.96
EU - Declaration of Conformity

Ba, 18.11.96

Manufacturer:	CEGELEC AEG ANLAGEN und ANTRIEBSSYSTEME GmbH Culemeyerstr. 1 D-12277 Berlin, Germany
Product description	This declaration of conformity relates to pulse-controlled inverters of the type serie Alspa MV1000 including optional accessories

The above-described product is in conformity with the requirements laid down in the following European guidelines:

Number:	73 / 23 / EWG (EEC) 93 / 68 / EWG (EEC)
Text:	Directive of the Council for the harmonization of legal provisions of the member states concerning electrical equipment for use within defined voltage limits - Low Voltage Directive - Directive for CE marking

The appendix contains further information concerning the compliance with this directive.

CE marking in:	1996
Issued by:	AAS/Q Mr. Bach

The appendix forms part of this declaration.
This declaration confirms the compliance with the quoted guidelines, but it does not constitute any warranty as to properties.
The safety information contained in the product documentation supplied must be adhered to.

Berlin, 18. Nov. 1996

CEGELEC AEG ANLAGEN und ANTRIEBSSYSTEME GmbH

by order: Dr. Möhlenkamp per proxy: Pawlitzki

CEGELEC
AAS

EG - Konformitätserklärung AAS-KE 013/11.96
EU - Declaration of Conformity

Ba, 18.11.96

Appendix

Product description: Pulse-controlled inverters of the type serie

Alspa MV1000
including optional accessories

The conformity of the above-described product with the requirements laid down in the directive No. 73/23/EWG (EEC) is demonstrated by full compliance with the following standards:

International Standard	European Standard	National Standard	
	EN 50178	DIN VDE 0160	Electronic equipment for use in power installations
		DIN VDE 0100	Erection of power installation with rated voltage below 1000 V
	EN 60529		Degrees of protection provided by enclosures (IP code)
IEC 249-1, 2-15			Basis materials for printed circuits
IEC 326-1	EN 60097		Printed boards
		DIN VDE 0110-1, -2	Insulation co-ordination for equipment within low voltage systems

CEGELEC AAS

EU Manufacturer's Declaration

In the sense of the EU Machine Directivesim Sinne der EG - Maschinenrichtlinie 89/392/EWG

Ba, 19.11.96

Manufacturer: CEGELEC AEG ANLAGEN und ANTRIEBSSYSTEME GmbH
Culemeyerstr. 1

D-12277 Berlin, Germany

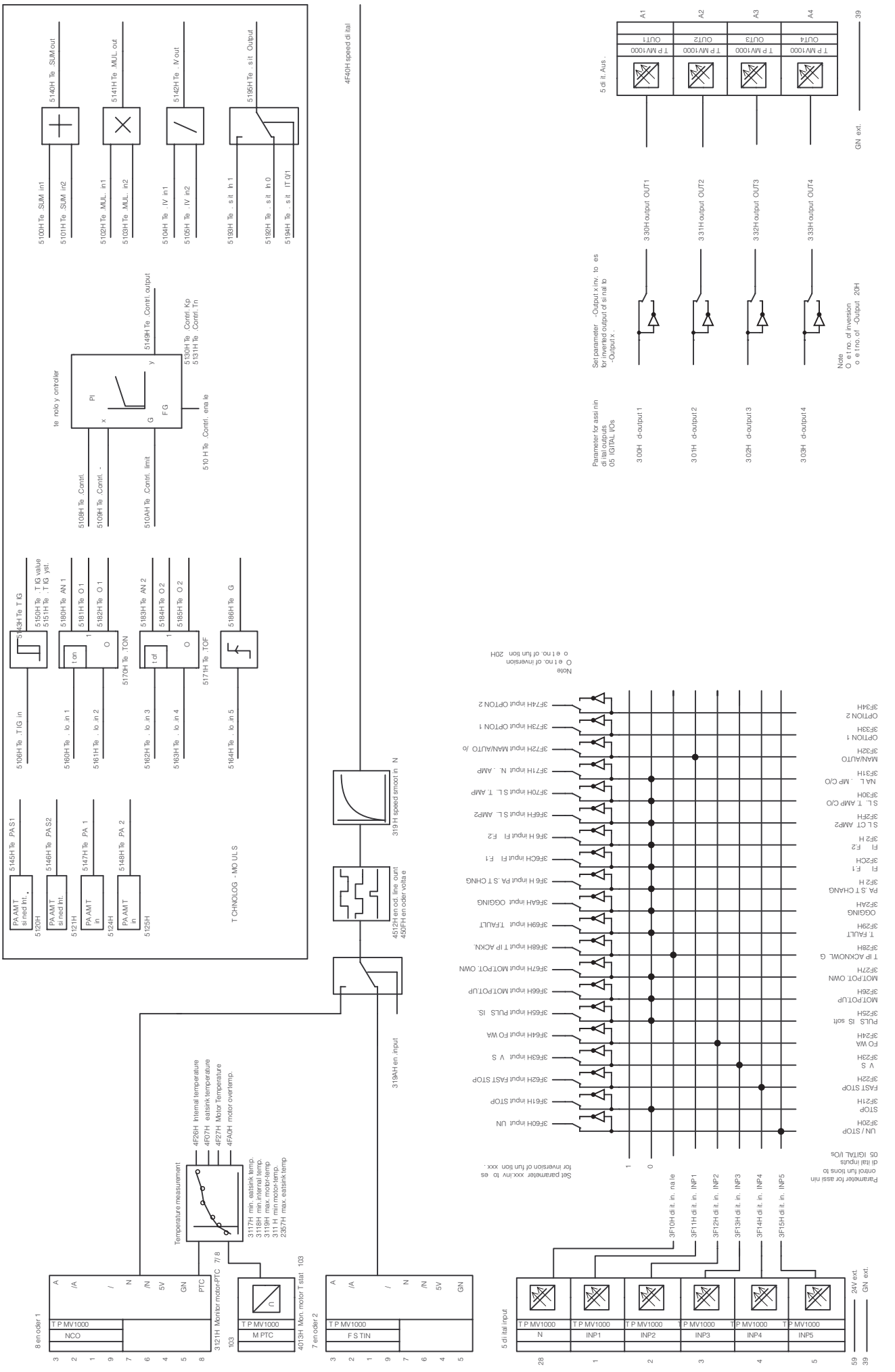
We hereby declare that the product(s) stated below is/are intended for installation in a machine. Commissioning is not permitted until conformity of the end product with the machine directive 89/3920/EU has been determined.

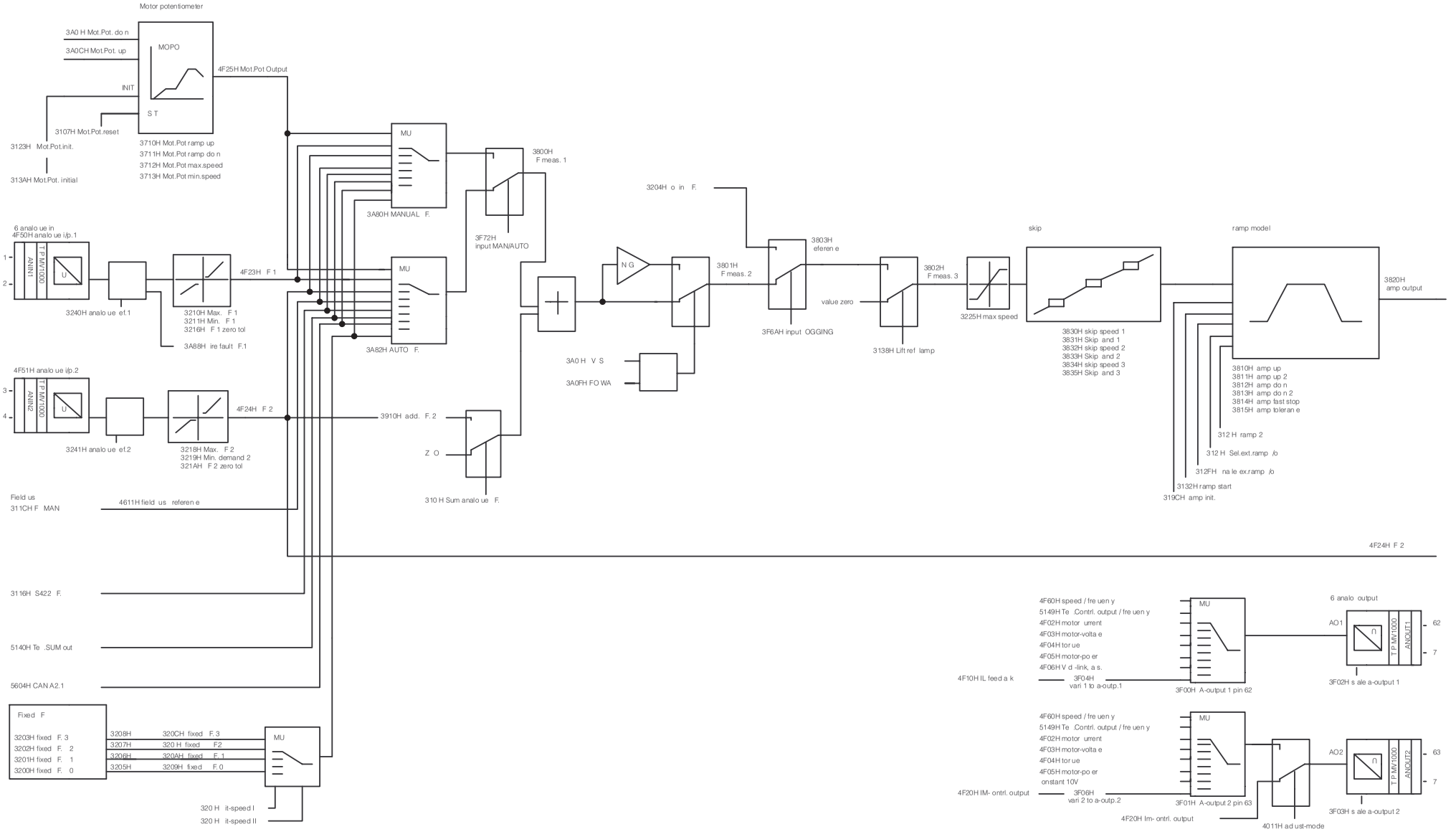
The appropriate instructions given in the operating manual supplied with the equipment must be observed for correct installation and connection of the product.

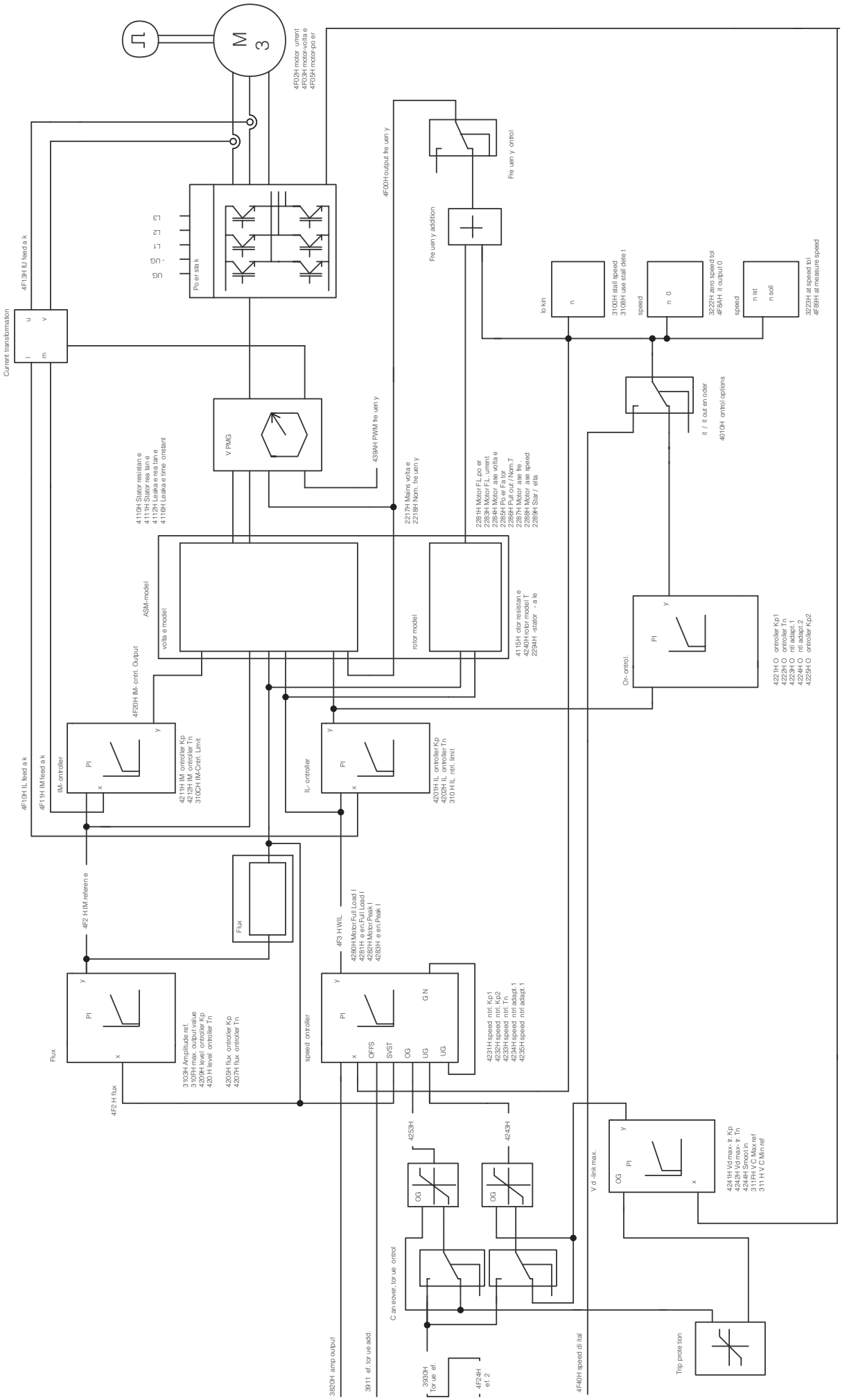
Product designation: Alspa MV1000 Frequency Inverter

CEGELEC AEG ANLAGEN und ANTRIEBSSYSTEME GmbH

by order:.Dr.Möhlenkamp per proxy:.Pawlitzki


T CHNOLOG - MO UL S
5120H PA AM T si ned Int.
5121H PA AM T si ned Int.
5124H PA AM T in
5125H PA AM T in
5145H Te .PA S1
5146H Te .PA S2
5147H Te .PA 1
5148H Te .PA 2
5106H Te . T IG in
5143H Te T IG
5150H Te . T IG value
5151H Te . T IG ysi.
5160H Te . Io. in 1
5161H Te . Io. in 2
5162H Te . Io. in 3
5163H Te . Io. in 4
5164H Te . Io. in 5
5180H Te . AN 1
5181H Te O 1
5182H Te O 1
5183H Te AN 2
5184H Te O 2
5185H Te O 2
5186H Te G
5170H Te .TON
5171H Te .TOF
5109H Te .Contrl.
5109H Te .Contrl. -
510AH Te .Contrl. limit
510 H Te .Contrl. ena le
te nolo y ontroller
PI
F G
5130H Te Contrl. Kp
5131H Te .Contrl. Tn
5149H Te .Contrl. output
5140H Te .SUM out
5141H Te .MUL. out
5142H Te .IV out
5195H Te . s it Output
5100H Te .SUM in1
5101H Te .SUM in2
5102H Te .MUL. in1
5103H Te .MUL. in2
5104H Te .IV in1
5105H Te .IV in2
5193H Te . s it In 1
5192H Te . s it In 0
5194H Te . s it IT 0/1
4F40H speed di itial
319 H speed smoot in N
4512H en od. line ount
450FH en oder volta e
319AH en. input
Temperature measurement
4F26H Internal temperature
4F07H eatsink temperature
4F27H Motor Temperature
4F40H motor overtemp.
3117H min. eatsink temp.
3118H min.internal temp.
3119H max.motor-temp
311 H min motor-temp.
2357H max. eatsink temp
7/ 8
103
8 en oder 1
3121H Monitor motor-PTC
T P MV1000
NCO
A
/A
/
N
/N
5V
GN
PTC
40/3H Mon. motor T stat
M PTC
7 en oder 2
F S TIN
Note
O e t no. of inversion
o e t no. of fun tion 20H
Set parameter xxx.inv to es for inverted output of si nal fo xxx.
3 00H d-output 1
3 01H d-output 2
3 02H d-output 3
3 03H d-output 4
Parameter for assi nin di ital outputs 05 IGITAL I/Os
3 30H output OUT1
3 31H output OUT2
3 32H output OUT3
3 33H output OUT4
Note
O e t no. of inversion
o e t no. of -Output 20H
5 di it. Aus .
OUT1
OUT2
OUT3
OUT4
A1
A2
A3
A4
GN ext.
3F60H Input UN
3F61H Input STOP
3F62H Input FAST STOP
3F63H Input V S
3F64H Input FO WA
3F65H Input PULS. IS.
3F66H Input MOT.POT.UP
3F67H Input MOT.POT. OWN
3F68H Input T IP ACKN.
3F69H Input T.FAULT
3F6AH Input OGGING
3F6 H Input PA .S T CHNG
3F6CH Input FI F.1
3F6 H Input FI F.2
3F6FH Input S L. AMP2
3F70H Input S L. T. AMP
3F71H Input N. . AMP
3F72H Input MAN/AUTO /o
3F73H Input OPTON 1
3F74H Input OPTON 2
Set parameter xxx.inv to es for inversion of fun tion xxx .
1
0
UN / STOP
3F20H
STOP
3F21H
FAST STOP
3F22H
V S
3F23H
FO WA
3F24H
PULS. IS soft
3F25H
MOT.POT.UP
3F26H
MOT.POT. OWN
3F27H
T IP ACKNOWL. G
3F28H
T. FAULT
3F29H
OGGING
3F2AH
PA .S T CHANG
3F2 H
FI F.1
3F2CH
FI F.2
3F2 H
S L. CT AMP2
3F2FH
S L. T AMP C/O
3F30H
NA L . MP C/O
3F31H
MAN/AUTO
3F32H
OPTON 1
3F33H
OPTON 2
3F34H
Parameter for assi nin di ital inputs 05 IGITAL I/Os
3F10H di it. in. na le
3F11H di it. in. INP1
3F12H di it. in. INP2
3F13H di it. in. INP3
3F14H di it. in. INP4
3F15H di it. in. INP5
5 di ital input
T P MV1000
N
INP1
INP2
INP3
INP4
INP5
24V ext.
GN ext.
28
1
2
3
4
5
59
39




M
3
4R02H motor urrent
4R03H motor-volta e
4R05H motor-po er
Po er sta k
4F13H IU feed a k
Current transformation
4F00H output fre uen y
Fre uen y addition
Fre uen y ontrol
4439AH PWM fre uen y
V PMG
4110H Stator resistan e
4111H Stator rea tan e
4112H Leaka e rea tan e
4116H Leaka e time onstant
2217H Mains volta e
2218H Nom. fre uen y
2281H Motor FL po er
2283H Motor FL urrent
2284H Motor ase volta e
2285H Po er fa tor
2286H Full out / Nom.T
2287H Motor ase fre .
2288H Motor ase speed
2289H Star / elta
ASM-model
volta e model
rotor model
4115H otor resistan e
4240H rotor model T
2294H stator - a le
4F20H IM- ontr. Output
4F1GH IL feed a k
4F11H IM feed a k
IM- ontroller
4211H IM ontroller Kp
4212H IM ontroller Tn
310CH IM-Contr. Limit
IL- ontroller
4207H IL ontroller Kp
4208H IL ontroller Tn
310 H IL ntr. limit
4F2 H IM referen e
Flux
4F3 H IWL
4280H Motor Full Load I
4281H e en.Full Load I
4282H Motor Peak I
4283H e en.Peak I
3103H Amplitude ref.
3107H max. output value
3108H level ontroller Kp
420 H level ontroller Tn
4209H flux ontroller Kp
4207H flux ontroller Tn
4F2 H flux
speed ontroller
4231H speed ntr. Kp1
4232H speed ntr. Kp2
4233H speed ntr. Tn
4234H speed ntr adapt .1
4235H speed ntr adapt.1
OFFS
SYST
OG
UG
G N
4253H
4243H
C an eover, tor ue ontrol
3820H amp output
3911 ef. tor ue add.
3920H
Tor ue ef.
4F24H
ef. 2
V d -link max.
4241H Vd max- tr. Kp
4242H Vd max- tr. Tn
4244H Speed- r.
311FH V C Max ref
311 H V C Min ref
4F40H speed di ital
Trip prote tion
lo kin
n
3100H stall speed
3106H use stall dete t
speed
n_0
3222H zero speed tol
4F6AH it output 0
n ist
n soll
3223H at speed tol
4F69H at measure speed
it / it out en oder
4010H ontrol options
Or- ontrol.
4221H O ontroller Kp1
4222H O ontroller Tn1
4223H O ntadapt.1
4224H O ntadapt.2
4225H O ontroller Kp2

List of figures

List of tables

For window envelope to DIN 680

It is our constant aim to improve the content and usefulness of our technical documentation. If you have any suggestions toward improvement or any additional requirements please complete and return this form to:

CEGELEC AEG
ANLAGEN und ANTRIEBSSYSTEME GmbH

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Project notes/Operating Manual/

Title _____

Order No. 029. _____

Print No. CID/V15 _____ / _____

Suggestions (please type or print):

Many thanks for your assistance.

Please continue overleaf if necessary.