BERGES

Operating manual

ACM-D2

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Operating manual ACM-D2

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1. Safety notes

1.1. Explanation of symbols and notes

Work safety symbol

You will find this symbol next to all work safety notes in this instruction manual if there is a risk of injury or death for persons involved. Pay attention to these notes and observe particular caution in such cases. Also pass on all work safety instructions to other users.

Voltage warning

This symbol is shown wherever particular caution is necessary owing to occurring or applied voltages (e.g. DC voltages up to 800 V) and where special precautionary measures have to be taken. The inverter must always be isolated from the mains when working on it.

Caution note

ATTENTION!

This note is shown in all parts of this instruction manual to which particular attention must be paid to ensure that the guidelines, specifications, notes and the correct sequence of work are obeyed to prevent damage or destruction of the inverter and/or systems.

1.2. General safety notes

You must read and observe the instruction manual and safety notes before commencing assembly and commissioning work!

Besides paying attention to the notes given in this instruction manual, also observe the generally valid safety and accident prevention regulations!

The inverters must always be isolated from the mains voltage before all work on the electrical or mechanical parts of the system.

The inverter are designed for installation in a switchgear cabinet and for permanent connection.

Installation, maintenance and repair work must only be carried out by instructed, technically suitable and qualified personnel.

Conversions or changes carried out on or in the inverter and its components and accessories without express authority render all warranty claims null and void.

Please contact BERGES if any conversions or changes are necessary, particularly in relation to the electric components.

The components of the power section and specific elements of the control section are connected to the voltage mains when the inverter is connected to the mains voltage.

Touching these components involves mortal danger!

Isolate the inverter from the mains before removing the front panel or the housing (e.g. by removing or deactivating on-site fuses or by deactivating a master switch isolating all poles etc.).

ATTENTION!

After switching off the mains voltage, wait **for at least 5 minutes** before beginning work on or in the inverter (the DC voltage in the DC link capacitors must first of all discharge through discharge resistors). **DC voltages of up to 800 V are possible.** In the event of malfunctions, the discharge time of 5 minutes may be exceeded **substantially.**

The inverter contains protective facilities that deactivate it in the event of malfunctions, as the result of which the motor is de-energized and comes to a standstill (so-called ‘‘coasting’’ of the motor is possible depending on the flywheel or the type of drive involved). Standstill of the motor can, however, also be produced by mechanical blockage. Voltage fluctuations, and particularly mains power failures may also lead to deactivation. In certain circumstances the drive may start up automatically once the cause of the fault has been remedied. As the result of this, certain systems may be damaged or destroyed and there may be a risk for operators working on the system. **For such operating cases, the user must take precautions to reliably prevent automatic starting of the motor.** For example, this can be done by using a speed monitor that deactivates the power supply to the inverter if the motor should come to an unscheduled standstill.

The motor may stop during operation due to a disabling protection circuit operation or by loss of the control signal. Resetting these systems can result in the motor restarting. If automatic starting of the motor must be prevented to protect operating personnel, interlocks must be provided to isolate the mains supply to the inverter.

The inverter must always be earthed when operated.

Measuring instruments must only be connected and disconnected after removing the power supply.

The responsible operating personnel must read, understand and observe the instruction manual.

We draw attention to the fact that no liability can be assumed for damage and malfunctions resulting from failure to observe the instruction manual.

Technical data and illustrations given in this operating manual may be amended to comply with modifications of the units which may be made to improve their functions.

2. Use of the inverter in accordance with its intended purpose

The application of the inverter described in this operating manual exclusively serves the purpose of continuously variable speed control of three-phase motors.

The inverter are designed for installation in a switch gear cabinet and for permanent connection.

The operator of the system is solely liable for damage resulting from improper use of the inverter.

The operator of the system is responsible for obeying the operating, maintenance and repair conditions.

Only personnel informed about the functions and hazards of the inverter may be employed for the purposes of operation, maintenance and repair.

Only items expressly approved by BERGES (e.g. mains filters and chokes etc.) may be used as accessories.

The installer of the system is liable for any damage resulting from the use of accessories that have not been approved expressly by BERGES. Please consult us in the event of uncertainty.

Before you continue reading, please check whether technical amendments are attached in the annex to this operating manual!

3. Introduction

The present operating manual contains specifications, installation instructions and troubleshooting procedures for ACM-D2 inverters.

The information in this manual must be known before installation of the inverter in order to guarantee fault-free installation and thus maximum performance.
The information contained in this manual refers to the software versions **D2A-STD-014** and **D2A-1300-012.**

4. Technical data (input voltage 1 x 220...240V)

	Inverter		ACM-D2				
			0.37kW	0.55kW	0.75kW	1.1kW	2.2kW
Inverter output data	Motor output	kW	0.37	0.55	0.75	1.1	2.2
	Output power	kVA	0.75	1.0	1.5	1.9	3.2
	Rated device current	A	2.0	2.6	3.4	4.5	9.0
	Overload capacity	%	200% × 180 s (+/-15%)				
	Output voltage (max. = mains voltage)	V	3 x 0...U_{IN}				
	Output frequency	Hz	0...650 Hz (0...1300Hz vers. D2A-1300-xxx)				
	Electrical efficiency	%	> 95%				
	Operating mode		4-quadrant operation (with braking chopper)				
Mains input	Mains voltage	V	1 x 220...240V, +/–15%				1x220...240V or 3x220...240V
	Mains frequency	Hz	40...70 Hz				
Control data	Modulation method		PWM				
	Modulation frequency	kHz	8				4
	Speed reference		0...10V DC; (10...0V DC); -10V...0...10V DC 0...20mA; 4...20mA External potentiometer (4K7); Keypad (JOG mode) Motorpotentiometer ((mode JOG MPt) only with softw. D2A-STD) RS485 (CAN on request)				
	Frequency resolutions	Hz	9 Bit of maximum frequency				
	Acceleration/ deceleration time	Sec.	0.01...1000 sec.				
	Maximum frequency	Hz	0...650 Hz (0...1300Hz vers. D2A-1300-xxx)				
	Minimum frequency		0...Fmax				
	DC brake		Standard				
	Braking chopper		Standard				
Protective functions	Undervoltage trip level	V	170...175V AC / 240...250V DC				
	Overvoltage trip level	V	280...285V AC / 395...405V DC				
	Short circuit		Electronically controlled				
	Overcurrent		Electronically controlled				
	Overtemperature		Monitoring of heat sink temperature				
	Programming block		Definable security code				
	Start block		Definable AUTOSTART function				
Ambient conditions	Ambient temperature	°C	From –5 °C to 45 °C				
	Storage temperature	°C	From –20 °C to 60 °C				
	Humidity	%	< 90% RH, non-condensing				
	Degree of protection	IP	IP 20				
	Weight, approx.	kg	1.6	2.5	2.5	2.7	4.9

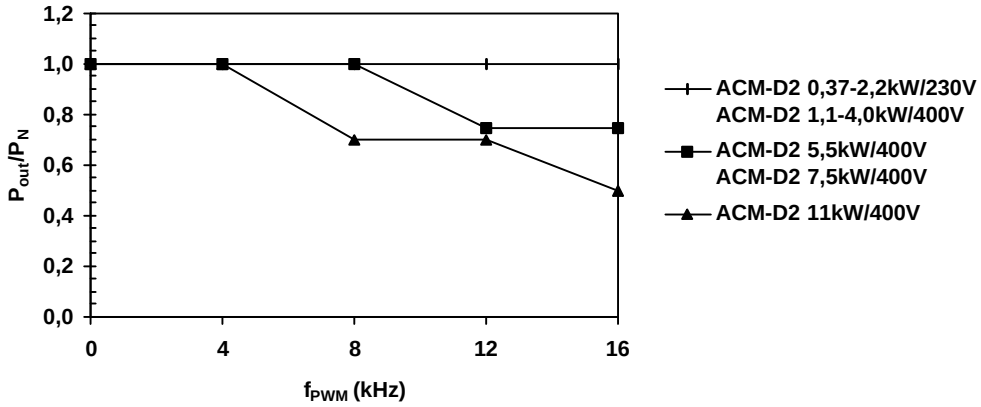
5. Technical data (input voltage 3 x 380...415V)

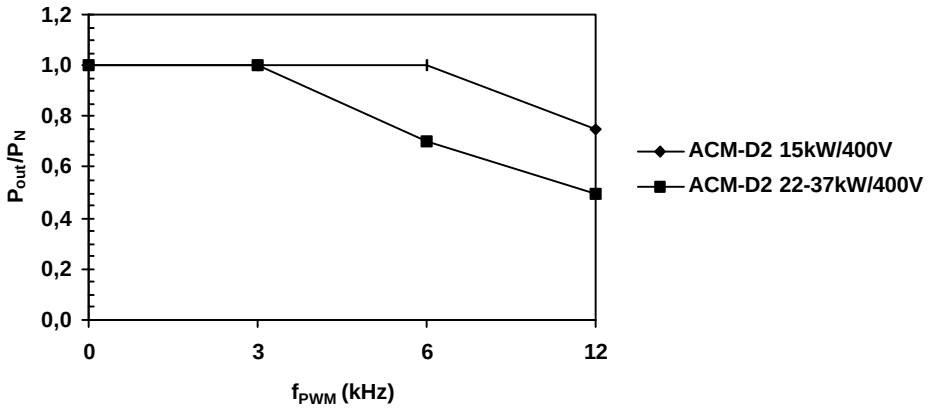
	Inverter		ACM-D2						
			0.75kW	1.1kW	1.5kW	2.2kW	3.0kW	4.0kW	5.5kW
Inverter output data	Motor output	kW	0.75	1.1	1.5	2.2	3.0	4.0	5.5
	Output power	kVA	1.6	1.8	2.9	3.3	4.6	6.1	7.8
	Rated device current	A	2.0	2.8	3.7	5.2	6.8	9.2	11.7
	Overload capacity	%	200% × 180 s (+/-15%)						
	Output voltage (max. = mains voltage)	V	3 x 0...U_{IN}						
	Output frequency	Hz	0...650 Hz (0...1300Hz vers. D2A-1300-xxx)						
	Electrical efficiency	%	> 95%						
	Operating mode		4-quadrant operation (with braking chopper)						
Mains input	Mains voltage	V	3 x 380...415V, (+/-15%)						
	Mains frequency	Hz	40...70 Hz						
Control data	Modulation method		PWM						
	Modulation frequency	kHz	4						
	Speed reference		0...10V DC; (10...0V DC); -10V...0...10V DC 0...20mA; 4...20mA External potentiometer (4K7); Keypad (JOG mode) Motorpotentiometer ((mode JOG MPt) only with softw. D2A-STD) RS485 (CAN on request)						
	Frequency resolutions	Hz	9 Bit of maximum frequency						
	Acceleration/ deceleration time	Sec.	0.01...1000 sec.						
	Maximum frequency	Hz	0...650 Hz (0...1300Hz vers. D2A-1300-xxx)						
	Minimum frequency		0...Fmax						
	DC brake		Standard						
	Braking chopper		Standard						
Protective functions	Undervoltage trip level	V	280V AC / 395V DC						
	Overvoltage trip level	V	490V AC / 695V DC						
	Short circuit		Electronically controlled						
	Overcurrent		Electronically controlled						
	Overtemperature		Monitoring of heat sink temperature						
	Programming block		Definable security code						
	Start block		Definable AUTOSTART function						
Ambient conditions	Ambient temperature	°C	From –5 °C to 45 °C						
	Storage temperature	°C	From –20 °C to 60 °C						
	Humidity	%	< 90% RH, non-condensing						
	Degree of protection	IP	IP 20						
	Weight, approx.	kg	2.6	3.0	4.9	4.9	4.9	4.9	7.0

6. Technical data (input voltage 3 x 380...460V)

	Inverter		ACM-D2					
			7.5kW	**11.0kW**	**15.0kW**	**22.0kW**	**30.0kW**	**37.0kW**
Inverter output data	Motor output	kW	7.5	11.0	15.0	22.0	30.0	37.0
	Output power	kVA	11	16.5	22.5	33	45	55
	Rated device current	A	15.6	22.5	30	43	58	71
	Overload capacity	%	200% × 180 s (+/-15%)					
	Output voltage (max. = mains voltage)	V	3 x 0...U_{IN}					
	Output frequency	Hz	0...650 Hz (0...1300Hz vers. D2A-1300-xxx)					
	Electrical efficiency	%	> 95%					
	Operating mode		4-quadrant operation (with braking chopper)					
Mains input	Mains voltage	V	3 x 380...460V, (-15% +10%)					
	Mains frequency	Hz	40...70 Hz					
Control data	Modulation method		PWM					
	Modulation frequency	kHz	4		3			
	Speed reference		0...10V DC; (10...0V DC); -10V...0...10V DC 0...20mA; 4...20mA External potentiometer (4K7); Keypad (JOG mode) Motorpotentiometer ((mode JOG MPt) only with softw. D2A-STD) RS485 (CAN on request)					
	Frequency resolutions	Hz	9 Bit of maximum frequency					
	Acceleration/ deceleration time	Sec.	0.01...1000 sec.					
	Maximum frequency	Hz	0...650 Hz (0...1300Hz vers. D2A-1300-xxx)					
	Minimum frequency		0...Fmax					
	DC brake		Standard					
	Braking chopper		Standard					
Protective functions	Undervoltage trip level	V	280V AC / 395V DC					
	Overvoltage trip level	V	537V AC / 760V DC					
	Short circuit		Electronically controlled					
	Overcurrent		Electronically controlled					
	Overtemperature		Monitoring of heat sink temperature					
	Programming block		Definable security code					
	Start block		Definable AUTOSTART function					
Ambient conditions	Ambient temperature	°C	From –5 °C to 45 °C					
	Storage temperature	°C	From –20 °C to 60 °C					
	Humidity	%	< 90% RH, non-condensing					
	Degree of protection	IP	IP 20					
	Weight, approx.	kg	8.5	8.7	21	21	22	26

7. Power-derating in function of the switching frequency





P_N Nominal power

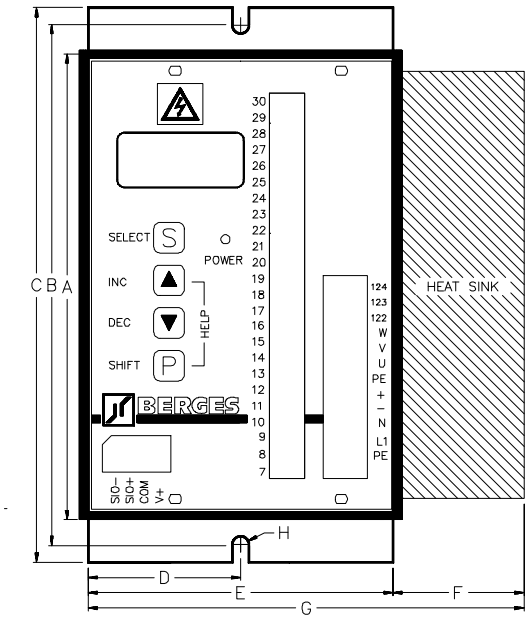
P_{OUT} Output power

f_{PWM} Switching frequency

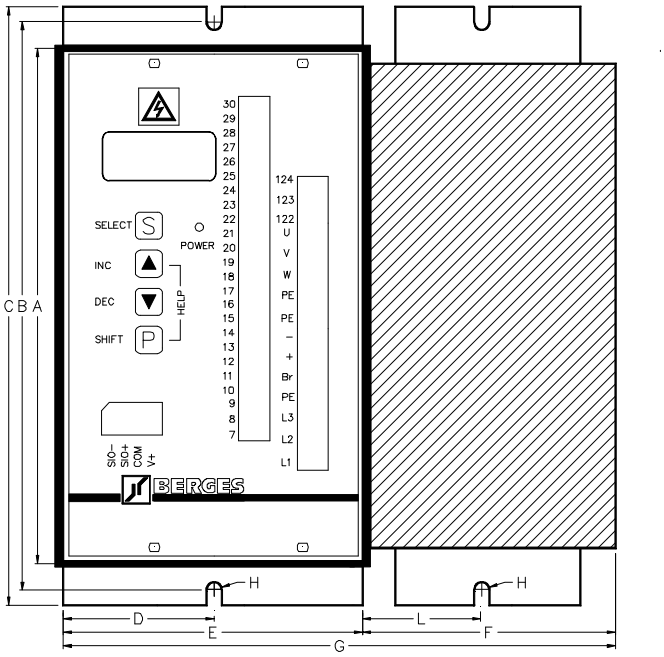
Ambient conditions: T_{amb} = 45°C

8. Dimensional data ACM-D2 0.37 kW - 5.5 kW

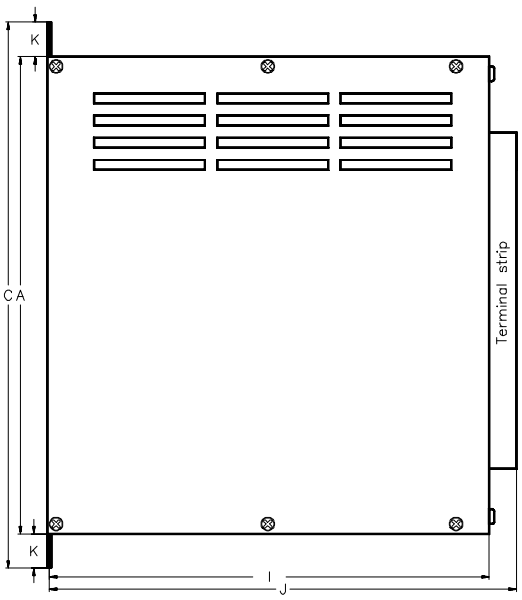
Additional mounting bracket:
Only for ACM-D2 5,5kW



ACM-D2 0.37 - 2.2kW

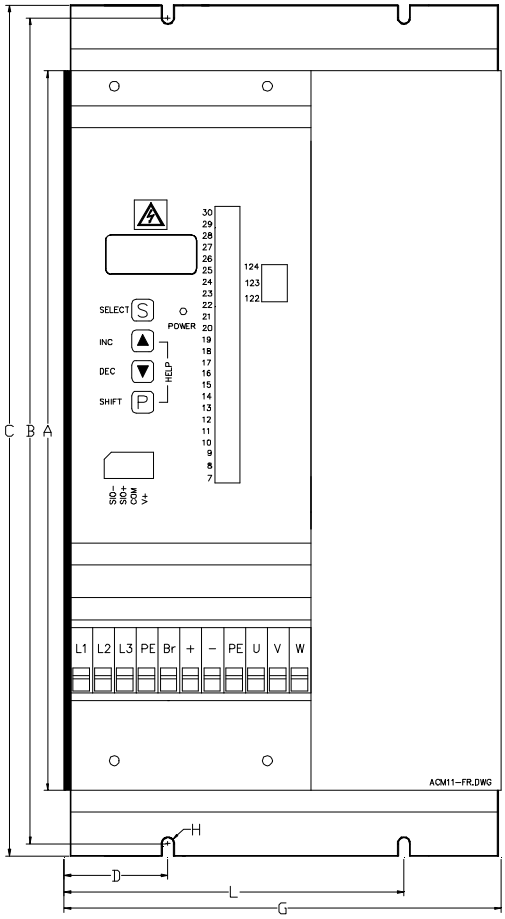


ACM-D2 0.75 - 5.5kW

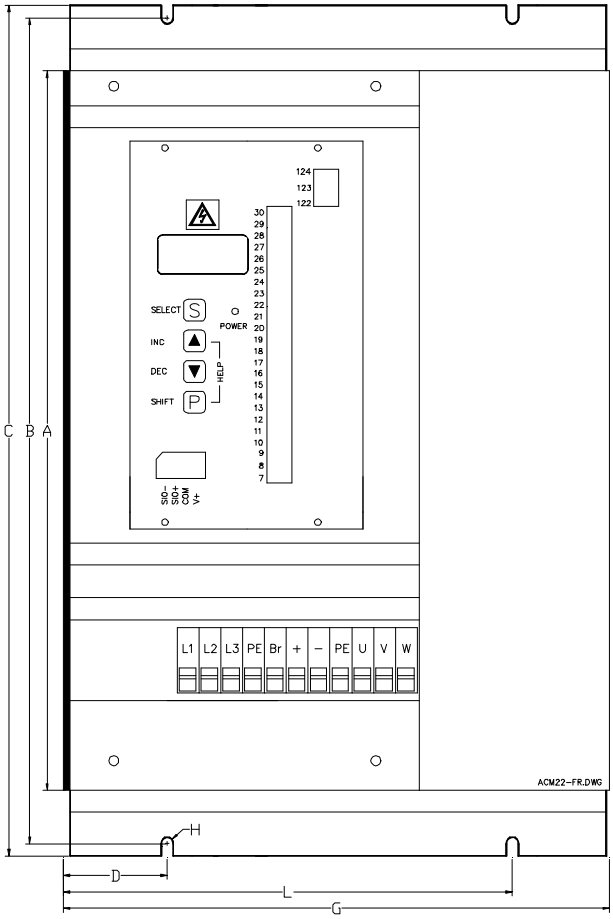


Dimensions (in mm)													
	ACM-D2 (1x230V)						ACM-D2 (3x400V)						
	0.37	0.55	0.75	1.1	1.5	2.2	0.75	1.1	1.5	2.2	3.0	4.0	5.5
A	153	153	153	153	193	193	193	193	193	193	193	193	265
B	168	168	168	168	208	208	208	208	208	208	208	208	280
C	181	181	181	181	221	221	221	221	221	221	221	221	293
D	53	53	53	58	58	58	58	58	58	58	58	58	58
E	108	106	106	106	116	116	116	116	116	116	116	116	116
F	-	40	40	45	90	90	4	27	90	90	90	90	90
G	-	146	146	151	206	206	120	143	206	206	206	206	206
H	Ø6	Ø6	Ø6	Ø6	Ø6	Ø6	Ø6	Ø6	Ø6	Ø6	Ø6	Ø6	Ø6
I	180	180	180	180	180	180	180	180	180	180	180	180	180
J	190	190	190	190	195	195	195	195	195	195	195	195	200
K	14	14	14	14	14	14	14	14	14	14	14	14	14
L	-	-	-	-	-	-	-	-	-	-	-	-	35

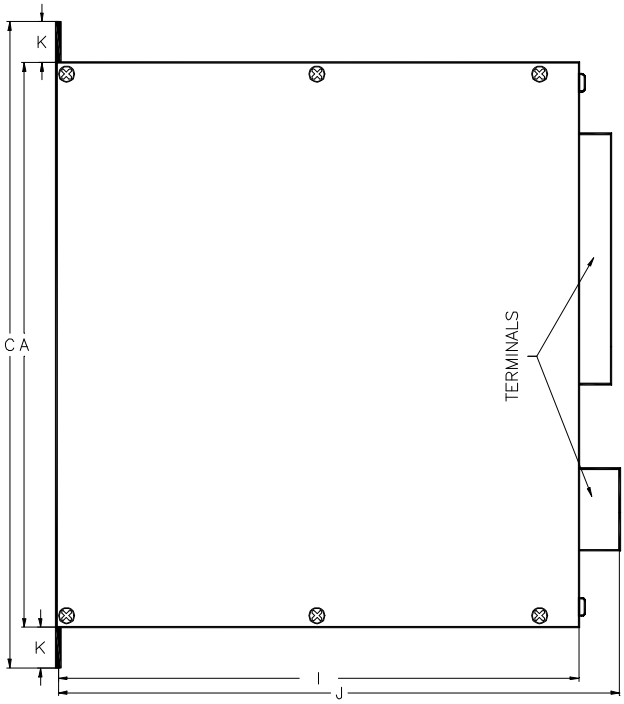
9. Dimensional data ACM-D2 7.5 kW - 22.0 kW



ACM-D2 7.5 - 11.0kW

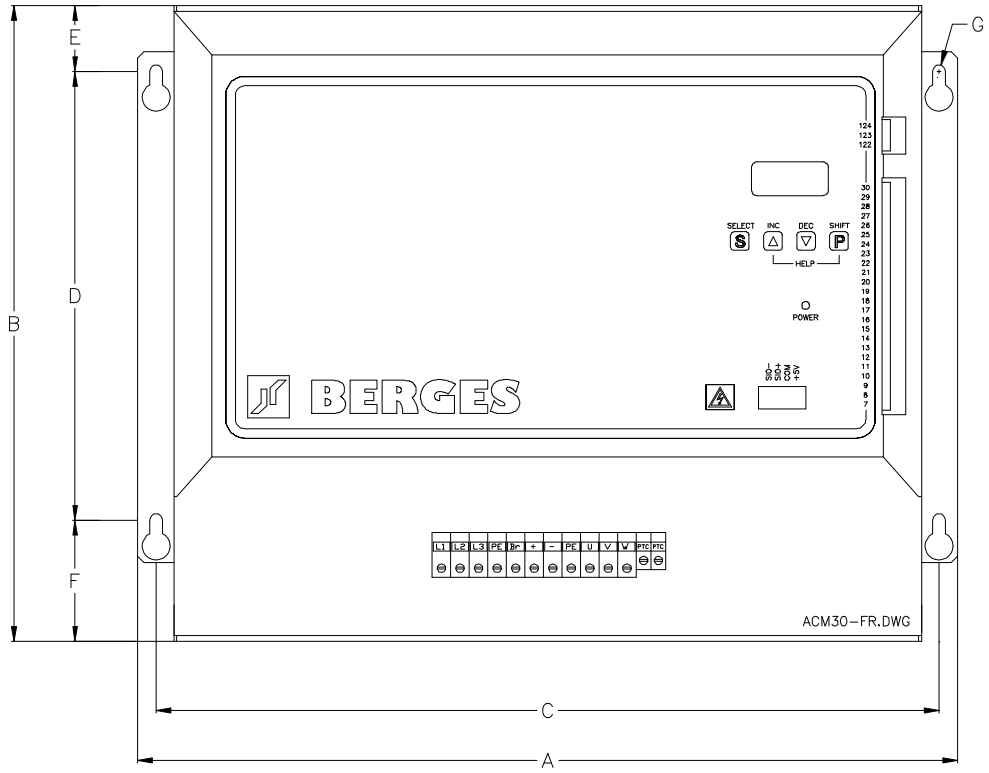


ACM-D2 15.0 - 22.0kW

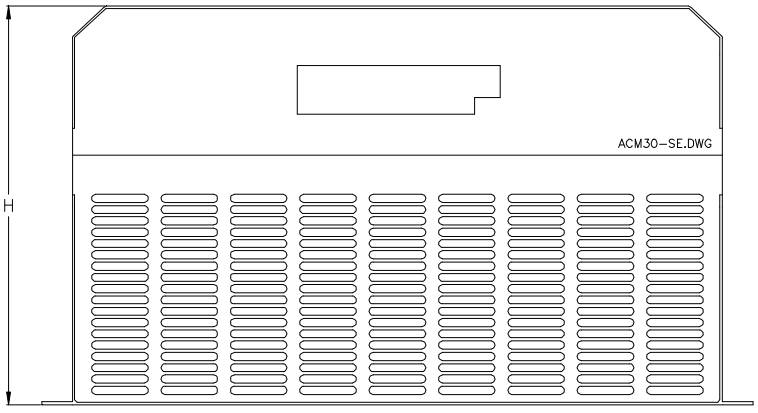


Dimensions (in mm)				
ACM-D2 (3x400V)				
	7.5	**11.0**	**15.0**	**22.0**
A	317	317	330	330
B	344	344	375	375
C	367	367	390	390
D	54.25	54.25	48	48
G	209	209	250	250
H	Ø7	Ø7	Ø6	Ø6
I	186	186	310	310
J	198	198	325	325
K	25	25	30	30
L	154.75	154.75	205	205

10. Dimensional data ACM-D2 30.0 kW - 37.0 kW



ACM-D2 30.0 - 37.0kW

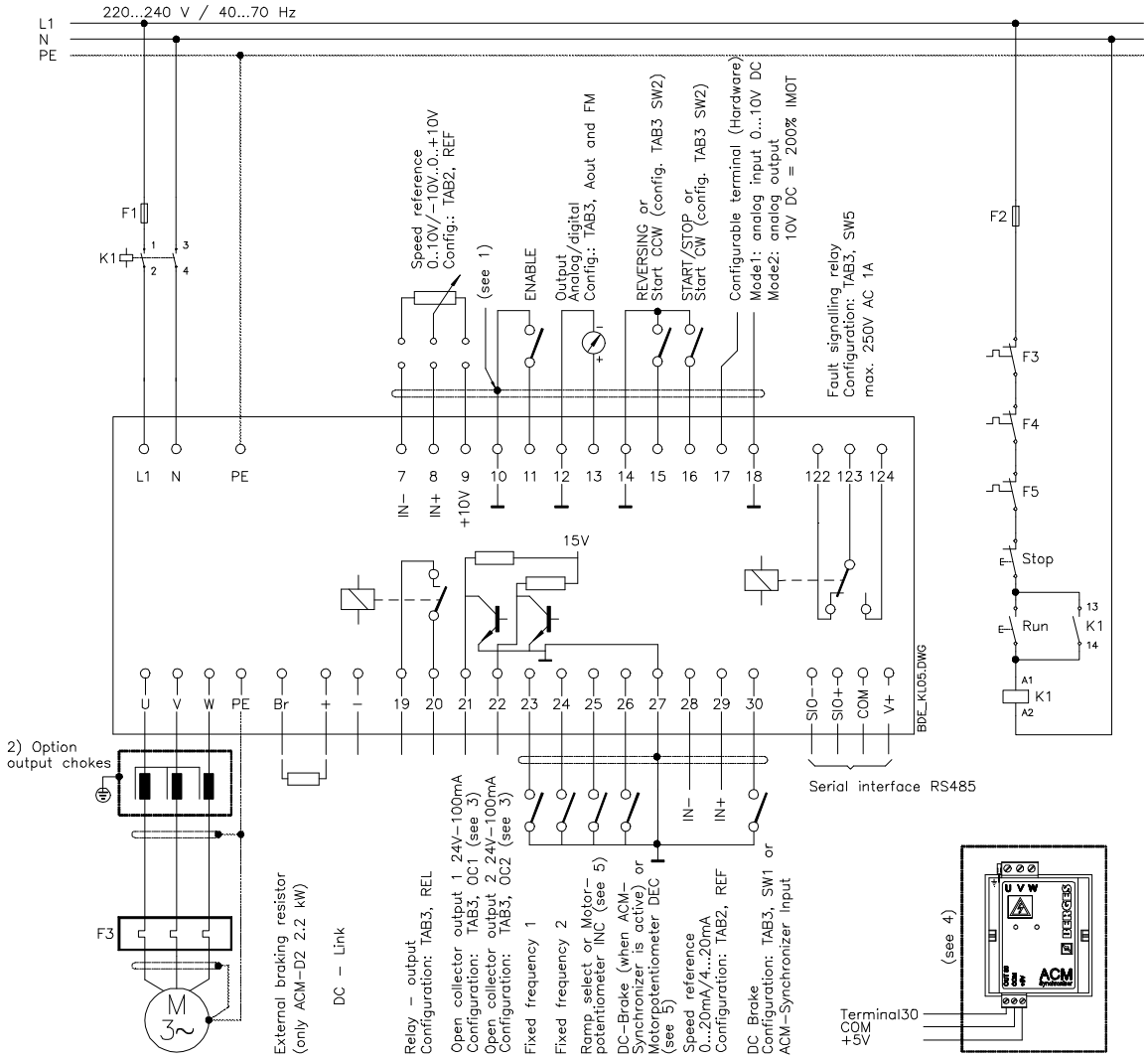


ACM-D2 30.0 - 37.0kW

Dimensions (in mm)		
ACM-D2 (3x400V)		
	30.0	**37.0**
A	442	442
B	343	408
C	422	422
D	242	242
E	35.5	67
F	65.5	98.5
G	Ø7	Ø7
H	255	255

11. Installation examples

11.1. Exemple 1: ACM-D2 0.37 kW - 2.2 kW (1 x 230V)



1) The GND terminals (10, 12 and 14) are floating and serve, among other things, as the reference potential for shielded cables of the control inputs. This potential must be grounded directly either at the control side (PLC or similar) or at the inverter (PE to one of the terminals 10, 12 or 14).

2) The option “Output chokes” is suitable for reducing the capacitive currents to ground and also the interference originating from the inverter.

3) Option relay board “REL”, see functions OC1/OC2 page 49/50.

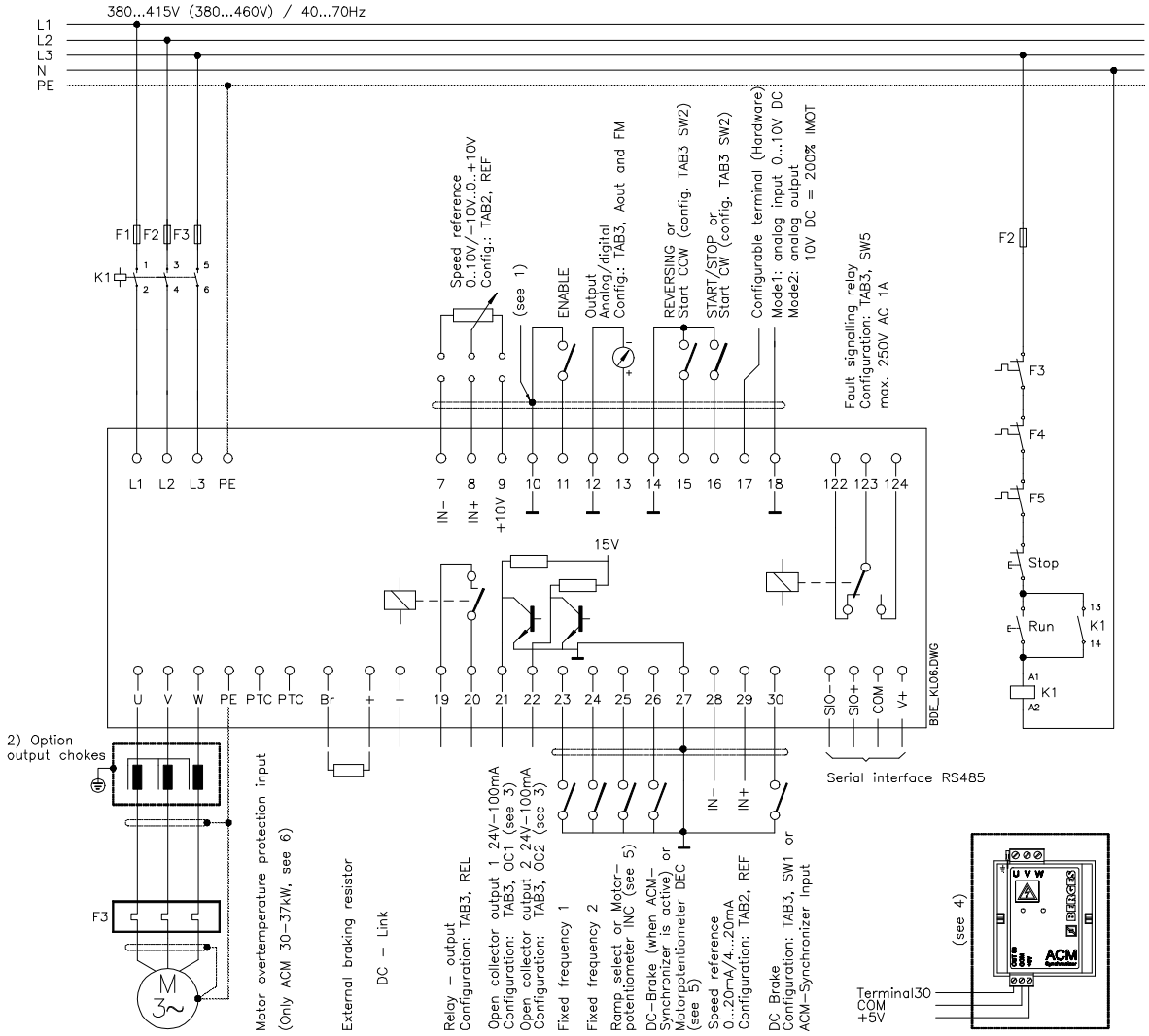
4) Option ACM - Synchronizer. (Only with Software D2A-STD)

5) Speed reference with motorpotentiometer possible only with Software D2A-STD

The terminal assignment shown in this drawing refers to the setting “Active LOW”.

Inverters can be operated via residual-current-operated circuit-breakers if special conditions are satisfied (see chapter 12, page 16)!

11.2. Exemple 2: ACM-D2 0.75 kW - 30 kW (3 x 400V)



1) The GND terminals (10, 12 and 14) are floating and serve, among other things, as the reference potential for shielded cables of the control inputs. This potential must be grounded directly either at the control side (PLC or similar) or at the inverter (PE to one of the terminals 10, 12 or 14).

2) The option “Output chokes” is suitable for reducing the capacitive currents to ground and also the interference originating from the inverter.

3) Option relay board “REL”, see functions OC1/OC2 page 49/50.

4) Option ACM - Synchronizer. (Only with Software D2A-STD)

5) Speed reference with motorpotentiometer possible only with Software D2A-STD

6) **Inputs Non-Isolated.**

The terminal assignment shown in this drawing refers to the setting “Active LOW”.

Inverters can be operated via residual-current-operated circuit-breakers if special conditions are satisfied (see Chapter 12, Page 16)!

12. Installation

12.1. Installation

The frequency inverters are designed for installation in a switchgear cabinet and for permanent connection.

The inverter must be installed so that the heat sink is facing to the right . Only in this way natural convection is guaranteed.

If the inverter has to be installed in a different position, external cooling is required for full capacity utilization.

BERGES inverters are generally designed so that they can be operated at ambient temperatures from –5 °C to +45 °C and at a relative humidity of up to 90%.

Formation of condensation must be avoided!

Please contact BERGES if the above values are exceeded. A heat build-up at the inverter during operation must be prevented. The internal air circulation may possibly be insufficient if the unit is installed in a control cabinet with a small volume.

The units should never be installed in the proximity of corrosive or flammable gases, conductive dust or large magnetic and electric fields.

The inverter should be installed in a location that is largely free of dust, steam and vibrations.

Operation of the units in the presence of abrasive dust, steam, condensate, oil mist or air containing salt will reduce their useful life.

Pay close attention during installation to ensuring that no objects (such as drilling swarf, wire or anything else) fall into the unit. Otherwise a device fault cannot be excluded, even after longer periods of operation.

12.2. Mains power connection

To guarantee lasting operating safety and reliability, the inverter must be connected expertly in accordance with the valid electric standards. Attention must be paid to good insulation from earth potential on the power terminals.

Connect an AC mains power supply with a rated voltage between 220V and 240V or a three phase mains power supply with a rated voltage between 380V and 460V (40..70Hz) to the mains power connection terminals L1, N or L1,L2,L3 and PE respectively. (TN-C System)

L1 (phase) – N	220...240V	40...70 Hz;	PE = Ground
L1, L2, L3 (phases)	380...415V (380...460V)	40...70 Hz;	PE = Ground

Ensure a voltage balance to earth when feeding in the mains power through an isolating transformer (star point earthed) or use the vector group “DY5” in the case of single-phase inverter power supply.

The inverter must always be earthed.

Frequency inverters must not be connected via a residual-current-operated circuit-breaker as the sole protective measure!

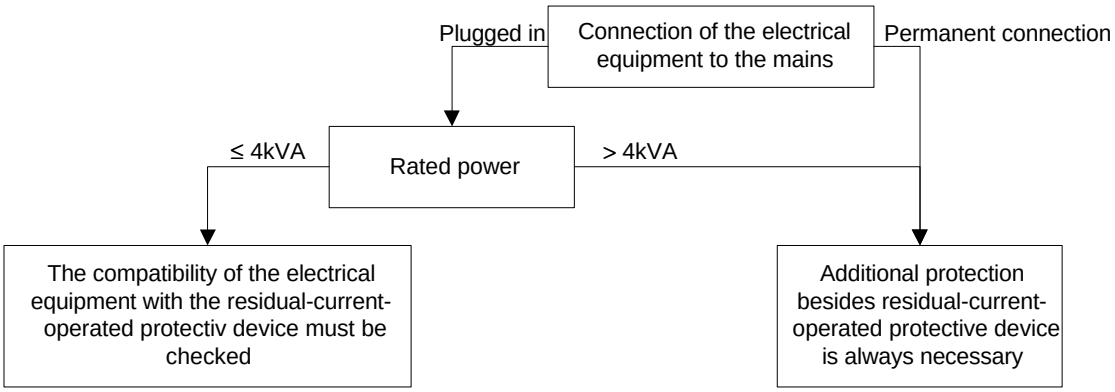
The single exception below permits connection of a frequency inverter via a residual-current-operated circuit-breaker as the sole protective measure:

Installation of a residual-current-operated circuit-breaker of the newest design **for frequency inverters up to 4kVA (input voltage 1x230V) with MOBILE connection.**This residual-current-operated circuit-breaker must be suitable for alternating and pulsating DC leakage current. Residual-current-operated circuit-breakers of this type bear the symbol .

Reliable tripping of the residual-current-operated circuit-breaker is not ensured in the case of frequency inverters up to 4 kVA (input voltage 3x400V) with MOBILE connection; an additional protective measure must be used for this reason. Also see the diagramm below.

In the case of frequency inverters with PERMANENT connection (input voltage 1x230V and 3x400V), another protective measure must always be used in addition to the residual-current-operated protective device. Also see the diagramm below.

The protective function of the residual-current-operated circuit-breaker is no longer ensured due to leakage currents from interface suppression capacitors in the inverter and DC-components in the fault current. All devices connected to this residual-current-operated circuit-breaker (and person touching them) are no longer protected in the event of a fault.



The pluggable terminal strips on the inverter (power connection terminals) must not be plugged or removed when alive (DIN VDE 0160/pr EN50178).

The inverter will be destroyed if the mains feeder is confused with the motor cable.

The DC link capacitors must be reformed if the inverter you wish to connect has been out of operation more than a year. To do this, connect the inverter to voltage for approx. 30 minutes.The inverter should not be loaded by connected motors during forming.

12.3. Motor connection

Connect the motor cable to the **U, V, W** and **PE** terminals.

The inverter will be deactivated in the event of a short circuit at the terminals **U, V, W.**

We recommend PTC evaluation using commercially available devices to achieve effective protection of the motor.

If interrupting contacts (e.g. contactors or motor protection switches etc.) have to be installed between the motor and inverter, the circuit must be configured so as to ensure that the **ENABLE** signal (terminals 10/11) is deactivated **before** separation of the inverter/motor connection. A relay switching time of approx. 30 ms suffices.

We recommend using output chokes for motor cable lengths over 20 m.

12.4. Interference suppression measures/EMC (electromagnetic compatibility)

Electrical/electronic devices are capable of influencing or disturbing each other through connecting cables or other metallic connections. Electromagnetic compatibility consists of the factors interference resistance and interference emission. **Correct installation of the inverter in conjunction with any possible local interference suppression measures has a crucial effect on minimizing or suppressing mutual interference.**

The following note refer to a mains power supply that is **not** ‘‘contaminated’’ by high frequency interference. Other measures may be necessary to reduce or suppress interference if the mains voltage is “contaminated”. No generally valid recommendations can be given in such cases. Please consult BERGES if all recommended interference suppression measures should not produce the desired result.

- When secured on metal (control panels or control cabinets etc.), the inverter should be installed using **screws with additional serrated washers** (to link the inverter metallically to the earthed base surface).
- Use a shielded motor cable (earthing on both sides). The shield should be laid **without interruption** from the inverter’s PE terminal to the motor’s PE terminal . If a shielded motor cable cannot be used, the unshielded motor cable should be laid in a metal duct. This metal duct must not be interrupted and must be adequately earthed.

The following points must be observed if radio interference suppression is to be realized in accordance with EN 55011, EN 55014 and EN 50081-1 :

- Line-side connection of a mains filter and a output choke (the mains filter and output choke are not contained in the scope of delivery).
- Lay the motor cable so that it is shielded.
- Lay the control cable so that it is shielded.
- Observe the general measures for radio interference suppression (also refer to the whole chapter “Interference suppression measures/EMC (electromagnetic compatibility)”.

- When connecting the shield to cables leading further, the cross section of the shield should not be tapered.
- Lay motor, mains power and signal cables separately and, as far away from each other as possible and separately.
- When using a mains filter, place it at the shortest possible distance from the inverter to be able to connect both devices by means of short connecting cables.
- When using an output choke (option), place it in the **direct proximity** of the inverter and connect it with the inverter using a shielded cable which is earthed at both ends.
- Shielded signal cables should be laid at a minimum distance of 10 cm from power cables running parallel. A separate earthed metal cable duct is advisable for such signal cables. If signal cables intersect with a power cable, they should do so at an angle of 90°.

We recommend that control cables with a length of more than 1 m be twisted or laid in a shielded configuration and earthed at both sides.

Other loads connected to the mains may produce voltage spikes that may interfere with functioning of the inverter or may even damage it. Chokes or main filters can be used on the mains side to protect the inverter against voltage spikes (resulting from switching large loads to the mains, for example). Such chokes and filters are available as accessories.

If inverters are operated in a switchgear or in their close proximity (e.g. in one common control cabinet) in connection with the same power mains, we recommend the following precautionary measures to suppress interference in the switchgear:

- Wire the coils of contactors, switchgear devices and relay combinations with RC elements or with free-wheeling diodes.
- Use shielded cables for external control and measuring cables.
- Lay disturbing cables (e.g. power and contactor control circuits) separately and at a distance from the control cables.

12.5. Mains back-up fuses

External upstream fuses are required to protect the cables and the unit itself. The fuses must be dimensioned so as to permit starting up and normal operation of motors. To guarantee this, we recommend the use of the followings slow-blow fuses :

Mains input 1 x 230V				
0.37kW	**0.55kW**	**0.75kW**	**1.1kW**	**2.2kW**
4A	8A	8A	8A	16A

Mains input 3 x 400V						
0.75kW	**1.1kW**	**1.5kW**	**2.2kW**	**3.0kW**	**4.0kW**	**5.5kW**
4A	6A	6A	8A	10A	16A	20A

Mains input 3 x 400V					
7.5kW	**11.0kW**	**15.0kW**	**22.0kW**	**30.0kW**	**37.0kW**
35A	35A	63A	63A	80A	100A

12.6. Series autotransformer

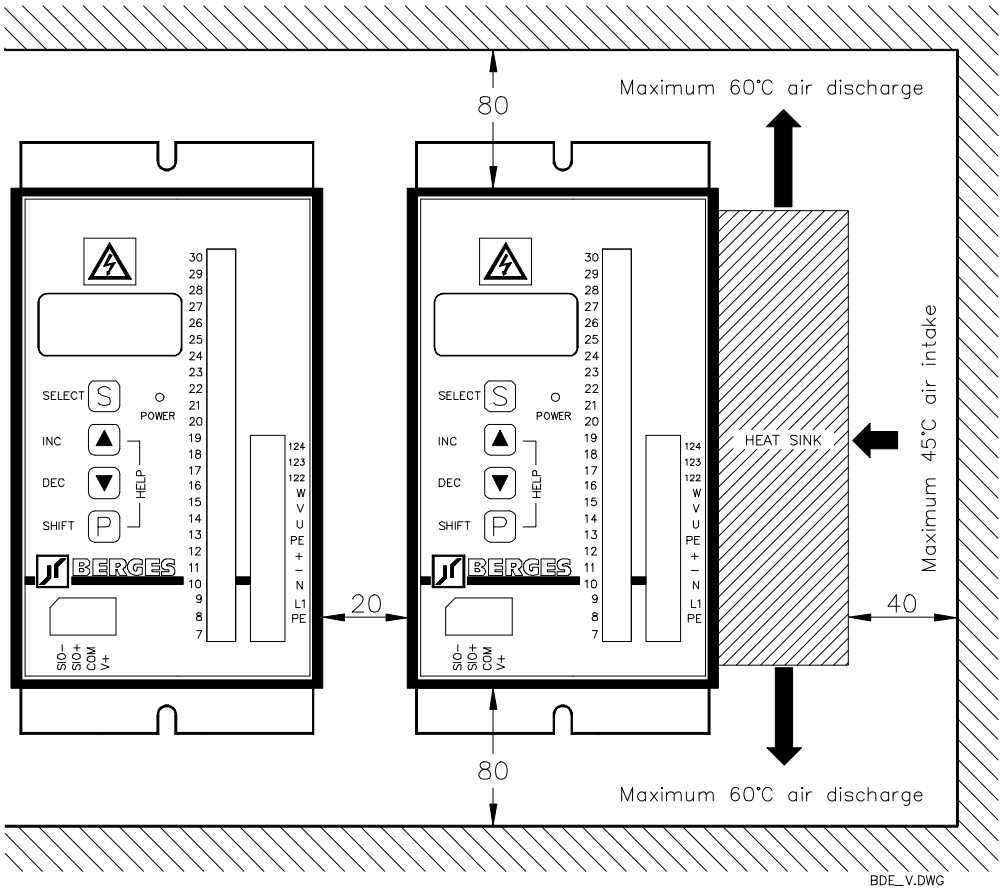
A series autotransformer is dimensioned as follows (guide value):

Rated inverter output × 2 = Transformer output in kVA.

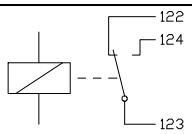
Attention must be paid to the voltage increases in no-load condition when using isolating transformers.

12.7. Ventilation

For all inverters, the permissible ambient temperature of 45 °C must not be exceeded. This particularly applies if the inverter is installed in a control cabinet, because operation of the inverter may increase the ambient temperature substantially. Appropriate measures, e.g. installation of a fan, must be taken if the permissible ambient temperature is almost reached or exceeded under full loading of the inverter.

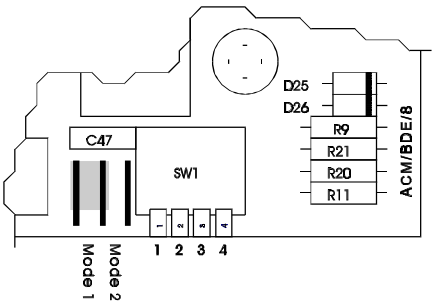


12.8. Control terminals

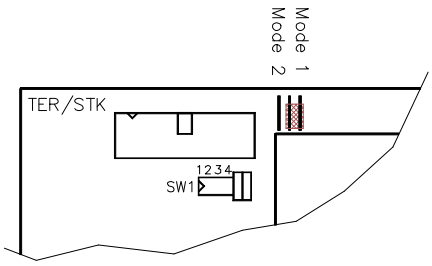
	Term.	Function	Description
Control terminals	7	Speed reference input 1 (low)	0...10V; -10V..0..+10V; external potentiometer 4k7 or 10k Configuration see TAB2, function REF.
	8	Speed reference input 1 (high)	
	9	Supply voltage, potentiometer	+10V DC, 5mA.
	10	Ground (GND)	Ground (earth-free).
	11	Enable	Inverter enable input.
	12	Ground (GND)	Ground (earth-free).
	13	Analog/digital output	Signalling output (max. 5mA). Configuration see TAB3, functions Aout and Fm.
	14	Ground (GND)	Ground (earth-free).
	15	Reversing	Configurable input: Reversing or START CCW Configuration see TAB3, SUB XPAR, function SW2.
	16	START/STOP	Configurable input: START/STOP or START CW Configuration see TAB3, SUB XPAR, function SW2.
	17	Configurable terminal	Mode 1: analog input 0...10V DC see TAB1, SUBIMOT, func. S and TAB2, SUBREF func. AO. Mode 2: analog output 10V DC = 200% I_{MOT}. (for Hardware configuration see next page)
	18	Ground (GND)	Ground (earth-free).
	19	Signalling relay	Configurable relay output. Configuration see TAB3, function REL.
	20		
	21	Output OC1	Configurable signalling output (open collector). Configuration see TAB3, function OC1.
	22	Output OC2	Configurable signalling output (open collector) Configuration see TAB3, function OC2.
	23	Digital input 1	Control inputs: preset frequency selection. Configuration and selection see TAB1, SUB FFIX.
	24	Digital input 2	
	25	Digital input 3	Control input: Ramp selection or motorpotentiometer (increase freq.) Configuration see TAB1, funct. JOG
	26	Digital input 4	Control input: DC-Brake (when ACM - Synchronizer is used) or motorpotentiometer (decrease freq.) see TAB1, funct. JOG
	27	Ground (GND)	Ground (earth-free).
	28	Speed reference input 2 (low)	0...20mA; 4...20mA; Input impedance 50 Ohm. Configuration see TAB2, SUBREF, function REF.
	29	Speed reference input 2 (high)	
	30	Digital input 5	Control input: DC-Brake activation; config. see TAB3 SUBXPAR func. SW1 or ACM - Synchron. input (option) see TAB2, SUBLOG, L8)
Serial interface	SIO+	Serial interface	Input high, corresponds to EIA Standard RS 485.
	SIO–		Input low, corresponds to EIA Standard RS 485.
	COM		Ground (earth-free).
	V+		Power supply (for BERGES options only).
Error relay	122	Error signalling relay 	**Inverter status** Normal operation : 123, 124 closed. Error : 122, 123 closed. Configuration see TAB3, SUBXPAR, function SW5.
	123		
	124		

Configuration terminal 17:

ACM-D2 0.37 - 22.0kW
Control board



ACM-D2 30.0 - 37.0kW
Control board



Digital inputs: max. input voltage: +30V DC
Low - level : 0...1V
High - level : 4...30V

Error signalling relay: 250V AC 1A

Signalling relay: 24V AC/DC 1A

Open collector outputs: 24V DC 100mA

12.9. Power terminals

	Term.	Function	Description
Power terminals	**L1**	Single-phase mains power supply	220...240V
	N	Neutral conductor	Connect with the neutral conductor of the mains supply.
	L1	3-phase mains power supply	380...415V (380...460V)
	L2		
	L3		
	PE	Mains ground	The inverter, motor and accessories must always be earthed.
	Br	External braking resistor	Connection for external braking resistor.
	+	DC-link	DC-link output.
	–		
	U	Motor terminals	3x0...U_{IN} 0...650 Hz (0...1300Hz vers. D2A-1300-xxx)
	V		
	W		
	PTC	Motor overtemprature protection input	**Inputs Non-Isolated.**
	PTC		

Never connect input AC-Power to the motor output terminals U, V, W or damage to the inverter will result.

13. Commissioning and settings

13.1. General information

The following points must be observed before commissioning:

- Corresponding of the mains voltage with the input voltage of the inverter.
- Check that the motor has the correct type of connection (star-delta connection).
- Check all wirings connections.
- Check the mechanical integrity of the driven system.

Make sure, that all safety regulations are followed.

13.2. Adaption to operation

The ramp-up and rampdown times must be adapted to the acceleration capacity of the three-phase motor and the inverter. If the acceleration time is too short, the motor demands more current from the inverter than the latter can provide. This may lead to the inverter being switched off (current limit or peak current). An additional external braking chopper must be connected at the terminals "+/–" if extreme regenerative feedback of the motor is expected (braking operation).

It is possible to limit the maximum output frequency attainable with the setpoint potentiometer by means of the maximum frequency function. Normally, the output frequency is 50 Hz. The field weakening and the related torque-drop must be included in planning for output frequencies higher than 50 Hz.

Using the minimum frequency function, it is possible to set the minimum output frequency which is the lower limit for setpoint input via the setpoint potentiometer or external setpoint.

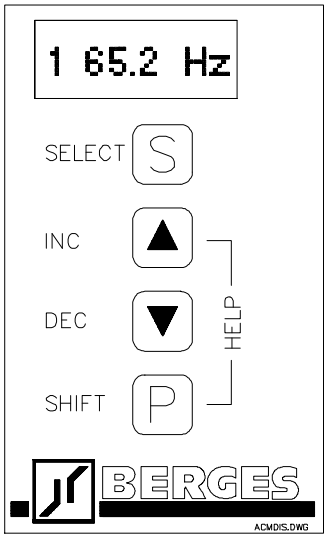
14. Operating functions

14.1. General

The ACM-D2 inverters are pre-programmed to run a 4-pole AC-induction motor. In many cases no additional programming is required.

14.2. Control panel

All functions of the inverter can be controlled by way of the ACM-D2 control panel. The 4 input keys allow control of the motor and direct parameter programming.



The functions are separated into three levels in order to facilitate programming (function tables TAB1, TAB2, TAB3).

TAB1: Programming of the basic parameters of the inverter and call-up of works settings.

TAB2: Configuration of the analog and digital inputs, programming of the output voltage and of the SECURITY function.

TAB3: Configuration of the analog and digital outputs, the extended setting functions and call-up of the diagnosis function.

Keys	Description
S	Function interrogation forward.
P + ▼	Function interrogation back.
S 1 sec.	a) Jump back to the first function of the function table or sub-menu. b) Jump out of the table or sub-menu (starting from the first function of the function table or sub-menu).
▲	Increments the parameter value of the selected function. To increase the speed at which scrolling through the value range takes place, keep **INC** depressed and briefly press **DEC**.
▼	Reduces the parameter value of the selected function. To increase the speed at which scrolling through the value range takes place, keep **DEC** depressed and briefly press **INC.**
P + S	Permits access to a sub-menu or a parameter table.
P + ▲	Help function: A Help text can be called for each function. A key change from **INC** to **DEC** with depressed **SHIFT** key inverts the text scroll-direction of the help text.
S + ▲ + ▼	Software reset.

14.3. Display

An eight-position alphanumeric display provides the user with all important information, such as inverter status messages and information on possible errors or faults and parameter setting values.The language for the display readout is selectable.

14.4. Help - function and language - select

When pressing SHIFT and INC, on the display appears a scrolling Help-text concerning the currently active function. Releasing INC and pressing DEC while holding SHIFT inverts the text scroll - direction.

Pressing SHIFT and INC in TAB1, funct. 1 enters the language - select mode. Select the language by pressing the corresponding key.

Italian	**SELECT**
German	**INC**
English	**DEC**

The selected language will be saved automatically. Press any key to return to TAB1, funct. 1.

14.5. Inverter status

Message	Description
OFF	No **ENABLE,** terminals 10/11 open.
STOP	If the AUTOSTART function is deactivated, the inverter is stopped after switching on (see TAB3, SUB XPAR, function SW7 = OFF). Activate **ENABLE** or **START/STOP** to start the inverter.
1 33.6Hz Value Function number	Display of current actual values or changeable parameters (the first number group indicates the function number and the 2nd number group the value of the respective parameter).
JOG	JOG mode is activated; output frequency setting by means of the unit keypad.
DEFAULT	Default parameter values (works setting) have been loaded but not saved.
SECUR. 1	SECURITY Level 1 is activated; parameter values cannot be saved.
SECUR. 2	SECURITY Level 2 is activated; parameter values can be neither changed nor saved.
Dyn Brake	Switching on braking chopper.
DC STOP	DC brake is activated.
FreqScan	ACM - Synchronizer: the inverter measures the actual motor frequency.

14.6. Warnings

Message	Description
undervol	The mains has been reached the Undervoltage Limit.
overload	The output current has almost reached the type-specific limit
HYST	The set limit value for the output current has been exceeded. The output frequency is reduced step-by-step until the output current falls below the limit value again (see TAB1, SUB IMOT, function S-INT =4).
RAMP	The set limit value for the output current has been reached. The acceleration ramp is stopped (see TAB1, SUB IMOT, funct. S-INT = 3).
br_limit	The dynamic braking power is near the programmed limit (configurable by TAB2, func. BrLim). This message can be signalized by the relais or the open collector outputs. (TAB3, funct. REL, OC1, OC2)
MPtFault	Motorpotentiometer function: it was enabled a preset frequency with a motor rotation sense different of the actual. The output frequency remains unchanged (TAB1 funct. JOG = MPt). (Only with Softw. D2A-STD)
overtemp	The inverter (heat sink) temperature reaches the limit value. (Only with Softw. D2A-STD)
ot_motor	The motor temperature reaches the limit value. (Only with Softw. D2A-STD)

14.7. Operating error messages

Message	Description	Note
UNDERVOL	Undervoltage has been detected in the link.	1)
OVERVOLT	The voltage in the link has reached the overvoltage value.	2)
OVERLOAD	The output current has exceeded the type-specific limit value.	2)
OVERTEMP	The inverter (heat sink) temperature is too high.	5)
ILIMIT	The set limit value for the output current has been exceeded (see TAB1, SUBIMOT, S-INT = 1 or 2).	3)
I < 4mA	The speed reference line is interrupted or the setpoint is less than 4 mA.	1)
BR_LIMIT	The dynamic braking power has reached its programmed limit.	3)
OT_MOTOR	The motor temperature has been reaching the limit value for more than 7 seconds. (Only with Softw. D2A-STD)	4)

1) Inverter stopped. Automatic error reset as soon as the link voltage rises above the undervoltage value.

2) Inverter stopped. If the AUTORESET function is activated (see TAB3, SUB XPAR, function SW3), a reset is possible by setting or the **START/STOP** input, or the **ENABLE** input, or by setting the setpoint to zero.

3) The motor is decelerated with the deceleration ramp and the inverter is stopped. An error reset can be performed as described in Item 2.

4) The motor is decelerated with the deceleration ramp and the inverter is stopped untill the temperature doesn't fall below the limit value. If the AUTORESET function is activated (see TAB3, SUB XPAR, function SW3), a reset is possible by setting or the **START/STOP** input, or the **ENABLE** input, or by setting the setpoint to zero.

5) Behaviour with Softw. D2A-STD: see 4)
Behaviour with Softw. D2A-1300: see 2)

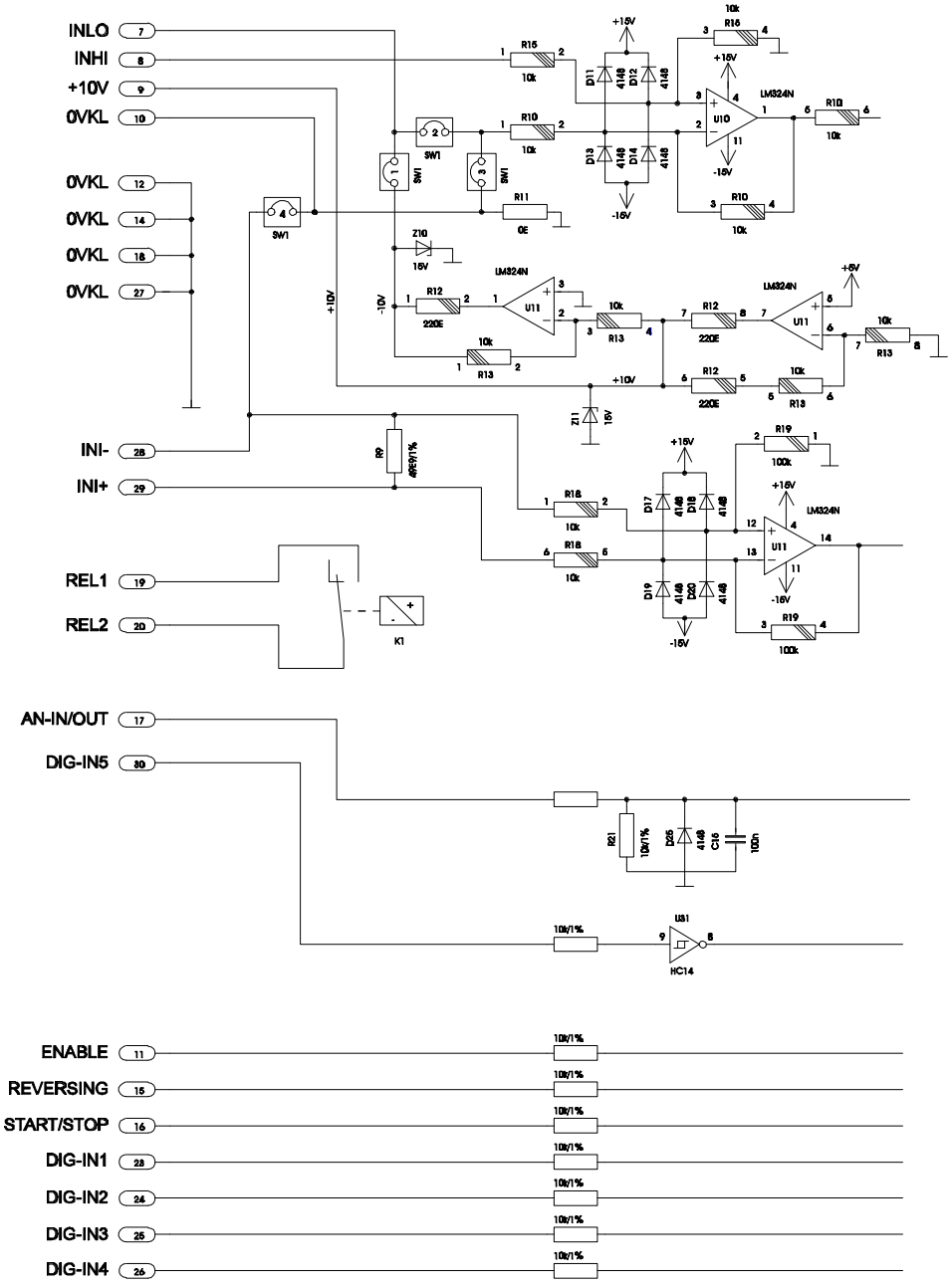
14.8. Hardware error messages

An error which is established during the self-test phase or during operation is shown on the display by the message "ERROR" together with an error number. The inverter is stopped by the safety devices.

To reset the error message, switch off the mains supply and switch back on again. If the error is not rectified by this, send the unit to the after-sales service for inspection.

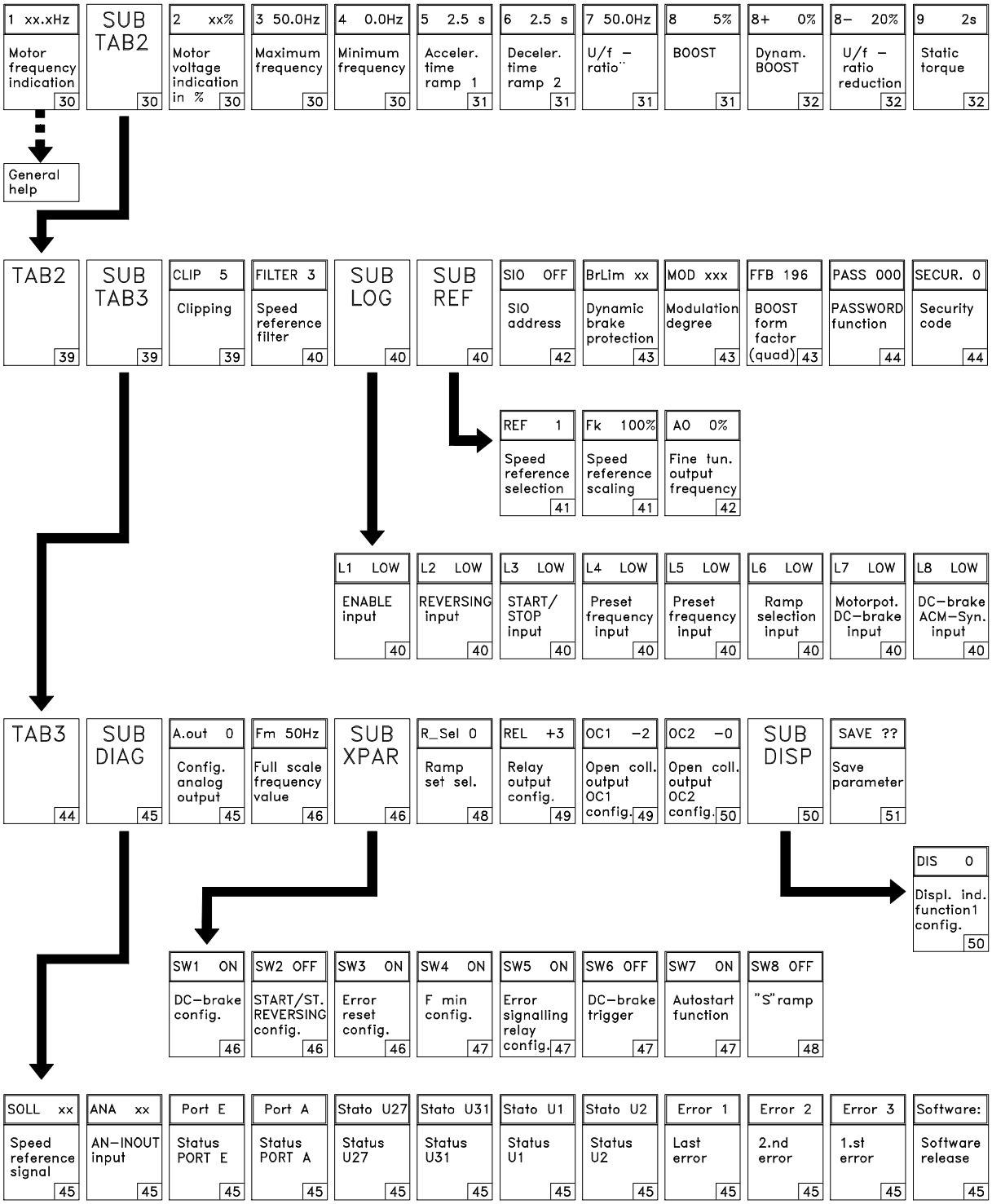
Error	Cause	Remedy
ERROR 1	Data error	Reprogram parameters.
ERROR 2	Hard- and software is not compatible	Have unit checked by technical after-sales service.
ERROR 3	CPU error	
ERROR 4	Keypad error	
ERROR 5	Error in ROM	
ERROR 6	Watchdog error	
ERROR 7	Clock error	
ERROR 8	Program error	
ERROR 9	Output stage error	

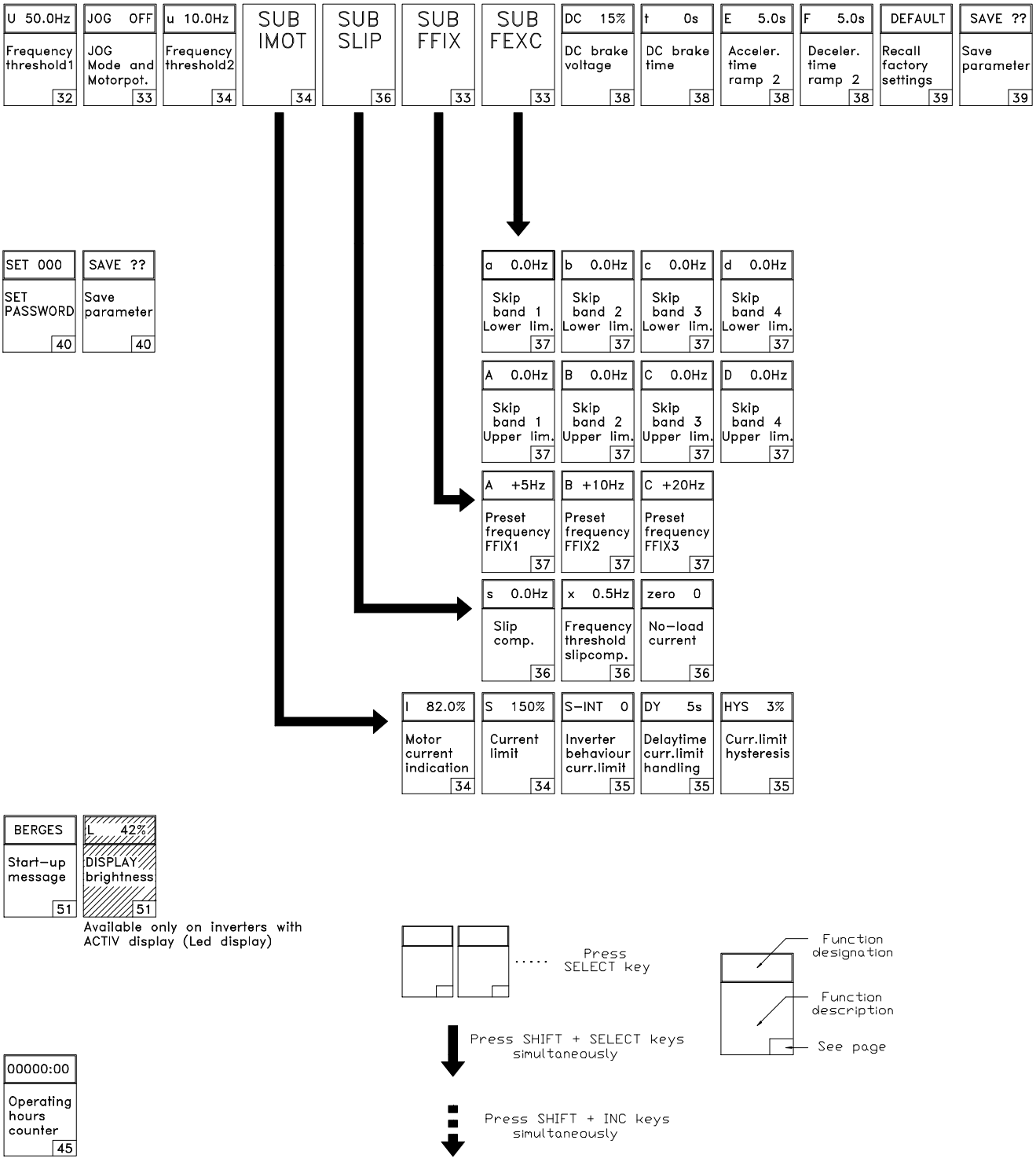
14.9. Input circuit



15. Programming ACM-D2

15.1. Program structure




U 50.0Hz
Frequency threshold1
32
JOG OFF
JOG Mode and Motorpot.
33
u 10.0Hz
Frequency threshold2
34
SUB IMOT
34
SUB SLIP
36
SUB FFIX
33
SUB FEXC
33
DC 15%
DC brake voltage
38
t 0s
DC brake time
38
E 5.0s
Acceler. time ramp 2
38
F 5.0s
Deceler. time ramp 2
38
DEFAULT
Recall factory settings
39
SAVE ??
Save parameter
39
SET 000
SET PASSWORD
40
SAVE ??
Save parameter
40
a 0.0Hz
Skip band 1 Lower lim.
37
b 0.0Hz
Skip band 2 Lower lim.
37
c 0.0Hz
Skip band 3 Lower lim.
37
d 0.0Hz
Skip band 4 Lower lim.
37
A 0.0Hz
Skip band 1 Upper lim.
37
B 0.0Hz
Skip band 2 Upper lim.
37
C 0.0Hz
Skip band 3 Upper lim.
37
D 0.0Hz
Skip band 4 Upper lim.
37
A +5Hz
Preset frequency FFIX1
37
B +10Hz
Preset frequency FFIX2
37
C +20Hz
Preset frequency FFIX3
37
s 0.0Hz
Slip comp.
36
x 0.5Hz
Frequency threshold slipcomp.
36
zero 0
No-load current
36
I 82.0%
Motor current indication
34
S 150%
Current limit
34
S-INT 0
Inverter behaviour curr.limit
35
DY 5s
Delaytime curr.limit handling
35
HYS 3%
Curr.limit hysteresis
35
BERGES
Start-up message
51
L 42%
DISPLAY brightness
51
Available only on inverters with ACTIV display (Led display)
Press SELECT key
Press SHIFT + SELECT keys simultaneously
Press SHIFT + INC keys simultaneously
Function designation
Function description
See page
00000:00
Operating hours counter
45

15.2. Program level TAB1

1 33.62Hz **Function 1: Indication of the output frequency**	**TAB1**
The standard display of function 1 shows the inverter operating frequency in Hertz. This can be changed to other operating data by the setting of TAB3, func. DIS. **GENERAL HELP:** To access this help level (in function 1 only), press both **SHIFT** and **INC**. Basic help information is shown by a scrolling text in the display. To end the help function press any key. **Language select:** Setting of the language for the display readout (see instructions on the display). The language setting is automatically saved.	**Language select:** SELECT - Italian INC - German DEC - English

SUB TAB2 **Enter program level TAB2**	**TAB1**
The program level functions in TAB2 allows to configure analog and digital inputs and to program the BOOST characteristic, the maximum output voltage and the security features of the inverter. To enter program level TAB2 press both **SHIFT** and **SELECT** simultaneously.	

2 78.3% **Function 2: Motor voltage display**	TAB1
Setting function 2, the display shows the inverter output voltage in percent of the line input voltage.	

3 50.0Hz **Function 3: Maximum output frequency**	**TAB1**
This parameter defines the maximum frequency that the inverter will deliver to the motor. ATTENTION! *Ensure that the maximum frequency cannot damage the motor or the equipment and result in personal injury*	Range: 6...650 Hz (12...1300 Hz *****) Default: 50 Hz *****Vers.D2A-1300-xxx

4 0.0Hz **Function 4: Minimum output frequency**	**TAB1**
This parameter defines the minimum output frequency with the Speed reference signal at zero. See TAB3, SUB XPAR, SW4 for the connection between the Speed reference signal and the minimum frequency.	Range: 0...Fmax Default: 0 Hz

5 2.5s **Function 5: Acceleration time ramp 1**	**TAB1**
This parameter sets the time to accelerate the motor from 0 to 50 Hz. Use the following formula to determine the proper time for other frequencies: $Tx = 50 * \frac{TACC}{FEND}$ T_X: Time to set T_{ACC}: Acceleration time F_{END}: End frequency Ramp selection is controlled by term. 25. active ramp / term. 25: ramp 1 / OFF; ramp 2 / ON	Range: 0.05...1000 sec. Default: 2.5 sec.

6 2.5s **Function 6: Deceleration time ramp 1**	**TAB1**
This parameter sets the time to decelerate the motor from 50 to 0 Hz. Use the following formula to determine the proper time for other frequencies: $Tx = 50 * \frac{TDEC}{FEND}$ T_X: Time to set T_{DEC}: Deceleration time F_{END}: End frequency Ramp selection is controlled by term. 25. active ramp / term. 25: ramp 1 / OFF; ramp 2 / ON	Range: 0.05...1000 sec. Default: 2.5 sec.

7 50.0Hz **Function 7: Voltage/frequency ratio**	**TAB1**
Sets the frequency (knee-point frequency) at which the maximum inverter output voltage is reached. The maximum inverter output voltage depends on the mains voltage and on TAB2, function MOD. ATTENTION! ***An incorrect setting of this parameter may lead to the damage of the motor.***	Range: 30...650 Hz (30...1300 Hz *****) Default: 50 Hz *****Vers.D2A-1300-xxx

8 5% **Function 8: BOOST**	**TAB1**
This parameter defines the amount of boost added at low speed to increase the initial motor torque. The boost-characteristic is set with the parameter in TAB2, func. FFB. Values are in percent (%) of the line input voltage. ATTENTION! ***Care must by exercised with this adjustment as too much boost may cause excessive heating.***	Range: 0...40% Default: 5%

8+ 0% **Function 8+: Dynamic BOOST**	**TAB1**
This parameter may be programmed to provide additional torque boost during acceleration. Values are in percent (%) of line input voltage.	Range: 0...50% Default: 0%

8– 20% **Function 8–: U/f-ratio reduction during deceleration**	TAB1
This parameter defines the motor voltage reduction during deceleration to compensate the increase of the DC bus voltage in the reverse regenerative mode. Values are in % of the line input voltage.	Range: 0...20% Default: 20%

9 2.0s **Function 9: Static torque time**	TAB1
This parameter defines the holding brake activation time at zero speed. The amount of DC-Voltage applied to the motor windings is controlled by TAB1, func. 8 (BOOST). To configure the holding brake for continous operation at zero speed, set the parameter value to its maximum (25sec.) and press both **INC** and **DEC** simultaneously. "oooo" in the display indicates the activated continuous operation mode. In this case the holding brake can be deactivated only by deactivating the inverter (**ENABLE** = OFF, term. 11). ATTENTION! ***If the holding brake is used for long time or with high DC-Voltage, excessive motor heating may result.***	Range: 0...25 sec. Default: 2 sec.

U 50.0Hz **Function U: Frequency threshold FX1**	**TAB1**
This parameter is used to program a frequency threshold FX1. The outputs OC1, OC2 or REL may be programmed to signalize motor speed equal or greather than FX1. For programming of the outputs see TAB3, functions OC1,OC2 and REL.	Range: 0...Fmax Default: 50 Hz

JOG OFF **JOG function: JOG Mode and motorpotentiometer** | **TAB1**

If the JOG is enabled the output frequency may be controlled by the keyboard (INC and DEC buttons).
The frequency control in the JOG Mode is possible after the enable operation is done and by returning to TAB1, function 1.
The JOG Mode enable operation is signaled by the alternate visualization of the parameter value and of the "JOG" message. The impased value in TAB1, function 1 isn't savable.
When the JOG function is disabled, the inverter returns to the output frequency determined by the speed reference signal or by an eventually preset frequency.

With the "motorpotentiometer" function enabled (JOG MPt), the frequency control is made by terminal 25 (increase frequency) and terminal 26 (decrease frequency).

MPt1: the impased frequency isn't saved.
MPt2: the impased frequency is automatically saved after 2.5 seconds. After a restart the inverter returns to this frequency.

Enabling a preset frequency, this frequency is acquired by the motorpotentiometer even if the frequency is in the skip-band frequencies or is out of range f_{max} or f_{min}.
In the first case the inverter returns to the higher or the lower frequency of the skip-band in function of the input direction in the skip-band and immediatly after the preset frequency is disabled. In the second case the output frequency returns to f_{max} or f_{min} immediatly after the motorpotentiometer function is disabled.

Functioning modes:

a) Frequency control by the motorpotentiometer and control of the rotation sense by the REVERSING input terminal 15
(TAB2, SUBREF, function REF = 1, 3, 4 or 5)

If the rotation sense doesn't corrispond to the sense of the motor, the output frequency remains the same and the inverter signals "MPtFault".

Term. 25	Term. 26	Rotation sense	Reaction
OFF	OFF	Term. 15	without variation
ON	OFF	Term. 15	acceleration
OFF	ON	Term. 15	deceleration
ON	ON	-	deceleration and inverter STOP

b) Frequency and rotation sense control by the motorpotentiometer
(TAB2, SUBREF, function REF = 2)

Term. 25	Term. 26	Rotation sense	Reaction
OFF	OFF	CW/CCW	without variation
ON	OFF	CW	acceleration
OFF	ON	CW	deceleration
OFF	ON	CCW	acceleration
OFF	ON	CCW	acceleration
ON	OFF	CCW	deceleration
ON	OFF	CW	acceleration
ON	ON	CW/CCW	deceleration and inverter STOP

Range: ON, OFF
MPt1, MPt2

Default: OFF

Motorpotentiometer function available only with software D2A-STD

u 10.0Hz **Function u: Frequency threshold FX2**	**TAB1**
This parameter is used to program a frequency threshold FX2. The outputs OC1, OC2 or REL may be programmed to signalize motor speed equal or greather than FX2. The threshold FX2 can also be used for automatic ramp switching (see TAB3, SUB XPAR, func. SW6). For programming of the outputs see TAB3, functions OC1,OC2 und REL.	Range: 0...Fmax Default: 10.0 Hz

SUB IMOT **Output current measurement**	**TAB1**
The functions under the Submenu IMOT make possible measurement, displaying and evaluate of the motor current. To enter the submenu press both **SHIFT** and **SELECT** simultaneously.	

I 82.0% **Function I: Motor current indication**	**TAB1**
This function indicates the actual inverter output current in % of the rated inverter current. The indication can be bypassed to function 1 of the main menu (see TAB3, func. DIS). The output current can be indicated on the analog meter output (term. 13; 10V = 200% I_{MOT}) (see TAB 3, func. AOUT).	**SUB IMOT**

S 150% **Function S: Current limit**	**TAB1**
This parameter defines a current limit for the inverter (in % of the rated inverter current). The limit value can be set internally by means of the function S or externally by means of an analog signal (0...10 V DC) applied to terminal 17 (input AN-IN/OUT). Setting the external current threshold: Set the threshold to 200% and then press the **INC** key once more. “rem xxx%” is now shown on the display, whereby xxx corresponds to the setpoint at terminal 17. The behaviour of the inverter, when the output current exceeds the limit, is programmable (see TAB1, func. S-INT). This condition can also be indicated on the outputs OC1, OC2, REL. (see TAB3, func. OC1, OC2, REL).	**SUB IMOT** Range: 0...200% - rem Default: 150%

S-INT 0 **Function S-INT: Inverter behaviour at the current limit**	**TAB1**
This parameter defines the inverter behaviour when the output current exceeds the programmed limit: **0**: Internal handling disabled. **1**: The inverter is immediatly stopped. The display shows a blinking "ILIMIT". **2**: The inverter is stopped after a programmable delay (see TAB1, SUB IMOT, func. DY). The display shows a blinking "ILIMIT". **3**: The acceleration ramp is halted and will be continued after the output current drops below the current limit. The display shows a blinking "RAMP". **4**: The motor will decelerate until the output current drops below the current limit by the value of HYS (see TAB1, SUB IMOT, func. HYS). The display shows a blinking "HYST".	**SUB IMOT** Range: 0...4 Default: 0

DY 5.0s **Function DY: Delay time at the current limit handling**	**TAB1**
The inverter will wait for the time programmed with this parameter before indicating the exceeding of the output current and/or stopping (see TAB1, SUB IMOT, func. S-INT and TAB3, func. OC1,OC2,REL).	**SUB IMOT** Range: 0...20 sec. Default: 5 sec.

HYS 3% **Function HYS: Current limit hysteresis**	**TAB1**
Output current hysteresis in % of the rated inverter output current. When S-INT = 4 and the output current exceeds the limit (see TAB1, SUB IMOT, func. S), the motor will decelerate, until the output current will drop below the current limit by the value of HYS.	**SUB IMOT** Range: 2...30% Default: 3%

SUB SLIP **Submenu slip compensation** (Only with software D2A-STD)	**TAB1**
Submenu containing the slip compensation functions. To enter the submenu press both **SHIFT** and **SELECT** simultaneously.	

s 0.0Hz **Function s: slip compensation frequency**	**TAB1**
The frequency with wich is enlarged the inverter output frequency when the inverter rated current is reached (100%). ATTENTION! ***For a correct behaviour it is absolutely necessary to define the no-load current with the function zero. (See also function x)***	**SUB SLIP** Range: 0...20 Hz Default: 0 Hz

x 0.5Hz **Function x: frequency threshold for slip compensation**	**TAB1**
The slip compensation is enabled only for frequencies higher then this value. ATTENTION! ***With higher BOOST values this limit must be increased in order to avoid an eventually overcompensation produced by a high current at low speed. This fact could forbit the deceleration to ward 0Hz or the inversion of the rotation sense.***	**SUB SLIP** Range: 0...30 Hz Default: 0.5 Hz

zero 0 **Function zero: no-load current definition**	**TAB1**
No-load current measuring. The slip compensation is enabled only for currents greater then the no-load current. Manual tuning by pressing the INC and DEC buttons or automatic measuring when the motor has no-load condition by pressing the SHIFT and SELECT buttons (the inverter signals "scan"). The maximum value of 110 corrispond to 85% of the rated inverter current.	**SUB SLIP** Range: 0...110 Default: 0

SUB FFIX **Submenu preset frequencies** | **TAB1**

The parameters of this submenu are used to set the three preset speeds. The sign of the parameter value defines the rotating sense of the motor (**+** forward; **-** reverse).

In order to permit control of the direction of rotation of the preset frequencies via terminal 15, it is necessary to deactivate the sign + or – by simultaneously pressing the keys **INC** and **DEC** after setting the desired value.

Refer to the following table for proper selection of preset frequencies.

Terminal 23	Terminal 24	Frequency
OFF	OFF	Speed reference signal
ON	OFF	FFIX1
OFF	ON	FFIX2
ON	ON	FFIX3

SUB FFIX

Range:
–650...0...+650
(–1300...0...+1300 Hz *)

*Vers.D2A-1300-xxx

A +5Hz	**Function A:**	**Preset-speed FFIX1**	(Default: +5 Hz)
B +10Hz	**Function B:**	**Preset-speed FFIX2**	(Default: +10 Hz)
C +20Hz	**Function C:**	**Preset-speed FFIX3**	(Default: +20 Hz)

SUB FEXC **Submenu skip frequencies** | **TAB1**

The parameters of this submenu are used to set up to four different skip frequency bands. A skip band is set by programming an upper and a lower limit for this band. Skip bands may be programmed to avoid certain mechanical resonances in the drive system. If upper and lower limits for a Skip band are equal, this band will be deactivated.
The setting is done programming a lower and an upper limit for each frequency range.

Range:
0...650
(0...1300 Hz *)

Default: 0 Hz

*Vers.D2A-1300-xxx

a 0.0Hz	**Function a:**	**Skip-band 1**	lower limit
A 0.0Hz	**Function A:**	**Skip-band 1**	upper limit
b 0.0Hz	**Function b:**	**Skip-band 2**	lower limit
B 0.0Hz	**Function B:**	**Skip-band 2**	upper limit
c 0.0Hz	**Function c:**	**Skip-band 3**	lower limit
C 0.0Hz	**Function C:**	**Skip-band 3**	upper limit
d 0.0Hz	**Function d:**	**Skip-band 4**	lower limit
D 0.0Hz	**Function D:**	**Skip-band 4**	upper limit

DC 15% **Function DC: DC brake voltage**	**TAB1**
This parameter controls the amount of DC voltage applied to the motor windings during activation of the DC-brake. The DC-brake is activate during the time when term. 30 is activated and after deactivation of term. 30 for the time set by TAB1, func. t. Depending on TAB3, SUB XPAR, func. SW1 the motor may automatically restart at the end of DC-brake. ATTENTION! ***If a long DC-brake time is programmed, excessive motor heating may result.***	Range: 0...50% Default: 15%

t 0.0s **Function t: DC brake time**	**TAB1**
After deactivating term. 30 the DC-brake will remain active for the period set by this parameter. ATTENTION! ***The motor may restart automatically at the end of the DC-brake time depending on TAB3, SUB XPAR, func. SW1.***	Range: 0...20 sec. Default: 0 sec.

E 5.0s **Function E: Acceleration time ramp 2**	**TAB1**
This parameter sets the time to accelerate the motor from 0 to 50 Hz. Use the following formula to determine the proper time for other frequencies: $Tx = 50 * \frac{TACC}{FEND}$ T_X: Time to set T_{ACC}: Acceleration time F_{END}: End frequency Ramp selection is controlled by term. 25. active ramp | term. 25 ramp 1 | OFF ramp 2 | ON	Range: 0.05...1000 sec. Default: 5.0 sec.

F 5.0s **Function F: Deceleration time ramp 2**	**TAB1**
This parameter sets the time to decelerate the motor from 50 to 0 Hz. Use the following formula to determine the power time for other frequencies: $Tx = 50 * \frac{TDEC}{FEND}$ T_X: Time to set T_{DEC}: Deceleration time F_{END}: End frequency Ramp selection is controlled by term. 25. active ramp | term. 25 ramp 1 | OFF ramp 2 | ON	Range: 0.05...1000 sec. Default: 5.0 sec.

DEFAULT **Recall factory settings**	**TAB1**
The original factory settings for all parameters can be restored by pressing both **INC** and **DEC** simultaneously for 5 sec. A blinking "DEFAULT" indicates that recalled parameters are not stored. To store the recalled parameter values into the non volatile inverter memory execute the SAVE - function. ATTENTION! ***The recall of default parameter values can change the drive system caracteristics subtiantially.***	

SAVE ?? **Save parameter**	**TAB1**
By pressing both **INC** and **DEC** simultaneously the parameter values are stored in the internal non-volatile inverter memory. At the end of the Save-function the program returns to TAB1, func. 1.	

15.3. Program level TAB2

TABLE 2 **Program level TAB2**	**TAB2**
The program level functions in TAB2 allows to configure analog and digital inputs and to program the BOOST characteristic, the maximum output voltage and the security features of the inverter.	

SUB TAB3 **Enter program level TAB3**	**TAB2**
The program level functions in TAB3 allows to configure the outputs, to access the diagnostic utilities and to program extended parameters. To enter program level TAB3 press both **SHIFT** and **SELECT** simultaneously.	

CLIP 2 **Function CLIP: Clipping of speed reference signal**	**TAB2**
This parameter allows to cut the speed reference signal at lowest frequencies in order to reduce the effect of noise on the speed reference line A speed reference signal below the limit as defined by the fellowing formula is cut to zero. $\text{Limit} = N * \frac{Fmax}{512}$ N.... CLIP parameter value	Range: 0...15 Default: 2

FILTER 3 **Function FILTER: Speed reference filter**	**TAB2**
The speed reference signal can be filtered by a digital filter. The line constant of the filter is set by this parameter.	Range: 0...6 Default: 3

SUB LOG **Submenu logic levels of digital inputs**	**TAB2**
The logic level of digital inputs can be changed between HIGH-and LOW-active. Inputs (except **ENABLE** and **START/STOP**) may be deactivated by setting the corresponding parameter to OFF. Any change in this submenu becomes active after a save and a restart of the inverter (Soft-Reset or POWER ON - Reset). A point in the display indicates that parameter values were modified but not saved. **L1 LOW** **ENABLE** term. 11 (OFF not possible) **L2 LOW** **REVERSING** term. 15 **L3 LOW** **START/STOP** term. 16 (OFF not possible) **L4 LOW** **PRESET FREQ. 1** term. 23 **L5 LOW** **PRESET FREQ. 2** term. 24 **L6 LOW** **RAMP SELECT** term. 25 **Motorpotentiometer** (increase frequency) (TAB1, func. JOG = MPt) **L7 LOW** **Motorpotentiometer** (decrease frequency) term. 26 (TAB1, func. JOG = MPt) **DC - Brake** when ACM - Synchronizer (Option) is used (activation ACM - Synchronizer with L8 = OFF) **L8 LOW** **DC BRAKE** term. 30 **ACM - Synchronizer** (OFF)	**SUB LOG** Range: HIGH, LOW, OFF, ON Default: LOW

SUB REF **Submenu speed reference**	**TAB2**
The functions in the submenu SUB REF permit configuration and selection of the speed reference. To enter the submenu press both **SHIFT** and **SELECT** simultaneously.	

REF 1 **Function REF: Speed reference selection**

TAB2

SUB REF

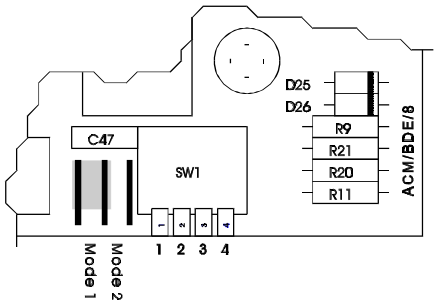
This parameter is used to define the type of external speed reference signal the inverter will be receiving from the corresponding control inputs. In order to work properly the jumpers must be set corresponding to the selected speed reference type.
Any modification of this parameter becomes active after a save and a restart of the inverter (Soft-Reset or POWER ON - Reset). A point in the display indicates that the parameter value was modified but not saved.

Speed reference type	Value	SWITCH SW1			
		1	2	3 *	4 *
0...10V	1	o	•	•	o
–10V...0...+10V	2	o	•	•	o
0...20mA	3	o	o	•	•
4...20mA	4	o	o	•	•
10V...0V	5	o	•	•	o
Potentiometer 0...10V	1	o	•	•	o
Potentiometer ±10V	2	•	o	•	o
o = open		• = closed			

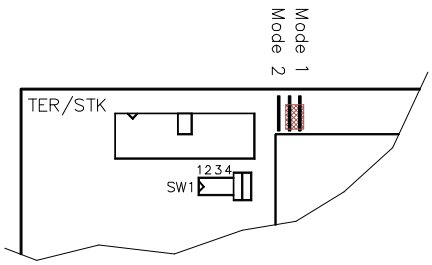
Range: 1...5

Default: 1

ACM-D2 0.37 - 22.0kW
Control board



ACM-D2 30.0 - 37.0kW
Control board



***** SWITCH SW1-3 and SW1-4 must not be closed if the speed reference input works as a differential input.

ATTENTION! ***The SWITCH must be set corresponding to the selected speed reference type.***

Fk 100% **Function Fk: Speed reference scaling**

TAB2

SUB REF

Scaling of the speed reference signal is possible by means of the parameter Fk. The programmed end values of the output frequency range are reached at the percentage of the scale end values of the selected setpoint range entered in the function Fk.

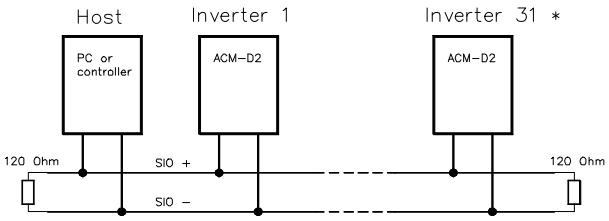
e.g. selected setpoint range: 4...20mA.

Fk = 50%; Fmax is reached at 10mA and Fmin at 2mA.

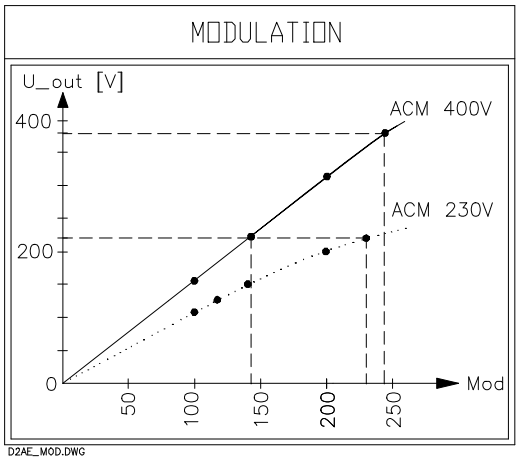
Range: 40...100%

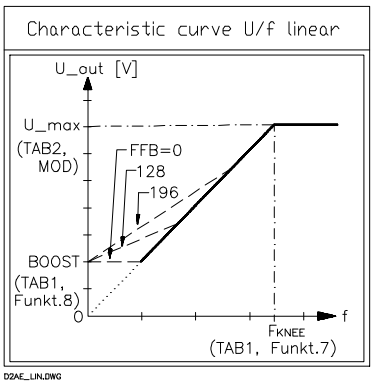
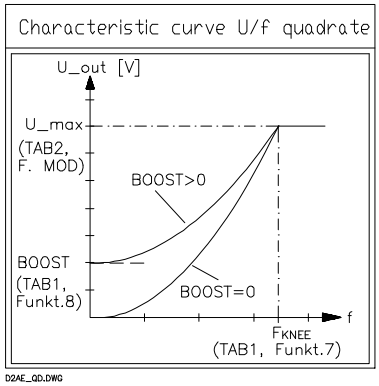
Default: 100%

AO 0% **Function AO: Fine tuning output frequency** (Only with software D2A-STD)	**TAB2**
The output frequency can be modified with an analog signal (0...10V) applied at the configurable analog input (terminal 17; configuration mode 1, see page 21). In this way is possible a fine tuning of the impased f_{nom} rating frequency. This parameter defines the maximum limit in percent of the f_{max} [1] or (f_{max} - f_{min}) [2] impased values. Regulation field: $V_{term.\ 17}$ = 0...5...10V: → $[f_{nom} - AO \times (f_{max})]...f_{nom}...[f_{nom} + AO \times (f_{max})]$ [1] $[f_{nom} - AO \times (f_{max} - f_{min})]...f_{nom}...[f_{nom} + AO \times (f_{max} - f_{min})]$ [2] [1] SW4 = ON [2] SW4 = OFF Example: AO = 10%; f_{max} = 50Hz; f_{min} = 10Hz; SW4 = OFF speed reference = 5V → f_{nom} = 25Hz $V_{term.\ 17}$ = 0V → f_{out} = 21Hz $V_{term.\ 17}$ = 5V → f_{out} = 25Hz $V_{term.\ 17}$ = 10V → f_{out} = 29Hz Note: This function is disabled if terminal 17 is configured like an input for the external current limit (see TAB1, SUBIMOT, function S).	SUB REF Range: 0...100% Default: 0%

SIO OFF **Funtion SIO: SIO address**	**TAB2**
SIO RS485 adress programming. On the RS485 bus may be linked till **32 nodes** (e. g. 1 Host and 31 inverters). The network must be arranged in a linear form and the layout cables must be twisted and/or shielded. It is recommended to finish the net at its endings with a 120 Ohm impedance specially when the distances are long.  ***** The range of adress numbers depends on the installed software. Software D2A-STD: 1...127. Software D2A-1300: 1...15.	Range: OFF...1...127 ***** Default: OFF

BrLim 0 **Dynamic braking protection**	**TAB2**
The dynamic braking circuit can be protected from overload activating this protection function. If the braking power exceeds the programmed limit, the motor is ramped down to zero and the inverter is stopped. The programmed value corresponds to the max. braking power. **0** : Braking protection function disabled. **1...15** : A value different from 0 corresponds to the braking power limit. ATTENTION! ***Select the limit value according to the power capability of the braking circuit.***	Range: 0...15 Default: 0

MOD xxx **Function MOD: Modulation degree**	**TAB2**
This parameter defines the output voltage the inverter will deliver to the motor when reaching the knee-frequency. The diagram shows how the output voltage corresponds to the Modulation degree. The maximum output voltage depends from the full line input voltage. 	Range: 0...255 Default: ACM230V 230 ACM400V 245

FFB 196 **Function FFB: BOOST form factor**	TAB2
This function defines the boost characteristics, as shown in the diagram. The U/f characteristic may be linear or quadratic. The U/f characteristic is linear with a gradient proportional to the value of FFB for FFB values between 0 and 255. A quadratic U/f characteristic is obtained by setting FFB to zero and pressing the **DEC** key once more. “FFB quad” is then shown on the display.  	Range: quad..0..255 Default: 196

PASS 000 **Function PASS: PASSWORD**	**TAB2**
If a password has been assigned (PASSWORD <> "000"), to enter the functions SECUR and SET PASS, the access code must be entered in this function.	

SECUR. 0 **Function SECUR: Security code**	**TAB2**
Setting of the requested security level: **0**: SECURITY off. **1**: SECURITY Level 1 Parameters can be modified but not saved. Any attempt to save will be interrupted and the message "SECUR.1" will be displayed. **2**: SECURITY Level 2 Parameters cannot be modified or saved. Any attempt to modify or save will be interrupted and the message "SECUR. 2" will be displayed.	Range: 0...2 Default: 0

SET 000 **Function SET PASS: SET PASSWORD**	**TAB2**
This function is used to set a password. If a password has been assigned (PASSWORD <> "000"), to enter the functions SECUR and SET PASS, the access code must be entered in function PASSWORD.	Range: 0...999 Default: 0

SAVE ?? **Save parameter**	**TAB2**
By pressing both **INC** and **DEC** simultaneously the parameter values are stored in the internal non-volatile inverter memory. At the end of the Save-function the program returns to TAB2, func. CLIP.	

15.4. Program level TAB3

TABLE 3 **Program level TAB3**	**TAB3**
The program level functions in TAB3 allows to configure the outputs, to access the diagnostic utilities and to program extended parameters.	

SUB DIAG **Submenu DIAGNOSTICS**	**TAB3**
	SUB DIAG

SOLL xx	Speed reference signal indication on term. 8 or 29 (dig. 9 bit 0...511)
ANA xx	Input AN-IN/OUT term. 17 (configuration mode 1, see page 21)
PortE	Status of port E
PortA	Status of port A
STAT U27	Status of U27
STAT U31	Status of U31
STAT U1	Status of U1
STAT U2	Status of U2
Error1	Last error
Error2	2.nd error
Error3	1.st error
Software:	Software release NAME/REL Nr./DATE/TYPE (scrolling text)
XXXXX:XX	Operating hours counter

Hours

Minutes

A.out 0 **Function Aout: Analog output**	**TAB3**
This parameter defines what the analog meter output (term. 13) will indicate.	Range: 0...2

Parameter value	Description
0	Output proportional to Fout. The frequency value corrisponding to full scale (10V) can be set in TAB3, func. Fm.
1	Output proportional to output current. Full scale (10V) = 200% of inverter rated device current.
2	Digital frequency indication. Square wave signal corrisponding to the motor frequency. (10V, duty cycle 50%). This parameter can only set, when the value in TAB2, function SIO is OFF.

Default: 0

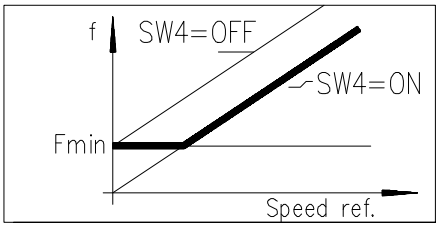
Fm 50.0Hz **Function Fm: Full scale frequency value**	**TAB3**
This parameter defines the full scale (10V) frequency value on the analog meter output (term. 13).	Range: 5...650 Hz (10...1300 Hz *) Default: 50 Hz *Vers.D2A-1300-xxx

SUB XPAR **Submenu extended parameters**	**TAB3**
Setting of eigth extended inverter parameters. To enter the submenu press both **SHIFT** and **SELECT** simultaneously.	

SW1 ON **Function SW1: DC - Brake**	**TAB3**
This function controls the motor at the end of the DC-brake operation. **ON**: The motor stops at the end of the DC-brake time. To restart the motor open and than close **START/STOP** or **ENABLE**. **OFF**: The motor will restart automatically at the end of the DC-brake time.	**SUB XPAR** Range: ON, OFF Default: ON

SW2 OFF **Function SW2: Input config. START/STOP and REVERSING**	**TAB3**
OFF: term. 16 = START/STOP term. 15 = REVERSING **ON**: term. 16 = START CW term. 15 = START CCW	**SUB XPAR** Range: ON, OFF Default: OFF

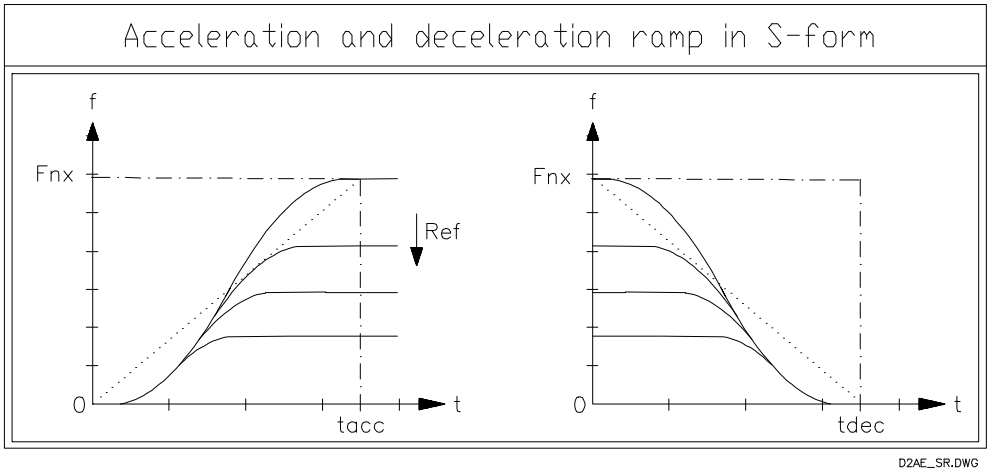
SW3 ON **Function SW3: Error reset**	**TAB3**
This function defines how the drive can be resetted after an error (except hardware errors). **ON**: To reset the drive open and then close **START/STOP** or **ENABLE** or set the speed reference signal to zero. (This works only when f-min = 0 and with no preset frequency selected). **OFF**: To reset the drive execute a Soft - Reset or POWER ON - Reset.	**SUB XPAR** Range: ON, OFF Default: ON

SW4 ON **Function SW4: Fmin configuration**	**TAB3**
This function defines the inverter behaviour at Fmin. Two different settings are possible (see the following diagramm).  **Fmin** : Value TAB1, function 4. **f** : Output frequency. **Speed ref.** : Speed reference value.	**SUB XPAR** Range: ON, OFF Default: ON

SW5 ON **Function SW5: Error signalling relay configuration**	**TAB3**
This function defines when the fault relay (term. 122,123,124) becomes active. **ON**: Fault relais becomes active on fault or when the inverter is disabled. **OFF**: Fault relais becomes active only on fault.	**SUB XPAR** Range: ON, OFF Default: ON

SW6 OFF **Function SW6: DC - Brake trigger**	**TAB3**
ON: The DC-brake is activated automatically if the output frequency sinks below the frequency threshold 1 (TAB1, funct. U) and the setpoint input value is zero or manually by activating term. 30. **OFF**: The DC-brake is ON if terminal is activated. **Indication**: For the RESET to the DC-brake see configuration in TAB3, SUBXPAR, function SW1.	**SUB XPAR** Range: ON, OFF Default: OFF

SW7 ON **Function SW7: Autostart**	**TAB3**
This function defines the start condition for line start (POWER-ON). **ON**: With this setting, the inverter will turn on when the line power is applied and the **ENABLE** and **START/STOP**-command is present. **OFF**: Line start lockout. The inverter will not start upon application of the line power. **START/STOP** or **ENABLE** must be opened, then closed to start the drive.	**SUB XPAR** Range: ON, OFF Default: ON

SW8 OFF **Function SW8: "S" ramp**	**TAB3**
S-form acceleration and deceleration ramps are selected with this function. The ramp characteristic is calculated on the basis of the highest frequency value entered in Fmax (TAB1, function 3), or FFIX1–FFIX3 (TAB1, SUB FFIX) and is symmetrical with respect to the point of inflection. The point of inflection is located at the frequency corresponding to half of the applied setpoint.  Fnx = Highest value from Fmax, FFIX1–FFIX3.	**SUB XPAR** Range: ON, OFF Default: OFF

R_Sel 0 **Function R_Sel: Activation of the 2.nd set of ramp time**	**TAB3**
0: Manual ramp selection via terminal 25. **1**: Automatic ramp selection: Automatic switchover to the second ramp set occurs when FX2 (TAB1, function u) is reached. **2**: Automatic ramp selection when FX2 (TAB1, function u) is reached or manual ramp selection via terminal 25. **3**: CCW rotation: ramp set 1 active. CW rotation: ramp set 2 active. **4**: CCW rotation: ramp set 1 active. CW rotation: ramp set 2 active or manual ramp selection via terminal 25.	Range: 0...4 Default: 0

REL +3 **Function REL: Relay output configuration (term. 19, 20)** — **TAB3**

This function defines the condition which will cause the auxiliary relay to operate. It may be programmed for one of 11 conditions.
The sign defines if the relay closes or opens at condition.

Range: –11..0..+11

Default: +3

sign : **+**: relay closed at condition.
- : relay open at condition.

code:

0: Motor speed greather than FX1 (TAB1, func. U).
1: Motor speed greather than FX2 (TAB1, func. u).
2: Motor has reached the end of the ramp. Indication at 0Hz included.
3: Motor speed = 0 Hz.
4: Motor speed = 0 Hz. Message at the end of the torque holding time. (see TAB1, func. 9).
5: Output current limit exceeded (TAB1, SUB IMOT, func. S).
6: Output current limit exceeded; Message at the end of the programmed delay time (TAB1, SUB IMOT, func. DY).
7: + : Relay activ when motor rotates in counter-clockwise direction (CCW).
– : Relay activ when motor rotates in clockwise direction (CW).
8: The dynamic braking power is near the programmed limit (TAB2, funct. BrLim).
9: Motor has reached the end of the ramp. Indication at 0Hz excluded.
10: The inverter (heat sink) temperature reaches the limit value. (Only with Softw. D2A-STD)
11: The motor temperature reaches the limit value. (Only with Softw. D2A-STD)

OC1 –2 **Function OC1: Open collector output 1 (term. 21)** — **TAB3**

Function OC1 defines the condition which will cause the open collector output OC1 to operate. It may be programmed to one of 11 conditions. The sign defines the output level for OC1 (ACTIVE or NOT ACTIVE) at condition.

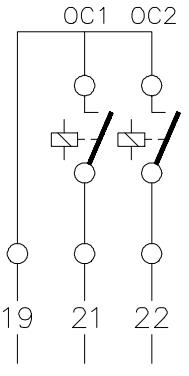
Range: –11..0..+11

Default: –2

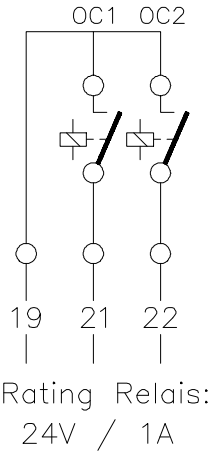
sign: **+**: NOT ACTIVE (HIGH) at condition.
- : ACTIVE (LOW) at condition.

code:

0: Motor speed greather than FX1 (TAB1, func. U).
1: Motor speed greather than FX2 (TAB1, func. u).
2: Motor has reached the end of the ramp. Indication at 0Hz included.
3: Motor speed = 0 Hz.
4: Motor speed = 0 Hz. Message at the end of the torque holding time (see TAB1, func. 9).
5: Output current limit exceeded (TAB1, SUB IMOT, func. S).
6: Output current limit exceeded; Message at the end of the programmed delay time (TAB1, SUB IMOT, func. DY).
7: +: Output activ or relay picks up when motor rotates in counter-clockwise direction (CCW).
-: Output activ or relay drops out when motor rotates in clockwise direction (CW).
8: The dynamic braking power is near the programmed limit (TAB2, funct. BrLim).
9: Motor has reached the end of the ramp. Indication at 0Hz excluded.
10: The inverter (heat sink) temperature reaches the limit value. (Only with Softw. D2A-STD)
11: The motor temperature reaches the limit value. (Only with Softw. D2A-STD)



Option REL (see adjacent diagram):
Inverters which are equipped with the REL option possess relay outputs instead of the two open collector outputs. Programming is performed by way of the functions OC1 and OC2. The switching states and switching conditions correspond to the above.

OC2 –0 **Function OC2: Open collector output 2 (term. 22)**	**TAB3**
Function OC2 defines the condition which will cause the open collector output OC2 to operate. It may be programmed to one of 11 conditions. The sign defines the output level for OC1 (ACTIVE or NOT ACTIVE) at condition. sign: **+**: NOT ACTIVE (HIGH) at condition. **-** : ACTIVE (LOW) at condition. code: **0**: Motor speed greather than FX1 (TAB1, func. U). **1**: Motor speed greather than FX2 (TAB1, func. u). **2**: Motor has reached the end of the ramp. Indication at 0Hz included. **3**: Motor speed = 0 Hz. **4**: Motor speed = 0 Hz. Message at the end of the torque holding time (see TAB1, func. 9). **5**: Output current limit exceeded (TAB1, SUB IMOT, func. S). **6**: Output current limit exceeded; Message at the end of the programmed delay time (TAB1, SUB IMOT, func. DY). **7**: +: Output activ or relay picks up when motor rotates in counter-clockwise direction (CCW). -: Output activ or relay drops out when motor rotates in clockwise direction (CW). **8**: The dynamic braking power is near the programmed limit (TAB2, funct. BrLim). **9**: Motor has reached the end of the ramp. Indication at 0Hz excluded. **10:** The inverter (heat sink) temperature reaches the limit value. (Only with Softw. D2A-STD) **11:** The motor temperature reaches the limit value. (Only with Softw. D2A-STD) Option REL (see adjacent diagram): Inverters which are equipped with the REL option possess relay outputs instead of the two open collector outputs. Programming is performed by way of the functions OC1 and OC2. The switching states and switching conditions correspond to the above.	Range: –11..0..+11 Default: –0 

SUB DISP **Submenu Display indication**	**TAB3**
This submenu defines what the display will indicate in TAB1, func. 1. To enter the submenu press both **SHIFT** and **SELECT** simultaneously.	

DIS 0 **Function DIS: Display indication TAB1, func. 1**	**TAB3**
Function DIS defines what the display will indicate in TAB1, func. 1. **0**: Motorfrequency in Hz **1**: Motorcurrent in % of rated inverter current (only with current meas. hardw.) **2**: RPM for a 2-pole motor **4**: RPM for a 4-pole motor **6**: RPM for a 6-pole motor **8**: RPM for a 8-pole motor	**SUB DISP** Range: 0...8 Default: 0

BERGES **Power-on message**	**TAB3**
The 8-character power-on message which is displayed during the self-test is programmed in this function. Cursor positioning with the **SHIFT** key. Character selection with the keys **INC** and **DEC**. The set characters are stored automatically.	**SUB DISP** Range: Display characters Default: BERGES

L 42% **Function L: Display brightness**	**TAB3**
Adjustment of the display brightness. Display in %. **This function is available only on inverters with ACTIV display (LED display).**	**SUB DISP** Range: 14...100% Default: 42%

SAVE ?? **Save parameter**	**TAB3**
By pressing both **INC** and **DEC** simultaneously the parameter values are stored in the internal non-volatile inverter memory. At the end of the Save-function the program returns to TAB3, func. 1.	

16. Braking chopper ACM - D2

16.1. Braking chopper 0.37 kW - 1.1 kW (1 x 230V)

The inverters ACM-D2 0.37 - 1.1 kW are equipped as standard with an internal dynamic braking chopper.

Braking resistance: 50 Ohm/50 Watt.

16.2. Braking chopper 0.75 kW - 37.0 kW (3 x 400V)

The inverters ACM-D2 0.75 - 37.0 kW are equipped as standard with an control unit for dynamic braking chopper. Brake operation is possible after connection of an external brake resistor.

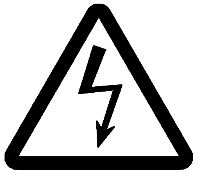
16.2.1. Minimum values for braking resistors (accessory)

The permitted minimum values for braking resistors depend on the respective inverter type and are shown in the table below. The power rating of the braking resistors must be selected corresponding to the required braking power.

Inverter	Minimum braking resistance
ACM-D2 2.2 kW (230 V)	47 Ohm
ACM-D2 0.75 - 4.0 kW (400 V)	75 Ohm
ACM-D2 5.5 - 37.0 kW (400 V)	20 Ohm

16.2.2. Assembling the braking resistor

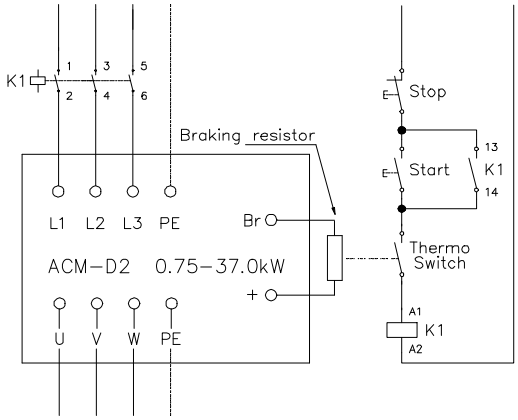
The braking resistor is connected to terminals **(+)** and **(Br)** of the terminal strip. The length of the connecting cables must not exceed 2 m.



The safety notes in this manual (Chapter 1, Page 3) must be followed exactly if work is performed inside the inverter!

ATTENTION!

The braking resistor must be equipped with a temperature monitoring device which isolates the inverter from the mains supply if the braking circuit is overloaded.



17. Accessories

17.1. Programming key

The programming key permits the parameter values of the inverter to be read out, read in and saved in a very simple way.

Loading the parameter values of the inverter in the programming key:

- Insert the programming key in the terminal “Serial I/O”.
- The current parameter values of the inverter are transferred to the key memory when the **INC** key on the inverter is pressed.

Programming the inverter with the data stored in the programming key:

- Insert the programming key in the terminal “Serial I/O”.
- The current parameter values of the programming key are transferred to the inverter memory when the **DEC** key on the inverter is pressed.

When the parameters are transferred between different software versions, then must be taken into consideration the following points:

- The motorpotentiometer values are not transferred for security reasons.

- Transfer to the D2A-STD-014 from an older version:

  The values in the version 014 programmed for the slip compensation (parameters s, x, zero) and for the ADC-Offset (parameter AO) remains unchanged.

  In the older versions the standard value for the logic level L7 (TAB2, SUB LOG) is OFF. After the data transfer from an older version it must be controlled L7 and eventually modified before the motorpotentiometer is turned on.

- Transfer from the D2A-STD-014 to older versions:

  In the version 014 the functions REL, OC1 and OC2 are extended (values +/-9, +/-10 and +/-11). These functions are not sustained by the older versions and are automatically modified during the transfer. The data related to these functions must be controlled and, if necessary, modified.

  Older versions have not motorpotentiometer function. If a parameter set is transferred with the motorpotentiometer function enabled, in the older versions is automatically activated the speed reference input. If this parameter set is again transferred to the version 014, the motor-potentiometer function is again enabled.

17.2. Software KEYSOFT

The software KEYSOFT permits transfer of parameter values from KEY to the PC and vice versa. Data can be saved on the PC.

System requirements:

- Personal computer AT-compatible with serial interface RS 232 (COM1 or COM2).
- Operating system DOS 3.21 or higher.

- The software KEYSOFT is supplied together with an interface converter which permits conversion of the data between RS 232 and RS 485.

Operation of the software is described in a separate manual.

17.3. Telecomander RC

The telecomander RC allows to remote control up to 15 inverters connected on the same RS485 bus. After selection all functions of the inverter can be controlled and saved by way of the telecomander keypad.

17.4. DVM - PLUS MP

Multifunctional device with a 2 lines display (visualization programmable). When is linked to the inverter by the RS485 interface, it is permitted to access all the inverter functions and to use the motorpotentiometer function.

17.5. ACM - Synchronizer

The ACM - Synchronizer furnished the number of revolutions and the rotation sens of a motor wich isn' t under voltage at the measurement moment. A ACM-D2 inverter linked with the motor and helped by these informations is able to rotate directly with the speed of the motor.

18. Faults and remedies

The inverter is equipped with devices for error detection and error signalling.

Error signals are routed to the error signalling relay (250V AC 1A; terminals 122, 123 and 124) and shown on the display.

Fault	Possible cause	Fault remedy
Motor does not run	No mains voltage	Check mains voltage.
	ENABLE or START/STOP missing	The motor can start only when both signals are active and when a setpoint deviating from 0 is present.
	Setpoint missing	Check setpoint at terminal 8 or 29.
	Unit not connected correctly	Check all connections.
	Motor blocked	Check drive.
	Internal inverter fault	Sending unit for repair.
Motor runs too slowly	“Fmax” is set too low	Increase “Fmax”.
	Setpoint not sufficient (terminal 8 or 29)	Check setpoint.
	Motor running with slip	Increase acceleration time or reduce “Fmax”.
Output current of inverter too high	U/f ratio incorrect	Set new U/f ratio or reduce “Fmax”.
Overcurrent during acceleration	Starting torque too high	Reduce starting torque.
	Acceleration time too short	Increase acceleration time.
	Motor running with slip	Increase acceleration time.
Overvoltage	Mains voltage too high	Measure mains voltage.
	Voltage peaks caused by switching large loads on the network	Determine cause and take counter-measures (e.g. mains filter).
	Braking operation	Increase deceleration time or use external braking chopper.
Heat sink temperature too high	Output stage overloaded	Check ambient temperature of inverter. Check whether inverter is correctly dimensioned for the application.

19. Functions of ACM-D2

		Function		Page	Works setting (Default)	Adjustment range	Customer setting
		Design.	Description				
TAB1		1	Output frequency indication	30	-	-	
		2	Motor voltage indication	30	-	-	
		3	Maximum output frequency	30	50 Hz	6...650 Hz (12...1300 Hz *)	
		4	Minimum output frequency	30	0 Hz	0...Fmax	
		5	Acceleration time ramp 1	31	2.5 sec.	0.05...1000 sec.	
		6	Deceleration time ramp 1	31	2.5 sec.	0.05...1000 sec.	
		7	U/f-ratio	31	50 Hz	30...650 Hz (30...1300 Hz *)	
		8	BOOST	31	5 %	0...40 %	
		8+	Dynamic BOOST	32	0 %	0...50 %	
		8-	U/f ratio reduction	32	20 %	0...20 %	
		9	Static torque time	32	2 sec.	0...25 sec.	
		U	Frequency threshold FX1	32	50 Hz	0...Fmax	
		JOG	JOG Mode and motorpotentiometer	33	OFF	ON - OFF - MPt1 - MPt2	
		u	Frequency threshold FX2	34	10.0 Hz	0...Fmax	
	SUB IMOT	I	Motor current indication	34	-	-	
		S	Motor current limit	34	150 %	0...200% - rem	
		S-INT	Inverter behaviour at the current limit value	35	0	0...4	
		DY	Delay time at the current limit value	35	5 sec.	0...20 sec.	
		HYS	Current limit hysteresis	35	3 %	2...30 %	
	SUB SLIP	s	Slip compensation frequency	36	0 Hz	0...20 Hz	
		x	Frequency threshold slip compensation	36	0.5 Hz	0...30 Hz	
		zero	No-load current	36	0	0...110	
	SUB FFIX	A	Preset frequency FFIX1	37	+5 Hz	-650..0..+650 Hz (-1300..0..+1300 Hz *)	
		B	Preset frequency FFIX1	37	+10 Hz	-650..0..+650 Hz (-1300..0..+1300 Hz *)	
		C	Preset frequency FFIX1	37	+20 Hz	-650..0..+650 Hz (-1300..0..+1300 Hz *)	
	SUB FEXC	a	Skip-band 1 Lower limit	37	0 Hz	0...650 Hz (0...1300 Hz *)	
		A	Skip-band 1 Upper limit	37	0 Hz		
		b	Skip-band 2 Lower limit	37	0 Hz		
		B	Skip-band 2 Upper limit	37	0 Hz		
		c	Skip-band 3 Lower limit	37	0 Hz		
		C	Skip-band 3 Upper limit	37	0 Hz		
		d	Skip-band 4 Lower limit	37	0 Hz		
		D	Skip-band 4 Upper limit	37	0 Hz		
		DC	DC brake voltage	38	15 %	0...50 %	
		t	DC brake time	38	0 sec.	0...20 sec.	
		E	Acceleration time ramp 2	38	5.0 sec.	0.05...1000 sec.	
		F	Deceleration time ramp 2	38	5.0 sec.	0.05...1000 sec.	

		Function		Page	Works setting (Default)	Adjustment range	Customer setting
		Design.	Description				
TAB2		**CLIP**	Clipping	39	2	0...15	
		FILTER	Speed reference filter	40	3	0...6	
	SUB LOG	**L1**	ENABLE input	40	LOW	HIGH - LOW	
		L2	REVERSING input	40	LOW	HIGH - LOW - OFF	
		L3	START/STOP input	40	LOW	HIGH - LOW	
		L4	PRESET FREQ. SEL. 1 input	40	LOW	HIGH - LOW - OFF	
		L5	PRESET FREQ. SEL. 2 input	40	LOW	HIGH - LOW - OFF	
		L6	RAMP SELECTION or **MOTORPOTENTIOMETER** input	40	LOW	HIGH - LOW - OFF	
		L7	MOTORPOTENTIOMETER or **DC - Brake** input	40	LOW	HIGH - LOW - OFF	
		L8	DC - Brake or **ACM - SYNCHRONIZER** input	40	LOW	HIGH - LOW - OFF	
	SUBREF	**REF**	Speed reference selection	41	1	1...5	
		Fk	Speed reference scaling	41	100%	40...100%	
		AO	Fine tuning output frequency (Only with softw. D2A-STD)	42	0%	0...100%	
		SIO	SIO address	42	OFF	OFF..1..127 (1...15) *****	
		BrLim	Dynamic braking protection	43	0	0...15	
		MOD	Modulation degree	43	230V 230 400V 245	0...255	
		FFB	BOOST form factor	43	196	quad...0...255	
		PASS	PASSWORD	44	-	-	
		SECUR	Security code	44	0	0...2	
		SET	SET PASSWORD	44	0	0...999	

		Function		Page	Works setting (Default)	Adjustment range	Customer setting
		Design.	Description				
TAB3	SUB DIAG	SOLL	Speed reference signal (terminal 8 or 29)	45	-	-	
		ANA	Input AN-IN/OUT	45	-	-	
		Port E	Status PortE	45	-	-	
		Port A	Status Port A	45	-	-	
		U27	Status U27	45	-	-	
		U31	Status U31	45	-	-	
		U1	Status U1	45	-	-	
		U2	Status U2	45	-	-	
		ERROR 1	Last error indication	45	-	-	
		ERROR 2	2.nd error indication	45	-	-	
		ERROR 3	1.st error indication	45	-	-	
		Software:	Software release	45	-	-	
		00000:00	Operating hours counter	45			
		Aout	Analog output configuration	45	0	0...2	
		Fm	Full scale frequency value	46	50 Hz	5...650 Hz (10...1300 Hz *)	
	SUB XPAR	SW1	DC brake configuration	46	ON	ON - OFF	
		SW2	START/STOP and REVERSING configuration	46	OFF	ON - OFF	
		SW3	Error reset (Autoreset)	46	ON	ON - OFF	
		SW4	Fmin configuration	47	ON	ON - OFF	
		SW5	Error signalling relay configuration	47	ON	ON - OFF	
		SW6	DC-brake trigger	47	OFF	ON - OFF	
		SW7	Autostart function	47	ON	ON - OFF	
		SW8	"S" ramp function	48	OFF	ON - OFF	
		R_Sel	2.nd set of ramp time selection	48	0	0...4	
		REL	Config. relay output term. 19,20	49	+3	-11..0..+11	
		OC1	Config. open coll. OC1 term. 21	49	-2	-11..0..+11	
		OC2	Config. open coll. OC2 term. 22	50	-0	-11..0..+11	
	SUB DIS	DIS	Display indication on TAB1, function 1	50	0	0...8	
		BERGES	Power-on messagge	51	BERGES	Set of eight alphanumeric signs	
		L	Display brightness (only with ACTIVE display)	51	42 %	14...100%	

***** Vers. D2A-1300-xxx

20. Notes

BERGES

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