



AMKASYN
VARIABLE SPEED DRIVES

AMKASYN

Digital inverters in modular construction

Start-up

AMKASYN drive systems AN, AZ, AW
AZ 05, AW 1,3/2,6 , ...

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Start-up

AMKASYN drive systems AN, AZ, AW
AZ 05, AW 1,3/2,6 , ...

1 General

In this guidance only the basic start-up of a drive system with main operation mode speed control with analog speed setpoint value is described. No optional cards are used. The motors are equipped with I type encoders. For motors with A type encoder the encoder adjustment procedure must be carried out before tuning the speed controller.

The signals „DC BUS enable“ (UE) and „Inverter On“ (RF) are fed in through the binary inputs at central module AZ. (UE is not existing and required at AZ 05).

Parameter entry and call-in of auxiliary modes during start-up exclusively occur via the control panel AZB.

For revised software versions additional parameters are introduced. They are not relevant for basic start-up. Please use the „Scroll down“ key to skip these ID-Numbers.

The separate manual „AMKASYN Parameters AZ“ does supply additional information and data related to the single parameters (ID-No.).

More comfortable and recommended by AMK is to use the AMK software AIPAR for parameter setting and start-up, running on a AT-compatible PC. During parameter setting and start-up the user is menu-assisted and supported by HELP texts. AIPAR makes it easy to configure complex modes, optional cards, output messages, analog output signals and so on. Complete parameter sets can be created off-line and then downloaded to the drive system. After finish of start up the optimized parameter set can be up-loaded into the PC for archiving.

2 Preparation

1. Master switch off.
2. Check correctness of wiring/connections and proper electrical connection.
Check strain relief for all cables.
The shield of the encoder cables must have no connection to the motor housing. The shield is connected to PE only at the inverter end. The shield of the motor cables must be connected to PE at the inverter end and at the motor end. The PTC sensors in the motors are connected at plug-in terminal block X54/X154 (RT1/RT2) of the related inverter module AW (PTC resistance cold is approx. 200 Ohm).
3. Ensure that all protective and safety devices/E-STOP circuit in the system are acting.
4. Define AW number
Each inverter module AW in the drive system receives its own number 1...8. This is set on the rotary coding switch „AWN“ (top right at the module AW) using a small screw driver. Multiple allocation of a AWN number is not permissible.
5. Set master switch on (mains on).

6. If existing in the drive system:

Check motor holding brake release if it is energized.

Caution with vertical axes!

Install safety dead stop before test and after remove it!

Check operation of motor fans.

Check operation of module fans (AZ 05, AW 2,5/5, AW 4,5/9).

(with the small size modular drive system only the modules AZ 05, AW 2,5/5 and AW 4,5/9 are equipped with a fan).

7. AZB display after mains on:

System Initialization

After successful booting:

System ready	CONTINUE
--------------	----------

(In case of error):

Error...	
----------	--

DIAGNOSIS	CONTINUE
-----------	----------

(With softkey  the diagnosis routine can be selected.
After this the related error message is displayed).

8.

F4 F2

(CONTINUE)

ERR.RESET	SYSTEM
DIAGNOSIS	START-UP

3 Parameter setting

1.

F4 F2

(START UP)

DIG.SPEED	MAN.JOG
PARAMETERS	G-PARAMETERS

2.

F4 F2

(G-PARAMETERS)

(G-PARAMETERS = Group parameters)

Parameter group:

System parameters

3. ID-No.: 32795 (don't change, default value)



4. ID-No.: 32796 (don't change, default value)



5. ID-No.: 32799 (don't change, default value)



6.



ID-No. 32 812	#1.1
Active drives	

7.



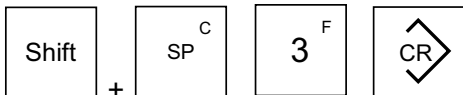
	0000 h	#1.1
Active drives		

Set „1“ for each active drive into the bit-position allocated to the AWN-No..Convert the bit pattern into hexadecimal and enter this value into ID-No. 32812.

Example: Drives 1, 2, 7 and 8 shall be active.

AWN-No.	8	7	6	5	4	3	2	1
Bit pattern	1	1	0	0	0	0	1	1
Hex-value	C				3			

8. Entry



9. Parameter set assignment AW1...



10. to Parameter set assignment AW8 remain without changes.

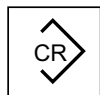


11.



ID-No. 32 821	#1.1
Password	

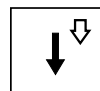
12.



0	#1.1
Password	

Through the password access to the parameters for unauthorized people is locked up. With „0“ in ID-No. 32821 (default value) the parameters are free accessible. This is recommended for start up and test procedures. Before shipment of the drive system, the wanted password must be entered into ID-No. 32821.

13. Slot assignment (don't change default value)

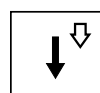


14.



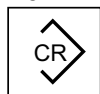
Parameter group
System parameters

15.



Parameter group:
Motor parameters:

16.

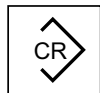


ID-No.: 111	#1.1
Mot. nom. current IN	

„#1.1“ indicates the active AW-No.. In this example inverter module AW1 with main parameter set 1 is active.

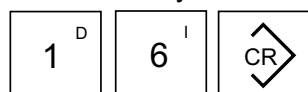
16.1 If a different AW-No./parameter set No. is required, press key . The cursor moves to „#1.1“. Enter the new AW-No. and parameter set No. and accept data with .

17.



A	2.5	#1.1
Mot. nom. current IN		

18. Entry of the nominal motor current I_N in [A] according to motor rating plate, e.g. 16A:



19.



1/min	6000	#1.1
Maximum motor speed		

20. **Enter maximum permissible motor speed for the process!**



21. Accept default value „20000“ unchanged.



Incr.	20000	#1.1
Resolution mot. encoder		

22.



A	2.0	#1.1
Magnetiz. current IM		

Enter magnetizing current I_M according to motor rating plate.



23.



A	1.0	#1.1
Magnetiz. current IM1		

Enter magnetizing current I_{M1} according to motor rating plate.



24.



Nm	2.0	#1.1
Nominal torque MN		

Enter nominal torque M_N according to motor rating plate.



25.



1/min	3000	#1.1
Nominal velocity		

Enter nominal speed n_N according to motor rating plate.



26.



Enter rotor time constant TR according to motor rating plate.

S	0.100	#1.1
Rotor time constant		



27.



Enter number of motor poles according to motor rating plate (the number of motor poles is included in the motor type designation, e.g. DV 10-29-4-A... (number of motor poles: 4)

	4	#1.1
Number of mot. poles		



28.



Enter number of motor encoder periods according to motor rating plate (P./Rev.), e.g. „1000“.

	50	#1.1
Mot. encoder periods/rev.		



29.



	1	#1.1
Encoder type		

Enter code „0“ for I type encoder (the encoder type is included in the motor type designation, e.g. DV 5 - 2 - 4 - I... ,I = I type encoder).
(For motor encoder type A code „1“ must be used).

Now all motor parameters for drive „AW1“ are entered. Next step is call for the next parameter group.

30.



Parameter group:
Motor parameter

31.



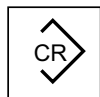
Parameter group:
Operating modes:

32.



ID-No.: 32800	#1.1
AMK main op. mode	

33.



The hexadecimal code „00010043“ defines as operation mode: speed control with analog setpoint value and activated ramp-up/-down.
(Don't change, default value).

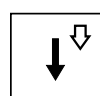
00010043h	#1.1
AMK main op. mode	

34.



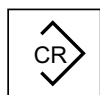
Parameter group: Operating modes

35.



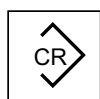
Parameter group: Torque parameters

36.



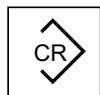
ID-No.: 82	#1.1
Positive torque limit	

37.

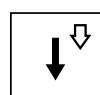


% MN	120	#1.1
Positive torque limit		

Enter value for the required positive torque limit in [%] of the nominal torque, e.. „200“.

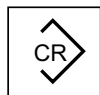


38.

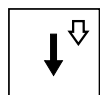


% MN	-120	#1.1
Negative torque limit		

Enter value for the required negative torque limit in [%] of the nominal torque with minus sign, e.g. „-200“.



39.



Repeated press „Scroll up“ key.
The parameters
„Torque polarity“
„Torque threshold Mdx“
„Torque rel. to 10V at A1“
are displayed. They are not relevant for basic function „speed control“. The default values remain unchanged.

40.



Parameter group:
Torque parameters

41.



Parameter group:
Speed parameters

42.



ID-No.: 38 #1.1
Pos. speed limit

43.



1/min 5000 #1.1
Pos. speed limit

Enter required value for positive speed limit (ID38 ≤ ID113 !).



44.



1/min -5000 #1.1
Neg. speed limit

Enter required value for negative speed limit with minus sign (| ID39 | ≤ ID113).



45.



0000h #1.1
Speed polarity

Don't change, default value.

46.



200 #1.1
Proportional gain KP

Enter small value for speed loop proportional gain KP, e.g. „100“.



47.



ms	50	#1.1
Integral action time TN		

Enter realitively high value for speed loop integral action time TN, e.g. „100“ ms.



48.



1/min	50	#1.1
Zero speed window		

49.



Repeated press „Scroll up“ key.
The parameters
„Speed threshold nx“
„Speed window“
„Low. adapt. limit“
„Upp. adapt. limit“
„Prop. gain adapt.“
„Int. act. time adapt.“
are displayed. They are not relevant
for basic function „speed control“.
the default values remain unchanged.

50.



1/min	3000	#1.1
Speed rel. to 10V at A1		

Enter the required setpoint speed
For 10 V at analog input A1. (ID32778 ≤ ID113).



51.



1/min	0.0000	#1.1
Speed offset at A1		

Not relevant in a first step.

52.



ms	100	#1.1
Acceleration ramp		

Enter required ramp-up time TH in [ms].
TH specifies the acceleration time from
zero to maximum speed (ID-No.: 113).



53.



ms	100	#1.1
Decleration ramp		

Enter required ramp-down time TL in [ms].
TL specifies the deceleration time from
maximum speed (ID-No.: 113) to zero.



54.



ms	10	#1.1
Decel. ramp RF inactive		



Enter required ramp-down time in [ms]. This ramp
becomes active, if RF is turned off while the motor
is running. It specifies the deceleration time from
maximum speed (ID-No.: 113) to zero.

For basic function „speed control“ the remaining parameters in this group and the remaining
parameter groups are without meaning.

55.



ERR.RESET	SYSTEM
DIAGNOSIS	START UP

Return to main menu.

56.



(START UP)

57.



(G-PARAMETERS)

58.



Parameter groups
Motor parameters

59. Change AW-No. / Parameter set No:

Press key . The cursor moves to „#1.1“.
Enter the new AW-No. and
parameter set No. and accept data with .

ID-No.: 111	#2.1
Mot. nom. current IN	

60. Repeat steps 16 to 59 for all axes in the system.

4 Start of the drive system

1. After basic parameter setting power must be switched OFF. (With AZ 05 wait > 10 s before ON again!)
2. Output „SBM“/„SBT“ (System Ready) is set after faultless booting and trouble-free drive status.
3. „Power output enable“ EF for all active axes must be set before „RF“ is activated.
(+ 24 V_{ext} to „EF“, 0 V_{ext} to „WEF“).
4. Apply + 24 V_{ext} to binary input „UE“ (DC BUS enable) and wait for handshake output „QUE“. (Not required for AZ 05).
5. Apply + 24 V_{ext} to binary input „RF“ (Inverters enable). With „RF“ all axes specified in ID32821 are activated. The motors are magnetized. Binary output „QRF“ (RF handshake) indicates, that all active drives are under control.
6. By the drift of the analog input circuit the motor shaft now can rotate slowly clockwise or counterclockwise.

5 Procedure for motor encoder adjustment (only for motors with A type encoder, not required for I type encoder).

For motors with A type encoder the encoder adjustment procedure must be carried out before tuning the speed controller. During the adjustment amplitude, offset and phase-angle of the A type encoder signals are fine-tuned. The then determined correction values are stored in the EEPROM on the associated AW module.

Call for encoder adjustment procedure:



ENC.ADJUST.	SERVICE
ERR.RESET	SYSTEM



Password:

(ENC.ADJUST.)

Enter Password („1 2 3 4 5“)



Enter AW-No. #0

Enter wanted AW-No.



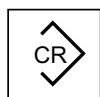
Rotate motor shaft	
MANUAL	JOG MODE



(JOG MODE)

Enter speed:
RPM

Enter low speed, e.g. „255“ RPM.



ABORT	
CW-rot.	CCW-rot.

As long as one of the softkeys  (positive direction of rotation) or  (negative direction of rotation) is pressed the motor shaft is rotating. For safe operation the motor should be without load during encoder adjustment procedure.

CAUTION at operation with coupled load. It is the operators responsibility to prevent possible collisions. Control and supervision functions for normal operation are not effective during encoder adjustment.

Rotate motor shaft (with changing rotation directions) until this message is displayed:

Encoder data ser. EEPROM

After storing of the correction values in the EEPROM this message is displayed:

Succesful enc. adjust.	
CONTINUE	

The motor encoder adjustment procedure must be carried out as described for all motors with A type encoder in the drive system.

6 Speed controller tuning

6.1 Configuration of analog outputs

By monitoring of the actual speed and torque value, the speed controller response can be evaluated. For that purpose actual speed and torque are recorded on a dual-trace storage oscilloscope as analog values. To achieve this, both variables have to be configured each at one of the four analog outputs AA1...AA4.

Example: Actual speed representation of drive AW1 at analog output AA1, output voltage 10 V at 500 RPM.

Actual torque representation of drive AW1 at analog output AA2, output voltage 10 V at 200% of nominal torque.

Parameters for actual speed configuration to output AA1:

Select AW1 via key . Enter „40“ in ID-No.: 32786 (Config. 32 bit AW message) of AW1 as code for „actual speed“.

1.



ERR.RESET	SYSTEM
DIAGNOSIS	START UP

2.



(START UP)

ENC.ADJUST	JOG MODE
PARAMETERS	G-PARAMETERS

3.



(PARAMETERS)

ID-No. 1	#1.1
NC cycle time	

4.



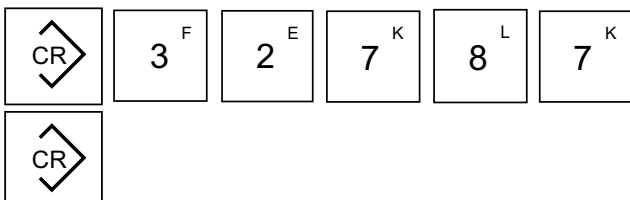
ID-No.: 32786	#1.1
Config. 32 bit AW message	

5.



40	#1.1
Config. 32 bit AW message	

6.



ID-No.: 32787	#1.1
Source analog ch.1	

7.

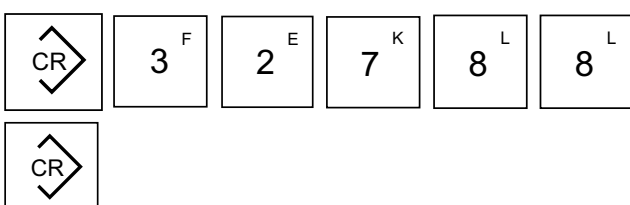


32786.1	#1.1
Source analog ch.1	

Accept default value „32786.1“

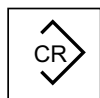
Analog output AA1 scaling:

8.



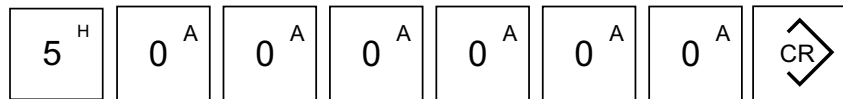
ID-No.: 32788	#1.1
Fin. analog value ch.1	

9.



5000000 #1.1
Fin. analog value ch.1

10.

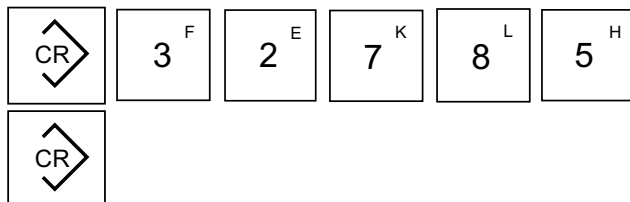


(500.0000 RPM correspond to 10V, entry in [0.0001 min⁻¹]).

Parameters for actual torque configuration to output AA2:

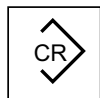
Enter „84“ in ID-No. 32785 (config. 16 bit AW message) of AW1 as code for actual torque.

1.



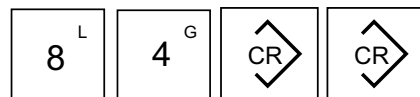
ID-No.: 32785 #1.1
Config. 16 bit AW message

2.



32828 #1.1
Config. 16 bit AW message

3.

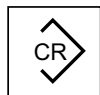


4.



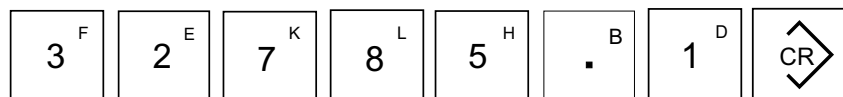
ID-No.: 32789 #1.1
Source analog ch.2

5.



0.0 #1.1
Source analog ch.2

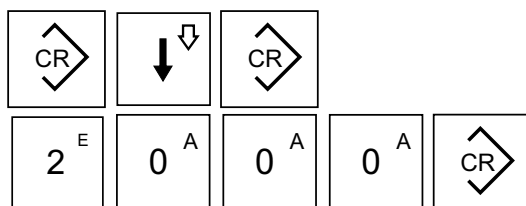
6.



I27851 defines AW1 as source for „Config. 16 bit AW message“.

Analog output AA2 scaling:

7.



ID-No.: 32790	#1.1
Fin. analog value ch.2	

By entry of „2000“ [0,1%] 10 V at analog channel AA2 are output if 200 % of nominal motor torque are reached.

For meaningful evaluation, final analog value of channel 2 may not exceed the positive (ID82) or negative (ID83) torque limit value.

6.2 Speed loop proportional gain KP tuning:

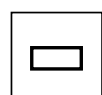
Speed loop tuning must be performed with coupled load.

For ID-No. 32780 (acceleration time) and ID-No. 32781 (deceleration time) 1 ms must be entered.

A speed setpoint analog voltage is entered as a step at A1 and the step response is recorded with a storage oscilloscope at analog output AA1. A small setpoint step value (approx. 5 % of maximum speed corresponding to approx. 0,5 V) is used and the „Actual torque“ is monitored at analog output AA2. For acceleration and deceleration the output voltage at AA2 must be below 10 V. By this is indicated, that the drive is not at the torque limit.

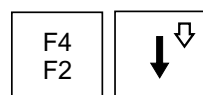
Select basic menu at AZB:

1.



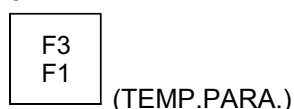
ERR.RESET	SYSTEM
DIAGNOSIS	START UP

2.



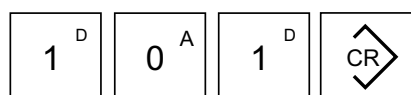
PARAMETERS	G-PARAMETERS
TEMP.PAR.	DIG.SPEED

3.



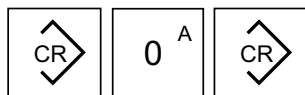
ID-No.: 38	#1.1
Pos. speed limit	

4.



ID-No.: 101	#1.1
Integral action time TN	

5.



ms	0	#1.1
Integral action time TN		

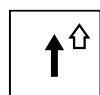
By entry of „0“ the speed loop integral action time component becomes ineffective.

6. Use e.g. a battery box for a pulse shaped setpoint step of approx. 0.5 V.
Record the actual speed characteristic at analog output AA1 with storage oscilloscope

Caution: Danger of collision!

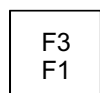
Control and monitor circuits used for normal operation are not effective during this speed controller tuning.

7.



Store parameters	
YES	NO

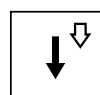
8.



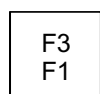
(YES)
by trials with increasing values for the proportional gain KP (ID-No. 100) determine the gain in such manner, that the motor just starts overshooting (cf. diagram „Optimization Proportional Gain“). Then half this value (round up to an integer number) and enter it into ID-No. 100.

50	#1.1
Proportional gain KP	

9.



Store parameters	
YES	NO



(YES)

ms	0	#1.1
Integral action time TN		

6.3 Speed loop integral action time TN tuning:

1. Determine the integral action time TN of the speed controller by trials starting with high values for ID-No. 101. The lowest possible value for ID-No. 101 must be found to obtain an actual speed characteristic with an overshooting width of maximum 20 % (cf. diagram „PI speed controller tuning“).

2.



Store parameters

YES

NO

3.



(YES)

ERR.RESET

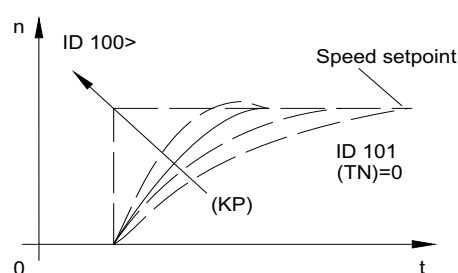
SYSTEM

DIAGNOSIS

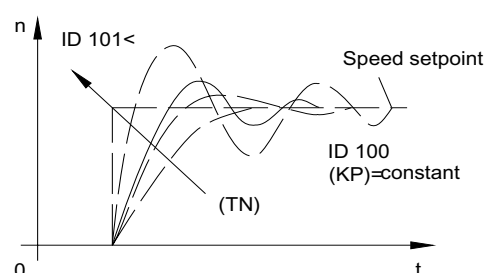
START UP

Step response (actual speed) at analog output AA1, recorded with storage oscilloscope:

Proportional Gain tuning



PI speed controller tuning



The result of the speed loop tuning is a „smooth“ running motor with fast reaction to setpoint value changes.

Further axes in the drive system are tuned in the same manner after selection of the appropriate AW-No..

Important:

Now the required time values for acceleration ramp TH (ID32780) and deceleration ramp TL (ID32781) must be entered for all AW modules.

The time is related to the maximum motor speed (ID113) of the respective motor. The ramps become only effective for speed setpoint values in operation mode „speed control“.

Depending on the application normally more parameters must be set and adapted (operation modes, closed loop position control, positioning, synchronous control, binary I/O assignment,...).

The AMK software AIPAR is recommended for setting of these parameters. With AIPAR complete parameter sets can be recorded and stored. For recurrent installations the corresponding parameter set then just has to be downloaded from the PC hard disk to the AZ processor card.

7 Impressum

Title **AMKASYN start-up**

Objective Description for start-up of the AMKASYN systems AN, AZ, AW, AZ 05 and AW 1,3/2,6...

Part-Number 27865

History

Date
1998/36

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- Nameplate data
- Software version
- System configuration and application
- Description of problem and presumed cause of failure
- Diagnostic message (error code)

Publisher

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