DELTA
DIMA Module

User's Manual

JETTER GmbH
Gräterstraße 2
D-71642 Ludwigsburg
Tel. +49 7141 2550 0
Fax +49 7141 2550 425
Hotline +49 7141 2550 444
E-Mail jetter@jetter.de
Mailbox +49 7141 59834

JETTER
PROCESS-PLC

Edition 1.1
December 1997

Table of Contents

III. DELTA DIMA Module

1. Safety Instructions

- The PROCESS-PLC DELTA is a quality product, made according to the recognised electrotechnical rules.
- The device has been delivered by the manufacturing company in faultless state. In order to keep up this condition and to guarantee problem free operation, the technical specifications given in this documentation are to be observed.
- The devices must not be used for purposes other than the purposes they have been designed for.
- The devices are only to be used inside the limits given in their technical data.
- The devices are only to be operated by SELV. The maximum operating voltage must not be exceeded.

When failure or malfunctioning of the device could result in endangering of man or damage of equipment, this should be prevented by incorporating additional safety mechanisms, like limit switches, protection devices, etc., into the system.

Note:

The data indicated in this manual have got merely informational character without warranty of any properties.

2. General Technical Specifications

Note:

The general technical specifications listed below apply to all PROCESS-PLC modules. Above that, further module specific data will be mentioned in the respective chapters on modules.

Technical Data		Remarks
Ambient temperature	0 .. 50 °C	
Storing temperature	-10 .. 70 °C	
Air humidity	5% - 95%	RH-2 according to IEC 1131-2
Contamination level	II	according to IEC1131-2
Oscillation fatigue limit	IEC 1131-2	
Protective system	IP20	
Category of protection	III	according to IEC 1131-2
ESD	Level ESD-4	according to IEC 1131-2
Housing	Aluminium	

3. Instructions on EMI

- A characteristic of interference immunity is the same as that of the often quoted chain: **It is as weak as its weakest member.**

Besides other precautions, shielding is important

- That's why besides precautions inside the device cable connections, respectively correct shielding, are of greatest importance.
- Shielding must be done on both ends of the applicable cables.
- The entire shield must be drawn behind the isolation, and then be extensively clamped under a strain relief.

Direct and extensive grounding is important

- When the signal is connected to terminal screws: The strain relief must be connected with a grounded surface directly and extensively.

Please use metallised male connector housings

- When male connectors are used: Only use metallised connectors, e.g. SUB-D with metallised housing. Please take care of direct connection here as well.

Separate signal and voltage connections spatially

- On principle, separate signal and voltage connections spatially.

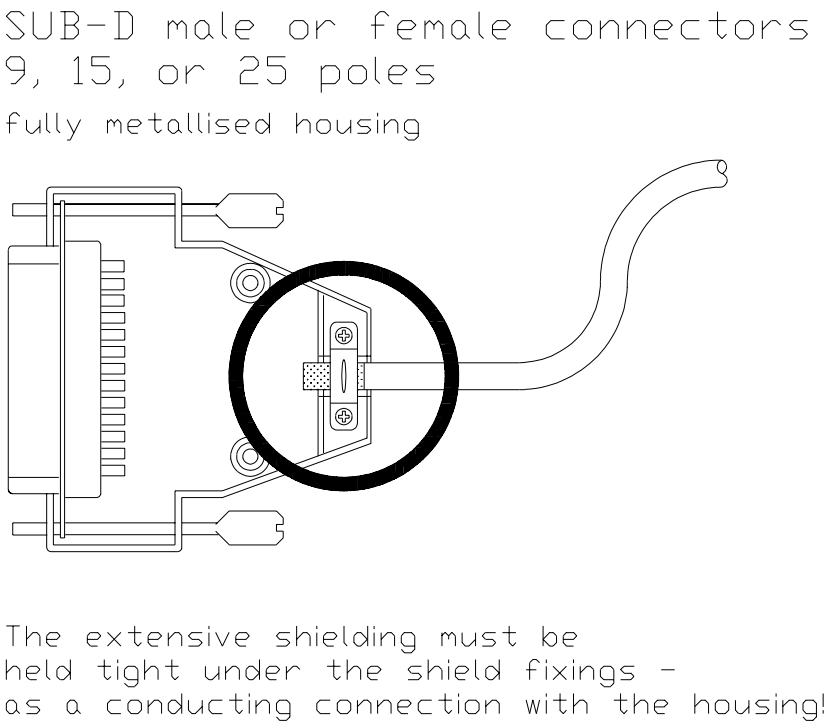


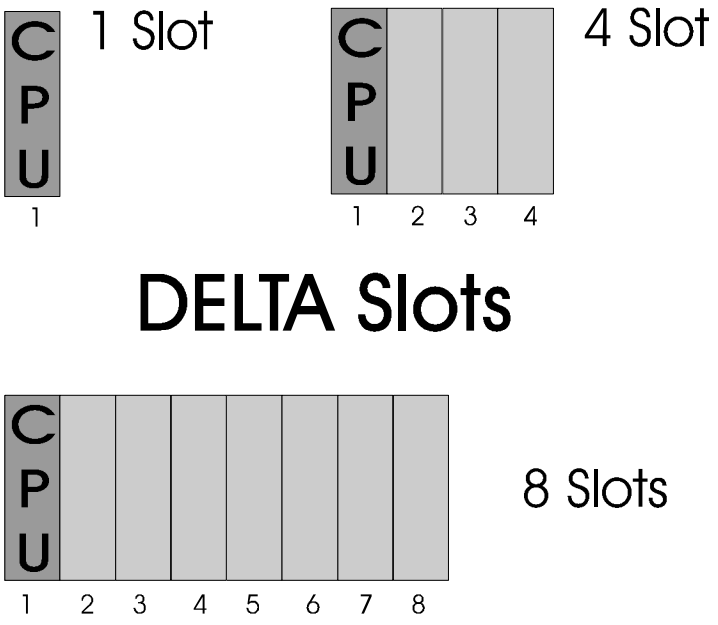
Figure 1: Shielding in Agreement with EMI

4. DIMA Digital Servo Controller

4.1 Technical Data and Configuration

Technical Data Digital Servo Controller	
Positioning Range	-8388608 .. +8388607
Max. Encoder Speed	6000 U/min
Positioning Accuracy	± 1 Increment
Start-/Stop ramp	Sine square, steepness programmable
Inputs	Limit switch left / right (24V, NCC or NOC) Home sensor (24V, NCC or NOC)
Maximum Load Current	DIMA3-8: 8A peak DIMA3-16: 16A peak DIMA3-32: 32A peak DIMA3-50: 50A peak
Cycle Time	Coprocessor: 250µs Speed loop: 500µs Position loop: 2ms
Transformer	(also autotransformer)
Primary Voltage	3 x 400V
Secundary Voltage	3 x 230 V **earth the center !**

Slots of the DELTA Housing



1 Slot DELTA

- **No** controller board can be plugged

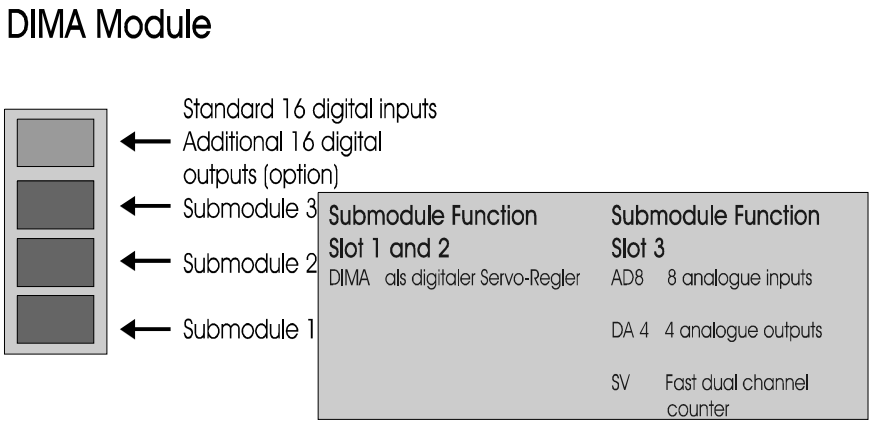
4 Slot DELTA

- 3 controller boards (6 axes) can be plugged

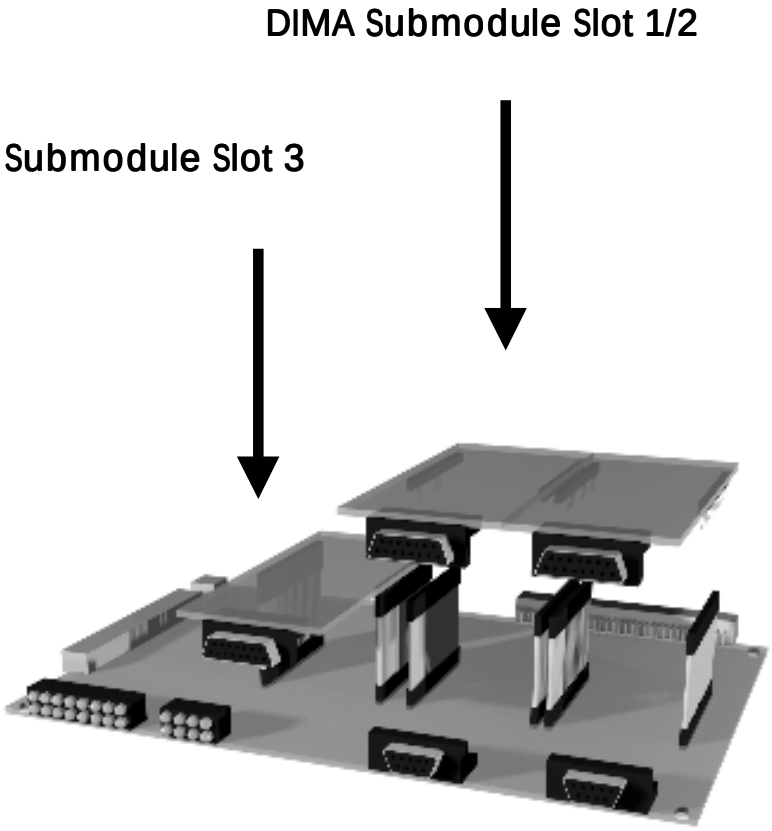
8 Slot DELTA

- 7 controller boards (14 axes) can be plugged

DIMA Module Submodules



Arrangement of the Controller Module Submodules



4.2 Terminals

4.2.1 Terminals of the DIMA Logic Module

4.2.1.1 Power Supply

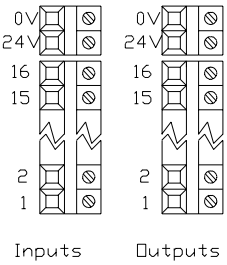


Figure 2: Power supply

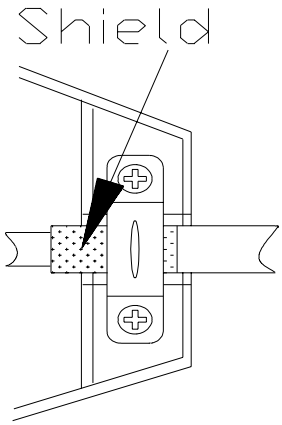
Power Supply at the Digital Input Terminals	
Terminal	**Meaning**
0V	Gnd for logic
24V	24VDC for logic

Power Supply at the Digital Output Terminals	
Terminal	**Meaning**
0V	Gnd for output supply
24V	24VDC for output supply

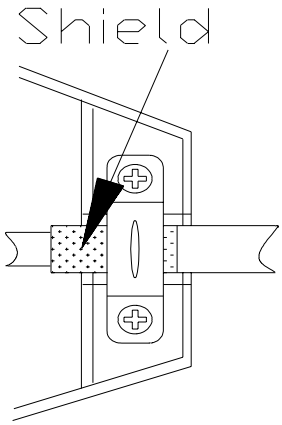
The power supply has to meet the following requirements:

Voltage range:	20 VDC.... 30 VDC
Filtered:	ripple 5 %
Power:	ca. 20 W without LCD, Options

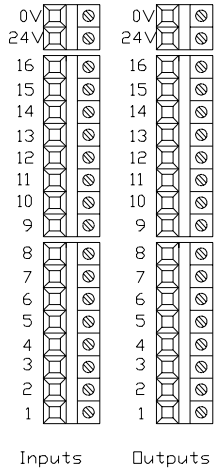
4.2.1.2 Resolver

Resolver Terminal (9 pin Sub-D)		
Connection on DIMA side	Shielding	Specification max Length
9 pin Sub-D male	 **Attach shield at both sides ! Use metallised housings !**	max cable length: 20m
Pin	**Signal**	**Meaning**
1	R1	Exciting +
6	R2	Exciting -
2	S4	Input sine +
7	S2	Input sine -
3	S3	Input cosine +
8	S1	Input cosine -

4.2.1.3 Connection to the Amplifier

Connection to the Amplifier (26 pin Sub-D)		
Connection on DIMA side	Shielding	Specification max Length
26 pin Sub-D-male	 **Attach shield at both sides ! Use metallised housings !**	max cable length: 20m
Pin	**Signal**	**Meaning**
1 .. 18	Connect 1 to 1	

4.2.1.4 Digital Inputs



16 terminals for digital inputs (24VDC) have been provided on the upper side of the controller housing. The 0V signal is connected to the control cabinet ground (Gnd).

Technical Specifications Digital Inputs	
Number of Inputs	16
Rated Input Voltage	24 VDC
Voltage Range	15 .. 27 V
Input Current	approx. 8 mA
Input Resistance	3,0 kΩ
Input Delay	ca. 3ms
Signal Voltage ON	min. 15 V
Signal Voltage OFF	max. 10 V
Potential Isolation	no

Consider slot numbering for input numbering

Input Numbering on the DIMA Module	
Input	**Number**
Input 1	Slot number x 100 + 1
Input 2	Slot number x 100 + 2
...	...
Input 16	Slot number x 100 + 16

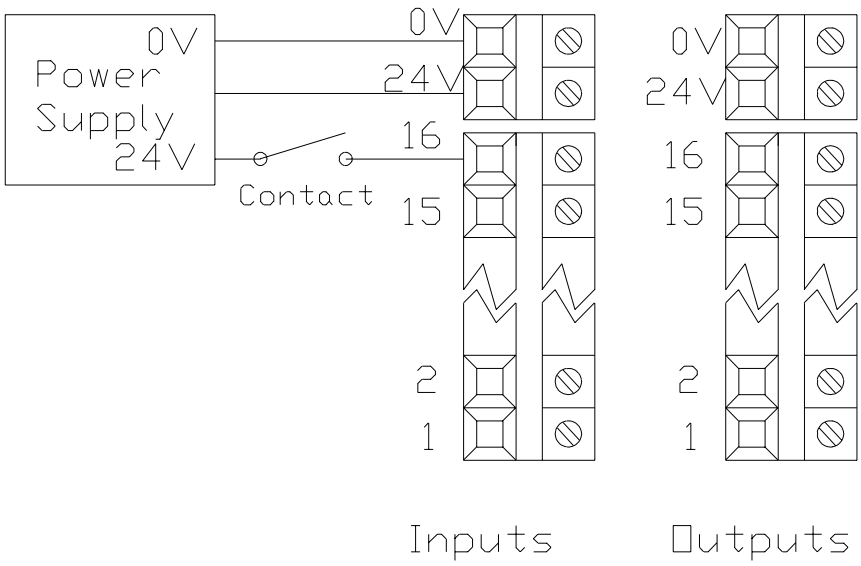


Figure 3: Digital input wiring

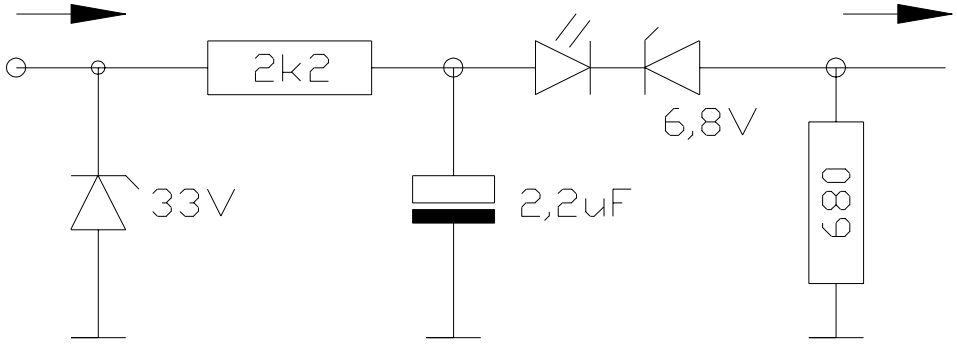
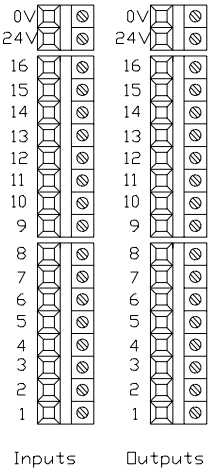


Figure 4: Internal circuit of the digital inputs

4.2.1.5 Digital Outputs



16 terminals for digital outputs (24VDC) have been provided on the upper side of the controller housing. The 0V signal is connected to the control cabinet ground (Gnd).

Technical Specifications digital Outputs	
Number of Outputs	16
Output Type	Transistor, pnp
Rated Voltage	24 VDC
Voltage Range	20 .. 30 V
Load Current	max. 0,5 A / output
Potential isolation	no
Protection Circiut	Overload, overvoltage, overtemperature
Protection Inductive Loads	yes
Signal Voltage ON	typ. V_{Supply} - 0,5 V

Consider slot numbering for output numbering

Output Numbering on the DIMA Module	
Output	**Number**
Output 1	Slot number x 100 + 1
Output 2	Slot number x 100 + 2
...	...
Output 16	Slot number x 100 + 16

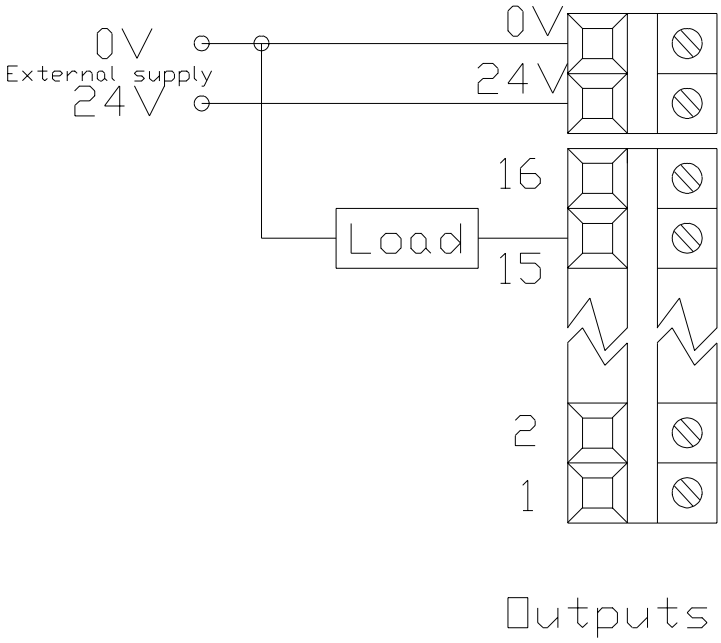


Figure 5: Digital output wiring

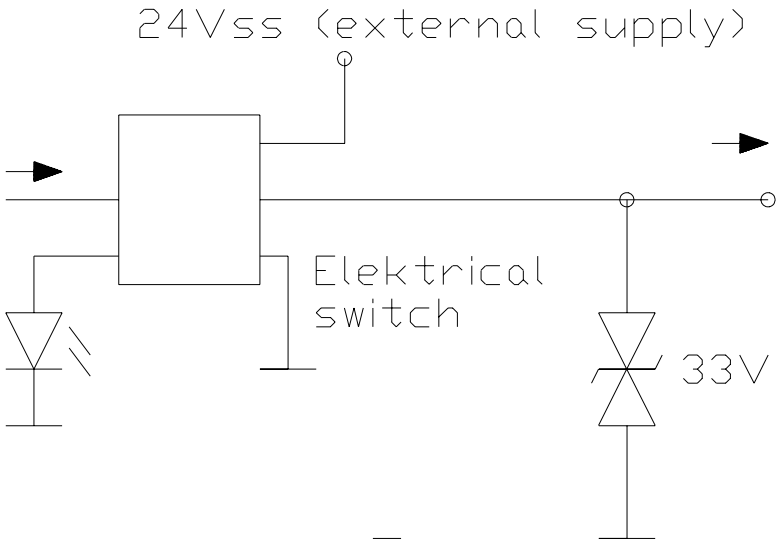
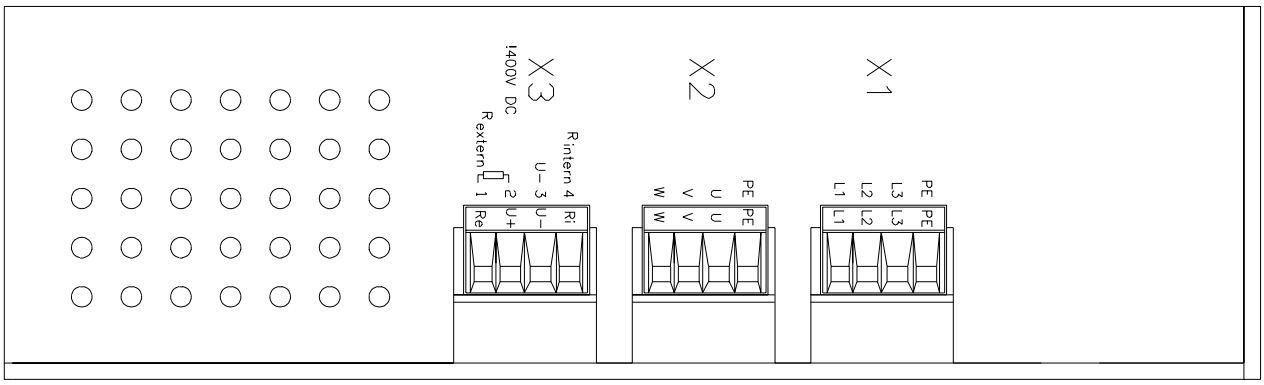


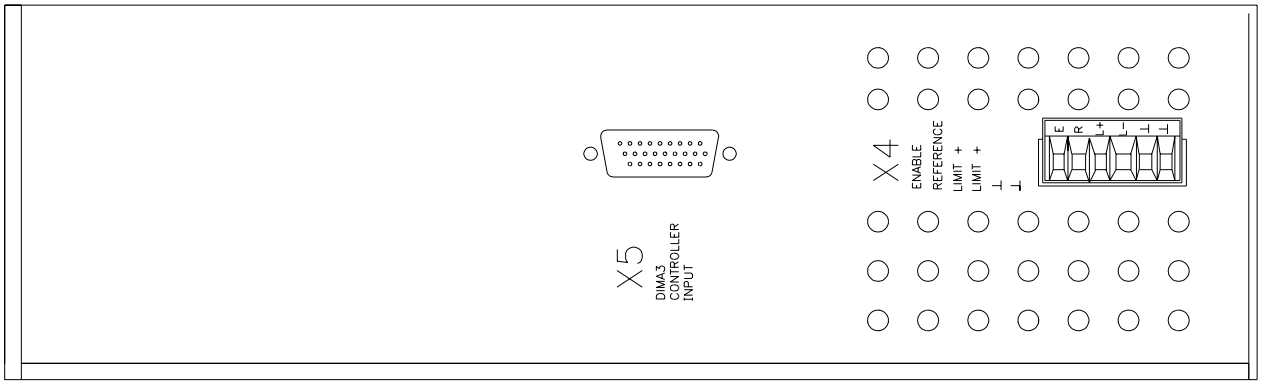
Figure 6: Internal circuit of the digital outputs

4.2.2 DIMA Amplifier Terminals (Standard)

Bottom View



Top View



Power Supply (Trafo) X1		
L1, L2, L3	Power supply	Secondary voltage trafo 3 * 230V
PE	Schutzleiter	**The center has to be earthed.**

Note:

Only use terminals L2 and L3 if the amplifier is directly connected to the mains. See *4.2.3.1 Direct*

Motor Connection X2		
U, V, W	Motor phases	Consider the right sequence !
PE	Motor Ground	The shielding of the motor cable has to be clamped under the strain relief.

Note:

Exchanging of the phases leads to oscillating or blocking of the motor.

Ballast Resistor X3	
$R_{external}$, $R_{internal}$	To be bridged if the internal

Internal ballast resistor	ballast resistor is used. Only type 8, 16 and 32
$R_{external}$ U_+ External ballast resistor (internal automatically disconnected)	Connection external ballast resistor. Minimum resistance DIMA-16 27Ω DIMA-32,50 16Ω
U_+ U_- Intermediate circuit voltage	Intermediate voltage terminal

Note:

Connection of an external ballast resistor disconnects the internal ballast resistor.

Limit Switches, Home Sensor X4

L+, L-	Limit switch	24V isolated NCC recommended Configuration 1xy004
R	Home sensor	24V isolated NCC or NOC Konfiguration 1xy004
F	Amplifier release	24 V isolated
⊥	Ground	for limit switches, home sensor and release

Warning:

The use of the limit switches does not necessarily protect the machine of problems in any case - for instance fast driving off.

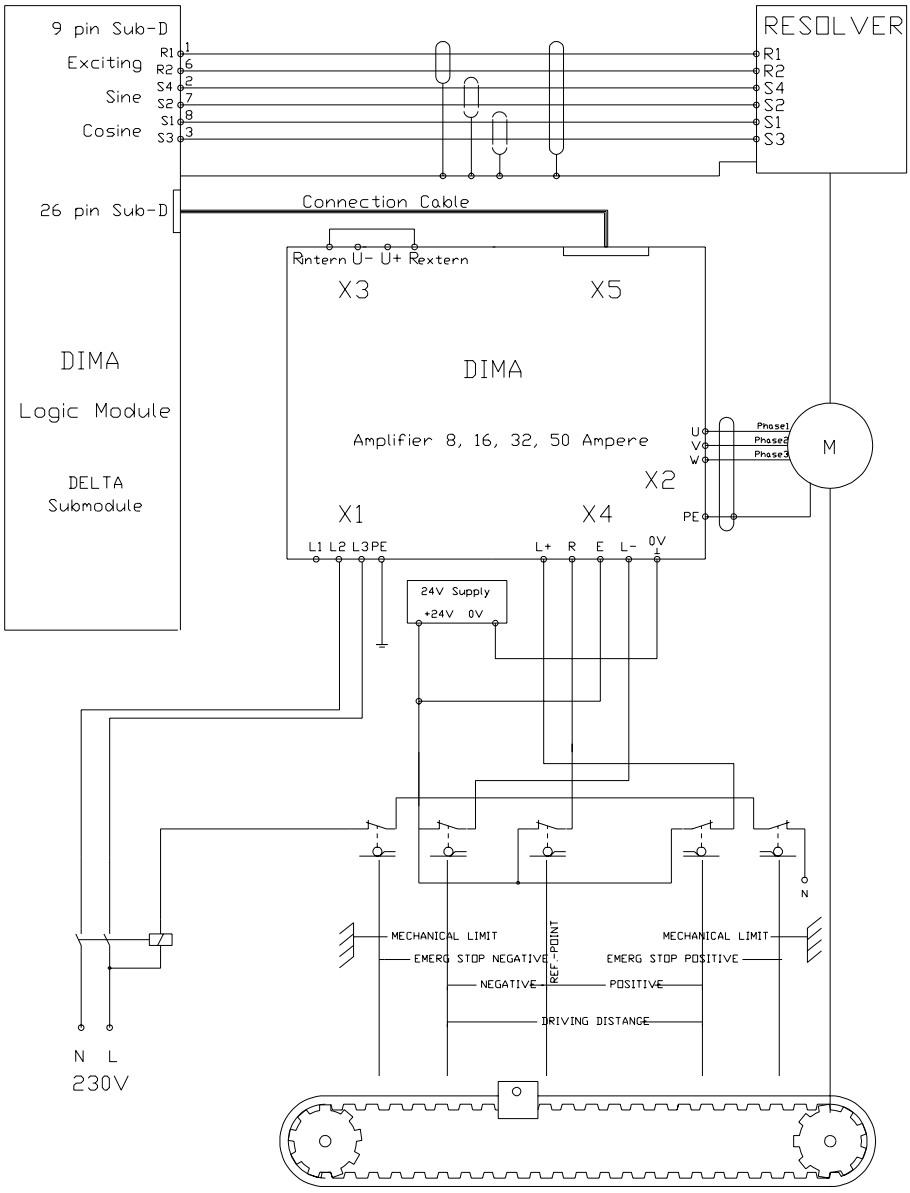
To avoid such cases a second set of limit switches has to be used to disconnect the power supply of the amplifier.

Connection to the Logic Module X5

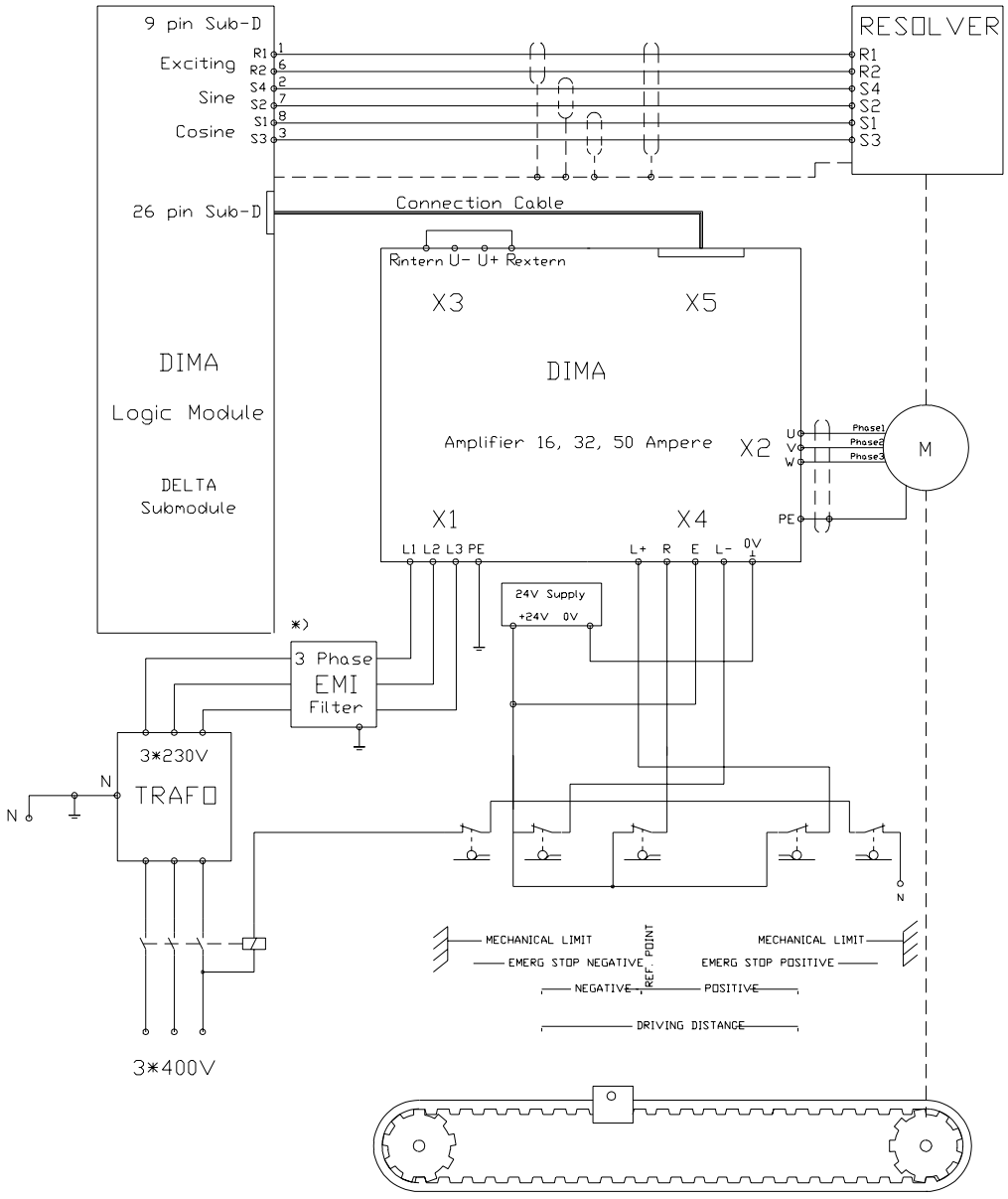
Pin 1 to 18 are connected 1 to 1.

4.2.3 Wiring Diagrams

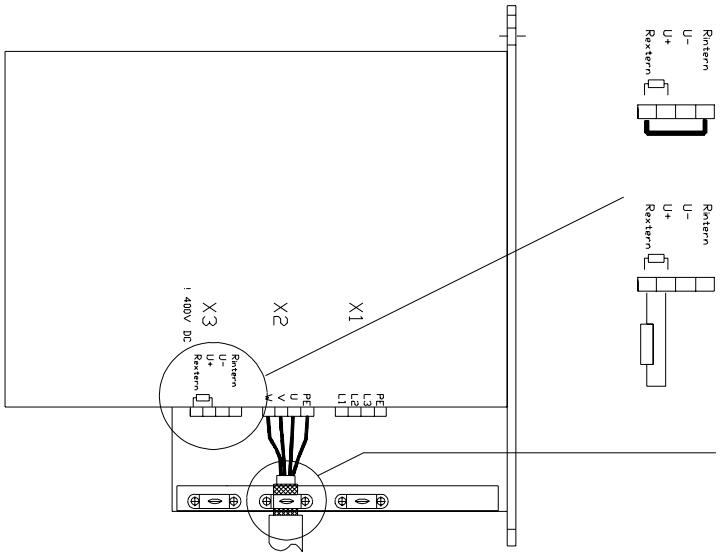
4.2.3.1 Direct Mains Connection



4.2.3.2 Connection with Trafo

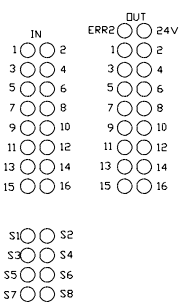


4.2.3.3 Ballast Resistor



4.3 LED Description

4.3.1 The LED of the DIMA Logic Module

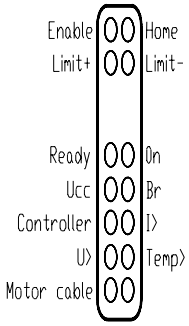


The upper 34 LED indicate the states of the digital inputs and outputs. LED **S1** to **S8** show the state of the DIMA logic module.

The Logic LED	
IN 1 .. 16	Digital inputs
OUT 1 .. 16	Digital outputs
ERR2	Digital output driver: overload, overtemperature, cable break of one or more outputs
24V	External power supply of the digital outputs
Following states are indicated	
S1	Positive limit switch axis 1 is or was active
S2	Axis 1 reached position (the LED lights when the axis reaches the destination window and extinguishes when the next positioning is started)
S3	Negative limit switch axis 1 is or was active
S4	Positive limit switch axis 2 is or was active
S5	Axis 2 reached position (the LED lights when the axis reaches the

	destination window and extinguishes when the next positioning is started)
S6	Negative limit switch axis 2 is or was active
S7, S8	reserved
The limit switch LED have different indication modes	
Continuous light	Axis stands at the limit switch, limit switch is active
Equally blinking	The limit switch was active, is not active, and no new positioning was started
Unequally blinking	The software limit switch was triggered

4.3.2 The LED of the DIMA Amplifier (Standard)



The amplifier LED indicate the physical states of the signal.

The amplifier LED indicate the **physical states** of the signal.

The Amplifier LED	
Enable (green)	24V attached to the release input
Home (yellow)	24V attached to the home sensor input
Limit+, Limit- (yellow)	24V attached to the limit switch input
Ready (green)	No external amplifier error
On (green)	Hard and software release
Br (yellow)	**blinking:** Ballast resistor is properly working **lights:** Ballast resistor overload
U_{cc} (green)	Logic voltage OK Intermediate circuit: between 100V and 450V
Controller (red)	Nominal value error e.g. cable logic - amplifier
I > (red)	Over current or short cut between motor phases or ground
U > (red)	Intermediate circuit voltage to high. Amplifier switched off
Temp > (red)	Cooling plate > 85°C Amplifier switched off
Motor cable (red)	Motor cable break

4.4 Software Description

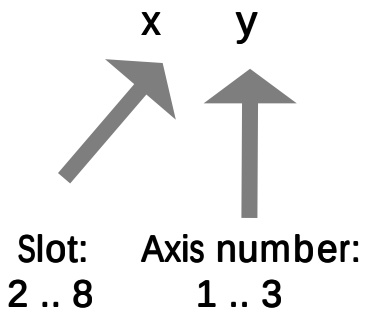
4.4.1 Axes and Registers Numbering

The Axis Number

The first digits defines the slot number of the SV module. The last digit specifies the axis number of the module. Following pattern illustrates the axis numbering:

Axis number coding: xy

Meaning:

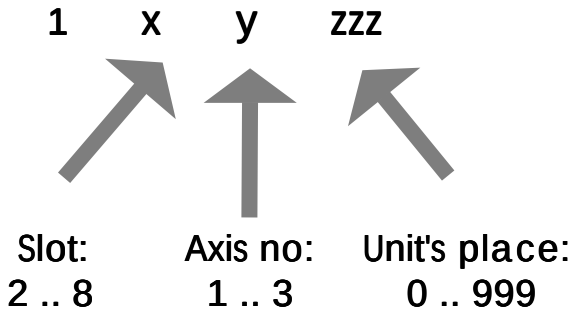


The Register Number

The registers are accessed by 6 digit places. The first digit is 1, the second digit defines the slot number of the SV module, the third specifies the axis number, the last three digits define the register number. Following pattern illustrates the register numbering:

Register number coding: 1xyzzz

Meaning:



Note:

Following different coding was valid before operating system version 2.00 of the CPU module:

xyzzz

The registers are upwards compatible (2.00 and bigger understands the old xyzzz numbers) but not downwards compatible (smaller 2.00 does not understand the new 1xyzzz coding).

4.4.2 General Registers

Register 1xy000: State Register	
Function	**Description**
Read	Current state Value after reset: 1024
Write	Defines a new state
Value range	-8388608 .. +8388607

The Meaning of the State Bits

Bit 0: Reference set

Bit 1: AXARR = the position was reached. The state bit is cleared at the beginning of a positioning and set when the destination window is reached.
Bit 2: Actaul position in destination window
Bit 3: Tracking error recognised(Reg 1xy019 > Reg 1xy020)
Bit 4: Negative limit switch active
Bit 5: Positive limit switch active
Bit 6: Reference switch active
Bit 7: Software limit switch was active
Bit 8: Limit switch was active
Bit 9: Position controller switched on
Bit 10: "Control after AXARR" switched on
Bit 11: Relay switched on
Bit 12: Reference run error
Bit 13: BUSY (only valid for commands 9 to 12 and 42)
Bit 14: Software limit switch acivated (write access with 1 activates function)

Bit 16:	**Axis** is within stop ramp
Bit 17:	Do not switch off if tracking error (write access with 1 activates function)
Bit 18:	Printing mark not found
Bit 19:	SV amplifier error
Bit 20:	Resolver error
Bit 21:	Motor temperature too high
Bit 23:	Tracking error correction switched off (a set bit deactivates function).

Register 1xy001: Command Register

Function	Description
Read	Last command Value after reset: 0
Write	Starts a new command
Value range	0 .. 255

The Commands

0: **AXARR with stop ramp**
the axis stops with the stop ramp (exception: if the remaining distance is smaller than the stop ramp, no additional ramp is used).

1: **Switch on**
switches ON all controllers and gives rerlease for servo amplifier by relay.

2: **Switch off relay**
the relay is switched off the controller remains active.

3: **Set reference**

the reference point is set on the current axis position. Simutaneously the nominal and actual positions of the axis are set to 0.

4: **Clear Reference**
the reference is cleared. The next coincidence of the home sensor and the K0 signal references the axis.

5: **AXARR with position control**
the axis is stopped and the position controlled.

6: **AXARR without position control**
the axis is stopped the position is not controlled.

7: **Position control in destination point - ON** (*)
the position is controlled in the destination point.

8: **Position control in destination point - OFF**
the position is not controlled in the destination point.

9: **Automatic reference run**
with the speed in register 1xy003;
start in positive direction, considering home sensor.
If the postive limit switch is hit the axis turns back and drives into the negative direction until:

- either the home sensor is found, then actual position is set to 0
- or the negative limit switch is hit, then nominal position is set equal to actual position, and an error is indicated in the state register 1xy000.

10: **Automatic reference run**
with the speed in register 1xy003;
start in negative direction, considering home sensor.

If the negative limit switch is hit the axis turns back and drives into the positive direction until:

- o either the home sensor is found, then actual position is set to 0
- o or the positive limit switch is hit, then nominal position is set equal to actual position, and an error is indicated in the state register 1xy000.

11 : **Automatic reference run**
with the speed in register 1xy003;
start in positive direction to the positive limit switch, ignore home sensor; turn back there, drive in negative direction considering home sensor.
If the negative limit switch is hit, reference run is terminated and an error is indicated in state register 1xy000.

12 : **Automatic reference run**
with the speed in register 1xy003;
start in negative direction to the negative limit switch, ignore home sensor; turn back there, drive in positive direction considering home sensor.
If the positive limit switch is hit, reference run is terminated and an error is indicated in state register 1xy000.

13: **Control at limit switch - OFF**
0V are output if the limit switch is reached.

14: **Control at limit switch - ON** (*)
the position is controlled if the limit switch is reached.

17: **Relative positioning**
the positioning relates to the last nominal position not to the reference position.

18: **Absolute positioning** (*)
the positioning relates to the reference position.

19: **Continue after positioning break**
the positioning breaked by AXARR is continued.

20: **Relative positioning with start input - ON**

21: **Relative positioning with start input - OFF**

22: **Stop at reference point - ON** (*)
the axis stops at the reference point during reference run.

23: **Stop at reference point - OFF**
the axis does not stop at the reference point during reference run.(see command 22).

24: **Annex next interpolation**
the next interpolation is annexed to the currently executed without interruption.

25: **Combine circle and linear interpolation**
the next circle interpolation is combined with a linear interpolation with axes of other modules.

30: **Axis master in follower**
this command is given in the master.

31 **Axis reads master actual position**
the axis reads the master actual position from bus.

32: **Axis 1 is slave**
axis 1 is slave in a linear or circle interpolation.

33: **Axis 2 is slave**
axis 2 is slave in a linear or circle interpolation.

38: **Master slave configuration 1**
axis 4 is master, only both module axes are slaves.

39: **Master slave configuration 2**
axis 4 is master, both axes of the module are slaves and additional external slave exist.

40: **Master slave configuration 3**
axis 4 is master, only axis 2 of the module and external axes are slaves.

41: **Start interpolation**
start circle or linear interpolation.

42: **Cancel interpolation for axis**
an AXARR instruction is executed. The interpolation mode of the axis is cancelled..

43: **Master slave configuration 4**
axis 4 is master, only axis 1 of the module and external axes are slaves.

44: **Follower via factor/divisor - ON**

45: **Follower via factor/divisor - OFF**

46: **Follower via table - ON**

47: **Follower via table - OFF**

52: **Run table with time index - ON**
the table is not executed with help of an encoder but by a time base defined in register 1xy075.

53: **Run table with time index - OFF**

54: **Follower: slave without correction**
no slave correction takes place in case of master overflow.

55: **Follower: slave with correction**

slave correction takes place in case of master overflow.

56: **Endless positioning in positive direction**
starts endless positioning in positive direction.

57: **Endless positioning in negative direction**
starts endless positioning in negative direction.

78: **Linear ramps**

79: **Sine squrae ramps** (default after reset)

Register 1xy002: Nominal Position	
Function	**Description**
Read	Current nominal position Value after reset: 0
Write	Set new nominal position
Value range	-8388608 .. +8388607

Example:

Positioning

1)

```
THEN
  REGISTER_LOAD [1xy002 with 10000]
```

Starts axis positioning to the (absolute) position 10000 (increments).

Nominal position display

2)

```
THEN
  DISPLAY_REG [#0, cp=1, Reg=1xy002]
```

Displays the current nominal position on the user interface top left.

3)

```
THEN
  REG 1xy002
  =
  REG 1xy002
  +
  100
```

Start axis positioning to the (relative) position 100, i.e. drive on 100 increments.

Note:

This register can be changed any time during positiong. Then the positioning relates to the new value. On this occasion the axis does not stop.

Register 1xy003: Nominal Speed	
Function	**Description**
Read	Current nominal speed Value after reset: 300 (‰)
Write	Defines new nominal speed
Value range	0 .. 1000 (if Reg 21 = 1000)

The value is immediately valid. This has follwing effect:

a) Axis at a standstill:
The new value is stored for the next positioning.

b) Positioning currently executed:
The new value is the new maximum nominal speed. The speed changes without a sharp rise or decrease but with the start ramp defined in register 1xy005.

Example:

1)

```
THEN
  REGISTER_LOAD [1xy003 with 20]
```

The axis moves with creep speed, 2% of the maximum speed.

2)

```
THEN
  REG 1xy003
  =
  REG 1xy003
  +
  80
```

Increases the speed to 10% of the maximum speed.

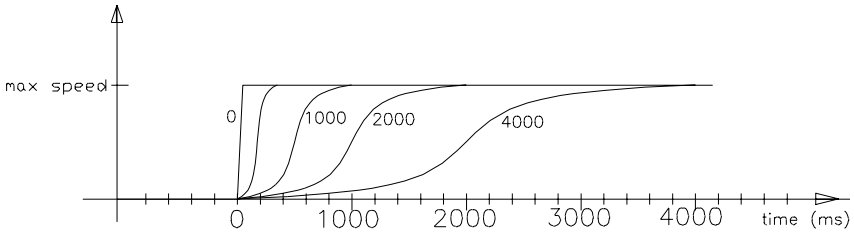
Register 1xy004: Input Polarities	
Function	**Description**
Read	Current polarities Value after reset: 3
Write	Sets new polarities The register is bit coded: **Bit 0**: 0 = home sensor 0V active 1 = home sensor 24V active **Bit 1**: 0 = limit switch 0V active (NCC) 1 = limit switch 24V active (NOC) **Bit 2**: 0 = interrupt input (print mark mode, pin 11 15 pin Sub-D) low active 1 = interrupt input high active **Bit 3**: 0 = normal rotation direction 1 = rotation direction reversed **Bit 4**: 0 = Follower: execute complete table 1 = execute upper table half **Bit 5**: 0 = activate limit switches 1 = deactivate limit switches **Bit 7**: 0 = activate home sensor 1 = deactivate home sensor
Value range	0 .. 191

Register 1xy005: Start Ramp	
Function	**Description**
Read	Current start ramp Value after reset: 1000 (ms)
Write	Defines new start ramp
Value range	0 .. 32767

This new value is stored and effects only the next positioning or speed change. Write access to register 1xy005 does not effect a running positioning. Only after start of the next positioning (i.e. write access to registers 1xy002 and 1xy003 or POS instruction) the new start ramp value is used.

Note:

The ramp becomes shorter if the axis does not run maximum speed.

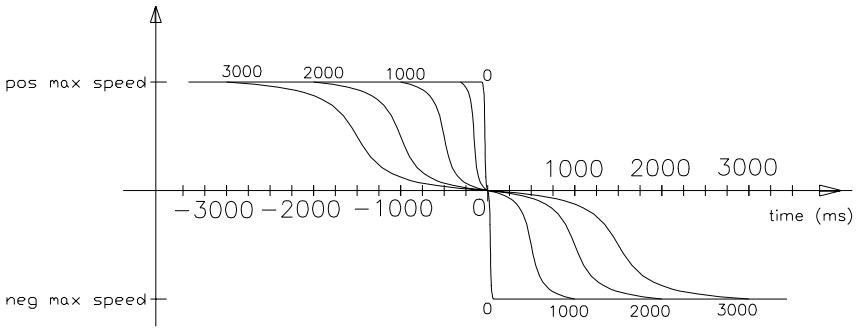


Register 1xy006: Stop Ramp	
Function	**Description**
Read	Current stop ramp Value after reset: 1000 (ms)
Write	Defines new stop ramp
Value range	0 .. 32767

This new value is stored and effects only the next positioning or speed change. Write access to register 1xy006 does not effect a running positioning. Only after start of the next positioning (i.e. write access to register 1xy002 or POS instruction) the new stop ramp value is used.

Note:

The ramp becomes shorter if the axis does not run maximum speed.



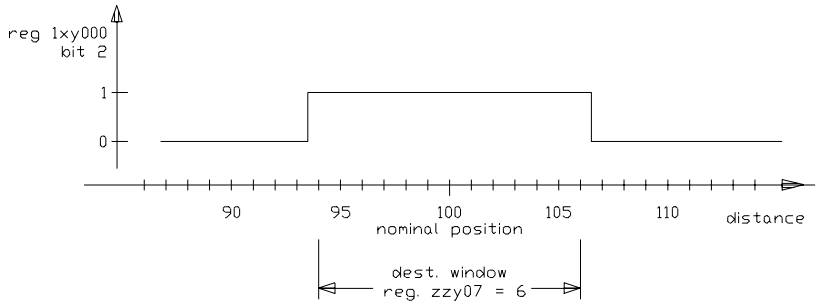
Register 1xy007: Destination Window Range

Function	Description
Read	Current destination window range Value after reset: 0 (increments)
Write	Defines new destination window range
Value range	0 .. 8388607

Program flow can be accelerated by the destination window range because the condition

```
WHEN
        AXARR
```

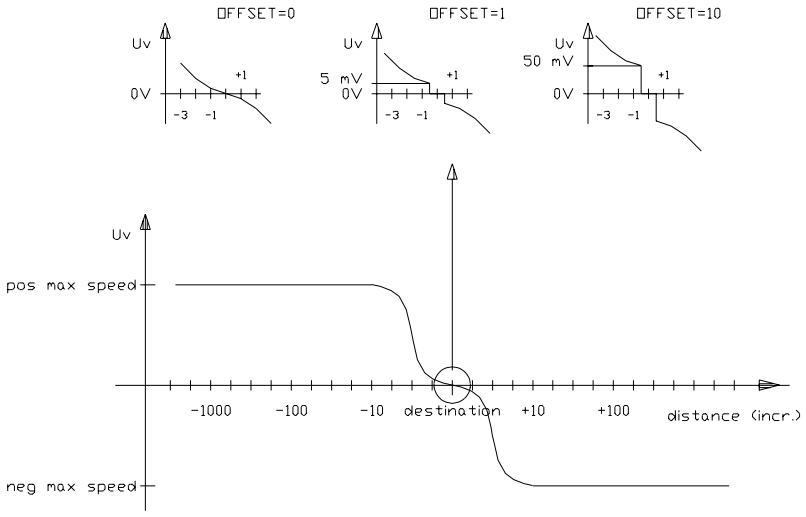
already is fulfilled before the exact destination point is reached. Of course the exact position is called at.



Register 1xy008: Digital Analogue Offset

Function	Description
Read	Current offset Value after reset: 0
Write	Defines new offset
Value range	0 .. 8388607

The mechanical friction can be overcome with help of this register.



Register 1xy009: Actual Position

Function	Description
Read	Current actual position Value after reset: 0
Write	defines a new actual position (reference is lost)
Value range	-8388608 .. +8388607

Example:

```
WHEN
    REG 1xy09
    >
    2000
  THEN
    OUT 3
    ...
```

Register 1xy010: P Gain Position Controller

Function	Description
Read	Current P gain Value after reset: 750
Write	Defines a new P gain
Value range	0 .. 32767

Register 1xy011: Nominal Speed of the Position Controller

Function	Description
Read	Current nominal speed calculated by the controller Value after reset: 0
Write	prohibited
Value range	-32768 .. +32767 (±10V)

Register 1xy012: Actual Speed

Function	Description
Read	Current actual speed Value after reset: 0 (1/min)
Write	prohibited
Value range	-32768 .. +32767

Register 1xy013: Time Base for Evaluation of the Actual Speed (1xy012)

Function	Description
Read	Current time base Value after reset: 6 (unit 3ms)
Write	Defines new time base
Value range	0 .. 32767

Register 1xy014: Positive Software Limit Switch	
Function	**Description**
Read	Current positive software limit switch Value after reset: +8388607
Write	New software limit switch
Value range	-8388608 .. +8388607

Bit 7 of register 1xy000 queries software limit switch

The state of the software limit switches can be queried by bit 7 in the state register 1xy000. A set bit indicates that one of both software limit switches was activated. Bit 14 of the state register (de)activates the software limit switches. Register 1xy014 defines the value in increments at which the positive software limit switch is triggered.

Register 1xy015: Negative Software Limit Switch	
Function	**Description**
Read	Current negative software limit switch Value after reset: -8388607
Write	New software limit switch
Value range	-8388608 .. +8388607

The state of the software limit switches can be queried by bit 7 in the state register 1xy000. A set bit indicates that one of both software limit switches was activated. Bit 14 of the state register (de)activates the software limit switches. Register 1xy015 defines the value in increments at which the negative software limit switch is triggered.

Register 1xy016: Phase Offset	
Function	**Description**
Read	Current digital analogue offset Value after reset: 0
Write	New digital analogue offset
Value range	0 .. 4096)

Phase offset

Note:

Register 1xy016 is reserved for special purposes. Register 1xy016 has only to be applied by very experienced users. The register value is determined by the manufacturer when required.

Register 1xy017: Encoder Lines	
Function	**Description**
Read	Current encoder lines Value after reset: 4096
Write	prohibited
Value range	0 .. 10000 *

Register 1xy018: Maximum Speed SV Motor Combination	
Function	**Description**
Read	Current maximum speed Wert nach Reset: 6000 (U/min)
Write	New maximum speed
Value range	0 .. 32767 *

The maximum speed that can be reached from the SV motor combination has to be be entered into this register.

Note:

The product of the registers 1xy017 and 1xy018 must not exceed 61.436.000.

Register 1xy019: Tracking Error

Function	Description
Read	Current tracking error Value after reset: 0
Write	prohibited
Value range	-8388608 .. +8388607

The register specifies in increments how much the axis differs from the virtual axis.

Note:

The tracking error is only available in the position controller modes 2 and 3.

Register 1xy020: Tracking Error Limit

Function	Description
Read	Current limit Value after reset: 8388607 (incr.)
Write	New tracking error limit
Value range	0 .. 8388607

This register defines from which value on an tracking error is recognised and bit 3 of the state register 1xy000 is set. A tracking error is recognised if the value of register 1xy019 is greater than the value in register 1xxy020. If Bit 17 of the state register 1xy000 is reset (bit 17 = 0) and a tracking error is recognised the controller release is cancelled, the axis stops.

Register 1xy021: Reference Value for 1xy003 (Maximum Nominal Speed)

Function	Description
Read	Current reference value Value after reset: 6000
Write	New reference value
Value range	0 .. 32767

Meaning of the Reference Value 1xy021

A register value

of 1000 means the contents of register 1xy003 are **per thousand** values of the maximum speed (1000 ‰ correspond to the maximum speed of the axis).

of 100 means the contents of register 1xy003 are **per cent** values of the maximum speed (100 % correspond to the maximum speed of the axis).

1xy021 = 1xy018 the unit of the register 1xy003 values is **rpm**.

Corresponding to this other reference values can be realised by register 1xy021.

Register 1xy022: User/Encoder Resolution Ratio

Function	Description
Read	Current resolution Value reset: 256
Write	New resolution
Value range	1 .. 256

The register value is calculated by following formular:

USER increments / encoder increments = Reg 22 / 256

Remark:

A division into halves of register 22 (128) doubles the number of rotations.

Register 1xy023: Number of Pole Pairs

Function	Description
Read	Current number of pole pairs Value reset: 3
Write	Sets a new number of pole pairs
Value range	2, 3, 4

4.4.3 Registers for the Digital Speed Loop (Mode 3)

Register 1xy024: P Gain of the Digital Speed Loop	
Function	**Description**
Read	Current P gain Value after reset: 10
Write	New P gain
Value range	0 .. 32767

Register 1xy025: Nominal Current	
Function	**Description**
Read	Current nominal current Value after reset: 0
Write	Defines a new nominal current
Value range	-256 .. +255

Register 1xy026: I-Coefficient	
Function	**Description**
Read	Current I-coefficient Value after reset: 350
Write	New I-coefficient
Value range	0 .. 32767

Register 1xy027: Current Limitation of the Digital Speed Loop

Function	Description
Read	Current limitation Value after reset: 0
Write	Sets a new current limitation
Value range	0 .. 256

Register 1xy028: Current I-Coefficient Digital Speed Loop

Function	Description
Read	Current I-coefficient Value after reset: 0
Write	Defines a new I-coefficient
Value range	-30000 .. +30000

Register 1xy029: I-Coefficient Limitation of the Digital Speed Loop

Function	Description
Read	Current limitation Value after reset: 30000
Write	Defines a new limitation
Value range	0 .. 30000

4.4.4 Registers for Linear Interpolation

Register 1xy030: Nominal Position 1. Axis of the Master Module	
Function	**Description**
Read	Current nominal position Value after reset: 0
Write	Sets a new nominal position
Value range	-8388608 .. +8388607

This register defines the nominal position of axis 1 of the master module if it participates in a linear interpolation (commands 38, 39, 43).

Register 1xy031: Nominal Position 2.Axis of the Master Module	
Function	**Description**
Read	Current nominal position Value after reset: 0
Write	New nominal position
Value range	-8388608 .. +8388607

This register defines the nominal position of axis 2 of the master module if it participates in a linear interpolation (commands 38, 39, 40).

Register 1xy032: Nominal Position External Slave 1

Function	Description
Read	Current nominal position Value after reset: 0
Write	New nominal position
Value range	-8388608 .. +8388607

This register defines the nominal position of an external slave axis if it participates in a linear interpolation (commands 32, 33).

Register 1xy033: Nominal Position External Slave 2

Function	Description
Read	Current nominal position Value after reset: 0
Write	New nominal position
Value range	-8388608 .. +8388607

This register defines the nominal position of an external slave axis if it participates in a linear interpolation (commands 32, 33).

Register 1xy034: Nominal Position External Slave 3

Function	Description
Read	Current nominal position Value after reset: 0
Write	Sets a new nominal position
Value range	-8388608 .. +8388607

This register defines the nominal position of an external slave axis if it participates in a linear interpolation (commands 32, 33).

Register 1xy035: Nominal Position External Slave 4

Function	Description
Read	Current nominal position Value after reset: 0
Write	New nominal position
Value range	-8388608 .. +8388607

This register defines the nominal position of an external slave axis if it participates in a linear interpolation (commands 32, 33).

Register 1xy038: Actual Position of the External Axis for Calculating of the Diagonal

Function	Description
Read	Current actual position Value after reset: 0
Write	New actual position
Value range	-8388608 .. +8388607

The actual positions of the master module axis need not to be defined

The actual positions of external slave axes have to be defined

- The actual position of one of the both axis is defined in this register, between which the resulting diagonal of the linear interpolation is fixed. Basically is valid:
- The **actual positions of the master module axes** (axis 1 and axis 2) are used, **but need not to be defined** by the user program. I.e. no actual positions have to be defined if both axes of the master module are used for calculation of the diagonal.
- **If the resulting diagonal is defined by one or two external slave axes** - so at maximum one axis is on the master module - **the actual positions of the two external axes have to be stored** into registers 1x4038 and 1x4039.
- The actual position of the axis which first gets its nominal position has to be stored into register 1x4038.
- Correspondingly the actual position of the axis that receives second its nominal position has to be stored into register 1x4039.

Register 1xy039: Actual Position of the External Axis for Calculating of the Diagonal

Function	Description
Read	Current actual position Value after reset: 0
Write	New actual position
Value range	-8388608 .. +8388607

The actual positions of the master module axis need not to be defined

- The actual position of one of the both axis is defined in this register, between which the resulting diagonal of the linear interpolation is fixed. Basically is valid:
- The **actual positions of the master module axes** (axis 1 and axis 2) are used, **but need not to be defined** by the user program. I.e. no actual positions have to be defined if both axes of the master module are used for calculation of the diagonal.

The actual positions of external slave axes have to be defined

- **If the resulting diagonal is defined by one or two external slave axes** - so at maximum one axis is on the master module - **the actual positions of the two external axes have to be stored** into registers 1x4038 and 1x4039.
- The actual position of the axis which first gets its nominal position has to be stored into register 1x4038.
- Correspondingly the actual position of the axis that receives second its nominal position has to be stored into register 1x4039.

Register 1x4040: Length of the Software Axis

Function	Description
Read	Current length Value after reset: 0
Write	Defines a new length
Value range	-8388608 .. +8388607

- The **calculated length of the software axis of the virtual master** of the linear interpolation is stored in this register.
- **The length of the software axis can also be specified by the user. Then the controller takes over this value** and does not calculate it again. In this case also the specification of the actual positions can dropped (registers 1xy038, 1xy039).

Register 1x4132: Axis Number Axis 1

Function	Description
Read	Current axis number Value after reset: 0
Write	Set new axis number
Value range	21 .. 82

The register contains the actual axis number of the first axis participating in the linear interpolation.

Register 1x4133: Axis Number Axis 2

Function	Description
Read	Current axis number Value after reset: 0
Write	New axis number
Value range	21 .. 82

The register contains the actual axis number of the second axis participating in the linear interpolation.

Register 1x4134: Axis Number Axis 3

Function	Description
Read	Current axis number Value after reset: 0
Write	Set new axis number
Value range	21 .. 82

The register contains the actual axis number of the third axis participating in the linear interpolation.

Register 1x4135: Axis Number Axis 4

Function	Description
Read	Current axis number Value after reset: 0
Write	Set new axis number
Value range	21 .. 82

The register contains the actual axis number of the fourth axis participating in the linear interpolation.

4.4.5 Registers for Circle Interpolation

Register 1x4041: Center Axis 1	
Function	**Description**
Read	Current center Value after reset: 0
Write	New center
Value range	-8388608 .. +8388607

- This register defines the center of axis 1 for the circle interpolation.
- Beside the center of this axis the center of axis 2 (1xy042) and the nominal angle (1xy045) of the interpolation have to be specified.
- Start points of the interpolation are automatically the last nominal positions of both axes.

Register 1x4042: Center Axis 2	
Function	**Description**
Read	Current center Value after reset: 0
Write	New center
Value range	-8388608 .. +8388607

- This register defines the center of axis 2 for the circle interpolation.
- Beside the center of this axis the center of axis 1 (1xy041) and the nominal angle (1xy045) of the interpolation have to be specified.

- Start points of the interpolation are automatically the last nominal positions of both axes.

Note:

The difference center x minus start point must not exceed ± 524207.

Register 1x4045: Nominal Angle of the Cricle Interpolation

Function	Description
Read	Current nominal angle Value after reset: 0
Write	Sets a new nominal angle
Value range	-8388608 .. +8388607 32768 = 360° ccw

This register determines the nominal angle of the arc, which both axes describe during circle interpolation.

Note:

The arc length must be less than 67108000.

Register 1x4046: Calculated Radius of the Circle Interpolation

Function	Description
Read	Current calculated radius Value after reset: 0
Write	prohibited
Wertebereich	-524207 .. +524207

The controller board calculates the radius of the circle interpolation with help of the registers 1xy041 to 1xy045.

Register 1x4047: Calculated Start Angle

Function	Description
Read	Current start angle Value after reset: 0
Write	prohibited
Value range	-8388608 .. +8388607

The controller board calculates the start angle of the circle interpolation with help of the registers 1xy041 to 1xy045.

Register 1x4048: Calculated Arc Length

Function	Description
Read	Current arc length Value after reset: 0
Write	prohibited
Value range	-8388608 .. +8388607

The controller board calculates the arc length of the circle interpolation with help of the registers 1xy041 to 1xy045.

Register 1x1049: Calculated Destination Position Axis 1

Function	Description
Read	Current destination position Value after reset: 0
Write	prohibited
Value range	-8388608 .. +8388607

The controller board calculates the destination position of axis 1 of the circle interpolation with help of the registers 1xy041 to 1xy045.

Register 1x1050: Calculated Destination Position Axis 2

Function	Description
Read	Current destination position Value after reset: 0
Write	prohibited
Value range	-8388608 .. +8388607

The controller board calculates the destination position of axis 2 of the circle interpolation with help of the registers 1xy041 to 1xy045.

Register 1xy051: Maximum Speed Adaption for Data Axis

Function	Description
Read	Current adaption Value after reset: 0
Write	Sets a new adaption
Value range	-8388608 .. +8388607

- Using the commands 38, 39, 43 the calculation of the speed of the software (master) axis of the linear and circle interpolation is realized with the data of axis 1 of the master module.
- In case of linear interpolation by command 40 the data of the axis 2 of the master module are used.
- Therefore this axis is called data axis.

- Each other axes participating in the interpolation has to be informed about the maximum speed of the master axis.
- Thus register 1xy051 of all axes gets the value of register 1xy018 of the data axis, if the maximum speed of the corresponding axes and the data axis are not equal.
- If they are identical the reset value 0 can be left in register 1xy051.

Register 1xy052: Adaption of Different Encoder Resolutions

Function	Description
Read	Current adaption value after reset: 0
Write	New adaption
Value range	-8388608 .. +8388607

Register 1xy052 is specified by following formula if one of the axes paticipating in the interpolation has a different encoder resolution than the data axis (see also description register 1xy051):

$$1xy052 = NELofThisAxis \,/\, NELDataAxis * 1000$$

NEL: Number of encoder lines

Register 1x4128: Axis Number Axis 1

Function	Description

Read	Current axis number Value after reset: 0
Write	Sets a new axis number
Value range	21 .. 82

This register contains the real axis number of the first axis participating in the circle interpolation.

Register 1x4129: Axis Number Axis 2

Function	Description
Read	Current axis number Value after reset: 0
Write	Sets a new axis number
Value range	21 .. 82

This register contains the real axis number of the second axis participating in the circle interpolation.

Register 1x4150: Start Position External Slave Axis

Function	Description
Read	Current start position Value after reset: 0
Write	Sets a new start position
Value range	-8388608 .. +8388607

4.4.6 Registers for the Follower

Note:

If the follower is used in table mode and the table runs between two fixed values (e.g. sine values with offset) command 54 has to be given previously.

Register 1xy053: Pointer to a Table Element	
Function	**Description**
Read	Current pointer Value after reset: 0
Write	New pointer
Value range	0 .. 7499

7500 nominal positions can be defined for the slave axis by a table. This register pointers to the different table entries.

Register 1xy054: Value of the Table Element	
Function	**Description**
Read	Current value Value after reset: 0
Write	New value for table element
Value range	-8388608 .. +8388607

This register contains the nominal position for the slave axis. The register content depends on the pointer register 1xy053 that points to one of the 7500 table elements.

Register 1xy055: Number of Table Elements

Function	Description
Read	Current number of table elements Value after reset: 0
Write	Sets a new number
Value range	1 .. 7500

This register defines the number of table elements - the size of the table.

Register 1xy056: Factor between Master and Slave

Function	Description
Read	Current factor Value after reset: 1
Write	New Factor
Value range	0 .. 32767

This register defines the master/slave ratio.

NomPos Slave = Factor * ActualPos Master / Divisor

Register 1xy057: Divisor between Master and Slave

Function	Description
Read	Current divisor Value after reset: 1
Write	New divisor
Value range	0 .. 32767

This register defines the master/slave ratio.

NomPos Slave = Factor * ActualPos Master / Divisor

Register 1xy058: Positive Maximum Position of the Master

Function	Description
Read	Current maximum position Value after reset: +8388607
Write	New maximum position
Value range	0 .. +8388607

The actual position is decreased by the value of this register when it exceeds the value of this register. It is quasi set to 0.

Register 1xy059: Negative Maximum Position of the Master

Function	Description
Read	Current maximum position Value after reset: -8388607
Write	New maximum position
Value range	-8388608 .. 0

The actual position is decreased by the value of this register when it exceeds the value of this register. It is quasi set to 0.

Register 1xy060: Increase Limitation of the Follower

Function	Description
Read	Current increase limitation Value after reset: 32767 increments
Write	New increase limitation
Value range	0 .. 32767

This register defines how many increments per controller cycle the speed of the slave axis is allowed to increase or decrease at maximum. Thus an acceleration limitation can be realized, which may be useful if a slave axis is switched to a running master axis.

Register 1xy075: Time Register for Execution of the Table	
Function	**Description**
Read	Last time Value after reset: 0
Write	New time
Value range	0 .. 32767

4.4.7 Registers for Relative Positioning

Register 1xy067: Relative Position	
Function	**Description**
Read	Current relative position Value after reset: 0
Write	New relative position
Value range	-8388608 .. +8388607

The value of register 1xy067 defines how many increments the axis positions further.

Note:

Register 1xy067 can only be used for relative positioning with start input.

Register 1xy068: Last Absolute Nominal Position in Relative Mode	
Function	**Description**
Read	Last nominal position Value after reset: 0
Write	New last nominal position
Value range	-8388608 .. +8388607

- The last nominal position can be read from register 1xy068 if the process was breaked by the AXARR

instruction during relative positioning and positioning is to be continued.

- Command 19 moves the axis to the absolute position that results of 1xy068 + 1xy067.
- Then the positioning continues by normal relative positioning.

Register 1xy085: Absolute Maximum Position
Endless-, Relative Positioning

Function	Description
Read	Last maximum position Value after reset: 7490000
Write	New maximum position
Value range	0 .. 7490000

- The actual and in case of relative positioning also the nominal position is set to 0 if the value specified in register 1xy085 is reached.
- If the absolute position reaches this value the positions are decreased by the value of register 1xy085.

4.4.8 Interpolation Control Registers (also see follower)

Register 1xy082: Curve Counter	
Function	**Description**
Read	Last counting value Value after reset: 0
Write	New counting value
Value range	0 .. 8388607

Register 1xy083: Table Filling Level	
Function	**Description**
Read	Current filling level Value after reset: 0
Write	Prohibited
Value range	0 .. 7499

Register 1xy084: Wait States Axis 42	
Function	**Description**
Read	Current number of wait states Value after reset: 50
Write	Current number of wait states
Value range	0 .. 32767

4.4.9 Position Controller Modes 1, 3 - Register 1xy098

The DIMA module can operate in 2 different modes:

Position controller mode 1

Mode 1: Without Tracking Error Compensation, with Digital Speed Loop

No tracking error compensation
Digital speed loop

Mode 1 does not compensate the tracking error and uses a digital speed loop.

Position controller mode 3

Mode 3: Tracking Error Compensation and Digital Speed Loop

Tracking error compensation
Digital speed loop

Mode 3 compensates the tracking error and uses a digital speed loop.

Register 1x1098: Mode Selection	
Function	**Description**
Read	Current mode Value after reset: 1
Write	New mode
Value range	1, 3

The mode specified in axis 1 but valid for both axes

The servo module operates in different modes; the mode selection is specified only in axis 1 but valid for both axes:

Register 1x1098 =	**1**	**No tracking error compensation, digital speed loop**
Register 1x1098 =	**3**	**Tracking error compensation and digital speed loop**

4.4.10 Miscellaneous Registers

Register 1xy071: Set Nominal and Actual Position Simultaneously	
Function	**Description**
Read	Last actual and nominal position Value after reset: 0
Write	New nominal and actual position
Value range	-8388608 .. +8388607

Write access to the register stops the axis: the axis has the new nominal respectivly actual position.

Remark:

This register should only be used if the axis is at standstill. This register is used to define a new **reference position** (also actual position) of the axis without loss of increments.

Following procedure is executed

Reg02 (NomPos) = Reg71
Reg09 (ActPos) = old ActPos + (Reg71 - old NomPos)

Register 1x1099: Version Number	
Function	**Description**

Read	Operating system version number Value after reset: version number
Write	Prohibited
Value range	-8388608 .. +8388607

The version number is necessary to provide effective technical support. Please give the version number if you contact the hotline for technical support.

Register 1xy155: Speed PreControl Adjustment

Function	Description
Read	Current factor for nominal speed Value after reset: 1000
Write	New factor
Value range	0 .. 1000

If state bit 23 = 0 (Reg 1xy000)

Nominal speed value = v_{Pre} * Reg1xy155 / 1000

4.4.11 Register Table

Reg No	R/W	SV Registers
0-23	***	**General Registers**
0	R/W	State register - Meaning of the bits: Bit 0: Reference set Bit 1: AXARR = position reached Bit 2: Actual position in destination window Bit 3: Tracking error recognised Bit 4: Negative limit switch active Bit 5: Positive limit switch active Bit 6: Home sensor active Bit 7: Software limit switch was active Bit 8: Limit switch was active Bit 9: Position controller switched on Bit10: Control after AXARR Bit11: Switch on relay Bit12: Reference run error Bit13: BUSY (only Com 9..12, 42, 43) Bit14: Software limit switch activated (1 = active) Bit16: Axis within stop ramp Bit17: Do not switch off if tracking error Bit18: Printing mark not found Bit19: SV amplifier error Bit20: Resolver error Bit21: Motor temperature too high Bit23: Tracking error correction switched off (1 = switched off)

01	R/W	Command register: **0** : AXARR with stop ramp **1** : Switch on controller **2** : Switch off relay **3** : Set reference **4** : Clear reference **5** : AXARR with position control **6** : AXARR without position control **7** : Position control in destination point - ON (*) **8** : Position control in destination point - OFF **9** : Automatic reference run **10**: Automatic reference run **11**: Automatic reference run **12**: Automatic reference run **13**: Control at limit switch - OFF **14**: Control at limit switch - ON (*) **17**: Relative positioning **18**: Absolute positioning (*) **19**: Continue after positioning break **20**: Relative positioning with start input - ON **21**: Relative positioning with start input - OFF **22**: Stop at reference point - ON (*) **23**: Stop at reference point - OFF **24**: Annex next interpolation **25**: Combine circle and linear interpolation **30**: Axis master in follower **32**: Axis 1 is slave **33**: Axis 2 is slave **38**: Master-slave configuration 1 **39**: Master-slave configuration 2 **40**: Master-slave configuration 3 **42**: Switch off command 30, register 43 **43**: Master-slave configuration 4 **44**: Follower via factor / divisor - ON **45**: Follower via factor / divisor - OFF **46**: Follower via table - ON **47**: Follower via table - OFF **52**: Run table with time index - ON **53**: Run table with time index - OFF

		54: Follower: slave without correction **55**: Follower: slave with correction **56**: Endless positioning in positive direction **57**: Endless positioning in negative direction **74**: Digital output 1 - ON **75**: Digital output 1 - OFF **76**: Digital output 2 - ON **77**: Digital output 2 - OFF **78**: Linear ramps **79**: Sine square ramps (*) **86**: Positioning by outputs - ON **87**: Positioning by outputs - OFF
02	R/W	Nominal position -8388608...+8388607
03	R/W	Nominal speed 0...1000 (if Reg21 = 1000)
04	R/W	Input polarities: 0...191 **Bit0**: 0=Home sensor 0V active 1=Home sensor 24V active **Bit1**: 0=Limit switch 0V active 1=Limit switch 24V active **Bit 2**: 0 = interrupt input (print mark mode, pin 11 15 pin Sub-D) low active 1 = interrupt input high active **Bit 3**: 0 = normal rotation direction 1 = rotation direction reversed **Bit4**: 0=Follower: execute table 1=execute upper table half **Bit5**: 0=activate limit switches 1=deactivate limit switches **Bit7**: 0=activate home sensor 1=deactivate home sensor
05	R/W	Start ramp 0...32767
06	R/W	Stop ramp 0...32767
07	R/W	Destination window range 0...8388607
09	R/W	Actual position -8388608...+8388607

10	R/W	P gain position controller	0...32767
11	Ro	Nominal speed position controller	-32768...+32767
12	Ro	Actual speed	0...32767
13	R/W	Time base for evaluation of the actual speed	6 ... 32767
14	R/W	Positive software limit switch	-8388608...+8388607
15	R/W	Negative software limit switch	-8388608...+8388607
16	R/W	Phase offset	0 .. 4096
17	R/W	Encoder lines	0...10000
18	R/W	Maximum speed of the SV motor combination	0...32767
19	Ro	Tracking error	-8388608...+8388607
20	R/W	Tracking error limit	0...8388607
21	R/W	Reference value for 1xy003 (maximum nominal speed)	0...32767
22	R/W	User/encoder resolution ratio	1...256
23	R/W	Number of pole pairs	2, ,3 4
24-29	***	**Registers for the Digital Speed Loop**	
24	R/W	P gain of the digital speed loop	0..32767
25	Ro	Nominal current	-256...+256
26	R/W	I-coefficient	0...32767
27	R/W	Current limitation of the speed loop	0...256

28	R/W	Current I-coefficient of the speed loop	-30000...+30000
29	R/W	I-coefficient limitation of the speed loop	0...30000
030-135	***	Linear Interpolation	
30	R/W	NomPos 1. axis master module	-8388608 .. +8388607
31	R/W	NomPos 2. axis master module	-8388608 .. +8388607
32	R/W	NomPos external slave 1	-8388608 .. +8388607
33	R/W	NomPos external slave 2	-8388608 .. +8388607
34	R/W	NomPos external slave 3	-8388608 .. +8388607
35	R/W	NomPos external slave 4	-8388608 .. +8388607
38	R/W	ActPos external axis for diagonale calculation	-8388608 .. 8388607
39	R/W	ActPos external axis for diagonale calculation	-8388608 .. 8388607
40	R/W	Software axis length	-8388608 .. +8388607
132	R/W	Axis number slave 1	21 .. 82
133	R/W	Axis number slave 2	21 .. 82
134	R/W	Axis number slave 3	21 .. 82
135	R/W	Axis number slave 4	21 .. 82

041-150	***	Circle Interpolation
41	R/W	Center axis 1 -8388608 .. +8388607
42	R/W	Center axis 2 -8388608 .. +8388607
45	R/W	Nominal angle -8388608 .. 8388607 Circle interpolation
46	Ro	Calculated radius -524207 .. 524207 of the circle interpolation
47	Ro	Calculated -32768 .. +32767 start angle
48	Ro	Calculated -8388608 .. +8388607 arc length
49	Ro	Calculated -8388608 .. +8388607 destination position axis 1
50	Ro	Calculated -8388608 .. +8388607 destination position axis 2
51	R/W	Maximum speed 0 .. 32767 adaption for data axis
52	R/W	Adaption of 0 .. 32767 different encoder resolutions
128	R/W	Axis number axis 1 21 .. 82
129	R/W	Axis number axis 2 21 .. 82
150	R/W	Start position -8388608 .. +8388607 external slave axis
53-60	***	Follower
53	R/W	Pointer to a table element 0 .. 7499

54	R/W	Value of the table element	-8388608 .. +8388607
55	R/W	Number of table elements	0 .. 7499
56	R/W	Factor between master and slave	1 .. 32767
57	R/W	Divisor between master and slave	1 .. 32767
58	R/W	Positive maximum position of the master	0 .. +8388607
59	R/W	Negative maximum position of the masters	-8388608 .. 0
60	R/W	Increase limitation of the follower	0 .. 32767
75	R/W	Time register for execution of the position table	0 .. 32767
67-68	***	**Relative Positioning**	
67	R/W	Relative position in relative mode with start input	-8388608...+8388607
68	R/W	Last absolute nominal position in relative mode	8388608...+8388607
85	R/W	Absolute maximum position endless, relative positioning	0 .. 7490000
75-84	***	**Interpolation Control Registers**	
82	R/W	Curve counter	0 .. 8388607
83	Ro	Table filling level	0 .. 7499
84	R/W	Wait states axis 42	1 .. 65535

****	***	**Miscellaneous**	
71	R/W	Set actual and nominal position simultaneously	-8388608 .. +8388607
98	R/W	Mode selection	0..3
99	Ro	Version number	0...8388607
155	R/W	Speed PreControl adjustment	0...1000

4.5 Linear Interpolation

4.5.1 Overview

Up to 6 axes can participate in a linear interpolation

- The SV module allows linear coordination of up to 6 axis.
- A virtual axis is attached to each physical axis which reflects the resulting movement of the coordination.
- The virtual axes of all SV axes move on a diagonale that is "fixed" between two physical axes.
- Also the start and stop ramps, the speed and the destionation window relate to this diagonale.
- The physical axes itself move slower by that part that they share in the movement.

The virtual software axis 4 is the master of the coordination

- The virtual software axis 4 is the master of the complete linear coordination. The controller board on which the master software axis is placed is called master board.
- The software axis 4 conducts all coordination tasks between the participating axis.
- Also the parametering of the linear interpolation is defined in axis 4.

Parametering is also done in the virtual master axis 4

- The parameters of the start and stop ramp as well as the speed and the destination window of the master axis (axis 4) are used as the parameters of the digital movement.
- Specification of these parameters in the registers of the master causes automatic transfer of the parameters to the registers of the slave axes when the coordination is started.

The master calculates the diagonale and transfers it to the slaves

- The master calculates the length of the diagonale movement and transfers it to the slaves. For that possibly (see registers 38, 39) the actual position of that both slaves between which the diagonale of the

complete coordination is "fixed", has to be declared to the master.

All axes are started and controlled corresponding to the virtual software master axis

- After this all virtual axes of the particular physical axes are started simultaneously and the physical axes are controlled corresponding to that part they share the movement (virtual master softeware axis 4).
- For this reason optimized adjustment of the tracking errors of the axes is very essential for linear coordination.

Note:

The better the tracking errors are adjusted the accurater the diagonale is followed by the physical axes.

4.5.2 Programming of a Linear Interpolation

6 linear interpolated axes

Assessment:

- o up to 6 axes can be linear interpolated.
- o the software axis of one module determines the parametering of the coordinated movement.

Software axis is master (axis 4)

- o the softtware axis, the axis 4 of this one module, is the master axis of the complete coordination.

Master axis 4 is placed on the master module

- o all participating physical axis are slaves.
- o further the module which software axis 4 is the master of a coordination is the master module.

There are 4 different variants to combine the axis of a linear interpolation:

4 variants of linear interpolation

1. only the **two axes** of the **master module** participate.
2. **both axes** of the **master module** and **1 to 4 external axes** paticipate.
3. **axis 1 of the master module** and up to **5 external axes** participate.
4. **axis 2 of the master module** and up to **5 external axes** participate.

4 different procedures to program a linear interpolation exist corresponding to these 4 different variants.

Basically is valid:

Declare one module for master

a) one module has to be defined as master board. For that axis 4 of the master module receives a command that define it as master axis of the coordination (1x4001 = 38 or 39 or 40 or 43).

Parametering in the master axis

b) the parametering (speed, start and stop ramps and destination window) is specified for the master axis (axis 4). (Registers 1x4003, 1x4005, 1x4006, 1x4007).

Declare axes per command to slaves

c) the external slaves has to be told bei command that they are participating the coordination (Register 1xy001 = 32, 33).

Declare physical axes numbers

d) write the physical axis numbers into the registers 1xy132 to 1xy135.

e) the nominal positions of the all slaves are given to the master axis (axis 4 of the master module). The master axis trafnsfers the necessary data to the other axes. (Registers 1x4030...1x4037; register

1x4030 always contains only the nominal position of axis 1 of the master module, register 1x4031 always contains only the nominal position of axis 2 of the master module).

Command to the master axis starts the interpolation

f) a command to the master axis starts the interpoaltion (Register 1x4041 = 41).

Command 42 cancels interpolation mode

g) command 42 to each physical axis cancels the coordinated mode of all physical axes paticipating in the linear interpolation (cancel linear interpolation -> 1xy001 = 42).

1. Variant (Configuration 1)

1. Variant: Only the two axes of the master module participate

The simplest case of a liear interpolation is programmed as follows.

Command 38 activates Configuration 1

a) command 38 to the software axis 4 of the corresponding master module defines the axis 4 to the master master of the interpolation and the module itself to the master module. Simultaneously command 38 specifies that only the both axes of this board participate in the interpolation. For that the both physical axes of the module need not to be defined to slave axes additionally.

Speed, start and stop ramps are now defined

b) now the speed (1x4003), the start ramp (1x4004), the stop ramp (1x4006) and the destination window (1x4007) for the coordinated movement are defined in the registers of the software axis 4. If no values are set, the settings of axis 1 of the master module are valid.

Nominal positions axis 1 (21) and axis 2 (22)

d) the nominal position of axis 1 is stored into register 1x4030, the nominal position of axis 2 is stored into register 1x4031.

Command 41 starts the interpolation

e) Command 41 for axis 4 starts the linear interpolation:

Both axis start simultaneously and reach their nominal positions simultaneously. Each axis move with such a speed that the resulting speed is equal with the speed in register 1x4003. Write access to register 1x4003 during positioning changes the speed of all axes. An AXARR instuction or command 0 to axis 4 stops all axes.
Further positionings are started by definition of new nominal positions and the start command to axis 4.

Command 42: cancels interpolation mode

f) command 42 to each physical axis cancels the coordinated mode of the both physical axes. The axes operate now as independent axes again.

Example program:

The SV module is placed in slot 2.

```
TASK 0 ------------------------------------------
    ; ***** 1. Positioning *****
    ;
    REGISTER_LOAD [21098 with 3]      ;Mod.3: DigSpeedLoop
    ;
    ; Release and referencing of both axes
    REGISTER_LOAD [121001 with 1]     ;Release axis 21
    REGISTER_LOAD [122001 with 1]     ;Release axis 22
    REGISTER_LOAD [121001 with 3]     ;Reference axis 21
    REGISTER_LOAD [122001 with 3]     ;Reference axis 22
    ;
    ; Config 1: Both axes on module at
    ; slot 2 participating interpolation
    REGISTER_LOAD [121001 with 38]    ;21 mast. int.slave
    ;
    REGISTER_LOAD [124003 with 600]   ;Speed
    REGISTER_LOAD [124005 with 1000]  ;Start ramp
    REGISTER_LOAD [124006 with 1000]  ;Stop ramp
    ;
    ; Define positions
    REGISTER_LOAD [124030 with 30000] ;NomPos axis 21
    REGISTER_LOAD [124031 with 14000] ;NomPos axis 22
    ;
    REGISTER_LOAD [121001 with 41]    ;Start interpol
    ;
WHEN
    AXARR axis=21                     ;Axis arrived ?
```

```
    AXARR axis=22
  THEN
    DELAY 10
    ;
    ; ***** 2. Positioning *****
    ;
    REGISTER_LOAD [124030 with 2000]  ;NomPos axis 21
    REGISTER_LOAD [124031 with -4000] ;NomPos axis 22
    ;
    REGISTER_LOAD [124001 with 41]    ;Start interpol
    ;
WHEN
    AXXAR axis=21                     ;Axis arrived ?
    AXARR axis=22
  THEN
    ;
    ; Cancel interpoaltion mode
    REGISTER_LOAD [121001 with 42]    ;Cancel interpol
    REGISTER_LOAD [122001 with 42]    ;mode
    DELAY 10
    GOTO 0
Program end
```

2. Variant (Configuration 2)

Both axis of the master module and external axes

a) in this case command 39 declares the master axis 4 (register 1x4001 = 39). Because of this both physical axes of the module became slave axes.

Assign physical axis numbers to logical axis numbers

b) Now the physical slave axis numbers have to be assigned to the logical slave axis numbers of the coordination. This is realized with the registers 1x4132 to 1x4135.

Speed, start and stop ramp

c) now the speed (1x4003), the start ramp (1x4005), the stop ramp (1x4006) and the destination window (1x4007) for the coordinated movement are defined in the registers of the software axis 4. If no values are set, the settings of axis 1 of the master module are valid.

Declare external axes to slaves

d) the external axes get either command 32 (axis 1) or command 33 (axis 2).

Define nominal positions

e) now the nominal positions of the axes are stored into the registers 1x4030 to 1x4035. The nominal position of the axis 1 of the master module is stored

into register 1x4030, the nominal position of the axis 3 of the master module is stored into register 1x4031. Then the nominal positions of the external slaves are entered.

Define resulting diagonale

The actual positions of the axes, which are used for calculation of the resulting diagonale, have to be stored into the registers 1x4038 and 1x4039, if the both axes of the master module are not used for calculation of the resulting diagonale. Besides, the nominal positions of these axes have to be declared first. The actual position of register 1x4038 relates to the nominal position (and axis) which was declared first. The actual position of register 1x4039 relates to the nominal position (and axis) which was declared second (see section before).

Command 41 starts coordination

f) command 41 for axis 4 start the coordination.

All axes start simultaneously and reach their nominal positions simultaneously. Each axis move with such a speed, that the resulting speed is equal to the value in register 1x4003.
Write access to register 1x4003 during a positioning changes the speed of all axes. An AXARR instruction or command 0 to axis 4 stops all axes.
Further positionings can now be started by definition of new nominal positions and the start command to software master axis 4.

Command 42 cancels coordinatio mode

g) command 42 for the physical axis cancels the coordinated mode (cancel linear interpolation -> 1xy001 = 42). The axes operate now as independent axes again.

3. Variant (Configuration 4)

Axis 1 master module and external axes

The third variant is on principle identical to the second variant, but it uses command 43 instead of 39. Command 43 defines that only the axis 1 of the master board participates in the interpolation. Besides the registers 1x4038 and 1x4039 have to be initialized.

In case of the variants 1 to 3, the axis 4 operates internally together with axis 1 therefore the values of the registers of axis 1 and axis 4 change together.

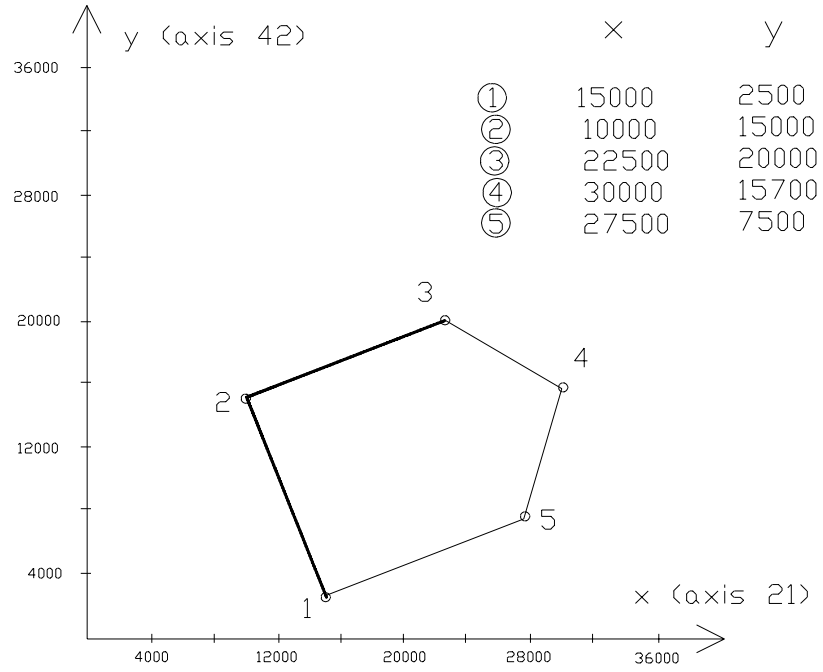
Adapt encoder line numbers and maximum speeds to the master axis 1

All encoder line numbers (register 1x4y52) and maximum speeds (1xy051) of the slave axes have to be adapted to the axis 1 of the master module, if the slave axes parameters should differ from the parameters of the master module.

Example program for the 3. Variant

The bold represented lines of the figure are executed linear interpolated. Following preconditions have to be observed:

- o one SV module is plugged into slot 2: axis 21
- o one SV module is plugged into slot 4: axis 42



	x	y
①	15000	2500
②	10000	15000
③	22500	20000
④	30000	15700
⑤	27500	7500

```
TASK 0 ------------------------------------------
    ; ***** 1. Positioning *****
    ;
    ; Mode 3: digital speed loop for
    ; both axes
    REGISTER_LOAD [121098 with 3]     ;DigSpeedLoop for 21
    REGISTER_LOAD [141098 with 3]     ;DigSpeedLoop for 42
    ;
    ; Realease and reference of bothaxes
    REGISTER_LOAD [121001 with 1]     ;Release axis 21
    REGISTER_LOAD [142001 with 1]     ;Release axis 42
    REGISTER_LOAD [121001 with 3]     ;Ref 21 ActPos=0
    REGISTER_LOAD [142001 with 3]     ;Ref 42 ActPos=0
    ;
    ; Declare axis 42 to slave in the slave
    REGISTER_LOAD [142001 with 33]    ;42 slave (in slave)
    ;
    ; Config 4: axis 1 master, external slaves
    REGISTER_LOAD [124001 with 43]    ;21 master, ext axis
    ;
    ; Declare axis 42 to slave in the master
    REGISTER_LOAD [124132 with 42]    ;42isSlave(in master)
    ;
    REGISTER_LOAD [124003 with 600]   ;Speed
    REGISTER_LOAD [124005 with 1000]  ;Start ramp
    REGISTER_LOAD [124006 with 1000]  ;Stop ramp
    ;
    ; Define positions
    REGISTER_LOAD [124038 with 0]     ;ActPos axis 21
    REGISTER_LOAD [124039 with 0]     ;ActPos axis 42
    REGISTER_LOAD [124030 with 10000] ;NomPos axis 21
    REGISTER_LOAD [124032 with 15000] ;NomPos axis 42
    ;
    REGISTER_LOAD [124001 with 41]    ;Start interpolation
WHEN
    AXXAR axis=21                     ;Axis arrived ?
    AXARR axis=42
  THEN
    DELAY 10
    ;
    ; ***** 2. Positioning *****
    ;
    REGISTER_LOAD [124038 with 10000] ;ActPos axis 21
    REGISTER_LOAD [124039 with 15000] ;ActPos axis 42
    REGISTER_LOAD [124030 with 22500] ;NomPos axis 21
    REGISTER_LOAD [124032 with 20000] ;NomPos axis 42
    REGISTER_LOAD [124001 with 41]    ;Start interpolation
WHEN
    AXARR axis=21                     ;Axis arrived ?
    AXARR axis=42
  THEN
    DELAY 10
    GOTO 0
Program end
```

4. Variant

Axis 2 master module and external axes

The fourth variant is on principle identical to the third variant, but in this case axis 2 not axis 1 of the master module participates in the interpolation. Thus command 40 is used for definition of the master board.

Now the axis 4 of the master module operates internally together with axis 2, therefore the values of the registers of axis 2 and axis 4 change together.

Adapt encoder line numbers and maximum speeds to the master axis 2

All encoder line numbers (register 1xy052) and maximum speeds (register 1xy051) of the slave axes have to be adapted to the axis 2 of the master module, if the slave axes parameters should differ from the parameters of the master module.

4.6 Circle Interpolation

Software axis 4 of the master module is master

Any SV axes can execute a circle interpolation. As in case of the linear interpolation software axis 4 is master of the circle interpolation.

Programming of a circle interpolation:

Define physical axis numbers

a) the numbers of the physical axes participating in the circle interpolation have to be defined in registers 1x4128 and 1x4129.

Define centers

b) the center coordinates are defined in the registers 1x4041 and 1x4042.

Define nominal angle

c) input of the nominal angle into register 1x4045.

Command 41 starts the interpolation

d) Command 41 for axis 4 starts the circle interpolation.

Command 42 cancels interpolation mode

e) command 42 to both physical axes cancels the circle interpolation mode of the both physical axes (end of circle interpolation -> 1xy001 = 42). The axes operate now as independent axes again.

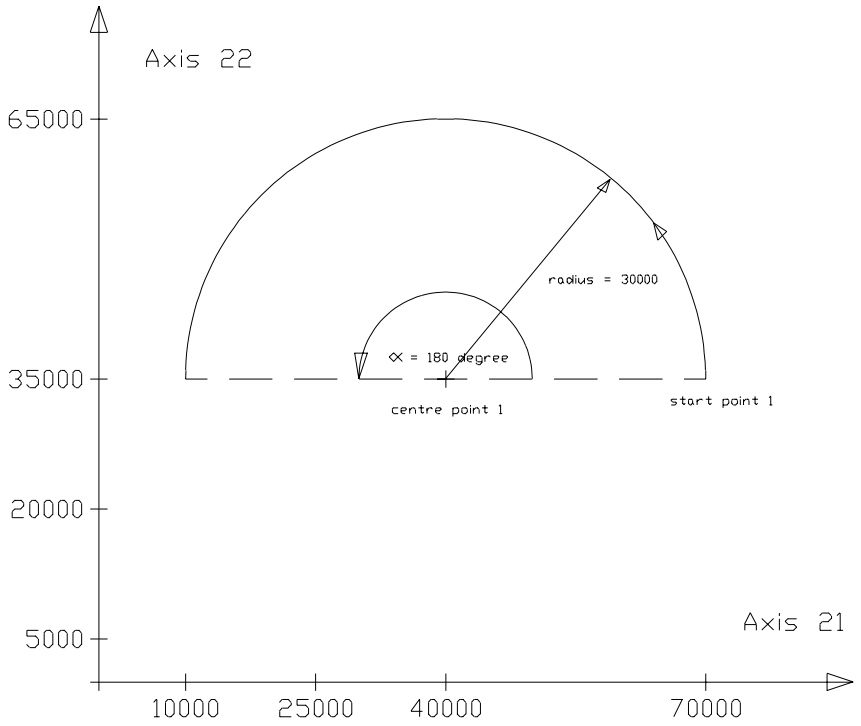
f) the last nominal positions are the start point of the arc.

Example program:

The SV module is placed in slot 2.

```
TASK 0 -------------------------------------------------
    ;
    ; Mode 3: digital speed loop for
    ; both axes 21, 22
    REGISTER_LOAD [121098 with 3]
    ;
    ; Reference and release of both axes
    REGISTER_LOAD [121001 with 1]     ;Release axis 21
    REGISTER_LOAD [122001 with 1]     ;Release axis 22
    REGISTER_LOAD [121001 with 3]     ;Ref 21 ActPos=0
    REGISTER_LOAD [122001 mit 3]      ;Ref 22 ActPos=0
    ;
    ; Declaration of the axes participating at
    ; the circle interpoaltion
    REGISTER_LOAD [124128 with 21];Axes 21, 22 participate
    REGISTER_LOAD [124129 with 22];circle interpolation
    ;
    REGISTER_LOAD [124003 with 600]   ;Speed
    REGISTER_LOAD [124005 with 1000]  ;Start ramp
    REGISTER_LOAD [124006 with 1000]  ;Stop ramp
    ;
    ; Define positions
    REGISTER_LOAD [124041 with 40000] ;Center axis 21
    REGISTER_LOAD [124042 with 35000] ;Center axis 22
    REGISTER_LOAD [124045 with 16383] ;Nominal angle 180°
    ;
    REGISTER_LOAD [124001 with 41]    ;Start interpolation
    ;
    DELAY 10
    GOTO 0
Program end
```

Following example illustrates the parametering:



4.6.1 Combined Cirlce and Linear Interpolation

4 axes linear to circle interpolation

Up to 4 axes can be linear interpolated to a circle interpolation. The circle movement can only be executed by the both axes of the master board. The axes of the other boards are linear interpolated to the length of the arc, that means the speed and the ramps of the linear interpolated axes are controlled by the relation of their nominal/actual-difference to the arc length.

The programming differs to the exclusive circle interpolation by following:

Command 25 defines other axes are participating

- command 25 precedes the parametring of the circle interpolation. The command informs the master board about the participation of further axes in the interpolation.

Commands 32 (axis 1) or 33 (axis 2) define the slave axes

- the commands 32 (axis 1) or 33 (axis 2) define the corresponding axes to slaves. If the commands were already specified in a preceding interpolation and not canceled by a command 42, then no repeated commands are necessary.

Nominal positions of the linear slaves

- identical to the linear interpolation the nominal positions of the external axes are stored into the registers 1x4032 to 1x4035.

Define center and nominal angle

- now the circle interpolation is started:
  register 1x4041 and 1x4042 define the centers
  register 1x4045 specifies the arc
  the commands 41 starts the movement

Commands 41 and 24 starts the movement

Example program

```
 1:     REGISTER_LOAD [134150 with 20000] ;StartPos axis 22
 2:     ; ************************************
 3:     ; Circle 31 and 22 with linear 32
 4:     ; ************************************
 5:     REGISTER_LOAD [134001 with 25]    ;Screw
 6:     REGISTER_LOAD [134128 with 31]    ;Declare axis no
 7:     REGISTER_LOAD [134129 with 22]    ;Declare axis no
 8:     ;
 9:     REGISTER_LOAD [134003 with 500]   ;Speed
10:     REGISTER_LOAD [134005 with 500]   ;Start ramp
11:     REGISTER_LOAD [134006 with 500]   ;Stop ramp
12:     ;
13:     ; ------ Destination window -------------
14:     REGISTER_LOAD [134007 with 10]    ;Dest. window
15:     ;
16:     REGISTER_LOAD [134041 with 20000] ;Center 31
17:     REGISTER_LOAD [134042 with 20000] ;Center 22
18:     ; ------ Relative angle for circle ------
19:     REGISTER_LOAD [134045 with 163840] ;5 circle
20:     ; --------  Gradient ---------------
21:     REG 134031
22:     =
23:     REG 132002
24:     +
25:     500
26:     ; ====================================
27:     REGISTER_LOAD [134001 with 41]    ;Start interpol
28:     ;
29: WHEN
30:     AXARR axis=22
31:     AXARR axis=31
32:     AXARR axis=32
33:   THEN
34:     REGISTER_LOAD [122001 with 42]    ;End of interpol
35:     REGISTER_LOAD [131001 with 42]
36:     REGISTER_LOAD [132001 with 42]
End of program
```

4.7 Setup of a DIMA Axis

Note:

- **Observe a strictly chronologically procedure for setup of a SV axis, since else an overlay of different errors can occur because of the multitude of parameters that have to be adjusted.**
- **In case of using drives that are able to cause mechanical demage it is unconditionally recommended to unmount the motor during setup.to avoid running through of the motor.**
- **First check if all connections are attached in the right way. Wrong wiring excludes proper positioning.**

Resolver Function Check Actual Position Register 1xy009	
Measure	**Detail**
• Watch the value of register 1xy009 and simultaneously turn the motor shaft. • The resolver cable may be defect if the position values are not incremented or decremented corresponding to the turning direction.	**move motor** **check ActPos Reg009** **poss reason: resolver cable**

Amplifier Power Supply

Measure	Detail
• Supply the amplifier -> both LED "Ucc" and "Ready" have to light.	supply amplifier -> Ucc -> Ready light
• Attach the 24 V release at the amplifier. Now the green "On" LED has to light.	24V to Enable -> On lights
• If the DELTA controller has not been supplied up to now the "Controller" LED lights. Else lights the "Ready" LED.	supply DELTA -> Ready lights Controller -> error 1. DELTA not supplied 2. Connection disturbed (cable)

Motor Type Adaption

Measure	Detail
Now carry out motor **type adaption** with registers **Reg027** = current limitation for speed loop **Reg010** = P-gain **Reg024** = P-gain of the digital speed loop **Reg026** = I-coefficient of the speed loop	Reg027 Reg010 Reg024 Reg026 Reg027

if necessary (**Reg029** = I-coefficient limitation of the speed loop) store register values that corresponds to the used motor type.	

Final Release	
Measure	**Detail**
• Final release can now be given setting register 1xy001 to 1. Consequently the "On" LED lights. • Now it is difficult to turn the motor out of position and it always moves back to its previous position. • If the motor can be turned in both directions as easily as previous the motor is without current. Check motor cables. • Either the motor cable or the resolver cable is connected the wrong way if the oscillates or can be turned into one direction more easily than into the other. • The control parameters possibly may be to great if the motor oscillates although all cables are properly connected. In this case registers 1xy024, 1xy026 and 1xy010 have to be load with small values (e.g. Reg. 1xy024 = 10, Reg. 1xy026 = 10, Reg. 1xy010 = 100)	**load Reg001 with 1** **->**  **On lights** **motor shaft is hard else** **-> motor without current** **motor oscillates -> motor or resolver cable connected the wrong way** **or** **control parameters to great -> decrease** **Reg010** (100) **Reg024** (10) **Reg026** (10)

First Positioning Motor Dismounted	
Measure	**Detail**
• A first positioning can be started if the motor shaft has come to a standstill like mentioned above. • This is realized by loading register 1xy002. • Register 1xy009 "runs with" the motor rotation and after standstill the register value is approximatly the value of register 1xy002.	**load NomPos into Reg002** **ActPos Reg009 has to concur** **after standstill Reg002 ≅ Reg009**

Check Limit Switches and Home Sensor	
Measure	**Detail**
• The **inputs should be checked** before the motor is mounted again. • For that activate the positive limit switch of axis 1: **Limit+** LED (amplifier) lights (NOC) or extinguishes (NCC). Absolutely consider direction. • Also lights the **S1** LED during activation of the limit switch if previously no positioning occured or the last executed positioning moved in positive direction. • The **Limit+** LED extinguishes (NOC) or lights (NCC) after deactivation of the limit switch and the **S1** LED lights on. If the **S1** LED does not light there is possibly a wiring error. • If the **S1** LED already lights before the	**activate positive limit switch axis 1 -> Limit+** (amplifier) **-> S1** (DELTA module) **light** **deactivate positive limit switch -> Limit+** (amplifier) **extinguishes**

activation of the limit switch, its polarity is wrong (see register 1xy004).	-> S1 (DELTA module) lights on, extinguishes after next positioning started
• Repeat the same procedure for the **negative limit switch** and consider the **Limit-** LED (amplifier) and **S3** LED (DIMA module).	repeat procedure with the negative limit switch
• At last activate the home sensor of axis 1: **Home** LED (amplifier) lights (NOC) or extinguishes (NCC).	activate home sensor -> Home (amplifier) lights
Repeat procedure with axis 2	repeat procedure with axis 2

Destination of the Parameters

This is usually realized with help of a small test program of following or similiar kind (assumption: DIMA at slot 3):

```
TASK  0 -----------------------------
    THEN
      REGISTER_LOAD [ 13101 with 3]       * set reference
      REGISTER_LOAD [ 13101 with 1]  *activate controller
LABEL  40
      COPY [n=3, from 100 to 13105] * copy register block
      POS [axis=31, Pos=10000, v=1000]  * drive to 10000
  WHEN                                  * with speed 1000
      AXARR axis=31                     * reached dest. ?
    THEN
      DELAY 10
      POS [axis=31, Pos=0, v=1000]      * drive to 0
  WHEN
      AXARR axis=31                 * reached dest. ?
    THEN
```

```
      DELAY 10
      GOTO 40                          * close task
TASK  1 --------------------------------
    THEN
      DISPLAY_REG [#0, cp=1, Reg=13109] * display ActPos
      DELAY 2
      GOTO 1
```

- The program first sets the reference point and gives release of the amplifier.
- After that the parameters that are stored from register 100 on are loaded and positions 0 and 10000 are continuously called up with 1 second break at each position.
- Simultaneoulsy the actual position is displayed on the user interface or can be watched in the setup screen of SYMPAS.
- Following registers have to be initialized before program start:

REGISTER 100 (start ramp) = 700	(steep)
REGISTER 101 (stop ramp) = 3000	(flat)
REGISTER 102 (destination range) = 10	

- Now the program can be started. After setting of the reference point positions 0 and 10000 are simultaneously called up.

Adapt Parameters to Load With Help of Test Programm mentioned above

Measure	Detail
• Small values are written into registers 1xy024, 1xy026 and 1xy010 to adapt the control parameters to the load (e.g. Reg. 1xy024 = 10, Reg.	**Reg010 = P-gain** **Reg024 =**

1xy026 = 100, Reg. 1xy010 = 100). • Now increase value of register 1xy024 until the motor oscillates and then decrease it by 10%. • Carry out the same procedure with register 1xy026. • Now register 1xy010 is increased until the motor oscillates and then decreased until the motor stops oscillating. • **Possibly this adjustment procedure has to be repeated a second time to find the best settings, since the three registers depends to each other.** • Now define start, stop ramp and the destination window range: • Increase or decrease stop ramp until the desired deceleration performance is obtained. • If the drive oscillates at both end positions the stop ramp is to steep. Increase register 101 (of the test program mentiond above). • Increase (steeper) or decrease (flatter) start ramp until the desired acceleration performance is obtained. • A WHEN .. AXARR instruction is fulfilled if the destination window range is reached. Of course the axis	**P-gain digital speed loop** **Reg026 = I-coefficient digital speed loop** **motor in standstill** **load Reg with small values** **Reg010=100** **Reg024=10** **Reg026=10** **increase Reg024 until motor oscillates then decrease by 10%** **the same with Reg026, Reg010** **adjust stop ramp here Reg101** **adjust start ramp here Reg100**

drives to the exact destination position.	

4.8 Operating System Update

Operating system updates can be lead through in the **Transfer** menu of the SYMPAS programming environment. Oparting system files are available on the **JETTER** Mailbox (*.OS).

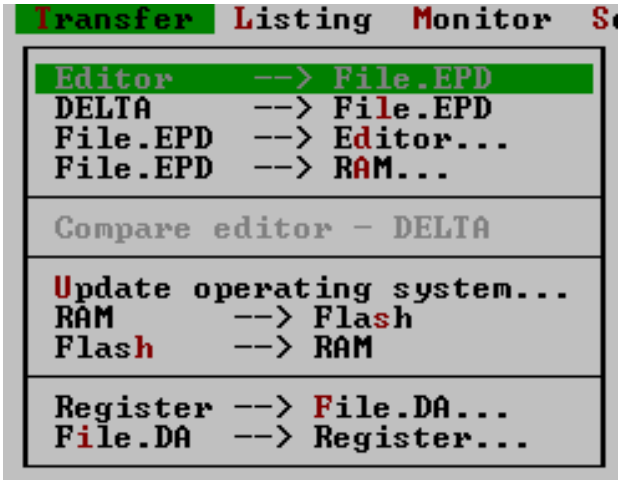
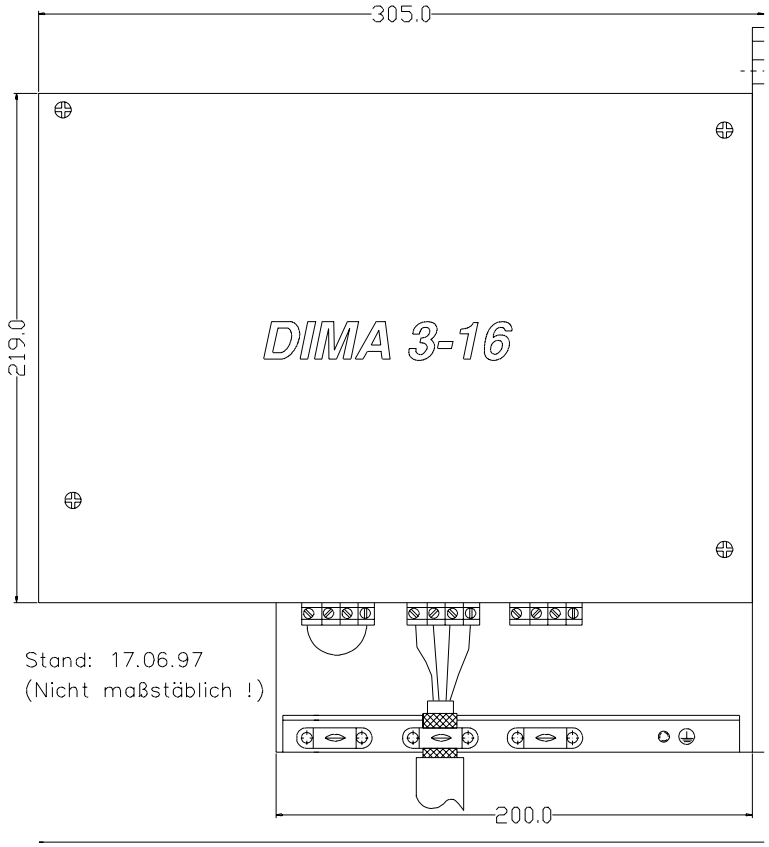


Figure 7: Operating system downloads for the DIMA module can be conducted with the SYMPAS programming environment.

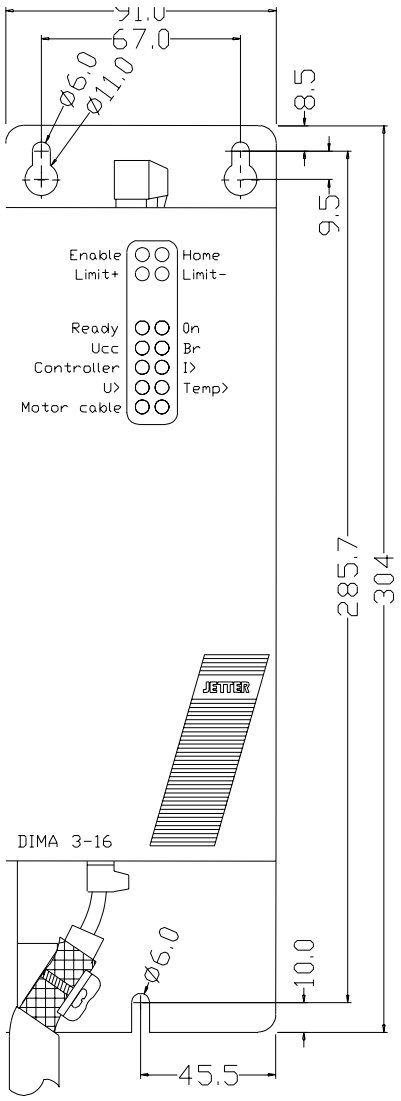
The timeout in the **Special/Settings** SYMPAS menu has to be set to 4000ms for operating system download (default).

4.9 DIMA Amplifier Dimensions (Standard)

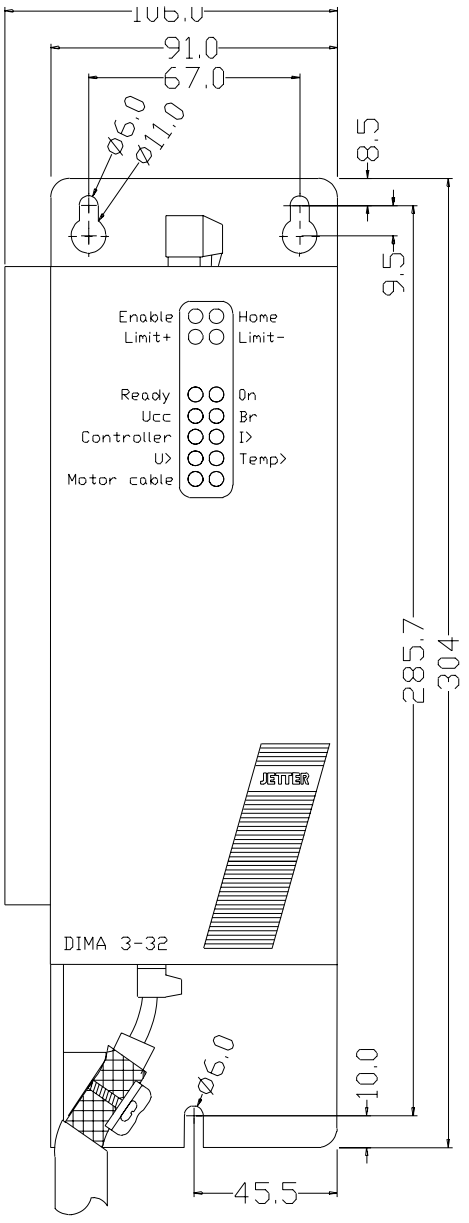
Side View DIMA3-16, -32, 50



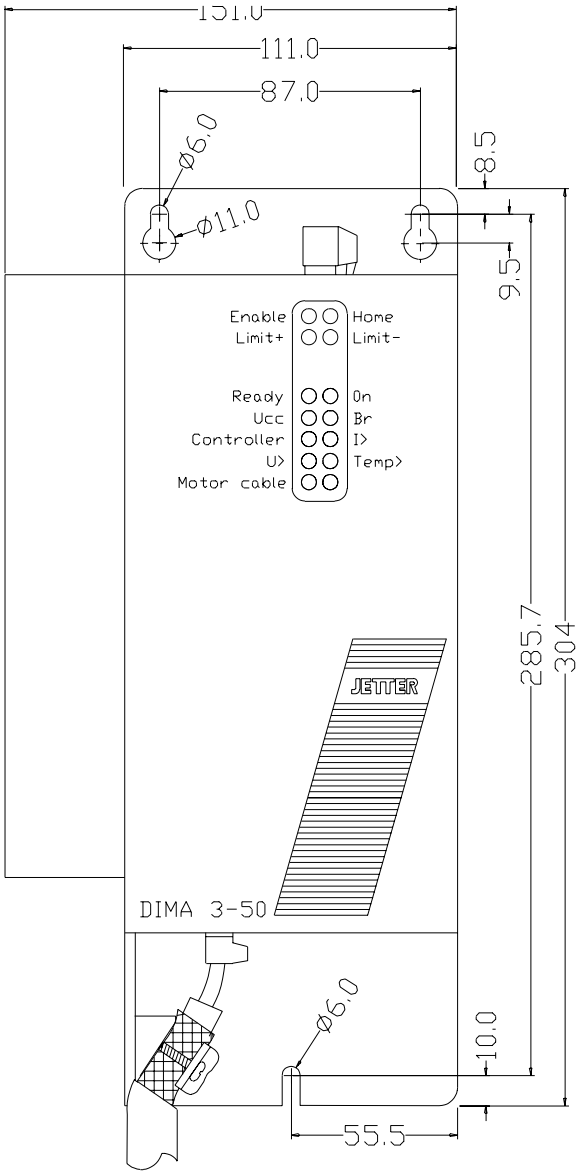
Front View DIMA3-16



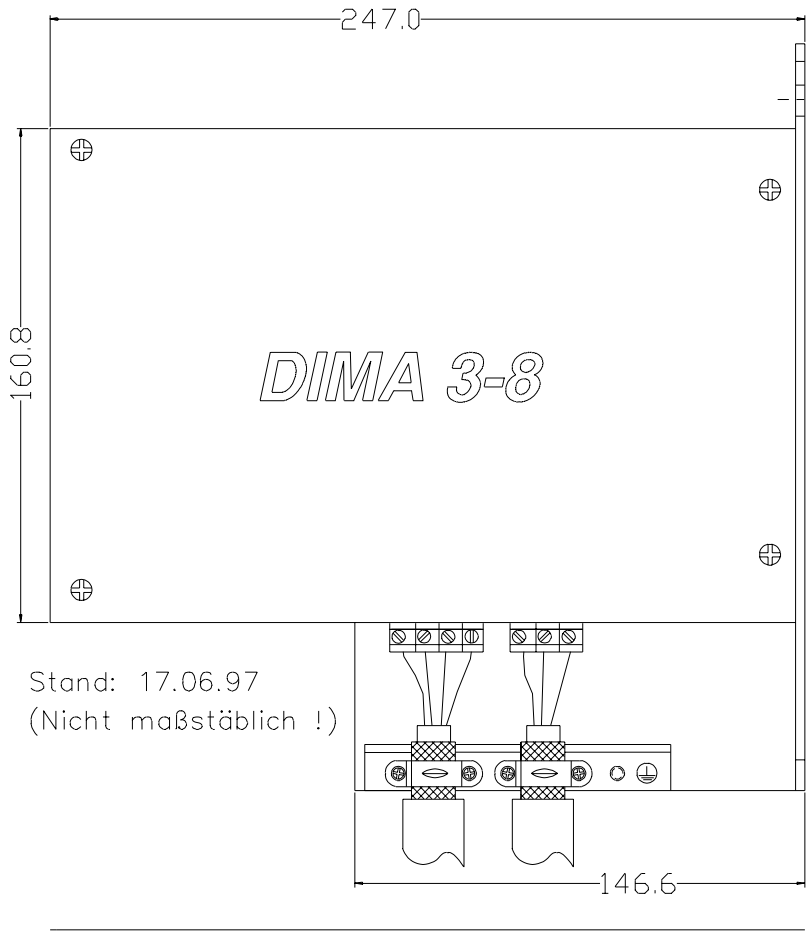
Front View DIMA3-32



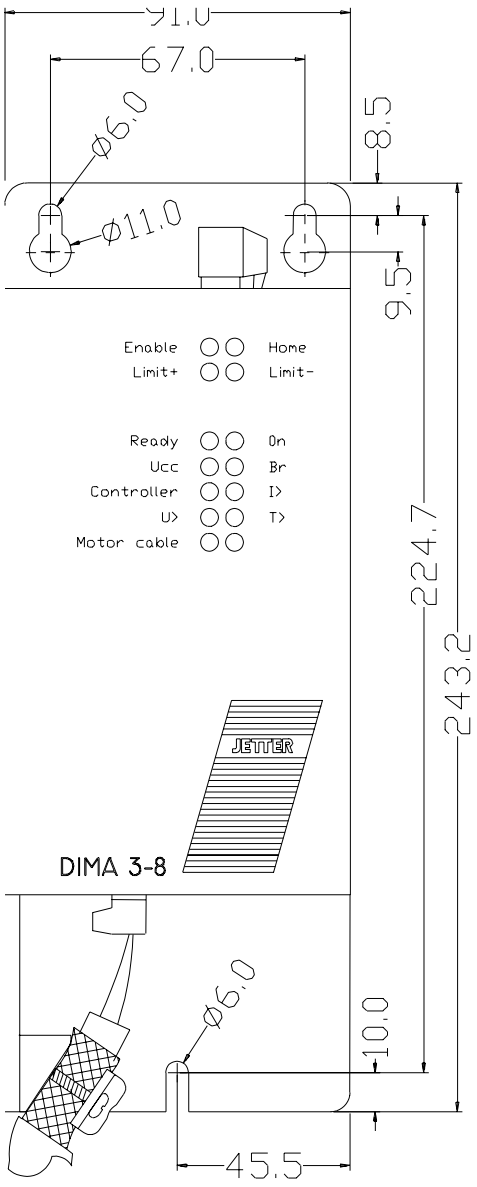
Front View DIMA3-50



Side View DIMA3-8



Front View DIMA3-8



Index

S

T