MANUAL

Batterie-Motor-Controller
BAMO A1,A2-x-60...500
for DC-Motors

BAMO A1, A260-500A

Contents

Electronic devices always involve the risk of failure.

Caution Direct Voltage
DC160V=

This manual has to be read carefully and must be understood by experts before installing or starting the device.
If there are any doubts call your trader or the manufacturer.

The BAMO series is designed to regulate electrical currents;
protection standard IP00.
Connection only toa battery or galvanic isolated direct voltage.(SeePage10)

Standardsand Guidelines:
The device andit's associated components can only be installed and switched on where the local laws and technical standards have been strictly adhered to:

EU-Guidelines   89/392/EWG,84/528/EWG,86/663/EWG,72/23/EWG
                            EN60204,EN50178,EN60439-1,EN60146,EN61800-3
- IEC/UL   IEC364, IEC 664,UL508C,UL840
- VDE-regulations   VDE100,VDE110,VDE160
- TÜV-regulations
- Regulations ofProfessionaland Occupational bodies:VGB4

The user has to assure that: after
-a failure ofthe device
-an incorrect handling
-a failure ofthe control unit etc.
the drive is brought toa secure operating condition.

Machinesandinstallations are to be provided with supervisory and safety equipment, that is independent ofthe device.

Adjustment
- only by qualified personnel
- adher to safety regulations

Installation work
- only when disconnected from allpower lines.

QS
The devices are archived by the manufacturer with serial number and their test specifications.
CE
The EU-guide line89/336/EWG with the Regulations EN61000-2andEN61000-4 are observed.

Safety advice

BAMO A1, A2 60-500A

GeneralInformation

The battery motor controller BAMO-Ax-xx forms together with the low voltage DC-motor a propulsion unit distingushed by its high control range.

With a DC-motor the current is proportionaltothe torque andthe voltage is proportional tothe speed.

Current and voltage are measured precisely.

The analogue circuits ofthe servo driveare simply constructed.

The speed actual value is generated from armature voltage or from the DC-tachogenerator.

The speed andthe current controller are disigned as P-I-controller.

In version BAMO-A2 (4Q)the brake energy is refeeded tothe battery.

Application

for all kinds ofmachines or vehicles upto40kW battery feeded drive power
especially for
-a great controller range
-ahigh efficiency
- small motor dimensions
-a even and smooth travel
for speed or torque regulation or
combined speed-torque regulation with or without superposed position controller.

For use in

battery powered vehicles like cleaning machines,el. boats,
fork-lift trucks, transport systems,
Solar- or wind powered installations,
and many other battery powered machinesandinstallations.

Construction:

Cubicle-mount unit inIP00 according totheVDE-DIN-andEU- regulations.
Standard analogue regulation electronics.
Power electronics with IGBT-power semiconductors,generous dimensioning.

Characteristics:

*   Battery supply or galvanicisolated direct voltage (Notice advice on page 10!)
*   Galvanic isolation between   auxiliary voltage and regulation electronics
     auxiliary voltage andpower stage
     regulation electronics andpower stage
*   Differentialcommand value inputs
*   Speedand torque regulation
*   Static and dynamic current limit
*   Measuringoutputs for speed and current
*   Enable logic,quickstop
*   Temperature control for motor and device

1 Basic-Information

Technical Data

Power Connection

Type BAMO A1,A2	36-60…360	160-60…360
Battery voltage	12,24V	36upto160V
Direct voltage bus	12,24V	36upto160V
Output voltage 0.8x U $_B$	max.30V	max.150V

Auxiliary voltage	24V=±20%,max.0.5A, waviness <20%

Spezifications

Type BAMO A1,A2-x-		60	120	180	280	360
Steady current max.	A=	60	120	180	280	360
Peek current max.(5s)	A=	100	200	300	400	600
El.powermax	kW	7.8	15.6	23.4	36.4	46.8
Power dissipation	W	300	600	900	1400	1800
External fusing	A	80	160	300	500	600
Cooling	See cooling advice page 8					
Dimensions (see drawings)	Size	2			3	
Weight	Kg	6			11	

Common specifications

Protection standard	IP 00
Device layout	VDE0100 group C
	VDE0160
Humidity stress	classF accordig toDIN40040
	no dewing
Setup height	<1000m above NN
Operation range	0...45°C
Extended operation range	upto60°Cred.2%/°C
Bearing range	-30°Cupto+80°C

Speed controller
control accuracy	without actual value error	±0,5%
Control range		1:,000
Temperature observation		80°C

VERSIONS: BAMO A1-xx 1 Quadrant-controller   propeling in rotation direction
BAMO A2-xx 4 Quadrant-controller   propeling and breaking in both rotation directions. Energy rear feed

CAUTION: for battery operation or direct current bus only
(see advice on page 10)

Dimensions

Dimensions BAMO A1,A2-x-60,120,240
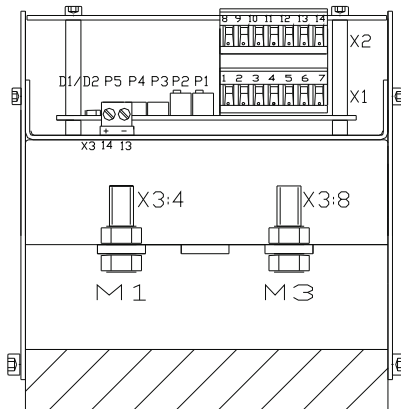
Mounting plate or
additional head sink .
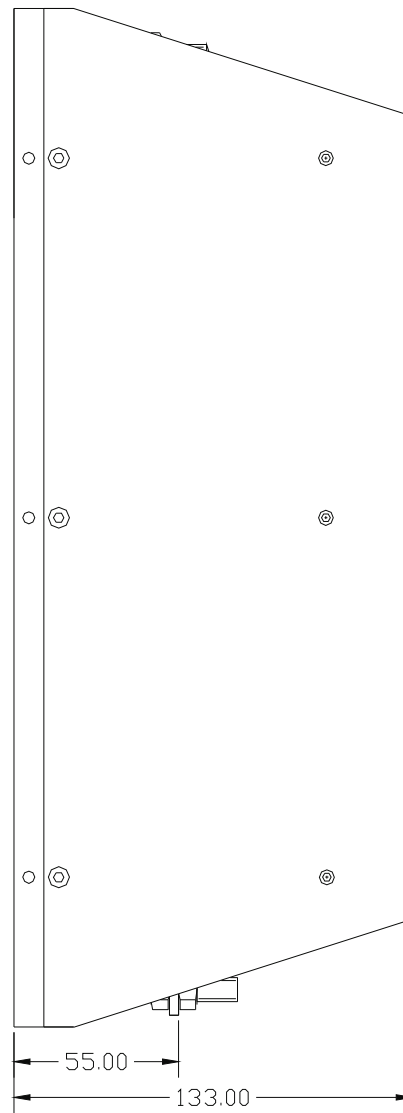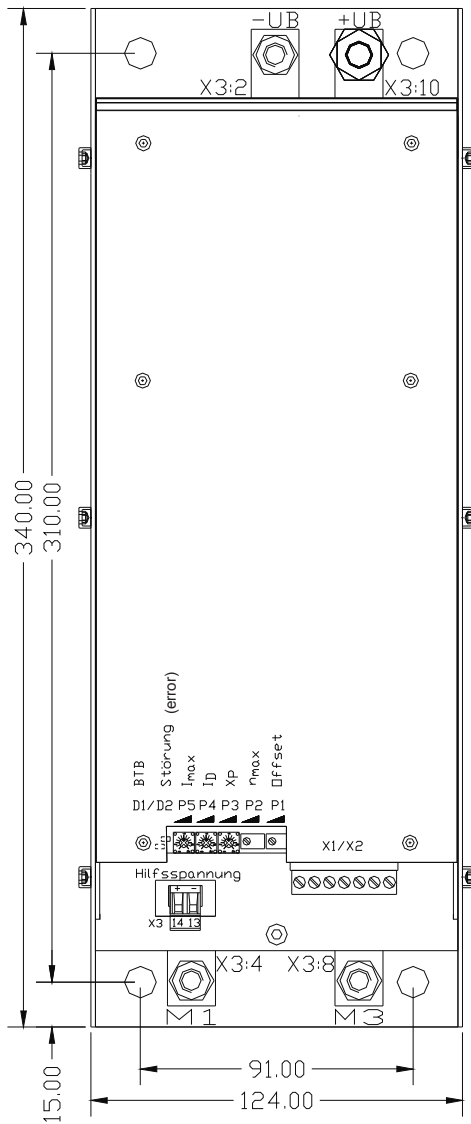
Size 2

Dimensions BAMO A1,A2-x-280,(500)
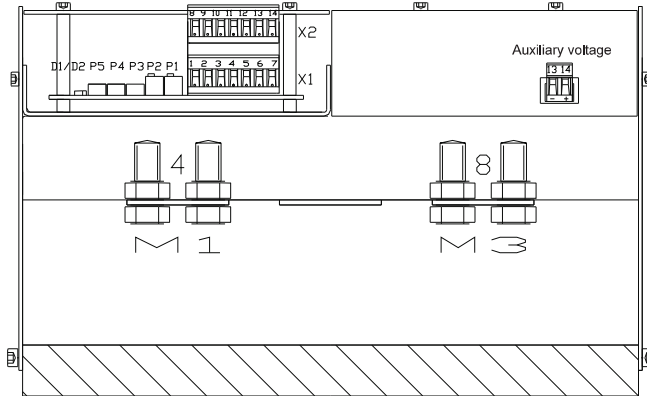
Mounting plate or additional head sink.
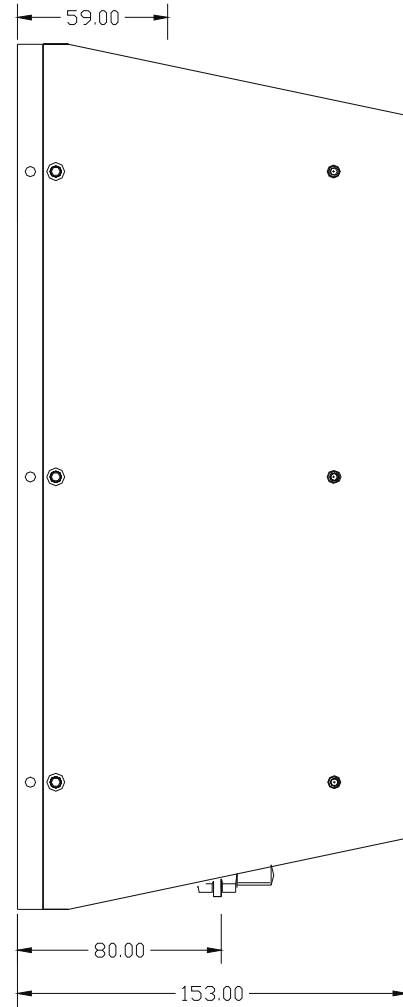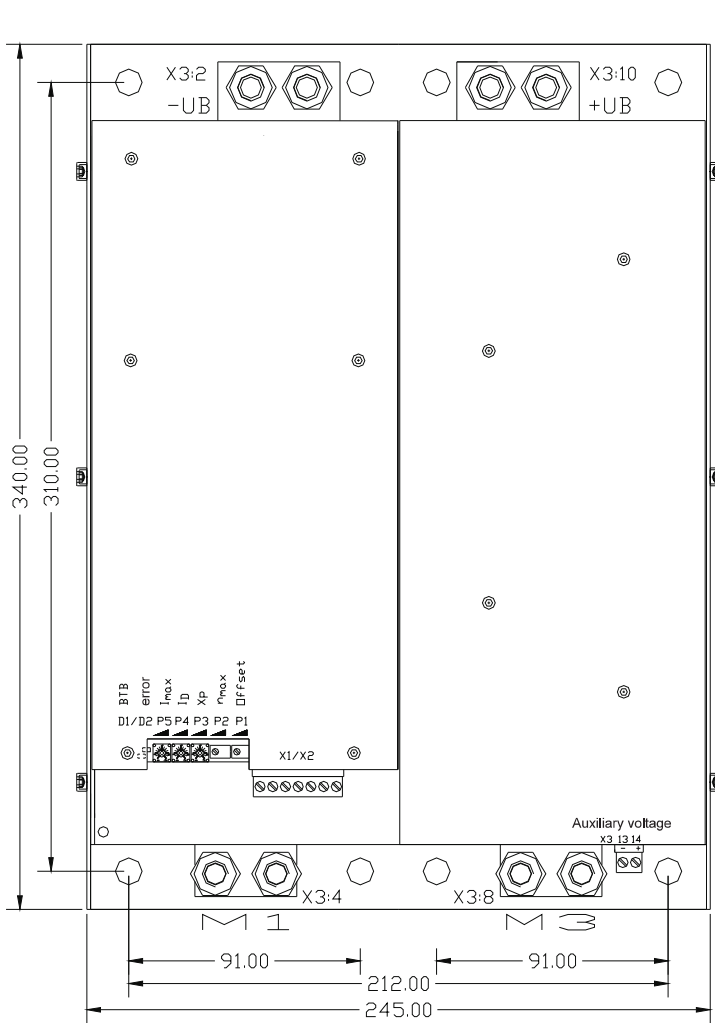
Size 3

Heat sink

Additional heat sinktype LUKUE -3,4(mountig onthe BAMO)
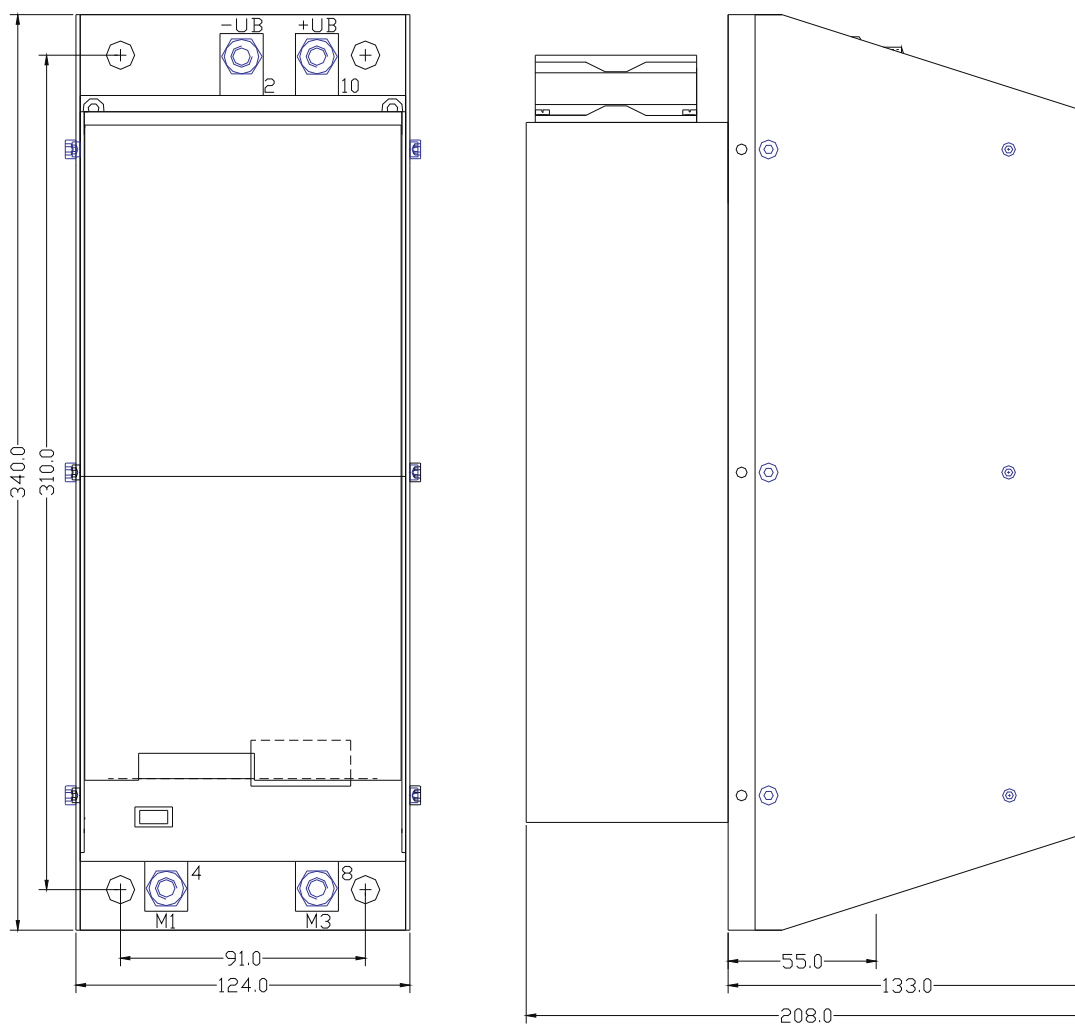
Size 2   1x addit. heat sink LUKUE 3   (Weight +3kg)
Size 3   1x addit. heat sink LUKUE 4
              or 2x LUKUE 3   (Weight +6kg)

Screws M10x110mm

Connection overview

BAMO A1, A2
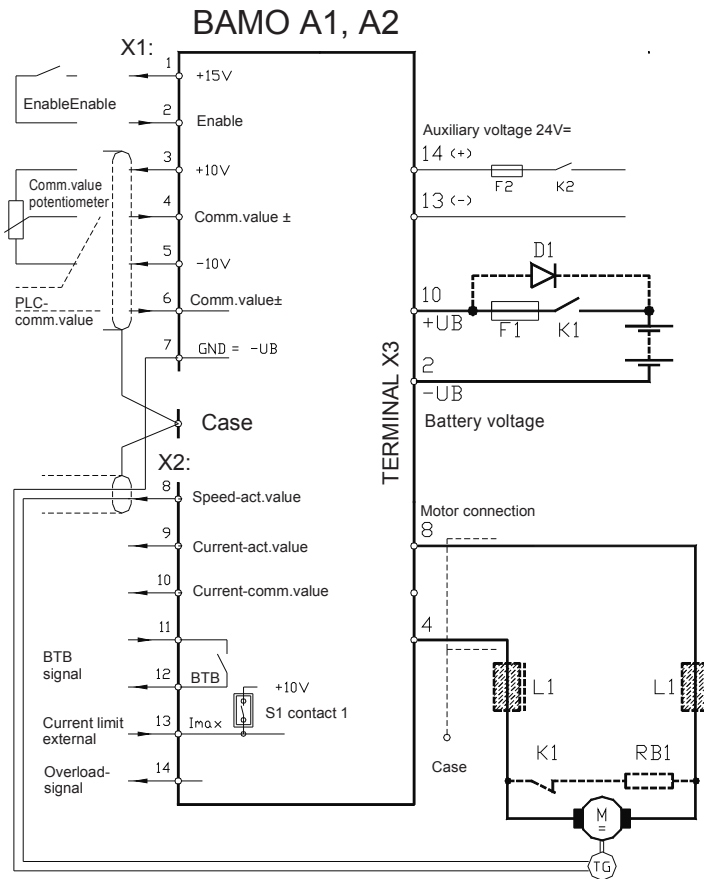
Notice:

Power connection X3:2(-UB),X3:10(+UB)

Connection polarity >   no protection against mixing upthe contacts
                 when the connection is wrong the output stage can be
           distroyed!

Thepower connection must not be devided during braking! If nessesary built in reverse-current-protection-diode D1. On-stage current = device peek current

Connection toDirect voltage bus or Power supply unit

Make sure that the overvoltage inthe buffer circuit is limitated to20% during braking. Small resistance ofthe source or ballast circuit.

If the resistance ofthe motor is very small thefast rising ofthe buffer voltage circuit can demage the semi-conductors.Innormal case the device is switched to error by the overvoltage observation.

Auxiliary voltage connection X3:13,X3:14

Safe against mixing upthe contacts.The connection can be switched seperated from thepower connection.

Notice the tolerance andtheresidualrippleofthe voltage.

Motor connection X3:4(M1),X3:8(M3)

The motor connections can be exchanged.

In case of EMC-problems use chokes and shielded line.

Brakong resistor RB1and DC-contactor K1as resistor brake with typeA1 or as battery failure brake with typeA2

Control connections see special advices.

Power Connection

Caution:
The connection advices concerning the individual attachment ofthe connections to the plug numbers or terminals are binding.
All further advices to this are not binding.
The input and output lines can be altered or completed in consideration ofthe electrical regulations.

Notice:
- **connection and operation advices**
- **local technical regulations**
- **EU-machine regulation 89/392/EWG, 84/528/EWG,86/663/EWG**
- **CE-advice, EMC**
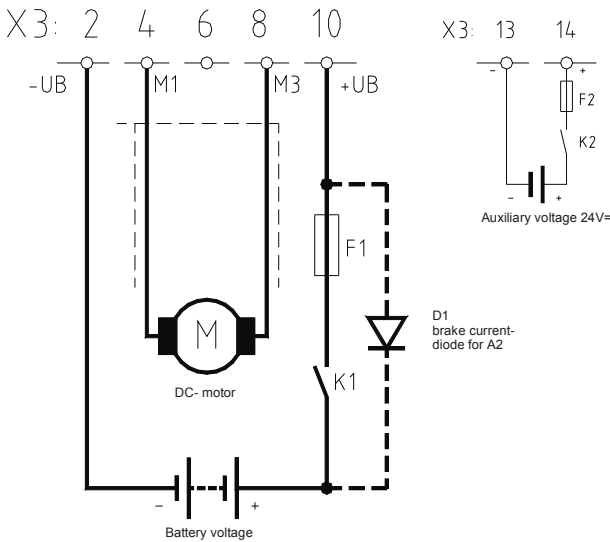
Caution:
Risk off distruction by overvoltage in buffer circuit

Using BAMO-A2-36 the batterie voltage (U $_B$+X3:10, U $_B$- X3:2) must be applicated tothe device 10s before switching onand10safter switching off enable to limitate a possible occuring brake voltage by the battery everse current protection diode D1 against uncontrolled disconnecting the battery voltage while braking.

If using aDC-Bus notice advices on page 10.

Dimensioning	atA	60	120	240	280
Battery lines (max.2m)	mm^2	10	35	95	120
Motor lines	mm^2	10	35	95	120
Fuse F1	A	89	160	360	500
Auxiliary voltage line	mm^2	0.5			
Fuse F2	A	2A			

Connection lines
Caution : with longer lines >>>   use a one step strengther cross section !

Connection

Control Connection
The connecting advices are for general information and without obligation

Notice:

- Connecting- and operating instructions
- Local regulations
- EU-machine regulation

pin-No.terminalblock
X1:1uptoX1:7andX2:8uptoX2:14

Signal lines
- Shielded and seperated from power lines.
- command values paired twisted and shielded.

Logical connections
- Relay with gold contacts or reed relays. Contact current 6mA.

Enable -internal logical voltage
- internal logical voltage   X1:1   +15V/10mA
- contact chain between   X1:1and   X1:2

Enable -external logical voltage
- enable voltage +10…+30V   X1:2
-GND   X1:7

Switch on enable
- command value and speed controller are enabled immediately.

Switch off enable
- command value and speed controller are enabled stop
- command value   >>>   is switched internally immediately to0
-after2 seconds   >>>   speed controller is locked.

Caution:
Make sure that the battery voltage is connected tothe device atleast for 10 seconds after switching offthe enable.

Auxiliary voltage connection
-Direct voltage command 24V=
- Operating range 19Vupto54V=
- Rated current 0.5A, inrush current 2A
-Residualripple<20%
- Fusing   2AF

Caution: when using a switching power supply for auxilary voltage.
                Switch onpower supply before connecting auxiliary voltage (K2).

Command value-speed

voltage source for command values ±10V,10mA

+10V	X1:3
-10V	X1:5
GND	X1:7

Command value input
- command value input maximum ±10V=
-differential input
- input resistance 50k Ω
- relay contacts: gold- or reed contacts

Caution
command value lines paired twisted and shielded. Screen connection one-sided.

Connection:

Command value voltage with internal supply

command value	X1:4(signal)
	X1:7(GND)
bridge	X1:6—X1:7

External command value voltage SPS/CNC

command value	X1:4(signal)
	X1:6(GND)

External command value current SPS/CNC
Resistance for command value current 0...±20mA>>>R-comm.=500 Ω

command value current	X1:4(signal)
	X1:6(GND)
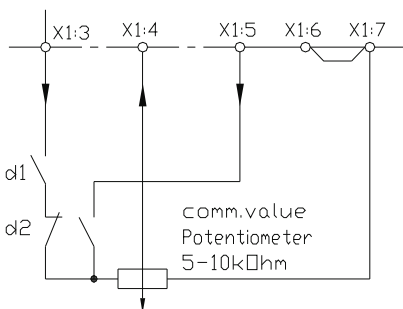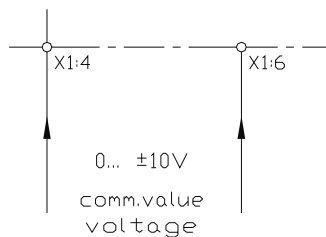
Int.supply   **CNC/PLC**   **Comm.value current**
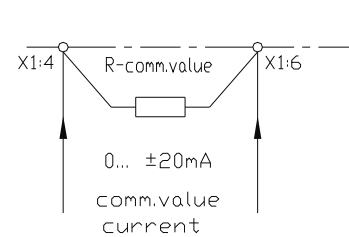
With **A1**(1Q) only positiove command value
leave outd2and connection X1:5 is not coated

Caution:
donot use a command value current between 4and20mA

Current

External current limitation

voltage source for external current limit

        +10V/10mA   X1:13
        GND   X1:7

Current limit input
maximum input voltage +10V

input resistance 10k Ω

internal attenuation with potentiometer I_{max}

relay contacts: gold- or reed contacts

switch S1, contact 2=OFF(see page 17)

Connection
current limit   X2:13 (signal)
                         X1:7   (GND)

Adjustment range

        0…+5V   >>>   0upto100% device command current
        0…+10V   >>>   0upto200% device command current
internal overcurrent control   >>>   max.5sec.

Int.supply	CNC/PLC	Comm.value current

X1:3   X2:13   X1:7   comm.value Potentiometer 5...10kΩhm

X2:13   X1:7   0... ±10V   Comm. value voltage

X2:13   R-comm.value   X1:7   0... ±20mA   Comm.value current
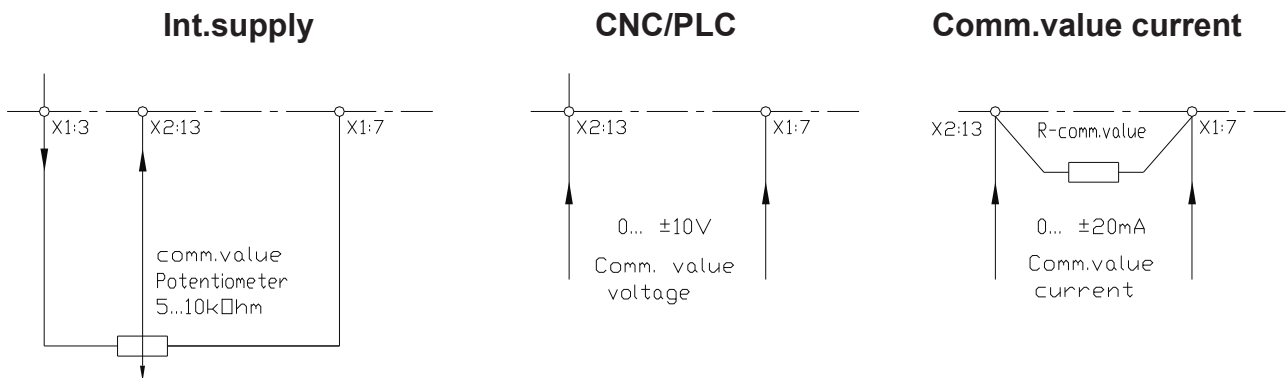
Caution:
case of internal current limit adjustment
switch S1   >>>   contact 2=ON
(see page 19)

Ready for operation signal BTB

Relay

signal contact	X2:12-X2:13
contact values	max.48V;0,5A

The ready for operation signal (BTB) shows theCNC/PLC
that the drive is ready for operation.
Switch BTB- signals of several axes in one row.

delay after switching onmains   >>>   max.1sec.

Function	Indication	BTB-Relay
Ready for operation	LED bright green	Contact closed
Not ready for operation	LED glims green	Contact open
Error	LED bright red	Contact open

BTB turns off with		Error is
Overtemperature		not stored
Overvoltage		stored
Short, Line-to-earth-fault		stored
Voltage error		not stored

To reset store switch off/on enable

Caution:
Use BTB-contact always with CNC/PLC - control
or with emergency-stop circuit !
Self-starting possible!
Fault memory is not effective with all faults !

"Blocked" Indication		
Current demand	Outpu X2:14	
Normal	>+10V	
Overload	<+2V	
Analogue measuring putputs		
Function	Motor current display	Speed display
Connection	X2:9,X1:7	X2:8,X1:7
Value peek current	+5.0V	
Value steady current	+2.5V	

BAMO A1, A260-500A

Control connections

Function	Designation	Clamp-Number
Voltage 15V/10mA	Enable - supply	X1:1
Enable +10bis+30V=	Enable - input	X1:2
Voltage +10V/10mA	Comm.value - supply +	X1:3
command value +	Comm.value - input +	X1:4
Spannung-10V/10mA	Comm.value - supply -	X1:5
command value -	Comm.value - input -	X1:6
GND		X1:7
Speed actual value	Tacho connection	X2:8
Current actual value	Measuring output	X2:9
Current command value	Measuring output	X2:10
BTB- contact	Ready for operation	X2:11
BTB- contact	Ready for operation	X2:12
Current limit external	Current limit input	X2:13
Blocked	Output	X2:14

Power connections

Function	Designation	Bolt-/Clamp-Number
Battery -	$-U_B$	X3:2
Motor1	M1	X3:4
Motor3	M3	X3:8
Battery +	$+U_B$	X3:10

Auxilary voltage connection

		Clamp-Number
GND-24V		X3:13
+24V=		X3:14

4 Device overview

Component overview
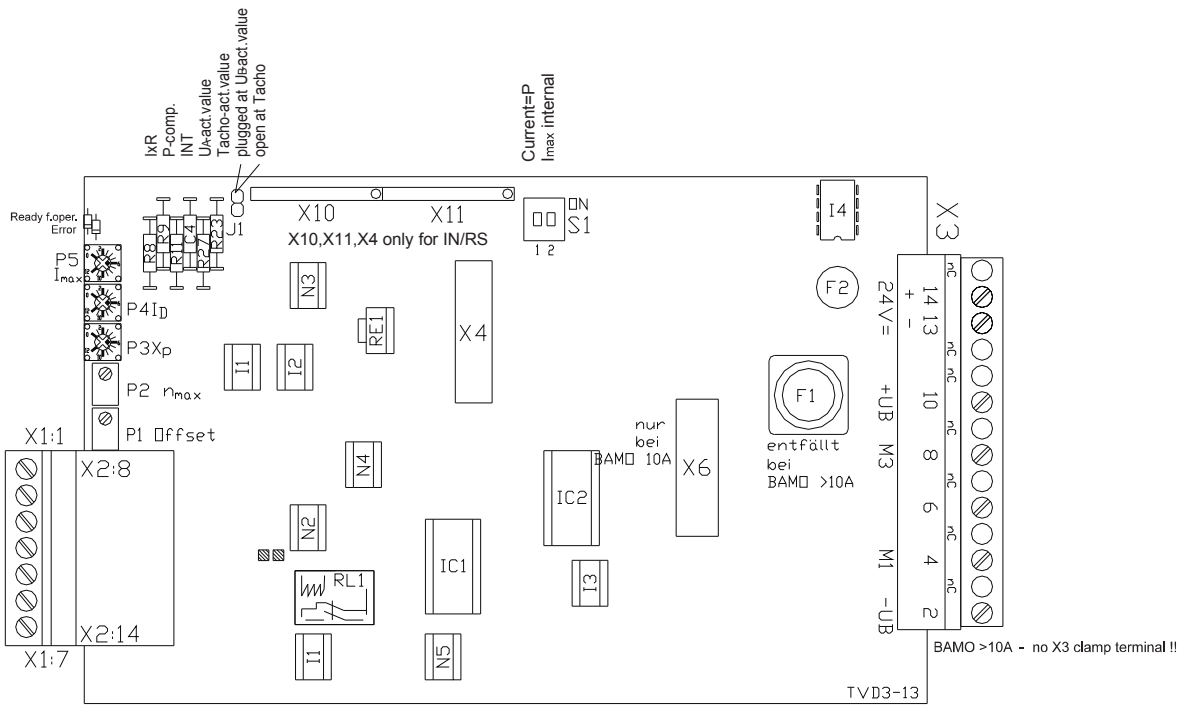
Indication	Function
D1 green	ready for operation
D2 red	Error

Trimmer	Function
P5	I_{max}
P4	I_D
P3	X_P
P2	n_{max}
P1	Offset

Clamp	Function
X1:1	+15V
X1:2	Enable
X1:3	+10V
X1:4	comm. value +(-)
X1:5	-10V
X1:6	comm. value -(+)
X1:7	GND
X2:8	n-act. value
X2:9	I-act. value
X2:10	I-comm. value
X2:11-12	BTB- contact
X2:13	Ext.current limit
X2:14	blocked

BAMO A1, A260-500A

4 Device overview
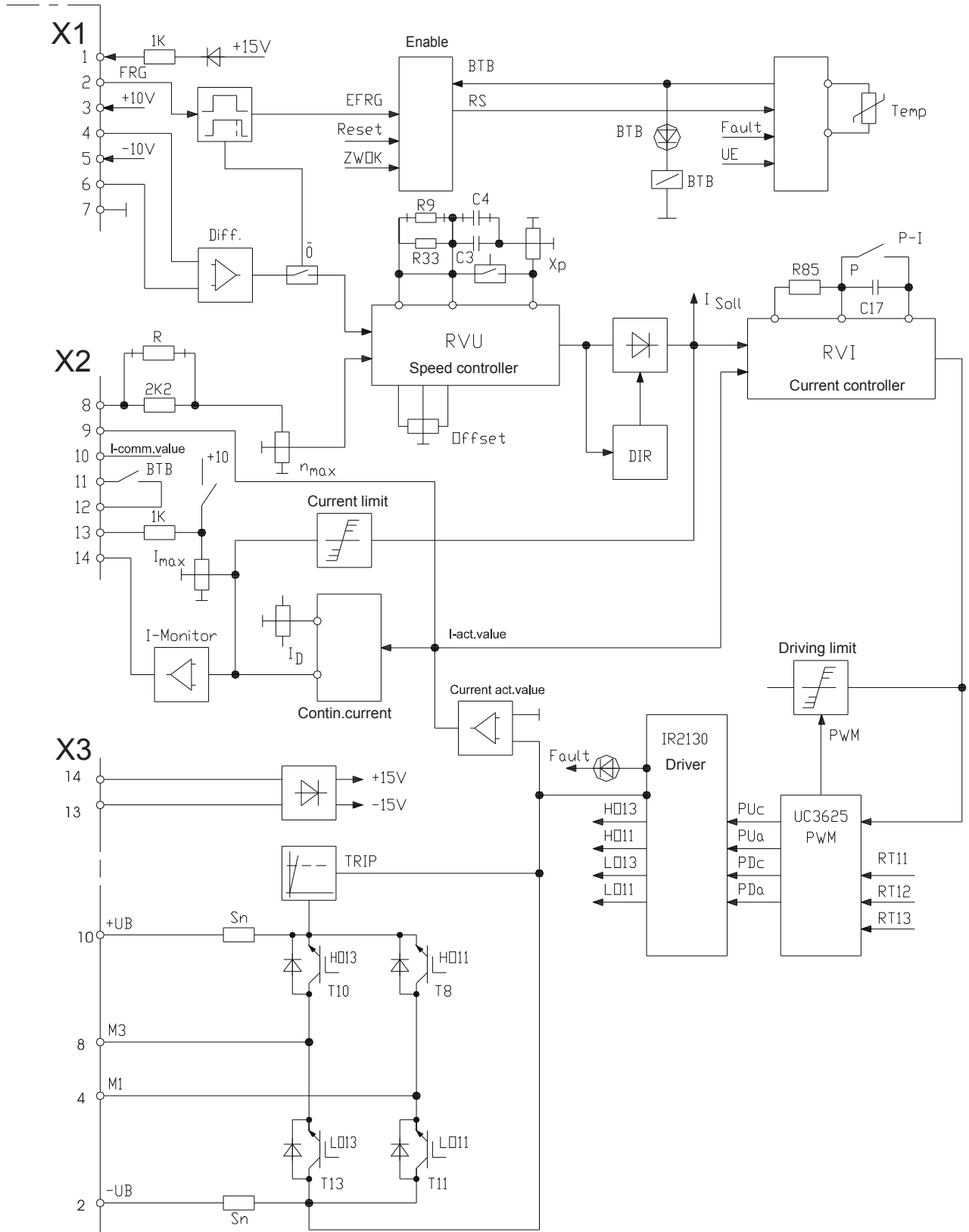
Adjustment functions

Function	Trimmer	Switch	Jumper	Component
Act.value balance DC-Tacho	$P2(n_{max})$		J1 open	R3
Actual value balance armature voltage control	$P2(n_{max})$		J1 plugged	R27
IxR-compentation				R8
Internal Current limit	$P5(I_{max})$	S1-2ON		
External Current Limit	$P5(I_{max})$	S1-2OFF		
Steady current	$P4(I_D)$			
Amplification P-Component	$P3(X_P)$			R9
Amplification I-Component				C4
Integrator				R11
Null balance	P1(Offset)			

Switch S1

Function	Contact	ON	OFF	
Current limit	2	internal	external	
Current amplification	1	P	PI	

LED-Indications

Function	Colour	Shines	LEDNo.	
Ready for operation (BTB)	green	bright	D1	
Temperature error	green	glim	D1	
Error	red	bright	D2	

Signal outputs

Function	Designation	Clamp-number
Speed	n-actual value	X2:8
Current	I-actual value	X2:9
Current command value	I-comm.value	X2:10
blocked	+12V/10mA	X2:14
Ready for operation -contact	BTB/error	X2:11,X2:12

Adjustment functions

Adjustment Advice

Adjustment
- only by qualified personnel
- adhered to safety regulations
- notice adjusting sequence

Presettings	Adjust with
Actual value	Tacho coarse adjustment R23
Internal/external current limit	Switch S1, contact 2
Current regulator P-PI	Switch S1, contact 1

Optimization	Adjust with
Act.value adjustment	n_{max} adjustment
Cuirrent controller	Switch S1, contact 1(default setup =ON)
Current limit	I_{max}, I_D-adjustment
Speed controller	X_P-adjustment,variable components
Zero point	Offset adjustment
Path-/position controller	inCNC\PLC

Caution:
control systems have to be optimized from inside tooutside.
Sequence :
Current controller   determinated by the load circuit time constants (motor circuit
        inductance and motor circuit resistance)
                optimized in factory, changing P/PI-amplification with S1
Speed controller   determinated by the drive (inertial moment, frictional moment)
                optimize to dynamic ofthe drive
position controller   optimize inthe contol (CNC\PLC)

Measuring values		
Measuring value	**max.value**	**Measuring point**
command value	±10V	X1:4
Speed act.value before divider	±150V	X2:8
Current act.value unipolar	+5V	X2:9
Current comm.value unipolar	-10V	X2:10

5 Adjustment

Actual Value

Function	max.Value	Connection
InputSignal	±10V=	X1:4
InputGND		X1:6

DifferentialInput   >>>   signal- and GND-connection exchangeable
External Supply   >>>   BridgeX1:6andX1:7,GND connected toX1:7

command value as current signal
comm.value from external currnet source   0upto±20mA
external burden resistor for comm. Value   0uptomax.±10V

comm.value resistor R-Soll[Ω]= comm. value voltage/comm. value current

Caution:
donot use comm. value current between 4and20mA
With A1x only positve command value

Command value integrator
Linear-integrator
Integrationtime adjustment with resistor R11(INT)
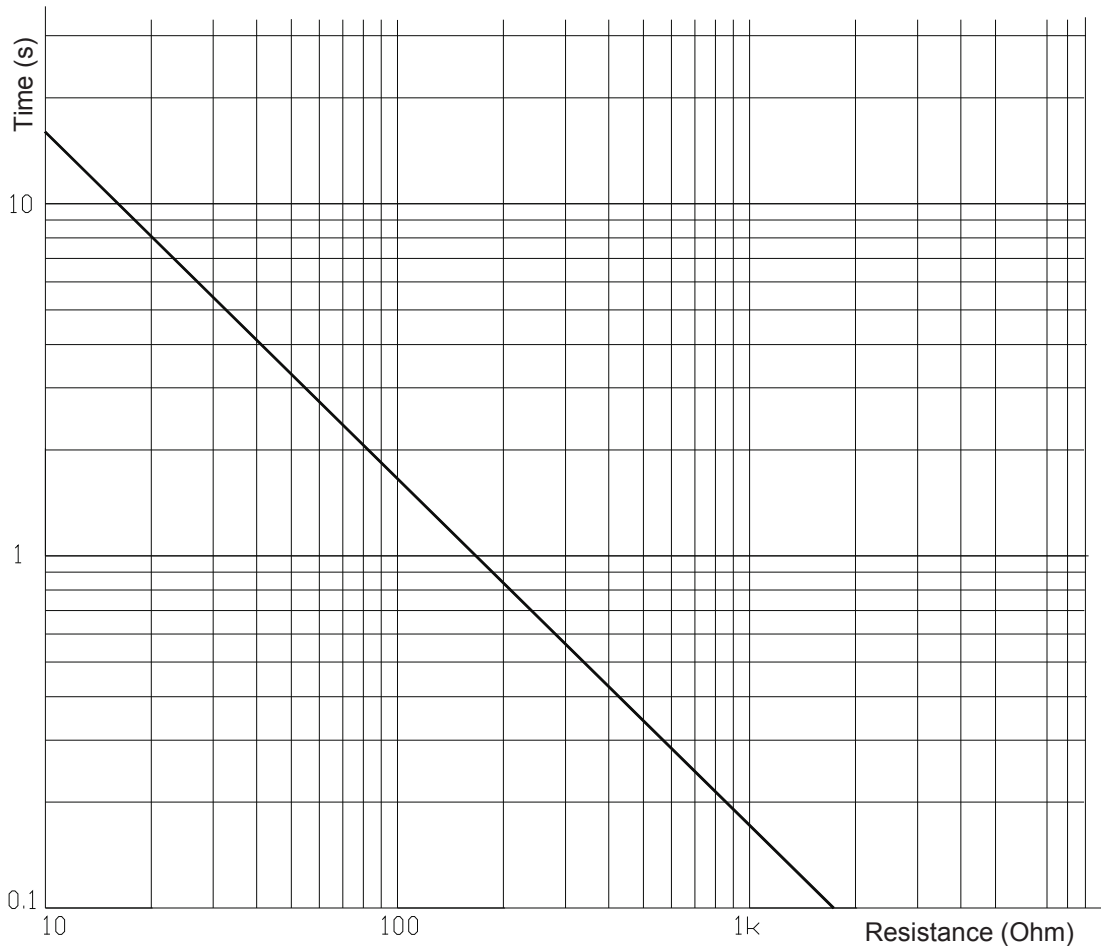
Actual value - speed

BAMO-A1x (1Q)DC- or AC-tachogenerator with rectifer
BAMO-A2x (4Q) only DC-tachogenerator

Tacho- Connection
JumperJ1open
InputX1:7   = tacho (GND)
InputX2:8   = tacho (Signal)
PE-Bolt   = shielding

Command value input X1:4positive   >>> tacho input X2:8positive

Tacho voltage
At maximum speed
limits   >>> minimum 5V=, maximum 160V=
Coarse adjustment
with resistor R23
Tacho-voltage-range
Without R23   >>>   15V   =upto160V=
With   R23   1kΩ >>>   5V   =upto55V=

Armature voltage regulation with IxR -compensation
Internal feed back,JumperJ1 plugged
coarse adjustment
voltage range   resistor R27
IxR compensation
motor resistance   resistor R8

Speedfine adjustment
With Potentiometer n $_{max}$ (P2)
command value from potentiometer:
with 1Vcomm. value   adjust to10%of maximum speed
with10Vcomm. value   fine adjust to100%(max. speed)

command value from CNC\PLC:
with 0.8Vcomm. value adjust to10%of maximum speed

Changing direction of rotation
change motor- **and** tacho-connection

with armature voltage regulation change only motor-connection.

Current limitation

peak current	range 0upto200% command current		trimmer I_{max} (P5)
	reset timemax.5sec.		
steady current	range 5upto100% command current		trimmer I_D (P4)

Internally resetting current limits

current limit	function	limit
overload	time	continous current
sigmal toX2:14	blocked	

Steady current

internal current limit (default setup)

adjustment	switch	trimmer
I_{max}	S1, contact 2=ON I	$_{max1}$ (P5)

external current limit

adjustment	input	switch	trimmer
I_{max}	X1:90…+10V	S1, contact 2=OFF	I_{max1} (P5)

the external current limit can internally be reduced with I_{max}-potentiometer.

Steady current

Motor protection. Adjust on motor command current with potentiometer I_D (P4).

Measure adjusted values:

-donot connect motor
- predetermine command value and enable >>>   switch off/on

Measuring value current command value X2:10		(5V=command current)
command value	Measuring value I_{max} (ca.2sec.)	Measuring value I_D
+5V	0uptomax.10V	0.25uptomax.5V
-5V	0uptomax.10V	0.25 upto max.5V

Actual value

Measuring value current actual value	X2:9	
command value	Measuring value I_{max} (ca.2sec.)	Measuring value ID
±	0uptomax.5V	0.12uptomax.2.5V

Caution:

for exact torque control:
PI-current control switching necessary (default = P-current control)
-change from PtoPlin current controller (switch S1,Contact1=OFF)

Speed controller switching
-variable components R9,C4
- amplification potentiometer P3(X_P)
-in case of changing devices >>> take over adjustment values.

Defult Setup
Values of solded in components

P-component = 390kΩ decrease with R9(47k Ω upto220k Ω)

I-component = 22nF increase with C4(0,1 μFupto1 μF)

- amplification trimmer X_P to50%

-optimal for most drives.

Adjustment without measuring instruments
Connect motor,

command value =0

Xp =50%(turning clock-wise increases amplification)

R,C = default values

Reglerfreigeben,

-PotentiometerXprechtsdrehenbisderAntriebschwingt

-PotentiometerXplinksdrehenbisdieSchwingungabklingt,

-Xp-Poti noch2Stellungenweiternachlinksdrehen.

Drive behaviour:

Amplification too low	Amplification too high
long oscillations 1...0.1Hz	short oscillations 30…200Hz
long overshoots	vibrates during acceleration,
overruns target position	vibrates during braking andin position

Caution:
in case of operating with CNC\PLC

-in case of maximum speed

-adjust command value speed with Poti n_{max} from 8upto9V

5 Adjustment

Default setup

Check connections before getting started

Connection	Voltage	Clamp	
Battery connection	Max.36V or max.160V	X3:2	X3:10
Auxiliary voltage	24V=±20%	X3:13	X3:14
Motor connection	max.30V or max.150V	X3:4	X3:8

NOTICE Technical data !!!

Basic connections -power supply	
Battery	2xpower connection, **NOTICE POLARITY!**
Motor	2xMotorline

Basic connections - control connections		
Auxiliary voltage	24V=±20%	X3:13,X3:14
Ready for operation (BTB)	Contact between	X2:11,X2:12
Enable	Contact between	X1:1undX1:2
Comm.value from PLC	Differential input ±10V	X1:4,X1:6

Comm.value - internal supply with trimmer		BridgeX1:6-X1:7
A1(1Q)	Positive10V	X1:3 (GNDX1:7)
A2(4Q)	Positive10V	X1:3
	Negative10V	X1:5
Comm.value	±10V	X1:4

Act.value tachometer	±160V	X2:8 (GNDX1:7)

Armature voltage regulation no actual value connection.JumperJ1 plugged!

Default setup for first getting started		
Function	**Potentiometer**	**Adjustment**
Peek current	I_{max}	20%
Steady current	I_D	100%
Amplification	X_P	10%
Speed	n_{max}	0%

Getting started

```
┌─────────────────────┐          ┌─────────────────────┐
│   Default setup     │──────────│  switch off mains   │─────────┐
│   switch on mains   │          │    clear failure    │         │
└─────────────────────┘          └─────────────────────┘         │
         │                                                       │
         │                       ┌─────────────────────┐         │
┌─────────────────────┐          │ LED BTB glim green  │         │
│     LED BTB         │──────────│   overtemperature   │         │
│    bright green     │          │                     │         │
└─────────────────────┘          │ LED "fault" red bright│       │
         │                       │ short in motor connection│     │
         │                       └─────────────────────┘         │
┌─────────────────────┐                                          │
│  command value 0V   │                                          │
│    enable drive     │                                          │
└─────────────────────┘                                          │
         │                       ┌─────────────────────┐         │
┌─────────────────────┐          │    motor speeds up  │         │
│  Motor stands still │──────────│   tacho connection  │─────────┤
│ or runs smooth slow │          │    mixed up or      │         │
└─────────────────────┘          │     interruped      │         │
         │                       └─────────────────────┘         │
┌─────────────────────┐                                          │
│ increase comm.value │                                          │
│      up to10%       │                                          │
└─────────────────────┘                                          │
         │                       ┌─────────────────────┐         │
┌─────────────────────┐          │  Motor stands still │         │
│  Motor runs smooth  │──────────│  check comm.value   │─────────┤
│    with ca. 10%     │          │ check motor connection│       │
└─────────────────────┘          │  motor runs jerky   │         │
         │                       │ reduce amplification XP│       │
         │                       └─────────────────────┘         │
┌─────────────────────┐                                          │
│  adjust speed to 0  │                                          │
│ with trimmer Offset │                                          │
└─────────────────────┘                                          │
         │                                                       │
┌─────────────────────┐                                          │
│  adjust speed with  │                                          │
│  poti nmax to 10%   │                                          │
└─────────────────────┘                                          │
         │                                                       │
┌─────────────────────┐                                          │
│ increase comm.value │                                          │
│      to 100%        │                                          │
└─────────────────────┘                                          │
         │                       ┌─────────────────────┐         │
┌─────────────────────┐          │ Speed cannot be adjusted│     │
│  Motor runs smooth  │──────────│  resistor R23 wrong │─────────┘
│    with ca. 100%    │          │ mains voltage too low│
└─────────────────────┘          │ current limit too low│
         │                       └─────────────────────┘
┌─────────────────────┐
│ adjust current limits│
│ peek current with Imax│
│        and          │
│  steady current ID to│
│     motor data      │
└─────────────────────┘
         │
┌─────────────────────┐
│  Getting Started    │
│     finished        │
│  optimize drive     │
│  fill in protocol   │
└─────────────────────┘
```
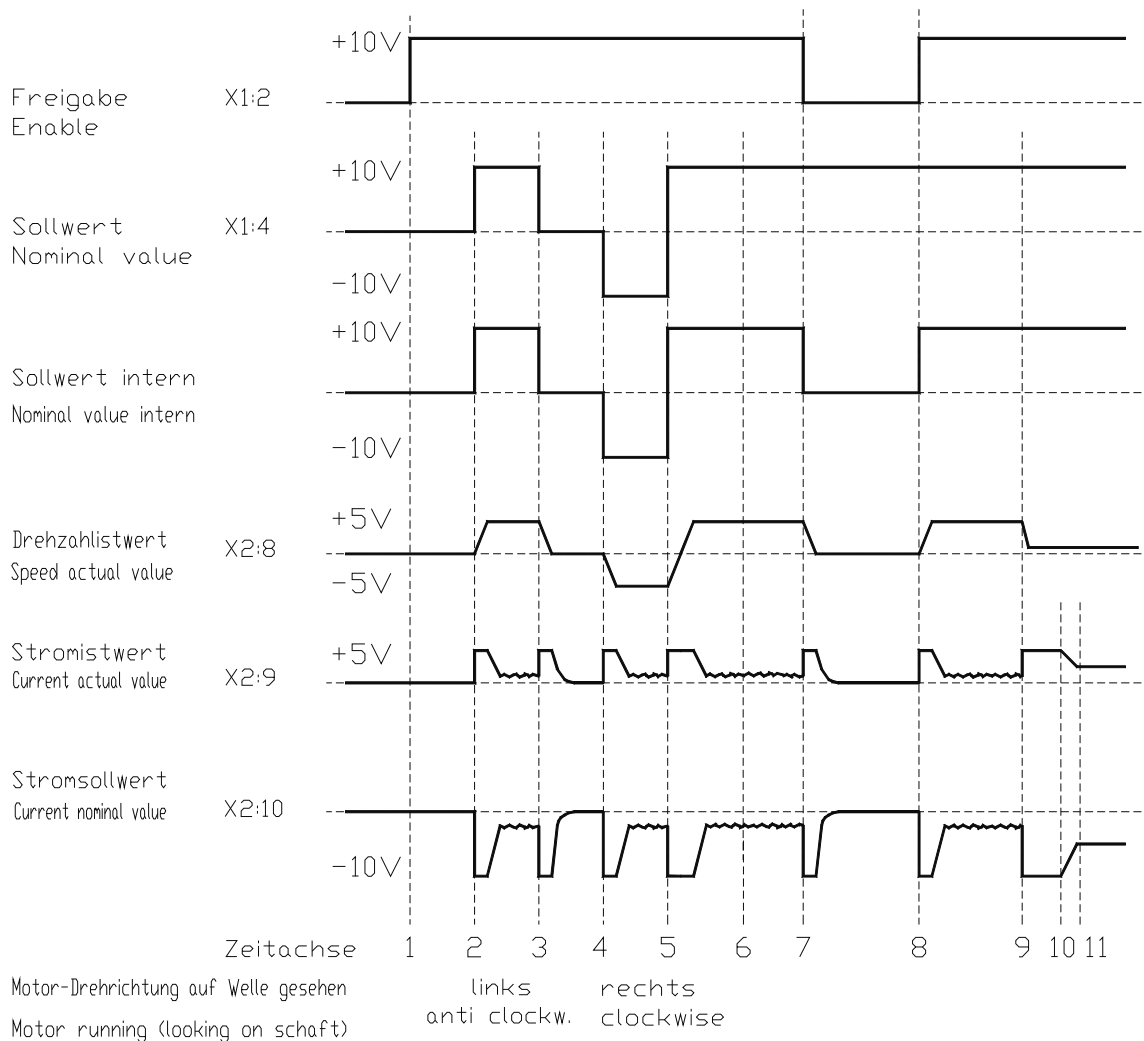
adjust current limits
peek current with I_{max}
and
steady current I_D to
motor data

Motor runs smooth with ca. 10% — motor runs jerky reduce amplification X_P

7 Fault finding

Function Errors	
Fault	**Cause**
LED glims green	Overtemperature heat sink
LED bright red	Shortin motor line output stage error, overvoltage overvoltage during brakeing
Motor stands still, no torque	Enabled missed Current limit I_{max} anti- clockwise stop motor line interrupped
Motor speeds up	Tachometer polarity wrong Tachometerline interruped
Motor runs jerky	Amplification X_P too high. command value disturbance
Drive switches to error LED bright red	Overvoltage,motorshort or short to -U_B output stage error
Speed cann't be adjusted with trimmer n_{max}	Tacho coarse adjustment R23 wrong JumperJ1 wrong,comm.value wrong

Signalplan
Signal scheme

Freigabe	X1:2	+10V
Enable		
Sollwert	X1:4	+10V / −10V
Nominal value		
Sollwert intern		+10V / −10V
Nominal value intern		
Drehzahlistwert	X2:8	+5V / −5V
Speed actual value		
Stromistwert	X2:9	+5V
Current actual value		
Stromsollwert	X2:10	−10V
Current nominal value		

Zeitachse 1 2 3 4 5 6 7 8 9 10 11

Motor-Drehrichtung auf Welle gesehen
Motor running (looking on schaft)

links / anti clockw. rechts / clockwise

Timeaxis		
1	Enableon	Motorstandsstillwithtorque
2	comm.valuepositive	Motoraccelerates
3	comm.value0V	Motordeccelerates
4	comm.valuenegative	Motoraccelerates
5	comm.valuepositive	Motordeceleratesandaccelerates
6	Speedconstant	Motorrunswithloadcurrent
7	Enableoff	Motordeccelerates,deviceislocked after5sec.
8	Enableon	Motoraccelerates
9	Overload	Speedbrakesdown,current increasestomaximumpeekcurrent
10	Overload>3s	Currentisreducedtosteadycurrent
11	Steadycurrentlimit	

Commissioning protocol

Customer		Machine-No.	
Device		Series-No.	

Connection

Battery voltage [V=]		Auxiliary voltage [V=]	
Fusing [A]		Fusing [A]	

Inputs

Enable	Contact	SPS/CNC	Voltage [V=]		
command Value	Trimmer	SPS/CNC	Voltage [V=]		
Current command value	External trimmer	SPS/CNC	Voltage [V=]		

Adjustment actual value

Tachometer	V=/1000UPM		R23[kW]		
Armature Voltage	V=/1000UPM		R27[kW]		
IxR-Comp.			R8[kW]		

Adjustment command value

Selector switch	S1-cont.1 ON = P	S1-cont.1 OFF = PI
Selector switch	S1-cont.2 ON = internal	S1-cont.2 OFF = external current limit

Adjustment speed controller

P-Component	R9[kW]		I-Component	C4[nF]	

Potensiometer positions

Peek current	I_{max} P5	Position		
Steady currnet	I_D P4	Position		
Amplification	X_P P3	Position		
Speed	n_{max} P2	Position		
Zero point	Offset P1	Position		

Measuring values

Motor voltage	max. [V=]			
Tacho voltage	max. [V=]			
Motor current	peek [A=]		steady [A=]	

Motor data

Producer		Type	
Series-No.		Motor voltage		Motor current	

Guarantee

Stegmaier-Haupt products have a warranty against defects inmaterialand workmanship for a period of one year from thedateof shipment.All values from the pre- andfinal quality control checks are archivied with the devices' serial numbers.
Stegmaier-Haupt does not guarantee the suitability ofthe device for any specific application.
During the warranty period, **Stegmaier-Haupt** will,at its option, either repair or replace products that prove to be defective, this includes guaranteed functional attributes.
Stegmaier-Haupt specifically disclaims the implied warranties or merchantability and fitness for a particular purpose. For warranty service or repair, this product must be returned to a service facility designated by **Stegmaier-Haupt**.
For products returned to **Stegmaier-Haupt** for warranty service,the Buyer shall prepay shipping charges to **Stegmaier-Haupt** shall pay shipping charges to return the product tothe Buyer.
However,the Buyer shall pay all shipping charges, duties,and taxes for products returned to **Stegmaier-Haupt** from another country.

The foregoing warranty shall not apply to defects resulting from:
      * improper or inadequate repairs effected by the Buyer or a third party,
      * non-observance ofthe manual which is included intheall consignments,
      * non-observance ofthe electrical standards and regulations
      * improper maintenance
      * acts ofnature

All further claims on transformation, diminution and replacement of any kind of damage, especially damage, which does not affect the **Stegmaier-Haupt** device, cannot be considered. Follow-on damage within the machine or system, which may arise dueto malfunction or defect inthe device cannot be claimed.
This limitation does not affect the product liability laws as applied inthe place of manufacture (i.e. Germany).

Stegmaier-Haupt reserves therightto change any information included in this MANUAL.
All connection circuitry discribed is meant for general information purposes and is not mandatory.
The local legal regulations,and those oftheStandards Authorities have to be adhered to.
Stegmaier-Haupt does not assume any liability, expressively or inherently, for the information contained in this MANUAL, for the functioning ofthe device or its suitability for any specific application.