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July 2009	Preliminary English edition (prototype deliveries)
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August 2012	Modification concerning loop-through of supply voltage XP1, XP2; LED flashing codes
August 2013	Option EMC housing; output current dependent losses value added; cables for ECOSTEP 34S

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1 About this documentation

This user manual describes the 2-axis servo amplifier ECOMiniDual. It concerns all persons who project, install and commission ECOMiniDual.

Further information:

- Software commissioning: ECO Studio Operation Manual ECOVARIO®, ECOSTEP®, ECOMPACT®
- Parameterization: ECO Studio Operation Manual ECOVARIO®, ECOSTEP®, ECOMPACT®
- Programming: Object Dictionary Manual ECOVARIO®, ECOSTEP®, ECOMPACT®
- Application Notes ECOVARIO®

This manual makes the following demands on qualified personnel:

Transport: Personnel trained in handling electrostatic sensitive devices




Installation: Electrotechnically qualified personnel who know the security directives of electrical engineering and automation

Setup/Commissioning: Qualified personnel with a broad knowledge of the fields of electrical engineering, automation and drives.

2 Safety instructions


2.1 Symbols

Table 2.1: Symbols

Pictogram	Warning	Consequences
	General warning about danger	Disregarding this warning may lead to death or serious injuries.
	Warning about dangerous electrical voltages	Disregarding this warning may lead to death or serious injuries.
	Warning about hot surfaces	Disregarding this warning may lead to burns to the skin.


2.2 General safety instructions

Tabelle 2.2: General safety instructions

	The servo amplifiers are components which are built into machines and can only be used as integral components of such equipment. Setting the servo amplifier into operation is forbidden until it has been established that the machine or plant fulfils the requirements of the EC Machinery Directive 2006/42/EC.
	Only properly qualified personnel are permitted to perform activities such as transport, installation, setup and maintenance of the product. The qualified personnel must know and observe all relevant safety standards.
	In case of modifications or retrofits with components of manufacturers other than Jenaer Antriebstechnik, please contact us to clarify that those components are suitable to be assembled with our devices.
	The operating conditions have to accord to the data on the nameplate.
	Emergency-off equipment must be workable in all operation modes, especially during setup and maintenance.



2.3 Electrical connection

Table 2.3: Safety instructions, electrical connection

	The servo amplifiers are not intended for direct connection to the power supply system but have to be driven with extra low voltage (ELV) of an appropriate voltage supply. Observe the maximum connection voltages according to the nameplate. Connecting the motor directly to the power supply system leads to the destruction of the motor.
	A protection against contact with live parts has to be foreseen on machine side.
	Never plug or loosen power or logic supply connections if they are live.

2.4 During operation

Table 2.4: Safety instructions, operation

	The surfaces of the motors can get hotter than 85 °C. Therefore they have to be protected against touching. No temperature sensitive parts may touch the surface or be fastened to them.
	Unintentional movements of motors, tools or axes may lead to death or serious injuries. ECOMiniDual drives can produce strong mechanical powers and high accelerations. Avoid staying in the danger zone of the machine. Never switch off safety equipment, not even for test operation! Malfunctions should be repaired by qualified personnel immediately.

2.5 Prescribed use

All notes about technical data and ambient conditions have to be observed.

Using the unit in hazardous locations and in ambients containing oil, gas, vapours, dusts, radiations etc. is prohibited if it is not explicitly allowed due to special measures.

The manufacturer of the machine must generate a hazard analysis for the machine and take appropriate measures to ensure that unforeseen movements cannot cause injury or damage to any person or property.

If one or more ECOMiniDual are built into machines or plants the intended operation of the whole machine or plant is forbidden until it has been established that the machine or plant fulfills the requirements of the EC Machinery Directive 2006/42/EC and the EMC Directive 2004/108/EC. Further EN 60204 and EN ISO 12100 parts 1 and 2 have to be observed.

3 Legal notes

3.1 Terms of delivery

Our terms of delivery are based on the „The General Terms of Delivery for Products and Services of the Electrical Industry“ (German: ALB ZVEI) of the Central Association of the Electrical and Electronics Industry (ZVEI e.V.) in their current version.

3.2 Liability

The circuits and procedures in this manual are proposals. Every user has to check the suitability for every special case. Jenaer Antriebstechnik GmbH is not responsible for suitability. Especially Jenaer Antriebstechnik is not responsible for the following damage causes:

- disregarding the instructions of this manual or other documents concerning ECOMiniDual
- unauthorized modifications of drive, motor or accessories
- operating or dimensioning faults
- Improper use of the ECOMiniDual components.

3.3 Standards and directives

ECOMiniDual servo amplifiers are components intended to be built into machines or plants for industrial purpose. The manufacturer of the machine or plant has to make sure that the relevant standards and directives are met.

3.3.1 CE conformity

ECOMiniDual servo amplifiers are components that are intended to be built into electrical plant and machines for industrial use. The manufacturer of the machine is responsible that the machine or plant fulfills the requirements of the EMC directive.

The ECOMiniDual 007DC-BN-xxx-xxx has been tested by an authorized testing laboratory in a defined configuration with the system components which are described in this documentation. Any divergence from the configuration and installation described in this manual means that you will be responsible for carrying out new measurements to ensure that the regulatory requirements are fulfilled.



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Declaration of Conformity

We, the company

Jenaer Antriebstechnik GmbH
Buchaer Straße 1
07745 Jena
Germany

declare the conformity of the product

Designation: 2-Axis Servo Amplifier
Type: ECOMiniDual 007DC-BN-XXX-XXX

with the following directives:

EC Directive 2004/108/EC: (EMC Directive)
Applied harmonized standards: EN 61800-3 (EMI Disturbance)
EN 61800-3 (EMI Immunity)
EC Directive 2006/95/EC: (Low Voltage Directive)
Applied harmonized standards: EN 61800-5-1
EN 60204

Issued by: Jenaer Antriebstechnik GmbH
Dipl.-Ing. (FH) Stephan Preuß
General Manager

Place, date: Jena, 06.08.2013

Legally binding signature:

A handwritten signature in blue ink, appearing to read 'Preuß', is written over a horizontal line.

This declaration does not guarantee specific features.

4 Technical Data

4.1 Equipment

The 2-axis servo amplifier ECOMiniDual is implemented as a PCB solution for integration on customer side. It provides the digital torque/force, velocity and position control for two axes independent from each other. The two power stages are supplied by a voltage of max. $60 V_{DC}$. The drive can be commissioned and parameterized by means of a CANopen or RS232 interface. Via CANopen® an interpolated mode is possible ($t_{sync} = 1 \text{ ms}$). For control purposes there are furthermore 12 digital 24-V-inputs and 6 digital outputs available. All connections are established via PCB connectors (Molex). The evaluation of limit position switches and reference switches is possible as well as using homing methods with index pulse evaluation. As an option, the ECOMiniDual is available with a mechanical protective housing or an EMC protective housing.

Supported motor types and encoders:

The ECOMiniDual is suitable for driving 2-phase low-power ECOSTEP® motors, e.g. series 17H and 23S. As feedback systems incremental encoders can be used. The encoders are monitored for counter error. There is an intelligent control for two holding brakes with automatic current reduction implemented. The technical data and precautions in this manual exclusively refer to the motor series mentioned above. If you want to drive other motors with ECOMiniDual please contact our technical service (see www.jat-gmbh.de under "Service and Support").

Applications:

In the first place, the ECOMiniDual is designed for the 2-axes servo operation („closed loop“). If a second measuring system should be connected or master/slave operation is necessary, the ECOMiniDual can be operated as 1-axis servo amplifier as well. If required the ECOMiniDual can also be used as 2-axes stepper motor amplifier („open loop“, also in master-/slave operation). The ECOMiniDual is also suitable for the control of voice coil actuators with linear measuring systems.

4.2 Electrical Data

Table 4.1: Electrical data, power supply

Symb.		Unit	Value
DC supply			
U_{NDC}	Rated supply voltage at DC input XP1 or XP2	V_{DC}	48 (24 ... 60)
P_N	Rated supply power	W	260
P_{Vn}	Rated losses	W	20
Losses if diverging from nominal load: $P_V = P_{VO} + P_{VI}$			
P_{VO}	Basic losses	W	8
$P_{VI/IO}$	Output current dependent losses per A	W/A	2.4
Power stage			
I_{ON}	Rated output current	A_{RMS}	2 x 2.5
P_{ON}	Rated output power	W	2 x 120
I_{OP}	Peak output current	A_{RMS}	7.5 (5s)
U_{BUSN}	Rated DC link voltage	V_{DC}	48
U_{BUSP}	Max. DC link voltage	V_{DC}	60
U_P	Overvoltage trip	V_{DC}	75
C_L	DC link capacity	μF	220
E_{N-P}	Regenerated capacity	Ws	0.2

Table 4.2: Electrical data, control signals

Qty.	Control signal	Unit	
1	24-V supply (current consumption without outputs)	V	24 (18 ... 30)
		A	0.3
12	Digital control signal inputs	V	LOW 0 – 7, HIGH 12 – 36
		mA	10 (bei 24 V)
6	Digital control signal outputs	V	24
		A	0.5

Table 4.3: Electrical data, external fuses

DC supply	8 A (time lag)
24 V supply	2 A (time lag)

4.3 Mechanical data

Table 4.4: Mechanical data, dimensions and weight

Dimensions and weight	Unit	PCB	with protective housing	with EMC protective housing
Dimensions W x H x D	mm	approx. 120 x 100 x 30	155 x 104 x 35.5	146 x 134 x 50
Weight of unit	kg	0.105	0.5	0.85

4.4 Ambient conditions

Table 4.5: General technical data, ambient conditions

Ambient conditions			
Symb.	Condition	Unit	
T _A	Ambient temperature during operation with nominal load	°C	5 – 40
	Storage temperature	°C	-10 – 70
	Degree of humidity (not condensing)	% rel. F.	5 – 95 %
p	Air pressure	mbar	860 – 1 060
	Cooling		the closed cubicle has to be sufficiently ventilated.
h	Installation altitude	m	up to 1 000 without restriction of power
	Installation position		any
	Protection class		IP00 (IP20 with optional protective housing)

Table 4.6: General technical data, applicable standards

	with EMC protective housing ECOMiniDual 007DC-BN-xxx-xxx	ECOMiniDual 007DN-BN-xxx-xxx ECOMiniDual 007DG-BN-xxx-xxx
Noise immunity	acc. to EN61800-3	no self-contained device, thus IEC 61800 is not applicable directly (cf. Chap. 3.3)
Noise emission	acc. to EN61800-3	
CE safety	acc. to EN61800-5-1	

5 Installation

5.1 Mechanical Installation

5.1.1 Important notes

- Make sure that transport and storage did not damage the unit.
- The ambient air must not be polluted by dust, greases, aggressive gas etc. Eventually appropriate countermeasures have to be taken (installation of filters, frequent cleaning).
- Depending on the power losses an appropriate ventilation should be provided.
- Observe the mounting spaces.
- At installation locations with permanent vibrations or shocks damping measures should be taken into consideration.
- The protection against accidental contact and the required protection against dust and moisture has to be implemented by the machine manufacturer (protection class of the ECO-MiniDual: IP00; with optional mechanical protective housing IP20).

5.1.2 Dimensions

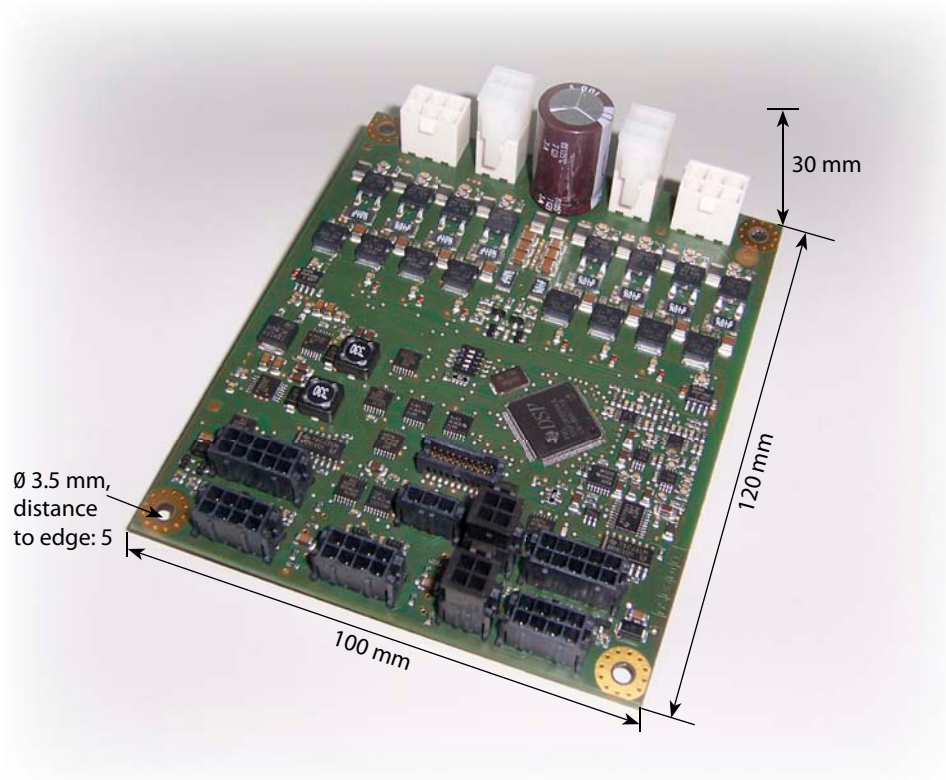


Fig. 5.1: Dimensions of the ECOMiniDual

Dimensions with optional mechanical protective housing or EMC protective housing cf. chapter 4.3.

5.1.3 Mounting

The ECOMiniDual is implemented as a single PCB solution and can be mounted into a device in any mounting position. A sufficient heat dissipation has to be observed. The surface temperature on the PCB must not exceed 85 °C. Preferential mounting position, however, is the vertical mounting position because here the best convection can be achieved.

The PCB is mounted by means of 4 screws M3. The arrangement of the holes can be seen from Fig. 5.1.

The manufacturer of the machine has to ensure that cabling of the ECOMiniDual is done in conformance with the EMC requirements.

To calculate the minimal mounting space the minimum bending radii of the connecting cables (cf. Chap. 9.2) have to be regarded.

For mounting of the ECOMiniDual with optional protective housing (ECOMiniDual 007DG-BN-xxx-xxx) please refer to Chap. 9.4.

For mounting of the ECOMiniDual with optional EMC protective housing (ECOMiniDual 007DC-BN-xxx-xxx) please refer to Chap. 9.5.

5.2 Electrical Installation

5.2.1 Important notes

All installation work may only be carried out if the machine or plant is not live and protected against restart. Never exceed the maximum rated voltage of $60 V_{DC}$ (+10 %) at the connector XP1 or XP2!

Fusing of the DC supply and of the 24-V logic supply should be carried out by the user.

5.2.2 EMC compliant installation

The supply connection of the machine should be equipped with an appropriate RFI suppression filter. Always use shielded cables.

Metal parts in the cabinet have to be interconnected extensively and conductive regarding HF. Used relays, contactors, solenoids etc. have to be protected against overvoltage. Supply cables and motor cables must be laid in a proper distance of control cables.

5.2.3 Connection diagram

The following diagram shows a connection example of the ECOMiniDual with external logic supply $24 V_{DC}$ and power supply $60 V_{DC}$. In this example power supply module SV24/60 is used.

Dependent on the resulting power consumption it is possible to supply several ECOMiniDual by means of one power supply module. A concatenation of devices is possible up to an overall power consumption of 480 W.

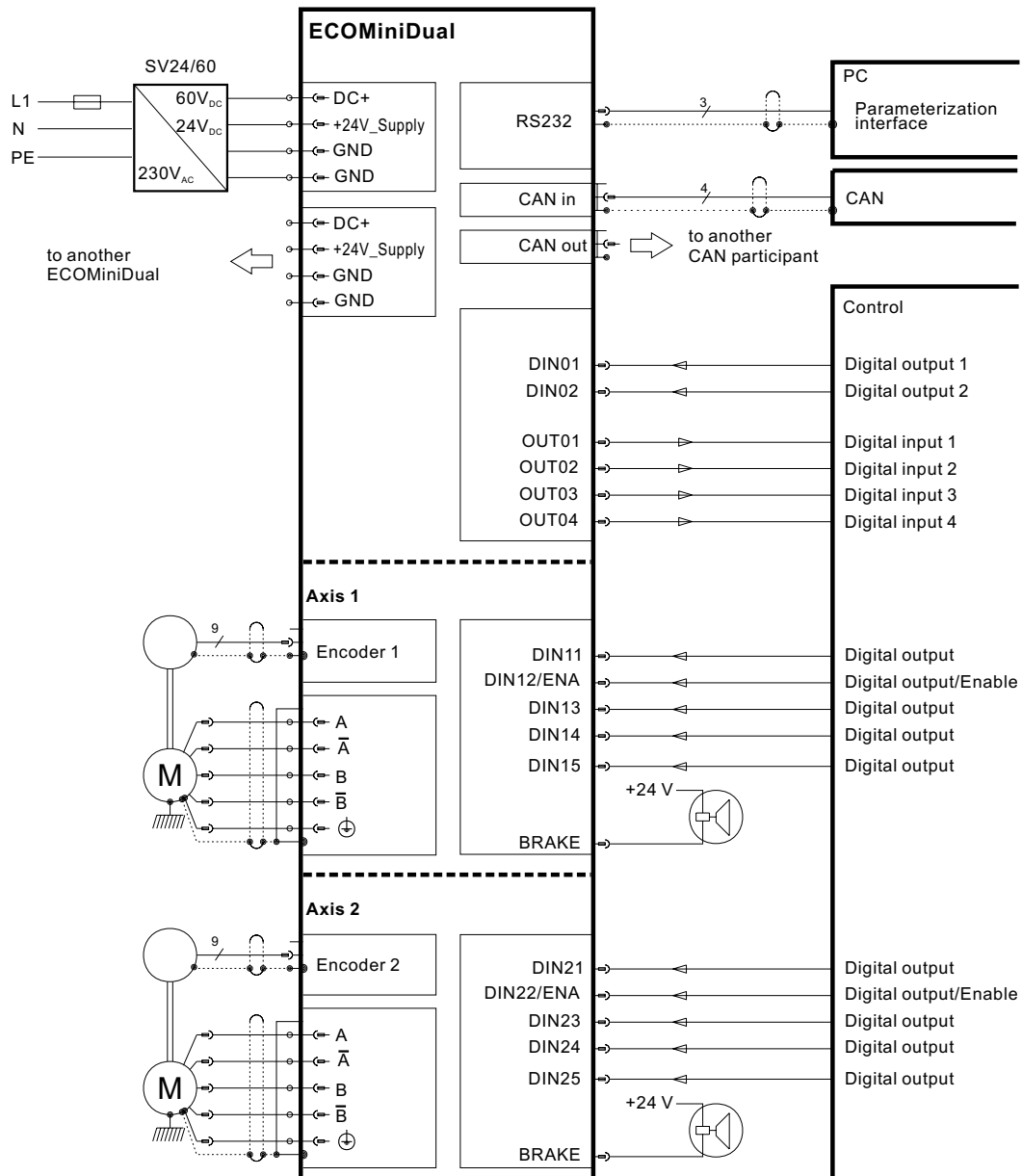


Fig. 5.3: Connection diagram ECOMiniDual with SV24/60

6 Interfaces

6.1 Available interfaces

By default, the ECOMiniDual provides interfaces for 12 digital inputs, 6 digital outputs, a CAN bus interface, RS232 interface, power supply +24 ... +60 V_{DC}, logic supply +24 V_{DC}.

6.2 Design of the interfaces

The interfaces of the ECOMiniDual are by default designed as PCB plug connectors. Fig. 6.1 shows the view to the connectors.



Danger of injury when unplugging the PCB plug connectors.
Observe that the connectors have to be unlocked before removing.
Unlock by pressing the locking lever.
Grip the connectors only at their housing (not at the cable).
Not observing these precautions can result in injuries or damages.

For the PCB plug connectors a mating connector set is available (cf. table 9.1 „Original accessories ECOMiniDual“), if required also pre-assembled with 10 cm single wires. The assignment of the wire colours can be found in the interface description tables. To simplify the handling all mating connectors are labelled.

6.2.1 Overview of all connectors

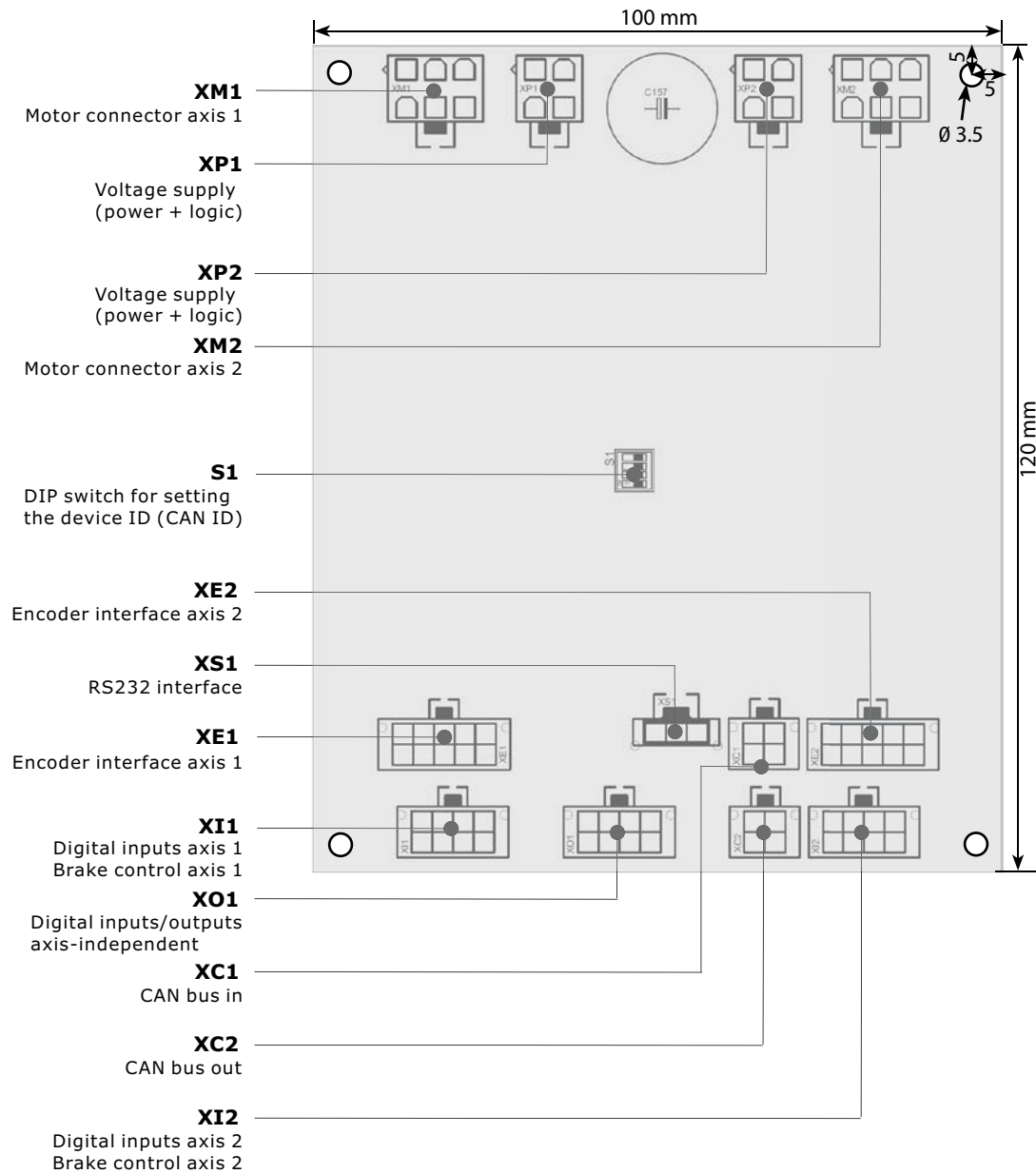


Fig. 6.1: Arrangement of the PCB plug connectors

6.3 Control signals

6.3.1 XO1: Digital outputs (24V) and digital inputs, axis-independent

Table 6.4: Pin assignment of the digital inputs and outputs, wire colours mating connector

Signal	Conn.	Pin	Wire colour	Description
+24V	XO1	1	red	Reference potential +24V
IN01	XO1	2	white	Digital input 01
IN02	XO1	3	brown	Digital input 02
OUT01	XO1	4	green	Digital output 01 $I_{O\max} = 0,5\text{ A}$
OUT02	XO1	5	yellow	Digital output 02 $I_{O\max} = 0,5\text{ A}$
OUT03	XO1	6	grey	Digital output 03 $I_{O\max} = 0,5\text{ A}$
OUT04	XO1	7	pink	Digital output 04 $I_{O\max} = 0,5\text{ A}$
GND	XO1	8	blue	Reference potential GND



The digital inputs and outputs provided on PCB plug connector XO1 (Molex MicroFit-2x4P) are for free use and are not assigned to one axis.

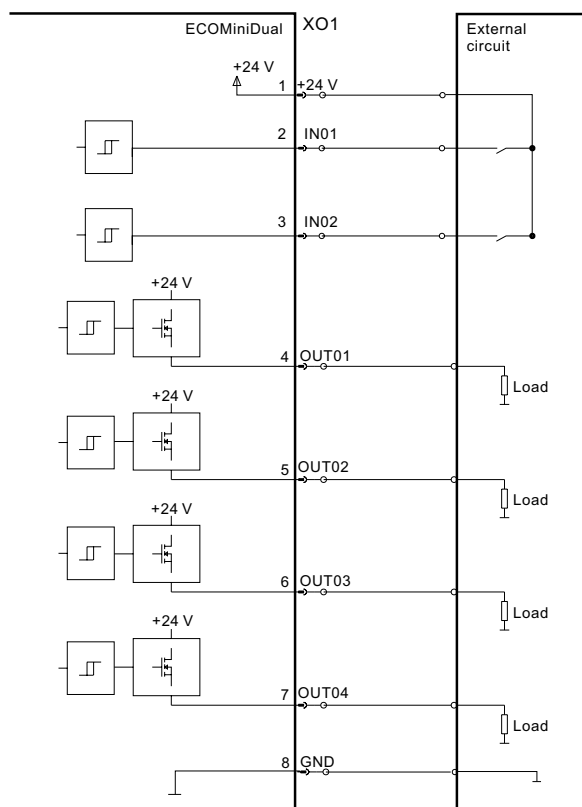


Fig. 6.2: Connector XO1: Circuit of the axis-independent digital inputs and outputs

6.3.2 XI1, XI2: Digital inputs + holding brake control

Table 6.5: Pin assignment of the digital inputs, wire colours mating cn.

Signal	Conn.	Pin	Wire	Description
+24V	XI1, XI2	1	red	Ref. potential +24V
RESET (IN11/21)	XI1, XI2	2	white	Reset input
ENABLE (IN12/22)	XI1, XI2	3	brown	Enable input
CWI (IN13/23)	XI1, XI2	4	green	Positive limit pos.
CCWI (IN14/24)	XI1, XI2	5	yellow	Negative limit pos.
HOME (IN15/25)	XI1, XI2	6	grey	Reference switch
BRAKE_OUT_11 BRAKE_OUT_21	XI1, XI2	7	pink	Holding brake ctrl output, 24 V, 0,5 A
GND	XI1, XI2	8	blue	Ref. potential GND



The input and output signals provided on PCB plug connectors XI1 and XI2 (Molex MicroFit-2x4P) are assigned to an individual axis each.

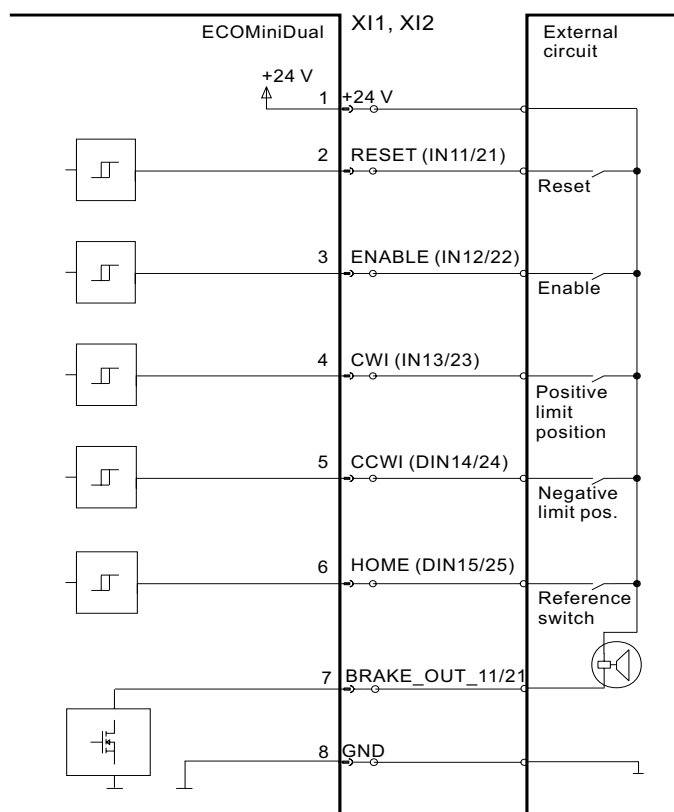
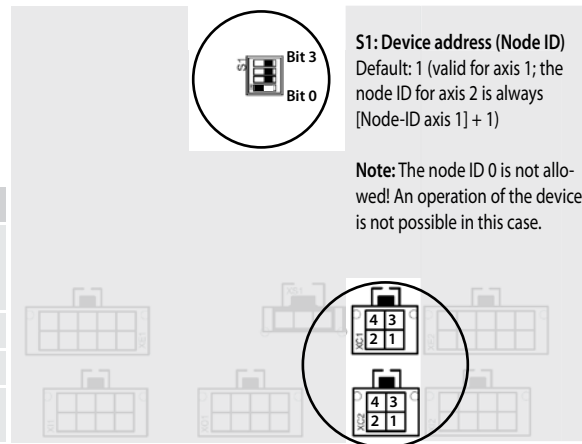


Fig. 6.3 Connector XI1 or XI2: Circuit of the digital inputs + holding brake control

6.3.3 XC1, XC2: CAN interface

Table 6.6: Pin assignment connector XC1, XC2

Pin	Wire colour	Signal	Description
1	white	CAN_VP	not used; CAN interface is supplied internally.
2	green	CAN_H	CAN data H
3	yellow	CAN_L	CAN data L
4	brown	GND	GND



The connectors XC1 and XC2 (Molex MicroFit-2x2P) can be used equivalently. The signals are looped through, thus the CAN bus can be connected to another device.

The ECOMiniDual CAN interface is based on the communication profile CiA DS 301 and on the device profile CiA DSP 402 (drives and motion control). Terminating resistors are not built in the ECOMiniDual. A CAN bus has to be terminated with a 120 Ω resistor at the beginning and at the end. If the ECOMiniDual is operated as first or last participant at a CAN bus, a 120- Ω terminating resistor (as part of the mating connector set, cf. Chap. 9) is used at XC1 or XC2 (depends on which one is free) between the pins 2 and 3 (cf. Fig. 6.5).

The device address (Node ID) is set via the binary coding of the DIP switch S1 (see diagram above). Furthermore, the node ID offset and the Baud rate can be set via software (e.g. ECO Studio).

The following Baud rates are supported: 1 000 kBit/s, 500 kBit/s, 250 kBit/s, 125 kBit/s, 100 kBit/s, 50 kBit/s. If point of sampling and scan rate (86.7 %, 3-times sampling at all Baud rates) do not meet the demands please get in touch with the technical service of Jenaer Antriebstechnik.

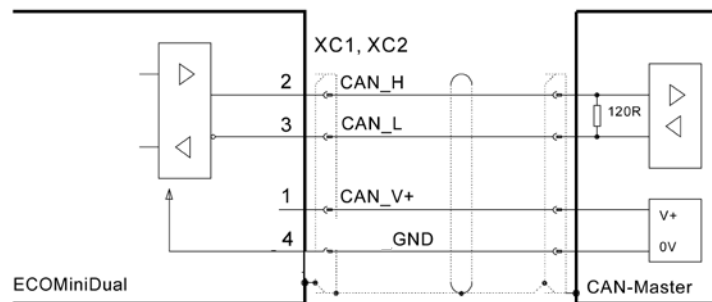


Fig. 6.4: Circuit XC1, XC2: CAN interface

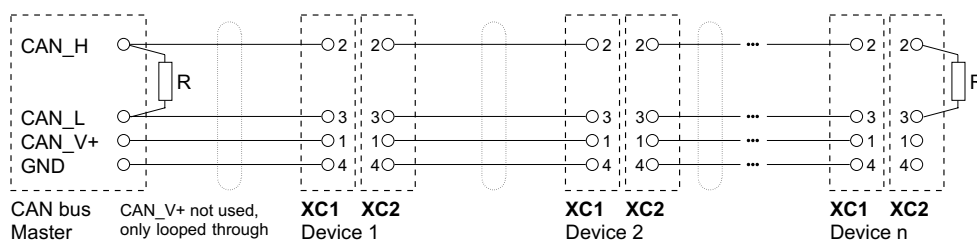


Fig. 6.5: Size terminating resistors R according to line impedance; normal: $R = 120 \Omega$

6.3.4 XS1: RS232 interface

Table 6.7: Pin assignment connector XS1, wire colours of mating conn.

Signal	Pin	Wire	Description
TxD	1	wh	RS232 TxD (to Pin 2 of the Sub-D socket)
RxD	2	br	RS232 RxD (to Pin 3 of the Sub-D socket)
GND	3	gn	Reference ground (to Pin 5 of the Sub-D socket)



Via the RS232 interface a PC can be connected to the ECOMiniDual for setting the parameters.

For RS232 communication with ECOMiniDual a 3-core connection to the host is needed. On PC side, the cable is equipped with a 9-pole Sub-D socket (COM port pin assignment). Transmitter and receiver of the ECOMiniDual meet the specifications of EIA-232E and CCITT V.28 and are EMC-protected according to IEC 61000-4-2.

The communication protocol allows network operation of up to 126 ECOMiniDual units as slaves in a mono master network. For this option a ring structure of the RS232 network according to the scheme in fig. 6.7 is necessary.

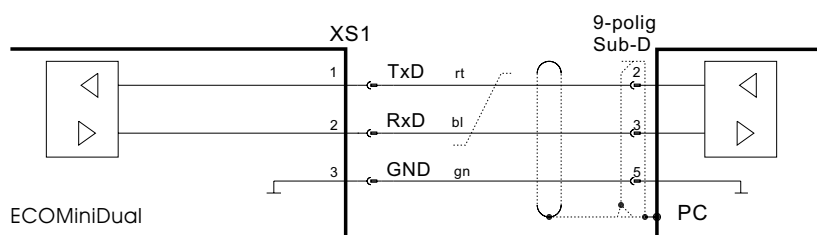


Fig 6.6: Circuit XS1: RS232 interface

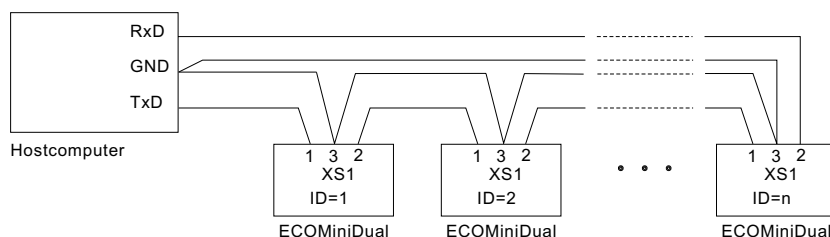


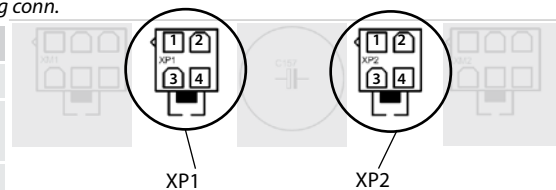
Fig. 6.7: RS232 network as a ring structure

6.4 Power interfaces

6.4.1 XP1, XP2: DC link voltage, logic supply

Table 6.8: Pin assignment connector XP1, XP2, wire colours of mating conn.

Signal	Pin	Wire colour	Beschreibung
GND	1	brown	Reference ground
DC+	2	orange	+ DC link (power supply)
GND	3	black	Reference ground
+24V_Supply	4	red	Logic supply



The connector XP1, implementation Molex MiniFit 2x2P, is used for direct DC supply (24 V ... 60 V). Furthermore, the logic circuit (+24V) which is separate from the power circuit is supplied here.

At connector XP2 the supply voltages of XP1 can be looped to another ECOMiniDual. Dependent on the resulting power consumption it is possible to supply several ECOMiniDual by means of one power supply module. A concatenation of devices is possible up to an overall power consumption of 480 W.

In case of direct DC supply of the DC link circuit, the inrush current is not limited by the servo drive. Therefore, special limitation measures have to be taken in the external power supply unit. If energy is regenerated, the power unit must be equipped with a ballast circuit in case the regenerated energy is higher than the energy consumed by all consumers connected to the DC bus.

6.5 Motor and encoder interfaces

6.5.1 Motor interfaces

Table 6.9: Pin assignment connector XM1, XM2, wire colours mating connector

Signal	Pin	Wire colour	2-phase motor
M1_A+ M2_A+	1	black	Phase A
M1_A- M2_A-	2	orange	Phase A-
M1_B+ M2_B+	3	red	Phase B
M1_B- M2_B-	4	brown	Phase B-
GND	5	-	Ground / shield
GND	6	-	



The motor connectors are implemented as PCB plug connectors XM1 and XM2 (Molex MiniFit-2x3P) and are assigned to one axis each. ECOMiniDual supports the operation of 2-phase ECOSTEP motors up to series 23S.

6.5.2 Encoder interfaces

Each encoder interface provided on the PCB plug connectors XE1 and XE2 (Molex MicroFit-2x5P) is assigned to one axis. The interfaces support incremental standard encoders with rectangular signals.

Table 6.9: Pin assignment connectors XE1, XE2

Signal	Pin	Wire colour	Description
+V _{ENC}	1	red	5 V
A	2	white	track A
B	3	green	track B
N	4	grey	track N
GND	5	-	GND
GND	6	blue	GND
/A	7	brown	track /A
/B	8	yellow	track /B
/N	9	pink	track /N
GND	10	-	GND



7 Commissioning



Only qualified personnel with a broad knowledge of the fields of electrical engineering, automation and drives are allowed to commission the servo amplifier ECOMiniDual. If required, Jenaer Antriebstechnik GmbH offers trainings.

The manufacturer of the machine must generate a hazard analysis for the machine and take appropriate measures to ensure that unforeseen movements cannot cause injury or damage to any person or property.

Check the wiring for completeness, short circuit and ground fault.

All live parts must be protected safely against touching.

Never pull the connectors while they are live!

If there are several axes in one machine commission one axis after the other. The axes already commissioned should be switched off.

During operation the temperature of the components on the PCB may rise up to over 85 °C. Before touching these parts after switching off the unit wait until the temperature has fallen down to 40 °C.

7.1 LED flashing codes

The device is equipped with a green status LED. The LED displays operational and error states of both axes alternating (approx. 1 s) by means of the following flashing codes:

Flashing code	Meaning
LED flashes twice in a long period (approx. 1 s)	Device in standard firmware, both axes errorfree and un-powered
LED flashes twice (short period)	Axis switched on and errorfree (if both axes are switched on the LED flashes four times)
LED flashes three times (short period)	Axis with device error (switched off), if both axes are affected the LED flashes six times

If the device is in boot loader state (loading process for new firmware version), the LED shows the following flashing codes:

Flashing code	Meaning
LED on	Device loads data into flash or EEPROM. If this takes longer than 20s, there is an error in hardware or software
LED flashes quickly	Device in standard bootloader (500ms period)

7.2 Work schedule commissioning

1. Check installation

The servo amplifier is disconnected from the supply. Check the wiring for completeness, short circuits and ground faults (according to the connection scheme in chapter 6.2.1.).

2. Enable = deactivated

For the required axis, connect the signal input ENABLE at the connector XI1 or XI2, respectively, to 0 V.

3. Switch on 24 V logic supply

Apply the 24 V logic supply to the connector XP1 (pins GND and +24 V).

4. Start setup software

Connect a PC to the RS232 interface (XS1) of the ECOMiniDual (or via CAN dongle to the CAN interface XC1 or XC2) and start the ECO Studio software. Establish the connection to the required axis of the ECO-MiniDual.

Note: For each axis a separate ECO Studio session has to be started.

5. Device configuration and mechanical configuration

By means of the ECO Studio device configuration wizard and the mechanical configuration wizard carry out the basic settings for the operation of the axes of the ECOMiniDual. For a detailed description of software commissioning please refer to the ECO Studio help system.

6. Check safety equipment



Before switching on the voltage it is vital to check if all safety equipment that protects from touching live parts and from the consequences of indeliberate movements functions properly.

7. Zero demand values

Before switching on the power supply the demand values for position and speed should be zeroed.

8. Switch on power supply

The power supply should only be switched on with the on/off switches of a contactor circuit.

9. ENABLE

0,5 s after switching on the power supply, the ENABLE signal can be switched to HIGH (24 V level at input XI1:ENABLE or XI2:ENABLE, according to the connection scheme in chapter 6.2.1.). If the motor vibrates or hums, first the p-gain of the velocity controller should be reduced (ECO Studio: in the navigation area under Controller, „Velocity Controller“ tab).

10. Optimization



The controller parameters are set to default values by the manufacturer. However, these values have to be checked and adapted to the respective application, if required. Wrong parameter settings can lead to damages of machine parts. A detailed description of the parameterization of the velocity controller and of the position controller can be found in the ECO Studio help system.

7.3 Error messages

If a device error is detected, it is displayed by ECO Studio in the „Device Errors“ list. The error messages of groups D and E are related to the axis which is connected to the individual ECO Studio session.

Table 7.1: Error messages

Error		Measure
Group A General errors		
A00	Incorrect checksum of a bootloader section or overall checksum	Repeat action, if the error reoccurs, send in device to manufacturer
A01	Error during deleting a flash section	Repeat action, if the error reoccurs, send in device to manufacturer
A02	Error during activating the flash memory	If the error reoccurs, send in device to manufacturer
A03	Error during programming the flash memory	Repeat action, if the error reoccurs, send in device to manufacturer
A04	Error during addressing the flash memory	Repeat action, if the error reoccurs, send in device to manufacturer
A10	Error during reading/writing the EEPROM	If the error reoccurs send in the device to manufacturer
A11	Incorrect checksum of an EEPROM section	Communication and/or application parameters have not (yet) been stored. This behaviour is normal with new devices and has been implemented for signalling this to the user.
A20	Incorrect calibration data	Send in device to manufacturer
A21	Watchdog error of standard loadware	If the error reoccurs send in the device to manufacturer
A23	Loadware does not support this unit	Contact service hotline of Jenaer Antriebstechnik GmbH
Group B Bus errors		
B00	CAN Nodeguarding error. No messages are sent. Synchronisation window in interpolated mode exceeded.	Check bus connection and device function, check CAN bus power supply
B01	CAN bus parameters not available, incorrect saving of parameters. No messages are sent	Enter parameters again, check node ID and Baud rate
Group D Device and axis errors		
D00	Restart lock blocks switch on	Check function of the restart lock
D01	No external enable	Check ENABLE signal
D03	Device temperature > 85 °C	Switch off unit and let it cool down. Make sure that no heat accumulation can occur in the mounting space.
D04	Temperature error motor	Let motor cool down
D06	Negative limit position reached	Reset if an error message is raised
D07	Positive limit position reached	Reset if an error message is raised
D10	Short circuit of motor phases or ground fault of the power stage resp.	Check motor and supply cables. Check whether the shield wires are connected correctly.
D11	Overcurrent in the motor phases	
D12	Exceeding $i^2 \times t$ limitation of device	Check parameters and operating conditions. Check if axis is freely movable.
D13	Exceeding $i^2 \times t$ limitation of motor	
D20	External 24 V supply at XP1/XP2 has fallen below 17 V	Check 24 V power supply. Are there disturbances on the supply line? Check output power specification of power supply whether it is dimensioned sufficiently
D21	DC link voltage too high	Check supply voltage (might be too high)

Error		Measure
D22	DC link voltage too low	Check power supply and connections. Check output power specification of power supply whether it is dimensioned sufficiently.
D24	Exceeding charging time of DC link	Check voltage
D25	Short circuit or overload of the digital outputs or of the brake control	Check digital outputs and brake. Check whether the shield wire of the motor cable is connected correctly.
D30	Following error too high	Check axis parameters and operating conditions. Check whether the axis is freely movable.
D31	Commutation not found	Check if axis is freely movable. Check whether the commutation settings are correctly.
D32	Internal software reset	If error reoccurs send in device to manufacturer
D33	Error controller watchdog	If error reoccurs send in device to manufacturer
Group E Encoder errors		
E00	1. Antivalence error of incremental encoder 2. No encoder has been selected	Check encoder and supply cables for wire breakage, if no encoder is configured, select encoder. If error reoccurs send in device to manufacturer.
E01	Capture error incremental encoder	Check encoder and supply cables for wire breakage
E03	Too high speed of encoder or cannot be read	Check parameters (overall speed of the motor). Error reason might be contamination or damage of the encoder disk or of the cog-wheels of the revolution counter
E14	Selected encoder type is wrong or not supported	Check configuration, enter appropriate encoder type
E16	Error during reading user data	Check encoder and supply cables and configuration, if the error reoccurs send in encoder

8 Parameter setting

By setting the parameters the ECOMiniDual is adjusted to the application. The parameters are set in the PC. The user interface ECO Studio is menu-driven and easy to handle. The connection PC – ECOMiniDual is established via the RS232 interface or via the CAN interface (with CAN dongle). For each axis a separate ECO Studio session has to be started.

8.1 PC user interface ECO Studio

How to work with the user interface ECO Studio is described in detail in the ECO Studio help system.

9 Accessories

Table 9.1: Survey of the ECOMiniDual original accessories

Order key	Description
Complementary parts	
VAK10	Mating connector set (for details cf. Chap. 9.1)
VAZ10	Shield set with mounting material (for ECOMiniDual 007DG-BN-xxx-xxx)
VAZ20	Mounting bracket with mounting material (for ECOMiniDual 007DG-BN-xxx-xxx)
Software tools	
	CD with ECO software tools (e.g. ECO Studio) and documentation
Power supplies	
SV24	1-phase power supply 24 V _{DC}
SV24/60	1-phase power supply 24 V _{DC} , 60 V _{DC}
SV60	1-phase power supply 60 V _{DC}
Cables	
cf. Tab. 9.3	

9.1 Mating connector set ECOMiniDual

A mating connector set for all interfaces of the ECOMiniDual is available. All mating connectors are clearly labelled and designed in a way that there is no danger of mixing them up. As an option, the mating connector set is available with pre-assembled 10 cm single wires. The assignment of the wire colours can be found in the interface description tables in chapter 6.

Table 9.2: Composition of mating connector set VAK10 for ECOMiniDual

Quantity	Part	Mating connector for	Function
2	4-pole socket housing Molex Mini-Fit Jr.	XP1, XP2	Power supply (max. 60 V) + Logic supply (24 V)
2	6-pole socket housing Molex Mini-Fit Jr.	XM1, XM2	Motor connector axis 1 Motor connector axis 2
20	Crimp socket AWG 24-18 Molex Mini-Fit Jr.	XP1, XP2, XM1, XM2	Power supply (max. 60 V) + Logic supply (24 V), Motor connectors
1	3-pole socket housing Molex Micro-Fit 3.0	XS1	RS232 interface
2	4-pole socket housing Molex Micro-Fit 3.0	XC1, XC2	CAN bus interface
3	8-pole socket housing Molex Micro-Fit 3.0	XI1, XI2, XO1	Digital inputs and outputs, holding brake control
2	10-pole socket housing Molex Micro-Fit 3.0	XE1, XE2	Encoder connector axis 1 Encoder connector axis 2
55	Crimp socket AWG 20-24 Molex Micro-Fit 3.0	XS1, XC1, XC2, XI1, XI2, XO1, XE1, XE2	for all socket housings Molex Micro Fit 3.0
1	Resistor 120 Ω wired		Terminating resistor for CAN bus

9.2 Cables

The following table lists the standard cables available for connection of the ECOMiniDual. The cables are further available in the lengths 5 m and 10 m. All cables are equipped with the appropriate mating connectors for the respective PCB plug connectors of the ECOMiniDual interfaces. The insulated shield mesh of the cables must be connected to the device potential or the PE conductor resp. If the grounding is improper or the mesh lies freely dangerous voltages may occur.

Table 9.3: ECOMiniDual accessories, cable set for ECOSTEP motor series 17H, 23S

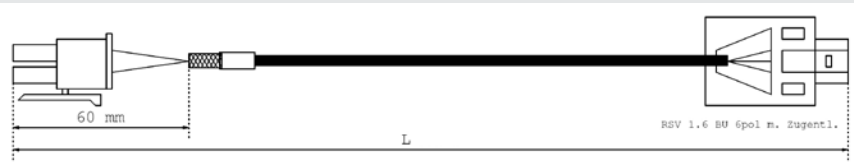
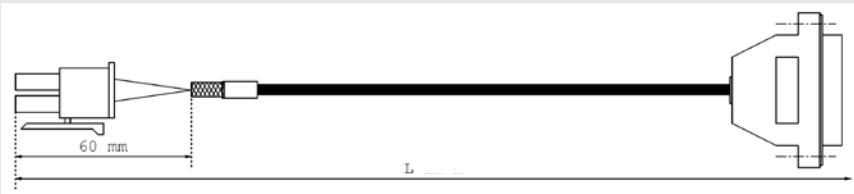
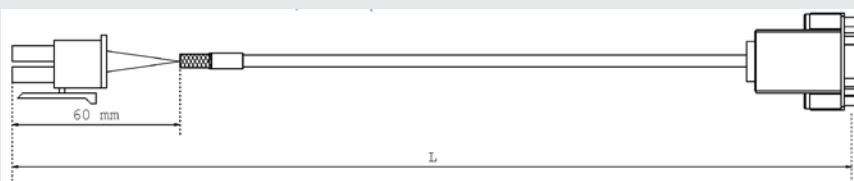
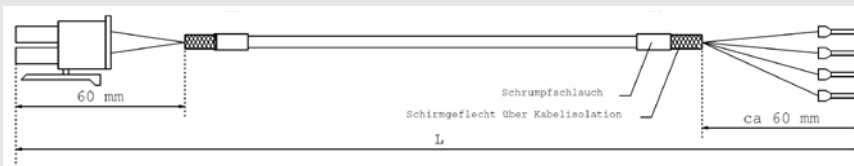
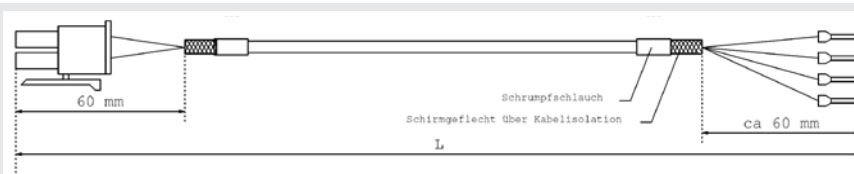
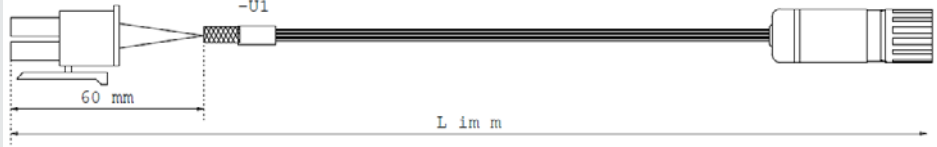
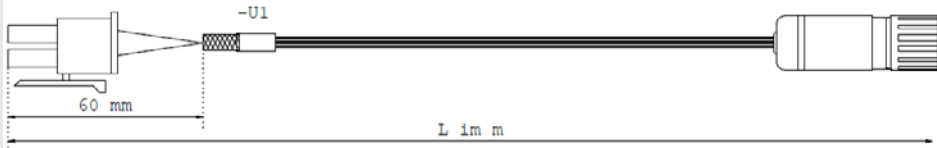
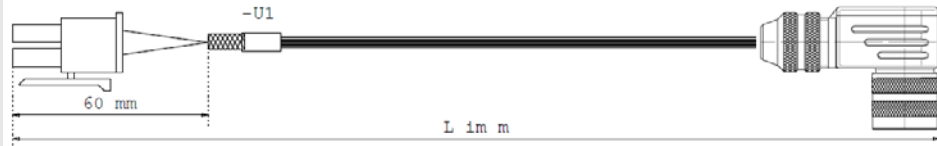
Cable type	Use	Ø [mm]	Wires	Length [m]	min. bending r	Customer connector
MOT-43-826-721-003-000	Motor cable (without brake)	Ø = 6.4 mm	5-lead	l = 3 m	r _B = 35 mm	RSV 1.6 BU 6-pol m. Zugentl.
						
ENC-47-845-495-003-000	Encoder cable	Ø = 6.2 mm	8-lead	l = 3 m	r _B = 35 mm	Sub-D, 9-pole, female
						
DAT30-842-412-003-000	CAN bus	Ø = 6.1 mm	4-lead	l = 3 m	r _B = 46 mm	Sub-D, 9-pole, male
						
DAT30-842-100-003-000	CAN bus (optional)	Ø = 6.1 mm	4-lead	l = 3 m	r _B = 46 mm	connector sleeves
						
NET43-825-100-003-000	Power supply (max. 60 V) + Logic supply (24 V)	Ø = 6.4 mm	4-lead	l = 3 m	r _B = 35 mm	connector sleeves
						

Table 9.3: ECOMiniDual accessories, cables for ECOSTEP motor series 34S

Cable type	Use	Ø [mm]	Wires	Length [m]	min. bending r	Customer connector
MOT-43-826-513-003-000	Motor cable (without brake)	Ø = 6,4 mm	5-lead	l = 3 m	r _B = 35 mm	M23, 6-pole
						
ENC-47-845-503-003-000	Encoder cable	Ø = 6,2 mm	8-lead	l = 3 m	r _B = 35 mm	M23, 12-pole
						
BRM-39-844-514-003-000	Brake cable	Ø = 6,1 mm	4-lead	l = 3 m	r _B = 46 mm	Angular connector 423
						

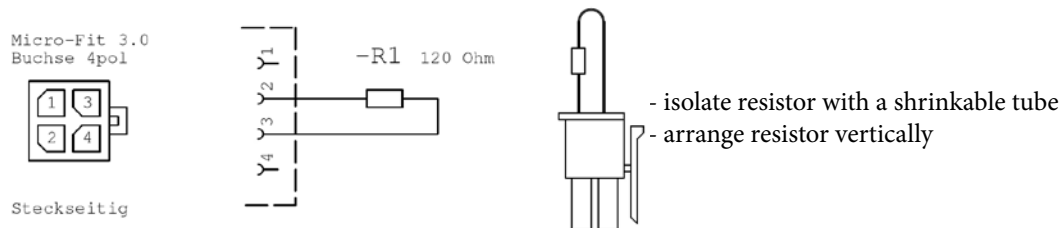
All cables are trailing cables. The PUR sheath is temperature resistant up to 80 °C.

9.3 Establishing the Crimp connections

If cable assembly is done by the customer, the following tool is required for establishing the crimp connections:

- Crimping tool for MOLEX Mini-Fit Jr., 16-24 AWG
- Crimping tool for MOLEX Micro-Fit 3.0, 20-30 AWG

Insertion of the 120 Ω resistor into the mating connector of XC1/XC2 (4-pole Micro-Fit 3.0 socket):



9.4 Protective housing

ECOMiniDual is as an option (order designation ECOMiniDual 007DG-BN-xxx-xxx) equipped with a housing for mechanical protection of the PCB and the components. Mounting brackets for horizontal or vertical mounting of the ECOMiniDual (VAZ20) with housing option are available as accessories. A shield set (VAZ10) is provided as well.

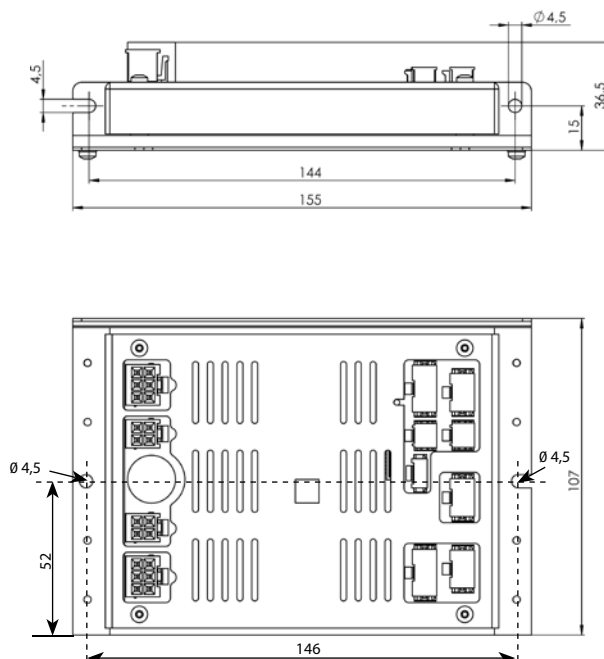


Fig. 9.1: Horizontal mounting of the ECOMiniDual with protective housing and mounting bracket

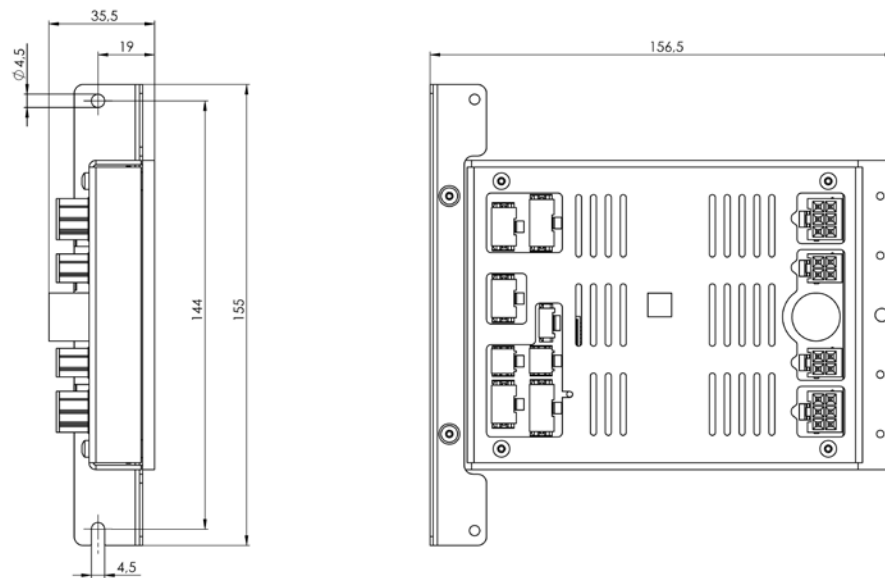


Fig. 9.2: Vertical mounting of the ECOMiniDual with protective housing and mounting bracket

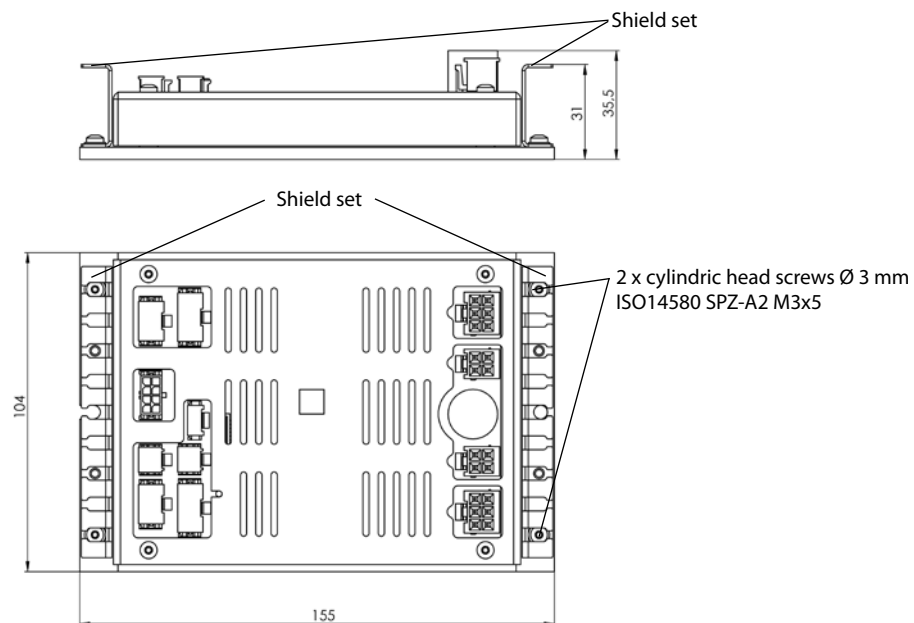


Fig. 9.3: Shield set (VAZ10) mounted

The shield set has a strain relief function. Therefore, the cables are secured to the lugs of the shield set by means of cable ties.

9.5 EMC protective housing

As an option, ECOMiniDual is available with a housing which provides a mechanical protection and an additional protection against electromagnetic influence (ordering designation ECOMiniDual 007DC-BN-xxx-xxx). By means of the housing the requirements concerning the electromagnetic compatibility according to EN 61800-3 are met.

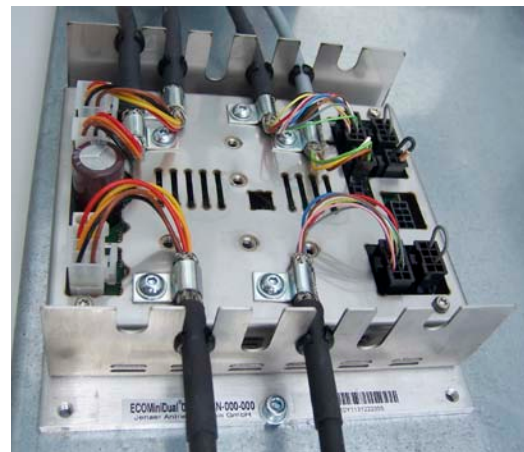
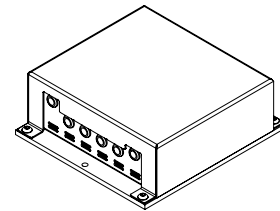
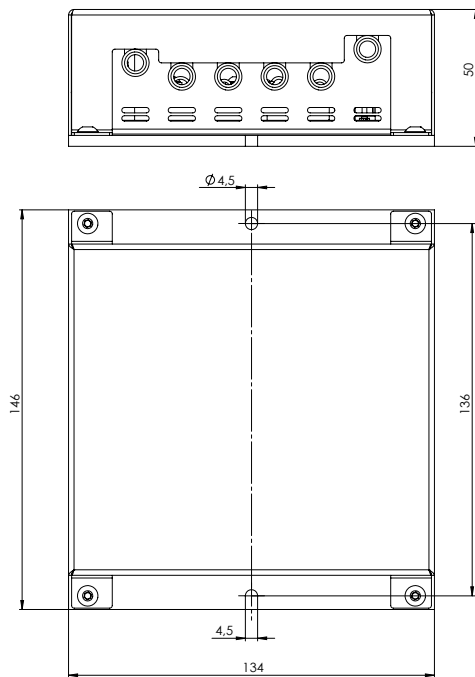


Fig. 9.4: ECOMiniDual with EMC protective housing

The shield set VAZ30 is part of the delivery of the ECOMiniDual 007DC-BN-xxx-xxx and contains:

- 12 cable sleeves
- 12 cable clamps
- 10 fillister-head screws with hexagon-socket M4x8
- 10 washers DIN 125 VZ 4,3

For cabling the housing of the ECOMiniDual 007DC-BN-xxx-xxx has to be opened. Loosen the 4 screws at the corners and take off the cover.

Cable management is done via cable clamps and cable sleeves as shown in Fig. 9.4. Observe that the cables have to be laid EMC conform by connecting the cable shields extensively to chassis earth via the cable clamps. The cable clamp diameter must fit to the cable diameter.

The cable sleeves delivered together with the device have to be pushed onto the cables where they are fed through the housing outlet. If pre-conditioned cables are used, the cable sleeves have to be slotted in the longitudinal direction before.

After the cabling has been finished close the housing by screwing on the cover again.

10 Appendix

10.1 Glossary

Baud rate	Unit of measure for the transmission rate of data in serial interfaces. The baud rate indicates the number of possible changes of state of the transmitted signal per second (1 baud = 1 state change/s). The baud rate can be lower than the bit rate (one bit is coded in several signal states). „Baud rate“ in this document refers to signals in which one bit is defined with the two signal states HIGH and LOW. In this case the bit rate equals the baud rate.
Bit rate	Transmission rate of information in bit/second
Bootloader mode	State of the servo amplifier in which a new loadware can be transmitted into the servo amplifier's memory.
CCWI	Counter Clockwise Inhibit: Negative limit position
Circuit breaker	Switch that cuts the power if an error current limit is exceeded
CWI	Clockwise Inhibit: Positive limit position
DC link voltage	Smoothed DC voltage
Disable	Take back ENABLE signal for the servo amplifier: ENABLE input = 0 V
Encoder	Measuring system, that transforms the angular position of a shaft or the position of a linear system into coded data
EMC	Electromagnetic compatibility
Enable	enable signal for the compact servo drive (24 V _{DC} signal)
ESD protection	Protection against electrostatic discharge
Fieldbus interface	here: CAN
Firmware	Part of the software that is stored to ROM (read-only memory), the firmware contains the start-up routines.
Ground fault	Here: electrically conductive connection between a power system or motor phase and the PE conductor
ID number	Identification number of a special device in a bus structure
Loadware	Part of the software that can be stored to the flash memory of the device
Node	Device connection in a bus structure
Restart lock	Technical measure that prevents actuators safely by mechanical elements (positively driven contacts) from restarting indeliberately.