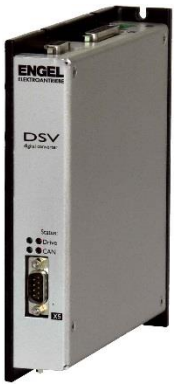
Operating Manual

Rev. 1.8

Digital Servo Controllers

DSV 130
DSV 132
DSV 133

suitable for
three-phase synchronous motors
and
DC motors



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technical changes reserved

Introduction

This document describes technical data and functionality of the digital servo controller DSV130, DSV132 and DSV133. It points out all its features, helps you adjust the parameters and explains the correct way to get the drive up and running.
The manual contains safety notes which have to be complied with at all times. However, they do not replace or void any regulations that may be valid for your application.
See the **CANopen** and the **DeviceNet handbook** for operation in fieldbus- systems.

Document	Date	Rev.	Description
DSV130_BA_051205	05.12.2005	-	temporary Version
DSV130_BA_060911	20.09.2006	-	revision / temporary specification regarding DSerV and EMC
DSV130_BA_061026	26.10.2006	-	installation of BL motors revised (temporary)
DSV130_BA_070705	05.07.2007	-	technical data revised
DSV130_BA_070924	24.09.2007	-	selection motorsystem, notice current control, RN12, Firmware EL V3.27
DSV130_BA_071205_en	05.12.2007	-	english version
DSV130_BA_080107_en	07.01.2008	-	revision
DSV130_BA_090121_en	21.01.2009	-	correction tacho signals X3 and installation plan
DSV130_BA_110307_en	07.03.2011	1.8	New page layout, installation plan (labels X1/X2)
DSV130_BA_Rev1.8_150602_en	02.06.2015	1.8	New page layout
DSV130_BA_Rev1.8_170606_en	06.06.2017	1.8	New syntax of phone numbers

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1 Indications for Safety and Handling

Attention!

Always stick to the safety indications without fail!
Non observance can cause serious bodily harm or material damage!

- Parts inside the DSV and its connectors can be energised with high, possibly lethal voltages!
- Switch off the voltage supply and wait at least five minutes before pulling any plugs.
- All security and accident prevention regulations for the specific application have to be regarded during installation, wiring, set-up, operation and maintenance.
- First connect protective earth during installation!
- The DSV is an electronic device designed for operating motors and for installation in machines. The security rules of the "Maschinenrichtlinie" (89/392/EWG) or its international counterparts have to be regarded.
- Make sure that the drive is secured against any dangers or uncontrolled movements before set-up.

The following list of valid regulations is not exhaustive:

DIN VDE 0100	Regulations for the installation of high voltage (up to 1000V) devices.
DIN EN 60204	Electrical Equipment of machines.
DIN EN 50178	Electronic Equipment for use in power installations.

Warning concerning DSV133!

Do not connect the alternating voltage supply to protective earth!
Connections between ac voltage supply and protective earth can cause damage to components connected to the DSV133, if they have a separate connection to protective earth (e.g. pc with GND-PE connection)

2 Functionality

Digital converter with cascaded controllers for current-, speed- and position and for dynamic driving of permanent magnet synchronous motors or brush-type DC motors. Operation is possible either with CANOpen according to CiA DSP 402 V2.0 or through digital and analogue inputs and outputs. The integrated positioning capability offers point-to-point positioning functions with trapezoidal speed demand. Up to 16 different position targets can be stored in the device and addressed via BCD- coded digital inputs, while the DSV is driven by digital and analogue in-/outputs. The DSV´s configuration is done via a clear and simple to use PC- software "DSerV".
Further Features:

- Short cycle times for the PI current controller (100µs), for the PI speed controller (200µs) and for the PI position controller (200µs), by using a high-performance DSP.
- 10Bit resolver interface for detecting the rotor position.
- Incremental interface A, B, Z- signal
- Galvanically isolated CAN-interface, CANopen implementation providing CiA DSP 402 V2.0.
- DeviceNet networks (optional).
- Parking brake output (24V).
- Integrated brake chopper with limited power, expandable with an external brake resistor.
- Power stage is short circuit proof and earthing proof.
- Designed for wall mounting

Safety installations:
- The **over-current-protection** detects short circuits between motorwindings and phases and protective earth
- The **over-voltage-protection** raises an error as soon as the dc-link voltage exceeds its maximum value.
- The **temperature of the motor system** respectively **power stage** is measured, when the value exceeds 85°C, the power stage is switched off.
- The **plausibility of the resolver signal** respectively **tacho** is evaluated. Invalid signal combinations lead to switch-off of the power stage.
- The **I^2t - surveillance** protects motor and power stage against thermal overload, by limiting the output current to the rated value after the maximum overload time has elapsed.

3 Technical Data of the DSV 13x

		DSV 130	DSV 132	DSV 133	
input voltage	V_{1eff}	$24V_{DC}$ 18 … 30 V_{DC}	$48V_{DC}$ 33 … 60V_{DC}	$42V_{AC}$ ± 15%	
input current	I1	25.5A_{DC}	16.5A_{DC}	11A_{AC}	
rated current	I2	40A	25A	8A	amplitude resp. DC
maximum current	$I2_{pk}$	80A	50A	20A	amplitude resp. DC
rated output power	P_N	580W	770W	320W	with rated output voltage
ambient temperature	ϑ_u	0°C ... 55°C			
storage temperature	ϑ_l	-25°C ... 60°C			
dimensions		ca. 36 x 182 x 171 mm³			(H x W x D)
protection category		IP20			
weight		ca. 1.0 kg			
PWM- Frequency	f_{PWM}	9.765kHz			
speed range		±16.380UPM *1)			recommended max. speed ±16.380UPM others on request
motor poles		selectable 4, 6			
analogue setpoint inputs					
AI1 (differential)		±10V, 10bit, R_i=20kΩ			
AI2		0...10V, 10bit, Ri=30kΩ			
analogue outputs					
AO1,AO2		0...10V (5V±5V), 10bit, I_{max}=2,5mA			for monitoring functions center voltage: 4,9…5,1V quantisation: 10Bit cut-off frequency: 1kHz
digital inputs					
DI1 ... DI10		0,0V ≤ U_{off} ≤ 5,0V 15,0V ≤ U_{on} ≤ 30V			galvanically isolated max. 35V common mode voltage DO1 = controller enable DO2 = power stage enable
inkremental interface		A-,B-,Z- signal RS422, 5V TTL, 10…30V supply voltage: 5V / 200mA 16V / 100mA			feedback f. DC motors (100…10.000Imp/U) (SSI optional) selectable via jumper
digital outputs					
DO1 ... DO2		24V, 50mA			galvanically isolated
'ready' – relay		100V, 100mA			potential-free contact
parking brake		24V, 1500mA			ground switching (npn)
resolver- / tacho interface (selectable: resolver with BL motor or tacho with DC motor)					
supply R1,R2		ca. 5.5V_{eff} , 10kHz			suitable for 2 pole resolver with r = 0.5
input sine/cosine		3.5V_{eff}			
tacho input		±35V			suitable for tachos with voltage constant of 5V/1000min^{-1}
serial interface					
		RS232 (9600 Baud)			communication with DSerV parameterizing software
		CAN 2.0B (max. 1MBaud)			galvanically isolated

auxilliary voltage supply +16V	+16V ±10% max. 30mA	stimulation of digital inputs
brake chopper	$P_{cont.}$ = 10W P_{peak} = ca. 900W $R_{extern} \geq 1.2\Omega$ (DSV130) $R_{extern} \geq 4.7\Omega$ (DSV132)	internal brake resistor external brake resistor, use low inductance - type (L<< 1mH)
electromagnetic compatibility		
transient emissions *2)	DIN EN 61800-3: 2001-02	first environment / limited availability second environment
interference resistance	DIN EN 61800-3: 2001-02	

*1) on request, doubling is possible
*2) conductive emissions have to be damped by using suitable filters in the power supply

3.1 Important technical notes

3.1.1 Brake chopper

Feedback energy from the drive leads to a rise of the intermediate circuit voltage. The increased intermediate circuit voltage is supplied to the voltage supply connector of the DC versions (DSV130 & DSV132). Make sure, that the connected power supplies and consumers tolerate the increased voltage. If necessary, use a suitable diode to decouple the voltage supply for the device.
The brake chopper starts to work when the intermediate circuit voltage exceeds the threshold of 30VDC (DSV132 & DSV133: 75V), the generated braking energy is converted into heat energy by the internal respectively external braking resistor. The continuous power rating of the brake resistor is electrically limited. If the braking energy can not be reduced (e.g. due to the limited continuous power rating of the braking resistor), the intermediate circuit voltage rises until it reaches the threshold of the over-voltage-protection of 32VDC (DSV132 & DSV133: 80V).
Using an external braking resistor is not possible for the DSV133 device.
When using an external braking resistor, the internal braking resistor has to be disabled by opening a soldering bridge SJ1. The mean continuous power rating of the external brake resistor can be tuned by a protected parameter. If required, please contact the manufacturer!

3.1.2 Lead fuses

The voltage supply of the servo controller DSV130 is internally fused with a lead fuse of 40A (DSV132 & DSV133: 30A). Only serious defects in the device can lead to a raise of the fuses, therefore changing the fuses by the user is not intended. Please send any device with damaged fuses back to the manufacturer.

3.1.3 Lifetime

The DSV's lifetime is mainly governed by the strain put on the dc-link capacitors. At an ambient temperature of 45°C and 3.0A rated output current, a lifetime of 20,000h can be expected. The lifetime increases with reduced output current or lower ambient temperature.

3.2 Safety installations

The DSV is equipped with substantial sensor technology to protect controller, power stage, motor and communication interfaces. All errors cause a shutdown of the power stage. They are reported by a blinking code of the red status LED. The power stage can not be switched on again before the source of fault is removed and the error is released using the enable input.

3.2.1 Power stage protection

The power stage is protected by the following safety installations:

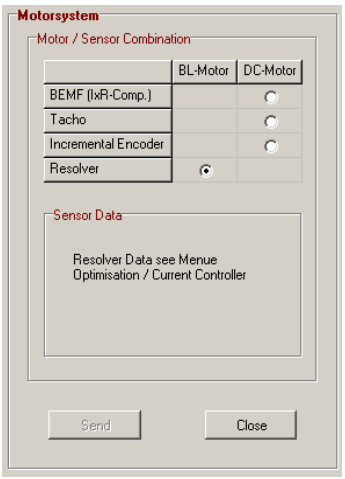
- The **over-current**- respectively **short-circuit-protection** detects short circuits between the motorwindings as well as between the motorwindings and the voltage supply.
- The **over-voltage-protection** raises an error as soon as the dc-link voltage exceeds its maximum value.
- The **temperature of the power stage** heat sink is measured, when the value exceeds 85°C, the power stage is switched off.

3.2.2 Motor protection

- The **plausibility of the resolver signal** is evaluated. Invalid signal combinations lead to switch-off of the power stage.
- Cable break detection when using a tacho.
- The DSV is equipped with an input for monitoring the **motor temperature**. Normally closed thermal contacts or PTC resistors can be used as sensors. The analogue nature of the input also allows the use of a linear temperature probe, enabling individual adjustments of the threshold.
- The **I^2t - surveillance** protects motor and power stage against thermal overload, by limiting the output current to the rated value after the maximum overload time has elapsed.

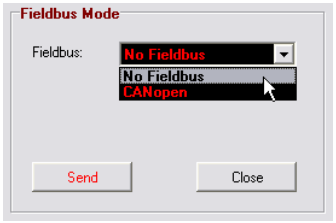
4 Modes of Operation

The digital servo-controllers DSV13x can operate with brush-type DC motors and brushless permanent magnet synchronous motors. It can be used as a current- (torque-), speed- or position controller. The configuration of the device is done with a pc-software "DSerV" via a serial interface (COM/RS232). Changed parameters affect the drives behaviour at once, but will be stored in the non-volatile memory not until the "save parameter" command is called.



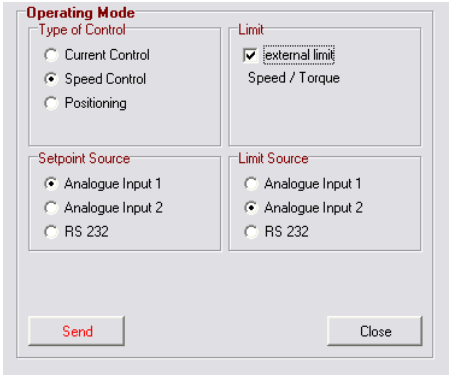
The currently used motor technology as well as the source of the feedback signals for determining velocity and angle can be set in the DSerV menu ***OPTIMISATION / MOTORSYSTEM***.

Notice:
Please pay attention to the jumper setting (see chapter 6.3), it must correspond to the selected velocity and angle feedback sensor.



The servo controller DSV13x is operated either by digital and analogue inputs and outputs or via a CANopen fieldbus.
The decision if the CAN interface is used and the choice of node-ID and baudrate is made in the menu ***OPTIMISATION / FIELDBUS***.

The description of the DSV´s functionalities in this documentation assume operating by digital/analogue in- and outputs ("no fieldbus"). The fieldbus- functionality, basically the same, is described in the CAN- Handbook.



When the DSV13x is operated by digital/analogue in- and outputs the operating mode and the source of setpoint can be selected using menu ***OPTIMISATION / OPERATING MODE.***

With the option "limit" dynamic limits can be set in the operation modes current and speed control. (chapter 4.4.1)

4.1 Speed control mode

In speed control mode the feedback of the actual values (velocity and angle / position) is handled depending on the used sensor. For supported combinations, see table below:

Motortype	Sensor	Speed	Angle/ Position	Note
brushless synchronous motor	**resolver**	yes	yes	for high quality speed and position control
	incremental encoder	*yes*	*yes*	*support projected*
DC motor	**BEMF with IxR compensation**	yes	no	simple speed control without sensor
	analogue tacho	yes	no	speed control
	incremental encoder	yes	yes	for high quality speed and position control

The desired configuration can be set up the menu ***OPTIMISATION / MOTOR.***
- Incremental encoder with pulse rate
- Voltage constant of the motor
- IxR compensation value

In speed control mode there are three possible input sources for the demanded values:

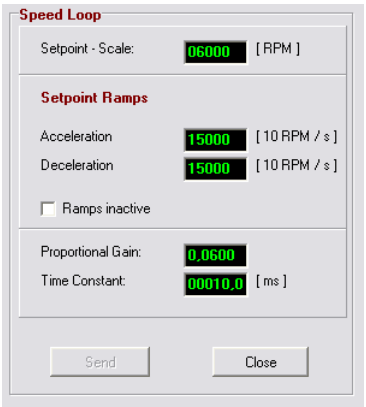
- analogue input 1 (differential input, ±10V, clockwise and counterclockwise rotation)
- analogue input 2 (unipolar, 0 ... 10V, clockwise rotation, can be inverted with digital input)
- RS232 (setpoint via DSerV by clicking RS232_SETPOINT and moving the slider left or right)

Notice:
Prior to setting-up or operating the speed controller, make sure that the current limits and the parameters of the current controller are set to match the appropriate motor values.
The tuning of the speed and current controllers is described in chapter 9.

Menu item ***OPTIMISATION /SPEED CONTROLLER*** allows setting the parameters of the speed controller:

Setpoint Scale: motor speed at 100% setpoint
Setpoint ramp: acceleration/ deceleration ramp for speed setpoint in 1pm/s.

Ramps inactive: no speed setpoint time delay
Propotional gain: Proportional gain of the speed controller (range: 0.000 .... 0.9999).
Time constant: time constant T_N (integral gain) of the speed controller.



The enable signal is always digital input DI1 (+15 ... +30V => enabled).
During operation, the digital input DI2 has to be set additionally for power stage enable.

4.2 Current / torque control mode

> **Notice:**
> The tuning of the current controller is described in chapter 9.1.

Current / torque control is selected in ***OPTIMISATION / OPERATING MODE***.
In this mode, the demanded value applied to one of the possible sources is interpreted as current setpoint. The standardisation of the value is always coupled to the parameter "rated current" (***OPTIMISATION / CURRENT CONTROLLER***).
Applied demand values are not affected by a time delay.

The enable signal is always digital input DI1 (+15 ... +30V => enabled).
During operation, the digital input DI2 has to be set additionally for power stage enable.

4.3 Positioning mode

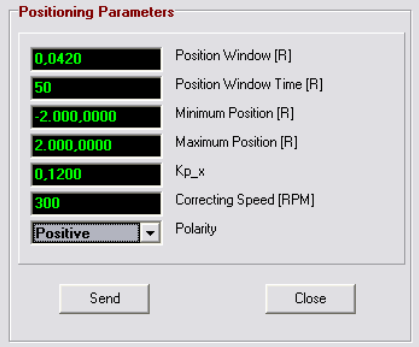
This operating mode allows time-optimised point-to-point positioning with trapezoidal speed profile.

Positioning range: $\pm 2^{19} = \pm 524288$ revolutions

Positioning resolution: resolver system: about 1/1024 revolutions = 0.352°

incremental encoder: 360° / (4 x pulse rate)
z.B.: 360 /(4 x 1024 pulses) = 0,088°

When operated by digital and analogue in- and outputs up to 16 target positions (relative and/or absolute) and target speeds can be stored as parameters. Selecting the desired position and starting the positioning process is done via the digital inputs.



The operating mode "Positioning" is selected in the menu ***OPTIMISATION / OPERATING MODE.***
The parameters needed for the positioning are available in ***OPTIMISATION / POSITIONING.***

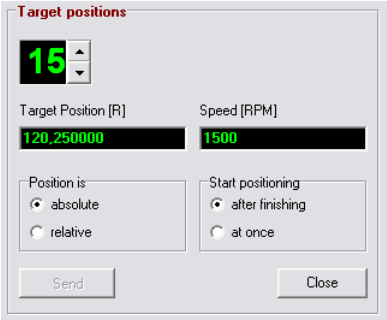
Position window
A positioning process is concluded when the difference between the set value and the actual value is less than the value contained in the "Position window", namely at least for a time duration specified in the "Time window".
Unit: revolutions of the motor shaft [R]

Time window
See "Position window".
Unit: milliseconds [ms]

Minimum positioning range
This is the negative limit of the positioning range. Should the set value or the actual value drop below this limit, a positioning error is announced.
Unit: revolutions of the motor shaft

Maximum positioning range
This is the positive limit of the positioning range. Should the set value or the actual value lie above this limit, a positioning error is announced.
Unit: revolutions of the motor shaft

kp_x	The proportional gain of the position controller. Range: 0...0.999.
Correction speed	This is the range of the position controller. It allows to modify the dynamic behaviour during achieving the target position. *Unit: [rpm]. Typical values: 100…500*
Polarity	This parameter allows an internal reversal of the positioning direction, in order to meet the user's mechanical requirements. Positive polarity means that the position increases with motor shaft turning clockwise. Negative polarity means that the position increases with motor shaft turning counter-clockwise.



Up to 16 target positions can be configured under ***OPTIMISATION / POSITIONING/ TARGET POSITIONS,*** which are accessible by four BCD coded digital inputs.

Target position	Set value for the target position (shown for target address 15), with choices for absolute/ relative values and starting conditions. *Unit: revolutions of the motor shaft*
Target position is	-absolute: Target position is an absolute value -relative: new target position = last target position + relative value
Start positioning	- after finishing: a new positioning process starts after the end of preceding positioning process. - at once: a new positioning progress starts at once and maybe interrupts a preceding one.
Speed	(Rotation) speed programmed to reach the target position. *Unit: [rpm]*

The acceleration and deceleration speed ramps can be set in the menu ***OPTIMISATION /SPEED CONTROLLER,*** and they are valid for all target positions.

4.3.1 Homing

Homing is done to get the information about a defined machine position. Homing is a must if angle-sensors with single-turn characteristics are used. The DSV supports different homing/referencing methods:

• Homing through limit- / referencing- switches
The drive moves to the switch with a speed setpoint according to “speed during search for switch”. After the switch is detected the drive reverses to “speed during search for zero”. The home position is detected, where the switch is switching to inactive.

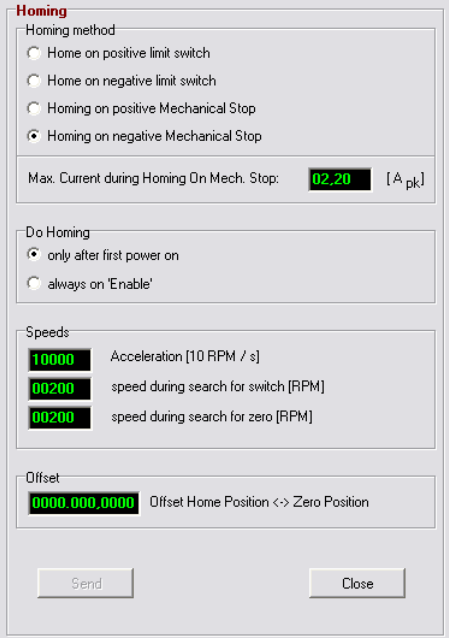
• Homing against a mechanical stop
The drive moves to the preferably hard stop with a speed setpoint according to “speed during search for zero” and a current limitation “max current during homing on mech stop”. The motor stop and its current rise are the criteria for detecting the home position.

Attention!
When homing against mechanical stop is used…

… choose low speed setpoints to keep dynamic forces low appearing at stop!

… mind the possibly high torques and forces!

=> Calculate or estimate developing forces by the given current limitation and check the effect to the entire system.



Homing must be done at least once after switching the DSV´s supply power on. In position mode homing starts automatically after enabling the controller for the first time.
If selected, homing can be performed each time after the controller is enabled, too.
Homing configuration is done in the menu ***OPTIMISATION/ POSITIONING/ HOMING.***

Homing method	Defines the method (switches or mech. stop) and whether referencing is done in negative or positive direction.
Do Homing	Defines, if homing is done once or every time the controller is newly enabled.
Acceleration	(Rotation-) Speed ramp for all the referencing speeds. *Unit: [10 rpm/second] => input value 1000 = 10,000 rpm/second*

Speed during search for switch The speed setpoint while driving to the switch.
Unit: [rpm]

Speed during search for zero The speed setpoint at which the negative edge of the limit switch is detected and speed setpoint in homing mode against mechanical stop.
Unit: [rpm]

Offset The offset between the homing position detected during the homing procedure and the possibly deviating zero position of the machine.

Note: Homing is stopped after having detected the state of the limit switch. The actual position allocated to this point is the negative offset.
Unit: revolutions of the motor shaft [r]

4.3.2 Limit switches

The limit switches are used to border the drives movement range and for homing purposes.
Configuration can be made at ***OPTIMISATION/ LIMIT SWITCHES.***

Limit Switch Surveillance

Inactive:
The drive is not affected by the limit switches.

Activ: an activated limit switch…
position control => … will cause a positioning error
speed control => … reduces the speed setpoint (depending on direction) to zero and switches the speed controller from PI- to P- characteristic.

Type of limit switches

Normally closed contacts:
an activated limit switch will set the digital output to 0V

Normally Open Contacts:
an activated limit switch will set the digital output to 24V

4.4 Supplementary functions

4.4.1 External limitation of speed / torque

The DSV has the possibility to apply an external dynamic limitation of either speed or torque / current. The limitation can be activated in ***OPTIMISATION / OPERATING MODE*** and is applied to the actual operation mode. The limit can be entered as analogue input or via the serial interface RS232.

- **Torque limitation during speed control**

When the drive is set to speed control, the maximum torque is limited. At 100% setpoint value, the current is limited to the motor's maximum current.
Notice: I^2t-motor-protection stays active, i.e. as soon as the I^2t limitation activates, the current will be limited to the rated current and this may be below the external limit!

• Speed limitation during torque control

When the drive is set to torque control, the maximum speed is limited. At 100% demanded value the speed is limited to setpoint scale (***OPTIMISATION / SPEED CONTROLLER***).

Notice:
When speed limitation during torque control is used, the speed control loop has to be tuned. The acceleration / deceleration ramp has to be switched off or set to its maximum.

4.4.2 Digital inputs

The function of the digital inputs partly depends on the selected operating mode, as shown in the table below:

Digital input	Modes of Operation Torque Control	Speed Control	Positioning
DI 1	enable controller	enable controller	enable controller
DI 2	enable power stage	enable power stage	enable power stage
DI 3			start positioning
DI 4	limit switch, right	limit switch, right	limit switch, right
DI 5	limit switch, left	limit switch, left	limit switch, left
DI 6	HALT	HALT	HALT
DI 7	setpoint = 0	setpoint = 0	position prefix, Bit 0
DI 8	inverted setpoint	inverted setpoint	position prefix, Bit 1
DI 9			position prefix, Bit 2
DI 10			position prefix, Bit 3

Setpoint = 0
Sets the demanded speed /torque to zero, regardless of the external set value. In the operating mode “Torque Control” the motor produces almost zero torque. Acceleration ramps stay active.

Inverted setpoint
Inverts the sign of the demanded speed- or torque- setpoint. Acceleration ramp stays active.

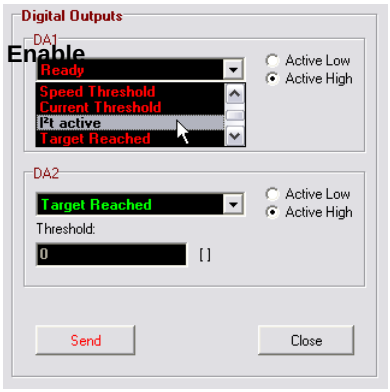
HALT
The drive decelerates speed-controlled down to the speed “zero” and then holds the achieved position. Does not depend on the operating mode.

Limit switch, right
Positioning mode:
Positive limitation of the positioning range.
Speed control mode:
Positive setpoints are ignored, the controller switches over to a P-characteristic in order to avoid positive torque. Negative setpoints are not influenced.

Limit switch, left
Similar to the right limit switch: negative setpoints are ignored, the controller switches over to a P-characteristic in order to avoid negative torque. Positive setpoints are not influenced.

4.4.3 Digital outputs

The function of the digital outputs DO1 and DO2 is configurable in the menu ***OPTIMISATION / DIGITAL OUTPUTS*** (see the DSerV software):



Active low/high Defines the outputs polarity

Shows the actual enable -state.

Speed threshold Active when the actual speed > threshold speed

Current threshold Active when the actual current > threshold current.

I²t active Active when the I^2t limitation is active

Target reached Active after a positioning process is successfully concluded.

Ready Active when the controller is error-free

Following error Active when the actual following error > threshold value.

4.4.4 Parking brake

The DSV13x features the triggering of an electromagnetic parking brake. Connected to X2, the parking brake will be automatically switched depending of the drives enable state. The parking brake is switched without any time delay.

Notice:
To prevent abrasion at an early stage mind the following:
- Avoid switching enable with an abruptly rising torque.
- Disable the drive preferably at standstill

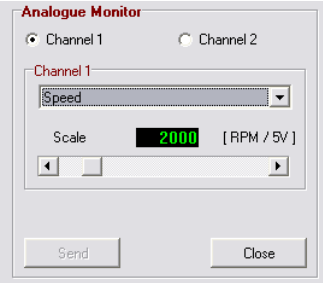
Attention!
Operating voltage of the parking brake = intermediate circuit voltage!
The voltage at X7/Pin1 is equivalent to the positive intermediate circuit voltage. Before connecting a parking brake, make sure the voltage supply of the parking brake is equal to the intermediate circuit voltage.
When using a permanent magnet parking brake:
- Take notice of polarity
- Exceeded intermediate circuit voltage can reduce the braking effect.

Parking brakes with a current consumption ≤ 1500mA can be connected directly. Brakes with a higher current consumption have to be supplied separately. The output of the DSV can be used to control a relais.

4.4.5 Analogue Monitor

The DSV13x features two analogue outputs with a resolution of 10 Bit at a voltage level of 5V ±5V to display internal values.

> **Notice:**
> When using the analogue output notice the tolerances of the center voltage, the cut-off frequency and the maximum output current!



In the menu ***OPTIMISATION / ANALOGUE MONITOR*** the following values can be selected and displayed at the desired scale:

actual speed

actual current in the q-axis I_q (torque producing current)

actual current in phase U

actual current in phase V

rotor position angle (fixed scaling 180°/5V)

5 Pin assignment

5.1 X1 – Motor connection

device side connector: 4-pole power- combicon (7,62mm)
cable side connector 4-pole plug (Phoenix PC 5/4-STF-SH-7,62)

Pin–No.	Abbreviation	Description BL motor	Description DC motor
1	U	motor phase U	motor +
2	V	motor phase V	motor -
3	W	motor phase W	(do not connect)
4	PE	motor PE	motor PE

5.2 X2 – Voltage supply

device side connector: 4-pole power- combicon (7,62mm)
cable side connector 4-pole plug (Phoenix PC 5/4-STF-SH-7,62)

Pin–No.	Abbreviation	Description DSV130/132	Description DSV133
1	+Ub	Supply +24V (+48V@DSV132)	Supply AC
2	0V	Supply 0V	Supply AC
3	PE	Ground	Ground
4	T	connector for external brake resistor	*1)

Warning concerning DSV133!
Do not connect the alternating voltage supply to protective earth!
Connections between ac voltage supply and protective earth can cause damage to components connected to the DSV133, if they have a separate connection to protective earth (e.g. PC with GND-PE connection)

5.3 X3 – Motorsignals

device side connector: 9 – pole D-SUB (female)
cable side connector: 9 – pole D-SUB (male)

Pin– No.	Resolver		Tacho
1	cosine – signal	S2	analogue tacho - *2)
2	sine – signal	S1	
3	GND		
4	rotor	R1	
5	temperature probe motor +		
6	cosine – reference	S4	analogue tacho + *2)
7	sine – reference	S3	
8	temperature probe motor –		
9	rotor	R2	

*1) Connecting an external brake resistor is not possible for the DSV133.
*2) When using an analogue tacho (for DC motors), the tacho input has to be activated by setting the Jumpers JP1 and JP2 in the inside of the DSV13x.

5.4 X4 – Set values connector

device side connector: 25 – pole D-SUB (female)
cable side connector: 25 – pole D-SUB (male)

Pin– No.	Abbreviation	Description	Wert
1	AI1+	analogue input 1 (differential input)	0... ±10V
2	AI1–		
3	AI2	analogue input 2 (ground supply = GND_H)	0...10V
4	+U_H	auxiliary voltage +24V (voltage source)	16V, 30mA
5		n. c.	
6	+U_EA	separate supply for DO's	
7	DI8	digital input 8 (position prefix bit 1/inverted set value)	
8	DI7	digital input 7 (position prefix bit 0/ set value=0)	
9	DI6	digital input 6 (HALT)	
10	DI5	digital input 5 (limit switch left)	
11	DI4	digital input 4 (limit switch right)	
12	DI3	digital input 3 (start positioning)	
13	DI2	digital input 2	
14	AO1	analogue output 1 (device monitoring)	5V ±5V, 10Bit
15	AO2	analogue output 2 (device monitoring)	5V ±5V, 10Bit
16	GND_H	reference potential for auxiliary voltage (pin 4)	
17		n. c.	
18	GND_EA	separate reference potential for the I/O's	
19	DI1	digital input 1 (enable)	
20	DI9	digital input 9 (position prefix bit 2)	
21	DI10	digital input 10 (position prefix bit 3)	
22	DO1	digital output 1 (configurable)	
23	DO2	digital output 2 (configurable)	
24	Relay 1	'ready' – relay	max. 100V/100mA
25	Relay 2		

Notice:
There is a galvanic isolation between the digital inputs / outputs and the control unit. The potential references of the I/O's are +U_EA (X4.6) and GND_EA (X4.18). In case that no external control voltage is available, the internal auxiliary voltage can be used to excite the inputs and/or to supply the digital outputs. In that case, connect +UH (X4.4) with +U_EA (X4.6), as well as GND_H (X4.16) with GND_EA (X4.18). The galvanic separation is thus cancelled!

5.5 X5 – Serial interface RS232

device side connector: 9 – pole D-SUB (male)
cable side connector: 9 – pole D-SUB (female)

Pin– No.	Signal	Description
1		n. c. (not connected)
2	RxD	receive data RS232
3	TxD	transmit data RS232
4		n. c.
5	GND	reference (ground) potential
6	DSR	used only for firmware download
7		n. c.
8		n. c.
9		n. c.

5.6 X6 – CAN interface

device side connector: MSTBA2,5/5-G5,08-AU (Phoenix Contact GmbH)
cable side connector: MSTB2,5/5-ST-5,08-AU (Phoenix Contact GmbH)

Pin – No.	Abbreviation	Description
1	GND_CAN	Reference potential CAN interface
2	CAN LO	Signal level CAN
3	Shield	Shielding connection
4	CAN HI	Signal level CAN
5	VDD_CAN	Supply voltage CAN interface

The CAN interface is galvanically isolated from the control unit. A voltage level of 12V ... 24V (VDD_CAN) is necessary to supply the CAN interface.
Only shielded bus cables should be used. The maximum bit rate is 1MBit/s.

5.7 X7 – Parking Brake

device side connector:: 2- pole mini-combicon (MC1,5/2-GF-3,81)
cable side connector: 2- pole mini-combicon plug (Phoenix MC1,5/2-STF-3,81)

Pin– No.	Abbreviation	Description
1	+UZK	Positive potential of the intermediate circuit
2	brake	0V switched brake output

Attention!
Operating voltage of the parking brake = intermediate circuit voltage!
The voltage at X7/Pin1 is equivalent to the positive intermediate circuit voltage. Before connecting a parking brake, make sure the voltage supply of the parking brake is equal to the intermediate circuit voltage.
When using a permanent magnet parking brake:
- Take notice of polarity
- Exceeded intermediate circuit voltage can reduce the braking effect.

Parking brakes with a current consumption ≤ 1500mA can be connected directly. Brakes with a higher current consumption have to be supplied separately. The output of the DSV can be used to control a relay.

5.8 X8 – Incremental interface

device side connector: 9 – pole D-SUB (female)
cable side connector: 9 – pole D-SUB (male)

Pin– No.	Abbreviation	Description
1	signal A *Data_In*	incremental encoder Signal A *data signal SSI*[*)]
2	signal B *Data_Out*	incremental encoder Signal B *dats signal SSI*[*)]
3	signal Z *CLK*	incremetal encoder zero pulse *clock signal SSI*[*)]
4	GND	ground
5	VCC	voltage supply of the incremental encoder, change JP6 for 5V or 16V
6	signal/ A/ *Data_In*	incremental encoder Signal A inverted *data signal SSI inverted*[*)]
7	signal/ B/ *Data_Out*	incremental encoder Signal B inverted *data signal SSI inverted* [*)]
8	signal/ Z/ *CLK*	incremental encoder zero pulse inverted *clock signal SSI inverted* [*)]
9	GND	

The signal values fort he incremental interface can be changed via the internal jumper JP3, JP4 and JP5 between RS422-, 5V TTL or 10-30V signals.

*) The use as an SSI interface is optional

6 Installation

Attention!
Connect protective earth **prior** to installation!

6.1 Cable type, cable length and shielding

EMC note:
Adherence to the limits that are specified in EMC product standard DIN EN 61800-03: 2001-02, has been confirmed in the test laboratory:
Interference emission[1)]: first environment / restricted availability
Interference immunity: second environment
The following installation recommendations are made in accordance with the situation in the test laboratory.

[1)] Conducted emissions must be attenuated by using suitable filtering in the power supply.

ENGEL supply cord set cables in standard lengths of 2m and 5m for optimal operation of the device. Other cable lengths can be supplied on demand.

Requirements for the motor cable:

- Minimum cross-sectional area for DSV13x: 2,5mm² (Attend voltage drop on the cable!)
- The motor cable must have an overall shielding which has to be connected to protective earth on the DSV side.
- Flexibility and temperature range have to be according to the specific application.

The Protective Earth (PE) is connected to X1.4 and the shielding to the shield connector of X2
Signal wires within the motor cable (parking brake) have to be shielded separately and need separate connection from the motor wires by a shielding which, for safety reasons, is connected to protective earth.

Recommendation: Ölflex- Servo 700CY 4x 2,5mm² + (2 x 2 x 0,75mm²) StD-CY
Supplier: Lapp GmbH, Stuttgart, Germany; www.lappkabel.de

Requirements for the resolver- , incremental- u. tacho cable:

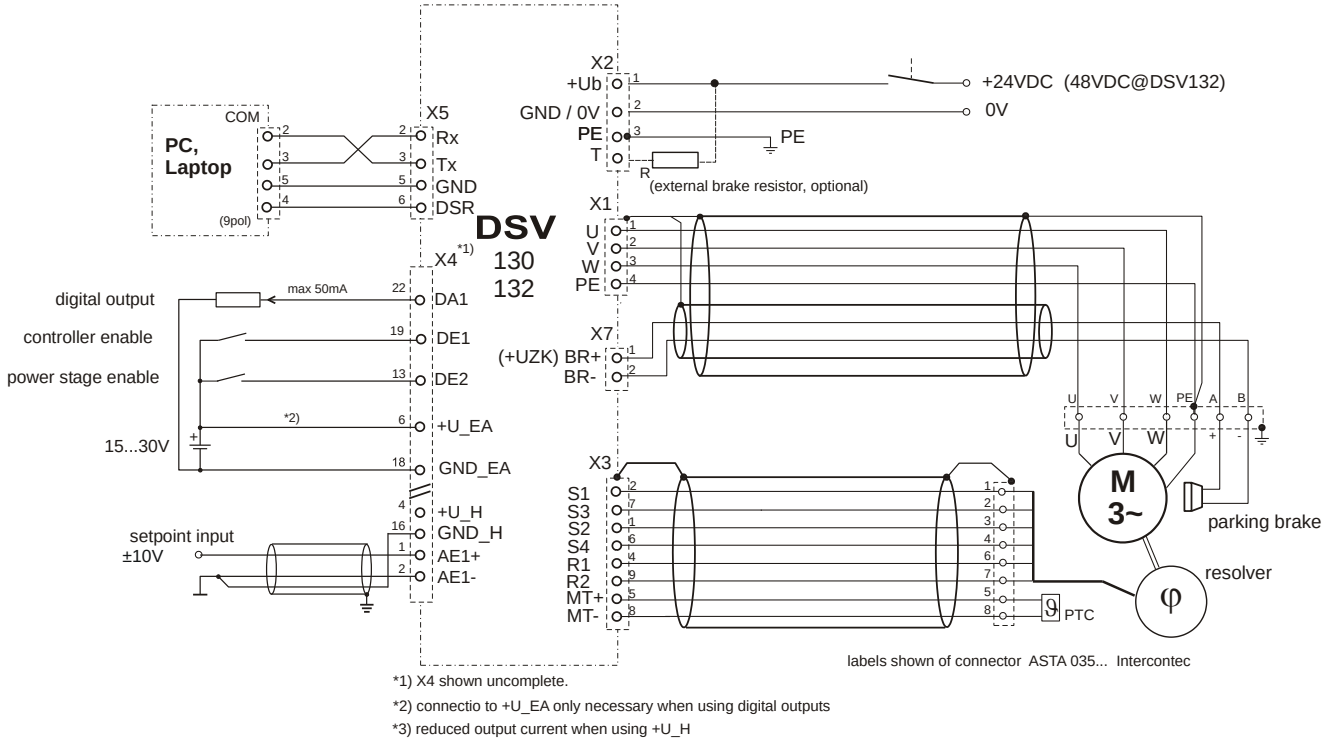
- Use twisted pair cables. Corresponding cable pairs are used for corresponding signals (resolver signal, incremental encoder, tacho voltage + und -)
- The cable must have an overall-shielding. The shield must be connected to protective earth on the DSV side.

Recommendation: Ölflex- Servo 720 CY 4x (2x 0,25mm²) + 2x 1mm² CY
Supplier: Lapp GmbH, Stuttgart, Germany; www.lappkabel.de

6.2 Installation diagram

The devices DSV130, DSV132 and DSV133 can either operate with brushless three-phase synchronous motors or brush-type DC motors.
The following diagrams are only two examples of configuration and do not represent all possibilities of wiring.

6.2.1 Operating with a three-phase synchronous motor



installation example: using internal voltage +U_H:
Attention: No galvanic isolation of digital inputs and outputs !

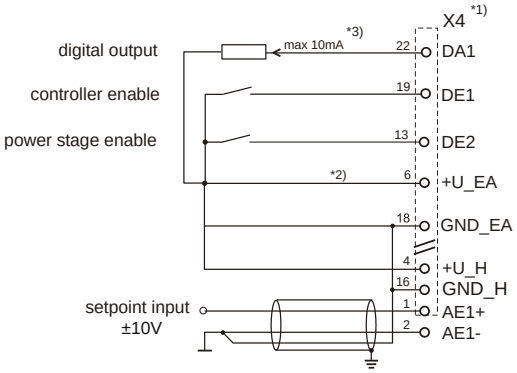


fig.: Installation diagram for a three-phase synchronous motor

Notice:
When connecting ENGEL BL motors, phases U and W have to be interchanged!

6.2.2 Operating with a DC motor

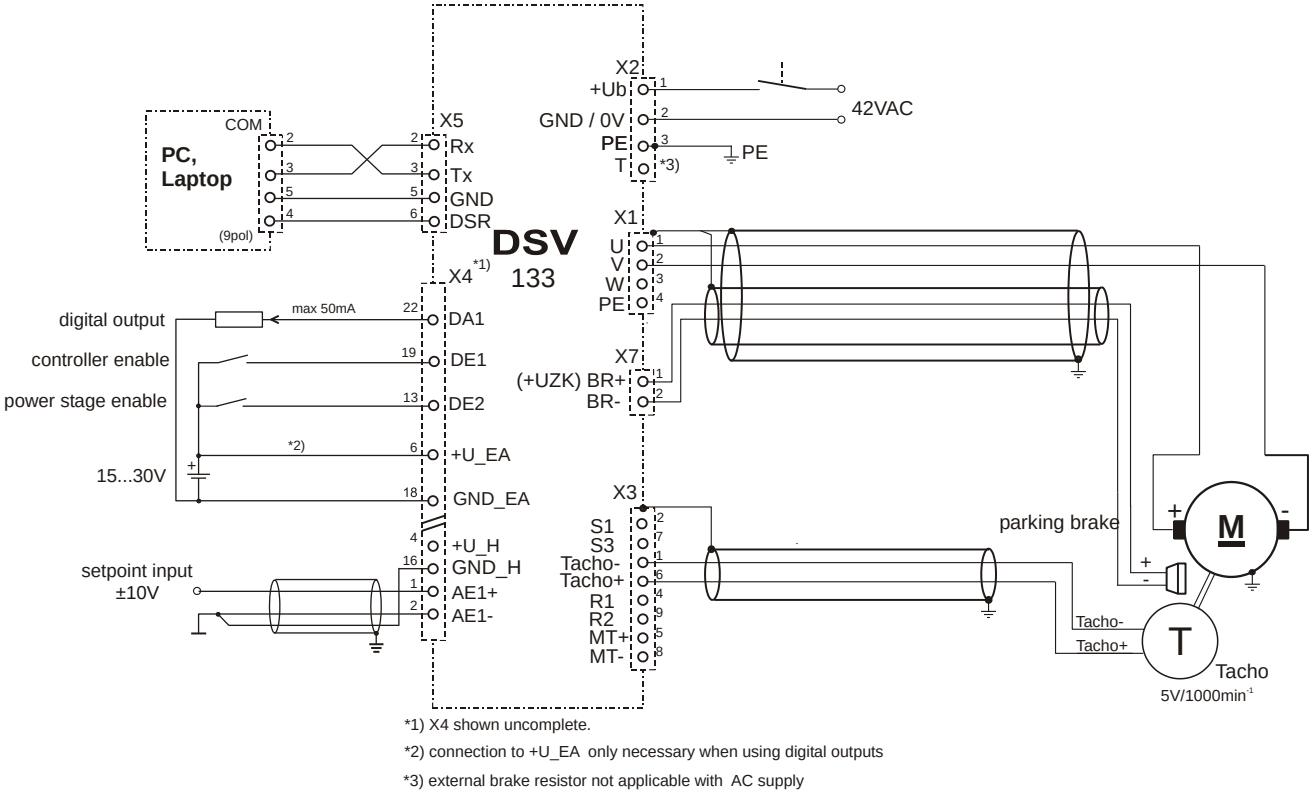


fig.: Installation diagram for a DC motor

The diagram shows the setup with a DC tacho for speed feedback.

Attention!
Rated voltage of the parking brake = intermediate circuit voltage Here: 42V x √2 = 60V !

6.2.3 Decoupling of the parking brake

If the rated voltage value of the parking brake is unequal to the intermediate voltage value, the parking brake has to be supplied by an external voltage source and controlled by a relay.

K1: rated voltage, if possible intermediate voltage value
R: To compensate possible differences of the voltage K1
D: free wheeling diode

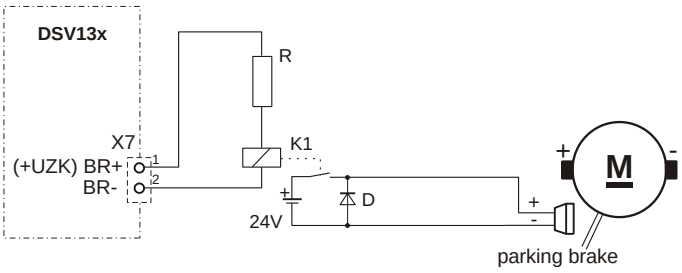


fig.: Decoupling of the parking brake

6.3 Jumper setting

Attention!
Remove all connectors before configuring the device!
Avoid static charging, do not touch electronic devices!
To configure the jumpers, the cover has to be removed. Therefore, remove the 4 screws on the cover.
Conductible parts on the printed circuit board cause destruction when switching-on the device.

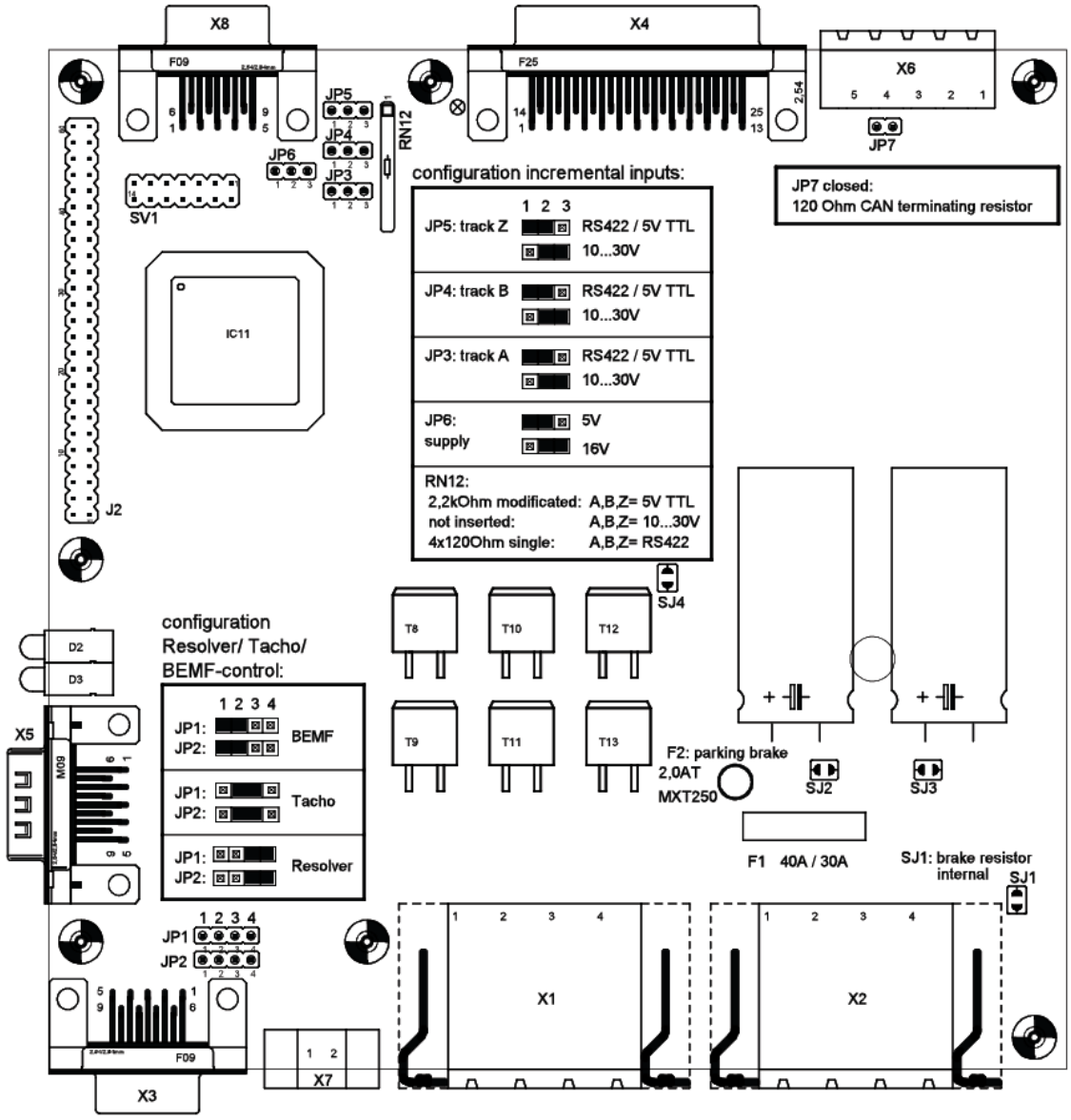


fig.: Jumper setting

The choice of the speed feedback sensor (resolver, tacho or BEMF) and the configuration of the incremental encoder interface (RS422/5V TTL/10…30V) can be done via the jumpers on the PCB of the DSV13x. (Additional configurations in the DSerV menu ***OPTIMISATION / MOTORSYSTEM*** are necessary!)
RN12 is delivered with a modified 2,2kOhm resistor array for 5VTTL configuration. Resistor array for „RS422“ setting on request.

7 Set-up procedure of the DSV13x

Attention!
During set-up the motor may turn. Make sure that the motor is securely fixed and that no danger can arise from the rotating motor/drive.

The following procedure is recommended to get the drive up and running:

Step 1: Installation

- Install the drive according to the installation diagram and wire all necessary digital and analogue inputs and outputs.
- Configure the jumpers as described in chapter 6.3 for proper installation of the resolver, tacho, BEMF and incremental encoder feedback.

Step 2: Check the installation

- Check your installation for any faults.

Step 3: Set to uncritical demanded values

- Set your external demanded values to minimum.
- Disable the drive (DI1 = OFF, DI2 = OFF).

Step 4: Switch on the supply voltage

- Green LED blinks regular.

Remedies for typical errors at this point:
Error code **1**: motor temperature probe improperly connected.
Error code **5**: erroneous installation of resolver or rotor position sensor.
Other error codes: see error table in chapter 8.1.

Step 5: Connection to PC software DSerV

- Connect COM1 or COM2 of your PC / Laptop to X5 of the DSV using a crossed (null modem) cable and start DSerV.
- The status bar displays type and version of the DSV. Remedies, in case of faulty connection in chapter 11.2.

Step 6: Check parameter set

- In the menu ***OPTIMISATION / CURRENT CONTROLLER*** check whether the rated and max current fit to the connected motor. If not, download the right parameter file or tune your controllers according to chapter 9.

Step 7: Enable power stage

- Switch enable input to high: Green LED is lit continuously.
- When applying a small speed demand, the motor will start rotating. For a positive speed demand, it will turn clockwise when looking at the shaft.

Remedies of typical errors at this point:

- Motor runs very rough or develops standstill torque: check proper connection of motor phases and resolver or rotor position sensor.
- Error codes: see table of error codes in chapter 8.1

Step 8: Ensure proper operation of your application

- Check all I/O signals for proper operation

8 Status indicator, error codes

The DSV13xs status indicator shows clearly the operating status of the drive. Each of the two pairs of LED's (green and red) show the status of the drive, respectively of the CAN interface. The red and green LED may show the following states of the drive:

LED green	LED red	Ready Relay	Operating Status
blinking	x	on	power stage ready, disabled
on	x	on	power stage ready, enabled
off	code	off	red LED shows highest active error code
off	off	off	Device without function: - Check supply voltage - Especially when USB-RS232 converters are used: disconnect RS232 and switch on the power supply again after a short delay time.

x = don't care

Attention!
Switch off the power supply before you start looking for errors!

The servo-controller DSV13x is equipped with an error register in order to detect and display even momentary errors, such as over-current.
An error causes the switch-off of the power stage and the motor drops out. Drive errors are indicated by the drive red LED as a blinking code with the number of light pulses representing the error code. The table of error codes allows to determine the error and to find a remedy. In case of multiple errors, only the one with the highest priority is reported. The PC software DSerV shows the cause of the error in plain text.
After removing the cause of the error, the drive becomes operational again by changing the enable input from "OFF" to "ON". The powerstage will only be enabled after a second change from "OFF" to "ON".

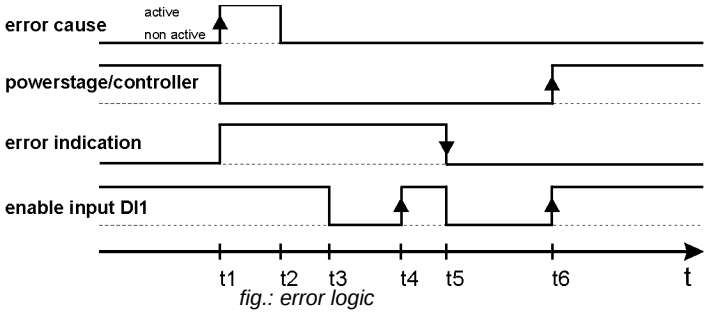


fig.: error logic

t1: Occurrence of an error: powerstage disabled, error indication active
t2: Cause of error relieved
t3: User sets enable input to off
t4: User sets enable input to on (1st OFF-ON-transition): powerstage / controller remain disabled
t5: User sets enable input to off. Error indication is reset as error is removed, ready relay is switched on.
t6: User sets enable input to on (2nd OFF-ON-transition): power stage and controller enabled

Switching the DSV mains supply off and on does also reset the error indication.

Notice: The error 10 "internal error" is not resettable with the enable input.

8.1 Table of error codes

The following table shows all possible error codes:

Error code Displayed	Meaning	Possible Remedies
no error code displayed	device without function	Check supply voltage. Especially when USB-RS232 converters are used: disconnect RS232 and switch on the power supply again after a short delay time.
1	motor temperature exceeds maximum	DSV adjusted to the motor rated current? Check the wiring
2	power stage temperature exceeds 85°C	Check installation conditions. Ambient temperature too high? Provide additional cooling if necessary.
3	internal auxiliary voltage missing	Check supply voltage. No further remedy if all right.
4	dc-link voltage exceeds maximum	Regenerating braking operation, adjust deceleration ramp if necessary.
5	resolver error, position sensor error	Check the resolver wiring, or rotor position sensor wiring.
6	undervoltage	Check input voltage.
7	over-current	Check motor wiring. Short circuit?
8	check sum parameter-memory	Parameter memory has not been read correctly. Error still present after switching off and on? => download known set of parameters => check parameters with DSerV and save with “save settings”.
9	erroneous set of parameters	Downloaded set of parameters faulty, parameters cannot be saved. => switch off and on to activate original parameters, or => use different parameter set.
10	internal error	Cause can not be relieved by user DSerV shows an internal Error code that allows to detect the error cause.
11	positioning error	DSerV shows a supplementary error number that allows to detect the error cause. See also the table for positioning errors.
12	fieldbus error	Fieldbus error.

Possible positioning errors are shown in the table below:

Error Code	Meaning	Cause / Remedy
1	Actual position < Minimum positioning range	Actual position is less than the specified positioning range.
2	Actual position > Maximum positioning range	Actual position is greater than the specified positioning range.
3	Set position < Minimum positioning range	Pre-fixed set position is less than the specified positioning range.
4	Set position > Maximum positioning range	Pre-fixed set position is greater than the specified positioning range.
5	Erroneous parameter(s) in the positioning range	Inadmissible parameters of the positioning range, e.g. min>max.
6	Supervision of the limit switches	Inadmissible leaving of the positioning range specified by the limit switches.
7	Homing	Possible causes: - wrong parameters in the referencing method; - both limit switches active - wrong limit switch is activated during referencing. - homing against mech. stop: motor stop not detected.

9 Tuning the controller

When ordering a drive system consisting of servo controller and motor, the controllers will be pre-set to the motor data. If needed, the speed controller has to be adjusted according to the concrete application.
If no parameter file for the motor is present, the current controller and the speed controller have to be adjusted according to the proceedings described below.

9.1 Current controller tuning

Step 1: completely installed, wired and fully operational according to the set-up notes in chapter 7.

Step 2: Adjust parameters for rated and maximum current in the menu ***OPTIMISATION / CURRENT CONTROLLER***.
Rated and maximum current can be found in the motor's datasheet or on its name plate. As for geared motors, the maximum current is usually decided by the gear's maximum power and can be significantly lower than stated on the name plate. Refer to the gear's or geared motor's datasheet.
According to an ENGEL standard, all currents are given as peak values. RMS values have to be converted:
$I_{Scheitel} = I_{eff} \times \sqrt{2}$

Step 3: The current controller's proportional gain can be calculated as follows:

> **Notice:**
> The approach described below provides approximate values for proportional gain and time constant, which can vary from the ideal configuration in particular cases. The approach also applies for three-phase synchronous motors.

Proportional Gain = R_a * T_a * 2000

R_a => Resistance between two motor phases [Ω], specified in the datasheet

T_a => Electrical time constant [s], specified in the datasheet

Step 4: The current controller's time constant is equal to the one of the motor:

Time constant = T_a

T_a => Electrical time constant [s] as specified in the datasheet

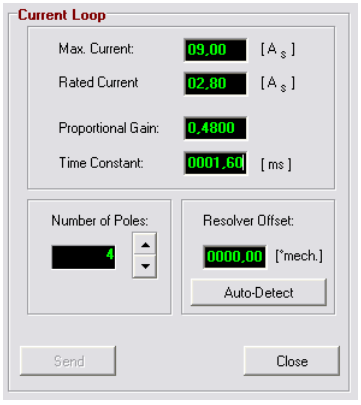
Example: **Tuning the current controller for motor BSR2650-R2.4 24V 4500UPM.**

From the datasheet:

rated current:	I_N = 30 A
max current :	I_s = 125 A
resistance:	Ra = 0.1 Ω
time conststant:	Ta = 0.7 ms

Proportional gain
$k_p = R_a$ * T_a * 2000
= 0.1Ω * 0,7ms * 2000 = 0.14

time constant = T_a = 0.7ms



9.2 Resolver offset detection, motor poles

A basic requirement for operating a three phase synchronous motor is the exact current commutation. The commutation is defined through the connection of the motorphases (U,V,W), the motor poles and the alignment of the resolver angle to the angel of the motorsystem.
The motor poles (pole pairs x 2) are given in the motor datasheet and can be set under **OPTIMISATION / CURRENT CONTROLLER.**
The alignment of the resolver is done by an automatic resolver offset detection procedure and can be started under **OPTIMISATION / CURRENT CONTROLLER.**

Attention !
During the automatic resolver offset detection procedure the drive moves abruptly!
Please mind the following requirements:

- The motorshaft should be unloaded
- Current controller is tuned
- Motor poles are set correctly
- Attend to the hints displayed by DSerV

If the error code 10 appears, check the wiring of motor and resolver.
(False motor connection if the motorshaft has moved ccw first during the procedure)

9.3 Speed controller tuning

Notice:
Adjusting the speed controller does only make sense if the current controller is properly tuned. If needed, tune the current controller as described in chapter 9.1

9.3.1 Tuning a motor system with a speed sensor (resolver, incremental encoder, tacho)

Step 1: Drive completely installed, wired and fully operational according to the set-up notes in chapter 7.

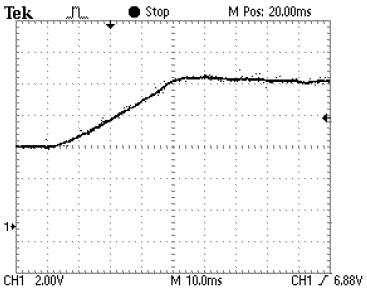
Step 2: Make sure that the rated and maximum current are set correctly and the current controller is properly tuned. If needed, adjust the current controller as described in chapter 9.1.

Step 3: To optimise the speed controller, the drive's dynamic behaviour has to be judged. Configure one of the analogue outputs as speed monitor and visualise the output voltage using an oscilloscope.
Adjust the analogue output in the menu ***OPTIMISATION*** / ***ANALOGUE MONITOR***.

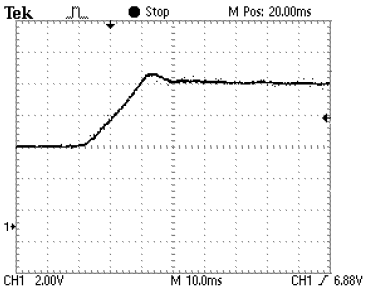
Step 4: The parameters of the speed controller can be accessed in the menu ***OPTIMISATION / SPEED CONTROLLER.***
For optimising the speed controller, switch the speed ramp off or set it to the maximum acceleration and set the scaling of the set value according to the speed needed in that application.
First set the control parameters to uncritical values, i.e. low gain (approx. 0.05 .... 0.1) and high time constant.

Step 5: Set the demanded speed to approximately 75% of the rated speed and enable the drive.
Judge the speed vs. time curve. Then disable the drive.

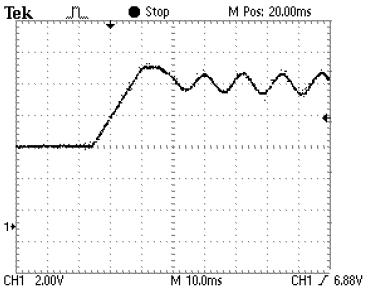
Step 6: Increase the proportional gain by a few hundredths, enable the drive and judge speed vs. time curve again. Increase the gain until the drive starts to oscillate. Then reduce the gain until the oscillation is not visible anymore.
For optimum control, reduce the time constant until the speed set value is reached with one single overshoot of approximately 4-10%. See also diagrams below:



a) gain too low
time constant too high



b) ideal gain / time constant



c) gain too high
time constant too low

fig.: speed step-responses with varying speed controller parameters

9.3.2 Tuning of DC motors with BEMF control and IxR compensation

Step 1: Drive completely installed, wired and fully operational according to the set-up notes in chapter 7.

Step 2: Make sure that the rated and maximum current are set correctly and the current controller is properly tuned. If needed, adjust the current controller as described in chapter 9.1.

Step 3: The voltage constant and the terminating resistance of the motor are assigned in DSerV under ***OPTIMISATION / MOTOR***.
The voltage constant is normally given in the datasheet. It can be estimated mathematically:

$k_e = (U_N – I_N \times R_A – 2V) / n_N \times 1000$ where: U_N = rated voltage
I_N = rated current
R_A = amature resistance
n_N = rated speed

Example:

GNM 5480 24V 3000min^{-1} with: I_N=12.9A R_A=0.106Ω

k_e = 24V – 12.9A x 0.109Ohm / 3000min-1 * 1000 = **7.5 V/1000min^{-1}**

The terminal resistance of the motor is also given in the data sheet.

Notice:
Assigning the voltage constant and the terminal resistance as specified in the datasheet does not necessarily guarantee the ideal configuration for the controller. Typically, the IxR compensation has to be estimated by the value of the terminal resistance.

Smaller terminal resistance values prevent oscillation!

The parameters of the speed controller can be accessed in the menu ***OPTIMISATION / SPEED CONTROLLER.*** First set the control parameters to uncritical values, i.e. low gain (approx. 0.05 .... 0.1) and high time constant.

Step 4: Set the demanded speed to approximately 75% of the rated speed and enable the drive.

If necessary, compare the real motor speed (e.g. laser tachometer) of the non loaded motor with the value displayed in DSerV and adjust the voltage constant. Test for multiple speeds (right/left).

Tune up the compensation value until the motor starts to oscillate. Then reduce the value until the motor is below the oscillating threshold.

Notice:
For BEMF control with IxR compensation, the analogue monitor displays a calculated value, which can vary from the real speed value significantly and is thus not always usable for optimisation.

Notice:

The high time constant of the speed capture is in BEMF- Mode with IxR compensation possibly makes the effect of Step 5 irreproducible.

Step 5: Tune up the speed controller gain some hundredth points and start the drive again from zero to nominal speed. Evaluate the characteristic of the speed.
Tune up the gain until the final rotation speed is reached without oscillation of the drive. For optimisation, turn down the time constant of the speed controller until the nominal speed is attained with only one overshoot (4-10% of the nominal speed).

10 Mechanical dimensions

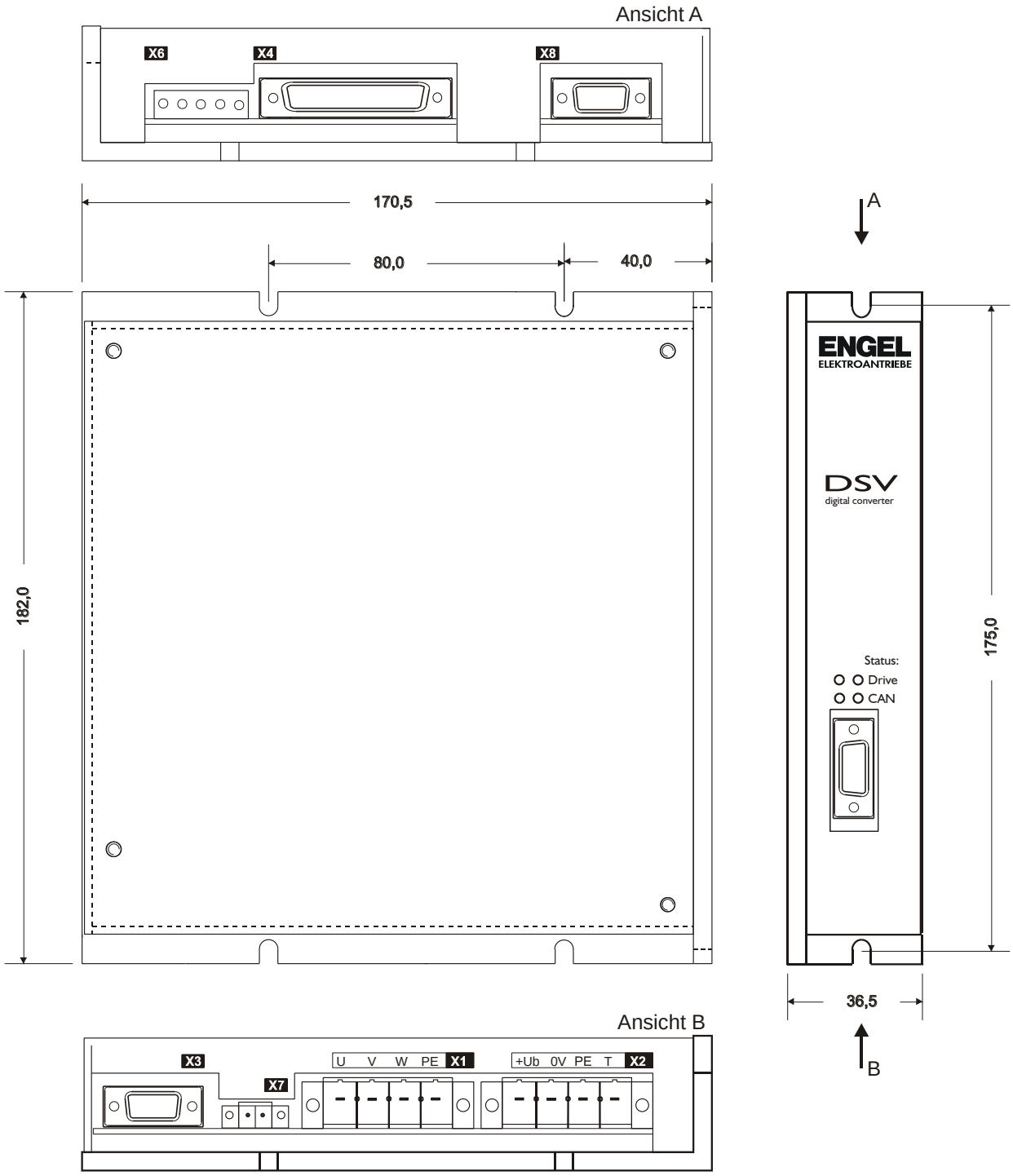


fig.: mechanical dimensions of DSV13x (in mm)

Notice:
When mounting several DSV 13x in one cabinet, keep a free space of at least 30mm between two neighbouring DSV devices in order to enable cooling by natural convection.
Allow a space of 80 ... 100mm on the connection side of the DSV for connectors and wiring.

11 PC- Service- Software „DSerV“

The service software DSerV allows for a clear and easy configuration of the DSV 13x. The operating condition, like the enable status and values such as speed and current, can be observed at a single glance. The operation modes, current limits and controller parameters can be adjusted via menus. All settings can be saved to the hard disk. The program language can be switched through English, German and French.

11.1 System Requirements

For installation and operation of DSerV your system has to meet the following requirements:

- **IBM-compatible PC-AT (Laptop), 80486 upwards, with at least 16MB RAM;**
- **Microsoft- WINDOWS® 95, 98, NT 4.0, XP, 2000, Vista;**
- **3,5“ floppy disk drive or CD-ROM drive;**
- **serial Interface COM1, ... COM99;**
- **serial interface cable (standard cable: 9pole - 9pole, wires 2 and 3 crossed).**

11.2 Installing and Running the Programm

Notice:
Carefully read the licence agreement prior to installing the software!
You accept all the regulations of the agreement a soon as you install the software!

The DSerV installation consists of copying the two program files to a folder on your hard disk. Take the following steps:

1. **Start WINDOWS.**
2. **Insert floppy disk or CD containing DSerV.**
3. **Start Windows – Explorer and create a working directory (File / New / Folder).**
   Suggestion: C:\Programme\ENGEL_DSERV.
4. **Copy DSERV.exe and *.dav into your working directory.**
5. **If present, copy parameter files *.par into subfolder PAR of your working directory.**

Connect your servo controller to your PC using the serial interface cable and switch on the DSV13x. Start DSerV by running DSerV.exe. There are three possibilities to start the program:

- Im WINDOWS ***Start-Menu*** => ***Execute*** (choose file DSerV.exe in your working directory).
- Double-click on DSerV.exe in your “Explorer”.
- Double-click on the DSerV-icon
  Shortcut to DSerV.exe must exist; if not, create one:
  Right-click Desktop, select ***NEW → SHORTCUT***, choose DSerV.exe and follow the instructions. The DSerV icon will appear on your desktop.

On start-up, DSerV will establish a connection to the DSV and the program window will appear. The system is ready to use.

Notice:
Check the following points in case DSerV can not establish a connection:
- Correct COM-port selected? (***OPTIONS*** / ***COM-PORT***)
- Number of COM-port larger than 99 (USB to RS232 converter)?

In the extended connection options of the controller….
- Serial cable connected to PC and servo-controller?
- Servo-controller switched ON?
- Does the *.dav file in your working directory match type and firmware of your servo-controller?
- Connect the RS232 after supplying the DSV.

11.3 Using DSerV

Main Menu
Select functions here

Monitor Window
Display of …
actual and demanded values,
currents, speeds,
I²t integrator,
temperatures,
inputs/ outputs

Status Bar
Display of…
device type,
firmware version,
drive status,
errors in plain text,
communication status

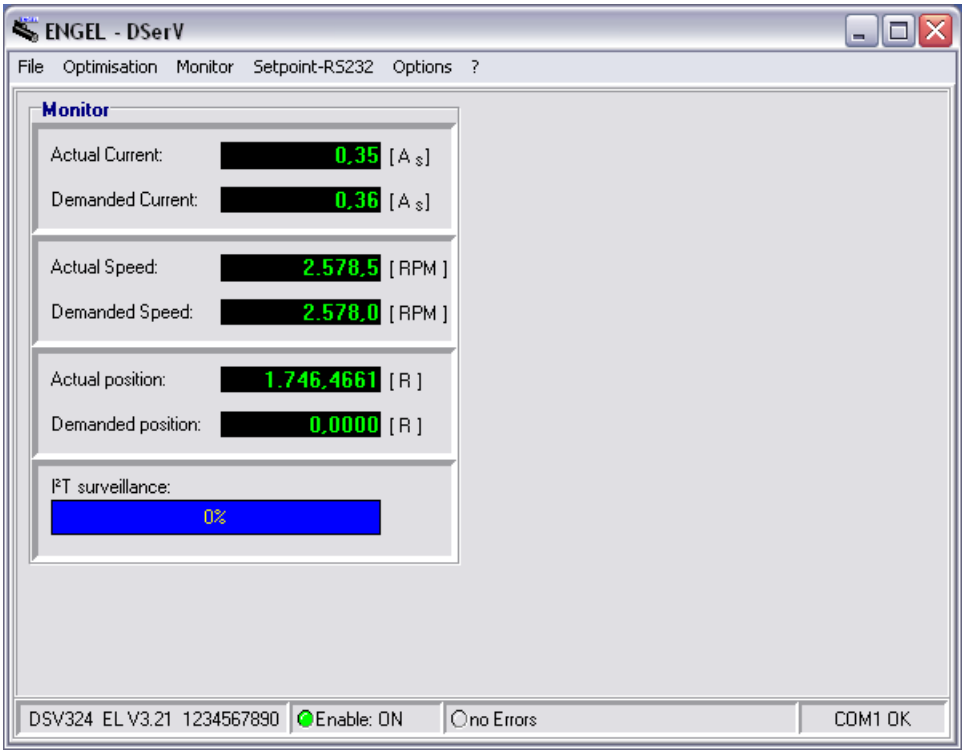


fig: DSerV window

DSerV is an intuitive software with a graphical user interface typical for WINDOWS programs. The DSerV menus and functions are explained below:

11.3.1 Menu 'File'

This menu allows access to the following functions:

Connect: Establishes a communication link with the DSV via RS232

Disconnect: Stops communication with the DSV and frees the serial interface.

Parameter Up-/Download:

Upload: Uploads the current set of DSV parameters and saves it to a *.par file. The file can be amended with a description and saved to disk.

Download: Downloads a set of parameters from a *.par file to the DSV. For an overview all available files are listed together with their description.

Firmware download: Opens the dialog to download Firmware into the DSV. Follow the instructions. Necessary *.hex files are provided on request.

Close: Closes DSerV.

11.3.2 Menu 'Optimisation'

This menu allows for manual adjustment of all DSV parameters.

Notice:
Parameter settings transmitted via the **TRANSMIT** – button are available in the servo-controller straight away.
All changes in the parameter set are saved in non-volatile memory on clicking ***SAVE PARAMETERS.*** They are still present after switching the controller off and on again.

The following sub-menus are available:

Operation mode: Switch between speed control and torque control, select your source of set values.

Fieldbus: Selects the fieldbus-operation of the drive. Adjustment for fieldbus- addresses and baudrate.

Current controller: Adjustment of rated and maximum current, as well as parameters of the current controller.

Speed controller: Adjustment of set value scaling, set value ramp and parameters of the speed controller.

Positioning: Adjustment of positioning and referencing parameters.

Digital outputs: Select functionality of digital outputs.

Limit switches: Configuration of the limit switches.

Analogue monitor: Select functionality and scaling of analogue outputs.

Fieldbus: Selects the fieldbus functionality.

Temperature probe motor: Switch between linear temperature probe KTY 83 and PTC resistor to protect the motor. If a linear temperature probe is chosen, the temperature threshold must be adjusted (max. 130°C). The actual motor temperature can be selected as monitoring function.

Save parameters: Saves parameters and settings in the DSV's non-volatile memory.

11.3.3 Menu 'Monitor'

The monitor window can be configured by switching on or off the display for different values.

> **Notice:**
> The refresh rate of single values decreases with rising number of monitor windows. Close the unnecessary windows.

Speed:	actual and set speed
Current:	actual and set current
Position:	actual and set position
Contouring error:	Deviation of the position in position control mode
I²t- Monitoring:	Shows the drive's overload capacity. Increasing display means "drive overloaded". At 100% integrator value, the output current is reduced to rated current. Overloading is re-enabled below 50% integrator value.
Motor temperature:	Only with linear temperature probe
Power-stage temperature:	Temperature of the power electronics heat-sink
Digital I/O:	Shows the state of all digital in- and outputs

11.3.4 Menu 'Set value – RS232'

On clicking the menu item "Set value RS232" a sliding bar is displayed. When the RS232 is selected as source of set values, this bar represents the demanded value for current, respectively speed. Moving the bar left / right increases / decreases the set value accordingly.

11.3.5 Menu 'Options'

COM-Port:	Select COM port in use
Language:	Select language: English / German / French

11.3.6 Menu 'Info'

Displays information about DSerV