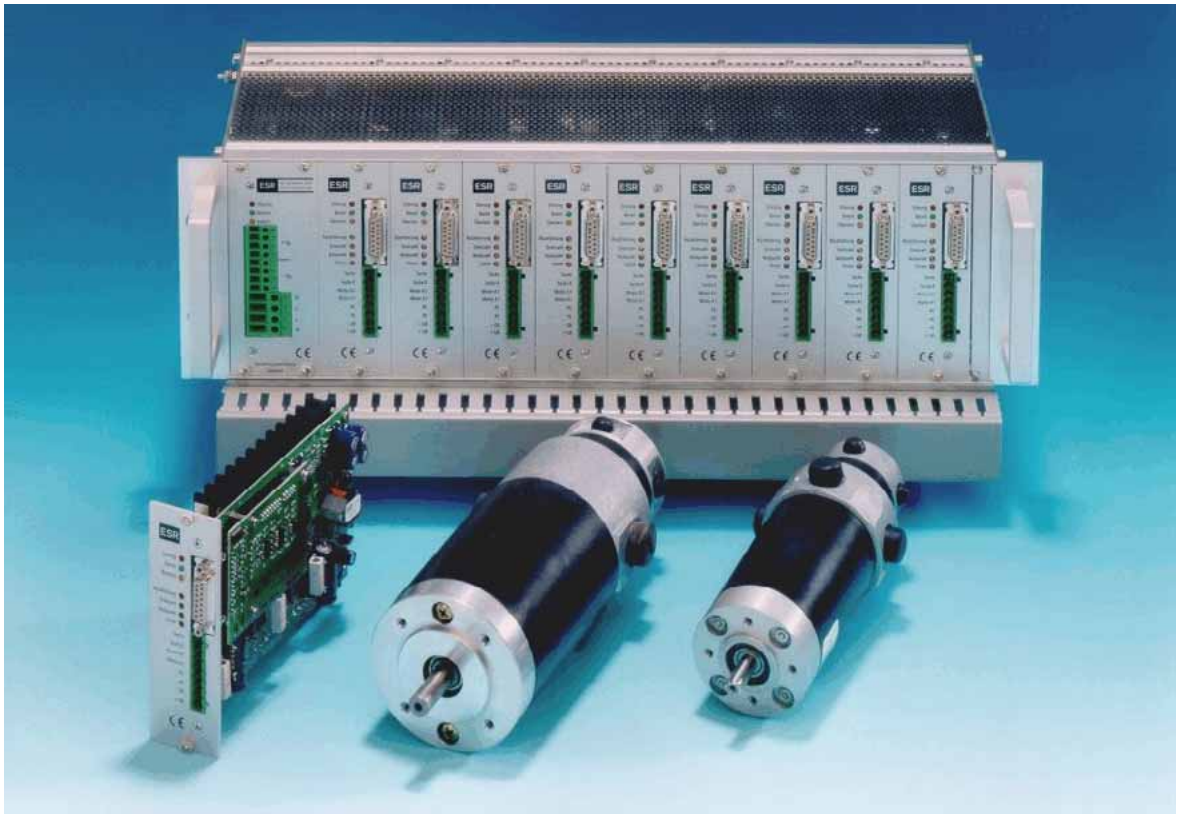
UNODRIVE SERVO DRIVES

Drive System Packages: DC Servo Drives and Servo Motors



UnoDrive servo drive system with DC motors, torques up to 3.8 Nm. In the back a 19" plug-in module with 9 axes and power supply unit. In the front a UnoDrive servo drive with connection via front panel, together with a MB 2133 and a MB 2224 motor.

Products, Consultation, Service

ESR drive packages consist of servo drives and servo motors, position sensors, gearboxes, and brakes. They are supplemented by power supply units (if not included in the drive), connectors, and connecting cables (ready-assembled on request). All parts of the packages are matching and have been tested as combinations. This delivery from a single source guarantees trouble-free commissioning, reliable operation, and a definite system responsibility on the part of only one supplier.

Our services include an individual drive system configuration. With many years of experience, we will be pleased to assist you at choosing the appropriate servo drive system for your application.

Applications

Positioning and feed movements with high dynamics and accuracy in

- Handling and assembly systems
- Optical discs production machinery (CDs, DVDs, ...)
- Electronics production machinery
- Semiconductor production machinery
- Measuring and testing machinery
- Machine tools and metal working machinery
- Packaging machinery
- Textile machinery
- Plastics processing machinery
- Coiling machinery
- and many other applications

Main Characteristics

Four power classes

Servo Drives		Servo Motors	
I_N	U_{Zk}	M_N	P_N
6 A	40 V	up to 0.3 Nm	up to 0.1 kW
6 A	100 V	up to 0.4 Nm	up to 0.2 kW
12 A	40 V	up to 1.6 Nm	up to 0.4 kW
12 A	100 V	up to 3.8 Nm	up to 1.0 kW

Characteristics of the drive system packages

- Low-price, high-quality drive system packages consisting of drive, motor, and accessories
- High dynamics due to motors with low capacity-to-weight ratio and drives with highest dynamics
- CE identification due to design in compliance with the Low Voltage Directive (tested according to EN 50178) and the EMC Directive (tested according to EN 61800-3)
- Options for drives and motors facilitate adaptation to various tasks
- High safety: position sensor signal monitoring
- Monitoring of the workflow via error messages in case of motor blocking

Characteristics of the servo drives

- Re-adjustment is not required when drives are replaced due to plug-in customer module with setting components
- Easy adaptation to special tasks with plug-in option module
- Easy adjustment of switching inputs and outputs to the PLC with 24 V signal voltage using plug-in PLC module
- High performance at small dimensions due to use of surface mounting devices and state-of-the-art power transistors
- Clearly arranged wiring for devices with front connection as all connections are made at the front panel
- 19" plug-in wiring and plain front panel for devices with rear connection
- Protection of drive and motor via adjustable current limitation
- Safe operation due to protection and monitoring circuits with fault memory for short circuit, earth leakage, drive overheating, and faulty voltages
- Fast motor acceleration, deceleration, and reversing by short-term current increase to twice the rated current
- Easy error diagnosis via LEDs for fault, readiness, and overload
- Convenient commissioning due to adjustable feedback, speed, zero, and current limit
- Load and speed monitoring possible via current and speed monitor outputs

Options:

- Standstill monitoring with “motor standstill” output
- Protection against stop overrun by connection for two directional limit switches with braking effect
- Input for drive enable, also with braking effect
- Setpoint ramp
- Input for external current limitation

Characteristics of the servo motors

- High motor dynamics for quickly responding drives
- Low capacity-to-weight ratio requires little space
- Optionally low-price motors with barium ferrite magnets or motors with particularly high power density due to samarium cobalt magnets
- High speed control range
- Long brush service life due to generously dimensioned collector and long brushes
- No bearing problems due to grease filling of the ball bearings for the entire service life and protection of the ball bearings against brush dust
- Design with flange
- Any mounting position

Characteristics of the gearboxes

Standard worm gear, ratio 1 : 6 to 1 : 80

- output torques up to 350 Nm
- special gearboxes

Servo Drives

Enclosure and Installation

UnoDrive servo drives are compact devices for installation into control cabinets. Depending on the series, the devices are designed for front or for rear connection. Suitable 19" power supply units and matching transformers are also available.

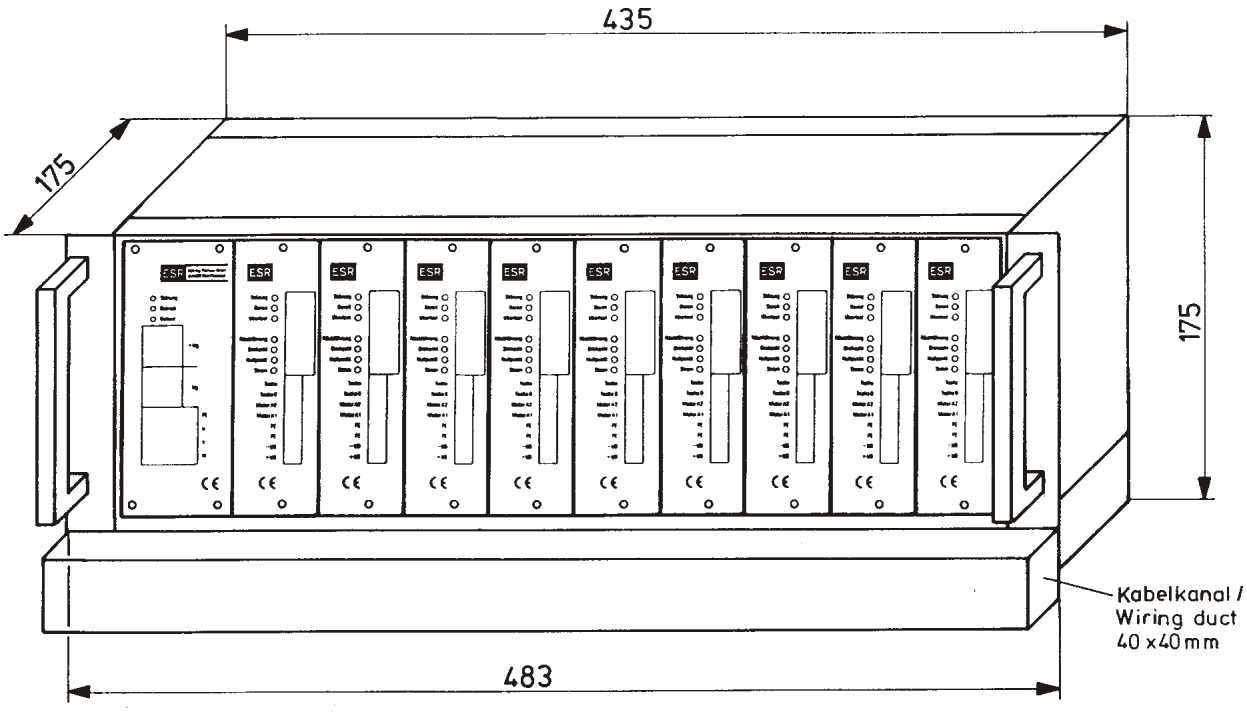


Fig. 1: Example of a 84 PU slot, devices with front connection for installation into 19" control cabinets

Interfaces of the servo drives

The connectors of the BN 6540 to BN 6548 devices are located at the front panel. The connectors of the BN 6550 to BN 6558 devices are located on a multipoint plug according to DIN 41612, series D, at the back. With all devices, the

- fault
- ready
- overload

LEDs and the trim potentiometers for

- feedback
- speed
- zero
- current limit
- I×R compensation

are located at the front panel.

The front panel of the BN 6540 to BN 6548 devices is additionally equipped with a 15-pin SUB D female connector for connecting

- motor
- speed indicator
- operating voltage

as well as an 8-pin Combicon connector for connecting

- control signals

With the BN 6550 to BN 6558 devices, these connectors are located on the back side.

Servo Motors

Design of servo motors and encoder systems

The servo motors described herein are permanent-magnet collector motors. The low-cost motors for standard applications are equipped with ferrite magnets. If smallest dimensions and very fast acceleration and deceleration are required, motors with samarium cobalt magnets are used. The motors are delivered for flange mounting.

The tachogenerator is installed directly on the motor shaft. The close coupling with the motor results in high system dynamics.

Connection is made via 1 m long cables led directly out of the enclosure. The tachometer cable is shielded. Special designs with connectors or, for larger motors, with terminal box on request.

More information on the motors is provided in the corresponding data sheets and the internet on www.esr-pollmeier.de.

Motor accessories

- Incremental encoder
  - coupled directly with the motor, preferably with own bearing
- DuoDrive encoder
  - position and speed sensor in a 32 mm enclosure
- Brakes
  - permanent-magnet brakes, designed as holding brakes; occasional load braking, e. g. in case or an emergency stop, is permitted
- Gearboxes

Functions of the Servo Drives

Control

The servo drive can be operated as speed controller or as current controller. An externally supplied rated value (–10 V to +10 V) determines speed or torque via the motor current. The speed feedback from the coupled tachogenerator permits a good load-independent speed accuracy and provides the prerequisite for an operation with precise positioning controls.

In contrast to the AC servo drives with collectorless motors described in other data sheets, the UnoDrive DC servo drives described herein work with permanent-magnet collector motors. For powers up to 1 kW, DC servo drives with collector motors are often preferred because of their low price, especially as in many servo applications the service life of the brushes is more than sufficient.

Customer module

An exchangeable customer module carries setting elements, LEDs, and components of the application-specific controller circuitry. If a device is exchanged, the customer module can be removed and plugged on the new device. Thus, controller circuitry and set values are preserved and nothing needs to be re-adjusted except for the zero.

A special customer module with I×R compensation is available for simple drive tasks. Another special customer module switches the servo drive to current control which is required for some digital positioning controls or for building up a torque control instead of a speed control.

Protection and Monitoring Circuits

Standard protection and monitoring circuits guarantee that the servo drives are not damaged even in extreme situations and switched off in case of a fault. The following is monitored:

- short circuit,
- earth fault,
- drive overheating, and
- faulty voltages.

If one of these faults occurs, the drive is shut down immediately. The fault is stored and reported.

Adaptation Using Modules

The UnoDrive servo drives can be adapted to different requirements using plug-in modules. In addition to the generally installed customer module described in the previous section, the following modules can be installed optionally:

- add-on module
- polarity module (PLC module)

Z1, Z2 add-on modules

In the standard version (Z0), an add-on module is not installed. If additional functionality such as

- second setpoint input
- two directional limit switches with braking effect
- setpoint ramp
- standstill monitoring via “motor standstill” input

is required, the additional circuitry parts are installed on an additional plug-in module.

Polarity module (PLC module)

The switching inputs of a servo drive (e. g. “motor standstill”) are mostly realized via transistors switching towards zero. The external switches for the switching inputs (e. g. for the enable signal) also switch towards zero.

Programmable logic controllers (PLC) switch the other way round: the transistors switch towards positive, the loads are on zero. The UnoDrive servo drives described herein can be supplied for both polarities of input and output signals. In the standard version, the output transistors switch towards zero, the input loads are on positive. The PLC compatible version is equipped with a PLC module which correspondingly reverses the switching directions of inputs and outputs.

Accessories

- **Chassis**, 4 HU high, with fan unit for the installation of up to nine drives and one power supply unit or up to eight drives and two power supply units. For devices with front connection, a rear wall with mounting lug for control cabinet mounting is available.
- **Mounting brackets** for control cabinet installation of a single BN 6540 to BN 6548 module.
- **Power supply units** for front and rear connection with rectifiers, charge capacitors, monitoring circuit, and shunt regulator including the shunt resistor which absorbs the energy fed back when the motor is braked. For higher braking powers, an external shunt resistor is available.
- **Isolating transformers** for supplying the power supply units. For 230 V or 3 × 400 V, other voltages on request.
- **Connector sets** consisting of the required SUB D connectors incl. screwable housings and Combicon connectors.
- **Multipoint socket connectors** according to DIN 41 612 for the devices with rear connection: a 32-pin connector (D series) for the servo drive, a 15-pin connector (H series) for the power supply unit.
- **Motherboards** for devices with rear connection. Conversion of the connections on a 15-pin SUB D connector for control signals, a 5-pin Combicon connector for motor and speed indicator, and connectors for operating voltage. Other motherboards for other connection types are available.
- **Motor supply cables** with separate shield for motor and tachogenerator supply lines and 6 additional cores.
- **Motor chokes** for motors with a particularly low inductance.

Detailed information on ESR products and corresponding accessories can be found in the internet on www.esr-pollmeier.de.

Drive system packages (selection), most important technical specifications and order numbers

In addition to the motors stated below, a number of other motors is available. More information on the motors is provided in the corresponding data sheets and the internet on www.esr-pollmeier.de.

Flange dimension (mm)	Order Number Motor	Speed (r.p.m.)	Rated Torque (Nm)	Peak Torque (Nm)	Shaft Power (kW)	Order Number Drive
⌀ 58	MB 2112	3,000	0.3	0.6	94	BN 6540 BN 6550
	MB 2113	3,000	0.4	0.8	125	
⌀ 84	MB 2132	3,000	1.1	2.2	345	BN 6548 BN 6558
	MB 2133	2,900	1.5	3.0	455	
100 × 100	MB 2152	2,800	2.7	5.4	791	
	MB 2153	2,700	3.7	7.4	1046	

The rated torques refer to the stated speed. For lower speeds, the torques are higher. We recommend to select the best combination for the respective application together with us. We will be pleased to configure and design a suitable drive system for you.

Servo drives, most important technical specifications and order numbers

Servo drives with front connection with rear connection	**BN 6540 BN 6550**	**BN 6542 BN 6552**	**BN 6546 BN 6556**	**BN 6548 BN 6555**
Rated input voltage	55 V		125 V	
Rated output voltage	40 V		100 V	
Min. DC-bus voltage	20 V		40 V	
Max. perm. DC-bus voltage	80 V		170 V	
Rated current (rms value)	6 A	12 A	6 A	12 A
Peak current (crest value)	12 A	24 A	12 A	24 A
Current limitation setting range	1 .. 6 A	2 .. 12 A	1 .. 6 A	2 .. 12 A
Clock frequency / current ripple frequency	approx. 17/34 kHz			
Available auxiliary voltages	+15 and –15 V per 20 mA			
Permissible ambient temperature	40 ºC			
Width standard	8 PU, 40.5 mm			
optional with reduced requirements	6 PU, 30.5 mm			
Height incl. front panel	3 HU / 128 mm			
Depth (without connectors)	front connection: 165 mm, rear connection: 173 mm			
Weight	0.45 kg			

Power supply units, technical specifications and order numbers

Power supply unit with front connection with rear connection	**BN 3240 BN 3250**	**BN 3246 BN 3256**
Suitable for servo drive	BN 6540/42 BN 6550/52	BN 6546/48 BN 6556/58
Mains connection via isolating transformer*	40 V~ or 3 × 40 V~	90 V~ or 3 × 90 V~
For DC-bus voltage	55 V	125 V
Response threshold of surge limitation	70 V	160 V
Maximum permissible permanent current	24 A	
Maximum permanent braking power	30 W	
Pulse braking power, 2% ED, 2 s	200 W	
Width	10 PU / 51 mm	
Height	3 HU / 128 mm	
Depth (without connectors)	165 mm	173 mm
Weight	approx. 0.5 kg	

* Up to approx. 0.5 kW, the power supply units can be connected single phase. For higher powers, three-phase connection is recommended. The mains transformers listed on the next page have been selected accordingly.

Mains transformers, technical specifications and order numbers

Transformer single-phase connection	**BN 3840**	**BN 3842**	**BN 3846**	**BN 3833**
Mains connection, primary	230 V, single-phase			
Output voltage 1 Output voltage 2	40 V –		90 V –	40 V 90 V
Load current at power supply unit output[1]	6 A	12 A	6 A	6/6 A
Weight	5 kg	8 kg	10 kg	11 kg
Suitable for servo drive	BN 6540 BN 6550	BN 6540/42 BN 6550/52 combination[2]	BN 6546 BN 6556	BN 6540/46 BN 6550/56

Transformer three-phase connection	**BN 3843**	**BN 3848**	**BN 3849**	**BN 3834**	**BN 3835**
Mains connection	3 × 400 V, three-phase				
Output voltage 1 Output voltage 2	3 × 40 V –	3 × 90 V –		3 × 40 V 3 × 90 V	
Load current at power supply unit output[1]	24 A	12 A	24 A	12/12 A	24/24 A
Weight	14 kg	19 kg	24 kg	20 kg	26 kg
Suitable for servo drive	BN 6540/42 BN 6550/52 combination[2]	BN 6546/48 BN 6556/58 combination[2]		BN 6540/42/46/48 BN 6550/52/56/58 combination[2]	

[1] Maximum permissible current at the output of the downstream power supply unit.

[2] For combinations, the following applies: The currents of the devices working simultaneously at full power are added up, the correspondingly reduced currents of the devices working with partial load are added to that. The current sum determines the required transformer. Do not connect more than one power supply unit to one transformer winding.

For the operation of servo drives with different output voltages, transformers with two secondary windings are available. For the loading of the individual windings, the statement of [2] applies.

Accessories

Description	**Order Number**
Chassis 54 and 84 PU, empty, with and without fan unit	BN 8651
Compact enclosure with built-in power supply unit	on request
Connector set for UnoDrive servo drives with front connection	ST 6540
Multipoint socket connector for UnoDrive servo drives with rear connection	ST 6550
Motherboard for rear connection (15-pin SUB D, Combicon, terminals)	BN 8190
Motor tacho connection cable, 1.0 mm^2, motor and tacho line shielded, 6 cores, shield	BN 8802
Motor supply cables	on request
Tacho supply cable, 2.5 mm^2, 2 cores, shield	BN 8827
Motor chokes for installation into an enclosure	BN 3749

Type code of the UnoDrive servo drives

Example ⇨ BN 6540.1023-K1-Z0-P0

⇩

40

Connection
- 4x front connection (Combicon, SUB D)
- 5x rear connection (VG strip)

Power
- x0 40 V, 6 A
- x2 40 V, 12 A
- x6 100 V, 6 A
- x8 100 V, 12 A

1023

Assembly code
Internal coding of ESR, given for various feature combinations. Statement of the assembly code is not required if all other features unequal zero are stated and the customer-specific equipment is described. For above-mentioned example ”BN 6540-K1” would be sufficient.

K1

Controller circuitry (customer module)
- K0 none (device not ready for operation)
- K1 speed control, tacho 6 V per 1000 r.p.m. (standard)
- K3 speed control, tacho 14 V per 1000 r.p.m.
- K5 I×R compensation (operation without tachogenerator)
- K6 current control
- KK customer-specific

Z0

Optional equipment (options module)
- Z0 none (standard)
- Z1 limit switch, ramp
- Z... further options, on request
- ZK customer-specific

P0

Input/output polarity (PLC module)
- P0 switching towards 0 (standard)
- P1 PLC compatible
- PK customer-specific

Type codes of the servo motors

are included in the separate data sheets of the respective motors, they are also available in the internet on www.esr-pollmeier.de.

Data Sheet 6540.250 V 2.0, KS, 2006-01-09

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