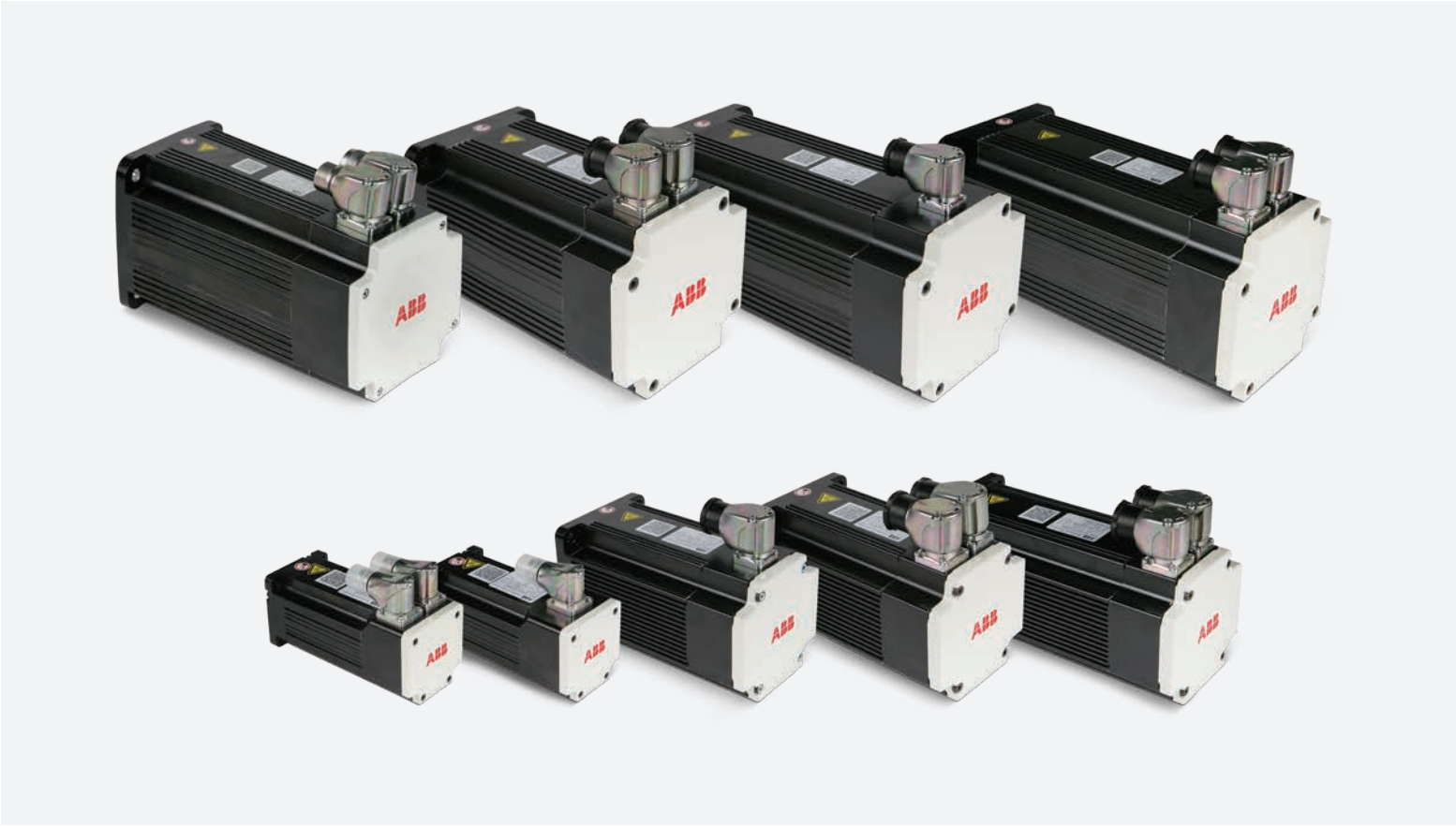
MOTORS AND DRIVES

HDS high-performance AC permanent magnet servo motor

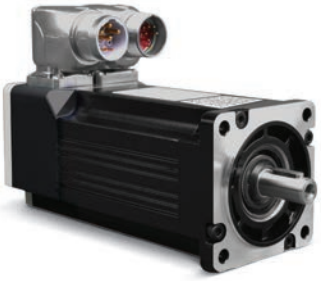


HDS high-performance AC permanent magnet servo motor, armed with pioneering design concept, keeping in mind the comprehensive need from the industry, incorporating various advanced manufacture technologies and ABB’s years of servo motor manufacture/robot body/ system servo application experience, delivers more flexible, better dynamic response, and higher control precision.

By meeting all kinds of harsh demands from system integrators and machine manufacturers, HDS series will bring unprecedented improvement of productivity and efficiency to customers in the new era of intelligent manufacturing.

Table of contents

HDS series servo motors



Cooling method	Totally enclosed, non-ventilated
Magnet material	Ultra-high intrinsic coercive field rare earth
Insulation class	F
Mounting	IMB5
Thermal protection	3×PTC155
Exterior paint	Epoxy Body in black, endcover in white with red ABB logo
Feedback device	Resolver Incremental/absolute encoder DSL single-cable absolute encoder
Ingress protection (IP)	IP54 without oil seal IP65 with oil seal
Certification	UL, CE

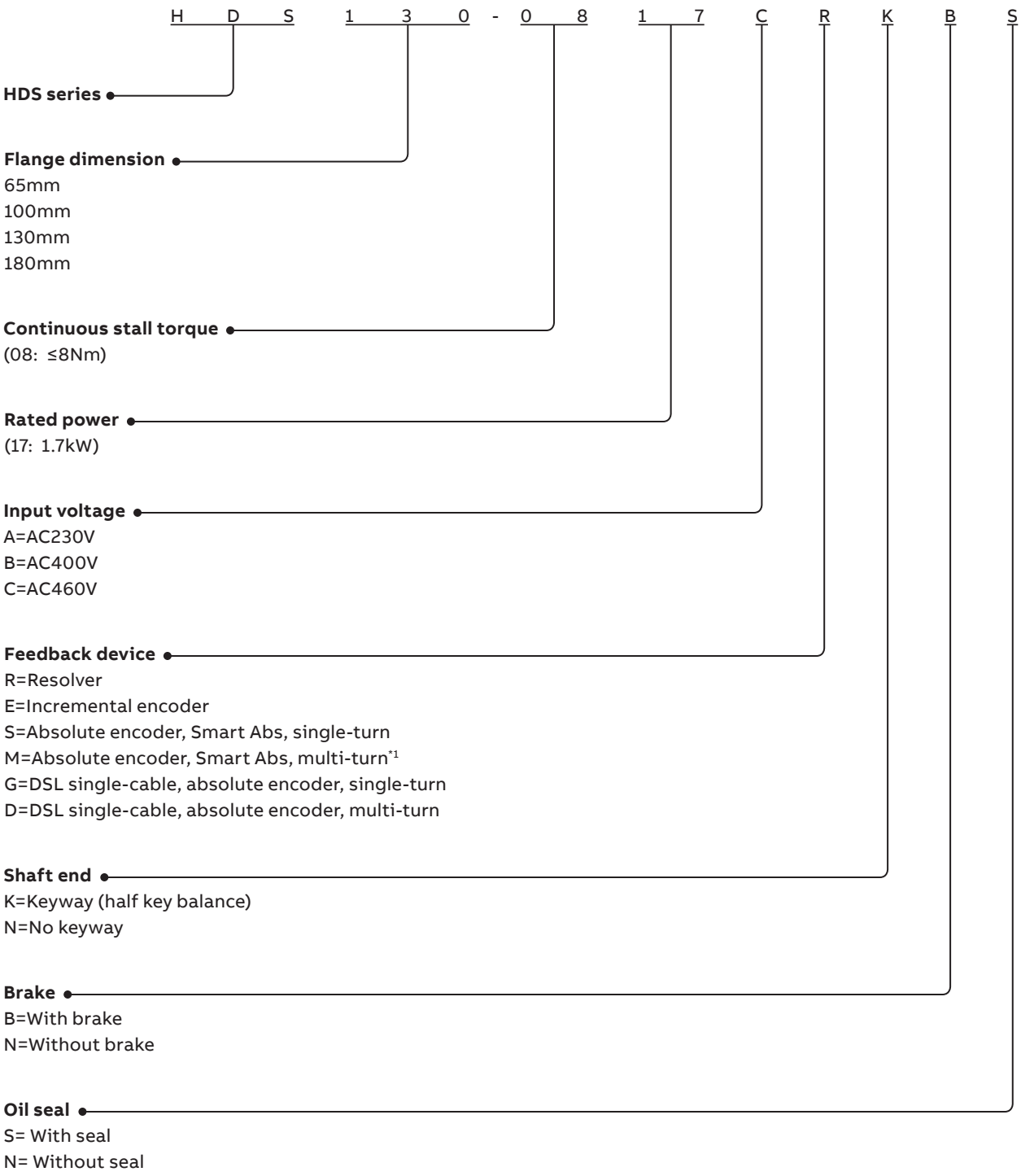
The HDS series provides outstanding performance with the combination of high torque and low inertia. Equipped with various high performance and resolution feedbacks, the HDS series meets the requirement of various applications and drives, bringing higher precision of control on speed, torque and position, ensuring reliability and stability of the whole control system.

Features:

- High density of torque and power output
- Low cogging torque and torque ripple — excellent performance of low speed and system control
- Outstanding overload performance – 3 times peak torque, 4 times mechanical overload
- Epoxy resin potting technology on complete stator — compact size and maximum heat dissipation
- Fast dynamic response, accurate rotor balancing
- Wide speed range, optional high speed precise flange and shaft matching, low noise and vibration
- Equipped with various feedback devices, including Hiperface DSL — single cable absolute encoder solution

Product information

Model description



*1: Smart Abs multi-turn absolute encoder requires external battery to operate. For customization needs, please contact ABB.

Product information

Technical specifications

Frame			HDS65
Model	HDS65-0102A	HDS65-0104A	HDS65-0206A
Input voltage	AC 230V	AC 230V	AC 230V
Continuous stall torque T_0 (Nm)	0.6	1.2	1.8
Peak torque T_p (Nm)	1.8	3.6	5.4
Rated speed n_N (r/min)	3000	3000	3000
Maximum speed n_{max} (r/min)*1	5000	5000	5000
Rated power P (kW)	0.19	0.38	0.57
Continuous stall current I_0 (A)	1.6	3.3	4.7
Rated current I_N (A)	1.6	3.3	4.7
Peak current I_p (A)	5.8	12	17.6
Line resistance (20°C) R_L (Ω)	5.27	2.07	1.45
Line inductance L_L (mH)	17.3	8.64	6.4
Rotor inertia J_M (kg.cm^2)*2	0.16	0.27	0.38
Torque constant K_t (Nm/A)	0.41	0.41	0.44
Voltage constant K_e (Vrms/krpm)	25	25	26.4
Electrical time constant t_e (ms)	3.3	4.2	4.4
Mechanical time constant t_m (ms)	0.4	0.3	0.3
Thermal time constant t_{th} (min)	8	12	17
Weight W (kg)*3	1.41	1.98	2.55
Number of poles	10	10	10

Frame				HDS100
Model	HDS100-0206A	HDS100-0308A	HDS100-0413A	HDS100-0619A
Input voltage	AC 230V	AC 230V	AC 230V	AC 230V
Continuous stall torque T_0 (Nm)	2	2.5	4	6
Peak torque T_p (Nm)	6	7.5	12	18
Rated speed n_N (r/min)	3000	3000	3000	3000
Maximum speed n_{max} (r/min)*1	4000	4000	4000	4000
Rated power P (kW)	0.63	0.75	1.3	1.9
Continuous stall current I_0 (A)	3.1	4.3	6.9	10.5
Rated current I_N (A)	3.1	4.3	6.9	10.5
Peak current I_p (A)	11.5	15.5	25.7	39.5
Line resistance (20°C) RL (Ω)	2.92	1.1	1.1	0.65
Line inductance L_L (mH)	17.1	7.54	7.54	5.15
Rotor inertia J_M (kg.cm^2)*2	0.76	1.31	1.31	1.85
Torque constant K_t (Nm/A)	0.73	0.68	0.68	0.69
Voltage constant K_e (Vrms/krpm)	44	41.3	41.3	41.8
Electrical time constant t_e (ms)	5.9	6.9	6.9	7.9
Mechanical time constant t_m (ms)	0.4	0.3	0.3	0.2
Thermal time constant t_{th} (min)	18	28	28	23
Weight W (kg)*3	3.71	4.71	4.71	5.51
Number of poles	10	10	10	10

*1: Maximum speed is default designed speed, for higher speed applications, please contact ABB.
*2: Excluding brake inertia.
*3: Excluding brake weight, slightly different among feedback types.

Product information

Technical specifications

Frame						HDS130
Model	HDS130-0817B	HDS130-1226B	HDS130-1829B	HDS130-0817C	HDS130-1226C	HDS130-1829C
Input voltage	AC 400V	AC 400V	AC 400V	AC 460V	AC 460V	AC 460V
Continuous stall torque T_0 (Nm)	8	12	18	8	12	18
Peak torque T_p (Nm)	24	36	54	24	36	54
Rated speed n_N (r/min)	2000	2000	1500	2000	2000	1500
Maximum speed n_{max} (r/min)*1	4000	4000	4000	4000	4000	4000
Rated power P (kW)	1.7	2.6	2.9	1.7	2.6	2.9
Continuous stall current I_0 (A)	7.7	9.5	14.8	6.6	8.2	13
Rated current I_N (A)	7.7	9.5	14.8	6.6	8.2	13
Peak current I_p (A)	29.5	30.6	51	25.2	26.6	44.6
Line resistance (20°C) R_L (Ω)	1.6	0.78	0.58	2.08	1.04	0.75
Line inductance L_L (mH)	12.3	8.3	6.13	16.6	11	8.19
Rotor inertia J_M (kg.cm^2)*2	4.06	7.46	9.74	4.06	7.46	9.74
Torque constant K_t (Nm/A)	1.22	1.41	1.40	1.41	1.63	1.62
Voltage constant K_e (Vrms/krpm)	73.5	85.4	84.7	85.4	98.3	98
Electrical time constant t_e (ms)	7.7	10.6	10.5	8.0	10.6	10.9
Mechanical time constant t_m (ms)	0.4	0.3	0.3	0.4	0.3	0.2
Thermal time constant t_{th} (min)	49	64	54	38	65	54
Weight W (kg)*3	6.65	8.75	10.25	6.65	8.75	10.25
Number of poles	10	10	10	10	10	10

Frame			HDS180
Model	HDS180-2540B	HDS180-3555B	HDS180-4876B
Input voltage	AC 400V	AC 400V	AC 400V
Continuous stall torque T_0 (Nm)	25	35	48
Peak torque T_p (Nm)	75	105	150
Rated speed n_N (r/min)	1500	1500	1500
Maximum speed n_{max} (r/min)*1	3500	3500	3500
Rated power P (kW)	4.0	5.5	7.6
Continuous stall current I_0 (A)	15.7	22.3	30.8
Rated current I_N (A)	15.7	22.3	30.8
Peak current I_p (A)	48.8	68.5	99.7
Line resistance (20°C) RL (Ω)	0.36	0.19	0.13
Line inductance L_L (mH)	5.9	3.9	2.9
Rotor inertia J_M (kg.cm^2)*2	44.6	63.5	82.1
Torque constant K_t (Nm/A)	1.75	1.74	1.75
Voltage constant K_e (Vrms/krpm)	105.9	105.1	105.9
Electrical time constant t_e (ms)	16.5	20.2	22.2
Mechanical time constant t_m (ms)	0.5	0.4	0.3
Thermal time constant t_{th} (min)	45	58	56
Weight W (kg)*3	19.7	24.4	28.9
Number of poles	10	10	10

*1: Maximum speed is default designed speed, for higher speed applications, please contact ABB.
*2: Excluding brake inertia.
*3: Excluding brake weight, slightly different among feedback types.

Product information

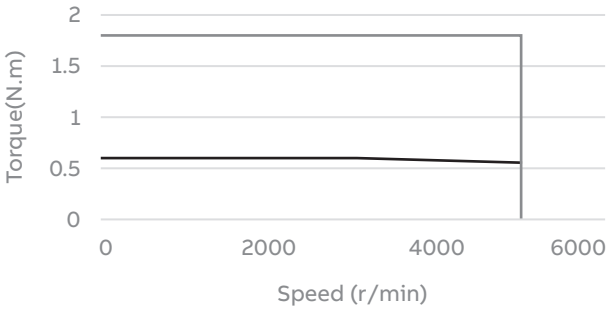
Performance curves

Motor operation curves

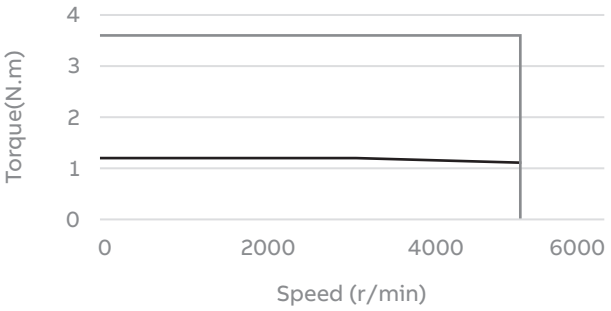
The operational area of servo motors is usually defined by performance curves in a 2-dimensional plane with output torque and motor speed as coordinates. Servo motors normally operate over a wide speed range, with a constantly changing output torque according to the actual load status (acceleration, constant-speed, deceleration, etc.). The performance curves of servo motors divide the entire operational area into continuous operation area and intermittent operation area.

- Continuous operation area: This is the area where the motor could operate for long period without having temperature rise over the permitted range. In the torque-speed curves provided below, the area contained by the lower curve of each figure is the continuous operation area.
- Intermittent operation area: This area goes beyond the continuous area, motor is allowed to run for a short period of time in this area as in overload mode[*1]. In the torque-speed curves provided below, the area between the two curves in each figure is the intermittent operation area. The time allowed to run a motor in this area shall be decided by comprehensive consideration of the operating environment, ventilation and the drive capacity.

HDS65-0102A



HDS65-0104A



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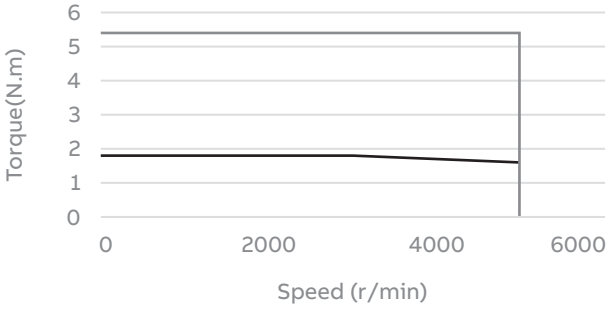

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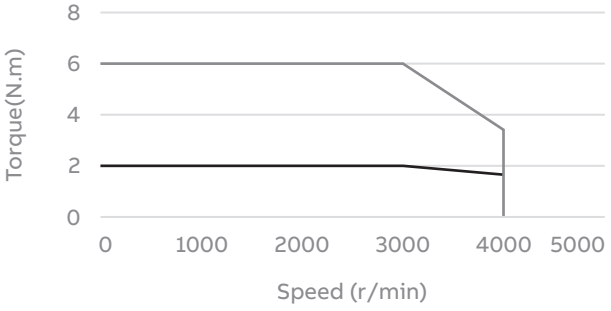
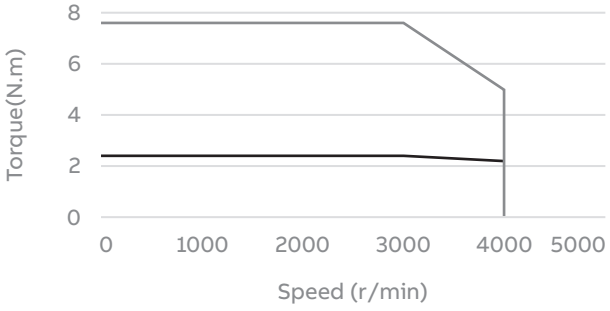


HDS100-0308A



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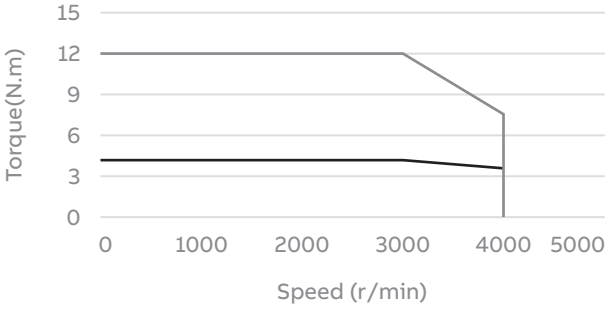
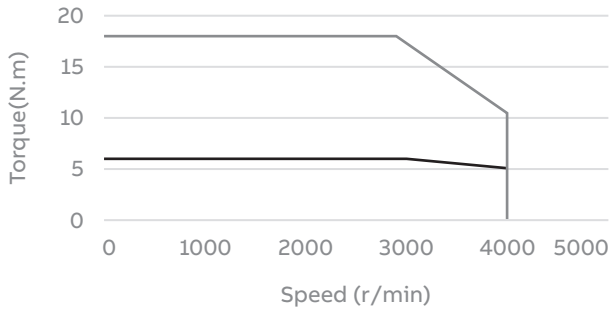


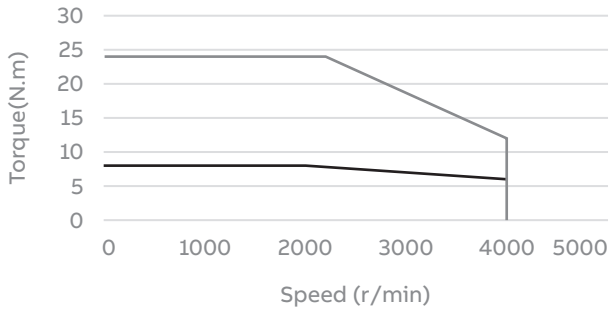
*1: Refer to the General Technical Specification for Permanent Magnetic AC Servo Motor (GB/T30549-2014).

Product information
Performance curves

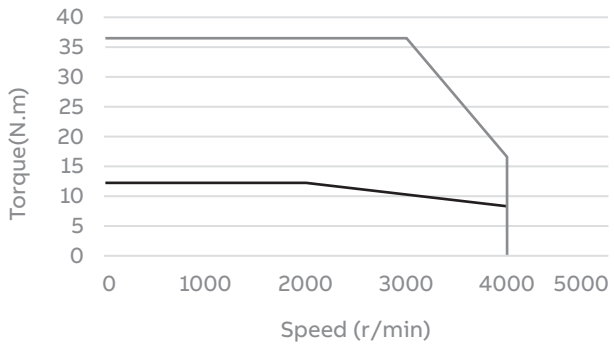
HDS100-0619A



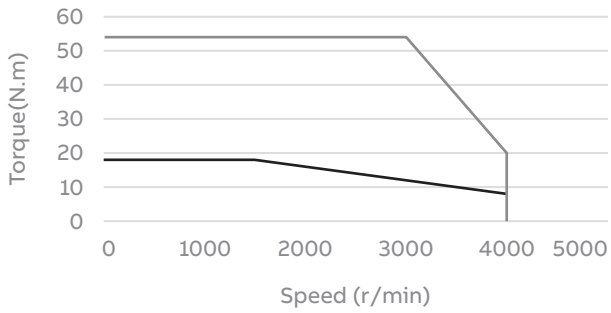
HDS130-0817B(C)



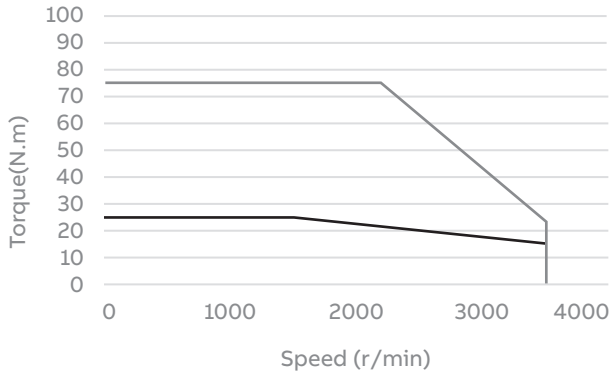
HDS130-1226B(C)



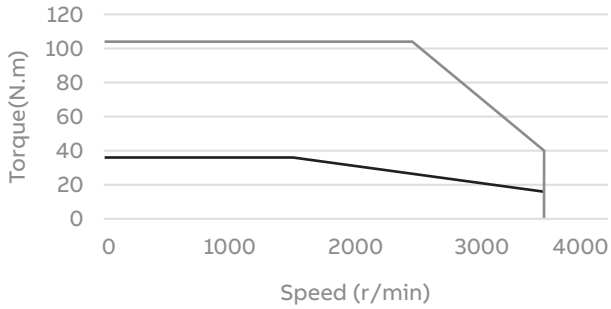
HDS130-1829B(C)



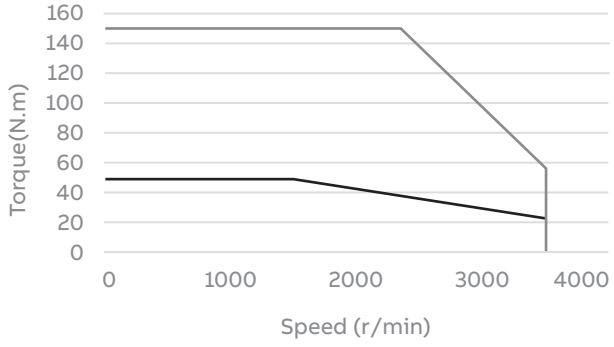
HDS180-2540B



HDS180-3555B



HDS180-4876B



Product information

Service environment

The servo motor performance specifications and curves provided above are obtained at an ambient temperature of 40°C, an altitude below 1,000 and with heat dissipation panel (aluminum alloy, dimensions[*1] listed in the table below) equipped. If actual operation environment does not meet these conditions, derating shall be considered in light of specific heat dissipation conditions.

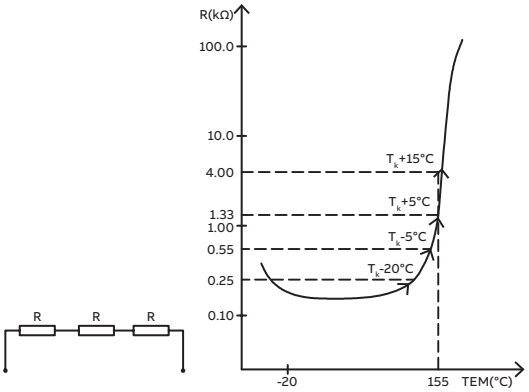
Motor	HDS65	HDS100	HDS130	HDS180
Heat dissipation panel dimensions L*W*H (mm)	210*210*5	300*300*8	390*390*10	380*380*8 (two panels)

In derating scenarios, the allowable torque/power of the motor shall be determined according to the table below[*2] (when ambient temperature> 40°C or installation altitude > 1000 m). When the temperature value is not an integral multiple of 5°C or the installation altitude value is not an integral multiple of 500m, allowable torque/power should be determined using linear interpolation method or based on the next integral multiple.

Installation altitude (m)	Ambient temperature (°C)				
	<30	40	45	50	55
1000	1.07	1.00	0.96	0.92	0.87
1500	1.04	0.97	0.93	0.89	0.84
2000	1.00	0.94	0.90	0.86	0.82
2500	0.96	0.90	0.86	0.83	0.78
3000	0.92	0.86	0.82	0.79	0.75
3500	0.88	0.82	0.79	0.75	0.71
4000	0.82	0.77	0.74	0.71	0.67
4500	0.76	0.72	0.70	0.67	0.63
5000	0.69	0.67	0.65	0.62	0.58

Thermal protection

HDS series servo motors have Class F thermal protection, with 3xPTC155 thermistor used to protect three-phase windings. The thermistor feature is shown below:



Temperature curve of single-core thermistor

Features of 3xPTC155	
Operating temperature	155°C
Resistance at 25°C	≤300Ω
Resistance below 135°C	≤750Ω
Resistance at 150°C	≤1650Ω
Resistance at 160°C	≥3990Ω

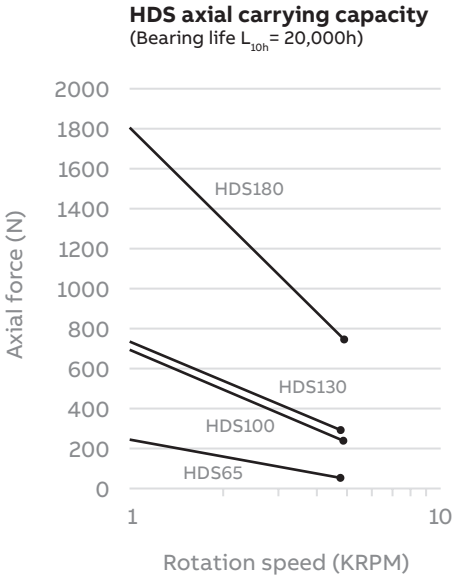
*1: Refer to the general technical specification for permanent magnetic AC servo motor (GB/T30549-2014).
*2: If proper capacity derating operations are not done when motor's bearable load is exceeded, the servo motor will be overheated or damaged.

Product information

Bearing load capacity

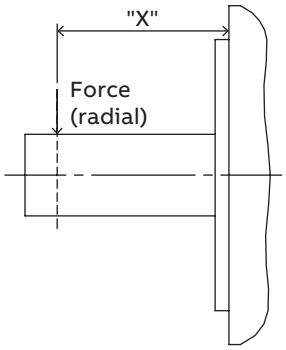
Bearing life: L_{10h} ≥ 20,000 hours, C/P >15
L_{10h}: Rated basic life of bearing in IS0 281
C: Rated basic dynamic load
P: Equivalent dynamic load

1) Axial load capacity

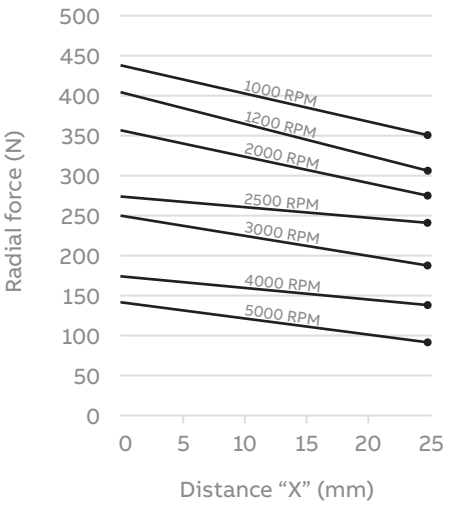


Product information
Bearing load capacity

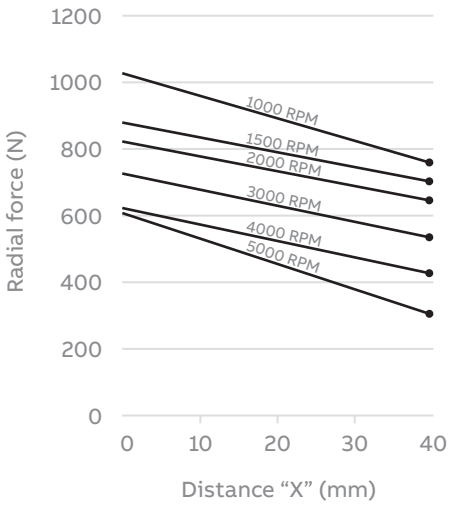
2) Radial load capacity



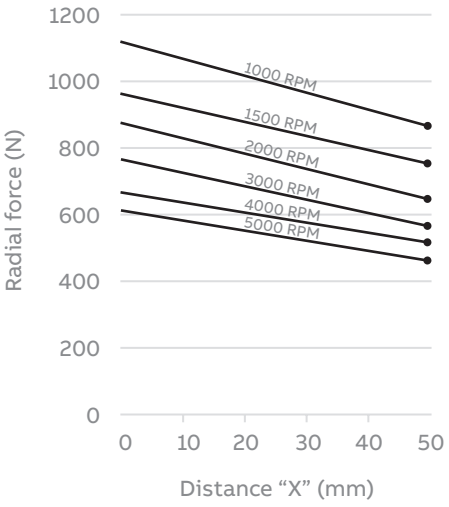
HDS65 radial load capacity
(Bearing life L_{10h} = 20,000h)



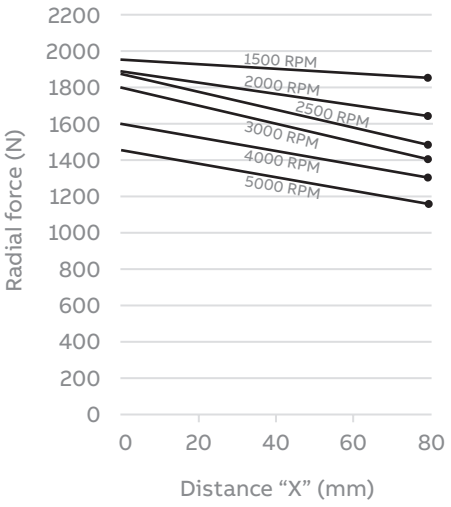
HDS100 radial load capacity
(Bearing life L_{10h} = 20,000h)



HDS130 radial load capacity
(Bearing life L_{10h} = 20,000h)

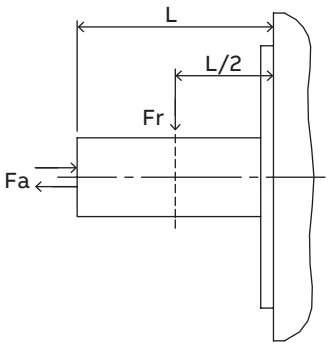


HDS180 radial load capacity
(Bearing life L_{10h} = 20,000h)

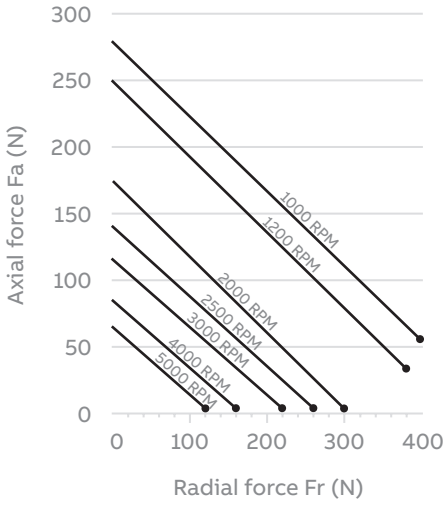


Product information
Bearing load capacity

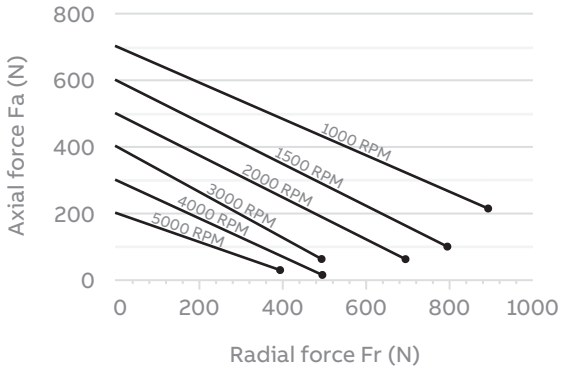
3) Joint load capacity
Load position: at 1/2 of shaft extension



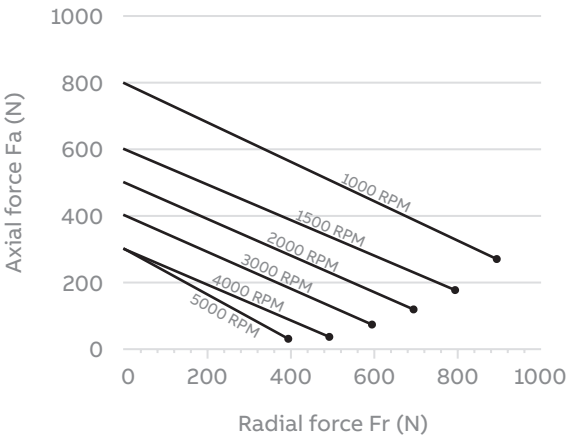
HDS65 joint load capacity
(Bearing life L_{10h}= 20,000h)



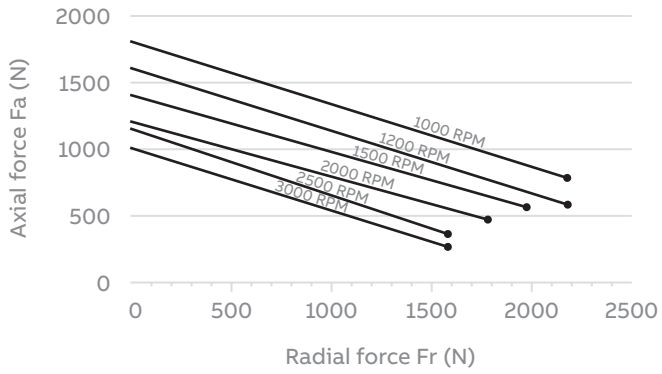
HDS100 joint load capacity
(Bearing life L_{10h}= 20,000h)



HDS130 joint load capacity
(Bearing life L_{10h}= 20,000h)



HDS180 joint load capacity
(Bearing life L_{10h}= 20,000h)

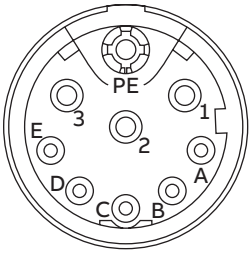


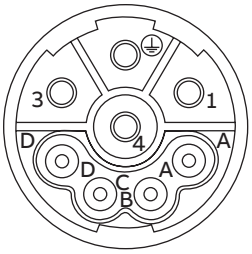
Product information

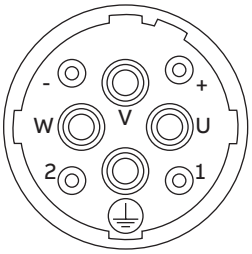
Power and feedback interface

Power interface

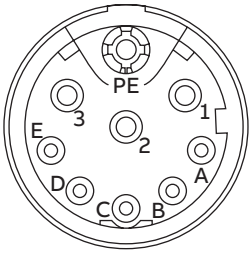
Dual cable

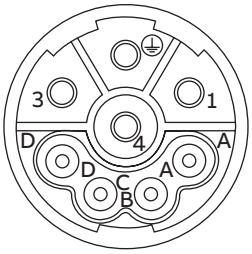
M17 power connector	HDS65	
	Pin	Definition
	1	U
	2	V
	3	W
	PE	Ground
	A	Thermistor
	B	Thermistor
	C	Brake (optional)
	D	Brake (optional)
	E	Null

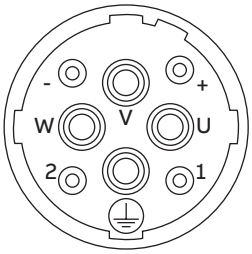
M23 power connector	HDS100/130	
	Pin	Definition
	1	U
	2	Ground
	3	W
	4	V
	A	Thermistor
	B	Thermistor
	C	Brake (optional)
	D	Brake (optional)

M40 power connector	HDS180	
	Pin	Definition
	U	U
	V	V
	W	W
	PE	Ground
	1	Thermistor
	2	Thermistor
	+	Brake (optional)
	-	Brake (optional)

Single cable

M17 power connector	HDS65	
	Pin	Definition
	1	U
	2	V
	3	W
	PE	Ground
	A	+Us/DSL+/PTC
	B	GND/DSL-/PTC
	C	Brake (optional)
	D	Brake (optional)
	E	Null

M23 power connector	HDS100/130	
	Pin	Definition
	1	U
	2	Ground
	3	W
	4	V
	A	+Us/DSL+/PTC
	B	GND/DSL-/PTC
	C	Brake (optional)
	D	Brake (optional)

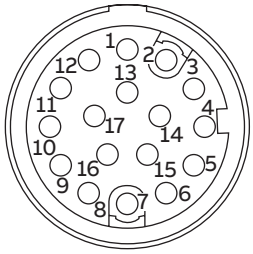
M40 power connector	HDS180	
	Pin	Definition
	U	U
	V	V
	W	W
	PE	Ground
	1	+Us/DSL+/PTC
	2	GND/DSL-/PTC
	+	Brake (optional)
	-	Brake (optional)

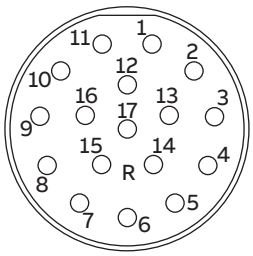
Product information
Power and feedback interface

Feedback interface

—

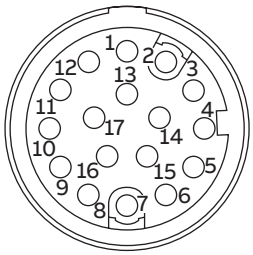
Resolver

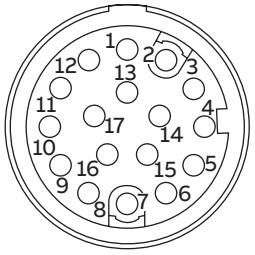
M17 signal connector	HDS65	
	Pin	Definition
	1	R1 (REF+)
	2	R2 (REF-)
	3	S1 (COS+)
	4	S3 (COS-)
	5	S4 (SIN-)
	6	S2 (SIN+)
	7-17	Null

M23 signal connector	HDS100/130/180	
	Pin	Definition
	1	R1 (REF+)
	2	R2 (REF-)
	3	S1 (COS+)
	4	S3(COS-)
	5	S4 (SIN-)
	6	S2 (SIN+)
	7-17	Null

—

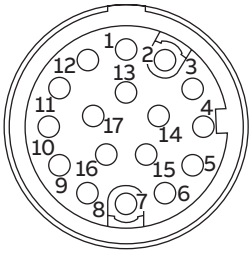
Absolute encoder
(Smart Abs, single-turn)

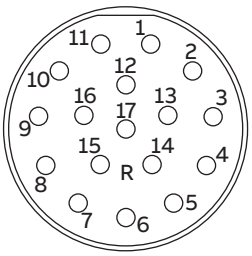
M17 signal connector	HDS65	
	Pin	Definition
	1	DC+5V
	2	GND
	3	-
	4	-
	5	SD+/Data+
	6	SD-/Data-
	7-17	Null

M23 signal connector	HDS100/130/180	
	Pin	Definition
	1	DC+5V
	2	GND
	3	-
	4	-
	5	SD+/Data+
	6	SD-/Data-
	7-17	Null

—

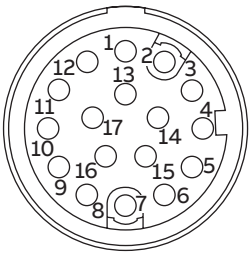
Incremental encoder (2500ppr)

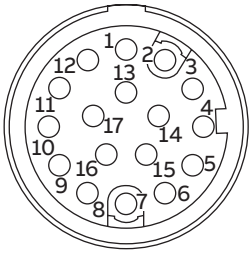
M17 signal connector	HDS65			
	Pin	Definition	Pin	Definition
	1	DC+5V	10	U+
	2	GND	11	U-
	3	A+	12	V+
	4	A-	13	V-
	5	B+	14	W+
	6	B-	15	W-
	7	Z+	9, 16, 17	Null
	8	Z-		

M23 signal connector	HDS100/130/180			
	Pin	Definition	Pin	Definition
	1	DC+5V	10	U+
	2	GND	11	U-
	3	A+	12	V+
	4	A-	13	V-
	5	B+	14	W+
	6	B-	15	W-
	7	Z+	9, 16, 17	Null
	8	Z-		

—

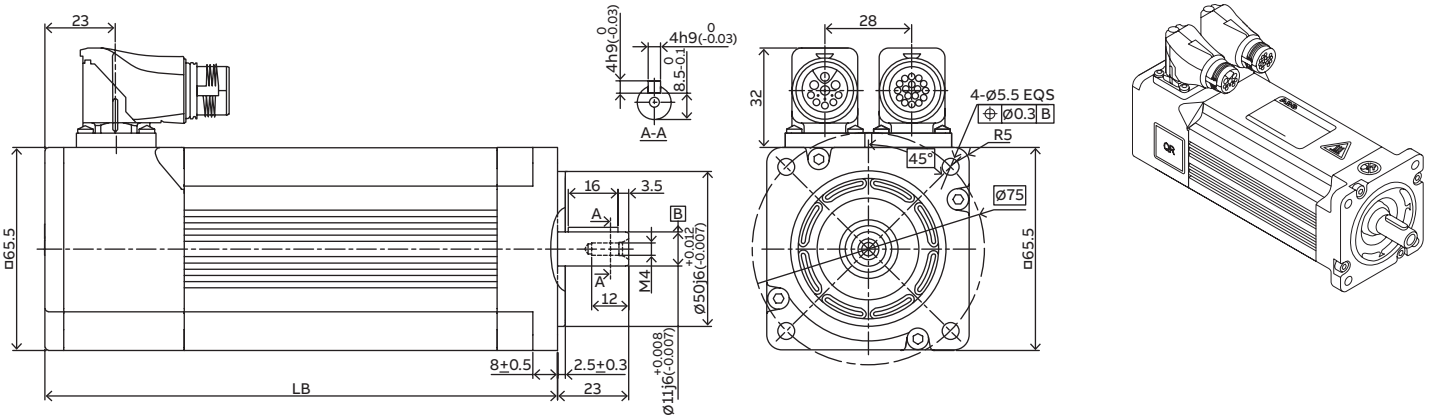
Absolute encoder
(Smart Abs, multi-turn)

M17 signal connector	HDS65	
	Pin	Definition
	1	DC+5V
	2	GND
	3	VB - battery
	4	GND - battery
	5	SD+/Data+
	6	SD-/Data-
	7-17	Null

M23 signal connector	HDS100/130/180	
	Pin	Definition
	1	DC+5V
	2	GND
	3	VB - battery
	4	GND - battery
	5	SD+/Data+
	6	SD-/Data-
	7-17	Null

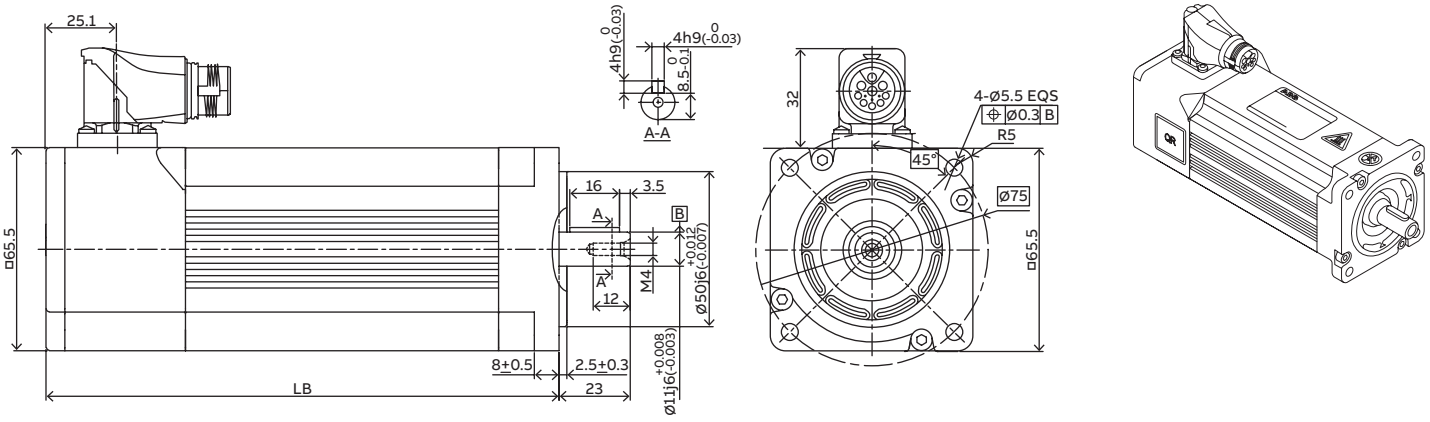
Product information

Motor dimension



HDS65 layout (dual cable)

Model	LB (mm)*1
HDS65-0102	147.5
HDS65-0104	165.5
HDS65-0206	183.5



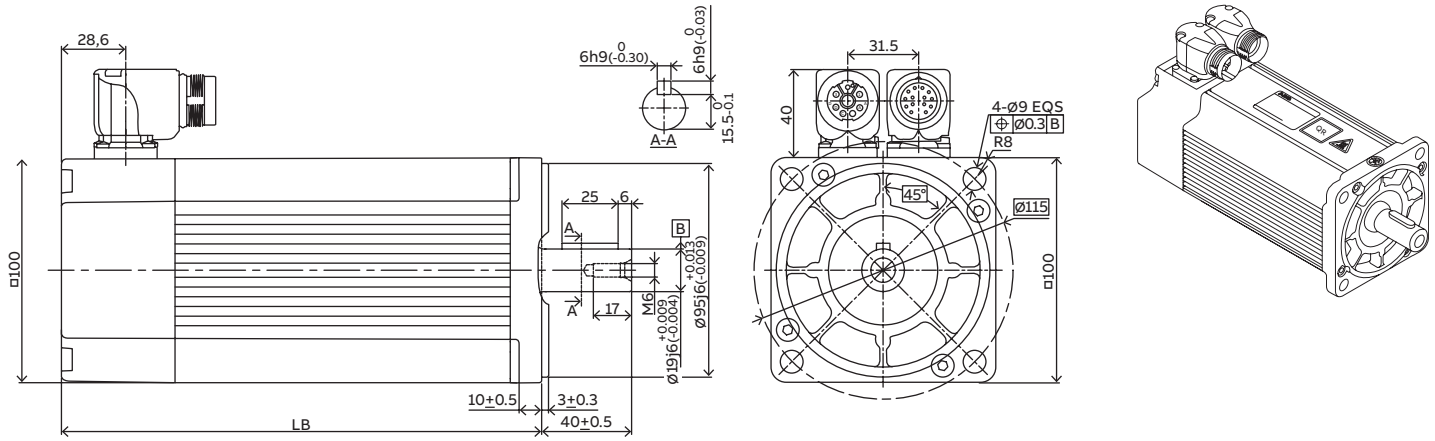
HDS65 layout (single cable)

Model	LB (mm)
HDS65-0102	147.5
HDS65-0104	165.5
HDS65-0206	183.5

*1: With brake.

Product information

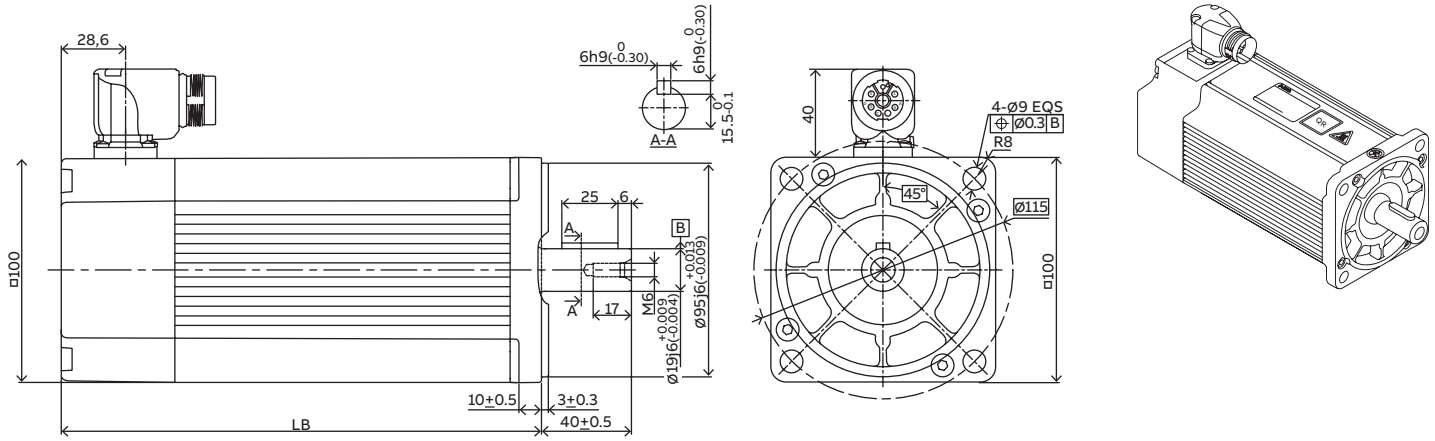
Motor dimension



—

HDS100 layout (dual cable)

Model	LB (mm)
HDS100-0206	189.5
HDS100-0308	213.5
HDS100-0413	213.5
HDS100-0619	237.5



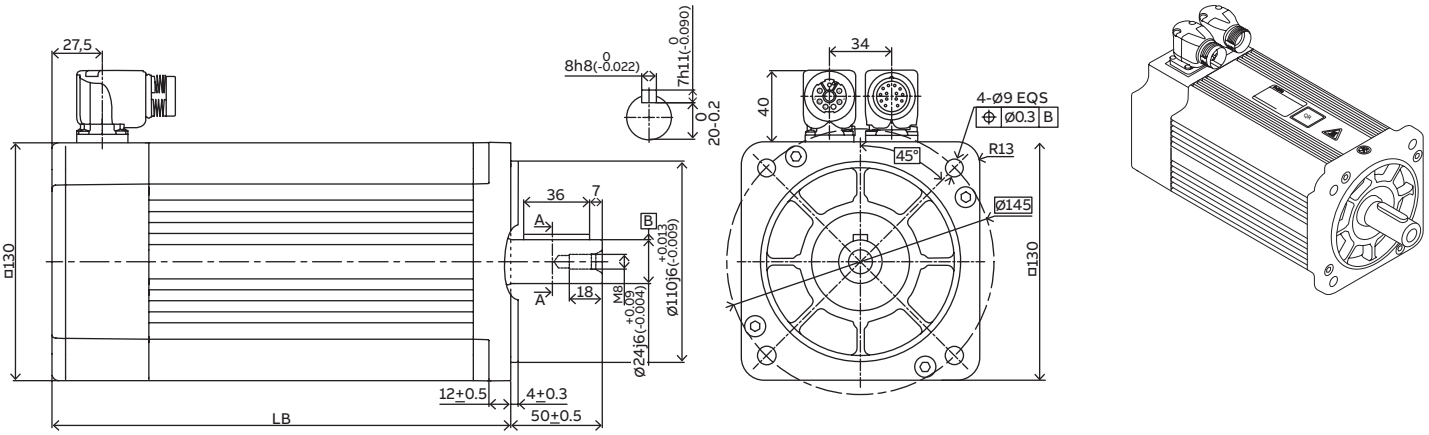
—

HDS100 layout (single cable)

Model	LB (mm)
HDS100-0206	189.5
HDS100-0308	213.5
HDS100-0413	213.5
HDS100-0619	237.5

Product information

Motor dimension



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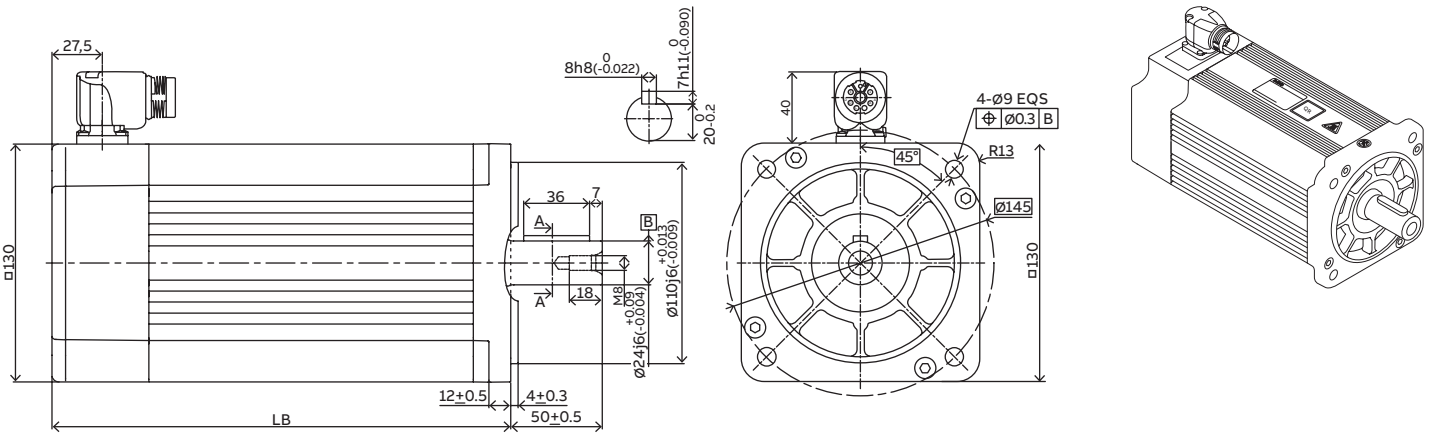
HDS130 layout (dual cable)

Model	LB (mm)
HDS130-0817	207
HDS130-1226	233
HDS130-1829	251



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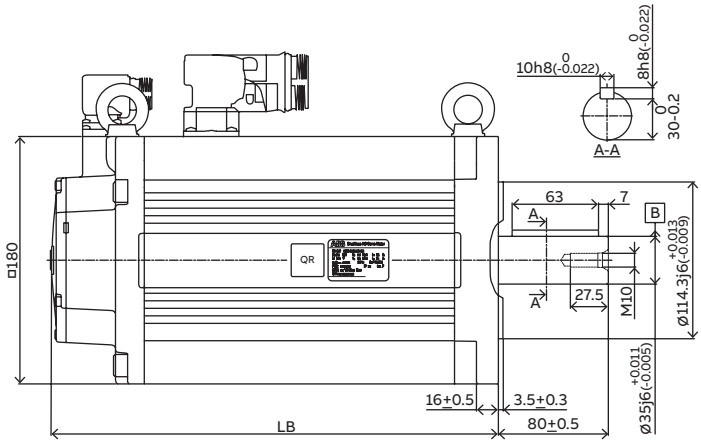
HDS130 layout (single cable)

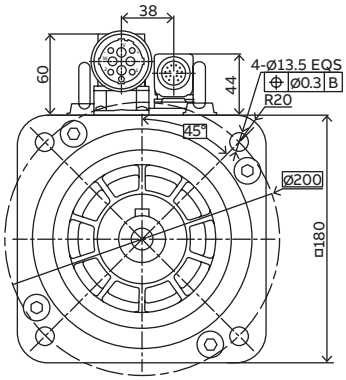
Model	LB (mm)
HDS130-0817	207
HDS130-1226	233
HDS130-1829	251

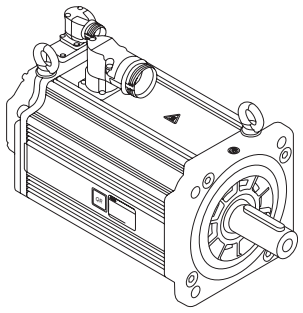
*1: With brake.

Product information

Motor dimension







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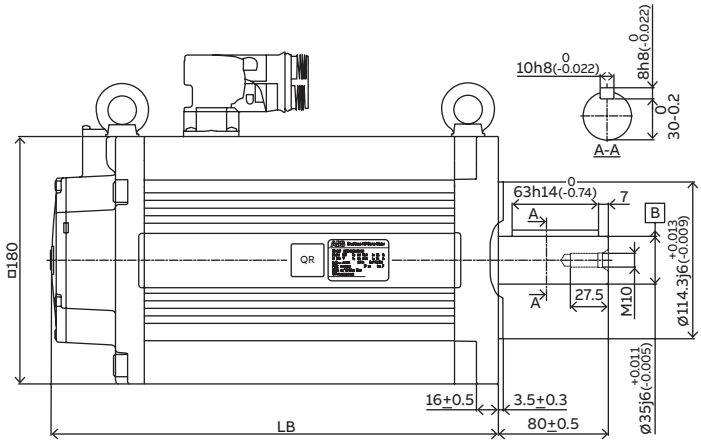
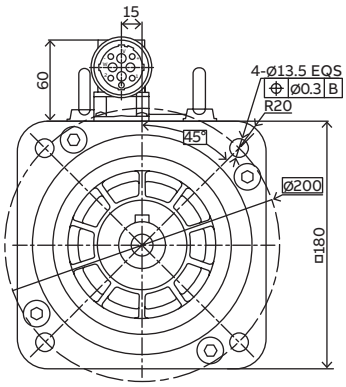
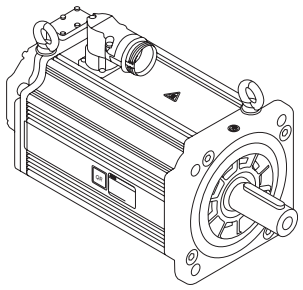
HDS180 layout (dual cable)

Model	LB (mm)
HDS180-2540	297
HDS180-3555	326
HDS180-4876	355







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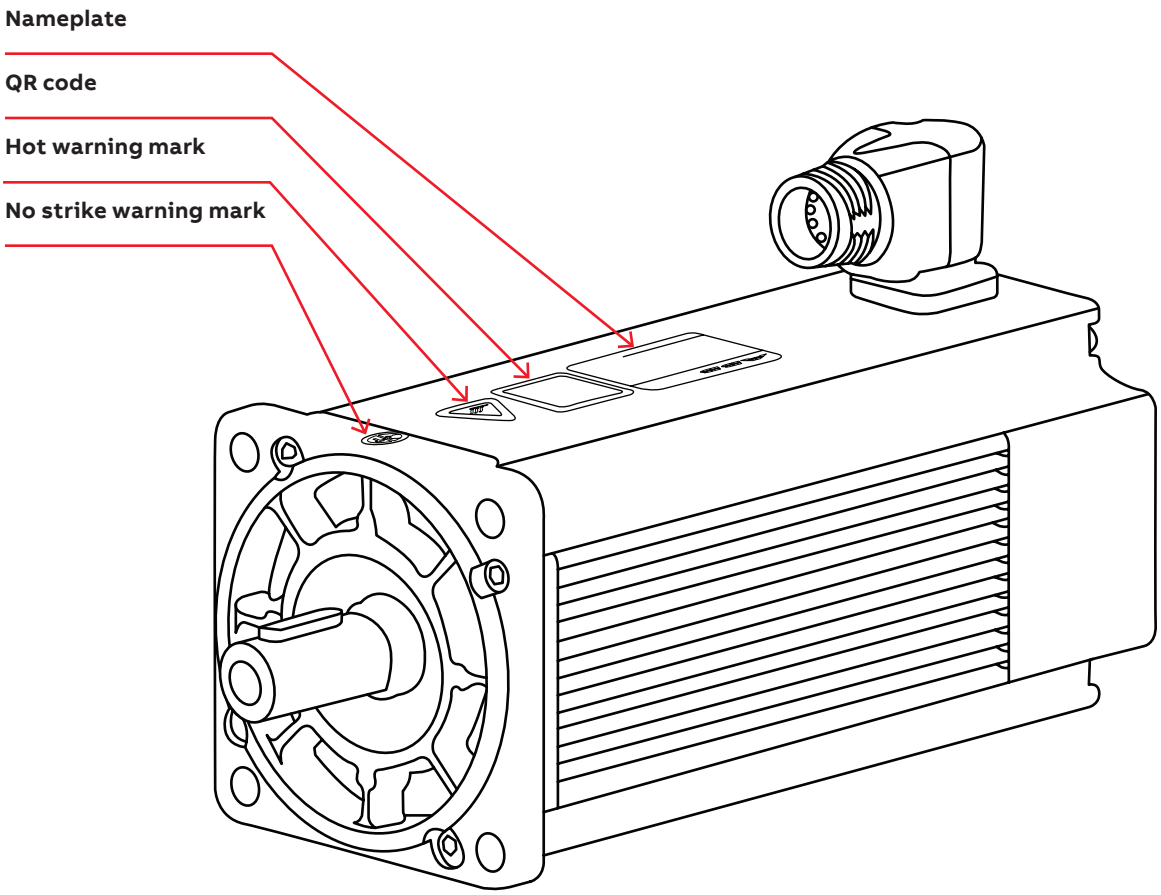
HDS180 layout (single cable)

Model	LB (mm)
HDS180-2540	297
HDS180-3555	326
HDS180-4876	355

Product information

Nameplate and identifiers

HDS series motor is accompanied with nameplate, QR code, hot warning and no strike warning marks (as shown below). Besides the parameters on the nameplate, details of the motor can be learned by scanning QR code.



Options and accessories

Brake

Parameters of standard brakes for HDS*1

Motor model	Static torque (N•m)	Power (W)	Voltage (VDC)	Current (A)	Pull-in, release time (msec)		Rotational inertia (kg.cm²)	Weight (kg)
					Pull-in	Release		
HDS65	2	11.4	24	0.47	10	58	0.03	0.33
HDS100	4.5	14	24	0.58	20	80	0.13	0.76
HDS130	18	20.8	24	0.87	40	145	1.00	1.95
HDS180	55	25.3	24	1.06	22	127	7.10	3.7

*1: Permanent magnet highly-dynamic response brake is optional, please contact ABB for details.

Options and accessories

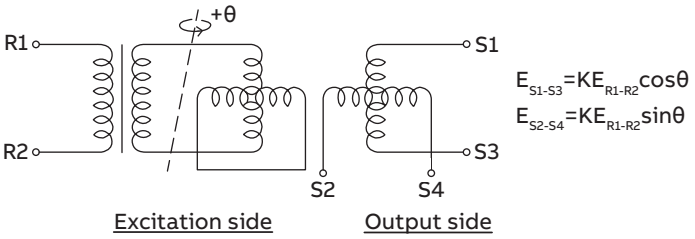
Feedback

Standard feedback devices include resolver, incremental encoder, absolute encoder and HIPERFACE DSL encoder. Customized feedbacks are acceptable. Please contact the factory for details.

(1) Resolver

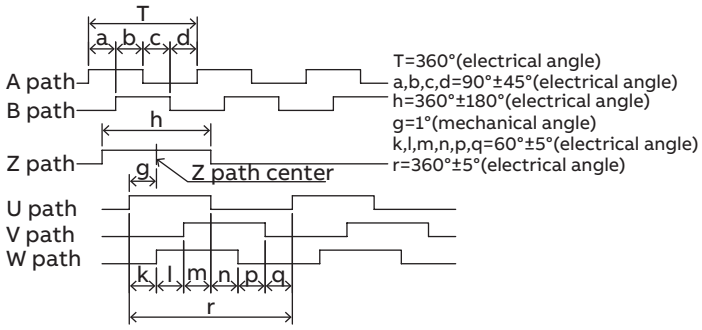
Input voltage	AC 5 Vrms/4 kHz
Input current	40mA max
Transformer ratio	0.5±10%
Number of pole-pairs	1
Electrical error	6’ max (mechanical angle)
Phase displacement	0±10° (electrical angle)
Insulation resistance	DC500V, ≥100MΩ
Operating temperature	-40°C ~+155°C

Seeing from the mounting side, +θ is in counter-clockwise.



(2) Incremental encoder

Input voltage	DC+5V±5%
Data output	40mA max Incremental orthogonal 2 path 10-polar hall output
Resolution	2500 ppr
Precision	0.018° (mechanical angle)
Maximum electrical frequency	250 kHz
Maximum mechanical rotation speed	6000 RPM
Operating temperature	-20°C ~+85°C



In counter-clockwise (seeing from the mounting side)

(3) Smart-ABS absolute encoder

Input voltage	DC+5V±5%
Number of bids/rotation	17 bits (single-turn)/ 16 bits (multi-turn)*1
Memory	762 Bytes
Protocol	Smart protocol
Data transmission type	RS 485
Communication Baud rate	2.5 Mbps
Maximum rotation speed	6000 RPM
Maximum angular acceleration	8000 rad/s²
Direction of rotation	CCW (seeing from the mounting side)
Operating temperature	-10°C ~+85°C

(4) HIPERFACE DSL absolute encoder

Input voltage	DC+7~+12V
Input current	150mA max (idle load)
Number of bids/rotation	18 bits (single-turn) 18 bits (multi-turn)
Recordable rotation number	1 rotation (single-turn) 4096 rotations (multi-turn)
Memory	8192 Bytes
Protocol	HIPERFACE DSL
Data transmission type	RS 485
Digital position output frequency	0~75 kHz
Communication Baud rate	9.375 Mbps
Maximum speed	6000 RPM
Direction of rotation	CW (seeing from the mounting side)
Operating temperature	-20°C ~+115°C

Options and accessories

Cable

Cable assembly P/N

CBLC 0 3 0 0 6 F 3 X F

Cable length:
030=3m
050=5m
100=10m
150=15m
200=20m
300=30m

Motor type:
Power and DSL cable:
06=HDS65
13=HDS100 & 130
18=HDS180
Feedback cable:
06=HDS65
13=HDS100 & 130 & 180

Maximum current of power and DSL cable:
06=6A
12=12A
20=20A
35=35A
Feedback cable signal type and drive:
F1=incremental encoder, e180 & e150 & e190
F2=Absolute Smart Abs, e180 & e150 & e190
F3=Resolver, e180

Type:
P=Power cable
F=Feedback cable
D=DSL cable

Example:
CBLC0300606P: 3-meter power cable, applicable to HDS65 series motor, maximum current 6A;
CBLC10013F3XF: 10-meter feedback cable, applicable to HDS100 & 130 & 180, resolver, drive e150 & e190.

Connector P/N

SPMC 0 6 F 1

Motor type:
Power and DSL:
06=HDS65
13=HDS100 & 130
18=HDS180
Feedback:
06=HDS65
13=HDS100 & 130 & 180

Type:
Power and DSL cable:
P=Power and DSL connector
F1=Feedback connector, resolver and smart Abs
F2=Feedback connector, incremental encoder

Example:
SPMC06P: HDS65 power connector;
SPMC13F2: HDS100 & 130 & 180 incremental encoder feedback connector.

Options and accessories

Cable

Cable P/N

SPCB 1 0 0 1 6 C F

Cable length:
100=10m
150=15m
200=20m
300=30m

Maximum current of power and DSL cable:
06=6A
12=12A
20=20A
35=35A

Number of cores in feedback cable:
16C=16-core
06C=6-core

Type:
P=Power and HDS cable
F=Feedback cable

Example:
SPCB20006P: 20-meter power cable, maximum current 6A;
SPCB30016CF: 30-meter feedback cable, 16-core.

Notes

Additional information
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

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