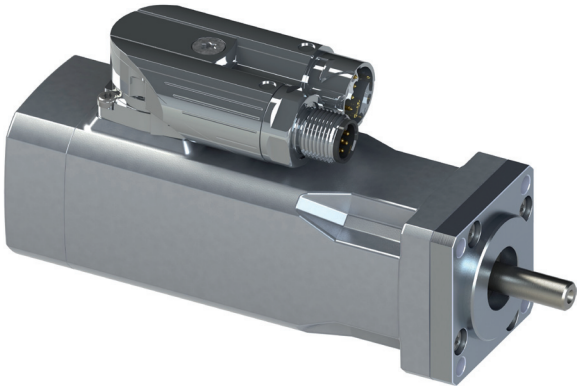
ENGEL ELEKTROANTRIEBE

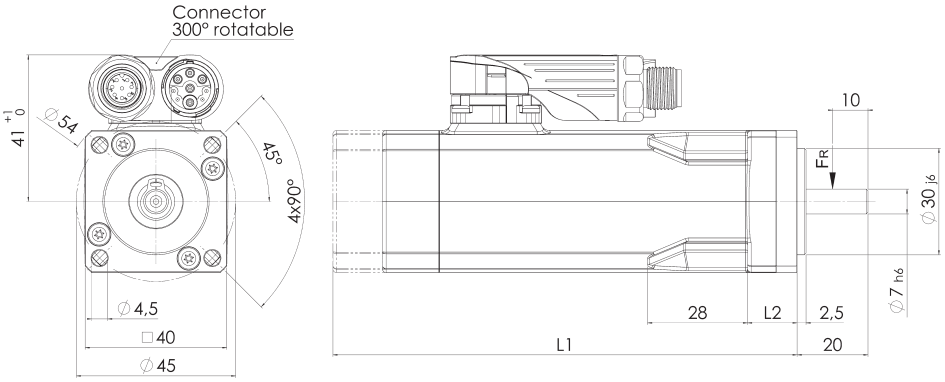


HBR 16

Synchronous Servo Motors

with permanent magnetic field

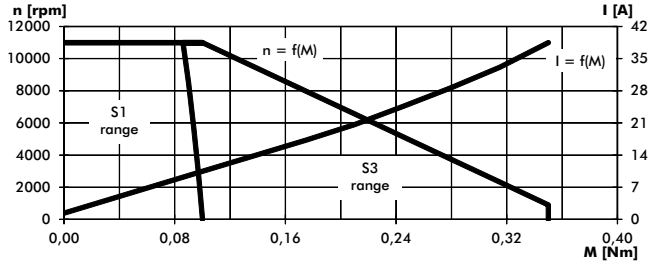
Motor series HBR 16
up to 140 Watts output power
with linear hall sensor system
with or without parking brake



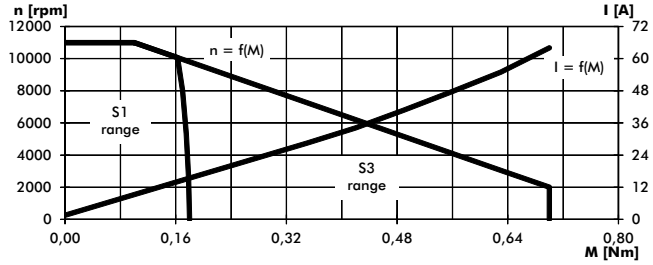
Motor type	Dimension	
	L1	L2
HBR 1625-DS1	92	14
HBR 1625-DS1-B7.004	121	18
HBR 1650-DS1	117	14
HBR 1650-DS1-B7.004	146	18

Operation characteristics:
Measured at servo-amplifier with 3-phase sinusoidal output

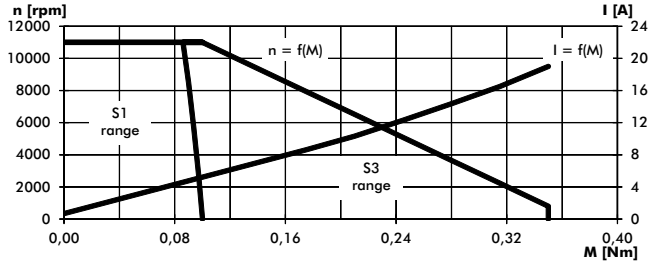
HBR 1625, 24V, 8500/11000rpm



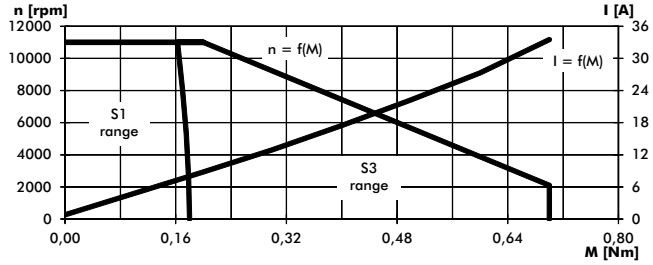
HBR 1650, 24V, 8000/11000rpm



HBR 1625, 48V, 8500/11000rpm



HBR 1650, 48V, 8000/11000rpm



Motor design:

The Synchronous Servo Motors of series HBR 16 are fitted with a 3-phase concentrated stator-winding system. The 4-pole rotor-magnet system is made of plastic-bonded Neodymium Iron Boron ring magnets.

The motors have a sinusoidal Back EMF. To avoid thermal overload a PTC resistor is embedded in the stator winding.

The position information of the rotor will be generated using the integrated linear hall sensor system with 12Bit resolution and pure digital interface (BiSS).

The motors are also available with hall-based multiturn encoder (BiSS interface), with brushless pancake-resolver (dimension L1 will be 14mm longer, motor weight increases by 0,05kg), with hall commutation sensor incl. incremental signals and/or with integrated parking brake (additional information see page 3).

Features:

- High efficiency through concentrated winding technology
- Cost-efficient design
- Constant torque development and lowest reluctance effects for best control properties
- The compact design allowing high power output out of small volume
- Robust mechanical structure with modern aluminium cast housing
- Versions for 320V bus voltage in preparation
- Customized versions on request

edition 02.16

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A.T.T.I. Srl | via Flli Cervi,3 | 20063 Cernusco S/N (MI) | tel.0292106954 | fax.0292107261 | www.atti.it

type		HBR 1625		HBR 1650	
series		-		-	
max. speed	rpm	11000	11000	11000	11000
bus voltage	V	24	48	24	48
nominal speed	rpm	8500	8500	8000	8000
nominal current [1] **)	A	9,5	4,8	14,6	7,6
nominal current, rms	A	6,7	3,4	10,3	5,4
nominal power [2]	W	80	80	140	140
operation acc. to standards VDE 0530		S1		S1	
protection acc. to standards VDE 0530		IP 54		IP 54	
rotating direction		reversible		reversible	
structural shape acc. standards VDE 0530		IM B5 - with end plate centering		IM B5 - with end plate centering	
kind of connection		connectors (see below)		connectors (see below)	
mechanical data:					
moment of inertia motor	kgm^2	$0{,}0013*10^{-3}$		$0{,}0021*10^{-3}$	
nominal torque [2]	Nm	0,09	0,09	0,17	0,17
max. continous torque at stall [2]	Nm	0,1	0,1	0,18	0,18
peak torque	Nm	0,35	0,35	0,7	0,7
speed regulation constant	$N^{-1}\ cm^{-1}\ rpm$	215	219	82	87
mechanical time constant	ms	3,4	3,5	2,1	2,2
friction torque	Nm	0,015		0,02	
rotor weight motor	kg	0,065		0,095	
motor weight incl. singleturn angle encoder	kg	0,5		0,67	
ball bearings	A/B-side	607/608		607/608	
F_R (allowable radial shaft load) [3]	N	20		20	
F_A (allowable axial shaft load)	N	8		8	
electrical data:					
number of phases		3		3	
number of poles		4		4	
terminal resistance [4]	Ω	0,32	1,3	0,17	0,65
inductance [4]	mH	0,25	1	0,17	0,65
voltage constant [1] *)	V/1000 rpm	1,35	2,7	1,6	3
torque constant [1] *)	Nm/A	0,011	0,022	0,013	0,025
current at peak torque [1] **)	A	38,5	19	64	33,5
max. peak current [1] [5]	A	47	23,5	79	41
electrical time constant	ms	0,8	0,8	1	1
thermal data:					
max. ambient temperature	°C	40		40	
isolation acc. to standards VDE 0530		F		F	
thermal time constant	min	6		7	
temperature-rise n.v.	K/W	2,1		1,8	
parking brake:					
type		**B 7.004**		**B 7.004**	
nominal voltage	V=	24		24	
nominal current	A	0,35		0,35	
static brake torque	Nm	0,4		0,4	
mass moment of inertia	kgm^2	$0{,}0013*10^{-3}$		$0{,}0013*10^{-3}$	
motor weight incl. encoder + parking brake	kg	0,7		0,9	
connectors:					
angled connector, rotatable 300°		series 615 ytec (INTERCONTEC)			

*) Tolerance – 10 %

**) Tolerance + 10 %

[1] Sinusoidal-peak

[2] Values are for motor-assembling on a locating face of aluminium of at least 0,15 m^2 at a thickness of 10 mm or similar metal face.

[3] Middle of the shaft-extension.

[4] Measured between two phases.

[5] The mentioned values are valid for operation in temperature-ranges from 0 up to +40 °C and it is not allowed to excess them, not even for a short-time, to avoid magnet-weakening.

design-changes reserved

options for feedback systems

DS1 singleturn angle encoder (standard feedback):

technology:	linear hall system, digitized
measuring range:	360° singleturn
resolution:	12 bit (4096 steps) ≙ 0,088°
nonlinearity:	max. 0,6°
supply:	V+ = 5,5 ... 12 VDC / max. 60 mA
interface:	BiSS, binary coded 12 bit data, 2 bit status, 6 bit CRC RS422, $R_{T(MA)}$ = 100 Ohm
connector:	M12 connector 8-pol., A coded

M12 connector
8-pol., A coded

connecting side
of connector

pin assignment

1 - V+
2 - V–
3 - Thermo+
4 - MA–
5 - SL+
6 - MA+
7 - Thermo–
8 - SL–

recommended cable type: Cat.5e, SF/UTP, AWG24

cable length	max. MA frequency without [6] / with line delay compensation
2 m	2,5 MHz / 10 MHz
5 m	2,2 MHz / 10 MHz
10 m	1,7 MHz / 10 MHz
25 m	1,0 MHz / 10 MHz

DS2 multiturn encoder:

technology:	linear hall system, digitized, multiturn, battery backed
measuring range:	360° x 4096 turns multiturn
resolution:	12 bit singleturn + 12 bit multiturn
nonlinearity:	max. 0,6°
supply:	V+ = 5,5 ... 12 VDC / max. 60 mA
interface:	BiSS, binary coded 24 bit data, 2 bit status, 6 bit CRC RS422, $R_{T(MA)}$ = 100 Ohm
connector:	M12 connector 8-pol., A coded

M12 connector
8-pol., A coded

connecting side
of connector

pin assignment

1 - V+
2 - V–
3 - Thermo+
4 - MA–
5 - SL+
6 - MA+
7 - Thermo–
8 - SL–

recommended cable type: Cat.5e, SF/UTP, AWG24

cable length	max. MA frequency without [6] / with line delay compensation
2 m	2,5 MHz / 10 MHz
5 m	2,2 MHz / 10 MHz
10 m	1,7 MHz / 10 MHz
25 m	1,0 MHz / 10 MHz

RL6 commutation sensor with incremental signals:

technology:	hall system
measuring range:	360° singleturn
resolution:	12 bit
nonlinearity:	max. 0,6°
supply:	V+ = 4,5 ... 12 VDC
interface:	open collector - H1, H2, H3 120° el (mac. 10 mA, max. 24 V) RS422 - channel A, B, Z
connector:	connector 12-pol., series 615

connector 12-pol.
series 615

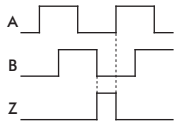
connecting side
of connector

pin assignment

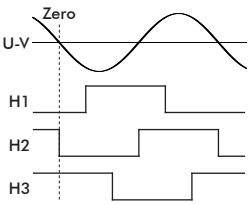
1 - V+
2 - GND
3 - Hall 1
4 - Hall 2
5 - Hall 3
6 - Ch A
7 - Ch A invers
8 - Ch B
9 - Ch B invers
10 - Ch Z
11 - Ch Z invers
12 - Thermo+ (vs. GND)

signal assignment

incremental
(complementary signals
NOT shown)



commutation (rotation CW)



R5.2 resolver:

technology:	pancake resolver
measuring range:	360°, 2 pole, singleturn
transformation ratio:	0,5 ± 5 %
electrical error:	max. ± 10´el
supply:	7 Veff 10 kHz / max. 50 mA
connector:	connector 12-pol., series 615

connector 12-pol.
series 615

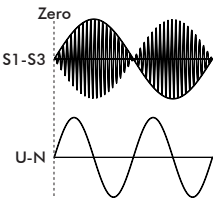
connecting side
of connector

pin assignment

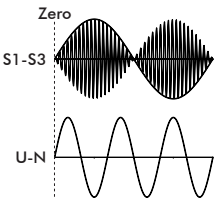
1 - S1
2 - S3
3 - S2
4 - S4
5 - R1
6 - R2
7 - Thermo+
8 - Thermo-
9 - free
10 - free
11 - free
12 - free

signal assignment (rotation CW)

4-pole motor

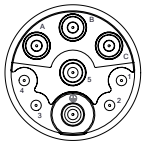


6-pole motor



pin assignment power connector

connector 9-pol.
series 615



connecting side
of connector

pin assignment

A - U
B - V
C - W
⏚ - PE
1 - Brake +
2 - Brake -
3 - free
4 - free
5 - free

[6] Condition: Total propagation delay in the BiSS master device $t_{d(MA)} + t_{d(SL)} \leq 25$ ns.

design-changes reserved

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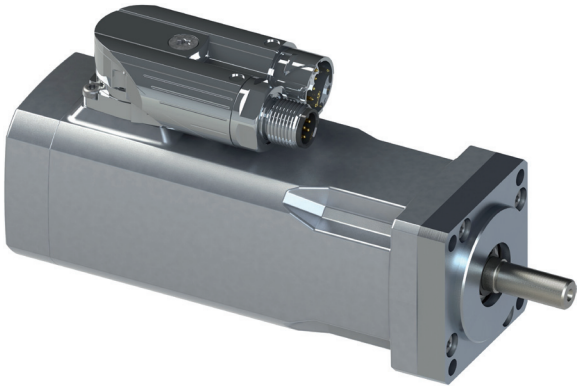
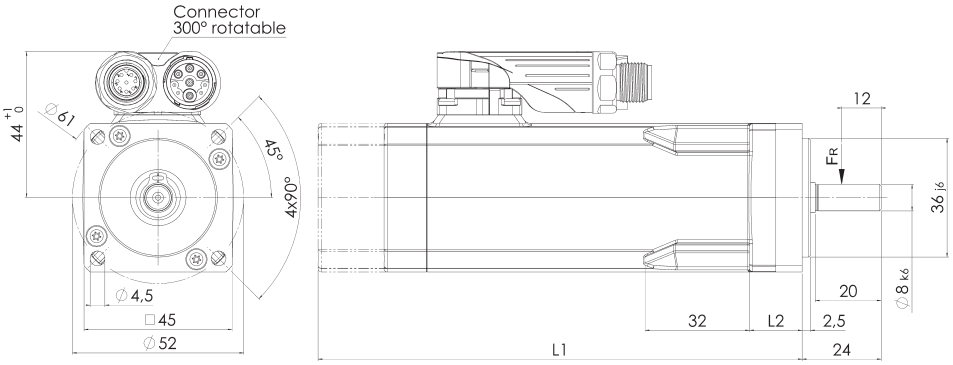


HBR 22

Synchronous Servo Motors

with permanent magnetic field

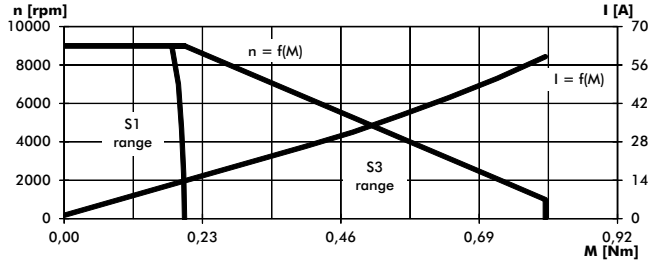
Motor series HBR 22
up to 240 Watts output power
with linear hall sensor system
with or without parking brake



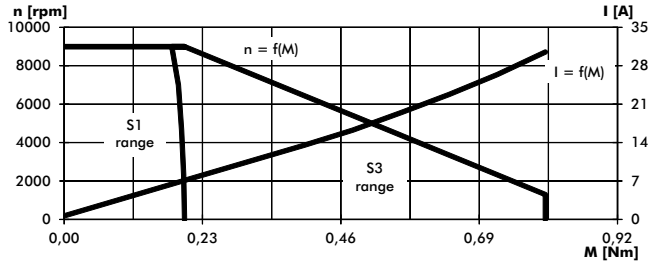
Motor type	Dimension	
	L1	L2
HBR 2230-DS1	97	16
HBR 2230-DS1-B7.01	129	18
HBR 2260-DS1	127	16
HBR 2260-DS1-B7.01	159	18

Operation characteristics:
Measured at servo-amplifier with 3-phase sinusoidal output

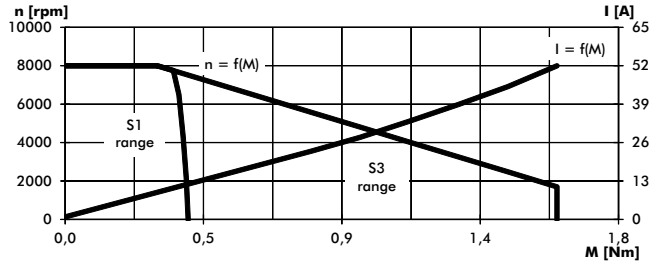
HBR 2230, 24V, 7000/9000rpm



HBR 2230, 48V, 7000/9000rpm



HBR 2260, 48V, 6500/8000rpm



Motor design:

The Synchronous Servo Motors of series HBR 22 are fitted with a 3-phase concentrated stator-winding system. The 6-pole rotor-magnet system is made of plastic-bonded Neodymium Iron Boron ring magnets.

The motors have a sinusoidal Back EMF. To avoid thermal overload a PTC resistor is embedded in the stator winding.

The position information of the rotor will be generated using the integrated linear hall sensor system with 12Bit resolution and pure digital interface (BiSS).

The motors are also available with hall-based multiturn encoder (BiSS interface), with brushless pancake-resolver (dimension L1 will be 20mm longer, motor weight increases by 0,08kg), with hall commutation sensor incl. incremental signals and/or with integrated parking brake (additional information see page 3).

Features:

- High efficiency through concentrated winding technology
- Cost-efficient design
- Constant torque development and lowest reluctance effects for best control properties
- The compact design allowing high power output out of small volume
- Robust mechanical structure with modern aluminium cast housing
- Versions for 320V bus voltage in preparation
- Customized versions on request

edition 02.16

ENGEL Elektroantriebe GmbH
A.T.T.I. Srl | via Flli Cervi,3 | 20063 Cernusco S/N (MI) | tel.0292106954 | fax.0292107261 | www.atti.it

type		HBR 2230		HBR 2260
series		-		-
max. speed	rpm	9000	9000	8000
bus voltage	V	24	48	48
nominal speed	rpm	7000	7000	6500
nominal current [1] **)	A	13,2	6,8	11,2
nominal current, rms	A	9,3	4,8	7,9
nominal power [2]	W	140	140	240
operation acc. to standards VDE 0530		S1		S1
protection acc. to standards VDE 0530		IP 54		IP 54
rotating direction		reversible		reversible
structural shape acc. standards VDE 0530		IM B5 - with end plate centering		IM B5 - with end plate centering
kind of connection		connectors (see below)		connectors (see below)
mechanical data:				
moment of inertia motor	kgm^2	$0{,}007*10^{-3}$		$0{,}011*10^{-3}$
nominal torque [2]	Nm	0,19	0,19	0,37
max. continous torque at stall [2]	Nm	0,2	0,2	0,4
peak torque	Nm	0,8	0,8	1,6
speed regulation constant	$N^{-1}\ cm^{-1}$ rpm	66	66	26
mechanical time constant	ms	5,5	5,5	3,4
friction torque	Nm	0,02		0,03
rotor weight motor	kg	0,16		0,23
motor weight incl. singleturn angle encoder	kg	0,7		0,98
ball bearings	A/B-side	609/608		609/608
F_R (allowable radial shaft load) [3]	N	50		50
F_A (allowable axial shaft load)	N	20		20
electrical data:				
number of phases		3		3
number of poles		6		6
terminal resistance [4]	Ω	0,2	0,75	0,4
inductance [4]	mH	0,1	0,36	0,25
voltage constant [1] *)	V/1000 rpm	1,9	3,7	4,4
torque constant [1] *)	Nm/A	0,016	0,031	0,036
current at peak torque [1] **)	A	59	30,5	52
max. peak current [1] [5]	A	73	38	65
electrical time constant	ms	0,5	0,5	0,63
thermal data:				
max. ambient temperature	°C	40		40
isolation acc. to standards VDE 0530		F		F
thermal time constant	min	8		9
temperature-rise n.v.	K/W	1,5		1,3
parking brake:				
type		**B 7.01**		**B 7.01**
nominal voltage	V=	24		24
nominal current	A	0,45		0,45
static brake torque	Nm	1		1
mass moment of inertia	kgm^2	$0{,}0021*10^{-3}$		$0{,}0021*10^{-3}$
motor weight incl. encoder + parking brake	kg	0,95		1,25
connectors:				
angled connector, rotatable 300°		series 615 ytec (INTERCONTEC)		

*) Tolerance – 10 %
**) Tolerance + 10 %
1) Sinusoidal-peak
2) Values are for motor-assembling on a locating face of aluminium of at least 0,15 m^2 at a thickness of 10 mm or similar metal face.
3) Middle of the shaft-extension.
4) Measured between two phases.
5) The mentioned values are valid for operation in temperature-ranges from 0 up to +40 °C and it is not allowed to excess them, not even for a short-time, to avoid magnet-weakening.

design-changes reserved

options for feedback systems

DS1 singleturn angle encoder (standard feedback):

technology:	linear hall system, digitized
measuring range:	360° singleturn
resolution:	12 bit (4096 steps) ≙ 0,088°
nonlinearity:	max. 0,6°
supply:	V+ = 5,5 ... 12 VDC / max. 60 mA
interface:	BiSS, binary coded 12 bit data, 2 bit status, 6 bit CRC RS422, $R_{T(MA)}$ = 100 Ohm
connector:	M12 connector 8-pol., A coded

M12 connector
8-pol., A coded

connecting side
of connector

pin assignment

1 - V+
2 - V–
3 - Thermo+
4 - MA–
5 - SL+
6 - MA+
7 - Thermo–
8 - SL–

recommended cable type: Cat.5e, SF/UTP, AWG24

cable length	max. MA frequency without [6] / with line delay compensation
2 m	2,5 MHz / 10 MHz
5 m	2,2 MHz / 10 MHz
10 m	1,7 MHz / 10 MHz
25 m	1,0 MHz / 10 MHz

DS2 multiturn encoder:

technology:	linear hall system, digitized, multiturn, battery backed
measuring range:	360° x 4096 turns multiturn
resolution:	12 bit singleturn + 12 bit multiturn
nonlinearity:	max. 0,6°
supply:	V+ = 5,5 ... 12 VDC / max. 60 mA
interface:	BiSS, binary coded 24 bit data, 2 bit status, 6 bit CRC RS422, $R_{T(MA)}$ = 100 Ohm
connector:	M12 connector 8-pol., A coded

M12 connector
8-pol., A coded

connecting side
of connector

pin assignment

1 - V+
2 - V–
3 - Thermo+
4 - MA–
5 - SL+
6 - MA+
7 - Thermo–
8 - SL–

recommended cable type: Cat.5e, SF/UTP, AWG24

cable length	max. MA frequency without [6] / with line delay compensation
2 m	2,5 MHz / 10 MHz
5 m	2,2 MHz / 10 MHz
10 m	1,7 MHz / 10 MHz
25 m	1,0 MHz / 10 MHz

RL6 commutation sensor with incremental signals:

technology:	hall system
measuring range:	360° singleturn
resolution:	12 bit
nonlinearity:	max. 0,6°
supply:	V+ = 4,5 ... 12 VDC
interface:	open collector - H1, H2, H3 120° el (mac. 10 mA, max. 24 V) RS422 - channel A, B, Z
connector:	connector 12-pol., series 615

connector 12-pol.
series 615

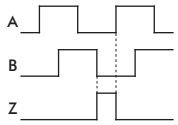
connecting side
of connector

pin assignment

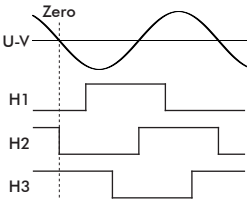
1 - V+
2 - GND
3 - Hall 1
4 - Hall 2
5 - Hall 3
6 - Ch A
7 - Ch A invers
8 - Ch B
9 - Ch B invers
10 - Ch Z
11 - Ch Z invers
12 - Thermo+ (vs. GND)

signal assignment

incremental
(complementary signals
NOT shown)



commutation (rotation CW)



R4.2 resolver:

technology:	pancake resolver
measuring range:	360°, 2 pole, singleturn
transformation ratio:	0,5 ± 5 %
electrical error:	max. ± 10´el
supply:	7 Veff 10 kHz / max. 50 mA
connector:	connector 12-pol., series 615

connector 12-pol.
series 615

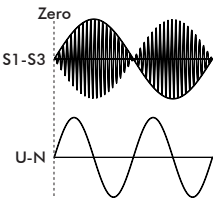
connecting side
of connector

pin assignment

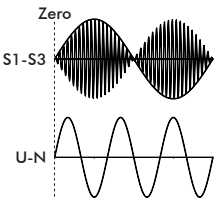
1 - S1
2 - S3
3 - S2
4 - S4
5 - R1
6 - R2
7 - Thermo+
8 - Thermo-
9 - free
10 - free
11 - free
12 - free

signal assignment (rotation CW)

4-pole motor

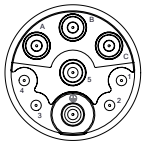


6-pole motor



pin assignment power connector

connector 9-pol.
series 615



connecting side
of connector

pin assignment

A - U
B - V
C - W
⏚ - PE
1 - Brake +
2 - Brake -
3 - free
4 - free
5 - free

[6] Condition: Total propagation delay in the BiSS master device $t_{d(MA)} + t_{d(SL)} \leq 25$ ns.

design-changes reserved

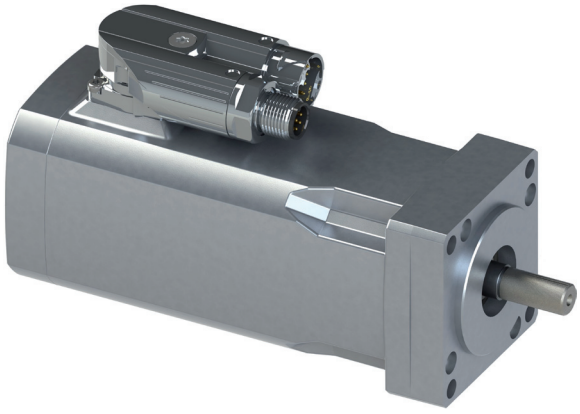
ENGEL ELEKTROANTRIEBE

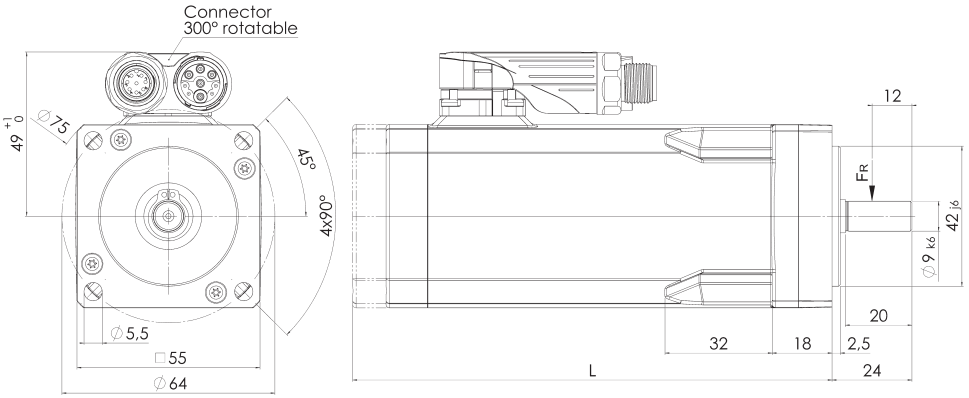
HBR 26

Synchronous Servo Motors

with permanent magnetic field

Motor series HBR 26
up to 300 Watts output power
with linear hall sensor system
with or without parking brake

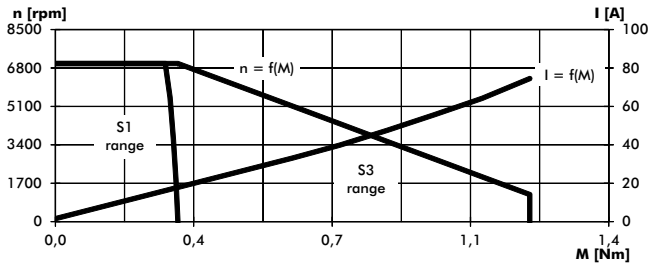




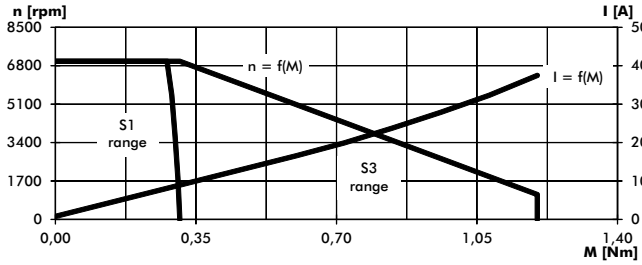
Motor type	Dimension L
HBR 2630-DS1	104
HBR 2630-DS1-B7.02	134
HBR 2660-DS1	134
HBR 2660-DS1-B7.02	164

Operation characteristics:
Measured at servo-amplifier with 3-phase sinusoidal output

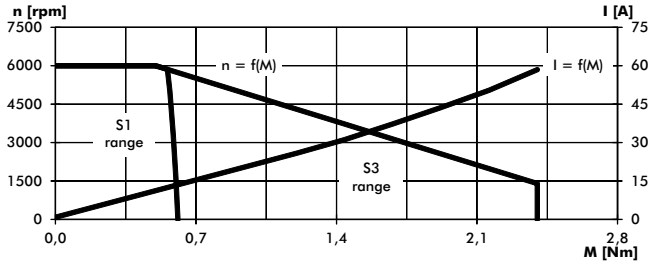
HBR 2630, 24V, 5500/7000rpm



HBR 2630, 48V, 5500/7000rpm



HBR 2660, 48V, 5000/6000rpm



Motor design:

The Synchronous Servo Motors of series HBR 26 are fitted with a 3-phase concentrated stator-winding system. The 6-pole rotor-magnet system is made of plastic-bonded Neodymium Iron Boron ring magnets.

The motors have a sinusoidal Back EMF. To avoid thermal overload a PTC resistor is embedded in the stator winding.

The position information of the rotor will be generated using the integrated linear hall sensor system with 12Bit resolution and pure digital interface (BiSS).

The motors are also available with hall-based multiturn encoder (BiSS interface), with optical multiturn encoder (BiSS interface, dimension L will be 27mm longer, motor weight increases by 0,13kg), with brushless pancake-resolver (dimension L will be 10mm longer, motor weight increases by 0,08kg), with hall commutation sensor incl. incremental signals and/or with integrated parking brake (additional information see page 3).

Features:

- High efficiency through concentrated winding technology
- Cost-efficient design
- Constant torque development and lowest reluctance effects for best control properties
- The compact design allowing high power output out of small volume
- Robust mechanical structure with modern aluminium cast housing
- Versions for 320V bus voltage in preparation
- Customized versions on request

edition 02.16

ENGEL Elektroantriebe GmbH
A.T.T.I. Srl | via Flli Cervi,3 | 20063 Cernusco S/N (MI) | tel.0292106954 | fax.0292107261 | www.atti.it

type		HBR 2630		HBR 2660
series		-		-
max. speed	rpm	7000	7000	6000
bus voltage	V	24	48	48
nominal speed	rpm	5500	5500	5000
nominal current [1] **)	A	16,8	8,4	12,7
nominal current, rms	A	11,9	6	9
nominal power [2]	W	165	165	300
operation acc. to standards VDE 0530		S1		S1
protection acc. to standards VDE 0530		IP 54		IP 54
rotating direction		reversible		reversible
structural shape acc. standards VDE 0530		IM B5 - with end plate centering		IM B5 - with end plate centering
kind of connection		connectors (see below)		connectors (see below)
mechanical data:				
moment of inertia motor	kgm^2	$0,01*10^{-3}$		$0,018*10^{-3}$
nominal torque [2]	Nm	0,29	0,29	0,57
max. continous torque at stall [2]	Nm	0,31	0,31	0,61
peak torque	Nm	1,2	1,2	2,4
speed regulation constant	$N^{-1}\ cm^{-1}$ rpm	34	34	11,5
mechanical time constant	ms	4,1	4,1	2,7
friction torque	Nm	0,03		0,04
rotor weight motor	kg	0,19		0,3
motor weight incl. singleturn angle encoder	kg	1,05		1,4
ball bearings	A/B-side	6000/608		6000/608
F_R (allowable radial shaft load) [3]	N	100		100
F_A (allowable axial shaft load)	N	40		40
electrical data:				
number of phases		3		3
number of poles		6		6
terminal resistance [4]	Ω	0,15	0,6	0,35
inductance [4]	mH	0,11	0,46	0,35
voltage constant [1] *)	V/1000 rpm	2,3	4,6	5,8
torque constant [1] *)	Nm/A	0,019	0,038	0,048
current at peak torque [1] **)	A	74,5	37,5	58,5
max. peak current [1] [5]	A	93	46	73
electrical time constant	ms	0,7	0,8	1
thermal data:				
max. ambient temperature	°C	40		40
isolation acc. to standards VDE 0530		F		F
thermal time constant	min	10		12
temperature-rise n.v.	K/W	1,3		1,1
parking brake:				
type		**B 7.02**		**B 7.02**
nominal voltage	V=	24		24
nominal current	A	0,5		0,5
static brake torque	Nm	2		2
mass moment of inertia	kgm^2	$0,0068*10^{-3}$		$0,0068*10^{-3}$
motor weight incl. encoder + parking brake	kg	1,35		1,7
connectors:				
angled connector, rotatable 300°		series 615 ytec (INTERCONTEC)		

*) Tolerance – 10 %
**) Tolerance + 10 %
[1] Sinusoidal-peak
[2] Values are for motor-assembling on a locating face of aluminium of at least 0,15 m^2 at a thickness of 10 mm or similar metal face.
[3] Middle of the shaft-extension.
[4] Measured between two phases.
[5] The mentioned values are valid for operation in temperature-ranges from 0 up to +40 °C and it is not allowed to excess them, not even for a short-time, to avoid magnet-weakening.

design-changes reserved

options for feedback systems

DS1 singleturn angle encoder (standard feedback):

technology:	linear hall system, digitized
measuring range:	360° singleturn
resolution:	12 bit (4096 steps) ≙ 0,088°
nonlinearity:	max. 0,6°
supply:	V+ = 5,5 ... 12 VDC / max. 60 mA
interface:	BiSS, binary coded 12 bit data, 2 bit status, 6 bit CRC RS422, $R_{T(MA)}$ = 100 Ohm
connector:	M12 connector 8-pol., A coded

M12 connector
8-pol., A coded

connecting side
of connector

pin assignment

1 - V+
2 - V–
3 - Thermo+
4 - MA–
5 - SL+
6 - MA+
7 - Thermo–
8 - SL–

recommended cable type: Cat.5e, SF/UTP, AWG24

cable length	max. MA frequency without [6] / with line delay compensation
2 m	2,5 MHz / 10 MHz
5 m	2,2 MHz / 10 MHz
10 m	1,7 MHz / 10 MHz
25 m	1,0 MHz / 10 MHz

DS2 multiturn encoder:

technology:	linear hall system, digitized, multiturn, battery backed
measuring range:	360° x 4096 turns multiturn
resolution:	12 bit singleturn + 12 bit multiturn
nonlinearity:	max. 0,6°
supply:	V+ = 5,5 ... 12 VDC / max. 60 mA
interface:	BiSS, binary coded 24 bit data, 2 bit status, 6 bit CRC RS422, $R_{T(MA)}$ = 100 Ohm
connector:	M12 connector 8-pol., A coded

M12 connector
8-pol., A coded

connecting side
of connector

pin assignment

1 - V+
2 - V–
3 - Thermo+
4 - MA–
5 - SL+
6 - MA+
7 - Thermo–
8 - SL–

recommended cable type: Cat.5e, SF/UTP, AWG24

cable length	max. MA frequency without [6] / with line delay compensation
2 m	2,5 MHz / 10 MHz
5 m	2,2 MHz / 10 MHz
10 m	1,7 MHz / 10 MHz
25 m	1,0 MHz / 10 MHz

AD36 multiturn encoder:

technology:	optical, multiturn, gear based
measuring range:	360° x 4096 turns multiturn
resolution:	17 bit singleturn + 12 bit multiturn
nonlinearity:	max. 0,01°
supply:	V+ = 5,5 ... 12 VDC / max. 60 mA
interface:	BiSS, binary coded 29 bit data, 2 bit status, 6 bit CRC RS422, $R_{T(MA)}$ = 100 Ohm
connector:	M12 connector 8-pol., A coded

M12 connector
8-pol., A coded

connecting side
of connector

pin assignment

1 - V+
2 - V–
3 - Thermo+
4 - MA–
5 - SL+
6 - MA+
7 - Thermo–
8 - SL–

recommended cable type: Cat.5e, SF/UTP, AWG24

cable length	max. MA frequency without [6] / with line delay compensation
2 m	2,5 MHz / 10 MHz
5 m	2,2 MHz / 10 MHz
10 m	1,7 MHz / 10 MHz
25 m	1,0 MHz / 10 MHz

RL6 commutation sensor with incremental signals:

technology:	hall system
measuring range:	360° singleturn
resolution:	12 bit
nonlinearity:	max. 0,6°
supply:	V+ = 4,5 ... 12 VDC
interface:	open collector - H1, H2, H3 120° el (mac. 10 mA, max. 24 V) RS422 - channel A, B, Z
connector:	connector 12-pol., series 615

connector 12-pol.
series 615

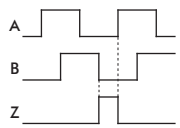
connecting side
of connector

pin assignment

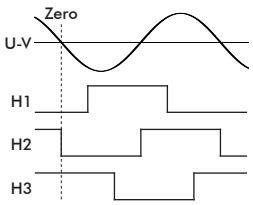
1 - V+
2 - GND
3 - Hall 1
4 - Hall 2
5 - Hall 3
6 - Ch A
7 - Ch A invers
8 - Ch B
9 - Ch B invers
10 - Ch Z
11 - Ch Z invers
12 - Thermo+ (vs. GND)

signal assignment

incremental
(complementary signals
NOT shown)



commutation (rotation CW)



R2.4 resolver:

technology:	pancake resolver
measuring range:	360°, 2 pole, singleturn
transformation ratio:	0,5 ± 5 %
electrical error:	max. ± 10´el
supply:	7 Veff 10 kHz / max. 65 mA
connector:	connector 12-pol., series 615

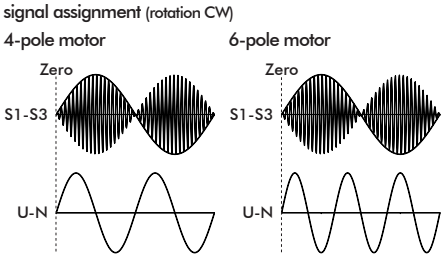
connector 12-pol.
series 615

connecting side
of connector

pin assignment

1 - S1
2 - S3
3 - S2
4 - S4
5 - R1
6 - R2
7 - Thermo+
8 - Thermo-
9 - free
10 - free
11 - free
12 - free

signal assignment (rotation CW)



pin assignment power connector

connector 9-pol.
series 615

connecting side
of connector

pin assignment

A - U
B - V
C - W
⏚ - PE
1 - Brake +
2 - Brake -
3 - free
4 - free
5 - free

[6] Condition: Total propagation delay in the BiSS master device $t_{d(MA)} + t_{d(SL)} \leq 25$ ns.

design-changes reserved