

# Hygienic Design Actuator



Harmonic  
Drive SE





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## Product description

# Reliable precision in the highest purity

The new HHA Hygienic Hollow Shaft Servo Actuator combines the latest motor technology, a high performance Harmonic Drive® CSG Gear Component Set and a high capacity tilt resistant output bearing. The Hygienic Design Actuator combines the expected reliability and highest performance of Harmonic Drive® Actuators in a specially designed stainless steel housing for compliance with hygiene standards. It scores not only with a clean simple design to assist with washdown, but also with selected surface finish and a large hollow shaft to pass cables and supply lines. The new HHA Hygienic Design Actuator is manufactured with a European supply chain at the Limburg production site.

## Features

- Outstanding, lifetime precision
- Large hollow shaft
- Third party controller compatibility
- Designed according to EHEDG directives, FDA standards and hygienic design standards
- Resistant to cleaning agents and disinfectants
- IP69K protection class
- Corrosion protection
- Latest Harmonic Drive® Gear Technology
- Ambient temperature -10 °C ... 40 °C
- Food grade grease
- High performance motor technology at the Limburg production site



## Ordering code

Table 1

Ordering code	HHA - 25 A - 100 - AO - L - MHH - B - 1 - SP									
<b>HHA Series</b>										
<b>Size</b> (corresponds to the pitch circle diameter of the Flexspline toothing in inches x 10)	17									
	20									
	25									
<b>Product Generation</b>	A									
<b>Ratio</b>					50					
					80					
					100					
					120					
					160					
<b>Motor winding type</b>										
DC link voltage 560 VDC, voltage constant 27,2 V <sub>rms</sub> /1000 rpm	AO									
DC link voltage 560 VDC, voltage constant 49,1 V <sub>rms</sub> /1000 rpm	AU									
<b>Connector version</b>										
O: Motor cable, encoder cable - Open cable ends	O									
<b>Motor feedback system</b>										
EnDat 2.2 Singleturn absolute encoder ECI-119 (19 bit Singleturn)	SZE									
Hiperface® Singleturn absolute encoder SES70 (32 Sincos, 10 bit Singleturn)	SIH									
BiSS-C Singleturn absolute encoder FFB (16 bit Singleturn)	SZB									
Hiperface® Multiturn absolute encoder SEM70 (32 Sincos, 10 bit Singleturn / 12 bit Multiturn mechanical)	MIH									
<b>Option holding brake</b>										
With holding brake 24 V	B									
Without holding brake (Field remains empty)	O									
<b>Option temperature sensor</b>										
1: Temperature sensor in motor cable (standard)	1									
2: Temperature sensor in encoder cable (optional)	2									
<b>Customised design</b>										
With customised design (on request)	SP									
Standard design (Field remains empty)	[]									

Please refer to the table of possible combinations.

## Designation of motor feedback system

Table 2

Example: ECI119	S	Z	E
<b>Type</b>			
Singleturn absolute	S		
Multi-turn absolute	M		
<b>Number of sine cosine periods</b>			
64		H	
32		I	
none		Z	
<b>Protocol</b>			
BiSS-C			B
EnDat 2.2/22			E
Hiperface®			H
SSI			S

## Combinations

Table 3

Size		17A	20A	25A
Ratio	50	o	o	•
	80	o	o	o
	100	o	o	•
	120	o	o	o
	160	-	o	•
Motor winding type	AO	o	o	-
	AU	-	-	•
Connector version	O	o	o	•
Motor feedback system	SZE	o	o	o
	SIH	o	o	o
	SZB	o	o	o
	MIH	o	o	•
Option holding brake	B	o	o	o
Option temperature sensor	1	o	o	•
	2	o	o	o

• available   o on request   - not available

## Technical data

### • Features

Table 4

Motor winding	[Unit]	AO/AU
Machine type		Permanent magnet synchronous motor with concentrated winding
Magnet material		Neodymium-iron-boron
Insulation class (EN 60034-1)		F
Insulation resistance (500 VDC)	[MΩ]	100
Insulation voltage (10 s)	[VAC]	2500
Lubrication		4BNo2
Degree of protection (EN 60034-5)		IP65 (Shaft seal ring is standard)
Ambient operating temperature	[°C]	0 ... 40
Ambient storage temperature	[°C]	-20 ... 60
Maximum installation altitude (above sea level)	[m]	4000 above sea level
Relative humidity (without condensation)	[%]	maximum 80 non dewing
Vibration resistance (DIN IEC 60068 part 2-6, 10 ... 500 Hz)	[g]	5
Shock resistance (DIN IEC 60068 part 2-27, 11 ms)	[g]	30
Corrosion protection (DIN IEC 60068 part 2-11 Salt spray test)	[h]	16
Thermal motor protection		1 x PT1000 <sup>1)</sup>
Gear component set		CSG-2A

<sup>1)</sup> Save separation according to EN 61800-5-1, design class B according to IEC 60751

### • Cooling

Unless otherwise indicated, the values given in the tables refer to an overtemperature of the winding of 70 K at an ambient temperature of 40 °C and a maximum installation altitude of 1000 m above sea level. From an installation altitude > 1000 m above sea level, a derating of 1 % per 100 m must be made. The values in the following tables and the operating characteristics apply to actuators mounted on an aluminium base plate with the following minimum dimensions:

Table 5

Series	Size	[Unit]	Dimension
HHA	17A	[mm]	300 x 300 x 15
	20A	[mm]	300 x 300 x 15
	25A	[mm]	350 x 350 x 18

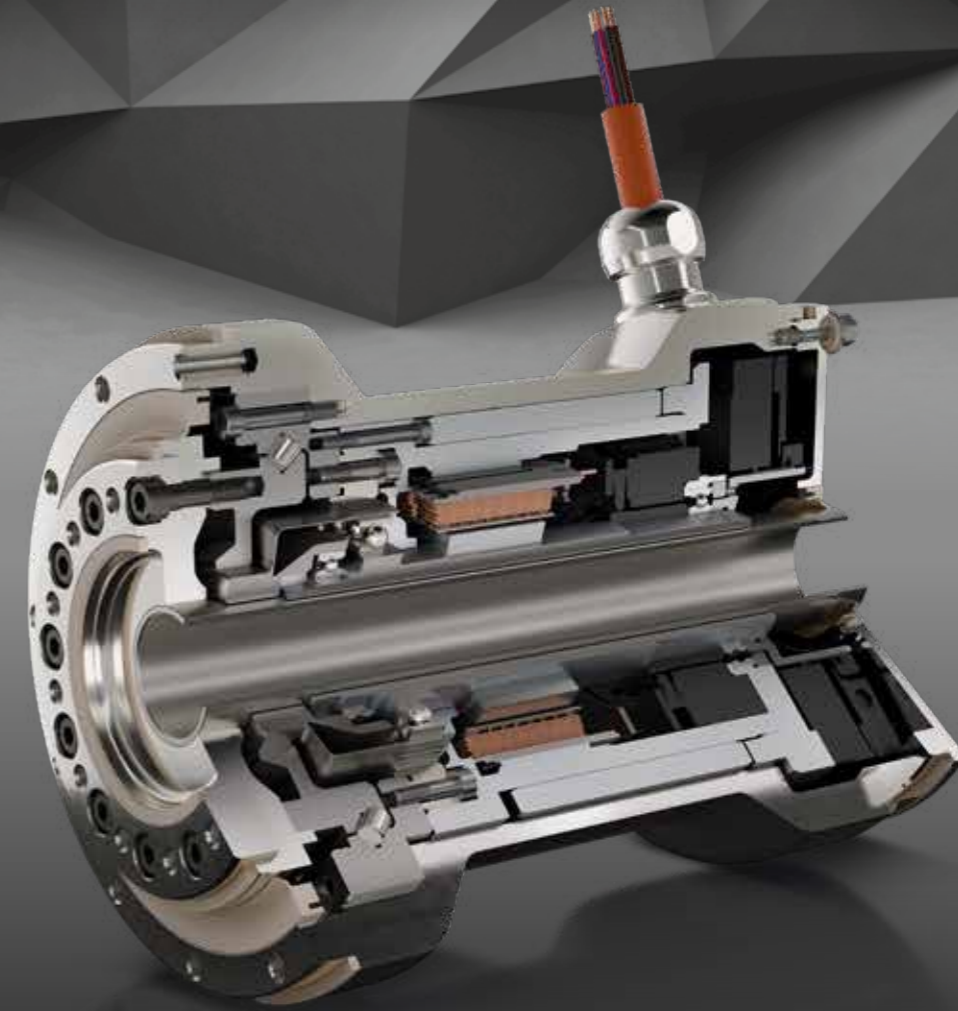
- Actuator data

**HHA-17A-AO, HHA-20A-AO, HHA-25A-AU**

Actuators with 560 VDC maximum stationary DC bus voltage

Table 6

Actuator	Symbol [Unit]	17A		20A			25A		
Stator winding		AO		AO			AU		
Motor feedback system		SZE / SZB / SIH / MIH		SZE / SZB / SIH / MIH			SZE / SZB / SIH / MIH		
Ratio	i	50	100	50	100	160	50	100	160
Maximum output torque	$T_{MAX}$ [Nm]	44	70	73	107	120	127	204	229
Maximum output speed SIH, MIH	$n_{MAX}$ [rpm]	146	73	130	65	41	112	56	35
Maximum output speed SZE, SZB	$n_{MAX}$ [rpm]	120	60	120	60	38	112	56	35
Maximum current (for 2 sec.)	$I_{MAX}$ [A <sub>rms</sub> ]	2.8	2.2	4.5	3.3	2.4	4.1	3.3	2.4
Continuous stall torque	$T_0$ [Nm]	34	51	44	64	64	72	140	140
Continuous stall current	$I_0$ [A <sub>rms</sub> ]	1.9	1.4	2.5	1.8	1.2	2.2	2.1	1.3
No load starting current	$I_{NLSC}$ [A <sub>rms</sub> ]	0.18	0.21	0.12	0.09	0.09	0.12	0.10	0.11
No load current constant (20 °C)	$K_{INL}$ [10 <sup>-3</sup> A/rpm]	5.24	10.02	6.59	12.57	19.65	6.10	11.90	18.20
No load current constant (90 °C)	$K_{INL}$ [10 <sup>-3</sup> A/rpm]	16.76	32.08	2.21	4.22	6.60	1.90	3.70	5.70
Torque constant (Motor)	$K_T$ [Nm/A <sub>rms</sub> ]	0.38		0.38			0.74		
AC voltage constant (L-L, 20 °C)	$K_E$ [V <sub>rms</sub> /1000 rpm]	25.7		25.7			49.1		
Maximum steady-state DC link voltage	$V_{CC}$ [V <sub>DC</sub> ]	680		680			680		
Mechanical time constant MIH, without brake (20 °C)	$T_M$ [ms]	3.7		4.2			4.2		
Electrical time constant (20 °C)	$T_E$ [ms]	1.6		1.6			2.6		
Maximum motor speed SIH, MIH	$n_{MAX}$ [rpm]	7300		6500			5600		
Maximum motor speed SZE, SZB	$n_{MAX}$ [rpm]	6000		6000			5600		
Rated motor speed	$n_N$ [rpm]	3500		3500			3500		
Resistance (L-L, 20 °C)	$R_{L-L}$ [Ω]	4.00		4.00			5.84		
Rotary field inductance	$L_d$ [mH]	3.10		3.10			7.50		
Number of pole pairs	p	8		8			8		
Brake voltage	$U_{Br}$ [V <sub>DC</sub> ]	24 ±10 %		24 ±10 %			24 ±10 %		
Brake holding torque	$T_{Br}$ [Nm]	36	70	36	72	120	72	144	229
Brake power consumption	$P_{BR}$ [W]	9.6		9.6			9.6		
Brake opening time	$t_o$ [ms]	15		15			18		
Brake closing time	$t_c$ [ms]	15		15			18		
Weight without brake	[kg]	6.45		7.2			9.8		
Weight with brake	[kg]	6.8		8.0			10.6		
Hollow shaft diameter	$d_h$ [mm]	18		18			27		
Rated torque gear component set for calculating the Wave Generator lifetime	$T_N$ [Nm]	21	31	33	52	52	51	87	87
Rated speed gear component set for calculating the Wave Generator lifetime	$n_N$ [rpm]	2000		2000			2000		



- Moment of inertia

Table 7

	Symbol [Unit]	17A	
<b>Motor feedback system</b>		<b>SZB</b>	
Ratio		50	100
<b>Moment of inertia at output side</b>			
Moment of inertia without brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.325	1.300
Moment of inertia with brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.375	1.500
<b>Moment of inertia at motor side</b>			
Moment of inertia without brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	1.30	
Moment of inertia with brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	1.50	
<b>Motor feedback system</b>		<b>SZE</b>	
Ratio		50	100
<b>Moment of inertia at output side</b>			
Moment of inertia without brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.450	1.800
Moment of inertia with brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.475	1.900
<b>Moment of inertia at motor side</b>			
Moment of inertia without brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	1.80	
Moment of inertia with brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	1.90	
<b>Motor feedback system</b>		<b>SIH / MIH</b>	
Ratio		50	100
<b>Moment of inertia at output side</b>			
Moment of inertia without brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.225	0.900
Moment of inertia with brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.275	1.100
<b>Moment of inertia at motor side</b>			
Moment of inertia without brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	0.90	
Moment of inertia with brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	1.10	

- Moment of inertia

Table 8

	Symbol [Unit]	20A			25A		
<b>Motor feedback system</b>		<b>SZB</b>					
Ratio		50	100	160	50	100	160
<b>Moment of inertia at output side</b>							
Moment of inertia without brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.350	1.400	3.584	0.655	2.620	6.707
Moment of inertia with brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.400	1.600	4.096	0.730	2.920	7.475
<b>Moment of inertia at motor side</b>							
Moment of inertia without brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	1.40			2.62		
Moment of inertia with brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	1.60			2.92		
<b>Motor feedback system</b>		<b>SZE</b>					
Ratio		50	100	160	50	100	160
<b>Moment of inertia at output side</b>							
Moment of inertia without brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.450	1.800	4.608	0.780	3.120	7.987
Moment of inertia with brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.500	2.000	5.120	0.855	3.420	8.755
<b>Moment of inertia at motor side</b>							
Moment of inertia without brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	1.80			3.12		
Moment of inertia with brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	2.00			3.42		
<b>Motor feedback system</b>		<b>SIH / MIH</b>					
Ratio		50	100	160	50	100	160
<b>Moment of inertia at output side</b>							
Moment of inertia without brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.250	1.000	2.560	0.690	2.760	7.066
Moment of inertia with brake	$J_{OUT}$ [kgm <sup>2</sup> ]	0.300	1.200	3.072	0.765	3.060	7.834
<b>Moment of inertia at motor side</b>							
Moment of inertia without brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	1.00			2.76		
Moment of inertia with brake	$J$ [kgm <sup>2</sup> x10 <sup>-4</sup> ]	1.20			3.06		

• Performance characteristics

The performance curves shown are valid for the specified ambient temperature (operation) and the specified motor terminal voltage  $U_M$ .

The performance curves shown are valid for the specified ambient temperature (operation) and the specified motor terminal voltage  $U_M$ .

Illustration 1 **HHA-17A-50**

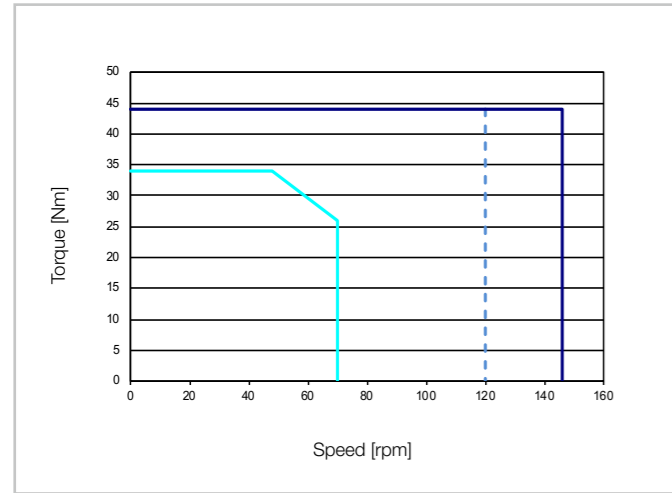


Illustration 2 **HHA-17A-100**

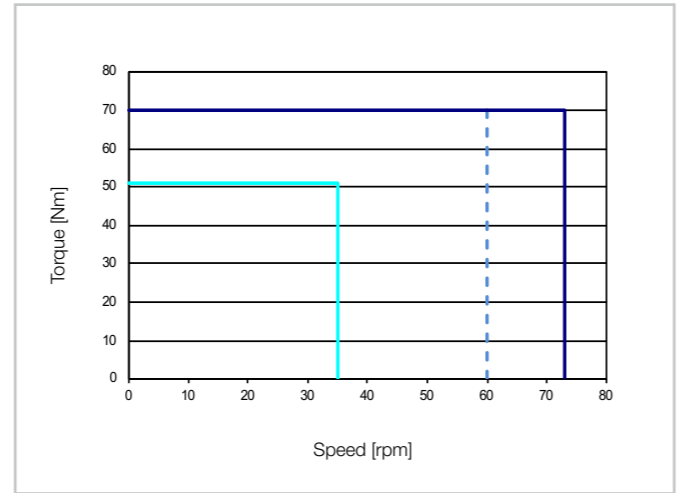


Illustration 6 **HHA-25A-50**

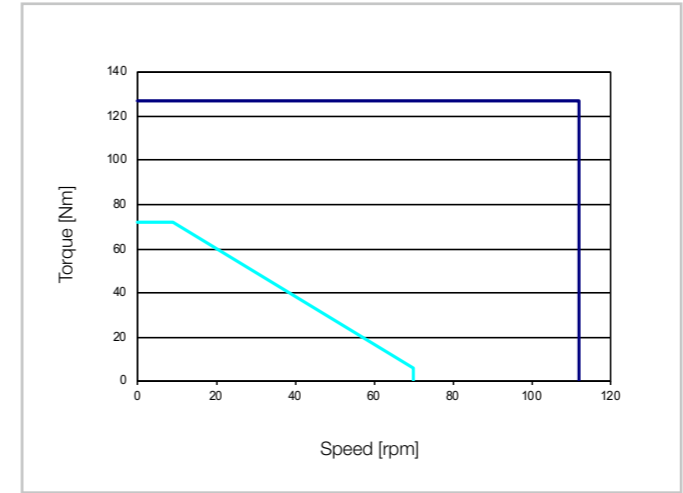


Illustration 7 **HHA-25A-100**

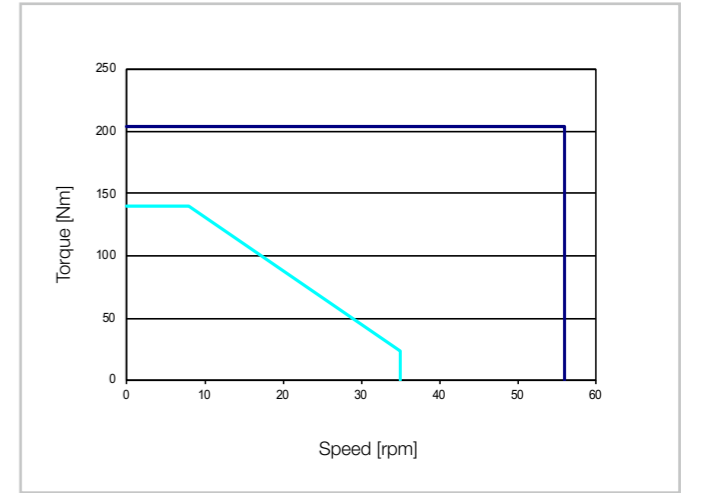


Illustration 3 **HHA-20A-50**

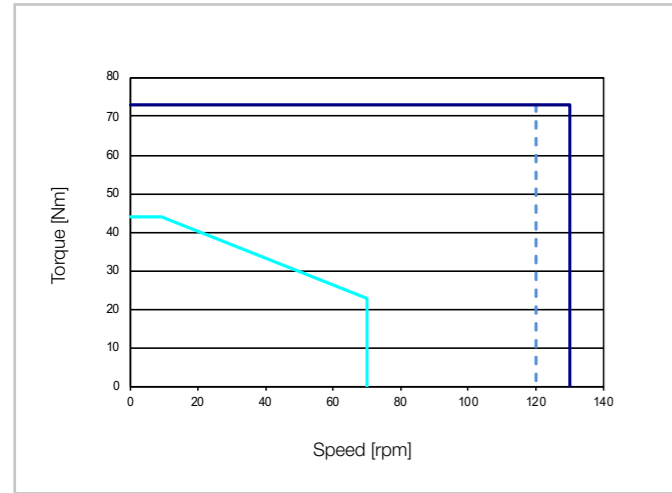


Illustration 4 **HHA-20A-100**

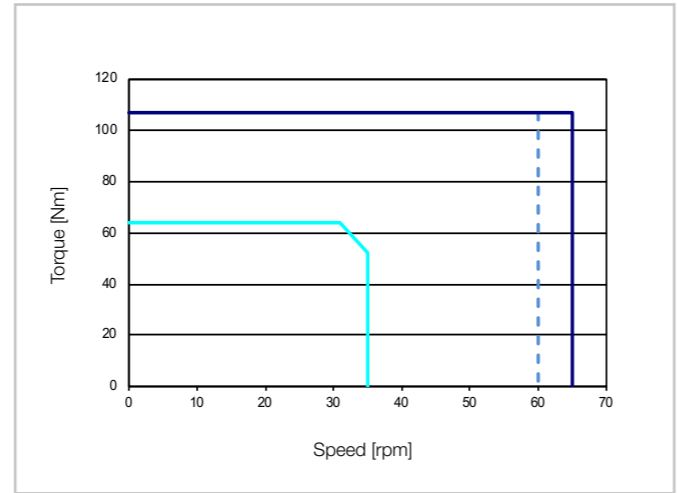
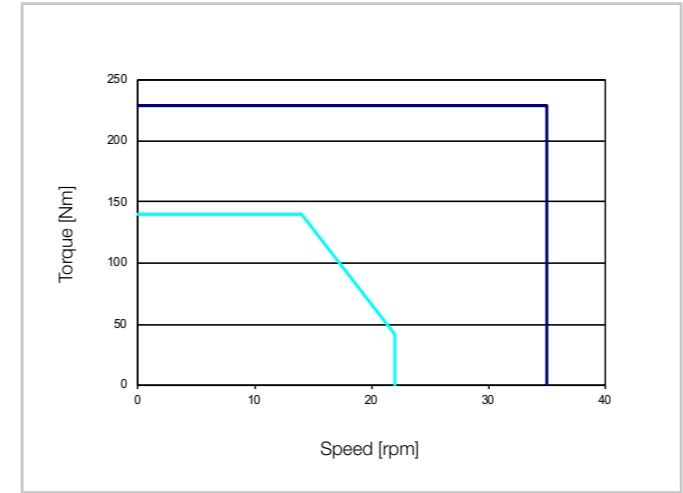
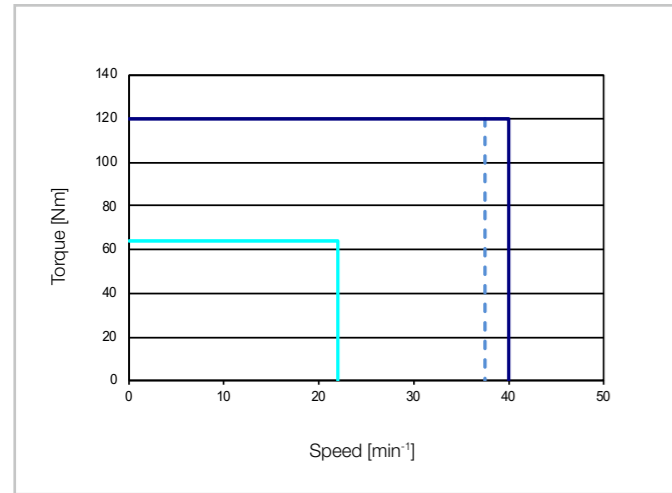


Illustration 8 **HHA-25A-160**



Intermittent duty ———  
 Continuous duty ———  
 Limit speed reduction ———  
 Motor feedback system - - - - -

Illustration 5 **HHA-20A-160**



Intermittent duty ———  
 Continuous duty ———  
 Limit speed reduction ———  
 Motor feedback system - - - - -

• Dimensions

Illustration 9

HHA-17A [mm]

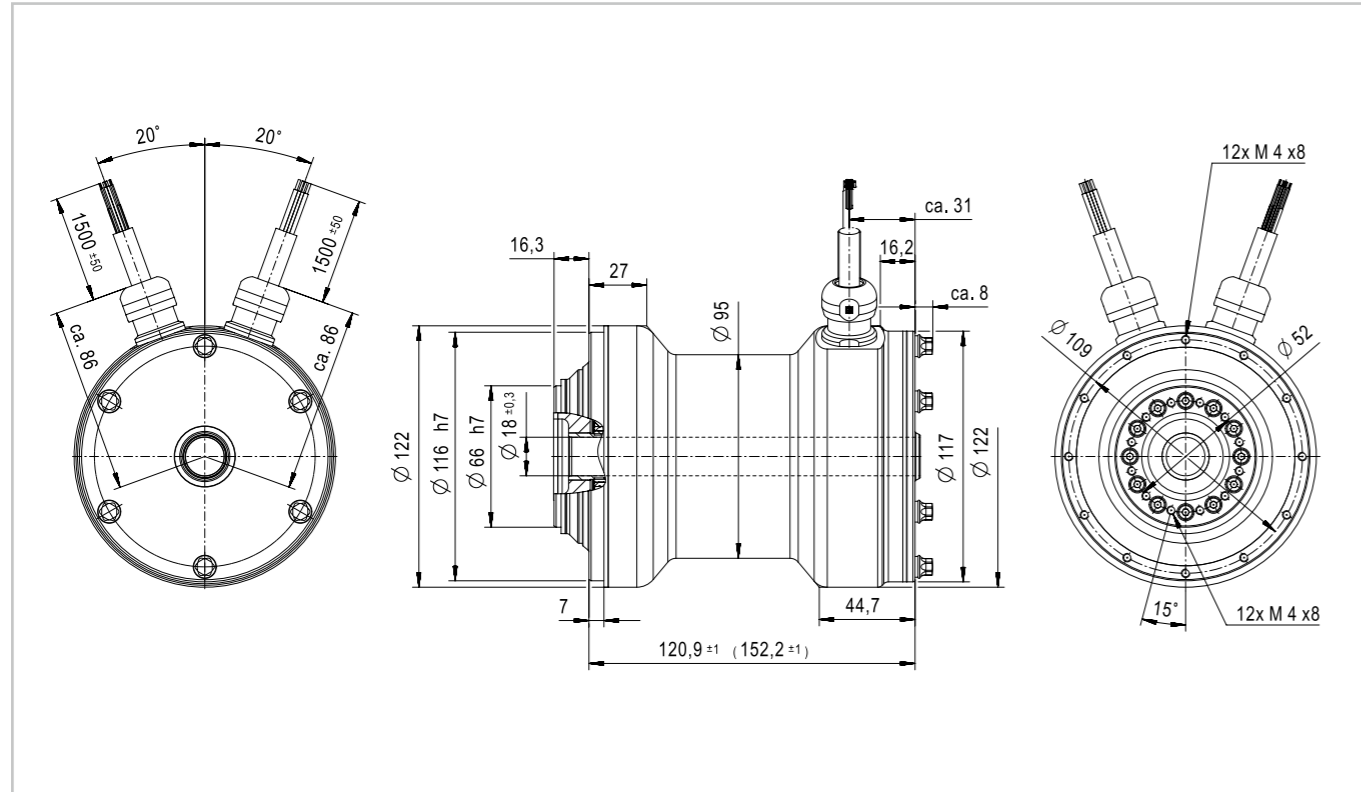


Illustration 11

HHA-25A [mm]

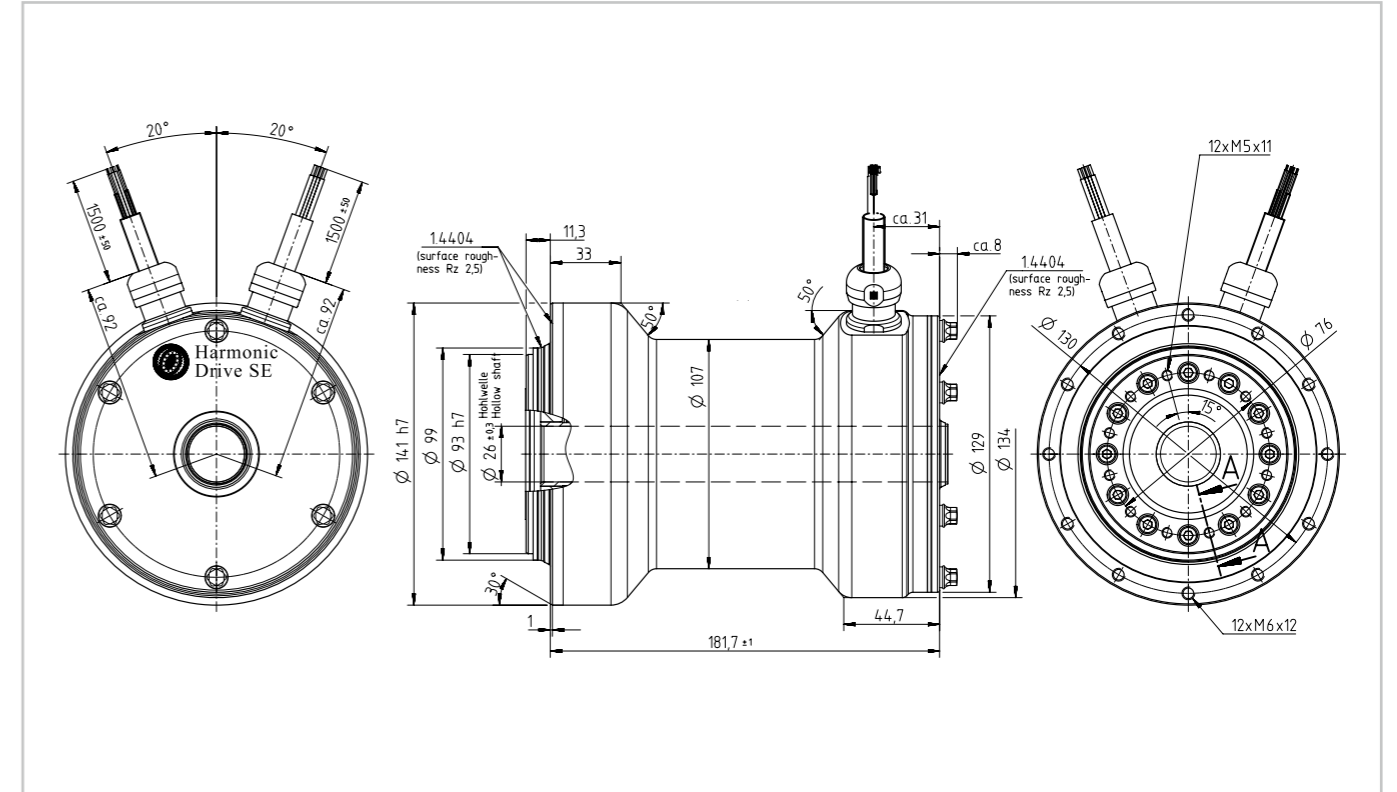
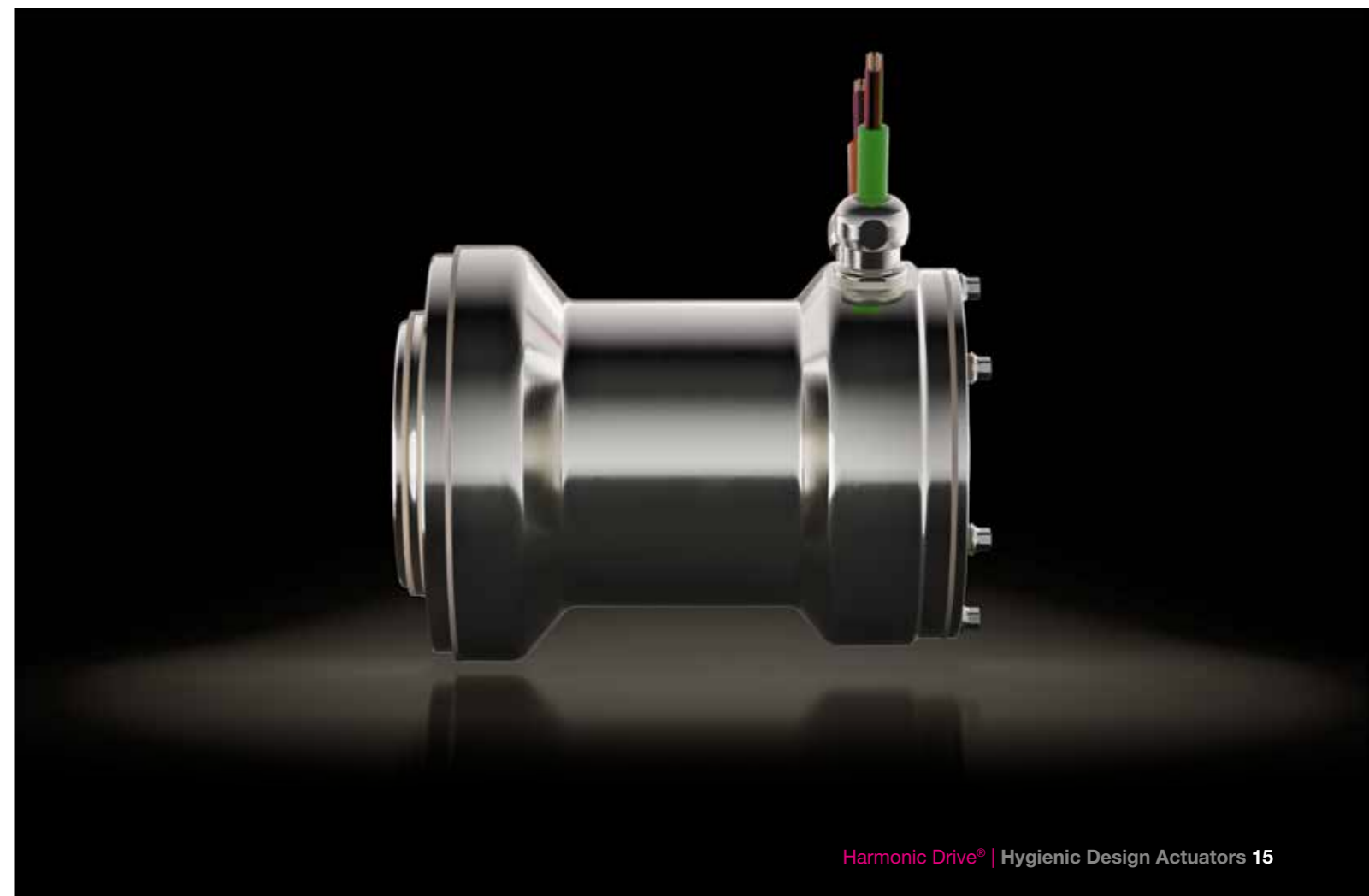
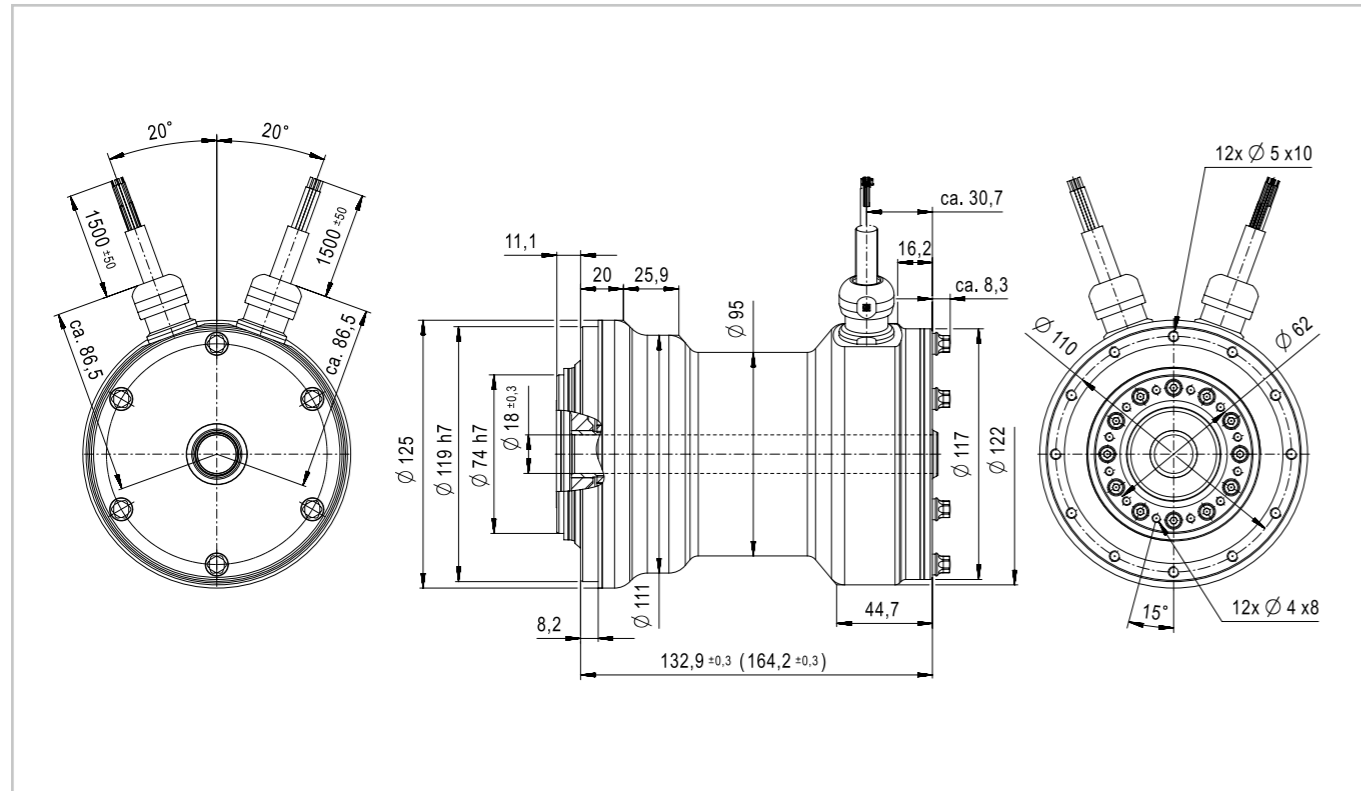


Illustration 10

HHA-20A [mm]



↓ CAD drawings for download: [www.harmonicdrive.co.uk](http://www.harmonicdrive.co.uk)





PASSION GENERATES THE HIGHEST QUALITY

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We reserve the right to make technical changes  
and modifications without prior notice.

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