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Catalogue



Germany
Harmonic Drive AG
Hoenbergstraße 14
65555 Limburg/Lahn

T +49 6431 5008-0
F +49 6431 5008-119

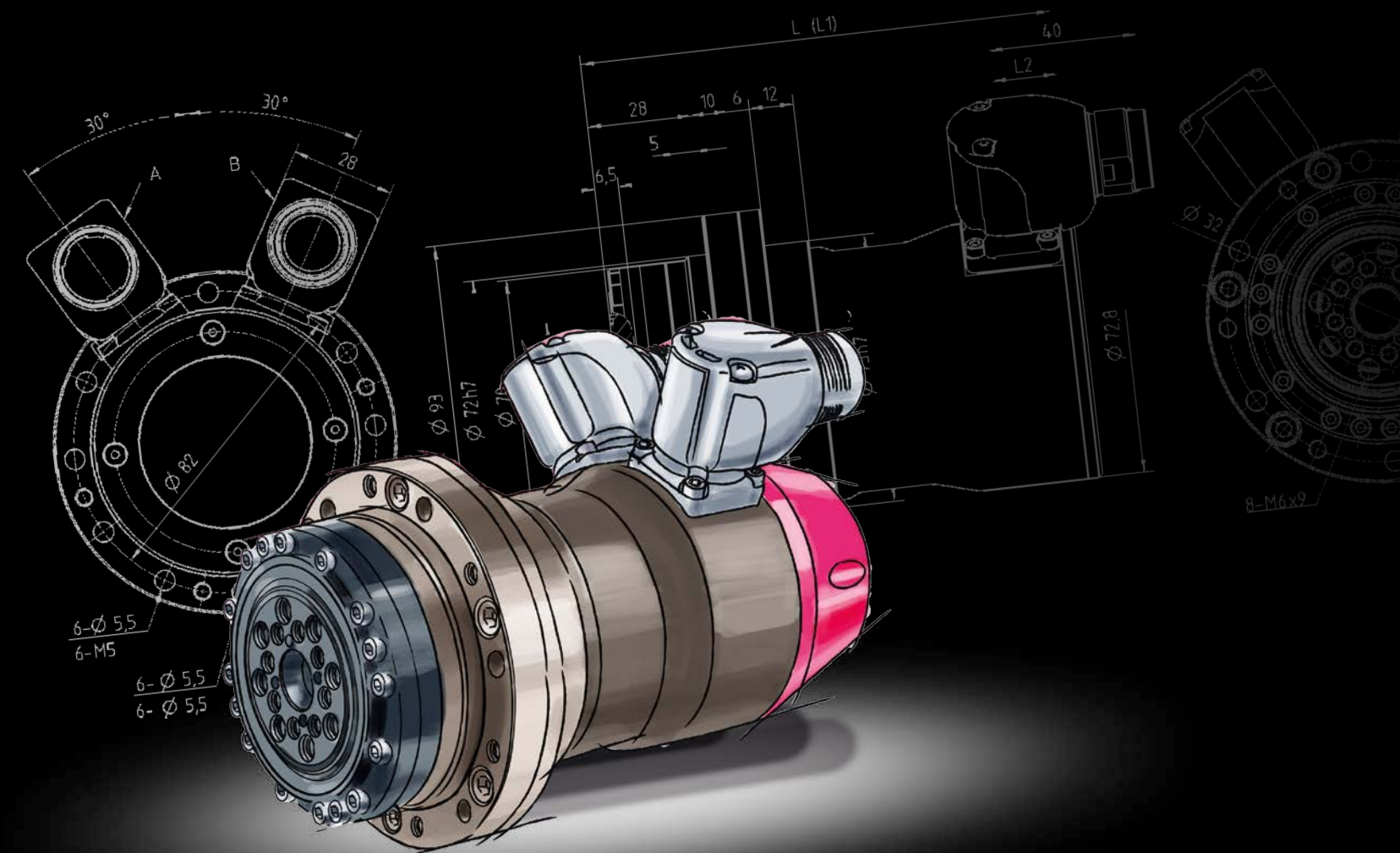
info@harmonicdrive.co.uk
www.harmonicdrive.co.uk

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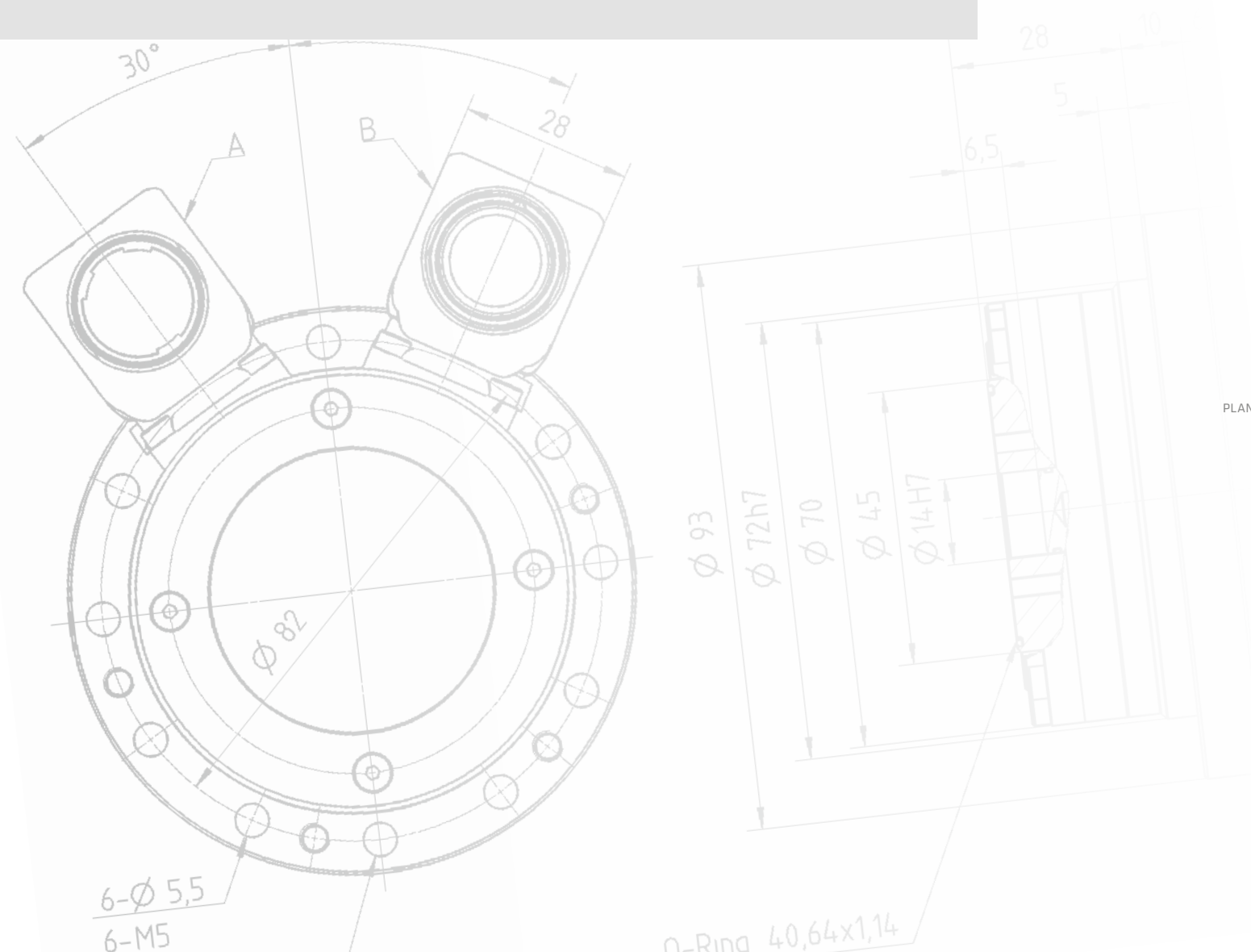
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For all products, in each chapter of the catalogue, you will find Quicklinks which easily leads you to more detailed information on our website. Just simply input the code in the field for the quick link into www.harmonicdrive.co.uk, e.g. 1010 for the CHA product – and you'll go straight to the page you want.

QUICKLINK
www.harmonicdrive.co.uk/1010

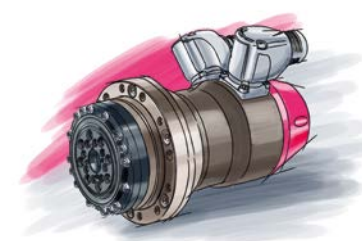
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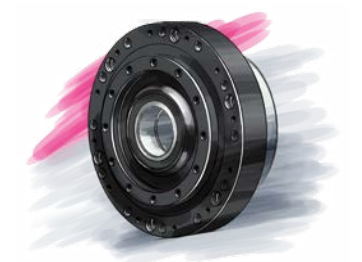


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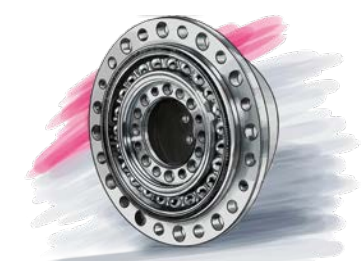
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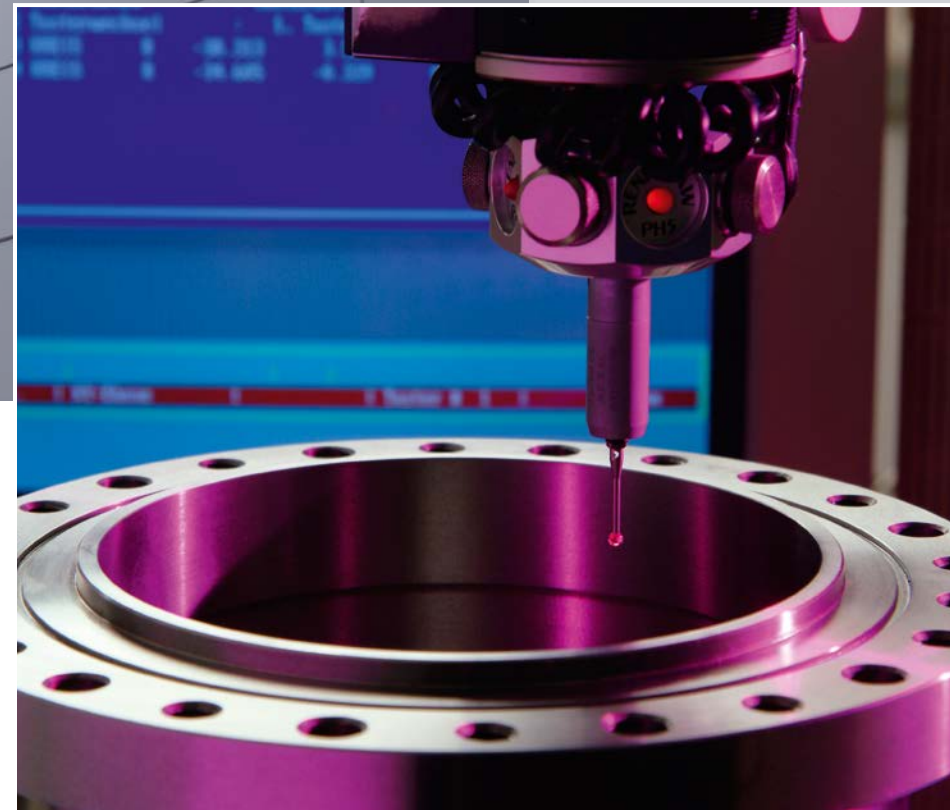


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Harmonic Drive AG and its products are being used in many different industries. Currently we offer drive solutions for use across many application sectors including:

- Robotics and Automation
- Machine Tools
- Semiconductor Technology
- Medical Technology
- Packaging Machines
- Defence Technology
- Aerospace



Our inspiration



Future production

With the expansion of the factory in 2013, the plan for economic production, short delivery times and high quality standards was taking shape. Cooling and heating using geothermal energy and the use of LED technology are contributing to a good environmental balance.

With nearly 400 staff at the Limburg/Lahn site we are confronting all the challenges of drive technology: the development of new technologies, individual application advice and the subsequent customer specific designs right through to production form part of our core competence.

The origins of Harmonic Drive AG lie in the invention of strain wave gearing by Walton Musser. Originally designed for space applications, the particular characteristics of this gear principle, such as zero backlash, compactness and a high single stage gear ratio meant the technology was also of interest to many other application areas.

Since its inception over 40 years ago, Harmonic Drive AG has transformed itself into the company offering the solution of choice for high precision drive technology. Whether for servo drives, direct drives, gears following the strain wave principle or planetary drives: the more demanding the task, the better!

Overall we currently offer more than 23,000 different products, of which more than 80% are customer specific solutions which can be manufactured from a lot size of 1. With this concept we are able to meet both the present and future needs of our customers.

Any questions you may have, please direct them to our staff in sales and in our technical customer services. It does not matter whether you want advice, check the current status of your order, start to use our products or simply purchase spare parts – we are happy to help you.

Harmonic Drive® worldwide

Our products are sold throughout the world. Harmonic Drive AG is the contact for customers in Europe, Asia, Africa and South America.

Quality assured!

With our EN 9100 certification we meet both industrial requirements and even more demanding requests from the aerospace industry and defence technology. We also comply with other requirements, for environmental management and safety at work which are reviewed annually.

Group of companies – we can offer more

Our subsidiaries, Ovalo GmbH and Micromotion GmbH, use the HarmonicDrive® technology in combination with special production technology for large scale production and in the field of micro systems technology.

North America and the Far East are looked after by our partner companies in those areas, with whom we constantly exchange our knowledge. We consider close proximity to our customers is very important and have sales offices throughout Germany as well as our subsidiary companies in UK, France, Spain, Italy, Austria and Switzerland.

In almost all other countries, we can also offer local contact through our representatives.

Manufacture of our own motors and bearings

In order to manufacture even more compact actuators, Harmonic Drive AG developed its own motors which are designed and manufactured in Limburg. This ensures close links between the development of the servo components, construction and production.

Many of our products use a precise and compact high capacity output bearing which can withstand high tilting loads. Here, in order to create greater flexibility and provide the opportunity for more innovative products and designs, we produce our own cross roller bearings.

QUICKLINK www.harmonicdrive.co.uk/0010

Principle of operation

Circular Spline

A solid steel ring with internal teeth

Wave Generator

A special ball bearing, mounted on an elliptical plug with a central hub

Flexspline

A flexible cylinder with external teeth

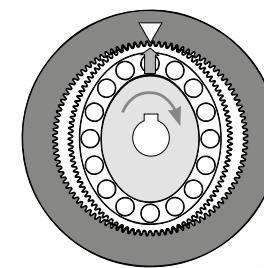
The Harmonic Drive® Gear belongs to the group of the strain wave gears.

The Flexspline is slightly smaller in diameter than the Circular Spline resulting in it having two fewer teeth on its outer circumference. It is held in an elliptical shape by the Wave Generator and its teeth engage with the teeth of the Circular Spline across the major axis of the ellipse.

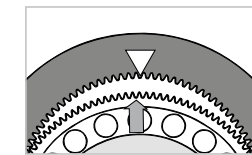
As soon as the Wave Generator starts to rotate clockwise, the zone of tooth engagement travels with the major elliptical axis.

When the Wave Generator has turned through 180 degrees clockwise, the Flexspline has regressed by one tooth relative to the Circular Spline.

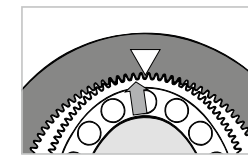
Each turn of the Wave Generator moves the Flexspline two teeth anti-clockwise relative to the Circular Spline.



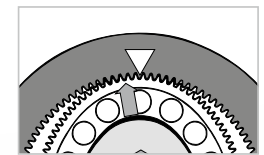
1. Start



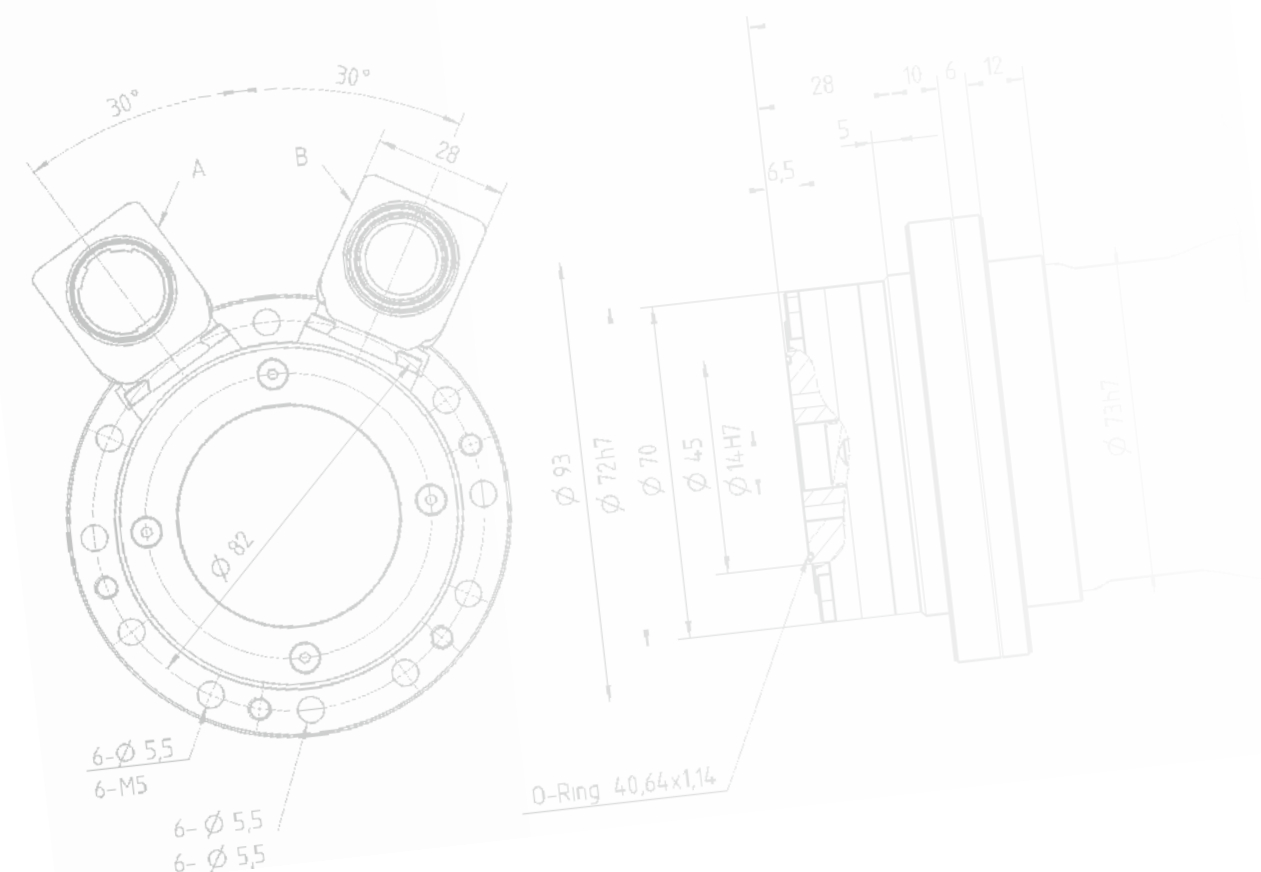
2. 1/4 Input rotation



3. 1/2 Input rotation



4. 3/4 Input rotation



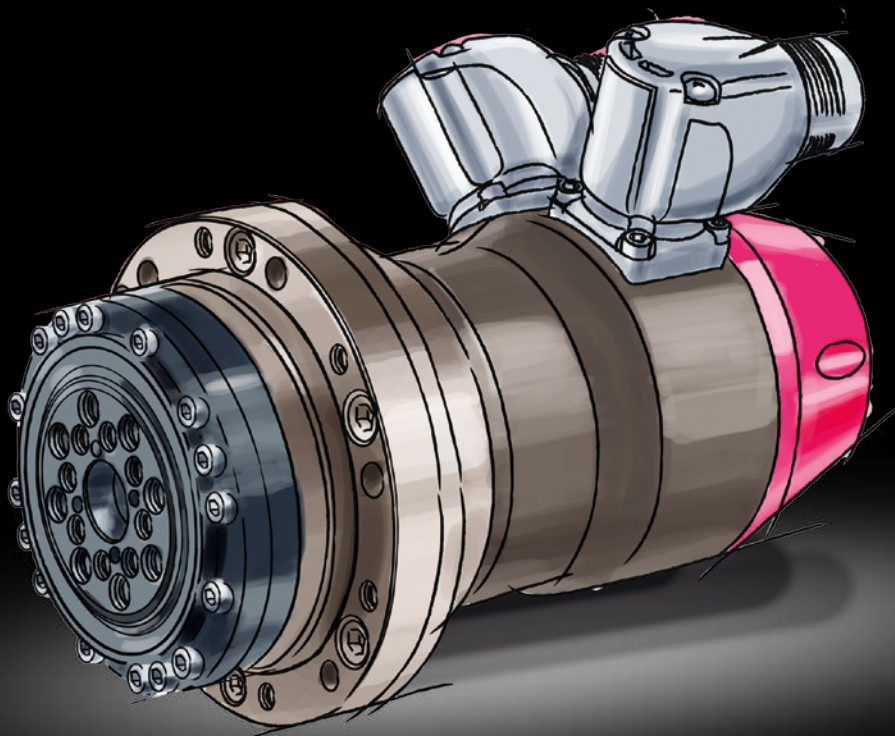
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Product Finder


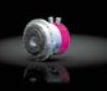




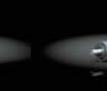








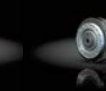

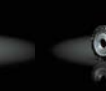

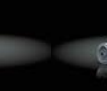
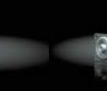

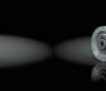
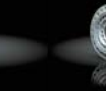
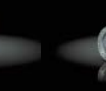
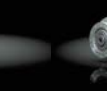

Finding the right product quickly from our huge range of possible options can be a time consuming task. With many years' experience and as part of our technical support service, we are pleased to assist you in your selection to ensure the correct product is specified for your application. However, if to start with you would like to look at the whole range yourself, then we hope the following pages are of interest.

The most important features and advantages are defined for each product: the extent to which these are significant for a product is marked out in magenta coloured circles. Using these optical markers you can very quickly filter out the important features for your application. The bar below will also lead you to the most frequently used areas of application for the products.



Your requirements - Our solution

perfect optimal good

Servo Products									Units, Gearboxes, Planetary Gears															Component Sets					
																													
CHA	FHA-C	FHA-C Mini	LynxDrive®	FPA	RSF Mini	PMA	CHM	TorkDrive®	CobaltLine®-CPM CPU-M	CobaltLine®-CPH CPU-H	CobaltLine®-CPS CPU-S	CobaltLine®-2UH HFUC-2UH	CSG-2UH	HFUS-2UH	HFUS-250	HFUS-2SH	CSD-2UH	CSD-2UF	SHD-2SH	PMG	CSF Mini	HPG HPGP	CobaltLine®-2A HFUC-2A	CPL-2A	CSG-2A	HFUS-2A	CSD-2A		

1. Excellent lifetime precision	• Positioning • Stable machine characteristics	• Reduced material use • Higher product quality • Less waste • Consistent quality • High availability • Reduced Total Cost of Ownership • Reduced maintenance costs																																
2. Compact, lightweight design	• Lightweight design • Low profile	• Reduced material use • Greater energy efficiency • Lower production costs • Small machine footprint																																
3. Easy to customise	• Application specific design	• Optimal design solution • Ease of integration																																
4. Direct motor connection	• Compact motor connection • Use of standard servo motors	• Simplified construction																																
5. Large hollow shaft	• To feed through supply lines or services for additional axes	• Simplified construction • Increased operating reliability																																
6. Integrated high capacity output bearing	• Quick, easy handling of heavy payloads	• Optimal design solution • Easy load connection • Low manufacturing and installation costs																																
7. High dynamics	• Shorter cycle times	• Increased machine throughput • Increased productivity																																
8. Corrosion protection	• Use in harsh and demanding environmental conditions • Longevity	• Reduced Total Cost of Ownership • High availability																																
9. Variable feedback systems	• Use of commercially available servo controllers • Best value for money	• Flexible control configuration																																
10. Servo controller available	• Pre-configured drive solution from a single source	• Reduced set up time • Increased operating reliability • Shorter time to market																																
11. Third party controller compatibility	• Use of commercially available servo controllers	• Flexible control configuration																																

Branch



An overview of industry sectors

It is always fascinating to find out the areas where Harmonic Drive® Servo Products and Gears are used. On this page you will find a selection of the industries in which we are currently represented.

Do contact us with your needs – together we can find the appropriate solution.



Robotics and Automation



Machine tools



Semiconductor technology



Medical



Packaging machines

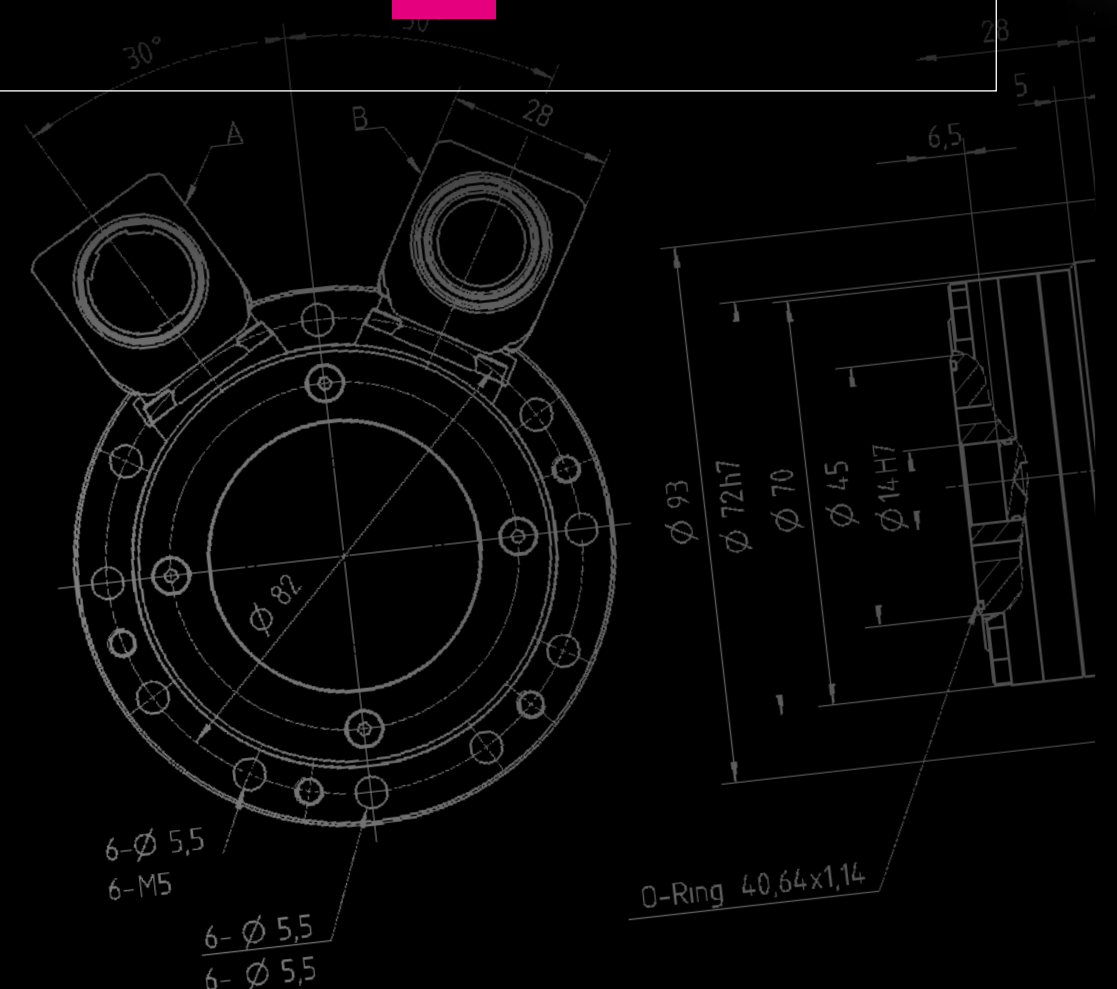
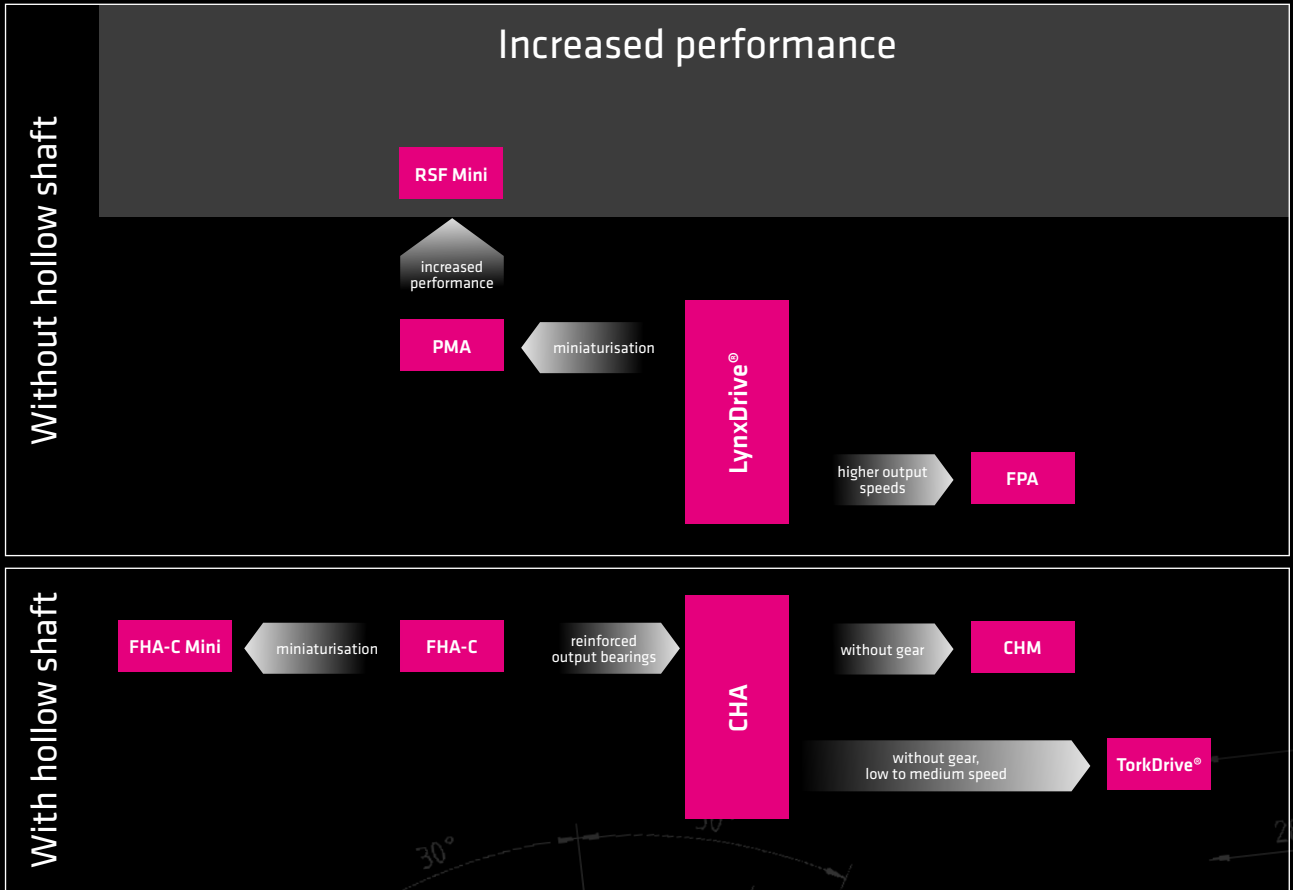


Defence and Homeland security

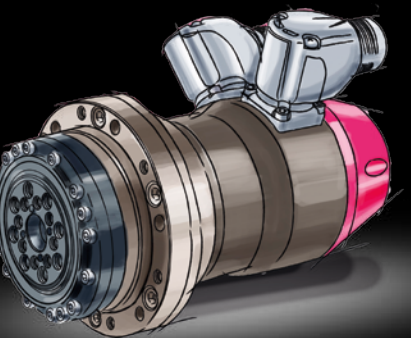


Aerospace

Servo Products



...just move it!



Do you place special emphasis on compactness, torque capacity and precision?
Furthermore, if you would like a complete drive solution from a single source, with perfectly matched components and without any additional construction time, then with the Harmonic Drive® Servo Actuators you have found the correct product. The combination of highly dynamic compact servo motors, precision Harmonic Drive® Component Sets and integral high load capacity, tilt resistant output bearings demonstrate their exceptional performance. If required, we can also supply the matching servo controllers.

However, a gear drive is not always the best solution for all applications. If precision and high torque but relatively low to medium speed are required, then we can offer a practical alternative with the Harmonic Drive® Direct Drives - hollow shaft included!



Would you like to use your own motor?
The Units and Gearboxes are the best choice – whether for procurement reasons or because of particular interfaces. Harmonic Drive® Units and Gearboxes are the combination of the precise Harmonic Drive® Component Sets, consisting of the three components Circular Spline, Flexspline and Wave Generator as well as integral high load capacity tilt resistant output bearings for handling heavy loads.

At higher speeds or with lower gear ratios than is possible with Harmonic Drive® Gears, there is still often the need for highest precision. Here, our Harmonic Planetary Gears can provide the answer. By utilising a special design with flexible ring gear in the final stage, we can guarantee constant high precision over a lifetime – we call this Permanent Precision®!



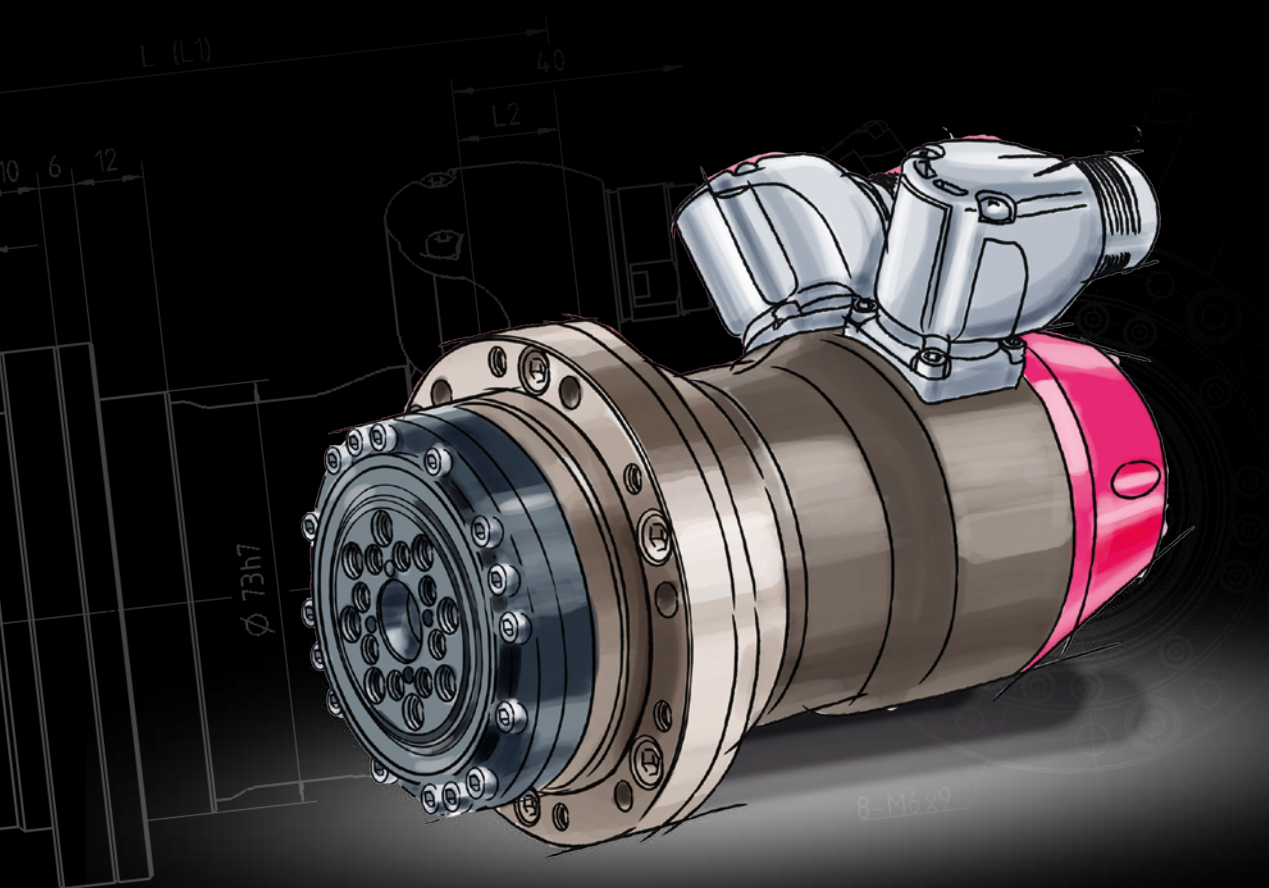
Quality Proven!
It is no wonder that the Harmonic Drive® Component Sets with their unique operating principle and constructional variety have already proven their worth as the ideal drive mechanism in numerous machines across the world. The extremely compact Component Sets consist of the three components namely the Circular Spline, Flexspline and Wave Generator. They offer the maximum freedom of design integration for inclusion in your design, offering you unsurpassed flexibility on both the input and output side. It would be very difficult to find this range of design options and possible variants with other gear systems. The compact design also guarantees to save you space and weight.

Servo Products

Do you place special emphasis on compactness, torque capacity and precision?

Furthermore, if you would like a complete drive solution from a single source, with perfectly matched components and without any additional construction time, then with the Harmonic Drive® Servo Actuators you have found the correct product. The combination of highly dynamic compact servo motors, precision Harmonic Drive® Component Sets and integral high load capacity, tilt resistant output bearings demonstrate their exceptional performance. If required, we can also supply the matching servo controllers.

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...just move it!

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C o n t e n t s
C o n t e n t s



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CHA | FHA-C | FHA-C Mini | LynxDrive® | FPA | RSF Mini | PMA | CHM | TorkDrive® | YukonDrive® | HA-680

Medical technology It is not only top footballers who want to be fit again quickly after an operation, and today in most cases, recovery is being supported by more technologies which permit targeted training of the body parts affected. The secret of success is programmable movement sequences which can be implemented via a precision actuator. Reliable and precise drive technology is also a fundamental design requirement in the field of surgery.

Semiconductor Moore's Law, which predicts a doubling of the performance of electronic components every 18 months, remains valid. What is innovative today may tomorrow be obsolete and uneconomical. Due to constant development, Harmonic Drive AG products can keep pace with these demands: whether this is to do with miniaturising, clean room compatibility or the field of greater reliability ... See more on page 126.

Your requirements - Our solution

Features	CHA	FHA-C	FHA-C Mini	Lynx Drive®	FPA	RSF Mini	PMA	CHM	Tork Drive®	Yukon Drive®	HA-680
Excellent lifetime precision	●	●	●	●	●	●	●	●	●		
Compact, lightweight design	●	●	●	●	●	●	●	●	●	●	●
Easy to customise	●	●	●	●	●	●	●	●	●		
Large hollow shaft	●	●	●					●	●		
Integrated high capacity output bearing	●	●	●	●	●			●	●		
High dynamics	●	●	●	●	●	●	●	●	●		
Corrosion protection	●	●	●	●	●	●	●	●			
Variable feedback system	●	●	●	●	●			●			
Servo controller available	●	●	●	●	●	●		●	●		
Third party controller compatibility	●	●	●	●	●	●	●	●	●		
Various field bus systems available										●	●
Integrated STO safety function										●	
Optimised for RSF Mini and FHA-C Mini											●

● perfect ● optimal ● good



CHA | FHA-C | FHA-C Mini | LynxDrive® | FPA | RSF Mini | PMA | CHM | TorkDrive® | YukonDrive® | HA-680

Largest hollow shaft with precision output bearing

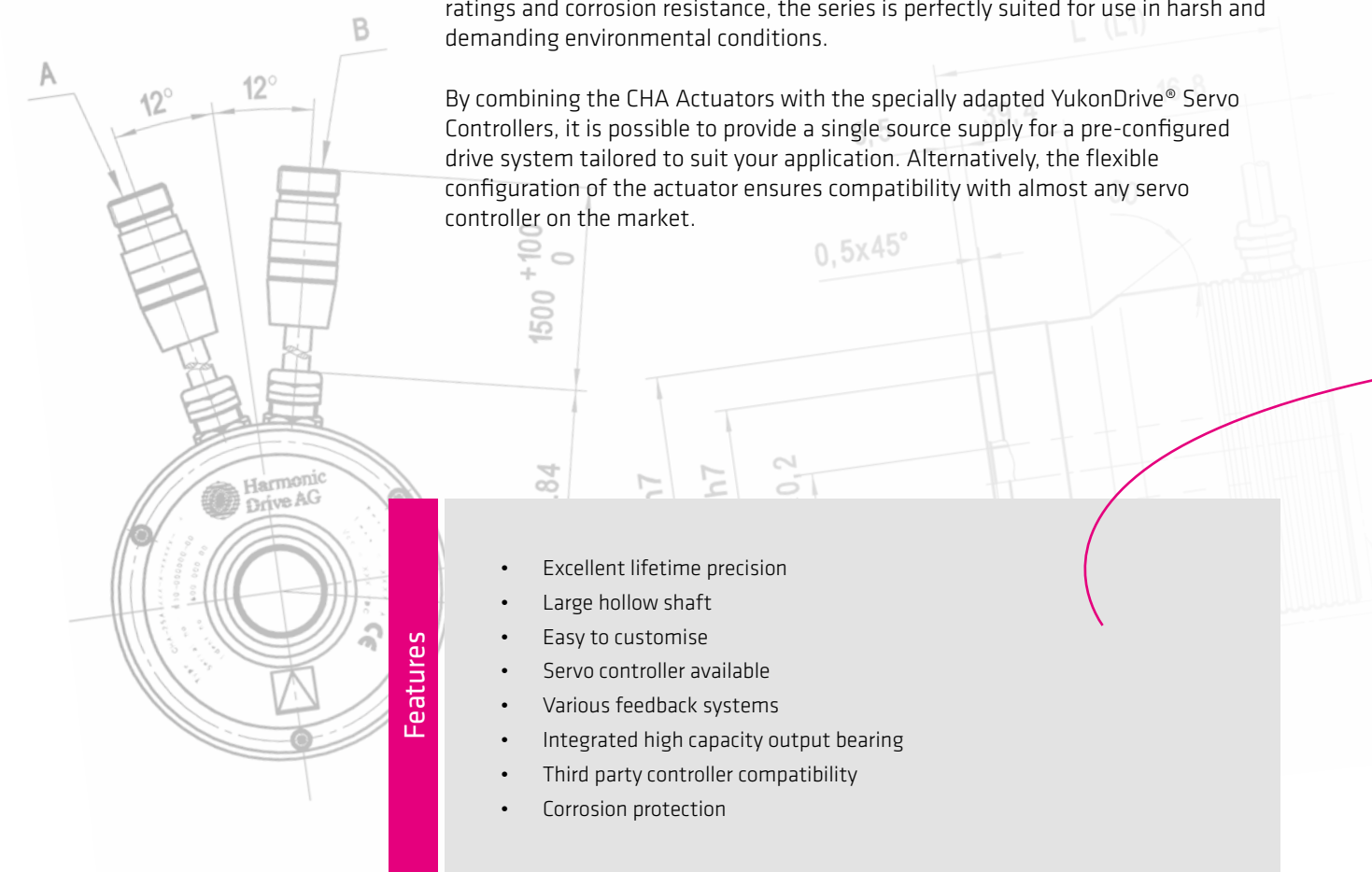
CHA Series Hollow Shaft Servo Actuators combine a synchronous servo motor, Unit from the CPU-H Series, feedback sensor and a high capacity precision output bearing. Available in eight sizes with gear ratios between 30 and 160:1, the actuators can provide maximum torques from 8 to 1840 Nm. The output bearing with high tilting capacity often allows direct attachment of heavy payloads without the need for further support, thereby providing simple and space saving design installations.

Harmonic Drive® Servo Actuators are the perfect combination of highly dynamic compact servo motors, precision Harmonic Drive® Component Sets and integral high load capacity, tilt resistant output bearings.

To adapt to your specific application, the CHA Series offers many possible combinations when selecting the motor winding, motor feedback, brake, various sensors and cable as well as connector options.

The integrated hollow shaft can be used to feed through supply lines or services for additional axes, enabling space saving designs with minimal installation dimensions required. With a reinforced output bearing offering maximum tilting rigidity, the actuators can easily absorb and accurately guide heavy payloads. The accurate positioning of the actuator ensures stable machine characteristics, increased operating reliability and consistent quality. With high protection ratings and corrosion resistance, the series is perfectly suited for use in harsh and demanding environmental conditions.

By combining the CHA Actuators with the specially adapted YukonDrive® Servo Controllers, it is possible to provide a single source supply for a pre-configured drive system tailored to suit your application. Alternatively, the flexible configuration of the actuator ensures compatibility with almost any servo controller on the market.



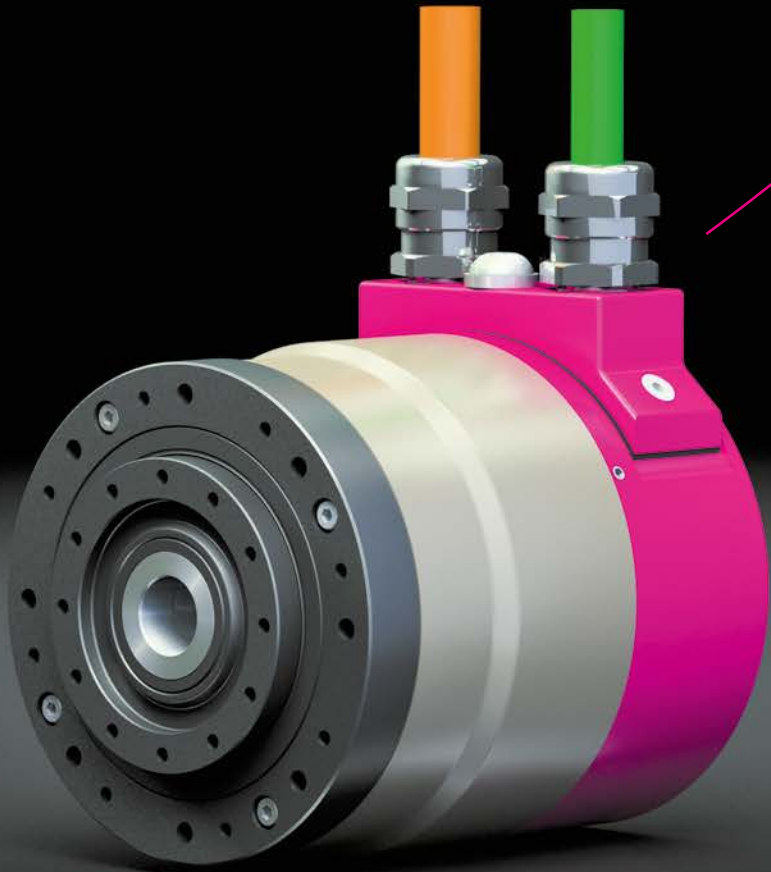
Features

- Excellent lifetime precision
- Large hollow shaft
- Easy to customise
- Servo controller available
- Various feedback systems
- Integrated high capacity output bearing
- Third party controller compatibility
- Corrosion protection

Optimised for your applications:

- | | |
|---|---|
| <ul style="list-style-type: none"> • Reduced material use • Higher product quality • Less waste • Consistent quality • High availability • Reduced Total Cost of Ownership • Reduced maintenance costs | <ul style="list-style-type: none"> • Optimal design solution • Increased operating reliability • Reduced set up time • Shorter time to market • Flexible control configuration • Easy load connection • Low manufacturing and installation costs |
|---|---|

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/1010

CHA

Ordering code

Table 24.1

Series	Size Version	Ratio						Motor winding and connector configuration	Motor feedback	Brake	Option 1	Option 2	Special design			
CHA	14A	30	50	80	100			E ¹⁾ H L N	C1024 S1024 M1024 M512P RES D2048 M128S	B	Sensor	Cable/ Connec- tor	According to customer requirements			
	17A	30	50	80	100	120	160									
	20A	30	50	80	100	120	160									
	25A	30	50	80	100	120	160									
	32A	30	50	80	100	120	160									
	40A		50	80	100	120	160									
	50A		50	80	100	120	160									
	58A		50	80	100	120	160									
Ordering code																
CHA	-	20A	-	100	-	H	-	C1024	-	B	-	EC	-	K	-	SP

Variations in **bold print** are available at short notice, subject to prior sale.
¹⁾ Preparation

Table 24.2

Motor winding and connector configuration		
Size Version	Ordering code	Maximum DC bus voltage
14A	E ¹⁾	48 VDC
17A		
14A	H, L, N	680 VDC
17A		
20A		
25A		
32A		
40A		
50A		
58A		

¹⁾ Preparation

Table 24.4

Motor feedback		
Ordering code	Type	Protocol
C1024	Incremental	–
S1024	Single turn absolute	HIPERFACE®
M1024	Multi-turn absolute	
M512P		EnDat®
RES	Resolver	
D2048	Incremental	
M128S	Multi-turn absolute	SSI

Table 24.3

Connector configuration					
Ordering code	Motor feedback	Motor	Motor feedback	Cable outlet	Connector
H	C1024	6 pin (M23)	17 pin (M23)	x	x
H	M512P				
H	M128S			x	
H	RES	Without	12 pin (M23)	x	
H	S1024			x	
H	M1024		Without	x	
L	S1024			x	
L	M1024	8 pin (M23)	17 pin (M23)	x	
N	M128S	8 pin (M17)		x	
N	RES		17 pin (M17)	x	
N	D2048			x	
E	RES	8 pin (M17)			x
E	D2014		17 pin (M17)		x
E	M128S				x

Table 24.5

Option 1	
Ordering code	Description
EC	Single turn absolute EnDat® Encoder system at the gear output

Table 24.6

Option 2	
Ordering code	Description
K	Cable outlet axial
R	Connector axial (only M512P)
S	Connector radial (only M512P)
-	Standard (cable outlet radial)

Combinations

Table 25.1

Size		14A	17A	20A	25A	32A	40A	50A	58A
Ratio	30	●	●	●	●	●	-	-	-
	50	●	●	●	●	●	●	●	●
	80	●	●	●	●	●	●	●	●
	100	●	●	●	●	●	●	●	●
	120	-	●	●	●	●	●	●	●
	160	-	-	●	●	●	●	●	●
Motor winding and connector configuration	E	○	○	-	-	-	-	-	-
	H	●	●	●	●	●	●	●	●
	L	-	-	●	●	●	●	●	●
	N	●	●	-	-	-	-	-	-
Motor feedback	C1024	-	-	●	●	●	●	●	●
	S1024	-	-	●	●	●	●	●	●
	M1024	-	-	●	●	●	●	●	●
	M512P	-	-	●	●	●	●	●	●
	RES	●	●	○	○	○	○	○	○
	D2048	●	●	-	-	-	-	-	-
	M128S	●	●	-	-	-	-	-	-
Brake	B	●	●	●	●	●	●	●	●
Option 1 (Sensor)	EC	-	-	●	●	●	●	●	●
Option 2 (Cable/Connector)	K	○ ¹⁾	○ ¹⁾	○	○	○	○	○	○
	R	-	-	Only in conjunction with M512P					
	S	-	-						

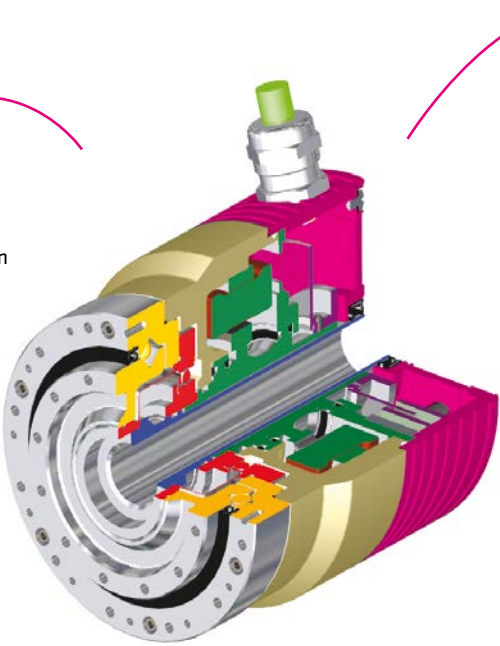
● available ○ on request - not available ¹⁾ Only for resolver and with increased length

Gear Component Set

- Zero backlash
- Hollow shaft
- Transmission accuracy better than 1 arcmin
- Repeatability better than ±6 arcsec

Output bearing

- High load capacity
- Tilt resistant
- Excellent running characteristics



Motor feedback

- Incremental encoder
- Single- or multi-turn absolute encoder
- EnDat® multi-turn encoder
- Resolver

AC Hollow shaft motor

- Sine commutated hollow shaft AC motor
- Multiple motor winding options
- Winding temperature monitoring with temperature sensor
- Maintenance free

Technical data

Table 26.1

	Unit	CHA-14A				CHA-17A				
Motor feedback		RES / D2048 / M128S				RES / D2048 / M128S				
Ratio	i []	30	50	80	100	30	50	80	100	120
Maximum output torque	T _{max} [Nm]	9	18	23	28	16	34	43	54	54
Maximum output speed	n _{max} [rpm]	283	170	106	85	243	146	91	73	61
Continuous stall torque	T ₀ [Nm]	6.8	6.9	11	11	12	26	27	39	39
Moment of inertia with resolver RES without Brake	J _{out} [kgm²]	0.031	0.087	0.222	0.347	0.095	0.264	0.676	1.056	1.520
Moment of inertia with resolver RES and brake	J _{out} [kgm²]	0.039	0.109	0.280	0.438	0.104	0.289	0.741	1.158	1.667
Moment of inertia with encoder D2048 without brake	J _{out} [kgm²]	0.020	0.056	0.142	0.223	0.047	0.131	0.335	0.523	0.753
Moment of inertia with encoder D2048 and brake	J _{out} [kgm²]	0.028	0.078	0.201	0.314	0.056	0.156	0.400	0.625	0.900
Moment of inertia with encoder M128S without brake	J _{out} [kgm²]	0.052	0.154	0.371	0.580	0.078	0.218	0.557	0.871	1.254
Moment of inertia with encoder M128S and brake	J _{out} [kgm²]	0.060	0.168	0.429	0.671	0.088	0.243	0.623	0.973	1.401
Brake holding torque	T _H [Nm]	9	18	23	28	15	25	40	50	54
Weight without brake	m [kg]	ca. 2.0				ca. 3.0				
Weight with brake	m [kg]	ca. 2.1				ca. 3.2				
Hollow shaft diameter	d _H [mm]	12				16				
Transmission accuracy	[arcmin]	< 2	< 1.5	< 1.5		< 2	< 1.5	< 1.5		
Lost Motion	[arcmin]	< 1				< 1				
Torsional stiffness	K ₃ [10³ Nm/rad]	3.4	5.7	7.1		6.7	13	16		
Ambient operating temperature	[°C]	0 ... 40				0 ... 40				
Output bearing										
Dynamic radial load	F _{R dyn (max)} [N]	1450				2300				
Dynamic axial load	F _{A dyn (max)} [N]	2880				4600				
Dynamic tilting moment	M _{dyn (max)} [Nm]	73				114				

Table 26.2

	Unit	CHA-20A						CHA-25A					
Motor feedback		C1024 / S1024 / M1024						C1024 / S1024 / M1024					
Ratio	i []	30	50	80	100	120	160	30	50	80	100	120	160
Maximum output torque	T _{max} [Nm]	27	56	74	82	87	92	50	98	137	157	167	176
Maximum output speed	n _{max} [rpm]	200	120	75	60	50	38	187	112	70	56	47	35
Continuous stall torque	T ₀ [Nm]	19	32	47	49	49	49	38	55	87	108	108	108
Moment of inertia without brake	J _{out} [kgm²]	0.10	0.28	0.72	1.12	1.61	2.86	0.29	0.8	2.0	3.2	4,6	8.1
Moment of inertia with brake	J _{out} [kgm²]	0.13	0.35	0.89	1.39	2.0	3.5	0.35	0.97	2.5	3.9	5.6	9.9
Brake holding torque	T _H [Nm]	27	45	72	82	87	92	54	90	137	157	167	176
Weight without brake	m [kg]	3.2						4.9					
Weight with brake	m [kg]	3.9						6.1					
Hollow shaft diameter	d _H [mm]	18						27					
Transmission accuracy	[arcmin]	< 1.5	< 1	< 0.8				< 1.5	< 1	< 0.8			
Lost Motion	[arcmin]	< 1						< 1					
Torsional stiffness	K ₃ [10³ Nm/rad]	11	23	29				21	44	57			
Ambient operating temperature	[°C]	0 ... 40						0 ... 40					
Output bearing													
Dynamic radial load	F _{R dyn (max)} [N]	8600						12700					
Dynamic axial load	F _{A dyn (max)} [N]	15800						19200					
Dynamic tilting moment	M _{dyn (max)} [Nm]	172						254					

Illustration 27.1

CHA-14A [mm]

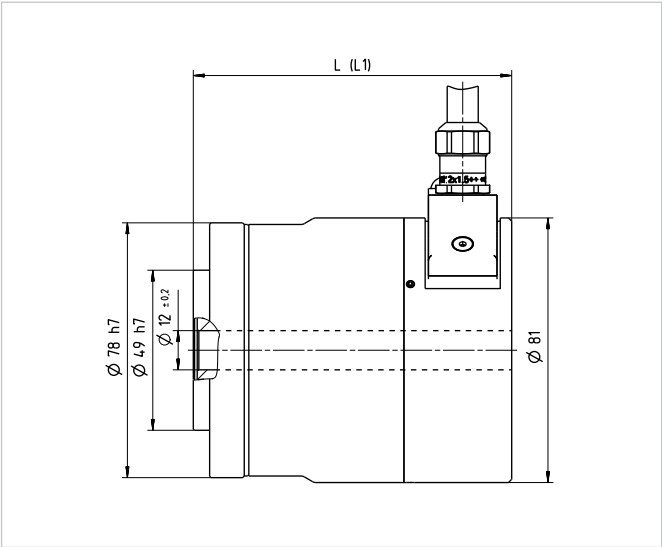


Illustration 27.2

CHA-17A [mm]

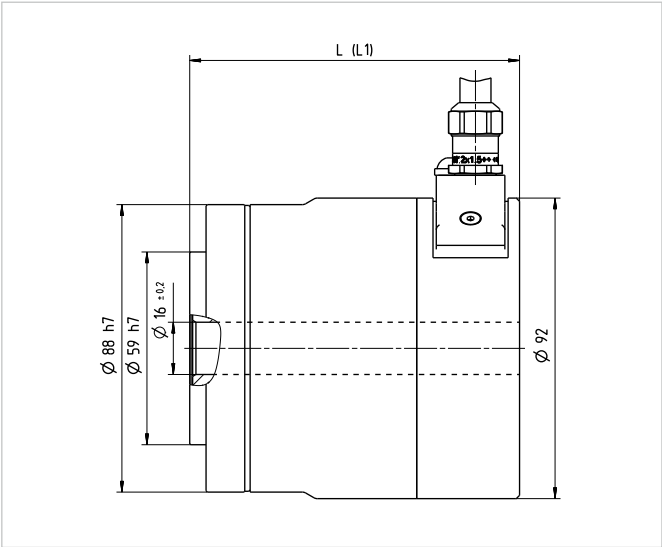


Table 27.3

	Unit	CHA-14A	CHA-17A
Motor feedback		RES / D2048 / M128S	RES / D2048 / M128S
Length (without brake)	L [mm]	97.5	101
Length (with brake)	L1 [mm]	120.6	123

Illustration 27.4

CHA-20A [mm]

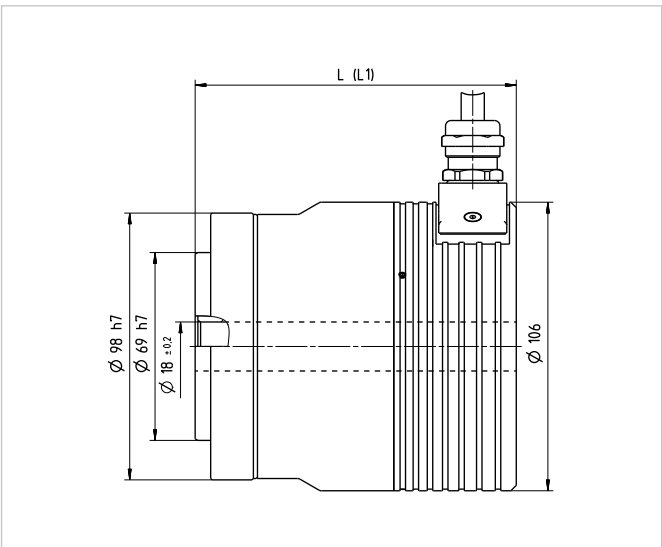


Illustration 27.5

CHA-25A [mm]

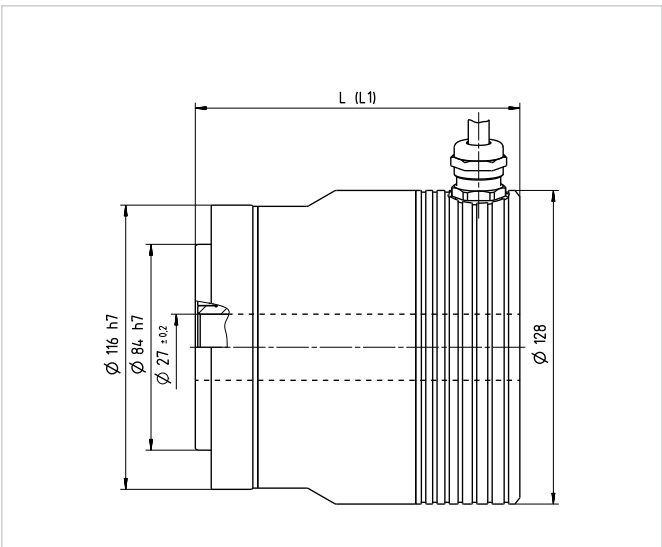


Table 27.6

	Unit	CHA-20A	CHA-25A
Motor feedback		C1024 / S1024 / M1024	C1024 / S1024 / M1024
Length (without brake)	L [mm]	118	132.5
Length (with brake)	L1 [mm]	138	160

Technical data

Table 28.1

	Unit	CHA-32A						CHA-40A				
Motor feedback		C1024 / S1024 / M1024						C1024 / S1024 / M1024				
Ratio	i []	30	50	80	100	120	160	50	80	100	120	160
Maximum output torque	T _{max} [Nm]	100	216	304	333	353	372	402	519	568	617	647
Maximum output speed	n _{max} [rpm]	160	96	60	48	40	30	80	50	40	33	25
Continuous stall torque	T ₀ [Nm]	44	71	119	154	179	216	125	208	260	314	420
Moment of inertia without brake	J _{out} [kgm²]	0.44	1.22	3.1	4.9	7.1	12.5	3.1	7.9	12.3	17.7	31.4
Moment of inertia with brake	J _{out} [kgm²]	0.53	1.47	3.8	5.9	8.5	15.0	3.6	9.1	14.2	20.4	36.3
Brake holding torque	T _H [Nm]	54	90	144	180	216	288	225	360	450	540	647
Weight without brake	m [kg]	6.6						11.7				
Weight with brake	m [kg]	7.8						13.8				
Hollow shaft diameter	d _H [mm]	32						39				
Transmission accuracy	[arcmin]	< 1.5	< 1	< 0.8				< 0.7	< 0.5			
Lost Motion	[arcmin]	< 1						< 1				
Torsional stiffness	K ₃ [10³ Nm/rad]	49	98	120				180	230			
Ambient operating temperature	[°C]	0 ... 40						0 ... 40				
Output bearing												
Dynamic radial load	F _{R dyn (max)} [N]	14600						27500				
Dynamic axial load	F _{A dyn (max)} [N]	22300						42000				
Dynamic tilting moment	M _{dyn (max)} [Nm]	578						886				

Table 28.2

	Unit	CHA-50A					CHA-58A				
Motor feedback		C1024 / S1024 / M1024					C1024 / S1024 / M1024				
Ratio	i []	50	80	100	120	160	50	80	100	120	160
Maximum output torque	T _{max} [Nm]	715	941	980	1080	1180	1020	1480	1590	1720	1840
Maximum output speed	n _{max} [rpm]	70	44	35	30	22	60	38	30	25	19
Continuous stall torque	T ₀ [Nm]	194	363	456	550	736	280	532	670	805	1080
Moment of inertia without brake	J _{out} [kgm²]	6.62	16.9	26.5	38.1	67.8	11.6	29.8	46.6	67.1	119
Moment of inertia with brake	J _{out} [kgm²]	7.30	18.7	29.2	42.0	74.7	11.8	30.3	47.3	68.1	121
Brake holding torque	T _H [Nm]	225	360	450	540	720	450	720	900	1080	1440
Weight without brake	m [kg]	19.9					27.2				
Weight with brake	m [kg]	23.5					31				
Hollow shaft diameter	d _H [mm]	45					45				
Transmission accuracy	[arcmin]	< 0.7	< 0.5				< 0.7	< 0.5			
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [10³ Nm/rad]	340	440				540	710			
Ambient operating temperature	[°C]	0 ... 40					0 ... 40				
Output bearing											
Dynamic radial load	F _{R dyn (max)} [N]	37300					38400				
Dynamic axial load	F _{A dyn (max)} [N]	56100					57700				
Dynamic tilting moment	M _{dyn (max)} [Nm]	1558					2222				

Illustration 29.1

CHA-32A [mm]

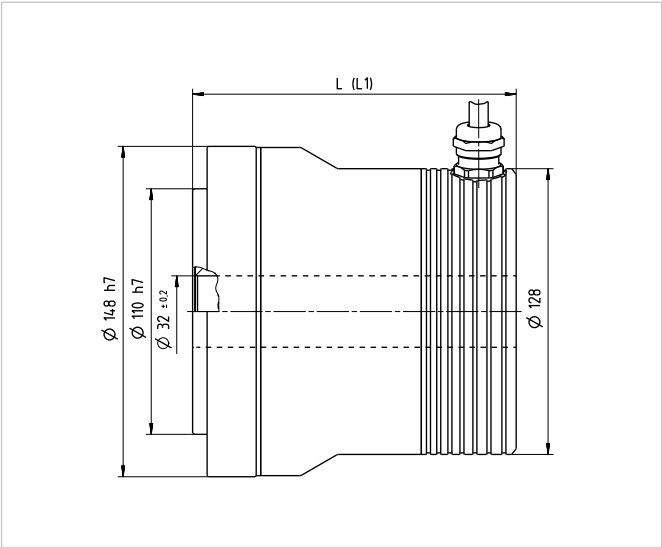


Illustration 29.2

CHA-40A [mm]

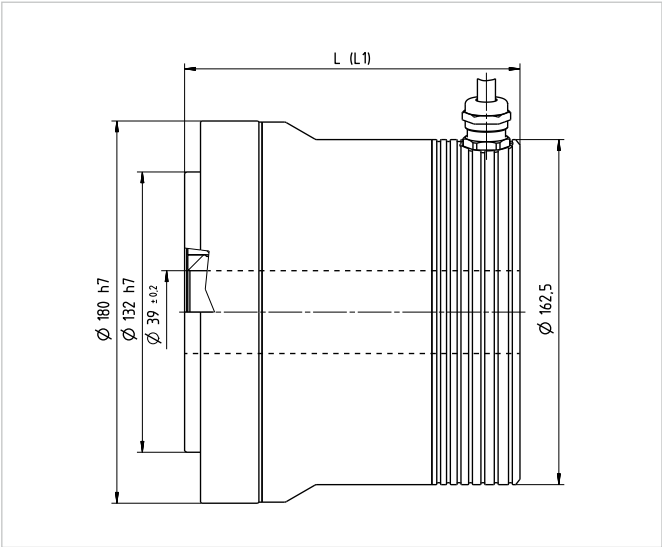


Table 29.3

	Unit	CHA-32A	CHA-40A
Motor feedback		C1024 / S1024 / M1024	C1024 / S1024 / M1024
Length (without brake)	L [mm]	145	158
Length (with brake)	L1 [mm]	172.5	177

Illustration 29.4

CHA-50A [mm]

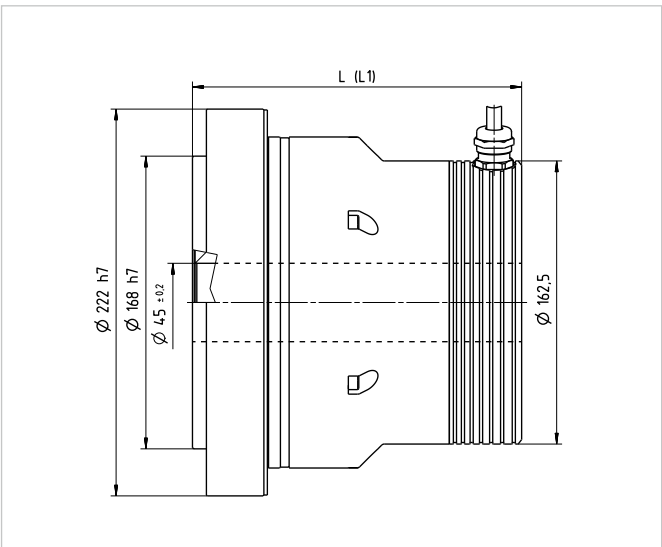


Illustration 29.5

CHA-58A [mm]

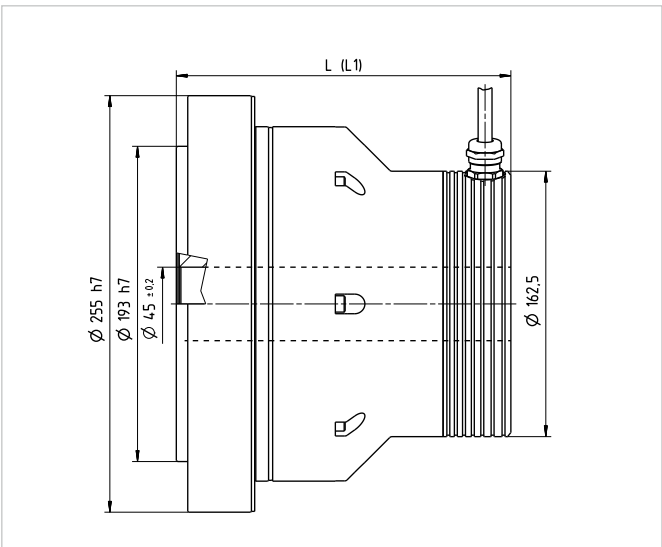


Table 29.6

	Unit	CHA-50A	CHA-58A
Motor feedback		C1024 / S1024 / M1024	C1024 / S1024 / M1024
Length (without brake)	L [mm]	189	205
Length (with brake)	L1 [mm]	208	226

Technical data

Table 30.1

	Unit	CHA-20A						CHA-25A					
Motor feedback		M512P						M512P					
Ratio	i []	30	50	80	100	120	160	30	50	80	100	120	160
Maximum output torque	T _{max} [Nm]	27	56	74	82	87	92	50	98	137	157	167	176
Maximum output speed	n _{max} [rpm]	200	120	75	60	50	38	187	112	70	56	47	35
Continuous stall torque	T ₀ [Nm]	19	32	47	49	49	49	38	55	87	108	108	108
Moment of inertia without brake	J _{out} [kgm²]	0.21	0.58	1.48	2.32	3.3	5.9	0.39	1.0	2.8	4.4	6.3	11.2
Moment of inertia with brake	J _{out} [kgm²]	0.23	0.65	1.65	2.60	3.7	6.6	0.46	1.27	3.2	5.1	7.3	13
Brake holding torque	T _H [Nm]	27	45	72	82	87	92	54	90	137	157	167	176
Weight without brake	m [kg]	4.2						5.9					
Weight with brake	m [kg]	4.9						7.1					
Hollow shaft diameter	d _H [mm]	18						27					
Transmission accuracy	[arcmin]	< 1.5	< 1	< 0.8				< 1.5	< 1	< 0.8			
Lost Motion	[arcmin]	< 1						< 1					
Torsional stiffness	K ₃ [10³ Nm/rad]	11	23	29				21	44	57			
Ambient operating temperature	[°C]	0 ... 40						0 ... 40					
Output bearing													
Dynamic radial load	F _{R dyn (max)} [N]	8600						12700					
Dynamic axial load	F _{A dyn (max)} [N]	15800						19200					
Dynamic tilting moment	M _{dyn (max)} [Nm]	172						254					

Table 30.2

	Unit	CHA-32A						CHA-40A				
Motor feedback		M512P						M512P				
Ratio	i []	30	50	80	100	120	160	50	80	100	120	160
Maximum output torque	T _{max} [Nm]	100	216	304	333	353	372	402	519	568	617	647
Maximum output speed	n _{max} [rpm]	160	96	60	48	40	30	80	50	40	33	25
Continuous stall torque	T _O [Nm]	44	71	119	154	179	216	125	208	260	314	420
Moment of inertia without brake	J _{out} [kgm²]	0.55	1.5	3.9	6.1	8.7	15.6	3.4	8.6	13.5	19.4	34.6
Moment of inertia with brake	J _{out} [kgm²]	0.64	1.77	4.5	7.1	10.2	18.2	3.9	9.8	15.4	22.2	39.4
Brake holding torque	T _H [Nm]	54	90	144	180	216	288	225	360	450	540	647
Weight without brake	m [kg]	7.6						12.7				
Weight with brake	m [kg]	8.8						14.8				
Hollow shaft diameter	d _H [mm]	32						39				
Transmission accuracy	[arcmin]	< 1.5	< 1	< 0.8				< 0.7	< 0.5			
Lost Motion	[arcmin]	< 1						< 1				
Torsional stiffness	K ₃ [10³ Nm/rad]	49	98	120				180	230			
Ambient operating temperature	[°C]	0 ... 40						0 ... 40				
Output bearing												
Dynamic radial load	F _{R dyn (max)} [N]	14600						27500				
Dynamic axial load	F _{A dyn (max)} [N]	22300						42000				
Dynamic tilting moment	M _{dyn (max)} [Nm]	578						886				

Illustration 31.1

CHA-20A-M512P [mm]

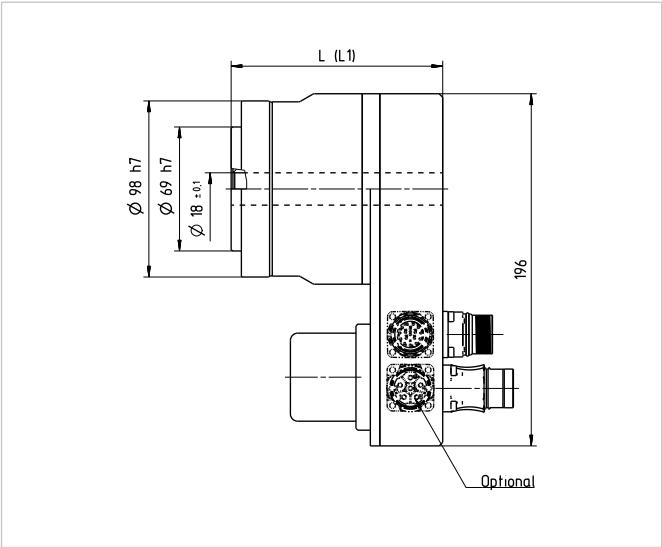


Illustration 31.2

CHA-25A-M512P [mm]

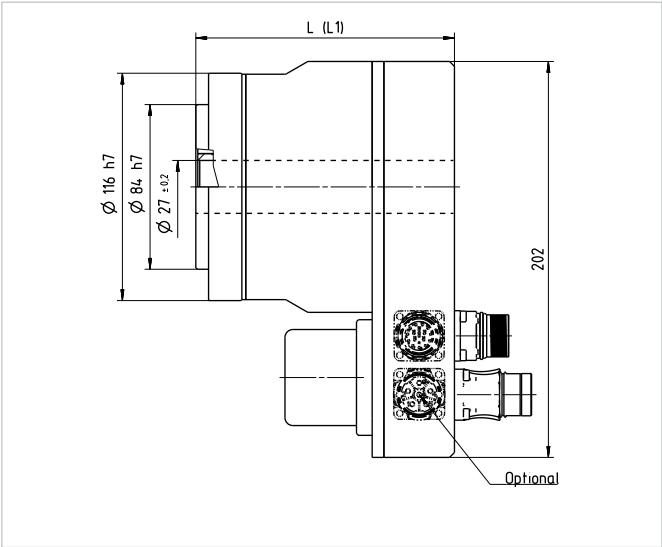


Table 31.3

	Unit	CHA-20A	CHA-25A
Motor feedback		M512P	M512P
Length (without brake)	L [mm]	118	132
Length (with brake)	L1 [mm]	137	159.5

Illustration 31.4

CHA-32A-M512P [mm]

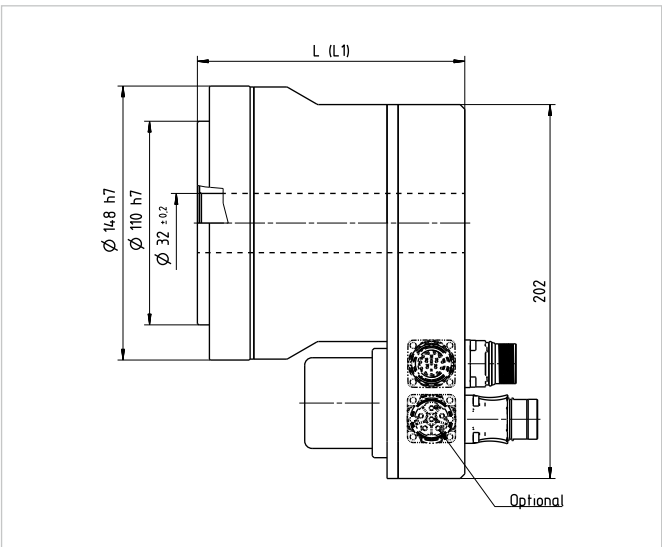


Illustration 31.5

CHA-40A-M512P [mm]

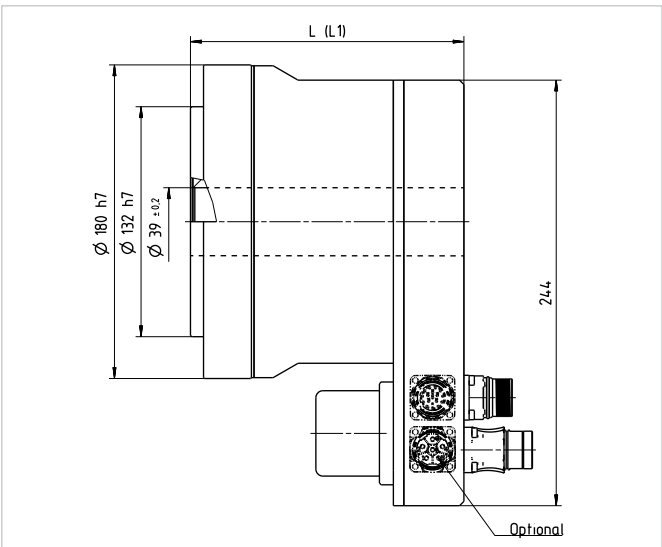


Table 31.6

	Unit	CHA-32A	CHA-40A
Motor feedback		M512P	M512P
Length (without brake)	L [mm]	144.5	157
Length (with brake)	L1 [mm]	172	176

Technical data

Table 32.1

	Unit	CHA-50A					CHA-58A				
Motor feedback		M512P					M512P				
Ratio	i []	50	80	100	120	160	50	80	100	120	160
Maximum output torque	T _{max} [Nm]	715	941	980	1080	1180	1020	1480	1590	1720	1840
Maximum output speed	n _{max} [rpm]	70	44	35	30	22	60	38	30	25	19
Continuous stall torque	T ₀ [Nm]	194	363	456	550	736	280	532	670	805	1080
Moment of inertia without brake	J _{out} [kgm²]	6.90	17.7	27.7	39.9	71.0	11.9	30.6	47.8	68.8	122
Moment of inertia with brake	J _{out} [kgm²]	7.60	19.5	30.4	43.8	77.8	12.1	31.1	48.5	69.8	124
Brake holding torque	T _H [Nm]	225	360	450	540	720	450	720	900	1080	1440
Weight without brake	m [kg]	20.9					28.2				
Weight with brake	m [kg]	24.5					32.0				
Hollow shaft diameter	d _H [mm]	45					45				
Transmission accuracy	[arcmin]	< 0.7	< 0.5				< 0.7	< 0.5			
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [10³ Nm/rad]	340	440				540	710			
Ambient operating temperature	[°C]	0 ... 40					0 ... 40				
Output bearing											
Dynamic radial load	F _{R dyn (max)} [N]	37300					38400				
Dynamic axial load	F _{A dyn (max)} [N]	56100					57700				
Dynamic tilting moment	M _{dyn (max)} [Nm]	1558					2222				

Illustration 33.1

CHA-50A-M512P [mm]

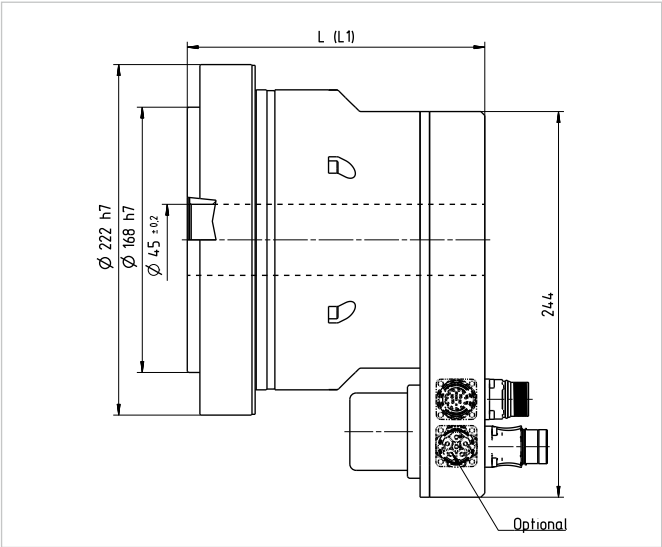


Illustration 33.2

CHA-58A-M512P [mm]

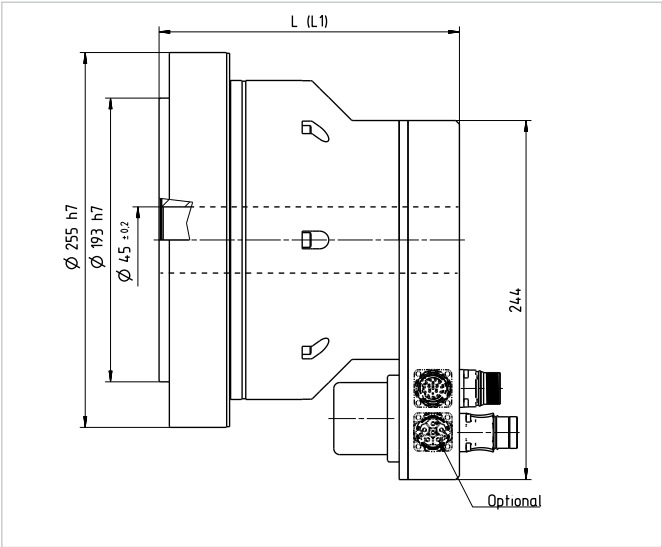


Table 33.3

	Unit	CHA-50A	CHA-58A
Motor feedback		M512P	M512P
Length (without brake)	L [mm]	188.5	204.4
Length (with brake)	L1 [mm]	207.5	225.4

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Motor feedback

Encoder

Table 34.1

Type	Incremental		Single turn absolute	Multi-turn absolute		
Ordering code	D2048	C1024	S1024	M1024	M512P	M128S
Manufacturers designation	-	CCK	SCK	SCL	EQN 1125	-
Protocol	-	-	HIPERFACE®	HIPERFACE®	EnDat®	SSI (binary) BiSS (optional)
Power supply	5 VDC ±5%	5 VDC ±10%	7 - 12 VDC	7 - 12 VDC	3.6 - 14 VDC	5 - 30 VDC
Incremental signal	EIA 422	1 V _{ss}	1 V _{ss}	1 V _{ss}		
Signal form	Square wave	sinusoidal	sinusoidal	sinusoidal		
Resolution	2048	1024	1024	1024	512	128
Commutation signals	5 x U, V, W	1 x C+D 1 V _{ss}	-	-	-	-
Reference signal	1 x Z	1 x R	-	-	-	-
Absolute position value/revolution	-	-	32768 (15 bit)	32768 (15 bit)	8192 (13 bit)	131072 (17 bit)
Revolutions	-	-	-	4096 (12 bit)	4096 (12 bit)	4096 (12 bit) Battery back up

Resolver

Table 34.2

Type	Resolver
Ordering code	RES
Power supply	7 VAC
Input frequency	5 ... 10 kHz
Current dissipation	< 50 mA
Number of pole pairs	1
Transformation ratio	0.5 ±10%

Position measuring system

Table 34.3

Type	Single turn absolute
Ordering code	EC
Manufacturers designation	ECN 113
Protocol	EnDat®
Power supply	5 VDC ± 5 %
Incremental signal	1 V _{ss}
Signal form	sinusoidal
Resolution	2048
Absolute position values / revolution	8192 (13 bit)
Revolutions	-
System accuracy	±20 “

Compatibility

Table 35.1

		Product	DC bus voltage			Temperature sensor		Motor feedback				
Manufacturer	Type	CHA	24 VDC	320 VDC	560 VDC	PTC	KTY 84-130	Resolver 2-pole	Incremental SIN/COS	HIPERFACE®	EnDat® + SIN/COS	Incremental TTL
Harmonic Drive AG	YukonDrive®	●		○	●	○	●			●		
Siemens	SINAMICS S120 SIMODRIVE 611	● ●			● ●		● ●		● ●		● ●	
Bosch Rexroth	IndraDrive C IndraDrive Cs	● ○		○	●		● ○			● ○		
Beckhoff	AX 5000 AX 2000	● ●			● ●		● ●			● ●		
B&R	ACOPOS	●			●		●			●		
NUM	NUMDrive	●			●		●			●		
LTi Drives	ServoOne	●		●	●		●			●		
Elmo	DRUM	●		●	●			○		●	○	
SEW-EURODRIVE	MOVIDRIVE B MOVIAXIS	● ●			● ●		● ●			● ●		
Lenze	Global Drive	●			●		●			●		
Fanuc	SVx	●		●					●			
Metronix	ARS 2000	●		●	●		●			●		
Parker	COMPAX	●			●					●		
KOLLMORGEN	AKD S700	○ ○		○ ○	○ ○	○ ○	○ ○			○ ○		
Mitsubishi	MDS	○		○					○			

● in service ○ compatible according to datasheet

Compatibility with other manufacturers controllers are available upon request.

Large hollow shaft with flange mounting

FHA-C Series Hollow Shaft Servo Actuators combine a synchronous servo motor, CSD Series Component Set, feedback sensor and a specially developed output bearing.

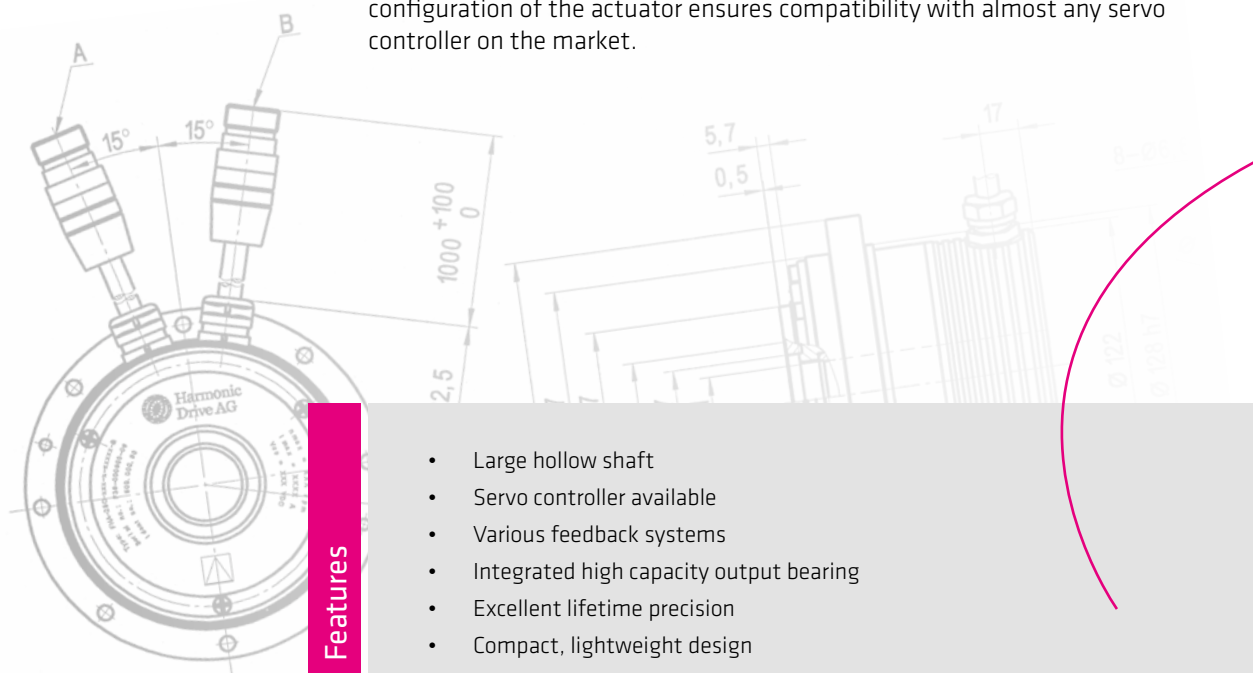
Harmonic Drive® Servo Actuators are the perfect combination of highly dynamic compact servo motors, precision Harmonic Drive® Component Sets and integral high load capacity, tilt resistant output bearings.

Available in four sizes with gear ratios of 50, 100 and 160:1, the actuators can provide maximum torques from 39 to 823 Nm. The output bearing with high tilting capacity often allows direct attachment of heavy payloads without the need for further support, thereby providing simple and space saving design installations.

To adapt to your specific application, the FHA-C Series offers many possible combinations when selecting the motor winding, motor feedback, brake, various sensors and cable as well as connector options.

The integrated hollow shaft can be used to feed through supply lines or services for additional axes, enabling space saving designs with minimal installation dimensions required. The accurate positioning of the actuator ensures stable machine characteristics, lower rejection rates and consistent quality.

By combining the FHA-C Actuators with the specially adapted YukonDrive® Servo Controllers, it is possible to provide a single source supply for a pre-configured drive system tailored to suit your application. Alternatively, the flexible configuration of the actuator ensures compatibility with almost any servo controller on the market.



Features

- Large hollow shaft
- Servo controller available
- Various feedback systems
- Integrated high capacity output bearing
- Excellent lifetime precision
- Compact, lightweight design
- Easy to customise
- Third party controller compatibility

Optimised for your applications:

- Increased operating reliability
- Reduced set up time
- Shorter time to market
- Flexible control configuration
- Optimal design solution
- Easy load connection
- Low manufacturing and installation costs
- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/1020

FHA-C

Ordering code

Table 38.1

Series	Size			Ratio		Motor winding and connector configuration		Motor feedback	Brake	Option 1	Option 2	Special design				
FHA	17C	50	100	160	H L	C1024 S1024 M1024 M512P	B	Sensor	Cable/ Connector	According to customer requirements						
	25C	50	100	160												
	32C	50	100	160												
	40C	50	100	160												
Ordering code																
FHA	-	17C	-	100	-	H	-	C1024	-	B	-	EC	-	K	-	SP

Variations in **bold print** are available at short notice, subject to prior sale.

Table 38.2

Motor winding		
Size	Ordering code	Maximum DC bus voltage
17C	H	680 VDC
25C		
32C	L	330 VDC
40C		

Table 38.3

Connector configuration			
Ordering code	Motor	Motor feedback	
		S1024 M1024	C1024 M512P
H	6 pin (M23)	12 pin (M23)	17 pin (M23)
L	8 pin (M23)		

Table 38.4

Motor feedback		
Ordering code	Type	Protocol
C1024	Incremental	-
S1024	Single-turn absolute	HIPERFACE®
M1024	Multi-turn absolute	
M512P		EnDat®

Table 38.5

Option 1	
Ordering code	Description
EC	Single-turn absolute EnDat® Encoder system at the gear output

Table 38.6

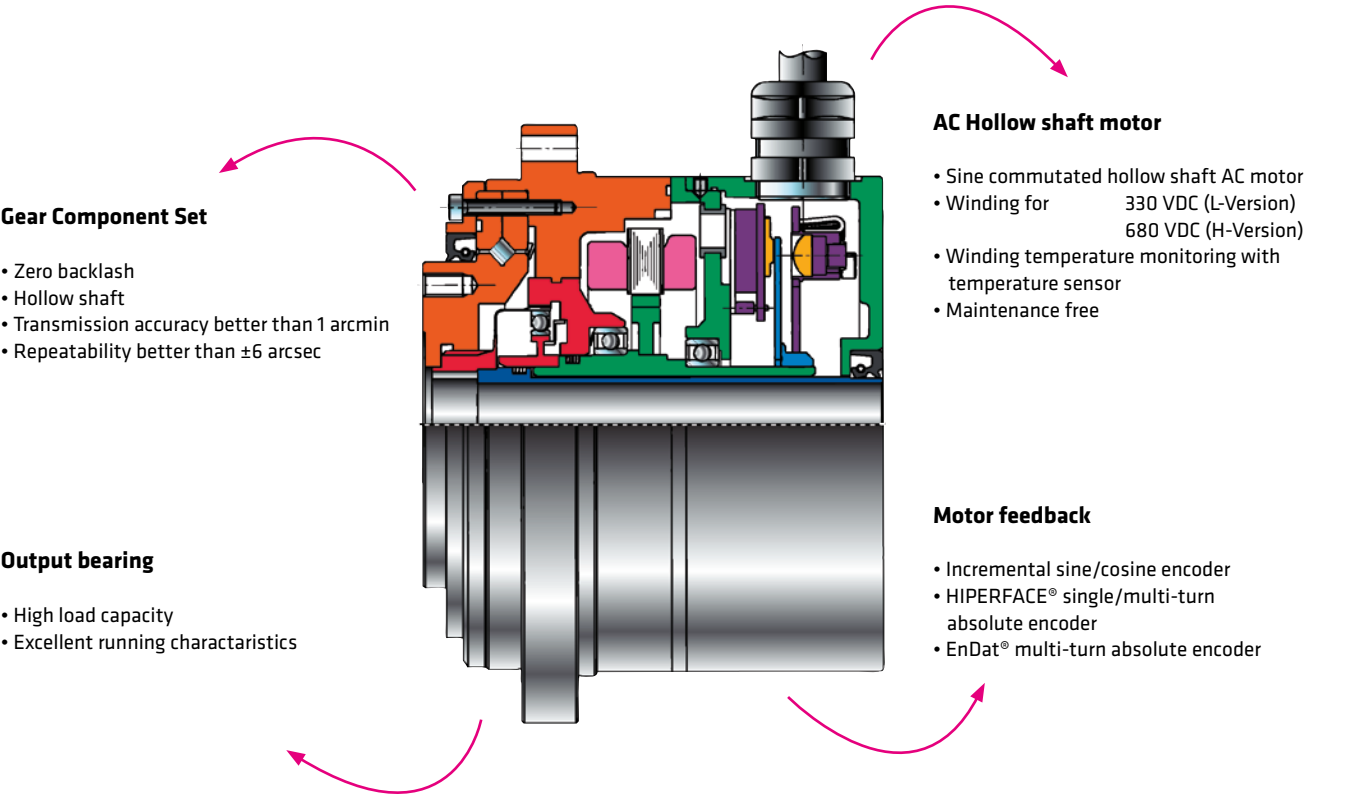
Option 2	
Ordering code	Description
K	Cable outlet axial
R	Connector axial (only M512P)
S	Connector radial (only M512P)
-	Standard (cable outlet radial)

Combinations

Table 39.1

Size		17C	25C	32C	40C
Ratio	50	●	●	●	●
	100	●	●	●	●
	160	●	●	●	●
Motor winding and connector configuration	L	●	●	●	●
	H	●	●	●	●
Motor feedback	C1024	●	●	●	●
	S1024	●	●	●	●
	M1024	●	●	●	●
	M512P	●	●	●	●
Brake	B	●	●	●	●
Option 1 (Sensor)	EC	●	●	●	●
Option 2 (Cable/Connector)	K	-	●	●	●
	R	●	●	●	●
	S	●	●	●	●

● available ○ on request - not available



Technical data

Table 40.1

	Unit	FHA-17C			FHA-25C		
Motor feedback		C1024 / S1024 / M1024					
Ratio	i []	50	100	160	50	100	160
Maximum output torque	T _{max} [Nm]	39	57	64	151	233	261
Maximum output speed	n _{max} [rpm]	96	48	30	90	45	28
Continuous stall torque	T _o [Nm]	17	28	30	42	86	102
Moment of inertia without brake	J _{out} [kgm²]	0.200	0.800	2.04	0.860	3.45	8.82
Moment of inertia with brake	J _{out} [kgm²]	0.270	1.09	2.78	1.09	4.34	11.1
Brake holding torque	T _H [Nm]	25	49	78	49	98	157
Weight without brake	m [kg]	2.8			4.3		
Weight with brake	m [kg]	3.2			5.1		
Hollow shaft diameter	d _H [mm]	18			32		
Transmission accuracy	[arcmin]	< 1	< 0.7		< 0.7	< 0.5	
Lost Motion	[arcmin]	< 2			< 2		
Torsional stiffness	K ₃ [x10³ Nm/rad]	20	25		84	110	
Ambient operating temperature	[°C]	0 ... 40			0 ... 40		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	2801			4668		
Dynamic axial load	F _{A dyn (max)} [N]	4180			6967		
Dynamic tilting moment	M _{dyn (max)} [Nm]	188			370		

Table 40.2

	Unit	FHA-32C			FHA-40C		
Motor feedback		C1024 / S1024 / M1024					
Ratio	i []	50	100	160	50	100	160
Maximum output torque	T _{max} [Nm]	281	398	453	450	690	823
Maximum output speed	n _{max} [rpm]	80	40	25	70	35	22
Continuous stall torque	T _o [Nm]	73	151	232	122	256	354
Moment of inertia without brake	J _{out} [kgm²]	1.87	7.50	19.2	5.00	20.0	51.2
Moment of inertia with brake	J _{out} [kgm²]	2.20	8.90	22.8	5.70	22.6	57.9
Brake holding torque	T _H [Nm]	75	150	240	108	216	346
Weight without brake	m [kg]	6.7			12.2		
Weight with brake	m [kg]	7.6			14.2		
Hollow shaft diameter	d _H [mm]	35			45		
Transmission accuracy	[arcmin]	< 0.7	< 0.5		< 0.7	< 0.5	
Lost Motion	[arcmin]	< 2			< 2		
Torsional stiffness	K ₃ [x10³ Nm/rad]	150	200		300	370	
Ambient operating temperature	[°C]	0 ... 40			0 ... 40		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	6250			11644		
Dynamic axial load	F _{A dyn (max)} [N]	9328			17379		
Dynamic tilting moment	M _{dyn (max)} [Nm]	530			690		

Illustration 41.1

FHA-17C [mm]

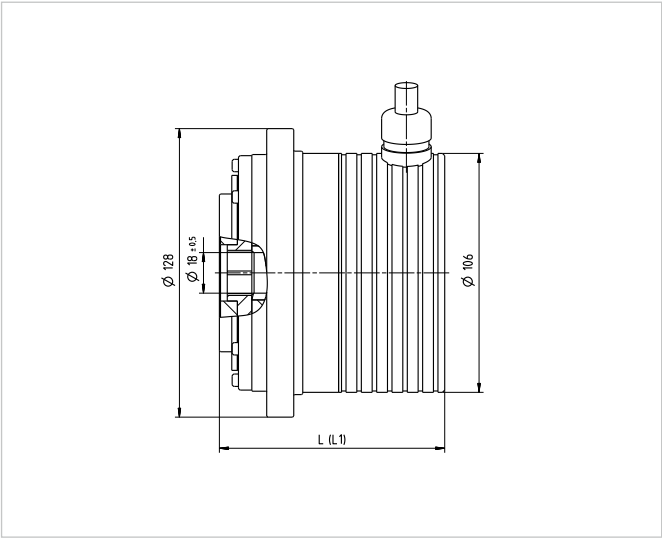


Illustration 41.2

FHA-25C [mm]

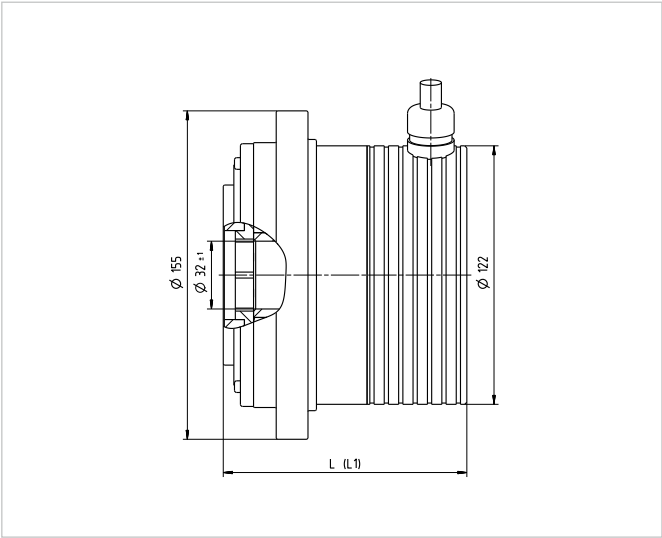


Table 41.3

	Unit	FHA-17C		FHA-25C	
Motor feedback		C1024 / S1024	M1024	C1024 / S1024	M1024
Length (without brake)	L [mm]	100	106.5	115	120
Length (with brake)	L1 [mm]	115.5	122	134.5	139.5

Illustration 41.4

FHA-32C [mm]

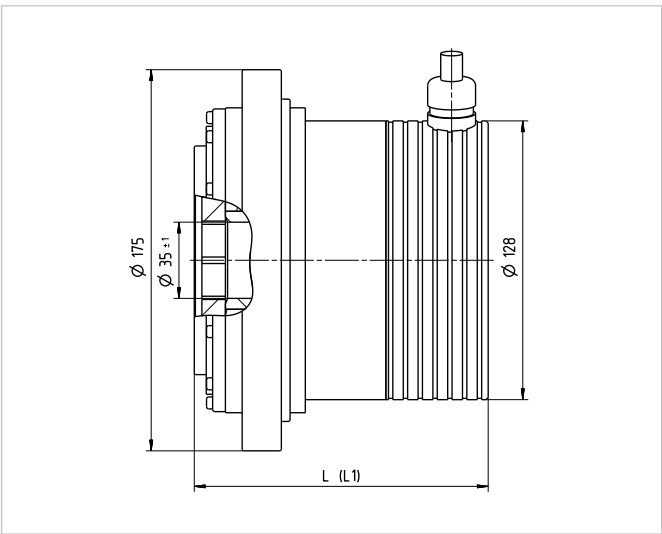


Illustration 41.5

FHA-40C [mm]

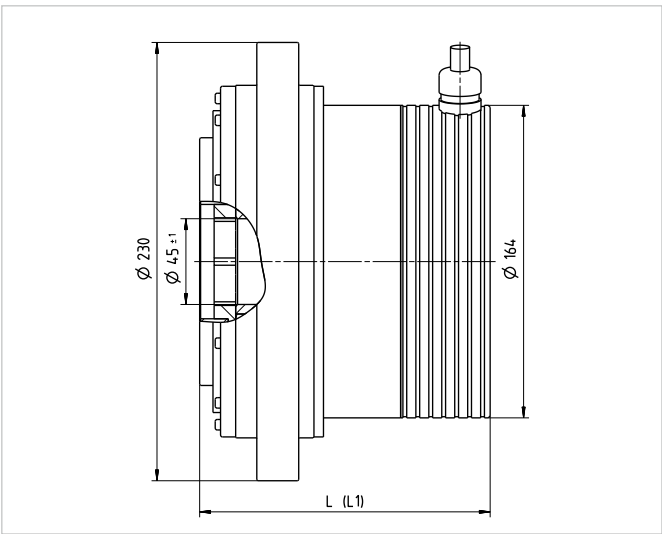


Table 41.6

	Unit	FHA-32C		FHA-40C	
Motor feedback		C1024 / S1024	M1024	C1024 / S1024	M1024
Length (without brake)	L [mm]	135	135	152.5	152.5
Length (with brake)	L1 [mm]	155.5	155.5	173.5	173.5

Technical data

Table 42.1

	Unit	FHA-17C			FHA-25C		
Motor feedback		M512P					
Ratio	i []	50	100	160	50	100	160
Maximum output torque	T _{max} [Nm]	39	57	64	151	233	261
Maximum output speed	n _{max} [rpm]	96	48	30	90	45	28
Continuous stall torque	T ₀ [Nm]	17	28	30	42	86	102
Moment of inertia without brake	J _{out} [kgm²]	0.500	2.00	5.12	1.15	4.60	11.8
Moment of inertia with brake	J _{out} [kgm²]	0.570	2.30	5.88	1.37	5.50	14.1
Brake holding torque	T _H [Nm]	25	49	78	49	98	157
Weight without brake	m [kg]	2.8			4.3		
Weight with brake	m [kg]	3.2			5.1		
Hollow shaft diameter	d _H [mm]	18			32		
Transmission accuracy	[arcmin]	< 1	< 0.7		< 0.7	< 0.5	
Lost Motion	[arcmin]	< 2			< 2		
Torsional stiffness	K ₃ [x10³ Nm/rad]	20	25		84	110	
Ambient operating temperature	[°C]	0 ... 40			0 ... 40		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	2801			4668		
Dynamic axial load	F _{A dyn (max)} [N]	4180			6967		
Dynamic tilting moment	M _{dyn (max)} [Nm]	188			370		

Table 42.2

	Unit	FHA-32C			FHA-40C		
Motor feedback		M512P					
Ratio	i []	50	100	160	50	100	160
Maximum output torque	T _{max} [Nm]	281	398	453	450	690	823
Maximum output speed	n _{max} [rpm]	80	40	25	70	35	22
Continuous stall torque	T ₀ [Nm]	73	151	232	122	256	354
Moment of inertia without brake	J _{out} [kgm²]	2.20	8.80	22.5	5.20	21.0	53.7
Moment of inertia with brake	J _{out} [kgm²]	2.50	10.2	26.1	5.90	23.6	60.4
Brake holding torque	T _H [Nm]	75	150	240	108	216	346
Weight without brake	m [kg]	6.7			12.2		
Weight with brake	m [kg]	7.6			14.2		
Hollow shaft diameter	d _H [mm]	35			45		
Transmission accuracy	[arcmin]	< 0.7	< 0.5		< 0.7	< 0.5	
Lost Motion	[arcmin]	< 2			< 2		
Torsional stiffness	K ₃ [x10³ Nm/rad]	150	200		300	370	
Ambient operating temperature	[°C]	0 ... 40			0 ... 40		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	6250			11644		
Dynamic axial load	F _{A dyn (max)} [N]	9328			17379		
Dynamic tilting moment	M _{dyn (max)} [Nm]	530			690		

Illustration 43.1

FHA-17C-M512P [mm]

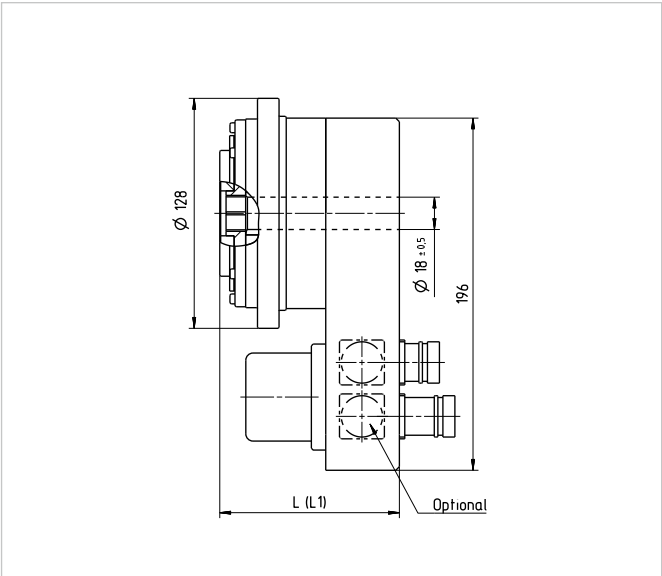


Illustration 43.2

FHA-25C-M512P [mm]

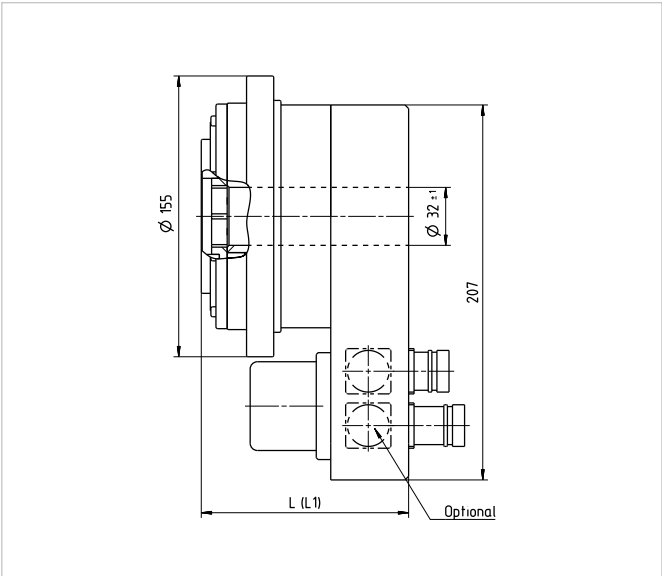


Table 43.3

	Unit	FHA-17C	FHA-25C
Motor feedback		M512P	M512P
Length (without brake)	L [mm]	100	114.5
Length (with brake)	L1 [mm]	115.5	134.5

Illustration 43.4

FHA-32C-M512P [mm]

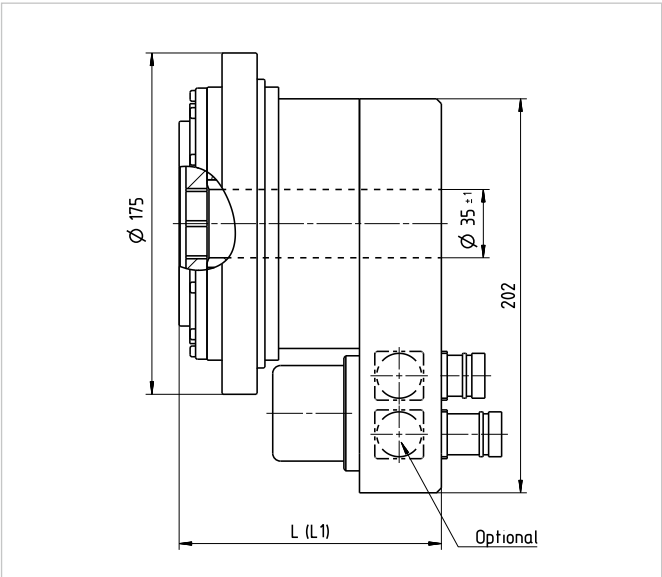


Illustration 43.5

FHA-40C-M512P [mm]

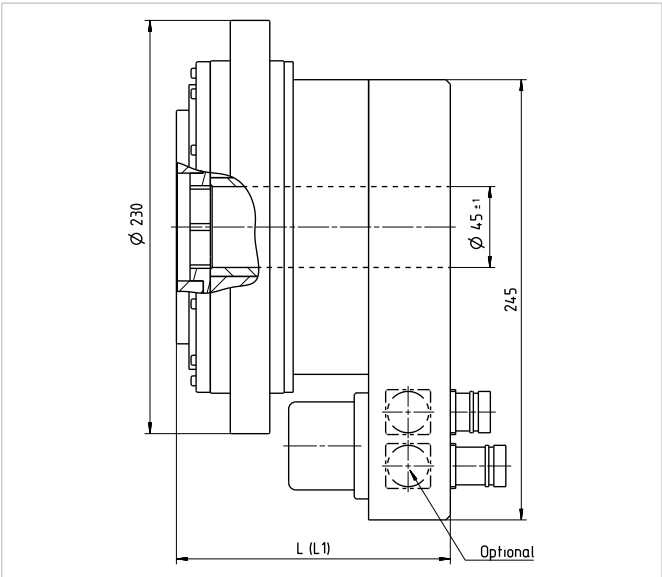


Table 43.6

	Unit	FHA-32C	FHA-40C
Motor feedback		M512P	M512P
Length (without brake)	L [mm]	134.5	152.5
Length (with brake)	L1 [mm]	155	173.5

Motor feedback

Encoder

Table 44.1

Type	Incremental	Single turn absolute	Multi-turn absolute	
Ordering code	C1024	S1024	M1024	M512P
Manufacturers designation	CCK	SCK	SCL	EQN 1125
Protocol	-	HIPERFACE®	HIPERFACE®	EnDat®
Power supply	5 VDC ±10 %	7 ... 12 VDC	7 ... 12 VDC	3.6 ... 14 VDC
Incremental signal	1 V _{ss}			
Signal form	sinusoidal	sinusoidal	sinusoidal	sinusoidal
Resolution	1024	1024	1024	512
Commutation signals	1 x C+D 1 V _{ss}	-	-	-
Reference signal	1 x R	-	-	-
Absolute position value/revolution	-	32768 (15 bit)	32768 (15 bit)	8192 (13 bit)
Revolutions	-	-	4096 (12 bit)	4096 (12 bit)

Position measuring system

Table 44.2

Type	Single turn absolute
Ordering code	EC
Manufacturers designation	ECN 113
Data interface	EnDat®
Power supply	5 VDC ± 5 %
Incremental signal	1 V _{ss}
Signal form	sinusoidal
Resolution	2048
Absolute position value/revolution	8192 (13 bit)
Revolutions	-
System accuracy	±20 "

Compatibility

Table 45.1

		Product	DC bus voltage			Temperature sensor		Motor feedback				
Manufacturer	Type	FHA-C	24 VDC	320 VDC	560 VDC	PTC	KTY 84-130	Resolver 2-pole	Incremental SIN/COS	HIPERFACE®	EnDat® + SIN/COS	Incremental TTL
Harmonic Drive AG	YukonDrive®	●		○	●	○	●			●		
Siemens	SINAMICS S120 SIMODRIVE 611	● ●			● ●		● ●		● ●		● ●	
Bosch Rexroth	IndraDrive C IndraDrive Cs	● ○		○	●		● ○			● ○		
Beckhoff	AX 5000 AX 2000	● ●		○ ○	● ●		● ●			● ●		
B&R	ACOPOS	●			●		●			●		
NUM	NUMDrive	●		●			●			●		
LTi-Drives	ServoOne	●		●	●		●			●		
Elmo	DRUM	●		●	●			○		●		
SEW-EURODRIVE	MOVIDRIVE B MOVIAXIS	● ●			● ●		● ●			● ●		
Lenze	Global Drive	●			●		●			●		
Fanuc	SVx	●		●					●			
Metronix	ARS 2000	●		●	●			●		●		
Parker	COMPAX	●			●					●		
KOLLMORGEN	AKD S700	○ ○		○ ○	○ ○	○ ○	○ ○			○ ○		
Mitsubishi	MDS	●		●					●			

● in service ○ compatible according to datasheet

Compatibility with other manufacturers controllers are available on request.



Compact mini servo actuator with hollow shaft

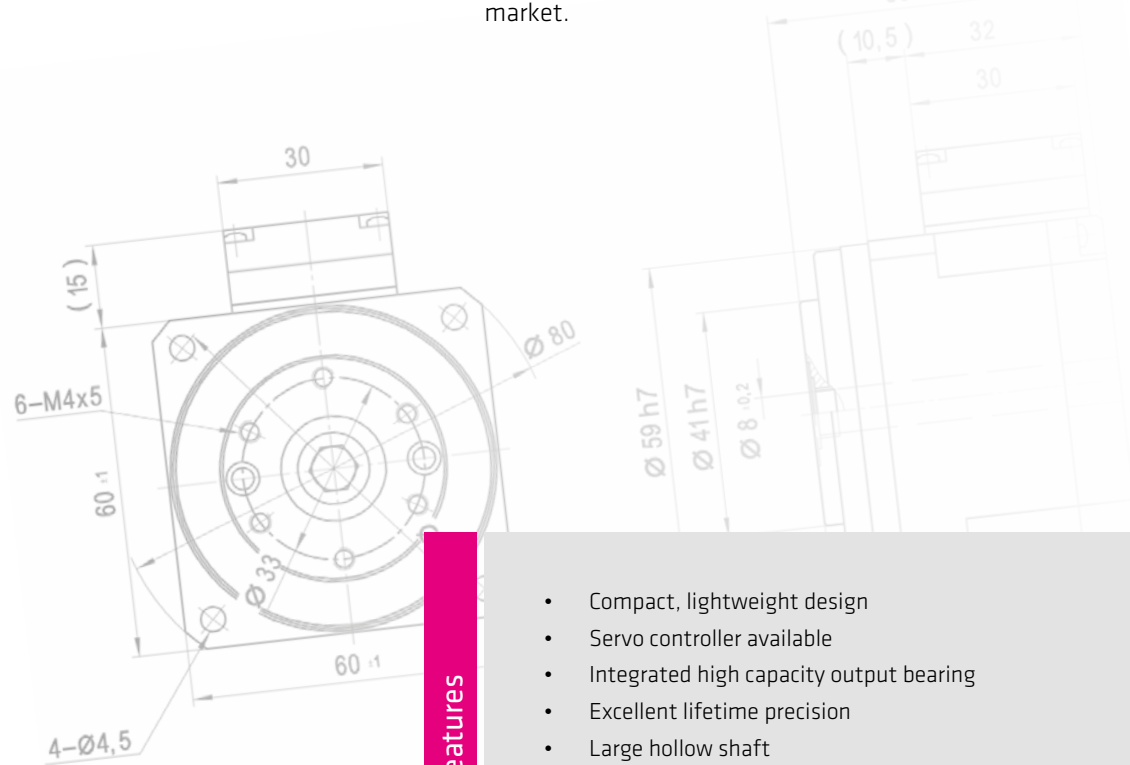
FHA-C Mini Servo Actuators with a central hollow shaft comprise a synchronous servo motor, an HFUC Series Component Set, feedback sensor and a specially developed output bearing.

Harmonic Drive® Servo Actuators are the perfect combination of highly dynamic compact servo motors, precision Harmonic Drive® Component Sets and integral high load capacity, tilt resistant output bearings.

Available in three sizes with gear ratios of 30, 50 and 100:1 the actuators can provide maximum torques from 1,8 to 28 Nm. The output bearing with high tilting capacity often allows direct attachment of heavy payloads without the need for further support, thereby providing simple and space saving design installations.

The integrated hollow shaft can be used to feed through supply lines or services for further additional axes. The accurate positioning of the actuator guarantees stable machine characteristics and short cycle times, whilst the compact design ensures minimum installation space is required.

By combining the FHA-C Mini Actuators with the specially adapted YukonDrive® or the HA-680 Servo Controllers, it is possible to provide a single source supply for a pre-configured drive system tailored to suit your application. Alternatively, the FHA-C Mini Actuators are compatible with many common servo controllers on the market.



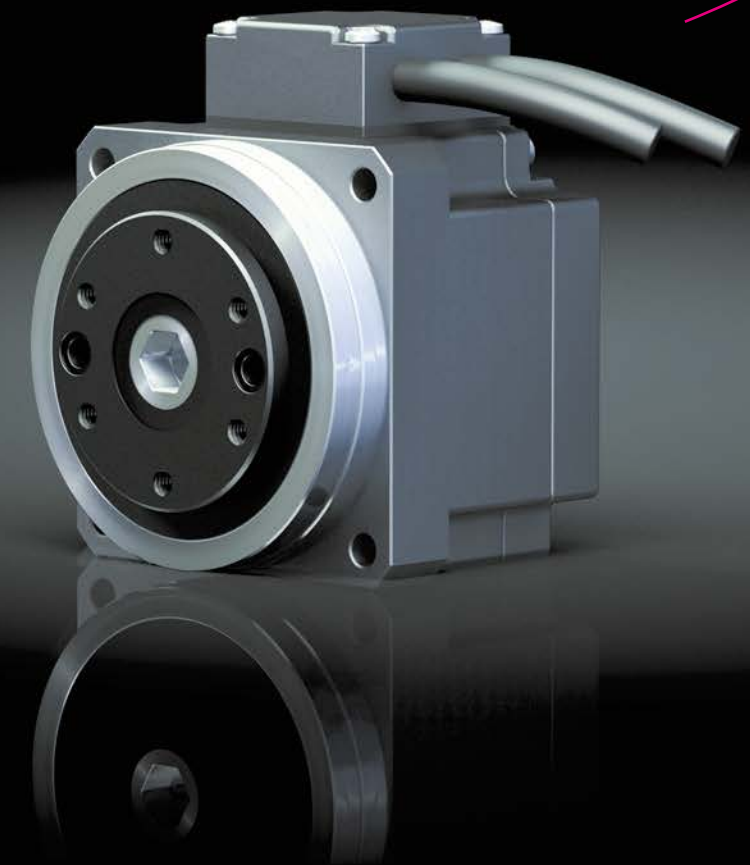
Features

- Compact, lightweight design
- Servo controller available
- Integrated high capacity output bearing
- Excellent lifetime precision
- Large hollow shaft
- High dynamics
- Third party controller compatibility

Optimised for your applications:

- Reduced material use
- Greater energy efficiency
- Lower production costs
- Small machine footprint
- Reduced set up time
- Increased operating reliability
- Shorter time to market
- Optimal design solution
- Easy load connection
- Low manufacturing and installation costs
- Higher product quality
- Less waste
- Consistent quality
- Reduced Total Cost of Ownership
- Reduced maintenance costs

Customer Benefits



QUICKLINK

www.harmonicdrive.co.uk/1030

FHA-C Mini

Ordering code

Table 48.1

Series	Size		Ratio			Motor feedback	Motor winding	Cable exit	Cable length	Special design
FHA	8C	30	50	100	D200	- E	- K	- M1	According to customer requirements	
	11C	30	50	100						
	14C	30	50	100						
Ordering code										
FHA	-	8C	-	100	-	D200	-	EKM1	-	SP

Variations in **bold print** are available at short notice, subject to prior sale.

Table 48.2

Motor feedback		
Ordering code	Type	Protocol
D200	Incremental	-

Table 48.3

Motor winding	
Ordering code	Maximum DC bus voltage
-	330 VDC
E	48 VDC

Table 48.4

Cable exit	
Ordering code	Description
-	Side cable outlet
K	Rear cable outlet

Table 48.5

Cable length	
Ordering code	Description
-	0.3 m
M1	1.0 m

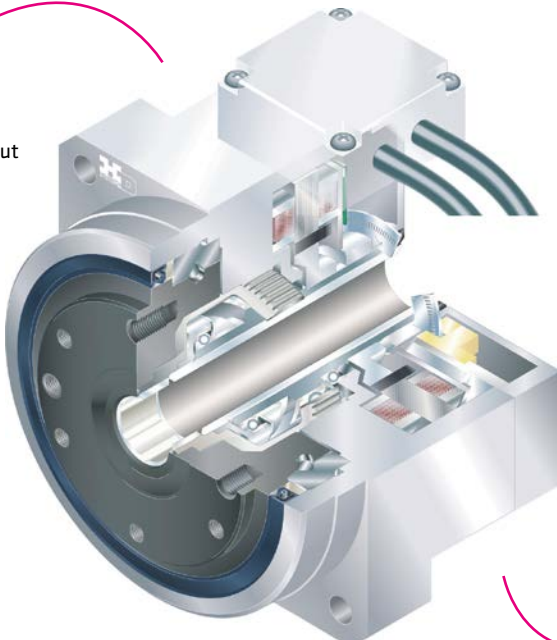
Combinations

Table 49.1

Size		8C	11C	14C
Ratio	30	●	●	●
	50	●	●	●
	100	●	●	●
Motor feedback	D200	●	●	●
Motor winding	-	●	●	●
	E	●	●	●
Cable exit	-	●	●	●
	K	○	○	○
Cable length	-	●	●	●
	M1	●	●	●

● available ○ on request

- Compact configuration
- Hollow shaft from 6.2 mm to 13.5 mm
- Zero backlash
- Highly compact, tilt resistant output bearing



- Motor winding for maximum DC bus voltage of 48 VDC or 330 VDC
- TTL Encoder with 2000 PPR
- Synchronous motor with concentrated winding

Technical data

Table 50.1

	Unit	FHA-8C			FHA-11C		
Ratio	i []	30	50	100	30	50	100
Maximum output torque	T _{max} [Nm]	1.8	3.3	4.8	4.5	8.3	11
Maximum output speed	n _{max} [rpm]	200	120	60	200	120	60
Continuous stall torque	T _o [Nm]	0.8	1.5	2.0	1.8	2.9	4.2
Moment of inertia	J _{out} [kgm ²]	0.0026	0.0074	0.029	0.006	0.017	0.067
Weight	m [kg]	0.40			0.62		
Hollow shaft diameter	d _H [mm]	6.2			8		
Transmission accuracy	[arcmin]	< 2.5	< 2.0		< 2.0	< 1.5	
Lost Motion	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	0.54	0.84	1.2	1.6	3.2	4.4
Ambient operating temperature	[°C]	0 ... 40			0 ... 40		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	1163			2857		
Dynamic axial load	F _{A dyn (max)} [N]	200			300		
Dynamic tilting moment	M _{dyn (max)} [Nm]	15			40		

Table 50.2

	Unit	FHA-14C		
Ratio	i []	30	50	100
Maximum output torque	T _{max} [Nm]	9	18	28
Maximum output speed	n _{max} [rpm]	200	120	60
Continuous stall torque	T _o [Nm]	3.5	4.7	6.8
Moment of inertia	J _{out} [kgm²]	0.018	0.050	0.200
Weight	m [kg]	1.2		
Hollow shaft diameter	d _H [mm]	13.5		
Transmission accuracy	[arcmin]	< 2.0	< 1.5	
Lost Motion	[arcmin]	< 1		
Torsional stiffness	K ₃ [x10³ Nm/rad]	3.4	5.7	7.1
Ambient operating temperature	[°C]	0 ... 40		
Output bearing				
Dynamic radial load	F _{R dyn (max)} [N]	5357		
Dynamic axial load	F _{A dyn (max)} [N]	500		
Dynamic tilting moment	M _{dyn (max)} [Nm]	75		

Illustration 51.1

FHA-8C Mini [mm]

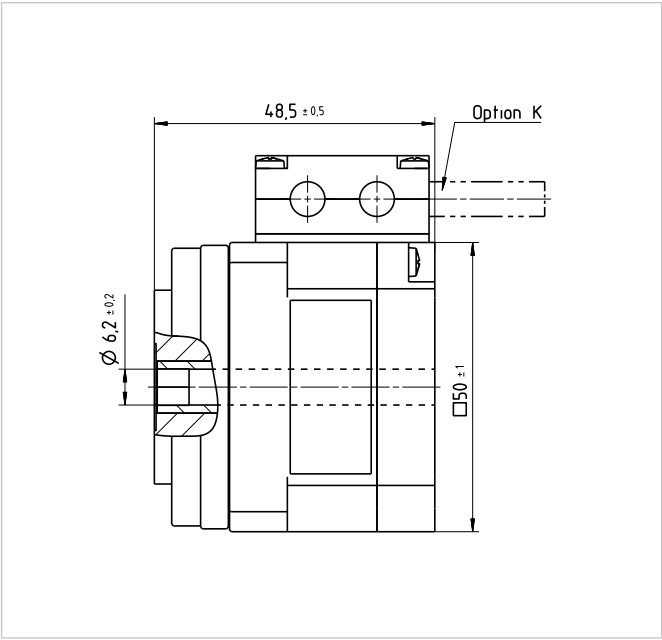


Illustration 51.2

FHA-11C Mini [mm]

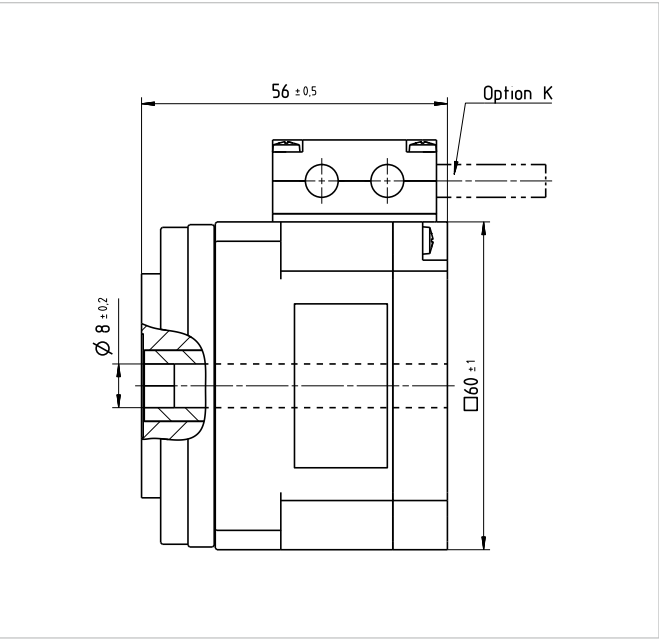
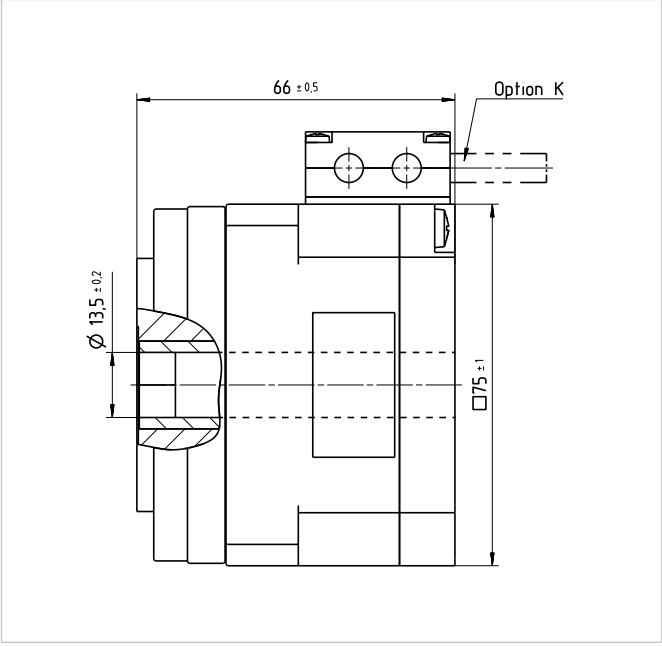


Illustration 51.3

FHA-14C Mini [mm]



Motor feedback

Encoder

Table 52.1

Type	Incremental	
Ordering code	D200	
Power supply	5 VDC ±5 %	
Output circuit	Line Driver	
Signal form	Square wave	
Resolution	A, B	2000
	U, V, W	5
	Z	1

Compatibility

Table 53.1

		Product
Manufacturer	Type	FHA-C Mini
Harmonic Drive AG	YukonDrive® HA-680	●
Siemens	SINAMICS S120	○
Bosch Rexroth	IndraDrive Cs	●
Beckhoff	AX 5000 AX 2000	○
Elmo	Harmonica Gold DC-Whistle Cello	●
Metronix	ARS 2000	○
	DIS 2	●
KOLLMORGEN	AKD S700	○
Maxon Motor	EPOS	●
miControl®	mcDSA	●

● in service ○ compatible according to datasheet

Compatibility with other manufacturers controllers are available on request.



Compact actuator with high corrosion protection

The servo drives of the LynxDrive® Series combine a synchronous servo motor, Unit from the HFUC-2UH Series, feedback sensor and a cross roller output bearing.

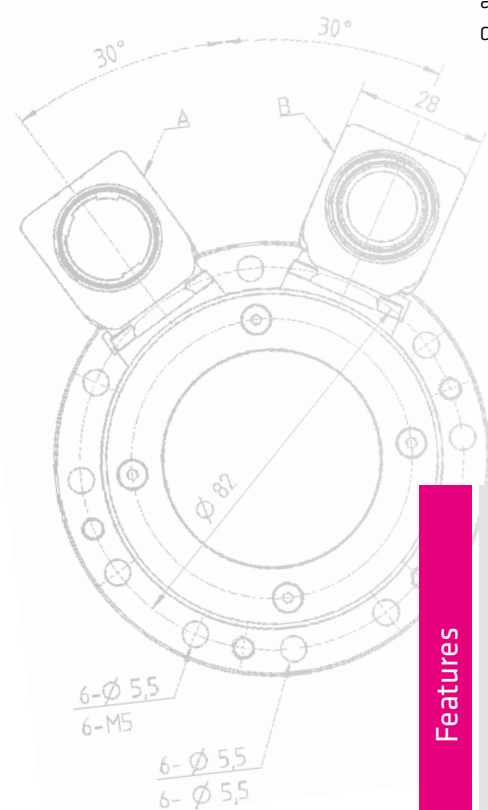
Harmonic Drive® Servo Actuators are the perfect combination of highly dynamic compact servo motors, precision Harmonic Drive® Component Sets and integral high load capacity, tilt resistant output bearings.

Available in five sizes with six gear ratios between 30 and 160:1, the actuators can provide maximum torques from 9 to 647Nm. The output bearing with high tilting capacity can easily withstand and accurately handle heavy payloads.

To adapt to your specific application, the LynxDrive® Series offers many possible combinations when selecting the motor feedback, brake, as well as offering various cable and connector options.

By combining the LynxDrive® Actuators with the specially adapted YukonDrive® Servo Controllers, it is possible to provide a single source supply for a pre-configured drive system tailored to suit your application. Alternatively, the flexible configuration of the actuator ensures compatibility with almost any servo controller on the market.

The accurate positioning of the actuator ensures stable machine characteristics, short cycle times and minimum space requirements. With high protection ratings and corrosion resistance, the series is perfectly suited for use in harsh and demanding environmental conditions.



Features

- Easy to customise
- Servo controller available
- Various feedback systems
- Integrated high capacity output bearing
- Third party controller compatibility
- Corrosion protection
- Excellent lifetime precision
- Compact, lightweight design

Optimised for your applications:

- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Optimal design solution
- Easy integration
- Reduced set up time
- Increased operating reliability
- Shorter time to market
- Flexible control configuration
- Easy load connection
- Low manufacturing and installation costs
- Reduced material use
- Higher product quality
- Less waste

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/1040

LynxDrive®

Ordering code

Table 56.1

Series	Size	Ratio						Motor winding	Connector configuration	Motor feedback	Brake	Special design
		30	50		100							
LynxDrive	14C	30	50		100			AO	H L	MGH MEE MKE ROO	B	According to customer requirements
	17C	30	50		100							
	20C	30	50	80	100	120	160					
	32C	30	50	80	100	120	160					
	40C		50	80	100	120	160	AT				
Ordering code												
LynxDrive - 20C - 100 - AO - H - MGH - B - SP												

Variations in **bold print** are available at short notice, subject to prior sale.

Table 56.2

Motor winding		
Size	Ordering code	Maximum DC bus voltage
14C	AO	680 VDC
17C		
20C		
32C	AR	
40C	AT	

Table 56.3

Connector configuration			
Ordering code	Motor	Motor feedback	
		MGH ROO	MEE MKE
H	6 pin (M23)	12 pin (M23)	17 pin (M23)
L	8 pin (M23)		

Table 56.4

Motor feedback		
Ordering code	Type	Protocol
MGH	Multi-turn absolute	HIPERFACE®
MEE		EnDat®
MKE		
ROO	Resolver	-

Combinations

Table 57.1

Size		14C	17C	20C	32C	40C
Ratio	30	●	●	●	●	-
	50	●	●	●	●	●
	80	○	○	●	●	●
	100	●	●	●	●	●
	120	-	○	●	●	●
	160	-	-	●	●	●
	AO	●	●	●	-	-
Motor winding	AR	-	-	-	●	-
	AT	-	-	-	-	●
	H	●	●	●	●	●
Connector configuration	L	○	○	●	●	●
	MGH	○	○	●	●	●
Motor feedback	MEE	○	○	●	●	●
	MKE	●	●	●	●	●
	ROO	○	○	●	●	●
	B	○	○	●	●	●

● available ○ on request - not available



Technical data

Table 58.1

	Unit	LynxDrive-14C			LynxDrive-17C		
Ratio	i []	30	50	100	30	50	100
Maximum output torque	T _{max} [Nm]	9	18	28	16	34	54
Maximum output speed	n _{max} [rpm]	283	170	85	243	146	73
Continuous stall torque	T ₀ [Nm]	6.8	6.9	11	12	26	39
Moment of inertia without brake	J _{out} [kgm²]	0.023	0.063	0.250	0.027	0.075	0.300
Moment of inertia with brake	J _{out} [kgm²]	0.030	0.083	0.330	0.034	0.095	0.380
Brake holding torque	T _H [Nm]	9	18	28	16	34	54
Weight without brake	m [kg]	2.2			2.3		
Weight with brake	m [kg]	2.6			2.8		
Transmission accuracy	[arcmin]	< 2	< 1.5		< 1.5		
Lost Motion	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x10³ Nm/rad]	3.4	5.7	7.1	6.7	13	16
Ambient operating temperature	[°C]	0 ... 40			0 ... 40		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	1930			2148		
Dynamic axial load	F _{A dyn (max)} [N]	2880			3207		
Dynamic tilting moment	M _{dyn (max)} [Nm]	41			64		

Table 58.2

	Unit	LynxDrive-20C						LynxDrive-32C					
Ratio	i []	30	50	80	100	120	160	30	50	80	100	120	160
Maximum output torque	T _{max} [Nm]	27	56	74	82	87	92	100	216	304	333	353	372
Maximum output speed	n _{max} [rpm]	217	130	81	65	54	41	160	96	60	48	40	30
Continuous stall torque	T ₀ [Nm]	20	34	47	49	49	49	67	108	167	216	216	216
Moment of inertia without brake	J _{out} [kgm²]	0.033	0.093	0.237	0.370	0.533	0.947	0.266	0.738	1.89	2.95	4.25	7.55
Moment of inertia with brake	J _{out} [kgm²]	0.039	0.108	0.275	0.430	0.619	1.10	0.281	0.780	2.00	3.12	4.49	7.99
Brake holding torque	T _H [Nm]	27	56	74	82	87	92	100	216	304	333	353	372
Weight without brake	m [kg]	2.6						6.5					
Weight with brake	m [kg]	3.0						7.1					
Transmission accuracy	[arcmin]	< 1.5	< 1					< 1.5	< 1				
Lost Motion	[arcmin]	< 1						< 1					
Torsional stiffness	K ₃ [x10³ Nm/rad]	11	23	29				49	98	120			
Ambient operating temperature	[°C]	0 ... 40						0 ... 40					
Output bearing													
Dynamic radial load	F _{R dyn (max)} [N]	2354						6101					
Dynamic axial load	F _{A dyn (max)} [N]	3511						7926					
Dynamic tilting moment	M _{dyn (max)} [Nm]	91						313					

Illustration 59.1

LynxDrive-14C [mm]

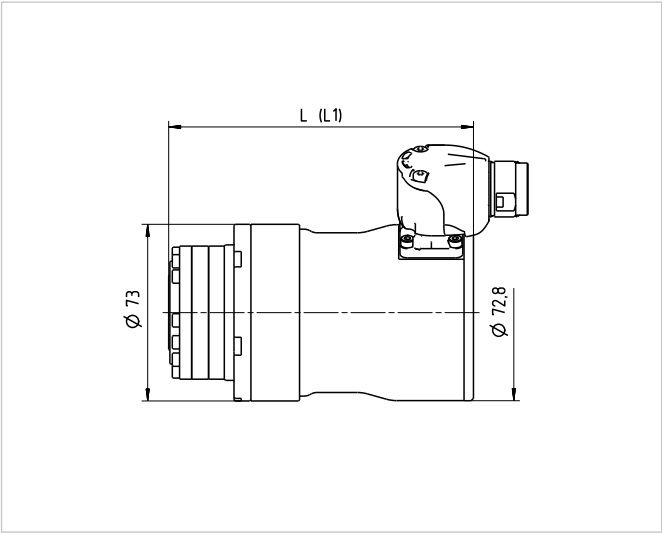


Illustration 59.2

LynxDrive-17C [mm]

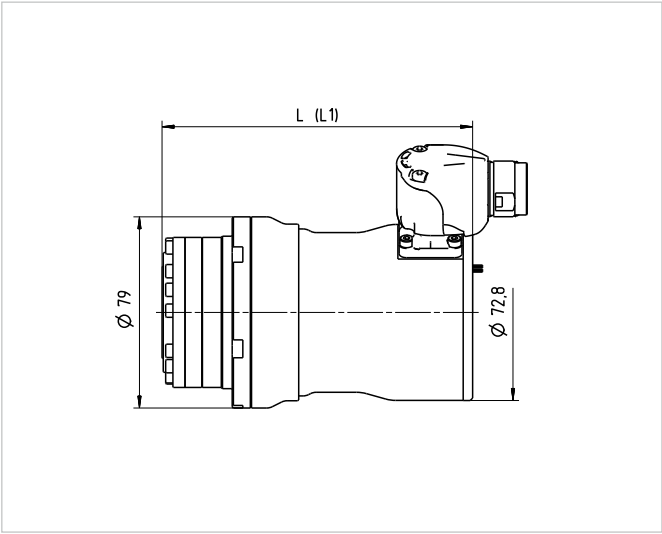


Table 59.3

	Unit	LynxDrive-14C	LynxDrive-17C
Motor feedback		MKE	MKE
Length (without brake)	L [mm]	126	129

Illustration 59.4

LynxDrive-20C [mm]

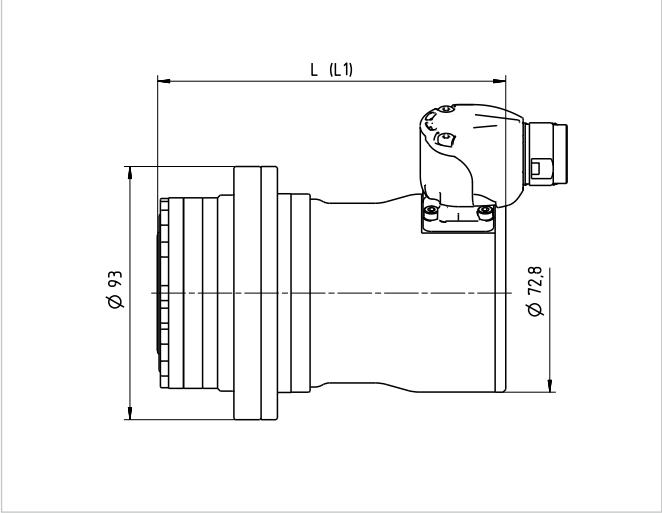


Illustration 59.5

LynxDrive-32C [mm]

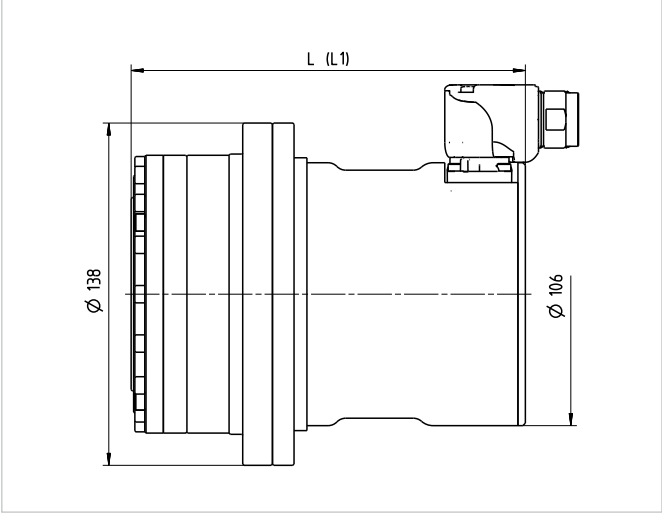


Table 59.6

	Unit	LynxDrive-20C		LynxDrive-32C	
Motor feedback		ROO / MKE	MGH / MEE	ROO / MKE	MGH / MEE
Length (without brake)	L [mm]	128	159	159	184
Length (with brake)	L1 [mm]	162	193	203	228

Technical data

Table 60.1

	Unit	LynxDrive-40C				
Ratio	i []	50	80	100	120	160
Maximum output torque	T _{max} [Nm]	402	519	568	617	647
Maximum output speed	n _{max} [rpm]	80	50	40	33	25
Continuous stall torque	T ₀ [Nm]	181	283	371	450	450
Moment of inertia without brake	J _{out} [kgm²]	1.97	5.03	7.86	11.3	20.1
Moment of inertia with brake	J _{out} [kgm²]	2.07	5.29	6.27	11.9	21.2
Brake holding torque	T _H [Nm]	372	519	568	617	647
Weight without brake	m [kg]	9.1				
Weight with brake	m [kg]	10.1				
Transmission accuracy	[arcmin]	< 1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	180	230			
Ambient operating temperature	[°C]	0 ... 40				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	8652				
Dynamic axial load	F _{A dyn (max)} [N]	11242				
Dynamic tilting moment	M _{dyn (max)} [Nm]	450				

Illustration 61.1

LynxDrive-40C [mm]

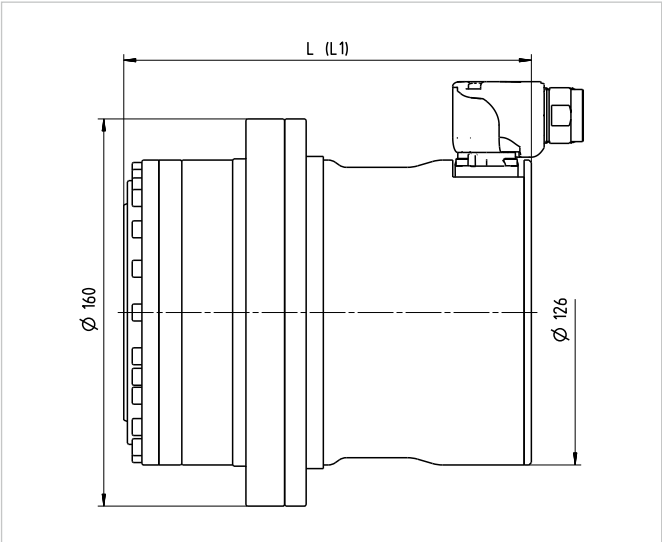
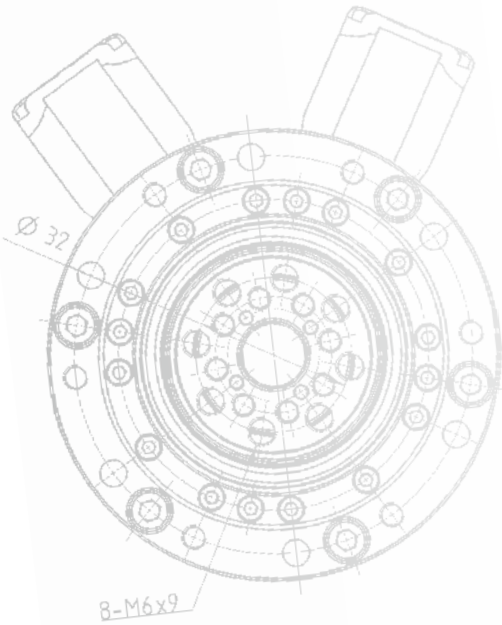


Table 61.2

	Unit	LynxDrive-40C	
Motor feedback		ROO/MKE	MGH/MEE
Length (without brake)	L [mm]	169	192
Length (with brake)	L1 [mm]	215	238

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Motor feedback

Encoder

Table 62.1

Type	Multi-turn absolute		
Ordering code	MEE	MKE	MGH
Manufacturers designation	EQN 1125	EQI 1130	SKM 36
Protocol	EnDat®	EnDat®	HIPERFACE®
Power supply	3.6 ... 14 VDC	3.6 ... 14 VDC	7 ... 12 VDC
Incremental signal	1 V _{SS}		
Signal form	sinusoidal		
Resolution	512	16	128
Absolute position value/revolution	8192 (13 bit)	262144 (18 bit)	4096 (12 bit)
Revolutions	4096 (12 bit)		

Resolver

Table 62.2

Type	Resolver
Ordering code	R00
Power supply	7 VAC
Input frequency	5 ... 10 kHz
Current dissipation	< 50 mA
Number of pole pairs	1
Transformation ratio	0.5 ±10 %

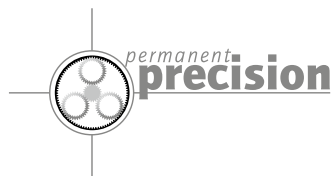
Compatibility

Table 63.1

		Product	DC bus voltage			Temperature sensor		Motor feedback				
Manufacturer	Type	LynxDrive®	24 VDC	320 VDC	560 VDC	PTC	KTY 84-130	Resolver 2-pole	Incremental SIN/COS	HIPERFACE®	EnDat® + SIN/COS	Incremental TTL
Harmonic Drive AG	YukonDrive®	●		○	●	○	●	●		●	○	
Siemens	SINAMICS S120 SIMODRIVE 611	● ●			● ●		● ●	● ●			● ●	
Bosch Rexroth	IndraDrive C IndraDrive Cs	● ○		○	●		● ○			● ○	○	
Beckhoff	AX 5000 AX 2000	● ●		○ ○	● ●		● ●			● ●		
B&R	ACOPOS	○			●		●			●		
NUM	NUMDrive	○			●		●			○		
LTI-Drives	ServoOne	●		●	●		●			●		
Elmo	DRUM	○		○	○			○		●		
SEW-EURODRIVE	MOVIDRIVE B MOVIAXIS	○ ○			○ ○		○ ○			○ ○		
Lenze	Global Drive	○			○		●			●		
Fanuc	SVx	○		○					○			
Parker	COMPAX	○			●					●		
KOLLMORGEN	AKD S700	○ ○		○ ○	○ ○	○ ○	○ ○	○ ○		○ ○	○ ○	
Mitsubishi	MDS	○		○					○			

● in service ○ compatible according to datasheet

Compatibility with other manufacturers controllers are available on request.



Harmonic Drive® FPA Series Servo Actuators are the perfect combination of highly dynamic compact servo motors, precision Harmonic Planetary Gear with flexible ring gear and integral high load capacity, tilt resistant output bearings.

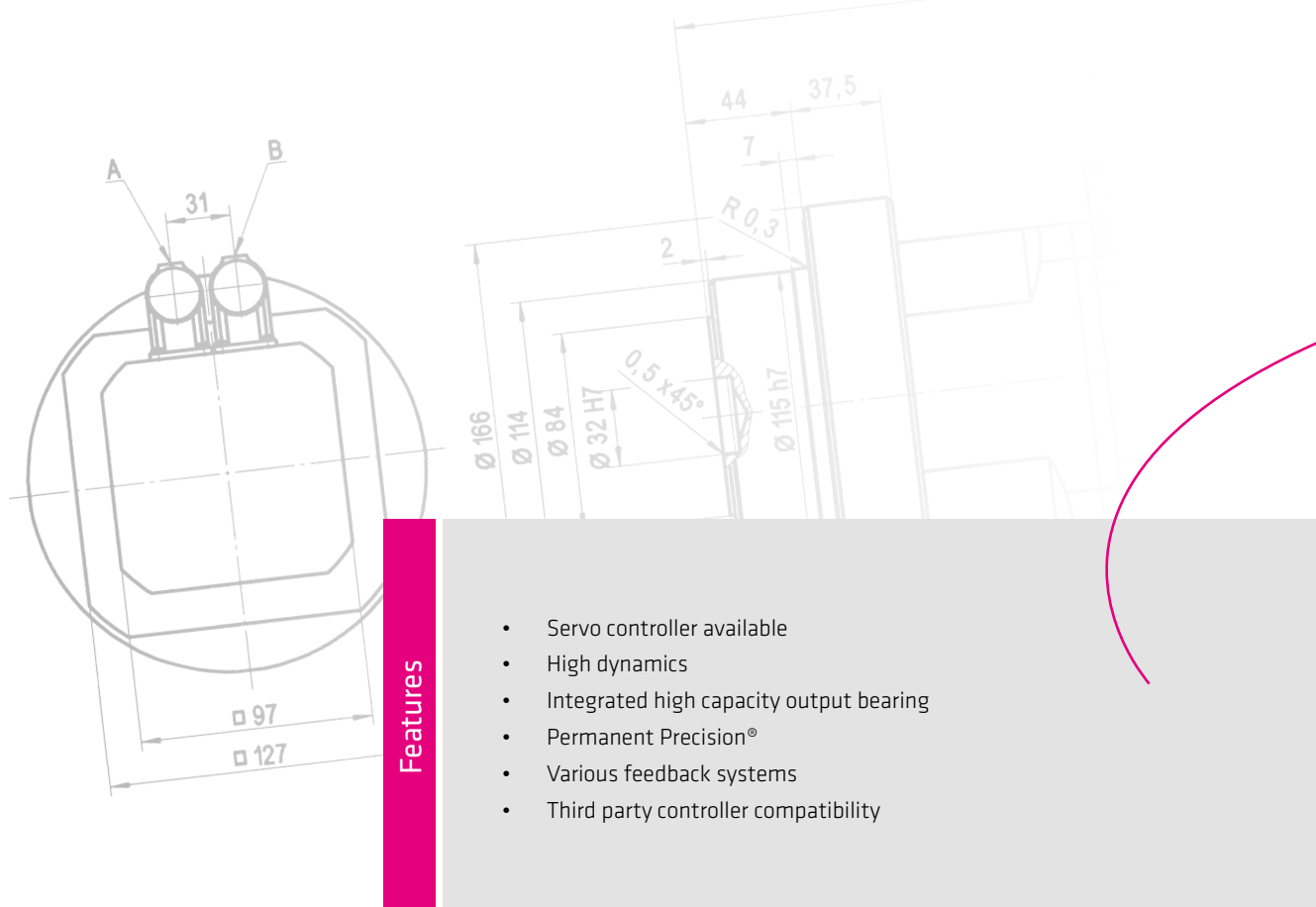
Permanent Precision® for servo actuators

FPA Series Servo Actuators combine a synchronous servo motor and a Harmonic HPG Series Planetary Gear to create a highly dynamic servo actuator. Available in four sizes with five gear ratios between 9 and 45:1, the actuators can provide maximum torques from 3,9 to 300 Nm. The output bearing with high tilting rigidity means that the actuators can easily absorb and accurately guide high payloads.

To adapt to your specific application, the FPA Series offers numerous combinations.

By combining the FPA Actuators with the specially adapted YukonDrive® Servo Controllers, it is possible to provide a single source supply for a pre-configured drive system tailored to suit your application. Alternatively, the flexible configuration of the actuator ensures compatibility with almost any servo controller on the market.

FPA Series with Permanent Precision® and no increase in backlash guarantees stable machine characteristics with short cycle times.



Features

- Servo controller available
- High dynamics
- Integrated high capacity output bearing
- Permanent Precision®
- Various feedback systems
- Third party controller compatibility

Optimised for your applications:

- | | |
|---|---|
| <ul style="list-style-type: none"> • Reduced set up time • Increased operating reliability • Shorter time to market • Increased machine throughput • Increased productivity • Optimal design solution • Easy load connection | <ul style="list-style-type: none"> • Low manufacturing and installation costs • Flexible control configuration • Consistent quality • High availability • Reduced Total Cost of Ownership • Reduced maintenance costs |
|---|---|

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/1050

FPA

Ordering code

Table 66.1

Series	Size	Ratio					Motor winding and connector configuration	Motor feedback	Brake	Special design			
FPA	11A	9	21		37	45	H	RES	B	According to customer requirements			
	14		21	33									
	20B		21	33									
	32B		21	33									
Ordering code													
FPA	-	20B	-	21	-		H	-	E2048	-	B	-	SP

Table 66.2

Motor winding		
Size	Ordering code	Maximum DC bus voltage
11A	H	680 VDC
14		
20B		
32B		

Table 66.3

Connector configuration			
Ordering code	Motor	Motor feedback	
		RES	E2048 M2048
H	6 pin (M23)	12 pin (M23)	17 pin (M23)

Table 66.4

Motor feedback		
Ordering code	Type	Protocol
E2048	Incremental	-
M2048	Multi-turn absolute	EnDat®
RES	Resolver	-

Combinations

Table 67.1

Size		11A	14	20B	32B
Ratio	9	●	-	-	-
	21	●	●	●	●
	33	-	●	●	●
	37	●	-	-	-
	45	●	○	○	○
Motor winding and connector configuration		H	●	●	●
Motor feedback	RES	●	●	●	●
	E2048	-	●	●	●
	M2048	-	●	●	●
Brake		B	●	●	●

● available ○ on request - not available



Technical data

Table 68.1

	Unit	FPA-11A				FPA-14	
Ratio	i []	9	21	37	45	21	33
Maximum output torque	T _{max} [Nm]	3.9	9.8	9.8	9.8	23	23
Maximum output speed	n _{max} [rpm]	1111	476	270	222	286	182
Continuous stall torque	T ₀ [Nm]	2.3	5.3	5.9	7.2	6	10
Moment of inertia without brake	J _{out} [kgm²]	0.0007	0.0037	0.0114	0.0168	0.012	0.030
Moment of inertia with brake	J _{out} [kgm²]	-				0.015	0.036
Brake holding torque	T _H [Nm]	-				23	
Weight without brake	m [kg]	0.7				2.0	
Weight with brake	m [kg]	-				2.2	
Transmission accuracy	[arcmin]	< 5				< 4	
Backlash	[arcmin]	3				1	
Torsional stiffness	[Nm/rad]	2200				4700	
Ambient operating temperature	[°C]	0 ... 40				0 ... 40	
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	2725				4707	
Dynamic axial load	F _{A dyn (max)} [N]	6192				10697	
Dynamic tilting moment	M _{dyn (max)} [Nm]	9.5				32.3	

Table 68.2

	Unit	FPA-20B		FPA-32B	
Ratio	i []	21	33	21	33
Maximum output torque	T _{max} [Nm]	100	100	242	300
Maximum output speed	n _{max} [rpm]	286	182	214	136
Continuous stall torque	T _o [Nm]	22	34	79	117
Moment of inertia without brake	J _{out} [kgm²]	0.059	0.142	0.270	0.640
Moment of inertia with brake	J _{out} [kgm²]	0.076	0.183	0.314	0.751
Brake holding torque	T _H [Nm]	52	82	105	165
Weight without brake	m [kg]	4.6		11	
Weight with brake	m [kg]	5.3		12	
Transmission accuracy	[arcmin]	< 4		< 4	
Backlash	[arcmin]	1		1	
Torsional stiffness	[Nm/rad]	18500		74100	
Ambient operating temperature	[°C]	0 ... 40		0 ... 40	
Output bearing					
Dynamic radial load	F _{R dyn (max)} [N]	11533		21867	
Dynamic axial load	F _{A dyn (max)} [N]	26212		49697	
Dynamic tilting moment	M _{dyn (max)} [Nm]	183		452	

Illustration 69.1

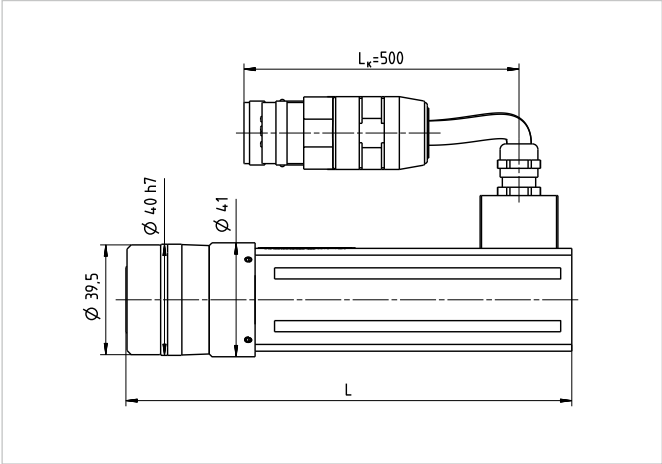


Illustration 69.2

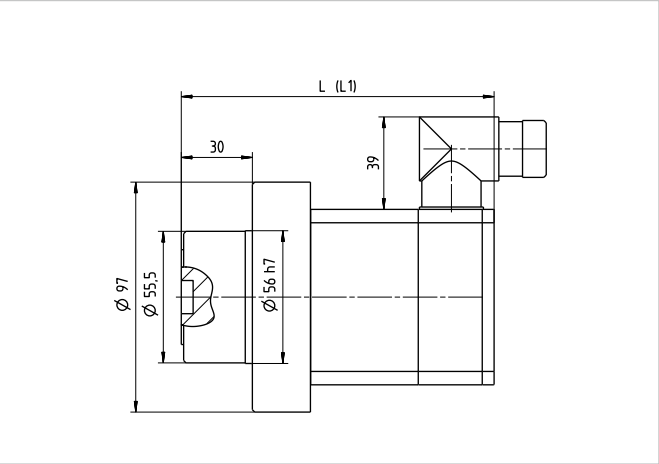


Table 69.3

	Unit	FPA-11A				FPA-14		
Motor feedback		RES				RES	E2048	M2048
Ratio		9	21	37	45			
Length (without brake)	L [mm]	152	161	146	146	132	158	188
Length (with brake)	L1 [mm]	-	-	-	-	179	205	235

Illustration 69.4

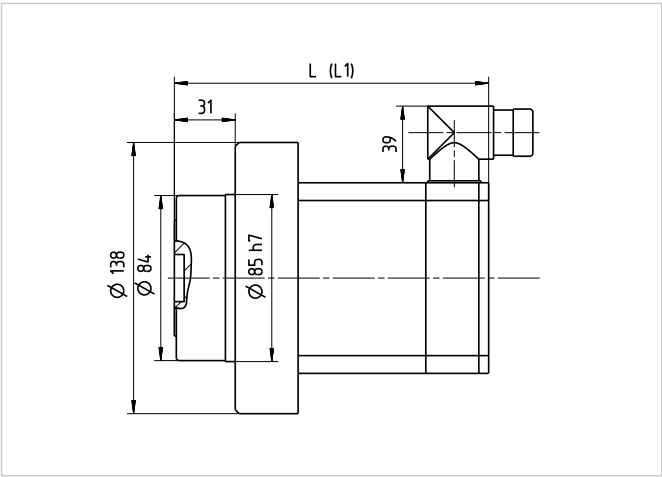


Illustration 69.5

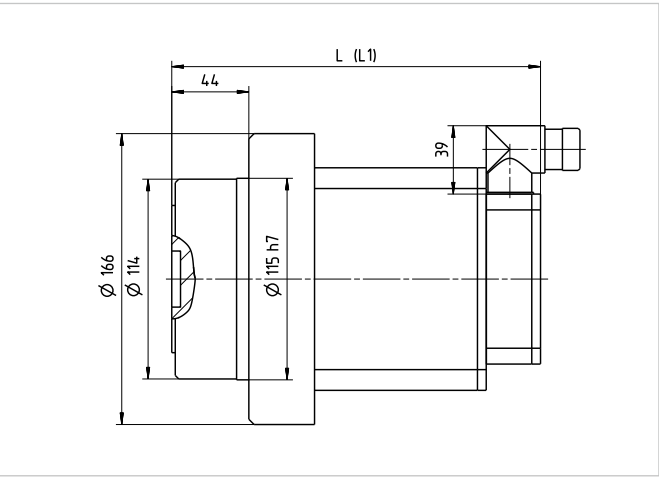


Table 69.6

	Unit	FPA-20B			FPA-32B		
Motor feedback		RES	E2048	M2048	RES	E2048	M2048
Length (without brake)	L [mm]	160	199		211	245	
Length (with brake)	L1 [mm]	207	246		271	305	

Motor feedback

Encoder

Table 70.1

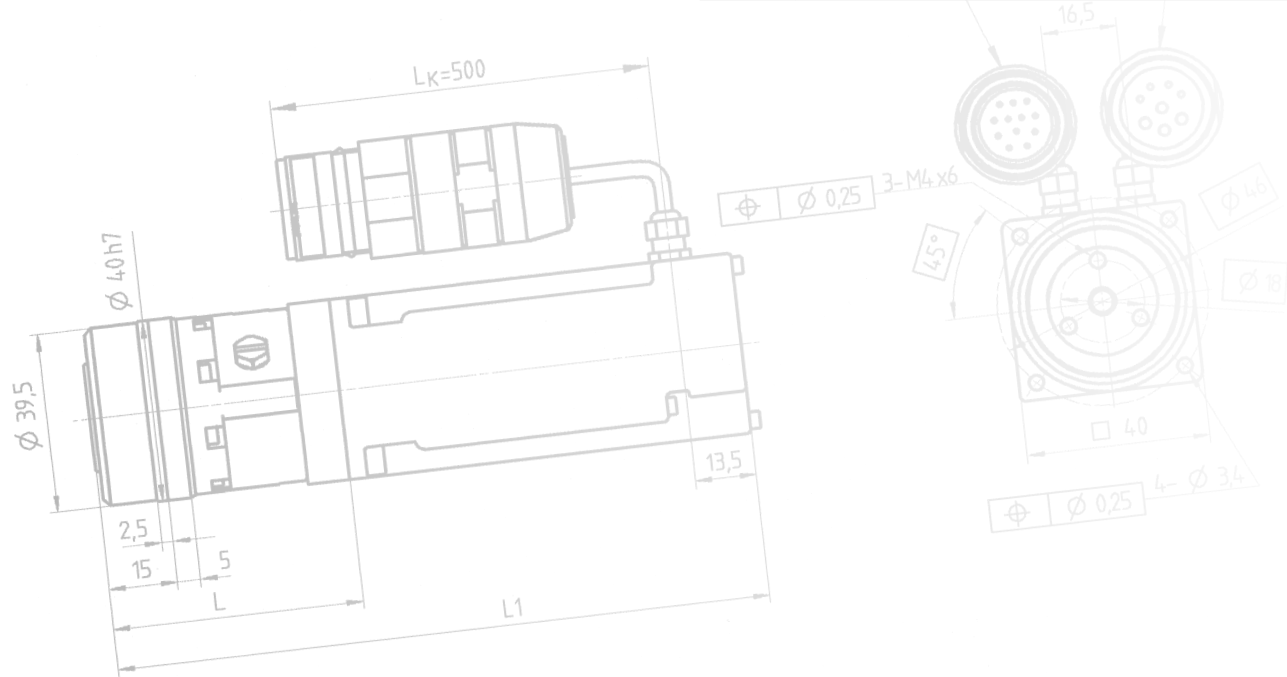
Type	Incremental	Multi-turn absolute
Ordering code	E2048	M2048
Manufacturers designation	ERN 1185 ¹⁾ / ERN 1387	EQI 1130
Protocol	-	EnDat®
Power supply	5 VDC ±10 %	5 VDC ±5 %
Incremental signal	1 V _{SS}	
Signal form	sinusoidal	
Resolution	2048	
Absolute position value/revolution		8192 (13 bit)
Revolutions		4096 (12 bit)

¹⁾ ERN 1185 only FPA-14

Resolver

Table 70.2

Type	Resolver
Ordering code	RES
Power supply	7 VAC
Input frequency	10 kHz
Current dissipation	< 50 mA
Number of pole pairs	1
Transformation ratio	0.5 ±10 %



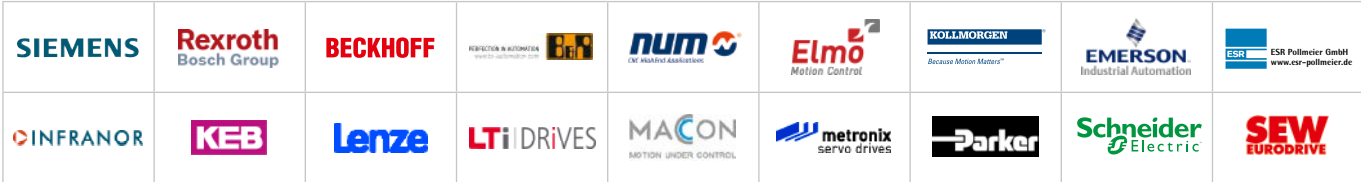
Compatibility

Table 71.1

		Product	DC bus voltage			Temperature sensor		Motor feedback				
Manufacturer	Type	FPA	24 VDC	320 VDC	560 VDC	PTC	KTY 84-130	Resolver 2-pole	Incremental SIN/COS	HIPERFACE®	EnDat® + SIN/COS	Incremental TTL
Harmonic Drive AG	YukonDrive®	●		○	●	○	●	●			●	
Siemens	SINAMICS S120 SIMODRIVE 611	● ●			● ●		● ●	● ●	●		● ●	
Bosch Rexroth	IndraDrive C	○			○		○				○	
Beckhoff	AX 5000 AX 2000	○ ○		○ ○	○ ○		● ●				○ ○	
B&R	ACOPOS	○			○		○				○	
NUM	NUMDrive	○			○		○			○		
Elmo	DRUM	○		○	○			○		○		
Fanuc	SVx	○		○					○			
KOLLMORGEN	AKD S700	○ ○			○ ○	○ ○	○ ○	○ ○			○ ○	
Mitsubishi	MDS	○		○					○			

● in service ○ compatible according to datasheet

Compatibility with other manufacturers controllers are available on request.



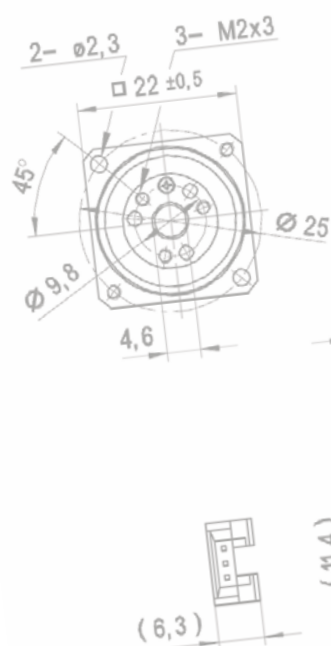
Small, flexible high precision actuator

RSF Mini Series Servo Actuators combine a synchronous servo motor and a CSF Gearbox to create a highly dynamic compact servo actuator.

Harmonic Drive® Servo Actuators are the perfect combination of highly dynamic compact servo motors, precision Harmonic Drive® Component Sets and integral high load capacity, tilt resistant output bearings.

Available in five sizes with gear ratios of 30, 50 and 100:1, the actuators can provide a maximum torque from 0.13 to 28 Nm. The accurate positioning of the actuator ensures stable machine characteristics and short cycle times.

By combining the RSF Mini Actuators with the specially adapted HA-680 Servo Controllers, it is possible to provide a single source supply for a pre-configured drive system tailored to suit your application. The RSF Mini Series is also compatible with many common servo controllers on the market.



Features

- Servo controller available
- Compact, lightweight design
- Excellent lifetime precision
- High dynamics

Optimised for your applications:

- Reduced set up time
- Increased operating reliability
- Shorter time to market
- Reduced material use
- Higher product quality
- Less waste
- Greater energy efficiency
- Lower production costs
- Small machine footprint
- Increased machine throughput
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs

Customer Benefits



QUICKLINK

www.harmonicdrive.co.uk/1060

RSF Mini

Ordering code

RSF Supermini

Table 74.1

Series	Size	Ratio			Motor feedback	Brake	Connector configuration	Special design				
RSF	3C	30	50	100	E020		C	According to customer requirements				
	5B	30	50	100	E050	B						
Ordering code												
RSF	-	5B	-	100	-	E050	-	B	-	C	-	SP

RSF Mini

Table 74.2

Series	Size	Ratio			Motor feedback	Motor winding	Connector configuration	Special design				
RSF	8B	30	50	100	F100	24B	C	According to customer requirements				
	11B	30	50	100								
	14B	30	50	100								
Ordering code												
RSF	-	8B	-	100	-	F100	-	24B	-	C	-	SP

Table 74.3

Motor feedback		
Ordering code	Type	Protocol
E020	Incremental	Without
E050		
F100	Incremental with Hall sensors	

Table 74.4

Motor winding		
Size	Ordering code	Maximum DC bus voltage
3C	Without	48 VDC
5B		
8B	24B	
11B		
14B		

Table 74.5

Connector configuration				
Size	Ordering code	Motor	Motor feedback	
			E020 E050	F100
3C 5B	C	4 pin	9 pin	
8B 11B 14B	C	6 pin		Encoder: 9 pin HALL-Sensor: 8 pin

Combinations

Table 75.1

Size		3C	5B	8B	11B	14B
Ratio	30	●	●	●	●	●
	50	●	●	●	●	●
	80	-	-	-	-	○
	100	●	●	●	●	●
	120	-	-	-	-	○
	160	-	-	-	-	-
Motor winding	24B	-	-	●	●	●
Connector configuration	C	●	●	●	●	●
Motor feedback	E020	●	-	-	-	-
	E050	-	●	-	-	-
	F100	-	-	●	●	●
Brake	B	-	●	-	-	-

● available ○ on request - not available



Technical data

Table 76.1

	Unit	RSF-3C			RSF-5B		
Ratio	i []	30	50	100	30	50	100
Maximum output torque	T _{max} [Nm]	0.13	0.21	0.30	0.50	0.90	1.40
Maximum output speed	n _{max} [rpm]	333	200	100	333	200	100
Continuous stall torque	T ₀ [Nm]	0.04	0.08	0.12	0.28	0.44	0.65
Moment of inertia without brake	J _{out} [x 10 ⁻⁴ kgm ²]	0.11	0.29	1.17	0.66	1.83	7.31
Moment of inertia with brake	J _{out} [x 10 ⁻⁴ kgm ²]	-			1.11	3.10	12.3
Brake holding torque	T _H [Nm]	-			0.18	0.29	0.44
Weight without brake	m [kg]	0.03			0.07		
Weight with brake	m [kg]	-			0.09		
Transmission accuracy	[arcmin]	< 10			< 4	< 3	
Lost Motion	[arcmin]	< 1.5			< 1.5		
Torsional stiffness	K ₃ [Nm/rad]	51	57	67	120	170	200
Ambient operating temperature	[°C]	0 ... 40			0 ... 40		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	36			90		
Dynamic axial load	F _{A dyn (max)} [N]	130			270		
Dynamic tilting moment	M _{dyn (max)} [Nm]	0.27			0.89		

Table 76.2

	Unit	RSF-8B			RSF-11B		
Ratio	i []	30	50	100	30	50	100
Maximum output torque	T _{max} [Nm]	1.8	3.3	4.8	4.5	8.3	11
Maximum output speed	n _{max} [rpm]	200	120	60	200	120	60
Continuous stall torque	T ₀ [Nm]	0.95	1.7	3.5	1.7	3.0	5.7
Moment of inertia without brake	J _{out} [kgm²]	0.0006	0.0016	0.0065	0.0018	0.0049	0.02
Moment of inertia with brake	J _{out} [kgm²]	-			-		
Brake holding torque	T _H [Nm]	-			-		
Weight without brake	m [kg]	0.3			0.5		
Weight with brake	m [kg]	-			-		
Transmission accuracy	[arcmin]	< 3	< 2.5		< 2.5	< 2	
Lost Motion	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x 10³ Nm/rad]	0.54	0.84	1.2	1.5	3.2	4.4
Ambient operating temperature	[°C]	0 ... 40			0 ... 40		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	196			245		
Dynamic axial load	F _{A dyn (max)} [N]	98			196		
Dynamic tilting moment	M _{dyn (max)} [Nm]	-			-		

Illustration 77.1

RSF-3C [mm]

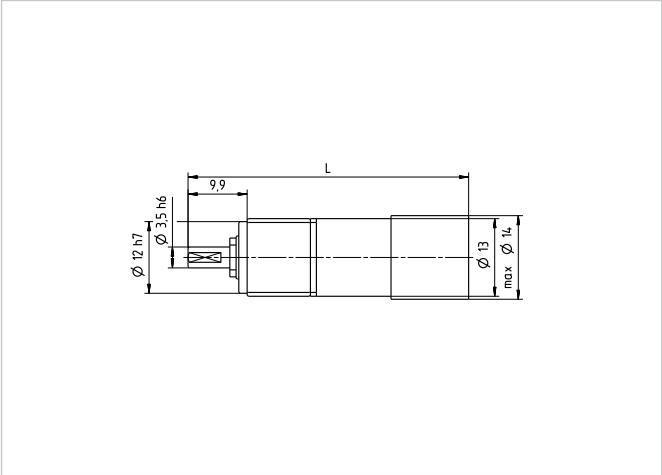


Illustration 77.2

RSF-5B [mm]

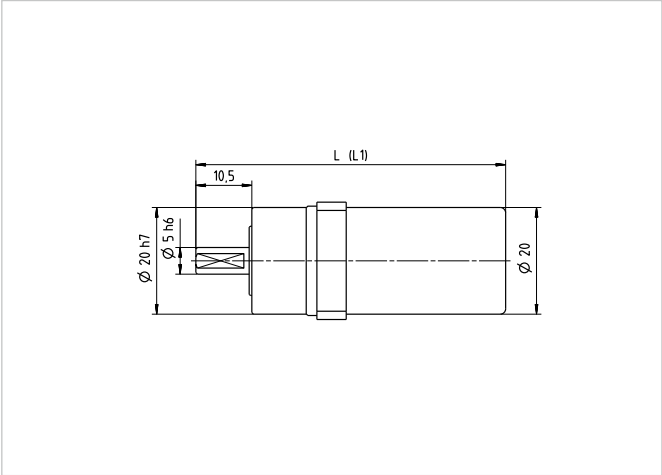


Table 77.3

	Unit	RSF-3C	RSF-5B
Length (without brake)	L [mm]	47	59
Length (with brake)	L1 [mm]	-	70

Illustration 77.4

RSF-8B [mm]

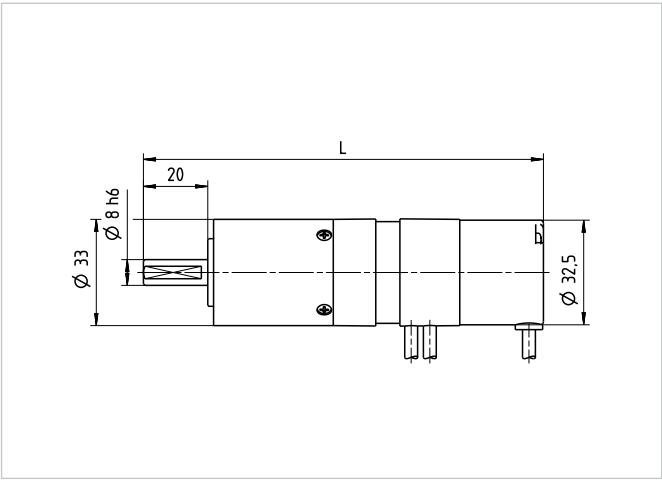


Illustration 77.5

RSF-11B [mm]

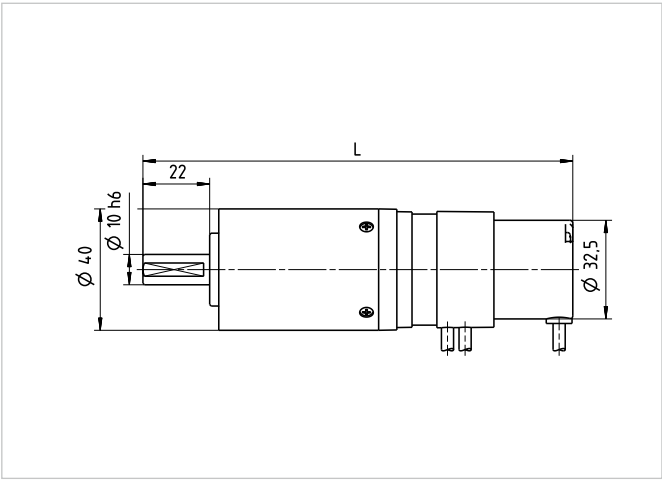


Table 77.6

	Unit	RSF-8B	RSF-11B
Length (without brake)	L [mm]	125	142
Length (with brake)	L1 [mm]	-	-

Technical data

Table 78.1

	Unit	RSF-14B		
Ratio	i []	30	50	100
Maximum output torque	T _{max} [Nm]	9	18	28
Maximum output speed	n _{max} [rpm]	200	120	60
Continuous stall torque	T ₀ [Nm]	2.5	4.5	9
Moment of inertia without brake	J _{out} [kgm²]	0.004	0.011	0.045
Moment of inertia with brake	J _{out} [kgm²]	-		
Brake holding torque	T _H [Nm]	-		
Weight without brake	m [kg]	0.8		
Weight with brake	m [kg]	-		
Transmission accuracy	[arcmin]	< 2.5	< 2	
Lost Motion	[arcmin]	< 1		
Torsional stiffness	K ₃ [x 10³ Nm/rad]	3.4	5.7	7.1
Ambient operating temperature	[°C]	0 ... 40		
Output bearing				
Dynamic radial load	F _{R dyn (max)} [N]	392		
Dynamic axial load	F _{A dyn (max)} [N]	392		
Dynamic tilting moment	M _{dyn (max)} [Nm]	-		

Illustration 79.1

RSF-14B [mm]

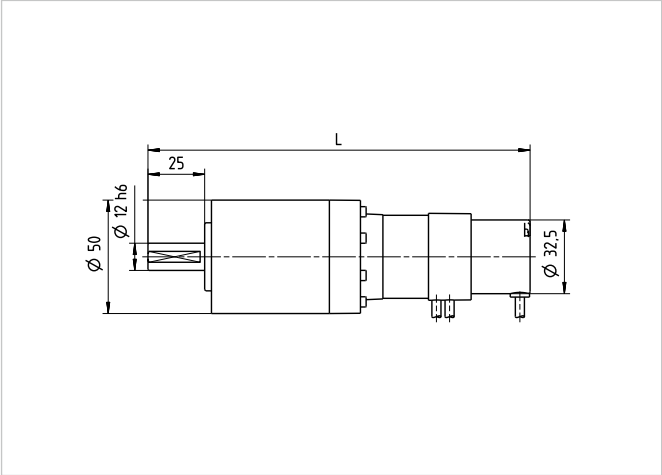
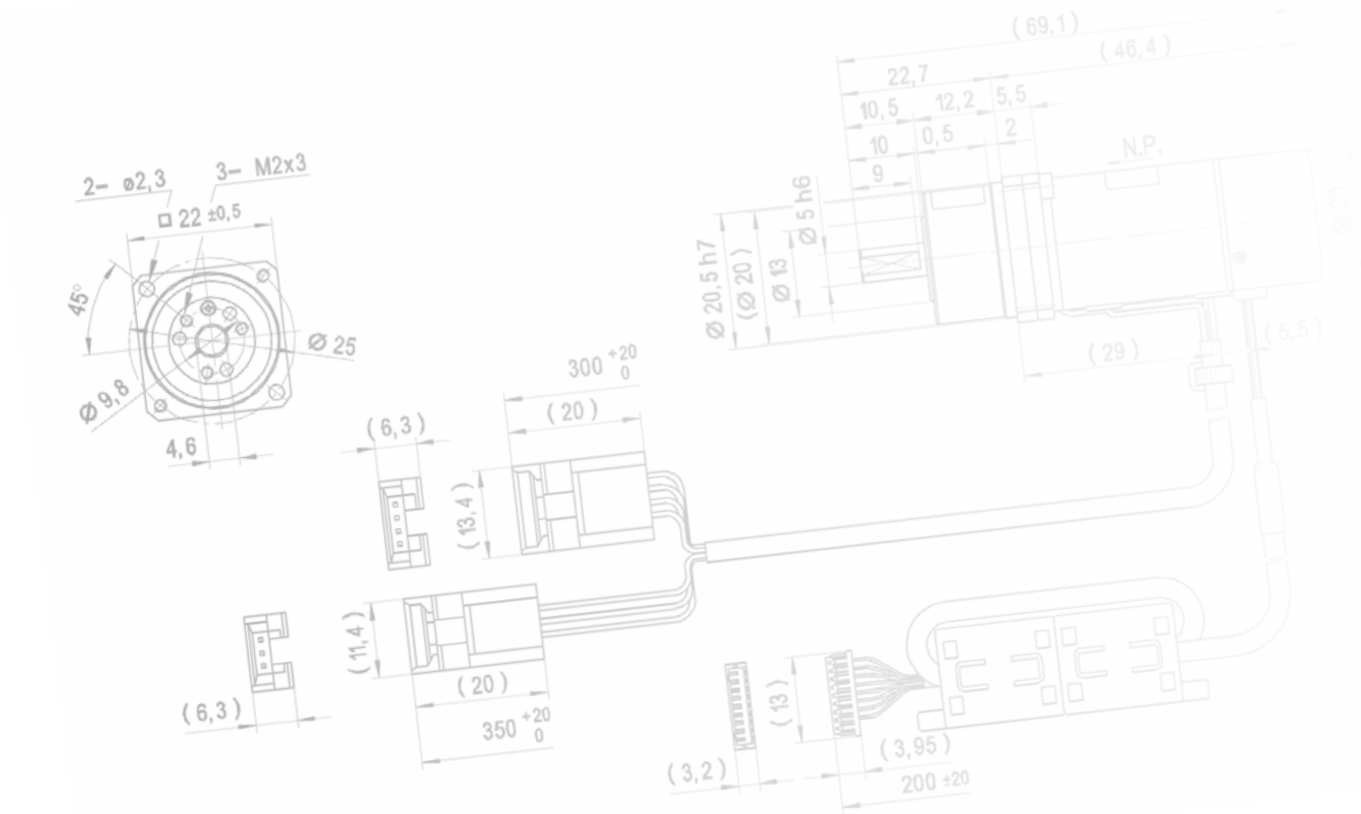


Table 79.2

	Unit	RSF-14B
Length (without brake)	L [mm]	169
Length (with brake)	L1 [mm]	-

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Motor feedback

Encoder

Table 80.1

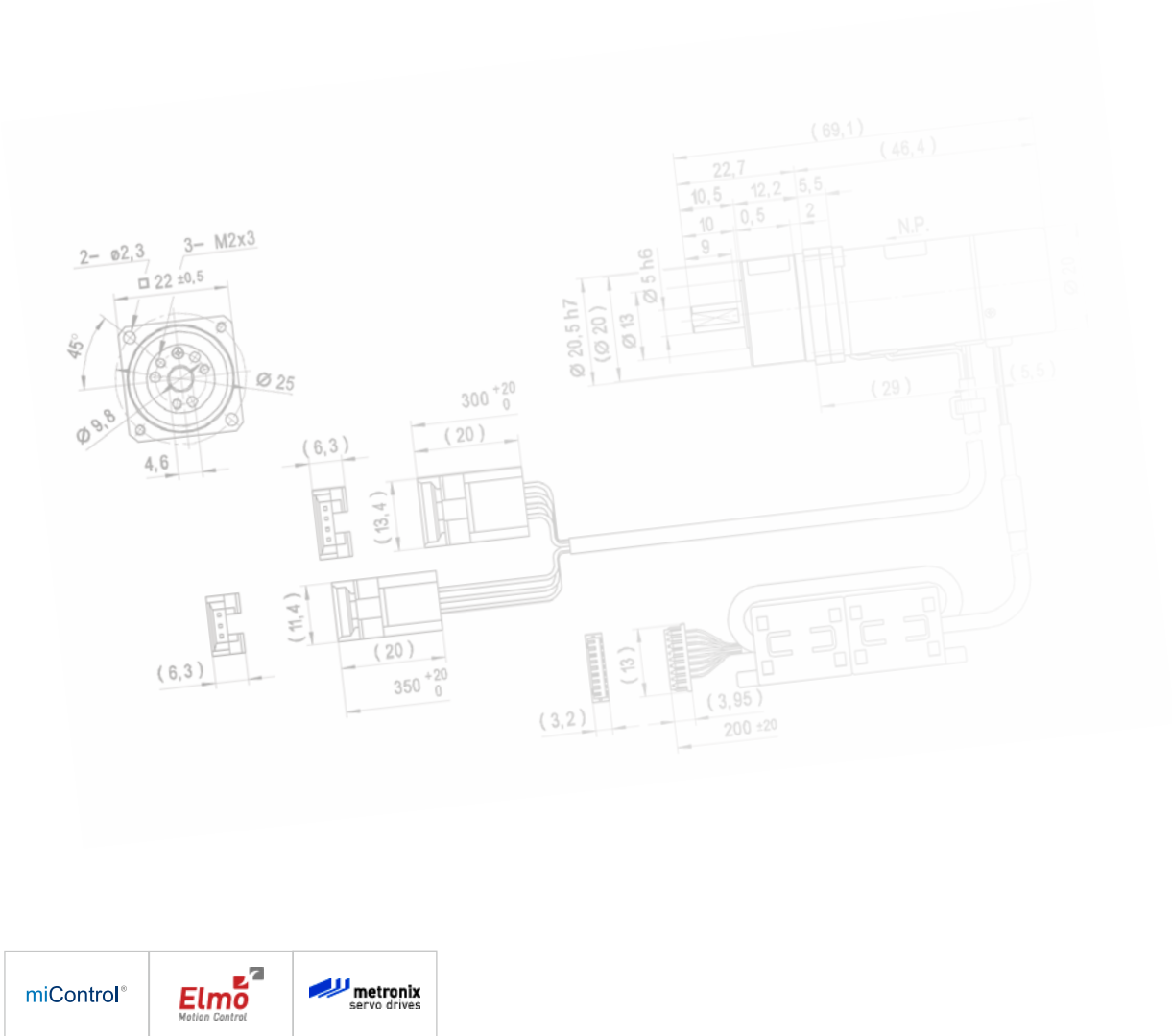
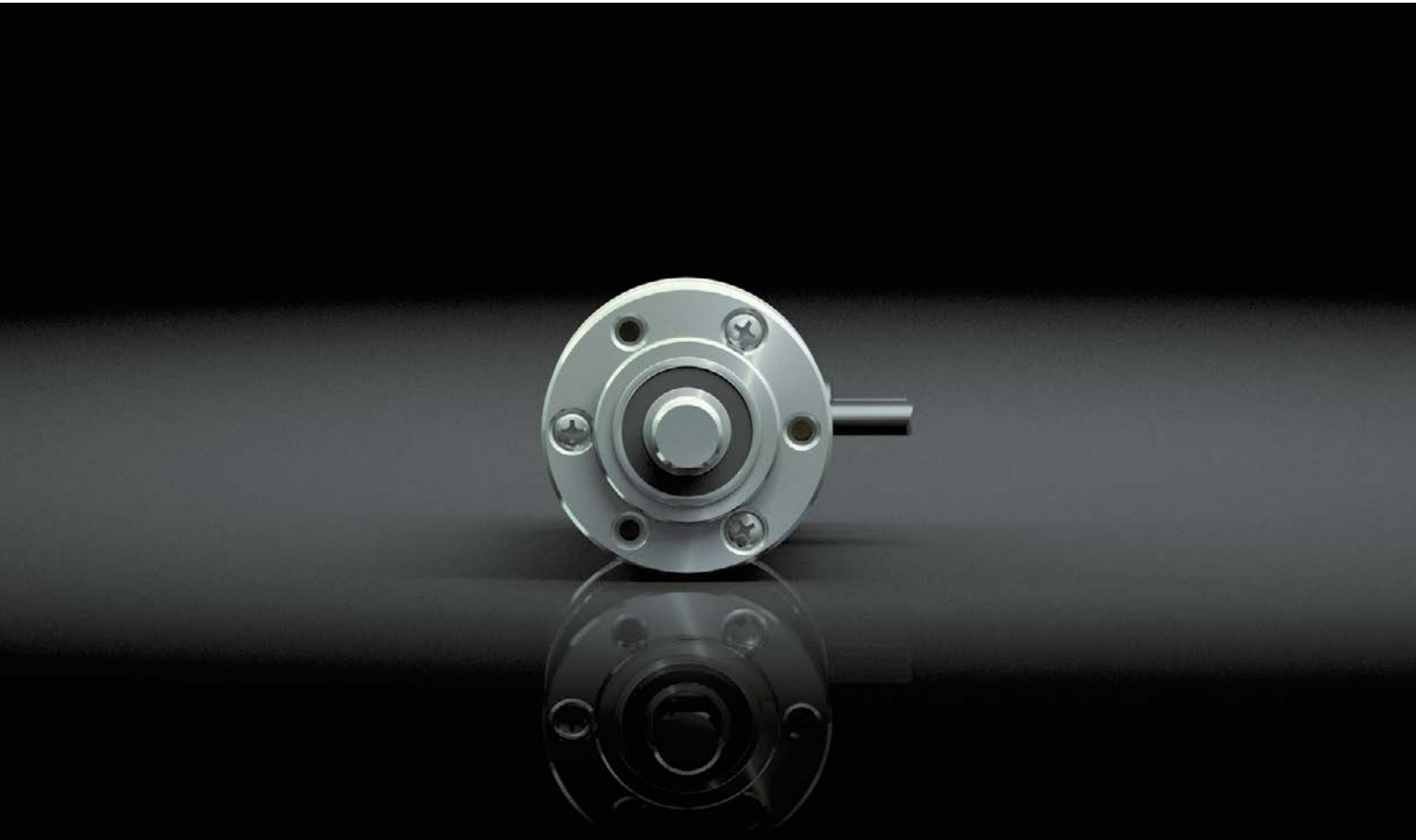
Type		Incremental		
Ordering code		E020	E050	F100
Power supply		5 VDC ± 5%		
Output circuit		Open collector		Line driver
Signal form		Square wave		
Resolution	A.B	200	500	1000
	U, V, W	4		
	Z	1		

Compatibility

Table 81.1

		Product
Manufacturer	Type	RSF
Harmonic Drive AG	HA-680	●
miControl®	mcDSA	○
Elmo Motion Control	Gold DC Whistle	○
Metronix	DIS-2	○

● in service ○ compatible according to datasheet
Compatibility with other manufacturers controllers are available on request.



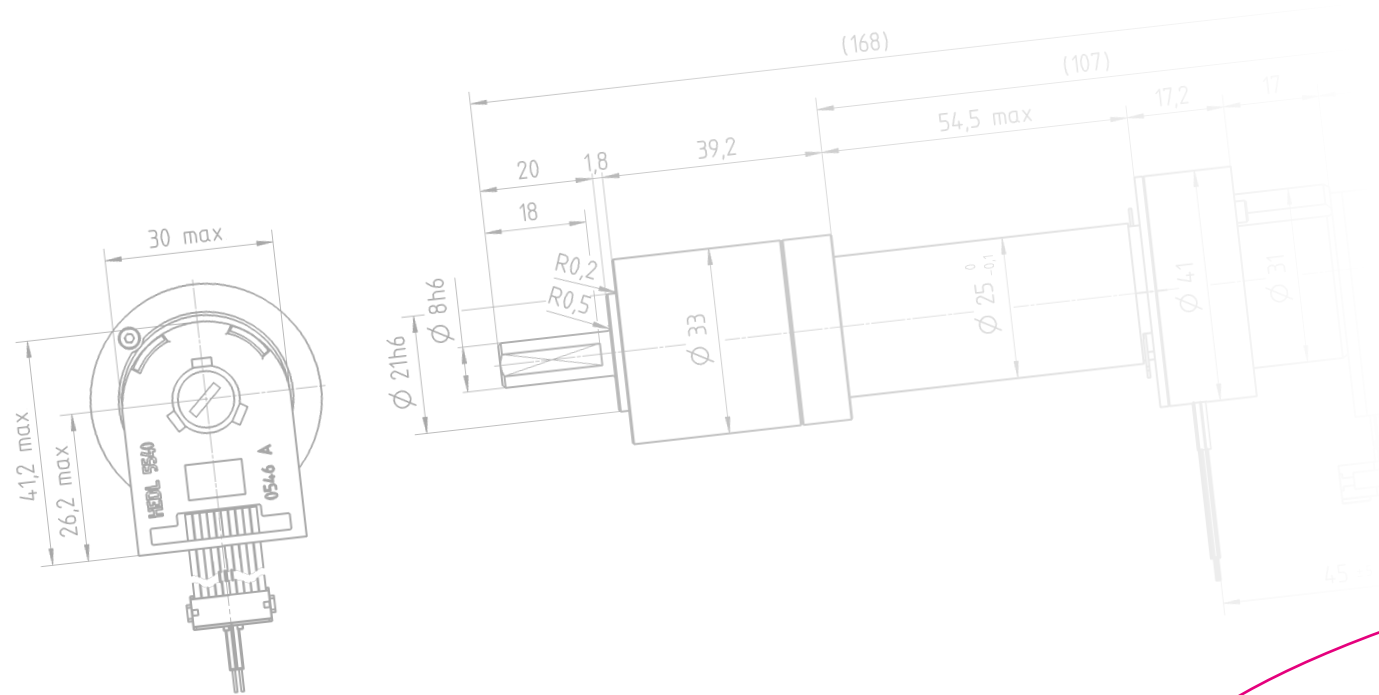
Mini servo actuator with DC motor

PMA Series Servo Actuators combine a highly dynamic DC motor with encoder and PMG Gearbox to create a dynamic compact servo actuator.

Harmonic Drive® Servo Actuators are the perfect combination of highly dynamic compact servo motors, precision Harmonic Drive® Component Sets and integral high load capacity, tilt resistant output bearings.

Available in four sizes with gear ratios of 50 and 100:1, the actuators can provide a maximum torque from 0.39 to 20 Nm. The accurate positioning of the actuator ensures stable machine characteristics and short cycle times.

Compatible with many common servo controllers on the market, PMA Mini Servo Actuators enable easy setup of compact servo axes – especially for small quantities.



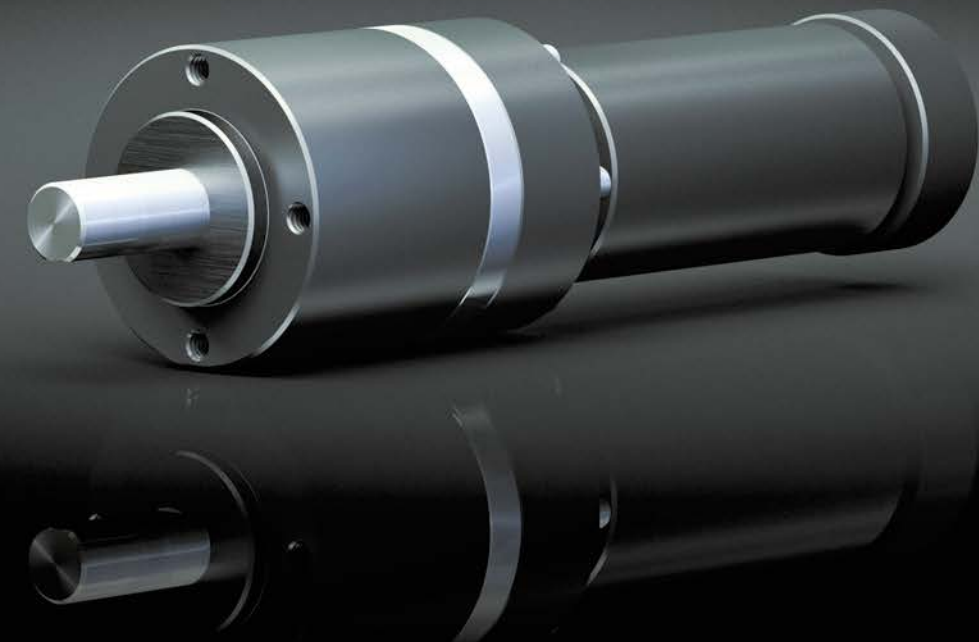
Features

- Compact, lightweight design
- Third party controller compatibility
- Excellent lifetime precision

Optimised for your applications:

- Reduced material use
- Greater energy efficiency
- Lower production costs
- Small machine footprint
- Flexible control configuration
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs

Customer Benefits



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PMA

Ordering code

Table 84.1

Series	Size	Ratio		Motor winding	Motor feedback	Special design				
PMA	5A	50	100	01	E256ML	According to customer requirements				
	8A	50	100		E500ML					
	11A	50	100							
	14A	50	100							
Ordering code										
PMA	-	8A	-	100	-	01	-	E500ML	-	SP

Table 84.2

Motor winding		
Size	Ordering code	Maximum DC bus voltage
5A	01	18 VDC
8A		48 VDC
11A		36 VDC
14A		42 VDC

Table 84.3

Motor feedback		
Ordering code	Type	Protocol
E256ML	Incremental	-
E500ML		

Combinations

Table 85.1

Size		5A	8A	11A	14A
Ratio	30	-	-	-	-
	50	●	●	●	●
	80	○	-	-	-
	100	●	●	●	●
	120	-	-	-	-
	160	-	-	-	-
Motor winding	01	●	●	●	●
Motor feedback	E256ML	●	-	-	-
	E500ML	-	●	●	●

● available ○ on request - not available



Technical data

Table 86.1

	Unit	PMA-5A		PMA-8A	
Ratio	i []	50	100	50	100
Maximum output torque	T _{max} [Nm]	0.39	0.69	2.7	3.5
Maximum output speed	n _{max} [rpm]	180	90	120	60
Continuous stall torque	T ₀ [Nm]	0.20	0.45	0.96	2.06
Moment of inertia without brake	J _{out} [x 10 ⁻⁴ kgm ²]	3.68	14.7	32.8	131
Moment of inertia with brake	J _{out} [x 10 ⁻⁴ kgm ²]	-		-	
Brake holding torque	T _H [Nm]	-		-	
Weight without brake	m [kg]	0.07		0.25	
Weight with brake	m [kg]	-		-	
Transmission accuracy	[arcmin]	< 4.5		< 2.5	
Lost Motion	[arcmin]	< 4		< 3	
Torsional stiffness	K ₃ [Nm/rad]	55 ¹⁾	100	389 ¹⁾	690
Ambient operating temperature	[°C]	0 ... 40		0 ... 40	
Output bearing					
Dynamic radial load	F _{R dyn (max)} [N]	59		196	
Dynamic axial load	F _{A dyn (max)} [N]	29		98	
Dynamic tilting moment	M _{dyn (max)} [Nm]	0.3		1.96	

¹⁾ K₂

Table 86.2

	Unit	PMA-11A		PMA-14A	
Ratio	i []	50	100	50	100
Maximum output torque	T _{max} [Nm]	5.0	7.9	14	20
Maximum output speed	n _{max} [rpm]	100	50	100	50
Continuous stall torque	T ₀ [Nm]	2.8	5.9	4.3	9.3
Moment of inertia without brake	J _{out} [x 10 ⁻⁴ kgm ²]	109	437	257	1026
Moment of inertia with brake	J _{out} [x 10 ⁻⁴ kgm ²]	-		-	
Brake holding torque	T _H [Nm]	-		-	
Weight without brake	m [kg]	0.50		0.76	
Weight with brake	m [kg]	-		-	
Transmission accuracy	[arcmin]	< 2		< 2	
Lost Motion	[arcmin]	< 3		< 3	
Torsional stiffness	K ₃ [Nm/rad]	1160 ¹⁾	1400	2250 ¹⁾	4270
Ambient operating temperature	[°C]	0 ... 40		0 ... 40	
Output bearing					
Dynamic radial load	F _{R dyn (max)} [N]	245		392	
Dynamic axial load	F _{A dyn (max)} [N]	196		392	
Dynamic tilting moment	M _{dyn (max)} [Nm]	2.7		4.9	

¹⁾ K₂

Illustration 87.1

PMA-5A [mm]

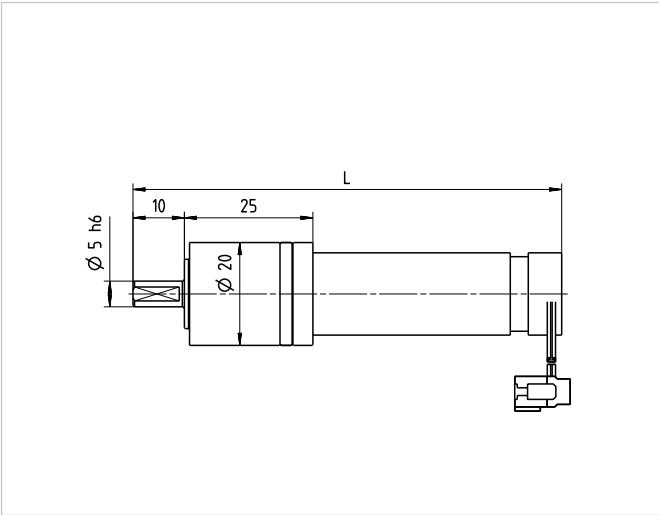


Illustration 87.2

PMA-8A [mm]

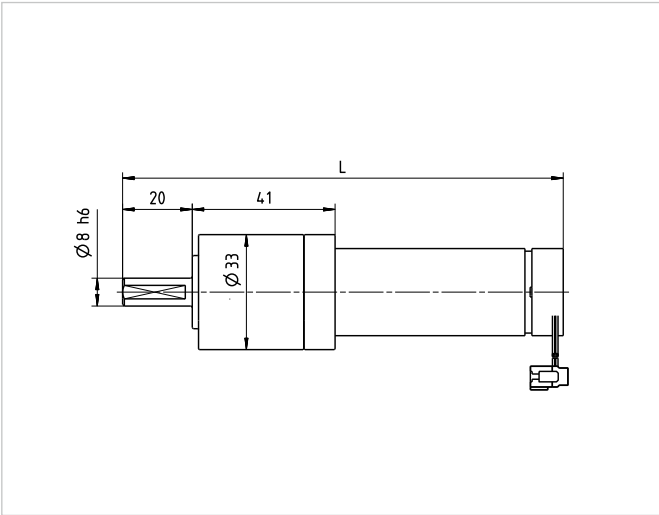


Table 87.3

	Unit	PMA-5A	PMA-8A
Motor feedback		E256ML	E500ML
Length (without brake)	L [mm]	84	127

Illustration 87.4

PMA-11A [mm]

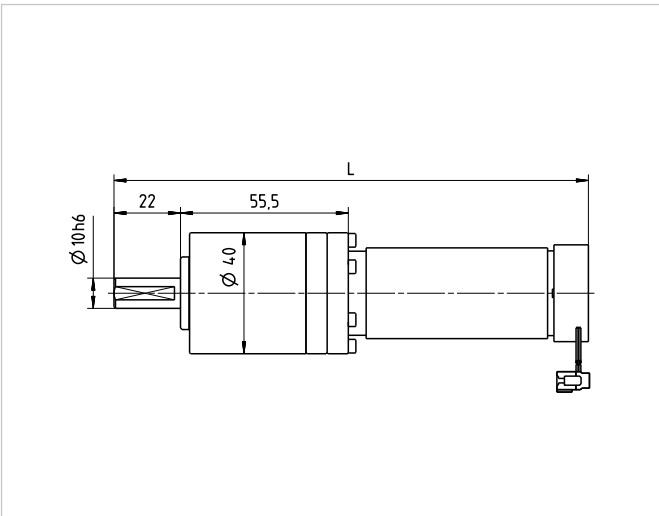


Illustration 87.5

PMA-14A [mm]

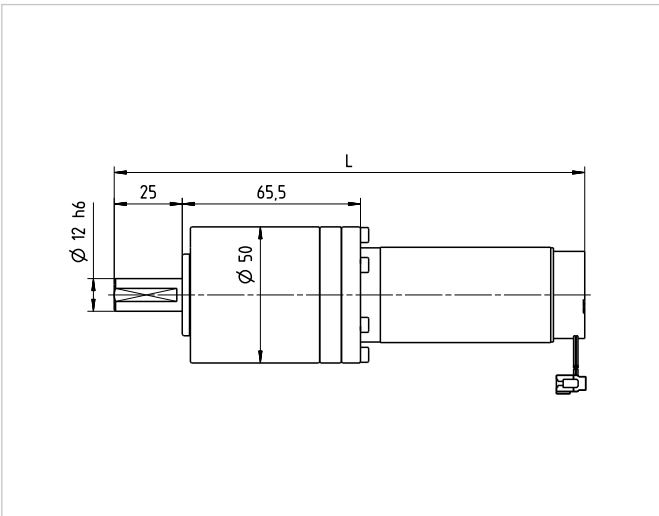


Table 87.6

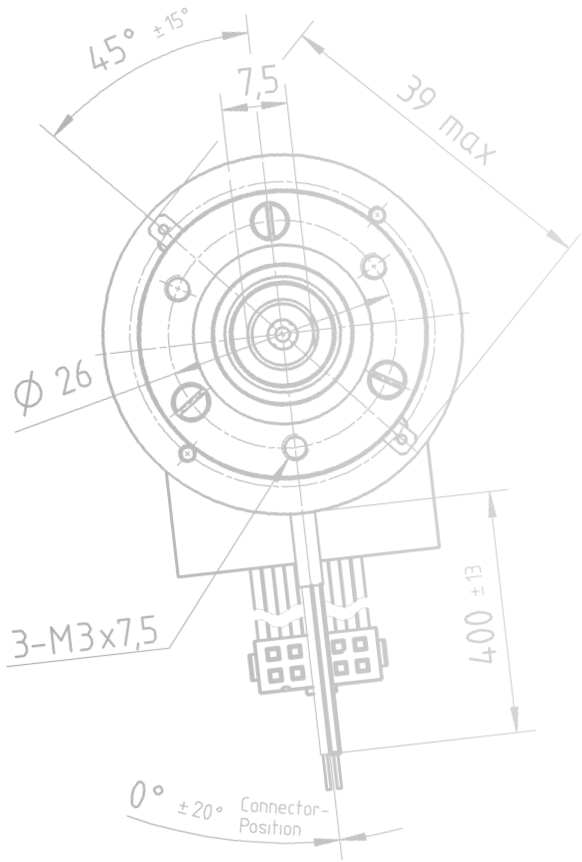
	Unit	PMA-11A	PMA-14A
Motor feedback		E500ML	E500ML
Length (without brake)	L [mm]	157	173

Motor feedback

Encoder

Table 88.1

Type		Incremental	
Ordering code		E256ML	E500ML
Power supply		5 VDC ± 5%	
Output circuit		Line driver	
Signal form		Square wave	
Resolution	A,B	256	500
	Z	1	



Compatibility

Table 89.1

		Product	Controller output voltage			
Manufacturer	Type	PMA	18 VDC	36 VDC	42 VDC	48VDC
maxon motor	ESCON EPOS3	● ●	● ●	● ●	● ●	● ●
Dr. Fritz FAULHABER	SC5004 SC5008	○ ○	○ ○	○ ○	○ ○	○ ○
MATTHE	MMC 24/3 MMC 24/6	○ ○	○ ○			
ESR Pollmeier	BN 6508 BN 6509	○ ○	○ ○	○ ○	○ ○	

● in service ○ compatible according to datasheet
Compatibility with other manufacturers controllers are available on request.



High speed and low cogging torque

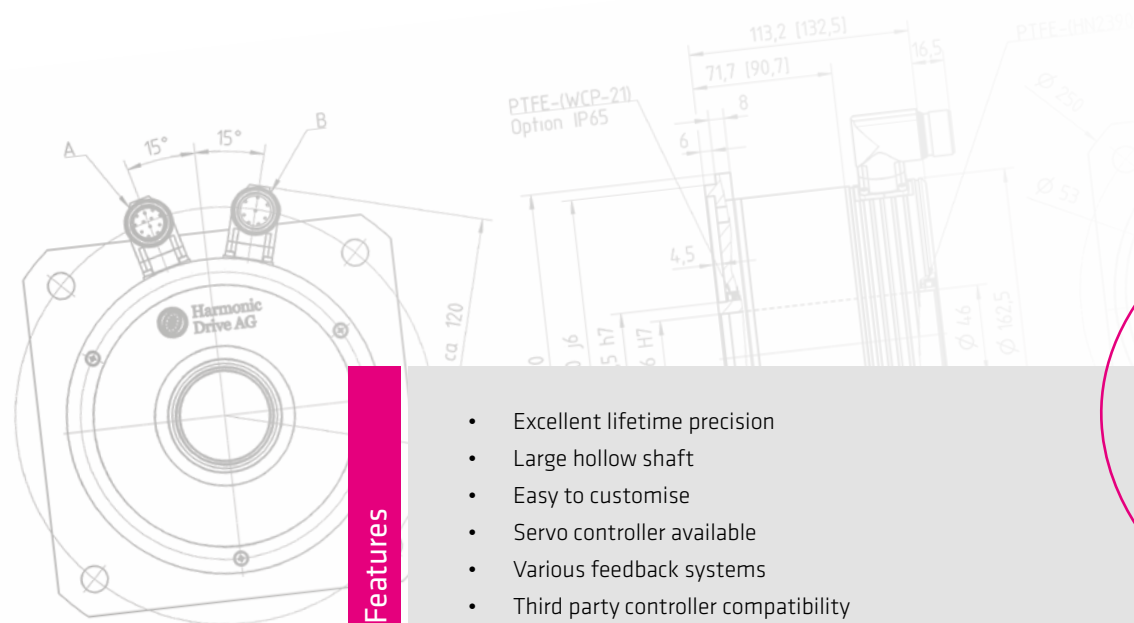
The CHM Servo Motor is characterised by distributed winding, high resolution measuring systems and a hollow shaft. Available in five sizes, the motors offer maximum torques from 2.8 to 37 Nm at speeds of up to 6,500 rpm.

CHM Hollow Shaft Servo Motors offer Harmonic Drive® precision in the applications for direct drives. They offer a high power density and allow extended dynamic range, accuracy and system stiffness.

To adapt to specific applications, the CHM Series offer numerous possible combinations covering the selection of motor feedback systems, brakes and various cable as well as connector options.

By combining the CHM Servo Motors with the specially adapted YukonDrive® Servo Controllers, it is possible to provide a single source supply for a pre-configured drive system tailored to suit your application. Alternatively, the flexible configuration of the actuator ensures compatibility with almost any servo controller on the market.

The integrated hollow shaft can be used to feed through supply lines or services for additional axes, enabling space saving designs with minimal installation dimensions required. Accurate positioning ensures stable machine characteristics, short cycle times and minimum space requirements. With high protection ratings and corrosion resistance, the series is perfectly suited for use in harsh and demanding environmental conditions.



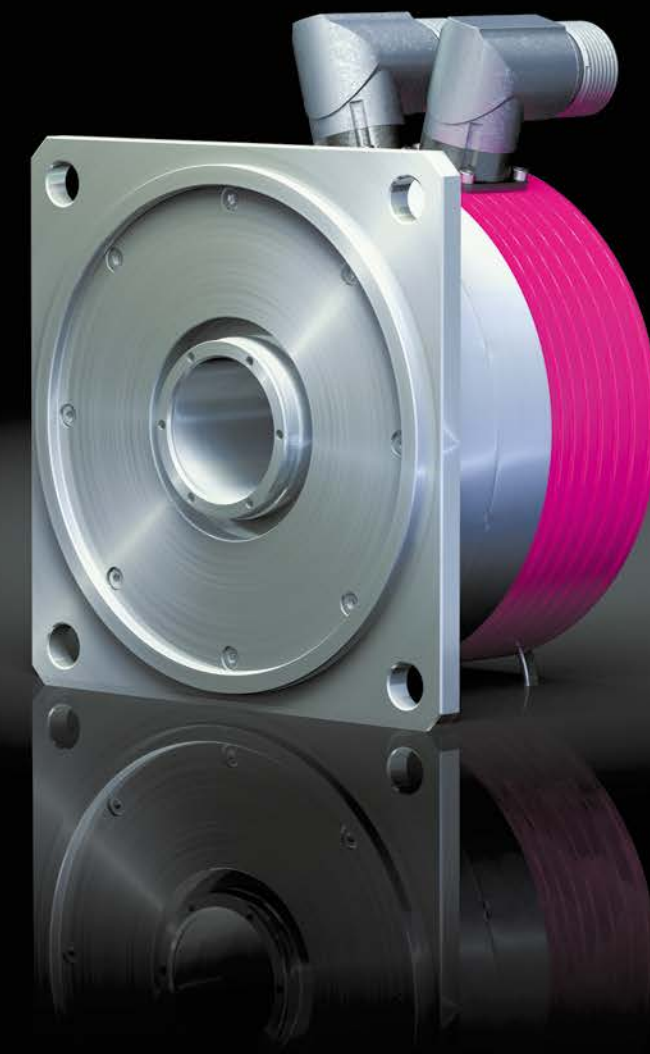
Features

- Excellent lifetime precision
- Large hollow shaft
- Easy to customise
- Servo controller available
- Various feedback systems
- Third party controller compatibility
- High dynamics
- Compact, lightweight design

Optimised for your applications:

- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Increased operating reliability
- Optimal design solution
- Easy integration
- Reduced set up time
- Shorter time to market
- Flexible control configuration
- Greater energy efficiency
- Low manufacturing and installation costs

Customer Benefits



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CHM

Ordering code

Table 92.1

Series	Size	Motor winding	Connector configuration	Motor feedback	Protection	Brake	Special design							
CHM	0083A	AM	H L	CDO SDH MDH	54 65	B	According to customer requirements							
	0200A	AR												
	0390A	AU												
	0800A	AX												
	1100A	AX												
Ordering code														
CHM	-	0083A	-	AM	-	H	-	MDH	-	54	-	B	-	SP

Table 92.2

Motor winding		
Size	Ordering code	Maximum DC bus voltage
0083A	AM	680 VDC
0200A	AR	
0390A	AU	
0800A	AX	
1100A	AX	

Table 92.3

Connector configuration			
Ordering code	Motor	Motor feedback	
		SDH MDH	CDO
H	6 pin (M23)	12 pin (M23)	17 pin (M23)
L	8 pin (M23)		

Table 92.4

Motor feedback		
Ordering code	Type	Protocol
CDO	Incremental	-
SDH	Single turn absolute	HIPERFACE®
MDH	Multi-turn absolute	

Table 92.5

Protection	
Ordering code	Class
54	IP54
65	IP65

Combinations

Table 93.1

Size		0083A	0200A	0390A	0800A	1100A
Motor winding	AM	●	-	-	-	-
	AR	-	●	-	-	-
	AU	-	-	●	-	-
	AX	-	-	-	●	●
Connector configuration	H	●	●	●	●	●
	L	●	●	●	●	●
Motor feedback	CDO	●	●	●	●	●
	SDH	●	●	●	●	●
	MDH	●	●	●	●	●
Protection	54	●	●	●	●	●
	65	●	●	●	●	●
Brake	B	●	●	●	●	●

● available ○ on request - not available



Technical data

Table 94.1

	Unit	CHM-0083A		CHM-0200A	
Protection	IP	54	65	54	65
Maximum output torque	T _{max} [Nm]	2.9	2.8	6.4	6.4
Maximum output speed	n _{max} [rpm]	6500		5600	
Rated torque	T _N [Nm]	0.6	0.4	1.4	1.1
Rated speed	n _N [rpm]	3000		3000	
Continuous stall torque	T ₀ [Nm]	0.8	0.7	1.8	1.7
Moment of inertia without brake	J [10 ⁻⁴ kgm²]	0.94		3.20	
Moment of inertia with brake	J [10 ⁻⁴ kgm²]	1.21		4.16	
Brake holding torque	T _H [Nm]	1		2	
Weight without brake	m [kg]	1.3		2.9	
Weight with brake	m [kg]	2		4.1	
Hollow shaft diameter	d _H [mm]	21		35.5	
Ambient operating temperature	[°C]	0 ... 40		0 ... 40	
Output bearing					
Dynamic radial load	F _{R dyn (max)} [N]	220		310	
Dynamic axial load	F _{A dyn (max)} [N]	180		210	
Dynamic tilting moment	M _{dyn (max)} [Nm]	6.7		9.4	

Table 94.2

	Unit	CHM-0390A		CHM-0800A	
Protection	IP	54	65	54	65
Maximum output torque	T _{max} [Nm]	11.3	11.2	27	27
Maximum output speed	n _{max} [rpm]	4000		4000	
Rated torque	T _N [Nm]	2.5	1.9	7.0	6.0
Rated speed	n _N [rpm]	3000		3000	
Continuous stall torque	T ₀ [Nm]	3.9	3.7	8.0	7.9
Moment of inertia without brake	J [10 ⁻⁴ kgm ²]	8.0		13.9	
Moment of inertia with brake	J [10 ⁻⁴ kgm ²]	9.9		16.6	
Brake holding torque	T _H [Nm]	5		5	
Weight without brake	m [kg]	4.7		7.3	
Weight with brake	m [kg]	6.8		10.9	
Hollow shaft diameter	d _H [mm]	42		46	
Ambient operating temperature	[°C]	0 ... 40		0 ... 40	
Output bearing					
Dynamic radial load	F _{R dyn (max)} [N]	350		450	
Dynamic axial load	F _{A dyn (max)} [N]	220		280	
Dynamic tilting moment	M _{dyn (max)} [Nm]	12		22.5	

Illustration 95.1

CHM-0083A [mm]

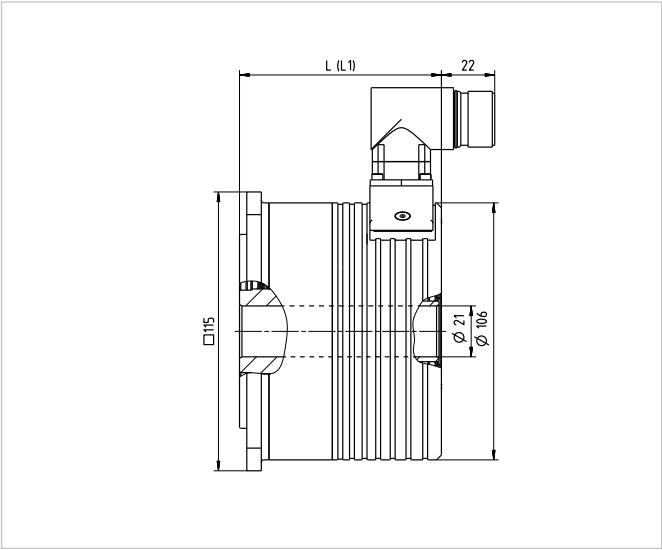


Illustration 95.2

CHM-0200A [mm]

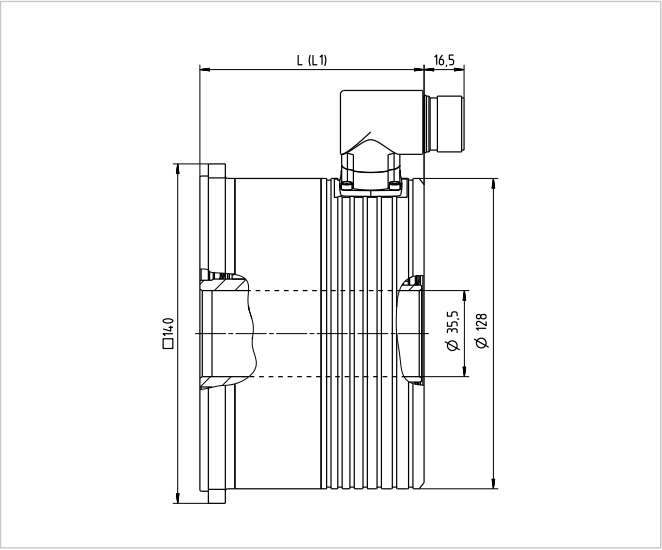


Table 95.3

	Unit	CHM-0083A	CHM-0200A
Motor feedback		CDO / SDH / MDH	CDO / SDH / MDH
Length without brake	L [mm]	83.3	92.5
Length with brake	L1 [mm]	103.3	120

Illustration 95.4

CHM-0390A [mm]

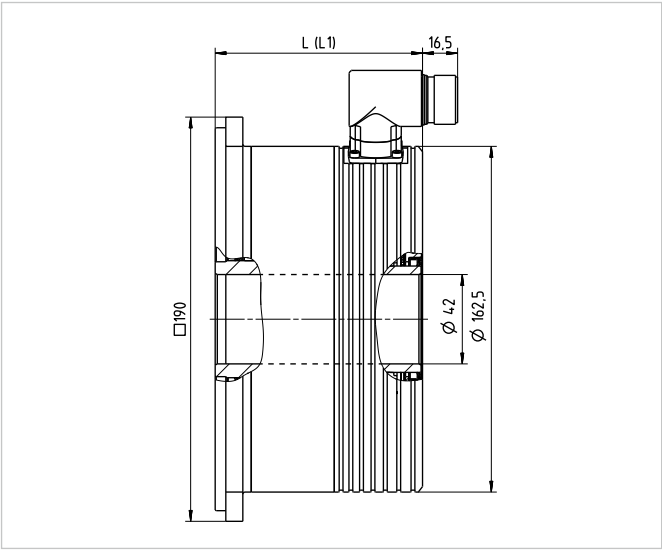


Illustration 95.5

CHM-0800A [mm]

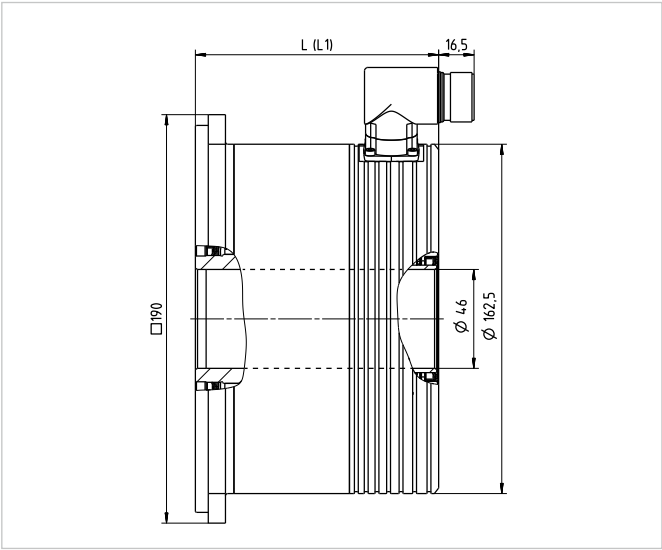


Table 95.6

	Unit	CHM-0390A	CHM-0800A
Motor feedback		CDO / SDH / MDH	CDO / SDH / MDH
Length without brake	L [mm]	97.5	113.2
Length with brake	L1 [mm]	116.5	132.5

Technical data

Table 96.1

	Unit	CHM-1100A	
Protection	IP	54	65
Maximum output torque	T _{max} [Nm]	37	37
Maximum output speed	n _{max} [rpm]	4000	
Rated torque	T _N [Nm]	10.5	9.6
Rated speed	n _N [rpm]	3000	
Continuous stall torque	T _o [Nm]	11	11
Moment of inertia without brake	J [10 ⁻⁴ kgm ²]	17.3	
Moment of inertia with brake	J [10 ⁻⁴ kgm ²]	18.0	
Brake holding torque	T _H [Nm]	10	
Weight without brake	m [kg]	8.9	
Weight with brake	m [kg]	12.6	
Hollow shaft diameter	d _H [mm]	46	
Ambient operating temperature	[°C]	0 ... 40	
Output bearing			
Dynamic radial load	F _{R dyn (max)} [N]	450	
Dynamic axial load	F _{A dyn (max)} [N]	280	
Dynamic tilting moment	M _{dyn (max)} [Nm]	27	

Illustration 97.1

CHM-1100A [mm]

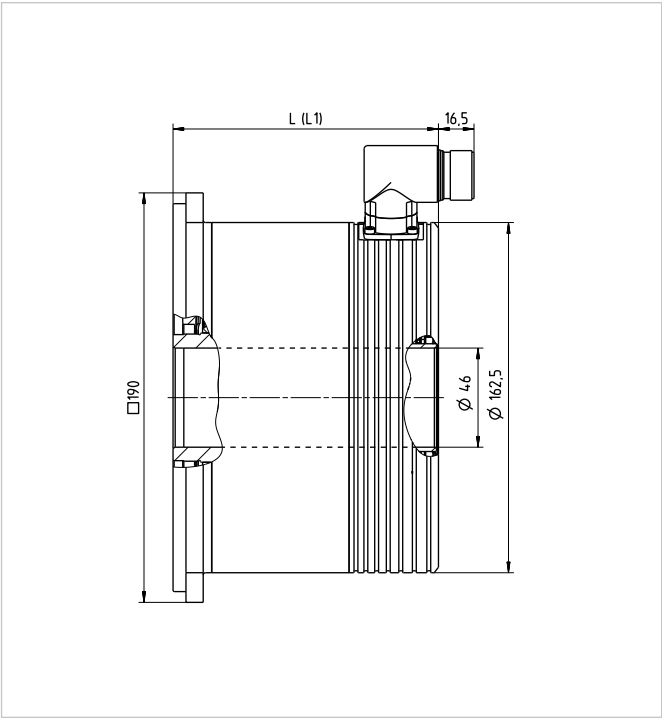
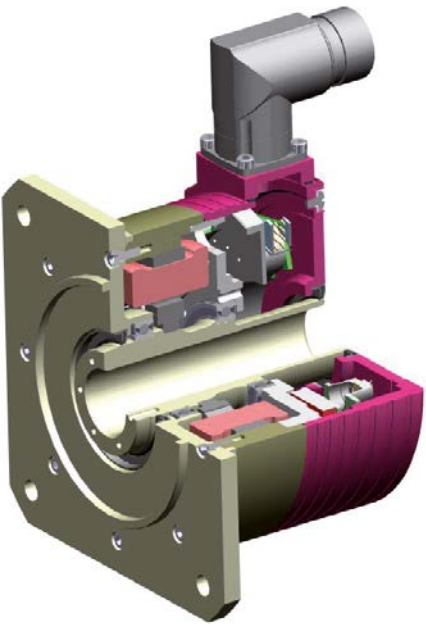
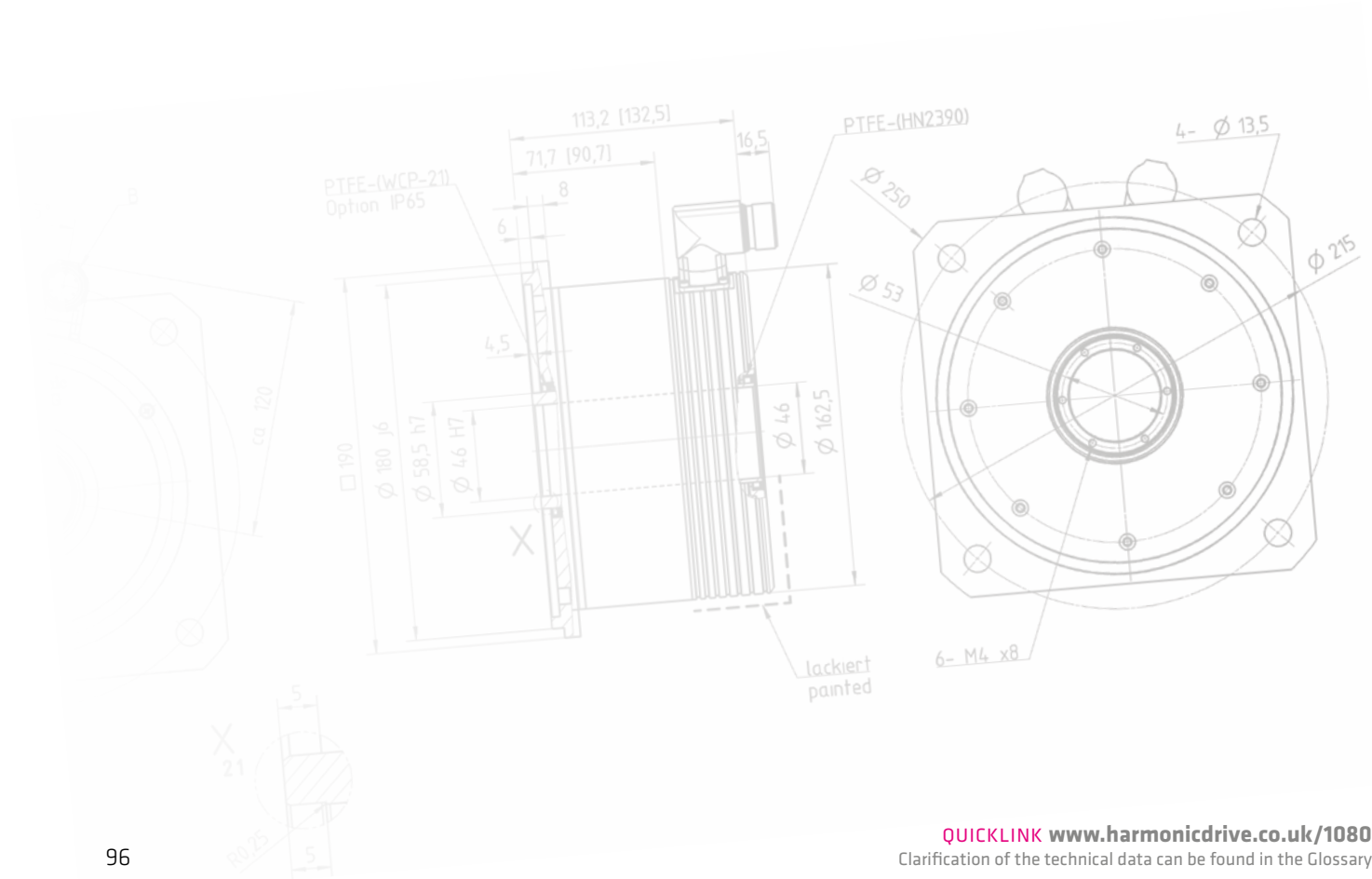


Table 97.2

	Unit	CHM-1100A
Motor feedback		CDO / SDH / MDH
Length without brake	L [mm]	123.2
Length with brake	L1 [mm]	144.2

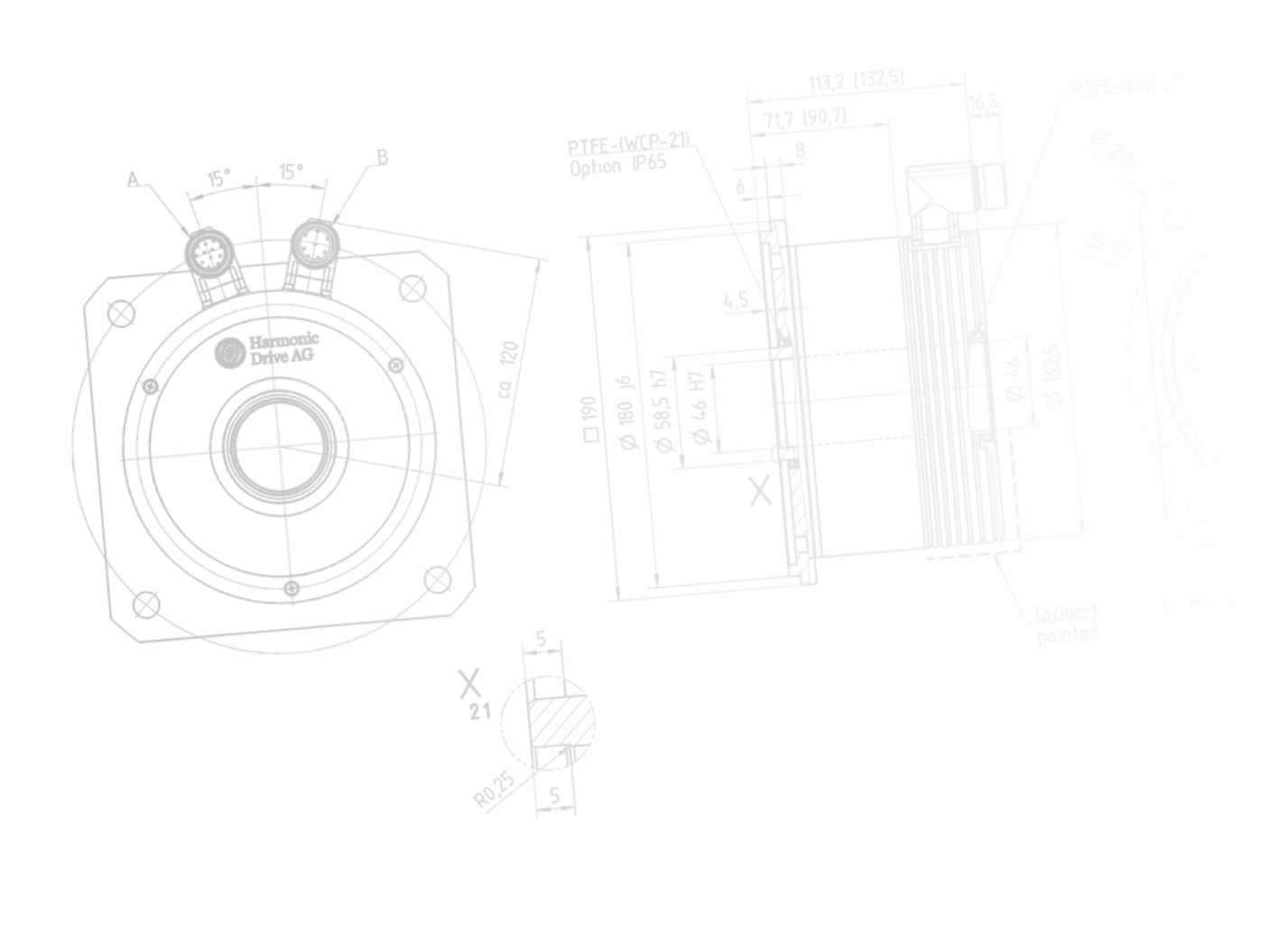


Motor feedback

Encoder

Table 98.1

Type	Incremental	Single turn absolute	Multi-turn absolute
Ordering code	CDO	SDH	MDH
Manufacturers designation	CCK	SCK	SCL
Protocol	-	HIPERFACE®	HIPERFACE®
Power supply	5 VDC ±10 %	7 ... 12 VDC	7 ... 12 VDC
Incremental signal	1 V _{ss}		
Signal form	sinusoidal		
Resolution	1024		
Cummutation signal	1 x C+D 1 V _{ss}	-	-
Reference signal	1 x R	-	-
Absolute position value/revolution	-	32768 (15 bit)	32768 (15 bit)
Revolutions	-	-	4096 (12 bit)



Compatibility

Table 99.1

		Product	DC bus voltage			Temperature sensor		Motor feedback				
Manufacturer	Type	CHM	24 VDC	320 VDC	560 VDC	PTC	KTY 84-130	Resolver 2-pole	Incremental SIN/COS	HIPERFACE®	EnDat® + SIN/COS	Incremental TTL
Harmonic Drive AG	YukonDrive®	●		○	●	○	●			●		
Siemens	SINAMICS S120 SIMODRIVE 611	● ●			● ●		● ●		● ●		● ●	
Bosch Rexroth	IndraDrive C IndraDrive Cs	● ○		○	●		● ○			● ○		
Beckhoff	AX 5000 AX 2000	● ●			● ●		● ●			● ●		
B&R	ACOPOS	●			●		●			●		
NUM	NUMDrive	●			●		●			●		
LTi-Drives	ServoOne	●		●	●		●			●		
Elmo	DRUM	●		●	●			○		●	○	
SEW-EURODRIVE	MOVIDRIVE B MOVIAXIS	● ●			● ●		● ●			● ●		
Lenze	Global Drive	●			●		●			●		
Fanuc	SVx	●		●					●			
Metronix	ARS 2000	●		●	●		●			●		
Parker	COMPAX	●			●					●		
KOLLMORGEN	AKD S700	○ ○		○ ○	○ ○	○ ○	○ ○			○ ○		
Mitsubishi	MDS	○		○					○			

● in service ○ compatible according to datasheet
Compatibility with other manufacturers controllers are available on request.



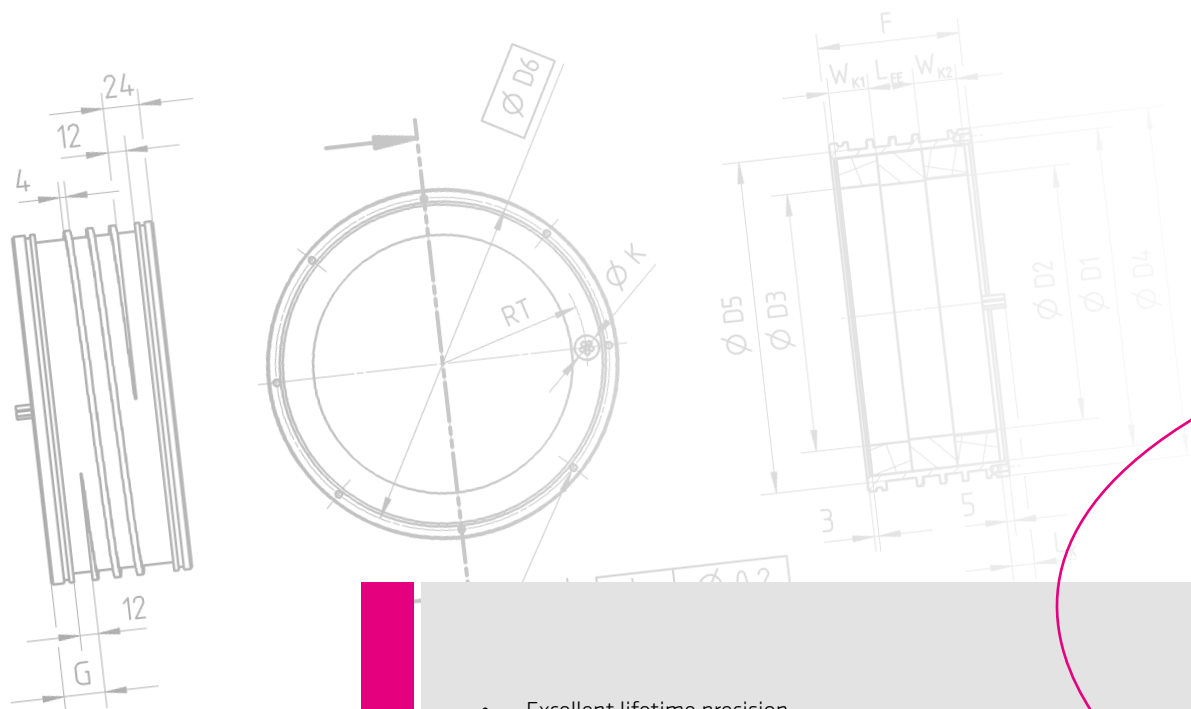
Multi-pole direct drive

TorkDrive® Series Direct Drives are normally supplied as kit motors comprising of a rotor and stator, which upon customer request, can also be delivered as integrated drive solutions. Due to the multi-pole design of the motor components, the Drives transmit high torques at low to medium rotational speeds.

The TorkDrive® Motor Series offer Harmonic Drive® precision in the applications for direct drives. They offer a high power density and allow extended dynamic range, accuracy and system stiffness.

They are available in five sizes offering a maximum torque from 19 to 600 Nm.

The large hollow shaft can be used to feed through supply lines or services for further drive axes. In the standard version, the Drives are designed for water cooling, thus increasing power density and minimising heat input into the machine.



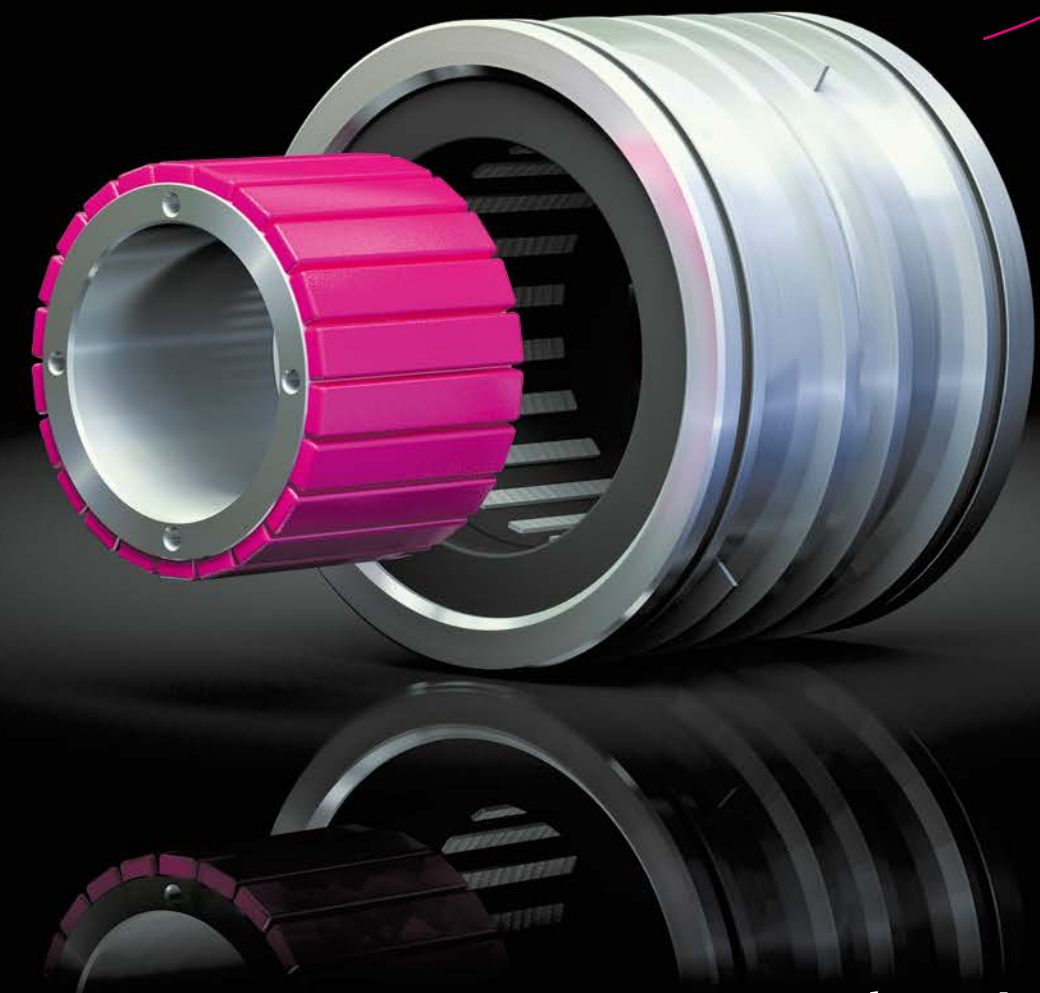
Features

- Excellent lifetime precision
- Large hollow shaft
- Compact, lightweight design
- Easy to customise
- High dynamics

Optimised for your applications:

- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Increased operating reliability
- Greater energy efficiency
- Low manufacturing and installation costs
- Small machine footprint
- Optimal design solution
- Easy integration

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/1090

TorkDrive®

Ordering code

Table 102.1

Series	Size	Length of iron core	Motor winding	Cooling jacket	Special design					
TorkDrive	100A	30 50 70	AA EA	C O	According to customer requirements					
	140A									
	210A									
	290A									
	370A									
Ordering code										
TorkDrive	-	100A	-	30	-	AA	-	C	-	SP

Table 102.2

Length of iron core	
Ordering code	Description
30	30 mm
50	50 mm
70	70 mm

Table 102.3

Motor winding	
Ordering code	Maximum DC bus voltage
AA	680 VDC
EA	48 VDC

Table 102.4

Cooling jacket	
Ordering code	Description
C	With
O	Without

Combinations

Table 103.1

Size		100A	140A	210A	290A	370A
Length of iron core	30	●	●	●	●	●
	50	●	●	●	●	●
	70	●	●	●	●	●
Motor winding	AA	●	●	●	●	●
	EA	○	○	○	-	-
Cooling jacket	C	●	●	●	●	●
	O	●	●	●	●	●

● available ○ on request - not available



Technical data

Table 104.1

	Unit	TorkDrive-100A			TorkDrive-140A		
		30-AA	50-AA	70-AA	30-AA	50-AA	70-AA
Maximum output torque	T _{max} [Nm]	19	38	50	32	53	73
Maximum output speed	n _{max} [rpm]	2000			1500		
Maximum power	P _{max} [kW]	1.8	3.6	6.8	5.0	8.3	10.7
Maximum current	I _{max} [A]	6	12	18	18	36	36
Rated torque	T _N [Nm]	10	17	26	21	35	48
Rated speed	n _N [rpm]	1400	1500	1700	1500	1500	1500
Rated power	P _N [kW]	1.5	2.7	4.6	3.3	5.5	7.5
Rated voltage	U _N [V _{eff}]	425	425	425	334	266	359
Rated current	I _N [A]	3	5	8	9	18	18
Continuous stall torque	T ₀ [Nm]	7.1	12.2	18.2	14.8	24.7	33.9
Number of pole pairs	p	11			11		
Moment of inertia rotor	J [x10 ⁻⁴ kgm²]	3.9	6.4	9.0	10.0	17.3	24.2
Weight of stator with cooling jacket	m [kg]	1.45	2.1	2.9	3.4	4.8	6.2
Weight of stator without cooling jacket	m [kg]	1.0	1.6	2.2	2.8	4.0	5.2
Weight of rotor	m [kg]	0.3	0.6	0.8	0.7	1.1	1.6
Ambient operating temperature	[°C]	-10 ... 40			-10 ... 40		
Cooling method		Water cooled					

QUICKLINK www.harmonicdrive.co.uk/1090
Clarification of the technical data can be found in the Glossary

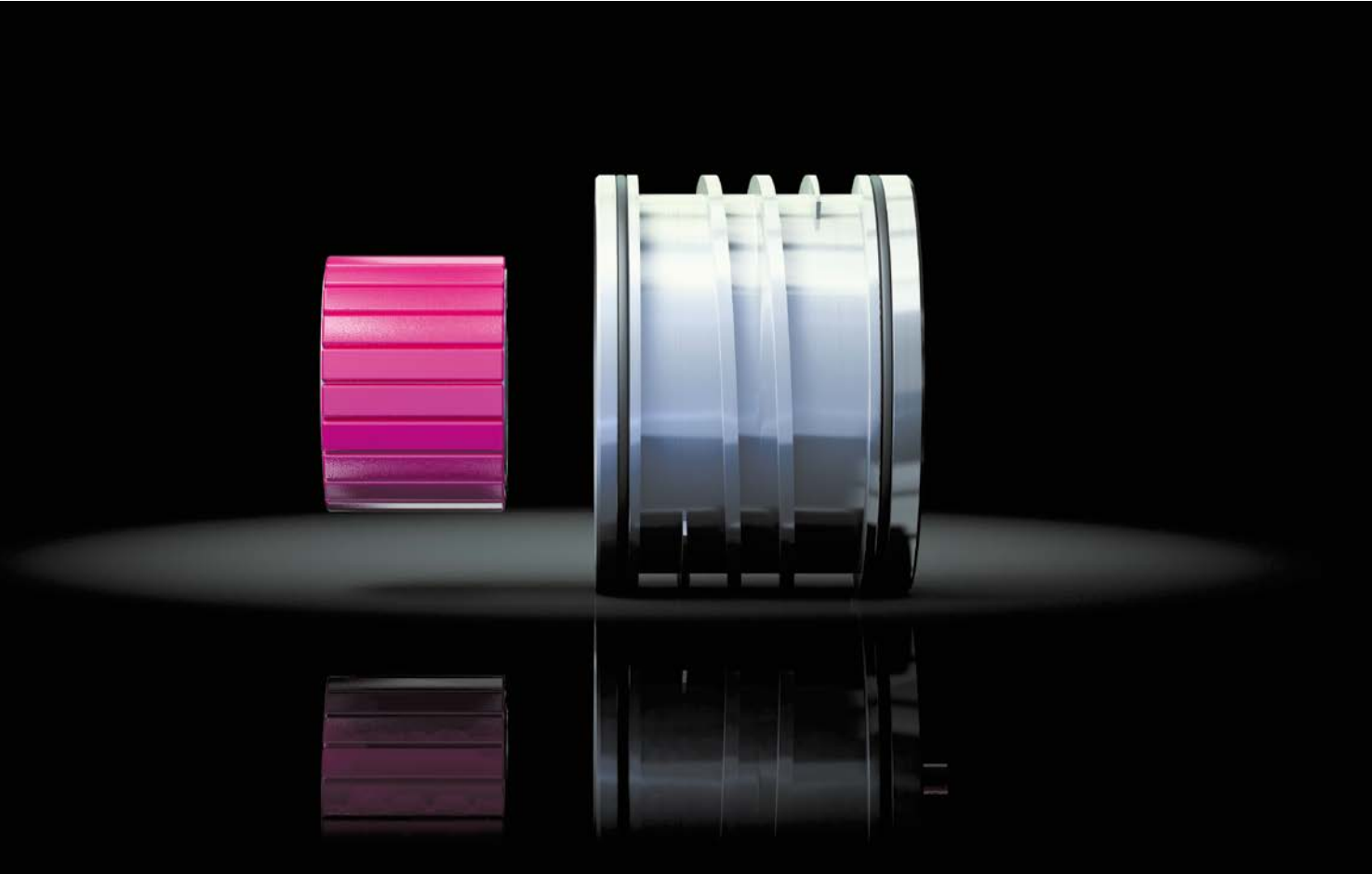


Illustration 105.1

TorkDrive-100A [mm]

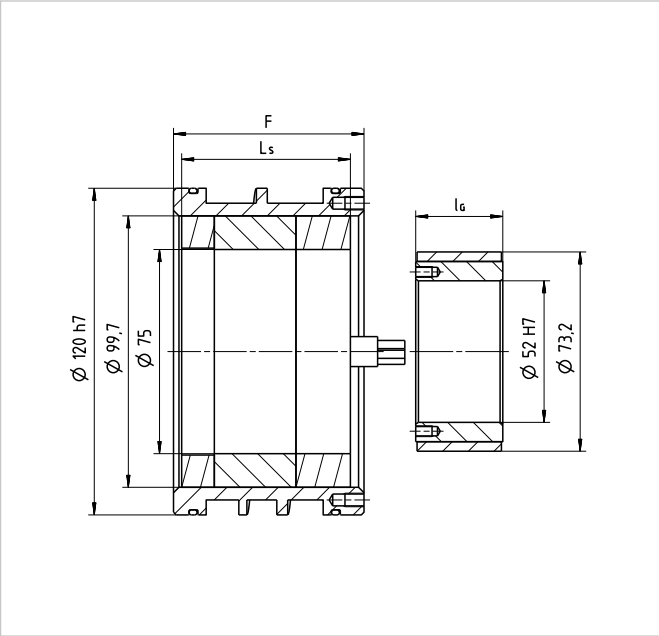


Illustration 105.2

TorkDrive-140A [mm]

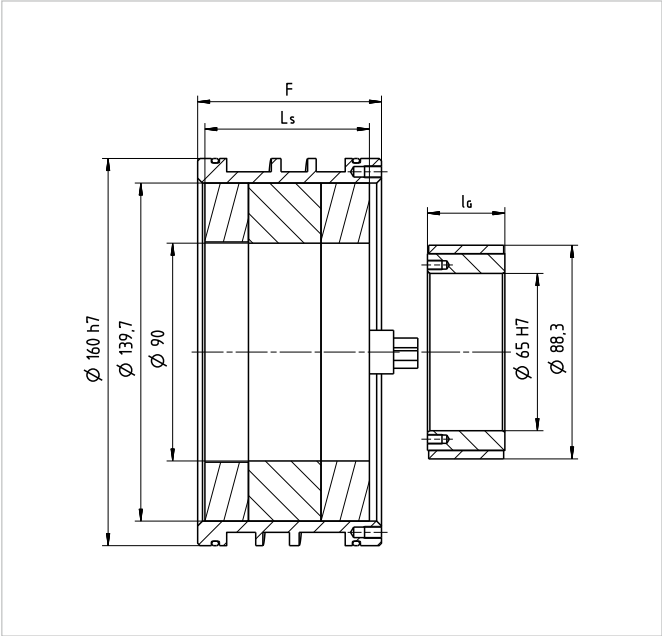


Table 105.3

	Unit	TorkDrive-100A			TorkDrive-140A		
		30	50	70	30	50	70
Length of cooling jacket	F [mm]	70	90	110	76	96	116
Length of stator	Ls [mm]	62	82	102	68	88	108
Length of rotor	lg [mm]	32	52	72	32	52	72

Technical data

Table 106.1

	Unit	TorkDrive-210A			TorkDrive-290A		
		30-AA	50-AA	70-AA	30-AA	50-AA	70-AA
Maximum output torque	T _{max} [Nm]	104	170	220	177	296	404
Maximum output speed	n _{max} [rpm]	1000			800		
Maximum power	P _{max} [kW]	10.9	12.5	23	14.8	19.2	31.3
Maximum current	I _{max} [A]	36	36	56	56	56	85
Rated torque	T _N [Nm]	61	100	133	120	200	267
Rated speed	n _N [rpm]	1000	1000	1000	800	750	800
Rated power	P _N [kW]	6.4	10.5	13.9	10.1	15.7	22.4
Rated voltage	U _N [V _{eff}]	288	425	338	270	425	382
Rated current	I _N [A]	18	18	30	30	30	45
Continuous stall torque	T ₀ [Nm]	43	71	94	85	141	189
Number of pole pairs	p	22			33		
Moment of inertia rotor	J [x10 ⁻⁴ kgm²]	100	160	220	240	390	560
Weight of stator with cooling jacket	m [kg]	4.8	6.8	8.8	14.8	18.8	23.8
Weight of stator without cooling jacket	m [kg]	3.6	5.4	7.2	9.6	12.6	16.7
Weight of rotor	m [kg]	1.6	2.4	3.0	2.0	3.2	4.6
Ambient operating temperature	[°C]	-10 ... 40			-10 ... 40		
Cooling method		Water cooled					

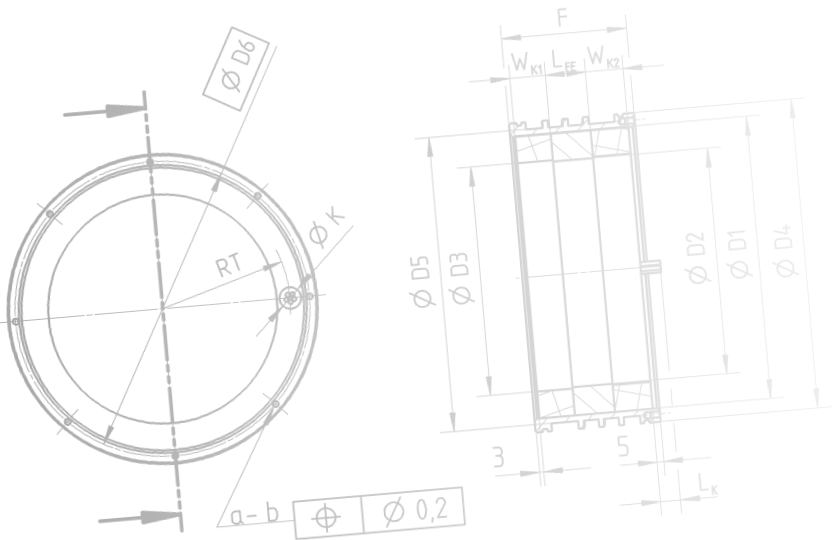


Illustration 107.1

TorkDrive-210A [mm]

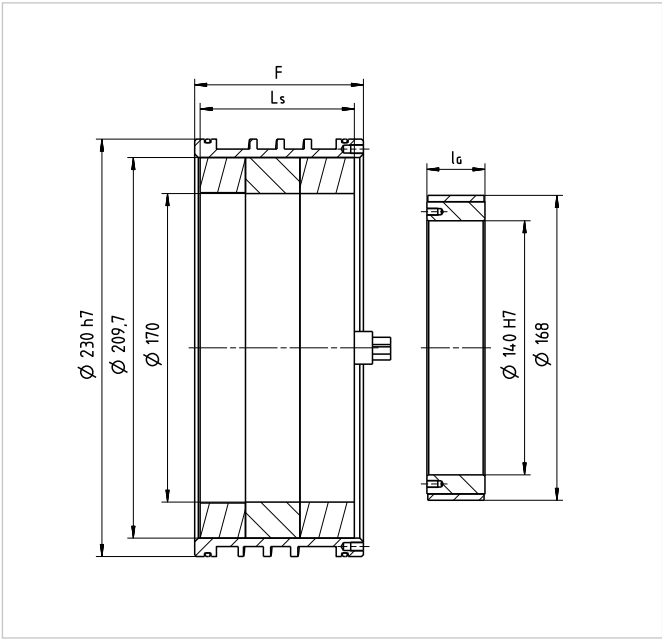


Illustration 107.2

TorkDrive-290A [mm]

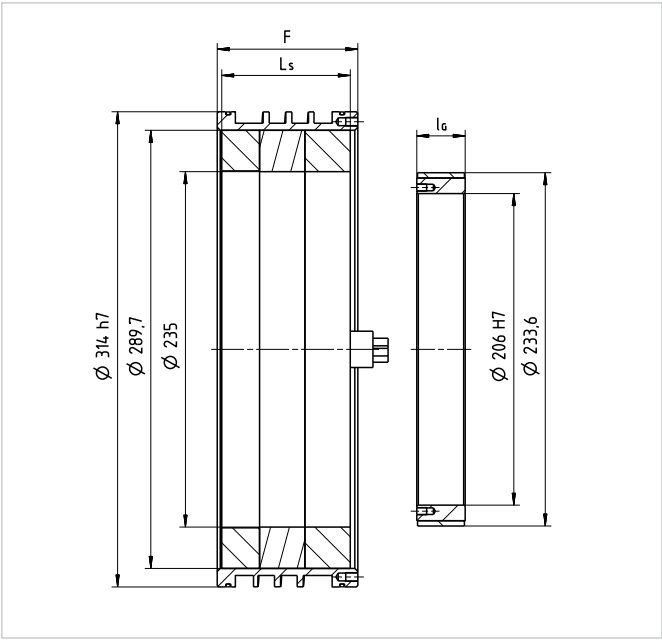


Table 107.3

	Unit	TorkDrive-210A			TorkDrive-290A		
		30	50	70	30	50	70
Length of cooling jacket	F [mm]	93	113	133	93	113	133
Length of stator	L _s [mm]	85	105	125	85	105	125
Length of rotor	l _g [mm]	32	52	72	32	52	72

Technical data

Table 108.1

	Unit	TorkDrive-370A		
		30-AA	50-AA	70-AA
Maximum output torque	T _{max} [Nm]	255	425	600
Maximum output speed	n _{max} [rpm]	800		
Maximum power	P _{max} [kW]	21.4	24.0	31.4
Maximum current	I _{max} [A]	85	85	113
Rated torque	T _N [Nm]	184	306	435
Rated speed	n _N [rpm]	800	640	600
Rated power	P _N [kW]	15.4	20.5	27.3
Rated voltage	U _N [V _{eff}]	313	425	425
Rated current	I _N [A]	45	45	60
Continuous stall torque	T ₀ [Nm]	130	216	308
Number of pole pairs	p	33		
Moment of inertia rotor	J [x10 ⁻⁴ kgm²]	580	980	1380
Weight of stator with cooling jacket	m [kg]	20.4	26.7	33.0
Weight of stator without cooling jacket	m [kg]	14.0	19.2	24.3
Weight of rotor	m [kg]	2.9	4.9	6.9
Ambient operating temperature	[°C]	-10 ... 40		
Cooling method		Water cooled		

[QUICKLINK www.harmonicdrive.co.uk/1090](http://www.harmonicdrive.co.uk/1090)
Clarification of the technical data can be found in the Glossary

Illustration 109.1

TorkDrive-370A [mm]

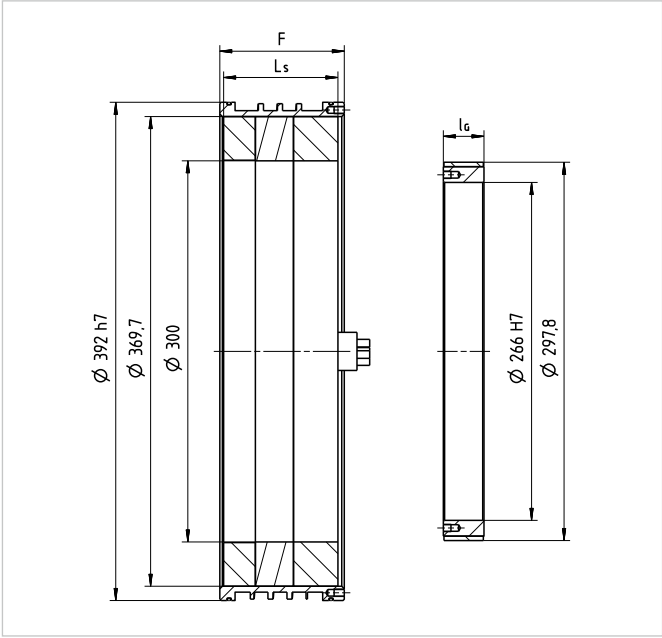


Table 109.2

	Unit	TorkDrive-370A		
		30	50	70
Length of cooling jacket	F [mm]	98	118	138
Length of stator	Ls [mm]	85	105	125
Length of rotor	lc [mm]	32	52	72

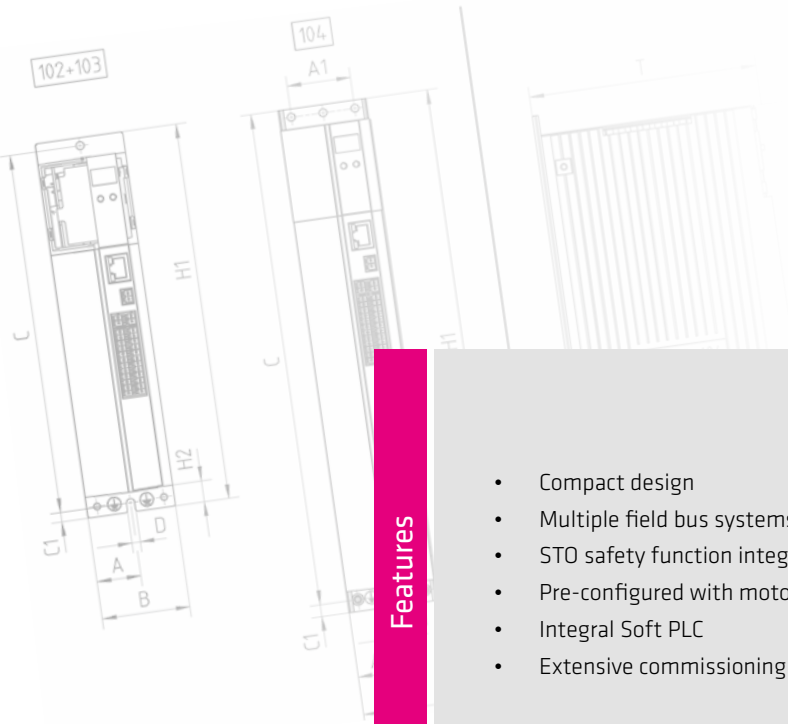
Universal servo controller

The YukonDrive® is designed to operate with superimposed CNC controls featuring cyclic set point selection via bus systems. At all times, the modularity of the YukonDrive® family ensures optimum integration of the servo axis into the machine process. Whether in high speed field bus communication with a central machine controller or with distributed motion control intelligence in the servo controller – the YukonDrive® is a master of both. Optimised for the lower power range, the YukonDrive® offers maximum capacity in four compact designs.

The YukonDrive® Servo Controller is the perfect complement to all Harmonic Drive® Servo Actuators and Motors and provides a single source for a pre-configured drive system.

The integration of high speed field bus systems and the latest encoder interfaces such as the digital EnDat 2.2 or HIPERFACE DSL interface ensure that future security and flexibility continue to be at the forefront of development. Comprehensive motion control functions provide a variety of possible solutions. Complete plug connections ensure fast installation and commissioning.

We have also considered the safety of your machine. Its SIL3-certified STO function means that the YukonDrive® can be integrated into your safety concept.



Optimised for your applications:

- Space saving
- Flexibility
- Time and cost savings
- Shorter production times
- Reduced set up time

Customer Benefits



Ordering code

Table 112.1

Series	Size	Supply voltage	Peak current	Option 1 Field bus	Option 2 Technology	Special design		
YukonDrive	102	1	A	A B C D E F ¹⁾	A B C O	According to customer requirements		
	103		C					
	104		E					
	102	2	B					
	103		D					
	104		F					
	105 ¹⁾		G H ¹⁾					
Ordering code								
YukonDrive	-	1022	-	B	E	O	-	SP

¹⁾ preparation
Variations in **bold print** are available at short notice, subject to prior sale.

Table 112.2

Supply voltage		
Size	Ordering code	Description
102	1	1/3 x 230 VAC
103		
104		
102	2	3 x 400 ... 480 VAC
103		
104		
105 ¹⁾		

Table 112.3

Peak current [A _{eff}]			
Ordering code	Supply voltage		
	1 x 230 VAC	3 x 230 VAC	3 x 400 VAC
A	9	9	-
C	11.8	17.7	-
E	16	24	-
B	-	-	6
D	-	-	10.5
F	-	-	19.5
G ¹⁾	-	-	36
H ¹⁾	-	-	48

Data valid for: 4 kHz switching frequency, motor cable length ≤ 10 m,
1 x 230 VAC when used with recommended mains choke

Table 112.4

Field bus	
Ordering code	Description
A	EtherCAT®
B	Sercos II
C	Sercos III
D	CANopen
E	PROFIBUS
F	PROFINET IRT ¹⁾

EtherCAT® is a registered trademark and patented technology,
licensed by the Beckhoff Automation GmbH, Germany

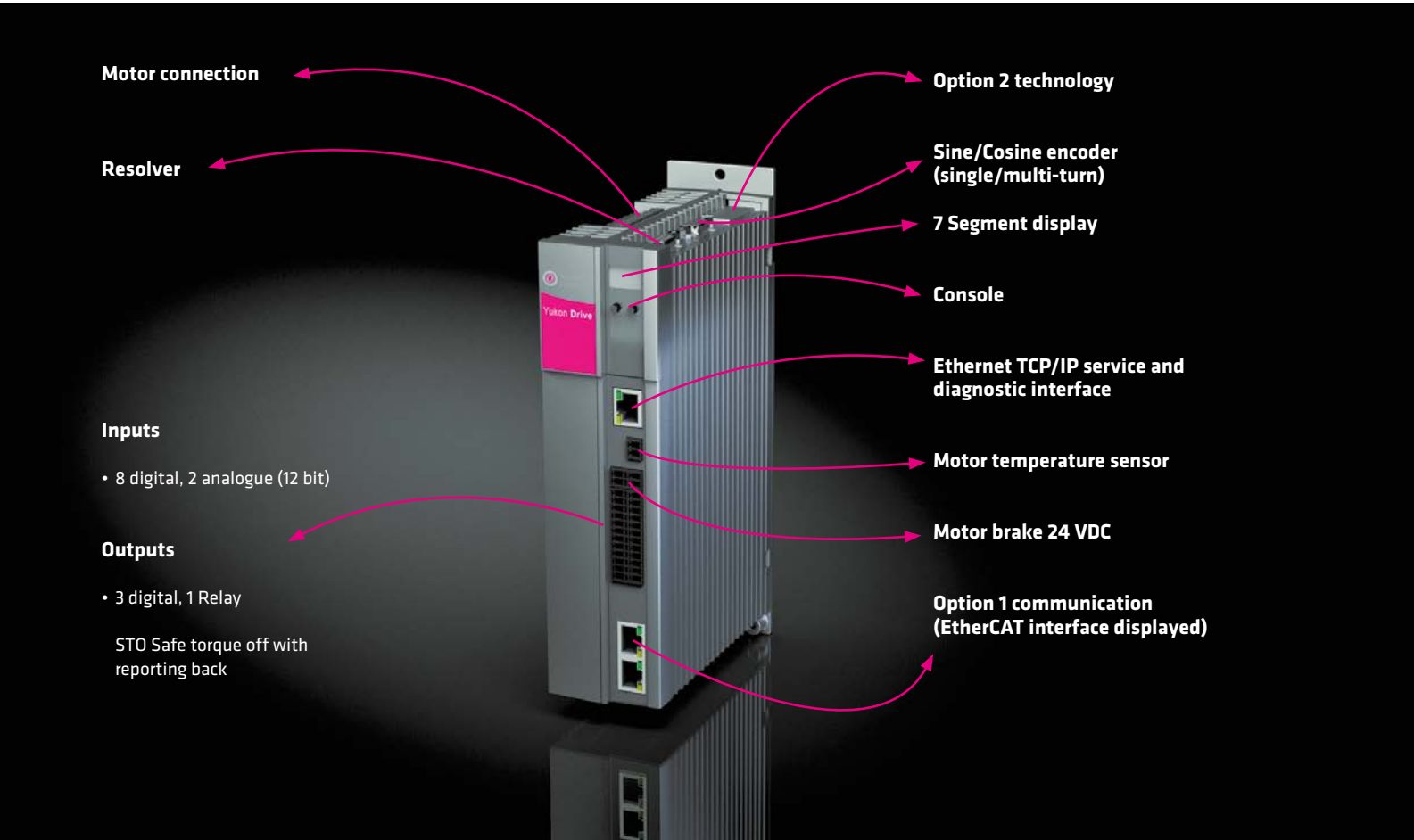
¹⁾ preparation

Combinations

Table 113.1

Actuator	Motor feedback	Size / Power supply							Options		
		-1021-Axx	-1031-Cxx	-1041-Exx	-1022-Bxx	-1032-Dxx	-1042-Fxx	-1052-Hxx ¹⁾	-10xx-xxA	-10xx-xxB	-10xx-xxC
FHA-C Mini	D200	●	-	-	-	-	-	-	○	●	○
FHA-C-H	S1024 M1024	-	-	-	●	●	-	-	○	-	○
	S1024-EC M1024-EC	-	-	-	●	●	-	-	○	-	○

● Standard mapping ○ Application dependant - Not available



Technical data

Version A

Table 114.1

	Unit	YukonDrive®							
Size / Rate input voltage		1021	1031	1041	1022	1032	1042	1052 ¹⁾	
Power supply	U _N [VAC]	1/3 x 230			3 x 400 ... 480				
Nominal current	I _N [A]	3	5.9	8	2	3.5	6.5	12	16
Maximum current ²⁾	I _{max} [A]	9 ³⁾	17.7 ³⁾	24 ³⁾	6 ⁴⁾	10.5 ⁴⁾	19.5 ⁴⁾	36	48 ⁴⁾
Device connected load (with mains choke)	P [kVA]	1.3	2.6	3.5	1.5	2.7	5	7.3	12.2
Dissipation (at 8 kHz and rated current)	P [W]	75	150	200	42 ⁴⁾	80 ⁴⁾	150 ⁴⁾	₋₅₎	₋₅₎
Dimensions (WxHxD)	[mm]	55 x 235 x 145	55 x 235 x 190	55 x 315 x 240	55 x 235 x 145	55 x 235 x 190	55 x 315 x 240	90 x 315 x 240	
Cooling		Air cooling							
Field bus (Option 1)		EtherCAT® / Sercos II & III / PROFINET IRT ¹⁾ / CANopen / PROFIBUS DPV1							
Technology (Option 2)		2nd SIN/COS Encoder / HIPERFACE® DSL ¹⁾ / Encoder simulation & TTL input / Incremental encoder with commutation signals							
Functional safety		STO according to SIL 3 to IEC 61508/IEC 62061, PL e to EN ISO 13849							
Analog input (± 10 VDC, 12 bit)		2							
Digital inputs/outputs Part of measuring sensor		8 / 3 2							
Relay		1							
Motor feedback		Resolver SSI, EnDat, HIPERFACE® with SIN/COS signals SSI, EnDat fully digital, HIPERFACE®, DSL ¹⁾							
Ambient operating temperature	[°C]	-10 ... 45 ⁵⁾ ⁸⁾ -10 ... 40 ⁷⁾ ⁸⁾							

YukonDrive®-10x1: required for single phase supply mains choke

All current values for motor cable lengths up to 10 m

¹⁾ Preparation
²⁾ At 4 kHz switching frequency
³⁾ For 3 x 230 VAC
⁴⁾ For 3 x 400 VAC
⁵⁾ On request
⁶⁾ Switching frequency 4 kHz
⁷⁾ Switching frequency 8 to 16 kHz
⁸⁾ Up to 55° with derating (2% / °C)

Software

iPLC

DriveManager

DriveManager 5 has full network capability. Thus, the communication can be handled either via the TCP / IP interface or made via the field bus, allowing for multiple axis modules to be handled simultaneously.

Highest flexibility

In addition to operating with a high level control system via field bus, or stand-alone positioning using the internal position table, the YukonDrive® provides the possibility of integrating the iPLC (Software PLC) to become a user programmable single axis position controller.

The iPLC, programmable in IEC 61131, shares the microcontroller platform of the YukonDrive® with the drive control, so permitting optimised, fast access to all system and control parameters and interfaces.

Sudden changes in requirements can be implemented immediately. See for yourself the performance of the YukonDrive®-iPLC!

Easy to use

Despite its versatility, the YukonDrive® is easy to use. From the initial commissioning through to process diagnostics, DriveManager 5 provides an extensive package of tools and functions tailored to any task. The graphical PC interface, based on the latest .NET technology, significantly reduces the startup time. This is supported with the integrated online help and an automatic tuning. Different user levels guarantee that only the necessary parameters are displayed. Due to the "Docking Views" technology, you can adjust the DriveManager 5 to your specific needs. This allows you to create and store user or application-related workspaces.

The DriveManager 5 supports the following tasks:

- Initial and serial commissioning , operation and diagnostics of the YukonDrive® drive system
- Project management – multiple devices in an overview

Tools and features:

- Data set handling for initial and serial commissioning
- Automatic motor identification
- Automatic determination of the mass moment of inertia
- 6 channel oscilloscope for adjustment of control loops and for verification of motion profiles
- FFT functions for the analysis of oscillatory mechanisms
- Manual setup
- Test signal generator for optimisation of control loops
- Graphical status and actual value displays
- Log File/Undo and Redo functions for fast tracking and modification of previous steps
- Online Help
- Firmware Download
- Language selection

Controller for mini servo actuators

The HA-680 Servo Controller is specially designed to meet the needs of the FHA-C Mini and RSF Mini Series Actuators, tuned to offer the best control performance.

The HA-680 Servo Controller is the perfect complement to the Harmonic Drive® Mini Servo Actuators and provides a single source for a pre-configured drive system.

Designed for a connection voltage of 24 VDC, the HA-680 can be used in the current controller, speed controller or position controller modes. Different field buses and modes enable a variety of control concepts and thus offer a comprehensive range of solutions for your motion requirements.

Separate inputs for power and electronics supply voltages enable the implementation of safety relevant functions.

Features

- Compact design
- 24 VDC supply
- Optimised for RSF Mini and FHA-C Mini Servo Actuators
- Pre-configured with motor and encoder data
- Commissioning and diagnostics software

Optimised for your applications:

- Space saving
- Process optimisation
- Flexibility
- Reduced set up time
- Cost savings

Customer Benefits



QUICKLINK

www.harmonicdrive.co.uk/1110

HA-680

Ordering code

Table 118.1

Series	Field bus	Rated current	Power supply	Option 1	Special design					
HA-680	- ML CL	4 6 4B 6B	20 ... 28 VDC	Sxxx (Only for HA-680ML)	According to customer requirements					
Ordering code										
HA-680	-	ML	-	4B	-	24	-	Sxxx	-	SP

Table 118.2

Field bus	
Ordering code	Field bus
-	Without
ML	MECHATROLINK
CL	CC-Link

Table 118.3

Rated current	
Ordering code	Description
4	4 A _{eff} for FHA-C Mini
6	6 A _{eff} for FHA-C Mini
4B	4 A _{eff} for RSF Mini
6B	6 A _{eff} for RSF Mini

Table 118.4

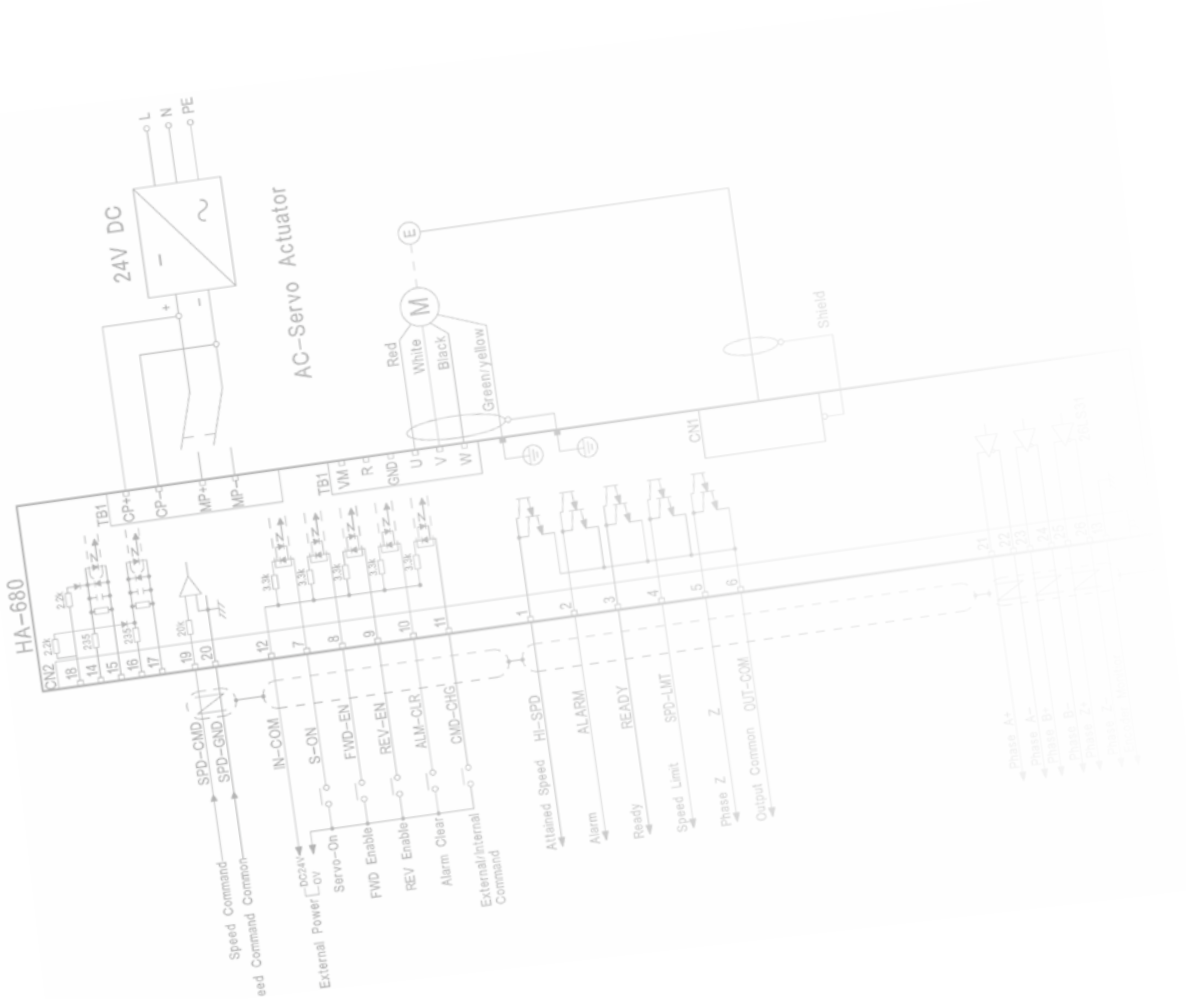
Option 1	
Ordering code	Description
Sxxx	Control number for model adaptation (Only for HA-680ML)

Combinations

Table 119.1

	Motor feedback	Size			
		HA-680xx-4	HA-680xx-6	HA-680xx-4B	HA-680xx-6B
FHA-8C	D200	●	-	-	-
	E200	○	-	-	-
FHA-11C	D200	●	-	-	-
	E200	○	-	-	-
FHA-14C	D200	-	●	-	-
	E200	-	○	-	-
RSF-3C	E020	-	-	●	-
RSF-5B	E050	-	-	●	-
RSF-8B	F100	-	-	●	-
RSF-11B	F100	-	-	-	●
RSF-14B	F100	-	-	-	●

● available ○ on request - not available

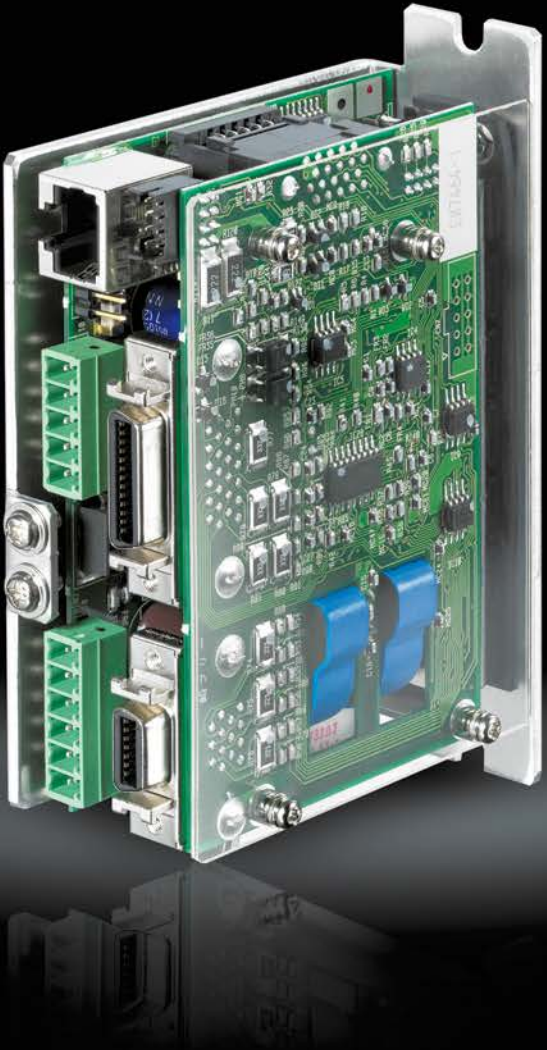


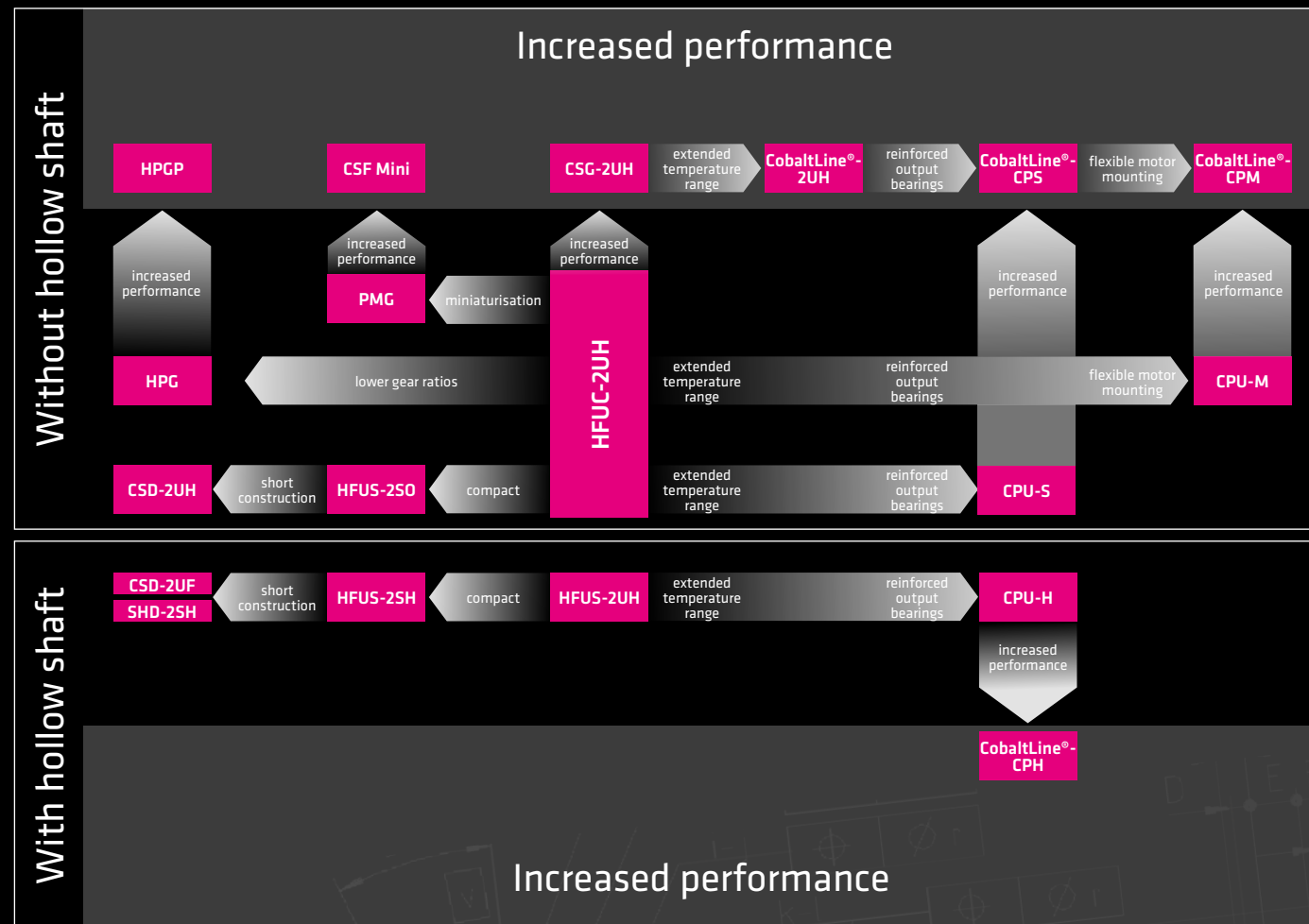
Technical data

Table 120.1

		Unit	HA-680xx-4x-24	HA-680xx-6x-24
Supply voltage	Main circuit	U _N [VDC]	20 ... 28	
	Control circuit	U _N [VDC]	20 ... 28	
Rated current		I _N [A]	4	6
Maximum current		I _{max} [A]	8.4	16.5
Cooling			Air cooling	
Field bus			MECHATROLINK CC-Link	
Dimensions (W x H x D)		[mm]	115 x 34 x 79.5 (Variant with field bus has other dimensions)	
Weight		m [kg]	0.23	
Analogue input (±10 VDC, 13 bit)			1	
Digital inputs and outputs			5 / 5	
Encoder monitor			1	
Motor feedback			Wire, incremental, square wave signal Wire, incremental, serial interface ¹⁾	
Ambient operating temperature		[°C]	0 ... 50	

¹⁾ On request





Units, Gearboxes, Planetary Gears

Would you like to use your own motor?

The Units and Gearboxes are the best choice – whether for procurement reasons or because of particular interfaces. Harmonic Drive® Units and Gearboxes are the combination of the precise Harmonic Drive® Component Sets, consisting of the three components Circular Spline, Flexspline and Wave Generator as well as integral high load capacity tilt resistant output bearings for handling heavy loads.

At higher speeds or with lower gear ratios than is possible with Harmonic Drive® Gears, there is still often the need for highest precision. Here, our Harmonic Planetary Gears can provide the answer. By utilising a special design with flexible ring gear in the final stage, we can guarantee constant high precision over a lifetime – we call this Permanent Precision®!



...just move it!

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CobaltLine®-CP | CobaltLine® | CSG | CPU | HFUC | HFUS | CSD | SHD | PMG | CSF Mini | HPG | HPGP



Packaging machines The fact that foods must not only be packaged attractively but also in such a way that they can keep their valuable ingredients and taste for as long as possible, is clearly one of the key disciplines in packaging technology. However, there are other fields too where products must be packaged in such a way as to use resources sparingly and to ensure they are safe in transport. In addition to the handling of several materials, high efficiency and high cycle rates are decisive for market success.

Robotics Robots have for a long time been taking over tasks which are too monotonous for humans to produce to the highest quality. With modern programming and performance improvements from drive technology, these little helpers are now entering fields which were unthinkable a short while ago. This cooperation between man and robot has become an important trend in recent years – one might go so far as to say ... [more on page 264](#).

Your requirements - Our solution

Features	CobaltLine®-CPM CPU-M	CobaltLine®-CPH CPU-H	CobaltLine®-CPS CPU-S	CobaltLine®-2UH HFUC-2UH	CSG-2UH	HFUS-2UH	HFUS-2SO	HFUS-2SH	CSD-2UH	CSD-2UF	SHD-2SH	PMG	CSF Mini	HPG HPGP
Excellent lifetime precision	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Compact, lightweight design	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Easy to customise	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Direct motor connection	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Large hollow shaft	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Integrated high capacity output bearing	●	●	●	●	●	●	●	●	●	●	●	●	●	●
High dynamics	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Corrosion protection	●	●	●	●	●	●	●	●	●	●	●	●	●	●

● perfect ● optimal ● good



Maximum torque capacity with precision output bearing

CobaltLine®-CP Series Units are available in six sizes with gear ratios of 50, 80, 100, 120 and 160:1 offering repeatable peak torques from 23 to 841 Nm.

Harmonic Drive® Units combine the precision Harmonic Drive® Component Sets consisting of three components - Circular Spline, Flexspline and Wave Generator - and integral high load capacity, tilt resistant output bearings.

The precision output bearing with high tilting capacity often allows direct attachment of heavy payloads without the need for further support, thereby providing simple and space saving design installations.

The CobaltLine®-CP Series are supplied in three versions: the CPM Unit for direct attachment of any motor, the CPH Unit with hollow shaft to feed through supply lines or services for further axes and the CPS Unit with stainless steel input shaft enabling flexible integration into your design.

The Units are available as specific configurations tailored to your application, or if required, with high corrosion protection. With a reinforced output bearing offering maximum tilting rigidity, they can easily absorb and accurately guide heavy payloads. The Units are fully sealed and thus ideally suited for use in harsh ambient conditions.

The CobaltLine®-CP Series can be used for ambient temperatures between -40 °C and 90 °C. The Units accurate positioning guarantees stable machine characteristics with short cycle times guaranteed.

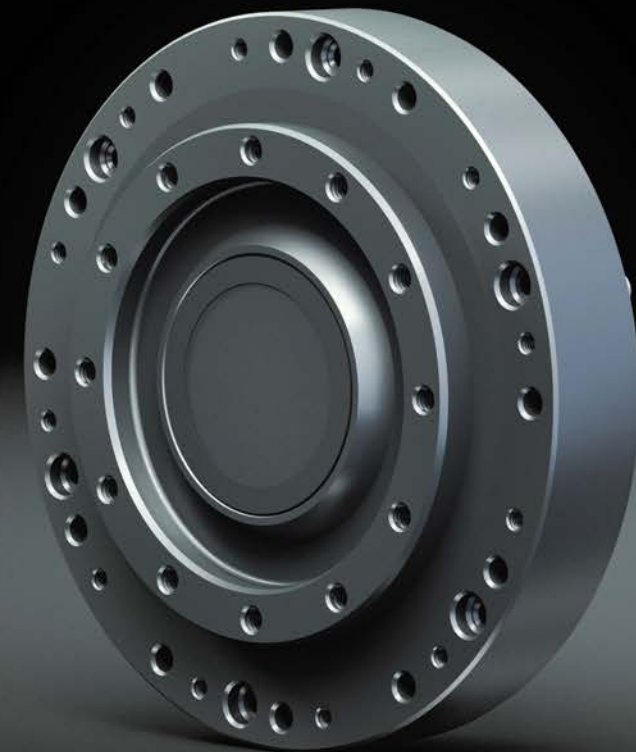
Features

- Excellent lifetime precision
- Large hollow shaft (CPH)
- Integrated high capacity output bearing
- Easy to customise
- Corrosion protection

Optimised for your applications:

- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Optimal design solution
- Easy load connection
- Low manufacturing and installation costs
- Easy integration

Customer Benefits



Ordering code

Table 130.1

Series	Size	Ratio					Version	Code for motor adaptation	Special design
CobaltLine	14	50	80	100			CPM CPH CPS	Depending on motor type	According to customer requirements
	17	50	80	100	120				
	20	50	80	100	120	160			
	25	50	80	100	120	160			
	32	50	80	100	120	160			
	40	50	80	100	120	160			
Ordering code									
CobaltLine	- 25	-	100	-	CPM	-	19.22	-	SP

Table 130.2

Version	
Ordering code	Description
CPM	Unit for motor assembly
CPH	Unit with hollow shaft
CPS	Unit with solid input shaft

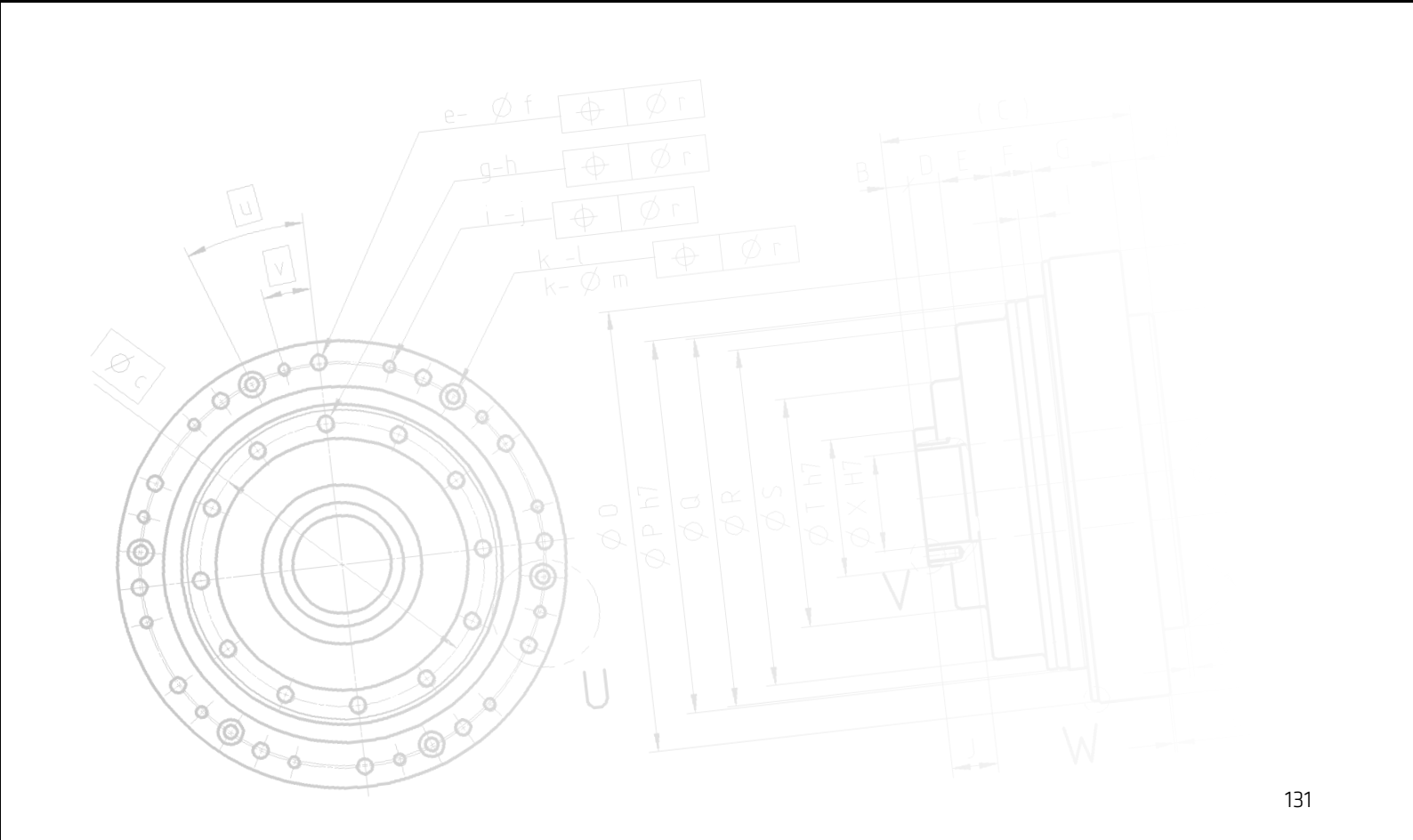
Available motor adaptations for CPM:

QUICKLINK www.harmonicdrive.co.uk/2105

Clarification of the technical data can be found in the Glossary



Units, Gearboxes, Planetary Gears



Technical data

Table 132.1

	Unit	CobaltLine-14-CP		
Ratio	i []	50	80	100
Repeatable peak torque	T _R [Nm]	23	30	36
Average torque	T _A [Nm]	9.0	14	14
Rated torque	T _N [Nm]	7.0	10	10
Momentary peak torque	T _M [Nm]	46	61	70
Maximum input speed	n _{in (max)} [rpm]	8500		
Average input speed	n _{av (max)} [rpm]	3500/3000 ¹⁾		
Moment of inertia CPM	J _{in} [x10 ⁻⁴ kgm²]	0.033		
Moment of inertia CPH	J _{in} [x10 ⁻⁴ kgm²]	0.091		
Moment of inertia CPS	J _{in} [x10 ⁻⁴ kgm²]	0.025		
Weight CPM	m [kg]	0.54		
Weight CPH	m [kg]	0.67		
Weight CPS	m [kg]	0.64		
Maximum hollow shaft diameter	d _{H (max)} [mm]	14		
Transmission accuracy	[arcmin]	< 1.2	< 1	
Repeatability	[arcmin]	< ±0.1		
Lost Motion	[arcmin]	< 1		
Torsional stiffness	K ₃ [x10³ Nm/rad]	5.7	7.1	
Ambient operating temperature	[°C]	-40 ... 90		
Output bearing				
Dynamic radial load	F _{R dyn (max)} [N]	1450		
Dynamic axial load	F _{A dyn (max)} [N]	2880		
Dynamic tilting moment	M _{dyn (max)} [Nm]	73		

Table 132.2

	Unit	CobaltLine-17-CP			
Ratio	i []	50	80	100	120
Repeatable peak torque	T _R [Nm]	44	56	70	70
Average torque	T _A [Nm]	34	35	51	51
Rated torque	T _N [Nm]	21	29	31	31
Momentary peak torque	T _M [Nm]	91	113	143	112
Maximum input speed	n _{in (max)} [rpm]	7300			
Average input speed	n _{av (max)} [rpm]	3500/3000 ¹⁾			
Moment of inertia CPM	J _{in} [x10 ⁻⁴ kgm²]	0.079			
Moment of inertia CPH	J _{in} [x10 ⁻⁴ kgm²]	0.193			
Moment of inertia CPS	J _{in} [x10 ⁻⁴ kgm²]	0.059			
Weight CPM	m [kg]	0.79			
Weight CPH	m [kg]	1.0			
Weight CPS	m [kg]	0.95			
Maximum hollow shaft diameter	d _{H (max)} [mm]	19			
Transmission accuracy	[arcmin]	< 1.2	< 1		
Repeatability	[arcmin]	< ±0.1			
Lost Motion	[arcmin]	< 1			
Torsional stiffness	K ₃ [x10³ Nm/rad]	13	16		
Ambient operating temperature	[°C]	-40 ... 90			
Output bearing					
Dynamic radial load	F _{R dyn (max)} [N]	2300			
Dynamic axial load	F _{A dyn (max)} [N]	4600			
Dynamic tilting moment	M _{dyn (max)} [Nm]	114			

¹⁾ Valid for CobaltLine®-CPH

Illustration 133.1
CobaltLine-14-CPM [mm]

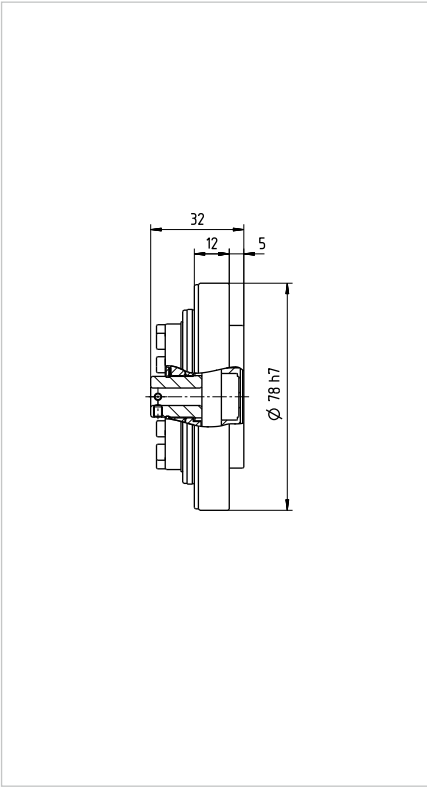


Illustration 133.2
CobaltLine-14-CPH [mm]

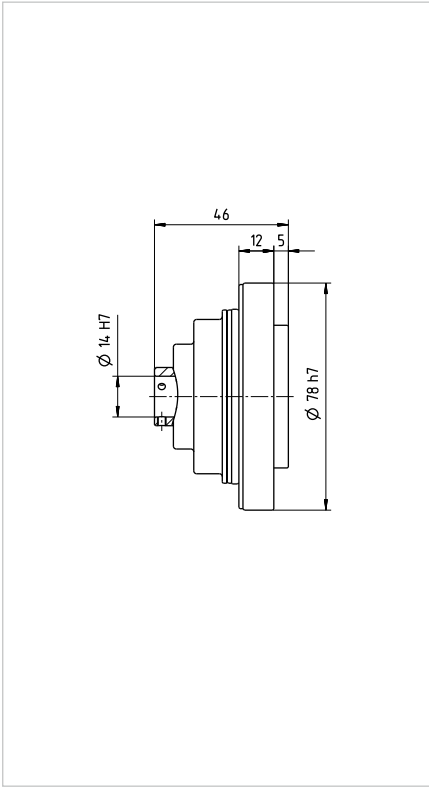


Illustration 133.3
CobaltLine-14-CPS [mm]

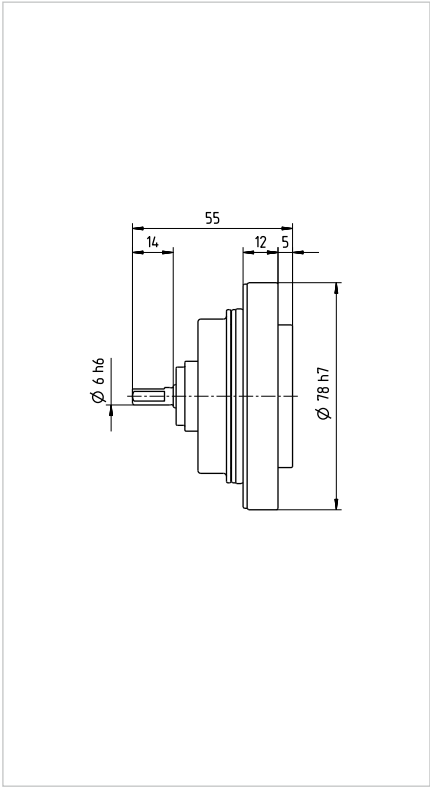


Illustration 133.4
CobaltLine-17-CPM [mm]

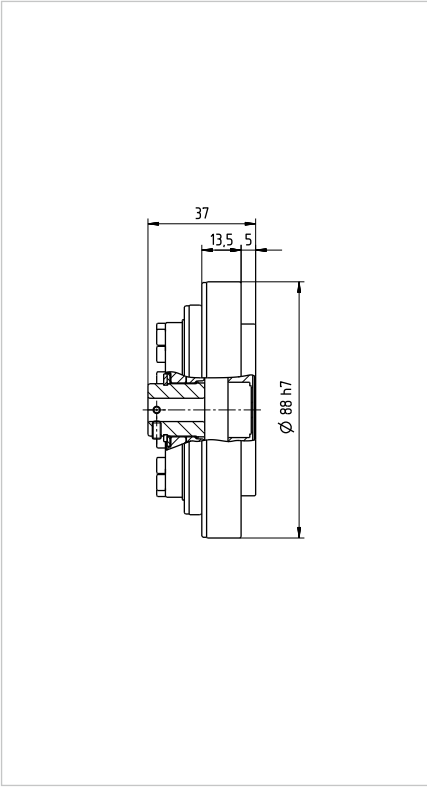


Illustration 133.5
CobaltLine-17-CPH [mm]

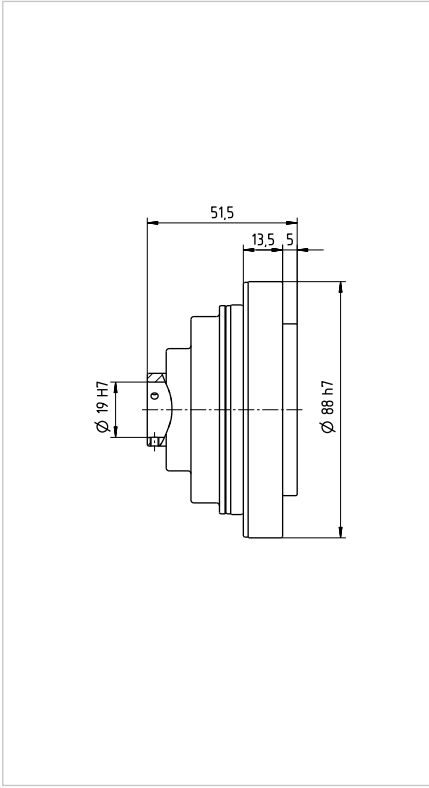
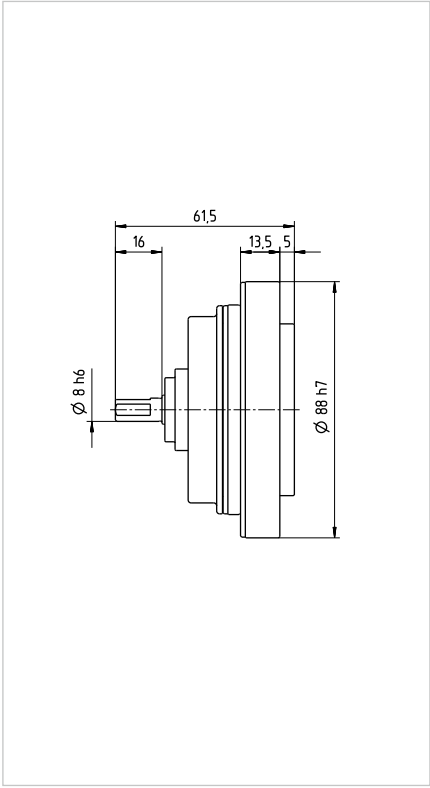


Illustration 133.6
CobaltLine-17-CPS [mm]



Technical data

Table 134.1

	Unit	CobaltLine-20-CP				
Ratio	i []	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	73	96	107	113	120
Average torque	T _A [Nm]	44	61	64	64	64
Rated torque	T _N [Nm]	33	44	52	52	52
Momentary peak torque	T _M [Nm]	127	165	191	191	191
Maximum input speed	n _{in (max)} [rpm]	6500				
Average input speed	n _{av (max)} [rpm]	3500/3000 ¹⁾				
Moment of inertia CPM	J _{in} [x10 ⁻⁴ kgm²]	0.193				
Moment of inertia CPH	J _{in} [x10 ⁻⁴ kgm²]	0.404				
Moment of inertia CPS	J _{in} [x10 ⁻⁴ kgm²]	0.137				
Weight CPM	m [kg]	1.3				
Weight CPH	m [kg]	1.55				
Weight CPS	m [kg]	1.4				
Maximum hollow shaft diameter	d _{H (max)} [mm]	21				
Transmission accuracy	[arcmin]	< 1.0	< 0.8			
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	23	29			
Ambient operating temperature	[°C]	-40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	8600				
Dynamic axial load	F _{A dyn (max)} [N]	15800				
Dynamic tilting moment	M _{dyn (max)} [Nm]	172				

Table 134.2

	Unit	CobaltLine-25-CP				
Ratio	i []	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	127	178	204	217	229
Average torque	T _A [Nm]	72	113	140	140	140
Rated torque	T _N [Nm]	51	82	87	87	87
Momentary peak torque	T _M [Nm]	242	332	369	395	408
Maximum input speed	n _{in (max)} [rpm]	5600				
Average input speed	n _{av (max)} [rpm]	3500/2575 ¹⁾				
Moment of inertia CPM	J _{in} [x10 ⁻⁴ kgm²]	0.41				
Moment of inertia CPH	J _{in} [x10 ⁻⁴ kgm²]	1.07				
Moment of inertia CPS	J _{in} [x10 ⁻⁴ kgm²]	0.32				
Weight CPM	m [kg]	1.95				
Weight CPH	m [kg]	2.4				
Weight CPS	m [kg]	2.5				
Maximum hollow shaft diameter	d _{H (max)} [mm]	29				
Transmission accuracy	[arcmin]	< 1.0	< 0.8			
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	44	57			
Ambient operating temperature	[°C]	-40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	12700				
Dynamic axial load	F _{A dyn (max)} [N]	19200				
Dynamic tilting moment	M _{dyn (max)} [Nm]	254				

¹⁾ Valid for CobaltLine®-CPH

Illustration 135.1
CobaltLine-20-CPM [mm]

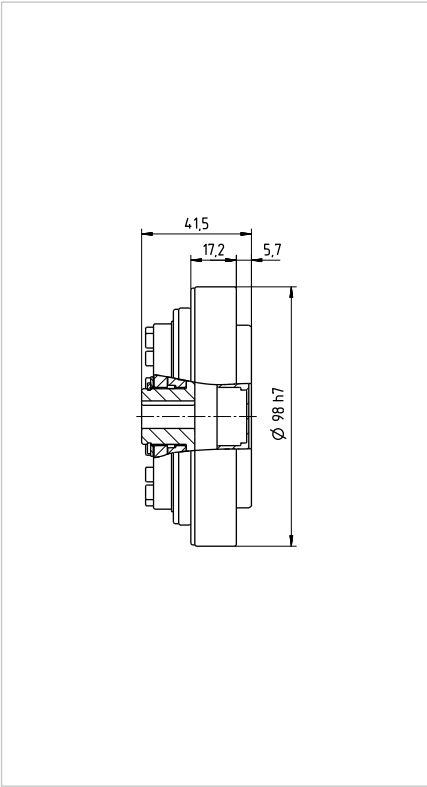


Illustration 135.2
CobaltLine-20-CPH [mm]

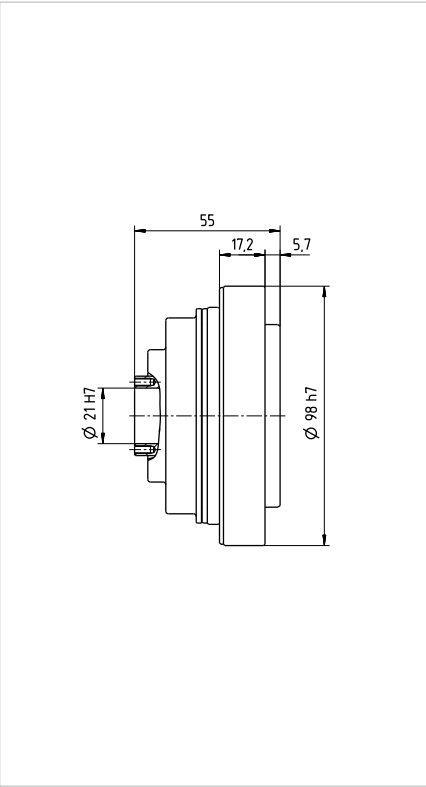


Illustration 135.3
CobaltLine-20-CPS [mm]

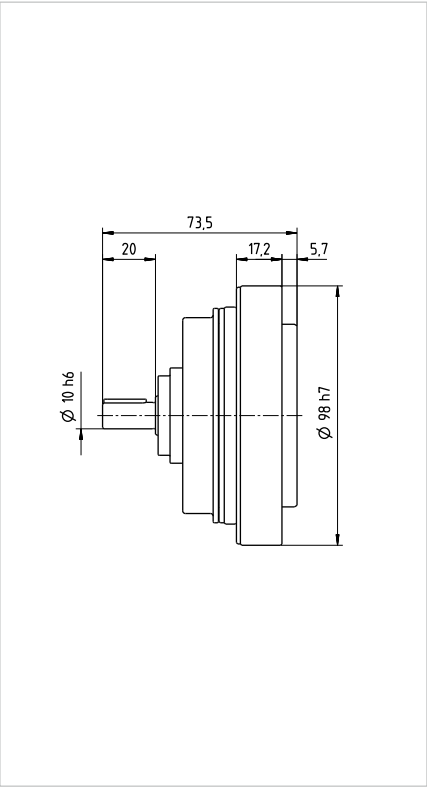


Illustration 135.4
CobaltLine-25-CPM [mm]

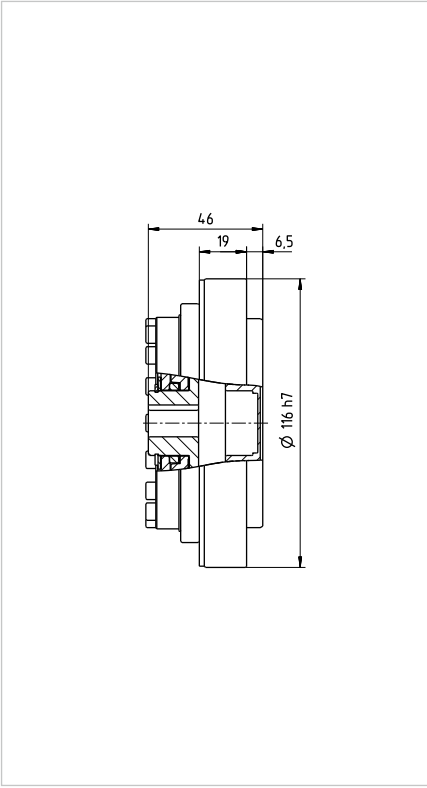


Illustration 135.5
CobaltLine-25-CPH [mm]

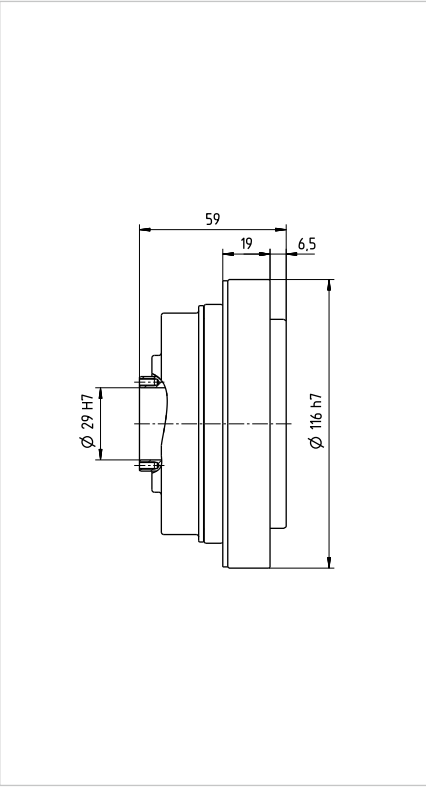
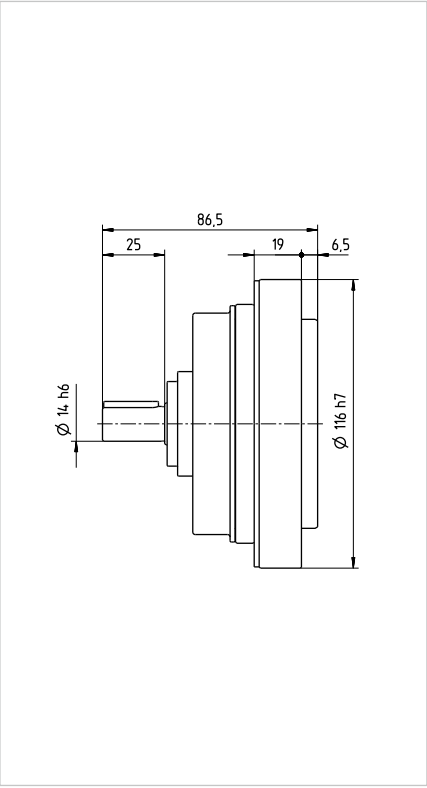


Illustration 135.6
CobaltLine-20-CPS [mm]



Technical data

Table 136.1

	Unit	CobaltLine-32-CP				
Ratio	i []	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	281	395	433	459	484
Average torque	T _A [Nm]	140	217	281	281	281
Rated torque	T _N [Nm]	99	153	178	178	178
Momentary peak torque	T _M [Nm]	497	738	841	892	892
Maximum input speed	n _{in (max)} [rpm]	4800				
Average input speed	n _{av (max)} [rpm]	3500/1980 ¹⁾				
Moment of inertia CPM	J _{in} [x10 ⁻⁴ kgm²]	1.69				
Moment of inertia CPH	J _{in} [x10 ⁻⁴ kgm²]	2.85				
Moment of inertia CPS	J _{in} [x10 ⁻⁴ kgm²]	1.20				
Weight CPM	m [kg]	3.9				
Weight CPH	m [kg]	5.0				
Weight CPS	m [kg]	5.4				
Maximum hollow shaft diameter	d _{H (max)} [mm]	36				
Transmission accuracy	[arcmin]	< 1.0	< 0.8			
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	98	120			
Ambient operating temperature	[°C]	-40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	14600				
Dynamic axial load	F _{A dyn (max)} [N]	22300				
Dynamic tilting moment	M _{dyn (max)} [Nm]	578				

¹⁾Valid for CobaltLine®-CPH

Table 136.2

	Unit	CobaltLine-40-CP				
Ratio	i []	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	523	675	738	802	841
Average torque	T _A [Nm]	255	369	484	586	586
Rated torque	T _N [Nm]	178	268	345	382	382
Momentary peak torque	T _M [Nm]	892	1270	1400	1530	1530
Maximum input speed	n _{in (max)} [rpm]	4000				
Average input speed	n _{av (max)} [rpm]	3000/1300 ¹⁾				
Moment of inertia CPM	J _{in} [x10 ⁻⁴ kgm²]	4.5				
Moment of inertia CPH	J _{in} [x10 ⁻⁴ kgm²]	9.28				
Moment of inertia CPS	J _{in} [x10 ⁻⁴ kgm²]	3.41				
Weight CPM	m [kg]	6.9				
Weight CPH	m [kg]	8.8				
Weight CPS	m [kg]	8.8				
Maximum hollow shaft diameter	d _{H (max)} [mm]	46				
Transmission accuracy	[arcmin]	< 0.7	< 0.5			
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	180	230			
Ambient operating temperature	[°C]	-40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	27500				
Dynamic axial load	F _{A dyn (max)} [N]	42000				
Dynamic tilting moment	M _{dyn (max)} [Nm]	886				

¹⁾Valid for CobaltLine®-CPH

Illustration 137.1
CobaltLine-32-CPM [mm]

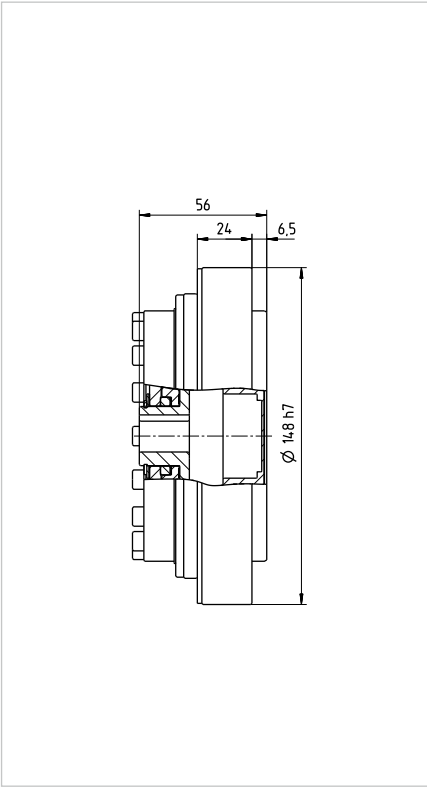


Illustration 137.2
CobaltLine-32-CPH [mm]

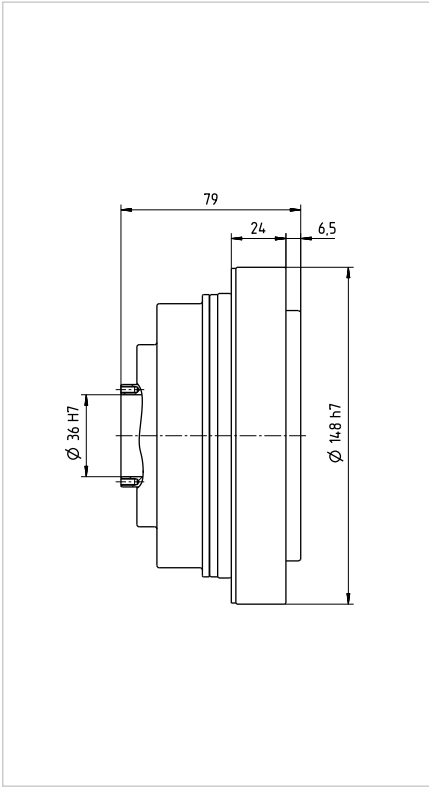


Illustration 137.3
CobaltLine-32-CPS [mm]

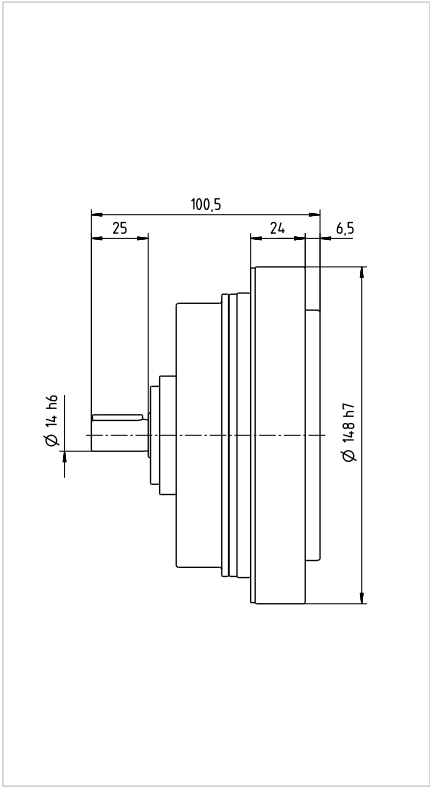


Illustration 137.4
CobaltLine-40-CPM [mm]

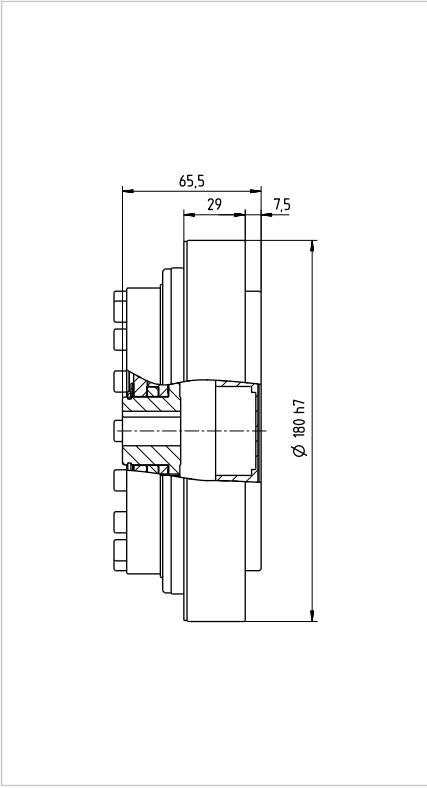


Illustration 137.5
CobaltLine-40-CPH [mm]

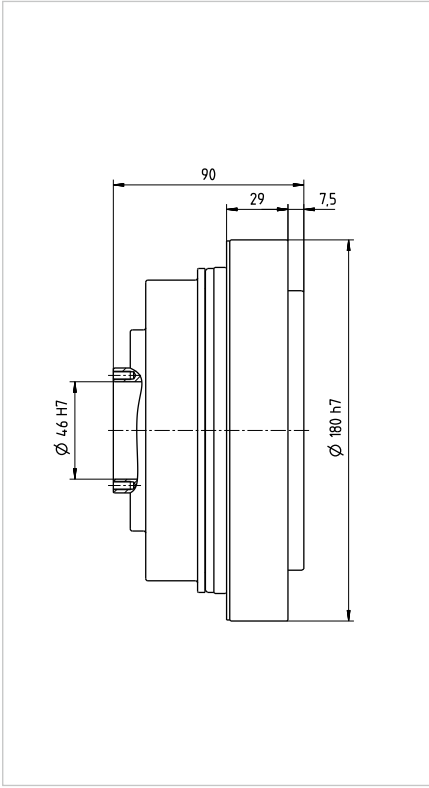
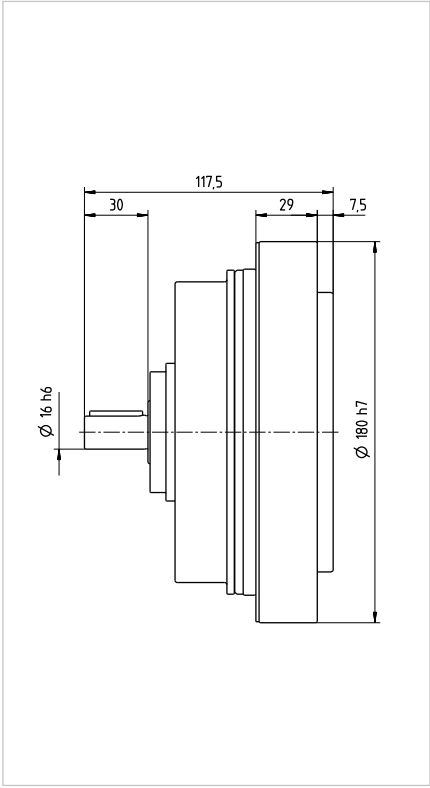


Illustration 137.6
CobaltLine-40-CPS [mm]



Maximum torque capacity with extended temperature range

CobaltLine®-2UH Series Units are available in six sizes with gear ratios of 50, 80, 100, 120 and 160:1 offering repeatable peak torques from 23 to 841 Nm.

Harmonic Drive® Units combine the precision Harmonic Drive® Component Sets consisting of three components - Circular Spline, Flexspline and Wave Generator - and integral high load capacity, tilt resistant output bearings.

The output bearing with high tilting capacity often allows direct attachment of heavy payloads without the need for further support, thereby providing simple and space saving design installations.

They cover a wide torque range and feature long service life. If required, the Units are available as specific configurations tailored to your application. Standard servo motors can be attached in a compact manner. The CobaltLine® Series can be used for ambient temperatures between -40 °C and 90 °C.

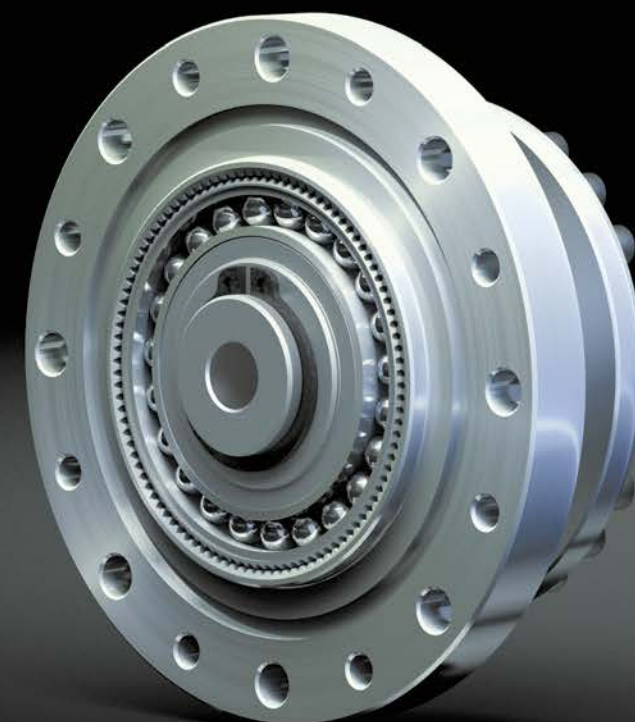
Features

- Direct motor connection
- Excellent lifetime precision
- Compact, lightweight design
- High dynamics
- Integrated high capacity output bearing

Optimised for your applications:

- Easy integration
- Reduced diversity of components
- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Greater energy efficiency
- Lower production costs
- Small machine footprint

Customer Benefits



QUICKLINK

www.harmonicdrive.co.uk/2020

CobaltLine®-2UH

Ordering code

Table 140.1

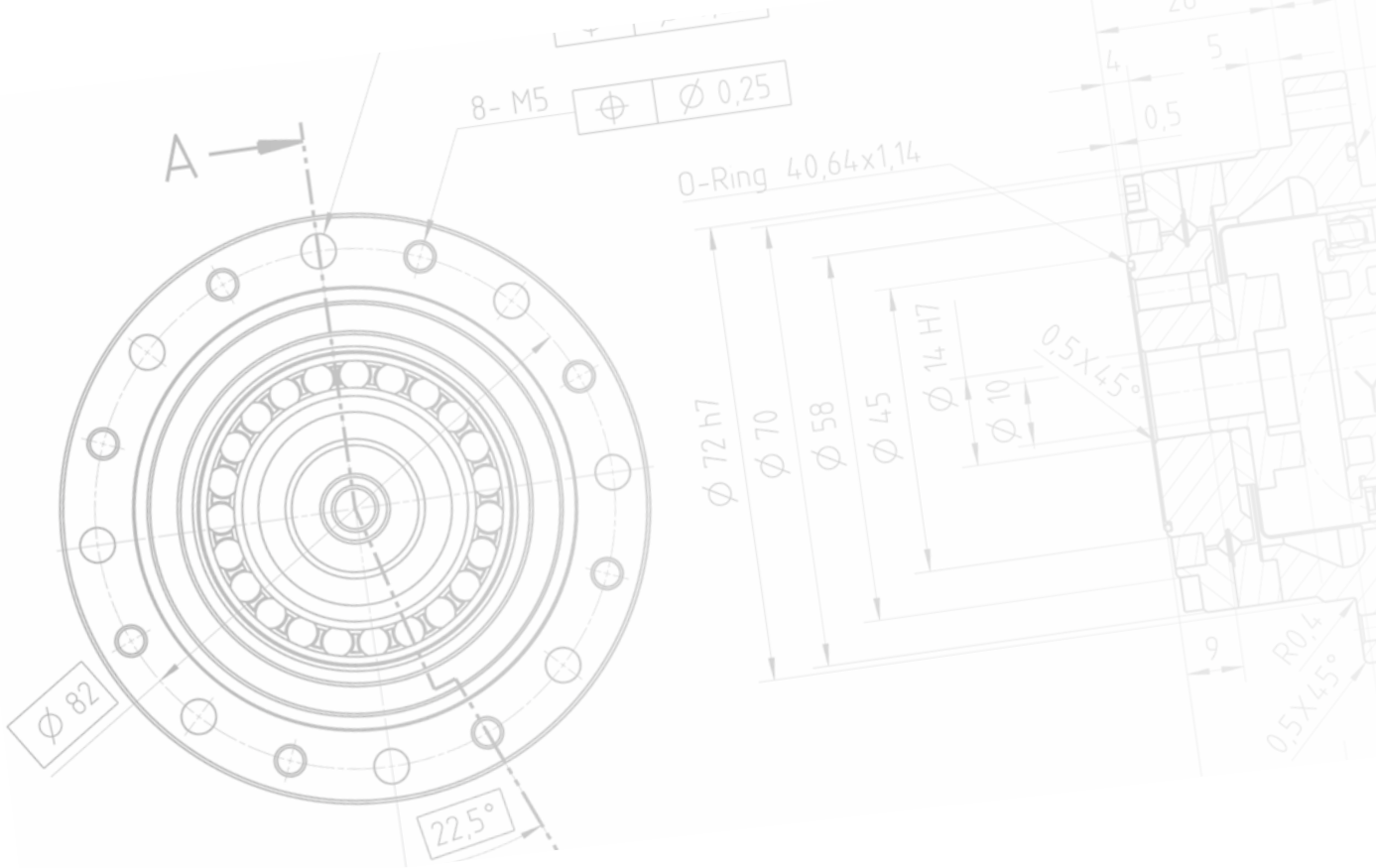
Series	Size	Ratio					Version	Special design
CobaltLine	14	50	80	100			2UH	According to customer requirements
	17	50	80	100	120			
	20	50	80	100	120	160		
	25	50	80	100	120	160		
	32	50	80	100	120	160		
	40	50	80	100	120	160		
Ordering code								
CobaltLine	-	25	-	100	-	2UH	-	SP

Table 140.2

Version	
Ordering code	Description
2UH	Unit

Available motor adaptations:

QUICKLINK www.harmonicdrive.co.uk/2105



Technical data

Table 142.1

	Unit	CobaltLine-14-2UH			CobaltLine-17-2UH			
Ratio	i []	50	80	100	50	80	100	120
Repeatable peak toque	T _R [Nm]	23	30	36	44	56	70	70
Average torque	T _A [Nm]	9.0	14	14	34	35	51	51
Rated torque	T _N [Nm]	7.0	10	10	21	29	31	31
Momentary peak torque	T _M [Nm]	46	61	70	91	113	143	112
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	14000			10000			
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			7300			
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500			6500			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500			
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.033			0.079			
Weight	m [kg]	0.52			0.68			
Maximum hollow shaft diameter	d _{H (max)} [mm]	8			7			
Transmission accuracy	[arcmin]	< 1.5			< 1.5			
Repeatability	[arcmin]	< ±0.1			< ±0.1			
Lost Motion	[arcmin]	< 1			< 1			
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	5.7	7.1		13	16		
Ambient operating temperature	[°C]	-40 ... 90			-40 ... 90			
Output bearing								
Dynamic radial load	F _{R dyn (max)} [N]	1928			2148			
Dynamic axial load	F _{A dyn (max)} [N]	2878			3207			
Dynamic tilting moment	M _{dyn (max)} [Nm]	41			64			

Table 142.2

	Unit	CobaltLine-20-2UH					CobaltLine-25-2UH				
Ratio	i []	50	80	100	120	160	50	80	100	120	160
Repeatable peak toque	T _R [Nm]	73	96	107	113	120	127	178	204	217	229
Average torque	T _A [Nm]	44	61	64	64	64	72	113	140	140	140
Rated torque	T _N [Nm]	33	44	52	52	52	51	82	87	87	87
Momentary peak torque	T _M [Nm]	127	165	191	191	191	242	332	369	395	408
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	10000					7500				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500					5600				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500					5600				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500					3500				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.193					0.413				
Weight	m [kg]	0.98					1.5				
Maximum hollow shaft diameter	d _{H (max)} [mm]	10					15				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	23	29				44	57			
Ambient operating temperature	[°C]	-40 ... 90					-40 ... 90				
Output bearing											
Dynamic radial load	F _{R dyn (max)} [N]	2354					3904				
Dynamic axial load	F _{A dyn (max)} [N]	3511					5827				
Dynamic tilting moment	M _{dyn (max)} [Nm]	91					156				

Illustration 143.1

CobaltLine-14-2UH [mm]

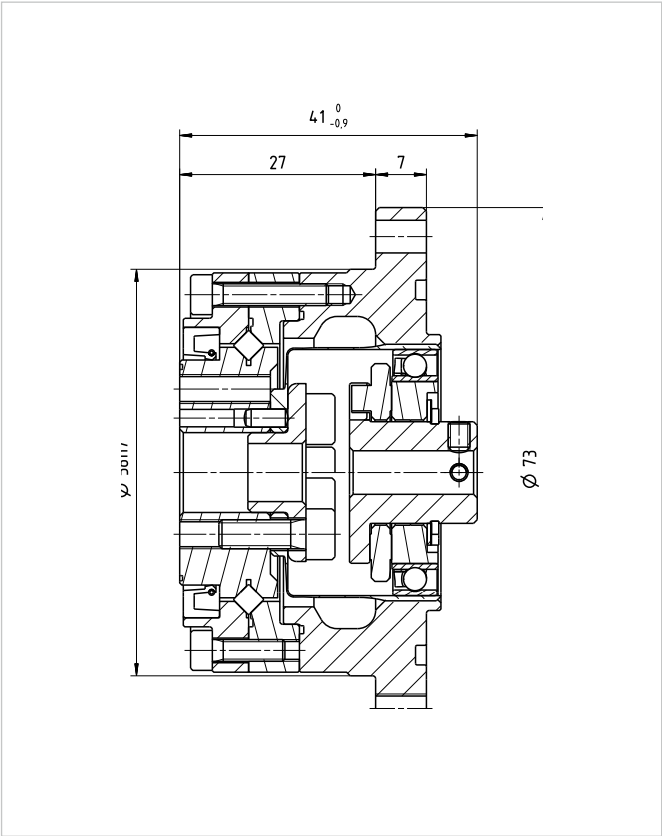


Illustration 143.2

CobaltLine-17-2UH [mm]

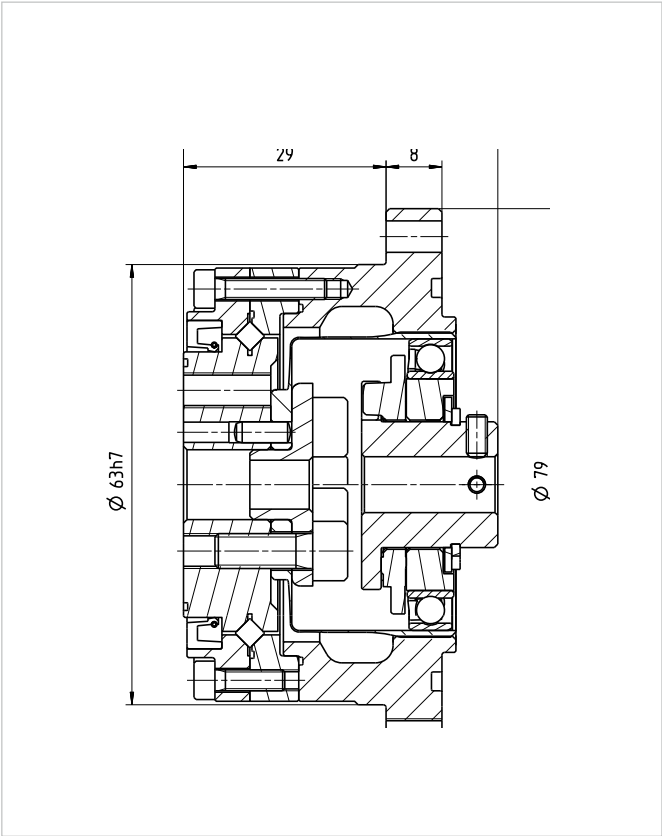


Illustration 143.3

CobaltLine-20-2UH [mm]

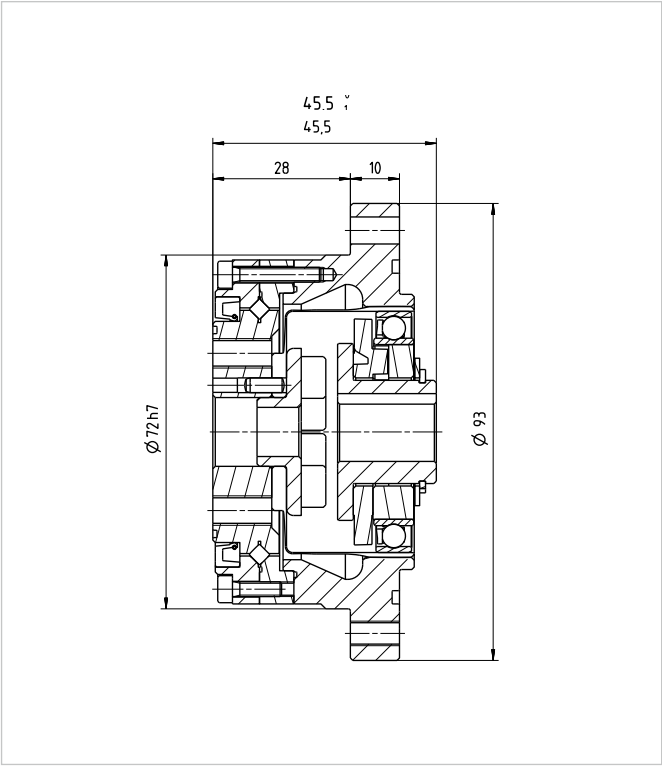
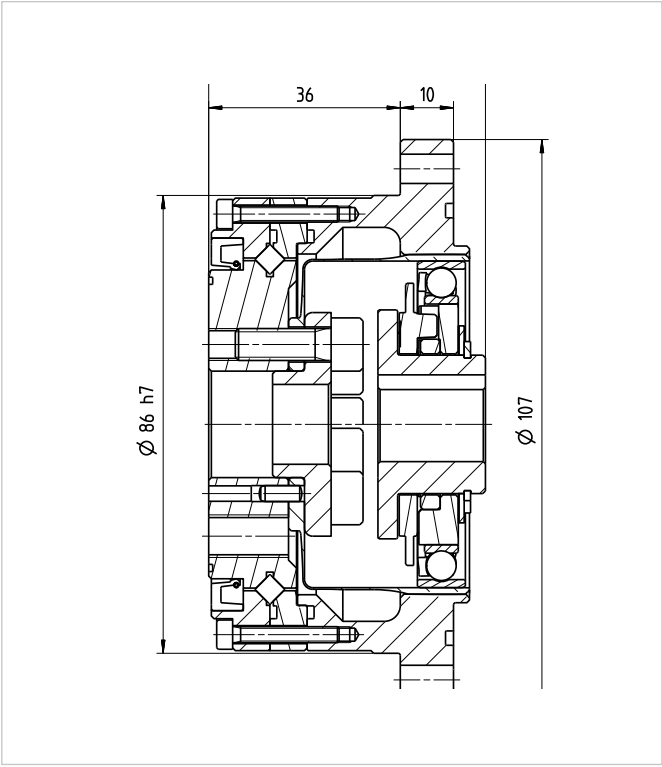


Illustration 143.4

CobaltLine-25-2UH [mm]



Technical data

Table 144.1

	Unit	CobaltLine-32-2UH					CobaltLine-40-2UH				
Ratio	i []	50	80	100	120	160	50	80	100	120	160
Repeatable peak toque	T _R [Nm]	281	395	433	459	484	523	675	738	802	841
Average torque	T _A [Nm]	140	217	281	281	281	255	369	484	586	586
Rated torque	T _N [Nm]	99	153	178	178	178	178	268	345	382	382
Momentary peak torque	T _M [Nm]	497	738	841	892	892	892	1270	1400	1530	1530
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	7000					5600				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800					4000				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	4600					3600				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500					3000				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	1.96					4.5				
Weight	m [kg]	3.2					5.0				
Maximum hollow shaft diameter	d _{H (max)} [mm]	20					24				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	98	120				180	230			
Ambient operating temperature	[°C]	-40 ... 90					-40 ... 90				
Output bearing											
Dynamic radial load	F _{R dyn (max)} [N]	6101					8652				
Dynamic axial load	F _{A dyn (max)} [N]	7926					11242				
Dynamic tilting moment	M _{dyn (max)} [Nm]	313					450				

Illustration 145.1

CobaltLine-32-2UH [mm]

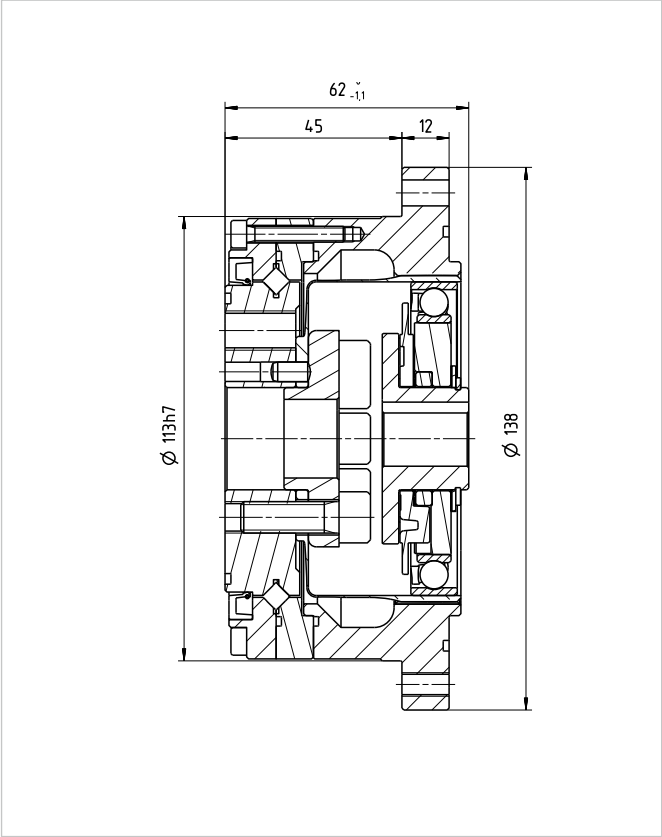
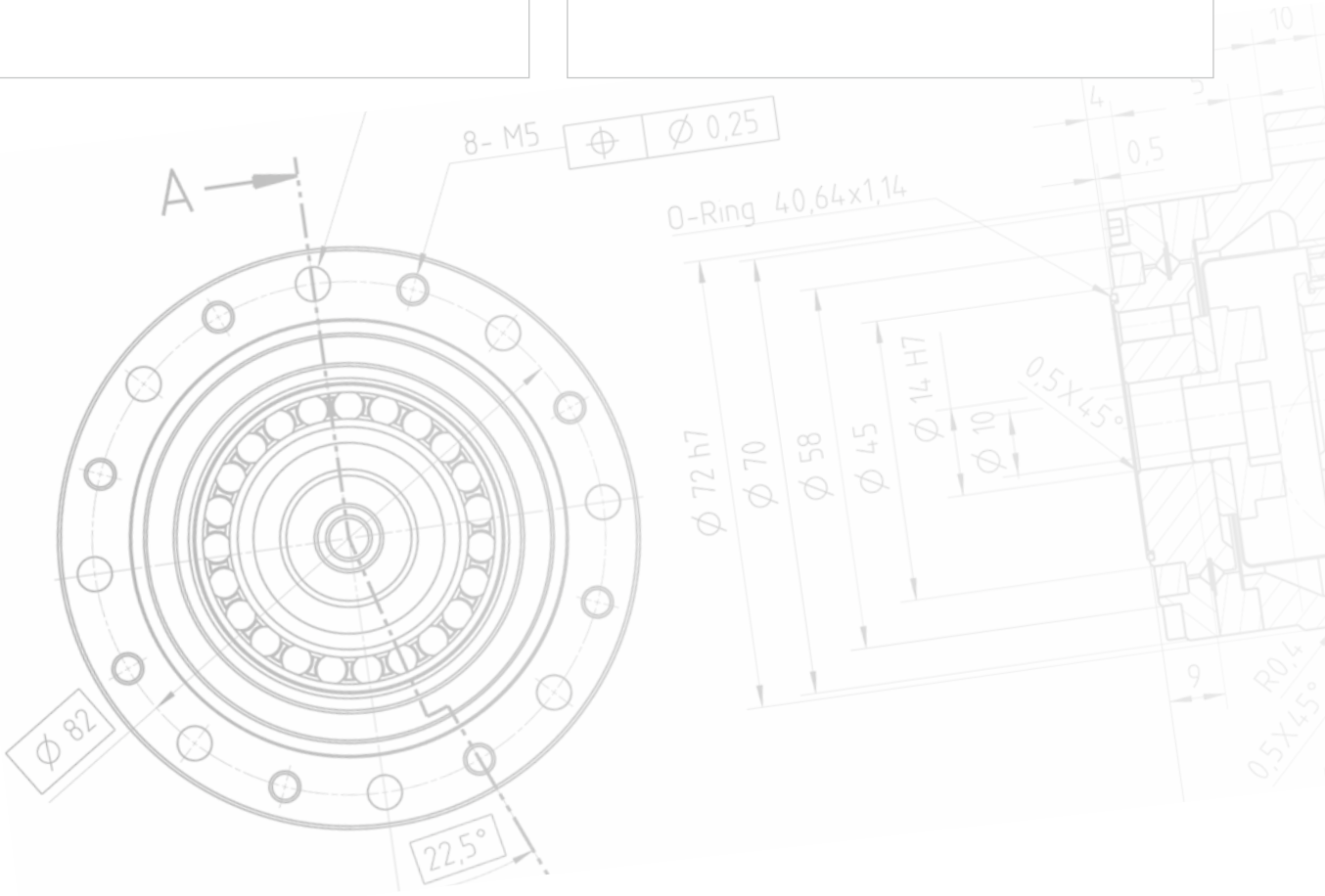
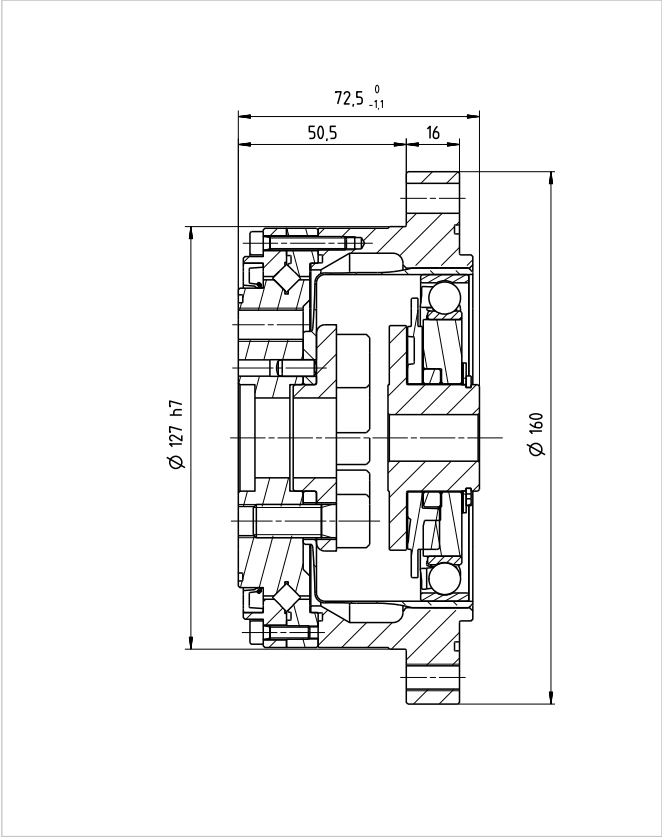


Illustration 145.2

CobaltLine-40-2UH [mm]



Increased torque range

CSG-2UH Series Units are available in ten sizes with gear ratios of 50, 80, 100, 120 and 160:1 offering repeatable peak torques from 23 to 3419 Nm.

Harmonic Drive® Units combine the precision Harmonic Drive® Component Sets consisting of three components – Circular Spline, Flexspline and Wave Generator – and integral high load capacity, tilt resistant output bearings.

The output bearing with high tilting rigidity enables the direct introduction of high payloads without further support and thus permits simple and space saving designs.

Standard servo motors can be attached in a compact manner. The Units cover a wide torque range and feature long service life, confirmed by many years of successful service. Unit and motor together form a compact and lightweight system capable of quickly withstanding high loads. Due to the Units positioning accuracy, stable machine characteristics with short cycle times are guaranteed.

Features

- Direct motor connection
- Excellent lifetime precision
- Compact, lightweight design
- High dynamics
- Integrated high capacity output bearing

Optimised for your applications:

- Simple design solution
- Reduced diversity of components
- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Greater energy efficiency
- Lower production costs
- Small machine footprint
- Increased machine throughput
- Increased productivity

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/2030

CSG-2UH

Ordering code

Table 148.1

Series	Size	Ratio					Version	Special design
CSG	14	50	80	100			2UH	According to customer requirements
	17	50	80	100	120			
	20	50	80	100	120	160		
	25	50	80	100	120	160		
	32	50	80	100	120	160		
	40	50	80	100	120	160		
	45	50	80	100	120	160		
	50		80	100	120	160		
	58		80	100	120	160		
	65		80	100	120	160		
Ordering code								
CSG	-	25	-	100	-	2UH	-	SP

Available motor adaptations:

QUICKLINK www.harmonicdrive.co.uk/2105

Table 148.2

Version	
Ordering code	Description
2UH	Unit



Technical data

Table 150.1

	Unit	CSG-14-2UH			CSG-17-2UH			
Ratio	i []	50	80	100	50	80	100	120
Repeatable peak toque	T _R [Nm]	23	30	36	44	56	70	70
Average torque	T _A [Nm]	9.0	14	14	34	35	51	51
Rated torque	T _N [Nm]	7.0	10	10	21	29	31	31
Momentary peak torque	T _M [Nm]	46	61	70	91	113	143	112
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	14000			10000			
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			7300			
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500			6500			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500			
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.033			0.079			
Weight	m [kg]	0.52			0.68			
Maximum hollow shaft diameter	d _{H (max)} [mm]	8			7			
Transmission accuracy	[arcmin]	< 1.5			< 1.5			
Repeatability	[arcmin]	< ±0.1			< ±0.1			
Lost Motion	[arcmin]	< 1			< 1			
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	5.7	7.1		13	16		
Ambient operating temperature	[°C]	-10 ... 80			-10 ... 80			
Output bearing								
Dynamic radial load	F _{R dyn (max)} [N]	1928			2148			
Dynamic axial load	F _{A dyn (max)} [N]	2878			3207			
Dynamic tilting moment	M _{dyn (max)} [Nm]	41			64			

Table 150.2

	Unit	CSG-20-2UH					CSG-25-2UH				
Ratio	i []	50	80	100	120	160	50	80	100	120	160
Repeatable peak toque	T _R [Nm]	73	96	107	113	120	127	178	204	217	229
Average torque	T _A [Nm]	44	61	64	64	64	72	113	140	140	140
Rated torque	T _N [Nm]	33	44	52	52	52	51	82	87	87	87
Momentary peak torque	T _M [Nm]	127	165	191	191	191	242	332	369	395	408
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	10000					7500				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500					5600				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500					5600				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500					3500				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.193					0.413				
Weight	m [kg]	0.98					1.5				
Maximum hollow shaft diameter	d _{H (max)} [mm]	10					15				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	23	29				44	57			
Ambient operating temperature	[°C]	-10 ... 80					-10 ... 80				
Output bearing											
Dynamic radial load	F _{R dyn (max)} [N]	2354					3904				
Dynamic axial load	F _{A dyn (max)} [N]	3511					5827				
Dynamic tilting moment	M _{dyn (max)} [Nm]	91					156				

Illustration 151.1

CSG-14-2UH [mm]

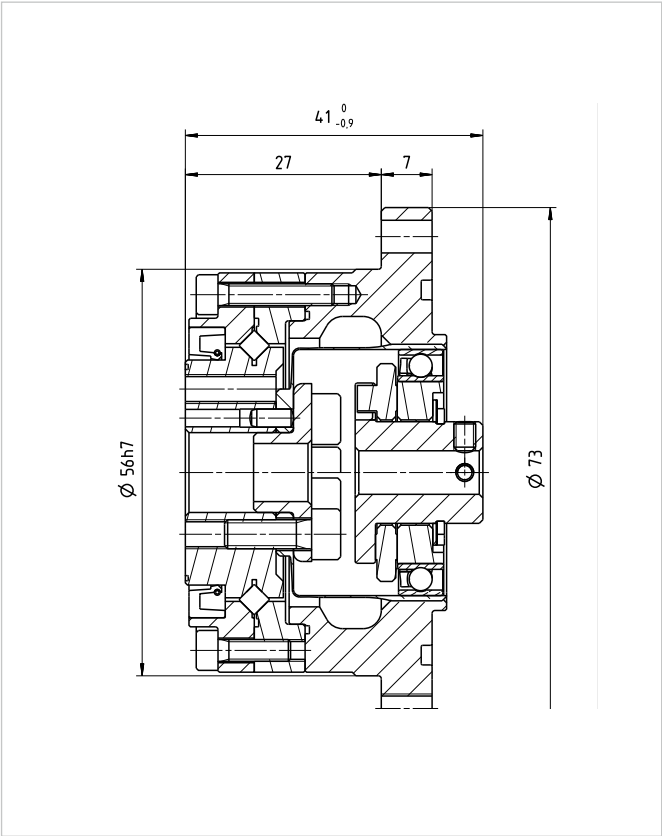


Illustration 151.2

CSG-17-2UH [mm]

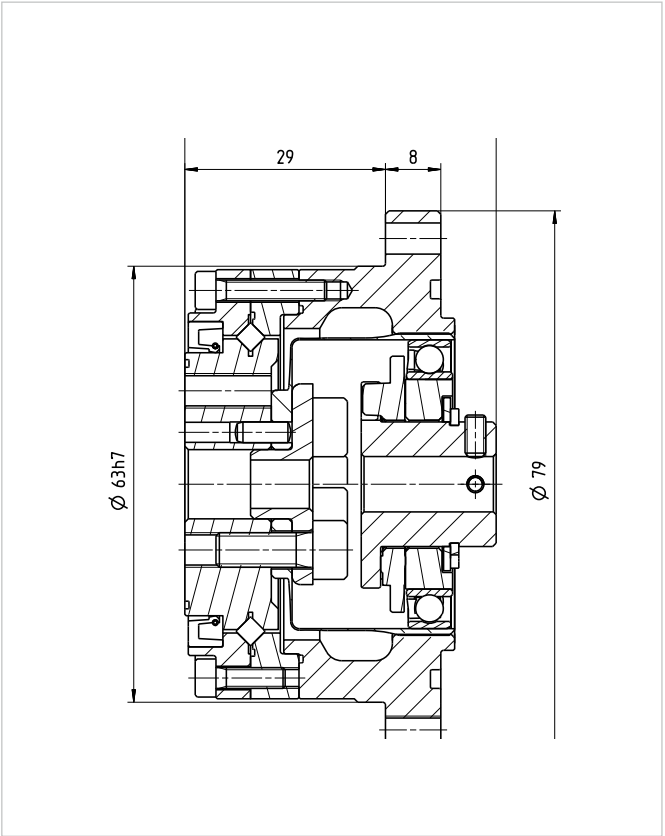


Illustration 151.3

CSG-20-2UH [mm]

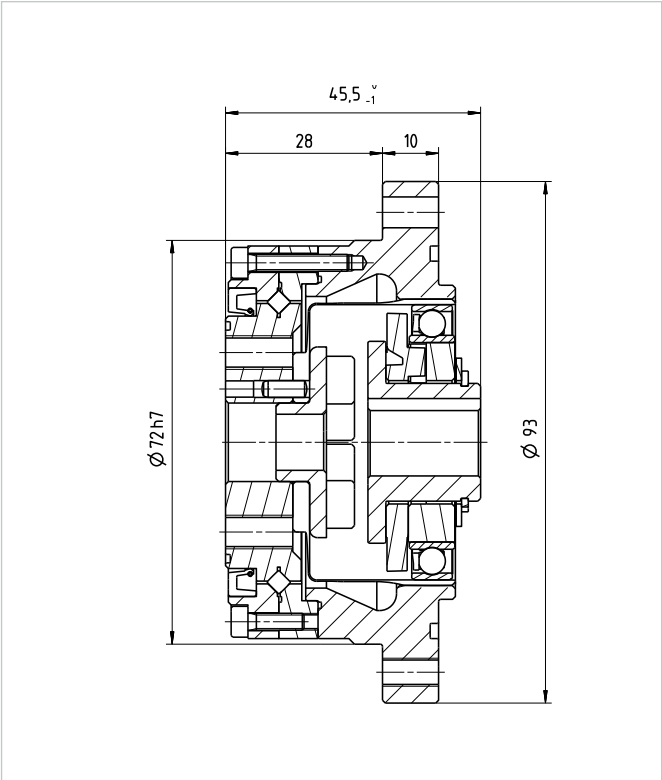
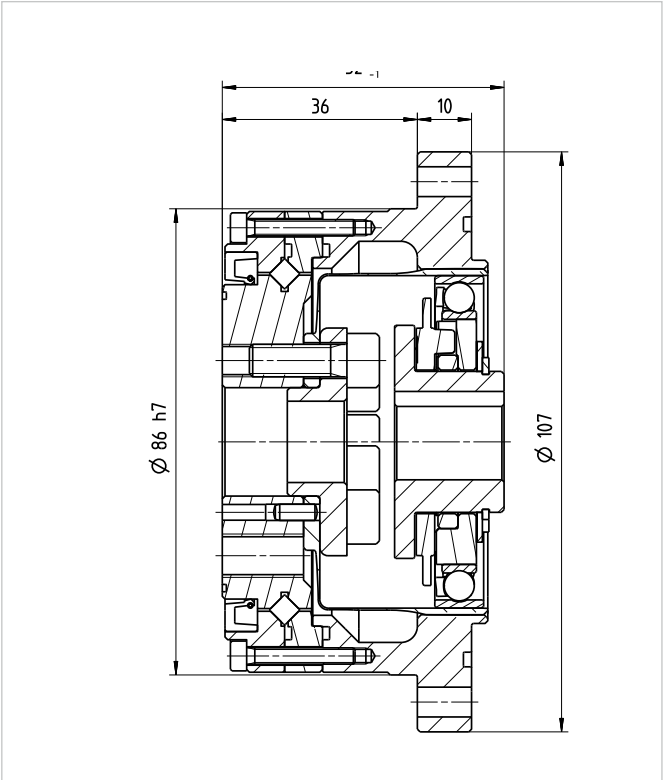


Illustration 151.4

CSG-25-2UH [mm]



Technical data

Table 152.1

	Unit	CSG-32-2UH					CSG-40-2UH				
Ratio	i []	50	80	100	120	160	50	80	100	120	160
Repeatable peak toque	T _R [Nm]	281	395	433	459	484	523	675	738	802	841
Average torque	T _A [Nm]	140	217	281	281	281	255	369	484	586	586
Rated torque	T _N [Nm]	99	153	178	178	178	178	268	345	382	382
Momentary peak torque	T _M [Nm]	497	738	841	892	892	892	1270	1400	1530	1530
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	7000					5600				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800					4000				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	4600					3600				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500					3000				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	1.96					4.5				
Weight	m [kg]	3.2					5.0				
Maximum hollow shaft diameter	d _{H (max)} [mm]	20					24				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	98	120				180	230			
Ambient operating temperature	[°C]	-10 ... 80					-10 ... 80				
Output bearing											
Dynamic radial load	F _{R dyn (max)} [N]	6101					8652				
Dynamic axial load	F _{A dyn (max)} [N]	7926					11242				
Dynamic tilting moment	M _{dyn (max)} [Nm]	313					450				

Table 152.2

	Unit	CSG-45-2UH					CSG-50-2UH			
Ratio	i []	50	80	100	120	160	80	100	120	160
Repeatable peak toque	T _R [Nm]	650	918	982	1070	1147	1223	1274	1404	1534
Average torque	T _A [Nm]	345	507	650	806	819	675	866	1057	1096
Rated torque	T _N [Nm]	229	407	459	523	523	484	611	688	688
Momentary peak torque	T _M [Nm]	1235	1651	2041	2288	2483	2418	2678	2678	3185
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	5000					4500			
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3800					3500			
Average input speed (oil lubrication)	n _{av (max)} [rpm]	3300					3000			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000					2500			
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	8.68					12.58			
Weight	m [kg]	7.0					8.9			
Maximum hollow shaft diameter	d _{H (max)} [mm]	25					32			
Transmission accuracy	[arcmin]	< 1					< 1			
Repeatability	[arcmin]	< ±0.1					< ±0.1			
Lost Motion	[arcmin]	< 1					< 1			
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	260	330				440			
Ambient operating temperature	[°C]	-10 ... 80					-10 ... 80			
Output bearing										
Dynamic radial load	F _{R dyn (max)} [N]	9368					14155			
Dynamic axial load	F _{A dyn (max)} [N]	12174					18393			
Dynamic tilting moment	M _{dyn (max)} [Nm]	686					759			

Illustration 153.1

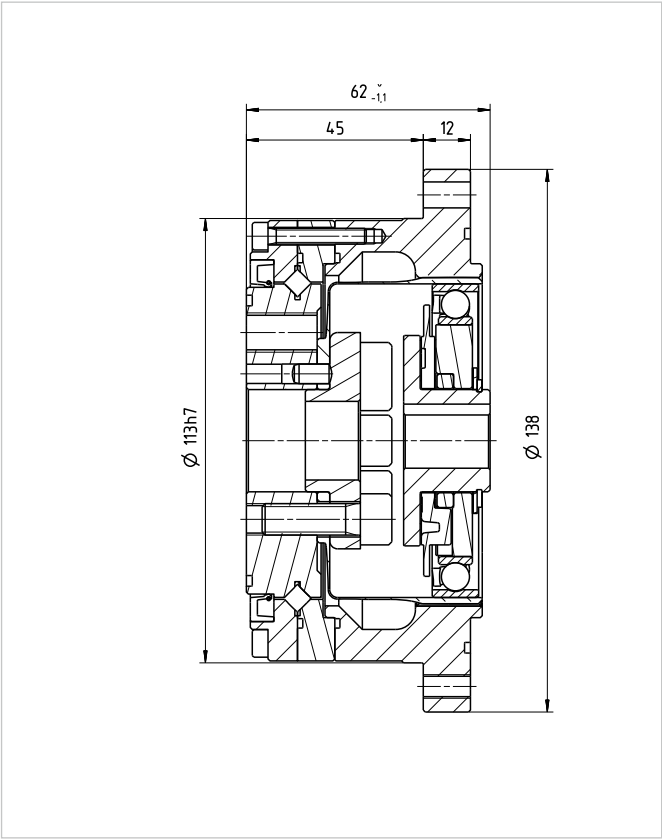


Illustration 153.2

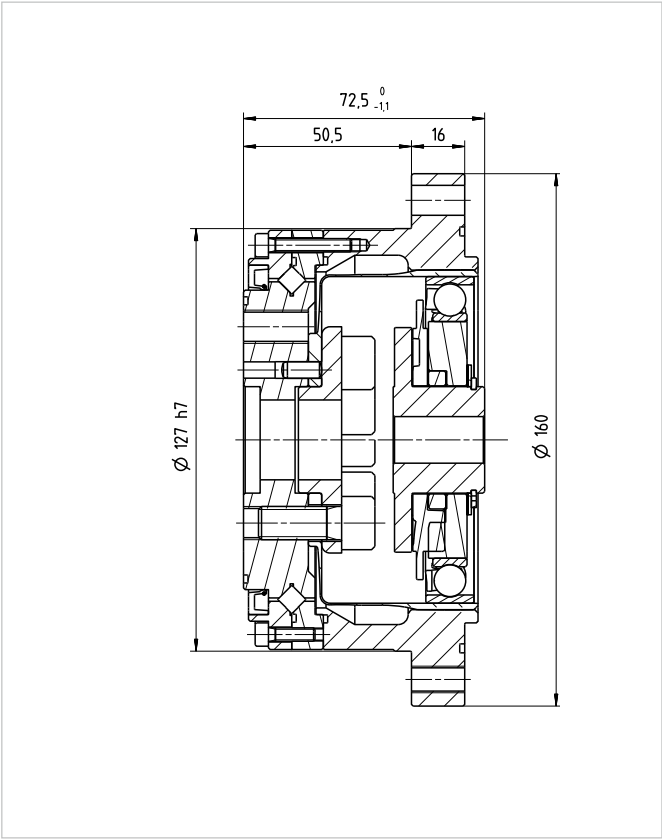


Illustration 153.3

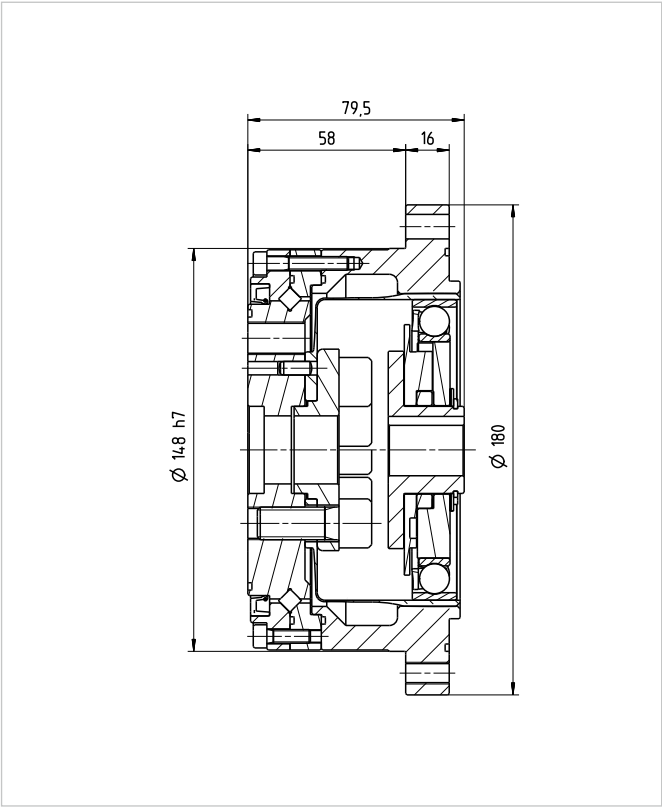
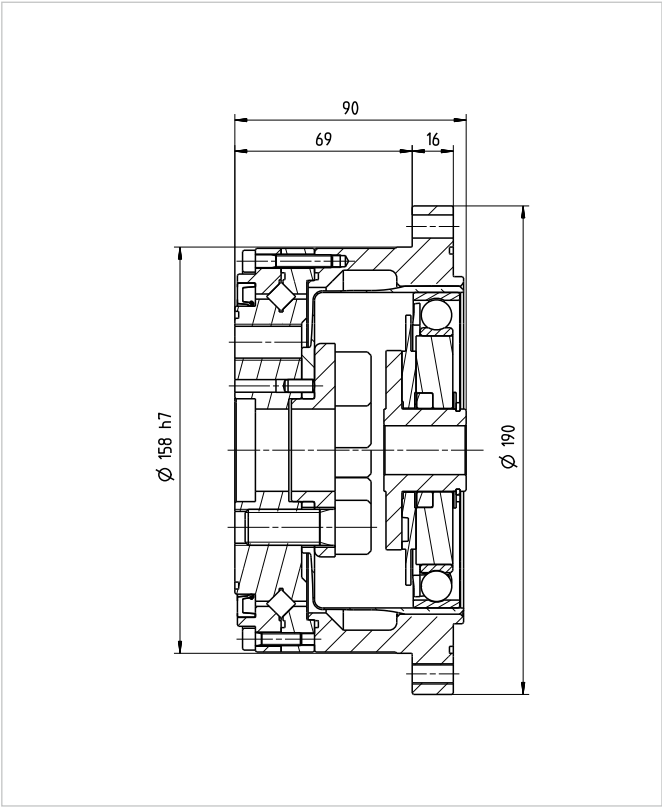


Illustration 153.4



Technical data

Table 154.1

	Unit	CSG-58-2UH				CSG-65-2UH			
Ratio	i []	80	100	120	160	80	100	120	160
Repeatable peak toque	T _R [Nm]	1924	2067	2236	2392	2743	2990	3263	3419
Average torque	T _A [Nm]	1001	1378	1547	1573	1352	1976	2041	2041
Rated torque	T _N [Nm]	714	905	969	969	969	1236	1236	1236
Momentary peak torque	T _M [Nm]	3185	4134	4329	4459	4836	6175	6175	6175
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	4000				3500			
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3000				2800			
Average input speed (oil lubrication)	n _{av (max)} [rpm]	2700				2400			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	2200				1900			
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	27.3				46.8			
Weight	m [kg]	14.6				20.9			
Maximum hollow shaft diameter	d _{H (max)} [mm]	38				44			
Transmission accuracy	[arcmin]	< 1				< 1			
Repeatability	[arcmin]	< ±0.1				< ±0.1			
Lost Motion	[arcmin]	< 1				< 1			
Torsional stiffness	K ₃ [x10³ Nm/rad]	710				980			
Ambient operating temperature	[°C]	-10 ... 80				-10 ... 80			
Output bearing									
Dynamic radial load	F _{R dyn (max)} [N]	21091				22602			
Dynamic axial load	F _{A dyn (max)} [N]	27409				29371			
Dynamic tilting moment	M _{dyn (max)} [Nm]	1180				1860			

Illustration 155.1

CSG-58-2UH [mm]

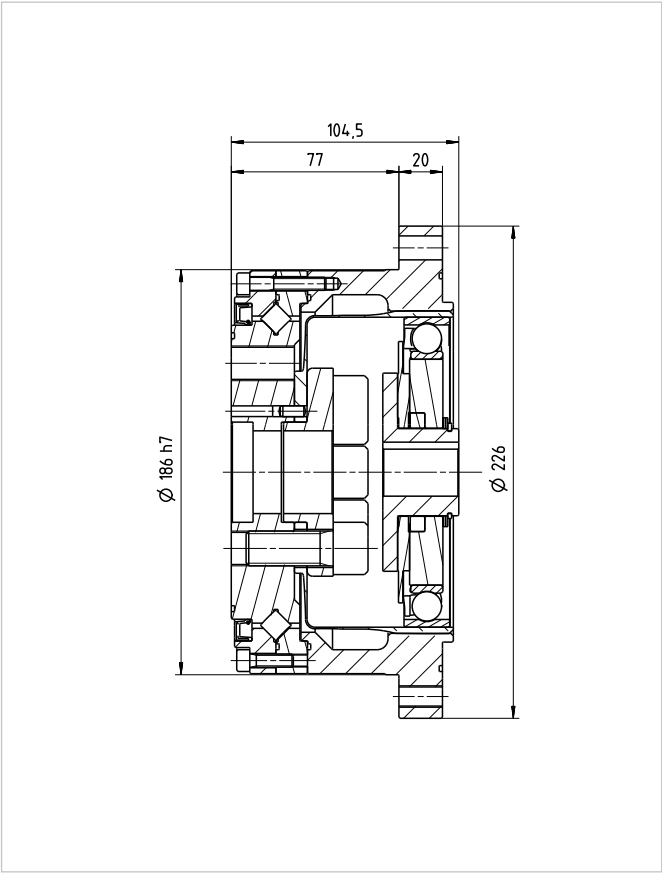
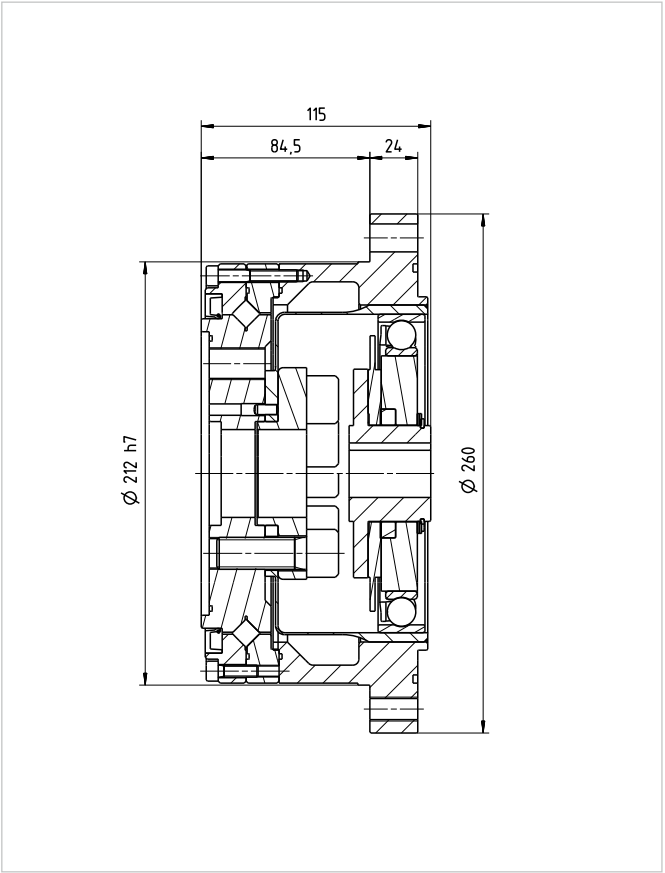


Illustration 155.2

CSG-65-2UH [mm]



Increased precision output bearing and flexible connectivity

The CPU Series Units are available in nine sizes with gear ratios of 30, 50, 80, 100, 120 and 160:1 offering repeatable peak torques from 9 to 1840 Nm.

Harmonic Drive® Units combine the precision Harmonic Drive® Component Sets consisting of three components - Circular Spline, Flexspline and Wave Generator - and integral high load capacity, tilt resistant output bearings.

The precision output bearing with high tilting capacity often allows direct attachment of heavy payloads without the need for further support, thereby providing simple and space saving design installations.

The CPU Series is available in three versions: the CPU-M Unit for direct mounting of any servo motor, the CPU-H Unit with hollow shaft to feed through supply lines for further drive systems and the CPU-S Unit with stainless steel input shaft enabling flexible integration into your design.

If required, the Units are available as specific configurations tailored to your application, or with particularly high corrosion protection. The high capacity output bearing with maximum tilting rigidity and precision means that the Units can quickly and easily absorb high payloads and feature long service life. The Units are fully sealed and thus ideally suited for use in harsh ambient conditions. The Units accurate positioning guarantees stable machine characteristics with short cycle times guaranteed.

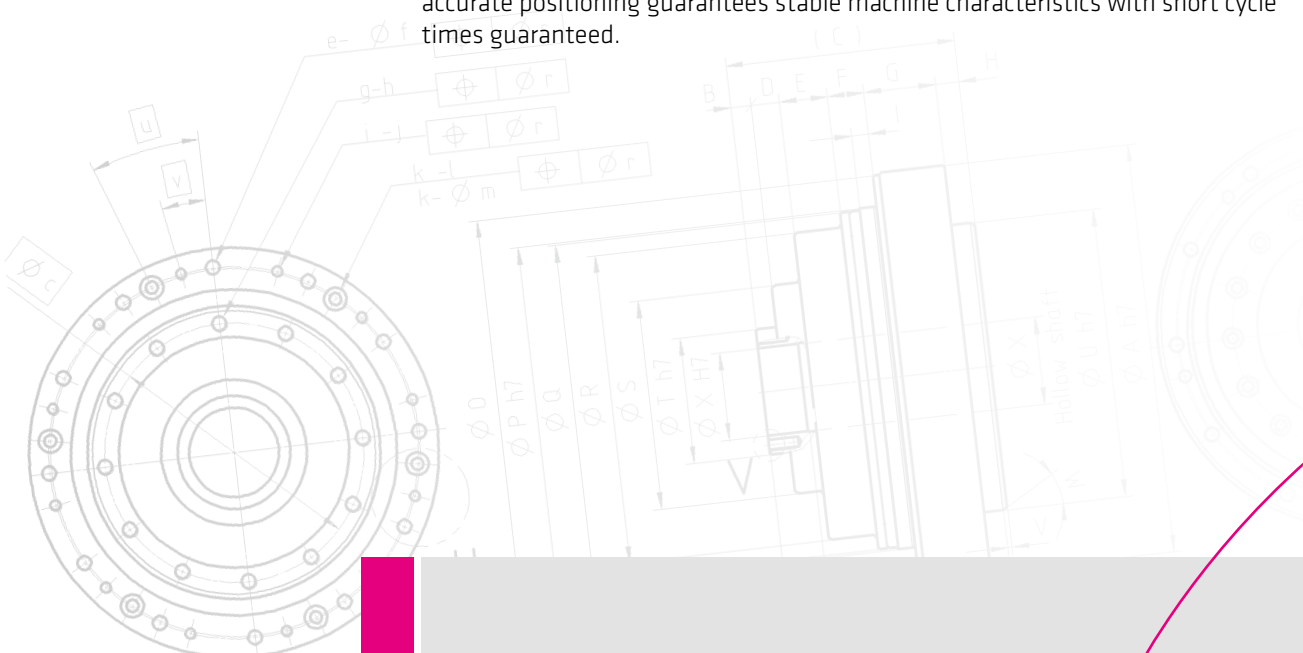


Table 158.1

Table 158.1

1) On request

Table 158.2

Available motor adaptations:

QUICKLINK www.harmonicdrive.co.uk/2105



Technical data

Table 160.1

	Unit	CPU-14			
Ratio	i []	30	50	80	100
Repeatable peak torque	T _R [Nm]	9.0	18	23	28
Average torque	T _A [Nm]	6.8	6.9	11	11
Rated torque	T _N [Nm]	4.0	5.4	7.8	7.8
Momentary peak torque	T _M [Nm]	17	35	47	54
Maximum input speed	n _{in (max)} [rpm]	8500			
Average input speed	n _{av (max)} [rpm]	3500/3000 ¹⁾			
Moment of inertia CPU-M	J _{in} [x10 ⁻⁴ kgm ²]	0.033			
Moment of inertia CPU-H	J _{in} [x10 ⁻⁴ kgm ²]	0.091			
Moment of inertia CPU-S	J _{in} [x10 ⁻⁴ kgm ²]	0.025			
Weight CPU-M	m [kg]	0.54			
Weight CPU-H	m [kg]	0.67			
Weight CPU-S	m [kg]	0.64			
Maximum hollow shaft diameter	d _{H (max)} [mm]	14			
Transmission accuracy	[arcmin]	< 2	< 1.2	< 1	
Repeatability	[arcmin]	< ±0.1			
Lost Motion	[arcmin]	< 1			
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	3.4	5.7	7.1	
Ambient operating temperature	[°C]	-40 ... 90			
Output bearing					
Dynamic radial load	F _{R dyn (max)} [N]	1450			
Dynamic axial load	F _{A dyn (max)} [N]	2880			
Dynamic tilting moment	M _{dyn (max)} [Nm]	73			

¹⁾ Valid for CPU-H

Table 160.2

	Unit	CPU-17				
Ratio	i []	30	50	80	100	120
Repeatable peak torque	T _R [Nm]	16	34	43	54	54
Average torque	T _A [Nm]	12	26	27	39	39
Rated torque	T _N [Nm]	8.8	16	22	24	24
Momentary peak torque	T _M [Nm]	30	70	87	110	86
Maximum input speed	n _{in (max)} [rpm]	7300				
Average input speed	n _{av (max)} [rpm]	3500/3000 ⁽²⁾				
Moment of inertia CPU-M	J _{in} [x10 ⁻⁴ kgm ²]	0.079				
Moment of inertia CPU-H	J _{in} [x10 ⁻⁴ kgm ²]	0.193				
Moment of inertia CPU-S	J _{in} [x10 ⁻⁴ kgm ²]	0.059				
Weight CPU-M	m [kg]	0.79				
Weight CPU-H	m [kg]	1.0				
Weight CPU-S	m [kg]	0.95				
Maximum hollow shaft diameter	d _{H (max)} [mm]	19				
Transmission accuracy	[arcmin]	< 2	< 1.2	< 1		
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	6.7	13	16		
Ambient operating temperature	[°C]	-40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	2300				
Dynamic axial load	F _{A dyn (max)} [N]	4600				
Dynamic tilting moment	M _{dyn (max)} [Nm]	114				

²⁾ Valid for CPU-H

Illustration 161.1 CPU-14-M [mm]

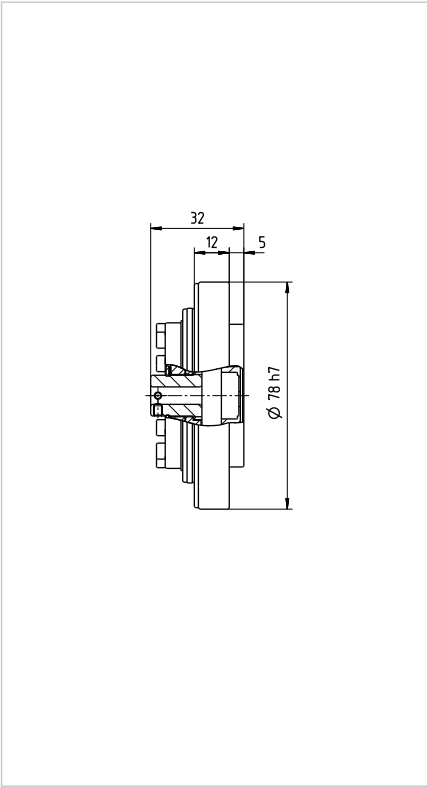


Illustration 161.2 CPU-14-H [mm]

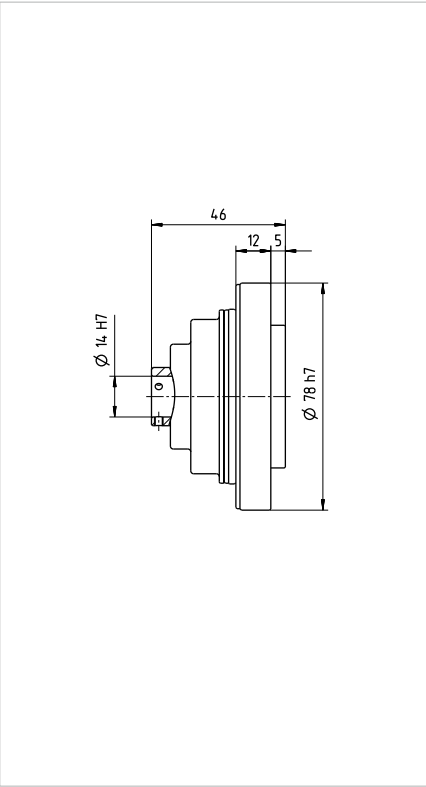


Illustration 161.3 CPU-14-S [mm]

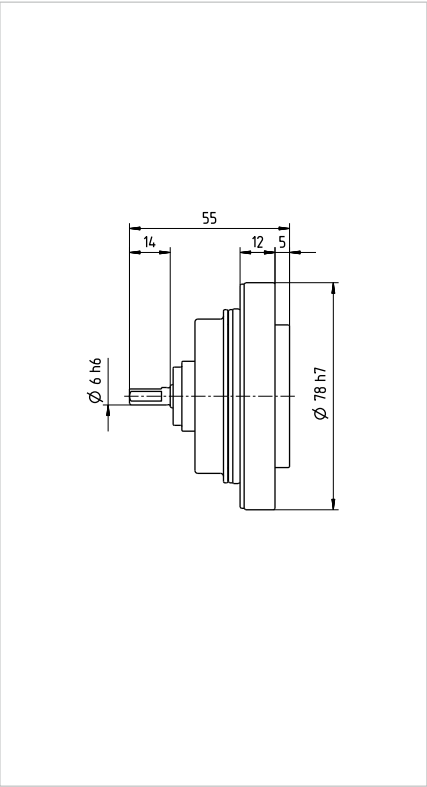


Illustration 161.4 CPU-17-M [mm]

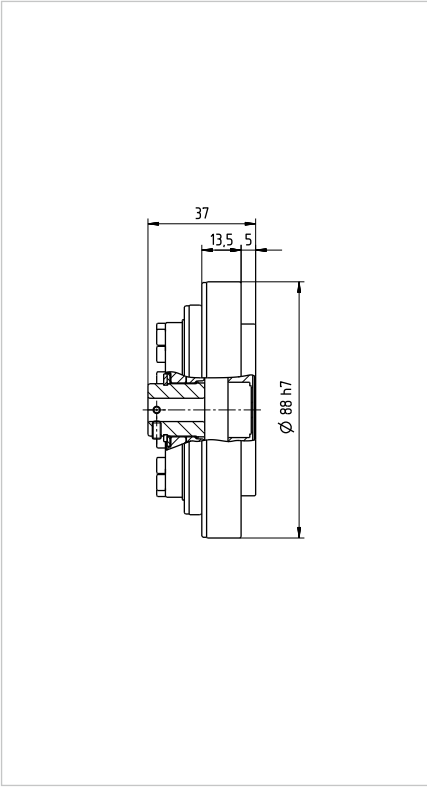


Illustration 161.5 CPU-17-H [mm]

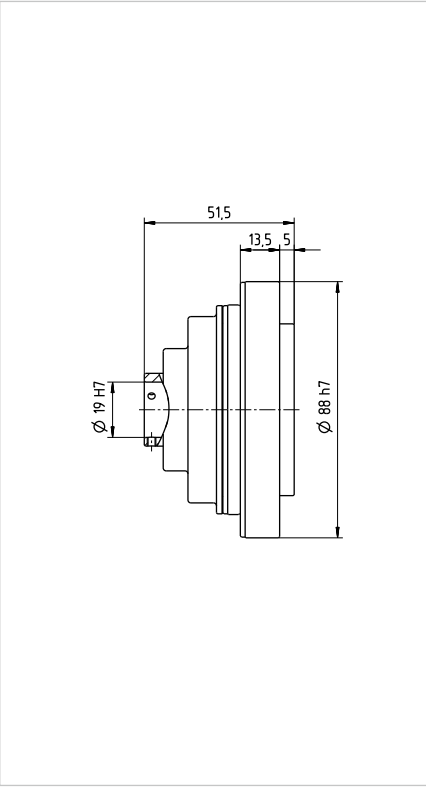
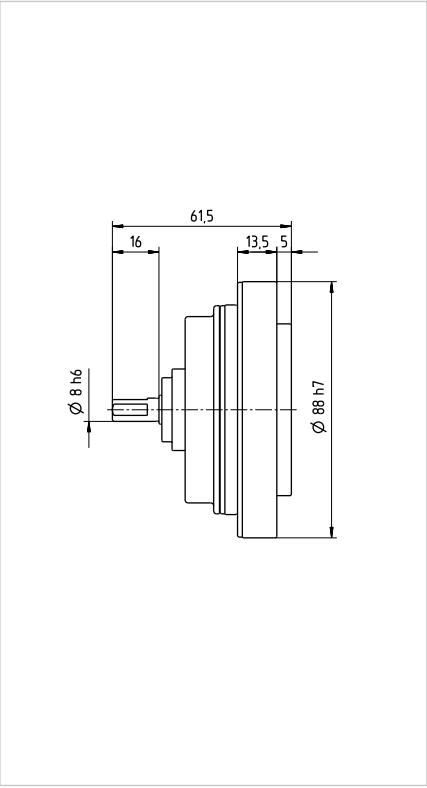


Illustration 161.6 CPU-17-S [mm]



Technical data

Table 162.1

	Unit	CPU-20					
Ratio	i []	30	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	27	56	74	82	87	92
Average torque	T _A [Nm]	20	34	47	49	49	49
Rated torque	T _N [Nm]	15	25	34	40	40	40
Momentary peak torque	T _M [Nm]	50	98	127	147	147	147
Maximum input speed	n _{in (max)} [rpm]	6500					
Average input speed	n _{av (max)} [rpm]	3500/3000 ¹⁾					
Moment of inertia CPU-M	J _{in} [x10 ⁻⁴ kgm ²]	0.193					
Moment of inertia CPU-H	J _{in} [x10 ⁻⁴ kgm ²]	0.404					
Moment of inertia CPU-S	J _{in} [x10 ⁻⁴ kgm ²]	0.137					
Weight CPU-M	m [kg]	1.3					
Weight CPU-H	m [kg]	1.55					
Weight CPU-S	m [kg]	1.4					
Maximum hollow shaft diameter	d _{H (max)} [mm]	10					
Transmission accuracy	[arcmin]	< 1.5	< 1	< 0.8			
Repeatability	[arcmin]	< ±0.1					
Lost Motion	[arcmin]	< 1					
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	11	23	29			
Ambient operating temperature	[°C]	-40 ... 90					
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	8600					
Dynamic axial load	F _{A dyn (max)} [N]	15800					
Dynamic tilting moment	M _{dyn (max)} [Nm]	172					

¹⁾ Valid for CPU-H

Table 162.2

	Unit	CPU-25					
Ratio	i []	30	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	50	98	137	157	167	176
Average torque	T _A [Nm]	38	55	87	108	108	108
Rated torque	T _N [Nm]	27	39	63	67	67	67
Momentary peak torque	T _M [Nm]	95	186	255	284	304	314
Maximum input speed	n _{in (max)} [rpm]	5600					
Average input speed	n _{av (max)} [rpm]	3500/2575 ²⁾					
Moment of inertia CPU-M	J _{in} [x10 ⁻⁴ kgm ²]	0.41					
Moment of inertia CPU-H	J _{in} [x10 ⁻⁴ kgm ²]	1.07					
Moment of inertia CPU-S	J _{in} [x10 ⁻⁴ kgm ²]	0.32					
Weight CPU-M	m [kg]	1.95					
Weight CPU-H	m [kg]	2.4					
Weight CPU-S	m [kg]	2.5					
Maximum hollow shaft diameter	d _{H (max)} [mm]	15					
Transmission accuracy	[arcmin]	< 1.5	< 1	< 0.8			
Repeatability	[arcmin]	< ±0.1					
Lost Motion	[arcmin]	< 1					
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	21	44	57			
Ambient operating temperature	[°C]	-40 ... 90					
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	12700					
Dynamic axial load	F _{A dyn (max)} [N]	19200					
Dynamic tilting moment	M _{dyn (max)} [Nm]	254					

²⁾ Valid for CPU-H

Illustration 163.1 CPU-20-M [mm]

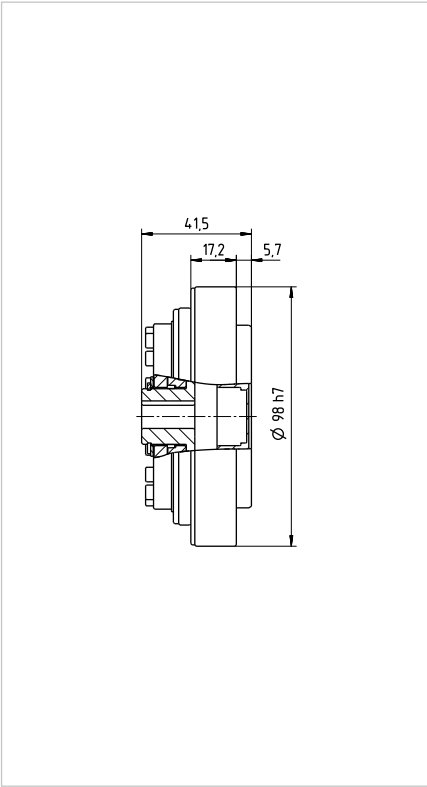


Illustration 163.2 CPU-20-H [mm]

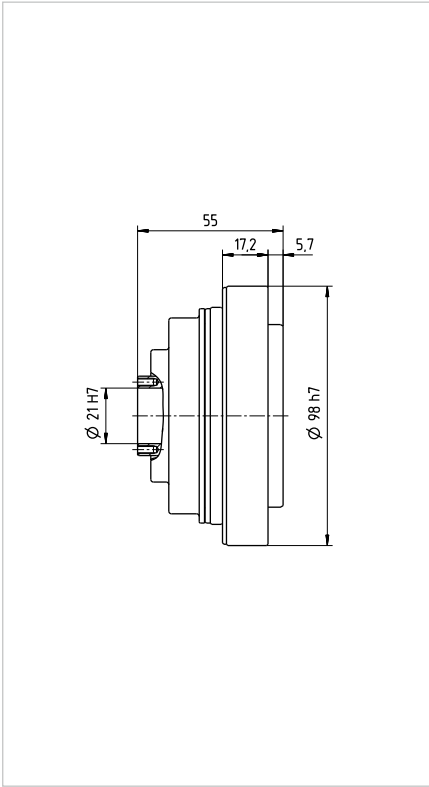


Illustration 163.3 CPU-20-S [mm]

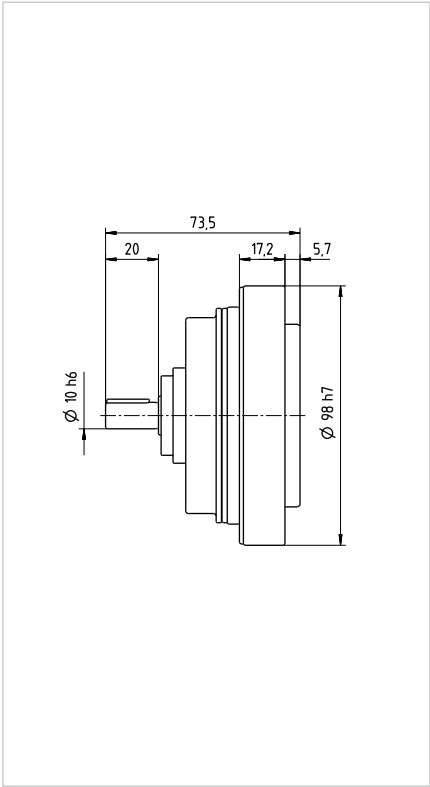


Illustration 163.4 CPU-25-M [mm]

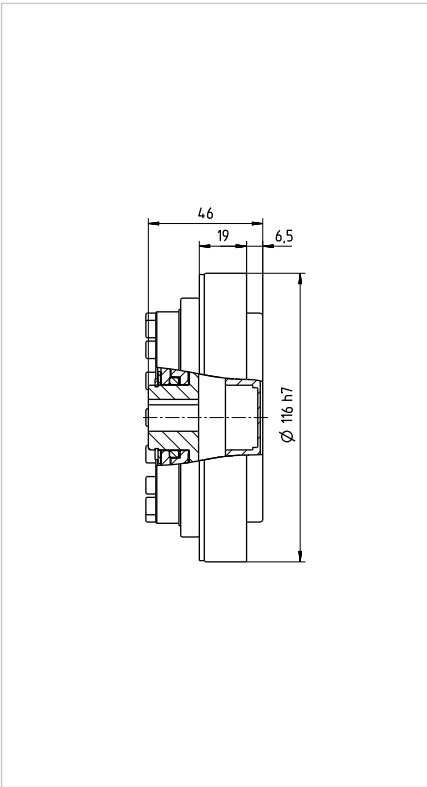


Illustration 163.5 CPU-25-H [mm]

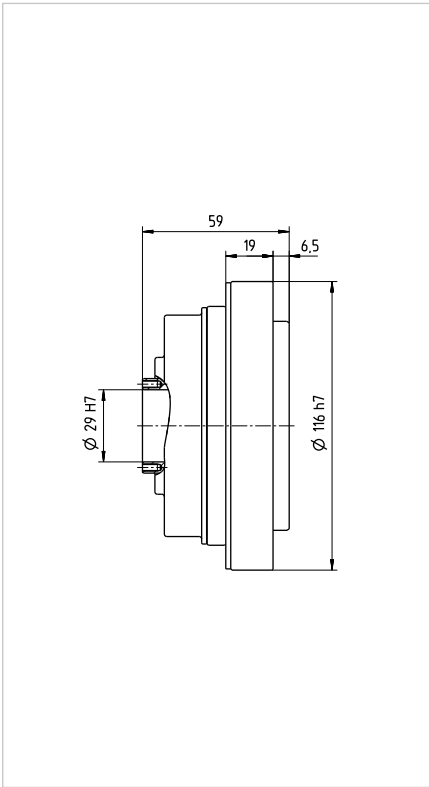
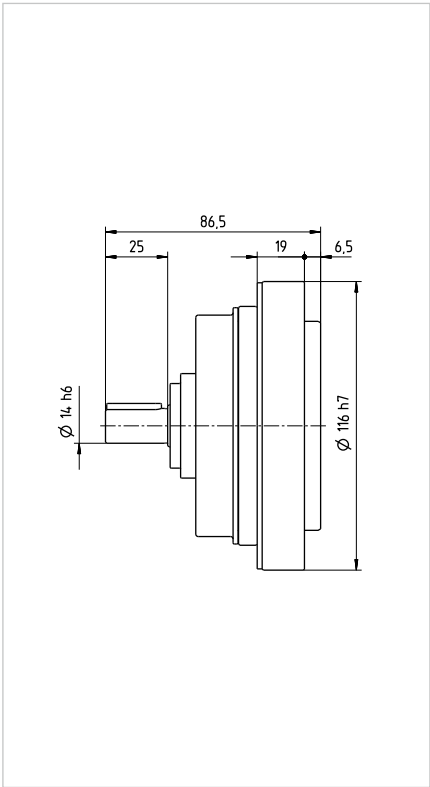


Illustration 163.6 CPU-25-S [mm]



Technical data

Table 164.1

	Unit	CPU-32					
Ratio	i []	30	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	100	216	304	333	353	372
Average torque	T _A [Nm]	75	108	167	216	216	216
Rated torque	T _N [Nm]	54	76	118	137	137	137
Momentary peak torque	T _M [Nm]	200	382	568	647	686	686
Maximum input speed	n _{in (max)} [rpm]	4800					
Average input speed	n _{av (max)} [rpm]	3500/1980 ¹⁾					
Moment of inertia CPU-M	J _{in} [x10 ⁻⁴ kgm ²]	1.69					
Moment of inertia CPU-H	J _{in} [x10 ⁻⁴ kgm ²]	2.85					
Moment of inertia CPU-S	J _{in} [x10 ⁻⁴ kgm ²]	1.20					
Weight CPU-M	m [kg]	3.9					
Weight CPU-H	m [kg]	5.0					
Weight CPU-S	m [kg]	5.4					
Maximum hollow shaft diameter	d _{H (max)} [mm]	36					
Transmission accuracy	[arcmin]	< 1.5	< 1	< 0.8			
Repeatability	[arcmin]	< ±0.1					
Lost Motion	[arcmin]	< 1					
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	49	98	120			
Ambient operating temperature	[°C]	-40 ... 90					
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	14600					
Dynamic axial load	F _{A dyn (max)} [N]	22300					
Dynamic tilting moment	M _{dyn (max)} [Nm]	578					

¹⁾ Valid for CPU-H

Table 164.2

	Unit	CPU-40				
Ratio	i []	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	402	519	568	617	647
Average torque	T _A [Nm]	196	284	372	451	451
Rated torque	T _N [Nm]	137	206	265	294	294
Momentary peak torque	T _M [Nm]	686	980	1080	1180	1180
Maximum input speed	n _{in (max)} [rpm]	4000				
Average input speed	n _{av (max)} [rpm]	3000/1300 ²⁾				
Moment of inertia CPU-M	J _{in} [x10 ⁻⁴ kgm ²]	4.5				
Moment of inertia CPU-H	J _{in} [x10 ⁻⁴ kgm ²]	9.28				
Moment of inertia CPU-S	J _{in} [x10 ⁻⁴ kgm ²]	3.41				
Weight CPU-M	m [kg]	6.9				
Weight CPU-H	m [kg]	8.8				
Weight CPU-S	m [kg]	8.8				
Maximum hollow shaft diameter	d _{H (max)} [mm]	46				
Transmission accuracy	[arcmin]	< 0.7	< 0.5			
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	180	230			
Ambient operating temperature	[°C]	-40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	27500				
Dynamic axial load	F _{A dyn (max)} [N]	42000				
Dynamic tilting moment	M _{dyn (max)} [Nm]	886				

²⁾ Valid for CPU-H

Illustration 165.1 CPU-32-M [mm]

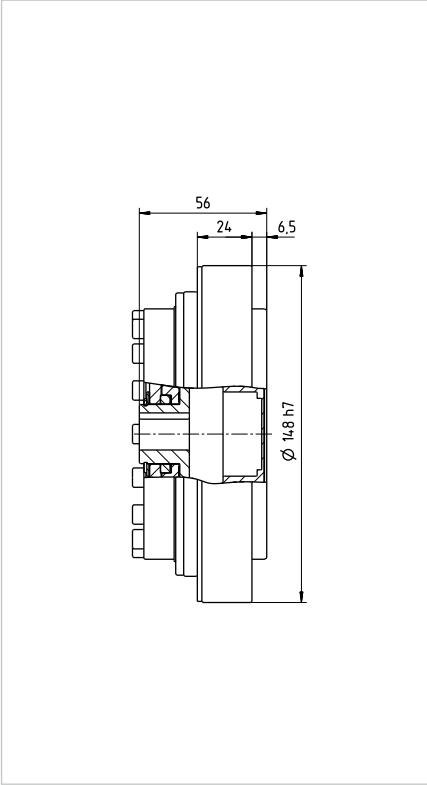


Illustration 165.2 CPU-32-H [mm]

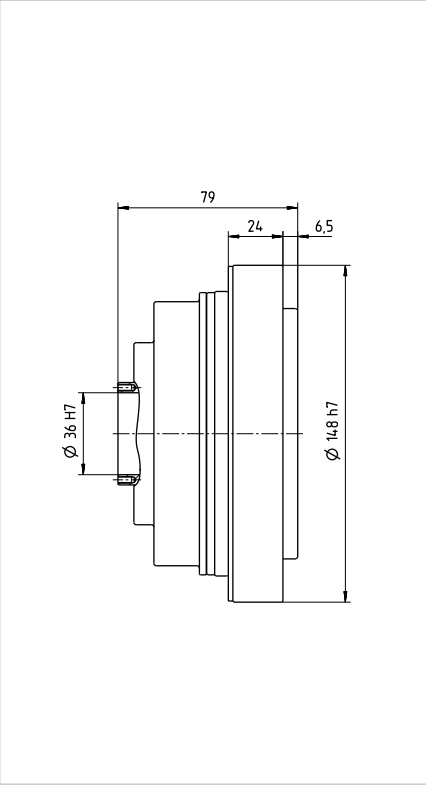


Illustration 165.3 CPU-32-S [mm]

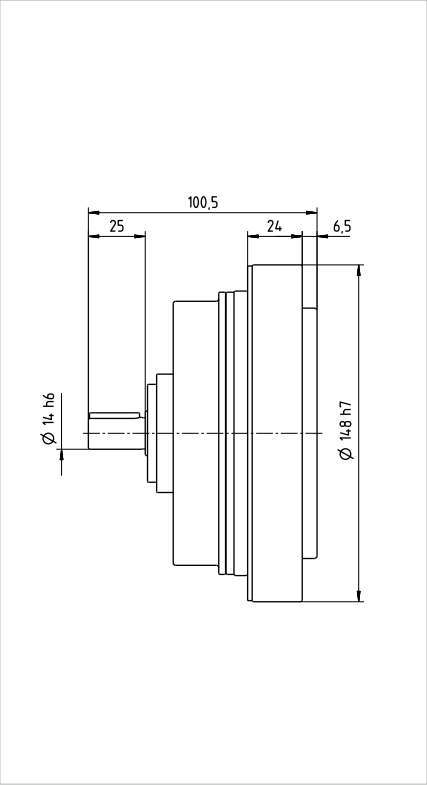


Illustration 165.4 CPU-40-M [mm]

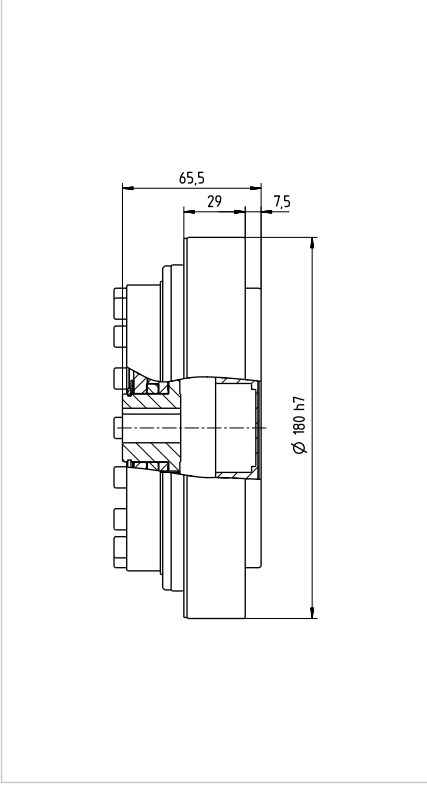


Illustration 165.5 CPU-40-H [mm]

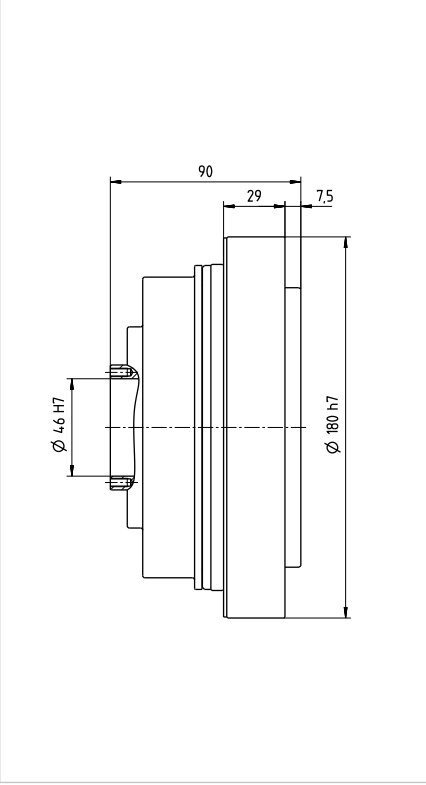
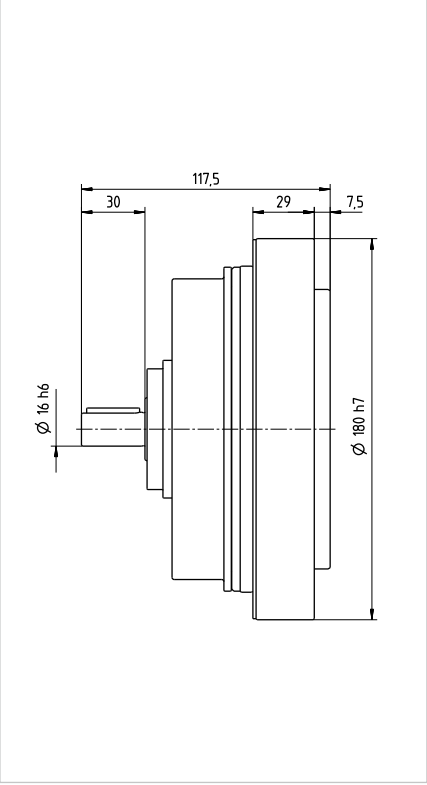


Illustration 165.6 CPU-40-S [mm]



Technical data

Table 166.1

	Unit	CPU-45				
Ratio	i []	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	500	706	755	823	882
Average torque	T _A [Nm]	265	390	500	620	630
Rated torque	T _N [Nm]	176	313	353	402	402
Momentary peak torque	T _M [Nm]	950	1270	1570	1760	1910
Maximum input speed	n _{in (max)} [rpm]	3800				
Average input speed	n _{av (max)} [rpm]	3000/1250 ¹⁾				
Moment of inertia CPU-M	J _{in} [x10 ⁻⁴ kgm ²]	8.7				
Moment of inertia CPU-H	J _{in} [x10 ⁻⁴ kgm ²]	13.8				
Moment of inertia CPU-S	J _{in} [x10 ⁻⁴ kgm ²]	5.80				
Weight CPU-M	m [kg]	9.6				
Weight CPU-H	m [kg]	12.1				
Weight CPU-S	m [kg]	11.8				
Maximum hollow shaft diameter	d _{H (max)} [mm]	52				
Transmission accuracy	[arcmin]	< 0.7	< 0.5			
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	260	330			
Ambient operating temperature	[°C]	-40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	34600				
Dynamic axial load	F _{A dyn (max)} [N]	52300				
Dynamic tilting moment	M _{dyn (max)} [Nm]	1253				

¹⁾ Valid for CPU-H

Table 166.2

	Unit	CPU-50				
Ratio	i []	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	715	941	980	1080	1180
Average torque	T _A [Nm]	122	519	666	813	843
Rated torque	T _N [Nm]	245	372	470	529	529
Momentary peak torque	T _M [Nm]	1430	1860	2060	2060	2450
Maximum input speed	n _{in (max)} [rpm]	3500				
Average input speed	n _{av (max)} [rpm]	2500/1200 ¹⁾				
Moment of inertia CPU-M	J _{in} [x10 ⁻⁴ kgm ²]	12.58				
Moment of inertia CPU-H	J _{in} [x10 ⁻⁴ kgm ²]	25.2				
Moment of inertia CPU-S	J _{in} [x10 ⁻⁴ kgm ²]	9.95				
Weight CPU-M	m [kg]	12.6				
Weight CPU-H	m [kg]	16.0				
Weight CPU-S	m [kg]	15.0				
Maximum hollow shaft diameter	d _{H (max)} [mm]	60				
Transmission accuracy	[arcmin]	< 0.7	< 0.5			
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	340	440			
Ambient operating temperature	[°C]	-40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	37300				
Dynamic axial load	F _{A dyn (max)} [N]	56100				
Dynamic tilting moment	M _{dyn (max)} [Nm]	1558				

¹⁾ Valid for CPU-H

Illustration 167.1 CPU-45-M [mm]

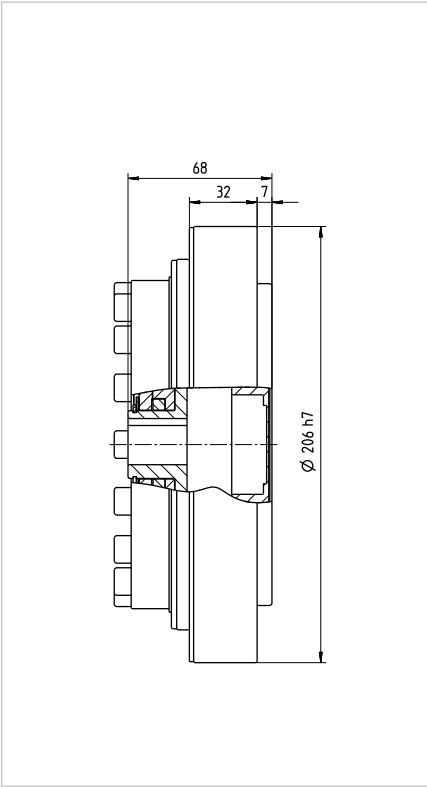


Illustration 167.2 CPU-45-H [mm]

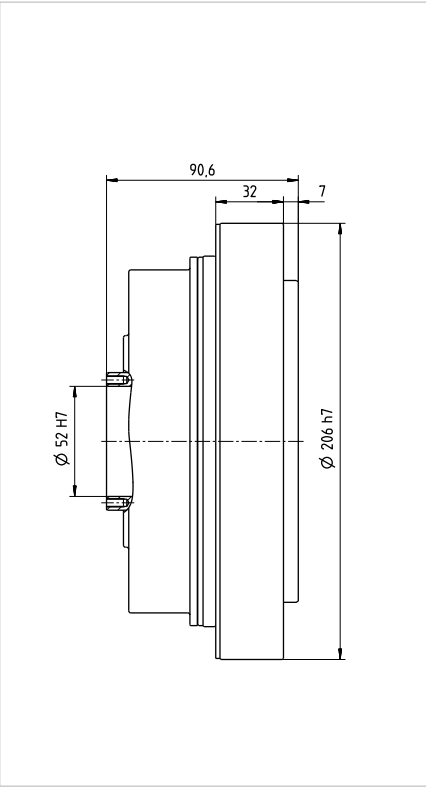


Illustration 167.3 CPU-45-S [mm]

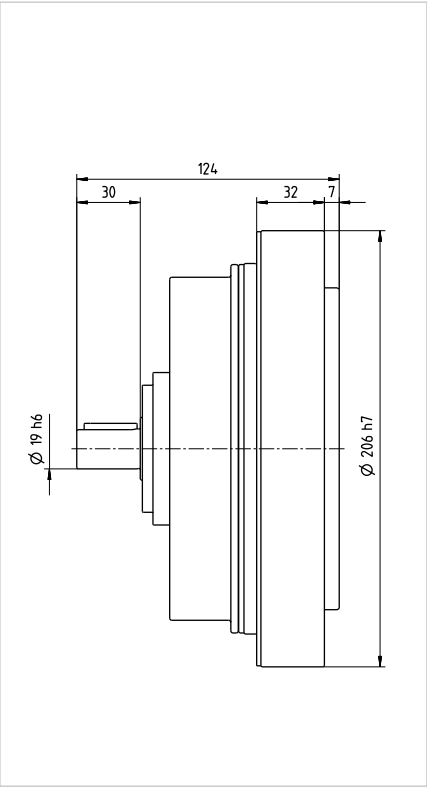


Illustration 167.4 CPU-50-M [mm]

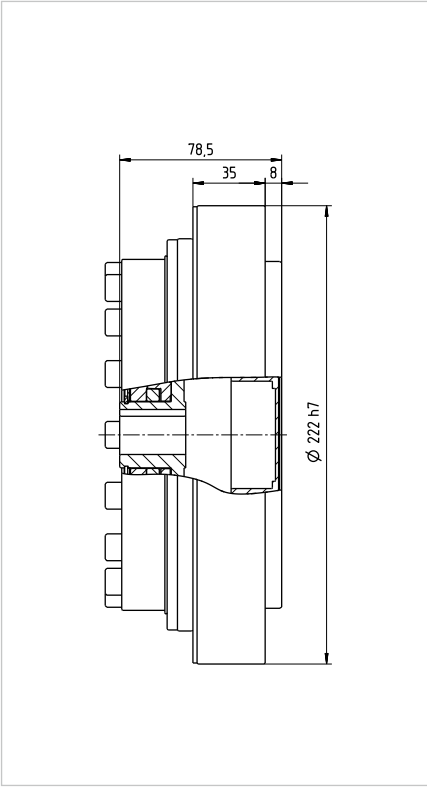


Illustration 167.5 CPU-50-H [mm]

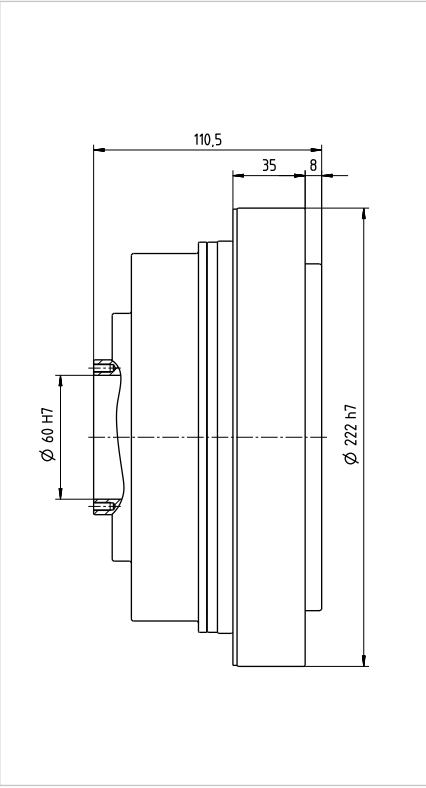
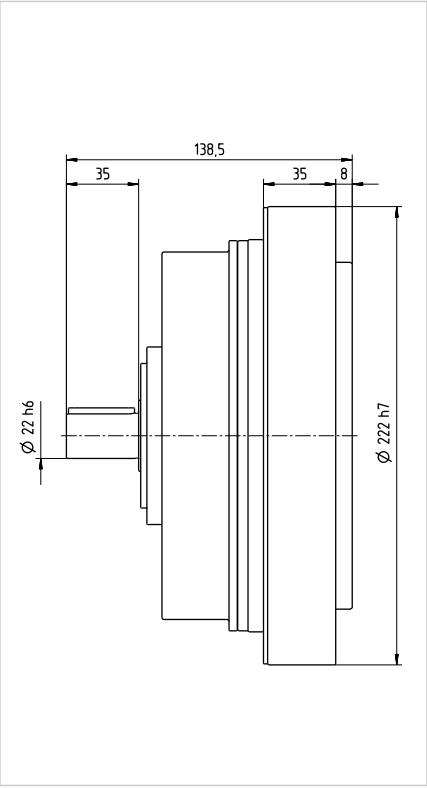


Illustration 167.6 CPU-50-S [mm]

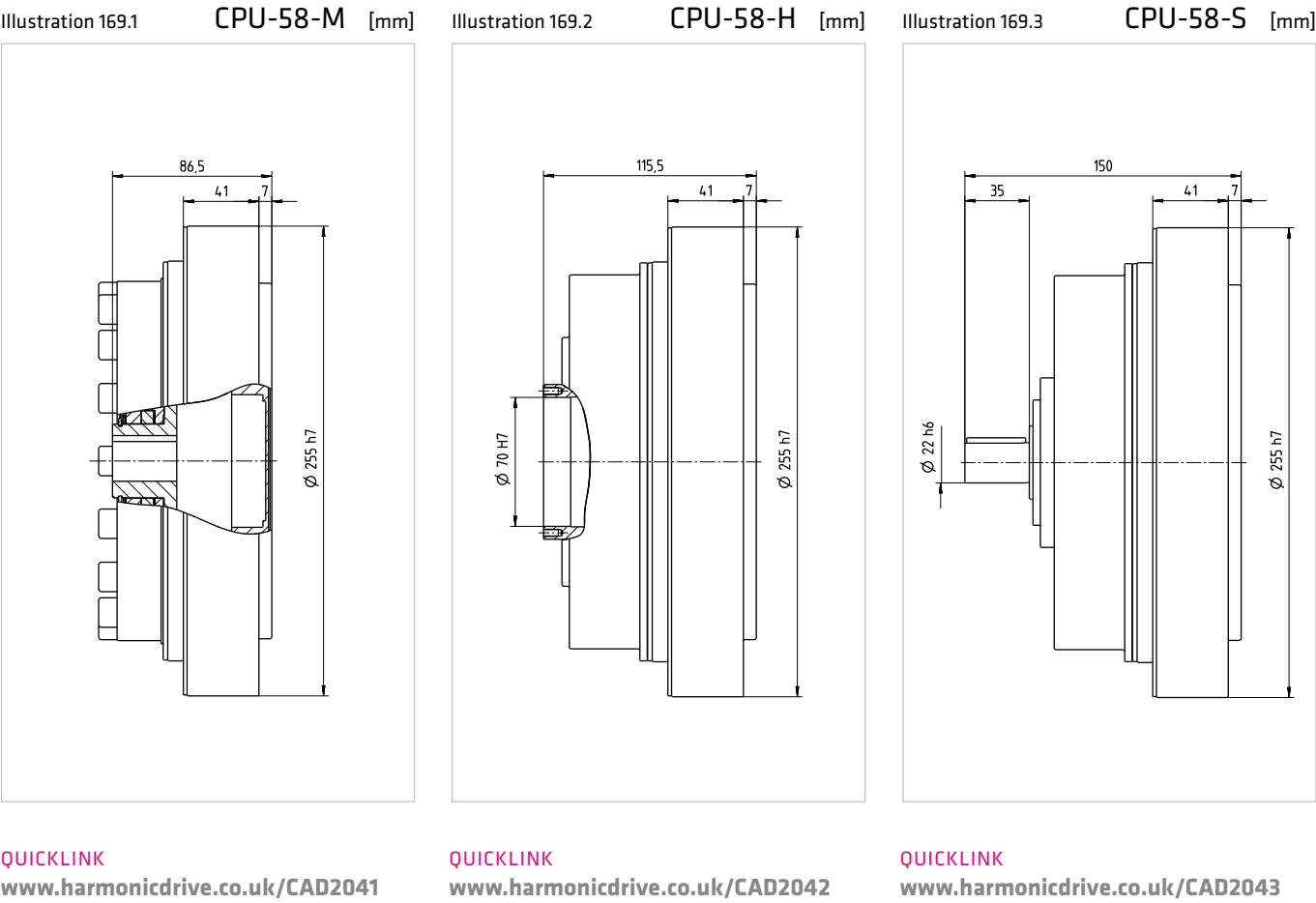


Technical data

Table 168.1

	Unit	CPU-58				
Ratio	i []	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	1020	1480	1590	1720	1840
Average torque	T _A [Nm]	177	770	1060	1190	1210
Rated torque	T _N [Nm]	353	549	696	745	745
Momentary peak torque	T _M [Nm]	1960	2450	3180	3330	3430
Maximum input speed	n _{in (max)} [rpm]	3000				
Average input speed	n _{av (max)} [rpm]	2200/1000 ¹⁾				
Moment of inertia CPU-M	J _{in} [x10 ⁻⁴ kgm ²]	27.3				
Moment of inertia CPU-H	J _{in} [x10 ⁻⁴ kgm ²]	49.5				
Moment of inertia CPU-S	J _{in} [x10 ⁻⁴ kgm ²]	20.5				
Weight CPU-M	m [kg]	17.8				
Weight CPU-H	m [kg]	22.8				
Weight CPU-S	m [kg]	22.1				
Maximum hollow shaft diameter	d _{H (max)} [mm]	70				
Transmission accuracy	[arcmin]	< 0.7	< 0.5			
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	540	710			
Ambient operating temperature	[°C]	-40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	38400				
Dynamic axial load	F _{A dyn (max)} [N]	57700				
Dynamic tilting moment	M _{dyn (max)} [Nm]	2222				

¹⁾ Valid for CPU-H



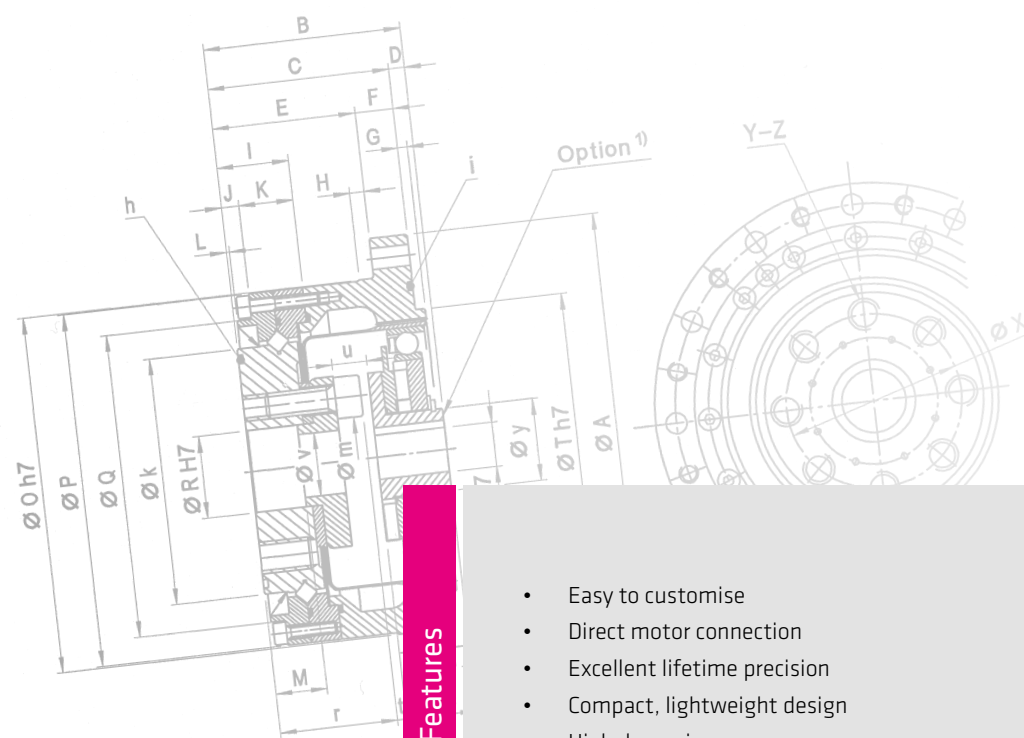
The standard series

HFUC-2UH Series Units are available in thirteen sizes with gear ratios of 30, 50, 80, 100, 120 and 160:1 offering repeatable peak torques from 9 to 9180 Nm.

Harmonic Drive® Units combine the precision Harmonic Drive® Component Sets consisting of three components – Circular Spline, Flexspline and Wave Generator – and integral high load capacity, tilt resistant output bearings.

The output bearing with high tilting rigidity enables the direct introduction of high payloads without further support and thus permits simple and space saving design installations.

If required, the Units are available as specific configurations tailored to your application and can utilise standard servo motors. Unit and motor together form a compact and lightweight system capable of withstanding high loads. On request, the series is available for ambient temperatures between -40 and 90 °C and can be used with a large selection of special lubricants tailored to your application. Due to the Units positioning accuracy, stable machine characteristics with short cycle times are guaranteed.



Features

- Easy to customise
- Direct motor connection
- Excellent lifetime precision
- Compact, lightweight design
- High dynamics
- Integrated high capacity output bearing

Optimised for your applications:

- Optimal design solution
- Easy integration
- Reduced diversity of components
- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Greater energy efficiency
- Lower production costs
- Small machine footprint

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/2050

HFUC-2UH

Ordering code

Table 172.1

Series	Size	Ratio						Version	Special design
HFUC	14	30	50	80	100			2UH	According to customer requirements
	17	30	50	80	100	120			
	20	30	50	80	100	120	160		
	25	30	50	80	100	120	160		
	32	30	50	80	100	120	160		
	40		50	80	100	120	160		
	45		50	80	100	120	160		
	50		50	80	100	120	160		
	58		50	80	100	120	160		
	65		50	80	100	120	160		
	80		50	80	100	120	160		
	90		50	80	100	120	160		
100 ¹⁾		50	80	100	120	160			
Ordering code									
HFUC	-	25	-	100	-	2UH	-	SP	

¹⁾ Information on request

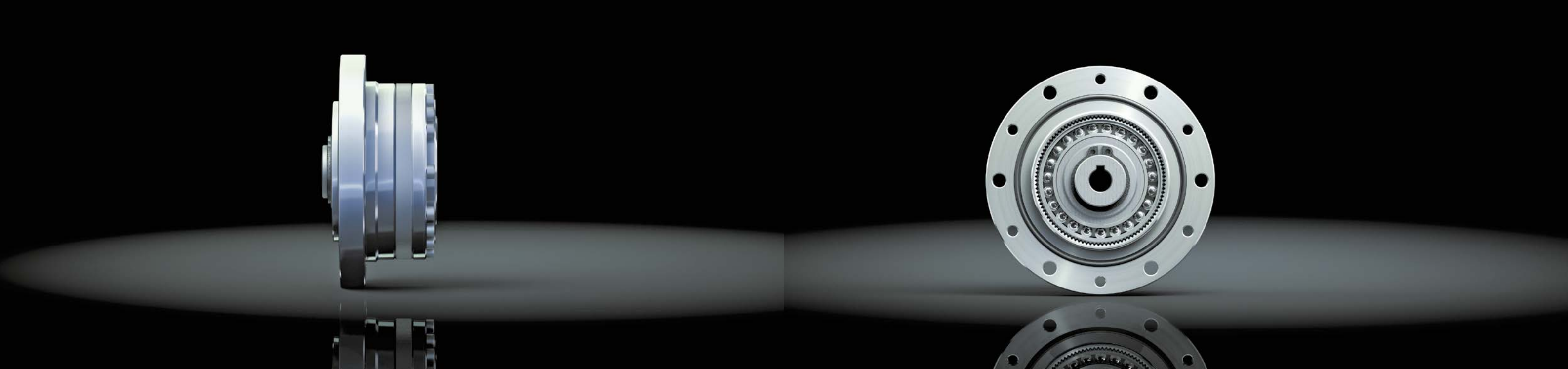
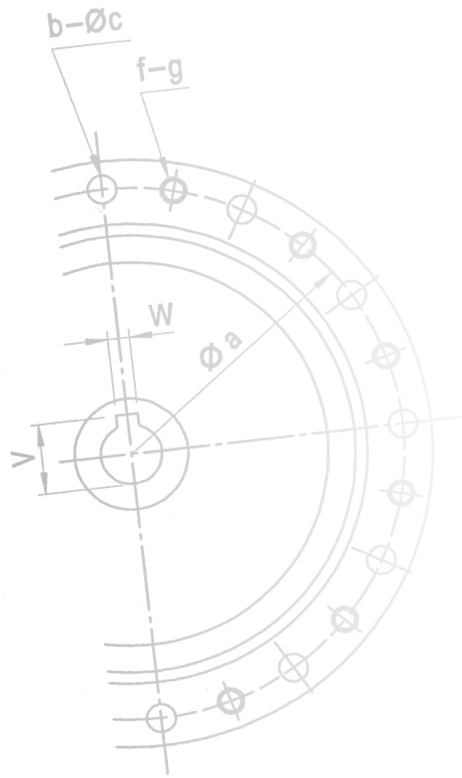
Table 172.2

Version	
Ordering code	Description
2UH	Unit with integrated cross roller output bearing

Available motor adaptations:

[QUICKLINK www.harmonicdrive.co.uk/2105](http://www.harmonicdrive.co.uk/2105)

Clarification of the technical data can be found in the Glossary



Technical data

Table 174.1

	Unit	HFUC-14-2UH				HFUC-17-2UH				
Ratio	i []	30	50	80	100	30	50	80	100	120
Repeatable peak torque	T _R [Nm]	9.0	18	23	28	16	34	43	54	54
Average torque	T _A [Nm]	6.8	6.9	11	11	12	26	27	39	39
Rated torque	T _N [Nm]	4.0	5.4	7.8	7.8	8.8	16	22	24	24
Momentary peak torque	T _M [Nm]	17	35	47	54	30	70	87	110	86
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	14000				10000				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500				7300				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500				6500				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500				3500				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.033				0.079				
Weight	m [kg]	0.49				0.64				
Maximum hollow shaft diameter	d _{H (max)} [mm]	8				7				
Transmission accuracy	[arcmin]	< 2	< 1.5			< 1.5				
Repeatability	[arcmin]	< ±0.1				< ±0.1				
Lost Motion	[arcmin]	< 1				< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	3.4	5.7	7.1		6.7	13	16		
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90								
Output bearing										
Dynamic radial load	F _{R dyn (max)} [N]	1930				2148				
Dynamic axial load	F _{A dyn (max)} [N]	2880				3207				
Dynamic tilting moment	M _{dyn (max)} [Nm]	41				64				

Table 174.2

	Unit	HFUC-20-2UH						HFUC-25-2UH					
Ratio	i []	30	50	80	100	120	160	30	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	27	56	74	82	87	92	50	98	137	157	167	176
Average torque	T _A [Nm]	20	34	47	49	49	49	38	55	87	108	108	108
Rated torque	T _N [Nm]	15	25	34	40	40	40	27	39	63	67	67	67
Momentary peak torque	T _M [Nm]	50	98	127	147	147	147	95	186	255	284	304	314
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	10000						7500					
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500						5600					
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500						5600					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500						3500					
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.193						0.413					
Weight	m [kg]	0.98						1.5					
Maximum hollow shaft diameter	d _{H (max)} [mm]	10						15					
Transmission accuracy	[arcmin]	< 1.5	< 1					< 1.5	< 1				
Repeatability	[arcmin]	< ±0.1						< ±0.1					
Lost Motion	[arcmin]	< 1						< 1					
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	11	23	29				21	44	57			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90											
Output bearing													
Dynamic radial load	F _{R dyn (max)} [N]	2354						3904					
Dynamic axial load	F _{A dyn (max)} [N]	3511						5827					
Dynamic tilting moment	M _{dyn (max)} [Nm]	91						156					

Illustration 175.1

HFUC-14-2UH [mm]

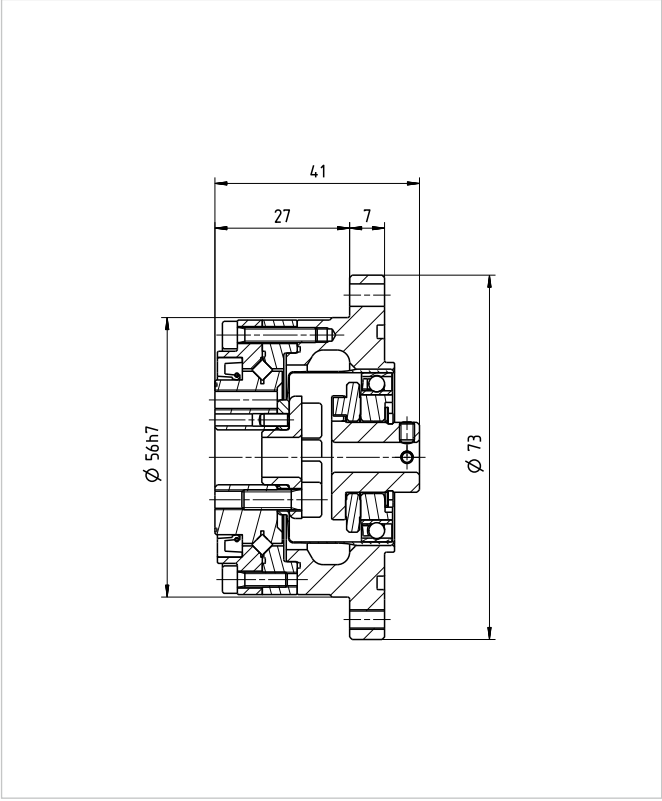


Illustration 175.2

HFUC-17-2UH [mm]

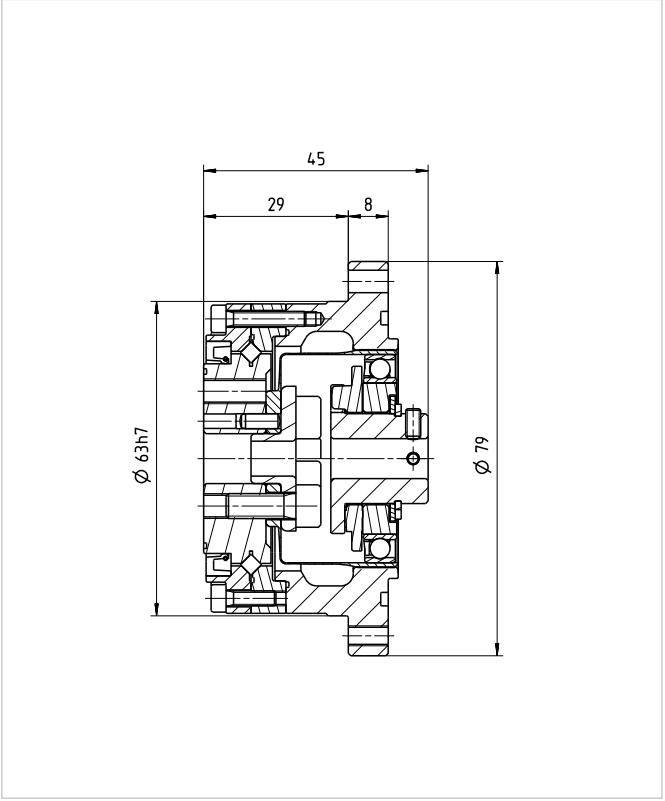


Illustration 175.3

HFUC-20-2UH [mm]

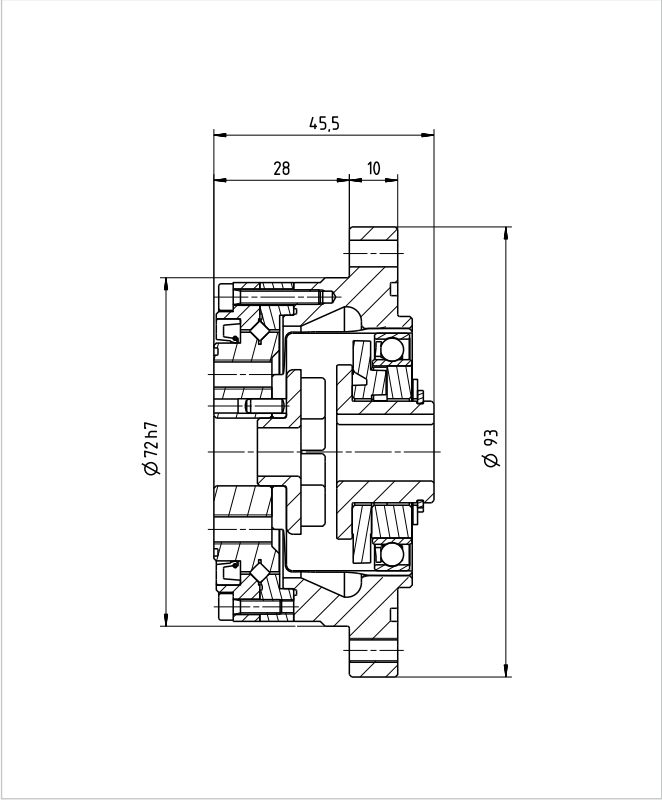
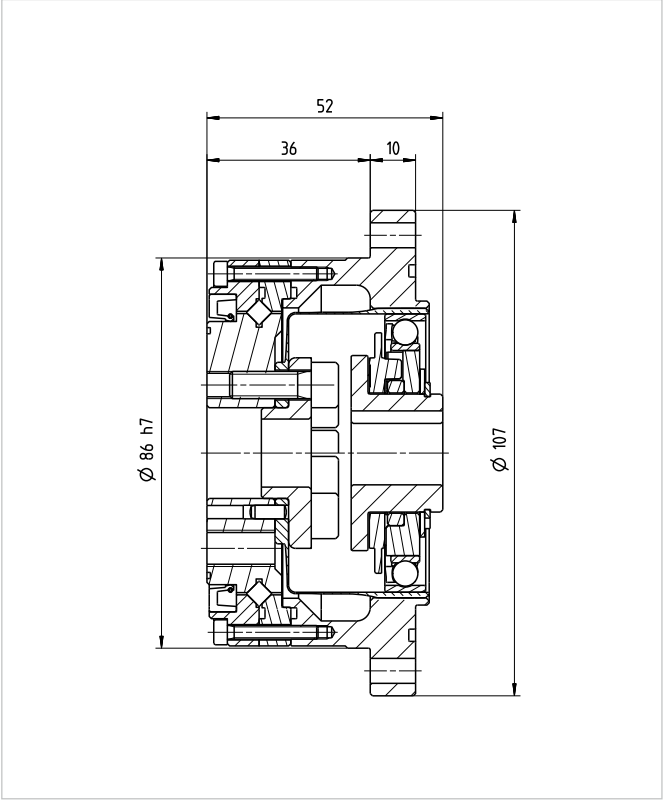


Illustration 175.4

HFUC-25-2UH [mm]



Technical data

Table 176.1

	Unit	HFUC-32-2UH						HFUC-40-2UH				
Ratio	i []	30	50	80	100	120	160	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	100	216	304	333	353	372	402	519	568	617	647
Average torque	T _A [Nm]	75	108	167	216	216	216	196	284	372	451	451
Rated torque	T _N [Nm]	54	76	118	137	137	137	137	206	265	294	294
Momentary peak torque	T _M [Nm]	200	382	568	647	686	686	686	980	1080	1180	1180
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	7000						5600				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800						4000				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	4600						3600				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500						3000				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	1.69						4.50				
Weight	m [kg]	3.2						5.0				
Maximum hollow shaft diameter	d _{H (max)} [mm]	20						24				
Transmission accuracy	[arcmin]	< 1.5	< 1					< 1				
Repeatability	[arcmin]	< ± 0.1						< ± 0.1				
Lost Motion	[arcmin]	< 1						< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	49	98	120				180	230			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90										
Output bearing												
Dynamic radial load	F _{R dyn (max)} [N]	6101						8652				
Dynamic axial load	F _{A dyn (max)} [N]	7926						11242				
Dynamic tilting moment	M _{dyn (max)} [Nm]	313						450				

Table 176.2

	Unit	HFUC-45-2UH					HFUC-50-2UH				
Ratio	i []	50	80	100	120	160	50 ¹⁾	80	100	120	160
Repeatable peak torque	T _R [Nm]	500	706	755	823	882	715	941	980	1080	1180
Average torque	T _A [Nm]	265	390	500	620	630	350	519	666	813	843
Rated torque	T _N [Nm]	176	313	353	402	402	245	372	470	529	529
Momentary peak torque	T _M [Nm]	950	1270	1570	1760	1910	1430	1860	2060	2060	2450
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	5000					4500				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3800					3500				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	3300					3000				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000					2500				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	8.68					12.6				
Weight	m [kg]	7.0					8.9				
Maximum hollow shaft diameter	d _{H (max)} [mm]	25					32				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ± 0.1					< ± 0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	260	330				340	440			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90									
Output bearing											
Dynamic radial load	F _{R dyn (max)} [N]	9368					14155				
Dynamic axial load	F _{A dyn (max)} [N]	12174					18393				
Dynamic tilting moment	M _{dyn (max)} [Nm]	686					759				

¹⁾ Only valid with oil lubrication. Grease lubrication can be used when the average torque T_{av} is not greater than half the nominal torque T_N

Illustration 177.1

HFUC-32-2UH [mm]

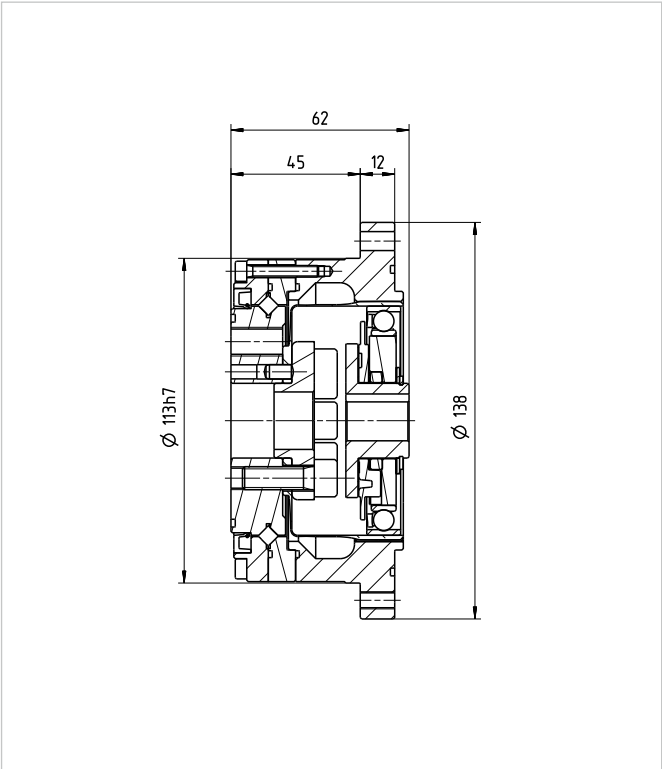


Illustration 177.2

HFUC-40-2UH [mm]

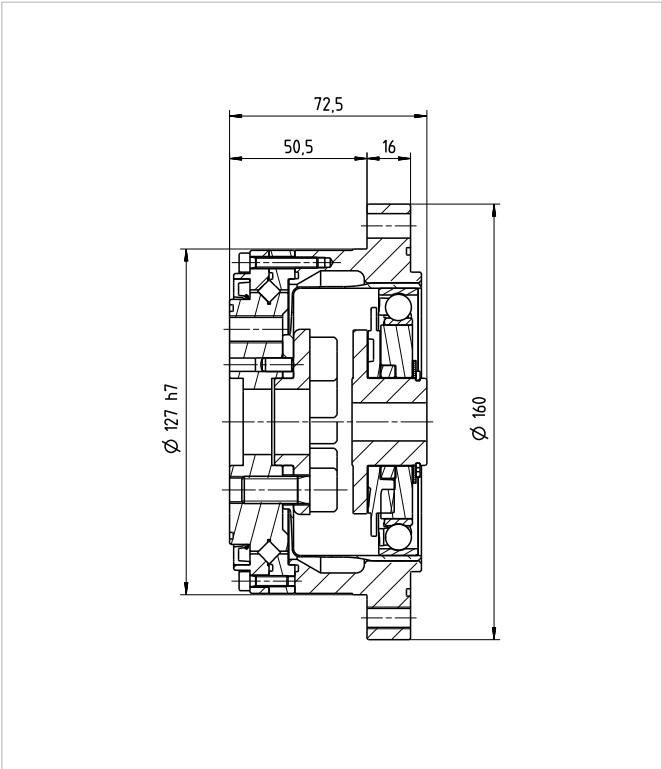


Illustration 177.3

HFUC-45-2UH [mm]

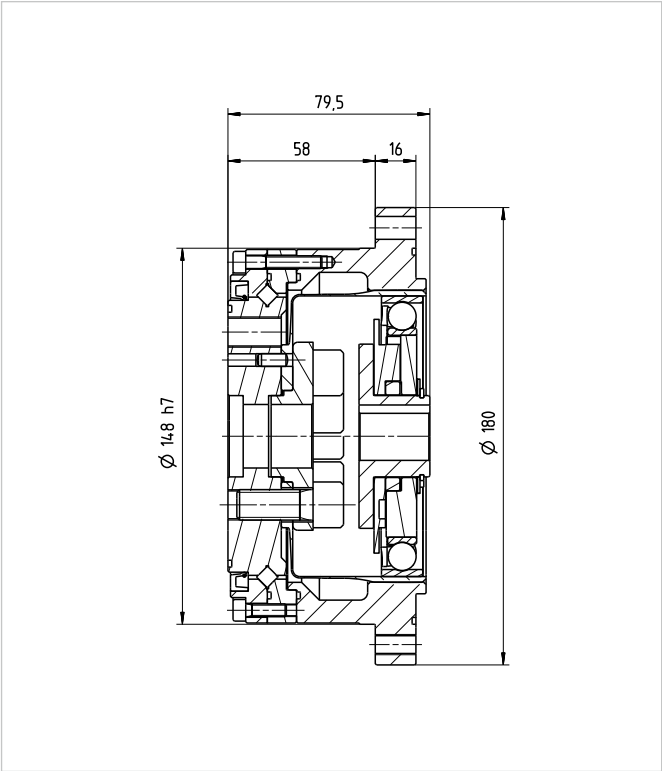
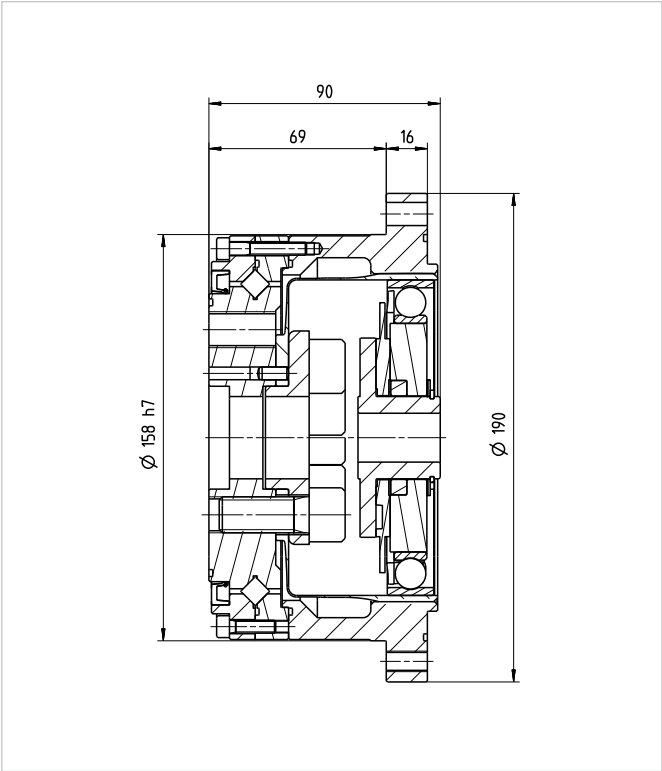


Illustration 177.4

HFUC-50-2UH [mm]



Technical data

Table 178.1

	Unit	HFUC-58-2UH					HFUC-65-2UH				
Ratio	i []	50 ¹⁾	80	100	120	160	50 ¹⁾	80	100	120	160
Repeatable peak torque	T _R [Nm]	1020	1480	1590	1720	1840	1420	2110	2300	2510	2630
Average torque	T _A [Nm]	520	770	1060	1190	1210	720	1040	1520	1570	1570
Rated torque	T _N [Nm]	353	549	696	745	745	490	745	951	951	951
Momentary peak torque	T _M [Nm]	1960	2450	3180	3330	3430	2830	3720	4750	4750	4750
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	4000					3500				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3000					2800				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	2700					2400				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	2200					2200				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	27.3					46.8				
Weight	m [kg]	14.6					20.9				
Maximum hollow shaft diameter	d _{H (max)} [mm]	38					44				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	<1					<1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	540	710				780	980			
Ambient operating temperature	[°C]	Standard 0 ... 60. Special lubrication -40 ... 90									
Output bearing											
Dynamic radial load	F _{R dyn (max)} [N]	21091					22602				
Dynamic axial load	F _{A dyn (max)} [N]	27409					29371				
Dynamic tilting moment	M _{dyn (max)} [Nm]	1180					1860				

Table 178.2

	Unit	HFUC-80-2UH					HFUC-90-2UH				
Ratio	i []	50 ¹⁾	80	100	120	160	50 ¹⁾	80	100	120	160
Repeatable peak torque	T _R [Nm]	2440	3430	4220	4590	4910	3530	3990	5680	6160	6840
Average torque	T _A [Nm]	1260	1830	2360	3130	3130	1720	2510	3360	4300	4300
Rated torque	T _N [Nm]	872	1320	1700	1990	1990	1180	1550	2270	2570	2700
Momentary peak torque	T _M [Nm]	4870	6590	7910	7910	7910	6660	7250	9020	9800	11300
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	2900					2700				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	2300					2000				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	2300					2100				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	1500					1300				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	122					214				
Weight	m [kg]	30.8					42.5				
Maximum hollow shaft diameter	d _{H (max)} [mm]	55					62				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	1450	1850				2060	2630			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90									
Output bearing											
Dynamic radial load	F _{R dyn (max)} [N]	25200					27400				
Dynamic axial load	F _{A dyn (max)} [N]	37611					40895				
Dynamic tilting moment	M _{dyn (max)} [Nm]	2740					4210				

¹⁾ Only valid with oil lubrication. Grease lubrication can be used when the average torque T_{av} is not greater than half the nominal torque T_N

Illustration 179.1

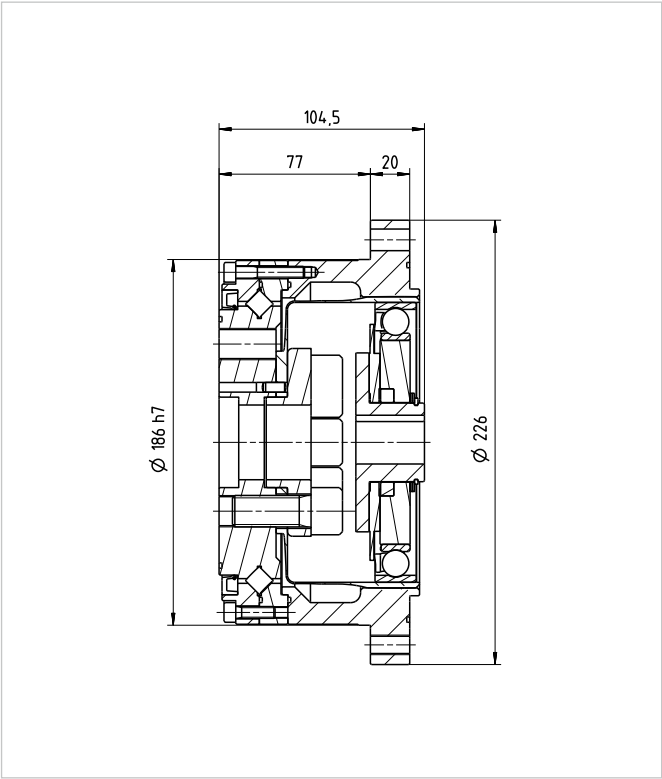


Illustration 179.2

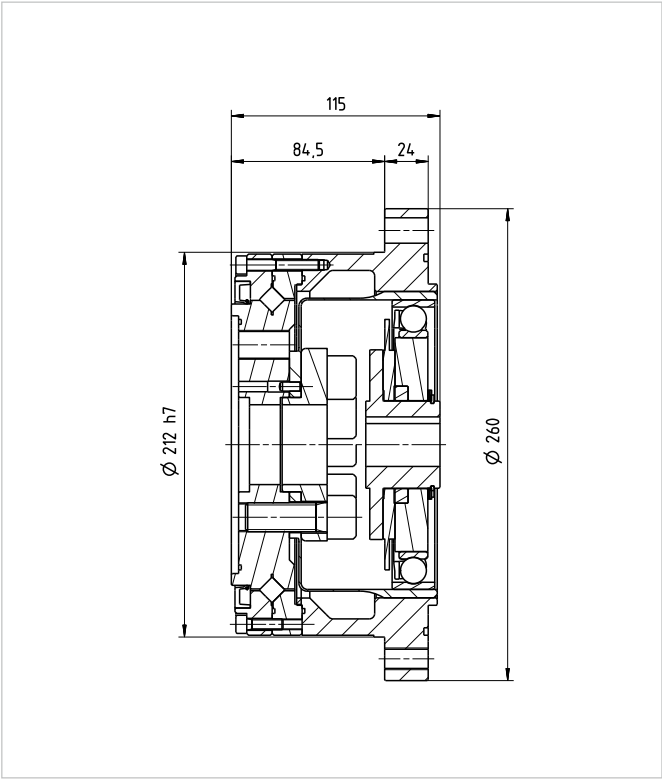


Illustration 179.3

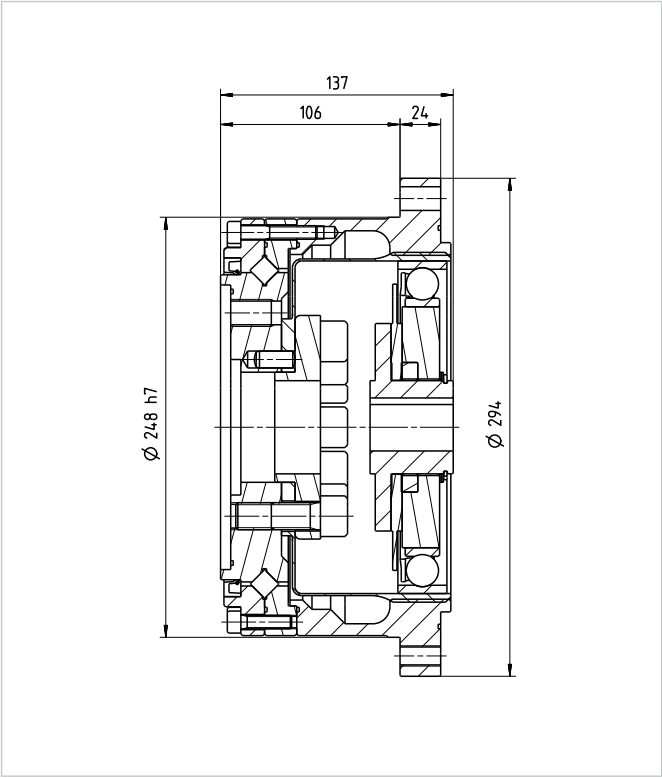
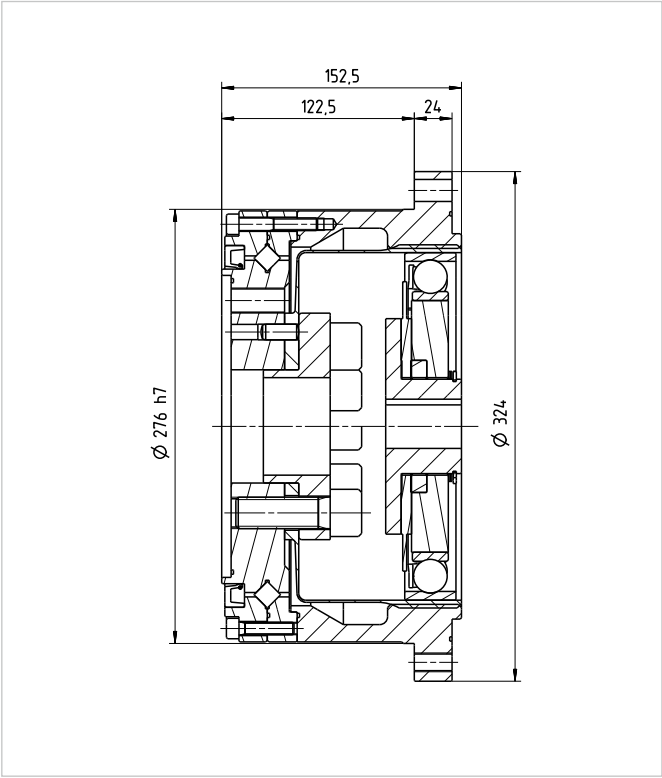


Illustration 179.4



Compact with largest hollow shaft

HFUS Series Units are available in nine sizes with gear ratios of 30, 50, 80, 100, 120 and 160:1 offering repeatable peak torques from 9 to 1840 Nm.

Harmonic Drive® Units combine the precision Harmonic Drive® Component Sets consisting of three components – Circular Spline, Flexspline and Wave Generator – and integral high load capacity, tilt resistant output bearings.

The output bearing with high tilting rigidity enables the direct introduction of high payloads without further support and thus permits simple and space saving design installations.

The HFUS Series is available in three versions: the HFUS-2UH Unit is fully sealed with a large hollow shaft diameter to feed through supply lines, shafts or cables for further drive systems. The HFUS-2SO and HFUS-2SH Simplicity Units are very short and lightweight, consisting of a component set and the heavy duty output bearing. The absence of input and output flanges means maximum flexibility in design integration, the 2SO version being available with a standard Wave Generator and the 2SH version with hollow shaft.

All versions of the HFUS Series are available on request for ambient temperatures -40 to 90 ° C and with a wide range of special lubricants tailored for your application.

Optimised for your applications:

- Optimal design solution
- Easy integration
- Easy load connection
- Low manufacturing and installation costs
- Reduced material use
- Greater energy efficiency
- Lower production costs
- Small machine footprint
- Simple design solution
- Increased operating reliability

Customer Benefits



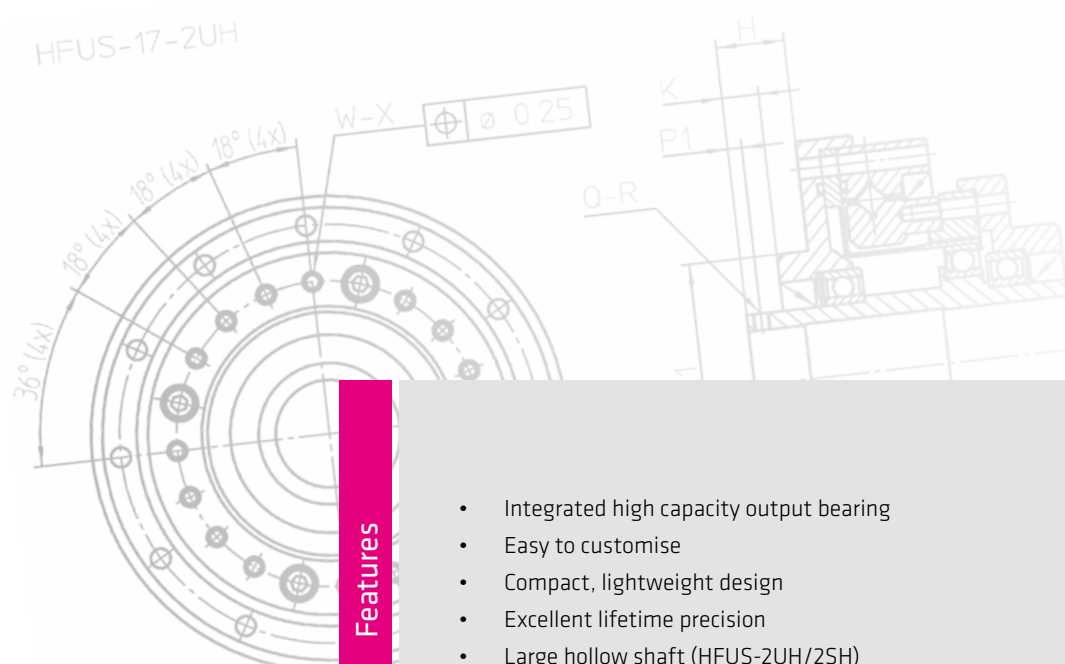
QUICKLINK
www.harmonicdrive.co.uk/2060

HFUS-2UH/2SO/2SH

Features

- Integrated high capacity output bearing
- Easy to customise
- Compact, lightweight design
- Excellent lifetime precision
- Large hollow shaft (HFUS-2UH/2SH)

HFUS-17-2UH



Ordering code

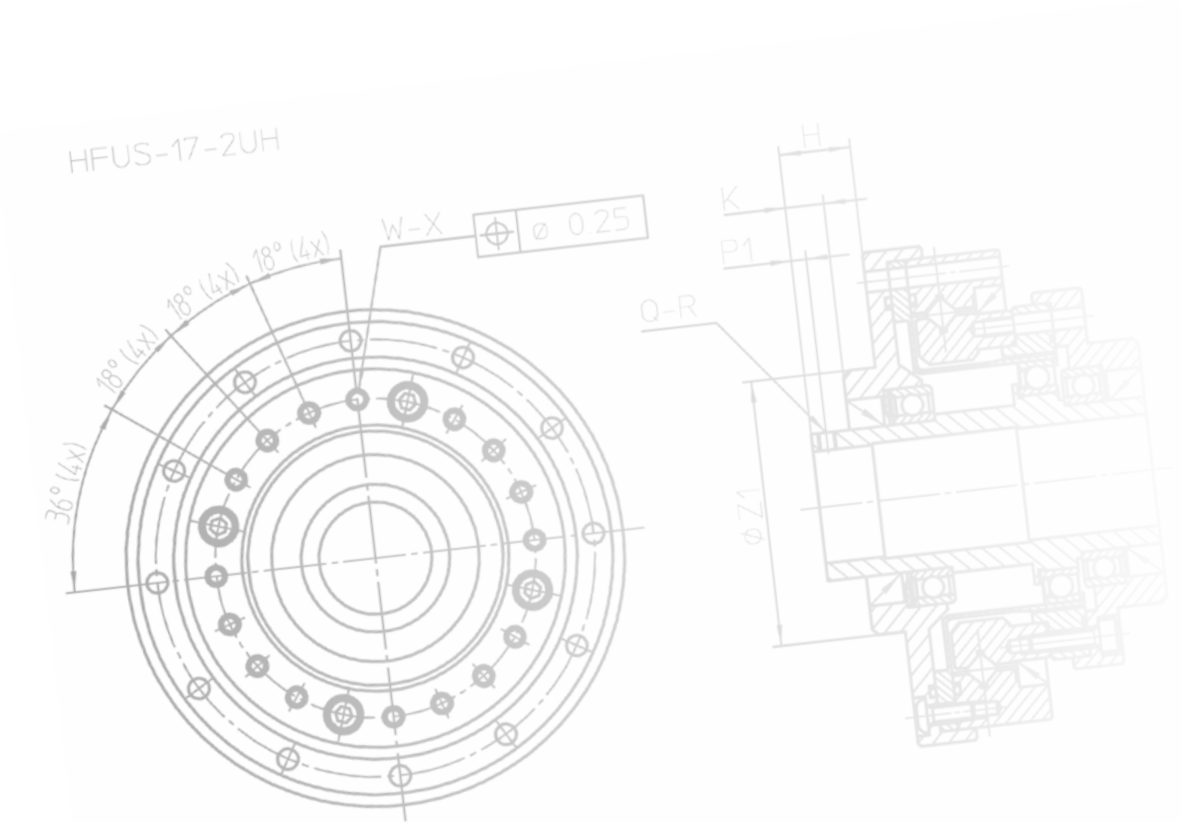
Table 182.1

Series	Size	Ratio						Version	Special design
HFUS	14	30	50	80	100			2UH 2SO 2SH	According to customer requirements
	17	30	50	80	100	120			
	20	30	50	80	100	120	160		
	25	30	50	80	100	120	160		
	32	30	50	80	100	120	160		
	40		50	80	100	120	160		
	45		50	80	100	120	160		
	50		50	80	100	120	160		
	58		50	80	100	120	160		
Ordering code									
HFUS	-	25	-	100	-	2UH	-	SP	

Table 182.2

Version	
Ordering code	Description
2UH	Unit with hollow shaft
2SO	Simplicity Unit with standard (Solid) Wave Generator
2SH	Simplicity Unit with hollow shaft

Clarification of the technical data can be found in the Glossary



Technical data

Table 184.1

	Unit	HFUS-14			
Ratio	i []	30	50	80	100
Repeatable peak toque	T _R [Nm]	9.0	18	23	28
Average torque	T _A [Nm]	6.8	6.9	11	11
Rated torque	T _N [Nm]	4.0	5.4	7.8	7.8
Momentary peak torque	T _M [Nm]	17	35	47	54
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	14000			
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500/1100 ¹⁾			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500/1100 ¹⁾			
Moment of inertia HFUS-2UH	J _{in} [x10 ⁻⁴ kgm ²]	0.091			
Moment of inertia HFUS-2SO	J _{in} [x10 ⁻⁴ kgm ²]	0.033			
Moment of inertia HFUS-2SH	J _{in} [x10 ⁻⁴ kgm ²]	0.091			
Weight HFUS-2UH	m [kg]	0.71			
Weight HFUS-2SO	m [kg]	0.41			
Weight HFUS-2SH	m [kg]	0.45			
Maximum hollow shaft diameter	d _{H (max)} [mm]	14			
Transmission accuracy	[arcmin]	< 2	< 1.5		
Repeatability	[arcmin]	< ±0.1			
Lost Motion	[arcmin]	< 1			
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	3.4	5.7	7.1	
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90			
Output bearing					
Dynamic radial load	F _{R dyn (max)} [N]	2039			
Dynamic axial load	F _{A dyn (max)} [N]	3044			
Dynamic tilting moment	M _{dyn (max)} [Nm]	74			

¹⁾Valid for HFUS-2UH and HFUS-2SH when radial shaft seals are used on the hollow shaft.

Table 184.2

	Unit	HFUS-17				
Ratio	i []	30	50	80	100	120
Repeatable peak toque	T _R [Nm]	16	34	43	54	54
Average torque	T _A [Nm]	12	26	27	39	39
Rated torque	T _N [Nm]	8.8	16	22	24	24
Momentary peak torque	T _M [Nm]	30	70	87	110	86
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	10000				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	7300				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500/1100 ¹⁾				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500/1100 ¹⁾				
Moment of inertia HFUS-2UH	J _{in} [x10 ⁻⁴ kgm ²]	0.193				
Moment of inertia HFUS-2SO	J _{in} [x10 ⁻⁴ kgm ²]	0.079				
Moment of inertia HFUS-2SH	J _{in} [x10 ⁻⁴ kgm ²]	0.193				
Weight HFUS-2UH	m [kg]	1.0				
Weight HFUS-2SO	m [kg]	0.57				
Weight HFUS-2SH	m [kg]	0.63				
Maximum hollow shaft diameter	d _{H (max)} [mm]	19				
Transmission accuracy	[arcmin]	< 1.5				
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	6.7	13	16		
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	3664				
Dynamic axial load	F _{A dyn (max)} [N]	5468				
Dynamic tilting moment	M _{dyn (max)} [Nm]	124				

¹⁾Valid for HFUS-2UH and HFUS-2SH when radial shaft seals are used on the hollow shaft.

Illustration 185.1 HFUS-14-2UH [mm]

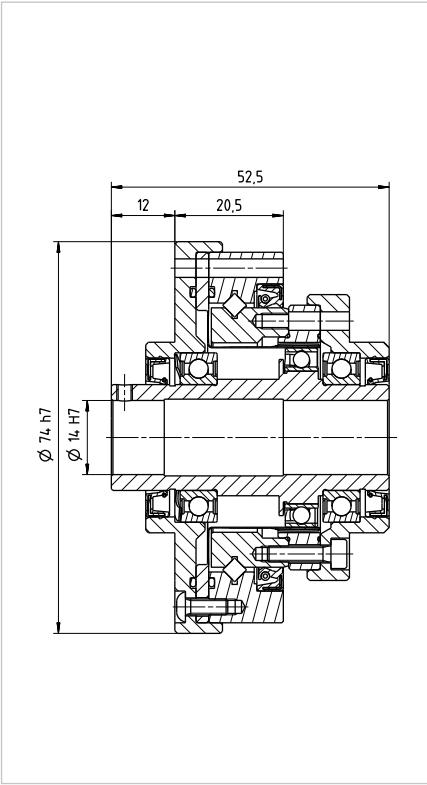


Illustration 185.2 HFUS-14-2SO [mm]

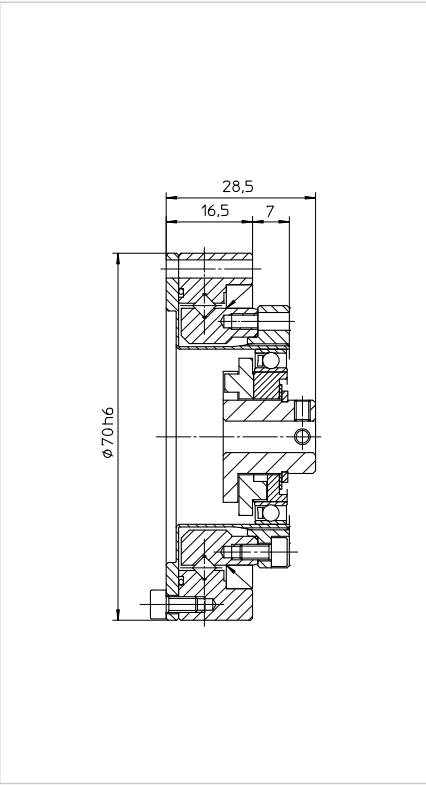


Illustration 185.3 HFUS-14-2SH [mm]

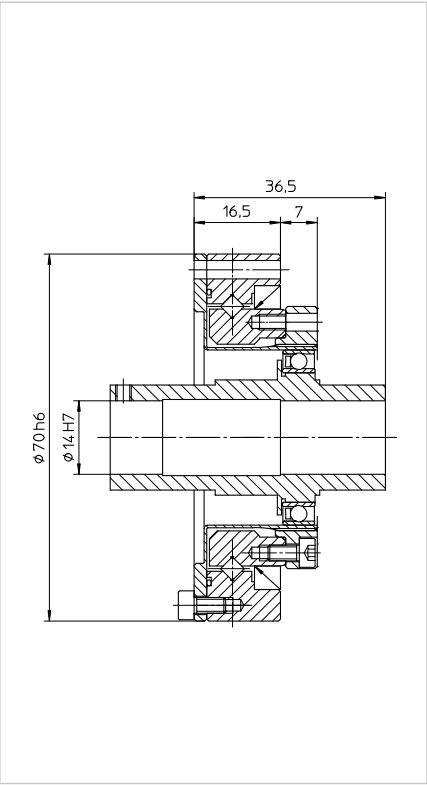


Illustration 185.4 HFUS-17-2UH [mm]

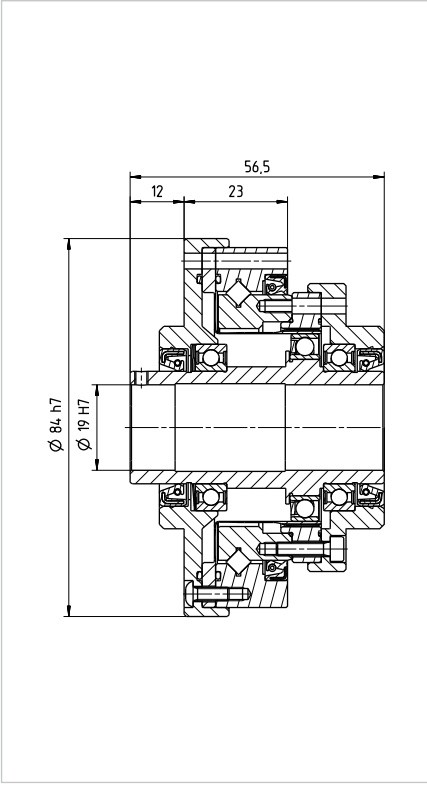


Illustration 185.5 HFUS-17-2SO [mm]

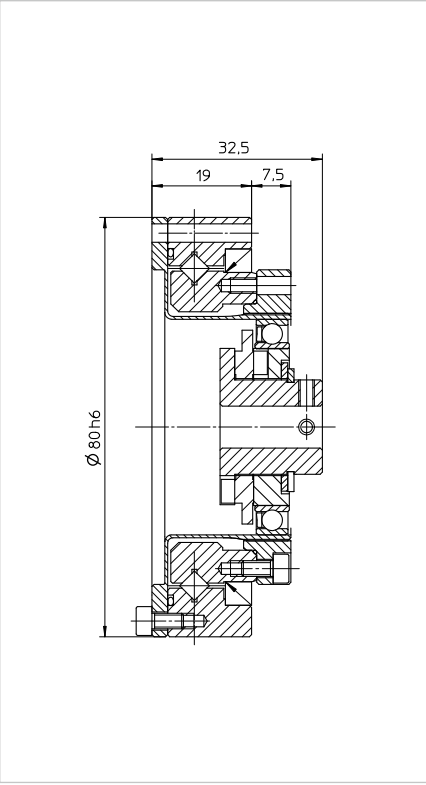
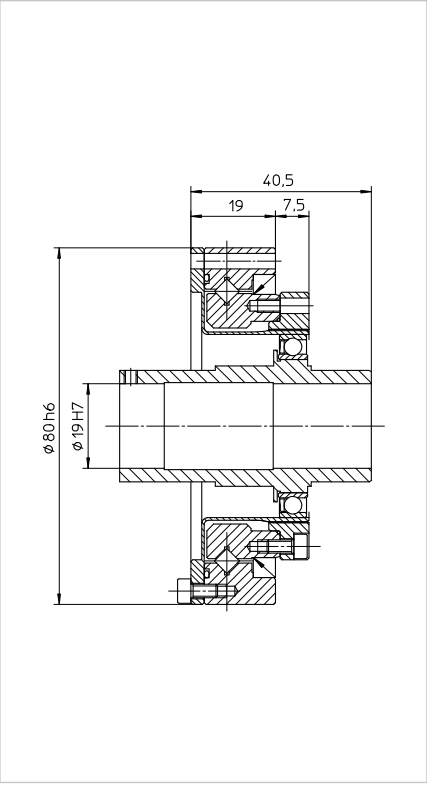


Illustration 185.6 HFUS-17-2SH [mm]



Technical data

Table 186.1

	Unit	HFUS-20					
Ratio	i []	30	50	80	100	120	160
Repeatable peak toque	T _R [Nm]	27	56	74	82	87	92
Average torque	T _A [Nm]	20	34	47	49	49	49
Rated torque	T _N [Nm]	15	25	34	40	40	40
Momentary peak torque	T _M [Nm]	50	98	127	147	147	147
Maximum input speed (oil lubrication)	n _{in (max)} [rpm ⁻¹]	10000					
Maximum input speed (grease lubrication)	n _{in (max)} [rpm ⁻¹]	6500					
Average input speed (oil lubrication)	n _{av (max)} [rpm ⁻¹]	6500/1100 ¹⁾					
Average input speed (grease lubrication)	n _{av (max)} [rpm ⁻¹]	3500/1100 ¹⁾					
Moment of inertia HFUS-2UH	J _{in} [x10 ⁻⁴ kgm ²]	0.404					
Moment of inertia HFUS-2SO	J _{in} [x10 ⁻⁴ kgm ²]	0.193					
Moment of inertia HFUS-2SH	J _{in} [x10 ⁻⁴ kgm ²]	0.404					
Weight HFUS-2UH	m [kg]	1.38					
Weight HFUS-2SO	m [kg]	0.81					
Weight HFUS-2SH	m [kg]	0.89					
Maximum hollow shaft diameter	d _{H (max)} [mm]	21					
Transmission accuracy	[arcmin]	< 1.5	< 1				
Repeatability	[arcmin]	< ±0.1					
Lost Motion	[arcmin]	< 1					
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	11	23	29			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90					
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	5150					
Dynamic axial load	F _{A dyn (max)} [N]	7687					
Dynamic tilting moment	M _{dyn (max)} [Nm]	187					

¹⁾Valid for HFUS-2UH and HFUS-2SH when radial shaft seals are used on the hollow shaft.

Table 186.2

	Unit	HFUS-25					
Ratio	i []	30	50	80	100	120	160
Repeatable peak toque	T _R [Nm]	50	98	137	157	167	176
Average torque	T _A [Nm]	38	55	87	108	108	108
Rated torque	T _N [Nm]	27	39	63	67	67	67
Momentary peak torque	T _M [Nm]	95	186	255	284	304	314
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	7500					
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	5600					
Average input speed (oil lubrication)	n _{av (max)} [rpm]	5600/1000 ¹⁾					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500/1000 ¹⁾					
Moment of inertia HFUS-2UH	J _{in} [x10 ⁻⁴ kgm ²]	1.07					
Moment of inertia HFUS-2SO	J _{in} [x10 ⁻⁴ kgm ²]	0.413					
Moment of inertia HFUS-2SH	J _{in} [x10 ⁻⁴ kgm ²]	1.07					
Weight HFUS-2UH	m [kg]	2.1					
Weight HFUS-2SO	m [kg]	1.31					
Weight HFUS-2SH	m [kg]	1.44					
Maximum hollow shaft diameter	d _{H (max)} [mm]	29					
Transmission accuracy	[arcmin]	< 1.5	< 1				
Repeatability	[arcmin]	< ±0.1					
Lost Motion	[arcmin]	< 1					
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	21	44	57			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90					
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	7708					
Dynamic axial load	F _{A dyn (max)} [N]	11504					
Dynamic tilting moment	M _{dyn (max)} [Nm]	258					

¹⁾Valid for HFUS-2UH and HFUS-2SH when radial shaft seals are used on the hollow shaft.

Illustration 187.1 HFUS-20-2UH [mm]

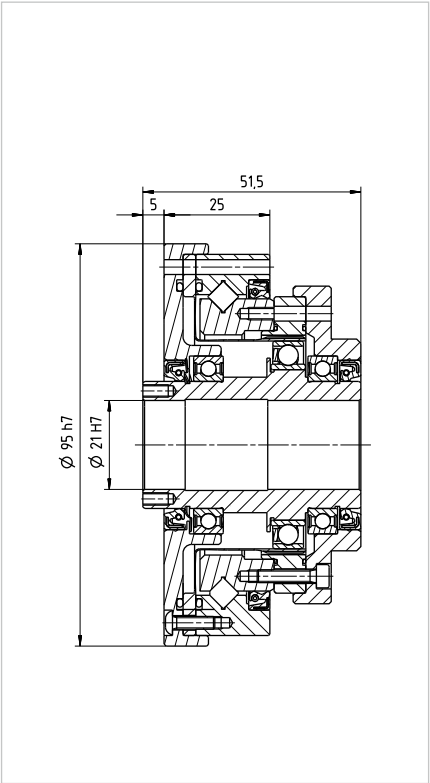


Illustration 187.2 HFUS-20-2SO [mm]

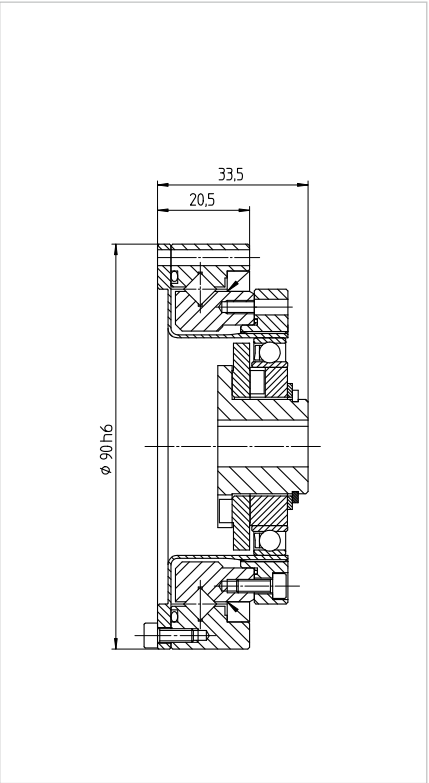


Illustration 187.3 HFUS-20-2SH [mm]

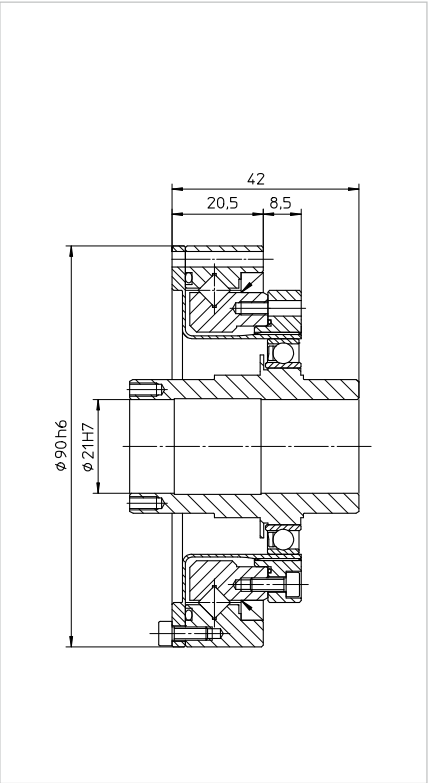


Illustration 187.4 HFUS-25-2UH [mm]

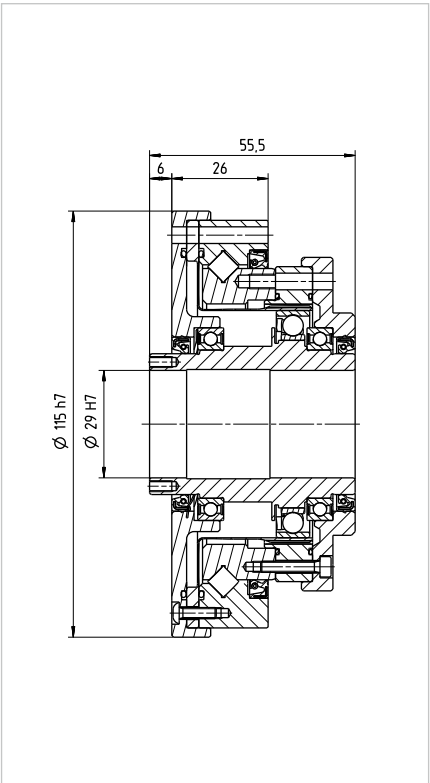


Illustration 187.5 HFUS-25-2SO [mm]

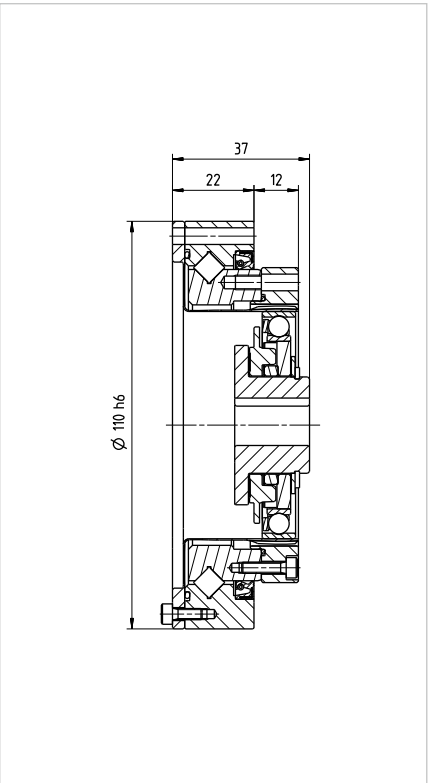
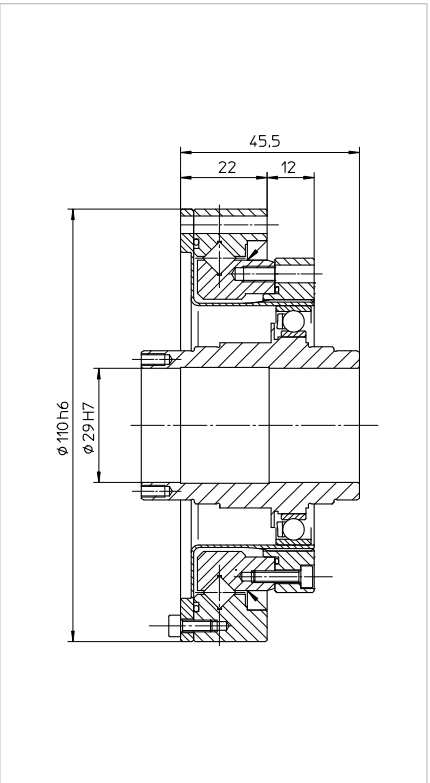


Illustration 187.6 HFUS-25-2SH [mm]



Technical data

Table 188.1

	Unit	HFUS-32					
Ratio	i []	30	50	80	100	120	160
Repeatable peak toque	T _R [Nm]	100	216	304	333	353	372
Average torque	T _A [Nm]	75	108	167	216	216	216
Rated torque	T _N [Nm]	54	76	118	137	137	137
Momentary peak torque	T _M [Nm]	200	382	568	647	686	686
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	7000					
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800					
Average input speed (oil lubrication)	n _{av (max)} [rpm]	4600/1000 ¹⁾					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500/1000 ¹⁾					
Moment of inertia HFUS-2UH	J _{in} [x10 ⁻⁴ kgm ²]	2.85					
Moment of inertia HFUS-2SO	J _{in} [x10 ⁻⁴ kgm ²]	1.69					
Moment of inertia HFUS-2SH	J _{in} [x10 ⁻⁴ kgm ²]	2.85					
Weight HFUS-2UH	m [kg]	4.2					
Weight HFUS-2SO	m [kg]	2.9					
Weight HFUS-2SH	m [kg]	3.1					
Maximum hollow shaft diameter	d _{H (max)} [mm]	36					
Transmission accuracy	[arcmin]	< 1.5	< 1				
Repeatability	[arcmin]	< ±0.1					
Lost Motion	[arcmin]	< 1					
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	49	98	120			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90					
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	13480					
Dynamic axial load	F _{A dyn (max)} [N]	20119					
Dynamic tilting moment	M _{dyn (max)} [Nm]	580					

¹⁾Valid for HFUS-2UH and HFUS-2SH when radial shaft seals are used on the hollow shaft.

Table 188.2

	Unit	HFUS-40				
Ratio	i []	50	80	100	120	160
Repeatable peak toque	T _R [Nm]	402	519	568	617	647
Average torque	T _A [Nm]	196	284	372	451	451
Rated torque	T _N [Nm]	137	206	265	294	294
Momentary peak torque	T _M [Nm]	686	980	1080	1180	1180
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	5600				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4000				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	3600/950 ¹⁾				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000/950 ¹⁾				
Moment of inertia HFUS-2UH	J _{in} [x10 ⁻⁴ kgm ²]	9.28				
Moment of inertia HFUS-2SO	J _{in} [x10 ⁻⁴ kgm ²]	4.50				
Moment of inertia HFUS-2SH	J _{in} [x10 ⁻⁴ kgm ²]	9.28				
Weight HFUS-2UH	m [kg]	7.7				
Weight HFUS-2SO	m [kg]	5.1				
Weight HFUS-2SH	m [kg]	5.4				
Maximum hollow shaft diameter	d _{H (max)} [mm]	46				
Transmission accuracy	[arcmin]	< 1				
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	180	230			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	15243				
Dynamic axial load	F _{A dyn (max)} [N]	22750				
Dynamic tilting moment	M _{dyn (max)} [Nm]	849				

¹⁾Valid for HFUS-2UH and HFUS-2SH when radial shaft seals are used on the hollow shaft.

Illustration 189.1 HFUS-32-2UH [mm]

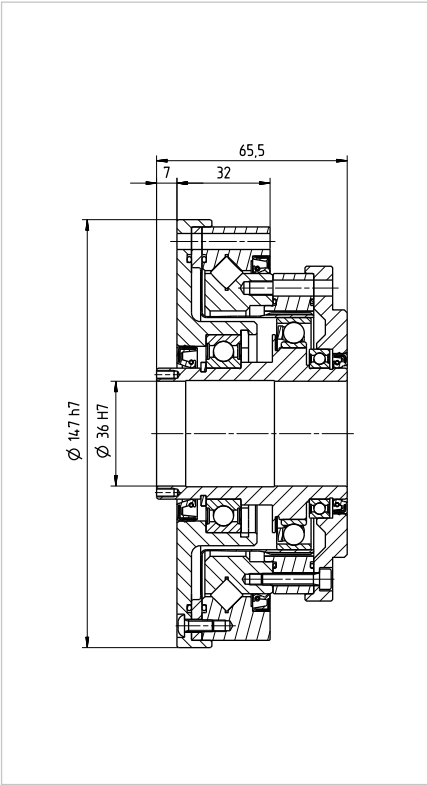


Illustration 189.2 HFUS-32-2SO [mm]

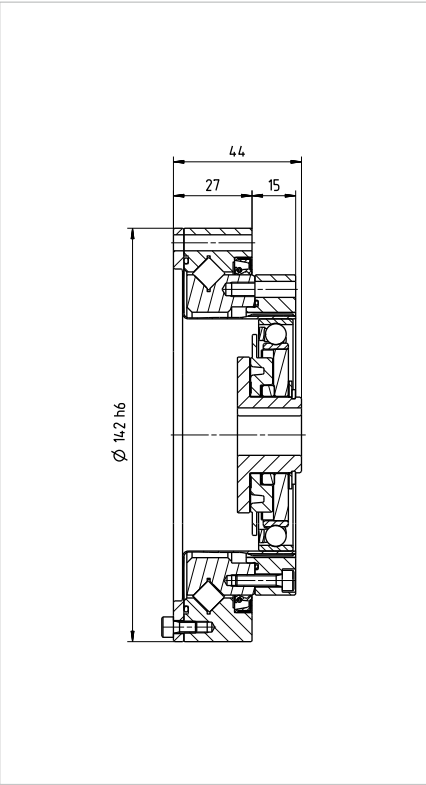


Illustration 189.3 HFUS-32-2SH [mm]

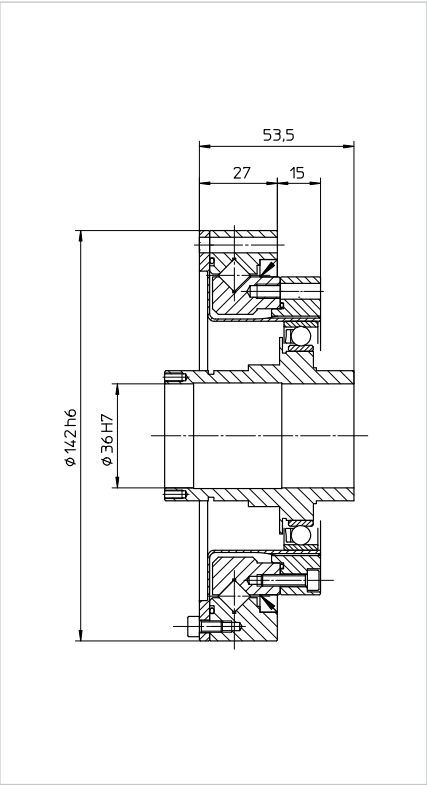


Illustration 189.4 HFUS-40-2UH [mm]

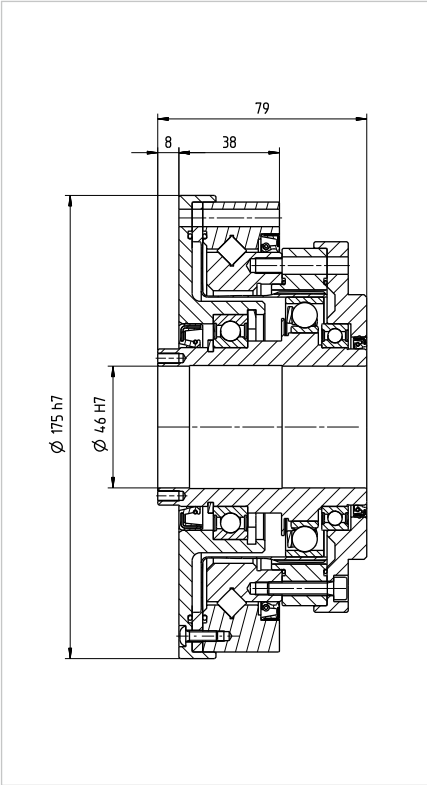


Illustration 189.5 HFUS-40-2SO [mm]

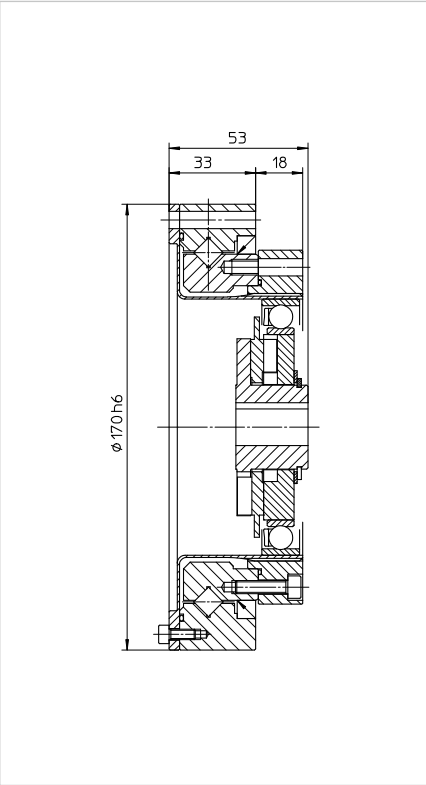
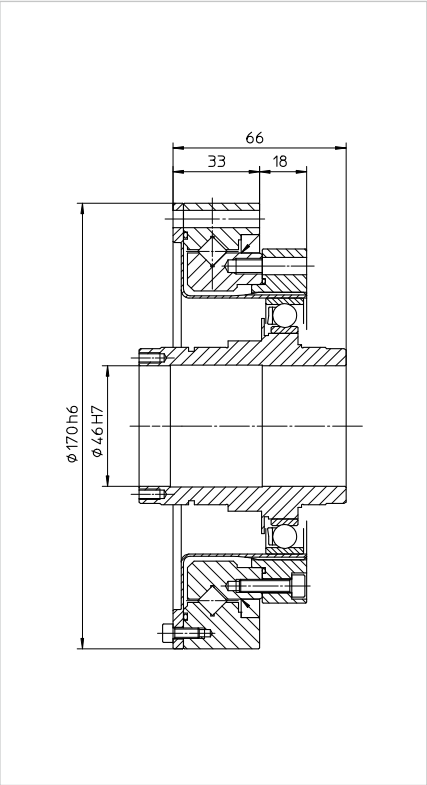


Illustration 189.6 HFUS-40-2SH [mm]



Technical data

Table 190.1

	Unit	HFUS-45				
Ratio	i []	50	80	100	120	160
Repeatable peak toque	T _R [Nm]	500	706	755	823	882
Average torque	T _A [Nm]	265	390	500	620	630
Rated torque	T _N [Nm]	176	313	353	402	402
Momentary peak torque	T _M [Nm]	950	1270	1570	1760	1910
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	5000				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3800				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	3300/900 ¹⁾				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000/900 ¹⁾				
Moment of inertia HFUS-2UH	J _{in} [x10 ⁻⁴ kgm ²]	13.8				
Moment of inertia HFUS-2SO	J _{in} [x10 ⁻⁴ kgm ²]	8.68				
Moment of inertia HFUS-2SH	J _{in} [x10 ⁻⁴ kgm ²]	13.8				
Weight HFUS-2UH	m [kg]	10				
Weight HFUS-2SO	m [kg]	6.5				
Weight HFUS-2SH	m [kg]	6.9				
Maximum hollow shaft diameter	d _{H (max)} [mm]	52				
Transmission accuracy	[arcmin]	< 1				
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	260	330			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	27375				
Dynamic axial load	F _{A dyn (max)} [N]	40858				
Dynamic tilting moment	M _{dyn (max)} [Nm]	1127				

¹⁾Valid for HFUS-2UH and HFUS-2SH when radial shaft seals are used on the hollow shaft.

Table 190.2

	Unit	HFUS-50				
Ratio	i []	50 ¹⁾	80	100	120	160
Repeatable peak toque	T _R [Nm]	715	941	980	1080	1180
Average torque	T _A [Nm]	350	519	666	813	843
Rated torque	T _N [Nm]	245	372	470	529	529
Momentary peak torque	T _M [Nm]	1430	1860	2060	2060	2450
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	4500				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3500				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	3000/850 ²⁾				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	2500/850 ²⁾				
Moment of inertia HFUS-2UH	J _{in} [x10 ⁻⁴ kgm ²]	25.2				
Moment of inertia HFUS-2SO	J _{in} [x10 ⁻⁴ kgm ²]	12.5				
Moment of inertia HFUS-2SH	J _{in} [x10 ⁻⁴ kgm ²]	25.2				
Weight HFUS-2UH	m [kg]	14.5				
Weight HFUS-2SO	m [kg]	9.6				
Weight HFUS-2SH	m [kg]	10.2				
Maximum hollow shaft diameter	d _{H (max)} [mm]	60				
Transmission accuracy	[arcmin]	< 1				
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	340	440			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90				
Output bearing						
Dynamic radial load	F _{R dyn (max)} [N]	28792				
Dynamic axial load	F _{A dyn (max)} [N]	42973				
Dynamic tilting moment	M _{dyn (max)} [Nm]	1487				

¹⁾ Only with oil lubrication. Grease lubrication can be used when the average torque T_{av} is not greater than half the nominal torque T_N.

²⁾ Valid for HFUS-2UH and HFUS-2SH when radial shaft seals are used on the hollow shaft.

Illustration 191.1 HFUS-45-2UH [mm]

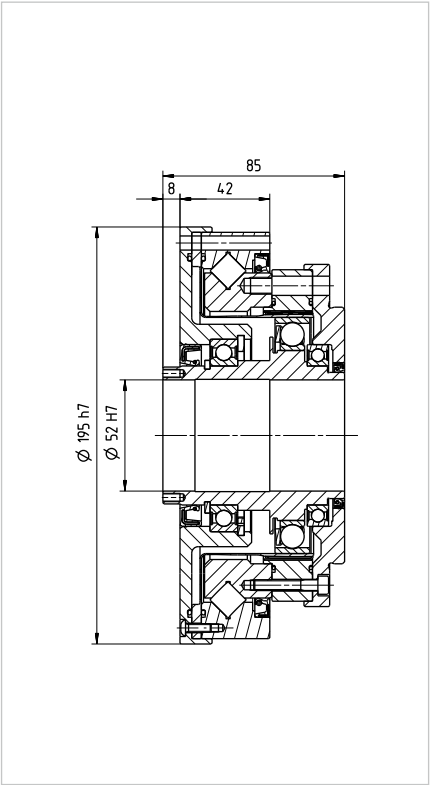


Illustration 191.2 HFUS-45-2SO [mm]

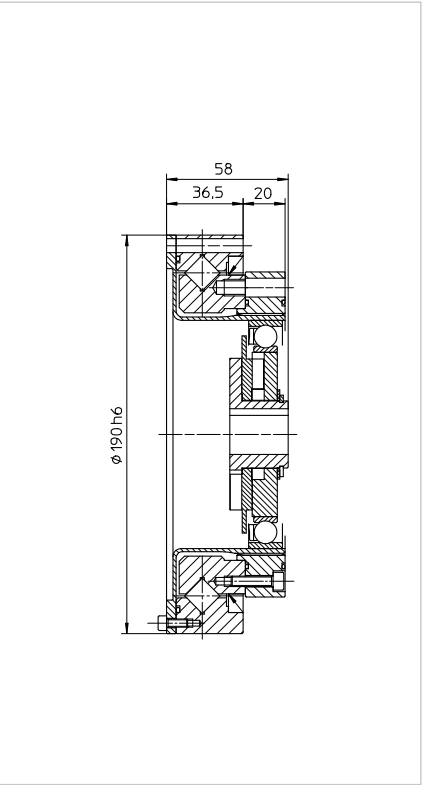


Illustration 191.3 HFUS-45-2SH [mm]

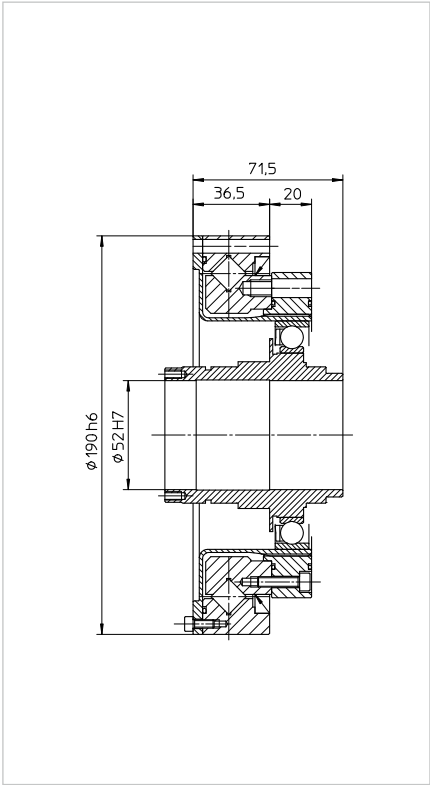


Illustration 191.4 HFUS-50-2UH [mm]

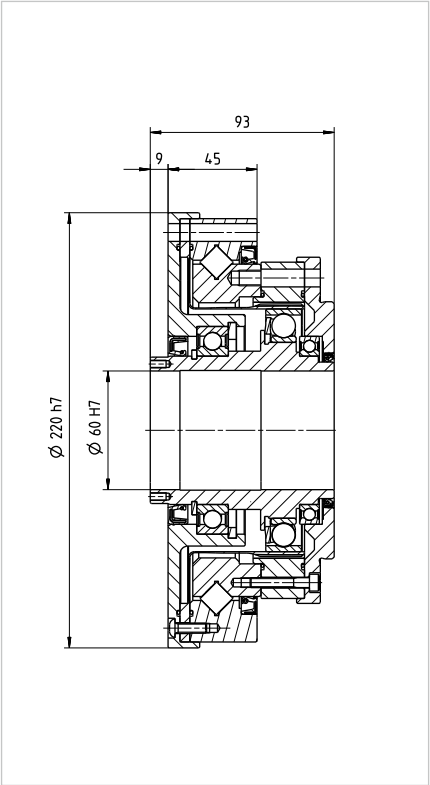


Illustration 191.5 HFUS-50-2SO [mm]

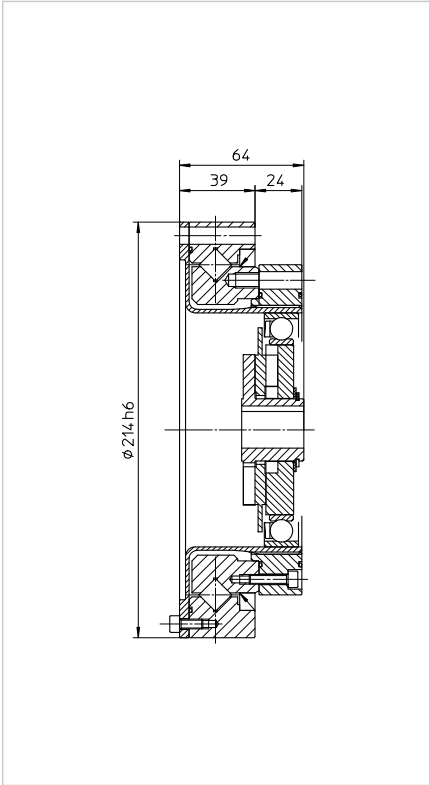


Illustration 191.6 HFUS-50-2SH [mm]

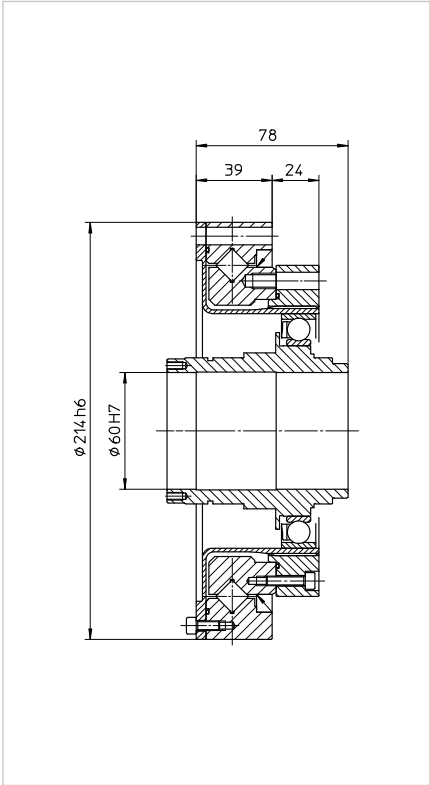
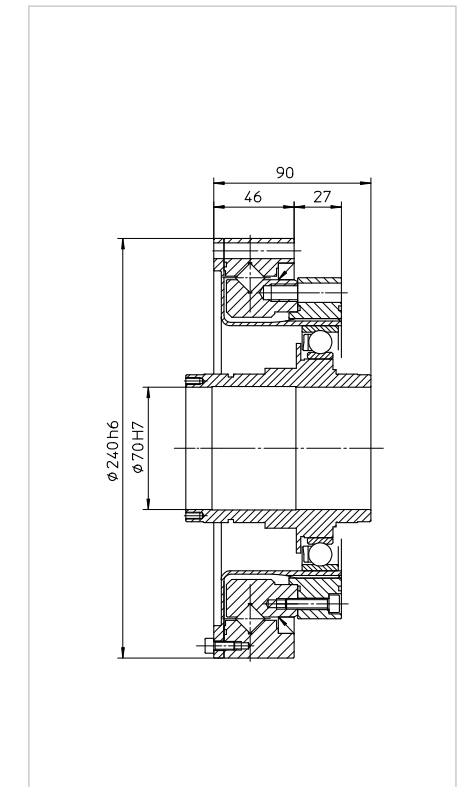
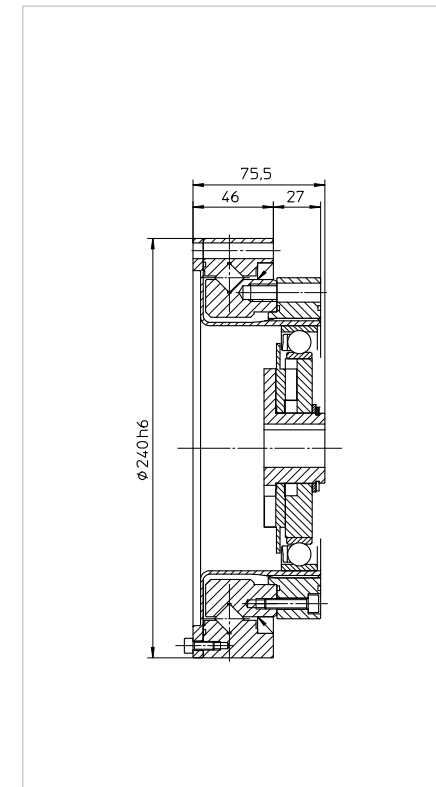
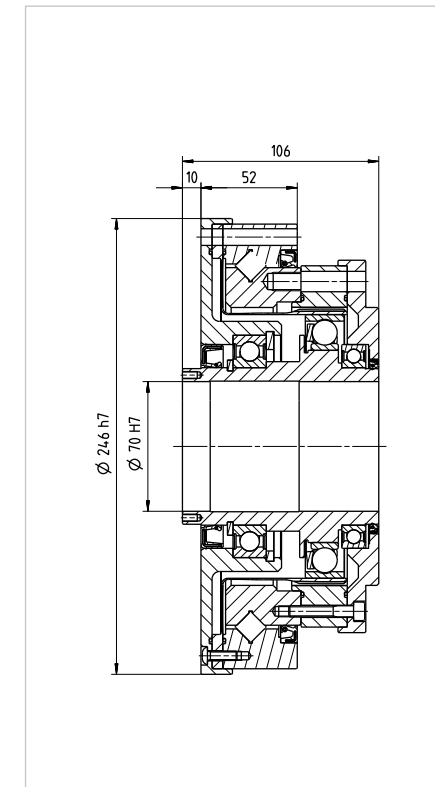


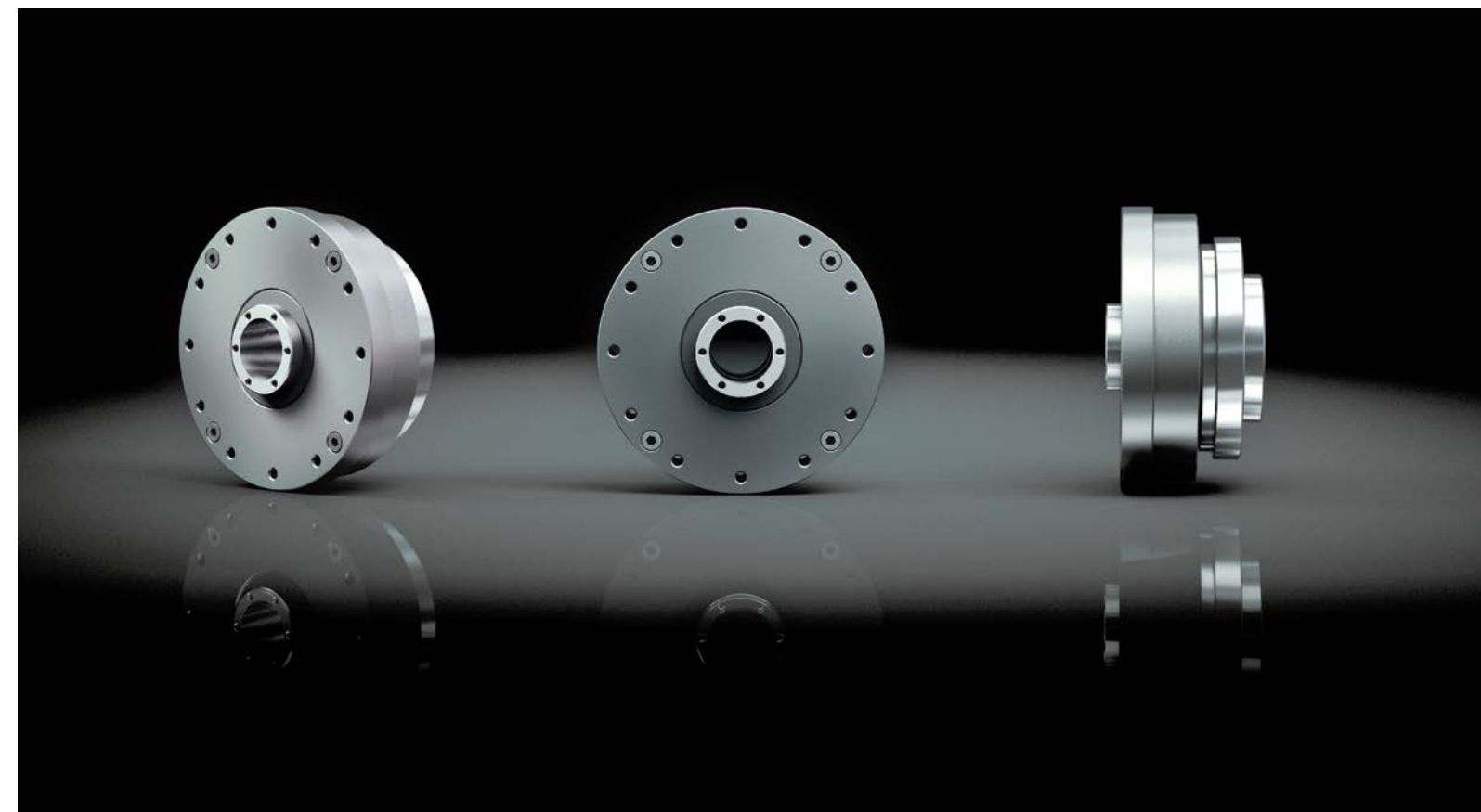
Table 192.1

²⁾ Valid for HFUS-2UH and HFUS-2SH when radial shaft seals are used on the hollow shaft.



QUICKLINK
www.harmonicdrive.co.uk/CAD2063

Units, Gearboxes, Planetary Gears



The compact series

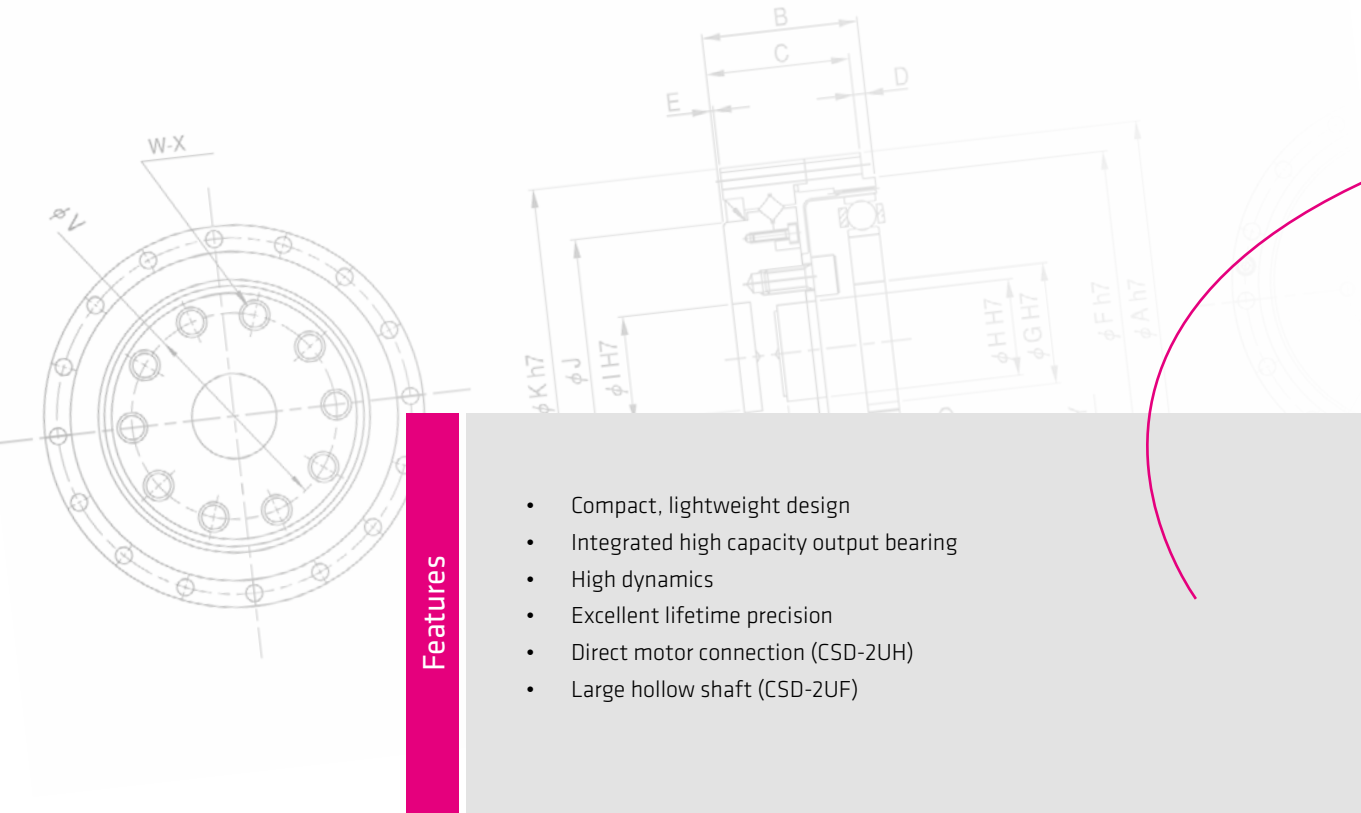
CSD Series Units are available in seven sizes with gear ratios of 50, 100 and 160:1 offering repeatable peak torques from 12 to 823 Nm.

Harmonic Drive® Units combine the precision Harmonic Drive® Component Sets consisting of three components - Circular Spline, Flexspline and Wave Generator - and integral high load capacity, tilt resistant output bearings.

The output bearing with high tilting rigidity enables the direct introduction of high payloads without further support and thus permits simple and space saving design installations.

The CSD Series is characterised by its' very short overall length and low weight. The CSD-2UF Unit is available with hollow shaft to feed through supply lines or services for further axes and with a high capacity output bearing that can withstand heavy payloads. The CSD-2UH Unit easily enables compact motor attachment for any standard servo motors.

Unit and motor form a compact, lightweight assembly, which can quickly withstand heavy loads. Due to the Units positioning accuracy, stable machine properties with short cycle times are guaranteed.



Optimised for your applications:

- Reduced material use
- Greater energy efficiency
- Lower production costs
- Small machine footprint
- Optimal design solution
- Easy load connection
- Low production and installation costs
- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/2070

CSD-2UH/2UF

Ordering code

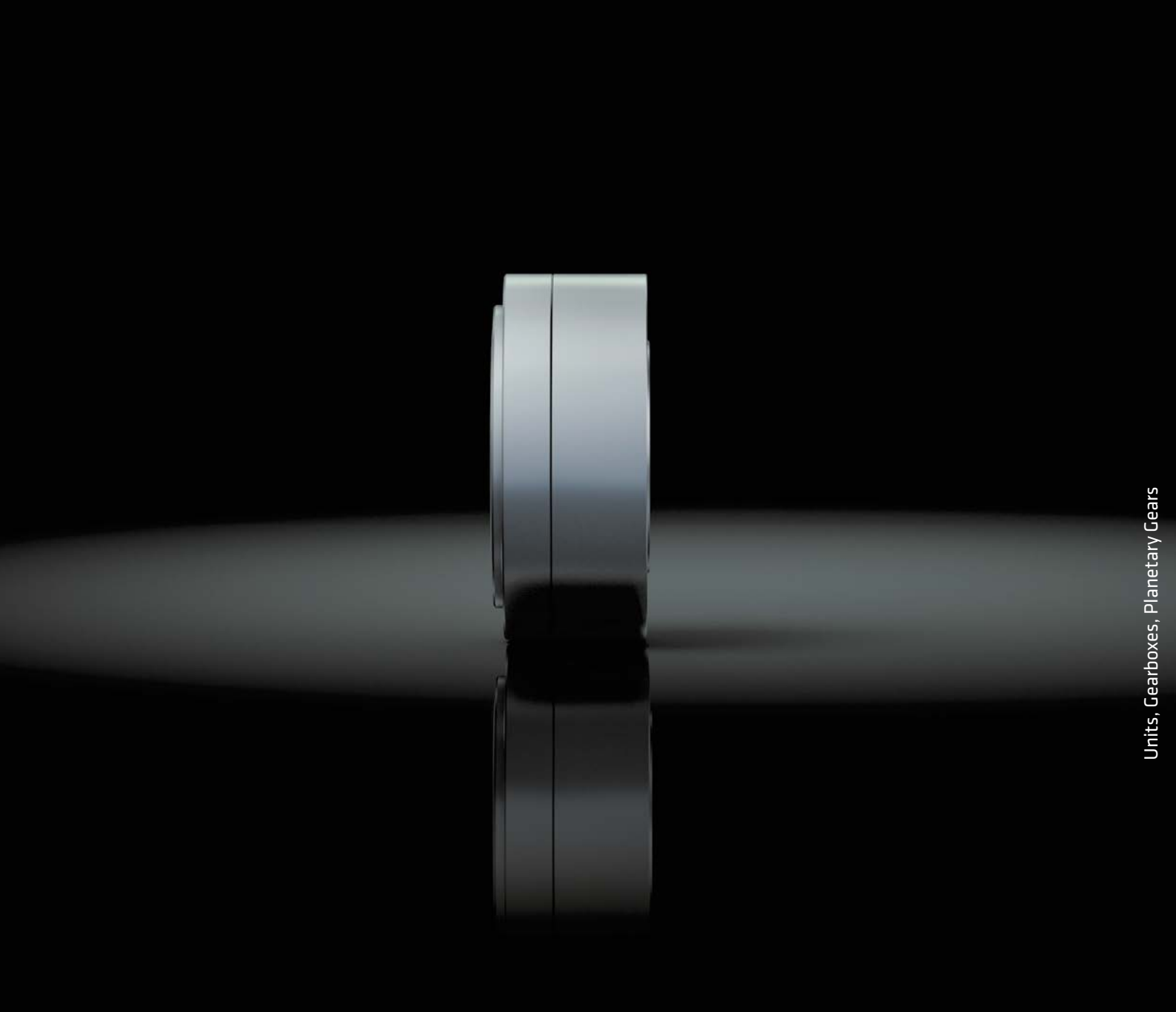
Table 196.1

Series	Size	Ratio			Version	Special design		
CSD	14	50	100		2UH	According to customer requirements		
	17	50	100					
	20	50	100	160				
	25	50	100	160	2UF			
	32	50	100	160				
	40	50	100	160				
	50	50	100	160				
Ordering code								
CSD	-	20	-	100	-	2UH	-	SP

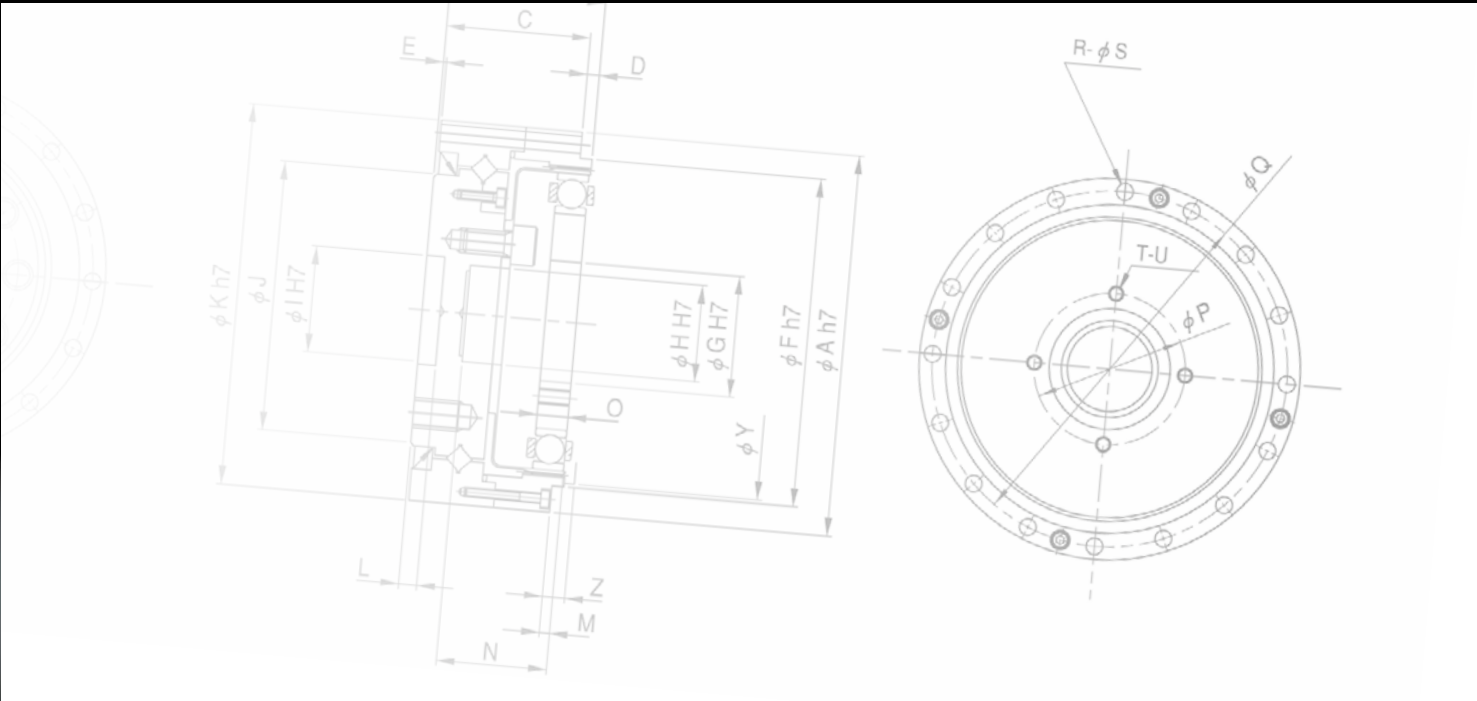
Table 196.2

Version	
Ordering code	Description
2UH	Units (Size 14-50)
2UF	Units with hollow shaft and increased capacity output bearing (Size 14-40)

Clarification of the technical data can be found in the Glossary



Units, Gearboxes, Planetary Gears



Technical data

Table 198.1

	Unit	CSD-14-2UH		CSD-17-2UH	
Ratio	i []	50	100	50	100
Repeatable peak torque	T _R [Nm]	12	19	23	37
Average torque	T _A [Nm]	4.8	7.7	18	27
Rated torque	T _N [Nm]	3.7	5.4	11	16
Momentary peak torque	T _M [Nm]	24	35	48	71
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500		7300	
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500		3500	
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.021		0.054	
Weight	m [kg]	0.35		0.46	
Transmission accuracy	[arcmin]	< 1.5		< 1.5	
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	4.7	6.1	12	13
Ambient operating temperature	[°C]	0 ... 60		0 ... 60	
Output bearing					
Dynamic radial load	F _{R dyn (max)} [N]	674		758	
Dynamic axial load	F _{A dyn (max)} [N]	1010		1130	
Dynamic tilting moment	M _{dyn (max)} [Nm]	41		64	

Table 198.2

	Unit	CSD-20-2UH			CSD-25-2UH		
Ratio	i []	50	100	160	50	100	160
Repeatable peak torque	T _R [Nm]	39	57	64	69	110	123
Average torque	T _A [Nm]	24	34	34	38	75	75
Rated torque	T _N [Nm]	17	28	28	27	47	47
Momentary peak torque	T _M [Nm]	69	95	95	127	184	204
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500			5600		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	0.090			0.282		
Weight	m [kg]	0.65			1.2		
Transmission accuracy	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x10³ Nm/rad]	20	25		37	47	
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	828			1380		
Dynamic axial load	F _{A dyn (max)} [N]	1240			2050		
Dynamic tilting moment	M _{dyn (max)} [Nm]	91			156		

Illustration 199.1

CSD-14-2UH [mm]

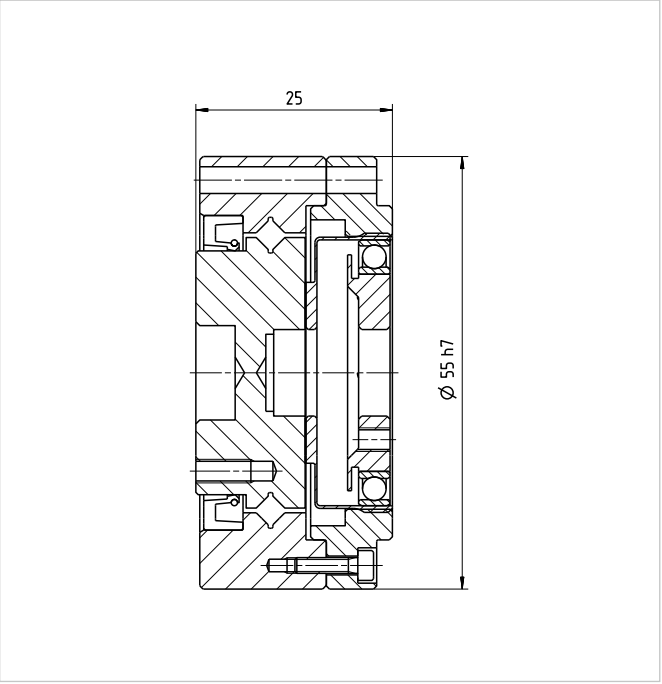


Illustration 199.2

CSD-17-2UH [mm]

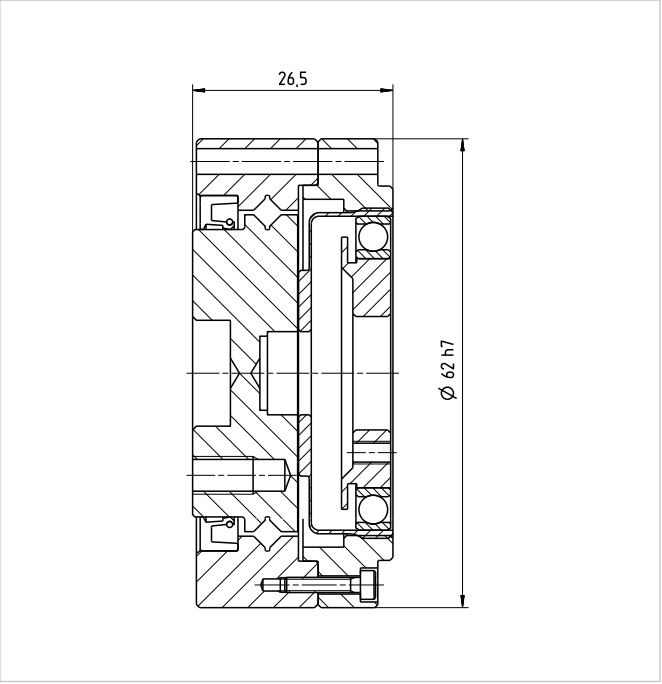


Illustration 199.3

CSD-20-2UH [mm]

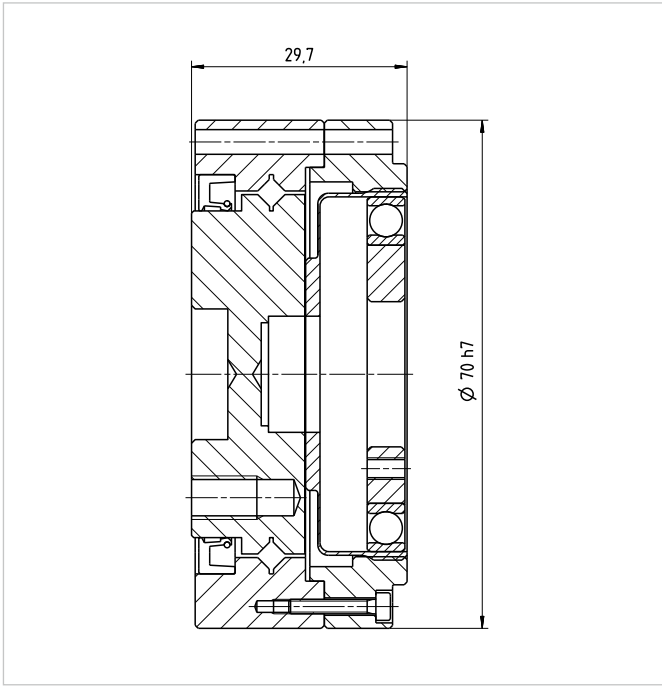
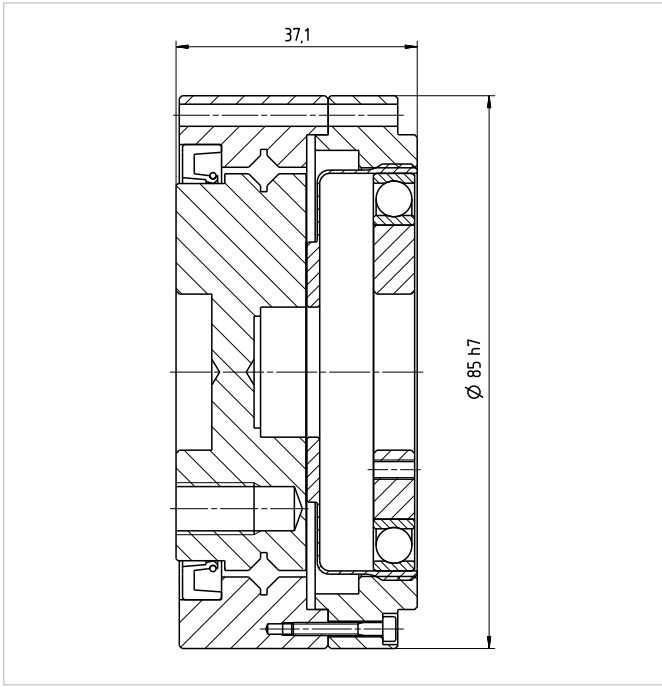


Illustration 199.4

CSD-25-2UH [mm]



Technical data

Table 200.1

	Unit	CSD-32-2UH			CSD-40-2UH		
Ratio	i []	50	100	160	50	100	160
Repeatable peak torque	T _R [Nm]	151	233	261	281	398	453
Average torque	T _A [Nm]	75	151	151	137	260	316
Rated torque	T _N [Nm]	53	96	96	96	185	206
Momentary peak torque	T _M [Nm]	268	420	445	480	700	765
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800			4000		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3000		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	1.09			2.85		
Weight	m [kg]	2.4			3.6		
Transmission accuracy	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	84	110		150	200	
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	2150			3050		
Dynamic axial load	F _{A dyn (max)} [N]	3210			4560		
Dynamic tilting moment	M _{dyn (max)} [Nm]	313			450		

Table 200.2

	Unit	CSD-50-2UH		
Ratio	i []	50	100	160
Repeatable peak torque	T _R [Nm]	500	686	823
Average torque	T _A [Nm]	247	466	590
Rated torque	T _N [Nm]	172	329	370
Momentary peak torque	T _M [Nm]	1000	1440	1715
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3500		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	2500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	8.61		
Weight	m [kg]	6.9		
Transmission accuracy	[arcmin]	< 1		
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	300	370	
Ambient operating temperature	[°C]	0 ... 60		
Output bearing				
Dynamic radial load	F _{R dyn (max)} [N]	4990		
Dynamic axial load	F _{A dyn (max)} [N]	7440		
Dynamic tilting moment	M _{dyn (max)} [Nm]	759		

Illustration 201.1

CSD-32-2UH [mm]

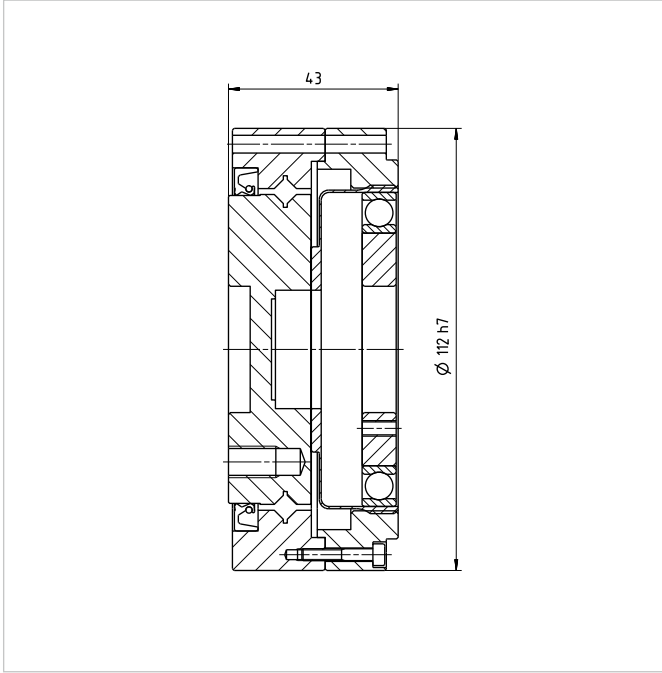


Illustration 201.2

CSD-40-2UH [mm]

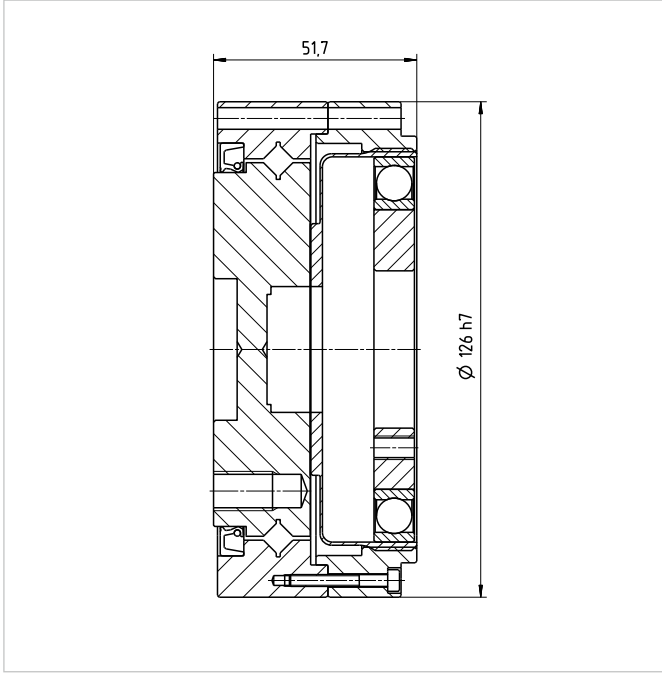
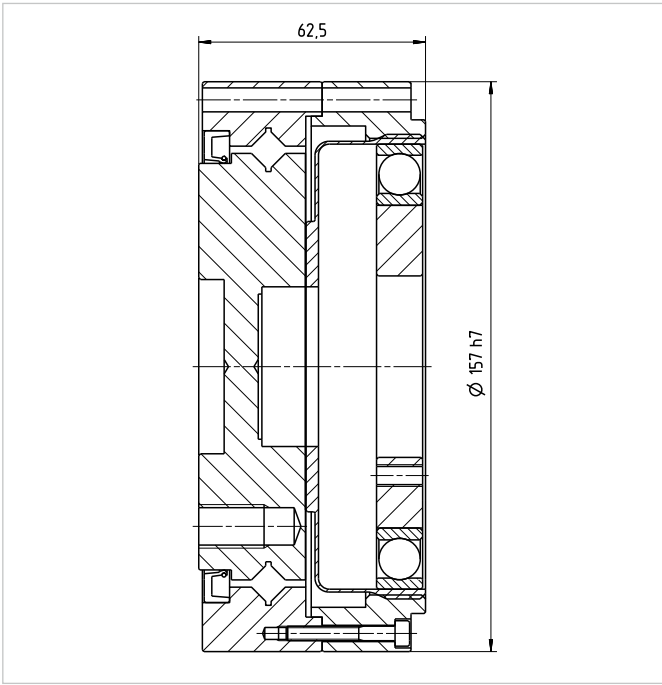


Illustration 201.3

CSD-50-2UH [mm]



Technical data

Table 202.1

	Unit	CSD-14-2UF		CSD-17-2UF	
Ratio	i []	50	100	50	100
Repeatable peak torque	T _R [Nm]	12	19	23	37
Average torque	T _A [Nm]	4.8	7.7	18	27
Rated torque	T _N [Nm]	3.7	5.4	11	16
Momentary peak torque	T _M [Nm]	24	35	48	71
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500		7300	
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500		3500	
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.021		0.054	
Weight	m [kg]	0.5		0.66	
Maximum hollow shaft diameter	d _{H (max)} [mm]	9		9	
Transmission accuracy	[arcmin]	< 1.5		< 1.5	
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	4.7	6.1	12	13
Ambient operating temperature	[°C]	0 ... 60		0 ... 60	
Output bearing					
Dynamic radial load	F _{R dyn (max)} [N]	828		1490	
Dynamic axial load	F _{A dyn (max)} [N]	1240		2220	
Dynamic tilting moment	M _{dyn (max)} [Nm]	91		124	

Table 202.2

	Unit	CSD-20-2UF			CSD-25-2UF		
Ratio	i []	50	100	160	50	100	160
Repeatable peak torque	T _R [Nm]	39	57	64	69	110	123
Average torque	T _A [Nm]	24	34	34	38	75	75
Rated torque	T _N [Nm]	17	28	28	27	47	47
Momentary peak torque	T _M [Nm]	69	95	95	127	184	204
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500			5600		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.090			0.282		
Weight	m [kg]	0.94			1.7		
Maximum hollow shaft diameter	d _{H (max)} [mm]	18			22		
Transmission accuracy	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	20	25		37	47	
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	2090			3120		
Dynamic axial load	F _{A dyn (max)} [N]	3120			4660		
Dynamic tilting moment	M _{dyn (max)} [Nm]	187			258		

Illustration 203.1

CSD-14-2UF [mm]

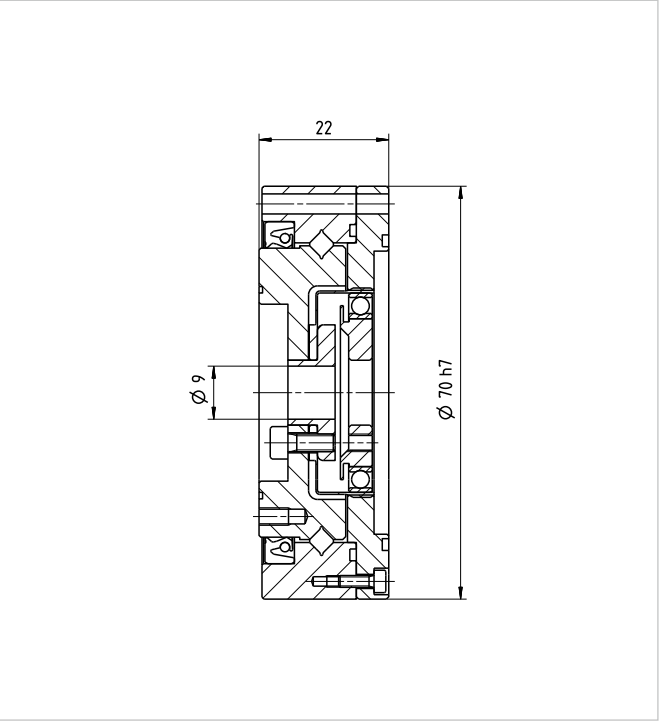


Illustration 203.2

CSD-17-2UF [mm]

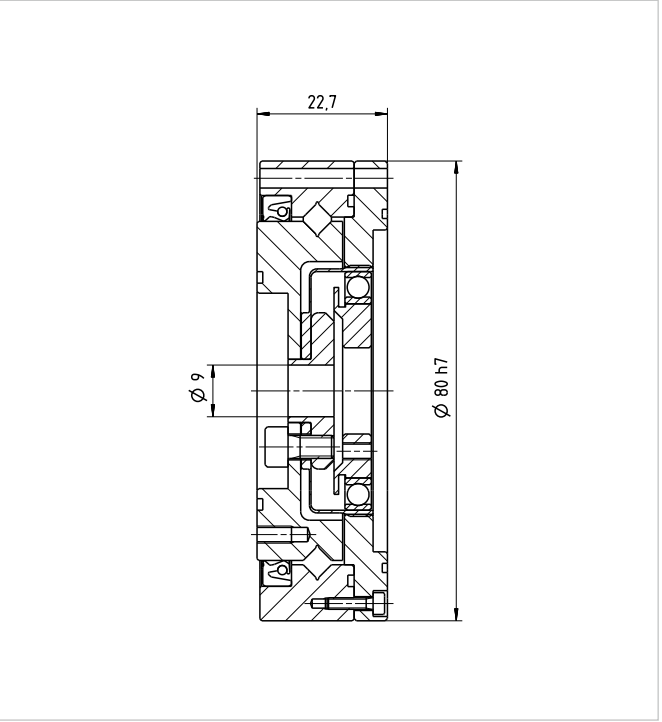


Illustration 203.3

CSD-20-2UF [mm]

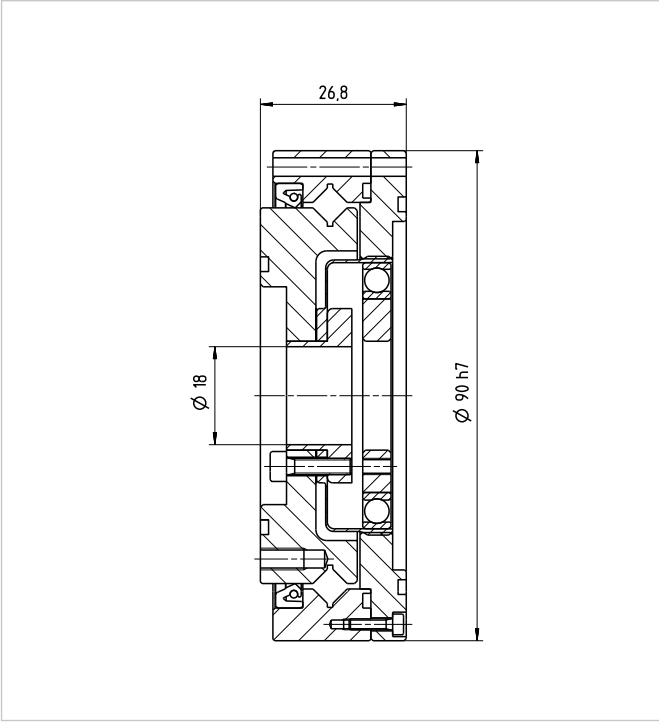
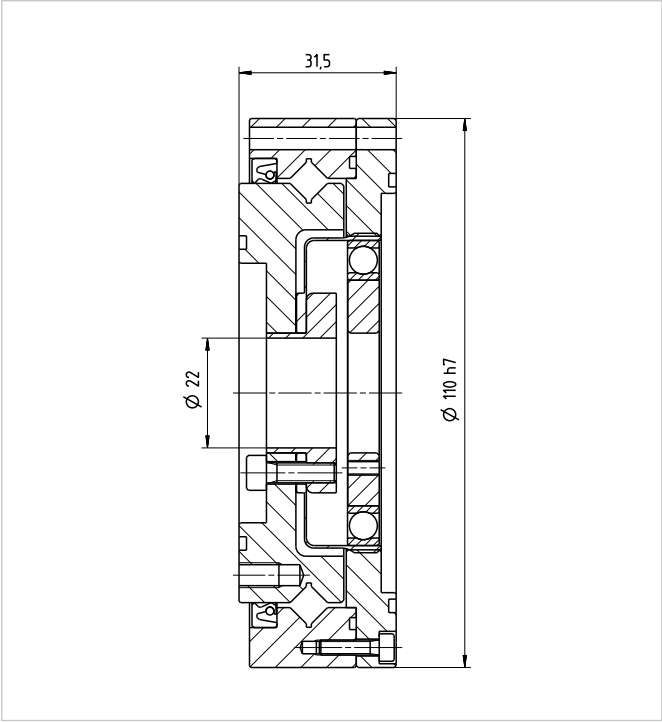


Illustration 203.4

CSD-25-2UF [mm]



Technical data

Table 204.1

	Unit	CSD-32-2UF			CSD-40-2UF		
Ratio	i []	50	100	160	50	100	160
Repeatable peak torque	T _R [Nm]	151	233	261	281	398	453
Average torque	T _A [Nm]	75	151	151	137	260	316
Rated torque	T _N [Nm]	53	96	96	480	185	206
Momentary peak torque	T _M [Nm]	268	420	445	281	700	765
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800			4000		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3000		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	1.09			2.85		
Weight	m [kg]	3.3			5.7		
Maximum hollow shaft diameter	d _{H (max)} [mm]	29			37		
Transmission accuracy	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	84	110		150	200	
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	5470			6200		
Dynamic axial load	F _{A dyn (max)} [N]	8170			9260		
Dynamic tilting moment	M _{dyn (max)} [Nm]	580			849		

Illustration 205.1

CSD-32-2UF [mm]

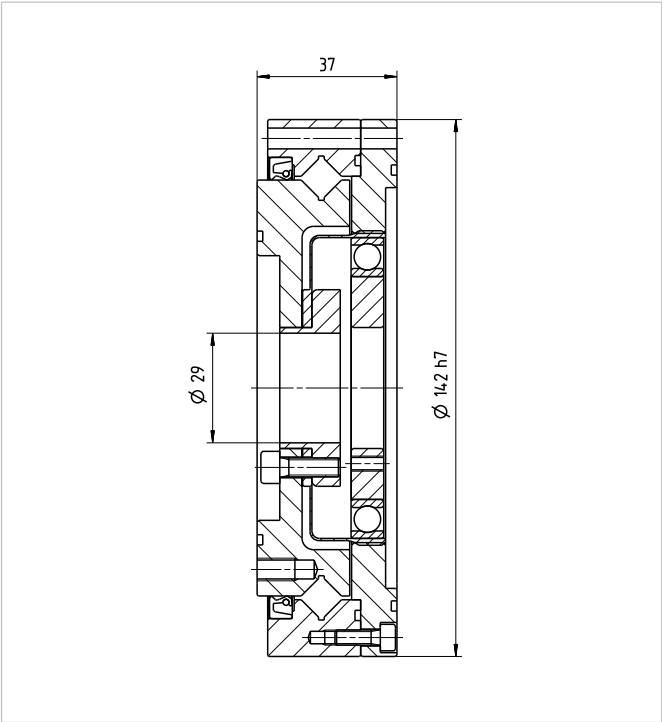
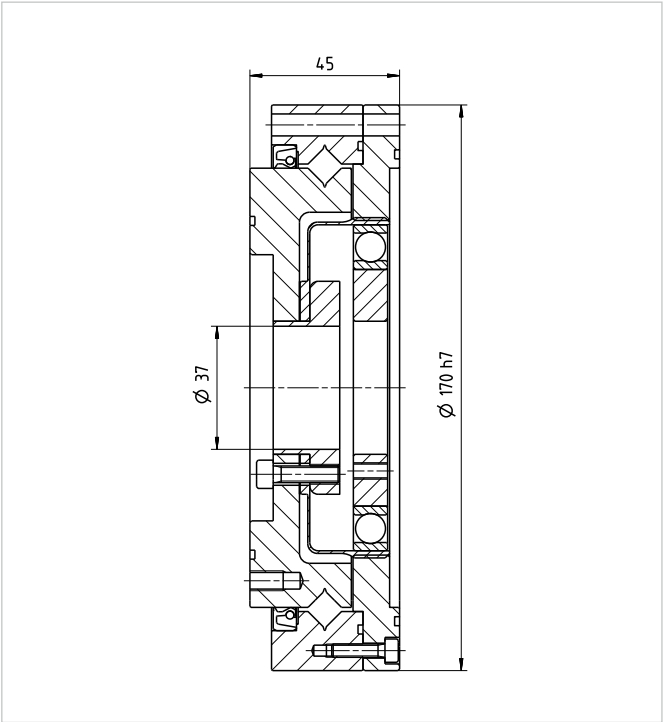
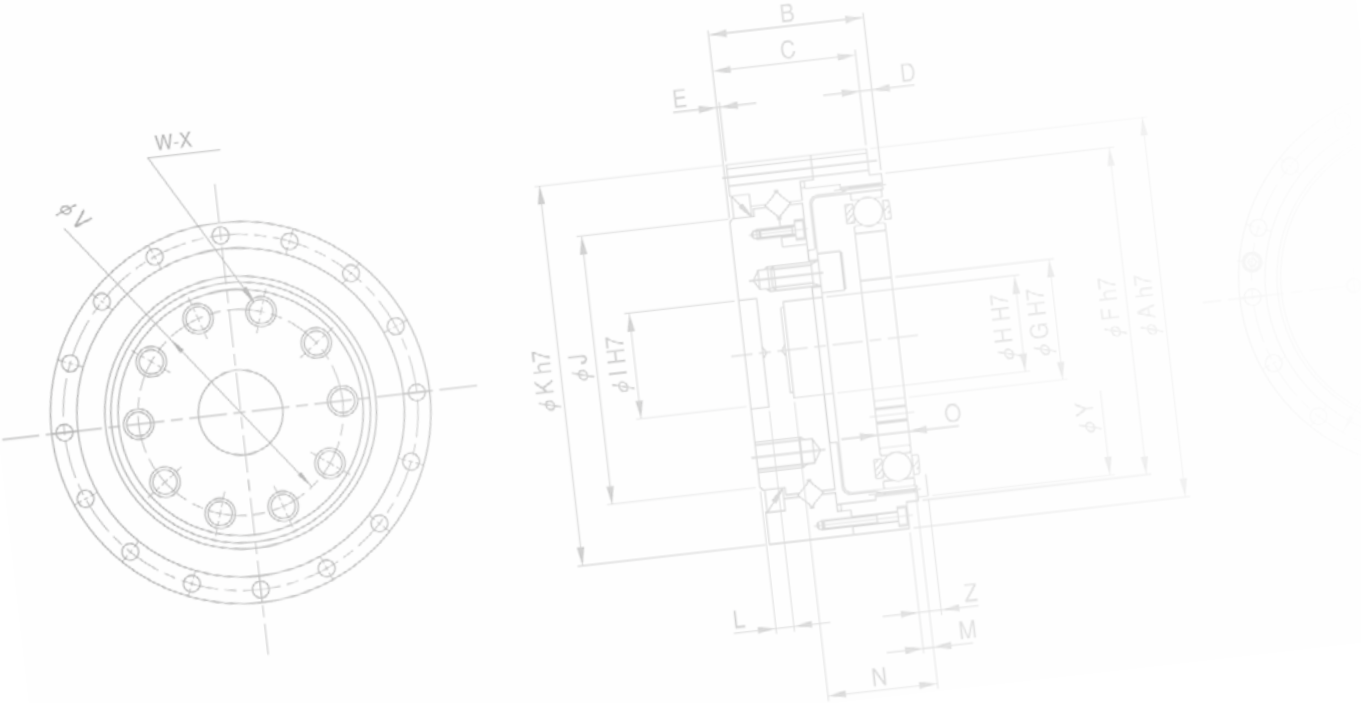


Illustration 205.2

CSD-40-2UF [mm]



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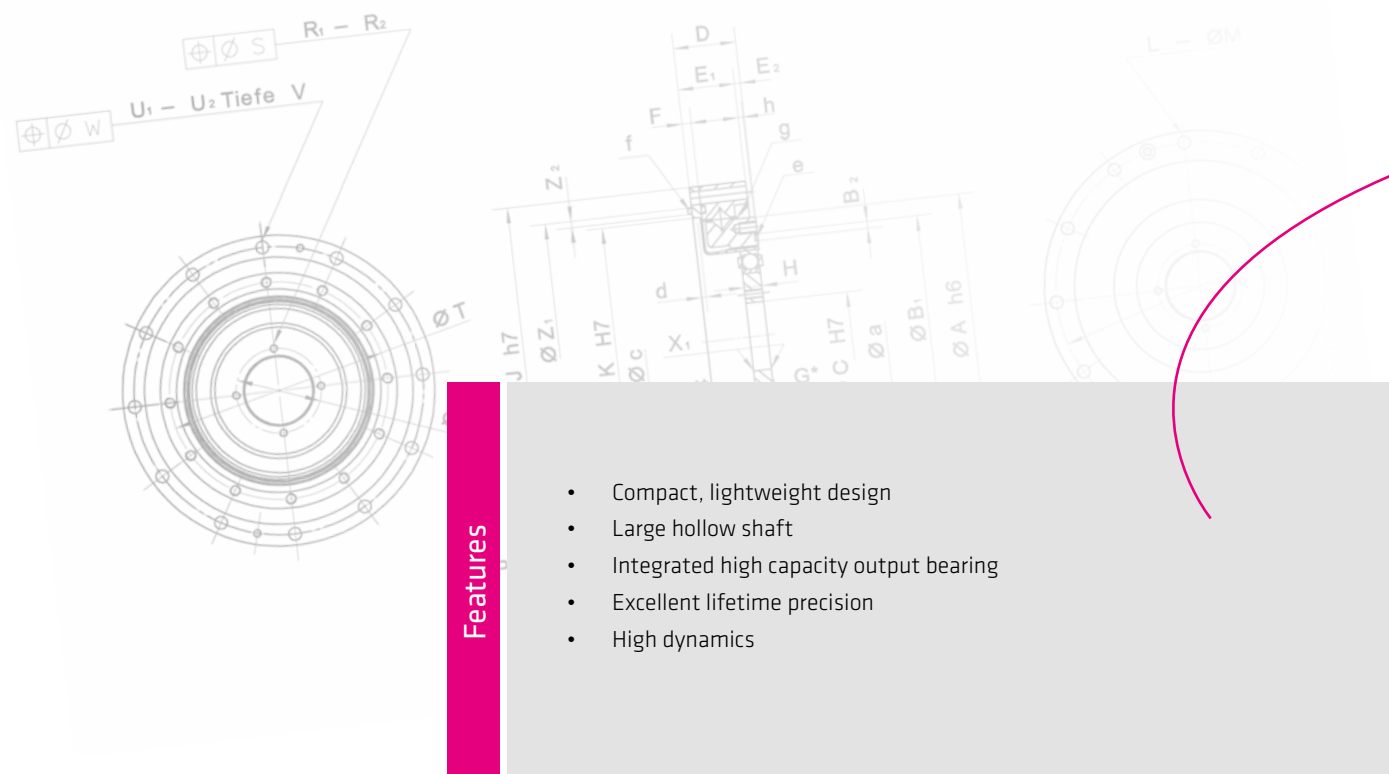
Short overall length with largest hollow shaft

SHD Series Units are available in six sizes with gear ratios of 50, 100 and 160:1 offering repeatable peak torques from 12 to 453 Nm.

Harmonic Drive® Units combine the precision Harmonic Drive® Component Sets consisting of three components – Circular Spline, Flexspline and Wave Generator – and integral high load capacity, tilt resistant output bearings.

The output bearing with high tilting rigidity enables the direct introduction of high payloads without further support and thus permits simple and space saving design installations.

The SHD-2SH Simplicity Units are characterised by highly compact dimensions and low weight, consisting of the component set with shortened Flexspline and the high capacity output bearing. The absence of input and output flanges means maximum flexibility in design integration. The integrated hollow shaft can be used to feed through supply lines or services for further axes. The high capacity, integrated output bearing means that the Unit can quickly and easily withstand heavy payloads.



Features

- Compact, lightweight design
- Large hollow shaft
- Integrated high capacity output bearing
- Excellent lifetime precision
- High dynamics

Optimised for your applications:

- Reduced material use
- Greater energy efficiency
- Small machine footprint
- Optimal design solution
- Easy load connection
- Low production and installation costs
- Increased operating reliability
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs

Customer Benefits



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SHD-2SH

Ordering code

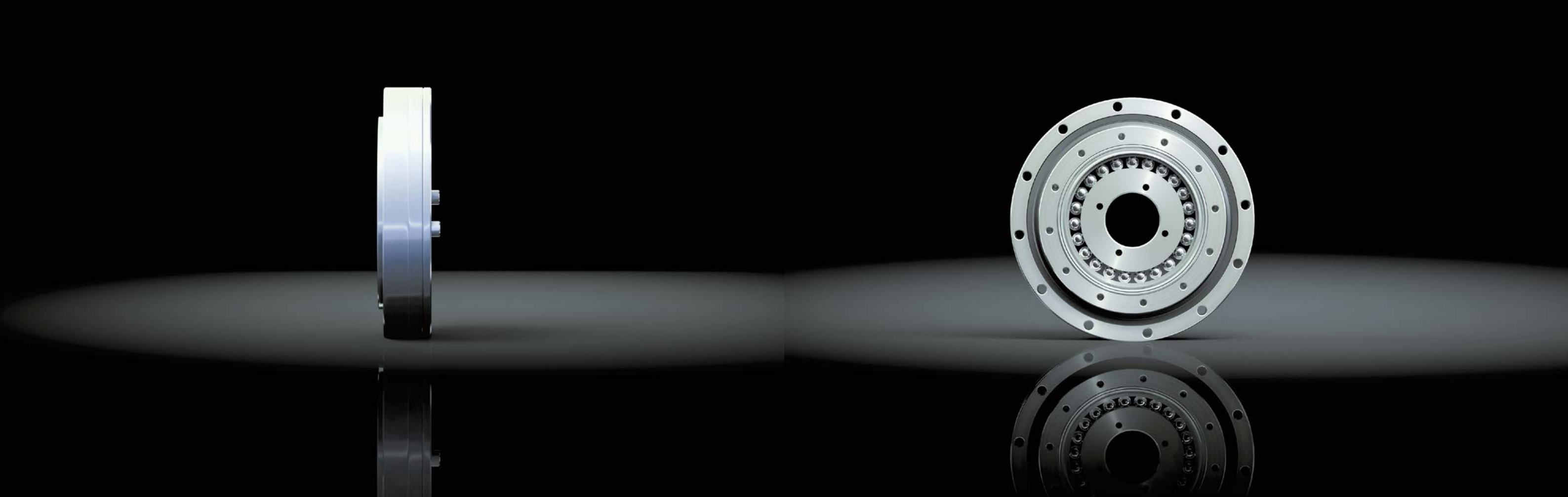
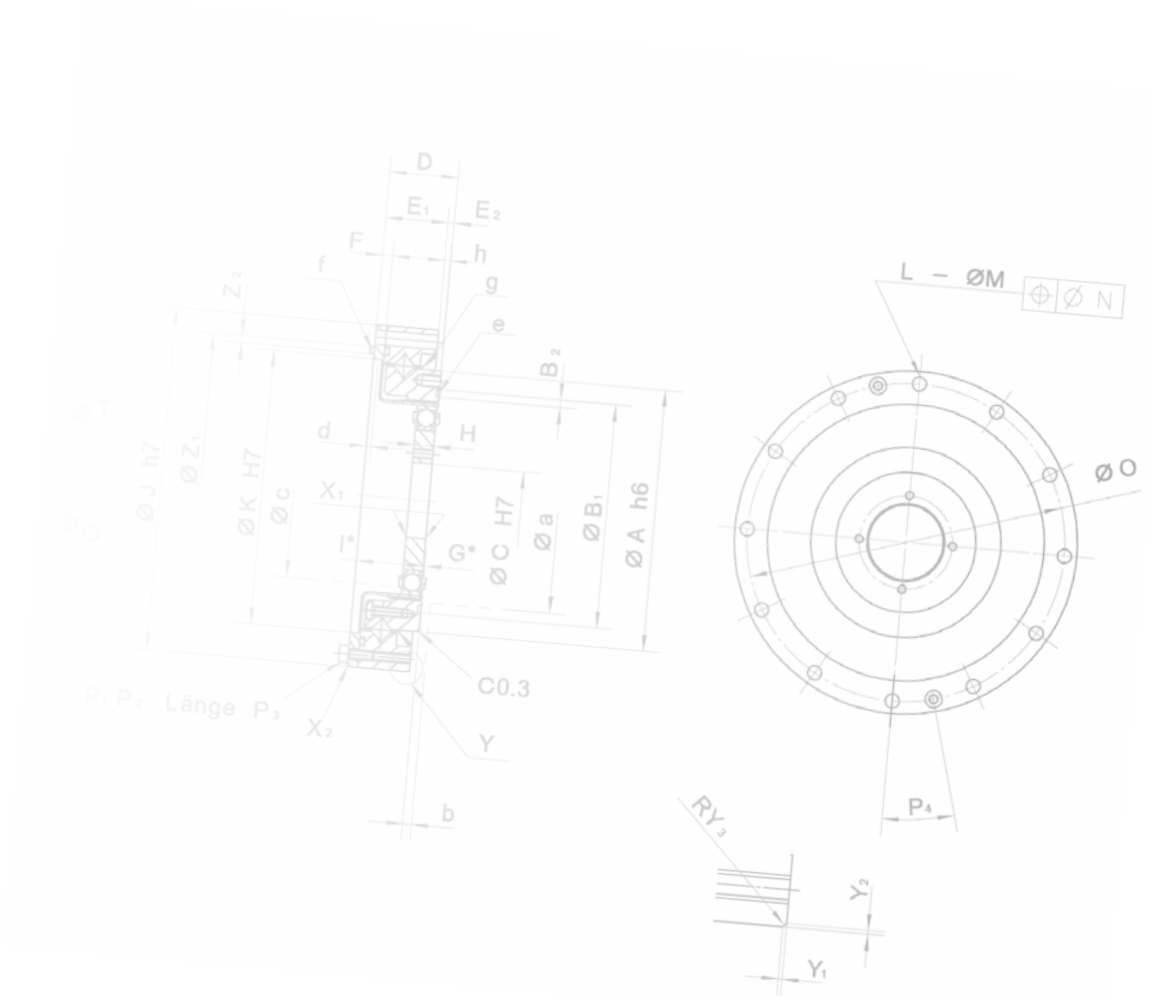
Table 208.1

Series	Size	Ratio			Version	Special design		
SHD	14	50	100		2SH	According to customer requirements		
	17	50	100					
	20	50	100	160				
	25	50	100	160				
	32	50	100	160				
	40	50	100	160				
Ordering code								
SHD	-	20	-	100	-	2SH	-	SP

Table 208.2

Version	
Ordering code	Description
2SH	Simplicity Unit with hollow shaft

Clarification of the technical data can be found in the Glossary



Technical data

Table 210.1

	Unit	SHD-14-2SH		SHD-17-2SH	
Ratio	i []	50	100	50	100
Repeatable peak torque	T _R [Nm]	12	19	23	37
Average torque	T _A [Nm]	4.8	7.7	18	27
Rated torque	T _N [Nm]	3.7	5.4	11	16
Momentary peak torque	T _M [Nm]	23	35	48	71
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500		7300	
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500		3500	
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.021		0.054	
Weight	m [kg]	0.33		0.42	
Maximum hollow shaft diameter	d _{H (max)} [mm]	11		15	
Transmission accuracy	[arcmin]	< 1.5		< 1.5	
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	4,7	6,1	12	13
Ambient operating temperature	[°C]	0 ... 60		0 ... 60	
Output bearing					
Dynamic radial load	F _{R dyn (max)} [N]	1180		2115	
Dynamic axial load	F _{A dyn (max)} [N]	1760		3160	
Dynamic tilting moment	M _{dyn (max)} [Nm]	37		62	

Table 210.2

	Unit	SHD-20-2SH			SHD-25-2SH		
Ratio	i []	50	100	160	50	100	160
Repeatable peak torque	T _R [Nm]	39	57	64	69	110	123
Average torque	T _A [Nm]	24	34	34	38	75	75
Rated torque	T _N [Nm]	17	28	28	27	47	47
Momentary peak torque	T _M [Nm]	69	95	95	127	184	204
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500			5600		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.090			0.282		
Weight	m [kg]	0.52			0.91		
Maximum hollow shaft diameter	d _{H (max)} [mm]	20			24		
Transmission accuracy	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	20	25		37	47	
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	2970			4430		
Dynamic axial load	F _{A dyn (max)} [N]	4430			6620		
Dynamic tilting moment	M _{dyn (max)} [Nm]	93			129		

Illustration 211.1

SHD-14-2SH [mm]

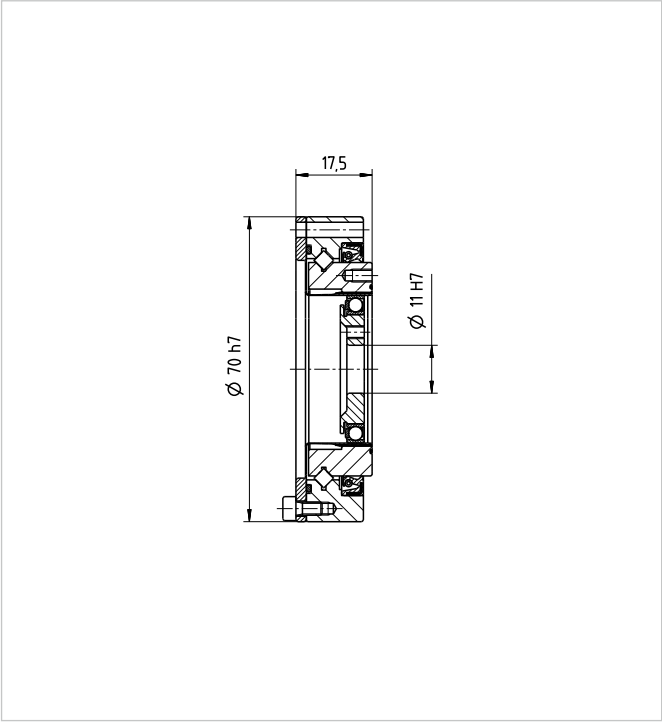


Illustration 211.2

SHD-17-2SH [mm]

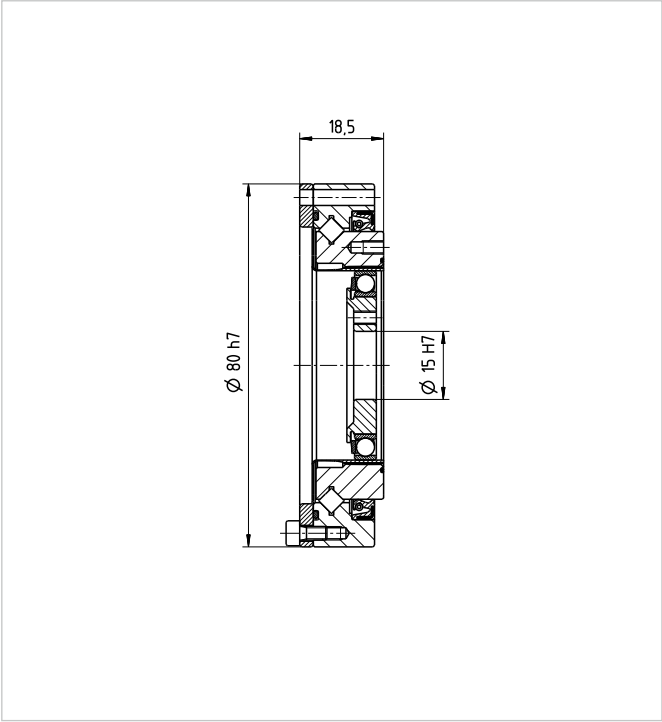


Illustration 211.3

SHD-20-2SH [mm]

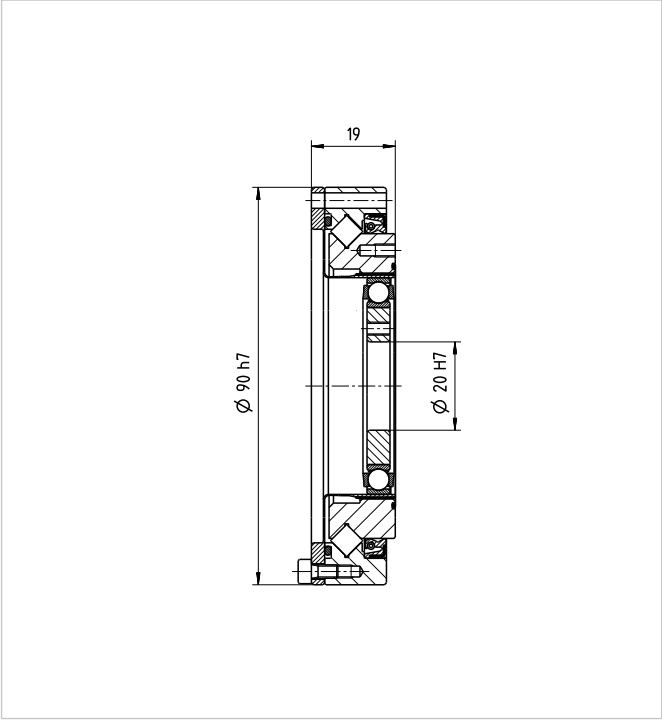
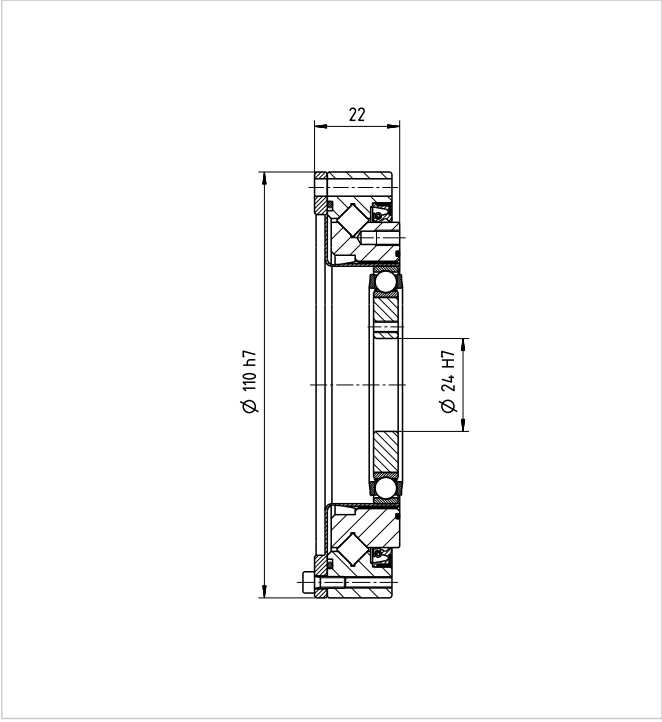


Illustration 211.4

SHD-25-2SH [mm]



Technical data

Table 212.1

	Unit	SHD-32-2SH			SHD-40-2SH		
Ratio	i []	50	100	160	50	100	160
Repeatable peak torque	T _R [Nm]	151	233	261	281	398	453
Average torque	T _A [Nm]	75	151	151	137	260	316
Rated torque	T _N [Nm]	53	96	96	96	185	206
Momentary peak torque	T _M [Nm]	268	420	445	480	700	765
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800			4000		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3000		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	1.09			2.85		
Weight	m [kg]	1.87			3.09		
Maximum hollow shaft diameter	d _{H (max)} [mm]	32			40		
Transmission accuracy	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	84	110		150	200	
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	7770			8790		
Dynamic axial load	F _{A dyn (max)} [N]	11600			13120		
Dynamic tilting moment	M _{dyn (max)} [Nm]	290			424		

Illustration 213.1

SHD-32-2SH [mm]

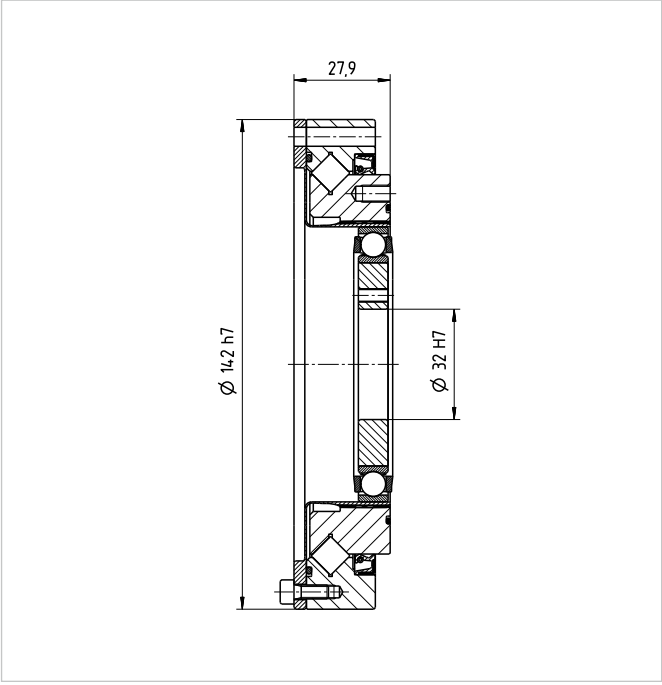
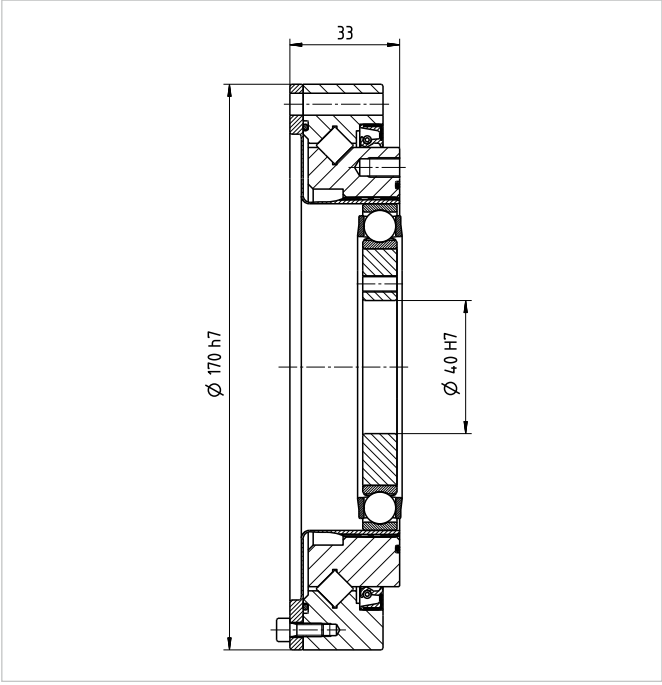
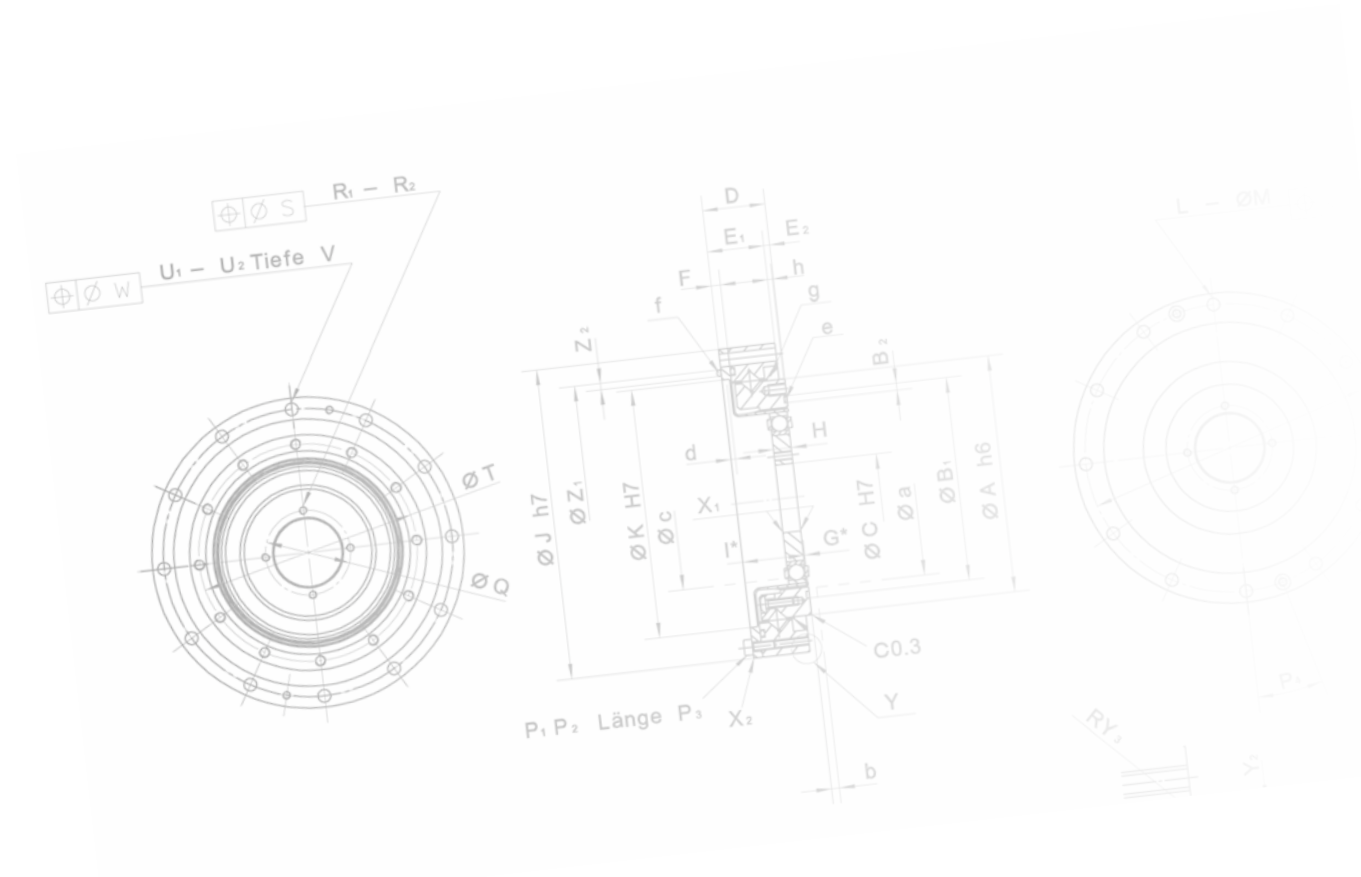


Illustration 213.2

SHD-40-2SH [mm]



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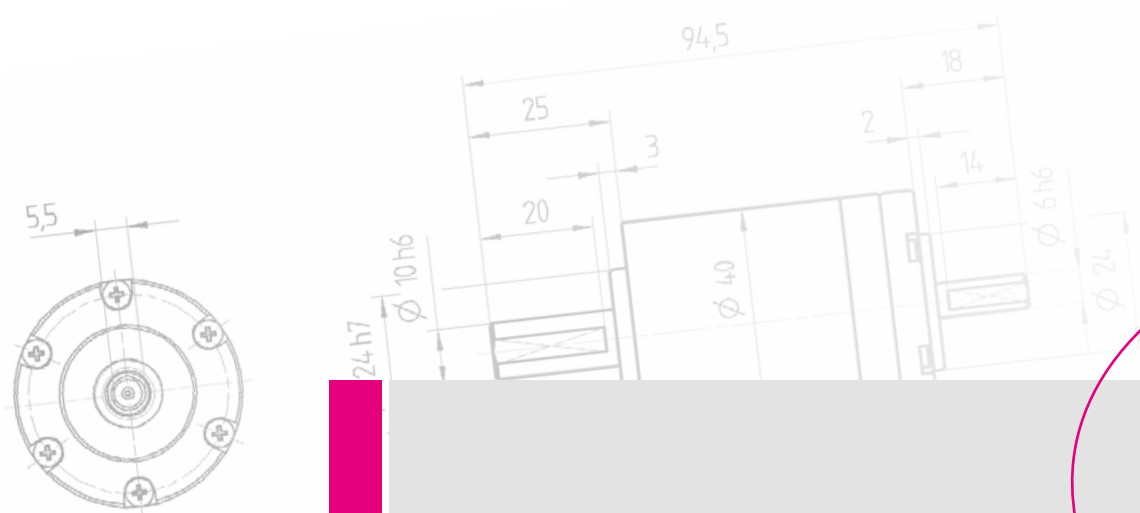
Small, economical gearbox

PMG Series Gearboxes are available in four sizes with gear ratios of 50, 72, 80, 88, 100 and 110:1 offering repeatable peak torques from 0.3 to 14.7 Nm.

Harmonic Drive® Gearboxes combine the precision Harmonic Drive® Component Sets consisting of three components – Circular Spine, Flexspline and Wave Generator – and integral high load capacity, tilt resistant output bearings. The Gearboxes housing is also extremely robust and protected against corrosion.

The PMG Series is available in two versions: the PMG-M Gearbox with input hub for motor adaptation and the PMG-S Gearbox with input shaft. Both variants come with an output shaft.

If required, the Gearboxes can be tailored to your application and can be easily mounted direct to standard servo motors. Zero backlash means short cycle times and high accuracy.



Features

- Direct motor connection
- Easy to customise
- High dynamics
- Corrosion protection

Optimised for your applications:

- Simple design solution
- Reduced material use
- Easy integration
- Increased machine throughput
- Increased productivity
- Reduced Total Cost of Ownership
- High availability

Customer Benefits



Ordering code

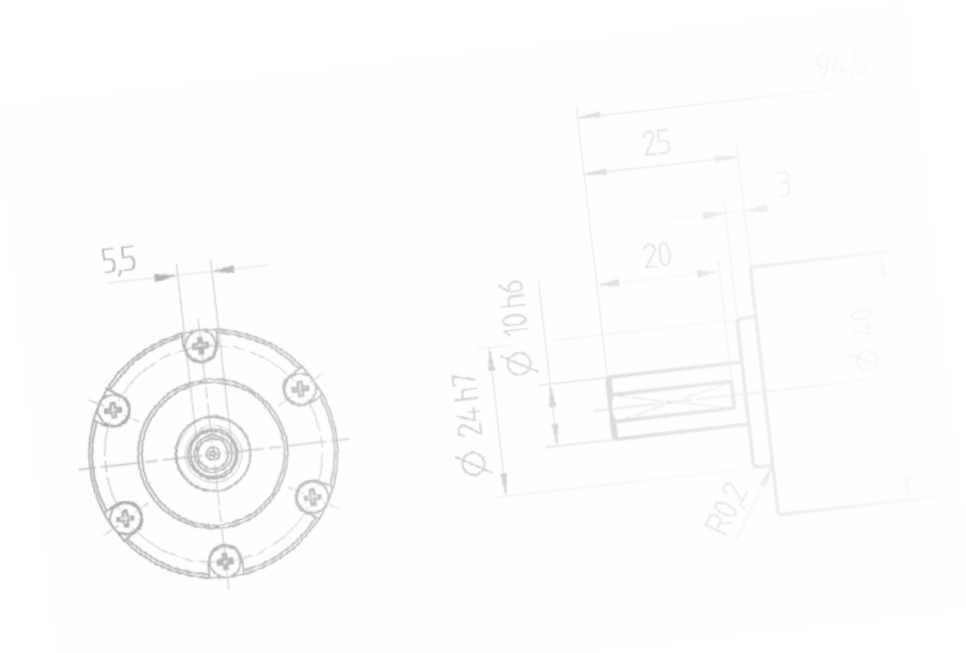
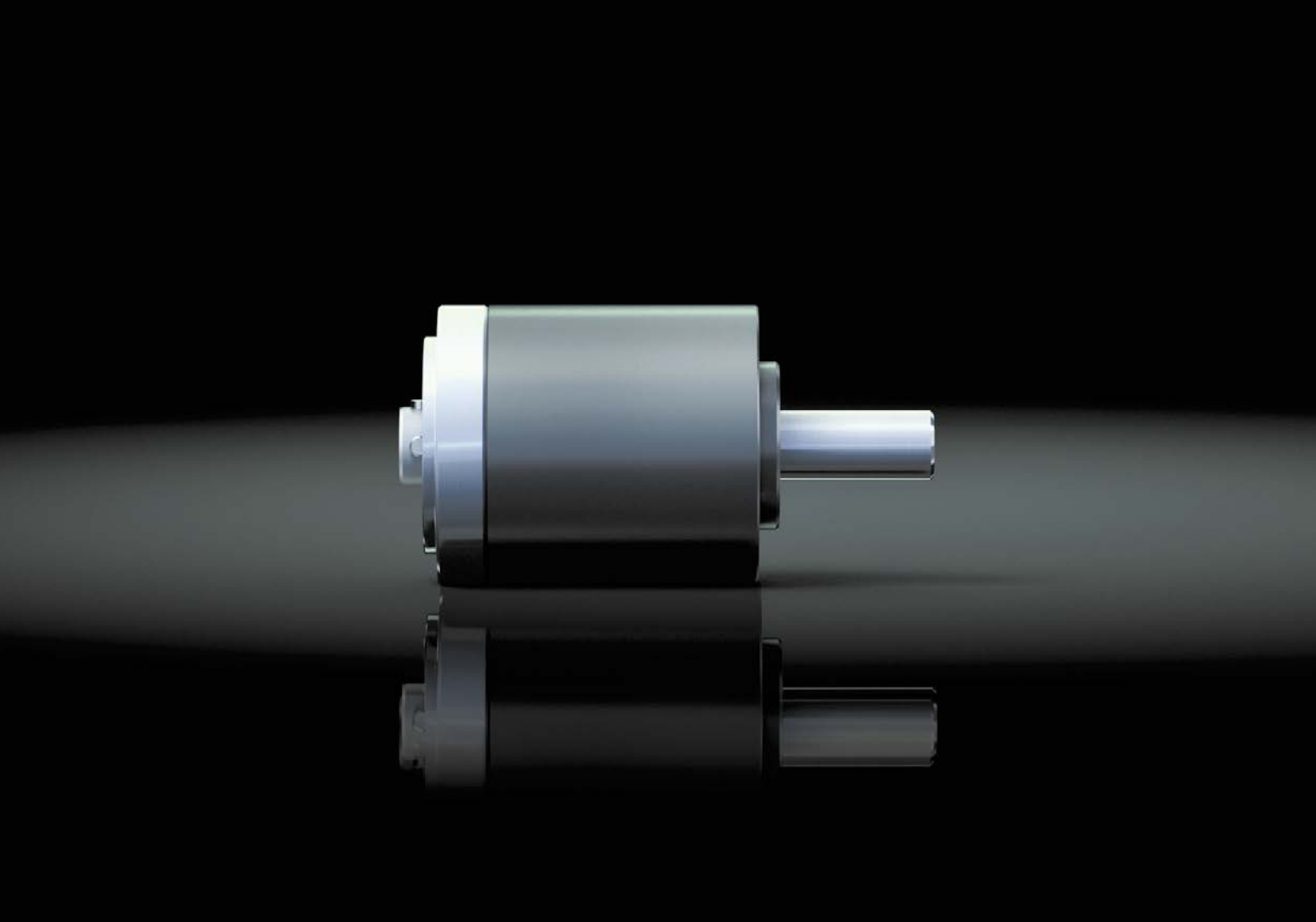
Table 216.1

Series	Size	Ratio						Version	Special design
PMG	5A	50		80		100		M S	According to customer requirements
	8A	50	72			100			
	11A	50	72			100			
	14A	50	72		88	100	110		
Ordering code									
PMG	-	8A	-	100	-	M	-	SP	

Table 216.2

Version	
Ordering code	Description
M	Close coupled model for motor adaptation
S	With input shaft

Clarification of the technical data can be found in the Glossary



Technical data

Table 218.1

	Unit	PMG-5A-M			PMG-8A-M		
Ratio	i []	50	80	100	50	72	100
Repeatable peak torque	T _R [Nm]	0.3	0.45	0.55	1.9	2.4	2.7
Average torque	T _A [Nm]	0.3	0.45	0.55	1.9	2.3	2.7
Rated torque	T _N [Nm]	0.2	0.3	0.3	1.5	2.0	2.0
Momentary peak torque	T _M [Nm]	0.4	0.6	0.7	2.5	3.1	3.8
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	10000			6000		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	4900			3500		
Moment of inertia	J _{in} [x10 ⁻⁸ kgm ²]	2.5			30		
Weight	m [kg]	0.030			0.120		
Transmission accuracy	[arcmin]	< 4.5			< 3		
Repeatability	[arcmin]	< ±1.5			< ±1		
Lost Motion	[arcmin]	< 4			< 1		
Torsional stiffness	K ₃ [Nm/rad]	55	100		389	690	
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	59			196		
Dynamic axial load	F _{A dyn (max)} [N]	29			98		
Dynamic tilting moment	M _{dyn (max)} [Nm]	0.3			1.96		

Table 218.2

	Unit	PMG-5A-S			PMG-8A-S		
Ratio	i []	50	80	100	50	72	100
Repeatable peak torque	T _R [Nm]	0.3	0.45	0.55	1.9	2.4	2.7
Average torque	T _A [Nm]	0.3	0.45	0.55	1.9	2.3	2.7
Rated torque	T _N [Nm]	0.2	0.3	0.3	1.5	2.0	2.0
Momentary peak torque	T _M [Nm]	0.4	0.6	0.7	2.5	3.1	3.8
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	10000			6000		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	4900			3500		
Moment of inertia	J _{in} [x10 ⁻⁸ kgm ²]	2.5			30		
Weight	m [kg]	0.031			0.125		
Transmission accuracy	[arcmin]	< 4.5			< 3		
Repeatability	[arcmin]	< ±1.5			< ±1		
Lost Motion	[arcmin]	< 4			< 1		
Torsional stiffness	K ₃ [Nm/rad]	55	100		389	690	
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	59			196		
Dynamic axial load	F _{A dyn (max)} [N]	29			98		
Dynamic tilting moment	M _{dyn (max)} [Nm]	0.3			1.96		

Illustration 219.1

PMG-5A-M [mm]

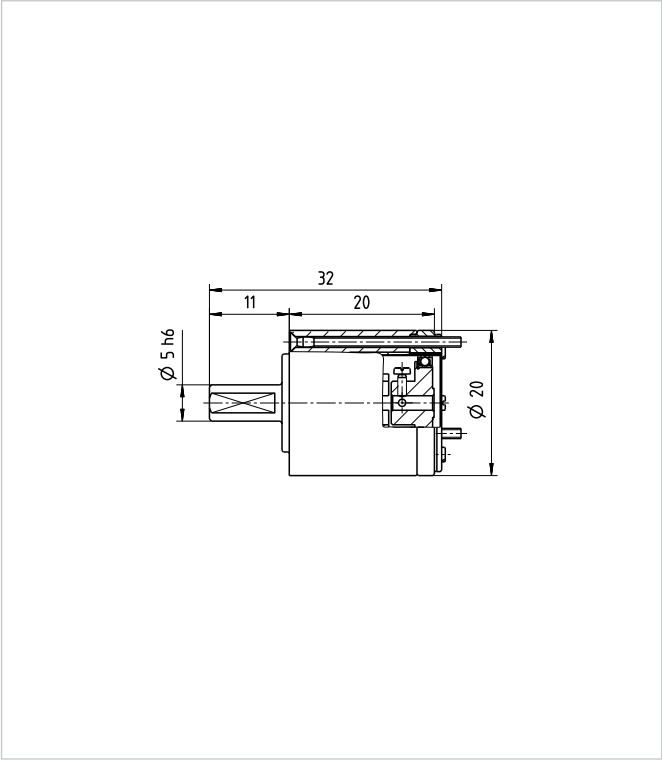


Illustration 219.2

PMG-8A-M [mm]

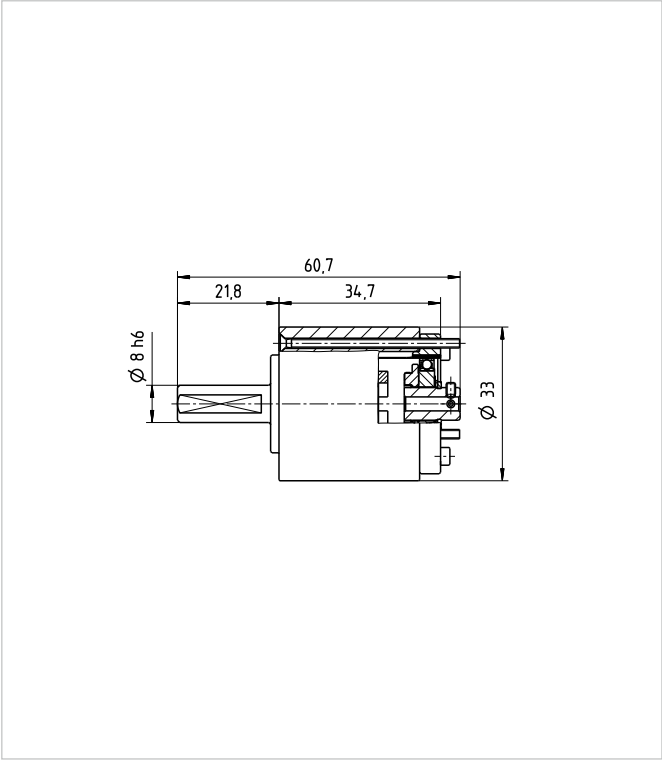


Illustration 219.3

PMG-5A-S [mm]

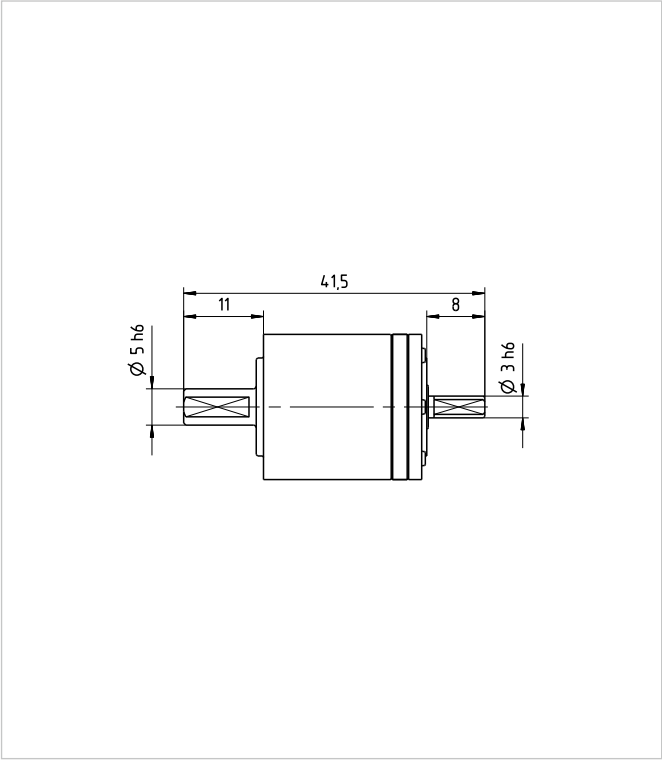
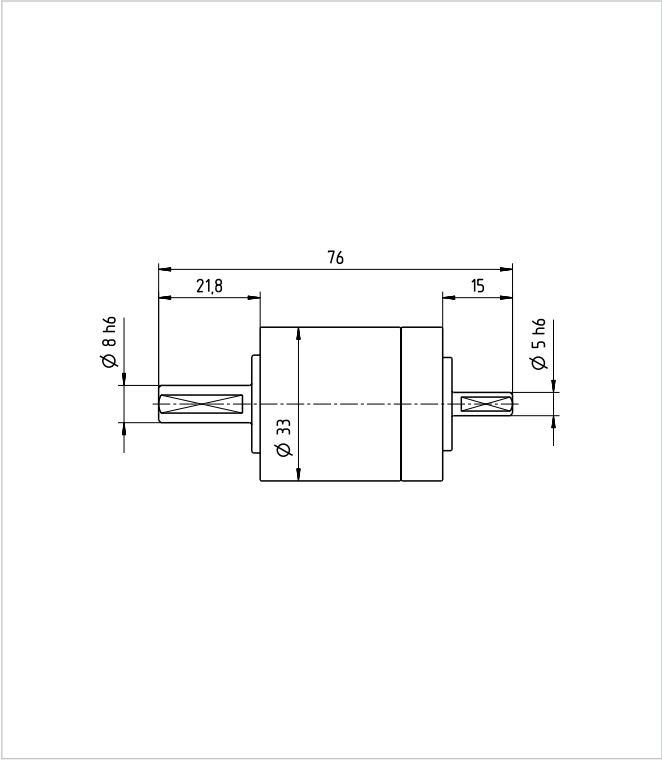


Illustration 219.4

PMG-8A-S [mm]



Technical data

Table 220.1

	Unit	PMG-11A-M			PMG-14A-M				
Ratio	i []	50	72	100	50	72	88	100	110
Repeatable peak torque	T _R [Nm]	5.0	5.6	7.9	9.8	11.8	12.7	14.7	14.7
Average torque	T _A [Nm]	4.7	5.4	7.6	7.0	9.0	11	11	11
Rated torque	T _N [Nm]	2.5	4.0	4.0	5.4	7.8	7.8	7.8	7.8
Momentary peak torque	T _M [Nm]	6.8	8.8	10.8	14	16	18	20	20
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	5000			5000				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500				
Moment of inertia	J _{in} [x10 ⁻⁸ kgm ²]	120			330				
Weight	m [kg]	0.25			0.42				
Transmission accuracy	[arcmin]	< 2.0			< 2.0				
Repeatability	[arcmin]	< ±1.0			< ±1.0				
Lost Motion	[arcmin]	< 1.0			< 1.0				
Torsional stiffness	K ₃ [Nm/rad]	1160	1400		2250	4270			
Ambient operating temperature	[°C]	0 ... 60			0 ... 60				
Output bearing									
Dynamic radial load	F _{R dyn (max)} [N]	245			392				
Dynamic axial load	F _{A dyn (max)} [N]	196			392				
Dynamic tilting moment	M _{dyn (max)} [Nm]	2.7			4.9				

Table 220.2

	Unit	PMG-11A-S			PMG-14A-S				
Ratio	i []	50	72	100	50	72	88	100	110
Repeatable peak torque	T _R [Nm]	5.0	5.6	7.9	9.8	11.8	12.7	14.7	14.7
Average torque	T _A [Nm]	4.7	5.4	7.6	7.0	9.0	11	11	11
Rated torque	T _N [Nm]	2.5	4.0	4.0	5.4	7.8	7.8	7.8	7.8
Momentary peak torque	T _M [Nm]	6.8	8.8	10.8	14	16	18	20	20
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	5000			5000				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500				
Moment of inertia	J _{in} [x10 ⁻⁸ kgm ²]	140			340				
Weight	m [kg]	0.27			0.495				
Transmission accuracy	[arcmin]	< 2.0			< 2.0				
Repeatability	[arcmin]	< ±1.0			< ±1.0				
Lost Motion	[arcmin]	< 1.0			< 1.0				
Torsional stiffness	K ₃ [Nm/rad]	1160	1400		2250	4270			
Ambient operating temperature	[°C]	0 ... 60			0 ... 60				
Output bearing									
Dynamic radial load	F _{R dyn (max)} [N]	245			392				
Dynamic axial load	F _{A dyn (max)} [N]	196			392				
Dynamic tilting moment	M _{dyn (max)} [Nm]	2.7			4.9				

Illustration 221.1 PMG-11A-M [mm]

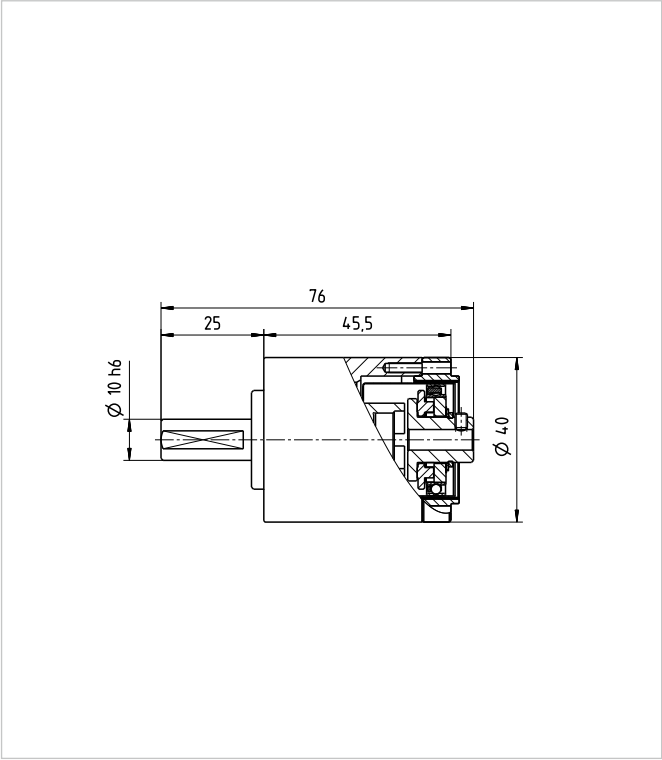


Illustration 221.2 PMG-14A-M [mm]

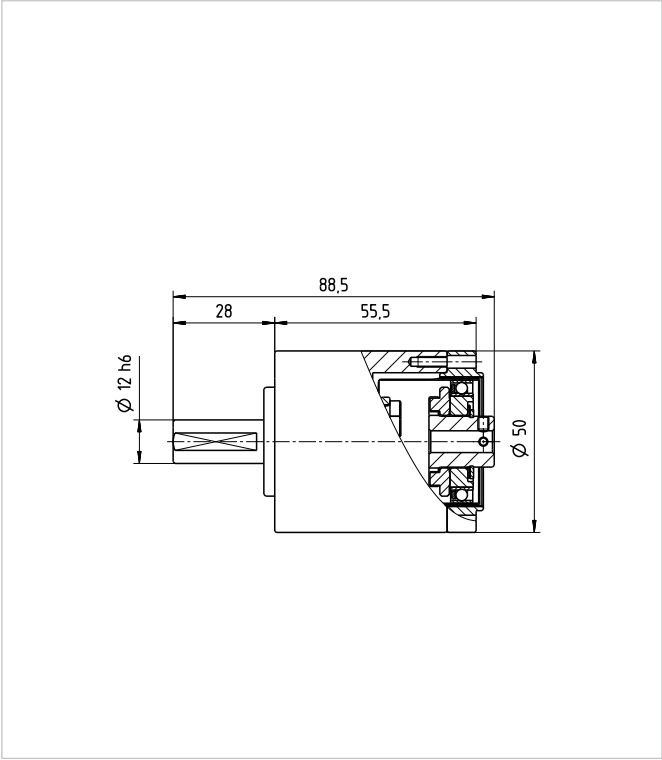


Illustration 221.3 PMG-11A-S [mm]

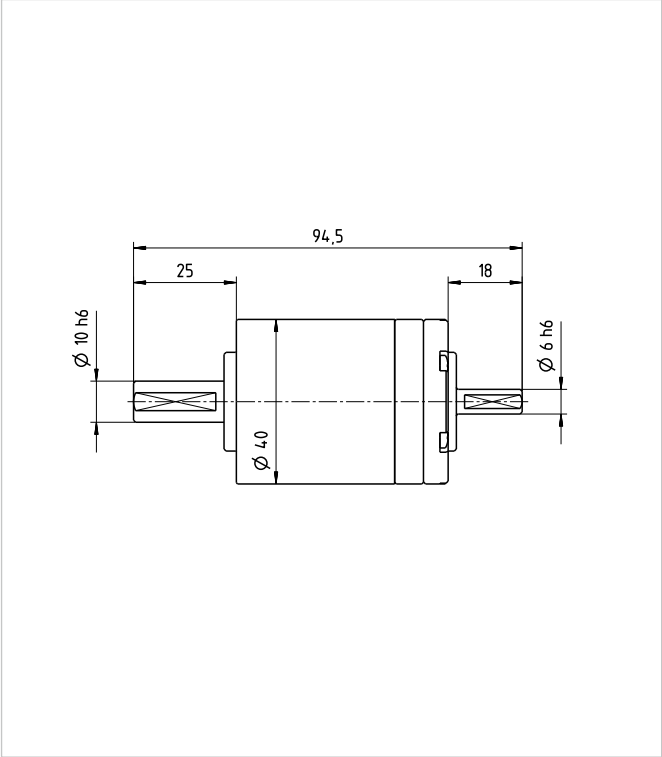
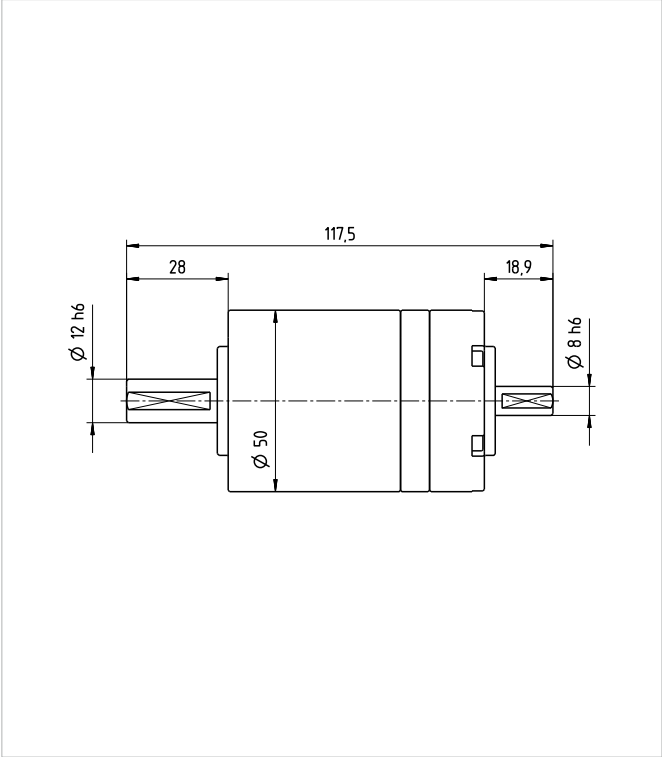


Illustration 221.4 PMG-14A-S [mm]

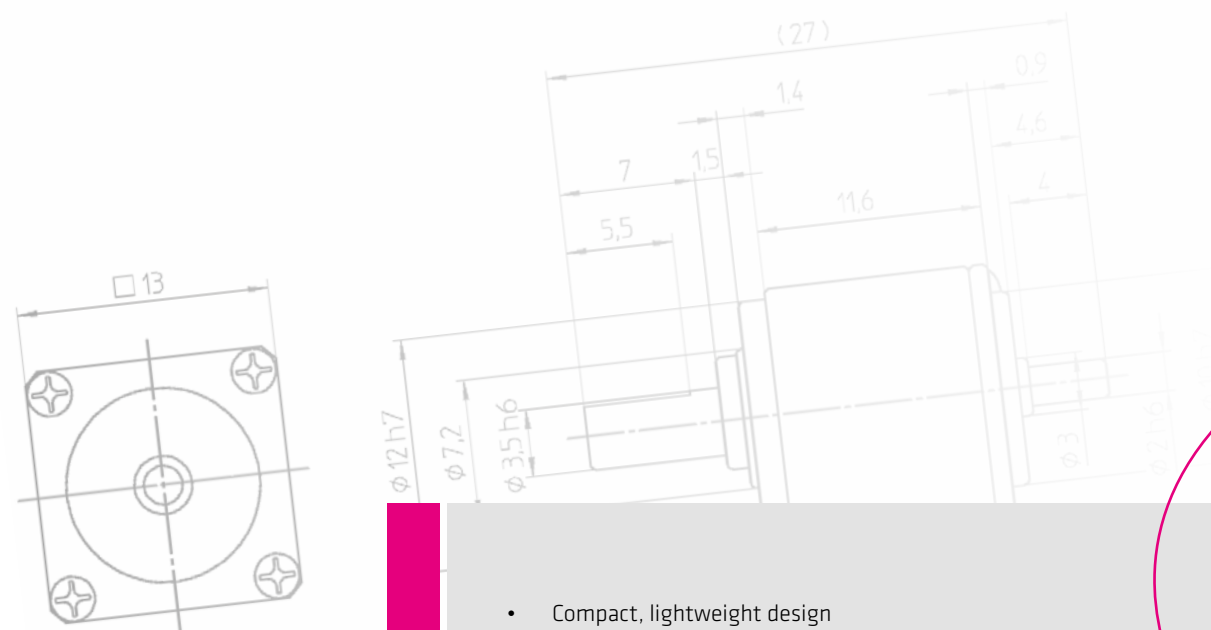


Small lightweight gearbox

CSF Series Gearboxes are available in five sizes with gear ratios of 30, 50, 80 and 100:1 offering repeatable peak torques from 0.09 to 28 Nm. The precision output bearing with high tilting rigidity enables the direct introduction of high payloads without further support and thus permits simple and space saving designs.

Harmonic Drive® Gearboxes combine the precision Harmonic Drive® Component Sets consisting of three components – Circular Spine, Flexspline and Wave Generator – and integral high load capacity, tilt resistant output bearings. The Gearboxes housing is also extremely robust.

The CSF Series is available in numerous combinations: with a choice of input shaft or input hub, output shaft or output flange, or a broad or flat mounting flange. The CSF Series is characterised by its very short length and low weight. Standard servo motors can be attached in a compact manner. Gearbox and motor together form a compact and lightweight system capable of withstanding high loads. Due to the positioning accuracy stable machine characteristics and short cycle times are guaranteed.



Features

- Compact, lightweight design
- Direct motor connection
- Excellent lifetime precision
- High dynamics
- Integrated high capacity output bearing

Optimised for your applications:

- Reduced material use
- Greater energy efficiency
- Lower production costs
- Small machine footprint
- Simple design solution
- Reduced diversity of components
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Increased machine throughput
- Increased productivity

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/2100

CSF Mini

Ordering code

Table 224.1

Series	Size	Ratio				Version	Special design	
CSF	3B	30	50		100	1U 1U-CC	According to customer requirements	
	5	30	50		100	1U 1U-CC 2XH-J 1U-F 1U-CC-F 2XH-F		
	8	30	50		100			
	11	30	50		100			
	14	30	50	80	100			
Ordering code								
CSF	-	5	-	100	-	1U-CC-F	-	SP

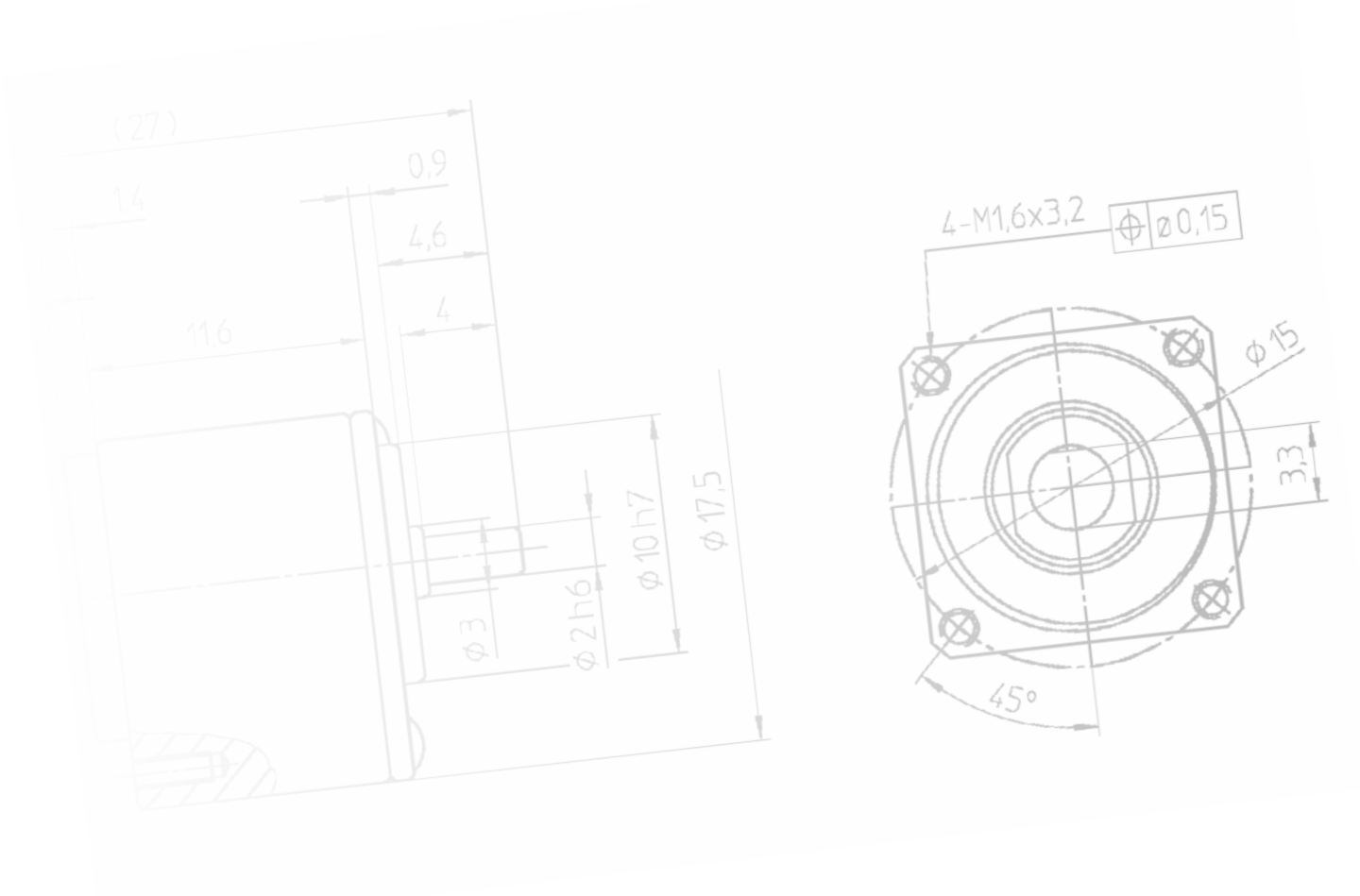
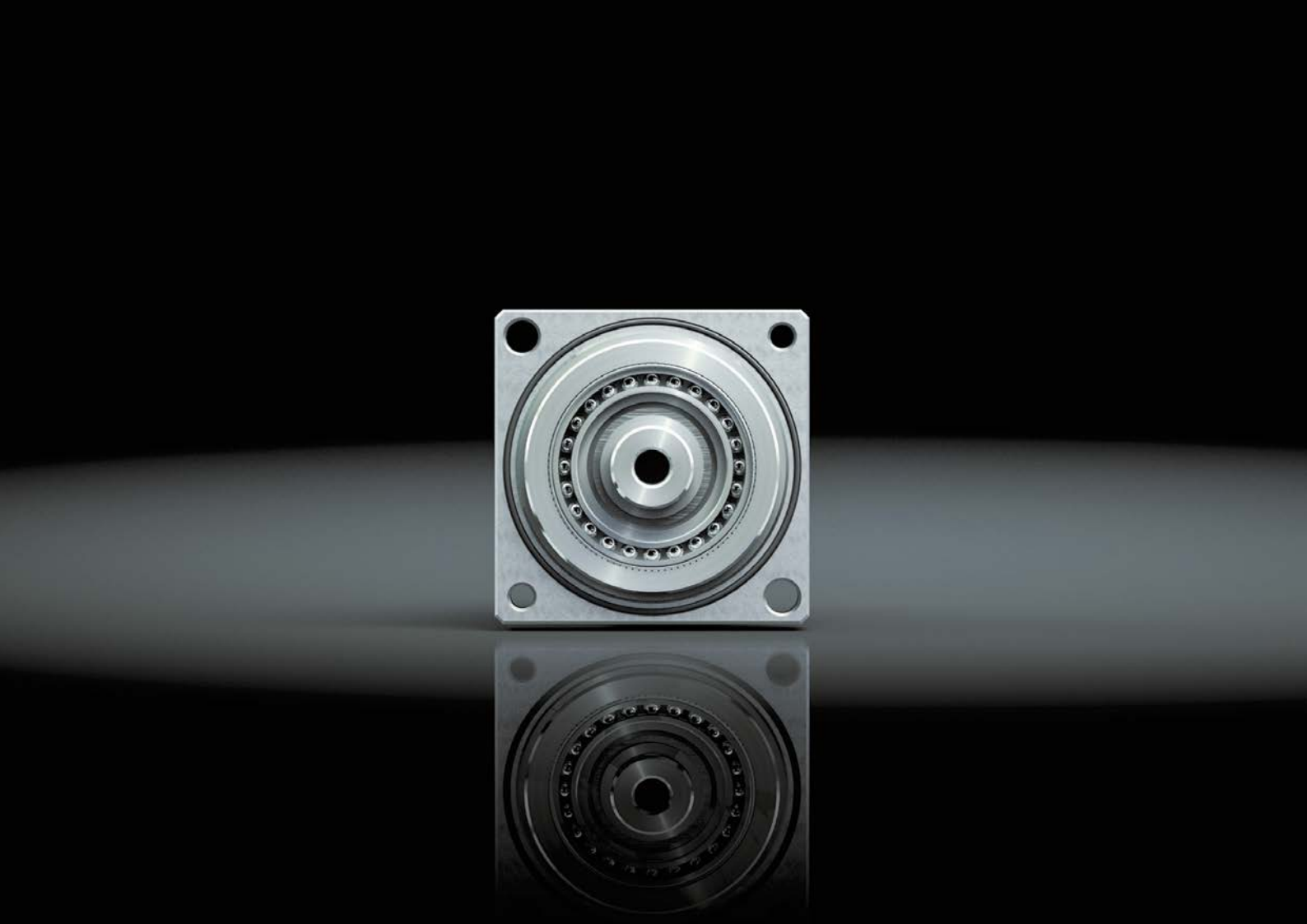


Table 224.2

Version		
Ordering code	Description	
1U	Output shaft, input shaft, broad mounting flange	
1U-CC	Output shaft, input hub, broad mounting flange	
2XH-J	Output shaft, input hub, flat mounting flange	
1U-F	Output flange, input shaft, broad mounting flange	
1U-CC-F	Output flange, input hub, broad mounting flange	
2XH-F	Output flange, input hub, flat mounting flange	



Technical data

Table 226.1

	Unit	CSF-3B-1U			CSF-3B-1U-CC		
Ratio	i []	30	50	100	30	50	100
Repeatable peak torque	T _R [Nm]	0.09	0.15	0.21	0.09	0.15	0.21
Average torque	T _A [Nm]	0.07	0.09	0.16	0.07	0.09	0.16
Rated torque	T _N [Nm]	0.04	0.08	0.11	0.04	0.08	0.11
Momentary peak torque	T _M [Nm]	0.15	0.29	0.4	0.15	0.29	0.4
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	10000			10000		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	6500			6500		
Moment of inertia	J _{in} [x10 ⁻⁸ kgm ²]	0.0053			0.007		
Weight	m [g]	13.7			11.4		
Transmission accuracy	[arcmin]	< 10			< 10		
Torsional stiffness	K ₃ [Nm/rad]	51	57	67	51	57	67
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	36			36		
Dynamic axial load	F _{A dyn (max)} [N]	130			130		
Dynamic tilting moment	M _{dyn (max)} [Nm]	0.27			0.27		

Table 226.2

	Unit	CSF-5-1U			CSF-5-1U-CC		
Ratio	i []	30	50	100	30	50	100
Repeatable peak torque	T _R [Nm]	0.5	0.9	1.4	0.5	0.9	1.4
Average torque	T _A [Nm]	0.38	0.43	0.94	0.38	0.43	0.94
Rated torque	T _N [Nm]	0.25	0.40	0.60	0.25	0.40	0.60
Momentary peak torque	T _M [Nm]	0.9	1.8	2.7	0.9	1.8	2.7
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	10000			10000		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	6500			6500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	2.5			2.5		
Weight	m [g]	35			27		
Transmission accuracy	[arcmin]	< 4	< 3		< 4	< 3	
Torsional stiffness	K ₃ [Nm/rad]	120	170	200	120	170	200
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	90			90		
Dynamic axial load	F _{A dyn (max)} [N]	270			270		
Dynamic tilting moment	M _{dyn (max)} [Nm]	0.89			0.89		

Illustration 227.1

CSF-3B-1U [mm]

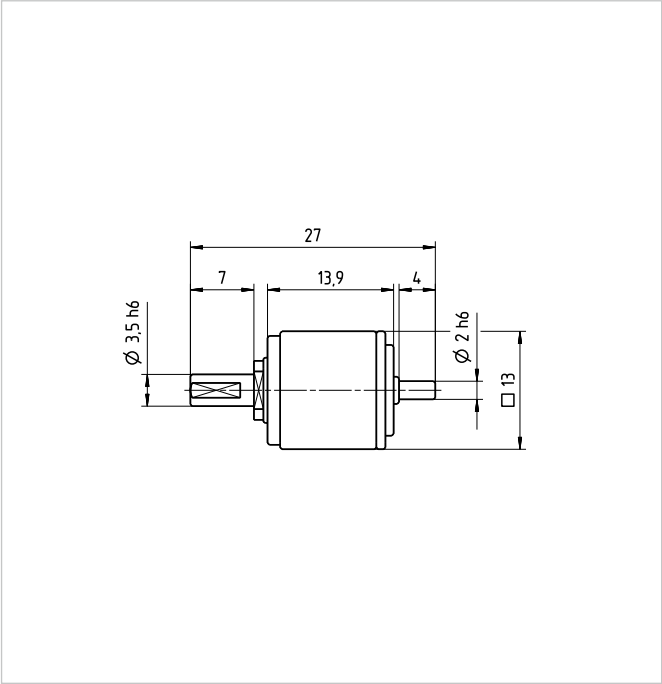


Illustration 227.2

CSF-3B-1U-CC [mm]

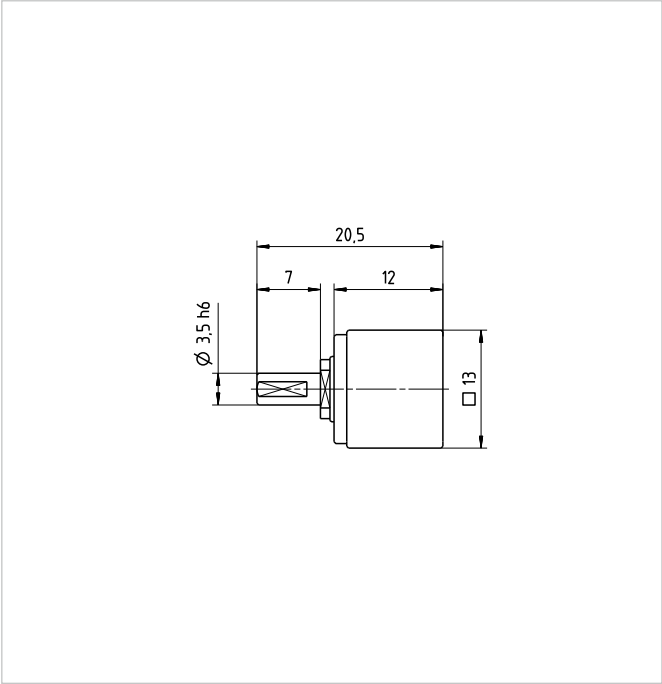


Illustration 227.3

CSF-5-1U [mm]

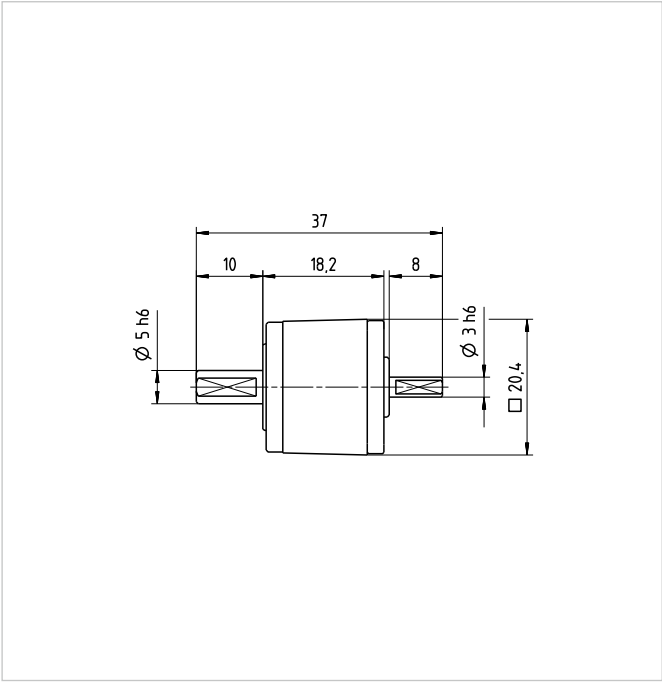
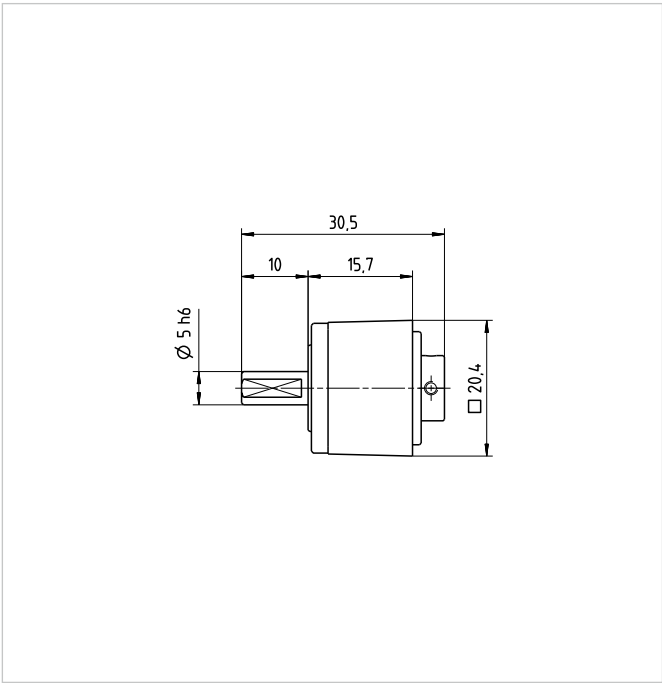


Illustration 227.4

CSF-5-1U-CC [mm]



Technical data

Table 228.1

	Unit	CSF-5-2XH-J			CSF-5-1U-F		
Ratio	i []	30	50	100	30	50	100
Repeatable peak torque	T _R [Nm]	0.5	0.9	1.4	0.5	0.9	1.4
Average torque	T _A [Nm]	0.38	0.43	0.94	0.38	0.43	0.94
Rated torque	T _N [Nm]	0.25	0.40	0.60	0.25	0.40	0.60
Momentary peak torque	T _M [Nm]	0.9	1.8	2.7	0.9	1.8	2.7
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	10000			10000		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	6500			6500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	2.5			2.5		
Weight	m [g]	27			34		
Transmission accuracy	[arcmin]	< 4	< 3		< 4	< 3	
Torsional stiffness	K ₃ [Nm/rad]	120	170	200	160	250	300
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	90			90		
Dynamic axial load	F _{A dyn (max)} [N]	270			270		
Dynamic tilting moment	M _{dyn (max)} [Nm]	0.89			0.89		

Table 228.2

	Unit	CSF-5-1U-CC-F			CSF-5-2XH-F		
Ratio	i []	30	50	100	30	50	100
Repeatable peak torque	T _R [Nm]	0.5	0.9	1.4	0.5	0.9	1.4
Average torque	T _A [Nm]	0.38	0.43	0.94	0.38	0.53	0.94
Rated torque	T _N [Nm]	0.25	0.40	0.60	0.25	0.40	0.60
Momentary peak torque	T _M [Nm]	0.9	1.8	2.7	0.9	1.8	2.7
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	10000			10000		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	6500			6500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	2.5			2.5		
Weight	m [g]	25			25		
Transmission accuracy	[arcmin]	< 4	< 3		< 4	< 3	
Torsional stiffness	K ₃ [Nm/rad]	160	250	300	160	250	300
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	90			90		
Dynamic axial load	F _{A dyn (max)} [N]	270			270		
Dynamic tilting moment	M _{dyn (max)} [Nm]	0.89			0.89		

Illustration 229.1

CSF-5-2XH-J [mm]

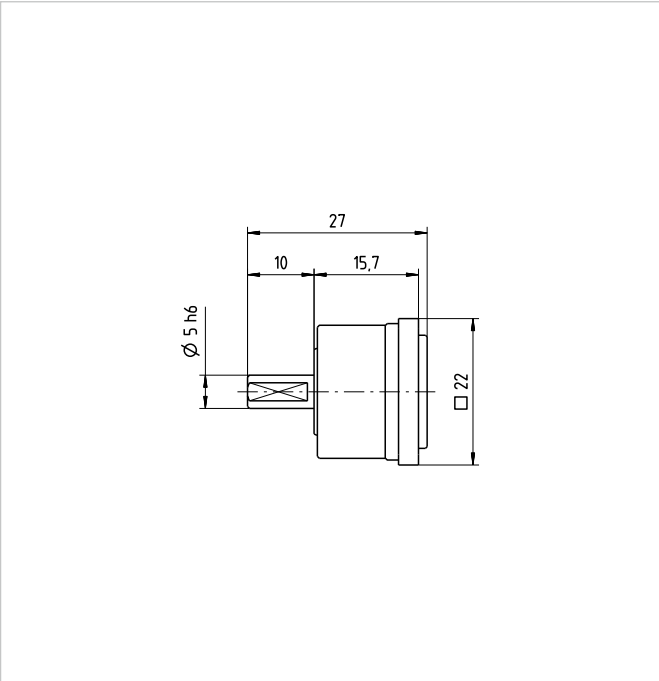


Illustration 229.2

CSF-5-1U-F [mm]

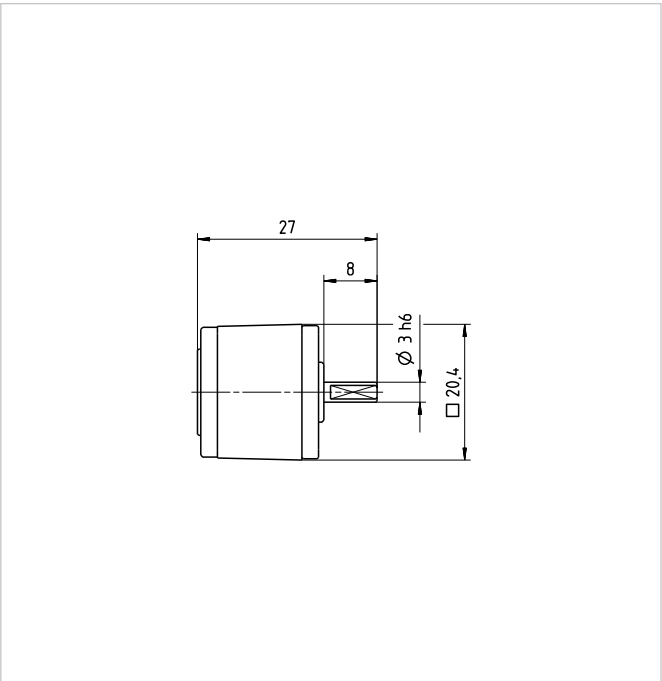


Illustration 229.3

CSF-5-1U-CC-F [mm]

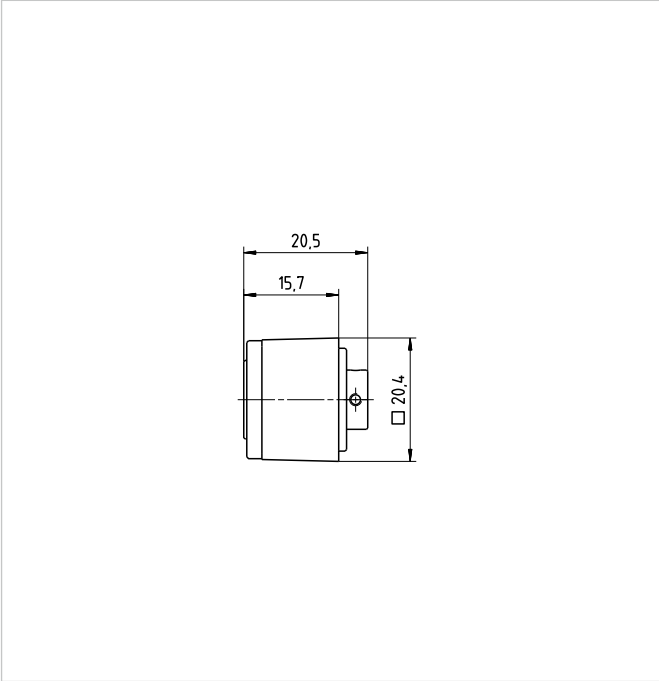
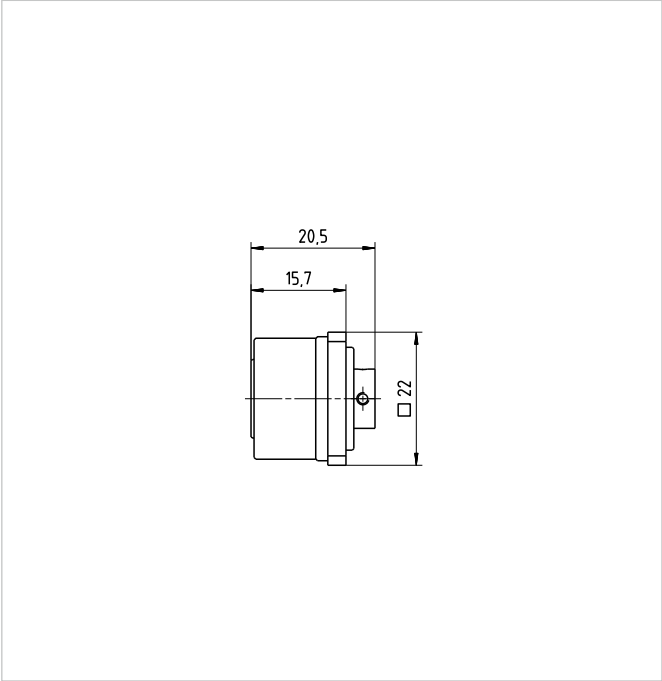


Illustration 229.4

CSF-5-2XH-F [mm]



Technical data

Table 230.1

	Unit	CSF-8-1U			CSF-8-1U-CC		
Ratio	i []	30	50	100	30	50	100
Repeatable peak torque	T _R [Nm]	1.8	3.3	4.8	1.8	3.3	4.8
Average torque	T _A [Nm]	1.4	2.3	3.3	1.4	2.3	3.3
Rated torque	T _N [Nm]	0.90	1.8	2.4	0.90	1.8	2.4
Momentary peak torque	T _M [Nm]	3.3	6.6	9.0	3.3	6.6	9.0
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			8500		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	30			32		
Weight	m [g]	130			111		
Transmission accuracy	[arcmin]	< 2			< 2		
Torsional stiffness	K ₃ [Nm/rad]	460	670	890	460	670	890
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	200			200		
Dynamic axial load	F _{A dyn (max)} [N]	630			630		
Dynamic tilting moment	M _{dyn (max)} [Nm]	3.46			3.46		

Table 230.2

	Unit	CSF-8-2XH-J			CSF-8-1U-F		
Ratio	i []	30	50	100	30	50	100
Repeatable peak torque	T _R [Nm]	1.8	3.3	4.8	1.8	3.3	4.8
Average torque	T _A [Nm]	1.4	2.3	3.3	1.4	2.3	3.3
Rated torque	T _N [Nm]	0.90	1.8	2.4	0.90	1.8	2.4
Momentary peak torque	T _M [Nm]	3.3	6.6	9.0	3.3	6.6	9.0
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			8500		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	32			30		
Weight	m [g]	111			120		
Transmission accuracy	[arcmin]	< 2			< 2		
Torsional stiffness	K ₃ [Nm/rad]	460	670	890	540	840	1200
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	200			200		
Dynamic axial load	F _{A dyn (max)} [N]	630			630		
Dynamic tilting moment	M _{dyn (max)} [Nm]	3.46			3.46		

Illustration 231.1

CSF-8-1U [mm]

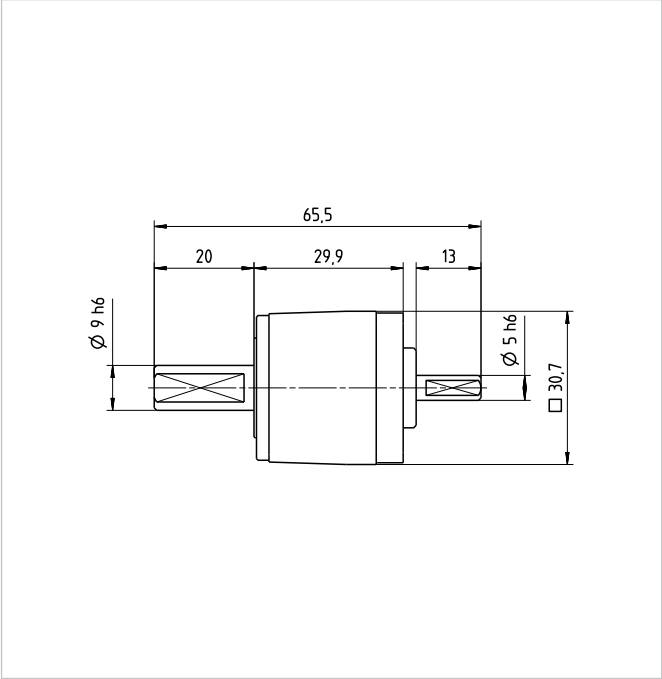


Illustration 231.2

CSF-8-1U-CC [mm]

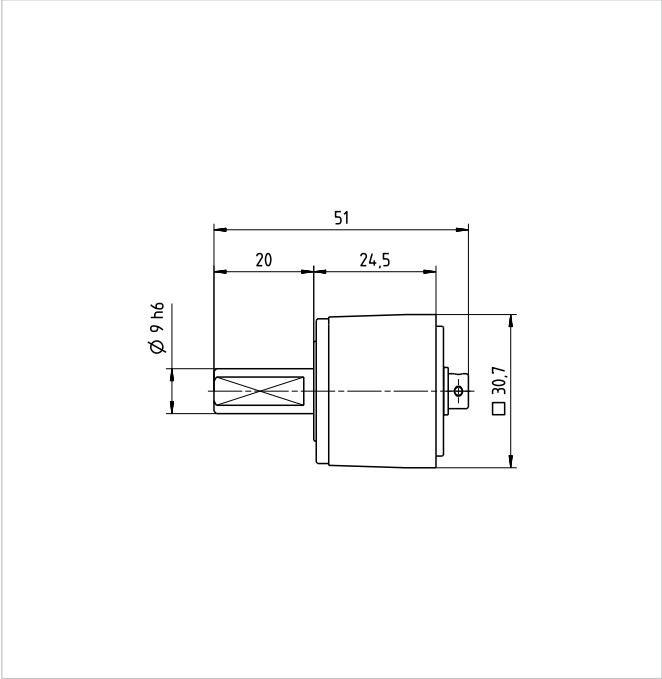


Illustration 231.3

CSF-8-2XH-J [mm]

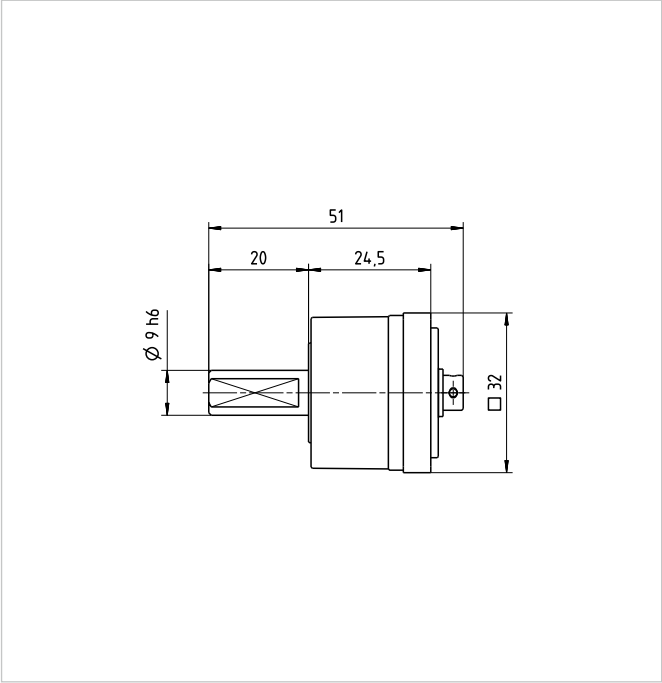
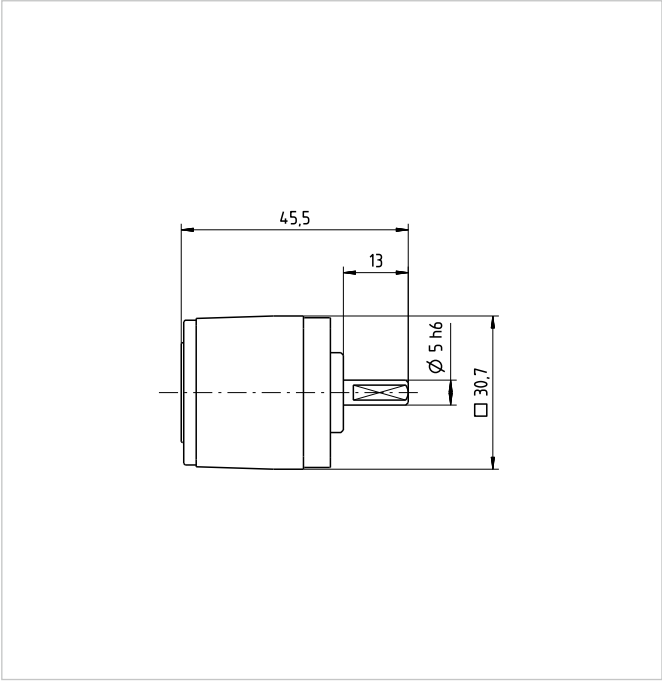


Illustration 231.4

CSF-8-1U-F [mm]



Technical data

Table 232.1

	Unit	CSF-8-1U-CC-F			CSF-8-2XH-F		
Ratio	i []	30	50	100	30	50	100
Repeatable peak torque	T _R [Nm]	1.8	3.3	4.8	1.8	3.3	4.8
Average torque	T _A [Nm]	1.4	2.3	3.3	1.4	2.3	3.3
Rated torque	T _N [Nm]	0.90	1.8	2.4	0.90	1.8	2.4
Momentary peak torque	T _M [Nm]	3.3	6.6	9.0	3.3	6.6	9.0
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			8500		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	32			32		
Weight	m [g]	100			100		
Transmission accuracy	[arcmin]	< 2			< 2		
Torsional stiffness	K ₃ [Nm/rad]	540	840	1200	540	840	1200
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	200			200		
Dynamic axial load	F _{A dyn (max)} [N]	630			630		
Dynamic tilting moment	M _{dyn (max)} [Nm]	3.46			3.46		

Table 232.2

	Unit	CSF-11-1U			CSF-11-1U-CC		
Ratio	i []	30	50	100	30	50	100
Repeatable peak torque	T _R [Nm]	4.5	8.3	11	4.5	8.3	11
Average torque	T _A [Nm]	3.4	5.5	8.9	3.4	5.5	8.9
Rated torque	T _N [Nm]	2.2	3.5	5.0	2.2	3.5	5.0
Momentary peak torque	T _M [Nm]	8.5	17	25	8.5	17	25
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			8500		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	120			140		
Weight	m [g]	240			176		
Transmission accuracy	[arcmin]	< 2	< 1.5		< 2	< 1.5	
Torsional stiffness	K ₃ [Nm/rad]	1340	2360	2910	1340	2360	2910
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	300			300		
Dynamic axial load	F _{A dyn (max)} [N]	1150			1150		
Dynamic tilting moment	M _{dyn (max)} [Nm]	6.6			6.6		

Illustration 233.1

CSF-8-1U-CC-F [mm]

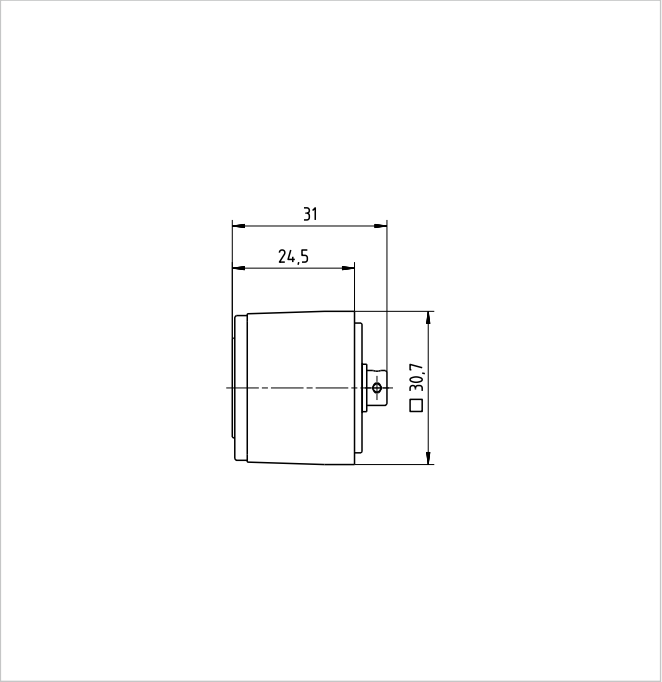


Illustration 233.2

CSF-8-2XH-F [mm]

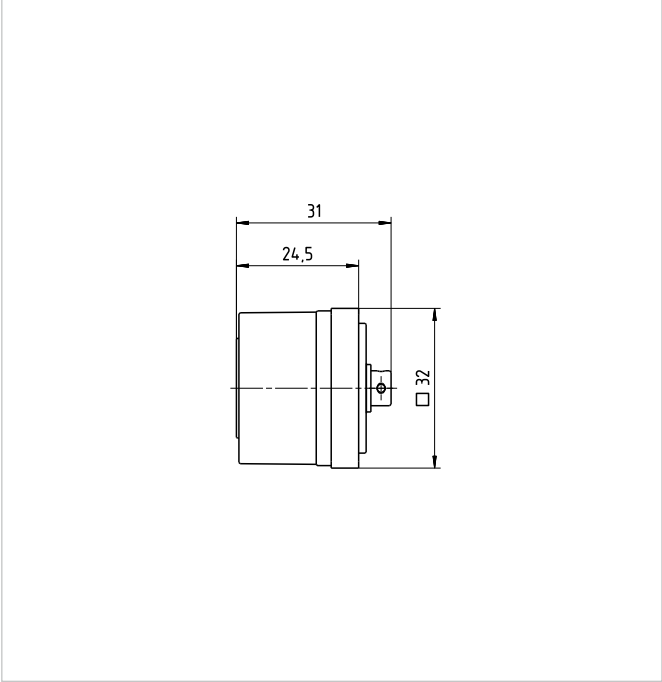


Illustration 233.3

CSF-11-1U [mm]

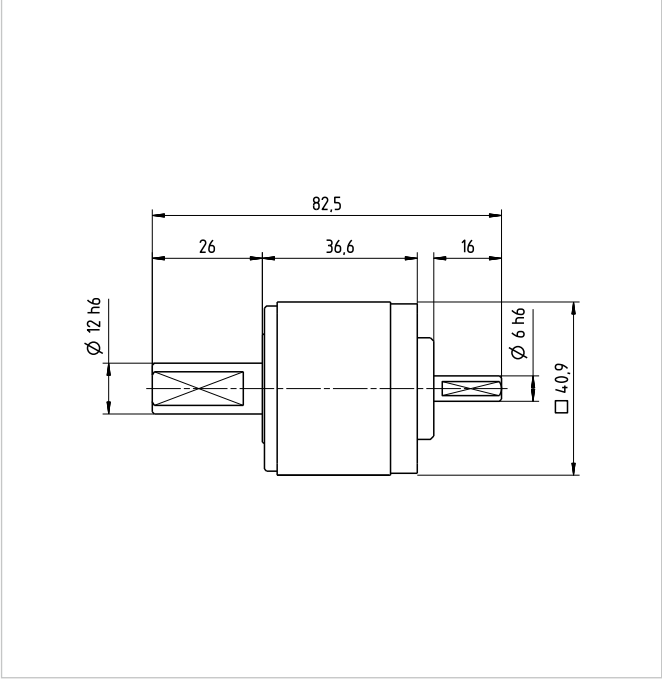
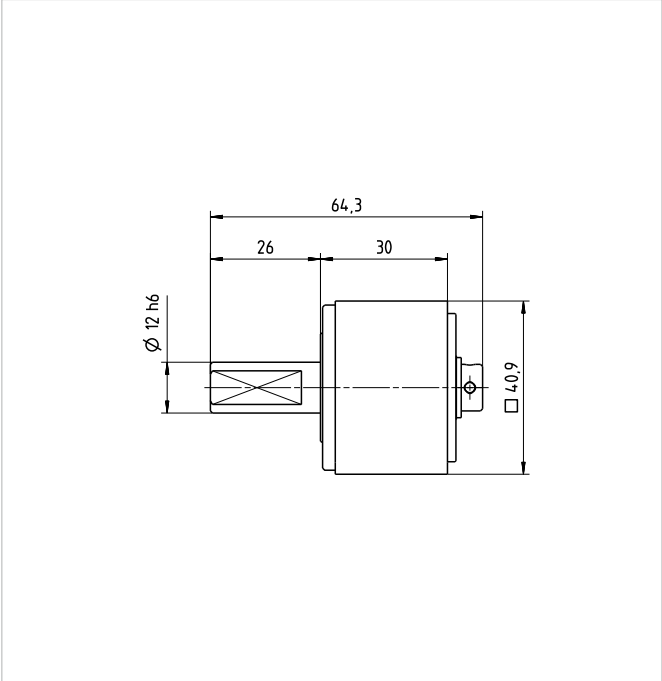


Illustration 233.4

CSF-11-1U-CC [mm]



Technical data

Table 234.1

	Unit	CSF-11-2XH-J			CSF-11-1U-F		
Ratio	i []	30	50	100	30	50	100
Repeatable peak torque	T _R [Nm]	4.5	8.3	11	4.5	8.3	11
Average torque	T _A [Nm]	3.4	5.5	8.9	3.4	5.5	8.9
Rated torque	T _N [Nm]	2.2	3.5	5.0	2.2	3.5	5.0
Momentary peak torque	T _M [Nm]	8.5	17	25	8.5	17	25
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			8500		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	140			120		
Weight	m [g]	176			220		
Transmission accuracy	[arcmin]	< 2	< 1.5		< 2	< 1.5	
Torsional stiffness	K ₃ [Nm/rad]	1340	2360	2910	1580	3200	4320
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	300			300		
Dynamic axial load	F _{A dyn (max)} [N]	1150			1150		
Dynamic tilting moment	M _{dyn (max)} [Nm]	6.6			6.6		

Table 234.2

	Unit	CSF-11-1U-CC-F			CSF-11-2XH-F		
Ratio	i []	30	50	100	30	50	100
Repeatable peak torque	T _R [Nm]	4.5	8.3	11	4.5	8.3	11
Average torque	T _A [Nm]	3.4	5.5	8.9	3.4	5.5	8.9
Rated torque	T _N [Nm]	2.2	3.5	5.0	2.2	3.5	5.0
Momentary peak torque	T _M [Nm]	8.5	17	25	8.5	17	25
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			8500		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	140			140		
Weight	m [g]	150			295		
Transmission accuracy	[arcmin]	< 2	< 1.5		< 2	< 1.5	
Torsional stiffness	K ₃ [Nm/rad]	1580	3200	4320	1580	3200	4320
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		
Output bearing							
Dynamic radial load	F _{R dyn (max)} [N]	300			550		
Dynamic axial load	F _{A dyn (max)} [N]	1150			1800		
Dynamic tilting moment	M _{dyn (max)} [Nm]	6.6			13.2		

Illustration 235.1

CSF-11-2XH-J [mm]

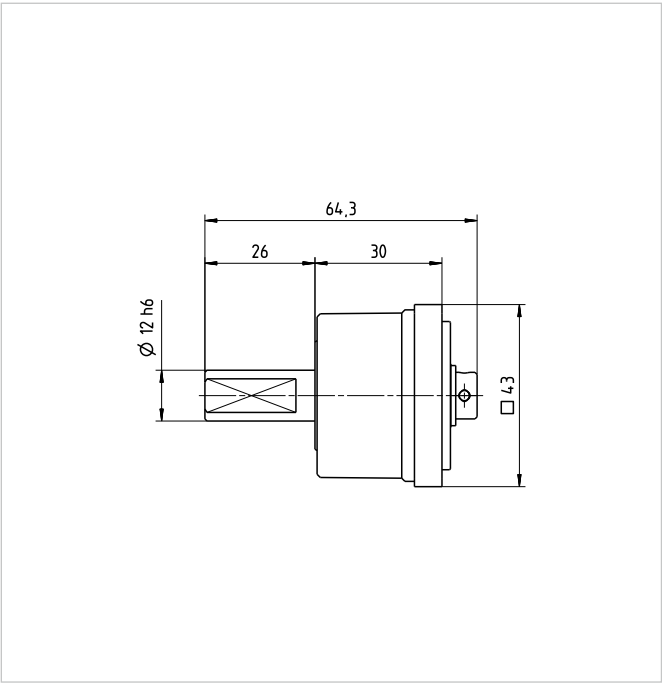


Illustration 235.2

CSF-11-1U-F [mm]

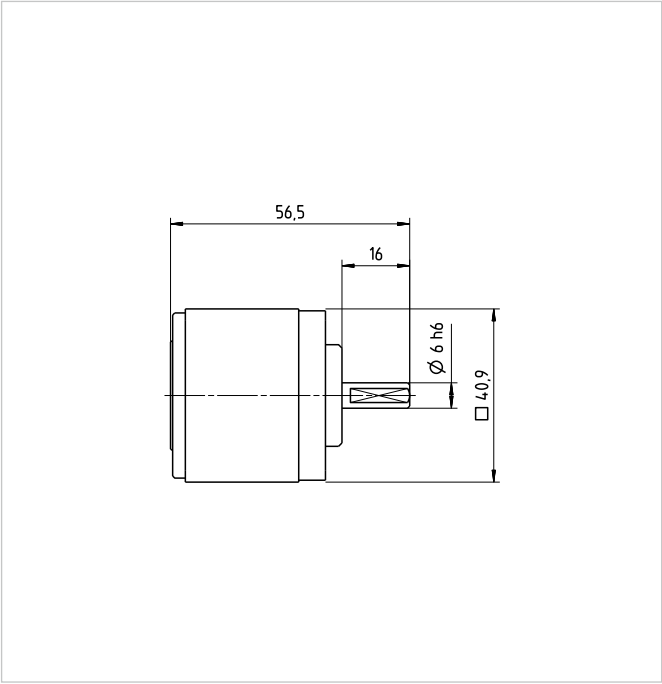


Illustration 235.3

CSF-11-1U-CC-F [mm]

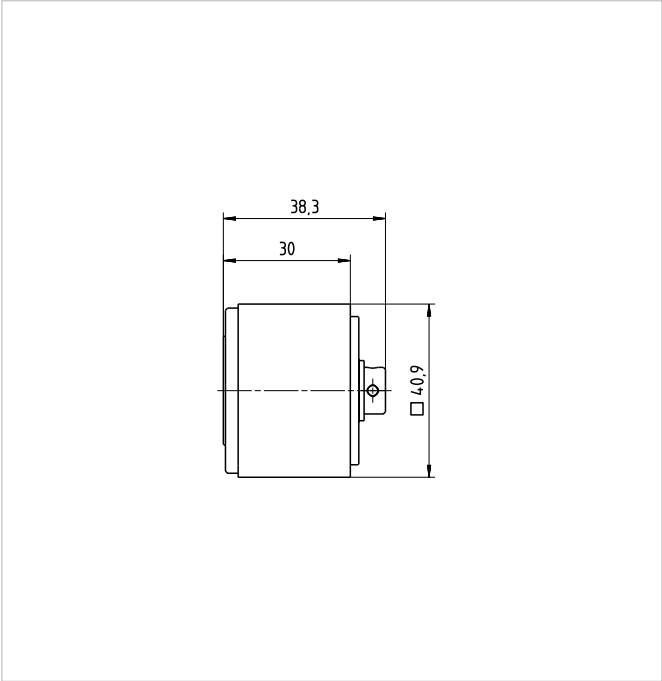
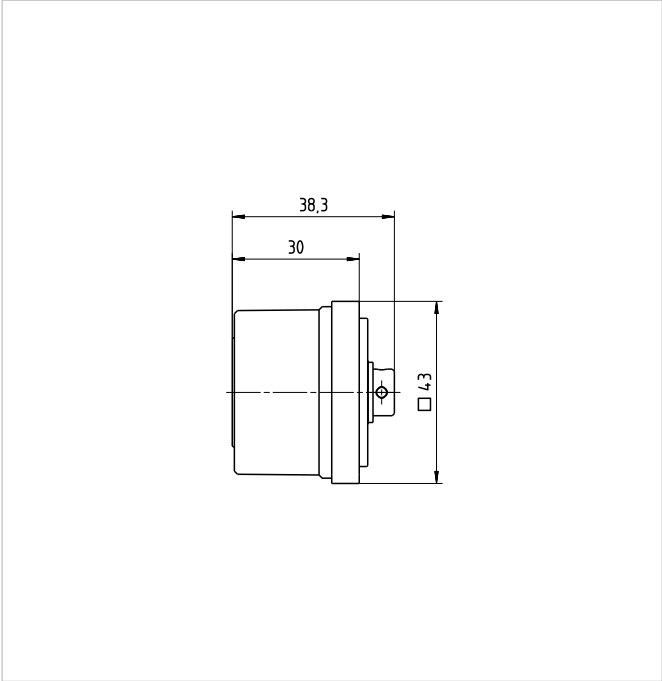


Illustration 235.4

CSF-11-2XH-F [mm]



Technical data

Table 236.1

	Unit	CSF-14-1U				CSF-14-1U-CC			
Ratio	i []	30	50	80	100	30	50	80	100
Repeatable peak torque	T _R [Nm]	9.0	18	23	28	9.0	18	23	28
Average torque	T _A [Nm]	6.8	6.9	11	11	6.8	6.9	11	11
Rated torque	T _N [Nm]	4.0	5.4	7.8	7.8	4.0	5.4	7.8	7.8
Momentary peak torque	T _M [Nm]	17	35	47	54	17	35	47	54
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500				8500			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500				3500			
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	330				340			
Weight	m [g]	440				335			
Transmission accuracy	[arcmin]	< 2	< 1.5			< 2	< 1.5		
Torsional stiffness	K ₃ [Nm/rad]	2860	4400	5160		2860	4400	5160	
Ambient operating temperature	[°C]	0 ... 60				0 ... 60			
Output bearing									
Dynamic radial load	F _{R dyn (max)} [N]	550				550			
Dynamic axial load	F _{A dyn (max)} [N]	1800				1800			
Dynamic tilting moment	M _{dyn (max)} [Nm]	13.2				13.2			

Table 236.2

	Unit	CSF-14-2XH-J				CSF-14-1U-F			
Ratio	i []	30	50	80	100	30	50	80	100
Repeatable peak torque	T _R [Nm]	9.0	18	23	28	9.0	18	23	28
Average torque	T _A [Nm]	6.8	6.9	11	11	6.8	6.9	11	11
Rated torque	T _N [Nm]	4.0	5.4	7.8	7.8	4.0	5.4	7.8	7.8
Momentary peak torque	T _M [Nm]	17	35	47	54	17	35	47	54
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500				8500			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500				3500			
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	340				330			
Weight	m [g]	295				405			
Transmission accuracy	[arcmin]	< 2	< 1.5			< 2	< 1.5		
Torsional stiffness	K ₃ [Nm/rad]	2860	4400	5160		3350	5680	7000	
Ambient operating temperature	[°C]	0 ... 60				0 ... 60			
Output bearing									
Dynamic radial load	F _{R dyn (max)} [N]	550				550			
Dynamic axial load	F _{A dyn (max)} [N]	1800				1800			
Dynamic tilting moment	M _{dyn (max)} [Nm]	13.2				13.2			

Illustration 237.1

CSF-14-1U [mm]

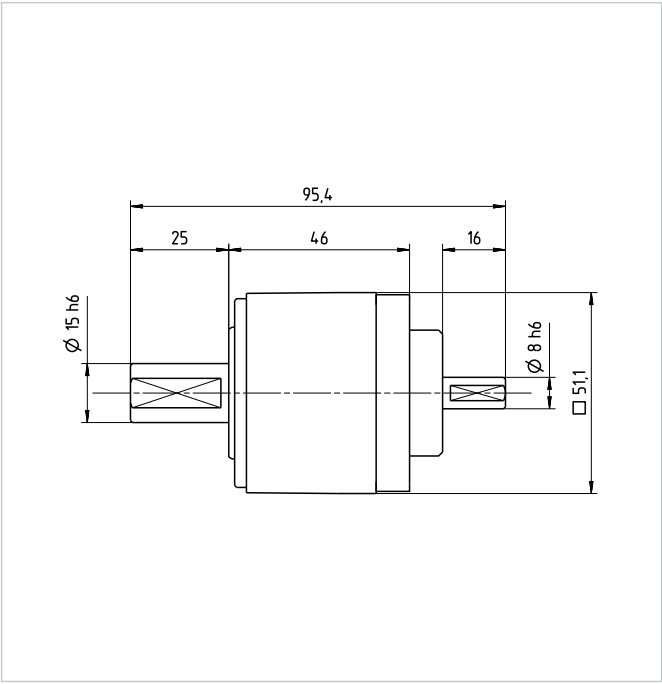


Illustration 237.2

CSF-14-1U-CC [mm]

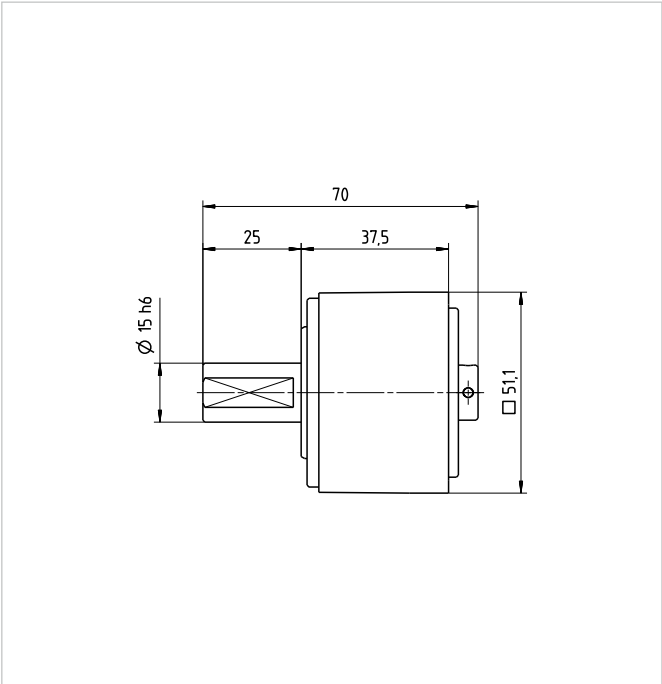


Illustration 237.3

CSF-14-2XH-J [mm]

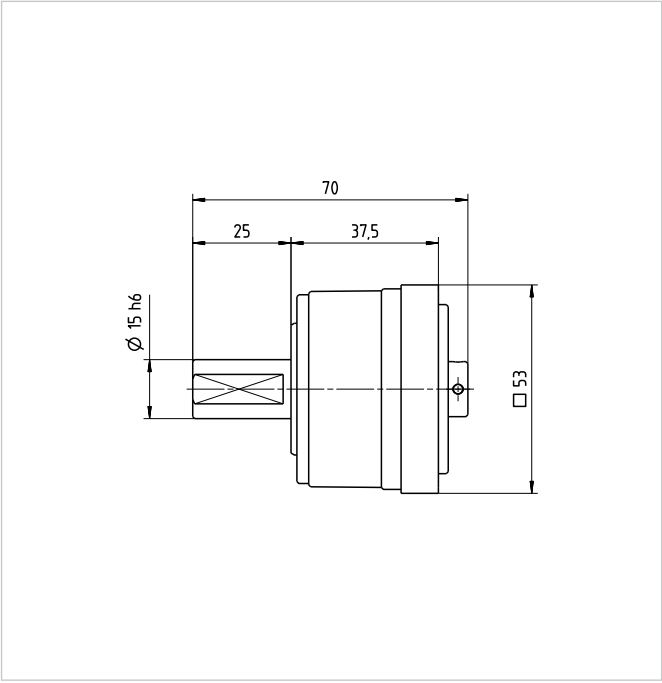
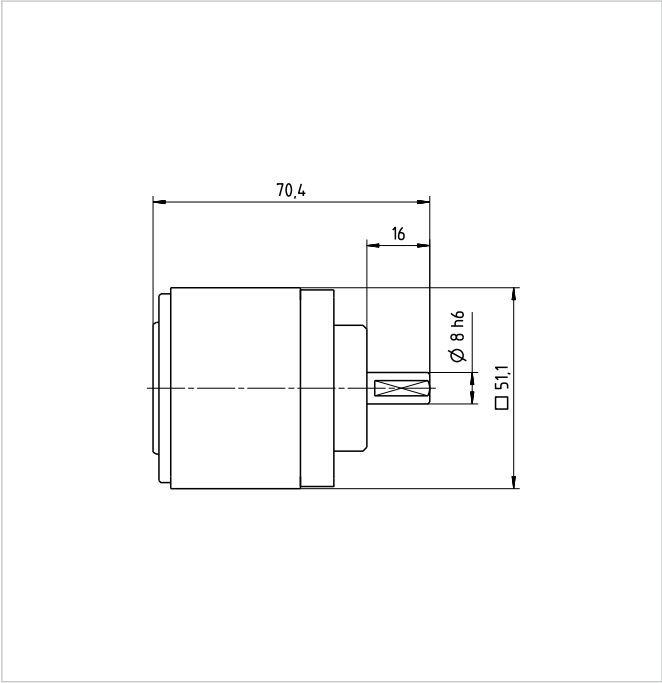


Illustration 237.4

CSF-14-1U-F [mm]



Technical data

Table 238.1

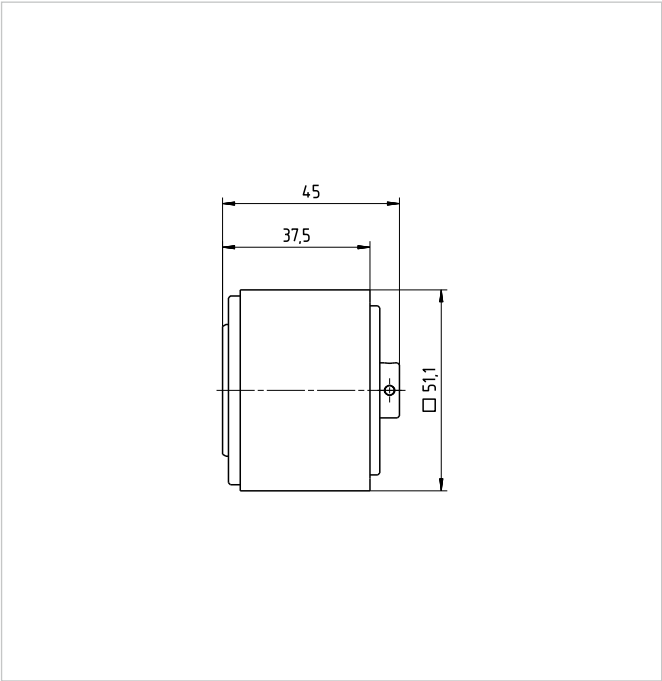
	Unit	CSF-14-1U-CC-F				CSF-14-2XH-F			
Ratio	i []	30	50	80	100	30	50	80	100
Repeatable peak torque	T _R [Nm]	9.0	18	23	28	9.0	18	23	28
Average torque	T _A [Nm]	6.8	6.9	11	11	6.8	6.9	11	11
Rated torque	T _N [Nm]	4.0	5.4	7.8	7.8	4.0	5.4	7.8	7.8
Momentary peak torque	T _M [Nm]	17	35	47	54	17	35	47	54
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500				8500			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500				3500			
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	340				340			
Weight	m [g]	295				295			
Transmission accuracy	[arcmin]	< 2	< 1.5			< 2	< 1.5		
Torsional stiffness	K ₃ [Nm/rad]	3350	5680	7000	7000	3350	5680	7000	7000
Ambient operating temperature	[°C]	0 ... 60				0 ... 60			
Output bearing									
Dynamic radial load	F _{R dyn (max)} [N]	550				550			
Dynamic axial load	F _{A dyn (max)} [N]	1800				1800			
Dynamic tilting moment	M _{dyn (max)} [Nm]	13.2				13.2			

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Clarification of the technical data can be found in the Glossary

Illustration 239.1

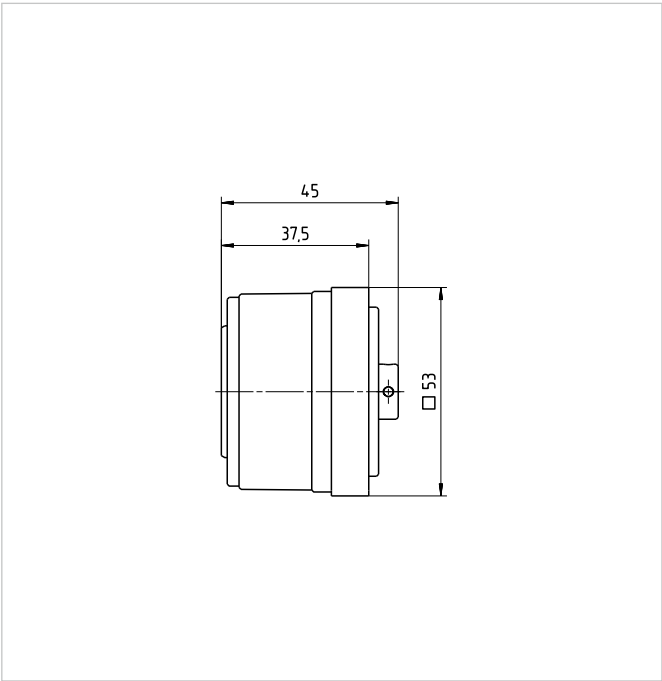
CSF-14-1U-CC-F [mm]

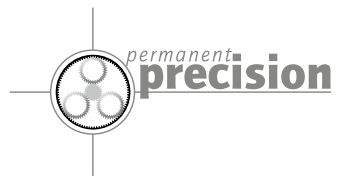


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Illustration 239.2

CSF-14-2XH-F [mm]





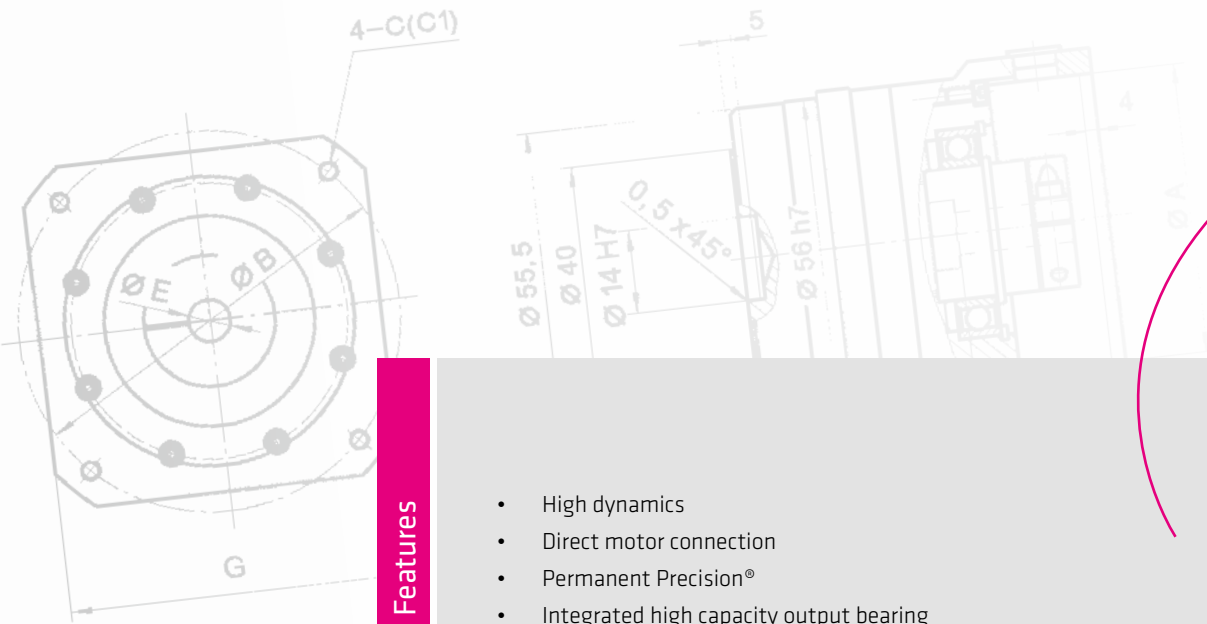
HPG Series Planetary Gears operate at higher speeds with lower ratios and there is often a need for the highest precision. Our special design with a flexible ring gear in the output stage means that we guarantee constant high precision over the entire lifetime – we call this Permanent Precision®!

Low gear ratios for high dynamics

The HPG Series Planetary Gears are available in six sizes with twelve gear ratios between 4 and 50:1 offering repeatable peak torques from 8 to 2200 Nm. The precision output bearing with high tilting rigidity enables the direct introduction of high payloads without further support and thus permits simple and space saving designs.

HPG Series Planetary Gears are available in three versions for the output: with output flange, with smooth output shaft and with output shaft with keyway. On the input side there is a version for motor adaptation, or alternatively it is available with input shaft.

Standard servo motors can be simply coupled to our Planetary Gears. Gear and motor together form a compact and lightweight system capable of withstanding high payloads ensuring stable machine properties with short cycle times are guaranteed.



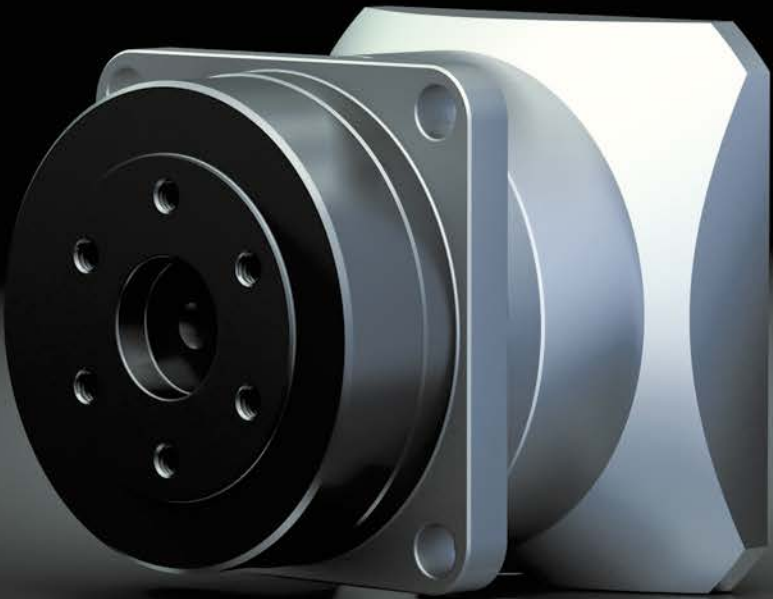
Features

- High dynamics
- Direct motor connection
- Permanent Precision®
- Integrated high capacity output bearing

Optimised for your applications:

- Simple design solution
- Reduced diversity of components
- Consistent quality
- Increased machine throughput
- High availability
- Increased productivity
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Easy load connection
- Low manufacturing and installation costs

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/2110

HPG

Ordering code

Table 242.1

Series	Size	Ratio								Backlash class	Version	Code for motor adaptation	Special design
HPG	11B		5	9		21	37	45		BL3	F0 J2 J6	Exx.xx U1	According to customer requirements
	14A	3	5	11	15	21	33	45		BL3 BL1			
	20A	3	5	11	15	21	33	45					
	32A	3	5	11	15	21	33	45					
	50A	3	5	11	15	21	33	45					
	65A	4	5	12	15	20	25	40	50				
Ordering code													
HPG	-	14A	-	11	-	BL3	-	F0	-	E14.20	-	SP	

Table 242.2

Backlash class	
Ordering code	Backlash
BL3	≤ 3 arcmin
BL1	≤ 1 arcmin

Table 242.3

Code for motor adaptation	
Ordering code	Description
Exx.xx	Depending on motor type
U1	Input shaft

Available motor adaptations:
QUICKLINK www.harmonicdrive.co.uk/2105

Table 242.4

Version	
Ordering code	Description
F0	Output flange
J2	Output shaft without key
J6	Output shaft with key



Technical data

Table 244.1

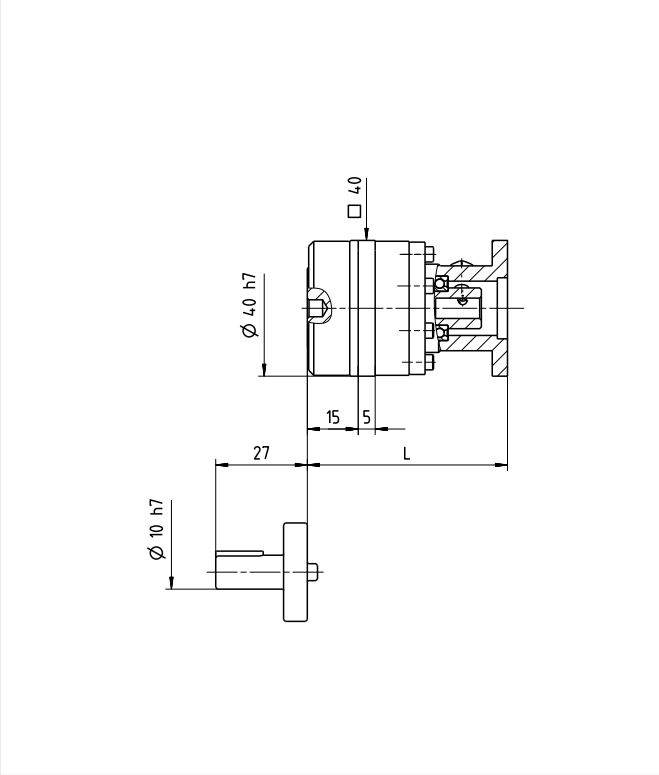
	Unit	HPG-11B					HPG-11B-U1				
Ratio	i []	5	9	21	37	45	5	9	21	37	45
Repeatable peak torque	T _R [Nm]	7.8	3.9	9.8	9.8	9.8	7.8	3.9	9.8	9.8	9.8
Average torque	T _A [Nm]	5.0	3.9	6.0	6.0	6.0	5.0	3.9	6.0	6.0	6.0
Rated torque	T _N [Nm]	2.5	2.5	3.5	3.5	3.5	2.5	2.5	3.5	3.5	3.5
Momentary peak torque	T _M [Nm]	20	20	20	20	20	20	20	20	20	20
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	10000					10000				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000					3000				
Moment of inertia with output flange (F0)	J _{in} [x10 ⁻⁶ kgm ²]	0.21	0.07	0.18	0.066	0.048	0.72	0.58	0.63	0.52	0.50
Moment of inertia with output shaft (Jx)	J _{in} [x10 ⁻⁶ kgm ²]	0.36	0.12	0.19	0.068	0.049	0.87	0.63	0.64	0.52	0.50
Weight with output flange (F0)	m [kg]	0.14		0.20			0.2		0.26		
Weight with output shaft (Jx)	m [kg]	0.18		0.24			0.24		0.3		
Transmission accuracy	[arcmin]	< 5					< 5				
Repeatability	[arcmin]	< ±0.5					< ±0.5				
Backlash	[arcmin]	≤ 3					≤ 3				
Torsional stiffness	K _s [x10 ³ Nm/rad]	2.2					2.2				
Ambient operating temperature	[°C]	0 ... 40					0 ... 40				
Output bearing											
Dynamic radial load	F _{R dyn (max)} [N]	280	340	440	520	550	280	340	440	520	550
Dynamic axial load	F _{A dyn (max)} [N]	430	510	660	780	830	430	510	660	780	830
Dynamic tilting moment	M _{dyn (max)} [Nm]	9.5					9.5				

Table 244.2

	Unit	HPG-14A							HPG-14A-U1						
Ratio	i []	3	5	11	15	21	33	45	3	5	11	15	21	33	45
Repeatable peak torque	T _R [Nm]	15	23	23	23	23	23	23	15	23	23	23	23	23	23
Average torque	T _A [Nm]	6.4	13	15	15	15	15	15	6.4	13	15	15	15	15	15
Rated torque	T _N [Nm]	3.0	6.0	8.0	9.0	9.0	10	10	3	6	8	9	9	10	10
Momentary peak torque	T _M [Nm]	56	56	56	56	56	56	56	56	56	56	56	56	56	56
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	5000	6000						5000	6000					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000							3000						
Moment of inertia with output flange (F0)	J _{in} [x10 ⁻⁶ kgm ²]	5.7	2.1	1.6	1.4	0.89	0.29	0.27	11	6.7	5.8	5.6	4.9	4.3	4.3
Moment of inertia with output shaft (Jx)	J _{in} [x10 ⁻⁶ kgm ²]	7.7	2.6	1.9	1.7	0.92	0.30	0.28	12	7.3	5.9	5.7	4.9	4.3	4.3
Weight with output flange (F0)	m [kg]	0.4		0.5					0.7		0.8				
Weight with output shaft (Jx)	m [kg]	0.5		0.6					0.8		0.9				
Transmission accuracy	[arcmin]	< 4							< 4						
Repeatability	[arcmin]	< ±0.35							< ±0.35						
Backlash	[arcmin]	≤ 3 or ≤ 1							≤ 3 or ≤ 1						
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	4.7							4.7						
Ambient operating temperature	[°C]	0 ... 40							0 ... 40						
Output bearing															
Dynamic radial load	F _{R dyn (max)} [N]	400	470	600	650	720	830	910	400	470	600	650	720	830	910
Dynamic axial load	F _{A dyn (max)} [N]	600	700	890	980	1080	1240	1360	600	700	890	980	1080	1240	1360
Dynamic tilting moment	M _{dyn (max)} [Nm]	32.3							32.3						

Illustration 245.1

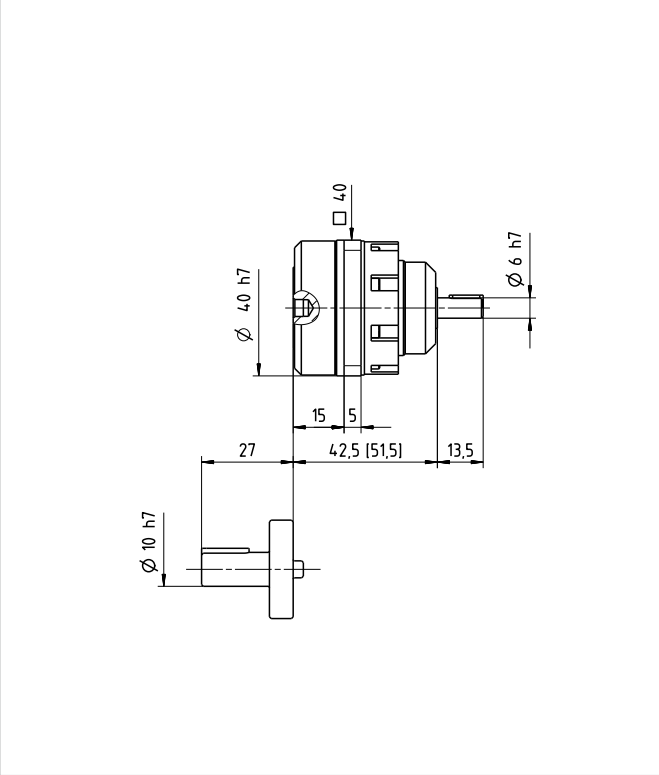
HPG-11B [mm]



L depends on the motor type

Illustration 245.2

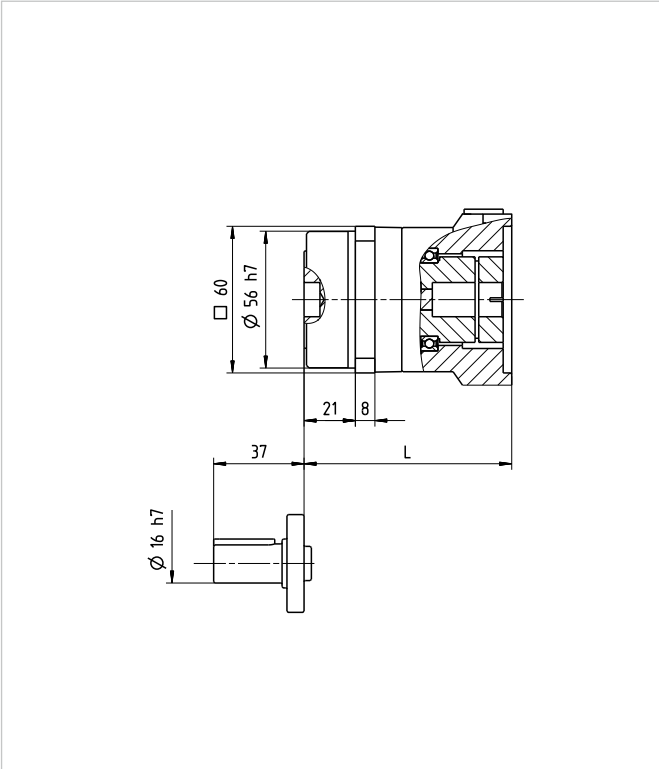
HPG-11B-U1 [mm]



() Two stage gear

Illustration 245.3

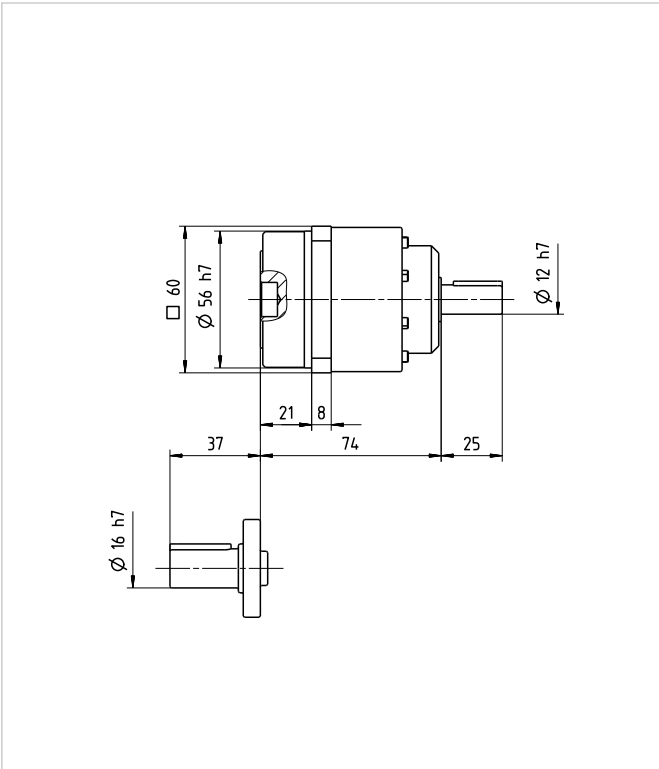
HPG-14A [mm]



L depends on the motor type

Illustration 245.4

HPG-14A-U1 [mm]



() Two stage gear

Technical data

Table 246.1

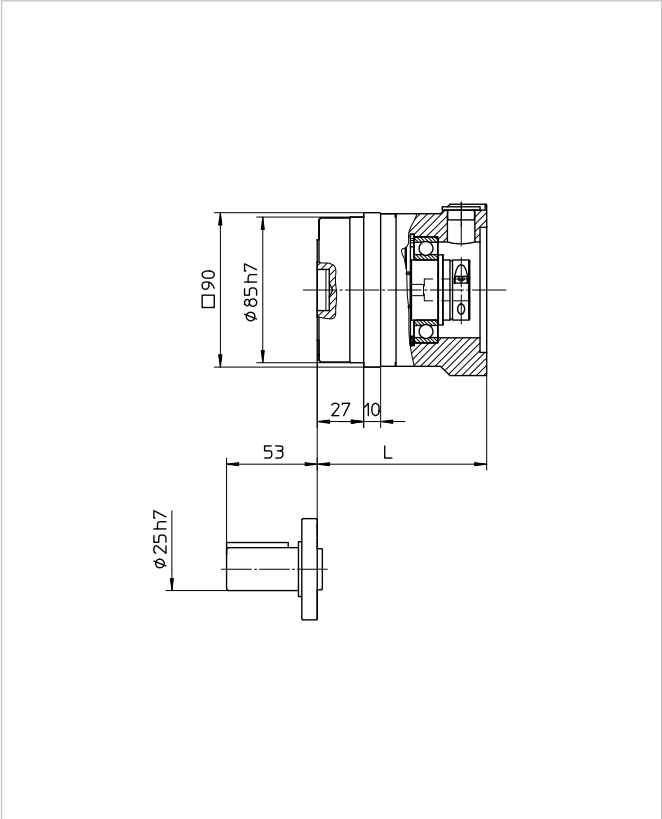
	Unit	HPG-20A							HPG-20A-U1						
Ratio	i []	3	5	11	15	21	33	45	3	5	11	15	21	33	45
Repeatable peak torque	T _R [Nm]	64	100	100	100	100	100	100	64	100	100	100	100	100	100
Average torque	T _A [Nm]	19	35	45	53	55	60	60	19	35	45	53	55	60	60
Rated torque	T _N [Nm]	9	16	20	24	25	29	29	9	16	20	24	25	29	29
Momentary peak torque	T _M [Nm]	124	217	217	217	217	217	217	124	217	217	217	217	217	217
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4000	6000						4000	6000					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000							3000						
Moment of inertia with output flange (F0)	J _{in} [x10 ⁻⁶ kgm²]	46	17	15	14	6.9	2.3	2.2	69	40	31	30	23	19	18
Moment of inertia with output shaft (Jx)	J _{in} [x10 ⁻⁶ kgm²]	57	21	16	14	7.1	2.4	2.2	80	44	32	30	23	19	18
Weight with output flange (F0)	m [kg]	1.2	1.4						2.0	2.1					
Weight with output shaft (Jx)	m [kg]	1.6	1.8						2.4	2.7					
Transmission accuracy	[arcmin]	< 4							< 4						
Repeatability	[arcmin]	< ±0.25							< ±0.25						
Backlash	[arcmin]	≤ 3 or ≤ 1							≤ 3 or ≤ 1						
Torsional stiffness	K ₃ [x10³ Nm/rad]	18.5							18.5						
Ambient operating temperature	[°C]	0 ... 40							0 ... 40						
Output bearing															
Dynamic radial load	F _{R dyn (max)} [kN]	0.84	0.98	1.24	1.36	1.51	1.73	1.89	0.84	0.98	1.24	1.36	1.51	1.73	1.89
Dynamic axial load	F _{A dyn (max)} [kN]	1.25	1.41	1.85	2.03	2.25	2.58	2.83	1.250	1.41	1.85	2.03	2.25	2.58	2.83
Dynamic tilting moment	M _{dyn (max)} [Nm]	183							183						

Table 246.2

	Unit	HPG-32A							HPG-32A-U1						
Ratio	i []	3	5	11	15	21	33	45	3	5	11	15	21	33	45
Repeatable peak torque	T _R [Nm]	255	300	300	300	300	300	300	255	300	300	300	300	300	300
Average torque	T _A [Nm]	71	150	170	170	170	200	200	71	150	170	170	170	200	200
Rated torque	T _N [Nm]	31	66	88	92	98	108	108	31	66	88	92	98	108	108
Momentary peak torque	T _M [Nm]	507	650	650	650	650	650	650	507	650	650	650	650	650	650
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3600	6000						3600	6000					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000						3000							
Moment of inertia with output flange (F0)	J _{in} [x10 ⁻⁶ kgm²]	200	73	78	62	34	12	11	340	220	190	180	150	130	130
Moment of inertia with output shaft (Jx)	J _{in} [x10 ⁻⁶ kgm²]	280	100	84	65	36	13	12	420	240	200	180	150	130	130
Weight with output flange (F0)	m [kg]	2.9	3.5				4.9		5.3						
Weight with output shaft (Jx)	m [kg]	4.3	4.9				6.3		6.9						
Transmission accuracy	[arcmin]	< 4							< 4						
Repeatability	[arcmin]	< ± 0.25							< ±0.25						
Backlash	[arcmin]	≤ 3 or ≤ 1							≤ 3 or ≤ 1						
Torsional stiffness	K ₃ [x10³ Nm/rad]	74.1							74.1						
Ambient operating temperature	[°C]	0 ... 40							0 ... 40						
Output bearing															
Dynamic radial load	F _{R dyn (max)} [kN]	1.63	1.90	2.41	2.64	2.92	3.34	3.67	1.63	1.90	2.41	2.64	2.92	3.34	3.67
Dynamic axial load	F _{A dyn (max)} [kN]	2.43	2.83	3.59	3.94	4.36	4.99	5.48	2.43	2.83	3.59	3.94	4.36	4.99	5.48
Dynamic tilting moment	M _{dyn (max)} [Nm]	452							452						

Illustration 247.1

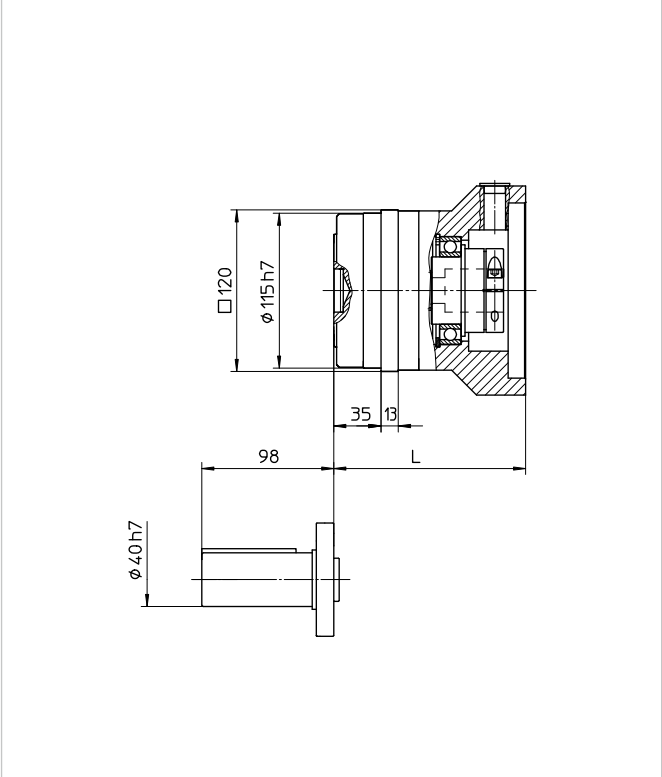
HPG-20A [mm]



L depends on the motor type

Illustration 247.3

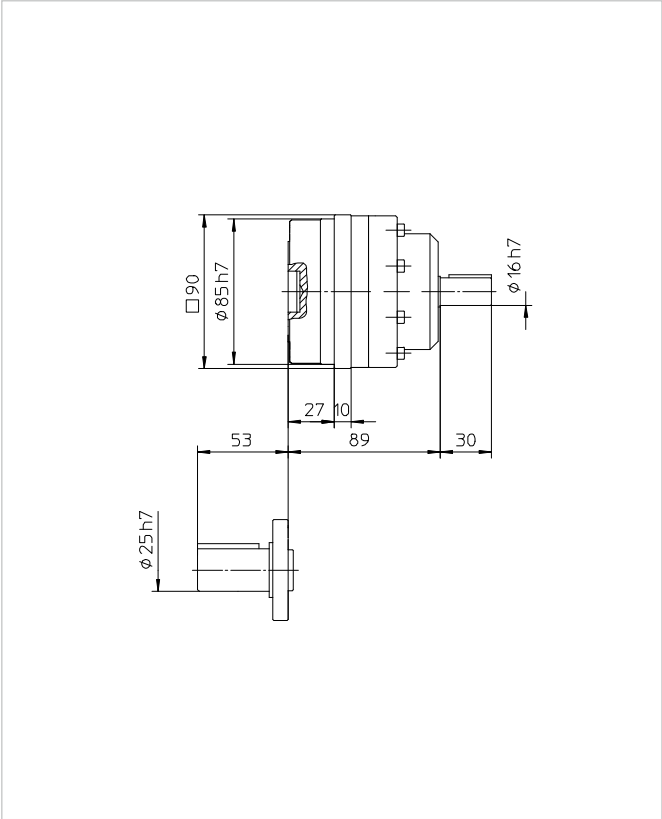
HPG-32A [mm]



L depends on the motor type

Illustration 247.2

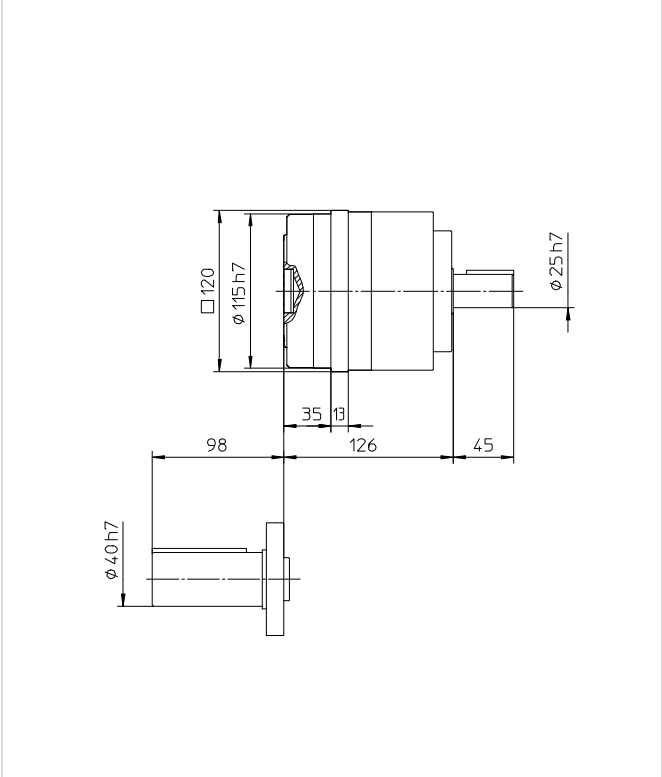
HPG-20A-U1 [mm]



() Two stage gear

Illustration 247.4

HPG-32A-U1 [mm]



() Two stage gear

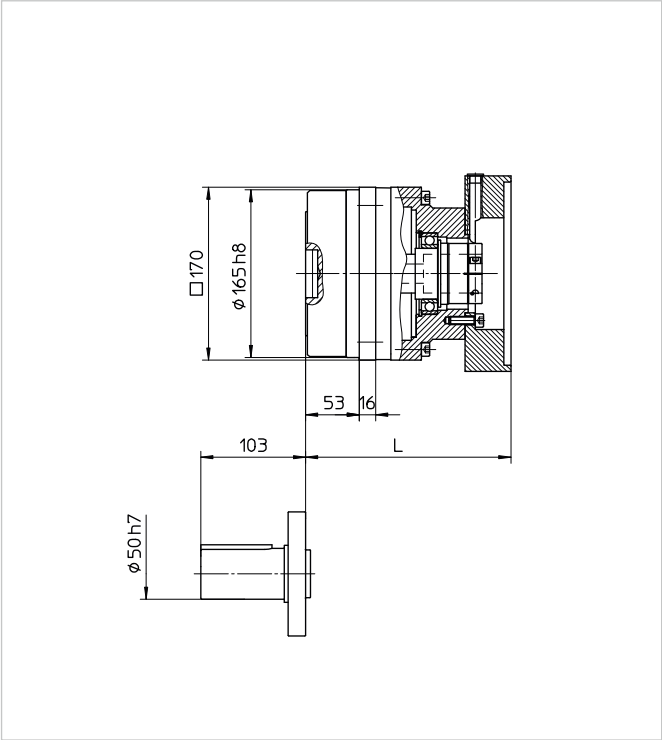
Technical data

Table 248.1

	Unit	HPG-50A							HPG-50A-U1						
Ratio	i []	3	5	11	15	21	33	45	3	5	11	15	21	33	45
Repeatable peak torque	T _R [Nm]	657	850	850	850	850	850	850	657	850	850	850	850	850	850
Average torque	T _A [Nm]	195	340	400	450	500	500	500	195	340	400	450	500	500	500
Rated torque	T _N [Nm]	97	170	200	230	260	270	270	97	170	200	230	260	270	270
Momentary peak torque	T _M [Nm]	1200	1850	1850	1850	1850	1850	1850	1200	1200	1850	1850	1850	1850	1850
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3000	4500							3000	4500				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	2000							2000						
Moment of inertia with output flange (F0)	J _{in} [x10 ⁻⁶ kgm²]	1300	480	330	290	160	60	60	1800	920	710	670	540	430	430
Moment of inertia with output shaft (Jx)	J _{in} [x10 ⁻⁶ kgm²]	1700	610	360	310	170	63	59	2100	1100	740	680	550	440	430
Weight with output flange (F0)	m [kg]	10	12							14	16				
Weight with output shaft (Jx)	m [kg]	13	15							17	19				
Transmission accuracy	[arcmin]	< 3							< 3						
Repeatability	[arcmin]	< ±0.25							< ±0.25						
Backlash	[arcmin]	≤ 3 or ≤ 1							≤ 3 or ≤ 1						
Torsional stiffness	K ₃ [x10³ Nm/rad]	230							230						
Ambient operating temperature	[°C]	0 ... 40							0 ... 40						
Output bearing															
Dynamic radial load	F _{R dyn (max)} [kN]	5.57	6.49	8.22	9.03	9.98	11.4	12.5	5.57	6.49	8.22	9.03	9.98	11.4	12.5
Dynamic axial load	F _{A dyn (max)} [kN]	5.57	6.49	8.22	9.03	9.98	11.4	12.5	5.57	6.49	8.22	9.03	9.98	11.4	12.5
Dynamic tilting moment	M _{dyn (max)} [Nm]	1076							1076						

Illustration 249.1

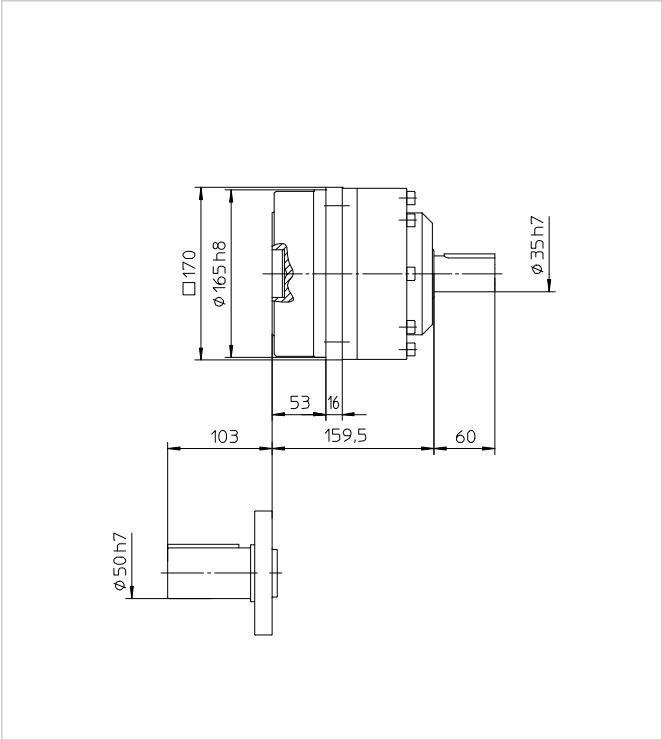
HPG-50A [mm]



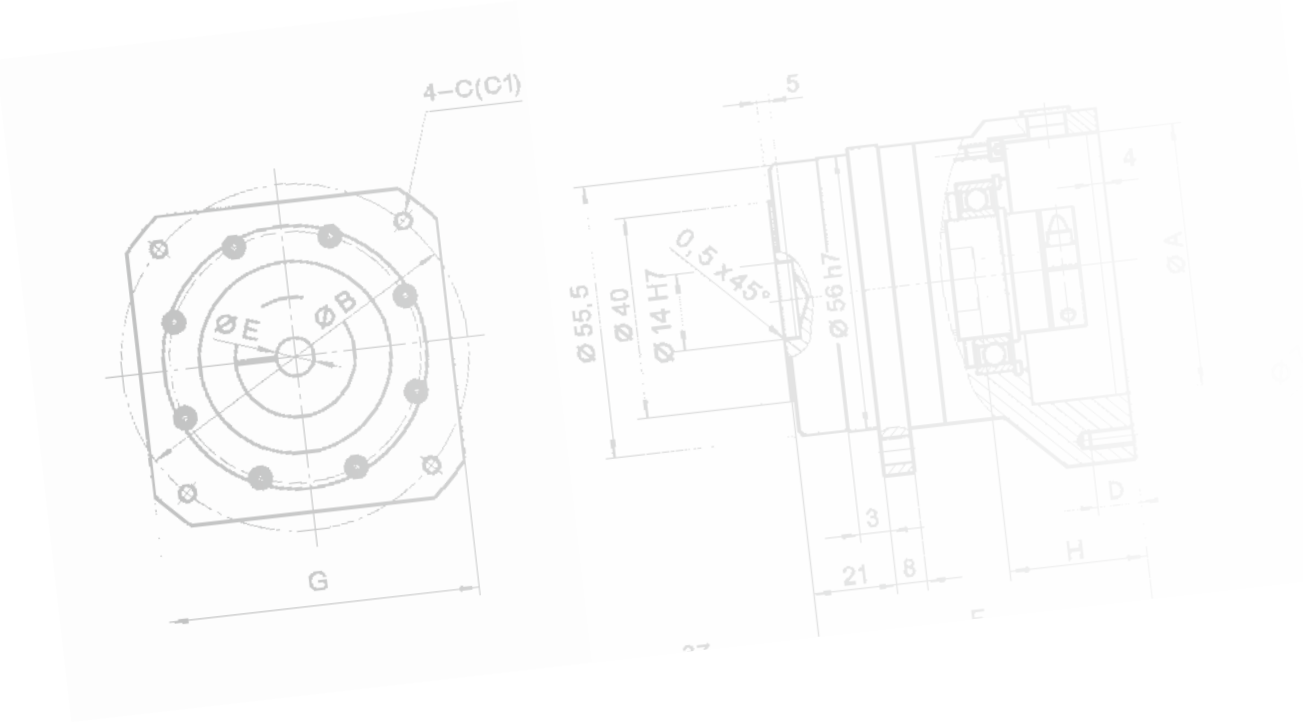
L depends on the motor type

Illustration 249.2

HPG-50A-U1 [mm]



() Two stage gear



Technical data

Table 250.1

	Unit	HPG-65A								HPG-65A-U1							
Ratio	i []	4	5	12	15	20	25	40	50	4	5	12	15	20	25	40	50
Repeatable peak torque	T _R [Nm]	2200	2200	2200	2200	2200	2200	1900	2200	2200	2200	2200	2200	2200	2200	1900	2200
Average torque	T _A [Nm]	900	1000	1100	1300	1500	1500	1300	1500	900	1000	1100	1300	1500	1500	1300	1500
Rated torque	T _N [Nm]	500	530	600	730	800	850	640	750	500	530	600	730	800	850	640	750
Momentary peak torque	T _M [Nm]	4500								4500							
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	2500	3000							2500	3000						
Average input speed (grease lubrication)	n _{av (max)} [rpm]	2000								2000							
Moment of inertia with output flange (F0)	J _{in} [x10 ⁻⁶ kgm²]	2800	1800	1700	1600	650	610	130	120	4400	3400	3200	3100	2100	2100	1600	1600
Moment of inertia with output shaft (Jx)	J _{in} [x10 ⁻⁶ kgm²]	4200	2700	1800	1700	710	650	150	130	5800	4300	3300	3200	2200	2100	1600	1600
Weight with output flange (F0)	m [kg]	22	37							33	48						
Weight with output shaft (Jx)	m [kg]	32	47							43	58						
Transmission accuracy	[arcmin]	< 3								< 3							
Repeatability	[arcmin]	< ±0.25								< ±0.25							
Backlash	[arcmin]	≤ 3 or ≤ 1								≤ 3 or ≤ 1							
Torsional stiffness	K ₃ [x10³ Nm/rad]	1290								1290							
Ambient operating temperature	[°C]	0 ... 40								0 ... 40							
Output bearing																	
Dynamic radial load	F _{R dyn (max)} [kN]	13.2	14.1	18.3	19.6	21.4	22.9	26.3	28.2	13.2	14.1	18.3	19.6	21.4	22.9	26.3	28.2
Dynamic axial load	F _{A dyn (max)} [kN]	13.2	14.1	12.3	13.1	14.3	15.3	17.6	18.9	13.2	14.1	12.3	13.1	14.3	15.3	17.6	18.9
Dynamic tilting moment	M _{dyn (max)} [Nm]	3900								3900							

Illustration 251.1

HPG-65A [mm]

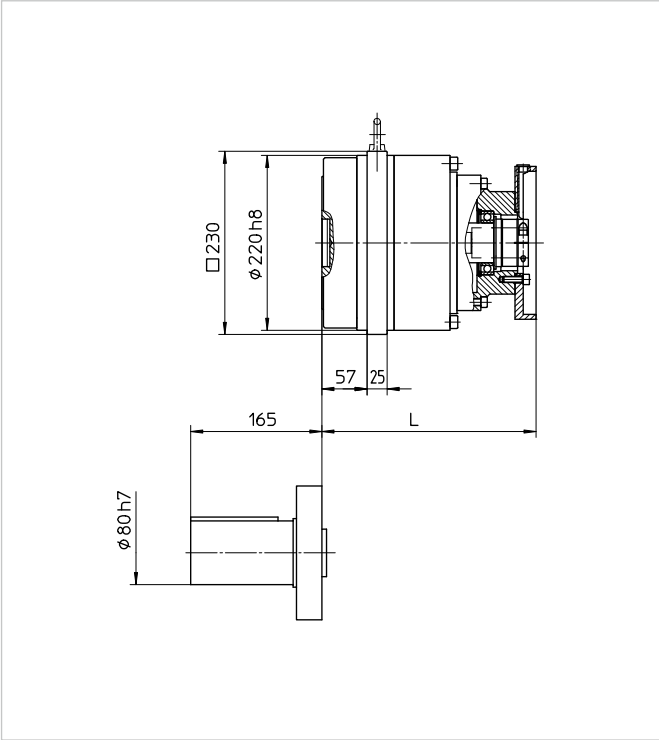
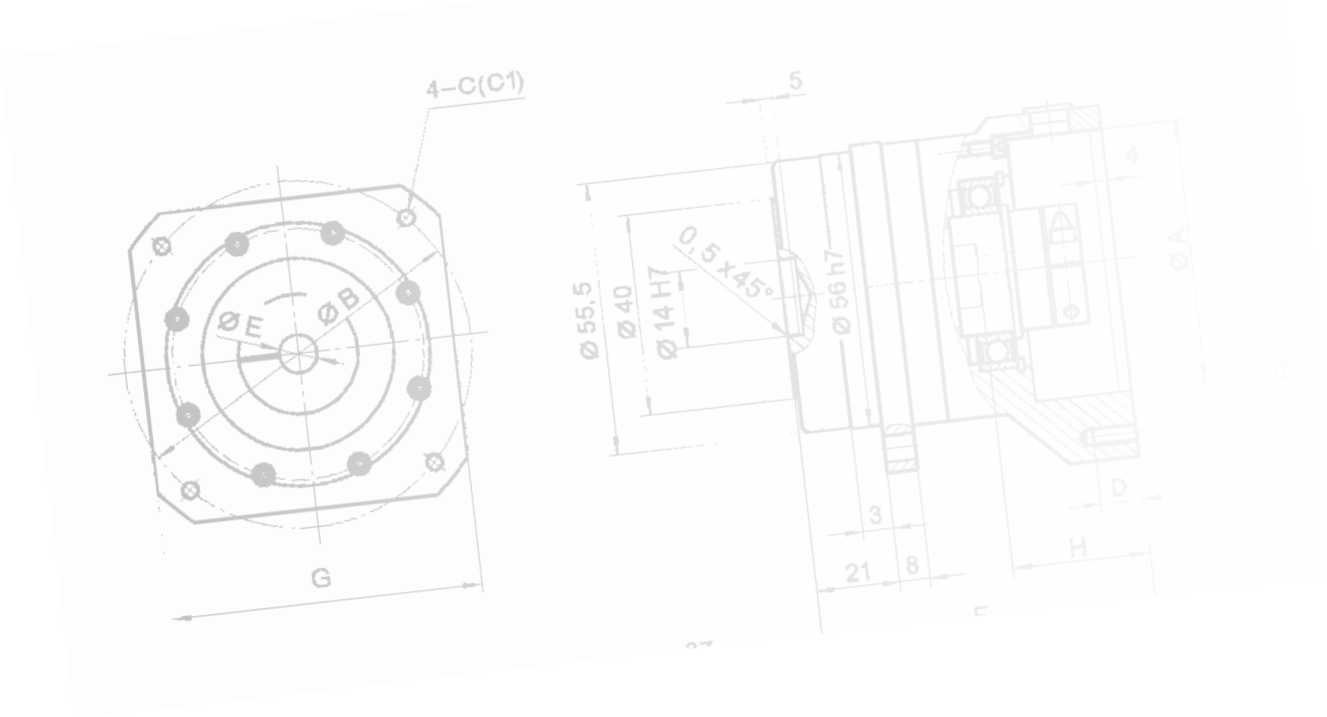
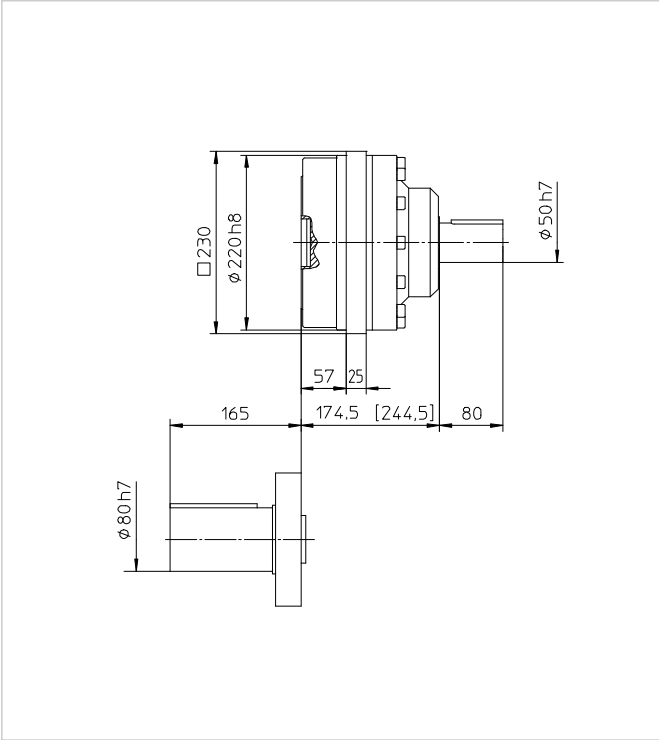


Illustration 251.2

HPG-65A-U1 [mm]



Enhanced performance with Permanent Precision®

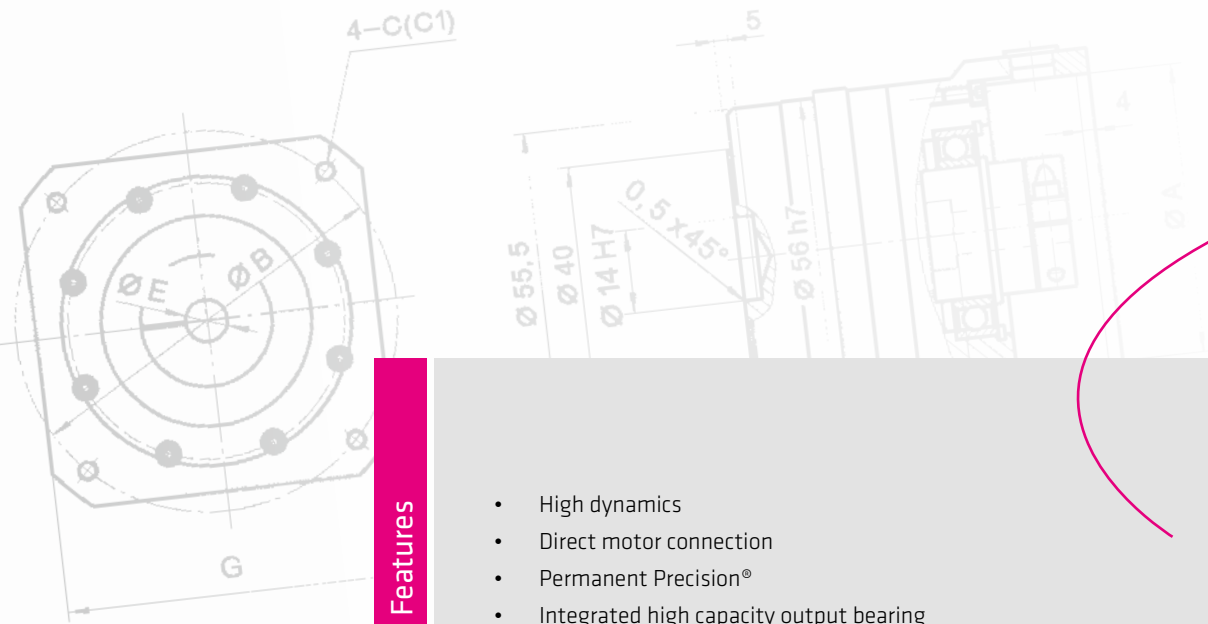


HPGP Series Planetary Gears operate at higher speeds with lower ratios and there is often a need for the highest precision. Our special design with a flexible ring gear in the output stage means that we guarantee constant high precision over the entire lifetime – we call this Permanent Precision®!

The HPGP Series Planetary Gears are available in six sizes with gear ratios between 4 and 45:1 offering repeatable peak torques from 10 to 2920 Nm. The precision output bearing with high tilting rigidity enables the direct introduction of high payloads without further support and thus permits simple and space saving designs.

HPGP enhanced series of Planetary Gears are available in three versions: with output flange, with smooth output shaft and output shaft with keyway.

Standard servo motors can be simply coupled to our Planetary Gears. Gearbox and motor together form a compact and lightweight system capable of withstanding high payloads ensuring stable machine properties with short cycle times are guaranteed.



Features

- High dynamics
- Direct motor connection
- Permanent Precision®
- Integrated high capacity output bearing

Optimised for your applications:

- | | |
|-----------------------------------|--|
| • Simple design solution | • Increased productivity |
| • Reduced diversity of components | • Reduced Total Cost of Ownership |
| • Consistent quality | • Reduced maintenance costs |
| • Increased machine throughput | • Easy load connection |
| • High availability | • Low manufacturing and installation costs |

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/2120

HPGP

Ordering code

Table 254.1

Series	Size	Ratio							Version	Code for motor adaptation	Backlash class	Special design		
HPGP	11A		5			21	37	45	F0, J20, J60	Depending on motor type	BL3	According to customer requirements		
	14A		5	11	15	21	33	45	F0 J2 J6					
	20A		5	11	15	21	33	45						
	32A		5	11	15	21	33	45						
	50A		5	11	15	21	33	45						
	65A	4	5	12	15	20	25							
Ordering code														
HPGP	-	14A	-	11		-		F0	-	E14.20	-	BL1	-	SP

Available motor adaptations:
QUICKLINK www.harmonicdrive.co.uk/2105

Table 254.2

Output	
Ordering code	Description
F0	Output flange
J2/J20	Output shaft without key
J6/J60	Output shaft with key

Table 254.3

Backlash class	
Ordering code	Backlash
BL1	≤ 1 arcmin
BL3	≤ 3 arcmin



Units, Gearboxes, Planetary Gears

Technical data

Table 256.1

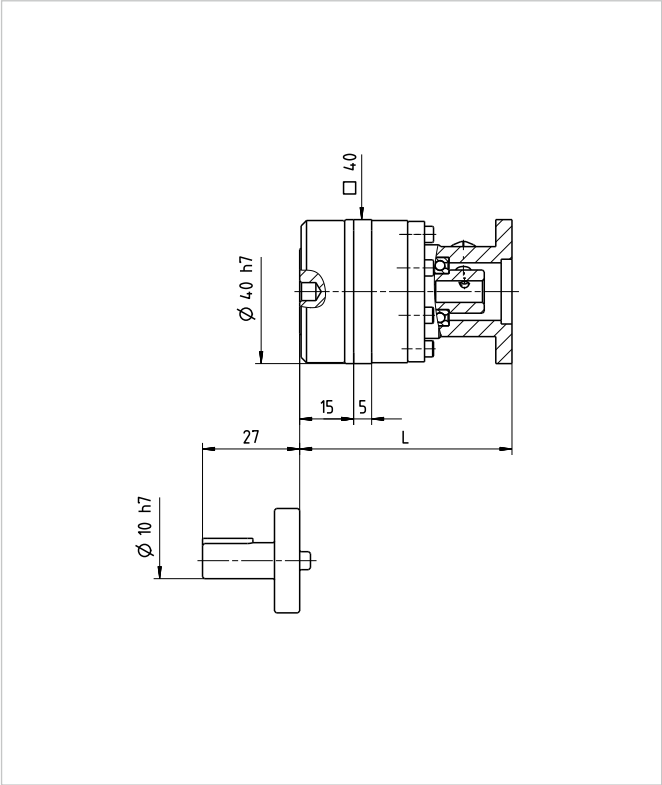
	Unit	HPGP-11				HPGP-14					
Ratio	i []	5	21	37	45	5	11	15	21	33	45
Repeatable peak torque	T _R [Nm]	10	13	13	13	30	30	30	30	30	30
Average torque	T _A [Nm]	6.7	8.0	8.0	8.0	17	20	20	20	20	20
Rated torque	T _N [Nm]	3.4	4.6	4.6	4.6	7.8	10	12	12	13	13
Momentary peak torque	T _M [Nm]	20	20	20	20	56	56	56	56	56	56
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	10000				6000					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000				3000					
Moment of inertia with output flange (F0)	J _{in} [x10 ⁻⁶ kgm²]	0.24	0.18	0.07	0.05	1.7	1.8	1.6	0.90	0.29	0.27
Moment of inertia with output shaft (Jx)	J _{in} [x10 ⁻⁶ kgm²]	0.40	0.19	0.07	0.05	2.3	1.9	1.7	0.93	0.30	0.28
Weight with output flange (F0)	m [kg]	0.14	0.20			0.42	0.51				
Weight with output shaft (Jx)	m [kg]	0.18	0.24			0.54	0.63				
Transmission accuracy	[arcmin]	< 5				< 4					
Repeatability	[arcmin]	< ±0.5				< ±0.35					
Backlash	[arcmin]	≤ 3				≤ 3 or ≤ 1					
Torsional stiffness	K ₃ [x10³ Nm/rad]	2.2				4.7					
Ambient operating temperature	[°C]	0 ... 40				0 ... 40					
Output bearing											
Dynamic radial load	F _{R dyn (max)} [N]	280	440	520	550	470	600	650	720	830	910
Dynamic axial load	F _{A dyn (max)} [N]	430	660	780	830	700	890	980	1080	1240	1360
Dynamic tilting moment	M _{dyn (max)} [Nm]	9.5				32.3					

Table 256.2

	Unit	HPGP-20						HPGP-32					
Ratio	i []	5	11	15	21	33	45	5	11	15	21	33	45
Repeatable peak torque	T _R [Nm]	133	133	133	133	133	133	400	400	400	400	400	400
Average torque	T _A [Nm]	47	60	70	73	80	80	200	226	226	226	266	266
Rated torque	T _N [Nm]	21	26	32	33	39	39	87	104	122	130	143	143
Momentary peak torque	T _M [Nm]	217	217	217	217	217	217	650	650	650	650	650	650
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6000						6000					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000						3000					
Moment of inertia with output flange (F0)	J _{in} [x10 ⁻⁶ kgm ²]	16	17	15	7.1	2.9	2.2	80	100	74	35	17	12
Moment of inertia with output shaft (Jx)	J _{in} [x10 ⁻⁶ kgm ²]	20	17	16	7.3	3.0	2.3	110	110	77	37	17	12
Weight with output flange (F0)	m [kg]	1.2	1.5	1.5	1.5	1.6	1.5	3.0	3.7	3.7	3.7	4.0	3.7
Weight with output shaft (Jx)	m [kg]	1.6	1.9	1.9	1.9	2.0	1.9	4.4	5.1	5.1	5.1	5.4	5.1
Transmission accuracy	[arcmin]	< 4						< 4					
Repeatability	[arcmin]	< ±0.25						< ±0.25					
Backlash	[arcmin]	≤ 3 or ≤ 1						≤ 3 or ≤ 1					
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	18						74					
Ambient operating temperature	[°C]	0 ... 40						0 ... 40					
Output bearing													
Dynamic radial load	F _{R dyn (max)} [N]	980	1240	1360	1510	1729	1890	1900	2410	2640	2920	3340	3670
Dynamic axial load	F _{A dyn (max)} [N]	1460	1850	2030	2250	2580	2830	2830	3590	3940	4360	4990	5480
Dynamic tilting moment	M _{dyn (max)} [Nm]	183						452					

Illustration 257.1

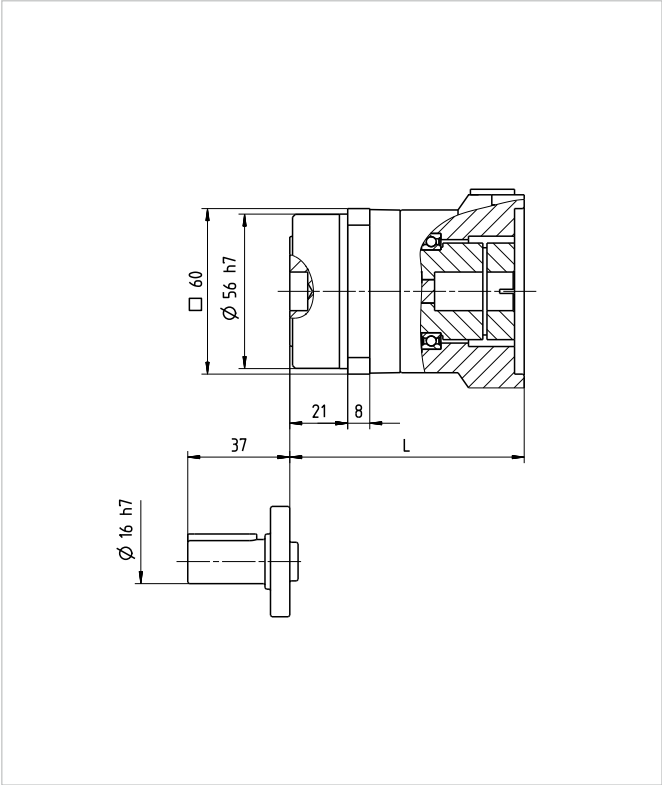
HPGP-11 [mm]



¹⁾ L = Depending on motor type

Illustration 257.2

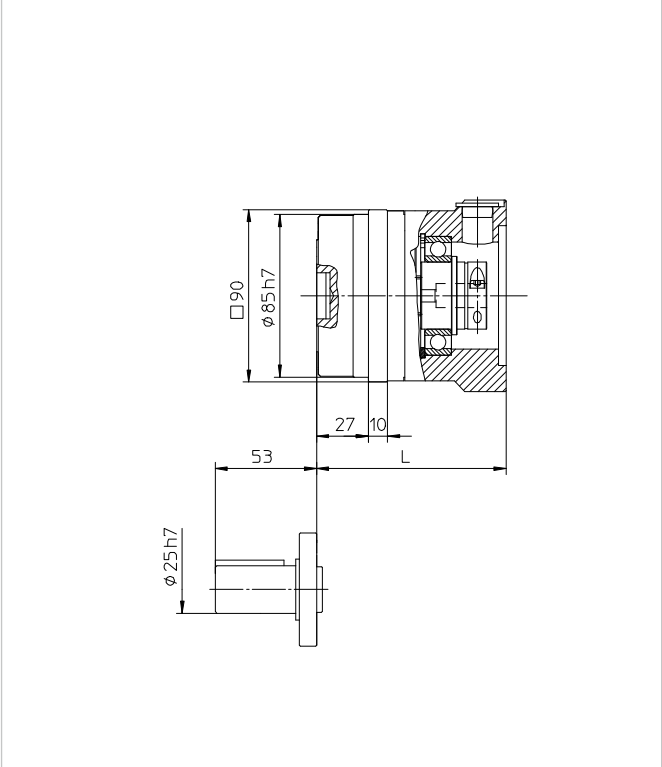
HPGP-14 [mm]



¹⁾ L = Depending on motor type

Illustration 257.3

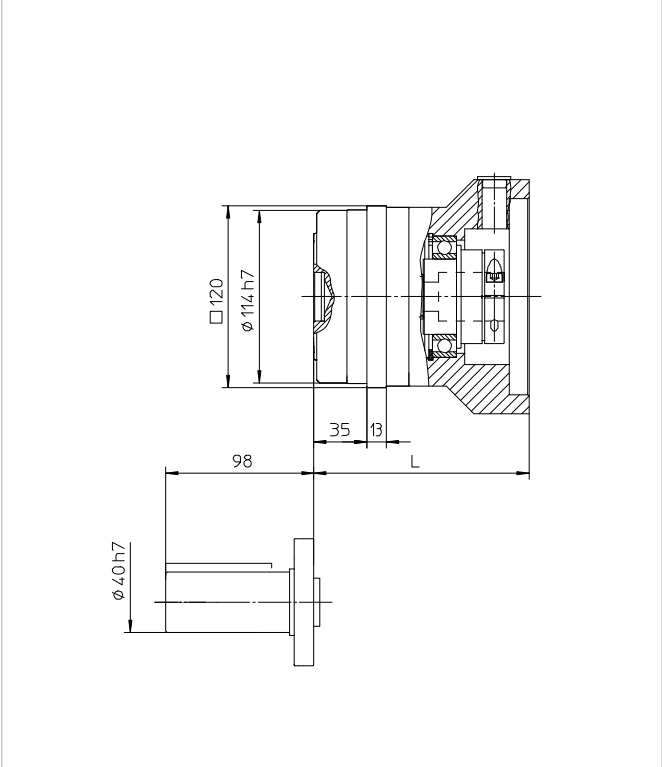
HPGP-20 [mm]



¹⁾ L = Depending on motor type

Illustration 257.4

HPGP-32 [mm]



¹⁾ L = Depending on motor type

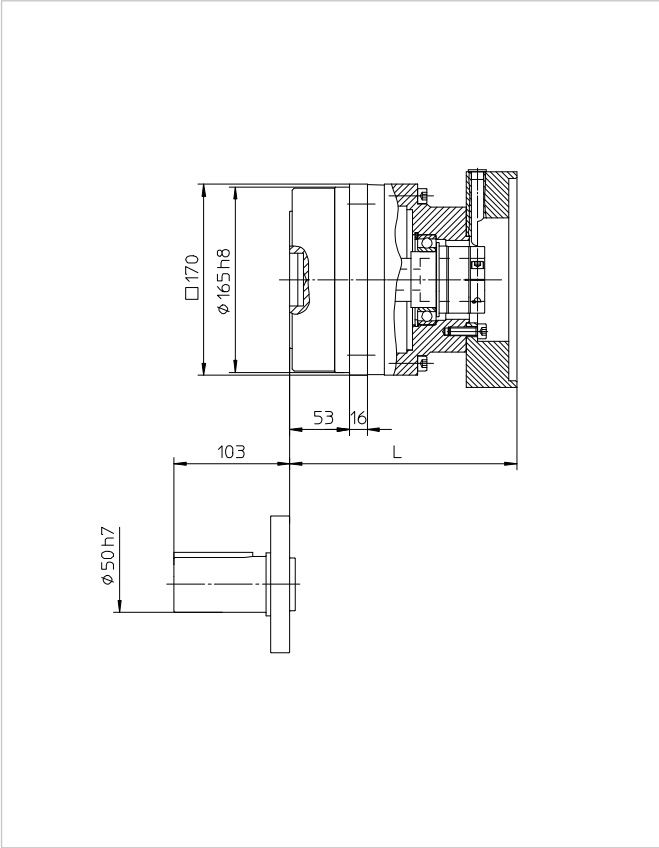
Technical data

Table 258.1

	Unit	HPGP-50						HPGP-65					
Ratio	i []	5	11	15	21	33	45	4	5	12	15	20	25
Repeatable peak torque	T _R [Nm]	1130	1130	1130	1130	1130	1130	2920	2920	2920	2920	2920	2920
Average torque	T _A [Nm]	452	532	600	665	665	665	1200	1330	1460	1730	2000	2000
Rated torque	T _N [Nm]	226	266	306	346	359	359	605	705	798	971	1060	1130
Momentary peak torque	T _M [Nm]	1850	1850	1850	1850	1850	1850	4500	4500	4500	4500	4500	4500
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4500						2500	3000				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	2000						2000					
Moment of inertia with output flange (F0)	J _{in} [x10 ⁻⁶ kgm ²]	490	400	350	160	72	50	3100	2100	2000	1900	730	680
Moment of inertia with output shaft (Jx)	J _{in} [x10 ⁻⁶ kgm ²]	620	420	370	170	75	52	4600	3000	2200	2000	780	720
Weight with output flange (F0)	m [kg]	10	12					22	37				
Weight with output shaft (Jx)	m [kg]	13	15					32	47				
Transmission accuracy	[arcmin]	< 3						< 3					
Repeatability	[arcmin]	< ±0.25						< ±0.25					
Backlash	[arcmin]	≤ 3 or ≤ 1						≤ 3 or ≤ 1					
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	470						1300					
Ambient operating temperature	[°C]	0 ... 40						0 ... 40					
Output bearing													
Dynamic radial load	F _{R dyn (max)} [N]	4350	5500	6050	6690	7660	8400	8860	9470	12300	13100	14300	15300
Dynamic axial load	F _{A dyn (max)} [N]	6490	8220	9030	9980	11400	12500	13200	14100	18300	19600	21400	22900
Dynamic tilting moment	M _{dyn (max)} [Nm]	1076						3900					

Illustration 259.1

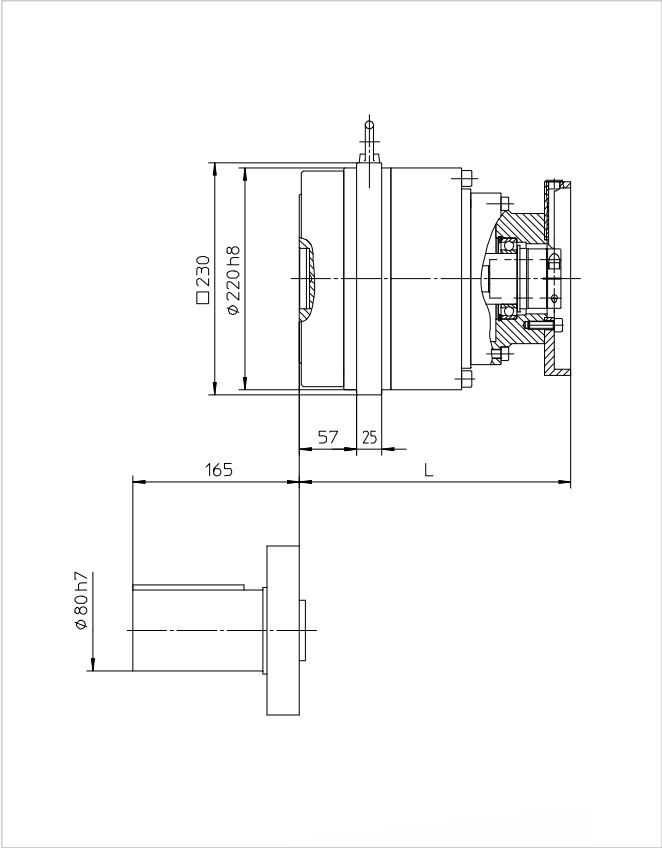
HPGP-50 [mm]



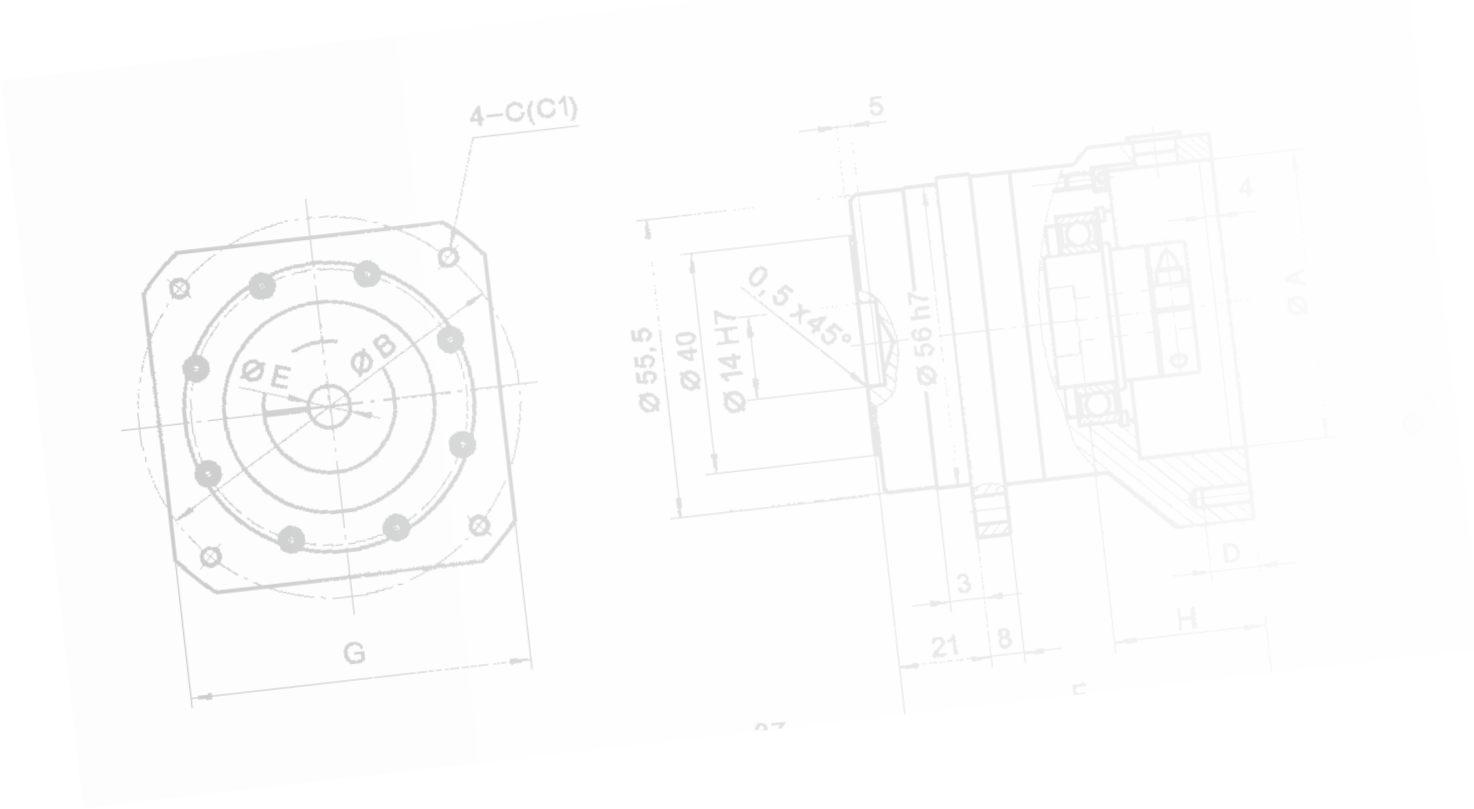
¹⁾ L = Depending on motor type

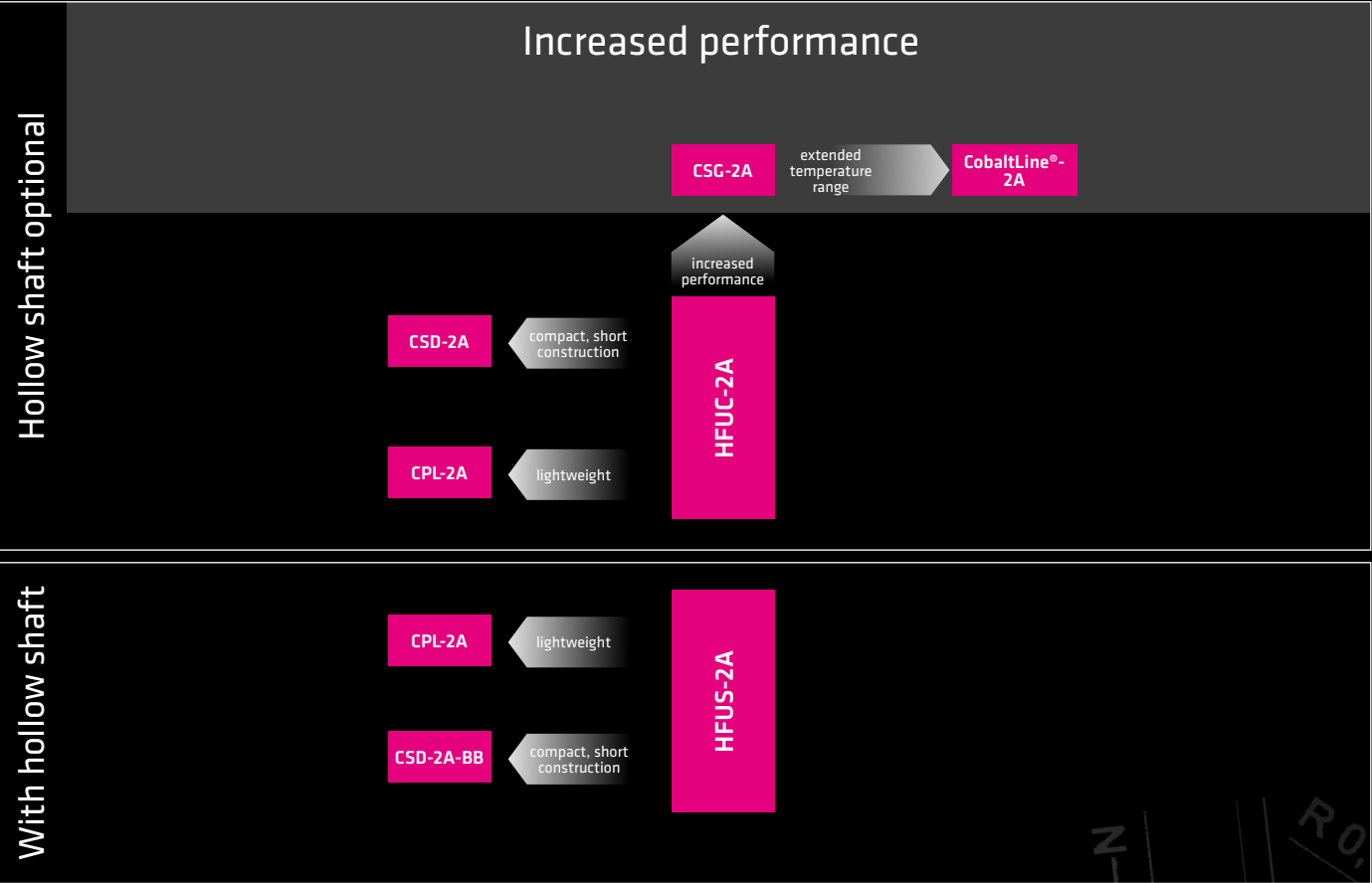
Illustration 259.2

HPGP-65 [mm]



¹⁾ L = Depending on motor type

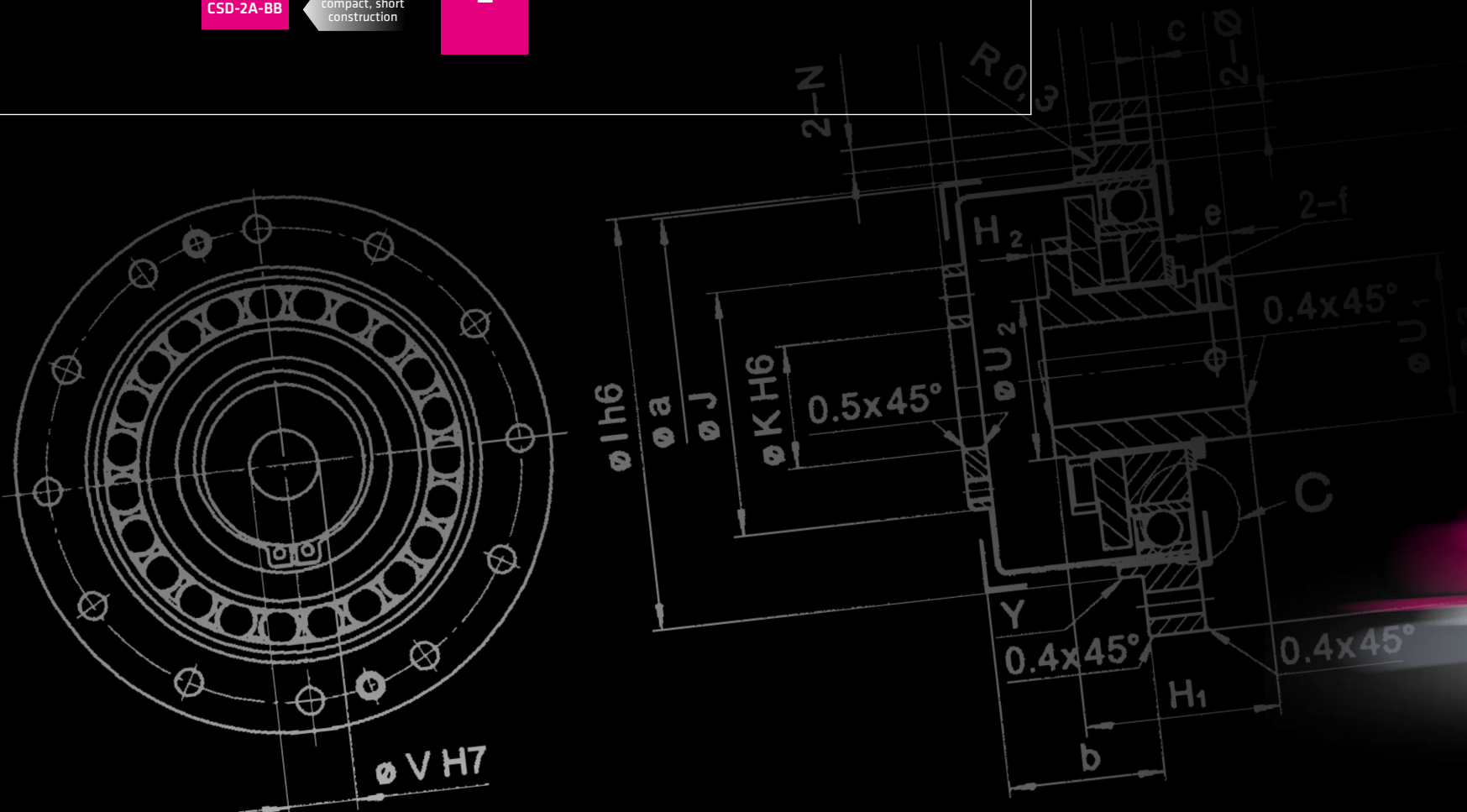




Component Sets

Quality Proven!

It is no wonder that the Harmonic Drive® Component Sets with their unique operating principle and constructional variety have already proven their worth as the ideal drive mechanism in numerous machines across the world. The extremely compact Component Sets consist of the three components namely the Circular Spline, Flexspline and Wave Generator. They offer the maximum freedom of design integration for inclusion in your construction, offering you unsurpassed flexibility on both the input and output side. It would be very difficult to find this range of design options and possible options with other gear systems. The compact design also guarantees to save you space and weight.



...just move it!

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C o n t e n t s

Contents

C o n t e n t s

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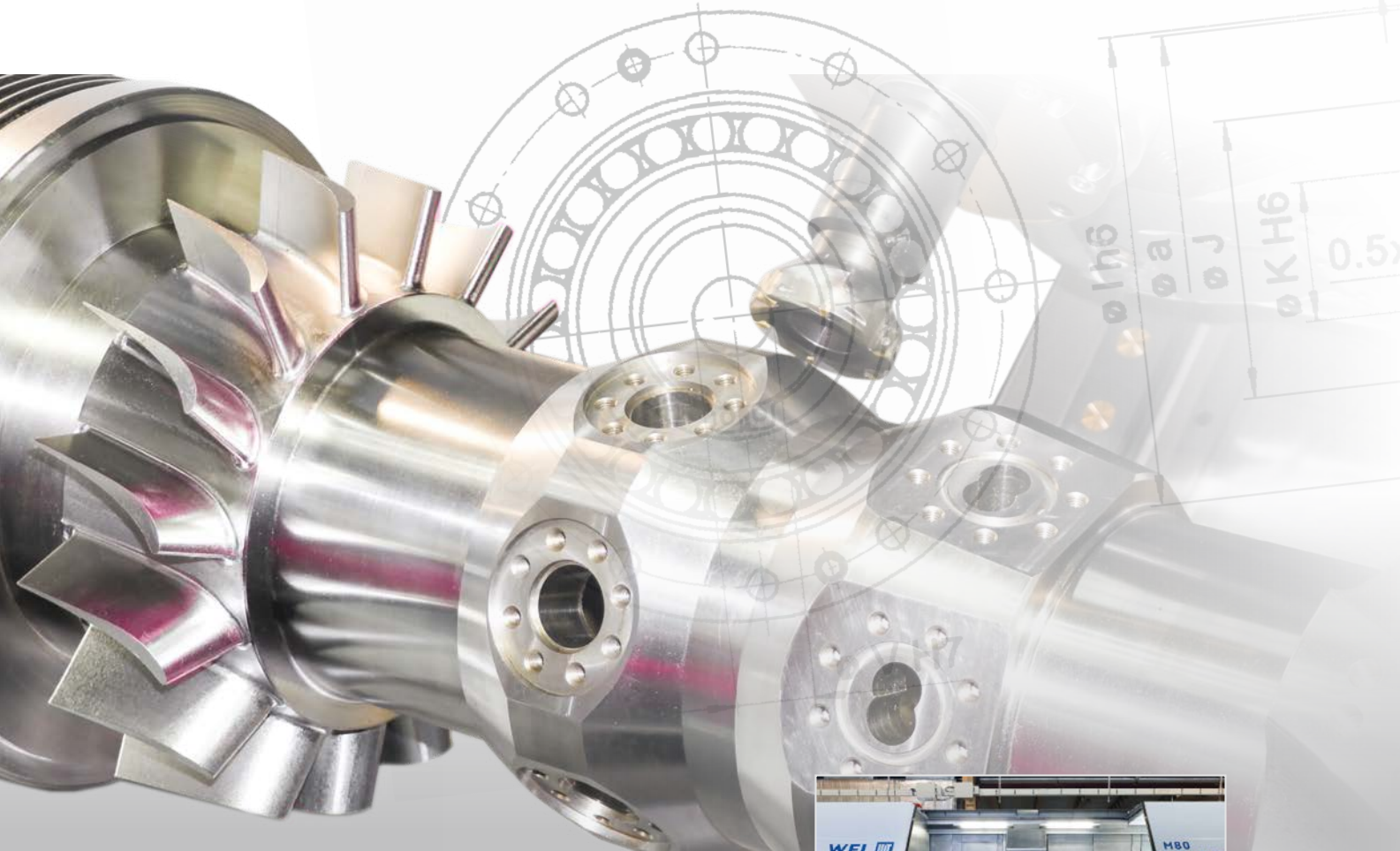
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CobaltLine® | CSG | CPL | HFUC | HFUS | CSD

Aerospace 40 years without any maintenance in space or 30 years of being built in to aircraft wings with daily temperature changes between -60 °C to +40 °C are indicators of the reliability and quality of our products. New demands, such as special materials, extremely light constructions or dry lubrication have been developed for aerospace and defence purposes, only for them later to find use in our industrial products.



Machine tools Is it possible to strike a Pound coin at a distance of a hundred metres? It is not only possible but must absolutely be achievable if high value machine tools are to be manufactured. Harmonic Drive AG products are used in particular at sites where space is limited. The layout in such cases is not defined by torque but rather by rigidity or by hollow shaft diameter.

Your requirements – Our solution

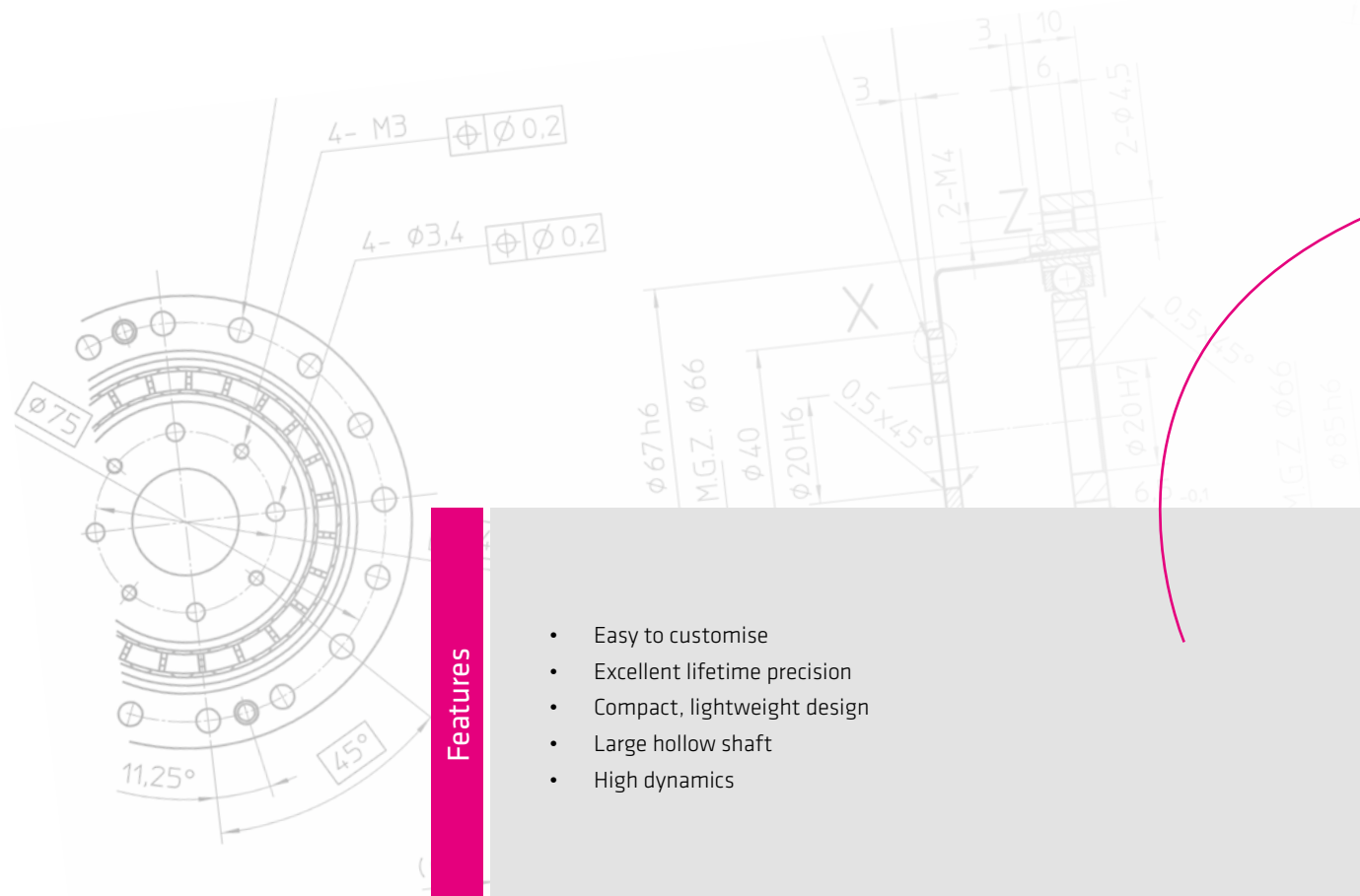
Features	CobaltLine®-2A HFUC-2A	CSG-2A	CPL-2A	HFUS-2A	CSD-2A
Excellent lifetime precision	●	●	●	●	●
Compact, lightweight design	●	●	●	●	●
Easy to customise	●	●	●	●	●
Large hollow shaft	●	●	●	●	●
High dynamics	●	●	●	●	●

● perfect ● optimal ● good



The CobaltLine® Series Component Sets are available in six sizes with gear ratios of 50, 80, 100, 120 and 160:1 offering repeatable peak torques from 23 to 841 Nm and a power density of up to 545 Nm/kg.

The Component Sets enable maximum flexibility in design integration and if required, can be tailored to your application as a specific configuration. Consisting of just three individual components, they are very lightweight and compact. The CobaltLine® Series can be used for ambient temperatures between -40 and 90 °C with a large selection of special lubricants. Due to their positioning accuracy stable machine characteristics with short cycle times are guaranteed.



- Optimal design solution
- Easy integration
- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Greater energy efficiency
- Lower production costs
- Small machine footprint
- Increased operating reliability
- Increased machine throughput
- Increased productivity

Customer Benefits



Component Sets

CobaltLine®-2A

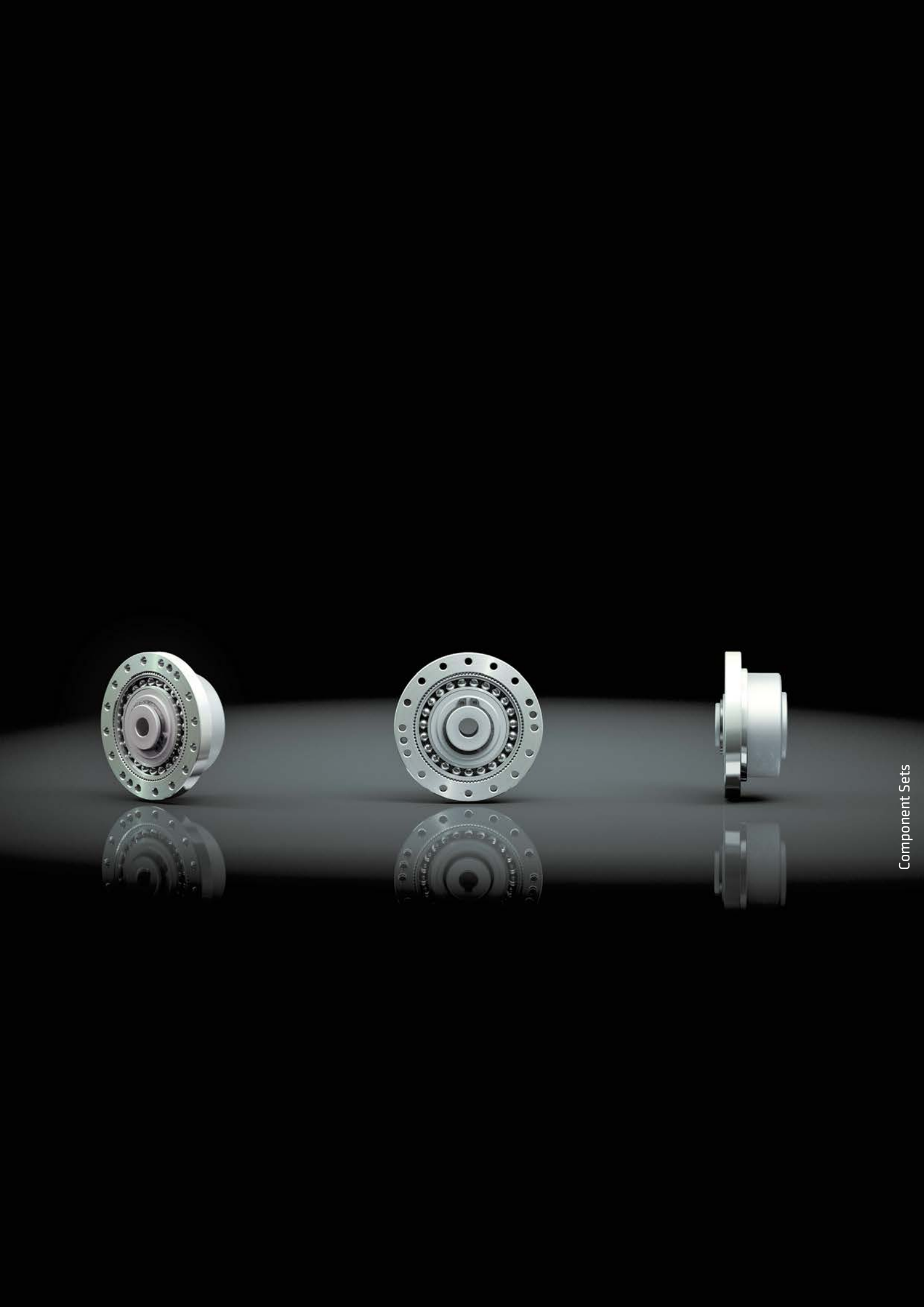
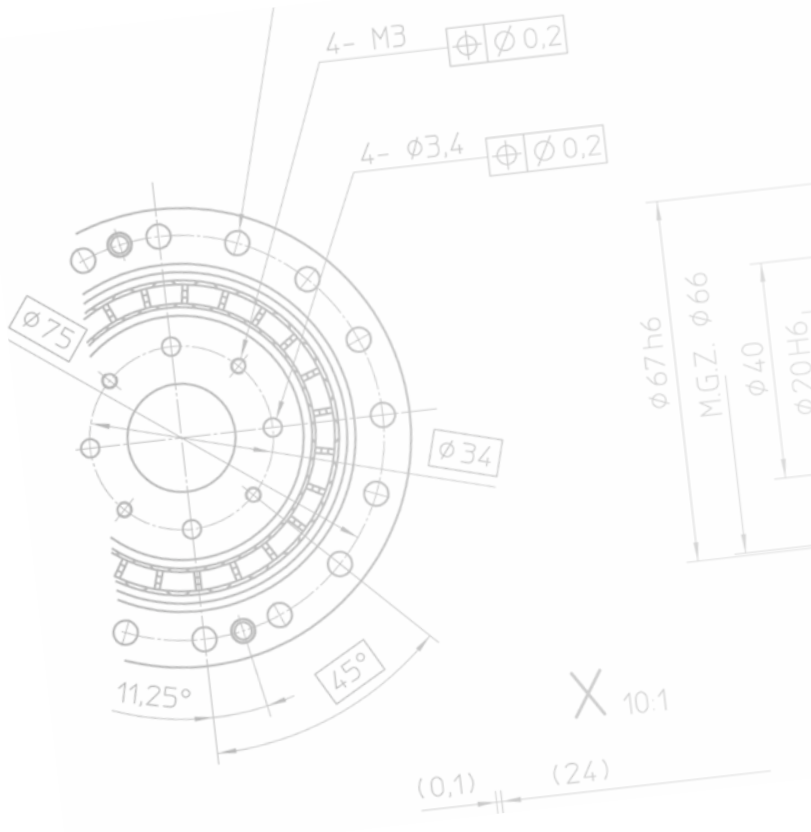
Ordering code

Table 268.1

Series	Size	Ratio					Version	Special design
CobaltLine	14	50	80	100			2A	According to customer requirements
	17	50	80	100	120			
	20	50	80	100	120	160		
	25	50	80	100	120	160		
	32	50	80	100	120	160		
	40	50	80	100	120	160		
Ordering code								
CobaltLine	-	25	-	100	-	2A	-	SP

Table 268.2

Version	
Ordering code	Description
2A	Component Set



Technical data

Table 270.1

	Unit	CobaltLine-14-2A			CobaltLine-17-2A			
Ratio	i []	50	80	100	50	80	100	120
Repeatable peak torque	T _R [Nm]	23	30	36	44	56	70	70
Average torque	T _A [Nm]	9.0	14	14	34	35	51	51
Rated torque	T _N [Nm]	7.0	10	10	21	29	31	31
Momentary peak torque	T _M [Nm]	46	61	70	91	113	143	112
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	14000			10000			
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			7300			
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500			6500			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500			
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.033			0.079			
Weight	m [kg]	0.09			0.15			
Maximum hollow shaft diameter	d _{H (max)} [mm]	11			10			
Transmission accuracy	[arcmin]	< 1.5			< 1.5			
Repeatability	[arcmin]	< ±0.1			< ±0.1			
Lost Motion	[arcmin]	< 1			< 1			
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	5.7	7.1		13.0	16.0		
Ambient operating temperature	[°C]	-40 ... 90			-40 ... 90			

Table 270.2

	Unit	CobaltLine-20-2A					CobaltLine-25-2A				
Ratio	i []	50	80	100	120	160	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	73	96	107	113	120	127	178	204	217	229
Average torque	T _A [Nm]	44	61	64	64	64	72	113	140	140	140
Rated torque	T _N [Nm]	33	44	52	52	52	51	82	87	87	87
Momentary peak torque	T _M [Nm]	127	165	191	191	191	242	332	369	395	408
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	10000					7500				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500					5600				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500					5600				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500					3500				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	0.193					0.413				
Weight	m [kg]	0.28					0.42				
Maximum hollow shaft diameter	d _{H (max)} [mm]	16					20				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	23	29				44	57			
Ambient operating temperature	[°C]	-40 ... 90					-40 ... 90				

Illustration 271.1

CobaltLine-14-2A [mm]

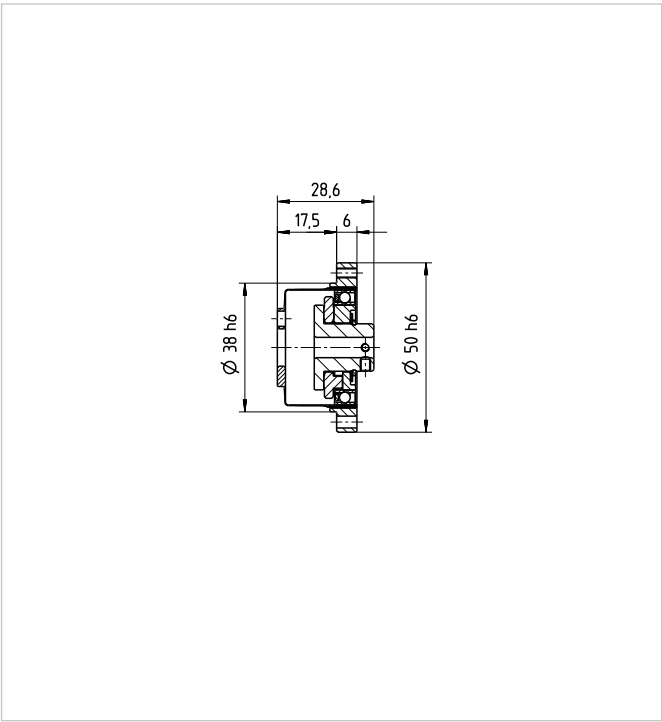


Illustration 271.2

CobaltLine-17-2A [mm]

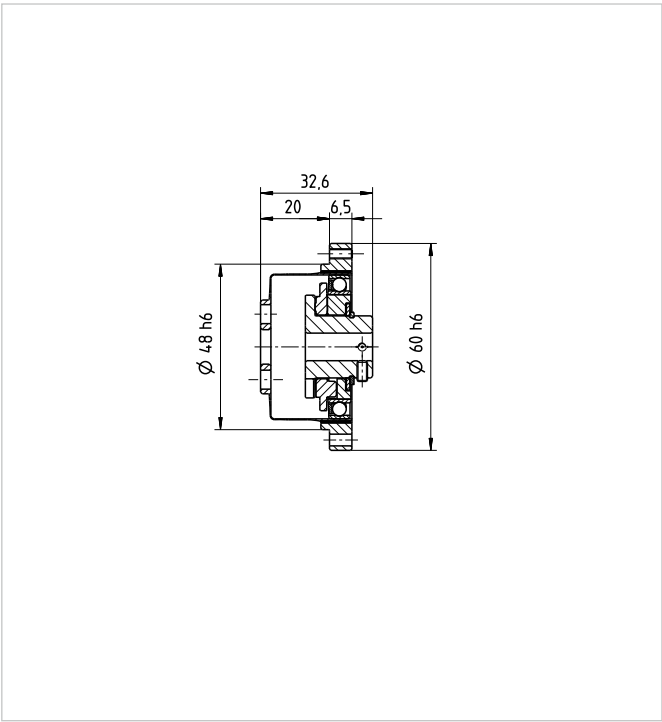


Illustration 271.3

CobaltLine-20-2A [mm]

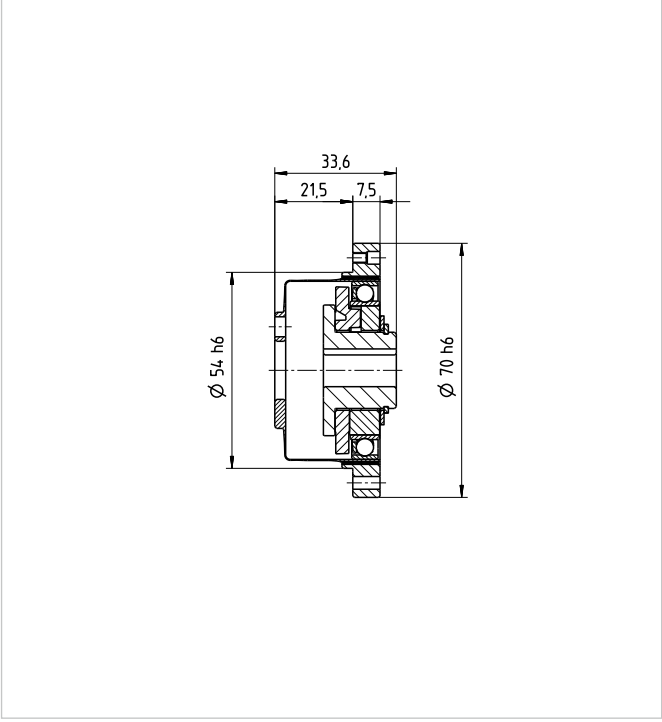
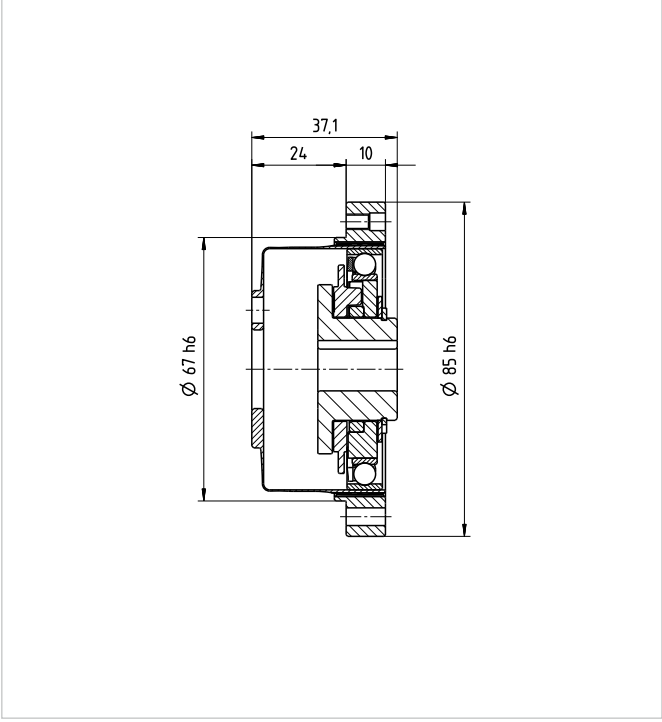


Illustration 271.4

CobaltLine-25-2A [mm]



Technical data

Table 272.1

	Unit	CobaltLine-32-2A					CobaltLine-40-2A				
Ratio	i []	50	80	100	120	160	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	281	395	433	459	484	523	675	738	802	841
Average torque	T _A [Nm]	140	217	281	281	281	255	369	484	586	586
Rated torque	T _N [Nm]	99	153	178	178	178	178	268	345	382	382
Momentary peak torque	T _M [Nm]	497	738	841	892	892	892	1270	1400	1530	1530
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	7000					5600				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800					4000				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	4600					3600				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500					3000				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	1.96					4.5				
Weight	m [kg]	0.89					1.7				
Maximum hollow shaft diameter	d _{H (max)} [mm]	26					32				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					<±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	98	120				180	230			
Ambient operating temperature	[°C]	-40 ... 90					-40 ... 90				

Illustration 273.1

CobaltLine-32-2A [mm]

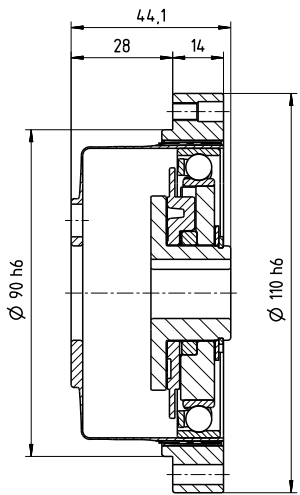
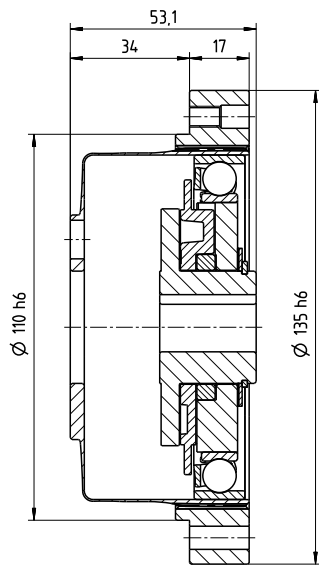
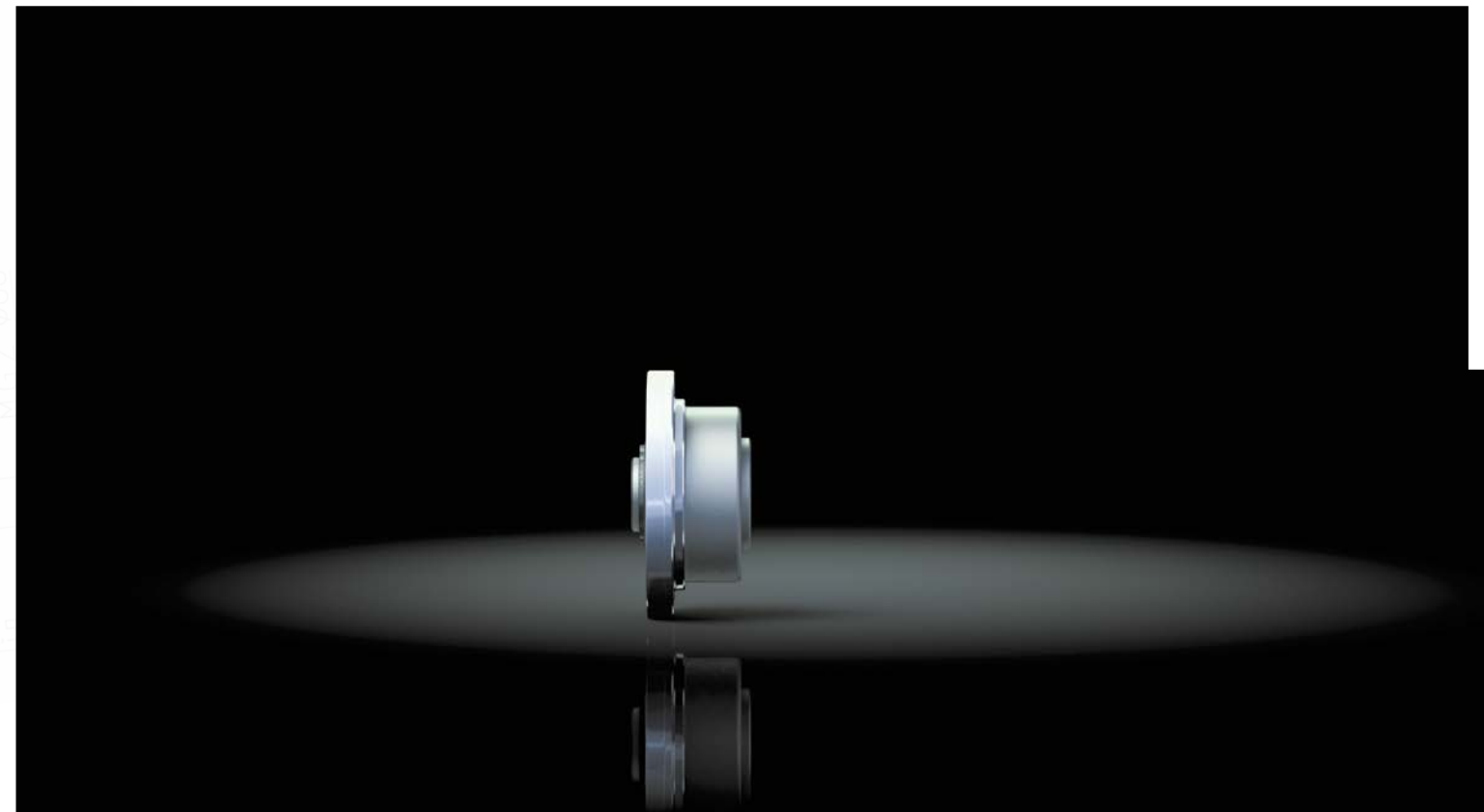


Illustration 273.2

CobaltLine-40-2A [mm]



QUICKLINK www.harmonicdrive.co.uk/CAD3010



Maximum torque capacity

The CSG Series Component Sets are available in ten sizes with gear ratios of 50, 80, 100, 120 and 160:1 offering repeatable peak torques from 23 to 3419 Nm and a power density of up to 545 Nm/kg.

Harmonic Drive® Component Sets consist of three individual components – Circular Spline, Flexspline and Wave Generator. They offer the maximum freedom of design integration on both input and output elements and their extremely compact design ensures installation in applications with the most demanding space requirements.

Consisting of just three individual components, they are very lightweight and compact. The series cover a wide torque range and features long service life, a fact confirmed by years of successful service.

Due to their positioning accuracy, stable machine characteristics with short cycle times are guaranteed.

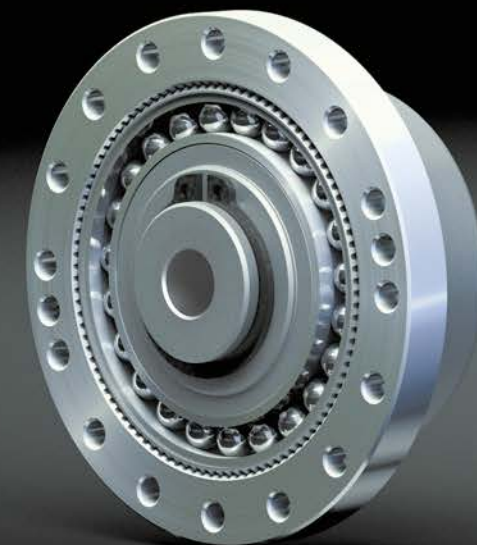
Features

- Excellent lifetime precision
- Compact, lightweight design
- Large hollow shaft
- High dynamics

Optimised for your applications:

- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Greater energy efficiency
- Lower production costs
- Small machine footprint
- Simple design solution
- Increased operating reliability

Customer Benefits



QUICKLINK

www.harmonicdrive.co.uk/3020

CSG-2A

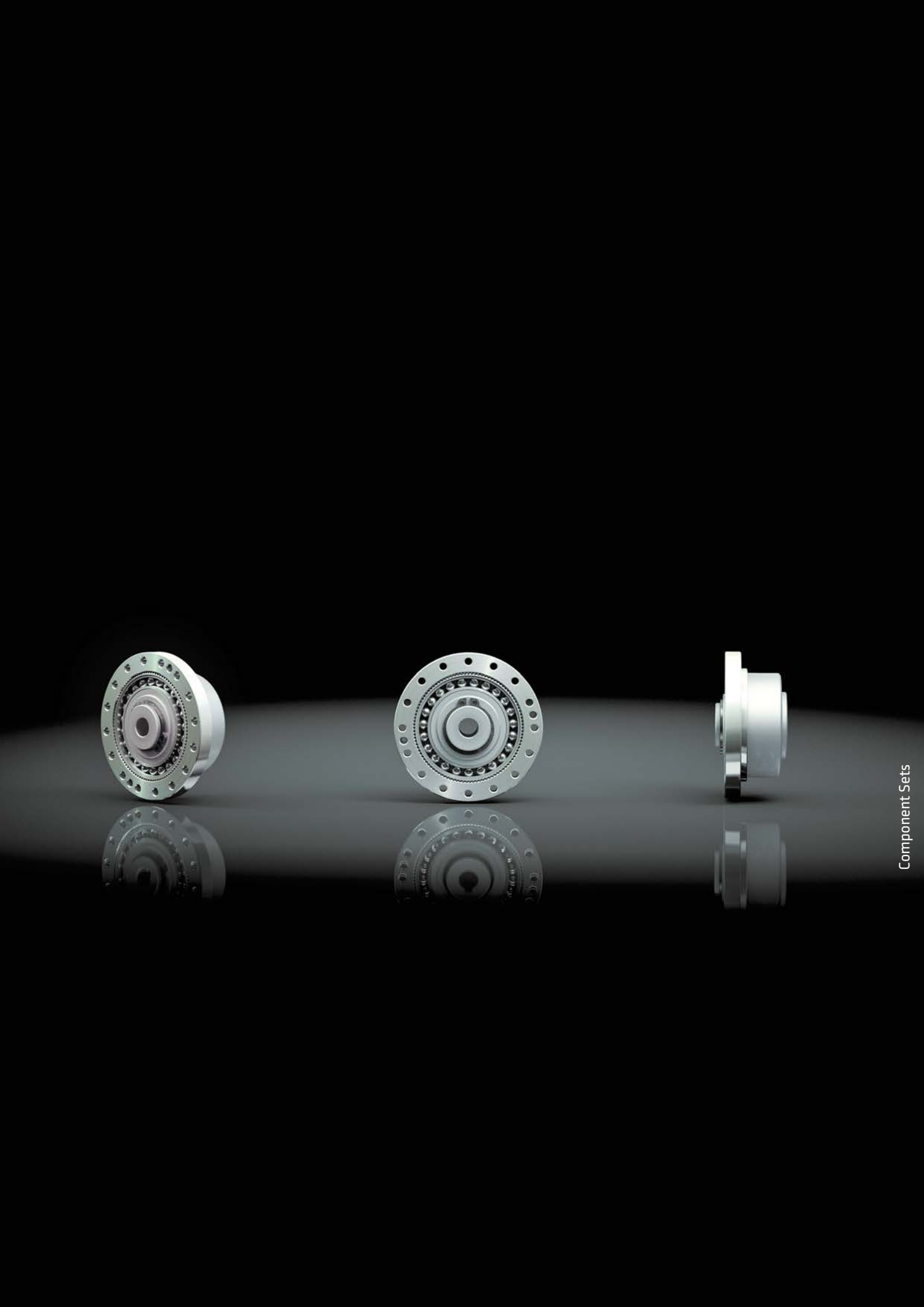
Ordering code

Table 276.1

Series	Size	Ratio					Version		Special design	
CSG	14	50	80	100			2A-R	E	According to customer requirements	
	17	50	80	100	120					
	20	50	80	100	120	160	2A-GR			
	25	50	80	100	120	160				
	32	50	80	100	120	160				
	40	50	80	100	120	160				
	45	50	80	100	120	160				
	50		80	100	120	160				
	58		80	100	120	160				
	65		80	100	120	160				
Ordering code										
CSG	-	25	-	100	-	2A-GR	-	E	-	SP

Table 276.2

Version	
Ordering code	Description
2A-R	Component Set
2A-GR	
2A-R-E	Component Set with EKagrip® gasket
2A-GR-E	



Technical data

Table 278.1

	Unit	CSG-14-2A			CSG-17-2A			
Ratio	i []	50	80	100	50	80	100	120
Repeatable peak torque	T _R [Nm]	23	30	36	44	56	70	70
Average torque	T _A [Nm]	9.0	14	14	34	35	51	51
Rated torque	T _N [Nm]	7.0	10	10	21	29	31	31
Momentary peak torque	T _M [Nm]	46	61	70	91	113	143	112
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	14000			10000			
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			7300			
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500			6500			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500			
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.033			0.079			
Weight	m [kg]	0.09			0.15			
Maximum hollow shaft diameter	d _{H (max)} [mm]	11			10			
Transmission accuracy	[arcmin]	< 1.5			< 1.5			
Repeatability	[arcmin]	< ±0.1			< ±0.1			
Lost Motion	[arcmin]	< 1			< 1			
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	5.7	7.1		13	16		
Ambient operating temperature	[°C]	-10 ... 80			-10 ... 80			

Table 278.2

	Unit	CSG-20-2A					CSG-25-2A				
Ratio	i []	50	80	100	120	160	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	73	96	107	113	120	127	178	204	217	229
Average torque	T _A [Nm]	44	61	64	64	64	72	113	140	140	140
Rated torque	T _N [Nm]	33	44	52	52	52	51	82	87	87	87
Momentary peak torque	T _M [Nm]	127	165	191	191	191	242	332	369	395	408
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	10000					7500				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500					5600				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500					5600				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500					3500				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.193					0.413				
Weight	m [kg]	0.28					0.42				
Maximum hollow shaft diameter	d _{H (max)} [mm]	16					20				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	23	29				44	57			
Ambient operating temperature	[°C]	-10 ... 80					-10 ... 80				

Illustration 279.1

CSG-14-2A [mm]

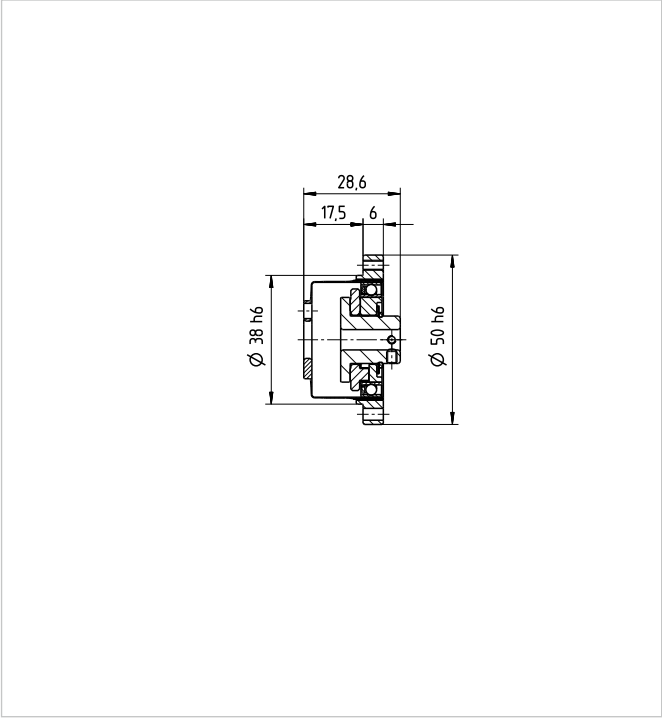


Illustration 279.2

CSG-17-2A [mm]

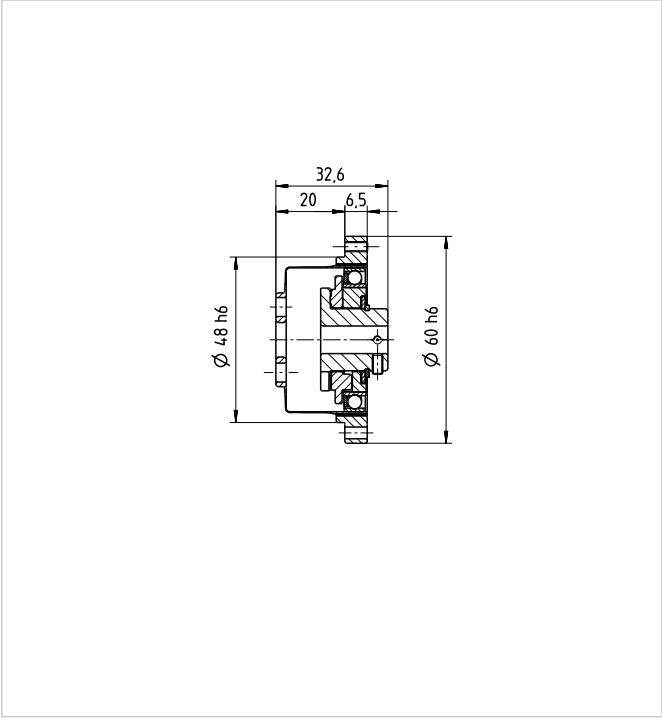


Illustration 279.3

CSG-20-2A [mm]

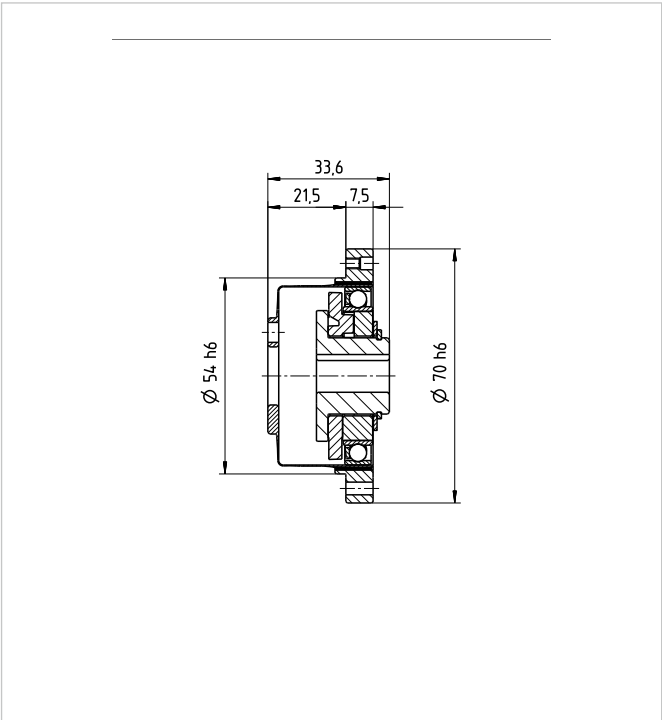
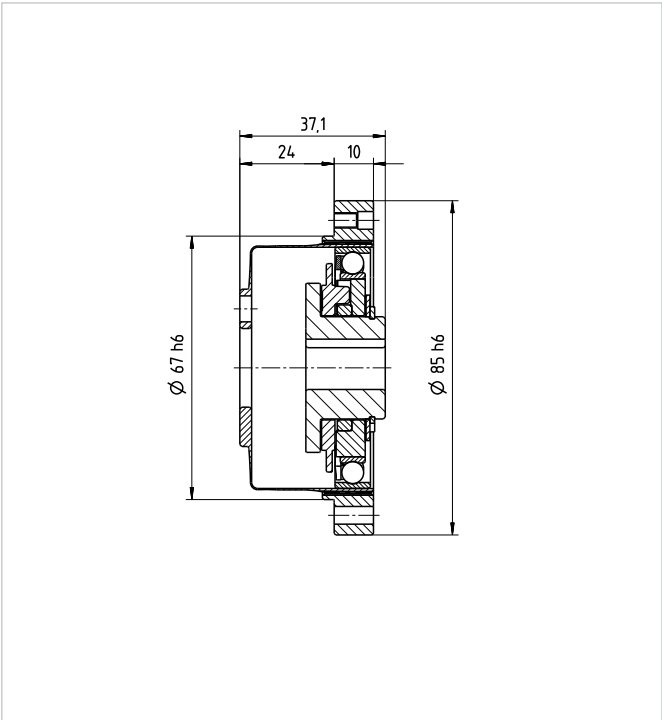


Illustration 279.4

CSG-25-2A [mm]



Technical data

Table 280.1

	Unit	CSG-32-2A					CSG-40-2A				
Ratio	i []	50	80	100	120	160	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	281	395	433	459	484	523	675	738	802	841
Average torque	T _A [Nm]	140	217	281	281	281	255	369	484	586	586
Rated torque	T _N [Nm]	99	153	178	178	178	178	268	345	382	382
Momentary peak torque	T _M [Nm]	497	738	841	892	892	892	1270	1400	1530	1530
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	7000					5600				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800					4000				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	4600					3600				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500					3000				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	1.96					4.5				
Weight	m [kg]	0.89					1.7				
Maximum hollow shaft diameter	d _{H (max)} [mm]	26					32				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	<±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	98	120				180	230			
Ambient operating temperature	[°C]	-10 ... 80					-10 ... 80				

Table 280.2

	Unit	CSG-45-2A					CSG-50-2A			
Ratio	i []	50	80	100	120	160	80	100	120	160
Repeatable peak torque	T _R [Nm]	650	918	982	1070	1147	1223	1274	1404	1534
Average torque	T _A [Nm]	345	507	650	806	819	675	866	1057	1096
Rated torque	T _N [Nm]	229	407	459	523	523	484	611	688	688
Momentary peak torque	T _M [Nm]	1235	1651	2041	2288	2483	2418	2678	2678	3185
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	5000					4500			
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3800					3500			
Average input speed (oil lubrication)	n _{av (max)} [rpm]	3300					3000			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000					2500			
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	8.68					12.58			
Weight	m [kg]	2.3					3.2			
Maximum hollow shaft diameter	d _{H (max)} [mm]	36					40			
Transmission accuracy	[arcmin]	< 1					< 1			
Repeatability	[arcmin]	< ±0.1					< ±0.1			
Lost Motion	[arcmin]	< 1					< 1			
Torsional stiffness	K ₃ [x10³ Nm/rad]	260	330				440			
Ambient operating temperature	[°C]	-10 ... 80					-10 ... 80			

Illustration 281.1

CSG-32-2A [mm]

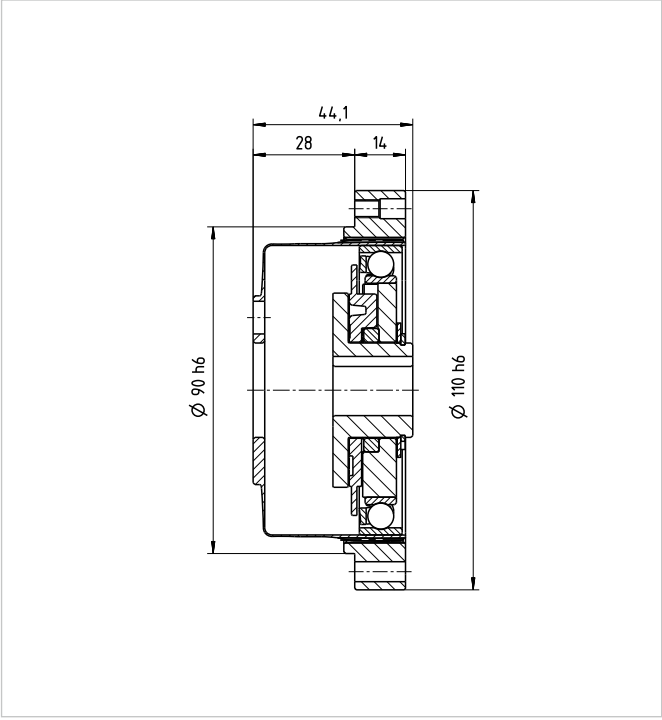


Illustration 281.2

CSG-40-2A [mm]

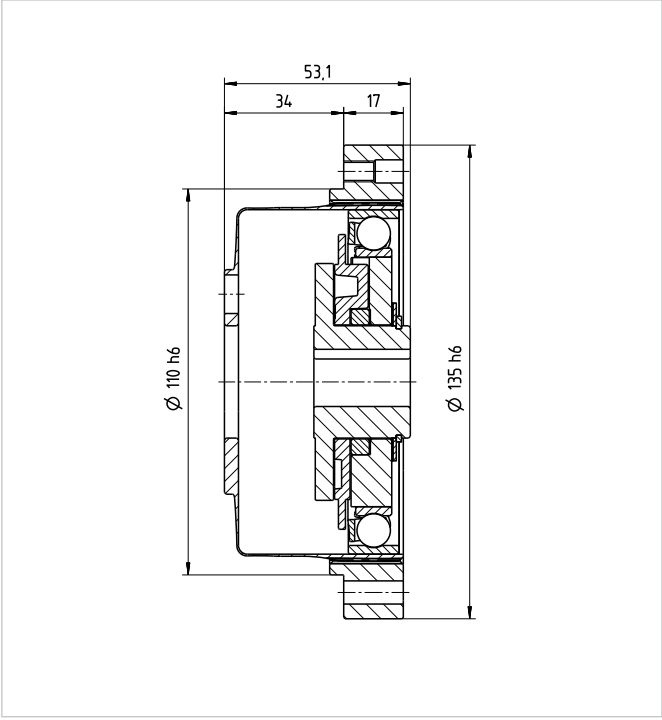


Illustration 281.3

CSG-45-2A [mm]

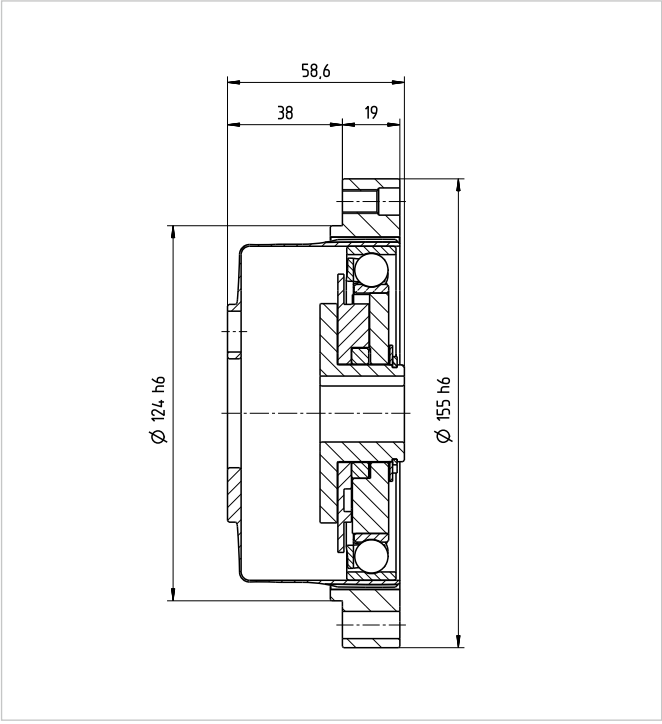
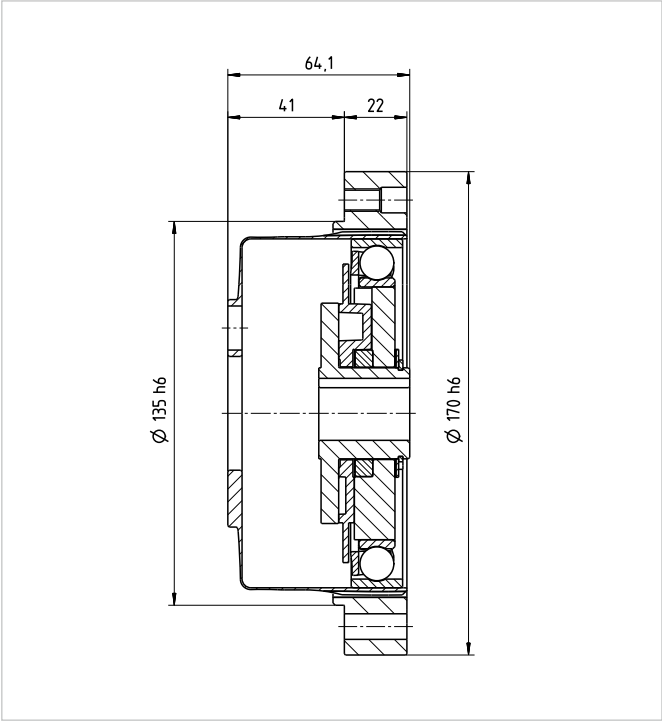


Illustration 281.4

CSG-50-2A [mm]



Technical data

Table 282.1

	Unit	CSG-58 -2A				CSG-65 -2A			
Ratio	i []	80	100	120	160	80	100	120	160
Repeatable peak torque	T _R [Nm]	1924	2067	2236	2392	2743	2990	3263	3419
Average torque	T _A [Nm]	1001	1378	1547	1573	1352	1976	2041	2041
Rated torque	T _N [Nm]	714	905	969	969	969	1236	1236	1236
Momentary peak torque	T _M [Nm]	3185	4134	4329	4459	4836	6175	6175	6175
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	4000				3500			
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3000				2800			
Average input speed (oil lubrication)	n _{av (max)} [rpm]	2700				2400			
Average input speed (grease lubrication)	n _{av (max)} [rpm]	2200				1900			
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	27.3				46.8			
Weight	m [kg]	4.7				6.7			
Maximum hollow shaft diameter	d _{H (max)} [mm]	46				52			
Transmission accuracy	[arcmin]	< 1				< 1			
Repeatability	[arcmin]	< ±0.1				< ±0.1			
Lost Motion	[arcmin]	< 1				< 1			
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	710				980			
Ambient operating temperature	[°C]	-10 ... 80				-10 ... 80			

Illustration 283.1

CSG-58-2A [mm]

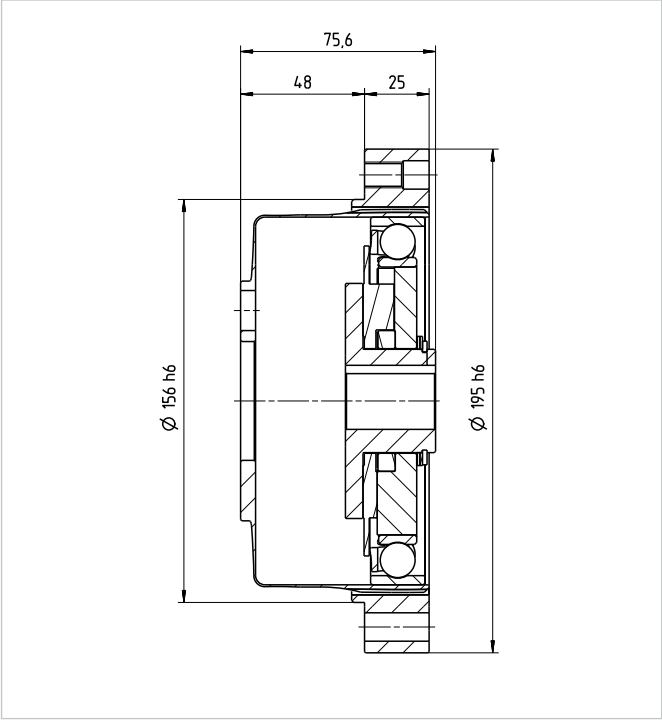
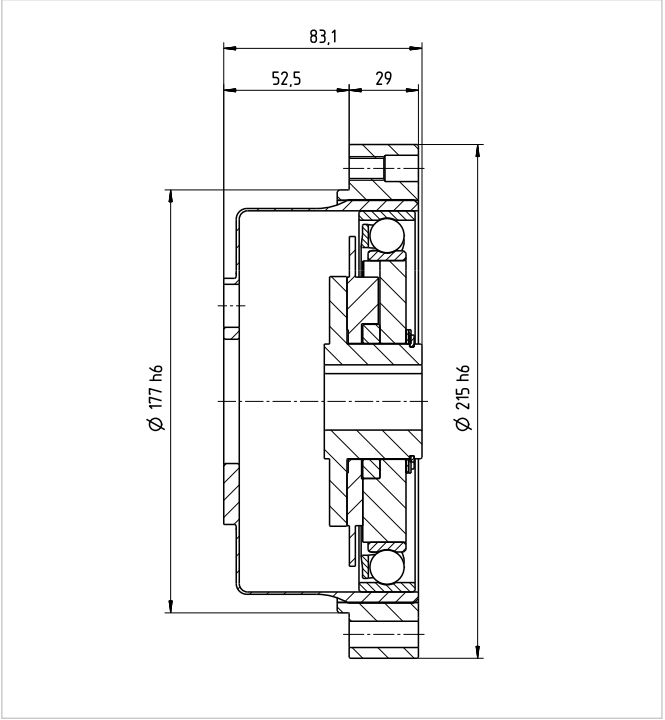


Illustration 283.2

CSG-65-2A [mm]



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Component Sets

Ordering code

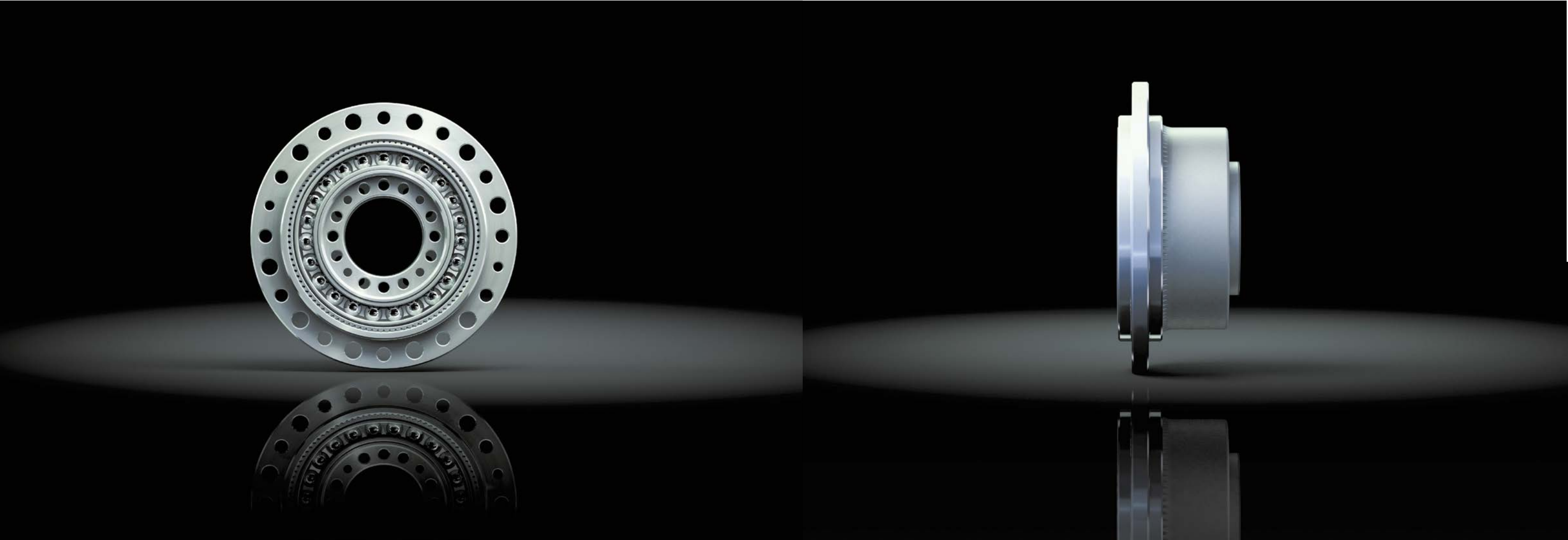
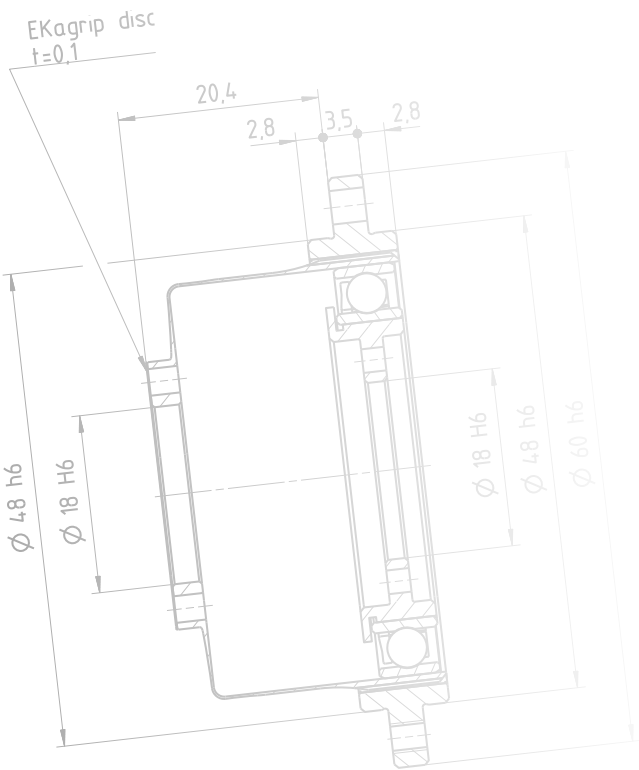
Table 286.1

Series	Size	Ratio						Version	Special design
CPL	14A	30	50	80	100			2A	According to customer requirements
	17A	30	50	80	100	120			
	20A	30	50	80	100	120	160		
	25A	30	50	80	100	120	160		
	32A	30	50	80	100	120	160		
Ordering code									
CPL	-	25A	-	100	-	2A	-	SP	

Table 286.2

Version	
Ordering code	Description
2A	Component Set

Clarification of the technical data can be found in the Glossary



Technical data

Table 288.1

	Unit	CPL-14-2A				CPL-17-2A				
Ratio	i []	30	50	80	100	30	50	80	100	120
Repeatable peak torque	T _R [Nm]	9	18	23	28	16	34	43	54	54
Average torque	T _A [Nm]	6.8	6.9	11	11	12	26	27	39	39
Rated torque	T _N [Nm]	4	5.4	7.8	7.8	8.8	16	22	24	24
Momentary peak torque	T _M [Nm]	17	35	47	54	30	70	87	110	86
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	14000				10000				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500				7300				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500				6500				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500				3500				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	0.020				0.049				
Weight	m [kg]	0.055				0.1				
Maximum hollow shaft diameter	d _{H (max)} [mm]	13.5				18				
Transmission accuracy	[arcmin]	< 2	< 1.5			< 1.5				
Repeatability	[arcmin]	< ±0.1				< ±0.1				
Lost Motion	[arcmin]	< 1				< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	3.4	5.7	7.1		6.7	13	16		
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90								

Table 288.2

	Unit	CPL-20-2A						CPL-25-2A					
Ratio	i []	30	50	80	100	120	160	30	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	27	56	74	82	87	92	50	98	137	157	167	176
Average torque	T _A [Nm]	20	34	47	49	49	49	38	55	87	108	108	108
Rated torque	T _N [Nm]	15	25	34	40	40	40	27	39	63	67	67	67
Momentary peak torque	T _M [Nm]	50	98	127	147	147	147	95	186	255	284	304	314
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	10000						7500					
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500						5600					
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500						5600					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500						3500					
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.112						0.263					
Weight	m [kg]	0.14						0.24					
Maximum hollow shaft diameter	d _{H (max)} [mm]	21						26					
Transmission accuracy	[arcmin]	< 1.5	< 1					< 1.5	< 1				
Repeatability	[arcmin]	< ±0.1						< ±0.1					
Lost Motion	[arcmin]	<1						<1					
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	11	23	29				21	44	57			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90											

Illustration 289.1

CPL-14-2A [mm]

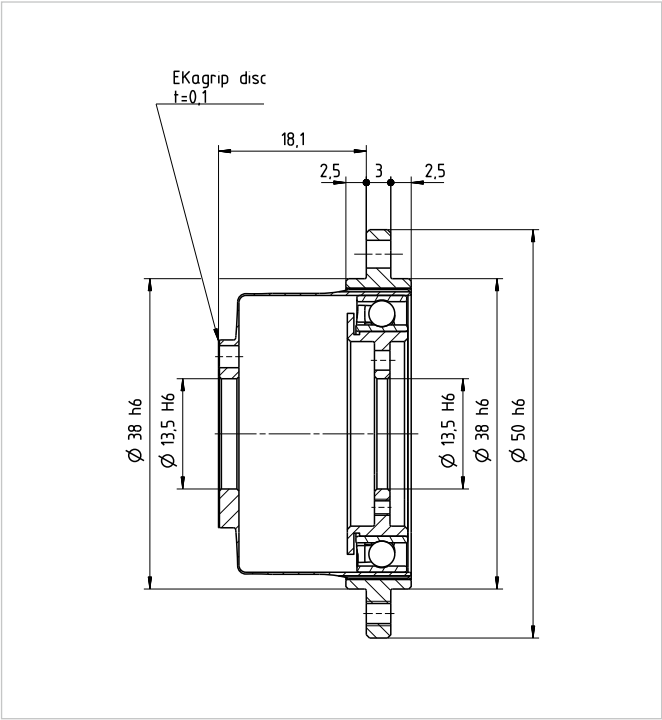


Illustration 289.2

CPL-17-2A [mm]

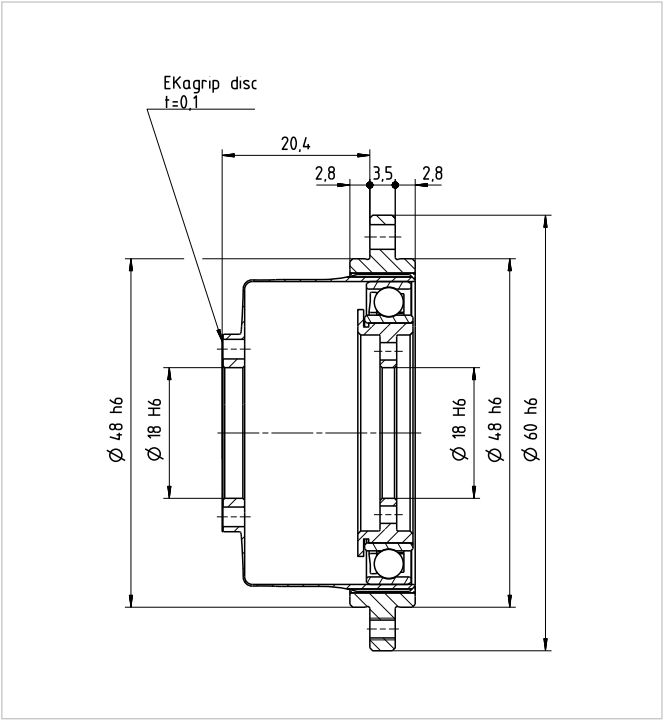


Illustration 289.3

CPL-20-2A [mm]

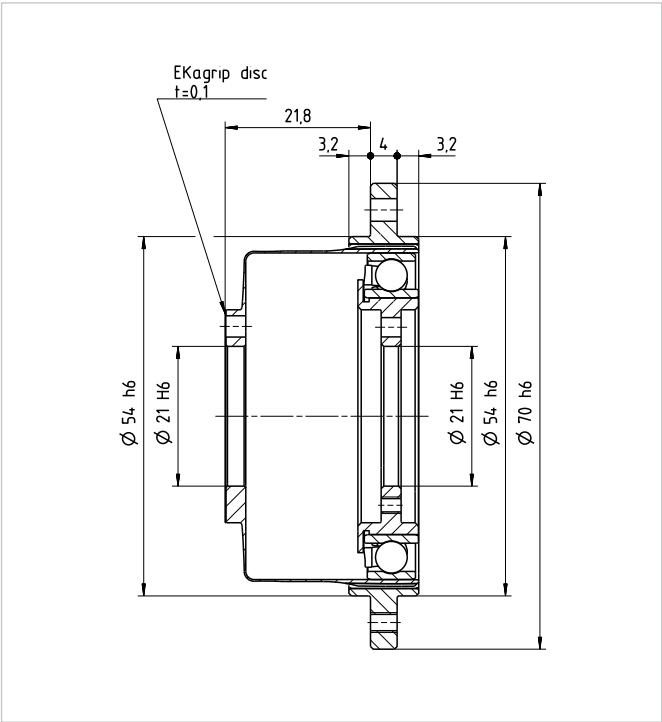
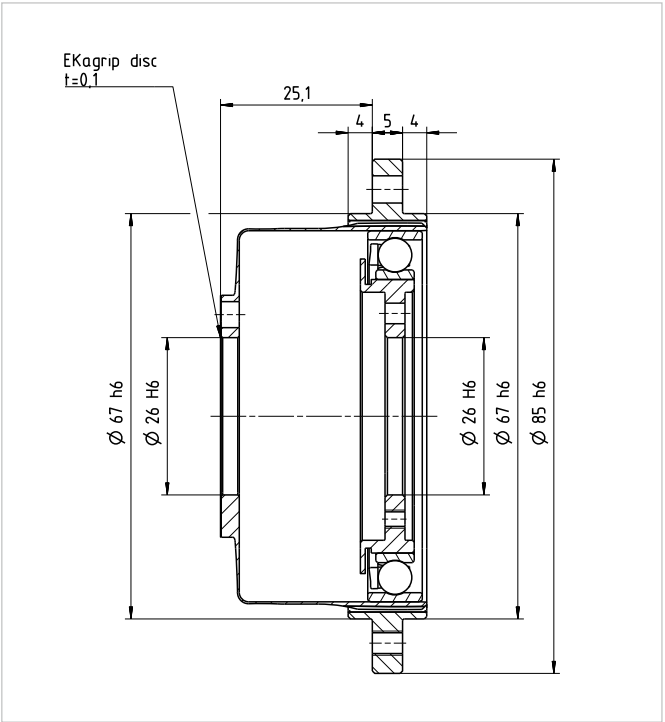


Illustration 289.4

CPL-25-2A [mm]

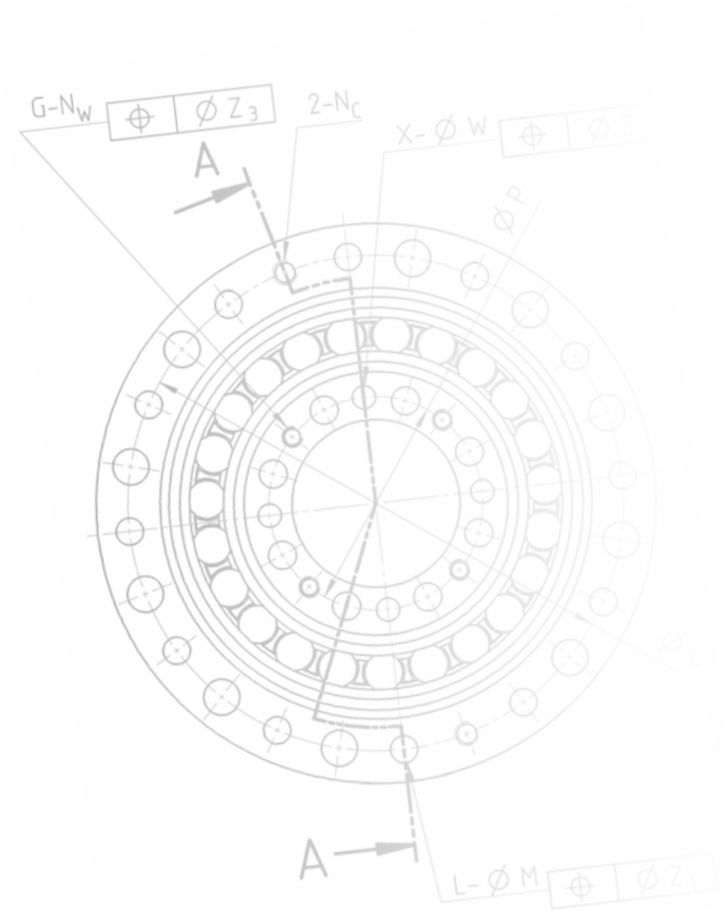
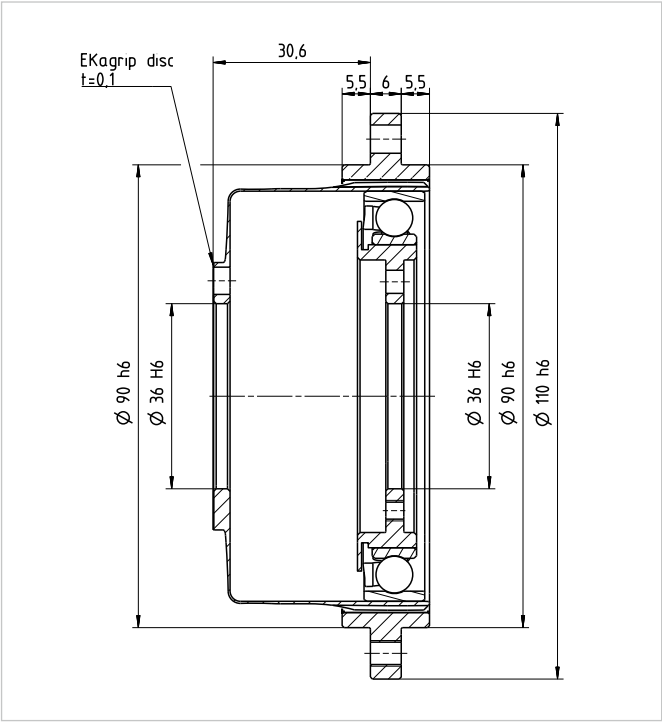


Technical data

Table 290.1

	Unit	CPL-32-2A					
Ratio	i []	30	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	100	216	304	333	353	372
Average torque	T _A [Nm]	75	108	167	216	216	216
Rated torque	T _N [Nm]	54	76	118	137	137	137
Momentary peak torque	T _M [Nm]	200	382	568	647	686	686
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	7000					
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800					
Average input speed (oil lubrication)	n _{av (max)} [rpm]	4600					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500					
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	0.924					
Weight	m [kg]	0.54					
Maximum hollow shaft diameter	d _{H (max)} [mm]	36					
Transmission accuracy	[arcmin]	< 1.5	< 1				
Repeatability	[arcmin]	< ±0.1					
Lost Motion	[arcmin]	< 1					
Torsional stiffness	K ₃ [x10³ Nm/rad]	49	98	120			
Ambient operating temperature	[°C]	Standard 0 ...60, Special lubrication -40 ... 90					

Illustration 291.1 CPL-32-2A [mm]



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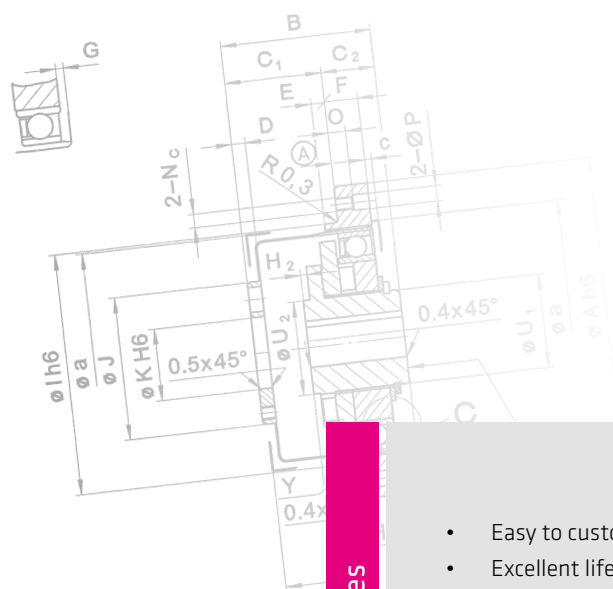


The standard series

The HFUC Series Component Sets are available in fifteen sizes with gear ratios of 30, 50, 80, 100, 120 and 160:1 offering repeatable peak torques from 1.8 to 9180 Nm and a power density of up to 420 Nm/kg.

Harmonic Drive® Component Sets consist of three individual components - Circular Spline, Flexspline and Wave Generator. They offer the maximum freedom of design integration on both input and output elements and their extremely compact design ensures installation in applications with the most demanding space requirements.

If required, the Component Sets are available as specific configurations tailored to your application, including special lubricants for extended temperature ranges or special materials for extreme ambient conditions. Consisting of just three individual components, they are very lightweight and compact. Due to their positioning accuracy stable machine properties with short cycle times are guaranteed.



Features

- Easy to customise
- Excellent lifetime precision
- Compact, lightweight design
- Large hollow shaft
- High dynamics

Optimised for your applications:

- Optimal design solution
- Easy integration
- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Greater energy efficiency
- Lower production costs
- Small machine footprint
- Increased operating reliability

Customer Benefits



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HFUC-2A

Ordering code

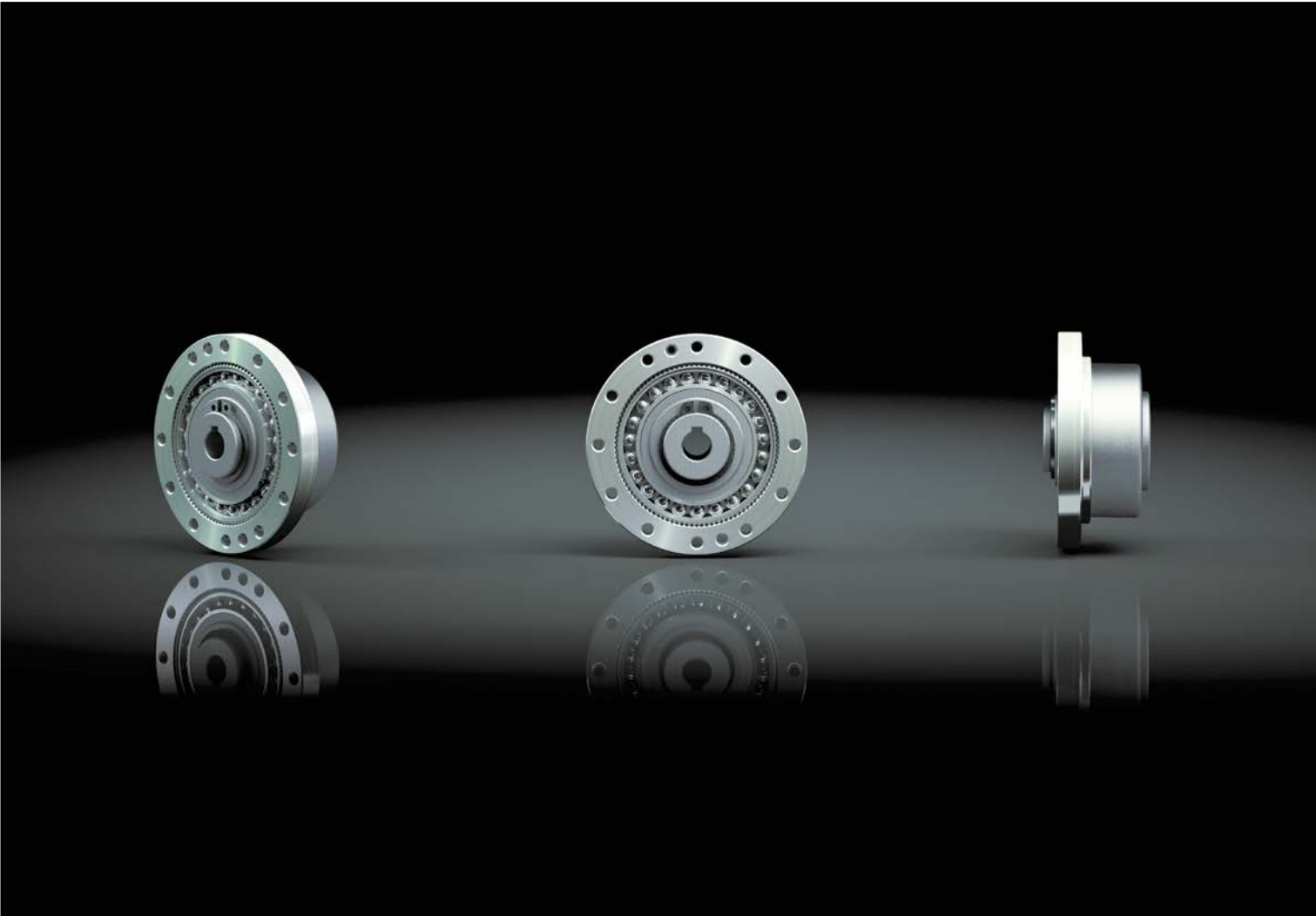
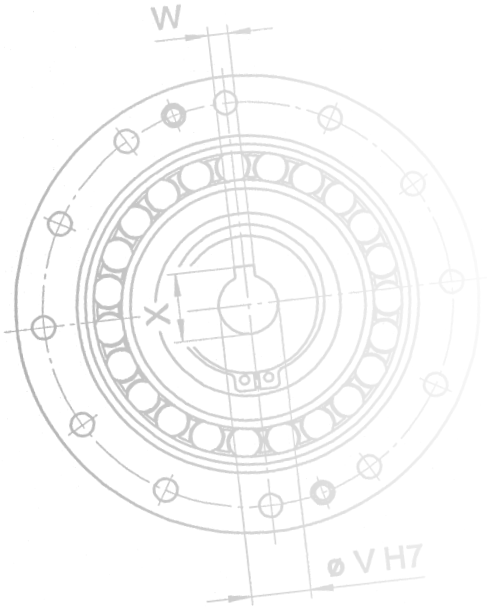
Table 294.1

Series	Size	Ratio						Version	Special design
HFUC	8	30	50		100			2A-R	According to customer requirements
	11	30	50		100				
	14	30	50	80	100				
	17	30	50	80	100	120			
	20	30	50	80	100	120	160	2A-GR	
	25	30	50	80	100	120	160		
	32	30	50	80	100	120	160		
	40		50	80	100	120	160		
	45		50	80	100	120	160		
	50		50	80	100	120	160		
	58		50	80	100	120	160		
	65		50	80	100	120	160		
	80		50	80	100	120	160		
	90		50	80	100	120	160		
	100		50	80	100	120	160		
Ordering code									
HFUC	-	25	-	100	-	2A-GR	-	SP	

Table 294.2

Version	
Ordering code	Description
2A-R	Component Set
2A-GR	

DETAIL C



Technical data

Table 296.1

	Unit	HFUC-8-2A			HFUC-11-2A		
Ratio	i []	30	50	100	30	50	100
Repeatable peak torque	T _R [Nm]	1.8	3.3	4.8	4.5	8.3	11
Average torque	T _A [Nm]	1.4	2.3	3.3	3.4	5.5	8.9
Rated torque	T _N [Nm]	0.9	1.8	2.4	2.2	3.5	5
Momentary peak torque	T _M [Nm]	3.3	6.6	9.0	8.5	17	25
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	14000			14000		
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500			8500		
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500			6500		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.003			0.012		
Weight	m [kg]	0.026			0.05		
Maximum hollow shaft diameter	d _{H (max)} [mm]	6			6		
Transmission accuracy	[arcmin]	< 2			< 2	< 1.5	
Repeatability	[arcmin]	< ±0.1			< ±0.1		
Lost Motion	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	0.54	0.84	1.2	1.6	3.2	4.4
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90					

Illustration 297.1

HFUC-8-2A [mm]

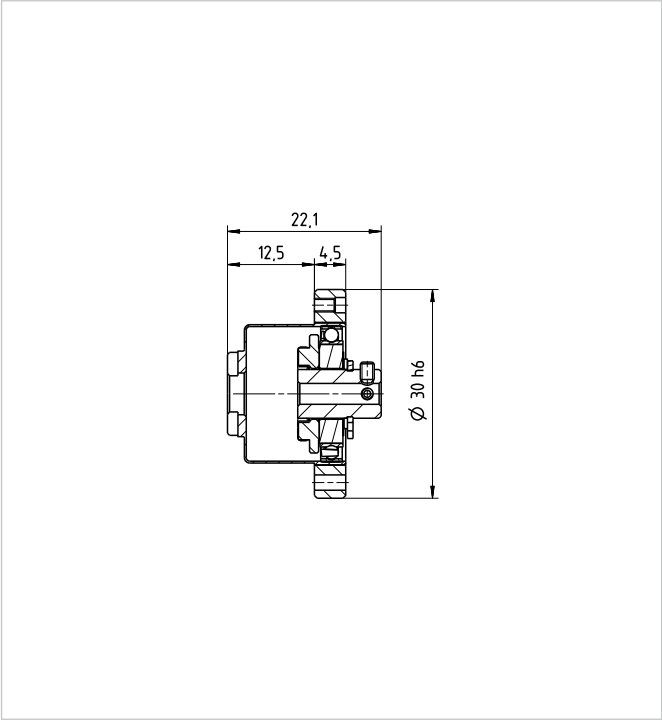


Illustration 297.2

HFUC-11-2A [mm]

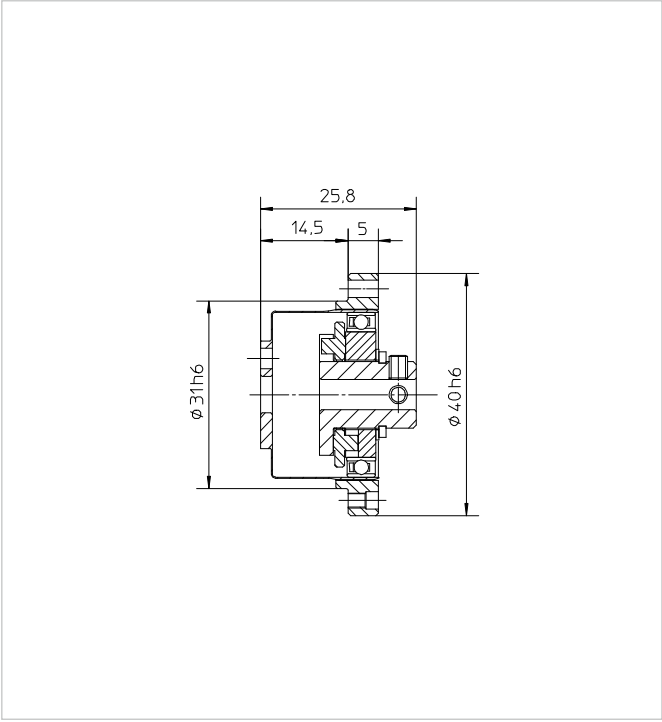


Table 296.2

	Unit	HFUC-14-2A				HFUC-17-2A				
Ratio	i []	30	50	80	100	30	50	80	100	120
Repeatable peak torque	T _R [Nm]	9	18	23	28	16	34	43	54	54
Average torque	T _A [Nm]	6.8	6.9	11	11	12	26	27	39	39
Rated torque	T _N [Nm]	4	5.4	7.8	7.8	8.8	16	22	24	24
Momentary peak torque	T _M [Nm]	17	35	47	54	30	70	87	110	86
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	14000				10000				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500				7300				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500				6500				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500				3500				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.033				0.079				
Weight	m [kg]	0.09				0.15				
Maximum hollow shaft diameter	d _{H (max)} [mm]	11				10				
Transmission accuracy	[arcmin]	< 2	< 1.5			< 1.5				
Repeatability	[arcmin]	< ±0.1				< ±0.1				
Lost Motion	[arcmin]	< 1				< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	3.4	5.7	7.1		6.7	13	16		
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90								

Illustration 297.3

HFUC-14-2A [mm]

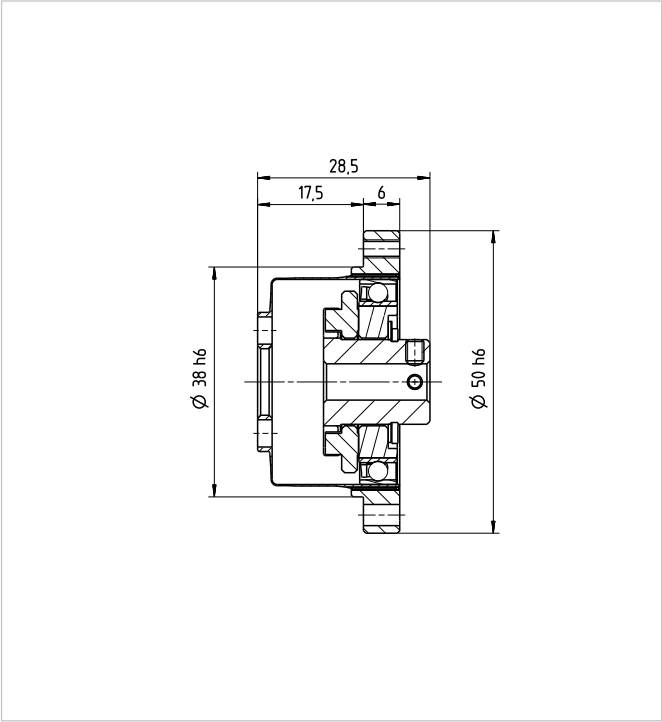
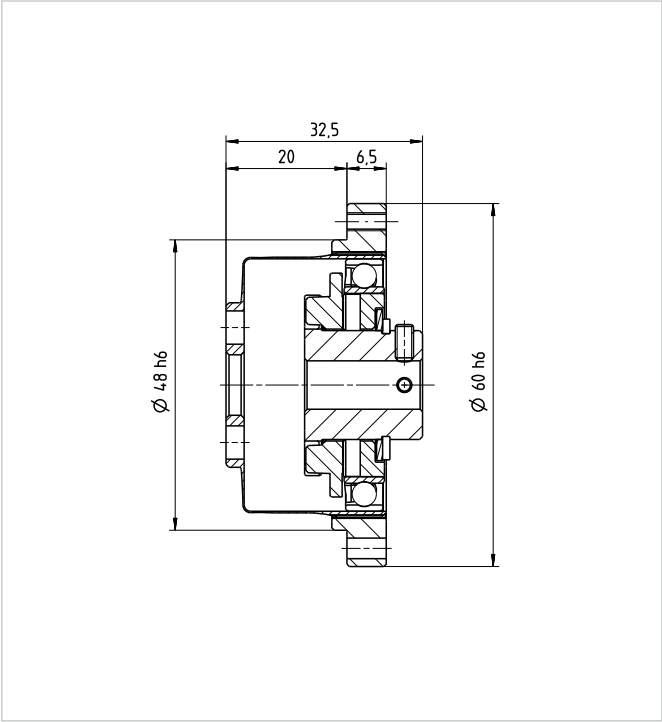


Illustration 297.4

HFUC-17-2A [mm]



Technical data

Table 298.1

	Unit	HFUC-20-2A						HFUC-25-2A					
Ratio	i []	30	50	80	100	120	160	30	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	27	56	74	82	87	92	50	98	137	157	167	176
Average torque	T _A [Nm]	20	34	47	49	49	49	38	55	87	108	108	108
Rated torque	T _N [Nm]	15	25	34	40	40	40	27	39	63	67	67	67
Momentary peak torque	T _M [Nm]	50	98	127	147	147	147	95	186	255	284	304	314
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	10000						7500					
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500						5600					
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500						5600					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500						3500					
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	0.193						0.413					
Weight	m [kg]	0.28						0.42					
Maximum hollow shaft diameter	d _{H (max)} [mm]	16						20					
Transmission accuracy	[arcmin]	< 1.5	< 1					< 1.5	< 1				
Repeatability	[arcmin]	< ±0.1						< ±0.1					
Lost Motion	[arcmin]	< 1						< 1					
Torsional stiffness	K ₃ [x10³ Nm/rad]	11	23	29			21	44	57				
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90											

Table 298.2

	Unit	HFUC-32-2A						HFUC-40-2A				
Ratio	i []	30	50	80	100	120	160	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	100	216	304	333	353	372	402	519	568	617	647
Average torque	T _A [Nm]	75	108	167	216	216	216	196	284	372	451	451
Rated torque	T _N [Nm]	54	76	118	137	137	137	137	206	265	294	294
Momentary peak torque	T _M [Nm]	200	382	568	647	686	686	686	980	1080	1180	1180
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	7000						5600				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800						4000				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	4600						3600				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500						3000				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	1.96						4.5				
Weight	m [kg]	0.89						1.7				
Maximum hollow shaft diameter	d _{H (max)} [mm]	26						32				
Transmission accuracy	[arcmin]	< 1.5	< 1					< 1				
Repeatability	[arcmin]	< ±0.1						< ±0.1				
Lost Motion	[arcmin]	< 1						< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	49	98	120				180	230			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90										

Illustration 299.1

HFUC-20-2A [mm]

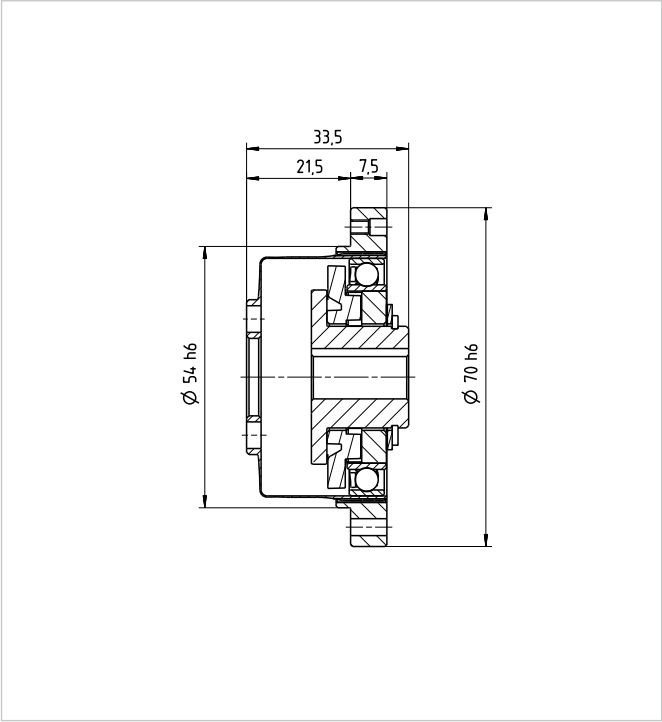


Illustration 299.2

HFUC-25-2A [mm]

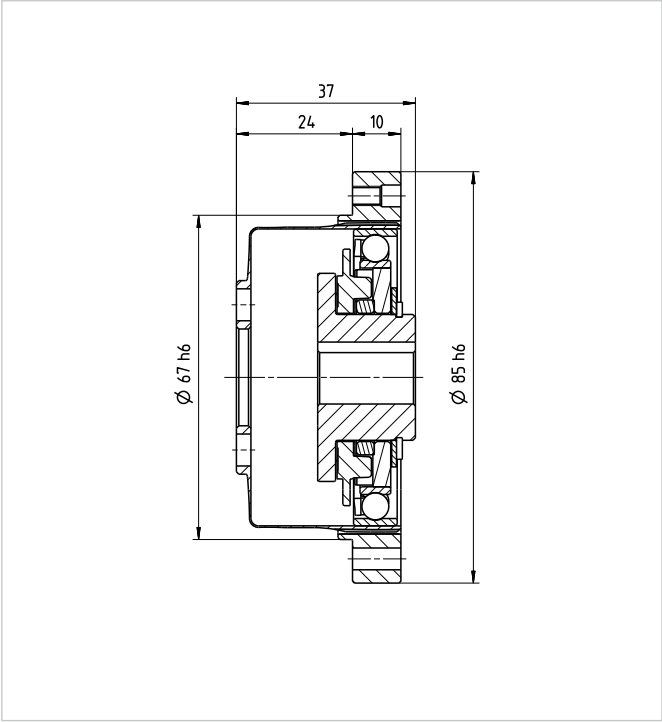


Illustration 299.3

HFUC-32-2A [mm]

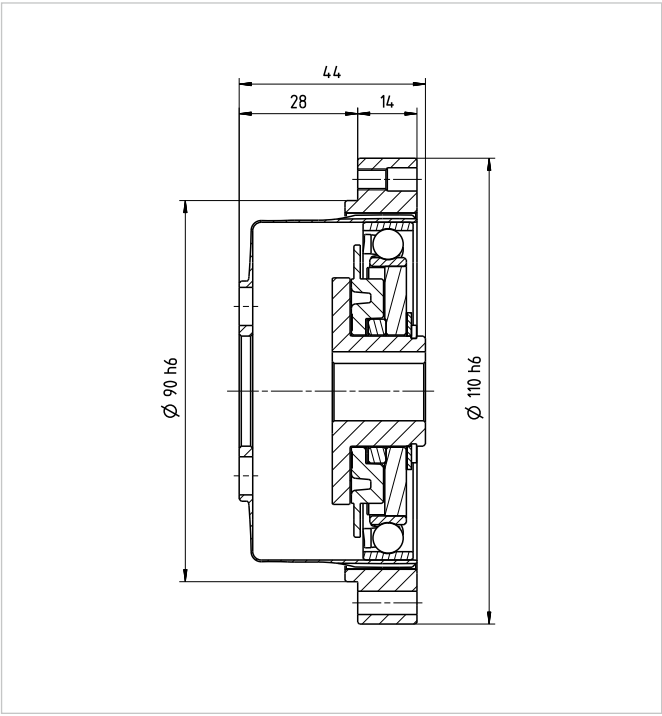
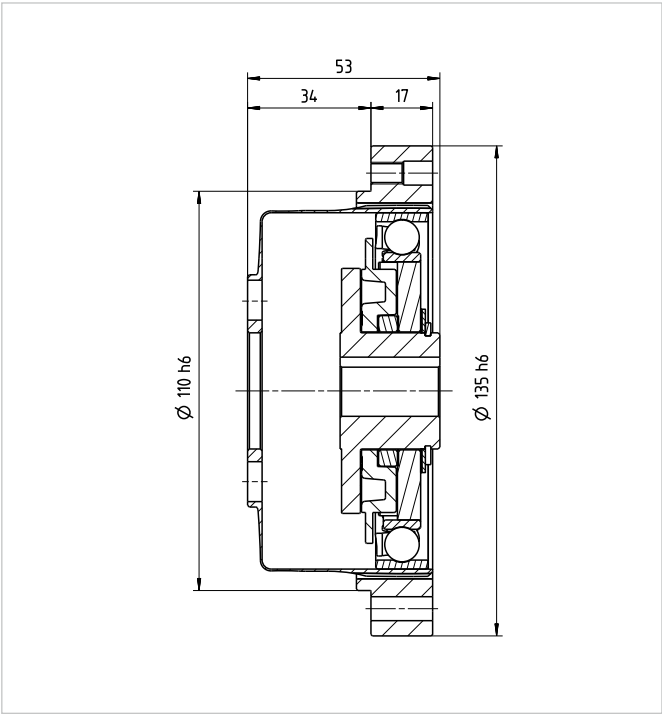


Illustration 299.4

HFUC-40-2A [mm]



Technical data

Table 300.1

	Unit	HFUC-45-2A					HFUC-50-2A				
Ratio	i []	50	80	100	120	160	50 ¹⁾	80	100	120	160
Repeatable peak torque	T _R [Nm]	500	706	755	823	882	715	941	980	1080	1180
Average torque	T _A [Nm]	265	390	500	620	630	350	519	666	813	843
Rated torque	T _N [Nm]	176	313	353	402	402	245	372	470	529	529
Momentary peak torque	T _M [Nm]	950	1270	1570	1760	1910	1430	1860	2060	2060	2450
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	5000					4500				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3800					3500				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	3300					3000				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000					2500				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	8.68					12.58				
Weight	m [kg]	2.3					3.2				
Maximum hollow shaft diameter	d _{H (max)} [mm]	36					40				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	260	330				340	440			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90									

Table 300.2

	Unit	HFUC-58-2A					HFUC-65-2A				
Ratio	i []	50 ¹⁾	80	100	120	160	50 ¹⁾	80	100	120	160
Repeatable peak torque	T _R [Nm]	1020	1480	1590	1720	1840	1420	2110	2300	2510	2630
Average torque	T _A [Nm]	520	770	1060	1190	1210	720	1040	1520	1570	1570
Rated torque	T _N [Nm]	353	549	696	745	745	490	745	951	951	951
Momentary peak torque	T _M [Nm]	1960	2450	3180	3330	3430	2830	3720	4750	4750	4750
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	4000					3500				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3000					2800				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	2700					2400				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	2200					1900				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	27.3					46.8				
Weight	m [kg]	4.7					6.7				
Maximum hollow shaft diameter	d _{H (max)} [mm]	46					52				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	540	710				780	980			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90									

¹⁾ Only valid with oil lubrication . Grease lubrication can be used when the average torque T_{av} is not greater than half the nominal torque T_N

Illustration 301.1

HFUC-45-2A [mm]

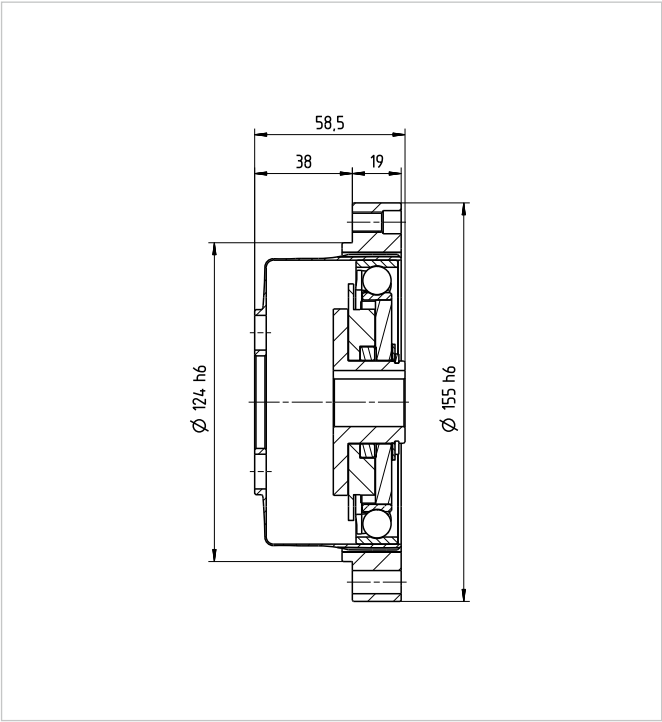


Illustration 301.2

HFUC-50-2A [mm]

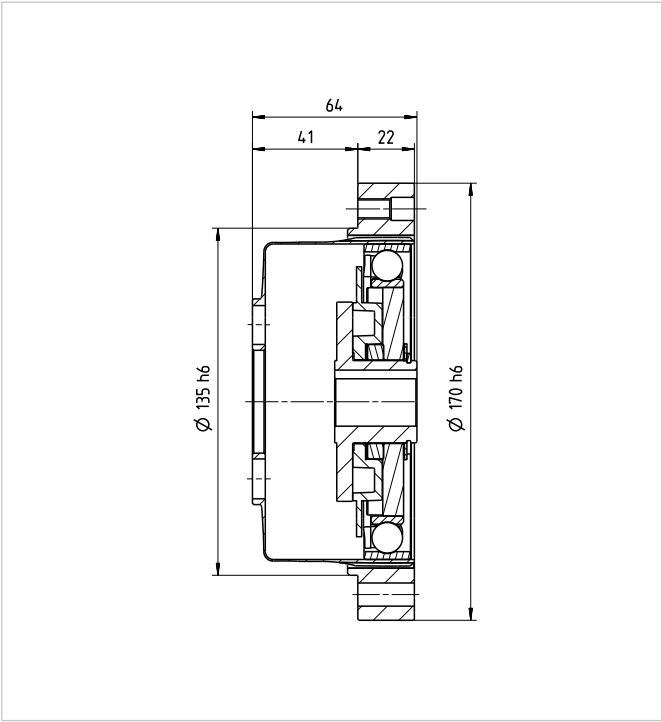


Illustration 301.3

HFUC-58-2A [mm]

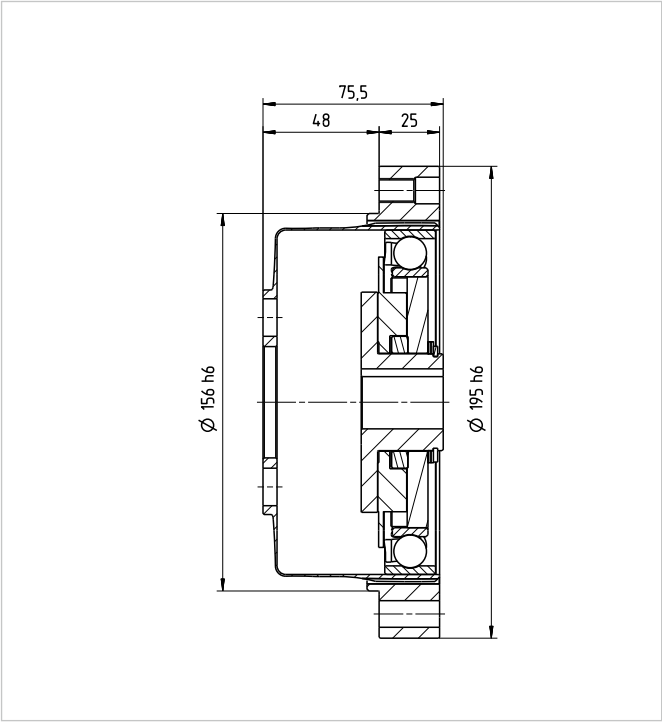
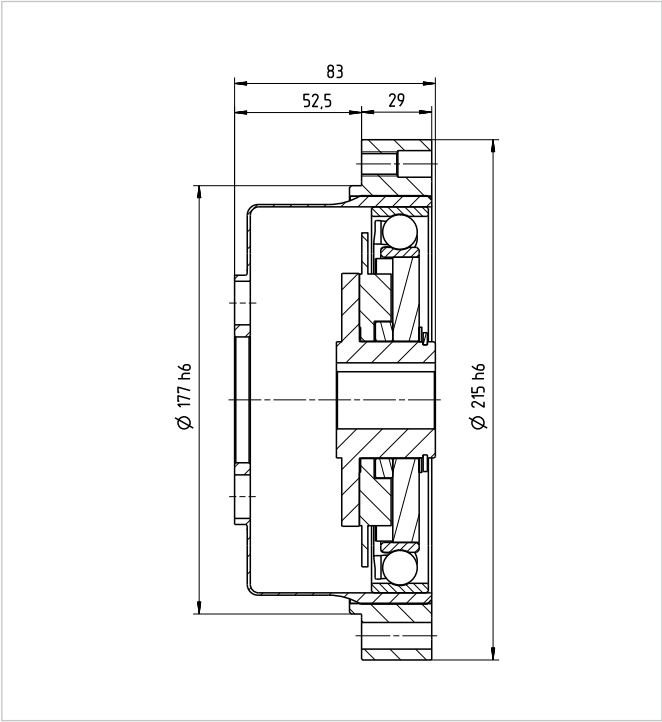


Illustration 301.4

HFUC-65-2A [mm]



Technical data

Table 302.1

	Unit	HFUC-80-2A					HFUC-90-2A				
Ratio	i []	50 ¹⁾	80	100	120	160	50 ¹⁾	80	100	120	160
Repeatable peak torque	T _R [Nm]	2440	3430	4220	4590	4910	3530	3990	5680	6160	6840
Average torque	T _A [Nm]	1260	1830	2360	3130	3130	1720	2510	3360	4300	4300
Rated torque	T _N [Nm]	872	1320	1700	1990	1990	1180	1550	2270	2570	2700
Momentary peak torque	T _M [Nm]	4870	6590	7910	7910	7910	6660	7250	9020	9800	11300
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	2900					2700				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	2300					2000				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	2200					2100				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	1500					1300				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	122					214				
Weight	m [kg]	12.4					17.6				
Maximum hollow shaft diameter	d _{H (max)} [mm]	65					72				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	1450	1850				2060	2630			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90									

Table 302.2

	Unit	HFUC-100-2A				
Ratio	i []	50 ¹⁾	80	100	120	160
Repeatable peak torque	T _R [Nm]	4450	6060	7350	7960	9180
Average torque	T _A [Nm]	2280	3310	4630	5720	5720
Rated torque	T _N [Nm]	1580	2380	2940	3180	3550
Momentary peak torque	T _M [Nm]	8900	11600	14100	15300	15500
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	2500				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	1800				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	2000				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	1200				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	365				
Weight	m [kg]	23.5				
Maximum hollow shaft diameter	d _{H (max)} [mm]	80				
Transmission accuracy	[arcmin]	< 1				
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	2830	3700			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90				

¹⁾ Only valid with oil lubrication. Grease lubrication can be used when the average torque T_{av} is not greater than half the nominal torque T_N

Illustration 303.1

HFUC-80-2A [mm]

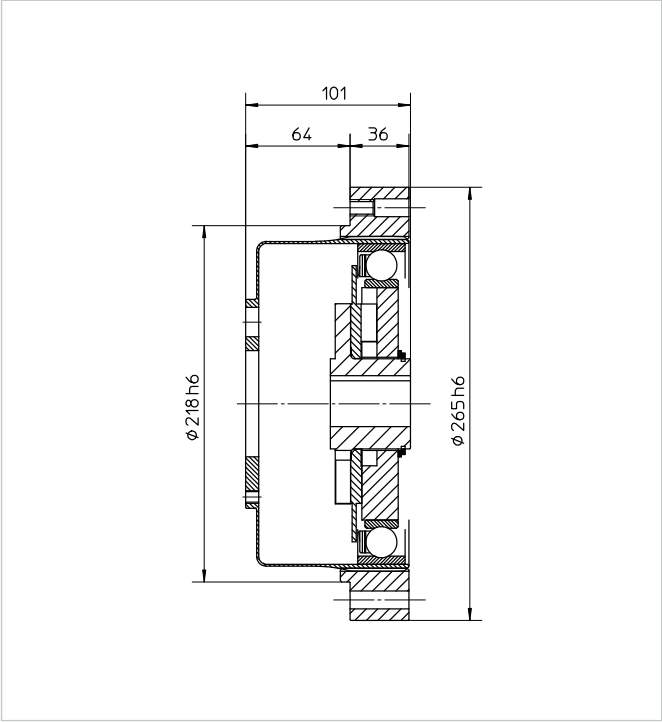


Illustration 303.2

HFUC-90-2A [mm]

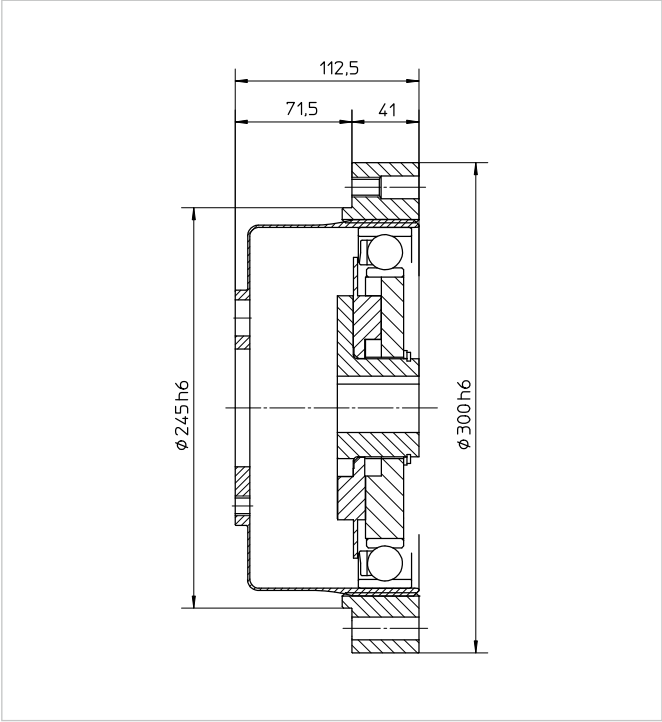
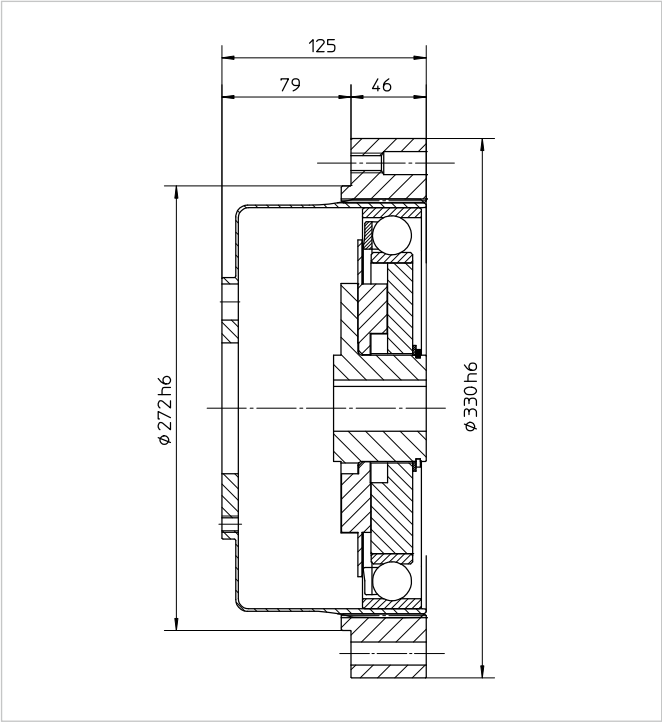


Illustration 303.3

HFUC-100-2A [mm]



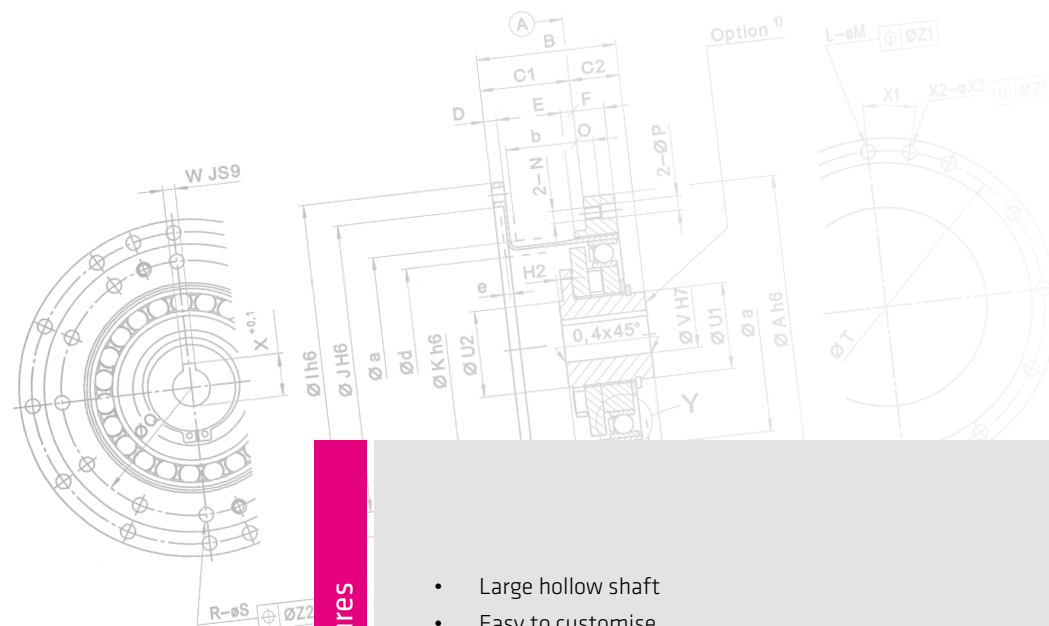
Compact with largest hollow shaft

HFUS-2A Series Component Sets are available in nine sizes with gear ratios of 30, 50, 80, 100, 120 and 160:1 offering repeatable peak torques from 9 to 1840 Nm and a power density of up to 384 Nm/kg.

Harmonic Drive® Component Sets consist of three individual components - Circular Spline, Flexspline and Wave Generator. They offer the maximum freedom of design integration on both input and output elements and their extremely compact design ensures installation in applications with the most demanding space requirements.

If required, the Component Sets are available as specific configurations tailored to your application, including special lubricants for extended temperature ranges or special materials for extreme ambient conditions. Consisting of just three individual components, they are very lightweight and compact.

The enlarged hollow shaft can be used to feed through supply lines, shafts or cables for further axes. Due to their positioning accuracy stable machine properties with short cycle times are guaranteed.



Features

- Large hollow shaft
- Easy to customise
- Excellent lifetime precision
- Compact, lightweight design

Optimised for your applications:

- Increased operating reliability
- Optimal design solution
- Easy integration
- Reduced material use
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs
- Greater energy efficiency
- Lower production costs
- Small machine footprint

Customer Benefits



QUICKLINK
www.harmonicdrive.co.uk/3050

HFUS-2A

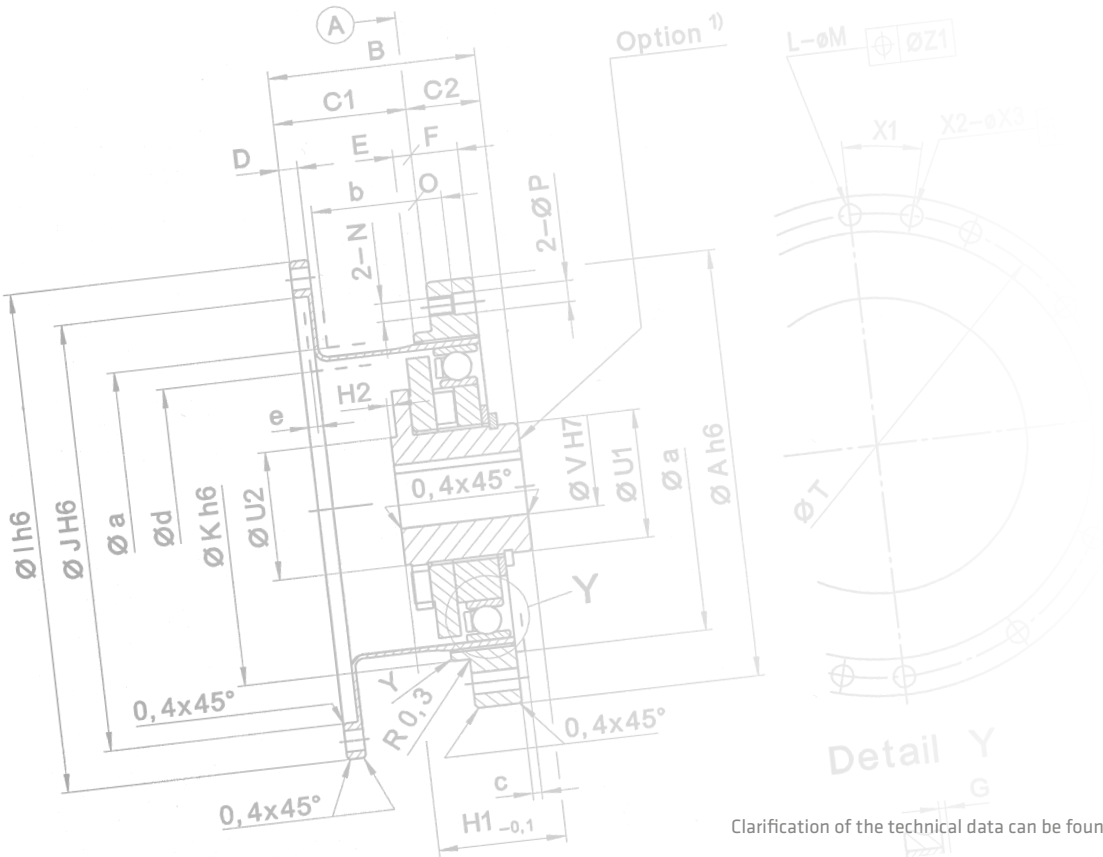
Ordering code

Table 306.1

Series	Size	Ratio						Version	Special design
HFUS	14	30	50	80	100			2A-R	According to customer requirements
	17	30	50	80	100	120			
	20	30	50	80	100	120	160	2A-GR	
	25	30	50	80	100	120	160		
	32	30	50	80	100	120	160		
	40		50	80	100	120	160		
	45		50	80	100	120	160		
	50		50	80	100	120	160		
	58		50	80	100	120	160		
Ordering code									
HFUS	-	25	-	100	-	2A-GR	-	SP	

Table 306.2

Version	
Ordering code	Description
2A-R	Component Set
2A-GR	



Clarification of the technical data can be found in the Glossary



Technical data

Table 308.1

	Unit	HFUS-14-2A				HFUS-17-2A				
Ratio	i []	30	50	80	100	30	50	80	100	120
Repeatable peak torque	T _R [Nm]	9.0	18	23	28	16	34	43	54	54
Average torque	T _A [Nm]	6.8	6.9	11	11	12	26	27	39	39
Rated torque	T _N [Nm]	4.0	5.4	7.8	7.8	8.8	16	22	24	24
Momentary peak torque	T _M [Nm]	17	35	47	54	30	70	87	110	86
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	14000				10000				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500				7300				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500				6500				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500				3500				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	0.033				0.079				
Weight	m [kg]	0.11				0.18				
Maximum hollow shaft diameter	d _{H (max)} [mm]	14				19				
Transmission accuracy	[arcmin]	< 2	< 1.5			< 1.5				
Repeatability	[arcmin]	< ±0.1					< ±0.1			
Lost Motion	[arcmin]	< 1					< 1			
Torsional stiffness	K ₃ [x10³ Nm/rad]	3.4	5.7	7.1		6.7	13	16		
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90								

Table 308.2

	Unit	HFUS-20-2A						HFUS-25-2A					
Ratio	i []	30	50	80	100	120	160	30	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	27	56	74	82	87	92	50	98	137	157	167	176
Average torque	T _A [Nm]	20	34	47	49	49	49	38	55	87	108	108	108
Rated torque	T _N [Nm]	15	25	34	40	40	40	27	39	63	67	67	67
Momentary peak torque	T _M [Nm]	50	98	127	147	147	147	95	186	255	284	304	314
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	10000						7500					
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500						5600					
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500						5600					
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500						3500					
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	0.193						0.413					
Weight	m [kg]	0.31						0.48					
Maximum hollow shaft diameter	d _{H (max)} [mm]	23						28					
Transmission accuracy	[arcmin]	< 1.5	< 1				< 1.5	< 1					
Repeatability	[arcmin]	< ±0.1						< ±0.1					
Lost Motion	[arcmin]	< 1						< 1					
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	11	23	29			21	44	57				
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90											

Illustration 309.1

HFUS-14-2A [mm]

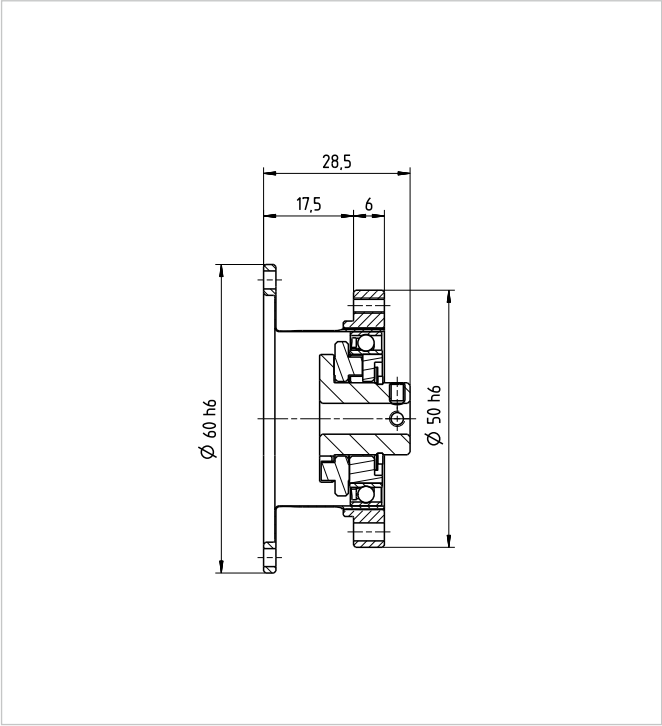


Illustration 309.2

HFUS-17-2A [mm]

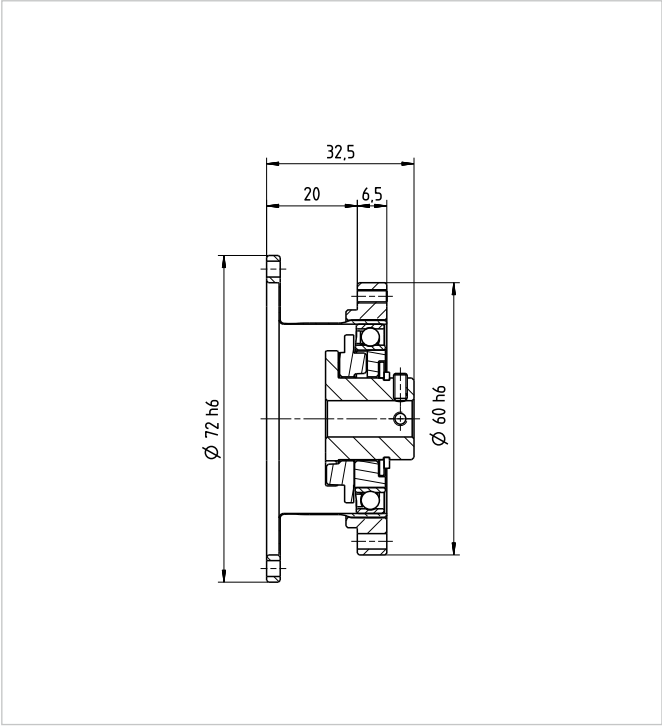


Illustration 309.3

HFUS-20-2A [mm]

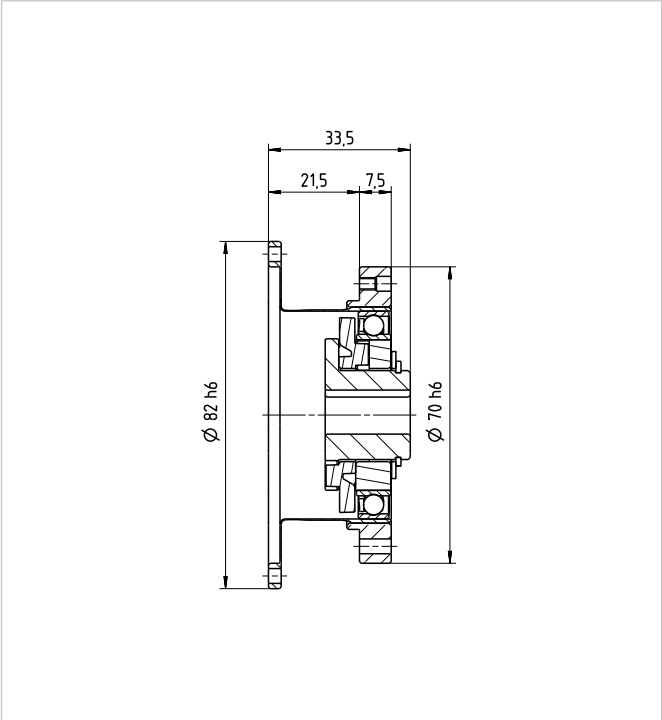
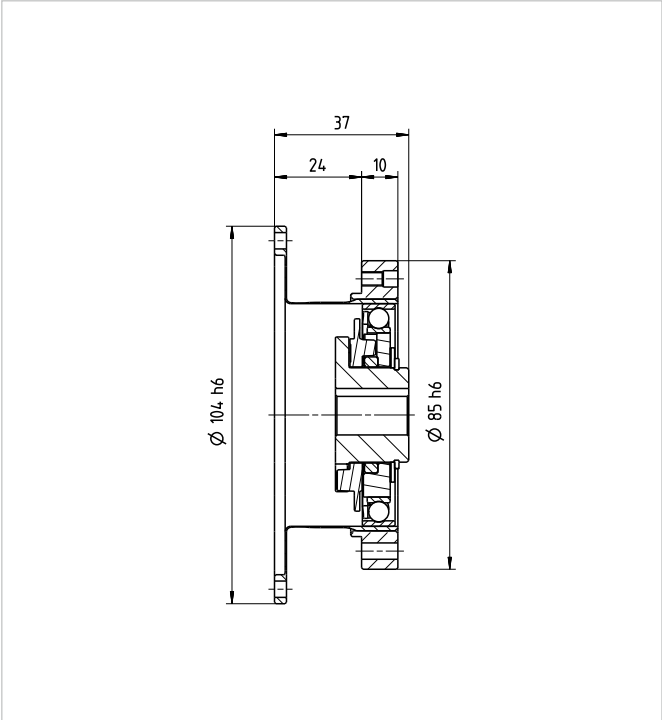


Illustration 309.4

HFUS-25-2A [mm]



Technical data

Table 310.1

	Unit	HFUS-32-2A						HFUS-40-2A				
Ratio	i []	30	50	80	100	120	160	50	80	100	120	160
Repeatable peak torque	T _R [Nm]	100	216	304	333	353	372	402	519	568	617	647
Average torque	T _A [Nm]	75	108	167	216	216	216	196	284	372	451	451
Rated torque	T _N [Nm]	54	76	118	137	137	137	137	206	265	294	294
Momentary peak torque	T _M [Nm]	200	382	568	647	686	686	686	980	1080	1180	1180
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	7000						5600				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800						4000				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	4600						3600				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500						3000				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	1.69						4.5				
Weight	m [kg]	0.97						1.86				
Maximum hollow shaft diameter	d _{H (max)} [mm]	36						42				
Transmission accuracy	[arcmin]	< 1.5	< 1					< 1				
Repeatability	[arcmin]	< ±0.1						< ±0.1				
Lost Motion	[arcmin]	< 1						< 1				
Torsional stiffness	K ₃ [x10³ Nm/rad]	49	98	120				180	230			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90										

Table 310.2

	Unit	HFUS-45-2A					HFUS-50-2A				
Ratio	i []	50	80	100	120	160	50 ¹⁾	80	100	120	160
Repeatable peak torque	T _R [Nm]	500	706	755	823	882	715	941	980	1080	1180
Average torque	T _A [Nm]	265	390	500	620	630	350	519	666	813	843
Rated torque	T _N [Nm]	176	313	353	402	402	245	372	470	529	529
Momentary peak torque	T _M [Nm]	950	1270	1570	1760	1910	1430	1860	2060	2060	2450
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	5000					4500				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3800					3500				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	3300					3000				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3000					2500				
Moment of inertia	J _{in} [x10 ⁻⁴ kgm²]	8.68					12.5				
Weight	m [kg]	2.64					3.53				
Maximum hollow shaft diameter	d _{H (max)} [mm]	47					52				
Transmission accuracy	[arcmin]	< 1					< 1				
Repeatability	[arcmin]	< ±0.1					< ±0.1				
Lost Motion	[arcmin]	< 1					< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	260	330				340	440			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90									

¹⁾ Only with oil lubrication. Grease lubrication can be used when the average torque T_{av} is not greater than half the nominal torque T_N.

Illustration 311.1

HFUS-32-2A [mm]

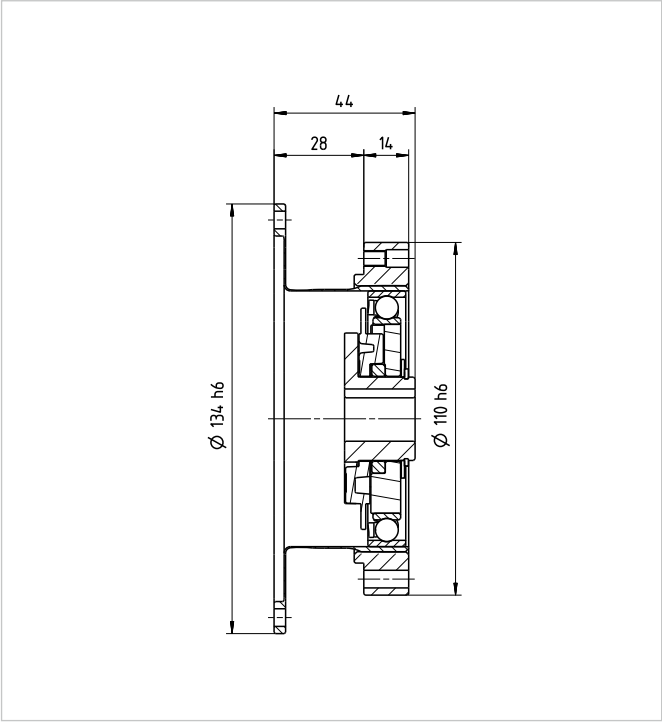


Illustration 311.2

HFUS-40-2A [mm]

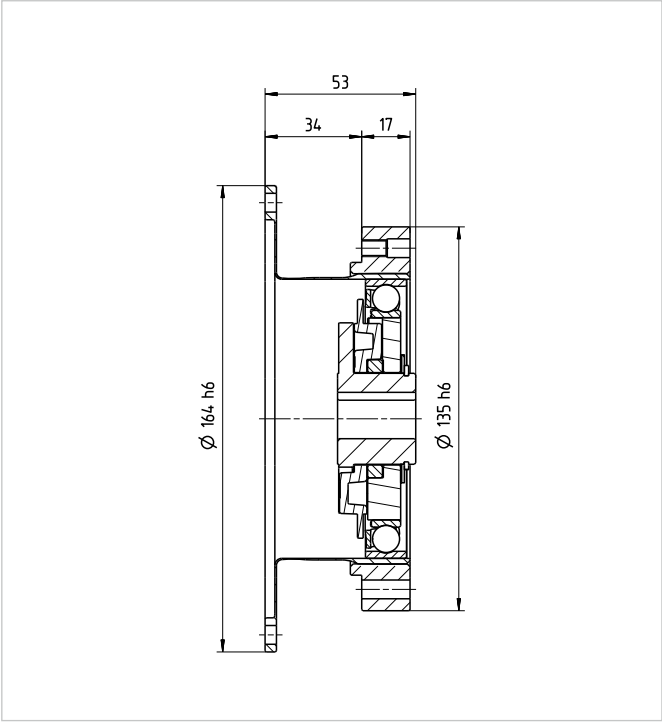


Illustration 311.3

HFUS-45-2A [mm]

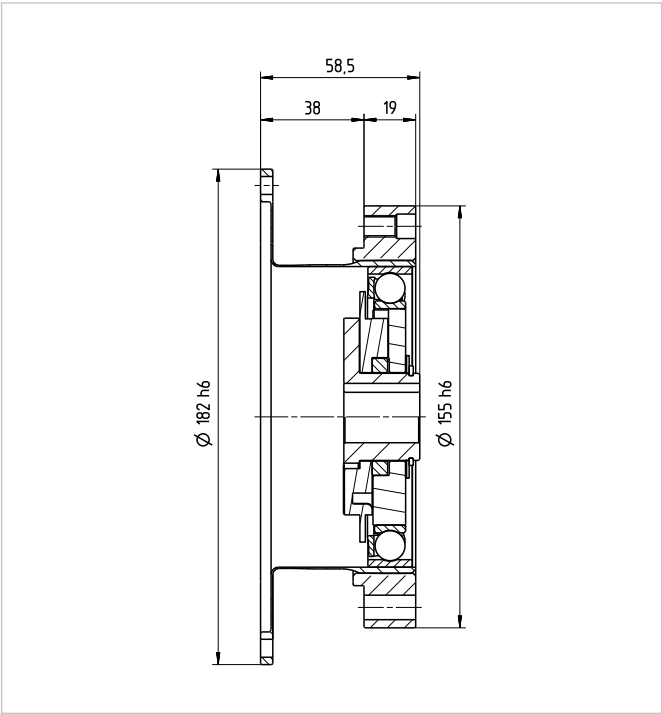
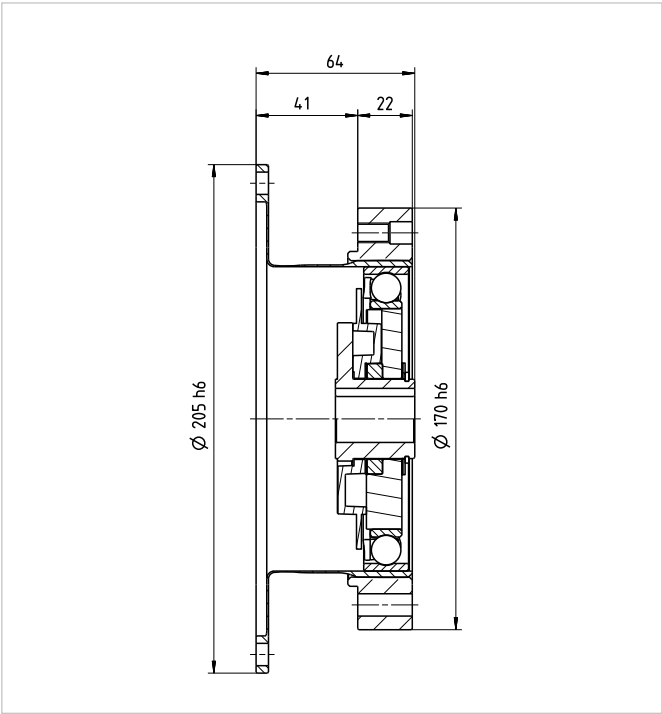


Illustration 311.4

HFUS-50-2A [mm]



Technical data

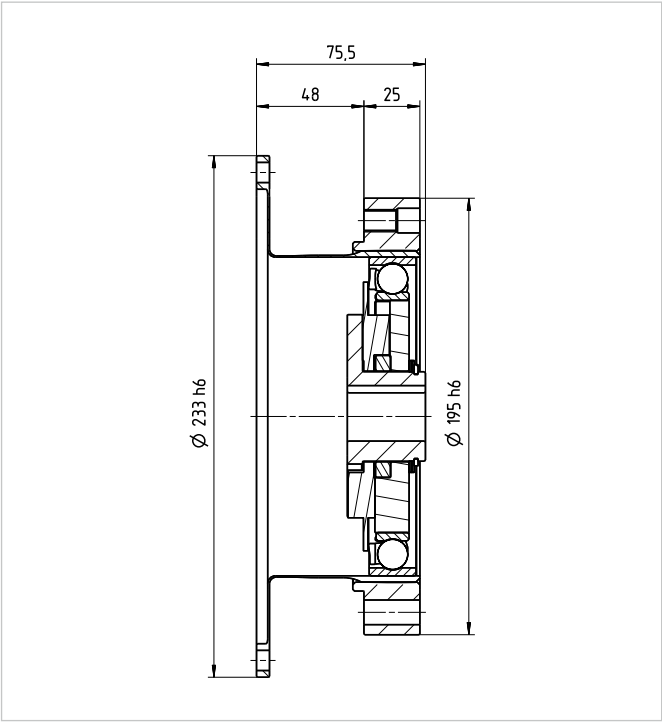
Table 312.1

	Unit	HFUS-58-2A				
Ratio	i []	50 ¹⁾	80	100	120	160
Repeatable peak torque	T _R [Nm]	1020	1480	1590	1720	1840
Average torque	T _A [Nm]	520	770	1060	1190	1210
Rated torque	T _N [Nm]	353	549	696	745	745
Momentary peak torque	T _M [Nm]	1960	2450	3180	3330	3430
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	4000				
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3000				
Average input speed (oil lubrication)	n _{av (max)} [rpm]	2700				
Average input speed (grease lubrication)	n _{av (max)} [rpm]	2200				
Moment of inertia	J _{in} [x10 ⁻⁴ kg]	27.3				
Weight	m [kg]	5.17				
Maximum hollow shaft diameter	d _{H (max)} [mm]	60				
Transmission accuracy	[arcmin]	< 1				
Repeatability	[arcmin]	< ±0.1				
Lost Motion	[arcmin]	< 1				
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	540	710			
Ambient operating temperature	[°C]	Standard 0 ... 60, Special lubrication -40 ... 90				

¹⁾ Only with oil lubrication. Grease lubrication can be used when the average torque T_{av} is not greater than half the nominal torque T_N.

Illustration 313.1

HFUS-58-2A [mm]



QUICKLINK www.harmonicdrive.co.uk/CAD3050

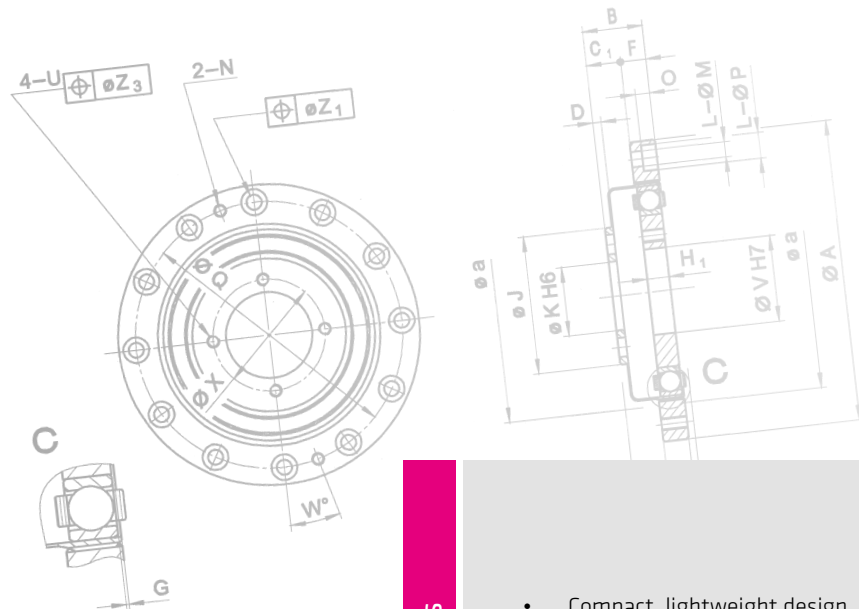


The short series

CSD-2A Series Component Sets are available in seven sizes with gear ratios of 50, 100 and 160:1 offering repeatable peak torques from 12 to 823 Nm and a power density of up to 512 Nm/kg.

Harmonic Drive® Component Sets consist of three individual components – Circular Spline, Flexspline and Wave Generator. They offer the maximum freedom of design integration on both input and output elements and their extremely compact design ensures installation in applications with the most demanding space requirements.

If required, the Component Sets are available as specific configurations tailored to your application. Consisting of just three individual components, they are very lightweight and the series with the shortest axial length. The hollow shaft can be used to feed through supply lines, shafts or cables for further axes. Due to their positioning accuracy, stable machine properties with short cycle times are guaranteed.



Features

- Compact, lightweight design
- Large hollow shaft
- Easy to customise
- Excellent lifetime precision

Optimised for your applications:

- Reduced material use
- Greater energy efficiency
- Lower production costs
- Small machine footprint
- Increased operating reliability
- Optimal design solution
- Easy integration
- Higher product quality
- Less waste
- Consistent quality
- High availability
- Reduced Total Cost of Ownership
- Reduced maintenance costs

Customer Benefits



QUICKLINK

www.harmonicdrive.co.uk/3060

CSD-2A

Ordering code

Table 316.1

Series	Size	Ratio			Version	Flexspline	Special design			
CSD	14	50	100		2A-R	-	According to customer requirements			
	17	50	100							
	20	50	100	160	2A-GR					
	25	50	100	160						
	32	50	100	160						
	40	50	100	160						
	50	50	100	160						
Ordering code										
CSD	-	25	-	100	-	2A-GR	-	BB	-	SP

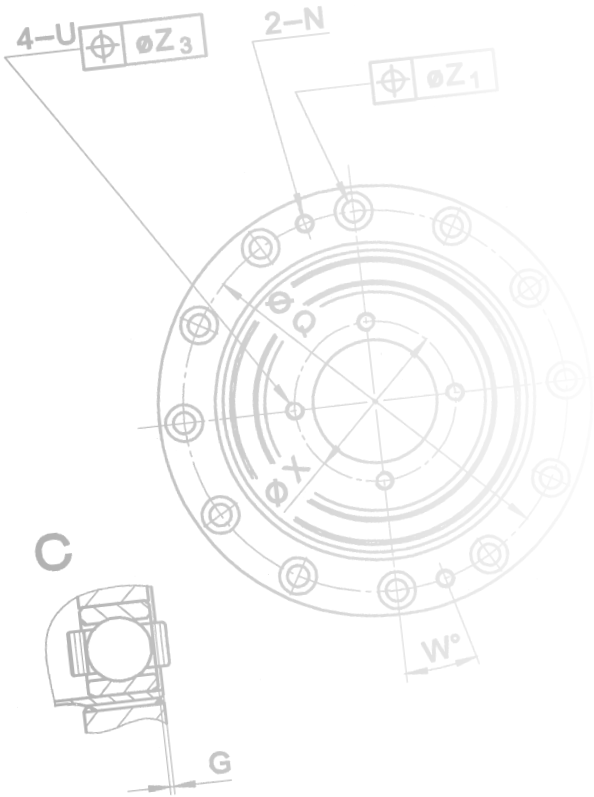
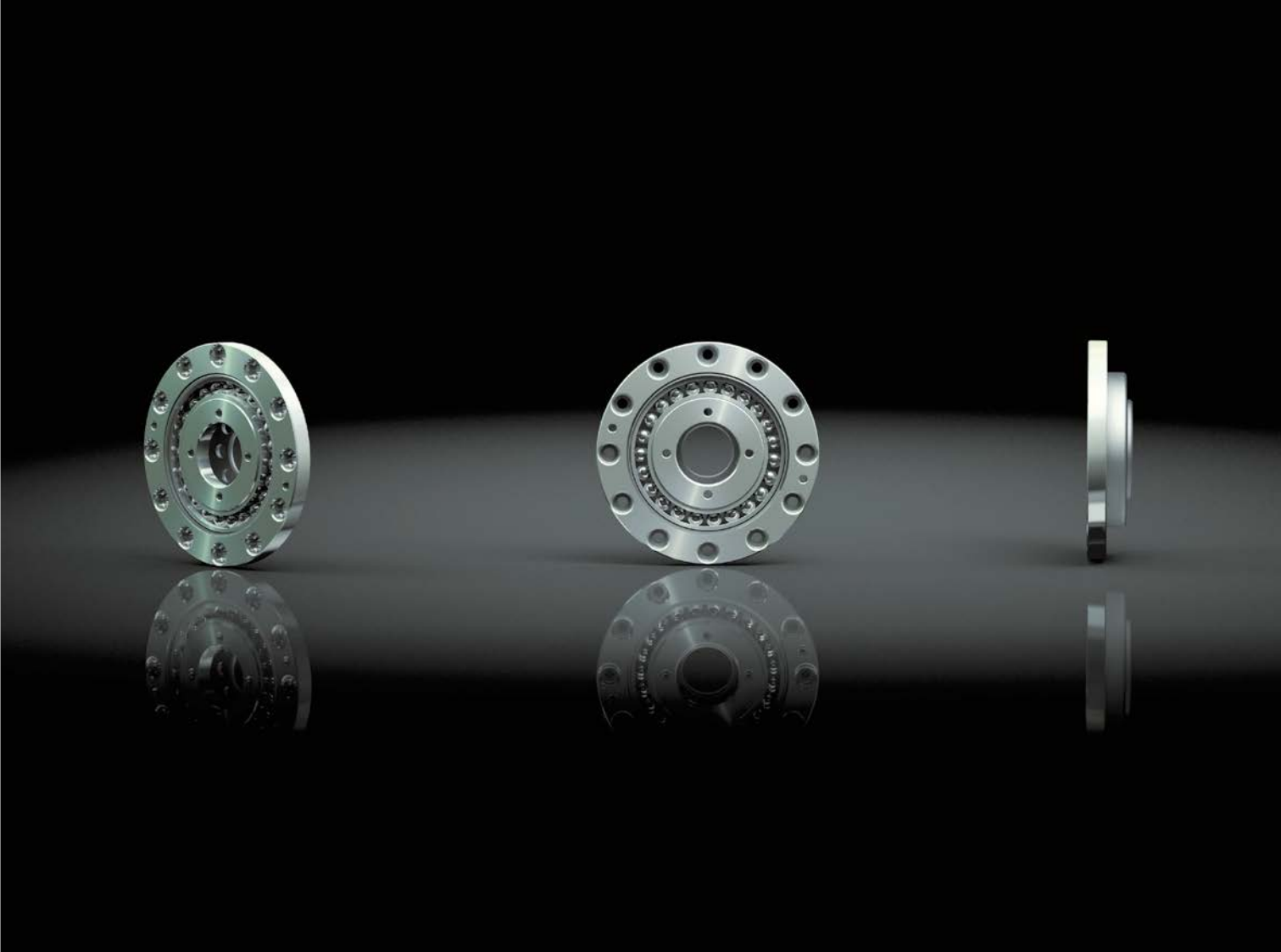


Table 316.2

Flexspline	
Ordering code	Description
-	Standard
BB	Flexspline with enlarged bore

Table 316.3

Version	
Ordering code	Description
2A-R	Component Set
2A-GR	



Component Sets

Technical data

Table 318.1

	Unit	CSD-14-2A		CSD-17-2A	
Ratio	i []	50	100	50	100
Repeatable peak torque	T _R [Nm]	12	19	23	37
Average torque	T _A [Nm]	4.8	7.7	18	27
Rated torque	T _N [Nm]	3.7	5.4	11	16
Momentary peak torque	T _M [Nm]	24	31	48	55
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	14000		10000	
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	8500		7300	
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500		6500	
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500		3500	
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.021		0.054	
Weight	m [kg]	0.06		0.1	
Maximum hollow shaft diameter	d _{H (max)} [mm]	11		11	
Transmission accuracy	[arcmin]	< 1.5		< 1.5	
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	4.7	6.1	12	13
Ambient operating temperature	[°C]	0 ... 60		0 ... 60	

Illustration 319.1

CSD-14-2A [mm]

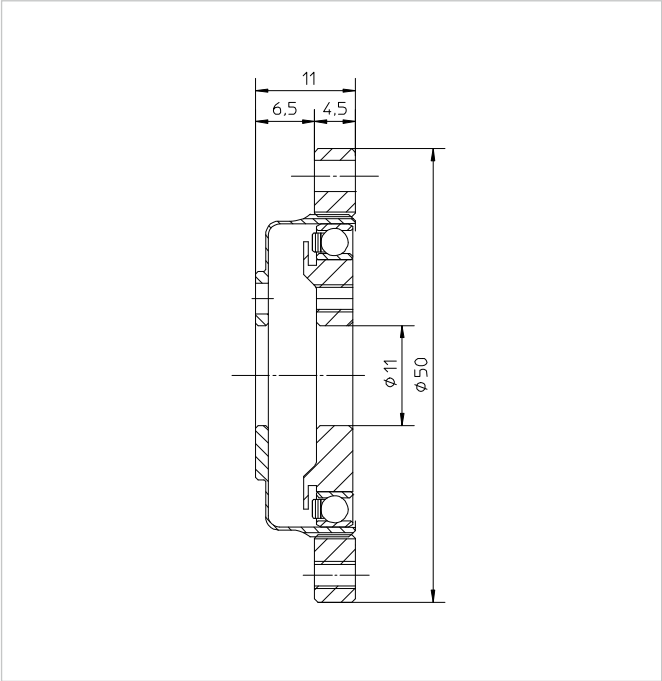


Illustration 319.2

CSD-17-2A [mm]

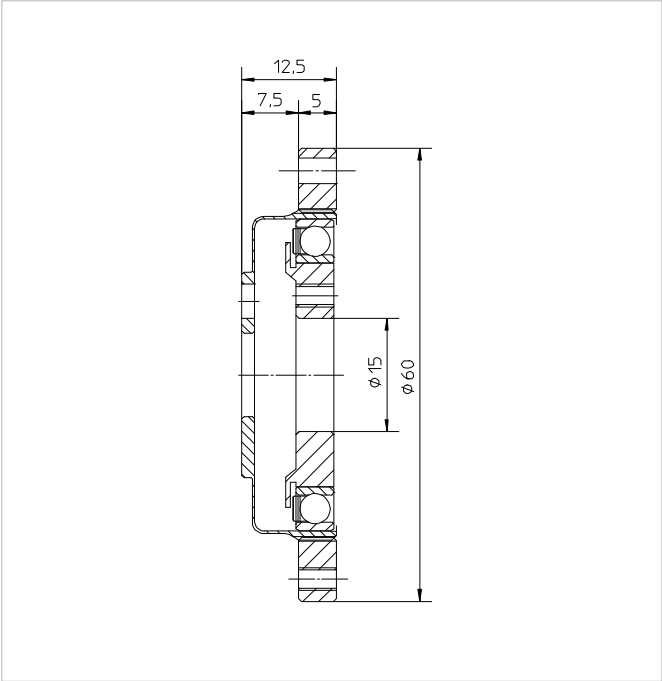


Table 318.2

	Unit	CSD-20-2A			CSD-25-2A		
Ratio	i []	50	100	160	50	100	160
Repeatable peak torque	T _R [Nm]	39	57	64	69	110	123
Average torque	T _A [Nm]	24	34	34	38	75	75
Rated torque	T _N [Nm]	17	28	28	27	47	47
Momentary peak torque standard	T _M [Nm]	69	76	76	127	152	152
Momentary peak torque with enlarged Flexspline bore (BB)	T _M [Nm]	64	64	64	127	135	135
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	10000			7500		
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	6500			5600		
Average input speed (oil lubrication)	n _{av (max)} [rpm]	6500			5600		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	0.090			0.282		
Weight	m [kg]	0.13			0.24		
Maximum hollow shaft diameter	d _{H (max)} [mm]	20			24		
Transmission accuracy	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	20	25		37	47	
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		

Illustration 319.3

CSD-20-2A [mm]

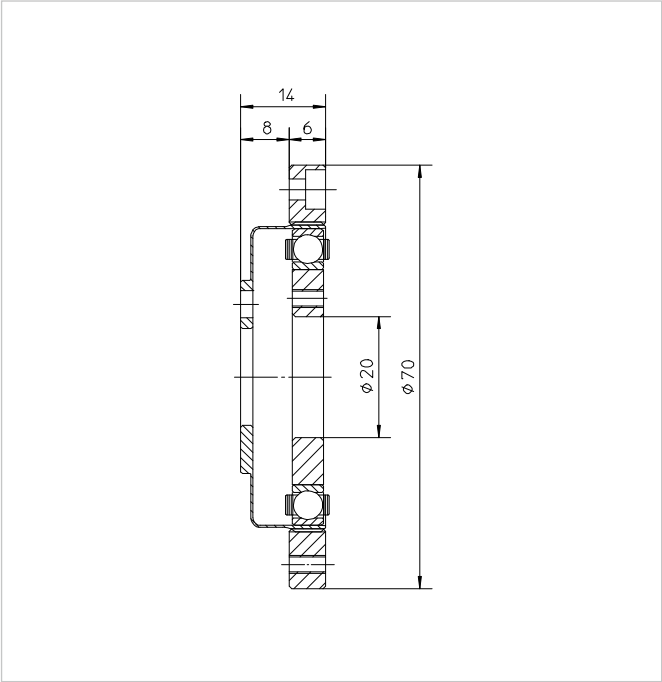
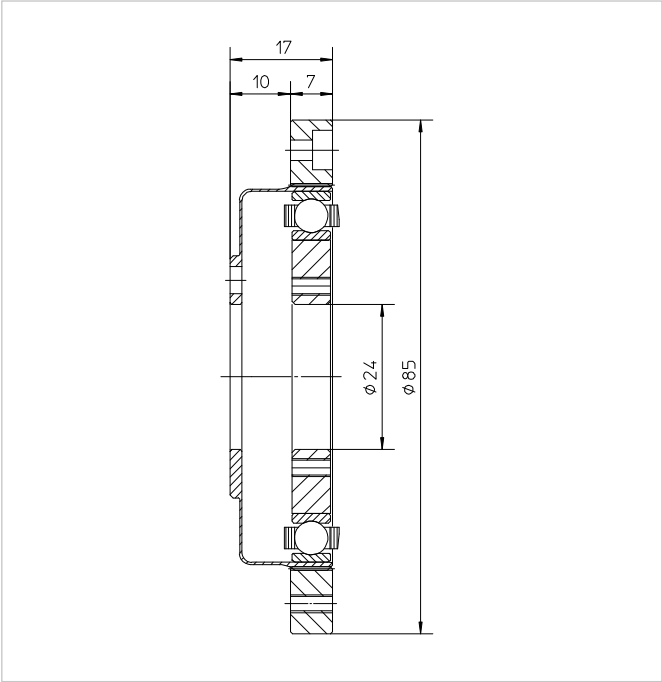


Illustration 319.4

CSD-25-2A [mm]



Technical data

Table 320.1

	Unit	CSD-32-2A			CSD-40-2A		
Ratio	i []	50	100	160	50	100	160
Repeatable peak torque	T _R [Nm]	151	233	261	281	398	453
Average torque	T _A [Nm]	75	151	151	137	260	316
Rated torque	T _N [Nm]	53	96	96	96	185	206
Momentary peak torque standard	T _M [Nm]	268	359	359	480	696	696
Momentary peak torque with enlarged Flexspline bore (BB)	T _M [Nm]	268	331	331	480	578	578
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	7000			5600		
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	4800			4000		
Average input speed (oil lubrication)	n _{av (max)} [rpm]	4600			3600		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	3500			3000		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	1.09			2.85		
Weight	m [kg]	0.51			0.92		
Maximum hollow shaft diameter	d _{H (max)} [mm]	32			40		
Transmission accuracy	[arcmin]	< 1			< 1		
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	84	110		150	200	
Ambient operating temperature	[°C]	0 ... 60			0 ... 60		

Table 320.2

	Unit	CSD-50-2A		
Ratio	i []	50	100	160
Repeatable peak torque	T _R [Nm]	500	868	823
Average torque	T _A [Nm]	247	466	590
Rated torque	T _N [Nm]	172	329	370
Momentary peak torque standard	T _M [Nm]	1000	1440	1560
Momentary peak torque with enlarged Flexspline bore (BB)	T _M [Nm]	1000	1320	1320
Maximum input speed (oil lubrication)	n _{in (max)} [rpm]	4500		
Maximum input speed (grease lubrication)	n _{in (max)} [rpm]	3500		
Average input speed (oil lubrication)	n _{av (max)} [rpm]	3000		
Average input speed (grease lubrication)	n _{av (max)} [rpm]	2500		
Moment of inertia	J _{in} [x10 ⁻⁴ kgm ²]	8.61		
Weight	m [kg]	1.9		
Maximum hollow shaft diameter	d _{H (max)} [mm]	50		
Transmission accuracy	[arcmin]	< 1		
Torsional stiffness	K ₃ [x10 ³ Nm/rad]	300	370	
Ambient operating temperature	[°C]	0 ... 60		

Illustration 321.1

CSD-32-2A [mm]

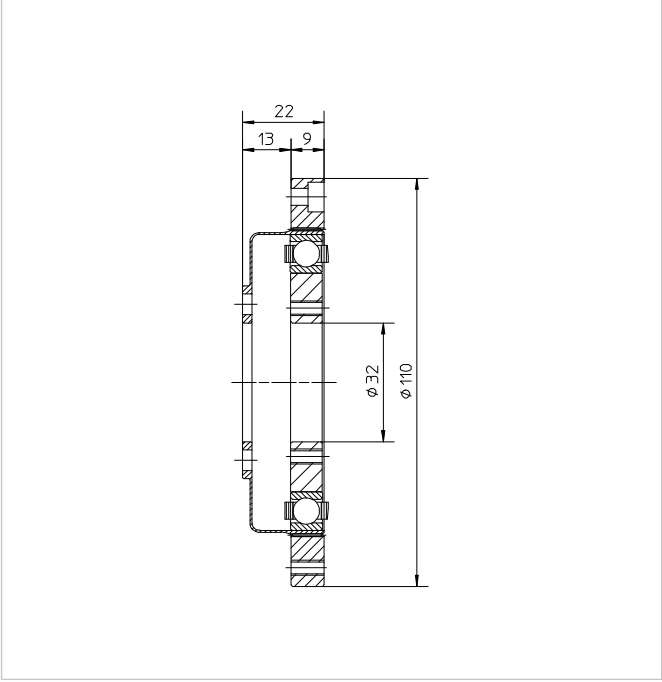


Illustration 321.2

CSD-40-2A [mm]

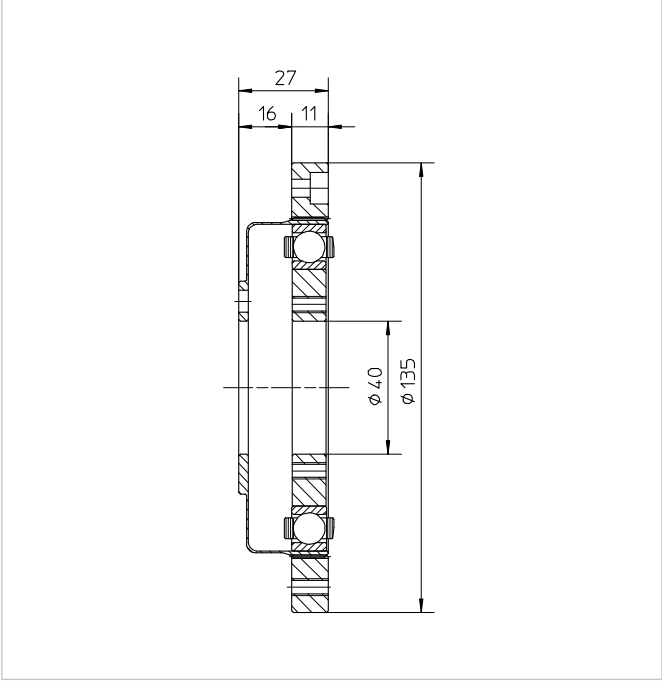
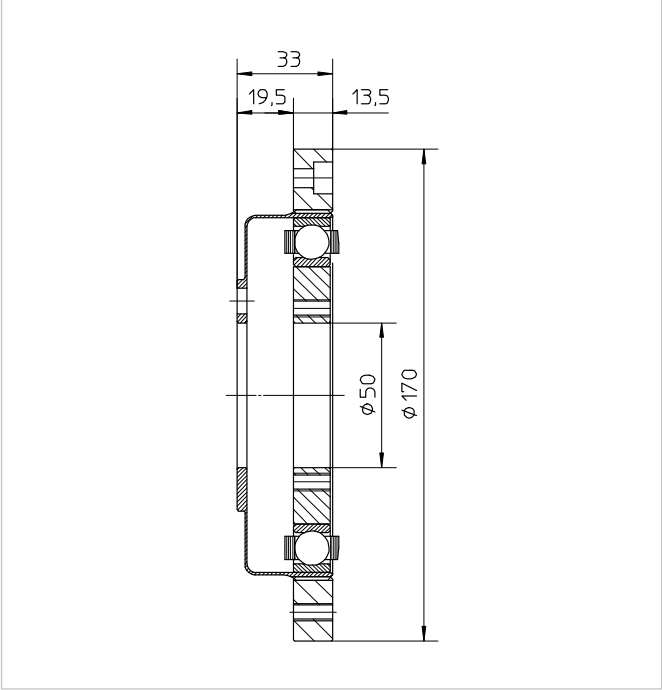


Illustration 321.3

CSD-50-2A [mm]

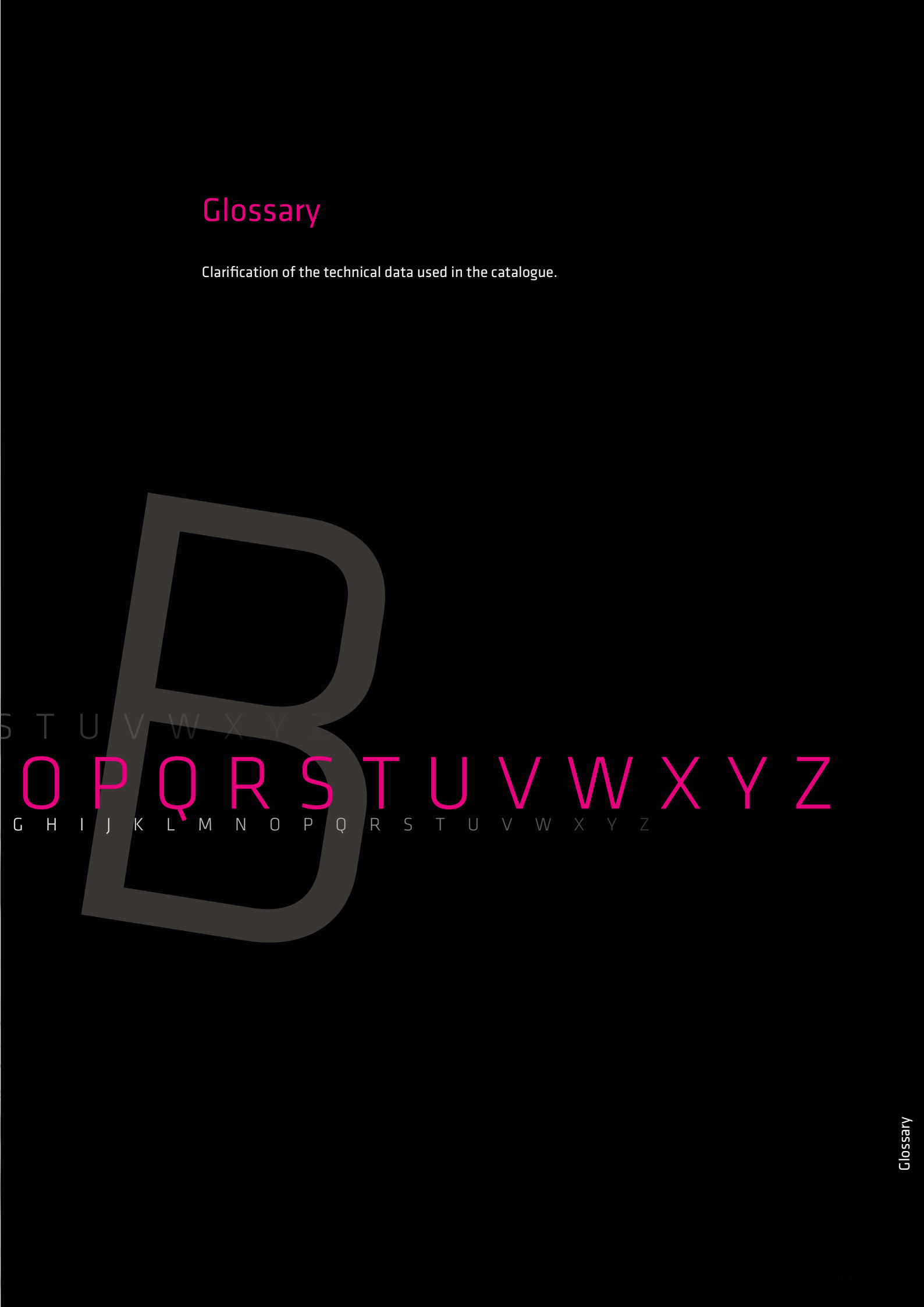




A

C

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z



Glossary

Clarification of the technical data used in the catalogue.

B

Technical data

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Technical data

Ambient operating temperature [°C]

The intended operating temperature for the operation of the actuator.

Average input speed (grease lubrication) $n_{av(max)}$ [rpm]

Maximum permissible average gear input speed for grease lubrication.

Average input speed (oil lubrication) $n_{av(max)}$ [rpm]

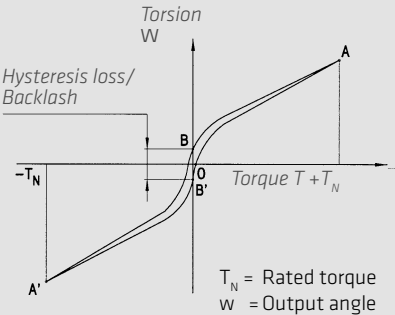
Maximum permissible average gear input speed for oil lubrication.

Average torque T_A [Nm]

When a variable load is applied to the gear, an average torque should be calculated for the complete operating cycle. This value should not exceed the specified T_A limit.

Backlash (Harmonic Planetary Gears) [arcmin]

When subjected to the rated torque, Harmonic Planetary Gears display characteristics shown in the hysteresis curve. When a torque is applied to the output shaft of the gear with the input shaft locked, the torque-torsion relationship can be measured at the output. Starting from point O the graph follows successive points A-B-A-B-A A where the value B-B is defined as the backlash or hysteresis.



Brake holding torque T_H [Nm]

Torque the actuator can withstand when the brake is applied, with respect to the output.

Collision torque T_M [Nm]

In the event of an emergency stop or collision, the Harmonic Drive® Gearing may be subjected to a brief collision torque. The magnitude and frequency of this collision torque should be kept to a minimum and under no circumstances should the collision torque occur during the normal operating cycle.

Dynamic axial load $F_{A dyn(max)}$ [N]

With bearing rotating this is the maximum allowable axial load, with no additional radial forces or tilting moments applied.

Dynamic radial load $F_{R\ dyn\ (max)}$ [N]

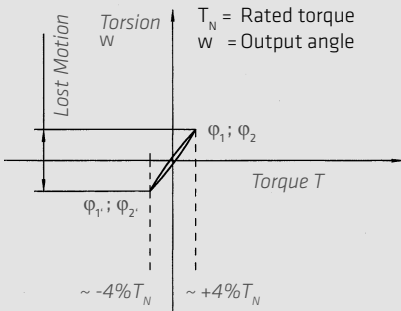
With bearing rotating this is the maximum allowable radial load, with no additional axial forces or tilting moments applied.

Dynamic tilting moment $M_{dyn\ (max)}$ [Nm]

With bearing rotating this is the maximum allowable tilting moment, with no additional axial forces or radial forces applied.

Hollow shaft diameter d_H [mm]

Free inner diameter of the continuous axial hollow shaft.



Lost Motion (Harmonic Drive® Gearing) [arcmin]

Harmonic Drive® Gearing exhibits zero backlash in the teeth. Lost Motion is the term used to characterise the torsional stiffness in the low torque region.

The illustration shows the angle of rotation w measured against the applied output torque as a hysteresis curve, with the Wave Generator locked. The Lost Motion measurement of the gear is taken with an output torque of about $\pm 4\%$ of the rated torque.

Mass moment of inertia J [kgm²]

Moment of inertia of the rotor.

Mass moment of inertia J_{in} [kgm²]

Mass moment of inertia of the gearing with respect to the input.

Mass moment of inertia J_{out} [kgm²]

Mass moment of inertia with respect to the output.

Maximum current I_{max} [A]

The maximum current is the maximum current that can be applied for a short period.

Maximum DC bus voltage $U_{DC\ (max)}$ [VDC]

The maximum DC bus power supply for the correct operation of the actuator. This value may only be exceeded for a short period during the braking or deceleration phase.

Maximum hollow shaft diameter $d_{H\ (max)}$ [mm]

For gears with a hollow shaft, this value is the maximum diameter of the axial hollow shaft.

Maximum input speed (grease lubrication) $n_{in\ (max)}$ [rpm]

Maximum allowed input speed for gearing with grease lubrication.

Maximum input speed (oil lubrication) $n_{in\ (max)}$ [rpm]

Maximum allowed input speed for gearing with oil lubrication.

Maximum power P_{max} [W]

Maximum power output.

Maximum speed n_{max} [rpm]

The maximum output speed. Due to heating issues, this may only be momentarily applied during the operating cycle. The maximum output speed can occur any number of times as long as the rated speed is greater than the permissible continuous operation calculated in the duty cycle.

Maximum torque T_{max} [Nm]

Specifies the maximum allowable acceleration and braking torques. For highly dynamic processes, this is the maximum torque available for a short period. The maximum torque can be parameterized by the control unit where the maximum current can be limited. The maximum torque can be applied as often as desired, as long as the average torque is within the permissible continuous operation calculated in the duty cycle.

Number of pole pairs p

Number of magnetic pole pairs on the rotor of the motor.

Protection IP

The degree of protection according to EN 60034-5 provides suitability for various environmental conditions.

Rated current I_N [A]

Rms value of the sinusoidal current when driven at rated torque and rated speed.

Rated speed n_N [rpm]

The output speed which can be continuously maintained when driven at rated torque T_N , when mounted on a suitably dimensioned heat sink.

Rated torque T_N [Nm]

The rated torque is a reference torque for the calculation of the gear life. When loaded with the rated torque and running at rated speed the gear will reach the average life L_{50} . The rated torque T_N is not used for the dimensioning of the gear.

Rated torque T_N [Nm]

The output torque which the motor or actuator can continuously transmit when driven at rated input speed, when mounted on a suitably dimensioned heat sink.

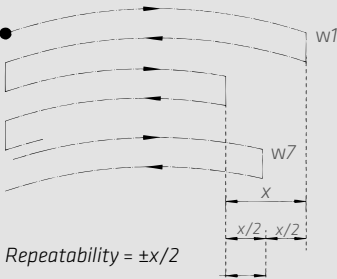
Rated voltage U_N [V_{eff}]

Supply voltage for operation with rated torque and rated speed.

Ratio i []

The ratio is the reduction of input speed to the output speed.

Note for Harmonic Drive® Gears: The standard version has the Wave Generator as the input drive element, the output element of the Flexspline and the Circular Spline is fixed to the housing. Since the direction of rotation of the drive (Wave Generator) to output reverses (Flexspline), a negative ratio for results calculations in which the direction of rotation must be considered.



Repeatability [arcmin]

The repeatability of the gear describes the position difference measured during repeated movement to the same desired position from the same direction. The repeatability is defined as half the value of the maximum difference measured, preceded by a ± sign.

Repeatable peak torque T_R [Nm]

Specifies the maximum allowable acceleration and braking torques. During the normal operating cycle the repeatable peak torque T_R should be not be exceeded.

Size

1) Actuators / Gears with Harmonic Drive® Gears or Harmonic Planetary Gears

The frame size is derived from the pitch circle diameter of the gear teeth in inches multiplied by 10.

2) CHM Servo Motor Series

The size of the CHM Servo Motors is derived from the stall torque in Ncm.

3) Direct drives from the TorkDrive® Series

The size of the TorkDrive® Series is the outer diameter of the iron core of the stator.

Stall torque T_0 [Nm]

Allowable actuator stall torque.

Torsional stiffness (Harmonic Drive® Gears) K_3 [Nm/rad]

The amount of elastic rotation at the output for a given torque and the Wave Generator blocked. The torsional stiffness K_3 describes the stiffness above a defined reference torque where the stiffness is almost linear. Values below this torque can be requested or found on our website.

The value given for the torsional stiffness K_3 is an average that has been determined during numerous tests. The limit torques T_1 and T_2 and calculation example for the total torsional angle can be found in the secondary technical documentation.

Torsional stiffness (Harmonic Planetary Gears) K [Nm/rad]

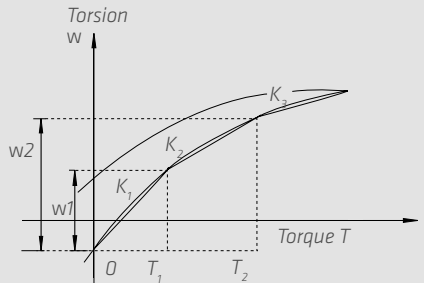
The amount of elastic rotation at the output for a given torque and blocked input shaft. The torsional rigidity of the Harmonic Planetary Gear describes the rotation of the gear above a reference torque of 15% of the rated torque. In this area the torsional stiffness is almost linear.

Transmission accuracy [arcmin]

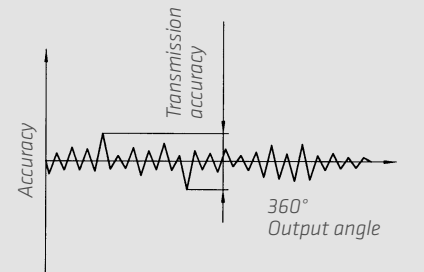
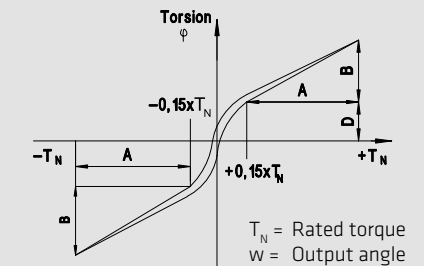
The transmission accuracy of the gear represents a linearity error between input and output angle. The transmission accuracy is measured for one complete output revolution using a high resolution measurement system. The measurements are carried out without direction reversal. The transmission accuracy is defined as the sum of the maximum positive and negative differences between theoretical and actual output rotation angle.

Weight m [kg]

The weight specified in the catalogue is the net weight without packing and only applies to standard versions.



K_1, K_2, K_3 = Torsional stiffness, w = Output angle
 w_1 = Torsion angle, with output torque T_1
 w_2 = Torsion angle, with output torque T_2



Labelling, Guidelines and Regulations

CE Marking

With the CE marking, the manufacturer or EU importer declares in accordance with EU regulation, that by affixing the CE mark the product meets the applicable requirements in the harmonisation legislation established the Community.



REACH Regulation

REACH is an European Community Regulation on chemicals. REACH stands for Registration, Evaluation, Authorisation and Restriction of Chemicals.



RoHS EU Directive

The RoHS EU Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment.



Closing remarks

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