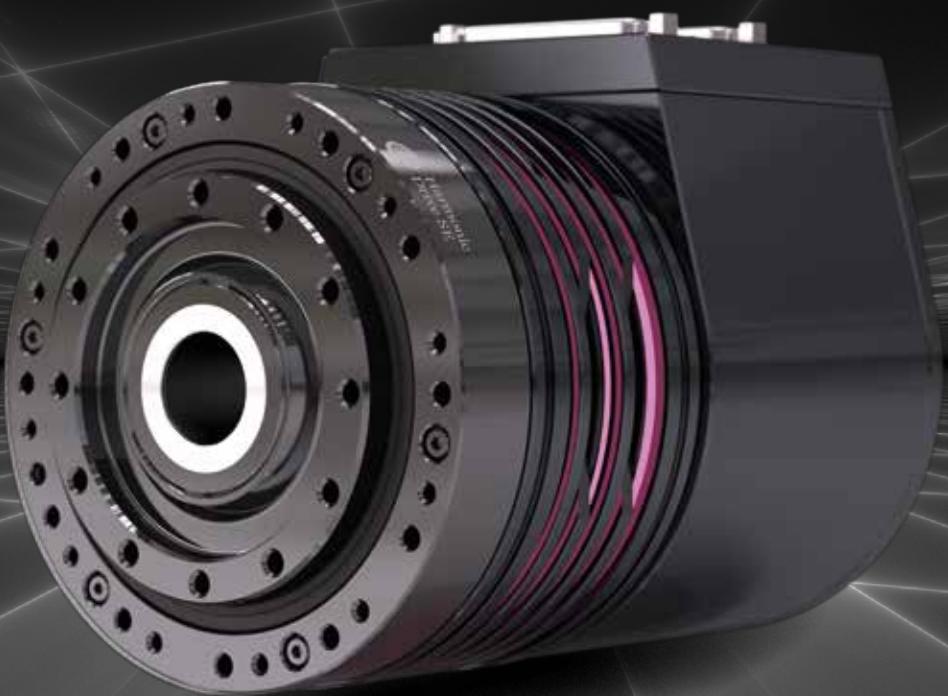


IHD Servo Actuators



Product Description

Smart, compact & highly integrated

Plug and Play via software: The new Smart System IHD from Harmonic Drive® brings together 50 years of experience with precision gears and state-of-the-art motor and drive technology. Experience innovation with our highly integrated drive solution, all without a control cabinet.

Integration made easy

Highly compact and highly integrated: The IHD system comprises a backlash-free gearbox, a sophisticated servo motor, a dual motor feedback system for position measurement and a powerful motion controller in a ready-to-use drive solution. Easy integration into your application is supported not only by the drive's central hollow shaft, which is predestined to carry a wide variety of media, but also by our specially developed, user-friendly software solution for simple commissioning – plug and play.

Compatible and predictive

Thanks to thermal optimization of its design, the IHD meets all requirements for high-performance applications in the field of stationary and mobile drive technology. Advanced simulation tools for thermal evaluation of the system have been developed for this purpose. The IHD system provides an additional application processor for future smart applications such as condition monitoring and can be used as a separate platform for customer-specific application programming. The system can operate with DC voltages of 24V or 48V.

Communication with the machine controller is possible via CANopen, Ethernet and EtherCAT. The servo actuators in our IHD Series are the perfect combination of highly dynamic, compact synchronous servo motors and zero backlash gears with output bearings. Our servo actuators with hollow shaft are another outstanding choice thanks to their low weight, small volume, excellent torque density, long lifetime and high reliability.



Table 2.1

Torque capacity	Accuracy	Dynamic	Tilt resistant	Low weight	Short design	Small outer diameter	Large hollow shaft	Temperature range
...

... perfect ... optimal . good

Ordering Code

Overview

Table 3.1

Series	Size Version	Ratio			Power supply	Controller	Protocol	Connector	Brake	Smart features	Technology options
IHD	17A	50	100	160	48	II1 Internal IE1 External ¹⁾	E=EtherCAT	RS	O = Without B = Brake	Enhanced functions	According to customer requirements
	20A 25A	50 50	100 100	160			C=CANopen				
Ordering code											
IHD	-20A	-50	-24	-II1	-E	-RS	-0	-XX	-SP		

1) On request

Connector

Table 3.2

Ordering Code	Description
RS	Radial D-Sub

Smart features

The integrated dual core micro controller provides additional computing power to introduce further functionalities which can be specified within customized solutions in co-operation with the customer.

Technology options

The integrated drive system consists of components which can be adopted to the customer needs. Modifications on the housing as well as on the electrical connection can be carried out in close co-operation with the customer.

Combinations

Table 3.1

Size Version	IHD-17A	IHD-20A	IHD-25A
Ratio	50	.	.
	100	.	.
	160	-	.
Communication Interface	EtherCAT	.	.
	CANopen	.	.
Brake	B	.	.

● available ○ on request - not available

Technical Data

General Technical Data

Table 4.1

	Symbol [Unit]	
Insulation class (EN 60034-1)		F
Insulation resistance (500 VDC)	MΩ	100
Insulation voltage (10 s)	V _{eff}	700
Lubrication		4BNo2
Degree of protection (EN 60034-5)		IP68
Ambient operating temperature	°C	0 ... 40
Ambient storage temperature	°C	-20 ... 60
Altitude (a.s.l.)	m	< 1000
Relative humidity (without condensation)	%	max. 80
Vibration resistance (DIN IEC 60068 Part 2-6, 10 ... 500 Hz)	g	5
Shock resistance (DIN IEC 60068 Part 2-27, 11 ms)	g	30
Corrosion protection (DIN IEC 60068 Part 2-11 Salt spray test)	h	-
Temperature sensors		1x PT1000 ¹⁾
Gear Component Set		CSG
Controller data		
Controller		i201A-H1-1.0
Power Supply		
Recommended power supply	V _{DC}	24-48
Recommended STO input voltage	V _{DC}	5-30
Recommended logic power supply (optional)	V _{DC}	8-30
Standby power consumption	W	<= 5
Interfaces		
EtherNet		Cyclic Synchronous Position Cyclic Synchronous Velocity Cyclic Synchronous Current
EtherCAT		Profiled Position (trapezoidal and s-curves) Profile Velocity
CANopen		Interpolated Position (P. PT. PVT) Homing
Additional inputs and outputs		
Digital Input	V _{DC}	3.3 & 5
Open collector output with maximum sink current	mA	100
Differential analog input	V _{DC}	+/- 10
Recommended braking resistor	Ω	10 (200 W / max 5A)

1) Save isolation according to EN 61800-5-1

The continuous operating characteristics given in the following apply to an ambient temperature of 40 °C and an aluminium cooling surface with the following dimensions:

Table 4.2

Series	Size Version	Unit	Dimension
IHD	17A	[mm]	300 x 300 x15
	20A	[mm]	300 x 300 x15
	25A	[mm]	350 x 350 x18

Actuator data

Technical data IHD-17A with 48 V DC bus voltage

Table 5.1

	Symbol [Unit]	IHD-17A	
Mechanical Data			
Ratio	i []	50	100
Maximum output torque	T _{max} [Nm]	44	70
Maximum output speed	n _{max} [min ⁻¹]	120	60
Continuous stall torque	T ₀ [Nm]	34	51
Hollow shaft diameter	d _h [mm]	18.1	
Weight without brake	m [kg]	3.2	
Weight with brake	m [kg]	3.6	
Mechanical time constant (without brake)	T _m [ms]	5.7	
Electrical Data			
Maximum current (for 2 s)	I _{max} [A _{DC}]	16.4	12.9
Maximum DC bus voltage	U _{DCmax} [V _{DC}]	60	
DC bus voltage	U _{DC} [V _{DC}]	48	
Electrical time constant (20 °C)	t _e [ms]	1.2	
Rated operation point			
Rated speed	n _N [min ⁻¹]	70	35
Rated torque	T _N [Nm]	28	51
Rated current	I _N [A _{DC}]	7.5	6.7
Rated voltage	U _N [V _{DC}]	48	
Electrical input power	P _{in} [W]	360	322
Mechanical output power	P _{out} [W]	205	187
Rated efficiency	η _N [%]	57	58.1
Rated torque gear component set for calculating the Wave Generator lifetime	T _N [Nm]	21	31
Rated input speed of gear component set for calculating the Wave Generator lifetime	n _N [min ⁻¹]	2000	
Thermal specification			
Ambient temperature	T _{amb} [°C]	40	
Maximum winding temperature	T _{cu,max} [°C]	105	100
Maximum housing temperature	T _{frame,max} [°C]	85	80
Thermal time constant of actuator	T _{th} [s]	2000	

Technical data IHD-20A with 48 V DC bus voltage

Table 6.1

	Symbol [Unit]	IHD-20A		
Mechanical Data				
Ratio	i []	50	100	160
Maximum output torque	T_{\max} [Nm]	73	107	120
Maximum output speed	n_{\max} [min ⁻¹]	120	60	38
Continuous stall torque	T_0 [Nm]	44	64	64
Hollow shaft diameter	d_h [mm]	18.1		
Weight without brake	m [kg]	3.3		
Weight with brake	m [kg]	3.7		
Mechanical time constant (without brake)	T_m [ms]	5.7		
Electrical Data				
Maximum current (for 2 s)	I_{\max} [A _{DC}]	29.3	22.6	16.7
Maximum DC bus voltage	$U_{DC\max}$ [V _{DC}]	60		
DC bus voltage	U_{DC} [V _{DC}]	48		
Electrical time constant (20 °C)	t_e [ms]	1.2		
Rated operation point				
Rated speed	n_N [min ⁻¹]	70	35	21
Rated torque	T_N [Nm]	26	56	64
Rated current	I_N [A _{DC}]	7.2	7.5	5.5
Rated voltage	U_N [V _{DC}]	48		
Electrical input power	P_{in} [W]	346	360	264
Mechanical output power	P_{out} [W]	190	207	141
Rated efficiency	η_N [%]	54.9	57.5	53.3
Rated torque gear component set for calculating the Wave Generator lifetime	T_N [Nm]	33	52	52
Rated input speed of gear component set for calculating the Wave Generator lifetime	n_N [min ⁻¹]	2000		
Thermal specification				
Ambient temperature	T_{amb} [°C]	40		
Maximum winding temperature	$T_{cu,max}$ [°C]	105	105	90
Maximum housing temperature	$T_{frame,max}$ [°C]	85	85	75
Thermal time constant of actuator	T_{th} [s]	2200		

Technical data IHD-25A with 48 V DC bus voltage

Table 7.1

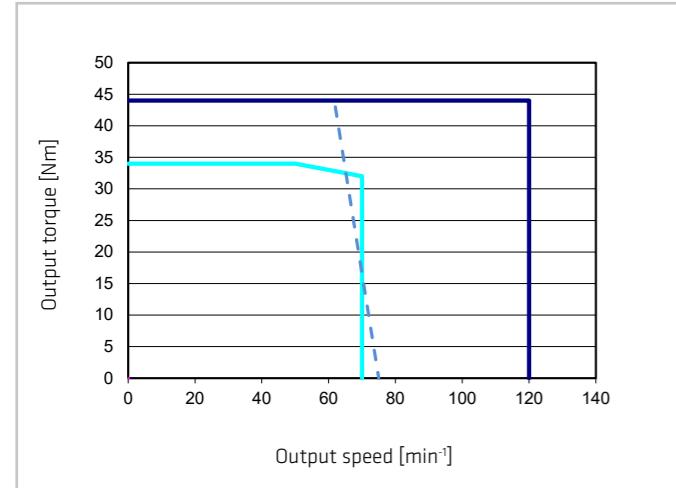
	Symbol [Unit]	IHD-25A		
Mechanical Data				
Ratio	i []	50	100	160
Maximum output torque	T_{\max} [Nm]	127	204	229
Maximum output speed	n_{\max} [min ⁻¹]	112	56	35
Continuous stall torque	T_0 [Nm]	58	119	140
Hollow shaft diameter	d_h [mm]	25		
Weight without brake	m [kg]	4.3		
Weight with brake	m [kg]	4.7		
Mechanical time constant (without brake)	T_m [ms]	11.2		
Electrical Data				
Maximum current (for 2 s)	I_{\max} [A _{DC}]	35.6	30.1	23.6
Maximum DC bus voltage	$U_{DC\max}$ [V _{DC}]	60		
DC bus voltage	U_{DC} [V _{DC}]	48		
Electrical time constant (20 °C)	t_e [ms]	2.3		
Rated operation point				
Rated speed	n_N [min ⁻¹]	70	35	21
Rated torque	T_N [Nm]	15	39	75
Rated current	I_N [A _{DC}]	5.3	5.9	6.3
Rated voltage	U_N [V _{DC}]	48		
Electrical input power	P_{in} [W]	283	283	302
Mechanical output power	P_{out} [W]	110	143	165
Rated efficiency	η_N [%]	43.2	50.5	54.5
Rated torque gear component set for calculating the Wave Generator lifetime	T_N [Nm]	51	87	87
Rated input speed of gear component set for calculating the Wave Generator lifetime	n_N [min ⁻¹]	2000		
Thermal specification				
Ambient temperature	T_{amb} [°C]	40		
Maximum winding temperature	$T_{cu,max}$ [°C]	105	105	105
Maximum housing temperature	$T_{frame,max}$ [°C]	90	90	90
Thermal time constant of actuator	T_{th} [s]	2400		

Performance Characteristics

The performance curves shown below are valid for the specified ambient operating temperature and the indicated DC bus voltage.

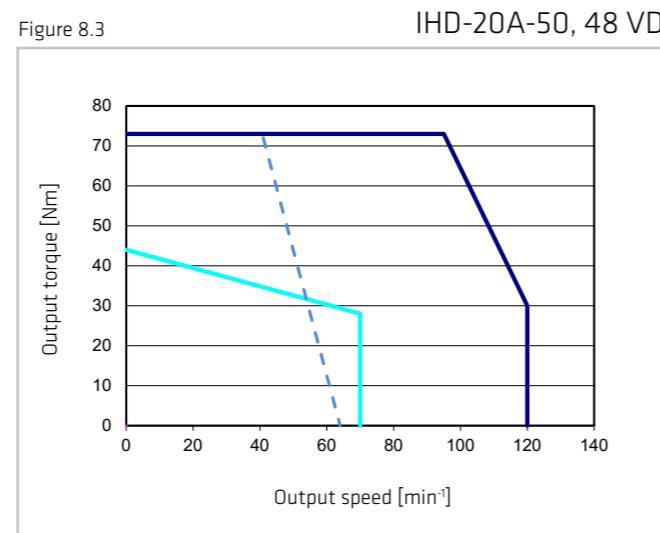
Size 17

Figure 8.1 IHD-17A-50, 48 VDC



Size 20

Figure 8.3 IHD-20A-50, 48 VDC



Size 25

Figure 9.1 IHD-25A-50, 48 VDC

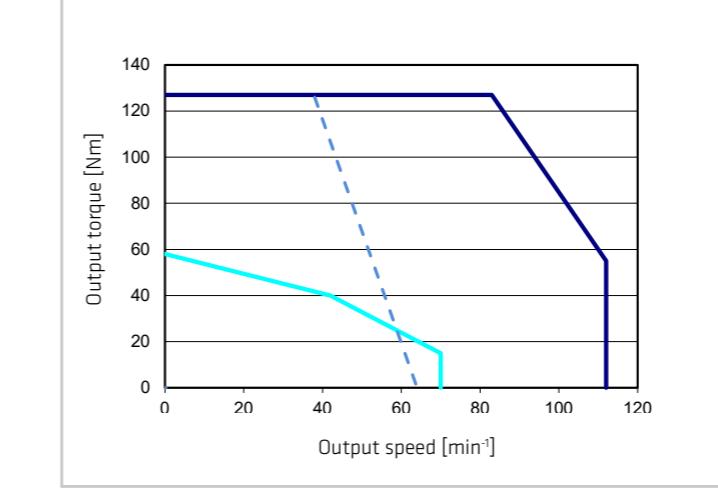


Figure 8.2 IHD-17A-100, 48 VDC

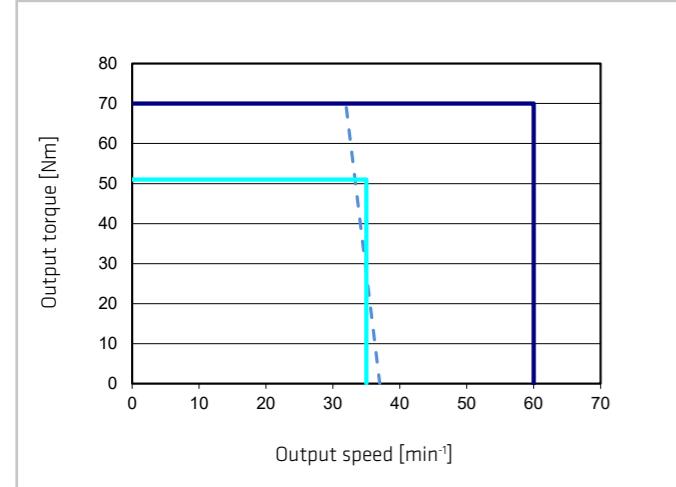


Figure 8.4 IHD-20A-100, 48 VDC

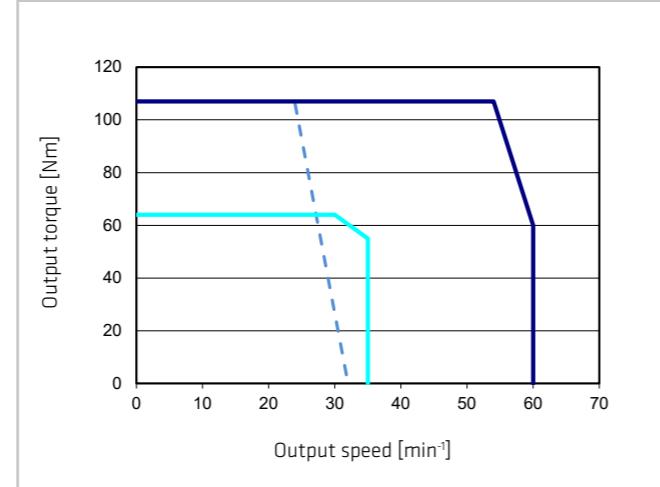


Figure 9.2 IHD-25A-100, 48 VDC

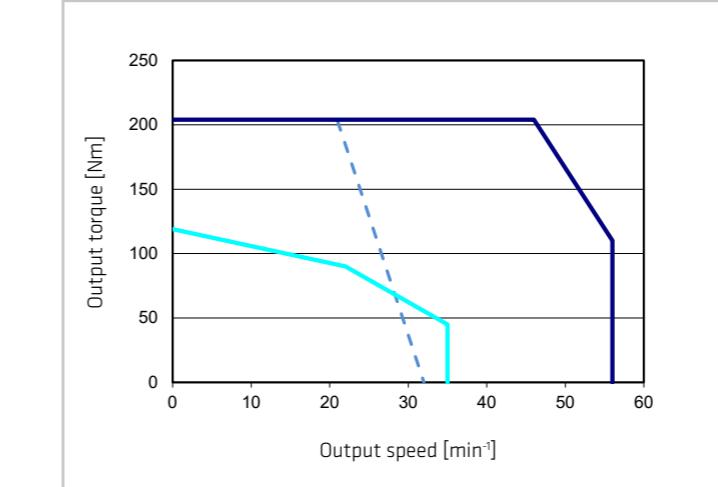


Figure 8.5 IHD-20A-160, 48 VDC

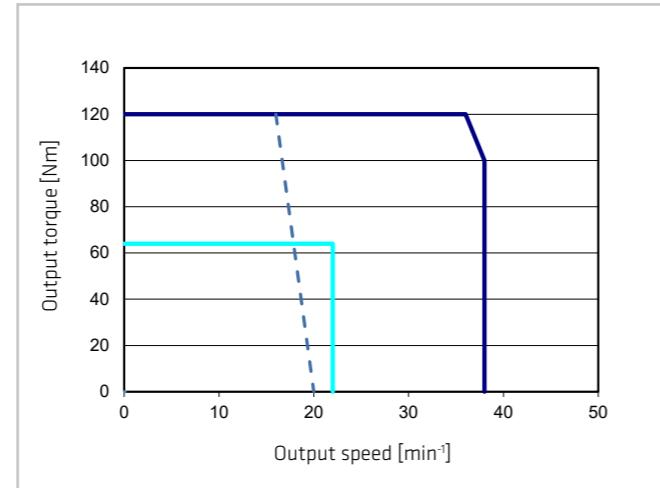
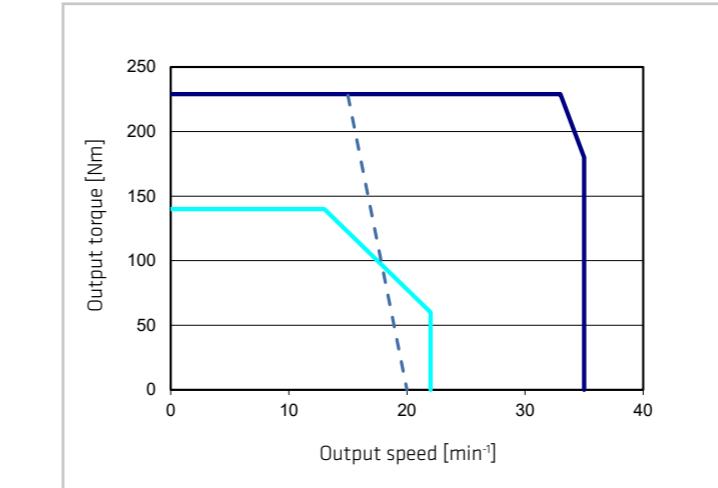


Figure 9.3 IHD-25A-160, 48 VDC



Legend

- Intermittent Duty
- Continuous Duty
- - - Limit of output speed at 24 VDC bus voltage

Moment of inertia

Table 10.1

	Symbol [Unit]	IHD-17A			IHD-20A			IHD-25A		
Ratio	i []	50	100	50	100	160	50	100	160	
Moment of inertia output side										
Moment of inertia without brake	$J_{\text{out}} [\text{kgm}^2]$	0.33	1.34	0.34	1.38	3.52	0.66	2.62	6.71	
Moment of inertia with brake	$J_{\text{out}} [\text{kgm}^2]$	0.38	1.5	0.39	1.56	4	0.73	2.92	7.84	
Moment of inertia at motor										
Moment of inertia at motor without brake	$J [\times 10^{-4} \text{ kgm}^2]$	1.34		1.4		2.62				
Moment of inertia at motor with brake	$J [\times 10^{-4} \text{ kgm}^2]$	1.5		1.6		2.92				

Technical data motor brake

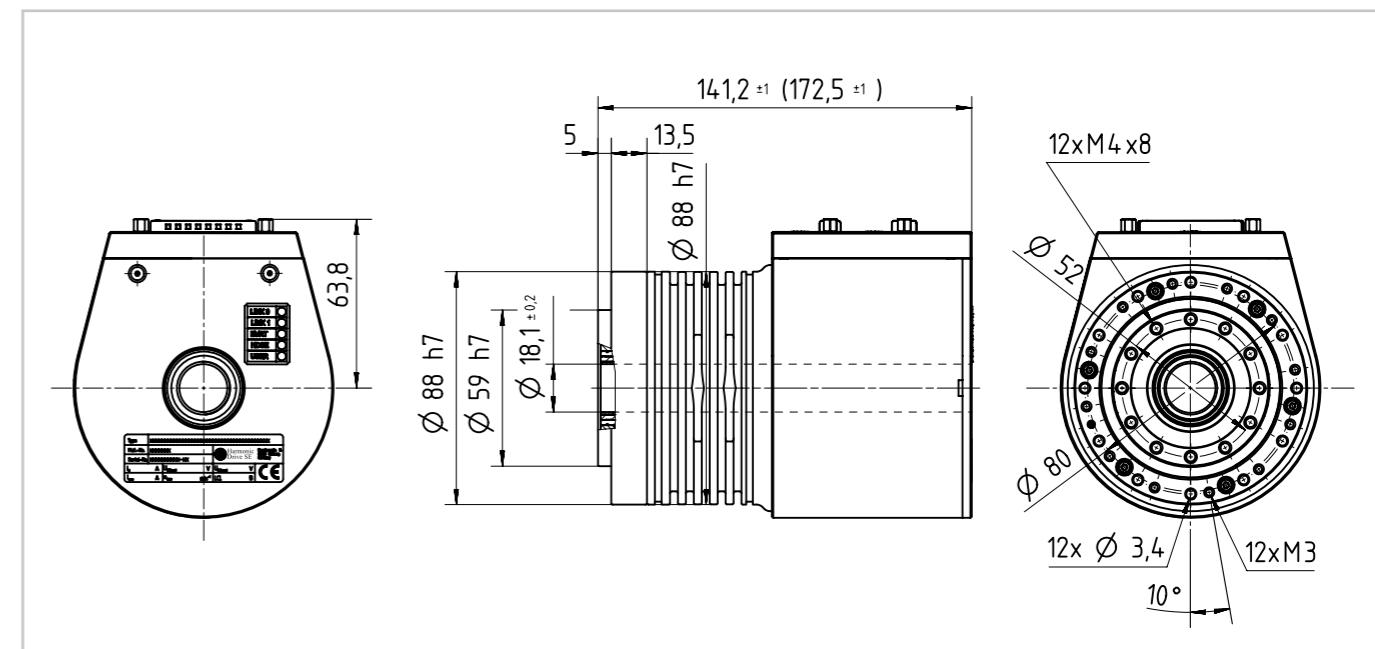
Table 10.2

	Symbol [Unit]	IHD-17A			IHD-20A			IHD-25A		
Ratio	i []	50	100	50	100	160	50	100	160	
Brake voltage										
Brake voltage	$U_{\text{Br}} [\text{VDC}]$	24 ± 10 %		24 ± 10 %		24 ± 10 %				
Brake holding torque (at output)	$T_{\text{Br}} [\text{Nm}]$	36	70	36	72	115	72	144	229	
Brake power consumption	$P_{\text{Br}} [\text{W}]$	9.5		9.5		9.5				
Opening time	$t_o [\text{ms}]$	-		-		-				
Closing time	$t_c [\text{ms}]$	-		-		-				

Dimensions

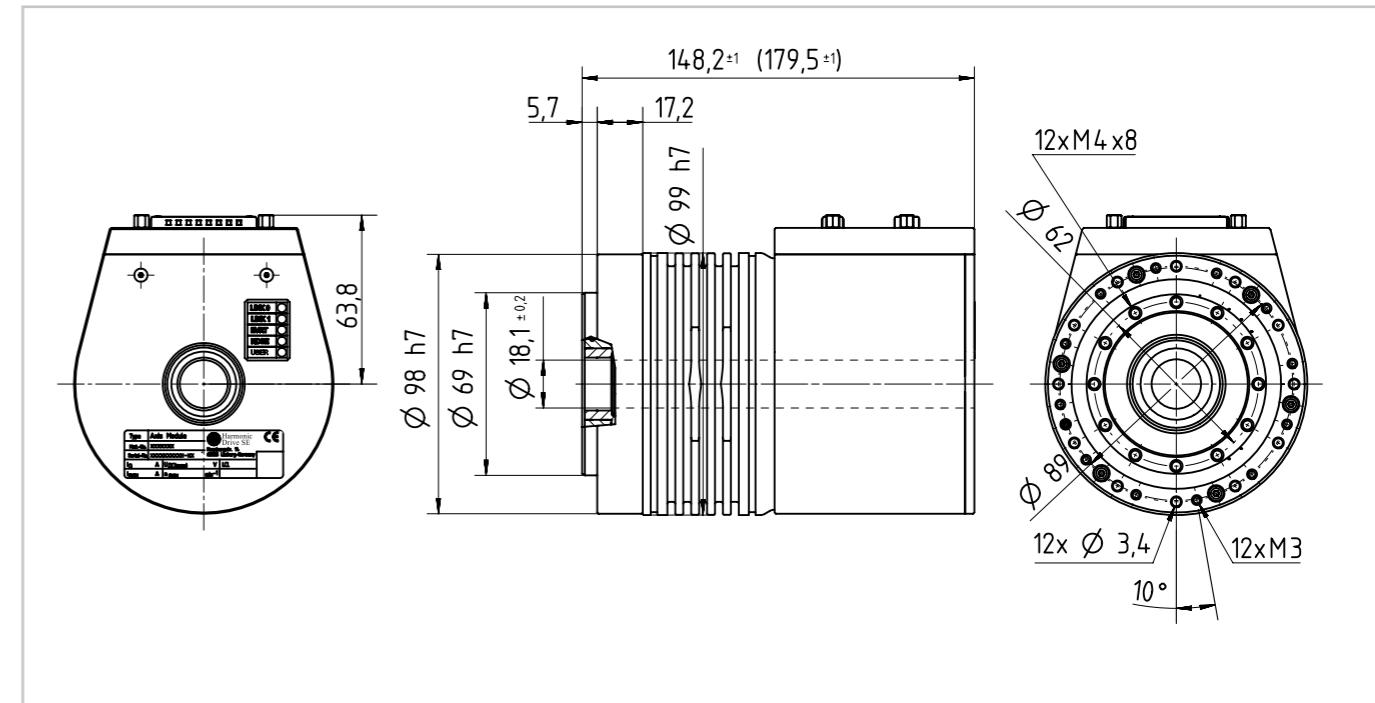
Size 17

Figure 11.1



Size 20

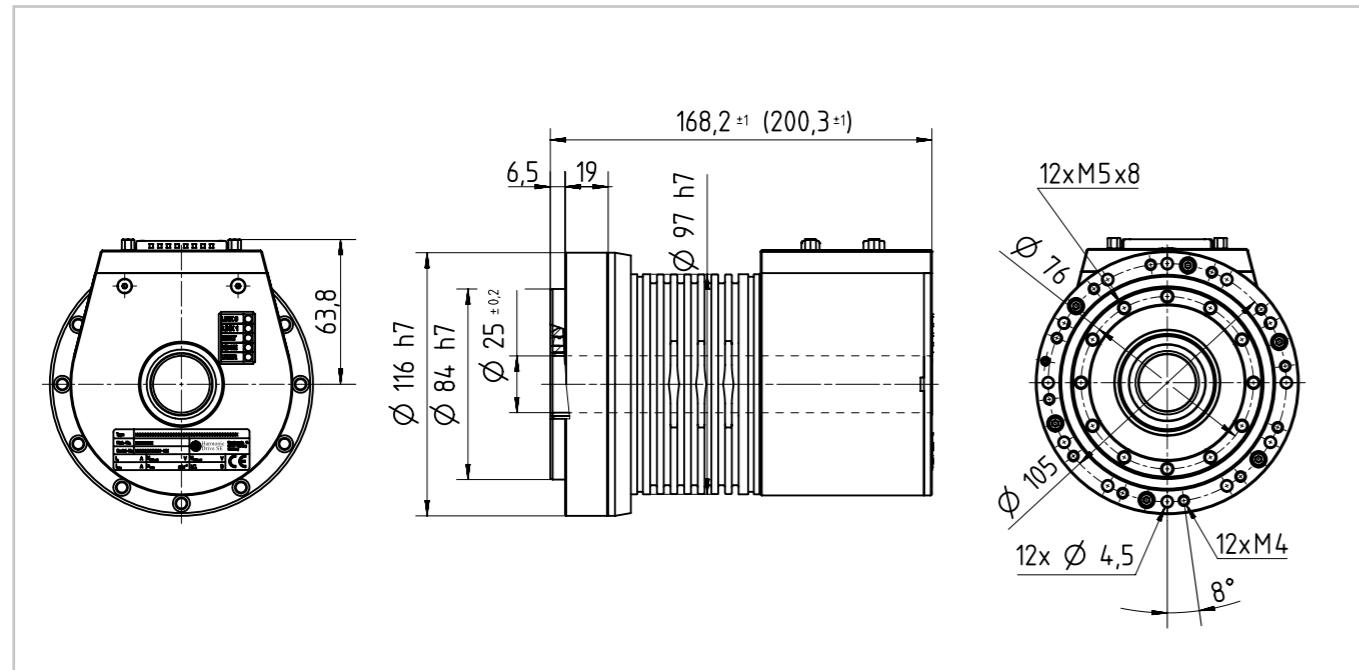
Figure 11.2



The appropriate CAD drawings as 2D or 3D files can be provided on request.

Size 25

Figure 12.1



The appropriate CAD drawings as 2D or 3D files can be provided on request.

Accuracy

Table 12.2

	Symbol [Unit]	IHD-17A ¹⁾	IHD-20A ¹⁾	IHD-25A ¹⁾
Ratio	i []	≥ 50	≥ 50	≥ 50
Transmission accuracy	[arcmin]	< 1.5	< 1	< 1
Repeatability	[arcmin]		< 1	
Hysteresis loss	[arcmin]		< 1	
Lost Motion	[arcmin]		< ±0.1	

1) Referring to gear accuracy, using motor side encoder

Torsional stiffness

Table 12.3

	Symbol [Unit]	IHD-17A ¹⁾		IHD-20A ¹⁾		IHD-25A ¹⁾	
Limit torque	T ₁ [Nm]	3.9		7		14	
	T ₂ [Nm]	12		25		48	
Ratio	i []	50	> 50	50	> 50	50	> 50
Torsional stiffness	K ₃ [·10 ³ Nm/rad]	13	16	23	29	44	57
	K ₂ [·10 ³ Nm/rad]	11	14	18	25	34	50
	K ₁ [·10 ³ Nm/rad]	8.1	10	13	16	25	31

1) Torsional stiffness related to the gear

Bearings

Output bearing

Our servo actuators incorporate a high stiffness output bearing. This specially developed bearing can withstand high axial forces and radial forces as well as tilting moments. The reduction gear thus protected from external loads, so guaranteeing a long life and consistent performance. The integration of an output bearing also serves to reduce subsequent design and production cost, by removing the need for an additional output bearing in many applications.

Technical Data

Table 13.1

	Symbol [Unit]	IHD-17A	IHD-20A	IHD-25A
Bearing type ¹⁾		C	C	C
Pitch circle diameter	d _p [m]	0.059	0.07	0.088
Offset	R [m]	0.014	0.016	0.018
Dynamic load rating	C [N]	10700	21000	21800
Static load rating	C ₀ [N]	14800	27000	35800
Dynamic tilting moment ²⁾	M _{dyn (max)} [Nm]	114	172	254
Static tilting moment ³⁾	M _{0 (max)} [Nm]	276	603	1050
Tilting moment stiffness ⁵⁾	K _B [Nm/arcmin]	40	70	114
Dynamic axial load ⁴⁾	F _{A dyn (max)} [N]	4600	15800	19200
Dynamic radial load ⁴⁾	F _{R dyn (max)} [N]	2300	8600	12700

1) C = Cross roller bearing, F = Four point contact bearing

2) These values are valid for moving gears. They are not based on the equation for lifetime of the output bearing but on the maximum allowable deflection of the Harmonic Drive® Component Set. The values indicated in the table must not be exceeded even if the lifetime equation of the bearing permits higher values.

3) These values are valid for gears at a standstill and for a static load safety factor f_s = 1.8

4) These data are valid for n = 15 rpm and L₁₀ = 15000 h..

3.4) These data are only valid if following conditions are fulfilled.

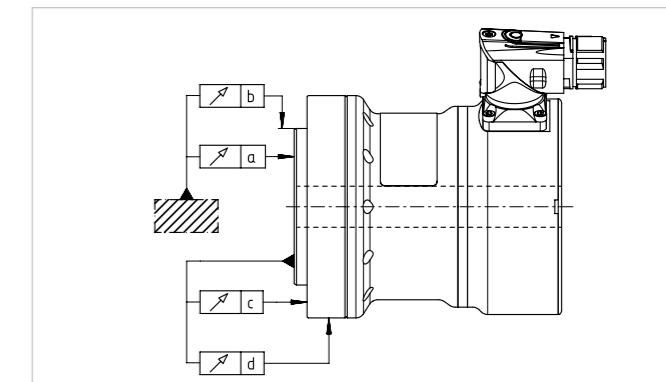
M₀; F_a = 0 N; F_r = 0 N

F_a; M₀ = 0 Nm; F_r = 0 N

F_r; M₀ = 0 Nm; F_a = 0 N

5) Average value

Figure 13.2



Tolerances

Table 13.3

	[Unit]	IHD-17A	IHD-20A	IHD-25A
a	[mm]		0.01	
b	[mm]		0.01	
c	[mm]		0.01	
d	[mm]		0.01	

Feedback systems

The IHD system is equipped with a so called Dual Feedback System.

Two singleturn absolute position sensors are available within the system. One sensor is connected to the motor shaft, the second is connected to the gear output side, meaning gear hollow shaft. Major parameters are:

Table 14.1

Sensor types	Symbol [Unit]	
Function		Singleturn absolute
Code disk		Master-Nonius
Number of poles		64/63
Position accuracy	p2p [°]	0.2

Temperatur sensors

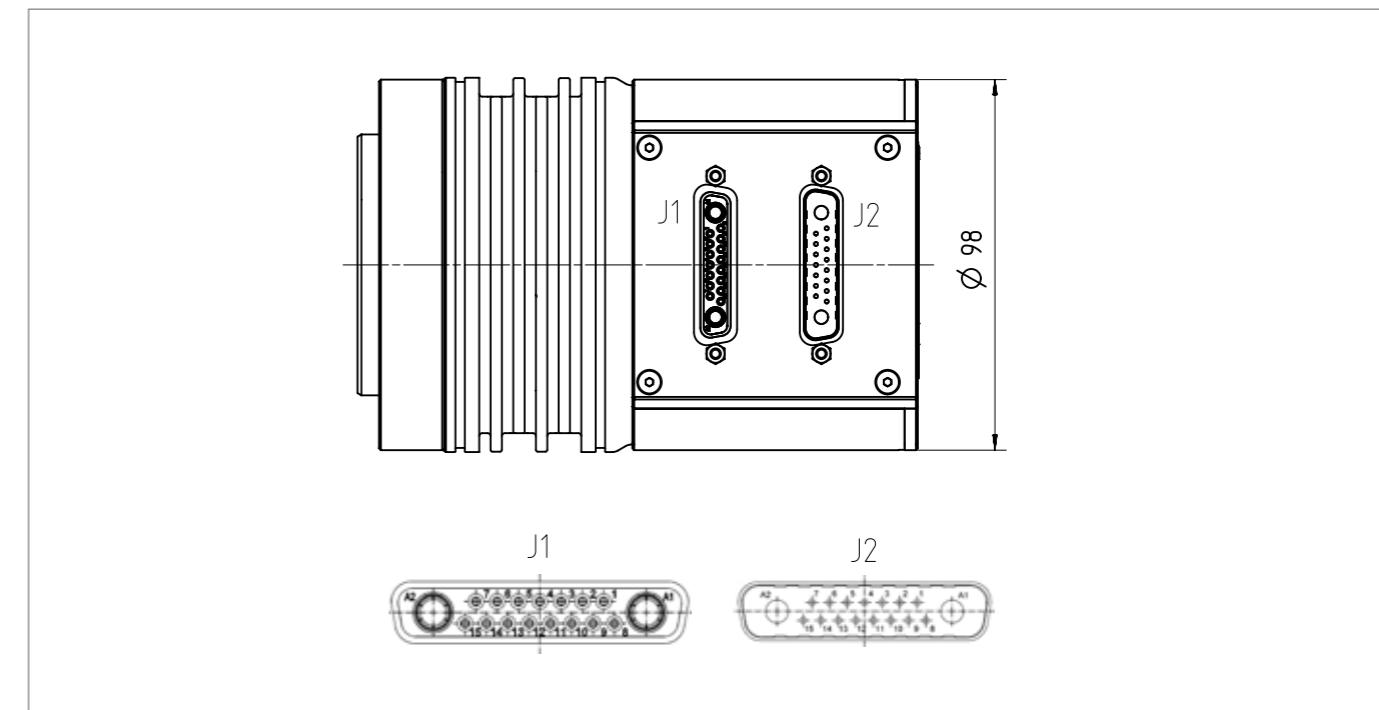
For motor protection at speeds greater than zero, temperature sensors are integrated in the motor windings. For applications with high load where the speed is zero, additional protection (e.g. $I^2 t$ monitoring) is recommended.

Table 14.1

Sensor type	Quantity	Parameter	Symbol [Unit]	Limit	
				Warning	Switch-off
PT 1000	1	Temperature	T [°C]	105	115

Electrical Connections

Table 15.1





PASSION GENERATES THE HIGHEST QUALITY

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

1051227 11/2021