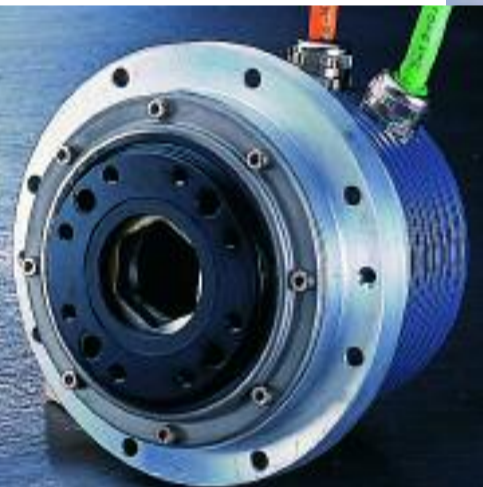


newdrive

The News-Magazine from Harmonic Drive AG



Successful in the third generation of rigorous offshore duty: The compact hollow shaft servo actuator from the FHA-C series by Harmonic Drive. These complete actuator systems prove themselves through maximum positional accuracy and precision.



Source: Harmonic Drive



Source: Mauritius



The Nera PointLink stabilizing platform supports high power parabolic antennas with diameters of up to 3 m. Frequency bands of up to 18 GHz are thereby covered, for sustainable communication even under extreme conditions.

Source: Nera Networks AS

The wind whips over the ocean, waves crash against the straining abutments of the oil platform, towering like a gigantic steel and concrete monster above the cold North Sea. If you don't have good sea legs here, you don't have a chance: heavy seas, bitter climate and icy temperatures define the life on an oil platform in the far north.

The work is a gruelling challenge. The people on these swimming workplaces don't have a chance to set foot on stable ground for weeks on end. Simply being aware that you are in the middle of the ocean on a swimming platform, utterly exposed to the forces of nature, grates on your nerves. The most critical connection to the outside world is radio contact. Cables under the ocean bed offer a connection to the mainland – but not between the moving platforms and their supply ships.

Communication under extremes

In the past, wide angle antennas were used for communication between these constantly moving objects, however the system developers soon hit

Harmonic Drive on the high seas

their concerning available bandwidth. Modern "off-shore" communication often requires extended bandwidth of up to N* 155 Mb/s. The Norwegian company NERA NETWORKS AS (www.nera.no), market leader in maritime satellite terminals, has specialized for more than 30 years in offshore communication.

Maximum actuator dependability

The company offers specially constructed large parabolic antennas to achieve this goal. Precise orientation is extremely difficult – not at all an easy undertaking in heavy seas, icy temperatures and aggressive environmental conditions. Harmonic Drive hollow shaft servo actuators from the FHA line are employed in the azimuth and elevation axes in antenna systems from NERA NETWORKS, in sizes ranging from 32 to 50 with the associated servo controllers. These complete actuator systems afford the extremely high positional accuracy

and precision required. The servo actuator's central hollow shaft uses NERA as a cable duct, thereby saving massive amounts of space. The FHA servo actuator's rigid actuator bearing offers the additional advantage, that the antenna can be mounted directly on the actuator.

Furthermore, the weight of the entire unit naturally plays an important role. The lighter the actuator components are, the easier it is to transport the antenna; it is not a rare occurrence to see them brought to the oil platform with a helicopter.

The antenna has a diameter of up to 3 m and must be stabilized to compensate for the movement of the platform or ship. The maximum angular motion speed an antenna of this diameter can reach is 3°/s in the azimuth axis, and 3°/s in the elevation. The maximum acceleration is around ± 5°/s² in the azimuth motion and around ± 3°/s² in the elevation motion. This application depends on absolute actuator reliability; contact may not be broken under any circumstances whatsoever.



Extended functionality and new design – W

The everyday life of a designer

Because project work is often a balancing act between factual knowledge, diverse assumptions and courage, knowing that the necessary parameters for calculation are rarely available in the early stages of product development is just a part of everyday life for a designer.

During the construction process, the basic conditions and load parameters sometimes change rapidly, or innovations may drive costs up. The only property which does not change is the project's finish date, requiring flexible reactions and constantly new solution variants, which of course have to be calculated as well.

Online help via the internet

for comfortable actuator selection procedures

In such cases, special software tools can be of enormous benefit to support the designer when selecting and calculating the appropriate actuator, by supplying the necessary CAD diagrams for the appropriate actuator when parameters change, thereby sparing time and effort.

Harmonic Drive has developed the WebCalculator selection software, which has been available on the internet for some time now, to meet this requirement. The newest version offers extended functionality and an improved user interface.

The user can also access motor databases when selecting motor-gear combinations comprised of Harmonic Drive gears and motors from various manufacturers. If the desired motor is not available there, motor data can be freely entered. All gear data has naturally also been entered; all databases are kept permanently up-to-date and are continuously expanded by Harmonic Drive.

Top-quality programming and high-performance hardware is employed for lightning fast calculation without any waiting time worth noting. The documentation created by the WebCalculator can be printed or be saved anonymously by the user for a period of five years.

What can the WebCalculator do?

You can call up the WebCalculator on the Harmonic Drive website www.harmonicdrive.de. When using internet-based software, you are always accessing the latest program version and database.

A new version of WebCalculator has been available for use on the Harmonic Drive homepage since April 2004, offering an improved user interface. The program can, in its current stage of expansion, calculate motor-gear combinations, Harmonic Drive servo actuators and moments of inertia. The necessary time for the relatively complex calculation of load cycles, the associated torques, lifetime, etc. and the actuator's moments of inertia is kept to a minimum.

Because the program is typically not used on a regular basis, but only for new construction queries or the reengineering of associated gear selections, particular

importance has been placed on the usability and clarity. The result is an intuitive user interface with which a complete actuator selection can be carried out within just a few minutes. The greatest advantage lies in the simple operation when automatically calculating all cycle data.

The program independently calculates the drive cycle under the specification of the smallest possible acceleration torque. When necessary, but also through manual entry of a defined drive time, pause time and the actuator speed limit, individual drive cycles can be defined. Naturally, the associated torques, etc. will also be calculated considering the maximum allowable specifications of the motor and gears.

Before the actual calculation can begin, the program must of course be supplied with certain basic data. Initially, the motor-gear combination and the operation mode must be selected. When entering the load, a program to calculate moments of inertia can be called up. Additionally, entries for the desired maximum rotational speed can be made alongside diverse load entries. Furthermore, it can be defined if the motor actively holds the load when standing still, or if it is held using a brake. Traditional calculations often fail to consider this, despite the considerable impact on the effective motor torque. The WebCalculator also takes the intended application into account. Based on our experience with various applications, a calculation process was developed which calculates the gear size selection and reduction, among other factors, as a function of the intended application.

The specification of the environmental temperature is necessary for automatic calculation of gear efficiency. The required gear life is an equally important parameter for proper dimensioning of the gearbox and servo actuator. Because the motor's heat removal depends on its attachment flanging, a corresponding entry can be made. If the motor is attached directly to the gearbox, the permissible effective torque is reduced by 15% in the calculation. When the motor is attached to the machine frame, the calculation will be carried out without reduction.

After clicking the "Calculate" button, the cycle is first to be calculated. As opposed to other selection programs, neither acceleration data nor a complete cycle with actuator torques, etc. has to be entered in the WebCalculator. It is all taken care of automatically in the program. The cycle is calculated under consideration of all specifications, such that the smallest possible acceleration torques occur. Based on this calculation, the suitable gears of the pre-selected type are displayed.

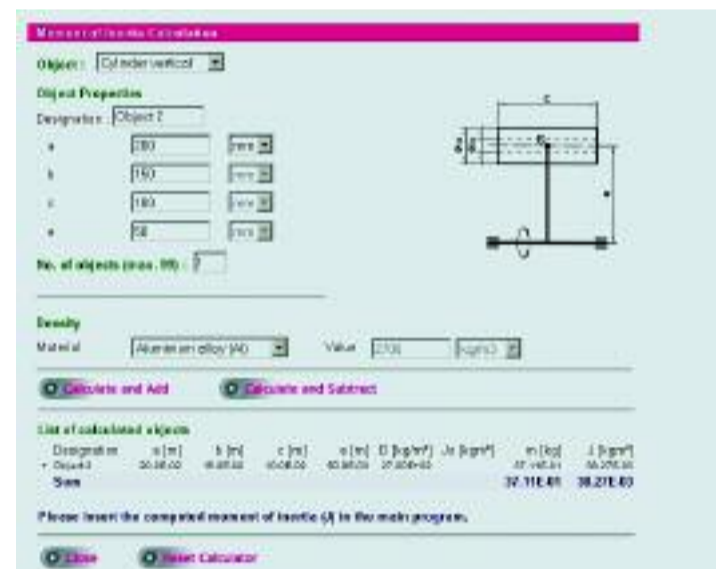
After the selection of the desired gearbox, the user can select the desired motor manufacturer, and receives a list of all suitable motors from this manufacturer. For the motor in the first position on the list, the motor specifications and the operating point "Max. torque over speed" are displayed. The maximum allowable limits according to the motor specifications are auto-



1 Starting your project ...



2 Enter the load data.



3 A program to calculate the moments of inertia is additionally available.



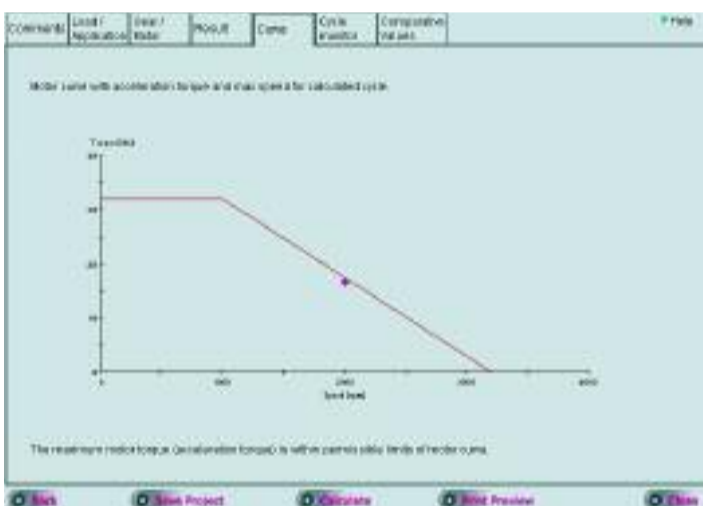
4 Select the desired gear type and motor.

matically checked. All relevant calculation results are displayed on a single screen. The user can also define a motor himself from the list of matching motors. This ensures that the program can also be used when the motor to be calculated is not (yet) present in the database. Motor and product databases are constantly being expanded and updated.

The program then displays an overview of the calculated gear lifetime. Harmonic Drive specifies lifetimes of L10 and L50. Moreover, certain comparison values of the calculated gears and motor will be displayed. Depending on the program version and the calculated result, more details may be provided. After completing the calculation, all entries and results can be saved in a personal database.



5 The program offers a selection of matching gears and motors.



6 The maximum allowable limits according to the motor specifications are automatically checked.

The screenshot shows a detailed table of cycle data. The table has columns for 'Designation', 'Unit', and 'Curve Position'. The data includes values for 'Time increments', 'Absolute Time', 'Start Torque', 'Motor Torque', 'Motor Speed', 'Gear Output Speed', and 'Gear Output Angle'. Below the table, there are 'Explanations' for various symbols used in the table.

Designation	Unit	Curve Position
Time increments	[s]	t ₁ , t ₂ , t ₃ , t ₄ , t ₅ , t ₆
Absolute Time	[s]	t ₁ , t ₂ , t ₃ , t ₄ , t ₅ , t ₆ , t ₇ , t ₈
Start Torque	[Nm]	0, 0.0000, 1.00, -0.0000, 0
Motor Torque	[Nm]	0, 0.0000, 0.2700, -0.0000, 0
Motor Speed	[rpm]	0, 2000, 0
Gear Output Speed	[rpm]	0, 38, 0
Gear Output Angle	[degree]	0, 0, 67, 0, 0
Motor Current [A]	[A]	0, 0.0000, 0.3000, 0.0000, 0

7 You receive all cycle data in a single view.

The screenshot shows a comparison data table. It lists 'Computed Values' and 'Max. permissible Values' for various parameters like 'T1 gear', 'T2 gear', 'T3 gear', 'Average Output Torque', 'Average Input Torque', 'T1 motor', 'T2 motor', 'T3 motor', and 'Max. permissible acceleration'. The table includes numerical values and units for each parameter.

Parameter	Computed Values	Max. permissible Values
T1 gear	0.18 Nm	0.68 Nm
T2 gear	0.08 Nm	0.68 Nm
T3 gear	0.08 Nm	0.68 Nm
Average Output Torque	0.08 Nm	0.73 Nm
Average Input Torque	0.07 Nm	0.68 Nm
T1 motor	0.07 Nm	0.73 Nm
T2 motor	0.08 Nm	0.73 Nm
T3 motor	0.08 Nm	0.73 Nm
Max. permissible acceleration	0.08 Nm	0.73 Nm

8 An overview of all comparison data.

WebCalculator for servo actuators

In addition to the combination of motors from various manufacturers and Harmonic Drive gears, Harmonic Drive servo actuators – such as the FHA type hollow-shaft actuators or the highly dynamic FFA and FPA type servo actuators – can now also be selected using the program. Starting from the customer's load data, a suitable servo actuator can be quickly selected. The positioning cycle will then be calculated using two dif-

ferent variants. Starting from the application requirements for acceleration and brake time, movement angle, load torque, load inertia and idle time, it will be tested if the selected servo actuator fulfils the requirements. In the second variant, the positioning cycle will be calculated with specifications concerning the torque and speed at the gear drive as a starting point. The calculation will be rounded by determination of the torsion angle and the output bearing duration.

THE TECHNOLOGY CORNER

DRUPA, the trade fair for printing and paper machines, took place in Düsseldorf in May 2004. Harmonic Drive was among the exhibitors, because demand for positioning actuators in the printing and paper machine branch is increasing. Harmonic Drive offers backlash free gears, actuators or system solutions for the print sector, and carries an extensive service arrangement - from competent consultation, concept development and selection to cost-free development of the actuator technology - to keep you ahead of the competition.

Up to now, Harmonic Drive® Gears have been employed e.g. for register adjustment in flexoprint machines or for web tension control purposes. In addition, they are particularly well suited for knife adjustment in folding machines or the phase adjustment in paper processing machines. In the following example, a bond printing machine is concerned, in which the phase adjustment is solved using a differential actuator.

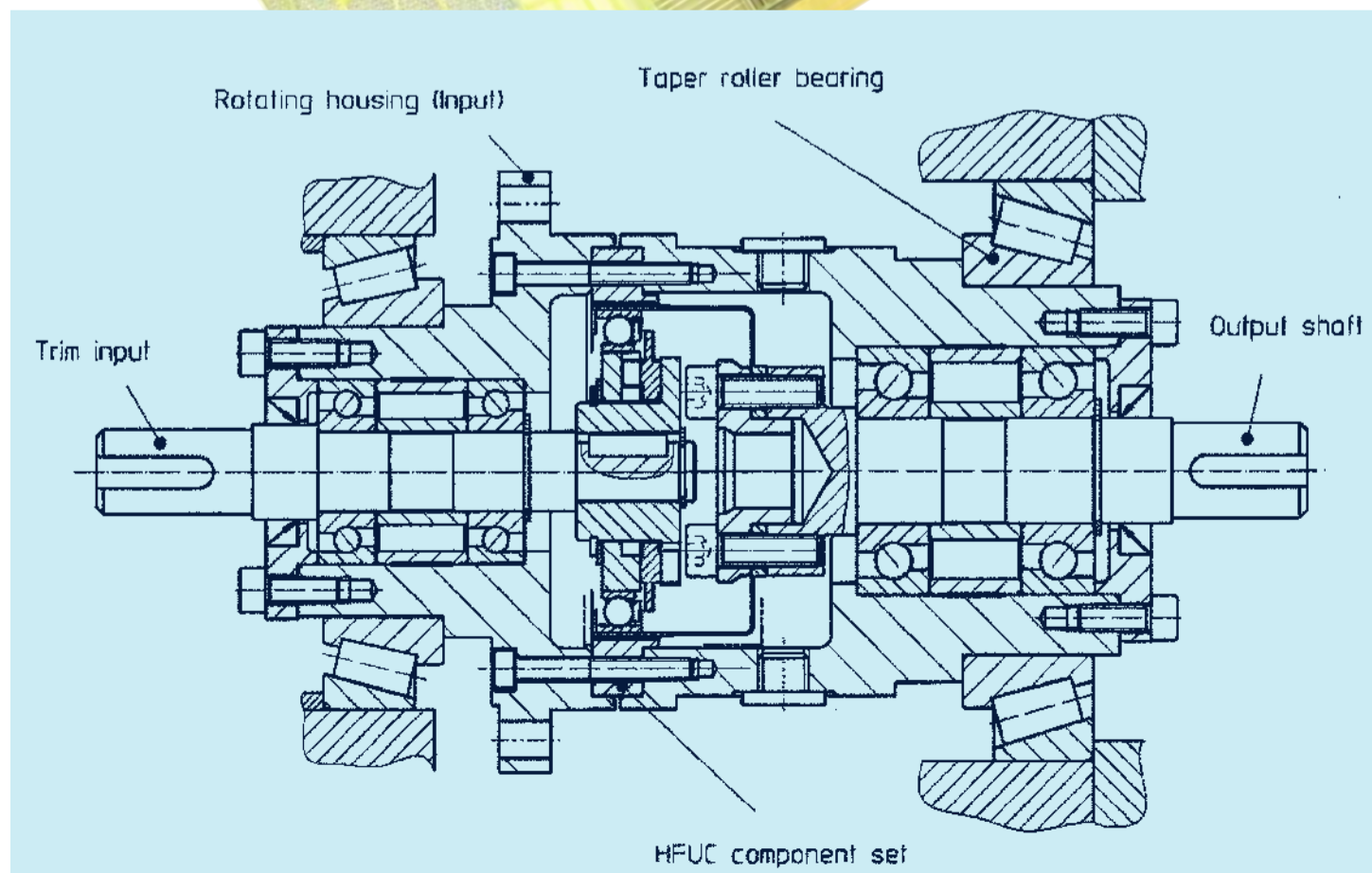
A large number of differential drive arrangements can be realized with the application of Harmonic Drive® Gears. This multifunctional differential drive with

housing and input and output bearings features an integrated Harmonic Drive HFUC cup-type gear. The Circular Spline is a part of the freely rotating casing. As depicted in the diagram, the Flexspline is connected with the input and output shaft. The Wave Generator is likewise coupled with a shaft, which is either used to fine-tune speed, or can be fixed. The type of use of the Wave Generator depends on the desired speed ratio between the input and output.

Due to the compact design and the high torque capacity, this actuator concept is particularly well suited to the following applications:

- Register adjustment
- Fine speed tuning
- Adjustment drive
- Drive with dual speed ranges.

Due to the high reduction between fine adjustment and the input or output shaft, the adjustment speed can be controlled with a unit of relatively small dimensions, e.g. a DC motor, stepping motor or a hand wheel for special applications. The unit depicted in the diagram is oil lubricated. Screws are provided for filling and draining of the oil.



The new Harmonic Drive UK sales subsidiary



Harmonic Drive UK Limited

Harmonic Drive announces new UK office in Stafford



Dear Customer,
Dear Business Partner,

Harmonic Drive AG is a leading manufacturer and supplier of precision gears and actuators since more than 30 years in Europe. Our core competences lie in the development, production and marketing of gear component sets, servo actuators, gearboxes or custom-made motion control systems which are manufactured at our facility and headquarters in Limburg – near Frankfurt –, Germany.

For many years, the Heason Technologies Group was our sales partner in UK. However, the continuous expansion of our company and our product range as well as the positive business development in the UK necessitates the foundation of a new sales subsidiary. This enables us to provide our specific know how directly to you.

Our new office is located at the Staffordshire Technology Park in Stafford, close to the motorway M6 between Manchester and Birmingham, at the heart of the UK manufacturing industry. This is the first of a number of major investments in both personnel and facilities.

As a 100 % daughter of Harmonic Drive AG we can now offer direct customer support by our local UK sales team. Customer care, short reaction time and intensive engineering support are the most important objectives for us.

Harmonic Drive UK aims to offer an improved level of services to all customers, now having the benefit of direct contact to specialist staff at our manufacturing plant in Germany. We will also try to offer customers some cost savings and shorter delivery times, where possible, associated with the purchase of products directly from the manufacturer.

If you need any further clarification or more information, please feel free to contact me. We are looking forward to hearing from you soon.

Best Regards,
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Source: Harmonic Drive UK



Graham Mackrell, Sales Director at Harmonic Drive UK Ltd., and Helen Cocker are looking forward to talking to you.

FAIR PREVIEW

This year one exhibition has been chased by the other. From November 23rd to 25th Harmonic Drive will be exhibitor at the SPS/IPC/DRIVES 2004. Our stand no. 158 is located in hall 4. We are looking forward to seeing you there. If you have not yet decided to visit this fair, here are some facts and figures.

SPS/IPC/DRIVES 2004

Electric Automation – Systems & Components, International Exhibition & Conference, Nuremberg – Germany

SPS/IPC/DRIVES is the exhibition for automation technology. It covers all components down to the system and offers herewith integrated automation solutions. Exhibitors and visitors profit from the advantage that visiting numerous exhibitions on components becomes superfluous. 60 % of the last years' visitors were categorised as construction/development and executive management.

Again new booking record

With 64,500 m² booked, SPS/IPC/DRIVES 2004 has now surpassed its 2003 size by 20 % and will be bigger than ever before.

Program SPS/IPC/DRIVES 2004

The conference and tutorial programme of the SPS/IPC/DRIVES offers up-to-date and high-quality conference lectures and tutorials on innovation and technologies, which are having an important impact on automation technologies now and will increasingly do so in the future. For detailed information on the Tutorials and sessions simply have a look on www.mesago.de and click on the respective program fields. Please note, that the conference language is mainly German. This years conference includes three English lectures.

New product family -

Modular components for Units and Actuators

At the SPS/IPC/DRIVES we will show you the results of our recent development work.

The new CPU product family represents a new modular gear range comprising a newly developed Harmonic Drive® component set combined with a specially designed flange-type output bearing. This modular unit is available with solid input shaft, hollow input shaft and in a version for direct motor assembly. These mechanical components are also featured in a new CHA hollow-shaft actuator family. This new range provides higher torque capacities and higher speeds than the current hollow-shaft actuator generation. A variety of different motor feedback systems and sensors are available to provide compatibility with all common CNC control systems and to extend the functionality of the actuators respectively. All this for an excellent price-performance relationship, because the number of individual parts could be reduced. These new products have been completely developed and manufactured in our German manufacturing plant in Limburg.

We are looking forward to seeing you in hall 4, stand no. 158.



SPS/IPC/DRIVES
Electric Automation
Systems and Components
Exhibition & Conference
23 – 25 Nov. 2004
Nürnberg

