



HEIDENHAIN



Product Information

RVM 4000

Reference Encoder for
the Acceptance Testing
of Rotary Axes

ACCOM 4.0

Software for Evaluating
Rotary Axes in Conformity
with Technical Standards

RVM 4000

Comparative encoder for the inspection of rotary axes

- Robust and easy to handle
- High system accuracy
- Zero-contact and wear-free measurement

The RVM 4000 is the ideal solution for determining the accuracy of a rotary table with speed, convenience, and high precision. It serves as a reference encoder for the acceptance testing of rotary axes and for machine inspection.

The wide scanning gap and wide mounting tolerances enable fast installation and easy handling. This also makes the system very robust and insensitive to external influences. Measurement can be started in very short time without a warm-up phase. The RVM 4000 can be used with any control and, along with all required accessories, is easy to transport in the provided storage case. The touchless measurement design is wear-free and ensures correct results.

The RVM 4000 rotary axis comparative encoder consists of an optical scale drum on a mounting holder, as well as a scanning module with three or four scanning heads. The relative motion between the scanning module and the scale drum allows the actual motion of the rotational axis to be measured and, via the appropriate software, compared with the programmed positions.

In some cases the machine geometry prevents measurement directly at the center of the axis's rotation. Thanks to the modular design of the RVM 4000 and with the aid of the ACCOM 4.0 software, measurement outside of the center of rotation is possible, since the control performs compensation movements in the linear axes. The system accuracy specified for the RVM 4000 here also applies to the mounting and operating tolerances stated in the operating instructions. Machine-specific component errors in the associated linear axes can influence the measurement result. The operator must therefore interpret the overall results.

The RVM 4000 is available in two variants:

- Standard device: for measuring rotary tables (RVM 4180)
- Optimized for space: for measuring swivel axes (RVM 4280)

Included in delivery:

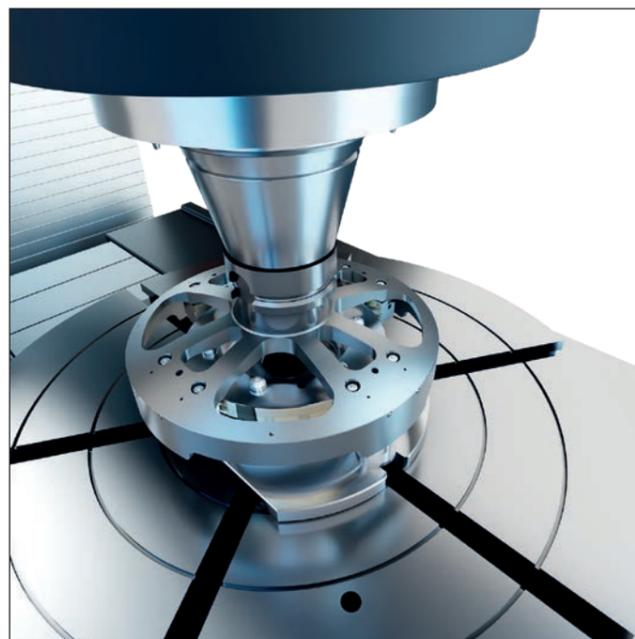
- RVM 4x80
- Mounting tools
- Central fastening via TTR holder (only with RVM 4280)

Accessories:

- Tool holder
- ACCOM 4.0 software
- EIB 74x external interface box
- 3 or 4 extension cables



Components of the RVM 4180



Sample mounting scenario for the RVM 4180



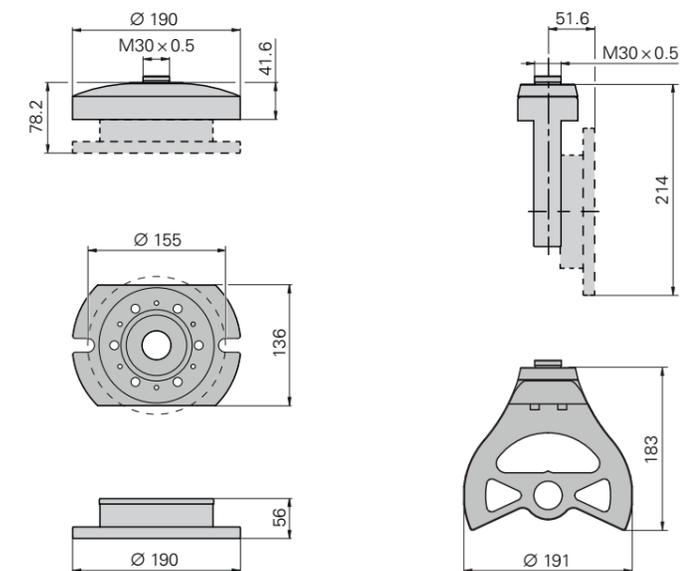
Sample mounting scenario for the RVM 4280

	RVM 4180	RVM 4280
Area of application	Rotary tables	Swivel axes
Measuring standard Grating period	METALLUR graduation on a steel drum 40 µm	
System accuracy	±0.5"	±1.0"
Possible measurement range	360°	360° ¹⁾
Runout tolerance	±0.2 mm	
Interface	~ 1 V _{PP}	
Measuring step	≥ 0.03" (with EIB 74x)	
Supply voltage	5 V ±0.5 V	
Current consumption (typical)	< 100 mA (per axis)	
Electrical connection	4 x 2.5 m cable with 15-pin D-sub connector; with locking screws	3 x 2.8 m cable with 15-pin D-sub connector; with locking screws
Cable length²⁾	≤ 20 m	
Holder for scanning module	M30x0.5, adapter for tool holder system available as an accessory	
Mechanically permissible shaft speed	≤ 100 rpm	
Operating temperature	15 °C to 25 °C	
Mass		
Scanning module	≈ 1.4 kg	≈ 2.2 kg
Drum holder	≈ 3.3 kg	≈ 3.3 kg
Total including case	≈ 10.7 kg	≈ 11.1 kg

¹⁾ Achievable measuring range might be limited by the machine geometry

²⁾ With HEIDENHAIN cable

Dimensions



ACCOM 4.0

- Software for use with encoders for machine calibration (RVM 4000)
- Data recording and evaluation in conformity with technical standards
- Intuitive user guidance

The ideal counterpart to the RVM 4000 comparative encoder is the PC software ACCOM 4.0. This intuitive software enables data recording and distinguishes between preparation and actual measurement. Acceptance tests in accordance with ISO 230-2 and ISO 230-3, as well as the VDI/DGQ 3441 guideline are possible. In addition to performing evaluations in conformity with technical standards, ACCOM 4.0 also features the user-friendly creation of compensation tables for the machine control and a printout of the measurement curves and key data for archiving and documentation purposes, either for the documentation of acceptance tests or for the customer.

Measurement of static positioning accuracy

The positioning accuracy and repeatability is determined on the machine tool through movement to certain positions. The information obtained can be used for the acceptance testing and documentation of an axis, and also for inspection of the positioning accuracy or for evaluation in a machine manufacturer's testing lab.

Measurement of the thermal drift

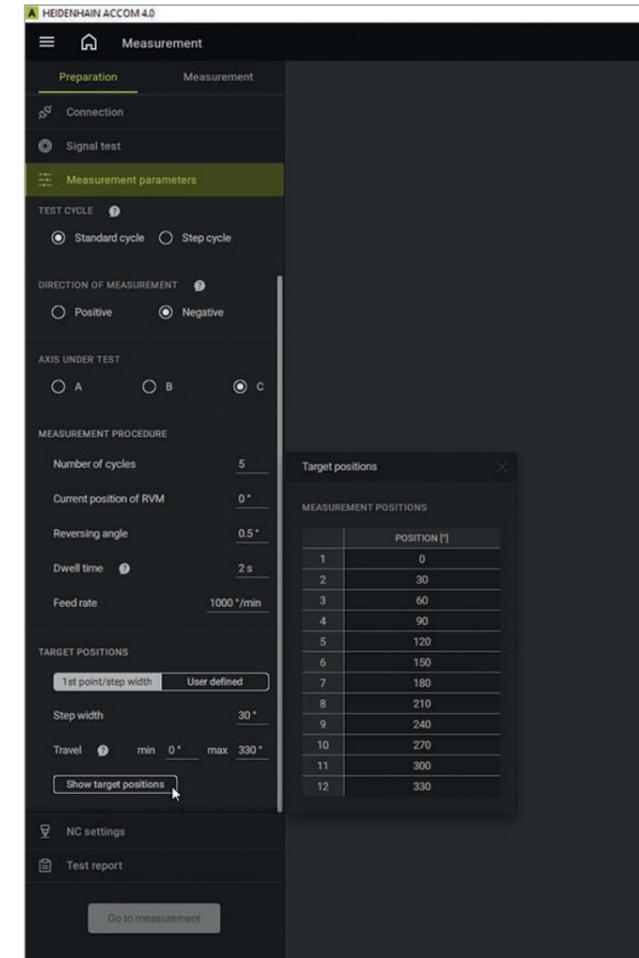
The thermal behavior of feed axes can be determined by means of a long-term positioning test in accordance with ISO 230-3. In this case, the table is repeatedly moved to two axis positions, and the deviation of the positioning accuracy is plotted as a function of time. Detailed knowledge about the thermal positioning stability of a rotary axis can be used to help improve the design and optimize the use of the cooling system. This information can also be used in sales argumentation.

Additional option: RVM 4280 mounting assistant

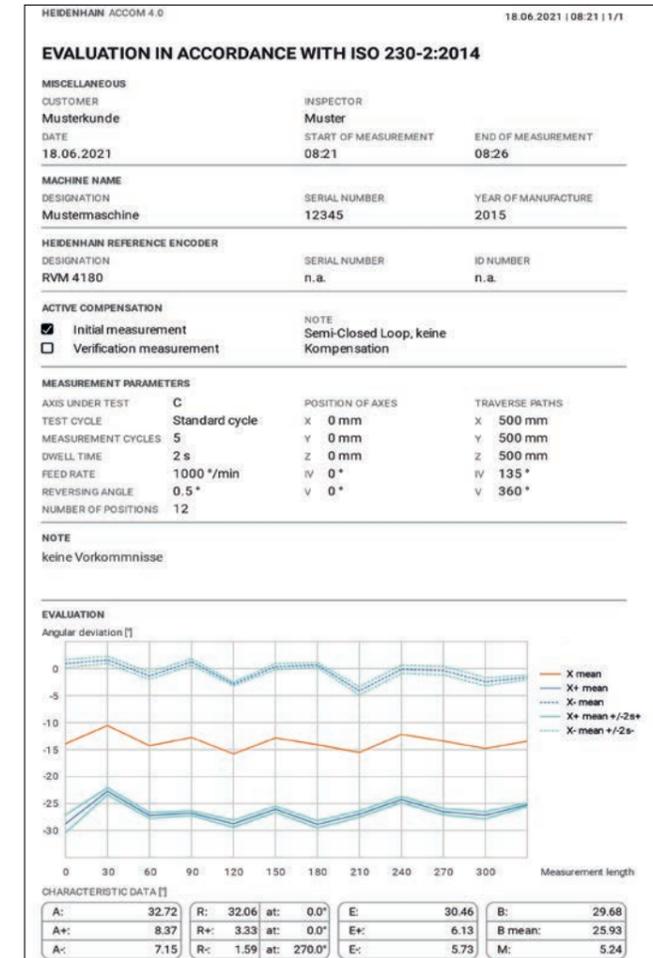
Centering of the scale drum of the RVM 4280 relative to the horizontal axis of measurement is made difficult by gravity as well as limited accessibility. The ACCOM 4.0 software offers a mounting assistant as an additional option for rapid centering within just a few minutes. The program uses two length gauges or dial indicators at different axis positions on the outer centering collar to evaluate the centering quality. If re-centering is necessary, then a direction and distance are indicated.

Measurement of dynamic axis motion (currently in preparation)

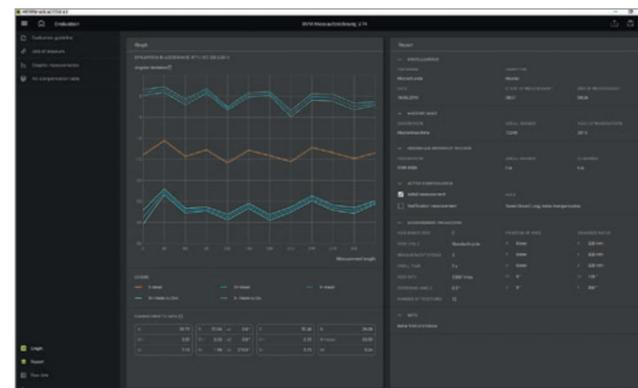
With the growing proportion of machining processes that require continuous 5-axis motion, the dynamic positioning accuracy of rotary axes is becoming increasingly important. With a service adapter or a trigger card as an additional accessory, the position information from the comparative encoder and the machine's angle encoder can be synchronously tracked for the evaluation of any dynamic motion desired. Along with positioning accuracy and other factors, the movement of the rotational axis within the measurement plane (runout) can be evaluated as well.



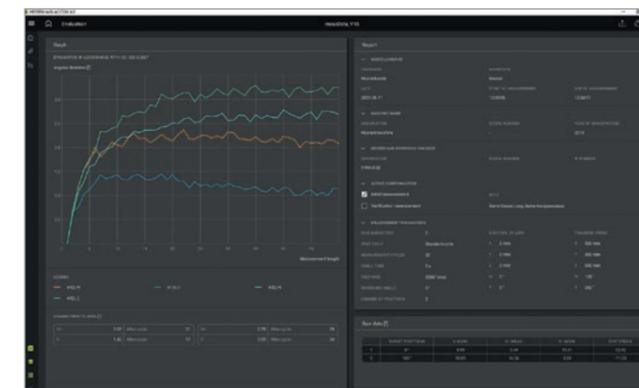
Preparation for measurement



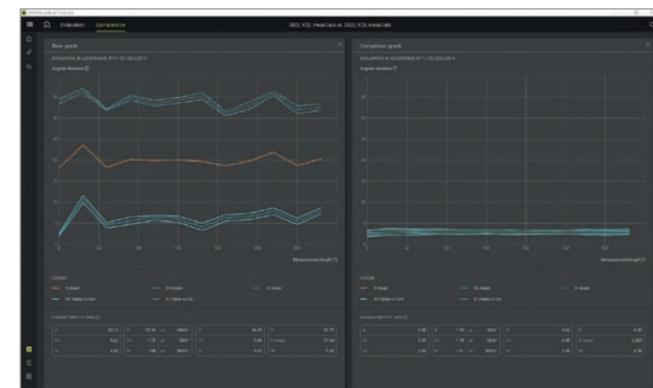
Output in form of a calibration chart



Evaluation in accordance with ISO 230-2



Evaluation in accordance with ISO 230-3



Comparing of evaluations

See for yourself how easy and intuitive ACCOM 4.0 is. For a free trial version, visit www.heidenhain.com

Configuration

A typical setup for inspecting a machine tool consists of the following components:

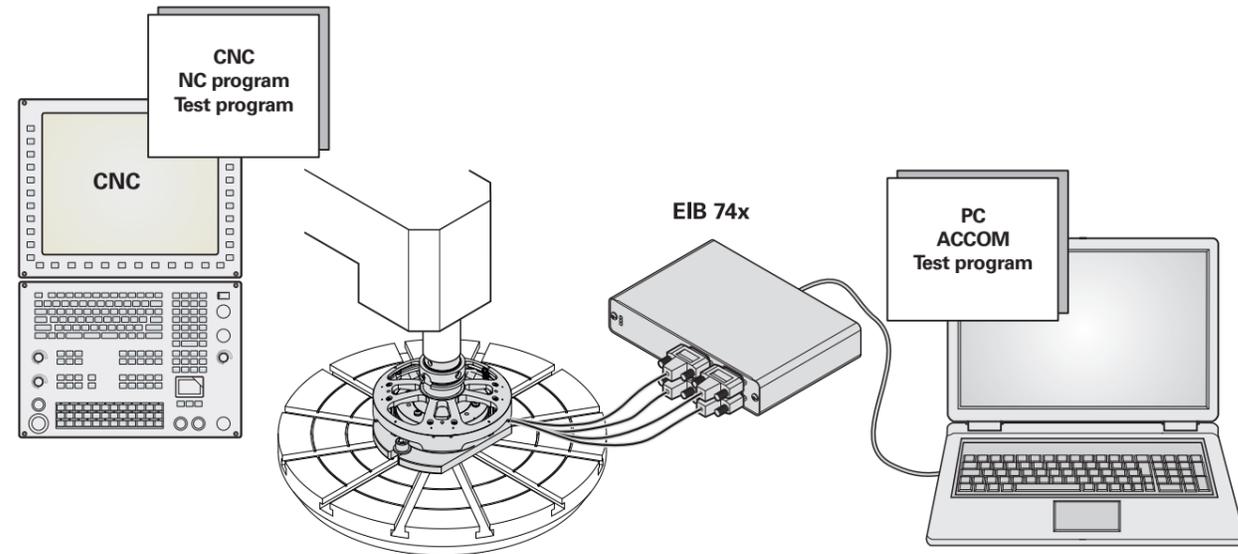
- RVM 4000 encoder for inspecting the axis motion
- EIB 74x external interface box
- PC with ACCOM 4.0 (or higher) evaluation software

The RVM 4000 comparative encoder touchlessly records the positioning movements of the rotational axis with high dynamic performance. For this purpose, the scale drum is attached to the rotary table via the TTR holder (either directly or via a machine-specific mounting bracket) and moves with it during the measurement. The scanning module is inserted into the machine's main spindle via a tool holder and remains motionless during the measurement.

Since this measuring setup operates completely on its own, no communication is necessary between the PC and the CNC.

Machines with any type of control can be inspected. The CNC and the PC (via the ACCOM 4.0 evaluation software) must merely have the same programmed movements. ACCOM 4.0 also offers the possibility of creating and exporting NC test programs based on the selected measurement parameters. Selectable formats are HEIDENHAIN Klartext or ISO programs in simplified G-code.

ACCOM 4.0 automatically detects when the measurement begins. The measuring points are likewise automatically recorded. The measurement data are processed in ACCOM 4.0 and shown in conformity with technical standards.



RVM 4180 measurement setup with an EIB 741 and a PC with ACCOM 4.0

Accessories

EIB 700 series (External Interface Box)

The EIB 700 series consists of external interface boxes for precise position measurement, specifically for inspection stations and for mobile data tracking, such as for machine calibration. They are ideal for applications that require high-resolution encoder signals and fast measurement analysis.

Up to **four HEIDENHAIN encoders** with sinusoidal incremental signals ($\sim 1 V_{PP}$) can be connected to the EIB 700 series. For the **measured value formation**, the EIB 700 series divides the signal periods of the incremental signal by up to 4096-fold. The measuring channels are synchronously recorded.

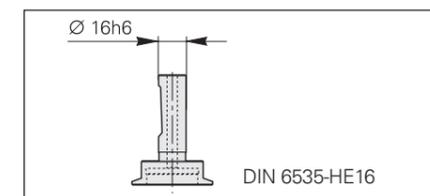
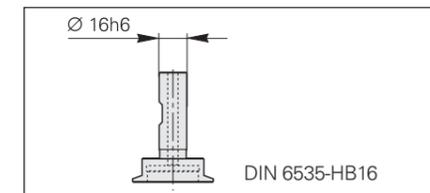
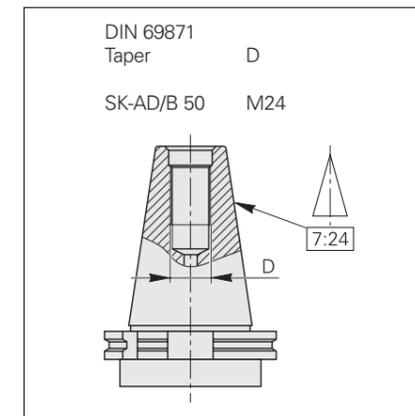
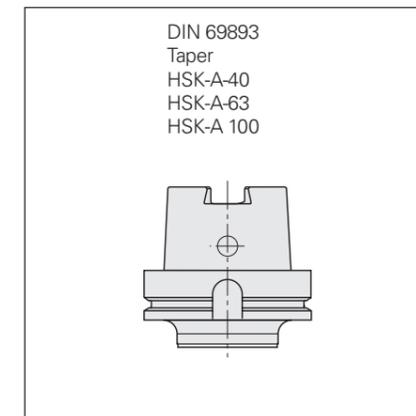
A standard Ethernet interface using TCP/IP or UDP communication is available for **data output**, permitting direct connection to a PC, laptop, or industrial PC.

	EIB 741 EIB 742
Encoder inputs	15-pin D-sub connections (female, X11 to X14), for four encoders
Input signals	$\sim 1 V_{PP}$
Input frequency	$\leq 500 \text{ kHz}$
Subdivision factor	4096-fold
Cable length	$\leq 150 \text{ m}$
Software	Driver software for Windows
Data interface	Ethernet as per IEEE 802.3 (max. 1 Gbit)
Dimensions	Approx. 213 mm x 152 mm x 42 mm
Supply voltage	EIB 741: 100 V to 240 V AC EIB 742: DC 24 V



Clamping shanks and tool holders

The RVM 4000 scanning module is deployed directly in the machine's spindle. Various clamping shanks are available for this. For other clamping shanks or special solutions, a connection can also be established via standardized cylindrical shanks that are used in the collet chucks.



Services performed

HEIDENHAIN offers to perform the machine calibration and optimization with the RVM 4000 reference encoder and ACCOM 4.0 software as a service. Customer-specific workshops with individualized topics for autonomous use of the encoder and software can be held on site.

Consult the Service department at HEIDENHAIN:

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This Product Information document supersedes all previous editions, which thereby become invalid. The basis for ordering from HEIDENHAIN is always the Product Information document edition valid when the order is placed.



Further information:

To ensure proper and intended use, comply with the specifications in the following documents.

- Brochure: *Interfaces of HEIDENHAIN Encoders* 1078628-xx
- Brochure: *Cables and Connectors* 1206103-xx
- Operating Instructions: *RVM 4180* 1399324-xx
- Operating Instructions: *RVM 4280* 1399325-xx
- User's Manual: *ACCOM 4.0* 1368143-xx