HYDAC INTERNATIONAL

Media management, connection and mounting technology

for wind turbines, towers and high-rise structures

EN 10.113.2.2/09.26

HYDAC in wind power

A pioneer from day one – HYDAC has been your partner for challenges in the wind power industry right from the start. From established onshore and offshore systems with and without gearboxes to more unusual options such as underwater turbines, we are here to support you. With the expertise gained from equipping over 200,000 wind turbines worldwide.

Development, components, systems and service for all wind turbines

Wind power expertise from a single source
From generators to gearboxes to power cables: with our many years of expertise in the wind energy sector, we provide you with innovative solutions for all the challenges relating to your wind turbine. And this isn't just with components and systems. We can even help you in the pre-development phase. With reliable services even after commissioning.

Development partnership

Achieving great things together! HYDAC has been a reliable and innovative partner in the wind power industry for over 25 years. Represented worldwide and yet with local, on-site support – we work with you to rise to your individual challenge and develop your tailor-made solution from the component right up to the system. Work with us to increase the efficiency and reliability of your wind turbine – contact us now!

Sustainability

Reduce, reuse, recycle – save energy and reduce costs sustainably by up to 30 % with HYDAC. Extend your fluid service lives and reduce your maintenance visits thanks to our innovative solutions. HYDAC helps you optimise the use of your resources and condition the components and systems in your wind turbine.

Climate-neutral hydrogen production through wind power

We believe that the perfect symbiosis of wind power and hydrogen will jointly shape a sustainable energy transition. Modern electrolysis processes can be used to convert surplus wind energy into green hydrogen and store it for flexible use. HYDAC is by your side as a reliable expert in alternative energy sources.

HYDAC T2T – Walk the line
Example application for mounting solution

Whether it's a new development or optimising existing machines: with **HYDAC T2T – Walk the line**, you get technical support right on site – rapid, tailored to you and practical.

Initial situation | **HYDAC T2T – Walk the line** | **HYDAC solution**

Twisted cables in the loop

- Insulation and cabled ceiling under heavy load
  ➞ Abrasion resulting in defects
  ➞ Reduced cable service life
- Cables are exposed to constant bending and oscillatory movement
- Eddy current losses
- Heat development ➞ Performance loss
- Risk of short circuit & fire

HY-Roflex star / fixed star

- Ideal cable bundle spacing
- Minimised risk of eddy current loss: optimal cooling of the cable bundle; protection of the insulation
- Rapid/simple mounting of up to 60 cables Modular system incl. tolerance compensation
- Short-circuit-tested up to 20 kA
- Material flame-resistant in acc. with UL94 Class Vo
- Our system significantly contributes to the operational / functional reliability of your turbine.

Our tried-and-tested approach to collaborative optimisations!

Discover

- Inspection of your machinery
- Uncover potential
- Collaborative exchange

Diagnose

- Analysis of approaches
- Concept creation
- Prioritisation

Design

- Development of a needs-based solution
- Feedback and concretisation

Deliver

- Integration of the solution developed
- Ongoing discussions about optimisations

Document

- Compilation of technical documentation

Duplicate

- Preparations for duplication or even series production

Mounting technology

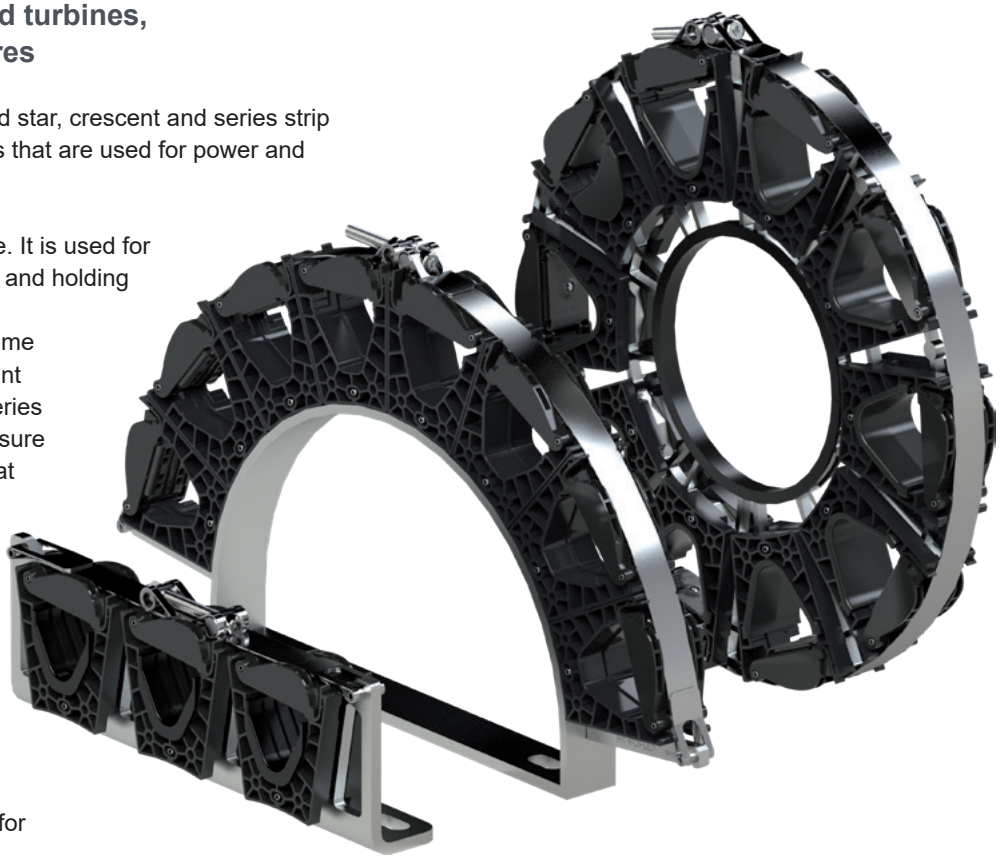
Our HY-light for large-cable mounting

HY-Roflex mounting solutions

Mounting technology for wind turbines, towers and high-rise structures

The cable mounts HY-Roflex star, fixed star, crescent and series strip are part of a system of various holders that are used for power and supply cables in wind turbines.

A steel frame forms the basis structure. It is used for both connection to the tower structure and holding the individual cable mount segments.
The segments are arranged on the frame structure in a semicircle for the crescent variant, and in a straight line for the series strip. Pivoting and spring-mounted closure units serve as snap-fit components that prevent the cables from coming loose. When they are closed, the band straps mounted on the side provide protection from any short circuit forces that may occur.



The holders are supplied in various versions (with different numbers of cable mounts).

Different cable groupings are catered for by customised adaptations.

- Cables can be installed quickly and easily
- Cables can be replaced very quickly
- Constant contact pressure thanks to spring package in the press
- Flexible for power cables ±5% Ø tolerance
- Ø up to 35 mm for bundles of three and up to 72 mm for single cables
- Up to 60 cables can be installed
- Very good protection of the cable insulation
- Designed for short circuits up to 20 kA
- Suitable for temperatures from -20 °C to +110 °C
- Material flame-resistant in acc. with UL94 Class V0

Intertek

Certificate No. 18360

ASTA Certificate

of Short-Circuit Rating

Laboratory Ref. No: 3565.2111402.0754

APPARATUS: Cable cleats

DESIGNATION: HRFLEX 5 M 0001 PPV0 ST ZN 8F

MANUFACTURER: HYDAC Accessories GmbH
Hirschbachstraße 2
66280 Sulzbach/Saar, Germany

TESTED BY: Institut „Prüffeld für elektrische Hochleistungstechnik" GmbH
Landsberger Allee 378A
12681 Berlin, Germany

DATE(S) OF TESTS: 22 November 2011

The apparatus, constructed in accordance with the description, drawings and photographs incorporated in this certificate has been subjected to the series of proving tests in accordance with

IEC 61914: 2009, BS EN 61914: 2009

BS EN 61914: 9.5. Test for resistance to electromagnetical force
9.5.1 General
9.5.2 For cable cleats and intermediate restraints classified in 6.4.3

Refer to page 1 for ratings

The results are shown in the record of Proving Tests attached hereto. The values obtained and the general performance is considered to comply with the above Standard(s) and to justify the ratings assigned by the manufacturer as stated on the ratings page(s). This certificate applies only to the apparatus tested. Responsibility for conformity of any apparatus having the same or other designations rests with the Manufacturer.

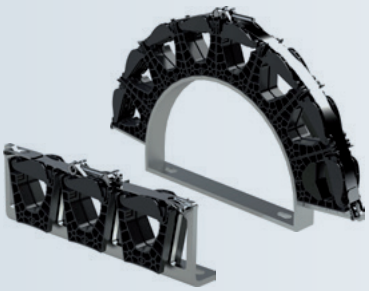
This Certificate comprises this front sheet, 1 rating page plus 19 other pages as detailed on page 3.

Only integral reproductions of this whole certificate or reproductions of this page accompanied by any ratings pages are permitted.
Issued by Intertek, Hilton House, Corporation Street, Rugby, CV21 2DN England.
Contact: asta@intertek.com Tel: +44 (0)1788 578435

ASTA Observer
H. Glabsch
Certification Manager

22nd MARCH 2012 Date

HY-Roflex mounting solutions



Crescent and series strip

- Cables can be installed quickly and easily in horizontal and vertical tower.
- Cables can be replaced very quickly
- Flexible for power cables ±5% Ø tolerance
- Ø up to 35 mm for bundles of three and up to 72 mm for single cables
- Very good protection of the cable insulation
- Short-circuit-proof design

Star

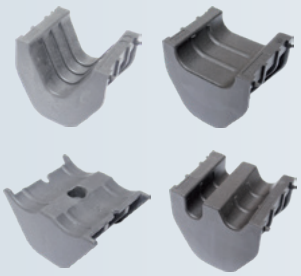
- Spacer for power cables and more → Perfect spacing between the cable bundles → Optimal cooling of bundles of three cables
- Minimised risk of eddy current loss thanks to optimised cable arrangement
- Minimised cable insulation abrasion thanks to outstandingly secure fastening
- Tangling prevented by fixing in the radial direction and routing in the axial direction
- Optimal cable routing from nacelle into the tower
- Dimensions: basic version 8-piece, Øex = 420 mm, Øin = 100 mm; other versions on request

Fixed star

- A star shape fixed to the substructure to absorb the torsion of the cable bundles.
- Stops the cable bundles from becoming twisted at the transition to the riser lines.
- Dimensions: basic version 8-piece, Øex = 420 mm, Øin = 100 mm
- Other versions on request

Segments

- Modular structure of the mounting system with individual segments connected by means of a steel substructure to form a crescent or series strip.
- Various shapes and surfaces available for vast range of cables.
- Segments are closed up by means of a spring-mounted press, which can be opened at any time to enable cable change.
- The spring elements integrated into the press enable tolerance compensation and provide constant pre-tensioning.



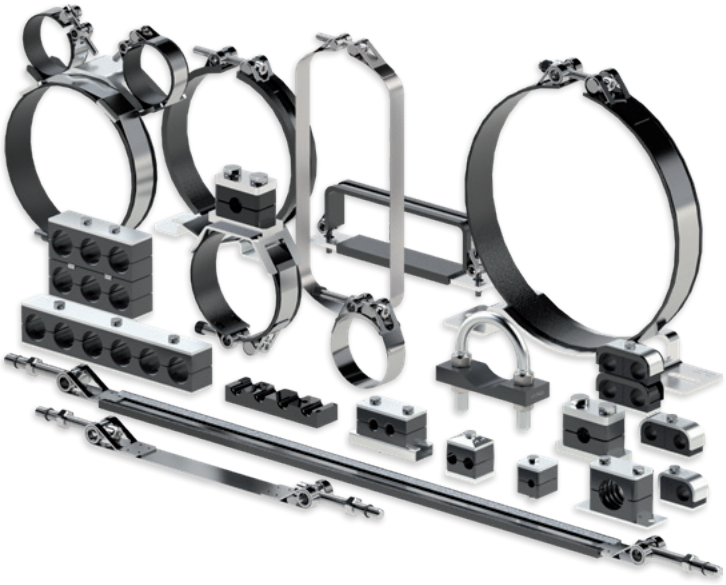
Applications

- For even better adjustment to suit the cables used, additional inserts are available for the segments.
- Inserts can be used for flat cables or cables with smaller diameters, for example.
- Cable-friendly materials such as elastomers are available.

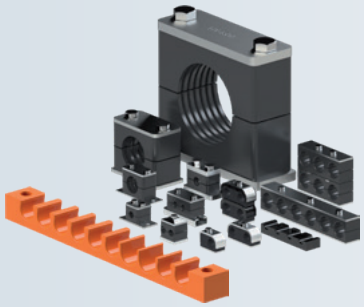
HY-ROS mounting solutions

Our in-house engineering and our multidisciplinary access to worldwide HYDAC know-how guarantees state-of-the-art technology and close links between development and sales. Thanks to the breadth and depth of the range of standards, light modifications, special components and custom solutions, HYDAC Accessories is able to perfect and optimise your specific application.

- Time-saving
- Cost-effective
- Customer-focused
- Tolerance compensation
- Easy-to-install
- Durable at high temperatures
- Shock-absorbing
- Vibration-damping
- Sound-absorbing
- Gentle on components



In-house production – from granules to the complete clamp and from the coil to the complete band strap. Made in Germany!



Pipelines and supply lines / high-voltage and low-voltage

When it comes to securely fixing pipes, hoses and cables, our HY-ROS range offers solutions outside of the norm in addition to solutions compliant with the DIN 3015 standard. We cover almost all applications, from 6 – 400 mm.

- Compact clamps in accordance with DIN 3015 (Part 1 – 3); series strips
- All parts are available as catalogue items and in vibration-damping and noise-damping versions

Our solutions are available for both low-voltage and high-voltage applications.

All kinds of components

As an extension of our proven band strap range, we offer optimised mounting technology for rotationally symmetrical components such as cylinders, accumulators, pipes, etc. The combination of a band strap and other mounting options, such as a DIN 3015 clamp or other band straps, allows for countless variations and is well-suited to mounting hydraulic lines or other components such as ball valves, blocks, pipes, pressure gauges, accumulators etc. on cylindrical components.

Fire protection

With our comprehensive HYDAC mounting technology, extinguishing bottles, pressure lines and control lines can be mounted reliably and safely.

Our mounting technology is certified:

✓ fire protection certification in accordance with EN 45545 / NFPA 130 with classification R22 / R23 HL3

Connection technology

TEEKAY
the pipe coupling

Teekay pipe couplings allow you to connect pipes without the need for welding, grooving, or flanging. By assembling pipes and connecting them with a Teekay pipe coupling, every installation saves space, weight, time and costs.

- **Simple assembly**
  94 % savings in labour costs, installation time and welding time
- **Cost effectiveness / space optimisation**
  50 % space savings and 78 % weight reduction
- **Compatible with all kinds of systems**
  Can connect different pipe materials
- **Features**
  Tension-free; compensates for tolerances; reduces noise, vibration and movement.
  Safe (installation without safety precautions)
- Increased efficiency in off-site prefabrication of pipes
- Reduced downtime when connecting to the customer's existing systems
- Sustainable solution – pipe couplings can be dismantled and reused

Teekay Axilock series

The Axilock design features two metal anchor rings that engage with the pipe surface during coupling installation. This prevents the pipes from pulling apart under pressure or tension. The Axilock pipe coupling is available in two versions: Axilock-S (single casing) and Axilock (double casing).

Special version: The Teekay Axilock-FP is the gold standard for quality and safety in fire-resistant mechanical pipe couplings. With its unique integrated fire proofing and dual casing, it's clear why this coupling is the top choice in shipbuilding and the maritime supply industry.

Teekay Axiflex

The Axiflex version does not include anchor rings, allowing for greater pipe expansion. It is designed to connect pipes that have already been attached / anchored. In the case of a supported line, the tensile force of the pipe no longer needs to be absorbed by the coupling. This design therefore allows for diameters of up to 4 metres to be produced. The coupling can be slid over the pipe ends in a standard version, or it can be supplied as a wrap-around version.

Special version: The Teekay stepped coupling is the ultimate problem solver on any construction site. With the ability to connect pipes of any diameter and pipes made from all kinds of materials, this technology offers high performance and significant potential for cost savings.

Teekay repair coupling

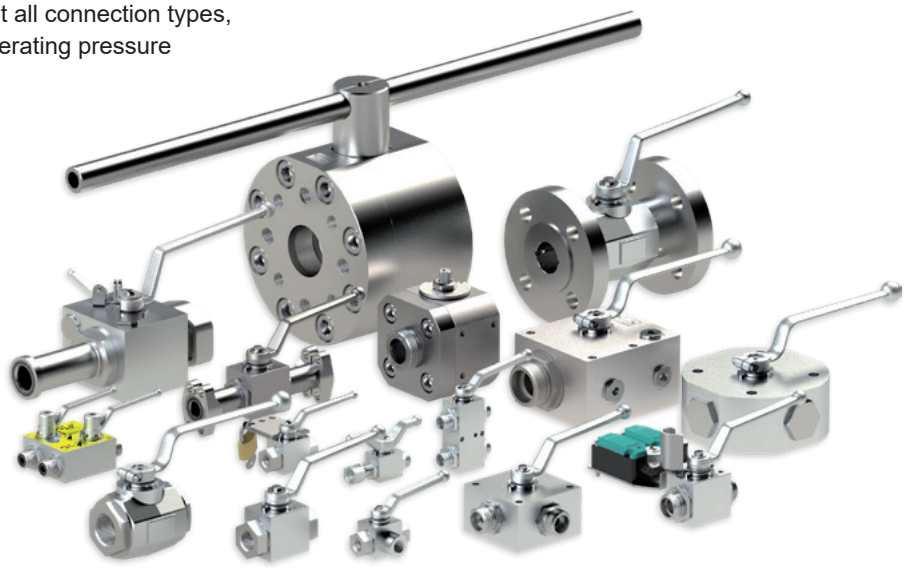
The repair coupling is ideal for any application where a permanent repair solution is required under pressure. You can simply open the coupling via the hinge to access the leak and then tighten it to the specified torque.

Media management

Ball valve technology

Thanks to their robust design, corrosion-resistant stainless steels and specially adapted sealing systems, HYDAC ball valves are suitable for use in harsh environments, such as offshore wind farms. The media that can be controlled are also virtually universal. Our ball valves feature outstanding leaktightness for fluids and gases and also long service lives.

Whether it's a shut-off ball valve, a multi-way ball valve or a ball valve with a custom function – our products are available with almost all connection types, nominal sizes up to DN 300 and a maximum operating pressure of up to 800 bar.



They meet international standards. On request, we offer additional certifications such as DNV, Lloyds Register and American Bureau of Shipping; for potentially explosive atmospheres, versions with antistatic properties in accordance with the ATEX Directive are also available. In addition, HYDAC supplies surface coatings to increase resistance to corrosive environmental factors. These coatings provide reliable corrosion protection and achieve at least 720 hours of red rust resistance in the ISO 12944 spray test.

Example solutions:

Bolt valve for wind turbine gearboxes

High-quality oil drain valve – the aluminium housing reduces weight; large elongated holes in the bolt enable high flow rates and rapid draining and filling.

Flanged ball valve for gearboxes

Our ball valve enables safe and easy draining of the transmission oil in wind turbines. With its practical flange connection, it provides a reliable connection and allows rapid maintenance.

Ball valve solution for wind power cooling systems

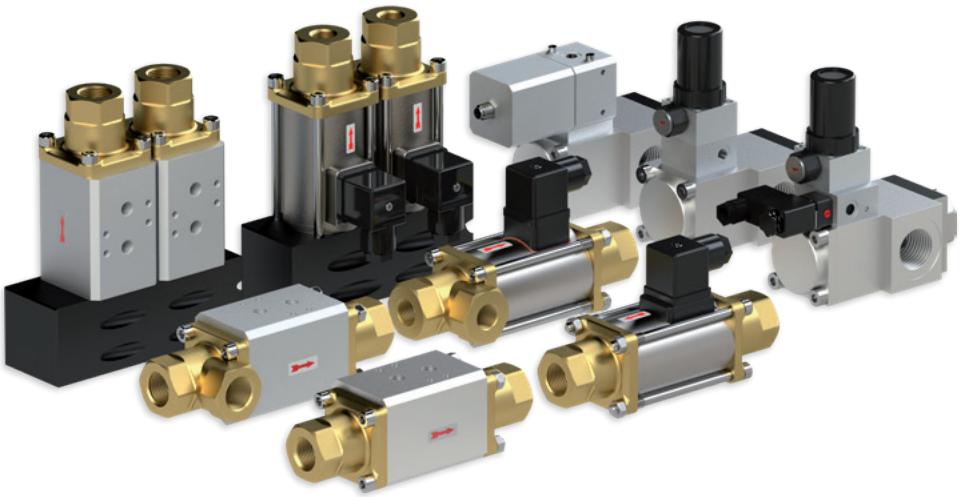
Ball valve bypass block with check valve for blocking and redirecting oil feed. Automated with electric actuator.

CX valve technology

HYDAC develops and produces highly specialised coaxial valves and high-pressure fittings.

These components are also used in the energy industry – especially in wind turbines – where they control media, such as lubricants, coolants and alternative fuels (e.g. HVO) precisely and reliably. They are often used in extreme conditions or in confined spaces inside turbines and nacelles. The valves are characterised by a compact design, rapid response and exceptional durability. This makes them ideally suited to demanding hydraulic and lubrication systems in modern wind turbines.

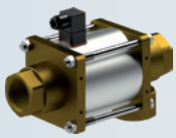
Get in touch with us – with our wide product range, we can provide the right solution for almost any application.



Example solutions:

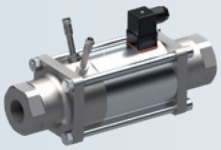
Lubrication

Controlling transmission and bearing oils in the nacelle, where precise metering and leaktightness are essential.



Hydraulics

Controlling pitch systems (blade adjustment) or yaw systems (nacelle adjustment), especially where rapid responses and high reliability are needed.



Special media / extreme conditions

Handling of modern fuels (HVO) or special coolants. Used in corrosive environments (e.g. offshore) or in high / low temperatures thanks to special material versions.

Media management

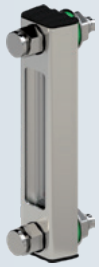
Fluid level gauges and sensors

Reliable monitoring of the fluid level in your tanks and containers with our high-quality fluid level gauges (FSA) and fluid level sensors (FSK).

Thanks to corrosion-resistant materials and specially designed sealing systems (many options for optimal adjustment scope), our product line features maximum tightness and durability – even in extreme conditions such as salty air, strongly fluctuating temperatures and intense UV radiation. Our solutions remain continuously operational even in the case of uneven tank walls, strong vibrations or aggressive media, such as liquids containing glycol.

In addition, we offer a wide range of accessories, such as attachable protective guards for riser tubes to increase mechanical safety or integrated thermometers to monitor the temperature of your media.

Example solutions:



Best possible environmental protection – FSA IB

Thanks to the use of specially selected materials and seals, and in particular the integration of check valves that effectively prevent uncontrolled leakage of the medium, our stainless steel fluid level gauges don't just offer the highest level of system availability. They also keep you, the surrounding waters and our environment safe.

Fluid level sensors – visually and electronically monitor your media levels with the FSK

The fluid level sensors monitor the fill level in a hydraulic tank and transmit an electrical signal if the level falls below a minimum level. The switch signal can be received as a warning message for level control or used directly in a PLC controller. Visual display of the fluid level is also provided in all versions.

Contact us today

Each and every day, we work on product innovations for you, your company and your success with renewed momentum. We look forward to your project!

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E-mail: accessories@hydac.com

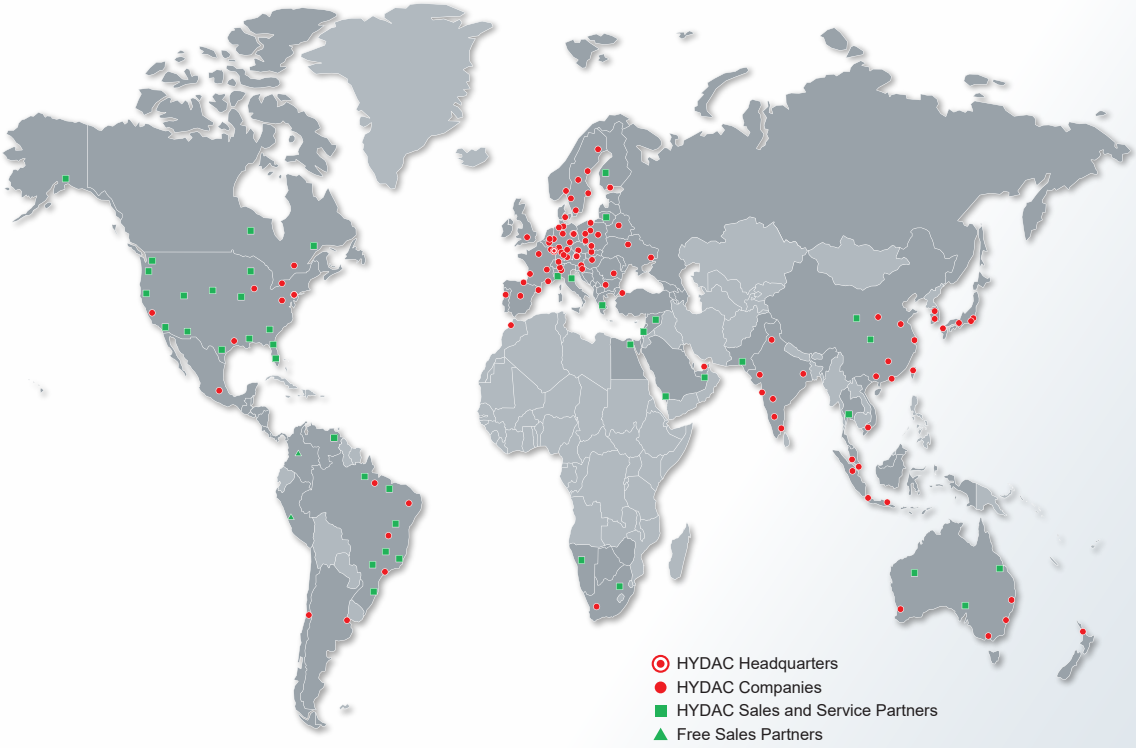
Internet: www.hydac.com

HYDAC is your development partner

With over 60 years of expertise in fluid technology, hydraulics and electronics and impressive innovative strength, we are dedicated to the technologies of the future.

HYDAC has roughly 10,000 employees, 50 national subsidiaries and over 500 sales and service partners, so it is on hand to help you as a reliable partner worldwide. Our product range extends from components and subsystems right up to complex drive units with closed-loop-control for mobile and industrial systems. We also offer our customers a wide range of technical services relating to HYDAC Fluid Engineering for hydraulic oils, lubricants, cooling lubricants and water.

Trust in our global network of experts and our top quality standards.



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Note

The information provided in this brochure refers to the described operating conditions and applications. For applications and/or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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