

HYDAC

INTERNATIONAL

**Components,
Systems and Service
for Drill Rigs**





Your expert partner for system solutions in specialised foundation engineering and drill rigs.

HYDAC

Your expert partner for drill rigs and specialised foundation machines.

HYDAC has been one of the leading suppliers of fluid technology, hydraulics, electronics and cooling equipment for more than 50 years and has over 7,500 members of staff worldwide.

With our wide range of products, and with our acknowledged expertise in development, manufacturing, sales and service we provide solutions for the wide range of requirements in the machine tool industry.

In addition to the standard products, HYDAC offers a multitude of industry-specific components developed from hydraulics, cooling, electronics and systems technology for use in drill rigs and specialised foundation engineering machines. Intelligent integration of products also creates innovative and technologically advanced subsystems and complete systems for the increased requirements of specialist machinery.

Customer benefits:

- Cost-optimisation achieved by customised system solutions which use standard components
- Reduction in number of models through standardisation and modular construction
- On hand everywhere: more than 45 foreign companies and more than 500 Sales and Service Partners
- Fluid engineering and service: Support in technical design for commissioning, maintenance, training and in the event of claims.
- Customized solutions: Designs can be tailored to individual customer requirements, made-to-order solutions for your machines.
- Advice on and implementation of the safety requirements in accordance with DIN ISO 13849 and DIN EN 16228 for all types of drilling applications



Solutions for different machine types

We offer you different solutions for the various primary and auxiliary functions of your drill rigs and are your partner for complete drive and control technology.

We have the correct solution for your machine in our product range.

Pile driving rigs / leaders / trench cutters

- Work functions:
Rotary drive in open circuit, crowd system, crawler track
- Kinematic and cylinder functions: Mast kinematics, telescopic chassis
- Feed function on the trackball
- Pilot oil supply and electro-hydraulic pilot control of the directional valves
- Cooling system:
Oil-air cooler, combination cooler, diesel engine cooling
- Accessories:
Mounting technology for exhaust gas system and accumulators, fluid level gauges and ball valves
- Control blocks for winch control, trackball drive, hydraulic hammer, locking functions
- Filtration:
Suction filter, pressure filter, return line filter, diesel filter
- Control technology:
Mobile controller, I/O modules and sensors for pressure, length measurement and temperature with enhanced functional safety

Underground drilling machines, drilling jumbos

- Main functions:
Rock drills for turning and hammering, crowd, boom kinematics and cylinder functions, outrigger
- Hydrostatic steering
- Pilot oil supply and electro-hydraulic pilot control of the directional valves
- Cooling system:
Oil-air cooler, combination cooler, diesel engine cooling
- Filtration:
Suction filter, pressure filter, return line filter, diesel filter
- Tank systems
- Control technology:
Mobile controller, I/O modules and sensors for pressure, length measurement and temperature with enhanced functional safety
- Accessories:
Mounting technology for exhaust gas system and accumulators, fluid level gauges and ball valves

Horizontal directional drill rigs (HDD)

- Main functions:
Travel drive, rotary drive, crowd drive, break-out tool, outrigger, mast
- Hydraulic supply to the primary crusher, turning mechanism and clamping jaws
- Torque limitation for rotary drives
- Feed function on the rotary drive
- Customer-specific control blocks for rod magazines and delivery systems
- Pilot oil supply and electro-hydraulic pilot control of the directional valves
- Cooling system:
Oil-air cooler, combination cooler, diesel engine cooling
- Filtration:
Suction filter, pressure filter, return line filter, diesel filter
- Tank systems
- Control technology:
Mobile controller, I/O modules and sensors for pressure, length measurement and temperature with enhanced functional safety
- Accessories:
Ball valves, hose and cylinder clamps and fluid level gauges





Universal drill rigs

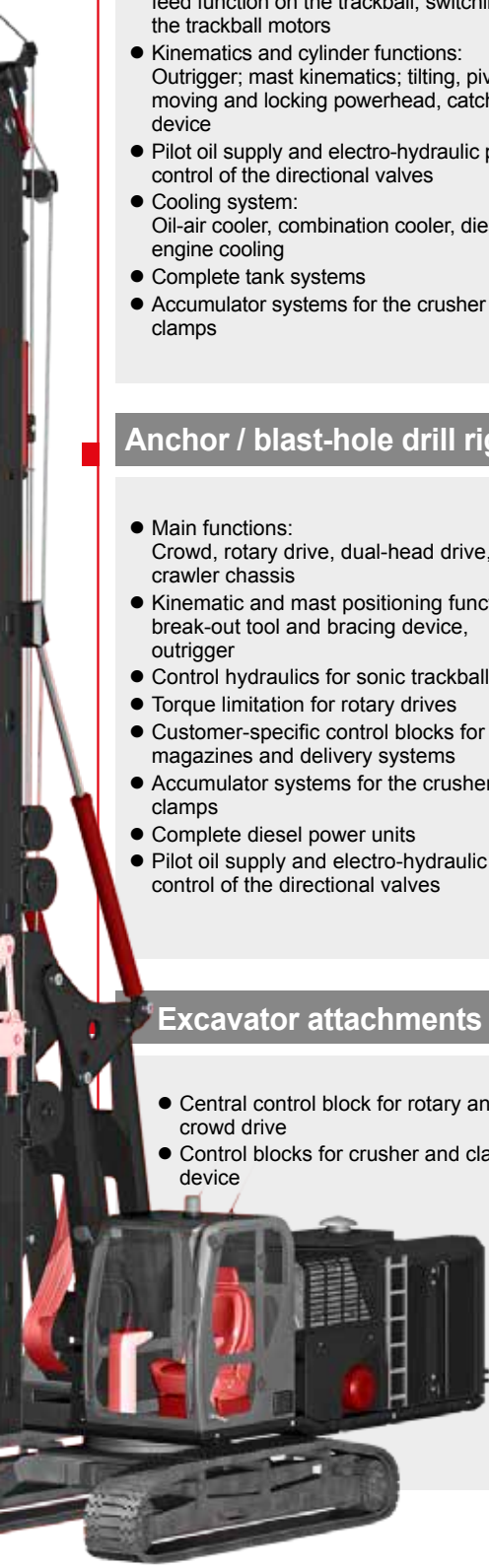
- **Main functions:**
Rotary drive in open circuit, crowd system, feed function on the trackball, switching of the trackball motors
- **Kinematics and cylinder functions:**
Outrigger; mast kinematics; tilting, pivoting/ moving and locking powerhead, catching device
- **Pilot oil supply and electro-hydraulic pilot control of the directional valves**
- **Cooling system:**
Oil-air cooler, combination cooler, diesel engine cooling
- **Complete tank systems**
- **Accumulator systems for the crusher clamps**
- **Control blocks for winch control, trackball drive, switching and locking functions, length compensation and load compensation, superimposed load regulation and torque limitation**
- **Filtration:**
Suction filter, pressure filter, return line filter, diesel filter
- **Control technology:**
Mobile controller, I/O modules and sensors for pressure, length measurement and temperature with enhanced functional safety
- **Accessories:**
Ball valves, fluid level gauges, pipeline and hose clamps

Anchor / blast-hole drill rigs

- **Main functions:**
Crowd, rotary drive, dual-head drive, crawler chassis
- **Kinematic and mast positioning functions, break-out tool and bracing device, outrigger**
- **Control hydraulics for sonic trackballs**
- **Torque limitation for rotary drives**
- **Customer-specific control blocks for rod magazines and delivery systems**
- **Accumulator systems for the crusher clamps**
- **Complete diesel power units**
- **Pilot oil supply and electro-hydraulic pilot control of the directional valves**
- **Cooling system:**
Oil-air cooler, combination cooler, diesel engine cooling
- **Filtration:**
Suction filter, pressure filter, return line filter, diesel filter
- **Accessories:**
Mounting technology for exhaust gas system, cylinder and hose clamps and ball valves
- **Control technology:**
Mobile controller, I/O modules and sensors for pressure, length measurement and temperature with enhanced functional safety

Excavator attachments

- **Central control block for rotary and crowd drive**
- **Control blocks for crusher and clamping device**
- **Kinematic and positioning functions, telescopic outrigger, tilting the drill mast, vibration drive,**
- **Accessories:**
Coupling technology and clamps
- **Control technology:**
Mobile control and I/O modules for a modular control system, sensors for pressure and speed, for example, with enhanced functional safety



Energy efficient, safe, comfortable.

Demands of modern drill rigs

The development of modern machinery is characterised by shared requirements across the various drilling machine classes. Increasingly complex control and regulation processes go hand-in-hand with greater productivity and efficiency of the machines. The machine operators are aided by modern electronic assistance and visualisation systems and the work process is optimised.

Changes to the regulatory framework result in increased investment in the functional safety of the machines and to a further development of the drive and control systems of the drill rigs.

As is also the case with the EU & US exhaust emissions regulations, the emerging markets in the rest of the world are taking up these standards and are introducing new standards at the same time.

HYDAC's contribution

HYDAC offers a variety of components and systems that meet these requirements and fulfil your demands. In addition to standard components, HYDAC offers a comprehensive modular system designed for drilling machine applications. HYDAC will also work with you to develop an individual solution for your machine.

HYDAC's key issues

Our development team and application engineers are working continuously to further develop our products. The focus of these developments is on the following key topics:

Our technology

● Increases in:

- ⇒ Drilling performance
The use of energy-efficient pumps and valve technology, optimal positioning of the drill mast in working position with sensitive controls, accurate repeatability for automatic and control functions
- ⇒ Corrosion resistance owing to surface coating and special materials

● Reduction in:

- ⇒ Piping and installation expenditure due to combined hydraulic function units
- ⇒ Noise emissions and power consumption through regulated fan speeds
- ⇒ Driver's exposure to dust due to cabin ventilation systems
- ⇒ Hydraulic oil tank sizes by optimizing air separation in hydraulic oil, proven through simulation and testing
- ⇒ Installation space, component weight and electrical power requirement by reducing solenoid valve sizes
- ⇒ Learning curve of the drivers through intelligent control and visualisation systems

● Extension of:

- ⇒ Maintenance intervals by monitoring the hydraulic oil quality

● Reduction in:

- ⇒ Software development time by using tested and certified software libraries
- ⇒ Development times by means of HYDAC modular systems and industry know-how
- ⇒ Assembly times through control technology tailored to customer specifications

Your benefits

● Energy efficiency

- ⇒ Reduced fuel consumption
- ⇒ Lower hydraulic losses
- ⇒ Energy saving and recovery
- ⇒ Precise cooling requirement temperature control
- ⇒ Reduced electrical power requirement



● Safety

- ⇒ Certified software modules
- ⇒ Systems for functional safety
- ⇒ Service life increased by protecting materials



● Noise reduction

- ⇒ Lower noise level in partial-load range of fan control



● Health & safety

- ⇒ Reduced exposure to dust for the driver
- ⇒ Reduced aerosol exposure for the driver



● Installation space reduction

- ⇒ Combined functional units
- ⇒ Integrated tank and filter systems



● Function integration

- ⇒ Reduced number of components
- ⇒ Reduced weight
- ⇒ Reduced joints and leakage points



● Comfort

- ⇒ Improved working environment for the driver
- ⇒ Sustained driver performance on longer jobs



● NoX

- ⇒ Compliance with the Emissions Directive
- ⇒ Reduced nitrogen oxide and CO₂ emissions



System intelligence

Electro-hydraulic system solutions as the interface between actuators and sensors.

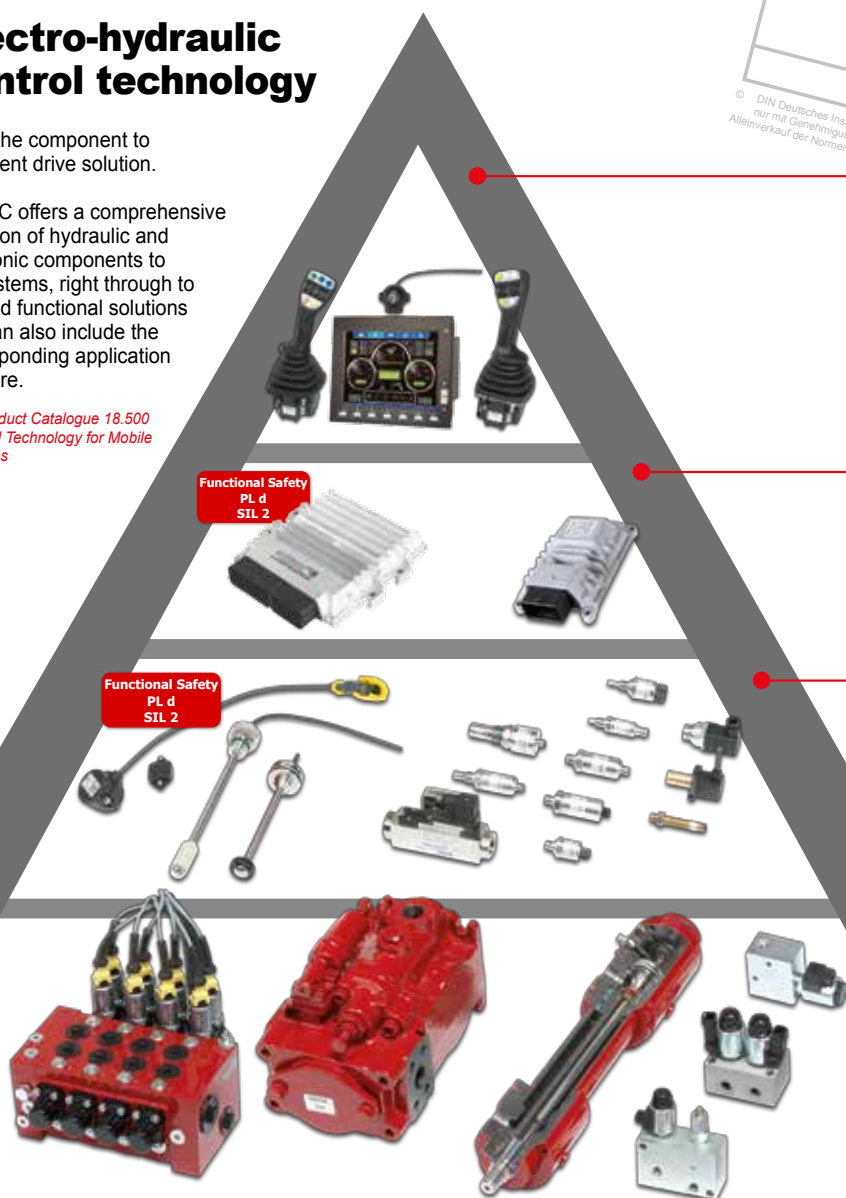
The demands of modern drill rigs are leading to ever-increasing complexity of control systems. Modern machines require a variety of assistance and control systems wherever simpler operating concepts and a better overview and controllability of the machine functions become necessary.

Electro-hydraulic control technology

From the component to intelligent drive solution.

HYDAC offers a comprehensive selection of hydraulic and electronic components to subsystems, right through to finished functional solutions that can also include the corresponding application software.

See Product Catalogue 18.500
- Control Technology for Mobile Machines



Ersatzvermerk

Mit DIN EN 16228-3
DIN EN 16228-6:2010
DIN EN 996:2010-02

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In addition, the introduction of the new drilling machine safety standard DIN EN 16228 calls for increased safety requirements for new drill rigs:

- Field of vision monitoring
- Safety of the controls in accordance with DIN ISO 13849 with defined performance levels for selected safety functions
- New standardised procedure for determining stability
- Protection from moving parts through the required use of separating safety devices
- Introduction of the limited operation mode (ROM – restricted operation mode)



USER LEVEL

- Displays for the highest visual requirements
- Peripherals, e.g., joysticks

CONTROL LEVEL

- Controllers in various classes
- I/O expansion modules
- Standard version and versions with increased functional safety are available

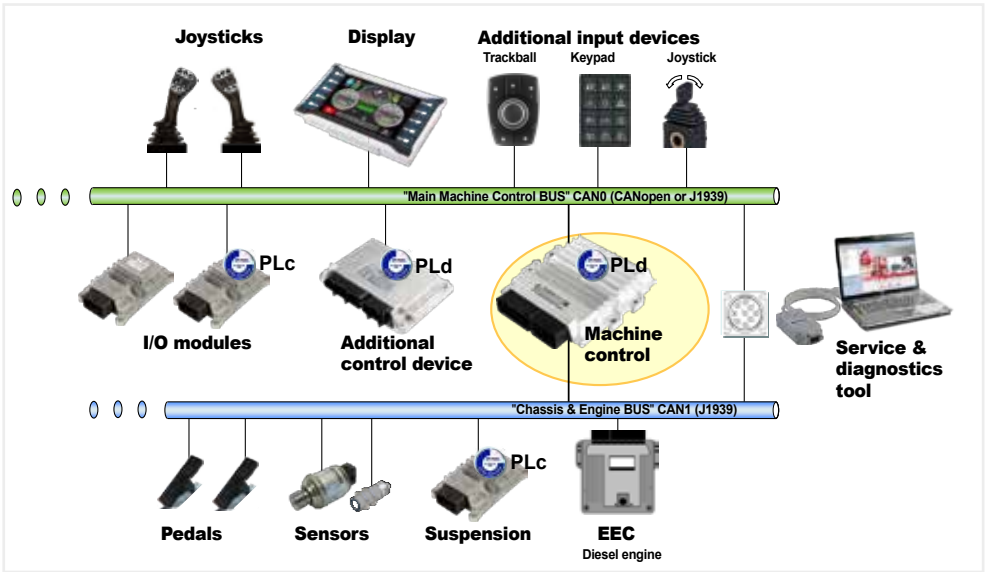
SENSOR LEVEL

- Pressure and temperature
- Distance, position, angle, inclination and level
- Speed
- Flow and oil level
- Standard version and versions with diagnostics and increased functional safety available

ACTUATOR LEVEL

- Pilot-controlled and direct-acting valves
- Control blocks (monoblock/sandwich)
- Pilot and primary control systems
- Intelligent axles
- Cylinders and motors

System development



Example of control architecture

Based on the customer's requirements, HYDAC offers support across the spectrum with developing electro-hydraulic control systems for mobile machinery. The scope of development is determined together with the customer according to the task.

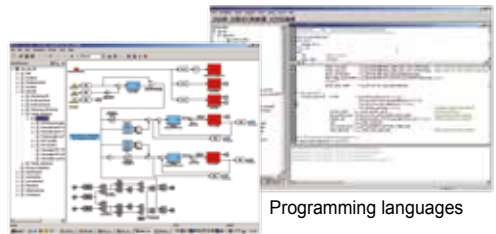
Services include:

- Creating customer-specific application software (according to specification)
- Integrating intelligent subsystems into the customer's machine (e.g., suspension systems, secondary steering systems, fan controls)
- Complete control solutions for mobile machinery (safety functions, electrical/electronic control architecture, application software)

Software development

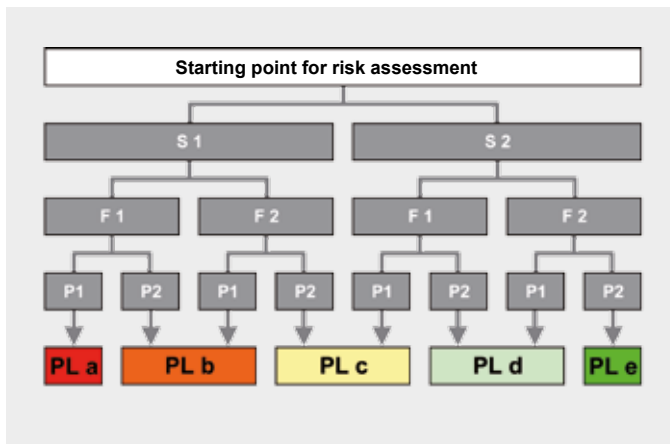
Depending on the hardware, the following programming languages can be used to program the application software:

- CoDeSys 2.3 / 3.5 / 3.5 SIL2
- C
- MATLAB/SIMULINK



Programming languages

System development support



Severity of injury

- S1 Minor, reversible injury
- S2 Severe, irreversible injury including death

Frequency/duration of exposure to hazard

- F1 Seldom or short exposure to hazard
- F2 Frequent to continuous exposure to hazard

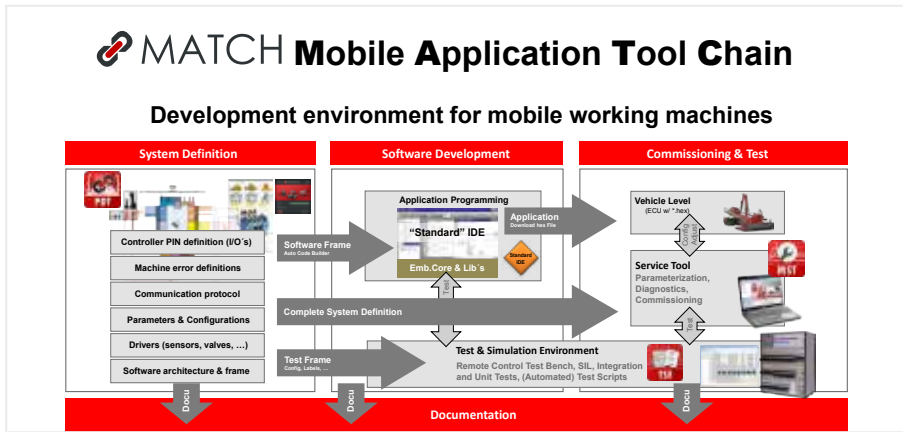
Possibility of avoiding the hazard or limiting the damage

- P1 Possible under certain circumstances
- P2 Practically impossible

HYDAC offers extensive consultation and support for customer projects with regard to:

- Hazard and risk (H&R) analysis
- Definition and description of safety functions
- Drafting safe system architectures and user interfaces (HMI)

"MATCH" development environment



Mobile Application Tool Chain

With the "MATCH" (Mobile Application Tool Chain) development environment, HYDAC offers a tool chain for system-level software development by the customer that is specially suited to the requirements of mobile machinery. "MATCH" supports development from defining the system at the vehicle level, to creating the application software, to start-up, testing, and documentation.

"MATCH" offers modules for:

- Defining the system at the vehicle level
- Starting up and servicing the machine
- The software test
- The documentation

Furthermore, an "embedded Middle Ware" is offered which permits a hardware-independent programming of the application and which contains a multitude of basic functions. A comprehensive selection of library modules (e.g. for sensor and valve drives) is also available for an efficient development of the application software.

Functional safety

"MATCH" can also write application software with increased functional safety according to the following safety standards:

- "SIL 2" to IEC 61508
- "PL d" to EN ISO 13849

Software library



Selection of library modules

In order to make software development significantly easier for the customer, HYDAC offers software libraries with ready-made modules as part of its "MATCH" development environment. The library modules can be configured and parameterised as desired.

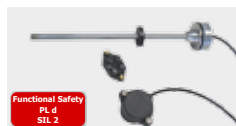
Examples of library modules include:

- Sensors
- Switches
- Proportional and switching valves
- Relays, LEDs
- Transfer functions/signal elements

Special error modules can also be used to detect system errors.

Sensors, system electronics and control systems.

Solutions perfectly tailored to the application – All from a single source.



Linear position and distance sensors



Inclination and angle sensors



Pressure transducers/
pressure measurement switches



Sensors for increased safety requirements (e.g. PL d, SIL 2)



Controller for mobile applications HY-TTC 500

Sensors

Function

The range of sensors includes products for measuring pressure, temperature, distance, position, level, flow rate, speed, inclination and angle as well as contamination and oil condition. In addition to products for standard applications, the product portfolio also covers special applications such as potentially explosive atmospheres or applications with increased functional safety.

Electronic sensors and controls to complement the system electronics.

- Max. load regulation
- Electro-hydraulic load sensing
- Working hydraulics
- Positioning
- Controls of special equipment
- Switch-off devices
- Safety systems

Features

- The sensors are available with a variety of output signals, connectors and fluid port connection options
- Robust design
- ECE type authorisation
- Approved for potentially explosive atmospheres
- Separate product portfolio, especially for applications with increased functional safety (SIL 2,3 / PL c,d)

Mobile controller HY-TTC 500

Function

The HY-TTC 500 controller series is based on a 32-bit processor with a modern micro-controller platform.

The controller is notable for its impressive 96 inputs and outputs and for its high performance capability. This new HY-TTC 500 controller series is therefore especially suitable for complex control tasks in centralised and decentralised control architectures.

The controller has three alternative PWM shut-off groups for differentiated safety functions.

Features

- SIL 2 / PL d
- Three alternative PWM shut-off groups
- Up to 36 PWM power outputs with current measurement
- Numerous and highly flexible IO groups
- Excellent processor performance
- Large number of interfaces, communication and information interfaces
- Four to seven CAN-bus interfaces
- Ethernet interface for extremely fast software download and debugging



HY-TTC 30X

I/O Expansion Module HY-TTC 30X / 30XS

Function

The new HY-TTC 30X series of I/O expansion modules provides an outstanding power balance combined with extremely compact design.

The HY-TTC 30X series extension modules are integrated very easily.

They provide a simple extension of on-board electronics.

The communication and integration of the extension modules takes place via CANopen according to CiA DSP 401. It enables inputs and outputs to be configured and parameterized via the control configuration of the available control device in a simple and uncomplicated way.

The different I/O modules provide a large number of high performance switching outputs or diverse PWM outputs with internal current measurement as well as configurable analogue and flexible digital inputs.

Our product range includes two additional safety-oriented versions for the implementation of distributed applications with enhanced functional safety (Safety PL c, EN ISO 13849).

Features

- PL c
- Freely configurable Node-ID via pin
- 30 E / A, with up to 8 PWM outputs, 6 of these with integrated current measurement
- Robust, very compact housing



Displays with integrated HY-eVision² controller

Mobile display HY-TTC eVision²

Function

The compact background-lit TFT colour displays with integrated high-end display controller are characterised by a very high image quality, low reflections and high colour saturation as well as optimal readability, even under the most unfavourable light conditions.

The displays are protected by a robust aluminium or plastic housing and can either be built directly into the instrument panel or surface-mounted in the field of vision of the driver/operator using a RAM Mount® system in the cockpit.

Ten programmable illuminated control keys, together with the optional touchscreen feature, provide an easy-to-use human-machine interface.

Up to two external cameras can be connected to the display via the two integrated composite video ports, and controlled via software.

Features

- User-friendly, self-explanatory and time-saving graphical design and user interface
- Good portability via CoDeSys platform
- High image brilliance
- High refresh rate
- Fast boot-up times
- Impressive display options such as 3D, picture-in-picture, overlapping effects, etc.
- Two pictures can be displayed simultaneously
- Up to 4 CAN, USB and Ethernet interfaces
- Robust housing with appealing design, suited for mobile applications

Hydraulic systems

The optimal working hydraulics for fast, accurate and efficient control.

Open center primary control valves

HYDAC's open centre primary control valves offer you a modular system with which to design robust, energy efficient and cost-effective open centre controls for mechanical, pneumatic, hydraulic and electro-hydraulic controls.

Features:

- Structural design as monoblock, multi-section and slice construction
- Key data: $Q_{\max} \leq 180 \text{ l/min}$; $p_{\max} = 350/420 \text{ bar}$
- Energy-saving Q-inlet option
- Robust, high quality and maximum controllability
- Low internal leakage
- Inlet track switching for safe volume flow distribution
- Electrical pump volume current cut-off
- Main consumer in parallel, series and tandem switching
- Simple integration of secondary safeguards
- Optional switch position monitoring of the main control spool
- Optionally also for the actuation of LS variable pumps

Key data for open centre primary control valves (see photos on right):

- | | |
|--------------------------------|---|
| • RS 160 primary control valve | $\Rightarrow Q_{\max} = 60 \text{ l/min}$; $p_{\max} = 250 \text{ bar}$ |
| • RS 220 primary control valve | $\Rightarrow Q_{\max} = 80 \text{ l/min}$; $p_{\max} = 300 \text{ bar}$ |
| • DX-6 primary control valve | $\Rightarrow Q_{\max} = 140 \text{ l/min}$; $p_{\max} = 350 \text{ bar}$ |



RS 160
Open centre primary control valve



RS 220
Open centre primary control valve



RS -6
Open centre primary control valve

Load-sensing primary control valves

HYDAC's load sensing primary control valves offer you a modular system with which to design load-compensated, energy efficient load-sensing controls for mechanical, pneumatic, hydraulic and electro-hydraulic controls.

Features:

- Structural design as monoblock, multi-section and section construction
- Key data: $Q_{\max} \leq 180 \text{ l/min}$; $p_{\max} = 350/420 \text{ bar}$
- Extra-large 10 mm piston stroke for optimal high-precision control
- Load-independent parallel actuation without reciprocal influencing possible
- Simple integration of primary/secondary safeguards
- Inlet track switching for safe volume flow distribution
- Electrical pump volume current cut-off
- Optional switch position monitoring of the main control spool
- Optional switch-off of individual sections with complete functionality of the remaining sections

Key data for load-sensing primary control valves (see photos on right):

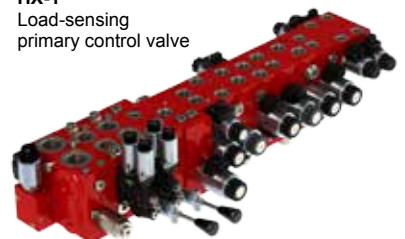
- | | |
|---|---|
| • HX-1 load-sensing primary control valve | $\Rightarrow Q_{\max} = 120/35 \text{ (prop) l/min}$; $p_{\max} = 250 \text{ bar}$ |
| • LX-6 load-sensing primary control valve | $\Rightarrow Q_{\max} = 160 \text{ l/min}$; $p_{\max} = 350 \text{ bar}$ |



LX-6
Load-sensing primary control valve



HX-1
Load-sensing primary control valve



LX-6 + HX-1
Primary control valve combination solution

● **Crowd**

The high traverse speed of the drilling head when moving up and down requires a high oil volume flow. At the same time, the very low speeds when drilling into hard bedrocks necessitate high-precision control valves, also with minimal oil flows. In order to control the weight on bit, the directional valves have an integrated, adjustable pressure reduction feature with which the maximum weight on bit can be set precisely.

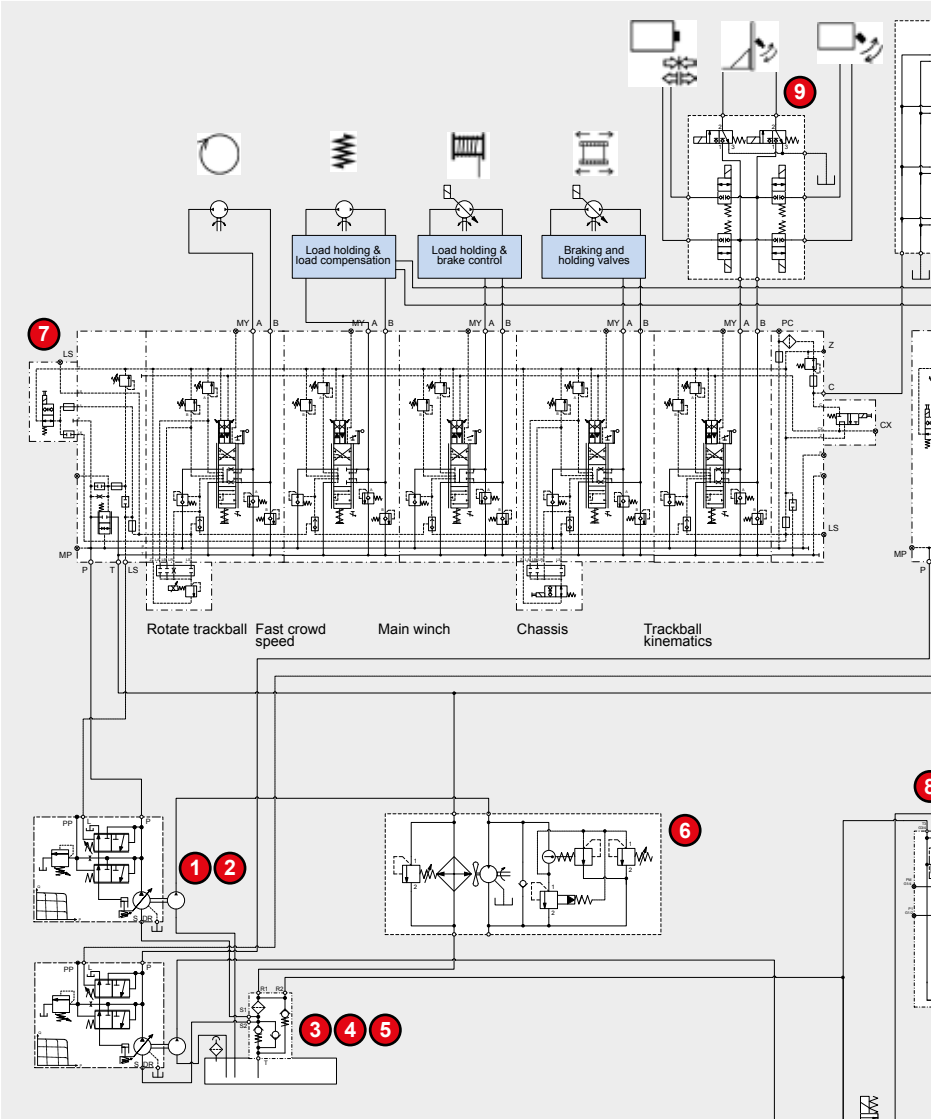
● **Rotary drive**

The rotary drive requires very sensitive actuation via high-resolution control spools when screwing on the pipe connectors. When drilling in difficult terrain, the machine requires a powerful drive that exhibits stable, highly dynamic control behaviour, even under extremely variable loads.

● **Functional safety** A modular system comprised of proven components is used to guarantee the safety technology requirements specified by EN 13849 and EN 16228. Includes integrated solutions for switching-off individual functions intelligently, thus reducing the number of required components and minimising the sources of error. Thus the HYDAC-Load-Sensing LX valve has a variety of safety features, e.g. integrated control pressure switch-off, switch-off of certain flow directions, sections and function groups or the entire directional valve.

● **Energy efficiency**

Energy-efficient multi-circuit hydraulics systems with pump flows adjusted according to requirement have become the standard for modern drill rigs. Load-sensing systems which are supplied by variable displacement pumps are the primary choice. They are supplemented by simple and cost-effective hydraulic circuits for auxiliary functions using fixed displacement pumps and open center valves.



1 PPV100S Medium Heavy Duty Pump

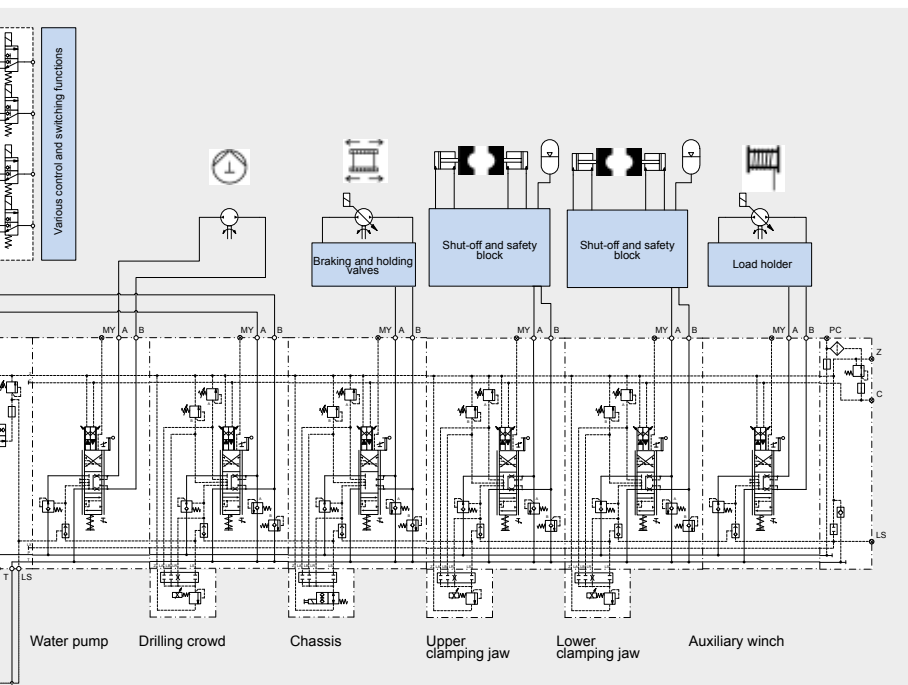
- Variable displacement pump for load-sensing circuits with a maximum displacement volume of 180 cm³/rev and pressure of 350 bar
- SAE version with splined shaft and through drive

2 PGE gear pump for fixed displacement systems

- Size 2 up to a maximum of 28 cm³/rev and a nominal pressure of 250 bar
- Size 3 up to a maximum of 60 cm³/rev and a nominal pressure of 250 bar

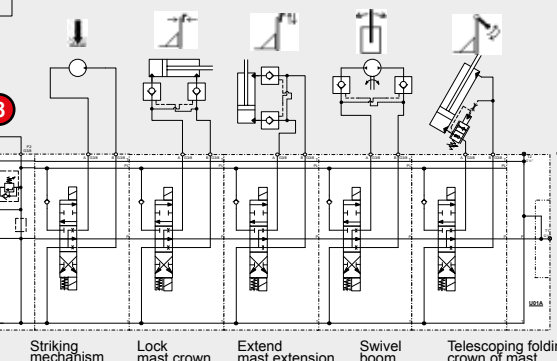
3 RKM Return Line & Suction Boost Filter

The RKM return line & suction boost filters are ideally suited for use in equipment with two or more circuits. The return line flow rate is supplied to the filter element via one or several inlets. After the fluid has passed through the filter element from outside to inside (filtering the fluid), the back-pressure valve creates a pressure inside the element, which ensures that the filtered return line flow is available to support the suction characteristics of the connected pumps, especially in cold start conditions. The risk of cavitation is significantly reduced.



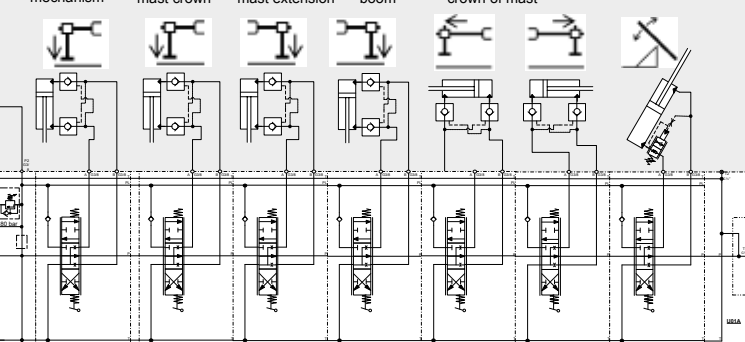
6 OK-ELH Oil-air cooler for mobile machines

These coolers use a combination of high-performance cooling elements and hydraulic drive motors in order to ensure a long, trouble-free operation of hydraulic systems in the mobile sector. The compact design ensures simple installation in hydraulic systems and excellent cooling capacity while at the same time taking up very little space.



7 LX6 Load-sensing directional spool valve

LX-6 is a load-compensated LS valve with upstream pressure compensator for systems with fixed and/or variable displacement pumps. Up to ten functions can be controlled independently of one another. The LX-6 was developed with a focus on high precision, sensitive control and energy efficiency. The valve is suitable for controlling the main function of modern drill rigs. Special drilling functions, e.g. weight on bit adjustment, torque limitation or clamping force limitation can be integrated just as easily as safety cut-outs.



8 RS 160 directional control valve

The RS 160 valve is ideally suited to controlling various auxiliary functions on a drill rig thanks to its modular and sectional construction. The valve is very robust and well-equipped for sophisticated mobile applications.

Examples of applications include the outrigger and mast kinematics of the drill rig or the control of the mast head.

4 ELF/BF Breathers and filler breathers

Air filters are an essential component of every hydraulic system. They guarantee that the air drawn into the tank as a result of fluctuations in the oil level is filtered reliably.

5 Tank fittings and accessories such as fluid level gauges or tank cover plates

9 Compact hydraulics control blocks

For the expansion of the directional valve technology, we offer customised valve block solutions. Our tried-and-tested compact valves extend the functionality of your machine – custom-fit, compact and cost-effective.

In drill rigs we offer you various solutions, e.g. for load compensation, brake control, gear shift and various switching and release functions.

Standard applications for control oil conditioning and/or pilot circuit systems.



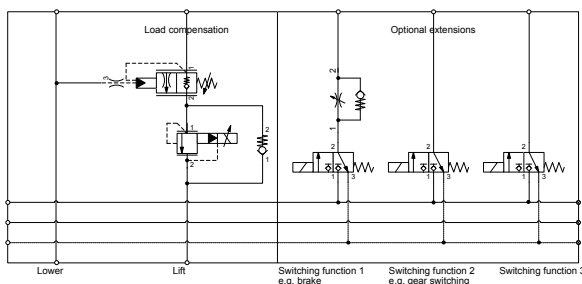
Overview of HYDAC Compact Hydraulics – Components, Modules, Subsystems as solution according to customer preference

Solutions for load compensation in form of crowd system

The load of the drill string weight is compensated for by a variable hydraulic back pressure as decided by the driller. The skid can be tared out as a result and automatic drilling progress can be achieved using an adjustable weight on bit (WOB).

HYDAC offers a variety of solutions for this:

- Load compensation in the main flow for rigs with mechanical length compensation with threaded connection (floating spindle)
- Load compensation in the bypass flow, can be extended to include hydraulic length compensation
- Can be used on hydraulic motors with chain or cable feed as well as with rack and pinion drives and on crowd cylinders.
- Possible integration of additional functions, e.g. release of holding brake, control of the motor setting, chain tensioning cylinders, rapid traverse-control for crowd cylinders or free-running of the crowd system
- RSM counterbalance valves for the safe operation of the crowd skid
- Robust 2-way switching valves and proportional pressure valve technology

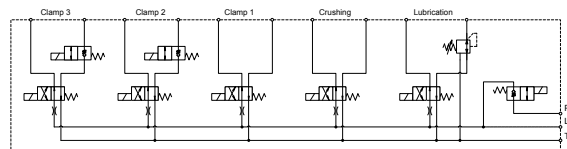


Compact control block with cartridge valves

Compact control block for actuation of a clamping and break-out tool on a horizontal drill

Customised control block, developed and designed from the proven modular system of HYDAC compact valves

- For integration in a load-sensing system
- 2/2-way switching valves
- Flow rate: 20 l/min
- Load pressure: 350 bar
- Leak-free closing of the clamping cylinders
- Second switch-off path for fulfilling the enhanced functional safety, e.g. PL c for inadvertent opening of the clamping functions
- Consumers in interaction with the electronic control
- Upper clamping jaws
- Lower clamping jaws
- Optional third clamping jaw
- Thread of break-out
- Lubrication of rods



See Product Catalogue 53.000 - Hydraulics

Hydraulic supply

Optimal solutions from the HYDAC technology platform.



Diesel PreCare filter

Diesel filtration

Features

- Suction-side pre-filter and water trap
- Manual or automatic water discharge
- Option: water sensor, fuel pre-heater, manual/electrical filling/booster pump
- Variants for diesel engines up to > 3000 kW

Function

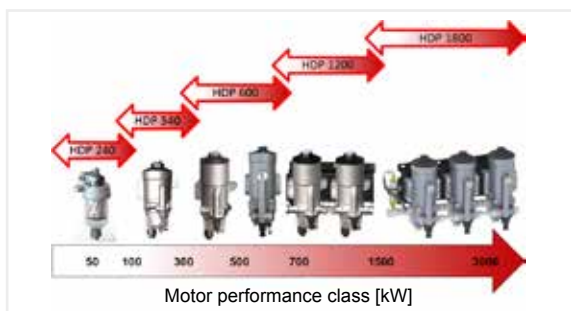
Guarantees the fuel purity required of modern common rail diesel engines to meet the requirements of the exhaust emissions standards Euro6 and Tier4, and component protection of the fuel system through the use of the latest, fully synthetic filter media and continuously reliable water separation.

Reduction of the Life Cycle Cost (LCC) by extending the service life and service intervals.

Advantages

Protection of all of the components of the fuel system, e.g.: suction pump, common rail injection pump, diesel injectors by:

- Excellent water removal
- Maximum contamination retention capacity
- Very long service life
- Very low pressure drop



Fuel pump for diesel fuel

Fuel pumps

Features

- Fuel pump for diesel or hydraulic oil
- Flow rate
 - Diesel: up to 80 l/min
 - Mineral oil: up to 15 l/min
- Installation position optional

Function

HYDAC fuel pumps are compact units with direct current drive for quick and simple tank-to-tank transfer of diesel fuel or hydraulic oil.

Advantages

- Possible to fill the fuel tank on the vehicle, away from stationary fuel stations
- Self-priming up to 2.5 m in height
no initial filling prior to commissioning required
- Compact design
saves on both space and weight
- DC motor with protection rating IP65
- Good efficiency, low current consumption
- Suitable for dry running
Safe also for short run periods without fluid
- Integrated temperature switch
- Check valve completely sealed, leak-tight



OK-ELD with DC Motor



OK-ELH / AC-LNH with hydraulic motor



Combination cooler CMS

Cooling

Hydraulic oil cooling

- Oil/air cooler with DC or hydraulic motor
- Electro-hydraulic fan controls

Features

- Robust aluminium plate construction
- Compact design for confined installation spaces
- High performance air fin with very good anti-contamination properties
- Low-noise fan

Function

Air coolers with DC motors (OK-ELD) or hydraulic motors (OK-ELH) are used to cool hydraulic oil. They were specially designed for mobile applications where high performance and easy installation in the smallest space is necessary. HYDAC offers electrically powered and hydraulically powered fans. They regulate the speed of the fan depending on the temperature of the medium. As an option, these controls can also be supplied with a reversing function, to "purge" the cooler of dirt (e.g. dust and debris).

- Cooling capacity up to 34 kW (OK-ELD) and 140 kW (OK-ELH)
- DC motor with 12 V or 24 V
- Hydraulic motors from 6.3 to 22 cm³/rev

Advantages

- Compact design
- Efficient due to individually controllable cooling circuits
- Low-noise fan
- ATEX version available for operation in explosive gas and explosive dust atmospheres

Combination cooler

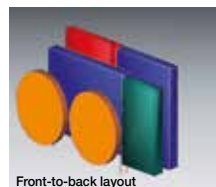
- CMS combination cooler for hydraulic oil, transmission oil, charge air, coolant, diesel fuel

The following cooling circuits can be combined together in various ways in a CMS mobile cooler:

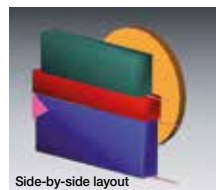
- Charge air cooling (CAC)
- Coolant cooling (RAD)
- Oil circuits: transmission, hydraulics, fan drive
- Fuel cooling

With the aid of our cooling calculation software (KULI), and on the basis of available data, it is simple to adjust for pressure losses and heating of the cooling air which will also occur as a result of installing a condenser.

- Drive: direct, electrical or hydraulic



Front-to-back layout



Side-by-side layout

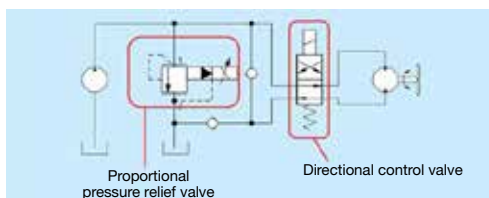
Individual cooler requirements for combination cooler systems - oil, water and charge air cooling

Fan control components and control blocks

Hydraulic and electro-hydraulic controls for regulating fan motor speed with optional reversal of rotation direction for use with various types of pumps.

Valves specially developed for the application:

- Directional control valves
- Non-return anti-cavitation valves
- Manually adjustable pressure relief valves
- Inversely proportional pressure relief valves



Example of fan control application





PGE100



PGI100



PVF100



PPV100S and PPV101

Drive technology

HYDAC offers a wide range of pumps for the working hydraulics of lift-lower systems in open hydraulic circuits. The pump range includes fixed and variable displacement pumps of various designs from 0.25 ccm/rev to 560 ccm/rev and pressure ranges of up to 400 bar.

HYDAC fixed displacement pumps for auxiliary circuits and control oil supply:

- **External gear pump PGE**
from 0.25 ccm/rev – 60 ccm/rev, nominal pressure up to 250 bar and maximum pressure up to 300 bar.
Also available in multiple pump combinations.
- **Internal gear pump PGI**
from 3.8 ccm/rev – 250 ccm/rev, nominal pressure up to 330 bar and maximum pressure up to 400 bar.
Also available in multiple pump combinations.
- **Vane pump PVF**
from 5.8 ccm/rev – 237 ccm/rev, nominal pressure up to 210 bar.
Ideally suited to offline cooling and filtration circuits.
Also available in multiple pump combinations.

HYDAC variable displacement pumps for main functions:

- **Axial piston pump PPV100S**
from 16 ccm/rev – 180 ccm/rev, nominal pressure = 315 bar and maximum pressure = 350 bar.
High speed reserves, finely graduated flow levels, control range constantly being expanded.
Design standard in accordance with DIN ISO 3019-2 and SAE.
Also available in multiple pump combinations.
- **Axial piston pump PPV101**
from 45 ccm/rev – 200 ccm/rev, nominal pressure = 320 bar and maximum pressure = 350 bar.
High speed reserves, versatile range of controls.
Design standard in accordance with DIN ISO 3019-2 and SAE.
Also available in multiple pump combinations.

See Pump Specifications brochure no. 2.900



Bladder, piston and diaphragm accumulators for mobile applications

Accumulators

HYDAC offers an exceptionally wide product portfolio of accumulators and dampers for a very wide array of hydraulic applications on drill rigs and their accessories. This enhances working comfort and functionality of the machines and thus minimises stress for both humans and machines.

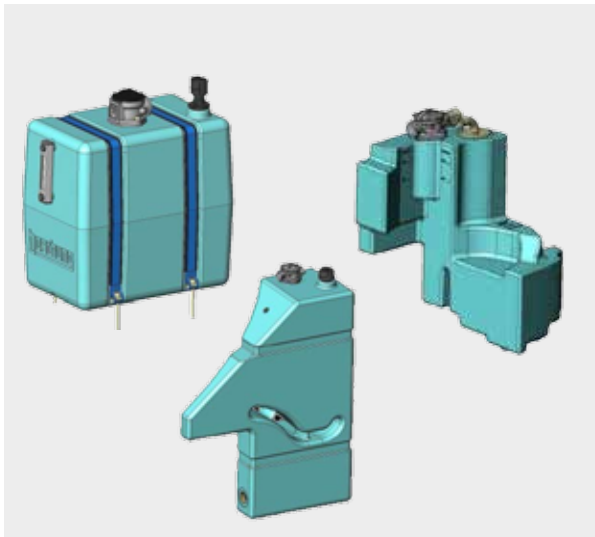
Typical accumulator tasks and benefits resulting from them include:

- Providing energy to hydraulic hammers
→ Increase in performance for comparable technical conditions
- Pulsation damping on flushing pumps
→ Increased service life of the built-on parts by minimising vibrations
- Energy storage to compensate for leaks on clamping and tensioning devices
- Emergency and safety tasks in the pilot circuit
→ Increase in functionality
- Media separation for pressure measurement in the flushing system
→ Prevention for the purpose of avoiding down times

Advantages:

Our accumulator specialists have decades of experience in the development and design of all the major types of accumulator. This means that they can select the right accumulator from the extensive product range to suit each application and to size it in accordance with operating conditions. The correct accumulator will always provide the best performance for an application and country-specific approvals mean that HYDAC accumulators can be used world-wide.

See Catalogue 30.000 Accumulator Technology



Plastic tanks

Hydraulic tanks

Function

Unlike welded steel tanks, customised plastic tanks are usually used when installation space is extremely limited and very lightweight construction is required.

Advantages

- *Improved component cleanliness*, since plastic tanks are very clean following production.
- *Air from oil*, special tank geometry allows quick and optimal air separation (RMTR)
- *Improved use of existing installation space* due to optimised design (complex, curved designs available)
- *Inexpensive* The costs depend on tank volume and not design complexity.
- *Clean tank surface*, due to integral baffle designed to prevent fluid spill from the breather filter onto the tank
- *Element does not block*, due to dry air filter element and partial cleaning whenever air is expelled – dust is purged from the filter material



Filtration

Function

Our broad filter range offers inline filters (LF, MDF, DF) with various pressure ratings and materials in addition to filler/breathers (ELF) for the hydraulic tanks. We also have a broad range of in-tank return line filters (RF) and return line & suction boost filters (RKM). Specially designed in-tank return elements (RMTR) offer good distribution of oil flow in the tank, highly effective air separation and thus a reduction in the size of the hydraulic tank.

The filters can also be used in explosion-hazard areas (ATEX).

Advantages

High level of operating safety thanks to first class filtration

- Protection of system components
- Element is easy to change and filter housing is easy to install
- Low operating costs thanks to low pressure drops across the filter and filter element
- Improvement in operating safety through the use of filter clogging indicators
- Brand labelling to protect the spare parts business
- Tank-filter complete systems, optimized for component protection, system cleanliness and venting
- Ultra-modern laboratory and test rig technology

Outriggers & hydraulic power units

Stable placement and flexible drive power.

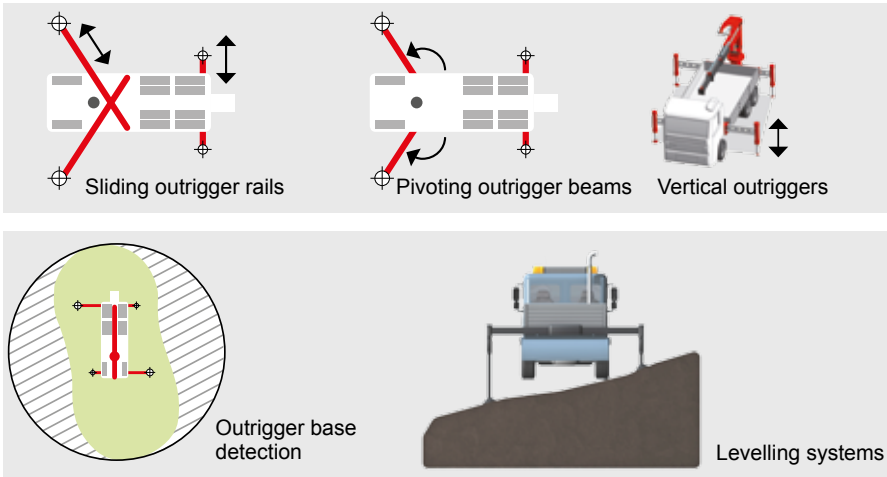
Using the modules for outrigger systems, which are scaled for safety, we can, in partnership with you, develop practically any outrigger system to suit any application, and to any safety requirement from a single source. We can also provide the necessary support in selecting the best control concept.

Modules can be used to depict PL b to PL d:

- For different performance classes
- For different safety requirements
- For different control types
- Interfaces for working area restriction and load moment limitation

Examples of applications

For all mobile machines that have an outrigger or levelling system, symmetrical or asymmetrical, remote-controlled or directly actuated. Can be supplied if required with interfaces to sensors, display instruments, data loggers, load safety systems and working range limitations.

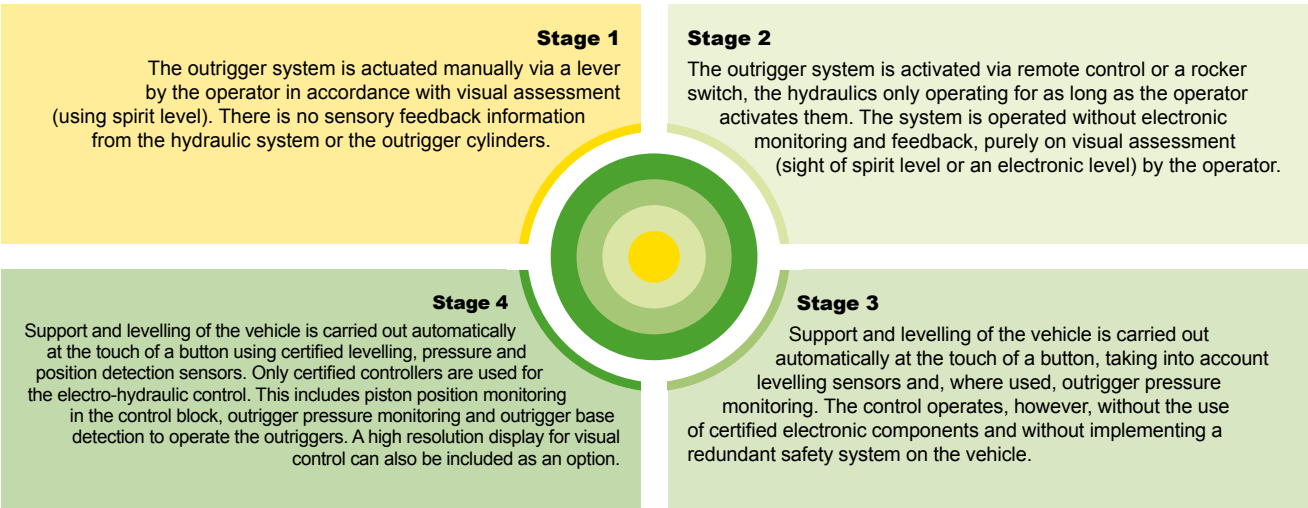


In accordance with the standard EN ISO 13849-1 Safety of Machines, the machine builder must determine the control category that is relevant for his machine, referred to as the Performance Level (PL). The safety-related parts of the control must thereby fulfil the requirements of the respective Performance Level.

Based on the system modules for outriggers that are scaled in accordance with safety requirements, the machine builder, together with our application engineers, can select the hardware components that fulfil the requirements of the control category of his machine.

In 4 stages: Design examples for controlling an outrigger system

The control examples* in stages 1-4 differ depending on the type of machinery and the statutory standards and directives. The functional safety in the control increases with each stage. The machine builders' product ideas and designs form the basis for designing an appropriate control. The requirements are defined by the manufacturer and our application engineers support him by advising him on the selection of suitable hardware components.





Power units for HDD systems



Hydraulic power units

Function

HYDAC hydraulic power units provide a reliable drive unit for your machine. As auxiliary power units, they ensure great flexibility and can be operated with various different devices. Our power unit system modules guarantee you superb quality, a high level of availability and short development times. We offer you a suitable and cost-effective solution for your application.

Versatile applications for drives and auxiliary power units for drilling operations:

- 20-50 kW class: break-out tong, mixers, small flushing pumps, pipe handlers, loading crane, winches, emergency power units
- 100-300 kW class: power units for drill rigs or attachments, e.g. deep vibrators, milling drives, pile drivers and shakers, pumps
- 400-800 kW class: power units for HDD systems, deep level drilling rigs, solids pumps, triplex pumps

Power unit versions:

- In lightweight or heavy-duty series, depending on customer requirement and area of application
- Various drive concepts: diesel, gas, benzene, electric motor, hybrid
- Fixed/variable displacement pump systems max. 420 bar with integrated control and valve technology
- Power unit solutions from the fully operational motor assembly unit to complete drive solutions
- Container power units in 8'/10'/20'/30'/40' transport containers, as mobile drive units

Options or special requests for all power units:

- ATEX versions
- Approvals by various certification companies, e.g. Germanischer Lloyd, DNV,....
- Various temperature versions (Arctic, Desert)
- Offshore capability
- GPS monitoring
- Additional noise protection [< 60 dB(A)]
- 3G modem remote service
- Oil pan, including monitoring and walkway grids,
- Special paint jobs (RAL)
- With lifting and/or lashing points
- Underbody in skid design

Advantages

- Robust and construction site-suitable technology
- High-performance and reliable transmission drives with proven HYDAC control technology
- Worldwide service on location
- Suitable solution from one source



Mobile small power units - heavy-duty series



Piggyback power unit for crawler drill rig

See Brochure 10.153 - Components, systems and service for mobile power units

Additional solutions

Perfectly tailored to the HYDAC Technology Platform.

Cabin air filter for very fine and nano dust: CabinAirCare.

Drill rigs and vehicles must not be used in contaminated areas unless the driver's cab is equipped with filtration and/or compressed air systems to ensure an air supply of sufficient breathing quality.

For tasks such as landfill sealing or encapsulation or land rehabilitation, a CabinAirCare module can be retrofitted to existing drill rigs, to provide optimum protection for the rig driver without having to make drastic changes to the existing air-conditioning system or the cab.

For a healthy and productive work environment, HYDAC Filter Technology already offers highly effective air filtration systems as original equipment or for retrofitting.

Customer benefits:

- ⇒ Easy to install and expand (on existing A/C or filter systems)
- ⇒ Sufficient system reserve (fan power, media sizing) for common cabin sizes in construction and agriculture
- ⇒ Robust and simple construction
- ⇒ Filters airborne pollutants, including nano-particles and gases



Active carbon filter



HEPA filter



Fine dust filter

See Brochure 7.016.1 - CACR CabinAirCare

Accessories for every sector

To make hydraulic systems complete

- Standard fittings and ball valves (high pressure)
- Mounting clamps for hydraulic hoses and pipes, cylinders, electrical cables and accumulators
- Tamper-proof inductive proximity switch (high pressure resistance)
- Fluid level sensors
- Temperature switch TSE
- Standard clamp 3015 air/water reservoir clamping bands
- Test points
- Quick-release couplings
- Special clamps for particle filters

Customer benefits:

HYDAC is your expert for modifications and special solutions at all times, and especially when custom jobs are required because standard parts are unsuitable. HYDAC's in-house engineering, coupled with our multidisciplinary approach and worldwide know-how, guarantee state-of-the-art technology and rapid development times.

HYDAC accessories provide the final perfect touch to your machine with a broad range of standard and special components, also available in stainless steel.



Ball valves

See Accessories brochure no. 61.000

Cylinder systems

Our cylinder systems are notable for their versatility and extreme compactness.

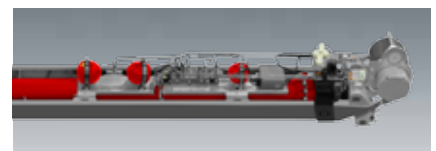
We offer cylinder drives with integrated valve technology and guarantee optimal operation of your machine, even with increased operational loads:

- Crowd cylinders with integrated functionality for load holding, load compensation and length compensation
- Outtrigger cylinders with relief,
- Mast inclination and kinematics cylinders
- Locking and clamping cylinders

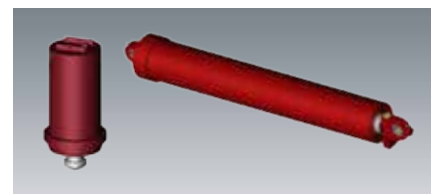
The cylinders can also be weight-optimised and they can be supplied with an integrated distance measurement system.

Customer benefits:

Our own Service Center offers you a comprehensive customer service. We support you with the design, assembly, maintenance and commissioning of your system. We begin working closely with the customer right from the development stage. Because of our knowledge, we can achieve the best cylinder solution for your product, e.g. by using special surface coatings for the piston rod. FE simulations or fatigue strength calculations also come under our Engineering Standard.



Telescoping cylinder (11 m) with semi-integrated hydraulic control



Outtrigger cylinder

See brochure HS-D 10.102 - Hydraulic cylinders and cylinder systems for mobile hydraulics

Fluid Conditioning Systems

To provide flexible servicing on machines, there are convenient mobile units for removing solid particles

- Portable filtration units
- Mobile filtration units
- Built-in filtration units (offline)

See Catalogue 79.000 - Filter Systems

Customer benefits:

- ⇒ Clean filling and flushing
- ⇒ Versatile design – can be used on a variety of systems
- ⇒ Relief for the main filter
- ⇒ Greater system availability
- ⇒ Reduction in Life Cycle Cost



Mobile filter systems

FluidCareCenter

We get involved in the process early on.

With our clean room in the FluidCareCenter, we promise you exceptional cleanliness from the components to the system:

Technical Cleanliness is becoming ever more important in mobile hydraulics. Phrases such as "reduction and prevention of production-stage breakdowns" and the difficulty of longer warranty periods are driving up the demands for component cleanliness.

Customer benefits:

- ⇒ By understanding the relevant cleanliness data of your components, you will be a step ahead of your competitors.
- ⇒ A laboratory approved and recommended by well-known automotive suppliers
- ⇒ Many years' experience in the area of technical cleanliness owing to active collaboration on VDA Volume 19 and ISO 16232
- ⇒ Analysis with the help of extraction units developed at HYDAC
- ⇒ Sophisticated analysis equipment
- ⇒ Continual advances in equipment and processes to meet the increasing requirements and needs of customers



FluidCareCenter

See Brochure 7.128 - FluidCareCenter

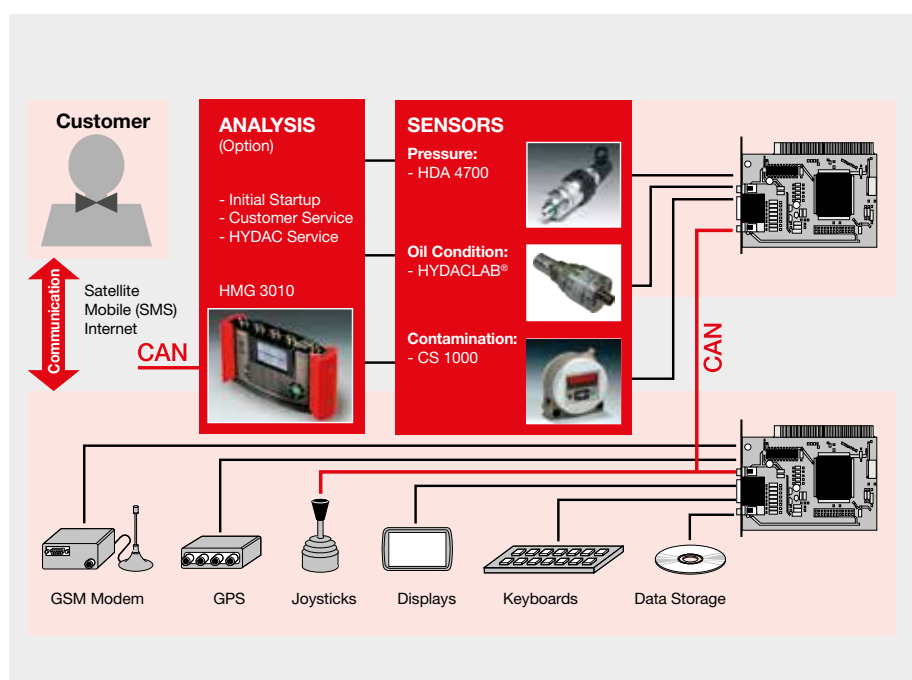
Condition monitoring, Teleservice

Constantly growing demands for operational availability, reduction in downtime, detailed load and service management (economy, wear & tear, service, warranty) require innovative monitoring, service and control concepts. A variety of sensors provides the ideal basis for the development of such integrated system solutions.

Oil condition, e.g. ageing or presence of contaminating fluids can be determined via the saturation level, temperature, change in electrical conductivity, change in dielectric constant (HYDACLAB®)

- Saturation level (AS):
- Particle contamination (CS)
- Pressure (HDA)
- Flow rate (EVS)
- Fluid level (ENS, HNT)

In combination with portable measuring instruments (HMG series), this data can be recorded and analysed to supplement the machine electronics (service).



See Brochure 10.122 - Condition Monitoring for an efficient Life Cycle Cost Management



Accumulator Technology 30.000



Filter Technology 70.000



Process Technology 77.000



Filter Systems 79.000



Compact Hydraulics 53.000



Accessories 61.000

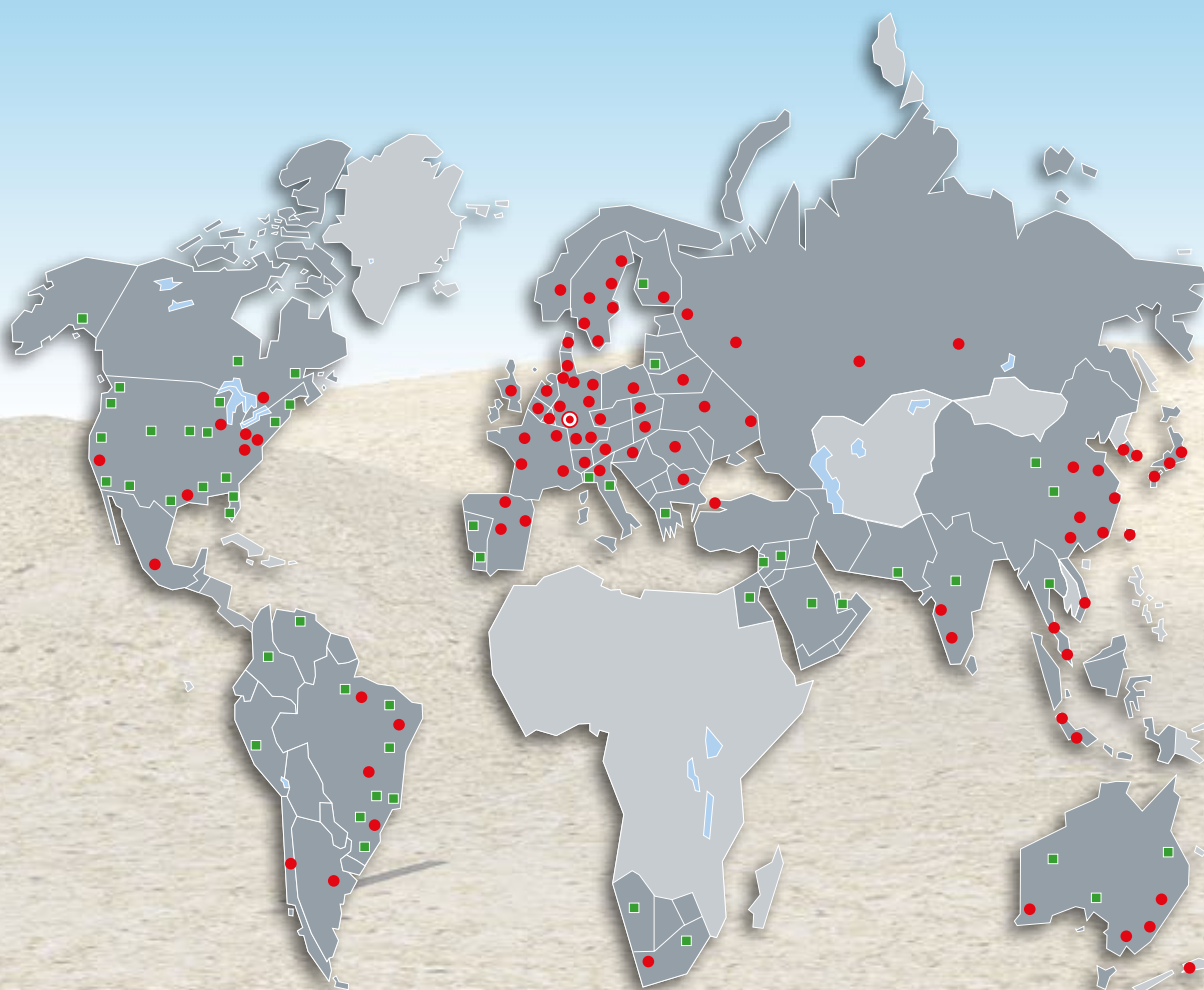


Electronics 130.000



Cooling Systems 57.000

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Note

The information in this brochure relates to the operating conditions and applications described.

For applications and/or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.