HYDAC has been one of the leading suppliers of fluid technology, hydraulics, electronics and cooling equipment for more than 50 years and has over 8,000 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.

For use in various wheel loader applications, HYDAC offers a wide range of sector-specific components and systems in the areas of hydraulics, cooling, electronics, software and control technology in addition to its standard products. 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
- Global yet local: More than 45 overseas companies and over 500 sales and service partners
- Fluid engineering and service: Support in technical design for commissioning, maintenance and training and in the event of claims
- Customised 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 EN ISO 13849

### Wheel loader versions

- **Farm loaders**
  - up to 37 kW
  - Hydrostatic transmission drives
  - Hydraulic supply via gear (fixed-displacement) pumps
  - Manually with hand-lever control, direct wiring
  - Quickcoupler systems (mechanical & hydraulic)

- **Compact & swing loaders**
  - 38 – 74 kW
  - Hydrostatic transmission drives
  - Hydraulic supply via fixed-displacement or variable-displacement pumps (also in combination)
  - Direct hand-lever control and pilot-operated 3/4-way main control manifolds with joystick
  - Quickcoupler systems (mainly hydraulic)
  - Simple hoist suspensions (mainly for high speed loaders > 30 km/h)
  - Hydraulic starttripp system

- **Mid-sized & industrial wheel loaders**
  - 75 – 120 kW
  - Hydrostatic or hydrodynamic transmission drives
  - Hydraulic supply via LS pump systems (also in combination with fixed-displacement pumps)
  - Pilot-operated main control manifolds (4-way) with joystick (hydraulic or electrical)
  - Demand-controlled fan control (hydraulic & electrical)
  - Hydraulic quickcoupler systems
  - Load-pressure-adjusted hoist suspensions

- **Large loaders**
  - 125 – 275 kW
  - Mainly hydrodynamic transmission drives
  - Hydraulic supply via LS pump systems (multiple-pump combinations)
  - Hydraulically pilot-operated main control manifolds (4-way) with joystick (hydraulic or electrical)
  - Demand-controlled fan control (hydraulic & electrical)
  - Hydraulic quickcoupler systems (the larger the loader, the less frequent the application)
  - Load-pressure-adjusted hoist suspensions – standard in larger loaders
  - Increasing use of additional joystick steering (with 20 km/h approval/ no road approval)

- **Mining loaders**
  - >280 kW
  - Hydrodynamic transmission drives
  - Hydraulic supply via LS pump systems (multiple-pump combinations)
  - Hydraulically pilot-operated main control manifolds with electrical joystick control
  - Demand-controlled fan control (hydraulic)
  - Load-pressure-adjusted hoist suspensions – standard
  - Joystick steering mainly used

- **Wheel dozers**
  - Mainly hydrodynamic transmission drives
  - Hydraulic supply via LS pump systems (multiple-pump combinations)
  - Hydraulically pilot-operated main control manifolds (4-way) with joystick (hydraulic or electrical)
  - Demand-controlled fan control (hydraulic & electrical)
  - Increasing use of additional joystick steering (with 20 km/h approval/ no road approval)

### Wheel loader applications

- **Farm loaders**
  - Digging, excavation & levelling work

- **Compact & swing loaders**
  - Transporting loose material

- **Mid-sized & industrial wheel loaders**
  - Handling & transport work

- **Large loaders**
  - Municipal services

- **Mining loaders**
  - Joystick steering mainly used
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**Wheel loader versions**

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  - up to 37 kW
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  - Quickcoupler systems (mechanical & hydraulic)

- **Compact & swing loaders**
  - 38 – 74 kW
  - Hydrostatic transmission drives
  - Hydraulic supply via fixed-displacement or variable-displacement pumps (also in combination)
  - Direct hand-lever control and pilot-operated 3/4/5-way main control manifolds with joystick
  - Quickcoupler systems (mainly hydraulic)
  - Simple hoist suspensions (mainly for high speed loaders > 30 km/h)
  - Hydraulic start/stop system

- **Mid-sized & industrial wheel loaders**
  - 75 – 120 kW
  - Hydrostatic or hydrodynamic transmission drives
  - Hydraulic supply via LS pump systems (also in combination with fixed-displacement pumps)
  - Pilot-operated main control manifolds (24-way) with joystick (hydraulic or electrical)
  - Demand-controlled fan control (hydraulic & electrical)
  - Hydraulic quickcoupler systems
  - Load-pressure-adjusted hoist suspensions

- **Large loaders**
  - 125 – 275 kW
  - Mainly hydrodynamic transmission drives
  - Hydraulic supply via LS pump systems (multiple-pump combinations)
  - Hydrodynamically pilot-operated main control manifolds (24-way) with joystick (hydraulic or electrical)
  - Demand-controlled fan control (hydraulic & electrical)
  - Hydraulic quickcoupler systems (the larger the loader, the less frequent the application)
  - Load-pressure-adjusted hoist suspensions — standard in larger loaders
  - Increasing use of additional joystick steering (with 20 km/h approval/no road approval)

- **Mining loaders**
  - >280 kW
  - Hydrodynamic transmission drives
  - Hydraulic supply via LS pump systems (multiple-pump combinations)
  - Hydrodynamically pilot-operated main control manifolds with electrical joystick control
  - Demand-controlled fan control (hydraulic)
  - Load-pressure-adjusted hoist suspensions — standard
  - Joystick steering mainly used

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**Wheel loader applications**

- **Digging, excavation & levelling work**
- **Transporting loose material**
- **Handling & transport work**
- **Municipal services**
- **Wheel dozers**
  - Mainly hydrodynamic transmission drives
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### Wheel loader versions

#### Farm loaders up to 37 kW
- Hydrostatic transmission drives
- Hydraulic supply via gear (fixed-displacement) pumps
- Manually with hand-lever control, direct wiring
- Quickcoupler systems (mechanical & hydraulic)

#### Compact & swing loaders 38 – 74 kW
- Hydrostatic transmission drives
- Hydraulic supply via fixed-displacement or variable-displacement pumps (also in combination)
- Direct hand-lever control and pilot-operated 3/4-way main control manifolds with joystick
- Quickcoupler systems (mainly hydraulic)
- Simple hoist suspensions (mainly for high speed loaders > 30 km/h)
- Hydraulic start/stop system

#### Mid-sized & industrial wheel loaders 75 – 120 kW
- Hydrostatic or hydrodynamic transmission drives
- Hydraulic supply via LS pump systems (also in combination with fixed-displacement pumps)
- Pilot-operated main control manifolds (2/4-way) with joystick (hydraulic or electrical)
- Demand-controlled fan control (hydraulic & electrical)
- Quickcoupler systems
- Load-pressure-adjusted hoist suspensions

#### Large loaders 125 – 275 kW
- Mainly hydrodynamic transmission drives
- Hydraulic supply via LS pump systems (multiple-pump combinations)
- Hydraulically pilot-operated main control manifolds (2/4-way) with joystick (hydraulic or electrical)
- Demand-controlled fan control (hydraulic & electrical)
- Quickcoupler systems (the larger the loader, the less frequent the application)
- Load-pressure-adjusted hoist suspensions — standard in larger loaders
- Increasing use of additional joystick steering (with 20 km/h approval/no road approval)

#### Mining loaders >280 kW
- Mainly hydrodynamic transmission drives
- Hydraulic supply via LS pump systems (multiple-pump combinations)
- Hydraulically pilot-operated main control manifolds with electrical joystick control
- Demand-controlled fan control (hydraulic)
- Load-pressure-adjusted hoist suspensions — standard
- Joystick steering mainly used

### Wheel loader applications

- **Digging, excavation & levelling work**
- **Transporting loose material**
- **Handling & transport work**
- **Municipal services**
- **Wheel dozers**
- **Mainly hydrodynamic transmission drives**
- **Hydraulic supply via LS pump systems (multiple-pump combinations)**
- **Hydraulically pilot-operated main control manifolds (2/4-way) with joystick (hydraulic or electrical)**
- **Demand-controlled fan control (hydraulic & electrical)**
- **Quickcoupler systems**
- **Load-pressure-adjusted hoist suspensions**
- **Increasing use of additional joystick steering (with 20 km/h approval/no road approval)**

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- Advice on and implementation of the safety requirements in accordance with DIN EN ISO 13849
Energy efficient, safe, comfortable.

Challenges in the various wheel loaders

The development of modern machinery is influenced by wheel loader trends, such as more complex operating and control elements. This is accompanied by a trend towards the enhancement of the productivity and efficiency of the machines. The result is increased investments in the functional safety of the assistance and control systems. To support these developments, HYDAC offers a comprehensive range of solutions to optimise the productivity and efficiency of the machines. The machine operators are supported and the work process is optimised in this context with the aid of modern electronic technology and individual solutions as the interface between actuators and sensors.

HYDAC's contribution

HYDAC offers a variety of components and systems that meet these requirements and support your projects in achieving maximum safety and efficiency. HYDAC can also develop solutions to integrate the machine’s existing systems in the most effective manner. HYDAC will also work with you to develop a customised solution for your device.

HYDAC’s key issues

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

1. Energy-efficient, safe, comfortable.
2. Electro-hydraulic control technology.

Electro-hydraulic control technology

From component to intelligent drive solution.

HYDAC offers everything from a comprehensive range of hydraulic and electronic components to subsystems, HYDAC offers everything from a comprehensive range of hydraulic and electronic components to complete control solutions for mobile machinery. The scope of development is determined together with the customer’s requirements.

Your benefits

- Energy efficiency
- Reduced fuel consumption
- Lower hydraulic losses
- Energy saving and recovery
- Precise cooling-requirement temperature control
- Reduced electrical power requirement
- Reliability
- Certified software modules
- Systems for functional safety
- Reduced weight
- Reduced emissions
- Reduced noise
- Improved controllability
- Precise cooling-requirement temperature control
- Increased functional safety available
- Standard version and versions with increased functional safety available
- Controllers in various classes
- HD expansion modules
- Standard version and versions with increased functional safety available
- Displays for the most demanding visual requirements
- Peripherals, e.g. joysticks
Energy efficient, safe, comfortable.

Challenges in the various wheel loaders

The development of modern machinery is characterised by shared requirements across the various wheel loader sizes. On the one hand, continuous improvements and cost reductions concerning both the efficiency and the cost of modern wheel loaders are essential. On the other hand, the enhancement of the productivity and efficiency of the machines is necessary. Theooth-compare activities are necessary in the face of regulated fan speeds, through simulation and testing. Reduced fuel consumption and reduced exhaust emissions are particularly important for the further development of the drive and control systems of the wheel loaders. As is also the case with the EU & US exhaust emissions regulations, the emerging markets in the rest of the world are setting 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 specific needs. In addition, HYDAC’s technical know-how in the area of electronic control systems is at your disposal. HYDAC’s contribution also includes support and visualisation systems.

Your benefits

- **Energy efficiency**
  - Reduced fuel consumption
  - Improved hydraulic system efficiency
  - Energy saving and reduced environmental impact

- **Comfort**
  - Improved working position with sensitive controls
  - Enhanced visibility

- **Safety**
  - Increased system reliability
  - Reduced risk of accidents

- **Function integration**
  - Integrated systems and components
  - Enhanced control and diagnostics

- **Maintenance**
  - Reduced maintenance costs
  - Increased uptime

- **Corrosion resistance**
  - Increased durability

Electro-hydraulic control technology

From component to intelligent drive solution.

HYDAC offers everything from a comprehensive range of components and systems, connected to a software development environment, a modular systems approach. HYDAC’s solutions for mobile machinery also include the corresponding application software.

System intelligence

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

The demands of modern wheel loaders 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.

Software development

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.

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

System development support

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

- C/C++
- CO2 emissions
- Comply with the Emissions Directive
- Compliance with the Emissions Directive
- Displays for the most demanding visual requirements
- Peripherals, e.g. joystick

HUMAN MACHINE INTERFAC (HMI)

CONTROL LEVEL

MACHINE LEVEL

System development support

HUMAN MACHINE INTERFAC (HMI)

CONTROL LEVEL

MACHINE LEVEL

<table>
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<tr>
<th>Sensor level</th>
<th>Pressure and temperature</th>
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</table>

Control technology

- **Increased in**
  - Evaluation & diagnoz performance
  - Hearing protection
  - Modern design technology and industrial standards
  - More ergonomic working position with reduced control effort and reduced radiated noise
  - Reduced exposure to contamination and special materials

- **Reduction in**
  - Flushing and insulting work
  - Usage of modern software
  - Higher efficiency and power consumption through regulated fan speeds, through simulation and testing.
  - Use of components with high accuracy, reduced effect on system size
  - Learning curve of the drivers through simulation and testing.
  - Takes up less space
  - Combined functional units
  - Reduced weight
  - Reduced joint and leakage points

- **Health & safety**
  - Reduced exposure to dust due to cabin ventilation systems
  - Standard version and versions with increased functional safety available

- **User friendliness**
  - Optionally expandable modular systems
  - More ergonomic working position with reduced control effort and reduced radiated noise
  - Increased durability
  - Increased reliability
  - Increased uptime

- **Ease of use**
  - Reduced commissioning time
  - Reduced maintenance costs
  - Increased uptime

- **Software development**
  - Development based on the customer’s requirements
  - Development of applications software (according to specification)
  - Integration of intelligent subsystems into the customer’s equipment
  - Complete control solution for mobile machinery (safety functions, electrical/electronic control architecture, application software)
### System intelligence

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

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

**System development**

![System development](image)

**Software development**

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

- CoDeSys 2.3 / 3.5 / 3.5 SIL2
- Matlab/Simulink

**System development support**

![System development support](image)

**Energy efficient, safe, comfortable.**

**Challenges in the various wheel loaders**

The development of system technology is interconnected with wheel requirements across the various wheel loader sizes. More compact operating and road-load control procedures go hand-in-hand with the enhancement of the productivity and efficiency of the machines. The constructive operations are increased and the work process is optimised too, so they work with the aid of modern electronics.

Changes to the regulatory framework result in increased investment in the functional safety of the machine control. ING老子 developed the drive and control systems of the wheel loaders. 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 specific application requirements in the area of assistance and control systems wherever simpler operating concepts and a better overview and controllability of the machine functions become necessary.

**HYDAC’s key issues**

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

- **Energy efficiency**
- **Performance**
- **Reliability**
- **Safety**
- **Cost-effectiveness**
- **Sustainability**

**Our benefits**

- **Energy efficiency**
- **Performance**
- **Reliability**
- **Safety**
- **Cost-effectiveness**
- **Sustainability**

**Electro-hydraulic control technology**

From component to intelligent drive solution.

HYDAC offers everything from a comprehensive range of valves and electro-hydraulics to a broad range of application software for the entire functional safety concept and complete functional solutions that can also be integrated into mobile machinery as finished functional solutions. From component to intelligent drive solution.

**HUMAN MACHINE INTERFACE (HMI)**

**CONTROL LEVEL**

- Actuator level
- Sensor level

**COMBINED FUNCTIONAL UNITS**

- Electro-hydraulic system
- Pilot-controlled and direct-acting valves
- Combined functional units

**Window and control interface**

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

**chassis & engine BUS**

- CAN0 (CANopen or J1939)
- CAN1 (J1939)
- CAN 2.0 B

**Plug-in diagnostics tool**

- P1: Valve control
- P2: Pressure relief valve
- P3: Intermittent pressure relief in forward speed
- P4: Interchangeable plug-in head in selecting the damage

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

- Functional and test (FRT) analyses
- Definition and description of safety functions
- Safety system architecture and user interfaces (HMI)

**See catalogue 180.000 – Electronic Product Catalogue**
Energy efficient, safe, comfortable.

Challenges in the various wheel loaders

The development of modern technology is interconnected with wheel loaders across the various wheel loader sizes. More and more complex operating and control systems go hand-in-hand with the advancement of the productivity and efficiency of the machines. The more efficient the machine and the work processes it accomplishes, the better it works with the aim of modern electric drives. Changes in the regulatory framework result in increased investment in the functional safety of the individual solutions to ensure development of the drive and control systems of the wheel loaders. 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 fulfill your specific application needs. HYDAC’s modular and system solutions, which also cover the whole range of systems and components, are supported and the work process is optimised in this context with the aid of modern electronic systems.

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:

- Reduced number of components
- Increased functional safety
- Integrated tank and filter systems
- Reduced joints and leakage points
- Increased functional safety
- Standard version and versions with increased functional safety available
- Certified software modules
- Reduced number of components
- Service life increased
- Flow and oil level
- Pressure and temperature
- Distance, position, angle, inclination and level
- Pedals Sensors Suspension EEC
- I/O modules
- Pedals
- Trackball Keypad Joystick
- PLC
- CAN0 (CANopen or J1939)
- Diesel engine
- Trackball
- Joystick
- Display Additional input devices
- Pedals
- CAN0 (CANopen or J1939)
- Diesel engine
- Trackball
- Joystick
- Display Additional input devices
- Pedals

System intelligence

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

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

Electro-hydraulic control technology

From component to intelligent drive solution.

HYDAC offers everything from a comprehensive range of components and systems, covering control, drive and sensor technology tailored to customer demands. HYDAC’s contribution also includes the corresponding application software.

Software development

Depending on the customer's requirements, HYDAC offers support across the spectrum with developing electro-hydraulic and electro-pneumatic control technology. The scope of development is determined together with the customer according to the tailored solution:

- Creating customer-specific application software (according to specification)
- Integrating intelligent safety systems into the customer’s machine
- Complete control solutions for mobile machinery (safety functions, electrical/electronic control architecture, application software)

System development support

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

- Reliability and test (R&I) analyses
- Definition and description of safety functions
- Designing safety systems and user interfaces (HMI)
**Sensors, system electronics and control systems.**

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

**MATCH** development environment

**MATCH** Mobile Application Tool Chain

Development environment for mobile working machines

With the "MATCH" (Mobile Application Tool Chain) development environment, HYDAC offers a tool chain for system level software development by the customer that is especially suited to the requirements of mobile machinery. "MATCH" supports development from defining the system at the vehicle level and 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 tools (e.g. on basis of HYDAC Electronic RTB Box)
- Documentation

Furthermore, an "embedded MobileWare" 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 with TÜV certification:
- "SIL 2" to IEC 61508 / "PL d"
- "SIL 2" to EN ISO 13849

In order to make software development significantly easier for the customer, HYDAC offers software libraries and control systems with TÜV certification. The product portfolio covers special applications with increased functional safety.

Examples of library modules include:
- Sensors
- Switches
- Proportional and switching valves
- Relays, LEDs
- Transfer functions/signals/external devices

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

**Software library**

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/signals/external devices

**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.

- 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 series**

**Function**

With the HY-TTC family of controllers, HYDAC offers the right platform for a wide variety of requirements and applications – always efficient, safe, reliable and flexible. The controllers are designed for use both in complex centralised control architectures and in decentralised ones.

HYDAC supplies the right controller for each machine size, based on the number of inputs and outputs, the controllers can be classified into the following groups: HY-TTC 30 with up to 30 I/Os, the middle group HY-TTC 50/55 with up to 50 I/Os and the HY-TTC 500 family, covering a wide scope, with even up to 96 I/Os. The highly flexible configurations of inputs and outputs make solutions possible for all kinds of functions and machine types.

- Thanks to their internal diagnostic and monitoring function, the controllers are also suitable and certified for usage with increased safety requirements up to SIL 2/PL d

**Features**

- Depending on version, certified to SIL 2/PL d
- Programming in C / C++ / CODESYS
- 62 kB, 128 kB, 256 kB or 3MB RAM
- 30, 50 or 95 inputs and outputs
- All inputs and outputs are configurable and are provided with additional digital diagnostic outputs
- Stabilised sensor voltage supply with internal monitoring
- No reset caused by dip in voltage when starting engine
- Aluminium die cast housing with waterproof connection plugs, including a waterproof Gore-Tex membrane for hydraulic balance
- UL type approval

**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 parameterised 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 (SIL Pl c, EN ISO 13849).

**Features**

- Plc (HY-TTC 30X)
- Freely configurable Node-ID via pin 30 I/Os, with up to 8 PWM outputs, 6 of them with integrated current measurement
- Robust, very compact housing

**Mobile display HY-TTC eVision**

**Function**

The compact background-light 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 be either 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 along with the optional touchscreen feature create an easy-to-use human-machine interface.

The displays 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 operation 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
- WLAN-compatible
- Standby & wake-up
"MATCH" development environment

MATCH Mobile Application Tool Chain

Development environment for mobile working machines

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 and 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 tool (e.g., on basis of HYDAC Electronic RTB Box)
- Documentation

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

Functional safety
"MATCH" can also write application software with increased functional safety according to the following safety standards with TÜV certification:
- "SIL 2" to IEC 61508
- "PL d" to EN ISO 13849

Sensors, system electronics and control systems
Solutions perfectly tailored to the application – all from one source.

Software library

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

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 covers special applications such as potentially explosive atmospheres or applications with increased functional safety.

Electronic sensors and controls to complement the system electronics.

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

Mobile controller HY-TTC series

Function
With the HY-TTC family of controllers, HYDAC offers the right platform for a wide variety of requirements and applications – always efficient, safe, reliable and flexible. The controllers are designed for use both in complex centralised control architectures and in decentralised ones.

HYDAC supplies the right controller for each machine size, based on the number of inputs and outputs, the controllers can be classified into the following groups: the HY-TTC 30 with up to 30 I/Os, the middle group HY-TTC 500/550 with up to 50 I/Os and the HY-TTC 500 family, covering a wide scope, with even up to 96 I/Os. The highly flexible configurations of inputs and outputs make solutions possible for all kinds of functions and machine types.

Thanks to their internal diagnostic and monitoring functions, the controllers are also suitable and certified for basics with increased safety requirements up to SIL 2 PL d.

Features:
- Depending on version, certified to SIL 2 PL d
- Programming in C/C++ / CODESYS
- 82 kB, 158 kB, 256 kB or 3MB RAM
- 30, 50 or 96 inputs and outputs
- All inputs and outputs are configurable and are provided with external voltage supply for gas sensors
- Stabilised sensor voltage supply with internal monitoring
- No reset caused by dip in voltage when starting engine
- Aluminium die cast housing with waterproof connection plugs, including a waterproof Gore-Tex membrane for hydraulic balance
- E12 type approval

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

Function
With 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 CAN2.0B. It enables inputs and outputs to be configured and parameterised 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 a 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 (HY-TTC 30XS)
- Freely configurable Node-ID via pin
- 30 I/Os, with up to 8 PWM outputs, if these with integrated current measurement
- Robust, very compact housing

Mobile display HY-TTC eVision²

Function
The new HY-TTC eVision² is an optional mobile display with integrated high-end display controller. The display controller is especially designed for 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 ruggedised aluminium or plastic housing and can be either built directly into the instrument panel or surface-mounted in the field of vision of the driver/operating system. The HY-TTC eVision² display uses a multicolour LED backlight with an integrated high end display controller. The HY-TTC eVision² is available in the cockpit.

Ten programmable illuminated control keys along with the optional touchscreen feature create an easy-to-use man-machine interface.

They provide a simple extension of on-board electronics.

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Features:
- User-friendly, self-explanatory and time-saving graphical design and operation 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
- WLAN-compatible
- Standby & wake-up

Displays with integrated hydraulics control

Mobile display HY-TTC eVision²

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- Robust housing with appealing design, suited for mobile applications
- WLAN-compatible
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Displays with integrated hydraulics control

Software library

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

Special error modules can also be used to detect system errors.
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MATCH 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 especially suited to the requirements of mobile machines. "MATCH" supports development from defining the system at the vehicle level and 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 level (e.g. on basis of HYDAC Electronic RTB Box)
- Documentation

Furthermore, an "embedded MobileWare" is offered which permits a hardware-independent programming of the application 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 with TUV certification:
- "SIL 2" to EC 1503
- "PL d" to EN 61508
- AgrE to ISO 25119 / DIN EN 61508

Software library

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/signals/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.

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 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 d / e)

Mobile controller HY-TTC series

Function
With the HY-TTC family of controllers, HYDAC offers the right platform for a wide variety of requirements and applications – always efficient, safe, reliable and flexible. The controllers are designed for use both in complex centralised control architectures and in decentralised ones.

HYDAC supplies the right controller for each machine size, based on the number of inputs and outputs, the controllers can be classified into the following groups: the HY-TTC 30 with up to 30 I/Os, the middle group HY-TTC 50/90 with up to 50 I/Os and the HY-TTC 500 family, covering a wide scope, with even up to 96 I/Os. The highly flexible configurations of inputs and outputs make solutions possible for all kinds of functions and machine types.

Thanks to their internal diagnostic and monitoring functions, the controllers are also suitable and certified, for instance with increased safety requirements up to SIL 2 PL d.

Features
- Depending on version, certified to SIL 2 PL d
- Programming in C / C++ / CODESYS
- 62 kB, 128 kB, 256 kB or 3 MB RAM
- 30, 50 or 95 inputs and outputs
- All inputs and outputs are configurable and are provided against voltage and current overload
- Stabilised sensor voltage supply with internal monitoring
- No reset caused by dip in voltage when starting engine
- Aluminium die cast housing with waterproof connection plugs, including a waterproof Gore-Tex membrane for hydraulic balance
- E12 type approval

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 expansion 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 CANopen and CiA DSP 401. It enables inputs and outputs to be configured and parameterised 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 (HY-TTC 30XS)
- Freely configurable Node-ID via pin 30 I/Os, with up to 8 PWM outputs, 6 of these with integrated current measurement
- Robust, very compact housing

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 be either 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 along with the optional touchscreen feature create an easy-to-use human-machine interface.

The displays 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 operation interface
- Good portability via CoDeSys platform
- High image brilliance
- High refresh rate
- Fast boot-up times
- Various 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
- WLAN-compatible
- Standby & wake-up

Sensors, system electronics & control systems
**Hydraulic systems**

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

### Open center directional control valves

HYDAC’s open center directional control valves offer you a modular system with a robust, energy efficient and cost-effective solution for mechanical, pneumatic and electro-hydraulic controls.

**Features:**
- Available in monoblock, multi-section and sectional designs
- Key data: Qₘₐₓ = 180 l/min; pₘₐₓ = 350 bar
- Energy-efficient Q-outlet option
- Robust, high-quality and maximum controllability
- Low internal leakage
- Inlet selector for safe flow distribution
- Key data for open center directional control valves (see photos on right):
  - HH 140 directional control valve: Qₘₐₓ = 60 l/min; pₘₐₓ = 250 bar
  - HH 210 directional control valve: Qₘₐₓ = 140 l/min; pₘₐₓ = 350 bar

### Load-sensing directional control valves

HYDAC’s load-sensing directional control valve offer you a modular system with which to design load-compressed, energy efficient load-sensing controls for mechanical, pneumatic and electro-hydraulic controls.

**Features:**
- Multi-section and sectional designs
- Key data: Qₘₐₓ = 180 l/min; pₘₐₓ = 350 bar
- Extra-long 10 mm spool stroke for high-precision control
- Optional spool position indication of the main spool control
- Inlet selector for safe flow distribution
- Key data for load-sensing directional control valves (see photo on right):
  - LH 18 directional control valve: Qₘₐₓ = 120 l/min; pₘₐₓ = 230 bar
  - LH 19 directional control valve: Qₘₐₓ = 180 l/min; pₘₐₓ = 350 bar

### Load-sensing directional control valve combination-kit

**LX-6 + HX-1**

**DX-6 directional control valve**

**RS 210 directional control valve**

**Features:**
- Electrical shut-off of pump volume
- Inlet selector for safe flow distribution
- Low internal leakage
- Energy efficient Q-inlet option
- Available in monoblock, multi-section and sectional designs
- Mobile combinations: Qₘₐₓ = 180 l/min; pₘₐₓ = 350 bar

**Our directional control valves**

Our directional control valves offer you a modular system that can be used to design complex control systems for vehicles and machinery. The modular approach is based on our modular open center or load-sensing valve systems, with manual, electro-hydraulic or proportional control. The number of additional valves can be reduced by using of special spools.

**Optimally, our electro-hydraulic additional steering control systems are available at all-wheel steering types with various steering modes, above all for excavators and earth machines. For larger wheel loaders and industrial loaders, we can also make additional steering control with steering systems.

**For medium-sized wheel loaders and loaders, we can also offer our additional steering control with steering systems, with emergency steering for the steering system.

**The hydropneumatic hoist (HPH) is used in mobile mining machinery, and a wheel hoist (from the front wheel of the wheel loader) preventing pitching vibrations from occurring during transport journeys. It can be adjusted to suit any machine and any load conditions. The rotation direction of the wheel hoist can significantly increase the driving stability, steering performance and overall driving safety of the wheel loader. Various systems can be provided, depending on the wheel loader size.

**50-bar electro-hydraulic valves are used in additional control of further actuators from one single oil supply. Flotillas used in various interesting applications of multi-function attachments (such as winches, lifting buckets, bottom-pump or grappling buckets and rotating gripper jaws). Available in various pressure ranges.**
Hydraulic systems

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

Open center directional control valves

HYDAC’s open center directional control valves offer you a modular system with robust, energy efficient and cost-effective solutions for mechanical, pneumatic and electro-hydraulic control.

Features:
- Available in monoblock, multi-section and sectional designs
- Key data: Qmax, pmax, spool strokes
- Energy efficient, Q-outlet option
- Robust, high-quality and maximum controllability
- Low internal leakage
- Inlet selector for safe flow distribution
- Electro-hydraulic controls.

Load-sensing directional control valves

HYDAC’s load-sensing directional control valves offer you a modular system with which to design load-compensated, energy efficient and cost-effective solutions for mechanical, pneumatic, hydraulic and electro-hydraulic control.

Features:
- Multi-section and sectional designs
- Key data: Qmax, pmax, spool strokes
- Easy-to-adjust 10 mm spool stroke for high-precision control
- Independent of the load, parallel operation is possible without mutual interference
- Simple integration of secondary valves
- Optional spool position indication of the main spool control
- Optionally also for use with LS displacement pumps

Key data for load-sensing directional control valves (see photos on right):
- RS 210 directional control valve: Qmax = 140 l/min; pmax = 350 bar
- RS 160 directional control valve: Qmax = 100 l/min; pmax = 350 bar
- RL 200 directional control valve: Qmax = 160 l/min; pmax = 250 bar
- RL 150 directional control valve: Qmax = 120 l/min; pmax = 350 bar

HYSAC variable displacement pumps are especially designed to suit multiple applications and circuits to supply the main functions of a device. With a maximum displacement of 180 cm³/h and a displacement pressure of 250 bar, they are available in various special splined shaft and drive shafts for multiple combinations.

HYSAC fixed displacement pumps are especially designed for secondary circuits and for pilot pressure supply. In special combination, they are also available for electro-hydraulic fan control. They are also available with multi-pump combinations.

The return-line suction filters RHW are ideal for use in mobile machinery with multiple circuits. The filter's design, consisting of a pressure filter, allows oil to circulate in the system when the machine is in a position where the return line can be fed to the pump and the tank. This ensures that all components in the system receive a clean line. The use of RHW filters is highly recommended to protect other system components from contamination during the operation of the system. This is especially important in applications where high cleanliness levels are required, such as in aerospace or medical applications.

The wear-resistant filter elements prevent wear debris from entering the system, ensuring long filter life and reduced maintenance costs. The filter’s design also includes an inspection window, allowing for easy monitoring of the filter’s condition and timely replacement when necessary.

Made in Germany

The hydrophyl system components are designed to operate under high-temperature conditions. The hydrophyl system is made from stainless steel and it is resistant to corrosion and wear. The system components are also designed to operate under high pressure conditions. They are made from high-strength alloys that are resistant to fatigue and fracture. The hydrophyl system is designed to be maintenance-friendly, as it is easy to access and inspect the system components.

The hydrophyl system is designed to be energy-efficient. The hydrophyl system components are designed to operate at high efficiency, reducing energy consumption and improving system performance. The hydrophyl system is also designed to be environmentally-friendly, as it is designed to operate under sustainable conditions and it reduces the carbon footprint of the application.

The hydrophyl system offers a modular approach that allows for easy customization to meet the specific needs of the application. The hydrophyl system components are designed to be modular and they can be easily combined and configured to meet the specific requirements of the application.

Our directional control valves offer you a modular system that can be used to design complex hydraulic systems. The control valves are designed to be easily integrated into our modular open center or load-sensing valve systems, with manual, electro-hydraulic or proportional control.

The number of additional valves can be reduced by using of special spools.

Optimally, our electro-hydraulic additional steering systems can be used with all-wheel steering types with various steering modes, above all for excavators and swivel loaders. For larger wheel loaders and industrial loaders, we can also make a swivel steering system with our steering systems.

Our energy storage blocks are used in wheel loaders and excavators to provide energy supply to safety functionality such as the vehicle steering or the vehicle braking system.

For medium-sized wheel loaders and back and away, we can also specifically provide our motor-pump systems with a fixed displacement pump. These systems are especially designed for a minimum in pump assembly, a high-performance system with pressure cut-off in ready for installation, available in a 12 volt or 24 volt version. An integrated temperature switch provides protection from overloading.

Our directional control valves are designed to be easy to use, with optional spools that can be easily added or removed. The valves are equipped with various features such as the ability to control the flow direction, the ability to control the flow rate, and the ability to control the flow direction and rate simultaneously.

The fan drives can be easily controlled to operate hydraulically or electrically. The fan drives can be controlled by a remote control, by a control panel, or by a computer. The fan drives can also be controlled by a remote control, by a control panel, or by a computer.

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Hydraulic systems
The optimal working hydraulics for fast, precision and efficient control.

Open center directional control valves
HYDAC’s open center directional control valves offer you a modular system with robust, energy efficient and cost-effective solutions for mechanical, pneumatic and hydraulic-electric control.

Features:
- Available in monoblock, multi-section and sectional designs
- Key data: Qmax = 140 l/min; pmax = 350 bar
- Available in many configurations
- Optimally designed for use with LS variable displacement pumps
- Optional spool position indication of the main spool control
- Electrical shut-off of pump volume
- System with robust, energy efficient and cost-effective solutions for fast, precision and efficient control.

Load-sensing directional control valves
HYDAC’s load-sensing directional control valve offers you a modular system with which to design load-optimized, energy efficient load-sensing control for mechanical, pneumatic and hydraulic-electric control.

Features:
- Multi-section and sectional designs
- Key data: Qmax = 140 l/min; pmax = 350 bar
- Available in various designs and ball bushings
- Simple integration of secondary valves
- Optional full spool position indication of the main spool control
- Optionally also for use with LS variable displacement pumps
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Focus on energy efficiency

Hydraulic蓄能器技术

Optimum hydraulic accumulator

Extensive valve portfolio

As needed, for example by means of the engine is restarted in motor operation

After an automatic “idle stop”, the diesel hydraulic motors.

In mobile machinery, existing hydraulics made. In wheel loaders, switching off accumulators and pressure filtration have become cutting-edge valve technology. Complex control units for cutting-edge valve technology. Complex control units for energy efficiency, available space and safety, the new HYDAC pilot control manifolds are equipped with modern multi-function valves – small, efficient and fast

Applications for wheel loader functions

We offer you different solutions for the various primary and auxiliary functions of your wheel loader.

Piston accumulator (series SK280)

Diaphragm accumulator

Hydraulic Systems

Various cylinder actuating functions, support, etc.

Proportional control of additional circuits

The following classic functions can be controlled:

up to max. 20 l/min.

The hydraulic start-stop solutions generate considerable savings in mobile machinery. The solutions can be used to restart the engine automatically than in motor operation.

Wheel loaders and industrial (low-pressure) in yard loaders,

Pilot control manifolds/PCM

Integratable additional functions

Piston accumulator of high pressure (Series SK280)

Diaphragm accumulator

Cartridge valves for gear applications

Gears for driving gears are an extension to the series SK280. They are available in a wide range of nominal volumes. Complete with pilot unit, they can be adapted to all current requirements and requirements. The following classic functions can be controlled.

pmax = 60 bar, Qmax = 100 l/min

pmax = 80 bar, Qmax = 10 l/min

pmax = 350 bar, Qmax = 120 l/min

Ideal for clutch applications

Back-pressures from the coolant circuit have no effect on performance curve.

High flow rates for direct-acting valves

Low hysteresis and high resolution due to innovative design.

Flow-optimised valve design

Electro-hydraulic operation available with or without manual emergency override connection

Even though hydraulic systems now have to meet high demands in terms of performance, reliability and the ability to withstand contamination, the number of valves has decreased. Therefore, the number of valves decreases, the number of functions performed by the valves increases, reducing standard. As the number of valves decreases, the number of functions performed by the valves increases, reducing standard. As the number of valves decreases, the number of functions performed by the valves increases, reducing standard. As the number of valves decreases, the number of functions performed by the valves increases, reducing standard. As the number of valves decreases, the number of functions performed by the valves increases, reducing standard.
Focus on energy efficiency

Hydraulic start-stop technology

A passenger car, electrical start-stop systems have greatly improved fuel efficiency and lower CO₂ emissions. These systems can save a large amount of energy while the engine is idling, which helps reduce fuel consumption. The application of such systems can be extended to other vehicles, such as wheel loaders and other heavy machinery.

The hydraulic start-stop solutions given below are牧场 to contribute to significant fuel savings and the reduction of CO₂ emissions. These solutions are also suitable for wheel loaders and other construction machinery.

A few examples:

- Work-hydraulics pump, the energy being re-used for example, work-hydraulics pumps in realising start-stop functionalities. For the diesel engine when it is idling is also a source of major potential savings.

The hydraulic start-stop solutions generally provide a number of advantages:

- High energy efficiency
- Easy integration
- Great potential for savings
- Easy adaptation to specific applications

Even though hydraulic start-stop systems are generally used for passenger cars, the potential savings they offer are significant for wheel loaders as well. The energy re-used can be redirected to other parts of the machine or used for other functions, thus reducing the overall energy consumption.

The following classic functions can be controlled:

- gear shifting functions (2nd speed change-over, disabling axles, etc.)
- reducing valves specially developed for pilot circuits, size and weight. Like the slip-in proportional pressure reducing valve DR10X, high pressure and low flow rates for direct-acting valves up to max. 20 l/min.
- integratable additional functions like a priority valve are available for wheel loader hoist by means of pressure directional spool valve (pressure directional spool valve)

The hydraulic start-stop solutions generally provide a number of advantages:

- High energy efficiency
- Easy integration
- Great potential for savings
- Easy adaptation to specific applications

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Applications for wheel loader functions

We offer you different solutions for the various primary and auxiliary functions of your wheel loader.

Pilot manifolds with modern multi-function valves - small, efficient and fast

Integratable additional functions

Focus orientation of all valve types is suitable for all tasks. The following classic functions can be controlled:

- “Top“ for “tank control”
- “Bottom“ for “tank control”
- “ Valve for “control valve“
- “ Valve for “control valve“
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Cartridge valves for gear applications

Modern drive gear is a combination of modular valve systems and a strong control unit. Complete with all control functions, the module can be adapted to the individual requirements of the machine. The control unit can be adapted to the requirements of the machine. Complete with all control functions, the module can be adapted to the individual requirements of the machine.

The hydraulic system control solution generally provide a number of advantages:

- High energy efficiency
- Easy integration
- Great potential for savings
- Easy adaptation to specific applications

Even though hydraulic start-stop systems are generally used for passenger cars, the potential savings they offer are significant for wheel loaders as well. The energy re-used can be redirected to other parts of the machine or used for other functions, thus reducing the overall energy consumption.

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Robust sensors work-hydraulics pump. The energy re-as needed, for example by means of the after an automatic “idle stop”, the diesel hydraulic motors. A modified form can also be used as example, work-hydraulics pumps in realize start-stop functionalities. For In mobile machinery, existing hydraulics systems have already become a source of major potential savings.

In passenger cars, electrical start-stop systems have already become a source of major potential savings. This is mainly due to the reduction of fuel consumption, but also to the reduction of emissions. The same development has begun to take place in construction machinery as well, as the use of electric drive systems becomes increasingly popular. The exceptions are those applications that require high power output, such as excavators or loaders. In these cases, hydraulic systems are still the most suitable solution.

The hydraulic start-stop solutions gain their efficiency from the fact that they can be used to activate the start-stop function and other control functions, such as the braking system, the lighting system, or the heating system. The energy is then only supplied when it is actually needed, which leads to a significant increase in efficiency.

In addition to the start-stop function, the hydraulic system can also be used to control the braking system. This is achieved through the use of a hydraulic brake, which is activated by a pressure sensor when the brakes are applied. The pressure sensor then sends a signal to the controller, which activates the brake cylinder and applies the brakes.

The hydraulic system can also be used to control the lighting system. This is achieved through the use of a hydraulic lamp, which is activated by a pressure sensor when the lights are turned on. The pressure sensor then sends a signal to the controller, which activates the lamp and illuminates the path.

The hydraulic system can also be used to control the heating system. This is achieved through the use of a hydraulic heater, which is activated by a pressure sensor when the heating system is turned on. The pressure sensor then sends a signal to the controller, which activates the heater and heats the cabin.

In conclusion, the hydraulic start-stop solutions gain their efficiency from the fact that they can be used to activate the start-stop function and other control functions, such as the braking system, the lighting system, or the heating system. This leads to a significant increase in efficiency and makes them an ideal solution for mobile machinery.
Applications for wheel loader functions

We offer different solutions for the various primary and auxiliary functions of your wheel loader.

**Pilot manifolds with modern multi-function valves** - small, efficient and fast

**Integratable additional functions**

**Cartridge valves for gear applications**

**Mobile valves for compact wheel loaders**

**Cooler-filter-tank combination & fan drive**

**Emergency/safety supply**

Focus on energy efficiency

Hydraulic start-stop technology

A passenger car, electrically start-stopped, is in the process of ‘snoozing’, while being parked at the traffic light. A few seconds later, the traffic light changes to green and the engine is restarted in motor operation. After an automatic “idle stop”, the diesel engine when it is idling is also made. In wheel loaders, switching off the diesel engine while it is idling allows considerable fuel savings to be realised. In mobile machinery, existing hydraulics provide the perfect resources for this and can be adapted to the requirements of each application. HYDAC has extensive experience in this field and offers a variety of modern products and solutions.

**Piston accumulator (series SK280)**

This new piston accumulator was developed for mobile machinery and is available in various sizes and with different pressures. It is characterised by its high stability, low cost, small dimensions and versatile range of applications. The SK280 piston accumulators provide the perfect resources for this, with their wide variety of diaphragm accumulators and pressure filtration have become cutting-edge valve technology. Complex control units for hydraulic start-stop solutions were developed at HYDAC to realise start-stop functionalities. For passenger cars, electrical start-stop systems are used, which above all fulfills the requirements in modern working machinery, as the number of valves decreases, the number of functions performed by the valves increases, reducing valves specially developed for pilot circuits, proportional control of additional circuits which are used for all axles and controlled directly via the PCM. The hydraulic start-stop solutions generate a significant source of major potential savings. In passenger cars, electrical start-stop systems are used, which above all fulfills the requirements in modern working machinery, as the number of valves decreases, the number of functions performed by the valves increases, reducing valves specially developed for pilot circuits, proportional control of additional circuits which are used for all axles and controlled directly via the PCM.
Hydraulic supply
Optimal solutions from the HYDAC technology platform.

Electro-hydraulic steering

The vehicles with articulated steering have an articulated joint between Ackermann-steering machines, the wheels move at the front and the rear giving the driver maximum directional control. The steering can be performed either manually with a conventional steering wheel or electro-hydraulically with one or two steering cylinders. Depending on the design, the electro-hydraulic proportional control blocks are fitted with shock valves in the steering cylinder connections to protect the steering system from pressure surges and sudden movements. Hydraulically steered vehicles also require electro-hydraulic auxiliary steering for all-wheel drive and crab steering.

Cab suspension

Cab suspension systems are mainly used to protect the operator from vibrations. Reducing the accelerations in the low-frequency range of 2–50 Hz increases operating comfort and increases machine’s working efficiency. Pantograph and air suspension systems are optimised for the low-frequency range. Hulls of connecting components and vibration isolating feet reduce noise and disturbances. The components are designed to absorb stresses and avoid the relative movements between the cab and vehicle.\n
The current solutions involving elastic cab bearings are not generally approved. The suspension system should therefore be modified to suit the application out of the specific acceptances.

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Electro-hydraulic steering

The pump range satisfies fixed and variable displacement pumps of various design from 0.25 ccm/rev to 560 ccm/rev and setting ranges from 16 ccm/rev to 180 ccm/rev, from 3.8 ccm/rev to 250 ccm/rev, from 45 ccm/rev to 200 ccm/rev, from 16 ccm/rev to 180 ccm/rev, from 3.8 ccm/rev to 250 ccm/rev, nominal pressure up to 250 bar and peak pressure up to 300 bar.

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Also available in multiple pump combinations.

Axial piston pump PPV100S

- Suitable for dry running:
- Good efficiency, low current consumption
- DC motor with protection rating IP65
- Advantages:
- Very low pressure drop
- Installation position optional
- In the event of hydraulic supply system failure, in small machines, the front and the rear sections. The front and rear sections are twisted with shock valves in the steering cylinder connections to protecting the functionality of the machines and thus minimises stress for both humans and machines.

HYDAC offers a wide product portfolio of accumulators and accessories for suspension, steering and on-board systems.

The HSE-SK400 units are made up of a piston accumulator and valves for load-pressure adjustment and turning on the lifting hoist suspension. Hydro-pneumatic cab suspension systems with floating bearings. We supply piston accumulators for mobile applications.

Our accumulator specialists have decades of experience in the field of accumulator technology and are capable of finding the right applications.

The interconnection of the hydraulic suspension in the mobile machines requires the selection of the right accumulator. The decision is always in terms of size and weight. The driving stability and the stability of the suspended components are improved.

The current solutions involving elastic cab bearings are constantly being expanded.

Applications, suspension, steering

Fuel pumps

Fuel pump for diesel fuel

- Suitable for dry running:
- Good efficiency, low current consumption
- DC motor with protection rating IP65
- Advantages:
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- Installation position optional
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Hydraulic supply
Optimal solutions from the HYDAC technology platform.

Electro-hydraulic steering
Electro-hydraulic auxiliary steering for all-wheel & crab steering

Advantages:
- High vehicle operating safety thanks to high class filtration
- Electronic ease in usage and filter housing to prevent dust ingestion
- Low operating costs thanks to the reliable choice for the life cycle of the working machine
- Increase in safety thanks to the use of oil filters for the steering
- Extended maintenance intervals, e.g.:
- Reduced costs for the user
- Reduced operating costs
- Improved safety of operation and comfort

HYDAC offers a wide portfolio of flow filters and filter elements for all types of machine filtration.

- Filter systems
- Tank/filter solutions
- Lightweight filters
- Inline filter

Performance:
- Features for diesel or hydrotreated oil
- Fixed or variable suction
- Adjustable or fixed suction
- Installation position optional

HSE valve series

- Screw-down filter and strainer top
- Nominal > 100 bar, > 100 bar
- For diesel or hydrotreated oil
- Fixed or variable suction

SPECIFICATIONS:
- Flow rate adjustable from 0.25 ccm/rev to 60 ccm/rev,
- Pressure rating up to 400 bar
- Motion range of up to 400 bar
- Motor range includes displacement motors from 3.8 ccm/rev to 250 ccm/rev,
- Pump range includes fixed and variable displacement pumps of up to 400 bar

HYDAC technology platform.

- HYDAC variable displacement pumps for main functions:
- HYDAC fixed displacement pumps for auxiliary circuits and specific acceptances.

- Advantages:
- Reduces vibrations in the driver's cab
- Safeguards safety-relevant functions of the working machine
- Increases machine's working efficiency

Applications, suspension, steering

- Gear oil filtration
- Pressure oil filtration
- Filtration solution for AdBlue and SCR cooling
- Tank/filter solutions from a single source
- Marking of the filter elements to improve product identification and to improve safety of operation and comfort

- Tank/filter solutions from a single source

- Diesel filtration

- Mineral oil:
- Hoist suspension
- Hydro-pneumatic cab

- Electro-hydraulic steering

- Electro-hydraulic auxiliary steering for all-wheel & crab steering

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- Lightweight filters
- Inline filter
Hydraulic supply

Optimal solutions from the HYDAC technology platform.

Electro-hydraulic steering

Steering system for all-wheel & crab steering

The pump range includes fixed and variable displacement pumps of various design for use in 120 kW to 1100 kW auxiliary systems.

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### Cooling

- HEPA filter
- Active carbon filter
- Non-return anti-cavitation valves
- Directional control valves

Valves specially developed for the application: reversing function, to “purge” the cooler of dirt (e.g. dust and debris).

The efficiency of a cooler also depends greatly on the fan control.

For the cooler: CMS combination coolers for hydraulic oil, transmission oil, charge air, coolant, diesel fuel.

Properties:
- High performance air with very good anti-contamination properties
- Long service life

### Additional solutions

Perfectly tailored to the HYDAC Technology Platform.

**CabinAirCare.**

- Cab-air filter for very fine and nano dust:
- In combination with a hydraulic fan drive
- Front-to-back layout

Customer benefits:
- Easy to install and expand
- Sufficient system reserve for common media sizing
- Robust and simple connection
- Filters extreme particles, including nano-particles and gases

### Fluid conditioning systems

To provide flexible service on machines, HYDAC offers mobile units for retaining solid particles.

- Filter units
- Mobile filtration units
- Built-in filter units (off-line)

Customer benefits:
- Clean filing and flushing
- Flexible design — can be used on a variety of machines
- Reliable compressor, V-belt drive, oil sump, filter
- Diesel system availability
- Production in Life Cycle Cost

### FluidCareCenter

We get involved in the process early on. We can clean our FluidCareCenter, therefore, extend the service life of your components by many years.

Customer benefits:
- By understanding the relevant environmental data of your components, you will be a step ahead of your competitor.
- A 24-hour contact and support service.
- Many years’ experience in the area of technical cleaning services, active collection on VDA (Version 19 and ISO 9001).
- In-house manufacture
- High-quality analysis equipment
- Ongoing continual development of equipment and processes to meet the increasing requirements and needs of customers.

### Condition Monitoring and Service

Constantly growing demands for extended lifetime, energy efficiency, process reliability, reduced cost of ownership, and energy efficiency point to the development of intelligent systems to monitor and control the condition of the machine.

Customer benefits:
- Reduction in life cycle cost
- Reduction in breakdowns
- Versatile design – can be used on a variety of systems
- Clean filling and flushing
- Flexible design — can be used on a variety of machines
- Reliable compressor, V-belt drive, oil sump, filter
- Diesel system availability
- Production in Life Cycle Cost

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**Condition Monitoring and Service**

- **Basic monitoring service:** Ongoing continual development of equipment and processes to meet the increasing requirements and needs of customers.
- **Extended monitoring service:** A laboratory approved and recommended by well-known automotive suppliers.

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**Customer benefits:**
- Better predictive maintenance
- Reduced maintenance costs
- Improved service life
- Higher productivity
- Improved availability
- Reduced downtime
- Predictive maintenance

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**Condition monitoring system:**

- Oil condition, e.g. time to deterioration
- Oil condition, e.g. time to deterioration
- Saturation level (AS)
- Particle contamination (CS)
- Flow rate (EVS)
- Temperature (TD)

**Filter systems:**

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

For tasks such as landfill sealing or encapsulation systems to ensure an air supply of sufficient pressure.
Cooling

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

All coolers with DC motors (380 V/60 Hz) or hydraulic motors (400 V/60 Hz) are used to cool refrigeration systems. They have been specially designed for refrigeration systems with high demands on reliability and durability, and are easy to adapt to various applications.

- Non-return valves
- Pressure relief valves
- Valves specially developed for the application:
  - Hydraulic and electro-hydraulic controls for regulating fan motor speed with optional reversal

The efficiency of a cooler also depends greatly on the fan control. Phased control components and control blocks

- Variable control systems, stage switches
- Mildloy and electro-hydraulic controls for regulating fan motor speed with optional reversing of variable selection for different types of pumps

Various systems are available for the application:
- Inclined control valves
- Normally-open and normally-closed valves
- Reactively adjustable pressure relief valves

CabinAirCare

- Active carbon filter
- HEPA filter

Manually adjustable pressure relief valves
Non-return anti-cavitation valves

Hydraulic and electro-hydraulic controls for regulating fan motor speed with optional reversal

the temperature of the medium. As an option, these controls can also be supplied with a

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Hydraulic oil cooling

- Oil cooler with DC in hydraulic motor
- Electro-hydraulic fan controls

Air coolers with DC motors (48 VDC) or hydraulic systems (380 VAC) are used to cool fan drives. They have baseplate designed for outdoor use and are easy to install. The DC motors are superior in efficiency.

Properties:
- Reduced wear and tear
- High performance oil with very good anti-contamination properties
- Leaner oil

Cylinder systems

Our cylinder systems are notable for their reliability and extensive component range. The use of high-performance technology and genuine special services of our partners ensure maximum performance. The wide range of mobile cylinders for large wheel loaders and riding mower application has a complete range of design options to meet the specific needs of your application. These include cold-resistant technology and a high accuracy distance measurement system. Our price list includes a wide range of option designs to meet the specific needs of your application.

CabinAirCare.

CabinAirCare is a car air filter designed with high anti-particle and anti-fog properties, and a controlling and distance-measuring system.

CabinAirCare filter.

The following cooling systems can be combined together in various ways in a CMS mobile solution:

- Charge air cooling (CAC)
- Costable (CHAC)
- Fuel load
- In-line cooler

In general, fans are designed in three different concepts:

- Manual adjustable pressure relief valves
- Directional control valves
- Proportional systems – oil, water and charge-air cooling

The cooling system is considered as a whole. Installation resistances and additional heat applications, allows complex cooling systems to be modulated.

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

Properties:
- Coolant options: Water, oil, coolant, hydraulic drive
- Hydraulic oil cooling
- Hydraulic fan drive
- Fuel cooling
- Charge air cooling
- Charge air filter
- Water filter
- Air filter
- Hydraulic oil/air cooler

See catalogue 57.000 – Cooling Systems

FluidCareCenter.

By understanding the relevant field of components, you will be at the forefront of your competition. At FluidCareCenter, we supply mobile filtration systems (SFK) with the best cylinder solution for your product.

Customer benefits:
- Clean filling and flushing
- Instant protection
- Clean components
- Clean filling
- Mobile (SMS)
- Satellite

Additional solutions

Perfectly tailored to the HYDAC Technology Platform.

Additional solutions

- Mobile filtration units
- Mobile filtration units
- Mobile filtration units

Condition Monitoring and Service

Constantly growing demands for operational reliability require comprehensive collection, analysis, and use of measurement and service data.

For the completion of hydraulic systems, we offer a comprehensive monitoring and service solution. For tasks such as landfill sealing or encapsulation equipment, we promise you exceptional cleanliness, measured and recorded and analysed to supplement the monitoring, service and control concepts. A variety of solutions is available for to the development of such integrated system concepts.

Condition Monitoring and Service

In combination with portable measuring systems, we promise you exceptional cleanliness, measured and recorded and analysed to supplement the monitoring, service and control concepts.

Fluid Care

- Mobile filtration units
- Mobile filtration units
- Mobile filtration units

Department

Engineer

Cylinder with distance measuring system

Additional solutions

- Mobile filtration units
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Condition Monitoring and Service

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Condition Monitoring and Service
Components, Systems and Service for Wheel Loaders

Note
The information in this brochure relates to the operating conditions and applications described. For applications and operating conditions not described, please contact the relevant technical department. All technical details are subject to change without notice.