Mobile hydraulic bolting technology
Bolts are by far the most important separable joints in mechanical, plant and automotive engineering and in process industries. More than two thirds of all separable joints use bolts. In Germany alone, more than 50 billion bolts are used every year. The vast majority of these bolts is smaller than M12, but the number of larger bolts is also continuously growing. For economic reasons, the trend of the past decade is towards larger, maintenance-free machines and plants.

Nowadays, construction equipment, utility vehicles, airplanes, power plants, wind turbines and even bridges and high-rise buildings are designed in sizes that would have been impossible only a few years ago. These larger dimensions require correspondingly larger fastening elements, and existing bolted joints must have an increased performance and a higher and more accurate preload.

HYTORC, the world’s leading manufacturer for industrial bolting, develops ever more powerful new tools, fasteners and bolting processes to increase efficiency, profitability, safety and quality for its customers all over the world.
Bolting technology made by HYTORC

- comprehensive product range
- many years of application experience
- innovative and customized bolting solutions for all applications
- ISO 9001, ISO 29990 and KTA 1401 certified
- customer-oriented sales and services
The perfect solution
Innovative technology and intelligent processes for the highest bolting quality

HYTORC is the leading manufacturer for industrial bolting technology and a reliable partner for many industries. Thanks to our wide range of products, the highest quality standards, unique services and valuable expert knowledge, we will find the perfect solution even for the most demanding applications.

HYTORC develops and manufactures innovative solutions for separable joints, and with its reliably fast tools and assembly systems, HYTORC contributes considerably to the high competitiveness of the oil and gas, chemical and petrochemical industry, energy and wind energy, mechanical and plant engineering, heavy industry, infrastructure, and many more.

From the world’s widest range of bolting technology, we identify the perfect individual solution, tailor-made to the specific requirements:

- Hydraulic torque wrenches
- Pneumatic torque wrenches
- Electric and battery torque wrenches
- Patented fastening elements
- Innovative bolting processes
- Intelligent system controls
- Industry 4.0 – robot-controlled hydraulic bolting technology

With this portfolio and on the basis of our key competences, including product development, engineering and system support, we have been developing the world’s greatest expertise in bolting technology for more than five decades. With safe and user-friendly systems as well as practical solutions, we support our customers in finding the perfect fastening solution in terms of costs, quality, productivity and plant availability from the first phase of planning. This allows our customers to take a decisive lead, and that is why we have been a valuable partner for leading companies for many years. Make HYTORC part of your bolting technology solution!
Perfect Bolting Technology
Made by HYTORC

HYTORC offers the entire range of mobile bolting technology, including all tightening methods in accordance with VDI 2230, unique fastening elements and customer-oriented services. Fast, safe, innovative.

HYTORC’s headquarters for Germany, Austria, Switzerland, Turkey and Azerbaijan are located in Krailling near Munich. Since 1985, the trading company Barbarino & Kilp GmbH has been responsible for HYTORC’s sales. Barbarino & Kilp GmbH has a successful company tradition of more than 275 years and has consistently developed the HYTORC brand.

We have a team of around 40 employees, some of them in our headquarters in Munich-Krailling and some in other sales and service locations. This team structure allows us to provide the highest efficiency in engineering, administration, processing and logistics in our headquarters and direct customer support on-site thanks to our locations in different regions.

Our customers value our strictly customer and service oriented approach: HYTORC has its own calibration center for pressure, torque and preload. We support our customers already in the first phase of planning with our CAD Design Center. This allows us to develop customized designs and provide valuable support in planning. The company-owned Akademie der Schraubverbindung in Augsburg provides theoretic and practical further training for management, engineering, quality assurance and assembly and ensures certified bolting expertise in your company. Our unique services such as on-site service and flexible financing solutions round off HYTORC’s portfolio.

Welcome to the world of HYTORC!
HYTORC provides unique solutions

- Experience and competence since 1968
- Fast and safe bolting with constant friction values and without reaction arms
  Hands-free via remote control even in applications overhead, explosion risk areas (ATEX approval) and underwater joints
- Intelligent hydraulic bolting technology in the sense of industry 4.0 and “intelligent factories”*
  Safe assembly processes thanks to perfect monitoring, system transparency, system analysis, bolt management and visualization of process data. The HYTORC system meets all standard minimum requirements according to VDI/VDE 2862-2 and more for bolted joints of category A = high, B = medium and C = low risk assessment
- Sustainably tight flange connections with particularly low leakage rates
  Instead of a product loss of 14.2 kg per year and meter due to manual tightening, a product loss of only 0.1 kg per year and meter is now possible. This is achieved thanks to the simultaneous use of several torque wrenches and one of our five fastening elements with constant friction value
- Maintenance-free bolted joints
  Nominal preload forces can be easily increased by using one of our five fastening elements with constant friction value and/or intelligent and process reliable fastening processes such as yield point controlled tightening or torque/angle tightening
- Comprehensive product range
  in the fields of hydraulic, pneumatic, electric and battery torque wrenches from 50 Nm to 190,000 Nm
- Standard bolted joints
  such as galvanized sets, anchor bolts, rolled bolt threads up to M200 and up to 18 m length of the highest quality and certification for the entire industry
- No-rotation fastening elements with constant friction value
- Lubricants, anti-seize and metal cleaners
- Thread cleaning machines for internal and external threads, nut splitters and lifting devices
- Customer-oriented sales
- On-site service
  For sustainable improvement of your occupational safety, ergonomics and quality, HYTORC supports you on-site, accompanying you during internal audits and shutdowns, on-site inspections, examinations and recalibration of your fastening tools. Great availability thanks to our rental tools
- Akademie der Schraubverbindung
  As a certified learning service provider, we offer different training modules, for example in accordance with DIN EN 1591-4:2013; ASME or OSHA, both in the Academy in Augsburg and on your premises

HYTORC is your one-stop shop for everything related to bolted joints!
HYTORC Bolting Solutions
For applications in many industries

HYTORC’s innovative, mobile bolting techniques are a valuable contribution for the entire industry.

Chemistry & petrochemistry
Oil & gas
Systematic development of the HYTORC flange concept for documented, economically efficient and safe bolting in chemical, oil and gas plants.

Exemplary applications:
• pressurized flanges
• BOP (preventer)
• compressors
• reactors
• fittings
• heat exchangers
• hydrogenators
• catalytic converters
• pumps
• cyclonic separators
• carburetor
and many more

Energy & wind energy
Process-reliable bolting with reduced weight using the yield point controlled tightening method for optimized operation and costs over the entire lifecycle.

Exemplary applications:
• gearbox bolting
• tower bolting
• machine support bolting
• yaw bolting
• blade bolting
• foundation bolt fastening
• mainframe bolting
• shrink disk on gearbox
• brake disc bolting
• clamping set bolting
• shaft-hub-connection
and many more

Machine & plant engineering
Industry 4.0 ready thanks to process controlled, documented bolting systems in accordance with VDI 2230 for maximum loaded and perfectly dimensioned bolted joints.

Exemplary applications:
• container bolting
• pressing
• variable displacement pumps
• cathodic and electrolytic furnaces
• nacelle bolting
• support boltings
• heat exchanger bolting
• bolting of wheel bearings
• bolting of motor mounts
• hexagon bolt fastenings on shredding facilities
• cylinder bolt fastening
• couplings
• bucket wheels
and many more
HYTORC offers unique bolting solutions for different industries and sectors. Among others, this allows us to find entirely new ways to significantly save time during downtimes and internal audits. To make the bolting process safe for the installers, HYTORC provides tools for hands-free tightening and tensioning without reaction arm. This also protects the plants and helps to prevent and significantly reduce damages on components and paintings. Furthermore, flanges can be fastened quickly, safely and entirely tightly with HYTORC. With plane parallel flange joints, we ensure that the ‘TA Luft’ (technical instruction on air quality control) is complied with. This is beneficial both for the environment and for your business. With our unique bolting methods and fastening elements, HYTORC users can master all kinds of challenges and fully document the orderly execution of their jobs at any point in time.

**Heavy industry**
Hydraulic bolting systems with maximum dimensions for torques of several 10,000 Nm. In conformity with VDI/VDE 2862-2 and fully documented.

**Exemplary applications:**
- bolting of wheels and tracks
- module bolting
- slewring gear bolting
- roller slewing ring
- vehicle frame bolting
- input and output flange
- pitman arm
- transverse control arm
- sprocket drum
- tow bar coupling
- operation cylinder bolting
- articulated links
- engine mount bolting
- crane boltings
and many more

**Infrastructure**
Customized systems for safety-relevant bolting and quick realization of repairs for heavily loaded bolted joints in infrastructure projects.

**Exemplary applications:**
- rail vehicles
- utility vehicle engineering
- crane and lifting technology
- bolting of couplings
- slewring gear bolting
- roller slewing ring
- bolting of wheel bearings
- vehicle frame bolting
- input and output flange
- pitman arm
- transverse control arm
- sprocket drum
- tow bar coupling
- operation cylinder bolting
- articulated links
- engine mount bolting
and many more

**Other industries**

**Mining**
- underground and opencast mining

**Shipbuilding and shipyards**
- ship diesel/big engines
- shaft couplings
- marine propellers

**Steel mills**
- bolting of guiding and stability rolls on mill trains
- cylinder bolting
- bending presses
- roll train cassettes on the rolling mill stand
- forging boxes and beds

**Construction companies**
- structural engineering
- civil engineering
- bridge construction

**Steel construction**

**Industry service providers / contractors**

**Public contractors**
- research institutes
- universities
- public utilities
- public service providers
- military

**Elevators and cable cars**
HYTORC's Hydraulic Square Wrenches

Universal tools up to 190,000 Nm for all assembly methods in accordance with VDI 2230 and beyond. No matter what assembly methods and fasteners you choose: HYTORC’s hydraulic square wrenches make axial bolting without reaction arm possible. For the highest performance and occupational safety.
AVANTI Hydraulic Square Wrench
User-friendly multipurpose tool

The AVANTI multipurpose tool can be used for both torque tightening and preload tensioning. Thanks to its compact dimensions and the robust casing, the AVANTI can be used in any working environment.

AVANTI – Benefits
• seven different tightening methods
• hands-free, safe bolting in combination with one out of five friction-optimized fasteners
• precise transfer of torques to the joint and optimized application of preload thanks to reduced bending moments
• automatic rotation angle control for constant preloads
• stepless setting of torques from 135 Nm 190,000 Nm
• reaction arms 360° rotatable around the square axis
• many fields of applications thanks to high user comfort and compact dimensions. Also suitable for applications underwater and explosion risk areas.
Yield point controlled tightening without reaction arm
Fastening without external reaction in confined spaces
Torsion-free preloading of case screws
AVANTI-1 in SimuTORC system for sub-sea applications
Flange assembly with zWasher and AVANTI-3
The AVANTI sets the highest standards for occupational safety: it is operated by pushing a button on the remote control. The tool no longer has to be held in hand. This also holds true for overhead applications.

**AVANTI – Features**
- hydraulic connection can be swiveled 360° × 180°
- robust one-piece housing
- standard square drive with plug fuse
- positioning of the reaction arm by pushing a button
- reaction pawl system
- safety clutches with dust protection
- calibration certificate with new deliveries

**AVANTI – Facts & Figures**

<table>
<thead>
<tr>
<th>Model</th>
<th>AV-0.7</th>
<th>AV-1</th>
<th>AV-3</th>
<th>AV-5</th>
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<td>97</td>
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</table>

Subject to technical modifications. 3D models in STEP upon request: info@hytorc.de
ICE Hydraulic Square Wrench
Multifunctional, safe, compact

The ICE is the intelligent advancement of the AVANTI and groundbreaking for hydraulic tools. The ICE multipurpose tool can be used for both torque tightening and preload tensioning.

ICE – Benefits

- hydraulic connection can be folded and rotated in all levels
- seven different tightening methods
- hands-free, safe bolting in combination with one out of five friction-optimized fasteners
- precise transfer of torques to the joint and optimized application of preload thanks to reduced bending moments
- automatic rotation angle control for consistent preload
- many fields of application thanks to high user comfort, ergonomic design and compact dimensions
- Also suitable for applications underwater and in explosion risk areas
ICE – Features

- hydraulic connection can be rotated by 360° and folded by 180° in two levels
- robust one-piece housing
- standard square drive with plug fuse
- positioning of the reaction arm by pushing a button
- interactive reaction pawl system
- safety clutches with dust protection
- calibration certificate with new deliveries

ICE – Facts & Figures

<table>
<thead>
<tr>
<th>Model</th>
<th>ICE-0.7</th>
<th>ICE-1</th>
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</table>

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MXT hydraulic square wrench
Proven, powerful, robust

The MXT is the compact and proven square wrench for conventional torque-controlled tightening with reaction arm on the cylinder side for applications with small radii.

**MXT – Benefits**

- The MXT wrench is a proven tool that is used all over the world for conventional bolting with reaction arm from 155 Nm to more than 72,000 Nm
- compact, ergonomic design
- robust one-piece housing
- lightweight reaction arm adjustable to 60 positions with centric catch
- reaction pawl system for safely detaching the tool from the workpiece
- automatically operating torque angle control for even preloads
- short set-up times

- Small and large MXT with torques from 60 Nm to 72,000 Nm
- MXT with rotation angle sensor
The MXT is sophisticated, user-friendly and robust. The low-wear ratchet system with coarse pitch and reaction pawl system guarantees a constant rotation angle of 24° with each stroke for direct transfer to preload, even under high loads. The reaction arm is adjustable to 60 positions and is locked in place safely by a quick lock. The wide range of applications of the proven MXT models is rounded off by a comprehensive portfolio of accessories.

**MXT – Features**
- hydraulic connection can be swiveled 360° × 180°
- one-piece housing
- standard square drive with drive-retainer
- torsion-free power head
- reaction pawl system
- constant rotation angle of 24° per stroke
- safety clutches with dust protection
- low-wear gear bearing
- calibration certificate with new deliveries

**MXT – Facts & Figures**

<table>
<thead>
<tr>
<th>Model</th>
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Subject to technical modifications. 3D models in STEP upon request: info@hytorc.de
EDGE Hydraulic Square Wrench
Simple, solid, affordable

The EDGE is a simple and affordable basic hydraulic square wrench that does the job with power and reliability.

EDGE – Benefits

• powerful basic tool for conventional bolting with reaction arm from 116 Nm to more than 40,199 Nm
• compact, ergonomic design
• robust one-piece housing
• drive ratchet with fine teeth with only three moving parts
• lightweight reaction arm adjustable to 60 positions with centric catch
• short set-up times
The EDGE is the perfect basic hydraulic square wrench for simple applications. Thanks to its solid, simple design, its small radii and its short set-up times, the hydraulic power pack is perfect for tightening to torque between 116 Nm and 40,199 Nm. With standard sockets and hex sockets, it is a reliable tool in the hands of experienced installers.

**EDGE – Features**

- hydraulic connection 360° rotatable and 180° foldable
- one-piece aluminum housing
- standard square drive
- safety clutches with dust protection
- drive ratchet with fine teeth
- wide range of high quality accessories for the entire torque range
- calibration certificate with new deliveries

**EDGE – Facts & Figures**

<table>
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<tr>
<th>Model</th>
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<th>EDGE-2</th>
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<th>EDGE-8</th>
<th>EDGE-12</th>
<th>EDGE-30</th>
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<tr>
<td>min. torque Nm</td>
<td>116</td>
<td>223</td>
<td>584</td>
<td>1,174</td>
<td>1,657</td>
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<td>max. torque Nm</td>
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<td>1,559</td>
<td>4,088</td>
<td>8,617</td>
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<td>square drive inch</td>
<td>¾</td>
<td>¾</td>
<td>1</td>
<td>1½</td>
<td>1½</td>
<td>1½</td>
<td>2½</td>
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<td>torque precision %</td>
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<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
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<td>tool weight with reaction arm kg</td>
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<td>2.2</td>
<td>4.9</td>
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<td>radius (R1) mm</td>
<td>21.0</td>
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<td>length (L1) mm</td>
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<td>125.5</td>
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<td>193.4</td>
<td>220.2</td>
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<td>206.8</td>
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<td>length (L3) mm</td>
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<td>30.0</td>
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<td>46.1</td>
<td>53.6</td>
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<tr>
<td>height (H1) mm</td>
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<td>50.0</td>
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<td>80.9</td>
<td>90.7</td>
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<tr>
<td>height (H2) mm</td>
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<td>153.5</td>
<td>166.9</td>
<td>179.6</td>
<td>256.5</td>
</tr>
</tbody>
</table>

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HYTORC’s Hydraulic Wrenches with Interchangeable Cartridges

The three product lines of our especially slim hydraulic wrenches with interchangeable cartridges can be used for all assembly methods in accordance with VDI 2230. Thanks to the interchangeable cartridges and the wide range of accessories, these tools can quickly be adapted to any assembly conditions.

All cartridges are designed for the full tool torque, making them quick, safe and accurate.
The CTS-STEALTH is a very slim multipurpose hydraulic wrench with interchangeable cartridges for tightening and tensioning – all in one system.

**CTS-STEALTH – Benefits**

- compact, ergonomic design and torques up to 42,795 Nm
- super slim design – power head and cartridge have the same height, with no protruding parts
- all cartridges are designed for the full tool torque
- hydraulic dual piston system for high-speed operation
- quick click-on cartridge exchange
- 360° rotatable and 120° foldable hydraulic connection
- all wrench sizes available in metric and inch dimensions and in all special designs
- automatically operating torque angle control for even preloads

**CTS-STEALTH – the right choice for long thread protrusions in the SimuTORC system (simultaneous bolting with two or more equal tools)**

![CTS-STEALTH with zWasher](image-url)

![Cartridge exchange within seconds with the click-on system. No lose parts, nothing can be lost.](image-url)
SimulTORC assembly system with Eco2TOUCH

Flat and fast: Application on a wind turbine

The CTS-STEALTH is perfect for bolting in confined spaces

The CTS-STEALTH is perfect for adapting any wrench sizes

CTS-STEALTH-2 in action on the NYC Freedom Tower
The CTS-STEALTH is the groundbreaking hydraulic limited clearance tool with super slim interchangeable cartridges, the smallest radii and high torques. The power system has the same height as the cartridges and is equipped with an automatic dual piston system generating very high speeds. The interchangeable cartridge is inserted quickly and directly into the tool.

**CTS-STEALTH – Equipment**

- hydraulic connection can be swiveled 360° × 120°
- robust one-piece housing
- constant rotation angle with every stroke
- reaction pawl system
- low-wear gear bearing
- safety clutches with dust protection
- calibration certificate with new deliveries

**CTS-STEALTH – Facts & Figures**

<table>
<thead>
<tr>
<th>Model</th>
<th>STEALTH-2</th>
<th>STEALTH-4</th>
<th>STEALTH-8</th>
<th>STEALTH-14</th>
<th>STEALTH-22</th>
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<tbody>
<tr>
<td>min. torque Nm</td>
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<td>2,760</td>
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<td>max. torque Nm</td>
<td>2,573</td>
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<td>10,990</td>
<td>19,622</td>
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<td>wrench size mm</td>
<td>19–60</td>
<td>36–80</td>
<td>50–100</td>
<td>70–120</td>
<td>75–145</td>
<td>90–165</td>
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<tr>
<td>torque precision %</td>
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<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
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<tr>
<td>tool weight kg</td>
<td>depending on wrench size</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>length (L) mm</td>
<td>140.5</td>
<td>166.7</td>
<td>203.1</td>
<td>237.5</td>
<td>274.2</td>
<td>322.8</td>
</tr>
<tr>
<td>height (H) mm</td>
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<tr>
<td>width (W) mm</td>
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<td>54.0</td>
<td>64.0</td>
<td>74.0</td>
<td>87.0</td>
</tr>
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</table>

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XLCTB Hydraulic Wrench with Interchangeable Cartridges
Compact, proven, robust

The XLCTB is the proven hydraulic wrench with interchangeable cartridges for universal use with hex sockets and square ratchet cartridges.

XLCTB – Benefits
- torques up to more than 81,617 Nm
- compact, ergonomic design
- robust one-piece housing
- interchangeable square cartridges and ratchet links available, optionally with hex or double hex and many adaption possibilities
- reaction pawl system for constant rotation angles
- wrench sizes available in metric and inch dimensions
- many individual customized options available
- automatically operating torque angle control for even preloads
- reaction force support on the entire length of the cassette
- long life thanks to modified proven technology

NEW: reaction force support on the entire length
NEW: long life thanks to modified proven technology

XLCTB for cutting ring pipe coupling
Special tool for foundation bolts in confined heights
The XLCTB is a universal bolting tool that is extremely flexible thanks to individual adaptation and special solutions. The basis is a torsion-free power head and standard ratchet hex wrenches or square ratchet wrenches in different sizes. The XLCTB is fast, extremely precise and absolutely reliable. With its many options for expansion, anything is possible in practical applications with the XLCTB.

**XLCTB – Features**
- hydraulic connection can be swiveled 360° × 360°
- torsion-free power head
- reaction pawl system
- constant rotation angle with every stroke
- safety clutches
- low-wear gear bearing
- calibration certificate with new deliveries

**XLCTB – Facts & Figures**

<table>
<thead>
<tr>
<th>Modell</th>
<th>XLCTB-2</th>
<th>XLCTB-4</th>
<th>XLCTB-8</th>
<th>XLCTB-14</th>
<th>XLCTB-18</th>
<th>XLCTB-30</th>
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<td>50–100</td>
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<td>75–145</td>
<td>90–155</td>
<td>95–190</td>
<td>150–295</td>
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<tr>
<td>torque precision %</td>
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<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
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<tr>
<td>tool weight kg</td>
<td>depending on wrench size</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>length [L] mm</td>
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<td>340.0</td>
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<td>width [W] mm</td>
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<td>64.0</td>
<td>72.0</td>
<td>85.0</td>
<td>100.0</td>
<td>106.0</td>
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</table>

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VERSA Hydraulic Wrench with Interchangeable Cartridges
Simple. solid. affordable

The VERSA is a simple, affordable and slim basic hydraulic square wrench with interchangeable cartridges that does the job with power and reliability.

VERSA – Benefits
- slim and fast – perfect for confined spaces
- compact design for torques from 197 Nm to 49.860 Nm
- drive ratchet with fine teeth with only three moving parts
- interchangeable cartridges from 24 mm to 165 mm with hex or double hex and many adaption possibilities
- low weight and short set-up times
Considering the favorable purchasing price, the features and the wide range of high quality accessories, the VERSA is the perfect tool for precise conventional torque-controlled tightening. Thanks to its simple design and small radii, it is the perfect choice especially in areas that are hard to access and in extremely confined spaces. Short set-up times and quick switching from tightening to loosening mode as well as accurate bolting to torque up to more than 49,860 Nm make it the perfect basic hydraulic wrench with interchangeable cartridges.

### VERSA – Features
- hydraulic connection 360° rotatable and 120° foldable, resp. 360° rotatable and rigid
- low-wear gear bearing
- safety clutches with dust protection
- calibration certificate with new deliveries

### VERSA – Facts & Figures

<table>
<thead>
<tr>
<th>Model</th>
<th>VERSA-1</th>
<th>VERSA-2</th>
<th>VERSA-4</th>
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<td>50–100</td>
<td>70–120</td>
<td>70–130</td>
<td>85–165</td>
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<tr>
<td>torque precision %</td>
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<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
<td>± 2.5</td>
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<tr>
<td>tool weight kg</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>length [L] mm</td>
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<td>136.0</td>
<td>180.0</td>
<td>218.0</td>
<td>267.0</td>
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<td>353.0</td>
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<tr>
<td>height [H] mm</td>
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<td>95.0</td>
<td>140.0</td>
<td>166.0</td>
<td>204.0</td>
<td>225.0</td>
<td>278.0</td>
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<tr>
<td>width [W] mm</td>
<td>24.0</td>
<td>29.0</td>
<td>38.0</td>
<td>48.0</td>
<td>60.0</td>
<td>73.0</td>
<td>76.0</td>
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</table>

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HYTORC – Your partner for high-quality accessories and customized solutions

For the benefit of our users, the highest quality standards apply when we select, produce and process our original equipment. This is ensured with our quality control in accordance with ISO 9001 and our own process controlling. This is especially important when it comes to customer specific customized solutions.
The entire range
High-quality accessories by HYTORC

The wide range of our outstanding torque tools is rounded off by an unrivaled comprehensive range of accessories.

HYTORC provides a broad range of accessories with socket wrenches, backup wrenches, hoses and much more.

Quality control in accordance with the ISO 9001 quality process and our own process controlling ensure the highest quality standards. With this, we meet both national and international standards, such as ISO 2725-2 and the German standard DIN 3129.

This is a solid foundation on which we can promote our own technologies for your benefit and further increase our technological lead. Upon the customer’s request we also produce customized equipment. True to the motto “anything is possible”, we are your strong partner for accessories.

Standard sockets in accordance with DIN 3129:2012-03
To ensure safe transmission of high torques with sockets, the highest quality requirements for production processes, durability and safety must be guaranteed. This also includes the exact and application-specific design of these important components of force transmission considering international standards such as ISO 1174-2, 1703, 1711-2, 2725-2 and 2725-3. Our standard range of stock for sockets includes square drives up to 2½ inch and wrench sizes up to 200 mm for all metric dimensions. This allows HYTORC to deliver within only a few hours.

Standard sockets for cylinder head bolts in accordance with ISO 4762
The selection of the right nut is crucial for occupational safety. Cylinder head bolts, also known as Inbus bolts, are among the fasteners that require particular care, especially for loosening. HYTORC designed a range of products in which all hexagon sockets of one square size have the same total length. This ensures that, with all wrench sizes, the reaction arm always diverts the counter torque on the same reaction level. Long hex sockets and adapters are also available for all ISO 4762 cylinder head bolts. Available in both metric and inch dimensions.

Stack sockets for bolted joints with long bolt protrusions
Stack sockets are a special solution and have for many years been a proven concept for all exchangeable link wrenches. These sockets have both an internal and an external hex. HYTORC’s stack sockets have tension-free hex corners, individually adapted heights, through-holes for the individual thread sizes and smaller dimensions than standard exchangeable link wrenches. And of course, HYTORC also provides the corresponding reaction arms.

High quality accessories made by HYTORC
Accessories for square torque wrenches

• sockets in mm and inch up to wrench size 200
• square drive from ¾” to 2½”
• direct drive sockets for all nut sizes
• direct hex drives for all nut sizes
• hex sockets in mm up to wrench size 100

Accessories for Limited Clearance Hydraulic Wrenches

• stack sockets tailor-made to customers’ requirements
• inbus adapter
• square adapter
• hex click-in links
• double-hex sockets

Reaction Fixtures

• custom-made for all torque tools
• axial reaction arm extensions
• in-line reaction arms
• adjustable 360°/360° rotation reaction arms
• TwinTORC reaction arms

Backups

• hydraulic backups up to 5,000 Nm with interchangeable double-hex sockets
• mechanic backups for all torque ranges
• models with double hex
• also available as customized solutions
Offset Link Cartridge System
- with interchangeable hex adapters
- clockwise and counterclockwise operation
- different torque levels
- compatible with jGUN, FlashGUN-DE, ICE and AVANTI
- available as a complete set in mm or inch

Reaction Extensions
- made of aluminum or steel
- one-piece, welded, bolted
- for all CTS-STEALTH, XLCTB or VERSA tools
- also for ICE, AVANTI, MXT and EDGE
- available in customized lengths

Hydraulic Hoses and Equipment
- available with clutches from all manufacturers
- nanometers class 1.0 and 0.25
- hoses with 5 m or 10 m length
- tested in accordance with BGR237
- burst pressure 2,800 bar (four times increased safety)
- customized lengths available upon request

flangeFIX
For simple, quick and safe marking of the order of assembly on all flange connections
- saves 70% of time during flange labeling
- for ANSI B16.5 – ANSI B16.47B and EN 1092 Type11
- for standardized and correct assemblies
- can be used in every assembly situation
- for all 1-TOOL-, 2-TOOL- and 4-TOOL assemblies
- also suitable for special flanges and for flanges on machines
- for one-time or repeated use
- customizable with your company logo, QR code, RFID chip
HYTORC’s thread cleaning system
For male and female threads

Clean internal and external threads are a fundamental requirement for precise fastening.

Clean internal and external threads are a fundamental requirement for precise fastening. Without this, a precise assembly preload is not possible. This holds true for both the internal thread of the nut and its contact areas as well as for the external thread of the bolt and its shank.

Automatically adjustable thread cleaners for internal and external threads
- simple, easy and quick operation
- compact and ergonomic design
- brushing wheels with safe spring suspension
- almost no wear
- no service or maintenance costs
- fixed and adjustable female thread cleaners
- optionally with extraction
- available as a full set in a case
Cleaner for external threads
The cleaners for external threads perfectly clean threaded bolts from size M8 to M230. The patented brush system enables automatic and stepless adjustment to the thread diameter in the corresponding range. The thread grooves and the threaded shaft can both be cleaned in the same step. The grooves of the threads are cleaned from all sides; adhering dust and dirt is removed perfectly and the surfaces are smoothed out. This creates a uniform friction value in the thread. The stainless steel brushes with spring suspension are located in a solid aluminum housing. By turning the engagement ring, pressure on the brushes is adjusted steplessly in the entire range. This creates the perfect settings for the individual cleaning job.

<table>
<thead>
<tr>
<th>Type of tool/model</th>
<th>application area</th>
<th>max. external ø</th>
<th>particulate extraction</th>
<th>min. bolt distance</th>
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<tbody>
<tr>
<td>DEV-ARG 10-27</td>
<td>M10-M27</td>
<td>100 mm</td>
<td>optionally available</td>
<td>62-79 mm (M10-M27)</td>
</tr>
<tr>
<td>DEV-ARG 20-55</td>
<td>M22-M54</td>
<td>150 mm</td>
<td>optionally available</td>
<td>99-133 mm (M22-M54)</td>
</tr>
<tr>
<td>DEV-ARG 35-70</td>
<td>M36-M68</td>
<td>160 mm</td>
<td>optionally available</td>
<td>118-150 mm (M36-M68)</td>
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<td>DEV-ARG 50-90</td>
<td>M52-M88</td>
<td>185 mm</td>
<td>optionally available</td>
<td>147-183 mm (M52-M88)</td>
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<td>DEV-ARG 90-120</td>
<td>M86-M120</td>
<td>212 mm</td>
<td>optionally available</td>
<td>194-228 mm (M86-M120)</td>
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</tbody>
</table>

Cleaner for internal threads
The cleaners for internal threads perfectly clean threaded holes from size M60 to M210. The patented technology enables automatic and stepless adjustment to the thread diameter in the corresponding range. For sizes M8 to M70, a set with special individual brushes is available. The grooves of the threads are cleaned from all sides, and the cleaner for internal threads removes adhering dust and dirt perfectly and the surfaces are smoothed out. This creates a uniform friction value in the thread. The stainless steel brushes are held by a brush support made of aluminum. After loosening the bolt and subsequent turning of the engagement ring, the brushes are steplessly adjusted to the desired thread diameter (in the corresponding range).

<table>
<thead>
<tr>
<th>Brush type</th>
<th>application area</th>
<th>max. external ø</th>
<th>particulate extraction</th>
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<tbody>
<tr>
<td>individual brushes</td>
<td>M8-M56</td>
<td>depending on the thread</td>
<td>optionally available</td>
</tr>
<tr>
<td>DEV-IK-6070</td>
<td>M60-M72</td>
<td>3 x 30 mm</td>
<td>optionally available</td>
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<tr>
<td>DEV-IK-7080</td>
<td>M72-M80</td>
<td>3 x 30 mm</td>
<td>optionally available</td>
</tr>
<tr>
<td>DEV-IK-8090</td>
<td>M80-M90</td>
<td>3 x 30 mm</td>
<td>optionally available</td>
</tr>
<tr>
<td>DEV-IK-9011</td>
<td>M90-M110</td>
<td>3 x 40 mm</td>
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</tr>
<tr>
<td>DEV-IK-1113</td>
<td>M110-M130</td>
<td>3 x 40 mm</td>
<td>optionally available</td>
</tr>
<tr>
<td>DEV-ISK-1027</td>
<td>Female thread sets in a case with drive machine from size M8 to M27.</td>
<td></td>
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</tr>
<tr>
<td>DEV-ISK-0872</td>
<td>Male thread sets in a case with drive machine from size M8 to M72.</td>
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</tr>
</tbody>
</table>
HYTORC lubricants
Designed for perfect joints

For lubricants and their application, HYTORC also provides expert consultation and perfect services.

Lubricants recommended by our experts ensure that the nominal bolt forces are safely reached thanks to the perfect interaction of all components of the bolted joint.

Our customers benefit twice from our lubricants: On the one hand, they get everything they need for bolting from a one-stop shop. And on the other hand, our high quality lubricants are precisely adapted to the corresponding area of application. Thanks to many decades of experience in the field of bolting, we have great expertise and have come across all kinds of challenges in this field on site. We make use of this experience when we developed the lubricants. Therefore, they meet real-life requirements.

Cleaners and lubricating pastes

- **HY.50 special lubricant** μmin. 0.08 is the perfect choice for clean non-destructive assembly and for inlet optimization of highly loaded bolts

- **HY.52 special lubricant** μmin. 0.09 is the perfect choice for assembly purposes and for the inlet of slowly running machine elements (also four-color metals and stainless steel)

- **HY.55 hot thread paste** μmin. 0.10 the perfect face for high-temperature applications up to +1,200 °C

- **HY.56 high-temperature paste** μmin. 0.12 bolt paste for high temperature applications up to +1,000 °C, developed especially for application on flange connections

- **HY.61 anti-seize** with loosening properties

- **HY.73 metal cleaner**

- **DISC.08 anti-friction coating spray** air drying anti-friction coating spray for constant friction coefficients - the perfect choice for hex nuts used with the DISC
Standard Fastening Elements

HYTORC’s C parts are 1A components

HYTORC is a full range provider, delivering every product with corresponding certificates in accordance with EN 10204.

Oftentimes, the importance of bolts, nuts, discs and fasteners in plants is underestimated. The truth is, these so-called C parts are indispensable for proper functioning.

At HYTORC, these C parts are always 1A components. Because the quality of the fastening elements is decisive for perfect joints that ensure safe and trouble-free operation of the plant. For our customers, we do not only provide detailed design and customized production, quality assurance and certification, but we also take care of procuring all required fastening elements. For HYTORC, being a one-stop shop includes the right corrosion protection and the use of suitable lubricants and test methods.

Our production possibilities
• external and internal threads up to M200 and up to 18 m length
• all threads available and inch dimensions
• bolts in accordance with, among others, ISO 4014, ISO 4017, ISO 4762, EN 14399
• pins and tension bolts in accordance with DIN, ASTM, AISI and UNS
• hex nuts in accordance with DIN 934, DIN 2510 and ASTM A193
• certification EN 10204
• heat treatment
• hot and cold working
• surface coating, e.g. zinc flake coating, ecologically galvanized or hot-dip galvanized
• company-owned laboratory test methods

Our testing possibilities
• chemical analysis (up to 20 elements)
• bending moment determination with the Charpy impact test up to -150 °C
• surface crack testing (two methods)
• spectral analysis
• tensile test (test device up to 600 kN)
• hardness test HRC and HRB
• determination of surface roughness (measuring machine)
• determination of coating thickness
• preload force measurement up to M90 and 3000 kN
Innovative Fastening Elements
For all assemblies and applications

HYTORC provides innovative fasteners for every kind of assembly: Washer System, DISC, CLAMP, SmartSTUD and JustBOLT For high-strength joints, for connections with high temperature resistance and for perfect surface protection at full capacity of the bolted joint.

**Washer System**
No reaction arm and no backup wrench needed thanks to anti-turn washers

The zWasher is an anti-turn washer that both serves as axial reaction element and ensures a defined friction coefficient. It is designed in such a way that all standard bolts can be axially preloaded. The Backup Washer also ensures that the locknut does not turn. No backup wrenches needed. The use of washers for optimization of friction is stipulated in sets of rules and regulations such as ASME PCC 1 and VDI 2200-2007-07.

**DISC Hexagon Washer**
For bolting without rotation and with optimized fiction

DISC hexagon washers make preloading of bolted joints with hex nuts much easier. The calibrated torque of the assembly tool is transformed into a reproducible preload force through the constant friction coefficients. The DISC ensures that the joined elements and the locknut do not turn during assembly. Traditional backup wrenches are no longer needed and the assembly tools can be fitted directly on the DISC.
The CLAMP tension nut is a mechanical preload system that can be calibrated and that can be used for almost every application to 450 °C. The CLAMP tension nut makes preloading of bolted joints much easier and much more safe. The torque is directly transformed into a reproducible preload force. The bolted joint is free from torsional or lateral forces and with a preload force accuracy of ±5%.

The SmartSTUD is a bolt with three components that is tightened without torsion. The bolt is designed either as waisted shank or full-shank bolt. With this simple design of the system, it is possible to tension axially and free from torsional or lateral forces for the first time. The dimensions of the SmartSTUD have been optimized so that the outer diameter corresponds to Inbus bolts and capped nuts in accordance with DIN 2510. Therefore, the SmartSTUD is creep resistant up to 600 °C.

JustBOLT is the simplified version of the SmartSTUD. JustBOLTs are available from size M20 and can be precisely axially preloaded. Axial tightening makes the friction coefficient much more consistent and steady than conventionally tightened bolted joints. This assembly concept is especially favorable in assemblies in confined installation spaces. Users can also replace Inbus connections in accordance with ISO 4762 with JustBOLTs and tighten safely, quickly and free from torsional or lateral forces without reaction arm. Without any design changes.
Reliable Hydraulic Power Packs
Robust, reliable, compact, fast

HYTORC hydraulic power packs are especially designed and constructed for HYTORC hydraulic tools. The most important features of the hydraulic pumps are their robustness, reliability, compact design, precision and high speed. They also have a noise level of less than 80 dB.

VECTOR
230 Volt (50 + 60 Hz)

The VECTOR controls every tool individually and switches off when all connected hydraulic tools have reached the target torque, while simultaneously recording the data.

- 3-stage compact high-performance hydraulic power pack
- usable at 50 Hz and 60 Hz
- standard remote control 5 m

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output of the electric motor</td>
<td>1.5 kW</td>
</tr>
<tr>
<td>Capacity low pressure level</td>
<td>10 l/min</td>
</tr>
<tr>
<td>Capacity medium pressure level</td>
<td>2.2 l/min</td>
</tr>
<tr>
<td>Capacity high pressure level</td>
<td>1.0 l/min</td>
</tr>
<tr>
<td>Weight without oil</td>
<td>37 kg</td>
</tr>
</tbody>
</table>

MiniJet
230 Volt (50 + 60 Hz)

- 2-stage hydraulic power pack
- compact, small and lightweight design
- usable at 50 Hz or 60 Hz
- standard remote control 5 m
- analog manometer class 1.0 filled with glycerin

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output of the electric motor</td>
<td>0.6 kW</td>
</tr>
<tr>
<td>Capacity low pressure level</td>
<td>4 l/min</td>
</tr>
<tr>
<td>Capacity high pressure level</td>
<td>0.4 l/min</td>
</tr>
<tr>
<td>Weight without oil</td>
<td>14 kg</td>
</tr>
</tbody>
</table>

JetPro 5.3
230 Volt

- 3-stage hydraulic power pack
- compact, small and lightweight design
- usable only at 50 Hz
- standard remote control 5 m
- analog manometer class 1.0 filled with glycerin

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output of the electric motor</td>
<td>0.6 kW</td>
</tr>
<tr>
<td>Capacity low pressure level</td>
<td>9 l/min</td>
</tr>
<tr>
<td>Capacity high pressure level</td>
<td>0.5 l/min</td>
</tr>
<tr>
<td>Weight without oil</td>
<td>15 kg</td>
</tr>
</tbody>
</table>
EcoPUMP
230 Volt / 400 Volt (50 + 60 Hz)
Can be upgraded to a process pump Eco2TOUCH

- The modular system allows customized upgrades
- Usable at 50 Hz or 60 Hz
- Capacity 5 to 15 L, adaptable at any time
- Manual or automatic control
- Can be upgraded to Eco2TOUCH system / complete documentation
- Can be upgraded with display remote control “Control” for process-reliable bolting with torque-controlled, torque angle-controlled and torque-controlled/rotation angle-monitored tightening (without data recording)
- Operation with control and reference parameters
- Setting parameters of the application on process display

Weight without oil: 26 kg

JetPro 9.3
230 Volt (50 + 60 Hz)

- 3-stage compact high-performance hydraulic power pack
- Usable at 50 Hz and 60 Hz
- Standard remote control 5 m
- Analog manometer class 1.0 filled with glycerin
- Also available with digital manometer

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output of the electric motor</td>
<td>1.5 kW</td>
</tr>
<tr>
<td>Capacity low pressure level</td>
<td>10 l/min</td>
</tr>
<tr>
<td>Capacity medium pressure level</td>
<td>2.2 l/min</td>
</tr>
<tr>
<td>Capacity high pressure level</td>
<td>1.0 l/min</td>
</tr>
<tr>
<td>Weight without oil</td>
<td>22 kg</td>
</tr>
</tbody>
</table>

JetPro 18.3
400 Volt

- 3-stage compact high-performance hydraulic power pack
- Usable only at 50 Hz
- Standard remote control 5 m
- Analog manometer class 1.0 filled with glycerin
- Also available with digital manometer

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output of the electric motor</td>
<td>3.0 kW</td>
</tr>
<tr>
<td>Capacity low pressure level</td>
<td>17 l/min</td>
</tr>
<tr>
<td>Capacity medium pressure level</td>
<td>6.0 l/min</td>
</tr>
<tr>
<td>Capacity high pressure level</td>
<td>2.0 l/min</td>
</tr>
<tr>
<td>Weight without oil</td>
<td>29 kg</td>
</tr>
</tbody>
</table>

JetAir 12.3
Air

- 3-stage compact high-performance hydraulic power pack
- Standard remote control 5 m
- Analog manometer class 1.0 filled with glycerin
- ATEX approval: EPS 12 ATEX 2 489 X and EX II 2 G EX c IIB T4

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity low pressure level</td>
<td>11 l/min</td>
</tr>
<tr>
<td>Capacity medium pressure level</td>
<td>2.5 l/min</td>
</tr>
<tr>
<td>Capacity high pressure level</td>
<td>1.1 l/min</td>
</tr>
<tr>
<td>Weight without oil</td>
<td>22 kg</td>
</tr>
</tbody>
</table>
Power takes control: HYTORC hydraulic power packs

Our current product range comprises cutting-edge standard, semi and fully automatic and process controlled hydraulic power packs. For every application and specification, we can provide the perfect hydraulic power pack.

The EcoPUMP product line, for example, can be upgraded with technology at any time for perfect profitability.
Groundbreaking mobile hydraulic bolting process control with automatic documentation and data recording
EcoPUMP with Eco2TOUCH control

Mobile, process-reliable, automated bolting, assessment, documentation and statistics for all safety-relevant bolted joints from 60 Nm to 65,000 Nm – made by HYTORC.

The Eco2TOUCH control was developed to meet the requirements of the new industrial standard 4.0 and is the consequent advancement of our successful SmartPUMP. All process parameters to comply with, among others, the requirements of VDI/VDE 2862 sheet 2: “Minimum requirements for application of fastening systems and tools” have been integrated into the system.

The hydraulic system is based on the standard EcoPUMP / 230 Volt / 400 Volt (50 + 60 Hz). The EcoPUMP is an outstandingly reliable and powerful hydraulic power pack that has been tried and tested for several years already. The corresponding electronic control unit is the Eco2TOUCH control, which is cutting-edge processor technology. It is positioned on the EcoPUMP and is controlled via a touch display. Existing EcoPUMPs can be easily upgraded with the Eco2TOUCH control. This unique control allows safe tightening of any bolt to the maximum with intuitive and simple touch operation. Without the need to enter any complicated tightening parameters or the like, the hydraulic power pack is simply controlled via the touch display with icons, just like on a smartphone. The parameters are set independently from any external operating systems and without using a laptop or PC.
With the Eco2TOUCH control, HYTORC does not only meet the minimum requirements laid down in VDI / VDE 2862 sheet 2 for application of fastening systems and tools in plant construction, mechanical engineering, equipment manufacturing and for flange connections in components under pressure, but goes much further. Thanks to its modular design, the control offers individual, flexible and user-oriented process and documentation solutions. If required, detachable rotation angle sensors are mounted to the HYTORC hydraulic standard torque tools that measure and monitor the rotation angle during the tightening process. The torque is measured on the EcoPUMP. During the tightening process, the Eco2TOUCH control monitors and measures the pressure, the corresponding increase of torque and the rotation angle.

Benefits of the Eco2TOUCH:
- process reliable, automated bolting, assessment, documentation and statistics, especially for all safety relevant bolted joints with category A = high risk assessment, risk for life and limb and the environment or B = medium risk assessment, malfunction or plant downtime
- know and act in advance: for every individual tightening process on bolted joints, the system detects if the tightening process is carried out in accordance with the user’s settings
- detection of abnormalities with statistics tools and integrated multi graph display
- the perfect quality and analysis tool for your bolted joints
- mobile, suitable for construction sites, field-proven and easy to operate
- simplifies documentation of product safety
- meets all the requirements in accordance with VDI / VDE 2862-2; DIN 25201-7, ISO and more
- standardization of bolting processes
- independent from external operating systems, laptops and PCs
- individual, flexible and expandable at any time

Eco2TOUCH features
- nine different assembly methods possible
- assessment of every individual bolting process
- provision of process parameters in Excel (XLS), text (TXT), graphic files (PNG) and protocol files (PDF)
- WLAN access on touch display
- remote maintenance access
- process capability test in accordance with VDI / VDE 2645-2
- perfectly suitable for production, on construction sites or in the field (e.g. for set-up, shut-off, service and maintenance works); also in quality assurance or research and development departments as well as research institutes and universities
- separate oil circuits for temperature optimization
- data comparison with random process data from the same tightening method
- selection and depiction of individual curves on the multi graph display
- additional text can be entered for individual curve documentation
- manual OK possible for joints that cannot be tested or bolted
- customer specific file names / extensions
The new hydraulic power pack Eco2TOUCH includes the entire VDI/VDE 2862 sheet 2 and much more. The entire mobile package was specifically designed for industry 4.0 applications.

HYTORC’s Eco2TOUCH meets the minimum requirements from VDI/VDE 2862 – sheet 2 for category A and B bolted joints, e.g.:

- directly measured control value (such as torque, rotation angle, elongation, pressure)
- directly measured reference value (such as torque, rotation angle, elongation, pressure)
- control and reference values may not be identical
- provision of bolting results for further processing
- accurate data recording thanks to the discontinuous operating mode of the hydraulic torque tool, monitored by the Eco2TOUCH control
- assessment of every individual bolting process
- provision of process parameters as text (CSV) and graphic files (PDF)
- system monitoring by means of a self-test for all components relevant for the control and reference values
- redundant parameter recording via optional industrial interfaces

**Tightening methods with Eco2TOUCH control**

- **DGA**: Torque-controlled tightening
- **DGD**: Torque-controlled/angle-monitored tightening
- **DGS**: Torque-controlled/yield point-monitored tightening
- **DDW**: Torque-angle-controlled tightening
- **DDW**: Torque-angle for detecting how much torque is required for further rotation of an already firmly fastened bolted joint. This is an approved measuring method in accordance with VDI/VDE 2645 sheet 3 (process capability test)
- **SGA**: Yield point-controlled tightening
- **SGD**: Yield point-controlled/angle-monitored tightening
- **EXT**: Externally controlled tightening with random measuring sensors with standard industry interface 0..10V / 0...20mA / 4...20mA
- **ANA**: Analysis tool for controlling the static rotation angle in bolts tightened with torque control (with rotation angle sensor)
- **SEQ**: Sequence linking of all named methods in a random automated order
- **SPSK**: Bolting process statistics: Statistic assessment of the measured process parameters. Can also be used as measuring equipment for process capability tests
- **PF**: Software module process capability
Connections with know-how
Overview of tightening methods

Bolted joints are by far the most important separable joints in the industry. Machines and plants with ever larger dimensions require ever larger fastening elements, and existing fastening elements must have a higher and more precise preload. HYTORC has the right solutions.

Nowadays, more than 90% of all bolted joints are preloaded by rotation. The most frequently used method by far is torque-controlled tightening. Apart from that, torque-angle-controlled and yield point-controlled tightening are becoming more and more popular.

Nowadays, engineers can determine the required minimum preload of a bolted joint with better methods than ever. HYTORC developed the right methods to meet the more and more challenging requirements. We would like to present the most important and most common methods.

In the hydraulic torque-controlled tightening method, the torque tool stops when reaching a pre-set torque, or signalizes that it has reached the target torque. For this method, it is very important to know the friction details. The friction behavior is influenced by both the lubricant and the quality of the components and their surfaces. To make sure that no inaccuracies in the torque are added to the scattering of friction, HYTORC developed especially precise torque tools. With hydraulic torque tools, differences in the tightening torque result mostly from the change of the lever arm during tightening.

The drive pawl optimizes the direct preload transfer to the bolt via the set torque. The drive pawl also significantly increases the fastening speed of HYTORC’s hydraulic torque wrenches. As the tightening torque increases directly when the hydraulic pressure increases, the bolted joint is preloaded in steps. The entire tightening process for each bolt can be documented with the Eco2TOUCH.

The fastening elements DISC, zWasher, CLAMP, tension nut, SmartSTUD and justBOLT even enable axial tightening with no lateral force with a preload accuracy of ±5%.

The torque-controlled tightening method is suitable for all bolted joints up to torques of approximately 200,000 Nm. The torque calculations define suitable lubricants to prevent seizure or fretting. It should be used for applications on flange connections as SIMULTORC assembly system with anti-turn washers to prevent damages on flange contact areas.

VDI 2230 tightening factor conventional: αA 1.4 – 1.6
VDI 2230 tightening factor friction optimized: αA 1.1 – 1.2
VDI 2230 tightening factor friction controlled: αA 1.0 – 1.1
This takes advantage of the fact that when tightening bolted joints by means of mutual torsion of the nut and the bolt not only AXIAL, but also TORSIONAL stress is used as a consequence of thread friction. Yielding of the bolt starts when the reference stress of tension and torsion reaches the material's yield point. Immediately after the preload is applied, 50% of the torsion share in the bolt springs back. Therefore, the reference stress decreases, while the preload remains and the yield point-controlled preloaded connection re-gains an elastic connection reserve. Superelastic tightening of bolted joints by means of yield point-exceeding assembly methods (yield point- and rotation angle-controlled tightening) is used with increasing success. It allows for optimum use of the bolt during tightening and generates maximum possible assembly preloads.

This does not reduce the durability of the joint, but actually significantly improves it:

- the elastic spring back of the bolting system after assembly leads to partial relief of the torsion tension applied during tightening not only in the tensioned component, but also in the bolt. This releases stress reserves for later operational loads.

- With the plasticizing process in the bolt and nut thread while the preload is applied and exceeding the yield point, a constant distribution of the thread load is created, at least part of which remains even after relieving back to the elastic range.

- If further plasticizing of the bolt occurs due to the operating force FA, the bolt load relaxation FZ that is always linked to this will return the connection to the elastic deformation range.

In case of subsequent vibration stress at a preload level below the yield point, even higher durability values for the bolted joint can be achieved because of improved load distribution and possible load-indicated pressure-inherent tensions. This holds true for bolts rolled before and after heat treatment. The hydraulic yield point-controlled tightening is a superelastic tightening method in which the start of yielding of the bolt serves as the control parameter for the preload. Independent from the friction under the head, the bolt is tightened until the yield point is exceeded because of the load from tension and torsion stress.

Just like with hydraulic torque-angle-controlled tightening, the components have to be preloaded to a rotation angle starting torque. The rotation angle starting torque can be set according to pretightening. The assembly process stops when the angle is exceeded, but can be continued upon the operator's request. During further tightening, torque and rotation angle are continuously measured and the gradient is calculated. The measuring technology detects the end of the elastic range and ends the bolting process at the preset gradient change. As the bolt is only plasticly deformed to a very low degree, even bolted joints with short grip lengths can be tightened with the yield point-controlled method. During the tightening process, all process parameters are controlled, documented and archived by the Eco2TOUCH control. The plastic elongation of bolted joints during assembly is very small, so that it hardly influences the reusability of yield point-controlled bolted joints. The hardness of the application, the rotation angle starting torque and the shutoff criteria should be adapted to every individual bolted joint.

This tightening method is especially suitable for bolted joints with short grip lengths and for fastening systems on construction sites. Bolted joints that are hydraulically fastened with the yield point-controlled method can, in general, be reused. However, suitable lubricants have to be used to prevent seizure or fretting.

VDI 2230 tightening factor: not applicable!
Bolted joints cannot break in yield point-controlled tightening. See comment VDI 2230 - Nov. 2015 Table A8.
**DDW**
The hydraulic torque-angle-controlled tightening method

The hydraulic torque-angle-controlled tightening method indirectly measures the elongation of the bolt. With the thread pitch, a precise rotation angle can be linked to a defined change of length of the bolted joint. Both the compression strain within the clamped parts and the elastic and plastic deformations occurring in the interfaces until full contact are measured. However, this measurement can only be used for defining the preload if the rotation angle is actually transferred into a change of length of the bolted joint. Therefore, it must be ensured that all interfaces are perfectly superimposed with a defined rotation angle starting torque prior to angle measurement, and that the components to be tensioned can withstand the required surface pressure. Precise calculations are critical here. The hydraulic torque-angle-controlled tightening method developed by HYTORC not only monitors the rotation angle starting torque and the rotation angle, but also the final torque. The system does not approve the tightening process as correctly terminated until the required rotation angle and the final torque are within the required parameter range. Accuracy can be increased even further when the bolted joint is tightened to the superelastic range. During the tightening process, all process parameters are controlled, documented and archived by the Eco2TOUCH control. This tightening method is especially suitable for bolted joints with short grip lengths and in production processes/production lines. It may only be used when bolted joints in accordance with ISO 4014, ISO 4017 and ISO 4762 in threaded holes (blind holes) are assembled. Furthermore, suitable lubricants are to be used to prevent seizure or fretting.

VDI 2230 tightening factor: αA 1.2 - 1.4

**DDW**: Torque-angle for detecting how much torque is required for further rotation of an already firmly fastened bolted joint. This is an approved measuring method in accordance with VDI/VDE 2645 sheet 3 (process capability test). The parameters are the rotation angle starting torque and the static angle. The rotation angle starting torque is defined at ca. 50% of the original tightening torque. The static angle is ca. 5° to 10°. The bolted joint shifts from static friction to dynamic fiction.

**ANA/DAT**
Analysis tool for controlling the static rotation angle in bolts tightened with torque control with rotation angle sensor

This analysis module determines the static angle of a bolt from a defined rotation angle starting torque until reaching the defined target torque. In this assembly method, the target torque is the control value.

**SEQ**
Sequence linking of all named methods in random order

In this module, all the available assembly methods can be combined in random order. In the standard version “without external sensors”, the category classification is to be made in correspondence with the kind of combination.

**SPSK**
Bolting process statistics: Statistic assessment of the measured process parameters. Can also be used for evaluation of a process capability test
**SGD**
Yield point-controlled/angle-monitored tightening

The control values in this assembly method are the target torque and the linear pitch progress, and the reached rotation angle is the reference value at the end of the process. The rotation angle starting torque can be set according to the preload. In addition, the assembly process is stopped in case the rotation angle is exceeded but can be continued if required.

**Suitable for application categories:**
A B C

**EXT**
Externally controlled tightening using random measuring sensors with standard industry interface

In this assembly method uses the control value target torque and another random external physical measuring parameter. This is continuously measured via the power and voltage interface and graphically depicted and documented in its physical unit.

**Suitable for application categories:**
A (limited/restricted) B C

**DGD**
Torque-controlled/angle-monitored tightening

The control value in this assembly method is the target torque, and the reached rotation angle is the reference value at the end of the process.

**Suitable for application categories:**
A B C

**DGS**
Torque-controlled/yield point-monitored tightening

The control value in this assembly method is the target torque, and the linear pitch progress is the reference value at the end of the process.

When there is a deviation of the linear progress because the yield point is detected, the process is stopped. That means that bolts can no longer break.

**Suitable for application categories:**
A B C
Service first. Typical for HYTORC

It is our highest priority to realize our customers’ requirements quickly and in time. HYTORC’s services provide the decisive added value with our on-site service, consultation, calibration service, customer service, seminars and trainings.

Let our services speak for themselves!
HYTORC Services
The customer is always in the focus

New tools, borrowed tools and rental tools: We provide on-time service also on site.

HYTORC’s customers are convinced by service modules that are tailor-made to their needs:

24-hour customer service
Outstanding services for great products. We provide that kind of services both in our headquarters and on site with our field service. Reliable and quick with short reaction times.

Measuring and test center
Theory and practice go hand in hand. We determine even high preload forces in bolted joints simply and safely and test torques and angles with all available tightening methods. On-site and in our measuring and test center.

Project and system support
Large projects require teamwork and trust. With our various services and service packages we are a reliable partner for the industry. We ensure full data protection: confidential, systematic, and discrete.

Bolt calculation program
To prevent errors in bolt calculation, HYTORC offers a simple torque calculation program based on a database which we provide for free upon request. Please send an email to info@hytorc.de and write “torque calculation program” in the reference line.

HYTORC services:
• 24-hour customer service
• seminars & trainings
• project and system support
• measuring and test center
• on-site service
• CAD-Design
• bolt calculation program
• flange bolting certificates
• rental and leasing service
• service hotline for Germany: 0800-5005 888 (free of charge)
• service hotline outside Germany: +49 89 230 999 0
Internal audit and shutdown services

HYTORC experts support your staff and contractors before and during internal audits and shutdowns to achieve sustainable improvement of occupational safety, ergonomics, and quality.

**Technical preparation before the beginning of internal audits and shutdowns:**
- analysis of drawings and parts lists
- determination of the most suitable tightening method
- we issue flange bolt certificates with integrated work instructions for the installers
- testing of torques, preload forces, required space and accessibility

**Technical service and support during internal audit/shutdown:**
- provision of replacement tools/accessories on site, on-site provision of spare parts
- provision of personnel on site to ensure that the bolting equipment used can be operated efficiently
- and safety in terms of occupational and plant safety by the users
- documentation of the required parameters in accordance with the requirements

**CAD-Design**

We make customized solutions visible in advance. For almost 10 years, we have continuously expanded the cooperation between our CAD design department and our customers’ engineering offices. To include engineers in the design of plants and machines at an early stage can save significant costs. This way, the shape of the component can be adapted to the standard tools that will be used, eliminating the need to design expensive customized solutions later on. Cutting-edge 3D printers can optically realize customized designs within a very short time that can be used for prototypes even before the customized tool is produced. This saves lots of time and money.

**On-site service**

Service is decisive for the quality of a fastening system. We offer this kind of services both in our service and repair department in our headquarters in Krailling and on site at your premises with our trained service technicians.

- **On-site spare parts service**
  Our on-site service technicians have all the important spare parts and tool gaskets on board. This ensures short reaction times and perfect supply with spare parts, also on weekends.

- **On-site repair service**
  Our on-site service technicians can perform all standard repairs and all inspection and maintenance works right on site.

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  Our on-site service technicians have all the important spare parts and tool gaskets on board. This ensures short reaction times and perfect supply with spare parts, also on weekends.

- **On-site repair service**
  Our on-site service technicians can perform all standard repairs and all inspection and maintenance works right on site.

**CAD design and... ...successful realization**
HYTORC flange bolt certificate

Both sets of rules, “TA Luft” (technical instruction for air quality control) and EN 1591, require proof for the tightness and stability of flange connections. To ensure this quality, HYTORC offers the certification software LoadCERT online for automatic creation of flange bolt certificates.

For further details, please visit our website www.hytorc.de

Advantages of the HYTORC flange bolt certificate:

• proof in accordance with TA Luft and EN 1591
• work instruction for tightening of the flange in all languages
• support in case of problems
• integration in existing quality management systems
• extension of tender documents for the preparation of downtimes
• resource planning for lubricants, bolts, gaskets and tools
• reduction of weak points thanks to automatic plausibility checks
• increases the safety of plants and staff

Industrie 4.0

Robot-controlled hydraulic bolting technology for series production

The HYTORC Robotik Tool allows full automation of repeating standard joints and simultaneous documentation. The bolting machine meets the requirements of VDI / VDE 2862-2 for process-reliable bolting. Both torque and angle are processed digitally. Should any deviations from the parameters occur during the tightening process, a notification is sent to the quality management department. Perfect in combination with the Eco2TOUCH.

* see catalog “Mobile hydraulic fastening technology”
Know-how connects to succeed.
Certified learning service provider for training and further training in accordance with ISO 29990*

Experts need expert knowledge in the field of bolting. This is highlighted in the directive VDI/VDE 2637, sheet 1 “Qualification in bolting technology” that will soon come into force and the standard DIN EN 1591:2013 “Flanges and their joints” that has been in force since 2013.

We have been operating our training center in Augsburg for several years. Throughout the years, more and more companies approached us, asking for specific training contents. This high demand turned the Akademie der Schraubverbindung into another brand by Barbarino & Kilp GmbH. New experts and professionals have been integrated. Together with them, we were able to significantly expand our training portfolio.

The new quality is regularly monitored and tested by audits carried out by accredited auditing companies. Certification in accordance with ISO 9001:2015 and ISO 29990:2010* ensures an international standard for non-formal education and training.

That means for training participants and their companies that the expert knowledge acquired after successful participation is confirmed by an internationally recognized certificate.

What is the benefit of a certified learning service provider for companies and participants?

ISO 29990:2010* is an international standard for providers of non-formal education and training which, in accordance with ISO requirements for management systems, is state-of-the-art. The standard refers to all kinds of training facilities: Individual trainers, private providers of seminars, organizations for further education, in-house trainings, colleges and universities.

The objectives of the ISO 29990:2010* include:

- assurance of quality, transparency and comparability of training institutions
- provision of a generic quality model for occupational practice and performance
- focusing on the competence of trainers and organizations
- training programs for users, technicians and engineers

Our training portfolio has a modular structure. The training center is famous for its focus “practitioners for practitioners”: Technicians, masters and skilled workers - all users are trained with the same practical orientation. Trainers and speakers consider the individual requirements and needs of their participants.
The training topics range from basics such as occupational safety to the correct handling of tools, compliance with requirements and trainings that are required to meet the requirements of individual standards. This includes DIN EN 1591-4:2013 which is relevant for flange connections (relevant for example in chemical and process industry). DIN EN 1591-4:2013 stipulates: Installers that disassemble and reassemble flange connections must have specific training and skills for this job.

When users know what they are doing they can reduce emissions, increase process safety and reduce operating costs because downtimes due to improperly bolted joints are reduced. And one more benefit: increased occupational safety and practice. When users know how to handle modern tools that operate without muscle power, they can meet any requirements.

But the Akademie der Schraubverbindung is not just beneficial for practitioners; planners, designers and engineers can also benefit. Engineers are also eager for knowledge. For example about standards and directives, so that they can make tailor-made and practicable developments and optimizations. It is crucial that process owners learn about new standards and the requirements at an early stage. This is the promise of the Academy. The trainers take up new and amended standards, directives and guidelines at an early stage and integrate them into the training programs. The trainings are provided according to your request, either as classroom trainings or as webinars (e-learning).

The high standards set for industrial bolting in terms of process capability and legal safety requirements are already becoming higher today and are predetermined to become even higher in the future. As early as in the planning phase, the responsibility for choosing the right bolting technology to meet the respective bolting case is delegated to developers. That choice directly affects the technology to be used, process and quality assurance and final product liability – while all this is subject to profitability pressure.

Open to everyone and everything
Apart from predefined standardized trainings, the Akademie der Schraubverbindung can also meet individual customer requests and provide tailor-made trainings. We also provide trainings on site in the company’s own training facilities or on production sites - a true USP and a huge gain for customers and participants!

For more details, please visit www.akademie-sv.de

*The legal entity Barbarino & Kilp GmbH is certified: Certification numbers ISO 29990:2010: 397107 LSP and ISO 9001: 397107 QM15
Let’s find the perfect solution together

With our comprehensive range of products and valuable expert knowledge, we can create tailor-made solutions - even for challenging applications. Constant innovations, a consistently high product quality and many years of experience make us a reliable partner for our customers. Whatever the challenge may be – together with you, we will find the perfect solution.
HYTORC
The global leader and your strong partner
and supplier for everything in the field of
industrial boating

• comprehensive and unique product portfolio
• innovative technologies and solutions
• service sites close to our customers
• training and education center in Augsburg
• customer oriented services that are promptly available

HYTORC provides innovative products, unique fastening
elements, intelligent bolting methods and many years of
expertise with applications and engineering in the field of
industrial bolting.

With our extensive sales and service network we are close
to our customers in Germany and Europe and can provide
prompt support with the best tools and expert knowledge.
On this basis, we always provide our customers with the best
solutions that are state-of-the-art in industrial bolting.

We look forward to your challenges!

For more details, please visit
www.hytorc.de
www.akademie-sv.de
All the information in this document reflects our current knowledge and serves the purpose of providing information about our products and their possibilities of application. The information is not intended to guarantee specific features for a particular application. We guarantee the highest quality within the framework of our "General Delivery Conditions".

ANSI B18.22
ANSI B16.5
ASTM A193
ASTM A194
EN 14399
DIN 2510
ISO 4762
ISO 4014
ISO 4017
DIN 976
DIN 939