Cooling System
Less weight for a lighter future
Our mission is to downsize. When it comes to designing an engine, we are constantly striving to maximize engine weight loss ultimately reducing permeation rate. We are proud to say that with our newly designed cooling systems, there are currently one million cars with a weight loss of more than thirty percent each.

We believe that thinking smaller can make a big difference.
Customer Value through Innovation.

NORMA Group’s innovative Engineered Joining Technologies and applications know-how make cleaner, more efficient use of precious energy sources in areas such as Cooling System, Air Intake & Induction, Emission Control, Ancillary System and Infrastructure. Distribution of NORMA Group trademark products is undertaken via a network of carefully selected companies specializing in volume distribution in their national market segments to reach the industrial aftermarket segment.

Global needs for greater energy efficiency in key sectors like transport and industrial infrastructure offer excellent growth prospects across the group’s broad portfolio of Engineered Joining Technology. Maintained investments in innovative solutions fund the continued development of new products and technologies.

The close strategic cooperation that has helped clients use our Engineered Joining Technology solutions to make a major impact on their businesses will be strengthened. We shall develop forward-thinking partnerships for our mutual benefit.
## Content

### Hose Clamps

<table>
<thead>
<tr>
<th>Hose Clamps</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worm Drive Hose Clamps</td>
<td>7</td>
</tr>
<tr>
<td>TORRO® Worm-drive hose clips</td>
<td>8</td>
</tr>
<tr>
<td>TX</td>
<td>11</td>
</tr>
<tr>
<td>FBS Springband hose clips to DIN 3021</td>
<td>12</td>
</tr>
<tr>
<td>ABA Original</td>
<td>14</td>
</tr>
<tr>
<td>BREEZE Constant Torque</td>
<td>15</td>
</tr>
<tr>
<td>BREEZE Liner</td>
<td>16</td>
</tr>
<tr>
<td>BREEZE Power Seal</td>
<td>17</td>
</tr>
<tr>
<td>BREEZE Aero Seal</td>
<td>18</td>
</tr>
<tr>
<td>Heavy Duty Clamps</td>
<td>19</td>
</tr>
<tr>
<td>T-Bolt Series</td>
<td>19</td>
</tr>
<tr>
<td>Flex Seal Series</td>
<td>20</td>
</tr>
</tbody>
</table>

### Retaining Products

<table>
<thead>
<tr>
<th>Retaining Products</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS/RSGU/RLGU</td>
<td>21</td>
</tr>
</tbody>
</table>

### Quick Connectors

<table>
<thead>
<tr>
<th>Quick Connectors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS3</td>
<td>26</td>
</tr>
<tr>
<td>C Style</td>
<td>28</td>
</tr>
<tr>
<td>S</td>
<td>29</td>
</tr>
<tr>
<td>SAE Style</td>
<td>31</td>
</tr>
<tr>
<td>V3</td>
<td>32</td>
</tr>
<tr>
<td>Twist II</td>
<td>33</td>
</tr>
<tr>
<td>Twist III</td>
<td>35</td>
</tr>
</tbody>
</table>

### Fluid Systems

<table>
<thead>
<tr>
<th>Fluid Systems</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOC</td>
<td>38</td>
</tr>
<tr>
<td>CWS</td>
<td>39</td>
</tr>
<tr>
<td>WDS</td>
<td>40</td>
</tr>
</tbody>
</table>

---

### Materials

- **W1**: All parts completely zinc plated steel
- **W2**: Band: Stainless steel 1.4301/1.4571 Screw + Trunnions: Zinc plated mild steel
- **W2**: Band + Housing Stainless steel 1.4016. Screw: Zinc plated mild steel TORRO® for all materials or equivalent.
- **W3**: All parts completely stainless steel 1.4016
- **W4**: All parts completely stainless steel 1.4301
- **W5**: Completely stainless steel 1.4401 TORRO®
The optimum sealing solution for all applications. The range varies from standard products with or without constant tension spring to special usage clips and heavy duty clamps.
TORRO® – Worm Drive Hose Clips to DIN 3017

TORRO® hose clips are specially suitable for applications under high mechanical loads. Since we are continuously working to improve its features this clip is still setting standards for modern hose clip design.

The distinguishing feature of the TORRO® is the asymmetrical construction which tells you at first sight whether it is a genuine TORRO® or not.

1. **Improved asymmetric housing**
   - even distribution of forces and safe assembly

2. **Screw support**
   - Ease of assembly due to the safe guidance of the emerging band end

3. **Material and clamping range stamped on the band**
   - prevention of errors

4. **Asymmetric extension**
   - prevents the housing from tilting over when the clamp is tightened

5. **Short housing saddle**
   - even contact pressure
   - improved efficiency

6. **Smooth or stamped inside of band**
   - optimal hose protection

**The advantages at a glance**
- Multi-range hose clamp
- Material: W1, W2, W3, W4, W5
- Chromium VI free: compliant with ROHS, WEEE and ELV Environmental Directives
- Clamping ranges to DIN 3017: 8 – 16 mm up to 140 – 160 mm
- Larger diameters on demand

**Materials**

<table>
<thead>
<tr>
<th>Materials</th>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
<th>W5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

* No chromium VI used for the coating of the closure components
Worm Drive Hose Clamps

Types of clamp band

**Band width 7.5 mm**
- W2, W3 with smooth inside

**Band width 9 mm**
- W1 with smooth inside
- W2, W3, W4, W5 with stamped inside

**Band width 12 mm**
- W1, W2, W3 with smooth inside
- W4, W5 with stamped inside

High band tensile force and high fracture torque
As always, the new TORRO® features high tensile forces. However, when compared with competitor’s products and the previous model, we now achieve significantly higher fracture torques. This provides for an increased assembly reliability.

Even clamping force distribution
Thanks to its enhanced technical design, the new TORRO® range delivers an even distribution of clamping force. The clamp sits perfectly on the hose and ensures the optimal sealing of the connection.

Screw

| Phillips head | SW 7* | • | • |
| Slotted head  | SW 7**|   |   |

* Band width 7.5 mm = SW 6
** Band width 16 mm = SW 8

Corrosion resistance

<table>
<thead>
<tr>
<th>Material</th>
<th>Corrosion resistance in salt spray testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>Min. 144 h</td>
</tr>
<tr>
<td>W2</td>
<td>Min. 72 h</td>
</tr>
<tr>
<td>W3</td>
<td>Min. 200 h*</td>
</tr>
<tr>
<td>W4</td>
<td>Min. 240 h</td>
</tr>
<tr>
<td>W5</td>
<td>Min. 400 h</td>
</tr>
</tbody>
</table>

* Max 10% corrosion of the base material allowed

Applications in combustion engines

- Cooling water lines
- Depressurized as well as pressurized fuel lines and vent lines
- Oil lines
- Air ducts, both vacuum and express pressure applications (e.g. charged air) up to 140 – 160 mm
- Larger diameters on demand
Worm Drive Hose Clamps

Modular System

TORRO®

The TORRO® modular system offers several accessories that can be added to the clip, in order to modify its technical characteristics. You are free to combine two or more of these accessories according to your requirements.

The Notch
The notch is a clever means for pre-positioning the TORRO® hose clip on the hose. In this case the oval hole in the clamp band finds its exact counter part on the hose surface. Thus the TORRO® is safely and accurately kept in place prior to the final assembly.
- Safe pre-assembly on the hose.

The Prefix Clip
With this accessory the TORRO® can also be pre-positioned on the hose. The two ‘teeth’ of this device keep the TORRO® hose clip safely in place if it needs to be stocked or transported prior to its final assembly.
- Safe pre-assembly on the hose.

The Spring insert
For this version of the TORRO® the standard hose clip is equipped with a spring insert on the inside of the clip band. When tightening the screw the spring is loaded and stores sufficient clamping force to ensure a long-lasting automatic retensioning effect. Thus the radial clamping force achieved will be sufficient even under extremely low temperatures. Therefore, the TORRO® is an optimal solution for applications under extreme temperature changes.
- Automatic re-tensioning effect in the event of hose relaxation
- Increased sealing reliability across a wide temperature range

The PreFix System
The PreFix System is a concept for integrated clamps and clips on hoses and pipes. The demand for complete systems that include the appropriate sealing function is increasing.
- Safe pre-assembly on the hose.

The Radial Insert
The Radial® Spring Clamp consists of a Standard riveted clamp with a stainless steel liner. This insert in the Radial acts as a spring. Inward radial pressure on the hose is made possible as the material between the cut-outs and the longitudinal beads acts as leaf springs.
- Radial integrated element located on the inside of the clamp band
- High contact pressure due to the radially corrugated design
- There are also dynamic properties
- Only available in 9 mm bandwidth
One more clamp type rounding off this range is the TX. These clamps are specially used in applications in the commercial vehicle sector where extremely high band tensile forces and high fracture torques are required. This is why TX hose clamps are only made with 12 mm band width and in W3 material quality.

The advantages at a glance

- 12 mm band width
- W3 material

Materials

<table>
<thead>
<tr>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
<th>W5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
Worm Drive Hose Clamps

FBS – Springband hose clips to DIN 3021

Because of their design, FBS springband hose clips are particularly suitable for use with hose-spigot connections which are submitted to extreme temperature changes. Once assembled FBS provide a continuously readjusting dynamic tightening effect.

Also at low temperatures the radially acting tightening force is sufficient to assure a reliable tightness of the system. Even hoses that are submitted to extreme temperature cycles, or those with a tendency to “creep” can be combined to form a safe connection when FBS are used.

The advantages at a glance
- Single-part hose clips without screw
- Uniform distribution of clamping forces
- Optimal roundness
- Temperature resistance from –40 °C up to 200 °C
- Unmistakable tracing due to lot numbering
- Visual control of nominal diameters by colour codes
- Corrosion resistance in salt spray testing – testing - 720 h on mandrel

Materials

<table>
<thead>
<tr>
<th>C 75 S</th>
<th>Zinc-Aluminium Coating</th>
<th>Organic Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Basecoat</td>
<td>Topcoat</td>
</tr>
</tbody>
</table>

1. Lot number stamped on clamp band
   - safe retraceability

2. NORMA® Logo – the visible sign for high quality

3. Inorganic/organic coating
   - optimal protection against corrosion
   - Coating in different colour
   - improved engine design

4. Nominal diameter stamped on the clamp
   - prevention of mistakes

5. Special design – uniform distribution of clamping forces and optimal roundness

6. Round band edges
   - optimal hose protection
## Worm Drive Hose Clamps

### Variants

<table>
<thead>
<tr>
<th><strong>FBS</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FBS R</strong></td>
<td>is a space-saving clamp. It was designed with the aim of realising the technical minimum overall height to allow its use in difficult assembly situations.</td>
</tr>
<tr>
<td><strong>FBS HC</strong></td>
<td>is a pre-opened version secured by a plastic retaining clip. After slipping the clamp onto the hose, this clip can be easily removed by hand.</td>
</tr>
<tr>
<td><strong>FBS MC</strong></td>
<td>is a pre-opened (and, if desired, pre-positioned) clamp secured by a small metal clip. The retaining clip for this version is removed by using pliers.</td>
</tr>
<tr>
<td><strong>FBS C</strong></td>
<td>is a pre-opened clamp which is pre-positioned on the hose. The retaining mechanism for this version is an integral part of the clamp band.</td>
</tr>
</tbody>
</table>
ABA Original

ABA Original clamps feature unique, one-piece housing, rolled-up band edges and a non-perforated (embossed) band that protect the hose. For added corrosion resistance the band in the 12 mm Standard is made of Aluzinc which gives three times the protection offered by conventional galvanized steel.

ABA Original

– Features high clamping force and high durability torque
– Aluzinc

ABA Original Stainless

– All parts in AISI 304 Stainless Steel

The advantages at a glance

• Solid band
• Rolled up band edges
• Smooth inside
• House protected from pipe
Worm Drive Hose Clamps

**Breeze Constant-Torque®**

The Breeze CONSTANT-TORQUE® is a breakthrough in clamping technology. A belleville spring mechanism permits the CONSTANT-TORQUE® clamp to automatically increase or decrease its own diameter due to changes in operational or environmental temperatures.

This unique design eliminates “cold flow” leaks. Both the Aero-Seal and Heavy Duty construction CT clamps have an extended inner liner which protects all types of hoses from damage and helps to maintain consistent sealing pressure.

- Per SAE standard J1508 Type “SLHD”

**The advantages at a glance**

- The premium hose clamp for Truck/Heavy Equipment/Bus and performance industry
- Recommended for use on turbo exhaust sleeves, heater hoses, coolant hoses, intake systems.
- Virtually unlimited product life – won’t rust or corrode, & is reusable.
- Soft Hoses- covers gear slots in band to protect all types of hoses from damage
- No special tools needed for installation
- Eliminates the sometimes necessary replacement of expensive “single use” clamps during routine or emergency maintenance.
- Prevents massive and costly loss of engine coolant
Worm Drive Hose Clamps

Breeze Liner

An integral extension of the band as an inner liner protects soft-surface hose (silicone and others) from damage caused by extrusion or shearing through the band slots. Liner clamps afford maximum protection to soft hoses while providing a true concentric seal.

The advantages at a glance

- Protects soft silicone hose with an integral inner liner
- Alternative to embossed, non-perforated band clamps
- Full range of sizes available for all applications
- Heavy-duty four piece Quadra-Lock construction
- Available in 1/2” (12.7 mm), 9/16” (14.2 mm) and 5/8” (15.8 mm) band widths
Breeze Power-Seal®

The BREEZE worm-gear clamps with heavy duty 4-piece Quadra-lock construction are designed for use in general-purpose and industrial applications. The BREEZE Quadra-lock clamp is a significant upgrade from common 3 piece SAE worm-gear designs, delivering the ultimate in both quality and value.

BREEZE Power-Seal miniatures offer a compact streamlined design for fuel, air and transmission hose lines. Breeze Power-Seal Full size Quadra-Lock have a design featuring heavy-duty four-piece, industrial aircraft construction. Here, the housing is clinched at 4 points for extra strength and stability, enabling the clamp to resist twist and housing tilt; a common factor during installation.

The advantages at a glance

**Miniatures:**
- 3 material Grades
- High clamping force
- High destruction torque

**Full Size:**
- Arcial slots give added strength against stripping
- Smooth housing underside ensures more even distribution of sealing pressure
- Exceeds SAE J 1508 specifications
Breeze Aero-Seal®

The original perforated stainless steel worm-gear clamp. Heavy duty four-piece Quadra-Lock construction enables far more tightening torque to be delivered to the band perforations. Use for aircraft and heavy-duty industrial applications.

The advantages at a glance
- Original patented worm-gear clamp
- Heavy-duty four piece Quadra-Lock construction
- Used for heavy-truck, industrial and aircraft applications
- Features wider 9/16" (14.2 mm) stainless steel band
- Available in a wide variety of materials and screw styles
Heavy Duty Clamps

T-BOLT Series

Heavy duty T-bolt hose clamps

T-bolt Hose Clamps are intended for use where other hose clamps do not work. Typical application includes air intake systems, cold side charge air hose connections and a variety of hose, pipe and ducting joints.

- Available in diameters 1.75” (44.5 mm) and larger, T-bolt Hose Clamps can be configured to suit almost any application and operating environment.
- Also available: different materials and Quick Connect or Quick Release latch styles.

T-BOLT Series

**Mini** – 9/16” (14.3 mm) wide stainless steel band with plated steel bridge, M5 or #10 T-bolt and hardware.

**SAE Type TB** – 3/4” (19 mm) wide stainless steel band and shoe with 1/4” (6.4 mm) plated steel T-bolt and hardware.

**SAE Type TB** – 3/4” (19 mm) wide stainless steel band with floating bridge, 1/4” (6.4 mm) plated steel T-bolt and hardware.

**SAE Type TB** – all stainless steel construction including, 3/4” (19 mm) wide band, floating bridge, 1/4” (6.4 mm) T-bolt and hardware.

**Super Duty** – 7/8” (22.2 mm) wide stainless steel band, shoe and trunnion with 5/16” (7.9 mm) plated steel T-bolt and nut.
Heavy Duty Clamps

FLEX SEAL™ Hose Clamps

FLEX SEAL™ Hose Clamps incorporate a compression spring to accommodate joint diameter changes resulting from hose set and thermal effects. They are accepted industry wide for use on charge air and coolant system hose connections.

- Heavy Duty T-bolt and FLEX SEAL™ Hose Clamps usually have a diameter take up range of 5/16” (7.9 mm).
- Also available: different materials and Quick Connect or Quick Release latch styles.

FLEX SEAL™ Series

**Mini** – 9/16” (14.3 mm) wide stainless steel band with plated steel bridge, M5 T-bolt and hardware.

**SAE Type SLTB** – 3/4” (19 mm) wide stainless steel band with floating bridge, 1/4” (6.4 mm) plated steel T-bolt and hardware.

**SAE Type SLTB** – 3/4” (19 mm) wide stainless steel band with floating bridge, 1/4” (6.4 mm) plated steel T-bolt and hardware, includes special long travel spring to accommodate larger changes in joint diameter.
The NORMA Group retaining products range comprises a wide variety of products for the attachment and retaining of pipes, cables, cable harnesses and hoses.
Retaining Products

RS/RSGU/RLGU – Pipe retaining clips to DIN 3016

RS/RSGU pipe retaining clips are the ideal retaining elements for pipes, cables, cable harnesses, cable protection pipes, hoses and other applications.

1 Form fitting and adjustable band
   – ease of assembly
   – safe attachment

2 Reinforced band ends
   – prevent the clip from tearing or loosening in cases where there is a high mechanical load

3 Optionally supplied with EPDM profile + Silicone + Chloroprene
   – vibration damping & protection against seepage water
   – sound insulation
   – clip fits tight on object

Materials

<table>
<thead>
<tr>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
<th>W5</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>x*</td>
<td>x*</td>
<td>x*</td>
<td>x*</td>
</tr>
</tbody>
</table>

* On request

Clip types

All pipe retaining clips are available with a special sound damping rubber profile as optional equipment. The standard version RS/RSGU clips (Type 1) are also available in a round shape (RS/RSGU Type 0) or open shaped (RS/RSGU Type 2).
In addition to the designs already mentioned we offer the RV clip. This special design, a variation of the standard RS/RSGU Type 1, is provided with an integrated mounting fastener. When the clip ends are compressed the fastener locks into place and locks the clip. Thus the RV can be easily preassembled on the pipe.

- Diameters and band widths will be furnished on request.

Recently a new type, the RLGU, was added to our retaining products range. It is also a variation of the standard Type 1, but without reinforced band ends and therefore suitable for use in applications submitted to only slight mechanical loads as, for example, the fastening of cables.

- RLGU are only available in band width 12 mm.
- For the complete programme please refer to the table of sizes.
Innovative, secure, and “quickfit” – the NORMA Group quick connector range of plug-in connectors made of synthetic material are suitable for most media carrying lines. No matter whether we are dealing with cooling water, oil, air or fuel carrying lines – NORMA Group quick connectors offer the state-of-the-art means of connection. These connectors are specially suited to being matched up with the tube system.
Quick Connectors

PS3 “Push & Seal” plastic quick connectors are an ideal means for the secure connection of cooling water and heating hoses.

1. Housing
2. O-ring
3. Retaining ring
4. Retainer (spring)

Standard materials
PS3 quick connectors are made from recyclable materials. For our standard versions we use Polyamide 6.6 with 30% glass fiber content.

The standard material for the O-rings consists of peroxide-cured EPDM which is resistant to hot water. For PS3 connectors that are likely to be used in direct contact with coolants we recommend PA 6.6 with 30% glass fiber content that has been stabilized against heat and hydrolysis.

The advantages at a glance
- Designed new and improved generator
- Locking function
- Simple spigot
- O-ring is on the inside in order to prevent damage to seal
- High temperature resistance 175/200°
Connecting spigot – to VDA standard

Please note that all PS3 connectors are delivered without spigot. However, we will be pleased to offer suitable VDA spigots on request.

1. Connection spigot
2. Diameter of bore – Nominal Width (NW)
3. Retainer (spring)
4. Retaining ring
5. O-ring
6. Connector

- **Medium/Fluid:** Cooling water
- **Operating Pressure:** Approx. 1.5 bar excess pressure
- **Operating Temperature:** Engine compartment: −40 °C to +135 °C, Short time up to +150 °C (approx. 30 min.).

The advantages at a glance
- Snap assembly without tool
  - time and cost reduction
- Robot assembly possible
  - automated processes
- Compact structural dimensions
  - to be used in extremely narrow spaces
- Integrated seal
  - optimal tightness
C Style

Specialized plastic quick connectors developed for coolant applications. Test parameters are significant higher than operation parameters. Special applications possible, contact us!

Applications
Coolant, glycol and water applications.

The advantages at a glance
Media: Coolant
• Operating temperature: -40 °C to 135 °C, short term higher
• Pressures: 0 to 2 bar pos. pressure, partially pulsating (sinusoidal)
• Vibrations: Usually engine vibrations 7-200 Hz, 0.2-20 g
S plastic quick connectors are the ideal means for connecting media carrying lines in combustion engines. The product has been especially developed for fuel system applications and is characterized by its “click” sound as well as its’ quick and safe connection.

The S does not open under pressure due to the “chuck cone” concept; the higher the system pressure, the higher the clamping force. Most importantly, for quick, easy and cost efficient assembly and removal, the product does not require any special tools or previous knowledge.

Special applications are available - please contact us for inquiries!

The advantages at a glance
- Media: Coolant water
- Operating temperature: -40 °C to 125 °C
- Pressures: 0 to 6.8 bar overpressure
- Very high withdrawal force through four locking points
- Colored retainer clips available in black, green, yellow, red, blue and natural
Quick Connectors

Connecting spigot – to SAE J2044, standard worldwide

Please note that all S connectors are delivered without SAE spigot. However, we will be pleased to offer suitable SAE spigots on request.

Insiders’ Tip
The perfectly matched system is achieved when combining S quick connectors and NORMA Group Fluid systems.

The advantages at a glance
- Fast assembly without tool – time and cost reduction
- Robot assembly possible – automated processes
- Compact building method – employment in extremely close installation conditions possible
- Integrated seal – optimal tightness
- Closing cone principle – S is protected from unintentional opening and cannot be unlocked under pressure

- Medium/Fluid: Coolant water
- Operating Pressure: Approx. 10 bar excess pressure
- Operating Temperature: Engine compartment –40 °C up to +135 °C, Short time up to +150 °C (approx. 30 min.).

Meeting the requirements of SAE J2044
SAE Style

Specialized plastic quick connectors developed for coolant applications. Test parameters are significant higher than operation parameters. Special applications possible, contact us!

Applications
Coolant, glycol and water applications.

The advantages at a glance
Media: Coolant
- Operating temperature: -40 °C to 135 °C, shortterm higher
- Pressures: 0 to 2 bar pos. pressure, partially pulsating (sinusoidal)
- Vibrations: Usually engine vibrations 7-200 Hz, 0,2-20 g
Quick Connectors

V3

The V3® is designed for coolant vent lines. To guarantee that the product can resist cooling-water, the V3® is made two-parted. The housing is made of materials resistant to cooling-water, and the locking ring is made of flexible material. To ensure that you save space, the V3® only has a half locking ring and is designed with an anti-rotation feature.
Quick Connectors

**Twist II**

Twist II is a "Push & Seal" plastic quick connector; an ideal solution for connecting cooling water systems.

**Standard materials**

Twist II quick connectors are made out of recyclable materials. As a standard solution Polyamide 6.6 with 30% to 50% glass fiber reinforcement is used.

When an application requires, other engineering thermoplastic material can be used. Different reinforcement fillers and additional heat or hydrolysis resistance can also be added. Application based design is possible when a minimum required quantity is ordered.

**The advantages at a glance**

- Can be integrated in end-tanks as well as be mounted on tubes or hoses
- A secure seal to the mating spigot with a low assembly force
- Robust and clear locking features with a click function to ensure a correct lock
- Easy operation for disassembly
- Temperature resistance of up to 180°C
Quick Connectors

Twist II

Assembly is in locked position. The arrow marks the closed position.

Turn connector ring to open position.

Pull connector backwards to disengage the joint. The connector is now released from its position.

Turn the connector ring back to its locked position. The arrow marks the closed position. Connector is now in a locked position and ready for engagement.

IMPORTANT NOTICE
Notch in male part must be aligned with arrows marking “locked position” when engaging the female part to the male.

Listen for audible “click” or feel when connector is fully engaged. Connecting joint is now in a locked position.
**Twist III**

TWIST III is a quick connector series for charged air system applications. Developed to meet extremely tough requirements, especially in low-emission vehicles, it combines a low assembly effort with very good hydrolysis tolerance, temperature resistance and mechanical performance. TWIST III operates at approx. 2.75 bar excess pressure and engine compartment temperatures of -48°C up to +135°C. Standard design configurations are straight. Special designs are also available.

**Materials and construction**

Standard versions are made from recyclable polyamide 66 with 35% to 50% GF. O-rings are available in various materials, including AEM. Note that both plastic and metal spigots can be used.

TWIST III quick connectors have a 360° symmetrical design. As they can be opened from any angle, they are perfect for tight environments as well as spin-weld applications. Additional cut-outs or knobs are not necessary.

**Quick and safe assembly/disassembly**

Assembling TWIST III is quick and easy. Press the self-locking spider ring onto the mating spigot and check that all the ring-locking tabs have passed the spigot’s locking edge. Then pull the connector to verify the connection.

To disassemble the connector, turn the spider ring counterclockwise, hold it in the open position and pull it off the mating spigot. When the connector disengages from the spigot, release the spider ring to automatically return it to its relaxed (locked) position.
Quick Connectors

Twist III

**Standard sizes and designs**

TWIST III connector size designations are determined by the sealing diameter (ØD1) of the TWIST III spigot. Current standard diameters are listed below. Larger diameters will be added in the future.

Five standard sizes are available. TWIST III SP (spin-weld) is for applications where the quick connector will be spin-welded to other injection or blow-molded plastic components. Based on recommendations from a spin-welding equipment supplier, this design includes weld surfaces, flash traps and support surfaces. This connector is tested using the GMW 15803 specification as reference.

### Standard sizes:

<table>
<thead>
<tr>
<th>TWIST III Quick Connector</th>
<th>Ø D1 (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWIST III 48.40</td>
<td>48.40</td>
</tr>
<tr>
<td>TWIST III 56.40</td>
<td>56.40</td>
</tr>
<tr>
<td>TWIST III 67.40</td>
<td>67.40</td>
</tr>
<tr>
<td>TWIST III 71.40</td>
<td>71.40</td>
</tr>
<tr>
<td>TWIST III 80.00</td>
<td>80.00</td>
</tr>
</tbody>
</table>

**Optional designs**

A hot-plate weld design (TWIST III HP) is used for housings in PBT material, when the connector has to be welded to a flexible TPE / TPC-ET (HYTREL®) Duct, or with flexible plastic ducts. It is also the standard solution when hot-plate/mirror welding is applied. A further special design TWIST III AR has an optional anti-rotation/assembly orientation feature. Other designs are also possible.

**Please ask for details.**

TWIST III V0 (straight) and TWIST III V90 (90° bend) are optional designs with a hose barb for applications where a hose will be crimpped/clamped onto the barb. Both allow reinforcement with an optional metal sleeve when required.
Fluid Systems

NORMA Group

Fluid systems comprise of smooth and corrugated tubes as well as partially corrugated tubes in mono or co-extruded wall thicknesses. When used with NORMA Group quick connectors and hose clamps they provide a complete transfer system for fluids and air.
TOC (Transmission Oil Cooler tube systems) are designed for engine and transmission oil cooling.

The product has a flexible tube system connecting the transmission oil cooler and the automatic transmission and the low push on force makes for easy and quick assembly. Being the manufacturer of all components, NORMA Group provides you with one global development partner for the complete system.

The advantages at a glance
- High temperature resistance -40°C up to 140°C
- High burst pressure
- Good media resistance
- High flexibility
- High mechanical strength
- Decrease part weight by more than 50%
CWS are plastic systems used for cooling water. Combining a variety of products from the extensive NORMA Group portfolio, the CWS creates a cost effective Cooling Water System. With an excellent media and chemical resistance especially against hydrolysis, the CWS has high system flexibility.

The advantages at a glance
- Reduces number of joints
- Reduces weight (up to >75%)
- Realizes very small diameters
- High temperature stability -40°C thru 135°C
WDS

WDS, Water Drainage tube Systems; can be used in petrol and diesel engines where the intake of fresh air passes through the air filter into the engine. The WDS combines a variety of NORMA products such as V2 quick connectors and extruded tubes for water drainage.

With an extensive range of standard components, we offer a solution specifically tailored to tight space conditions. The product is characterized by its low weight, high flexibility and quick and easy installation in the engine.

Technical features

- High temperature resistance -40°C up to 140°C
- High burst pressure
- Good media resistance
- High flexibility
- High mechanical strength
- Decrease part weight by more than 50%