Customer Value through Innovation

Emission Control
Providing greener solutions
Reducing permeation rates is important for us. Smaller engines that weigh less, require less fuel and give a higher performance is what we strive to achieve.

Our customers choose NORMA Group because they know high quality products will pay off economically. We offer complete connector, fluid systems and clamp solutions that fulfill your requirements.
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.
### Materials

| W1 | = All parts completely zinc plated steel |
| W2 | = Band: Stainless steel 1.4301. Screw + Trunnions: Zinc plated mild steel |
| W2 | = Band: Stainless steel 1.4510 / 1.4511. Clamping head: Steel, zinc plated GBS |
| W2 | = Band + Housing Stainless steel 1.4016. Screw: Zinc plated mild steel for all materials or equivalent |
| W3 | = All parts completely stainless steel 1.4016 |
| W4 | = All parts completely stainless steel 1.4301 |
| W5 | = Stainless steel 1.4571 / 1.4401 TORRO®, S/SP |
| W5 | = Completely stainless steel 1.4571 GBS |

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Hose Clamps

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.
Hose Clamps

GBS – Heavy duty clamps to DIN 3017

GBS are particularly suited for sealing suction and pressure lines with plastic or steel reinforcements and high shore hardnesses. Their distinguishing feature is the extremely high band tensile force.

The assembly of GBS is easily completed by means of either manual, pneumatic or electric standard tools.

1. **W1/W2**
   - New specially designed bolt with integrated spacer
   - improved efficiency, cannot get lost.
   - W5. Hexagonal socket screw.

2. **Reinforced loops**
   - allow to withstand significantly higher torques

3. **Mechanically locked closure**
   - no welding points, no contact corrosion

4. **Bridge**
   - optimal hose protection

5. **Robust band with rounded edges**
   - protection against injuries and damage to the hose surface

### Technical features

**Band tensile forces**

The results of numerous test sequences proved that GBS are superior to comparable competitive products.

### Materials

<table>
<thead>
<tr>
<th></th>
<th>W1*</th>
<th>W2*</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>
</tr>
</tbody>
</table>

* No Chromium VI used for surface treatment of closure unit
GBS with QR closure

On request the GBS is available with QRC (Quick Release Closure). The hinged bolt can be quickly released and enables the fast and easy assembly or disassembly of the clamp.

- Available in all materials W1, W2, W4, W5.

GBS Multi-Part version

The 2-part version of the GBS is an additional clamp type in this range.
Hose Clamps

S/SP – Sealing clamps

Sealing clamps (S) to DIN 3017, Retaining clamps (SP) to DIN 3016

Thanks to their robust clamping brackets with metric bolts the clamping force offered by S/SP is very high. We recommend the two-part version for applications submitted to extreme pressure and tensile loads.

1 Strong clamping brackets
   – high clamping force
   – optimum sealing

2 Bridge
   – optimum hose protection

3 Robust band with rounded edges
   (from band width 20 mm)
   – prevention of injuries and damage to the hose

The advantages at a glance

- Material: W1, W5
- Chromium VI free: compliant with ROHS, WEEE and ELV Environmental Directives
- Clamping ranges to DIN 3017 and 3016
- Larger diameters on demand

Materials

<table>
<thead>
<tr>
<th></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></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
Hose Clamps

Clamp Types

**S**

Hose sealing clamps are used to seal rubber and plastic hoses as well as rubber sleeves on pipe ends or connecting spigots. Larger diameters can be connected without problems using two-part clamps.

- Sizes are stepped up in 1 mm intervals.
- Available in W1 and W5.

**SP**

Retaining clamps are suitable for clamping containers, pipes and cables.

- Available sizes and bandwidths on request.
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.

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

* No chromium VI used for the coating of the closure components
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
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
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.
BRS – Wide band hose clamps (BRS) to DIN 3017-5

BRS wide band hose clamps, in combination with a rubber sleeve, are particularly suitable for connecting pipes with smooth ends. Cast iron pipes and steel pipes as well as plastic or glass pipes are joined securely and without welding.

1 Bridge
   - Hose or sleeve ends are completely covered

2 The extra wide band is gentle on the hose or the sleeve
   - Distribution of clamping force over the complete band width
   - No damage to the object to be clamped
   - Increased transverse rigidity

Screw

<table>
<thead>
<tr>
<th>Band width</th>
<th>Hex head with slot W2</th>
<th>Hex head W4</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 mm</td>
<td>M 6 x 38 Sz</td>
<td>M 6 x 45 Sk</td>
</tr>
<tr>
<td>54 mm</td>
<td>M 8 x 47 Sz</td>
<td>M 8 x 50 Sk</td>
</tr>
<tr>
<td>65 mm</td>
<td>M 8 x 47 Sz</td>
<td>M 8 x 50 Sk</td>
</tr>
</tbody>
</table>

BRS sealing clamps are manufactured in standard band widths and materials. Sizes are increasing in steps of 1 mm for single-part clamps.

Up to a clamping diameter of 300 mm they are supplied in rolled-up form, from 301 mm clamping diameter they are supplied in open form.

The advantages at a glance
- Extra wide clamp band
- Large-area distribution of clamping forces
- Increased transverse rigidity
- Single and multi-part versions
Pipe Connections and V-Band Clamps

Both industrial and OEM manufacturers rely on NORMA Group Pipe Connecting Solutions as a safe means of connecting pipes in various applications that feature different materials and sizes.
Pipe Connections and V-Band Clamps

V-Band clamps

The V profile clamps are reliable and time-effective connection elements for industrial and automotive use. They are made to customer requirements and can be supplied with various profiles, band widths and closure types.

The advantages at a glance
- Quick assembly
- Compact design
- Light weight
- No loose closure parts
- Wide range of existing profiles

Materials

V profile clamps are available in three material specifications:

<table>
<thead>
<tr>
<th>Material Reference</th>
<th>Closure Types</th>
<th>Closure Components</th>
<th>Profile segments / Coverband</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STC</td>
<td>QRC</td>
<td>SVS</td>
</tr>
<tr>
<td>W2</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>W4</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>W5*</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

* Available on request
Pipe Connections and V-Band Clamps

Product Advantages

**Easy handling**
Profile clamps are easy to handle and can be assembled with conventional tooling.

**Quick assembly**
Profile clamps are quick to assemble saving time and money. With a single closure design, only one bolt has to be tightened to produce a secure joint.

**Compact design**
In contrast to conventional flanges, profile clamps require only minimal space and can therefore be used in critical fitting situations.

**Light weight**
Compared to flanges, profile clamps are extremely lightweight. This helps to reduce the total weight of the system.

**Product Function**
The profile clamp works on the principle of the inclined plane: when the closure is tightened, a circumferential force $F_1$ is exerted on the profile segments. By means of the profile, the two flange parts are pressed together (see drawing opposite). The exerted circumferential force is converted into a considerably higher axial force $F_2$. 

Pipe Connections and V-Band Clamps

Closure types

**STC**

With the STC type closure we offer a cost-effective alternative to conventional T-bolt closures.

**Advantage:**
- Low friction losses
- High strength precision machined components
- Manufactured from consistently high quality materials
- State-of-the-art automated manufacturing
- Highly competitively priced

**QRC**

The revolutionary QRC closure has significant advantages over conventional T-bolt closures.

**Advantage:**
- All benefits of the STC closure

**Plus**
- Quick assembly and release feature
- No loose closure parts
- Substantially reduced assembly time
- Screw secured in place whilst tightening

### Band & Closure Dimensions

V profile clamps are manufactured with band and closure dimensions according to the profile selected.

<table>
<thead>
<tr>
<th>Closure type</th>
<th>Cover band 1.0 x 20 mm</th>
<th>Cover band 1.5 x 25 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>STC</td>
<td>Screw</td>
<td>Screw</td>
</tr>
<tr>
<td>QRC</td>
<td>M 6 x 50</td>
<td>M 8 x 70</td>
</tr>
</tbody>
</table>
Pipe Connections and V-Band Clamps

Examples of typical applications

**Turbocharger / Catalyst connection**

**Exhaust manifold**

**Industrial:**
- Bulk handling vessel

**Industrial:**
- Bypass filter unit

Example of flange designs

Use of gasket may be required in some applications, support and advice on gasket selection can be provided.
V PP – Profile clamp without cover band

The V PP profile clamps are reliable and time-effective connection elements.

Materials

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

* Available on request

- Material 1.4301 (other materials on demand)
- Internal profile diameters available:*  
  - Closure with bolt 20 mm – 180 mm  
  - Snap-in closure 20 mm – 45 mm  
  - depending on the closure design and the type of profile
Examples of typical applications

V profile clamps are quick assembly connecting devices for flanges which offer an economical alternative to conventional bolted flange joints.

Examples for applications

- Exhaust gas systems
- Exhaust gas recirculation (EGR)
- Charged air applications
- Cooling systems
- Filter systems
- Selective catalytic reduction (SCR)
- Turbo charger manifold connections

Product Function

The profile clamp works with the principle of the inclined plane: when the closure is tightened, a circumferential force $F_1$ is exerted on the profile segments. By means of the profile, the two flange parts are tightly joined.

The exerted circumferential force is converted into a considerably higher axial force $F_2$. 

Exhaust gas recirculation
**SEC – Ball zone exhaust gas clamp**

The SEC is the ideal problem solver for connection points in the central and rear exhaust gas area. During assembly, in combination with flange connections there is the option to swivel the exhaust silencer.

1. **Torx screw with integrated washer**
   - simplified assembly and disassembly

2. **Convex-shaped band fitting ball-shaped flanges**
   - perfectly adapted to the system

3. **Chromium VI-free, non-seizing coating**
   - improved clamping force

4. **Solid trunnion, Chromium VI-free coating**
   - high temperature resistance; withstanding high clamping forces

**Technical features**

- System tightness* with new part (start of service):
  - Leakage rate ≤ 2 Ltr./min

- System tightness after temperature ageing (after full load):
  - 8 h > 400°C Leakage rate ≤ 2 Ltr./min

- Bending moment: > = 150 Nm

- Torsion moment (twisting) of the joint: > = 150 Nm

- Band material: Steel 1.4301

- Screw: Steel, class 10.9

- Solid trunnion: Steel 1.0718/C45

**Applications in the industry**

- Connecting pipes in the central and rear exhaust gas area

**Corrosion resistance**

- Ball shape
- Counter-part

Not tightened
- Corrosion resistance in salt spray testing = Min. 96 h

Tightened

**Materials**

<table>
<thead>
<tr>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
<th>W5</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
Exhaust Pipe clamps (ARS)

Exhaust pipe clamps connect pipes fitted into each other securely and reliably. They are also used to connect pipes that are subject to extreme thermal fluctuations and therefore, are especially suitable for connecting, for example, exhaust pipes and silencers in combustion engines.

1. **Either M8, M10 or M12 bolt**
   - depending on the required clamping force

2. **One-piece clamp band**
   - uniform contact pressure on the pipe circumference
   - high efficiency with regard to system tightness

3. **1 Bolt**
   - easy assembly

4. **Rounded band edges**
   - hose protection and protection against injury

**The advantages at a glance**
- Made in one piece
- Persistent contact on the pipe surface
- Uniform contact pressure on the pipe circumference
- No asymmetric deformation of the pipe

**Materials**

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

* Chrome VI-free  ** On request
Pipe Connections and V-Band Clamps

Bolt types

For information which bolt is supplied for each clamping range please refer to the table of sizes.

<table>
<thead>
<tr>
<th>Bolt</th>
<th>Hammer head/Flange nut</th>
<th>Hexhead bolt/Flange nut</th>
<th>Hexhead bolt/Hexagonal nut</th>
<th>Loose fit washer*</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 8</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X**</td>
</tr>
<tr>
<td>M 10</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>M 12</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

* underneath the bolt head and the nut
** underneath the bolt head (only applicable to several diameters!)

M8 version with hammer head bolt

M10 and M12 version with hex head bolt
Pipe Connections and V-Band Clamps

V-Insert clamps – General Purpose

- **Materials:** Corrosion resistant and specialty steels
- **Fasteners:** #10, 1/4" (6.4 mm), 5/16" (7.9 mm)
- **Sizes:** 2" (51 mm) and larger diameters
- **Options:** Two tightening points (180° apart)

**Features**
- V-inserts welded to a flexible outer band

**Applications**
- Pumps
- Diesel engines
- EGR systems
- Truck exhaust connections
- Turbochargers, and other flanged joints
Quick Connect

- **Materials**: Corrosion resistant and specialty steels
- **Fasteners**: 1/4" (6.4 mm) and 5/16" (7.9 mm)
- **Sizes**: 2" (51 mm) and larger diameters
- **Options**: Two tightening points (180° apart)

**Features**
- V-inserts welded to a flexible outer band, latch allows the clamp to be installed quickly without removing the nut.

**Applications**
- Automotive exhaust systems
- Filters
- Food processing systems
- Ducting connections
Quick Release

- **Materials**: Corrosion resistant and specialty steels
- **Fasteners**: #10, 1/4" (6.4 mm), 5/16" (7.9 mm)
- **Sizes**: 2" and larger diameters
- **Options**: Two tightening points (180° apart)

**Features**
- V-inserts welded to a flexible outer band; pivoting latch allows the clamp to be opened with minimal rotation of the nut.

**Applications**
- Filters
- Mixers
- Separators

Light Duty

- **Materials**: Corrosion resistant steels
- **Fasteners**: 5/16" (8 mm) slotted hex screw
- **Sizes**: 1.75" (44.5 mm) to 7" (178 mm) diameter

**Features**
- V-inserts welded to a low cost stainless steel worm gear clamp

**Applications**
- Dairy equipment
- Diesel engines
- Swimming pool equipment
V-Band clamps – Roll Formed

- **Materials:** Corrosion and heat resistant steels
- **Fasteners:** 1/4" (6.4 mm)
- **Sizes:** 3.5" (89 mm) to 12" (305 mm) diameter
- **Options:** Short loop configuration for added clearance, drain holes in V-retainer.

**Features**
- Continuous V-retainer and partial outer band, compact profile to fit flanges having limited clearance.

**Applications**
- Turbochargers
Pipe Connections and V-Band Clamps

**Uni-Flex**

- **Materials**: Corrosion resistant steels
- **Fasteners**: 1/4” (6.4 mm).
- **Sizes**: 4” (102 mm) to 9” (229 mm) diameter.
- **Tooling**: Application specific.

**Features**

- Cost-effective continuously formed metal band having two 180° V-retainers and a hinge point for flexibility.

**Applications**

- Turbochargers
- Diesel exhaust connections

---

**E-Series**

- **Materials**: Steel, plated steel and corrosion resistant steels
- **Fasteners**: 1/4” (6.4 mm) and 5/16” (7.9 mm)
- **Sizes**: 1.75” (44.5 mm) to 7” (178 mm) diameter
- **Tooling**: Application Specific

**Features**

- Economical coupling, continuously formed metal band having two 180° V-retainers and a hinge point, spot weld free construction enhances corrosion resistance.

**Applications**

- Ducting
- Air connections
- Exhaust connections
Pipe Connections and V-Band Clamps

Halves

- **Materials:** Steel, plated steel, corrosion and heat resistant steels
- **Fasteners:** #10, 1/4" (6.4 mm), 5/16" (7.9 mm)
- **Sizes:** 2" (51 mm) to 14" (356 mm) diameter
- **Tooling:** Application specific
- **Options:** Carriage, hex head or special bolts, captivated nuts

**Features**
- Two separate V-retainers with two bolts, develops a more uniform clamping load than a single bolt clamp, spot weld free construction enhances corrosion resistance.

**Applications**
- Air brakes exhaust connections
- Diaphragm pumps
- Turbochargers

Band & strap assemblies

- **Materials:** Steel, plated steel, aluminized steel and corrosion resistant steels
- **Fasteners:** 1/4" (6.4 mm), 5/16" (7.9 mm), 3/8" (9.5 mm) or metric equivalents
- **Sizes:** Engineered to fit a specific application
- **Options:** Weld or clinch nuts in offset brackets, special holes, Quick Connect latch

**Features**
- Round or special shapes with spot welded or mechanically clinched construction.

**Applications**
- Attach mufflers
- Heat shields
- Grab bars
Breeze V-Band

Breeze V-Band clamps provide fast, secure coupling for connecting flanged joints. The V-Band clamp features high strength and positive sealing integrity.

- Custom designs and sizes available.
- Typical applications include heavy duty diesel engine exhaust and turbochargers.
Pipe Connections and V-Band Clamps

RS/DIN – Exhaust pipe clamps to DIN 71 555

RS/DIN clamps offer an alternative to our ARS exhaust pipe clamps. They are used to safely connect pipes which are fitted into each other. Due to its simple design, the clamp can be fitted with an additional bracket and is then suitable for use as a retaining clamp.

1 Optional attachment of brackets
   – the clamps can be used for fastening and/or retaining objects

2 The clamps are supplied without bolt
   – bolts can be chosen as required

3 Simple design
   – hose protection
   – easy handling

Bolt

The clamps are supplied without bolt and nut. Required bolt sizes: M 8 or M 10.

Materials

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* No chromium VI used for surface treatment
** On request
Pipe Connections and V-Band Clamps

Exhaust Components

Torca AccuSeal
- Provides joint serviceability
- Unique sealing performance
- Superior clamp load capability
- Pre-assembled - easy installation
- Designed for part-in-assembly attachment
- Durable installation without damage to pipe ends
- Available in standard industry sizes from 44.5 mm (1-3/4") through 177.8 mm (7")
- Available in Aluminized Steel, 409 Stainless Steel, 430 Stainless Steel and 304 Stainless Steel

Torca DuraSeal
- Provides joint serviceability
- Improved clamp performance for thicker pipes or larger pipe gaps
- Pre-assembled for easy installation
- Only one assembly torque point
- Designed for part-in-assembly pre-attachment
- Available in standard industry sizes from 50 mm (2") through 127 mm (5")
- Available in 409 Stainless Steel and 304 Stainless Steel

Torca Coupler
- Provides joint serviceability
- Does not require pipe overlap
- Unique sealing performance
- Superior clamp load capability
- Available in standard industry sizes from 38 mm (1-1/2") through 89 mm (3-1/2")
- Available in 409 Stainless Steel and 304 Stainless Steel
Pipe Connections and V-Band Clamps

Exhaust Components

Torca TorcTite
- Specific OEM & Service designs
- Unique sealing performance
- Superior clamp load capability
- Compatible with pipes, flex, mufflers
- Durable installation without damage to pipe ends
- Available in standard industry sizes from 2” through 6”
- Available in Aluminized Steel and bright finish 304 Stainless Steel

Torca AccuLock
- Provides OE with a robust design alternative to flat flanges
- Enhanced assembly flexibility, lower weight, improved overall value
- Designed for use in low leak, pre-after treatment (catalyst) applications
- Positive axial retention
- Uses less space than a flat flange joint
- Provides rotational and axial alignment flexibility
- Available in standard industry sizes from 45 mm (1-3/4”) through 127 mm (5”)
- Available in 409 Stainless Steel, 439 Stainless Steel and 301 Stainless Steel

Torca EasySeal
- Ideal, service specific design
- Flat, packaged, easy to store
- Easy, fast, accurate installation
- Unique sealing performance
- Premium materials and finish
- Durable installation without damage to pipe ends
- Available in standard industry sizes from 2” through 6”
- Available in bright finish 304 Stainless Steel
Pipe Connections and V-Band Clamps

Exhaust Components

**Torca EuroCoupler**

- Provides joint serviceability
- Does not require pipe overlap
- Unique sealing performance
- Superior clamp load capability
- Available in standard industrial sizes 38 mm and from 40 mm to 70 mm in 5 mm steps
- Available in 409 Stainless Steel and 304 Stainless Steel
- Low weight version of TorcaCoupler

**Torca AccuSealCoupler**

The Torca AccuSealCoupler is the simple, effective way to connect exhaust system components, pipes, mufflers and converters. It is a pipe based coupler that is flexible in both length and diameter and with its unique seal and high clamp loads, permanent distortion to exhaust members are prevented.

- Unique designed slots provide optimal seal and joint retention performance
- Efficient use of materials reduces weight and assembly costs
- Unique fastening system stretches the band using its tensile strength permitting the use of thinner gauge, corrosive resistant materials.
- Exclusive reaction block provides a full 360 equal distribution of stretching forces, prohibiting pipe distortion while completing a seal around the joined exhaust components.
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**

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* 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).
RV Clip

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.

RV Clip

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 for being matched with the tube system.
Quick Connectors

MK

MK connectors have primarily been developed to reduce permeation rates. Compared with standard connectors that are prone to high permeation rates and constant micro leakage, MK provides the perfect link between the tank and the pipe system. The MK is not a standard part. All projects are based on specific customer requirements. We are therefore pleased to receive a description of your application in order to offer you an optimal, customized solution.

Technical features
- Angle versions: 0°, 90°
- Meeting the requirements of standards as ENG 016, VW TL 82417, KT-2KDL-0802, STD-SAL 0013

Easily combined with other NORMA products such as:
- S (See page 48)
- PS3
- V2 (See page 50)
- Fluid Systems (See chapter on Fluid Systems)

The advantages at a glance
- Competitive price
- Can offer the complete solution and knowledge
- Full in-house production—we produce the entire system on our own from connectors to fuel lines to multi-layer lines.
- Easy assembly
- Low permeation rate
- LET tube key component meets high requirement for a competitive price
- Reduces weight
- State-of-the-art lab to test products on request
- Conductive PA is possible
Connecting spigot

MK connectors have been developed with the aim to achieve significantly reduced permeation rates.

MK provide a perfect link between the tank and the pipe system in cases where existing standard 1K connectors are prone to a high permeation rate while their tendency to "creep" causes additional micro leakage.

MK for the first time combine reinforced and unreinforced materials and thus enable the safe connection of the connector with the plastic fuel tank.

1. Chemical bonding
2. Welded ring HDPE
3. Spigot PA 12 (glass fiber reinforced)

Materials
MK combine materials that so far have been incompatible. Welded ring made from HDPE, can be welded onto the plastic fuel tank. Spigot made from Polyamide 12 with 30% glass fiber content.

Insiders’ Tip:
The perfectly matched system is achieved when combining MK connecting spigots and NORMA Group Fluid systems.

MK are applicable for use with the following connectors:
- SAE (e.g. S)
- VDA (e.g. PS 3)
- V2
- Firtree

MK with S
MK Multishot spigot
S Quick connector
Optional O-ring on firtree
Quick Connectors

S

S plastic quick connectors are designed to connect media carrying lines on automobiles and have been developed for fuel system applications. The connectors can be used for both line-to-line and line-to-device connections.

The advantages at a glance
- Extremely low permeation rates
- Quick assembly time equaling cost reduction
- Automated production, no human factor equals less margin of error
- No tools needed
- Possible to install in extremely small installation conditions
- An integrated seal provides optimal tightness
- Closing cone function, S is protected from unintentional opening and cannot be locked under pressure

Easily combined with other NORMA products such as:
- NORMA Group Fluid systems (See page 53)
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.

Technical features
- **Medium/Fluid**: Fuel, urea, oil
- **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

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
Quick Connectors

V2 plastic quick connectors are an ideal means to connect media carrying lines as well as ventilation and exhaust lines in combustion engines. The connectors can be used for both line-to-line and line-to-device connections. V2 can be applied on both plastic and metal spigots.

Technical features
- **Medium/Fluid:** Fuels, air, oil and oil vapors
- **Long term operating temperature:** from -40°C to 135°C
- **Short term operating temperature:** up to +150°C (approx. 30 min.)

The advantages at a glance
- Quick assembly time equaling cost reduction
- Automated production, no human factor equals less margin of error
- No tools needed
- Compact dimensions allowing ease of use in narrow spaces
- An integrated seal provides optimal tightness
- All seals can be visually checked, permitting safe assembly
- Featuring extremely low permeation values

Easily combined with other NORMA products such as:
- NORMA Group Fluid systems (See page 53)
Connecting spigot

NORMA Group standard (Production drawings will be made available on request) V2 connectors can be used on both plastic and metal spigots. Would you please note that all V2 connectors are delivered without spigot. However, we will be pleased to offer suitable spigots on request.

Insiders’ Tip:
The perfectly matched system is achieved when combining V2 quick connectors and NORMA Group Fluid systems.

Technical features
- **Medium/Fluid**: Fuels, air, oil & oil vapours
- **Operating Pressure**: Approx. 5 bar excess pressure
- **Operating Temperature**: Engine compartment
  -40 °C up to +135 °C. Short time up to +150 °C (approx. 30 min.)

The advantages at a glance
- Fast assembly without tool – reduced time and cost
- Robot assembly possible – automated processes
- Compact dimensions – to be used in narrow spaces
- Integrated seal – optimal tightness
- The seals can be visually checked – safe assembly work
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.
UREA

SCR route to cleaner and greener emissions

Leading combustion engine manufacturers, plus a wide range of OEMs and first-tier suppliers, have chosen NORMA Group as their global development partner for an SCR (Selective Catalytic Reduction) exhaust emissions solution. The result is UREA.

UREA is a complete SCR system for any vehicle. Pipes (up to six meters long) can be thermoformed like standard fuel pipes. Tight-bending radii and small external diameters create extra space, and the urea conveyer, filler and ventilation pipes can be fitted with a wide range of clips or retaining elements. We solved AdBlue’s freezing problem by integrating heating wires that unfreeze the urea directly after the engine starts and keep it liquid while the vehicle is moving.

EU emission regulations are a big challenge for European combustion engine manufacturers. To meet these tough requirements, most manufacturers have chosen SCR technology. SCR converts nitric oxides and harmless atmospheric nitrogen into water by injecting an aqueous urea solution called AdBlue® into the exhaust gases. AdBlue® is non-toxic yet still requires urea-tight couplers, profile clamps and quick connectors to work effectively. Furthermore, AdBlue® freezes at minus 11°C.
UREA – to be used in exhaust gas treatment systems

The urea fluid that induces a reaction in the Selective Catalytic Reduction (SCR) converter, is better known as AdBlue®. By injecting AdBlue® into the SCR converter, nitric oxides of exhaust gases are converted into water and atmospheric nitrogen, helping you GO GREEN!

NORMA Group is a pioneer of this technology and therefore has an extremely high competency in this area. So, what’s in it for you?

Problem-Solution Story:

“One of the challenges we faced was the fact that the AdBlue® (urea) liquid freezes easily at -11°C. We solved this problem by developing Fluid pipes and Quick connectors with integrated heating wires. By doing this, we created a brand new fluid transport system, which unfreezes the urea fluid directly after the engine starts and keeps it liquid while the vehicle is driving.”

The advantages at a glance

- Impressive client portfolio demonstrating trust and high proficiency. Many OEMs and 1st Tier suppliers have selected NORMA Group as their global development partner of SCR technology
- A notable product portfolio with the ability to provide a complete SCR system in any vehicle
- Small external diameter and tight bending radius providing more available space
- UREA conveyer and filler and ventilation pipes can be easily attached to vehicles
- Electrical wiring and connections can be adapted to individual requirements of any vehicle
- Every product is thoroughly tested in the NORMA Group state-of-the-art lab
- This product is constantly and continuously developed and improved

New and improved Gen 2
FTS

The FTS (Fuel Transport System) is a tube system connecting fuel feed lines and fuel return lines from fuel tank to the engine. Whether it be a diesel or benzene engine, any OEM can use the FTS to connect the fuel tank to the engine.

By using the crucial LET tube component with the FTS, emissions are greatly reduced through its technologically advanced and environmentally friendly material.

So why do our customers need the FTS? Find out below what advantages you can benefit from.

The advantages at a glance
- Competitive price
- Wide variety of quick connector sizes from 7.89 mm - 15.82 mm
- Can offer the complete solution and knowledge
- Full in-house production—we produce the entire system on our own from connectors to fuel lines to multi-layer lines.
- Low assembly rates
- Low permeation rate
- Can be connected with any SAE connector
- LET tube key component meets high requirement for a competitive price
- Reduces weight
- Quick to produce prototypes
- State-of-the-art lab to test products on request

Easily combined with other NORMA products such as:
- S (See page 48)
- V2 (See page 50)
**TFS – to be used in Oil Transport Tube Systems**

The TFS is delivered and produced specifically for the Mercedes Benz M-class. The filler tube (TFS) transports a medium (fuel, diesel or gasoline) through the tank inlet to reach the fuel tank.

**We supply complete fuel systems incl.**

- Fuel Transportation lines
- Ventilation Lines
- Underbody lines and bundles
- Purge and Purge valve lines
- Mono- & Multilayer tubing smooth- & corrugated
- Quick Connectors
- MK parts
- Filler Heads & filler necks
- Clamps
- Tank Straps
- Since 1994 over 20 mio. Fuel lines made
TVS – to be used in Tank Ventilation Tube Systems

A member of the fuel application family, TVS operates in Tank Ventilation Tube Systems. Its sole purpose is to ensure that a bare minimum of gases is released in the environment.

A crucial part to any tank manufacturer, the TVS meets necessary requirements and is easily connected with many essential standard parts.

Naturally, the TVS is a component of a larger available solution. Making every day a little easier for you and saving precious minutes, you can be sure that at NORMA Group you can receive an entire solution and expertise from one single source.

**Problem-Solution Story:**

“I received a call one day from one of my clients who needed immediate information about a connector that is attached to the product I am responsible for. I didn’t know much about this connector to be honest, so I leaned over my desk to check with my colleague who is the product director for this connector. He was able to talk to my client and within 5 min we had solved the problem. This is a great example of how we can really offer the complete package to our clients, but also that we really are sitting a couple of meters from each other so we can offer this fast and knowledgeable feedback without a problem."

**The advantages at a glance**

- Competitive price: Competitors buy parts and we have them
- Quick to produce prototypes, in-house prototype shop
- Quick feedback from one source: engineers and specialists sit in one location
- Reduces weight
- Quick to produce prototypes
- Produce V2 on our own
- Easy assembly

**Easily combined with other NORMA products such as:**

- V2 (See page 50)
- SAE spigot Quick Connector (see page 49)
Reducing exhaust gas emission is a priority. With the SAS (Secondary Air tube Systems), air is added into engine combustion through suction pipes and pressure pipes. SAS is used in gasoline engine vehicles as well as for the transport of secondary air.

In order to improve the oxidation process of the pollutants in the catalyst during the warm-up phase as well as reduce the initiation time, fresh air (secondary air) is injected and initiates a post-combustion.

With an extensive range of standard components, SAS offers a solution tailored specifically to space related conditions.

**The advantages at a glance**
- Low price
- Low weight
- High flexibility
- Quick and easy installation in the vehicle
- Full in-house production from prototype to serial phase
- Temperature range from -40°C to +150°C

This product is recyclable according to ELV (extra-low voltage) regulations!
CVS – to be used in Crankcase Ventilation Tube Systems

Either with or without heating

The CVS can be used in petrol and diesel engine motor vehicles. In order to protect the environment from the escape of harmful oil vapors and gases, the CVS leads these oil vapors and gases from the cylinder cover to the intake manifold of the combustion.

With an extensive range of standard components, we offer tailored solutions especially designed for tight installation conditions. The CVS is characterized by its low weight, high flexibility and quick and easy installation. Automobile industry customers include high-end brands such as Volkswagen, Audi, Bentley, Maseratti, BMW, etc. The CVS is recyclable according to ELV regulations.
CWV – to be used in Cooling Water Tube Systems

The thermoformed lines ventilating the cooling water circuit is what we call CWV (Cooling Water Ventilation). These thermoformed lines are connected to the cooling water lines at critical areas where air, which is in the cooling water line, can exhaust. If the lines fail to work, the air in the circuit cannot cool and the engine ultimately breaks. This product is recommended to be used in the engine bay of a passenger vehicle.

Technical Features:
- High temperature stability, from -40°C to 135°C
- Excellent media resistance compared with common medias
- Great chemical resistance, especially compared with hydrolysis
- High system flexibility

The advantages at a glance
- Quality: Reduces the number of joints
- Cost reduction (part price) with up to 40%
- Reduces assembly time
- Reduces weight with up to 75% Important
- Realizes very small diameters
NORMA Group plastic products comprise of plastic hose and pipe connectors suitable for numerous applications such as connecting fluid carrying lines.
Over the years, these top quality very versatile connectors have been used in millions of different applications and the product has become an indispensable aid to the domestic, commercial and industrial market sectors. SV products are proven plastic hose and tube connectors, which connect fluid carrying lines reliably and at a competitive price.

SV hose and tube connectors are not only used in motor vehicles, but also in nearly every industrial application.

The advantages at a glance
- High strength
- Tough
- Low weight
- Shock damping
- Scuff resistance
- High impact resistance
Types and Variants

1. Taper thread connector
These SV connectors made of Polyamide 6 feature on one end a tapered thread and on the other end one or two push-on spigots. The ribbed surface of the push-on spigots ensures that the hoses are tight-fit after assembly. Three different thread geometries are distinguished by means of colour coding allowing for a quick visual identification:
- Metric taper thread ............. light grey
- Whitworth pipe thread ........ charcoal
- NPT thread ........................ black
(Other materials are available on request)

2. Hose connectors
With these SV connectors without thread hoses are connected quickly and easily with one another by just pushing the hose onto the connectors. The ribbed surface of the push-on spigots ensures that the hoses are tight-fit after assembly. The SV hose connectors are made of ecru-coloured POM (acetalcopolymerisat); other materials are available on request.

3. Compression
The SV threaded connectors feature on one end a metric thread and on the other end one or two pipe unions. These compression connectors are made of black polyamide 6 with 30% glass-fibre reinforcement.

4. Push-on connectors
These SV parts are used for connecting plastic pipes made of PA6 or PA12. With these connectors safe connections can be achieved even without the use of additional hose clips. The push-on connectors are made of black polyamide 6 or polyamide 12 containing 30% glass fibre reinforcement. The connectors can be supplied with O-rings on request.
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