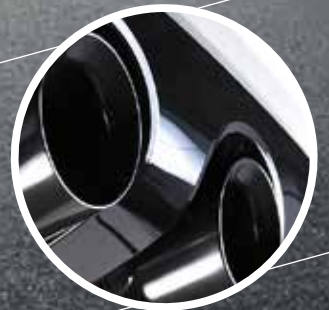


# *Emission Control*

Providing greener solutions



Reducing permeation rates is important to us. We strive to achieve smaller engines that weigh less, require less fuel and perform better.

Our customers choose NORMA Group because they know high quality products are cost-effective. We offer complete connector, fluid systems and clamping 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.



We will continue to strengthen the close strategic cooperation that has helped clients use our Engineered Joining Technology solutions make a major impact on their businesses. At the same time as we develop forward-thinking partnerships for our mutual benefit.

# Materials

- W1** = Zinc Plated Mild Steel
- W2** = Stainless Steel with Zinc Plated Mild Steel Fasteners
- W3** = Ferritic Stainless Steel
- W4** = Austenitic Stainless Steel
- W5** = High Temperature & High Corrosion Resistant Austenitic Stainless Steel
- W6** = Aluminum Alloy

Note material descriptions apply to metal products only

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# Hose Clamps





## **Optimal sealing solutions for all industries**

With over 60 years experience of proven solutions the NORMA Group range of Hose Clamps provides optimal sealing solutions for all industries and their individual requirements – delivering reliability and robust performance even in extreme conditions.

# 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.



### 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 upon request

- 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)
  - prevents injuries and damage to the hose

### Materials

W1	W2	W3	W4*	W5
x			x	x

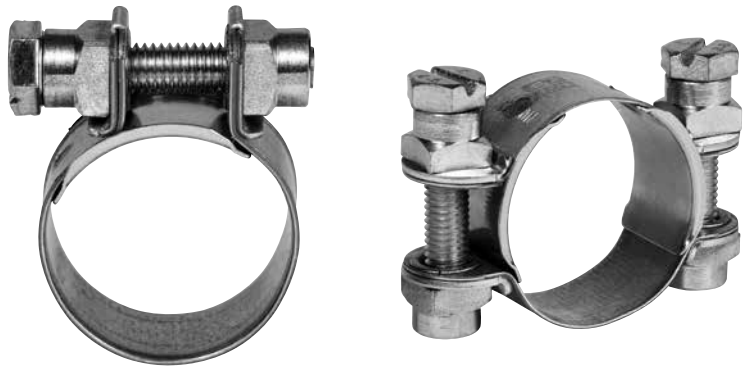
\* Available on request

## 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 problem using two-part clamps.

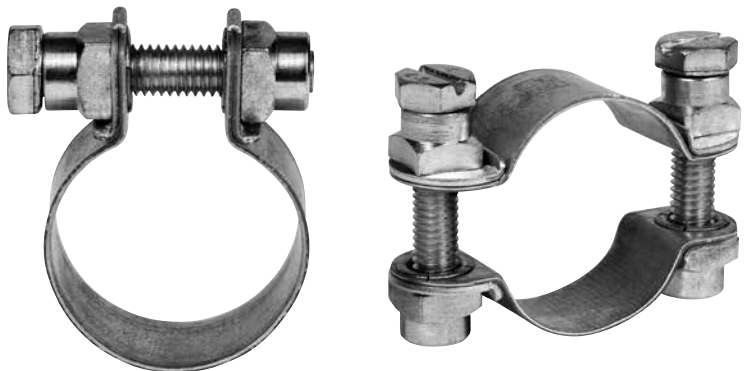
- Sizes are stepped up in 1 mm intervals
- Available in W1 and W5



### SP

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

- Available sizes and bandwidths on request

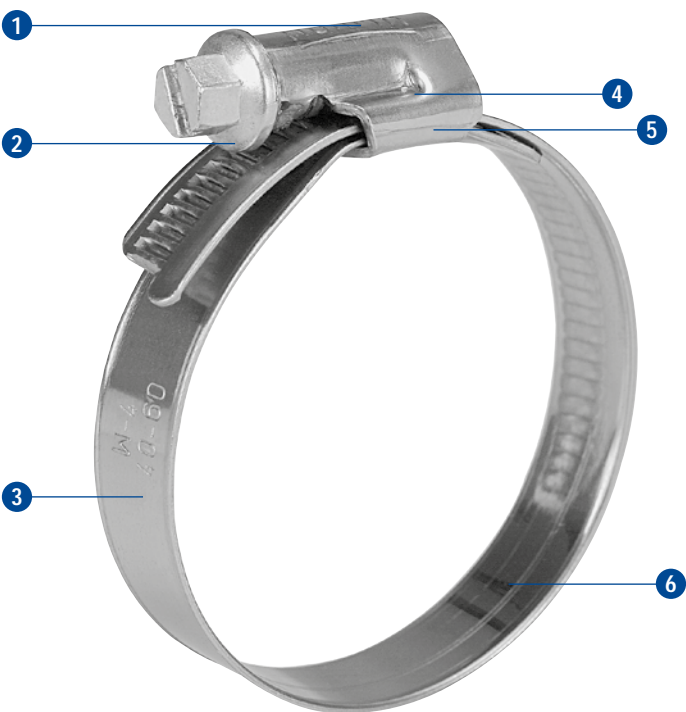


# WORM DRIVE HOSE CLAMPS

## TORRO® – WORM DRIVE HOSE CLAMPS TO DIN 3017

TORRO® worm drive hose clamps are specially suitable for applications under high mechanical loads. Since we are continuously working to improve its features this clamp is still setting standards for modern hose clamp 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 upon request

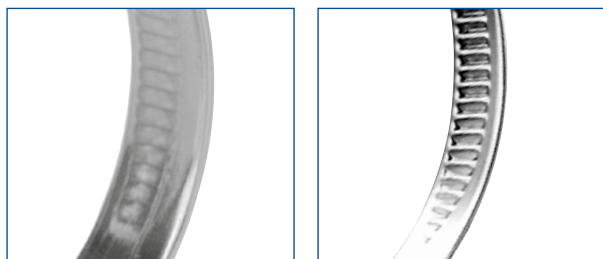
- 1 Improved asymmetric housing**  
– even distribution of forces and safe assembly
- 2 Screw support**  
– ease of assembly due to the safe guidance of the emerging band end
- 3 Material and clamping range stamped on the band**  
– prevents errors
- 4 Asymmetric extension**  
– prevents the housing 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

### Materials

W1*	W2*	W3	W4	W5
x	x	x	x	x

\* 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

## Screws



		W1	W2	W3	W4	W5
Phillips head	SW 7*	•	•			
Slotted head	SW 7**			•	•	•

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

## High band tensile force and high fracture torque

As always, the new TORRO® features high tensile forces. However, when compared with competitors' 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.

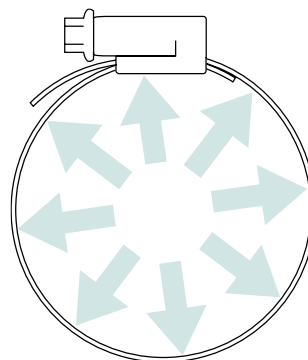
## Corrosion resistance

Material	Corrosion resistance in salt spray testing
W1	Min. 144 h
W2	Min. 72 h
W3	Min. 200 h*
W4	Min. 400 h
W5	Min. 1000 h

\* 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 features that can be added to the clamp, 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 option for pre-positioning the TORRO® hose clamp on the hose. In this case the oval hole in the clamp band finds its exact counterpart 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
- Smart weight saving option without weakening the performance of the clamp



#### The Prefix Clamp

With this accessory the TORRO® can also be pre-positioned on the hose. The two 'teeth' of this device keep the TORRO® hose clamp 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 clamp is equipped with a spring insert on the inside of the clamp 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® Insert clamp consists of a standard riveted clamp with a stainless steel liner. This insert in the radial acts as a spring.

- 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

### 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**  
– 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

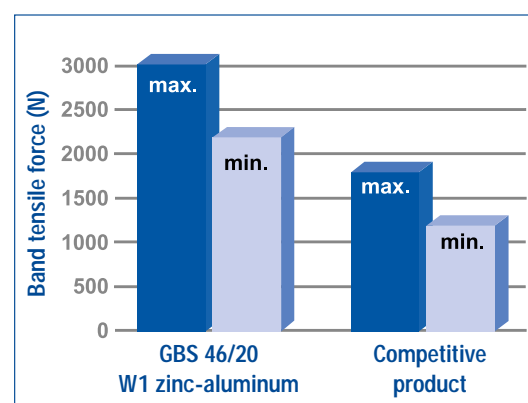
##### Band tensile forces

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

#### Materials

W1*	W2*	W4	W5
x	x	x	x

\* No Chromium VI used for surface treatment of closure unit



## HEAVY DUTY CLAMPS

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### Clamp Types

#### GBS WITH QR CLOSURE

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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

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



## 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 applications include 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.



T-Bolt clamp with floating bridge



T-Bolt clamp with shoe



T-Bolt clamp plain band

## 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 Flex

- 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.



Flex Seal Channel



Flex Seal Standard



Flex Seal Mini

## WIDE BAND HOSE CLAMPS

### 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.



### *The advantages at a glance*

- Extra wide clamp band
- Large-area distribution of clamping forces
- Increased transverse rigidity
- Single and multi-part versions

#### Screws

	Hex head with slot W2	Hex head W4
		
Band width 48 mm	M 6 x 38 Sz	M 6 x 45 Sk
Band width 54 mm	M 8 x 47 Sz	M 8 x 50 Sk
Band width 65 mm	M 8 x 47 Sz	M 8 x 50 Sk

BRS sealing clamps are manufactured in standard band widths and materials. Sizes increase 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.

#### 1 Bridge

- hose or sleeve ends are completely covered

#### 2 The extra wide band is gentle on the hose or the sleeve

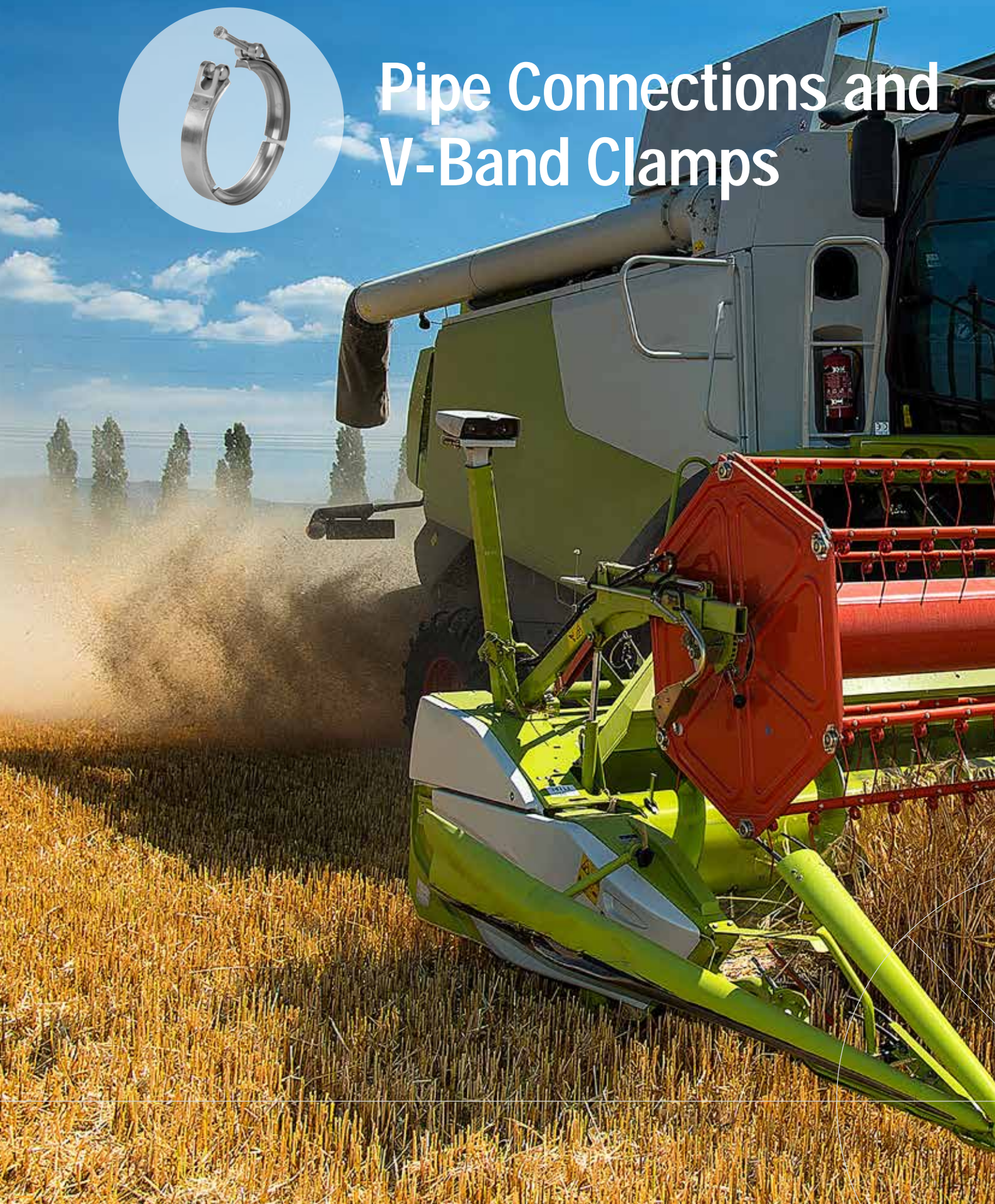
- distribution of clamping force over the complete band width
- no damage to the object to be clamped
- increased transverse rigidity

#### Materials

W1	W2	W3	W4	W5
	x		x	



# Pipe Connections and V-Band Clamps



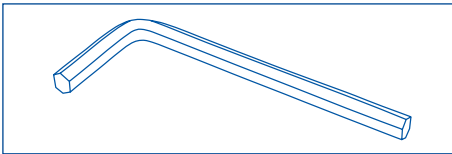


## Exceeding worldwide emission standards

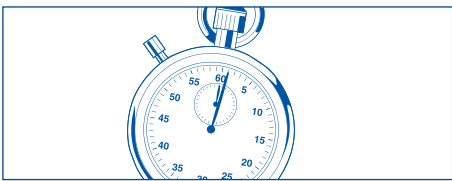
With an extensive range of Pro-File Clamps, NORMA Group supports customers in meeting and exceeding worldwide emission standards. All clamps support the lowest leakage levels and increase efficiency by providing fast and simple assembly.

# PIPE CONNECTIONS AND V-BAND CLAMPS

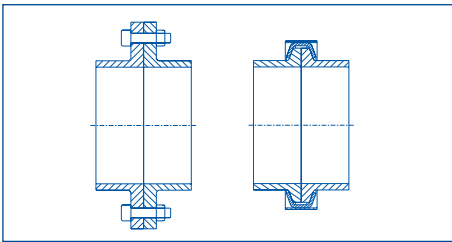
## PRODUCT ADVANTAGES



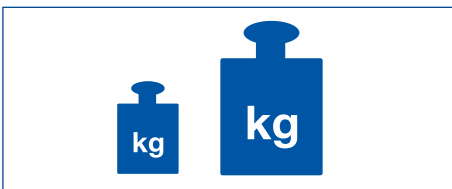
**Easy handling**  
Pro le clamps are easy to handle and can be assembled with conventional tooling.



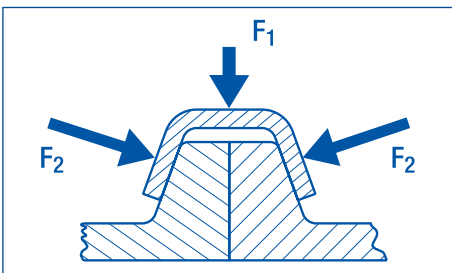
**Quick assembly**  
Pro le clamps are quick to assemble saving time and money. With a single closure design, only one bolt has to be tightened to produce a secure joint.



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

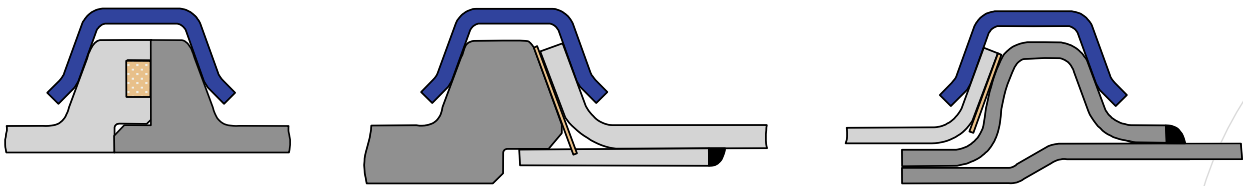


**Lightweight**  
Compared to angles, pro le clamps are extremely lightweight. This helps reduce the total weight of the system.



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

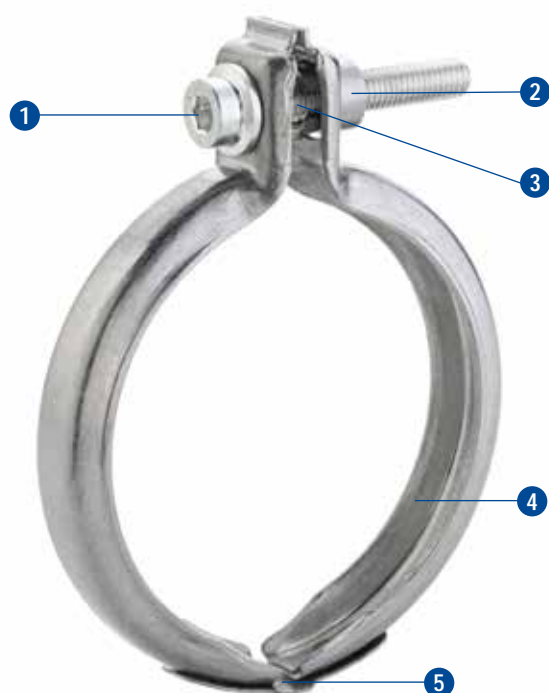
### Example of angle designs



Use of gasket may be required in some applications. Support and advice on gasket selection can be provided.

## VPP BRIDGE

The VPP bridge clamps offer a connection solution to applications exposed to high temperatures. A typical application is petrol turbocharger connections.



## *The advantages at a glance*

- Fast and easy assembly thanks to its swivel nut, bridge and anti-loss washer components
- Head support feature on the clamp closure provides better force distribution and increases high temperature resistance

1 Flanged bolt

2 Swivel nut

3 Anti-loss washer

4 Profile half

5 Bridge

- **Internal profile diameters available:**

Ø 69–138 mm (other diameters upon request)

Note: Many NORMA VPP clamps have head support

### Materials

W1	W2	W3	W4*	W5
			x	x

\* Available on request

### Applications

- Turbo petrol engine manifold, turbocharger and catalyst joints
- High temperature diesel engine manifold and turbocharger joints

## PIPE CONNECTIONS AND V-BAND CLAMPS

### V2PP – TWO-PIECE PROFILE CLAMP

The V2PP two-piece profile clamps enable fast and easy pre-assembly by using only two fingers. The special design is based on a spring element and a hook at the bottom of the clamp in combination with a pre-assembled bolt.



### *The advantages at a glance*

- Fast and easy assembly
- Pre-engaged screw and hook closure allows one-handed assembly
- No risk of cross-threading the bolt during assembly
- Optimized for extremely tight packaging spaces

- 1 Pre-assembled bolt
- 2 Fixed nut / collar formed thread
- 3 Spring element
- 4 Profile half

- Internal profile diameters available:  
Ø 31 mm and 98 mm (other diameters upon request)

#### Materials

W1	W2	W3	W4	W5*
			x	x

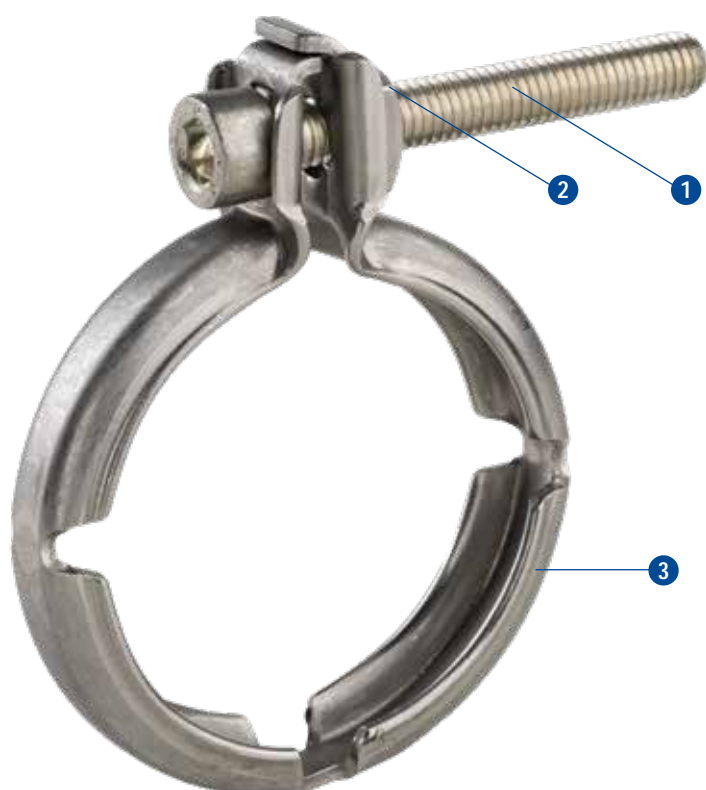
\* Available on request

#### Applications

- Turbocharger
- Hot end and cold end joints
- EGR, SCR injector and sensor joints

## VPP COMPACT

The VPP profile clamps are reliable and time-efficient connection elements.



## *The advantages at a glance*

- Easy assembly
- Reliable and time-efficient solution

**1 Bolt**

**2 Nut**

**3 Profile**

- **Internal profile diameters available:**  
Ø 50–98 mm (other diameters on demand)

## Applications

- Turbocharger
- Hot end and Cold end joints
- EGR, SCR injector and sensor joints

## Materials

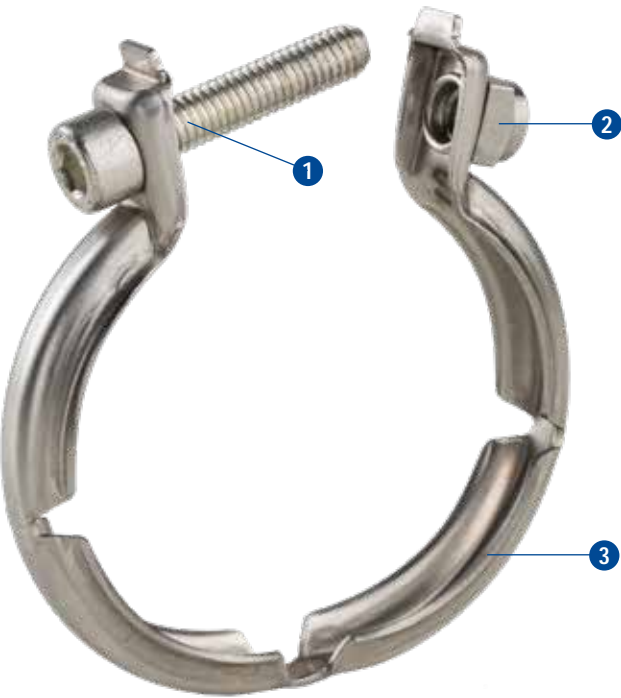
W1	W2	W3	W4	W5*
			x	x

\* Available on request

## PIPE CONNECTIONS AND V-BAND CLAMPS

### VPP STANDARD

The VPP profile clamps are reliable and time-efficient connection elements.



### The advantages at a glance

- Easy assembly
- Reliable and time-efficient solution

- 1 Bolt
- 2 Fixed nut / collar formed thread
- 3 Profile

- Internal profile diameters available:  
Ø 20–180 mm (other diameters upon request)

### Applications

- Turbocharger
- Hot end and Cold end joints
- EGR, SCR injector and sensor joints

### Options:



Pre-assembly Clip



VPP Clip (Snap-in closure)

### Materials

W1	W2	W3	W4	W5*
			X	X

\* Available on request

## PIPE CONNECTIONS AND V-BAND CLAMPS

### EXAMPLES OF TYPICAL APPLICATIONS

V-Pro le clamps are quick assembly connecting devices for anges which offer an economical alternative to conventional bolted ange joints.

#### Examples of applications

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



Exhaust gas recirculation



SCR injector



Petrol turbocharger application

## PIPE CONNECTIONS AND V-BAND CLAMPS

### V-BAND CLAMPS

V-Band 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
- Lightweight
- No loose closure parts
- Wide range of existing profiles

- 1 Coverband**  
– optimal distribution of clamping forces
- 2 Closure**
- 3 Three profile segments**  
– ease of assembly

### MATERIALS

V-Band clamps are available in four material specifications:

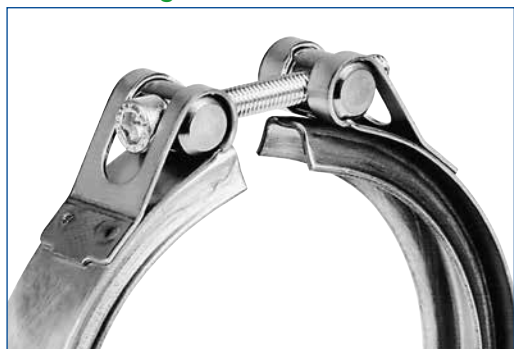
Code	Closures		Closure components	Profile segments/ Cover band
	STC	QRC		
W1			Mild steel, zinc plated	Stainless steel
W2	•		Mild steel, zinc plated	
W4	•	•	Stainless steel	
W5*	•	•	Stainless steel	

\* Available on request

## PIPE CONNECTIONS AND V-BAND CLAMPS

### CLOSURE TYPES

#### STC – Straight Trunnion Closure



##### Advantage:

- Low friction losses
- High-strength precision-machined components
- Manufactured from consistently high-quality materials
- State-of-the-art automated manufacturing
- Competitively priced

#### QRC – Quick-Release Closure



##### Advantage:

- All the advantages of STC-type closures

##### Plus

- Rapid closing and opening
- Captive closure components
- Significantly shorter installation times
- Closure bolt secured during tightening

### BAND WIDTHS & CLOSURE SIZES

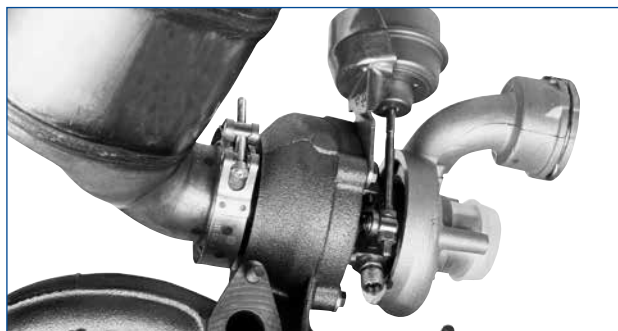
V-Band clamps are manufactured in two different band widths and with different closures, depending on the profile type concerned:

Closure type	Cover band 1.0 x 20 mm	Cover band 1.5 x 25 mm
STC	Bolt M 6 x 50	Bolt M 8 x 70
QRC		

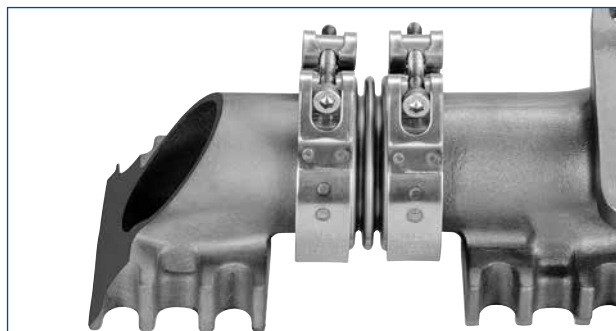
## PIPE CONNECTIONS AND V-BAND CLAMPS

### EXAMPLES OF TYPICAL APPLICATIONS

**Turbocharger / Catalyst connection**



**Exhaust manifold**



**Industrial:  
Bulk handling vessel**



**Industrial:  
Bypass filter unit**



## PIPE CONNECTIONS AND V-BAND CLAMPS

### V-INSERT CLAMPS – GENERAL PURPOSE



General Purpose V-Insert

- **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 angled joints



## PIPE CONNECTIONS AND V-BAND CLAMPS

### QUICK CONNECT



Slot V-Insert with Handle



Quick Connect V-Insert

- **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



Slot V-Insert with Handle



Quick Connect V-Insert

## PIPE CONNECTIONS AND V-BAND CLAMPS

### SWING KNOB



Swing Knob V-Insert

- **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



Swing Knob V-Insert

### LIGHT DUTY



Light Duty V-Insert WG-band with Hex Screw

- **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

## PIPE CONNECTIONS AND V-BAND CLAMPS

### V-BAND CLAMPS – ROLL FORMED



Roll Formed V-clamp Unequal Straps

- **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 angles with limited clearance

#### Applications

- Turbochargers



Roll Formed V-clamp Assembly



Roll Formed V-clamp with Equal Straps

## PIPE CONNECTIONS AND V-BAND CLAMPS

### UNI-FLEX



Uni-Flex V-clamp type

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

#### Features

- Cost-effective continuously formed metal band with two 180° V-Retainers and a hinge point for flexibility

#### Applications

- Turbochargers
- Diesel exhaust connections

### E-SERIES



Stamped Equal Lug V-clamp type

- **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:** Applications specific
- **Options:** Carriage or hex head bolts, captivated nut

#### Features

- Economical coupling, continuously formed metal band with 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



Stamped Half clamp type

- **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:** Applications 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



Shaped double strap



- **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

## PIPE CONNECTIONS AND V-BAND CLAMPS

### BREEZE V-BAND

Breeze V-Band clamps provide fast, secure coupling for connecting angled joints. The V-Band clamps 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

### ABA ORIGINAL WITH PROFILE SEGMENT

The ABA Original with profile segment clamp is intended for smaller V-Band applications.

The clamp is easy to open up and close in order to be able to apply on the V-Profile application.

The WDHC cover band gives an equal force to the V-Band profile.



### *The advantages at a glance*

- Easy to assemble, usage where a small space is required

#### Materials

- AISI 316 / 1.4404 in WDHC and  
AISI 304 / 1.4301 in profile segment

#### Applications

- For smaller applications where a V-Profile segment clamp is needed, for example, EGR systems

## SEC – BALL ZONE EXHAUST GAS CLAMPS

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



### Technical features

- System tightness with new part (start of service):  
Leakage rate  $\leq 2$  Ltr./min
- System tightness after temperature ageing (after full load):  
8 h  $> 400^{\circ}\text{C}$  Leakage rate  $\leq 2$  Ltr./min
- Bending moment:  $> = 150$  Nm
- Torsion moment (twisting) of the joint:  $> = 150$  Nm
- Band material: Steel 1.4301 or 439 Stainless Steel
- 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

### Materials

W1*	W2*	W3	W4	W5
	x			

## The advantages at a glance

- Angle compensation in the exhaust gas system  $\pm 3^{\circ}$
- The muffler can be swiveled during assembly
- Simplified assembly and disassembly owing to the increased system flexibility
- Higher torsion moment as compared to standard ball-type angle connections
- Low leakage rate
- Low weight
- PIA clip (optional)

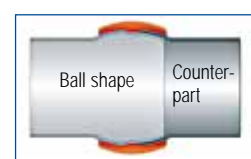
- 1 Torx screw with integrated washer**  
– simplified assembly and disassembly  
– also offer Hexhead

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

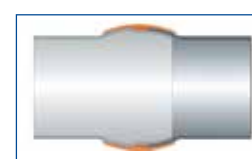
- 3 Chromium VI-free, non-seizing coating**  
– improved clamping force

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

### Corrosion resistance



Not tightened



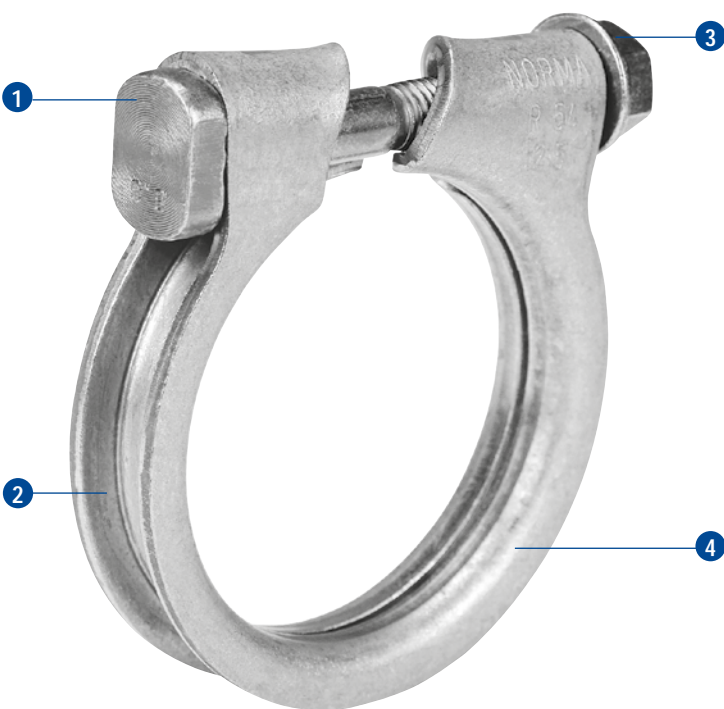
Tightened

Corrosion resistance in salt spray testing = Min. 96 h

## PIPE CONNECTIONS AND V-BAND CLAMPS

### 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 are specially suitable for connecting exhaust pipes and mufflers in combustion engines.



### *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

- 1 Either M8, M10 or M12 bolt**  
– depending on the required clamping force
- 2 One-piece clamp band**
- 3 One bolt**  
– easy assembly
- 4 Rounded band edges**  
– hose protection and protection against injury

### Materials

W1*	W2*	W3	W4	W5
X	X**		X**	X**

\* Chrome VI-free    \*\* On request

## BOLT TYPES

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

Bolt	Hammer head/ Flange nut	Hexhead bolt/ Flange nut	Hexhead bolt/ Hexagonal nut	Loose fit washer*
M 8	X	X		X**
M 10			X	X
M 12			X	X

\* underneath the bolt head and the nut

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



M8 version with hammer head bolt

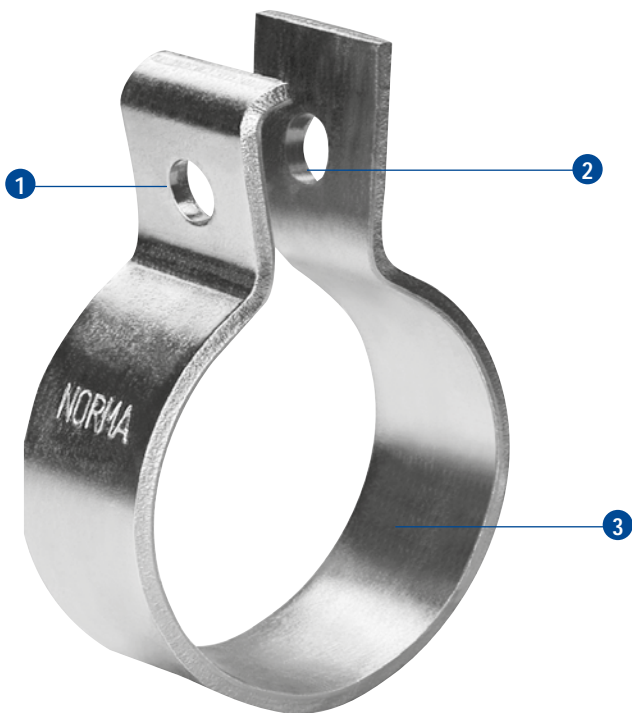


M10 and M12 version with hex head bolt

## PIPE CONNECTIONS AND V-BAND CLAMPS

### 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

#### Materials

W1*	W3	W4	W5
x	x**	x**	x**

\* No chromium VI used for surface treatment      \*\* On request

#### Bolts

The clamps are supplied without bolt and nut.  
Required bolt sizes: M8, M10 or M12.

## EXHAUST COMPONENTS

### Torca Coupler

- Provides joint serviceability
- Does not require pipe overlap or slotting
- 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



### Torca EuroCoupler

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



## PIPE CONNECTIONS AND V-BAND CLAMPS

### EXHAUST COMPONENTS



#### Torca TorcTite

- Specific OEM & Service designs
- Superior clamp load capability
- Compatible with pipes, ex, 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
- Available with fiberglass gasket for added leak reduction



#### 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 42 mm (1-3/4") through 177.8 mm (7")
- Available in Aluminized Steel, 409 Stainless Steel, 430 Stainless Steel, 304 Stainless Steel and aluminized 409 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

## EXHAUST COMPONENTS



### Torca AccuLock

- Provides OE with a robust design alternative to 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 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 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



### 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 is 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, corrosion 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



# Retaining Products





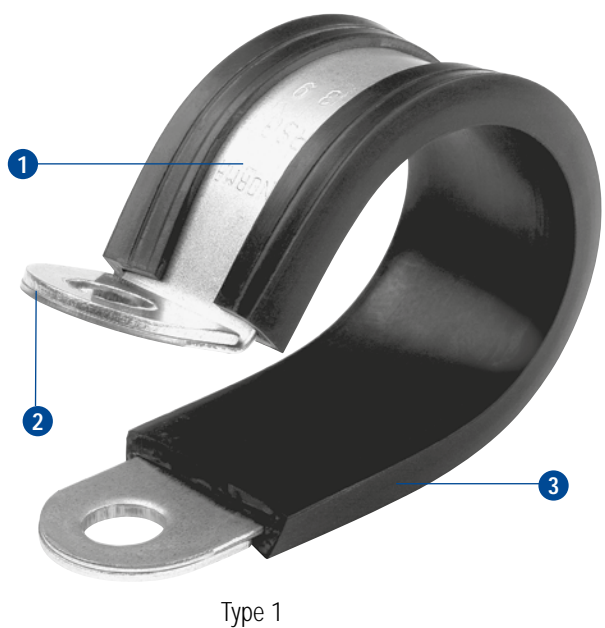
## Ready for any application

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 – 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 or Silicone Profile**
  - vibration damping & protection against seepage water
  - sound insulation
  - clip fits tight on object

#### Materials

W1	W3	W4	W5
x	x*	x*	x*

\* On request

### CLIP TYPES TO DIN 3016

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**).



## RSV/RSGU-V CLIP

In addition to the standard RS/RSGU designs we offer a V-feature. 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 RS/RSGU clip with V-feature can be easily pre-assembled on the pipe.

- Diameters and band widths will be furnished on request.

### Materials

W1	W2	W3	W4*	W5*	W6*
		X	X	X	X

\* On request



## RLGU 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 program please refer to the table of sizes





# Quick Connectors



## **Optimized connections that lower permeation rates**

Perfect connector solutions for fluid systems with very low permeation rates. Excellent temperature and chemical resistance is combined with a lightweight and compact design to reduce assembly times.

## 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.



### *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

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

- S (See page 52)
- PS3
- V2 (See page 54)
- Fluid Systems (See chapter on Fluid Systems)

#### **Technical features**

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

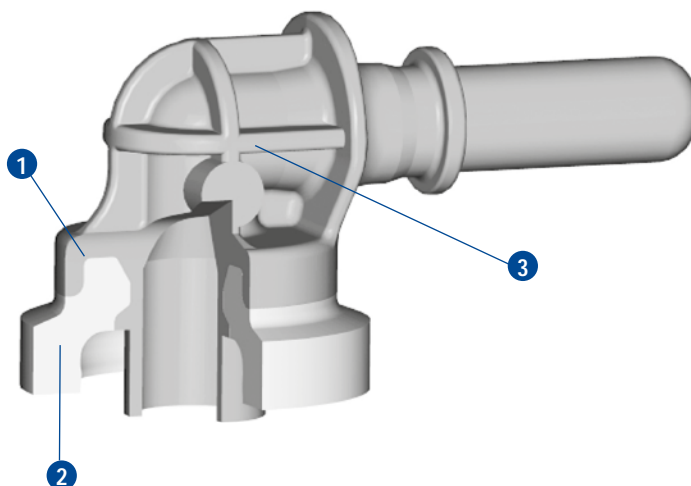
## CONNECTING SPIGOT

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.

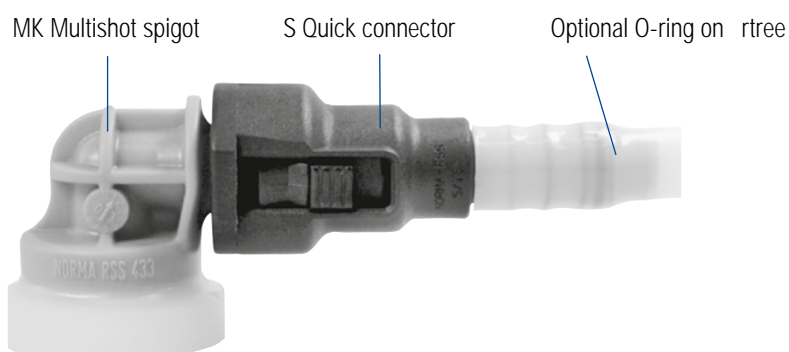
### Insider tip

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



## 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*

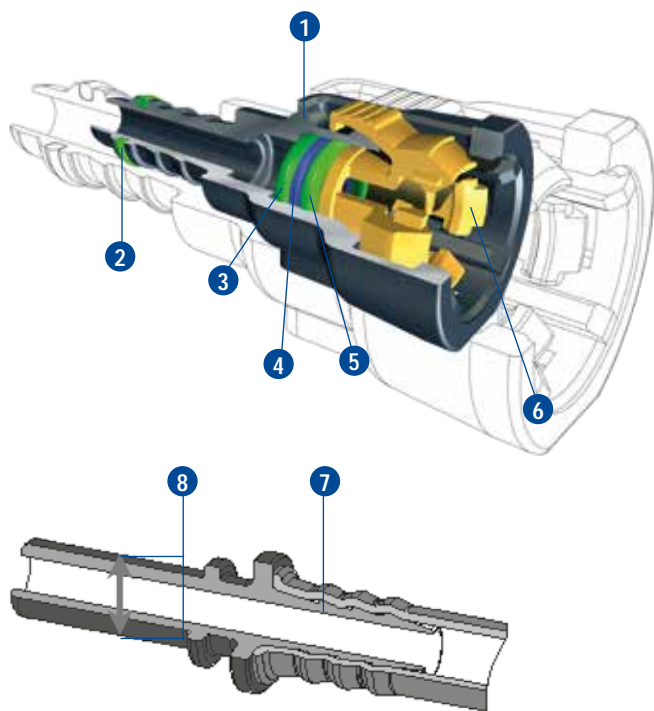
- Extremely low permeation rates
- Quick assembly time equaling cost reduction
- Automated production, no human factor means less margin of error
- No tools needed
- Possible to install in extremely small installation conditions
- An integrated seal provides optimal tightness
- Closing cone function,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

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

- NORMA Group Fluid systems (See page 56)

## CONNECTING SPIGOT – TO SAE J2044, STANDARD WORLDWIDE

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



### *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

- 1 Housing
- 2 Firtree plus O-ring (optional)
- 3 Primary O-ring
- 4 Spacer
- 5 Secondary O-ring
- 6 Retainer (spring)
- 7 Adapter
- 8 Diameter of connecting spigot  
– Nominal Width (NW)

### Insider tip

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

### 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

## QUICK CONNECTORS

### V2

V2 plastic quick connectors are an ideal means to connect media carrying lines as well as ventilation and exhaust lines in automotive industry. 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.



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

- NORMA Group Fluid Systems (See page 56)

### *The advantages at a glance*

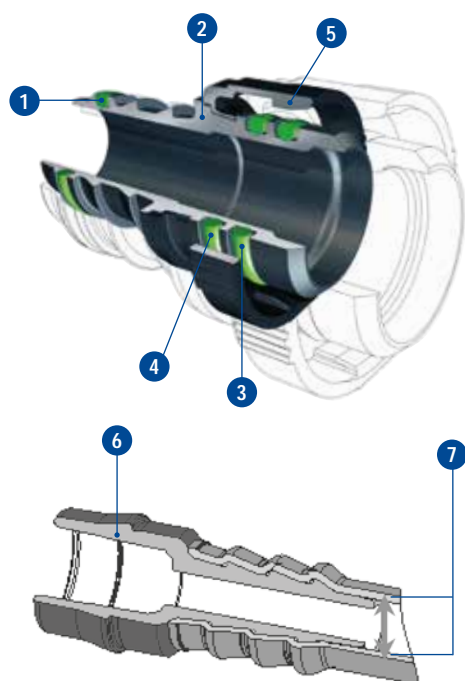
- Quick assembly time equaling cost reduction
- Automated production, no human factor means less margin of error
- No tools needed
- Compact dimensions allowing ease of use in narrow spaces
- An integrated seal provides optimal tightness
- All seals can be visually checked, permitting safe assembly
-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

### Technical features

- **Medium/Fluid:** Air, oil & fuel vapors
- **Long term operating temperature:** from  $-40^{\circ}\text{C}$  to  $135^{\circ}\text{C}$
- **Short term operating temperature:** up to  $+150^{\circ}\text{C}$  (approx. 30 min.)

## CONNECTING SPIGOT

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



### Insider tip

The perfectly matched system is achieved when combining quick connectors and NORMA Group Fluid Systems.



## 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

- 1 Firtree plus O-ring (optional)
- 2 Housing
- 3 Primary O-ring
- 4 Secondary O-ring
- 5 Locking device (ring)
- 6 Spigot
- 7 Pipe inside diameter = Nominal Width (NW)

### Technical features

- **Medium/Fluid:** Air, oil & fuel vapors.
- **Operating pressure:** Approx. 2,5 bar bar excess pressure
- **Operating temperature:** Engine compartment –40°C up to +135°C. Short time up to +150°C (approx. 30 min.)



# Fluid Systems

## Energy savings

With an inner heating rod, SCR lines from NORMA Group achieve quicker heating compared with other solutions. A lightweight and compact design improves de-freezing performance and reduces overall system weight.



## FLUID SYSTEMS

### UTS – UREA TRANSPORT SYSTEMS

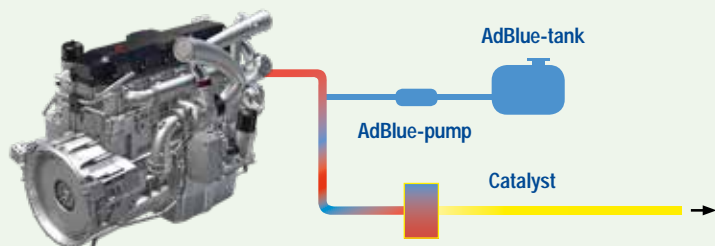
#### SCR route to cleaner and greener emissions

UREA is a complete Selective Catalytic Reduction (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 keeps it liquid while the vehicle is moving.



Leading combustion engine manufacturers, plus a wide range of OEMs and Tier 1 suppliers, have chosen NORMA Group as their global development partner for an SCR exhaust emissions solution. The result is NORMA Group's UREA Transport Systems.

#### SCR and AdBlue® help meet EU and global emission legislations.



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.

## UTS – UREA TRANSPORT SYSTEMS – 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 in exhaust gases are converted into water and atmospheric nitrogen, helping you GO GREEN!

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



### *The advantages at a glance*

#### Problem-Solution Story:

"One of the challenges we faced was the fact that the AdBlue® (urea) liquid freezes easily at  $-11^{\circ}\text{C}$ . 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 moving."

- Impressive client portfolio demonstrating trust and high proficiency. Many OEMs and Tier 1 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 being constantly and continuously developed and improved

## FLUID SYSTEMS

### FTS – FUEL TRANSPORT SYSTEMS

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

By using the crucial Low Emission Tube (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.



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

- S (See page 52)
- V2 (See page 54)

### *The advantages at a glance*

- Competitive price
- Wide variety of quick connector sizes from 7.89–15.82 mm
- Can offer knowledge and the complete solution
- 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

## TFS – TO BE USED IN TANK FILLER SYSTEMS

The TFS is delivered and produced specifically to meet customer needs and guides. The tank filler tube (TFS) transports a medium (fuel, diesel or gasoline) through the tank inlet to reach the fuel tank.



We supply complete fuel systems including:

- 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 million fuel lines made

## FLUID SYSTEMS

### 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.



### *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 Group products such as:**

- V2 (see page 54)
- S Quick Connector (see page 53)

#### 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 steps from each other so we can offer this fast and knowledgeable feedback without a problem."

## SAS – TO BE USED IN SECONDARY AIR TUBE SYSTEMS

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.

## FLUID SYSTEMS

### 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. The CVS is recyclable according to ELV regulations.





# Plastic Products

## Ready to work in any industry

Our versatile and easy to handle range of plastic connectors has applications across a wide range of industries – combining high performance, toughness and lightweight with reliability.

## PLASTIC PRODUCTS

### SV – PLASTIC PRODUCTS

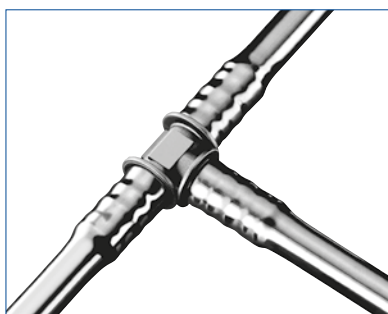
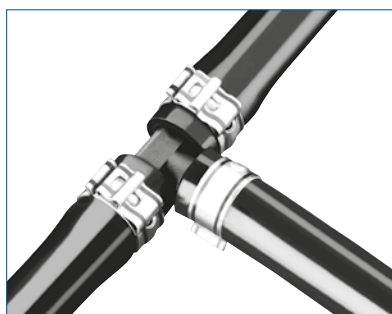
Over the years, these top quality very versatile connectors have been used in millions of different applications and the product has become an indispensable aid to the domestic, commercial and industrial market sectors. SV products are proven plastic hose and tube connectors, which connect fluid carrying 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



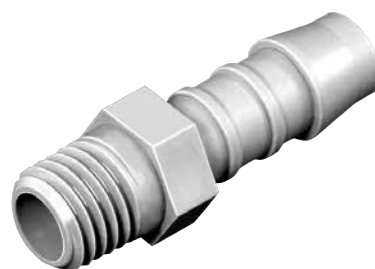
## TYPES AND VARIANTS

### 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-  
t after assembly. Three different thread geometries are distinguished by means of color coding allowing for quick visual identification:

- Metric taper thread.....light gray
- Whitworth pipe thread .....charcoal
- NPT thread .....black

(Other materials are available on request)



### 2. Hose connectors

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-  
t 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-  
bre 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-  
bre reinforcement. The connectors can be supplied with O-rings on request.



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## **NORMA Group**

Postfach 1149 · D-63461 Maintal  
Edisonstraße 4 · D-63477 Maintal  
Germany

Tel.: +49 (6181) 4 03-0

Fax.: +49 (6181) 4 03-210

[www.normagroup.com](http://www.normagroup.com)

[info@normagroup.com](mailto:info@normagroup.com)