Customer Value through Innovation

NORMA GROUP

V-Profile and V-Band Clamps

Your partner for innovative connections

www.normagroup.com

Eliminating leakages

With a safe seal connection, leakages and potential leak paths are eliminated, avoiding the breakdowns that are so detrimental to manufacturers, drivers and the environment. NORMA Group actively works to minimize permeation rates and leakages by combining innovative design with current and future legislation to bring you robust, economical and environmentally compliant solutions.

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.

Contents

Materials

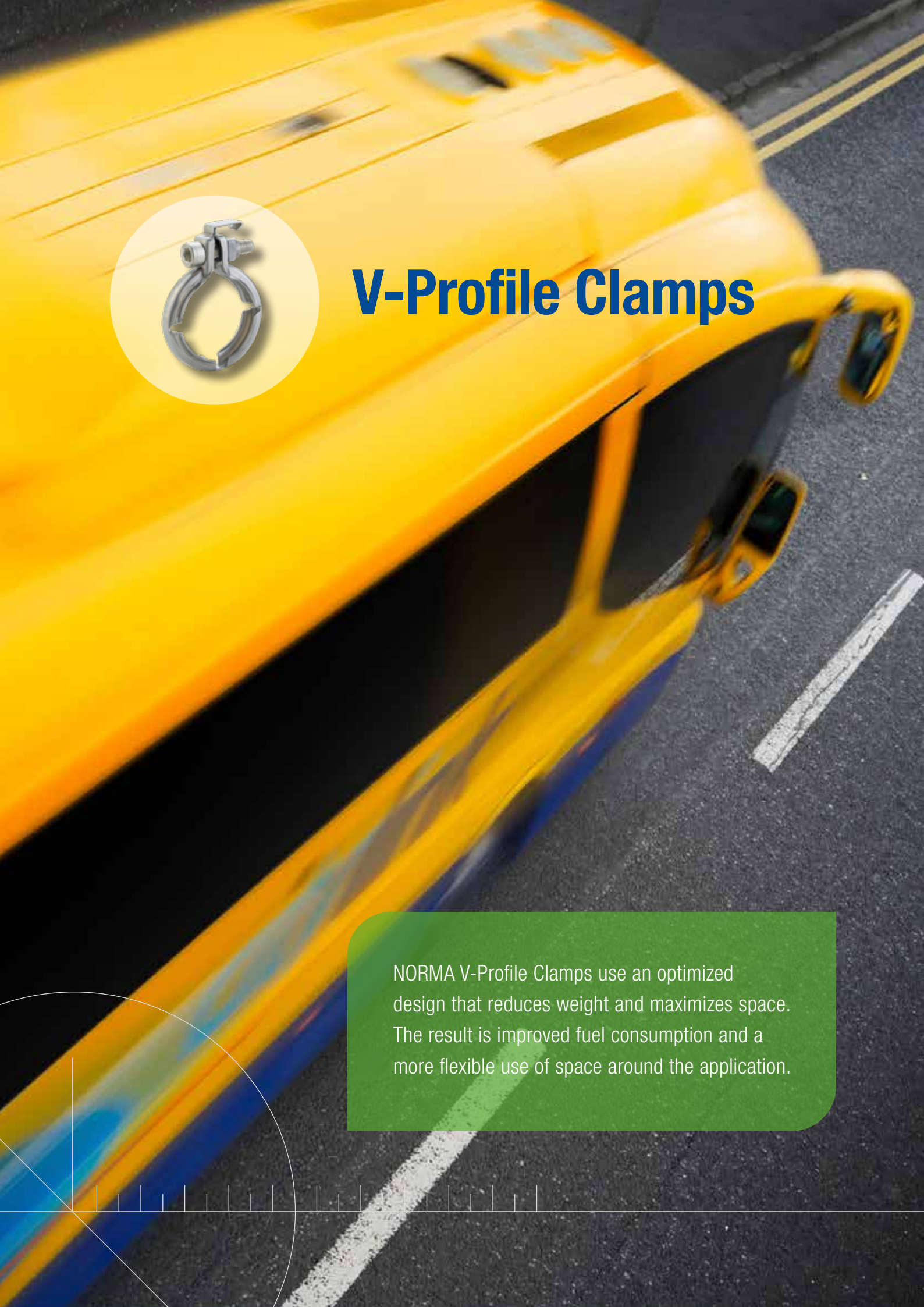
W1 = Zinc Plated Mild Steel

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



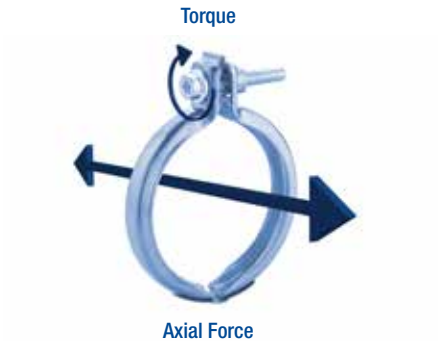
V-Profile Clamps

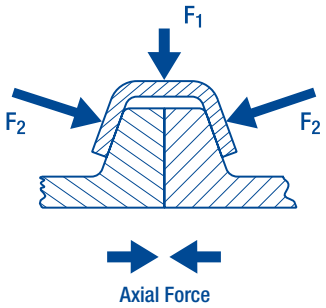
NORMA V-Profile Clamps use an optimized design that reduces weight and maximizes space. The result is improved fuel consumption and a more flexible use of space around the application.

V-Profile Clamps

PRODUCT'S METHOD OF OPERATION

The profile clamp's method of operation is based on the principle of an inclined plane.
When the closure bolt is tightened, this exerts circumferential force on the profile segments.
The two halves of the flange are pressed together by means of the profile (see diagram below).
The circumferential force that is exerted is converted into considerably higher axial force.



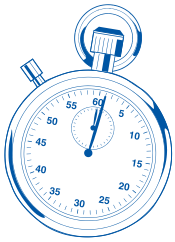


PRODUCT ADVANTAGES

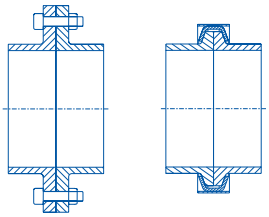
All NORMA Group's V-Profile clamps offer a variety of benefits such as:

Easy handling
V-Profile clamps are easy to handle and provide ease of assembly. They therefore need less operator effort.

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.



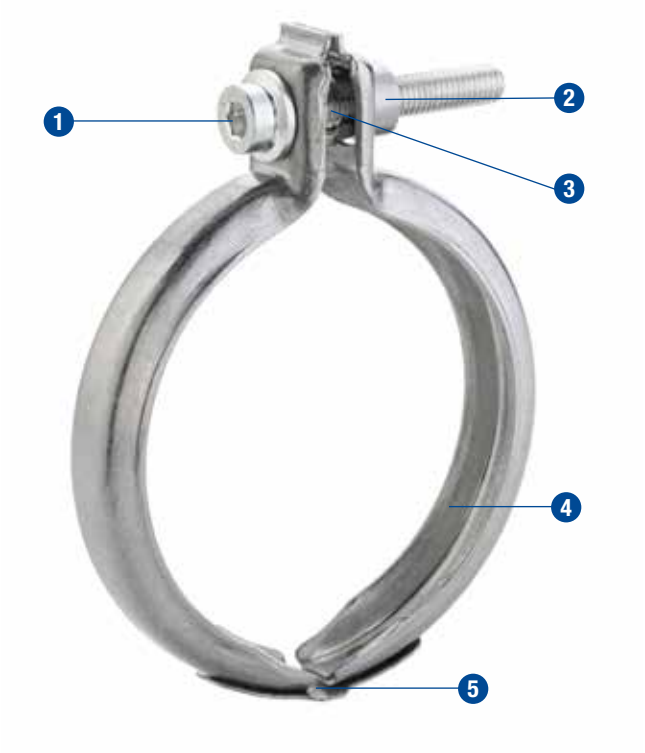
Compact design
In contrast to conventional flanges, profile clamps require only minimal space and can therefore be used in critical fitting situations.



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

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:**
  ∅ 69–138 mm (other diameters upon request)

Note: Many NORMA VPP clamps have head support

Applications

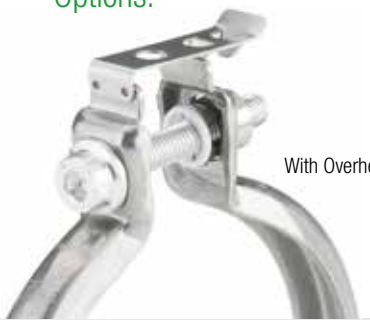
- Turbo petrol engine manifold, turbocharger and catalyst joints
- High temperature diesel engine manifold and turbocharger joints

Materials

W1	W2	W3	W4*	W5
			x	x

* Available on request

Options:



With Overhead clip

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 in 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:**
  ∅ 31 mm and 98 mm (other diameters upon request)

Materials

W1	W2	W3	W4	W5*
			x	x

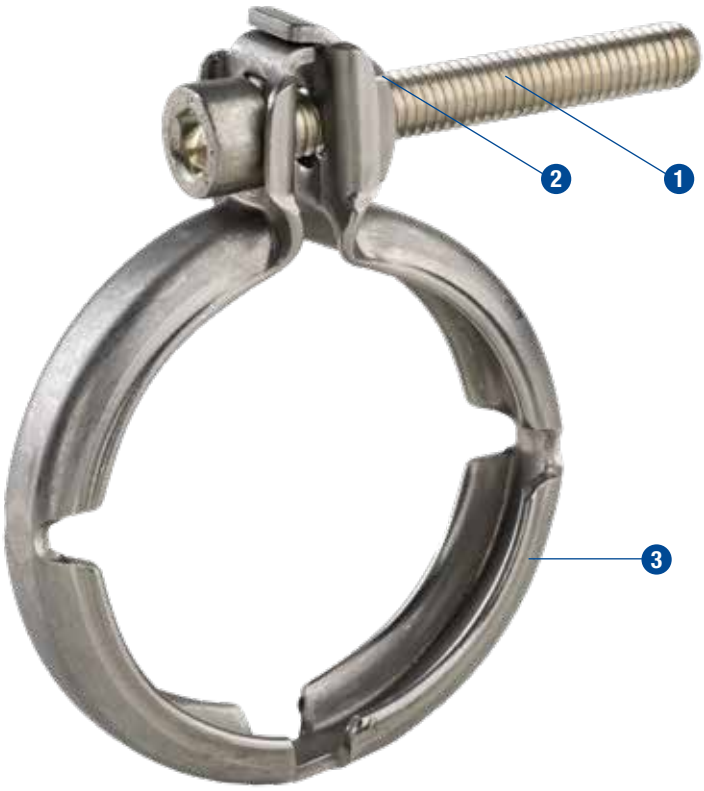
* Available on request

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:**
  ∅ 50–98 mm (other diameters upon request)

Applications

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

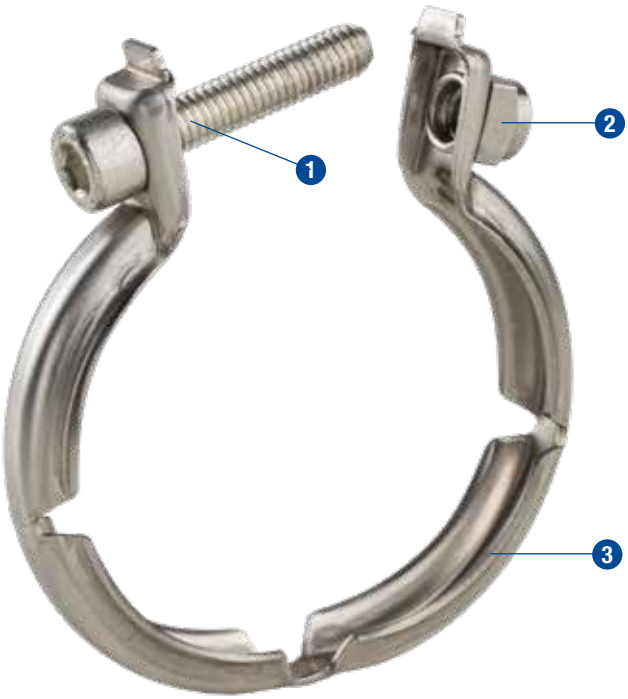
Materials

W1	W2	W3	W4	W5*
			x	x

* Available on request

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:**
  ∅ 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

VPP – TURBINE HOUSING

VPP – Turbine housing – Chain link

- Easy assembly

1. **Bolt**
2. **Self locking nut**
3. **Profile half segment**
4. **Chain link**

VPP – Turbine housing – 1 piece VPP

- Reliable and time-efficient solution
- Head support feature on the clamp closure provides better force distribution and increases high temperature resistance

1. **Bolt**
2. **Self locking nut**
3. **Profile**

- **Internal profile diameters available:**
  ∅ 60–92 mm (other diameters upon request)

Materials

W1	W2	W3	W4	W5*
			x	x

* Available on request

Features

Two V-Retainers connected with a hinge for easy installation, spot weld free construction enhances corrosion resistance.

Applications

- Turbocharger turbine / central housing connection
- Hot end and cold end joints

VPP – TURBINE HOUSING – HALF CLAMP

- Assembled in pairs

1. **Bolt**
2. **Self locking nut**
3. **Profile half segment**

- **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

Applications

- Air brakes exhaust connections
- Diaphragm pumps

Features

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

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**: Application specific

Applications

- Turbochargers
- Diesel exhaust connections

Features

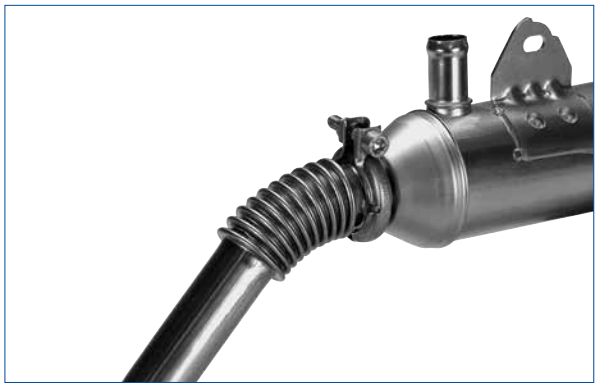
Cost-effective continuously formed metal band with 180° V-Retainers and a flat point for flexibility.

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 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

SCR injector

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.

V-Band Clamps

V-BAND CLAMPS

V-Band clamps are reliable and time-efficient 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

1 Cover band
– optimum distribution of clamping forces

2 Closure

3 Three profile segments
– ease of assembly

Applications

- Engines
- Turbochargers
- Exhaust connections
- Bulk material container
- Bypass filter units
- Pumps
- EGR systems

CLOSURE TYPES

STC – Straight Trunnion Closure

Advantages:

- 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

Advantages:

- All the advantages of STC-type closures

Plus

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

QRC with spring

Advantages:

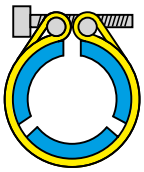
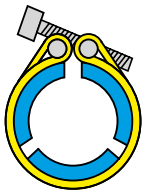
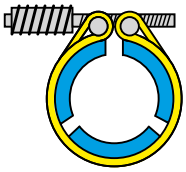
- All the advantages of QRC-type closures

Plus

- Elasticity added to overcome thermomechanical load at high temperature

V-Band Clamps

CLAMP OVERVIEW

	STC	**QRC**	**QRC** with spring
Single-closure 3 profile segments Dia ≤ 300			
Double-closure 2 profile segments Min dia 200 mm Max dia 500 mm			

MATERIALS

V-Band clamps are available in the following material specifications:

Code	**Closures**			**Closure components**	**Profile segments/ Cover band**
	STC	**QRC**	**QRC** with spring		
W4	•	•		Stainless steel	Stainless steel
W5*	•	•	•	Stainless steel	

* Available on request

BAND WIDTHS & CLOSURE SIZES

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

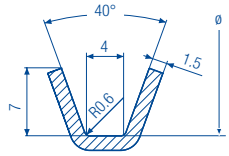
Closure type	**Cover band 1.0 x 20 mm**	**Cover band 1.5 x 25 mm**
STC	Bolt M 6 x 50	Bolt M 8 x 70
QRC		
QRC with spring	Bolt M 6 x 95	

PROFILE TYPES

All profiles can be supplied with a diameter of up to 300 mm, larger diameters are available upon request.
Contact NORMA Group to discuss the flange design and profile selection for the optimal project solution.

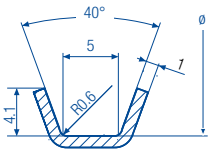
The table below tells you which cover band is suitable for which profile.
In the case of special applications, please ask for information on other profile types.

4.0 b ≥ ø 89



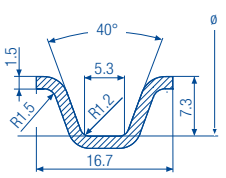
	20 mm	25 mm
STC	●	
QRC	●	

5.0 a ≥ ø 82



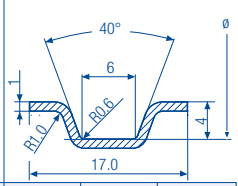
	20 mm	25 mm
STC	●	
QRC	●	

5.3 b ≥ ø 110



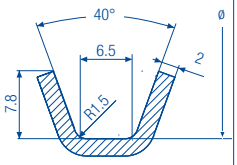
	20 mm	25 mm
STC	●	
QRC	●	

6.0 a ≥ ø 100



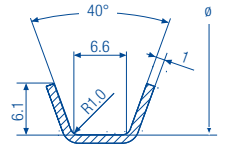
	20 mm	25 mm
STC	●	
QRC	●	

6.5 a ≥ ø 120



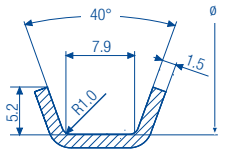
	20 mm	25 mm
STC		●
QRC		●

6.6 b ≥ ø 100



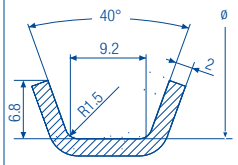
	20 mm	25 mm
STC	●	
QRC	●	

7.9 b ≥ ø 100



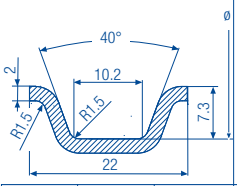
	20 mm	25 mm
STC	●	
QRC	●	

9.2 a ≥ ø 100



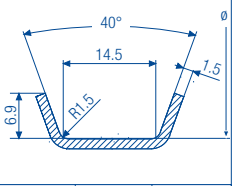
	20 mm	25 mm
STC		●
QRC		●

10.2 a ≥ ø 100



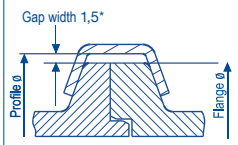
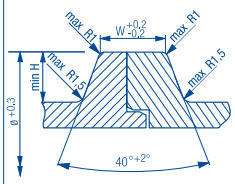
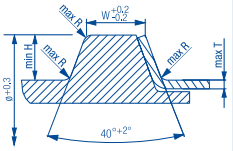
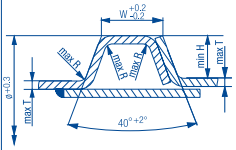
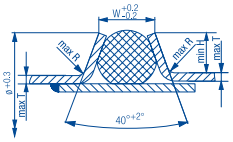
	20 mm	25 mm
STC		●
QRC		●

14.5 a ≥ ø 105



	20 mm	25 mm
STC		●
QRC		●

EXAMPLES OF FLANGE STRUCTURES

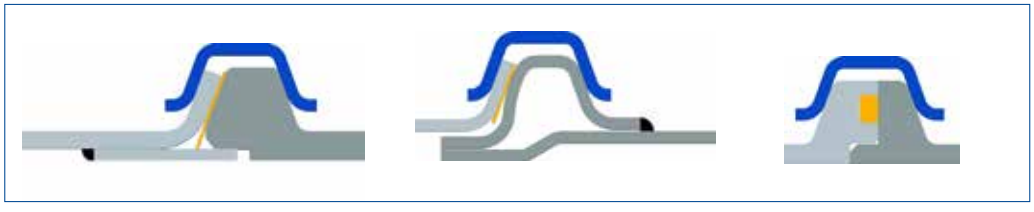
Inner profile ø		Flange 1		Flange 2				Flange 3				Flange 4			
 Profile ø = flange ø +2 x gap height															
Profile type	**Profile ø (mm)**	**W (mm)**	**H (mm)**	**W (mm)**	**H (mm)**	**R (mm)**	**T (mm)**	**W (mm)**	**H (mm)**	**R (mm)**	**T (mm)**	**W (mm)**	**H (mm)**	**R (mm)**	**T (mm)**
4.0b	≥ 100	5.1	7.5	5.1	8	2	2	5.1	7.5	1	1	Not recommended			
5.0a	≥ 100	6.1	4.6	6.1	4.6	1.5	1.5	6.1	4.6	1	1	6.1	4.6	1.5	1.5
5.3b	≥ 110	6.4	7.3	6.4	7.8	2	2	6.4	7.3	1.5	1.5	6.4	7.8	2	2
6.0a	≥ 125	7.1	4	7.1	4	1.5	1.5	Not recommended				7.1	4	1.5	1.5
6.5a	≥ 130	7.6	8.3	7.6	8.8	2	2	7.6	8.3	1.5	1.5	7.6	8.8	2	2
6.6b	≥ 100	7.7	6.6	7.7	6.6	1.5	1.5	7.7	6.6	1.5	1.5	7.7	6.6	1.5	1.5
7.9b	≥ 100	9	5.7	9	6.2	2	2	9	5.7	1.5	1.5	9	6.2	2	2
9.2a	≥ 100	10.3	7.3	10.3	7.8	2	2	10.3	7.8	2	2	10.3	7.8	2	2
10.2a	≥ 130	11.3	7.3	11.3	7.8	2	2	11.3	7.8	2	2	11.3	7.8	2	2
14.5a	≥ 105	15.6	7.4	15.6	7.9	2	2	15.6	7.9	2	2	Not recommended			

Abbreviations: W = overall flange width** H = overall flange height R = flange radius T = flange thickness

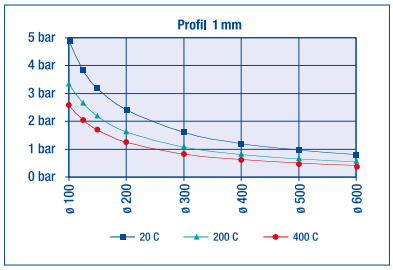
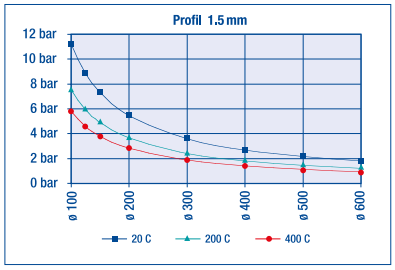
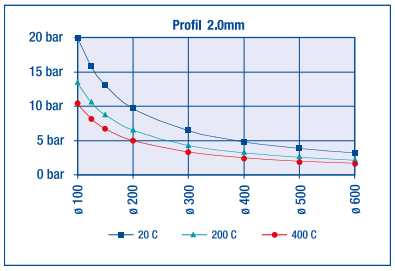
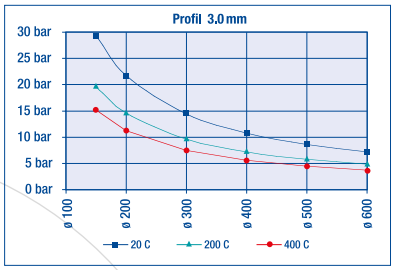
*Gap height when flange outside diameter < 200 mm. For outside diameter >200 mm gap height is 2.0
** Including compressed gasket thickness.

EXAMPLE OF FLANGE DESIGNS INCORPORATING A GASKET

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

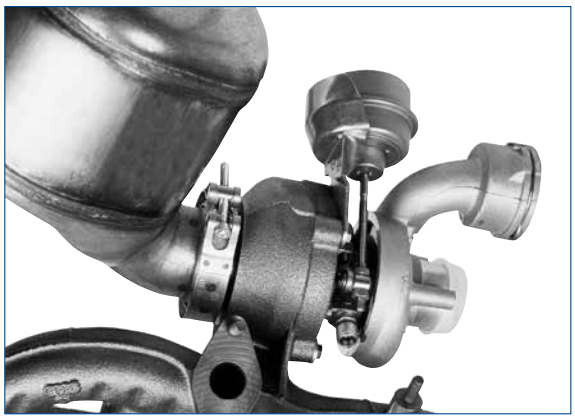


TECHNICAL INFORMATION

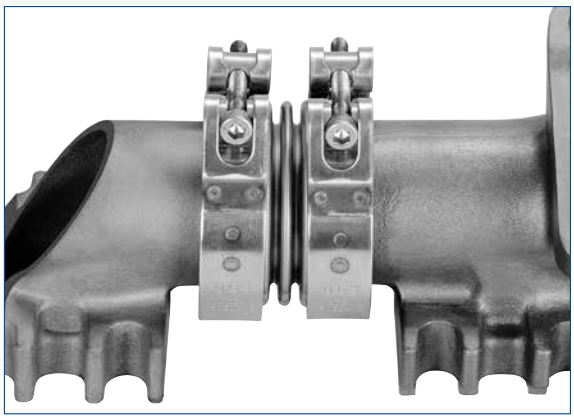
Profile type	Profile ø (mm)	Performance (stainless steel only)	Technical information
5.0a 6.0a 6.6b	≥ 100 ≥ 125 ≥ 100		1. Determine the **application or test pressure**. 2. Determine the **max. operating temperature** to which the profile clamp will be exposed. (Note: The profile clamps presented in this brochure have been designed for a maximum operating temperature of 400°C.) 3. Calculate the required inner diameter of the profile as follows: outer flange diameter **+ gap height multiplied by 2** 4. Using the diagrams on the left, check whether the profile thickness you have selected will be sufficient. (Note: The result only represents an initial approximation based on static pressures and ideal operating conditions.) Other factors may come into play, such as: • Shape of and material used for sealing measures • Roughness of flange surface • Operating temperatures • Bending moments • Pressure surges/Vibrations • Safety requirements Based on these factors, you may decide that a thicker profile is necessary.
4.0b 5.3b 7.9b 14.5a	≥ 100 ≥ 110 ≥ 100 ≥ 105		
6.5a 9.2a 10.2a 11.4b	≥ 130 ≥ 100 ≥ 130 ≥ 180		5. The tables below provide information on the tightening torques for the various closure types and bolt sizes. 5.1. Recommended tightening torque for STC & QRC-type closures Band width / Bolt / Tightening torque 20 mm / M 6 / 6 Nm 25 mm / M 8 / 12 Nm
9.2 b	≥ 155		Example of application: • Operating pressure: 4 bar (static) • Temperature: 20 °C • Profile type: 4.0b • Profile thickness: 1.5 mm • Flange diameter: ø 197 mm • Inner profile diameter: ø 200 Max. permissible pressure at 20 °C: • 5.4 bar > 4 bar ‹OK

APPLICATION AREAS

V-Band clamps are quick-release connecting elements for flanges and represent an economical alternative to conventional bolted flange connections.



Automotive: Turbocharger – catalytic converter connection



Automotive: Exhaust manifold

DOUBLE CLOSURE

The double closure clamps are ideal for connections with large diameters where two closures provide an improved clamping force distribution.

- **Materials:** Corrosion resistant and specialty steel
- **Fasteners:** M6, M8
- **Sizes:** 200 mm and larger diameters

Features

- Two Straight Trunnion Closure, full cover band or closure loops for industrial applications

Applications

- Turbochargers for power generation
- Diesel particle filters

GENERAL PURPOSE V-INSERT – T-BOLT CLOSURE

- **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

V-Insert – T-Bolt closure

QUICK CONNECT

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

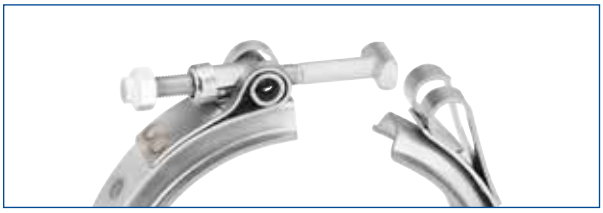
Features

- 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 Latch



Quick Connect V-Insert

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

Quick Release with Knob Handle

Quick Release with T-Handle

LIGHT DUTY

- **Materials:** Corrosion resistant steels
- **Fasteners:** 5/16" (7.9 mm)
- **Sizes:** 1.75" (44.45 mm) to 7" (177.8 mm)
- **Tooling**: Application specific

Features

- V-Inserts welded to a low cost stainless steel worm gear clamp

Applications

- Dairy equipment
- Diesel engines

Option

- Thumb screw for hand tightening

Light Duty V-Insert WG-band with Hex Screw

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" and larger diameters
- **Options:** Short loop configuration for added clearance, drain holes in V-Retainer upon request

Features

- Continuous V-Retainer and partial outer band, compact profile to fit flanges having limited clearance

Applications

- Turbochargers

Roll Formed V-clamp Half Assembly

Roll Formed V-clamp with Equal Straps

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

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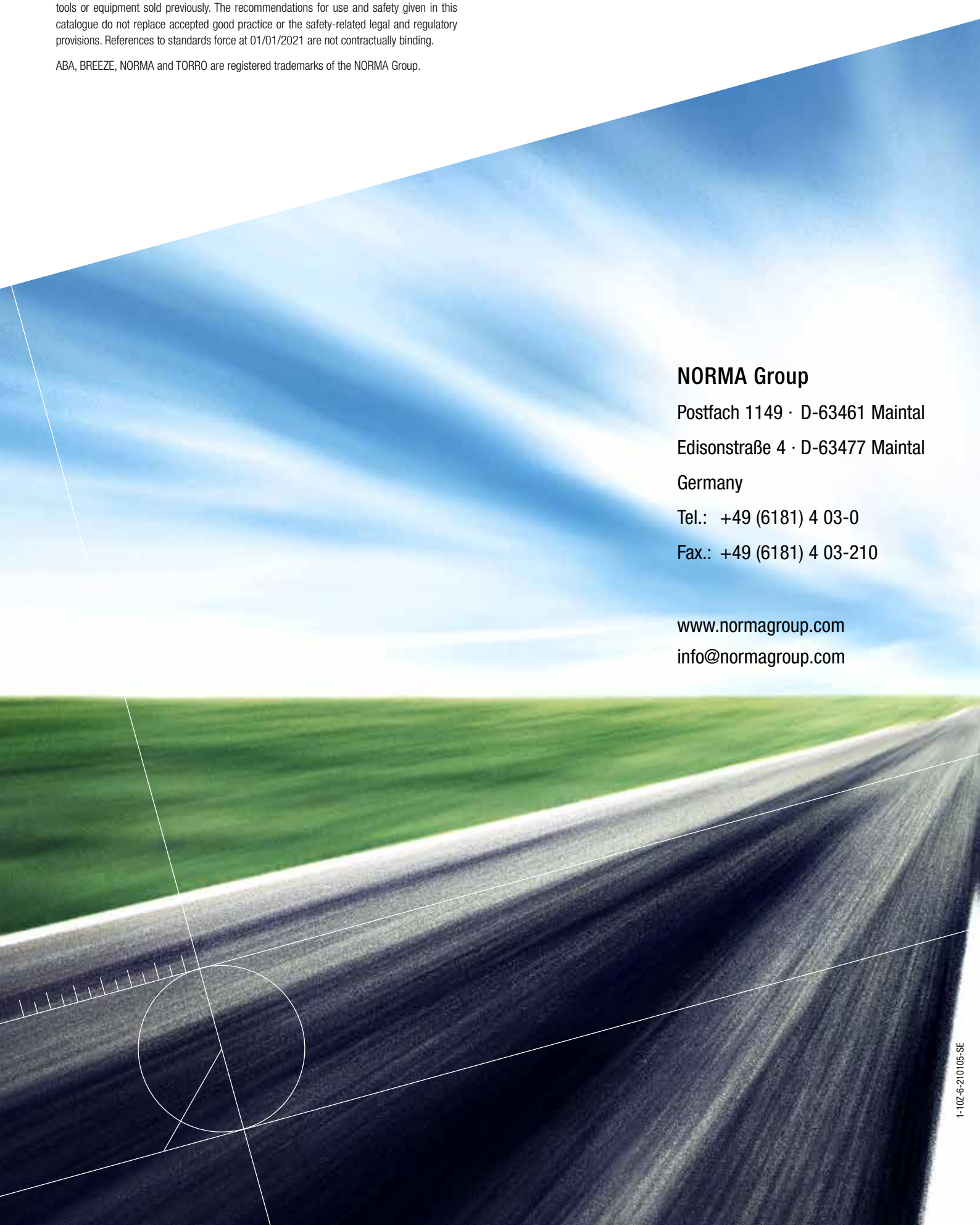

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