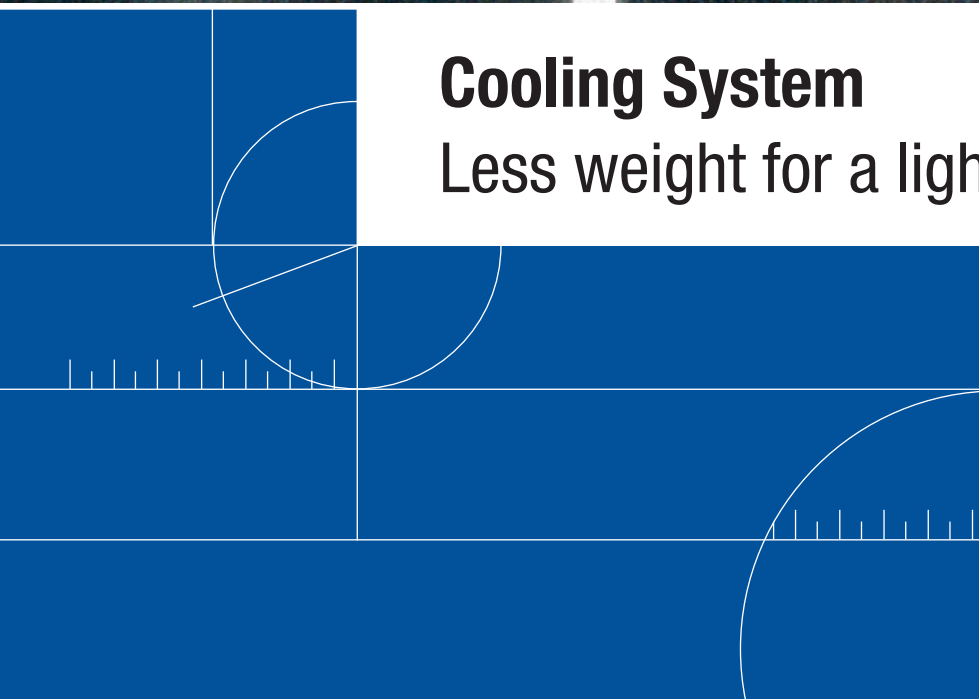


Customer Value through Innovation.



Cooling System

Less weight for a lighter future



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

We believe that thinking smaller can make a large difference.





Content

The survey given on these two pages reflects the diversity of our products as well as their applications – at a glance. Use the page number given in the third column to get directly to the product you wish to learn more about.

	Page	Reduces Weight
Hose Clamps		
NORMACLAMP® TORRO® Worm-drive hose clips	8	X
NORMACLAMP® TX	11	X
NORMACLAMP® FBS Springband hose clips to DIN 3021	12	X
ABA Original	14	
BREEZE Constant Torque	15	
BREEZE Liner	16	X
BREEZE Power Seal	17	
BREEZE Aero Seal	18	
Retaining Products		
NORMAFIX® RS/RSGU	20	X
Quick Connectors		
NORMAQUICK® PS3	24	X
NORMAQUICK® S	26	X
NORMAQUICK® V3	28	X
NORMAQUICK® XM	29	X
NORMAQUICK® XP	30	X
NORMAQUICK® Twist II	31	X
Fluid Systems		
NORMAFLEX® TOC	34	X
NORMAFLEX® CWS	35	X

Reduces Space	Reduces Assembly Time	Reduces Emissions	Recycable
	X		
	X	X	X
	X	X	X
X	X	X	X
X	X	X	X
X	X	X	X
X	X		
	X	X	X
		X	X
	X	X	X
X	X	X	X
X	X	X	X
X	X		X
	X		X
	X		X

Materials

- W1** = All parts completely zinc plated steel
- W2** = Band: Stainless steel 1.4301.
Screw + Trunnions: Zinc plated mild steel
- W3** = All parts completely stainless steel 1.4016
- W4** = All parts completely stainless steel 1.4301
- W5** = Completely stainless steel 1.4401 NORMACLAMP® TORRO®



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.



Hose Clamps



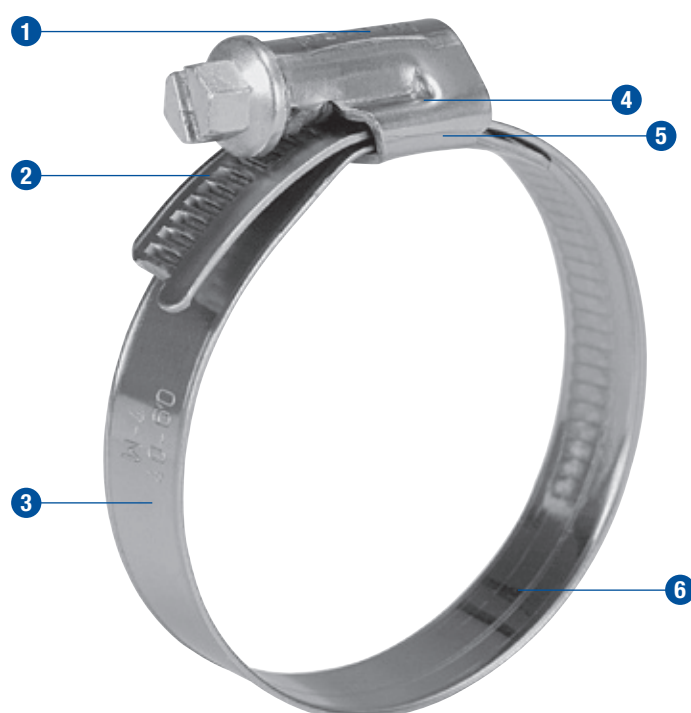
The optimum sealing solution for all applications. The range varies from standard products with or without constant tension spring to special usage clips and heavy duty clamps

Hose Clamps

NORMACLAMP® TORRO® – Worm Drive Hose Clips to DIN 3017

NORMACLAMP® 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 NORMACLAMP® TORRO® is the asymmetrical construction which tells you at first sight whether it is a genuine TORRO® or not.



- 1 Improved asymmetric housing**
– even distribution of forces and safe assembly
- 2 Screw support**
– Ease of assembly due to the safe guidance of the emerging band end
- 3 Material and clamping range stamped on the band**
– prevention of errors
- 4 Asymmetric extension**
– prevents the housing from tilting over when the clamp is tightened
- 5 Short housing saddle**
– even contact pressure
– improved efficiency
- 6 Smooth or stamped inside of band**
– optimal hose protection

Materials

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

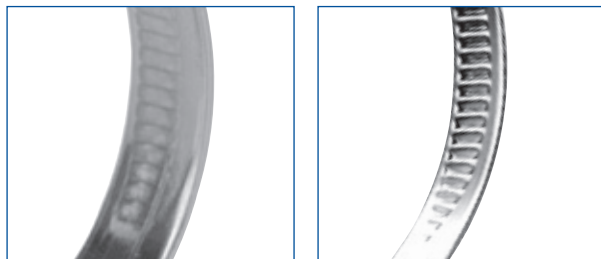
* No chromium VI used for the coating of the closure components

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

Hose Clamps

Types of clamp band



Band width 7.5 mm

- W2, W3 with smooth inside

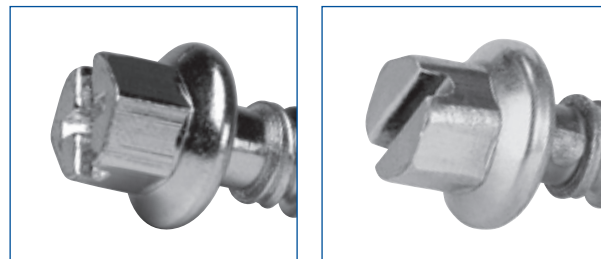
Band width 9 mm

- W1 with smooth inside
- W2, W3, W4, W5 with stamped inside

Band width 12 mm

- W1, W2, W3 with smooth inside
- W4, W5 with stamped inside

Screw



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

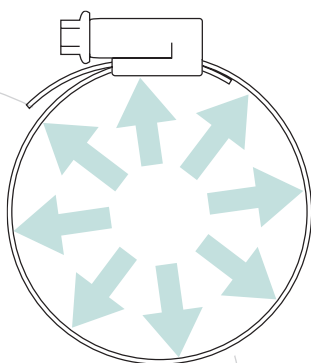
* Band width 7.5 mm = SW 6 ** Band width 16 mm = SW 8

High band tensile force and high fracture torque

As always, the new NORMACLAMP® 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 NORMACLAMP® 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. 240 h
W5	Min. 400 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)

Hose Clamps

Modular System

NORMACLAMP® 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.

Advantage

- 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.

Advantage

- Safe pre-assembly on the hose.

The Spring insert



For this version of the NORMACLAMP® 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.

Advantage

- Automatic re-tensioning effect in the event of hose relaxation
- Increased sealing reliability across a wide temperature range

The PreFix System



The NORMACLAMP® 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.

Advantage

- 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.

Advantage

- 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

Variants

NORMACLAMP® TX

One more clamp type rounding off this range is the NORMACLAMP® TX. These clamps are specially used in applications in the commercial vehicle sector where extremely high band tensile forces and high fracture torques are required. This is why NORMACLAMP® TX hose clamps are only made with 12 mm band width and in W3 material quality.



Advantage

- 12 mm band width
- W3 material

Materials

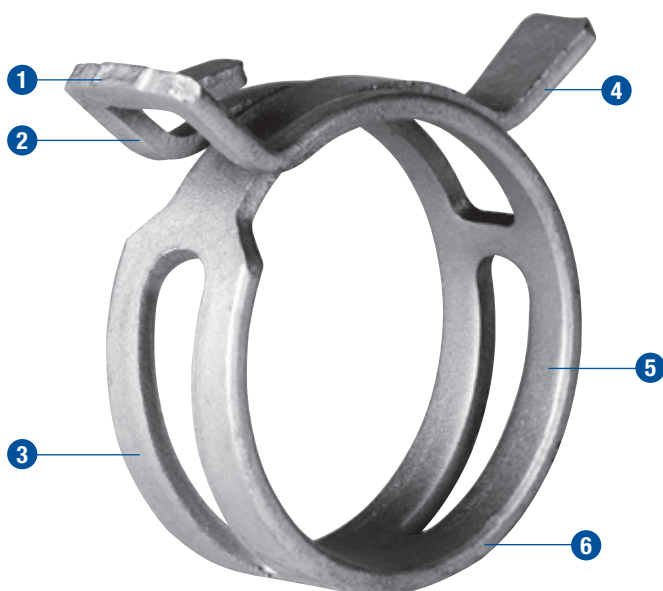
W1	W2	W3	W4	W5
		x		

Hose Clamps

NORMACLAMP® FBS – Springband hose clips to DIN 3021

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

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



- ❶ **Lot number stamped on clamp band**
– safe retraceability
- ❷ **NORMA® Logo** – the visible sign for high quality
- ❸ **Organic/inorganic coating**
– optimal protection against corrosion
Coating in different colour
– improved engine design
- ❹ **Nominal diameter stamped on the clamp**
– prevention of mistakes
- ❺ **Special design** – uniform distribution of clamping forces and optimal roundness
- ❻ **Round band edges**
– optimal hose protection

Materials

C 75 S	Zinc-Aluminium Coating	Organic Coating
X	Basecoat	Topcoat

The advantages at a glance

- Single-part hose clips without screw
- Uniform distribution of clamping forces
- Optimal roundness
- Temperature resistance from –40 °C up to 200 °C
- Unmistakable tracing due to lot numbering
- Visual control of nominal diameters by colour codes
- Corrosion resistance in salt spray testing – from 480h

Variants

NORMACLAMP® FBS



NORMACLAMP® FBS R

is a space-saving clamp. It was designed with the aim of realising the technical minimum overall height to allow its use in difficult assembly situations.



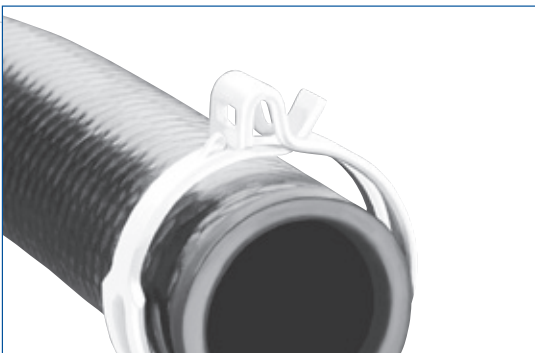
NORMACLAMP® FBS HC

is a pre-opened version secured by a plastic retaining clip. After slipping the clamp onto the hose, this clip can be easily removed by hand.



NORMACLAMP® FBS MC

is a pre-opened (and, if desired, pre-positioned) clamp secured by a small metal clip. The retaining clip for this version is removed by using pliers.



NORMACLAMP® FBS C

is a pre-opened clamp which is pre-positioned on the hose. The retaining mechanism for this version is an integral part of the clamp band.

Hose Clamps

ABA Original

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

ABA Original – Features high clamping force and high durability torque.

ABA Original Stainless – All parts in AISI 304 Stainless Steel.



Aluzinc



Stainless Steel

The advantages at a glance

- Solid band
- Rolled up band edges
- Smooth inside
- House protected from pipe

Hose Clamps

Breeze Constant-Torque®

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

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



Constant-Torque - Aero-Seal Construction



Constant-Torque - Heavy Duty Construction

Materials

W1	W2	W3	W4	W5

The advantages at a glance

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

Hose Clamps

Breeze Liner

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



Materials

W1	W2	W3	W4	W5

The advantages at a glance

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

Hose Clamps

Breeze Power-Seal®

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

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



The advantages at a glance

Miniatures:

- 3 material Grades
- High clamping force
- High destruction torque

Full Size:

- Arcial slots give added strength against stripping
- Smooth housing underside ensures more even distribution of sealing pressure
- Exceeds SAE J 1508 specifications

Materials

W1	W2	W3	W4	W5

Hose Clamps

Breeze Aero-Seal®

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



Standard Hex Head Screw



Thumb / Wing Screw



Safety Collared Screw


Materials

W1	W2	W3	W4	W5

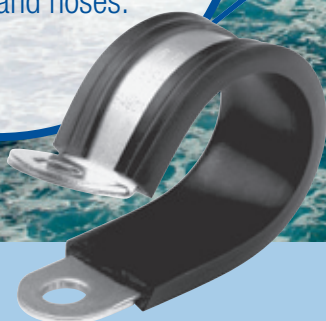
The advantages at a glance

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

Retaining Products



The NORMA Group retaining products range comprises a wide variety of products for the attachment and retaining of pipes, cables, cable harnesses and hoses.

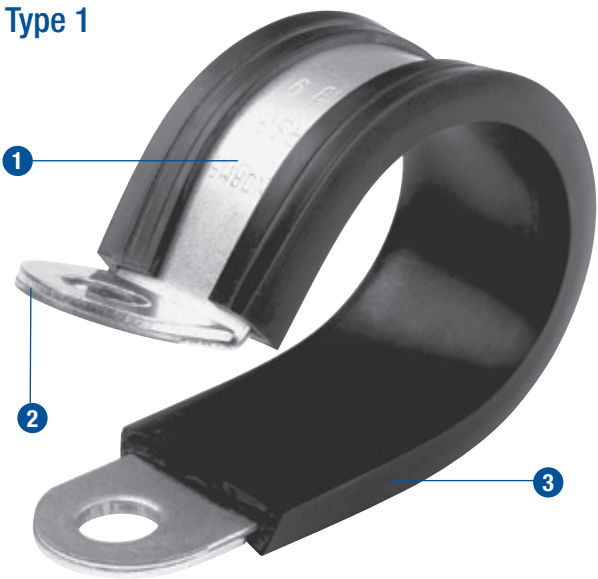


Retaining Products

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

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

Type 1



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

Materials

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

* On request

Retaining Products

Clip types

All pipe retaining clips are available with a special sound damping rubber profile as optional equipment.

Type 0



Type 2



The standard version NORMAFIX® RS/RSGU clips (**Type 1**) are also available in a round shape (NORMAFIX® RS/RSGU **Type 0**) or open shaped (NORMAFIX® RS/RSGU **Type 2**).



In addition to the designs already mentioned we offer the NORMAFIX® 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 NORMAFIX® RV can be easily preassembled on the pipe.

Diameters and band widths will be furnished on request.



Recently a new type, the NORMAFIX® 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.

NORMAFIX® RLGU are only available in band width 12 mm.
For the complete programme please refer to the table of sizes.

Quick Connectors



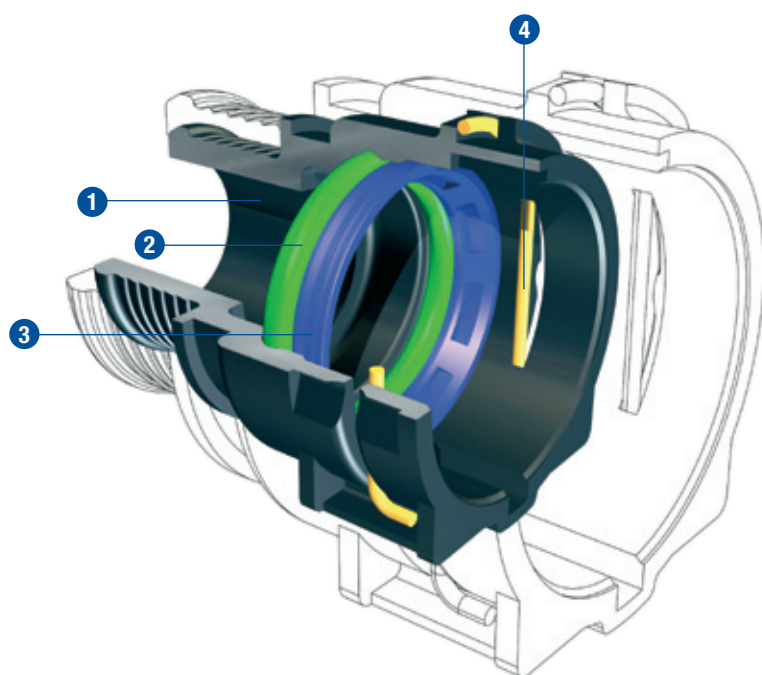
Innovative, secure, and “quickfit” – the NORMA Group quick connector range of plug-in connectors made of synthetic material are suitable for most media carrying lines. No matter whether we are dealing with cooling water, oil, air or fuel carrying lines – NORMA Group quick connectors offer the state-of-the-art means of connection. These connectors are specially suited to being matched up with the NORMAFLEX® tube system.



Quick Connectors

NORMAQUICK® PS3

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



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

Standard materials

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

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

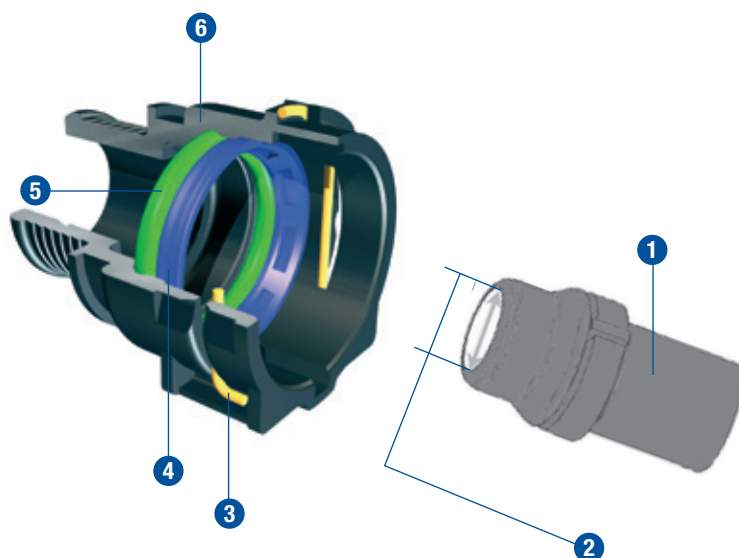
The advantages at a glance

- Designed new and improved generator
- Locking function
- Simple spigot
- O-ring is on the inside in order to prevent damage to seal

Quick Connectors

Connecting spigot – to VDA standard

Please note that all NORMAQUICK® PS3 connectors are delivered without spigot.



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

Technical features

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

The advantages at a glance

- Snap assembly without tool
– time and cost reduction
- Robot assembly possible
– automated processes
- Compact structural dimensions
– to be used in extremely narrow spaces
- Integrated seal
– optimal tightness

Quick Connectors

NORMAQUICK® S

NORMAQUICK® S plastic quick connectors are the ideal means for connecting media carrying lines in combustion engines. The product has been especially developed for fuel system applications and is characterized by its' "click" sound as well as its' quick and safe connection.

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

Special applications are available - please contact us for inquiries!



Technical features

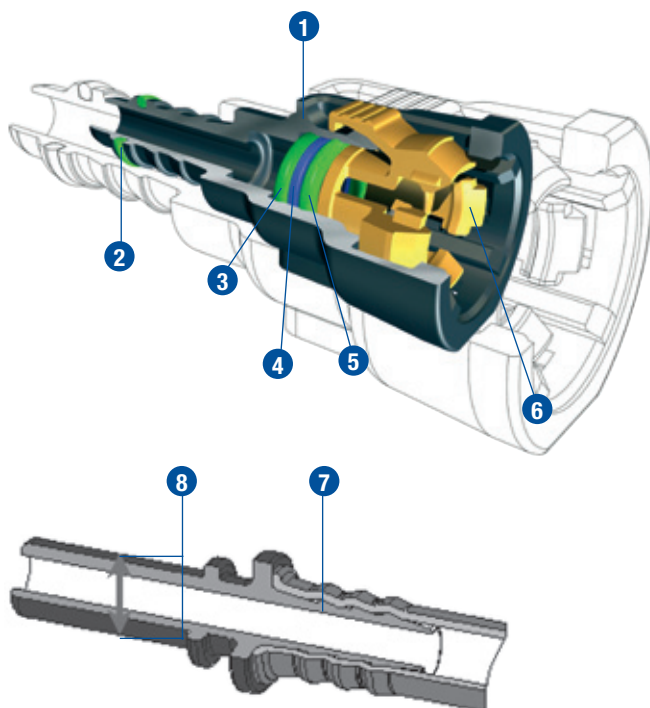
The advantages at a glance

- Media: fuel, oil, urea
- Operating temperature: -40 ° C to 125 ° C
- Pressures: 0 to 6.8 bar overpressure
- Very high withdrawal force through four locking points
- Colored retainer clips available in black, green, yellow, red, blue and natural

Quick Connectors

Connecting spigot – to SAE J2044, standard world wide

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



- 1 Housing
- 2 Firetree 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)

Insiders' Tip

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

Technical features

- **Medium/Fluid**
Fuel
- **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

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 – NORMAQUICK® S is protected from unintentional opening and cannot be unlocked under pressure

Quick Connectors

NORMAQUICK® V3

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



Quick Connectors

NORMAQUICK® XM

A major advantage of the NORMAQUICK® XM presents is its very compact design, allowing for easy installation in small, condensed spaces. Spend less time fixing and be sure that with one click the assembly is done robust and safely sealed in place. After all, time is money!



The advantages at a glance

- Operating temperature up to 150°C
- Mounting forces meet world-wide ergonomic standards (<80N)
- Standardized sizes >20 up to <91mm)
- Extremely robust against radiant heat and low packaging
- Design fit to VDA standard spigot
- No risk of contamination of the seal element
- Axial stop function and robustness for pressure rised system
- Qc opening can be done either manually or special hand tools
- Connecting element manufactured out of NORMA spring band clamp material
- Ease of assembly/ low disassembly force

Quick Connectors

NORMAQUICK® XP

With the ability to fasten with all types of synthetic materials, the NORMAQUICK® XP ring does not have contact with the inside medium, preventing contamination of the O-ring. At NORMA Group, our customer's needs are always our first priority. Like most NORMA Group products, the NORMAQUICK® XP and XM in particular are highly customizable. Have a glance at some advantages and customizing possibilities below.



The advantages at a glance

- Operating temperature up to 200°C
- Mounting forces can be adapted to individual customer requirements by careful selection of spring, the quality, thickness and design
- Ability to open the connecting element with integrated opening clip (separate tool) or by simple rotation of the connector
- Possibility of shaping the fastener, preventing opening on its own
- Standardization is possible
- High removal/withdrawal force
- Simple spigot design
- Upon customer request, connecting element can be customized such that it can be opened on one side only after the first assembly.

Quick Connectors

NORMAQUICK® Twist II

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



Standard materials

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

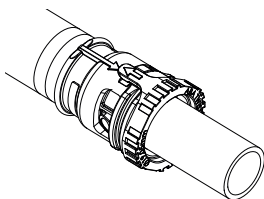
When an application requires, other engineering thermoplastic material can be used. Different reinforcement fillers and additional heat or hydrolysis resistance can also be added. Application based design is possible when a minimum required quantity is ordered.

The advantages at a glance

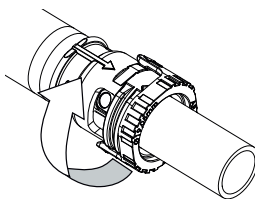
- Can be integrated in end-tanks as well as be mounted on tubes or hoses
- A secure seal to the mating spigot with a low assembly force
- Robust and clear locking features with a click function to ensure a correct lock
- Easy operation for disassembly
- Temperature resistance of up to 180°C

Quick Connectors

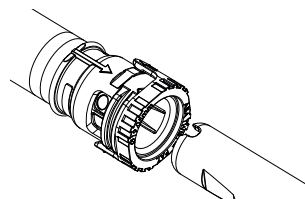
NORMAQUICK® Twist II



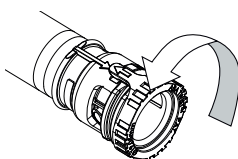
*Assembly is in locked position.
The arrow marks the closed position.*



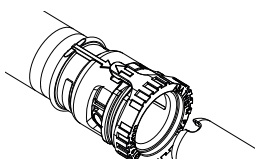
Turn connector ring to open position.



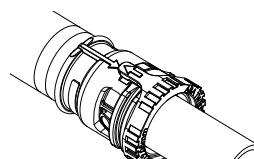
Pull connector backwards to disengage the joint. The connector is now released from its position.



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

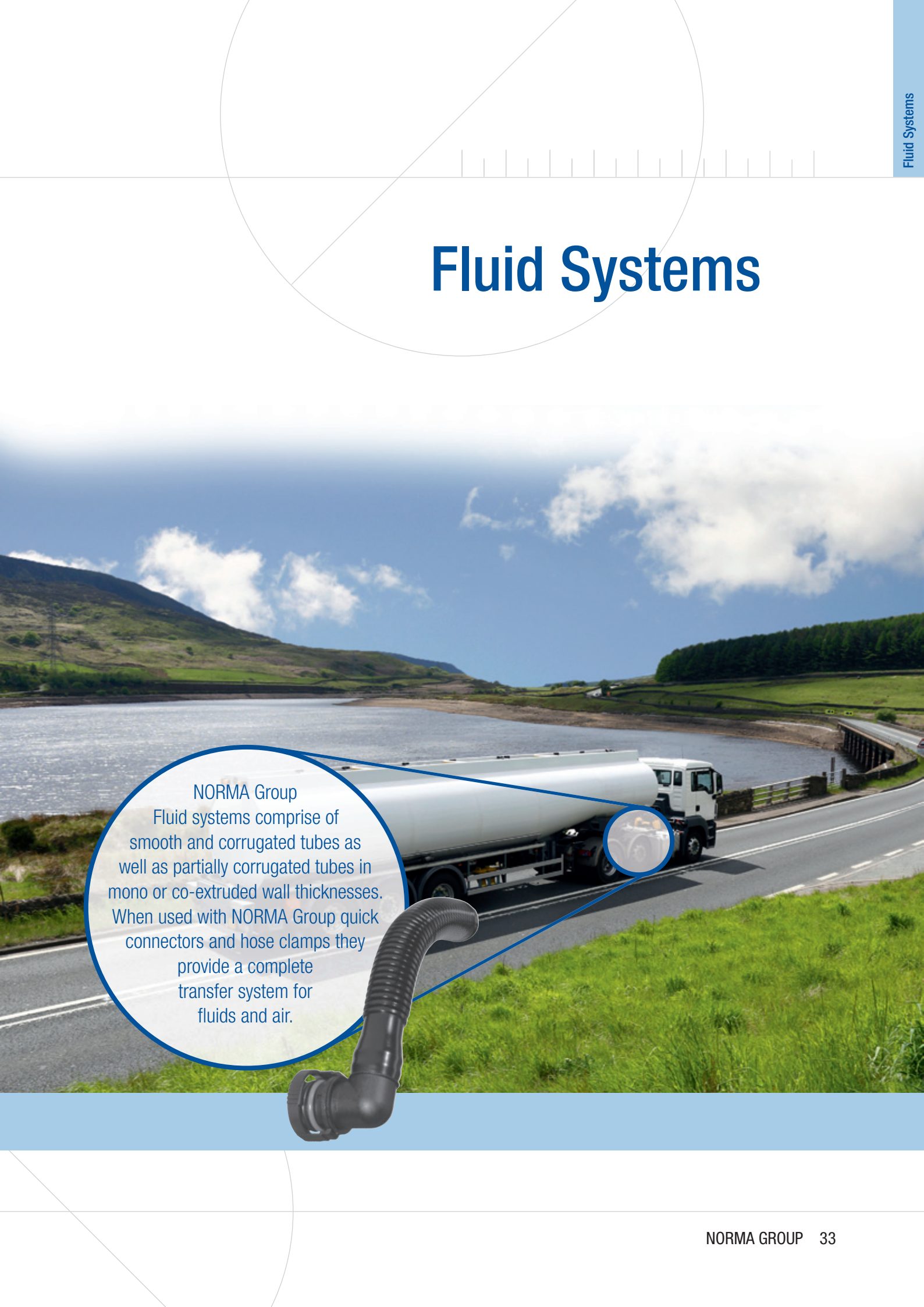


IMPORTANT NOTICE
Notch in male part must be aligned with arrows marking "locked position" when engaging the female part to the male.



Listen for audible "click" or feel when connector is fully engaged. Connecting joint is now in a locked position.

Fluid Systems



NORMA Group
Fluid systems comprise of
smooth and corrugated tubes as
well as partially corrugated tubes in
mono or co-extruded wall thicknesses.
When used with NORMA Group quick
connectors and hose clamps they
provide a complete
transfer system for
fluids and air.

Fluid Systems

NORMAFLEX® TOC

NORMAFLEX® TOC (Transmission Oil Cooler tube systems) are designed for engine and transmission oil cooling.

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



Technical features

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

NORMAFLEX® CWS

NORMAFLEX® CWS are plastic systems used for cooling water. Combining a variety of products from the extensive NORMA Group portfolio, the NORMAFLEX® CWS creates a cost effective Cooling Water System.

With an excellent media and chemical resistance especially against hydrolysis, the NORMAFLEX® CWS has high system flexibility.



Technical Features:

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

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