COMPOSITE FITTING RANGE PRODUCT OVERVIEW
Agenda

• Composite System Introduction

• Product Information
  • Product structure and function
  • Assembly information

• General Information
SYSTEM INTRODUCTION

Product Overview
Current Brass System

The Raufoss BRK P5 System

- Building blocks
- P5-Plug-in swivels
- Push-in couplings

- Approximately 200 different articles
- Since 20 years successful in the market
- More than 100 million parts sold
Composite System Introduction

A new generation of couplings based on composite materials in combination with leading coupling technology.

BENEFITS OF COMPOSITE MATERIALS:

- Reduced system cost
- Reduced system weight
- Increased Design Flexibility
- Brass components secure structural integrity

The system will provide significant improvement in all essential coupling areas.
Composite System Introduction (2)

The benefits & functionality of the Composite system is given through:

1. Extensive use of advanced composite materials.

2. Consequent focus on producibility, process stability and integrated assembly.

3. Maximum modularity by
   - high building flexibility with few articles.
   - increased single article production volumes.
   - one standardized system fulfilling different engineering philosophies.
Composite System Components

- Composite System
  - Push-In
    - New Line Push-In
    - Threadless Push-In
    - Integral Push-In
  - Composite Building Blocks
    - Composite Blocks
  - Tools and Accessories
    - Standard Release Tool
    - Professional Release Tool
    - Standard Circlip Plier

Different components from Composite System.
New Line Push-in Geometry

- Cone element
- ‘Ring snap’ press connection
- Environmental seal
- Brass grip ring
- With integrated port seal
- Large section O-ring main seal
- Support sleeve
- One piece housing brass/composite
Color of tubular stiffener

**WHY**: Colored tubular stiffeners prevent from swapping different tube sizes.

**Standard Composite**

<table>
<thead>
<tr>
<th>Pipe size</th>
<th>Color of tubular stiffener</th>
</tr>
</thead>
<tbody>
<tr>
<td>10x1.0</td>
<td>Light grey (RAL7035)</td>
</tr>
<tr>
<td>10x1.5</td>
<td>Dark grey (7030)</td>
</tr>
<tr>
<td>Others, incl. 10x1.25</td>
<td>Black</td>
</tr>
</tbody>
</table>
‘First grip then seal’ functionality

Cut tube

Grip

Distinct assembly feeling through clamping ring

Seal

Detail of ‘Grip’

Free distance after clamping ring and O-Ring ensures complete assembly and allows angles in tube cut

If the connection is sealed, no slip out of tubing is possible
‘Check Valve’ functionality

From outside

Bore: 1.5 mm diameter

Tube can be re-pushed under pressure

From inside

Local slot

Bypass

O-Ring in Standard position

O-Ring in displacement

O-Ring in ‘whistle’ position

Integrated security check for correct assembled tubes
‘Feedback Signal’ functionality

The operator gets a distinct 'Feed Back Signal' to verify correct assembly of tube.

- Click element integrated in support sleeve
Composite Building Block System

The composite building block system consists of two parts:

- Building block = 90° elbows, Union „F“, „L“, „T“, three way blocks…
- Brass swivels for structural integrity
Composite Building Block Geometry

- Composite building block
- Sealing surface
- Sealing O-Ring
- Vibration damping ring
- Integrated port sealing
- Snap arms for two step assembly
- Female composite port
- Two grooves for two step assembly
- Male brass swivel for composite system
‘First grip then seal’ functionality

1. (safety) position
   - O-Rings not compressed
   - Snap-arms in first groove

2. (seal) position
   - O-Rings compressed
   - Snap-arms in second groove

Two-step assembly
Distinctly assembly feeling by passing first step
‘First grip then seal’ functionality (2)

Safety position

Swivel or Push-in
First (safety) position

Air whistle and small pressure drop in 'End of line test' indicates not complete assembly.
PRODUCT INFORMATION

Assembly Information
## Push-in Forces

Low push-in forces secure correct assembly

Accepted by leading OEM manufacturers

Push-in forces are depending on:

- Tolerances of tube and coupling (O-Ring)
- Tube quality ('y'-quality = 10% higher push-in force

<table>
<thead>
<tr>
<th>Tube</th>
<th>Push-in force (average values) [N]</th>
<th>Push-in force (maximum values) [N]</th>
</tr>
</thead>
<tbody>
<tr>
<td>6x1</td>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>8x1</td>
<td>50</td>
<td>90</td>
</tr>
<tr>
<td>10x1</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>10x1.25</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>12x1.5</td>
<td>70</td>
<td>110</td>
</tr>
<tr>
<td>15x1.5</td>
<td>85</td>
<td>130</td>
</tr>
<tr>
<td>16x2</td>
<td>85</td>
<td>130</td>
</tr>
</tbody>
</table>
Fastening torque HEX - 1

The straight push-in fittings, ABC connectors, counter nuts etc. are mounted to the threat without any preparation (DIN 3852, ISO 6149, ISO 4039-1, ISO 4039-2, Voss Geometry). Fastening torque is listed in the following table:

<table>
<thead>
<tr>
<th>Threat</th>
<th>Recommended fastening torque 1) 2)</th>
<th>Max. fastening torque 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G 1/8”</td>
<td>15 Nm</td>
<td>18 Nm</td>
</tr>
<tr>
<td>G 1/4”</td>
<td>24 Nm</td>
<td>28 Nm</td>
</tr>
<tr>
<td>M 10 x 1.0</td>
<td>15 Nm</td>
<td>18 Nm</td>
</tr>
<tr>
<td>M 12 x 1.5</td>
<td>20 Nm</td>
<td>24 Nm</td>
</tr>
<tr>
<td>M 14 x 1.5</td>
<td>24 Nm</td>
<td>28 Nm</td>
</tr>
<tr>
<td>M 16 x 1.5</td>
<td>30 Nm</td>
<td>35 Nm</td>
</tr>
<tr>
<td>M 22 x 1.5</td>
<td>34 Nm</td>
<td>40 Nm</td>
</tr>
<tr>
<td>M 26 x 1.5</td>
<td>43 Nm</td>
<td>50 Nm</td>
</tr>
</tbody>
</table>

Explanation for 1) and 2) on next slide
Fastening torque HEX - 2

Using push-in fittings and ABC connectors the following reduced fastening torque is effective.

<table>
<thead>
<tr>
<th>Threat</th>
<th>Recommended fastening torque 1) 2)</th>
<th>Max. fastening torque 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 10 x 1.0</td>
<td>10 Nm</td>
<td>12 Nm</td>
</tr>
<tr>
<td>M 12 x 1.5</td>
<td>14 Nm</td>
<td>16 Nm</td>
</tr>
<tr>
<td>M 16 x 1.5</td>
<td>20 Nm</td>
<td>24 Nm</td>
</tr>
</tbody>
</table>

1) The recommended fastening torque is not valid for pretreated threats. The recommended fastening torque is valid for threats of aluminum, brass, or steel. The application of a torque key is recommended.
2) Please consider the permitted fastening torque of valve, air cartridge, etc.
Distinct assembly feeling during tube push-in

Main seal

Click feature

Environmental seal ~ 35N

Grip ring

<table>
<thead>
<tr>
<th>Tube Nr</th>
<th>[N]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>65</td>
</tr>
<tr>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
</tr>
<tr>
<td>5</td>
<td>67</td>
</tr>
<tr>
<td>6</td>
<td>67</td>
</tr>
<tr>
<td>7</td>
<td>61</td>
</tr>
<tr>
<td>8</td>
<td>60</td>
</tr>
<tr>
<td>Average</td>
<td>65</td>
</tr>
</tbody>
</table>
‘Assembly’ Force

1. (safety) position

Safety position: 0 N

Distinct assembly feeling

2. (seal) position

Push-in force: 70 N

Push-in force

Load (N)

Deformation (mm)
‘Pull-out’ Force

Pull-out force 1875 N = 2x Rohr 12x1.5
‘Fixed Orientation’

In cases:

- A fixed orientation of the tube is requested
- Use of the Composite Building block between frame and axle

![Standard 'Building block'

![RotoLock

Building block

Can be fixed with 15° steps
Repair of Composite Building Block

Standard circlip plier
• Straight
• 90° elbow

Circlip plier not currently in WABCO portfolio
Tube release tool

- It is possible to release the assembled tube from the coupling
- 'Tube releaser' are available in two versions:
GENERAL INFORMATION
## Composite System (Brass Swivels) – Sizes

<table>
<thead>
<tr>
<th>Swivel / building block size</th>
<th>Tube</th>
<th>Comment</th>
<th>Threat (Depending on size)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMALL</td>
<td>6x1 / 8x1</td>
<td>Mainly for Truck / Bus OEM</td>
<td>M10x1</td>
</tr>
<tr>
<td>REGULAR</td>
<td>8x1 / 12x1,5</td>
<td>Truck / Bus + Trailer OEM</td>
<td>M12x1,5</td>
</tr>
<tr>
<td>HEAVY DUTY</td>
<td>15x1,5 / 16x2</td>
<td>Truck / Bus + Trailer OEM</td>
<td>M14x1,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M16x1,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M22x1,5</td>
</tr>
</tbody>
</table>
Composite Building Block – Program overview

- 45° Elbow
- Union F
- 3-Way block
- Union Female
- Test Point
- 90° Elbow
- Union T&L
- Cross
- Union Male
- Threadless Female thread
- 90° integral
- Union Y
- 4-Way block
- Reducer
- Threadless Push-In
Composite Building Block – Samples
Composite System Comparison Against Brass System
Composite System General Info

Operating temperature:

-40 °C bis +100 °C

Can by used with Hytrel and nylon tubing (PA11/PA12) in accordance with

DIN 74324 / 73378 – Polyamide tubings used in motorvehicles

ISO 7628 – Road vehicles, thermoplastic tubing for air braking systems

Sealing towards standard ports:

- DIN 3852
- ISO 4039-1
- ISO 9974-1

- ISO 4039-2

- ISO 6149

- Voss