PENTAX and N-Form

IN-LINE MIXERS
**PENTAX - for intensive mixing**

We offer a wide variety of solutions to solve specific mixing problems. The range includes either static or dynamic in-line mixers depending on the application. The PENTAX dynamic in-line mixer offers excellent performance and can accommodate a wide capacity range, variable shear and can be supplied with auxiliary equipment as required.

**DESIGN AND CONSTRUCTION**

The multi-frequency liquid mixer comprises a series of opposed rotors and stators on a common axis. The rotors are fitted with milled teeth for low viscosity applications and with round studs for use with viscous fluids.

Inside the PENTAX mixer, constantly changing areas of rapid flow and resistance subject the liquid to high frequency acceleration and deceleration. The resulting high energy shear forces result in effective dispersion and emulsification.

A pre-mixing chamber is located at the entrance to the mixer. When one or more components are fed in by non-synchronous piston or diaphragm pumps, this chamber accommodates the discharge volume of several pump strokes and thereby equalises any differences in concentration before the liquids enter the main mixing area.

**Applications**

**Chemicals and plastics**
- Dispersing hardeners, accelerators and colourants into resins.
- Continuous cross-linking of PVA solutions.
- Continuous molten resin saponification.
- Wax and paraffin emulsion preparation.
- Dispensing propellant in foams.

**Food**
- Continuous production of mayonnaise.
- Fine dispersion of additives in cocoa and chocolate.
- Soya milk drink production.
- Enzymatic or chemical degumming of vegetable oil.
- Homogenization of nut-nougat sandwich spread.
- Preparation of beaten egg-white/sugar foam mixtures.

**Cosmetics and detergents**
- Continuous manufacture of creams and emulsions.
- Alkaline neutralisation of fatty and sulphonic acids.
- Dilution of molten alkane sulphonate.
- Elimination of viscosity anomalies in alkyl ether sulphate dilutions.
- Continuous shampoo and dishwashing liquid production.

**Fibres and textiles**
- Dyeing and delustering for semi- and fully synthetic spinning solutions.
- Homogenization for viscous solutions.
- Production of lubricant emulsions.
- Continuous starch gelatinization.
PENTAX Standard KMF

**ADVANTAGES**
- Extremely fine droplet size and material distribution
- Low space requirement
- High shearing action and phase boundary area
- Rapid reaction rate for neutralisation and other reactions
- Effective material exchange for reactions involving gases

**CONNECTIONS AND DIMENSIONS**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>CONNECTION DN</th>
<th>DIMENSIONS (MM) APPROX. DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>KMF 8</td>
<td>DN 025</td>
<td>A 230, B 093, C 128, D 298, E 130, F 180, G 105, H 600, L 1015</td>
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<tr>
<td>KMF 15</td>
<td>DN 040</td>
<td>A 303, B 116, C 106, D 289, E 200, F 240, G 170, H 210, L 1335</td>
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<tr>
<td>KMF 30</td>
<td>DN 050</td>
<td>A 334, B 170, C 355, D 477, E 360, F 385, G 210, H 215, L 1600</td>
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<tr>
<td>KMF 70</td>
<td>DN 080</td>
<td>A 392, B 173, C 303, D 480, E 470, F 380, G 420, H 350, L 1700</td>
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<td>KMF 120</td>
<td>DN 100</td>
<td>A 445, B 165, C 310, D 657, E 500, F 400, G 440, H 350, L 2100</td>
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<tr>
<td>KMF 250</td>
<td>DN 150</td>
<td>A 470, B 210, C 385, D 593, E 410, F 450, G 350, H 400, L 2400</td>
</tr>
<tr>
<td>KMF 300</td>
<td>DN 150</td>
<td>A 500, B 333, C 437, D 707, E 560, F 610, G 584, H 560, L 2500</td>
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</table>

PENTAX Hygienic SMD

**ADVANTAGES**
- EHEDG - Certificate
- Hygienic mechanical seal
- Components gasketed with O-rings only
- Vertical execution for total emptying prior to cleaning
- No dead space
- Vertical design allows easy and fast disassembly and reassembly
- Robust design; wide variety of materials available
- Reduced wear due to moderate RPM
- Low noise level

**CONNECTIONS AND DIMENSIONS**

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<thead>
<tr>
<th>TYPE</th>
<th>CONNECTION DN</th>
<th>DIMENSIONS (MM) APPROX. DIMENSIONS</th>
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<tbody>
<tr>
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<td>DN 040</td>
<td>A 368, B 170, C 137, D 644, L 1015</td>
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<td>SMD 30</td>
<td>DN 050</td>
<td>A 343, B 267, C 157, D 803, L 1618</td>
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<td>DN 080</td>
<td>A 419, B 398, C 222, D 934, L 1781</td>
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<td>SMD 130</td>
<td>DN 150</td>
<td>A 470, B 280, C 215, D 1070, L 1985</td>
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How to choose the right dynamic in-line PENTAX Mixer

<table>
<thead>
<tr>
<th>TYPE</th>
<th>CONNECTION DN</th>
<th>THROUGHPUT(^1) L/H</th>
<th>SPEED RANGE (\text{m/s})</th>
<th>DRIVE POWER (\text{Kw})</th>
<th>ROTOR DIAMETER (\text{mm})</th>
</tr>
</thead>
<tbody>
<tr>
<td>KMF 8</td>
<td>DN 025</td>
<td>25 - 800</td>
<td>500 - 4500</td>
<td>0.05 - 4.0</td>
<td>70</td>
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<tr>
<td>KMF/SMD 15</td>
<td>DN 040</td>
<td>40 - 3000</td>
<td>300 - 4000</td>
<td>0.02 - 9.5</td>
<td>14</td>
</tr>
<tr>
<td>KMF/SMD 30</td>
<td>DN 050</td>
<td>50 - 800</td>
<td>350 - 2800</td>
<td>0.04 - 19.3</td>
<td>149</td>
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<tr>
<td>KMF/SMD 70</td>
<td>DN 080</td>
<td>80 - 1300</td>
<td>250 - 1450</td>
<td>0.05 - 22.2</td>
<td>236</td>
</tr>
<tr>
<td>KMF/SMD 120</td>
<td>DN 150</td>
<td>150 - 1800</td>
<td>200 - 950</td>
<td>0.15 - 30.3</td>
<td>256</td>
</tr>
<tr>
<td>KMF 250</td>
<td>DN 150</td>
<td>150 - 2500</td>
<td>150 - 3000</td>
<td>0.15 - 30.3</td>
<td>317</td>
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<tr>
<td>KMF 300</td>
<td>DN 150</td>
<td>150 - 4500</td>
<td>100 - 4500</td>
<td>0.22 - 45.0</td>
<td>515</td>
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</table>

As many products exhibit non-Newtonian flow characteristics, it is not normally possible to determine the effective viscosity within the mixer; in these cases test runs in our pilot plant are required.

PENTAX mixers can be supplied with fixed gearing via a directly coupled motor, or with variable speed drives.

The table above indicates the relationship between throughput, drive power and rotation speed.

Low viscosity applications require high throughput and rotation speed with a low power rating; high viscosity applications require the opposite.
The N-form mixer is a static mixer using forced flow separation and geometrically offset stream recombination to give a progressive mixing effect.

Advantages
- Excellent radial mixing
- The N-form of the mixing elements produces four separate flows which are mixed simultaneously

Combining the liquids
For optimum mixing it is important that the liquids to be mixed are combined using the correct type of fitting. A simple T-inlet is only acceptable where the flow rates of both liquids are almost the same. Where the ratio is \( \geq 10 \), such as resin/hardener in resin mixtures, an injection tube must be used to add the low-volume component, immediately before the N-form mixer, in mid-stream and in the direction of the flow.

Applications
- Plastics
  - Mixing hardeners, accelerators and colourants into resins.
  - Mixing propellant and colour stock into polyol.
  - Dispersing TiO\(_2\) suspensions and acetic acid in caprolactam.
  - Mixing waterglass, catalysts and water.

- Paper and textiles
  - Continuous colour shading and dilution.
  - Diluting retention media.
  - Mixing glue.
  - Continuous shading of printer’s ink.

- Food and drinks
  - Addition of fat to low-fat soft cheese and quark.
  - Colouring glucose-sugar mixtures.
  - Dispersing water in crude vegetable oil.
  - Mixing hop extract and sugar solution into beer.
  - Mixing sugar syrup, fruit concentrates and water.

- Cosmetics and detergents
  - Mixing surfactants, preservatives, perfume and salt solutions with water.
  - Neutralizing sulphonic and fatty acids with sodium hydroxide solution.

N-Form Static mixer with excellent cross mixing effect

Low-viscosity liquids can be completely mixed with only a few N-elements, thanks to the simultaneous effects of flow separation and turbulence; longer mixers are ideal for medium to high-viscosity fluids with laminar flow characteristics.

Aqueous liquids
6 elements

Viscous liquids
11 – 16 elements

Liquids with viscosity differences up to about 1:1000
16 – 21 elements

Liquids with higher viscosity differences
21 or more elements

N-Form mixers (Standard specification)

<table>
<thead>
<tr>
<th>CONNECTION</th>
<th>NO. OF ELEMENTS</th>
<th>F PRESSURE PN 16</th>
<th>LENGTH L (MM)</th>
<th>CONNECTION</th>
<th>R WELDING RADIUS</th>
<th>WORLD TUBE O.D. (MM)</th>
<th>HEATING/COOLING CONNECTION Z (MM)</th>
<th>PRESSURE LOSS COEFFICIENT</th>
<th>KH</th>
<th>KN’</th>
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<tbody>
<tr>
<td>15</td>
<td>6</td>
<td>146</td>
<td>148</td>
<td>150</td>
<td>18X1</td>
<td>R3/8”</td>
<td>7,85</td>
<td>7,85</td>
<td>7,85</td>
<td>7,85</td>
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<tr>
<td>20</td>
<td>11</td>
<td>206</td>
<td>208</td>
<td>208</td>
<td>25X1</td>
<td>R3/8”</td>
<td>13,2</td>
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<tr>
<td>35</td>
<td>16</td>
<td>266</td>
<td>268</td>
<td>268</td>
<td>32X1</td>
<td>R3/8”</td>
<td>27,4</td>
<td>27,4</td>
<td>27,4</td>
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<tr>
<td>40</td>
<td>21</td>
<td>326</td>
<td>328</td>
<td>328</td>
<td>40X1</td>
<td>R3/8”</td>
<td>40,5</td>
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<td>40,5</td>
<td>40,5</td>
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<tr>
<td>65</td>
<td>26</td>
<td>426</td>
<td>428</td>
<td>428</td>
<td>50X1</td>
<td>R1/2”</td>
<td>58,2</td>
<td>58,2</td>
<td>58,2</td>
<td>58,2</td>
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<tr>
<td>80</td>
<td>31</td>
<td>526</td>
<td>528</td>
<td>528</td>
<td>60X1</td>
<td>R1/2”</td>
<td>70,0</td>
<td>70,0</td>
<td>70,0</td>
<td>70,0</td>
</tr>
</tbody>
</table>

Standard material: 1.4571 for N-form mixers, 1.4581 for N-elements of high-grade cast stainless steel.
Metering Pumps
for universal application in the low to medium requirement range
ProCam
ProCam Hygienic

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PowerMon S
PowerMon Compact

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