An introduction to Planetary Centrifugal Mixers
What is a THINKY mixer?

- A THINKY Mixer **mixes, disperses** and **degasses** your materials in seconds to minutes within your own product container.
- It can process materials with very low to very high viscosity up to 100 million centipoise (cP) or millipascals (mPa•s).

*Flux paste and solder powder 45 seconds*
How does it work?

- THINKY Mixers use a “planetary” mixing action
- A combination of
  - Rotation
  - Revolution
Planetary centrifugal mixer basics

- The material container rotates at a 45° angle whilst it revolves in a set radius.
- Intensive circulation of the material in the container under 400G of force results in quick mixing and air being squeezed out.

Oil Based Modelling Clay

<table>
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<th>Start</th>
<th>30 sec</th>
<th>2 mins</th>
<th>7 mins</th>
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*Images of oil-based modelling clay at different stages.*
What can it mix?

- Water-like liquids
- Pastes
- Powders
- Mixtures of liquids and solids
- Mixtures of high and low viscosities

And any combination of these!
What can it mix?

- Adhesives
- Inks
- Cosmetics
- Pharmaceuticals
- Sealants
- LED phosphors
- Nano-particles
- Precious metal fillers
Controlling mixing results

Different mixing results can be achieved by altering:

- The speed of **Rotation** and **Revolution**
- The ratio between them

There are two standard modes which are used to achieve optimal mixing results:

- **Mixing Mode**
- **Defoaming Mode/Degassing Mode**
Two modes – 1) Mixing

- The Mixing Mode has high speed Rotation and Revolution
  - On the ARE-250:
    - The ratio between them is 1:2.5
    - Typical speeds are 800rpm:2000rpm
    - With normal spin radius, this provides **400G of mixing force**

- The Mixing Mode achieves fast, homogeneous mix
  - This mixing action adds no air to the materials
  - In fact, it has a tendency to remove entrapped air
Two modes – 2) Degassing

- The Degassing Mode has high speed Revolution
  - On the ARE-250
    - The ratio between them is 1:36
    - Typical speeds are up to 60rpm:2200rpm
    - It is more similar to a simple centrifuge action
    - With normal spin radius, this provides **510G of force**

- The Degassing mode removes any remaining air
  - Too fast a rotation will separate the material like a centrifuge, although it degasses well
Is it easy to operate?

1. Load material into the container
2. Measure the gross weight & adjust the counter balance dial to suit
3. Set the time, speed & mode
   or
3. Recall a previously saved program or recipe
4. Press the start button

- Mixing profiles or recipes can be stored and recalled

- See our ‘Getting Started’ video to find out more
What is multi-step mixing?

- Allows you to process up to nine continuous steps in a batch
  - Mix -> degas -> mix -> degas etc.
  - Is very effective for powder applications, heat- or shear-sensitive materials or reactive materials

Mixing talc into a viscous silicone
Example: powder mixing

- Problem of mixing hard-to-wet powder into a liquid
  - Once some of the powder starts wetting, the rest tends to wet as well
  - To trigger this wetting, the mixer starts at a slow speed akin to mixing by hand
  - Then, mix at full speed
  - Degas
  - Re-mix again to make sure any dense particles which might separate in degassing mode are mixed and the material is fully homogenous
- Dynamic speed change from slow to fast, or vice versa, gives “shaking” effect to the materials which can result in better mixing quality
- Speed adjustments in a cycle can increase or decrease shear, which can change the material viscosity, etc
Example: powder mixing

- Program all steps to one memory slot
  - Batch time - two minutes and 50 seconds total
  - Stages proceed automatically

Step 1
500 rpm
1 min
Mixing

Step 2
2000 rpm
20 sec
Mixing

Step 3
2200 rpm
1 min
Degassing

Step 4
1000 rpm
30 sec
Mixing
THINKY ARE-250

- Our most popular mixer
- Use for the majority of materials
- No vacuum
  - But usually no bubbles > $\Omega 1\mu m$
- Processes 0.5ml – 300ml
  - 310 grams gross
THINKY ARV-310P

- Same capacity as ARE-250
- Includes integral vacuum capability
- Used where even micro-bubbles cannot be tolerated
  - < Ø1μm bubbles

- See our Technical Bulletin - Vacuum Mixing & Degassing
THINKY ARM-310

- Use for the majority of materials
- No vacuum or degassing modes
- Processes 0.5ml – 250ml
  - 310 grams gross
THINKY ARE-400 Twin

- Mixes 2 x 250ml containers
- USB connectivity for control and data-logging
- Stores up to 20 programmed recipes
- No vacuum
  - But usually no bubbles > Ø1μm
THINKY ARE-500

- Mixes up to a 0.5l container
- Can mix up to 1.1kg of material
- Stores up to 5 programmed recipes
THINKY ARV-501

- Mixes up to a 0.5l container
- Can mix up to 700g of material
- Stores up to 20 programmed recipes
- Vacuum mixing possible through optional stand or your own external vacuum pump source.
THINKY ARV-931Twin

- Includes integral vacuum capability
- Max 0.5l in 0.75l container x 2
- 1 litre overall mixing capacity
- Can apply 670G when using defoam mode
THINKY ARV-5000

- Includes integral vacuum capability
  - A full vacuum can be achieved in 30 seconds
- Up to 4L or 5kg mixing
- Stores 10 recipe profiles
- Equipped with an air cooling mechanism
THINKY ARV-10K Twin

- Includes integral vacuum capability
  - A full vacuum can be achieved in 30 seconds
- Up to 20kg mixing, 10kg containers x 2
- Stores 20 recipe profiles
THINKY SR-500

- Designed to bring solder paste up to optimal mixed quality and temperature in a few minutes
- Standard 500g solder paste containers can be conditioned without repackaging
- Stores up to 10 programmed recipes
Containers

- Mixing quality and speed is optimised by using a suitable container.
- Ideal containers have rounded internal corners and no gaps on the container wall surfaces.
  - This allows no particles to be trapped in sharp corners or gaps.
- Stocked containers include:
  - 90ml PP
  - 150ml HDPE
  - 240ml PP
  - 300ml HDPE
- Containers are also available in capacities from 12ml to 4L.
Adapters

- THINKY Mixers hold a small container with an optional adapter
- You can use various sizes of jars, syringes and cartridges. We also can make adapters for your container needs
- The cooling adapter has a freeze gel function that keeps the material cool throughout the mixing process
- The heat insulation adapter allows you to process heated materials up to 130°C
What is a counterbalance?

- All THINKY mixers are equipped with balance adjusters
- High speed spins of the single containers requires a counter dummy weight to spin in balance
- Unbalanced spins cause heavy vibrations of the mixing unit
  - Like a wobbling washing machine
Why THINKY?

- There are many engineered materials which are
  - Hard to mix
  - Hard to de-aerate or de-gas
  - Hard to wet, or get dry powders into liquids

- They can be
  - High and/or low density materials
  - High SG metallic powders
  - Pasty, viscous materials
  - Fine particles

THINKY Mixers are effective for effortless, homogeneous mixing of all types of engineered compounds. The precision can be simply confirmed when examined under a microscope.
Benefits of using THINKY mixers

- For high viscosity, materials with different densities
- Simultaneous mixing & degassing in one batch
- Process in your own container
  - jar, barrel, cartridge, syringe
- Remove voids and re-disperse filled materials already packed in syringes
- Non-invasive processing ends the risk of cross contamination between batches
- Process from 0.5ml - no waste of expensive materials
- Re-mixing of separated materials to prolong shelf life
- No volatile constituent loss with vacuum-less processing
- No material damage unlike processes involving rollers, mixing blades or propellers
- No unit cleaning between batches
Benefits of using THINKY mixers

- Saves time and cost significantly
- Improves yield rate
- Reduces production cycle time in seconds to minutes
- Improves productivity
- Production on demand reduces material stock
- Improves and produces consistent quality, regardless of operator skills, with digitally controlled processing
Our customers

- Our selection of customer case studies showcase the importance of achieving consistent, homogeneous mixes during production.

More efficient operations at EMS provider with consistent solder paste conditioning

Manufacture of NMC electrodes for lithium-ion batteries with high active material content
Find out more

- Thank you for your interest in the THINKY Mixers
- **Visit our website** for more information, technical specifications and a product videos:
  
  [www.intertronics.co.uk/thinky](http://www.intertronics.co.uk/thinky)

- **Come and see a THINKY Mixer!** We welcome you to our Technology Centre for a demonstration
- **Call us** to discuss your application on +44 (0)1865 842842