



AM Technology

Engineering Chemistry

Coflore[®] ATR

Agitated Tube Reactor



www.amt.uk

sales@amt.uk

Issue Date: Feb23



AM Technology
Engineering Chemistry

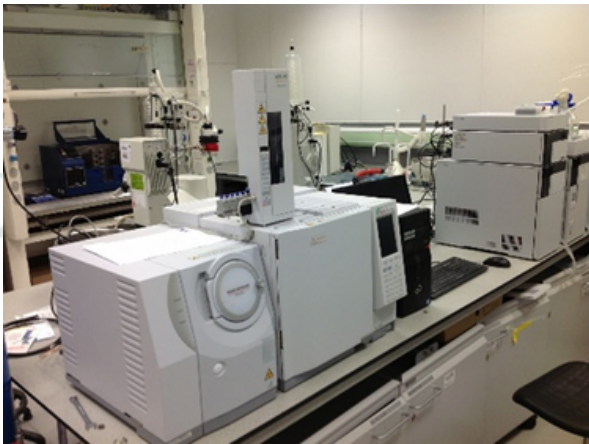
Coflore[®] ATR

Company Overview

AM Technology designs and manufactures continuous flow reactors and chemical plants.

Our multi-disciplinary team of experts work together with customers from process R&D all the way through to chemical plant design, installation & commissioning.

Our patented Coflore active mixing technology unlocks the benefits of continuous flow to a wide-range of chemical processes from benchtop R&D to multi-tonne production plant.



Certificate Number: 12703
ISO 9001

For further information contact Sales@amt.uk or visit www.amt.uk

Issue Date: Feb23

Flow Chemistry

In a traditional batch process, such as a reaction performed in a flask, or jacketed glass reactor, the vessel contents alters over time as starting reagents are converted to product.

Flow Chemistry enables a chemical reaction to be run continuously, through constant addition starting reagents to a reactor whilst simultaneously removing chemical product.

In a flow reactor, reaction time is a function of distance through the reactor.

Flow reactors process multiple reactor volumes without interruption, making them inherently more productive than their batch counterparts.

Smaller working reactor volumes offer advantages such as increased heat transfer efficiencies and mixing efficiencies and reduced risk associated with handling hazardous reaction mixtures.

For further information contact Sales@amt.uk or visit www.amt.uk

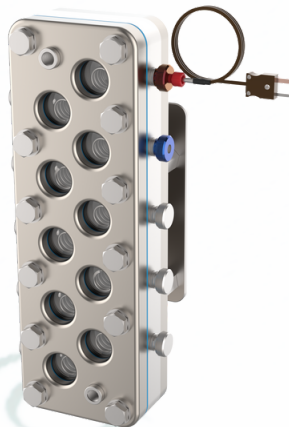


Coflore Flow Reactors

Coflore Flow Reactors are dynamically mixed reactors. This means that mixing is applied to the flow reactor via an external energy source, similar to how the contents of a batch reactor is mixed with an overhead stirrer.

Dynamic mixing is key to ensuring wide process compatibility, with Coflore reactors able to handle an extensive range of chemistry including multiphase reactions such as liquid/liquid, liquid/gas and liquid/solid/gas.

The Coflore range covers production scale from grams to kilotonnes.



AGR

**Grams /
Kilograms**



ATR

**Kilograms /
Tonnes**



RTR

**Tonnes /
Kilotonnes**

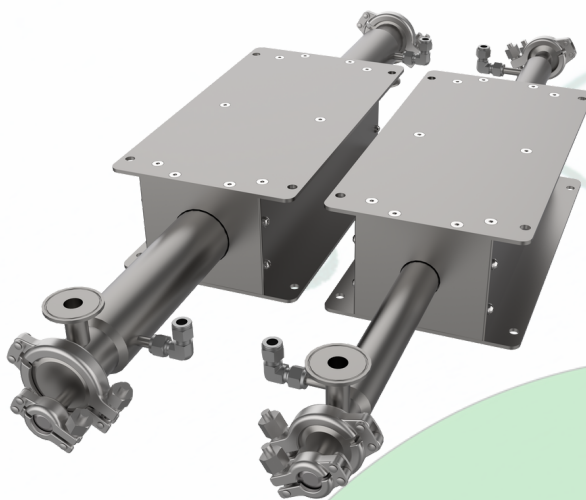
For further information contact Sales@amt.uk or visit www.amt.uk

Coflore ATR



The **Coflore Agitated Tube Reactor** is a dynamically mixed flow reactor designed for pilot-plant and production scale continuous processes.

The ATR consists of an agitating platform that houses up to 8 Reactor Tubes connected in series. Reactor Tubes come in 0.35 L and 1.25 L sizes, providing a working reactor volume range of between 0.35 L and 10 L, allowing for a **28-fold process scale up on a single ATR platform**.



The ATR is ideal for establishing continuous processes at pilot-scale, or for tonnes per annum production. All fittings are sanitary grade and all wetted parts can be easily accessed for cleaning, with the Coflore ATR suitable for use in GMP environments (i.e. pharma).

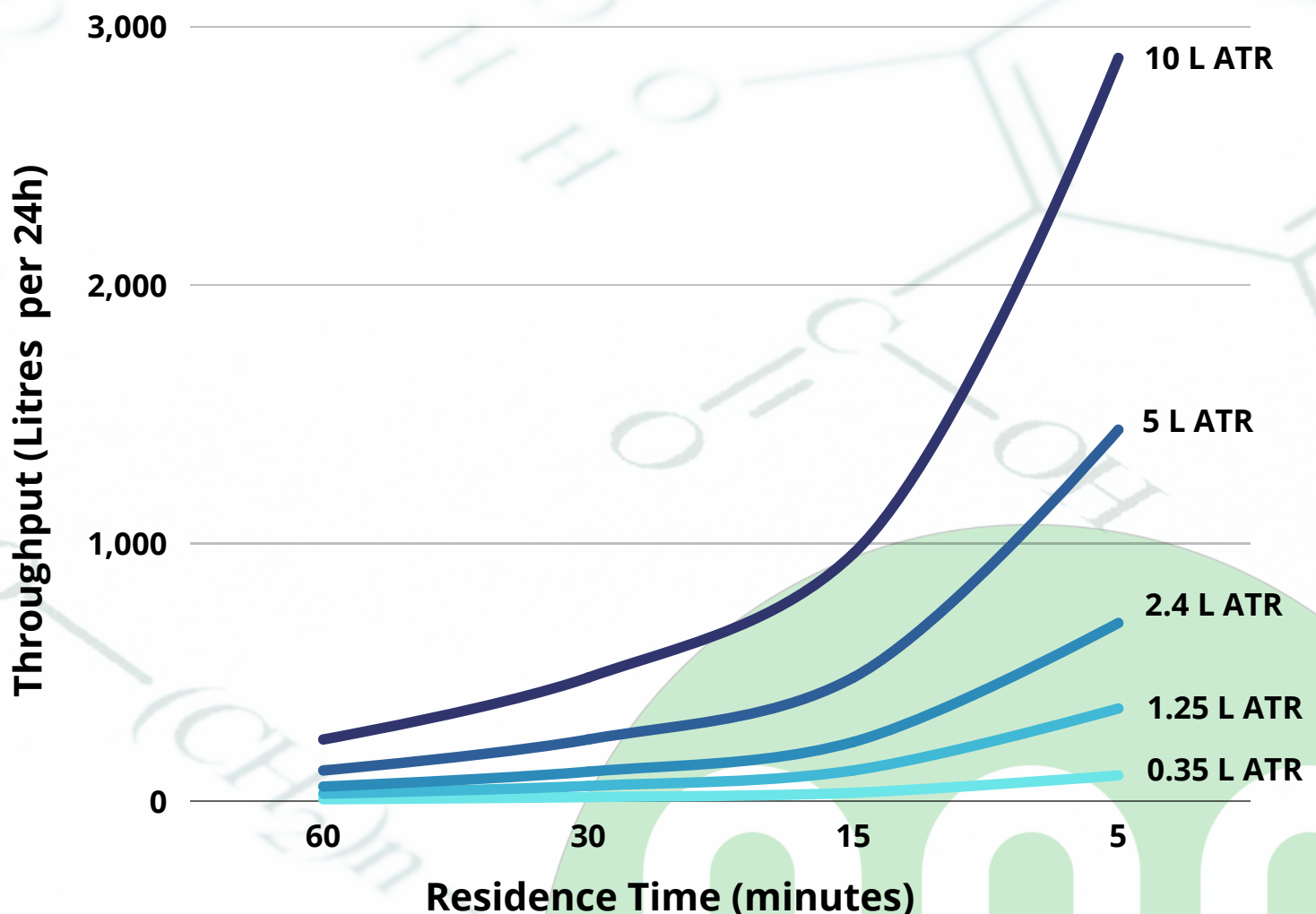
Processes developed on an ATR platform have a straight-forward path to scale up via the 100 L volume **Coflore RTR** production-scale flow reactor.

For further information contact Sales@amt.uk or visit www.amt.uk



Coflore ATR Productivity

In any flow process, **productivity is directly linked to the reaction residence time**. A shorter residence time allows for greater productivity from a single system.



The variable volume of the Coflore ATR provides you with an extremely versatile system and **28-fold scale up** on a single platform.

For further information contact Sales@amt.uk or visit www.amt.uk

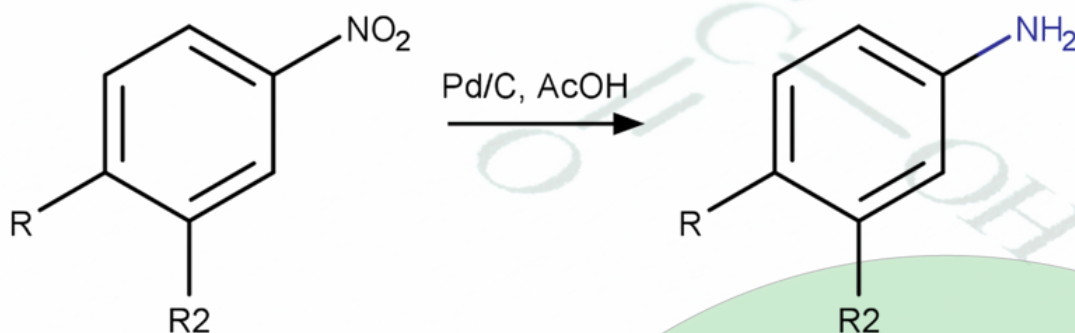


Hydrogenation in Coflore

Flow Case Study

Catalytic hydrogenation remains an industrially prominent yet difficult process to manage using conventional plant equipment, largely due to the safety concerns and costs associated with processing hydrogen at high pressures using large reaction vessels.

AM Technology have developed and validated multiple methods of performing hydrogenation chemistry in Coflore systems more efficiently, and safer, than batch.



Hydrogenation of an aromatic nitro compound to yield the corresponding amino compound has been performed at pressures under 10 bar and with rates of conversion **twice as fast** as equivalent batch processes reported in the literature.

The versatility of Coflore systems afforded through dynamic mixing allows for simple operation of **both homogenous and heterogenous catalysis** in flow.

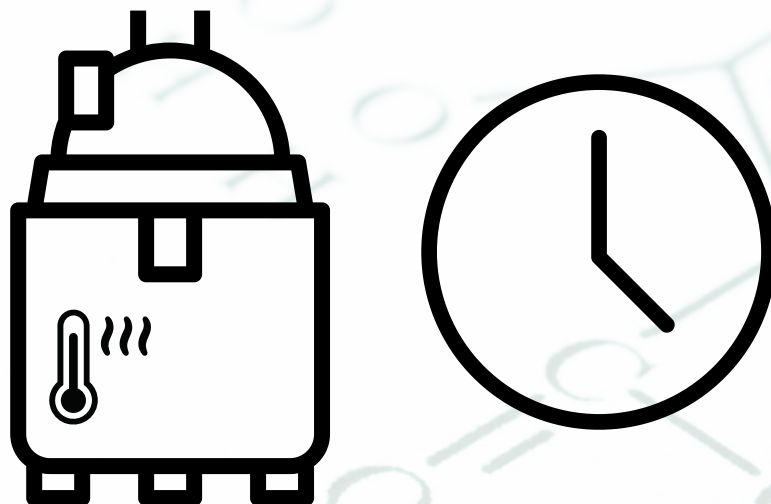
For further information contact Sales@amt.uk or visit www.amt.uk



Nitration in Coflore

Flow Case Study

Highly exothermic reactions, such as nitration reactions, often require dropwise addition of reagent over several hours in batch manufacturing processes.



A key advantage of Coflore flow reactors is their **greatly improved heat-transfer coefficient** compared to batch reactors, meaning that exothermic reactions can be performed much more efficiently and safely, through greater control of process temperatures.

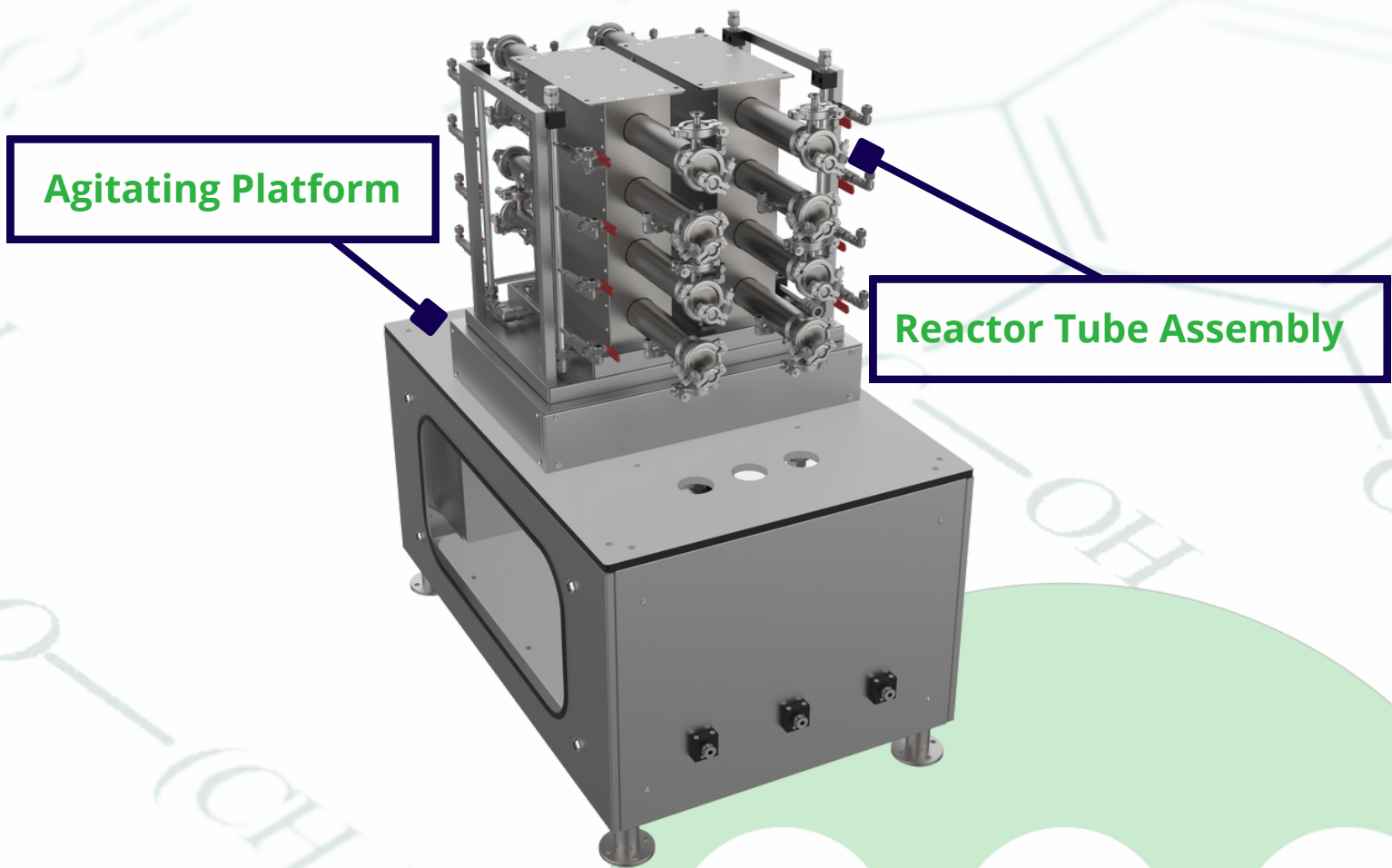
Various nitration reactions performed by AM Technology as part of customer feasibility work have demonstrated that a continuous approach to manufacturing utilising Coflore offers efficiency improvements orders of magnitude greater than existing batch methods, allowing chemical manufacturers to **produce material more quickly, safely and at lower cost**.

For further information contact Sales@amt.uk or visit www.amt.uk



Coflore ATR System

The **Coflore ATR** consists of an **Agitating Platform** and **Reactor Tube Assembly**.



The **Agitating Platform** provides lateral motion to the reactor tubes, generating mechanical mixing.

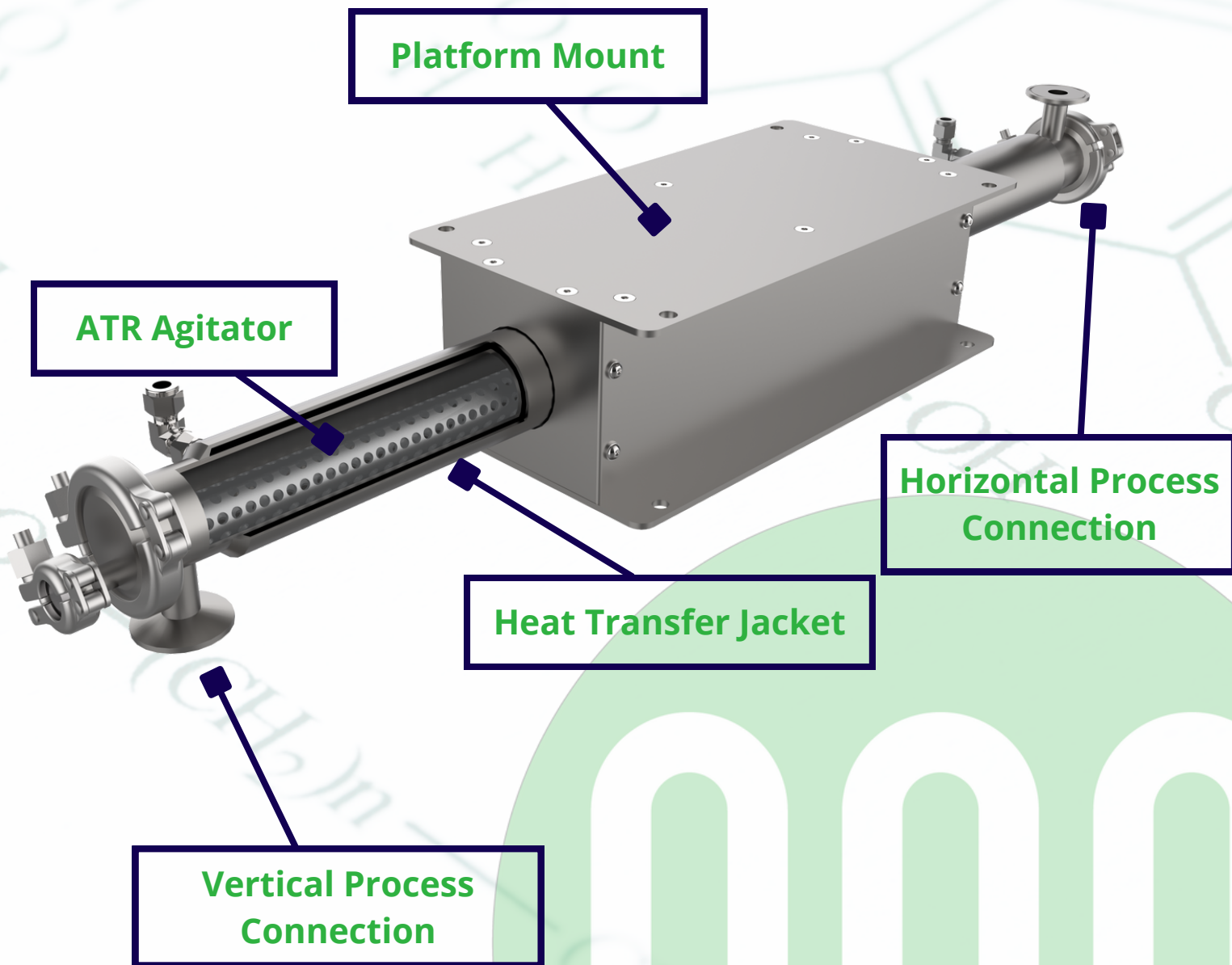
Reactor Tube Assemblies can be stacked in two banks of four, connected by vertical drop connections.

For further information contact Sales@amt.uk or visit www.amt.uk



ATR Reactor Tube

The **Reactor Tube Assembly** is available in 0.35 L and 1.25 L sizes. An agitator is housed within each reactor tube, to actively mix the reaction mixture.



For further information contact Sales@amt.uk or visit www.amt.uk



ATR Connections

Horizontal Connections allow connection of additional process inlets and temperature probes via sanitary 1/2" triclover fittings (9.5 mm ID).

Vertical Connections connect multiple reactor tubes together, and provide a primary process inlet and outlet.

A range of 1/2" triclover adapters are available including:



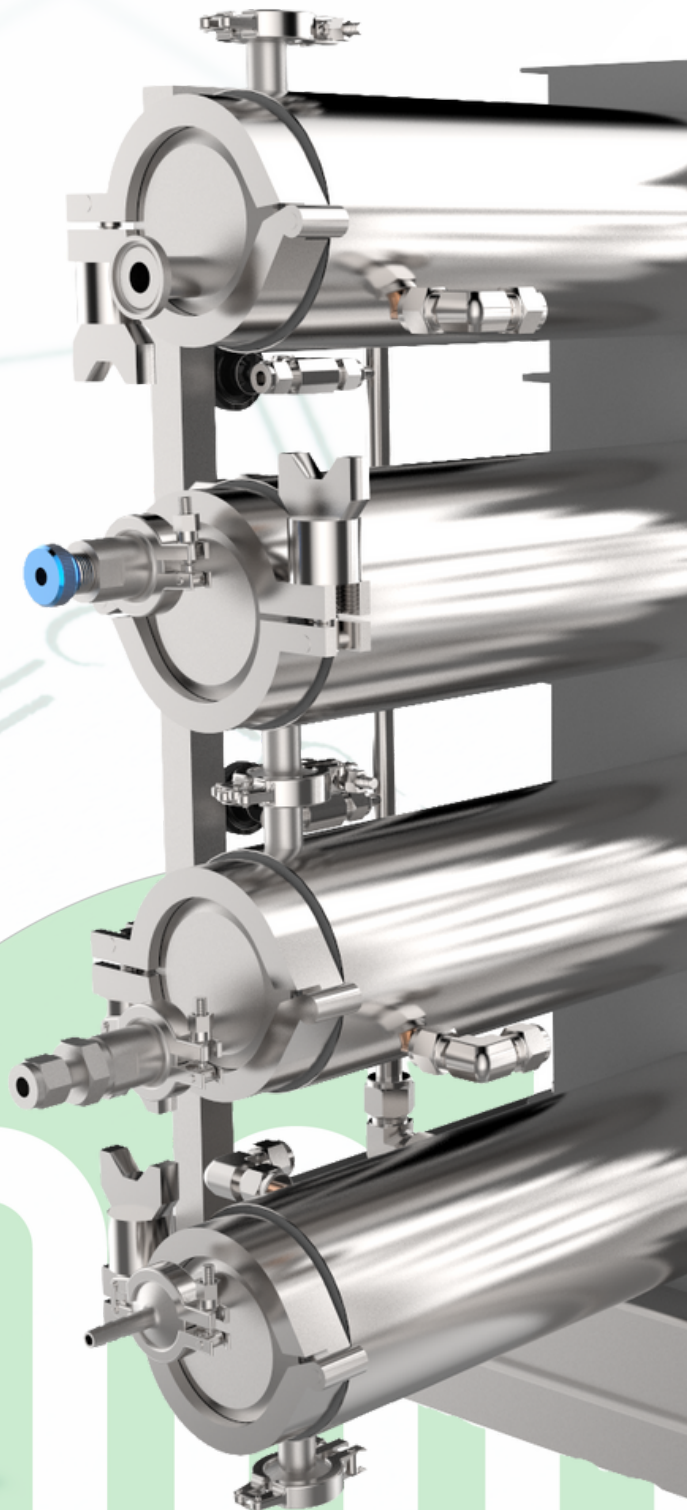
1/4" BSPP with 4mm ID



1/4" BSPP with 9.5mm ID



Hosebarb



For further information contact Sales@amt.uk or visit www.amt.uk



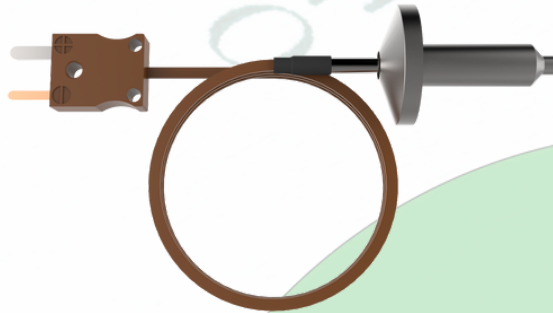
ATR Temperature Control

Temperature control in the **Coflore ATR** is achieved through connection to an external Temperature Control Unit (TCU). Thermal fluid is recirculated through the heat transfer jacket and can be arranged to flow co-current or counter-current to your process.

For temperature control of multiple reactor tubes, the agitation platform has a thermal fluid manifold to split the feed to multiple tubes in parallel.

As standard, the Coflore ATR temperature range is -40 ... +140 C.

If you require an alternative range please contact us directly to discuss your requirements.



Internal process temperatures can be monitored with an ATR Thermocouple Assembly, pictured above, which can be placed at any of the reactor tube process connections.

The thermocouples have T-Type connectors and will connect to standard T-Type thermometers. The Pro and Ultimate control systems have in-built I/O to connect up to 8 ATR thermocouples and monitor temperature through the control interface.

For further information contact Sales@amt.uk or visit www.amt.uk



Control System Overview

The **Coflore ATR** has three main control system options, offering the user flexibility based upon what they require. All control system options can be integrated into your existing DCS.

Essential

The Essential control system offers On/Off control with agitation frequency selection from 2-6 Hz.

Please note, a PC is required.

Pro

The Pro control system builds upon the Essential system with the inclusion of an I/O interface incorporating:

8x T-Type Thermocouple inputs

4x Analogue ports (4-20 mA, 2x input, 2x output)

6x Digital ports (3x input, 3x output)

Please note, a PC is required.

Ultimate

The range-topping Ultimate control system includes an in-built industrial PC SCADA system and Pro I/O interface, data logging and programmable alarm capabilities.

The Ultimate control system can conform to CFR21 if required.

For further information contact Sales@amt.uk or visit www.amt.uk



ATR-260 Package

ATR System With Four Reactor Tubes

The **ATR-260 Package** includes a Coflore ATR system with four ATR reactor tubes.

The ATR reactor tubes are available in two sizes: 0.35 L and 1.25 L.

Please specify how many of each size of tube you require along with your purchase order.



ATR-260 Includes:

- 1x Coflore ATR Agitation Platform
- 1x Essential control system software
- 4x ATR Reactor Tube Assemblies
- 4x ATR Thermocouple Assemblies
- 4x Triclover to 1/4" BSP thread (4mm) Adapters
- 4x ATR 1.6 M Process Hoses
- 1x ATR Service Kit
- 1x ATR Tool Kit

For further information contact Sales@amt.uk or visit www.amt.uk

ATR-270 Package

ATR System With Eight Reactor Tubes

The **ATR-270 Package** includes a Coflore ATR system with eight ATR reactor tubes.

The ATR reactor tubes are available in two sizes: 0.35 L and 1.25 L.

Please specify how many of each size of tube you require along with your purchase order.



ATR-270 Includes:

- 1x Coflore ATR Agitation Platform
- 1x Essential control system software
- 8x ATR Reactor Tube Assemblies
- 8x ATR Thermocouple Assemblies
- 8x Triclover to 1/4" BSP thread (4mm) Adapters
- 8x ATR 1.6 M Process Hoses
- 1x ATR Service Kit
- 1x ATR Tool Kit

For further information contact Sales@amt.uk or visit www.amt.uk



Technical Details

Temperature Range	-40 ... +140 C*
Pressure Range	Vacuum ... 16 BarG*
Reactor Tube Volume	0.35 and 1.25 L
Reactor Volume Range	From 0.35 to 10 L (up to 8 reactor tubes can be mounted on an ATR platform)
Process Connections	Sanitary triclover connections (can be adapted into a range of fittings as required)
Agitation Frequency Range	2 - 6 Hz
Wetted Materials	Hastelloy C276 / PTFE / FFKM

**As standard. Contact us if you have specific requirements outside of this range.*

For further information contact Sales@amt.uk or visit www.amt.uk



Technical Details

Maximum Reactor Mass	120 kg
Agitating Platform Mass	150 kg
Noise Output	< 70 dBA

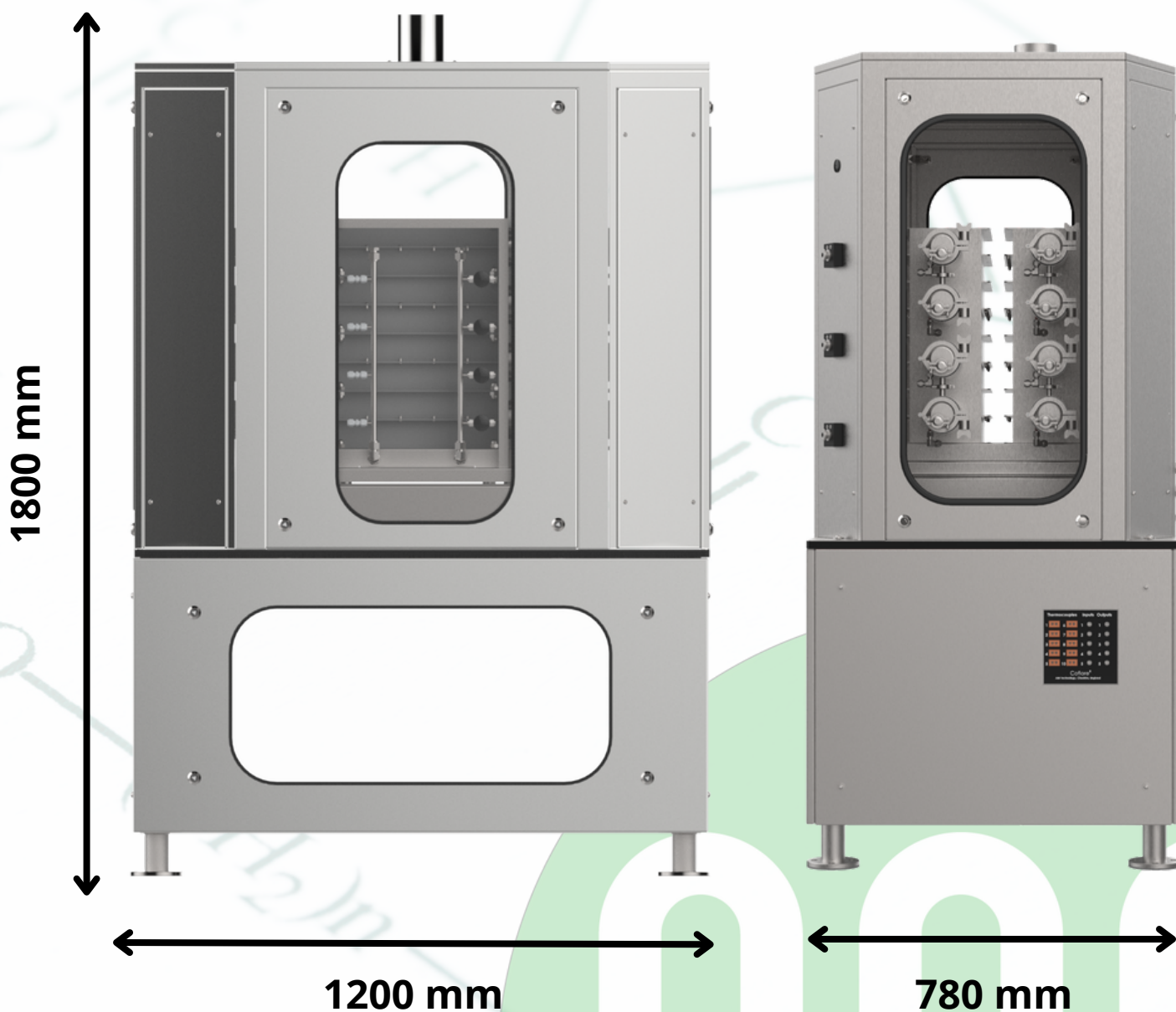
Requirements:

Compressed Air	3-7 bar, 13 CFM oil free clean air
Maximum Air Pressure	7 bar
Power Supply	100-240 vac, 50/60 Hz, 2A max
Compressed Air Connection	10 mm push fit
Heat Transfer Connection	1/2" Swagelok

For further information contact Sales@amt.uk or visit www.amt.uk



Dimensions



For further information contact Sales@amt.uk or visit www.amt.uk



AM Technology
Engineering Chemistry

Coflore[®] ATR

Notes

For further information contact Sales@amt.uk or visit www.amt.uk

Issue Date: Feb23



AM Technology
Engineering Chemistry

Coflore[®] ATR

Contact

AM Technology is based in the United Kingdom. A list of distribution partners can be found at: <https://www.amt.uk/distributors>

UK Address

AM Technology
Unit 18, Berkeley Court,
Manor Park,
Runcorn,
Cheshire,
WA7 1TQ

Telephone

+44 1928 237 420

Email

Sales@amt.uk

Website

www.amt.uk



AM Technology

Engineering Chemistry

www.amt.uk

sales@amt.uk