# AR-401

With the development of the AR-401 prereforming catalyst, the best characteristics of its predecessors have been combined and enhanced.

The new prereforming catalyst combines an exceptional resistance towards carbon formation and sintering together with a superior activity and sulphur tolerance. This has been achieved without compromising the qualities of our previous catalysts, such as high mechanical strength and the unique ability to tolerate condensing steam.

**AR-401 - Great Operational Flexibility**
AR-401 is suited for prereforming of hydrocarbon feedstocks ranging from natural gas over refinery off gas and LPG to naphtha. The operating temperature range is 325-650°C (620-1200°F) depending on feedstock composition. AR-401 can operate at very low steam to carbon ratios and industrial experience with operation at steam to carbon ratio of 0.6 is already achieved.

**Main Benefits by using AR-401**
**Superior Activity and Sulphur Tolerance**
The superior activity and sulphur tolerance of AR-401 have been achieved by optimising the distribution and content of the active nickel crystallites. Furthermore, advances in the production process enable a unique structure and size of the nickel crystallite in AR-401, which increases the resistance towards sintering. As a result of these improvements, a high conversion of hydrocarbons for an extended catalyst lifetime is accomplished.

**High Resistance towards Carbon Formation**
At prereforming conditions two different carbon types may occur, encapsulating carbon or whisker carbon. Considerable insight in the mechanisms of carbon formation has been gained by performing atomic-scale in-situ studies in Topsøe's Environmental Transmission Electron Microscope (ETEM). This has resulted in the design of AR-401, which shows a very high and stable catalytic activity for the reforming reaction for a variety of feedstocks without formation of either type of carbon.

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## Two Catalyst Shapes for Customised Solutions

AR-401 comes in the shape of a small cylinder-shaped tablet or in a 7-hole shape. In some plants, especially in cases of installing a large prereformer in an existing plant, it may be crucial to minimise the pressure drop, either due to energy savings or due to limitation in feed gas pressure. Due to the unique mechanical strength of AR-401, it is possible to manufacture the catalyst in complex geometries, which minimise pressure drop and optimise the external surface.

The AR-401 catalyst in the 7-hole shape provides this combination of very low pressure drop and a high external surface. The external surface and thereby the activity is some 40% higher than a tablet of the same size.

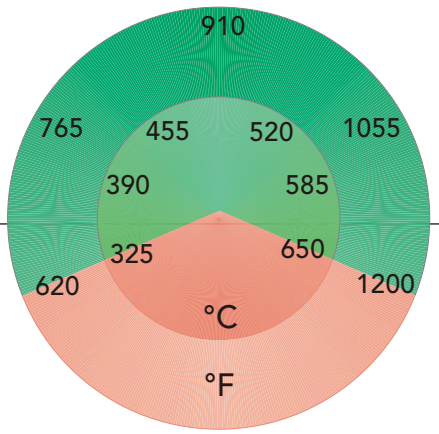
## Prereduced Catalyst

AR-401 is delivered in the prereduced form. The plant can therefore be started up quickly and smoothly without any production loss arising from a lengthy reduction procedure.

### TYPICAL PHYSICAL AND CHEMICAL PROPERTIES FOR AR-401

| | TABLET | 7 HOLE CATALYST |
|---|---|---|
| Ni (wt %) | >35 | >35 |
| Activated $MgAl_2O_4$ | BALANCE | BALANCE |
| Size, D x H | 4.5 x 4.5 mm | 11 x 6 mm |
| Holes, x D | | 7 x 2 mm |

### OPERATING TEMPERATURE RANGE





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