



**Siempelkamp**

NIS Ingenieurgesellschaft mbH

# NIS-PAR – NIS Passiv Autocatalytic Recombiner (H<sub>2</sub>-Recombiners)

Passive autocatalytic H<sub>2</sub>-recombiners are an economical and effective solution to master hydrogen release during postulated accidents in nuclear power plants. Also in other facilities hydrogen coming from radiolysis or another source can be depleted efficiently. As a result of it explosions will be securely prevented.

The NIS-PAR functions completely passive and is self starting also at low temperatures and wet conditions. The catalytic material palladium is covering on the spherical surface of pellets out of aluminum oxide with a diameter of about 4-6 mm. It is filled in cartridges made out of slotted stainless steel sheet. A different number of such cartridges is arranged vertically (max. 44) in a stainless steel housing. A hood prevents against spray, chimney elongations boost the depletion rate.





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Up to now a great number of international test programs were conducted with the NIS-PAR module which verifies the development results:

- NRC in Sandia National Laboratory / US
- Consolidated Edison in Wyle-Laboratory / US
- EPRI / EDF in the KALI-H2-test facility of the CEA in Cadarache / France
- EDF / IPSN in Cadarache / France
- EG and NIS in MC (Model Containment) by Battelle in Frankfurt, Germany
- Toshiba / Hitachi in Japan
- OECD in the THAI-test facility, Frankfurt / Germany

There is a great variety of NIS-PAR module options for the flexible adaption to the local needs and for the needed H<sub>2</sub> depletion rates in the NPP. NIS delivers complete solutions from one hand:

- Planning
- Necessary model calculation
- Assistance with approval procedures
- Manufacturing and delivery
- Assembly

For periodic inspections a test facility will be delivered which is easy to handle for the cartridges filled with catalytic material. The cartridges can be easily removed out of the housing through the inspection flap.

## Referencens:

- In Germany NIS-Par modules are utilised in:
  - NPP Gundremmingen
  - NPP Philippsburg
  - NPP Biblis
- World wide NIS-PAR modules are utilised in:
  - NPP PAKS, 4 units, Hungary
  - NPP Indian Point 2, US
  - NPP Surry I, US
- Special NIS recombiners are also utilised in CASTOR®-casks for wet storage of spent fuel elements.

### NIS Ingenieurgesellschaft mbH

Industriestrasse 13 · 63755 Alzenau · Germany  
Phone: +49 (0) 6023 / 91-3991 · Fax: +49 (0) 6023 / 91-3970  
nis.alzenau@siempelkamp.com

### Branch office Rheinsberg

Am Langen Luch 3 · 16831 Rheinsberg · Germany  
Phone: +49 (0) 33931 / 415-0 · Fax: +49 (0) 33931 / 415-22  
nis.rheinsberg@siempelkamp.com

### Branch office Essen

Altenessener Strasse 37 · 45141 Essen · Germany  
Phone: +49 (0) 201 / 12-23385 · Fax: +49 (0) 201 / 12-22981  
nis.essen@siempelkamp.com

### Branch office Dresden

Hugo-Junkers-Ring 9 · 01109 Dresden · Germany  
Phone: +49 (0) 351 / 88363-0 · Fax: +49 (0) 351 / 88363-60  
nis.dresden@siempelkamp.com