Reference Case:
Caring safely for the smallest patients

The children's hospital Amsterdamer Straße in Cologne is one of the leading paediatric clinics in Germany. The team includes anaesthetists, who safely guide the smallest patients through dangerous operations. Dräger supports their work with modern ventilation technology that allows small breathing volumes and carbon dioxide levels to be monitored reliably.

- Intensive care tailored to the particular needs of premature babies
- No anaesthesia limitations due to low body weight
- Anaesthesia of premature babies requires a sure instinct
- Finely tuned ventilation avoids cerebral haemorrhages

The scene in the patient room is both amazing and awe-inspiring. The intensive care unit of the children's hospital Amsterdamer Straße in Cologne is dedicated to babies who barely larger than the palm of an adult hand. Ventilated by machines, connected to perfusion pumps and infusions. The little patients are difficult to see between the cables of the monitoring devices and the warm bedding they are wrapped in. Looking at the incubators, one thing is immediately clear: this is high-performance medicine, finely tuned to the special requirements of infants. And even though the young patients are so small, they fight with all their might to get well soon and to leave the hospital ward.

OPERATION WITH A BODY WEIGHT OF 800 GRAMS
One of the patients in the intensive care unit of the Cologne paediatric clinic is a little girl called Lucie, who was born prematurely and currently has a body weight of 2000 grams. She was born approximately eight weeks before the estimated due date. And the parents received a shocking diagnosis right away: intussusception. Even though Lucie was very weak with a body weight of just 800 grams at birth and lungs that were not fully developed, she had to undergo abdominal surgery to have this dangerous disorder treated.

Two days ago, the little girl underwent another operation. The artificial anus which had been created to protect the intestinal anastomosis was reversed and the abdominal wall was re-closed.

Medical devices from Dräger are Lucie’s constant and reliable bedside companions. A monitoring device in the patient room displays and records all vital parameters, an incubator keeps her body temperature at a suitable level, a ventilator helps her to breathe, and an integrated monitoring system immediately sounds an alarm should something not be quite right on the way to the operating theatre and back.

THE CHALLENGE OF VENTILATING PREMATURE BABIES

The Zeus® Infinity® Empowered anaesthesia device, known for short as the Zeus IE, enables safe ventilation of premature babies in the operating theatre. Anaesthetists consider Zeus to be unique because it allows the precise handling of extremely low ventilation pressures. This means that all ventilation values can be adjusted very finely, finely, avoiding possible complications. "If a hypocapnia of 20 mmHg or one of 90 mmHg CO₂ is reached just once, the risk of a cerebral haemorrhage can increase tenfold," explains Dr Jost Kaufmann, consultant paediatric.
anaesthetist in the children’s hospital Amsterdamer Straße. The lungs are very vulnerable, too. Breathing volumes that are too large can cause volutrauma due to the over-extension of the alveoli and bronchioli. A breathing volume of 5 ml/kg body weight is suitable for a newborn baby. This corresponds to a respiratory minute volume of 240 to 300 ml/kg body weight/minute. If ventilation volumes or peak pressures are too high, this can lead to inflammations of the lungs in newborn babies, which can spread to the whole body and become life threatening. There is a risk of pneumothorax or intrapulmonary air accumulations.

With the help of the Zeus IE from Dräger, it was possible to ventilate a child with a body weight of only 385 grams on his ward in the last year, says Professor Frank Wappler, director of anaesthesiology at the Amsterdamer Strasse paediatric clinic: ‘Now we face no limitations regarding the age or weight of patients here.’

**ANAESTHESIA OF PREMATURE BABIES REQUIRES A STRONG INSTINCT**

Dr Kaufmann emphasises that the anaesthesia of premature and newborn babies, not unlike the anaesthesia of children, requires a strong instinct. ‘The anaesthesia of a child is also based on experience. One milligram of propofol per kilogram body weight can cause a circulatory collapse in a newborn baby, while larger children need much more of the same medication – sometimes four to five times the amount.’ One has to increase the titration to reach the required value, which might be half a milligram per kilogram body weight, diluted accordingly in a syringe.

Equally specialist knowledge is required of the doctors on the intensive care unit of the Amsterdamer Strasse children’s hospital, for example during weaning – the process when the ventilation of a prematurely born baby is reduced and the independent breaths should begin slowly. Lucie has to master this in the coming days so that she can go home soon. But this will be a success for both her and the Amsterdamer Strasse children’s hospital, which is famous for treating such difficult cases. The focus here is on small, sick, premature babies. Nurses and doctors administer care, and Dräger supports their work with a range of devices and its comprehensive service programme. By providing device training, maintenance and consultation sessions for doctors and nurses in special cases, Dräger is always ready to help.
Professor Frank Wappler, director of anaesthesiology at the Amsterdamer Strasse paediatric clinic in Cologne has developed safe strategies for the ventilation and anaesthesia of premature babies with his team. The Zeus IE represents yet another option for him. Professor Wappler and his colleagues work closely with the device and in cooperation with service engineers from Dräger. Dräger is ready to provide advice or assist with device operation, while doctors share their experiences using the Zeus IE to the service engineers: ‘We didn’t want to bring intensive ventilation devices into operating theatres because we aim to provide maximum care to the children. Then Dräger launched the ideal solution on the market with Zeus.’

‘The lungs of premature babies are very vulnerable,’ warns Dr Jost Kaufmann, consultant paediatric anaesthetist in the Cologne children’s hospital. ‘There is a risk of pneumothorax or intrapulmonary air accumulations for unadjusted ventilation.’ Another risk is a cerebral haemorrhage, which can result from a single hypo- or hypercapnia. The Zeus IE anaesthesia device from Dräger can help to protect against these risks by allowing the extremely precise measuring and adjustment of breathing volumes and carbon dioxide exhalation. Kaufmann cautions that the anaesthesia of children requires a strong instinct, especially the anaesthesia of premature babies.
About the paediatric clinic

The Amsterdamer Strasse children’s hospital belongs to the clinics of Stadt Köln gGmbH and is one of the largest paediatric clinics in Germany.

The following specialist departments are contained in the clinic: paediatrics and adolescent medicine with a social paediatric centre and perinatal centre, paediatric surgery, anaesthesia, radiology, and child and adolescent psychiatry.

A teaching hospital of Cologne University, the facility treats approximately 10,000 inpatients and houses 4,600 surgical operations every year.