

PLL

KÜSTER PLL-ANTI TRAP SYSTEM



Intelligent

WINDOW MANAGEMENT – SO YOU DON'T FE



Our fascination with cars should be constantly reinforced with technical highlights. As a result, more and more significance is being attached to safety and comfort technology via the consistent use of electronic assemblies.

These days, almost all new cars are fitted with power window regulators, whose functions include much more than just opening and closing the window.

When opening and closing frameless doors, the "short-drop-function" moves the windows automatically into and out of the window seal. A preset gap may be opened or closed, such as a small "smoker's gap", for example. Rear windows can be opened "blind" from the driver's seat. In a convertible, the windows operate automatically when the top is raised and lowered. Communication between

The KÜSTER PLL (phase locked loop) anti trap system ...

- is suitable for every door concept and may be integrated into all door electronics.
- facilitates compliance with the statutory requirements of 70/60 EEC (EU Directive) and FMVSS 118 (US standard).
- ensures user-friendly, safe closure of the window even for one shot up mode. Any external forces acting on the window will trigger automatic direction reversal in case of danger.
- distinguishes dangerous entrapment situations from "unavoidable" stresses such as areas of mechanical tightness and environmental factors such as poor road conditions.
- permits only minimal squeezing forces following the detection of both soft and hard objects.
- has a high level of sensitivity, even for cases of entrapment arising during the initial window start-up.
- is largely independent of external influences such as the supply voltage, temperature or poor road conditions.
- does not require time-consuming learning cycles by the system.
- facilitates low squeezing forces by evaluating the speed characteristics.
- does not require additional motor current measurement and evaluation.
- has a minimal zero-signal current consumption of the electronics in inactive (stand-by) mode, thanks to the use of selected components.
- contains a flash processor, allowing KÜSTER to respond very quickly and easily to altered customer requirements.

the window regulator mechanism and electronics control unit has made these types of functions possible.

When we consider the wealth of functions which can be executed automatically by a modern vehicle without much attention on the part of the operator, it becomes clear that assemblies need to be both sensitive

and intelligent. KÜSTER has accepted this challenge. One result of the company's research and development work is the KÜSTER PLL anti trap system.

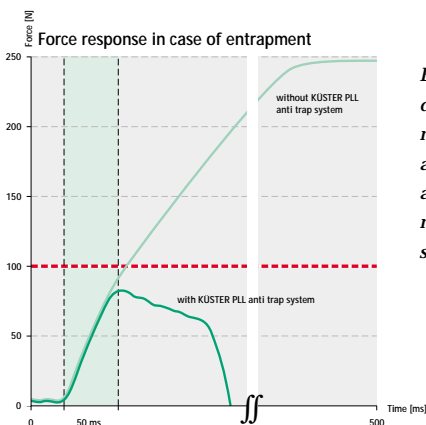
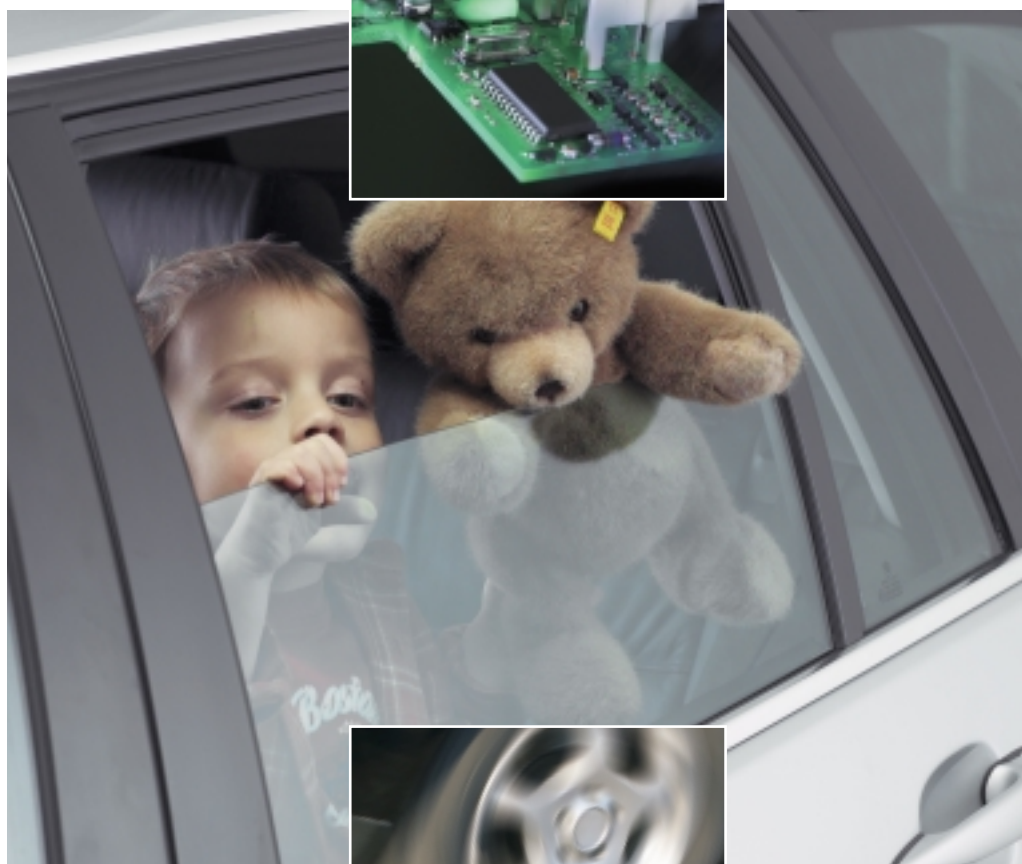
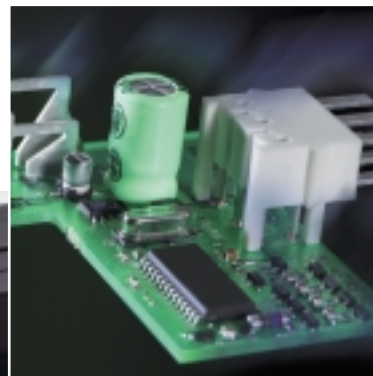
Power window regulators without an anti trap system can have dangerous consequences under certain circumstances. For this reason, KÜSTER window regulators are designed to operate intelligently and offer extensive protection.

The KÜSTER PLL anti trap system reliably and sensitively detects objects and initiates immediate reversal of the window in the event of entrapment. This affords reliable protection for a child's hand, as well as his teddy bear.

RELIEVE THE PRESSURE!

In accordance with the statutory requirements, the squeezing force when closing the window must not exceed 100 newtons under certain circumstances. The KÜSTER concept is designed in such a way that soft or elastic obstructions are promptly detected at below this value, and only subjected to the amount of pressure necessary for detection. In fact, the technology used generally limits the squeezing force to below the permitted 100 N, even in unfavourable conditions.

The electronics are adapted to the specific door situation in a particular vehicle, so that allowance is made in the calculation for every additional resistance. The controller is also capable of adapting to altered conditions, such as the friction resistance occurring during closing or fluctuations in the supply voltage, and guarantees a consistently high level of protection.



Entrapment is generally detected and direction reversal initiated within approximately 50 ms, and at well below the required maximum squeezing force of 100 N.

The KÜSTER PLL anti trap system guarantees safe, user-friendly closure of the window, even under the influence of external factors such as poor road conditions.

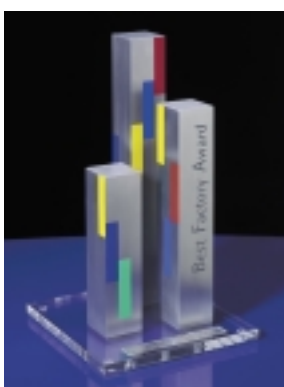
Technical summary

Function	KÜSTER PLL-ANTI TRAP SYSTEM
Operating voltage	6 V ... 16 V
Power consumption of electronics (active)	≤ 10 mA
Power consumption of electronics (stand-by)	≤ 100 µA
Ambient temperature	-40 °C ... +85 °C
Weight with 6-pole connector	45 g/55 g with relay

Requirements for anti trap systems in windows with one shot up mode

Requirement	EU 74/60/EEC	USA/Cdn FMVSS 118
Anti trap systems must be effective at a window gap of 4 mm to 200 mm	yes	yes
Reversal of the window at a maximum squeezing force of 100 N (measurement admissible at any window position)		
At a window gap of	Measurement with spring rate	
	4 mm to 200 mm	10 N/mm
	4 mm to 25 mm	65 N/mm
	25 mm to 200 mm	20 N/mm

BEST FACTORY AWARD 2002



KÜSTER
Automotive Door Systems GmbH
Am Bahnhof 13
D-35630 Ehringshausen
Tel. +49 (0) 64 43/62-0
Fax +49 (0) 64 43/6 23 75
e-Mail: ads@kuester.net
Internet: www.kuester.net