

# SAFETY THROUGH TECHNOLOGY

AVIATION RESTRAINT SYSTEMS







# WELCOME TO SCHROTH AVIATION





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# ABOUT SCHROTH

**SCHROTH is a world leader in Aviation restraint technology for fixed wing aircraft and helicopter applications, offering some of the most advanced and innovative restraint solutions available today.**

Nearly 70 years of experience have made SCHROTH a prime address for sophisticated and customized occupant protection systems in any kind of aircraft and performance race cars as well as for defence and other special applications.

Since the beginnings SCHROTH has focused on providing “Safety through Technology”. Our team takes special pride in the goal to protect human lives in any means of transportation. We apply state-of-the-art design technologies, highly advanced research and development processes as well as sophisticated quality monitoring programmes. For example, SCHROTH constantly runs development crash test series in order to continuously improve our protection technology for the Aviation industry.

International aircraft manufacturers, commercial airlines and individual customers alike highly value the renowned SCHROTH product quality and excellent customer service and use SCHROTH restraint systems as original equipment on their aircraft.

Due to our capacious and well-equipped engineering facilities SCHROTH is able to offer bespoke restraint solutions for any aircraft application including, for example, special light-weight components, customized VIP designs or belt-integrated airbag systems.

## HISTORY

**1946**

Business started by Hildegard and Carl F. Schroth.

**1954**

SCHROTH develops the first safety belt in Germany.

**1960s**

Beginning of dynamic crash testing to support internal research and development.

**1970s**

SCHROTH is the market leader for 3-point and 4-point harness restraints in the automotive aftermarket.

**1991**

SCHROTH enters the Aviation market (beginning of collaboration with Airbus).

**1996**

SCHROTH's engagement in motor sport focuses on Formula 1 and other race series such as Formula 3000.

**1998**

Approximately 70% of all restraints for new, dynamically certified helicopter seats are made by SCHROTH.

**2000**

Start of manufacturing in the United States (SCHROTH Safety Products Corp., Florida).

**2013**

SCHROTH embarks on a comprehensive commercial Aviation strategy with increased capabilities throughout the group of companies.

**2018**

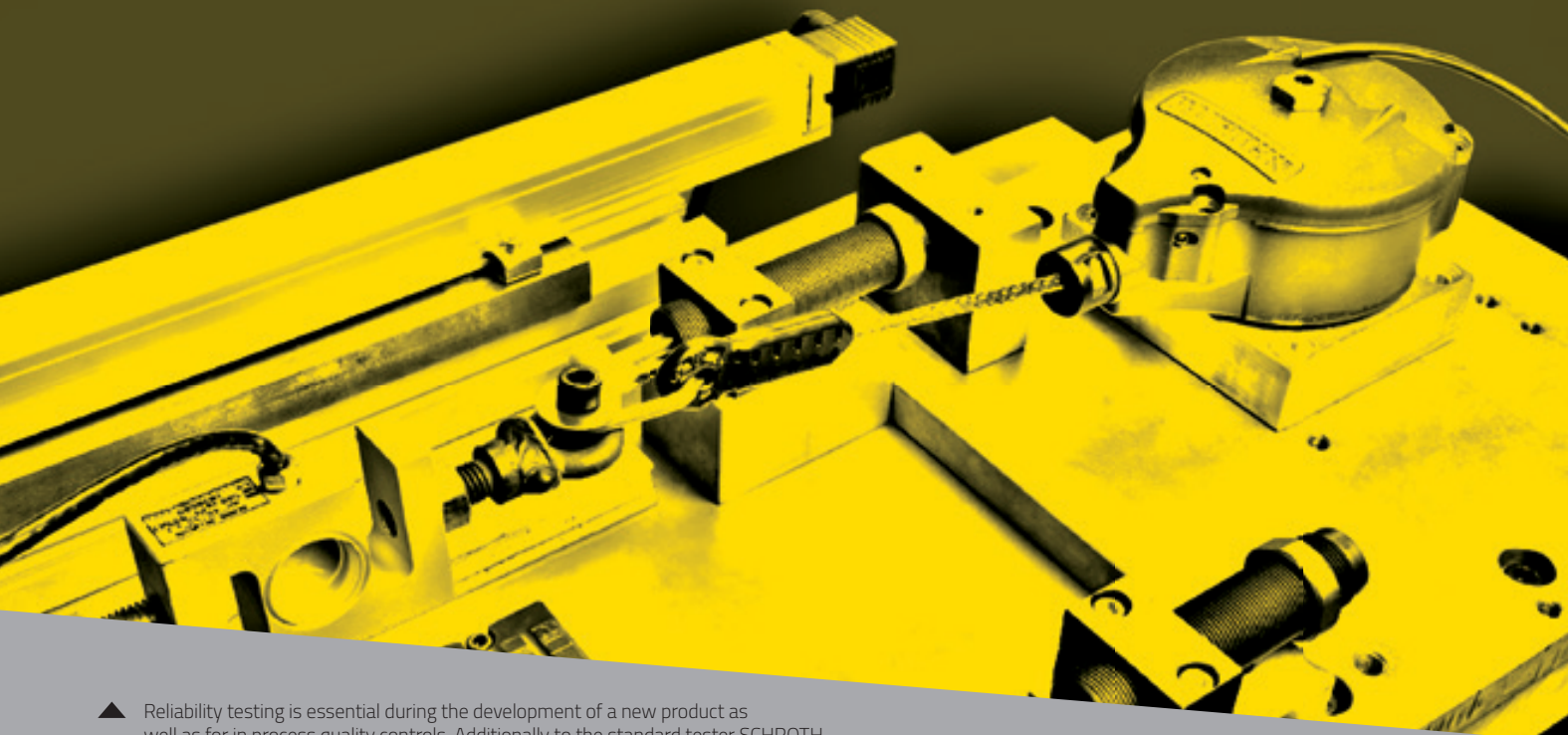
SCHROTH becomes a privately owned business with management holding a significant stake in equity.

## IN THE FUTURE

SCHROTH continues to support the aerospace industry with a great variety of advanced restraint solutions meeting tomorrow's occupant safety and comfort requirements. Follow the story to unfold at [schroth.com](http://schroth.com).



# ENGINEERING



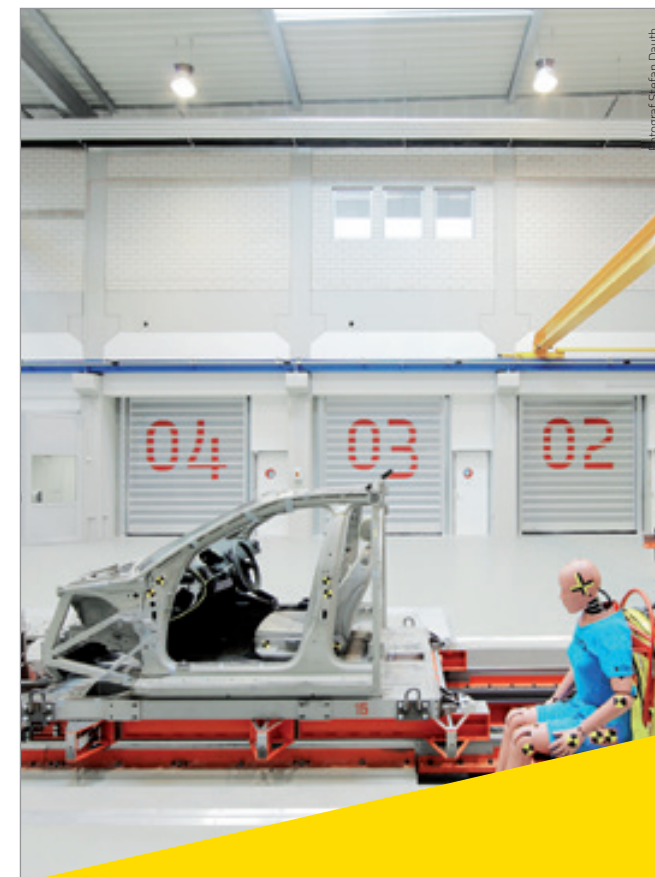
▲ Reliability testing is essential during the development of a new product as well as for in process quality controls. Additionally to the standard tester SCHROTH uses electro-magnetic linear sleds for tests which requires high accelerations or non-linear movements.

▼ SCHROTH performs in-house static airbag inflation tests using state-of-the-art test equipment such as high speed video cameras and internal airbag pressure measuring devices.



▲ Products of SCHROTH offer the full functionality and safety even under extreme climatic conditions. To guarantee this high standard and continuously improve the behavior under all required environmental conditions, SCHROTH is able to perform nearly all environmental tests in house using computer controlled test equipment.

▼ SCHROTH utilizes most advanced test facilities for dynamic development as well as for certification tests available today.



▲ Customized products often require customized and special stitch pattern. To react in a short time frame and to realize every thinkable stitch pattern SCHROTH's stitching machines are CNC programmable.

▼ Beside intensive static and dynamic testing of restraint systems and its components SCHROTH uses state of the art CAD and CAE software to develop optimized products in respect to weight, costs and quality standards.





# GENERAL AVIATION

SCHROTH offers a wide range of restraint systems for general Aviation applications which are supplied as original equipment to many major aircraft manufacturers and which are available in numerous configurations.

The SCHROTH general Aviation range includes 3-point and 4-point restraints, static or automatic, with rotary buckle or push button buckle. All models are certified according to ETSO(JTSO)-C114/TSO-C114 standards and can be individually configured to match virtually any aircraft type.

Due to the use of special light-weight Aviation components these restraints offer the most modern design and the lowest possible weight. Choose from more than 160 different Webbing colors and a wide range of end fittings and other technical options to meet your individual requirements.

## Model 8

Adopted from the automotive industry, the comfortable operation of a push button buckle is well-known all over the world. Easy operation and the use of light-weight Aviation components make this an ideal restraint for micro and ultralight aircraft applications. This model is also available with a standard lift lever buckle. A wide range of end fittings, length adjusters and Webbing colors can be selected to meet your individual requirements. Please ask us about your aircraft type or use our aviation restraint configurator available at [www.schroth.com](http://www.schroth.com).

Weight: approx. 750 g



Model 8

## Model 4

**Model 4-01**

**Model 4-03**

SCHROTH 3-point and 4-point static restraint systems feature the proven and ergonomic SCHROTH RFR™ rotary actuator with lost motion functionality to prevent unintended release. The use of light-weight Aviation components makes these restraints particularly advantageous for micro and ultralight aircraft applications. For aerobatic aircraft SCHROTH offers additional single or dual crotch straps (model 4-02). A wide range of end fittings, length adjusters and Webbing colors can be selected to meet your individual requirements. Please ask us about your aircraft type or use our aviation restraint configurator available at [www.schroth.com](http://www.schroth.com).

Weight: approx. 850 g



Model 4-01



Model 4-03

## Model 5 / 7

**Model 5-01 fixed shoulder belt, push button buckle**

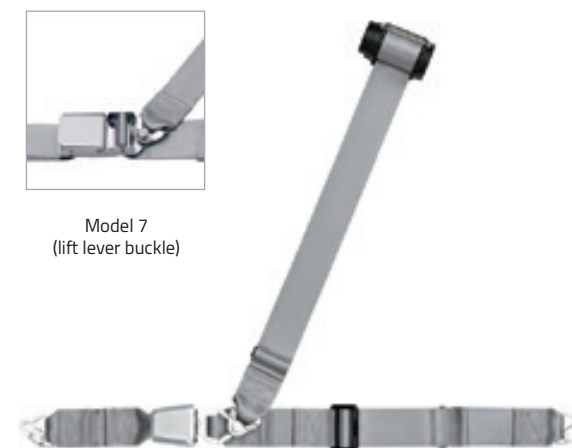
**Model 5-02 swivel, detachable or fixed shoulder belt, push button buckle**

**Model 7 swivel, detachable or fixed shoulder belt, lift lever buckle**

SCHROTH 3-point restraints are available as static or inertia reel models with different push button buckle options, including the newly developed SCHROTH mini push button buckle. This new buckle has been developed to offer customers additional design choices to meet individual cabin interior requirements. It offers easy and comfortable handling and is available with a red or black push button. Alternatively, this model is also available with a standard lift lever buckle as a static or inertia reel version. Different latch versions with either a detachable or non-detachable (permanently fixed) shoulder belt complement the aforementioned options, plus a wide range of end fittings, inertia reels, and various length adjusters. Further product features such as belt stiffeners or automatic locking retractors can be added upon request.



Model 7  
(lift lever buckle)



Model 5 (mini push button)



# EXECUTIVE AVIATION

Customize or refurbish the cabin interior of your business jet, executive aircraft or business helicopter with SCHROTH VIP restraints that match your individual style.

With more than 160 available Webbing colors, over 60 magnificent plating options to choose from and a variety of engravings only limited by your imagination, SCHROTH is the No.1 supplier of executive and VIP restraints for most major business jet manufacturers and for the leading business aircraft completion centres worldwide.

SCHROTH offers any standard crew and passenger restraint systems with numerous design options as well as specialized executive restraint systems for divans and side-facing VIP aircraft seats also with airbag technology for usage during taxi, take-off and landing, always ensuring the highest possible level of safety. It goes without saying that all SCHROTH executive restraints are certified according to ETSO(JT50)/TSO-C114 or ETSO(JT50)/TSO-C22 g standards and are individually configured to meet the technical requirements of the respective aircraft type.

## Model 1

### Model 1-08

SCHROTH executive 4-point restraints for pilots, crew or passengers can be configured as static restraints or with inertia reels. For the light-weight aluminium RFR™ rotary buckle there is a huge choice of magnificent plating options. In addition, a wide range of end fittings, inertia reels and various length adjusters can be selected to meet any individual requirement. Further options such as belt stiffeners or automatic locking retractors on lap belts can be added upon request.



Model 1-08

## Model 5

### Model 5-01 fixed shoulder belt, push button buckle

### Model 5-02 swivel, detachable or fixed shoulder belt, push button buckle

SCHROTH executive 3-point restraints are available as static or inertia reel versions. The light-weight aluminium push button buckle housing can be finished with a plating and engraving of your individual choice and is configurable with a red or a black push button. Different latch versions are available with either a detachable or non-detachable (permanently fixed) shoulder belt. A wide range of end fittings, inertia reels and various length adjusters guarantee to meet any requirement. Further options such as belt stiffeners or automatic locking retractors on lap belts can be added upon request.



Model 5-02 (detachable shoulder belt)



Model 5 (mini push button)

## Model 6

SCHROTH executive lap belts are applicable for all kinds of passenger seats. The standard lift lever buckle as well as length adjusters and end fittings can be plated with a huge variety of magnificent coatings and finished with your individual engraving. All SCHROTH executive lap belts can be supplied with the end fittings made as loops, wraps, snap hooks or brackets.



Model 6





## EXECUTIVE AVIATION

### Model 7

SCHROTH's executive 3-point restraints are also available with lift lever buckles. Different latch versions with an integrated length adjuster allow for multifunctional applications. A wide range of end fittings, inertia reels and Webbing colors is available. Further options such as plating and individual engraving complement our customers' choices.



Model 7

### Model 12

SCHROTH's innovative and popular push button lap belt is now available in an exclusive executive version that is extremely easy and convenient to use. Different latch versions allow selection of the best solution for any requirement. All hardware components are available in a wide range of different and decorative platings.



Model 12

### Model 19

SCHROTH's well-known light-weight lap belt is now also available as executive aircraft version. AirLite lap belts, one of the most advanced passenger restraint solutions available today, have been selected by many of the world's leading airlines due to the ultra low profile lift lever design and various end fitting options. A huge variety of magnificent coatings and finishings inclusive of individual engraving meet any individual cabin design requirement.



Model 19

### Accessories

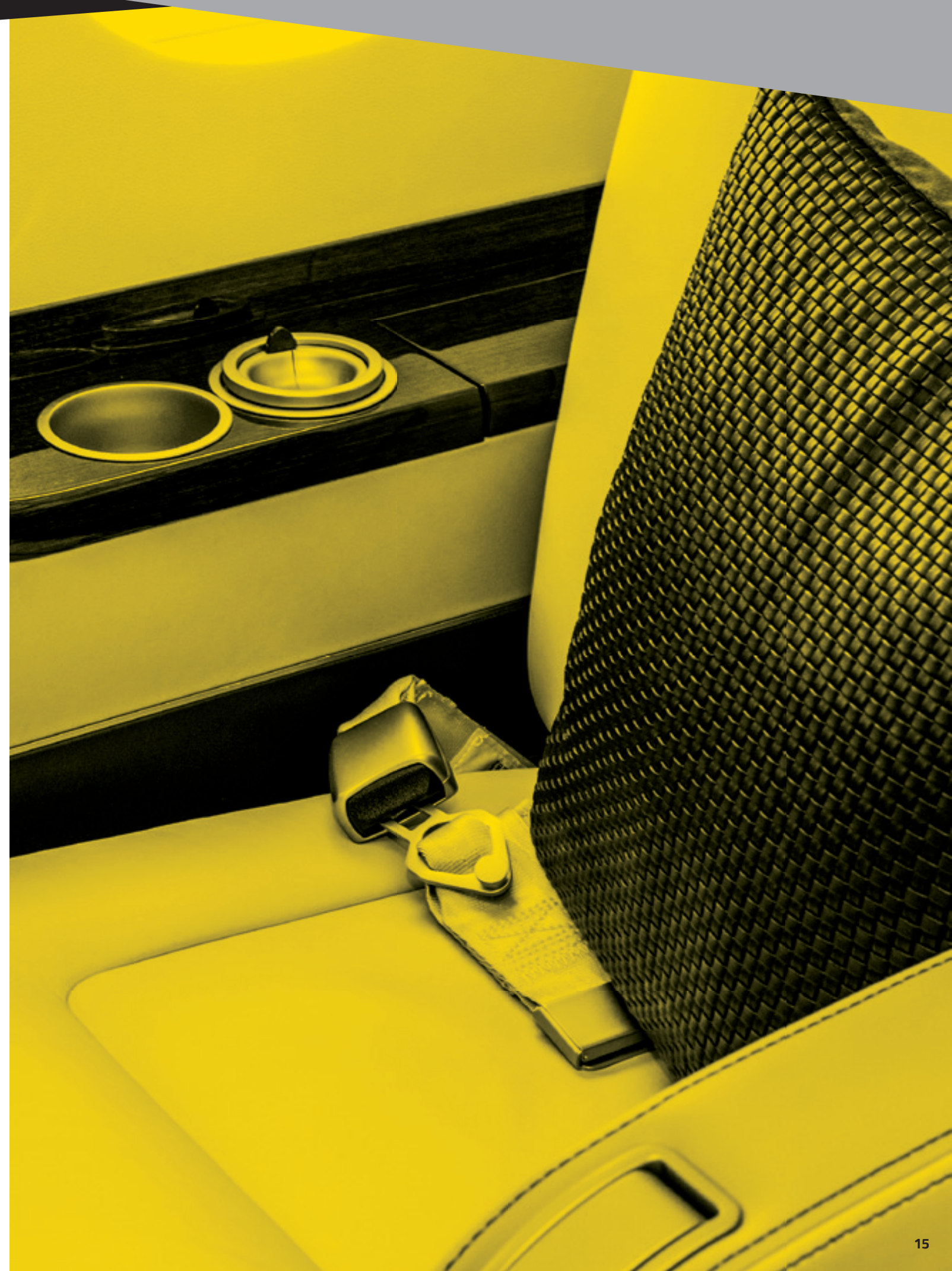
SCHROTH passenger lap belts and restraint systems are available with a wide range of matching accessories and complementary products such as extension belts, sleeper belts, demo belts and infant/utility belts.



Extension belts



Infant / Utility belts







# COMMERCIAL AVIATION

SCHROTH is a long-time supplier of passenger seat belts to numerous airlines and airframe manufacturers worldwide. We supply cabin attendant restraints for the entire Airbus fleet as well as 16g passenger lap belts to many of the world's leading commercial airlines.

SCHROTH has been the first manufacturer to offer and certify a push button lap belt for commercial airline use, thus providing a highly innovative and extremely easy-to-use lap belt solution.

SCHROTH passenger belts are available in more than 160 different Webbing colors to match any aircraft interior design.

SCHROTH offers a variety of passenger restraints that specifically meet exclusive requirements of first and business class passengers. Buckle housings are available with a great variety of attractive surfaces that will make passengers immediately feel highly esteemed by their preferred airline.

## CREW AVIATION

### Model 18

**Airbus A330 / A340 / A350 / A380**

The use of special light-weight components make these restraints a preferred choice to airlines. Dual reel function, mini rotary buckle design and easy-to-operate length adjusters provide the highest comfort and safety for your cabin crew.

#### A330 / 340

AMI Seat Model 2157 + 2158  
PN 18-0100K0KZN-xx

#### A350 / A380

PN 18-0201D1DYE-xx  
PN 18-0501D1DYE-xx

xx = indicates Webbing color  
Certified according to ETSO(JTSO)/TSO-C114



### Model 1-11

**Airbus A330 / A340**

The well known and patented SCHROTH RFR™ rotary buckle and the single inertia reel function ensure extremely easy and comfortable handling of these restraints. Load limiting stitching on the shoulder belts and mechanical load limiters on the pelvic restraints offer optimum safety for the entire cabin crew.

#### AMI Seat Model 2057 + 2058

PN 1-11-0302xx (RH)  
PN 1-11-0352xx (LH)

#### AMI Seat Model 2071 + 2072

PN 1-11-0402xx (RH)  
PN 1-11-0452xx (LH)

xx = indicates Webbing color  
Certified according to ETSO(JTSO)/TSO-C114



### Model 1-08

**Airbus A319 / A320 / A321**

This well proven and reliable cabin crew restraint for Airbus single aisle aircraft features the patented SCHROTH RFR™ rotary buckle as well as a dual reel function, offering the highest level of comfort and safety for the flight crew.

#### Sigma Single Seat

PN 1-08-0102xx (RH)  
PN 1-08-0152xx (LH)

#### Sigma Bench Seat

PN 1-08-0602xx (RH)  
PN 1-08-0652xx (LH)

xx = indicates Webbing color  
Certified according to ETSO(JTSO)/TSO-C114

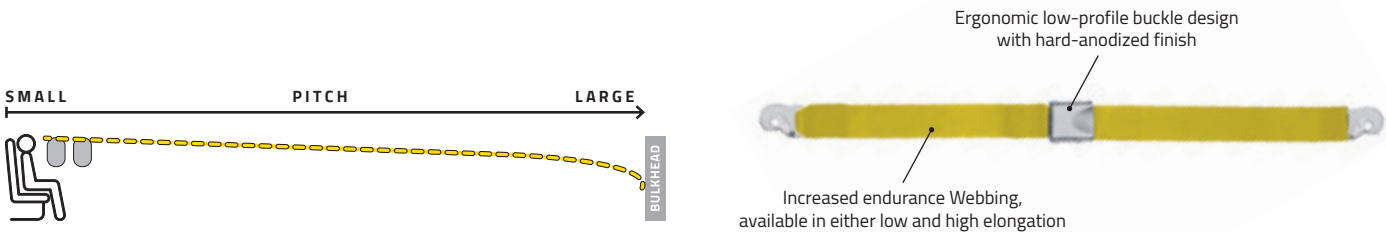




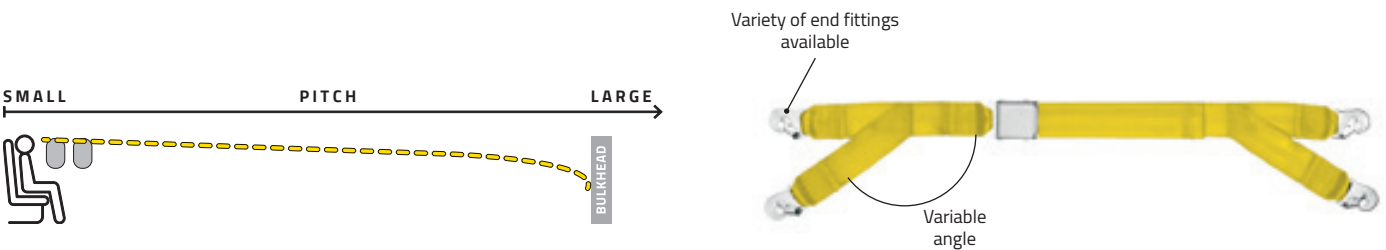
# PASSENGER AVIATION

More than 70 years of experience have made SCHROTH an unparalleled provider for some of the most advanced and innovative restraint solutions available today for any kind of aircraft. Our team takes special pride in the goal to protect human lives in any means of air transportation. We apply state-of-the-art design technologies, highly advanced research and development processes as well as sophisticated quality monitoring programs. Solutions for commercial aerospace include the entire product portfolio, ranging from ultra-light-weight SCHROTH AirLite® passenger lap belts to active pretensioning restraint systems and airbag applications.

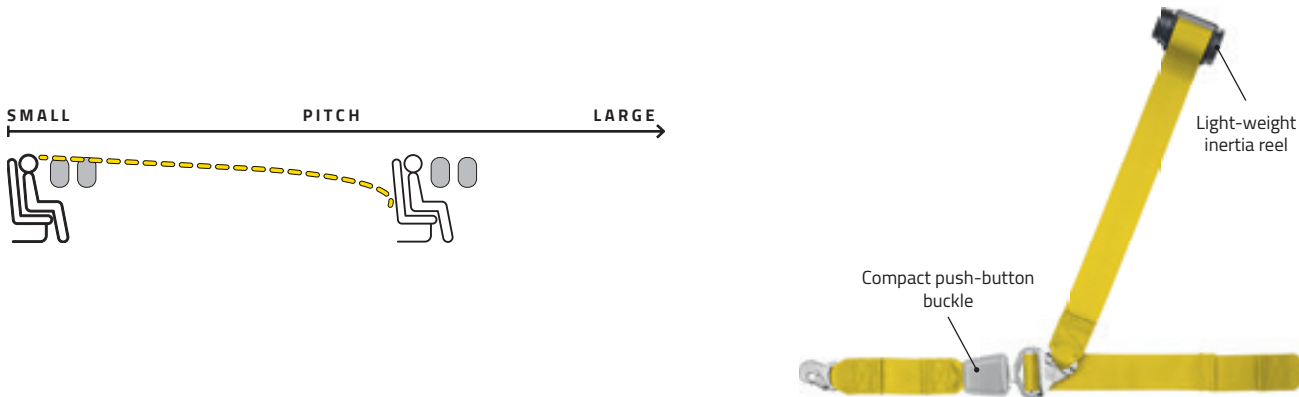
## 2-Point Lap Belt



## Y-Belt

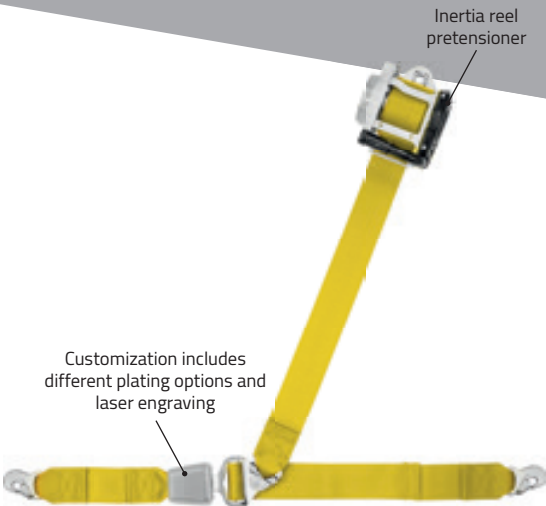
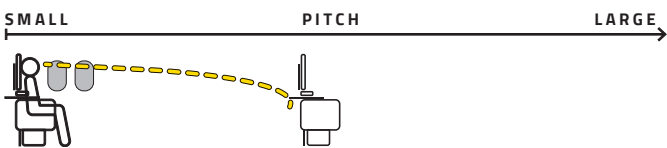


## 3-Point Restraint with Inertia Reel



# PASSENGER AVIATION

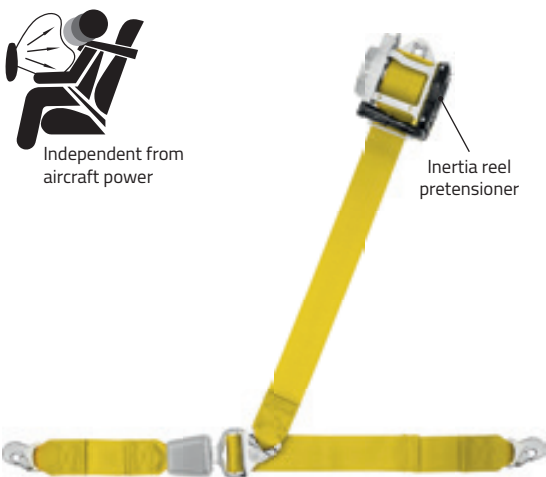
## 3-Point Restraint with Inertia Reel Pretensioner



## 3-Point Restraint with Inertia Reel combined with Structure-Mounted Airbag



## 3-Point Restraint with Intertia Reel Pretensioner combined with Structure-Mounted Airbag



Head Arc reduction based on rigid steel seat testing using an FAA Hill with 25.562 pulse. Pitch not to scale.





# ROTORCRAFT

SCHROTH is the leading manufacturer worldwide for restraint systems on rotorcraft. We supply crew and passenger restraints for the leading helicopter manufacturers such as Airbus Helicopters, Leonardo Helicopters, Bell, Sikorsky, Robinson, Enstrom, Kazan, MD Helicopters, Mil and many others.

SCHROTH rotorcraft restraints can be specified as static or automatic systems, with or without manual lock function and with a great selection of Webbing colors and plating options.

Inflatable restraint systems designed and manufactured by SCHROTH perfectly combine the advantages of highly effective conventional restraint systems with advanced airbag technology.

Under emergency conditions, the belt-integrated airbags will pretension the restraint system, stabilize the occupants' head and body, and reduce G-forces and head path. The result is a significantly improved level of safety, protecting crew and passengers against severe head and neck injuries.

Different types of shapely and highly functional rotary buckles are available to exactly meet our customers' expectations on function, safety, design and ergonomics. A unique and life-saving invention by SCHROTH is the WAB™, a water-activated buckle that releases automatically after an emergency landing on water.

All SCHROTH rotorcraft restraints are certified according to ETSO(JTSO)/TSO-C114 standards.

## Model 5

**Model 5-01** fixed shoulder belt, push button buckle

**Model 5-02** swivel, detachable or fixed shoulder belt, push button buckle

SCHROTH 3-point restraints are equally safe and convenient to use. The push button buckle offers easy and comfort handling for passengers and is available with a red or a black push button. A detachable shoulder belt allows passengers to be comfortably secured in any seated position. Also, a light-weight aluminium push button housing inclusive of optional plating and engraving complements our customers' choices. Alternatively, this model is also available with a standard lift lever buckle. A wide range of end fittings, inertia reels, various length adjusters and Webbing colors meet any cabin design requirement SCHROTH customers may have.



Model 5 (push button buckle and latch special plated)

## Model 1

**Model 1-10 (3-point)**

**Model 1-08 (4-point)**

SCHROTH rotorcraft 3-point harness restraints (model 1-10) and 4-point harness restraints (model 1-08) are available with dual shoulder belts, Y-type shoulder belt or Comfort Collar shoulder belt. Different rotary buckle types are available, all of them featuring the patented RFR™ rotary buckle and SCHROTH's unique Lost Motion Technology which prevents unintended release. The SL 11 rotary buckle with separate shoulder belt release allows maximum upper torso movement, e.g. monitoring and precisely controlling loads hanging under a helicopter. The inertia reel versions are available with a 360 degree manual lock option, thus permitting maximum flexibility in installation and operation.



Model 1-10 (with manual lock)



Model 1-10 (Y-type shoulder belt)



Model 1-09  
(comfort collar shoulder belt)

## Model 1

**Model 1-09 (3-point with crotch strap)**

**Model 1-07 (4-point with crotch strap)**

SCHROTH rotorcraft 3-point crotch strap harness restraints (model 1-09) and 4-point crotch harness restraints (model 1-07) are available as static or as inertia reel type versions with dual shoulder belts, Y-type shoulder belt or Comfort Collar shoulder belt. The illustrated SL 12 rotary buckle with its patented finger-grooved actuator allows safe operation even with gloved hands. Dual latch configuration is available, offering a quick one-click latching procedure and perfect storing of the restraint when not in use. Many different end fittings and inertia reel types guarantee to fit any installation environment.





# SPECIALS

SCHROTH has developed a wide range of specially designed restraint systems for medical stretchers which offer the highest level of safety and comfort for reclined occupants.

The restraints are equipped with the proven SCHROTH RFR™ rotary buckle and with special latches which allow the upper thigh straps to run downward in an ideal, predefined angle. As an option, an additional knee belt with a light-weight push button buckle for lower leg belt fixation can be added.

Due to the great variety of special light-weight Aviation components SCHROTH can meet all requirements for medical transportation as well as fixation of medical equipment and accessories of all kinds. Further customized technical solutions for even more specialized requirements are available on request.

Certified according to ETSO(JTSO)/TSO-C114 and ETSO(JTSO)/TSO-C22g standards.

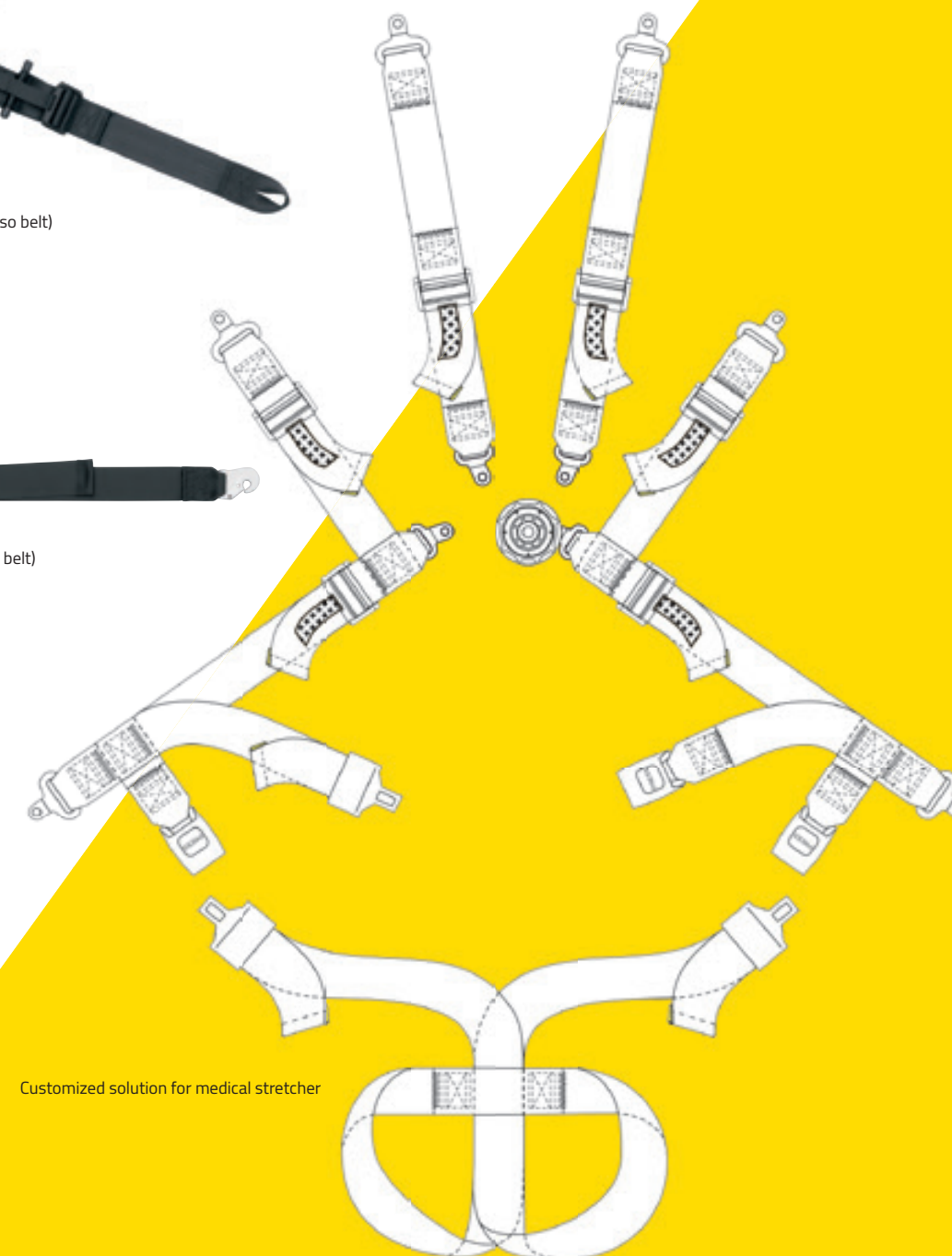
## MEDICAL STRETCHER RESTRAINTS



Model 4-01 (used as torso belt)



Model 12 (used as leg belt)



Customized solution for medical stretcher





# SPECIALS

## HMR - High Mobility Restraint

Paramedics, loadmasters and other aircraft occupants are particularly vulnerable when they have to work and move in a flying aircraft. The SCHROTH high mobility restraint provides safety for these previously unrestrained occupants while maintaining their mobility when attending to their tasks.

The SCHROTH High Mobility Restraint combines different advanced ELR and ALR functions thus providing maximum safety and maximum flexibility at the same time.

Under normal conditions the system will allow a 1.6 m radius of action around the seat. In the seated position the occupant will be secured just as by any other advanced restraint system. In the event of a significant deceleration the system will automatically lock and retract while the occupant returns to a seated position.

## Applications:

- Air ambulance units
- Search and rescue units
- Loadmasters
- Commanders
- Gunners
- Observers
- Film teams
- Any other application where safety has to be combined with high mobility

Certified according to ETSO-C114.



## SL 10 Light-weight Rotary Buckle



This special light-weight version of the well-proven SL10 rotary buckle is part of SCHROTH's ultimate light-weight rotorcraft restraint concept and is already being used on several civilian and military helicopters such as the NH90.

## SL 55 Water-Activated Buckle



For enhanced safety during any fly-over-water operation, SCHROTH has developed the unique and life-saving Water-Activated Buckle™ (WAB™). Under normal operating conditions, the WAB™ is fastened and unfastened manually, just like a regular rotary buckle.

Under certain emergency conditions, for example, after an emergency landing on water, the WAB™, if not operated manually, automatically releases after being submerged in water for about 6 to 10 seconds. Under such conditions, this greatly increases the chances of any occupants to save themselves from a sinking aircraft or to be saved by another person.

The SCHROTH Water-Activated Buckle™ is the perfect safety solution for search and rescue, coast guard and offshore applications or for any other over-water operation. It is available as an option for any SCHROTH multi-point restraint system.

## SL 40 Dual Motion Rotary Buckle with RFR™ Technology



The actuator of this unique rotary buckle does not allow any rotation unless the yellow push button is pressed at the same time. Also, the release gear stays in a permanent open position unless the actuator is turned back into the lock position.

As an option the extra long shoulder belt latches (easy to operate with gloved hands) can come colored green and red to prevent interchanging of the shoulder straps. The fix point of this buckle is optional to either one of the lap straps or the anti-sub strap. Padding styles are optional as well.

## Left and Right Hand Inertia Reels, 360° Manual Lock



SCHROTH Aviation-type inertia reels are available in left and right handed versions to meet any conceivable installation requirement.

Any SCHROTH Aviation-type inertia reel can be fitted with a 360° degree manual lock cable assembly which allows maximum flexibility in installation and operation. The SCHROTH 360° manual lock assembly features the same advanced functions which have been used for the proven single and dual reel manual lock assemblies already in use on most major helicopter types. Different cable lengths are available in accordance with the customer's requirements.

As a new and additional option, SCHROTH can offer a crossbar-mounted dual inertia reel design including a dual manual lock function. The crossbar forms part of the seat structure and can be customized to exactly match the seat design.





# PLATING AND WEBBING

SCHROTH uses sophisticated polyester Webbing for its restraint systems. Polyester has a much better energy conversion capability than common polyamide (Nylon) Webbing, which is used by other harness belt manufacturers. Polyester has superior resistance against UV rays and chemicals such as solvents and acids. The SCHROTH mono file shot thread Webbing technology prevents the straps from tangling and provides optimum load distribution during crash conditions because it stays flat due to its "memory effect".

The illustrations show our most popular Webbing colors and plating options. Virtually hundreds of magnificent combinations are available. We can also supply requested custom dye. Please ask us to match your individual style. Samples are available upon request.

## Plating More than 60 options available



polished chrome



satin smoke nickel



polished gold 24K



polished rose gold

## Polyester Webbing More than 160 Webbing colors

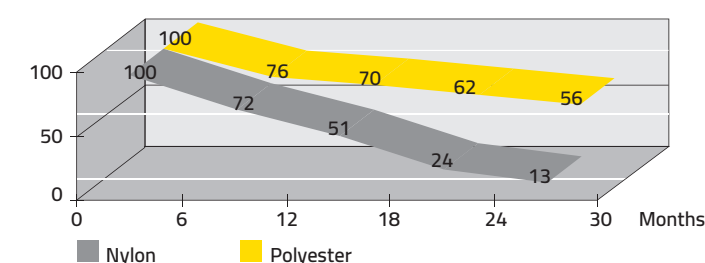


Figure 1: Remaining strength in percent over a 2 year period.

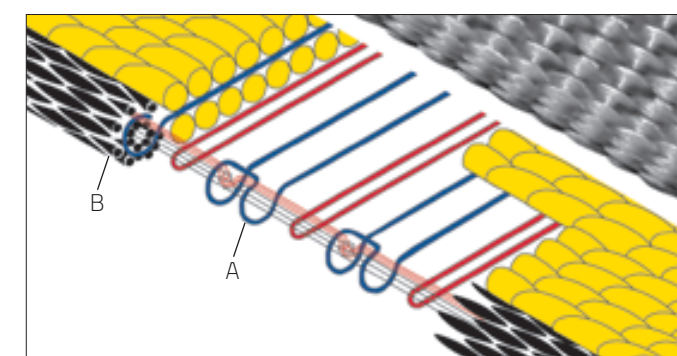


Figure 2: A points to the woven in mono filaments responsible for the "memory effect". B points to the round edges for additional comfort.





## Sales and Service

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## Company Approvals

GERMANY

- EASA Part 21 Section A Subpart G  
Approval No. DE.21G.0114
- EASA Part 145 /  
Approval No. DE.145.0240
- APDOA Authorization  
EASA AP210
- DIN EN ISO 9001
- EN 9100

USA

- FAR Part 21 /  
Approval No. PT 1662-CE
- AS 9100

## Disclaimer

This document gives a general description of the product(s) or services and except where expressly provided otherwise it shall not form part of any contract. From time to time, changes may be made to the products or the conditions of supply. SCHROTH Safety Products GmbH reserves the right to change product specifications without prior notice.

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