



**MADEV**  
ENGINE PARTS

# MASTERING PISTON RINGS

Insights from  
Madedv Engine Parts



# TYPES OF PISTON RINGS

There are mainly three types of piston rings

## 1 COMPRESSION RING

The compression ring is installed in the upper grooves of the piston. Its main role is to transfer heat from the piston to the cylinder liner. Additionally, it helps control the side thrust on the piston, which can lead to variations.

## 2 OIL CONTROL RING

The oil control ring is positioned below the compression ring. Its function is to ensure adequate lubrication between the piston and the cylinder. Additionally, if excess lubrication accumulates inside the cylinder, the ring helps to scrape it away.

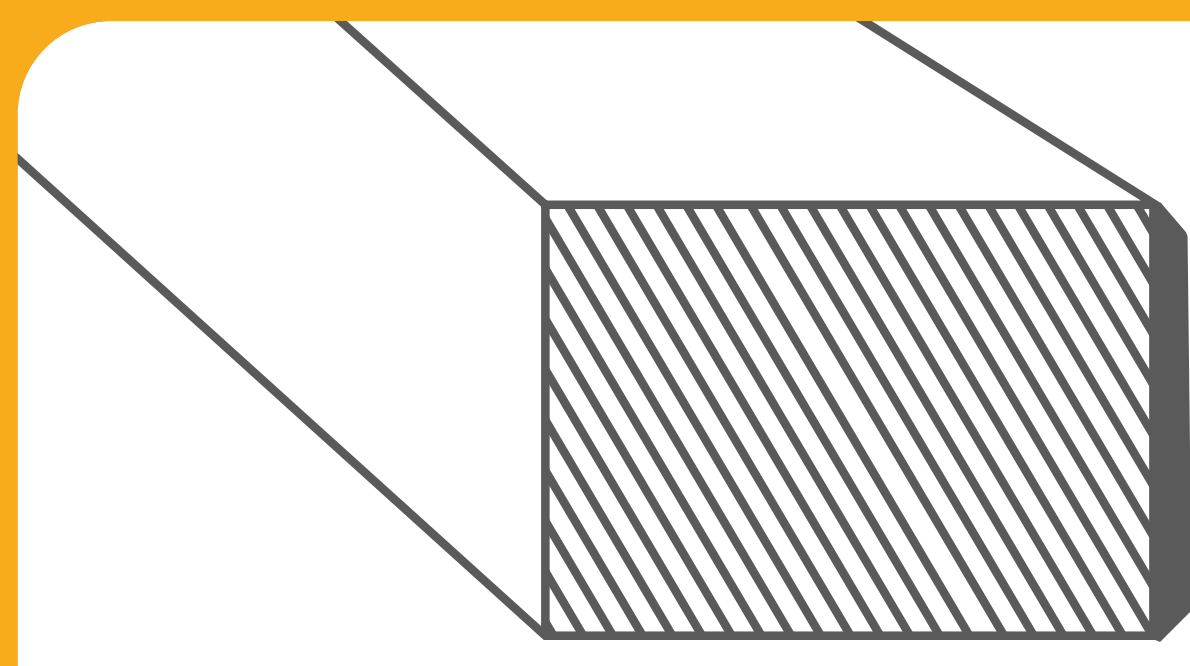
## 3 SCRAPER RING

The scraper ring is situated alongside the oil control ring. Its function is to remove excess oil from the cylinder walls. Additionally, it ensures the correct oil film thickness, preventing any oil from entering the combustion chamber.

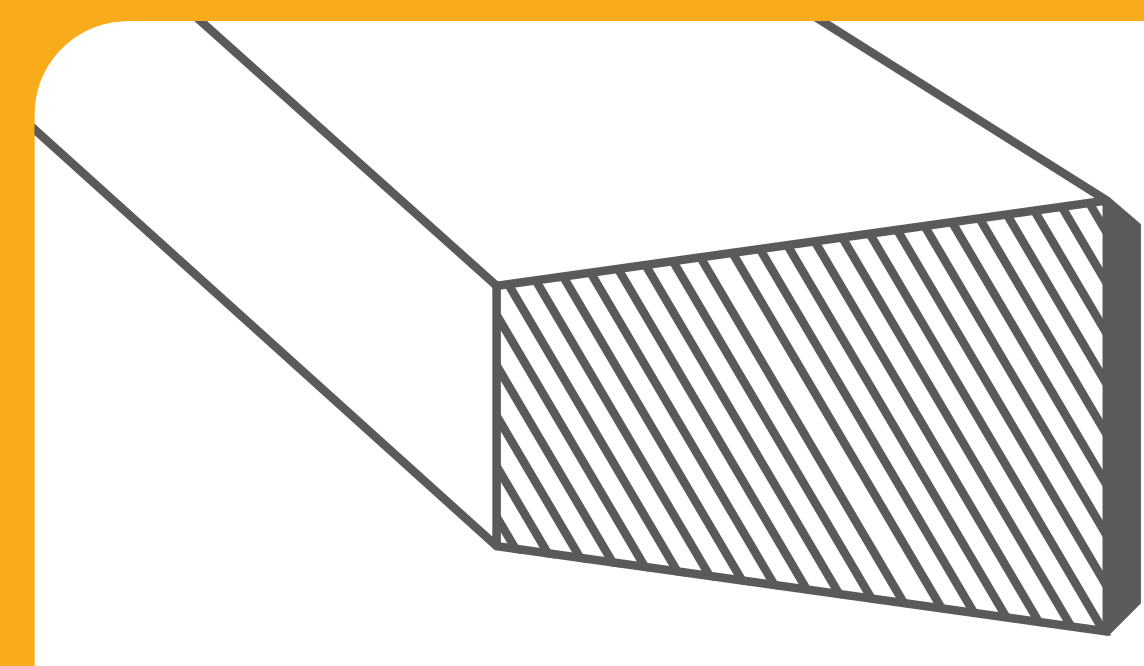




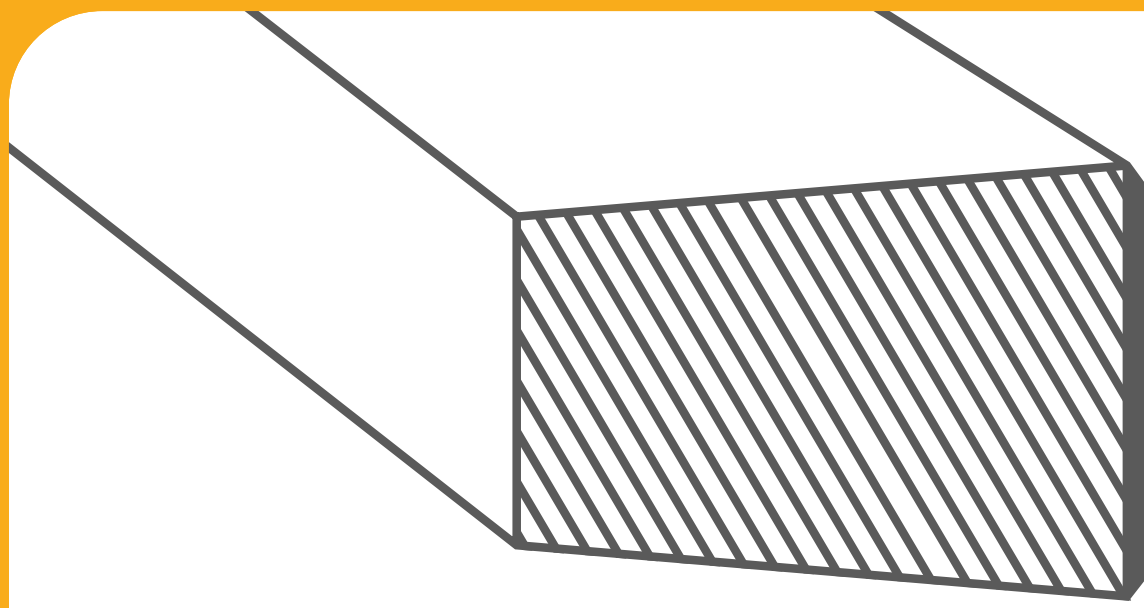
## TOP RINGS



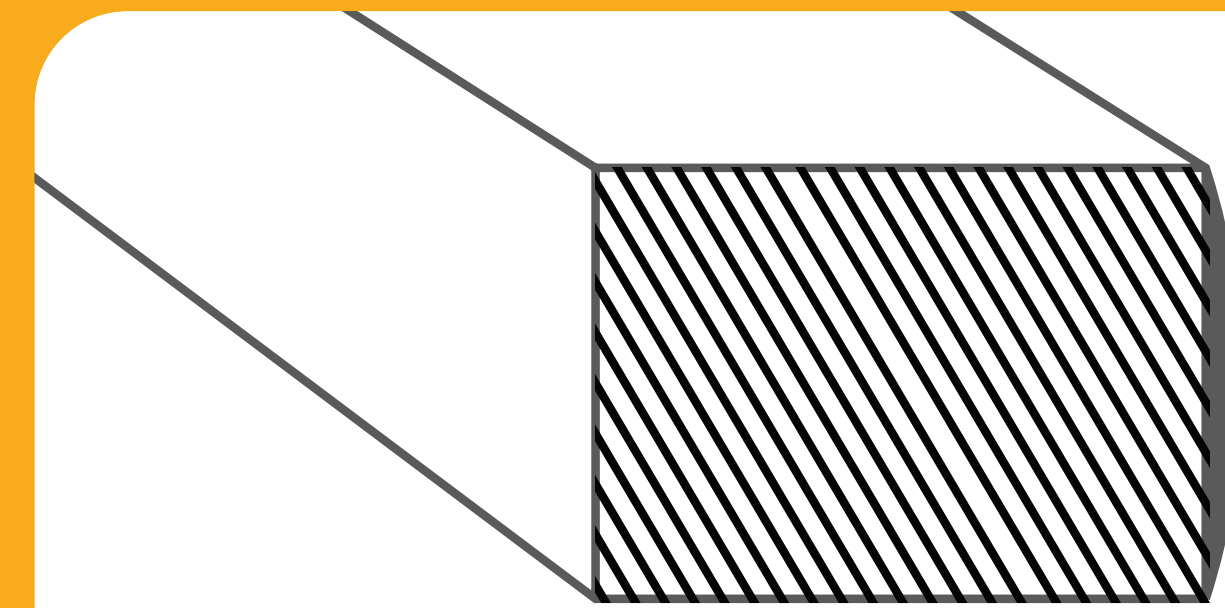
RECTANGULAR  
FACE RING



KEYSTONE  
RING

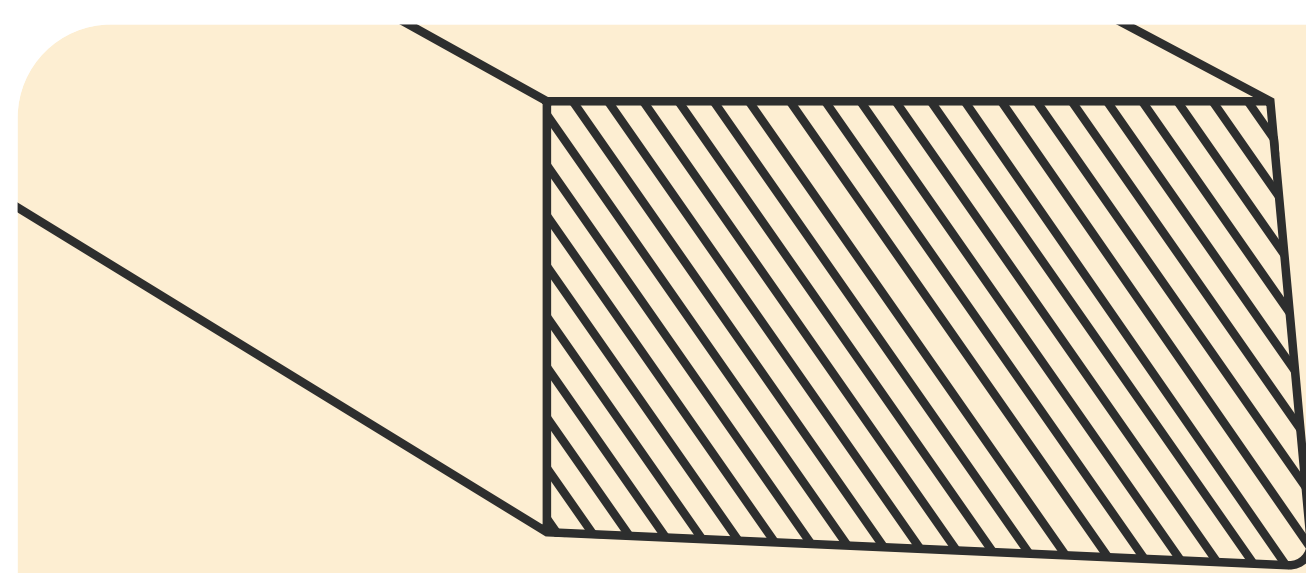


HALF KEYSTONE  
RING

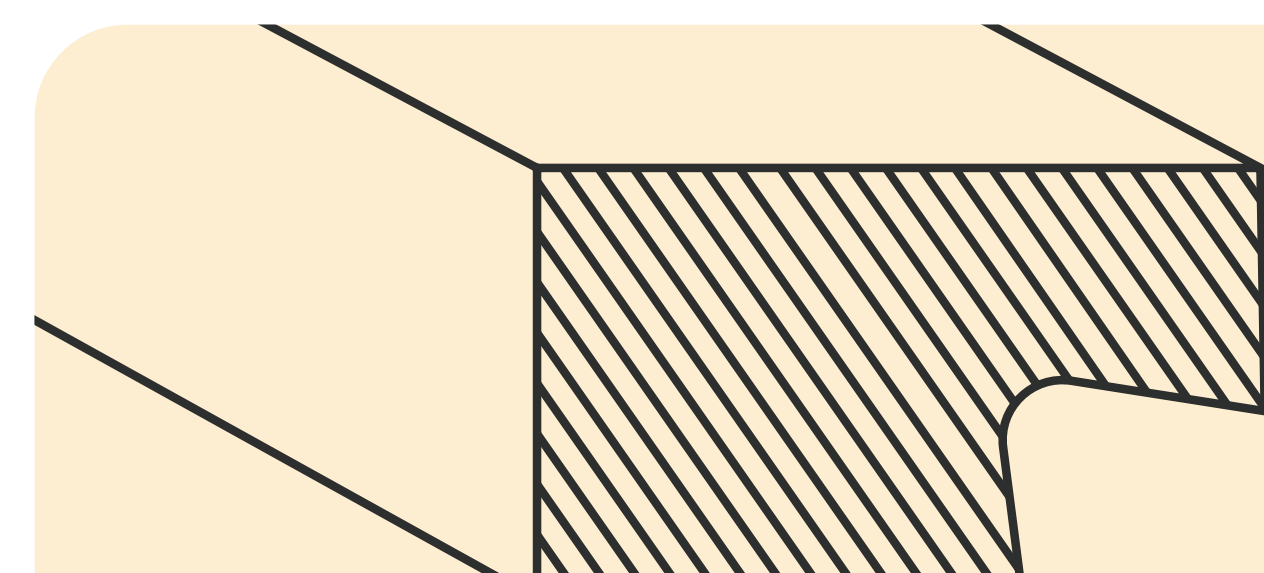


BAREL FACE  
RING

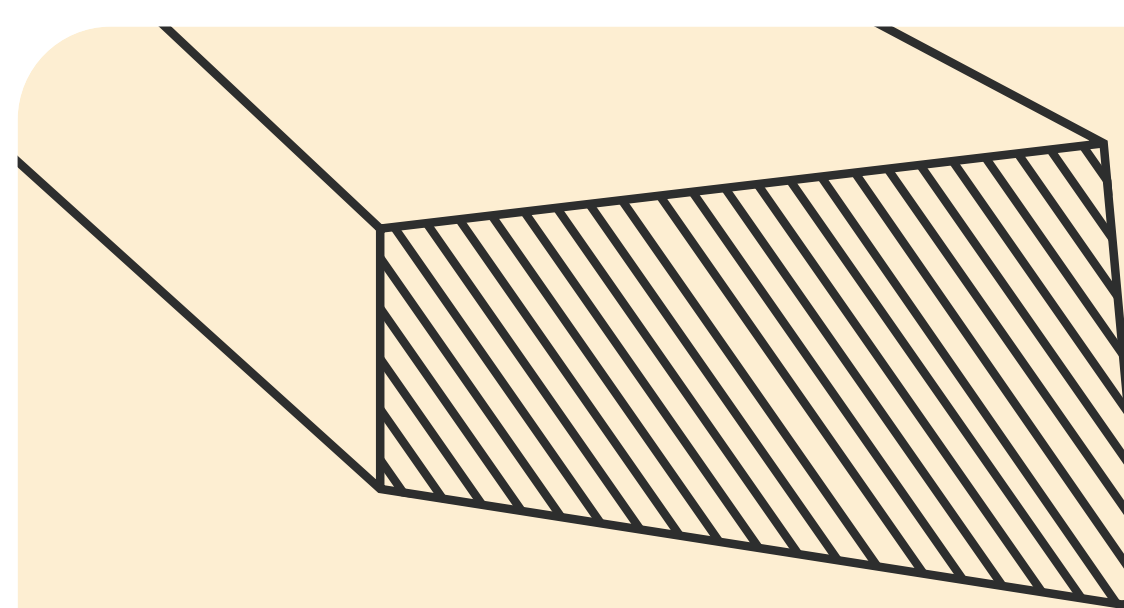
## COMPRESSION RINGS



TAPER FACED  
RING

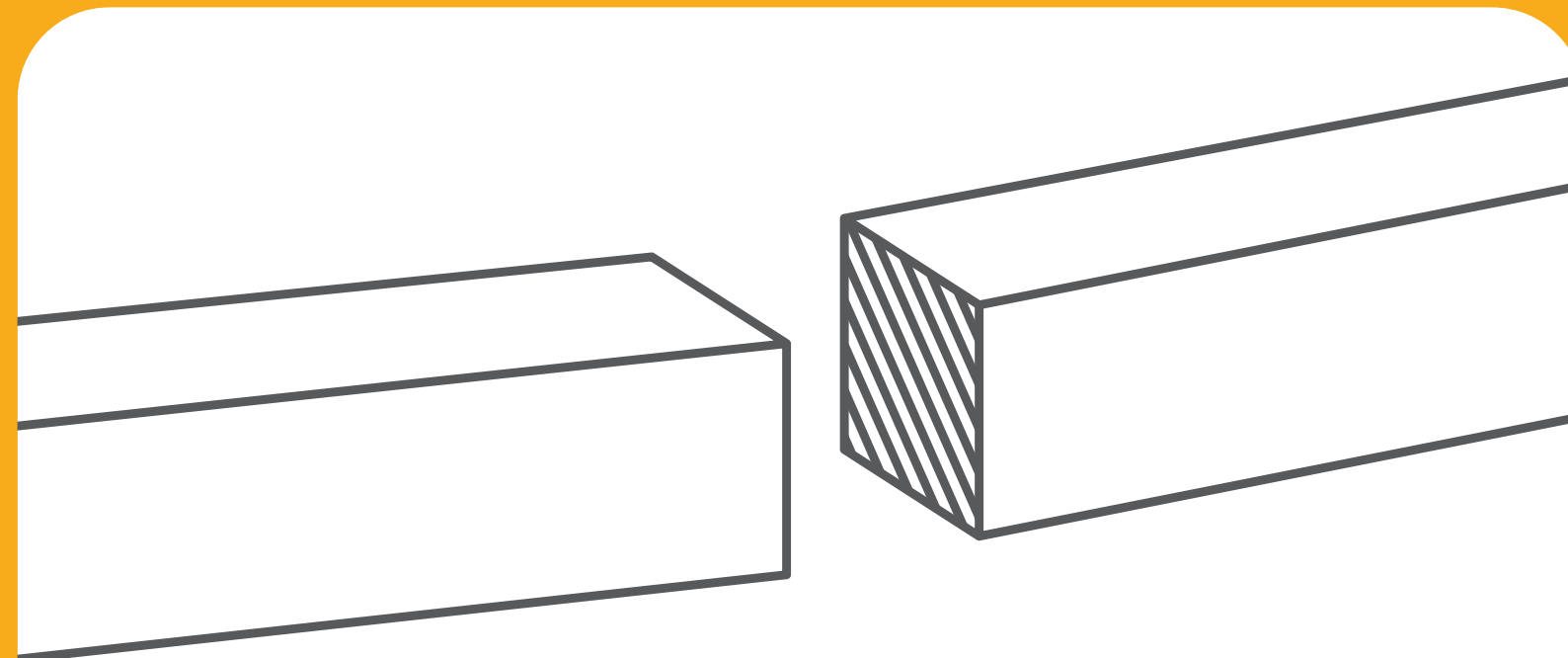


TAPER FACED  
SCRAPER RING



TAPER FACED  
KEYSTONE RING

## TYPES OF JOINTS



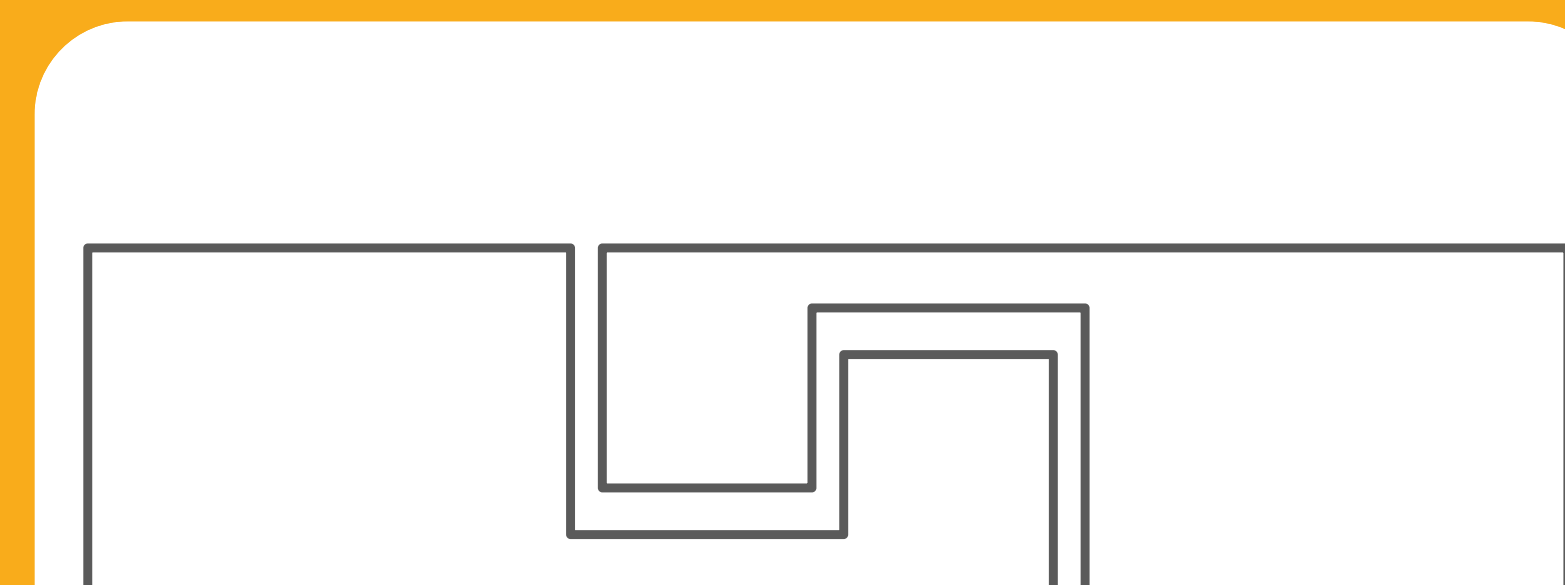
BUTT JOINT



ANGLE JOINT



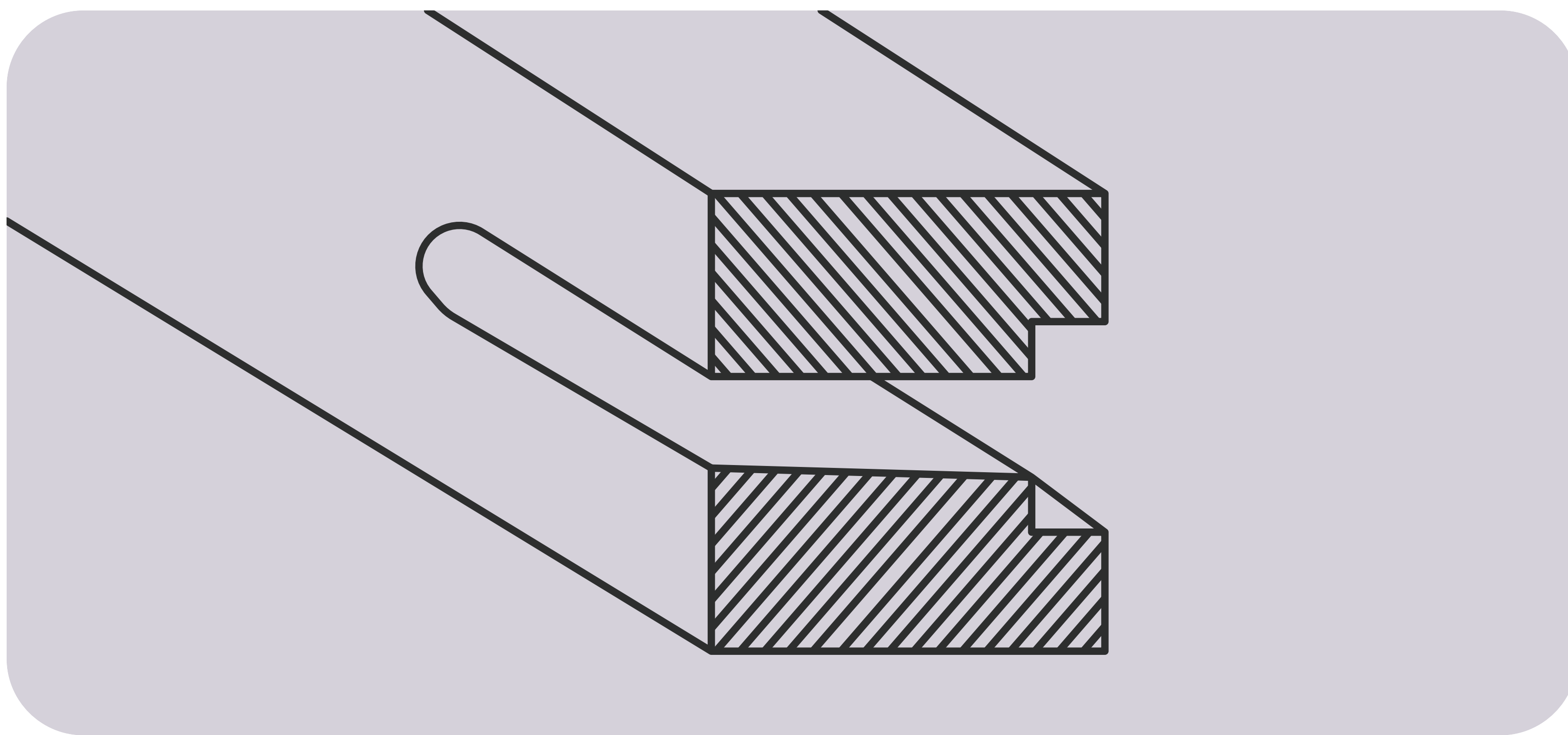
STEP JOINT



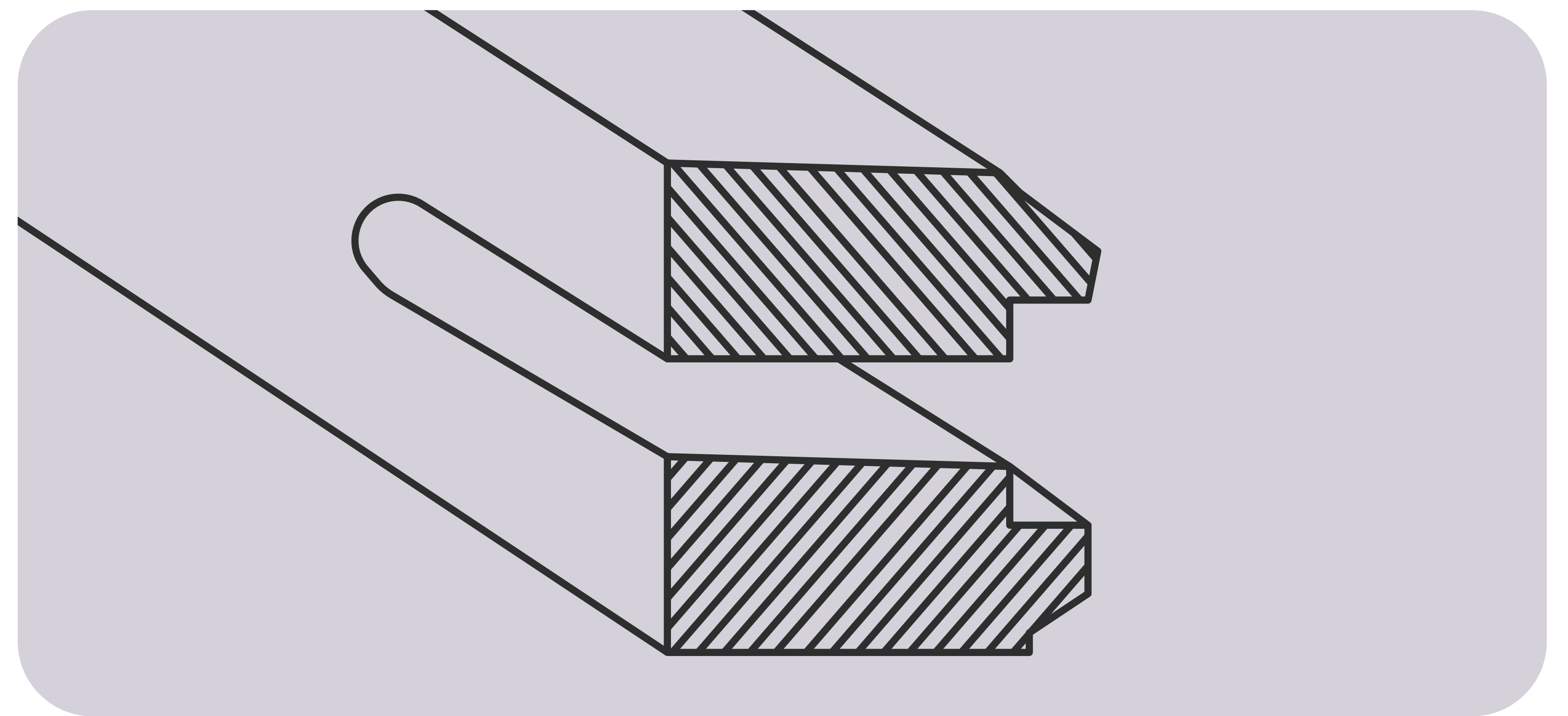
STEP JOINT HOOKED

# TYPES OF PISTON RINGS

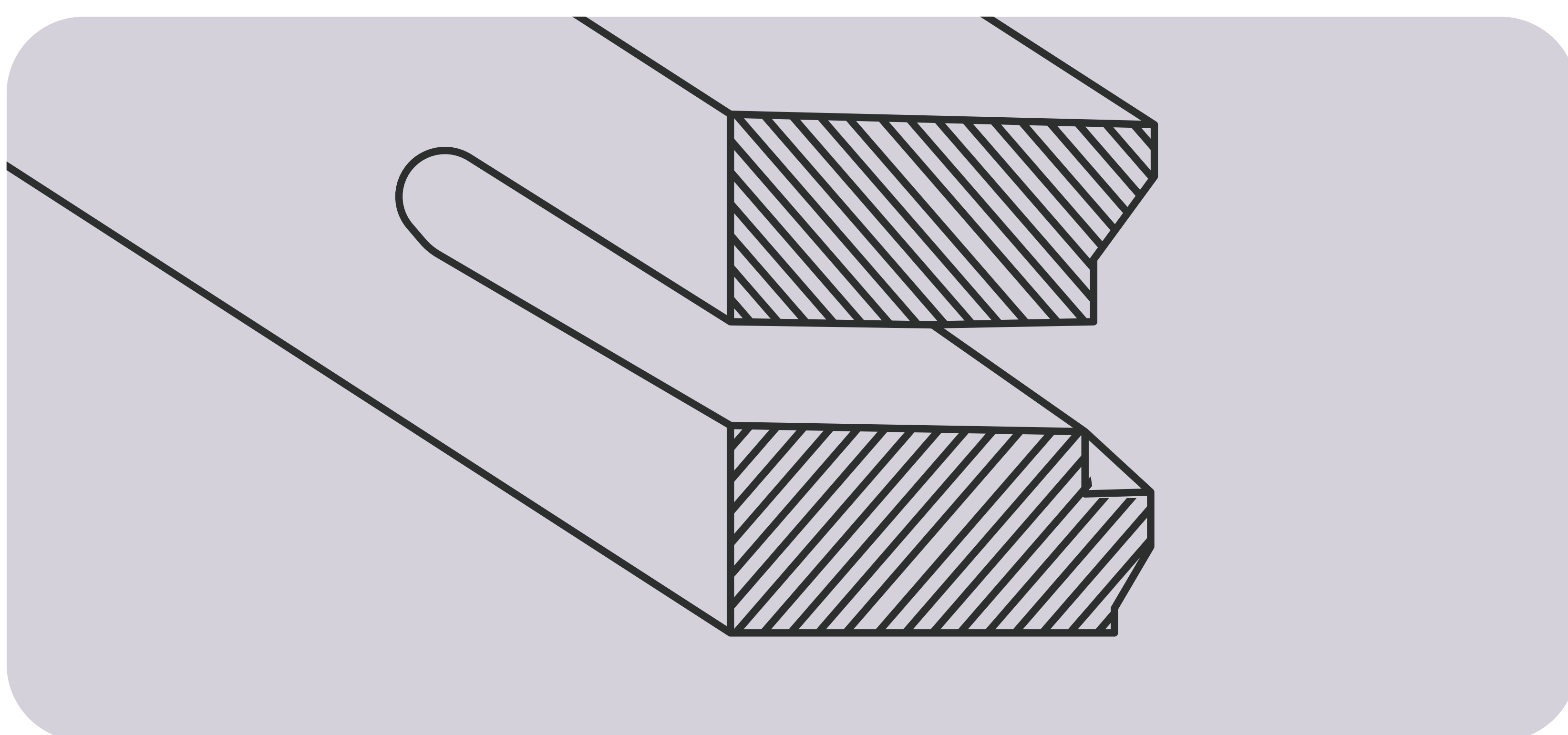
## OIL RINGS



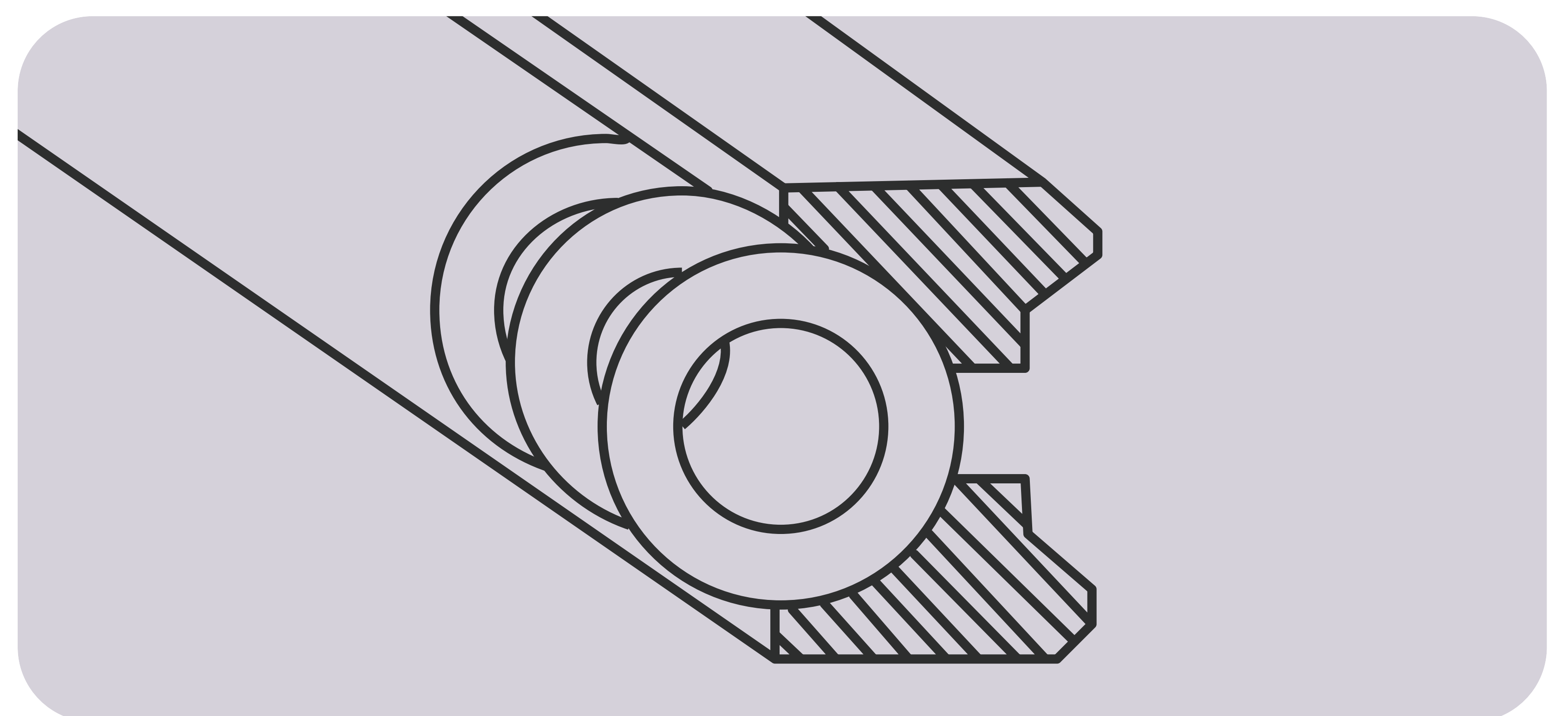
**SLOTTED OIL  
CONTROL RING**



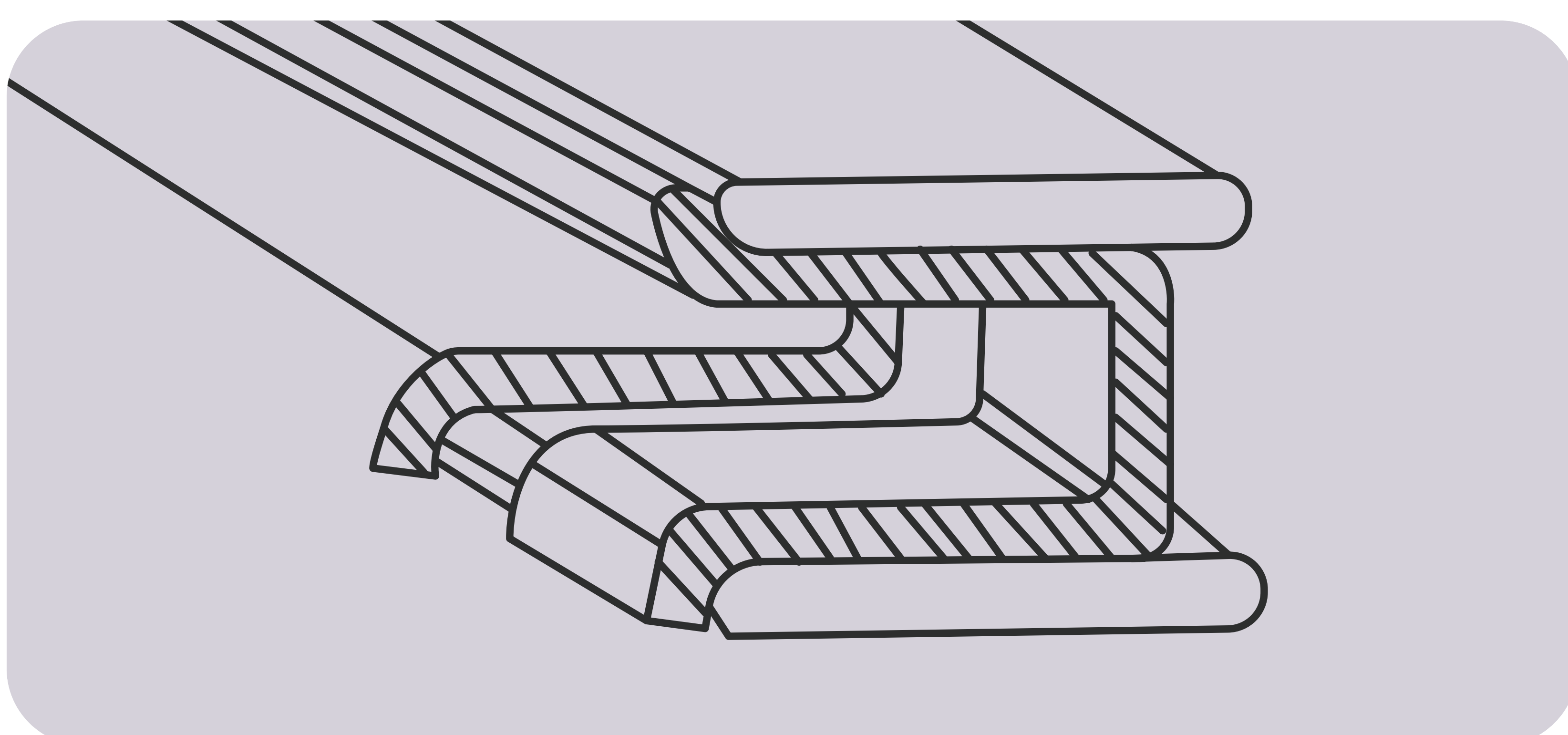
**BEVELLED OIL  
CONTROL RING**



**DOUBLE BEVELLED  
OIL CONTROL RING**



**SPRING LOADED  
OIL CONTROL RING**

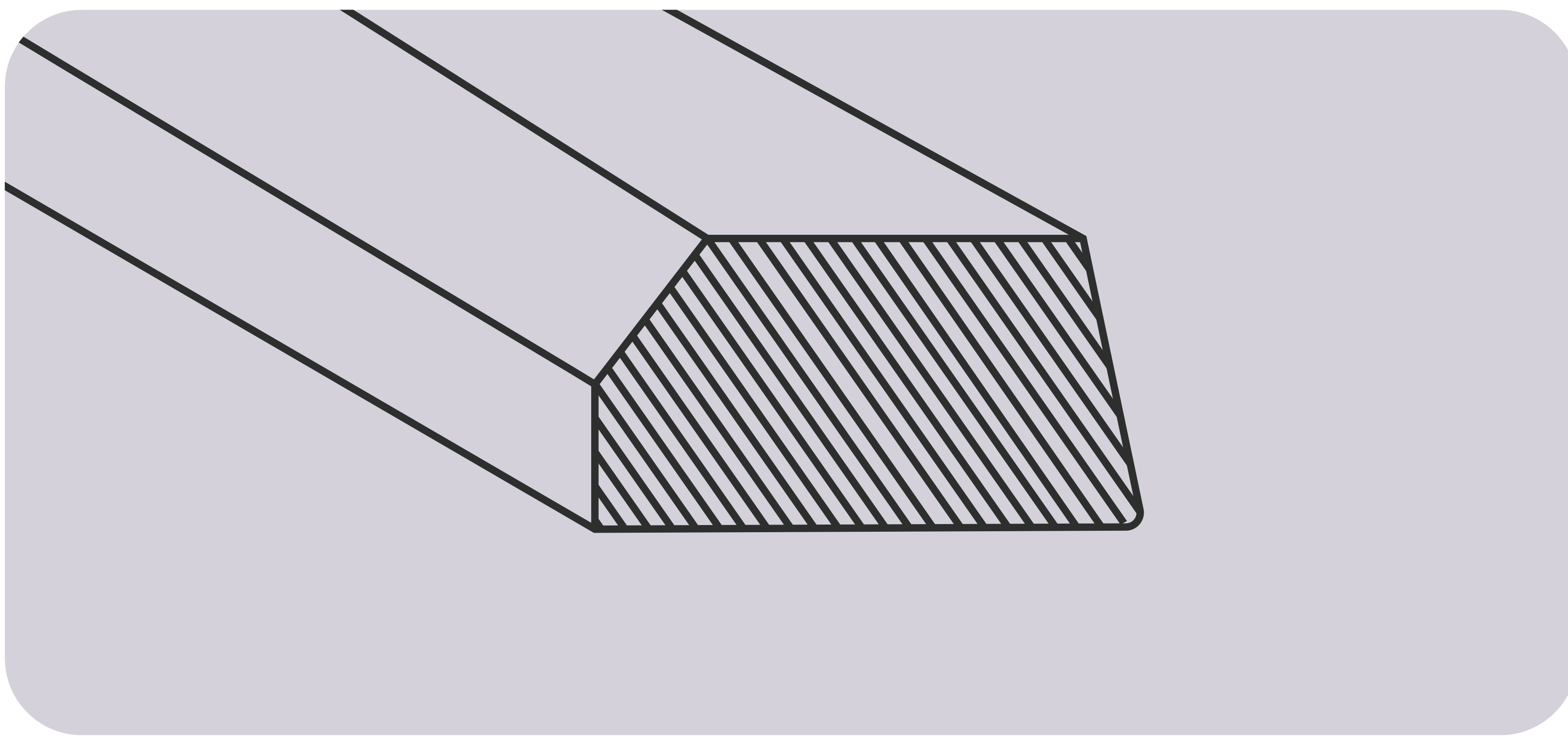


**THREE PIECE  
OIL RING**

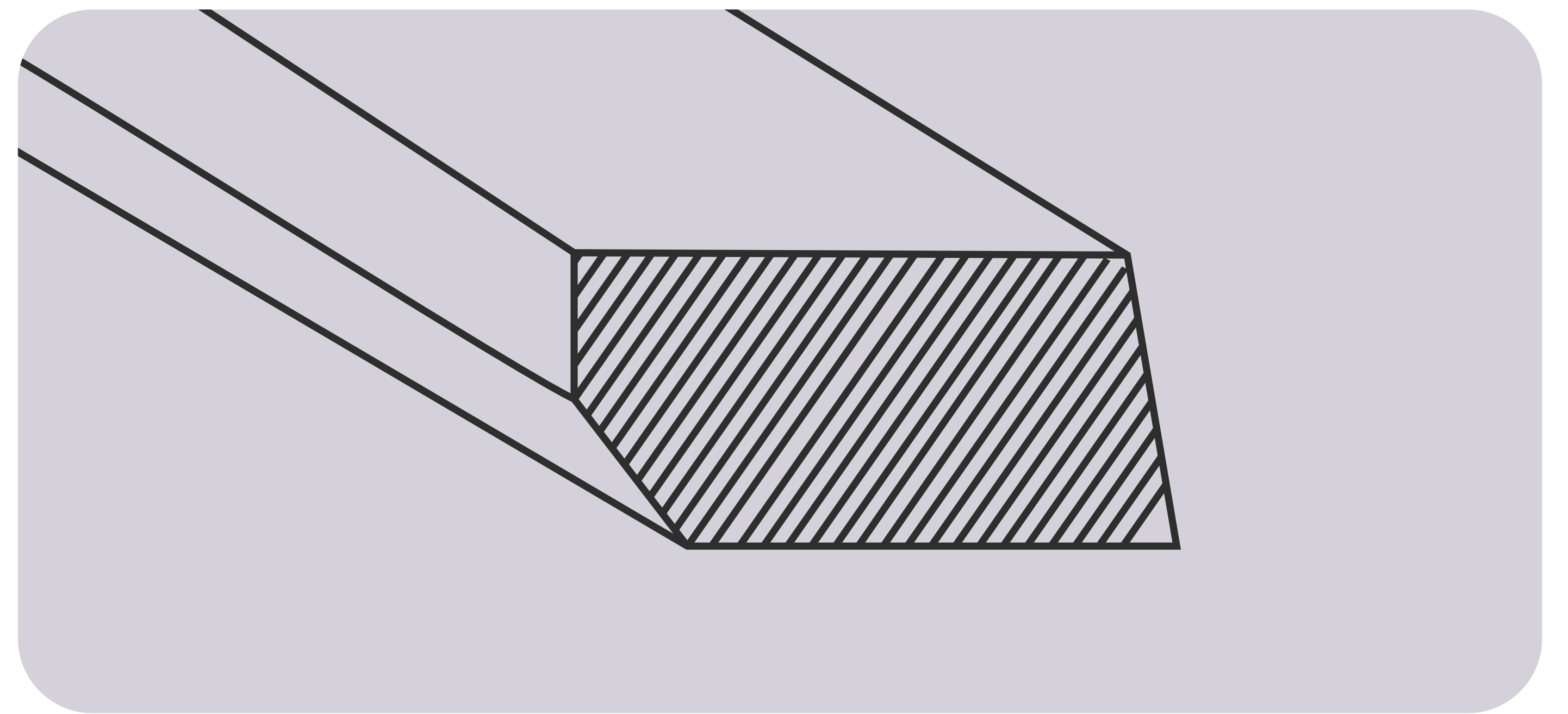


# TYPES OF PISTON RINGS

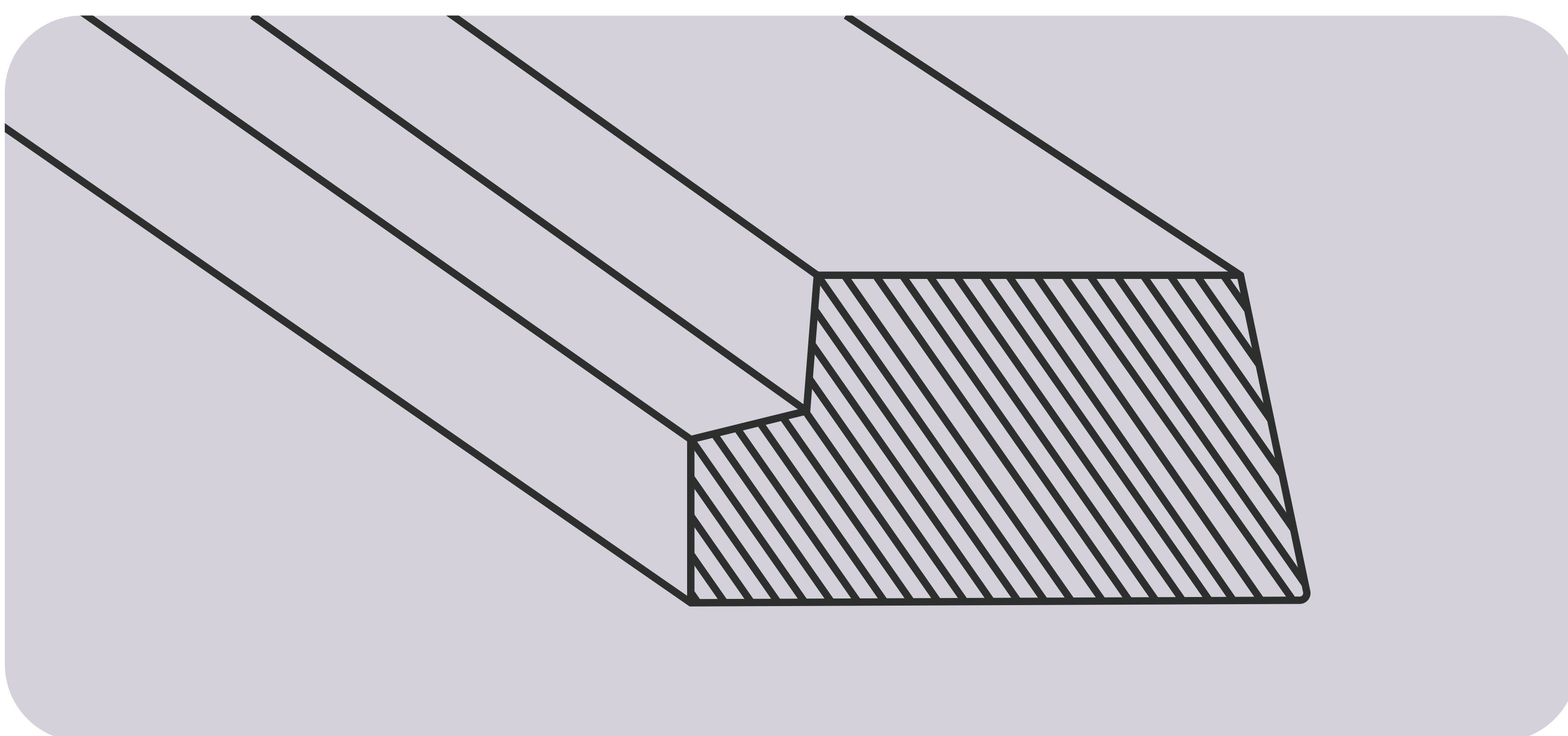
## EDGE FEATURES OF COMPRESSION RINGS



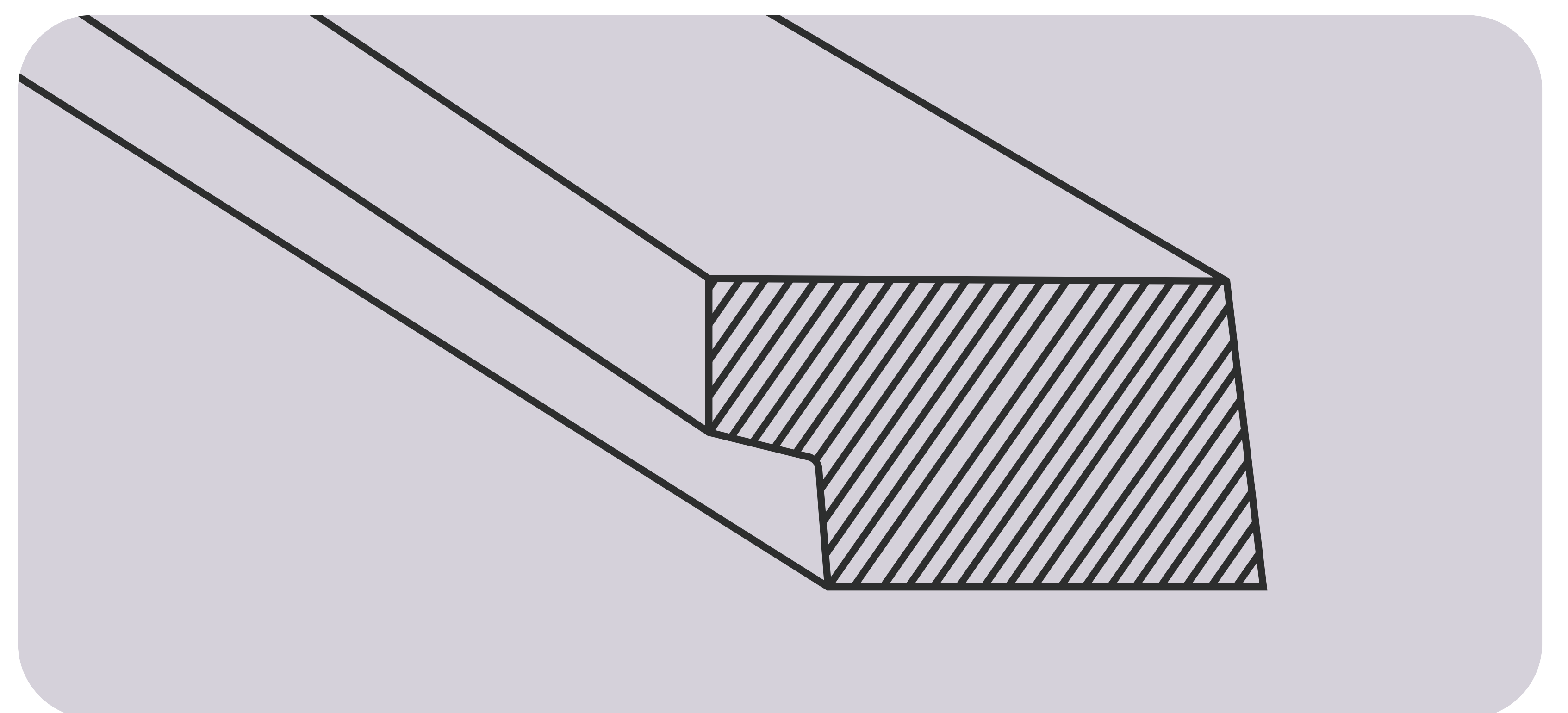
**INSIDE  
BEVEL**



**INSIDE BEVEL  
BOTTOM SIDE**



**INSIDE  
STEP**



**INSIDE STEP  
BOTTOM SIDE**



# COATINGS

## PHOSPHATING: PHOSPHATE COATING ON ALL SURFACES

Phosphating deposits crystalline phosphates on all surfaces of the piston rings, except for chrome-plated areas. The phosphate layer, with a thickness ranging from 0.002 to 0.005 mm, enhances the piston ring's break-in performance by improving oil adhesion. Additionally, this layer provides some anti-corrosive protection during prolonged storage, even in humid conditions.

## CHROME PLATING: O.D. SURFACE CHROME-PLATED AND LAPPED

Chrome plating on piston rings involves electroplating a thin chromium layer, typically 0.005 to 0.025 mm thick, onto the surface. This process boosts surface hardness beyond 1000 HV, enhancing wear resistance and durability. This makes chrome plating valuable for both compression and oil control rings, extending engine life and efficiency.





# COATINGS

## NITRIDING (NIT): NITROGEN COATING ON ALL SURFACES

Nitride coating on piston rings enhances durability and performance by increasing surface hardness through the diffusion of nitrogen atoms into the base metal. Applied to steel top and oil rings, this coating offers excellent wear and scuff resistance, comparable to chrome but with additional benefits. It improves heat transfer and side thrust management in pistons.

## MOLYBDENUM COATING

Molybdenum coatings on piston rings reduce friction, enhance wear resistance, and improve lubrication by retaining oil on the ring surface. Applied via plasma spraying, these coatings provide excellent scuff resistance and withstand high temperatures, resulting in improved fuel efficiency, lower emissions, enhanced power output, and extended engine life.





# MATERIALS

There are several kinds of material used in manufacturing madev piston rings

1

**CI: CAST  
IRON**



2

**SGI: CAST IRON  
WITH SPHEROIDAL  
GRAPHITE**



3

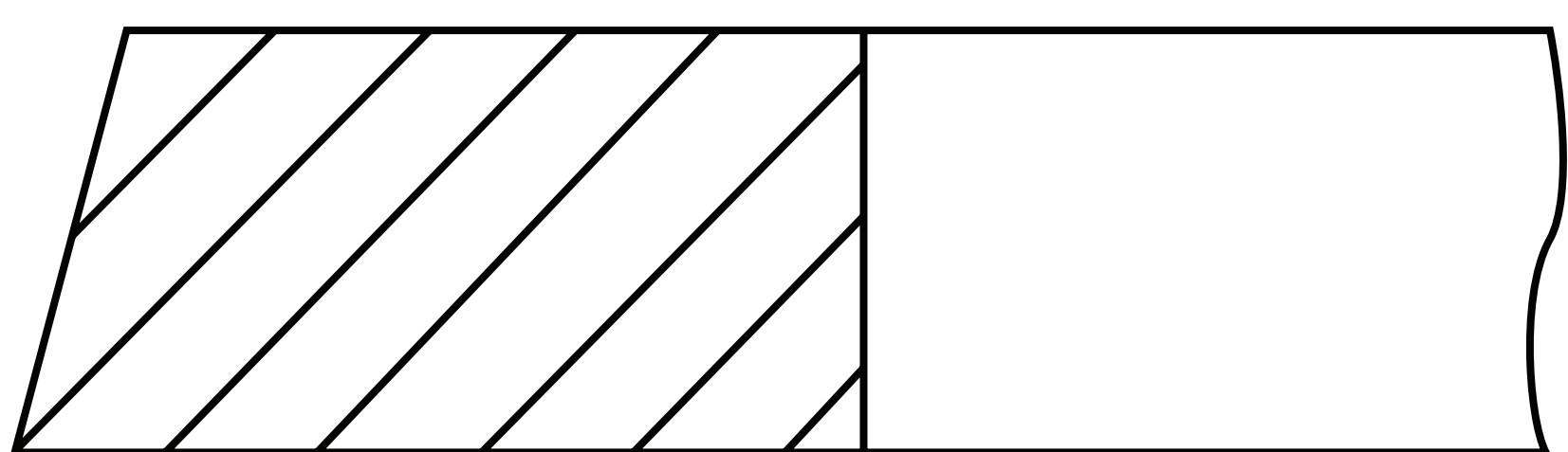
**SS: STEEL**



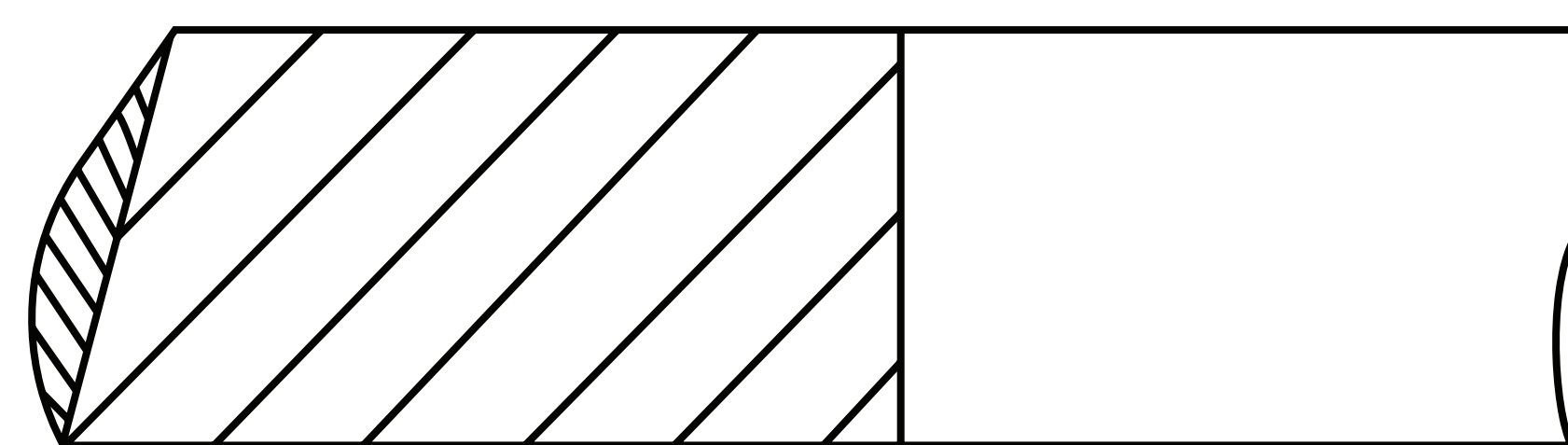


# TYPES AND CROSS SECTIONS PISTON RINGS

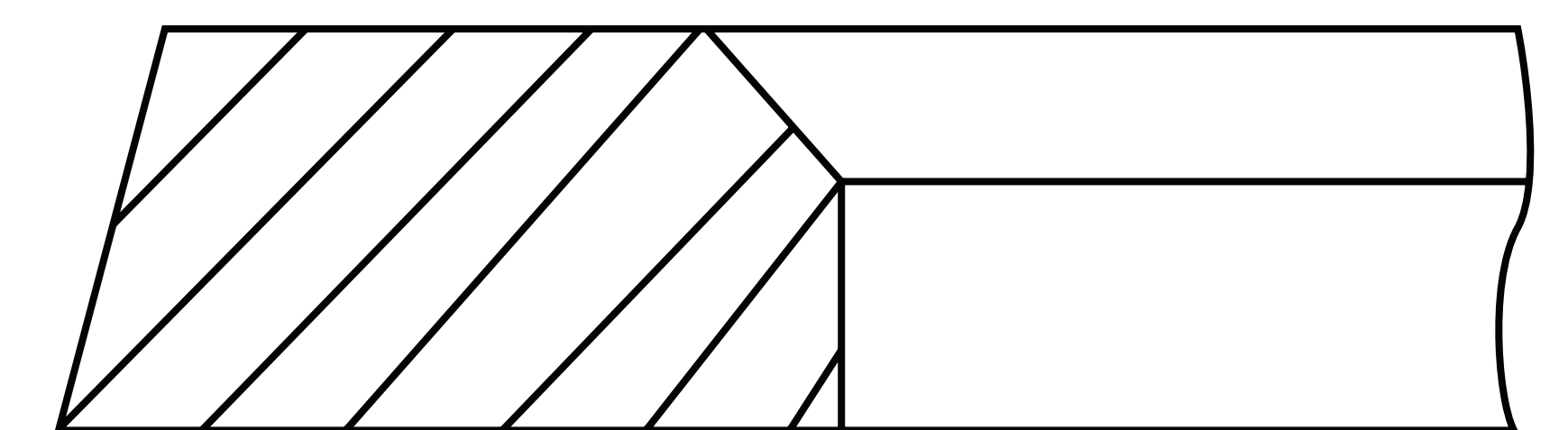
## 311 TAPER FACED RINGS



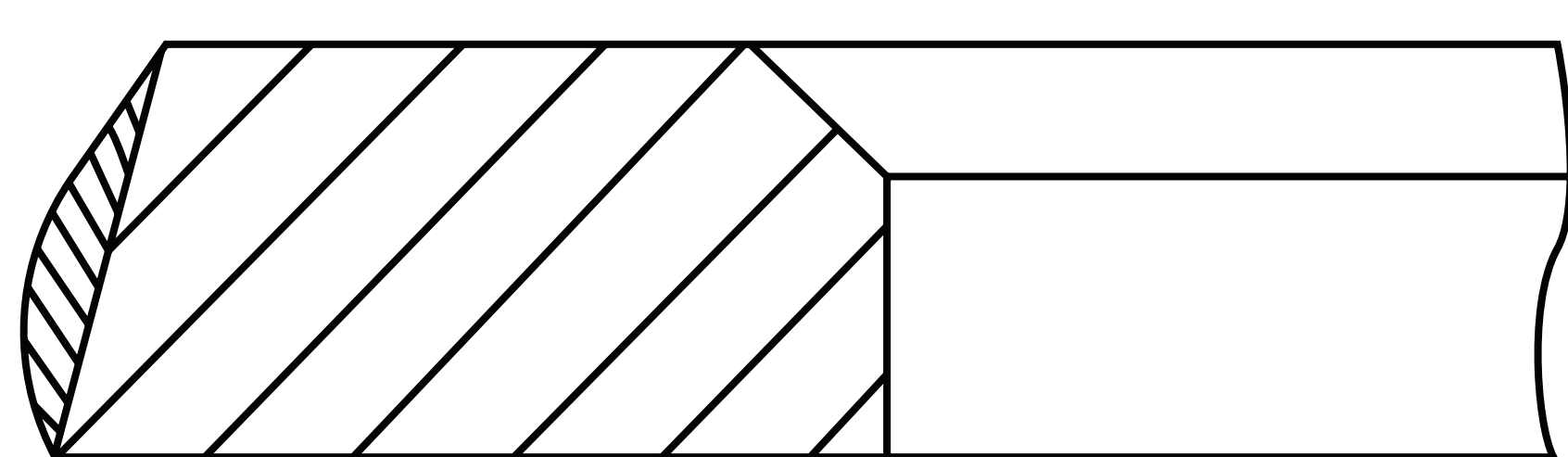
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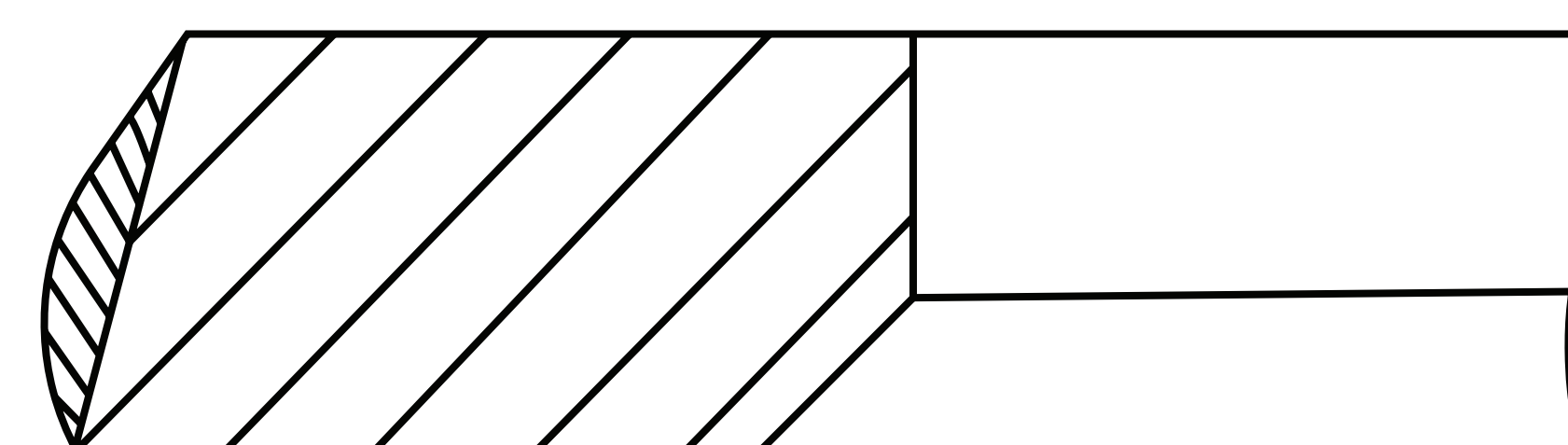
311 CR



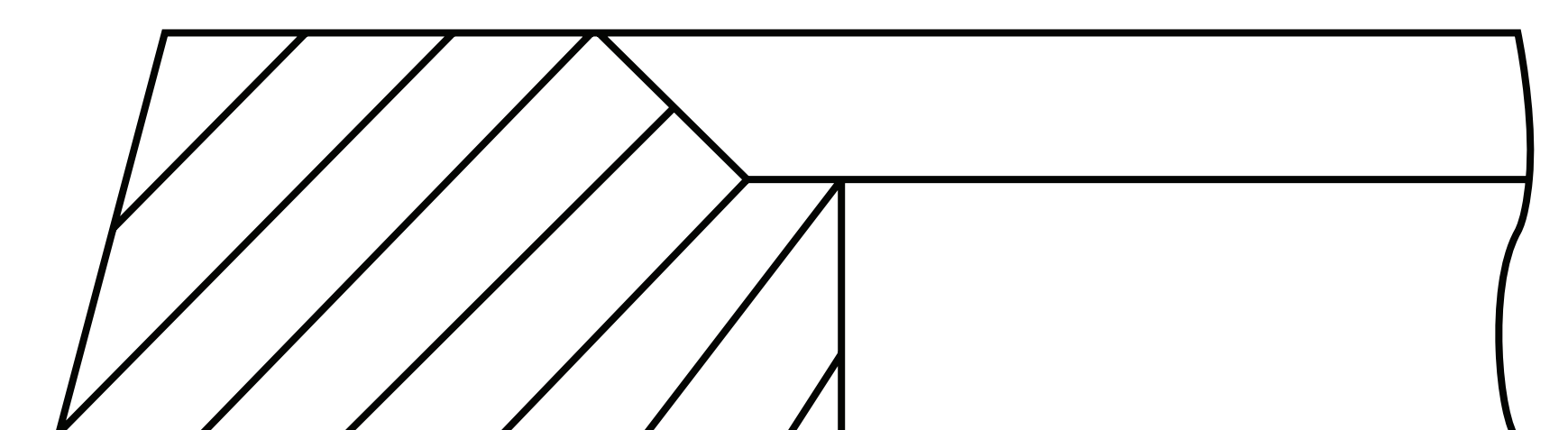
311 1F



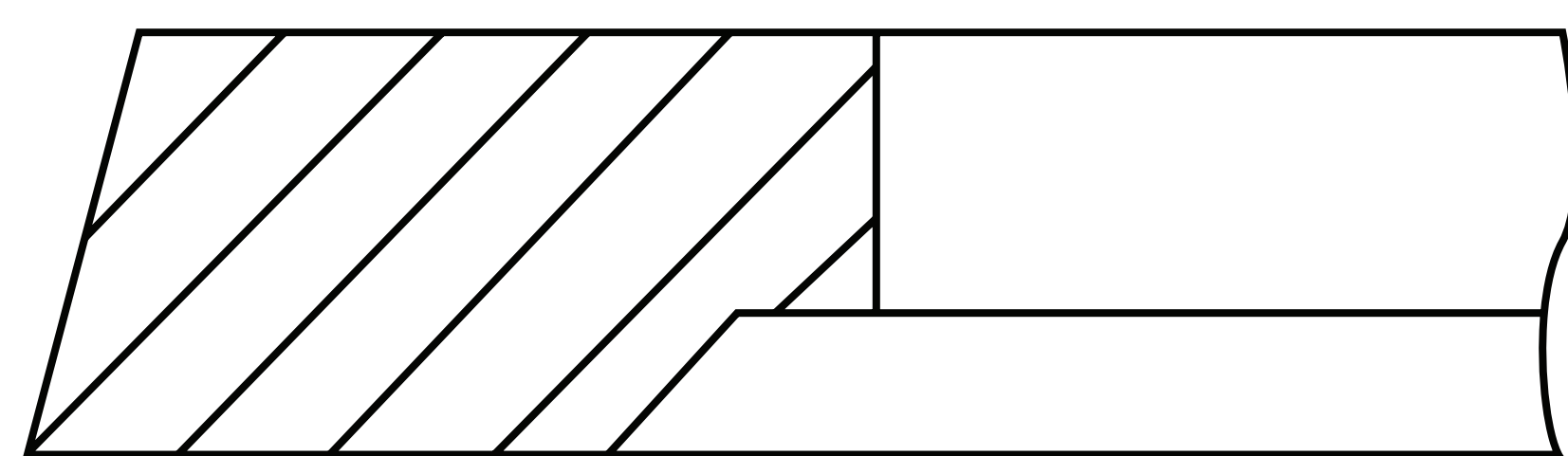
311IF CR



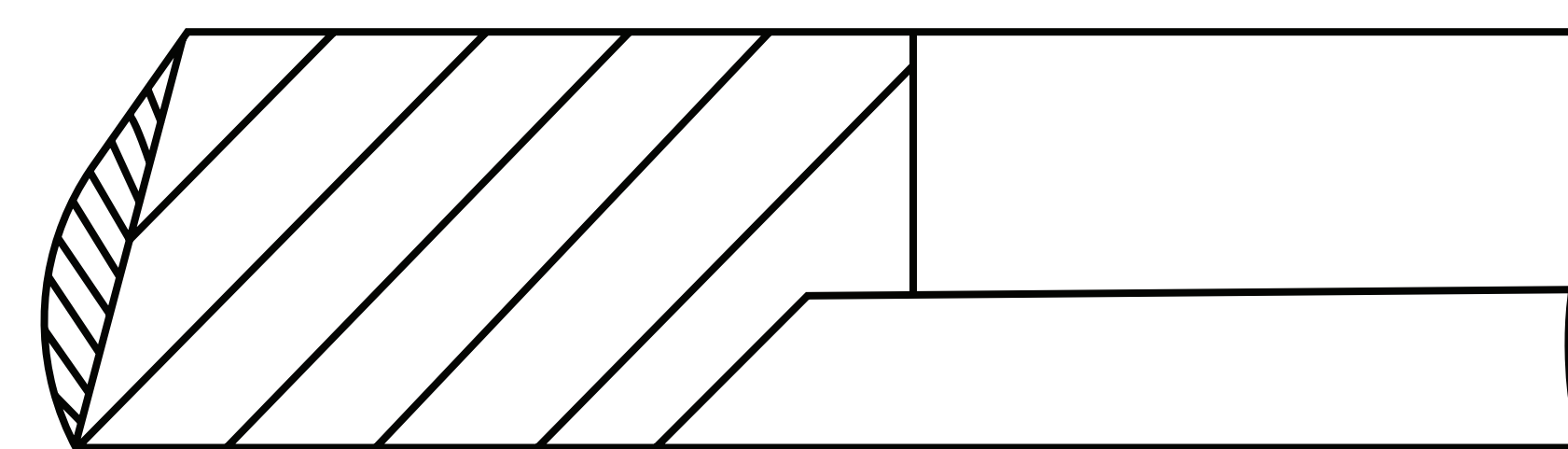
311 IF U CR



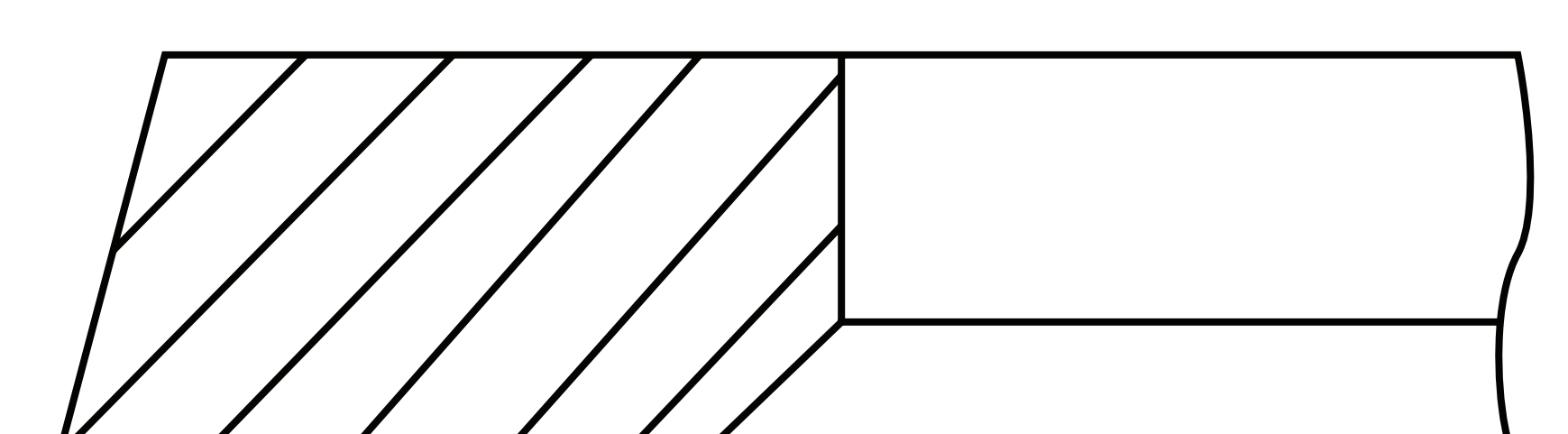
311 IW



311 IW U

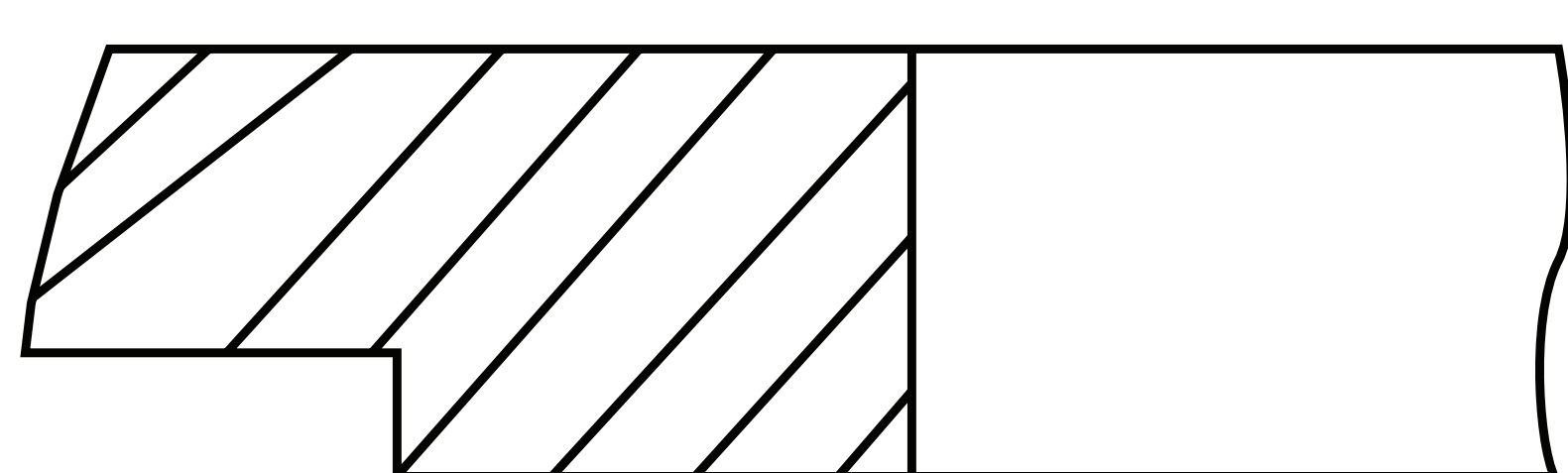


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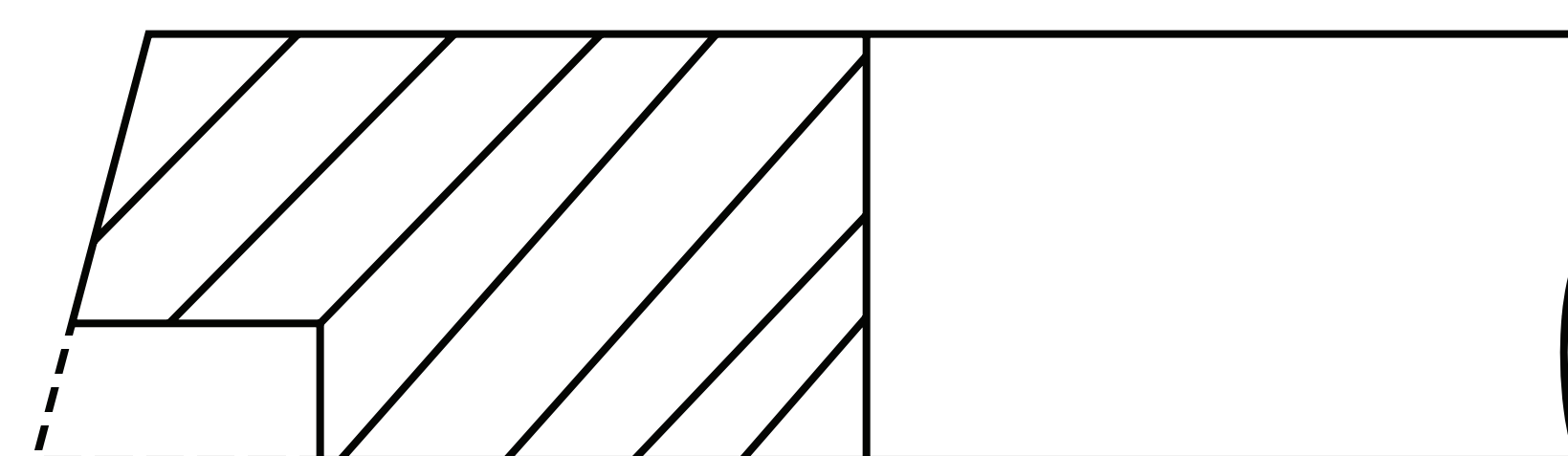


311IF U

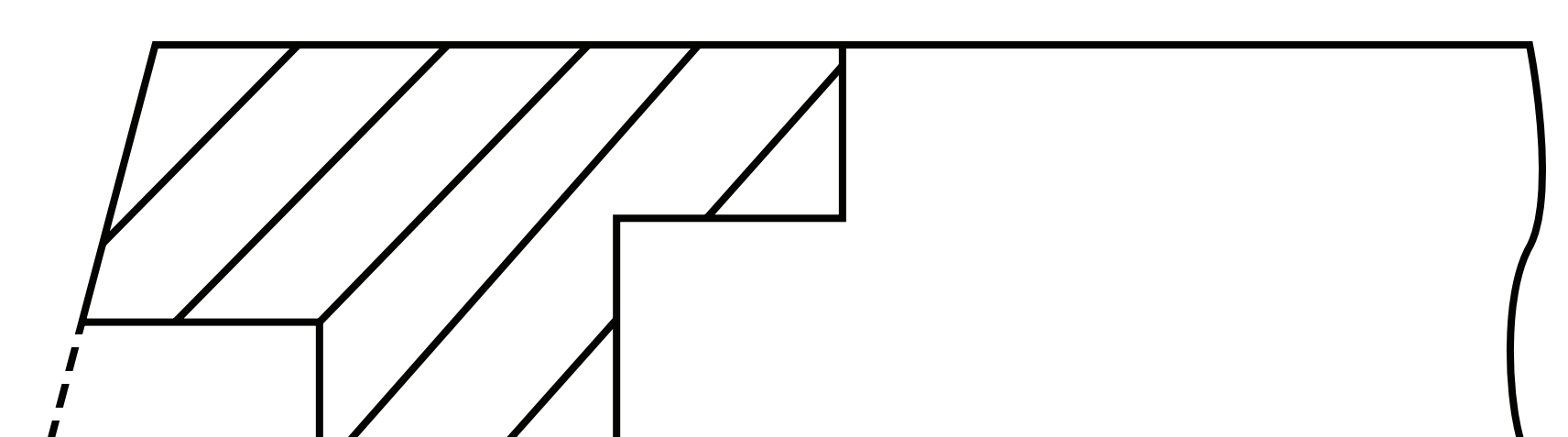
## 331 TAPER FACED NAPIER RING



331



331 ES

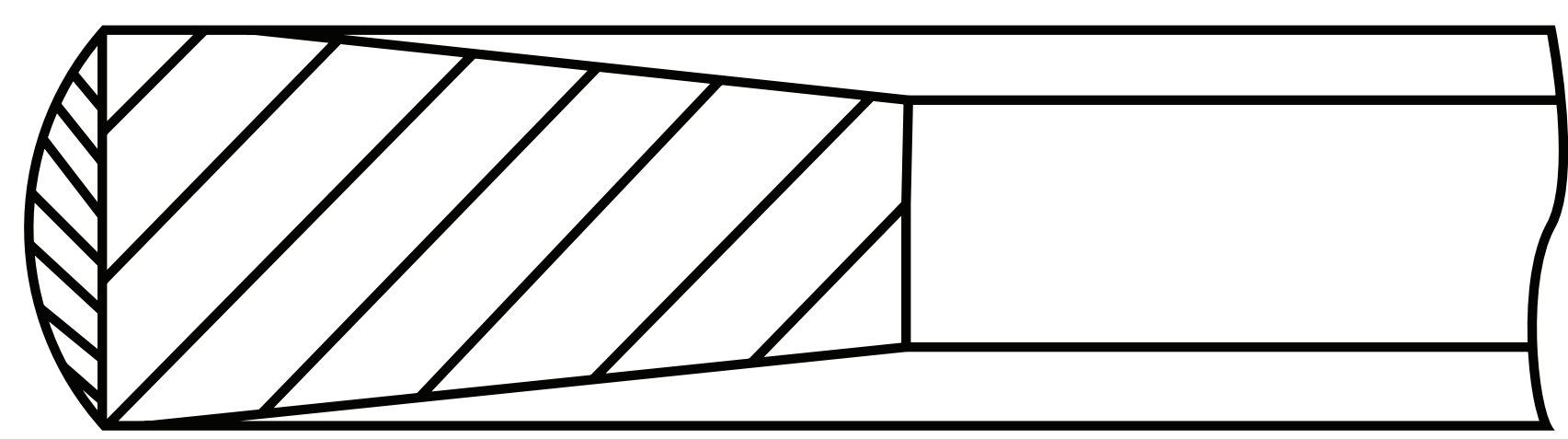


331 ESIW U

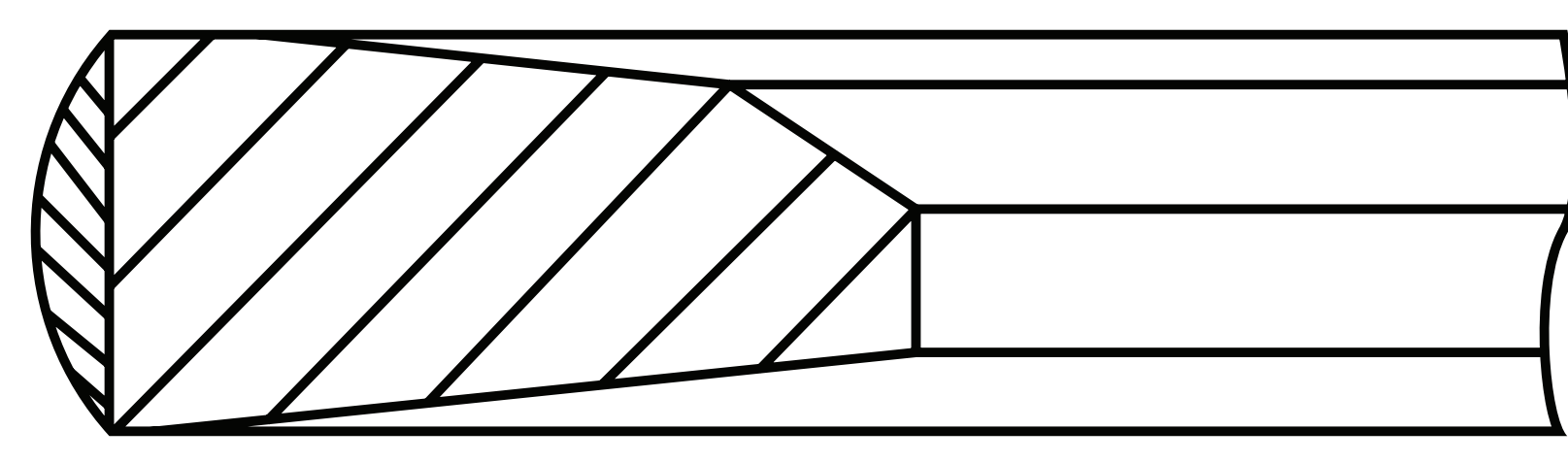


# TYPES AND CROSS SECTIONS PISTON RINGS

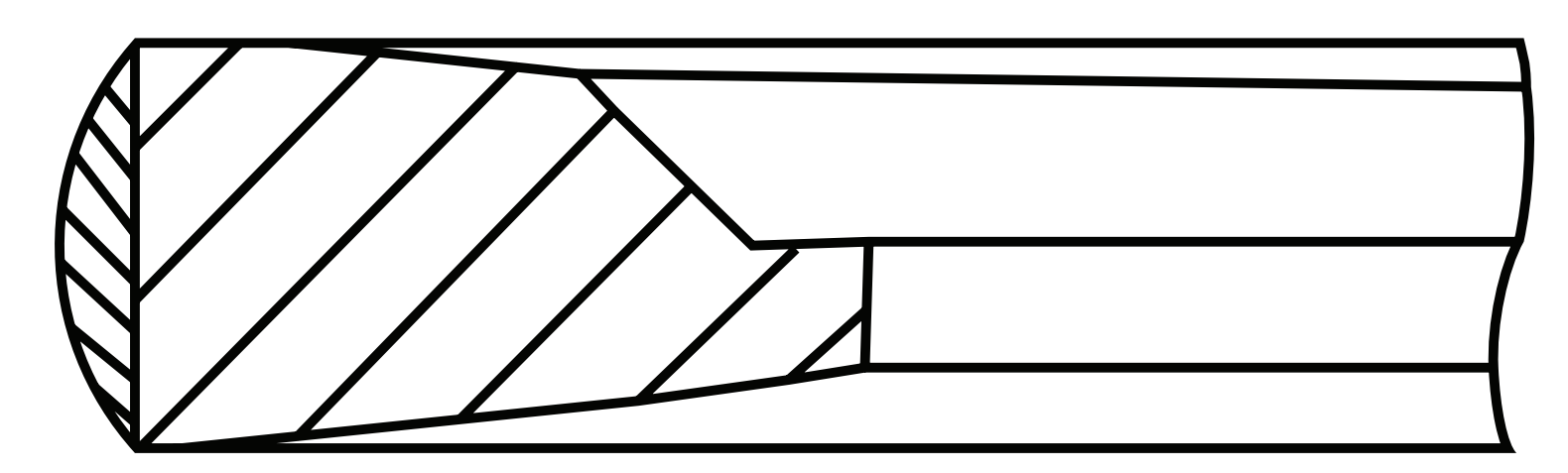
## 304 DOUBLE KEYSTONE RING 7° ANGLE



304 CR

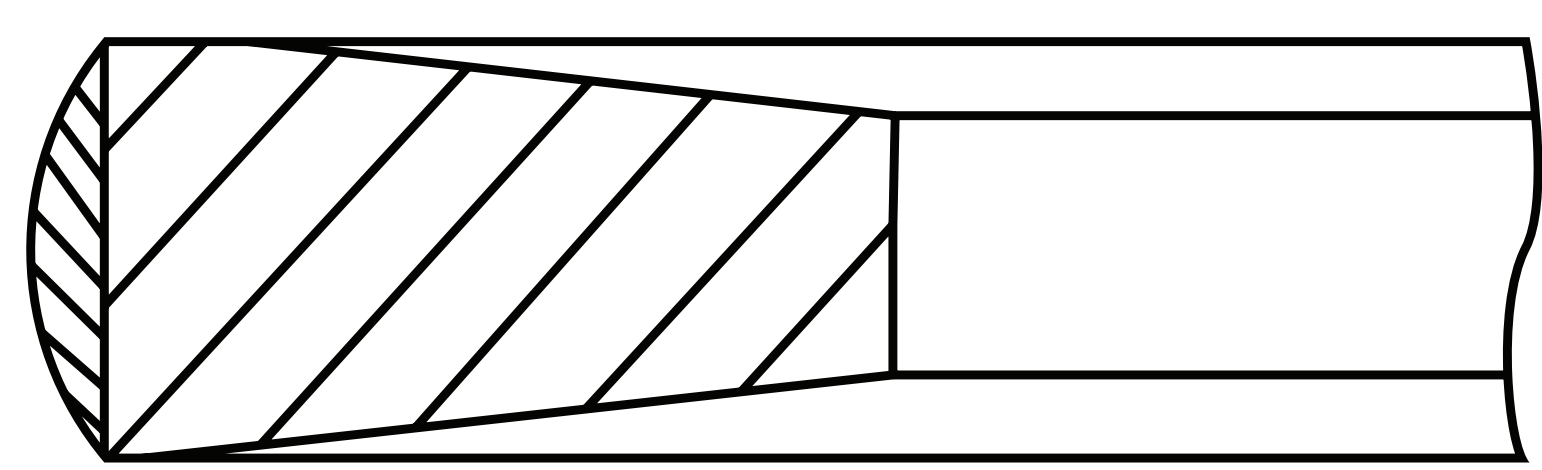


304 IF CR

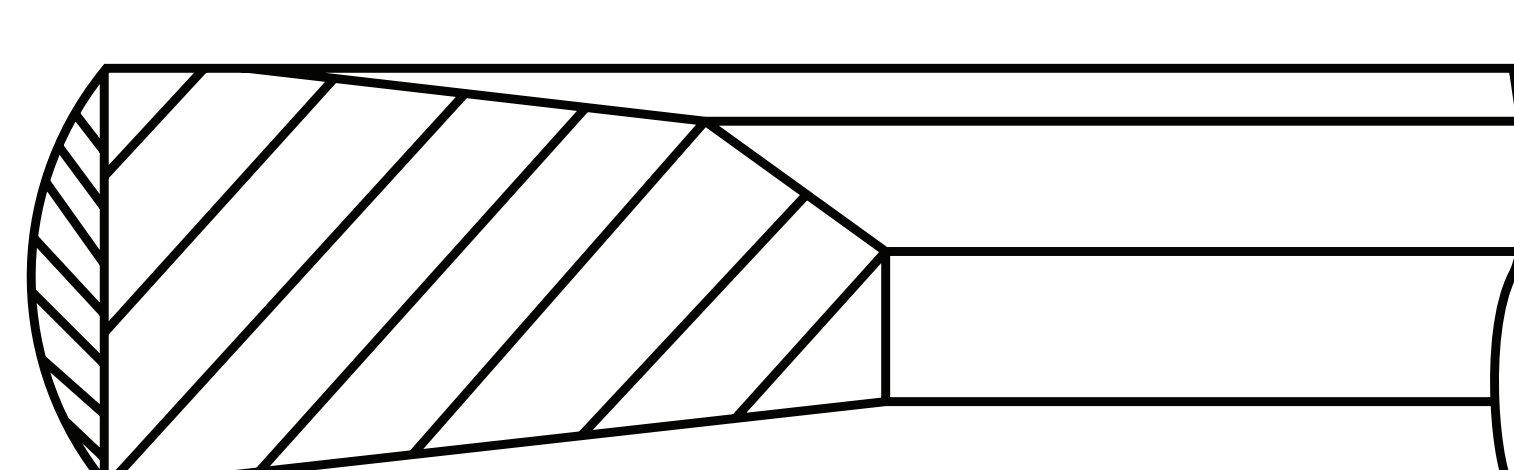


304 IW CR

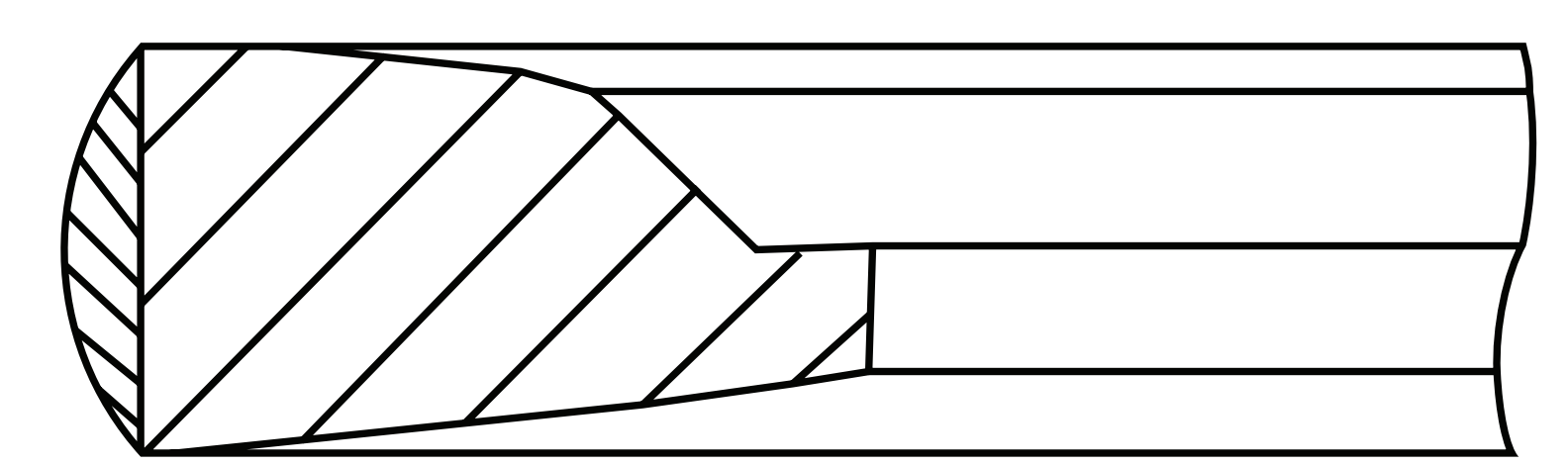
## 303 DOUBLE KEYSTONE RING 3° ANGLE



303 CR

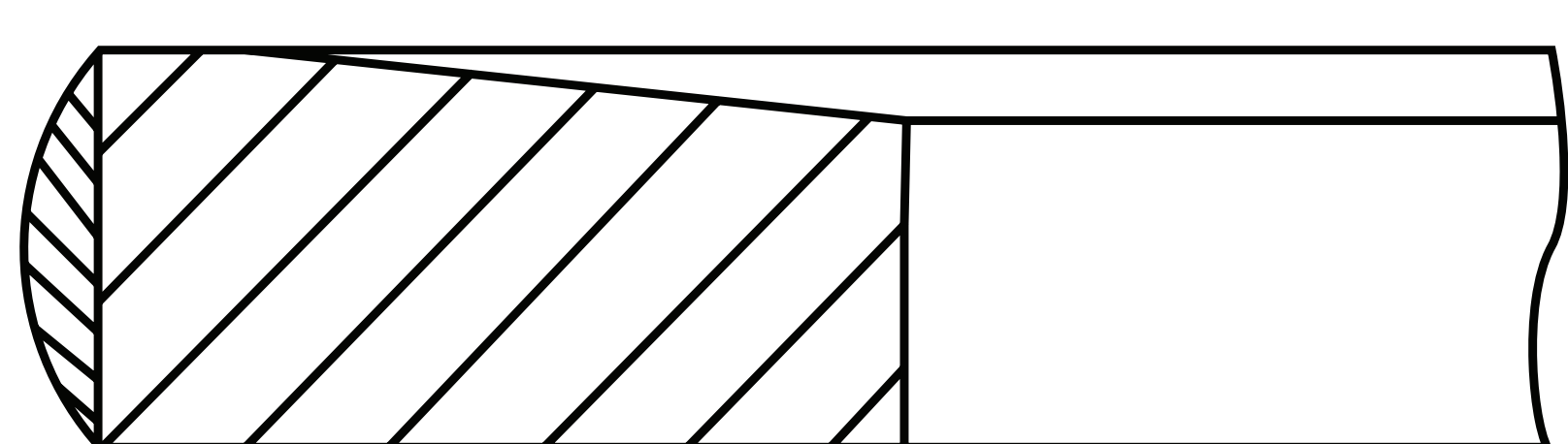


303 IF CR



303 IW CR

## 302 HALF KEYSTONE RING

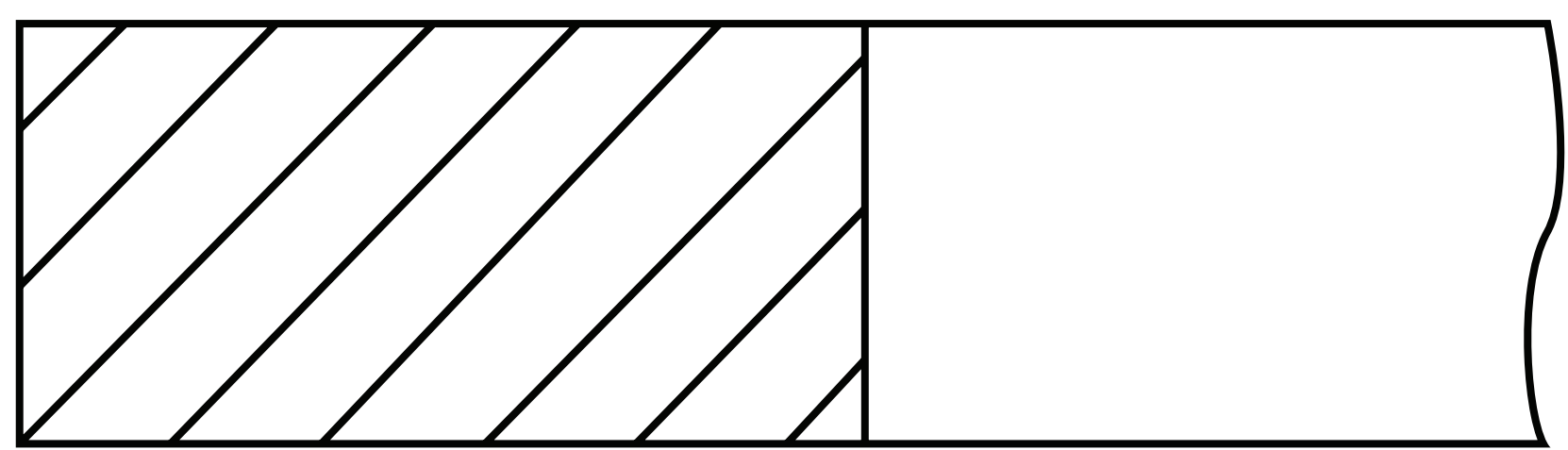


302 CR

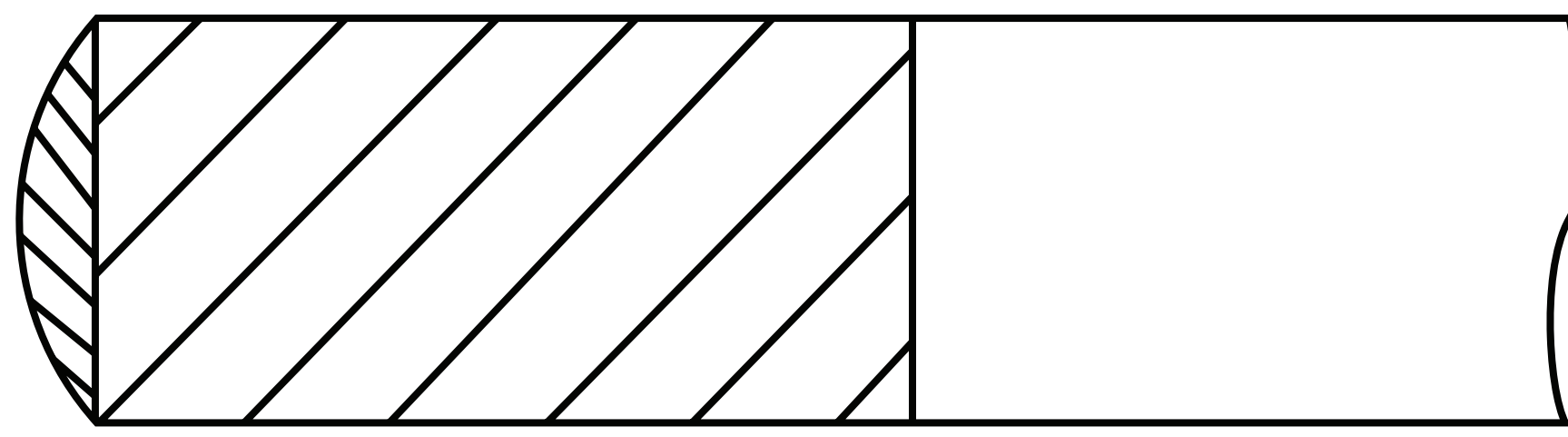


# TYPES AND CROSS SECTIONS PISTON RINGS

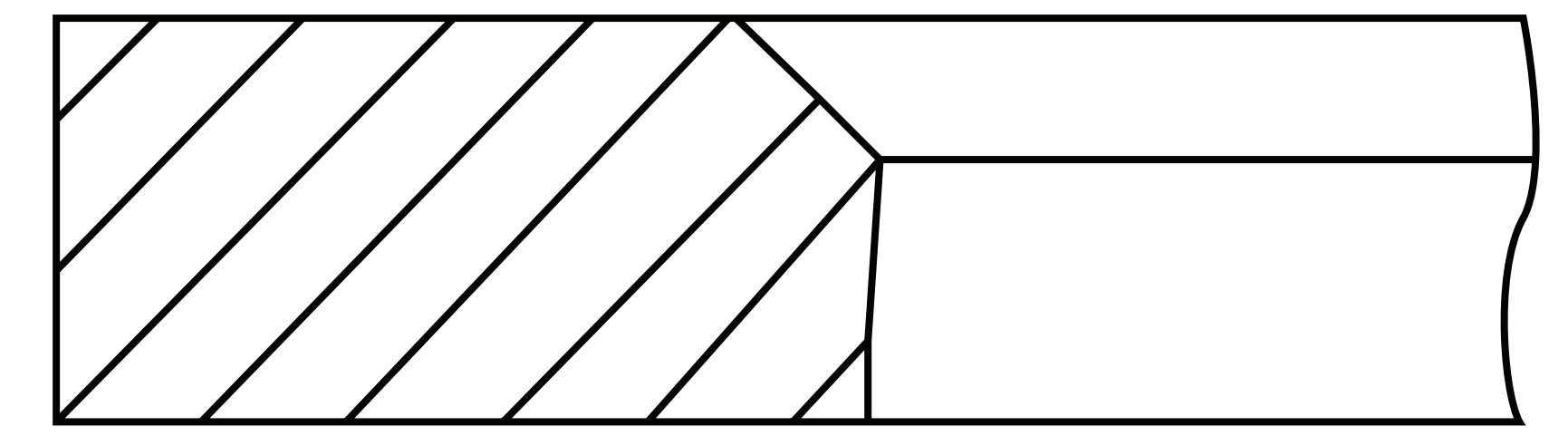
## 310 RECTANGULAR RING



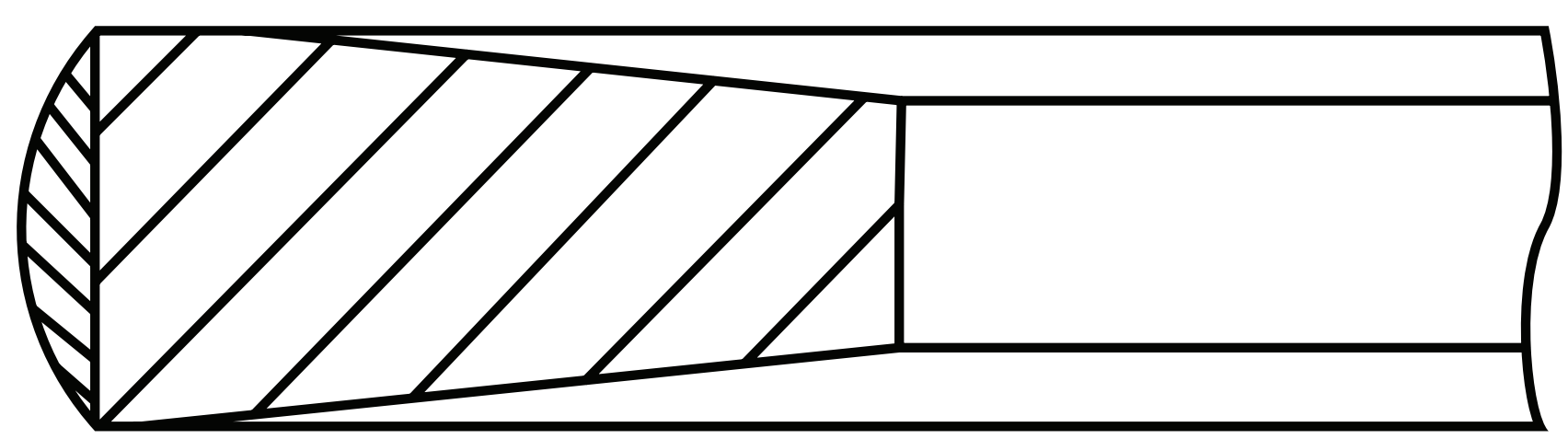
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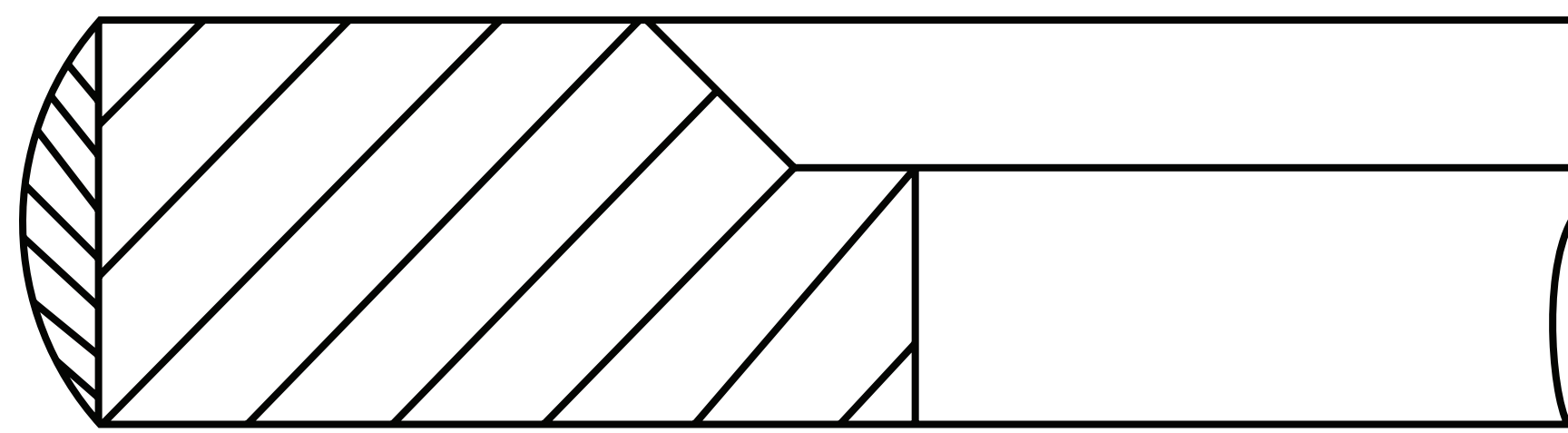
310 CR



310 IF

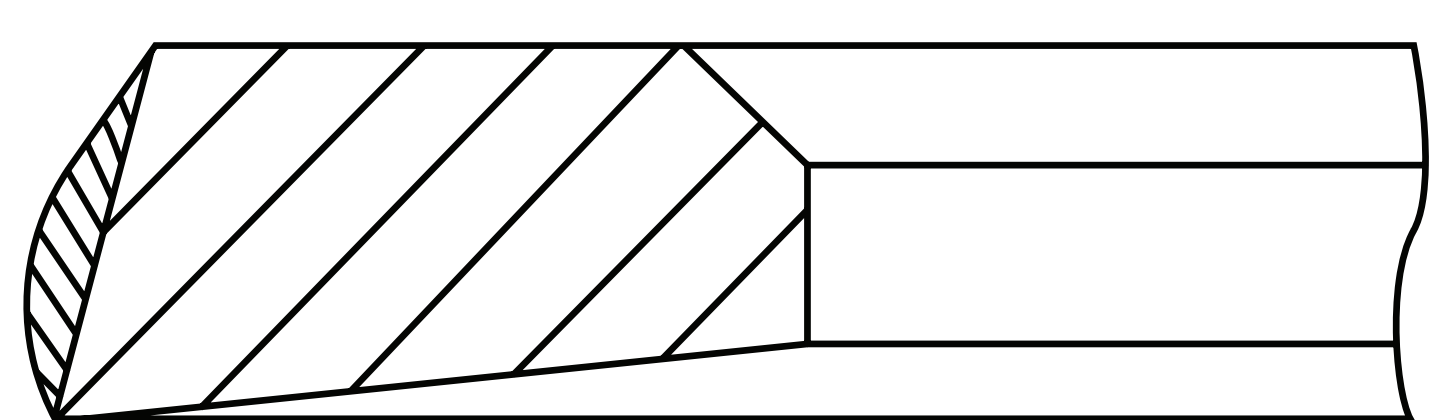


310 IF CR



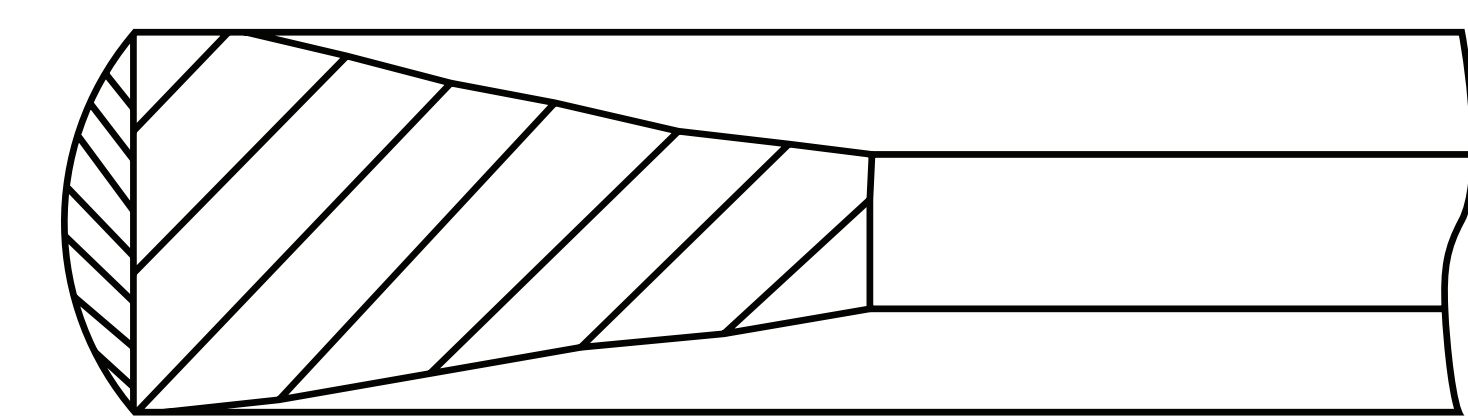
310 IW CR

## 344 TAPER FACED DOUBLE KEYSTONE RING 7° ANGLE



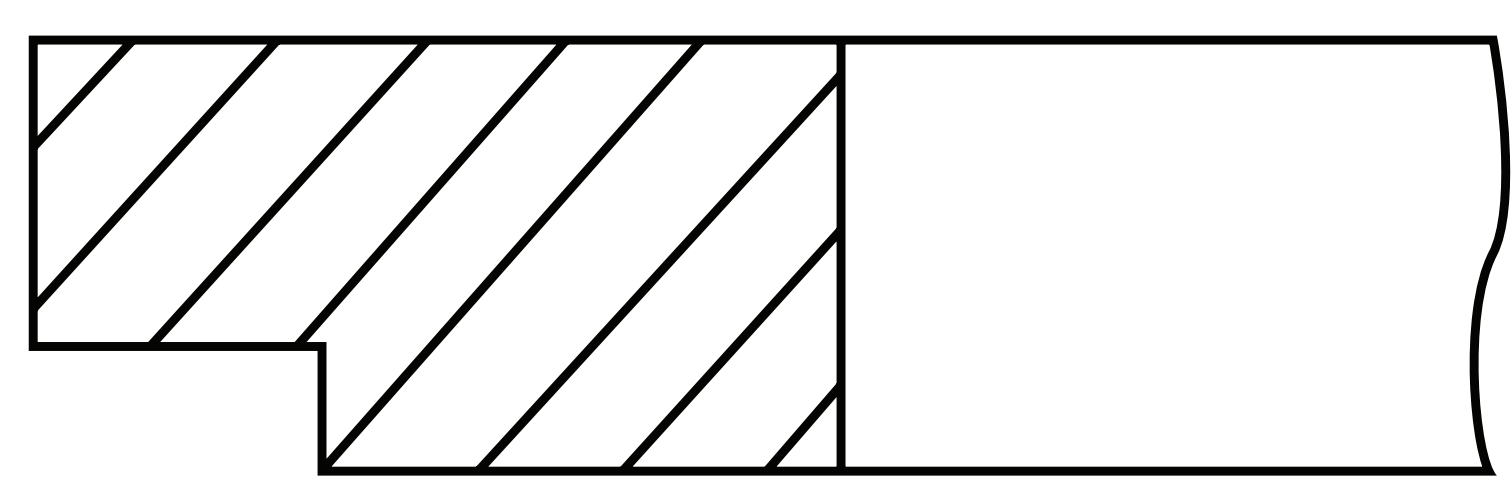
344 CR

## 322 DOUBLE KEYSTONE RING 7° ANGLE

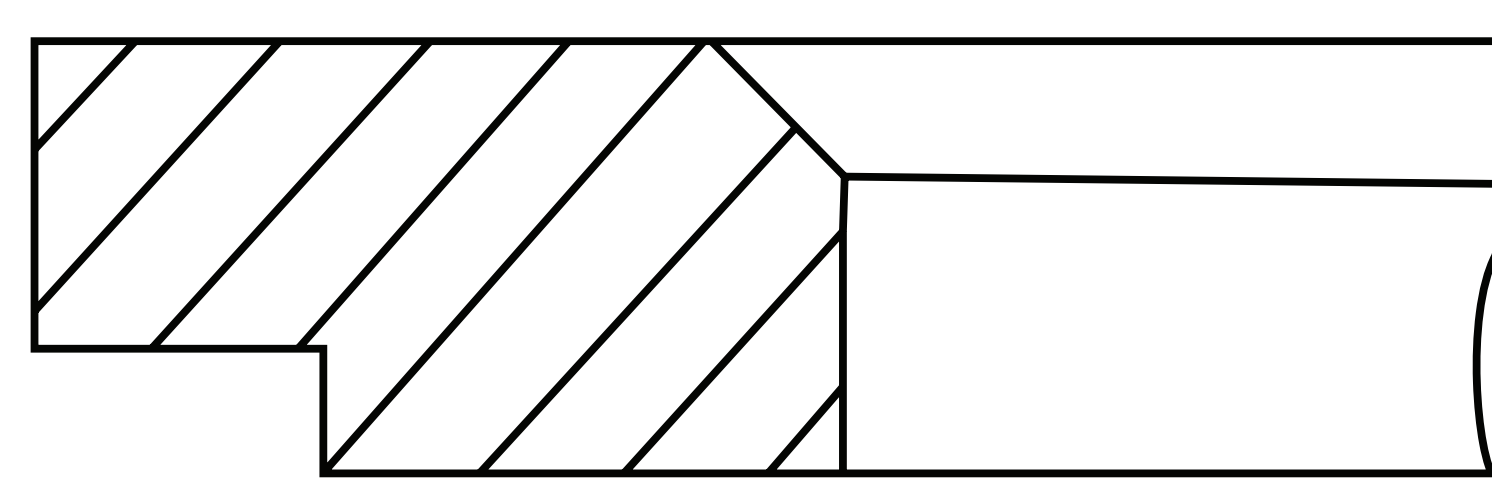


322

## 330 NAPIER RING



330



330 IF

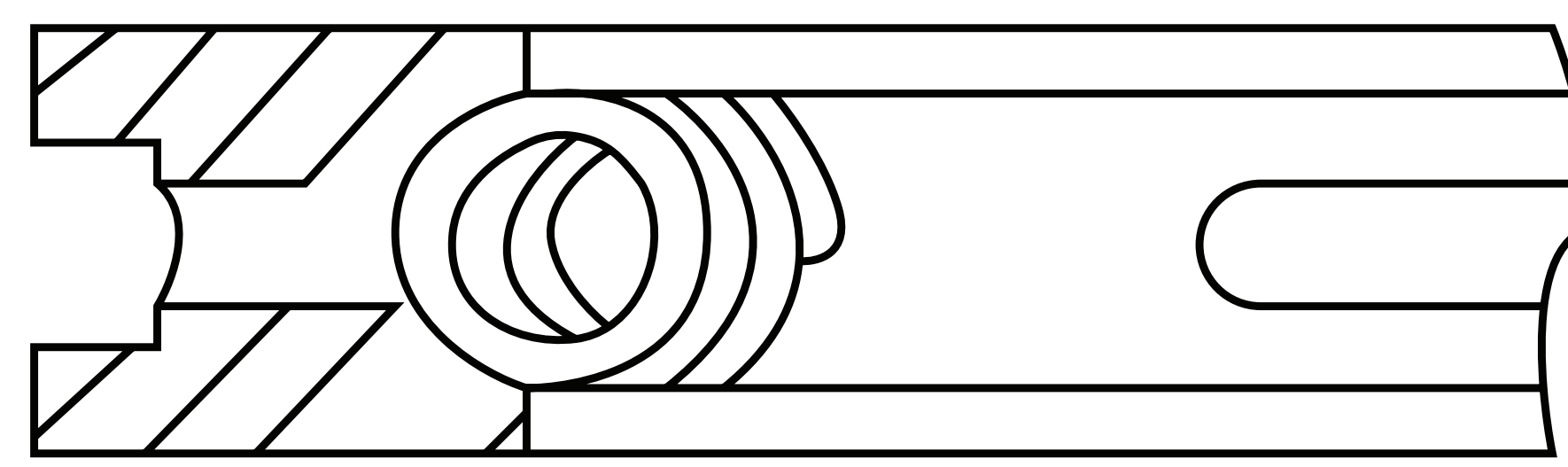


# TYPES AND CROSS SECTIONS PISTON RINGS

## 501 SLOTTED OIL CONTROL RING (WITH SPIRAL EXPANDER)



501

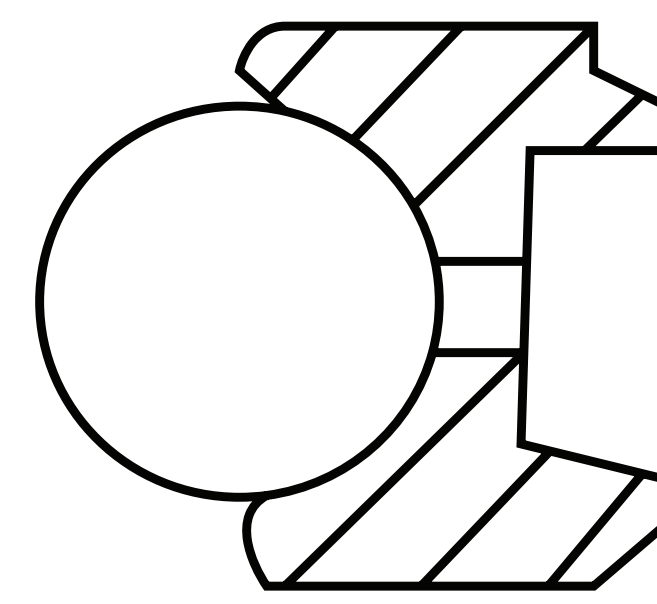


501 EX

## 503 DOUBLE BEVELLED OIL CONTROL RING

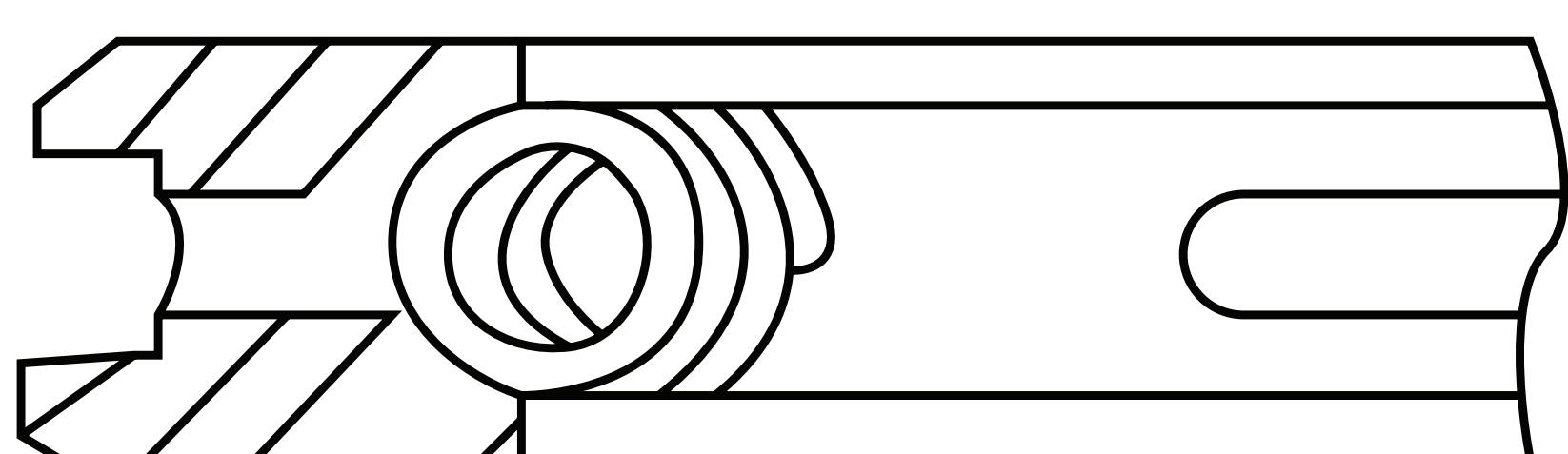


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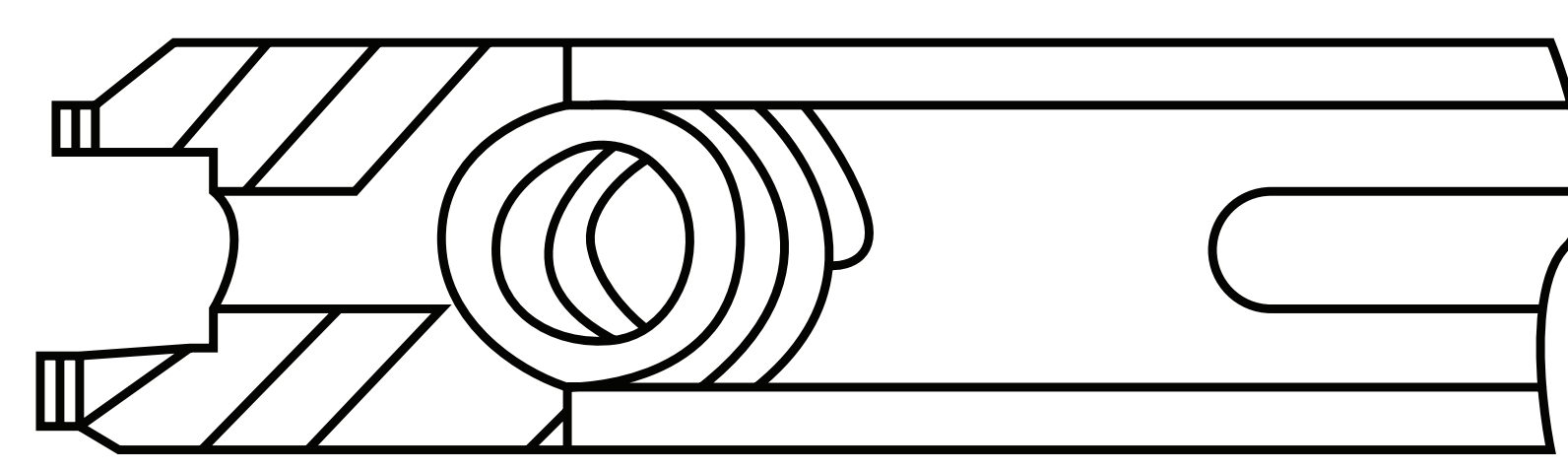


503 EX NIT

## 503 EX DOUBLE BEVELLED OIL CONTROL RING



503 EX

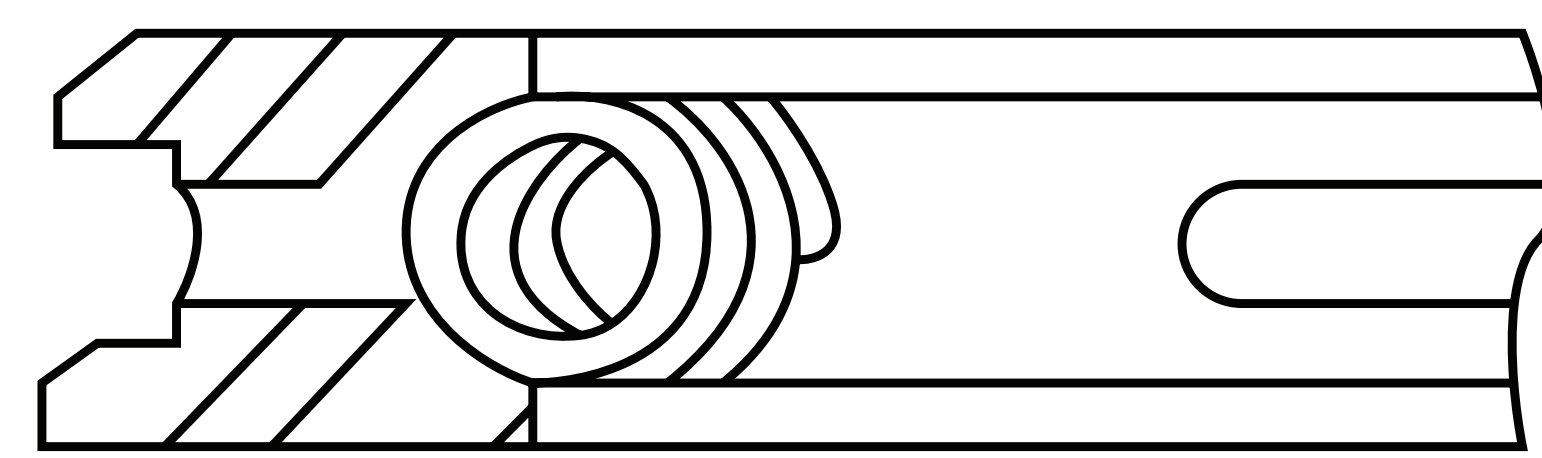


503 EX CR

## 505 DOUBLE BEVELLED OIL CONTROL RING



505

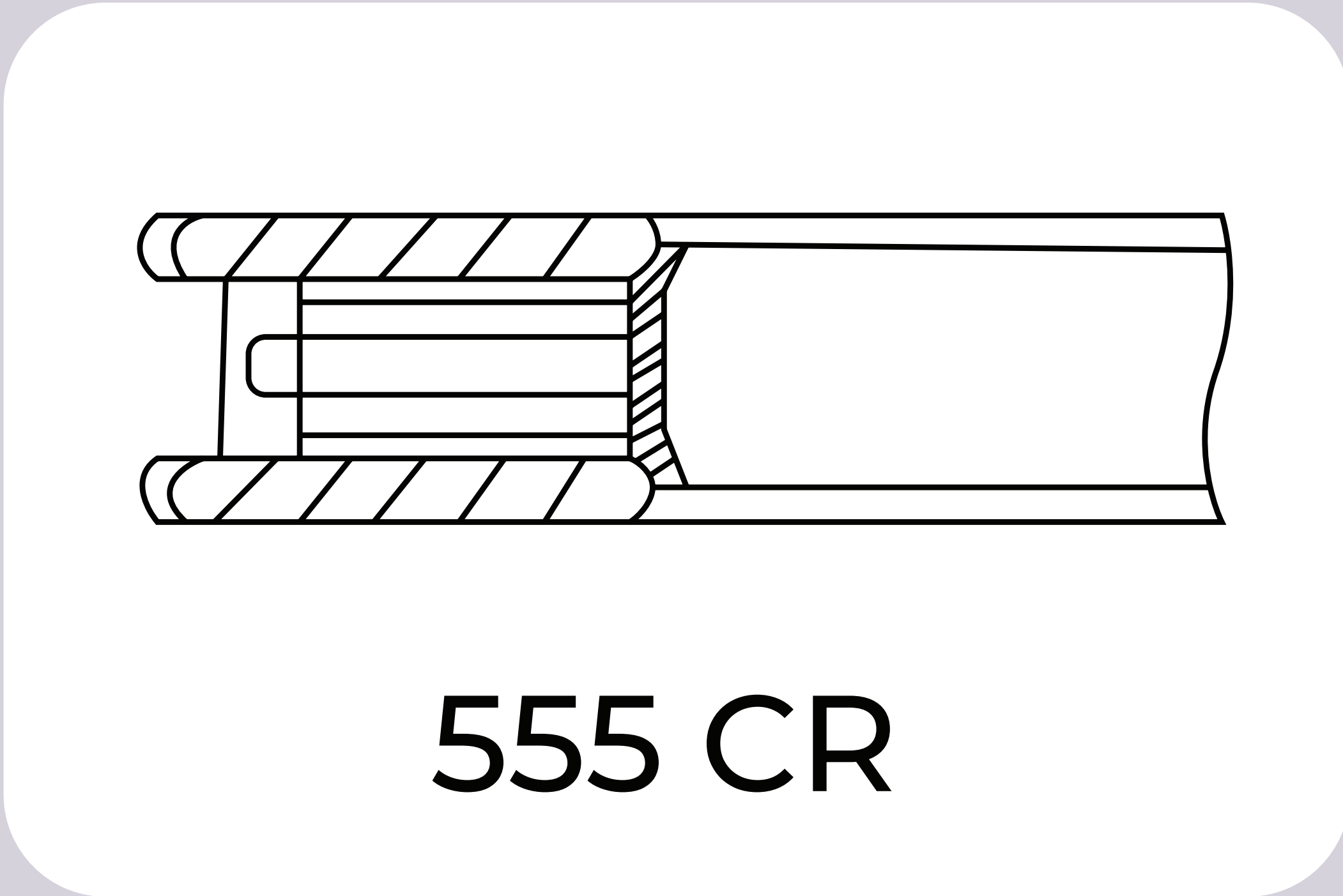
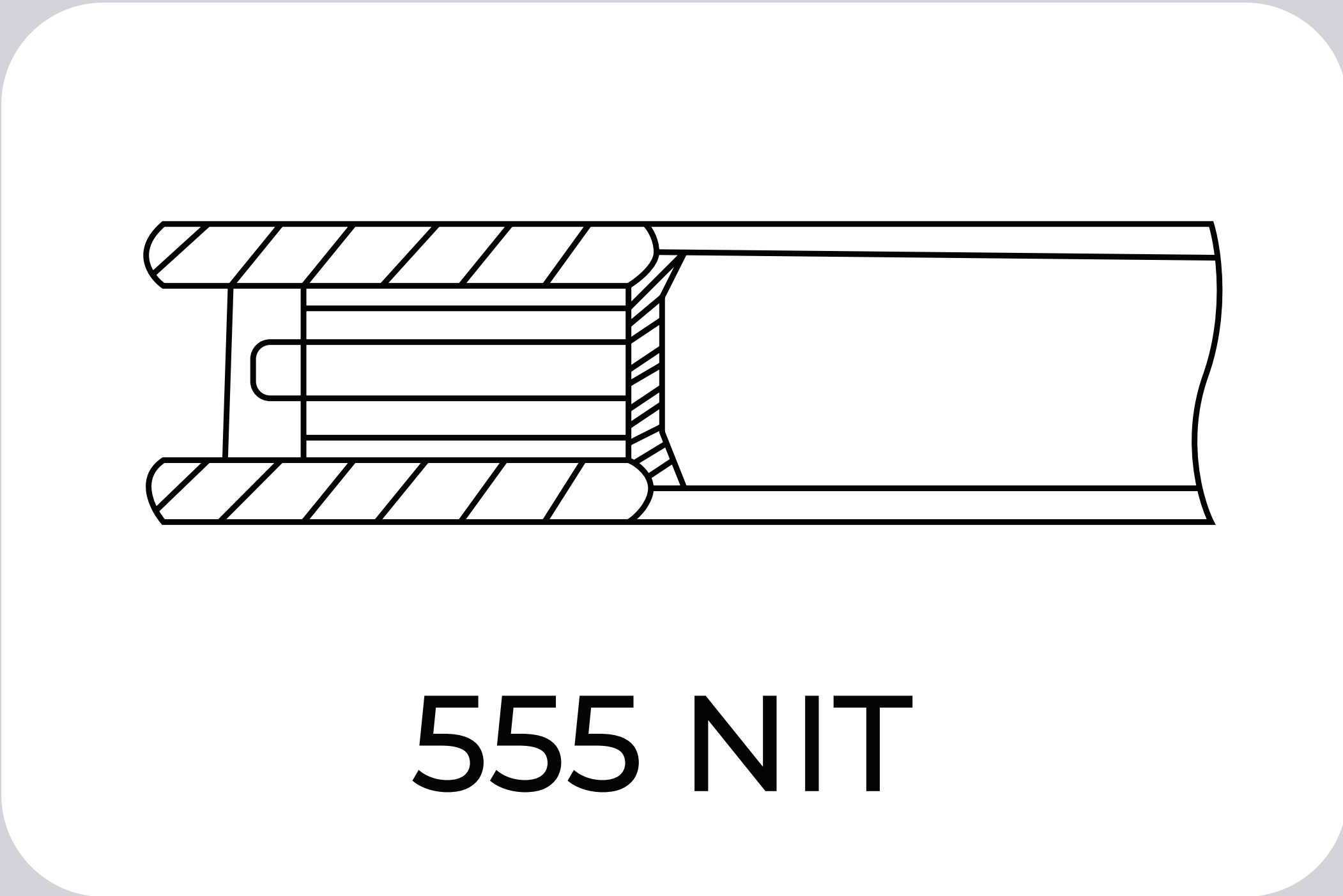


505 EX



# TYPES AND CROSS SECTIONS PISTON RINGS

## 555 THREE PIECE STEEL RAIL OIL CONTROL RING



### RING DENOMINATIONS

<b>IF</b> Inner Bevel	<b>IF U</b> Inner Bevel Bottom Side	<b>ES</b> Interrupted Gap
<b>IW</b> Inner Cut	<b>IW U</b> Inner Cut Bottom Side	

### COATINGS AND SURFACE TREATMENTS

<b>CR</b> Periphery Chrome-Plated	<b>FX</b> Periphery with Ferrox insert
<b>MO</b> Periphery Molybdenum-Plated	<b>P</b> Phosphated
<b>PL</b> Periphery Plasma Spray-Coated	<b>SN</b> Tin-Plated
<b>NIT</b> Nitrited	<b>IN</b> Coilspring & Interior of Oil Ring Chrome-Plated
<b>TF</b> Periphery Teflon-Coated	<b>FS</b> Joint with Side Notch
<b>4CR</b> all sides Chrome-Plated	<b>PVD</b> Physical Vapour Deposition
<b>3CR</b> Periphery not Chrome-Plated other sides Chrome-Plated	<b>CDS</b> Chrome-Diamond-Coating
<b>FE</b> Ferroxided	<b>CKS</b> Chrome-Ceramnic-Coating





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