

BÖLLHOFF

SEALING PLUG

Efficient sealing of holes



SEALING PLUG – High performance, low cost

Simply sealed! – SEALING PLUG permanently seals holes.

The SEALING PLUG is a two-part all-metal component which works according to the push/pull expansion principle. It is used to permanently close and seal holes in pneumatic and hydraulic components and systems. Simply insert the SEALING PLUG into the drilled hole, expand the plug and seal the hole. This highly efficient method means there is no need for tapping or reaming of holes. Furthermore, additional sealants are not required.

The SEALING PLUG can be used to regulate and control all types of flow as it can withstand operating pressures of up to 500 bar.

Method / principle

The SEALING PLUG with ball works according to the push-expansion principle. The ball is pushed into the sleeve, causing it to expand.

The SEALING PLUG with mandrel and the PULLPLUG™ work according to the pull-expansion principle. The mandrel / pin is pulled into the sleeve, causing it to expand. All versions of the SEALING PLUG feature serrations on the outside of the sleeve, which anchor the SEALING PLUG into the housing material as it expands. This additionally increases the performance of the SEALING PLUG.

Application areas

SEALING PLUGS can be used to control and regulate all kinds of flow. Typical applications include, for example, motors, power and drive trains, chassis and brake systems, steering and injection components as well as various hydraulic applications.

Advantages at a glance:

- Permanent closure and sealing of holes
- Up to 500 bar operating pressure
- Easy installation
- No tapping or reaming of holes required
- Use of additional sealants not required
- Process reliable and reproducible

SEALING PLUG with ball – Series 11

Available in diameters
from 3 mm to 22 mm.

- Push-expansion principle
- Up to 350 bar operating pressure

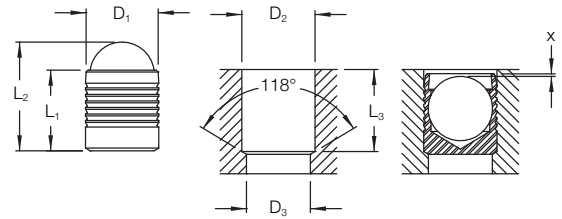
Version:

Sleeve:

- 1** Case Hardening Steel,
Zinc-Plated (CrVI-free)

Ball:

- 1** Bearing Steel,
Black Oxide Finished



								Conversion table	
D ₁	L ₁	L ₂	D ₂ +0.1 / -0.0	D ₃ max.	L ₃ min.	x +/-0.2	Böllhoff Article no.	KVT Article no.	Farmington Article no.
3.0	3.6	4.6	3.0	2.2	3.4	0.4	ET11030	MB850-030	CVMS0031110A
4.0	4.0	5.2	4.0	3.3	3.8	0.2	ET11040	MB850-040	CVMS0041110A
5.0	5.5	7.1	5.0	4.3	5.3	0.4	ET11050	MB850-050	CVMS0051110A
6.0	6.5	8.7	6.0	5.3	6.3	0.4	ET11060	MB850-060	CVMS0061110A
7.0	7.5	10.2	7.0	6.4	7.3	0.4	ET11070	MB850-070	CVMS0071110A
8.0	8.5	11.6	8.0	7.4	8.3	0.3	ET11080	MB850-080	CVMS0081110A
9.0	10.0	13.6	9.0	8.4	9.8	0.4	ET11090	MB850-090	CVMS0091110A
10.0	11.0	15.2	10.0	9.4	10.8	0.4	ET11100	MB850-100	CVMS0101110A
12.0	13.0	17.9	12.0	10.6	12.8	0.4	ET11120	MB850-120	CVMS0121110A
14.0	15.0	20.6	14.0	12.7	14.5	0.4	ET11140	MB850-140	CVMS0141110A
16.0	17.0	23.4	16.0	14.7	16.5	0.6	ET11160	MB850-160	CVMS0161110A
18.0	19.0	26.4	18.0	16.7	18.5	0.6	ET11180	MB850-180	CVMS0181110A
20.0	22.0	30.1	20.0	18.7	21.5	0.8	ET11200	MB850-200	CVMS0201110A
22.0	25.0	34.0	22.0	20.7	24.5	0.8	ET11220	MB850-220	CVMS0221110A
i Appropriate tools on request.									



Appropriate tools on request.

	Installation materials						
	SAE 1144 ETG100	SAE 10L15 C15Pb	ASTM A48 GG-25	ASTM A356 GGG-50	2024-T4 AlCuMg2	EN 6061-T6 AlMg1SiCu*	356-T6 G-AlSi7Mg
Ø 3 — 10 mm							
Test pressure	16.000 psi/ 1.100 bar					14.500 psi/ 1.000 bar	
Maximum operating pressure	5.000 psi/ 350 bar					4.500 psi/ 320 bar	
Ø 12 — 22 mm							
Test pressure	13.000 psi/ 900 bar					11.500 psi/ 800 bar	
Maximum operating pressure	4.000 psi/ 280 bar					3.500 psi/ 250 bar	

* Material composition similar to AlMgSiPb / EN 6005 / EN 6012

SEALING PLUG with ball – Series 3 1

Available in diameters
from 3 mm to 22 mm.

- Push-expansion principle
- Up to 450 bar operating pressure

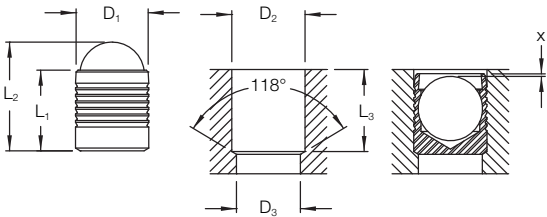
Version:

Sleeve:


3 Stainless Steel,
AISI 300

Ball:

1 Bearing Steel,
Black Oxide Finish



								Conversion table	
D ₁	L ₁	L ₂	D ₂ +0.1 / -0.0	D ₃ max.	L ₃ min.	x +/-0.2	Böllhoff Article no.	KVT Article no.	Farmington Article no.
3.0	3.6	4.6	3.0	2.2	3.4	0.4	ET31030	MB700-030	CVMS0033110A
4.0	4.0	5.2	4.0	3.3	3.8	0.2	ET31040	MB700-040	CVMS0043110A
5.0	5.5	7.1	5.0	4.3	5.3	0.4	ET31050	MB700-050	CVMS0053110A
6.0	6.5	8.7	6.0	5.3	6.3	0.4	ET31060	MB700-060	CVMS0063110A
7.0	7.5	10.2	7.0	6.4	7.3	0.4	ET31070	MB700-070	CVMS0073110A
8.0	8.5	11.6	8.0	7.4	8.3	0.3	ET31080	MB700-080	CVMS0083110A
9.0	10.0	13.6	9.0	8.4	9.8	0.4	ET31090	MB700-090	CVMS0093110A
10.0	11.0	15.2	10.0	9.4	10.8	0.4	ET31100	MB700-100	CVMS0103110A
12.0	13.0	17.9	12.0	10.6	12.8	0.4	ET31120	MB700-120	CVMS0123110A
14.0	15.0	20.6	14.0	12.7	14.5	0.4	ET31140	MB700-140	CVMS0143110A
16.0	17.0	23.4	16.0	14.7	16.5	0.6	ET31160	MB700-160	CVMS0163110A
18.0	19.0	26.4	18.0	16.7	18.5	0.6	ET31180	MB700-180	CVMS0183110A
20.0	22.0	30.1	20.0	18.7	21.5	0.8	ET31200	MB700-200	CVMS0203110A
22.0	25.0	34.0	22.0	20.7	24.5	0.8	ET31220	MB700-220	CVMS0223110A

 Appropriate tools on request.

	Installation materials						
	SAE 1144 ETG100	SAE 10L15 C15Pb	ASTM A48 GG-25	ASTM A356 GGG-50	2024-T4 AlCuMg2	EN 6061-T6 AlMg1SiCu*	356-T6 G-AlSi7Mg
Ø 3 — 10 mm							
Test pressure	20.000 psi / 1.400 bar					17.500 psi / 1.200 bar	
Maximum operating pressure	6.500 psi / 450 bar					5.500 psi / 380 bar	
Ø 12 — 22 mm							
Test pressure	16.500 psi / 1.150 bar					13.000 psi / 900 bar	
Maximum operating pressure	5.000 psi / 350 bar					4.000 psi / 280 bar	

* Material composition similar to AlMgSiPb / EN 6005 / EN 6012

SEALING PLUG with ball – Series 3 3

Available in diameters
from 3 mm to 22 mm.

- Push-expansion principle
- Up to 450 bar operating pressure

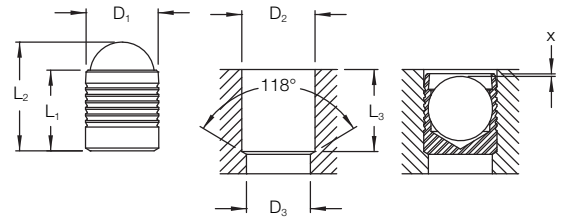
Version:

Sleeve:

3 Stainless steel,
AISI 300

Ball:

3 Stainless steel,
AISI 300



							Conversion table	
D ₁	L ₁	L ₂	D ₂ +0.1 / -0.0	D ₃ max.	L ₃ min.	x +/-0.2	Böllhoff Article no.	
3.0	3.6	4.6	3.0	2.2	3.4	0.4	ET33030	MB600-030
4.0	4.0	5.2	4.0	3.3	3.8	0.2	ET33040	MB600-040
5.0	5.5	7.1	5.0	4.3	5.3	0.4	ET33050	MB600-050
6.0	6.5	8.7	6.0	5.3	6.3	0.4	ET33060	MB600-060
7.0	7.5	10.2	7.0	6.4	7.3	0.4	ET33070	MB600-070
8.0	8.5	11.6	8.0	7.4	8.3	0.3	ET33080	MB600-080
9.0	10.0	13.6	9.0	8.4	9.8	0.4	ET33090	MB600-090
10.0	11.0	15.2	10.0	9.4	10.8	0.4	ET33100	MB600-100
12.0	13.0	17.9	12.0	10.6	12.8	0.4	ET33120	MB600-120
14.0	15.0	20.6	14.0	12.7	14.5	0.4	ET33140	MB600-140
16.0	17.0	23.4	16.0	14.7	16.5	0.6	ET33160	MB600-160
18.0	19.0	26.4	18.0	16.7	18.5	0.6	ET33180	MB600-180
20.0	22.0	30.1	20.0	18.7	21.5	0.8	ET33200	MB600-200
22.0	25.0	34.0	22.0	20.7	24.5	0.8	ET33220	MB600-220
								Farmington Article no.
								CVMS0033130A
								CVMS0043130A
								CVMS0053130A
								CVMS0063130A
								CVMS0073130A
								CVMS0083130A
								CVMS0093130A
								CVMS0103130A
								CVMS0123130A
								CVMS0143130A
								CVMS0163130A
								CVMS0183130A
								CVMS0203130A
								CVMS0223130A



Appropriate tools on request.

		Installation materials						
		SAE 1144 ETG100	SAE 10L15 C15Pb	ASTM A48 GG-25	ASTM A356 GGG-50	2024-T4 AlCuMg2	EN 6061-T6 AlMg1SiCu*	356-T6 G-AlSi7Mg
Ø 3 — 10 mm								
Test pressure		20.000 psi / 1.400 bar					17.500 psi / 1.200 bar	
Maximum operating pressure		6.500 psi / 450 bar					5.500 psi / 380 bar	
Ø 12 — 22 mm								
Test pressure		16.500 psi / 1.150 bar					13.000 psi / 900 bar	
Maximum operating pressure		5.000 psi / 350 bar					4.000 psi / 280 bar	

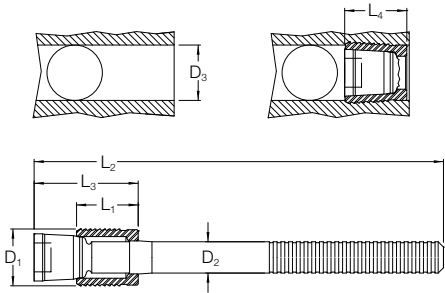
* Material composition similar to AlMgSiPb / EN 6005 / EN 6012

SEALING PLUG with mandrel – RS series

Available in diameters
from 4 mm to 9 mm.

- Pull-expansion principle
- Up to 500 bar operating pressure


Version:
Sleeve: Case Hardened Steel, Black Oxide Finish
Pin: Heat Treatable Steel, Black Oxide Finish



With either standard (RS) or long mandrel (RSL).

Standard mandrel length (RS)

							Conversion table	
D ₁	L ₁	D ₂	L ₂	L ₃ max.	L ₄ max.	D ₃ +0.12 / -0.0	Böllhoff Article no.	KVT Article no.
4.0	4.5	2.50	39.0	9.0	6.5	4.0	ETRS040	SK550-040
5.0	5.5	3.00	41.0	10.0	7.5	5.0	ETRS050	SK550-050
6.0	6.5	3.40	43.0	12.0	8.0	6.0	ETRS060	SK550-060
7.0	7.5	4.10	38.0	14.0	9.0	7.0	ETRS070	SK550-070
8.0	8.5	4.20	40.0	15.0	10.5	8.0	ETRS080	SK550-080
9.0	9.5	4.50	43.0	17.0	11.0	9.0	ETRS090	SK550-090

 Appropriate tools on request. Special materials on request.

Installation materials						
SAE 1144 ETG100	SAE 10L15 C15Pb	ASTM A48 GG-25	ASTM A356 GGG-50	2024-T4 AlCuMg2	EN 6061-T6 AlMg1SiCu*	356-T6 G-AISi7Mg
Ø 4 – 10 mm						
Test pressure		23.000 psi / 1.600 bar			20.000 psi / 1.400 bar	
Maximum operating pressure		7.000 psi / 500 bar			6.500 psi / 450 bar	

* Material composition similar to AlMgSiPb/EN 6005/EN 6012

PULLPLUG™ – RST series

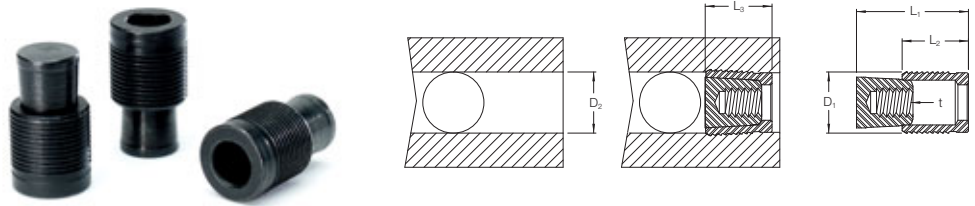
**Available in diameters
from 6 mm to 22 mm.**

- Pull-expansion principle
- Up to 500 bar operating pressure

Version:

Sleeve: Case Hardening Steel, Black Oxide Finish

Pin: Heat Treatable Steel, Black Oxide Finish



D ₁	L ₁	D ₂ +0.1/-0.0	L ₂	L ₃	t	Böllhoff Article no.
6.0	11.0	6.0	6.5	7.0	M 3	ETRST060
7.0	13.0	7.0	7.5	8.0	M 3.5	ETRST070
8.0	14.0	8.0	8.5	9.0	M 4	ETRST080
9.0	16.0	9.0	9.5	10.0	M 4	ETRST090
10.0	18.0	10.0	10.5	11.0	M 5	ETRST100
12.0	21.0	12.0	12.5	13.0	M 5	ETRST120
14.0	25.0	14.0	14.5	15.0	M 6	ETRST140
16.0	28.0	16.0	16.5	17.0	M 8	ETRST160
18.0	31.5	18.0	18.5	19.0	M 8	ETRST180
20.0	35.0	20.0	20.5	21.0	M 10	ETRST200
22.0	38.5	22.0	22.5	23.0	M 10	ETRST220

i Appropriate tools on request. Special materials on request.

Advantages of PULLPLUG™ compared to SEALING PLUG with mandrel



- Less material = lower price
- No noise when mandrel breaks off
- No disposal of broken mandrel required
- No raw material after mandrel breaks off
- Higher process reliability as controlled by stroke and not by nominal breaking force
- Therefore, particularly suited to harder installation materials
- Creates a usable internal thread

SEALING PLUG – Installation guidelines

Installation guidelines for:

SEALING PLUG series 1 1 (ET11)

SEALING PLUG series 3 1 (ET31)

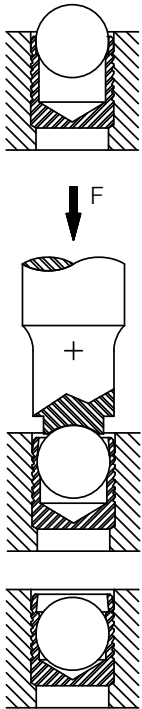
SEALING PLUG series 3 3 (ET33)

Drill holes

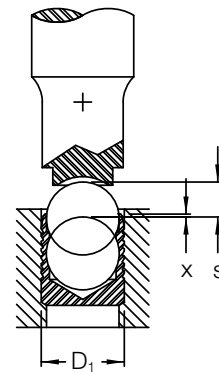
- Use the relevant catalogue sheet or drawing to determine the correct dimensions and tolerances.
- The roundness tolerances of the hole must be held within $t = 0.05$ mm.
- The surface roughness of the hole must be $RZ = 10 - 30$ μm .
- Longitudinal and spiral grooves may affect the performance and must be avoided.
- The holes must be free from burrs, oil and grease.

How to install

- Insert the SEALING PLUG with the ball facing outwards into the counterbored hole.
- The top of the sleeve must be below the contour of the workpiece.
- This can be ensured by complying with the hole dimensions and tolerances in the catalogue sheet.
- Push the ball into the sleeve so that the top of the ball is slightly below the top of the sleeve. The table below contains guideline values for the stroke s and the dimension x (position of ball).
- Please make sure that you use the correct installation tool for each size.



D_1	Stroke s	Position of top of ball relative to top of sleeve x
3.0	1.2	0.4
4.0	1.5	0.2
5.0	2.0	0.4
6.0	2.5	0.4
7.0	3.0	0.4
8.0	3.5	0.3
9.0	4.0	0.4
10.0	4.5	0.4
12.0	5.5	0.4
14.0	6.4	0.4
16.0	7.0	0.6
18.0	8.0	0.6
20.0	9.0	0.8
22.0	10.0	0.8

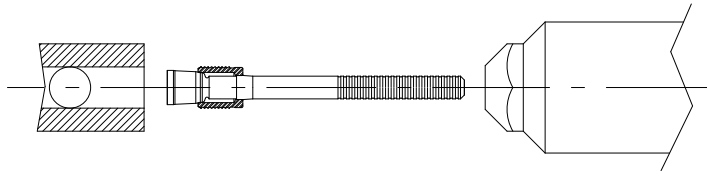


Installation guidelines for: SEALING PLUG RS series (ETRS – Rivet Style)

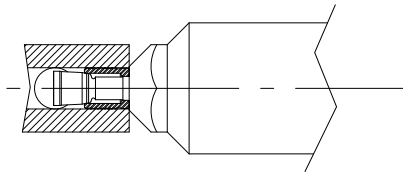
Drill holes

- Use the relevant catalogue sheet or drawing to determine the correct dimensions and tolerances.
- The roundness tolerances of the hole must be held within $t = 0.05 \text{ mm}$.
- The surface roughness of the hole must be $RZ = 10 - 30 \text{ }\mu\text{m}$.
- Longitudinal and spiral grooves may affect the performance and must be avoided.
- The holes must be free from burrs, oil and grease.

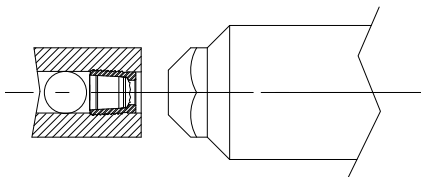
How to install



- Insert mandrel side into tool.



- Insert sleeve side into hole to be sealed.



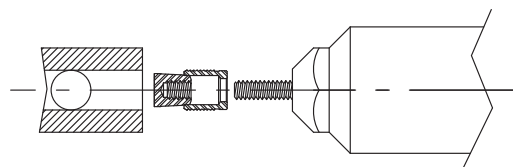
- By triggering the setting process, the pin is pulled until the nominal breaking force is reached and the mandrel breaks off. The pin is pulled into the sleeve, causing the sleeve to expand, and anchors itself in the installation material.

Installation guidelines for: PULLPLUG™ RST series (ETRST)

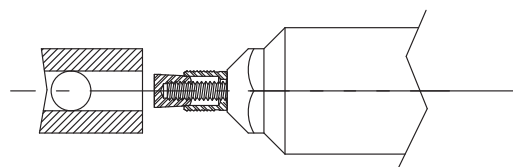
Drill holes

- Use the relevant catalogue sheet or drawing to determine the correct dimensions and tolerances.
- The roundness tolerances of the hole must lie within $t = 0.05 \text{ mm}$.
- The surface roughness of the hole must be $RZ = 10 - 30 \text{ }\mu\text{m}$.
- Longitudinal and spiral grooves may affect the performance and must be avoided.
- The holes must be free from burrs, oil and grease.

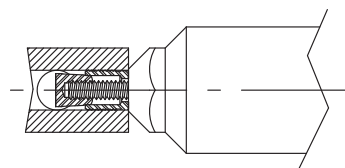
How to install



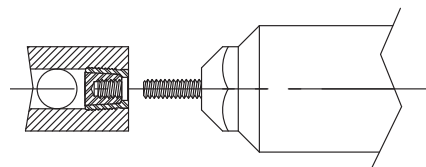
- Position tool and PULLPLUG™.



- Push PULLPLUG™ onto thread of tool. The PULLPLUG™ will automatically screw/thread itself on.



- Insert into hole to be sealed.

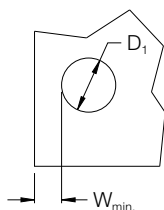


- By triggering the setting process, the pin is pulled along the preset stroke and then automatically unthreads itself. The pin is pulled into the sleeve, causing the sleeve to expand, and anchors itself in the installation material.

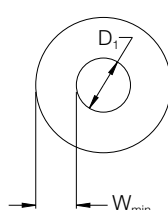
SEALING PLUG – Design guidelines for wall thicknesses and edge distances

Through semi-plastic radial expansion, the SEALING PLUG/PULLPLUG™ is anchored in the installation material. In order to optimise the anchoring and withstand the hydraulic pressures and thermal stresses that exist in the application, it is important to comply with minimal wall thicknesses/edge distances

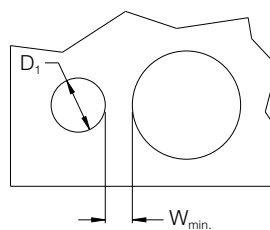
Distance to external contour (straight)



Distance to external contour (round)



Distance between holes









The guideline values for the minimum wall thicknesses and edge distances (W_{min}) are set out below. If you comply with these guideline values, only slight deformations ($\leq 20 \mu m$) may occur on the external contours of the installation material. This will not affect the performance of the SEALING PLUG/PULLPLUG™. If the wall thicknesses and edge distances are below the W_{min} guideline values, the function of the SEALING PLUG/PULLPLUG™ cannot be guaranteed. If this is the case, please contact us and we will be happy to advise you. Together we can find a solution for your application.

Guideline value W_{min} for wall thicknesses and edge distances

$$D_1 \geq 4 \text{ mm: } W_{min} = f_{min} \times D_1$$

$$D_1 < 4 \text{ mm: } W_{min} = f_{min} \times D_1 + 0,5 \text{ mm}$$

	Installation materials						
	SAE 1144 ETG100	SAE 10L15 C15Pb	ASTM A48 GG-25	ASTM A356 GGG-50	2024-T4 AlCuMg2	EN 6061-T6 AlMg1SiCu*	356-T6 G-AlSi7Mg
Article	Factor f _{min.}						
SEALING PLUG series  	0.5	0.6	1.0	0.6	0.6	1.0	1.0
SEALING PLUG series  	0.6	0.8	1.0	0.8	0.8	1.0	1.0
SEALING PLUG series  	0.6	0.8	1.0	0.8	0.8	1.0	1.0
SEALING PLUG RS series	0.5	0.6	1.0	0.6	0.6	1.0	1.0
PULLPLUG™ RST series	0.5	0.6	1.0	0.6	0.6	1.0	1.0

* Material composition similar to AlMgSiPb/EN 6005/EN 6012

All dimensions specified in mm.

More interesting products for you



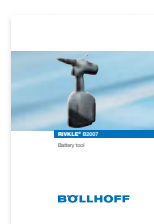
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Sealing nuts for high-strength screw joints

Catalog no. 0500

On the internet:

<https://www.boellhoff.com/de-en/seal-lock>



RIVKLE® B2007

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Catalog no. RK B2007

On the internet:

<https://www.boellhoff.com/de-en/rivkle-b2007>



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