



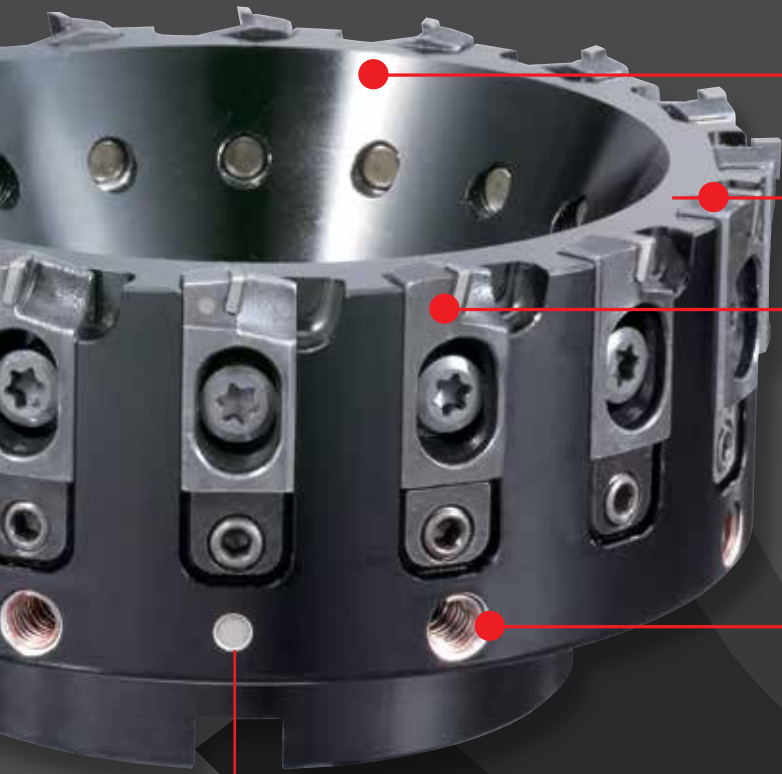
Finishing cutter for Aluminium

PFAL

Volume 1

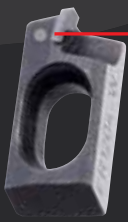


KEY FEATURES: PHOENIX PFAL



- 1 Excellent balance
- 2 High efficiency
- 3 PCD integrated blades
- 4 High precision balancing

Wiper blade position indicator



Wiper blade indicator

Wiper blade



Normal blade

WIPER BLADE

Enables superior surface finish

Mount in designated position

NORMAL BLADE

Enables stable milling with multiple blades configuration

Mount in any cutter body slots (except wiper blade position)

Incredibly lightweight with Aluminum body construction

Broad size lineup to accommodate various cutting environment, even small machining centers.

Standardized wiper blade

The wiper blade enables a superior surface finish. One wiper blade is used per cutter body; for mounting in the designated position. The wiper blade can be recognized from the indicator on the blade

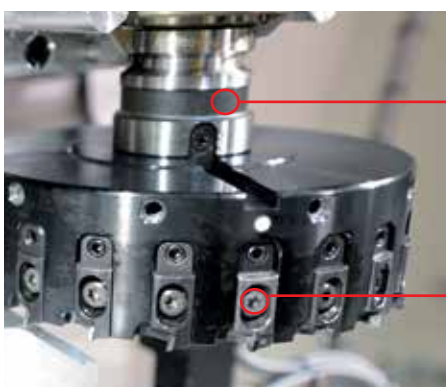


Normal blade

The normal blades are configured for stable milling. The normal blades are mounted in any of the cutter body slots except for the wiper blade position (see image).

PFAL Ø160 with BT30

Bore diameters of Ø25.4 and Ø27 are standard offering in the PFAL Ø160 cutter lineup



| | | | | |
|---|---|--|---|---------------------------------------|
| Face mill arbor BT30-FMA25.4-45 Weight 0,90 kg | + | PFAL Ø160 PFAL04R160M25.4-20 Weight 1,98 kg | = | Total Weight 2,88 kg |
|---|---|--|---|---------------------------------------|

Component examples

Aluminium automotive component solutions

- Clutch housing
- Transmission case
- Cylinder head
- Cylinder block



Spare parts compatibility

The spare parts are compatible with all cutter sizes. The rigidity is improved for the large clamping screw M6 and the eady cutting edge adjustment reduces the required setup time.

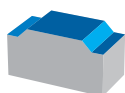


PFAL BORE

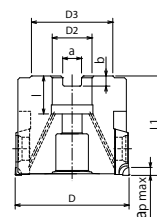
Milling | Indexables



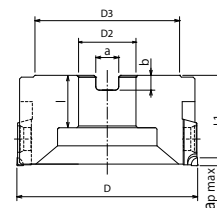
- Face milling finishing cutter for aluminium
- PCD blades
- Bore type
- 50 -160 mm



Type 1



Type 2



| EDP | Designation | Z | D | D3 | D2 | L1 | l | a | b | Type | Price |
|---------|------------------|----|-----|----|----|----|----|------|-----|------|-------|
| 7803600 | PFAL04R050M16-5 | 5 | 50 | 40 | 16 | 55 | 20 | 8,4 | 5,6 | 1 | |
| 7803601 | PFAL04R063M22-6 | 6 | 63 | 45 | 22 | 55 | 21 | 10,4 | 6,3 | 1 | |
| 7803602 | PFAL04R063M22-8 | 8 | 63 | 45 | 22 | 55 | 21 | 10,4 | 6,3 | 1 | |
| 7803604 | PFAL04R080M27-8 | 8 | 80 | 70 | 27 | 50 | 28 | 12,4 | 7 | 2 | |
| 7803606 | PFAL04R080M27-10 | 10 | 80 | 70 | 27 | 50 | 28 | 12,4 | 7 | 2 | |
| 7803608 | PFAL04R100M27-8 | 8 | 100 | 80 | 27 | 50 | 28 | 12,4 | 7 | 2 | |
| 7803610 | PFAL04R100M32-8 | 8 | 100 | 80 | 32 | 50 | 28 | 14,4 | 8,2 | 2 | |
| 7803612 | PFAL04R100M27-12 | 12 | 100 | 80 | 27 | 50 | 28 | 12,4 | 7 | 2 | |
| 7803614 | PFAL04R100M32-12 | 12 | 100 | 80 | 32 | 50 | 28 | 14,4 | 8,2 | 2 | |
| 7803616 | PFAL04R125M27-10 | 10 | 125 | 80 | 27 | 50 | 28 | 12,4 | 7 | 2 | |
| 7803618 | PFAL04R125M40-10 | 10 | 125 | 85 | 40 | 63 | 30 | 16,4 | 9,2 | 2 | |
| 7803620 | PFAL04R125M27-16 | 16 | 125 | 80 | 27 | 50 | 28 | 12,4 | 7 | 2 | |
| 7803622 | PFAL04R125M40-16 | 16 | 125 | 85 | 40 | 63 | 30 | 16,4 | 9,2 | 2 | |
| 7803624 | PFAL04R160M27-12 | 12 | 160 | 80 | 27 | 50 | 28 | 12,4 | 7 | 2 | |
| 7803625 | PFAL04R160M40-12 | 12 | 160 | 85 | 40 | 63 | 30 | 16,4 | 9,2 | 2 | |
| 7803630 | PFAL04R160M27-20 | 20 | 160 | 80 | 27 | 50 | 28 | 12,4 | 7 | 2 | |
| 7803627 | PFAL04R160M40-20 | 20 | 160 | 85 | 40 | 63 | 30 | 16,4 | 9,2 | 2 | |

Milling | Indexables



90 degrees

Accessories & spare parts

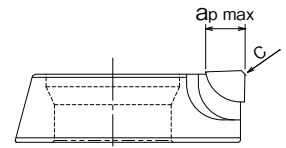
| Applicable cutter | Clamping screw | | Wedge | | Clamping screw for wedge | | L-wrench (for wedge) | | T-Handle wrench (for insert) | |
|-------------------|----------------|------------------|---------|--------|--------------------------|--------|----------------------|-------|------------------------------|-------|
| Ø 50~160 | 7808125 | FS60620 (Torx25) | 7808143 | W12-06 | 7808142 | WS0617 | 7808231 | 3MM-L | 7808211 | T25-T |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

PFAL INSERTS

Milling | Indexables

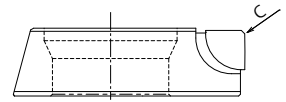


Type 1



Normal blade

Type 2



Wiper blade

- Face milling finishing cutter for aluminium
- PCD blades

| EDP | Designation | Z | C | Type | ap max | Grade | P | | M | | K | | N | | S | | H | | Price |
|---------|-------------|---|---------|------|--------|-------|-----|---|-----|---|----|-----|-----|---|-----|---|-----|---|-------|
| | | | | | | | dry | 👉 | dry | 👉 | GG | GGG | dry | 👉 | dry | 👉 | dry | 👉 | |
| 7820500 | FR1204 | 1 | 0,4x45° | 1 | 4 | DP010 | | | | | | ● | ● | | | | | | |
| 7820502 | FR1206 | 1 | 0,4x45° | 1 | 6 | DP010 | | | | | | ● | ● | | | | | | |
| 7820501 | FR1204-W | 1 | 0,4x45° | 2 | - | DP010 | | | | | | ● | ● | | | | | | |

Cutting conditions

| Work Material | Component | Material | Application | Vc (m/min) | | Feed per Tooth fz (mm/t) | Depth of cut ap (mm) |
|---------------|-----------------|----------|----------------------------|----------------|---------------------|--------------------------|----------------------|
| | | | | BT30 | BT40, BT50 HSK63 | | |
| N | Aluminium Alloy | ~ 12% Si | A7075, A5052, A2017, ADC12 | Semi-finishing | 1.000 | 2.000 | 0.08 (0.05 ~ 0.10) |
| | | | | Finishing | (800~2.000) | (1.000~5.000) | 0.06 (0.05 ~ 0.08) |
| | Aluminium Alloy | ~ 13% Si | AC9A, AC98 | Semi-finishing | 600 (400 ~ 800) | | 0.08 (0.05 ~ 0.10) |
| | | | | Finishing | | | 0.06 (0.05 ~ 0.08) |



CUTTING DATA

Milling | Indexables

BT30 high efficiency milling on BT30 with PFAL Ø160

The use of a large-diameter cutter allows processing of a wide area in one pass with no overlap marks. Stable and high quality surface finish was achieved for semi-finishing and finishing even in small machining centers such as the BT30.

| Tool | PFAL04R160M25.4-20 Ø160x20 flutes | |
|-------------------|---------------------------------------|---------------------------------------|
| Application | Semi-finishing | Finishing |
| Work material | ADC12 | |
| Cutting speed | 1.000 m/min(2.000 min ⁻¹) | 2.000 m/min(4.000 min ⁻¹) |
| Feed | 3.200 mm/min(0,08mm/t) | 6.400 mm/min(0,08mm/t) |
| Depth of cut | ap=2mm ae=100mm | ap=0,2mm ae=100mm |
| Coolant | Water soluble | |
| Machine | Vertical Machining Center | |
| Surface Roughness | Ra=0,25µm Rz=1,22µm | Ra=0,12µm Rz=0,96µm |



High precision milling of aluminium component

The PFAL cutter had doubled milling efficiency without chattering, enabling an excellent surface finish.

| Tool | PFAL04R080M25.4-10 Ø80x10 flutes | Competitor (Ø80x6 flutes) |
|-------------------|--|------------------------------|
| Work Material | ADC12 | |
| Cutting Speed | 3.000 m/min(12.000 min ⁻¹) | |
| Feed | 14.400 mm/min (0,12mm/t) | 7.200 mm/min (0,1mm/t) |
| Depth of Cut | ap=0,5mm ae=53mm | |
| Coolant | Water soluble | |
| Machine | Horizontal Machining Center | |
| Surface Roughness | Ra=0.17 ~ 0.22µm Rz=1.08 ~ 1.24µm | |



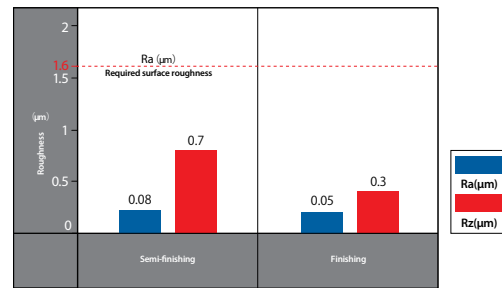
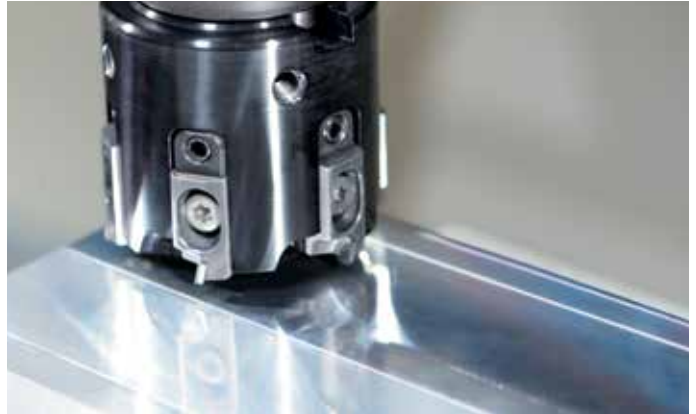
CUTTING DATA

Milling | Indexables

High precision milling of aluminium component

Semi-finishing and finishing took place with the BT30 small machining center. The PFAL cutter was able to meet the required surface roughness in both processes. Moreover, the number of passes was reduced from 2 to 1 during both semi-finishing and finishing, shortening machining time.

| Tool | PFAL04R063M22-6 Ø63x6 flutes | |
|-------------------|---|---|
| Application | Semi-finishing | Finishing |
| Work Material | ADC12 | |
| Cutting Speed | 1.000 m/min (5.000 min ⁻¹) | 1.500 m/min (7.500 min ⁻¹) |
| Feed | 3.000 mm/min (0,1mm/t) | 4.500 mm/min (0,1mm/t) |
| Depth of Cut | ap=2mm ae=34mm | ap=0,2mm ae=34mm |
| Coolant | Water soluble | |
| Machine | Horizontal Machining Center | |
| Surface Roughness | Ra=0,08µm Rz=0,7µm | Ra=0,05µm Rz=0,3µm |



Analysis of cutting chip shape

The cutter body must avoid direct contact with cutting chips. Cutting chips are processed through the blade's chip pocket to prevent them from coming into contact with the cutter body.

The cutting chip does not come in direct contact with the body!

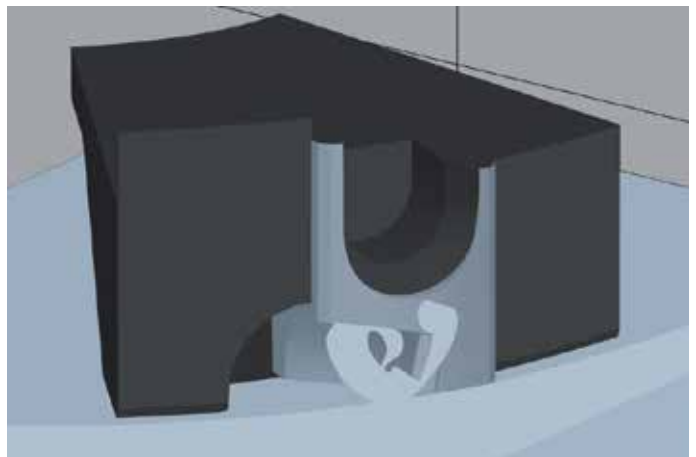


Image of chip evacuation

Instructions for adjusting the cutting edge height

1 Confirm wedge position

Check and ensure that all wedges are in the correct position. Make adjustments when necessary.



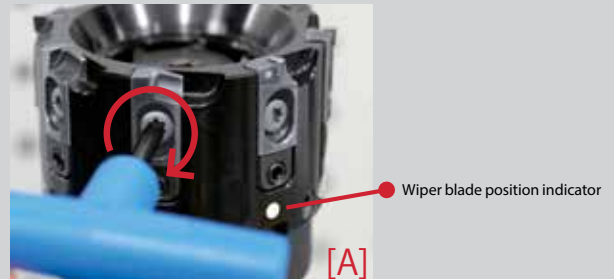
Correct



Incorrect

2 Mounting of blades

Mount one wiper blade (FR1204-W) to the wiper blade position indicator and the normal blades (FR1204 or FR1206) to the remaining positions. Using the T-Wrench [A], tighten the clamp screw completely to 10Nm.

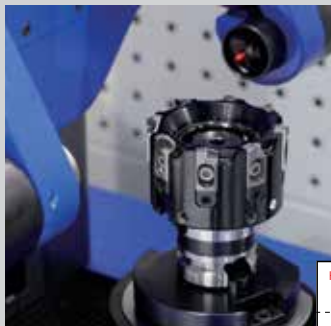


Wiper blade position indicator

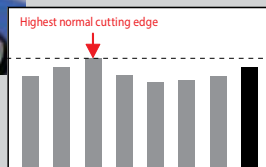
[A]

3 Measurement of cutting edge height

Measure all of the cutting edge heights and determine the highest normal cutting edge.



Cutting edge height



■ Normal blade
■ Wiper blade

4 Adjustment of normal blades

Adjust all other normal cutting edges to match the highest normal cutting edge height. The offset should be within 0.005mm. To lift the wedges, use the L-Wrench [B] to turn the wedge screw clockwise.



[B]

Cutting edge height



■ Normal blade
■ Wiper blade

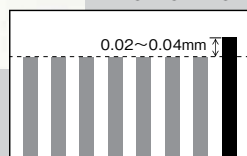
5 Adjustment of wiper blade

Use the L-Wrench [B] to adjust the wiper blade so that it is 0.02 - 0.04mm higher than the other normal blades.



[B]

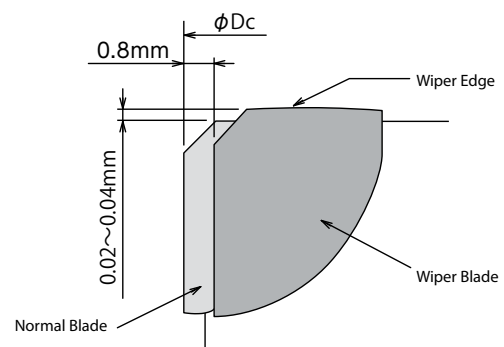
Cutting edge height



■ Normal blade
■ Wiper blade

Cutting edge position of the wiper blade

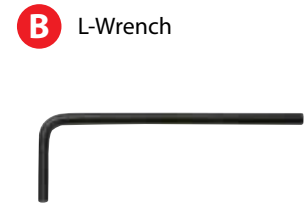
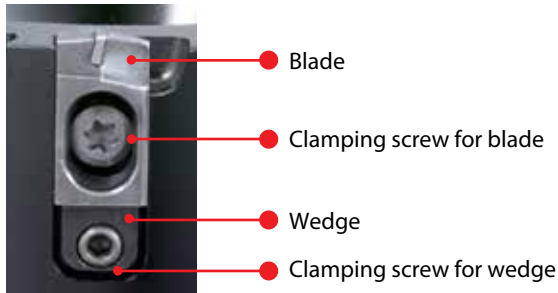
The wiper blade is automatically set to be 0.8mm closer to the interior than the normal blade. Based on this design, only the bottom of the wiper edge is used during processing, thus enabling a high quality surface finish even in high depth (ap) milling.



TECHNICAL DATA

Milling | Indexables

Spare parts & accessoires



IMPORTANT NOTE !

Blades can be adjusted by lifting upward only

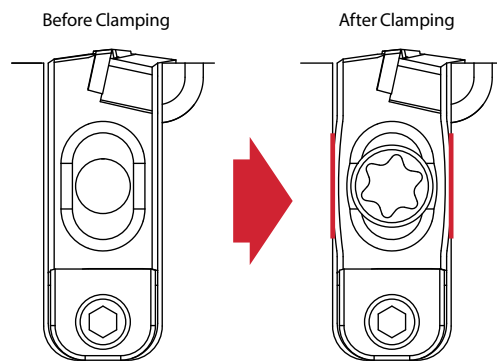
Maximum adjustment is 0.6mm

When the maximum adjustment limit is reached, remove the blade and start over from step 1

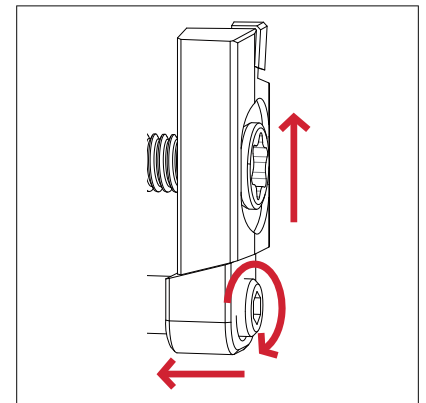
When measuring the edge height using a contact tool presetter with a touch probe

Please be cautious to not damage the PCD edge

Temporary tightening is not required. Cutting edge height can be adjusted after complete tightening of the clamping screw, making the setup process quick and effortless.



The tightening of the clamping screw pushes sides of the blade outward, locking it tightly in place with the cutter body



After tightening the clamping screw, the blade is locked into position secured by the wedge taper. The wedge assures a fix and unmovable blade position during machining.

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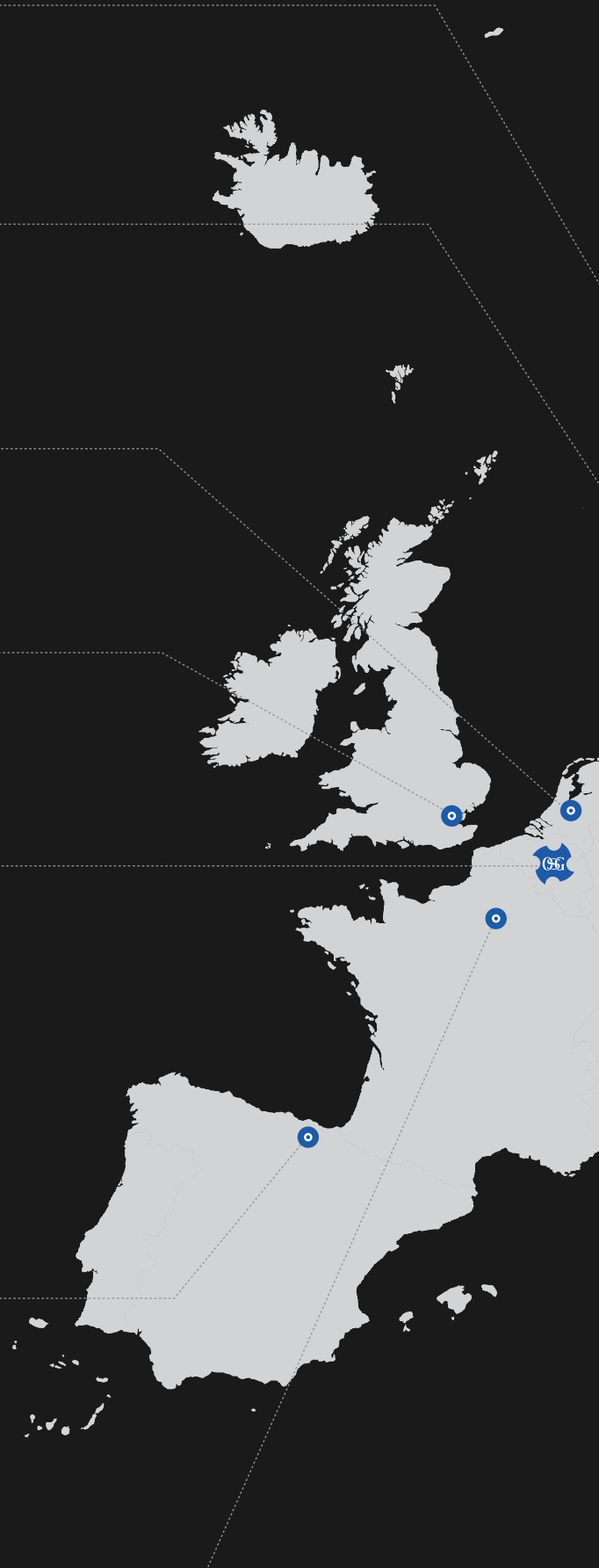
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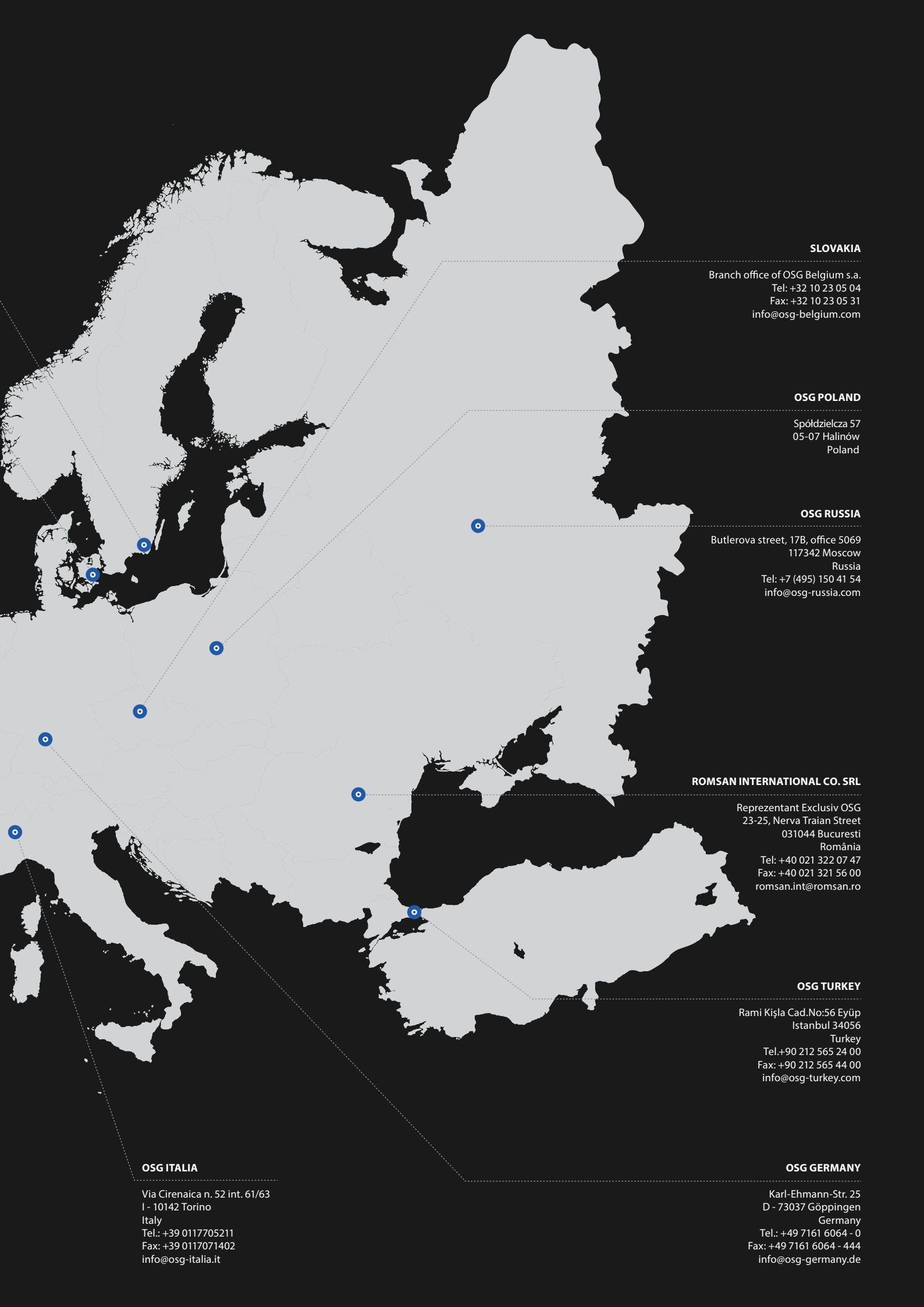
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