

SHOP MANUAL



GUIDANCE FOR REUSABLE PARTS

HST (piston motors)

CONTACT CHECKING OF INNER PARTS



KOMATSU

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INTRODUCTION

The piston motors of HST consist of three vital inner parts, CYLINDER BARREL, BEARING PLATE and END CAP. The most important point of rebuilding the motor of HST is to make correct contact of mating surfaces between these three parts.

This GUIDANCE provides new method of CONTACT CHECKING and its skill. It includes photographs of various types of CONTACT CHECKING SAMPLE so that judgement can be made visually as to whether a part can be used again or must be repaired by lapping.

The CONTACT CHECKING method has changed in the KAWASAKI plant to increase the accuracy. So the method introduced on the GUIDANCE, SEBG4240-1 must be changed to the new method on this GUIDANCE.

The judgement of contact requires accumulated experience together with skill and practice so we prepared also a video tape of real CONTACT CHECKING acted by a real KAWASAKI plant veteran worker as an additional and helpful material to this GUIDANCE.

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STANDARDS FOR CHECKING CONTACT OF CYLINDER BARREL (C/B) AND BEARING PLATE (B/P)

1. PURPOSE

This work procedure has been prepared to reduce the variation between workers arising from the method of measuring the contact of the cylinder barrel and bearing plate.

2. WORK PROCEDURE

2-1 Cleaning inspection work piece

- (1) Using a waste cloth, wipe off the dirty oil lightly from the work piece.
- (2) Using cleaning fluid, remove all the dirty grease and oil from the work piece.
- (3) Check the surface of the work piece to confirm that there are no burrs, sharp edges, or lapping powder embedded in the surface.
- (4) If any foreign material is found, press gum tape strongly against the surface of the work piece to remove the foreign material, and wash the surface again with cleaning fluid.

2-2 Painting with oil color

Paint the whole surface of the cylinder barrel with oil color, Prussian Blue.

- (1) Push a small amount of Prussian Blue out on to a piece of paper.
(The paint evaporates and becomes hard, so only use the necessary amount for each lot.)
- (2) Use the tip of your finger to dab paint on about 20 places on the surface of the cylinder barrel. (See Fig. 1)

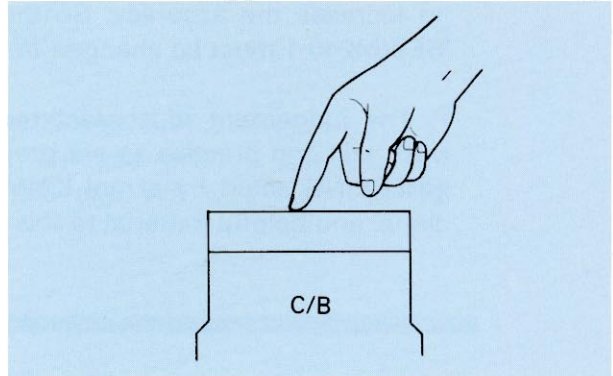


Fig. 1

- (3) Use your finger to spread the paint over the whole surface to a uniform thickness. (See P.8)
(*Use the standard for the amount of paint for reference to get the feeling.)

2-3 Rubbing together

- (1) Insert the specified collar in the cylinder barrel center hole, and fit the bearing plate on top. (See Fig. 2)
- (2) Push down on the whole bearing plate with both hands, and rotate the bearing plate about 5° from side to side three times to rub the surfaces together.
(Press with a force of 35 kg ~ 40 kg.)
(See Fig. 3)
- ★ Do not rotate too much (5°), max. 10 mm on the outer circumference of the cylinder barrel.
- ★ Dowel pin holes should be aligned.
- (3) Next, move your hands 45° around the bearing plate, then apply pressure and repeat the procedure in Step (2) to rub the surfaces together. Do this at a total of four places. (See Fig. 4.)

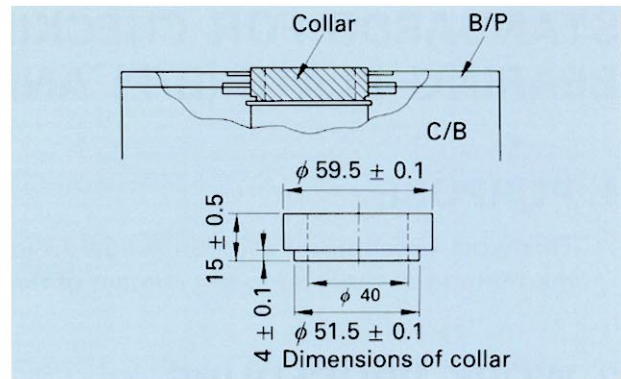


Fig. 2

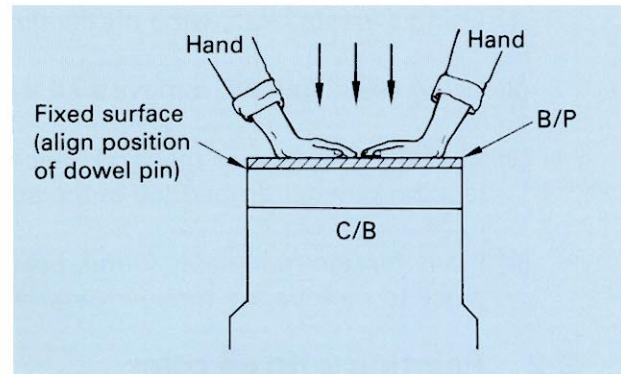


Fig. 3

2-4 Checking surface contact

- (1) Remove the bearing plate and place it with the fixed surface upward.
 - (2) Stick mending tape to the bearing plate contact surface.
 - a) First, stick one piece of mending tape across the center.
 - b) Put the second and following pieces of mending tape at right angles to the first piece and parallel to each other with no gap between them along the edges.(See Fig. 5.)
 - (3) Peel off the mending tape and stick it on a paper.
(Compare with the service limit sample, and judge if the part can be reused.)
- (Note) Try pushing down on a weighing scale to get an idea of the pushing force used when rubbing the surfaces together.

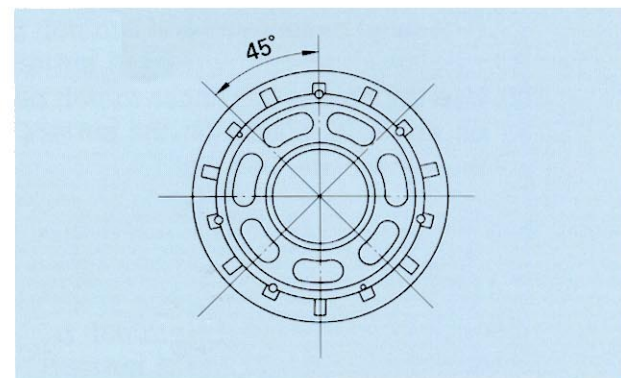


Fig. 4

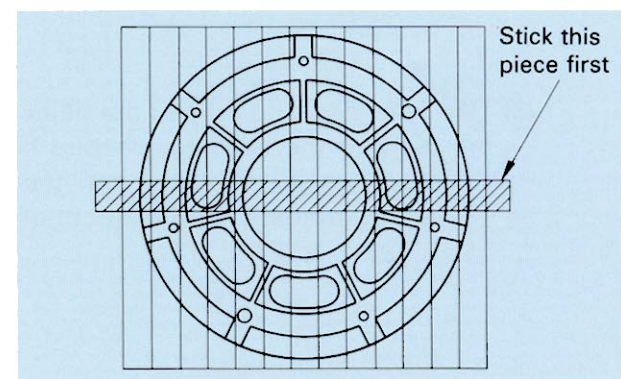


Fig. 5

STANDARDS FOR CHECKING CONTACT OF BEARING PLATE (B/P) AND VALVE PLATE (V/P)

1. PURPOSE

This work procedure has been prepared to reduce the variation between workers arising from the method of measuring the contact of the bearing plate and valve plate.

2. WORK PROCEDURE

2-1 Cleaning inspection work piece

- (1) Using a waste cloth, wipe off the dirty oil lightly from the work piece.
- (2) Using cleaning fluid, remove all the dirty grease and oil from the work piece.
- (3) Check the surface of the work piece to confirm that there are no burrs, sharp edges, or lapping powder embedded in the surface.
- (4) If any foreign material is found, press gum tape strongly against the surface of the work piece to remove the foreign material, and wash the surface again with cleaning fluid.

2-2 Painting with oil color

Paint the whole surface of the valve plate with oil color, Prussian Blue.

- (1) Push a small amount of Prussian Blue out on to a piece of paper.
(The paint evaporates and becomes hard, so only use the necessary amount for each lot.)
- (2) Use the tip of your finger to dab paint on about 20 places on the surface of the valve plate. See Fig. 1.

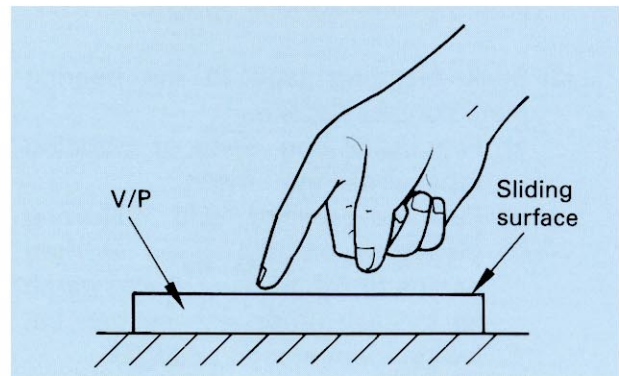


Fig. 1

- (3) Use your finger to spread the paint over the whole surface. However, the Prussian Blue will go into the eyebrow shaped holes in the work piece, so it will gradually become thinner. Continue this work until the blue paint on the surface has almost disappeared.
(*Use the standard for the amount of paint for reference to get the feeling.)

2-3 Rubbing together

- (1) Insert the specified collar in the valve plate center hole, and fit the bearing plate on top. (See Fig. 2)
- (2) Push down on the whole bearing plate with both hands, and rotate the bearing plate about 5° from side to side three times to rub the surfaces together.
(Press with a force of 35 kg ~ 40 kg.)
See Fig. 3.
- ★ Do not rotate too much (5°), max. 10 mm on the outer circumference of the B/P or the V/P.
- (3) Next, move your hands 45° around the bearing plate, then apply pressure and repeat the procedure in Step (2) to rub the surfaces together. Do this at a total of four places. See Fig. 4.

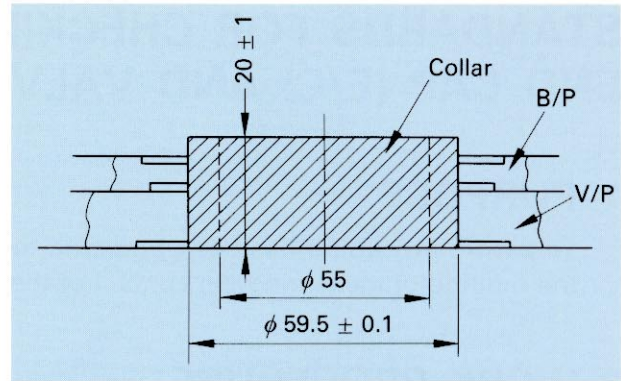


Fig. 2

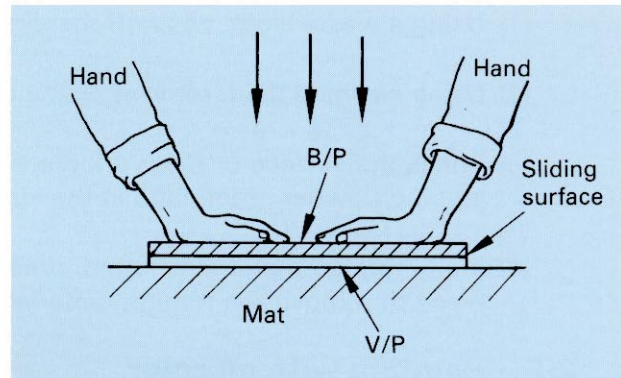


Fig. 3

2-4 Checking surface contact

- (1) Remove the bearing plate and place it on a sliding surface.
 - (2) Stick mending tape to the bearing plate contact surface.
 - a) First, stick one piece of mending tape across the center.
 - b) Put the second and following pieces of mending tape at right angles to the first piece and parallel to each other with no gap between them along the edges. See Fig. 5.
 - (3) Peel off the mending tape and stick it on recording paper.
(Compare with the service limit sample, and judge if the part can be reused.)
- (Note) Try pushing down on a weighing scale to get an idea of the pushing force used when rubbing the surfaces together.

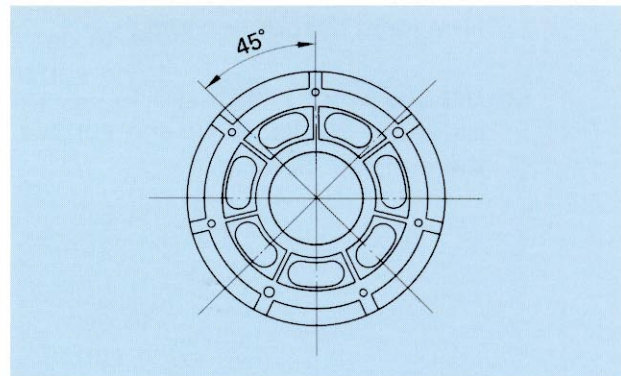


Fig. 4

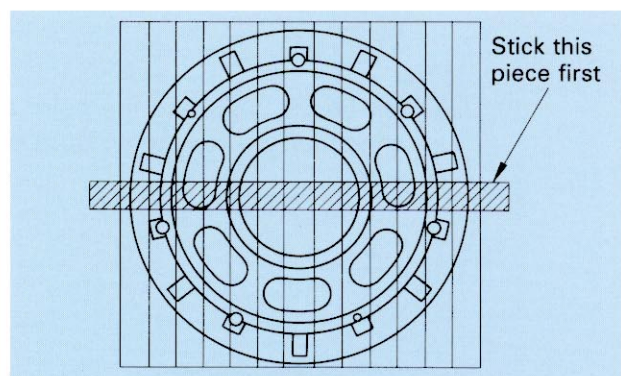


Fig. 5

STANDARDS FOR CHECKING CONTACT OF END CAP (E/C) AND VALVE PLATE (V/P)

1. PURPOSE

This work procedure has been prepared to reduce the variation between workers arising from the method of measuring the contact of the end cap and valve plate.

2. WORK PROCEDURE

2-1 Cleaning inspection work piece

- (1) Using a waste cloth, wipe off the dirty oil lightly from the work piece.
- (2) Using cleaning fluid, remove all the dirty grease and oil from the work piece.
- (3) Check the surface of the work piece to confirm that there are no burrs, sharp edges, or lapping powder embedded in the surface.
- (4) If any foreign material is found, press gum tape strongly against the surface of the work piece to remove the foreign material, and wash the surface again with cleaning fluid.

2-2 Painting with oil color

Paint the whole surface of the end cap with oil color, Prussian Blue.

- (1) Push a small amount of Prussian Blue out on to a piece of paper.
(The paint evaporates and becomes hard, so only use the necessary amount for each lot.)
- (2) Use the tip of your finger to dab paint on about 20 places on the surface of the end cap. See Fig. 1.

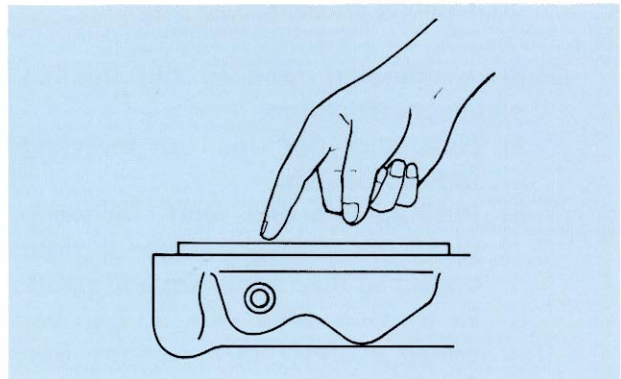


Fig. 1

- (3) Use your finger to spread the paint all over the surface to a uniform thickness.
(*Use the standard for the amount of paint for reference to get the feeling.)

2-3 Rubbing together

- (1) Insert the collar in the end cap center hole, align the dowel pin holes of the valve plate, and fit the valve plate on top of the end cap. See Fig. 2.
- (2) Push down on the whole valve plate with both hands, and rotate the valve plate about 5° from side to side three times to rub the surfaces together. (Press with a force of 35 kg ~ 40 kg.) See Fig. 3.
 - ★ Do not rotate too much (5°), max. 10 mm on the outer circumference of the V/P.
- (3) Next, move your hands 45° around the bearing plate, then apply pressure and repeat the procedure in Step (2) to rub the surfaces together. Do this at a total of four places. See Fig. 4.

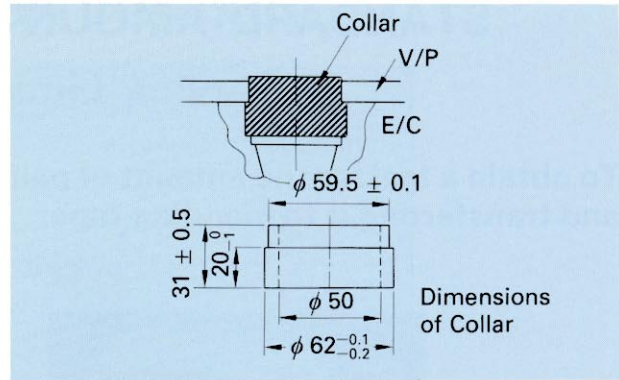


Fig. 2

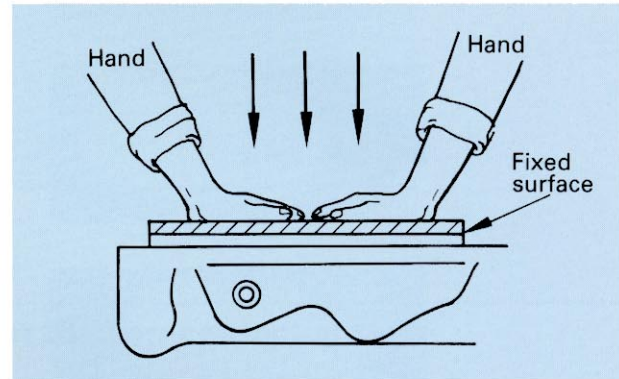


Fig. 3

2-4 Checking surface contact

- (1) Remove the valve plate and place it on a fixed surface.
- (2) Stick mending tape to the valve plate contact surface.
 - a) First, stick one piece of mending tape across the center.
 - b) Put the second and following pieces of mending tape at right angles to the first piece and parallel to each other with no gap between the along the edges. See Fig. 5.
- (3) Peel off the mending tape and stick it on recording paper. (Compare with the service limit sample, and judge if the part can be reused.)

(Note) Try pushing down on a weighing scale to get an idea of the pushing force used when rubbing the surfaces together.

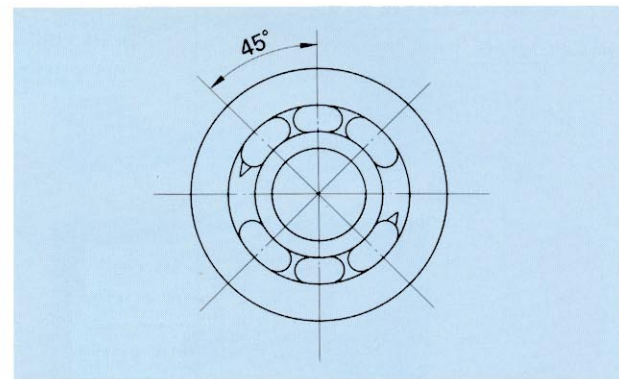


Fig. 4

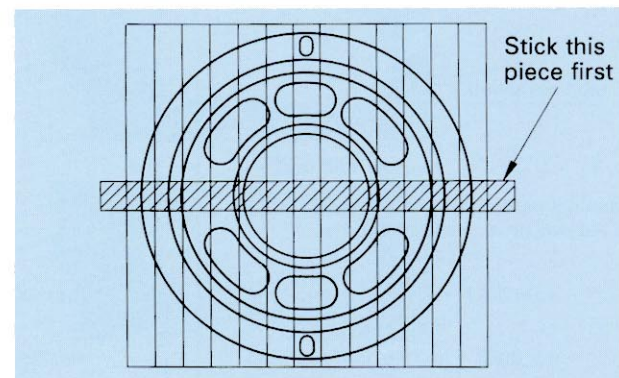


Fig. 5

STANDARD AMOUNT OF OIL COLOR PAINT

Service Limit Sample

To obtain a feel for the amount of paint to use, practice coating the work piece and transferring it to mending tape.



NG (Too much)



NG (Too much)



NG (Slightly too much)



GOOD (Right amount)



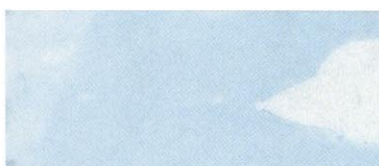
GOOD (Right amount)



GOOD (Right amount)



NG (Too little)



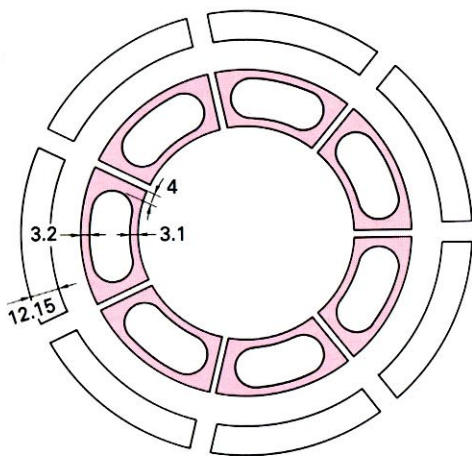
NG (Too little)

JUDGEMENT STANDARDS FOR CONTACT

Contact area			Standard value	
			Contact width	Contact area
1	Between C/B and B/P (fixed surface)	Seal portion	No break	Min. 80%
		Other portion	—	Min. 60%
2	Between V/P and B/P (sliding surface)	Seal portion	No break	Min. 80%
		Other portion	—	Min. 60%
3	Between E/C and V/P (fixed surface)	Seal portion	No break	Min. 80%
		Other portion	—	Min. 60%

Take the area given below as 100% and subtract the non-contact area to calculate the actual contact area.

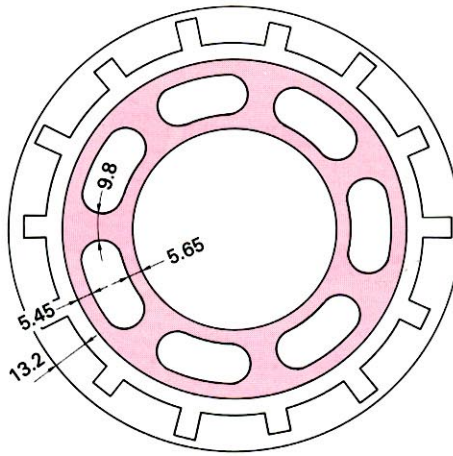
B/P fixed surface



█: Seal portion

- [Area of seal portion = 3130 mm²
5% of area = 155 mm²
- [Area of other portion = 5240 mm²
5% of area = 260 mm²

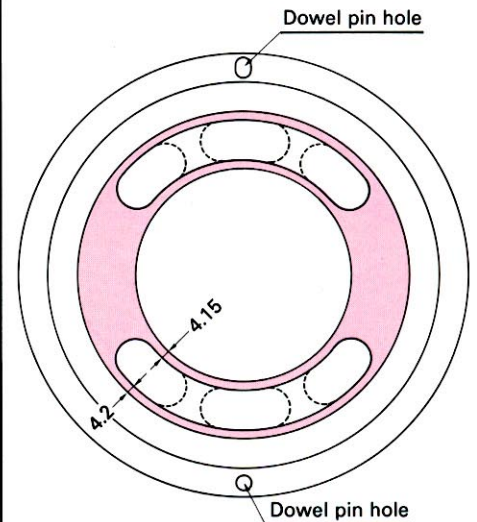
B/P sliding surface



█: Seal portion

- [Area of seal portion = 4900 mm²
5% of area = 250 mm²
- [Area of other portion = 5350 mm²
5% of area = 270 mm²

V/P fixed surface

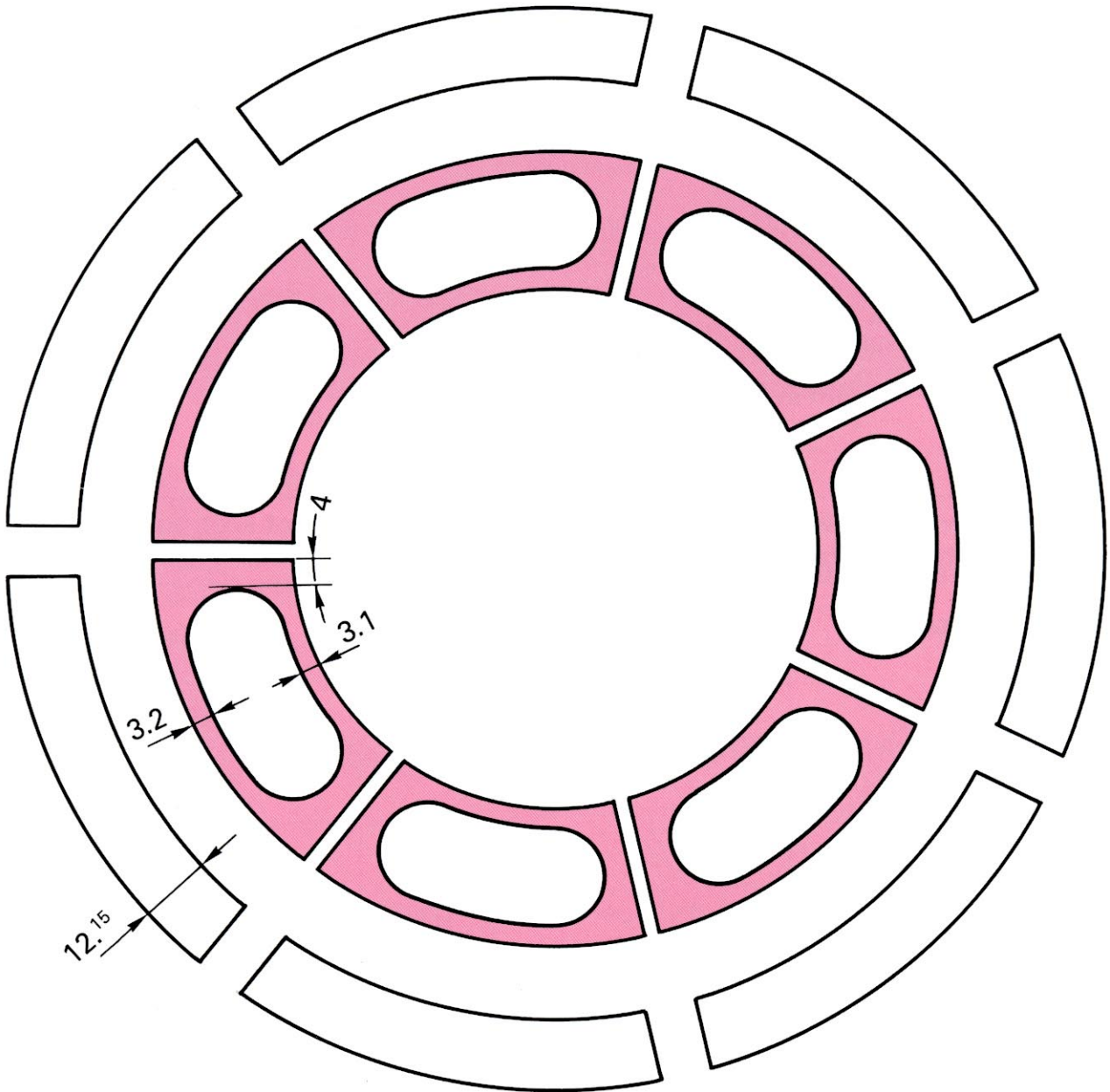


█: Seal portion

⋮: The mating E/C has an escape groove so there is no contact at all in this portion.

- [Area of seal portion = 4300 mm²
5% of area = 215 mm²
- [Area of other portion = 5900 mm²
5% of area = 295 mm²

B/P FIXED SURFACE



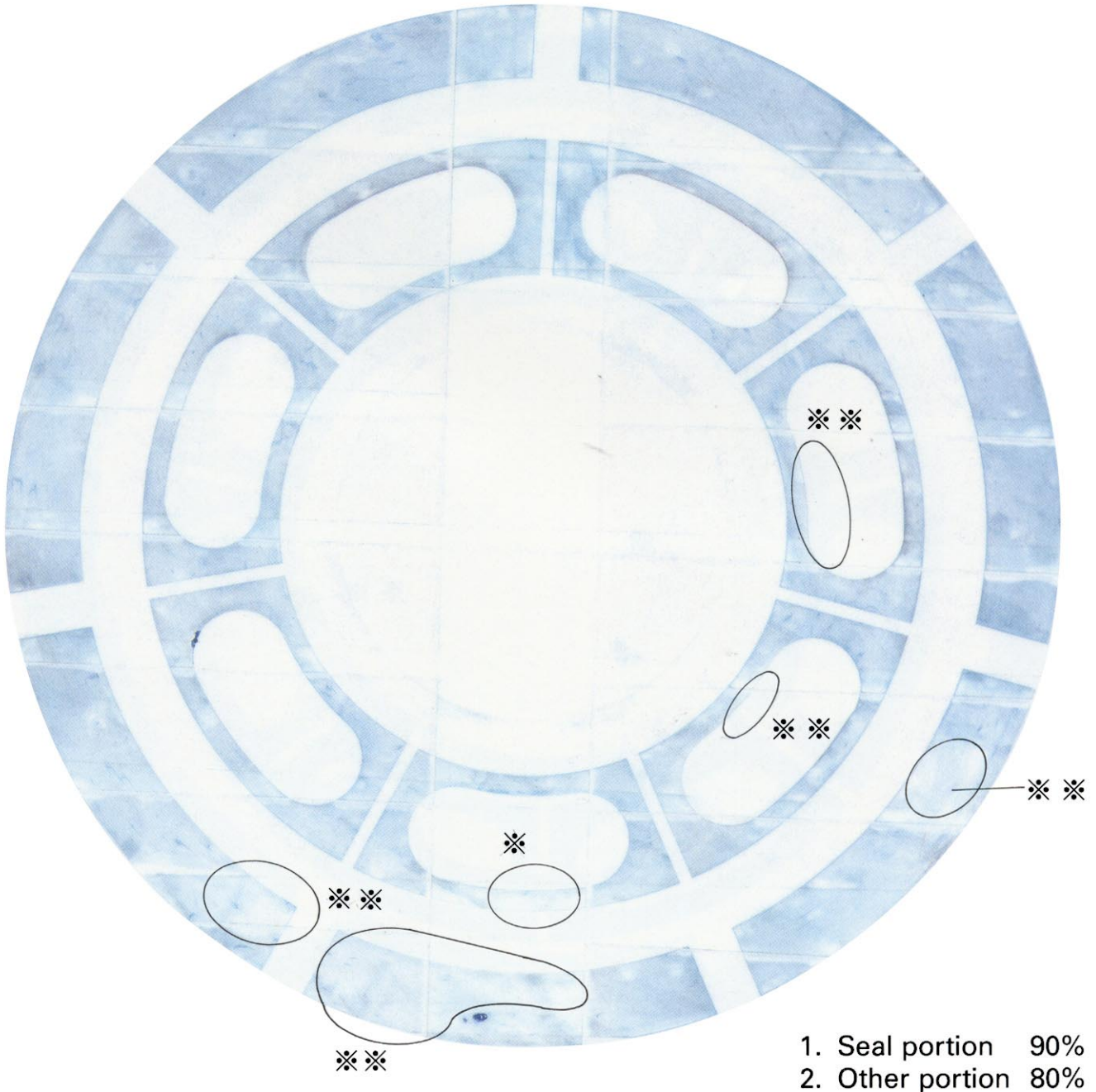
: Seal portion

- [Area of seal portion \doteq 3130 mm²
5% of area \doteq 155 mm²
- [Area of other portion \doteq 5240 mm²
5% of area \doteq 260 mm²

CONTACT OF FIXED SURFACE BETWEEN C/B AND B/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	OK	OK
No break	NG	—

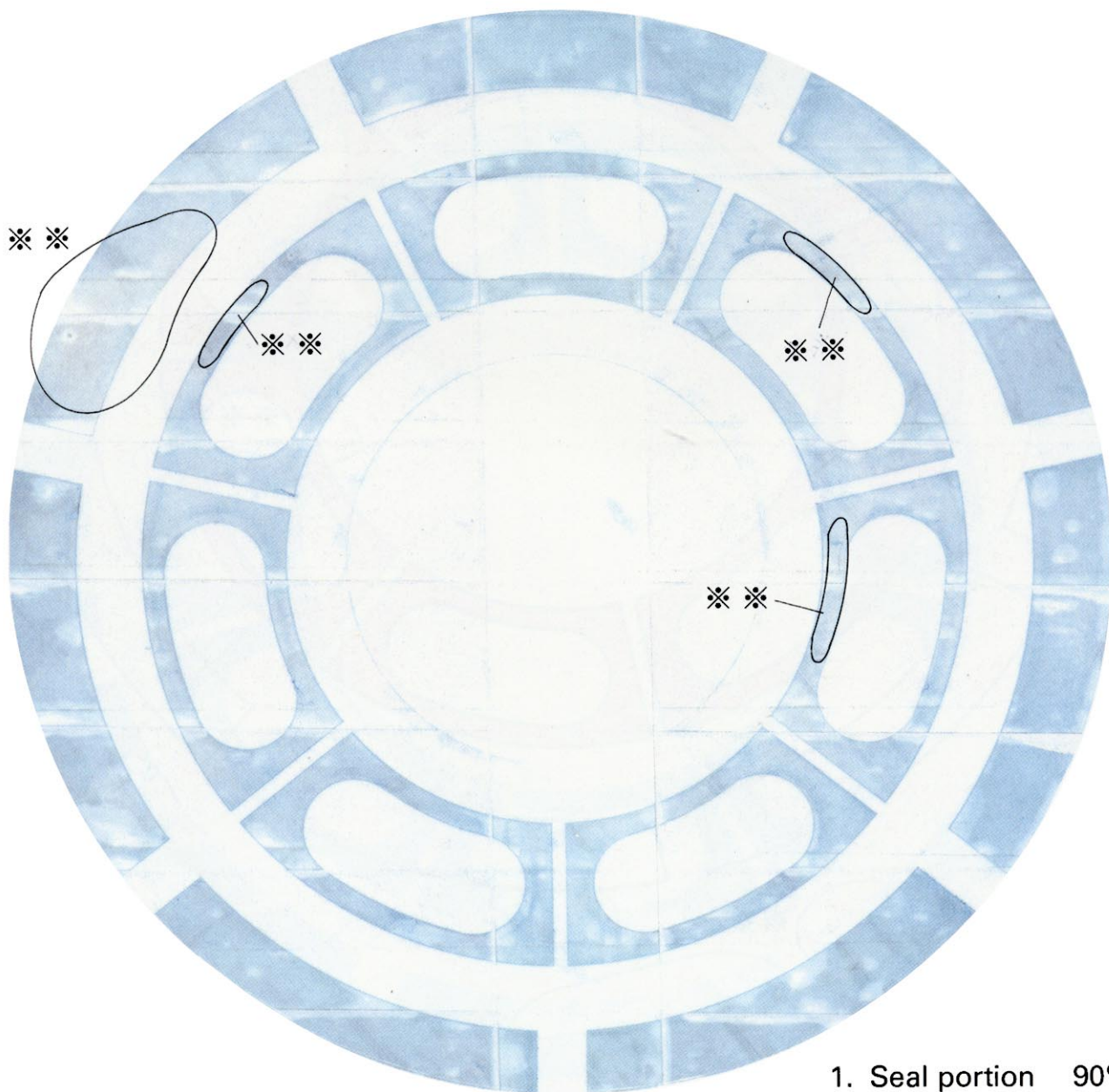


- Break in seal portion (marked *). ----- NG
- White or pale gray places such as those marked ** are places where there is no contact.

CONTACT OF FIXED SURFACE BETWEEN C/B AND B/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	OK	OK
No break	OK	—

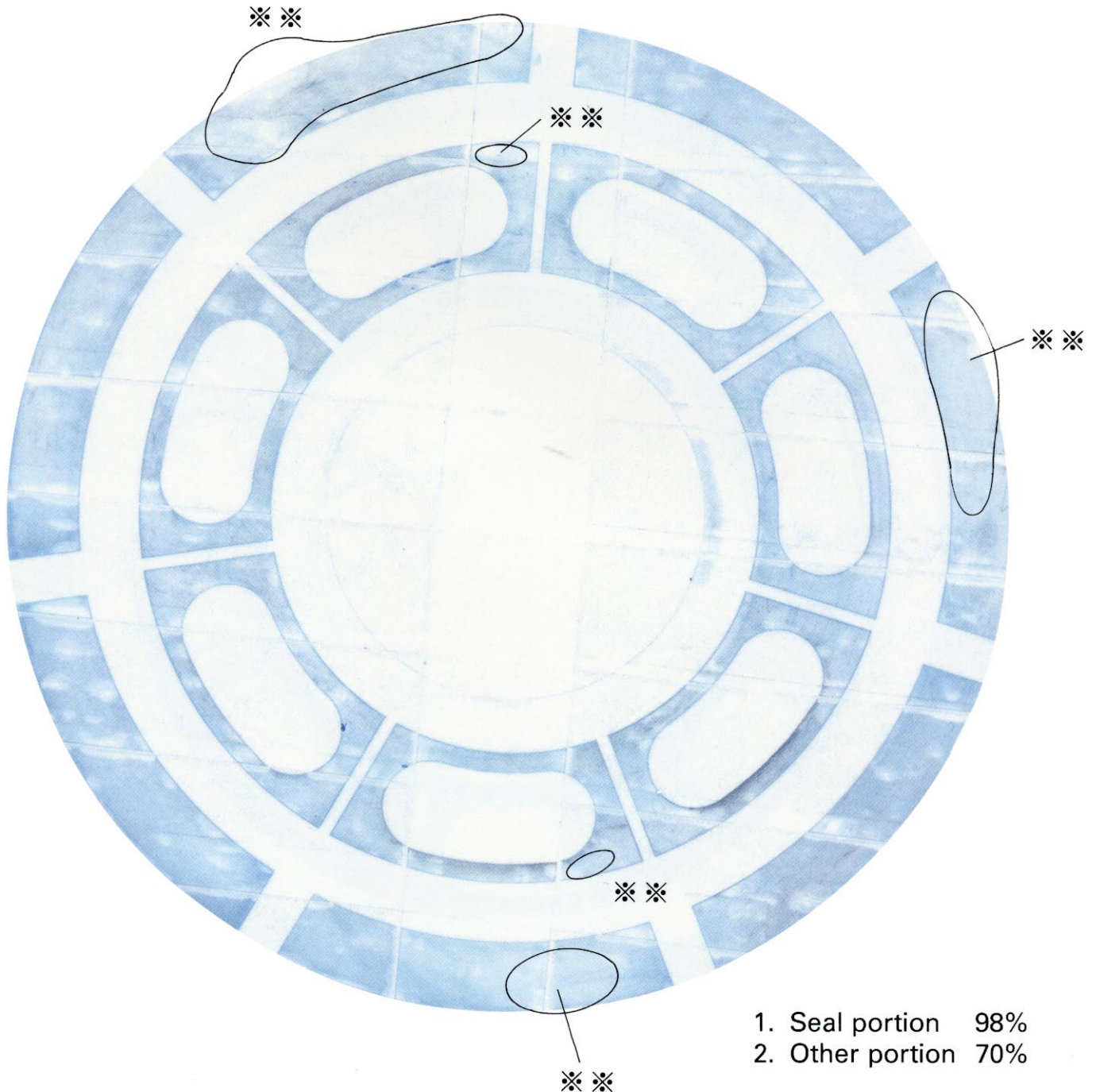


- White or pale gray places such as those marked ** are places where there is no contact.

CONTACT OF FIXED SURFACE BETWEEN C/B AND B/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	OK	OK
No break	OK	—



- White or pale gray places such as those marked ※※ are places where there is no contact.
- There is contact at the black places where the dirt in the first coat has been transferred.

CONTACT OF FIXED SURFACE BETWEEN C/B AND B/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	OK	OK
No break	OK	—

※ ※



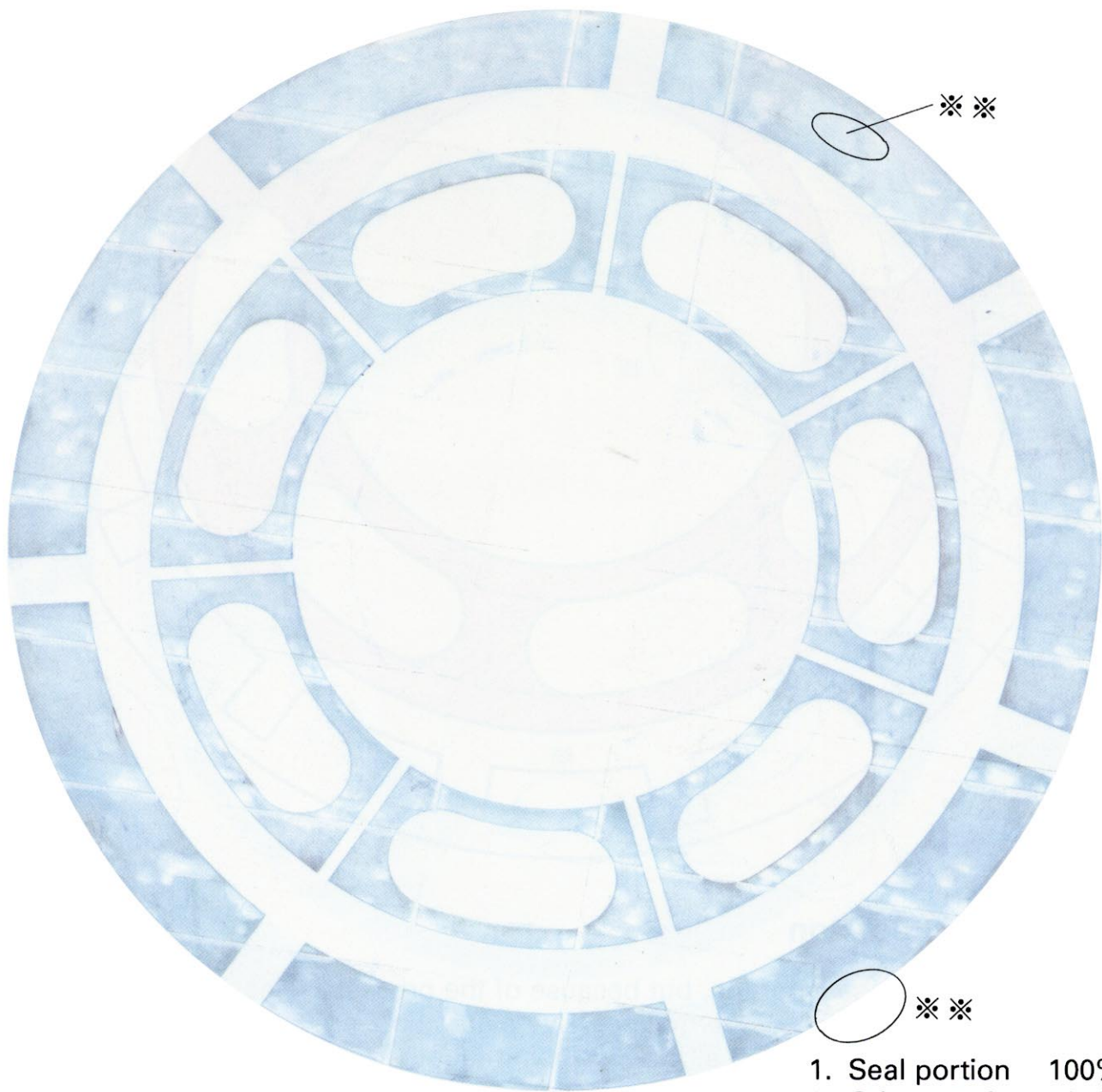
※ ※
1. Seal portion 100%
2. Other portion 97%

- White or pale gray places such as those marked ※※ are places where there is no contact.
- There is contact at the black places where the dirt in the first coat has been transferred.

CONTACT OF FIXED SURFACE BETWEEN C/B AND B/P

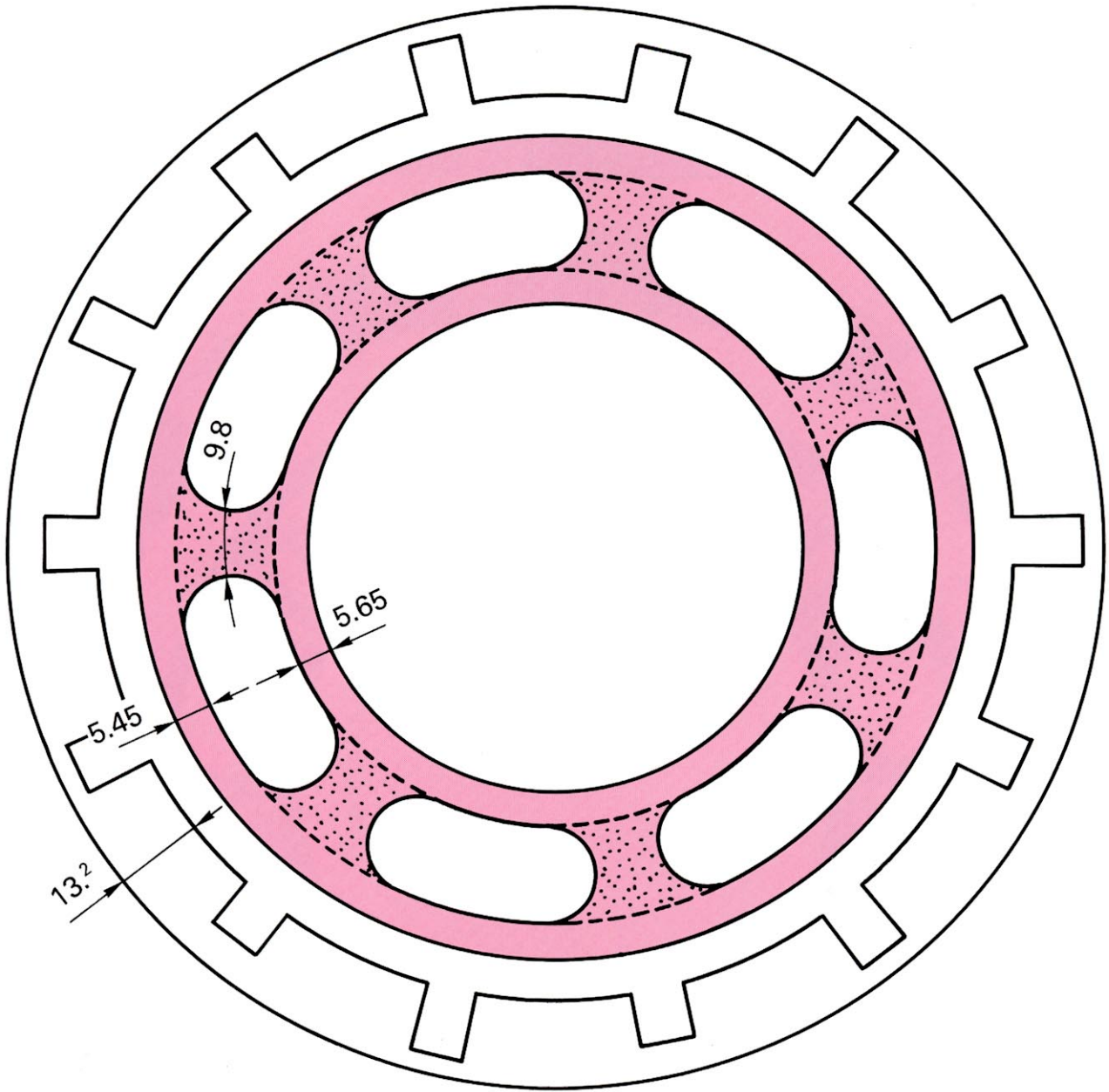
Service Limit Sample

	Seal portion	Other portion
Contact area %	OK	OK
No break	OK	—



- White or pale gray places such as those marked** are places where there is no contact.

B/P SLIDING SURFACE



█: Seal portion

▨: This is the seal portion, but because of the pressure releasing shape of the eyebrow groove of the mating valve plate, there are some places where there is no contact at all when rubbing together.

Area of seal portion \doteq 4900 mm²
 5% of area \doteq 250 mm²

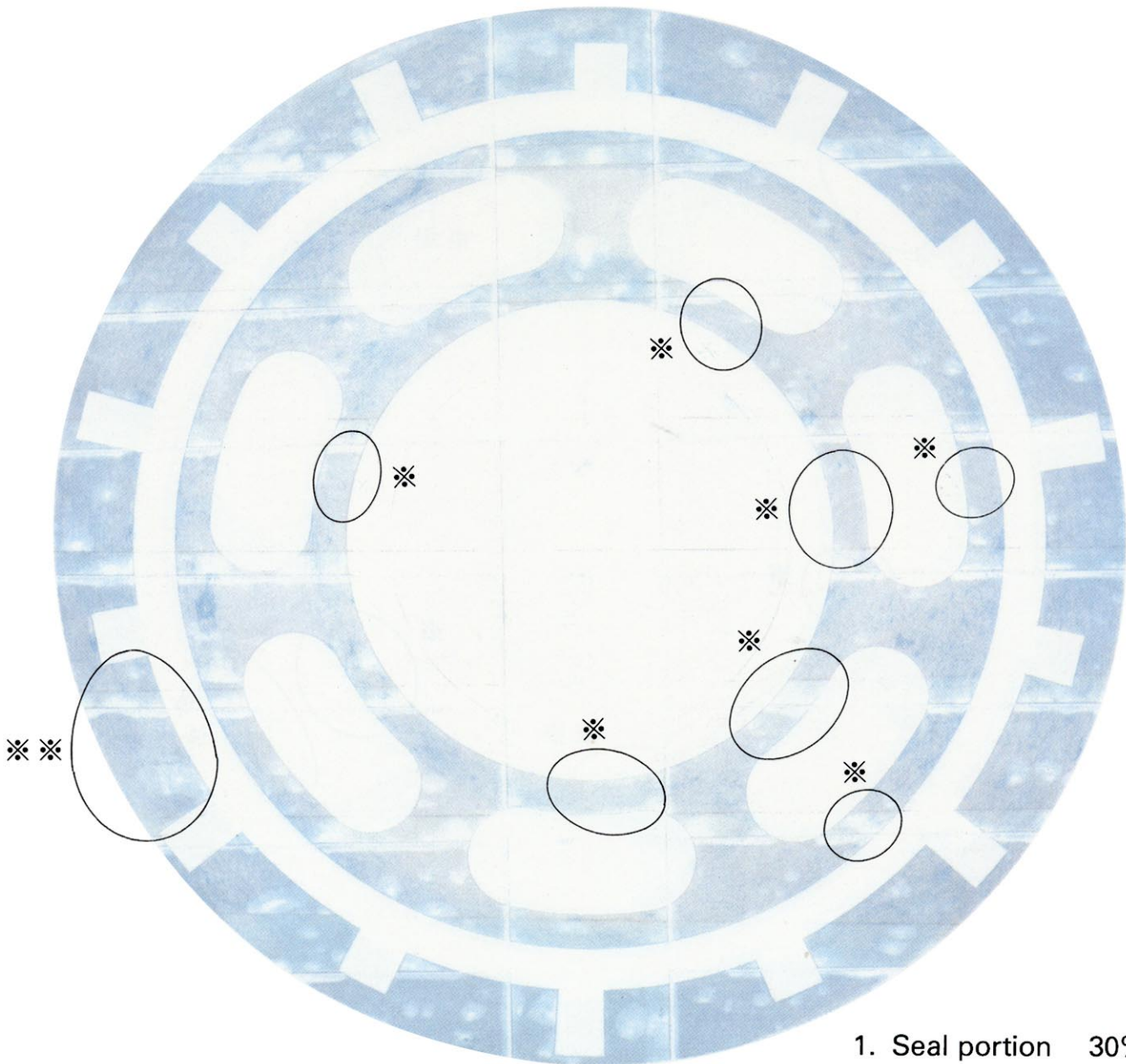
Area of other portion \doteq 5350 mm²
 5% of area \doteq 270 mm²

▨: These places are rubbed together, so judge the total contact of these places.

CONTACT OF SLIDING SURFACE BETWEEN V/P AND B/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	NG	OK
No break	NG	—

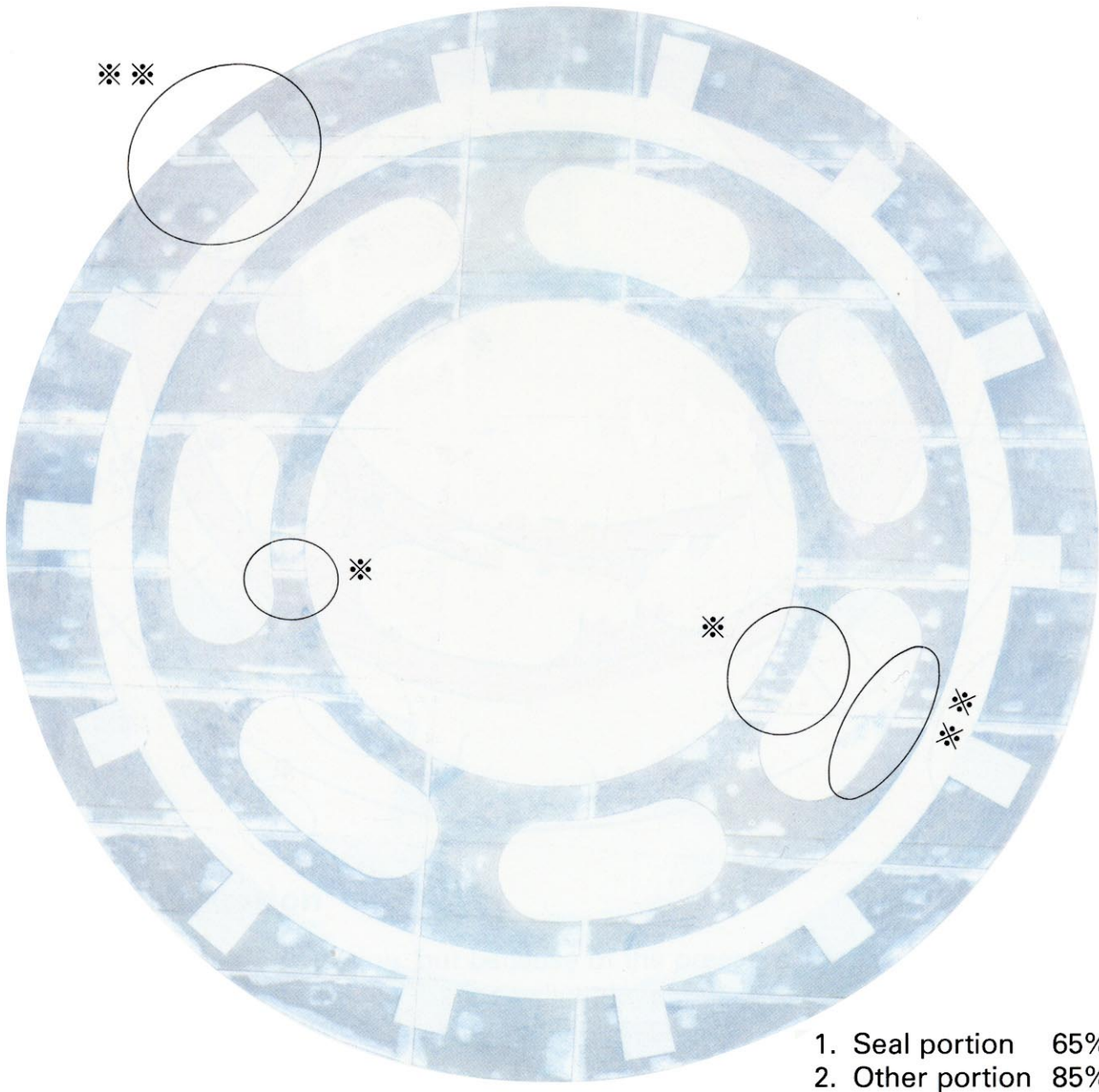


- Break in seal portion (marked *).
- White or pale gray places such as those marked ** are places where there is no contact.

CONTACT OF SLIDING SURFACE BETWEEN V/P AND B/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	NG	OK
No break	NG	—

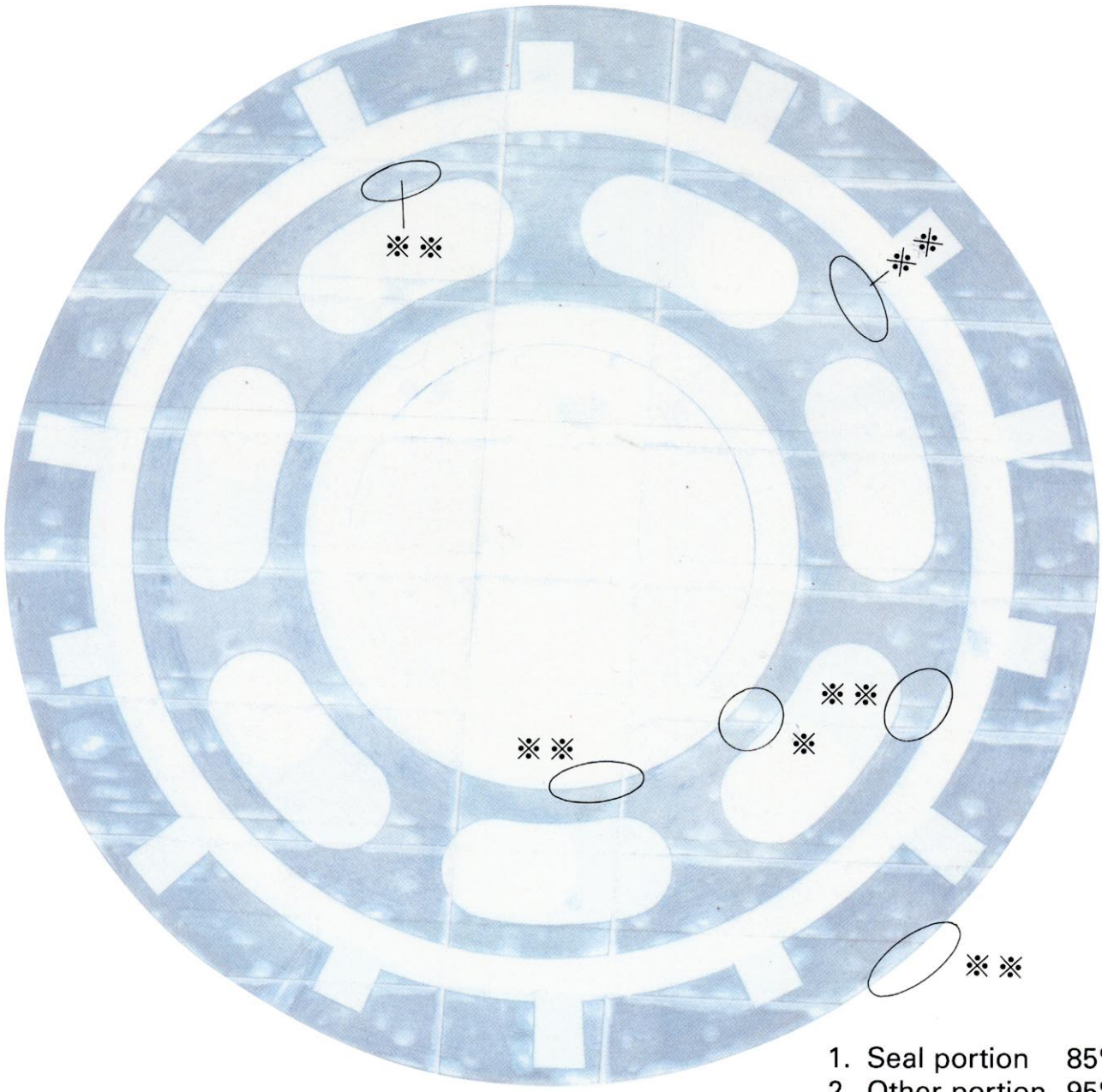


- Break in seal portion (marked *).
- White or pale gray places such as those marked ** are places where there is no contact.

CONTACT OF SLIDING SURFACE BETWEEN V/P AND B/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	OK	OK
No break	NG	—

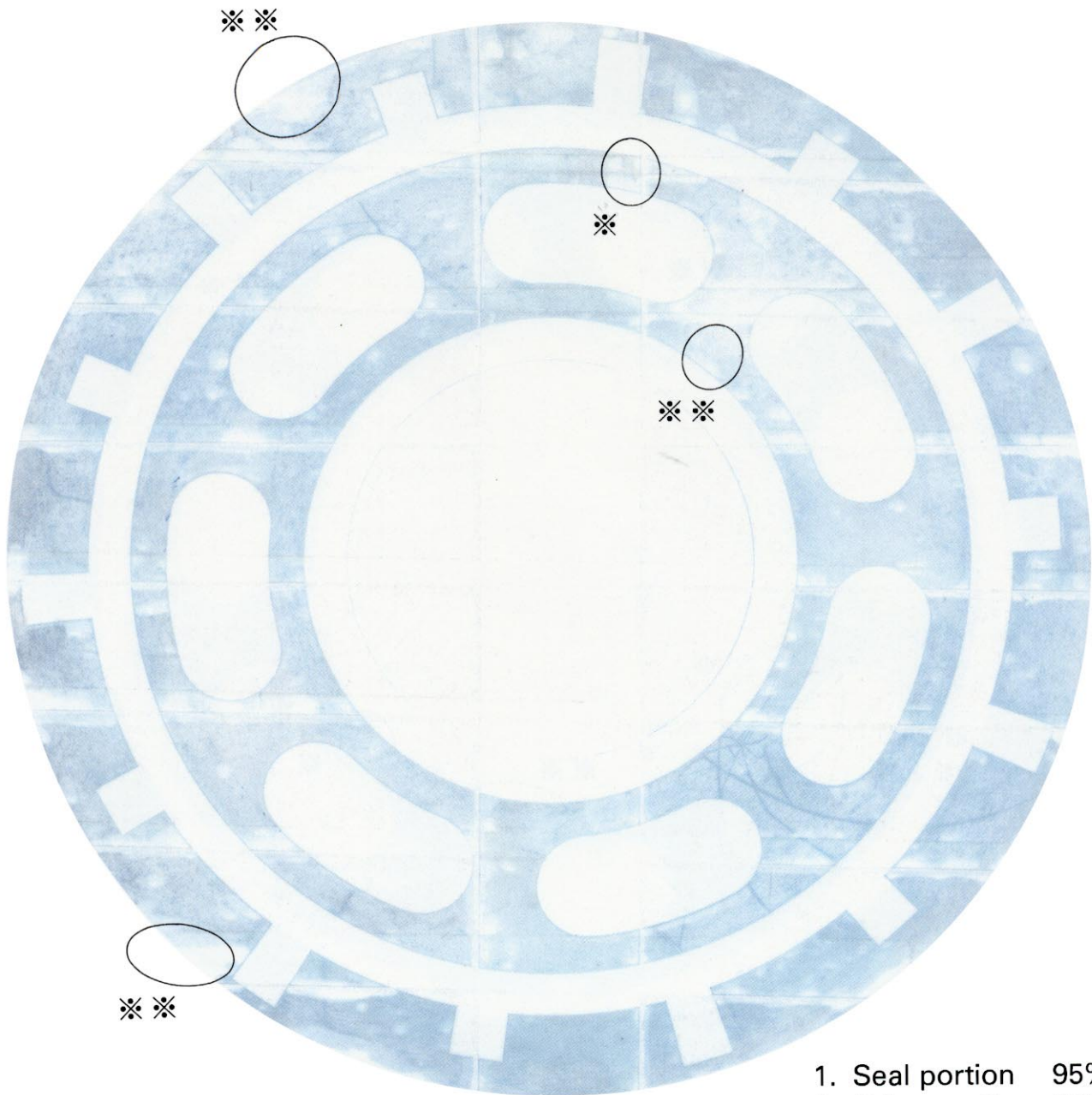


- Break in seal portion (marked *).
- White or pale gray places such as those marked ** are places where there is no contact.

CONTACT OF SLIDING SURFACE BETWEEN V/P AND B/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	OK	OK
No break	NG	—



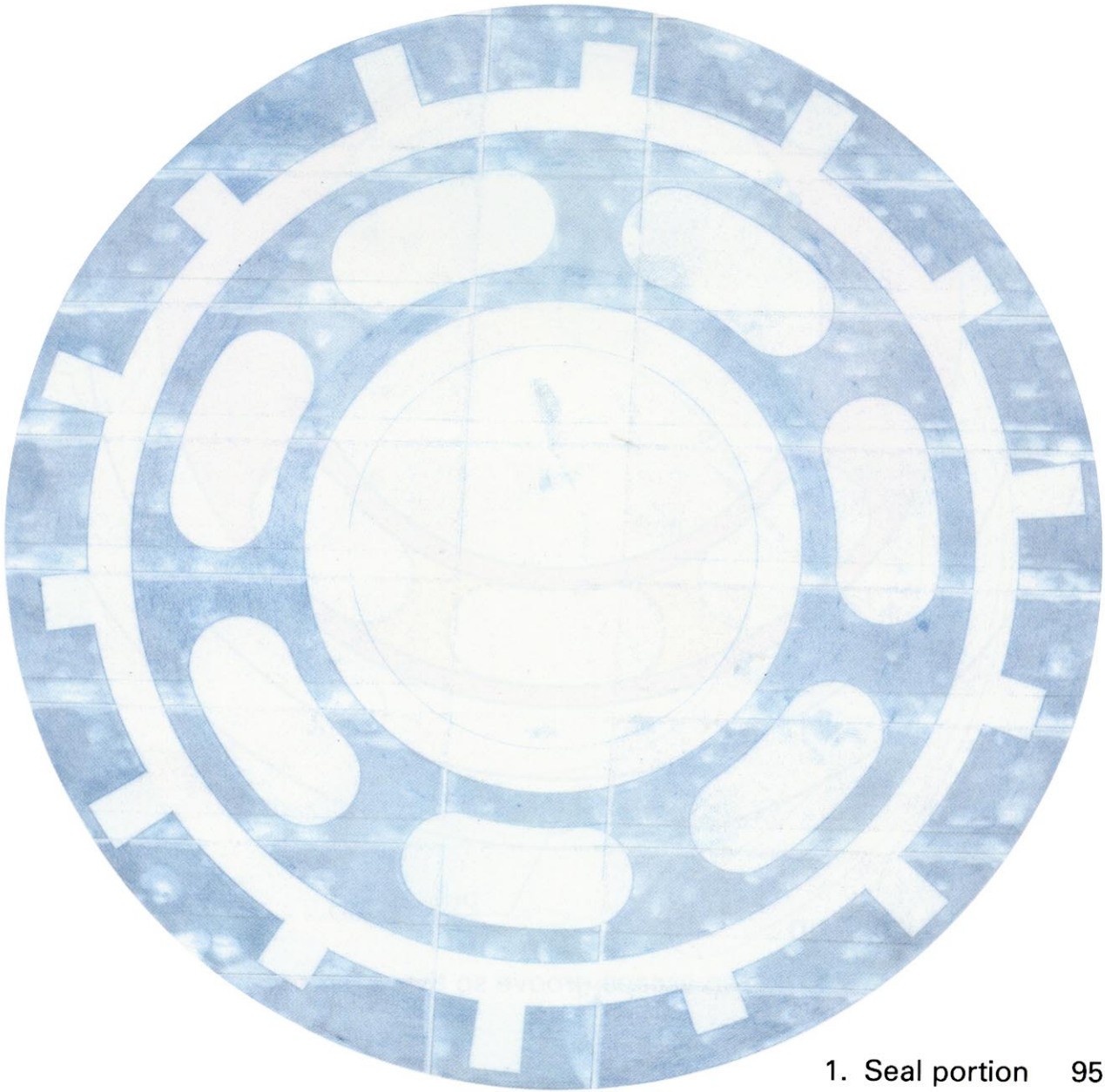
1. Seal portion 95%
2. Other portion 90%

- Break in seal portion (marked ※).
- White or pale gray places such as those marked ** are places where there is no contact.

CONTACT OF SLIDING SURFACE BETWEEN V/P AND B/P

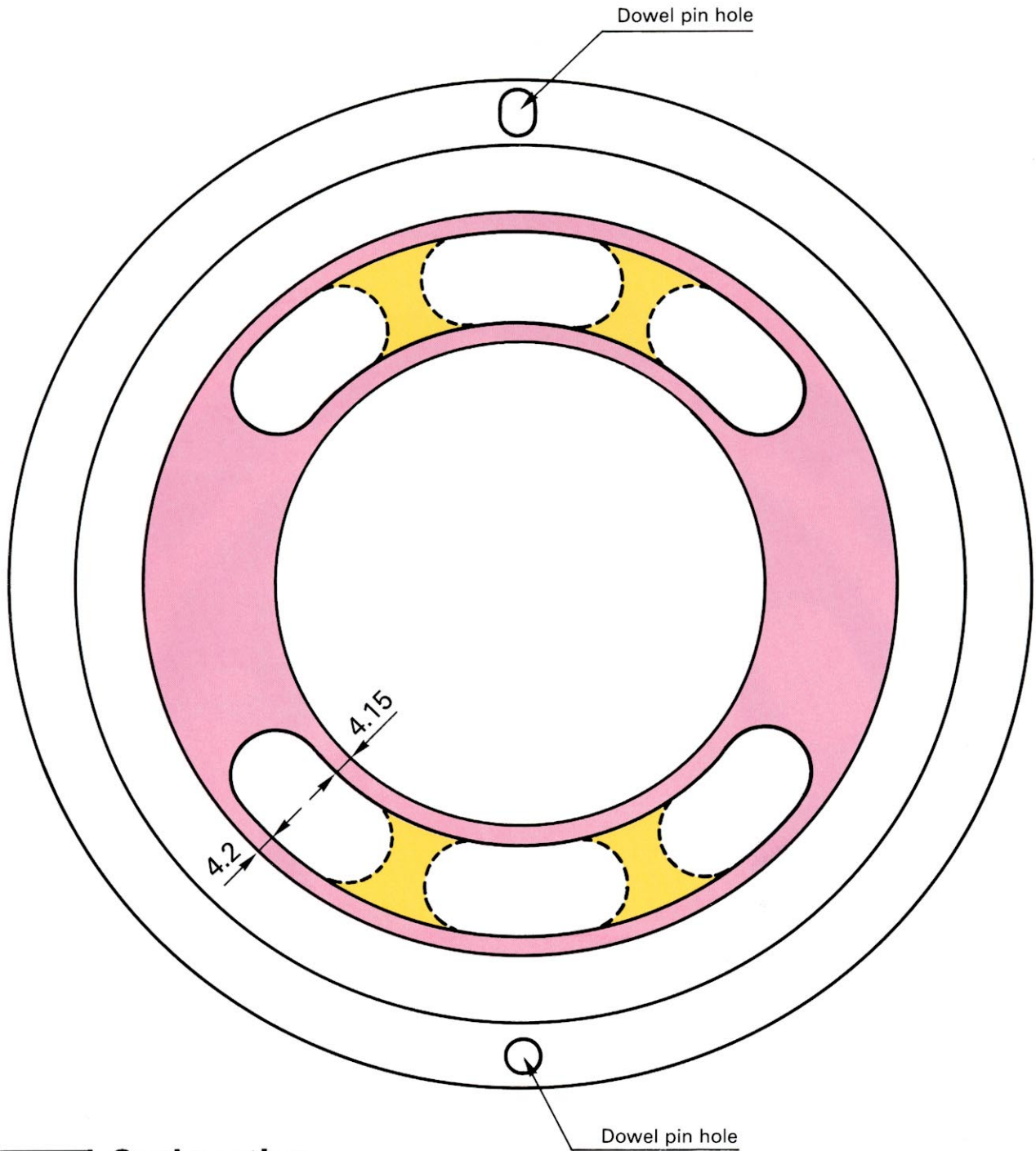
Service Limit Sample

	Seal portion	Other portion
Contact area %	OK	OK
No break	OK	—



1. Seal portion 95%
2. Other portion 100%

V/P FIXED SURFACE



■: Seal portion

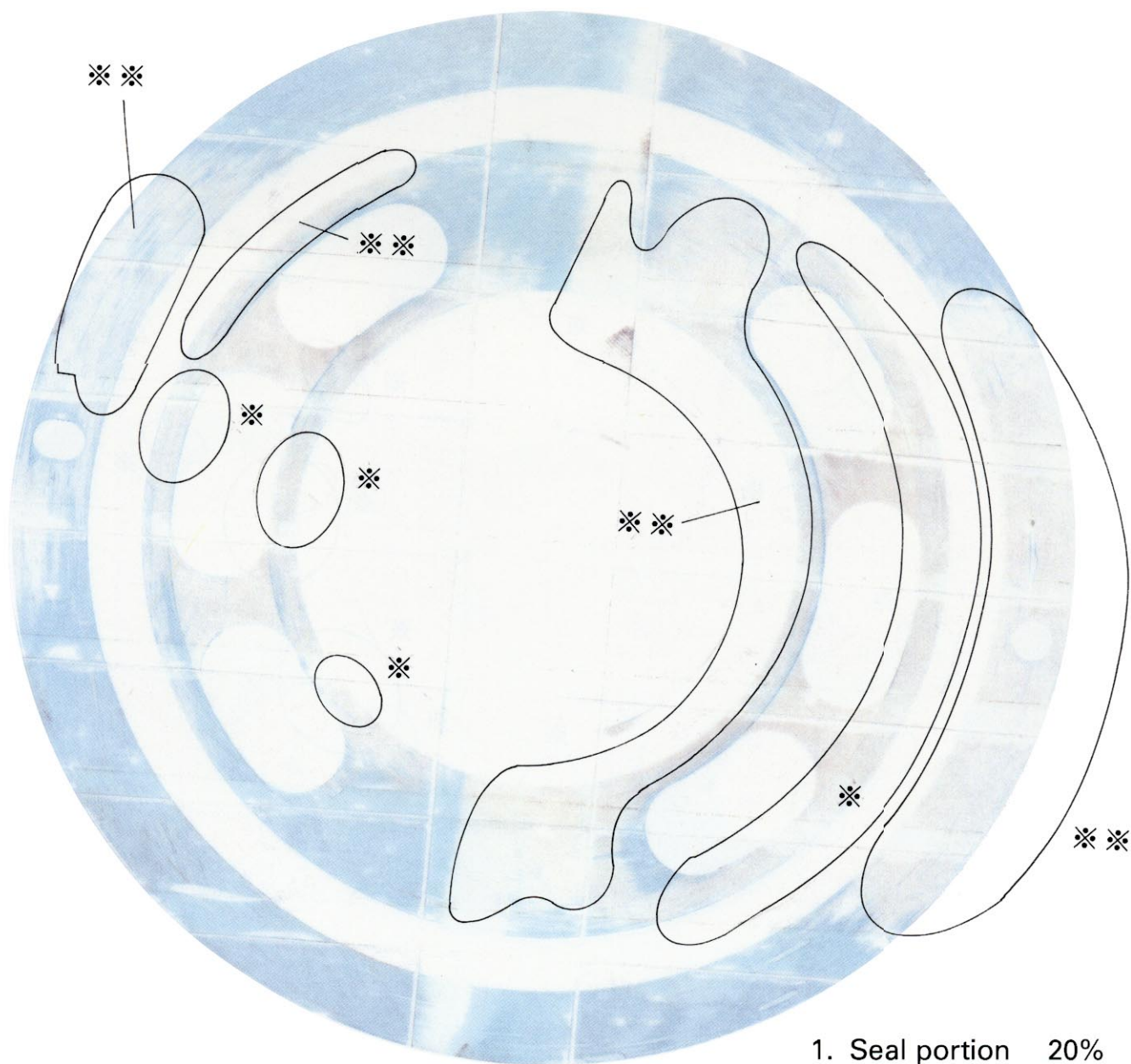
■: The mating E/C has an escape groove so there is no contact at all in this portion

- Area of seal portion $\doteq 4300 \text{ mm}^2$
5% of area $\doteq 215 \text{ mm}^2$
- Area of other portion $\doteq 5900 \text{ mm}^2$
5% of area $\doteq 295 \text{ mm}^2$

CONTACT OF FIXED SURFACE BETWEEN E/C AND V/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	NG	NG
No break	NG	—

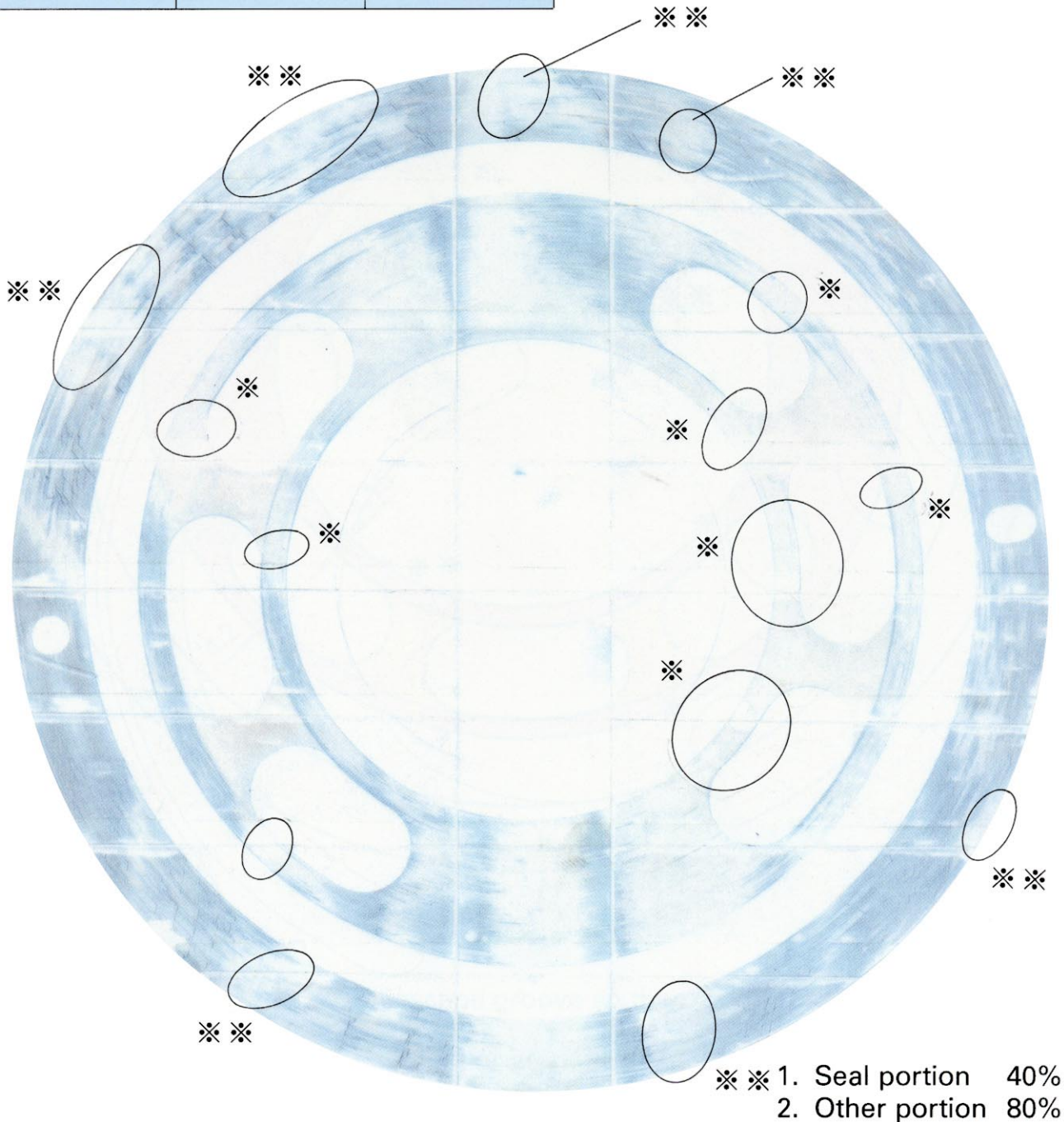


- Break in seal portion (marked *).
- White or pale gray places such as those marked ** are places where there is no contact.

CONTACT OF FIXED SURFACE BETWEEN E/C AND V/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	NG	OK
No break	NG	—

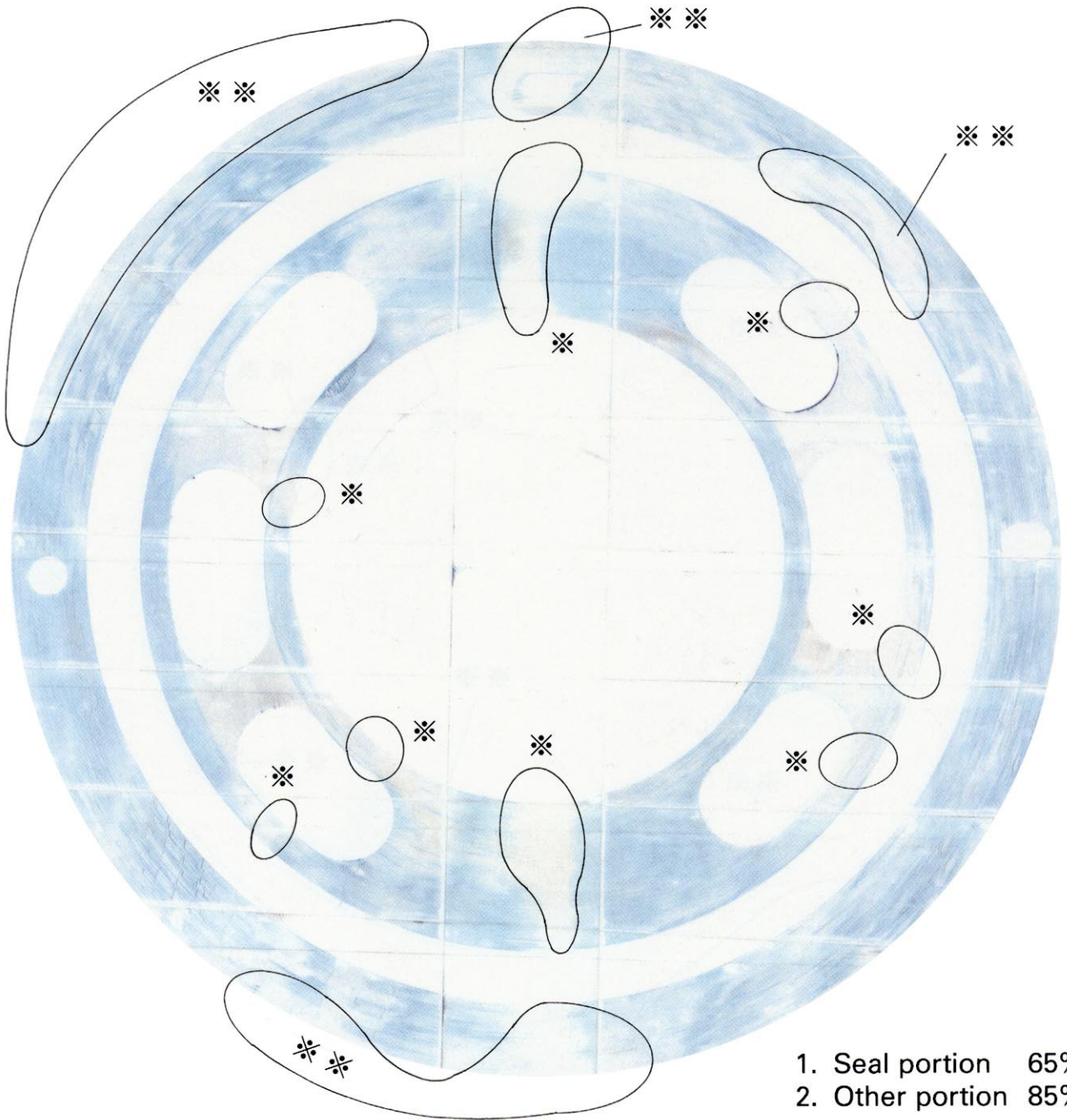


- Break in seal portion (marked *).
- White or pale gray places such as those marked ** are places where there is no contact.

CONTACT OF FIXED SURFACE BETWEEN E/C AND V/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	NG	OK
No break	NG	—

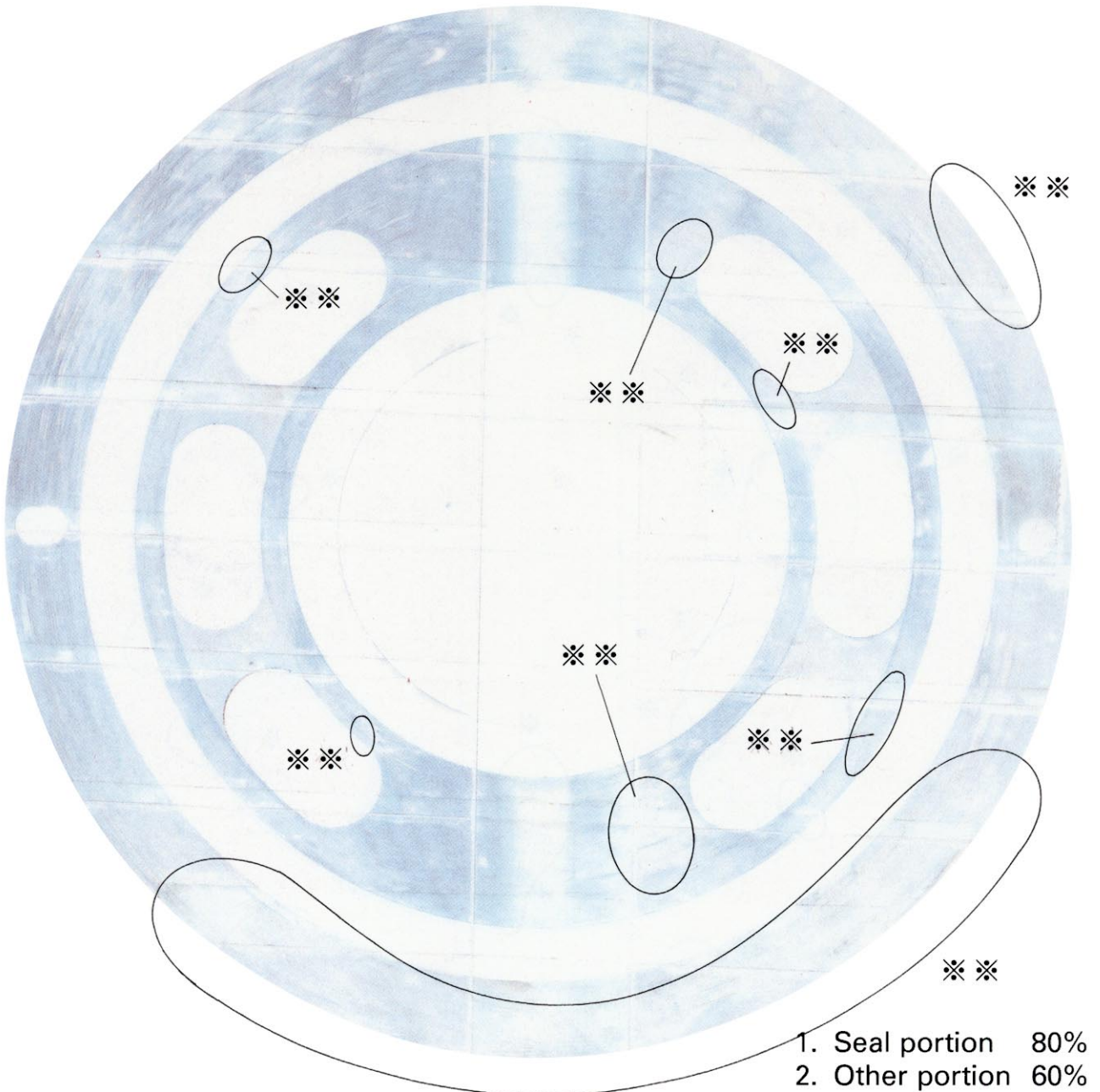


- Break in seal portion (marked *).
- White or pale gray places such as those marked ** are places where there is no contact.

CONTACT OF FIXED SURFACE BETWEEN E/C AND V/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	OK	OK
No break	OK	—

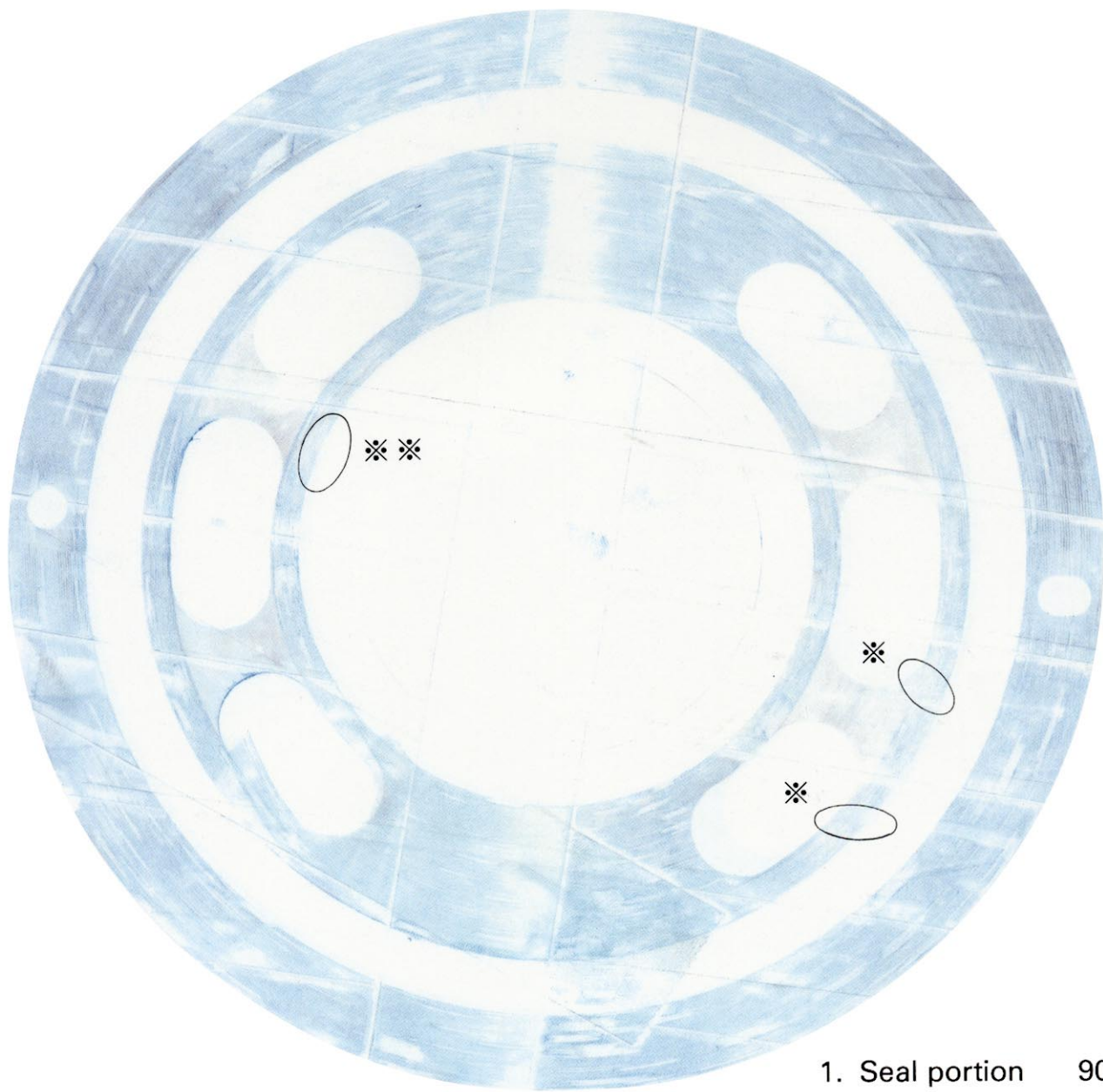


- White or pale gray places such as those marked ** are places where there is no contact.

CONTACT OF FIXED SURFACE BETWEEN E/C AND V/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	OK	OK
No break	NG	—



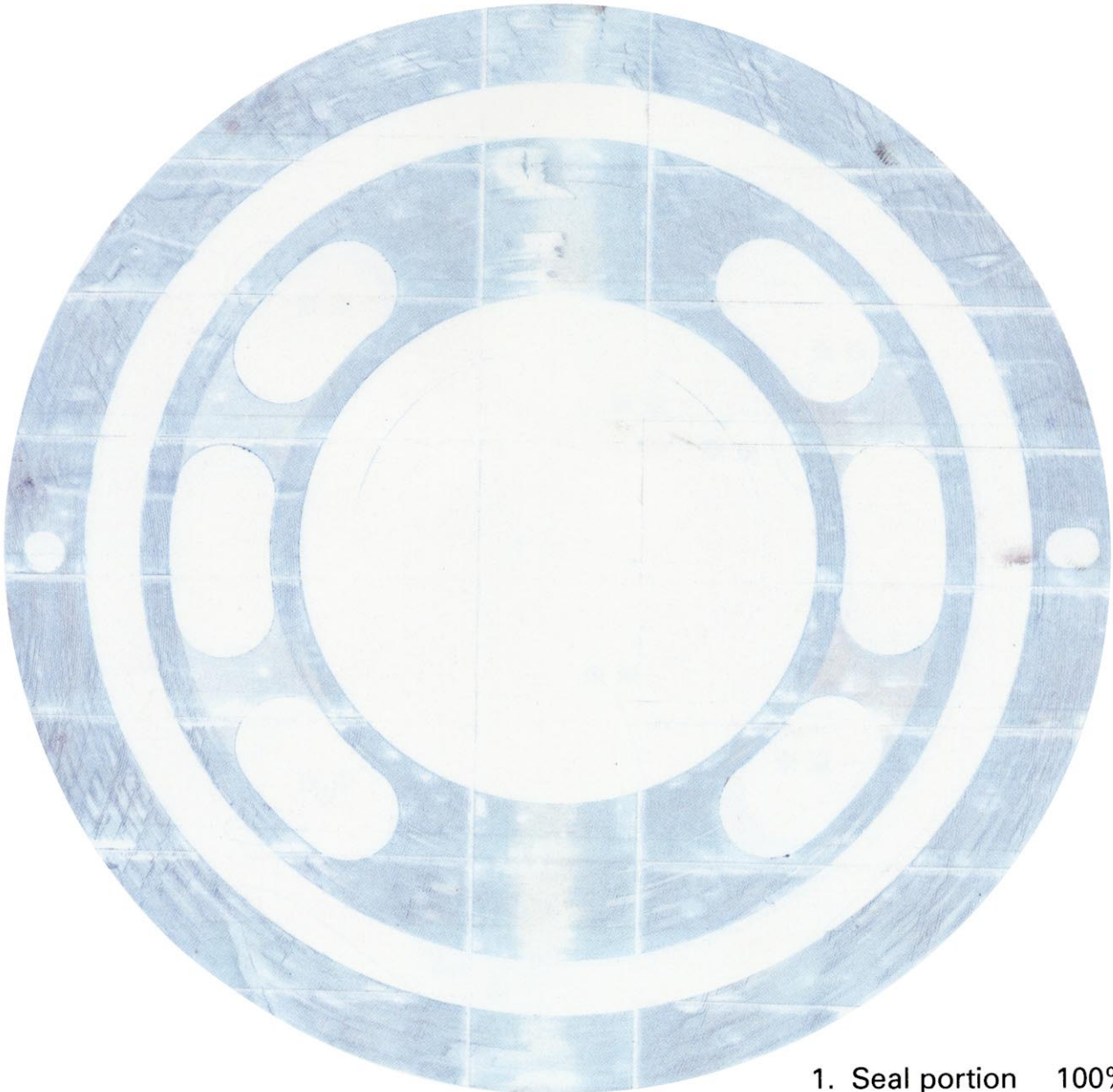
- 1. Seal portion 90%
- 2. Other portion 100%

- Break in seal portion (marked *)
- White or pale gray places such as those marked ** are places where there is no contact.

CONTACT OF FIXED SURFACE BETWEEN E/C AND V/P

Service Limit Sample

	Seal portion	Other portion
Contact area %	OK	OK
No break	OK	—



- 1. Seal portion 100%
- 2. Other portion 100%

