

MODEL AL-150T series and AL-140T series SAFETY RELIEF VALVE

PRODUCT MANUAL

Thank you very much for choosing the Yoshitake's product. To ensure the correct and safe use of the product, please read this manual before use. This manual shall be kept with care for future references.

The symbols used in this manual have the following meanings.

 Warning	This symbol indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
 Caution	This symbol indicates a hazardous situation that, if not avoided, may result in minor or moderate injury or may result in only property damage.

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YOSHITAKE

1. Usage of the Product

The AL-150T series and the AL-140T series safety relief valves are used mainly in various pressure vessels, instrumentation devices and at outlet of pressure reducing valves to prevent accidents caused by abnormal pressure rise.

2. Specifications

Model	AL-150T	AL-140T	AL-140TML	AL-150TML	AL-150TR
Structure	Closed type		Closed type with lever		Closed type with handle
Application	Air, water, Oil, Other non-dangerous fluids				Water, Oil, Other non-dangerous fluids
Working pressure	0.05-1.0 MPa				
Working temperature	5-120°C				5-90°C
Connection	JIS Rc screwed				
Nominal size	15-50A				
Material	Spring case	Cast bronze	Cast stainless steel		Cast bronze
	Valve, valve seat	Stainless steel			
	Spring	Stainless steel			
	O ring	Composition rubber			

* Closed lever type AL-150TML and AL-140TML are able to carry out a blowout inspection manually.

* Handle type AL-150TR is available for use in relief valve, which is easy to change the set pressure.

Warning

1. Do not use the product for equipment or device which vibrates excessively.
* Failure to follow this notice may result in malfunction.
2. Do not adjust or change the set pressure.
* Failure to follow this notice may result in damage to the equipment.



Caution

Please confirm that the indications on the product correspond with the specifications of the ordered product model before use.
* If they are different, do not use the product and contact us.

3. Dimensions and Weight

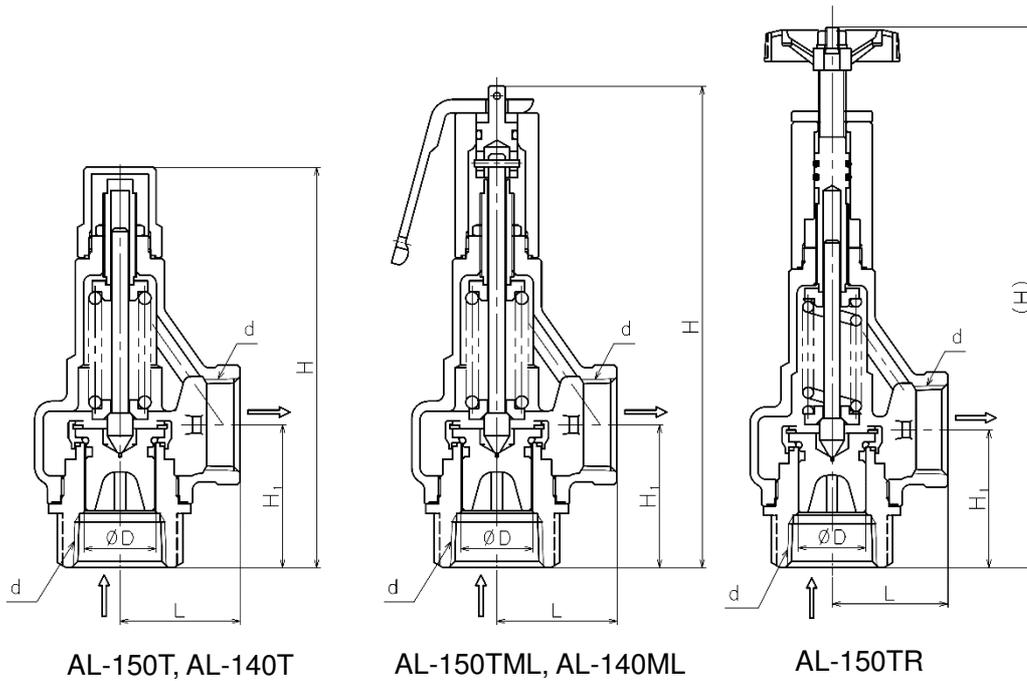
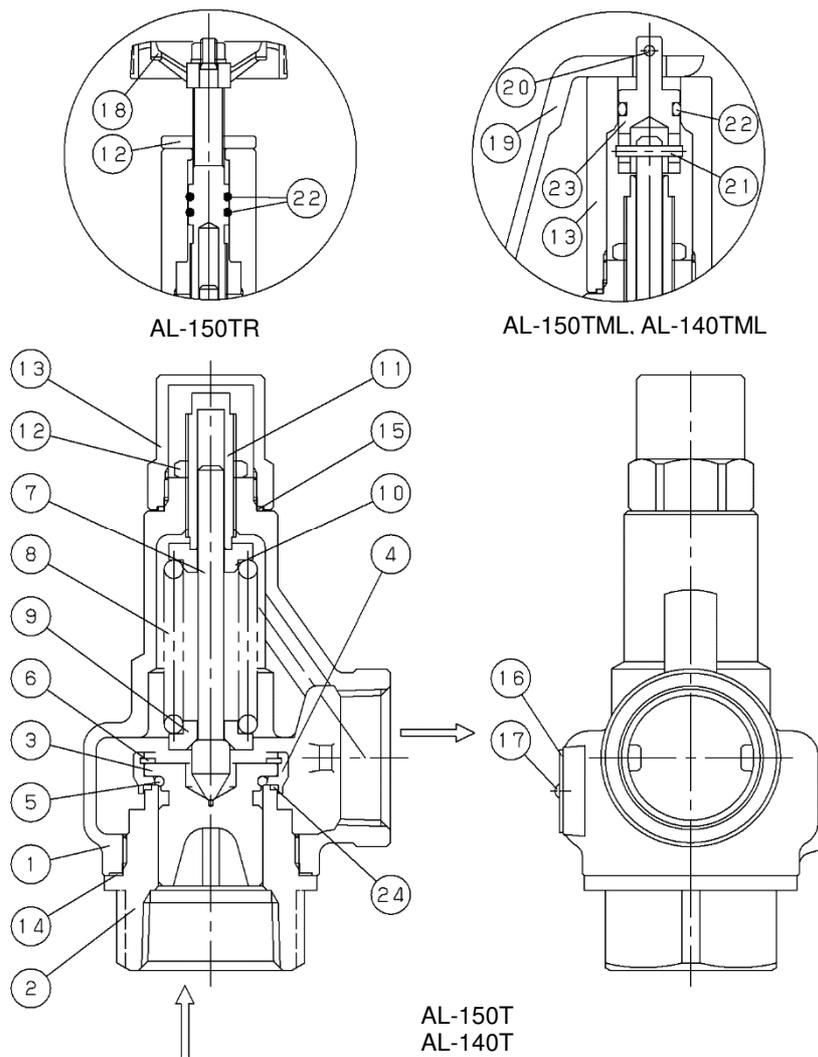


Fig.1 Dimensions

Nominal size	Blowout area [mm ²]	Dimensions [mm]				
		d	D	L	H ₁	
					AL-150T AL-150TML AL-150TR	AL-140T AL-140TML
15A	20.1	Rc 1/2	16	34	40	40
20A	34.6	Rc 3/4	21	38	43	42
25A	53.0	Rc 1	26	43	51.5	51
32A	93.3	Rc 1 1/4	33	50	61.5	61.5
40A	135.2	Rc 1 1/2	41	60	60	64
50A	208.2	Rc 2	51	75	76	76

Nominal size	Dimensions [mm]				Weight [kg]		
	H						
	AL-150T	AL-140T	AL-150TML AL-140TML	AL-150TR	AL-150T AL-140T	AL-150TML AL-140TML	AL-150TR
15A	128	128	157	185	0.7	0.8	1.0
20A	128.5	128.5	158	185	0.8	0.9	1.1
25A	144.5	148	174	203	1.1	1.3	1.4
32A	181.5	181.5	212	250	1.8	1.9	2.1
40A	205	205	246	280	2.8	3.0	3.1
50A	245.5	245.5	286	315	4.7	4.9	5.1

4. Structure



No.	Part name
1	Spring case
2	Valve seat
3	Valve
4	Valve cover
5	O ring
6	C ring
7	Spindle
8	Spring
9	Bottom spring plate
10	Top spring plate
11	Adjusting screw
12	Lock nut
13	Cap
14	Gasket
15	Gasket
16	Name plate
17	Rivet
18	Handle
19	Lever
20	Spring pin
21	Spring pin
22	O ring
23	Connecting rod
24	Pressure groove

Fig.2 Structure

5. Operation

- **Blowout operation**
 As the inlet pressure approaches the blowout pressure, the force of fluid pushing up the valve [3] approaches the force of the spring [8] pressing down the valve [3]. The safety relief valve commences to blow when the inlet pressure gets lower than the blowout pressure.
 Then, when the inlet pressure rises and reaches the blowout pressure, the valve [3] pops.
- **Closing operation**
 Since the inlet pressure of the safety relief valve decreases when the fluid is released into the atmosphere by the pop action of valve [3], the force of fluid lift is lowered. At this point, the repelling force of the spring [8] becomes larger than the force of fluid lift and thus the valve closes. In addition, while the safety relief valve discharges, pressure of fluid entering into the back of the valve [3] (back pressure) adds to the closing force.

6. Nominal Size Selection Table

6.1 For air (at 20°C)

Capacity <Pressure vessel structure standard>

[kg/h]

Nominal size	Blowout area [mm ²]	Set pressure [MPa]										
		0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	20.1	25	33	48	65	81	98	114	131	147	164	181
20A	34.6	44	57	83	111	140	169	197	226	254	283	311
25A	53.0	67	87	127	171	215	258	302	346	390	433	477
32A	93.3	113	147	214	288	362	435	509	582	656	730	803
40A	135.2	169	221	321	431	542	652	762	872	982	1093	1203
50A	208.2	262	341	496	666	836	1006	1176	1346	1516	1687	1857

6.2 For water (at 20°C, accumulation: 25%)

Capacity <Yoshitake standard>

[m³/h]

Nominal size	Blowout area [mm ²]	Set pressure [MPa]										
		0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15A	20.1	0.4	0.5	0.9	1.1	1.3	1.5	1.6	1.8	1.9	2.0	2.1
20A	34.6	0.6	0.9	1.6	2.0	2.3	2.6	2.8	3.1	3.3	3.5	3.7
25A	53.0	1.0	1.5	2.5	3.1	3.6	4.0	4.4	4.7	5.1	5.4	5.7
32A	93.3	1.8	2.6	4.5	5.5	6.3	7.1	7.8	8.4	9.0	9.5	10.0
40A	135.2	2.7	3.8	6.5	7.9	9.2	10.3	11.3	12.2	13.0	13.8	14.6
50A	208.2	4.1	5.9	10.0	12.3	14.2	15.9	17.4	18.8	20.1	21.3	22.4

*1: [Example] When the set pressure of 1.0 MPa, and the valve size is 50A

The capacity is 22.4 m³/h, when the inlet pressure reaches 1.25 MPa (accumulation becomes 25%) after the fluid pressure reaches the set pressure of 1.0 MPa.

7. Installation

Warning

1. Do not install any closing device such as a stop valve at inlet or outlet sides of the product.
* Failure to follow this notice may result in damage to the pressure vessel because such closing device may hamper the blowout of the safety relief valve.
2. Install an exhaust pipe on outlet side of the product, and lead it to a place where there is no risk of physical damage even if fluid blows out.
* Failure to follow this notice may result in injury and scalds in case of fluid blow out.
3. Do not disassemble the product.
* Failure to follow this notice may prevent the product from functioning properly and lead to danger.
4. When installing, tighten the hexagonal part of the valve seat [2] with a spanner.
Do not adjust its direction by rotating the outlet piping.
* Failure to follow this notice may result in scalds or injury due to blow-off caused by screw crack on the spring case [1] or losing of the spring case [1] and the valve seat [2].
5. Do not apply viscous fluid that may make fixation of the valve and valve seat.
* Failure to follow this notice may prevent the product from functioning properly.

Caution

1. Before installing the product, remove foreign substances and scale from the piping.
* Failure to follow this notice may prevent the product from functioning properly.
Note that the customer will be required to pay repair charge for any defect that occurs due to foreign substances.
2. When installing the product, match the direction of fluid flow with the inlet and outlet of the product respectively.
* Failure to follow this notice may prevent the product from functioning properly.
3. Install the product vertically with the cap [13] facing upward.
* Failure to follow this notice may prevent the product from functioning properly.
4. Securely support and fasten the pipes.
Refer to the following "Pipe mount" and "Exhaust pipe".
* If an excessive stress is applied to the piping, the product may be deformed and not open/close.
5. Lead exhaust pipe to outside of buildings if there is a risk that fluid blowout causes alarm activation or contamination of the peripheral equipment.
* Improper placement may cause contamination of the peripheral equipment.
6. Connect the product to the pipes securely.
* Improper connecting may cause fluid leakage from the piping joint when vibration is applied, or may cause scalds in case that fluid is hot.
7. If there is a risk that condensate or rain water accumulates in exhaust pipe, attach drain pipe with the product and/or the exhaust pipe in a position where they can be drained.
* Failure to follow this notice may cause rust and result in malfunction.
8. Inner diameters of pipe mount and of exhaust pipe shall be more than those of each inlet and outlet of the product.
* Failure to follow this notice may result in malfunction or insufficient amount of blowout.
9. Secure enough space required for maintenance or inspections.
* Failure to follow this notice prevents maintenance and inspections being implemented.
10. Avoid rapid pressure change. Impact by a rapid pressure change, such as water hammer, may damage the product/parts.
11. Do not apply excessive load, torque or vibration to the product.
12. Select a proper model according to usage conditions including operation frequency and durability required.

- Cleaning the inside of the piping
 1. Please clean the inside of the pipe thoroughly and remove any dust or scales before installing the product. **Please note that all repairs for disorders due to foreign substances shall be charged.**
- Pipe mount
 1. Pipe mount should have sufficient strength and rigidity against stress which are induced by reaction force in opposite direction of the exhaust through the axis of the exhaust pipe.
 2. Pressure loss in pipe mount leads to decrease in the discharge volume and to unstable operation of the product. To prevent this from happening, install the product vertically as close as possible to the can body and the header. In addition, place the product in a position where maintenance and inspection can be done easily.
 3. Inner diameter of pipe mount shall be more than that of the product inlet.
- Exhaust pipe
 1. Install exhaust pipe and drip pan elbow so that the product can not be subject to the stress caused by thermal expansion of equipment and by dilatation of the exhaust pipe due to thermal action of blowout.
 2. Inner diameter of exhaust pipe shall be more than that of the product outlet to avoid improper back pressure.

7.1 Piping example

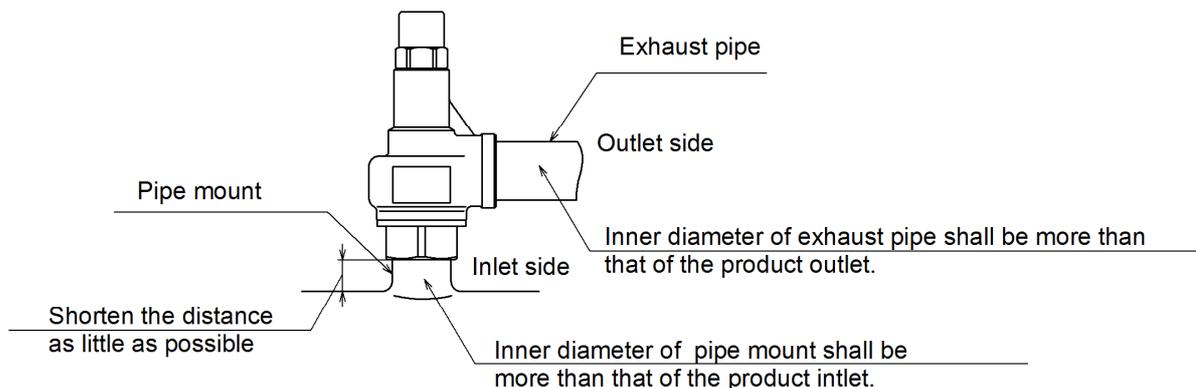


Fig.3 Piping example

8. Maintenance

⚠ Warning

1. Do not touch the product/pipes or the lever [19] with bare hands.
* Failure to follow this notice may result in scalds or injury in case that fluid is hot.
2. Do not touch the product unless it is necessary.
* Failure to follow this notice may result in scalds or injury in case that fluid is hot.
3. When checking the operation of the product, wear earplugs and stand clear of exhaust pipe end during inspection. Do not look down or touch the open end of the exhaust pipe.
* Failure to follow this notice may result in scalds or injury due to blow-off. Be aware that the product makes a loud noise at start-up.
4. Do not remove the cap [13].
* Failure to follow this notice may cause danger due to blow-off from the adjusting screw.
5. Do not disassemble the product.
* Please contact us if any abnormal condition is observed.

 **Caution**

1. Before applying higher pressure fluid to the product, check that no problems have occurred in the equipment on the piping.
* Failure to follow this notice may damage the equipment.
2. Completely discharge fluid from the product and piping before leaving the product not operated for a long time.
* Failure to follow this notice may cause foreign substances and scale inside of the piping and may result in malfunction of the product.
3. If the product is not operated for a long time, perform test working before starting operation.

8.1 Daily inspection

Check the following items while the system is in operation.

- Leakage from between the cap [13] and the O ring [22]. (AL-140TML, AL-150TML, AL-150TR)
- Corrosion or crack on the product
- Leakage from the product under normal working pressure (check it visually and aurally).
- Leakage from the joint between the product and piping, and between the spring case and the valve seat.
* Please contact us if any abnormal condition is observed.

8.2 Regular inspection (once per 6 months)

1. Check that there is no loose piping at inlet and outlet side of the product. In addition, check that the cap [13] is fastened securely.
2. Check the operation of the product by raising fluid pressure to the set pressure.
For the AL-150TML and the AL-140TML (closed type with a lever), check the operation, by lifting up the lever, while differential pressure between the set and inlet pressures is within the range of table 1.
* Please contact us if any abnormal condition is observed.

Table 1. The differential Pressure in which the blow-off inspection by lever operation is possible

Size	Differential pressure between set and inlet pressures
15-25A	1.0 MPa or less
32-40A	0.6 MPa or less
50A	0.4 MPa or less

8.3 Troubleshooting

Trouble	Cause	Remedy
Leakage detected at the outlet	1. Foreign substance or scale stuck on contact surface between the valve [3] and valve seat [2].	1. Follow the procedure described in 8.2.2. to operate the product and eliminate the foreign substance and scale. Please contact us if the trouble does not stop.
	2. Damage on the O ring [5] or on the contact surface of valve seat [2].	2. The product needs to be disassembled and its parts need to be replaced. Please contact us.
	3. Excessive vibration applied to the piping where the product is installed.	3. The product should not be used on device or equipment that vibrates excessively.
	4. The pressure difference between the set pressure and the normal working pressure is too small.	4. The set pressure needs to be readjusted. For AL-150TR, readjust the set pressure by handle (See 8.4). For the other models, please contact us.
	5. The pressure momentarily exceeds the set pressure because of fluid pulsation.	5. In view of fluid pulsation, the set pressure needs to be raised (readjusted) or the normal working pressure needs to be lowered. To raise (readjust) the set pressure, please contact us.
	6. Fluid flows into the outlet piping.	6. Change the piping layout to keep the fluid from flowing into the outlet piping.
Blows at a pressure lower than the set pressure.	1. The product specifications are not consistent with the use condition.	1. Check the set pressure indication on the name plate. If the product is not suitable for the usage condition, replace it with a proper one.
	2. The pressure gauge is out of order.	2. Calibrate the pressure gauge or replace it with a new one.

Trouble	Cause	Remedy
Blows at a pressure lower than the set pressure.	3. Damage on the O ring [5] or on the contact surface of valve seat [2].	3. The product needs to be disassembled and its parts need to be replaced. Please contact us.
	4. The product does not keep the accuracy of its set pressure.	4. The set pressure needs to be readjusted. For AL-150TR, readjust the set pressure by handle (See 8.4). For the other models, please contact us.
Does not operate at the set pressure.	1. The product specifications are not consistent with the use condition.	1. Check the set pressure indication on the name plate. If the product is not suitable for the usage condition, replace it with a proper one.
	2. The pressure gauge is out of order.	2. Calibrate the pressure gauge or replace it with a new one.
	3. Sliding parts of the valve [3] and valve seat [2] do not move smoothly.	3. The product needs to be disassembled and cleaned. Please contact us for repair.
	4. There is a back pressure at the piping of the product outlet.	4. Remove the back pressure. Change the piping layout not to allow the back pressure exist.
	5. The product does not keep the accuracy of its set pressure.	5. The set pressure needs to be readjusted. For AL-150TR, readjust the set pressure by handle (See 8.4). For the other models, please contact us.
Does not stop blowing.	1. Foreign substance or scale stuck on contact surface between the valve [3] and valve seat [2].	1. The product needs to be disassembled and cleaned. Please contact us.
	2. Sliding parts of the valve [3] and valve seat [2] do not move smoothly.	2. The product needs to be disassembled and cleaned. Please contact us.
	3. The normal working pressure exceeds the closing pressure.	3. Increase the difference between the set pressure and normal working pressure. If the set pressure needs to be readjusted, please contact us.
	4. The product is installed at outlet side of pressure reducing valve which is out of order, and the reduced pressure of the valve is getting higher than expected.	4. The pressure reducing valve needs to be repaired. If it is Yoshitake's product, please contact us.
The lever [19] does not lift up. <AL-150TML> <AL-140TML>	1. The pressure difference between the set pressure and the inlet pressure is large.	1. Make the differential pressure between the set and inlet pressures within the range of table 1.
	2. Sliding parts of the valve [3] and valve seat [2] do not move smoothly.	2. The product needs to be disassembled and cleaned. Please contact us.
Does not stop blowing after lifting and letting go the lever [19]. <AL-150 TML > <AL-140 TML >	1. Foreign substance or scale stuck on contact surface between the valve [3] and valve seat [2].	1. Lift up the lever again to eliminate scale. Please contact us for repair if the trouble does not stop.
	2. Sliding parts of the valve [3] and valve seat [2] do not move smoothly.	2. The product needs to be disassembled and cleaned. Please contact us.
Leakage from between the cap [13] and the O ring [22]. <AL-150TR> <AL-150 TML > <AL-140 TML >	1. Damage on the O ring [22].	1. The product needs to be disassembled and its parts need to be replaced. Please contact us.

8.4 Procedure for set pressure adjustment

DO NOT ADJUST THE SET PRESSURE OF THE MODELS OTHER THAN AL-150TR.

Warning

1. To adjust the set pressure of AL-150TR, turn the handle [18] slowly at the rotation of 1/4-1/3 and confirm the operation each time. Be careful of the sudden blowout when the handle are turned too much. In case of blowout, step away from the product immediately.
* Failure to follow this notice may result in injury and scalds due to blowout in case that fluid is hot.
2. Be sure to wear gloves while operating the handle of AL-150TR.
* Failure to follow this notice may result in burn and scalds in case that fluid is hot.

Caution

1. Do not adjust the set pressure of the models other than AL-150TR. Besides, set pressure adjustment for AL-150TR must be done according to the set pressure range shown in Table 2.
2. For AL-150TR, be sure to turn the handle or tighten/loosen the lock nut by hand. Be careful not to turn it with excessive force or turn too much.
* Handle can be turned only within the limited numbers of turns. Using tools or turning it with excessive force causes damage to the handle or malfunction of the product.

- Procedure for adjusting the set pressure of AL-150TR (See" Fig. 2 Structure.")
 1. Loosen the lock nut [12] by turning it counterclockwise by hand. (Outer peripheral surface of the lock nut [12] is knurled for easy turning by hand.)
 2. To increase the set pressure, turn the handle [18] clockwise. To decrease the set pressure, turn the handle [18] counterclockwise. Each turn must be slow and 1/4 to 1/3 of full turn. Also check the operation of the product per each turn.
 3. After the completion of adjustment, tighten the lock nut [12] by turning it clockwise by hand.
 Set pressure adjustment must be done according the set pressure range shown in Table 2. Please note that the range differs per size.

Table 2 Set pressure range of AL-150TR

Nominal size	Set pressure range (MPa)					
	A	B	C	D	E	F
15A	0.05~0.2	0.21~0.4	0.41~0.55	0.56~0.75	0.76~1.0	-----
20A	0.05~0.2	0.21~0.35	0.36~0.45	0.46~0.6	0.61~0.75	0.76~1.0
25A	0.05~0.2	0.21~0.35	0.36~0.45	0.46~0.55	0.56~0.8	0.81~1.0
32A	0.05~0.2	0.21~0.4	0.41~0.65	0.66~1.0	-----	-----
40A	0.05~0.2	0.21~0.4	0.41~0.65	0.66~0.8	0.81~1.0	-----
50A	0.05~0.2	0.21~0.4	0.41~0.65	0.66~0.8	0.81~1.0	-----