Technical Literature G-03-02

AURUM® Product Design

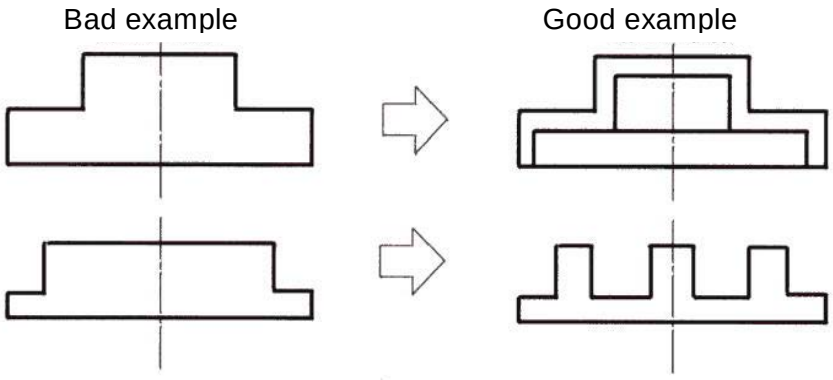
Product Wall Thickness

In principle, the standard wall thickness of molded articles is 1 to 4 mm and uniform. In the case of a wall thickness of 5 mm or above, a sink mark will be formed in the surface of a thick-walled section of a molded article, and a void or micro-void may occur in the central part.

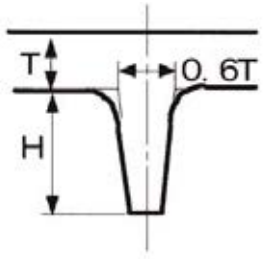
As a preventive measure, the product should be so designed that the wall thickness is uniform, with a rib structure adopted for a thick-walled section to avoid any abrupt change in the wall thickness. Furthermore, the wall thickness needs to be changed from structural and molding considerations. The reasons for that include the following:

(1) Structural strength
(2) A measure to prevent the occurrence of cracks due to shrinkage at the time of insert molding
(3) Strength of a welded section
(4) A measure to prevent of the occurrence of a sink mark in a thin-walled section
(5) A measure to prevent of the occurrence of a sink mark in a thick-walled section

An example of a change to wall thickness:

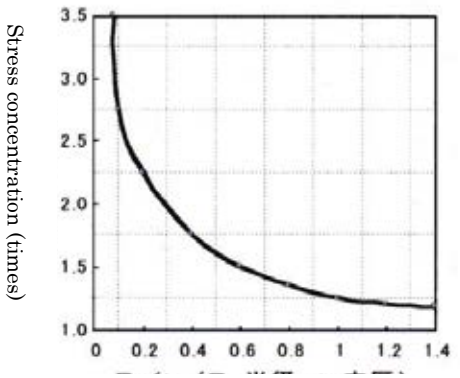


Standard rib design: Draft angle should be 0.5º or larger (as large as possible).



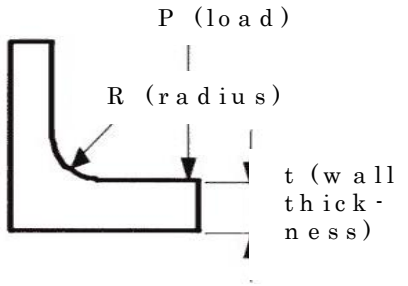
The largest possible radius should be taken at the edge section.
(Reduction of stress concentration)
It would be more effective to take a radius both inside and outside.

Stress concentration in the corner section:



R/t (R: radius; t: wall thickness)

R/t: 0.3 or below
Stress will increase. (R: radius; t: wall thickness)



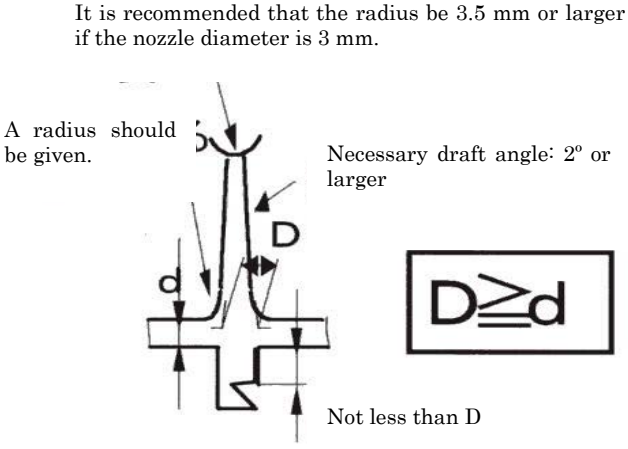
Sprue/runner

The shape of the sprue/runner varies with molded articles and the size of molding machines. The following is a standard shape of the sprue/runner:

Sprue/runner Design Points:
It is advisable to give a radius to the root.

(1) The injection inlet diameter shall be larger by about 5 to 1 mm larger than the nozzle diameter
(2) Taper angle: 2 to 5º (to be determined on the basis of runner dimensions)

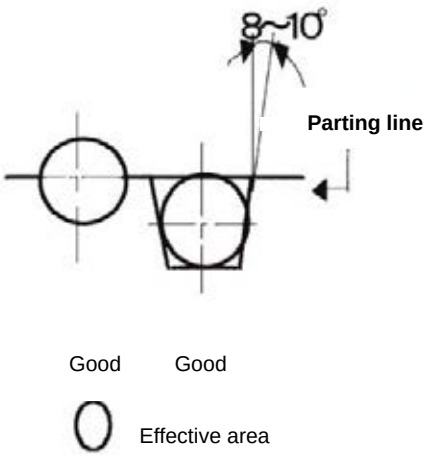
* If the flow of the resin is not satisfactory, it is recommended that the sprue diameter be made larger. (Especially, this will have a significant effect for a direct gate: on the basis of results of an analysis of charging)



An example of standard shape

Runner shape points:

A cold slug well shall be provided at the ends of the runner and the subrunner.



Decision shall be made as to which should be adopted depending on molded articles: the circular type or the trapezoid type.

• Standard dimensions of the circular type

(mm)

D : Diameter
3．0
4．0
5．0
6．0
7．0
8．0
9．0
10．0

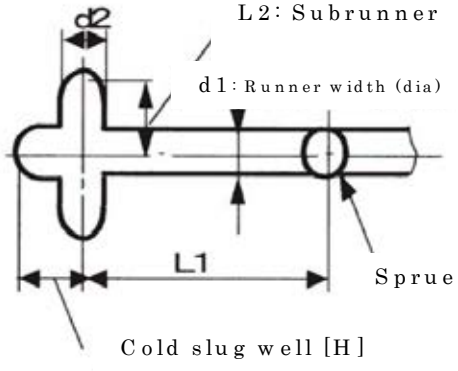
• Standards for the trapezoid type: Taper angle 8 to 10º

(mm)

H: Height	W: Width	R: Edge part
2．5	2．5	0．5
3．0	3．0	0．5
4．0	4．0	0．5
5．0	5．0	1．0
6．0	6．0	1．0
8．5	8．5	1．0

Cold slug well shape points:

* The optimum cold slug well [H] at the product inlet is 1.5 times the runner width [diameter] (d1).



(mm)

Runner length (L1)	Runner width (d1)
70 or below	6
70 - 200	8
Over 200	Over 10

(mm)

Runner length (L1)	Runner width (d1)
70 or below	6

Gate

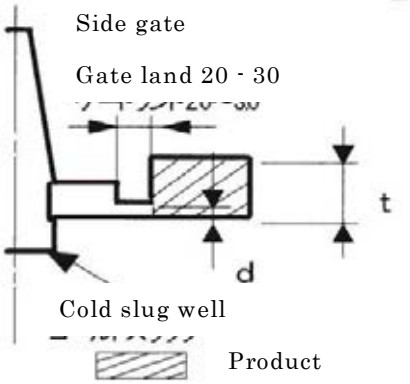
Care should be taken to make sure that the shape and location of the gate is such that the resin can be charged fully and the molded article can be cut off easily.

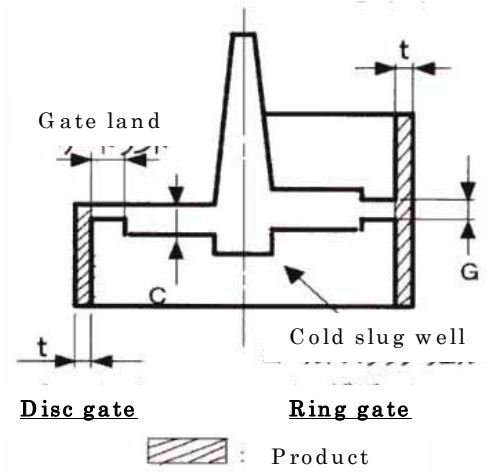
Points in relation to the shape of the gate:

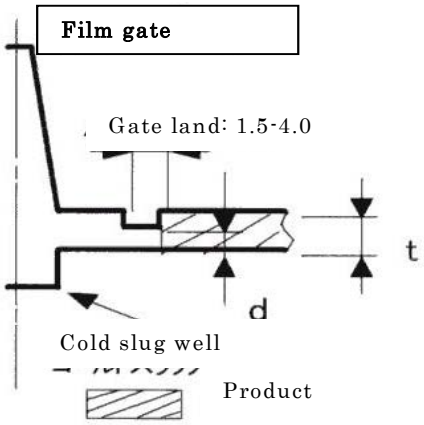
(1) Side gate (Since the resin is injected from the side of the molded article, the side gate helps prevent the clouding and jetting of the gate section and reduce residual stress.)
Gate land: 2 – 3 (mm)
Gate thickness (d): 0.6 xt – 0.7xt
[t: product wall thickness] (Ex. wall thickness t5→t3)
Gate thickness: Max. 3 – 4 (mm)

(2) Film gate (fan gate) (This helps prevent jetting.)
Gate land: 1.5 – 4 (mm)
Gate thickness (d): 0.3 xt – 0.5xt
[t: product wall thickness] (Ex. wall thickness t5→t3)
Gate thickness: Max. product width

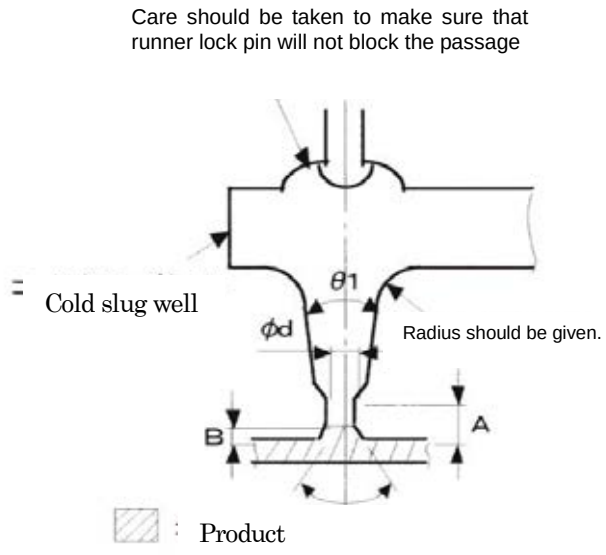
(3) Disk gate (ring gate) (This helps prevent a weld mark in the cylindrical section.)
Gate land: Approximately the same as gate thickness (G)
Gate thickness (G): 0.5xt – 0.8xt [t: product wall thickness]
Disc thickness (C): Gate thickness (G) + 2(mm) or so







(4) Pin-point gate (using the 3-plate type)

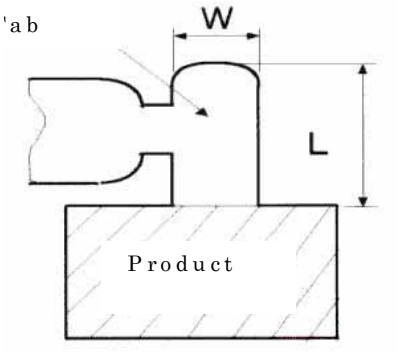


(For use in the case in which the sprue/runner of a molded article is to be cut automatically)

θ 1	°	2～3
θ 2	°	90
A	mm	0．7～1．0
B	mm	0．3～0．5
φ d	mm	1．0～2．0

(Generally, φ d: product thickness x 0.6 – 0.7)
* A radius should be given to the edge section (to prevent breakage due to stress concentration).

(5) Tab gate

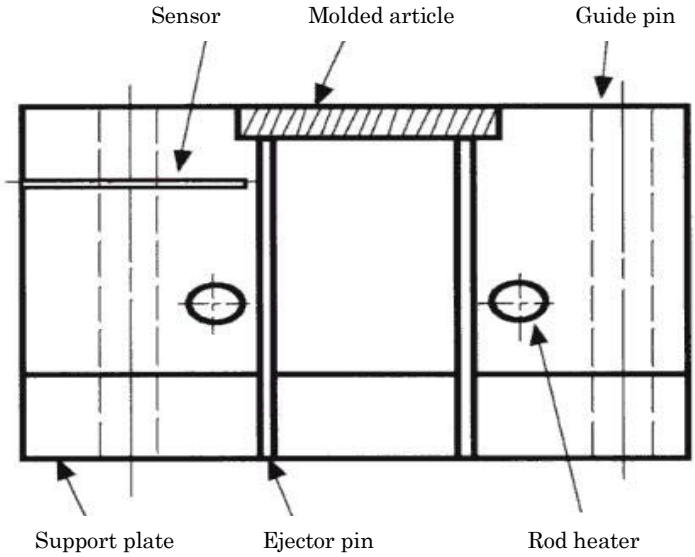


Tab thickness: 1/2 – 2/3 of the thickness of a molded article
W: 7 – 10 mm
L: 15 – 20 mm

Gas vent

It is recommended that an air vent 0.05 mm in size be provided wherever deemed necessary.

Temperature Control



- A rod heater is preferable.
- It is recommended that a heater be inserted in each plate of the 3-plate type.

Location of the sensor:
It is recommended that the sensor be near the product in such location that the end of the sensor will be in the vicinity of the center of the mold plate.
Precautions:
(1) Depending on the size of the mold, heat release from the mold should be taken into consideration.
(2) A temperature rise in the central part of the mold to be caused by the injection of the melted resin should be taken into consideration.

Location of the sensor:
It is recommended that the sensor be installed in a location far away from the product.
Number of the sensor:
It is advisable to install as many sensors as possible at the same wattage. (4 pieces are better than 2.)
* It would be better if a heater is inserted in the support plate and a sensor be inserted near the cavity.