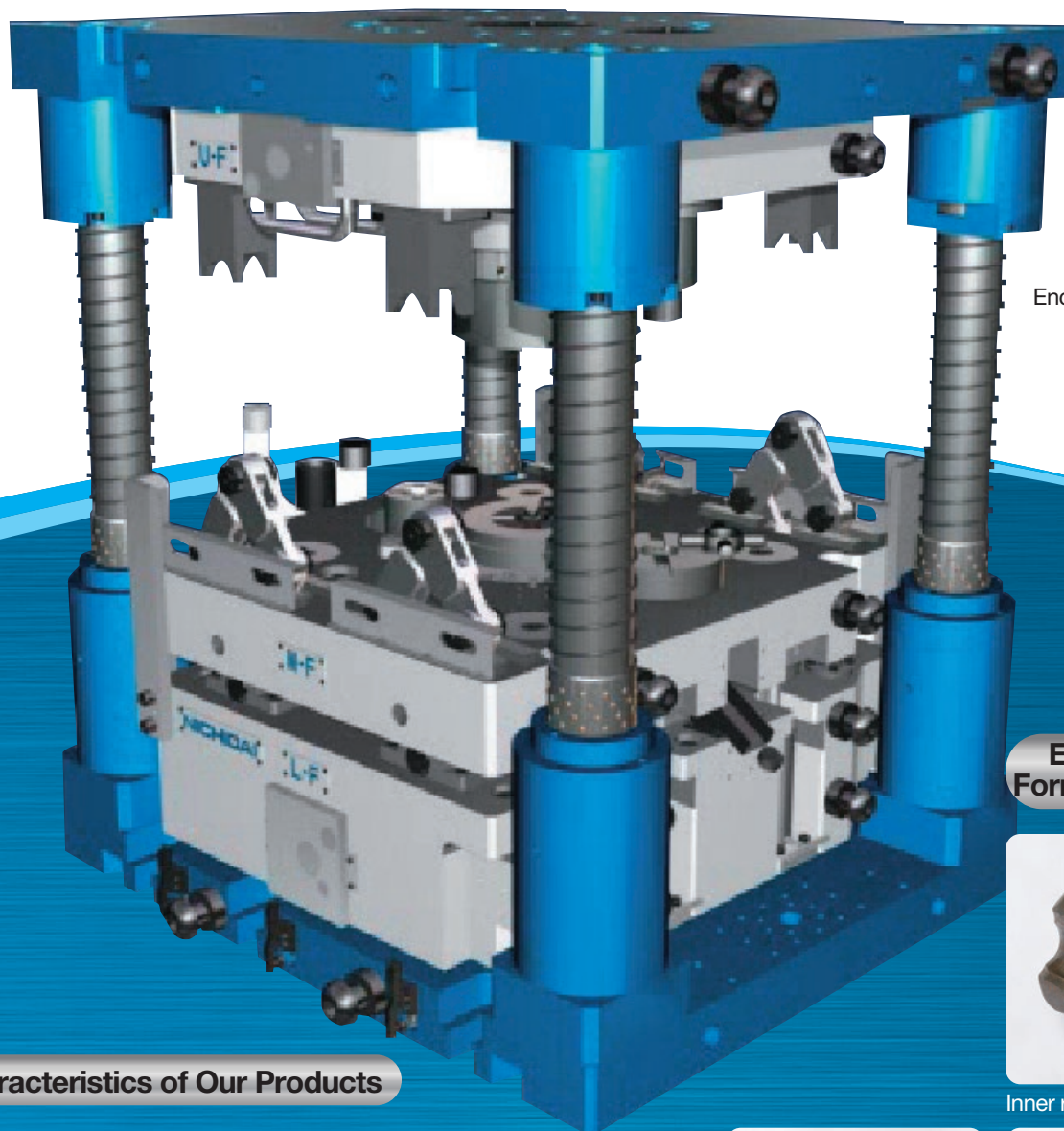


# Enclosed Die Set



We created a net shaping process for our customers' complicated products by using the clients' presses and our Enclosed Forging Die Set that we developed on our own.



Enclosed Die Set

## Examples of Formed Products



Inner races



Bevel gears



Cross joints

## Characteristics of Our Products

- Create enclosed die forging processes by simply adding our dies to general purpose presses
- Utilize our proprietary link system
- Produce a variety of enclosed die forging products by merely changing the length of the pantograph

## Product Specification

### Pantograph-type Hydraulic Enclosed Die Set

#### Specifications

(actually used for manufacturing)

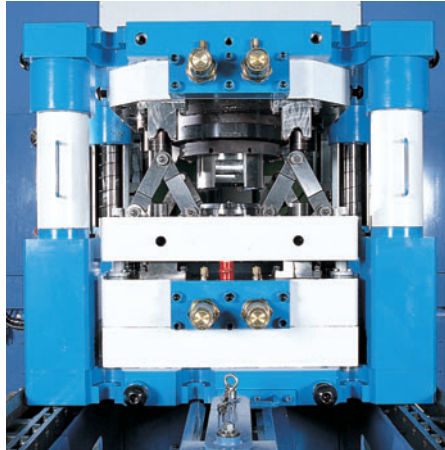
Enclosing load : MAX 1,960KN  
 Enclosing stroke : 20-30mm (two-sides)  
 : 20-50mm (one-side)  
 Press : 200-1,250ton  
 Die height : 500-1,200mm  
 Slide stroke : 200-400mm

### Hydraulic Back Pressure Die Sets

#### Specifications

(actually used for manufacturing)

Enclosing load : MAX 3,920KN  
 Enclosing stroke : 50-70mm  
 Press : 600-1,000ton  
 Die height : 900-1,200mm  
 Slide stroke : 400mm



### Gas Pressure-type Enclosed Die Sets

#### Specifications

(actually used for manufacturing)

Enclosing load : MAX 1,960KN  
 Enclosing stroke : 25-50mm (one-side)  
 Two-side type can be produced.  
 Press : 600-1,200ton  
 Die height : 600-1,200mm  
 Slide stroke : 400-500mm

### Gas Pressure-type Back Pressure Die Sets

#### Specifications

(actually used for manufacturing)

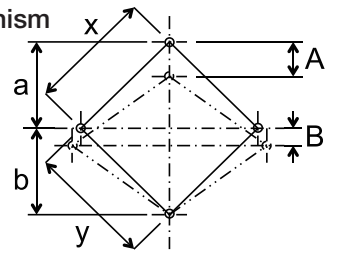
Enclosing load : MAX 4,340KN  
 Enclosing stroke : 45-55mm  
 Press : 600-1,000ton  
 Die height : 1,000mm  
 Slide stroke : 400mm

## Features of Enclosed Die Set

### Hydraulic Type vs. Gas-pressure Type Comparison Table

		Hydraulic type	Gas-pressure type
(1) Operating force		Mineral oil	N2 gas
(2) Cylinder / Piston		Specialty	General purpose
(3) Quantity		1	Multiple parts
(4) Capacity range		2,000KN	2,000KN
(Setup pressure)		~20MPa	~14MPa
(5) Pressure control		Available	Not available
(6) Enclosing stroke	One side	~40mm	~40mm
	Both sides	~25mm	~25mm
(7) Production speed		~38spm	~580mm/sec
(8) Peripheral equipment		Hydraulic system	—
(9) Other peripheral equipment		Piping, cooling water, etc.	Nothing

### Pantograph Mechanism



a : Upper link height X : Upper link length A : Swaging stroke  
 b : Lower link height y : Lower link length B : Lower die stroke

From the diagram shown above,

$$x^2 - a^2 = y^2 - b^2 \quad [1]$$

$$x^2 - (a - A + B)^2 = y^2 - (b - B)^2 \quad [2]$$

Eliminating x and y from equations [1] and [2],

$$B = \frac{aA - A^2/2}{a+b-A} \quad [3]$$

Case I If speed ratio is 1 : 1 (top / bottom), we get A = 2B.

and, from equation [3], we get b = a.

Case II If speed ratio is 2 : 1 (top / bottom), we get A = 3B.

and b = 2a - A / 2.

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