Swing Cam Catalogue

Ver.2023～2024

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YB YOURBUSINESS.CO.LTD

"Swing Cam" is protected by a patent of Your Business Co., Ltd
Please refer to the next pages for notice.
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Important 1： Please be certainly informed Your Business Co.,Ltd. before starting
the planning drawing and design for Swing Cam or Half Mount Cam structure.
.

Important 2： Please send the data of the Swing Cam portion to Your Business Co.,Ltd.
before starting to make the tooling die for Swing Cam(including the copied tooling die).

【Contact】Your Business Co.,Ltd. (E-Mail：yourb@yourb.co.jp)

1st Aug.2023 revised

SWING CAMS Catalogue 2023/2024 edition

Thank you so much for using SWING CAMS and HALF MOUNT CAMS structure.

The tooling dies industry continues to be in a difficult situation in 2023, and we would like to cooperate to reduce the cost of tooling dies in such an environment. According to use this mechanism, it is possible to downsize of tooling dies, shorten the process, improve processability, improve maintainability, and improve panel quality. Measuring these improvement, we would like you to progress reducing the cost of tooling dies.

We are constantly keeping improvements to make this mechanism better with the cooperation of our customers.
Our catalog is released for use in Automotive sheet metal forming process planning and tooling die design.
Many Automobile manufacturers keep tooling die design standards confidential, but we release this mechanism we have developed and been constantly improved.

When using this mechanism, it is necessary to note the mechanism related to intellectual property rights.
Also, since the designer who is not familiar with SWING CAMS and HALF MOUNT CAMS structure in the tooling die design, there are many cases where major mistakes occur.
Thus, when the SWING CAMS concept of the tooling die is completed or planned to use this mechanism, in this case, please send the design data to us for a design review. Naturally, we will protect the confidentiality and are pleased to provide technical advice free of charge.
In addition, we are also waiting for enquiries (for a charge) for the planning drawings for continuous forming, etc., including shortening of the forming process.

It is the following changes in 2023/2024 catalogue.

1) We have established the die design standard for SWING CAMS in case of no using the air cylinder.

2) We have particularly stipulated the HALF MOUNT CAMS Mechanism into the design standard. This standard can easily replace to the conventional rotary cam method. Please pay special attention to the rotation stop in case of using.

    a) In case of stopping rotation by using an aerial cam, please note the related position for the distance between the rotating axis and the machining part position, the sliding length of the upper cam.

    b) In many cases, the rotating axis is designed into the panel or close to the edge of the panel.

    c) It is possible not to slide by shifting the slice line about both the rotating SWING CAM and the punch side.

    d) We will also respond to requests for the design and manufacture of SWING CAMS module units and HALF MOUNT CAM module units.

3) Request for SWING CAMS (HALF MOUNT CAMS) structure and each component.

    a) Regarding the durability of various components, when used in the usual correct use, it has an operating record of more than 1 million stampings. <u>However, if the SWING CAMS components are damaged, we will basically supply them for a charge.</u>

    b) What is wrong usage?
    For example, operating the SWING CAMS with air cylinder, although it is not set situation, the production is performed by stamping with an aerial cam or a terminated device of a breakage prevention mechanism.
    Normally, in the case of design at our company, we will respond with a design that does not cause such troubles.
    Or if there are other design or stamping problems, etc.

If it is considered that there are almost no advantages such as "shortening the forming process", "improving panel quality", "reducing costs by improving workability", "downsizing tooling dies", etc. by using this standard (SWING CAMS or HALF MOUNT CAMS structure) (for example, the cost is the same as that of double cams), we will not request to pay the royalties.
In this case, we would like to discuss with customers.

Modification history

Ver.	Issue date	details of modification

2010 ⋮ 2019	Jun.2019	04-Standard components for Swing Cam,
		    A301 changed to Half bearing,
		      A311 Developed Half Mount Cam and added newly
		      (A301 Deleted)

2020	26 Jun.2020	Reviewed whole and revised version

2021.2022	1 Oct.2021	Added by the detail of a modification for" Swing Cam Catalogue ver.2021-2022"
		03-03 Revised by the figure of Dropped Swing Cam type
		03-04 Revised by the figure (Half Mount Cam type) of
		      Swing Cam on Swing Cam type
		04-Standard components for Swing Cam
		      A102 revised by the corrections
		      A313 added by a description for the setting of
		          a rotating pivot of Swing Cam
		04-Standard components for Swing Cam
		      B102 changed by a location of the Urethane
		      B201 categorized by B201 and B202 according to the usage
		      B401 & B402 added by a tolerance
		      B413 added by F dimension
		      B501 added by example for the usage
		      B601 categorized B601-1 and B601-2
		      B701 & B702 added by a description for the usage
		      B721 added by the increasing of Stroke.
		04-Standard components for Swing Cam
		      C301, C302 added by the usage
		      C402 revised by a figure of the usage
		      C511 deleted and added newly by C513-1 and C513-2
		      C521 added by a description for the usage
		      C803 & C804 added by the notes
		      C905 added by the caution
		05-01-4 Revised by the figure for a usage of SB100
		05-03-1 Added the figure for a usage Half Mount Cam
		      on the crossing-section B-B.
		06-04-8 Added the figure of a progressing direction for
		      selecting the pressed type of rotating pivot shaft
		06-04-15 Revised by a description for the positive return
		      method for the termination and added a description for
		      aerial cam stroke and interference.
		06-04-old Page16, Deleted
		06-06-06-3 Page, revised by the description of a rotating
		      prevention type under the both strengthen of cam
		      driver and Swing Cam
		06-06-09 Added by a description about the standard for Swing Cam
		      stopper

Modification history

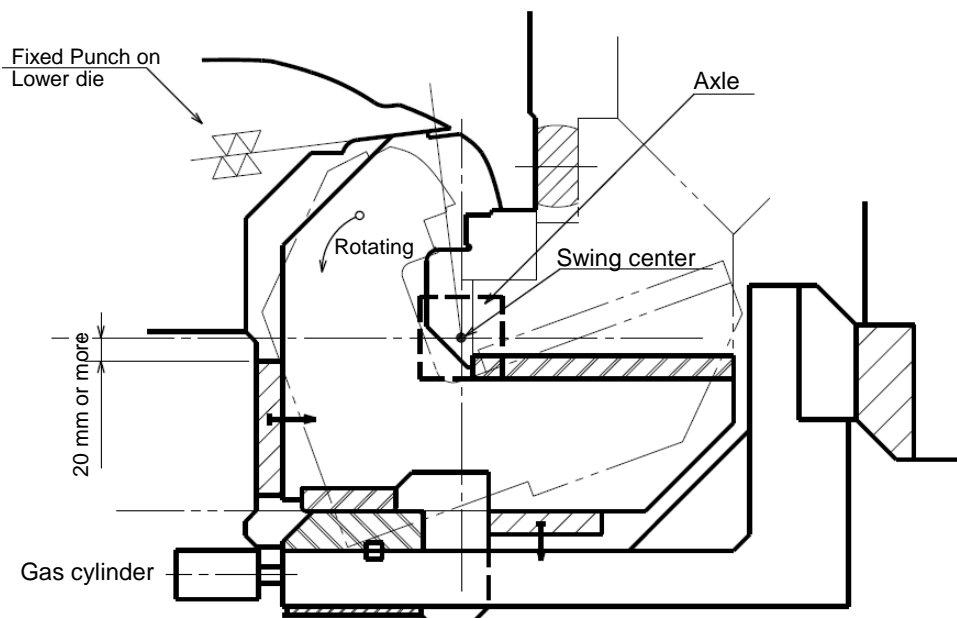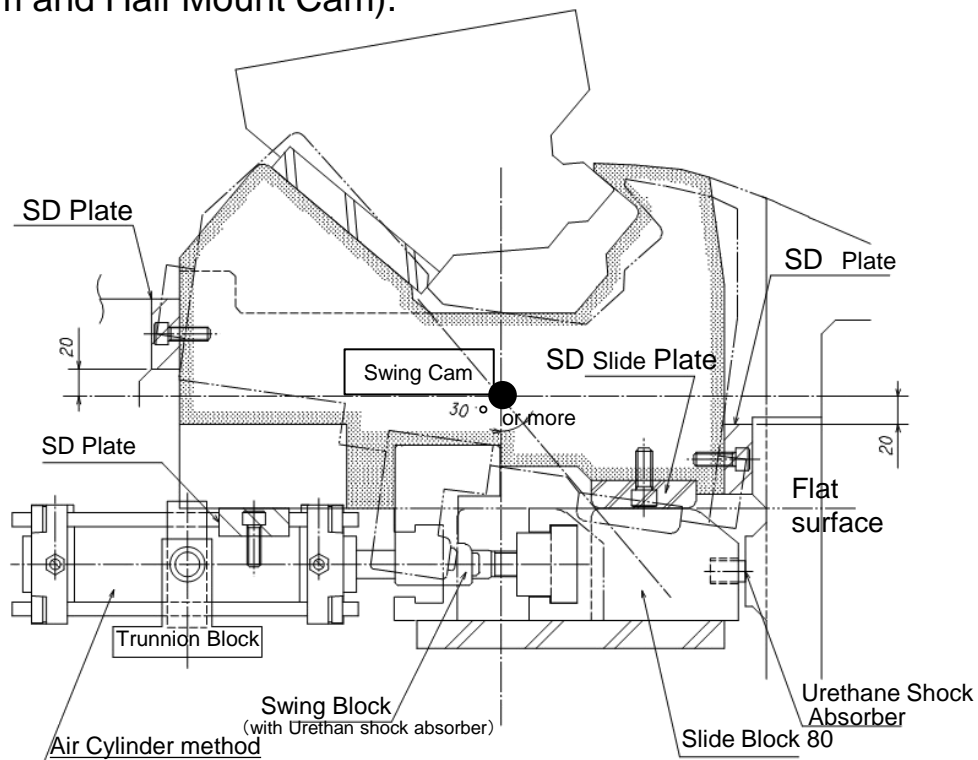| Ver.	Issue date	details of modification
2023.2024	1 Jun. 2023	01-01-1 Added unnecessary of air cylinder method and the figure. 01-03　Added the swing structure method by HALF MOUNT CAMS. 01-06　Added and modified the comparison table of various cam mechanisms. 03-05　Added " Introduction for Swing Cam " 04- A ・Abolition of old standard, added explanation and designed dimensions for A311 on the standard components for Swing Cam ・Added design dimensions for A312〜A313 on the standard components for Swing Cam. 04-B ・Added and modified for SDSLPC of B202 on the standard components for Swing Cam. 04-C ・C801〜C804 Revised. 05 Modified about assembly work and maintenance as follows 05-01 Manual for Swing Cam assembly 　05-02 Cautionary points for Manufacturing of Swing Cam and Regular Maintenance 　05-03 Standard Tolerance 　05-04 Machining and assembly work standard for Half Mount Cam 05-01-1 Added and modified the figure. 05-01-4 Added design dimensions. 05-04-1 Deleted a tolerance 05-04-2 Added explanatory text 06-01-3 Added design dimensions 06-01-4 Added explanatory text 06-01-6, 7 Added design dimensions 06-02-1 Revised design dimensions 06-06　Deleted
	1 Aug. 2023	04-C ・Modified the figure for Lifting Type by Air Cylinder or Lift Pin Type of C513-1
		1st Aug.2023 revised

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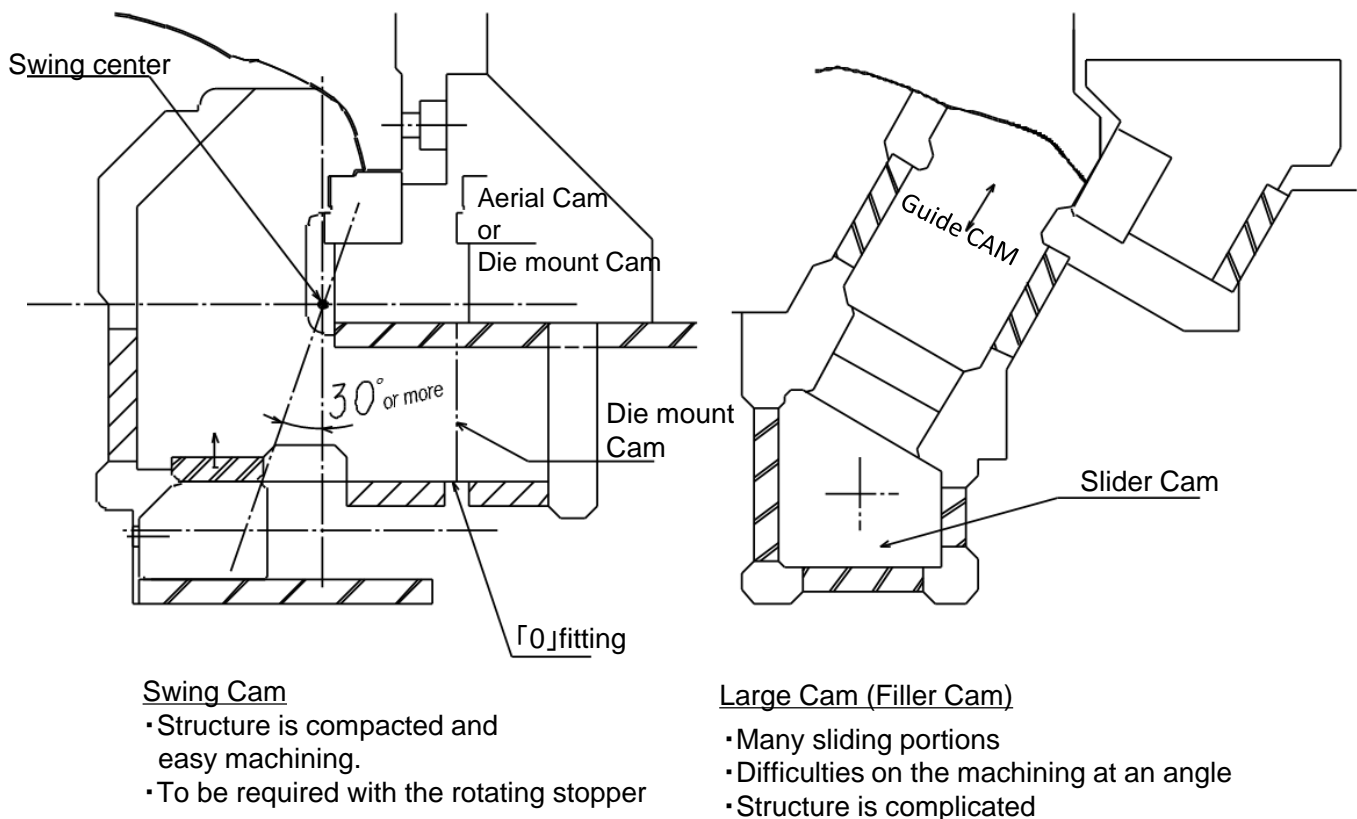# 01-01 General Explanation for Swing Cam and Half Mount Cam

Swing Cam is the capable mechanism for reducing the cost of making a die and the process, improving the panel quality and the easy maintainability in the forming process by the press stamping die.

Swing Cam is a simple structure, which is possible to be machined into a flat surface for both the assembled portion on the lower die and the rotating portion (Swing Cam and Half Mount Cam).

Air Cylinder method

Unnecessary of air cylinder

01-02 Feature and comparison for various forming structure

Rotating clearance with around 0.02

To keep a sliding clearance

To keep a Sliding clearance

Collapsing Cam (Double Cam)
・Structure is complicated and larger size

Rotary Cam
・Difficulties on the machining

Swing center

Aerial Cam or Die mount Cam

$30°$or more

Die mount Cam

Guide CAM

「0」fitting

Slider Cam

Swing Cam
・Structure is compacted and easy machining.
・To be required with the rotating stopper

Large Cam (Filler Cam)
・Many sliding portions
・Difficulties on the machining at an angle
・Structure is complicated

It is possible to design both Swing Cam structure and the fixed Punch are not sliding according to moving away the slide line about 10 mm from the rotating center, which means gaps occur with rotation.(Licensed by YB)

Rotating stopper by Aerial Cam

300 (B)

Aerial Cam

R150

120 (A)

10

R160

Half Mount Cam

120 (A)

Unnecessary

2(A)≦(B)

Conventional Collapse Cam
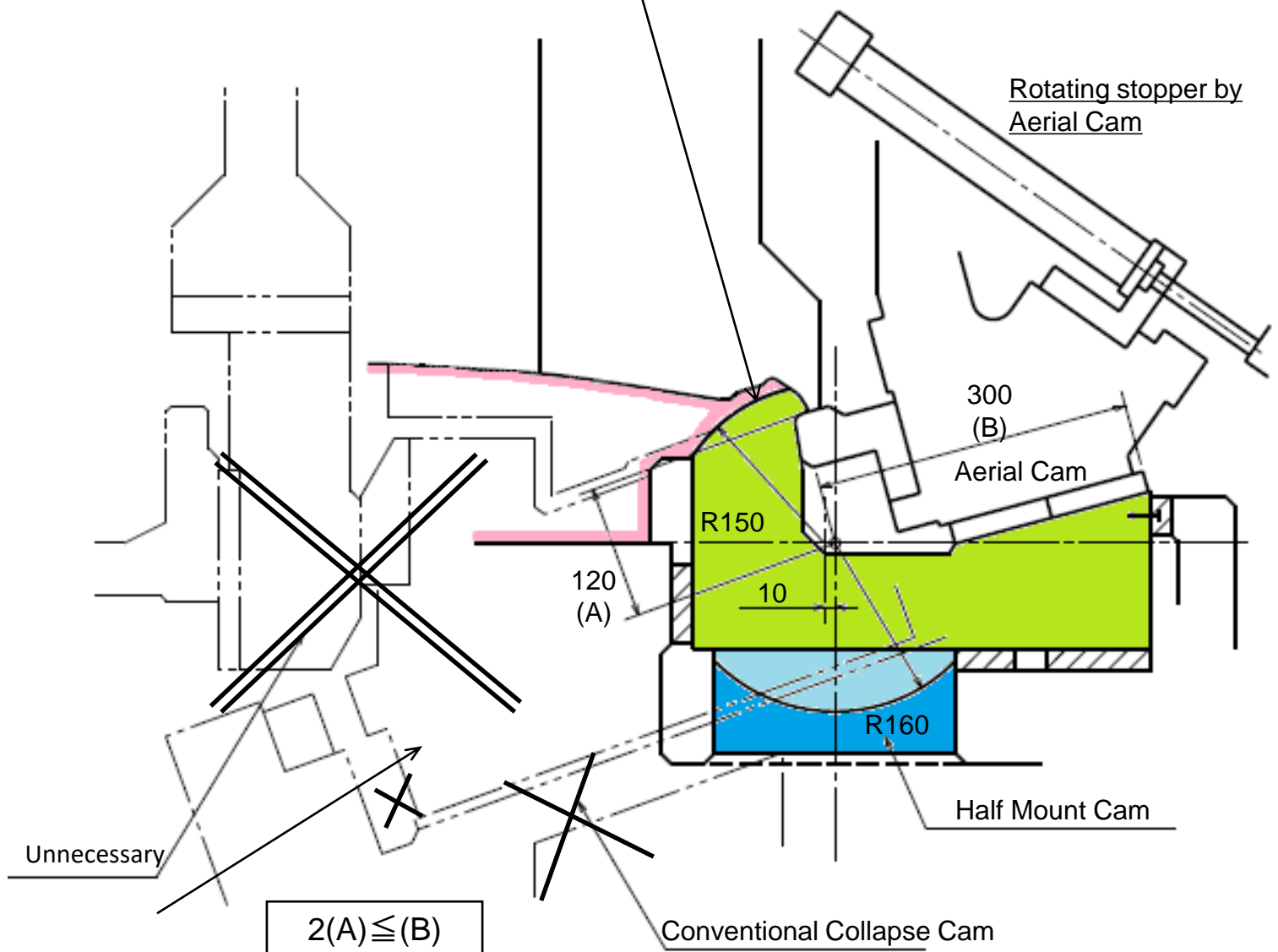
This figure shows a typical forming process cross-section for Body Side Outer.

1) It is possible to keep the max strength of the fixed Punch by R-shaped slice line.
2) It is possible to be eliminated the slide portion by moving away the center of rotating axle and slice line.
3) The R-shaped slice line all needs to be set by profiling and processing with the die design data.
4) It is possible to be much simplified the die structure and significantly reduce costs.
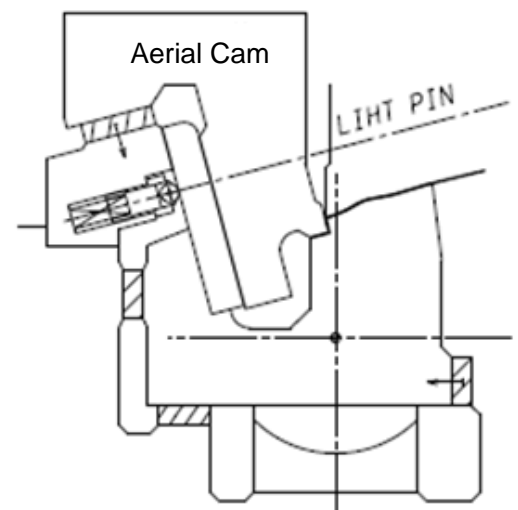
01-04 Various Swing Cam structures
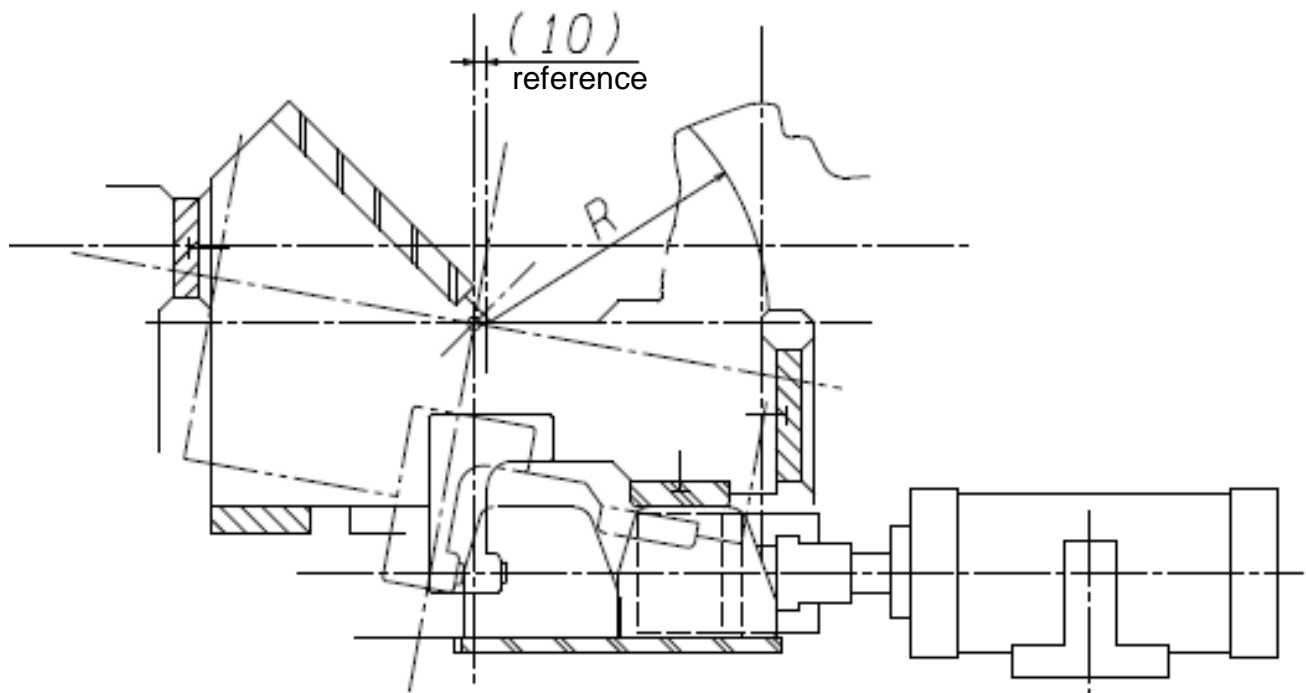
Half Mount Cam
BODY-SIDE-OTR

It is available the structure without sliding together by moving the rotating pivot of Swing Cam and the center of slicing line. (YB patent)
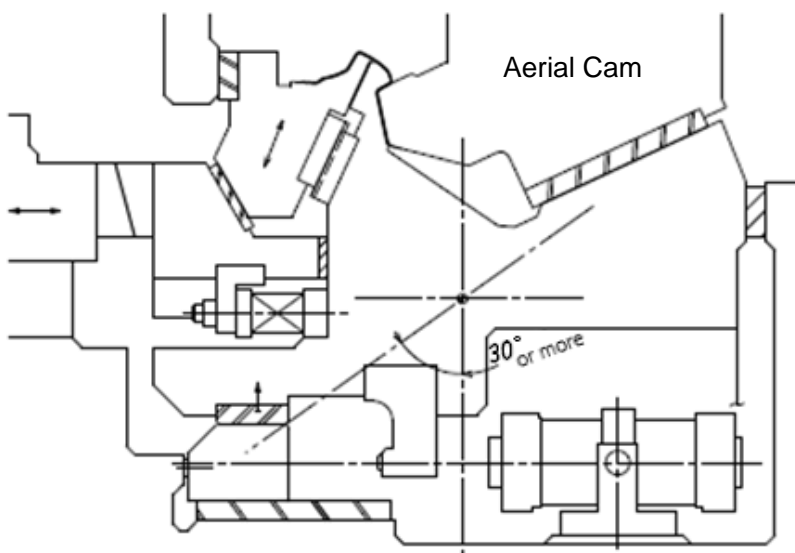
Drop type
BODY-SIDE-OTR

Lift pin type
ROOF

01-05 Swing Cam in Comparison with Double Cam (Collapsing Cam)

Double cam has a difficulty on its machinability and is required a dividing of steel material portion in the shaped panel.

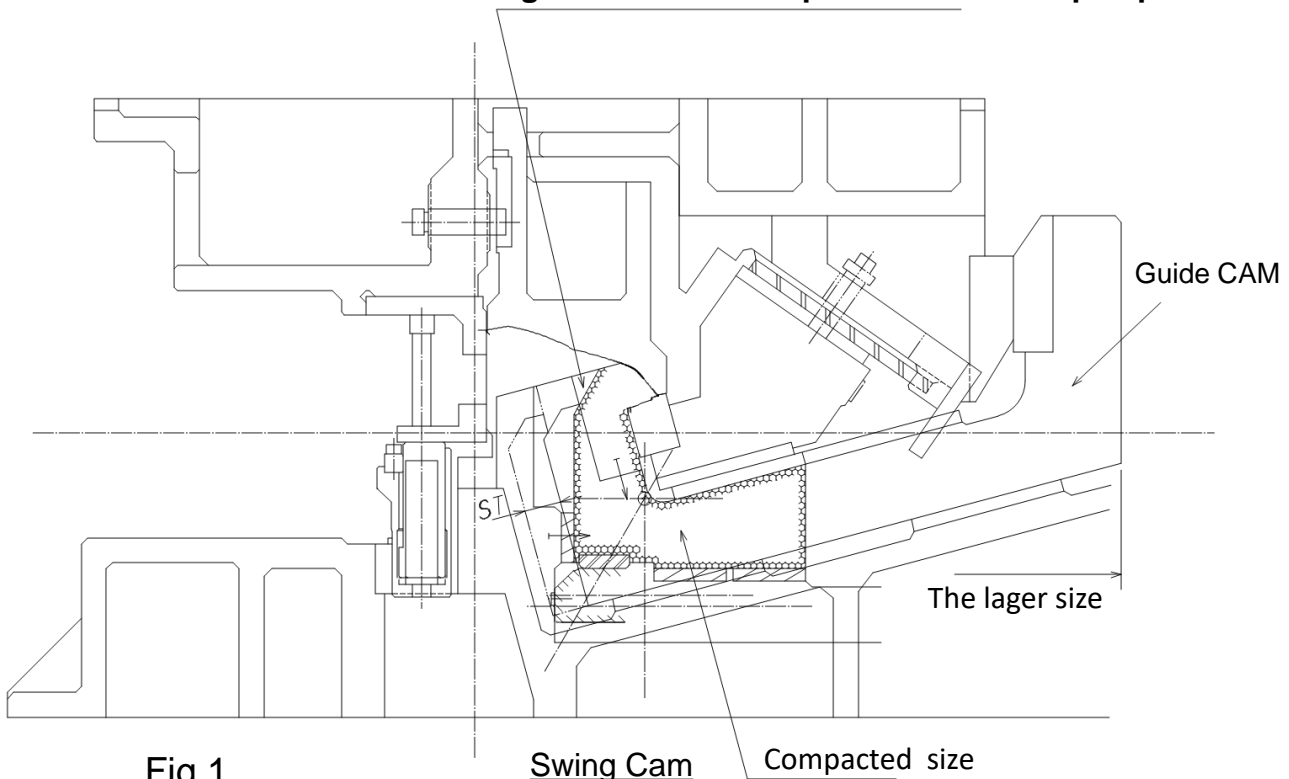Guide CAM

The lager size

ST

Fig.1　　　　Swing Cam　　Compacted size

- It is easy to understand the difference by overlapping both a double cam and a Swing Cam as shown in Fig.1.

- It is easy to be hold up the structure by Swing Cam in spite of the difficult structure by a double cam which has a guide cam of pulling up type as shown in Fig.1.

- It is required to be divided in the separated steel material portion for a double cam, and the die which is assembled a double cam is becoming larger as the disadvantaged point. Besides, it is also very difficult on its machinability.

The scope of the application for Swing Cam

Rotary Cam

Reducing the process

Swing Cam
Half Mount Cam

Double Cam
（Collapsing Cam）
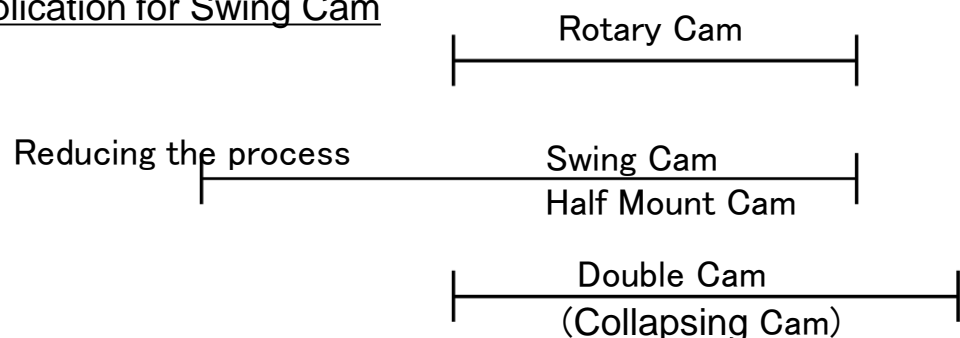
01-06 Comparative Chart of Cam Flange Mechanisms

YB

|	Swing Cam （Include Half mount type）	Double Cam （Collapsing Cam） （Large Cam）	Rotary Cam
Total cost And Machinability	◎ It is basically easy machining on the flat surface.	△ It is larger whole die size and divided the bending punch, which is assembled with many die components.	△ ○ It is required to be manufactured by using a specialized machine.
Quality （the strength for die）	◎ It is easy adjustment without a friction, easy setting for a rotating prevention and easy dividing in the suitable point from the fixed punch.	○ It is not stable in the quality of the shaped panel according to the reason of Insufficient of the strength of a die.	○ It is important to be maintained during a stamping although it is said the initial quality is no problem.
Productivity （Die mount cam）	○ It is possible to be smaller swing angle by moving the rotating pivot away from the panel. It is easily applied a die mount cam structure.	△ It is used with the large size of air cylinder for returning a collapsing cam. Thus, it is often to appear scratches on the movable portion.	△ It is enlarged the rotating angle in case of removing a panel because of the limited for a diameter of rotor. It is also required to drop down SPM.
Reducing process	◎ It is possible to be formed at a time by the combination of Swing Cams, which is also included the right angle.	× ―	△ It is all possible to be combined rotary cam at a gradual angle.
Maintenance	◎ It is easily to be maintained because there is no sliding portion for occurring a friction.	× It is often occurred an abrasion from friction because of many sliding portions or frequently damaged about each component.	× It is occurred often a trouble of quality by using the both combination of a rotor and a holder portion.
Positive return for the termination	◎ It is certainly arranged by the various positive return method for the termination.	○ It is used the cam stroke plates for a positive return method for the termination.	△ It is very difficult to be installed in a die because of the column structure. It is mostly case to be used with the aerial cam.
Compact structure	○	×	○

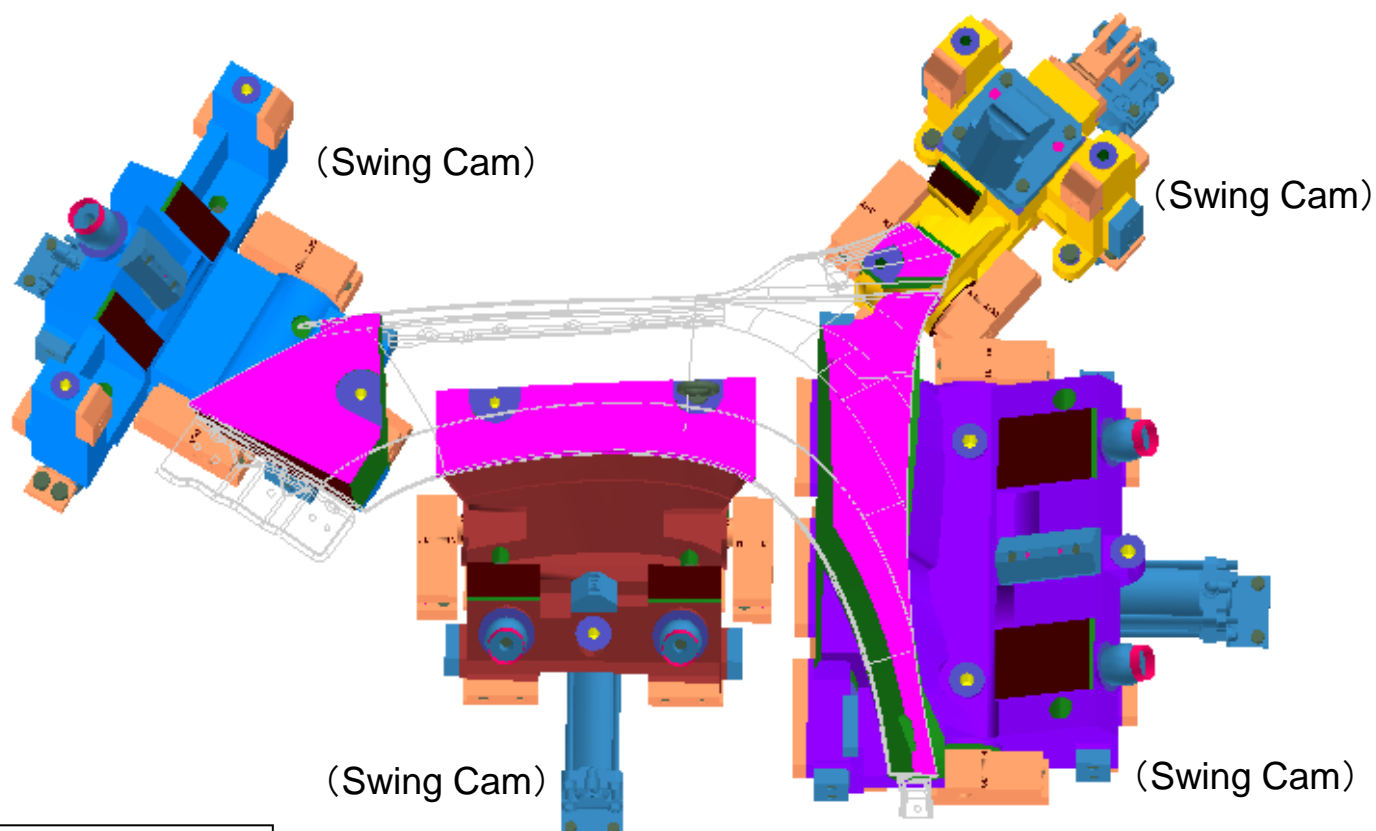## 02-01   HOOD OTR and BACK DOOR OTR

HOOD OTR

1 continuous forming
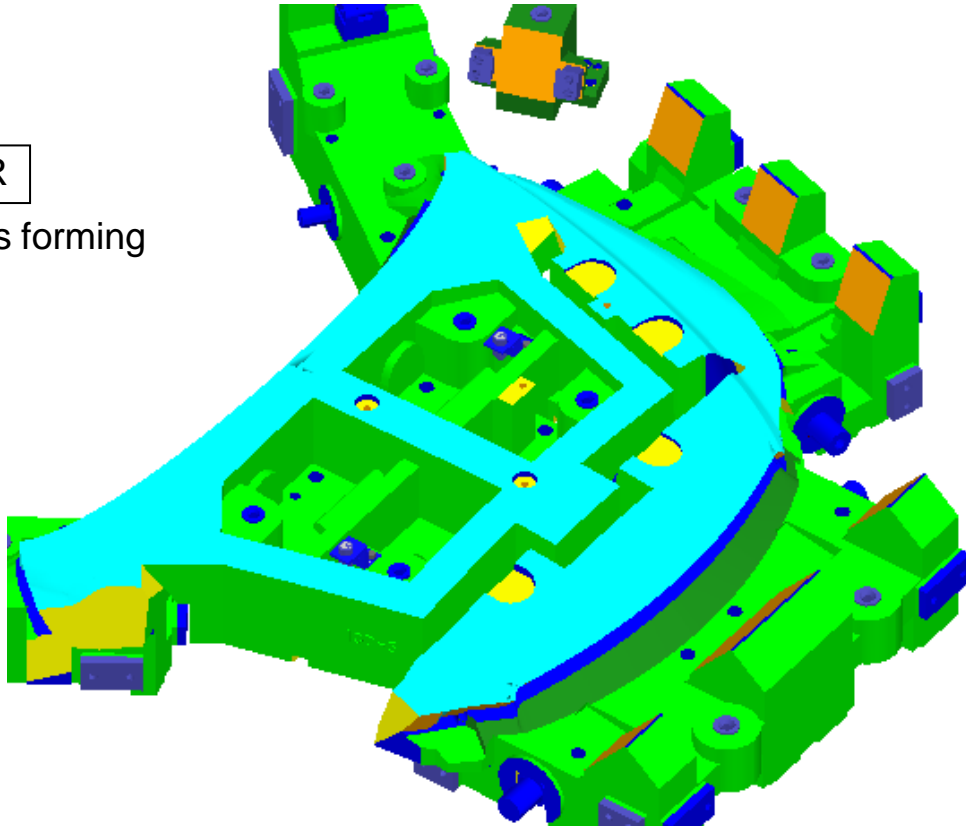
BACK DOOR OTR

1 continuous forming
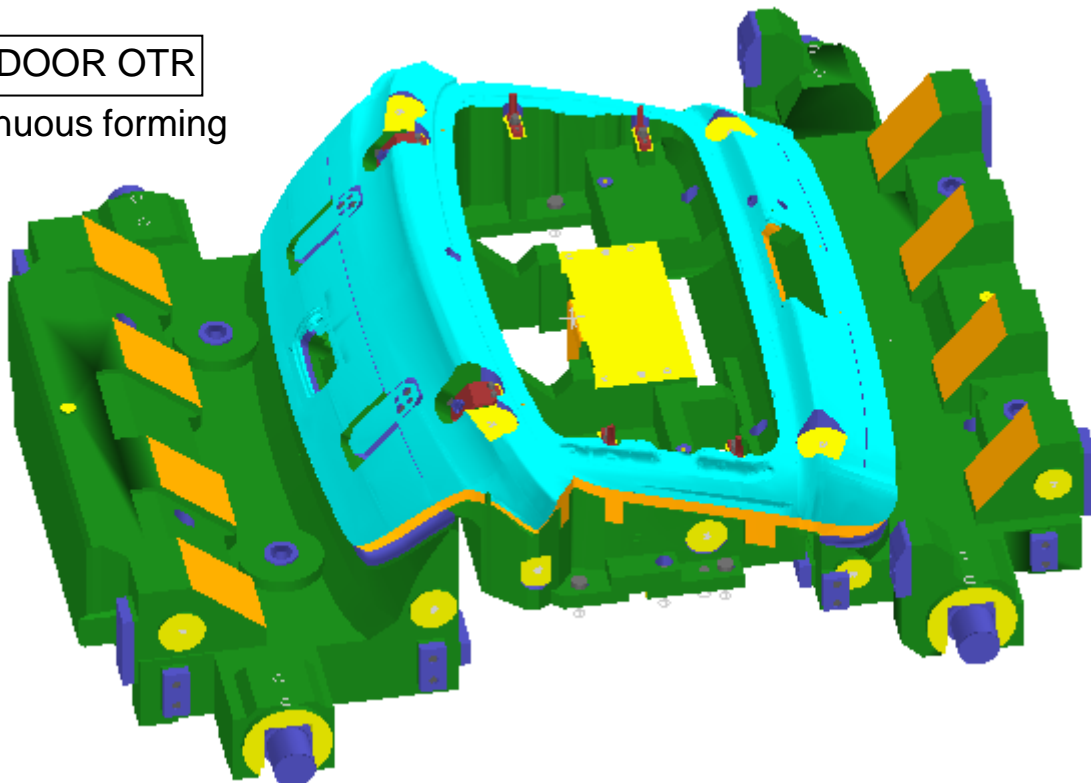
02-02 FENDER and FR DOOR OTR

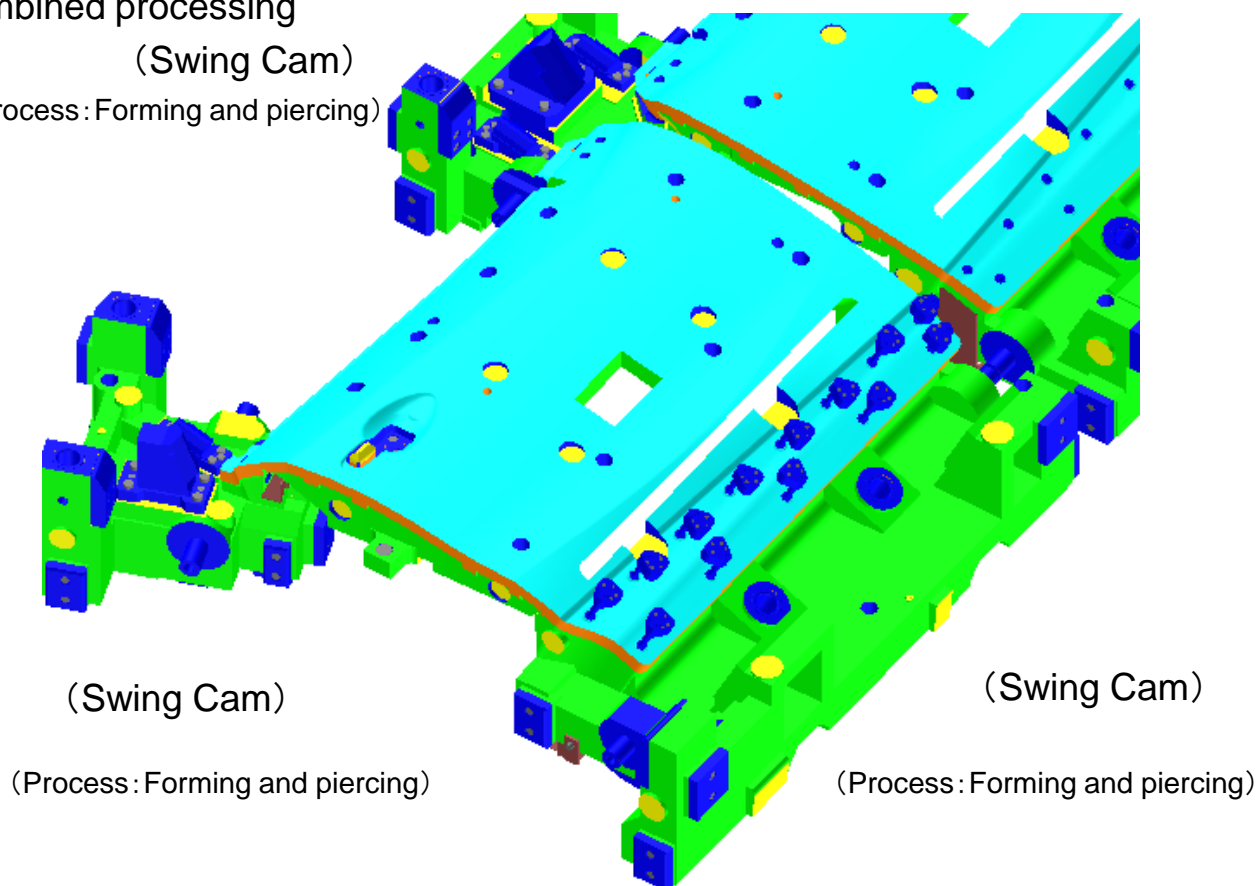FENDER

（Swing Cam）

（Swing Cam）

（Swing Cam）

（Swing Cam）

FR DOOR OTR

combined processing
（Swing Cam）
（Process：Forming and piercing）

（Swing Cam）

（Swing Cam）

（Process：Forming and piercing）

（Process：Forming and piercing）

02-03 ARC SWING and
AERIAL CAM SET SWING Type

Clearance

The sliding portion was eliminated by moving away the axle of the slice line (R).
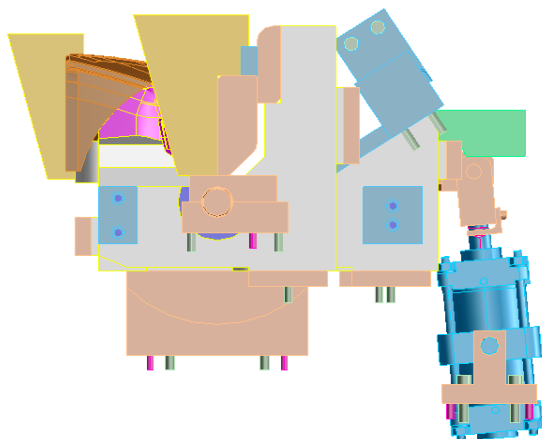
Licensed by YB

Rotating center

R
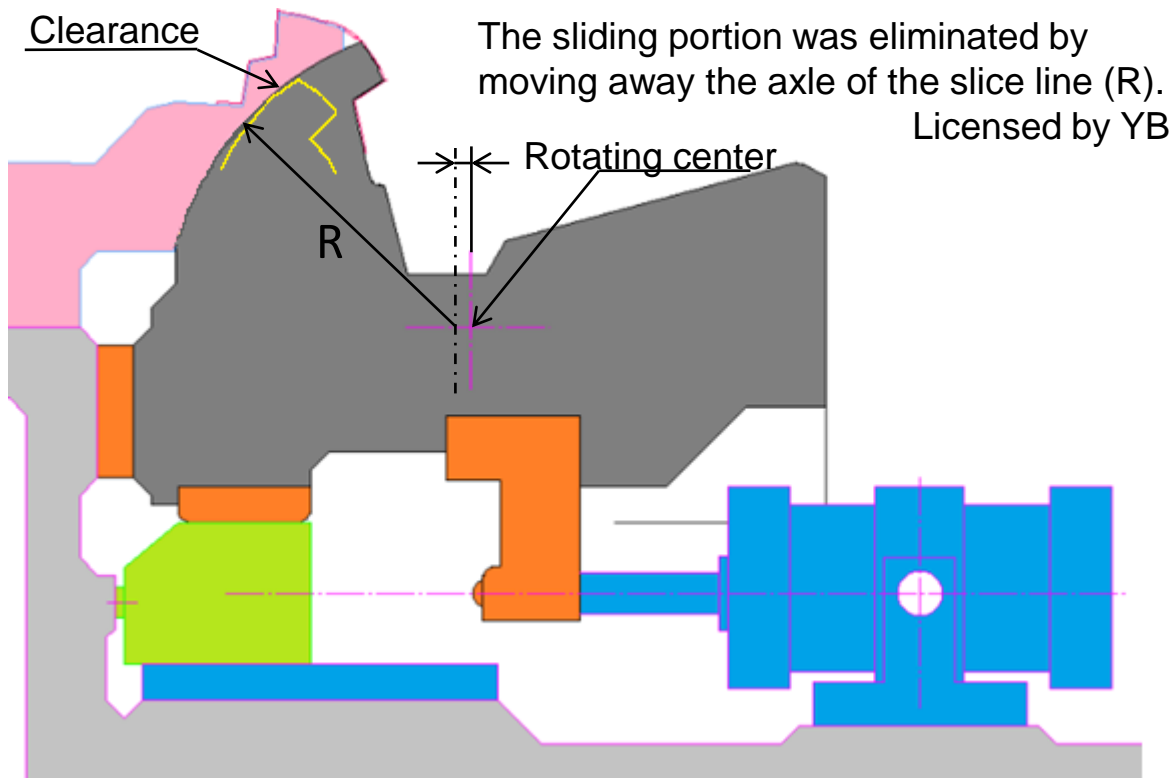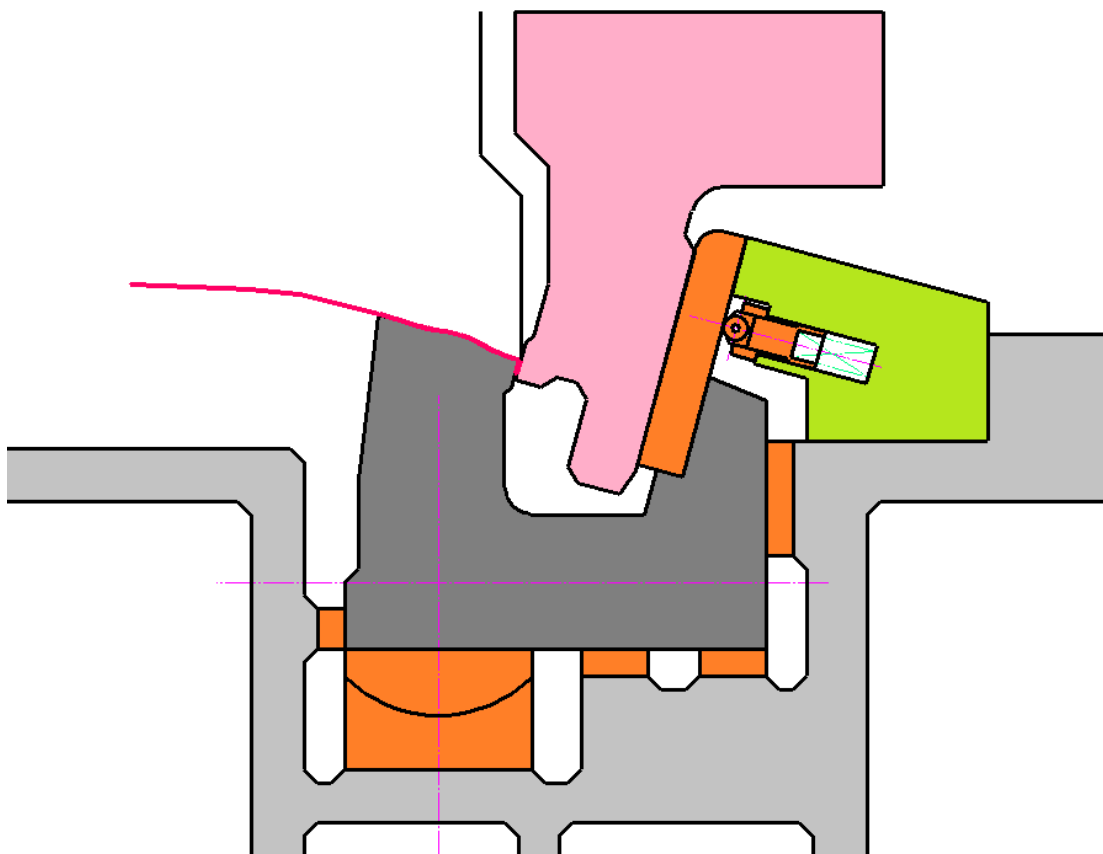
ARC SWING Type

AERIAL CAM SET SWING Type
Unnecessary of air cylinder

02-04 HALF MOUNT CAMS Type for BSO

CAM-B FL

CAM-A
CAM-A
SWING

CAM-B SWING
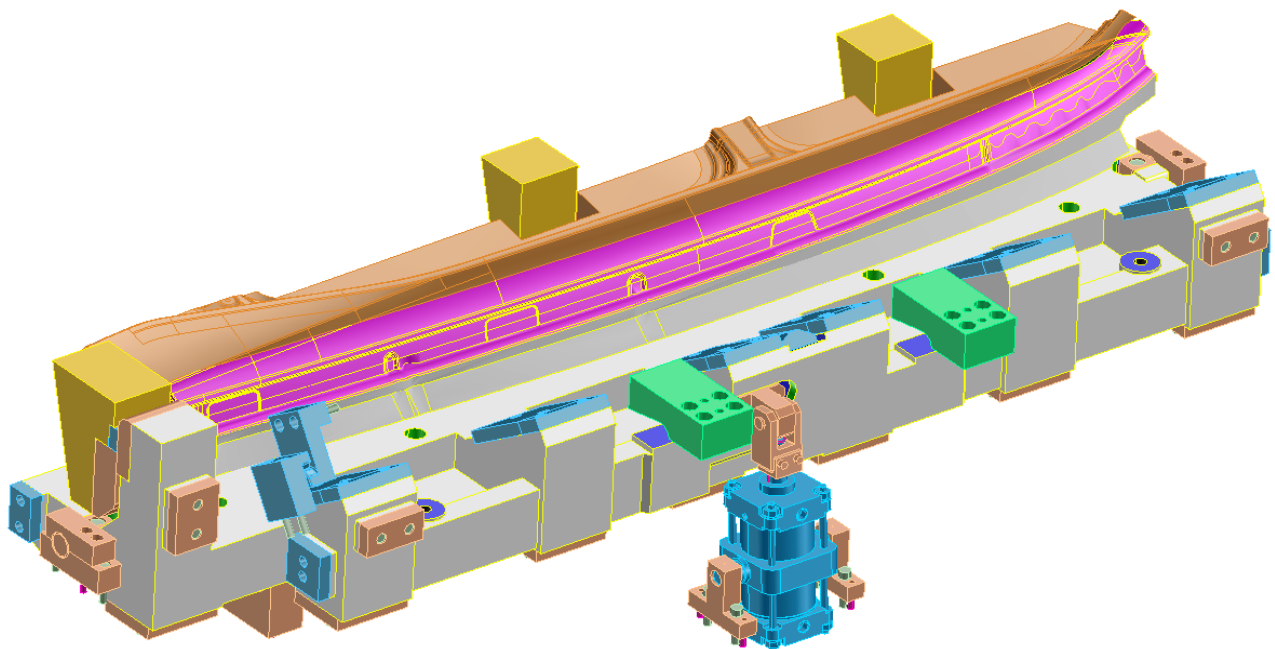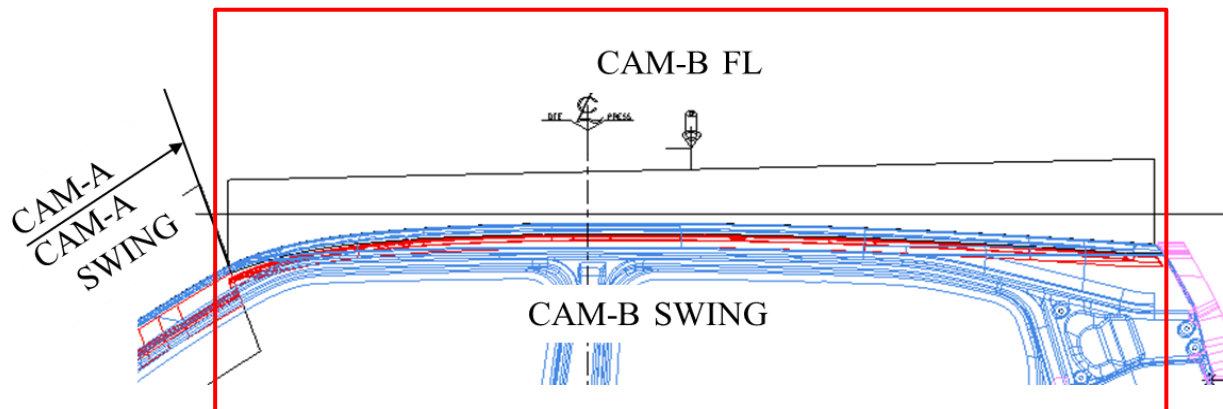
Positive Return Dwelling structure with Swing stopper for the termination.
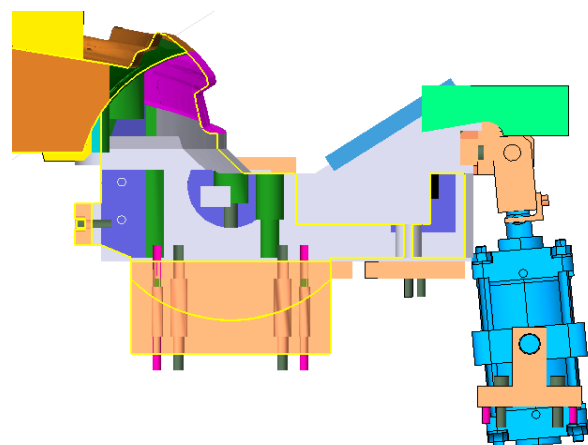
Half Mount Cam without greasing , No sliding (the sliding portion is eliminated by moving away from the slice line.)

03 Ex) Swing Cam structure

03-01 Slide Block Type

【The main Body of Swing Cam】

SWB

SDSLP
SDSLPC

Products on the
market   W/P

SDPA

SDAX

SDUJ

【The Holder side of Swing Cam】

SDBSO

SDUS

SB80

SUPH

SDPA

TB

Products on the market
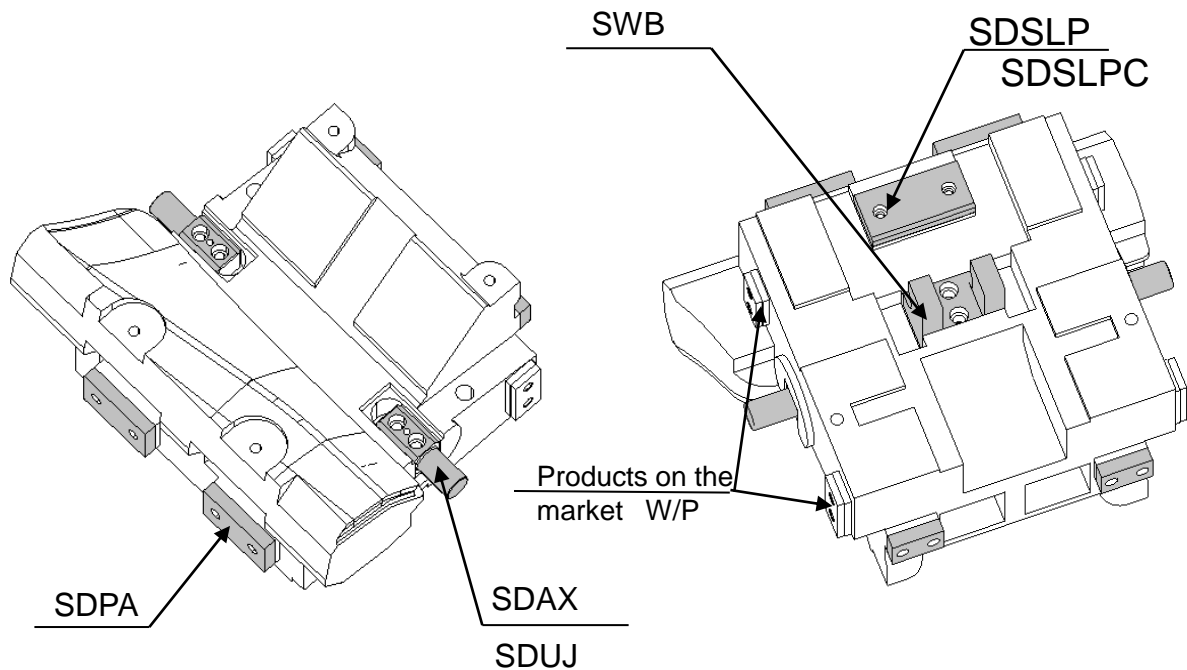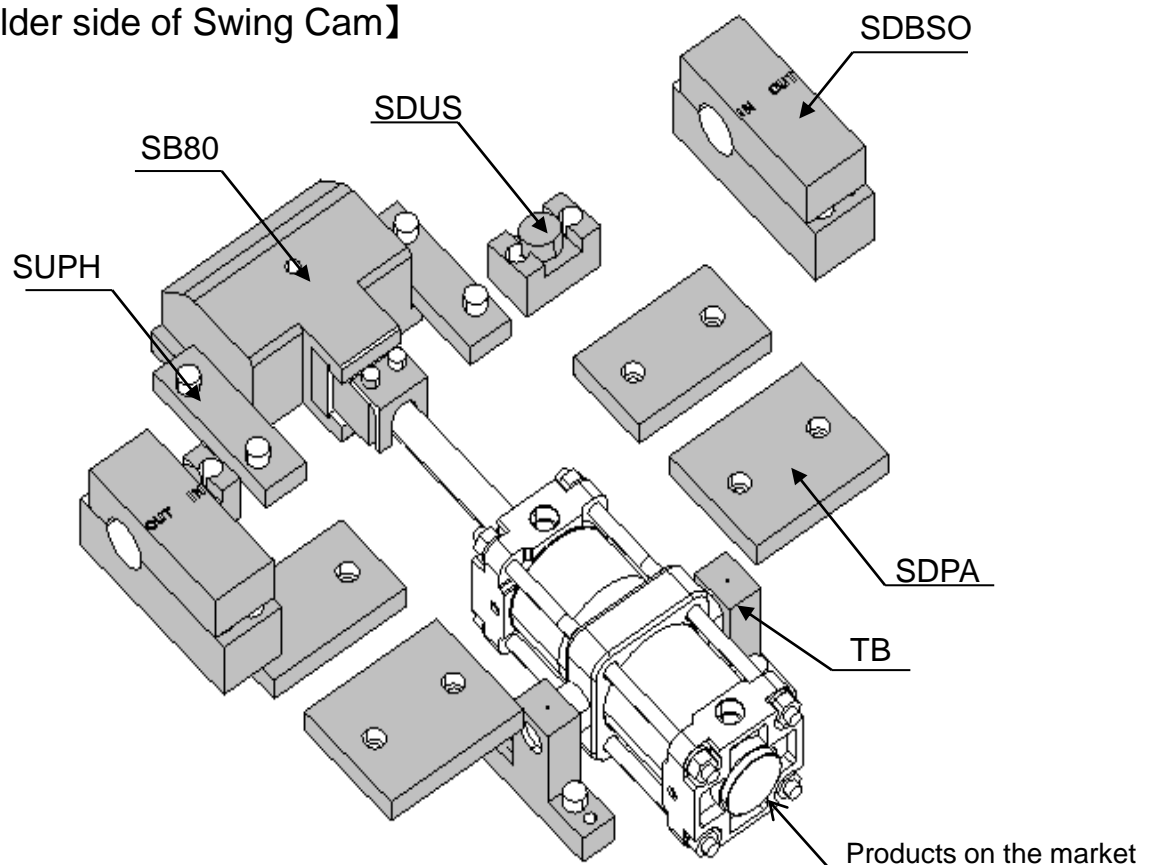
03-02 Positive Return Dwelling unit Type
for the termination
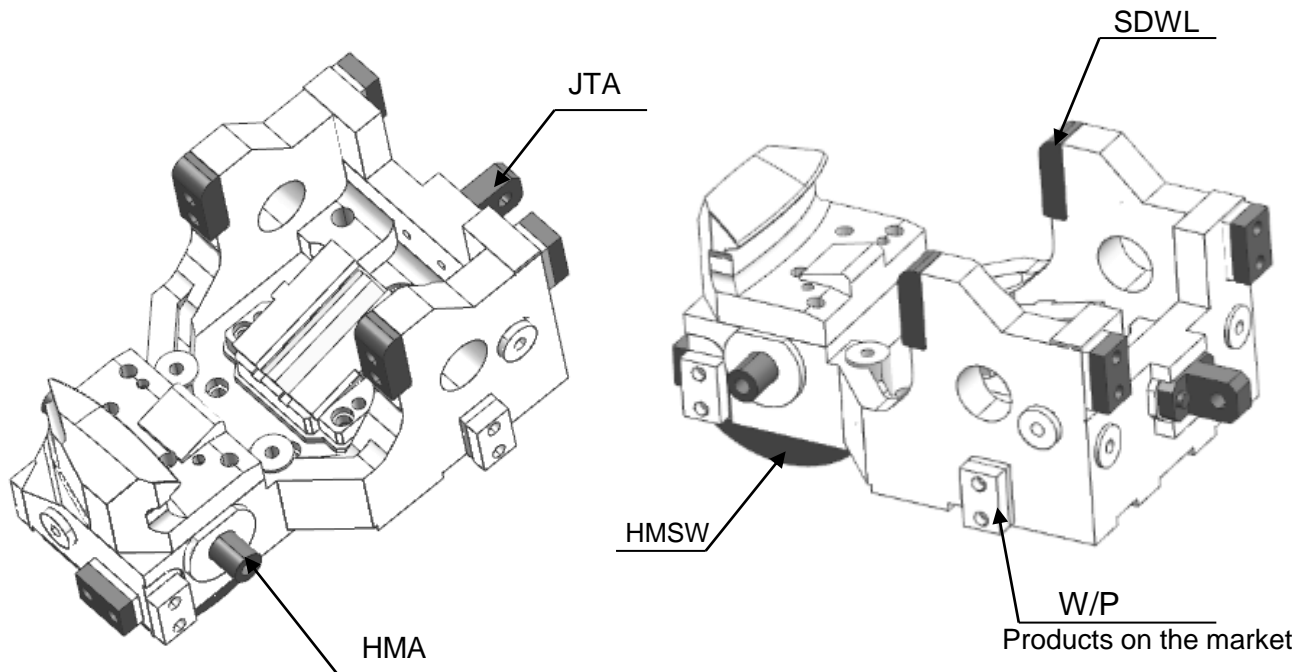
【The main Body of Swing Cam】

JTA

SDWL

HMSW

W/P
Products on the market

HMA

【The Holder side of Swing Cam】

HMH

SSTB

NJS

HMSW

SDPA

TB

03-03 Drop-Swing Type

SWB

SB80

SDPU-100-

【The main Body of Swing Cam】

SDWL

Products on the market

Products on the market

SDWPS

SDWL

SDAX

Products on the market

Products on the market
W/P

SDPA

SDSLP

【The Holder side of Swing Cam】

SDBSO

SDUS

SB80

SDPA

TB
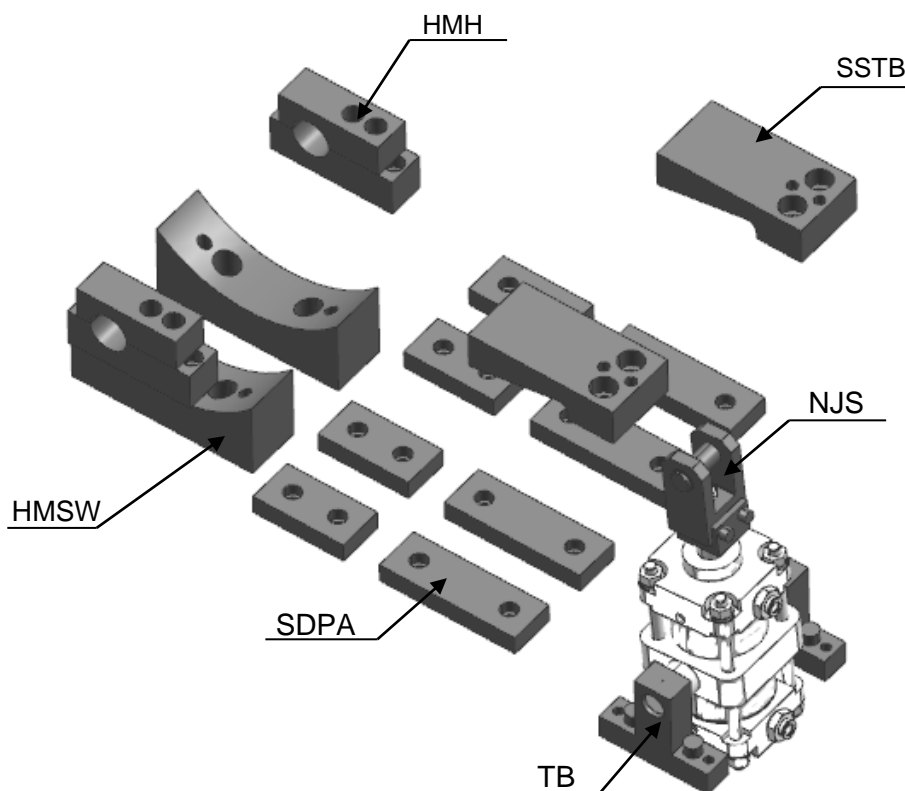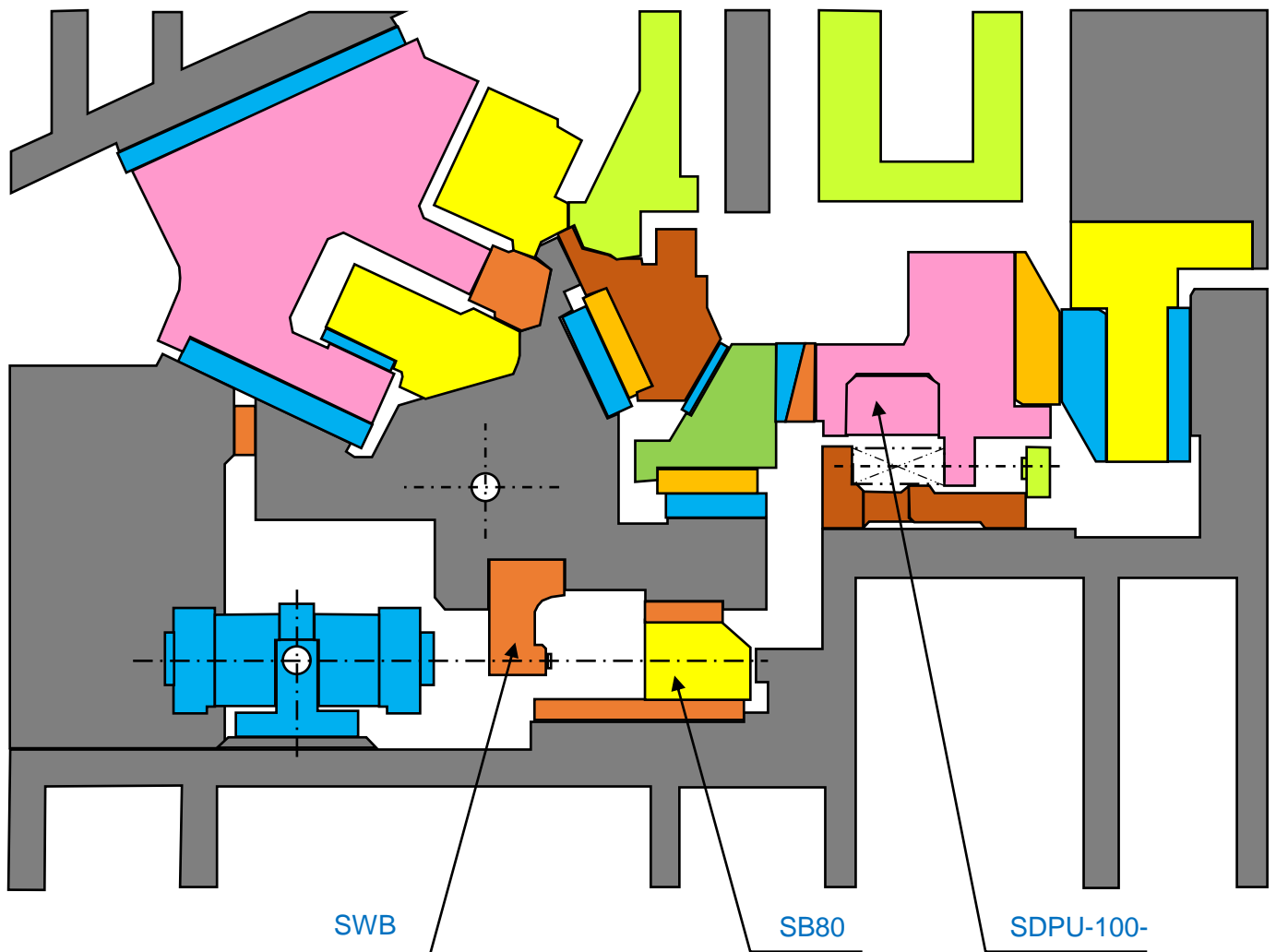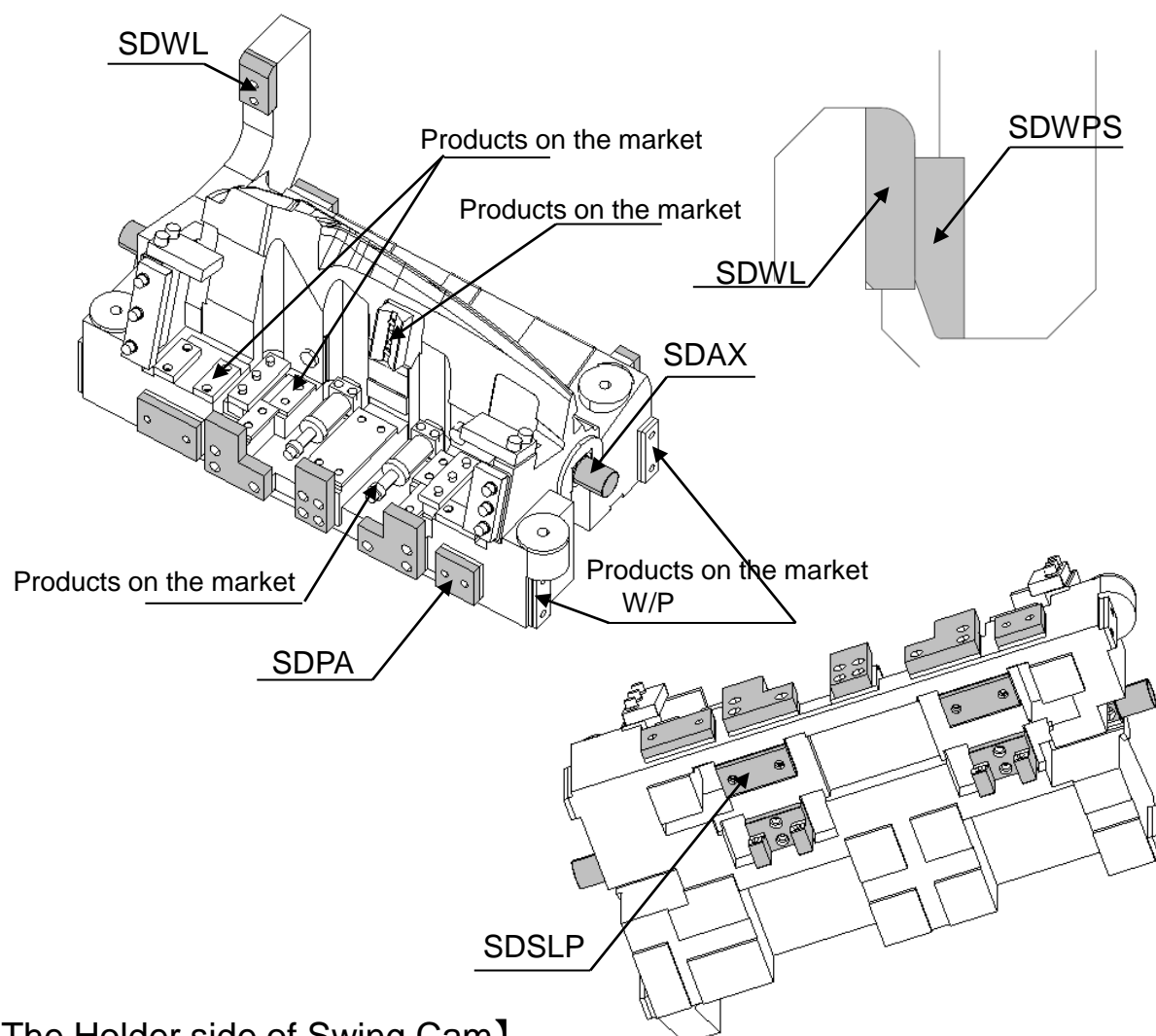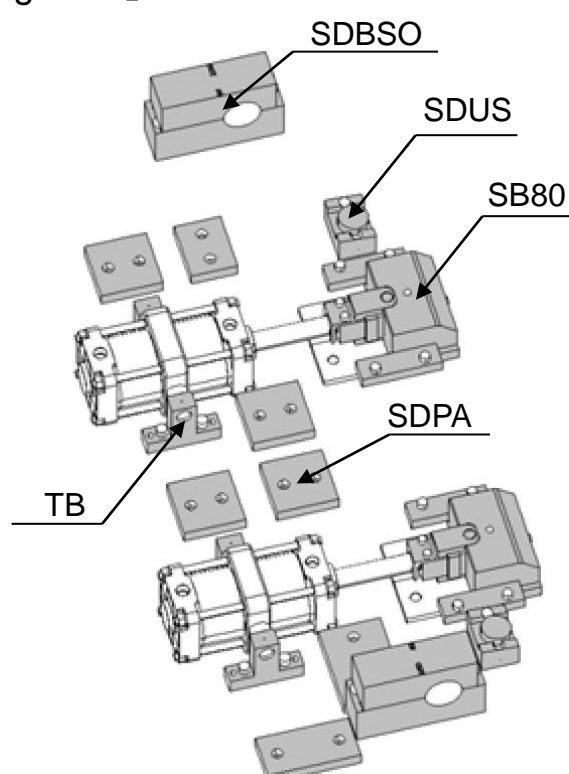
03-04 Sub Swing Cam on main Swing Cam Type

SDPU

SDBSO
SDUJ

FRONT FENDER
Forming for HOOD side
and A-PILLAR side

【Main Swing Cam】

HMH

SDAX

W/P
Products on the market

SKP

SDPA

STBSB

HMSW

SDNB

SDPA

LPRA

【Sub Swing Cam】

SDAX

SDPA

HMSW
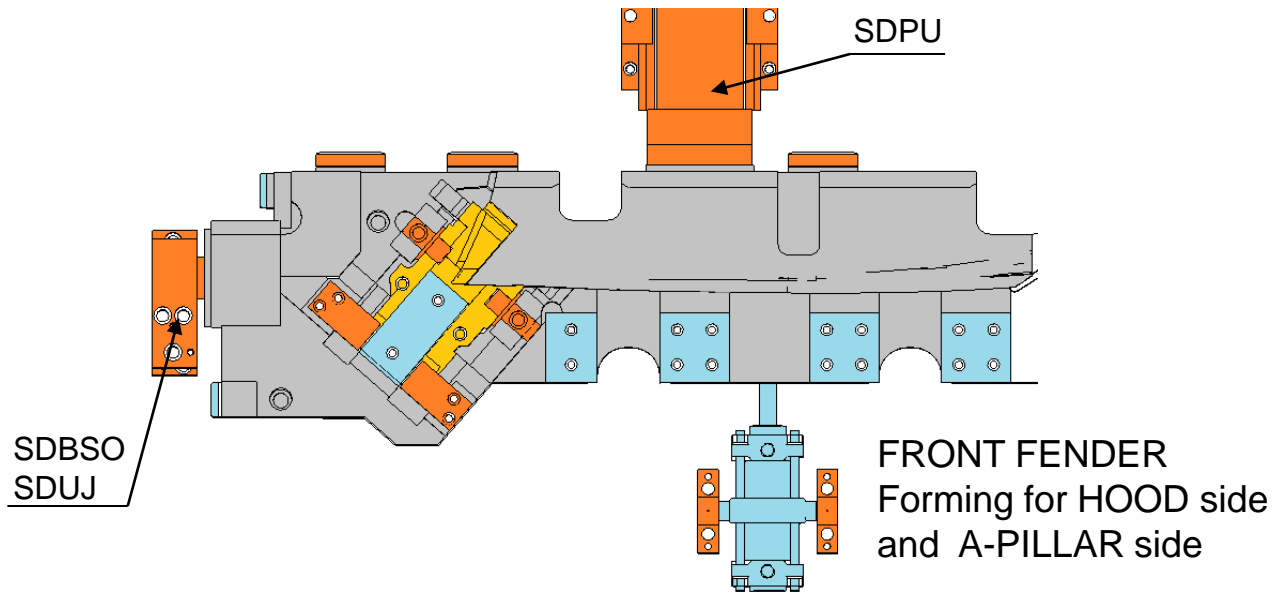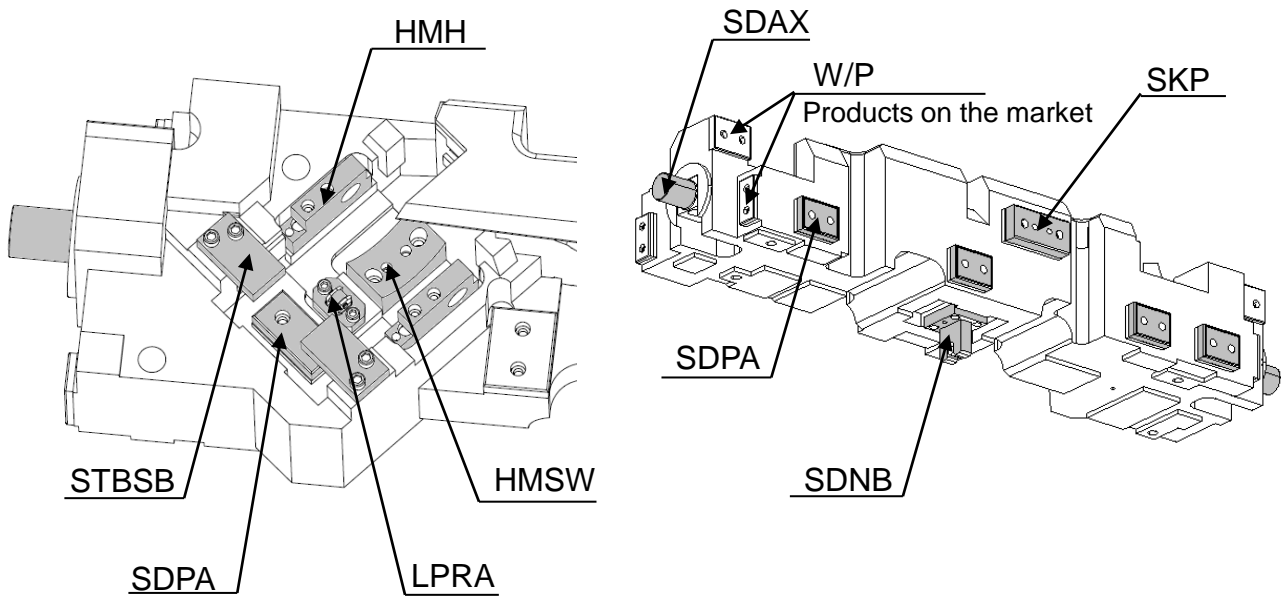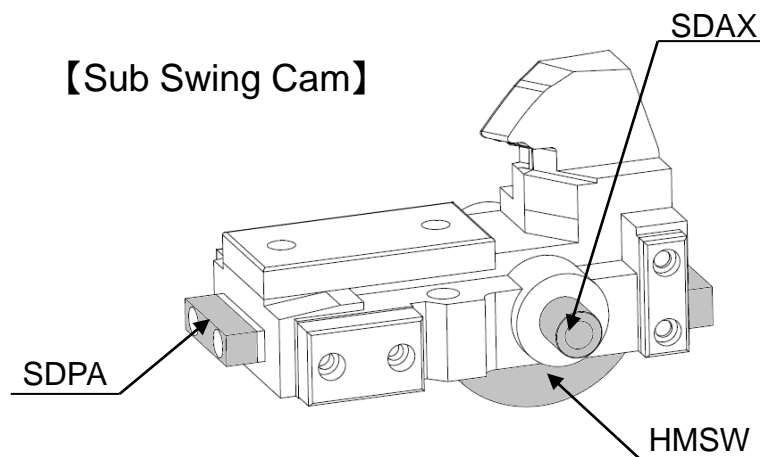
①Feature of Swing Cam Structure

Rotating
center

Contact surface = 0

Swing Cam
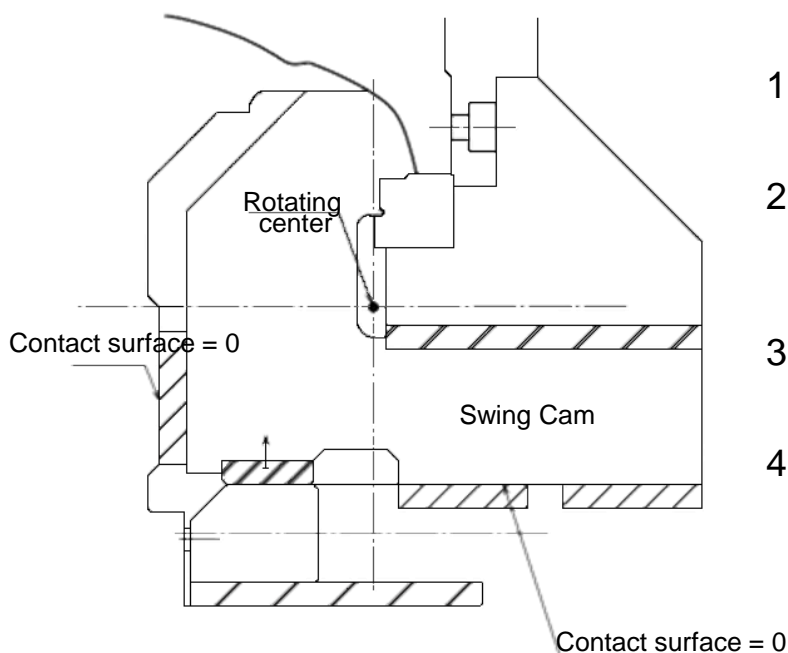
Contact surface = 0

1. The axle and bearing are not subjected to machining force.

2. The machining force is received "0" contact surface on the right angle surface.

3. It is possible to be selected various method of operation

4. It is possible to be decided freely about the axle position and rotating angle.

②Combination of Swing Cams
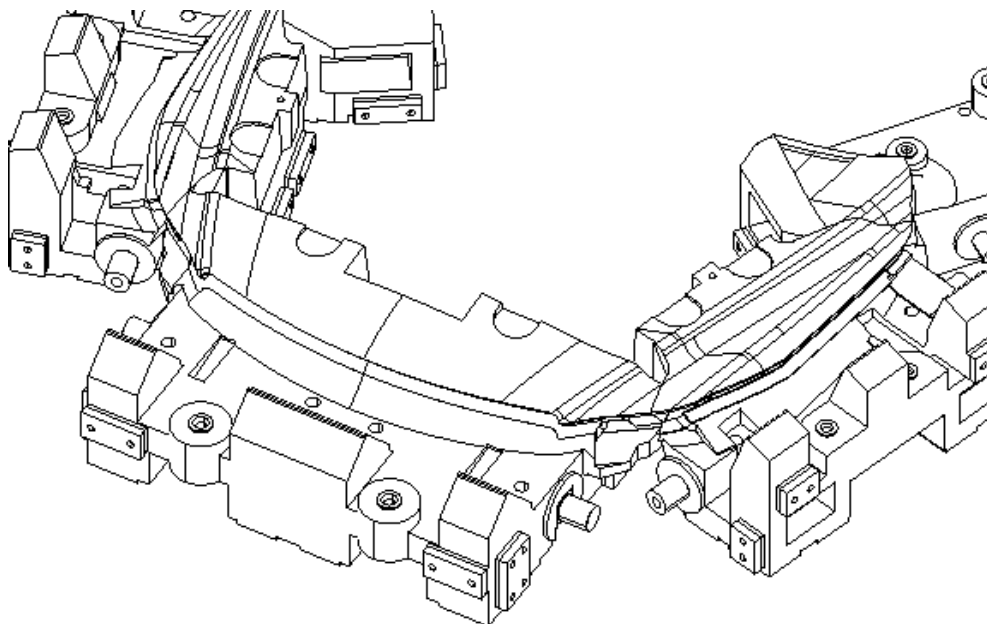
Example : Hood Outer

③Die Mount Cam Method

④The forming and the piercing
by Swing Cams
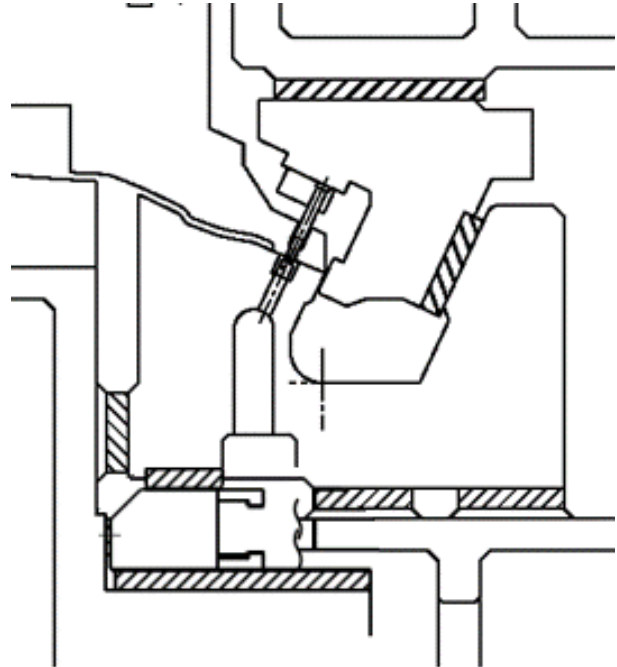
⑤Half Mount Cam
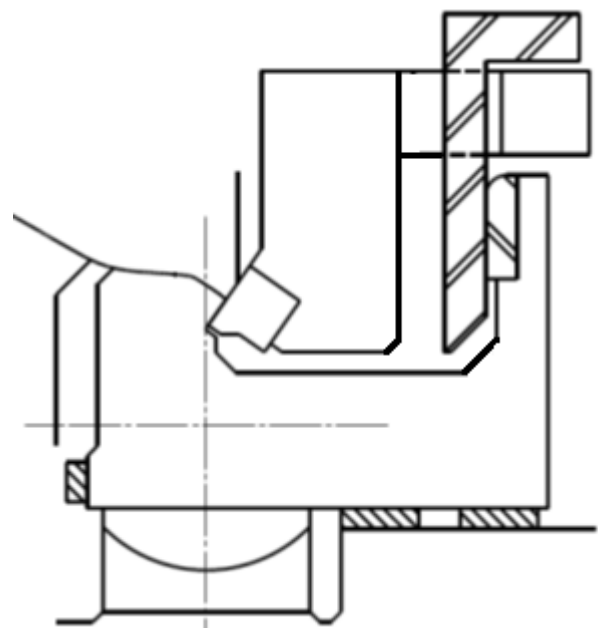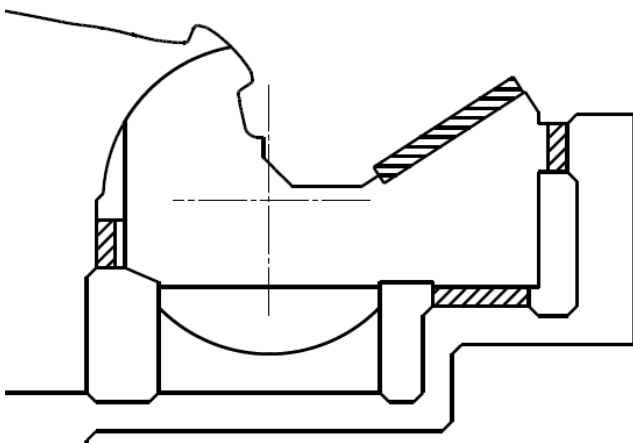
A001	Name				
	04-A Swing pivot shaft & Bearing Related				

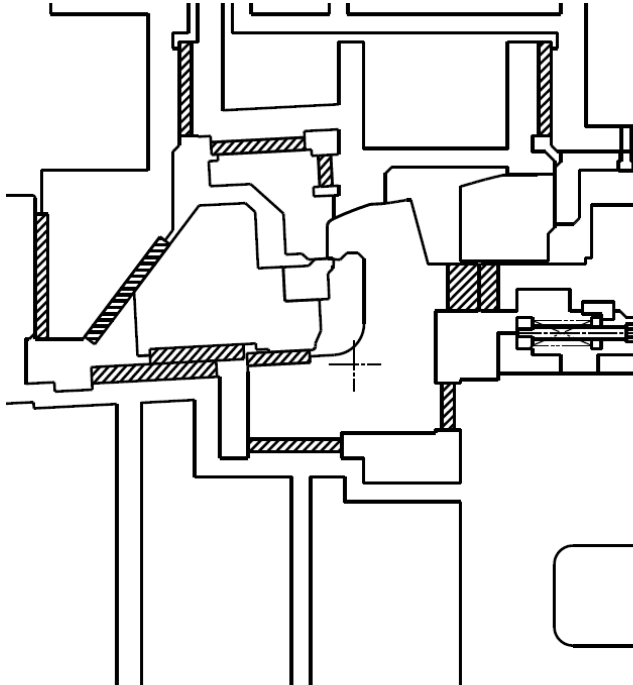| Name	Code	Category Number	Sketch	Remarks
SD Trunnion Mount	SDBS-V	A101		1 Oct. 2022 Rev
SD Trunnion Mount One Handed Type	SDBSO-V	A102		1 Oct. 2022 Rev
Trunnion Mount One Handed Type Φ30	SDBSO-B	A103		26 Jun. 2020 Rev
Trunnion Mount Compact Type Φ40	SDBSO-XB-A	A104		26 Jun. 2020 Rev
Swing Die Axle (Swing Cam Rotating Pivot shaft)	SDAX	A201		26 Jun. 2020 Rev
Swing Die Axle Fitting In Type (Swing Cam Rotating Pivot shaft pressed-in type)	SDUJ	A202		26 Jun. 2020 Rev
Half Mount,70R,100R	HMSW-A/B	A311		1 Oct. 2022 Rev
Half Mount,120R	HMSW-A/B	A311		26 Jun. 2020 Rev
Half Mount,140R,160R	HMSW-A/B	A311		26 Jun. 2020 Rev
Half Mount Axle A (Half Mount Rotating Pivot shaft A)	HMA-A	A312		26 Jun. 2020 Rev
Half Mount Axle B (Half Mount Rotating Pivot shaft B)	HMA-B	A313		1 Oct. 2021 Rev
Half Mount Holder Φ30	HMH-30	A314		26 Jun. 2020 Rev
Half Mount Holder Φ40	HMH-40	A315		26 Jun. 2020 Rev
Half Mount Holder Φ50	HMH-50	A316		26 Jun. 2020 Rev

| Your Business | New Rev | Date 1 Oct. 2022 | | 23/139 |

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Standard type

Bolt & Dowel pin R/L symmetry

Swing Cam Side

A

E （NC dowel pin hole）

C

15

ϕD

X

Y

ϕD

(G+5)

F

G

NC
dowel pin hole

$B_{-0.04}^{0}$

Pay attention for
installation in right
and left side

2-$\phi d1$

$Z_{-0.03}^{0}$

L

Φ40:2-M12x45
Φ60:2-M16x70

T

2-$\phi 13$

K

J

H

2-$\phi 10H7$
NC dowel pin hole

*Thrust washer BW
(Setting is optional)*

E1

Swing Die Axle

(0.2)
clearance
Between the shaft
and the bearing

C1

0.025$^{\pm 0.02}$
clearance

Swing Cam

Usage

Between the shaft and the bearing

ϕD	A	B	C	E	F	G	H	J	K	L	d1	T	X	Y	Z	C1	E1
$\phi 40$	180	55	90	150	25	12.5	85	50	35	120	$\phi 13$	15	90	25	30	3	7
$\phi 60$	200	65	100	170	30	15	125	70	55	140	$\phi 18$	20	100	30	40	2	8

Code:SDBS-40-V-R/L
Code:SDBS-60-V-R/L

Note：
1.This drawing shows RH and symmetrical on LH.
2.Material :ASTM1045(JIS S45C)
        or ASTM 1018 (JIS SS400)
3.The assembly dimensions of these parts and old
  parts are the same.
4.The dowel pin holes are finished by NC machining.

2022.10：added setting method.
2016.7：change usage.

Your Business

New Rev Date 1 Oct. 2022

In stock
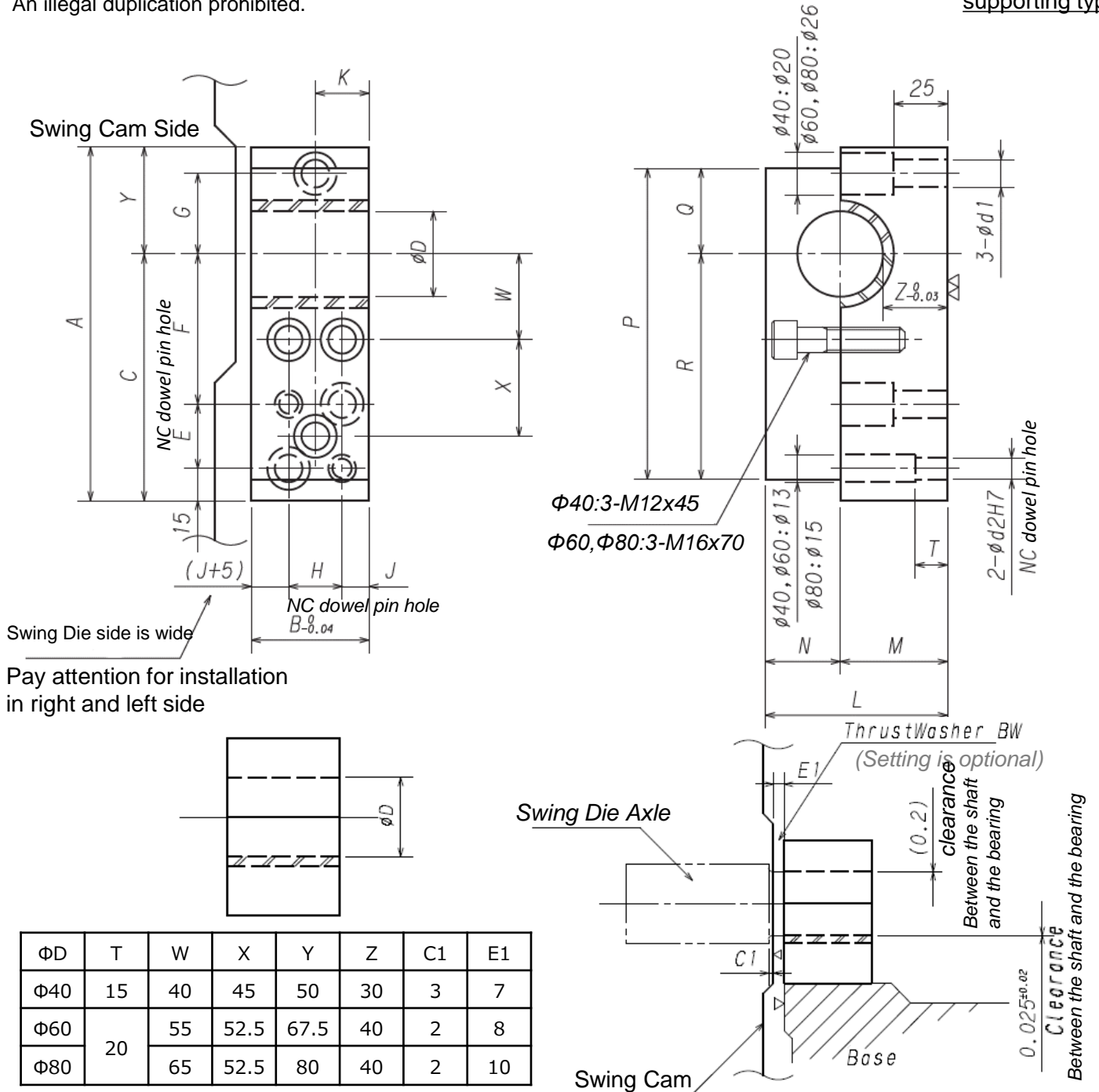
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Cantilevered
supporting type

Swing Cam Side

$\phi 40 : \phi 20$
$\phi 60, \phi 80 : \phi 26$

25

3-$\phi d1$

$Z\ ^0_{-0.03}$

Φ40:3-M12x45
Φ60,Φ80:3-M16x70

$\phi 40, \phi 60 : \phi 13$
$\phi 80 : \phi 15$

2-$\phi d2$H7
NC dowel pin hole

NC dowel pin hole

Swing Die side is wide

$B\ ^0_{-0.04}$
NC dowel pin hole

Pay attention for installation
in right and left side

ThrustWasher BW
(Setting is optional)

Swing Die Axle

(0.2)
clearance
Between the shaft
and the bearing

Base

$0.025^{±0.02}$
Clearance
Between the shaft and the bearing

Swing Cam

ΦD	T	W	X	Y	Z	C1	E1
Φ40	15	40	45	50	30	3	7
Φ60	20	55	52.5	67.5	40	2	8
Φ80		65	52.5	80	40	2	10

ΦD	A	B	C	E	F	G	H	J	K	L	M	N	P	Q	R	d1	d2
Φ40	165	55	115	30	70	37.5	25	12.5	25	85	50	35	145	40	105	Φ13	Φ10
Φ60	207.5	65	140	35	90	52.5	30	15	30	125	70	55	185	55	130	Φ18	Φ10
Φ80	230		150		100	65				150	80	70	210	70	140		Φ12

Code:SDBSO-40-V-R/L
Code:SDBSO-60-V-R/L
Code:SDBSO-80-V-R/L

2022.10:added setting method.
2020.6:added an inventory in notes.
2016.7:change usage.

Note：1.This drawing shows RH and symmetrical on LH.
2.Material :ASTM1045(JIS S45C)
   or ASTM 1018(JIS SS400)
3.The assembly dimensions of these parts and old
   parts are the same.
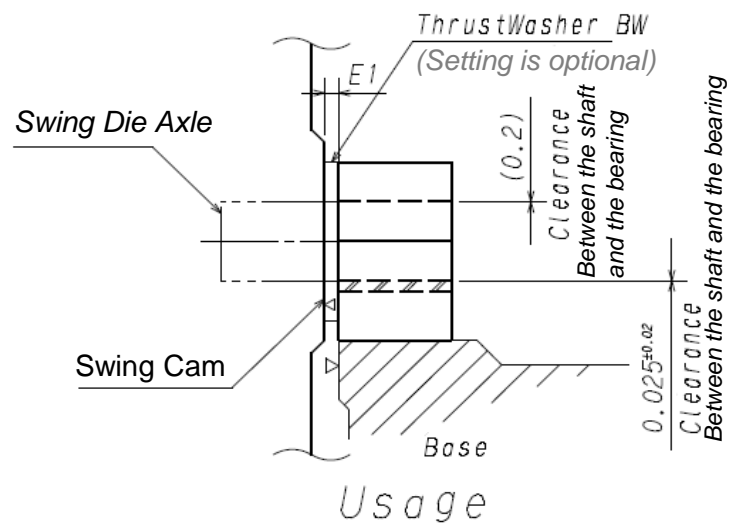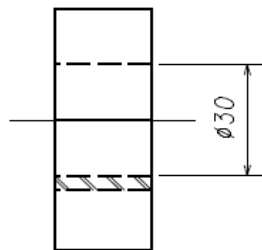4.The dowel pin holes are finished by NC machining.

NC dowel pin hole

NC dowel pin hole

2-M8x30

ThrustWasher BW
(Setting is optional)

Swing Die Axle

Swing Cam

Base

Usage

Clearance
Between the shaft and the bearing

Clearance
Between the shaft and the bearing
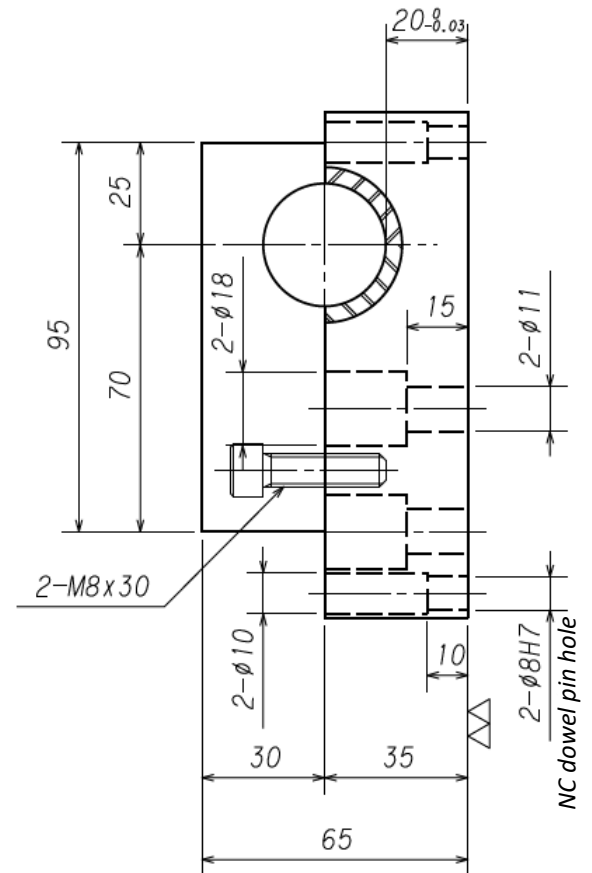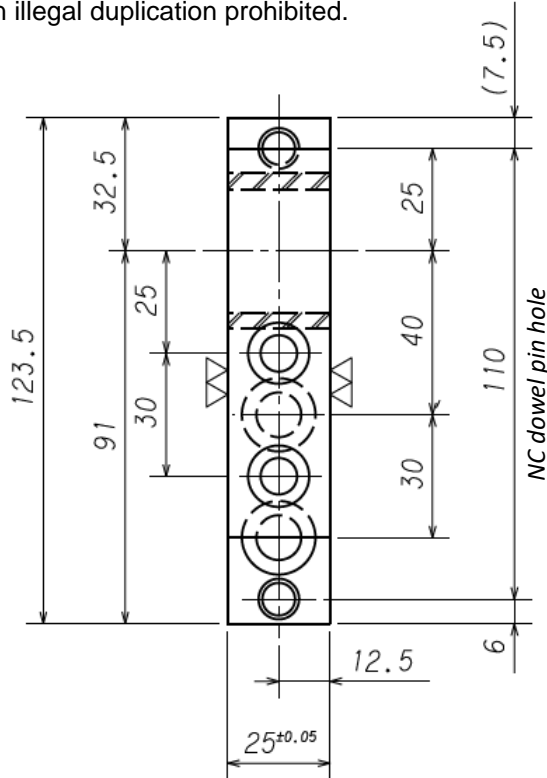
Rotating pivot shaft	E1
SDUJ-3045	2.5
SDUJ-3060	5

Note：
1. There is no R/L trunnion mount, the mount is common parts.
2. Material :ASTM1045(JIS S45C)
3. The dowel pin holes are finished by NC machining.

2016.7：change usage.

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2-Φ20

30-⁰₀.₀₃

25

2-Φ13

50

37.5

35

140

32.5

110

45

25

90

77.5

75

2-Φ13

15

2-Φ10H7

NC dowel pin hole

20

NC dowel pin hole

40-⁰₀.₀₄

2-M12x40

35

50

85

Φ40

40

Clearance 7

Fitting in type

SDUJ-4086

(0.2)

clearance
Between the shaft
and the bearing

Swing Cam

Bose

0.025⁺⁰.₀₂

Clearance
Between the shaft and the bearing

Usage

Note：
1.There is no R/L trunnion mount, the mount is
   common parts.
2.Material :ASTM1045(JIS S45C)
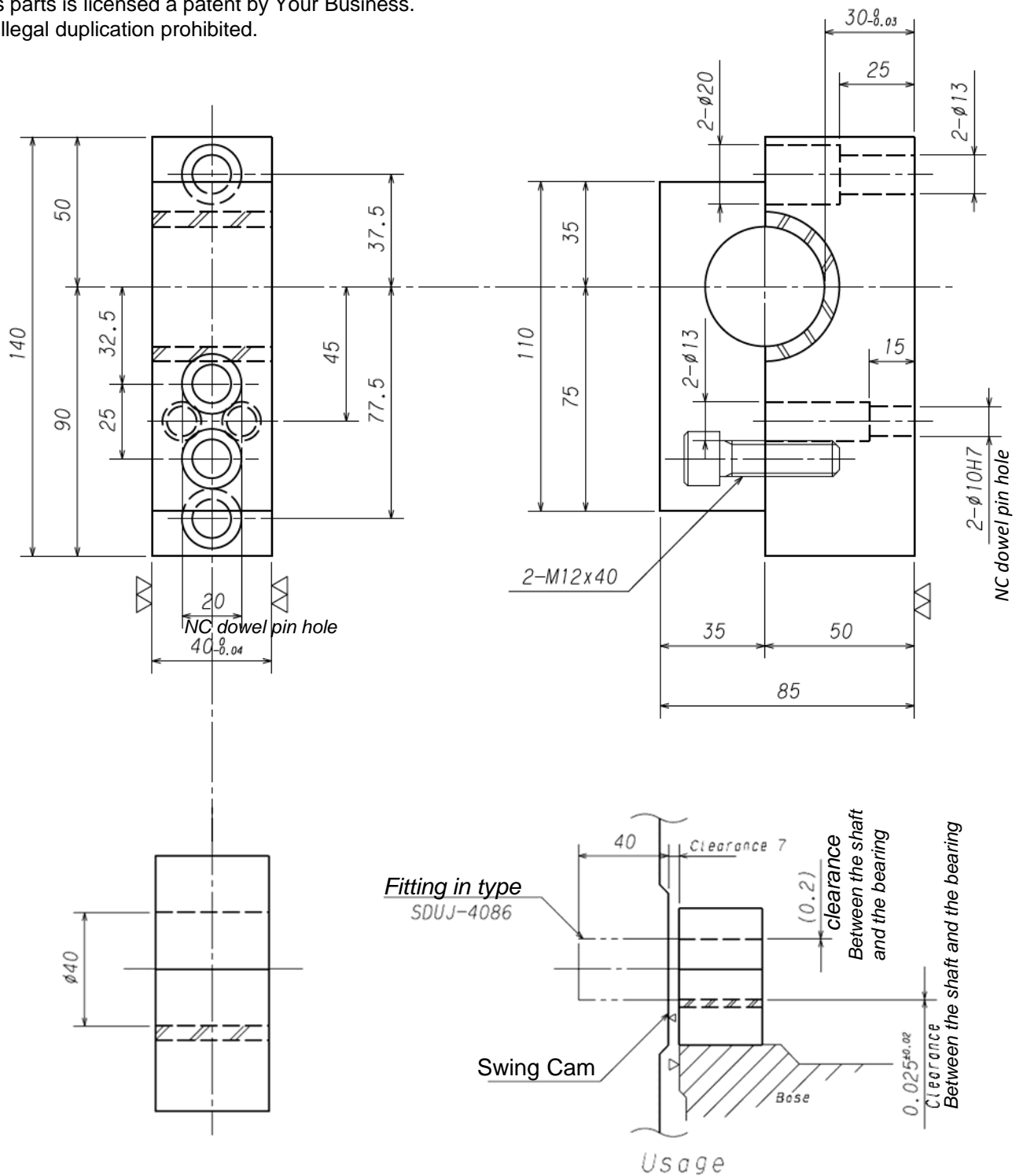3.The dowel pin holes are finished by NC machining.

2016.7：change usage.

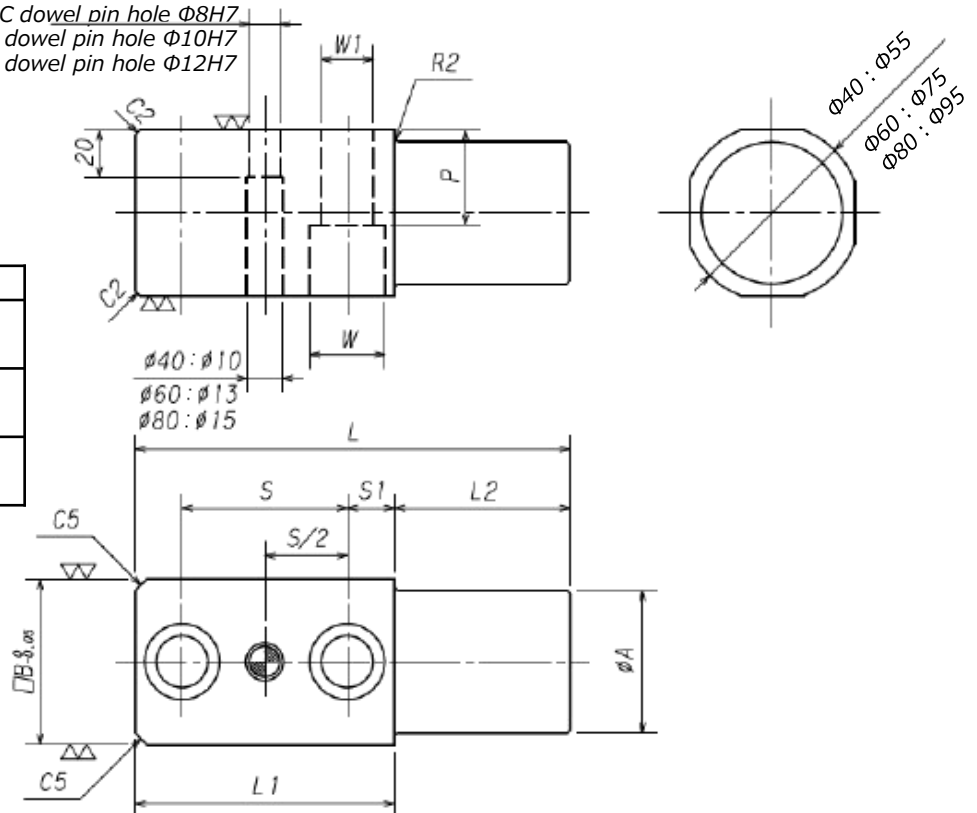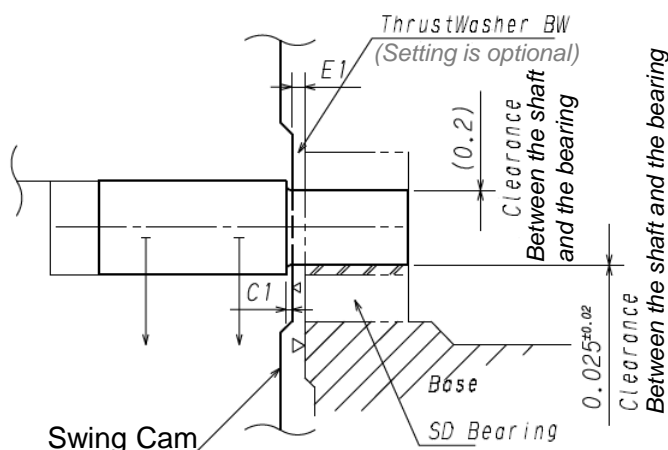This parts is licensed a patent by Your Business.
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Φ40 : NC dowel pin hole Φ8H7
Φ60 : NC dowel pin hole Φ10H7
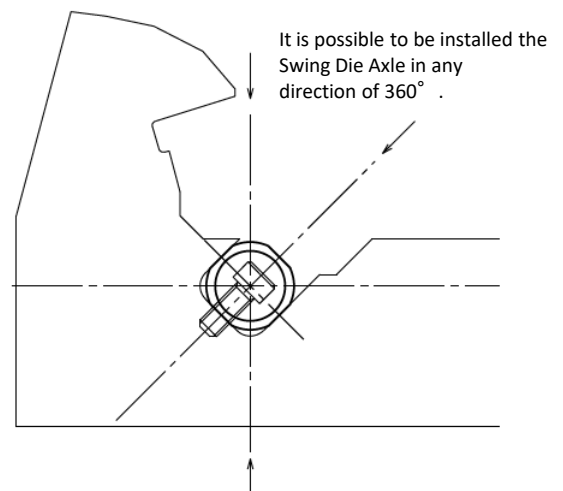Φ80 : NC dowel pin hole Φ12H7

Φ40 : Φ55
Φ60 : Φ75
Φ80 : Φ95

W1 R2

20 C3 C2

Φ40:Φ10
Φ60:Φ13
Φ80:Φ15

W

Code	C1	E1
SDAX-40B	3	7
SDAX-60C	2	8
SDAX-80B	2	10

C5

S S1 L2

S/2

L

□B-0.05

ΦA

C5 L1

Code	ΦA		□B	L	L1	L2	S	S1	W	W1	P
SDAX-40B	Φ40	-0.050 / -0.075	□50	144.5	80	64.5	40		Φ25	Φ17	30
SDAX-60C	Φ60	-0.060 / -0.090	□70	184.5	110	74.5	70	20	Φ31	Φ21	40
SDAX-80B	Φ80	-0.060 / -0.090	□90	186.5		76.5					

ThrustWasher BW
(Setting is optional)

E1

(0.2)

Clearance
Between the shaft
and the bearing

C1

Clearance
Between the shaft and the bearing

0.025±0.02

Swing Cam

Base

SD Bearing

Usage

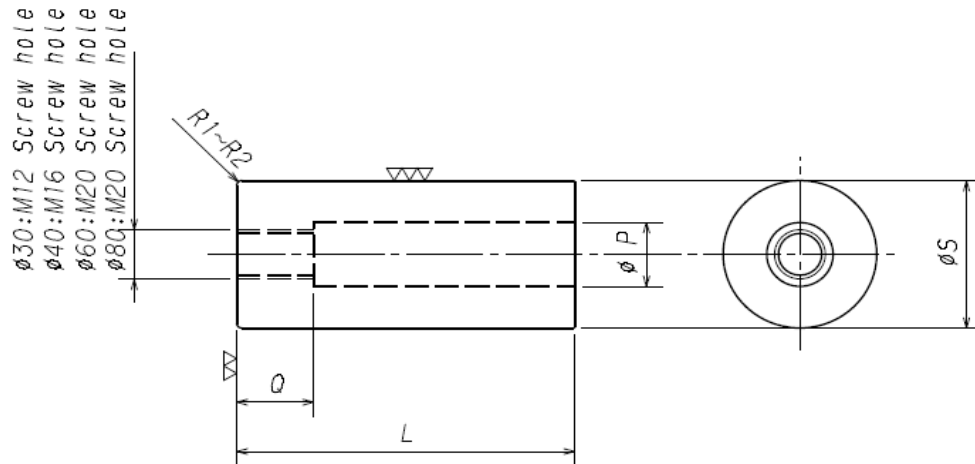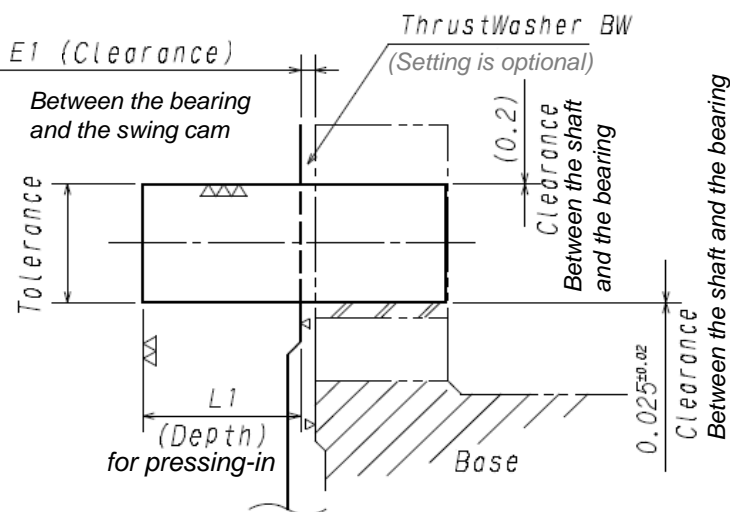It is possible to be installed the Swing Die Axle in any direction of 360°.

Note：
1.This standard shows the Swing Die Axle.
2.ASTM1045(JIS S45C) Tempering (HRC18～25)
3.It is not necessary to be used the dowel pins.

2016.7：added axis tolerance.

Your Business	New (Rev) Date 26 Jun. 2020	In stock	28/139

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Φ30:M12 Screw hole
Φ40:M16 Screw hole
Φ60:M20 Screw hole
Φ80:M20 Screw hole

R1~R2

Φ P

Φ S

Q

L

Code	L	P	Q	S		Bolt	usage
SDUJ-3045	45	Φ18	15	Φ30	-0.030 -0.055	M10×30	For minimum design
SDUJ-3060	60					M10×30	For 1d
SDUJ-4086	86	Φ20	30	Φ40	-0.050 -0.075	M12×50	For A104-XB
SDUJ-40101	101					M12×50	For 1d
SDUJ-40121	121					M12×50	For 1.5d
SDUJ-60132	132	Φ26		Φ60	-0.060 -0.090	M16×60	For Φ60
SDUJ-80154	154	Φ26		Φ80	-0.060 -0.090	M16×60	For Φ80

E1 (Clearance)

Between the bearing and the swing cam

ThrustWasher BW
(Setting is optional)

(0.2)
Clearance
Between the shaft and the bearing

Tolerance

L1
(Depth)
for pressing-in

Base

0.025±0.02
Clearance
Between the shaft and the bearing

Usage

Code	L1	E	Tolerance
SDUJ-3045	18	2.5	-0.01 -0.03
SDUJ-3060	30	5	
SDUJ-4086	40	7	-0.02 -0.05
SDUJ-40101	40	7	
SDUJ-40121	60	7	
SDUJ-60132	60	8	-0.03 -0.06
SDUJ-80154	80	10	-0.03 -0.06

Note：
1.This standard shows the Swing Die Axle fitting in type.
2.Material:ASTM1045(JIS S45C) Tempering(HRC18～25)

Your Business　　New　Rev　Date　26 Jun. 2020　　In stock

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This standard was revised in June 2019.
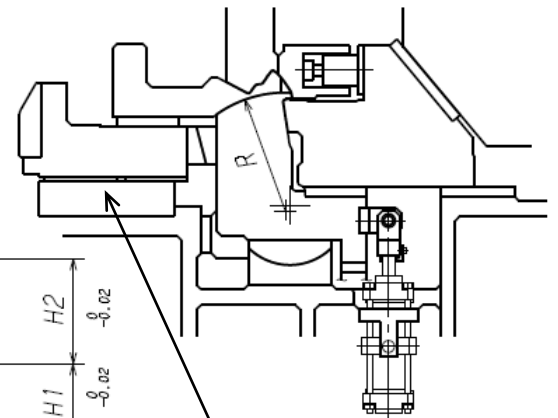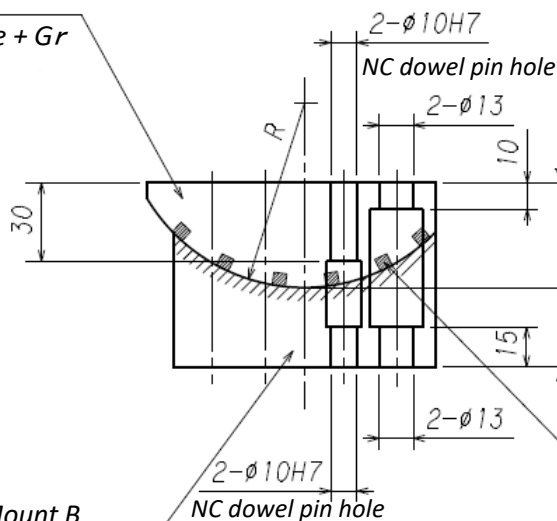70R and 100R take over to HMSW of the new standard.

LA1
LA3 LA2
35
60
LA4
NC dowel pin hole
LA5 15
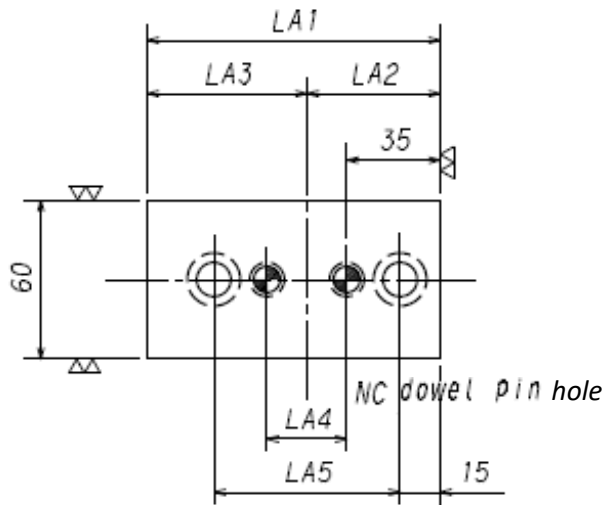
	LA1	LA2	LA3	LA4	LA5	H2
70R	110	50	60	30	70	40
100R	150	70	80	70	110	50

Code: HMSW-A70R
: HMSW-A100R

・GP,120R,140R,and 160R have been discontinued.
 These are supported as a new standard.
 Please see the next page.
・The center of rotation should be inside or near the panel
 when using the half-mount type.

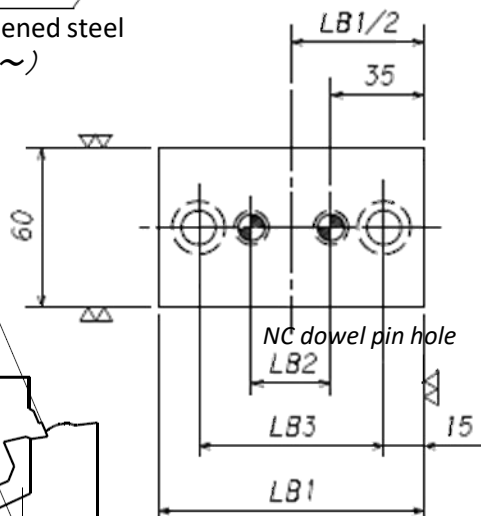**1** *Half Mount A*

Material: Bronze + Gr

2-ø10H7
NC dowel pin hole
2-ø13
10
R
30
15
2-ø13
2-ø10H7
NC dowel pin hole
$H1$ $H2$ -0.02 -0.02

Using positive-pressure-unit
is an ideal combination

Embedded GRAPHITE

Usage
(BSO)

2 *Half Mount B*

Material:Pre-hardened steel
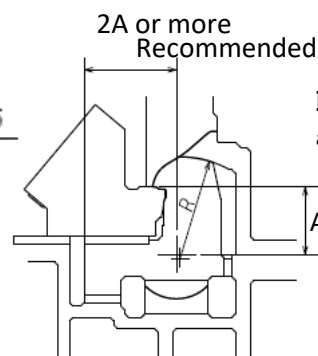*(HRC40〜)*

LB1/2
35
60
NC dowel pin hole
LB2
LB3 15
LB1

	LB1	LB2	LB3	H1
70R	100	30	70	30
100R	140	70	110	40

・GP,120R,140R,and 160R have been discontinued.
 These are supported as a new standard.
 Please see the next page.

Code: HMSW-B70R
: HMSW-B100R

2A or more
Recommended

A
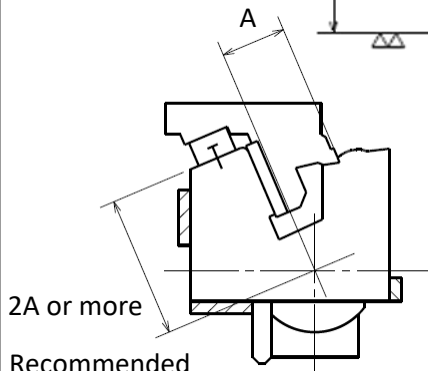
It is preferable if there is
an anti-rotation mechanism.

A

In stock
But please contact us
at least one month in
advance.

A

2A or more

Recommended

Usage
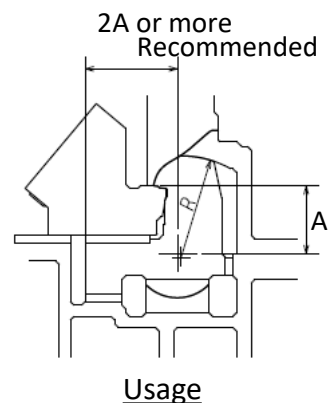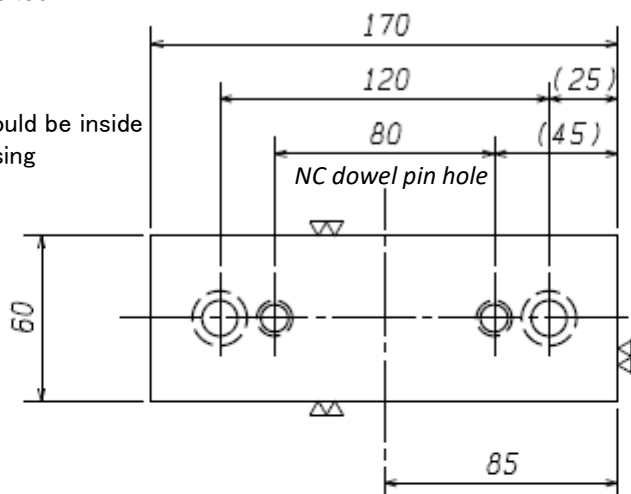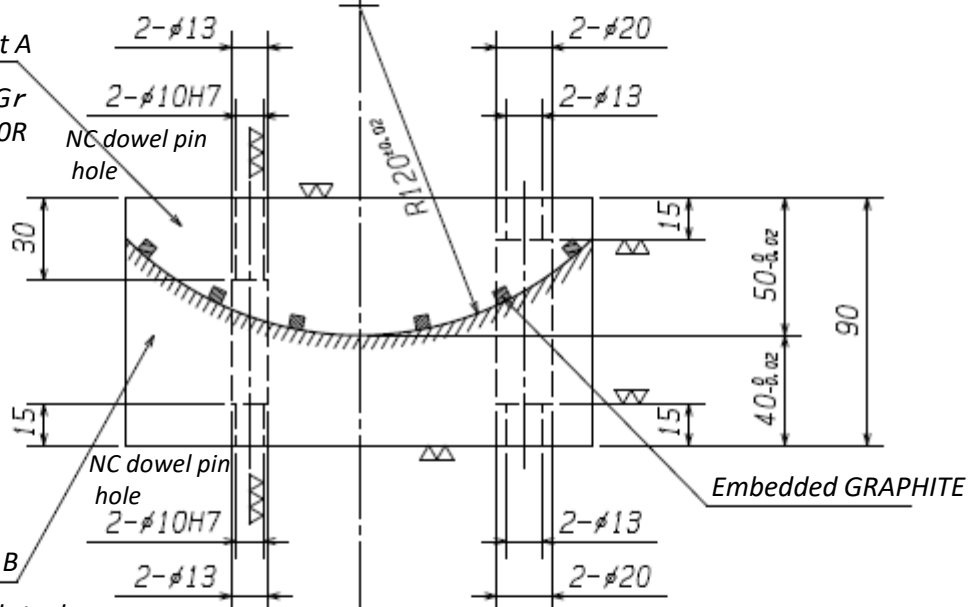
Usage

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・ The center of rotation should be inside
   or near the panel when using
   the half−mount type.

170

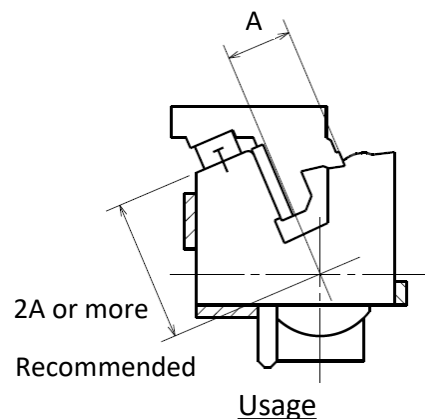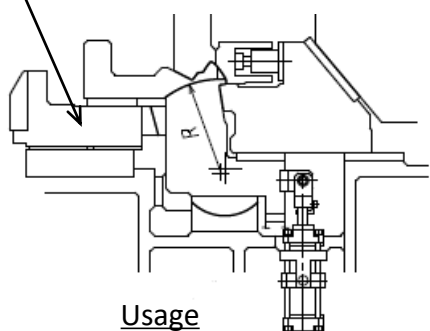120 (25)

80 (45)

NC dowel pin hole

60

85

2A or more
Recommended

R

A

Usage

① Half Mount A

Material:Bronze+Gr
Code:HMSW-A120R

2-φ13

2-φ10H7

NC dowel pin
hole

2-φ20

2-φ13

$R120^{+0.02}$

30

15

NC dowel pin
hole

2-φ10H7

2-φ13

15

$50^{-0}_{-0.02}$

$40^{-0}_{-0.02}$

90

15

Embedded GRAPHITE

② Half Mount B

Material:Pre-hardened steel
（HRC40〜）
Code:HMSW-B120R

2-φ13

2-φ20

85

A

Using positive-pressure-unit
is an ideal combination

60

2A or more

Recommended

Usage

80 (45)

NC dowel pin hole

120 (25)

170

R

Usage
(BSO)

Half Mount

A311

HMSW-A140R,A160R/B140R,B160R

Using positive-pressure-unit is an ideal combination

Usage (BSO)

・ The center of rotation should be inside or near the panel when using the half−mount type.

LA1
LA2
(30)
NC dowel pin hole
LA3
(55)
60
LA1/2
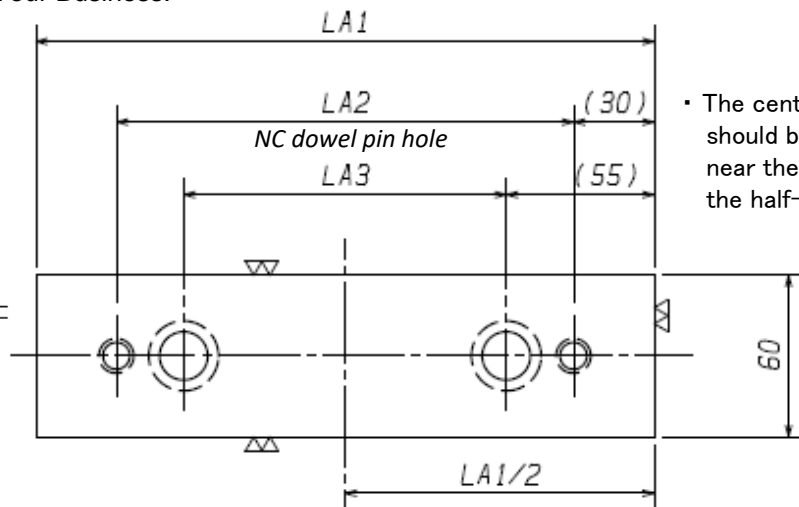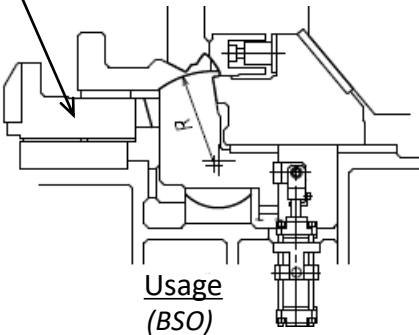
① **Half Mount A**

Material: Bronze+ Gr

Code:HMSW-A140R/A160R

2-⌀26
2-⌀18
2-⌀13
2-⌀10H7
NC dowel pin hole
20
30
$R^{\pm 0.02}$
H2-⁸₀.₀₂
H3
40-⁸₀.₀₂
Embedded GRAPHITE
20
20
NC dowel pin hole
2-⌀10H7
2-⌀13
2-⌀18
2-⌀26
LA1/2
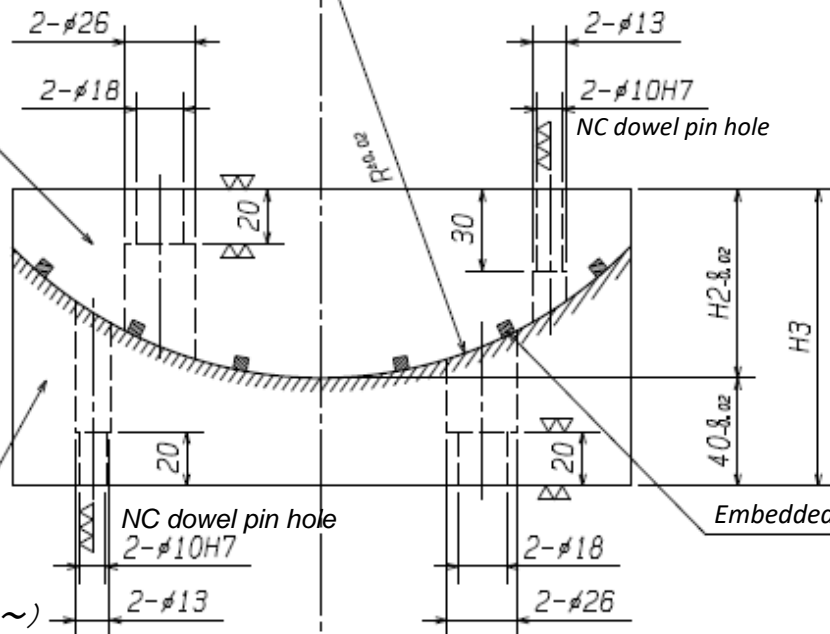
② **Half Mount B**

Material:Pre-hardened steel（HRC40～）

Code:HMSW-B140R/B160R

2A or more Recommended

60
A
Usage

LA1/2
60
LA3
(55)
2A or more Recommended
LA2
(30)
NC dowel pin hole
LA1
A
Usage
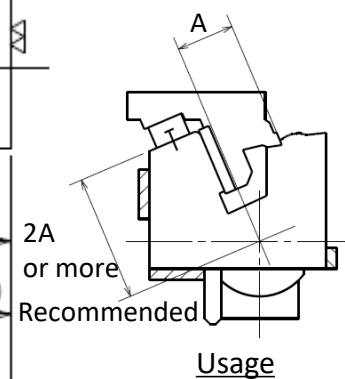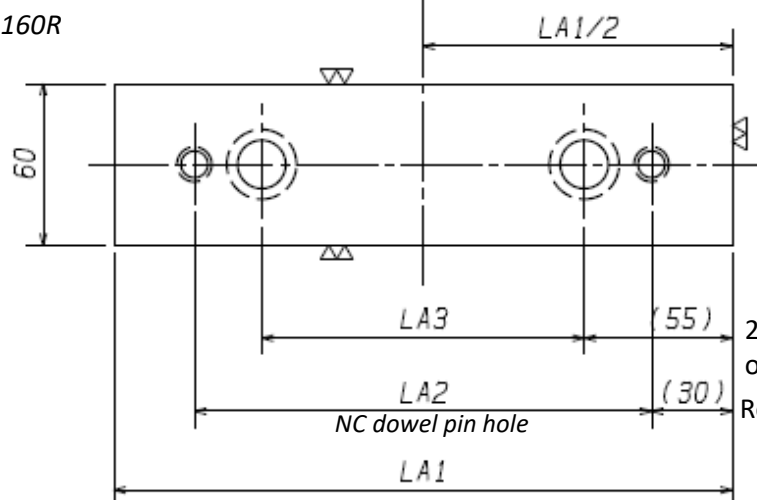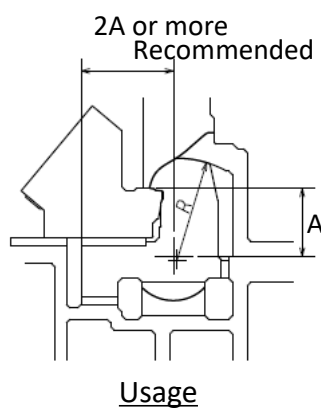
	LA1	LA2	LA3	H2	H3
140R	200	140	90	60	100
160R	230	170	120	70	110

In stock
But please contact us at least one month in advance.

Your Business New Rev Date 26 Jun. 2020 In stock

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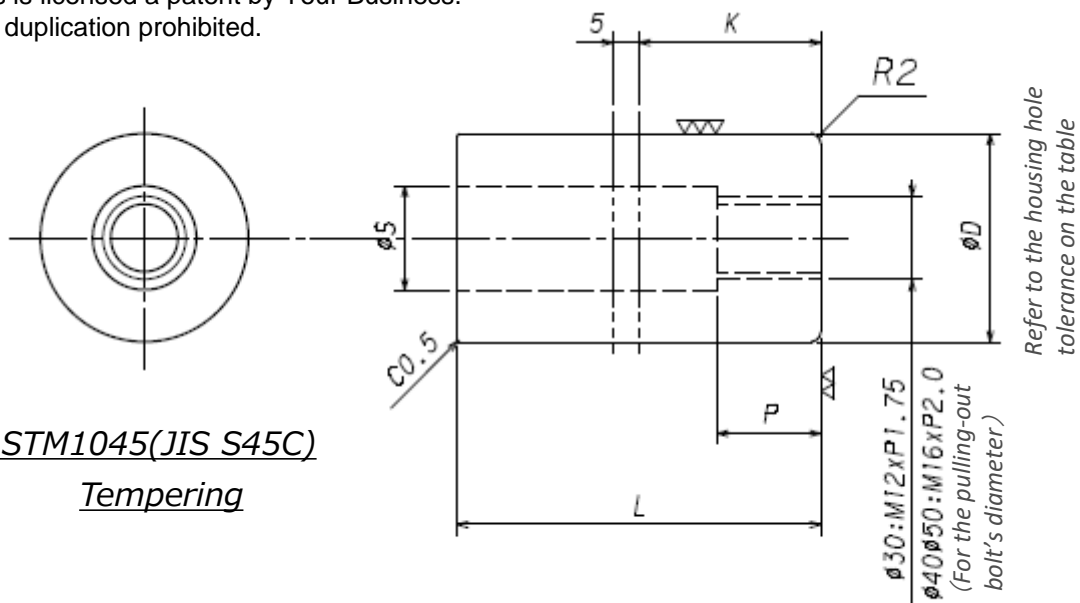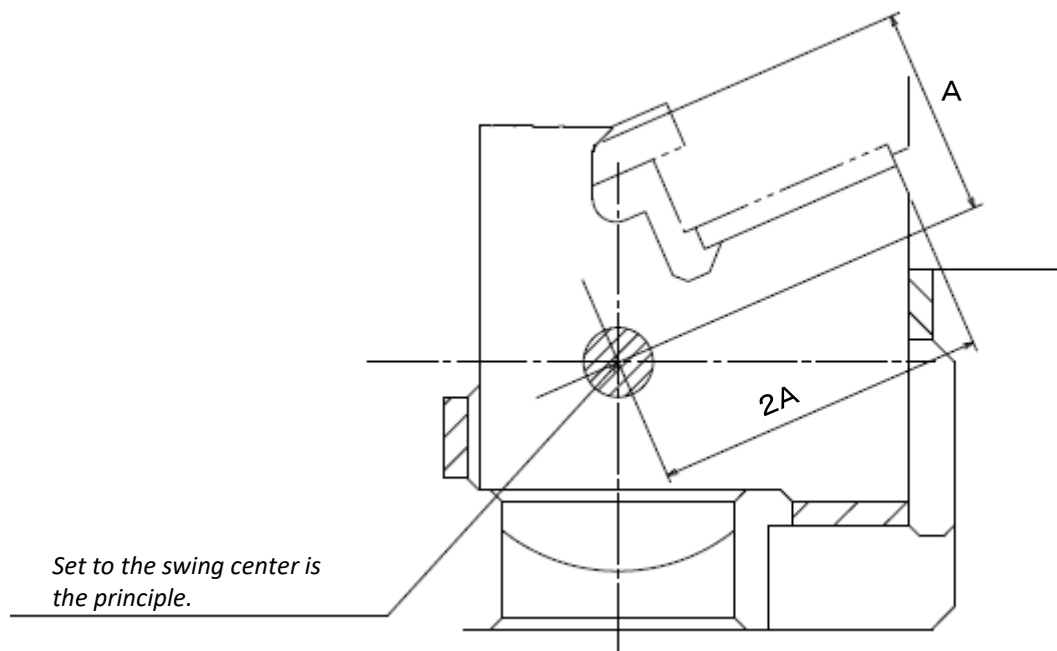An illegal duplication prohibited.

5 *K*

R2

ø5

C0.5

ø30:M12xP1.75
ø40ø50:M16xP2.0
(For the pulling-out bolt's diameter)

øD

Refer to the housing hole tolerance on the table

P

L

ASTM1045(JIS S45C)
Tempering

code	ΦD	L	S	P	K	Bolt	tolerance
HMA-A1-3050	Φ30 $^{-0.030}_{-0.055}$	50	18	15	20	M10	Φ30 $^{-0.01}_{-0.03}$
HMA-A1-4075	Φ40 $^{-0.050}_{-0.075}$	75	20	20	30	M12	Φ40 $^{-0.02}_{-0.05}$
HMA-A1-5090	Φ50 $^{-0.050}_{-0.075}$	90	20	20	40	M12	Φ50 $^{-0.02}_{-0.05}$

・This standard is used for falling prevention on both sides of the Half Mount Swing.

・Half Mount Axle A is set in the center of Swing Cam in principle.

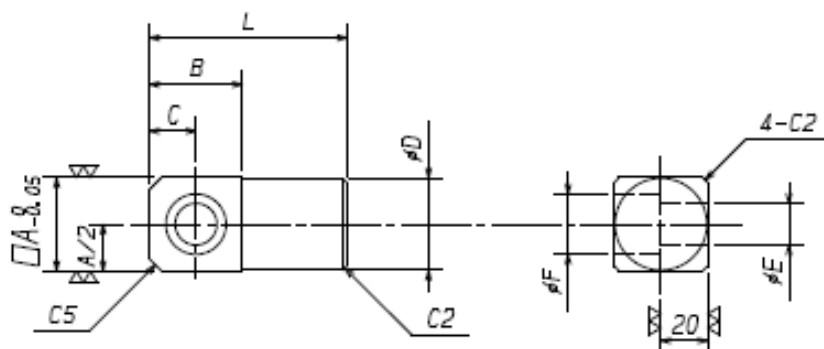・The pressed amount is possible to be changed according to the designing convenience.

A

2A

Set to the swing center is the principle.

Usage

In stock

The main role of this standard t is to prevent the swing die from falling during reversing.

ASTM1045(JIS S45C)
Tempering

code	A	L	D	B	C	E	F	Bolt
HMA-B1-4085	40	85	Φ39.6	40	20	17	26	M16
HMA-B1-50100	50	100	Φ49.6	50	25	21	32	M20

Half Mount・Swing

To insert as a spigot joint

$4.0^{+0.85}_{-0.82}$
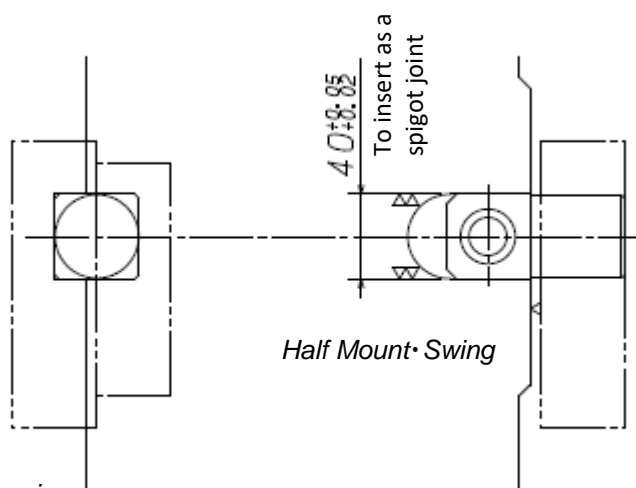
Half Mount・Swing

Use this axle when the axis position is close to the shape and the required thickness for driving is not enough.

A
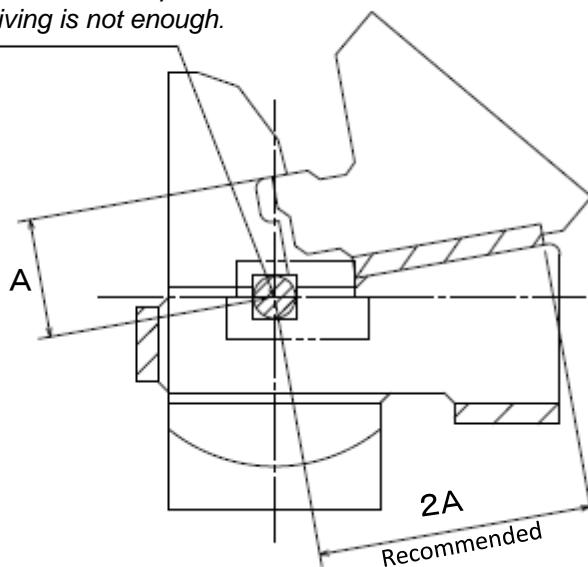
2A
Recommended

It is possible to be installed the rotating pivot shaft in any direction of 360°.

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The main role of this standard is to make a prevention of falling and floating up during the reversing work,
and to be installed in both side of Half Mount Swing Cam.

NC dowel pin hole

2-M8x30

NC dowel pin hole
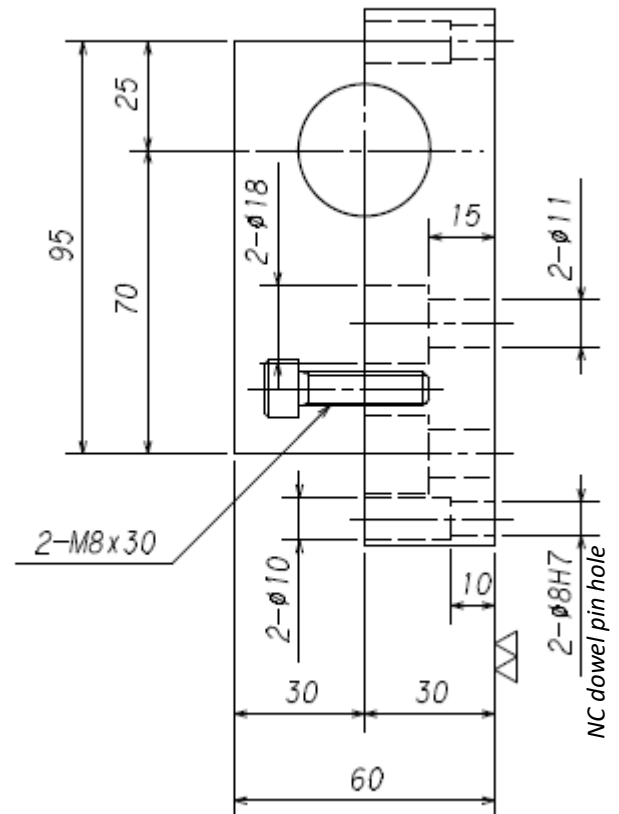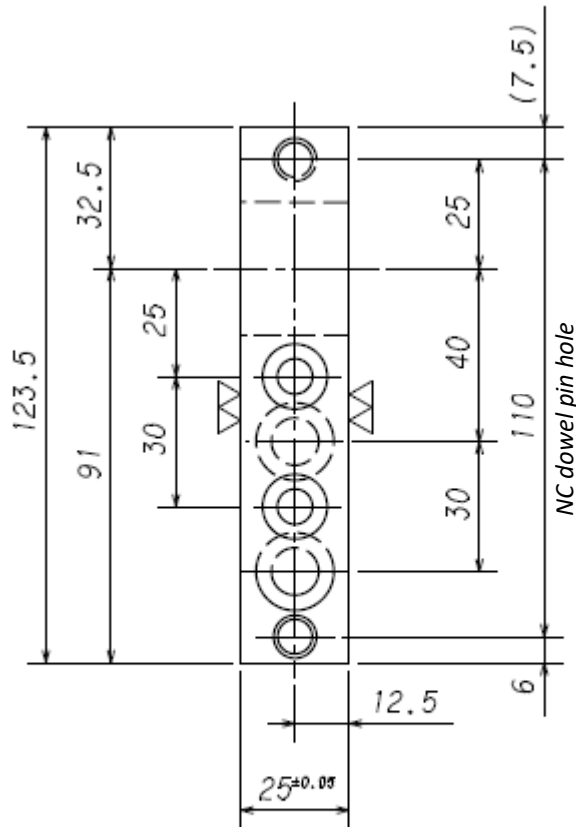
Material:ASTM1045
（JIS S45C）

Rotating pivot shaft
for Half Mount

Half Mount
Swing Cam

Usage

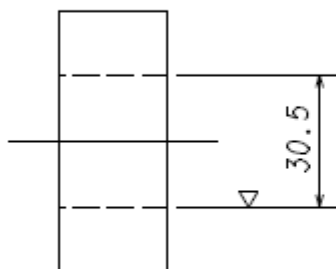This parts is licensed a patent by Your Business.
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The main role of this standard is to make a prevention of falling and floating up during the reversing work,
and to be installed in both side of Half Mount Swing Cam.

NC dowel pin hole

$40_{-0.04}^{0}$

2-M12x40

NC dowel pin hole

2-Φ10H7

Rotating pivot shaft
for Half Mount

Half Mount
Swing Cam

Usage

Material : ASTM1045
(JIS S45C)

Half Mount Holder Φ50

HMH-50A-45

The main role of this standard is to make a prevention of falling and floating up during the reversing work,
and to be installed in both side of Half Mount Swing Cam.

2-Φ26

30

2-Φ18

55

(37.5)

(55)

137.5

167.5

112.5

35

40

130

90

40

2-Φ13

15

2-Φ10H7

NC dowel pin hole

57.5

15

NC dowel pin hole

25   10

45−0.04

2−M16x50

45   50

95

5

*Rotating pivot shaft
for Half Mount*

Φ50.5

*Half Mount
Swing Cam*

*Material : ASTM1045
（JIS S45C）*

Usage
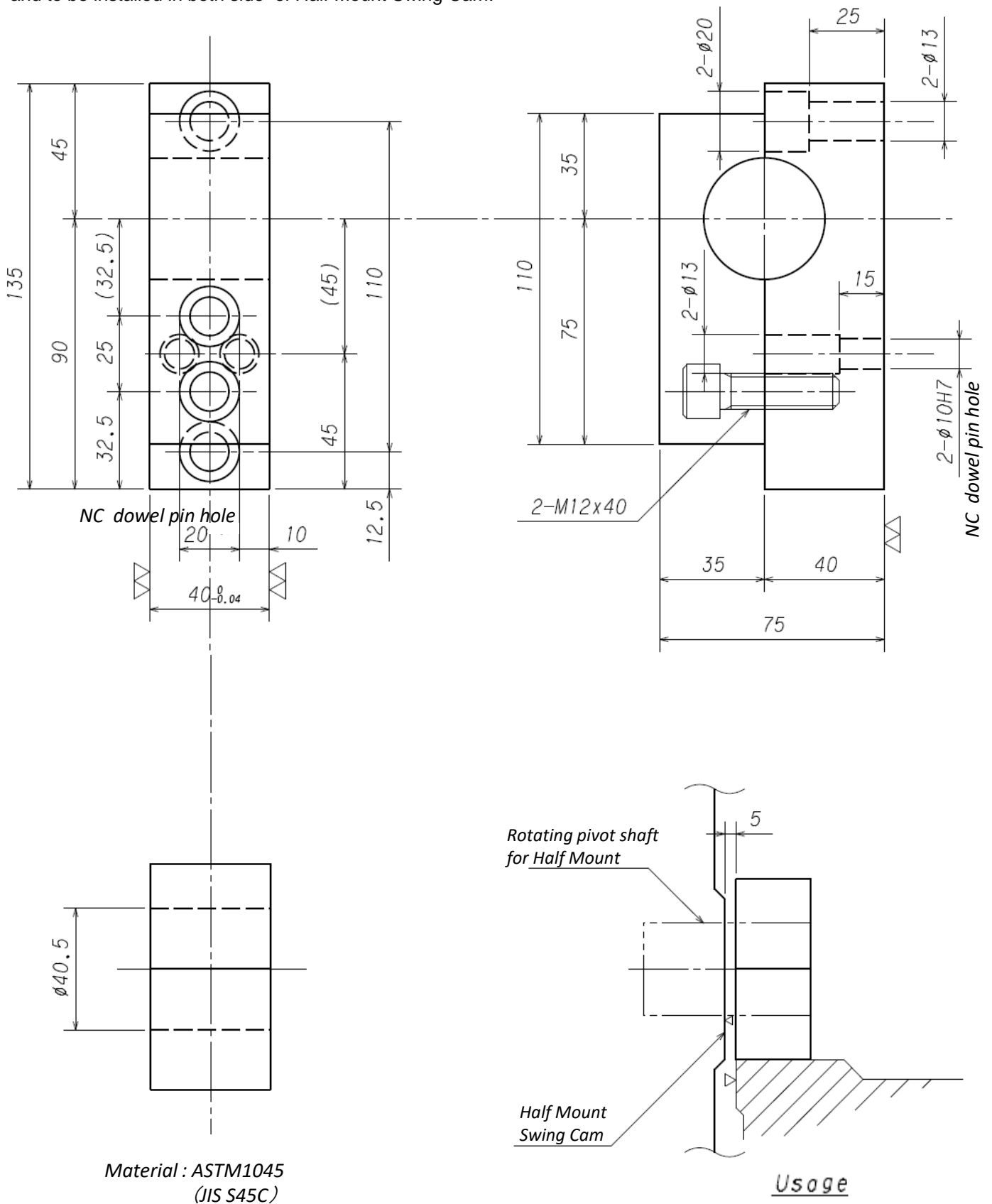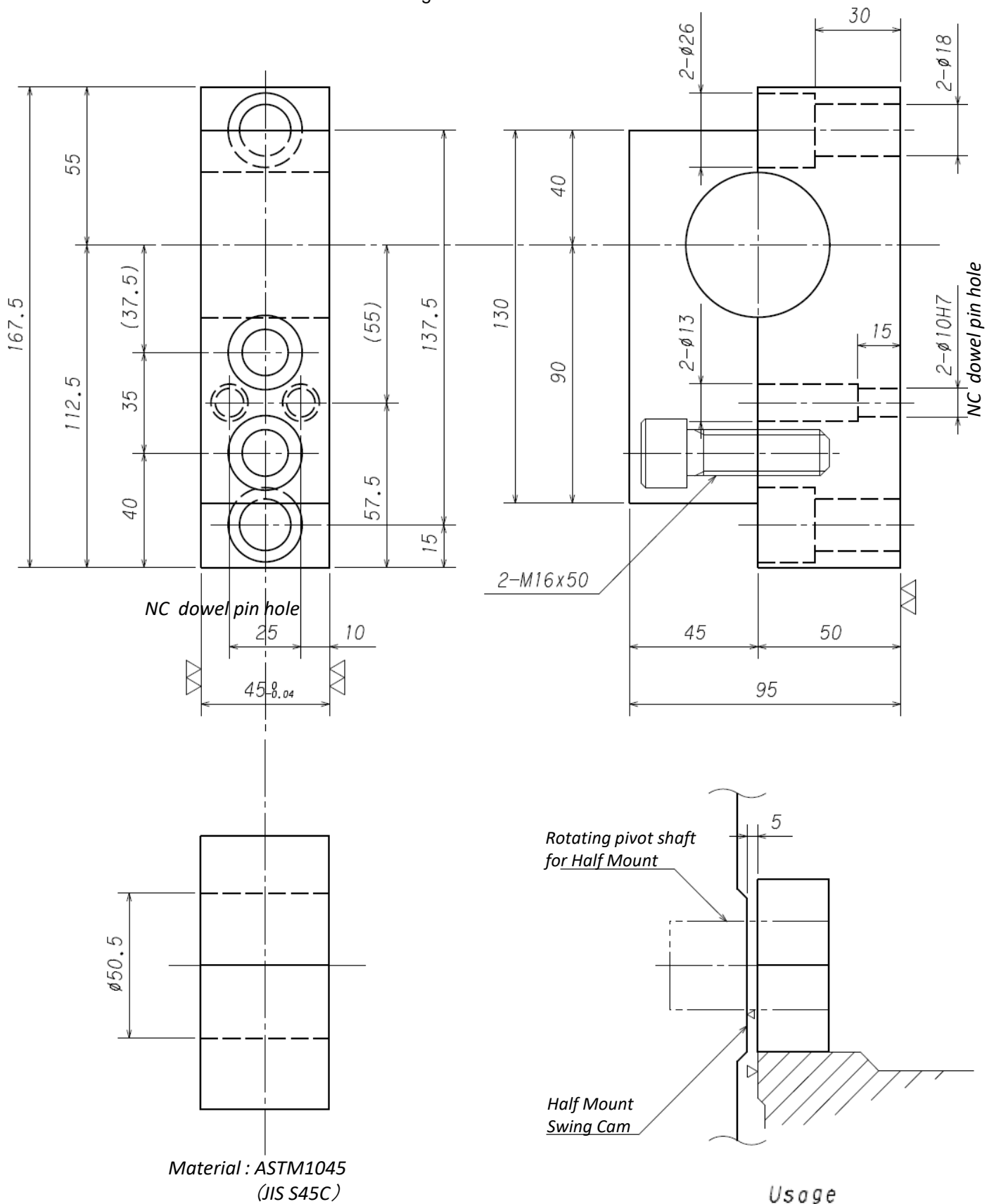
Name	Code	Category Number	Sketch	Remarks
Slide Block 80	SB80	B102		1 Oct. 2021 Rev
Slide Block 100PL	SB100PL	B105		26 Jun. 2020 Rev
Slide Block 100PS	SB100PS	B106		26 Jun. 2020 Rev
Urethane Spring	UK	B104		26 Jun. 2020 Rev
Joint Stroke Block	JSTB	B111		26 Jun. 2021 Rev
Knuckle Bracket	SDNB	B112		26 Jun. 2020 Rev
SD Slide Plate	SDSLP	B201		1 Oct. 2021 Rev
SD Slide Plate C	SDSLPC	B202		1 Oct. 2021 Rev
Cylinder Joint Set	CYJS	B301		26 Jun. 2020 Rev
Cylinder Joint Set	CYJS-DS	B302		26 Jun. 2020 Rev
Cylinder Joint Set G	CYJS-DG	B303		1 Oct. 2021 Rev
Trunnion Block	TB	B401		1 Oct. 2021 Rev
Trunnion Block G	TB-G	B402		1 Oct. 2021 Rev
Knuckle Joint Set	NJS	B411		26 Jun. 2020 Rev
Knuckle Joint Set G	NJS-G	B412		26 Jun. 2020 Rev
Joint Arm	JTA	B413		1 Oct. 2021 Rev
Block Hold Plate	BHP	B501		1 Oct. 2021 Rev
Upper Plate	SUP/SUPH	B502		26 Jun. 2020 Rev
Swing Block	SWB	B601		1 Jun. 2023 Rev
Swing Block E	SWBE	B603		1 Jun. 2023 Rev
SD Lift Pin φ50 RA/RB	SDLP-50-RA/RB	B701/B702		1 Oct. 2021 Rev
Lift Pin Mini Set	LPRB/LPRA	B721		1 Oct. 2021 Rev
Lifter Stopper	LPST/LPSTC	B801		26 Jun. 2020 Rev

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$W+20_{-0.05}$

W （Select from list）

44

(45)

(105)

60

Induction hardening

Induction hardening

79.5

55.5

46

15

18

12

R5

R10

30

45°

$80_{-0.02}$

R2

$20_{-0.05}$

Material:ASTM1045
(JIS S45C)
Induction hardening

For lifting
M12x25L

(5)

Ø18

Urethane for shock absorption

2.5 gap

2.5 gap

SUP / SUPH

SUP / SUPH

clearance
0.05~0.5

27.5

Wear plate

tolerance $^{+0.14}_{+0.06}$
(+0.1 target)

Code	W
SB80M-75	75
SB80M-100	100
SB80M-125	125
SB80M-150	150
SB80M-200	200
SB80M-250	250

SWB

30° or more

SB80

SDSLP

Any type of air cylinder
is acceptable

At small rotation

SWB

30° or more

SB80

SDSLPC

at medium rotation
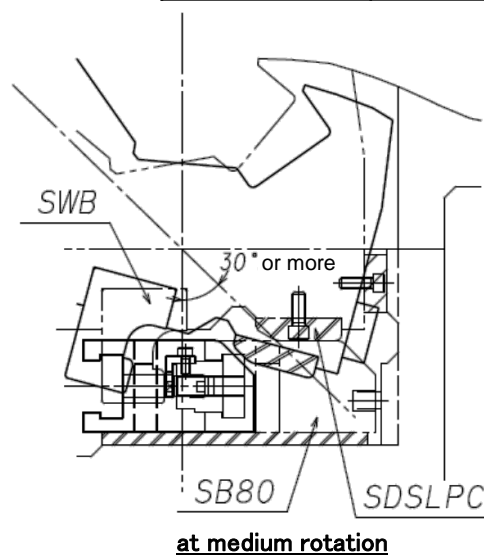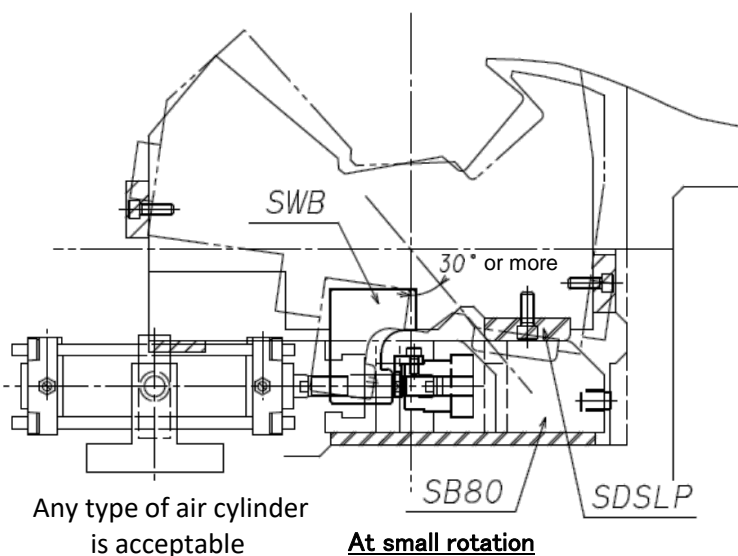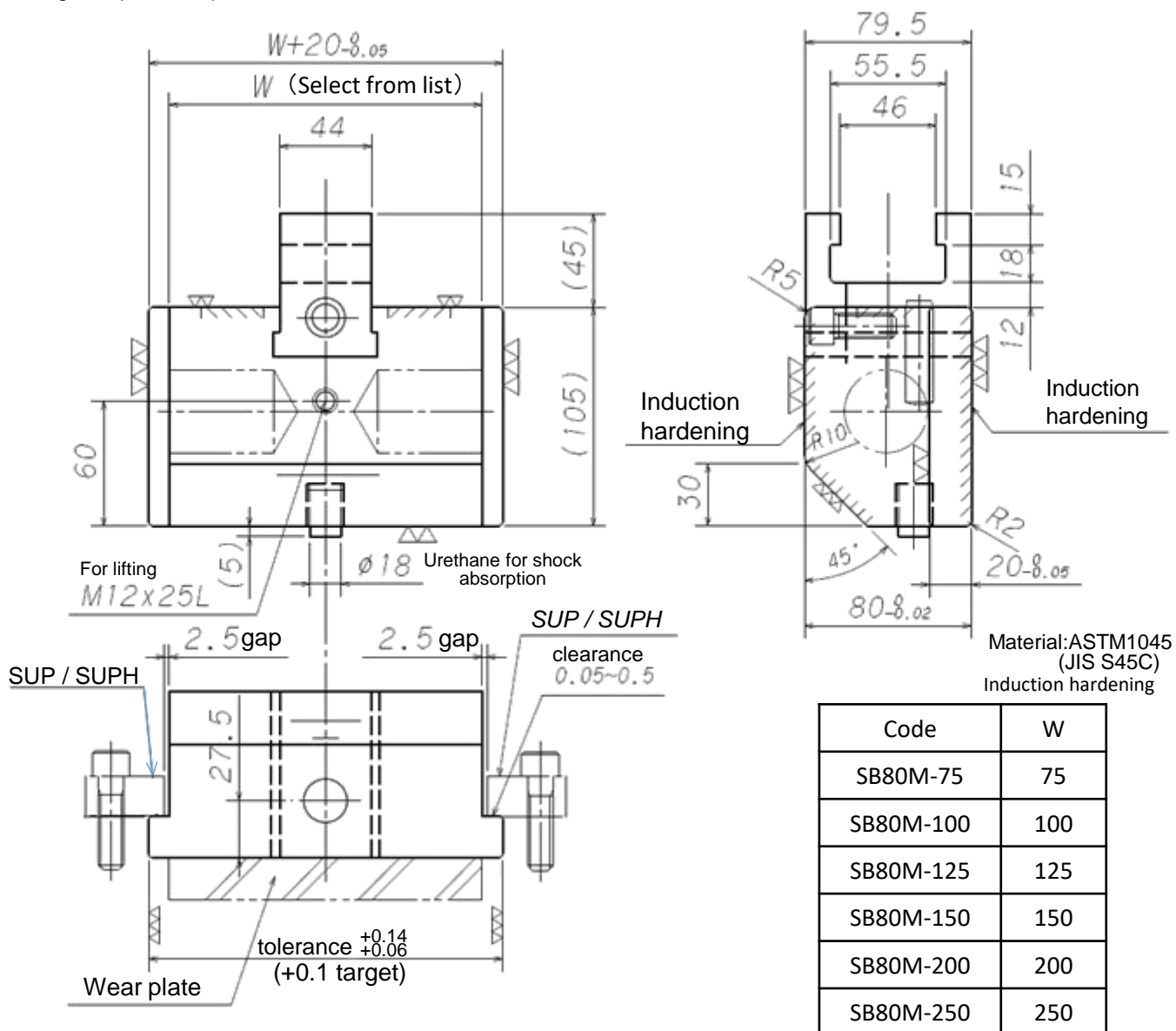
Usage

Special size : made-to-order
Standard size: In stock

Your Business	New Rev	Date	1 Oct. 2021	In stock	39/139

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For large rotation.
A type that installed A/C at the shape side.

induction hardening

$W+20^{-0}_{-0.05}$

W

50   A

$100^{-0}_{-0.02}$

50

4-R3   3-R3

R10

15

(75)

153

120

40

20°   R15

18

M12x25L

A=75   SDSLP-7575
A=50   SDSLP-4875

42
B

14.8

induction hardening

46
56

30

SUP / SUPH

2.5 clearance

$20^{-0}_{-0.05}$

20

5

90

5

WEAR PLATE

tolerance +0.14 / +0.06

①Slide Block   ASTM 1045
    (JIS S45C)
     induction hardening
②Sub block U   ASTM 1018
    (JIS SS400)
③Sub Block L   ASTM 1018
    (JIS SS400)

Material: ASTM1045(JIS S45C) induction hardening

Code	W	A	B
SB100PL-150-120A	150	50	110
SB100PL-200-120A	200	75	160

(40°)

30°
or more

SB100PL

Usage

For large rotation.
A type that installed A/C at the shape side.

Note :
There are no stock in this parts.
Please order one month in advance.

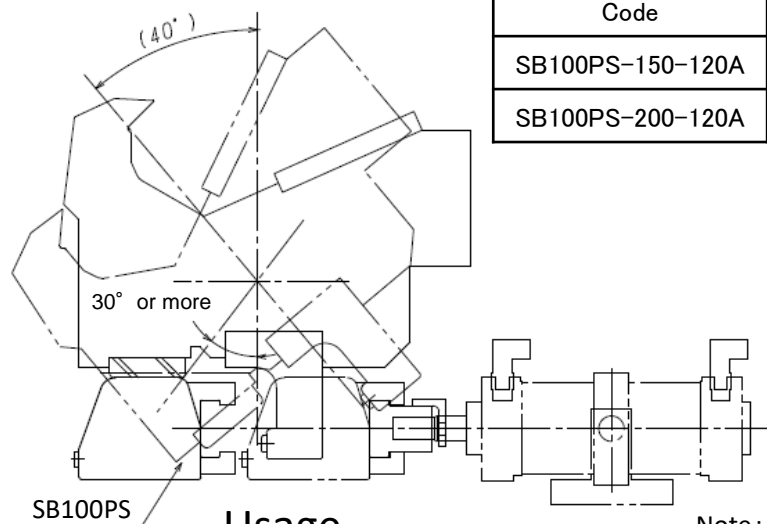| Your Business	New (Rev)	Date 26 Jun. 2020	Made to order	40/139

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For large rotation.

Induction hardening

$W+20 \, ^{0}_{-0.05}$

$10 \, ^{0}_{-0.02}$

B

50   A

30

R3   3-R3

25

R15

20°

(75)

120

153

R10

15

40

18

14.8

42

W

M12x25L

Induction hardening

2

46

56

50

1

3

A=75   SDSLP-7575
A=50   SDSLP-4875

SUP / SUPH

5

tolerance
2.5

$20 \, ^{0}_{-0.05}$

90

20

①Slide Block   ASTM1045 (JIS S45C)
            induction hardening
②Sub block U   ASTM 1018
            (JIS SS400)
③Sub Block L   ASTM 1018
            (JIS SS400)

5

tolerance $^{+0.14}_{+0.06}$

WEAR PLATE
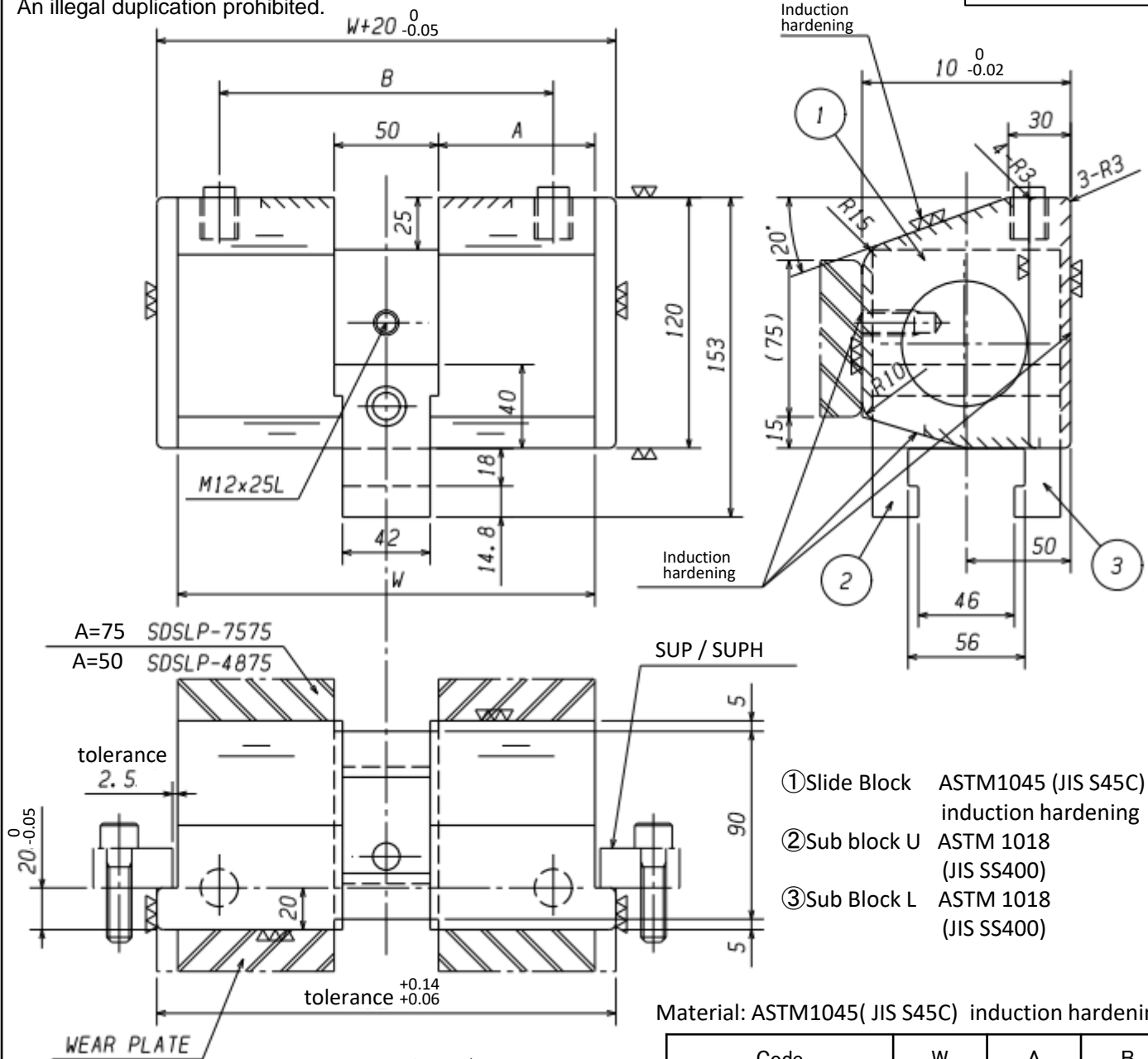
Material: ASTM1045(JIS S45C) induction hardening

Code	W	A	B
SB100PS−150−120A	150	50	110
SB100PS−200−120A	200	75	160

(40°)

30° or more

SB100PS

Usage
For large rotation.

Note :
There are no stock in this parts.
Please order one month in advance.

This parts is licensed a patent by Your Business.
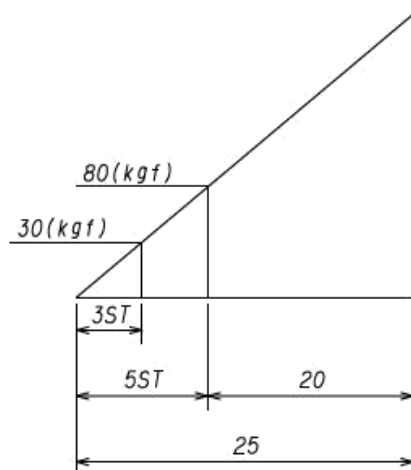An illegal duplication prohibited.

It is not necessary to be described code name for using together with Slide Block.(To be delivered Slide Block with the urethane spring.)
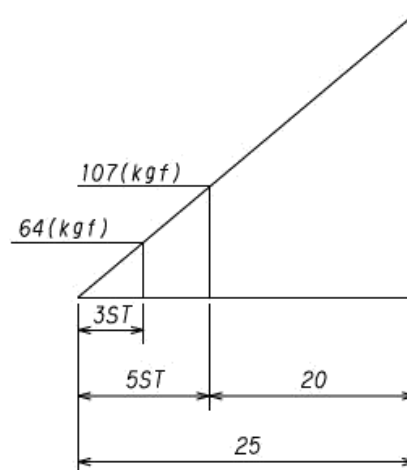Using this parts in case of urethane breakage.
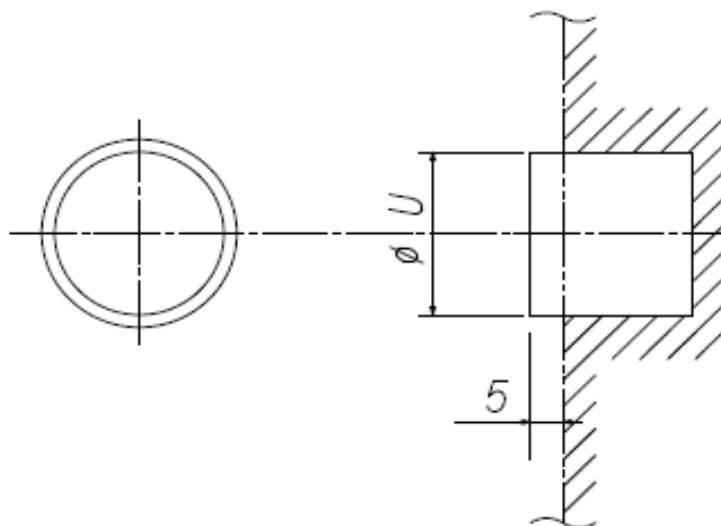
Code	ΦU	3ST absorbing energy	5ST absorbing energy
UK-15A	15	45(kg・mm)	155(kg・mm)
UK-18A	18	96(kg・mm)	267(kg・mm)

Material : Urethane shore A90

Regarding a special Slide Block, it is all acceptable for quotation with the locating position of a urethane spring.

UK-15A

UK-18A

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80±8.1

50
95

165
130

20
15

45.5
56

hinge pin
(included)

(65)   85±8.1
20   30

hatched area for
induction hardening

65

(10~10.5)

SUP-13038A or BHP-3280B
ASTM 1045(JIS S45C)
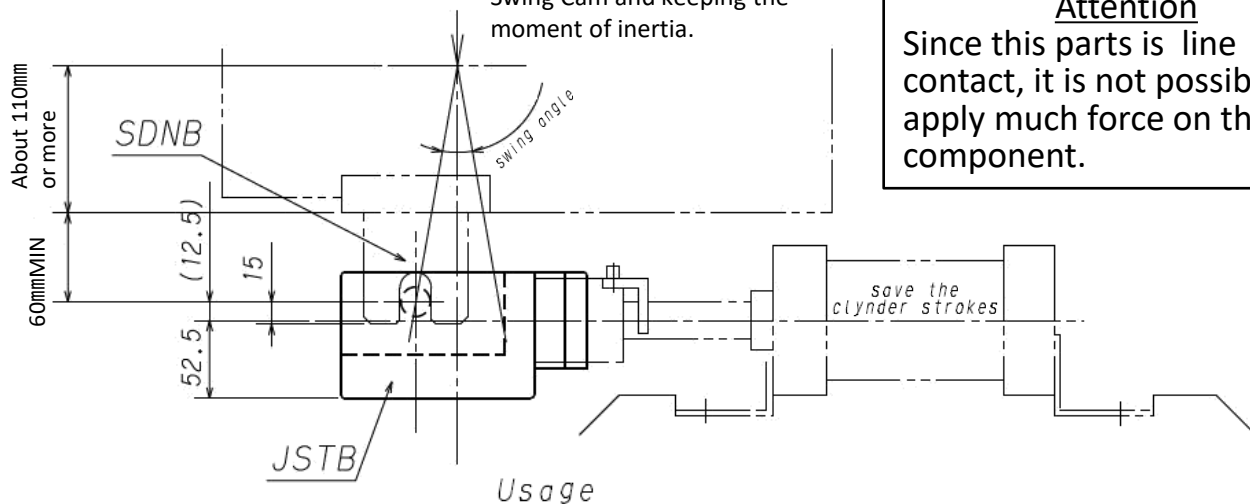*induction hardening*
JSTB-80165-B

induction
hardening
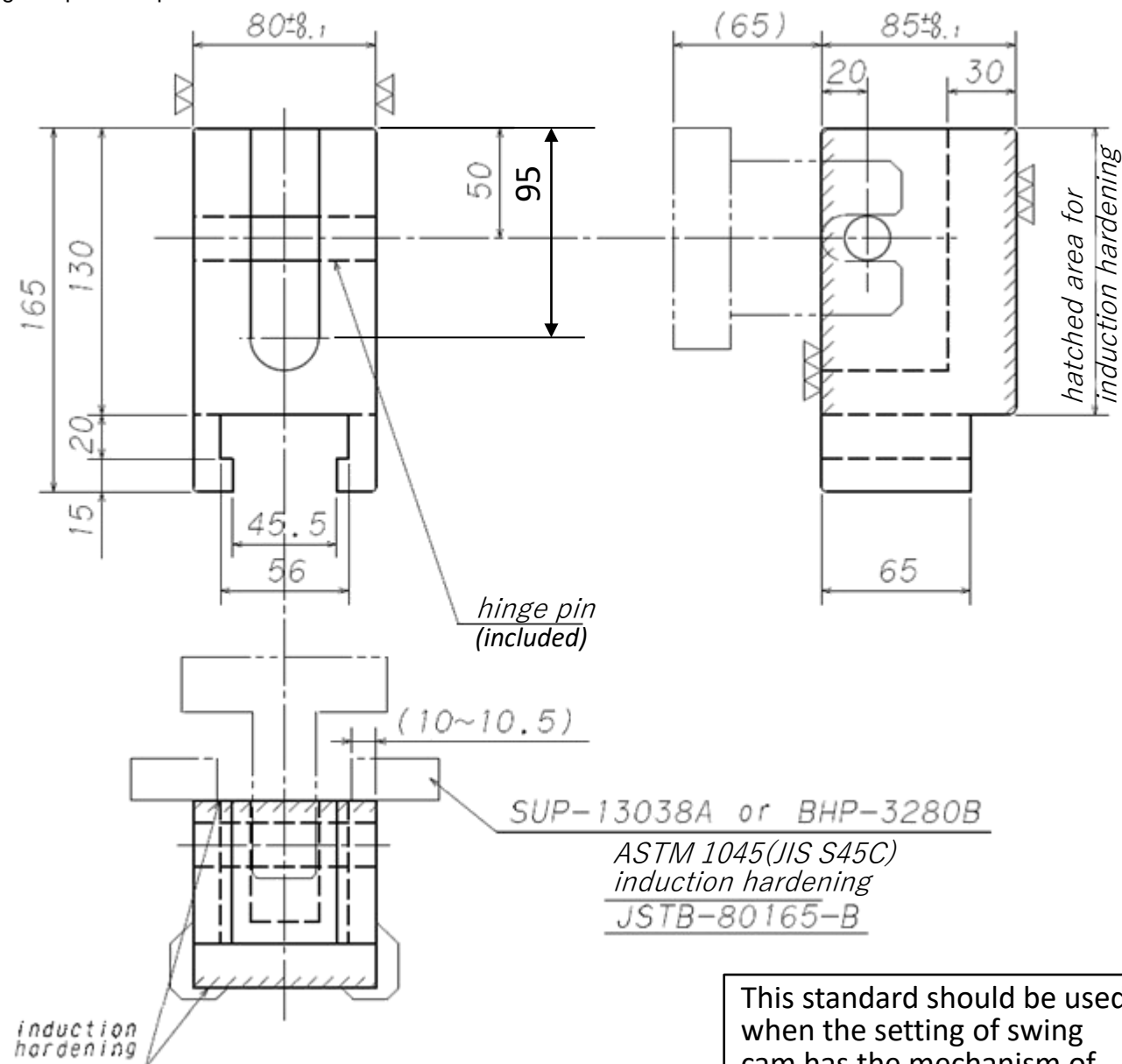
This standard should be used when the setting of swing cam has the mechanism of positive return.

Considering the good balance for Swing Cam and keeping the moment of inertia.

swing angle

About 110mm or more
60mmMIN

SDNB
(12.5)
15
52.5

JSTB

Usage

save the
clynder strokes

Attention
Since this parts is line contact, it is not possible to apply much force on this component.

Your Business	New (Rev) Date 26 Jun. 2021	In stock	43/139

$100^{-0}_{-0.05}$　70

90　$60^{+0.02}_{0}$

50

28

$\phi 10H7$

NC Dowel pin holes

$4-\phi 20$

25　$4-\phi 13$　15

C5

F/H hatched area
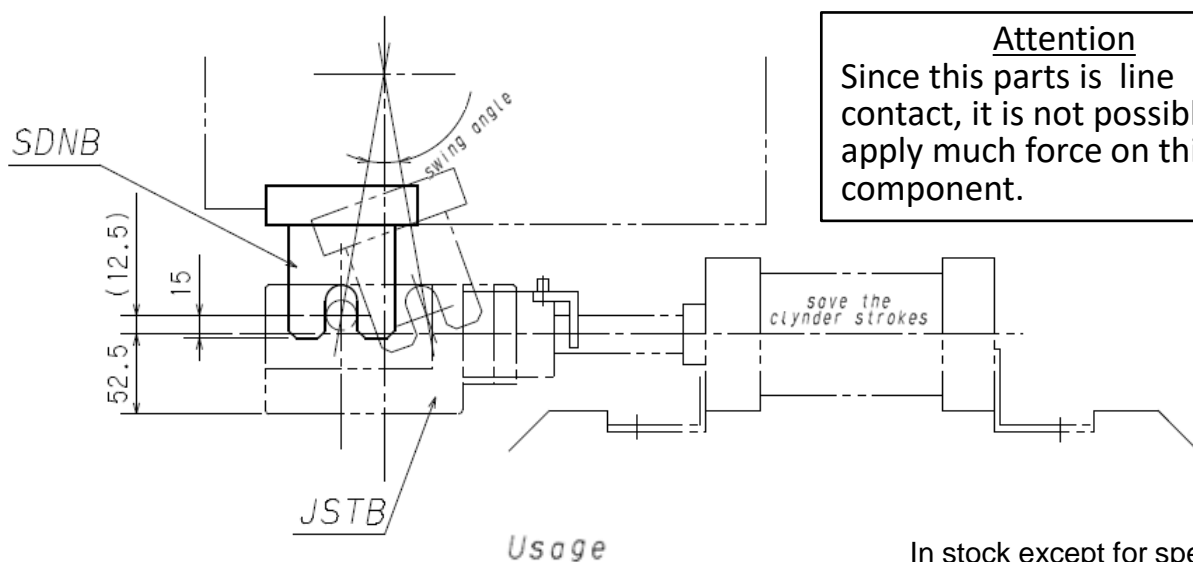
21　35　15

L
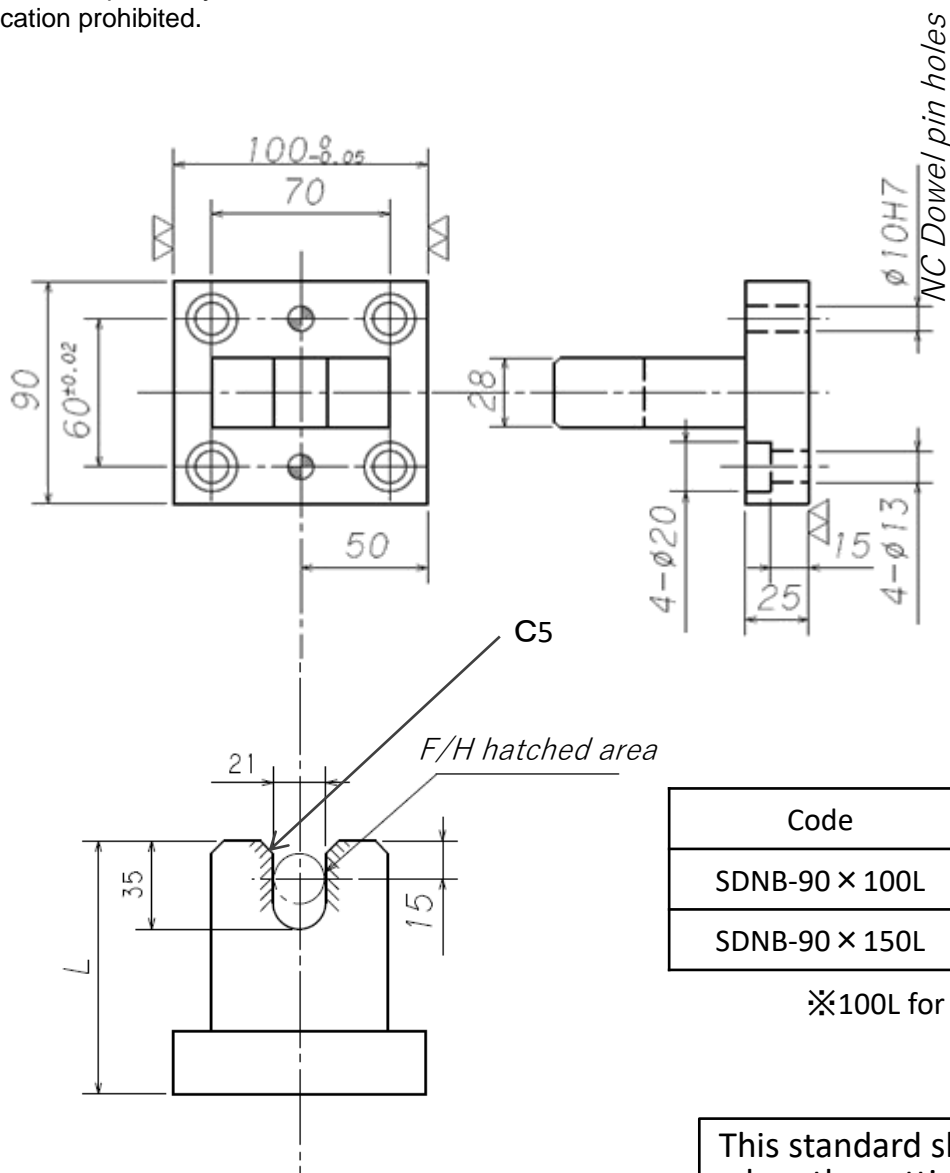
Code	L
SDNB-90 × 100L	100
SDNB-90 × 150L	150

※100L for normal use

This standard should be used when the setting of swing cam has the mechanism of positive return.

Attention
Since this parts is line contact, it is not possible to apply much force on this component.

SDNB

(12.5)　15　52.5

swing angle

save the clynder strokes

JSTB

Usage

In stock except for special orders.

【For small rotation 1°～14° 】

L

M

W

Slide direction

R5

R5

C1

Embedded GRAPHITE

C1

2-Ø19

C1

2-Ø13

$20_{\pm0.01}$

7

Embedded GRAPHITE

R5

R5

C1

C1
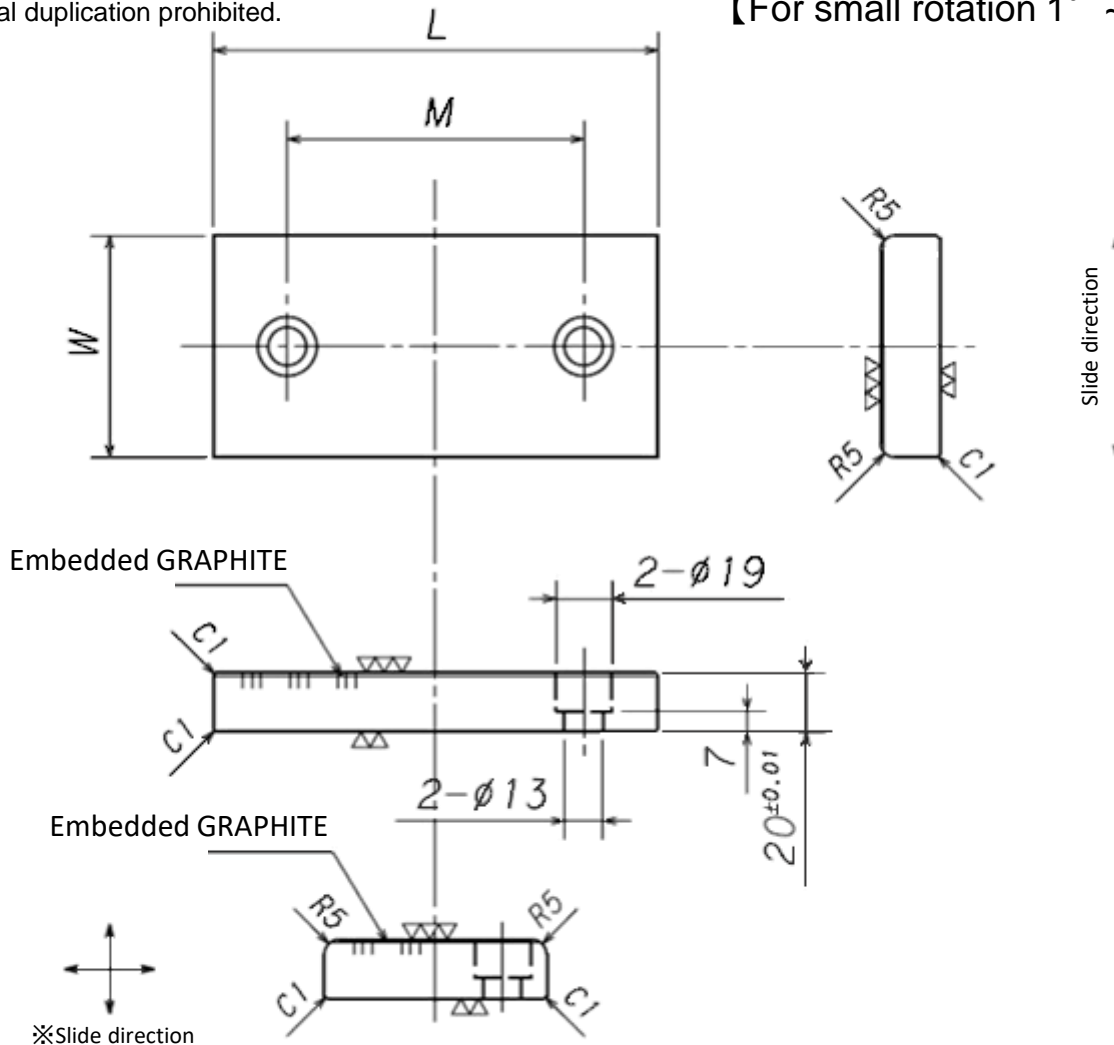
※Slide direction

※4 upper edges of SDSLP-4875C and SDSLP-7575C are all R5.
Slide direction is both direction.

SWB

30° or more

SB80
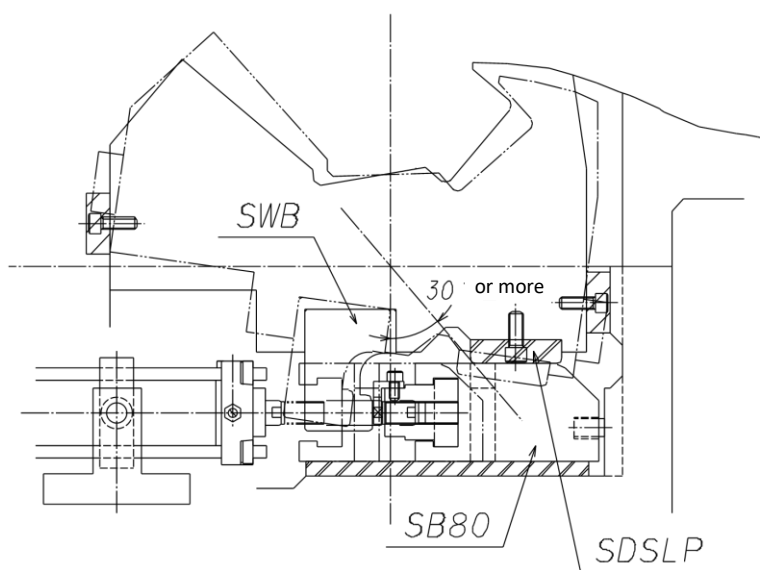
SDSLP

Code	W	L	M
SDSLP-3875C	38	75	45
SDSLP-4875C	48	75	45
SDSLP-48100C		100	50
SDSLP-48125C		125	75
SDSLP-48150C		150	100
SDSLP-7575C	75	75	45
SDSLP-75100C		100	50
SDSLP-75125C		125	75
SDSLP-75150C		150	100

Bolt M12×30
(anti-loosening socket screw)

<u>Usage</u>   For small rotation 1°～14°

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【For medium rotation 15°～20°】

L

M

75

30°

C1 C1

R10

R5 C1

10

Slide direction

Embedded GRAPHITE

C1

2-Ø19

C1

2-Ø13

7

20 ± 0.01
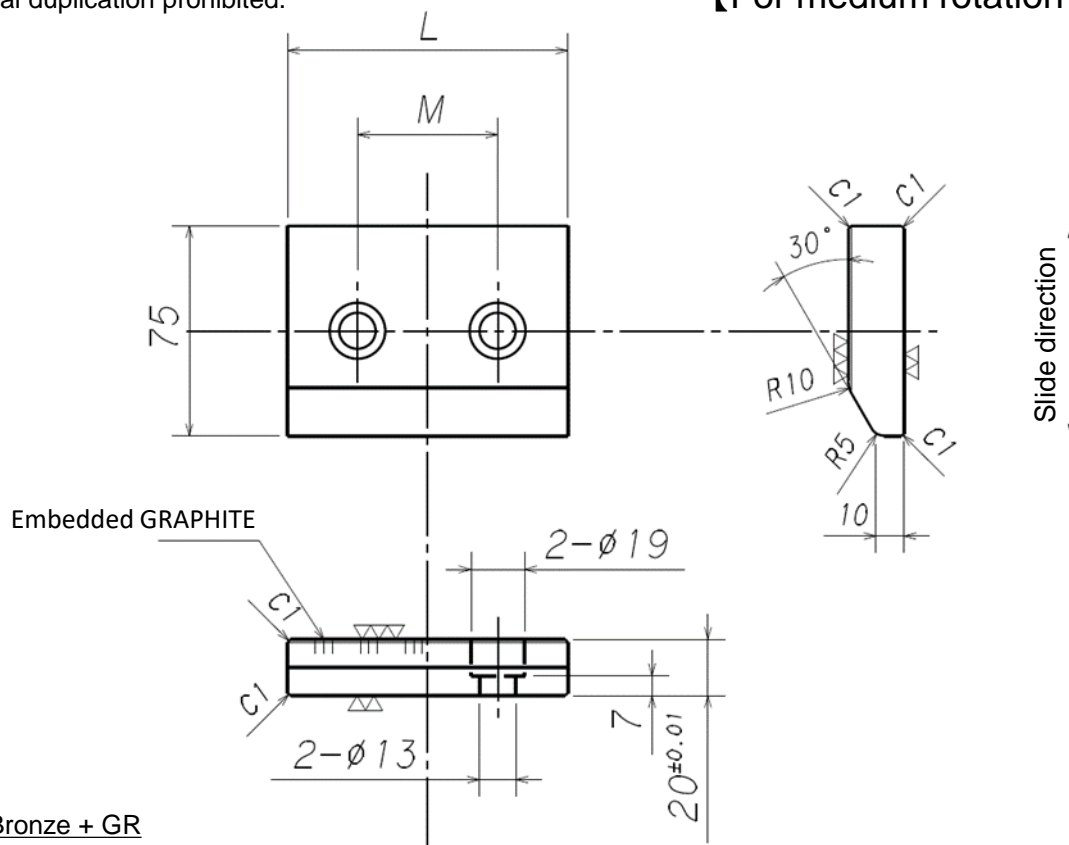
Bronze + GR

name	L	M
SDSLPC-7575	75	45
SDSLPC-75100	100	50
SDSLPC-75125	125	75

using 2 pcs of 75 width for SB80-150
using 2 pcs of 100 width for SB80-200
using 2 pcs of 125 width for SB80-250

Fixing bolt M12x30（using anti-loosen bolt）

SWB

30° or more

SB80

SDSLPC
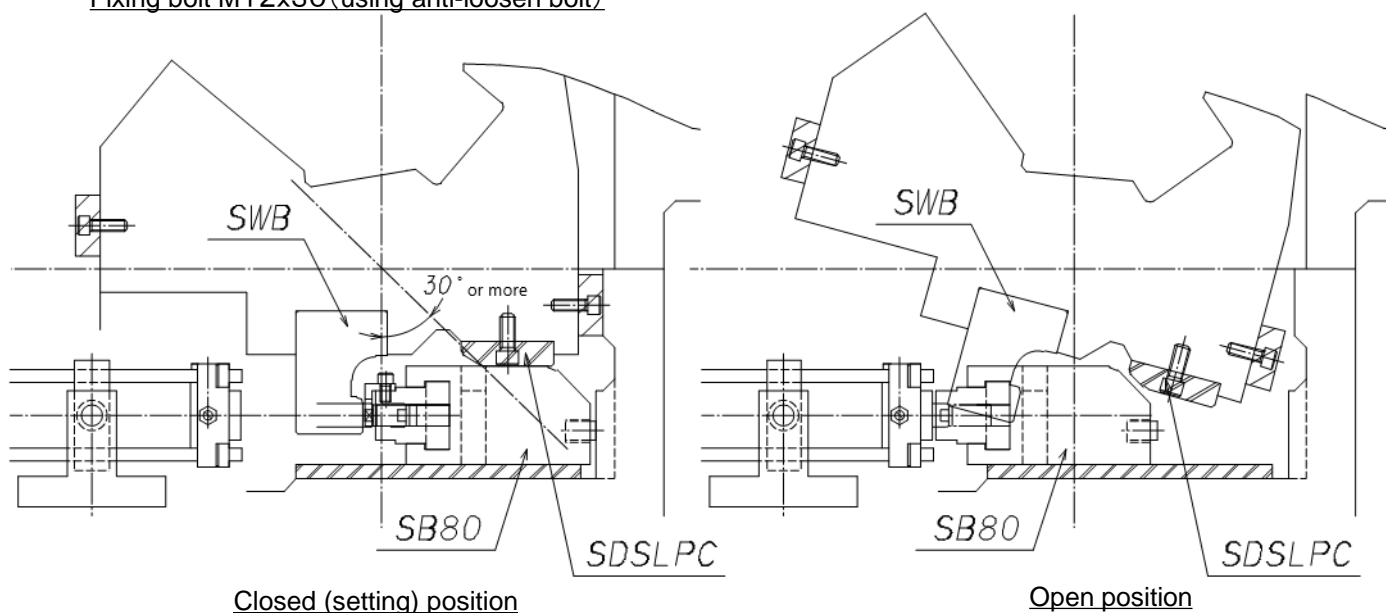
Closed (setting) position

SWB

SB80

SDSLPC

Open position

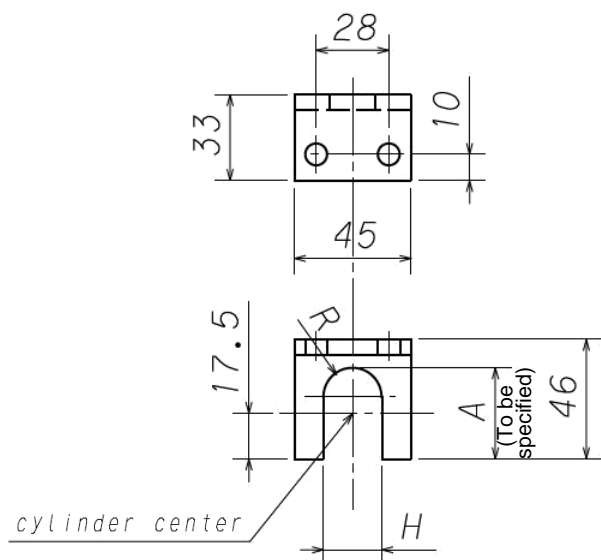<u>Usage</u>　For medium rotation 15°～20°

2021.10:New

Attention
1. This type is applied to all air cylinder under specifying the dimension.
2. The global type for SMC is shown on from B302 to B304.
3. Type S will be used for SB80 and SB100.
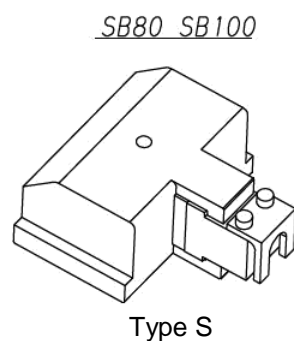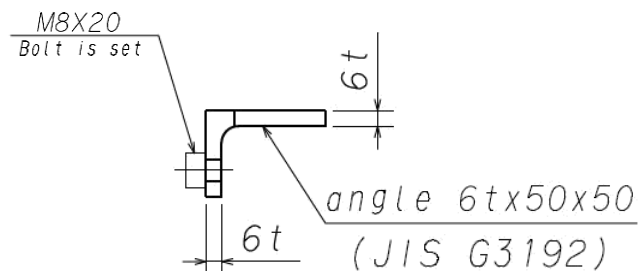   Type J will be used for JSTB.

(reference dimensions)

Cylinder bore D	A
Φ63	34
Φ80	35
Φ100	39

Width,length,collar dimensions

Type	L	B
S	58	17
J	60	19

28
33
10
45

17.5
R
A (To be specified)
46

cylinder center
H

(To be specified the width contacting to air cylinder +0.5)

M8X20
Bolt is set
6t
angle 6tx50x50
(JIS G3192)
6t

SB80 SB100

JSTB

Type S

Type J

Type S
Joint
45
□45
55
28
10
(L) 58
17 (B)
M8xP1.25X20L
Chamfer
2-C1
2-C3
MxP
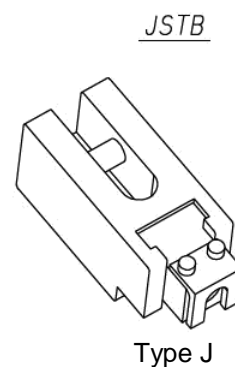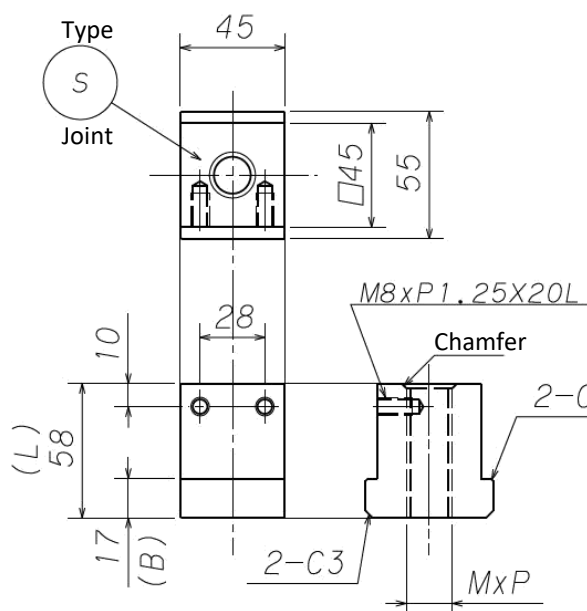
(To be specified the diameter of screw thread and pitch)

Type J
Joint
55
□45
45
28
10
19 (B)
60 (L)
M8xP1.25X20L
Chamfer
2-C1
2-C3
MxP
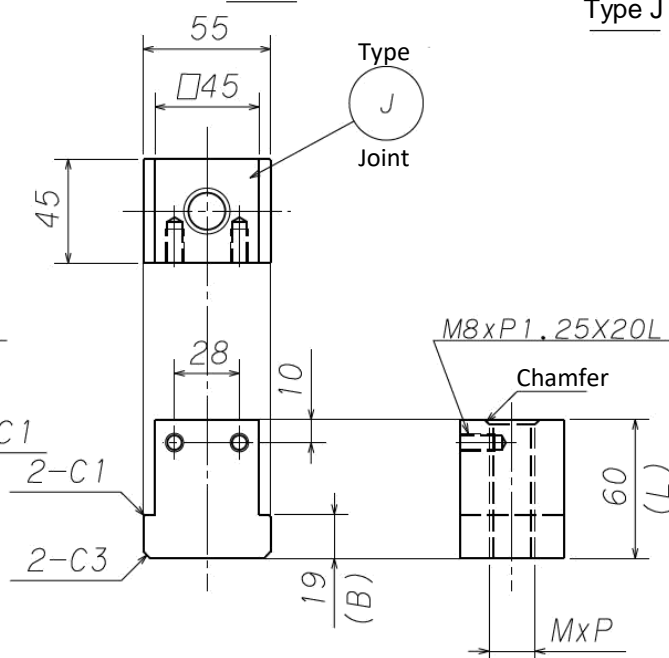
(To be specified the diameter of screw thread and pitch)

Ex of code:（a set of the angle and the joint）
Code:CYJS-TYPE-D-MP(Screw diameter and pitch of cylinder)-H-A
Ex of code: CYJS-S-63-M16P1.5-H17.5-A29
             CYJS-J-80-M20P1.5-H22.5-A31

Note：
1. Unless otherwise specified all corners are chamfered.
2. Material：ASTM 1018（JIS SS400）
3. M8×20 hexagon anti-loosening bolt is included.

Note:
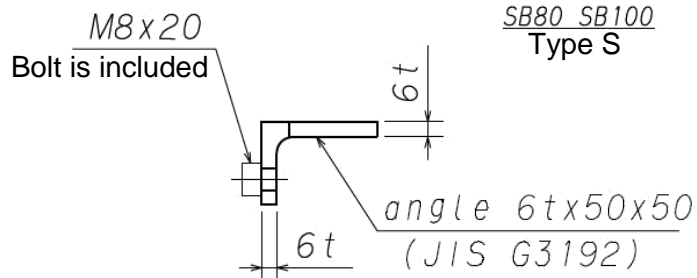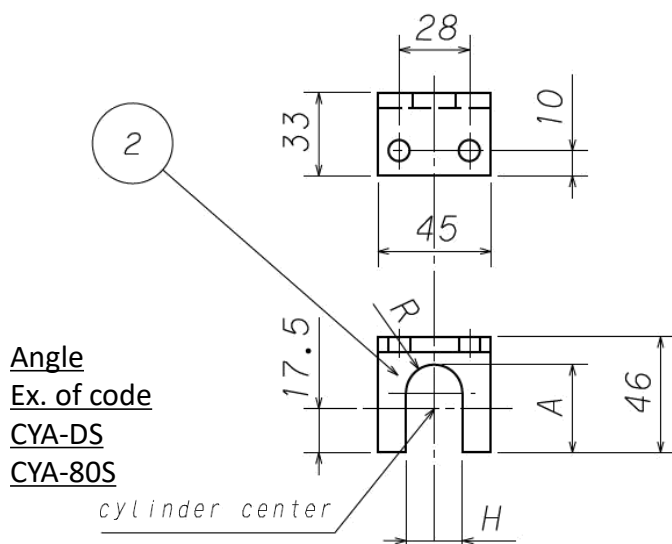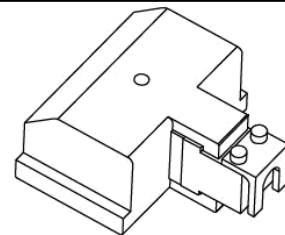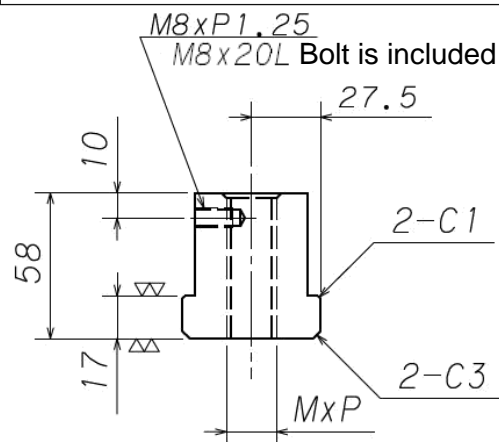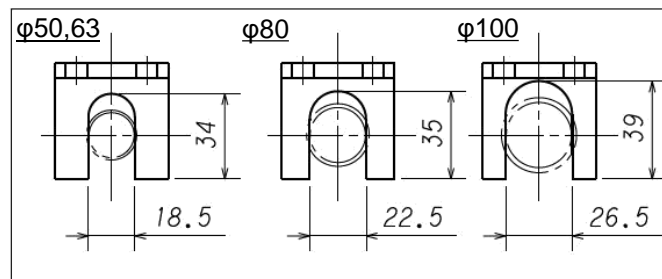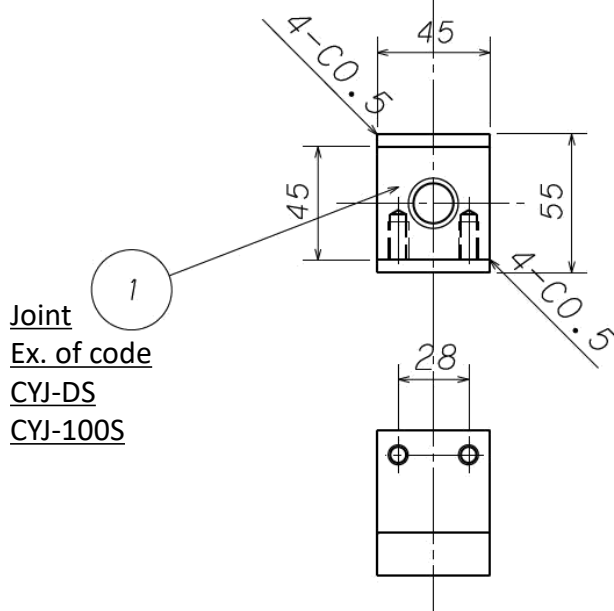1.This standard component applies to the Air cylinder of CA2 series (SMC).
2.This standard applies SB80 and SB100P.

M8x20
Bolt is included

SB80 SB100
Type S

angle 6tx50x50
(JIS G3192)
6t

(2)

Angle
Ex. of code
CYA-DS
CYA-80S

28
33
10
45

R
17.5
A
46
cylinder center
H

Cylinder bore D	MxP	H	A
Φ50	M18xP1.5	18.5	34
Φ63	M18xP1.5	18.5	34
Φ80	M22xP1.5	22.5	35
Φ100	M26xP1.5	22.5	39

φ50,63   φ80   φ100
34   35   39
18.5   22.5   26.5

4-C0.5
45
45
55
4-C0.5
28

(1)

Joint
Ex. of code
CYJ-DS
CYJ-100S

M8xP1.25
M8x20L Bolt is included
27.5
10
58
2-C1
17
2-C3
MxP

1.The code of the joint set for the cylinder of SMC.
 CYJS-DS
2.EX.of code: CYJS-80S

Note：
1. There are no stock in this parts.
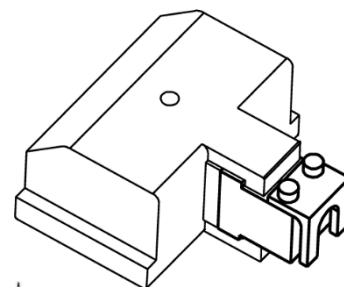2. M8×20 hexagon anti-loosening bolt is included.
3. Material：ASTM1018（JIS SS400）

Note:
1. This standard component applies to Global type of Air cylinder.
2.This standard applies SB80 and SB100P.

SB80 SB100
Type S

M8 x 20
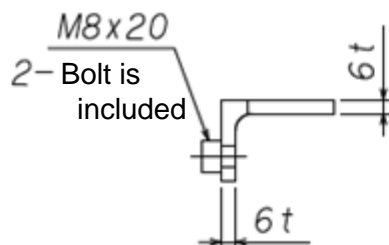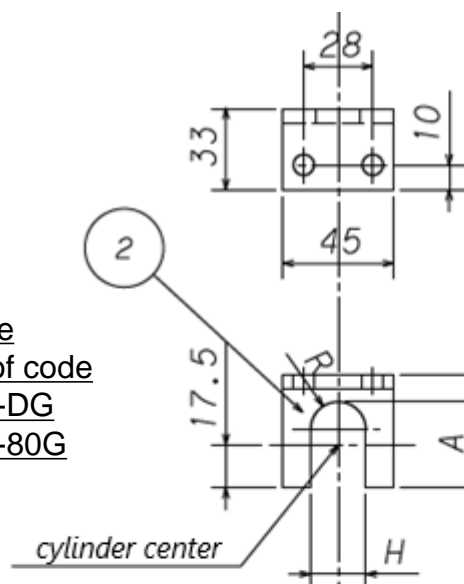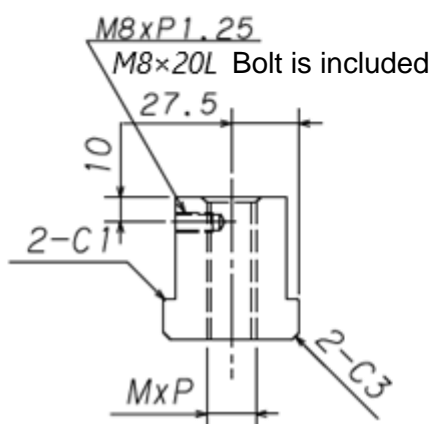2- Bolt is included

6 t

Angle
Ex. of code
CYA-DG
CYA-80G

cylinder center

Cylinder bore D	MxP	H	A
Φ50	M16xP1.5	17.5	34
Φ63	M16xP1.5	17.5	34
Φ80	M20xP1.5	22.5	35
Φ100	M20xP1.5	22.5	39

φ50,63   φ80   φ100
34   35   39
17.5   22.5   22.5

Joint
Ex. of code
CYJ-DG
CYJ-100G

4-C0.5

M8xP1.25
M8×20L Bolt is included
27.5
2-C1
MxP
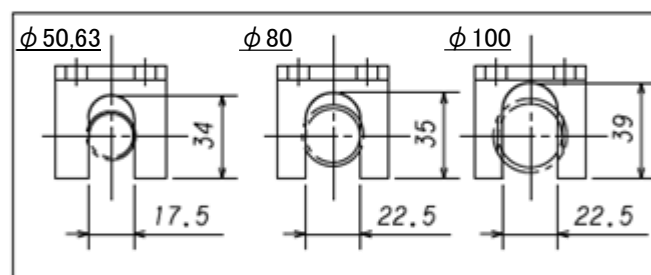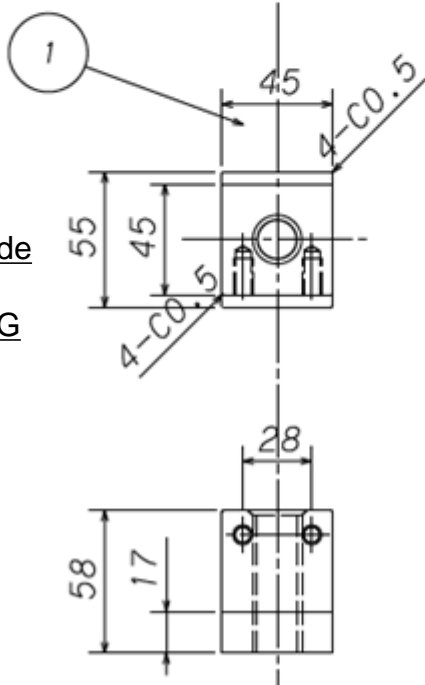
1. The code of the joint set for Global.
   CYJS-DG
2.EX.of code: CYJS-80G

Note：
1. M8×20 hexagon anti-loosening bolt is included.
2. Material：ASTM 1018（JIS SS400)
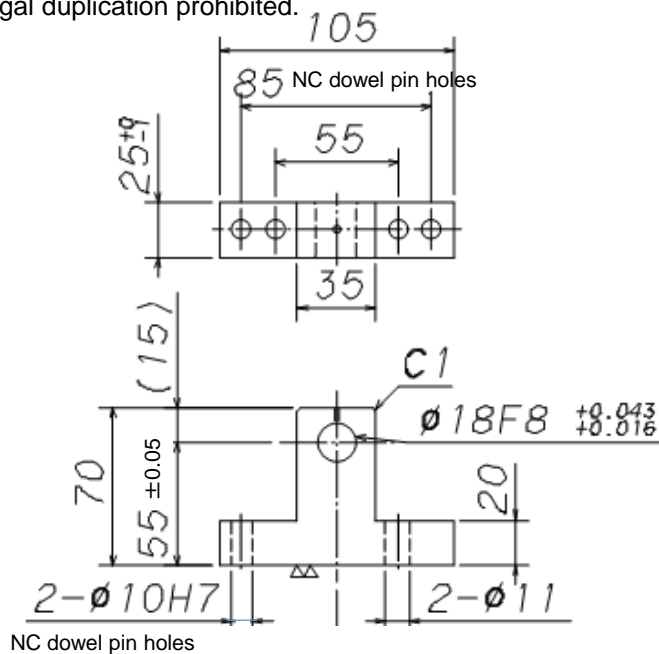
105
85 NC dowel pin holes
55
35
25^{+9}
(15)
70
55 ± 0.05
C1
Ø18F8 $^{+0.043}_{+0.016}$
20
2-Ø10H7
2-Ø11
NC dowel pin holes

Code:
TB-18
Φ63bore
ASTM 1018 (JIS SS400)
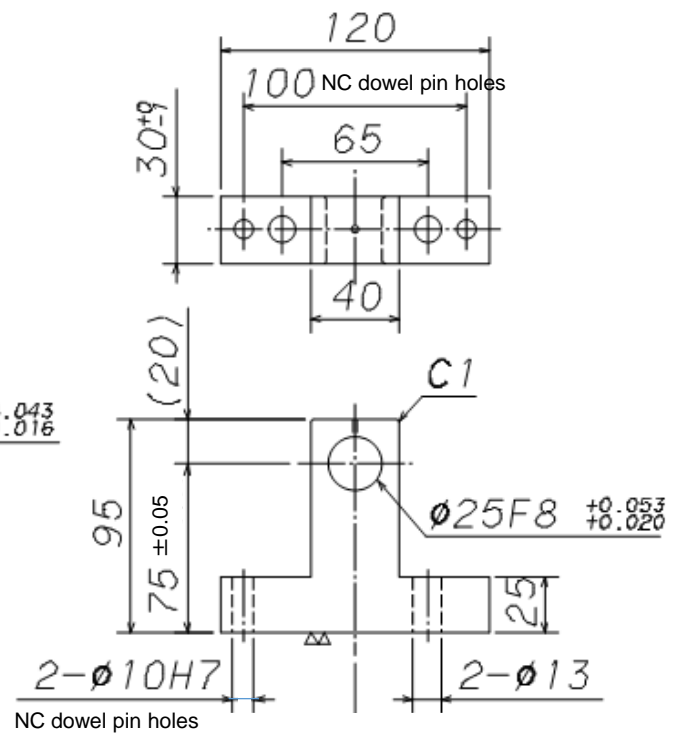
120
100 NC dowel pin holes
65
40
30^{+9}
(20)
95
75 ± 0.05
C1
Ø25F8 $^{+0.053}_{+0.020}$
25
2-Ø10H7
2-Ø13
NC dowel pin holes

Code:
TB-25
Φ80,Φ100bore
ASTM 1018 (JIS SS400)

0.5clearance

0.5clearance
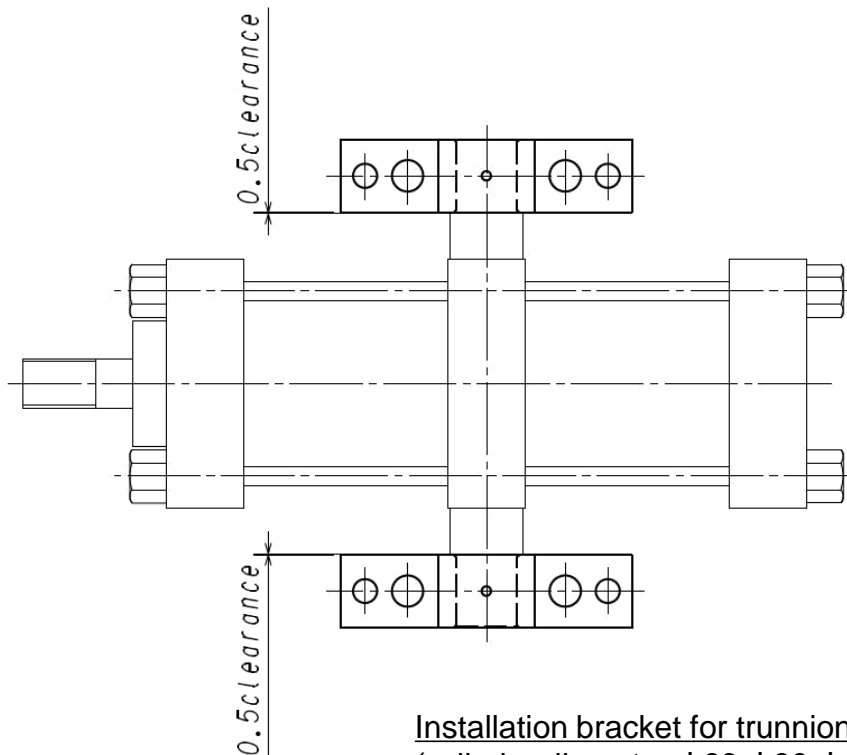
Installation bracket for trunnion type air cylinders
(cylinder diameter Φ63,Φ80,Φ100)

Trunnion boss of Φ18 and Φ25 for the other air cylinder
 is made of casting iron(JIS FC250N).

This parts is licensed a patent by Your Business.
An illegal duplication prohibited.

1.This standard applies to Global type of Air cylinder.
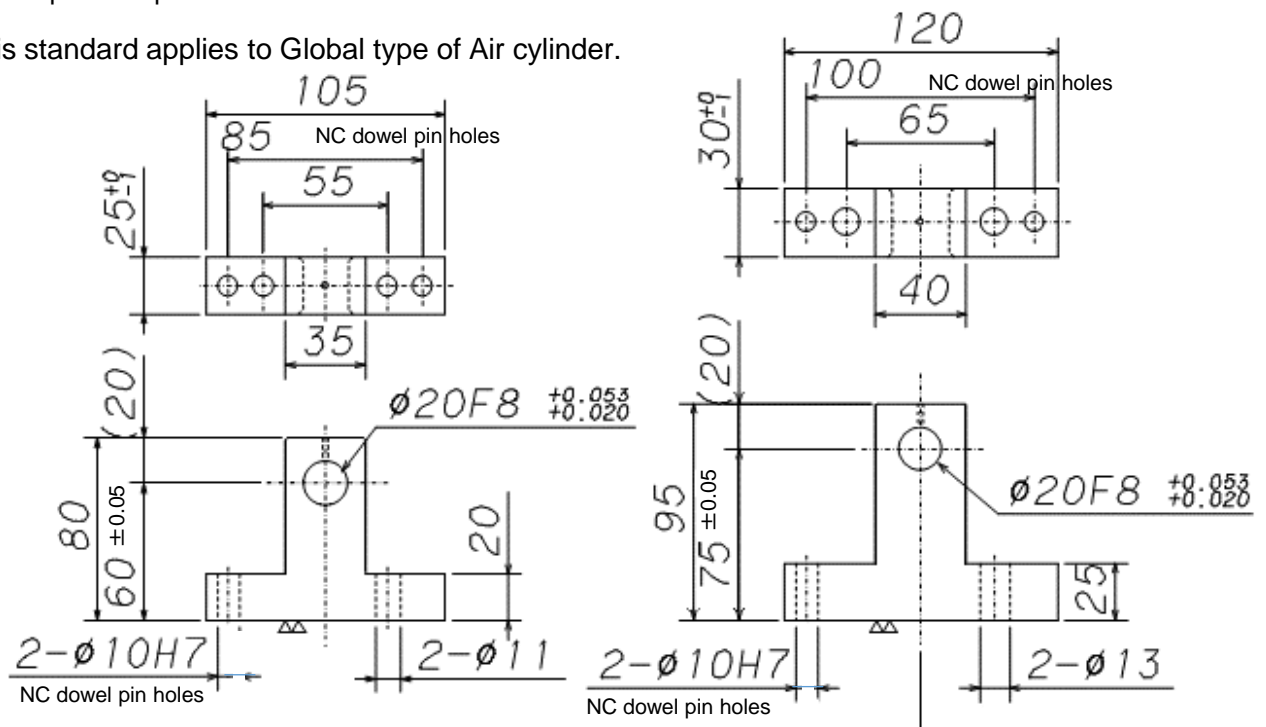
Code:
TB-2063G
Φ63bore
ASTM 1018(JIS SS400)

Code:
TB-2080G
Φ80bore
ASTM 1018(JIS SS400)

Code:
TB-25100G
Φ100bore
ASTM 1018(JIS SS400)
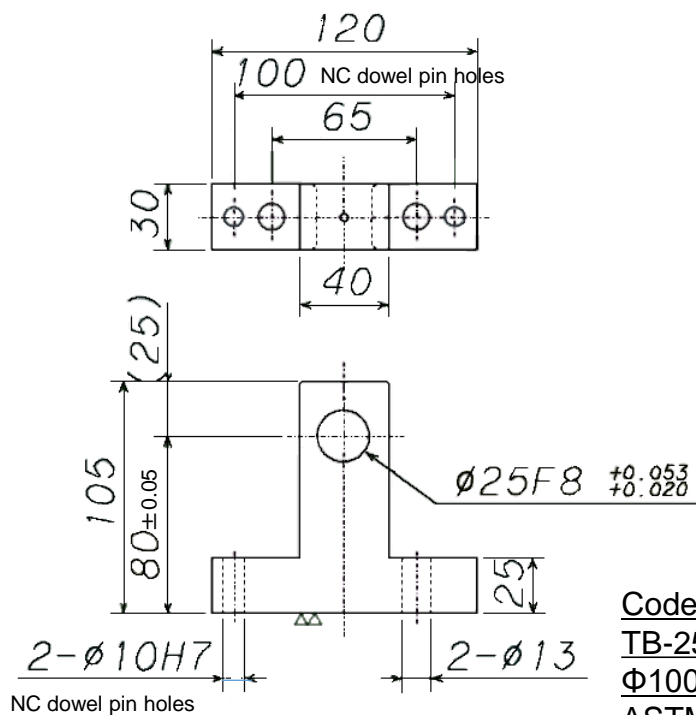
| Your Business | New (Rev) Date | 1 Oct. 2021 | Made to order | 51/139 |

Note:1.Joint portion is adjusted to the diameter
of screw thread and pitch of air cylinder.

H To be specified the width
contacting to air cylinder
+0.5mm

6t MxP

M8x20

Cylinder bore D	A
Φ63	34
Φ80	35
Φ100	39

(reference dimension)

code	D	L	B	C	E
NJS-40	20	70	55	8	15
NJS-45	30	90	70	10	20

code	F	G	J	d
NJS-40	45	30	40	16
NJS-45	55	40	45	20

ASTM 1018（JIS SS400)
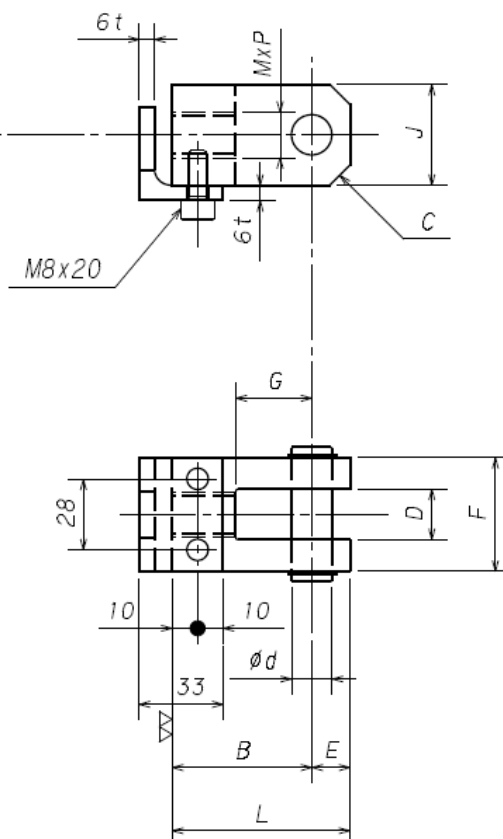
code	applicational cylinder bore
NJS-40-MxP-HxA	Φ50. Φ63
NJS-45-MxP-HxA	Φ80. Φ100

In the case of a made-to-order product,
please add "-NS" to the end of parts name.

φ80
17.5 22.5 46 35 45

φ100
17.5 26.5 46 39 45

φ50,63
18.5 34 20 46 45

JTA

NJS

Usage
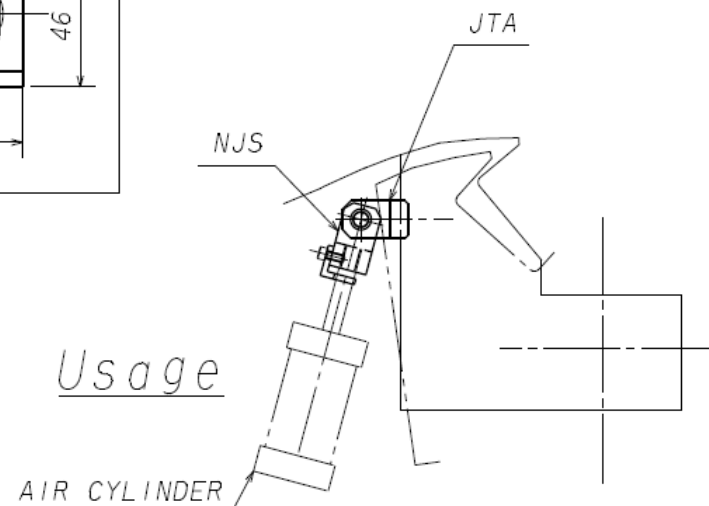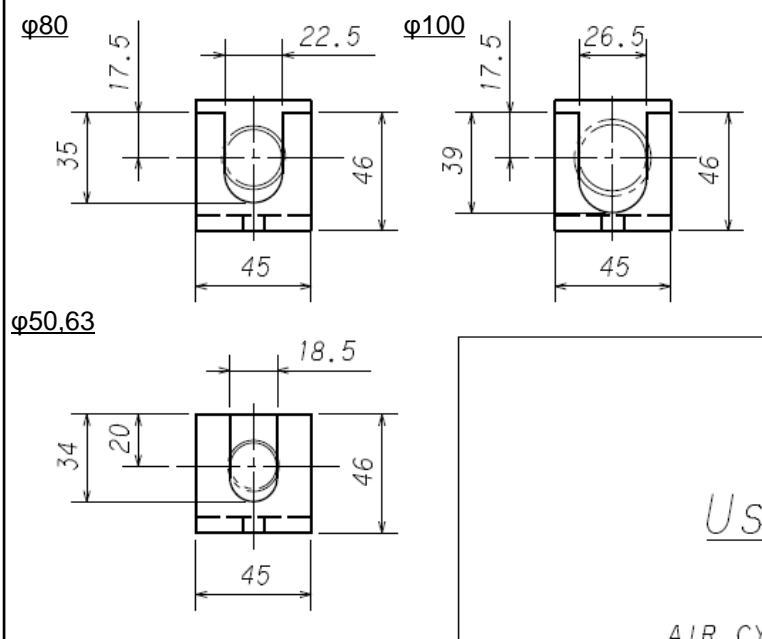
AIR CYLINDER

Note:
1.This standard applies to Global type of air cylinder.
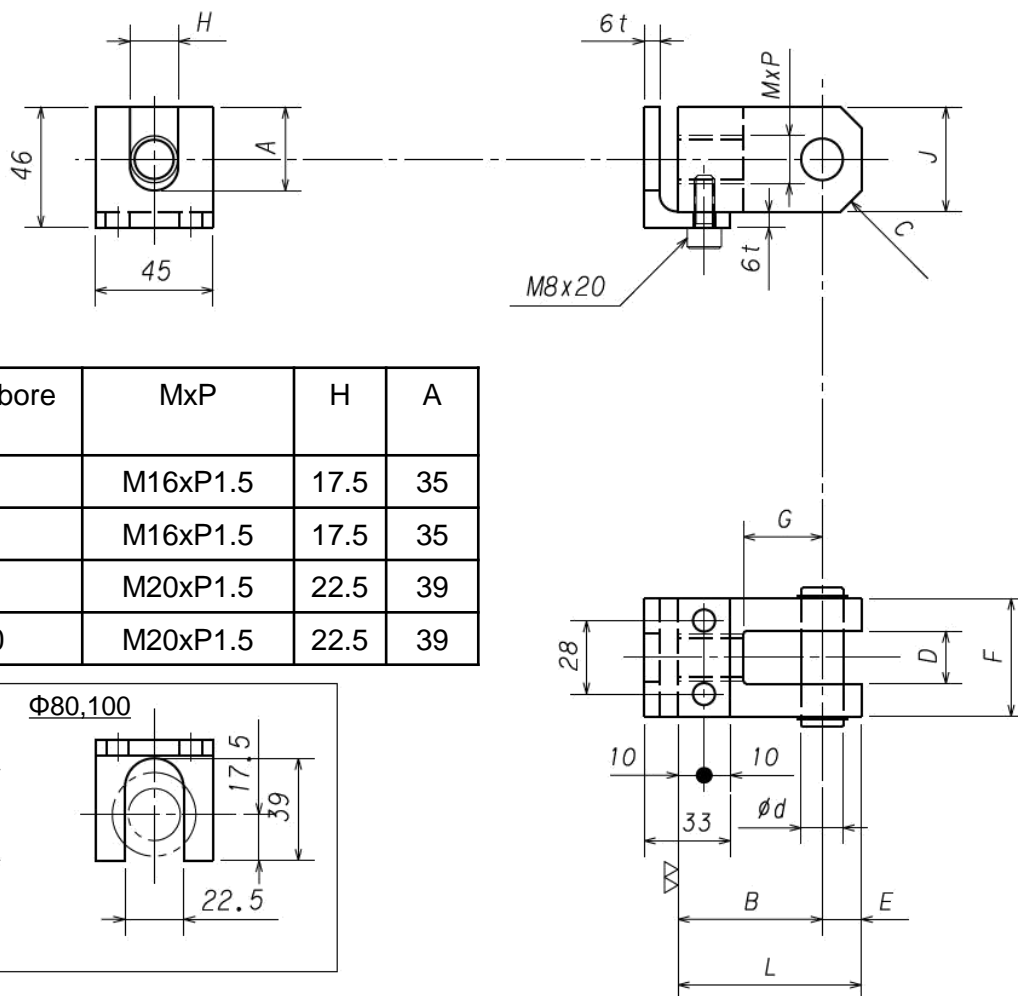
Cylinder bore D	MxP	H	A
Φ50	M16xP1.5	17.5	35
Φ63	M16xP1.5	17.5	35
Φ80	M20xP1.5	22.5	39
Φ100	M20xP1.5	22.5	39

φ50,63   Φ80,100

Code	D	L	B	C	E	F	G	J	d
NJS-40-G	20	70	55	8	15	45	30	40	16
NJS-45-G	30	90	70	10	20	55	40	45	20

ASTM 1018(JIS SS400)

Code	Cylinder bore D
NJS-40-G	Φ50.Φ63
NJS-45-G	Φ80.Φ100
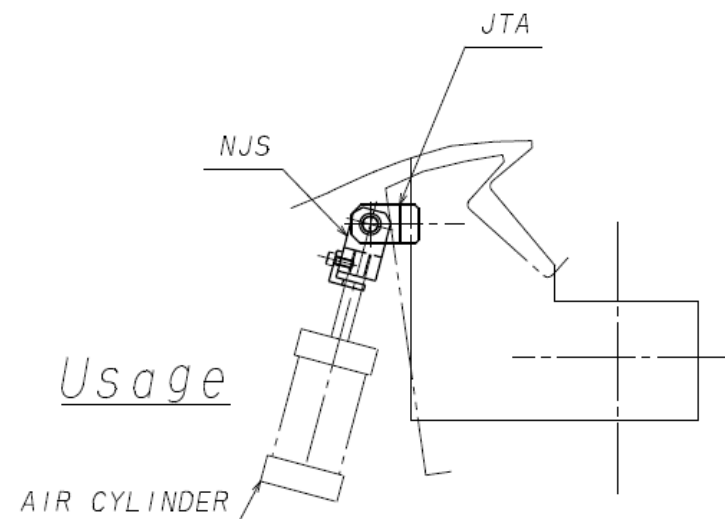
Usage
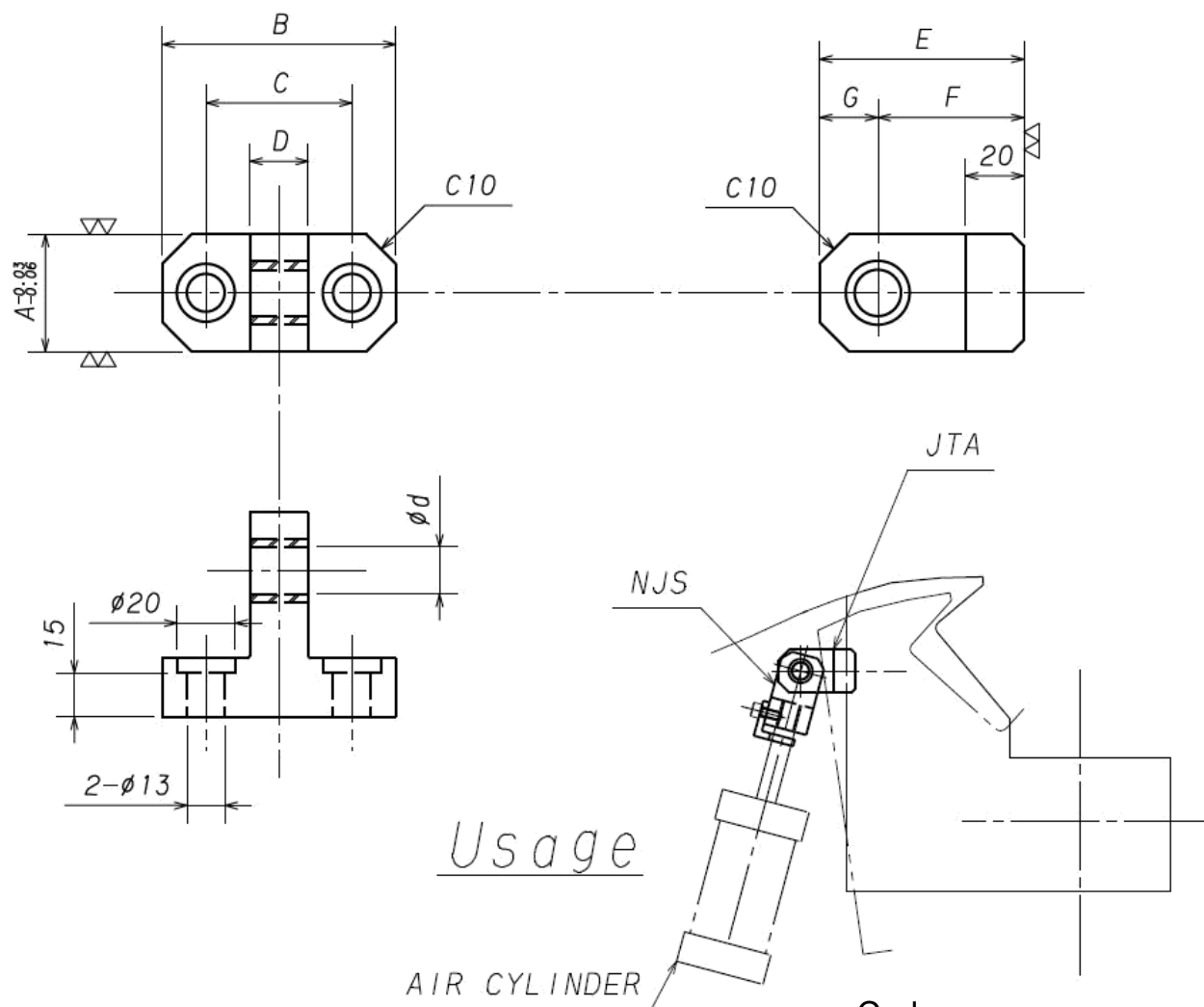
AIR CYLINDER

Code:
JTA-A40 × 80
JTA-A52 × 90-F65-NS

※F dimension can be changed
EX)
JTA-A40 × 80-F60-NS

ASTM 1018(JIS SS400)

Code	A	B	C	D	E	F (※)	G	d	Cylinder bore D
JTA-A40x80	40	80	50	20	75	55	20	16	Φ50 Φ63
JTA-A52x90	52	90	60	30	85	60	25	20	Φ80 Φ100

In the case of a made-to-order product,
please add "-NS" to the end of parts name.
and attach part drawing.

Block Hold Plate
BHP

80

50

15

32

19

13

2-⌀11

9
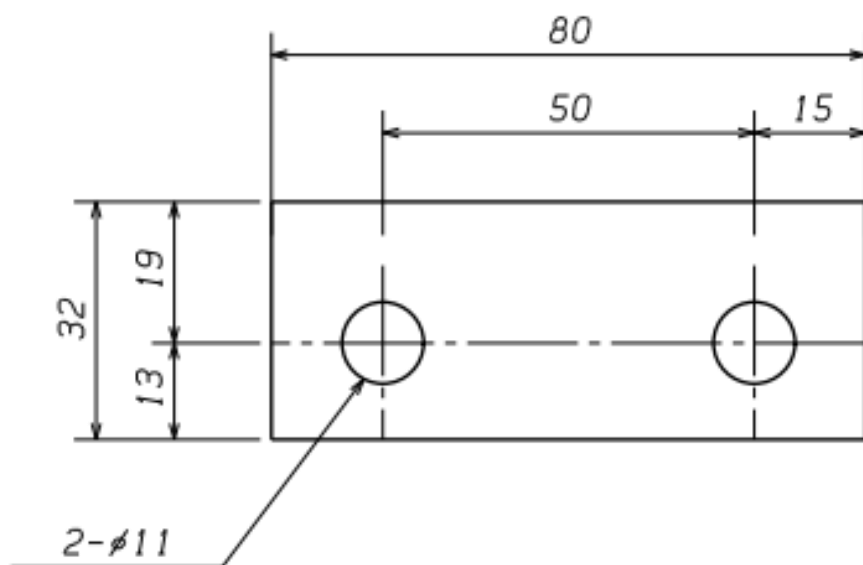
ASTM 1018(JIS SS400)
Code:BHP-3280B

Usage
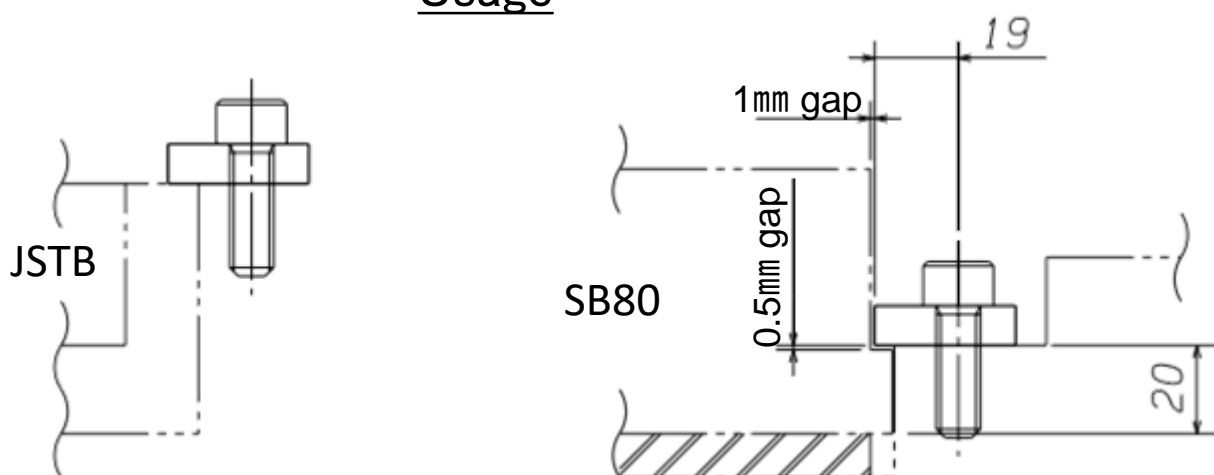
JSTB

SB80

19

1mm gap

0.5mm gap

20

use for small stroke

$2-\phi d$

$19^{\ 0}_{-1.0}$

Induction hardening
In the case of using SUPH

25.5

38

12.5

$L1$

L
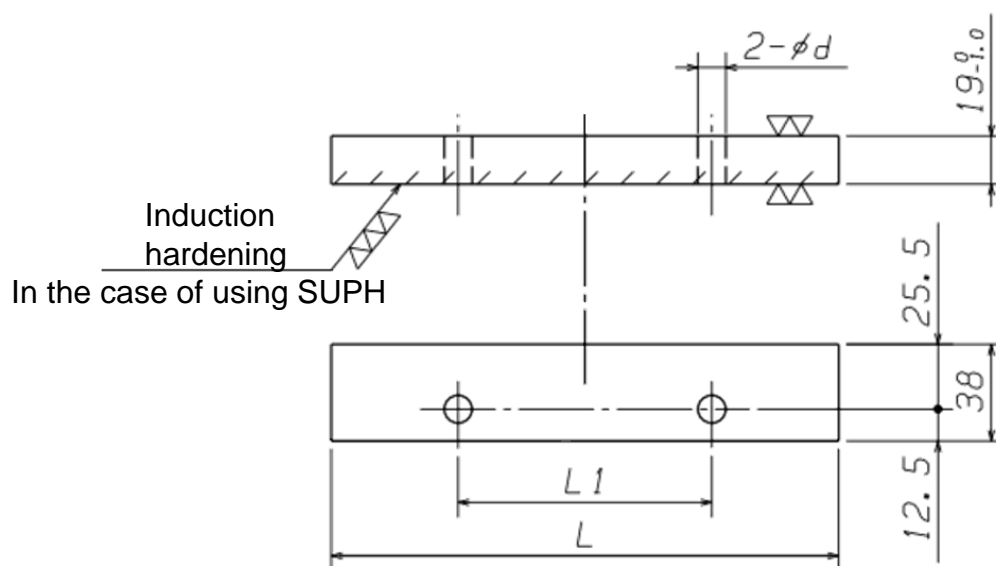
ASTM 1018 (JIS SS400)

Code	L	L1	Φd
SUP-13038A	130	80	Φ11
SUP-20038A	200	100	Φ11

ASTM 1045 (JIS S45C)

Code	L	L1	Φd
SUPH-13038	130	80	Φ13
SUPH-20038	200	100	Φ13
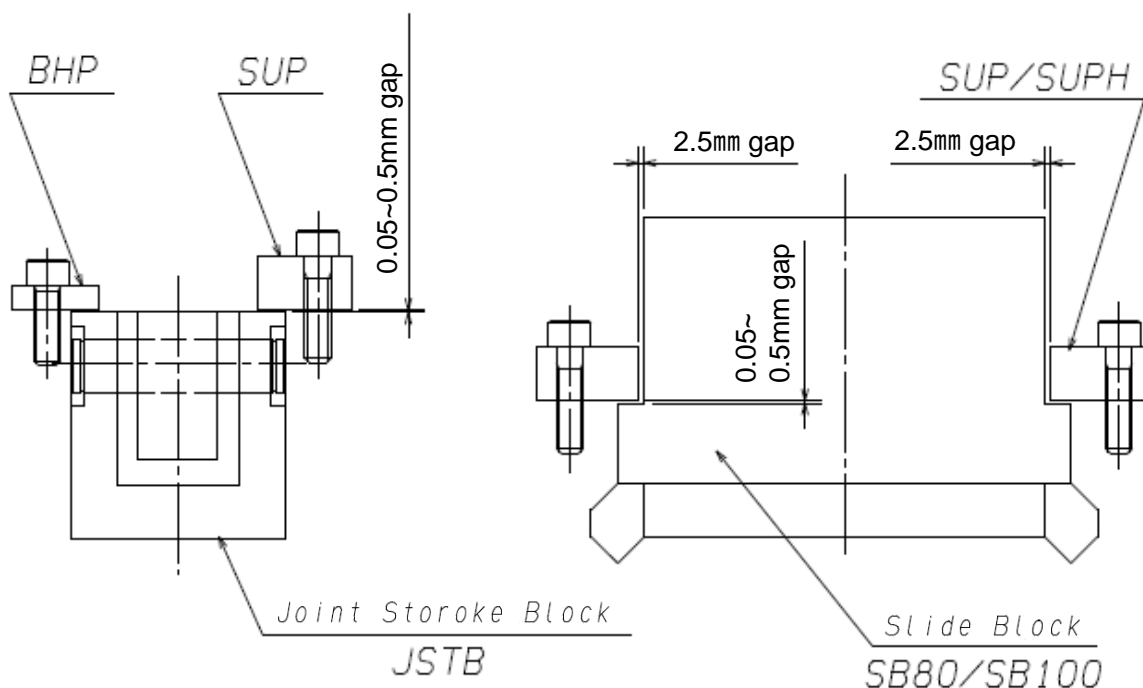
BHP   SUP

0.05~0.5mm gap

SUP/SUPH

2.5mm gap   2.5mm gap

0.05~0.5mm gap

Joint Storoke Block
JSTB

Slide Block
SB80/SB100

Usage

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1.The usage of these parts as per the following figure.
2.It will be to use H size 115 for avoiding the interference with the slide block in case of the large swing amount.
3.SWBA applies to SB80 125-250 width.

Code
SWBA-11075-100H
SWBA-11075-115H

Mat : ASTM 1045(JIS S45C)
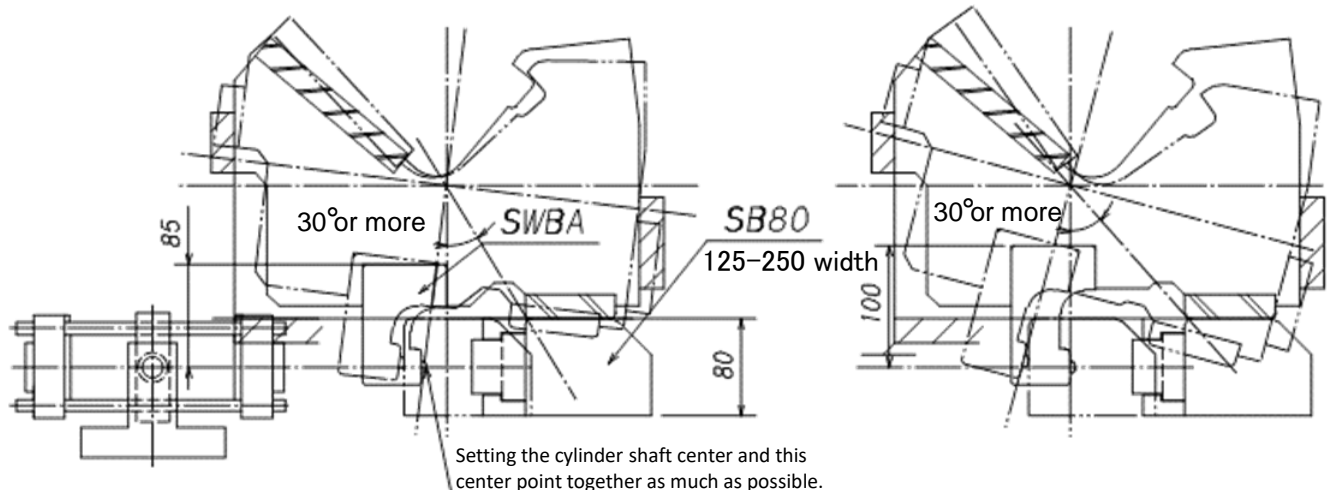
Spring washer
2-CBW16 (included)
bolt
M16x45 or M16x50

R10

50

2-ø26

19 | 17

36

15

2-ø18

Cylinder center

17.5 | 40

80

110

55

15

75 -⁰.₀₅

To insert as a spigot joint

45

R20

R5 (R2)

30

Cylinder center

F/H to hatched area
HRC45~

55 | 5ST

50 or more (h=100)

35 or more (h=85)

Refer to backup

H	h
100	85
115	100

Usage

85

30°or more | SWBA | SB80
125−250 width

80

30°or more

100

Setting the cylinder shaft center and this center point together as much as possible.

H=100

H=115

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1.The usage of these parts as per the following figure.
2.It will be to use H size 115for avoiding the interference with the slide block in case of the large swing amount.
3.SWBB applies to SB80 75, 100 width.

Code
SWBB-9070-100H
SWBB-9070-115H

Mat: ASTM 1045(JIS S45C)
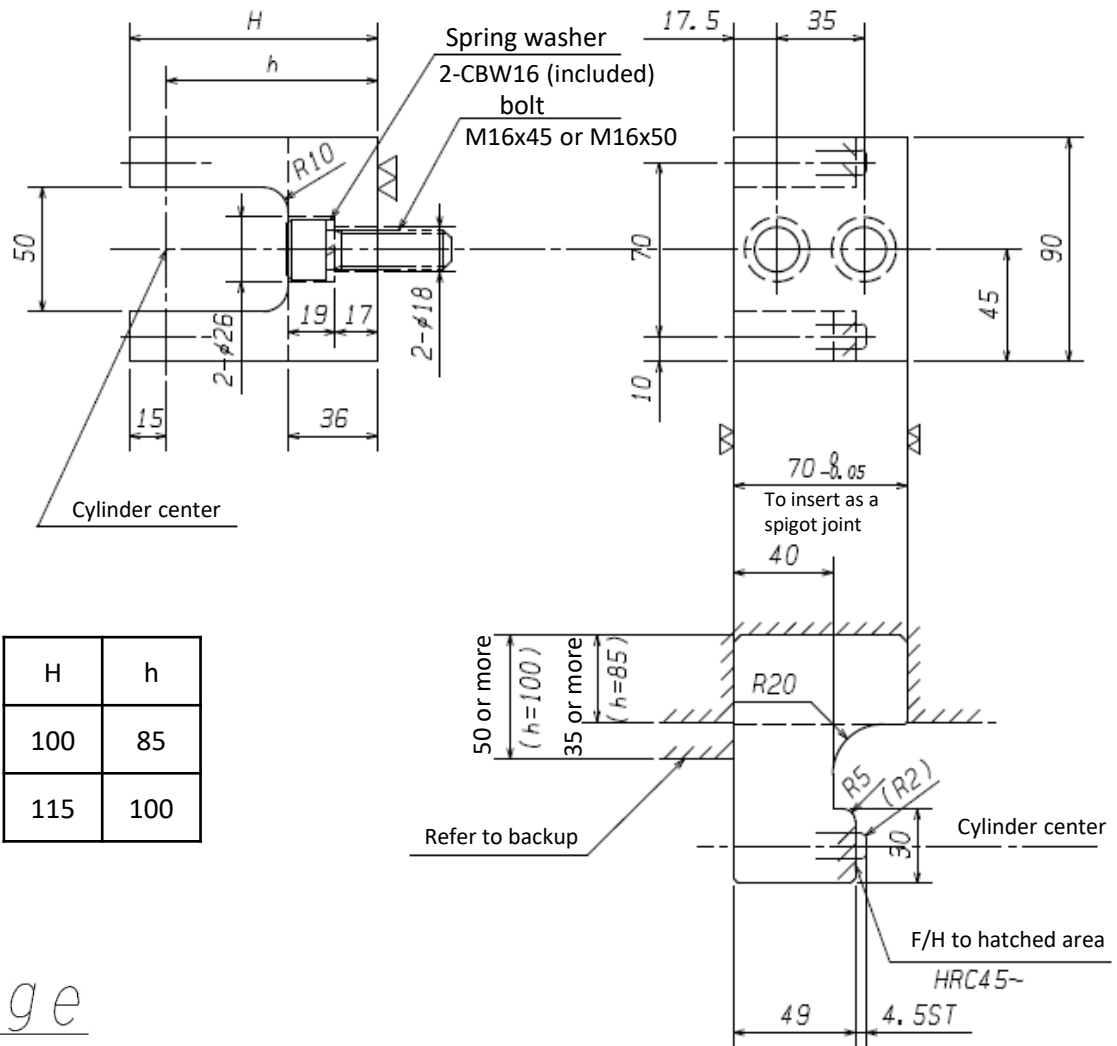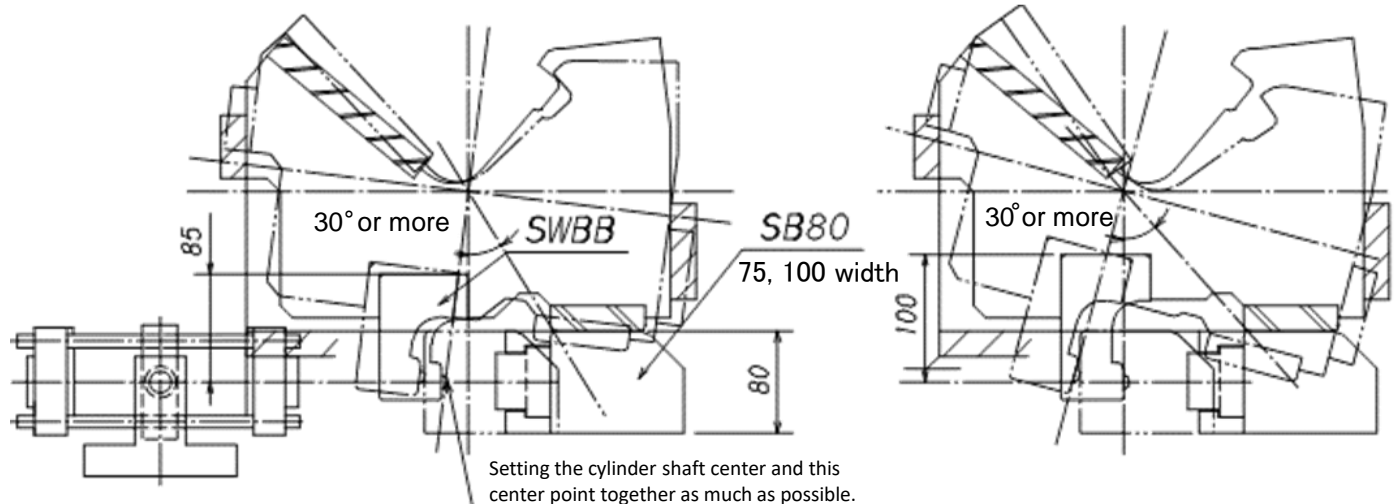
Spring washer
2-CBW16 (included)
bolt
M16x45 or M16x50

Cylinder center

To insert as a spigot joint

Refer to backup

Cylinder center

F/H to hatched area
HRC45~

H	h
100	85
115	100

Usage

30° or more   SWBB   SB80
75, 100 width

30° or more

Setting the cylinder shaft center and this center point together as much as possible.

H=100

H=115

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1. The usage of these parts as per the following figure.
2. Using for SB100PL/SB100PS.

Spring washer
3-CBW16 (included)
bolt
M16x50

To insert as a spigot joint

50 or more

Refer to backup

F/H to hatched area
HRC45~

SB100PL/SB100PS

Slide Block for large rotating

Usage

SWBE

This parts is licensed a patent by Your Business.
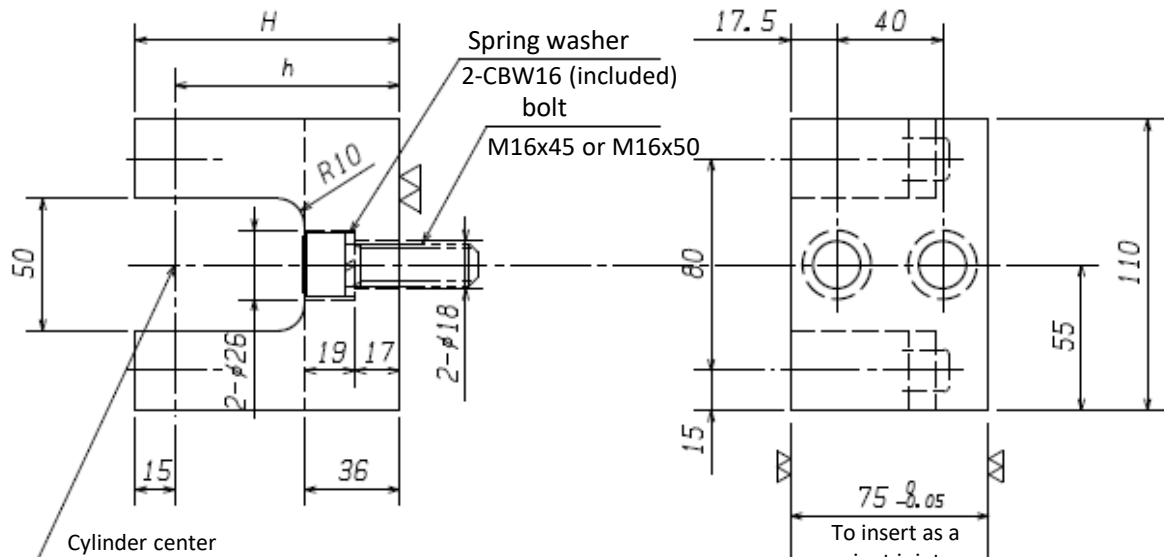An illegal duplication prohibited.

RA-type

RB-type

40

40

12.5

20

115

82.5

60

45

ø35

102.5

120

16

3

2

1

R3

ø29

ø50

holder H7$^{+0.025}_{0}$

oile groove

air hole

Swing Cam

37

MAX ST

It is possible to increase the stroke by using the low head bolts or by adjustment of fixing holes for stopper plate.

It is ideal usage to be installed SD Lift Pin at an angle in case of the large amount of swing.

It is possible to be installed guide bushing as necessary.

Setting spring guide pin is possible as necessary.

Applying to coil spring Φ27

Usage

Code
SDLP-50-RA
SDLP-50-RB
ASTM1045(JIS S45C)
induction hardening

Note:
1.After it is required to be calculated a weight moment, selecting the suitable coil spring.
2.The coil spring is not included in this standard.

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Grease groove

RA-type

2-⌀11

⌀19

65

C10

40

9.5

60   7

69.5

□25

48

MAX stroke 19

(0.5)

19

21

20

A relief cut hole on
the installed side

Applying to coil spring Φ20

⌀21

⌀29

⌀30~31

It is possible to increase
the stroke by using the
low head bolts or by
adjustment of fixing
holes for stopper plate.

Note:
1: This drawing shows RB type,
   and, in RA, 90 degrees turns
   with a stop plate.
2: This drawing shows
   a top dead center stop position.
3: It can be used at the same
   function as old types.
4: After it is required to be calculated a
   weight moment, selecting the suitable
   coil spring.
5: The coil spring is not included
   in this standard.

Lift Pin Mini Set
Code:LPRB-29×69.5-A
Code:LPRA-29×69.5-A

Usage
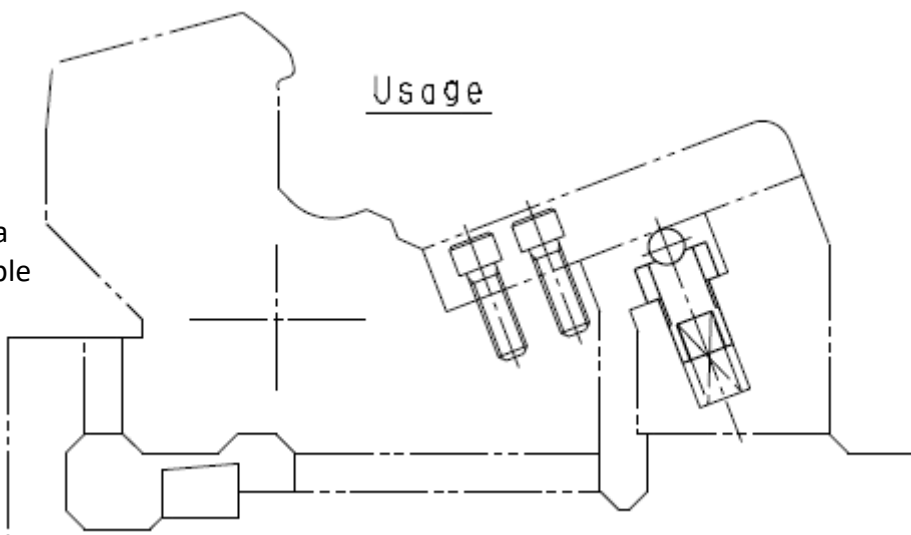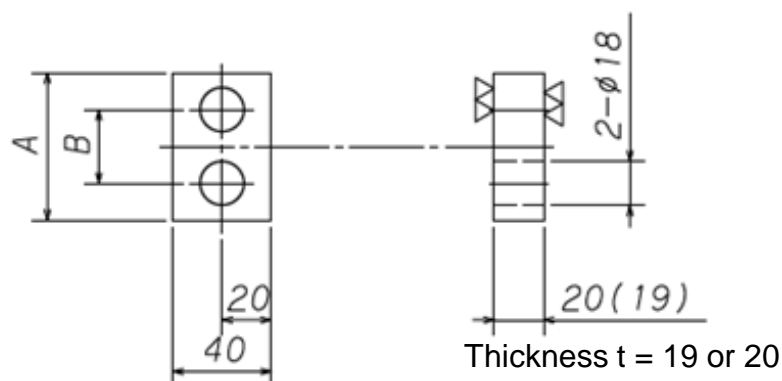
2-⌀18

20(19)

Thickness t = 19 or 20

ASTM 1045(JIS S45C)
Code: LPST-60

Code	A	B	Remarks
LPST-60	60	30	In stock
LPST-80	80	50	Made-to-order

2-R10

57

40.5

95

60

20

2-⌀18

4-C5

30

30

75

20(19)

Thickness t = 19 or 20
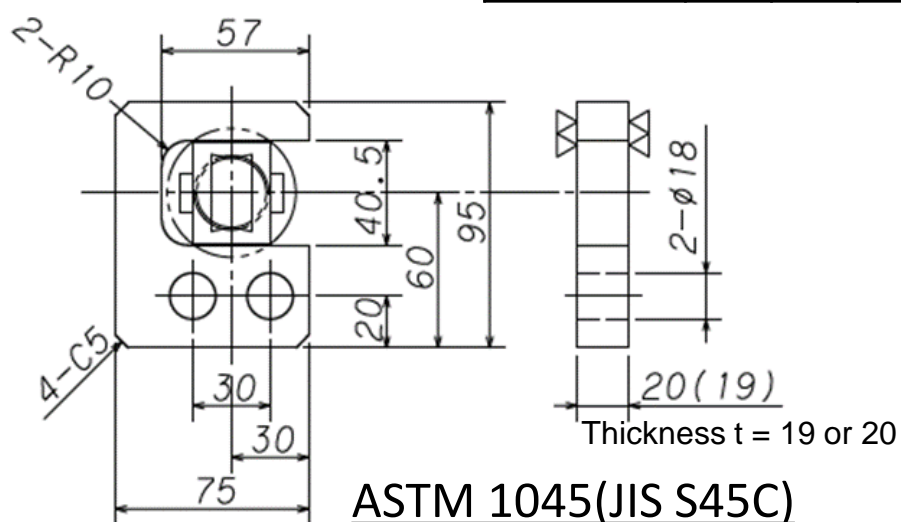
ASTM 1045(JIS S45C)
Code: LPSTC-75

LPST-60, 80

LPST-60, 80
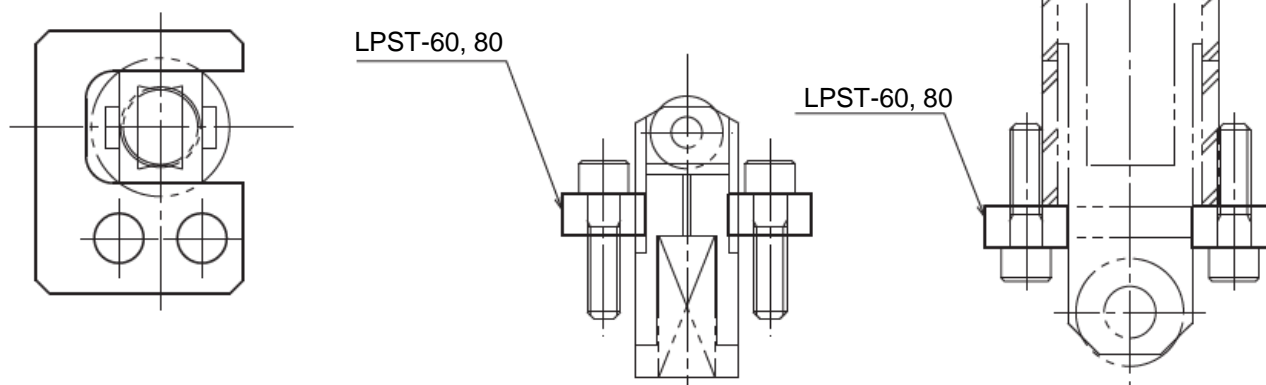
Usage

	name
	04-C The Control Related

Name	Code	Category Number	Sketch	Remarks
Thrust Washer	BW	C101		26 Jun. 2020 Rev
SD Plate	SDPA	C201		26 Jun. 2020 Rev
Shock absorber Plate	SAP	C301		1 Oct. 2021 Rev
Shock absorber	RBQ	C302		1 Oct. 2021 Rev
Taper Block	SDTB	C401		26 Jun. 2020 Rev
Taper Block	SDTB-30°	C402		1 Oct. 2021 Rev
Taper Block	SDTB-45°	C403		26 Jun. 2020 Rev
SD Urethane Stopper	SDUS-A7/B7	C501		26 Jun. 2020 Rev
SD Urethane Stopper	SDUS-T7	C502		26 Jun. 2020 Rev
Urethane Stopper	SDU	C503		26 Jun. 2020 Rev
Air cylinder lift type swing stopper in half mount system	SSTB	C513		1 Aug. 2023 Rev
Swing Tapered Stop Block	SDTPS	C521		1 Oct. 2021 Rev
Sunroof SD Stop Block	SRSD	C531		26 Jun. 2020 Rev
Sunroof Stroke Block	SRSB/SRSBS	C701/C702		26 Jun. 2020 Rev
SD dowelling Plate	SDWPS	C801		26 Jun. 2020 Rev
Dowelling Lower Plate	SDWL	C802		26 Jun. 2020 Rev
Dowelling Plate S	DWPS	C803		1 Oct. 2021 Rev
Dowelling Plate W	DWPW	C804		1 Jun. 2023 Rev
Swing set slide plate	SSSP	C821		26 Jun. 2020 Rev
SD Positive Pressure Unit 30	SDPU-30A	C905		1 Oct. 2021 Rev
SD Positive Pressure Unit 45	SDPU-45A	C906		26 Jun. 2020 Rev
SD Positive Pressure Unit 70	SDPU-70A	C907		26 Jun. 2020 Rev
Positive Plate 2	SKP2	C912		26 Jun. 2020 Rev

Your Business	New	Rev	Date	2023.8.1	
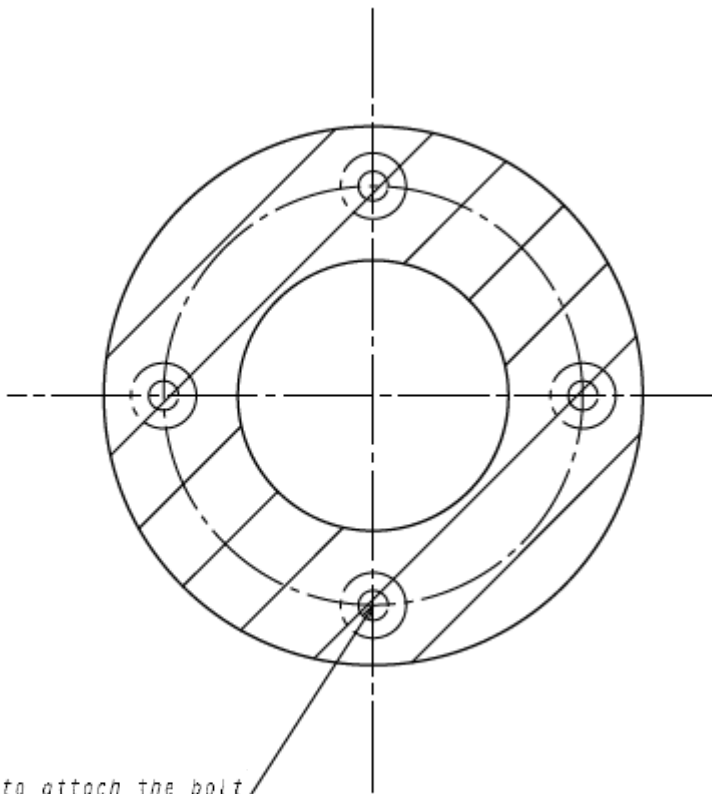
Do not need to attach the bolt
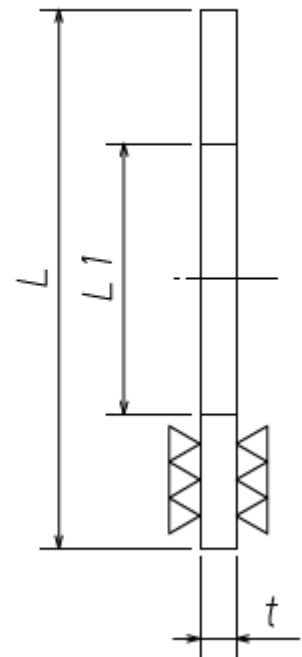
Bronze + GR

BW	t	L	L1
30	5	60	30.2
40	7	80	40.2
60	8	120	60.3
80	10	150	80.3

It is cf.A201.

Thrust Washer BW

Swing Cam rotating pivot shaft
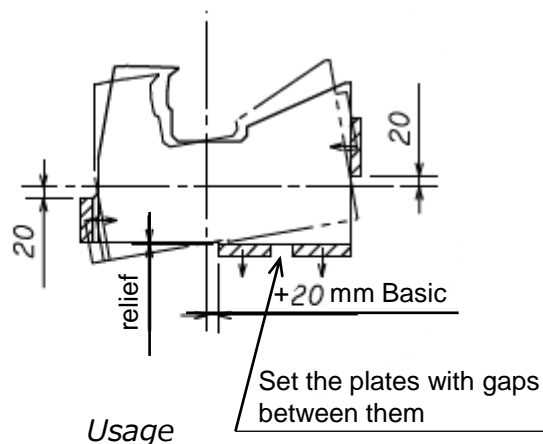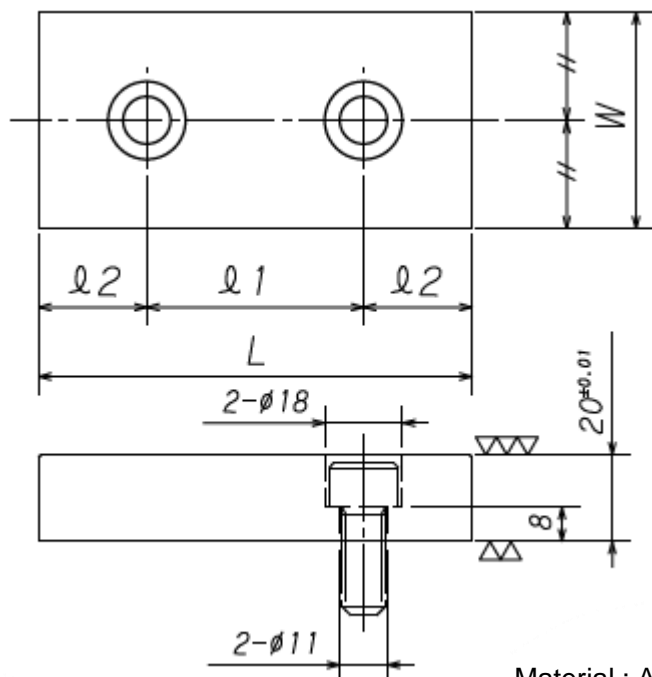
SD Trunnion Mount

Base

Swing Cam
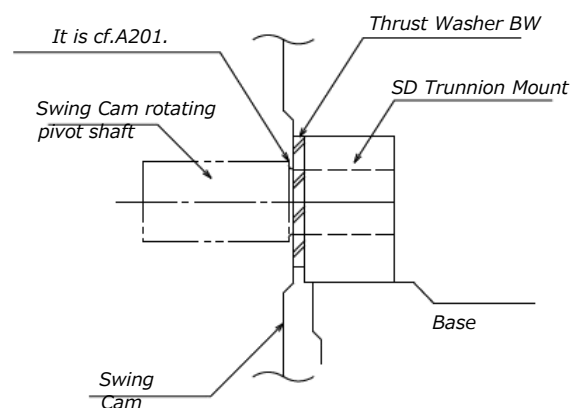
Usage

Note:
In case of a thrust load by using this washer,
It s required to be machined together both the
dowel pin holes for SD Trunnion Mount and the
base.

SD Plate

SDPA

relief

+20 mm Basic

Set the plates with gaps between them

Usage

Material : ASTM 1018（JIS SS400) or ASTM G2500（JIS FC250)

Code	W	L	ℓ1	ℓ2
SDPA-28×50	28	50	25	12.5
SDPA-28×75		75	45	15
SDPA-38×75	38	75	45	15
SDPA-50×50	width is 48 or 50 50 (48)	50	25	12.5
SDPA-50×75		75	45	15
SDPA-50×100		100	50	25
SDPA-50×125		125	75	
SDPA-50×150		150	100	
SDPA-75×75	75	75	25	25
SDPA-75×100		100	50	
SDPA-75×125		125	75	
SDPA-75×150		150	100	
SDPA-100×100	100	100	50	25
SDPA-100×125		125	75	
SDPA-100×150		150	100	

It is available to supply the special SD plate according to the requested size and material.

C301	Shock absorber Plate	YB
	SAP	

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M(metric fine screw thread)

2-ø18

2-ø11

8

20±0.01

50

L

L1
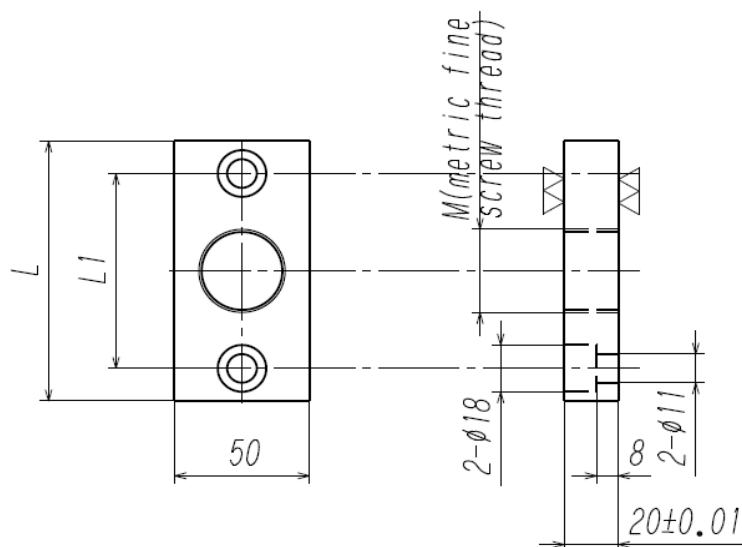
Code	L	L1	M	Mat.
SAP-165075			M16 P1.5	
SAP-205075	75	55	M20 P1.5	ASTM 1018 (JIS SS400)
SAP-255075			M25 P1.5	
SAP-3050100	100	75	M30 P1.5	
SAP-3250100			M32 P1.5	

250 mm or more

Swing center

30° or more

MM

α°
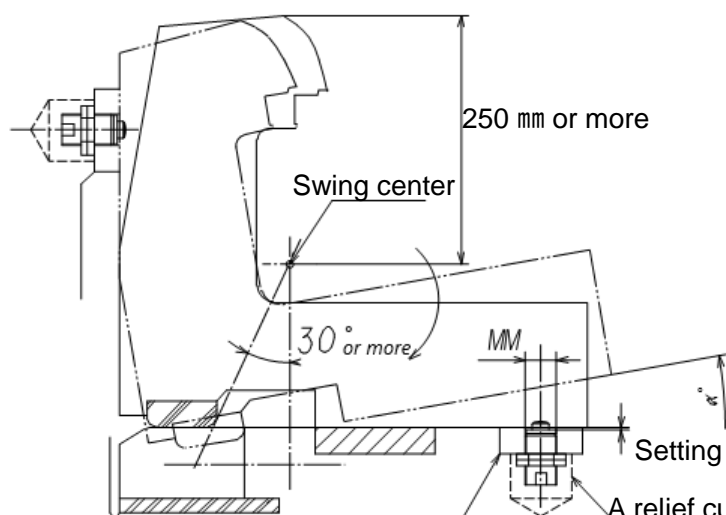
Note:
In case of the larger Swing Cam structure of 250 ㎜ or more from the rotating pivot center for Swing Cam, it is required to consider of setting a stopper or a shock absorber because of increasing the moment of inertia.

Setting to H-1 ㎜, or adjusting 1 ㎜ or more is possible.

A relief cutting hole.

Shock Absorber Plate
Screw hole (metric fine screw thread)

This device is primarily set up an anti-noise, but is unnecessary in most cases.

1)Considering to be installed the shock absorber plate on a swing cam that uses a slide block and has a swing angle of 10° or more.
2)Considering of the other structures (Slide Block system) which is expected to increase the operating speed for Swing Cam, it is required to be used the shock the absorber.
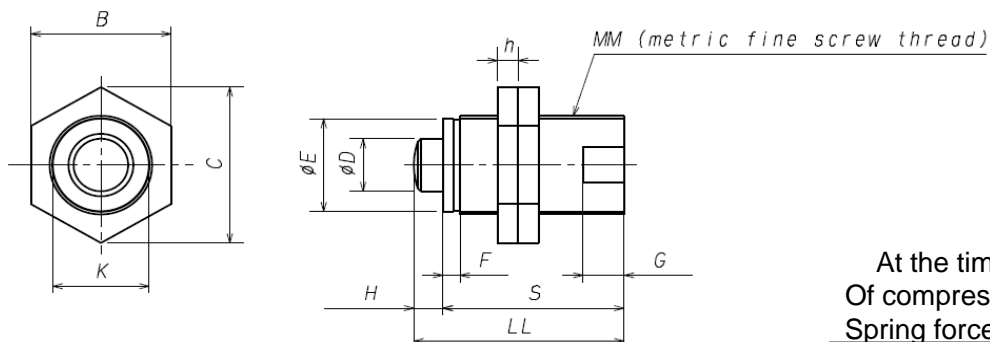
| Your Business | New (Rev) Date | 2021.10.1 | Made to order | 66/139 |

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This standard is used for the prevention of the swing die "NOISE", and shock absorption.

MM (metric fine screw thread)

At the time
Of compression
Spring force(Kg)

absorbing energy

Code	Shock absorber main parts size									Hexagon nut size				
	D	E	F	H	K	G	LL	MM	S	B	C	h		
RBQ1604	6	14.2	3.5	4	14	7	31	M16×1.5	27	22	25.4	6	1.3	1.96
RBQ2007	10	18.2	4	7	18	9	44.5	M20×1.5	37.5	27	31.2	6	2.8	11.8
RBQ2508	12	23.2	4	8	23	10	52	M25×1.5	44	32	37	6	3.8	19.6
RBQ3009	16	28.2	5	8.5	28	12	61.5	M30×1.5	53	41	47.3	6	4.5	33.3
RBQ3213	18	30.2	5	13	30	13	76	M32×1.5	63	41	47.3	6	5.5	49

a fast rotating speed means that it rotates close to the swing center by Slide Block and so on.
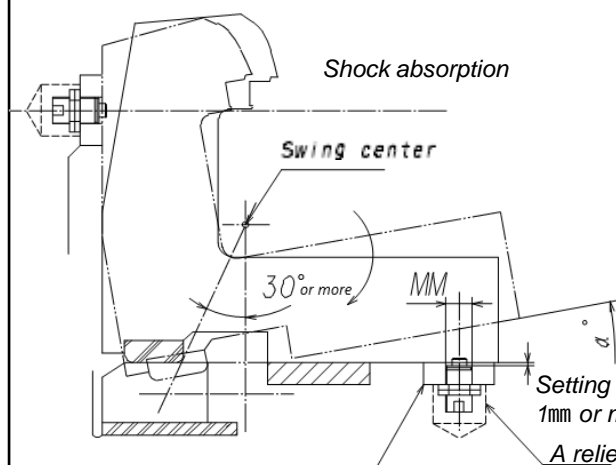
Swing Cam weight	rotating speed	cord No.	using q'ty
under 50kg	fast(increasing a speed)	RBQ1604	1
	usual(cylinder speed)		1
50～200kg	fast(increasing a speed)	RBQ2007	1
	usual(cylinder speed)		1
200～400kg	fast(increasing a speed)	RBQ2007	2
	usual(cylinder speed)		2
400～600kg	fast(increasing a speed)	RBQ2508	2
	usual(cylinder speed)		1～2
600～800kg	fast(increasing a speed)	RBQ3009	2
	usual(cylinder speed)	RBQ2508	2
over 800kg	fast(increasing a speed)	RBQ3213	2
	usual(cylinder speed)	RBQ3009	2

usage

Shock absorption

Swing center

30°or more   MM

Setting to H-1mm, or adjusting to 1mm or more is possible.
A relief cutting hole

Shock Absorber Plate,
Screw hole(metric fine screw thread)

Note： Considering that the spring force of compression work as lifting up the swing Cam.
It is also recommended to install it after confirming the Try-out.

This parts is licensed a patent by Your Business.
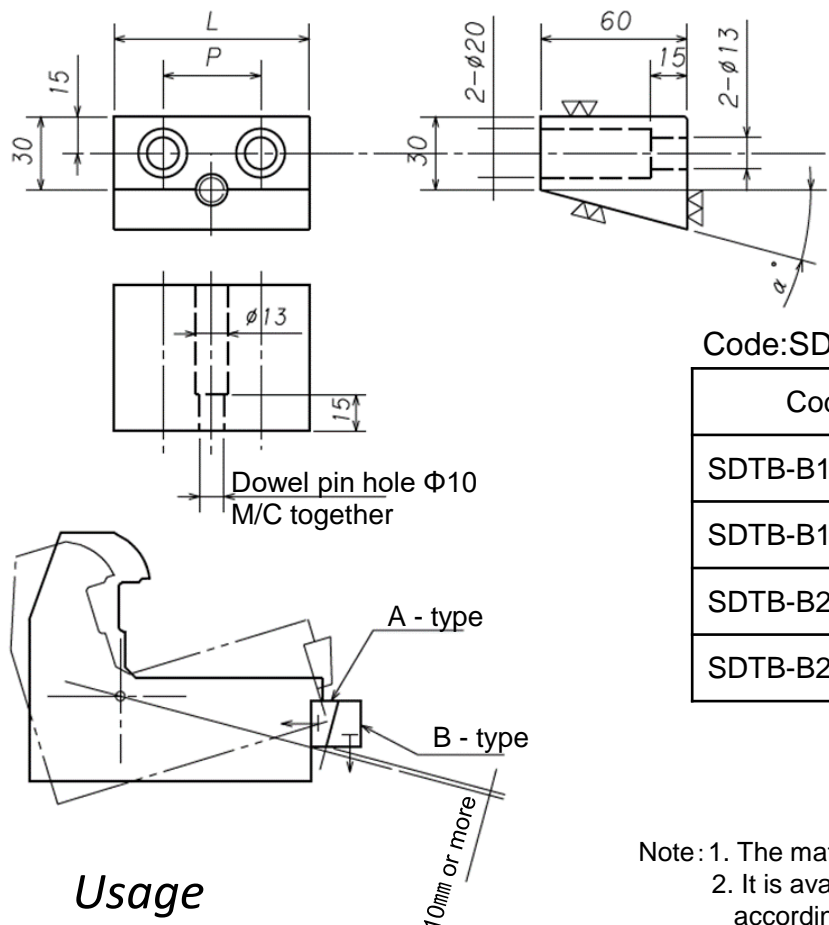An illegal duplication prohibited.

1.Taper Block (A)

Dowel pin hole Φ10
M/C together
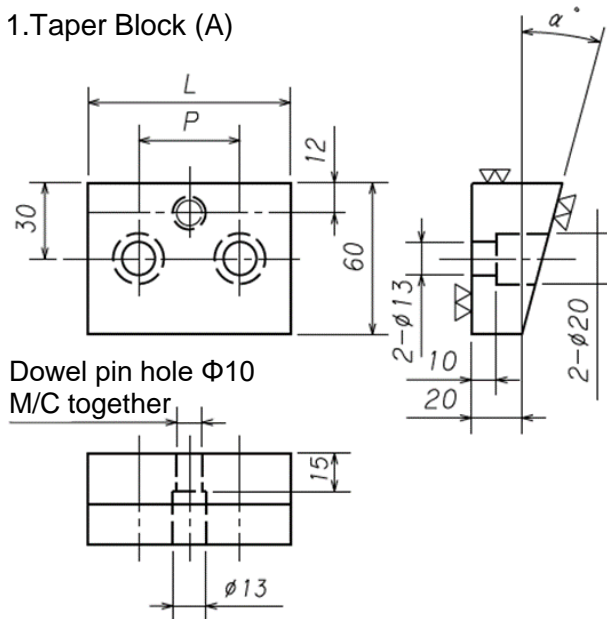
Code:SDTB-A15° - 6080

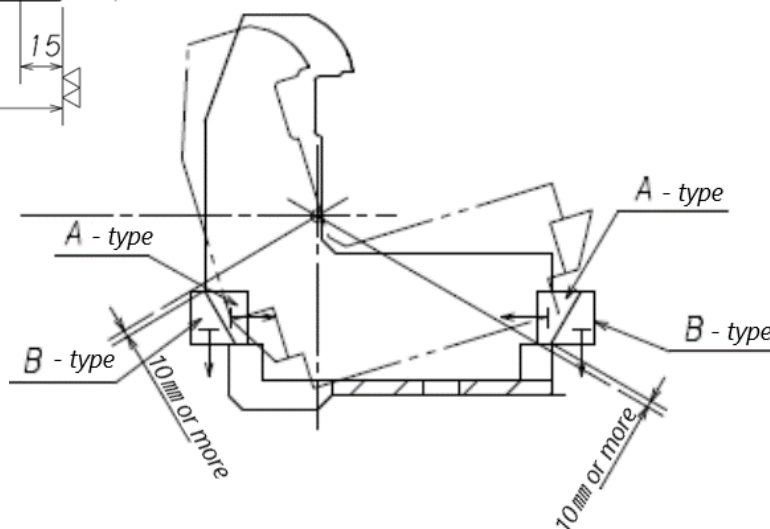| Code	α°	L	P
SDTB-A15°-6080	15	80	40
SDTB-A15°-6050		50	25
SDTB-A20°-6080	20	80	40
SDTB-A20°-6050		50	25

2.Taper Block (B)

Dowel pin hole Φ10
M/C together

A - type

B - type

Usage

10mm or more

Code:SDTB-B15° - 6080

Code	α°	L	P
SDTB-B15°-6080	15	80	40
SDTB-B15°-6050		50	25
SDTB-B20°-6080	20	80	40
SDTB-B20°-6050		50	25

Note：1. The material is ASTM 1045（JIS S45C).
2. It is available to supply the special SDTB
according to the requested size and material.
3.Dowel pin hole is machined together.

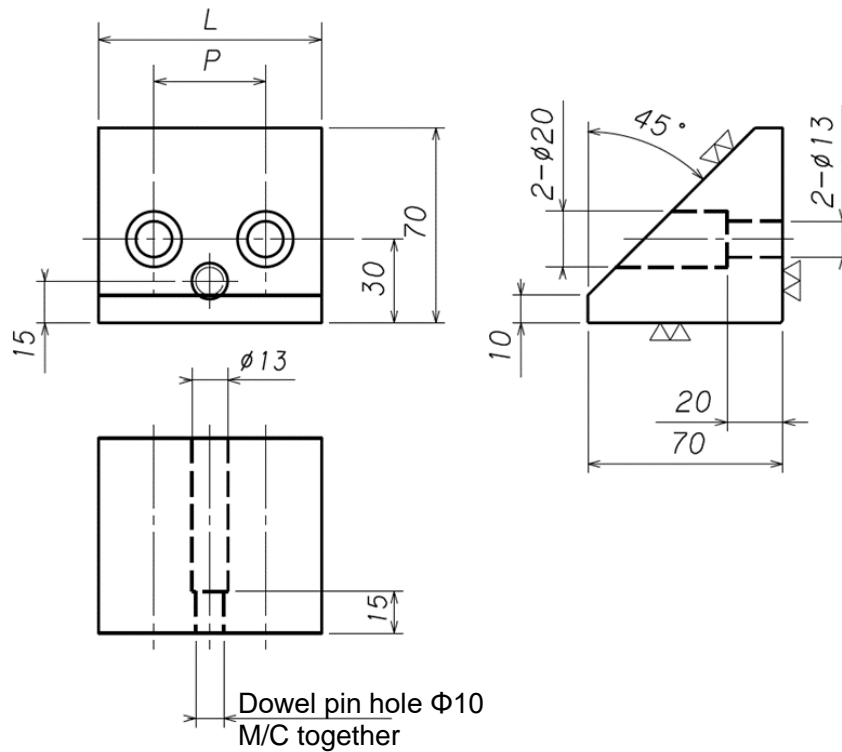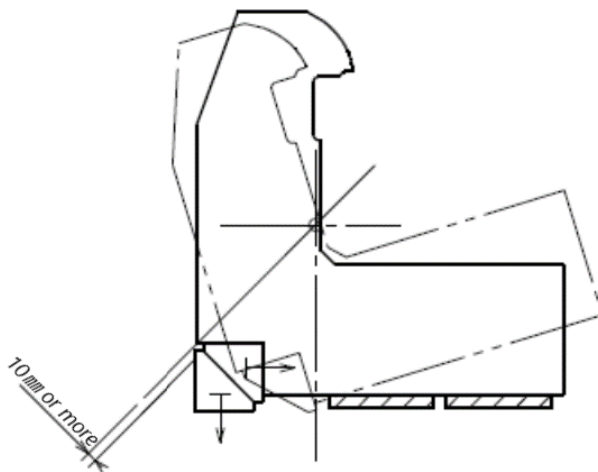Your Business | New Rev Date 26 Jun. 2020 | Made to order

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1.Taper Block (A)

Code	L	P
SDTB-A30°-6080	80	40
SDTB-A30°-6050	50	25

Dowel pin hole Φ10
M/C together

2.Taper Block (B)

Code	L	P
SDTB-B30°-6080	80	40
SDTB-B30°-6050	50	25

Dowel pin hole Φ10
M/C together

A - type
B - type
A - type
B - type
10㎜ or more
10㎜ or more

Note：1. The material is ASTM 1045（JIS S45C).
2. It is available to supply the special SDTB-30˚
according to the requested size and material.
3.Dowel pin hole is machined together.

C403	Taper Block 45°	
	SDTB-45°	YB

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(using as a special case)

Dowel pin hole Φ10
M/C together

Code	L	P
SDTB-45°-7080-D	80	40
SDTB-45°-7050-D	50	25

10 mm or more

Note：1. The material is ASTM 1045（JIS S45C）.
2. It is available to supply the special SDTB-45°
   according to the requested size and material.
3.Dowel pin hole is machined together.

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Recommended number of
SD urethane stoppers to install

swing cam weight
within 350kg :   2
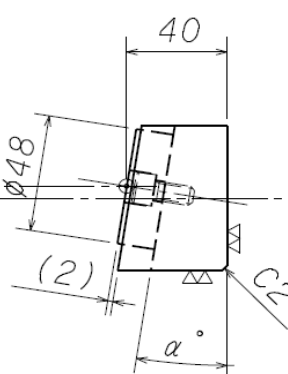351~699kg   :   3
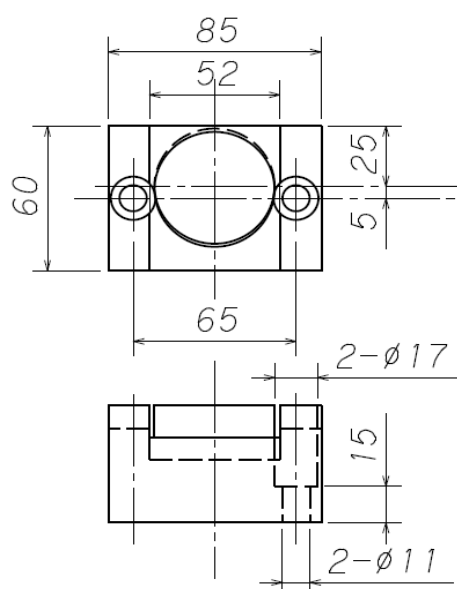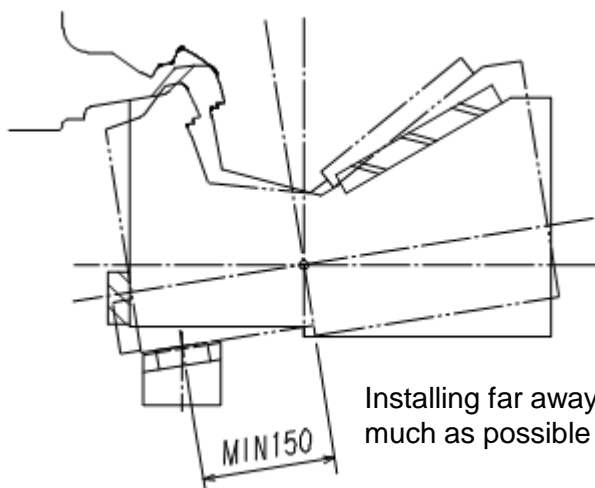700~1000kg   :   4~5

70
35
17.5
45
5
50

40
⌀32
(2)
C2
α°

2-⌀17
10
2-⌀11
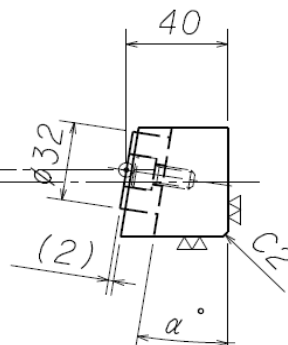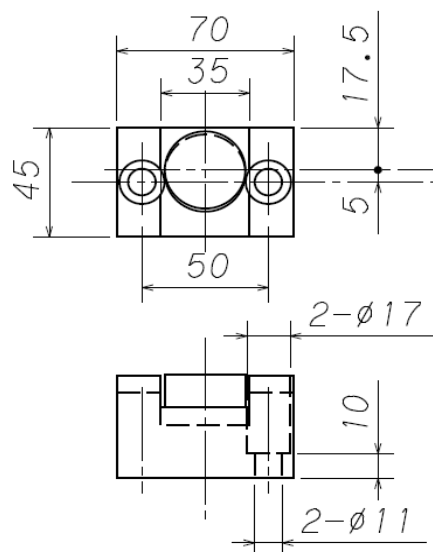
Code:SDUS-A7-45-α
α is decided by an angle of the stopper.
(4°, 5°, 6°, 7°, 8°, 10°, 13°, 15°, 17°)
※The other angles(except the standard angles)
   are made to order.
※Available of special made-to-order every 1°.

85
52
60
25
5
65

40
⌀48
(2)
C2
α°

2-⌀17
15
2-⌀11

Recommended number of
SD urethane stoppers to install

swing cam weight
700kg or less :   2~3
701~1000kg   :   4

Code:SDUS-B7-60-α
α is decided by an angle of the stopper.
(4°, 5°, 6°, 7°, 8°, 10°, 13°, 15°, 17°)
※The other angles(except the standard angles)
   are made to order.
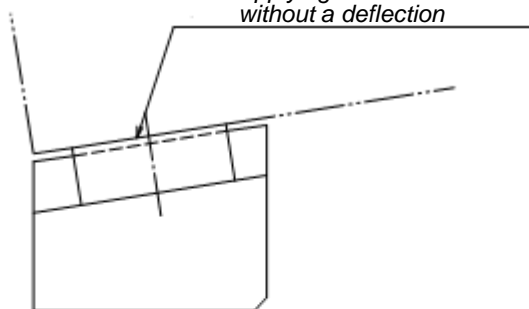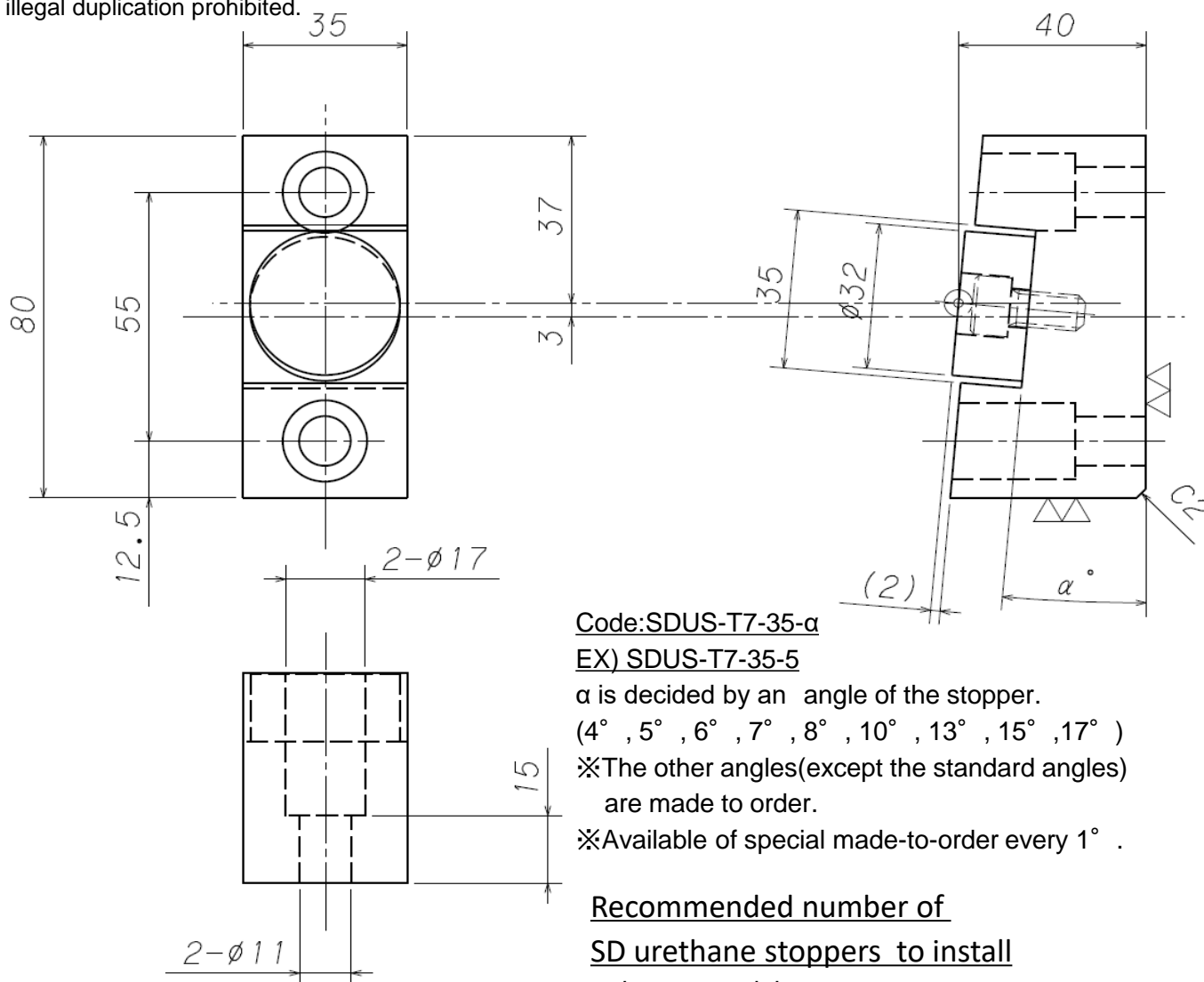※Available of special made-to-order every 1°.

.

Applying the urethane
without a deflection

MIN150
Installing far away as
much as possible

It is recommended that this part be installed
as a stopper for the swing cam with a swing
amount of 5 deg or more and a weight of
50kg or more.

35

80

55

12.5

37

3

35

Ø32

40

(2)

α°

C2

2-Ø17

15

2-Ø11

Code:SDUS-T7-35-α
EX) SDUS-T7-35-5
α is decided by an angle of the stopper.
(4°, 5°, 6°, 7°, 8°, 10°, 13°, 15°, 17°)
※The other angles(except the standard angles)
　are made to order.
※Available of special made-to-order every 1°.

Recommended number of
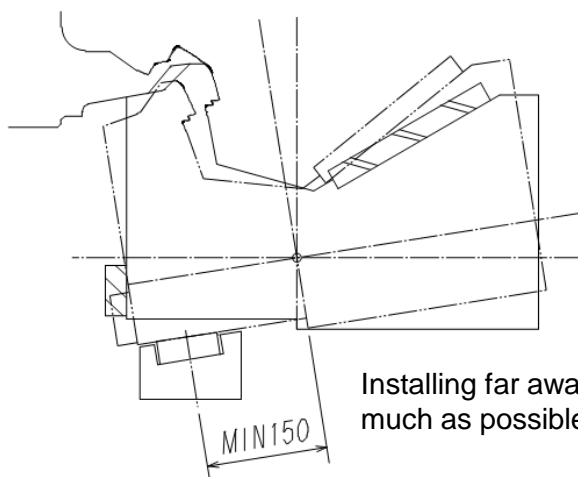## SD urethane stoppers to install
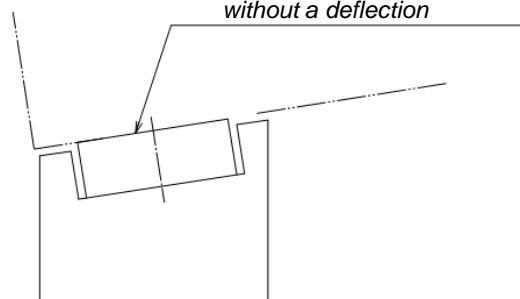swing cam weight
within 350kg :　2
351~700kg　　:　3
701~1000kg　:　4~5

*Applying the urethane
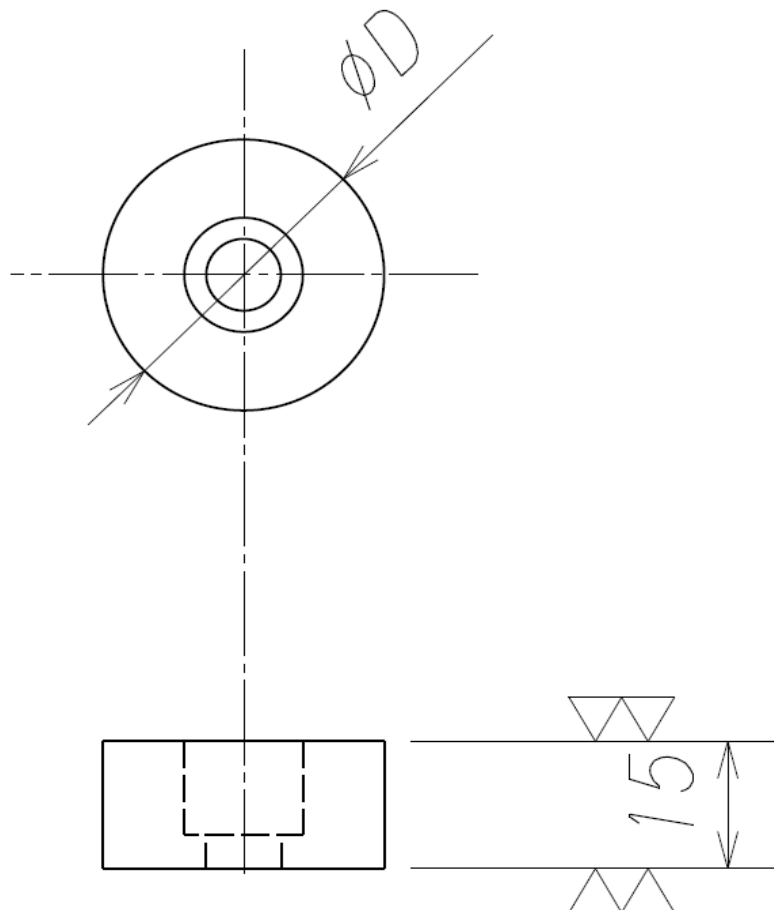without a deflection*

MIN150

Installing far away as
much as possible

It is recommended that this part be installed
as a stopper for the swing cam with a swing
amount of 5 deg or more and a weight of
50kg or more.

ΦD

15

Code	ΦD	a load at 2mm deflection.
SDU-32×15	32	320(kgf)
SDU-48×15	48	890(kgf)

materials：Urethane Shore A90

Using this parts in case of urethane breakage.

SSTB-80110-α

Half-Mount type

SSTB-80110

Air Cylinder Lifting Type or Lift Pin Type

This parts is licensed a patent by Your Business.
An illegal duplication prohibited.

110

25

2-ø18

40
80
28

SSTB-80110

100

30

15

15 20 15
50

2-ø13

25

SSTB-50100

α° : Optional angle by each design

R
acceptable figures
ø18−ø26 depth 20mm for
the fixing holes

110

50

25

40
80

30

10

2-ø13

15
40

2-ø10H7
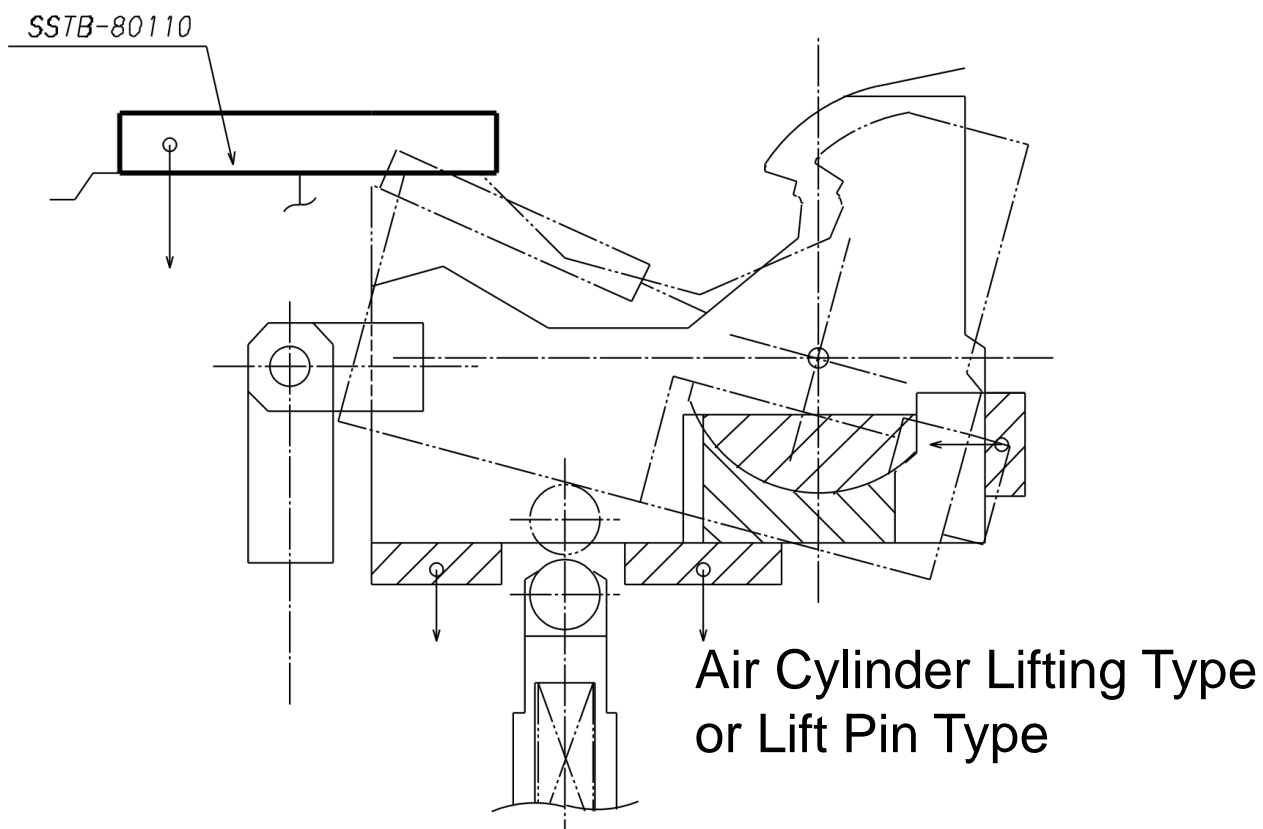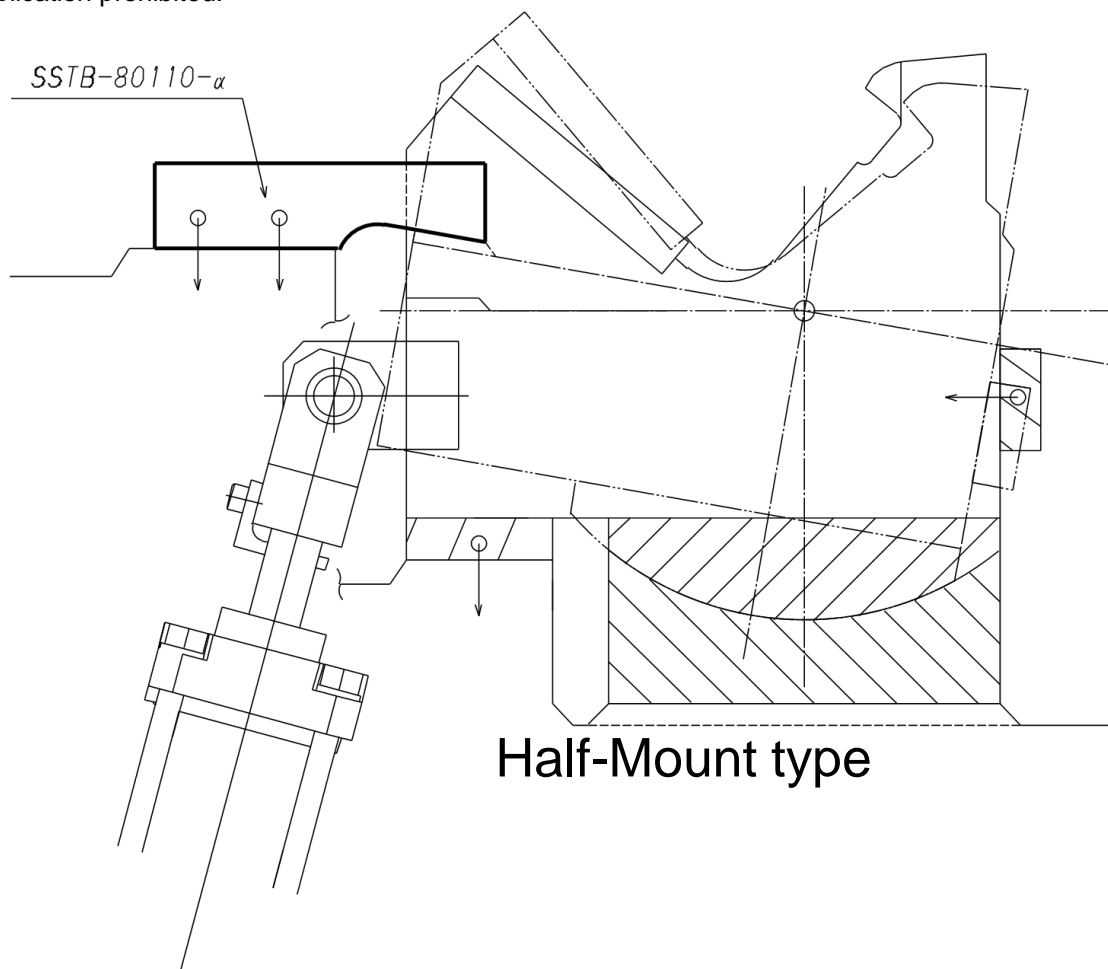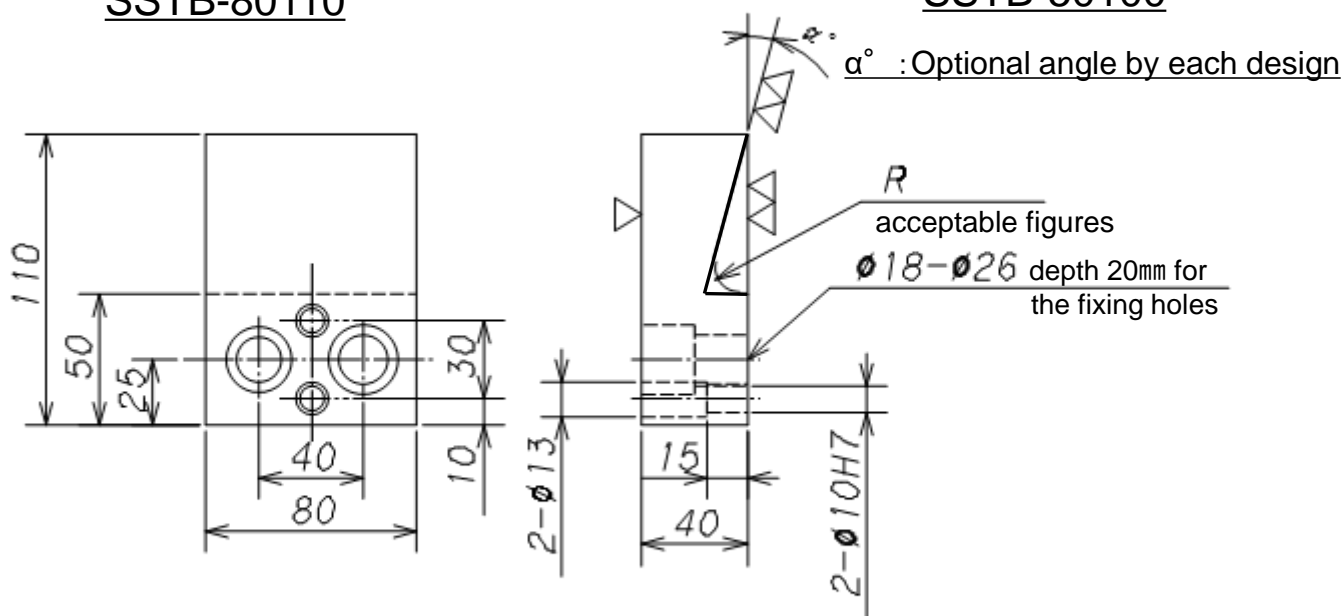
SSTB-80110-α

Note:
1. It is available by the made-to-order based on this standard sheet.
    In that case, please add "-NS" at the end of code.
    Ex: SSTB-○○○○-NS
2. The number to be set is up to the design.
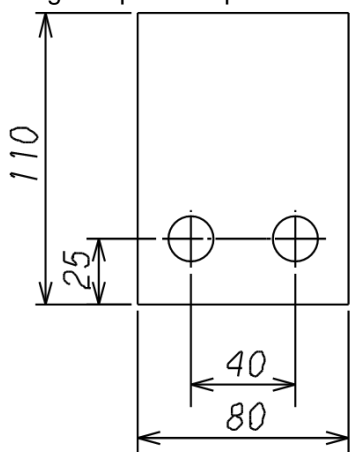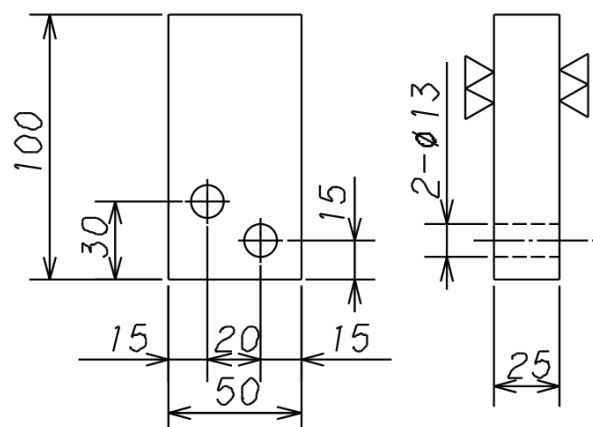3. α° = Optional angle by each design.

Usage 1

Usage 2

This parts is licensed a patent by Your Business.
An illegal duplication prohibited.

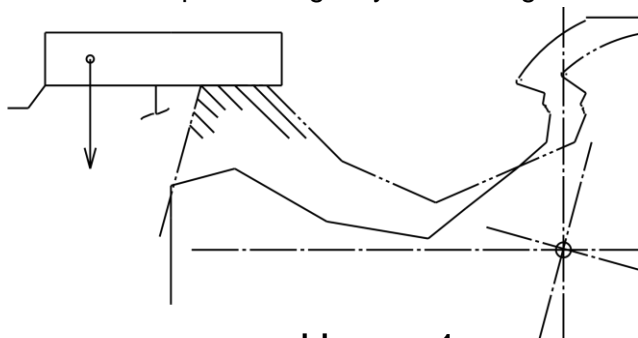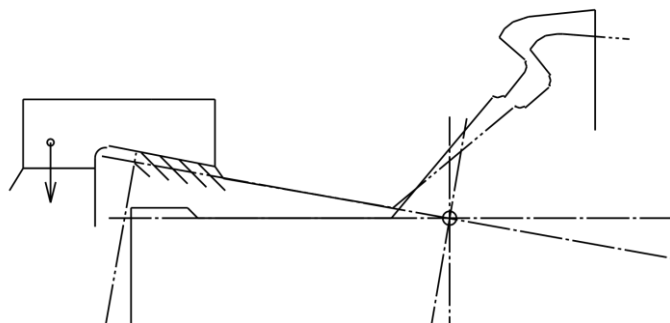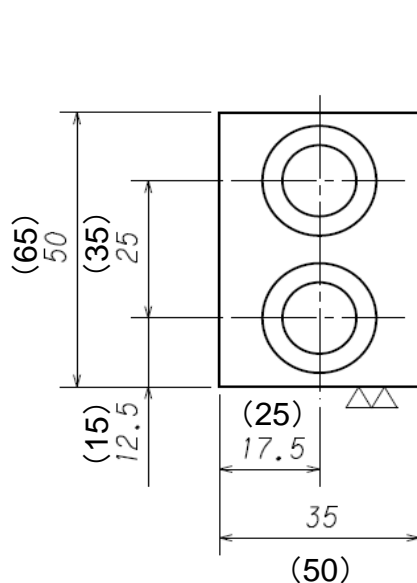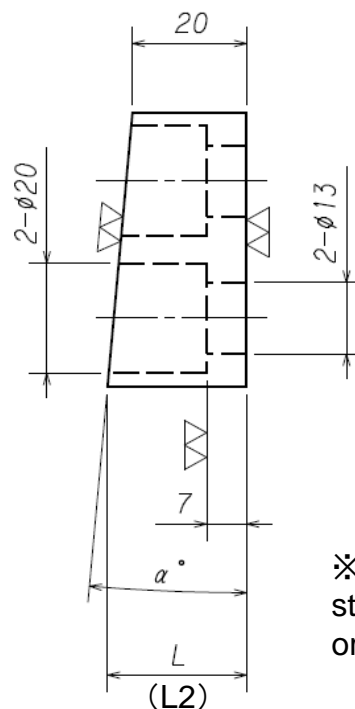| α	L	(L2)
3	22.62	23.41
4	23.5	24.55
5	24.37	25.69
6	25.26	26.83
7	26.14	27.98
8	27.03	29.14
9	27.92	30.29
10	28.82	31.46
13	31.54	35.01
15	33.4	37.42

※The other angles(except the standard angles) are made to order.

ASTM 1045（JIS S45C）
Code:SDTPS-3550C-α

When to use parentheses dimensions
Code:SDTPS-5065C-α

※ It is necessary to be set a stopper (special made-to-order) on the upper portion of this air cylinder type.

Joint Arm

Knuckle Joint Set

In case of using under 250 mm as target or 300 mm or more
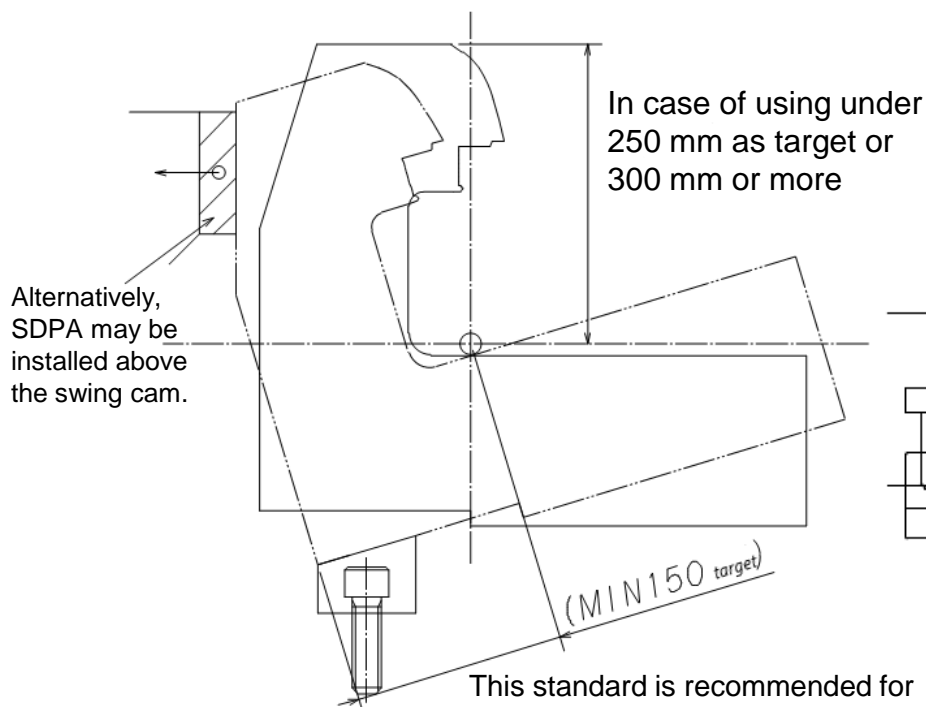
Alternatively, SDPA may be installed above the swing cam.

Knuckle Bracket

(MIN150 target)

Joint Stroke Block
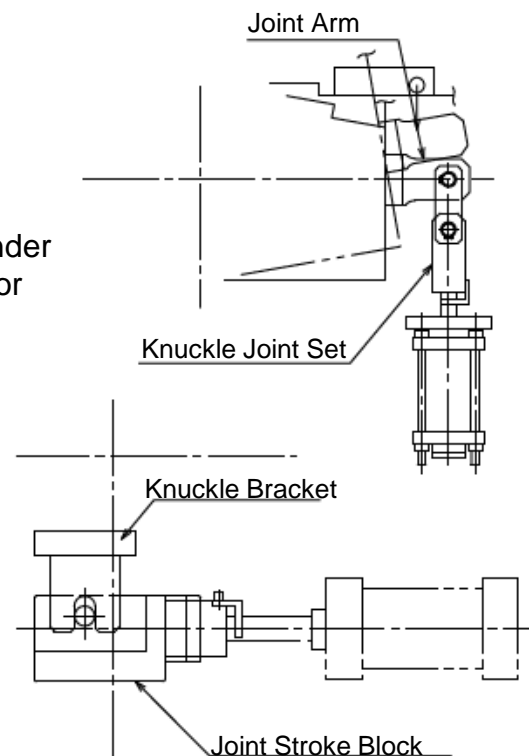
This standard is recommended for use when
・no using slide block
・swing amount is small(8deg or less)
・weight is 200kg or less

If there are no stocks in this parts, it is possible to be supplied as a special made-to-order.

2-ø20

5°

2-ø14

60

20

15 30

60

25

40
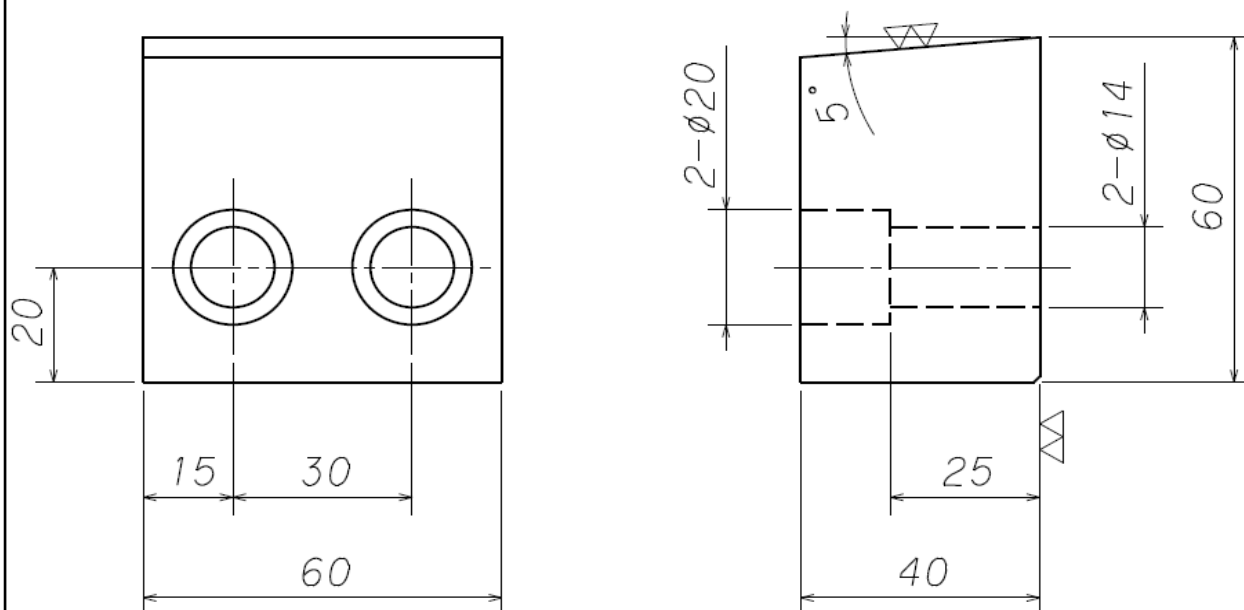
ASTM 1018（JIS SS400）
Code : SRSD-5°-6060

SRSD

line of action

100 ㎜ or more
150 ㎜ or more are recommended

Swing cam axle
(center)
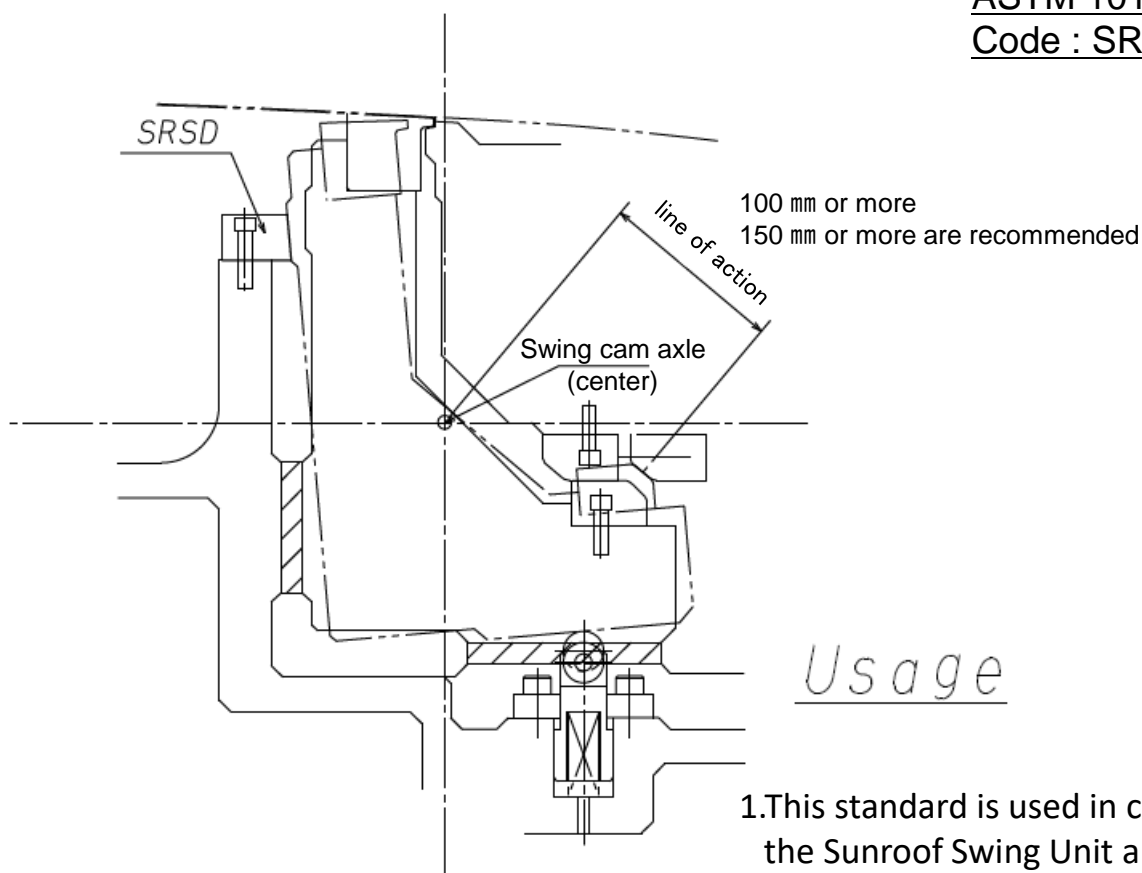
Usage

1.This standard is used in case of using
  the Sunroof Swing Unit applies.
2.For use in it as the stopper of Swing Cam.
  For use in no sufficient space
  in the bottom surface.

Sunroof Stroke Block

SRSB/SRSBS

This parts is licensed a patent by Your Business.
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This standard is used as the positive return of the Swing Cam for the termination by using Cam stroke block for the small flange forming.
Not limited to use for Sunroof.
It is required to be used under 5 degrees.

Bronze + GR
Code : SRSB-45° -80×65

ASTM 1045(JIS S45C)
Code : SRSBS-40° -80×65
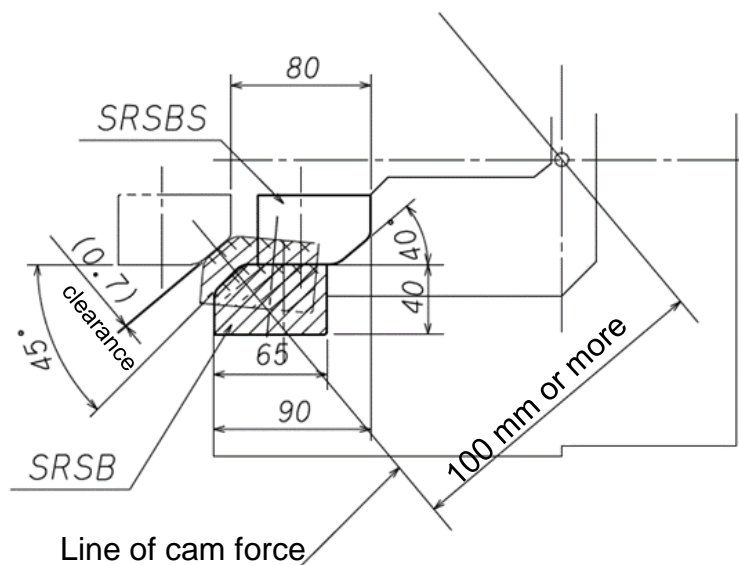
Induction hardening

Usage

Line of cam force

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Induction hardening
ASTM 1045 (JIS S45C)

$T^{+0.01}_{-0.02}$

130

50

20

50

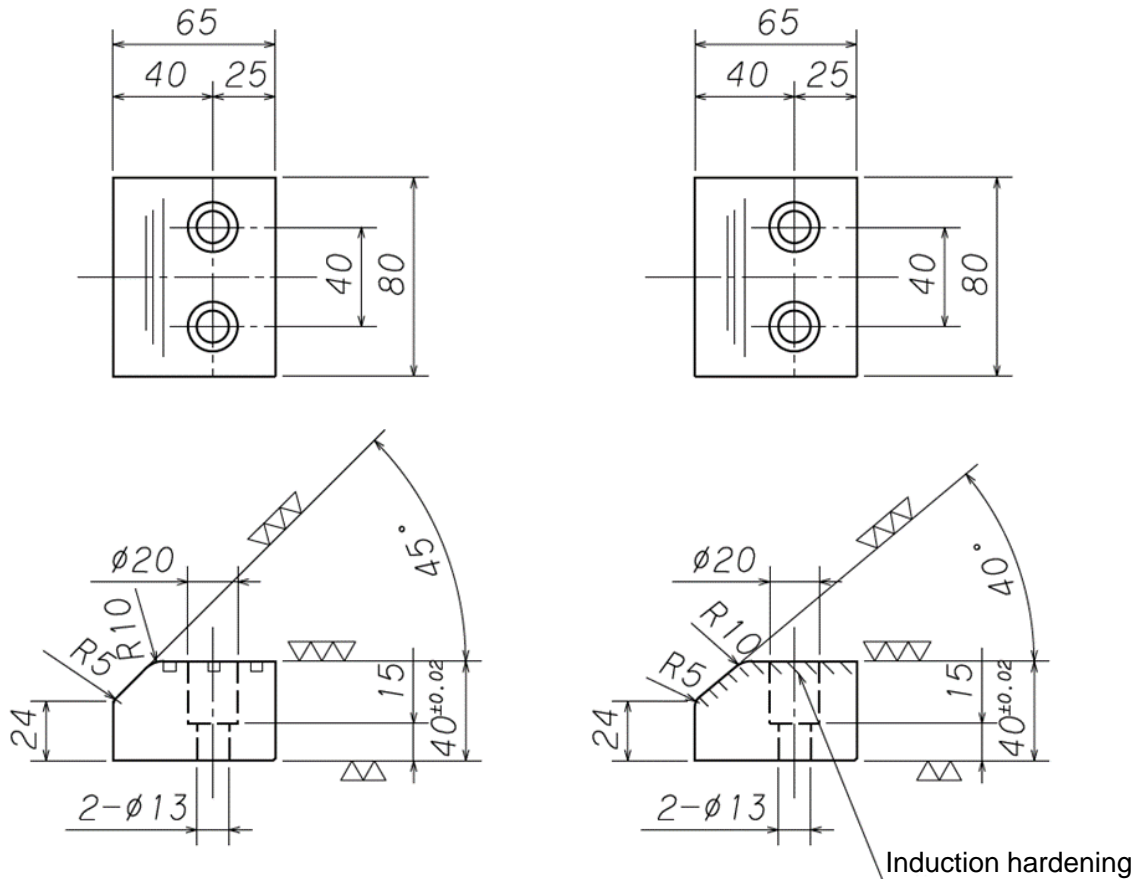W

130

50

20

75

W

60

100

W

95

4-ø20

4-ø13

K

C1

R5

R15

R1

C3

15
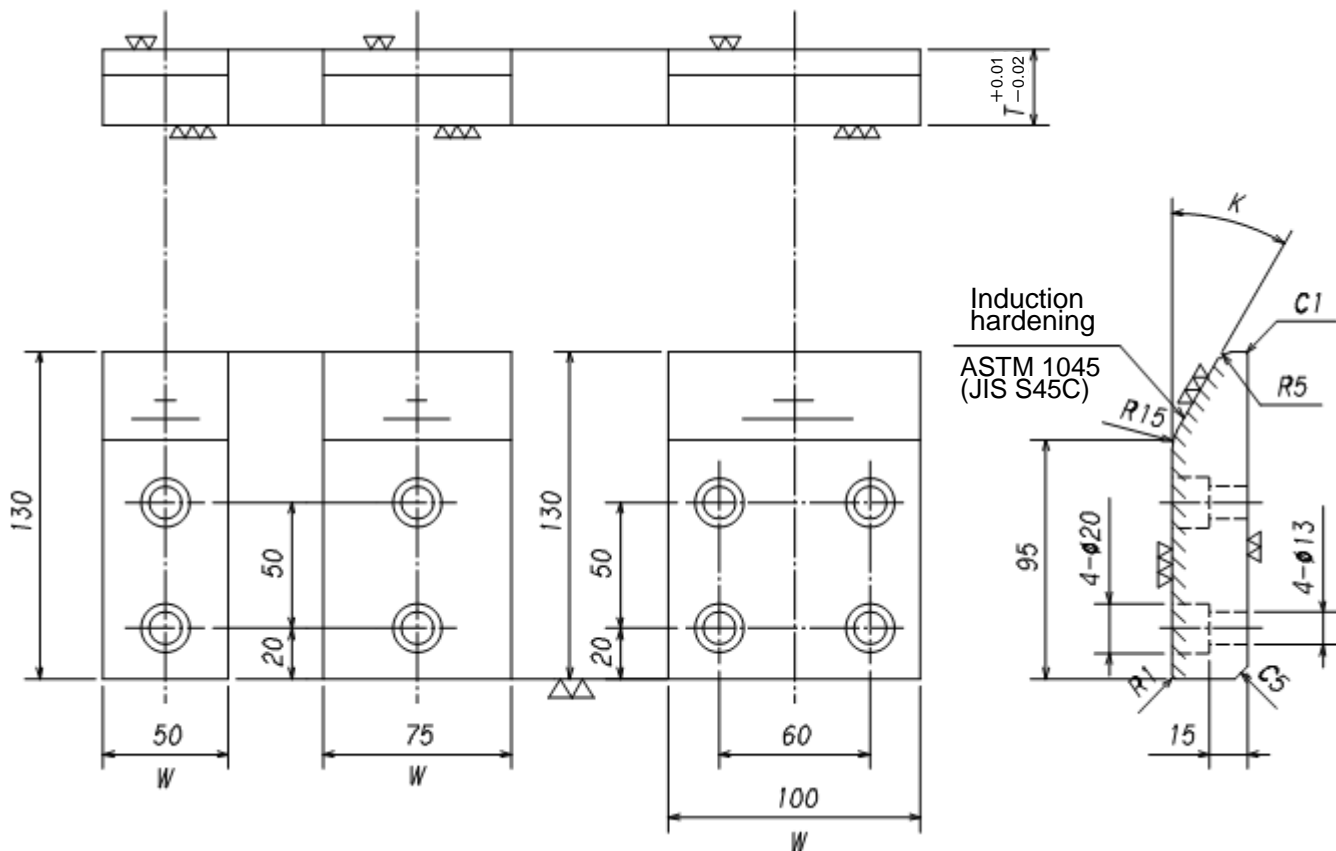
Usage

swing cam weight		Line of action ℓ
300kg or more	:	100mm or more
600kg	:	150mm or more
1000kg or more	:	200mm or more

SDWL

SDWPS

30° or more

30° or more

Line of action ℓ

Code:
SDWPS-W × T × K-NS

EX)
SDWPS-100 × 35 × 36-NS
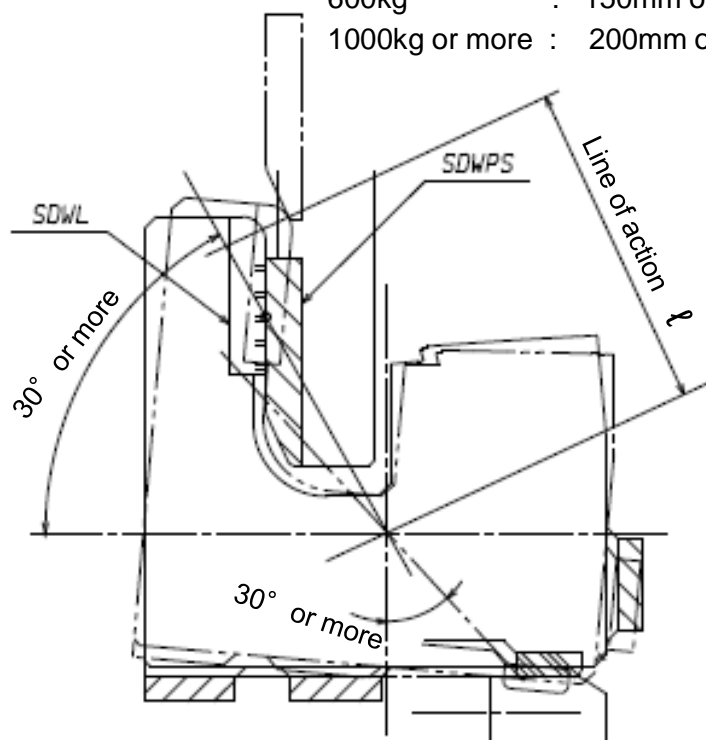
Note:
1. This standard is used as the positive return of the Swing Cam for the termination.
2. It is required to be installed in 30° or more from the rotating pivot of Swing Cam. (It is unable to rotate by frictional force.)

In the case of a made-to-order product, please add "-NS" to the end of parts name. and attach part drawing.

It is available to supply the special SDWPS according to the requested size.

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100

40

20

50

100

40

20

75

100

40

20

60

100

embedding
Bronze + GR

$\phi 20$

$\phi 13$

R20

C1

R0.5

R1

C5

$30 \begin{smallmatrix} +0.01 \\ -0.02 \end{smallmatrix}$

15
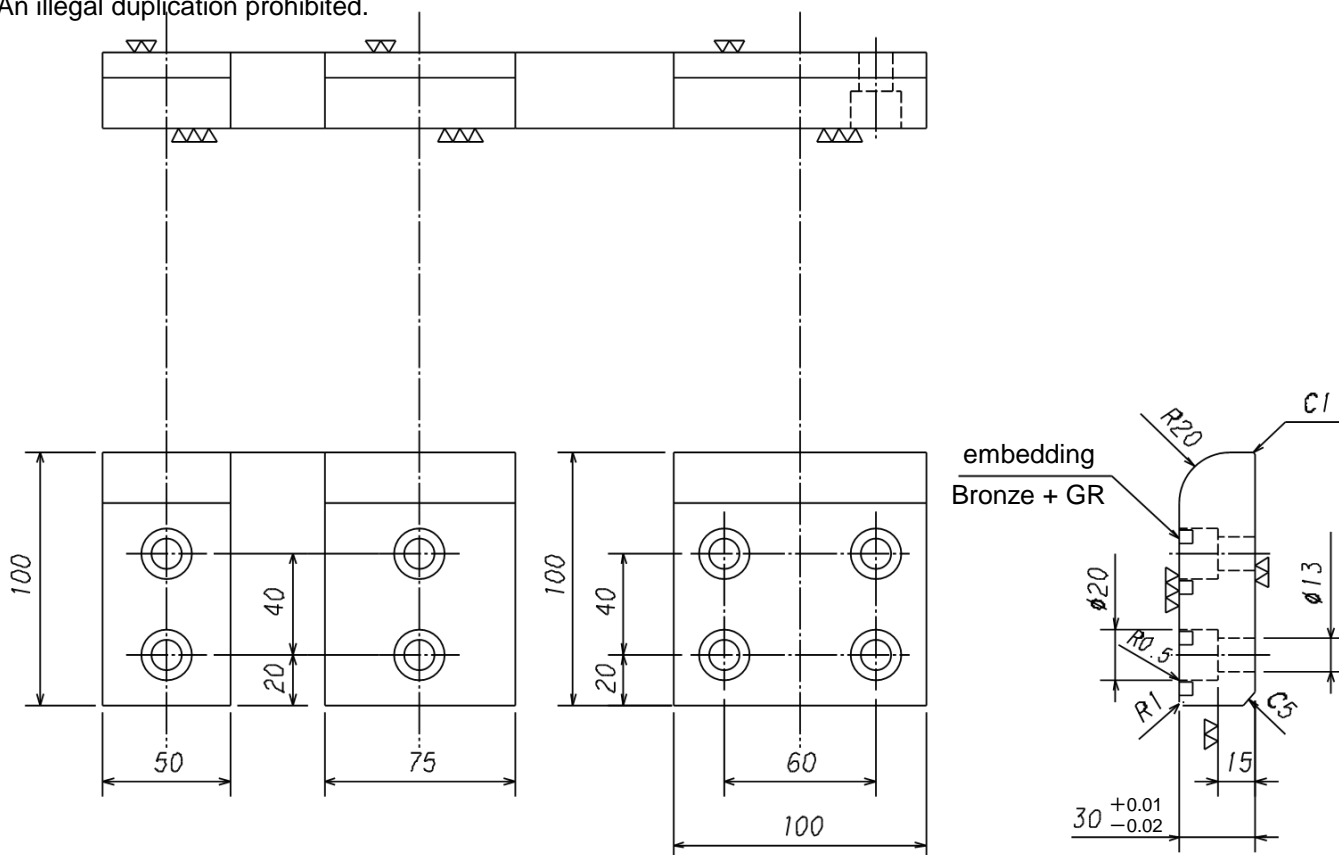
Code
SDWL-50×100

Code
SDWL-75×100

Code
SDWL-100×100

Usage
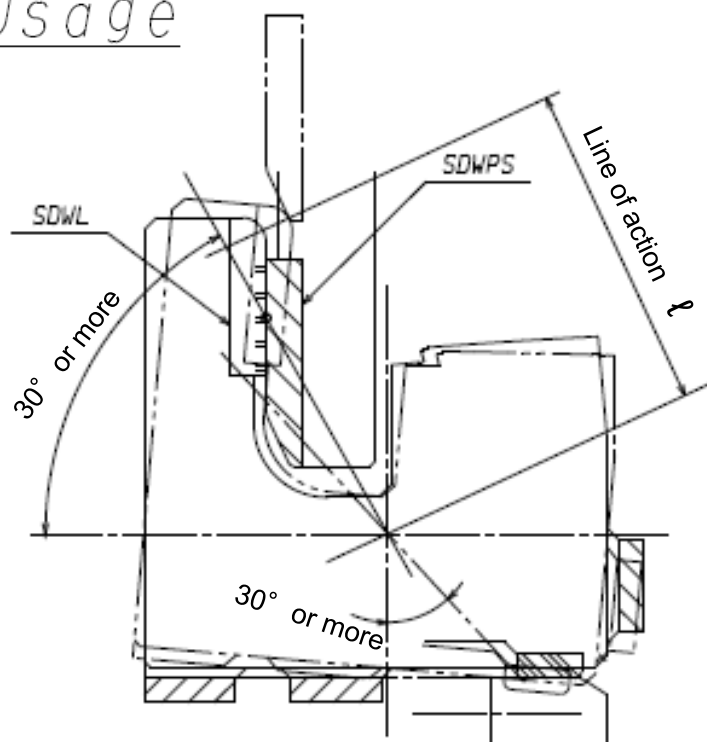
SDWPS

Line of action ℓ

SDWL

30° or more

30° or more

Note:
1.This standard is used as
  the positive return of the
  Swing Cam for the
  termination.
.
2. It is required to be installed in
    30° or more from the rotating
    pivot of Swing Cam.
    (It is unable to rotate by
     frictional force.)

This parts is licensed a patent by Your Business.
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Deciding whether or not to use dowel pin for each design.
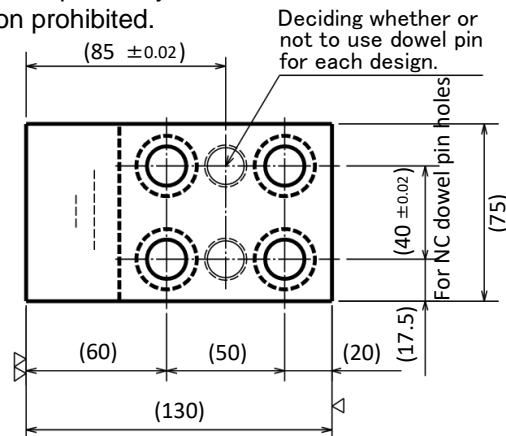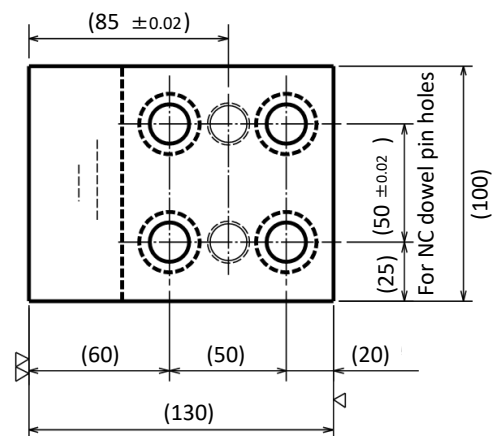
(85 ±0.02)

(40 ±0.02)

For NC dowel pin holes

(75)

(17.5)

(60) (50) (20)

(130)

Coe:
DWPS75-130-230-K

(85 ±0.02)

(50 ±0.02)

For NC dowel pin holes

(100)

(25)

(60) (50) (20)

(130)

Code:
DWPS100-130-230-K

(C5) (C3)

(R30)

(45)

(70)

(40±0.03) (90)

(230)

Induction hardening
HRC50~

(R20)

K(33°～44°)

45-swing amount

(R10)

(6)

150mm or more
Line of action

DWPS

DWPW

stopper

30° or more

(2-φ16H7)
NC dowel pin holes

(2-φ17)

(30)

(25)

(2-φ18)

(2-φ26)
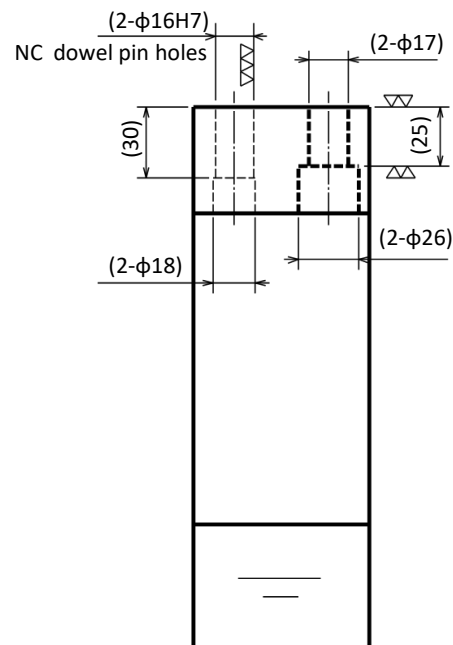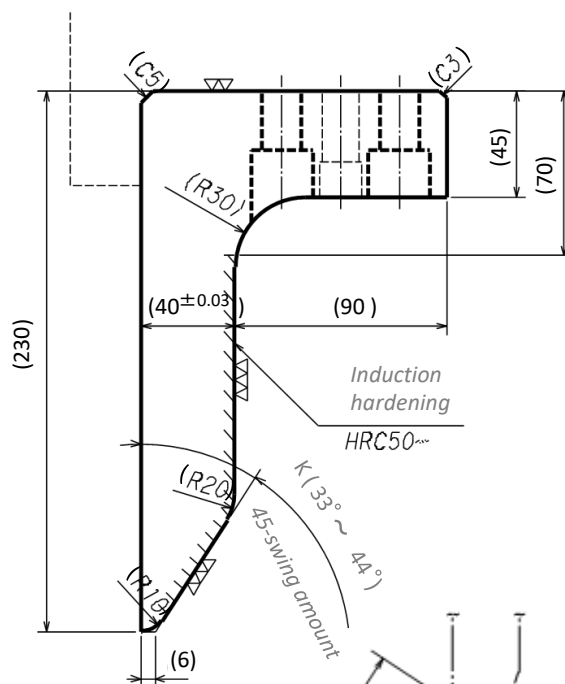
Note:
1. This standard is used as the positive return of the swing Cam for the termination.
2. It is necessary to be located this dowelling plate in the direction of 30° or more far from the rotating pivot because It is unable to rotate by frictional force.
3. Material: ASTM1045(JIS S45C) , Induction hardening for the hatched area.
4. This standard is the made-to-order based on this sheet.
5. Based on this sheet, a parts drawing is required for each design.
   The dimensions shown in parentheses are changed by the design, but it is possible to change dimensions other than the shown in parentheses.
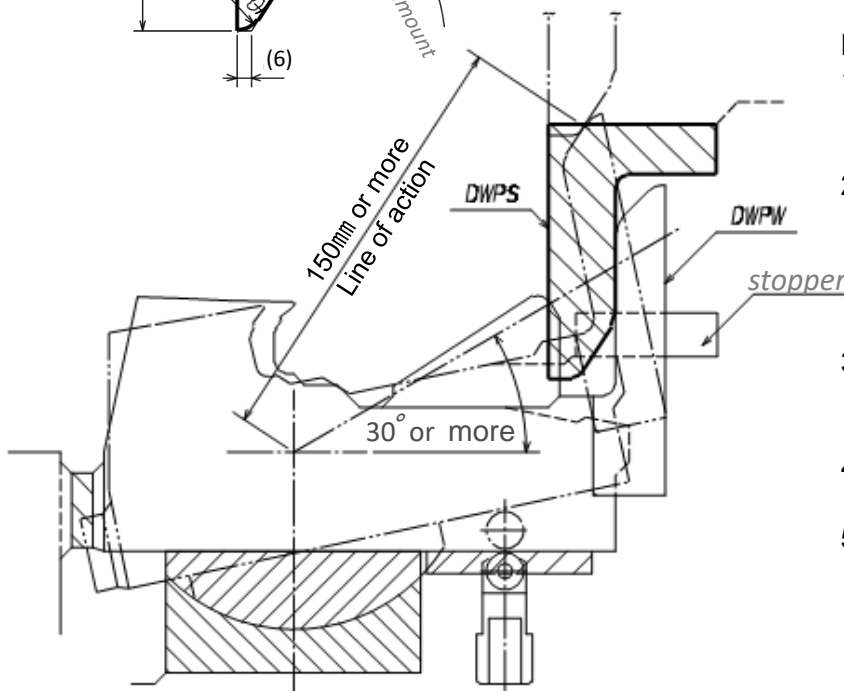
Code	d1	d2	T
DWPW75	17	26	25
DWPW100	21	32	30

Code:
DWPW75-280-45

Code:
DWPW100-280-45

Bronze
+ GR

Embedded
Graphite area
(110)

(45)

(R20)

(R15)

45°

(245)

(280)

(4−∅d1)

(4−∅d2)

(C3)

(T)

(17. 5)　(40)

(40)

(20)

(75)

2-C5

(25)　(50)

(40)

(20)

(100)

2-C5

Usage

150mm or more
Line of action

DWPS

DWPW

stopper
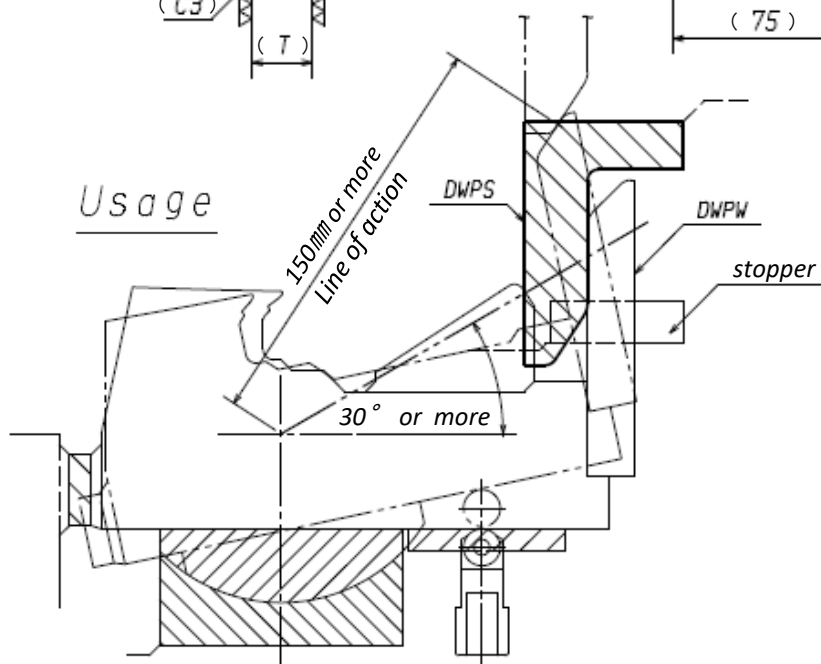
30° or more

Note:
1.This standard is used as the positive
  return of the swing Cam.
2.It is necessary to be located this dowelling
  plate in the direction of 30° or more far
  from the rotating pivot because it is unable
  to rotate by frictional force.
3.Material: Bronze(JIS CAC304)
4.This standard is the made-to-order based
  on this sheet.
5.Based on this sheet, a parts drawing is
  required for each design.
  The dimensions shown in parentheses are
  changed by the design, but it is possible to
  change dimensions other than the shown
  in parentheses.

This is a method of setting the swing cam
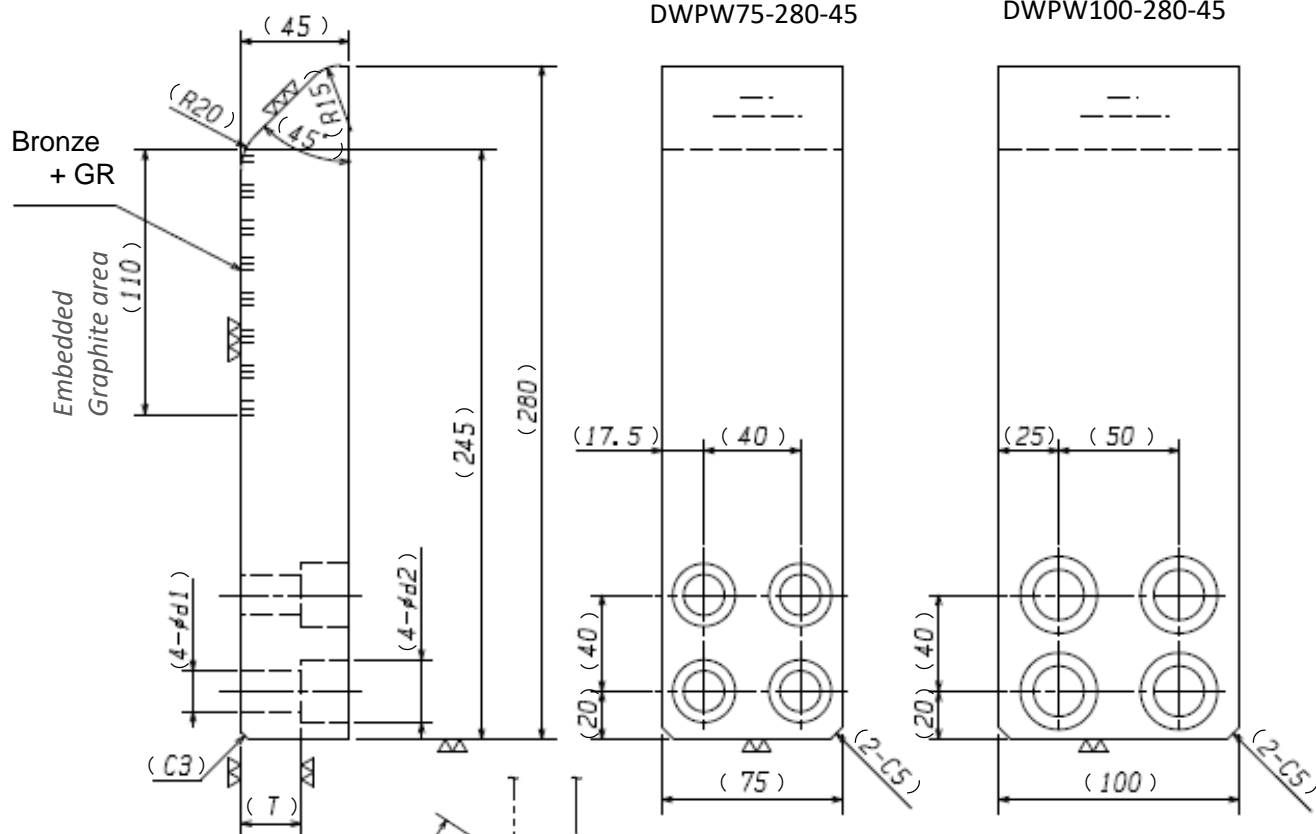with a aerial cam and processing it.

200(225)

25　35　　　　　30

20

W　　　W/2

20
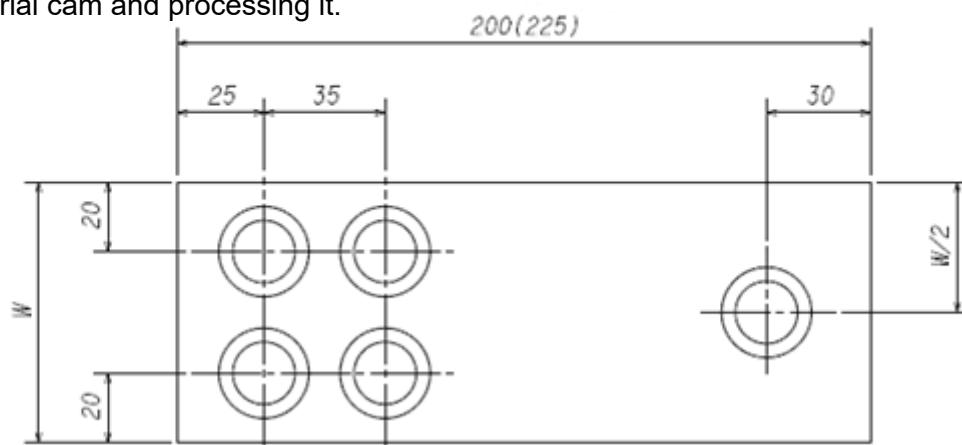
ASTM 1018(JIS SS400) +
#2000(sintered)

W	L
75	200
	(225)
100	200
	(225)

(all around)　R3

Ø26

#2000(sintered)

R15

35±0.01

R2-R3

15

C6　　Ø18
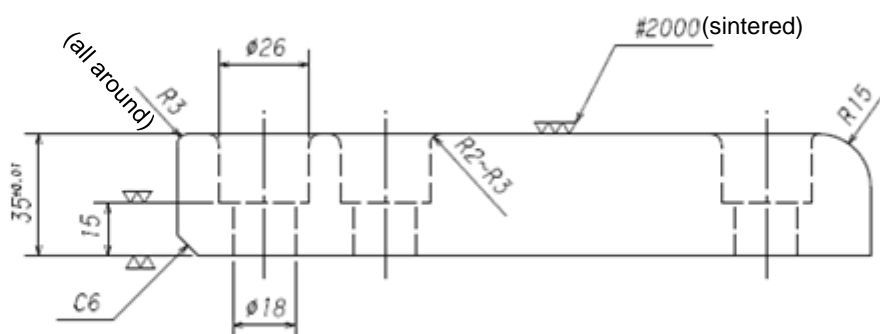
Code:SSSP-WxL
EX):SSSP-75x200
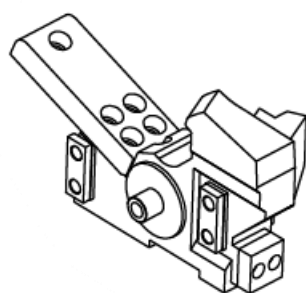
Aerial Cam

It is required to have
completed to hold by
the Aerial Cam
before the upper pad
strokes.
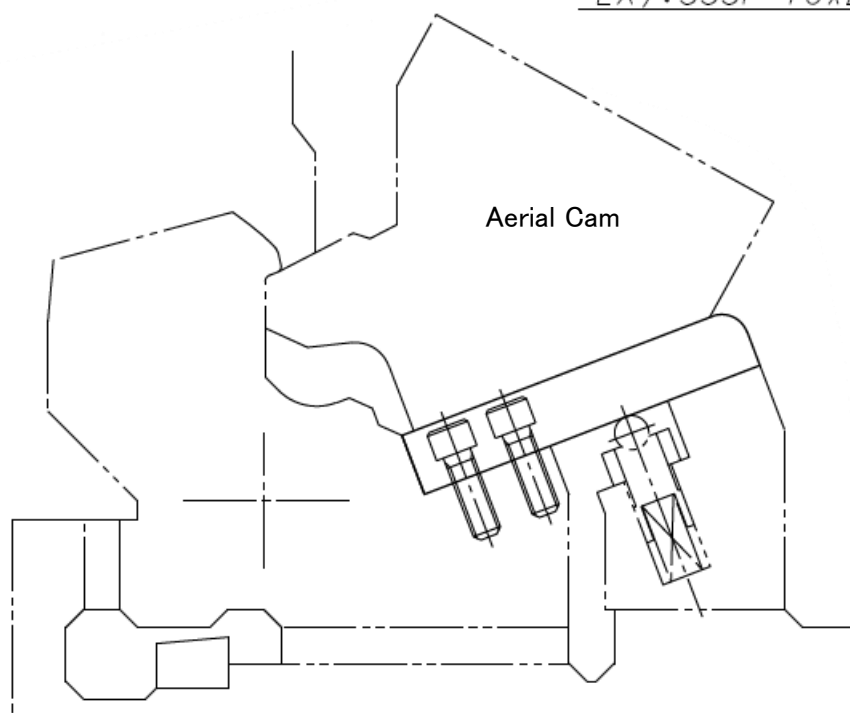
※It is not available to supply with non-standard
size.
In the unavoidable case, it is all acceptable to
be used L=(225).

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An illegal duplication prohibited.

In case of setting the swing cam, pay attention to the line of action of the force.

(2-M12 2-φ10 dowel pin holes)

Selecting the appropriate SKP2 standard because the threaded hole and locating pin hole are already processed.

Selecting from
SKP2 standard
(the other standard)

NC dowel pin holes

M20xP2.5

Bronze + Gr
CSPW

1 million times ST

$40 \times 1.96 = 78.4 (kgf)$

$10 \times 1.96 = 19.6 (kgf)$

initial pressure	ST	Final Length
10	30	60

Free Length 100

Coil spring Diagram

SWF35-100
K=1.96

Code

SDPU-100-200-30A

2019 New type (Old type was abolished)

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Line of action

Selecting from
SKP2 standard
(the other standard)
Selecting the appropriate SKP2
standard because the threaded
hole and locating pin hole are
already processed.

(2-M12 2-φ10 dowel pin holes)

NC dowel pin holes

270

90   180

70

45ST

2-φ18

30

2-φ16H7

R25

M20×P2.5

85

4-φ20

45ST

20

(30°)

(45)

4-φ13

(90)

Bronze + Gr

(150)

CSPW

100

130

40

70

1 million ST
$60×1.31=78.6(kgf)$

$15×1.31=19.65(kgf)$

initial pressure	ST	Final Length
15	45	90

Free Length 150

Coil spring Diagram
SWF35-150
K=1.31

Code
SDPU-100-260-45A

2019 New type (Old type was abolished)

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Selecting from SKP2 standard
(the other standard)

Z

$160^{\pm0.02}$ NC dowel pin holes

270

90 · 180

70

25

70ST

120

275 · 340

6-Φ20

20

6-Φ13

115

100$^{\pm0.02}$ NC

R25

2-Φ18

2-16H7

90

30

20

70ST

2-Φ16H7

40

M20xP2.5

(30°)

(45°)

190

(90)

(150)

Bronze + Gr

CSPW
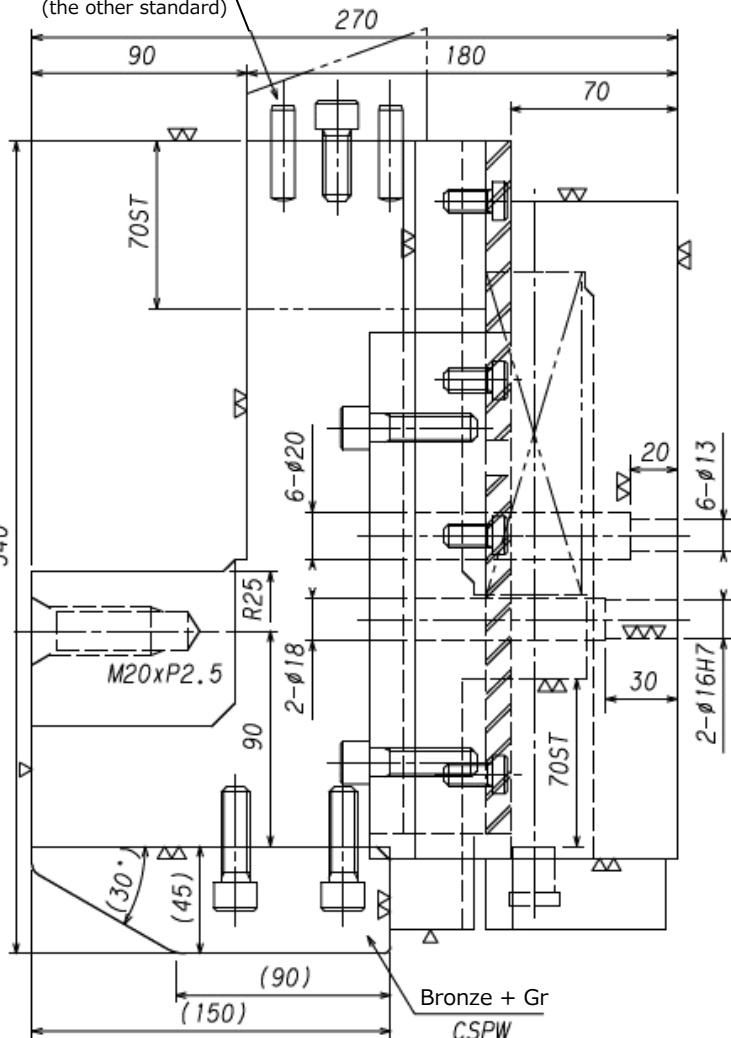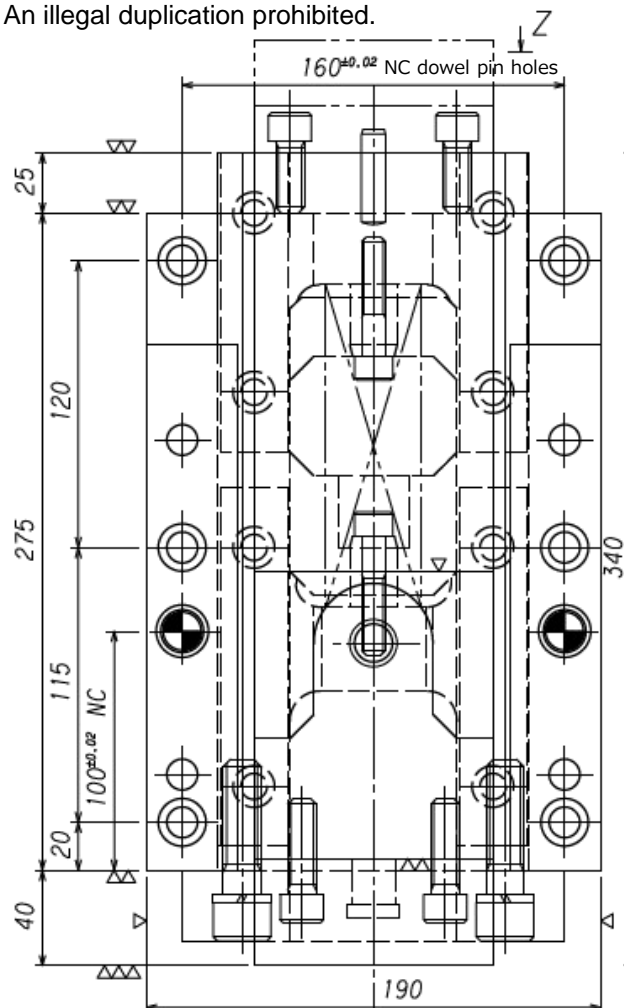
1 million times ST
$90 \times 1.14 = 102.6 (kgf)$

$20 \times 1.14 = 22.8 (kgf)$

Initial pressure	ST	Final Length
20	70	135

Free Length 225

100

130

Coil spring Diagram

SWF40-225
K=1.14
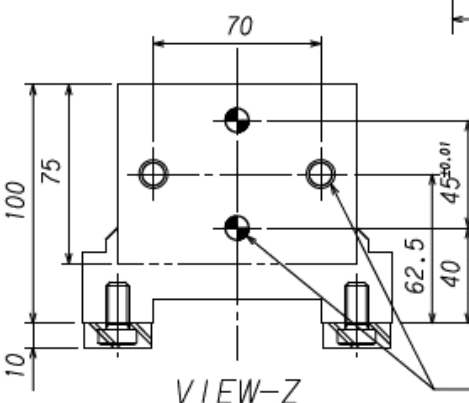
70

75

100

45$^{\pm0.01}$

62.5

40

40

10

70

VIEW-Z

Selecting the appropriate SKP2 standard because the threaded hole and locating pin hole are already processed.

(2-M12 2-Φ10 dowel pin holes)

Code

SDPU-100-340-70A

2019 New type (Old type was abolished)

This parts is licensed a patent by Your Business.
An illegal duplication prohibited.

L	100
L	150
L	200

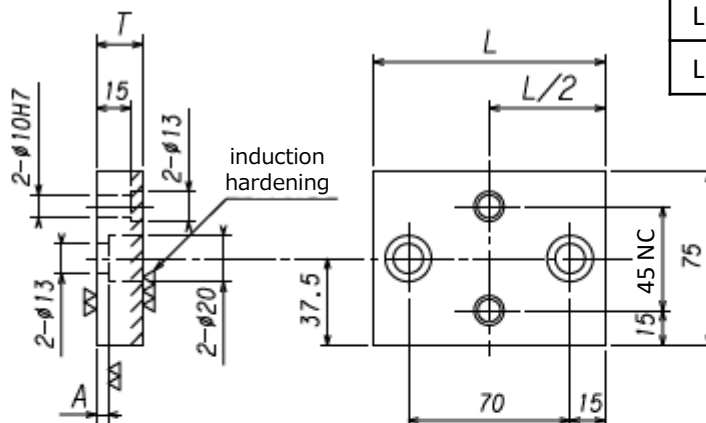| T	20	30
A	5	15

A-TYPE : for positive pressure unit
Material : ASTM 1045(JIS S45C)
Code: SKP2-A-T-75×L
EX) SKP2-A-20-75×100

induction hardening

L	100
L	150
L	200

T	20	30
A	5	15

C-TYPE : for Swing Cam
Material : ASTM 1045(JIS S45C)
Code: SKP2-C-T-75×L
EX) SKP2-C-20-75×100
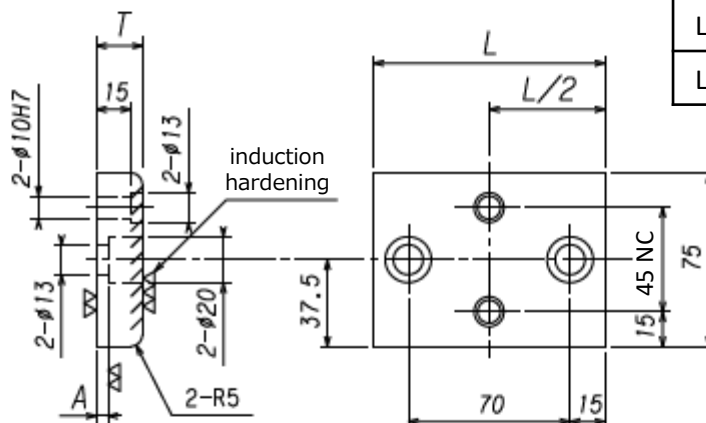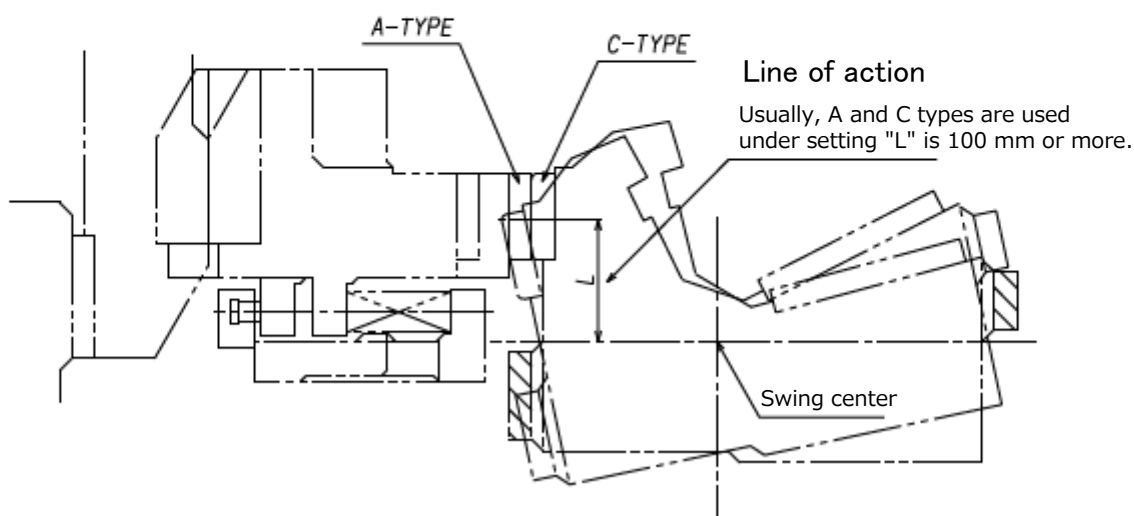
induction hardening

2-R5

A-TYPE   C-TYPE

Line of action

Usually, A and C types are used
under setting "L" is 100 mm or more.

Swing center

Usage

Your Business	New (Rev)	Date 26 Jun. 2020	Made to order	87/139

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L	100
L	150
L	200

B-TYPE:for positive pressure unit
Material : ASTM 1045(JIS S45C)
Code: SKP2-BT-T-L-α
EX) SKP2-BT-20-150-15
（T and α are optional,
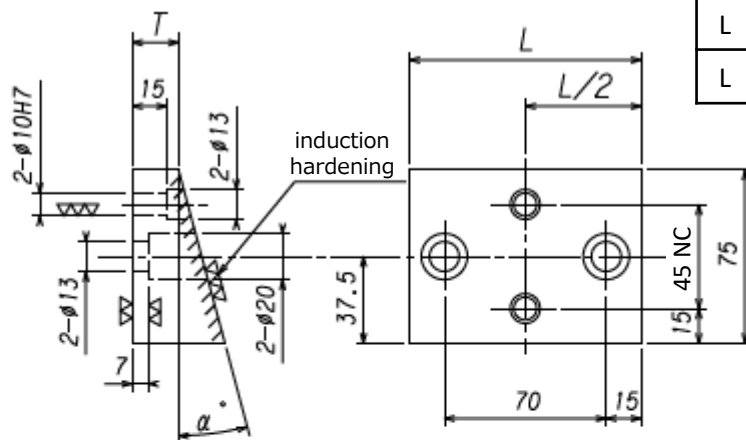 There are no stocks in this parts
  by the made-to-order.）

induction
hardening

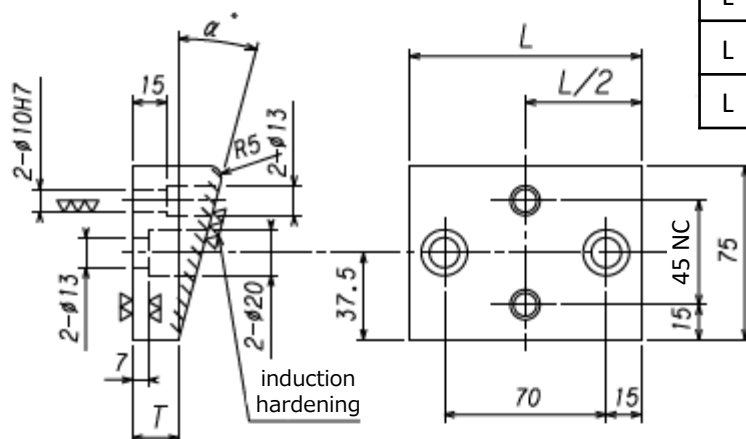| L	100
L	150
L	200

D-TYPE:for Swing Cam
Material : ASTM 1045(JIS S45C)
Code: SKP2-DT-T-L-α
EX) SKP2-DT-20-150-15
（T and α are optional,
  There are no stocks in this parts
  by the made-to-order each time.）

induction
hardening

B−TYPE   D−TYPE

Line of action

If "L" is 100 mm or less when using
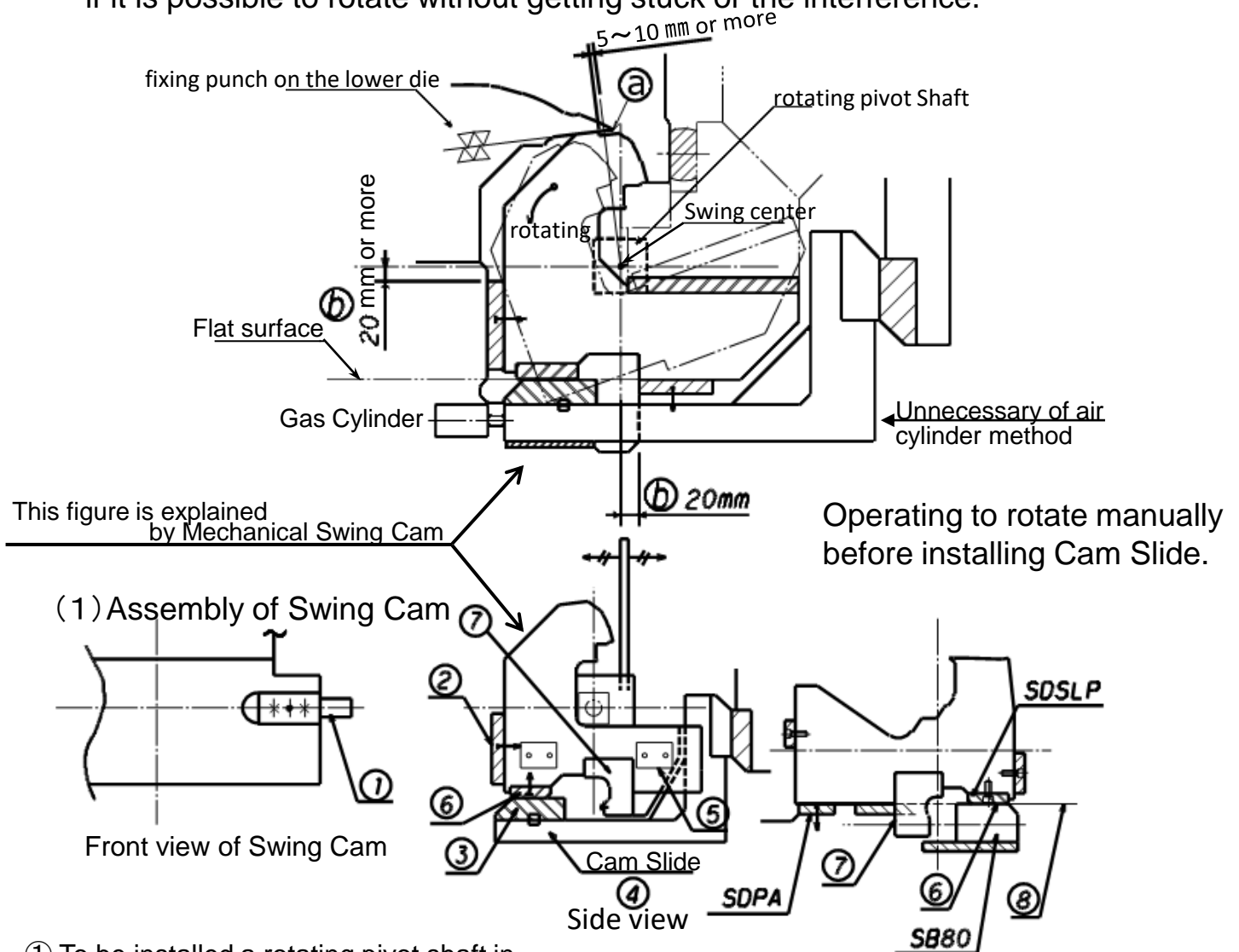A&C, use B&D instead.

Swing center
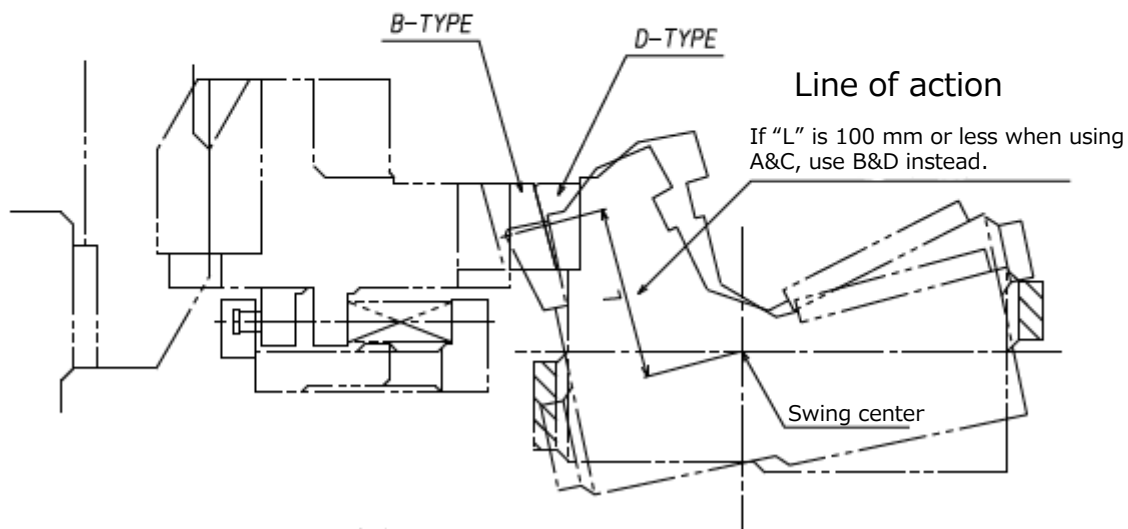
Usage

05 About assembly work and maintenance
05-01 Manual for Swing Cam assembly

Regarding the assembling procedure for Swing Cam, follow the below steps to be installed each component in Swing Cam.

It is required Swing Cam to be possible to rotate in the direction of the arrow on Figure for the purpose of pressing a panel. Therefore, it is common sense on the design the (a) portion to leave away from both the arc swing line and the right-angled surface. After forming a shaped panel, it is important to rotate the portion (a) of Swing Cam without an interference. It is required to be operated manually if it is possible to rotate without getting stuck or the interference.

5～10 ㎜ or more

fixing punch on the lower die

ⓐ

rotating pivot Shaft

Swing center

rotating

20 ㎜ or more

ⓑ

Flat surface

Gas Cylinder

Unnecessary of air cylinder method

ⓑ 20mm

This figure is explained by Mechanical Swing Cam

Operating to rotate manually before installing Cam Slide.

（1）Assembly of Swing Cam

⑦

②

SDSLP

⑥

⑤

③

Cam Slide

④

Side view

SDPA

⑦

⑥

⑧

SB80

①

⑥

Front view of Swing Cam

① To be installed a rotating pivot shaft in Swing Cam.
② To be installed SD Plate.
③ Assembling Swing Slide Plate on Cam Slide.
④ Install Cam Slide.
⑤ To be installed Slide Plate for receiving a thrust load.

⑥ To be installed SD Slide plate.
⑦ To be installed Swing Block.
⑧ To check with the flatness between the bottom surface of Swing Cam and the surface of setting SDPA together with SB80 on the lower die.

（2）Setting and adjustment for both Swing Cam and the lower die

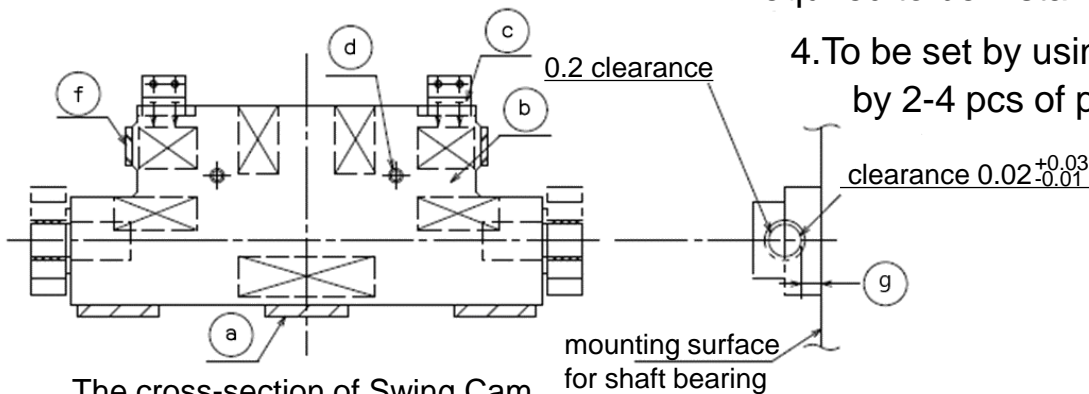This section shows the air cylinder and Slide Block method.
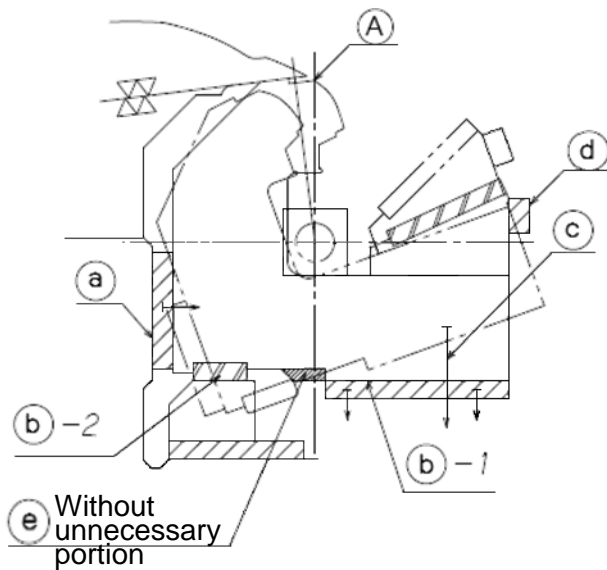
1. To be installed Swing Cam on the lower die under lifting by crane, it is required to be adjusted with "Zero fitting" by using a red lead primer for contacting with both (a) and (b).

2. In case of setting the SD Slide Plates for receiving a trust load from both left and right side, it is required to be adjusted with the clearance of (f) as a target of 0.02-0.04 mm.

3. After checking with the gap of (c), it is required to be installed SD Plate.

4. To be set by using the temporary by 2-4 pcs of pre-fixing bolts (d).

(A)
(a)
(d)
(c)
(b)-2
(b)-1
(e) Without unnecessary portion

0.2 clearance

clearance $0.02^{+0.03}_{-0.01}$

(f)
(d)
(c)
(b)
(a)
(g)

mounting surface for shaft bearing

The cross-section of Swing Cam

（3) Installation of Swing Cam Shaft Bearing

Note: In case of fitting "zero" with SD Plate, it is required to make a clearance of 0.01-0.05 mm for between the swing pivot shaft and the bottom surface of the shaft bearing.
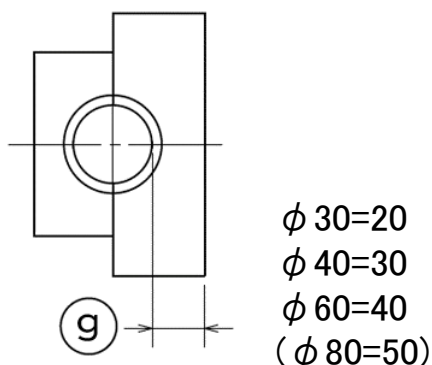
① After measuring with both the installed surface of the shaft bearing and the bottom surface of the shaft, it is required to keep the tolerance of the dimension (g) as a target of 0.01-0.05 mm. Or it is required to be adjusted by the actual fitting under using a feeler gauge 0.02 mm for fitting into.

$\phi 30=20$
$\phi 40=30$
$\phi 60=40$
$(\phi 80=50)$

(g)

Lower clearance 0.01～0.05 mm
It is required to be installed the shaft bearings not to lift up the shaft.

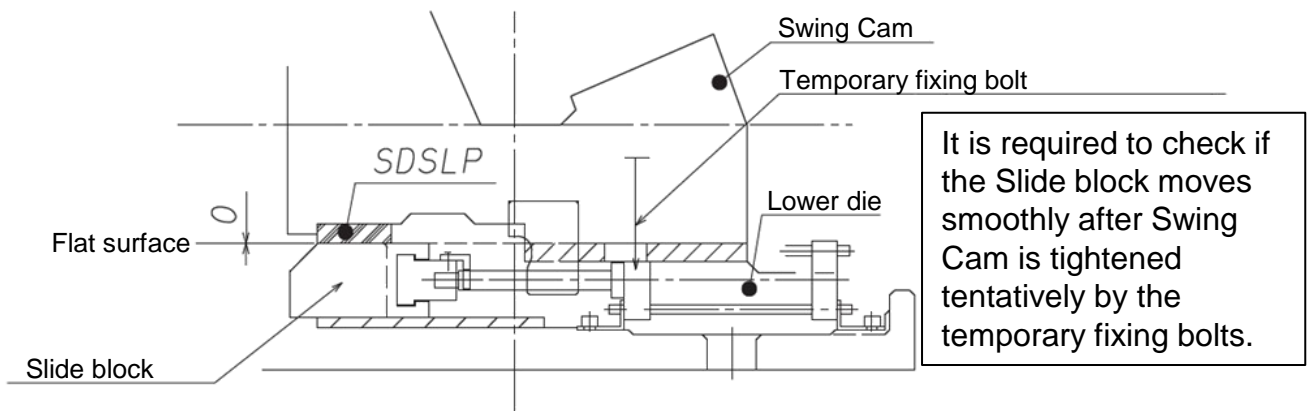（**4**）Setting with the punch on the lower die and Fitting
with Swing Cam.
(In case there is the fixed Punch on the lower die and the continuous bending.)

Machining R (distance to
Punch) with the target of
tolerance (0 / +0.05)

ⓐ A gap appears when the
Swing Cam starts to rotate.

Shape of rough
machined

The Punch on
the lower die
ⓒ

Licensed by YB

R

(10)

Lower die

reference
dimension

Flat
surface

M12

ⓓ

ⓑ

①After setting the punch on the lower die, it is
required to check the contacting with the surface
of the upper fitting surface (a).It is required to be
fitting with "zero" for the continuous bending
portion

↓
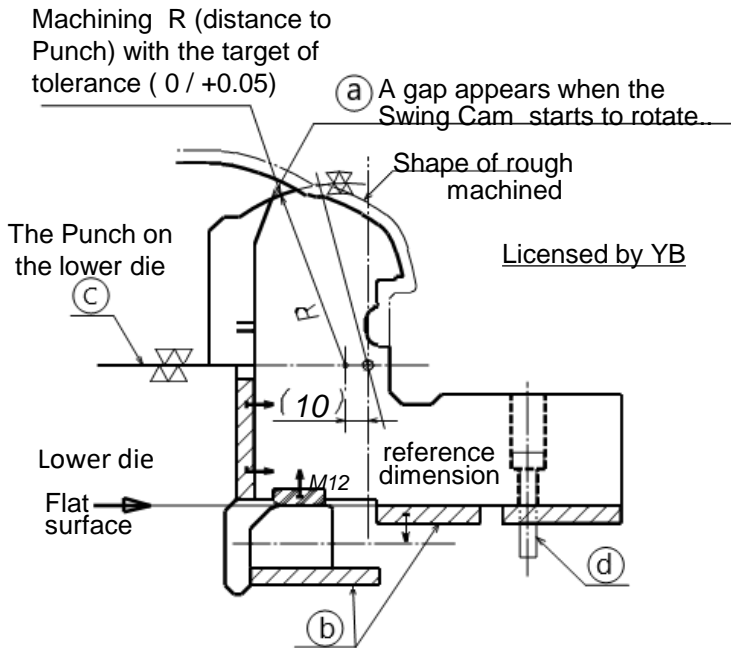
・In case of a strong impact (due to no
clearance), it is required to be adjusted on
the contacted surface by installing a shim
plate into the portion (c).

↓

・In case of a week impact (due to a sufficient
gap), it is required to be adjusted on the
contacted surface by installing a shim plate
into (b) and the installed surface for the shaft
bearing. Or it is required to be machined on
the surface of (c).

（5）Slide block type for Swing Cam

Swing Cam

Temporary fixing bolt

SDSLP

Lower die

Flat surface

Slide block

It is required to check if
the Slide block moves
smoothly after Swing
Cam is tightened
tentatively by the
temporary fixing bolts.

① To check with the flatness of the bottom surface for Swing Cam.
② To check with the flatness of both the upper surface of the Slide block and the upper
surface of SD plate on the lower die.
③ To make a final check about the contacted surface by using a red lead primer.

Check the flatness

M12 fixing Bolt

Check the
deviation flatness
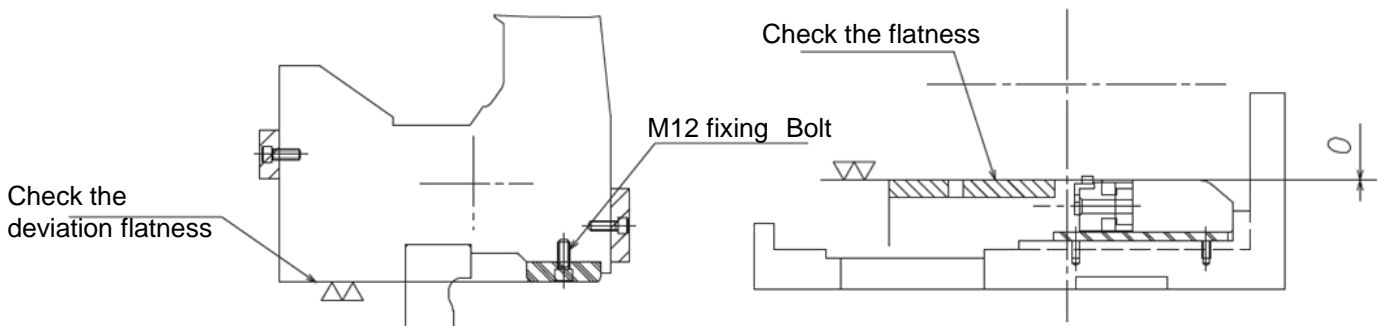
(6) To check the movement of air cylinder to be operated manually
   if at all possible after assembled Swing Cam with "zero" fitting

① To check movement for Swing Cam.

② To check if the returned position is not
   changed and if the clearance for the left
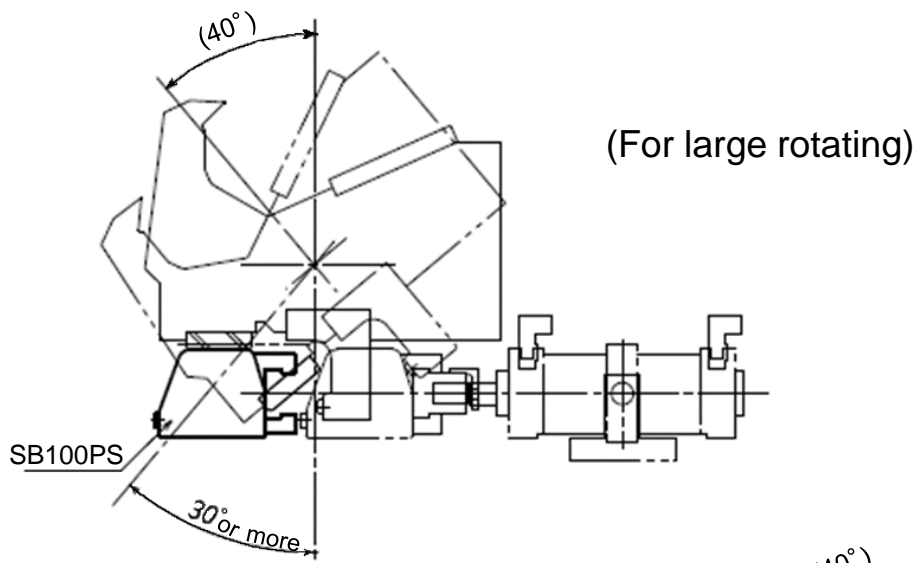   and right is appropriate after the movement.

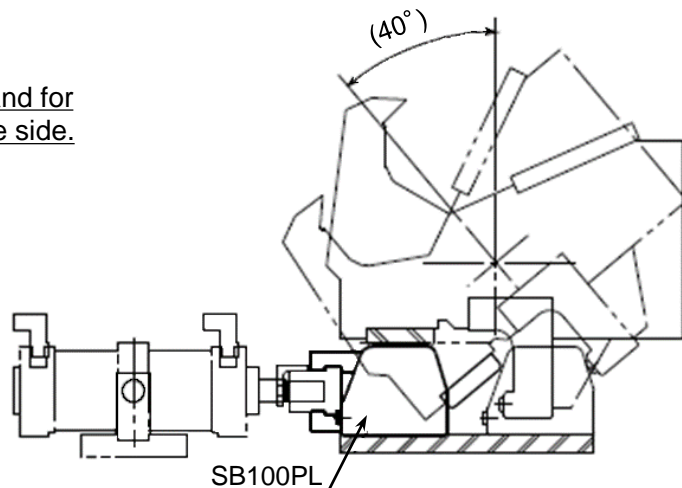   Note: To be machined finally by 3D copying

Before a shaped machining

20

Air cylinder method
or Cam slide method
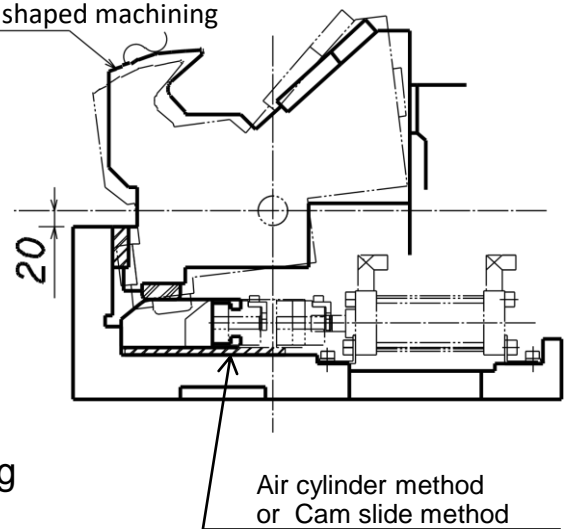
(7) To start 3D shaped machining after checking
   the movement.

(8) Example of usage for SB100.

(40°)

(For large rotating)

SB100PS

30° or more

In case of setting for large rotating and for
installing air cylinder on the opposite side.

(40°)

SB100PL

Notice:

(1) To check the rotating for Swing Cam.

   The reason why it is considered a factor that it is not operated Swing Cam to move smoothly.

    ①In case of the prevention of a rotating for Swing Cam by the interference of the unnecessary casting (ⓔ area of (2) on page 2/5). It is required to be adjusted without the contacted surface in the rotating direction on the front side of the right-angle line between the each contacted comer and the swing rotating pivot.
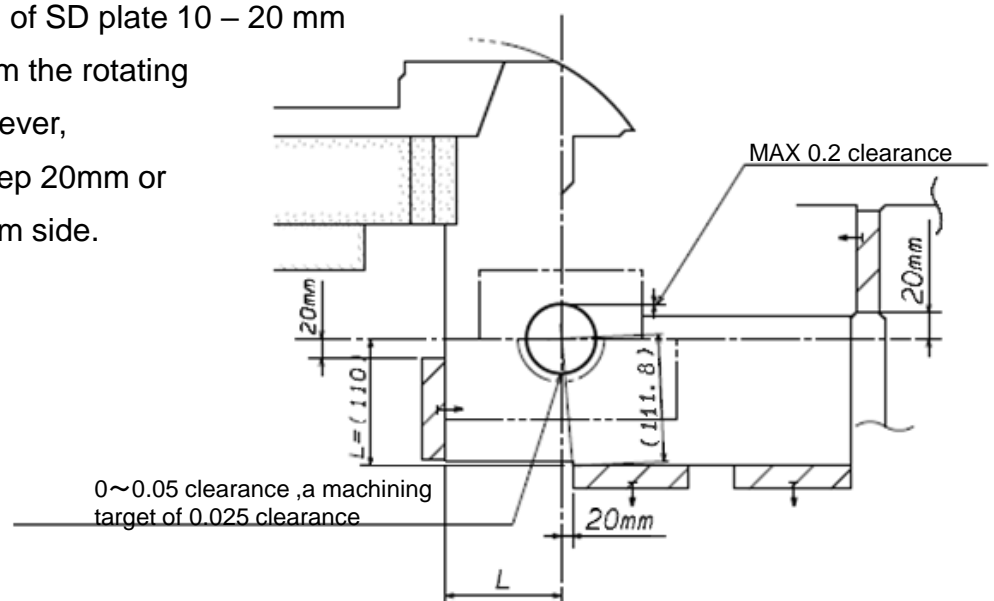
Upper block

0.2~0.15 clearance

0~0.05 clearance
a machining target of
0.025 clearance
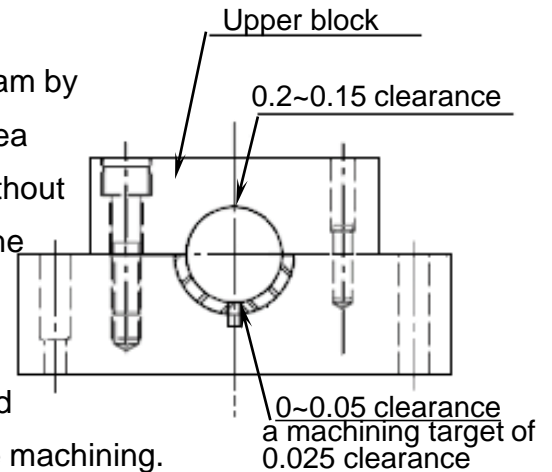
    ②In case that the rotating pivot shaft is much slipped in the left and right side according to the defective machining.

    ③To check with the clearance between Swing Cam rotating pivot shaft and bearing for setting. (within 0 – 0.05 mm) under the condition of 0 fitting for SD plate.

    ④To check the relief cutting portion (A) as shown page 2/5.

(2) Progressing load on the rotating pivot shaft because of a defective installation of Swing Cam. The rotating pivot shaft for Swing Cam is all designed for a swing movement instead of receiving a progressing load. Therefore, it is required never to be applied the progressing load on the rotating pivot shaft and the shaft bearing.

(3) Installing instructions for both Swing Cam rotating pivot shaft and shaft bearing.

   The clearance for Installing both Swing Cam rotating pivot shaft and shaft bearing and the installation for SD plate-related.

   To keep a location of SD plate 10 – 20 mm or more away from the rotating pivot center. However, it is required to keep 20mm or more for the bottom side.

MAX 0.2 clearance

20mm

20mm

L=(110)

(111.8)

0~0.05 clearance ,a machining target of 0.025 clearance

20mm

L

05-02 Cautionary points for Manufacturing of Swing Cam and Regular Maintenance

1.About Durability

The reason why it is considered to cause the damage on Swing Cam is as follows.
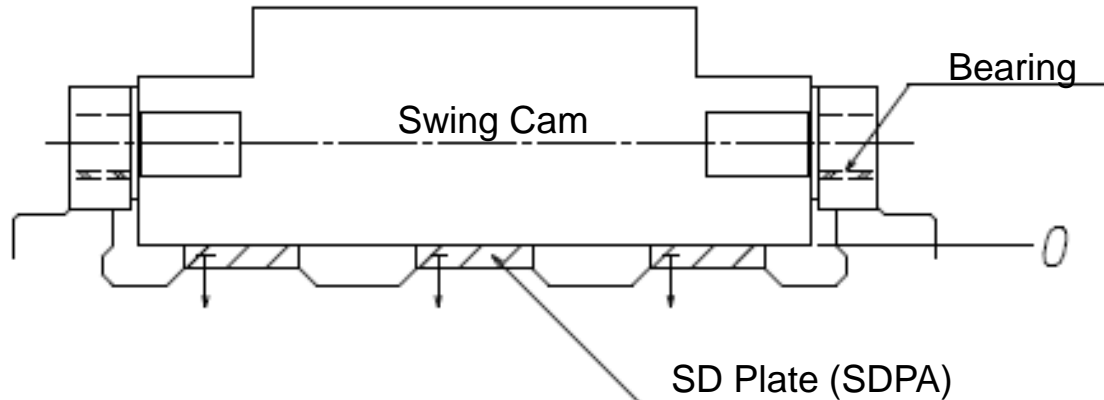
① Damaged on Swing rotating pivot shaft

In case of setting for both SD Plate and Swing Cam with sufficient clearance, it caused a damage in a situation to be lifted the both rotating pivot shafts for Swing Cam according to the load on swing rotating pivot shaft by a progressing force. Therefore, it is required to be used with a shim plate for SD Plate or with lifting the rotating pivot shaft.

② A malfunction for air cylinder or a rotating trouble

In case of loosening each bolt or the fall of a component.
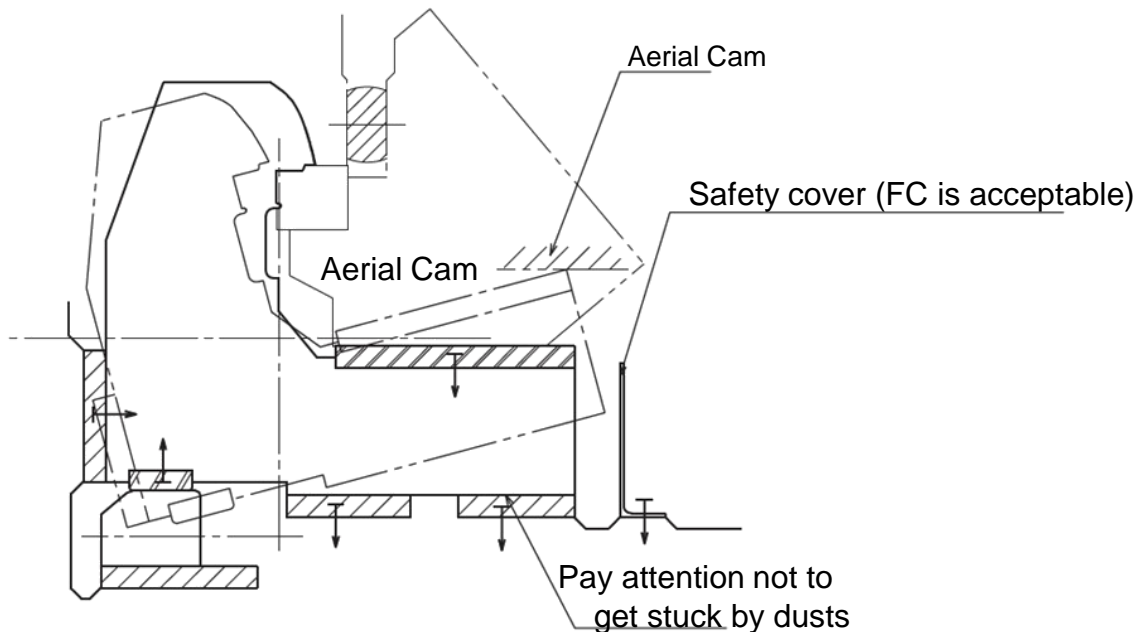Accumulating a grease on SD Plate,
Swing Cam gets hard to move.
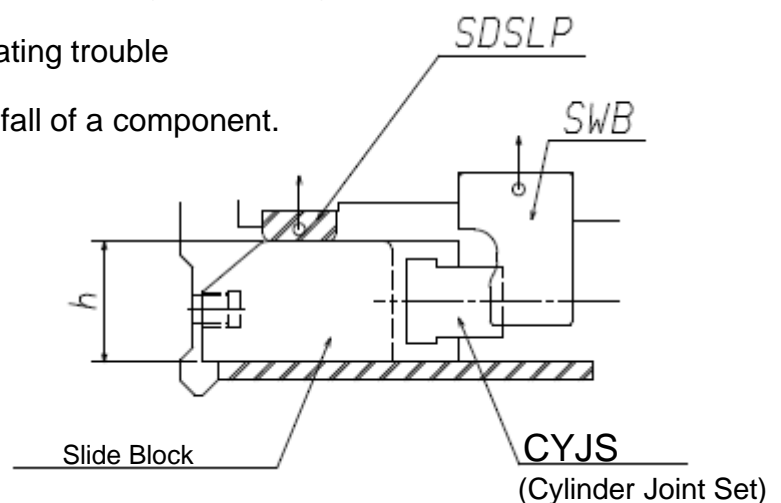
③ Loosening and abrasion for each components of Swing Cam

It is particularly cautioned about the loosening for the fixing portion of SD Slide Plate (SDSLP) and Swing Block (SWB). Also, in case of getting a large clearance of the height (h) because of the abrasion under moving the Slide Block, it is required to be adjusted with using a shim plate for the bottom surface of the slide plate. Regarding Slide Block, it is required to check to move smoothly by the temporary fixed Swing Cam.
Check with the joint portion for damage.

2. Notice during producing a panel

①It is required definitely to avoid the method of a positive return for the termination by a pressing machine under the condition of rotating Swing Cam by air cylinder. It may be the cause of the damage for Slide Block, Swing Block and air cylinder, etc.

Aerial Cam

Safety cover (FC is acceptable)

Aerial Cam

Pay attention not to get stuck by dusts

②Pay attention not to get stuck by dusts between the lower die and SD Plate.
It is required to pay attention not to get stuck by dusts not only during producing the panels, but for the maintenance of the die. It is required to be taken a measure of the installed safety cover and cleaning up on the SD Plates.
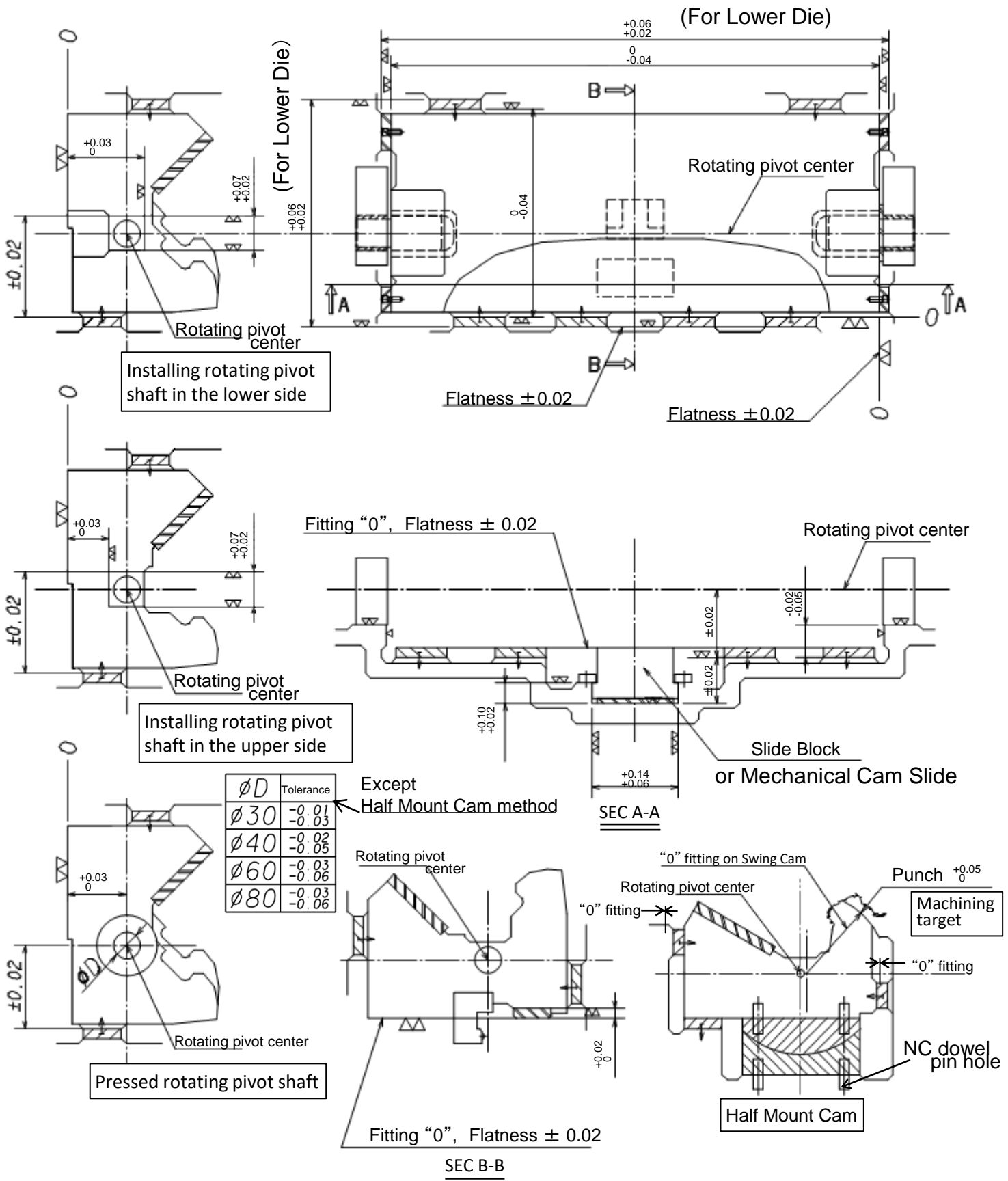
3. Maintenance

① In case of assembling the die, it is all required to apply a grease on both the bearing and the sliding portion for receiving a trust load. In case of disassembly cleaning the die, it is required to work in the same way.

② Although it is required to maintain for the usual portion of the die in the same way, it is required specially to check with the tightening condition of SDSLP, SD Plate and Tapper Block behind SWB by the fixing bolts in case of disassembling the die.

③ It is required regularly to check with the tightening condition of the fixing bolts and maintain in 2,000 shots or more of a production once per 6 months for the first 2 years and once a year for 2 years after.

4. Preparation of Spare Parts

It is recommended to keep a stock of each 2 pcs for Swing Cam Bearing set, rotating pivot shaft and Swing Block, etc. It is required to be considered about the other components depending on the components list which are used in the plants.

As shown in figure standard tolerances for designing the Swing Cam due to without any trouble.
Please be sure to comply with these tolerances. (NOTE: Stricter tolerances are acceptable.)

(For Lower Die)

(For Lower Die)

Rotating pivot center

Installing rotating pivot shaft in the lower side

Rotating pivot center

Flatness ±0.02

Flatness ±0.02

Installing rotating pivot shaft in the upper side

Fitting "0", Flatness ± 0.02

Rotating pivot center

Slide Block or Mechanical Cam Slide

SEC A-A

ØD	Tolerance
Ø30	-0.01 / -0.03
Ø40	-0.02 / -0.05
Ø60	-0.03 / -0.06
Ø80	-0.03 / -0.06

Except Half Mount Cam method

Pressed rotating pivot shaft

Rotating pivot center

Rotating pivot center

"0" fitting on Swing Cam

Rotating pivot center

"0" fitting

Punch $^{+0.05}_{0}$

Machining target

"0" fitting

NC dowel pin hole

Half Mount Cam

Fitting "0", Flatness ± 0.02

SEC B-B

05-04 Machining and assembly work standard for Half Mount Cam

・It is the method to be designed compactly the die for the inversed forming die by using both Half Mount Cam A and B. In case of a bad processing of assembly and no accuracy of machining, it may be the cause of the damage. it is required absolutely to follow the procedure for the assembly of Half Mount Cam.
　Additionally, it is not allowed in principle to be used by the combination of Slide Block type and Half Mount Cam type into the same swing structure.
　On the condition of the completed whole machining (including NC dowel pin holes) before assembling stage, it is required to follow the assembly work standard as follows.

[About machining]

1, Regarding machining for NC dowel holes on the Swing Cam side, it is required to be machined with±0.02 mm from the reference plane (L1) behind Swing Cam structure.

2, Regarding NC machining for the dowel holes on the lower die side, it is required to be machined with from the contact surface of the SDPA plate as a reference for Swing Cam.

◎Note： For reference purpose only, it is required to be based on the center of Half Mount Cam A and B

Fig.1

[About assembly]

1, It is required to check the setting height for both the upper plate A and the Lower plate B of Half Mount Cam.
　In case of using the multiple q'ty of Half Mount Cams, it is required to check with each setting height of them.

Fig.2

2, It is required to check the flatness of assembled surface on both the Swing Cam side and the lower die side. In case of appearing the steps of Machining on the assembled portion of the die, it is required to be modified smoothly.

3, It is required to check the machining steps h2 on SD Plate (SDPA) behind of the Half Mount Cam, and then to check the 20 mm thickness h1 of SDPA. In case of Swing Cam placing horizontally, it is required to check no appearance of machining steps.
　However, in case of appearance of machining steps, it is required to be adjusted the SD Plate (SDPA) by installing a shim plate.
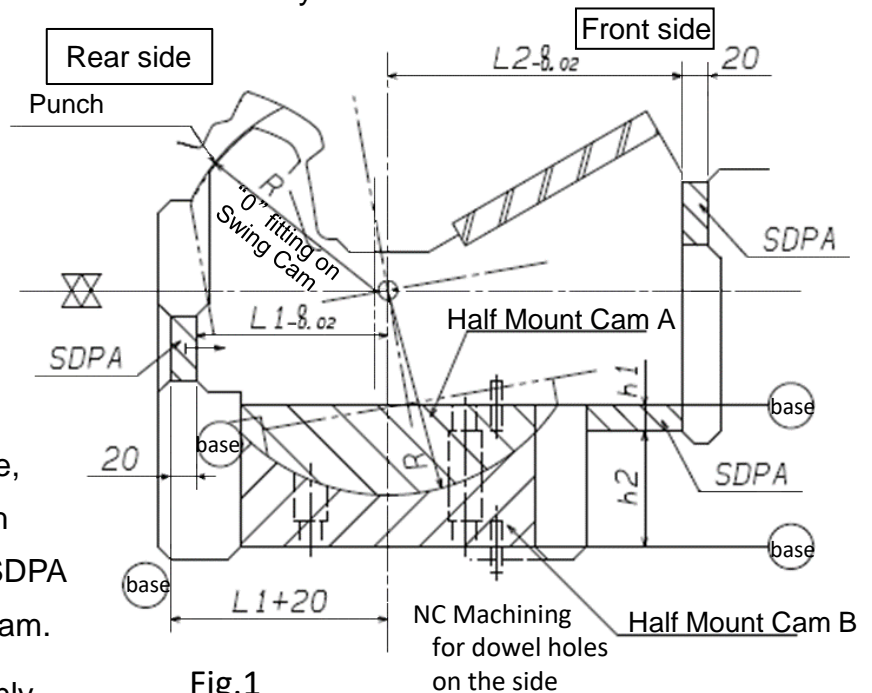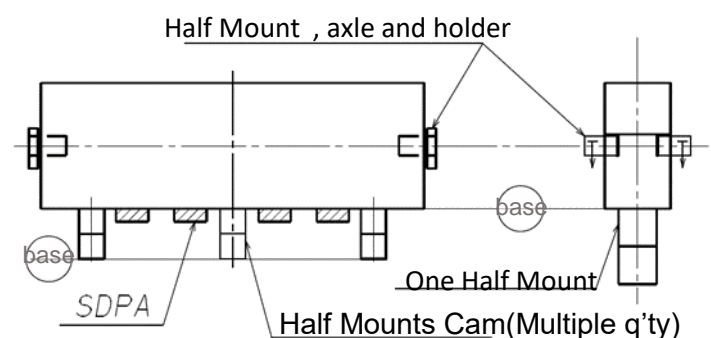
4, Install the Half Mount Cam (A) and (B) with NC dowel pins and fixing bolts.

5, It is required to check the following procedure to make a position of the center for both the rotating structure A and the lower die B.
   1) To check with the distance of L1(NC) from the installing surface for SDPA behind of the lower die.
   2) To check with the rotating center of L2(NC) for Swing Cam.
   3) To check with the clearance of SDPA (t = 20.00 – 20.02 mm).
   4) Check the thickness (t = 20 mm) and the dimensions of SDPA plate to be installed and confirm whether to insert the shim plate or to be machined.

6, It is required to be set the rotating Swing Cam structure (the assembled swing structure) on the Half Mount Cam B side (which is marked with a red color on the surface) with lifting by a crane.
   1) To check with the setting condition (to check with the clearance and mounting surface and height for installing of SDPA).
   2) To be installed SD Plate.
   3) To check with a rotating Swing Cam structure by the manual operation As much as possible.
   4) To check with the condition of the portion which is marked a red color and to be adjusted if it is not accepted.

7, It is required to check about the clearance (20 mm) in front and back for Swing Cam structure. In case of the insufficient clearance against 20 mm, it is required to be adjusted by using a shim plate. Or in case of the over clearance against 20 mm, it is required to be adjusted to machine on SDPA. Then to be installed SDPA on the correct location.

8, It is required to check with a rotating Swing Cam structure by manual operation.
(by using a lever) Basically, the position of Swing Cam structure is decided by the R-slide portion of Half Mount Cam.

9, In case of no trouble on the above checking method after the adjusting repeatedly, it is required to be assembled with an air cylinder and to check a rotating condition by using air.

10, It is required to be proceeded the shaped machining after fixing Swing Cam by the temporary fixing bolts.

11, Half Mount Cam method, regarding the axle and bearing on the both side of this structure.
   1) In this method, the concept of the axle and bearing is simply to prevent the suspended tooling die from falling down in case of its reversing.
   2) Therefore, neither the axle nor the bearing slide, and the shape allows the clearance to be set with the standard products.

12, In case of installing multiple Half Mount Cams, the dowel pin on the upper and lower of Half Mount Cams on the center side may be eliminated as the master setting the both sides.

06 Design standard for Swing Cam

06-01 The way of thinking & the important notice for Swing Cam's design

1.The foundation of a basic way of thinking for Swing Cam (Fig.1)
(In case of the design of Swing Cam for the first time, please read this manual carefully.)

1) Swing Cam's rotating and the SD Plate

It is the reason why the Swing Cam is able to rotate in the direction of The arrow of rotating in the right of Fig.1 by the principal of rotating which is provided the contacted surface in the rotating direction with respect to the perpendicular line on the crosshair from the center of the swing rotating pivot. Especially, regarding the contacted surface on the bottom side of Swing Cam, it is recommended to make 20 mm clearance from the crossing line and make a relief cut to avoid interference with the SD Plate.
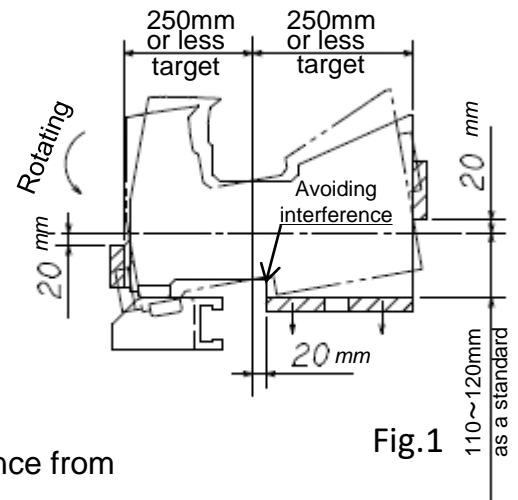
Fig.1

2. The stopping structure of rotating for Swing Cam (Fig.2-7)

It is possible to be taken out the panel by the rotation of Swing Cam, which also means there is a weak point to be easy to rotate. Therefore, it is very important point on the design of Swing Cam's structure to control the rotating by PAD holding force or the processing force. This is the feature of Swing Cam, which has a several mechanisms to stop its rotation by the processing force.

1) Slide Block Type

This structure of Fig.2 is shown the both SD Slide Plate (SDSLP) and Slide Block (SB) are forced by the PAD holding or by the processing From the back side of Swing Cam. Rotating Swing Cam : By L (the distance from rotating pivot) x Line of Action x Working force by Air Cylinder.
It is recommended to be installed the sliding surface of SDSLP with 30 degree or more outside from the rotating pivot.
Otherwise since the rotating force is increasing by the frictional resistance, it is necessary to be cautioned about the problem which cannot be removed Slide Block.
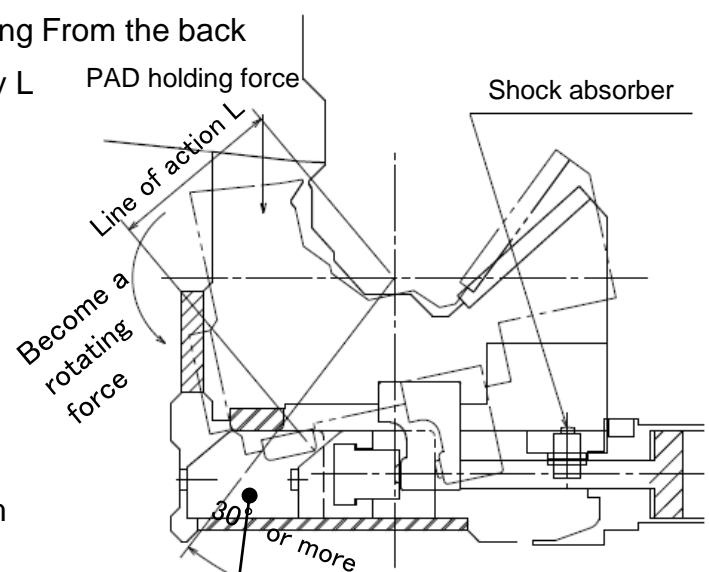

In case of the large Swing distance, it is absolutely necessary to be installed the SD Urethane Stopper and also consider to be installed the Shock Absorber against an impact force.

Fig.2

In case of the larger angle of Swing, it is necessary to use SB100PL or 100PS Slide Block.

This structure (as Fig.3) is shown the Slide Block is forced by the PAD holding and by the processing from the front side of Swing Cam. <u>The sliding surface of Slide Block should be at least 30 degrees away from rotating pivot as a positional relationship.</u>

Fig.3
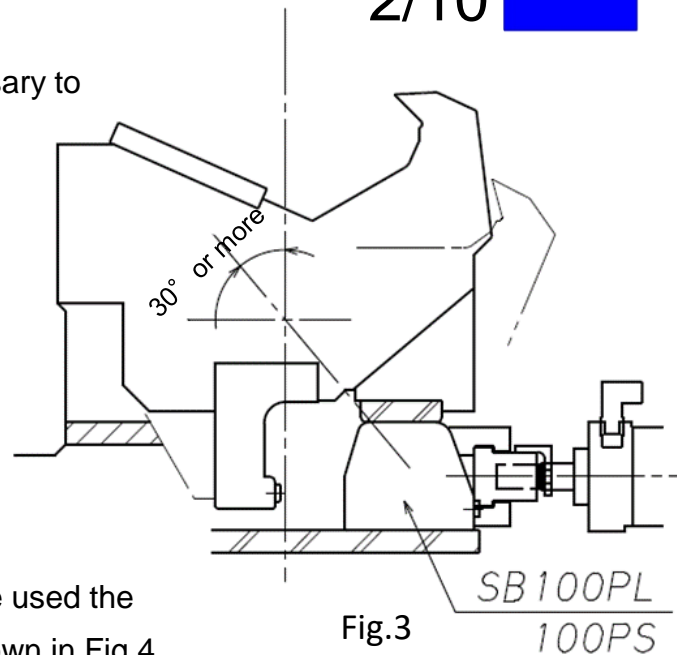
2) Swing Cam Positive return unit Type

It is the most reliable and effective method to be used the Swing Cam Positive Return Unit (SDPU) as shown in Fig.4, which is used for the purpose of a Positive Return for Swing Cam and a receiver of trust load. We are available three strokes of 30, 45 and 70, which are also used for the method of taking a mechanical timing with a combination together with Swing Cam. For example, this structure is used for connecting of Swing Cams on the tooling die of body side outer or the larger Swing Cam (like 2 m – 4 m length). It is necessary to select the type of SKP2 which are Assembled on SDPU for keeping a distance (target over 120 mm) from the line of action.

Two or more of SDPA installations in the back side for a backup

Fig.4
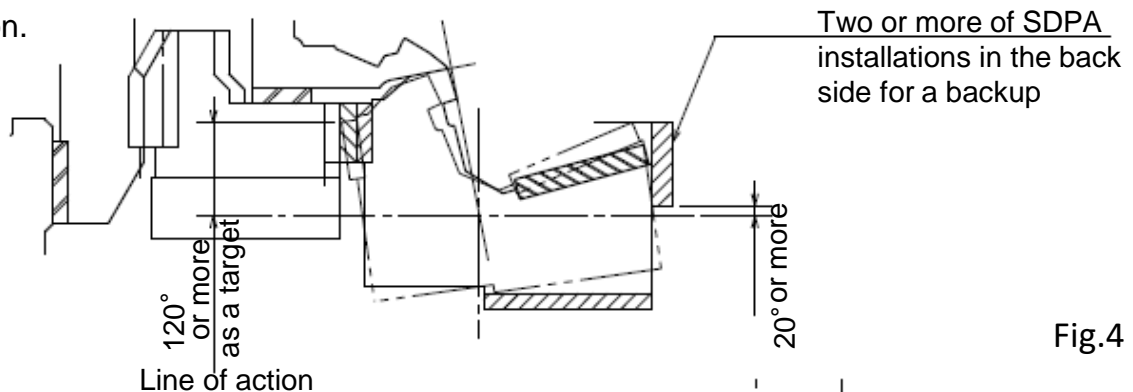
3) SD dwelling plate Type

It is the method to be used dwelling lower plate (SDWL) or SD dwelling plate (SDWPS) as shown in Fig.5. This dwelling structure is directly installed on the upper die, it is necessary to consider if the structure will be possible or not according to both the swing amount and the installed position.

Dwelling

Line of action

Fig.5

The center of the slides must be 30° or more
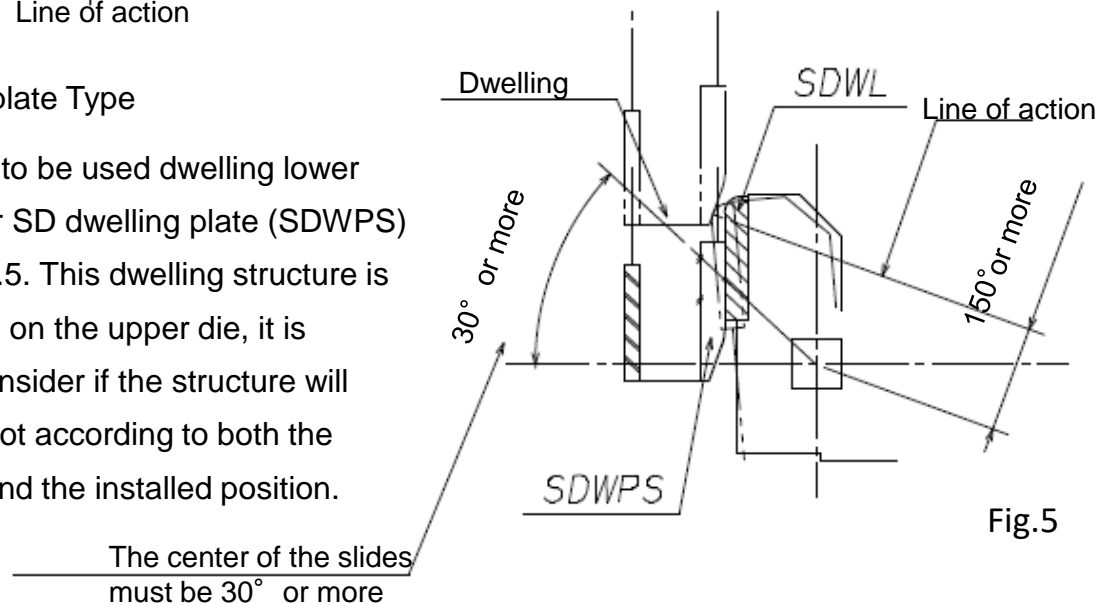
4) Another supporting option of receiving a thrust load and another option
of dwelling structure for a positive termination (as shown in Fig.6.)

It is the optional supporting method to be forced
by the processing of Swing Cam. Or it is the
method to be used as the positive termination
of swing. After the swing has completed by
using the method of 2) 3), or by using the
other mechanical method, the smaller surface
of stopper plate L contacts with Swing Cam.
It is necessary to be cautioned about the
interference with this protruding structure on
the upper die in case of using this method.
Although the Swing distance is larger than usual, the rotating pivot should be
installed upper side as possible as you can.

(A) Another supporting option of receiving a thrust load.

(B) Another option of dwelling structure for a positive termination.
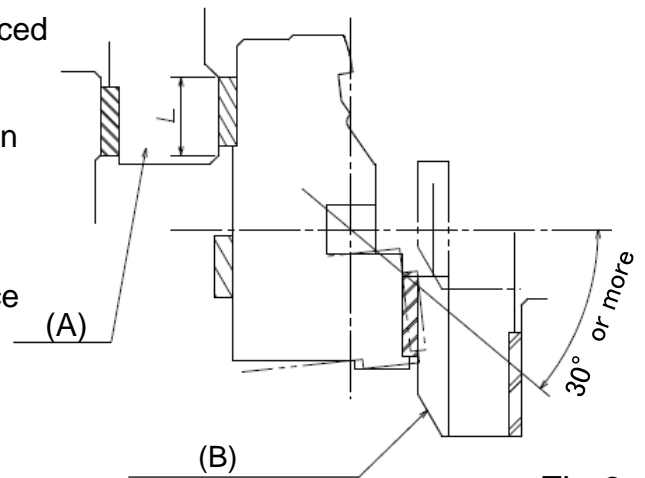
Fig.6

**3.The method for positioning both the Swing rotating
pivot and the bearing. (as shown in Fig.8-10)**

Considering with each section of Swing structure, it is
necessary to make a position not to be interfere both
the upper lifting panel and forming flanged panel.
Regarding L dimension, it is positioned by both bearing
type and the die structures. (as shown in Fig.7)

① Swing rotating pivot

For example, it is the following the length of Swing Cam.

200 or less   φ30
200-600   φ40
600 or more   φ60
1,600 or more, or for Mass-production   φ80

250 mm or less as a target

Fig.7

② Selecting of Swing rotating pivot

Considering the strength of Swing Cam, it is
necessary to use the compact size or the driving
type for small rotating pivot. Although it is prioritized
to be installed the rotating pivot on the side or the lower side, it is also possible
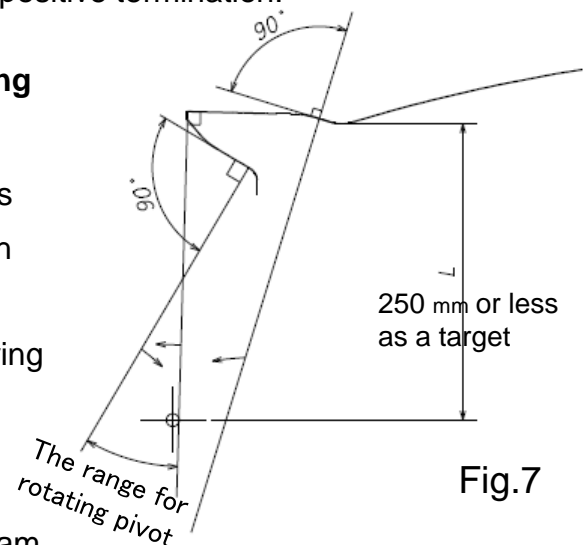to be installed it on upper side in case of no enough casting of mounted area.

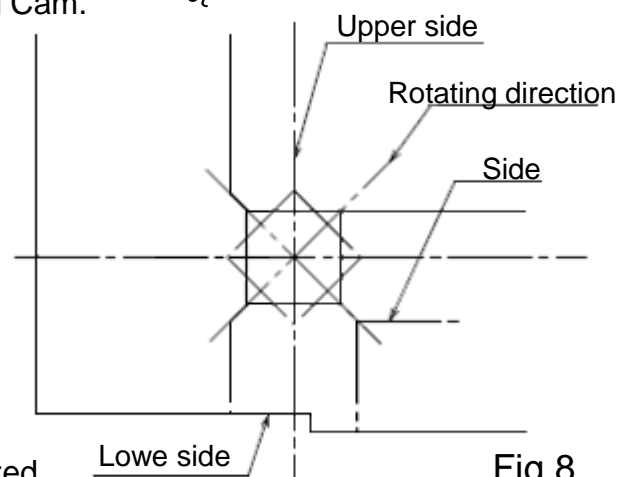Upper side

Rotating direction

Side

Lowe side

Fig.8

③ A design for Half Mount Cam

It is the following cases to be used Half Mount Cam, but please note it is necessary to avoid to use this structure together with the combination of a slide block type.

1) It is a compact structure of Swing Cam according to be installed the rotating pivot into the panel and in about 100 mm in front side of it without using a Slide Block.

2) In case of using small Swing Cam into the double Swing Cam's structure.

3) It is a high loading structure with more 20 times than FC material by using the sliding surface which is made of bronze material instead of the Rotary Cam unit.

About 90°
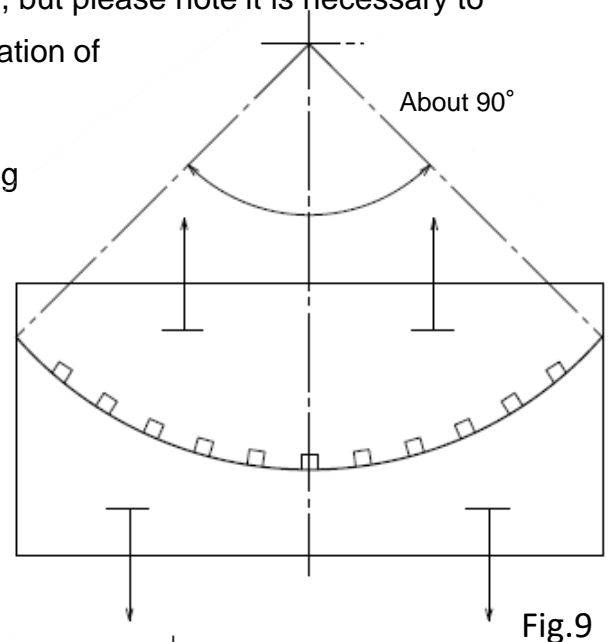
Fig.9

4. Installation of taper block (as shown in Fig.10)

It is the method to be installed a taper block at the original home position of Swing Cam, which is received the trust load from Cam driver and from the processing force by Swing Cam. It is the necessary to keep the principal of rotating side which is provided the contacted surface in the rotating direction with respect to the perpendicular line on the crosshair from the center of the Swing rotating pivot. (this method is not often used because it is difficult to adjust a surface to surface.)

Fig.10

10 mm or more

10 mm or more
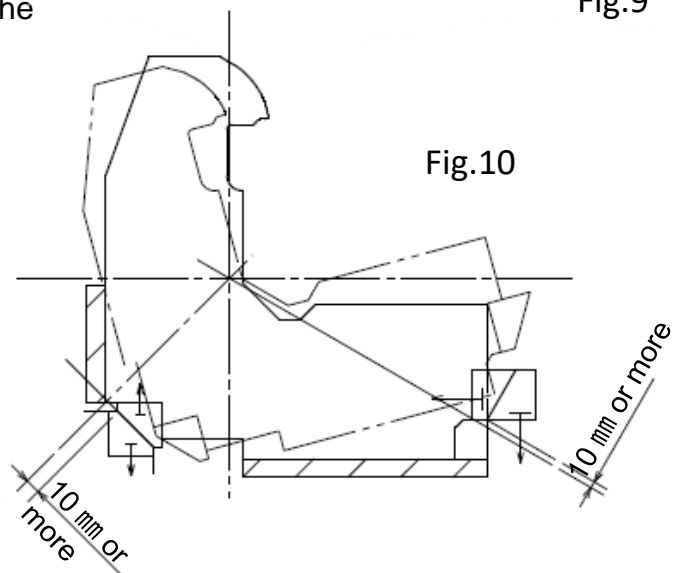
5. The rotating device for Swing Cam (Power source) (as shown in Fig.12 -15)

It is obtained the moment (M) to be loaded on Swing Cam by a multiplying The own weight (m) of Swing Cam and the center of gravity (J).

M=Jxm   M: weight moment

In principal, it is recommended to be installed the center of gravity position (J) and kept a balance near the center of rotating, which should be off within ±30 mm as a target.

Rotating center

target 110 ~120 mm

Rotation

J

weight (m)

250 mm or less as a target

250 mm or less as a target
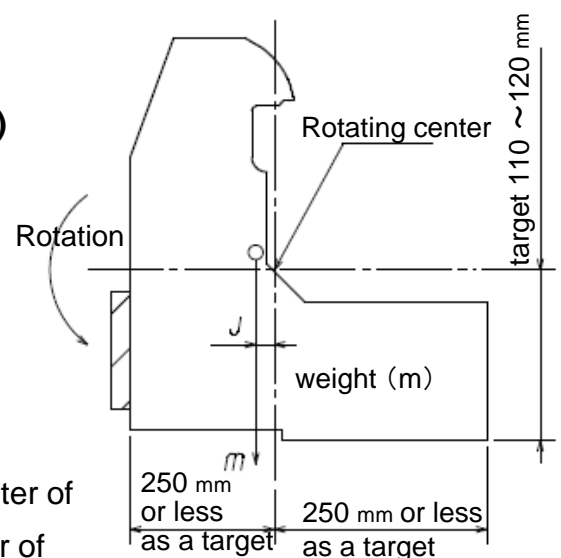
1) Air Cylinder type

It is the most efficient method to be used a Slide Block and a Swing Block, which is operated by the reciprocating movement of Air Cylinder. (as shown in Fig.12)
The air cylinder is adopted to all types of center trunnion (as Air cylinder with a Shock absorber).
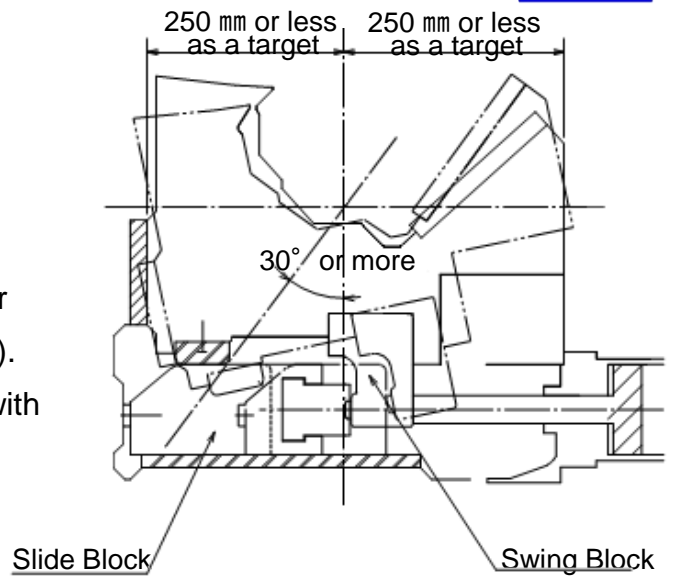It is recommended to be adjusted Air cylinder with a keeping stroke of the extra push and pull.

It is the method to be used a Joint stroke block and a Knuckle bracket, which is possible to be adjusted with all taking down Swing Cam from upper direction. (as shown in Fig.13)
Since the stroke of air cylinder is small and this is link type, it is unlikely to occur any moving malfunction. However, since it is not the mechanism to stop its rotating, it is necessary to use together with another stopping method.
It is recommended to be adjusted Air cylinder with a keeping stroke of the extra push and pull. Since this mechanism is operated by the line contact with the pin, it should not be loaded with a large force. It is necessary to be cautioned about a keeping L dimension (over 200mm).
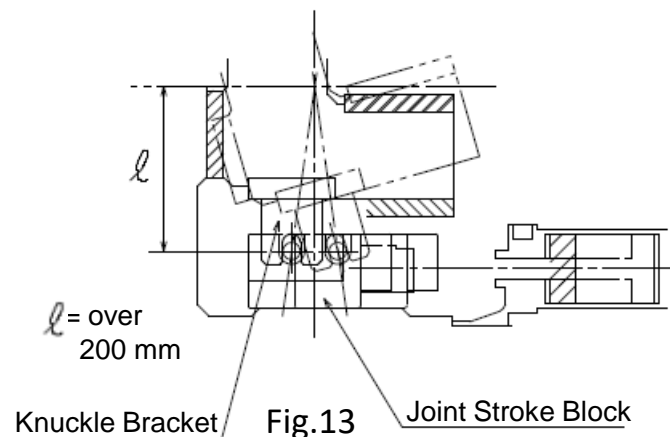
It is described in case of using a Half Mount Cam. (as shown in Fig.14)
In this case, it is the principal to be installed the Stopper Plate on the upper side of air cylinder from the air cylinder's side.

250 mm or less as a target | 250 mm or less as a target

30° or more

Slide Block   Swing Block

Fig.12

ℓ

ℓ = over 200 mm

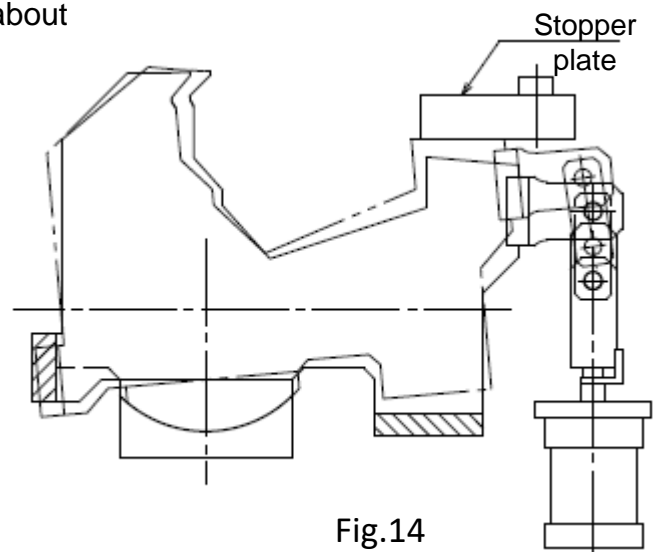Knuckle Bracket   Fig.13   Joint Stroke Block

Stopper plate

Fig.14

2) Lift Pin type (without air cylinder)

It is basic method to be used Half Mount Cam instead of using air cylinder. It is necessary to be installed the Lift Pin which is positioned the distance(L) far from the rotating pivot. (as shown in Fig.15) In this case, it should be required to make a positive return plates set which are adjusted on the center or the both ends of Swing Cam. Also, the distance A (between the rotating axle and the forming portion) are target to keep as B=2A or more.

Positive return plate sets for the termination

B ≧2A

Fig.15
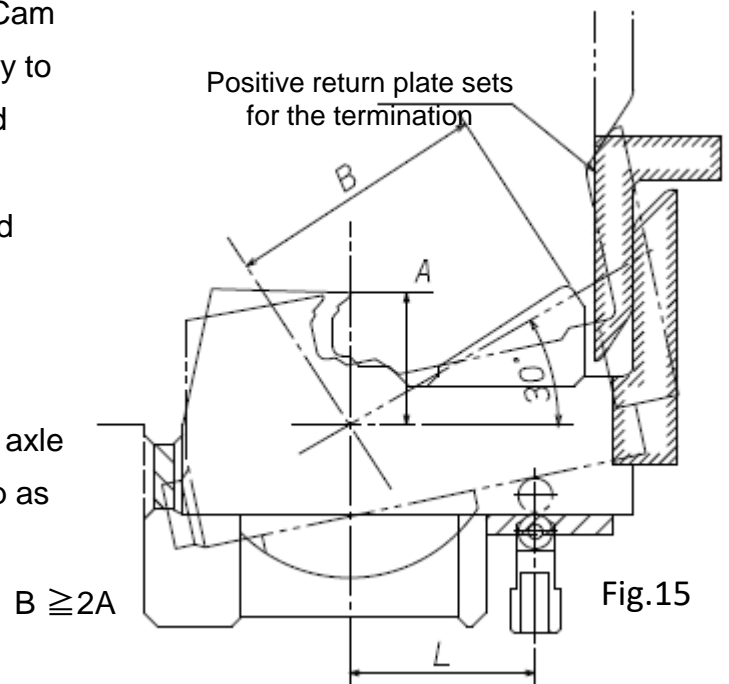
6. The trust receiver for Swing Cam (as shown in Fig.16-17)

The SD Slide Plate performs a sliding guide of the left side and the right side for Swing Cam. In case of the wider Swing Cam, it is possible to be installed 2 pcs of SD Slide Plates on A or B. (as shown in Fig.16)
Or in the unavoidable case, it is recommended to be installed the trust washer on C. However, it is more stable to be installed Slide plates on 4 points of A, B. In case of the Swing Cam in portrait orientation, it should be installed SD Slide Plates on A and B for the purpose of stability on a rotating of Swing Cam. Also, it is not necessary to be used the trust washer in this case of using SD Slide plates.
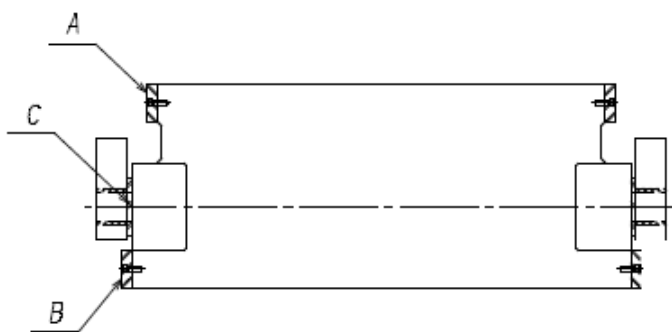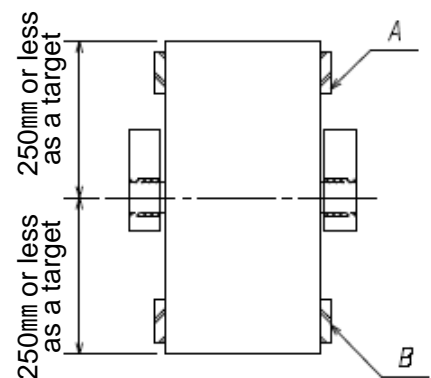
Fig.16

Fig.17

7. Positive return plate for the upper Cam method(as shown in Fig.18-20)

1) Urethane spring type (or Gas spring type)

There is the following method as Fig.18-20.
In particular, the method shown in Fig 20 has a cam angle and is also available a rotating stopper for Swing Cam.

Gas cylinder

Positive return and rotating prevention by gas cylinder

Fig.18   Fig.19   Fig.20

ℓ

L

L≧2ℓ
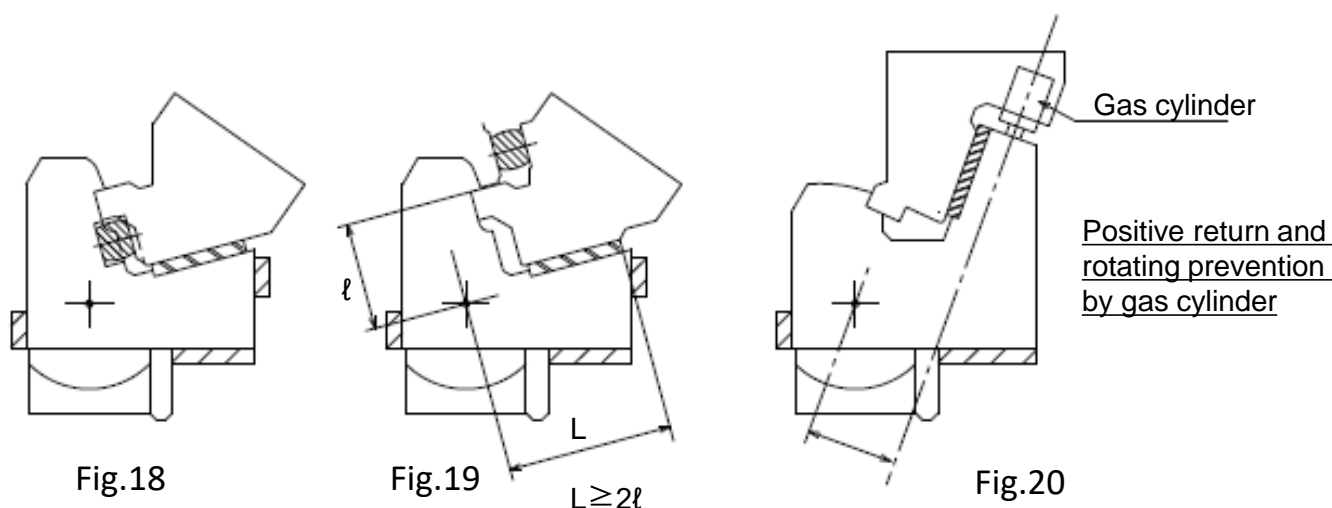
2) Positive return plate for the aerial cam unit

It is necessary to be installed the positive return plate on the other side of lower die or 1 pc each for RH/LH. It is cautioned not to be installed the Positive return plate on the Swing Cam's side. In case of once caused a scoring on the positive return plate, it will be the force of lifting Swing Cam, which is the reason why this force may damage on the Swing Cam and the lower die itself.

Positive return plate

CAM SLIDER

Fig.21

Positive return plate

Bad example

Positive return plate   Fig.22
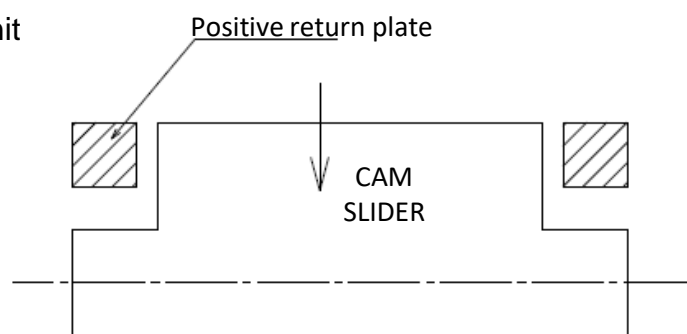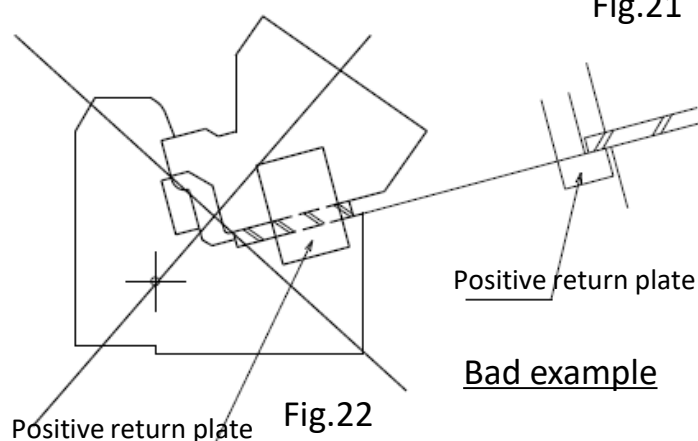
8. The strength of Swing Cam and cautions (as shown in Fig.23)

1) The strength of Swing Cam and selecting a rotating pivot

In case of the Swing Cam with a long distance far from the rotating pivot, or in case of moving the position of rotating pivot for outside, It is not occurred the problem. However, it should be cautioned to select a rotating pivot in the case of Fig.23.
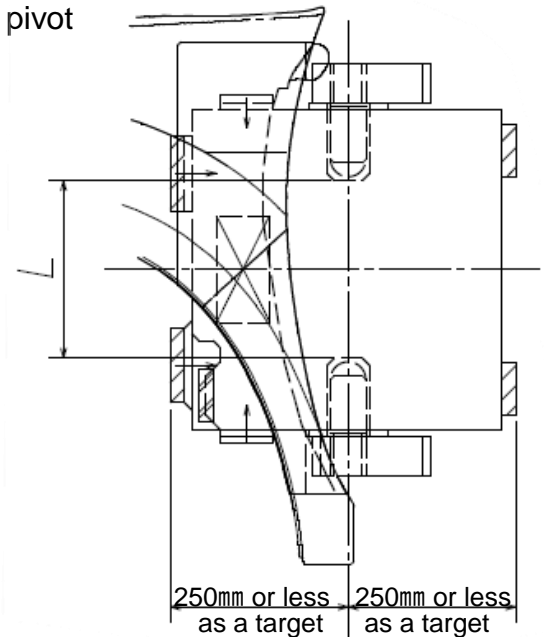
In case of being installed the SDAX axis for the lower surface of Swing Cam, it will be difficult to keep the strength by the dropping rigidity because of the shortened Length of (L). (as shown in Fig.23) Therefore, in this case, it is recommended to be used the driving type of Axis. It is available two kind of length for O.D.40mm of the driving axis. (as shown in Fig.25)
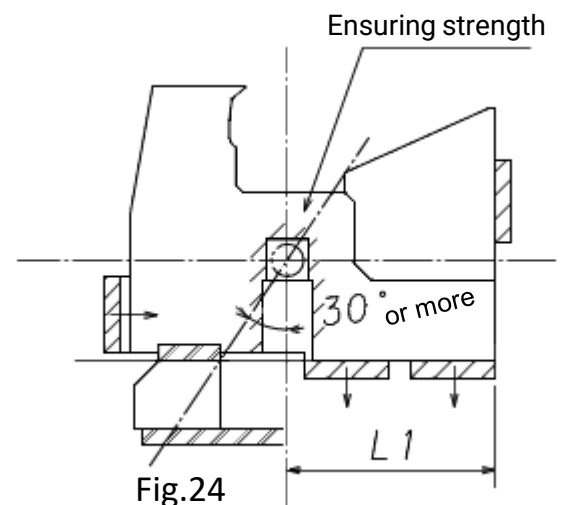
2) The length of a loaded surface on the driver side of Swing Cam although it is recommended to keep an enough length for the loaded surface, it is also necessary to consider the balance of the weight. (Refer L1 as shown In Fig.24) L1 is in the range of 200-250mm as usual. In the unavoidable case of no sufficient length of loaded surface on Swing side, it is necessary to consider to be installed a cam driver on the lower die side.

250mm or less
as a target | 250mm or less
as a target

Fig.23

Ensuring strength

30° or more

L 1

Fig.24
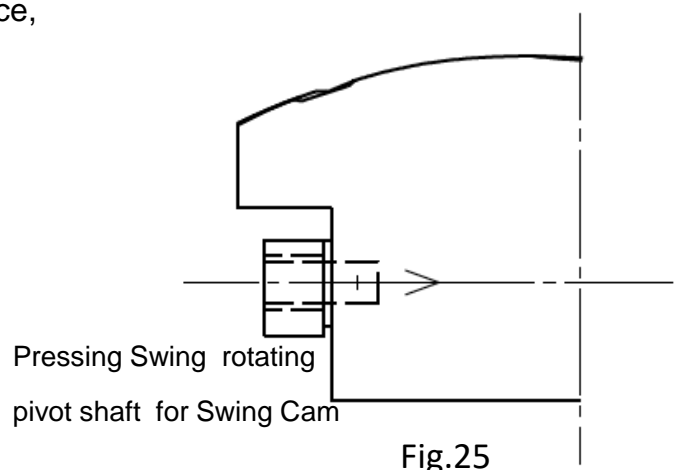
Pressing Swing rotating pivot shaft for Swing Cam

Fig.25

3) The strength of the cross-section for Swing Cam

In case of keeping a sufficient strength on these illustrated portions, the deflection will never occur. Thus, it is necessary to keep a sufficient rigidity of the cross-section.
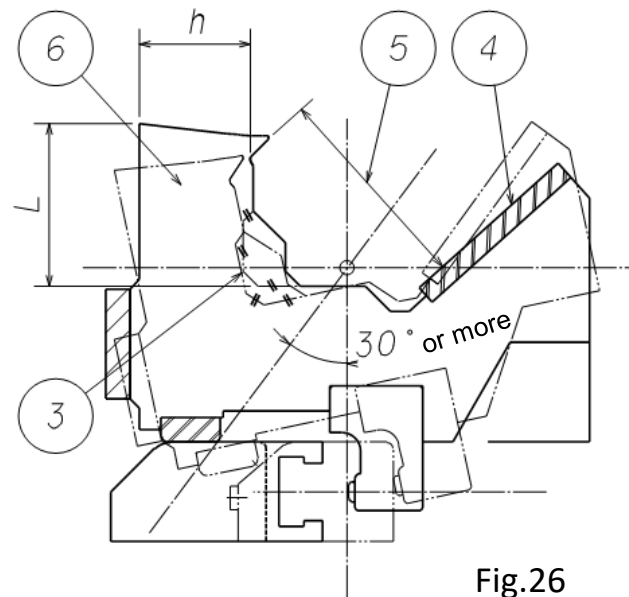

Fig.26

4) Integration of cam driver with Swing Cam and installation of Slide plates on cam structure although it is possible to be installed the sliding plates on aerial cam side or cam slide side of Swing Cam, it is necessary to be designed the sliding surface closer to the panel shape.

5) It is necessary to keep a minimum of 110 mm considering a processability.

6) It is a sufficient strength for the forming of Swing Cam, which is considered as h $\geqq$ L even in case of the force forming.

7) Installation on the fixed side

  a) In case of the installation for the purpose of improved quality of the panel. (For the first grade of Outer panel)

  b) In case of continuous bending process

  c) In case of supporting even a little bit to be loaded on the fixed side since it is worry about the strength of Swing Cam's side. (as shown in Fig.27)
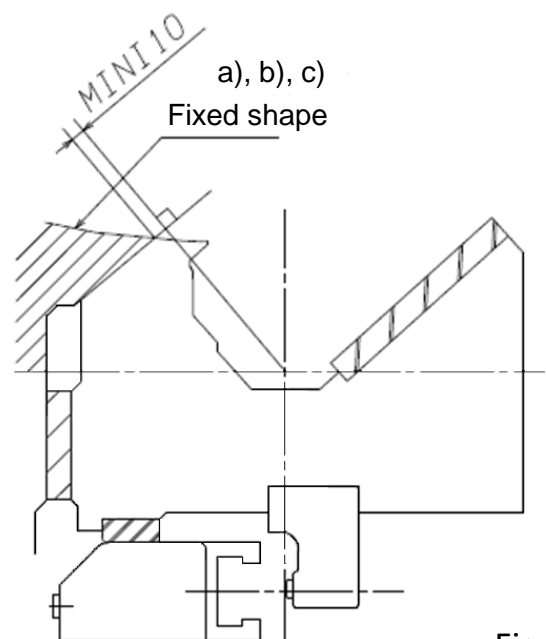

Fig.27

8) Shock absorber and SD Urethane Stopper

Regarding the Slide plate and Swing Block type (as shown in Fig.28), it is necessary to be installed SD Urethane Stopper to prevent an impact and a noise because of the faster setting speed. It is all possible to use the steel stopper for small Swing. Also, in case of 10 degrees or more of the swing angle, it should be considered to install a Shock absorber.

Regarding the Swing Cam structure which is heavy and far from the axle center, it is necessary to consider installing a shock absorber because the moment of inertia increases.

SD Urethane Stopper   Shock absorber
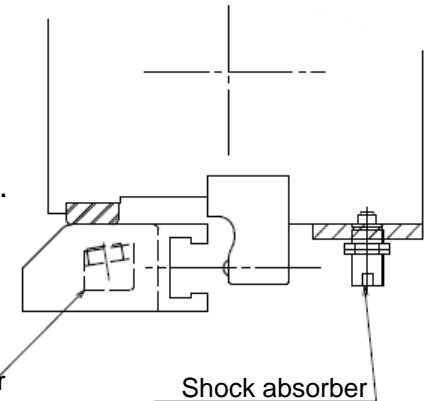
Fig.28

9) A contact surface of Pad stroke and Cam driver plate

Regarding Swing Cam by the slide block type, it is not necessary to increase the stroke of the upper cam which is required stroke on the condition that air cylinder is operated normally.

Furthermore, in case of the malfunction of air cylinder, it is necessary to make an introduction area on the upper cam driver which is structured to be positive terminated for Swing Cam.
 (As shown in Fig.30)
Of course, it is good to have a positive termination device. In the case ,It is assumed that the cam return force has sufficient one.

Contacted surface

PAD

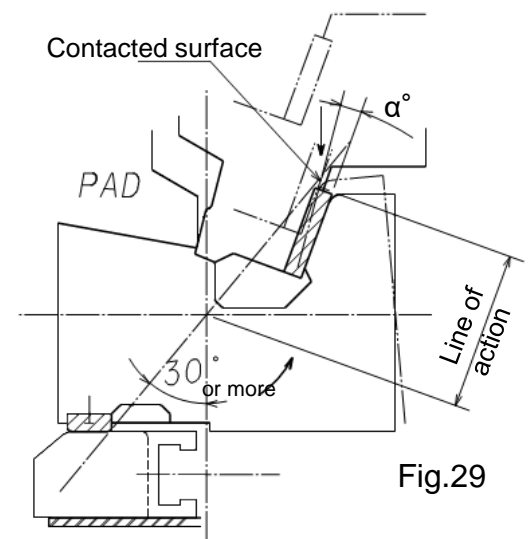30° or more

Line of action

Fig.29

10) R Slice type (Arc Swing)

In case of possibility to be installed the operated rotating pivot in the direction of (a), it is simply possible to be divided the fixed side and the swing side on a straight line. However, in case of installation in the direction of (b), it is positioned (c) to be horizontally divided. However, it is also reasonable method to be divided the R slice line on the strength of fixed punch. Furthermore, in case of moving R center in the direction of (d), it is leaving away with a rotating. (licensed Patent by YB) No sliding surface.
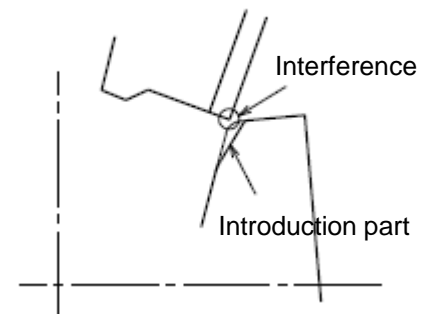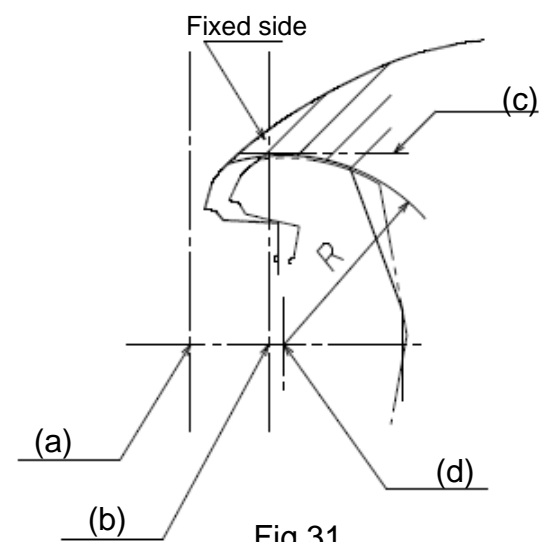
Interference

Introduction part

Fig.30

Fixed side

(c)

R

(a)

(d)

(b)   Fig.31

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06-02 Method of obtaining the driving force by Swing Cam and spring force.

1. Method of obtaining the moment of Swing Cam

The moment (M) which is loaded on Swing Cam is obtained by the multiplication of both the weight (m) of Swing Cam and the center of gravity (J).

$$M＝J x m$$

Generally, in case of moving the center of gravity position (J) to the shaped panel side by 10 – 20 mm, it is necessary to keep a balance for a rotating of Swing Cam. In case of moving to the direction of no shaped panel   side, it should be positioned ±30 mm from a rotating center as a target.

rotating

Rotating center

J

Weight(m)

m
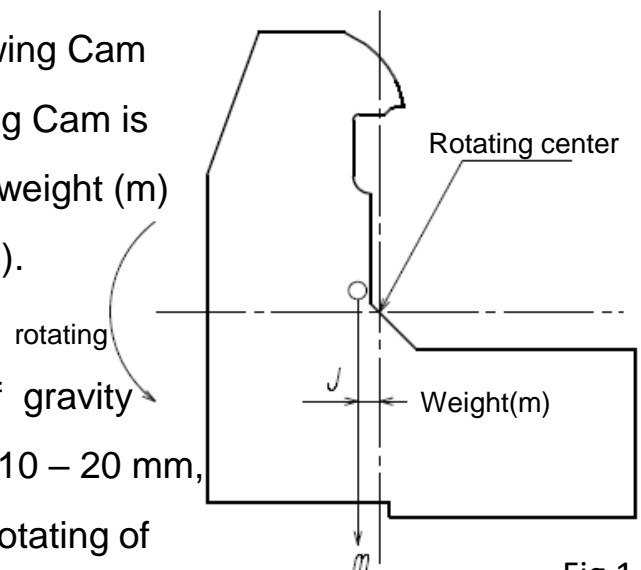
Fig.1

2. Method of obtaining the progressing force by Swing Cam

φ40～φ100 Rotating Axle and bearing type

D: Diameter of rotating axle

W: Weight of Swing Cam

L: Distance between Swing Cam and Air cylinder

F: Driving force (Spring force, Progressing force by Air cylinder)

$$F(kgs)=\frac{f \times D}{2 \times L}$$

f: W x 0.3 (Frictional resistance)

Furthermore, since there is room for 0.3 of frictional resistance, it is also possible to be operated with a frictional resistance of 0.2.

L
(B)

Center of Gravity

W

øD

Air Cylinder

L
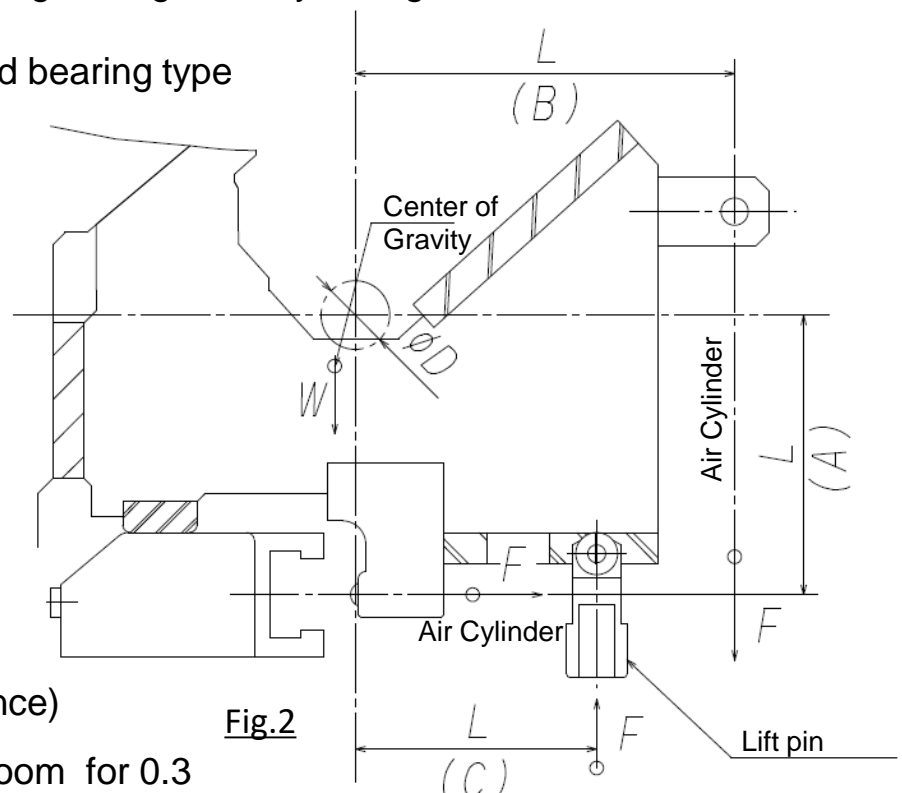(A)

F

Air Cylinder

F

L
(C)

F

Lift pin

Fig.2

The lift pin method is used for a small rotating body such as small Swing Cam.

2.-1 (A) Slide Block and Swing Block type (by Air cylinder) as shown in Fig.2

    (B) Link type by air cylinder (including a joint stroke block)

It is calculated on the condition that the air supply pressure is 5 kgs as below table.

It is shown a safety factor of considering 75% as below table.

I.D. of Air cylinder	safety ratio for pushing	safety ratio for pulling
φ40	47(kgf)	42(kgf)
φ63	116(kgf)	105(kgf)

I.D. of Air cylinder	safety ratio for pushing	safety ratio for pulling
φ80	188(kgf)	170(kgf)
φ100	294(kgf)	267(kgf)

Example of calculation

$$F(kgs) = \frac{f \times D}{2 \times L}$$

D = Diameter of axle of I.D.60

    （When using Half Mount, D=2R）

W = Weight of Swing Cam: 550(kgs)

L = 160(mm)

$F(kgf) = \frac{550 \times 60}{2 \times 160} = 103(kgf)$

It is necessary to choose the suitable
Air cylinder from the above table since
the required driving force is 103kgf.
However, it is recommended to choose
ID=80mm instead of ID=63mm because
103kgf of I.D.63 is barely satisfied with
a ratio (105kgf) on the above table.

・It is not necessary to have a much room
  of safety ratio because it is possible to
  sufficiently keep L dimension, which is
  advantageous as a method of installing
  air cylinder. (as shown in Fig.3)

・In case of using a multiple Air cylinders on
  the slide block type, it is recommended
  to choose I.D.=63mm of Air cylinder at safety
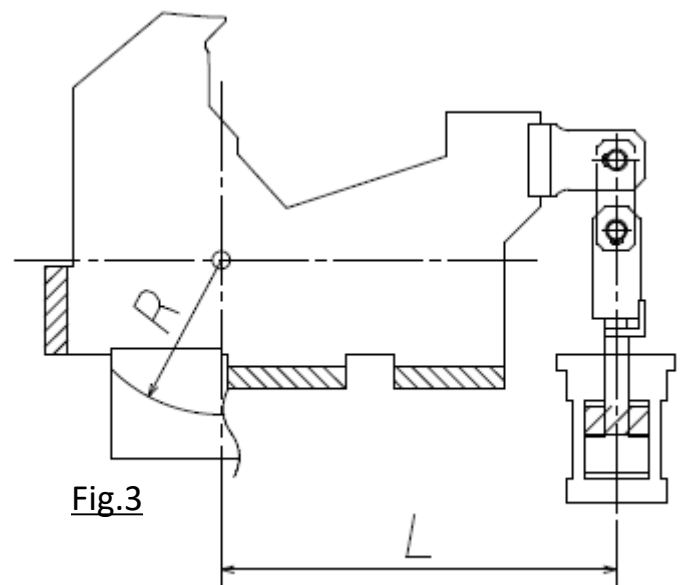 as a minimum size. (as shown in Fig.4)
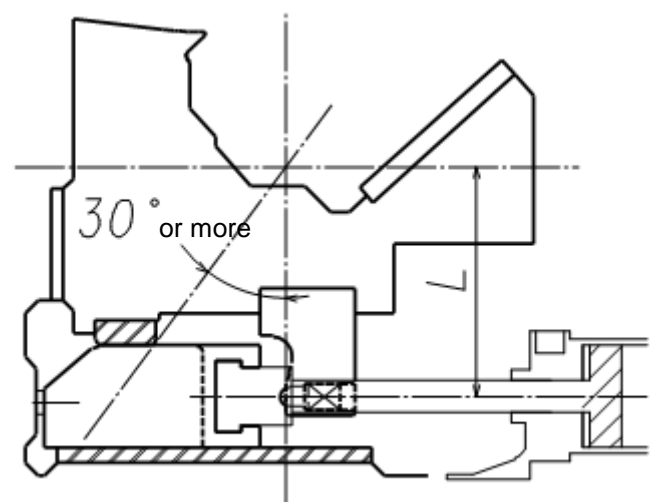

Fig.3

30° or more

Fig.4

2-2 (C) Calculation of operating force by Lift Pin (with Coil spring) type (as shown in Fig.2)

Regarding the Lift Pin type, it is generally used for Half Mount Cam or for the operation of a small Swing Cam. The calculated lifting force is completely different for depending on the position of the center of gravity which is located in front of or behind from the rotating pivot of Half Mount Cam.

・In case of locating the center of gravity in front of the rotating pivot, it is supported the swing rotating by the weight moment, the weight of Swing Cam x (L).

・In case of locating the center of gravity behind of the rotating pivot, it may be lifted by the force of the Lift Pin on the contrary.

Safety Moment for Swing Cam and Half Mount Cam

Swing Cam length	Moment with room for adjustment
300 mm or less	4,000kgmm
600 mm or less	8,000kgmm
1,000 mm or less	10,000kgmm
1,500 mm or less	15,000kgmm

・In case of locating the center of gravity of the weight in front of the rotating pivot, it is possible to be subtracted by the value of the Moment with room for adjustment in the left table from the value of Swing Cam moment.

・In case of locating the center of gravity of the weight behind of the rotating pivot, it will be added on the contrary.

【Example of calculation】

Length of Swing Cam: 980 mm   Weight of Swing Cam: 400 kgs

The center of gravity: 11 mm behind of the rotating pivot   L per 2 pcs of Lift Pin: 150 mm

Moment with room for adjustment : 10,000 kgs・mm (as per the above table)

M=400 kgs x 11 mm = 4,400 kgs・mm   10,000 + 4,400 = 14,400 kgs・mm

14,400 kgs・mm/150 mm =96 kg・f (as required initial pressure)

The initial pressure per piece is 48 kg・f (as 2 Lift Pins)

・The more L dimension is far away from the rotating pivot, the smaller the lifting force is reducing. However, the stroke is increasing bigger.

・It is possible to be similarly calculated about a Panel Stabilizer Pin with coil spring type or with gas spring type.

・In case of using the Lift Pin with the coil spring type, it is recommended to design on the condition that the weight in front side (panel shaped side) of Half Mount Cam is increased heavier.

・It is recommended to be operated Half Mount Cam by the initial pressure of the Lift Pin. However, since it is possible to be operated Half Mount Cam under growing of swing on the final pressure of the Lift Pin, the driving force is calculated by P1+P2/2 as P1: the initial pressure, P2: the final pressure. (Refer to Half Mount Cam design standards)
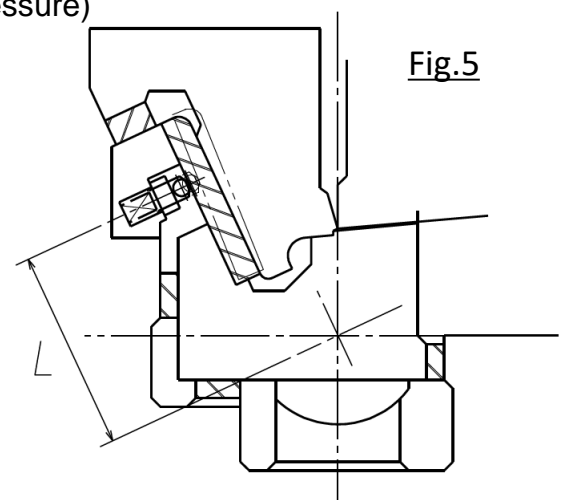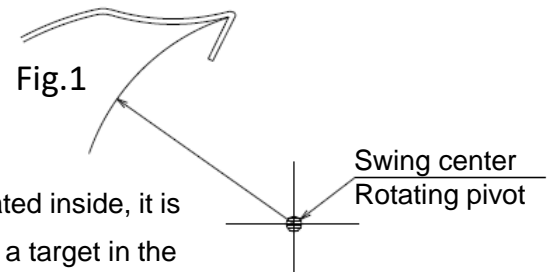
Fig.5

1.Standard Design

① On each cross-section, whether it is possible to be receded Swing Cam from the formed
bending panel. Also, whether Swing Cam interferes with the panel under rotating. There
is the supplied record of a approved interference on Outer panel (1 mm – 2 mm). 　[OK , NG]

② Whether the divided point(a) does not interfere with the
fixed punch of lower die. (as shown in Fig.1)
It is no problem, whether the divided line which is right
angle against the arc line from a rotating pivot is located
outside the panel. However, whether this divided line is located inside, it is
necessary to be receded Swing Cam by 10 mm – 20 mm as a target in the
right-angle direction against the surface of shaped panel. 　[OK , NG]

Fig.1

Swing center
Rotating pivot

Fixing punch on the lower die
Swing Cam

Rotating pivot shaft
SD Slide Plate
Swing center

⑧
20mm
⑨ SD Plate
(Backup plate)
⑪ Slide Block

SD Plate

③

MIN 30° ⑧
④ 20mm
Working A/C
Swing Block

Fig.2

③ In case of the design by 2D, it is necessary to make the orders of a machining tolerance
between the Swing Cam and the lower die by +0.02 mm to 0 mm on the design. However,
it is actually required to machine by 0 mm target. 　[OK , NG]

④ In case of using the slide block type, it is necessary to be located the sliding surface of it
at 30 degrees or more from the rotating pivot. Because the frictional force will change into
the rotating force. 　[OK , NG]

⑤ In case of no using the slide block type nor using the dwelling structure for the positive
termination, whether it is possible to receive the pad force by Half Mount Cam type.
However, it is required to use both the stroke and the preload by aerial cam as a
pre-holding for Swing Cam in unavoidable case. 　[OK , NG]

⑥ Considering a balance of the weight although the rotating pivot is automatically located according
to the shape of a panel. Also, whether it is the most appropriate for (1) Swing Block type,
(2) Joint Stroke type, (3) Half Mount Cam type, (4) Lifting Pin type.　　　　　[OK , NG]

⑦ It is necessary to be reduced the weight and kept a balance of the weight in front and back since
it is overloaded on a rotating pivot, in case of the malfunctioned air cylinder because of the
heavier weight on the shaped panel side, and in case of a rotating by the aerial cam or by
the positive dwelling termination.　　　　　[OK , NG]

⑧ It is necessary to be located the SD Plate by 20 mm or more from the rotating pivot, and be
sufficient receded the mounted base on bottom side for Swing Cam since it is hard to swing
in case of the expanded contact surface. It is also required to be made 20 mm gap on the
bottom surface side.　　　　　[OK , NG]

⑨ Whether it is correctly located the height of Swing shaft and the receiving trust load by the
processing force. Whether it is sufficient of the strength about Swing Cam.　　　　　[OK , NG]

⑩ Whether the range and the angle of swing is appropriate without too large or too small.   It is
required to make a gap of minimum 3 mm – 5 mm from the shaped panel under the open
position. In case of the panel easy to be deformed, it is required to be much increasing this
gap. However, regarding Swing Cam structure for the door outer on the side-sill side, it is
required to check with a succeeded record even if there is the interference on the flanged
portion.　　　　　[OK , NG]

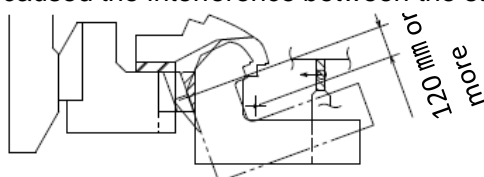⑪ Whether it is sufficiently considered to make a stopper of the rotating Swing Cam.
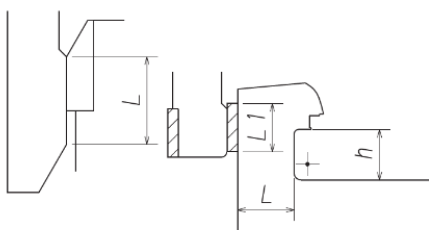
⑪-1 In case of direct receiving thrust load from the upper
die, it is necessary to be assembled Swing Cam together
with the other device for a positive dwelling termination,
which is operated in advance of L1 dimension. Whether
it is sufficient of the strength about Swing Cam.
 (against the thickness of Swing Cam: h $\leqq$ L)　　[OK , NG]

⑪-2 In case of using by the slide block type and the swing block type, whether it is appropriate
for its width, for q'ty and for a diameter of air cylinder.　　　　　[OK , NG]

⑪-3 In case of using by the positive return dwelling unit for the termination, whether it is not
caused the interference between the stroke by the positive return dowelling unit and the swing
motion by Swing Cam. Or whether the line of action
by the processing force is correct under using the
positive return dwelling unit for the termination.　[OK , NG]

⑪-4 In case of using multiple of Swing Cams, whether it is not caused the interference of
each Swing Cam and if it is considered of the positive return dwelling for the termination.　[OK , NG]

⑪-5 In case of pressing by the positive return unit, whether it is considered to be
located a SD plate on the opposite side.　　　　　[OK , NG]

2.Design for a slide bearing portion of Swing Cam and the strength, the method of receiving thrust load.

Plate for a receiving thrust load

Thrust Washer

Trunnion block
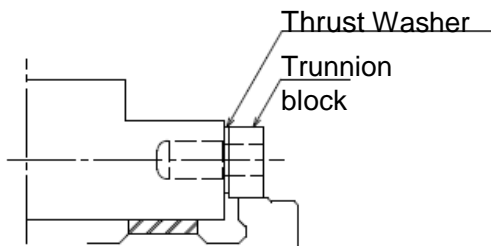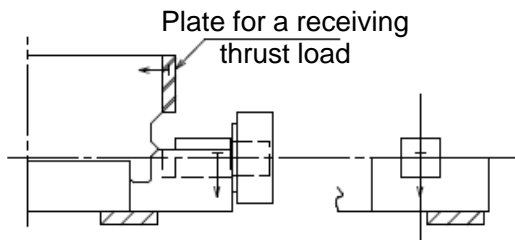
In case of the four surfaces type as a receiving thrust load, it is not necessary to use thrust-washer.

L
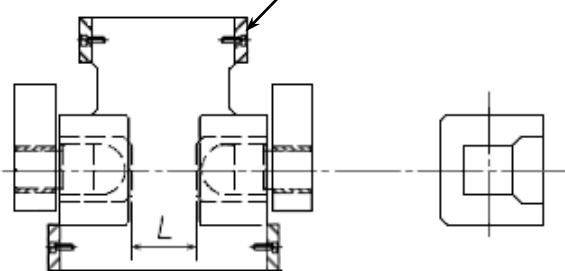
① Whether it is sufficient about the strength of the 1 slide bearing portion on Swing Cam. 〔 OK , NG 〕

② Whether it is considered to be machined on the slide bearing portion in correct direction and its processability. 〔 OK , NG 〕

③ Whether it is checked with a normal type of Trunnion Block or not (the cantilevered supporting type), and the different tightening position for R side/L side.〔 OK , NG 〕

④ Whether it is considered to be correctly located the plate of receiving thrust load from left and right side with keeping a balance. 〔 OK , NG 〕

⑤ Whether it is considered to be correctly chosen a diameter, a normal type, a compact type and the pressed in type of Swing shaft. 〔 OK , NG 〕

⑥ Whether it is the standard tolerance on machining for the slide bearing portion and the others. 〔 OK , NG 〕

⑦ Whether it is considered to keep the sufficient strength of Swing Cam for the assembled swing shafts. (Requited to check the dimension L, if not, it is considered to be used the pressed-in type of Swing shaft.) 〔 OK , NG 〕

3. The fixed punch on the lower die and its dividing line

10 ㎜ or more

90

Fixing punch
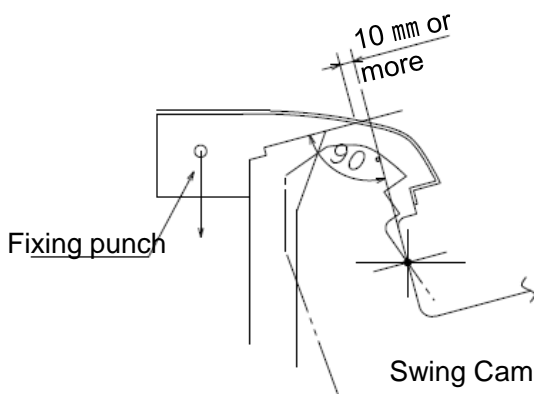
Swing Cam

① Whether it is considered to be ejected smoothly the formed panel from the fixed punch on The lower die. 〔 OK , NG 〕

② Whether is considered to be positioned the divided line between Swing Cam and The fixed punch on the lower die with 10 mm or more from the swing arc line, or be made with a relief of the machining. 〔 OK , NG 〕

③ Whether it is considered to make an angle for the dividing line. 〔 OK , NG 〕

④ Whether it is checked with the position and the angle on each cross section. Regarding 3D designed data, whether it is checked with the interference by rotating its three-dimensional shape.
〔 OK , NG 〕

⑤ Whether it is required to be divided the fixed punch for considering about the disassembling of Swing Cam. 〔 OK , NG 〕

⑥ Whether it is checked with the dowel pin holes which is near the swing arc line of Swing Cam in case of the divided and the disassembled type of fixed punch. 〔 OK , NG 〕

4.Interference under the progressing by Swing Cam

① Whether it is considered to be no interference with SD Plate under the progressing by Swing Cam.

Whether the SD plate is located on the lower die.   [OK , NG]
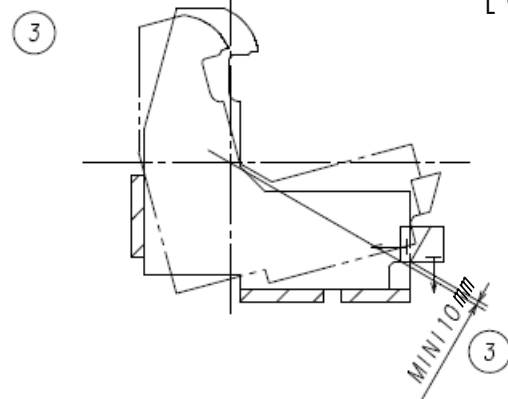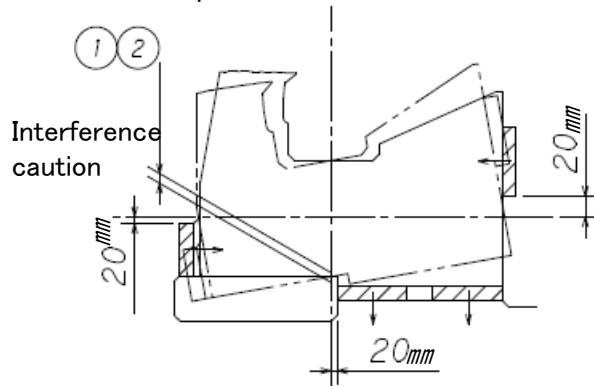
② Whether it is considered to be no interference with SD Plate (on backup side) under the progressing by Swing Cam. Whether the SD Plate is located on the Swing Cam side.   [OK , NG]

③ Whether it is considered to be no interference with the taper block under the progressing by Swing Cam. Whether it is considered to be receded at least 10mm or more as a target of 20 mm from the swing arc line.   [OK , NG]

5.Progressing Cam

① In case of using aerial cam type by the actuated air cylinder as usual, or using a lifting pin instead of using air cylinder, whether it is recommended to be used the stroke which is hold Swing Cam by aerial cam before Swing Cam will be hold by Pad. Especially, in case of causing a risk of pushing back by Pad force, it is recommended to make a positive return dwelling device for the termination.   [OK , NG]

② It is also effective method on Half Mount Cam type to be used this Swing Cam structure. However, in this case, whether it is recommended to make a various positive return dwelling device for the termination.   [OK , NG]

③ In case of using with slide Swing Block type and malfunctioning by air cylinder, whether it is considered to be possible to return safely Swing Cam (including air cylinder) by the weight of aerial cam and by the pre-load of gas spring.   [OK , NG]

④ In case of using the die mount structure cam, whether it is considered to make a positive return mechanism for the termination before the die mount cam is progressed into Swing Cam. Whether it is recommended to make a mechanical positive return dwelling system or use the positive return dwelling unit for the termination.
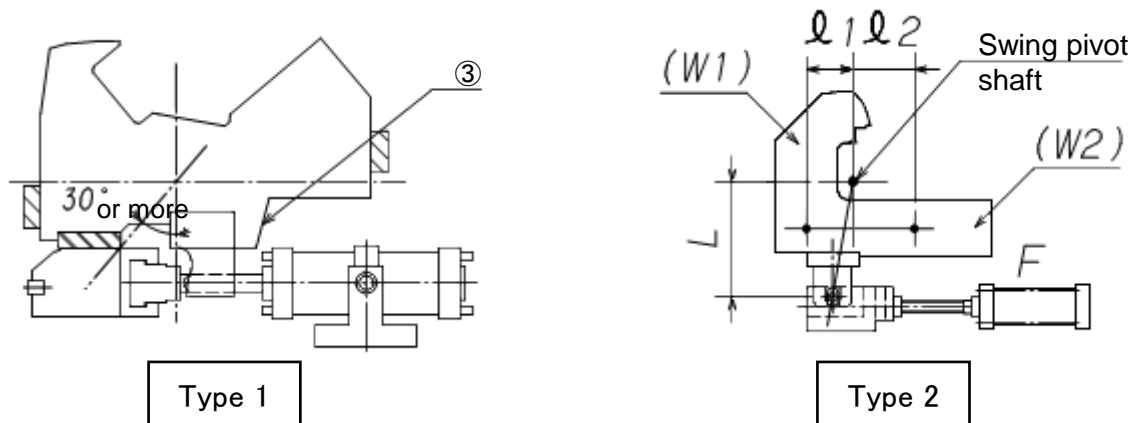

stopper
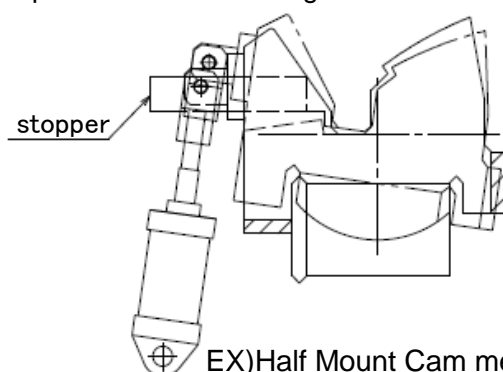
EX)Half Mount Cam method

For a swing movement by Half Mount Cam

1) Location of Half Mount Cam   [OK , NG]

2) Quantity of Half Mount Cam   [OK , NG]

3) Whole strength and selecting   [OK , NG]

6. Air cylinder force for progressing Swing Cam (Rotating &Trunnion Block type)


| Type 1 | Type 2 |

① Whether it is calculated on the moment to be possible to rotate Swing Cam.　　[OK , NG]

② Whether it is possible to be operated by an air cylinder in case of using the method of
　Type 1 (with using the multiple q'ty of Slide Blocks).　　[OK , NG]

③ Whether it is appropriate about the height of the Swing Block for a back-up.　　[OK , NG]

7. Setting of Half Mount Cam and Air cylinder force

① In case of using Half Mount Cam, it is recommended to contact with YB in advance.
　(According to the standard design of Half Mount Cam.)　　[OK , NG]

② In case of Swing Cam which is having concerns about a deflection under the weight of Swing Cam,
　whether it is considered to use Half Mount Cam type. (It is required the caution about the length
　of 3,000 mm or more as Swing Cam.)　　[OK , NG]

③ In case of using Half Mount Cam, whether it is required to be calculated the Air cylinder force
　under rotating according to "Design standard for Half Mount Cam".　　[OK , NG]

④ Whether it is considered to make a machining cast hole in the backward for looking through as
　much as possible.　　[OK , NG]

8. Other

① Whether it is considered to be used the temporary fixing bolts for Swing Cam.　　[OK , NG]

② Whether it is considered to be used SD Urethane Stopper and Shock absorber as the measure
　against a noise reduction and an impact.　　[OK , NG]
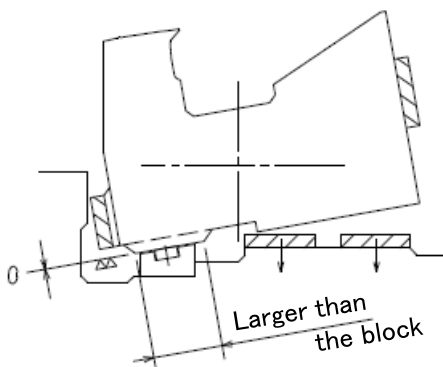
③ Whether it is considered to make a lifting hook bolt
　on Swing Cam.　　[OK , NG]

④ Whether it is considered to be set Swing Cam Stopper
　with "0" on the upper dead point stop in case of using a
　urethane stopper.　　[OK , NG]

⑤ Whether it is considered to be set the assembled surface
　on Swing Cam side by an appropriate size which is covering
　a whole stopper function.　　[OK , NG]

⑥ Whether it is checked with the positive return method for the upper aerial cam. It is shown the
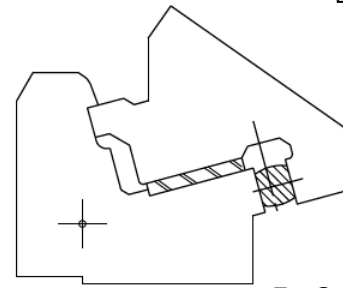method by a urethane spring and a gas spring as follows.
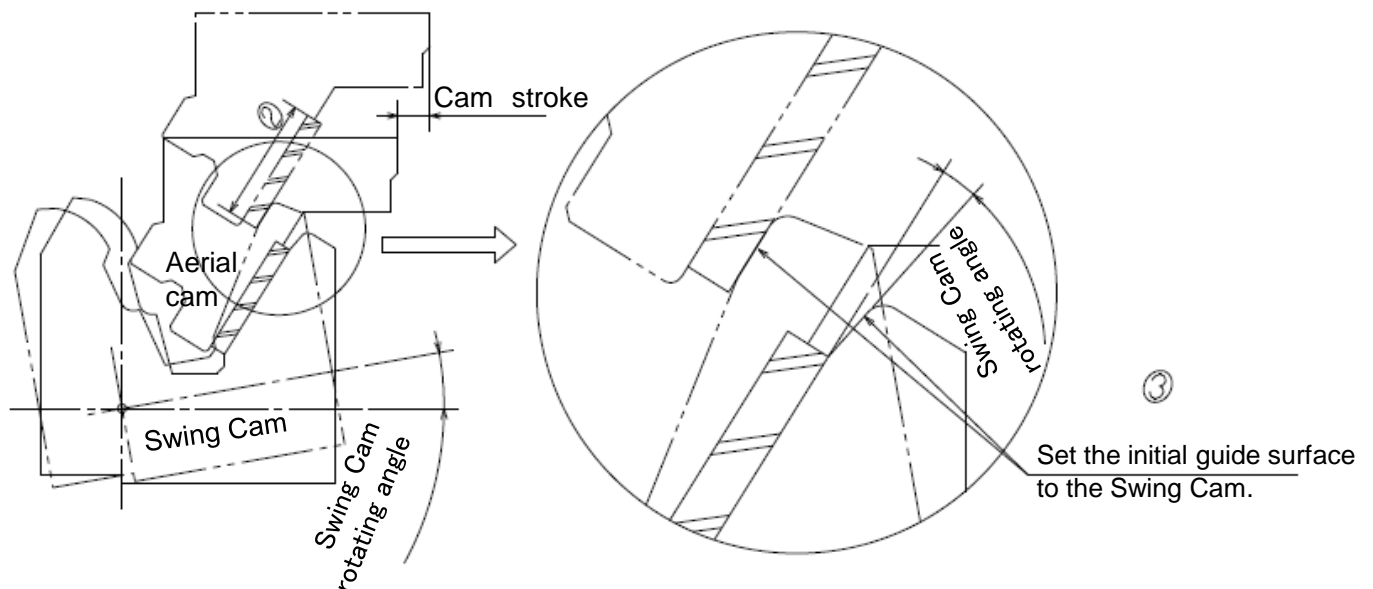
[OK , NG]
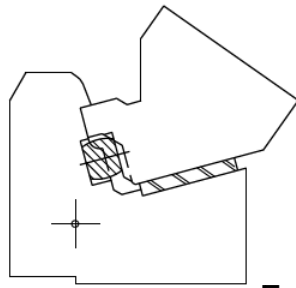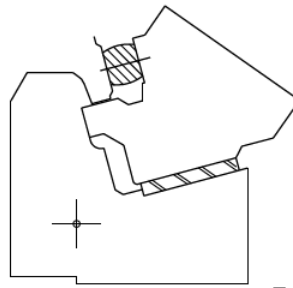
Ex.1　　　　　　　　　Ex.2　　　　　　　　　Ex.3

⑦ In case of setting the mechanical method for a positive return termination, Whether it is required
to be machined a cutout on one side or both side of the Swing Cam against the lower die and
the upper aerial cam. However, it should be cautioned not to make the positive return device
for the termination on the Swing Cam.

[OK , NG]

9. Checking with the upper dead point stop and the lower dead point stop

① Whether it is checked with the drawing about the initial contacted situation between Swing Cam
and upper Aerial cam.

[OK , NG]

② Whether it is checked the initial contacted surface is located into the sliding plate.　　[OK , NG]

③ Whether it is checked to be set the initial guide surface on the cam driver.　　[OK , NG]

Cam stroke

Aerial
cam

Swing Cam

Swing Cam
rotating angle

Swing Cam
rotating angle

③

Set the initial guide surface
to the Swing Cam.

06-04 Design Manual for the multiple of connected Swing Cam

It is possible to perform a continuous forming all at once in the bending process by the multiple of connected Swing Cams.
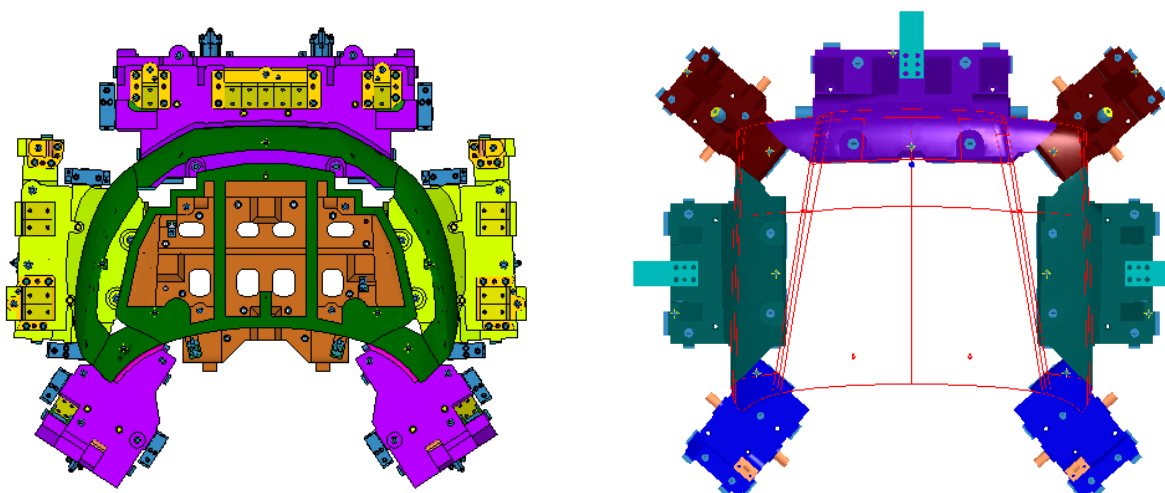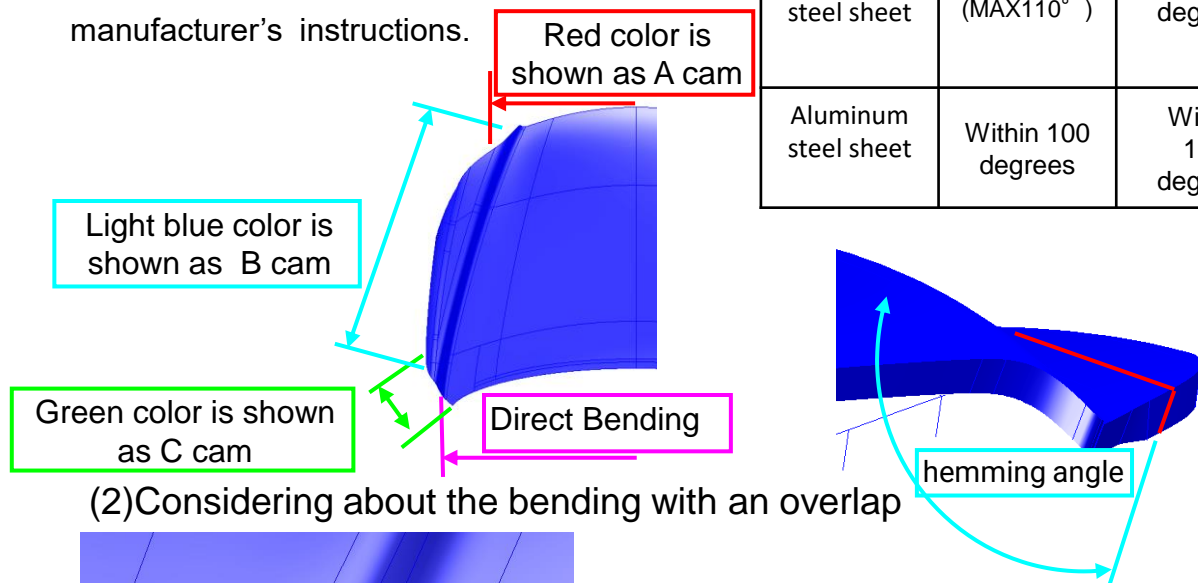
<2 Connected Swing Cams>
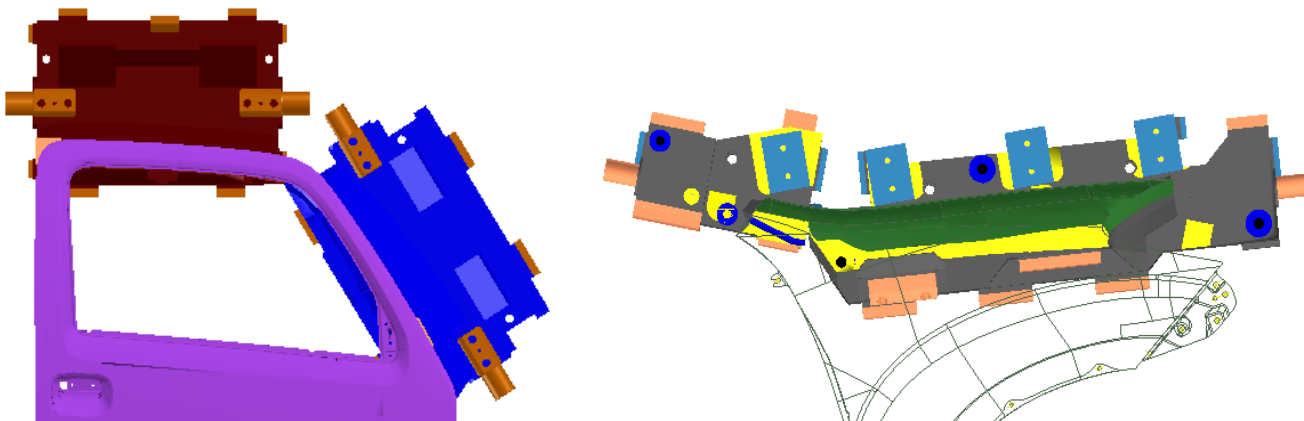
<3 Connected Swing Cams>
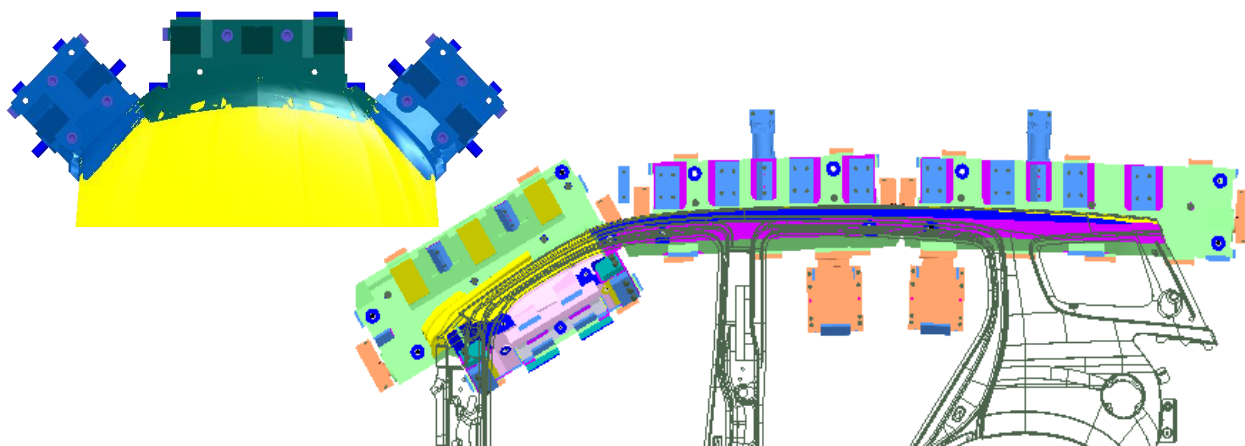
<5 – 7 Connected Swing Cams>

* It is absolutely prohibited to take out this data and the copies.

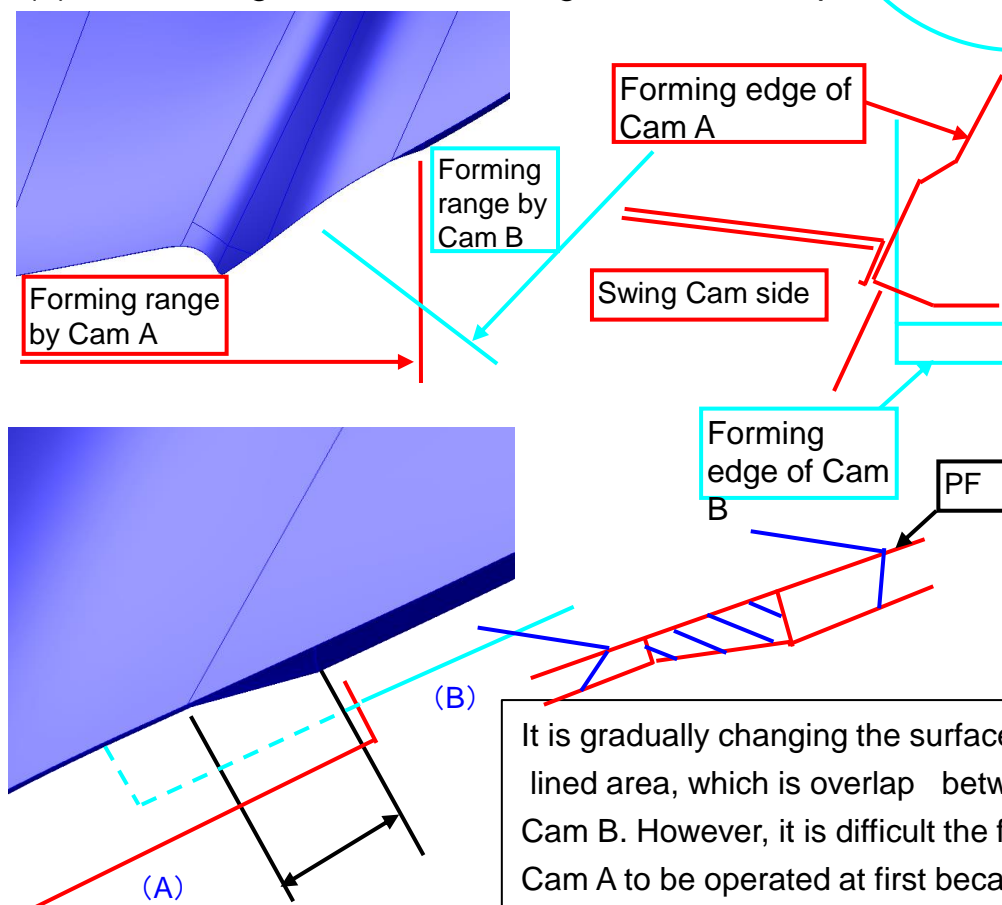Your Business Co., Ltd.   2013/4 New Issued

2021/10 Revised

Index

1. Decision of Cam angle due to a Hemming angle, and the drawing of rendering panel, considering a layout for the forming all at once

(1) Although it is the general condition of a Hemming process to use the angle of approximate 90 degrees against the panel surface, it is recommended to follow the manufacturer's instructions.

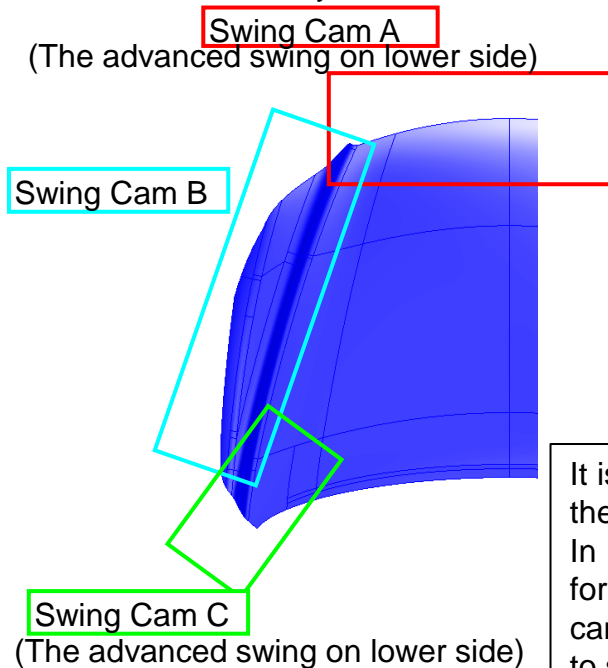| Reference	General Hemming	Roller Hemming
Ordinary steel sheet	Within 105 degrees (MAX110°)	Within 120 degrees
Aluminum steel sheet	Within 100 degrees	Within 115 degrees

Red color is shown as A cam

Light blue color is shown as B cam

Green color is shown as C cam

Direct Bending

hemming angle

(2)Considering about the bending with an overlap

Forming edge of Cam A

Forming range by Cam B

Swing Cam side

Forming range by Cam A

Forming edge of Cam B

PF

(B)

(A)

It is gradually changing the surface in the oblique lined area, which is overlap between Cam A and Cam B. However, it is difficult the forming edge of Cam A to be operated at first because of a striking by Cam A. In this case, it is recommended to be performed the forming edge of Cam B in advance. Also, it is not necessary to be set a flange lifters for lifting a panel, and visa versa.

2. Flat surface layout of Swing Cam (5 Connected Swing Cams)

It is recommended the design to be matched the flat surface angle of Swing Cam and the progressing direction of Cam. However, since it is necessary to reduce the number of connected points on each Swing Cam as much as possible, it is necessary to decide the progressing direction of Cam. Therefore, it is necessary to make the positive return dwelling structure for the termination because it is impossible to be pressed down Swing Cam by the aerial cam as a safety mechanism.

Swing Cam A
(The advanced swing on lower side)

Swing Cam B

Swing Cam C
(The advanced swing on lower side)

Swing Cam B:

In case of the longer stroke by Cam B from the overlapped points, it is performed Swing Cam at earlier timing than at normal position. Therefore, Swing Cam B is performed the setting at earlier timing and to swing late under the smallest swing amounts.

Lager cam stroke > The smallest swing amount

Swing Cam A, C:

It is necessary to be divided for Swing Cam considering the strength of Swing Cam.
In case of considering a positive return safety method for the termination, on the contrary Swing Cam B, the cam stroke of each Swing Cam A and C is smaller due to swing in advance.

3. Decision of the rotating pivot location for Swing Cam

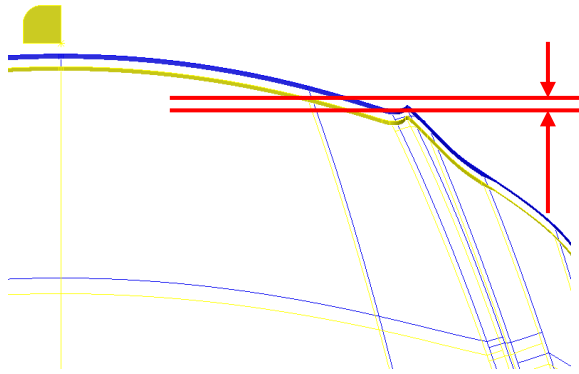(1)Decision of the rotating pivot location-1 (A location at flat surface)

It is easy to avoid the interference with Swing Cam B, in case of keeping the rotating Pivot location for Swing Cam A away from the shaped panel. However, it is restricted to be a narrow range for rotating accordingly.

In case of keeping the rotating pivot location for Swing Cam B away from the shaped panel, it is often restricted to be a narrow range for rotating. Also, in case of keeping the rotating pivot location away from the shaped panel, it is caused to be interfered next to Swing Cam due to the increasing amount of dropping down for Swing Cam after rotating. → It is necessary to keep the rotating pivot location in the nearest to the shaped panel.
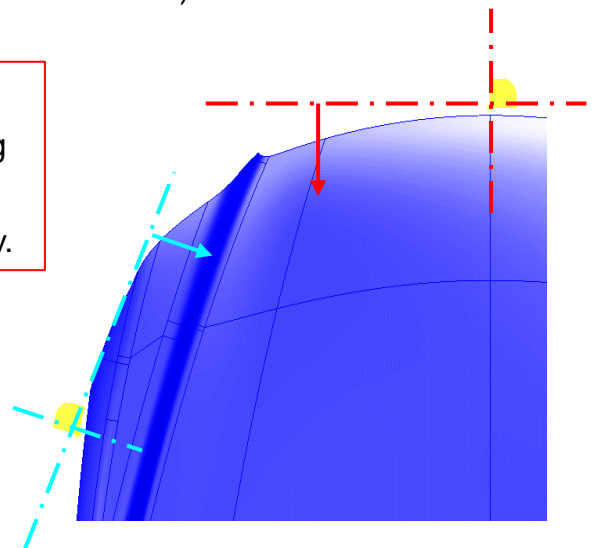
In case of the small interference, it is no problem to be performed due to the designed results. Especially, it is possible to be performed well in 1 mm of the interference in the case of the die for Door Inner.

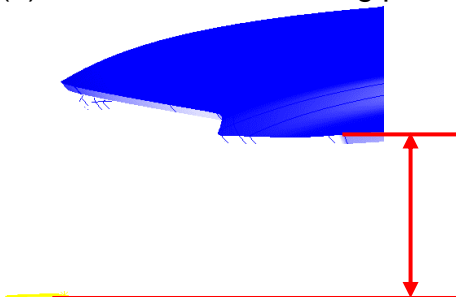(2)Decision of the rotating pivot location-2 (A rotating amount)

After it is once decided the location of the rotating pivot due to a possible rotating range, it is necessary to be decided a rotating amount by rotating the panel until there is the gap of approx. 3-5 mm.
→It is decided the minimum rotating amount.

It is possible to avoid the interference with Swing Cam B, in case of keeping the rotating pivot axle for Swing Cam C away from the shaped panel.
Also, it is at an advantage the divided angle against the fixed Punch (brown color) according to a keeping away from the shaped panel. However, it is necessary to be cautioned of the size in front side from the rotating pivot.
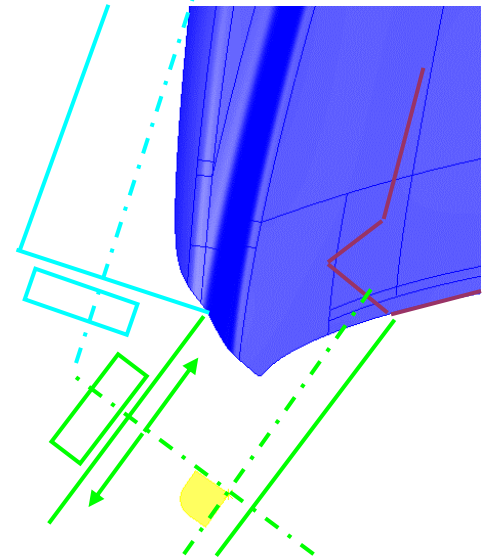
After it is decided both the rotating pivot location and the rotating amount, it is necessary to check with the interference for Swing Cams each other by rotating of the 3D solid shape. Except Swing Cam B which is minimized the rotating amount, it is necessary to avoid the interference for Swing Cam by increasing the rotating amount. In that case, it is considered to make the rotating amount smaller as a target of 10 degrees.

(3) Decision of the rotating pivot location-3 (A height of the rotating pivot)

In case of no remarkable changes on the PF height, it is easily possible to be machined the surface for the assembled bearing by arranging in the same heights of the rotating pivot of each Swing Cam which has the same axel shaft diameter.
In case of the connected each Swing Cam, it is necessary to be designed simply as much as possible because of becoming more complicated in the holder side.
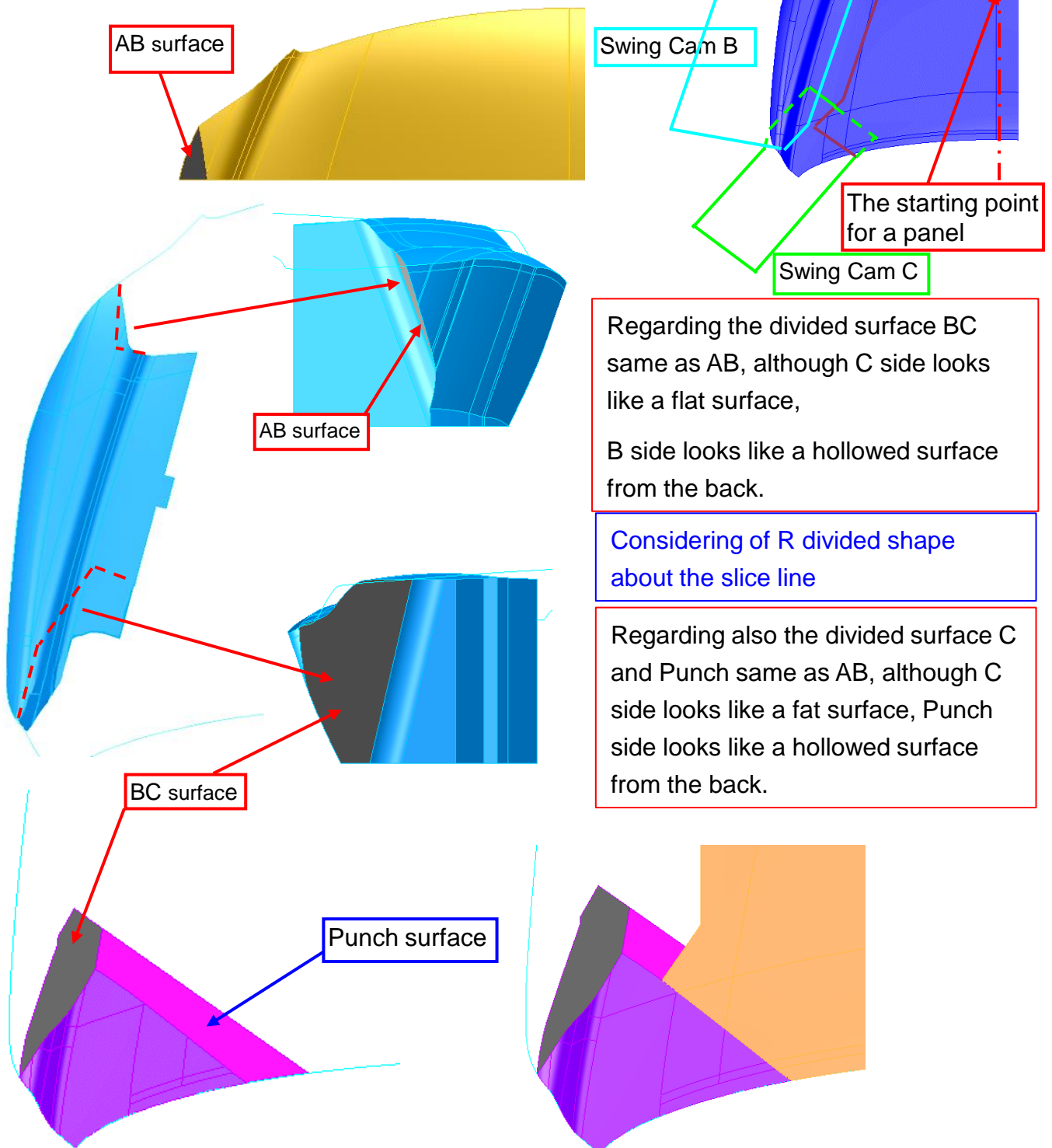
A height of the rotating pivot is located in around 150 mm at the lowest point of PF.
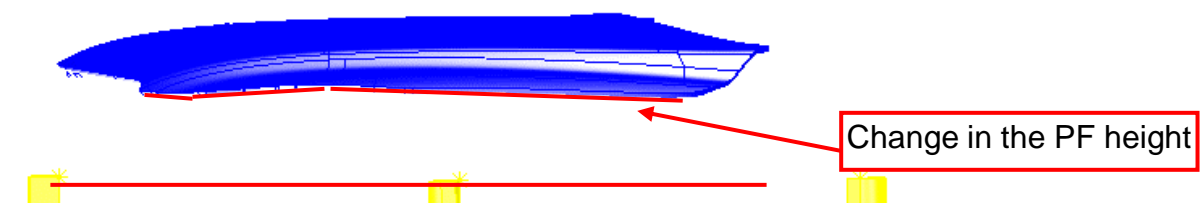
Change in the PF height

4. Divided method for Swing Cam (Example)

(1) Outline

Since Swing Cam B has the smaller rotating amount, it is in the position to be on both Swing Cam A and Swing Cam C. Therefore, although the divided surface AB on A side looks like a flat surface as follows, it on B side looks like a hollowed surface from the back.

Swing Cam A

AB surface

Swing Cam B

The starting point for a panel

Swing Cam C

AB surface

Regarding the divided surface BC same as AB, although C side looks like a flat surface,

B side looks like a hollowed surface from the back.

Considering of R divided shape about the slice line

Regarding also the divided surface C and Punch same as AB, although C side looks like a fat surface, Punch side looks like a hollowed surface from the back.
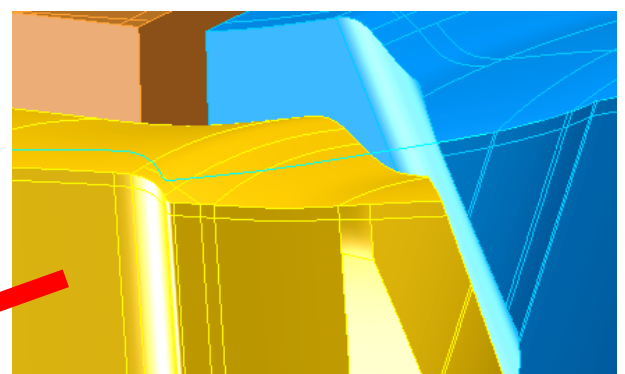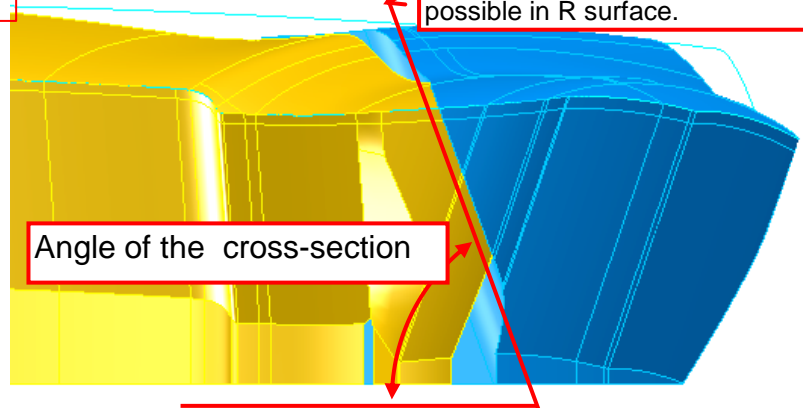
BC surface

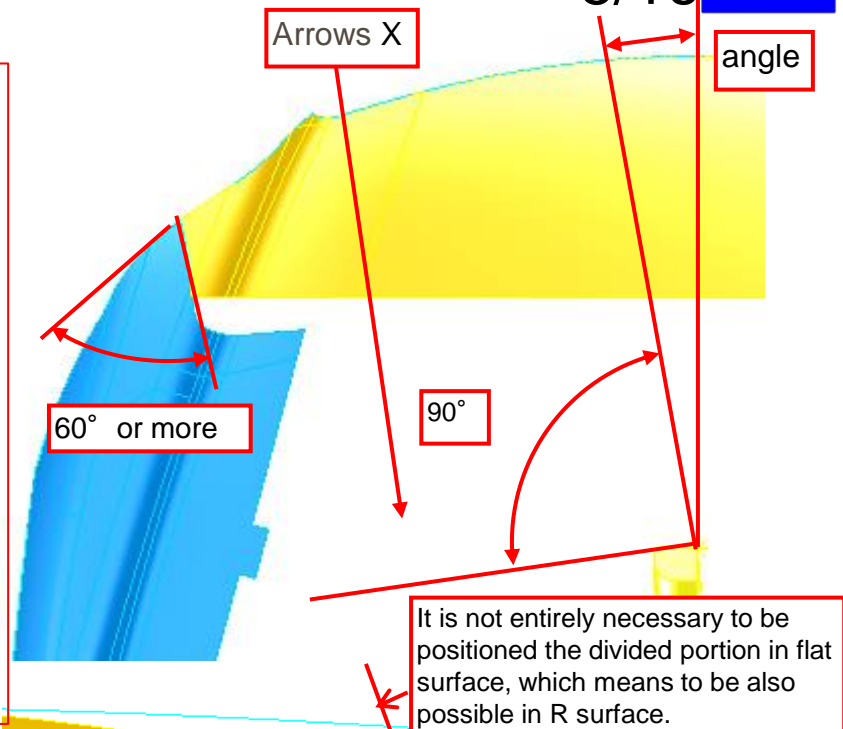Punch surface

(2)Divided method-1

(1) Considering to be designed a flat surface angle of Swing Cam for the estimated dividing direction. First of all, it is necessary to try (2) after that in the swing direction of 0 degree, which is easily to be completed the design in case of the close each the rotating pivot angle for the connected Swing Cam.
If not adjusting well, it is necessary to be made the angle in the direction of 60 degrees or more as a flat surface angle. In case of still not going well, it is necessary to be adjusted with 5 degrees pitch and repeat again with (1) – (3).

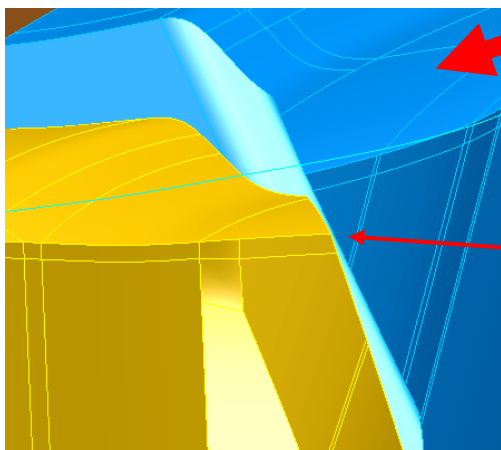Using 1 degree pitch in case of impossible

(2) It is divided in the direction of the arrow X under making the angle of the crossing-section.
In case of making larger angle (about 70 degrees) for this angle of the crossing-section, it is not necessary to make the sufficient relief of the Swing Cam which is installed on top.

(3) It is necessary to be checked with an interference under the rotating actually. After it is decided the location of the minimum swing for Swing Cam B, it is necessary to decide the final location without an interference between Swing Cam A and C.

Arrows X

angle

90°

60° or more

It is not entirely necessary to be positioned the divided portion in flat surface, which means to be also possible in R surface.

Angle of the cross-section

Arrows X

After the lower Swing Cam A has rotated 10 degrees.

It should be around 3 mm of gap.

After the upper Swing Cam B has rotated 4 degrees.

(3) Divided method-2

Regarding also Swing Cam B and C, it is necessary to consider in the same way as Swing Cam A.

(1) It is the simplest if the flat surface angle matches up the direction for rotating. If it is impossible case, it is necessary to be repeated with (2) and (3) for avoiding an interference after approaching parallel to Swing B by rotating under 5 degrees each.

1 degree pitch if not possible case

Arrows Y

(2) It is necessary to be divided after deciding the angle of the cross-section by arrow Y in the same way as Swing Cam A and B.

(3) It is possible to avoid an interference due to devise the method of separating downward under actually rotating of 3D data.

*After deciding the divided Swing Cam, it is necessary to be checked again if the panel will be certainly released. Because it may be caused a possibility to be changed the location for a rotating pivot, etc.

(4) Divided method-3

It is necessary to be divided the surface of Punch at right angle against the line from the rotating pivot for Swing Cam C. Because, in case that the rotating pivot is close to the forming panel, the angle of Punch is making a sharp. Therefore, it is necessary to consider together with the other divided portion.
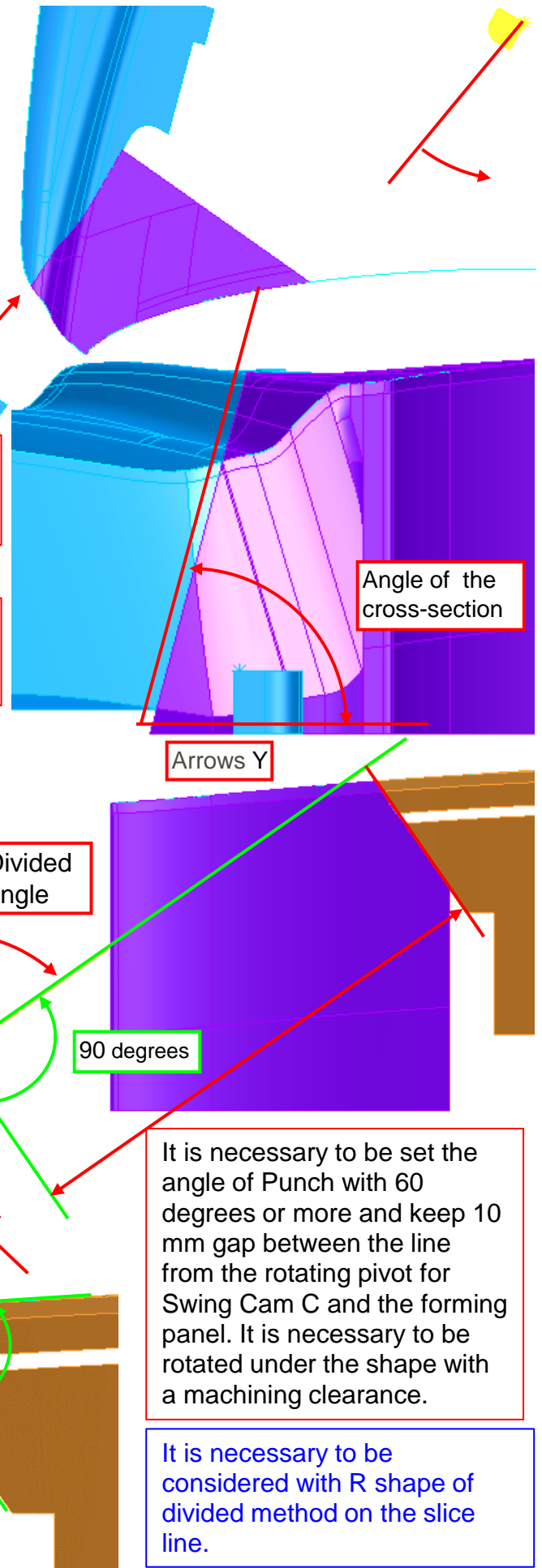
Angle of the cross-section

Arrows Y

Divided angle

90 degrees

10 mm or more
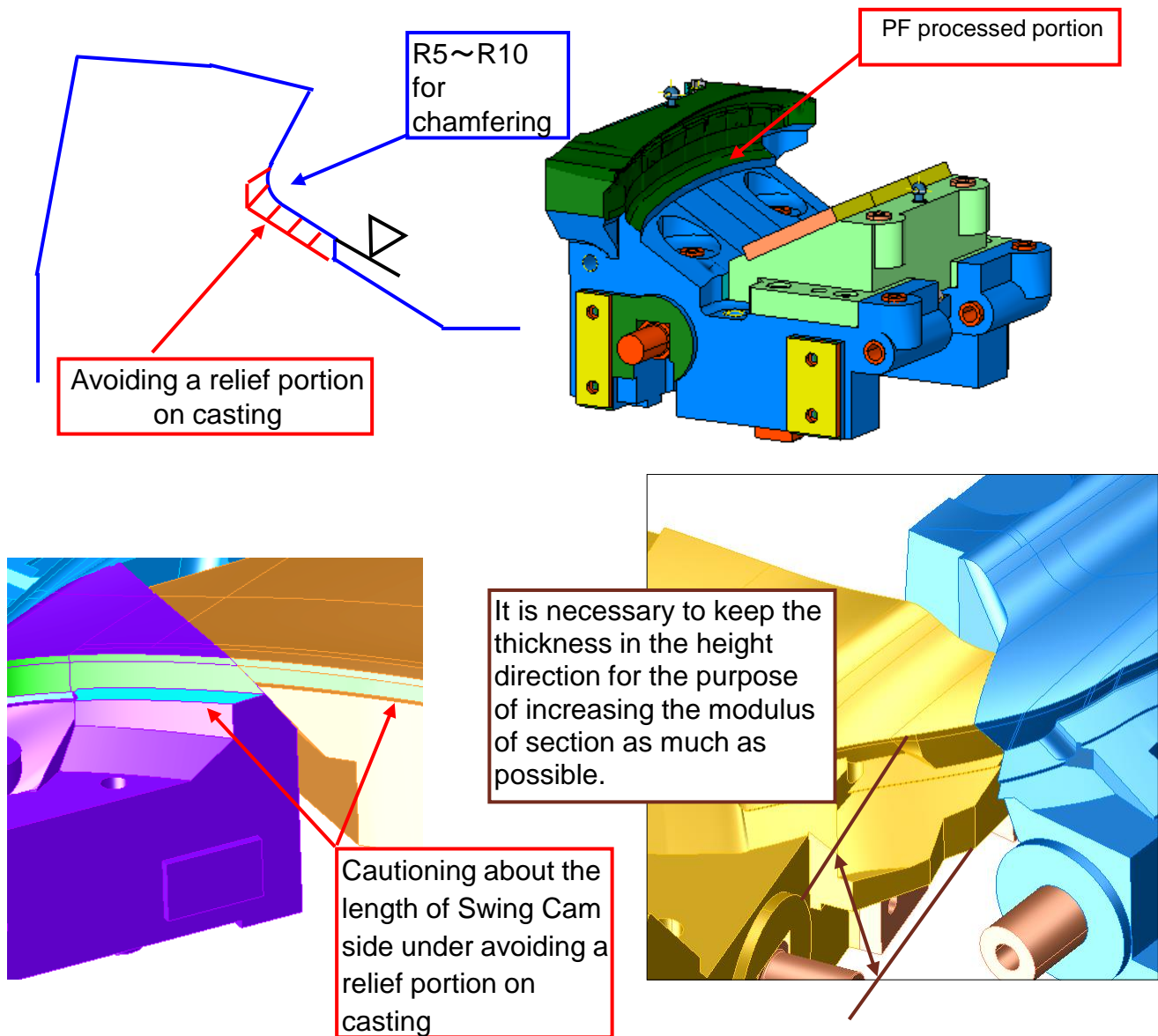
It is necessary to be set the angle of Punch with 60 degrees or more and keep 10 mm gap between the line from the rotating pivot for Swing Cam C and the forming panel. It is necessary to be rotated under the shape with a machining clearance.

It is necessary to be considered with R shape of divided method on the slice line.

5. Reinforcement and standard shape for machining portions by a profiling

PF processed portion

R5～R10
for
chamfering

Avoiding a relief portion
on casting

It is necessary to keep the
thickness in the height
direction for the purpose
of increasing the modulus
of section as much as
possible.

Cautioning about the
length of Swing Cam
side under avoiding a
relief portion on
casting

.

6. Selecting of rotating pivot shaft and bearing

(1) Selecting the rotating pivot shaft

It is necessary to be selected the rotating pivot shaft from the following table 1 according to the width of Swing Cam.
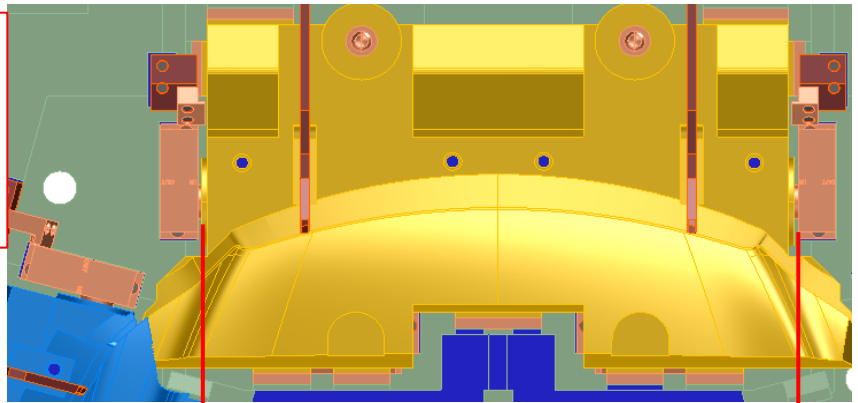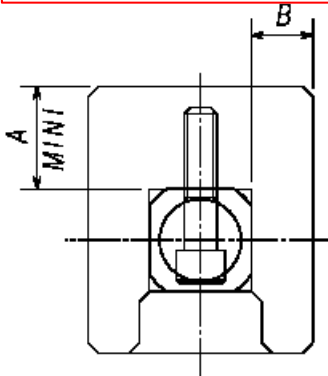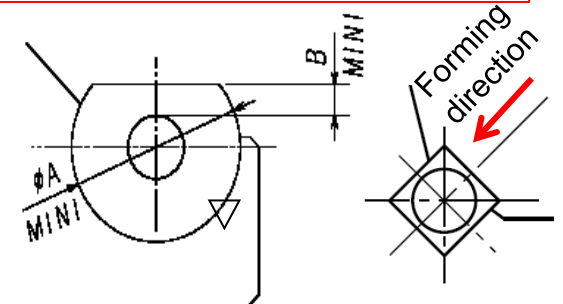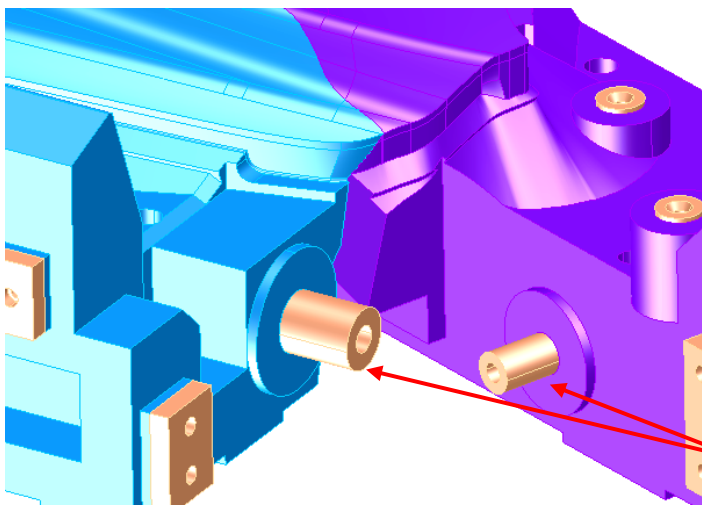
<table 1>

Shaft diameter	Swing die width	A	B
Φ40	400 mm～600 mm	50	30
Φ60	600 mm or more	50	30
Φ80	Width 1,600 mm or more, or mass production	50	30

Regarding the fixing direction for rotating pivot shaft, it is possible to be assembled in all direction (up and down, left and right or diagonal direction).

(2) Selecting of rotating pivot shaft (Pressed type)

It is necessary to be selected a rotating pivot shaft of the pressed-in type as per table 2. Avoiding the interference between the thickness of a bearing portion and the blade of Cam, it is recommended to use the pressed-in type for assembling Swing Cam on top.
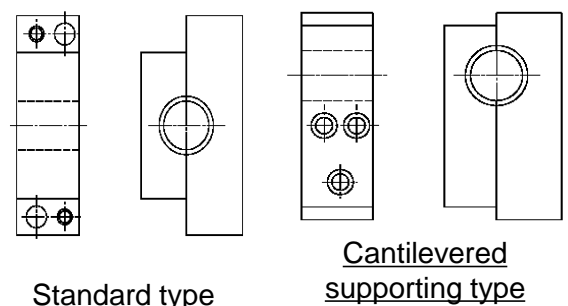
<table 2>

Rotating pivot diameter	Swing Cam width	A	B
Φ30	Minimum to about 200 mm	Φ90	15
Φ40	200 mm～600 mm	Φ100	15
Φ60	600 mm～1,599 mm	Φ120	15
Φ80	1,600 mm or more	Φ150	20

2017.8.18Rev.（400→600）
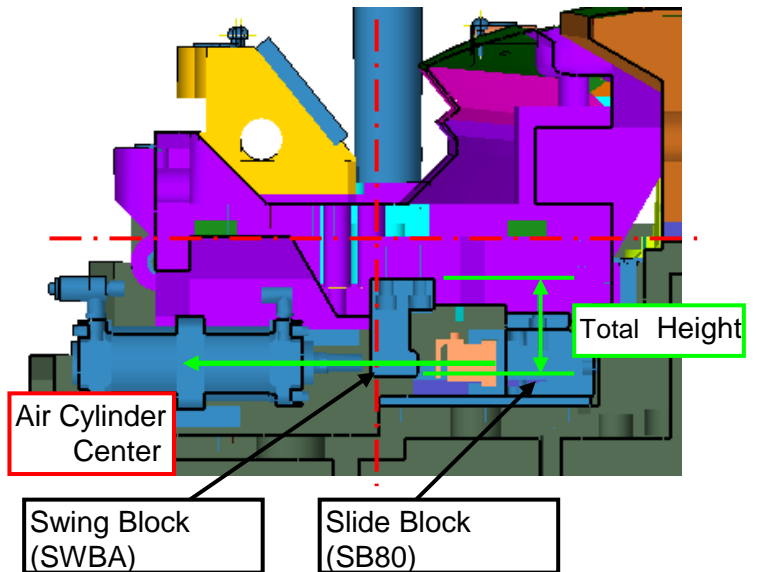
(3) Selecting of bearing

It is necessary to be selected the same diameter for a bearing as a rotating pivot shaft according to considering of the space problem for which the standard type is suitable or the cantilevered supporting type.
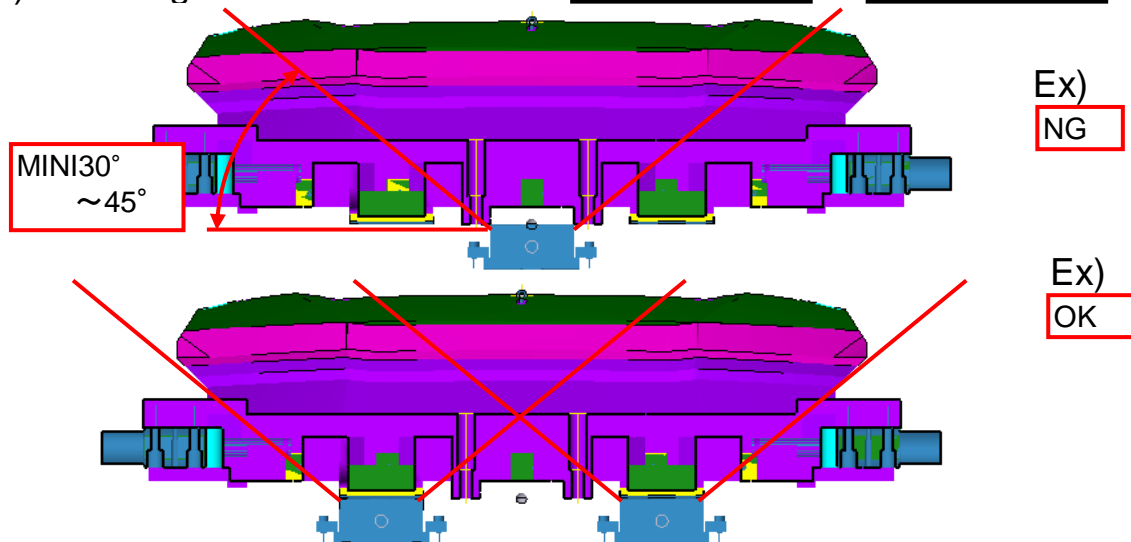
Standard type

Cantilevered supporting type

7. Slide Block and Swing Block

(1) Selecting of Swing block

It is basically used SB80 as a slide block. The Swing Block is selected according to the width of Slide Block. It is necessary to be set with the Swing Block which is located its shock absorber pin in the center of air cylinder. In case of increasing the amount of swing, it must be cautioned abut the interference for Slide Block under using SB100PL and SB100PS.
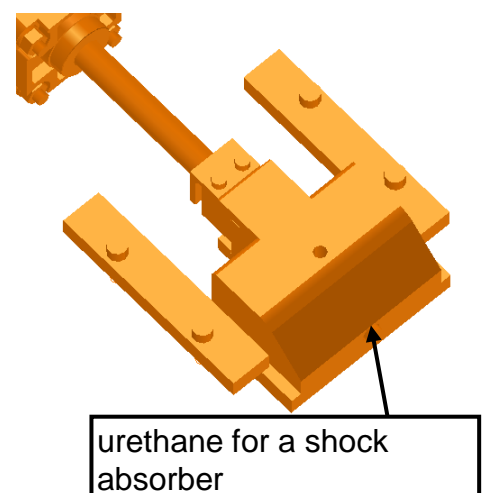
Total Height

Air Cylinder Center

Swing Block (SWBA)

Slide Block (SB80)

(2) Selecting of Slide Block

MINI30°
～45°

Ex)
NG

Ex)
OK

It is the ideal method to be located the line of 45 degrees from the corner of Slide Block in the lower than the shaped panel. (Minimum 30 degrees)
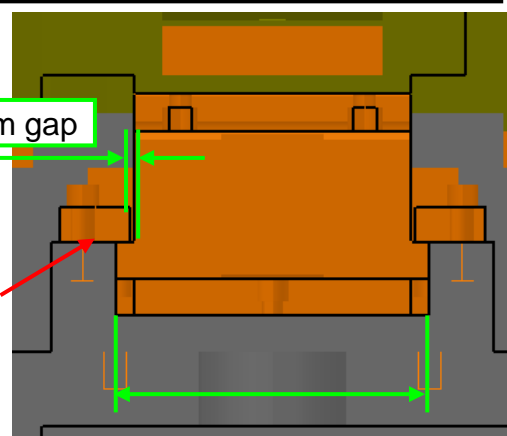It is used max 2 pcs of Slide Block for Swing Cam under 1,500 mm width as usual.
It is necessary to be matched both SDSLP and the width of Slide Block with the urethane shock absorber as a standard component.

urethane for a shock absorber

2.5 mm gap

The design value is set to "0", it is target to be machined under a clearance of 0.25 mm
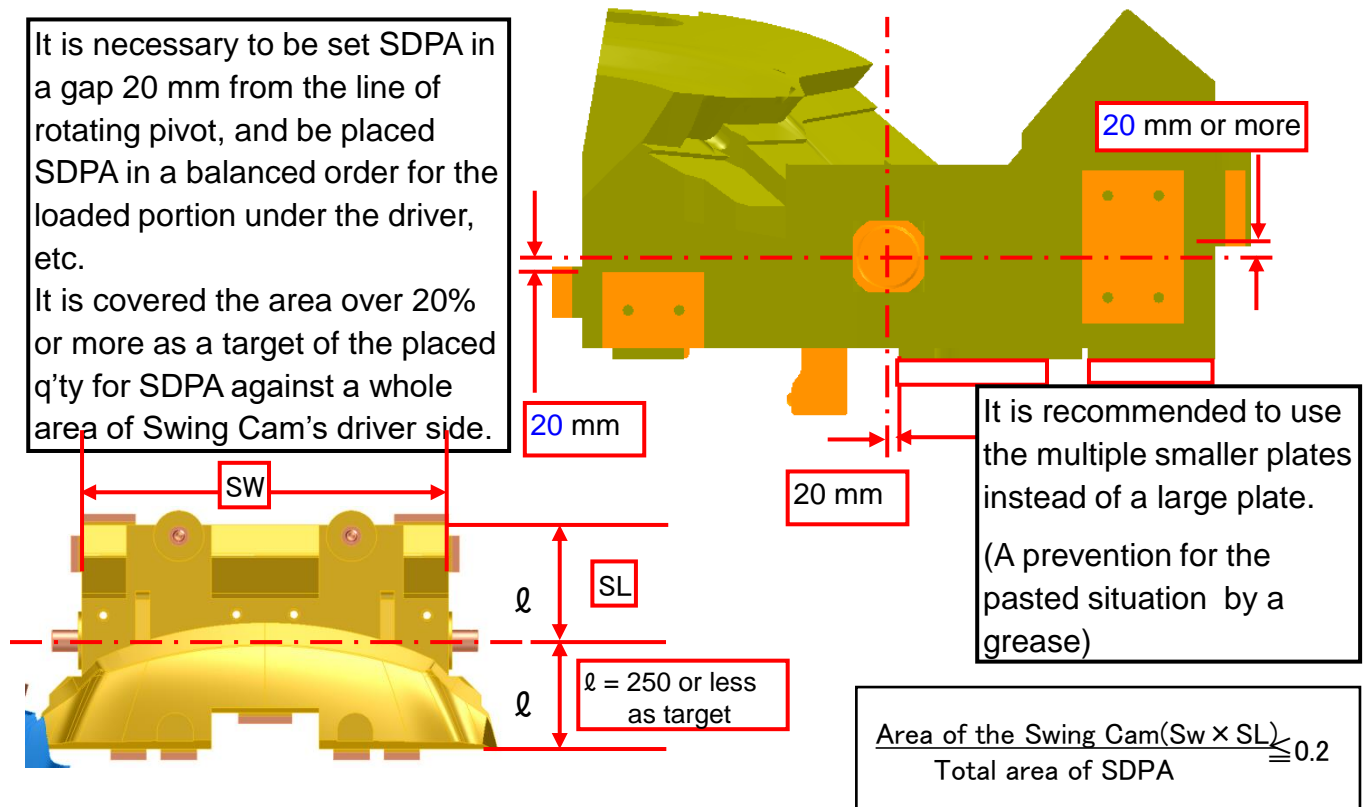(0.1 mm - 0.5 mm)

The design value is set to "0" on the urethane without a compressing, it is target to be machined under a clearance of 0.05 mm on one side
(0.03 mm - 0.07 mm)

8. Swing Cam reference plane and A placing of SDPA

It is necessary to be set SDPA in a gap 20 mm from the line of rotating pivot, and be placed SDPA in a balanced order for the loaded portion under the driver, etc.
It is covered the area over 20% or more as a target of the placed q'ty for SDPA against a whole area of Swing Cam's driver side.

20 mm or more

20 mm

SW

20 mm

SL

ℓ

ℓ

ℓ = 250 or less as target

It is recommended to use the multiple smaller plates instead of a large plate.

(A prevention for the pasted situation by a grease)

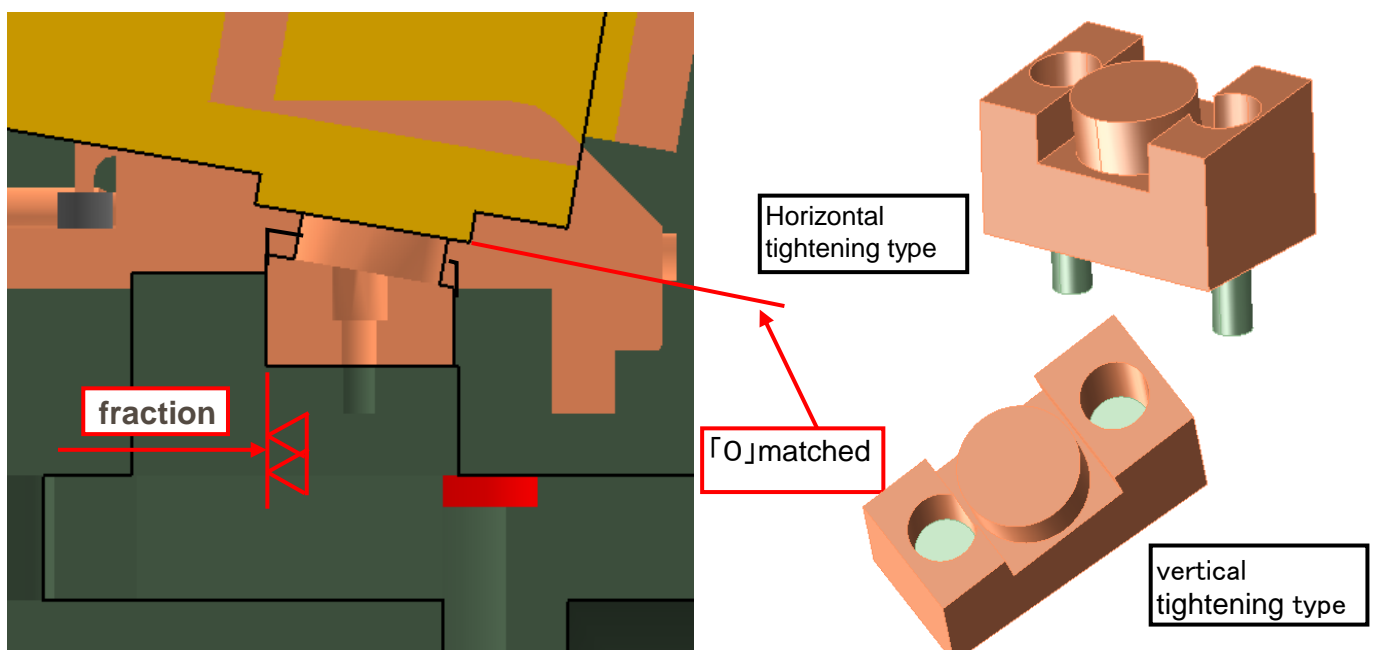$$\frac{\text{Area of the Swing Cam}(Sw \times SL)}{\text{Total area of SDPA}} \leqq 0.2$$

9. Design standard for Swing stopper

It is basically used the Urethane stopper for stopping the rotating of Swing Cam. In case of small swing amount (with under 5 degrees), it is possible to be used a steel stopper. It is available to supply the horizontal tightening type and vertical tightening type, with small and large size each.
It is necessary to be assembled the urethane stopper as follow without a completion, and to be made a backup for considering of assembling.
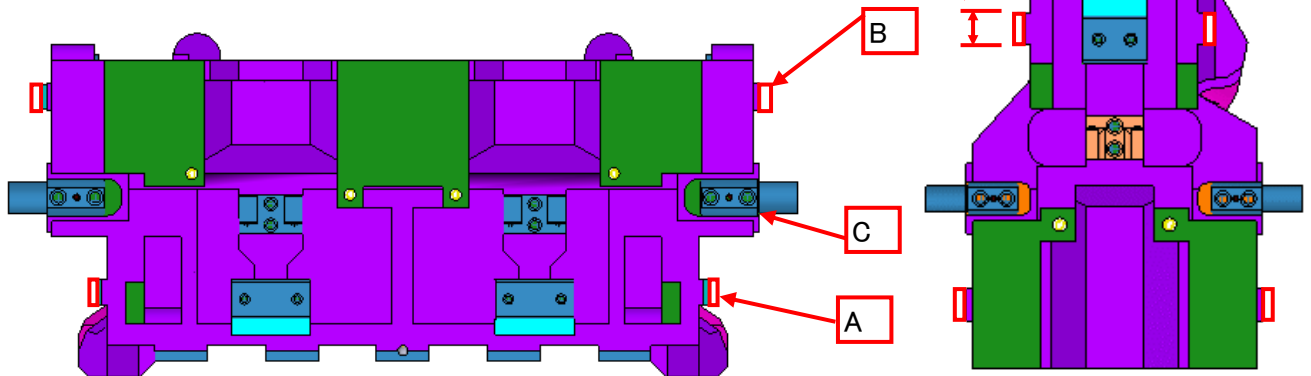It is summarized on holder side if the height of Urethane stopper is matched to the Upper Plate for Slide Block, which makes a fraction for the back-up side.

fraction

Horizontal tightening type

「0」matched

vertical tightening type
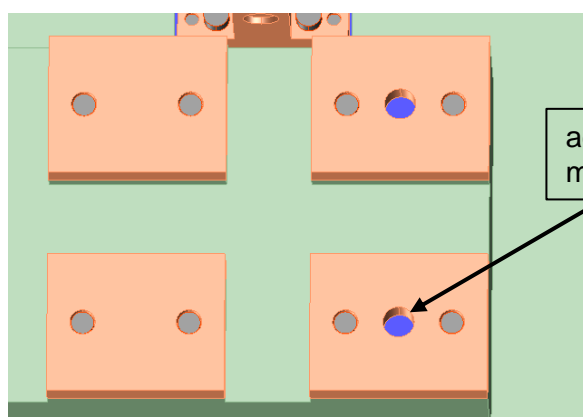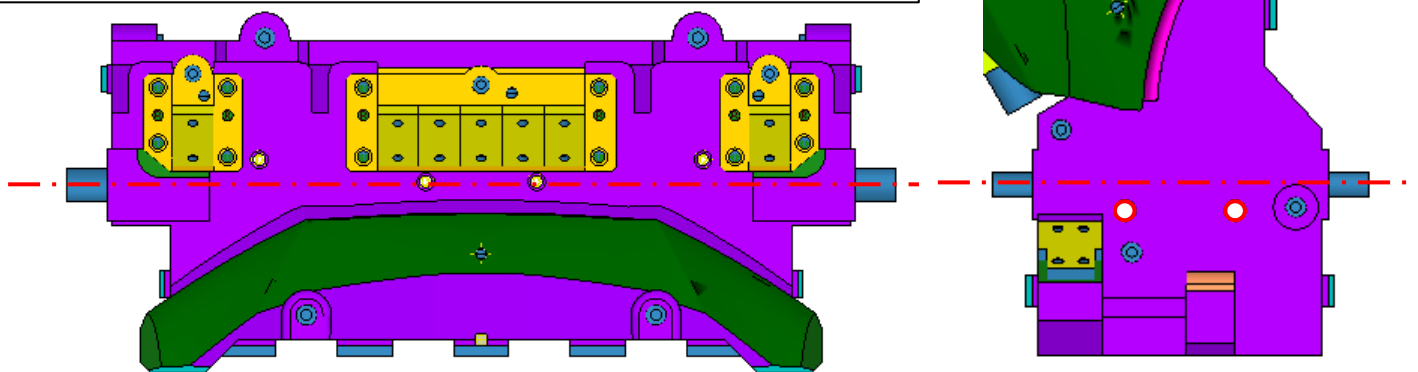
10. A receiving trust load for Swing Cam

It is necessary to be set 4 pcs of SD Slide Plates on the left side and the right side for Swing Cam as the guide plate. If it is unable to be set Slide plate on either Swing Cam A nor Swing Cam B because of no setting space, it is necessary to be set a thrust washer on C portion. Regarding SD Slide Plate, it is recommended to use a smaller plate of the width. (Sintered type)

Width: 28-75 mm, applying 48 mm as usual

B

C

A

11. A temporary fixing bolts for Swing Cam

It is a temporary fixing bolt for the shaped machining for Swing Cam. It is necessary to be set the location with considering the balance and the suitable size as per referring the following table 3. It is tightened on Swing Cam side by a temporary fixing bolts under setting near SDPA not to be over tightened by the operator. In the other case, it is also acceptable to make holes on the center of SDPA.
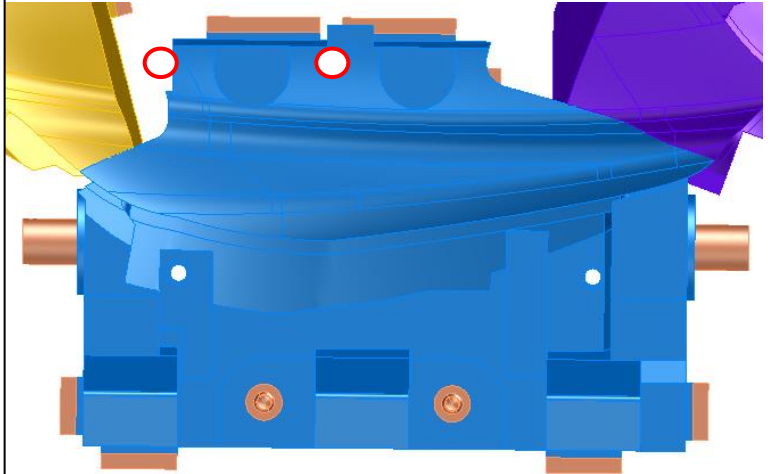
additional machining

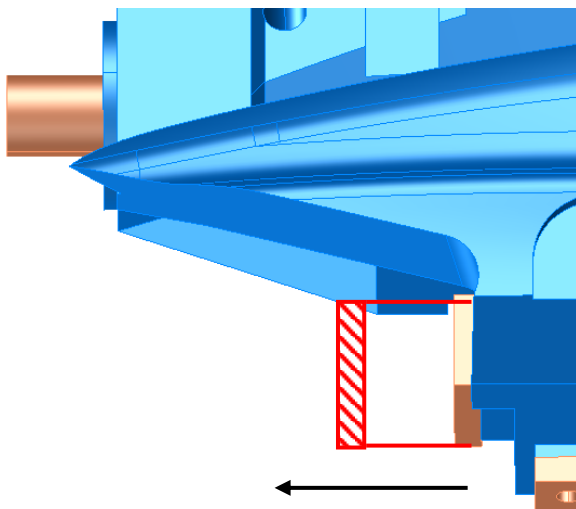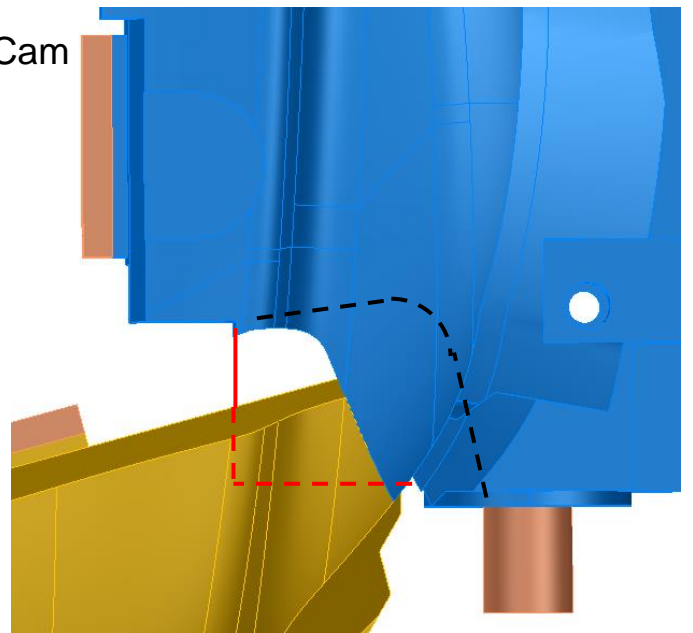| Rotating pivot diameter	thread diameter
φ30	M12～M16
φ40	M16
φ60	M20
φ80	M20

2 to 4 pcs each   <table 3>

12. Lifting hook bolts for Swing Cam

It is used as a priority standard of the pressed hook bolts with considering an operational efficiency. If not available, it is possible to be used the machined hook bolts. In case of the divided cam driver, it is prohibited to lift Swing Cam by the lifting hook bolts on the driver without setting in the other different location.   It is necessary to be set carefully the shaped panel side which is not hanged over the VC portions.
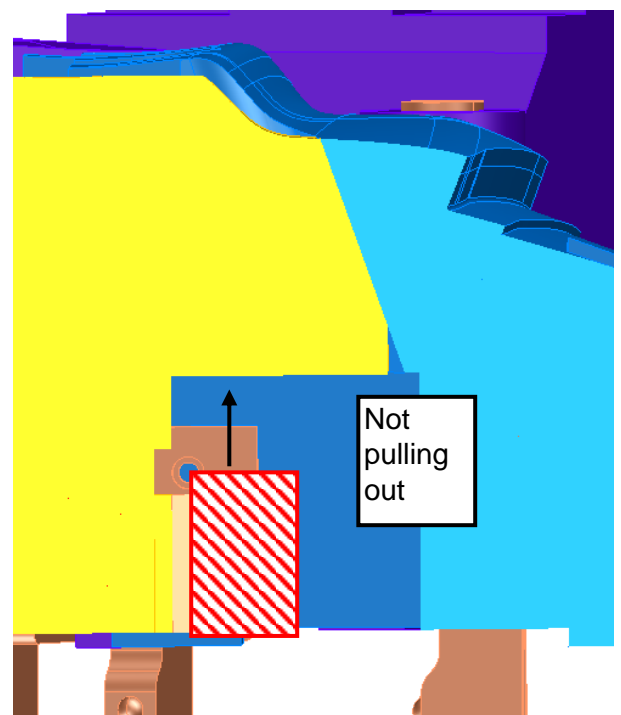
13. Considering an assembly for Swing Cam

Regarding the upper Swing Cam which is installed on top, it is usually weak structure for the strength. Therefore, although it is necessary to make any reinforcement, it is impossible to be assembled Swing Cam in case of the structure under the hanged over area. After it is assembled the lower Swing Cam on the main die at first, it is considered to be assembled Swing Cam which is installed on top.
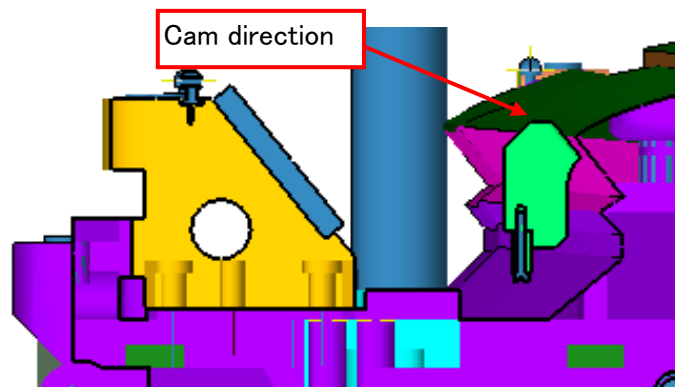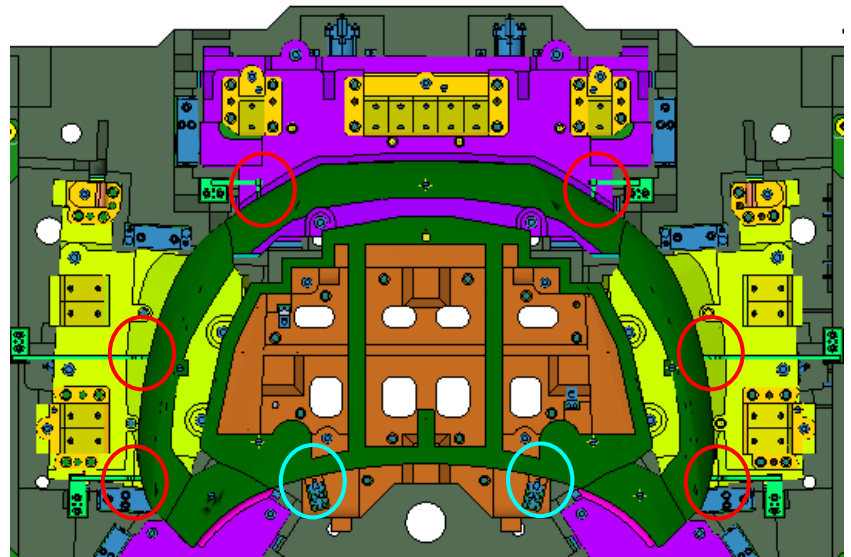
Not pulling out

Although it is necessary to be moved the location of SD Slide Pate in the direction of further outside, it is impossible to be assembled on it.
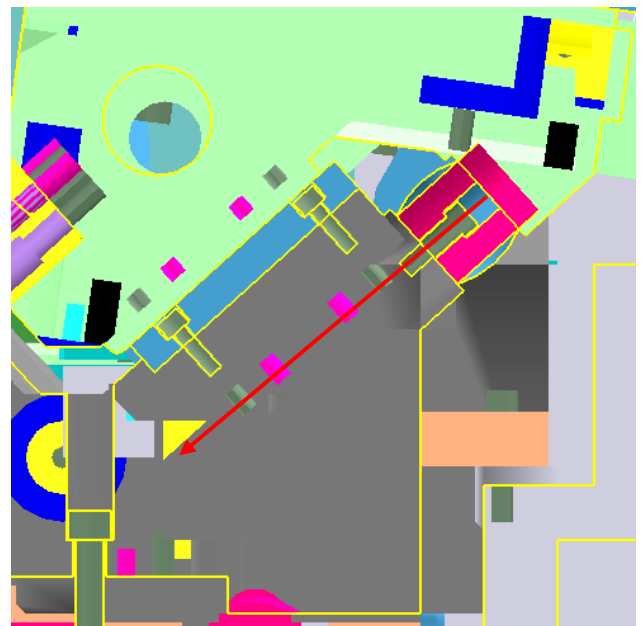
14. Gauge

In case of setting the gauge by extending from the backward of Swing Cam, it is necessary to be machined the gauge along the cam direction and to be located in the longest flange portions for the purpose of saving the smallest relief of the cam blade (5 mm allowance). It is located the standard gauge in window side.

Cam direction

15.Positive return follower

In case of required to be set the positive return follower, it is necessary to be set on the lower die instead of Swing Cam. Just in case the cam is not operated well, the lower die will be big damaged under the lifted Swing Cam by the troubled cam.

It is also available of the method to be assembled a urethane spring behind Swing Cam under making a pressure by cam.

16. Operating timing and positive return dwelling for the termination-1
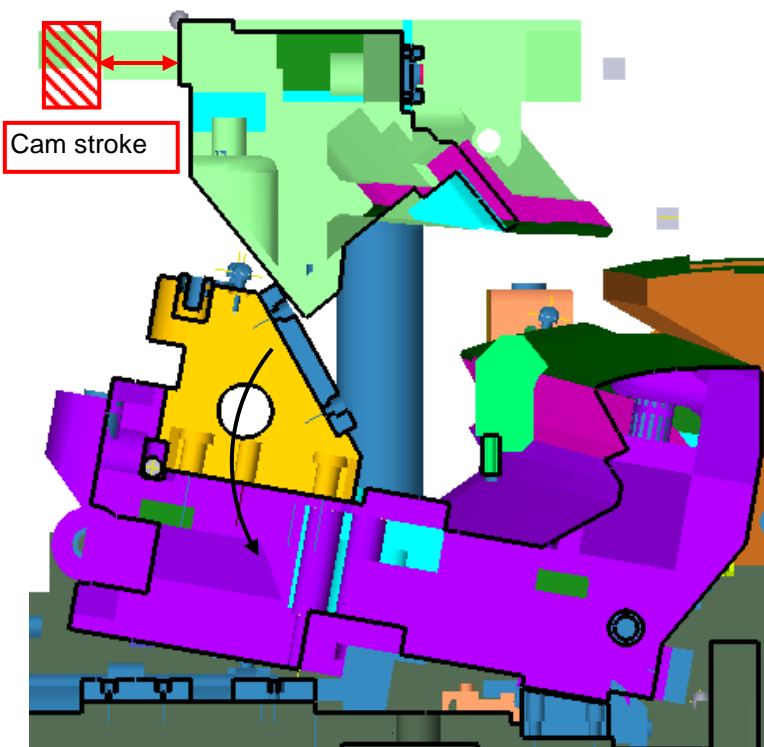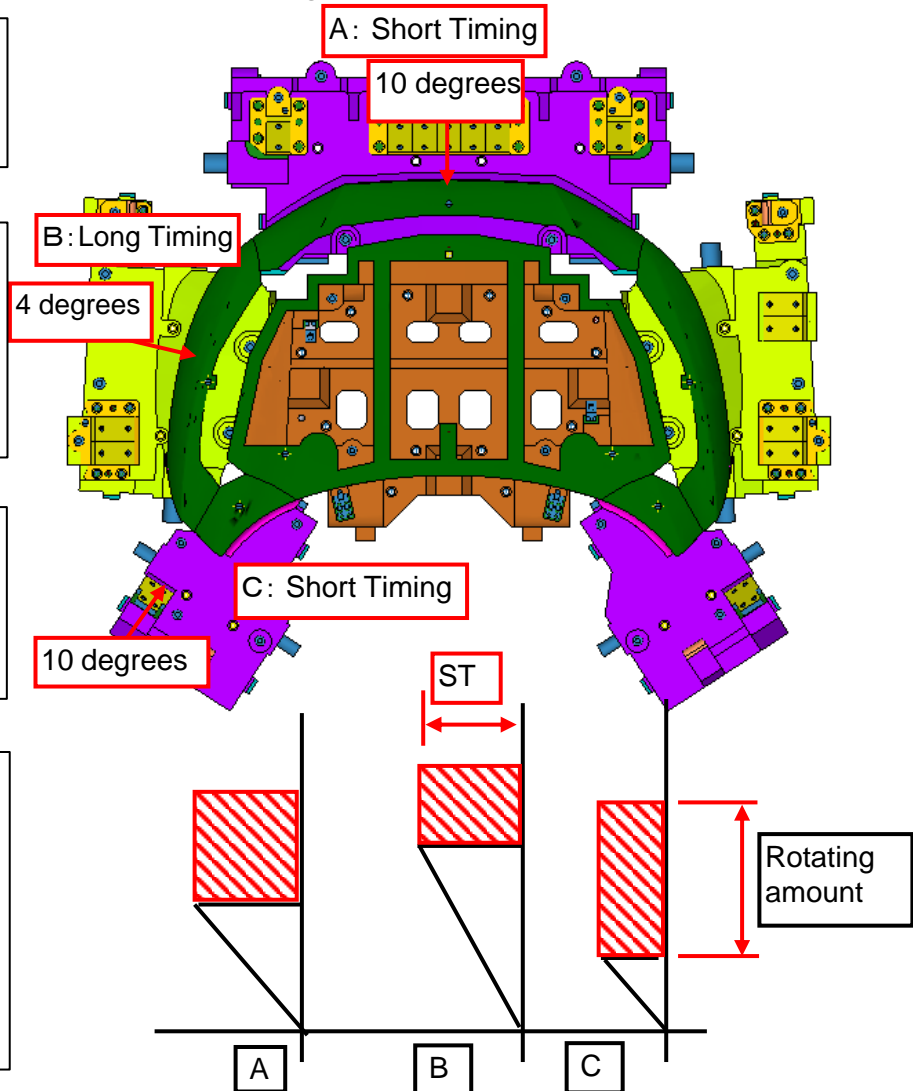
(1) It is necessary to decide a rotating amount due to the divided Swing Cam.

(2) It is necessary to decide a stroke due to the standby location under the overlapped cam condition and the cam angle.

(3) It is necessary for Swing Cam (on top) which has smaller rotating amount to be set on a quick timing.

(4) In case of no timing by cam stroke, or mismatched both cam and the flat surface angle, it is necessary to be set a positive return dowelling for the termination instead of using a pilot pin.

A：Short Timing
10 degrees

B：Long Timing
4 degrees

C：Short Timing
10 degrees

ST

Rotating amount

A   B   C

Cam stroke

It is recommended to be set on top Swing Cam which has long cam stroke and staying a long time at the original housing position. In case of located on top of Swing Cam B, it is getting smaller of the swing amounts. That are often cases, the bigger the cam stroke is, the smaller the swing amount is.

It is necessary to consider about the rotating amount on the operating timing under pressing down Swing Cam before Cam is operated. However, the cam return force is required to be bigger than air cylinder force.

16. Operating timing and positive return dwelling for the termination-2

In case of set a positive return dowelling for the termination, it is necessary to be cautioned about the following 3 points.

1) To be set the line of action from the rotating pivot with 150 mm or more far away if possible.
2) To be set the angle with 30 degrees or more from the rotating pivot to the center of the sliding surfaces. Because the frictional force will change into the rotating force.
3) To be possible to make a smaller on timing in case of making a larger angle for positive return set plate. At that time, it is necessary to meet the above requirement of (1) and (2).

angle

30° or more

150 mm or more

4) It is diagonally divided on Swing Cam A and C which are on the bottom of Swing Cam B. Swing Cam B is set at first, then Swing Cam A and C is set later. On the contrary, Swing Cam A and C start to rotate at first, then Swing Cam B is rotating later.

5) It is not caused a trouble even if it is operated at the same time by air cylinder. And it is not damaged of the die due to the diagonal divided Swing Cam. However, it is necessary to be considered of progressing a mechanical positive return for the termination like a target in the order.

6) Mechanical positive return dowelling method
   a) The timing method by the stroke of aerial cam
   In case of Swing Cam is not set due to the malfunction by air cylinder, it is necessary to be terminated a swing by the force of aerial cam.
   If it is not terminated by cam sliding (no aerial cam or both cam angle and the flat angle of Swing Cam is different case.), it is necessary to make a positive return dowelling structure for the termination.

   b) Aerial cam stroke and cut into by a forming blade
   The stroke of aerial cam depends on the reason of overlapped by which side of cam, or the approach angle of cam. It is possible to be adjusted for Swing Cam under taking a timing to be pressed by aerial cam, in case of aerial cam is operated in the same direction of Swing Cam. (However, if the swing direction is different from the flat surface angle of aerial cam, it is necessary t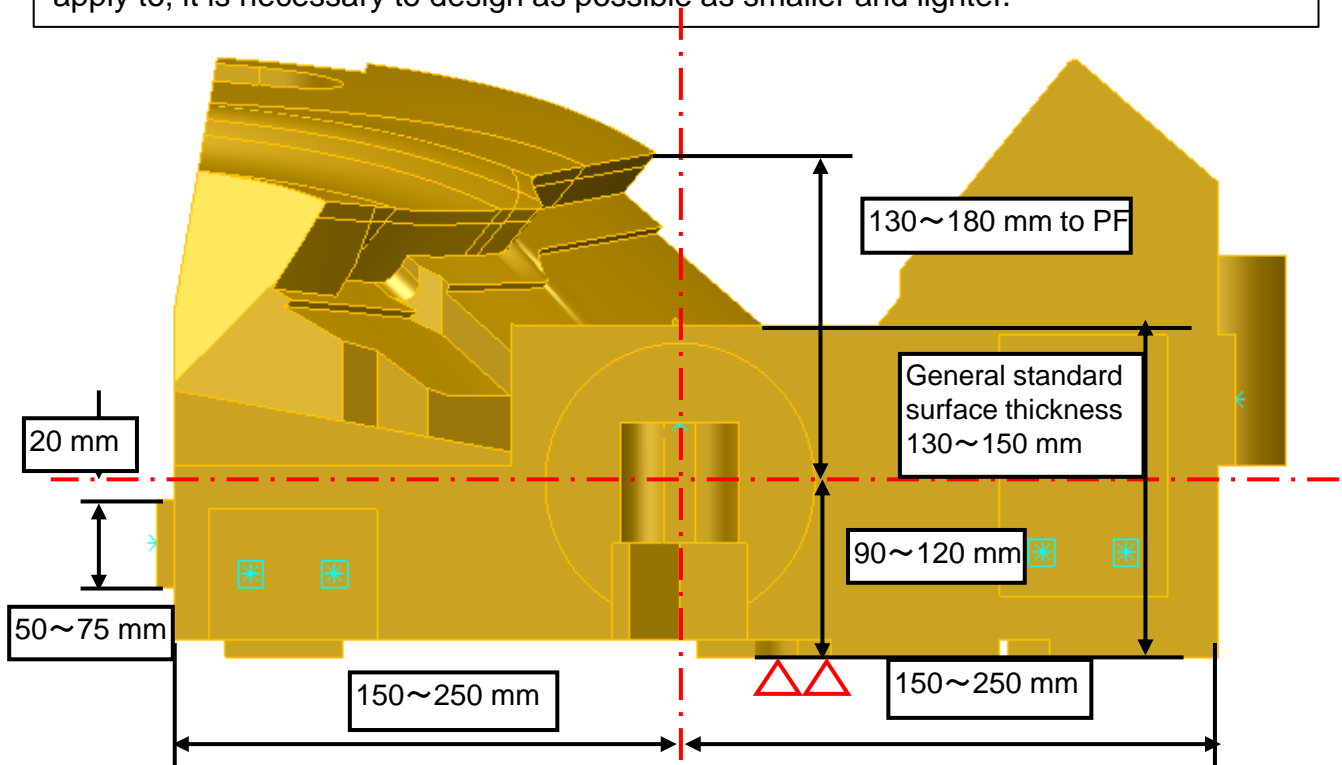o make a positive return dowelling for the termination.) After aerial cam has made a correct home position (the lower dead point stop), it is decided to be the preceding Swing Cam under depending on holding Swing Cam a limit of millimeters. Then, it is necessary to be considered of the top and bottom for the diagonal divided Swing Cam.

17. Material and standard dimension for Swing Cam

It is recommended to basically use the material of FCD540(ASTM D6510) for Swing Cam and it is necessary to be performed the annealing treatment.

It is the following standard dimensions of Swing Cam. However, although this shall not apply to, it is necessary to design as possible as smaller and lighter.

130～180 mm to PF

General standard surface thickness 130～150 mm

20 mm

90～120 mm

50～75 mm

150～250 mm

150～250 mm

18. Calculation of Moment, driving force for Swing Cam and implementing a check list

It is necessary to carry out "06-03 Design check list for Swing Cam" on the catalogue.
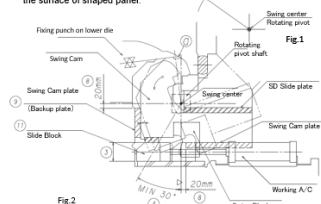
It is necessary to be calculated under using the reference "06-02 Method of obtaining the driving force by Swing Cam and the spring force".

06-03:
1/10
YB

06-03 Design Check List for Swing Cam

1.Standard Design

① On each cross-section, whether it is possible to be receded Swing Cam from the formed bending panel. Also, whether Swing Cam interferes with the panel under rotating. There is the supplied record of a approved interference on Outer panel (1mm – 2 mm)　　　　[OK , NG]

② Whether the divided point(a) does not interfere with the fixed punch of lower die. (as shown in Fig.1) It is no problem, whether the divided line which is right angle against the arc line from a rotating pivot is located outside the panel. However, whether this divided line is located inside, it is necessary to be receded Swing Cam by 10mm – 20mm as a target in the right-angle direction against the surface of shaped panel.　　　　[OK , NG]

③ In case of the design by 2D, it is necessary to make the orders of a machining tolerance between the Swing Cam and the lower die by +0.02 mm to 0 mm on the design. However, it is actually required to machine by 0 mm target.　　　　[OK , NG]

69/100

06-02:
1/3
YB

06-02 Method of obtaining the driving force by Swing Cam and spring force.

1. Method of obtaining the moment of Swing Cam
The moment (M) which is loaded on Swing Cam is obtained by the multiplication of both the weight (m) of Swing Cam and the center of gravity (J).

$M= J×m$

Generally, in case of moving the center of gravity position (J) to the shaped panel side by 10 – 20 mm, it is necessary to keep a balance for a rotating of Swing Cam. In case of moving to the direction of no shaped panel side, it should be positioned ±30 mm from a rotating pivot as a target.

2. Method of obtaining the progressing force by Swing Cam
φ40～φ100 Rotating Axle and bearing type

D: Diameter of rotating axle
W: Weight of Swing Cam
L: Distance between Swing Cam and Air cylinder
F: Driving force
(Spring force, Progressing force by Air cylinder)
　　F(kgs)=f x D/2 x L
f: W x 0.3 (Frictional resistance)
Furthermore, since there is room for 0.3 of frictional resistance, it is also possible to be operated with a frictional resistance of 0.2.
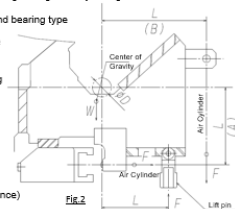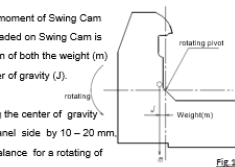
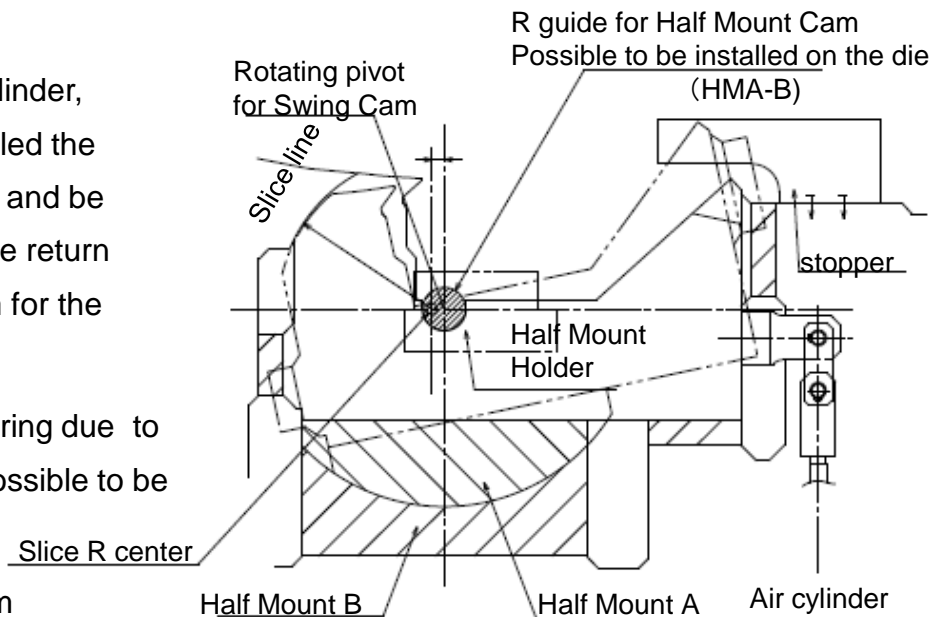The lift pin method is used for a small rotating body such as small Swing Cam.

(1) A usage standard for Half Mount Cam

a) It is basically possible to be used Half Mount Cam instead of the rotary cam.
In case of using the dividing line between the fixed punch and Swing Cam structure as advantageous as possible, in case of moving the location of the rotating pivot shaft to the shaped panel side, or in case of receiving the progressing load on Half Mount Cam, it is used Half Mount Cam.

b) In case of not using air cylinder, it is necessary to be installed the lift pin for a lifting purpose and be required to make a positive return dowelling or by aerial cam for the termination.

c) In case of not using a bearing due to the space problem, it is possible to be compactly designed.

R guide for Half Mount Cam
Possible to be installed on the die
（HMA-B)

Rotating pivot for Swing Cam

Slice line

stopper

Half Mount Holder

Slice R center

Half Mount B

Half Mount A

Air cylinder

Fig.1

(2) Design for Half Mount Cam

a) It is necessary to be design for Half Mount Cam as compact as possible.
Because since the larger overall size becomes, the larger the moment of inertia becomes, the frictional resistance for rotating is also increasing.

b) It is possible for the slice line to keep a clearance under rotating by shifting the slice line in front of the rotating pivot for Half Mount Cam.

(3) Prevention of falling and floating up during the reversing work

a) Since the male plate A of Half Mount Cam is assembled on top of the female plate B, it is necessary to make a prevention of falling and floating up during the reversing work.

b) It is necessary to be used a Half Mount Shaft and a Half Mount Holder for the purpose of a prevention of falling.

c) In case of no space for a prevention of falling, it is possible to be used with both a slice line and a rotating stopper.
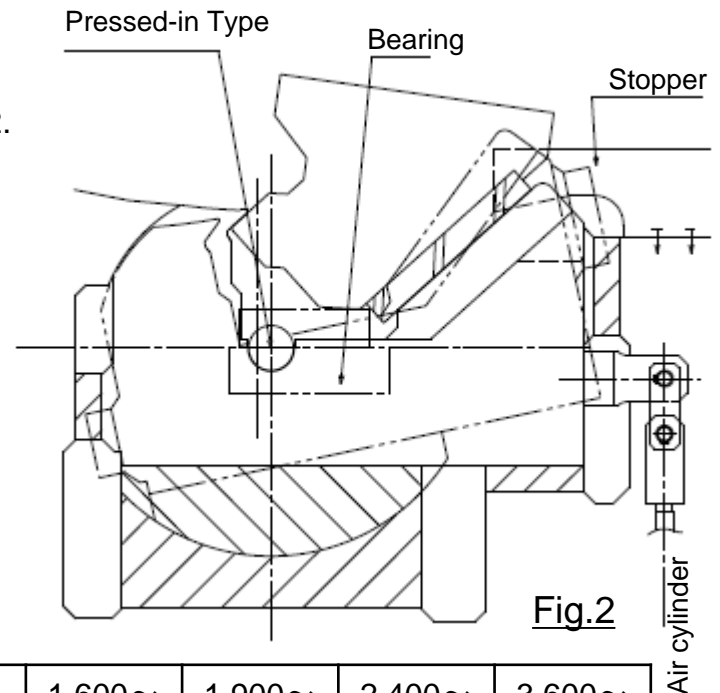
d) Refer to A312 - A316

(4) Swing stopper

a) In case of using a usual urethane stopper for Half Mount Cam, since Swing Cam may be lifted up due to the extra progressing force by air cylinder, it is recommended to use the stopper method as shown on Fig.1 and Fig.2.

b) The standard of a swing stopper is not established.

(5) The installed Q'ty for Half Mount Cam

a) It is an estimated target to be installed q'ty of Half Mount Cams as per the following table 1 and under forming standard steel panel t<1.0.

Pressed-in Type
Bearing
Stopper

Fig.2

Air cylinder

width	200 or less	200〜800	800〜1,600	1,600〜1,900	1,900〜2,400	2,400〜3,600	3,600〜4,000
Example of the number used	1	2	3〜4	4〜5	5	6	7

<table 1>

HMA-A   HMH

HMA-B

Fig.3
Example of half mount usage

In case of 1 piece

HMA-B
Fall prevention standard

Fig.4

HMA-A
Pressed-In Type
SDUJ
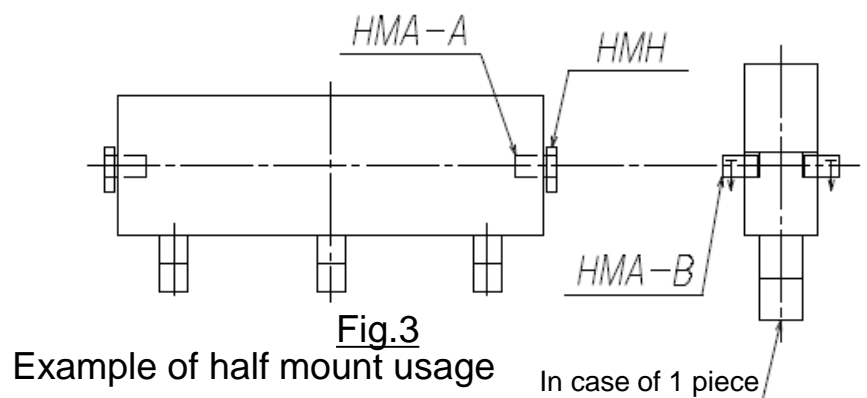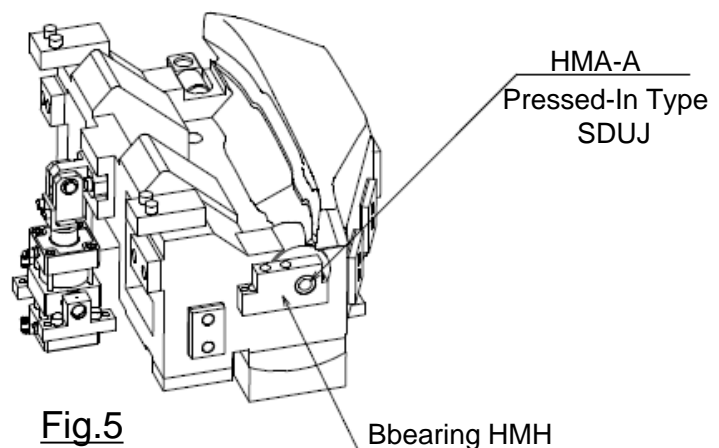
Fig.5

Bbearing HMH

(6) The method of obtaining the driving force by Half Mount Cam It is stipulated the method of obtaining the driving force under using Half Mount Cam for the tooling die. It is the following driving method.

① Pulling force by air cylinder
(Setting with approx. 4 kgf (39.2N) according to air pressure at factory)

② Spring force by the coil spring lifting pin

a) Although it is required to be operated coil spring in the initial compression, it is also possible to be operated under a powerful movement in the final compression.
Therefore, it is shown as follows.
A driving force: (P1+P2)/2
P1: the initial compression
P2: the final compression

Center of gravity

Saving weight

Air cylinder

Fig,6

Lifting Pin type

b) Positive return dowelling for the termination in lifting pin type in case of using with the lifting pin type, it is the principal to be made a positive return dowelling structure for Half Mount Cam. It is also used with an aerial cam for small cam's structure.

③ The method of obtaining the driving force by Half Mount Cam
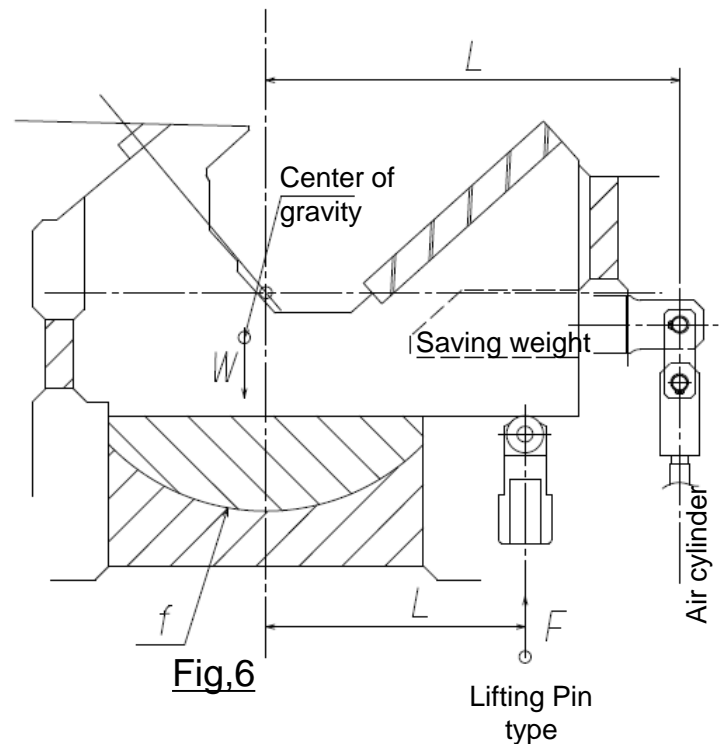(Spring force and air cylinder force)

D: Radius of Half Mount Cam x 2

W: Weight of Swing Cam structure

L: Distance between the rotating pivot for Swing Cam and the point of action

F: Driving force (Spring force, air cylinder farce)

f: W x 0.3 (frictional resistance)

Note, since f (W x 0.3) is sufficient safety factor, it is possible to be operated under even W x 0.2.

④ Calculating formula

a) It is necessary to be submitted this calculating formula in case of designing a tooling die.

Note: It is recommended to be located the center of gravity position as close as possible to the rotating pivot. It is necessary to be selected an air cylinder and a coil spring, etc. with F(kgf) value or more against the driving force which is calculated by the above formula.

$$F(kgf) = \frac{f \times D}{2 \times L}$$

Example of calculation

D: Radius of Half Mount Cam x 2　　　　D=140x2=280 mm

W: Weight of Swing Cam structure　　　　W=203 kgs

L: Distance between the rotating pivot for　　L=130 mm

　　Swing Cam and the point of action

f: W x 0.3 (frictional resistance)　　　　f=203x0.3=60.9kgf=596.8N

F: Driving force (Spring force, air cylinder force)

$$F(kgf) = \frac{f \times D}{2 \times L}$$

$$F(kgf) = \frac{(203 \times 0.3) \times (140 \times 2)}{2 \times 130}$$

$$= \frac{17{,}052}{260} = 65.58kgf = 642.7N$$

Driving force F is required 65.58kgs for a rotating.

a) In case of using the lifting pin, it is necessary to be calculated for the driving force.

P1: the initial compression　　P1=45kgf=441N

P2: the final compression　　　P2=90kgf=882N

Driving force by the lifting pin=(P1+P2)/2= (45+90)/2=67.5kgf=662N

The required driving force F < The driving force by Lifting pin

65.58kgf (642N) < 67.5kgf (662N)

Therefore, it is confirmed to be possible to be operated by using the estimated coil spring for the Lifting pin

b) In case of operating by air cylinder, it is necessary to be selected the more exceeding air cylinder force on the following table 2-3 than the driving force.

c) It is the following table 2-3 to be calculated by 5kgf (49N) of air pressure at factory and considered under 70% of safety factor.

Cylinder inner diameter	Push safety factor	Pull safety factor
φ40	47(kgf)	42(kgf)
φ63	116(kgf)	105(kgf)

<table 2>

Cylinder inner diameter	Push safety factor	Pull safety factor
φ80	188(kgf)	170(kgf)
φ100	294(kgf)	267(kgf)

<table 3>