



Chen Hsong

**MK6 vs XX-A5 (Internal Confidential)**



# Measured Performance

Specifications vs  
Actual Measured

INTERNAL ONLY

## Summary Scoring

Model	General	Electricals	Hydraulics	Mechanics	Total Score
JM168-MK6					16
XX160-A5					5

## Highest Actual Measured Speed for All Specifications at 99% Settings

	单位	XX160-A5	JM168-MK6
Max. Clamp Closing Speed	mm/s	768	817 (+6%)
Max. Clamp Opening Speed	mm/s	1,242	1,313 (+6%)
Max. Injection Speed	mm/s	98	108 (+10%)
Max. Plasticizing Speed	rpm	233	224 (-4%)
Max. Mould Adj. Speed	mm/s	1.7	2.5 (+50%)

- MK6 has a all-rounded speed advantage
- **XX-A5** is slightly faster in plasticizing rpm (but at the expense of very low torque due to much smaller hydraulic motor)



# What Makes The Difference

Precision Hydraulics®  
for the MK6



# Precision Hydraulics®

## **Precision at HIGH SPEED**

(JM168-MK6 has *sustainable* dry cycle of only 1.9s)

- Next-Gen computer control algorithms and hydraulics circuit design
- Developed by senior Japanese engineers with decades of technical expertise, using advanced hydraulics simulation software
- Enhancement of 3<sup>rd</sup> Gen Servo-Pump technology: from 3G to 4G
- Eliminates unnecessary pressure drops for ultimate precision

## **Rock-Solid Stability**

(little vibrations and shocks even running at max. speed)

## **High Repeatability**

(tolerances < 0.05%)

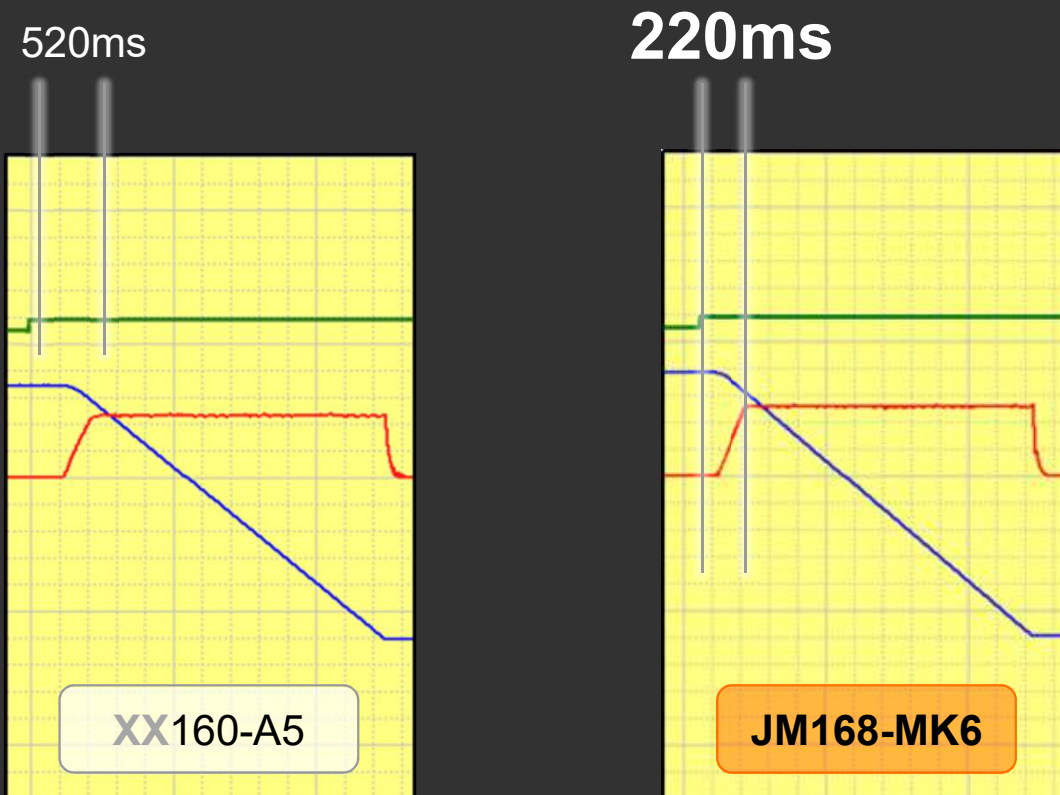


# Injection Performance

Comparisons of Injection Specs &  
Actual Measurements

INTERNAL ONLY

# Injection Speed Response (0 → 99%)

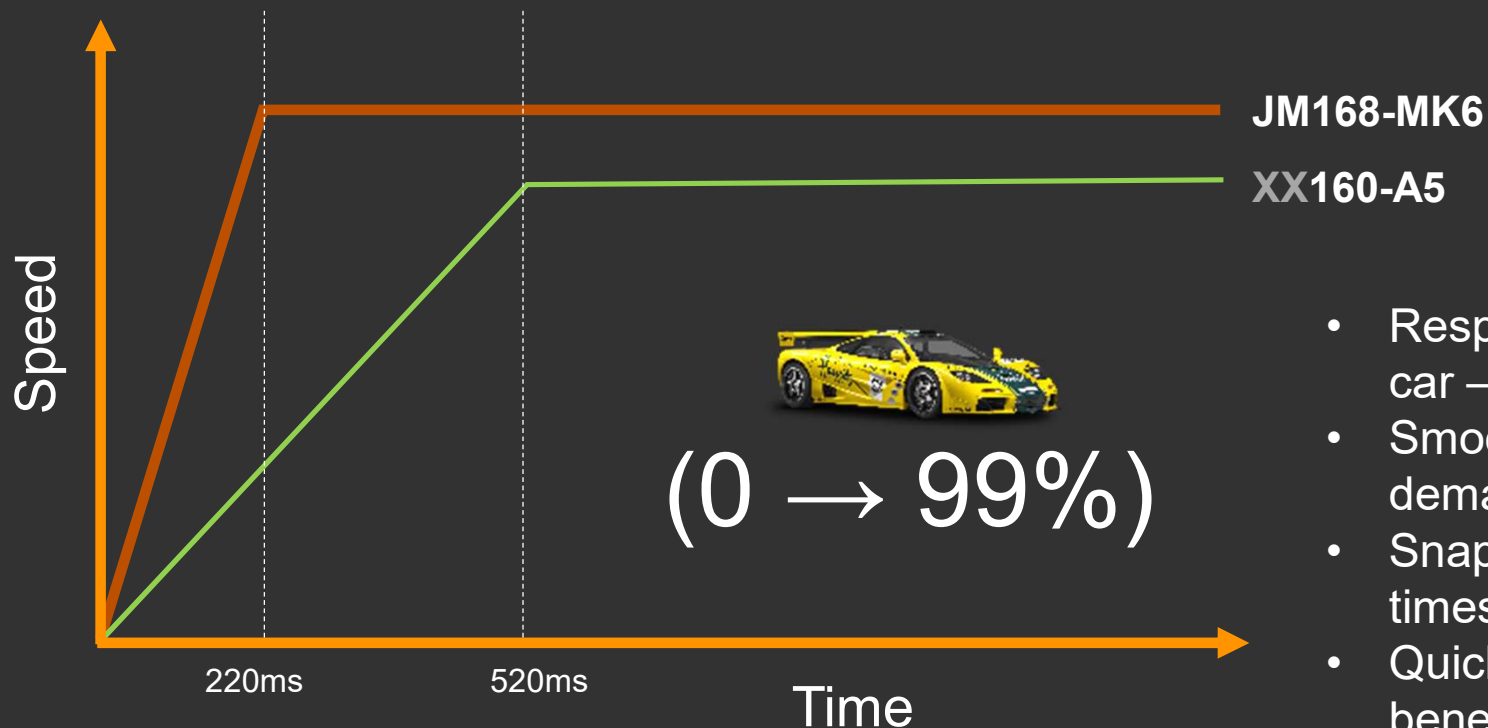


- Injection speed response curves from 0-99%
- Smaller numbers are better
- Look for: smoothness, no fluctuations, no overshoots

— Command  
— Speed  
— Position



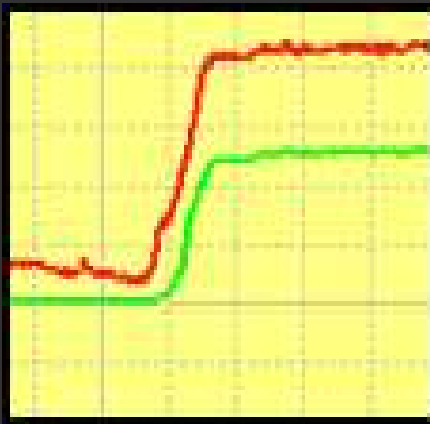
# The Importance of Speedy Response



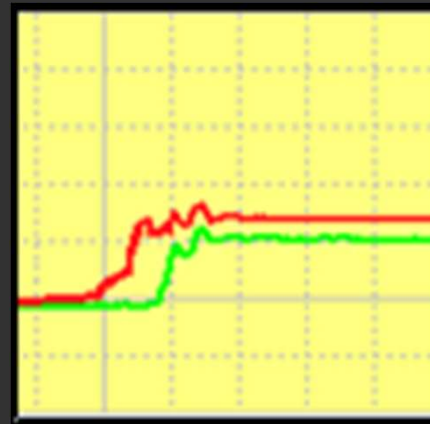
## Notes

- Response is similar to a sports car – 0-100kph acceleration time
- Smooth rides at high speed demands quick responses
- Snappy responses reduce cycle times, increase productivity
- Quick responses are particularly beneficial to difficult or thin-walled moulding processes

# Injection Pressure Control



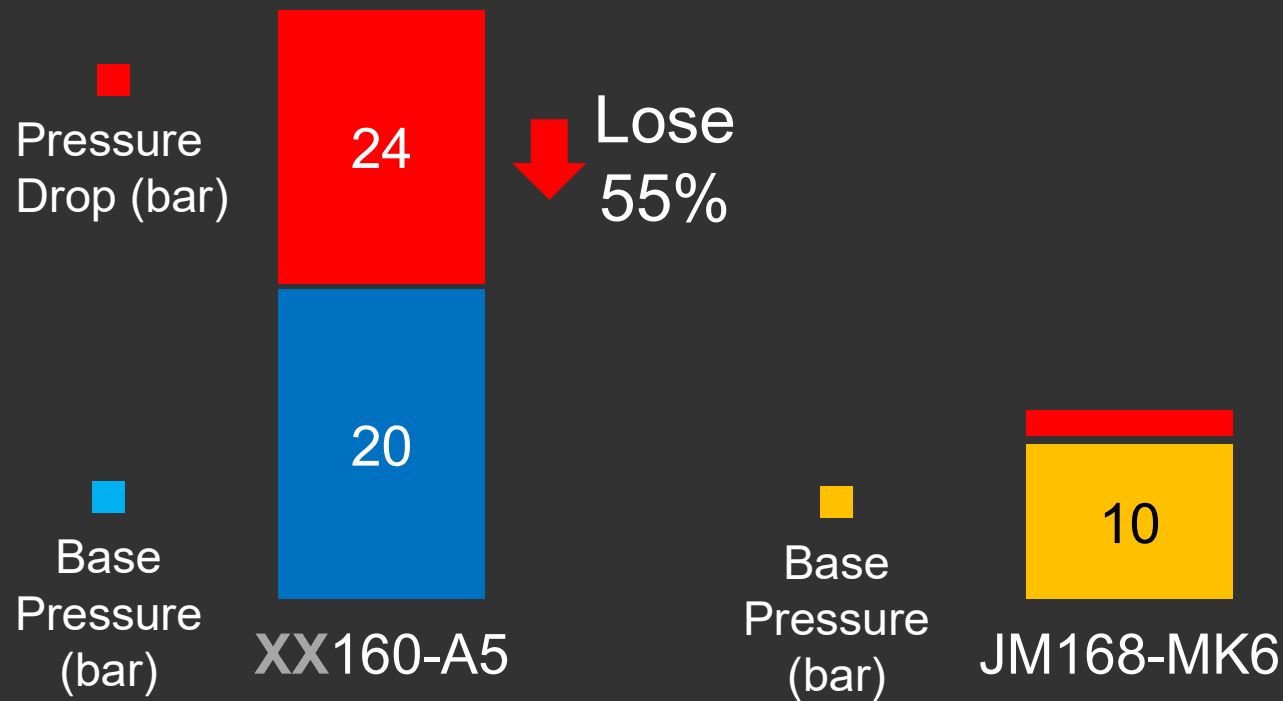
XX160-A5



JM168-MK6

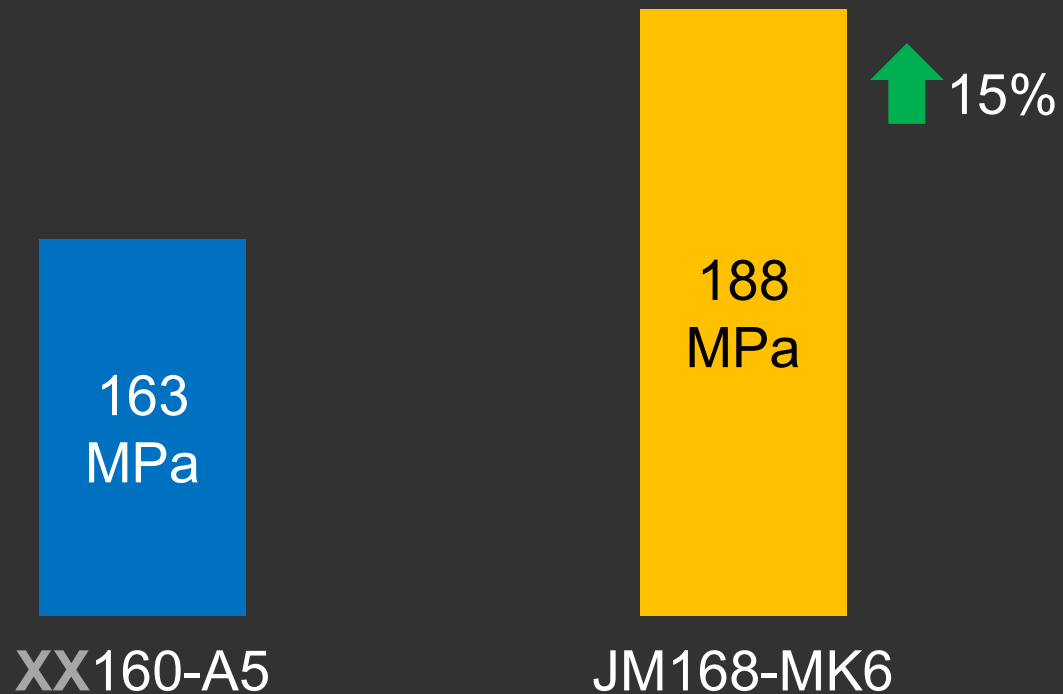
- Look for: smoothness, no fluctuations, no overshoots
- Injection pressure control is vital to ultimate part quality
- Special materials (e.g. engineering resins) are particularly sensitive to pressure fluctuations
- Stable injection pressure has a definitive impact on yield rates
- MK6 has superior pressure control

# Injection Base Pressure and Pressure Drop



- Smaller numbers are better
- Base pressure and pressure drops are non-work wasted energy dispersed as heat, requiring even more energy to cool
- High base pressure or pressure drops leads to significantly lower power efficiency and energy saving
- MK6's *Precision Hydraulics*® all but eliminates pressure drops and has very low base pressure

## Injection Pressure



- Bigger numbers are better
- Higher injection pressure means better and more consistent part quality

# Nozzle Protection Guard

no window



XX160-A5

not convenient

Window



JM168-MK6

Easy to operate

# Injection Carriage Cylinders

horizontal dual  
balanced



XX160-A5

not convenient  
when working on nozzle

Diagonal  
Dual Balanced



JM168-MK6

Easy to operate on nozzle

# Injection Base

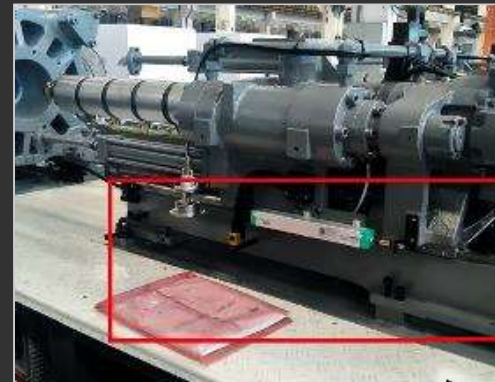
traditional guide rods



XX160-A5

not designed for  
high-speed injection

Linear Rails



JM168-MK6

Smoothness for  
high-speed injection



# Holding Performance

Comparisons of Holding Specs &  
Actual Measurements

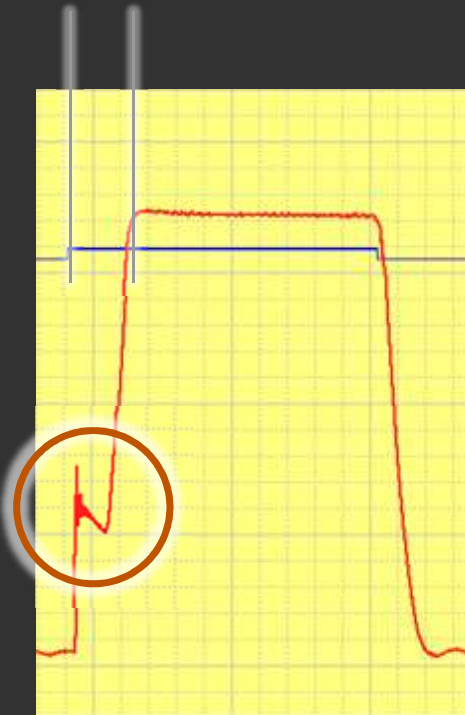


INTERNAL ONLY



## Holding Pressure Response (0 → 99%)

490ms



XX160-A5

270ms

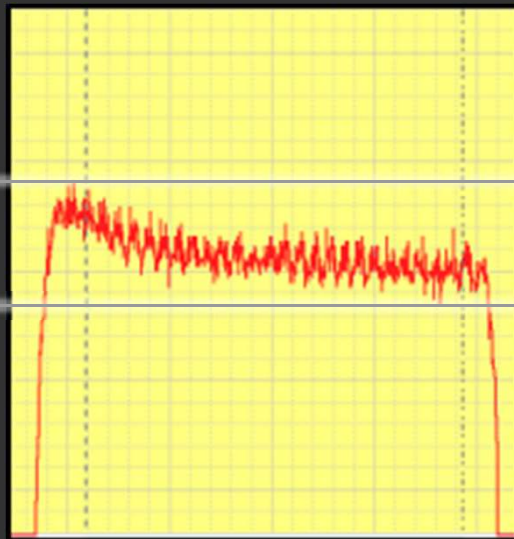


JM168-MK6

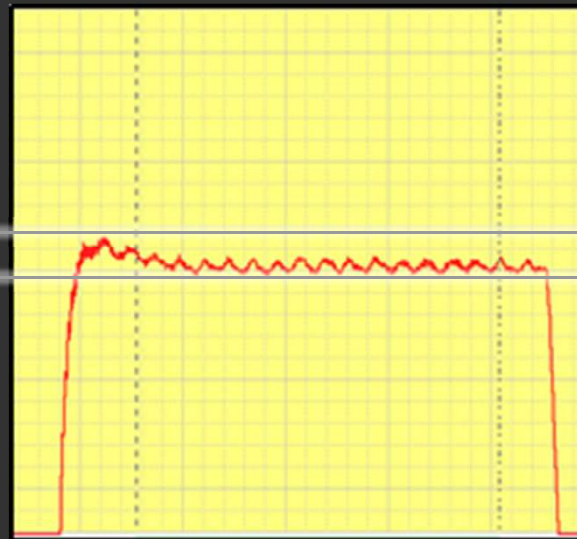
- Holding pressure response curves from 0-99%
- Smaller numbers are better
- Look for: smoothness, no fluctuations, no overshoots
- Stable holding pressure is vital to part quality and high yield
- **XX-A5** experiences significant overshoots and instabilities

— Pres. — Cmd.

# Pressure Control



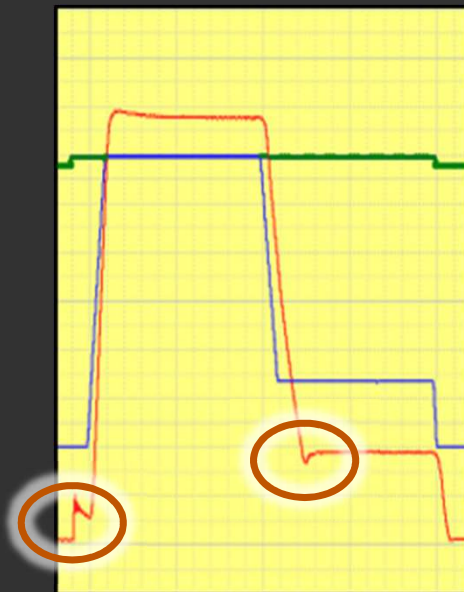
XX160-A5



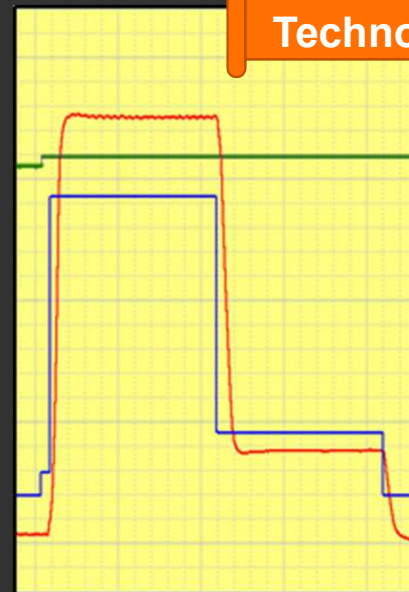
JM168-MK6

- Look for: smoothness, no fluctuations, no overshoots
- XX-II/IIS have lower quality pressure control – i.e. high fluctuations and overshoots
- MK6's innovative *Precision Hydraulics*<sup>®</sup> technology yields precise pressure control
- Precise pressure control is vital for demanding, pressure-sensitive applications such as optical parts

## V/P Switch-Over Response



XX160-A5

**Patented  
Technology**

JM168-MK6

- Look for: smoothness, no fluctuations, no overshoots
- Precise and stable V/P switch-over is vital for demanding applications requiring precise dosing

— Injection Command  
— Actual Pressure  
— Pressure Command

# Back Pressure Control

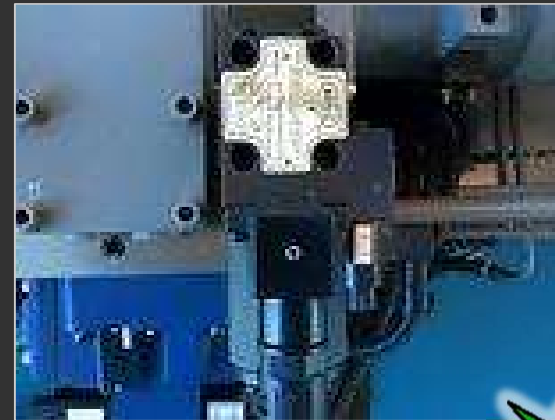
manual



XX160-A5

not convenient  
slow and inaccurate

Digital



JM168-MK6

Easy, fast, accurate



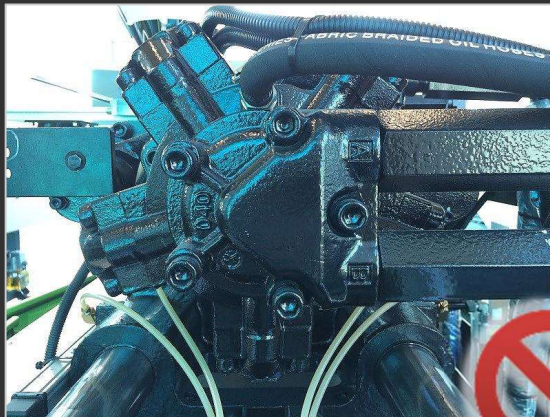
# Plasticizing Performance

Comparisons of Specs &  
Actual Measurements

INTERNAL ONLY

## Plasticizing Motor Size and Torque

weak!



XX160-A5

Size: 400cc  
Unit torque: 56 Nm

Fast and Strong



JM168-MK6

Size: 500cc  
Unit torque: 80 Nm

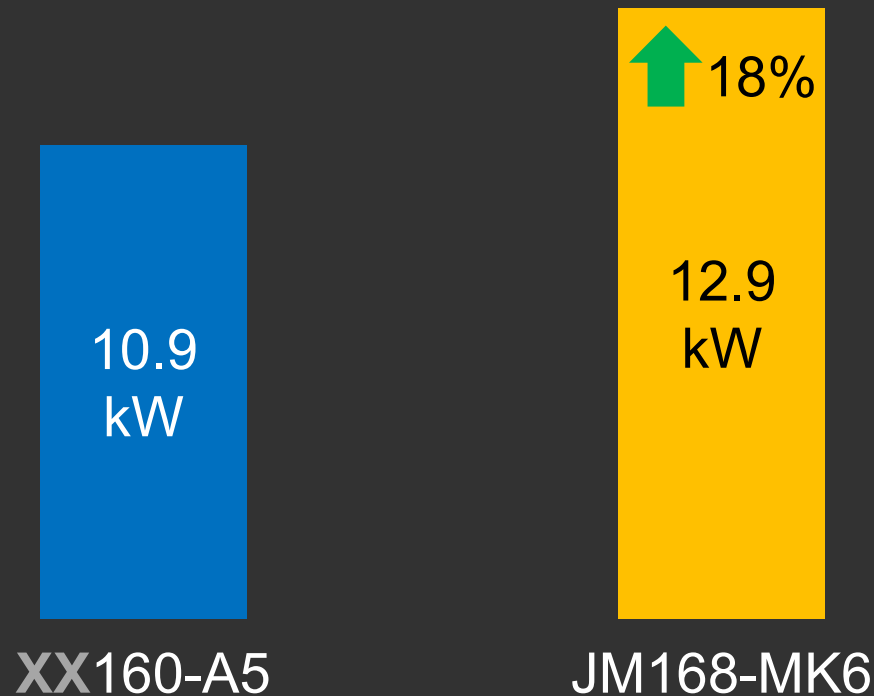
## Plasticizing Torque

Model	Screw Diam.	Flow Rate	Unit Torque	Max. Pressure	Max. Torque
<b>JM168-MK6</b>	<b>46mm</b>	<b>500cc</b>	<b>8</b>	175 bar	<b>1,400</b>
XX160-A5	48mm	400cc	5.6	175 bar	980

 30%

Due to reduced power-pack of the **XX-A5**, the hydraulic motor is artificially made smaller to maintain plasticizing speed, at the expense of very low torque (bad for engineering resins)

## Max. Heater Power



- Bigger numbers are better
- Inadequate heating power reduces plasticizing quality and efficiency, lengthens cycle time



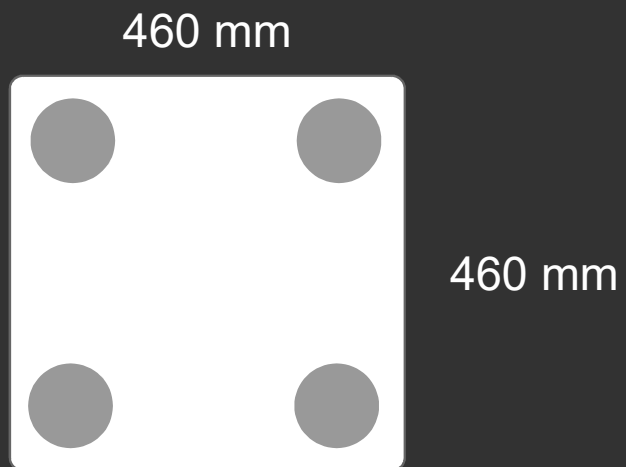


# Clamp Performance

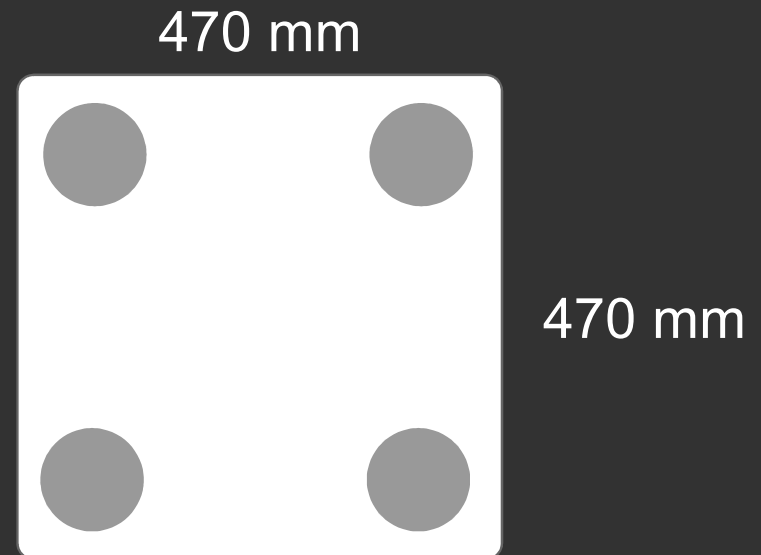
Comparisons of Platen and  
Toggle Designs, Specs &  
Actual Measurements

INTERNAL ONLY

## Space Between Tie-bars

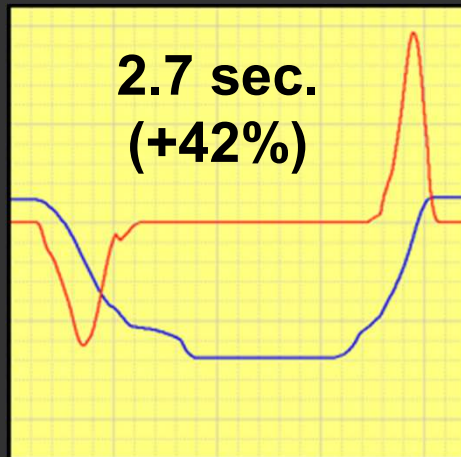


XX160-A5



JM168-MK6

## Dry Cycle Time



XX160-A5

Japanese Hydraulic  
& Mechanical Tech.



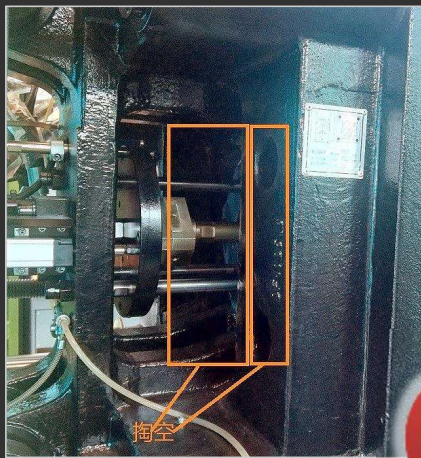
JM168-MK6

- Smaller numbers are better
- Look for: smooth motion, no fluctuations, no overshoots
- MK6's toggle mechanism and hydraulic circuit is based on advanced Japanese designs, enabling ultra-high speed operations

— Clamp Speed  
— Clamp Position

# Platen Construction

large deformation



XX160-A5

Hollow inside  
Actual thickness: 70mm



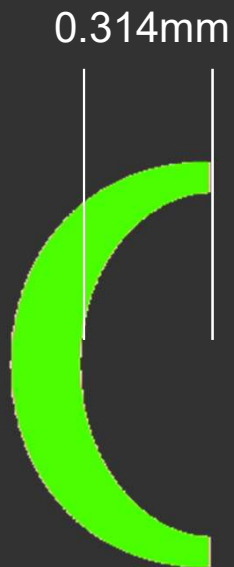
No Deformation



JM168-MK6

Solid inside  
Actual thickness: 142 mm

# Platen Deformation

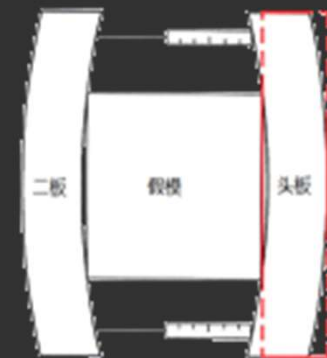


XX160-A5

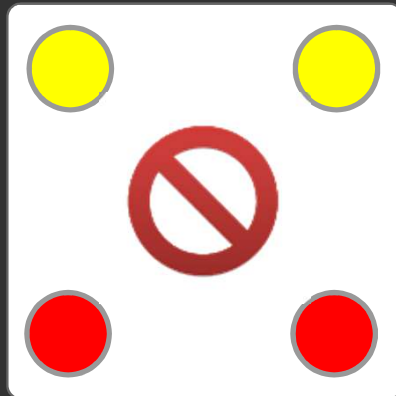


JM168-MK6

- Smaller numbers are better
- Large deformations can cause flashes
- MK6 v.next will target <math><0.1\text{mm}</math> deformation



# Uniformness of Tie-Bar Deformations



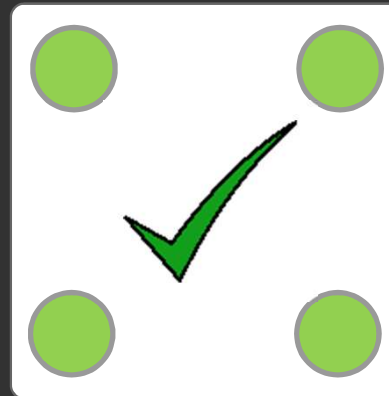
XX160-A5

● &gt; 10%

● 1-10%

● &lt; 1%

Japanese  
Toggle Design



JM168-MK6

- All four tie-bars must deform equally, or uniformly, for the best part quality without flashes and internal stresses
- Only MK6's special toggle design based on advanced Japanese technology guarantees absolute uniformity

## Bushings for the Moving Platen

copper



XX160-A5

high friction

### Oil-less Bushings



JM168-MK6

Smooth motion  
Low friction

# Lubrication Oil Sensor

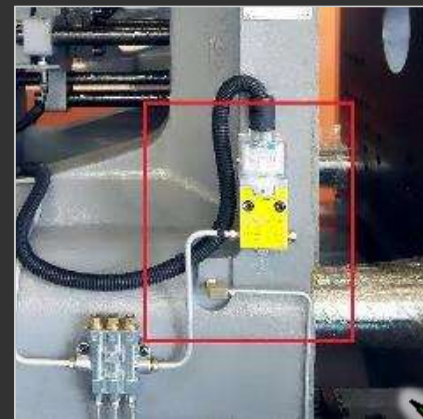
poor detection



XX160-A5

sensor installed at pump  
limited detection

Perfect Detection

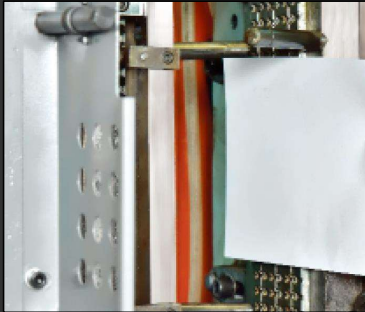


JM168-MK6

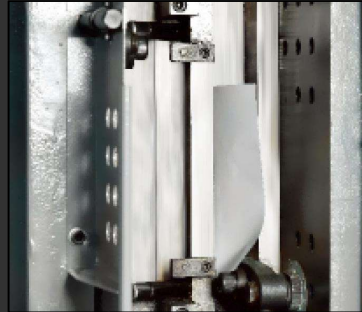
Sensor installed  
at application end



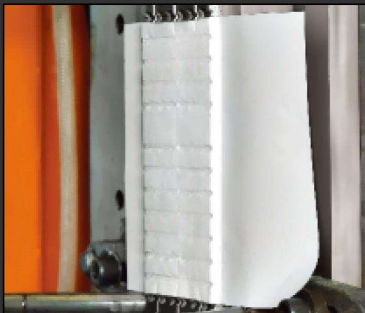
## MK6 – “A4” Mould Protection Feature



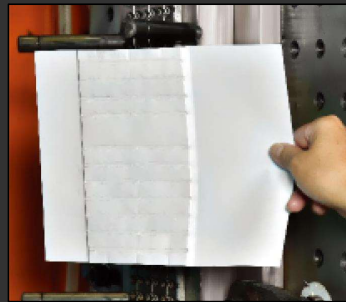
Place sheet of A4 paper inside clamp



Close clamp at 99% speed & pressure!



Clamp bounces open and alarm sounds



Inspect paper: it is not even punctured through!

- MK6 delivers the ultimate in mould protection – a single sheet of A4 paper, at 99% clamp speed and pressure settings
- *Precision Hydraulics*<sup>®</sup> at works here
- **XX-II/IIS** has no equivalent mould protection feature

## Reopening a Locked Clamp

Locked Period	Model	XX160-A5	JM168-MK6
1 hour	Pressure	>150 bar	< 100 bar
	Status	Large noise Hard vibration	Silky Smooth
60 hours	Pressure	>160 bar	< 100 bar
	Status	Large noise Hard vibration	Silky Smooth

## Hydraulic Safety Valve



XX160-A5

no safety valve  
not compliant to  
safety regulations



JM168-MK6

Compliant to all  
safety standards

## Opening Stroke



420  
mm

XX160-A5

450  
mm

JM168-MK6

- Bigger numbers are better
- Larger opening strokes enable production of deep-cavity parts

## Ejector Force



XX160-A5



JM168-MK6

- Bigger numbers are better
- Larger ejector force enables production of deep-cavity/extra-long parts





# Mould Adj. Performance

Comparisons of Specs &  
Actual Measurements

INTERNAL ONLY

## Automatic Clamping Force Adjustment

Model	Time Needed	Set Clamp Force	Measure Mould Thickness
JM168-MK6	29 sec.		not needed
XX160-A5	77 sec.		Must

- Due to complex non-linear relationship between clamping pressure and clamping force, achieving accurate clamping force usually requires experience and certain “black arts”
- Both allow intelligent automatic adjustment of clamping force
- **XX-A5** also requires measuring the mould’s actual thickness which is time-consuming



# Electricals

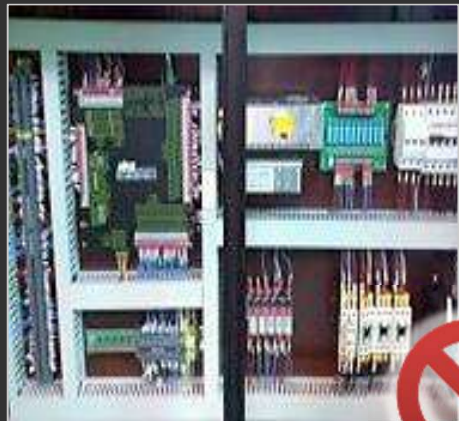
Comparisons of Specs &  
Standards

INTERNAL ONLY



# Electrical Cabinet

prone to interference



XX160-A5

traditional resin board

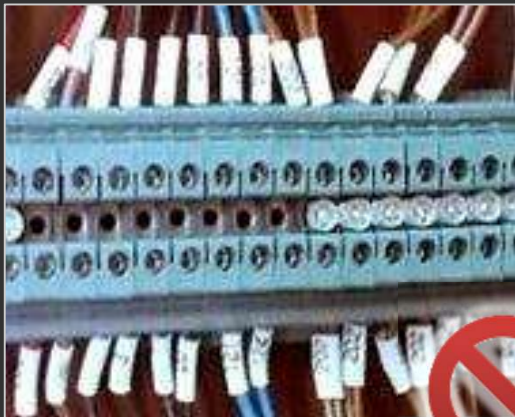
Resistant to  
Interference



JM168-MK6

Galvanized sheet

# Low-Voltage Terminals



XX160-A5

traditional terminals



JM168-MK6

CE-standard spring-type terminals

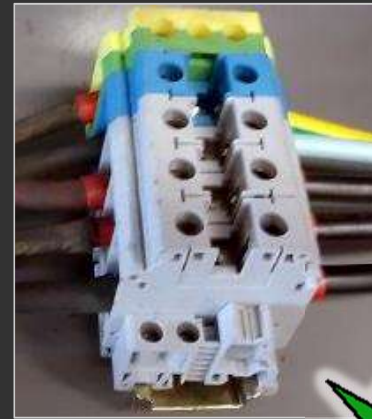
# Power Connection Terminals



XX160-A5



normal terminals  
not compliant  
to safety regs



JM168-MK6

CE-compliant terminals

## Safety Modules



XX160-A5

no safety module  
not compliant to  
safety regulations



JM168-MK6

Pilz (Germany)  
Fully compliant to  
safety standards

## Nozzle Guard Safety Switch



XX160-A5

no safety switch  
not compliant to  
safety regulations



JM168-MK6

Full Compliant to  
Safety Standards



# Guard Door Safety Switches



XX160-A5



non-safe switch  
not compliant to  
safety regulations



JM168-MK6

Safety Switch  
Full Compliant to  
Safety Standards



# Power Pack

Comparisons of Specs

INTERNAL ONLY

## Maximum Sustainable Power Output

slow, low power (15kW)



XX160-A5

Pump: 50cc  
Max. power: 17.5kW

Fast, High Power (22kW)



JM168-MK6

Pump: 64cc  
Max. power: 22kW



## Impact of Maximum Power Output on Application Processes

Power Demand by Process	5kW	10kW	15kW	20kW
JM168-MK6	✓	✓	✓	✓
XX160-A5	✓	✓	✓	trips alarm!

- Different applications require different power outputs (e.g. engineering resins and thin-walled parts require more power)
- If process power demand exceeds servosystem limit, alarm is tripped and machine stops
- Energy efficiency drops significantly when power output is close to limit
- Notes: As a servo-pump system can achieve 0 rpm, *ACTUAL* energy consumption is *NOT* related to max. power limit