Horizon

COLLATING

VAC Series

World fastest collator in this class.

HORIZON'S UNIQUE ROTARY SUCTION FEEDING SYSTEM OPERATES EFFECTIVELY ON A WIDE RANGE OF PAPER STOCKS.

The VAC series perform a wide range of applications at high productivity, with flexible but powerful programming and user-friendly operation.

VAC-L1000 (60 bins) + ST-40 + PJ-77R

BENEFITS

RELIABLE SUCTION ROTOR FEEDING

Horizon's unique suction rotor feeding system can feed a wide variety of paper stocks. Even signatures can be fed consistently. The feed wheel employs a special, highly durable rubber for totally mark-less feeding. Feed height sensors and air blowers enable a broad range of sheets to be fed with ease.

What is suction rotor feeding?

1. Air is blown into the stack to float the sheets.
2. Picks-up the top sheet.
   (The rest of the sheets are stopped by the double feed stop pads.)
3. Rotates to feed the sheet.

Double Feed Stop Pads
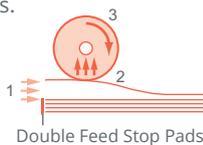
RELIABLE SENSING CAPABILITY

High-intensity infrared LEDs are employed at each bin for double feed detection. These long-lasting LEDs save the time and cost of replacing individual lamps. The IC2-V600 image checker is also available as an option for the VAC-600H / L600H.

CONNECTABLE WITH BOOKLETMAKING SYSTEM

The VAC series can be connected to Horizon bookletmakers to form a complete in-line bookletmaking system.

USER-FRIENDLY OPERATION

A large color touchscreen is icon-based for user friendly operation. The graphical screen guides the user through all set-up procedures with ease. Standard wireless remote controller allows collating speed adjustment and start / stop / jog operation from a remote position while monitoring the feeding or delivering condition.

A WIDE CHOICE OF RECEIVING TRAYS

Choose between the criss-cross receiving tray for signatures, or the stacker receiving tray for large volume collated sets. An optional paper jogger is also available.

VAC-600H / VAC-1000

COLLATOR THAT ACHIEVES HIGH PRODUCTIVITY AND HIGH QUALITY

- A wide variety of paper stocks can be fed at speeds up to 9,900 sets per hour.

- Maximum W350 × L500 mm or W13.77" × L19.68" sheet size can be fed, and thick eight-page signature can be inserted. When an optional six-page fold unit is installed to the StitchLiner series, six-page signature can also be inserted between any pages.

- The system is expandable up to 6 towers : 36 feed bins for the VAC-600H and 60 feed bins for the VAC-1000.

VAC-600H (12 bins)

VAC-1000 (20 bins)

VAC-L600H / VAC-L1000

A4 LANDSCAPE BOOKLETS ARE AVAILABLE

- Expanded paper size capacity to produce A4 landscape booklets with the StitchLiner series, and SPF-200L. A maximum W350 × L610 mm or W13.77" × L24.01" sheet size can be loaded in each bin.

- The D-VAC600 digital feed kit is provided as standard equipment to allow the collator to run as a feeder for digital prints. The system can be easily switched from the collator and feeder on the touch panel.

- The system is expandable up to 6 towers : 36 feed bins for the VAC-L600H and 60 feed bins for the VAC-L1000.

VAC-L600H (12 bins)

VAC-L1000 (30 bins)

DETAILED PROCESS FEATURES.

## Advanced programming functions for easy and efficient collating.

## EFFICIENT PROGRAMMING FUNCTIONS

Double Cycle

When any bin in the first collator section empties, the system immediately switches over to the second section and continues collating. This maximizes efficiency by giving the operator ample time to prepare stock for reloading.


Divided into two sections.
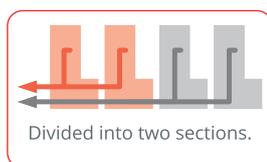
Block Feed *This is valid only if the StitchLiner series is connected as the finisher.

One book block is separated into several collated sets to enhance the folding quality for thick booklet production. Reducing the number of sheets to feed into the folding section on the StitchLiner provides sharper and tighter folds for higher quality booklets.

The second block

The first block
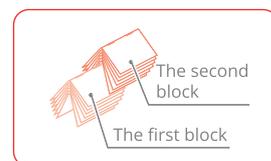
Dual Cover Feed

The top two bins are prepared for feeding covers. When one cover bin empties, the collator automatically switches over to the other cover bin.
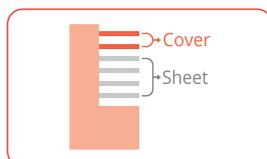
Cover

Sheet

Preset Tabbing

Up to 2 tab sheets can be inserted to every pre-set collation. Especially useful for inserting two sheets as front and back covers.


Tab Sheet

Collated Sheets

Tab Sheet
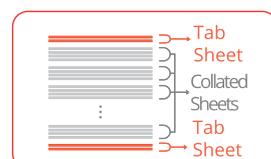
VAC-L600H (36 bins) + SPF-200L + FC-200L + TBC-200L

LEFT AND RIGHT SIDE DELIVERY

The operator can run sets into the bookletmaking system at the left side, while at the same time collating straight sets into the receiving tray on the right side of the system. The right side delivery is useful for collating reverse-numbering jobs because the sheets are turned over during transport.

*The c-tower and PJ-77R are necessary for right side delivery.
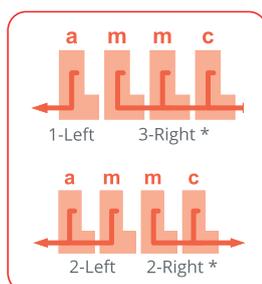
MEMORIZE FREQUENT JOB SETTINGS

Collating speed, type of program, number of bins, and sensor sensitivity settings are stored in the system memory for quick restart of regular job. Up to 9 different jobs can be memorized.
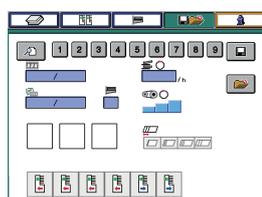
IMPROVED FEEDING PERFORMANCE `VAC-L600H / L1000`

Individual DC fans are employed at each bin for stable feeding performance to provide sufficient air amount and control. Air amount can be adjusted individually according to paper quality and size.

Air Flow of VAC-L600H / L1000

Improved smooth air flow to provide sufficient air for improved feeding performance.
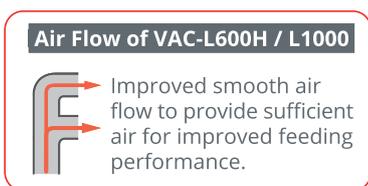
ACCURATE OVERLAP `VAC-L600H / L1000`

The new control system enables the adjustment of the sheet overlap amount between the connected towers on the touch panel. The sheet overlap accuracy is also improved to achieve stable and accurate booklet production.

ENERGY SAVINGS `VAC-L600H / L1000`

Power consumption* is reduced by 35% with the VAC-L600H and 22% with the VAC-L1000 as compared to previous models.

*VAC-L600H : Power consumption 1.5 kW (35% energy saving compared to VAC-600H)
 VAC-L1000 : Power consumption 1.8 kW (22% energy saving compared to VAC-1000)

OPTIONS.

Performance Enhancing Options.

CTK-100 α-TOWER RIGHT DELIVERY KIT `All`

- The a-tower kit is required for a-towers to deliver sheets to the right side.

  *This kit is not required for the right side delivery on the c-tower.

ESB-L1000 / ESB-L600

EXTRA SIDE BLOWER `VAC-L1000 / VAC-L600H`

- This enables to stably feed the large sheets.

EAB-1000 EXTRA AIR BLOWER `VAC-1000`

- The EAB-1000 improves the feeding operation with coated paper.

D-VAC600 DIGITAL FEED KIT `VAC-600H`

- The D-VAC600 allows the collator to be used as a feeder for digital prints.

  *D-VAC600 is equipped to the VAC-L600H / L1000 as standard equipment.

D-VAC600US ULTRASONIC SENSOR

`VAC-600H / L600H / L1000`

- The ultrasonic sensor ensures accurate double feed detection at the delivery section for digital feed.

IC2-V600 IMAGE CHECKER `VAC-600H / L600H`

- The image checking system installed in each bin scans all pages and checks paging disorder. A scanning position can be changed on the touchscreen. The system can also detect differences in color.

LG-1000 LANDSCAPE KIT `VAC-1000`

- LG-1000 landscape kit enables to load the sheet length up to 610 mm or 24" for A4 landscape booklet production.

OPTION LIST

YES : Installable

NAME	MODEL	DESCRIPTION	VAC-1000	VAC-L1000	VAC-600H	VAC-L600H
a-tower Right Delivery Kit	CTK-100	This is required for a-towers to deliver to the right side.	YES	YES	YES	YES
Extra Side Blower	ESB-L1000	This blows air from the side for stable sheet feeding.	-	YES	-	-
Extra Side Blower	ESB-L600	This blows air from the side for stable sheet feeding.	-	-	-	YES
Extra Air Blower	EAB-1000	This helps to improve feeding the coated sheets.	YES	-	-	-
Digital Feed Kit	D-VAC600	This is required when feeding digital printed sheets.	-	Standard	YES	Standard
Ultrasonic Sensor	D-VAC600US	This detects double-feeding at the delivery section when feeding digital printed sheets.	-	YES	YES	YES
Tandem Stacker	ST-60	The twin tray enables non-stop collating.	YES	YES	YES	YES
Bypass Stacker	ST-40	This serves as a high-capacity offset or straight stacking device.	YES	YES	YES	YES
Criss-Cross Receiving Tray	SW-12 SW-20	The tray swings 90 degrees at each collating interval.	YES	YES	YES	YES
Paper Jogger	PJ-77	The jogger vibrates collated sheets into perfect alignment.	YES	YES	YES	YES
Paper Jogger for Right Side Delivery	PJ-77R	The jogger vibrates collated sheets delivered on the right side into perfect alignment.	YES	YES	YES	YES
Sub Accumulator	SA-40	This temporarily accumulates the sheets delivered from the collator and stabilizes the sheet jog for the stitcher.	YES	YES	YES	YES
Bypass Conveyor	BC-20	This can be connected with the collators, stitchers and receiving trays (SW-12 / SW-20) all together.	YES	YES	YES	YES
Image Checker	IC2-V600	This compares the particular printed pattern and the colors to detect the misplaced page.	-	-	YES	YES
A4 Landscape Kit	LG-1000	This enables to load the sheet length up to 610 mm or 24" for A4 landscape booklet production.	YES	-	-	-

ST-60 TANDEM STACKER

- The twin-tray design delivers 8,000 sets per hour as neatly jogged off-set stacks. When one stack tray becomes full, the sets are automatically stacked on to the other stack tray, with no system slowdown.

- Errored sets are delivered to the built-in reject tray for non-stop operation.

- A continuously cycling tail jog keeps all sheets well positioned for superior stack quality.

ST-60		
Sheet Size	Width Length	**Width × Length** Max.350 × 500 mm or 13.8" × 19.7" Min.182 × 128 mm or 7.2" × 5.0"
Sheet Weight Range	52 to 208 gsm	
Production Speed	2-tray : 8,000 sets per hour (A4 or 8.5" × 11" / 10 sheets / offset stacked) 1-tray : 5,000 sets per hour (A4 or 8.5" × 11" / 10 sheets / offset stacked) 1-tray : 8,000 sets per hour (A4 or 8.5" × 11" / 10 sheets / straight stacked)	
Stack Capacity	Right Tray (A) : 360 mm or 14.1" Left Tray (B) : 580 mm or 22.8"	
Max. Transport Thickness	Max. 6 mm or 0.24"	
Voltage / Frequency	Single Phase 200 to 240 V, 50 or 60 Hz	
Machine Dimensions	W1,957 × D652 × H1,102 mm or W77.1"× D25.7"× H43.4"	

ST-40 BYPASS STACKER

- Connected between the collating and bookletmaking systems, the ST-40 serves as a high-capacity offset or straight stacking device.

- Errored sets are delivered to the built-in reject tray for both non-stop collating and booklet-making production.

- A continuously cycling tail jog keeps all sheets well positioned for superior stack quality.

- The ST-40 is equipped with hand feeding function as standard.

- Preset count function allows for efficient stack handling.

ST-40		
Sheet Size	Width Length	**Width × Length** Max.350 × 500 mm or 13.8" × 19.7"* Min.182 × 128 mm or 7.2" × 5.0" *Maximum 610 mm or 24.02" length of a sheet can be received on the stack tray by attaching the optional guide ST-LG on the stack tray.
Sheet Weight Range	52 to 208 gsm	
Production Speed	8,000 sets per hour (A4 or 8.5" × 11" / 10 sheets / straight stacked) 5,000 sets per hour (A4 or 8.5" × 11" / 10 sheets / offset stacked)	
Stack Capacity	360 mm or 14.1"	
Max. Transport Thickness	Max. 6 mm or 0.24"	
Voltage / Frequency	Single Phase 200 to 240 V, 50 or 60 Hz	
Machine Dimensions	W1,353 × D652 × H1,027 mm or W53.3"× D25.7"× H40.5" (including feed error tray)	

PJ-77 / PJ-77R PAPER JOGGER

- Driven by an independent motor, the paper jogger vibrates collated sheets into perfect alignment. The jogger tray rises automatically by a foot switch to start collating.

PJ-77

| PJ-77 / PJ-77R		
Sheet Size	Width Length	**Width × Length** Max. 320 × 460 mm or 12.60" × 18.11" Min. 128 × 182 mm or 5.04" × 7.17"
Stack Pile Height	110 mm or 4.4"	
Voltage / Frequency	The power is supplied from the collator.	
Machine Dimensions	W480 × D400 × H530 mm or W18.9" × D15.8" × H20.9"	

OPTIONS.

High Performance Delivery Options.

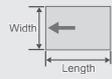## SW-12 / SW-20
CRISS-CROSS RECEIVING TRAY

- The criss-cross receiving tray swings 90 degrees at each collating interval, clearly separating collated sets to simplify the post-collating processes. This is also suitable for piling sets onto previously collated sets.
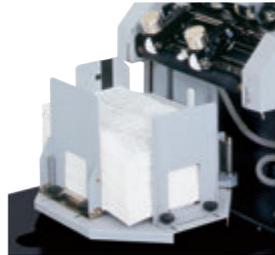
SW-20

SW-12 / SW-20		
Sheet Size	Width Length	**Width × Length** Max. 320 × 470 mm or 12.60″ × 18.51″ Min. 148 × 210 mm or 5.83″ × 8.27″
Stack Pile Height		Small Sheet Receiving Plate (A5-A4) 170 mm or 6.7″ Large Sheet Receiving Plate (A4-A3) 100 mm or 4.0″
Voltage / Frequency		The power is supplied from the collator.
Machine Dimensions		W645 × D560 × H480 mm or W25.4″ × D22.1″ × H18.9″

BC-20 BYPASS CONVEYOR

- The BC-20 can be connected with the collators, stitchers, and receiving trays (CCR / CCR-DX) all together. The BC-20 switches over from bookletmaking to stacking with simple push of a button.
- The built-in rejecting tray is equipped for non-stop collation.
- Sheet jam detection is provided. And the LED shows the location of jam.
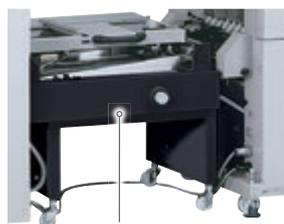- The BC-20 is equipped with hand feeding function as standard.
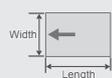
BC-20

SW-20
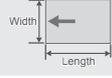
BC-20		
Sheet Size	Width Length	**Width × Length** Max. 350 × 500 mm or 13.78″ × 19.69″ Min. 120 × 148 mm or 4.73″ × 5.83″
Sheet Weight Range		It depends on the connected collator specifications.
Production Speed		Speed is set in three steps to match the driving speed of collator.
Reject Tray Capacity		Max. 30 mm or 1.2″
Voltage / Frequency		Single Phase 200 / 220 / 240 V, 50 / 60 Hz Single Phase 230 V, 50 Hz
Machine Dimensions		W1,255 × D686 × H910 mm or W49.4″ × D27.0″ × H35.9″
Connectable Machines		SW-12, SW-20

SA-40 SUB ACCUMULATOR

- The SA-40 temporarily accumulates the sheets delivered from the collator for stable sheet jog in the stitcher for quality bookletmaking. Also the SA-40 improves the sheet jog for the ST-40 bypass stacker.
- Misfeed detection ensures to eject all the misfed sheets in the accumulating mode.
- Sheet delivery angle, assist air, stopper plate, and jog waiting time are adjustable for running the various types of paper.

SA-40

SA-40		
Sheet Size		**Width × Length**
	Accumulate	Max. 350 × 500 mm or 13.78″ × 19.69″ Min. 140 × 204 mm or 5.52″ × 8.04″
	Pass Through	Max. 350 × 500 mm or 13.78″ × 19.69″ Min. 120 × 148 mm or 4.73″ × 5.83″
Sheet Weight Range		It depends on the connected collator specifications.
Max. Thickness		3 mm or 0.11″
Voltage / Frequency		Belt driving power is supplied from the Stacker ST-40.
Machine Dimensions		W710 × D600 × H850 mm or W28.0″ × D23.7″ × H33.5″ (When the transport section is opened)
Connectable Machines		ST-40

ADVANCED BOOKLETMAKING SYSTEM SOLUTIONS.

Efficient In-line Booklet Production.

STITCHLINER SERIES
SADDLE STITCHING SYSTEM

- The StitchLiner series combines all processes from flat sheet collating, scoring, folding, and saddle-stitching through three-knife trimming into a single system.

HTS-50
Three-knife Trimmer

SPF-50
Saddle Stitcher

VAC series
Collator

ACF-50
Accumulate & Folder
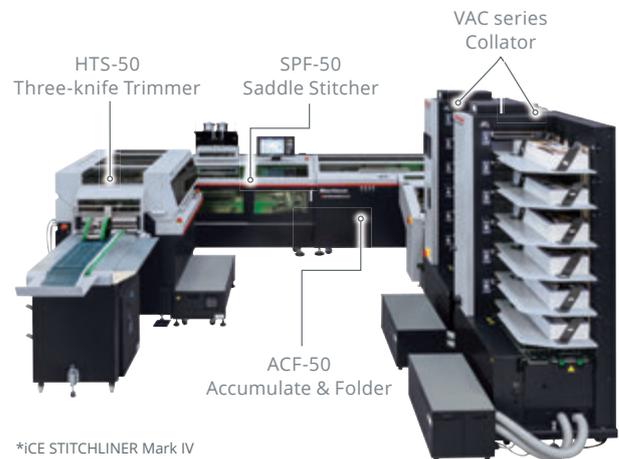
*iCE STITCHLINER Mark IV

SPF-200 SERIES + FC-200 SERIES
BOOKLETMAKING SYSTEM

- High performance in-line bookletmaking system with collating, stitching, folding and fore-edge trimming. The SPF-200L + FC-200L allows the A4 landscape finishing. By connecting the TBC-200L, top-and-bottom trimming is available after stitching and fore-edge trimming.

FC-200L
Fore-edge Trimmer

SPF-200L
Stitcher & Folder

VAC series
Collator

TBC-200L
Top and Bottom
Trimmer

HOF-400
HIGH-SPEED OFFLINE FEEDER

- Digital prints piled up on the sheet feed station are reliably transported to the bookletmaker. A standard mark sensor enables variable sheet count documents to be handled with integrity and verification. The system feeds at a speed of 25,000 sheets (A3) per hour.

VAC series
Collator

AC-400
Accumulator

CF-400
Cover Feeder

HOF-400
High Speed Offline Feeder
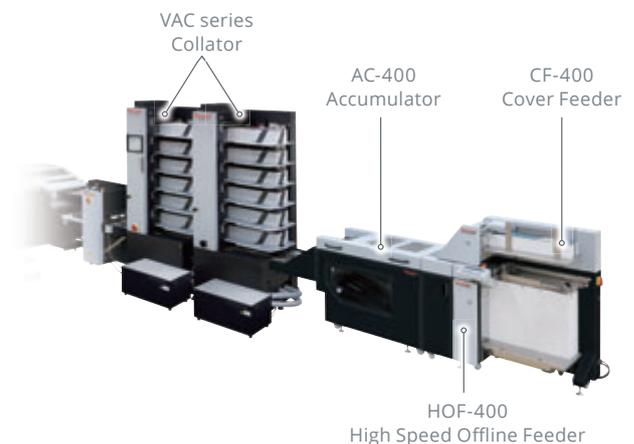
*The photos are examples of system configurations. The system configurations and layout vary for each customer.
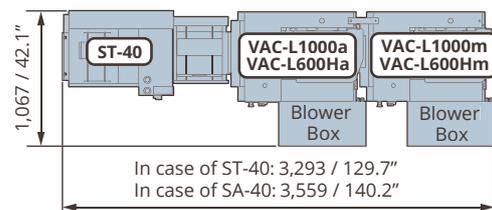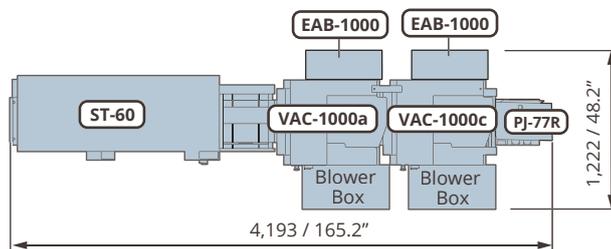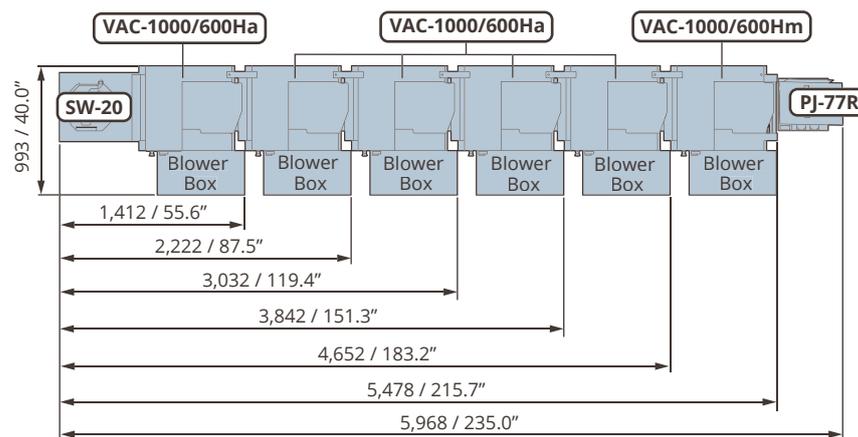
SPECIFICATIONS.

Machine Dimensions. (Unit : mm / inch)

(Top View)

Height : 1,962 mm or 77.3"

* 2,040 mm or 80.4" when including the IC2-V600. (Only for the VAC-600H / VAC-L600H)

VAC-L1000/L600Ha — VAC-L1000/L600Hm — VAC-L1000/L600Hc

SW-20 | Blower Box | Blower Box | Blower Box | Blower Box | Blower Box | Blower Box | PJ-77R

1,031 / 40.6"

1,582 / 62.3"
2,562 / 100.9"
3,542 / 140.0"
4,522 / 178.1"
5,502 / 216.7"
6,482 / 255.2"
6,986 / 275.1"

VAC-1000/600Ha — VAC-1000/600Ha — VAC-1000/600Hm

SW-20 | Blower Box | Blower Box | Blower Box | Blower Box | Blower Box | Blower Box | PJ-77R

993 / 40.0"

1,412 / 55.6"
2,222 / 87.5"
3,032 / 119.4"
3,842 / 151.3"
4,652 / 183.2"
5,478 / 215.7"
5,968 / 235.0"

EAB-1000 | EAB-1000

ST-60 | VAC-1000a | VAC-1000c | PJ-77R | Blower Box | Blower Box

1,222 / 48.2"

4,193 / 165.2"

ST-40 | VAC-L1000a / VAC-L600Ha | VAC-L1000m / VAC-L600Hm

Blower Box | Blower Box

1,067 / 42.1"

In case of ST-40: 3,293 / 129.7"
In case of SA-40: 3,559 / 140.2"

	VAC-1000			VAC-L1000		
Model	VAC-1000a, VAC-1000m, VAC-1000c			VAC-L1000a, VAC-L1000m, VAC-L1000c		
Number of Bins	10 bins	20 bins	30 bins	40 bins	50 bins	60 bins
Sheet Feeding System	Suction Rotor System					
Sheet Size	**Width × Length** Max. 350 × 500 mm or 13.77" × 19.68" Min. 148* × 148 mm or 5.83"* × 5.83" *Machine can collate the sheet of 120 mm or 4.73" width when option guide is attached.			**Width × Length** Max. 350 × 610 mm or 13.77" × 24.01" Min. 148* × 148 mm or 5.83"* × 5.83" *Optional support guide for small size is capable of handling the 120 mm or 4.73" width sheet at minimum.		
Sheet Weight Range	Art / Coated Paper : 73.3 to 207 gsm Normal Paper : 52.3 to 207 gsm 8-page fold signature : up to 104.7 gsm					
Bin Stack Height	Max.Stack Height : 55 mm or 2.16" Max. Stack Weight : 11 kg or 24.3 lb each bin					
Sheet Overlap	Front delivery : 4 Steps Maximum, Large, Middle and Small Rear delivery : 4 Steps Maximum, Large, Middle and Small					
Production Speed	10 bins	Max. 9,900 sets per hour (A5LEF, Straight Receiving) Max. 8,900 sets per hour (A4LEF, Straight Receiving) *Production speed is limited by the type of finisher or sheet weight.				
	20 bins	Max. 6,900 sets per hour (A4LEF, Straight Receiving)				
	30 bins	Max. 6,400 sets per hour (A4LEF, Straight Receiving)				
	40 bins	Max. 5,000 sets per hour (A4LEF, Straight Receiving)				
	50 bins	Max. 4,500 sets per hour (A4LEF, Straight Receiving)				
	60 bins	Max. 4,000 sets per hour (A4LEF, Straight Receiving)				
Receiving Tray	Swing Type SW-20 Stack Type ST-60, ST-40 Jogger Type PJ-77, PJ-77R					
Voltage / Frequency	Single Phase 208 / 220 V, 50 or 60 Hz Single Phase 230 to 240 V, 50 or 60 Hz					
Machine Dimensions	862 (a) 930 (m) 945 (c) (W) × 652 (D) (*1) × 1,962 (H) mm or 34.0" (a) 36.7" (m) 37.3" (c) (W) × 25.7" (D) (*1) × 77.3" (H) Pitch between towers : 810 mm or 31.9" Blower box : 665 (W) × 345 (D) × 320 (H) mm or 26.2" (W) × 13.6" (D) × 12.6" (H) *1 Blower box excluded 693 mm or 27.3" (D) when including the projection			1,034 (a) 1,100 (m) 1,113 (c) (W) × 686 (D) (*2) × 1,962 (H) mm or 40.7 (a) 43.3 (m) 43.8 (c) (W) × 27.1 (D) (*2) × 77.3" (H) Pitch between towers : 980 mm or 38.6" Blower box : 665 (W) × 345 (D) × 320 (H) mm or 26.2" (W)× 13.6" (D) × 12.6" (H) *2 Blower box excluded 726 mm or 28.6" (D) when including the projection		

	VAC-600H			VAC-L600H		
Model	VAC-600Ha, VAC-600Hm, VAC-600Hc			VAC-L600Ha, VAC-L600Hm, VAC-L600Hc		
Number of Bins	6 bins	12 bins	18 bins	24 bins	30 bins	36 bins
Sheet Feeding System	Suction Rotor System					
Sheet Size	**Width × Length** Max. 350 × 500 mm or 13.77" × 19.68" Min. 120* × 148 mm or 4.73"* × 5.83" *Use the side guide for small sheets when handling sheets smaller than 148 mm or 5.83" in width.			**Width × Length** Max. 350 × 610 mm or 13.77" × 24.01" Min. 148* × 148 mm or 5.83"* × 5.83" *Optional support guide for small size is capable of handling the 120 mm or 4.73" width sheet at minimum.		
Sheet Weight Range	Art / Coated Paper : 73.3 to 207 gsm Normal Paper : 52.3 to 207 gsm 8-page fold signature : up to 104.7 gsm					
Bin Stack Height	Max.Stack Height : 130 mm or 5.11" Max.Stack Weight : 26 kg or 57.3 lb each bin					
Sheet Overlap	Front delivery : 4 Steps Maximum, Large, Middle and Small Rear delivery : 4 Steps Maximum, Large, Middle and Small					
Production Speed	6 bins	Max. 9,900 sets per hour (A5LEF, Straight Receiving) Max. 9,600 sets per hour (A4LEF, Straight Receiving) *Production speed is limited by the type of finisher or sheet weight.				
	12 bins	Max. 7,000 sets per hour (A4LEF, Straight Receiving)				
	18 bins	Max. 6,600 sets per hour (A4LEF, Straight Receiving)				
	24 bins	Max. 5,000 sets per hour (A4LEF, Straight Receiving)				
	30 bins	Max. 4,500 sets per hour (A4LEF, Straight Receiving)				
	36 bins	Max. 4,000 sets per hour (A4LEF, Straight Receiving)				
Receiving Tray	Swing Type SW-20 Stack Type ST-60, ST-40 Jogger Type PJ-77, PJ-77R					
Voltage / Frequency	Single Phase 208 / 220 V, 50 or 60 Hz Single Phase 230 to 240 V, 50 or 60 Hz					
Machine Dimensions	862 (a) 930 (m) 945 (c) (W) × 652 (D) (*1) × 1,962 (H) (*3) mm or 34.0" (a) 36.7" (m) 37.3" (c) (W) × 25.7" (D) (*1) × 77.3" (H) (*3) Pitch between towers 810 mm or 31.9" Blower box : 665 (W) × 345 (D) × 320 (H) mm or 26.2" (W) × 13.6" (D) × 12.6" (H) *1 Blower box excluded 693 mm or 27.3" (D) when including the projection *3 2,040 mm or 80.4" (H) when including the IC2-V600			1,034 (a)1,100 (m)1,113 (c) (W) × 686 (D) (*2) × 1,962 (H) (*3) mm or 40.7 (a) 43.3 (m) 43.8 (c) (W) × 27.1 (D) (*2) × 77.3" (H) (*3) Pitch between towers : 980 mm or 38.6" Blower box : 665 (W) × 345 (D) × 320 (H) mm or 26.2" (W) × 13.6" (D) × 12.6" (H) *2 Blower box excluded 726 mm or 28.6" (D) when including the projection *3 2,040 mm or 80.4" (H) when including the IC2-V600		

* The machine design and specifications are subject to change without any notice.
* Specifications may vary depending on the job, paper quality, environmental influences, and various other factors. Please do a test run before starting production.

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