


Photron

PhotoCam
Speeder V2

HIGH-SPEED CAMERA



PhotoCam
Speeder V2



HIGH-SPEED CAMERA SYSTEM TO TROUBLESHOOT MANUFACTURING LINE PROBLEMS

In the rapidly evolving automated manufacturing environment, the ability to analyze high-speed processes in order to increase quality and efficiency, and to identify and resolve immediate manufacturing line problems is essential. Factory floor personnel are required to accurately and quickly analyze and adjust complex electro-mechanical systems. Understanding the real time dynamics of fast moving production mechanisms is a frequent challenge for many factory technicians. Analyzing and clearly understanding the details of these high-speed processes is often impossible with the naked eye.

With the aid of super-slow-motion replay even the fastest events taking place in thousandths of a second can be clearly visualized allowing the factory personnel to see, analyze and understand the detail of these high-speed processes and events.

With this unique and dynamic understanding the factory technician has the confidence to adjust, optimize and improve high-speed manufacturing systems.

High-speed imaging technology providing engineers with the freedom to see and understand complex production processes.

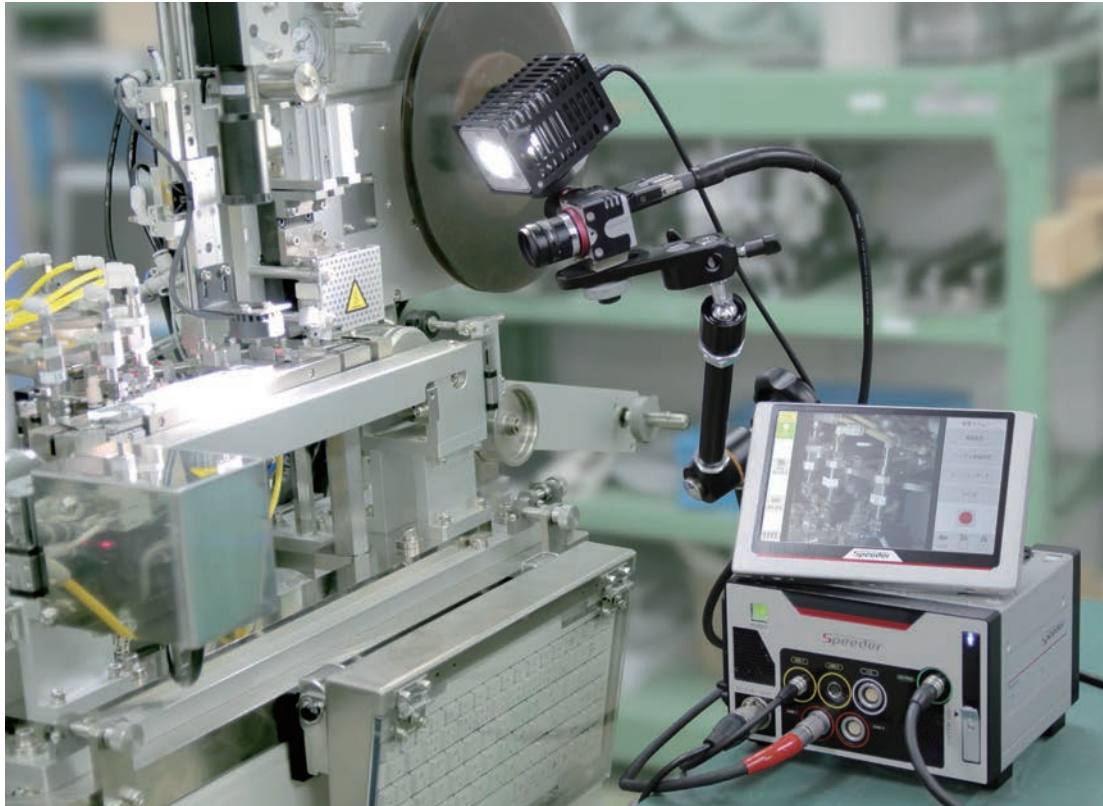


PhotoCam **Speeder V2**

- | Designed specifically for machine optimization and fault finding applications.
- | Super-miniature camera heads allow use in space limited and difficult to reach locations.
- | Easy to use. Anywhere and by everyone.
- | Two recording modes ensure critical images are always captured.
- | Fast and convenient replay and analysis of image data.

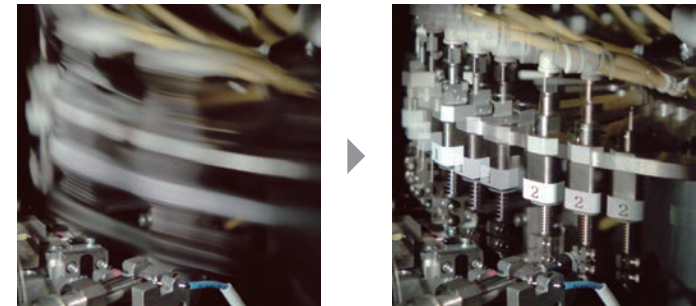
SpeederV2 allows you to optimize processes and diagnose the cause of problems

Analysis of high-speed machinery using slow-motion replay allows technicians to truly understand complex processes making optimization and improvement possible.



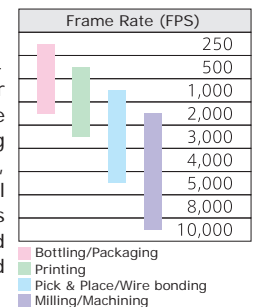
Powerful high-speed imaging performance

A standard video camera captures images at a rate of 30 frames per second (fps). SpeederV2 captures full frame images at up to 2,000fps. With this powerful imaging performance SpeederV2 allows the detail of high-speed events to be easily captured and replayed immediately in super slow-motion.



Flexibility allowing use in a wide variety of production applications

SpeederV2 offers a range of frame rates and other recording parameters to be selected to suit the requirements of a wide range of manufacturing processes. Applications include materials handling, filling and processing in FMCG, food and pharmaceutical industries, pick and place of parts and components in semiconductor and electronics manufacture and forming, and cutting and pressing in metal and plastics production.



Examples of problems solved, and improvements made to manufacturing processes:

Plastic bottle filling line

Bottling/Packaging

The problem to be solved was liquid content of the bottle penetrating the cap thread due to splashing during the bottle filling process. By recording images of bottle movement with SpeederV2 over an extended period of time, the location where splashing occurred was recognized and the cause identified and corrected. A timing misalignment due to partial wear on the conveyor was the problem.

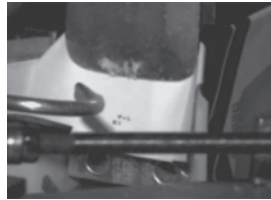


Frame Rate : 500 FPS

Heat sealing of paper packages

Printing

A defective heat sealing process resulted in leakage of liquid content from a paper package. Due to the high speed of the process, it had been impossible to identify the cause. By recording the paper folding process with SpeederV2 it was possible to determine that the defect was due to insufficient bending of the package material. Adding an additional small former to the process allowed the package to be fully folded and the problem was solved.

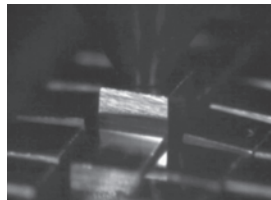


Frame Rate : 1,000 FPS

Semiconductor 'pick and place' process

Pick & Place/Wire bonding

A longstanding problem existed that related to picking of a component by a vacuum pad. The cause was difficult to detect due to the small size of the component. By placing the SpeederV2 camera head inside the machine it was possible to record detailed images of the vacuum pad operation. A nozzle misalignment was identified and subsequently corrected.

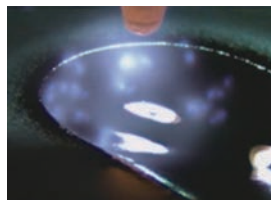


Frame Rate : 2,000 FPS

TIG welding

Milling/Machining

A number of defects were present in an automotive component production process. Viewing the welding process to observe optimal conditions was problematic due to the high intensity of the welding arc. By recording the arc discharge and the resulting weld pool using SpeederV2 with a very short exposure duration, it was possible to clearly visualize the welding process. Operators were able to adjust the process settings which lead to improved welding quality.



Frame Rate : 4,000 FPS

Pharmaceutical packaging transfer line

Bottling/Packaging

A tablet packaging transfer line was stalling due to intermittent jamming of packages. Because the problem occurred just once in tens of thousands of operations, it was impossible to observe the cause of the problem. SpeederV2 was used to record the package transfer process over an extended period of time in order to capture the failure event. The defect was found to be due to a mistiming of a vacuum suction pad and was corrected by an adjustment of timing.



Frame Rate : 1,000 FPS

Transfer line of printed sheets

Printing

The ejector of a DVD package sheet printer was bending the printed sheets and jamming. The fault was intermittent and difficult to analyze due to the high-speed and complex process. Continuous high-speed video recording of the ejector process with SpeederV2 revealed the cause of the defect, which was simply corrected by the adjustment of process components.



Frame Rate : 1,000 FPS

Chip moulder

Pick & Place/Wire bonding

When mounting components onto a printed circuit board the yield rate was poor due to misalignment of parts and soldering errors. By making fine adjustments to machine operation while recording the component mounting process with SpeederV2, it was possible to reduce errors and improve yield and efficiency.



Frame Rate : 2,000 FPS

Metal cutting

Milling/Machining

During the cutting process products were being damaged due to scratches caused by ejected metal chips. The problem was difficult to solve because of the high speed and complexity of the process. By recording the process with SpeederV2 it was possible to understand the problem, and via adjustment of the cutter angle, rotation speed and travel, the problem was corrected.



Frame Rate : 8,000 FPS

Unique benefits of the SpeederV2 super-miniature camera head

Imaging from positions previously inaccessible with conventional cameras and operation in space limited locations is now possible.



Viewing a process from any position, even within the machine is now possible

SpeederV2 makes it possible to position the camera head in any location to achieve the best view of the process being studied, i.e. within a production machine, over, under or through a narrow gap – everything is now possible. Compatible with a wide range of miniature C mount CCTV lenses, the system offers freedom and flexibility.



Recording through a narrow gap



Recording from high above a production process

Color and Monochrome camera options

Both color and monochrome camera heads can be selected for use with the system. Equipped with a color camera head and recording in 24-bit color, images are suitable for inclusion in reports and presentations. The SpeederV2 monochrome camera head offers high light sensitivity, providing clear images even under very low light levels.



Simultaneous two-camera video capture

With an optional second camera head, simultaneous recording from two camera heads is now possible at an affordable cost. By observing a process simultaneously from two different angles, in close-up and wide views or recording multiple related processes, complex problems can be clearly identified.



Viewing from two different angles



Observing in close-up and general views



Recording multiple inter-related processes



※ Actual size

Easy to use, everywhere and by everyone

Portable, easy to set-up and simple to use – designed for convenient process diagnostics.

All-in-one package for transport and storage OPTION

All system components including camera, processor module and accessories are stored in a single custom transit case. The system is suitable for checked airline baggage and for courier delivery allowing efficient usage. Additional space is provided in the case for the storage of optional parts and accessories.



Small and lightweight system design



Flexible operation

Each SpeederV2 system component is fitted with a standard ¼ inch threaded mounting point. Components can be configured together in a number of ways to provide flexible operation to meet the individual requirements of different applications.

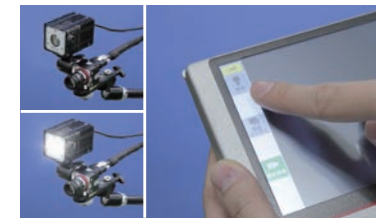
Fast system set-up in only 3 minutes

Conventional high-speed camera systems require complex and specialized set-up and configuration. The SpeederV2 transit case contains all the components required for system operation including camera head(s), LED Light(s), and touch panel LCD remote keypad. It allows for components to be stored with cables connected. Just connect the components together and the system is ready to go. Because SpeederV2 does not require a PC for operation, there is no delay before the system can be used. SpeederV2 provides the capability to save its most recently used recording settings allowing operation as soon as the system is powered on.



LCD remote keypad

The LCD remote keypad provides a large 7 inch easy-to-view touch panel screen. All system operations including recording, image replay and set-up are made using this touch panel screen while the live view from the camera is continuously displayed. Intuitive controls allow the user to zoom in on a section of the image as may be required during operation. When two camera heads are connected, both can be controlled from a single remote keypad for simultaneous live recording and slow motion replay.



LED lighting module OPTION

The SpeederV2 system is equipped with optional high intensity 10 watt LED lights providing illumination of over 30,000lx at a working distance of 30cm. The LED lights incorporate a focusing lens allowing the beam angle to be adjusted to meet the requirements of the scene being recorded.



High capacity battery pack OPTION

With the optional high capacity battery pack attached, no plug-in power is required for system operation or lighting.



First-step operation guide

An easy-to-follow operation guide is supplied with the system. It explains system connection, set-up, operation and recording, image replay and editing, and dismantling for repacking. Clear instructions and illustrations allow the system to be used by a novice operator without the requirement for specialist training.



Fast and convenient replay and analysis of image data

Using unique SpeederV2 system software, recorded image data can be conveniently processed and utilized. By combining image data from multiple tests, recordings can be synchronized and compared. An imaging report can be compiled presenting test details in a clear and easy-to-understand format.



SSD reader

Image data stored on a high capacity SSD drive can be connected to a PC via the SSD reader. Using a USB 3.0 interface, the SSD reader is recognized as an external drive by the PC.

PSV software to replay and edit image data

PSV (PhotoCam Speeder Viewer) software has been specifically developed to replay and edit image data from the SpeederV2 system. Replay speed, brightness, contrast and colorization of images can be adjusted together with zoom functions to pick out a portion of interest within the image. Image data from multiple tests can be combined and synchronized to allow comparison of multiple events. PSV software allows images to be converted into a standard movie file for storage and sharing of data.



Main replay functions

- Replay, pause, jog, reverse replay and variable speed replay
- Adjustment of brightness, contrast, gamma and color, and synchronized replay of multiple recordings

Main editing functions

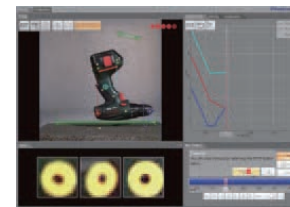
- Cut editing, trimming, set-up information saving and still image capturing
- Combination of multiple image data sets, file format conversion (AVI, MOV, BMP, TIFF, etc.)

PFA 2D motion analysis software

OPTION

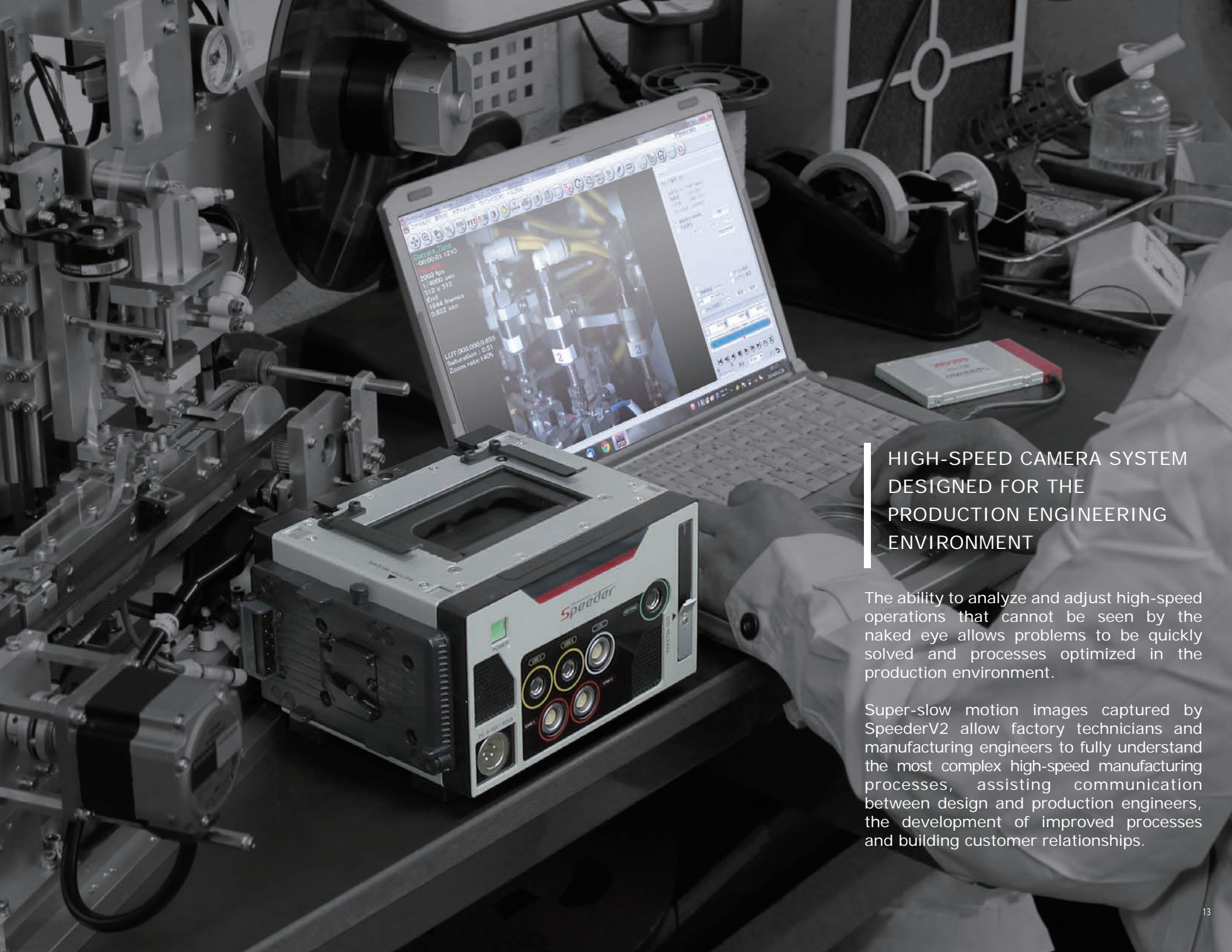
PFA (Photron FASTCAM Analysis) motion analysis software offers analytical functions for the further dynamic analysis of image data captured using SpeederV2. Features can be marked and automatically tracked in order to calculate their X-Y coordinates, velocity and acceleration, with graphic presentation of analysis results.

PFA has a built-in 'Guide Function' that provides simple step-by-step instructions for using the software, making it possible for beginner to work with the image data, track and analyze results, and output a graphic display of the final results.



Main analysis functions

- Tracking • scaling • coordinate function • correlated tracking
- distance measurement between two points • static coordinate conversion • dynamic coordinate conversion
- displacement / velocity / acceleration (X, Y and absolute values) • synchronized replay of image and graphs
- coordinate grid display • zooming of image and graphs • fit display • CSV data output, image graphic output function • guide function



HIGH-SPEED CAMERA SYSTEM DESIGNED FOR THE PRODUCTION ENGINEERING ENVIRONMENT

The ability to analyze and adjust high-speed operations that cannot be seen by the naked eye allows problems to be quickly solved and processes optimized in the production environment.

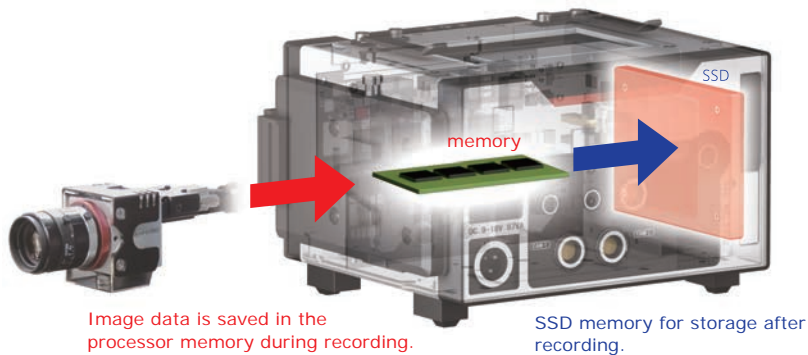
Super-slow motion images captured by SpeederV2 allow factory technicians and manufacturing engineers to fully understand the most complex high-speed manufacturing processes, assisting communication between design and production engineers, the development of improved processes and building customer relationships.

Two recording modes ensure critical images are always captured

With two recording modes - 'Speed-priority' and 'Time-priority' - SpeederV2 allows recording to be optimized for the requirements of the event.

Speed-priority mode

In this operation mode image data is saved directly to the 4GB RAM memory in the processor module, allowing the highest frame rate recording of very high-speed events.



High-speed recording at frame rates more than 25 times higher than a conventional camera.

Recording speeds up to 10,000fps, allowing slow-motion analysis of even the fastest high-speed processes.



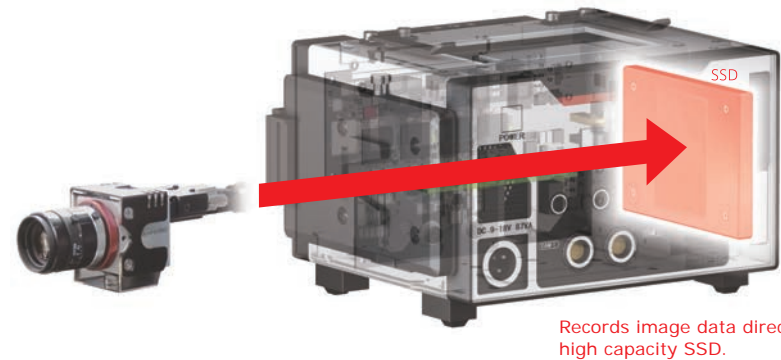
Frame Rate: 4,000 FPS



Frame Rate: 10,000 FPS

Time-priority mode

By recording image data directly to a high capacity 256GB SSD (512GB optional), long time recording operation at high frame rates is possible, allowing the capture and analysis of random and intermittent events.



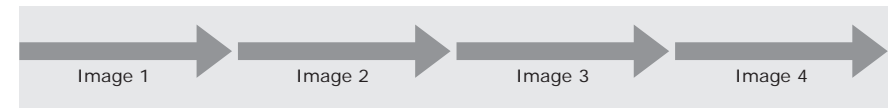
Long-time recording of up to 17 hours* (with SSD of 512GB capacity).

*In Compression Mode.

The system provides a recording time of more than 100 times that of a conventional high-speed camera system, allowing the capture of intermittent events.

Continuous recording

Because there is no delay while images are transferred to SSD memory after recording it is possible to capture fast-repeated consecutive events.

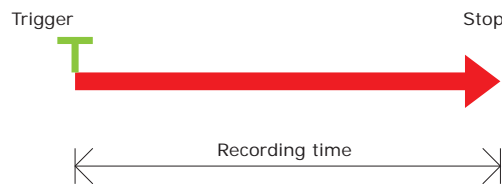


Recording trigger functions

The system provides trigger functions that make it possible to capture unpredictable and random events. In addition to the manual trigger input available from the keypad, an optional Input/Output (I/O) connector cable provides compatibility with trigger signals from external devices. 'Start', 'End' and 'Manual' trigger modes allow reliable recording of a wide variety of events and processes.

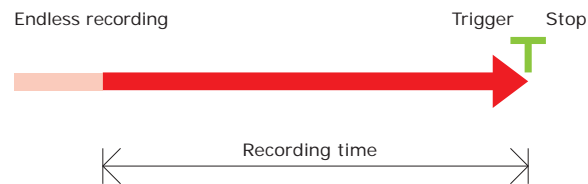
Start trigger mode

Recording of image data starts as soon as the trigger input is received, and recording continues until the memory is full (recording can be manually stopped at any time). Start trigger mode is suitable for recording predictable high-speed phenomena.



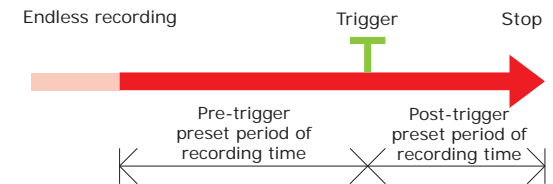
End trigger mode

In end trigger mode the system continuously captures data, overwriting previously recorded data when the memory is full, until an end trigger signal is received. Image data recorded immediately before the trigger is retained in memory. End trigger mode is suitable for recording unpredictable high-speed events.



Manual trigger mode

As in end trigger mode, the system continuously captures data, overwriting previously recorded data when the memory is full, until an end trigger signal is received. Manual trigger mode allows the user to pre-set a period of time both before and after the trigger signal is received, when image data will be recorded and saved.

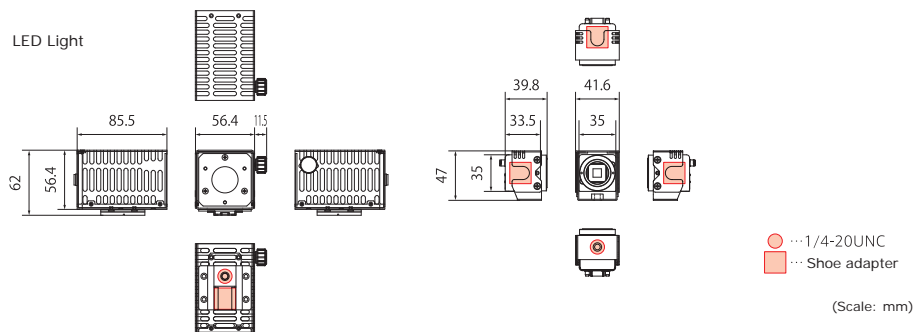
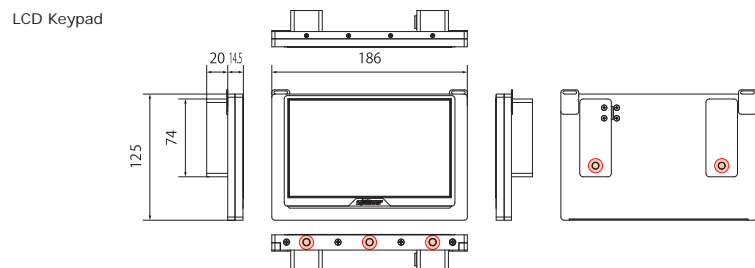
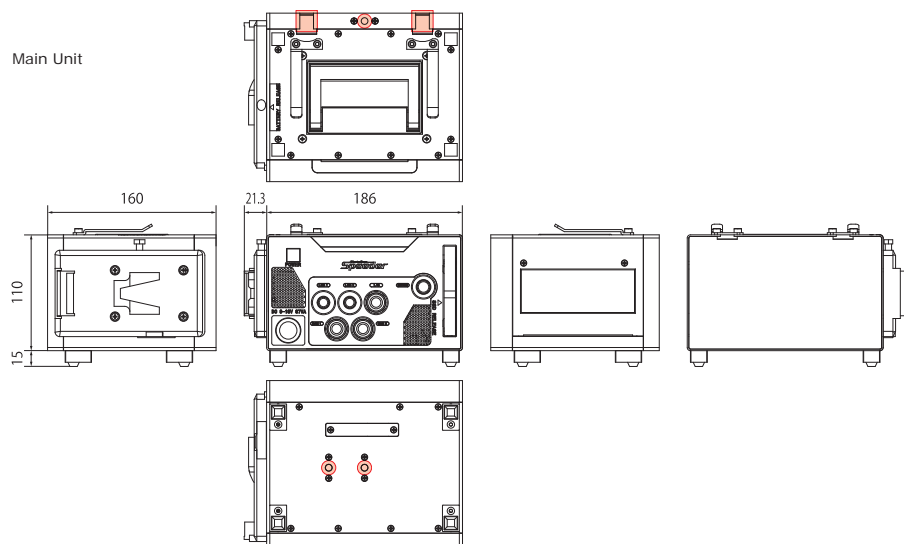


Event marking function

By selecting an event mark during recording, specific events defined by the operator can be easily located and reviewed during playback. Event marks can be defined manually by pressing the event mark button or remotely by inputting an external signal through the optional I/O cable. Up to 512 event marks can be set during a recording.



External dimensions



Specifications

Image sensor	C-MOS
Sensor resolution	512×512 pixels
Sensor size	5.12mm × 5.12mm
Pixel size	10μm × 10μm
Density scale	8-bit ADC (Bayer system color, 24-bit single sensor)
Minimum exposure time	1/160,000 sec (6.25μsec)
Recording method	Speed priority mode: Write in 4 GB built-in memory; Time priority mode: Write direct into SSD
Image recording format	Uncompressed AVI, Motion JPEG AVI (only in compression mode)
Lens mount	C-Mount
Trigger mode	Start, End, Manual
Gain control	Hardware gain incorporated (x1 and x3)
Input/output signals	Input: trigger (TTL and contact), sync signal (5 Vp-p, negative going), REC signal, event
*when optional I/O cable is in use	Output: trigger (TTL), sync signal (5 Vp-p, negative going), REC signal, Level
External control	LED remote keypad
Size/weight (excluding protrusions and accessories)	Main unit : 110×186×160 (HWD) mm / 2.5kg
	Camera head : 35×35×33.3 (HWD) mm / 90g
	LCD remote keypad : 125×186×14.5 (HWD) mm / 760g
	Optional LED Light : 56.4×56.4×85.5 (HWD) mm / 300g
Storage temperature / relative humidity	-20°C to 60°C, 85 % RH or lower (no condensation)
Operation temperature / relative humidity range	0 to 40°C, 85 % RH or lower (no condensation)
AC power	100V ~ 240V, 50 ~ 60Hz, 100VA
DC power	9V ~ 18V, 85VA
Battery drive duration	70min (Single Camera Head)
	45min (Two Camera Heads)

Partial Frame Rate / Recording Duration Table

Frame Rate (FPS)	Single Camera Head						Dual Camera Head					
	Speed Priority Mode		Time Priority Mode		Compression Mode		Speed Priority Mode		Time Priority Mode		Compression Mode	
	Resolution	Time (sec)	Resolution	Time (min) ^{※1}	Resolution	Time (min)	Resolution ^{※2}	Time (sec)	Resolution ^{※2}	Time (min) ^{※1}	Resolution ^{※2}	Time (min)
125	512 x 512	254	512 x 512	248	512 x 512	1030	1024 x 512	128	1024 x 512	126	1024 x 512	548
250	512 x 512	126	512 x 512	124	512 x 512	514	1024 x 512	64	1024 x 512	62	1024 x 512	274
500	512 x 512	62	512 x 512	62	512 x 512	256	1024 x 512	32	1024 x 384	42	1024 x 384	186
1,000	512 x 512	30	512 x 384	40	512 x 384	170	1024 x 512	16	1024 x 192	40	1024 x 192	170
2,000	512 x 512	14	512 x 512	38	512 x 192	170	1024 x 512	4	1024 x 96	38	1024 x 96	128
3,000	512 x 352	14	-	-	-	-	1024 x 352	6	-	-	-	-
4,000	512 x 256	14	512 x 96	36	512 x 96	128	1024 x 256	6	-	-	-	-
8,000	512 x 128	14	-	-	-	-	1024 x 128	6	-	-	-	-
10,000	512 x 96	14	-	-	-	-	1024 x 96	8	-	-	-	-

※1 Recording duration for 512 GB SSD. Duration is halved for 256 GB SSD. ※2 When two camera heads are used, image data from them are combined and output as one file.

■ Bottling/Packaging
 ■ Printing
 ■ Pick & Place/Wire bonding
 ■ Milling/Machining

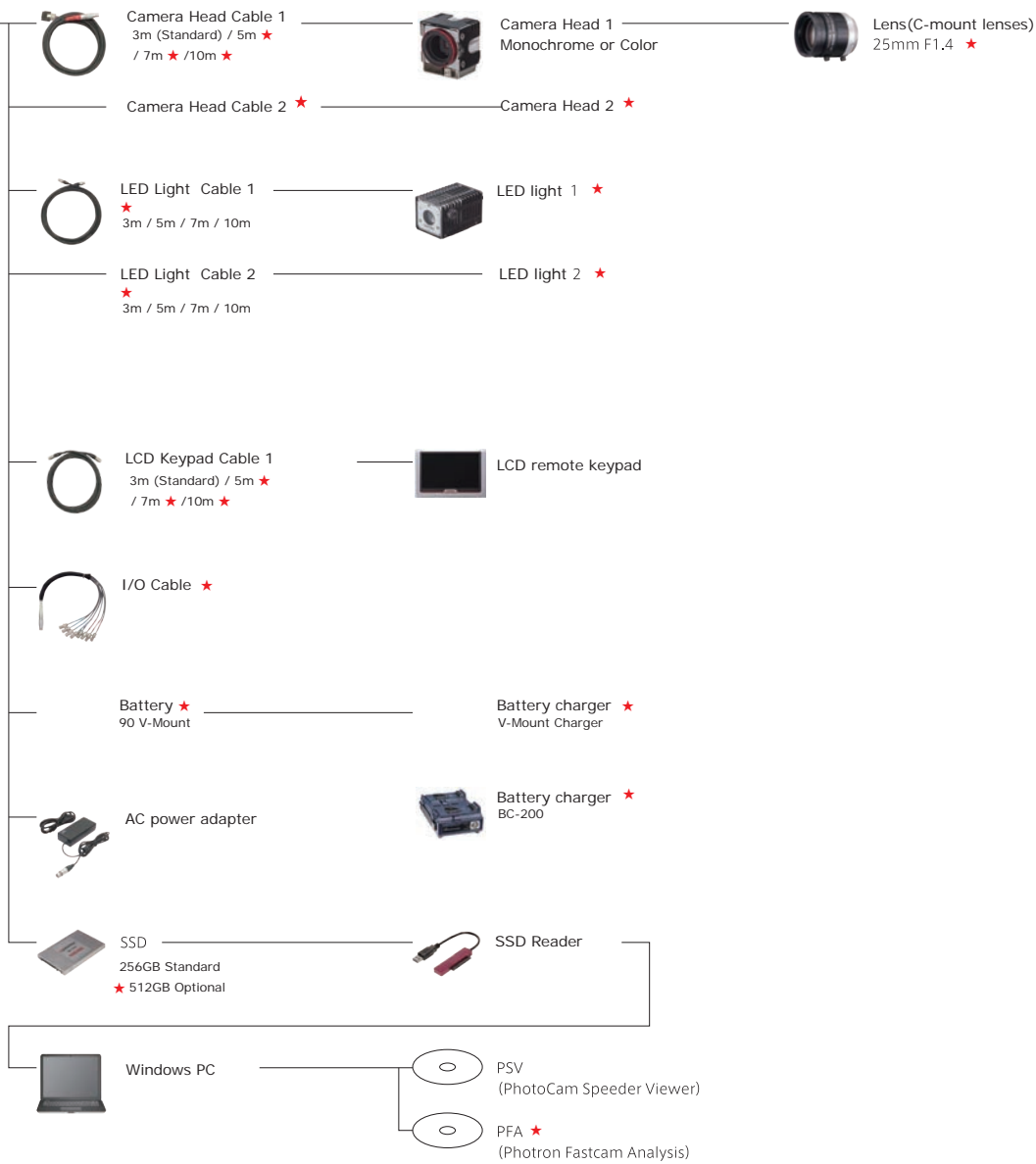
Package Contents

Model	Sensor type	Standard Accessories
PhotoCam SpeederV2 Type C	Color	Main unit×1, Camera Head (Mono or Color) ×1, Camera head cable 3M×1, LCD Keypad×1, LCD Keypad cable 3M×1, Keypad strap×1, AC power adapter×1, SSD256GB×1, SSD reader×1, PSV (Software CD-ROM) ×1, First step guide×1, Software Manual×1, Hardware Manual×1
PhotoCam SpeederV2 Type M	Mono	

System chart



- ① Battery connection plate
- ② Connection terminal for AC power adapter
- ③ Connection terminal 1 for LED light cable
- ④ Connection terminal 1 for camera head cable
- ⑤ Connection terminal 2 for LED light cable
- ⑥ Connection terminal 2 for camera head cable
- ⑦ Connection terminal for I/O cable
- ⑧ Connection terminal for LCD remote keypad cable
- ⑨ SSD slot



First step guide



Platform for led light
T-001 ★

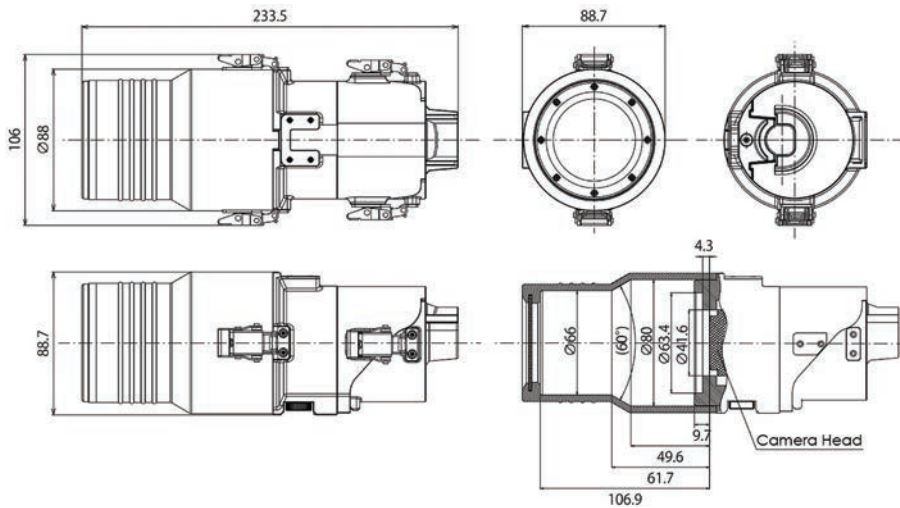


Platform for lcd keypad
T-001 ★

★ Optional parts

IP54 rated dust-proof, water-resistant case

IP54 rated dust-proof, water-resistant case mounts on the SpeederV2 camera head. IP54 rating provides dust and water splash protection from any direction without damaging equipment. This will expand the usage of SpeederV2 in locations where water splashing may occur, such as in food and pharmaceutical factories.



Easy 4 steps installation



Product specification

IP Code	IP54
Dimension and Weight*	88.7 (H) x 106 (W) x 233.5 (D) mm / 690g (1.52 lbs.)
Storage Temperature / Humidity	-20c to 60c / below 85%
Operation Temperature / Humidity Range	0c to 40c / below 85%

*Excluding protrusions and accessories

Photron; High quality products with high-level customer support

As an ISO9001: 2008 certified manufacturer, Photron manufacturer, its full range of imaging systems at its own production facility located in Yonezawa City, Yamagata Prefecture, Japan.



International technical support centers located in the USA, Europe and China are staffed by factory trained engineers and provide a full range of support equipment to ensure fast and professional local support for Photron camera users around the world.



Design and specifications described are subject to change without prior notice. Product names and brands shown are Photron's registered trade-marks. To use this product in the correct and safe way, the user is advised to read and fully understand the operation manual. All the photos, illustrations and graphs shown in this manual represent visual interpretations and may be different from actual items.

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