



Quantum Leap/...

**The modular high speed image intensifier module
continuous or gated operation**

(e.g. with Time Gain Module, optional)



Standard Features

- Compact module with built-in image intensifier optimized relay optics
- Gated or continuous operation
- Gated System: Gating times from 0.2 – DC (with TGE) or 1.2ns or (with TGN)
- 18 or 25 mm Image intensifier
- Spectral Sensitivity of photocathode from UV - NIR (110 - 1300nm)
- Very compact high voltage power supply and pulse amplifier
- Photonic gain up to 10^6 , 0 – 1000V, 10-turn potentiometer or remotely controlled
- Single Photon detection
- Improves image contrast and S/N ratio
- Customized 6-element distortion free lens coupling between image intensifier and CCD
- Distortion free imaging
- Needs only 12V, 300mA electrical power
- Precision adjustment rings for back focusing to video camera

Specifications

Unique Features	Quantum Leap	Quantum Leap N/E (gated)	
Shortest gating time	non gateable	N: down to 1.2ns	E: 0.2ns
Remote control	not applicable	RS 232 (standard)	
Optical input	c-mount (standard), Nikon F-mount (optional)		
Optical input window	quartz		
Sensitivity corresponding to conventional film	$1 \times 10^{12} \text{fc} = 50 \times 5^7 \text{ASA}$		
Multiple exposures, „dead“ time between exposures	any sequence $0.3 \mu\text{m}$		
Gate repetition rate	3.3MHz burst, 200kHz continuous		
Intensifier output coupling	customized distortion free f/0.8 relay lens		
CE certified	yes		

Programmable control parameter entry via RS 232 (with Time & Gain Module), or 10-turn potentiometer

Distortion free imaging due to advanced proximity focused MCP (Micro Channel Plate) image intensifier and use of highest quality CCD array for best sensitivity and resolution.

Switches and Connections



left side / front / right side of Quantum Leap

Image Intensifier

Image Intensifier specifications	
Image intensifier type (proximity focused MCP)	single stage (standard), dual stage (optional)
Phosphor material	P43, P46
Image intensifier diameter (mm)	18mm, 25mm
Image area of the relay lens	25mm MCP: 20 x 15mm, 18mm MCP: 14.4 x 10.8mm
Wavelength range, subject to window design	180 – 1300nm quartz window (standard) 110 – 850nm MgF2-window (S20UV optional)
Spectral Sensitivity of MCP (nm)	110..1300nm, depends on the type of the photocathode
Quantum Efficiency (Q.E.) (see curves below)	depends on the type of the MCP, up to 35%
Gain (4k steps) ($V_{MCP} = \dots 1000V$) control via RS 232 digital setup	single stage MCP (standard): 4×10^4 dual stage MCP (optional): 4×10^6
Signal to noise (db @ μLx)	46dB min @ $0.5\mu Lx$
Coupling phosphor (MCP \rightarrow CCD)	customized 6 element f/0.8 relay lens

Spectral Sensitivity of Photocathodes (Wavelength in nm)					
Standard 25 mm			Optional 25 mm		
S20	C	approx. 165 - 820nm	S20 UV(MgF2)	A	approx. 110 - 820nm
S25	F	approx. 200 - 840nm	Solar Blind (CsTe)	G	approx. 180 - 340nm
Standard 18 mm			Bialkali		approx. 165 - 600nm
S20UV	B	approx. 165 - 820nm	Enhanced S20	D	approx. 165 - 820nm
S25 IR (Super S25)	H	approx. 350 - 920nm	Enhanced S25 (glass)	I	approx. 270 - 900nm
Optional 18 mm			Wideband S25 WB	K	approx. 200 - 900nm
Broadband	J	approx. 190 - 920nm	S1	E	approx. 700 - 1300nm

Deviations of up to $\pm 25\%$ from the above typical spectral sensitivity curves are possible. The position of the curves can vary $\pm 20nm$.
The input window material limits the spectral response of the photocathode in the shorter wavelengths.
The window materials and their transmission limits are:
quartz (165nm), MgF2 (110nm).

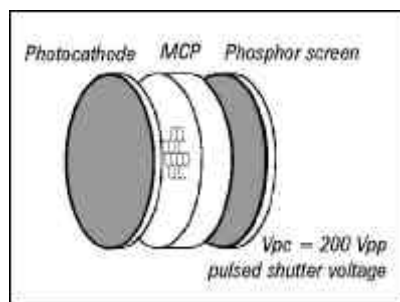
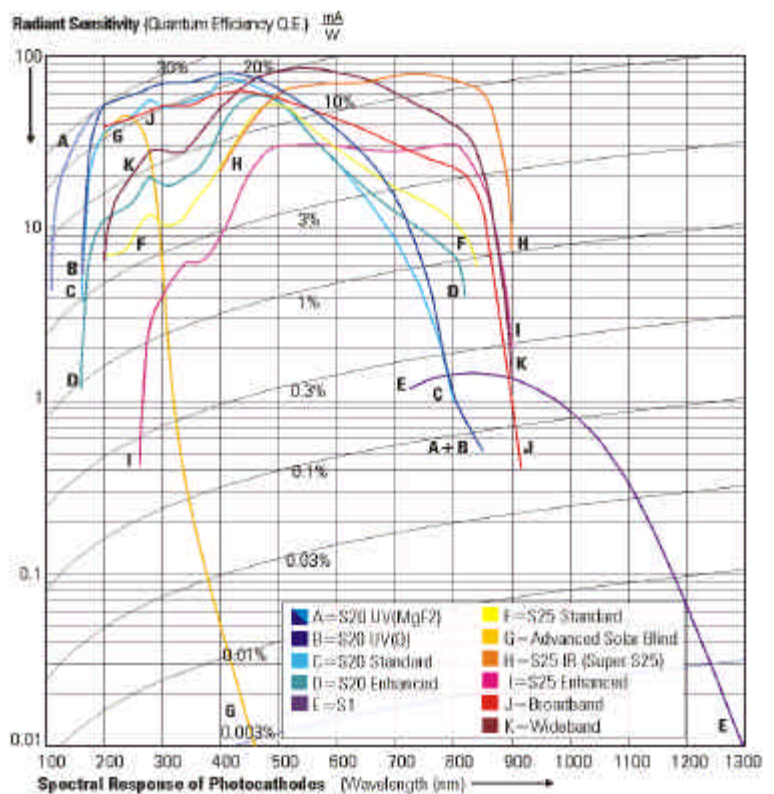


Image intensifier and shutter (schematic)

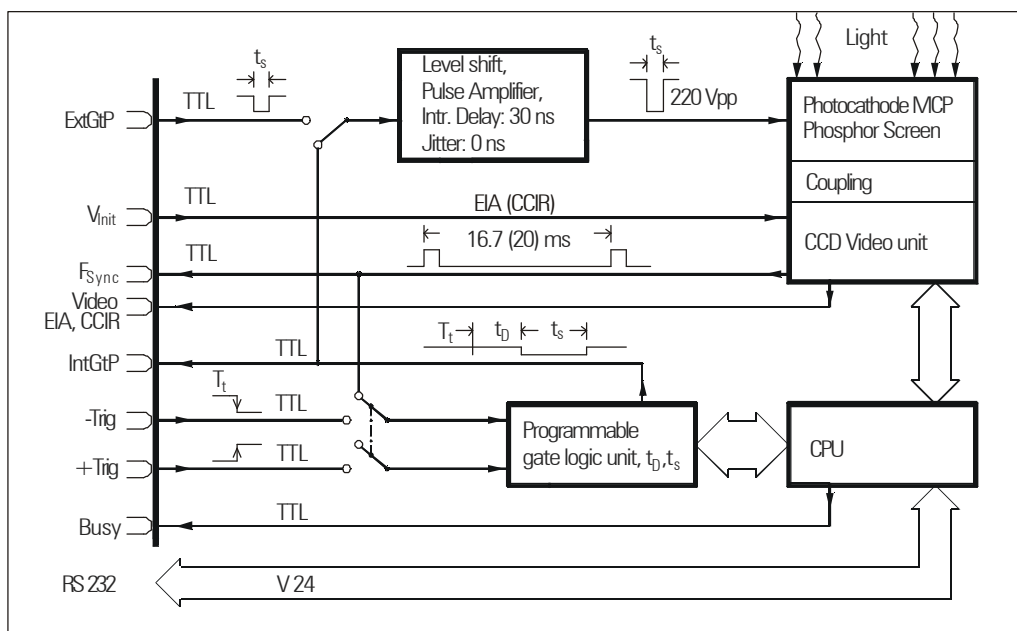


Shutter control (with optional Time & Gain Module)

The advanced, digitally controlled shutter delay feature is the perfect match for your laser, range gating, flow analysis, or many other high speed applications. It is operational in 'scattered light' environments, underwater or for highest speed multi-instrument sequential image acquisition. Multiple direct images with a repetition/ delay time setting as short as $0.3\mu\text{s}$ can be synchronized with ease to any external TTL source.

Internal exposure control	Quantum Leap E/0.2-18	Quantum Leap N/01-18
Time (t_s) and delay (t_D) of the gate pulse, or multiple exposure with CPU internally digital programmable	$t_s = 0.2\text{ns} \dots 80\text{s}$, min. steps 10ps $t_D = 0 \dots 80\text{s}$, min. increments 10ps	$t_s = 1.2\text{ns} \dots 80\text{s}$, min. steps 100ps $t_D = 0 \dots 80\text{s}$, min. increments 100ps
Trigger propagation delay	<65ns, less than 20ps jitter	
Initializing	-Trig, +Trig, or FSync	
Multiple Exposure	Any sequence, $0.3\mu\text{s}$ "dead time" between exposures	

External exposure control	Quantum Leap E/0.2-18	Quantum Leap N/01-18
Control of the camera internal Pulse E amplifier via ExtGtP (TTL Pulse) input: Shutter continuous from:	$t_s = 0.2\text{ns} \dots \infty$, t_D, ∞ t, t_D determined by external device	$t_s = 1.2\text{ns} \dots \infty$, t_D, ∞ t, t_D determined by external device
Trigger propagation delay	<45ns, no jitter	



Analog shutter control (schematic)

Mechanical & Environmental Data

Mechanical & Environmental Data, Power Requirements	
Camera dimensions (l x b x h), without lens	60 x 236 x 150mm, 2 3/8 x 5 3/8 x 5 7/8"
Camera weight (all in one) (kg / lb)	1.7kg
Camera mount (at the bottom plate of the camera)	1/4" x 20 and M8 mounting hole
Operating Humidity (%)	25..95%, non condensing
Operating temperature (°C / °F)	0°C – 50°C / 32°F – 122°F
Performance specification	10°C – 40°C / 50°F – 104°F
Operating limits	-10°C – 50°C / 14°F – 122°F
Shock and Vibration	60 g accel. shock, 7g Vibration (11 – 200Hz)
Voltage	12V +5%/-2%

Applications

Physical Sciences

Plasma temperature and density analysis
Plasma flow analysis
Combustion analysis
Synchrotron radiation
Laser induced fluorescence

Engineering Research

Particle Tracking Velocimetry (PTV)
Particle Imaging Velocimetry (PIV)
Automotive Fuel Injection
Spray analysis
Wind tunnel studies
Stress analysis of ceramics materials

Biological Sciences

Fundus imaging spectroscopy
X-ray detection
Luminescence
Time resolved fluorescence

High Speed Imaging

Dynamic Schlieren Phenomena
Shock tubes
Range gating

Low Light Imaging

Thomson Scattering
Raman Spectroscopy
Glow Discharge Spectroscopy
Semiconductor failure analysis

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Quantum Leap, modular screw on Module

	Quantum Leap continuous	Quantum Leap gateable	Quantum Leap E (with TGE Module)	Quantum Leap N (with TGN Module)					
*25mm Standard: S20 or S25 **18mm Standard: S20 or Super S25 Optional: Bialkali/Fused Silica, Advanced Solar Blind (CsTe), Enhanced S25, Enhanced Blue-UV S20, Wideband S25 WB Two photocathode window materials may be ordered depending upon the required response.									
Standard									
Gated system		■		■	■				
Gating Speeds from 1.2ns → ∞ (18mm MCP)		□			■				
Gating Speeds from 0.2ns → ∞		□			■				
Image Intensifier with 18mm MCP	■	■		■	■				
Image Intensifier with 25mm MCP	□	□		□	□				
Image Intensifier with Single stage MCP	■	■		■	■				
Image Intensifier with V-stack dual stage MCP	□	□		□	□				
Lens Coupling	■	■		■	■				
High Efficiency customized relay lens	■	■		■	■				
Two c-Mount outputs	■	■		■	■				
Programmable control parameter via RS232		□		■	■				
Multiple Exposures	■	■		■	■				
Shutter dead time 0.3μs	■	■		■	■				
Terminal Software and printed manual	■	■		■	■				
Comfortable case for shipment & storage for free	■	■		■	■				
Additional Options									
Nikon F-mount Adapter (for 25mm MCP)	□	□		□	□				
Image Intensifier with Special Photocathodes	□	□		□	□				

■ standard □ optional

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