X-Scan F01 series



Modular linear array detectors



- Efficient material separation by dual energy and optimized sensors
- Accurate object detection by extremely fast and sensitive scintillator materials
- Enhanced multi-view systems supported with a single controller unit
- Modular design easily scalable
- Optimized detector structure for target applications
- Possibility to balance resolution and contrast by pixel binning function
- Various detector lengths enabling also inspection of large objects with a single unit
- Fast scanning speed, up to 8 m/s belt speed
- Robust data transmission and fast synchronization between detector units and a system computer
- Enhanced diagnostic functions

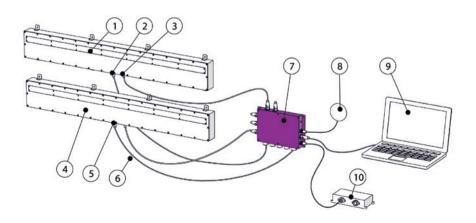
X-Scan F series is a product family of high-resolution X-ray line cameras designed for accurate and fast-paced quality inspection, and the grading and sorting of raw materials. X-Scan F enables the superior material separation capability with a dual energy imaging functionality and optimized sensors.

The series comes with a single controller unit supporting enhanced multi-view systems. The series utilizes extremely fast and sensitive scintillator materials providing the most accurate object detection. A pixel binning function embedded in the linear array detectors also makes it possible to balance the resolution and contrast of X-ray images.

The plug-and-play type X-Scan F series is built on a modular platform making it easily scalable to various system configurations. Several different detector lengths are also available allowing the inspection of large-scale objects with a single line camera

The X-Scan F series is based on a new generation digital platform providing over two times faster scanning speeds and quick data synchronization between the detector unit and a system computer. The series has a Gigabit Ethernet interface and enhanced diagnostic functions.

A typical X-Scan F01 setup



X-Scan F01 module	1
Power 1	2
X-Link 1 (Circular RJ45)	3
X-Scan F01	4
Power 2	5
X-Link 2 (Circular RJ45)	6
X-GCU control unit	7
Trigger (optional)	8
PC (via GigE), DT X-Lib	9
AC/DC power supply	10

Key features

- Single and dual energy options
- X-ray energy range: 40–225 kVp
- Pixel pitches: 0.4, 0.8 and 1.5 mm
- Active area lengths: From 307 up to 1638 mm
- Dynamic range >16,000
- Gigabit Ethernet interface
- Diagnostic functions
- Easy software design based on DT X-View2 software and development kit for Windows and Linux

Applications

- Recycling, metal sorting
- Sawmilling and mining, inspection and grading of raw materials
- Food industry, grading of ingredients and quality controlmining, oil and gas

General characteristics

Scintillator material GOS screen Single energy, B models: 120-225kVp	Product	X-Scan F0104	X-Scan F0108	X-Scan F0115
Single energy, C models: Ceramic Dual energy, D models: East GOS & Ceramic Active area lengths, single module 307, 410, 512, 614, 717, 922, 1229 mm 672, 1152, 1344, 1442 mm 768 - 4096 384 - 2048 Single energy, 448, 768, 896, Dual energy, 896, 1536, 179 Maximum number of modules and active length with one XCCU EX-PH control unit 3890 mm 8190 mm 6720 mm 1.4 x 3.2 mm 5200 mm 53800 mm 8190 mm 1.4 x 3.2 mm 5200 mm	X-ray tube voltage Vp range	40-160kVp		Single energy, C models: 80–225kVp
Total pixel number per module 768-4096 384-2048 Single energy: 448, 768, 896. Dual energy: 896,1536,179 Maximum number of modules and active length with one XGCU Ex-PH control unit 5 modules, 8190 mm 5 modules, 6720 mm length with one XGCU Ex-PH control unit 3890 mm 8190 mm 6720 mm Pkel size (photodiode) 0.3 x 0.6 mm 0.7 x 0.8 mm 1.4 x 3.2 mm Scanning speed 2 m/s 7 m/s Single energy: 5 m/s. Dual energy: 2.5 m/s Integration time range 0.12128 ms 0.10128 ms 0.58128 ms Line averaging and summing Yes. 1, 2 or 4 pixels 0.58128 ms Line averaging and summing Yes. 1, 2 or 4 pixels 0.58128 ms Line averaging and summing Yes. 1, 2 or 4 pixels 0.58128 ms Line averaging and summing Yes. 1, 2 or 4 pixels 0.58128 ms Line averaging and summing Yes. 1, 2 or 4 pixels 0.58128 ms Line averaging and summing Yes. 1, 2 or 4 pixels 0.58128 ms Line averaging and summing Yes. 1, 2 or 4 pixels 0.58128 ms Line averaging and summing Yes. 1, 2 or 4 pixels 0.58128 ms <	Scintillator material	GOS screen		Single energy, C models: Ceramic
Maximum number of modules and active length with one XGCU EX-PH control unit Pixel size (photodiode) 0.3 x 0.6 mm 0.7 x 0.8 mm 0.7 x 0.8 mm 1.4 x 3.2 mm Scanning speed Maximum scanning speed 2 m/s 7 m/s Single energy: 5 m/s. Dual energy: 2.5 m/s Integration time range 0.12128 ms 0.10128 ms 0.10128 ms 0.58128 ms Une averaging and summing Yes, up to 256x Pixel binning Yes, 1, 2 or 4 pixels A/D resolution 16 bits Overall X-ray response non-uniformity, dark of fixed subtracted at detector level X-ray response linearity Max number of dead pixels Channel electronic crosstalk Sensitivity settings Range 0.87512.25 pC with 1.75 pC steps (8 settings) Interface, detector module to control unit Interface, control unit to host computer BMC compliance BMC compliance BMC compliance Sensitivity and power Operational voltage and power Operational voltage and power Operational temperature Uniferime under X-ray Weight per module Uniferime under X-ray Weight per module Stock of Maximum Davis Sensitivity Settings Send of Compliance Stock of Compli	Active area lengths, single module	307, 410, 512, 614, 717, 922, 1229 mm		672, 1152, 1344, 1442 mm
length with one XGCU EX-PH control unit Pixel size (photodiode) 0.3 x 0.6 mm 0.7 x 0.8 mm 1.4 x 3.2 mm Scanning speed Maximum scanning speed 2 m/s 0.12128 ms 0.10128 ms 0.	Total pixel number per module	768-4096	384-2048	Single energy: 448, 768, 896. Dual energy: 896,1536,1792
Scanning speed Maximum scanning speed Maximum scanning speed 1 2 m/s 1 7 m/s 1 7 m/s 1 5 ingle energy: 5 m/s. Dual energy: 2.5 m/s Integration time range 0.12128 ms 0.10128 ms 0.10128 ms 0.58128 ms Line averaging and summing Yes, up to 256x Pixel binning Yes, up to 256x Yes, 1 2 or 4 pixels A/D resolution 1 16 bits Overall X-ray response non-uniformity, dark offset subtracted at detector level X-ray response linearity Sensitivity condead pixels Channel electronic crosstalk Qos % Dynamic range Pange 0.875.12.25 pC with 1.75 pC steps (8 settings) Range 7.5.84 pC with 7.5 pC steps (12 settings) Interface, detector module to control unit Interface, detector module to control unit Interface, control unit to host computer EMC compliance EN61326-1, EN61000-3-2, EN61000-3-3 IP classification IP55 ROHS compliance Querational voltage and power 24 VDC, max 35 W per module. Industrial power supply units available from DT Operational temperature and humidity 0-40 °C, 30-80 % (non-condensing) Storage temperature Lifetime under X-ray Weight per module 5 to 40 kg	Maximum number of modules and active length with one XGCU EX-PH control unit			
Maximum scanning speed 2 m/s 7 m/s Single energy: 5 m/s. Dual energy: 2.5 m/s Integration time range 0.12128 ms 0.10128 ms 0.58128 ms Line averaging and summing Yes. u to 256x Pixel binning Yes. 1, 2 or 4 pixels AD resolution 16 bits Overall X-ray response non-uniformity, dark offset subtracted at detector level ±25 % X-ray response linearity >99 % Wax number of dead pixels Zero, no dead pixels Channel electronic crosstalk < 0,5 %	Pixel size (photodiode)	0.3 x 0.6 mm	0.7 x 0.8 mm	1.4 x 3.2 mm
Integration time range O.12128 ms O.10128 ms O.10128 ms O.58128 ms Ves. up to 256x Pixel binning Yes, up to 256x Ves. 1, 2 or 4 pixels A/D resolution Overall X-ray response non-uniformity, dark offset subtracted at detector level X-ray response linearity Nax number of dead pixels Channel electronic crosstalk Dynamic range Sensitivity settings Range 0.87512.25 pC with 1.75 pC steps (8 settings) Interface, detector module to control unit Interface, control unit to host computer EMC compliance EMC compliance EN61326-1, EN61000-3-2, EN61000-3-3 IP classification IP 55 ROHS compliance Querational voltage and power Operational voltage and power Operational temperature and humidity Storage temperature Lifetime under X-ray Weight per module Ves Uno 20 % (non-condensing) Storage temperature Lifetime under X-ray Weight per module Sto 40 kg	Scanning speed			
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Pixel binning Yes. 1, 2 or 4 pixels A/D resolution 16 bits Overall X-ray response non-uniformity, dark offset subtracted at detector level X-ray response linearity 99 % Max number of dead pixels Zero, no dead pixels Channel electronic crosstalk < 0.5 % Dynamic range > 16 000:1 depending on sensitivity settings Sensitivity settings Range 0.87512.25 pC with 1.75 pC steps (8 settings) Range 7.584 pC with 7.5 pC steps (12 settings) Interface, detector module to control unit X-Link protocol in Cat5e cable with RJ45 connectors Interface, control unit to host computer Gigabit Ethernet, UDP protocol EMC compliance EN61326-1, EN61000-3-2, EN61000-3-3 IP classification IP55 ROHS compliance 24 VDC, max 35 W per module. Industrial power supply units available from DT Operational temperature and humidity 0-40 °C, 30-80 % (non-condensing) Storage temperature -10-50 °C Lifetime under X-ray typical 100 kGy Weight per module	Integration time range	0.12128 ms	0.10128 ms	0.58128 ms
A/D resolution 16 bits Overall X-ray response non-uniformity, dark offset subtracted at detector level X-ray response linearity >99 % Max number of dead pixels Zero, no dead pixels Channel electronic crosstalk <0.5 % Dynamic range >16 000:1 depending on sensitivity settings Sensitivity settings Range 0.87512.25 pC with 1.75 pC steps (8 settings) Range 7.5.84 pC with 7.5 pC steps (12 settings) Interface, detector module to control unit X-Link protocol in Cat5e cable with RJ45 connectors Interface, control unit to host computer Gigabit Ethernet, UDP protocol EMC compliance EN61326-1, EN61000-3-2, EN61000-3-3 IP classification IP55 ROHS compliance 24 VDC, max 35 W per module. Industrial power supply units available from DT Operational voltage and power 24 VDC, max 35 W per module. Industrial power supply units available from DT Operational temperature and humidity 0-40 °C, 30-80 % (non-condensing) Storage temperature -10-50 °C Lifetime under X-ray typical 100 kGy Weight per module	Line averaging and summing	Yes, up to 256x		
Overall X-ray response non-uniformity, dark offset subtracted at detector level X-ray response linearity Max number of dead pixels Channel electronic crosstalk Dynamic range Sensitivity settings Sensitivity settings Range 0.87512.25 pC with 1.75 pC steps (8 settings) Interface, detector module to control unit TX-Link protocol in Catbe cable with RJ45 connectors Interface, control unit to host computer EMC compliance ENC compliance FOR classification Rober Sompliance Operational voltage and power Operational temperature and humidity Operational temperature Lifetime under X-ray Weight per module S to 40 kg Vegent to 40 kg Vegent to 40 kg	Pixel binning	Yes. 1, 2 or 4 pixels		
dark offset subtracted at detector level X-ray response linearity Nax number of dead pixels Channel electronic crosstalk Dynamic range Sensitivity settings Range 0.87512.25 pC with 1.75 pC steps (8 settings) Interface, detector module to control unit Interface, detector module to control unit Interface, control unit to host computer EMC compliance EMC compliance ENC compliance IP classification Roys Roys Operational voltage and power Operational temperature and humidity Storage temperature Lifetime under X-ray Weight per module Yes Ogenational voltage Sensitivity settings A ange 0.87512.25 pC with 1.75 pC steps (8 settings) Range 7.584 pC with 7.5 pC steps (12 settings) Range 7.584 pC with 7.5 pC steps	A/D resolution	16 bits		
Max number of dead pixels Channel electronic crosstalk Channel electronic crosstalk Dynamic range Sensitivity settings Range 0.87512.25 pC with 1.75 pC steps (8 settings) Interface, detector module to control unit Interface, control unit to host computer EMC compliance EMC compliance EN61326-1, EN61000-3-2, EN61000-3-3 IP classification ROHS compliance Operational voltage and power Operational temperature and humidity Storage temperature Lifetime under X-ray Weight per module Tenson dead pixels Zero, no dead pixels < 0.5 % Consider of the sensitivity settings Range 0.87512.25 pC with 1.75 pC steps (8 settings) Range 7.584 pC with 7.5 pC steps (12 settings) R	Overall X-ray response non-uniformity, dark offset subtracted at detector level	< ±25 %		
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Dynamic range >16 000:1 depending on sensitivity settings Range 0.87512.25 pC with 1.75 pC steps (8 settings) Range 7.584 pC with 7.5 pC steps (12 settings) Interface, detector module to control unit Interface, control unit to host computer EMC compliance EN61326-1, EN61000-3-2, EN61000-3-3 IP classification IP55 RoHS compliance Operational voltage and power Operational temperature and humidity Storage temperature Lifetime under X-ray Weight per module Sto 40 kg Page 7.584 pC with 7.5 pC steps (12 settings) Range 7.5	Max number of dead pixels	Zero, no dead pixels		
Range 0.87512.25 pC with 1.75 pC steps (8 settings) Interface, detector module to control unit Interface, detector module to control unit Interface, control unit to host computer EMC compliance EN61326-1, EN61000-3-2, EN61000-3-3 IP classification IP55 RoHS compliance Operational voltage and power Operational temperature and humidity Storage temperature Lifetime under X-ray Weight per module Range 7.584 pC with 7.5 pC steps (12 settings) Range 7.584 pC with 7.5 pC steps	Channel electronic crosstalk	< 0.5 %		
Interface, detector module to control unit Interface, control unit to host computer EMC compliance EN61326-1, EN61000-3-2, EN61000-3-3 IP classification ROHS compliance Operational voltage and power Operational temperature and humidity Storage temperature Lifetime under X-ray Weight per module X-Link protocol in Cat5e cable with RJ45 connectors Gigabit Ethernet, UDP protocol EN61326-1, EN61000-3-2, EN61000-3-3 IP55 ROHS compliance Yes Operational voltage and power 24 VDC, max 35 W per module. Industrial power supply units available from DT Operational temperature and humidity 0-40 °C, 30-80 % (non-condensing) Storage temperature -10-50 °C Lifetime under X-ray Veight per module	Dynamic range	>16 000:1 depending on sensitivity settings		
Interface, control unit to host computer EMC compliance ENG1326-1, ENG1000-3-2, ENG1000-3-3 IP classification IP55 RoHS compliance Yes Operational voltage and power Operational temperature and humidity Storage temperature Lifetime under X-ray Weight per module Gigabit Ethernet, UDP protocol ENG1326-1, ENG1000-3-2, ENG1000-3-3 IP55 ROHS compliance Yes Operational voltage and power 24 VDC, max 35 W per module. Industrial power supply units available from DT Operational temperature and humidity 0-40 °C, 30-80 % (non-condensing) Storage temperature -10-50 °C Lifetime under X-ray Weight per module 5 to 40 kg	Sensitivity settings	Range 0.87512.25 pC with 1.75 pC steps (8 settings) Range 7.584 pC with 7.5 pC steps (12 settings)		Range 7.584 pC with 7.5 pC steps (12 settings)
EMC compliance EN61326-1, EN61000-3-2, EN61000-3-3 IP classification IP55 RoHS compliance Yes Operational voltage and power 24 VDC, max 35 W per module. Industrial power supply units available from DT Operational temperature and humidity 0-40 °C, 30-80 % (non-condensing) Storage temperature -10-50 °C Lifetime under X-ray typical 100 kGy Weight per module 5 to 40 kg	Interface, detector module to control unit	X-Link protocol in Cat5e cable with RJ45 connectors		
IP classification IP55 RoHS compliance Yes Operational voltage and power 24 VDC, max 35 W per module. Industrial power supply units available from DT Operational temperature and humidity 0–40 °C, 30–80 % (non-condensing) Storage temperature -10–50 °C Lifetime under X-ray typical 100 kGy Weight per module 5 to 40 kg	Interface, control unit to host computer	Gigabit Ethernet, UDP protocol		
RoHS compliance Operational voltage and power Operational temperature and humidity Storage temperature Lifetime under X-ray Weight per module Yes 24 VDC, max 35 W per module. Industrial power supply units available from DT 0-40 °C, 30–80 % (non-condensing) -10–50 °C typical 100 kGy 5 to 40 kg	EMC compliance	EN61326-1, EN61000-3-2, EN61000-3-3		
Operational voltage and power Operational temperature and humidity Operational temperature Operational temperature Operational temperature -10–50 °C Lifetime under X-ray Weight per module 24 VDC, max 35 W per module. Industrial power supply units available from DT O-40 °C, 30–80 % (non-condensing) -10–50 °C typical 100 kGy 5 to 40 kg	IP classification	IP55		
Operational temperature and humidity Storage temperature -10-50 °C Lifetime under X-ray Weight per module 0-40 °C, 30-80 % (non-condensing) -10-50 °C typical 100 kGy 5 to 40 kg	RoHS compliance	Yes		
Storage temperature -10-50 °C Lifetime under X-ray typical 100 kGy Weight per module 5 to 40 kg	Operational voltage and power	24 VDC, max 35 W per module. Industrial power supply units available from DT		
Lifetime under X-ray typical 100 kGy Weight per module 5 to 40 kg	Operational temperature and humidity	0-40 °C, 30-80 % (non-condensing)		
Weight per module 5 to 40 kg	Storage temperature	-10−50 °C		
	Lifetime under X-ray	typical 100 kGy		
Power on time recording Yes, up to 100 000 hours	Weight per module	5 to 40 kg		
	Power on time recording		Yes, up to 1	00 000 hours

