

FUJIFILM INDUSTRIAL RADIOGRAPHIC FILM IX20, IX25, IX50, IX80, IX100, IX150, IX29 AND IX59



Fujifilm industrial X-ray films feature revolutionary new film technology. The combination of the latest in emulsion making science and computerized manufacturing processes assure consistent batch-to-batch performance; optimum image quality and compatibility with all NDT chemistries and current brand tank / automatic processing conditions.

The Fujifilm family of films incorporate unique speed, and grain technologies thus permitting their use over a wide range of applications with consistent high quality regardless of the material examined and the source of radiation employed.

TYPES AND FEATURES

An appropriate choice is made among the eight types of Fujifilm Industrial Radiographic Film according to the material and thickness of specimens, the kilovoltage or energy of radiation, and the required accuracy of inspection.

Film	Features and Major Applications	Relative Speed *				Class of Film **		
		X-ray 100KV	X-ray 200KV	Ir-192	C0-60	ASTM E1815	EN 584-1	ISO 11699-1
		(without Pb)	(with Pb)					
IX20	Single emulsion, low-speed, very-high contrast, ultra-fine graininess film ● Castings : thin part of multi-thickness object ● Neutron radiography ● Micro-electronic parts	10	9	8	5	—	—	—
IX25	Low-speed, very-high contrast, ultra-fine graininess film ● Welds : Very high sensitivity level ● Castings : Very high sensitivity level ● High-output supervoltage exposure	20	17	15	10	SPECIAL	C1	C1
IX50	Low-speed, very-high contrast, very low graininess film ● Welds : High sensitivity level ● Castings : High sensitivity level ● High energy isotope exposure	35	30	30	30	I	C3	C3
IX80	Low-speed, very-high contrast, very low graininess film ● Welds : Normal sensitivity level ● Castings : Normal sensitivity level ● Normally used for many kind of usage	55	55	55	55	I	C4	C4
IX100	Medium-speed, high contrast, low graininess film ● Welds : Normal sensitivity level ● Castings : Normal sensitivity level ● Normally used for many kind of usage	100	100	100	100	II	C5	C5
IX150	High-speed, medium contrast, high graininess film ● Heavy metal or thick object inspection ● Welds ● Castings	170	170	170	170	III	C6	C6
IX29	Low-speed, high contrast, very low graininess film ● Castings : ● Multi-thickness object	22	22	22	22	W-A	—	—
IX59	Low-speed, high-contrast, very low graininess film ● Castng : ● Multi-thickness object	45	45	45	45	W-B	—	—

* Speed as compared to that of type IX100 used as a standard 100 under each exposure conditions.

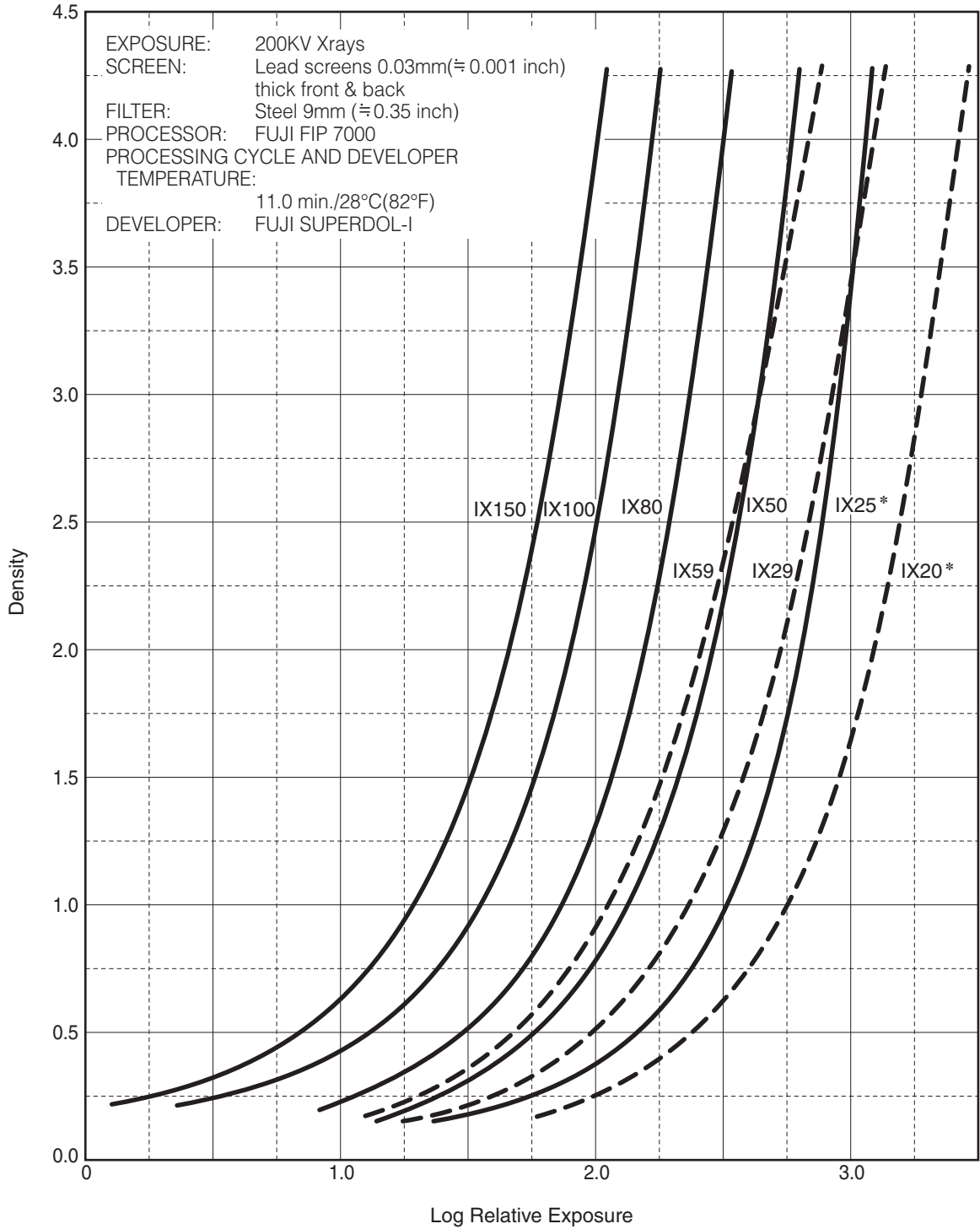
** Classification based on developed with Fujifilm's recommended processing conditions.
Examples of recommended conditions (temperature and immersion time) are as follows.
Manual : 20 degree Celsius 5 minutes
Automatic : 28 degree Celsius 1.5min.

FILM SELECTION GUIDE Standards for film selection dependant on material, specimen thickness. X-ray equipment power and type of gamma-ray sources are given below.

Material and Thicknesses (mm)	X-ray Tube Voltage (kV)							Cobalt-60	
	below 50	50 ~ 80	80 ~ 120	120 ~ 150	150 ~ 250	250 ~ 400	1000		
Light Metals	0 ~ 6	50 • 59 • 80	50 • 59	50 • 59	25 • 29	25 • 29			
	6 ~ 13	50 • 59 • 80	50 • 59 • 80	50 • 59 • 80	50 • 59	25 • 29	25 • 29		
	13 ~ 25	59 • 80 • 100	50 • 59 • 80	50 • 59 • 80	50 • 59 • 80	29 • 50 • 59	25 • 29		
	25 ~ 50	100 • 150	59 • 80 • 100	50 • 59 • 80	50 • 59 • 80	50 • 59	25 • 29 • 50	25 • 29	
	50 ~ 100	150	100 • 150	80 • 100	80 • 100	59 • 80 • 100	59 • 80		
	over 100			150	100	80 • 100	59 • 80		
Iron and Steel	0 ~ 6	150	150	80 • 100	59 • 80 • 100	50 • 55 • 80	50 • 59	25 • 50 • 59	25 • 29 • 50 • 59
	6 ~ 13		150	150	80 • 100	80 • 100	50 • 59 • 80	25 • 50 • 59	50 • 59
	13 ~ 25			150	150	100	59 • 80 • 100	50 • 59 • 80	50 • 59 • 80
	25 ~ 50				150	150	100	50 • 59 • 80	50 • 59 • 80 • 100
	50 ~ 100					150	100 • 150	59 • 80 • 100	80 • 100 • 150
	over 100						150	100 • 150	100 • 150
Bronze	0 ~ 6		150	100 • 150	80 • 100	50 • 59 • 80	50 • 59	25 • 50	25 • 50
	6 ~ 13			150	100 • 150	59 • 80 • 100	50 • 59 • 80	50 • 59	50 • 59 • 80
	13 ~ 25					150	80 • 100	50 • 59 • 80	50 • 59 • 80
	25 ~ 50						100 • 150	80 • 100	80 • 100
	50 ~ 100							80 • 100 • 150	100 • 150
	over 100							150	150

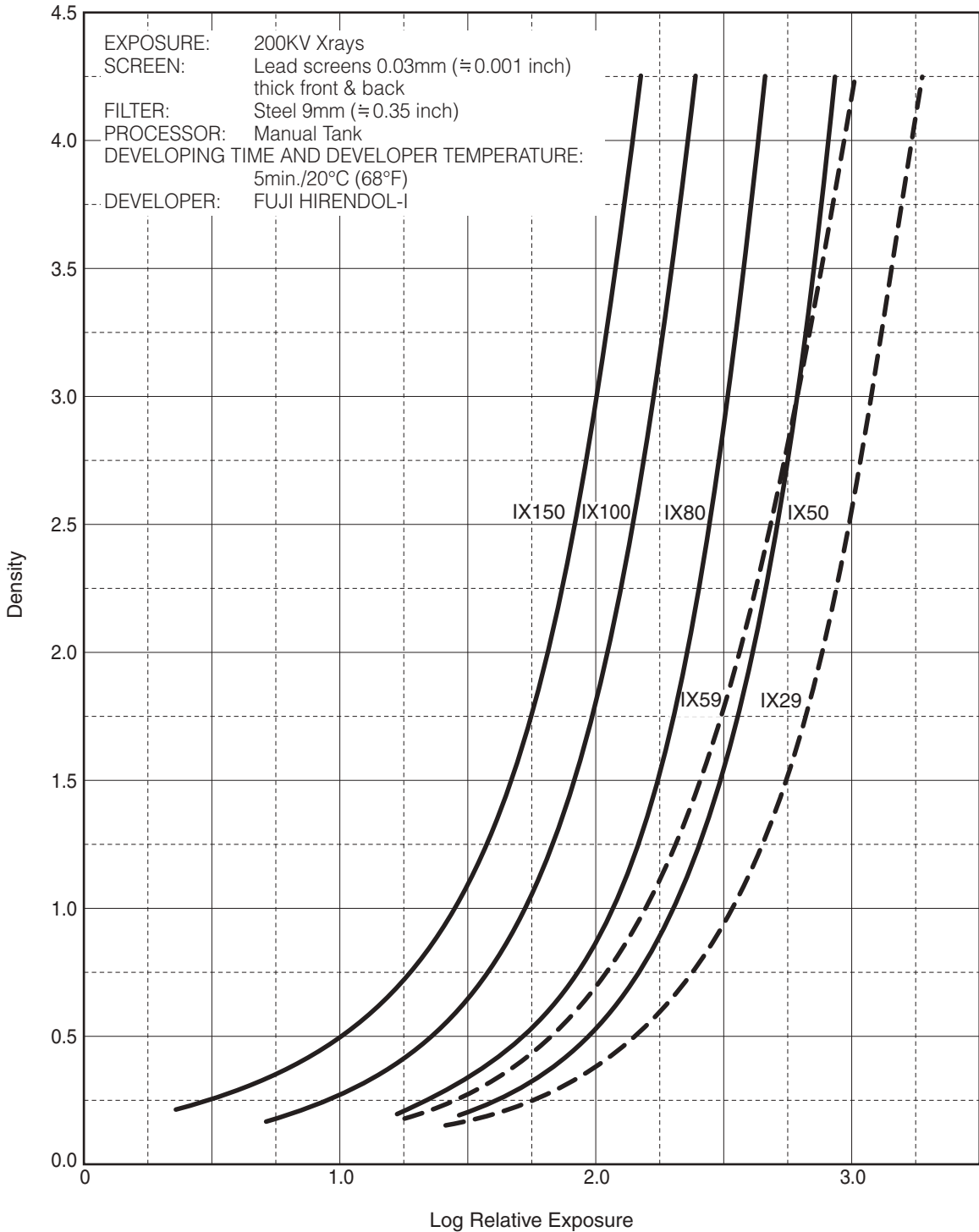
CHARACTERISTIC CURVE

Automatic Processing



CHARACTERISTIC CURVE

Manual Processing



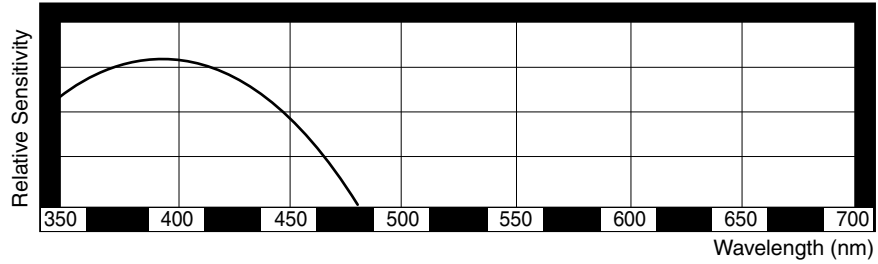
BASE USED

Polyester 0.175 mm thick, blue tinted base.
 A polyester base is used having excellent strength and safety being suitable also for automatic processing

COLOR SENSITIVITY

Blue sensitive

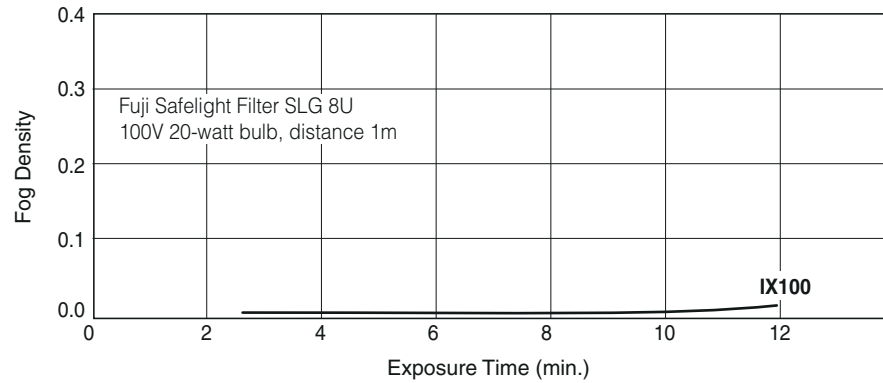
Spectral Sensitivity Curve



SAFELIGHT

This film should be handled under the Fuji Safelight Filter SLG 8U (red-orange) in a lamp with 15-or-20-watt bulb at a distance of not less than 1 meter (3.3 feet).

Safelight Tolerances of IX100 Films

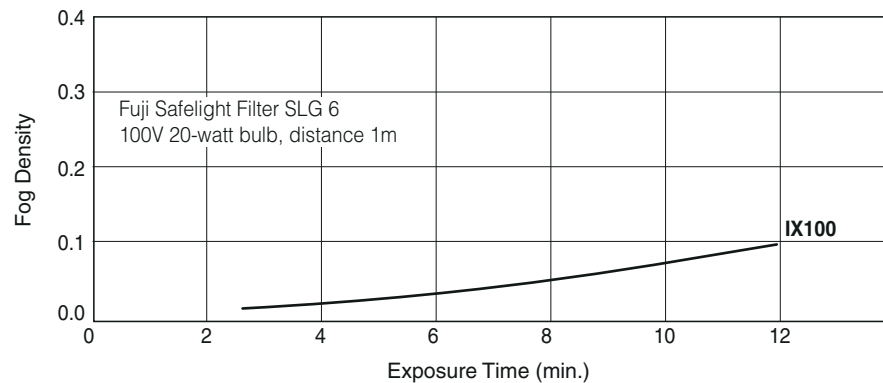


The values of IX80 and IX50 are smaller than those of IX100.
 The fog density means the increasing fog value from the no safelight exposure.

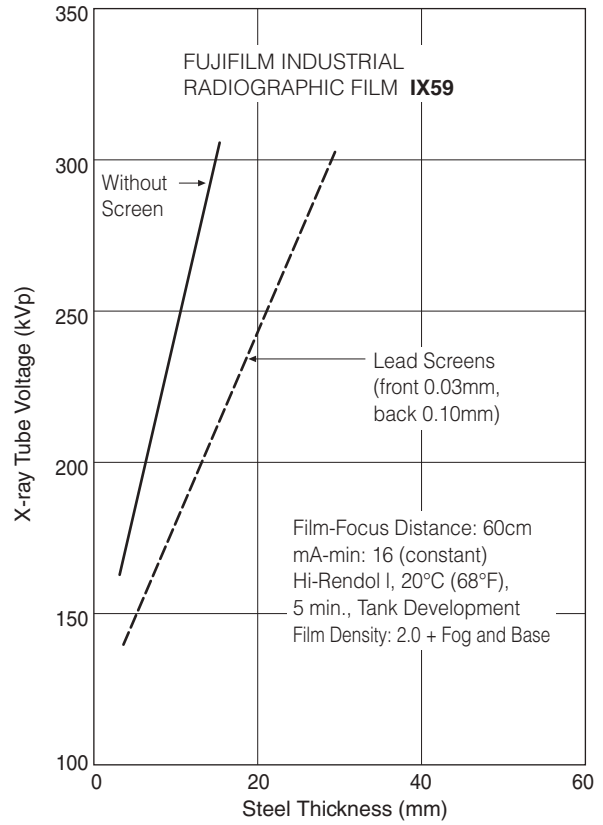
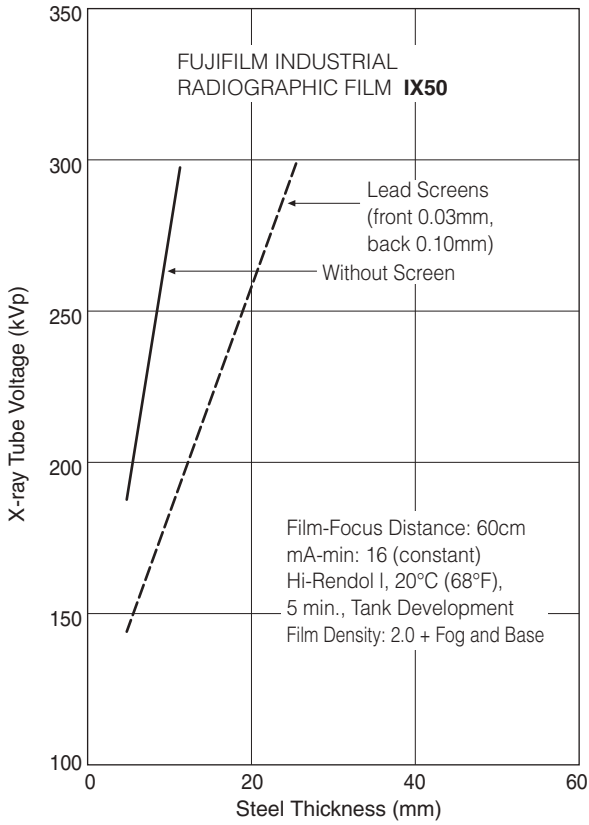
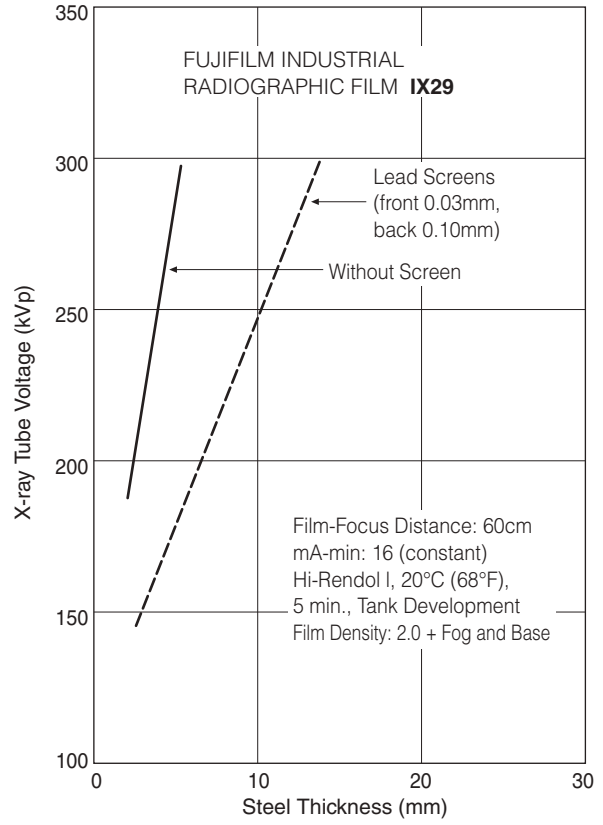
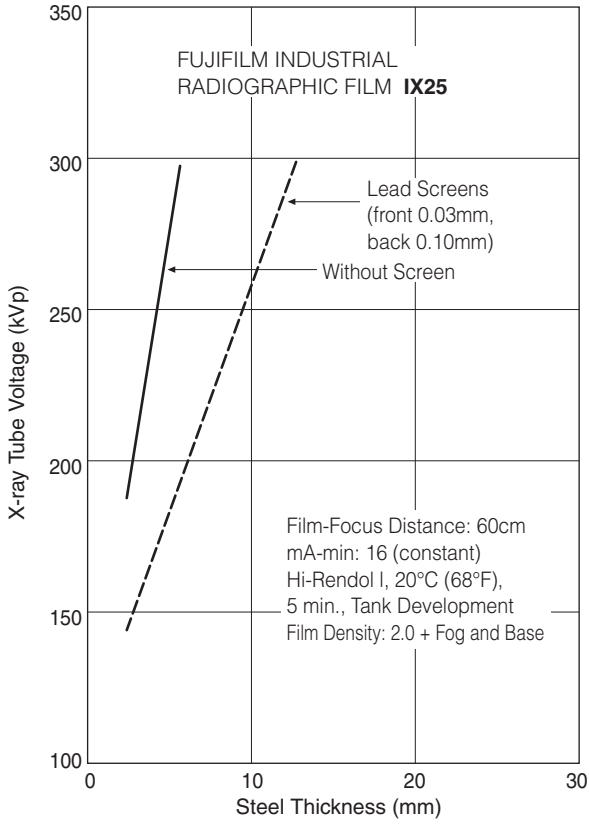
(For reference)

SLG8U is recommended, but the safelight fog of SLG6 is mentioned as one example of other safelights.

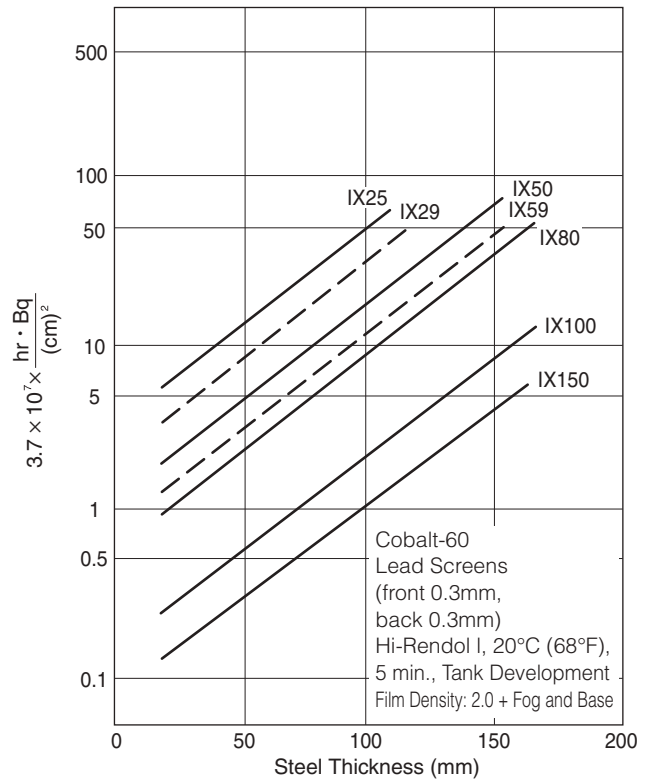
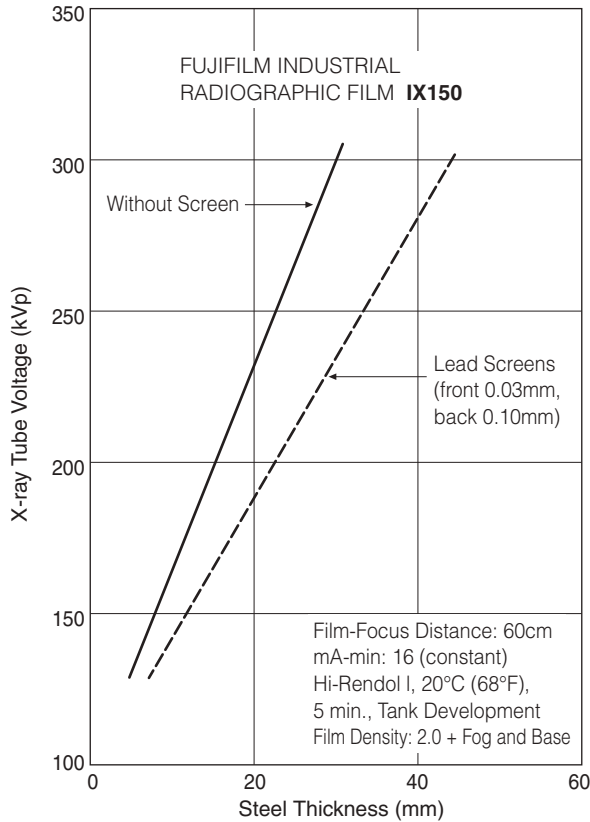
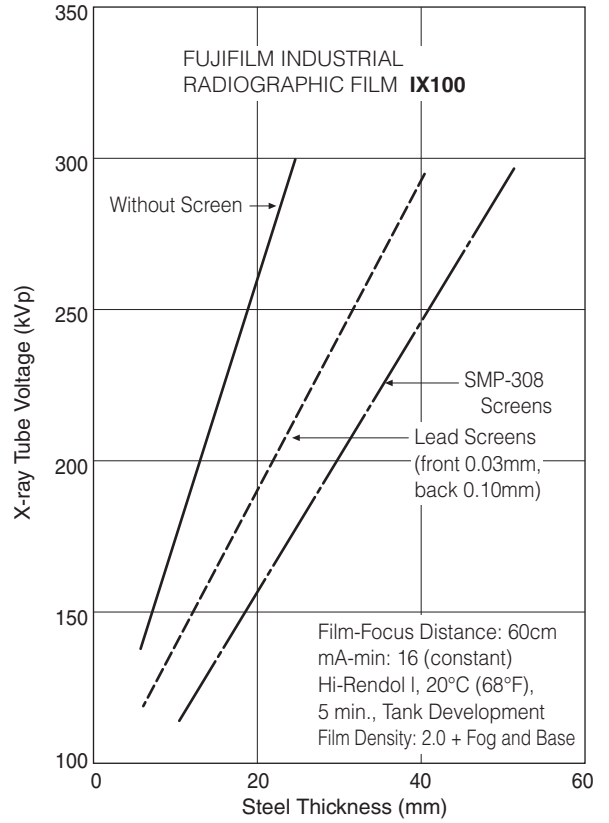
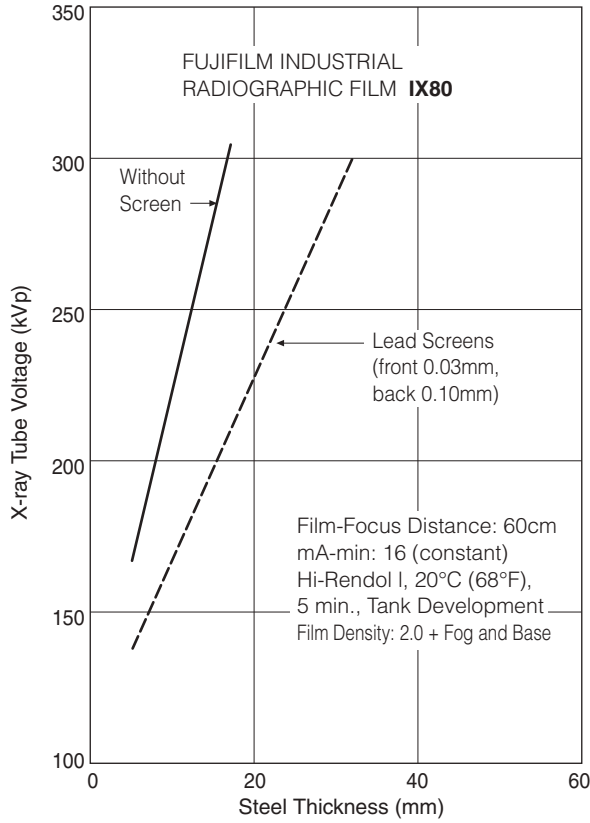
Safelight Tolerances of IX100 Films



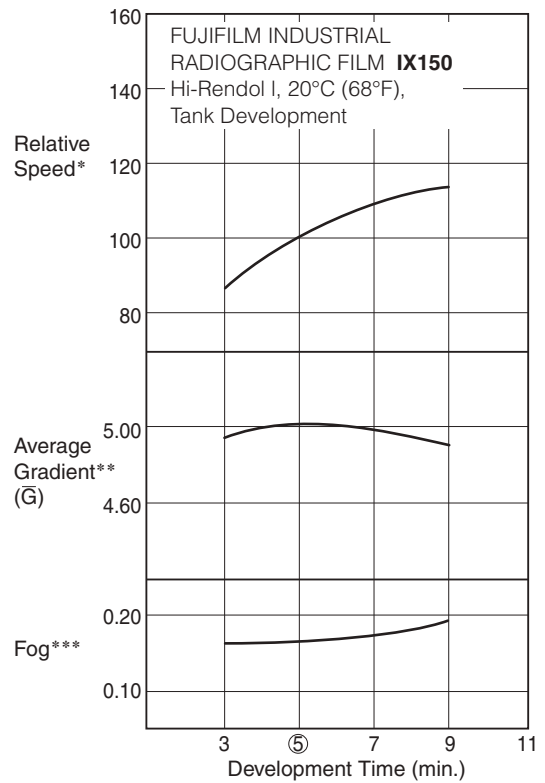
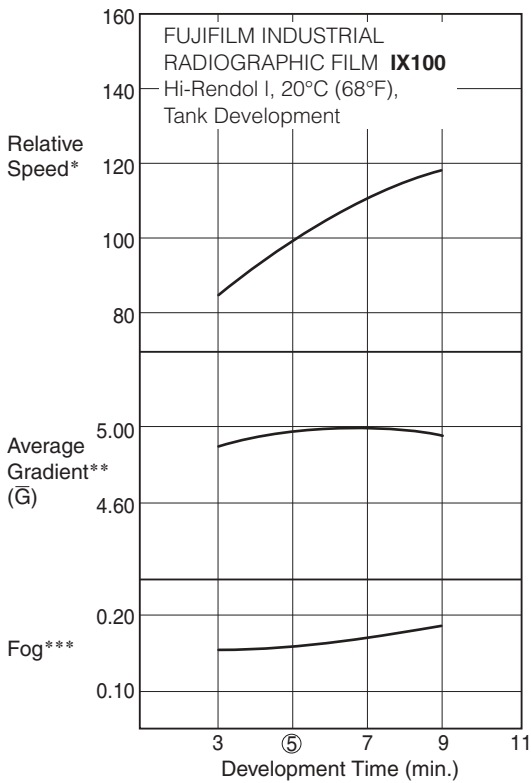
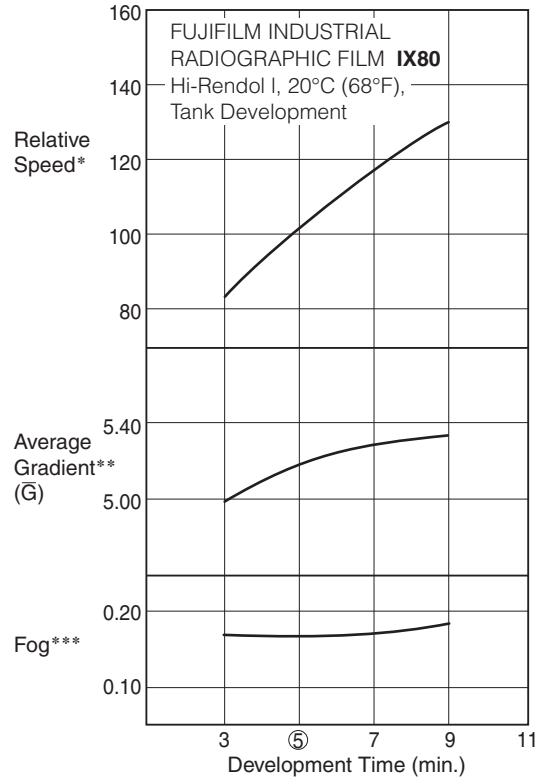
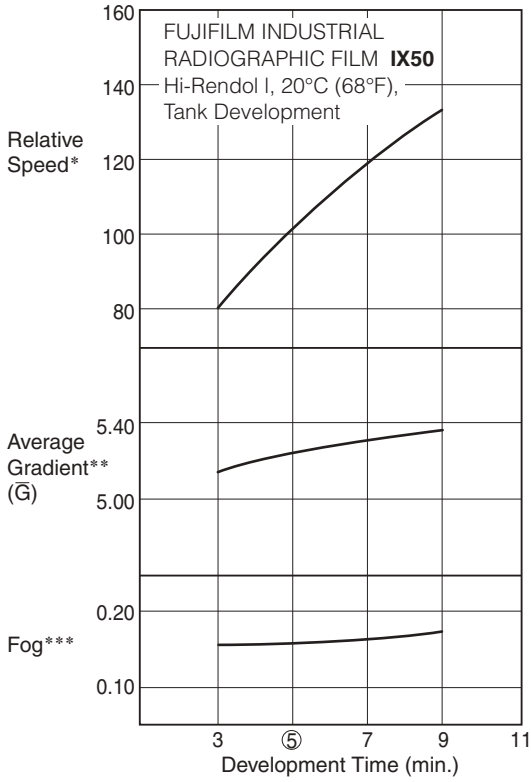
EXPOSURE CHART



EXPOSURE CHART



DEVELOPMENT RATE



*Relative Speed: Relative value at a density of 2.0 above fog and base density on the value of 100 when developed for five minutes.

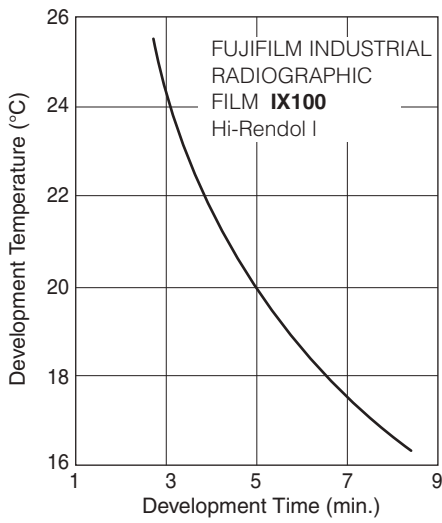
**Average Gradient (\bar{G}): Gradient of line between the density points of 1.5 and 3.5 above fog and base density on the characteristics curve.

***Fog: Fog and base density.

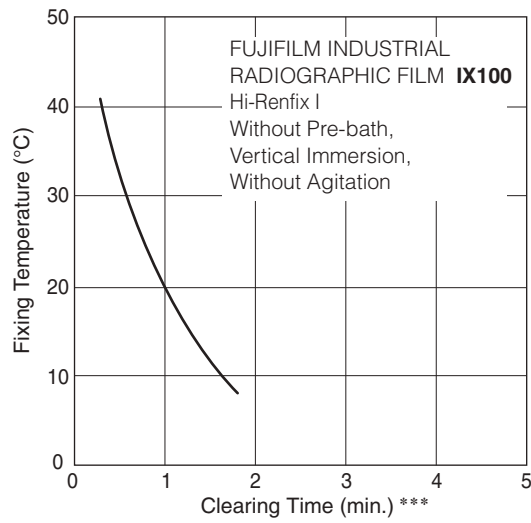
**MANUAL
PROCESSING
(Example)**

Process	Processing Solutions	Temperature	Time
Development	Hi-Rendol I	20°C (68°F)	5 min.
Stop Bath	(Acetic Acid 3% Solution)	18°C to 22°C (64°F to 72°F)	30 sec.
Fixing	Hi-Renfix I	18°C to 22°C (64°F to 72°F)	5 to 10 min.
Washing*	(Running Water 2 to 4 liters/min.)	18°C to 22°C (64°F to 72°F)	50 min.
Drying	(Wetting Agent)	18°C to 22°C (64°F to 72°F)	30 sec.
	—	ca. 50°C (ca. 122°F)	—

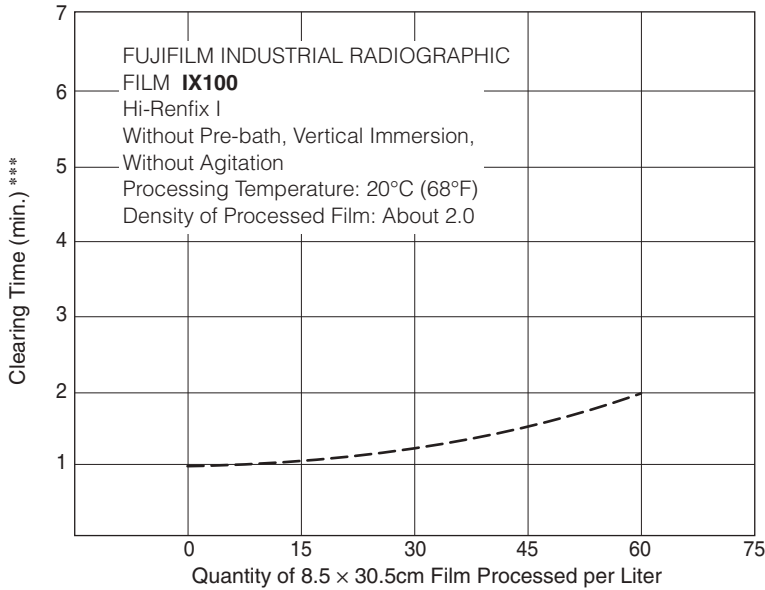
Development Time-Temperature Curve**



Fixing Time-Temperature Curve



Fixing Rate



** Conditions required for the derivation of densities equal to those of standard processing.

*** Clearing Time: Time from immersion of film into fixing solution to disappearance of milk white color from the emulsion.

**AUTOMATED
PROCESSING
(Example)**

Developer		Audel		
Processing Time (dry-to-dry)		about 9 min.	about 14 min.	about 9 min.
Development Temperature		28°C (82°F)	27°C (81°F)	30°C (86°F)
Development Immersion time		90 sec.	150 sec.	100 sec.
Fixing Temperature		31°C (88°F)		
Replenishment Rate for 8.5 × 30.5 cm, 4 films	Developer	about 65 ml		
	Fixer	about 200 ml		
Wash water Temperature		less than 31°C (88°F)		
Drying Temperature		about 45°C (113°F)		

FUJIFILM

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