

GLOSSARY

X-ray tube Vacuum tube that converts electrical input into X-rays and are used in the variety of applications. In general, those applications are divided in „continuous“ and „cyclic“ operation.

Continuous operation is characterized by a number of ON/OFF cycles **per day of maximum 15 times** whereas **cyclic operations** means more than **15 cycles ON/OFF per day**. In general, tubes for industrial x-ray applications are designed for continuous operation. In case of continuous operation, the power rating of HP tubes as specified in the documentation can be applied.

Cyclic operation represents much higher thermal-mechanical load for the tube therefore the power rating of the HP tubes has to be reduced.

HV cable High Voltage cable that connects HV generator with the X-ray tube. While choosing the cable it is necessary to specify: terminal on the tube side, terminal on the generator side, the length of the cable and the angle of the cable respective to the axis of the tube and the generator. In addition, cable can be chosen to be spring loaded (recommended) or non-spring loaded.

The length of the cable has to be chosen in a proper way. Cable should not be exposed to any mechanical stress (no pulling, torque or shearing forces), which can influence the electrical cable properties. Therefore, it is advised, that the cable is loosely adapted with maintaining recommended bending radiuses.

In addition, the maximum voltage rating is also adapted to the cable length – longer the cable - lower the HV cable rating (refer to the table below).

Reduction of the HV at longer cable lengths is a measure to reduce the stored energy in the cable (capacitance), which can damage equipment in case of arcing.

Maximum voltage rating in kV							
STANDARD LENGTH	Cable length	XRS-100	XRS-160	XRS-225	XRS-320	XRS-450	XRS-500
	5m	100	160	225	320	450	500
	10m	100	160	225	320	450	480
	15m	100	160	225	320	450	450
	20m	100	160	220	315	440	
	25m	100	160	210	310	420	
	30m	95	155	200	310	400	
	35m	95	155	200	310	400	

Cooler Cooler is a device allowing for the passive exchange of the heat. In case of chiller, there is active cooling of cooling medium. There are following types of the coolers/chillers available:

WA – stands for Water-Air Cooler. The water is circulating in the cooling system and it flows through radiator that radiates (with the help of fan) away the heat to the atmosphere.

WW – stands for Water-Water Cooler. In this case, the building water is needed. The water is circulating between the cooler and the tube and the heat is given away by the radiator to the second circuit – the building water. The clear advantage of this solution is the lack of noise created by the fan that is present in the WA solution.

OA – stands for Oil-Air solution. It functions the same way as WA solution with the difference of circulating oil instead of water.

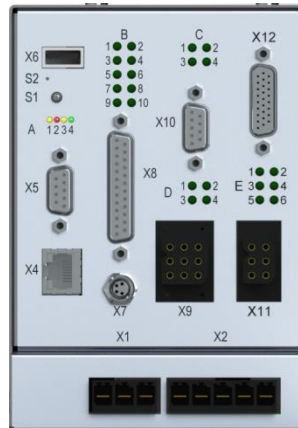
OW – stands for Oil-Water solution. It functions the same way as WW with the difference of circulating Oil instead of water in the cooling system of the tube.

Please note: Drop of pressure approx. 1bar per 10m height difference!
Therefore, the maximum length of cooling hoses is reduced, if there is a height difference between cooler and tube. For details ask your local partner.

Starter kit Starter kit includes different accessories that are helpful for the first installations.

Starter Kit content:

- X12: Dummy plug – Emergency stop D-sub 26-P
- X11: Dummy plug – Safety Interlock & Pin
- X10: Cable for warning lights D-sub 9-P, 9m + D-sub to Terminal block interface
- X8: Cable for input/output signals D-sub 25-P, 9m + D-sub to Terminal block interface
- Earth cable 10mm², 10m
- Ethernet Cable 10m
- Warning Light Red 24 V
- Ethernet adapter



	Connector function	Scope of delivery
X1	Power supply (230 VAC) for Control Circuit	Connector delivered with iXRS (Additional cable sets available as Accessory)
X2	Power Supply (230 VAC) for Power Circuit	Connector delivered with iXRS (Additional cable sets available as Accessory)
X4	RJ45 – Ethernet Communication Interface	Ethernet cable delivered when iVario Controller is ordered (Also part of the accessory Starter Kit)
X5	D9, RS-232 communication interface	Available as Accessory
X8	D25, inputs and outputs	Only delivered with Starter Kit
X9	9PIN plug for cooling system control	Connector delivered with iXRS. If cooler cable selected, this connector is replaced by the appropriate cooler cable.
X10	D9, Connection for 24V warning lamps with monitor	Only delivered with Starter Kit
X11	6PIN, Safety Interlock (dummy plug)	Connector delivered with iXRS. If External Safety is selected, a connection cable is delivered instead. Dummy Plug available as an option, and also part of the Starter Kit.
X12	D26HD, control panel plug or emergency stop jumper (dummy plug)	Dummy Plug delivered with iXRS (Also part of the accessory Starter Kit) If the option iVario Controller is selected, the iVario Controller cable will be delivered instead.

Warning Lights

Function	Warning Lamp 1	Warning Lamp 2	Warning Lamp 3
Enable (Warning Light Connected)	✓	not used	not used
Active in Not Ready state	not used		
Active in Safety Ready state	not used		
Active in Ready state	not used		
Active in Prewarn state	not used		
Active in HV-ON state	✓ B		
Active when Imminent (Mains on)	not used		
Current threshold Low (off state) [mA]	40		
Current threshold High (on state) [mA]	40		

Pre-warning time

Function	Value
Pre-warning time	2 s
Pre-warning time long*	10 s

Dynamic Monitoring

Disabled

HV Enable / Start button

Enabled

Outputs

Function	Output 1	Output 2	Output 3	Output 4
Enable	✓	✓	✓	✓

S- Steady; B – Blinking (when choosing the state, please circle the type as well)

Active in Ready state	✓ S			
Active in Prewarn state		✓ S		
Active in HV-ON state			✓ S	✓ S
Imminent	not used	not used	not used	not used

iXRS Options

In case of the generator configuration, apart from the Voltage and power that needs to be selected in the purchasing process, there is also number of hardware add-ons that can complete the system configuration. Here are listed and described the options that complete the installation.

- **IP21 Cover**
The IP21 cover is an easy-to-install protection cover for interfaces and cable connections. It is made for environments where no increased protection against dust and water is required.
- **IP54 Cover**
An optional cover can be placed on the power supply to improve the protection level against dust and water of the enclosures to the level of IP54. The cover contains the filters with fast and easy installation solution that can be easily replaced. Cover is also recommended for the use with the I/O Terminal as an electrical connection
- **Controller**
The control of the iVario generator can be realized in three different ways. One of the ways is 19`` external controller, which communication is based on the newly developed Ethernet Protocol. The controller comprises touchscreen panel, key switch, buttons and lamps as well as rotary knob such as presented on the figure. In addition, there can be emergency stop incorporated into the Controller.
- **Cooler Interface**
Cooler interface is necessary in the situation when iVario generator is working with the former type of the COMET cooler. It includes connector for the Canon plug on one side (connection for the former cooler) and two cables that are connection for the new type of cooler on the other side: one for the power supply and the second one for the control (connection to the generator). It also includes relay that after the certain time switches off the cooler if not used.
- **External Safety box**
iVario External Safety was developed with intention to provide support in integration of the functional safety necessary for operation of the industrial X-ray modules. It can be chosen to be delivered in factory configuration, or, alternatively it can be preconfigured in the factory (customer configuration).

Factory Configuration	
Line Input (Phases)	3 Ps+N
iVario Controller	No
External key switch	Not enabled
Customer interlock1	Connected to 24V
Customer interlock2	Connected to 24V
Stop button	Connected to 24V
External E-mcy stop	Enabled