

SIEMENS

POLYDOROS SX 65/80

AX

Installation-Instructions

POLYDOROS SX

PL SX

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Product-specific Remarks

Required Documents

- POLYDOROS SX 65/80 Wiring Diagram X2206
- Installation and Setting Instructions for the options

Required Tools and Test Equipment (Service Tools Catalogue)

- Set of installation tools
- Protective ground wire tester
- Multimeter test instrument
- Torque wrench

Items Included in the Generator Shipment

The generator shipment includes the following parts:

- Power cabinet, equipped with modules and PC boards
- H1 HF high-voltage transformer
- Control console (console base or wall mount or table mount as option)

The generator can be shipped as follows:

- As a component assembly, e.g. for generator replacement in an existing system.
- In combination with a system.

NOTE

With systems or subsystems, generator installation is performed according to the documents in the System Binder, the binder with the yellow spine label.

Safety Measures

- The safety notes described in Register 2 or Register 2 of the system binder (yellow spine label) must be observed.
- Before any intervention in the generator, switch it off at the power **OFF** switch on the D160 (switch in the up position).
- To switch power off to all parts of the system (generator and connected units), set the system switch to the **OFF** position.



Oil can leak out during transport.

⇒ For this reason, the H1 high-voltage transformer may only be transported in an upright position.

Torque Values for Threaded Connectors

When checking tightness, the torque values in Nm for hardness rating 8.8 must be used, taking into consideration that all electrical connections from M3 - M4 are tightened to the value listed in the table and those from M5 - M12 are tightened to half the value listed in the table.

A tolerance of 10% is permissible for torque values.

Nominal thread diameter	Screw material			Steel per DIN 267				Brass CuZn alloy
	Hardness rating	4,6	4,8	5,8	8,8	10,9	12,9	
M 3		0,5	0,67	0,83	1,3	1,9	2,2	0,62
M 3.5		0,76	1,0	1,3	2,0	2,8	3,4	0,95
M 4		1,1	1,5	1,9	3,0	4,2	5,1	1,4
M 5		2,2	3,0	3,7	6,0	8,4	10,1	2,8
M 6		3,8	5,1	6,4	10,2	14,4	17,3	4,8
M 8		9,5	12,6	15,8	25,3	35,6	42,7	11,9
M 10		18,7	24,8	31,1	49,8	70,0	84,0	23,3
M 12		32,9	43,8	54,8	87,6	123,3	147,9	41,1

Setting Up the Power Cabinet

- Move the power cabinet into its location.
- Fasten the top of the cabinet to the wall with retaining brackets to prevent the cabinet from tilting over.
- If required, the cabinet can also be bolted to the floor.

NOTE

Do not insert the H1 high-voltage transformer until the generator is cabled in the power cabinet.

Setting Up the Control Console

Installation on a console base

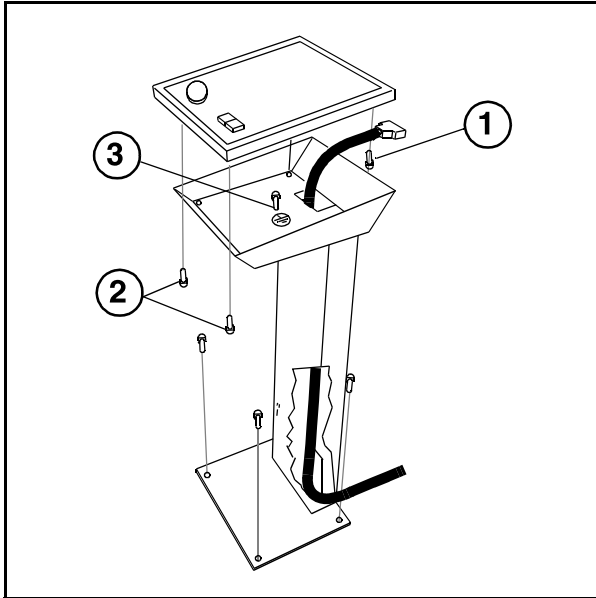


Fig. 1: Control console

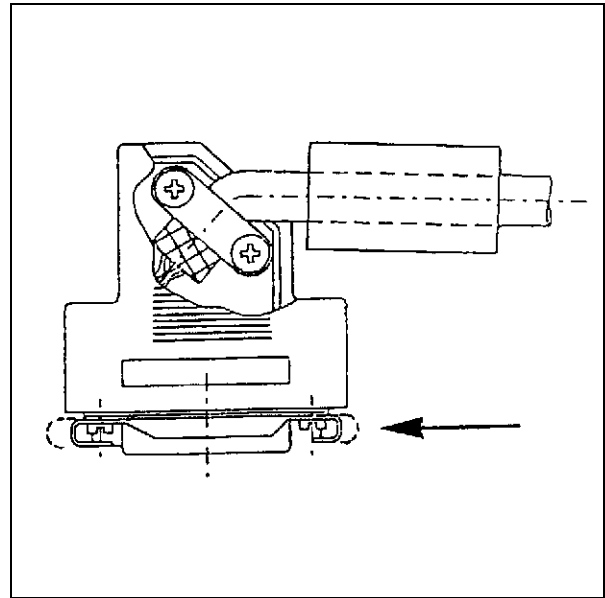


Fig. 2:

- Guide in the connection cable for the control console and the 6 mm² protective ground wire from below or from the back into the console base and run them upwards through the console column.
- Fasten the 6 mm² protective ground wire to the grounding stud (3/Fig. 1 / p. 8).
- Remove the base plate on the control console (it is no longer required).
- Plug the control console cable, with ferrite core, to the back of the control console and **snap** in the plug lock (arrow/(Fig. 2 / p. 8)).
- **At the back** of the control console, thread in the 2 retaining screws (1/Fig. 1 / p. 8) by hand at the top.
- Insert the control console from **above** in the console base and insert and tighten the 2 cylinder head screws below (2/Fig. 1 / p. 8).
- Drill the holes and bolt the console base to the floor.

Installation in a work table

The control console can be installed in a work table. For this, cut an opening of **300 x 300 ± 5 mm**.

Installation on a Work Table / Wall

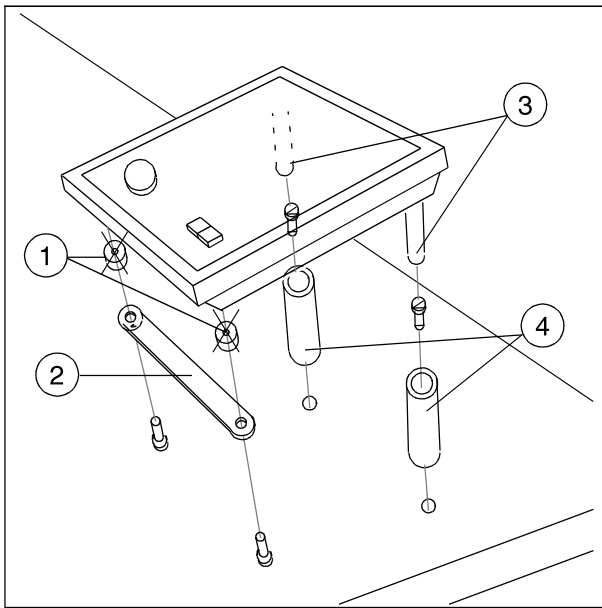


Fig. 3:

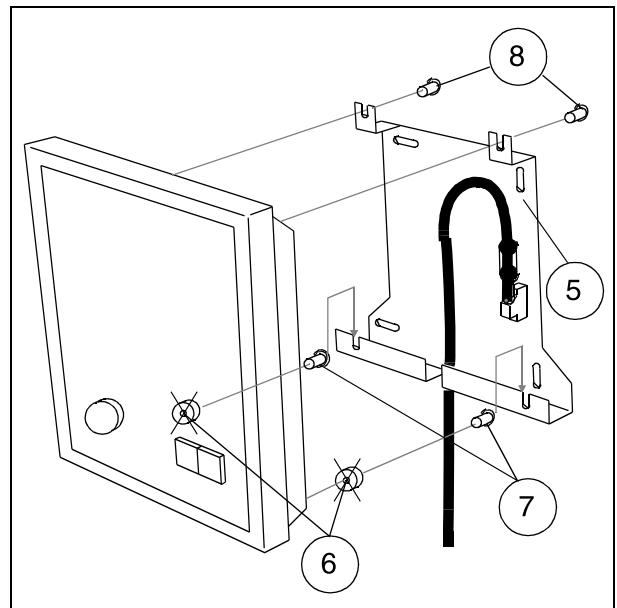


Fig. 4:

Installation on a work table

- Remove the 2 rubber feet (1/Fig. 3 / p. 9) on the base plate of the control console and attach the rail (2/Fig. 3 / p. 9) with 2 Allen screws.
- Pivot out the control console base (3/Fig. 3 / p. 9). Push the two sleeves (4/Fig. 3 / p. 9) on the feet (note angle). Set the control console on the work table, align it and mark the sleeves.
- Remove the control console, fasten the sleeves to the work table with 2 screws.
- Plug the control console cable, with ferrite core, to the back of the control console and **snap** in the plug lock (arrow/Fig. 2 / p. 8).
- Plug the control console back onto the sleeves.

Installation on the wall

- Use the wall plate (5/Fig. 4 / p. 9) as a template, drill the mounting holes and fit the wall plate.
- Remove the 2 rubber feet (6/Fig. 4 / p. 9) on the bottom of the control console. Screw the 2 retaining screws (7/Fig. 4 / p. 9) into the threads which have been opened up.
- Plug the control console cable, with ferrite core, to the back of the control console and **snap** in the plug lock (arrow / (Fig. 2 / p. 8)).
- Hook the control console with the retaining screws (7/Fig. 4 / p. 9) **below** in the retaining slots and tighten above with the 2 hexagonal head screws (8/Fig. 4 / p. 9).

Manual release switch with spiral cable

At the request of the customer, the exposure release switch from the accessories bag can be installed on the front of the control console.

Fasten the holder for the exposure release switch in a suitable location.

General Remarks

If the generator was shipped as a system, e.g. in conjunction with a SIRESKOP SX, all ordered expansions have already been installed, programmed and tested as far as possible at the factory. The cabling must be completely laid and connected.

Before making the control and power connections, provide the cables with the target designations according to the "Overview of the cable connections" section and lay them.

The control and power cables **to the power cabinet** must be introduced from below or the side into the cabinet.

The connection cable to the **control console** must be introduced from below or from the back into the console base and plugged into the control console.

Lead up and run the cables into the power cabinet according to [\(Fig. 5 / p. 16\)](#).

Secure the plug connections with the screws or strain-relieve the cables.

NOTE

Because of interference to the electronics, do not lead the high-voltage cables upwards from the H1 high-voltage generator to the tube assemblies through the power cabinet..

If the high-voltage cables have to be led up, this must be done outside the power cabinet, e.g. in a cable duct.




With separate shipment of the generator or on generator replacement, do not connect the cables from the units and extensions until the generator has been started up in its basic version; however, the cables must be run before inserting the H1.

Overview of the Cable Connections

Before establishing the control and power connections, provide the cables with the target designations and lay them (see Table).

NOTE

The connections are described below.

from	to	Cable	Remarks
D160.X9	Control console	SPK	Control console connection
M16.L1, L2, L3 N, 	L1, L2, L3, N,  main distributor	3/N/PE NK	Power connection of the generator
M16.K30.L1, L2, L3 N, 	GA...	mm ² - see unit	Power connection of the units (see also chap. 3, p. 7)
D292.KK1.B.G1/G	GA.KK1.G1/G	EK20	1.st unit/FK and 2nd unit
G3	G3	EK20	3rd unit
G4	G4	EK20	4th unit (option)
D292.KK2.G1/G2 switchable	GA.KK2.G1/G2	EK20	Selection of the tomographic times at the unit
G3-G5	G3-G4	EK20	
D100.X200/DI D320.X3S (D292.X2)	FZ.D5.X111 FZ.D5.X13	SPK- XCS SPK- XCS	I.I.-TV cabinet connection VIDEOMED DI
D190.X10 D190.X11	N84.X1 FLH.SK111	EK20 SPK	I.I.-TV cabinet connection VIDEOMED SX
D320.X3S (D292.X2) D320.X4S	FZ.D7.X3 FLH.D100.X3	SPK- XCS SPK- XCS	FLUOROSPOT
DIAMENTOR MS ¹	D160.X88	SPK	DIAMENTOR MS connection

1. The use of a DIAMENTOR chamber on overtable collimators is not permissible in countries with applicable DHHS regulations, because the required edge contrast of the light field with the chamber installed can not be complied with.

NK = power cable

GA = unit connection

EK = standard cable

Int. = internal cabling

HSK = high voltage cable

(W) = optional

IEK = IONTOMAT standard cable

SPK = special cable

StK = stator cable

SPK-XCS = special cable XCS interface

from	to	Cable	Remarks
D100.A ... F	Unit 1 ... 5	IEK	Connection of the ION-TOMAT detectors
K3.R2, R4, R6 K3.2, 4, 6	Tube 1 (I) Tube 2 (II)	StK 3x0,75 mm ² StK 3x0,75 mm ²	Rotating anode connection to starter (old)
K31.R2, R4 + K32.R2 K31.2, 4 + K32.2	Tube unit 1 (I) Tube unit 2 (II)	3x0.75 mm ² standard cable 3x0.75 mm ² standard cable	Rotating anode connection to starter (new)
H1.API APII	Tube unit 1 Tube unit 2	2 x HSK 2 x HSK	High voltage cable connections
⊕ rail	H1. ⊕	Int.	Ground wire connection to H1
W1. TH V1.1 SK.2 W2. TH V5.1 SK6	H1.U2 H1.V2 H1.U1 H1.V1	Int. Int. Int. Int.	High voltage transformer primary connections
D160.X44	H1.D220.X41	Int.	Power supply for D220.(X41)
D100.X1	H1.D220.X1	Int.	Tube unit selection actual value sensor connection
Door contact WS1/WS2/WS3	D160.X61/62/63	2 x 0.75 mm ² per connection	For radiation shield
WS1/WS2/WS3 radiation display lamps	D160.X61/62/63	2 x 0.75 mm ² per connection	Displays for WS selection and radiation display
Room light control	D160.X64	2 x 0.75 mm ² per connection	For breaker connection
WS1/WS2/WS3 OPTI 154/30/50R-100 temperature monitoring	D160.X61.1/2 D160.X62.1/2 D160.X63.1/2	2 x 0.75 mm ² per connection	Thermo switch

from	to	Cable	Remarks
Door contact or oil pressure switch OPTI 154/30/50R-101S	D160.X61.1/2 D160.X62.1/2 D160.X63.1/2	2 x 0.75 mm ² per connection	Oil pressure switch
⊕ stud	Tube unit 1 Tube unit 2 Tube unit 3	1 x 6 mm ² 1 x 6 mm ² 1 x 6 mm ²	Ground wire connection Tube units 1 ... 3 Console base
⊕ stud (to M16 below K30)	Unit	1 x 6 mm ²	Unit ground wire connection

NK = Power cable

Int. = internal cabling

GA = unit connection

HSK = high voltage cable

EK = standard cable

(W) = optional

IEK = IONTOMAT standard cable



SPK = special cable

StK = stator cable

SPK-XCS = special cable XCS interface

from	to	Cable	Remarks
3D-CX PBL	M9.D1.X5 M9.D1.X7 M9.D4.X2 M9.D5.X3 Unit	SPK SPK SPK SPK SPK	Stand voltage supply Collimator voltage supply 4-wires for the collimator SID encoder Park position
KRL (PBL) RWG (PBL) M9.D4.X22	M9.D5.X1 M9.D5.X2 D291KK1Bg1/g2 and KKBg3	SPK SPK SPK	Control conn. 2nd and 3rd unit
3D-CX Manual	M9.D1.X5 M9.D1.X7 Unit	SPK SPK SPK	Stand voltage supply Collimator voltage supply Park position
KRL (Man.) RWG (Man.) M9.D7.KK1.g1/g2 M9.D7.KK1.g3	M9.D7.X1 M9.D7.X2 D292.KK1.g1/g2 D292.KK1.g3	SPK SPK EK20 EK20	Control connection 2nd unit Control connection 3rd unit

3rd Tube Unit Assembly Option

from	to	Cable	Remarks
Starter unit K3.2, 4, 6	Oil pressure sw. K7.R1,R3,R5	StK 3 x 0.75 mm ²	Rotating anode connection to oil pressure switch
Oil pressure switch K7.R2,R4,R6	Tube unit II	StK 3 x 0.75 mm ²	Rotating anode connection to oil pressure switch
Oil pressure switch K7.R2,R4,R6	Tube unit III	StK 3 x 0.75 mm ²	Rotating anode connection to oil pressure switch
D160 X55.4,5,6,718	Oil pressure sw. K7.A1,A2,21,22	SPK	Rotating anode switch-over
D160 X55.1,2,3	Oil pressure sw. 50,51,52	SPK	Workstation switch-over
M16. PE 	Oil pressure sw. PE 	1 x 6 mm ²	Ground wire connection
D160 X62/63	Oil pressure sw.	2 x 0.75 mm ²	Excess pressure switch

NK = power cable

GA = unit connection

EK = standard cable

IEK = IONTOMAT standard cable

StK = stator cable

Int. = internal cabling

HSK = high-voltage cable

(W) = optional

SPK = special cable

SPK-XCS = special cable XCS interface

Overview of Cable Run in the Power Cabinet

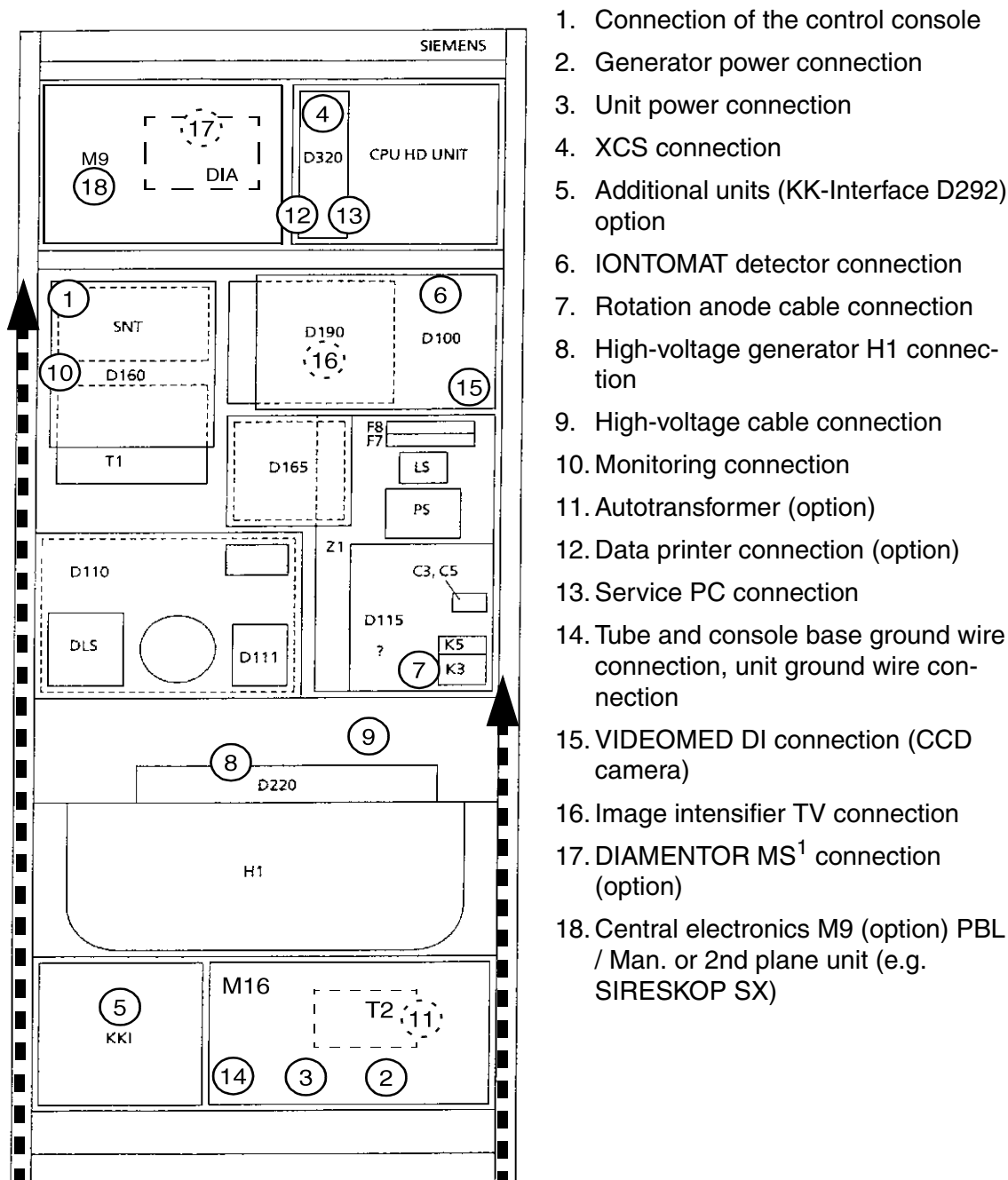


Fig. 5:

1. The use of a DIAMENTOR chamber on overtable collimators is not permissible in countries with applicable DHHS regulations, because the required edge contrast of the light field with the chamber installed can not be complied with.

NOTE**The connection is described below.**

Connection of the Control Console in the Power Cabinet

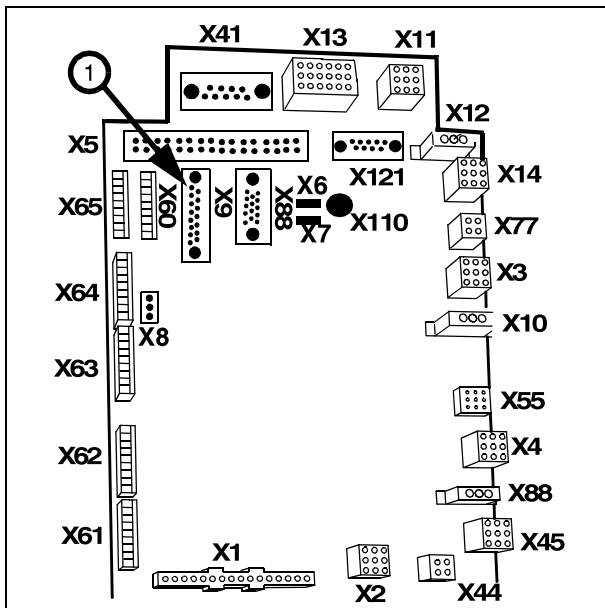


Fig. 6:

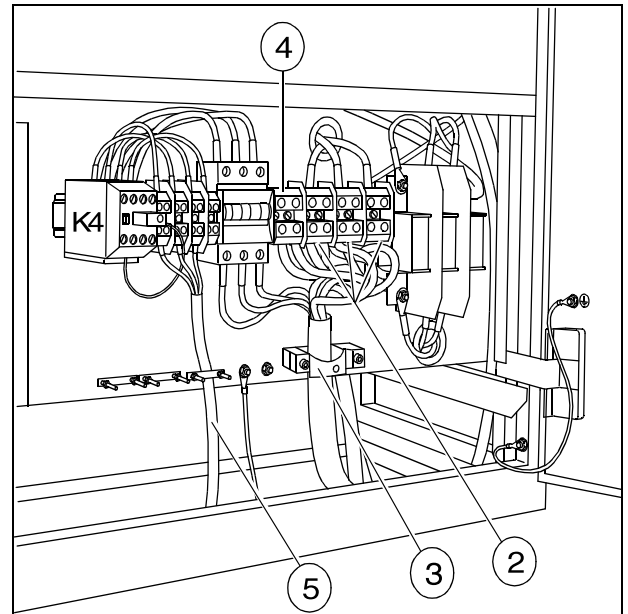


Fig. 7:

- Plug the control console cable to board D160.X9 (1/Fig. 6 / p. 17) and secure with the connector latching device.
- Strain-relieve the cable with cable ties.

Netzanschluß des Generators

Line voltage	Line voltage control range	Maximum line current PL SX 65	Maximum line current PL SX 80
400 V	360 V ... 440 V	173 A _{eff}	209 A _{eff}

NOTE

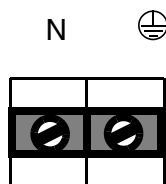
At line voltage of 440/480 V the auto transformer (option) must be installed and connected according to wiring diagram X2206-10.

On retrofit ([Pretransformer \(Option\)](#) / p. 43).

- Connect the power leads L1, L2, L3, N, PE to the terminal block K20 ([2/Fig. 7 / p. 17](#)); pay attention to connection of the correct phases.
- Strain-relieve the power cable ([3/Fig. 7 / p. 17](#)).

NOTE


Check the jumpers at the terminals in M16. K20 ([4/Fig. 7 / p. 17](#)) change over if necessary (jumpers in accessories bag).



2-pole jumper in systems without a ground fault interrupter (FI) or a neutral lead (N)

Fig. 8:

Power Connection of the Units

- Connect the power cables of the units or modules to be connected in M16 at terminal block K30 or K4 breaker ([5/Fig. 7 / p. 17](#)) (see also Wiring Diagram X2206-10).
- K4.2, 4, 6 Voltage is switched on through K4 breaker with generator **ON**.
- K30.L1, L2, L3 Voltage is already switched on with system breaker **ON**.
- K30. N
- K30.  - stud
- Strain-relieve the power cables.

Control connection of the units and additional units/options

On separate delivery of generator or on generator replacement, the cables of the units and extensions must not be connected until the generator has been started up in its basic version.

Connection through the KK interface

NOTE

The generator is set up for 24 V DC ($\pm 15\%$) control voltage. To avoid undefined interference, units with 230 V control voltage must be converted to 24 V DC.

If the generator was shipped as a "Powerup" package, components for the conversion are included in the shipment.

- In Bucky cabinets replace the two 110 V relays "ab" and "bb" by 24 V DC relays (10 55 896 B0202).
Bucky cabinets with round relays (solder connection) can be replaced by relays (10 01 445 B0202) (not in scope of supply).
- Connect free-running diodes (1N4007) parallel to the relay coils for interference suppression.
- An Fremdgeräten ist generell zu prüfen ob Freilaufdioden vorhanden sind.
- In a situation in which a unit can not be converted to 24 V DC, a 230 V converter is supplied in the "Powerup" package.
 - Establish a connection on the D220 board from X2.11 to D160 X45.7 (wiring harness connector/230 V~ with 50 Hz line power) or D160 X45.9 (wiring harness connector / 250 V~ with 60 Hz line power). Disconnect wiring harness D220 X1.9 and insulate it.
 - Position the converter below the KK interface and secure it in place
 - Connect the wiring harness to the corresponding unit connector of the KK interface on the D291 KK1B.G1/2...G4 or D400 KK1B.G1/2...G4.
 - Connect the KK1A standard cable from the allocated unit to the converter (D220).

NOTE

If the unit requires a 220 V ~ power supply at KK1A.4, this must be generated via a special circuit (e.g. an external isolation transformer). The generator 230 V ~ power is not designed to handle this increased load!

- The following interference suppression measures must be present or retrofitted in the units if problems occur:
 - Coils of alternating voltage breakers must be shunted with RC elements (31 55 017 B0399; 8 pcs. contained in the accessories bag.
 - The grid drive motor in the Bucky cabinets must be interference suppressed with a RC element (31 33 147 B0399; 4 pcs. contained in the accessories bag.
- Plug in the standard cables corresponding to the system configuration at the KK connection.

NOTE

For better cable running it can be necessary to change over the clips for strain relief (turn them by 90) at the plugs of the standard cables.

Tomo Mode on G1 Unit

NOTE

Due to the software, with the DL/PDA KK interface, Part No.: 37 75 322 X2206 and the DL/MPL KK interface, Part No.: 56 58 880 X2206, tomo mode (and fluoroscopy as well) is possible only on the G1 unit!

For this, a + 24 V signal must be applied to KK17.3 (select "DIRECT" exposure system) when the G1 unit is selected.

- Establish a connection from KK17.2 to KK17.3 on the KK interface connector panel.

NOTE

With the KK interface workstation, Part No.: 38 27 297 X2206, the above-listed measure is not required!

Connecting the M9 module with 3D-CX (PBL) (option)

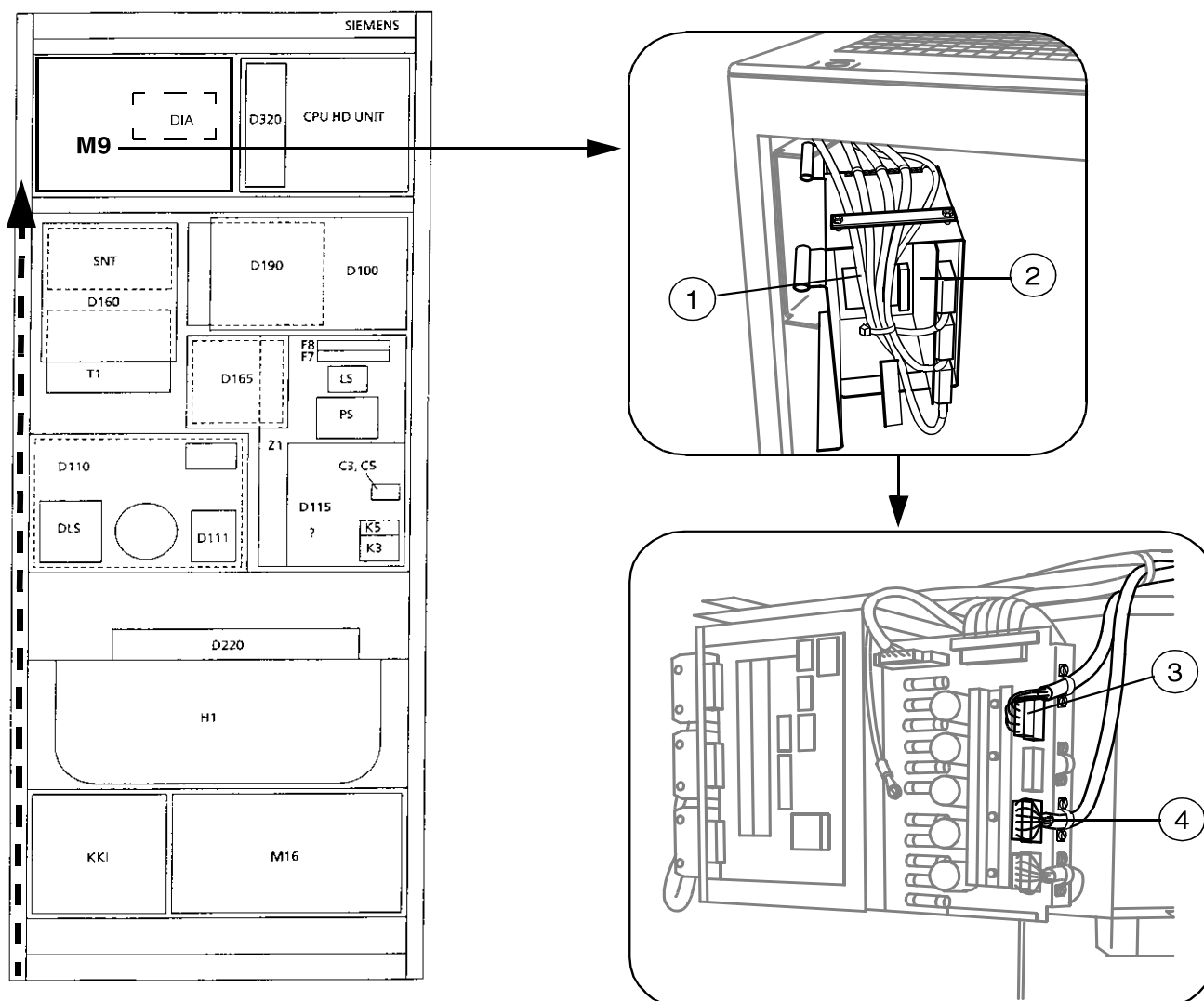


Fig. 9:

- Run the following cables on the left side in the generator cabinet up to above the module M9, plug in to the M9 module as designated and clamp:

M9 PBL

- D4.X2 cable D4 board (1/Fig. 9 / p. 22)
- D5.X3 D5.X1 and D5.X2 cables (from the BWS, if present) D1 board (2/Fig. 9 / p. 22)
- M9.D1.X7 cable D1 board (3/Fig. 9 / p. 22)
- M9.D1.X5 cable D1 board (4/Fig. 9 / p. 22)

Connecting the M9 Module to the 3D-CX (Manual) (option)

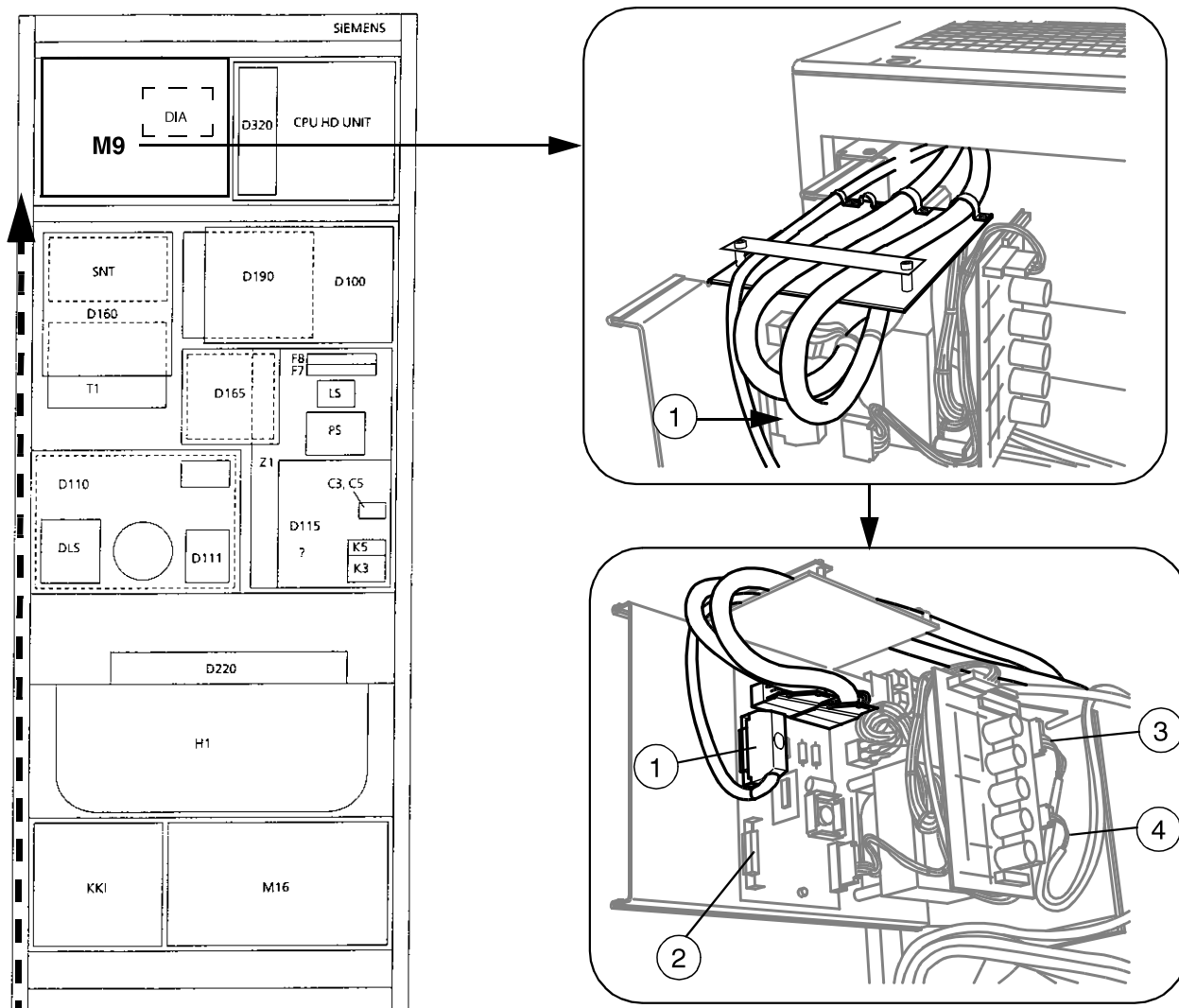


Fig. 10:

- Run the following cables on the left side in the generator cabinet to above the module M9, plug it into the M9 module as designated and clamp it in place:

M9 Manual

- | | |
|--------------------------------------------------------|------------------------------|
| • M9.D7.X1 cable | D7 board (1/Fig. 10 / p. 23) |
| • M9.D7.X2 cable
(from the Bucky WS, if configured) | D7 board (2/Fig. 10 / p. 23) |
| • M9.D1.X7 cable | D1 board (3/Fig. 10 / p. 23) |
| • M9.D1.X5 cable | D1 board (4/Fig. 10 / p. 23) |

Connection of the DIAMENTOR Measuring Unit (option)

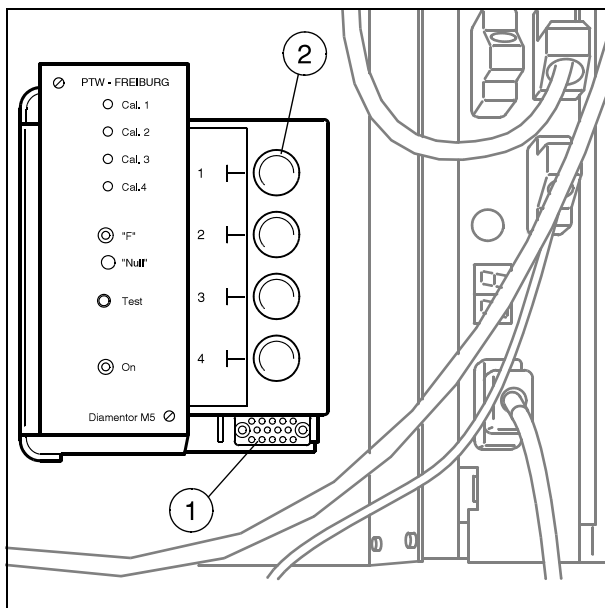




Fig. 11:

Connection of the DIAMENTOR Measuring Unit (option)

- Plug in the IONTOMAT standard cable to D160.X88, run it to the DIAMENTOR and connect (1/ Fig. 11 / p. 24).

Connection of the DIAMENTOR Measuring Chambers

- Connect the DIAMENTOR measuring cable coming from the particular X-ray tube unit (WS1...WS2) to the corresponding socket 1  ...4  on the DIAMENTOR (2/ Fig. 11 / p. 24).

Connection of the IONTOMAT Detectors

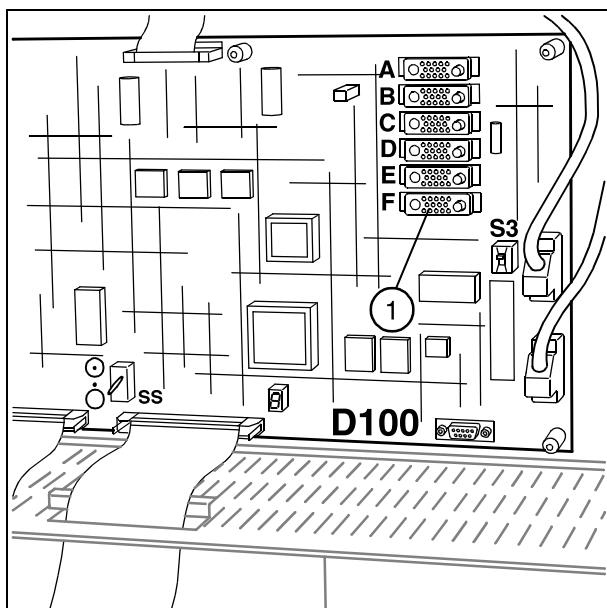


Fig. 12:

The IONTOMAT has 6 inputs; the following can be connected:

- 2-pole chambers (12 mm chambers with adapter III/IV or 6 mm chambers).
- 1-pole chambers with switch boxes, a chamber converter (Part No. 37 75 090 X2218, 1 x supplied in the "Powerup" package) is required for each chamber to be connected.
- 1 times multiplier or B signal.
- 6 times HSE detectors.

NOTE

Use only the thick IONTOMAT cable for the connection of the HSE detectors.

2polige Kammer
2-pole chamber

Gerät
Unit

Generator
Generator

JK1

Ansicht von vorne
Front view

6/12 mm chambers (with adapter III/IV)

- The contact numbering for the plug JK1 can be seen in (Fig. 13 / p. 26).
- On the unit side, the exposed lead at JK1 (coming from JK2) must run to JK1.2.
- Eject and insulate the shielding plugged to JK1.2 (refer to the corresponding unit wiring diagram).
- Make sure that the + 300 V ($\pm 10\%$) / JK2.R is run to JK1.6 (Fig. 13 / p. 26).
- Pull in the IONTOMAT standard cable at the **left** side of the frame of the power cabinet, run it up and plug it in to board D100.A ... F (1/ Fig. 12 / p. 25).
- Strain-relieve the cables with cable ties.

NOTE

On connecting 2-pole chambers it is possible to lead the signals for the dominant selection through the IONTOMAT standard cable.

This should be done if possible; especially if the dominant should be selected at the generator control console.

The following lead changes may have to be made in the unit for this:

Remove the following leads from the KK1B plug and connect them to the plug JK2.

KK1B.2 --> JK2.P

KK1B.17 --> JK2.B

KK1B.18 --> JK2.L

KK1B.19 --> JK2.F

A made-up connection cable (3.5 m) for the subsequent iontomatization of existing Bucky cabinets in conjunction with adapter IIII can be ordered with Part No 74 31 422 2080.

Connection of 1-pole chambers

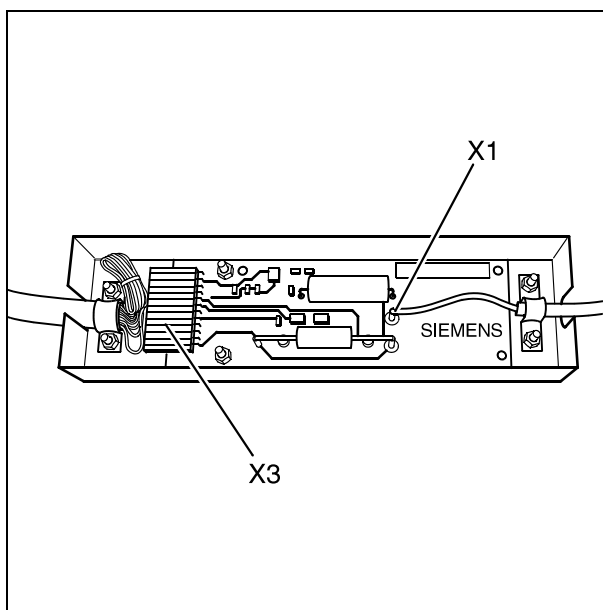


Fig. 14:

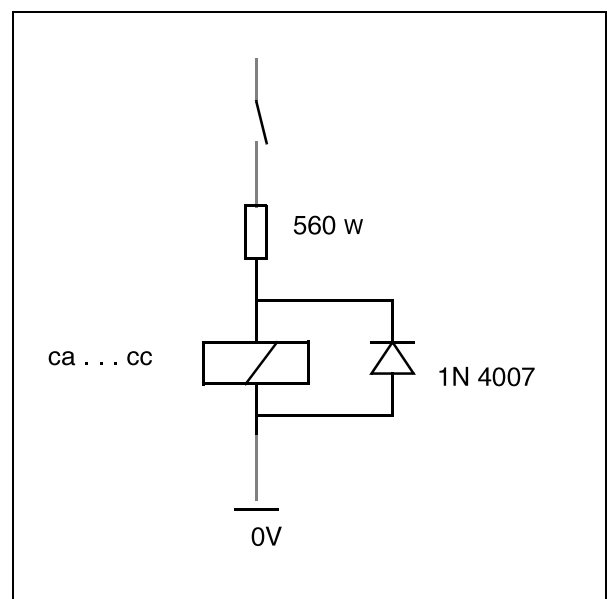


Fig. 15:

- Connect the IONTOMAT lead coming from the unit in the chamber converter (Fig. 14 / p. 27), core to X1 and shielding under strain relief.
- Plug the IONTOMAT special cable in the chamber converter at X3. Strain-relieve the cable, there must be a spacer under the cable.
- Fit the chamber converter cover, push the supplied black shrink hose over the converter and shrink at the ends.

- Run the IONTOMAT special cable to the board D100 and plug in at plugs A...F.
- Fasten the converter with cable ties in the generator, e.g. on the left frame, do not place it on the floor.

When using the 3-field switch box, make the following changes to the switch box (Fig. 15 / p. 27):

- Replace the existing 1.2 kOhm bias resistors by 560 ohm resistors ($\pm 5\%$).
- Connect free-running diodes (1 N 4007) parallel to the relay coils.

It has been found frequently that a too high hum voltage occurs in the IONTOMAT in conjunction with the three-field switch boxes. This can be caused by the leads of the heating device which are not connected on both sides.

A further source of interference can be the control cables for the Bucky cabinet, if these are run through the three-field switch box to the not shielded measuring cable.

Electrical Isolation of the IONTOMAT Chambers

To avoid uncontrollable hum interference through the IONTOMAT lead shielding, all IONTOMAT chambers must be installed so they are electrically isolated.

All recently shipped IONTOMAT chambers are already provided with appropriate isolation.

Connection of the HSE Detectors

- Attach the supplied 14-pin plug to the IONTOMAT cable.
- Remove the jumper JK2.C-A at the plug.
- Remove the JK2.C-A jumper on the connector.
- Prepare the thick IONTOMAT cable according to (Fig. 16 / p. 29) for the connection; the materials required for this are in the accessories bag of the generator.
- Connect the core (dose rate signal) to JK2.C.
- Connect the shielding (ground) to JK2.A.
- Strain-relieve the cable with the cable clamp.
- Draw in the IONTOMAT cable at the **left** side in the frame of the power cabinet, run it upwards and plug it in to board D100 A ... F (Fig. 12 / p. 25).

NOTE

When connecting the HSE detector of the ORBIX observe the installation note R69-020.038.13... in the microfilm.

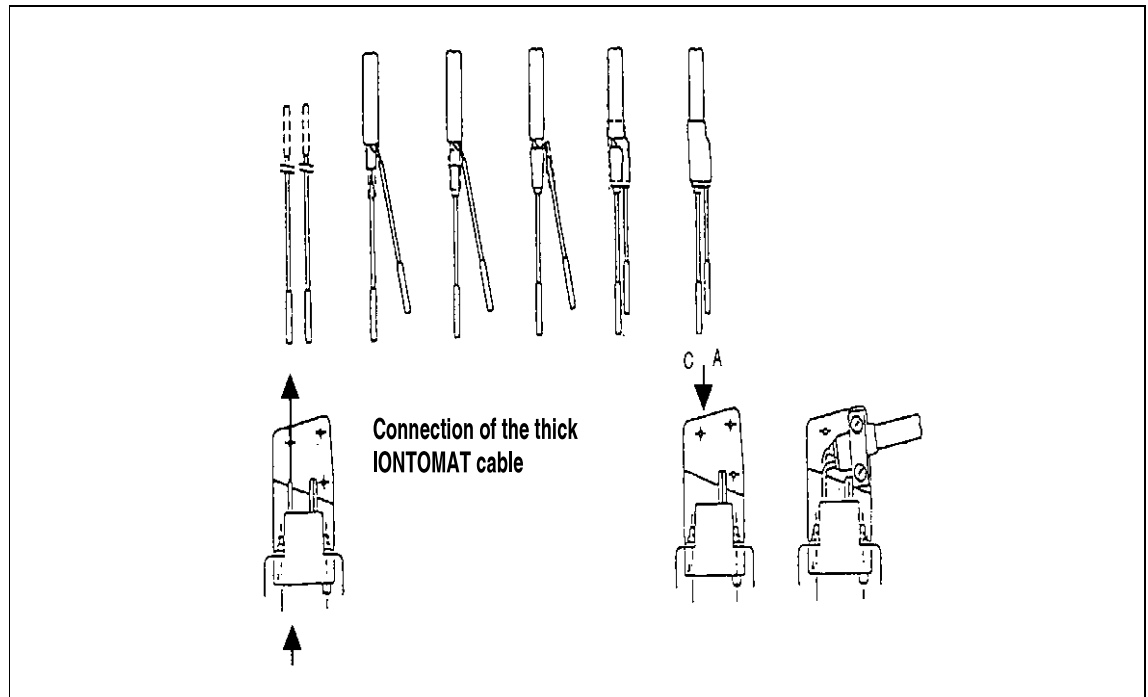


Fig. 16:

Connection of the Rotating Anode Cable

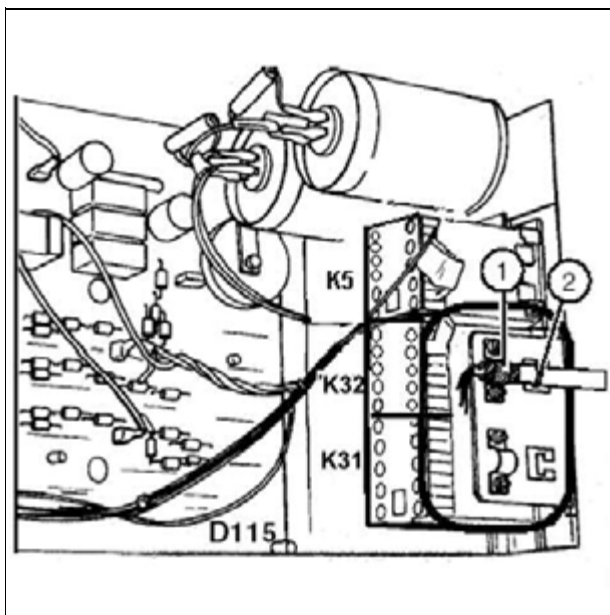


Fig. 17: POLYDOROS SX 65/80

- Draw in the rotating anode cable on the right side in the frame of the power cabinet and run it up to the starter.
- Remove approx. 25 cm from the outer sheath.
- Cut off the shielding braid except for approx. 2 cm and push it back over the cable.
- Strip all conductor ends and provide them with terminals.
- Clamp the shielding braid of the cable on the right side of the starter under a clamp (1/Fig. 17 / p. 30) (tube 1 above, tube 2 below).
- Strain-relieve the cables with cable ties (2/Fig. 17 / p. 30).

NOTE

Connect the shielding braid of the rotating anode cable to the tube assembly and to the starter!

With rotating anode cables fitted with double shielding, snip off the lead of the inner shielding and do not connect the inner shielding.

Connection for (3rd Tube Unit Option / p. 31).

- Connect the conductors as follows:

Stator	Starter with K3 (old)	Starter with K31, K32 (new)
Tube unit 1.I	K3. R2	K31.R2
Tube unit 1.0	K3. R4	K31.R4
Tube unit 1.II	K3. R6	K32.R2

Stator	Starter with K3 (old)	Starter with K31, K32 (new)
Tube unit 2.I	K3.2	K31.2
Tube unit 2.0	K3.4	K31.4
Tube unit 2.II	K3.6	K32.2

3rd Tube Unit Option

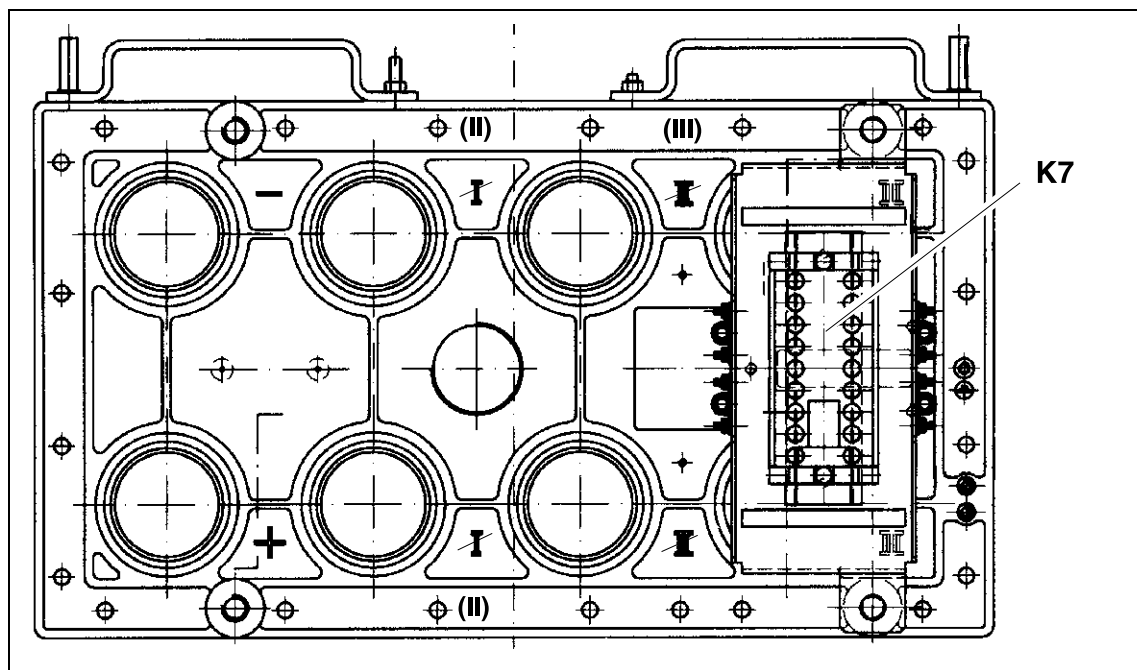


Fig. 18:

NOTE

Connect the shielding braid of the rotating anode to the starter and to K7 on the tube unit assembly!

With rotating anode cables fitted with double shielding, snip off the lead of the inner shielding and do not connect the inner shielding.



- Connect the leads from the rotating anode cable as follows:

Starter	K7 oil pressure switch		Stator
K3.2 or K31.2 to	K7.R1	K7.R2 to	2nd tube I
K3.4 or K31.4 to	K7.R3	K7.R4 to	2nd tube 0
K3.6 or K32.2 to	K7.R5	K7.R6 to	2nd tube II

Starter	K7 oil pressure switch		Stator
		K7.2 to	3rd tube I
		K7.4 to	3rd tube 0
		K7.6 to	3rd tube II

Connecting the Signal Cables

- Plug into D160.X55 and connect the shielding braid.
- Connect the signal cables per their designations at K7 (oil pressure switch) and clamp the cable shielding braid under one of the clamps.
- Connect the protective ground wire and the oil pressure switch per the table.

from	to	Cable	Remarks
D160 X55.4,5,6,7,18	Oil pressure switch K7.A1,A2,21,22	SPK	Rotating anode switch-over
D160 X55.1,2,3	Oil pressure switch 50,51,52	SPK	Workstation switch-over
M16. PE 	Oil pressure switch PE 	1 x 6 mm ²	Ground wire connection
D160 X62/63	Oil pressure switch	2 x 0.75 mm ²	Excess pressure switch

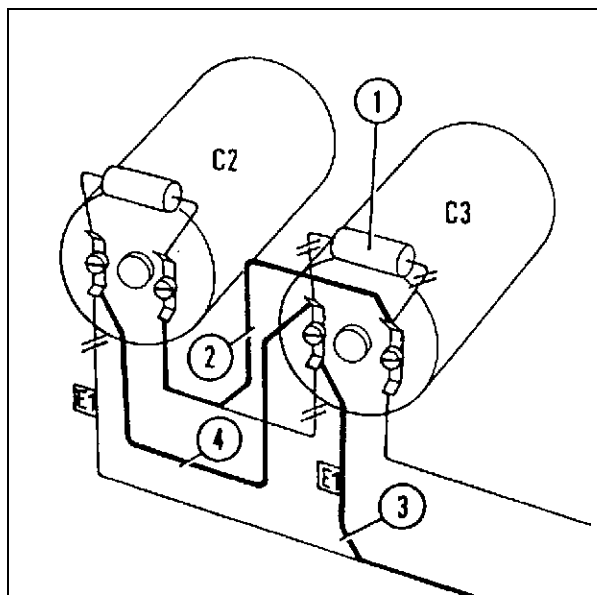


Fig. 19:

NOTE

Combined operation with OPTI 154 and other 150 Hz 2-phase tube assemblies is not possible!

Operation of OPTI 154 tube assemblies is possible only after the following change in the starter:

The existing phase shift capacitors C2 and C3 must be connected in parallel. The lead required for this is in the service accessories bag.

- Remove resistor (1/Fig. 19 / p. 32) at C3.
 - Change connection lead C2/C3 (2/Fig. 19 / p. 32) over to C3.
 - Pull of lead E1 (3/Fig. 19 / p. 32) at C2 and plug on to C3.
 - Plug new lead from service accessories bag (4/Fig. 19 / p. 32) to C2 and C3.
 - Attach sticker with reference to change "for OPTI 154 tube assembly connection" to the starter.
-

Connection of the H1 High-voltage Transformer

Inserting the high-voltage transformer in the power cabinet

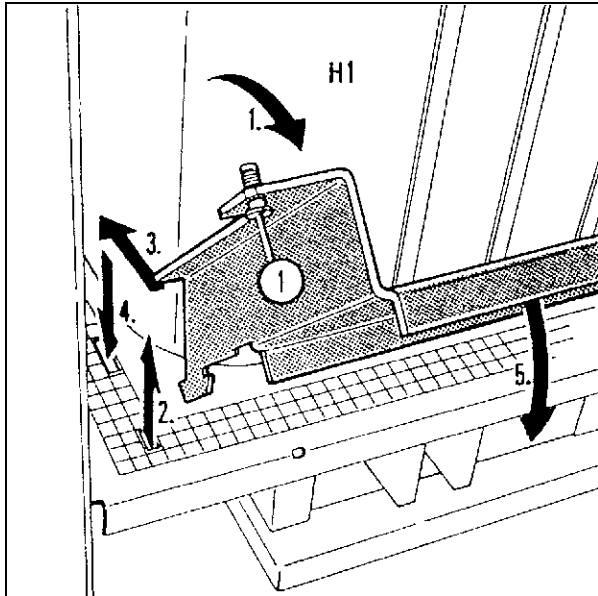


Fig. 20:

- Open bayonet catches of the holder (1/ Fig. 20 / p. 34).
- Change over and hinge out the holder for the high-voltage transformer according to (Fig. 20 / p. 34).
- Push the pallet with the high-voltage transformer in front of the power cabinet.
- Place the high-voltage transformer on the holder.



Oil can leak out when installing the high-voltage transformer.

⇒ **For this reason, do not tilt the high-voltage transformer!**

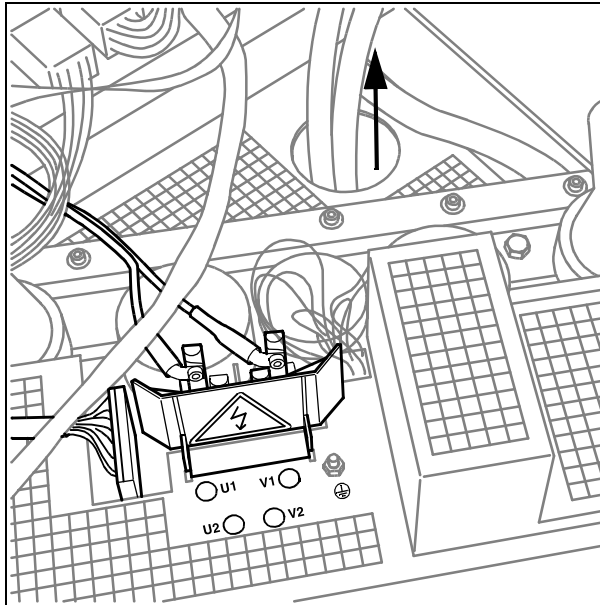


Fig. 21:

- Run the high-voltage cables up to the high-voltage transformer (arrow/Fig. 21 / p. 35) .
- If the high-voltage transformer is replaced, the DHHS labels on the cabinet base of the generator must be replaced.

Connection of the High-voltage Cables

NOTE

If the transformer is connected as a replacement to an already existing system, the resistance of the shielding braid of the high-voltage cables must be checked before the connection is made.

For this purpose measure at the two plug collars of the high-voltage cables; the measured resistance must not exceed 1 ohm/m.

Replace the high-voltage cable if the resistance is higher.

Use only new high-voltage cables (see SIR)).

The length of the high voltage cables from the H1 to the oil pressure switch and to the X-ray tube max be max. 24 m.

Installation of the high-voltage plugs for HV cable type RH 098-5DF6 071:

- See installation instructions RX0-000.031.01... in Reg. 3

Installation of the high-voltage plugs for previous types of HV cables:

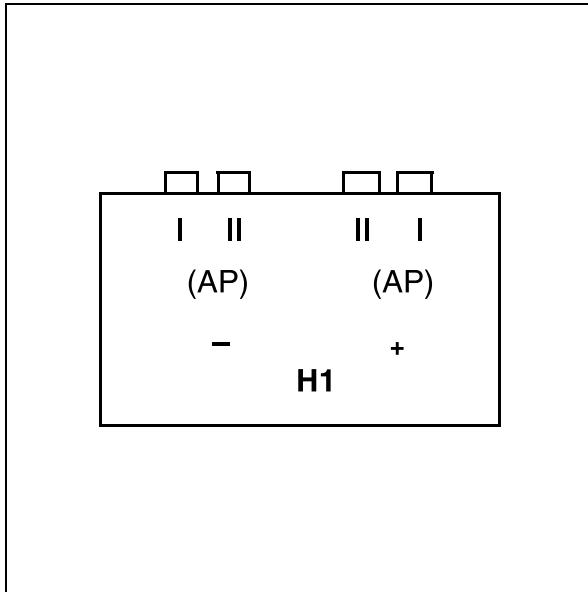


Fig. 22:

High-voltage cables and end connections:

- Push the spacer over the plug and push the threaded ring with knurled edge forwards up to behind the collar of the plug.
- Screw threaded half rings far enough into the threaded ring so that bottom edge of the plug collar and bottom edge of the threaded ring align; fix with the set screw.
- Center the threaded ring to the plug collar with 3 set screws.
- If only one tube is connected, allocate the first workstation ! WS1) to the high-voltage transformer ([Fig. 22 / p. 36](#)).
- Because of the checks during startup, do not yet plug the cathode-side high-voltage plug into the tube assembly.
- If inserted high-voltage plugs are pulled out, the existing silicone disk (17 86 508 R4186) must be replaced by a new one each time the high-voltage cable is inserted in the tube assembly (silicone disks swell in contact with the silicone oil).
- Check the oil level (approx. 1 cm) in the high-voltage receptacles; if necessary, fill up with oil (44 10 023 RV090 / 1 liter).
- Insert the high-voltage plugs with angled cuffs (if configured) and silicone gasket (on the generator side **without** silicone disk) as designated in the H1 high-voltage transformer.
- Push the H1 high-voltage transformer into the power cabinet and snap in the bayonet catches.

Connecting the Primary Leads

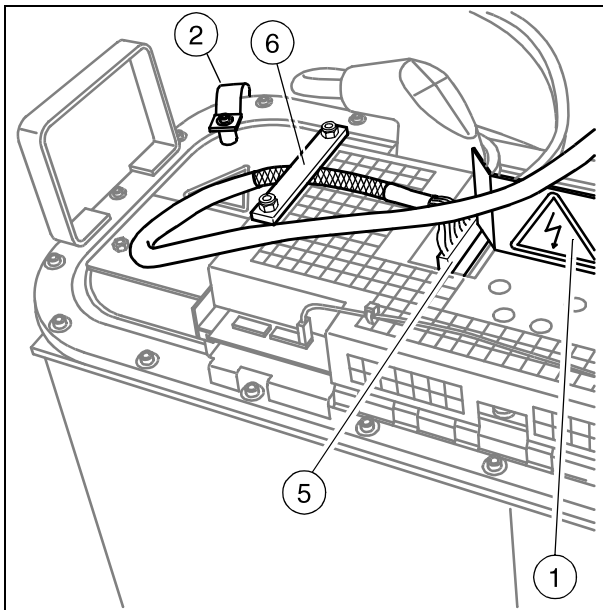


Fig. 23:

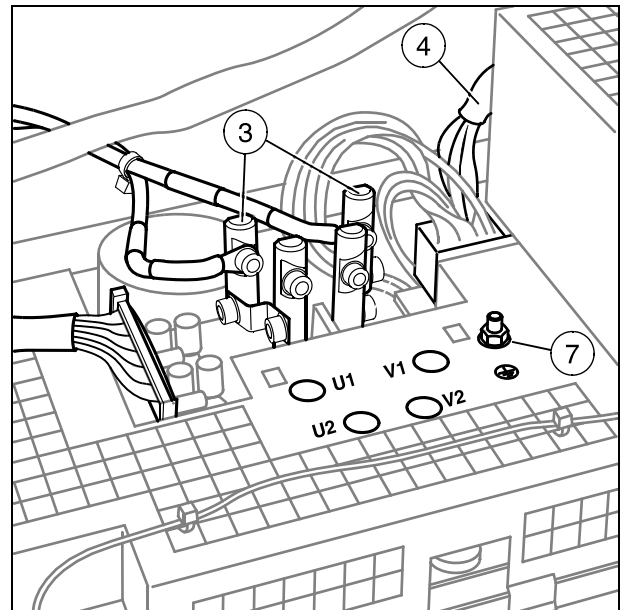


Fig. 24:

- Carefully remove the guard (with “Symbol ⚡ (1/ Fig. 23 / p. 37).
- Connect the protective ground wire band to H1. ⚡ (2/ Fig. 23 / p. 37).
- Screw on the leads H1-U1 and H1.V1 from the inverter as designated on the H1 (3/no content). (3/ Fig. 24 / p. 37).
- Run the cable connected to D220.X41 (4/ Fig. 24 / p. 37) to the board D160 and plug in at X44.
- Plug in the cable I X1 from D100 on D220.X1 (5/ Fig. 23 / p. 37) and clamp the shielding braid beneath the strain relief (6/ Fig. 23 / p. 37).

NOTE

There must be a ground connection between the cover and ground.

- Check the nut of the ground bolt (7/ Fig. 24 / p. 37) for firm seat, tighten if necessary.
- Fasten the guard (with “Symbol ⚡ (1/ Fig. 23 / p. 37).

Monitoring and Displays for Radiation Shield with the D160, Part No.: 37 74 788

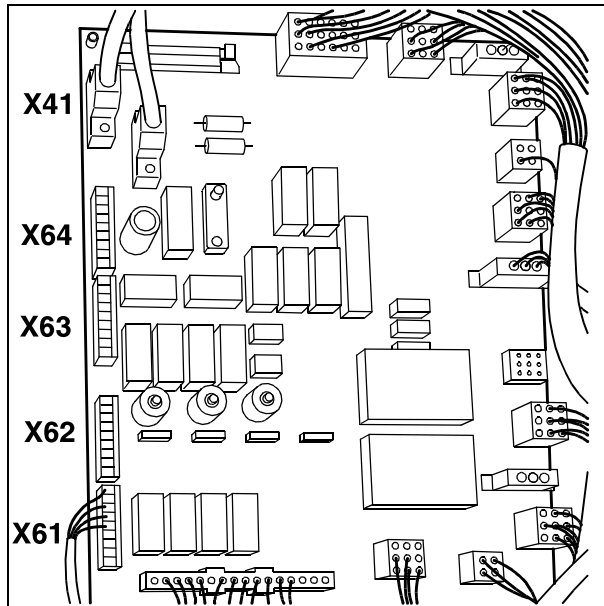


Fig. 25:

If the customer requests it, or if required by country-specific regulations (e.g. DHHS), the following monitoring devices and displays can be connected in the power cabinet at D160.X61 to X64 ([1/Fig. 25 / p. 38](#)), see also Wiring Diagram X2206, page 11):

- Connecting the door contact for radiation blocking
After removing the particular jumper, connect the door contact
- for **AP1** to: D160.X61.3 and D160.X61.4
- for **AP2** to: D160.X62.3 and D160.X62.4
- for **AP3** to: D160.X63.3 and D160.X63.4
- Connecting the display lamps for tube unit selection
Install a display lamp (24 V ~, max. 5 W) in the vicinity of the tube assembly so that it is clearly visible from the control console.
Connect the lamp
 - for **AP1** to: D160.X61.5 24 V ~ and D160.X61.6 (0 V_L)
 - for **AP2** to: D160.X62.5 24 V ~ and D160.X62.6 (0 V_L)
 - for **AP3** to: D160.X63.5 24 V ~ and D160.X63.6 (0 V_L)

NOTE

If two X-ray tube assemblies are to be controlled by one hand-switch from the control console, they must be labeled at the control console in the unit switch fields.

- Connecting the display lamps for radiation display
(e.g. outside the door of the examination room)
If an external radiation display for fluoroscopy and exposure is wished, connect the lamps corresponding to the type of radiation (24 V ~, max. 5 W) to the D160 board as follows:
 - Display when ZB is pressed: jumper X38.1-2 installed on D160
 - Display when radiation is released: jumper X38.2-3 installed on D160
- Radiation display lamps for separate rooms
 - for **AP1** to: D160.X61.7 24 V ~ and D160.X61.8 (0 V_L)
 - for **AP2** to: D160.X62.7 24 V ~ and D160.X62.8 (0 V_L)
 - for **AP3** to: D160.X63.7 24 V ~ and D160.X63.8 (0 V_L)
- General radiation display lamp
for WS1 / WS2 / WS3 connect:
 - D160.X64.8 24 V ~ and D160.X64.7 (0 V_L)
- Connecting the temperature sensor and oil pressure switch

NOTE

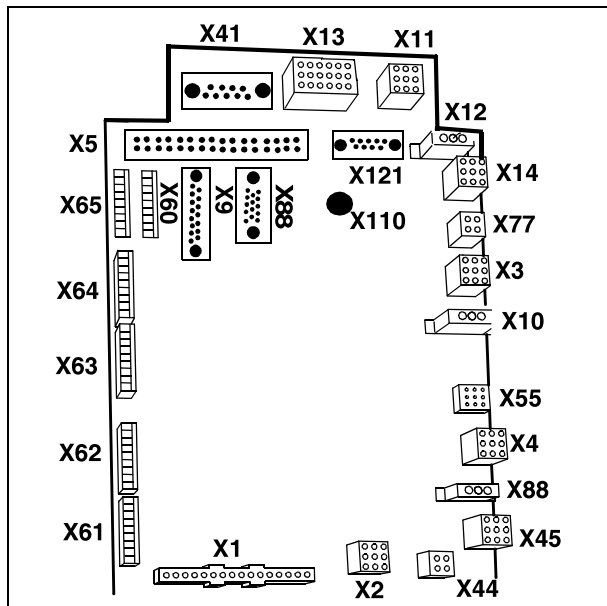
If a temperature sensor switch is configured, connect it in series with the oil pressure switch.

The Opti 154/... tube units have an internal temperature sensor (not an oil pressure switch)

After removing the particular jumper, connect the thermostat switch

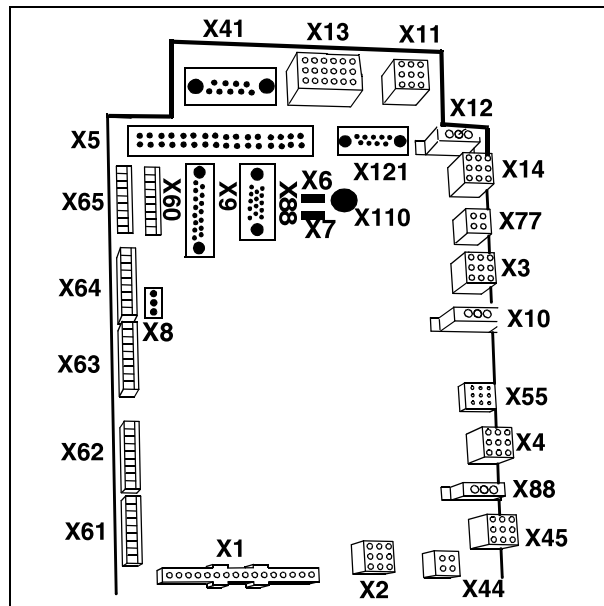
- for **AP1** to: D160.X61.1 and D160.X61.2
- for **AP2** to: D160.X62.1 and D160.X62.2
- for **AP3** to: D160.X63.1 and D160.X63.2
- Room light control
A breaker for the room light control can be connected on the D160 board. For programming the room light control, see the Startup Instructions.
System Configuration, RX63-055.034... or RX63-020.034... Select "Site Adjustments" in the field "Roomlight" as needed.
Connect the breaker at:
 - D160.X64.5 24 V ~ and D160.X64.6 (0 V_L)

Additional Monitoring, Displays and Controls with the D160, Part No: 56 58 906



D160 "E1"

Fig. 26:



D160 "E2"

Fig. 27:

NOTE

The D160 with Part No. 56 58 906 is compatible with the D160 with Part No.: 37 74 788 and has 2 additional connectors: X60 and X65, for system peripherals (see Wiring Diagram X2206-11-4).

With the D160, Part No.: 56 58 906 "E2" (Fig. 27 / p. 40) the following jumpers have been added:

- Jumper X6 (can be separated) (PE) --- $X/(0_{V_{Load}})$ or the installation step "Checking for Inadmissible Ground Loops".
- Plug-in jumper X8 (can be separated), provides possibility to convert a K15 potential-related fluoro contact into a potential-free K15 fluoro contact, e.g. for video recorder start or room light with fluoro ON/OFF.

• X-Ray Disable Switch

NOTE

Prerequisite is the XCU-HD Unit with the D320, Part No.: 56 58 963 and the XCU software beginning with version VB05C.

An A potential-free switch can be connected to D160.X65.1 and D160.X65.2, which when pressed prevents unintentional triggering of radiation; for this, remove the jumper installed on the D160.

- **Emergency power backup**

NOTE

Prerequisites is the XCU HD Unit with the D320, Part No.: 56 58 963 and the XCU software beginning with version VB05C.

Lay the two cables from the potential-free contact of the emergency backup power **ON** to D160.X65.3 and D160.X65.4; for this, remove the jumper installed on the D160.

- **Video Recorder Start or Room Light Control with Fluoro ON / OFF**

Potential-free contact (max. 230 V ~, 4A).

K15 relay	X60 connector	1
D160.K15.5	D160.X60.3	Closer
D160.K15.6	D160.X60.2	Toggle
D160.K15.7	D160.X60.1	Opener

1. see Wiring Diagram X2206-11

With D160 "E2" (Fig. 27 / p. 40) here is a 2nd potential-free fluoro contact (max. 230 V ~, 4A) available when the X8 jumper is in position 2---3

K15 relay	X64 connector	1
D160.K15.3	D160.X64.5	Closer
D160.K15.4	D160.X64.6	Closer

1. see Wiring Diagram X2206-11

With the D160 "E2" and the X8 = 1---2 jumper, a breaker for the room light control can be connected on the D160. For programming the room light control, see the Startup Instructions/System Configuration, RX63-055.034... or RX63-020.034..., if needed, select "Site Adjustments" in the "Roomlight" box.

Breaker connector on: D160.X64.5 (24 V ~) and D160.X63/X62/X61.6 or 8 (O_{VLoad})

- **External General Radiation Display**

Display is made when ZB is pressed: Jumper X38.1-2 installed on D160

Display is made when exposure is pressed: Jumper X38.2-3 installed on D160

Potential-free contact (max. 230 V ~, 4A).

K180 relay	X60 connector	¹
D160.K180.5	D160.X60.6	Closer
D160.K180.6	D160.X60.5	Toggle
D160.K805.7	D160.X60.4	Opener
D160.K180.4	D160.X60.8	Closer
D160.K180.3	D160.X60.7	Closer

1. see Wiring Diagram X2206-11

Pretransformer (Option)

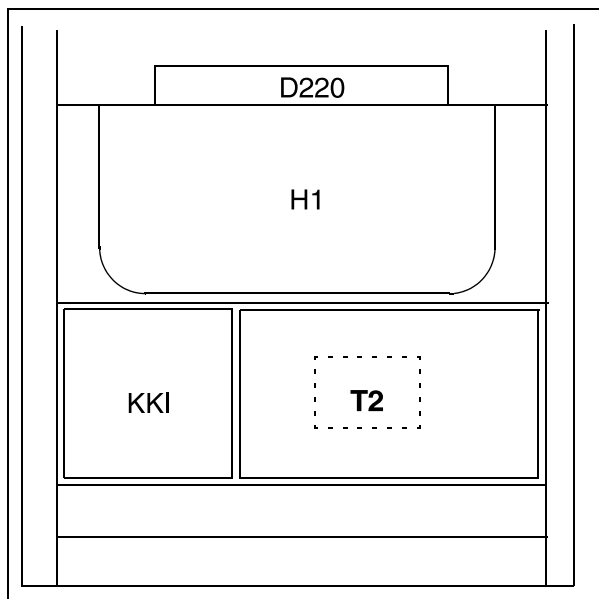


Fig. 28:

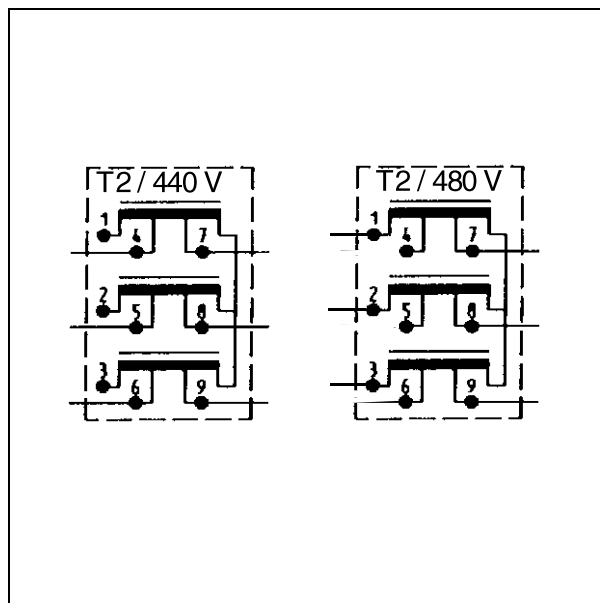


Fig. 29:

Nominal line voltage	Line voltage control range	Maximum line current PL SX 65	Maximum line current PL SX 80
440 V	396 V ... 484 V	157 A _{eff}	190 A _{eff}
480 V	432 V ... 528 V	155 A _{eff}	175 A _{eff}

- The T2 auto transformer is already installed in the factory as specified in the BZ. For subsequent installation location, (Fig. 28 / p. 43)
- Disconnect the existing supply leads to the fuses F1, F2, F3 from the K20 terminal block (power cable connection) and connect by referring to the wiring diagram X2206/10 to the terminal 7, 8, 9 of the T2 auto transformer.
- Install the auto transformer with the enclosed screws.
- Connect the supplied leads between the K20 power connection terminal and the T2 auto transformer corresponding to the wiring diagram X2206-10 (440 V or 480 V connection) (Fig. 29 / p. 43).

50Hz/60Hz Line Frequency Adaptation

- Frequency-dependent adaptations are made by programming on the D160 board D160 (X2206-10)

Line Frequency	D160 Jumper Position	
50 V	X20---X21	X23---X24
60 V	X21---X22	X24---X25

Connecting the Ground Wires

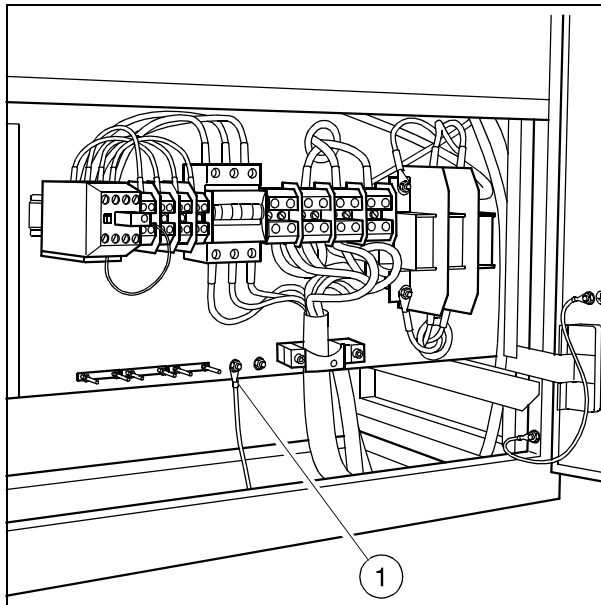


Fig. 30:

- Connect the protective ground wires of the tube assemblies and of the components (units and options) and, if configured, the console base to the protective ground wire terminals (Fig. 30 / p. 45) at M16.

NOTE

To avoid interference due to ground loops, run the protective ground wires in the star-shaped configuration to the central protective ground wire connection point.

Check of Ground Wires

- Carry out the check of the ground wire connections using the ground wire test instrument.

Checking for Inadmissible Ground Loops

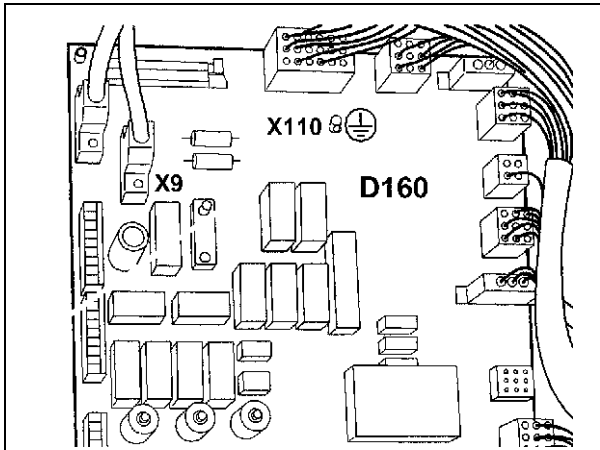


Fig. 31: D160 Part No.: 37 74 788

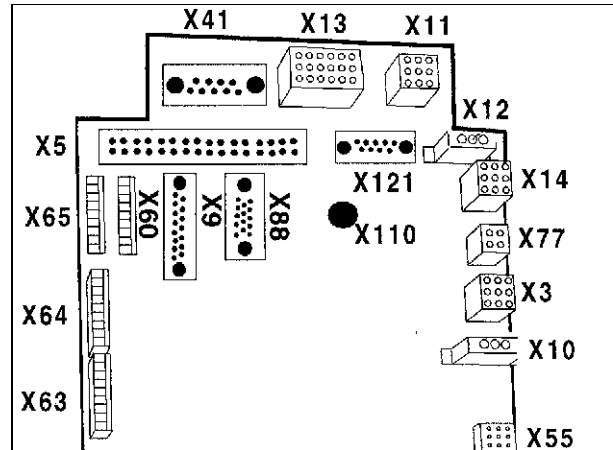


Fig. 32: D160 "E1" Part No.: 56 58 906

- After disconnecting the connection between PE and $0V_L$ in the generator power cabinet, remeasure to determine if any inadmissible ground loops are present.
- Depending on the version of the D160, measure the resistance
 - With the D160 with Part No.: 37 74 788 (Fig. 31 / p. 46) or. D160 "E1" with Part No.: 56 58 906 (Fig. 32 / p. 46):
Remove the nut on D160.X110, and separate the D160 from the chassis.
Measure the resistance between the X110 stud and D160. $0V_L$.
The measured resistance must be $> 30 \text{ k}\Omega$ in a cabled system.
Reinstall the nut on D160.X110.

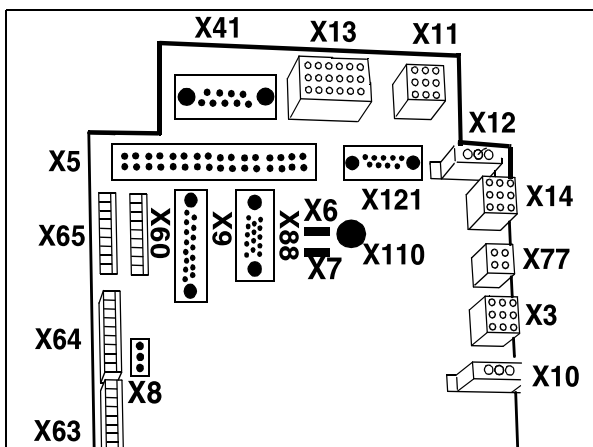


Fig. 33: D160 "E1" Part No.: 59 58 906

- With the D160 "E2" with the Part No.: 56 58 906 ([Fig. 33 / p. 46](#)):
On the D160, remove the X6---X7 wire jumper. Measure the resistance between X6 (0VL) and X7 (PE). The measured resistance must be > > 30 kΩ; in a cabled system.
Reinstall the X6---X7 wire jumper on the D160.

In chapter "Establishing the Cable Connections, table "Overview of Cable Connections" supplemented with the new K31 and K32 breakers for connection of the rotating anode to the starter.

In chapter "Establishing the Cable Connections" under "Connecting the Rotating Anode Cable", table supplemented with the new K31 and K32 breakers.

In chapter "Establishing the Cable Connections" under "Option 3. Tube Unit", table supplemented with the new K31 and K32 breakers.