

BeamTrek® Elite 6

Rev.: V1.1 (September 2016)



- Hardware Manual -

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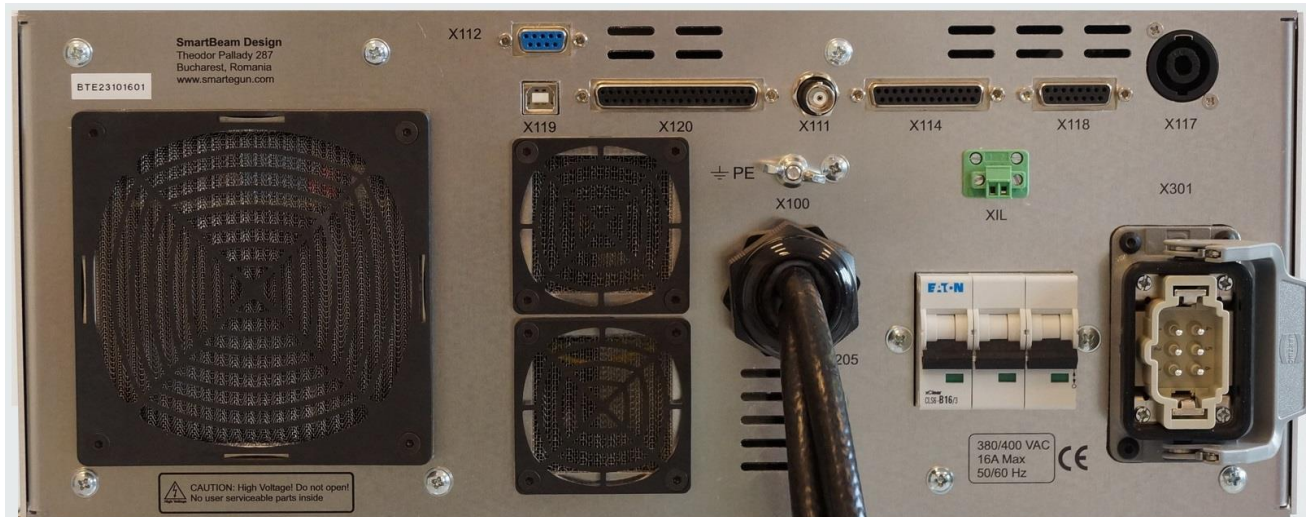
1. Overview

The BeamTrek (BT) Elite 6 series represents a unique All-In-One solution for the evaporation industry. It includes our latest BeamTrek evaporation controller, a 0-10V / 0-50A Filament-Power-Supply (FPS) and a 5 - 10.0kV / 0 - 600mA HV Power Supply (HVPS) into a single 5U, 360mm (main chassis) + 100mm (protruding glands and connectors) deep 19” rack case.

The BT Elite offers an array of interfacing options to the system integrator. This includes many communication standards plus digital and analog inputs and outputs. Each section of the unit is insulated from each other using 3KV opto-couplers to the main controller. The function of each I/O may be changed if this is required in a custom installation. Please contact us for details, if you have a special requirement.

2. Panel Layout

The designation of each connector is available in the below image:



Connector description:

- X120** : PLC Connection;
- X111** : PLC / Deposition Controller Input for Auto Emission Set-Point;
- X112** : Slave RS232 Serial port to connect the Controller to a PC / PLC;
- X113** : Master RS232 Serial port to connect the Controller to a slave equipment;
- X119** : USB Programming port for firmware updates (not recommended for permanent connection to a PLC / PC);
- X114** : Power Supply Interface;
- X118** : Gun Rotation Interface;
- X117** : Magnet Interface (X and Y);
- X301** : Mains input (3 Phase - 3 x (380-400)V + 1 Phase 220-240V);
- X100** : Protective Earth Link (M5).

HVPS Controller Board Connector description:

XIL : General HVPS Section Only Interlock (connect to a switch or relay output contacts, no voltage should be supplied on these pins)

!!! Always install the protective earth link directly to a single common point on the vacuum chamber !!!

The RC connector is located on the front panel. Connect to the Remote Control using supplied shielded patch cable.

The USB and RS232_SLAVE ports can not be used simultaneously. There is no special configuration required to connect any of these to a PC or master PLC and there will be no damage to the unit if both connectors are used at the same time (actually neither of them will control the unit properly).

The X114 connector is designed to connect to Power Supplies from different manufacturers, including our BeamWell FPS (Filament Power Supply) and Warp HVPS (High Voltage Power Supply). This is not used actively in the Elite configuration and will be available for future developments.

!!! Always check the operation of the 120mm main fan and abort operation if any anomaly is detected !!!

Interlock Operation:

There are 2 interlock sections on the unit. First section is represented by the BT section interlocks (general and rotation). Please refer to the PLC interface section for details.

The second one is the XIL Interlock for the HV Section only, which prevents any HV operation by inhibiting the drive voltage for the main contactor, thus bypassing the DSP Hybrid Controller completely and offering a high degree of safety.

3. Main Power Connector

The connector used is a HAN 6 Series Harting plug. The pairing connector is included in the delivery package. If a replacement is needed, the part numbers are:

- Han 6 E-BU-S (09330062701) – Socket Insert;
- Han 6B-gg-M20 (19300061440) – Straight cable output hood;
- Han M20 Cable Grommet (19000005081)

Connector assignment:

Pin Number	Designation
1	Phase 1
2	Phase 2
3	Phase 3
4	Neutral
5	Controller Section Neutral Line
6	Controller Section Phase Line
PE	Mains Protective Earth

For the HVPS and FPS section use a 3-Phase circuit breaker rated at 20Amps, and for the Controller 1-Phase input a 2-Pole single Phase breaker rated at 5Amps.

4. Magnet Connector

The part number is “NL4MD”. Consult Neutrik for a suitable plug if you wish to build a custom cable, instead of using the supplied 1-1 cord. An example is the NL4FC plug, supplied with our Magnet FT Cable:

Pin Number	Designation
1+	X Output +
1-	X Output -
2+	Y Output +
2-	Y Output -

5. Communication

The Unit offers slave RS232 and USB. The slave USB and RS232 use separate connectors but should not be used at the same time as mention before. The pin-out is available below:

X112 (9SUBD – Socket)	Designation
2	TX Output
3	RX Input
5	GND (connected to PE)

6. OEM / PWS Interface

The detailed circuitry for the OEM input / output section is available below. The connector used is a standard D-SUB 25pin female:

Pin Number	Name	Designation
1	HVPS_RESET	HV PWS Reset Output Relay NO
2	HVPS_ON	HV PWS ON Output Relay NO
3	HVPS_OK	HV PWS OK Input to Optoisolator
4	FIL_OK	FPS Filament OK Input to Optoisolator
5	PLC+12V	Supply to use with the relay common
6	AOUT1	HV U Target Set Point Output (0-10V)
7	AIN3+	HV I Monitoring (0-10V) Positive Input
8	AIN4+	HV U Monitoring (0-10V) Positive Input
9	AOUT4	FPS I Target Output (0-10V)
10	AIN5+	FPS I Monitoring (0-10V) Positive Input
11	FPS_ON	FPS ON Output Relay NO
12	GND	Internally connected to PE
13	PWS_COM	PWS 12V Common for relay Outputs(1)
14	GND	Internally connected to PE
15	GND	Internally connected to PE
16	GND	Internally connected to PE
17	GND	Internally connected to PE
18	GND	Internally connected to PE
19	GND	Internally connected to PE
20	AIN3-	HV I Monitoring (0-10V) Negative Input
21	AIN4-	HV U Monitoring (0-10V) Negative Input
22	GND	Internally connected to PE
23	AIN5-	FPS I Monitoring (0-10V) Negative Input
24	OUT4	Relay Output 4 NO
25	OUT5	Relay Output 5 NO

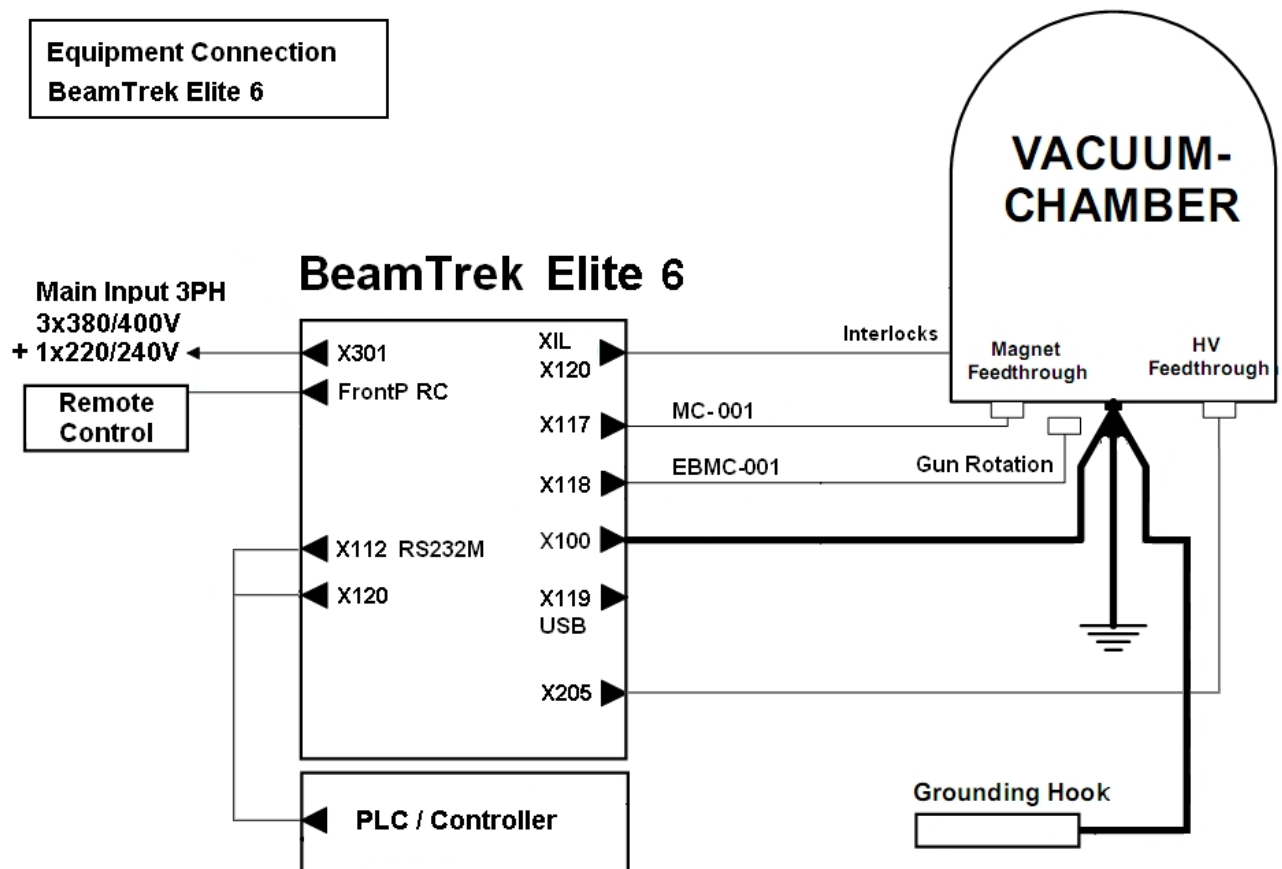
- (1) To use a different voltage for the relay outputs, this has to be specified at time of order since PIN 13 is internally connected to +12V through a solder jumper. If required this can be left unsoldered and the user can provide a different (24V for example) voltage on PIN 13;

7. HVPS Native Interface for Monitoring

Only the highlighted Pins should be used in Elite Configuration. The others are in only for the reference.

Pin Number	Name	Designation
1	HVRST+	HV Reset Input+ (5-24V)
2	HVON+	HV On Input+ (5-24V)
3	HVARC	HV Arc Output (12V PNP)
4	FIL_OK	FPS Filament OK Output (12V Reed Relay)
5	BT+12V	Supply to use with the relay common
6	HVSP	HV U Target Set Point Input (0-10V)
7	HVIM	HV I Monitoring (0-10V) Positive Output
8	HVUM	HV U Monitoring (0-10V) Positive Output
9	AUTO1	FPS I Target Input/Auto1 Shared (0-10V)
10	OUTFIL1	Filament Current for Output 1 (0-10V, 0-50A)
11	HVON+	HV On Input+ (5-24V)
12	GND	Internally connected to PE
13	PWS_COM	PWS 12V Common for relay Outputs
14	HVRST-	HV Reset Input- (reference for PIN 1)
15	HVON-	HV On Input- (reference for PIN 2)
16	OUTEM1	Emission for Output 1 (0-10V, 0-1000mA)
17	OUTEM2	Emission for Output 2 (0-10V, 0-1000mA)
18	OUTFIL1	Filament Current for Output 1 (0-10V, 0-50A)
19	OUTFIL2	Filament Current for Output 2 (0-10V, 0-50A)
20	GND	Internally connected to PE
21	GND	Internally connected to PE
22	GND	Internally connected to PE
23	GND	Internally connected to PE
24	NC	Not Connected
25	NC	Not Connected

8. System Connection Diagram:



The end of the HV Filament Cable is configured for use with our Dual HV Feed-Through. If required, it can be adapted for 2 independent Feed-Trough's although we don't recommend it.



!!! Always install the HV Return yellow-green link directly to the PE common point on the vacuum chamber!!!

9. “PLC” I/O Interface:

The PLC Interface groups the **X120** DB37 Female Connector, and the **X111**, BNC, Industry Standard, and Auto Emission Input. These are easy to connect and disconnect from the rack, and offer an excellent and compact interface with all the signals in the same place.

The standard function of pins is:

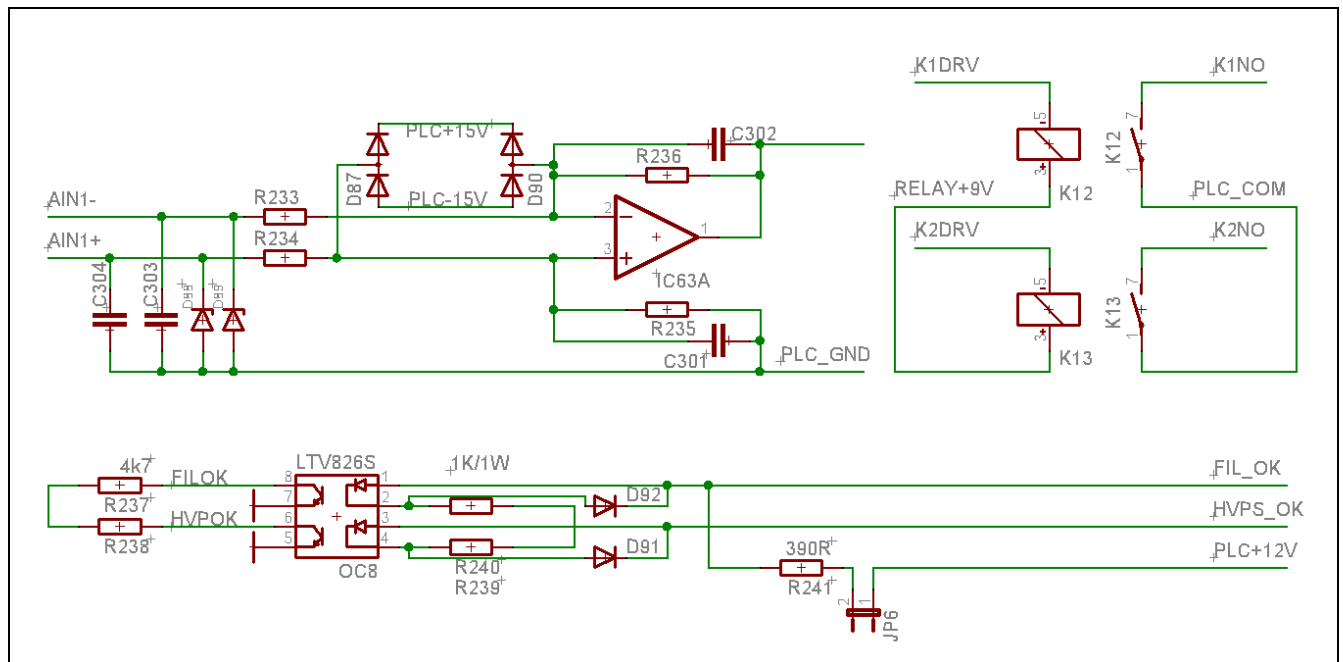
X120	Name	Designation (Yellow = Input, Grey = Output)	
1	AIN2+	Filament Current Positive Input (0-10V)	
2	AOUT2	HV Monitoring Analog Output (0-10V)	
3	AOUT3	Emission Current Monitoring (0-10V)	
4	RINT	Rotation Inter-Lock (5-24V) or OC with (JP2-2) installed Master Inter-Lock (determines when is HV On Allowed) – (5-24V) or OC with (JP2-1) installed HV On request (5-24V) or OC with (JP1-10) installed Gun (Filament) On Request (5-24V) or OC with (JP1-9) installed Dataset Bit 7 (5-24V) or OC drive with (JP1-8) installed Dataset Bit 6 (5-24V) or OC drive with (JP1-7) installed Dataset Bit 5 (5-24V) or OC drive with (JP1-6) installed Dataset Bit 4 (5-24V) or OC drive with (JP1-5) installed Dataset Bit 3 (5-24V) or OC drive with (JP1-4) installed Dataset Bit 2 (5-24V) or OC drive with (JP1-3) installed Dataset Bit 1 (5-24V) or OC drive with (JP1-2) installed Dataset Bit 0 (5-24V) or OC drive with (JP1-1) installed	
5	MINT		
6	HVON		
7	GUNON		
8	DATASET7		
9	DATASET6		
10	DATASET5		
11	DATASET4		
12	DATASET3		
13	DATASET2		
14	DATASET1		
15	DATASET0		
16	GND	Internally Connected to PE	
17	GND	Internally Connected to PE	
18	RELAY_COM	Relay Common to connect to GND, +12 or External PLC Supply	
19	+12V	+12V Power Supply to use for the relay outputs if required	
20	AIN2-	Filament Current Negative Input (0-10V)	
21	FIL_MON	Filament Current Monitoring (0-10V)	
22	GND	Internally Connected to PE	
23	GND	Internally Connected to PE	
24	GND	Internally Connected to PE	
25	GND	Internally Connected to PE	
26	GND	Internally Connected to PE	
27	GND	Internally Connected to PE	
28	GND	Internally Connected to PE	
29	GND	Internally Connected to PE	
30	GND	Internally Connected to PE	
31	K1NO	When Closed : When Closed the Controller is Ready:	- HV is ON - Powered On; - Pocket in position; - Magnet Ok; - Interlock Ok.
32	K2NO		
33	K3NO	When Closed : Pocket In Sight Bit 3 Pocket In Sight Bit 2 Pocket In Sight Bit 1 Pocket In Sight Bit 0	- Pocket in position;
34	K4NO		
35	K5NO		
36	K6NO		
37	K7NO		

The Controller offers also a Filament Current Analog Input for implementing custom procedures like Filament break in, and custom operation.

Both, the Auto Input and Filament Current Input, are easily configurable to support also a negative input voltage (-10V to 0V). This is accomplished by reversing the 2 wires, since the controller uses a fully differential measurement technique:

To fully understand the connection diagrams, a schematic example with each type of the available Inputs / Outputs is provided below:

Important : Never load the relays with more than 1 Amp Peak or Continuous Current !



Operation Example:

Dataset Selection Bits (Binary Mode BCD0)

X120 Pin Number	8	9	10	11	12	13	14	15
Meaning	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT 1	BIT 0
Dataset 1 Selected	0	0	0	0	0	0	0	0
Dataset 2 Selected	0	0	0	0	0	0	0	1
Dataset 3 Selected	0	0	0	0	0	0	1	0
Dataset 4 Selected	0	0	0	0	0	0	1	1
...	-	-	-	-	-	-	-	-
Dataset 64 Selected	0	0	1	1	1	1	1	1

Dataset Selection Bits (Binary Mode BCD1)

X120 Pin Number	8	9	10	11	12	13	14	15
Meaning	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT 1	BIT 0
No action	0	0	0	0	0	0	0	0
Dataset 1 Selected	0	0	0	0	0	0	0	1
Dataset 2 Selected	0	0	0	0	0	0	1	0
Dataset 3 Selected	0	0	0	0	0	0	1	1
...	-	-	-	-	-	-	-	-
Dataset 63 Selected	0	0	1	1	1	1	1	1

Dataset Selection Bits (Linear Mode)

X120 Pin Number	8	9	10	11	12	13	14	15
Meaning	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT 1	BIT 0
No action	0	0	0	0	0	0	0	0
Dataset 1 Selected	0	0	0	0	0	0	0	1
Dataset 2 Selected	0	0	0	0	0	0	1	0
Dataset 3 Selected	0	0	0	0	0	1	0	0
...	-	-	-	-	-	-	-	-
Dataset 7 Selected	0	1	0	0	0	0	0	0
Dataset 8 Selected	1	0	0	0	0	0	0	0

10. Standards and Directives

The BeamTrek® Evaporation Controller Conforms to the following EC Directives and safety standards:

1. Low Voltage Directive (73/23/EEC, 93/68/EEC):

- 1.1. SR EN ISO 12100-1 : Part 1 – Safety of Machinery; principles;
- 1.2. SR EN ISO 12100-2 : Part 2 – Safety of Machinery; principles;
- 1.3. SR EN 60204-1:2000 : Safety of Machinery; Electrical equipment of machinery;

2. EC Directive EMC (89/336/EEC, 91/263/EEC, 92/31/EEC, 93/68/EEC):

- 2.1. SR EN 61000-6-3:2003 : EMC Part 1;
- 2.2. SR EN 61000-6-1:2003 : EMC Part 1.

July 2014,
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11. Specifications

Parameter	Value
General	
Power Input	3x380V (3x400V) 3-Phase + Neutral
Dimensions	5U, 360mm deep main unit Extra 140mm clearance required for cables
Filament Cable	2 x 10sqmm, 50A, 10kV Rated, insulated with separate HV Return Wire (0V)
Operating Temperature	Max. 35deg Celsius
High Voltage Power Supply	
Ripple and regulation	+/- 0.25% up to 200mA (8kV) +/- 0.50% full Power Range
Output Voltage	Min : 5000V; Max : 10000V;
Output Current	Max : 600mA (any Voltage Output)
Arc Recovery	2.5ms
Arc Wait before Recovery	User adjustable, 2.5ms minimum
Filament Power Supply	
Voltage Output	Max 10V DC
Current Output	Max 50A
Evaporation Controller (for a full list of features consult the BeamTrek® Manual)	
Type	BeamTrek® V3.5 Evaporation Controller
X,Y Deflection	+/-3A Maximum, Hall Sensor, Full isolation each channel
Sweep Capability	Sinus, Triangle, Square, User Defined Lissajous Spiral with sector and radius energy variation User Defined Dwell Path Defocus, Shape adjust and advanced EBeam Compensation
Digital Inputs	Dataset Selection and HV On/Off
Analog Inputs	0-10V Auto Input for Emission Set-Point

12. Quick Start Guide

Protective Earth (PE)!

Always connect a 10sqmm cable to the X100 grounding screw to the central grounding at the Chamber directly.

Power Input:

Connect the **3 Phase** Wires to pins no. **1,2 and 3** of the supplied Harting Connector;
Connect the **Neutral** to pin no. **4**;
Connect the Controller **Neutral** to pin no. **5**;
Connect the Controller **Phase** Line to pin no. **6**;
Connect the Mains PE line to the PE tab.

HV Interlock:

Connect the HV interlock to the supplied removable terminal block (simple switch, no power should be provided on these pins)

BeamTrek® Interlock:

Connect pin 4 (If rotation is required) to pin 19 of the X120 connector.
Connect pin 5 (General Controller Interlock) to pin 19 of the X120 connector.

BeamTrek® Magnet/Gun Rotation:

Connect the Magnet Cable to the X117 connector or a dummy plug if not required.
Connect the Gun Rotation Cable to the X118 connector if used.

HV Connection (X205)

Connect the ends to the HV Feed-Through and tighten the strain relief screws to lock the cable in and prevent accidental fall and connect the yellow green cable to the central grounding at the Chamber:

