

Fastron Electronics Installation Guide for Advanced Energy Thyro A Series Controllers Rev 1.11

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1. Wiring up Thyro A Series Models

1-1. Control Input wiring

You can select either 5-10kohm Pot, mA or Voltage Inputs between 0-20mA and 0-10V.

The selection can be made via Dip switch Settings or via Thyro Tool Pro Software.

For POT input; Connect one side of POT to pin 8, connect the center POT terminal to pin 4 (+) and then connect the other side of the POT to Pin 3.

For 0-20mA/0-10V input; Connect Pin X2.4 to (+) terminal of analogue input source, and connect pin X2.3 to (-) terminal of analogue input source

1-2. Analogue Meter Wiring

You can output Load voltage, current or Power via Pins X2.9 (+) and Pins X2.5(-). The Scale is given by the maximum output of the controller. Note you can only select the parameter which is available i.e. for H3 you can only output Voltage, for H RLP 3 you can select to output voltage, current or power.

1-3. Fault/Signalling Relay K1 Wiring

For Faulty/Alarm Signalling via K1 Relay, you can connect X3.1 for Common and X3.2 for Normally Open, or X3.3 for Normally Closed action

1-4. Pulse Lock (Disable Output) Wiring

By default, if Pins X2.1 and X2.2 are **NOT linked** the controller output is locked and will not output power. For the controller to output the link must applied

1-5 Auxiliary Power Supply Wiring

If you are to operate at very low voltage more than 57% below the nominal voltage. For example for 230VAC controller if operating below 131.1 VAC then you will need a 24VDC Auxiliary Power Supply. If you need to monitor comms for 24 hours without any disruption, the aux power supply needs to be connected to a 24 hour mains power circuit.

1-6 Main Power Connections

For Thyro 1A Single Phase Models

See Appendix 1 & Appendix 2

For Thyro 2A Single Phase Models

See Appendix 1 & Appendix 2

For Thyro 3A Single Phase Models

See Appendix 1 & Appendix 2

2. Thyro Too Pro Dip Switch Settings Settings

2-1. DIP Switch Settings for Analogue Control Input (S1 Dip Switch)

Use the following Dip Switch Settings to chose the control input to be used.

Table 4-7. Setpoint input range

Type	1	2	3	4	5	6	7	8	9	10	Function
Setpoint H3/HRL3/HRLP3											
						0	1	1			0 mA to 20 mA setpoint (Ri=250 Ω)
						1	1	1			4 mA to 20 mA setpoint (Ri=250 Ω)
						0	0	1			0 V to 5 V setpoint (Ri=44 Ω)
						1	0	1			1 V to 5 V setpoint (Ri=44 Ω)
						0	0	0			0 V to 10 V setpoint (Ri=88 Ω)
						1	0	0			2 V to 10 V setpoint (Ri=88 Ω)

2-2. DIP Switch Settings for Control & Firing Mode (S1 Dip Switch)

First Set the Firing Type

TAKT = Burst Fire or Zero Firing Control

VAR = Phase Control

QTM – Quick TAKT/Burst Mode

Note: QTM Mode is only available for 1A (Single Phase/Leg) models

2-3. DIP Switch Settings for Optional Analogue Output (S1 Dip Switch)

Table 4-4. Operating mode and load types

Type	1	2	3	4	5	6	7	8	9	10	Function
1A and 2A											
Default	1	0	0	0	0	0	1	1	0	1	TAKT, UxU, Transformer load, 0 mA to 20 mA setpoint, 0 V to 10 V analog output
	1	0									TAKT
	0	1									VAR (1A only)
	1	1									QMT (1A only)
3A											
Default	0	1	0	0	0	0	1	1	0	1	VAR, UxU, Transformer load, 0 mA to 20 mA setpoint, 0 V to 10 V analog output

Table 4-8. Analog output

Type	1	2	3	4	5	6	7	8	9	10	Function
HRL3/HRLP3											
									0	1	0 V to 10 V analog output
									1	1	2 V to 10 V analog output
									0	0	0 mA to 20 mA analog output
									1	0	4 mA to 20 mA analog output

The analog output allows the effective values U_{load} , I_{load} , or P (HRLP3) to be displayed. The output signal level can be set.

Note: for any selected control mode, and analogue output, the highest value is always used for control and display. For example, the maximum will be 10V/20mA for 100% input control setting. See 2-4 for more detail on the output scaling.

2-4. DIP Switch Settings for Control Mode & The parameter for Analogue Output (S1 Dip Switch)

Select if you need voltage control, current control or power control. Also squared control function is available for voltage (UxU) and current (IxI).

Use the following S1 DIP Switch Settings to chose the Firing Type, and Analogue Output to be used.

Table 4-6. Control mode

Type	1	2	3	4	5	6	7	8	9	10	Function
HRL3/HRLP3											
			0	0	0						UxU with analog output Uload
			1	0	0						U with analog output Uload
			0	1	0						IxI with analog output Iload
			1	1	0						I with analog output Iload
			0	0	1						I with analog output Uload
			1	0	1						UxU with analog output Iload only for HRL3
			0	1	1						U with analog output Iload only for HRL3
HRLP3											
			1	0	1						P with analog output Pload
			0	1	1						P with analog output Iload
H3/HRL3/HRLP3											
			1	1	1						Thyro-Tool Pro software mode

3. Setpoint & Limits Setting via Analogue

3-1. Scale Setpoint; The Set point is pre-calibrated to give 0-100% voltage output for the set analogue input range. If the user has changed the analogue set point scale POT R202, then this will need to be re-calibrated to give 0-100% output.

If you wish to limit the output for voltage, then you can reduce the scale to limit the output voltage (and current)

In practice, once set correctly, the controller will output 0-100% for 0-100% analogue input range.

Take the following example, the analogue output scale can be set as follows for logical interpretation of the signal. This example is for a 100 Amp Controller with H RLP 3 option installed.

For Pload Output 44kW = 100% = 20mA (or 10V)

For Iload Output 110A = 100% = 20mA (or 10V)

For Vload Output 440V = 100% = 20mA (or 10V)

The scale can be selected through Thyro Tool Pro, or through scale adjustment POT R204.

3-2. Scale Output;

Sets the scaling for the analogue output. This is pre-calibrated and should not need to adjust. If requires adjustment, use with scaling setting of your digital panel meter to give the correct display based on the full range of the controller output.

Table 4-9. Potentiometer locations

Location	Function	Default
R201	Transformer adaptation (Phase angle of first half wave)	Thyro-A 1A 60° electrical phase angle Thyro-A 2A 90° electrical phase angle Thyro-A 3A 90° electrical phase angle
R202	Scale setpoint ^[1]	U-regulation: $U_{type} + 10\%$ P-regulation: $P_{type} + 10\%$
R203	Current limit ^[1]	I_{type}
R204	Scale output ^[1]	U_{type}, I_{type}, P (depending on output variable of analog output)
R205	Load monitoring ^[1]	Off (left stop)

¹ For ... HRL3 and HRLP3 only.

3-2. Current Limit;

Once 100% output has been confirmed by applying 0-100% analogue input. When the output is at 100%, you can reduce the Current Limit POT slowly until you see the output current reduce. Once you see movement you can now reduce to the required Current limit set point.

Please note for all the above setting there is a LED bar graph which will override the main LED indication. Once the setting is not adjusted the LED's will return to normal state.

Table 4-10. Setting aids

LED Bar Graph	Analog Output	Setting %	Corresponding Phase Angle
100%	10.0 mA/5 V	100%	100° electrical phase angle
100% dimmed [1]	9.0 mA/4.5 V	90%	90° electrical phase angle (default Thyro-A 2A & 3A)
80%	8.0 mA/4.0 V	80%	80° electrical phase angle
80% dimmed	7.0 mA/3.5 V	70%	70° electrical phase angle
60%	6.0 mA/3.0 V	60%	60° electrical phase angle (default Thyro-A 1A)
60% dimmed	5.0 mA/2.5 V	50%	50° electrical phase angle (default Thyro-A 1A)
40%	4.0 mA/2.0 V	40%	40° electrical phase angle
40% dimmed	3.0 mA/1.5 V	30%	30° electrical phase angle
20%	2.0 mA/1.0 V	20%	20° electrical phase angle
20% dimmed	1.0 mA/0.5 V	10%	10° electrical phase angle
¹ At 90%, the 100% LED is dimmed.			

5. Appendix 1 – Mains Power Connection Instruction from User manual

This task applies to all units. Three-phase units will have three mains input terminals and three load terminals. Two-phase and 1-phase units will have two sets or one set of mains terminals and load terminals, and will require a reference phase connection to connector X1, as shown in the connection diagram (see “Connection Diagrams” on page 5-20).


TO CONNECT LOAD AND AUXILIARY POWER

1. Press on the retaining clip on the front of the unit(s), and slide the plastic cover(s) forward to remove.
2. Verify that the Protective Earth ground conductor is connected.
3. Connect each phase of the mains supply to the mains terminal (L1, L2, L3).

 **Important**

A clockwise rotating field is required. The mains terminals are labeled 1 on units with less than a 45 A current rating.

- a. Use the screw size specified in Table 5-1.
 - b. Tighten to the torque specified in Table 5-2.
4. Connect each phase of the load to the load terminals (T1, T2, T3).

 **Important**

The load terminals are labeled 2 on units with less than a 45 A current rating.

- a. Use the screw size specified in Table 5-1.
 - b. Tighten to the torque specified in Table 5-2.
5. For 1-phase and 2-phase units only, connect terminal X1.1 on the bottom of the unit:
 - To the neutral conductor (1-phase units)
 - To the mains side of L2 through an external 2 A fuse (1-phase or 2-phase units)

An external 2 A fuse might be required. Use the included plug-in, screw-terminal block to make this connection. Do not alter any existing factory wiring connected to this terminal block.

6. To use the unit beyond the normal voltage range, connect a current-limited external 24 V power source to the power input connector XII on the bottom of the unit.

External 24 V auxiliary power allows bus communication operation during mains faults.

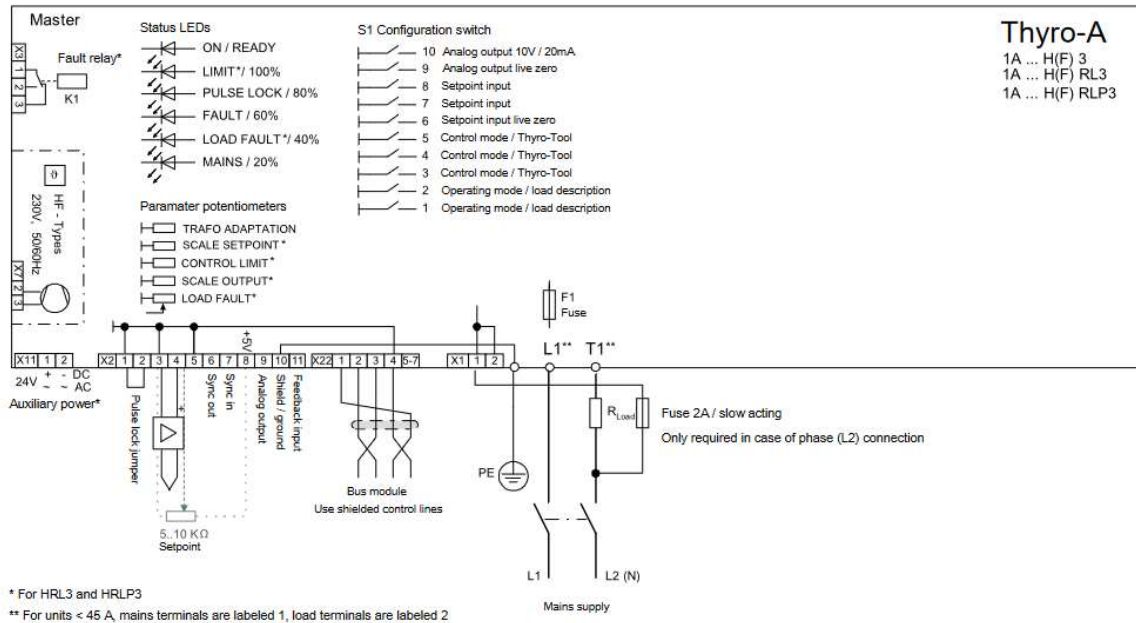
- Writer
7. For HF units, connect the 230 VAC (or 115 VAC special option) fan power supply to connector X7.

Use the included plug-in, screw-terminal block to make this connection. Follow the torque recommendation for M2 terminal screws.

6. Appendix 2 - Thyro 1A, 2A and 3A Wiring Schematic

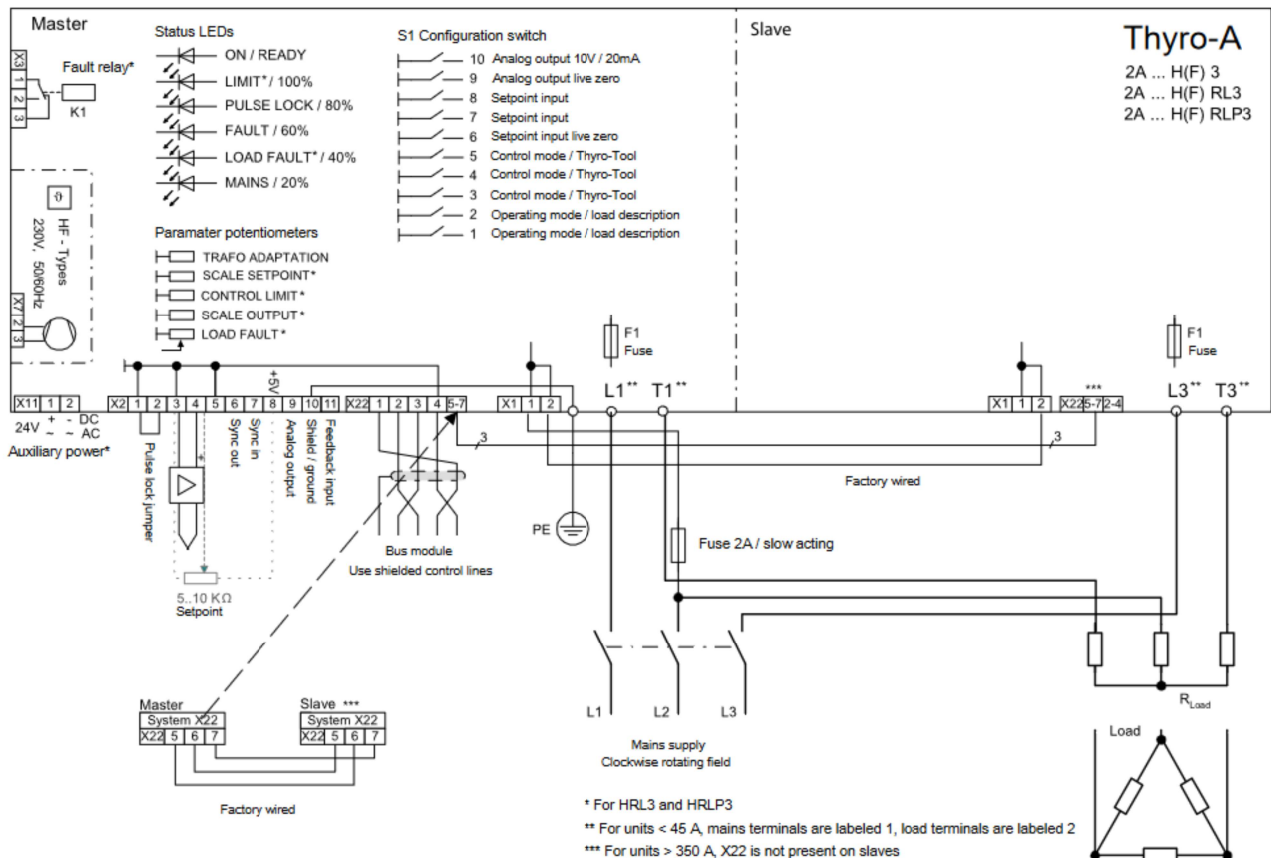
Thyro A 1A

Figure 5-25. 1A power controller connections



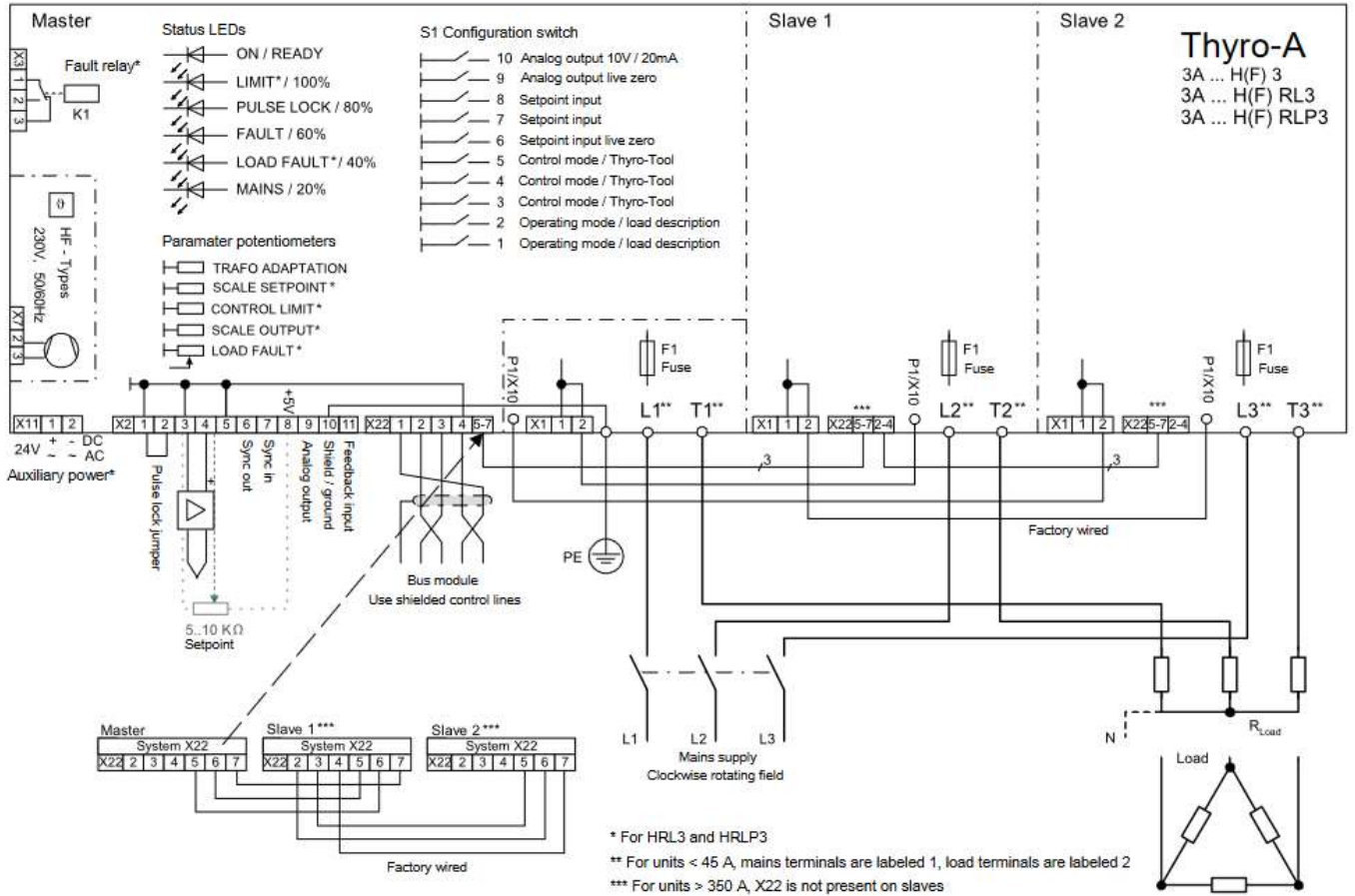
Thyro A 2A

Figure 5-26. 2A power controller connections



Thyro A 3A

Figure 5-27. 3A power controller connections



Appendix 3 – Response times and fine tuning the PID Loop

Thyro-A Series is configured by the factory for accurate control and safe operation of transformer coupled heaters.

For certain applications such as welders, or bag sealers the output response may need to be sped up. The speed of the controller depends on the inductivity of the transformer.

To configure fastest output response (without transformer safety feature), the unit can be configured as below:

- Set DIP switch 3,4,5 = on. All software settings can be done in our PC-Software and the Potentiometers are ignored.
- Set operation mode = VAR,
- Set Softstart time = 0 (no safety ramping),
- Set Control mode = None (output is set according to setpoint, ignoring voltage, current, power control).

With this configuration a set point jump from 0 to 100% would cause a output change from 0 to 100% within 1 to 2 sine waves.

(20-40ms at 50Hz).

In case current control and/or limiting is required, I-control is recommended. Even without soft start setting, the output will take a while to be reached. To make this faster, the PID-settings needs to be modified:

Faster PID-Settings [default] -> faster, (max):

TI_1 [20] -> 10 (4)

KP_1 [60] -> 60 (13107)

KR_1 [5] -> 10 (17)

In case there is a transformer which may cause inrush, too fast settings can blow our semiconductor fuse.

If the output becomes unstable with stable set point, the PID settings are too fast.

