tekmar®
A WATTS Brand
5100 Silver Star Road | Vernon, BC V1B 3K4 | Tel. (250) 545-7749 | Fax (250) 984-0815

CSI SPECIFICATION: Smart Heat Pump Control 291

SECTION: 230913 Instrumentation and Control Devices for HVAC

Part 1 – General

Summary
Applicable general requirements for electrical Work specified within Division 23 Specification Sections apply to this Section.

References

A. Canadian Standards Association (CSA): CSA E60730-1:15 (R2020) – Automatic Electrical Controls

B. Underwriters Laboratories, Inc. (UL): UL 60730-1 - Automatic Electrical Controls

Submittals

Quality Assurance

Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of ten years.

The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar. Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.

The manufacturer or their representative shall have service, repair, and technical support services available during Monday through Friday during standard business hours.

All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Process controllers, assemblies, materials, and equipment shall be listed and labeled by Underwriter's Laboratories or by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

Limited Warranty
The liability of tekmar under this warranty is limited. The Purchaser, by taking receipt of any tekmar product (“Product”), acknowledges the terms of the Limited Warranty in effect at the time of such Product sale and acknowledges that it has read and understands same.

The tekmar Limited Warranty to the Purchaser on the Products sold hereunder is a manufacturer’s pass-through warranty which the Purchaser is authorized to pass through to its customers. Under the Limited Warranty, each tekmar Product is warranted against defects in workmanship and materials if the Product is installed and used in compliance with tekmar’s instructions, ordinary wear and tear excepted. The pass-through warranty period is for a period of twenty-four (24) months from the production date if the Product is not installed during that period, or twelve (12) months from the documented date of installation if installed within twenty-four (24) months from the production date.

Part 2 – Products

General
The Smart Heat Pump Control 291, Smart Heat Pump Expansion 291EXP, Smart Mix Expansion 295 and Smart Boiler Control 294 operate as a modular system. The 291 is the central controller that operates either a 2-pipe or 4-pipe system with 1 to 4 heat pumps or 1 to 3 heat pumps with a single backup boiler. The optional 291EXP adds an additional 4 heat pumps as a group. Up to 3 291EXP can be installed to support a total up to 16 heat pumps. The optional 295 operates a hydronic mix loop to support radiant floor heating and cooling. Up to 3 295 can be installed to support a total of 3 hydronic mix loops.

Smart Heat Pump Control 291
The control shall:

1. Have four binary inputs.
2. Have six 10K, type 2 sensor inputs.
3. Have four tekmarNet communication buses.
4. Have one expansion communication bus.
5. Have one RJ45 port supporting 10 or 100 Mbps (Megabit per second) Ethernet communications.
6. Has Wi-Fi 802.11N communications.
7. Have fifteen binary outputs.
8. Has one analog output supporting 0 to 10 Vdc or 4 to 20 mA signals.
9. Sequence up to four single-stage or two two-stage heat pumps.
10. Operate of one backup one-stage or modulating boiler.
11. Operate modulating boilers using an analog 0 to 10 V(dc) or 4 to 20 mA signal.

12. Operate modulating boilers using an analog signal to change the boiler firing rate or the boiler target temperature.
13. Operate up to 16 backup boilers through the installation of a Smart Boiler Control 294 and three Smart Boiler Expansion 294EXP.
14. Use proportional, integral and derivative (PID) logic when modulating or staging the heat pumps or boilers.
15. Operate dual fuel systems whereby the heat pumps are normally the lead group and the boilers are the backup group.
16. Include a time delay before the backup boiler(s) are staged on when all available heat pumps are on and unable to reach the set point temperature.
17. Include a dual fuel time-of-day programmable schedule selecting when electric heat pumps operate and fossil fuel backup boilers.
18. Include a dual fuel call that prioritizes backup boilers.
19. Include an outdoor air temperature balance point at which air-source heat pumps are shut off and backup boilers operate.
20. Have an adjustable minimum inter-stage delay that can be set manually or calculated by the control.
21. Have an option to rotate the boilers based on the accumulated running hours.
22. Display the run time of equipment including heat pumps, boilers and pumps.
23. Display the number of equipment cycles including heat pumps, boilers and pumps.
24. Operate a 2-pipe system that has a manual heating and cooling switchover.
25. Operate a 4-pipe system with hot water and cold water storage tanks.
26. Operate diverting valves for each heat pump for 4-pipe systems.
27. Operate a single diverting valve for a group of heat pumps for 4-pipe systems.
28. Provide domestic hot water tank heating directly from heat pumps using a 3-way diverting valve.
29. Provide domestic hot water tank heating from a backup boiler in a side arm configuration.
30. Have a hot tank call.
31. Calculate a hot tank target using outdoor air reset when a hot tank call is present.
32. Calculate a hot tank target using a fixed setpoint.
33. Have an adjustable warm weather shut down applied to outdoor temperature reset operation.
34. Have a cold tank call.
35. Calculate a cold tank target using outdoor air reset when a cold tank call is present.
36. Calculate a cold tank target using a fixed setpoint.
37. Have an adjustable cold weather shut down applied to outdoor temperature reset operation.
38. Have a domestic hot water tank call.
39. Have an optional passcode to prevent unauthorized access to the home screen and setting menus.
40. Have manual override options to test heat pump, boiler and pump operation, suspend operation, operate pumps for purging air and operate the system with a maximum heat or cooling output.

41. Display the current outdoor, hot tank, cold tank, heat pump return, and domestic hot water temperatures.
42. Continually monitor the temperature sensors and provide an error message upon a control or sensor failure.
43. During extended periods of inactivity, all pumps shall be periodically exercised to prevent seizure during long idle periods.
44. Include a setback schedule to provide energy savings during unoccupied time periods.
45. Have a 5-inch color touch screen user interface.
46. Have the option to connect to the Internet using Ethernet or Wi-Fi.
47. Have the ability to automatically set the time and date from the Internet.
48. Have the ability to retrieve the local outdoor air temperature through the Internet.
49. Have the ability to be remotely monitored and adjust settings through a web and/or mobile application.
50. Inform enrolled customers of error or alerts through email or SMS text messages.

Smart Heat Pump Expansion 291EXP
When connected to the Smart Heat Pump Control 291, the 291EXP shall:

1. Have one expansion communication bus.
2. Have twelve binary outputs.
3. Have ten indication LED lights.
4. Sequence up to 16 single-stage or 8 two-stage heat pumps through the installation of three Smart Heat Pump Expansion 291EXP.
5. Indicate the operating mode of the heat pump as heating or cooling.
6. Indicate the run time compressor operation of heat pump.
7. Indicate when the Expansion control is powered with 115 V(ac).
8. Indicate when the expansion bus is in communication with the Smart Heat Pump Control 291.

Smart Mix Expansion 295
When connected to the Smart Heat Pump Control 291, the 295 shall:

1. Have one 10K, type 2 sensor input.
2. Have one binary input.
3. Have one expansion communication bus.
4. Have four binary outputs.
5. Have one analog output that supports 0 to 10 V(dc) or 4 to 20 mA signals.
6. Have one 115 V(ac) triac powered output to provide a chopped sine wave signal.
7. Have ten indication LED lights.
8. Operate a hydronic mix loop to maintain a target temperature.
9. Have a mix call that calculates a mix target temperature.
10. Operate an actuator to drive a mixing valve open or close to regulate the hydronic mix temperature target.
11. Provide a 24 V(ac) floating action signal to the actuator.

12. Provide an analog 0 to 10 V(dc) or 4 to 20 mA signal to the actuator.
13. Provide a 115 V (ac) variable speed injection mixing pump signal to a wet rotor, impedance protected pump.
14. Operate a chilled water diverting valve for 4-pipe systems.
15. Indicate the mix percent output of the mixing signal.
16. Operate the mix system pump when the actuator is operating greater than 0%.
17. Indicate the run time operation of the mix system pump.
18. Indicate when the Smart Mix Expansion 295 is powered with 115 V(ac).
19. Indicate when the expansion bus is in communication with the Smart Heat Pump Control 291.
20. Have up to 3 hydronic mix loops when up to 3 295 are installed.

END OF SECTION