ProHeat™ 35

Weld Preheating and Stress Relieving

Issued Apr. 2009 • Index No. IN/11.0

Induction Heating System

Quick Specs

Applications
Transmission Pipeline – Construction/Repair
Pipe Fabrication Shops
Power Piping – Construction/Repair
Petrochemical – Construction/Repair
Shipbuilding
Mining Equipment Maintenance
Drill Pipe Manufacturing
Shrink Fit

Process
Induction Heating

Input Power
460–575 VAC, 3-Phase, 60 Hz
400–460 VAC, 3-Phase, 50/60 Hz

Temperature Rating
Storage: -40°C – +60°C
Operation: -30°C – +50°C

Rated Output
35 kW at 100% Duty Cycle, 5 – 30 KHz

Input Amperes at Rated Output
400 V: 60 Amps
460 V: 50 Amps
575 V: 40 Amps

Dimensions
H: 27-1/2 in (699 mm)
W: 21-3/4 in (552 mm)
D: 36-3/4 in (933 mm)

Weight Net: 227 lb (103 kg) Ship: 265 lb (120 kg)

The Power of Blue®

Easy to install primary power through panel that does not require removal of sheet metal.

Multiple output provides two insulated connectors for air-cooled blankets or liquid-cooled cables.

Versatile mobility through a lifting eye or optional running gear designed for construction and maintenance.

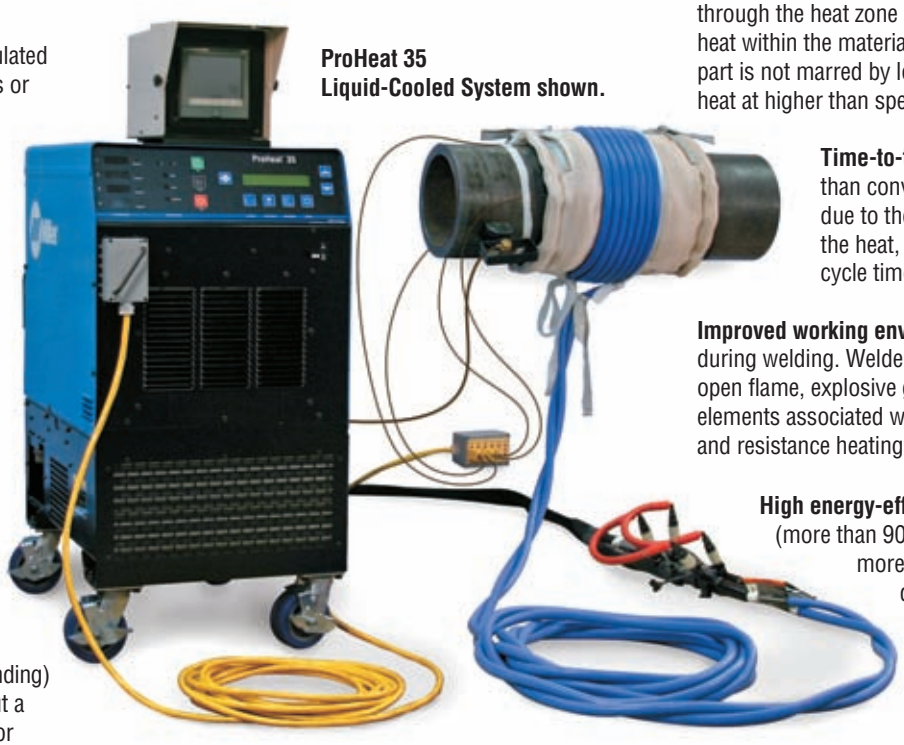
On-board temperature control provides for manual- or temperature-based programming in a simple-to-learn operator interface.

Multiple control thermocouple inputs (patent-pending) are available to control on the hottest TC during heating and coolest TC during cooling for uniform heating and quality.

Open output detection (patent-pending) prevents system operation without a covered output receptacle (cable or protective plug).

Cable identification system (patent-pending) knows the type of cable attached and limits output to protect cables and blankets.

Isolation fault protection (patented) provides automatic system shut down should power source output short to ground. A sense lead provides direct feedback to the power source to sense fault condition.



ProHeat 35 Liquid-Cooled System shown.

Operator tutoring system provides helpful information to optimize coil arrangements for maximum performance.

Low consumable costs. No fuel costs and minimal insulation costs. Insulation is reusable and may be used 50 times or more, reducing cost of disposal and replacement.

Uniform heating is maintained along and through the heat zone by using induction to heat within the material. The surface of the part is not marred by localized conducted heat at higher than specified temperatures.

Time-to-temperature is faster than conventional processes due to the method of applying the heat, reducing heating cycle time.

Improved working environment is created during welding. Welders are not exposed to open flame, explosive gases and hot elements associated with fuel gas heating and resistance heating.

High energy-efficient systems (more than 90% efficient) transfers more energy to the part, decreasing heating times and improving power efficiency (less than 60-amp current draw).

Easy set-up is achieved using preheat blankets or flexible heating cables combined with user-friendly insulation blankets.

TRUE BLUE® WARRANTY

MADE IN USA
APPLETON, WI

Miller Electric Mfg. Co.
An Illinois Tool Works Company
1635 West Spencer Street
Appleton, WI 54914 USA

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Web Site
www.MillerWelds.com

ISO 9001:2000 REGISTERED QUALITY SYSTEM

ProHeat™ 35 Induction Power Source

ProHeat 35
shown with optional running gear.

Built-In Temperature Controller

The ProHeat 35 Induction Power Source is equipped with a built-in temperature controller. The controller provides for Manual Programming or Temperature Based Programming. Manual programming provides for setting a power level and a time duration. This is beneficial in preheat applications where a part is heated to temperature and the heating device removed. Temperature Based Programming provides the ability to develop procedures for preheat, hydrogen bake-out or stress relieve. Four control thermocouple inputs and two monitoring thermocouple inputs are provided for heating. The control thermocouples are read by the controller which regulate the heat rise based on the hottest thermocouple and cooling based on the coolest thermocouple. This capability helps to insure the heating and cooling rates are not violated during the procedure. The controller is designed to be easily understood and programmed.

On-Board Diagnostics

The ProHeat 35 Induction Power Source is designed with on-board diagnostics with operator tutoring. Operating parameters are available at the touch of a button. Induction parameters are highly dependent on how the heating system (blanket or cable) is placed on the part to be heated. The ProHeat provides for Limit Conditions where a parameter maximum has occurred. The ProHeat will continue to deliver power, notify the operator and then provide helpful information to increase the output. The ProHeat will also identify Fault Conditions and provide information. The purpose of these capabilities is to provide continuing education of the operator on the use of induction heating equipment and protect the system.

Specifications (Subject to change without notice.)

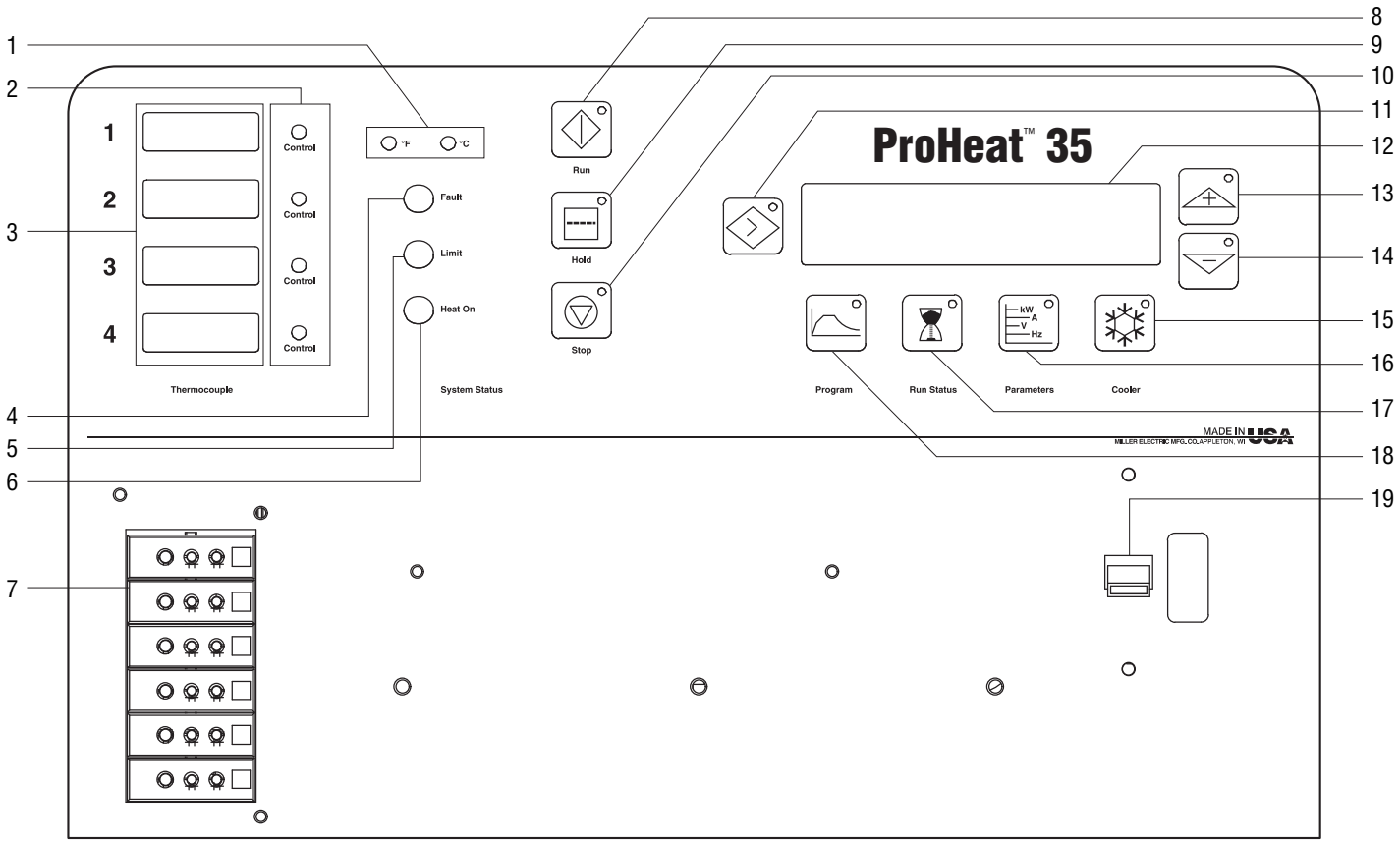
Input Power	Output Frequency	Rated Output	Input Amperes at Rated Output	KVA/KW at Rated Output	Dimensions	Weight
460–575 V, 3-Phase, 60 Hz	5–30 kHz	35 kW at 100% Duty Cycle	50 A, 460 V 40 A, 575 V	39/37	H: 27-1/2 in (699 mm) W: 21-3/4 in (552 mm) D: 36-3/4 in (933 mm)	Net: 227 lb (103 kg) Ship: 265 lb (120 kg)
400–460 V, 3-Phase, 50/60 Hz, **CE**			60 A, 400 V 50 A, 460 V			

Certified by Canadian Standards Association to both the Canadian and U.S. Standards.

System Configurations

The ProHeat 35 Induction Power Source is designed with two output connectors for either air-cooled blankets or liquid-cooled cables. This capability requires the use of same size air-cooled blankets or in the case of liquid-cooled systems, the applications must be the same (same size pipe, same program and same coil). The Cable Identification System is able to detect which type of cables are attached and configures the maximum output for the power source. This helps to protect cables and blankets from exceeding the rated duty cycle. The outputs are protected through insulated connectors or when not in use, a protective output cap. The system will not operate with an exposed output connector.

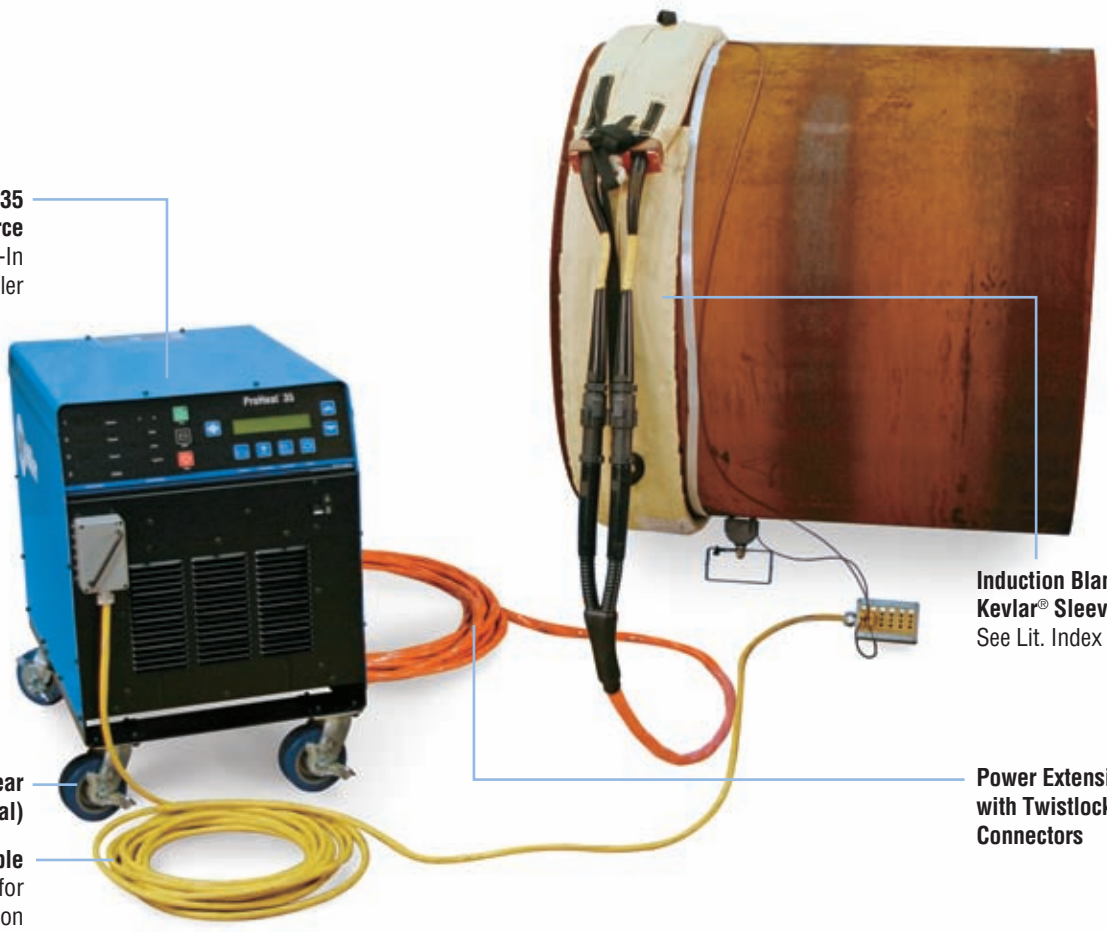
Control Panel



When a control panel button is pushed the yellow lamp lights to indicate activation.

1. Temperature Units LEDs (LEDs indicate units for temperature measurements [°F or °C])
2. Control Thermocouple LEDs (LEDs indicate which thermocouples [1–4] are used to control the heating process)
3. TC1–4 Temperature Display (Provides temperature display of thermocouples 1 through 4)
4. Fault LED (LED lights to indicate a system fault condition)
5. Limit LED (LED lights to indicate a system limit condition)
6. Heat On LED (LED lights to indicate the power source output is energized)
7. Thermocouple Input Receptacles (Use receptacles for type K thermocouple inputs)
8. Run Button (Use button to run a heating process)
9. Hold Button (Use button to hold a heating process)
10. Stop Button (Use button to stop a heating process)
11. Cursor Button (Use button to move selection cursor in the 4 x 40 LCD display [item 12])
12. 4 x 40 LCD Display (Displays programming; run status, parameters, fault and limit conditions, and troubleshooting guide)
13. Increase Button (Use button to increase values)
14. Decrease Button (Use button to decrease value)
15. Cooler Button (Use button to turn cooler on and off)
16. Parameter Button (Use button to display “real time” power source operating parameters)
17. Run Status Button (Use button to display “real time” operating status)
18. Program Button (Use button to program the process control)
19. Power Switch (Use switch to turn power source on and off)

ProHeat™ 35 Air-Cooled Induction System



The Air-Cooled Induction Heating System is specifically designed for preheating applications up to 400° F (204° C). The system can be operated in the Manual Programming mode where a power output is applied to a part for a specified time or in the Temperature Based Programming mode where part temperature is used to control power output. Air-cooled blankets are available for pipe diameters from 8 to 56 inches or in the case of plate, the lengths are from 41 to 193 inches.

Typical Applications for Air-Cooled Induction Heating Systems

On-Shore Transmission Pipelines
- Provides uniform heating around the circumference of higher strength pipe.
- Maintains temperature on large diameter, thick wall pipe where heat input from process cannot maintain minimum interpass temperature.
- Eliminates propane costs.

Off-Shore Transmission Pipelines (Barge)
- Provides uniform heating around the circumference of higher strength pipe.
- Provides rapid time-to-temperature.
- Eliminates propane costs, storage and transportation.
- Eliminates open flame safety hazard on barge.

Ship Building
- Provides uniform rapid heating in plate applications.
- Multiple outputs and up to 4 blankets can heat long joints with minimum machines.
- Provides a safer, friendlier work environment for welders and operators. Personnel are not exposed to open flame, explosive gases or hot heating elements.
- Power efficient compared to resistance heating.

Mining
- Provides uniform heating on high hardness material to prevent cracking.
- Increases productivity by improving welder environment and maintains temperature.
- Multiple outputs and up to 4 blankets can heat long joints with minimum machines.
- Eliminates propane costs.

Induction Blanket

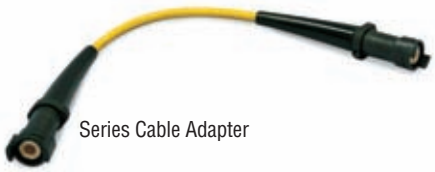
Miller's patented flexible **induction blanket** is the newest innovation in preheat technology from a leader in the welding industry. The flexible, lightweight induction heating blankets come in a variety of sizes and are capable of preheat temperatures up to 400° F (204° C). See Lit. Index No. IN/3.0 for additional information on temperature rating and duty cycle. The blankets easily conform to circular and flat parts and install in a matter of seconds. Manufactured from durable high-temperature materials, flexible induction blankets are designed to withstand the tough conditions in both industrial and construction applications. Each blanket is supplied with two spare blanket-securing straps and one replaceable **Kevlar® sleeve** which provides added protection against abrasion, cuts and tears, extending blanket life.

Output Extension Cables and Series Cable Adapter

Output Extension Cable

Output extension cables are available in 25, 50, and 75 ft (7.6, 15.2, and 22.8 m) lengths and provide interconnection between the power source and flexible induction blanket. This product includes durable twistlock connectors for attachment to the induction blanket. The power source connection is made using an insulated twistlock connector which also identifies the type of heating device to the power source controller (air-cooled or liquid-cooled system). This cable identification system (patent-pending) prevents over duty cycling of the heating blanket. A special cable-potting process is utilized at the cable ends to assure the product withstands the rugged environment experienced in the industrial and construction markets.

The **series cable adapter** is used to combine two blankets in series. This enables one power source and one output cable to be used to create extra heating area using two blankets.



Series Cable Adapter

Remote On/Off Switch (Optional)

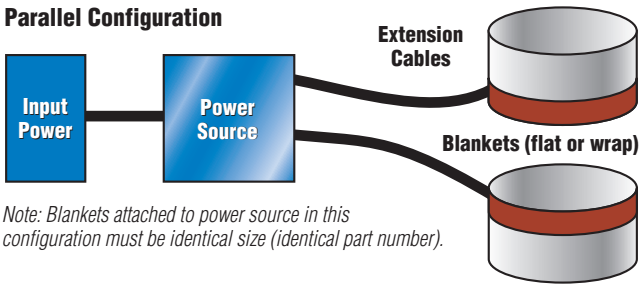
The Miller **remote contactor control** is a simple lightweight control for manually and remotely turning the power source output on and off. It is designed to interface with the ProHeat power source through the 14-contact receptacle.

The simple rocker-style contact switch is mounted in a rugged housing and includes a 25 ft (7.6 m) cable and 14-contact connector.

Series and Parallel System Configurations

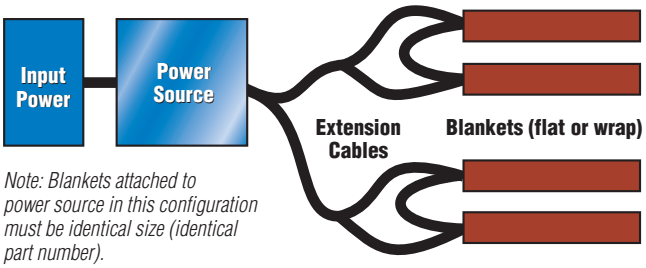
See literature Index No. IN/3.0 Flexible Induction Blankets for more information on air-cooled blanket configurations.

Parallel Configuration



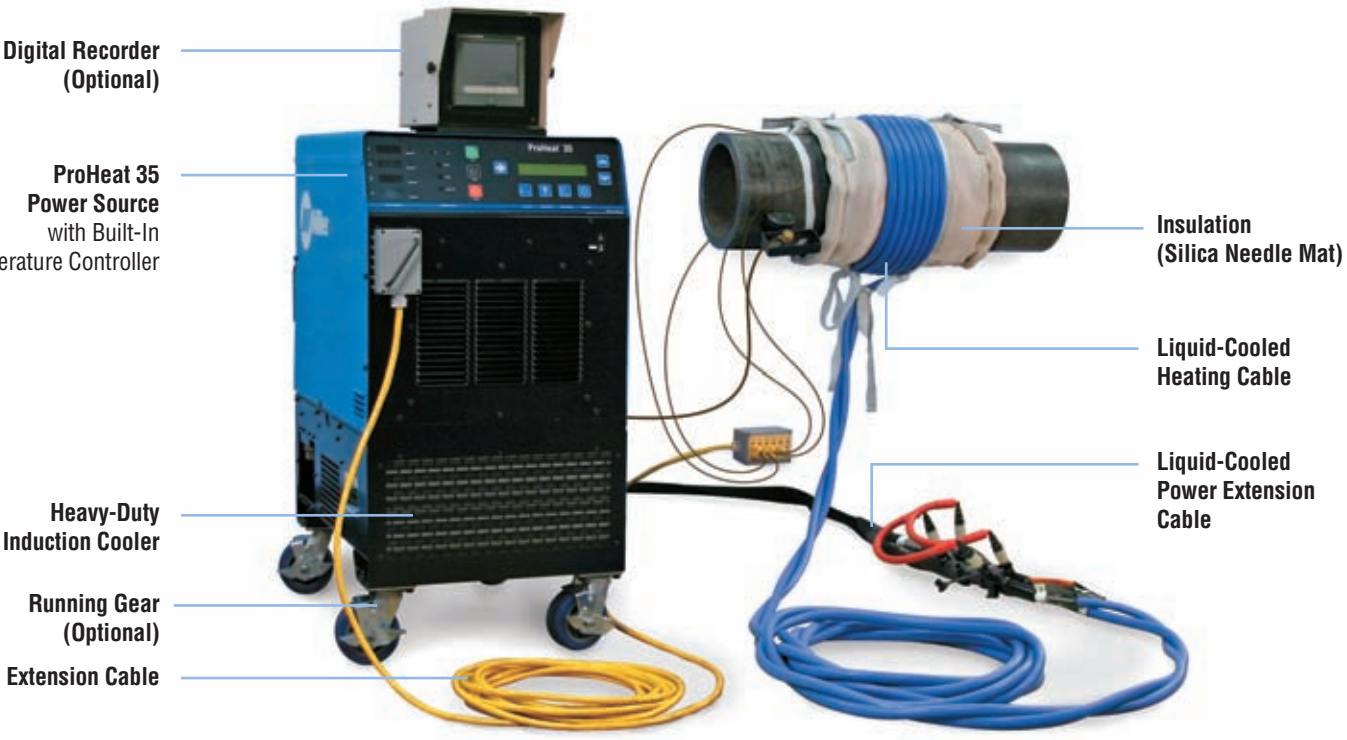
Note: Blankets attached to power source in this configuration must be identical size (identical part number).

Series Parallel Configuration



Note: Blankets attached to power source in this configuration must be identical size (identical part number).

ProHeat™ 35 Liquid-Cooled Preheat and Stress Relieving Systems



The Liquid-Cooled Induction Heating System is designed for preheating, hydrogen bake-out and stress relieving applications up to 1450° F (788° C). The system can be operated in the Manual Programming mode where a power output is applied to a part for a specified time or in the Temperature Based Programming mode where part temperature is used to control power output. Liquid-cooled heating cables provide a highly versatile tool for preheating a variety of pipe diameters and even flat plate. In general, shorter cables are used for smaller diameter pipe and are easier to handle and set-up. Longer cables are used for larger diameter pipe or small pressure vessels and tanks. Great for preheat applications on geometrics that prevent use of air-cooled blankets.

Typical Applications for Liquid-Cooled Induction Heating Systems

Pipe Fabrication Shops
- Provides uniform heating around the circumference of higher strength pipe.
- Reduces set-up time and time-to-temperature in preheat applications.
- Significantly reduces consumable costs.
- Eliminates propane costs.

Field Construction of Power and Process Piping
- Provides uniform heating around the circumference of higher strength pipe.
- Provides rapid time-to-temperature, reducing total weld cycle time.
- Easy to set-up and operate in preheat applications — welder friendly.
- Reduces consumable costs.

Shrink Fit
- Expand impellers, flanges, and other interference fit components for removal or installation on a shaft.

Shipbuilding — Prop Shafts, Piping Systems, Plate (High Duty Cycle/High Temp)
- Provides uniform rapid heating in plate and pipe applications.
- Adaptable to heavy plate applications.
- Provides a safer, friendlier work environment for welders and operators. Personnel are not exposed to open flame, explosive gases or hot heating elements.
- Power efficient compared to resistance heating.

Mining
- Provides uniform heating on high hardness material to prevent cracking.
- More flexible than air-cooled systems for complex shapes.
- Enables higher preheat temperatures than air-cooled systems.
- Eliminates propane costs.

Heavy-Duty Induction Cooler

Heavy-duty induction cooler with optional running gear shown attached to bottom of ProHeat 35.

The **heavy-duty induction cooler** is designed with an efficient fin and tube heat exchanger, 2-1/2 gallon rustproof polyethylene tank, high-pressure pump and blower to yield a high cooling capacity.

- The cooler is equipped with a flow sensor/ indicator and temperature sensor to provide system reliability.
- External input and output filters are used to remove contaminants from the cooler and cable. Filters are easily accessible for cleaning.
- Cooler is attached to power source and available separately. The cooler can be added to power source at a later date to upgrade from air-cooled to liquid-cooled systems.
- Running gear can be attached to power source or cooler.
- **Dimensions**
  H: 12-3/4 in (324 mm)
  W: 21-1/4 in (540 mm)
  D: 30 in (762 mm)

Shipping Weight
122 lb (55 kg)

Output Extension Cables

The **output extension cables** are available to remote the power source up to 50 feet from the work. Insulated quick-connects are used to easily remove and attach the coolant lines. The power source connector securely locks the cable to the power source and insulates the output connector. The Cable Identification System (patent-pending) built into the connector identifies the liquid-cooled systems and permits full power. The cables are flexible for ease of use.

Liquid-Cooled Heating Cable and Preheat Cable Covers

Liquid-Cooled Heating Cable

The **liquid-cooled heating cable** couples the power to the part to be heated. The silicone hose encloses a special copper conductor specifically designed for carrying high-frequency current to maximize efficiency. The hose also carries the coolant, which cools the conducting wire. The hose is reinforced for strength and durability.

Preheat cable covers are available to protect the heating cable from slag and molten metal created during welding. The cable covers must be used with the 1/2 in. preheat insulation up to 650° F (343° C).

Preheat Cable Cover

Preheat Insulation and Postweld Heat Treatment Insulation Blankets

Preheat Insulation

Postweld Heat Treatment Insulation Blanket

The insulation is designed to insulate the work for process efficiency, maintain the optimum coupling distance between the coil and the work and protect the liquid-cooled cable from high temperatures.

Preheat insulation is provided in strips six or twelve inches wide and ten feet long. Preheat insulation is 1/2 in (12.7 mm) thick due to the lower temperatures of preheating (typically up to 600° F). The insulation is cut to length for the application.

Postweld heat treatment insulation blankets are sized and stenciled for the pipe size to be treated. The insulation is sewn into a silica blanket, which provides high durability. 50 thermal cycles or more can be achieved with one blanket. The sewn blanket insulation does not create the dust and particulate associated with insulation. This creates a friendlier environment for the heat-treaters and welders.

Digital Recorder with Protective Enclosure (Optional)

Digital Recorder

The **digital recorder** is commonly used in stress relieving and critical preheat applications. The recorder stores temperature data based on time. It is not required to perform successful heating applications.

- The recorder is attached to power source top panel or can be removed for office downloads, storage or protection when not in use.
- The recorder power cord plugs into the 110 V auxiliary receptacle on the rear of the ProHeat and the TC cable plugs into the TC receptacle on the rear of the ProHeat.
- Six temperature (0–10 V) inputs provide temperature data on the heating cycle.
- The recorder is equipped with a touch screen for simple programming and use. The color display permits clear monitoring of the heating process in outdoor environment (direct sunlight).
- Data can be transferred from internal memory to USB memory stick or directly to a PC via a network cable for printing, storage or further analysis. Files are encrypted for quality assurance.
- Simplified software prints recorded information onto 8-1/2 x 11 in size paper for convenient handling.
- The recorder does not require pens, paper or fragile mechanical devices to document the heating cycle.
- **Dimensions**
  H: 14 in (356 mm)
  W: 12 in (305 mm)
  D: 18 in (457 mm)

Shipping Weight
22 lb (10 kg)

TC Extension Cable

TC Extension Cable

The **thermocouple extension cable** is a simple means of providing thermocouple inputs from the heated part to the power source. The durable 50 ft cable eliminates the cluttered stringing of individual wires to the work. The terminal connection enables six thermocouples to be used with the system.

Ordering Information

Equipment and Options	Stock No.	Description	Qty.
ProHeat™ 35 with Built-In Temperature Control	**#907 271** **#907 432**	460–575 VAC, 3-phase, 60 Hz, 35 kW power source 400–460 VAC, 3-phase, 50/60 Hz, 35 kW power source, **CE**	
Running Gear	**#195 436**	For power source or cooler	
Remote Contactor Control	**#043 932**	Provides remote on/off for power source	
Heavy-Duty Induction Cooler	**#195 406**	Attaches to power source	
Temperature Measurement Accessories			
Digital Recorder with Protective Enclosure	**#195 374**	Includes temperature output cable	
Interconnect Cable	**#300 168**	Temperature output, 5 ft, used with alternative recorder (not required if ordering #195 374)	
Thermocouple Attachment Unit	**#194 959**	Welder	
Thermocouple (Welded)	**#194 999**	Type K thermo. wire, 500 ft	
Thermocouple Connectors (Used with #194 999)	**#195 098**	Type K, 2-pin male, pkg of 10	
Thermocouple (Contact)	**#200 202**	Contact thermocouple sensor (for preheat only)	
Thermocouple Extension	**#194 968** **#200 201**	Cable, ext, 6 pair type K, 50 ft Cable, ext, 25 ft type K, armored	

Air-Cooled Components			Qty.
Output Extension Cables	**#195 404** **#195 405** **#300 362** **#195 437**	Air-cooled, 25 ft Air-cooled, 50 ft Air-cooled, 75 ft Air-cooled, 28 in series cable adapter	
Induction Blankets (Selected based on pipe size or plate length)	**#224 584** **#300 060** **#300 061** **#300 062** **#300 063** **#300 064** **#300 065** **#300 066** **#300 067** **#300 068** **#300 069** **#300 070** **#300 071** **#300 072** **#300 073** **#300 074** **#300 075** **#300 077** **#300 078** **#300 079** **#300 080**	For 56 in pipe (185" X 7.5" with sleeve) For 52 in pipe (173" X 7.5" with sleeve) For 48 in pipe (160" X 7.5" with sleeve) For 46 in pipe (154" X 7.5" with sleeve) For 42 in pipe (141" X 7.5" with sleeve) For 38 in pipe (129" X 7.5" with sleeve) For 36 in pipe (122" X 7.5" with sleeve) For 34 in pipe (116" X 9.0" with sleeve) For 32 in pipe (110" X 9.0" with sleeve) For 30 in pipe (104" X 9.0" with sleeve) For 28 in pipe (97" X 9.0" with sleeve) For 26 in pipe (91" X 9.0" with sleeve) For 24 in pipe (85" X 9.0" with sleeve) For 22 in pipe (78" X 9.0" with sleeve) For 20 in pipe (72" X 9.0" with sleeve) For 18 in pipe (66" X 9.0" with sleeve) For 16 in pipe (60" X 10.1" with sleeve) For 14 in pipe (53" X 10.1" with sleeve) For 12 in pipe (47" X 10.1" with sleeve) For 10.75 in pipe (45" X 11.3" w/sleeve) For 8.625 in pipe (40" X 13.1" w/sleeve)	
Replacement Blanket Sleeves	**#217 628** **#200 262** **#198 670** **#194 809** **#198 669** **#194 813** **#194 705** **#194 812** **#194 811** **#198 668** **#198 667** **#198 666** **#194 706** **#198 665** **#198 664** **#194 707** **#194 887** **#194 888** **#194 889** **#195 338** **#195 337**	For 56 in pipe (193" X 7.5") For 52 in pipe (179" X 7.5") For 48 in pipe (166" X 7.5") For 46 in pipe (159" X 7.5") For 42 in pipe (146" X 7.5") For 38 in pipe (133" X 7.5") For 36 in pipe (127" X 7.5") For 34 in pipe (120" X 9.0") For 32 in pipe (114" X 9.0") For 30 in pipe (107" X 9.0") For 28 in pipe (100" X 9.0") For 26 in pipe (94" X 9.0") For 24 in pipe (87" X 9.0") For 22 in pipe (81" X 9.0") For 20 in pipe (74" X 9.0") For 18 in pipe (68" X 9.0") For 16 in pipe (62" X 10.1") For 14 in pipe (55" X 10.1") For 12 in pipe (49" X 10.1") For 10.75 in pipe (45" X 11.3") For 8.625 in pipe (41" X 13.1")	

Liquid-Cooled Components			Qty.
Output Extension Cables	**#300 180** **#195 402** **#195 403** **#204 877**	Liquid-cooled, 10 ft Liquid-cooled, 25 ft Liquid-cooled, 50 ft Water jumpers	
Heavy-Duty Induction Cooler	**#951 142**	Includes case of coolant #300 355	
Coolant	**#300 355**	4 gallons (case)	
Heating Cables	**#300 045** **#300 046** **#300 047** **#300 049**	30 ft 50 ft 80 ft 140 ft	
Preheat Covers	**#204 611** **#204 614** **#204 620**	30 ft 50 ft 80 ft	
Preheat Insulation	**#204 669** **#195 376** **#211 474** **#194 965**	Woven silica (1/2" X 6" X 120") Woven silica (1/2" X 6" X 240") Woven silica (1/2" X 12" X 120") High-temperature rope, 1" wide, 50 ft roll	
Postweld Heat Treatment Insulation Blankets	**#194 947** **#194 948** **#195 477** **#194 949** **#195 476** **#194 950** **#194 951** **#194 952** **#194 953** **#194 954** **#194 955** **#194 956** **#300 449** **#194 957** **#194 958** **#195 502** **#194 998** **#207 817** **#222 228** **#300 155** **#300 156**	For 2.5 in pipe (12" X 15") For 4 in pipe (12" X 21") For 5 in pipe (12" X 26") For 6 in pipe (12" X 30") For 7 in pipe (18" X 34") For 8 in pipe (18" X 38") For 10 in pipe (18" X 43") For 12 in pipe (18" X 49") For 14 in pipe (18" X 54") For 16 in pipe (18" X 58") For 18 in pipe (24" X 67") For 20 in pipe (24" X 73") For 21 in pipe (24" X 76") For 22 in pipe (24" X 79") For 24 in pipe (24" X 85") For 26 in pipe (24" X 91") For 28 in pipe (24" X 98") For 30 in pipe (24" X 105") For 32 in pipe (24" X 112") For 36 in pipe (24" X 126") For 40 in pipe (24" X 140")	

Date: **Total Quoted Price:**

Distributed by:

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Litho in USA