

# HEATING INVERTER DHP 6010, 6010R and DHC 6510R WELD PREHEATING AND STRESS RELIEVING

## ADVANTAGES

- **Mobility** - weighs only 17 kg, small size similar to a small welding machine.
- **High performance** - 10.5 kW connection to up to 4 elements with a total length of up to 4.5 m.
- **3 in 1** - complex consisting of inverter + thermocontrol + recorder\*.
- **Flexibility of use** - can be connected anywhere, power supply 3x 400 V 32 A, easy and quick installation.
- **Intuitive and easy control** - low attention demands during operation. Control is similar to welding machines.
- **Versatile use of preheating** - even heating for shaped, flat, circular positioned or standard components.

**Quick and easy installation of the whole system** - connecting elements, thermocouples and source set up in a matter of minutes - ready to heat up quickly!

**Built-in controller** enables manual mode or programming.

**Low operating cost and low cost of consumables.** No gas cost and minimal cost insulation. Insulation can be used repeatedly: 40-50x. Elements withstand repeated use under standard treatment. Low power consumption. **Energy efficient system of preheating and heat treatment.**

**Even and stable heating** to the desired temperature with minimal deviation. Surface of the heated part is not locally overheated above the desired temperature as with a flame source. Surface of the material is not carburized as when using flame heating.

**Better safety and working conditions for welders.** Operators and welders are not exposed to open flame, hot gases and the risk of explosion as when using flame. No health risks for operators from high frequency or high output voltage.

**Parts can be heated up to 800°C or higher without using water cooling** and therefore offer greater flexibility of use.

**Any material can be preheated.** Enables easy preheating of any material and non-ferrous materials.

**Lower costs for staff training, lower wage costs.** Staff only installs and programs the device. The source heats the material unattended. There is no need to hold the burner and permanently check achieved temperature as with the flame.

**Continuous control of heating power, power supply.** Significantly increases life of elements, reduces energy consumption and reduces demands on power grid.

**Very reasonable purchase cost** compared to inductive heating.

## APPLICATIONS

- Parts that require preheating before welding in the automotive, rail and shipping industry.
- Pipe and flange – manufacturing, construction and repairs.
- Petrochemical industry - manufacturing, construction and repairs.
- Preheating before hard surfacing, foundry.
- Heat exchangers, pressure vessels, flanges etc.
- Energy industry.
- Manufacture of steel structures.
- Mining equipment.
- Maintenance

**Multizone heating and control.** Parallel connection of multiple inverters (up to 9 sources) enable multiple heating power and precise control of heating in up to 9 zones from one control.

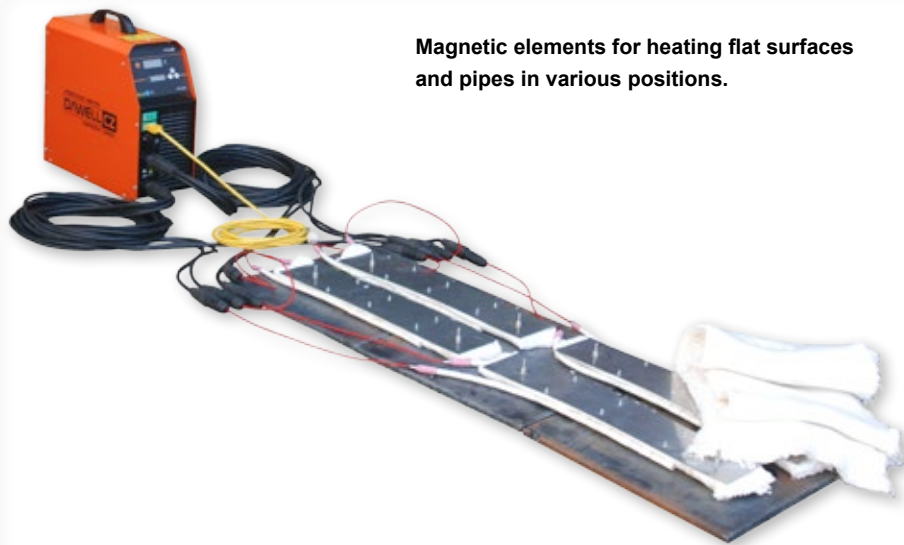


TECHNICAL DATA	DHP 6010/R	DHC 6510R
Output voltage / current	0-60 V / 180 A, continuously adjustable, CV/CC	0-60 V / 180 A, 65 V / 160 A continuously adjustable, CV/CC
Load	Resistance heater elements 24-60 V (type 30 / 42 / 60 V)	
Supply voltage / current	3~400 V, 50/60 Hz, 23 A ±15%	
Supply fuse	25 A	
Temperature sensor	Thermocouple type K, with galvanized insulation	
Range / regulation	-40°C to 1350°C / -25°C to 1200°C	
Alarm	1 Hi-alarm	2 adjustable (deviation SV/PV, temperature achieved etc.)
Fault detection	Thermocouple disconnection, overload, overheating, output short circuit etc.	
Multizone control	No	Yes, master/slave type, max. 9 units
Operating temp. / coverage	-20°C to 40°C (with a capacity limit to 50°C)	
Dimensions and weight	170x370x405 mm, 17 kg	

\*) for „R“ only



**INVERTER DHP 6010/R** is a complex system specifically designed for quick and easy controlled weld preheating of various materials from 0°C to 1050°C. Heating output can be programmed or changed during the process. The operator sets the temperature to which the material needs to heat up and the controller itself will ensure the fastest heating to the desired temperature. Alternatively, you can set the heating rate in the program and the controller heats the material at the set speed. Inverter DHP 6010R is also equipped with recording machine. The whole heating process is digitally recorded and can be displayed in a table and graph form. Data can be copied to a PC using USB cable.



**Magnetic elements for heating flat surfaces and pipes in various positions.**

### TYPICAL USE OF PREHEATING DHP

**Power and petrochemical industry** – preheating pipe joints, heat exchangers, boilers, stators, steel vessels, flanges etc.

**Constructions production, shipbuilding** – preheating long, short and shaped welds.

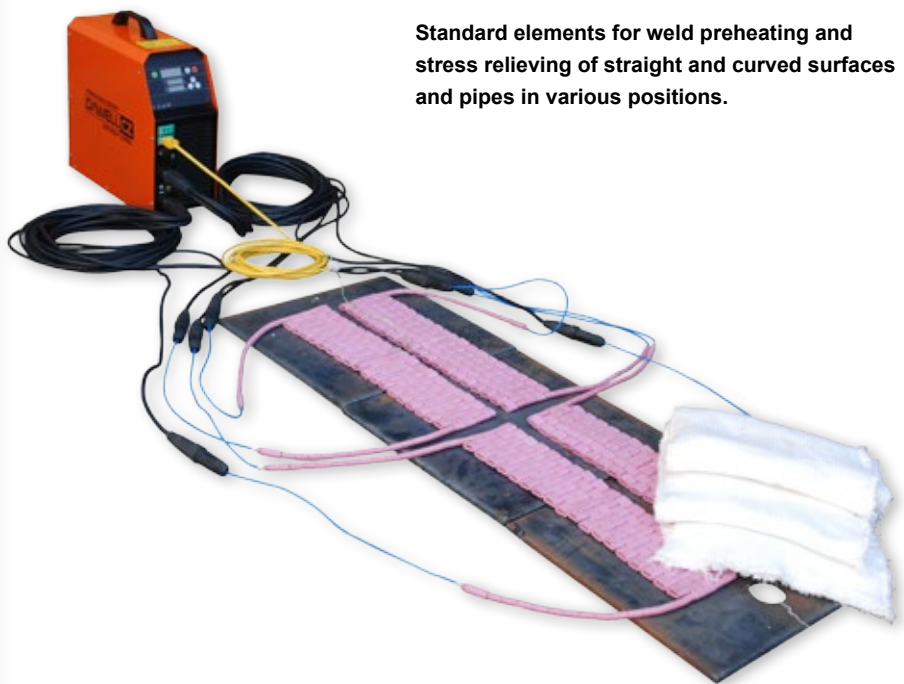
**Mining industry** – preheating pipes before welding and hard surfacing.

**Industrial protection** – preheating parts to a desired temperature.

**Repairs, renovations and hard surfacing** – economically and technologically correct preheating of components.

With the ability to use up to four elements, it is possible to preheat long welds. Saves time preheating and therefore costs. Maintains required temperature of the parts before, during and after welding. Higher quality of welding. Even heating of parts to exact temperature. Significantly reduces gas costs. Increases safety and productivity of welders.

**INVERTOR DHC 6510R** is designed primarily for weld preheating and stress relieving of materials after welding to reduce stress, reduce hydrogen content and for preheating before welding up to 1050°C. Compared to inverters DHP, it also has the option of higher-level programming designed especially for weld preheating and stress relieving. It also enables multizone mode, linking and copying programs, setting more control values and others. Recording time is 64 hours.



**Standard elements for weld preheating and stress relieving of straight and curved surfaces and pipes in various positions.**

### TYPICAL USE OF HEAT TREATMENT INVERTER DHC

**Power and petrochemical industry** – heat treatment and preheating pipe joints, heat exchangers, boilers, stators, steel vessels, flanges – wherever there is a need to anneal welds after welding.

**Constructions production, shipbuilding** – welding long and short circuits – weld preheating and subsequent heat treatment.

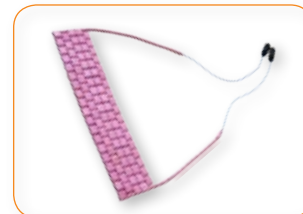
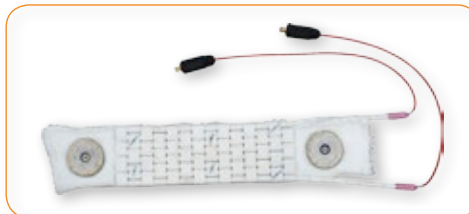
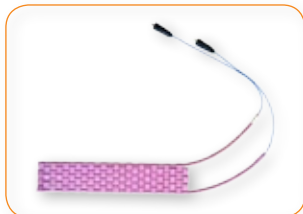
**Mining industry** – weld preheating components before welding and hard surfacing.

**Industrial protection** – weld preheating parts to a desired temperature.

**Repairs, renovations and hard surfacing** – economically and technologically correct preheating of components. Due to high mobility, DHC inverters can be used for preheating and heat treatment also in the field.

With the ability to use up to four elements, it is possible to preheat long welds. Maintains required temperature of the parts before and after welding. Even heating of parts to exact temperature. Significantly reduces gas costs. Possibility of timing the process start and therefore reducing time for preparation before welding. Increases safety and productivity of welders. Due to parallel connection, continuous power up to 95 kW can be achieved.

*A wide range of element sizes and types. For normal preheating or stress relieving, 1-2 elements are sufficient. Low demands on storing consumables.*





# DHP 6010, DHP 6010R, DHC 6510R ADVANTAGES OVER OTHER METHODS

Inverters DHP and DHC can be used to supplement or replace conventional flame heating. Or can complete induction, big resistance heating sources. Inverter sources DHP and DHC for resistance heating have the following advantages, which increase their attractiveness in production, maintenance, renovation workshops, foundries, outdoor plants, etc.:



## ADVANTAGES OF RESISTANCE HEATING DHP AND DHC OVER FLAME HEATING

Controlled preheating with recording. It is possible to print out the preheating record from PC and to present it together with manufacturing documentation.

Controlled preheating to exact temperature with minimal deviation.

Programmed and automatic preheating will reach the required temperature without need for operator's intervention or assistance, which reduces labor costs.

Surface of the heated component is not locally overheated more than to the required temperature as with the flame. Surface of the material is not exposed to open flame and is not carburized as when using flame heating.

Significantly higher safety. Operators and welders are not exposed to open flame and its effects, hence the risk of injury, fire or explosion.

Lower energy use. Thanks to insulation, temperature does not leak outside the heated area.

No need of testing and certification of staff to work with flame.

Savings on thermochalks, thermometers, etc.



## ADVANTAGES OF RESISTANCE HEATING DHP AND DHC OVER INDUCTION HEATING

Multi-zone heating – better temperature control of larger parts by using more thermocouples.

Parallel arrangement of sources to achieve higher continuous power and more precise control of the desired temperature.

It is possible to heat various types of materials without modifications such as ferrous metals etc.

Heating of temperature up to 1050°C. No need for water-cooling in the whole temperature range up to 1050°C.

Significantly lower purchase cost of equipment and accessories.

Easier and inexpensive staff training.

Even heating of surfaces due to greater surface of elements.

Safe output voltage.

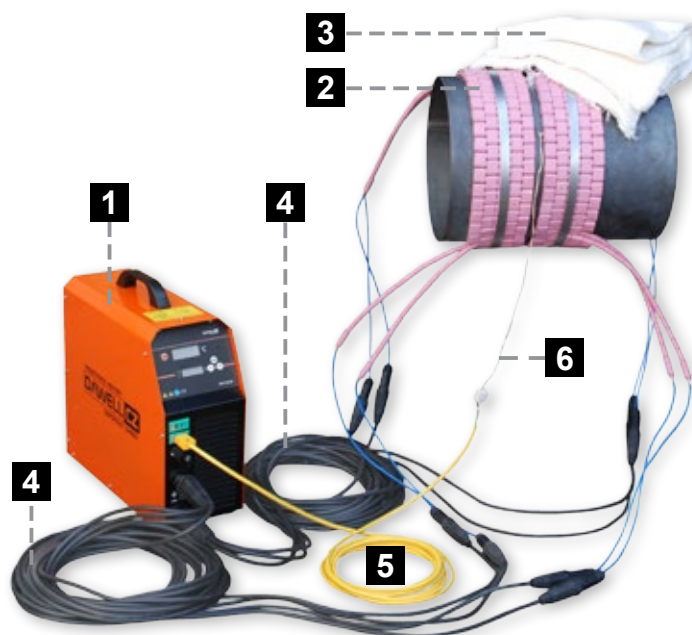
Possibility of using magnetic elements. Several types of elements for various applications.

Higher mobility – weighs only 17 kg. Can be transported even in a passenger car!

**Easy and quick installation of elements, thermocouples and insulation.**

### COMPLETE SET OF INVERTER DHP AND ACCESSORIES

Order No.	Description	Amount	Pos.
DHP6010-2004R	DHP 6010R inverter machine with regulator and recorder 10.5 kW	1	1
HEA06-03014560	Heating element 2.7 kW - 60 V - 45 A 100x540 mm	4	2
HEA06-06030106	Tygasil insulation, 12 mm thick, 3000x300 mm	1	3
HEA06-0055	Splitting cable 10 mm <sup>2</sup> , 4 m long, 4-way	2	4
HEA06-02301505	Compensating cable 2x1.5 mm <sup>2</sup> , 5 m	1	5
HEA06-02300500	2x0.5 mm <sup>2</sup> thermocouple type „K“ twisted wire, isolated	10	6





**CONTROLLER DHP 6010/R** – easy and intuitive operation. Easy adjustment of controller parameters and heating start. The controller allows setting in the following modes - heating power, heating to a temperature, or adjustment of the following parameters of ramp segment, i.e. heating rate C/h, target temperature, i.e. set point and holding time. The most commonly used program for preheating is PRG1, i.e. heating to a temperature in the shortest time possible.

**CONTROLLER AND RECORDER DHC 6510R** – easy programming of the controller. Fast download of data from recording machine and easy work with measured data. Temperature can be controlled from any of the 20 user-adjustable temperature profiles / programs with up to 180 segments or directly to a user-set temperature, which can be changed any time as needed. You can set heating or cooling rate, time over which the temperature should be maintained as well as target temperature, independently in each profile segment as well as in the manual mode of temperature control. Of course, heating power can be controlled directly. The controller has a user lock in menu for locking settings of PID values. Digital recorder of the course of heating with the capacity of 64 hours of recording is also integrated. Data can be transferred to a PC where it can be further processed, for example for logging the course of heating or its control. Thereby, maximum complexity and simplicity of use of this device was achieved, its control can be handled by anyone.

Both inverters DHP 6010R and DHC 6510R allow you to connect external recorder.

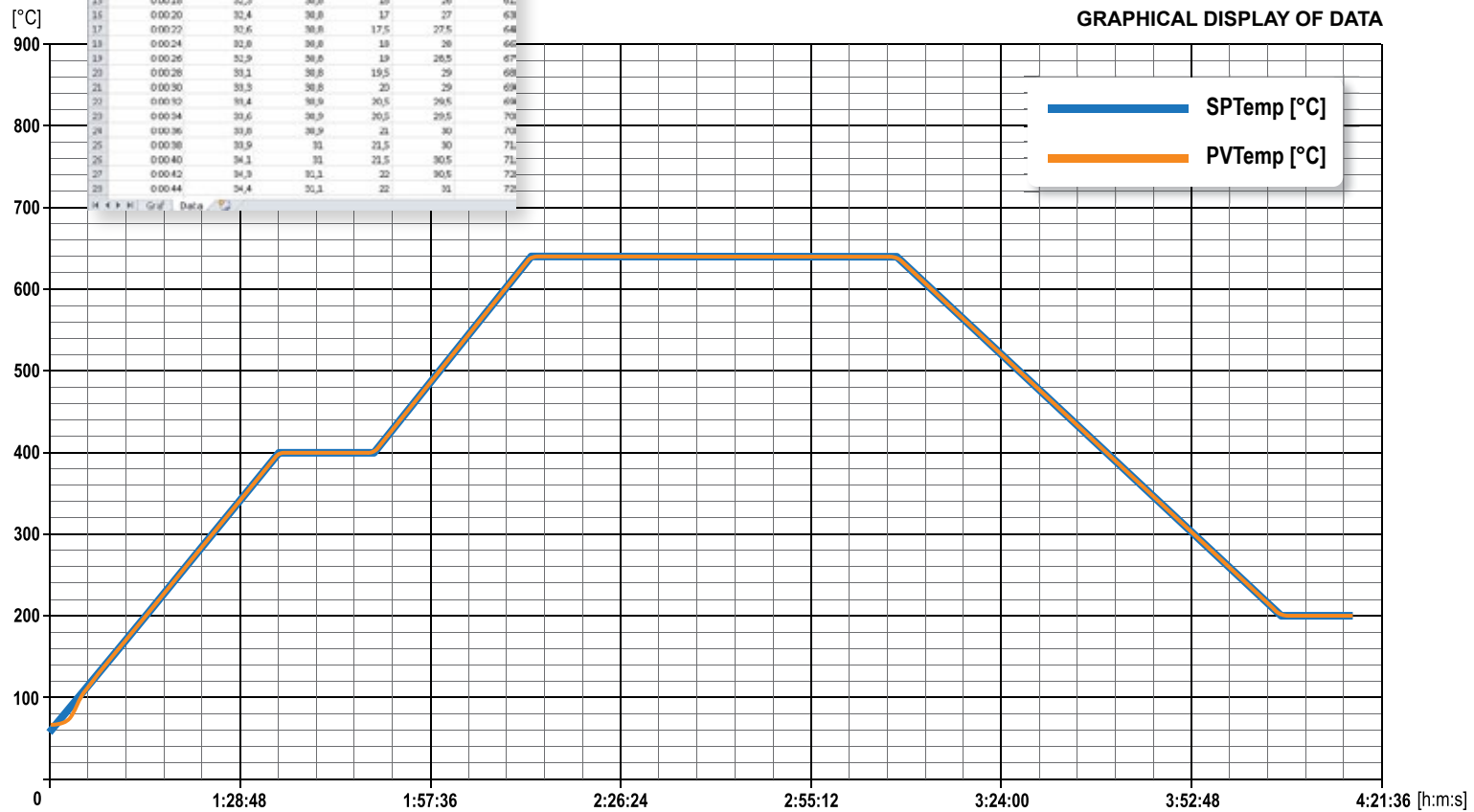
### VALUES RECORDED IN RECORDING MACHINE

<b>SPTemp</b>	[°C]	Setting value – required temperature
<b>PVTemp</b>	[°C]	Process Value – real measured temperature
<b>MV</b>	[%]	Manipulation Value – output power
<b>Volt</b>	[V]	Measured output voltage
<b>Curr</b>	[A]	Measured output current
<b>Time</b>	[h:m:s]	Measured time

TABLE WITH MEASURED DATA

File Name	A	B	C	D	E	F
2011-11-07_0405_F02						
RecTime [h:m:s]	SPTemp [°C]	PVTemp [°C]	MV [%]	Volt [V]	Curr [A]	
000002	30,9	30,8	3	0	0	
000004	30,3	30,8	6	14	36	
000006	30,3	30,8	6,5	19	44	
000008	30,4	30,8	10,5	21	49	
000010	30,6	30,8	12	22,5	52	
000012	30,8	30,8	13	23,5	55	
000014	30,9	30,8	14	24,5	58	
000016	30,3	30,8	15	25,5	60	
000018	30,3	30,8	16	26	61	
000020	32,4	30,8	17	27	63	
000022	32,6	30,8	17,5	27,5	64	
000024	32,8	30,8	18	28	65	
000026	32,9	30,8	19	28,5	67	
000028	33,1	30,8	19,5	29	69	
000030	33,3	30,8	20	29	69	
000032	33,4	30,8	20,5	29,5	69	
000034	33,6	30,9	20,5	29,5	70	
000036	33,8	30,9	21	30	70	
000038	33,9	31	21,5	30	71	
000040	34,1	31	21,5	30,5	71	
000042	34,3	31,1	22	30,5	72	
000044	34,4	31,1	22	31	72	

GRAPHICAL DISPLAY OF DATA



### TECHNICAL DATA OF CONTROLLER AND RECORDER

	DHP 6010 / DHP 6010R	DHC 6510R
<b>Control</b>	Temperature control according to the set temperature program 2 Control to the set temperature 1 Control of (output) power 0	
<b>Temperature profiles</b>	2 segments	20 adjustable profiles at 9 segments, max. 180 segments
<b>Segment parameters</b>	Ramp OFF / 1 ... 9999°C/h Setpoint -25°C ... 1200°C Hold time OFF ... 9999 min.	
<b>Controller</b>	Digital, user-adjustable	
<b>Recorder</b>	8 hours of recording*	64 h of recording, stores PV/SP/MV and error status
<b>Data downloading</b>	Using 485/USB to PC to a text file (direct import to Excel)*	

\*) for „R“ only



Easy and intuitive inverter DHP 6010/R control. Well-arranged connection of cables on the front of the inverter.

DHP	1	ON button to start and stop heating
	2	Temperature and MW displays
	3	SET PARAMETERS button to select parameters
	4	+ and - buttons to select values
	5	Thermocouple plug
	6	Plug for downloading data from integrated recording machine
	7	+ and - quick-couples to connect elements

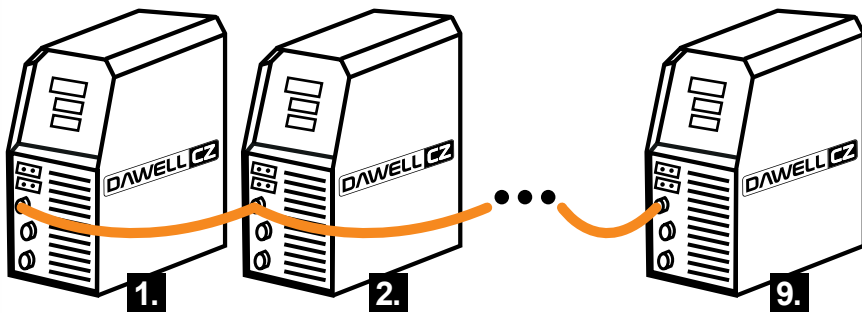


Fast and easy operator training within approx. 4 hours. Operator can adjust the machine and work independently after 4 hour training.

DHC	1	ON button to start and stop heating
	2	PV, SV and MV displays
	3	Control buttons for programming and recording process
	4	SET PARAMETERS button to select parameters
	5	+ and - buttons to select values
	6	Thermocouple and external recorder plug
	7	MASTER/SLAVE plug for connecting second inverter and for downloading data from internal recording machine
	8	+ and - quick-couples to connect elements

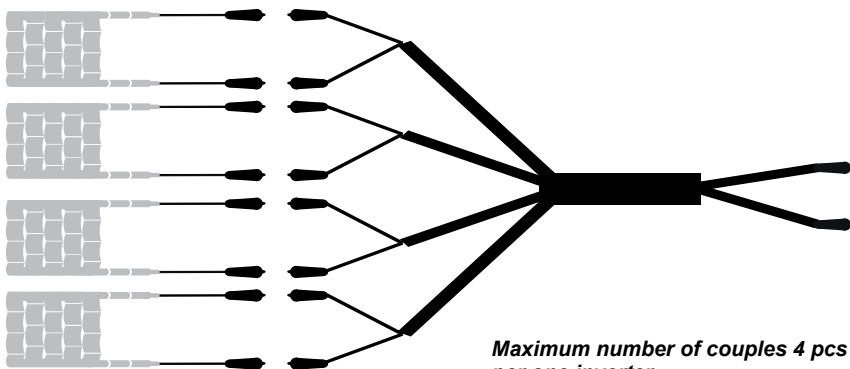


### MULTIZONE CONNECTION OF DHC INVERTERS

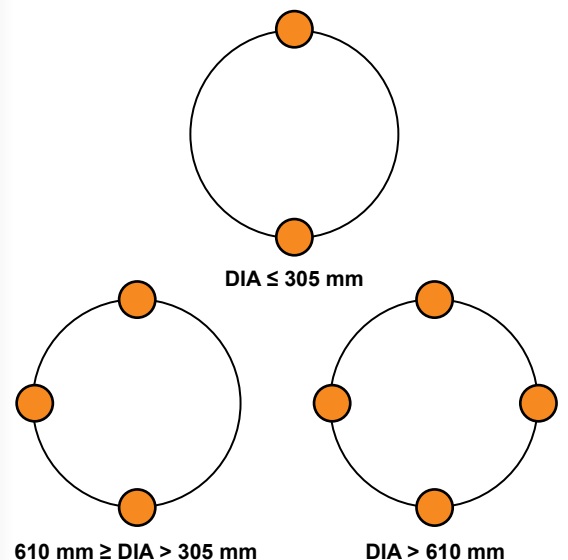


Linking up to 9 machines, 95 kW.

### PARALLEL CONNECTION OF COUPLES



### MULTIZONE THERMOCOUPLE MEASUREMENT FOR VARIOUS PIPE DIAMETERS



Arrangement of thermocouples in the case of multi-zone control.



Order No.	Heating inverters
DHP6010-2004	DHP 6010 inverter machine with regulator 10.5 kW, 3 phase 400 V 50/60 Hz
DHP6010-2004R	DHP 6010R inverter machine with regulator and recorder 10.5 kW, 3 phase 400 V 50/60 Hz, CD with download software and USB connector included

Order No.	Heating inverters
DHC6510-2004R	DHC 6510R inverter machine with regulator and recorder 10.5 kW, 3 phase 400 V 50/60 Hz, CD with download software and USB connector included

Order No.	Elementy 60 V
HEA06-03013560	Heating element 2.7 kW - 60 V - 45 A 50x1050 mm
HEA06-03013660	Heating element 2.7 kW - 60 V - 45 A 50x1075 mm
HEA06-03013760	Heating element 2.7 kW - 60 V - 45 A 50x1095 mm
HEA06-03013860	Heating element 2.7 kW - 60 V - 45 A 50x1115 mm
HEA06-03013960	Heating element 2.7 kW - 60 V - 45 A 50x1135 mm
HEA06-03014060	Heating element 2.7 kW - 60 V - 45 A 50x1155 mm
HEA06-03014160	Heating element 2.7 kW - 60 V - 45 A 75x715 mm
HEA06-03014260	Heating element 2.7 kW - 60 V - 45 A 75x735 mm
HEA06-03014360	Heating element 2.7 kW - 60 V - 45 A 75x760 mm
HEA06-03014460	Heating element 2.7 kW - 60 V - 45 A 100x525 mm
HEA06-03014560	Heating element 2.7 kW - 60 V - 45 A 100x540 mm
HEA06-03014660	Heating element 2.7 kW - 60 V - 45 A 100x565 mm
HEA06-03014760	Heating element 2.7 kW - 60 V - 45 A 125x420 mm
HEA06-03014860	Heating element 2.7 kW - 60 V - 45 A 125x440 mm
HEA06-03014960	Heating element 2.7 kW - 60 V - 45 A 125x460 mm
HEA06-03015060	Heating element 2.7 kW - 60 V - 45 A 150x335 mm
HEA06-03015160	Heating element 2.7 kW - 60 V - 45 A 150x360 mm
HEA06-03015260	Heating element 2.7 kW - 60 V - 45 A 150x380 mm
HEA06-03015360	Heating element 2.7 kW - 60 V - 45 A 175x295 mm
HEA06-03015460	Heating element 2.7 kW - 60 V - 45 A 175x315 mm
HEA06-03015560	Heating element 2.7 kW - 60 V - 45 A 200x255 mm
HEA06-03020060	Heating tapes 60 V, max. length 1200 mm
HEA06-03050330	Magnetic preheater 30 V, 500x80 mm
HEA06-03050360	Magnetic preheater 60 V, 1000x80 mm
HEA06-03040160	One-line heating cable 60 V, length 4500 mm
HEA06-ONREQT	Heating elements made to size

Order No.	Insulation
HEA06-06010013	Ceramic fibre insulat. 128 kg/m <sup>2</sup> - 13 mm thick, 8.92 m <sup>2</sup>
HEA06-06010025	Ceramic fibre insulat. 128 kg/m <sup>2</sup> - 25 mm thick, 4.46 m <sup>2</sup>
HEA06-06010050	Ceramic fibre insulat. 128 kg/m <sup>2</sup> - 50 mm thick, 2.23 m <sup>2</sup>
HEA06-06030104	Tygasil insulation, 12 mm thick, 2000x300 mm
HEA06-06030105	Tygasil insulation, 12 mm thick, 2500x300 mm
HEA06-06030106	Tygasil insulation, 12 mm thick, 3000x300 mm
HEA06-06030201	Tygasil insulation, 12 mm thick, 500x600 mm
HEA06-06030202	Tygasil insulation, 12 mm thick, 1000x600 mm
HEA06-06030203	Tygasil insulation, 12 mm thick, 1500x600 mm
HEA06-06030204	Tygasil insulation, 12 mm thick, 2000x600 mm

Order No.	Thermocouples type "K"
HEA06-02300500	2x0.5 mm <sup>2</sup> thermocouple type "K" twisted wire, isolated
HEA06-02300700	2x0.7 mm <sup>2</sup> thermocouple type "K" twisted wire, isolated
HEA06-02301000	2x1.0 mm <sup>2</sup> thermocouple type "K" twisted wire, isolated

Order No.	External recorders
HEA06-05030601	Monitoring recorder with 6 channels, CF card
HEA06-05031202	Monitoring recorder with 12 channels, CF card
HEA06-05020601	FH 60-6 with 6 channels
HEA06-05021201	FH 60-12 with 12 channels

Order No.	Elements 30 V
HEA06-03010130	Heating element 1.35 kW - 30 V - 45 A 50x525 mm
HEA06-03010230	Heating element 1.35 kW - 30 V - 45 A 50x545 mm
HEA06-03010330	Heating element 1.35 kW - 30 V - 45 A 50x565 mm
HEA06-03010430	Heating element 1.35 kW - 30 V - 45 A 75x360 mm
HEA06-03010530	Heating element 1.35 kW - 30 V - 45 A 75x380 mm
HEA06-03010630	Heating element 1.35 kW - 30 V - 45 A 100x235 mm
HEA06-03011530	Heating element 1.35 kW - 30 V - 45 A 150x195 mm
HEA06-03011630	Heating element 1.35 kW - 30 V - 45 A 175x125 mm
HEA06-03011730	Heating element 1.35 kW - 30 V - 45 A 175x150 mm
HEA06-03011830	Heating element 1.35 kW - 30 V - 45 A 175x175 mm
HEA06-03011930	Heating element 1.35 kW - 30 V - 45 A 200x105 mm
HEA06-03012030	Heating element 1.35 kW - 30 V - 45 A 200x125 mm
HEA06-03012130	Heating element 1.35 kW - 30 V - 45 A 200x150 mm

Order No.	Cables and connectors
HEA06-0056	Splitting cable 10 mm <sup>2</sup> , length 2 m, 2-way
HEA06-0062	Connecting cable - double 10 mm
HEA06-0054	Splitting cable 10 mm <sup>2</sup> , length 5 m, 4-way
HEA06-02301505	Compensatig cable 2x1.5 mm <sup>2</sup> , 5 m
HEA06-02301510	Compensatig cable 2x1.5 mm <sup>2</sup> , 10 m
HEA06-02500503	Thermocouple socket
HEA06-02500502	Thermocouple plug „female“
HEA06-02500501	Thermocouple plug „male“
HEA06-06050018	USB connection cable 1x1 with USB reducer
HEA06-06050019	USB connection cable multichanel 1x2 with USB reducer
HEA06-06050020	USB connection cable multichanel 1x3 with USB reducer

Order No.	Tightening straps
HEA06-06050005	Tightening straps 16x 0.5 mm 360-400 m
HEA06-06050006	Locks for tightening strap 16x 0.5 mm

Order No.	Thermocouple fine point attachment units
HEA06-05060001	Thermocouple fine point attachment unit FPU100, comp.
HEA06-05060003	Thermocouple fine point attachment unit FPU200, comp.



Order No.	Trolleys for inverters
DHC-TROLL-3U	Trolley for 3 DHC units
DHC-TROLL-6U	Trolley for 6 DHC units

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