MPG Finned Tube Packages

For all applications of the efficient energy utilization
MPG Thermal and refrigeration engineering

MPG Finned tube packages for optimum heat transfer

When high energy demands lead to price increases of energy resources, its efficient utilization within modern plant and apparatus engineering, especially in the field of heat transfer, is an indisputable must. By means of problem solving and good component selection it is possible to design and build heat exchangers with improved efficiency for an optimum energy utilization.

In order to reach this goal, MPG Finned Tube Packages offer an ideal approach. Based upon finned tubes where the accurately formed integral fins are rolled out of the tube wall. All tube types, tube lengths and coil forms are adapted to practical requirements.

The aim of this catalogue is to give you, our customer, the possibility to determine the optimum type for your requirements from the large range of standard heat exchangers. In order to achieve this in a simple way, we first introduce to you all models in the chapters "MPG standard types" including the corresponding design aids on the last pages of this catalogue.

Furthermore, the catalogue shows you the way we approach problems which are submitted to us by you, whether for reasons of optimum energy utilization, the often limited space and the consequent requirement for particularly compact geometries or because of the involvement of substances which makes higher demands on the materials.

As a matter of course, this involves applications of water heating, refrigerant condensation, air and oil cooling as well as all other questions of efficient heat transfer.

Contents
MPG Components ........................................... 3
MPG Concept .............................................. 4/5
MPG Applications ........................................ 6
General ...................................................... 7
Water heating ............................................... 8
Refrigerant condensation / Evaporation .......... 9
Cooling and heating of gases ...................... 10
Oil cooling ............................................... 11
MPG standard types .................................... 12
MPG Components

MPG Finned tubes and materials

A decisive part of the optimal design of heat exchangers is the size and design of the heat transfer surfaces. For example, different heat transfer conditions on the inside and outside of heat exchanger tubes can be overcome by the corresponding enlargement of the surface on the side of lower heat transfer. This is often achieved by finning the tube wall.

The starting material for MPG Finned Tubes are seamless plain tubes. By means of a rolling procedure the fins are drawn out of the tube wall without material loss. Thus, tube and fins are integral. As a result of this production process the material is work hardened in the finned section while the unfinned ends and the intermediate sections remain soft. The tubes are supplied according to EN 12452, VdTUV Material Sheet, as well as to other national and international standards.

We offer a broad range of materials, MPG produces finned tubes from a variety of copper and aluminium based materials. Also special materials such as titanium, steel and stainless steel, copper-nickel alloys and precious metals, such as silver, are used for finned tubes.

By rolling different tube materials together we produce bimetallic finned tubes combining the benefits of both materials. In this way, for example, an excellent corrosion resistance on the inside, achieved by a thin-walled inner tube of copper-nickel alloy, can be combined with the very good heat transfer properties of a finned outer tube in aluminium.

In addition, double walled tubes allow the production of safety tubes with leak-detecting capabilities. For example, with an internal corrugation of the outer tube, defined channels are formed between the inner and outer tube carrying the liquid to an electrical or optical leak indicator.

Advantages of finned tubes:
- Low material and manufacturing costs
- Flexible design of fin geometries
- Appropriate materials for all applications; even the combination of two materials is possible
- Compact construction for heat exchangers
MPG Concept

Customer-oriented solutions / Standard types

We offer a two-pronged approach in the production of finned tube packages. On the one hand we produce standard heat exchanger coils – particularly for applications in the heating industry, solar technology and heat recovery through refrigerant condensation – the dimensions of which are adapted to the standardized components used in these industries. This puts us in a position to supply from stock compact and economic products based on our high quality, rationalized, production range.

The illustrations below represent some of our standard types from the WTN, WTD, WTT and WTA range complete with brazed fittings of the STANDARD series or the MPG system ELECTRICAL SEPARATION that is described in the next section. The MPG standard types are presented in a tabular form, including design and selection aids, starting on page 12.

Where the customer desires slight adaptations, e.g. for specific installation conditions, we are, of course, able to realize them with short delivery times when required.

Secondly and equally important, our finned tube coil production is customer-oriented to solve problems for heat exchangers with special designs. The request for a special design frequently results from the requirement that, where space is limited a particularly compact geometry is necessary or that in the case of extreme operating conditions higher demands are made on the materials.

Such special designs are developed in close co-operation with the customer. Based on the design documents and the quantities to be expected, we establish a manufacturing plan and a calculation, which, in co-ordination with the customer, is developed into an economic and optimized solution.

In the absence of customer drawings we are in a position, based on our manufacturing and application knowledge, to develop solutions and thus support the customer in the design and production of heat exchangers.

The MPG Concept

- Customer-oriented solutions with special designs based on customer drawings or in house developments
- Standard heat exchangers with short delivery times and high quality, for water heating, heat recovery and oil cooling
Special designs

Gas cooler

Gear oil cooler

Refrigerant condenser

Power-assisted steering oil cooler
Below we would like to present to you various applications of our Heat Exchanger Packages as well as particular results of our application research, e.g. the external boiler system EBL or the MPG system ELECTRICAL SEPARATION.

This should inspire your ideas for new developments – e.g. an ingenious hot water tank heating system or an oil or air cooler – which are further developed with our co-operation into feasible concepts.

Please, take full advantage of our manufacturing and technical expertising by involving us in the development stages of your new products.

**The MPG applications**
- Water heating with heat pumps
- Heat recovery through refrigerant condensation for heating of domestic drinking water and heating water
- Heating of water tanks
- Thermal safety device to prevent overheating in boilers using solid fuel
- Water heating in solar energy engineering
- Oil cooling and air cooling
- Heating or cooling of other liquids or gases

**Energy offer**
- Boiler heat
- Process heat
- Refrigerant condensation
- Refrigerant evaporation
- Solar energy
- District heating
- Waste heat
  - ........
  - ........

**MPG Competence**
Heat exchanger system

**Process goal**
- Heating of central heating water
- Drinking water heating
- Heat recovery
- Oil cooling
- Air cooling
  - ........
  - ........
Correct installation

MPG has carried out extensive examinations concerning the influence of the form of the heat exchanger and its position in the hot water tank. These tests have been carried out in order to establish the necessary design parameters for our standard types and also to obtain application knowledge which is important for mutual problem solving with our customers.

In Fig. 1 for example the temperature in the tank and the instantaneous heat capacity for different installation positions of the heat exchanger has been given as a function of the heating-up time. A WTN standard coil type has been used which has been installed in the vertical, as well as the usual horizontal position. As regards the speed of the heating-up process and the heat capacity indicated, advantages were found for the vertical deep installation. This refers particularly to the application as a refrigerant condenser.

Furthermore, for some applications it has been found to be advantageous if the distance between the windings of the coil is increased so that an improved transverse flow across the coil is achieved. This is shown in Fig. 2 by comparing the measurements.

When installing horizontally, the construction shown in Fig. 3 is advantageous. In this case, the heat exchanger is installed in a slightly angled position towards the tank bottom and is surrounded by a thin-walled stainless guiding tube. This type of construction creates a circular flow which results in an improved heat supply in this part of the tank and therefore counteracts the contamination with micro-organisms in this area.
Water heating

Corrosion resistance due to the MPG system Electrical Separation

The MPG system Electrical Separation allows the use of copper finned tube packages without difficulty in enamelled hot water tanks, as in the case of water heating using copper heat exchangers electrochemical corrosion can be avoided.

Because of existing enamelling flaws, hot water tanks from steel are equipped with a cathodic corrosion protection using magnesium or other sacrificial anodes. Copper heat exchangers which have not been installed with electrical separation now form a "nobler" large cathode surface in comparison with the small flaws in the enamelled surface, so that high pitting corrosion rates in the base metal may occur. Therefore, the installation of the heat exchanger should be carried out using electrically separated union connectors. However, our protection goes far beyond this as an indirect short circuit with the connected water conduit system must be avoided by the electrical separation of the inlet and outlet pipes.

Therefore, MPG has, in co-operation with important tank manufacturers, developed the utility model protected MPG system Electrical Separation consisting on the one hand of an electrically separated union connectors and on the other of an electrically separated screwed tube joint which are described in detail on page 20.

The MPG system ELECTRICAL SEPARATION

- Prevention of electrochemical corrosion
- Considerably delayed calcification of the heating surfaces
- Corrosion protection also in the area of the inlet and outlet pipes
Finned tube packages are often used as condensers for refrigerant evaporation. Typical applications are hot water heat pumps or the heating of drinking water in the recovery of waste heat from refrigerating plants. Also for this application the MPG Standard Heat Exchangers have proved successful thousands of times. For applications with refrigerants Finned Tube Packages meet all the requirements of relevant legislation and standardization, in particular the AGK Regulations*. For use with refrigerants our union connectors are mounted in an adapted fitting.

Safety coils with leak detection
When heating drinking water with refrigerant condensers any contamination of the drinking water with the refrigerant must be avoided. Therefore, MPG offers a heat exchanger coil with built-in safety. The safety coils of the types SWN in the normal single-tube execution and SWT in the twin execution are produced from SM Safety Tubes offering the possibility of leak detection. By means of a corrugation of the inner tube, defined channels are formed between the inner and outer tube carrying the liquid to an electrical or optical leak indicator (see Fig. 5). This permits the plant to be stopped immediately and quick leak detection.

On account of good heat-conducting metal connection between the inner and the outer tube our coils feature very good overall heat transfer values.

The executions of the coil types SWN (1.2 - 2.5 m²) and SWT (3.6 - 6.0 m²) are similar to the MPG Standard Coil Program.

If you require Safety Coils, please feel free to contact us.

* = AGK = Arbeitsgemeinschaft Kälteindustrie (Refrigeration Industry Working Party)
Cooling and heating of gases

In many fields of process technology, cooling or heating of gaseous fluids is required, e.g. condensation of solvent vapours in the atmosphere. These have to be removed from the air for reasons of recycling and environmental protection.

MPG Gas Coolers or Heaters can make a contribution to solving the problems occurring in these processes.

Gas coolers are frequently equipped with bimetallic finned tubes consisting of a plain inner tube onto which a finned tube is rolled. As shown in Fig. 6, MPG Bimetallic Finned Tubes offer significant advantages compared with conventional oval finned tubes with rectangular fins or round finned tubes with helically wound fins.

The Fig. shows a typical customer's application of finned tube coolers. Furthermore, it shows that MPG can produce a broad range of special finned tubes in this field.

**MPG Gas Coolers and Heaters**
- High overall heat transfer coefficients with small pressure drop
- Free choice of materials
- Thermal treatment of aggressive fluids using MPG Bimetallic Finned Tubes

![Fig. 6: Advantages of MPG Bimetallic Finned Tubes in comparison with conventional tube types](image-url)
Oil cooling

Our total finned tube and standard coil range is suitable for applications in the field of oil cooling.

In addition, the oil cooling applications represent for us a forum for the demonstration of our production possibilities.

On account of the great number of pieces in the large-scale production of engines, steering and gears a production strategy presents itself which utilizes the special possibilities of the hydrostatic stretchforming technique and the very good thermal properties of the finned tubes.

The particular advantage for our customers is the possibility to obtain a component that is perfectly adapted to the often very limited installation space and the existing operating conditions, offering at the same time the highest production quality at economical prices, MPG is in a position to produce suitable tools and samples in close co-operation with you, our customer, which will result in the optimum solution of your problem.

The illustration below shows the development stages of a gear oil cooler created in this way. It features very tight bending radii, good heat transfer properties, high fitting accuracy and easy assembly.

Therefore, let us help you to transform your fantasy into practical products.
The MPG Standard Types

MPG Finned Tube Packages

The Heat Exchanger Types

The MPG Standard Heat Exchanger types are reliable components for all fields of rational energy utilization. These high-performance space-saving Finned Tube Packages are suitable for many kinds of heat transfer. On the inside of the tubes all commonly used heating and cooling agents can be used, such as water, steam, R22, R134a and glycol. All AGK regulations are met.

As a matter of course, any minor modifications of our standard types are no problem for us and also regarded as standard heat exchangers.

The Finned Tubes

Our finned tubes feature geometrically exact fins which are rolled out of the tube wall.

These finned tubes can be supplied with different surface finish, such as inside and outside tinned, pickled, or nickel plated.

The union connectors

are produced of CuZn39Pb3 in the sizes G 1/2” to G 1” in normal execution or with “Electrical Separation”, if required, suitable for refrigerants.

Union connectors
(Page 18/19)

The MPG system „Electrical Separation”
(Page 20)
Type WTN – Single tube normal execution

The type WTN is our most economy-priced coil form which is produced for all commonly required flange holes. This type is equipped with brazed union connectors. The refrigerant execution meets the requirements of the AGK regulations. In this case the tube is fed through the fitting. The advantage is that you save a soldered connection for the domestic water. The coil surfaces are supplied with different surface finishes, such as inside and outside tinned, pickled, or nickel plated. The basis for the following design diagrams can be taken from page 22 of the leaflet.

Fig. 7: Type WTN

Types, assembly dimensions and connection threads

Individual description of the tubes: page 17 · Individual description of the union connectors: pages 18-21

<table>
<thead>
<tr>
<th>Type WTN</th>
<th>Surface area [m²]</th>
<th>Tube type Part No.</th>
<th>Tube length [mm]</th>
<th>inside cross section [cm²]</th>
<th>Weight [kg]</th>
<th>Dimensions</th>
<th>suitable Fittings F</th>
<th>G</th>
<th>L</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1.0</td>
<td>11.16.19</td>
<td>5150</td>
<td>0.85</td>
<td>3.45</td>
<td>350</td>
<td>140</td>
<td>1/2&quot;</td>
<td>F I - F VI</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1.2</td>
<td>11.18.19</td>
<td>5780</td>
<td>1.22</td>
<td>4.45</td>
<td>410</td>
<td>147</td>
<td>3/4&quot;</td>
<td>F I - F VI</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>1.8</td>
<td>11.22.19</td>
<td>6700</td>
<td>2.13</td>
<td>6.45</td>
<td>450</td>
<td>170</td>
<td>3/4&quot; * 1&quot;</td>
<td>F I - F VI</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>2.3</td>
<td>11.22.19</td>
<td>8460</td>
<td>2.13</td>
<td>8.10</td>
<td>550</td>
<td>170</td>
<td>3/4&quot; * 1&quot;</td>
<td>F I - F VI</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>2.5</td>
<td>11.22.19</td>
<td>9400</td>
<td>2.13</td>
<td>9.00</td>
<td>600</td>
<td>170</td>
<td>3/4&quot; * 1&quot;</td>
<td>F I - F VI</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>3.2</td>
<td>11.28.18</td>
<td>9400</td>
<td>3.80</td>
<td>14.00</td>
<td>600</td>
<td>180</td>
<td>1&quot;</td>
<td>F I - F V</td>
<td></td>
</tr>
</tbody>
</table>

Important notice
We have integrated the test results for our standard heat exchangers into this catalogue. This data and the characteristics of the individual coil types serve as design assistance for the calculation of the heat demand and are found on page 22 of this leaflet.

Fig. 8: Capacity diagram for the WTN series

Fig. 9: Pressure drop diagram for the WTN series
Type WTD – Single tube double-coil execution

The WTD type represents our most compact standard heat exchanger. It is available for all current flange holes. The union connectors are also brazed.

These coils can be supplied inside and outside tinned, pickled, or nickel plated.

The basis for the following design diagrams can be taken from page 22 of the leaflet.

Fig. 10: Type WTD

Types, assembly dimensions and connection threads

Individual description of the tubes: page 17 · Individual description of the union connectors: pages 18-21

<table>
<thead>
<tr>
<th>Typ WTD</th>
<th>Oberfläche [m²]</th>
<th>Rohrtyp Artikel-Nr.</th>
<th>Rohrlänge [mm]</th>
<th>lichter Querschnitt [cm²]</th>
<th>Gewicht [kg]</th>
<th>Abmessungen</th>
<th>geeignete Flanschdurchführungs-Armaturen F</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>1.8</td>
<td>11.22.19</td>
<td>6700</td>
<td>2.13</td>
<td>6.45</td>
<td>300</td>
<td>180 3/4&quot; *1&quot;</td>
</tr>
<tr>
<td>23</td>
<td>2.3</td>
<td>11.22.19</td>
<td>8460</td>
<td>2.13</td>
<td>8.10</td>
<td>430</td>
<td>180 3/4&quot; *1&quot;</td>
</tr>
<tr>
<td>25</td>
<td>2.5</td>
<td>11.22.19</td>
<td>9400</td>
<td>2.13</td>
<td>9.00</td>
<td>470</td>
<td>180 3/4&quot; *1&quot;</td>
</tr>
<tr>
<td>30</td>
<td>3.0</td>
<td>11.22.19</td>
<td>11200</td>
<td>2.13</td>
<td>10.80</td>
<td>490</td>
<td>180 3/4&quot; *1&quot;</td>
</tr>
</tbody>
</table>

Important notice

We have integrated the test results for our standard heat exchangers into this catalogue. This data and the characteristics of the individual coil types serve as design assistance for the calculation of the heat demand and are found on page 22 of this leaflet.

Fig. 11: Capacity diagram for the WTD series

Fig. 12: Pressure drop diagram for the WTD series
Type WTT – Twin tube double-coil execution

The WTT type represents our Heat Exchanger Standard, featuring the largest surface areas, also suitable for all current flange holes. It permits increased flow rates with a small pressure drop. As a matter of course, the union connectors are brazed.

These coils are supplied with inside and outside surfaces tinned, pickled, or alternatively nickel plated.

The basis for the following design diagrams can be taken from page 22 of the leaflet.

Fig. 13: Type WTT

Types, assembly dimensions and connection threads

Individual description of the tubes: page 17 · Individual description of the union connectors: pages 18-21

<table>
<thead>
<tr>
<th>Type WTT</th>
<th>Surface area [m²]</th>
<th>Tube type Part No.</th>
<th>Tube length [mm]</th>
<th>inside cross section [cm²]</th>
<th>Weight [kg]</th>
<th>Dimensions</th>
<th>suitable Fittings F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L [mm]</td>
<td>D [mm]</td>
</tr>
<tr>
<td>36</td>
<td>3.6</td>
<td>11.22.19</td>
<td>2 * 6700</td>
<td>2 * 2.13</td>
<td>13.80</td>
<td>650</td>
<td>180</td>
</tr>
<tr>
<td>46</td>
<td>4.6</td>
<td>11.22.19</td>
<td>2 * 8460</td>
<td>2 * 2.13</td>
<td>17.30</td>
<td>790</td>
<td>180</td>
</tr>
<tr>
<td>50a</td>
<td>5.0</td>
<td>11.22.19</td>
<td>2 * 9400</td>
<td>2 * 2.13</td>
<td>19.10</td>
<td>870</td>
<td>180</td>
</tr>
<tr>
<td>50b</td>
<td>5.0</td>
<td>11.22.19</td>
<td>2 * 9400</td>
<td>2 * 2.13</td>
<td>19.10</td>
<td>580</td>
<td>245</td>
</tr>
<tr>
<td>60a</td>
<td>6.0</td>
<td>11.22.19</td>
<td>2 * 11200</td>
<td>2 * 2.13</td>
<td>22.60</td>
<td>1000</td>
<td>180</td>
</tr>
<tr>
<td>60b</td>
<td>6.0</td>
<td>11.22.19</td>
<td>2 * 11200</td>
<td>2 * 2.13</td>
<td>22.60</td>
<td>680</td>
<td>245</td>
</tr>
</tbody>
</table>

Important notice
We have integrated the test results for our standard heat exchangers into this catalogue. This data and the characteristics of the individual coil types serve as design assistance for the calculation of the heat demand and are found on page 22 of this leaflet.

Fig. 14: Capacity diagram for the WTT series

Fig. 15: Pressure drop diagram for the WTT series
Type WTA – Thermal Safety Device

The Standard Type WTA features extremely narrow windings which permit assembly into most boiler types. The outside diameter remains constant throughout the total length.

This coil type is also suitable as a condenser for direct condensation in domestic hot water tanks. The necessary modifications of the union connectors are a standard execution for us.

The refrigerant execution meets the requirements of the AGK regulations. In this case the tube is fed through the fitting. The advantage is that you save a soldered connection for the domestic water. These coils can be supplied with inside and outside surfaces tinned, pickled, or alternatively nickel plated.

Types, assembly dimensions and connection threads

<table>
<thead>
<tr>
<th>Type WTA</th>
<th>Surface area [m²]</th>
<th>Tube type Part No. (* at F III 11.15.19)</th>
<th>Tube length [mm]</th>
<th>inside cross section [cm²]</th>
<th>Weight [kg]</th>
<th>Dimensions</th>
<th>Dimensions</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L [mm]</td>
<td>D [mm]</td>
<td>G [inch]</td>
</tr>
<tr>
<td>1</td>
<td>0.41</td>
<td>11.16.19</td>
<td>2150</td>
<td>0.85</td>
<td>1.85</td>
<td>410</td>
<td>63</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>2</td>
<td>0.43</td>
<td>11.16.19</td>
<td>2270</td>
<td>0.85</td>
<td>2.10</td>
<td>455</td>
<td>63</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>3</td>
<td>0.51</td>
<td>11.16.19</td>
<td>2700</td>
<td>0.85</td>
<td>2.25</td>
<td>510</td>
<td>63</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>4</td>
<td>0.58</td>
<td>11.16.19</td>
<td>3050</td>
<td>0.85</td>
<td>2.50</td>
<td>590</td>
<td>63</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>5</td>
<td>0.63</td>
<td>11.16.19</td>
<td>3315</td>
<td>0.85</td>
<td>2.80</td>
<td>635</td>
<td>63</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>6</td>
<td>0.78</td>
<td>11.16.19</td>
<td>4105</td>
<td>0.85</td>
<td>3.20</td>
<td>765</td>
<td>63</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>7</td>
<td>1.00</td>
<td>11.16.19</td>
<td>5200</td>
<td>0.85</td>
<td>3.80</td>
<td>950</td>
<td>63</td>
<td>1/2&quot;</td>
</tr>
</tbody>
</table>

Important notice
We have integrated the test results for our standard heat exchangers into this catalogue. This data and the characteristics of the individual coil types serve as design assistance for the calculation of the heat demand and are found on page 22 of this leaflet.
The finned tubes

The starting material for our finned tubes are seamless plain tubes. By means of a rolling procedure the fins are drawn out of the tube wall without material loss. Thus, tube and fins are integral. As a result of this production process the material is work hardened in the finned section while the unfinned ends and the intermediate sections remain soft.

The tubes are supplied according to EN 12452, VdTÜV Material Sheet as well as to other national and international standards. For our Finned Tube Packages we use medium-high finned tubes of the M type featuring very good bending properties. These properties permit the production of our compact and high-performance standard coils.

Characteristics of the finned tubes for our Packages

Type M · 11 fins per inch (m = 2.31 mm) · Fin height h = 3.5 mm / 4.5 mm*

<table>
<thead>
<tr>
<th>Type</th>
<th>Part No.</th>
<th>O.D. (d_1) [mm]</th>
<th>I.D. (d_2) [mm]</th>
<th>Initial tube</th>
<th>O.D. (d_3) [mm]</th>
<th>I.D. (d_4) [mm]</th>
<th>O.D. (d_5) [mm]</th>
<th>W.T.</th>
<th>BWG</th>
<th>(s_2) [mm]</th>
<th>(A_A) [m²/m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTN 10</td>
<td>11.16.19</td>
<td>16.00</td>
<td>12.00</td>
<td>10.50</td>
<td>12.50</td>
<td>19.50</td>
<td>19</td>
<td>1.00</td>
<td>0.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WTN 12</td>
<td>11.18.19</td>
<td>18.00</td>
<td>14.00</td>
<td>12.50</td>
<td>14.50</td>
<td>21.50</td>
<td>19</td>
<td>1.00</td>
<td>0.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WTN 18</td>
<td>11.22.19</td>
<td>22.00</td>
<td>18.00</td>
<td>16.50</td>
<td>18.50</td>
<td>25.50</td>
<td>19</td>
<td>1.00</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WTN 23</td>
<td>11.22.19</td>
<td>22.00</td>
<td>18.00</td>
<td>16.50</td>
<td>18.50</td>
<td>25.50</td>
<td>19</td>
<td>1.00</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WTN 25</td>
<td>11.22.19</td>
<td>22.00</td>
<td>18.00</td>
<td>16.50</td>
<td>18.50</td>
<td>25.50</td>
<td>19</td>
<td>1.00</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WTN 32</td>
<td>11.28.18</td>
<td>28.0</td>
<td>23.50</td>
<td>22</td>
<td>24.50</td>
<td>31.50</td>
<td>18</td>
<td>1.25</td>
<td>0.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>all WTD types</td>
<td>11.22.19</td>
<td>22.00</td>
<td>18.00</td>
<td>16.50</td>
<td>18.50</td>
<td>25.50</td>
<td>19</td>
<td>1.00</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>all WTT types</td>
<td>11.22.19</td>
<td>22.00</td>
<td>18.00</td>
<td>16.50</td>
<td>18.50</td>
<td>25.50</td>
<td>19</td>
<td>1.00</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>all WTA types</td>
<td>11.16.19</td>
<td>16.00</td>
<td>12.00</td>
<td>10.50</td>
<td>12.50</td>
<td>19.50</td>
<td>19</td>
<td>1.00</td>
<td>0.19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* = Important notice

All heat exchangers described here can also be supplied with 4.5 mm fin height. On request, we shall inform you of the changes in geometry. Due to the increased outside surface area (m²/m) the tube length is reduced.
The Union Connectors

MPG Finned Tube Packages are equipped with union connectors as standard. The following table lists the fittings suitable for the individual coil type and describes their construction. This table permits the determination of the union connectors for the standard type chosen by you. Please, also enquire for our solutions where a smaller flange thickness is required.

The individual description of the fitting types F 1–F VI listed in the table is presented on the following pages.

Survey of the suitable union connectors for the various coil types

<table>
<thead>
<tr>
<th>Designation</th>
<th>Type</th>
<th>WTN 10 WTA 1-7</th>
<th>WTN 12, 18, 23, 25 WTD 18, 23, 25, 30</th>
<th>WTT 36, 46, 50a/b, 60a/b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Size Flange bore</td>
<td>Size Flange bore</td>
<td>Size Flange bore</td>
</tr>
<tr>
<td>Standard</td>
<td>F I</td>
<td>1/2&quot; 22</td>
<td>3/4&quot; 27.5</td>
<td>1&quot; 34.5</td>
</tr>
<tr>
<td>Electrical Separation enlarged flange bore</td>
<td>F II</td>
<td>1/2&quot; 24</td>
<td>3/4&quot; 30</td>
<td>1&quot; 39</td>
</tr>
<tr>
<td>Standard refrigerant type</td>
<td>F III</td>
<td>1/2&quot; tube type 11.15.19</td>
<td>1&quot; 34.5</td>
<td></td>
</tr>
<tr>
<td>Electrical Separation MPG-System</td>
<td>F V</td>
<td>1/2&quot; 22</td>
<td>3/4&quot; 27.5</td>
<td>1&quot; 34.5</td>
</tr>
<tr>
<td>Electrical Separation – MPG-System refrigerant type</td>
<td>F VI</td>
<td>1&quot; 34.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Drawing items

<table>
<thead>
<tr>
<th>Item</th>
<th>Component Parts</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connecting fitting</td>
<td>Cu Zn39 Pb3</td>
</tr>
<tr>
<td>2</td>
<td>Slanting disk</td>
<td>Cu Zn39 Pb3</td>
</tr>
<tr>
<td>3</td>
<td>O-ring seal</td>
<td>EPDM / Viton</td>
</tr>
<tr>
<td>4</td>
<td>Hexagonal nut</td>
<td>Cu Zn39 Pb3</td>
</tr>
</tbody>
</table>

### Types, assembly dimensions, connection threads

<table>
<thead>
<tr>
<th>Size G [inch]</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D1</td>
</tr>
<tr>
<td></td>
<td>[mm]</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>13.1</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>18.1</td>
</tr>
<tr>
<td>1&quot;</td>
<td>22.1</td>
</tr>
</tbody>
</table>
The MPG System Electrical Separation

The advantages of the MPG System "Electrical Separation" have already been described in the catalogue. Here, you may now choose the suitable union connector and the screwed connection.

Electrically separated union connector

The separated union connector represents a further development of the fitting type G 1/2" to G 1". Therefore, these improved fittings can be changed to existing systems.

The connection fitting has been designed for a flange thickness of 8 to 16 mm. A distance disk can be used in order to compensate a smaller flange thickness.

A correctly positioned polyamid plastic ring takes care of the electrical separation without prejudicing the sealing function.

The other components of the separated union connectors are a slanting disk with an O-ring seal as well as a Klingerit disk with support disk and nut.

As a matter of course, we also supply the separated union connectors for increased flange bores, as refrigerant execution and in the extended execution.

Fig. 22:

Fig. 23:

Fig. 24:

Types, assembly dimensions, connection threads

<table>
<thead>
<tr>
<th>Size G [inch]</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D₁</td>
</tr>
<tr>
<td>--------------</td>
<td>----</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>13.1</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>18.1</td>
</tr>
<tr>
<td>1&quot;</td>
<td>22.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Component parts</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connection fitting</td>
<td>Cu Zn39 Pb3</td>
</tr>
<tr>
<td>2</td>
<td>Slanting disk</td>
<td>Cu Zn39 Pb3</td>
</tr>
<tr>
<td>3</td>
<td>O-ring seal</td>
<td>EPDM / Viton</td>
</tr>
<tr>
<td>4</td>
<td>Hexagonal nut</td>
<td>Cu Zn39 Pb3</td>
</tr>
<tr>
<td>5</td>
<td>Distance disk</td>
<td>Cu Zn39 Pb3</td>
</tr>
<tr>
<td>6</td>
<td>Separation clip</td>
<td>Polyamid</td>
</tr>
<tr>
<td>7</td>
<td>Separation disk</td>
<td>Klingerit</td>
</tr>
<tr>
<td>8</td>
<td>Angular clip</td>
<td>Polyamid</td>
</tr>
</tbody>
</table>
The electrically separated threaded tube connection

The electrically separated threaded tube connection protects the hot water tank against electrochemical corrosion coming from the earthed water pipe. The threaded tube connection consists of an inner plastic section separating the tubes at the centre, an outside plastic separation ring as well as an 0-ring for the sealing function. The threaded parts and the cap nut are made from solid brass which guarantees a workmanlike assembly.

The water pipe connection can be supplied with either an internal thread or a solder nipple. Therefore, other threaded tube connections are unnecessary.

Fig. 25: Electrically separated threaded tube connection with a threaded connection on both sides

Fig. 26: Electrically separated threaded tube connection with solder connection on one side

<table>
<thead>
<tr>
<th>Item</th>
<th>Component parts</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connection fitting</td>
<td>Cu Zn39 Pb3</td>
</tr>
<tr>
<td>2</td>
<td>Slanting disk</td>
<td>Cu Zn39 Pb3</td>
</tr>
<tr>
<td>3</td>
<td>O-ring seal</td>
<td>EPDM / Viton</td>
</tr>
<tr>
<td>4</td>
<td>Hexagonal nut</td>
<td>Cu Zn39 Pb3</td>
</tr>
<tr>
<td>5</td>
<td>Distance disk</td>
<td>Cu Zn39 Pb3</td>
</tr>
<tr>
<td>6</td>
<td>Separation clip</td>
<td>Polyamid</td>
</tr>
<tr>
<td>7</td>
<td>Separation disk</td>
<td>Klingerit</td>
</tr>
</tbody>
</table>
The MPG Standard Types

Design example:

The heat transfer to the tank water is effected by free convection. In this process the temperature difference and the overall heat transfer is constantly changing so that a design by calculation is time-consuming. Furthermore, the influence of the tank dimensions, the construction type and the installation position of the heat exchanger is important.

These influences have been examined at MPG GmbH in numerous tests with most tank types.

Basic formulas result from the curves of the logarithmic diagram (similar to the mean temperature difference), which can be used for the design of the heat exchangers with a known volume flow.

In order to further simplify your design, the individual curves for a typical application for the standard types have been shown in the Fig. It is also possible to use the same data to calculate your heat demand and select the correct coil type for a desired water flow rate.

Design example:

A heat exchanger for the following conditions is to be designed:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usable tank volume</td>
<td>$V_{Sp}$ 500 [l]</td>
</tr>
<tr>
<td>Tank starting temperature</td>
<td>$T_{Sp,1}$ 15 [°C]</td>
</tr>
<tr>
<td>Tank end temperature</td>
<td>$T_{Sp,2}$ 55 [°C]</td>
</tr>
<tr>
<td>Output temperature of heating circuit</td>
<td>$T_{H,1}$ 70 [°C]</td>
</tr>
<tr>
<td>Desired heating-up time</td>
<td>$t$ 60 [min]</td>
</tr>
<tr>
<td>Chosen water flow velocity</td>
<td>$u_w$ 1.5 [m/s]</td>
</tr>
</tbody>
</table>

In the first place, the heat quantity $Q_{Sp}$ required for the heating-up process of the tank is calculated:

$$Q_{Sp} = \frac{m_{Sp} \cdot c_{p} \cdot \Delta T_{Sp}}{3600} \text{ [kWh]}$$

This results in a simplified formula (with a heat capacity of the water of $c = 4.218 \text{[kJ/(kg K)]}$):

$$Q_{Sp} = \frac{V_{Sp} \cdot \Delta T_{Sp}}{3600} \text{ [kWh]}$$

This can also be expressed as:

$$Q_{Sp} = \frac{m_{Sp} \cdot c_{p} \cdot \Delta T_{Sp}}{3600} \text{ [kWh]}$$

For the desired heating-up time $t$, the required heat capacity $Q_{Sp}$ is determined from the heat quantity $Q_{m}$ with:

$$Q_{m} = Q_{Sp} \cdot \frac{t}{60} \text{ [kWh]}$$

From the Fig., with the mean overall heat transfer coefficients $k_{mk}$ (see bottom right) for the output temperature of heating circuit $T_{H,1}$ and the chosen water flow velocity, a mean overall heat transfer coefficient $k_{mk}$ results, in this case for the example with a value of $k_{mk} = 301 \text{[W/(m²K)]}$.

The temperatures differences $\Delta T_{A}$ and $\Delta T_{E}$ at the end of the heating-up process in surface-related heat capacities $q_A = Q_{m}/A$ at the beginning and $q_E = Q_{m}/A$ at the end of the process with:

$$q_A = k_{mk} \cdot \Delta T_{A} = k_{mk} \cdot (T_{H,1} - T_{Sp,1}) = 301 \cdot (70 - 15) = 16.56 \text{[kW/m²]}$$

$$q_E = k_{mk} \cdot \Delta T_{E} = k_{mk} \cdot (T_{H,1} - T_{Sp,2}) = 301 \cdot (70 - 55) = 4.52 \text{[kW/m²]}$$

which after forming of the logarithmic mean value (see Fig., bottom right), results in:

$$q_{m,LN} = q_A - q_E = \frac{16.56 - 4.52}{\ln(16.56/4.52)} = 9.271 \text{[kW/m²]}$$

Subsequently, the surface area $A$ of the heat exchanger is determined by the equation:

$$A = \frac{Q_{m}}{q_{m,LN}} = 2.5 \text{[m²]}$$

The coil to be chosen is type WTN 25 with 2.5 [m²] surface area.

If the same conditions as in our example exist, you may also take the transferable heat transfer capacities from the diagrams assigned to the individual coil types, so that you save the calculations for these frequently occurring application conditions.

The required volume flow is a result of the inside cross section of the tube (see tables assigned to the individual types) and the water flow velocity: $V = \frac{1}{u_w} = 2.13 \text{[l/min]}$

Finally, the pressure drop in this application can be taken from the diagram for the specific type for the resulting volume flow. The example shows 0.32 [bar].

---

**Fig. 27:** Reasons for taking the logarithmic mean of the heat capacity

**Fig. 28:** Thermal design: Overall heat transfer coefficient $k$
Our production process is submitted to an functioning Quality Assurance Management System as high quality has priority in our company. Therefore, at an early date we have taken measures for the certification of our Quality Assurance Management System according to DIN ISO 9001. In the meantime, we have obtained certification for the total enterprise.

At first, our finned tubes are submitted to an eddy current leak test according to the relevant standards. After completion, our standard coils are also submitted to a leak test with air under water. The standard test pressure is 25 bar. It is also possible, depending on the material, for the tubes to be used at considerably higher operating pressures and at elevated temperatures.
MPG Mendener Präzisionsrohr GmbH

Balver Straße 86
D-58706 Menden

Telephone +49 2373 1769-0
Telefax +49 2373 1769-10

E-mail: info@mpg-tubes.com
Internet: http://www.mpg-tubes.com