

# **BENVIG HEAT TRANSFER SPOL.S R.O.**

**(For company's internal use)**

The Production Area has equipment for the production of tube bundles of air coolers, tube&shell heat exchangers, air condensers, vaporizers, heaters and pressure vessels.

## **The current capabilities of the Production Area:**

### **1. Machines for cutting material**

|              | <b>Type</b>      | <b>Max. dimensions of material</b>   |
|--------------|------------------|--|
| Band saw     | BOMAR            | height 460 x width 500mm, power input 3.45kW<br>Tube D460 1 cut, maximum D550 when rotate tube<br>Saw band 31x1,10x5200<br><b>BANDS USED</b><br><b>Marat X3000(631;34x1,1-2;3K)</b><br><b>Marat M42(529;34-1,1-1,4;2k)</b><br><b>Magnum HL(2/3k)</b><br><b>Pilana M51(531;34X1,1-2;2/3) commonly used</b><br><b>ARNTZ445M42prof. 3/4K-for profiles</b><br><b>When sawing under angle, it is necessary to reduce the max. cross section, maximum cut angle 60° (65°-must be checked with operator)</b><br><b>Tolerance of perpendicularity of the cut +/- 0.2 at a cross section of 100 mm<sup>2</sup></b><br>It is possible to saw materials 18m long.(18.5m from the saw to the wall) |
| Band saw     | THOMAS 340 SO    | height 250 x width 300mm, power input 2,2 kW   |
| Band saw     | OMES PRIZMA 270S | height 200 x width 300mm   |
| Table shears | HACO             | <b>steel up to a thickness of 10mm x width 3000mm</b><br><b>stainless steel up to a thickness of 6mm x width 3000mm</b><br><b>the edge after cutting shall be treated for welding, narrow strips shall have a minimum</b>  |

|                                 |                 |   |
|---------------------------------|-----------------|---|
|                                 |                 | <b>width of 30x the thickness of the plate in order to achieve minimum deformation on shearing</b>                                |
| Shears for profiles + punching  | KINGSLAND 40 XM | profile <b>I</b> ; <b>U</b> ,+ cutting out with a width of 40mm and to a depth of down to 100mm                                   |
| Shears for profiles + punching  | KINGSLAND 60 XM | Strip # 200 x 20 - # 300 x 15mm<br>profile <b>I</b> 120 x 12mm, Rod $\varnothing$ 40mm ; Square 35mm                              |
| Plasma cutting machine with CNC | ES 320          | thickness of 100mm width of 2000 x length of 6000mm- steel<br>thickness of 20mm width of 2000 x length of 6000mm- stainless steel |
| O <sub>2</sub> cutting          |                 | Thickness of 200mm steel  |

## 2. Equipment for surface treatment

|  |                                  |
|--|----------------------------------|
| High pressure cleaning with water + cleaning agent, max 3.2MPa | KÄRCHER HDS 698 CSX – 90°C water |
| High pressure hand spraying of paint                           |                                  |
| Air spraying of paint  |                                  |

## 3. Forming machines

|                            | Type       | Max. dimensions  |
|----------------------------|------------|--|
| Hydraulic press            | P 6328 50t | table 300 x 1200mm   |
| plate bending press - 200t | HACO 200t  | for the forming of profile <b>C</b> - pl. 4 x the length of bend 3000mm steel<br>pl. 5 x the length of bend 2000mm steel<br><b>pl. 8 x the length of bend 1000 mm</b><br><b>stainless steel pl. 5x2000mm</b> |
| Plate bending machine      | 2000/2a    | thickness 2 x width of 2000mm, <b>power input 2.2 kW</b>   |

|                                       |   |   |
|---------------------------------------|---|---|
| Roll bending machine -<br>4-roll type | MG EH 215 C<br>7.5kW<br>D of roll<br>260mm<br>Working<br>length<br>L=2050mm | For max. thickness 12mm - the width of the rolled plate is max. 1.2m<br>The achieved diameter from 650mm up to 4000 mm<br>The smaller diameter, the worse quality, it is not possible to guarantee good ovality<br>Dependent on the material - yield value<br>Thickness 5mm – L 2m<br>Diameter of 650mm up to 3m<br>On roll bending there shall be an allowance at both ends of plate of 500mm, because such allowance remains straight |
| Tube roll expansion machine           | Technodata and KRAIS  | Min. inner $\varnothing$ of the tube 10mm (in chapter no.15)  |

## 4. Bending machines

### 4.1 Hand bending machine with mechanical transmission XOT R-35

|                          |   |  |
|--------------------------|---|--|
| tube $\varnothing$ D x t | $\varnothing$ 20x2 ÷ $\varnothing$ 33.5x3 |  |
|--------------------------|---|--|

### 4.2 Small hand bending machine for copper and brass tubes

|                          |   |  |
|--------------------------|---|--|
| tube $\varnothing$ D x t | $\varnothing$ 12x1,5 ÷ $\varnothing$ 25x2 |  |
|--------------------------|---|--|

## 5. Machine tools

|                                 | Type           | Clamping size   |
|---------------------------------|----------------|---|
| Milling machine CNC<br>bed type | FSQ 125<br>CNC | Range of the travel in the axis:<br>X=5000 mm<br>Y=1250 mm<br>Z=1400 mm<br>The area of the bed: 1120 x 5000 mm<br>Maximum load of the bed: 10500 kg<br>Utilizable motor power output:22kW<br>Spindle rpm: 11÷2500 rpm<br>Turning the spindle around the horizontal axis: in steps by 2.5° |

|   |                 |  |
|---|-----------------|--|
| <b>Turntable bed<br/>(Accessories FSQ125)</b> | <b>ISN1000V</b> | Diameter of the bed: $\varnothing$ 1000 mm<br>Central hole: $\varnothing$ 80 mm<br>Maximum load of the bed: 3500 kg  |
| <b>Portal machining<br/>center</b>            | <b>FRFQ 200</b> | Range of the travel in the axis:<br>X=6000 mm<br>Y=2900 mm<br>Z=1500 mm<br>The area of the bed: 2000 x 6000 mm<br>Maximum load of the bed: 4000kg/m <sup>2</sup><br>Utilizable motor power output:22kW<br>Spindle rpm: 20÷6000 rpm<br>Exchange Head:<br>Single spindle with spindle axis coaxial with headstock<br>Single spindle with spindle axis perpendicular to spindle axis - rotational range $\pm$ 185 |
| Milling machine                               | FGS 50/63       | bed 500 x 1 800mm, vertical travel = 500mm   |
| Milling machine                               | OR 11           | bed 200 x 600mm, vertical travel = 220mm, power input 5,5 kW   |
| Universal lathe                               | SUR 350         | max. $\varnothing$ for machining 600 mm, power input 22 kW   |
| Universal lathe                               | 645 P 031       | max. $\varnothing$ of machining 300 mm   |
| Universal lathe                               | SPF 1500 PH     | max. $\varnothing$ of machining 650,<br><b>power input 5,5 kW</b>  |
| Vertical drilling machine                     | 2xVR4           | drill max $\varnothing$ 40mm,> 40mm –drilling head   |
| Vertical drilling machine                     | 2 A 554         | drill max $\varnothing$ 40mm,> 40mm – drilling head  |
| Vertical drilling machine                     | VR10            | drill max $\varnothing$ 40mm,> 40mm – drilling head  |
| Mobile drilling machine                       | VOM 50          | drill max $\varnothing$ 40mm,> 40mm – drilling head  |
|   |                 |  |

## 6. Finning tube machine

Max. Length of tube to be finned.....14000mm, optionally up to 20000mm (for L, LL)

Length of ends without fins .....arbitrary

Material of fins.....aluminium, soft carbon steel, copper

Material of plain tube.....carbon and alloyed steels (austenitic, duplex), alloys Ni, Cu, and special alloys

Type of wound fins: I – Fin, G – Fin, L – Fin, LL – Fin, KL – Fin.

Dimensions of plain tubes:  $\varnothing 19 \div \varnothing 50.8$  mm (3/4” - 2”).

Dimensions over the fins:  $\varnothing 44.5 \div \varnothing 82.55$  mm.

Number of fins per inch:  $6.3 \div 11$  /inch.

Number of fins per meter:  $284 \div 432$  /m.

Detailed information is available at request.

## 7. Welding

**Welded material options:** non-alloyed carbon steels, including pre-heating  
low-alloyed carbon steels, including pre-heating  
high-alloyed Cr - Ni austenitic,  
ferritic-austenitic steels (duplex)  
aluminium and its alloys  
alloys of Ni - monel, inconel...  
alloys of Cu – brass, ...  
alloys of Ti, Ti

**Welding methods -** 111 MMA  
121 SAW  
135 MAG  
136 MAGF  
141 TIG  
783 (stud welding)  
912, 942 soldering with copper  
131 MIG  
136,138 MAG F -PENDL

### 7.1 Mechanical equipment for mechanized welding:

**7.1.1 MANDELLI (ESAB A6) submerged arc welding with one or two torches for external welds of the rectangular profile**

height - 750mm  
width - 400mm  
length - 4000mm  
submerged arc welding of a fillet weld  
height - 750mm  
width - 400mm  
length - 4000mm  
min. inner hole of the part to be welded 50 x 50mm

**7.1.2 AIR LIQUID WELDING CB MATIC**

Post mounted automatic welding machine for longitudinal and circumferential welds of cylindrical exchangers

max.  $\varnothing$  4000 mm,  
min. inner  $\varnothing$  680 mm  
max. working height 4000 mm  
max. throat depth 4000 mm

Optionally, weld overlaying with a strip electrode (SAW or ESW).

For weld overlaying with a strip:

- min. inner  $\varnothing$  720mm
- min. thickness of a shell 30mm
- min. thickness of weld overlay 5mm
- width of the strip 30-90 mm

Butt welding (PI weld) up to a thickness of plates of 12 mm and from an outer diameter of 680 mm.

**7.1.3 ORBITAL WELDING Polysude, Hobart**

inner min. dimension of the tube welded  $\varnothing$  12mm  
outer max. dimension of the tube welded  $\varnothing$  60mm

**7.1.4 TRV NELSON ALPHA 850 spot welding of studs max. M12**

**7.1.5 WELDING OF NOZZLES SA 603**

The diameter of nozzles from D60mm - D300mm

**7.1.6 Dimensions of the "pit" for welding the covers of headers**

width: 975 mm  
length: 2000 mm

depth: 2500 mm

## 8. Assembling

The company has an assembling shop of two bays

bay A size of the entrance gate width 5750mm x height 4250mm front gate  
width 4240mm x height 4240mm side gate  
2 x bridge crane ABUS lifting capacity 10t

bay B size of the entrance gate width 4250mm x height 4250mm front gate  
width 4220mm x height 4220mm side gate  
1 x bridge crane KONECRANES lifting capacity 5t  
1 x bridge crane ABUS lifting capacity 10t

Shed by the shop D7

1 x bridge crane KONECRANES lifting capacity 5t

**bay C**

**2x bridge crane lifting capacity 30t**

**bay D**

**2x bridge crane lifting capacity 30t**

Height under hook:

10t lifting capacity crane – 5,5m

30t lifting capacity crane – 10m

The floor bearing capacity in the Production Shop – the bays A,B,C,D ... 10 t / 1 m<sup>2</sup>.

## 9. Quality Control

check of the thickness of paints

check of hardness, roughness

check of the dimensions

check of the quality of material (X-ray spectrometer ALFA 2000A)

capillary penetrant testing

leak test with a foam forming solution

pressure test with air or nitrogen 250bar

pressure test with water – water pump SIGMA type 12 PAR 3 - 800bar

carbon steels - drinking water + inhibitor

high grade materials - demineralised water

## 10. Transportation

|  | Type | carrying capacity |
|--|------|-------------------|
|--|------|-------------------|

|                              |                      |               |
|------------------------------|----------------------|---------------|
| Platform truck               |                      | 20t           |
| Fork lift truck              | TOYOTA               | 3.5t          |
| Fork lift truck              | TOYOTA               | 2.5t          |
| Fork lift truck              |                      | 5t            |
| Side fork lift truck lateral | TRANSPORTA<br>SB 65Q | 6.5t<br>6.5t  |
| Lorry                        | IVECO                | 6t, length 6m |
| Platform truck - double axle |                      | 8t            |
| Fork lift truck              | LINDE                | 3 t           |

## 11. Heat treatment equipment

11.1 El. annealing truck-chamber furnace VKT 7000/09 max. temperature 900°C  
(for a short time), power input 150 kW

Max. size of the charge 1200 x 1400 x 4000mm

11.2 Device for induction preheat and heat on heat treatment  
ProHeat 35W/Temperature Control 400-460V, CE, prod. year 2010  
Can be used up to a max. temperature of 750°C

## 12. Others

|   |  |
|---|--|
| Stationary compressor (SE350) –<br>air distribution system <b>ATMOS</b> | 0,8 MPa 2x350m <sup>3</sup> / hour,<br><b>power input 35 kW/pc</b> |
| Unit for drying vessels after pressure testing                          | RECUSORB DR-031C   |
| vacuum pump   | LEMB 161 CZ B3N OA 7F  |
| Al mobile scaffolding   | Height 6m  |

## 13. Blasting box

Dimensions L x W x H: 6000x3900x2750

Power input 17 kW

**blasting box, the size of the inner space 6.1x4x2.75m**

**the size of the gate 3.8 x 2.75 m**

## 14. Limiting sizes of products

Tube bundles W x H x L 4000mm x 1200mm x 20000mm



Cylindrical exchangers ø D x L      4000mm x 20000mm

Max. weight of a single product: up to 60 000 kg

Upon consultation, with the condition of taking special measures, it is possible to manufacture products of a higher weight.

## **15. Expanding equipment for joint tube into tubesheet**

Technodata, classic design with electric drive – 3ks NFAB-D 42V / 50-60 Hz

Technodata, mech. – hydr. equipment – 1ks NFAB-H400 with traction D532

Krais, classic design with pneumatic drive – 1ks K-50-400

Krais, classic design with electric drive – 1ks TES-700-M-STD with driver DUSS-500NM

## **16. Painting and drying box**

Inner dimensions LxWxH: 15610x3790x3000mm

Gate dimensions WxH: 3790x2900mm

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25.3.2013

Date of revision: 29.8.2014

Prepared by: Kubištová

Date of revision: 5.10.2015

Prepared by: Antony

Saw BOMAR maximum cutting dimensions of tube

Date of revision: 6.1.2016

Prepared by: Rutar

Deletion FSQ 80

Date of revision: 19.2.2016

Prepared by: Antony

Saw BOMAR maximum cutting angle

Date of revision: 2.5.2016

Prepared by: Rutar

Supplemented chapter no. 15

Date of revision: 30.3.2017  
Prepared by: Antony  
Height under crane hook completed.

Date of revision: 12.10.2017  
Prepared by: Antony  
Filled dryer name and type, modified maximum cut angle of Bomar saw.

Date of revision: 26.4.2018  
Prepared by: Major  
Added chapter 16. – Painting box

Date of revision: 25.10.2018  
Prepared by: M. Minařík  
Cancelled - Mechanical tube bending machines XOT 50A  
Added - Portal machining center