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Basic rules of dimensioning
Reference coordinate system

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Dimensioning in engineering technical documentation

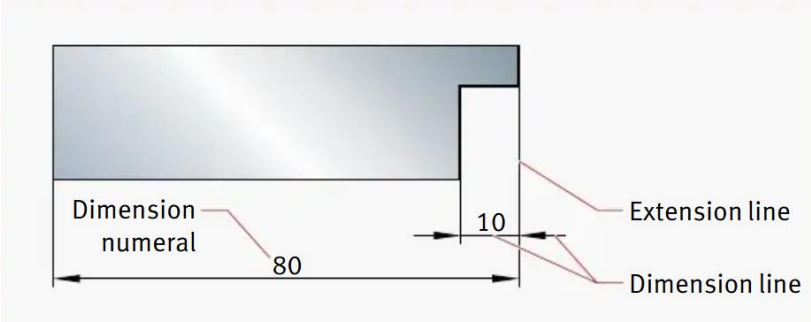
Dimensions and tolerances on technical drawings are given by the standard **ISO 129-1: 2004**.

The main dimensioning principles

- All dimension information must be shown on the drawing.
- The dimensions must be placed in a view in which it is clear to which element it belongs.
- Ever informations may be on the drawing only once.
- Prefer to place dimensions related to the same element in one view.
- Prefer functional dimensions.
- The same length units (mm) must be used.
- Angles are given in degrees, minutes and seconds (0 ° 10´20,5´´).
- We don´t create more dimensions than absolutely necessary.
- Repeating features are dimensioned on only in one base feature.
- For definition positions and values of features are decisive dimensions.
- Dimensions that result from the representation of elements are not quoted (right angles, regular polyhedra…)

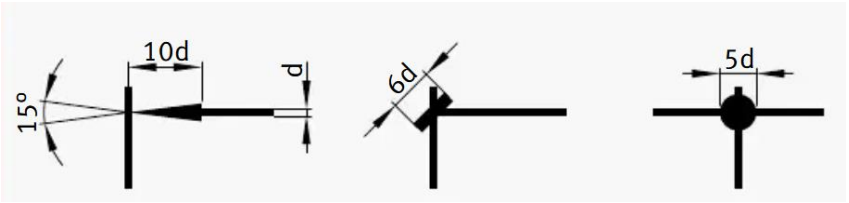
Elements in entry of dimensions

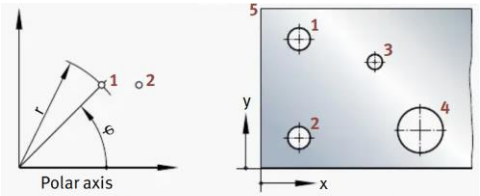
- dimension lines:
  - are at a distance of approx. 10mm from the edge of the body,
  - other parallel dimension lines have a spacing of at least 7mm,
  - centre lines and edges must not be used as dimension lines,
- extension lines - project approx. 2mm beyond the dimension line,
- dimension lines and extension lines should not intersect any other lines,
- dimension numerals:
  - are positioned at the approximate centre of the dimension line (although exceptions occur),
  - are positioned approx. 0,5mm to 1,5mm above the dimension line,
- within a drawing, only one of the possible terminations of dimension lines may be used,



Elements in entry of dimensions

- **Geometric element** – point, line, surface.
- **Dimensional element** – geometric shape determined by length or angular dimension (cylinder, cone).
- **Reference element** – element used as a base to determine another element.
- **Repeating element** – a periodically repeating regular element.
- **Axis** – a line representing the symmetry axis of the geometric feature.
- **Dimension line.**
- **Extension line.**
- **Axis of symmetry** – plane of symmetry plane, axis of rotation.
- **Terminantion of dimensional lines** – defines the length of the dimension line, terminates the extension lines.

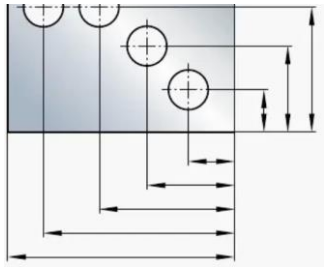




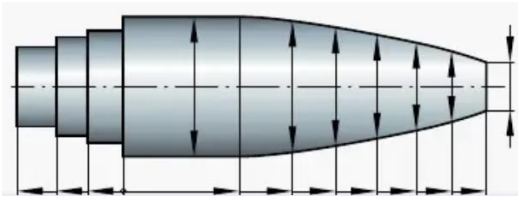
Pos.	r	φ
1	15	45°
2	19	35°

Pos.	x	y	d
1	5	17	∅3
2	5	4	∅3
3	15	14	∅2
4	21	5	∅6
5	0	21	–

Dimensioning



- Dimension – distance between two elements, angle.
- Dimension numeral – numeric value (nominal size).
- Dimension tolerance.
- Informative dimension - for information only.
- Chain dimension.
- Coordinate dimension –all origin dimensions in the reference feature.
- Parallel dimensioning – parallel, origin of all dimensions in one reference feature.
- Running dimensioning - the origin of all dimensions in a single reference element and are arranged in a single line/circle.
- Tabular dimensioning – elements indicated by numbers/letters and numerical values given in the table.



Datum reference frame

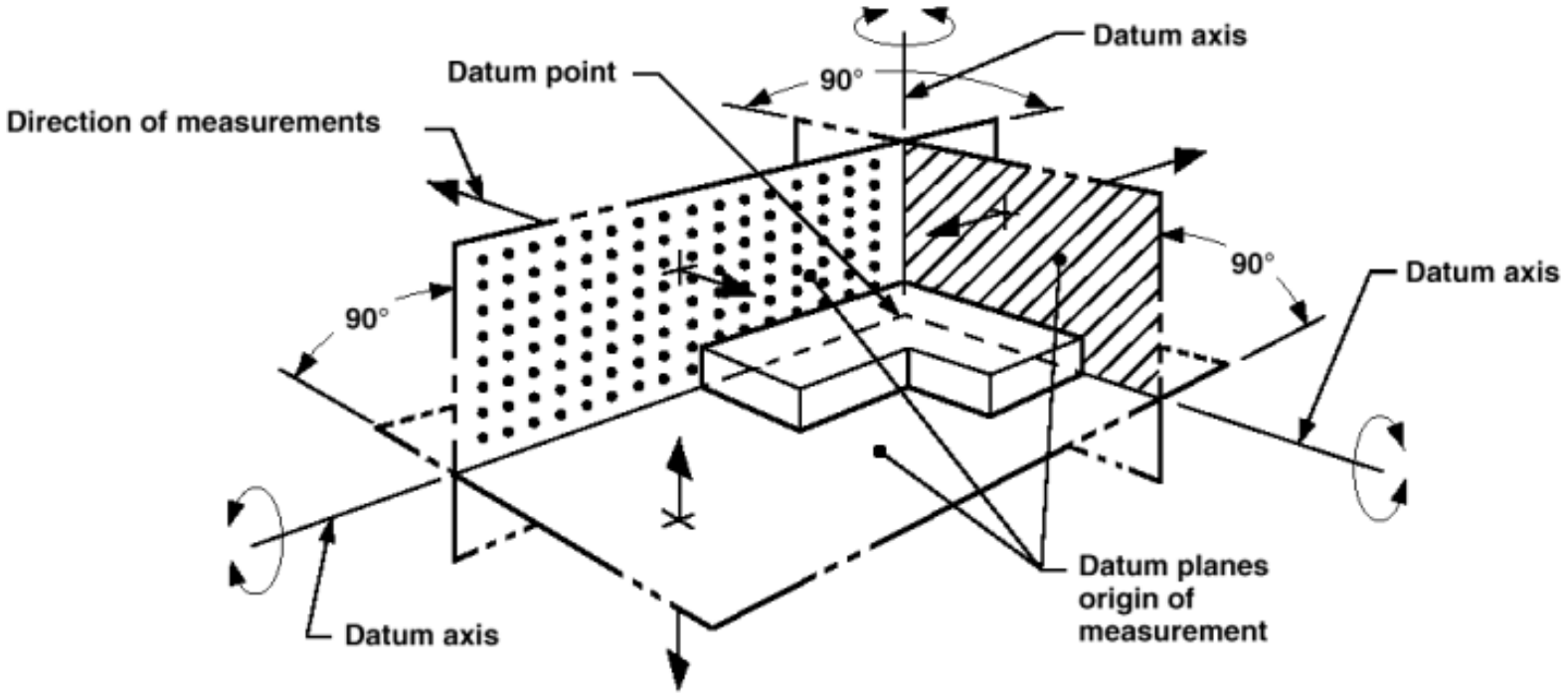
Datum reference frames are typically for **3D**. A typical datum reference frame is made up of **three planes**. For example, the three planes could be one **"face side" and two "datum edges"**. These three planes are marked **A, B** and **C**, where A is the face side, B is the first datum edge, and C is the second datum edge. In this case, the datum reference frame is A/B/C. A/B/C is shown at the end of feature control frame to show from where the measurement is taken.

http://slideplayer.com/slide/1405696/

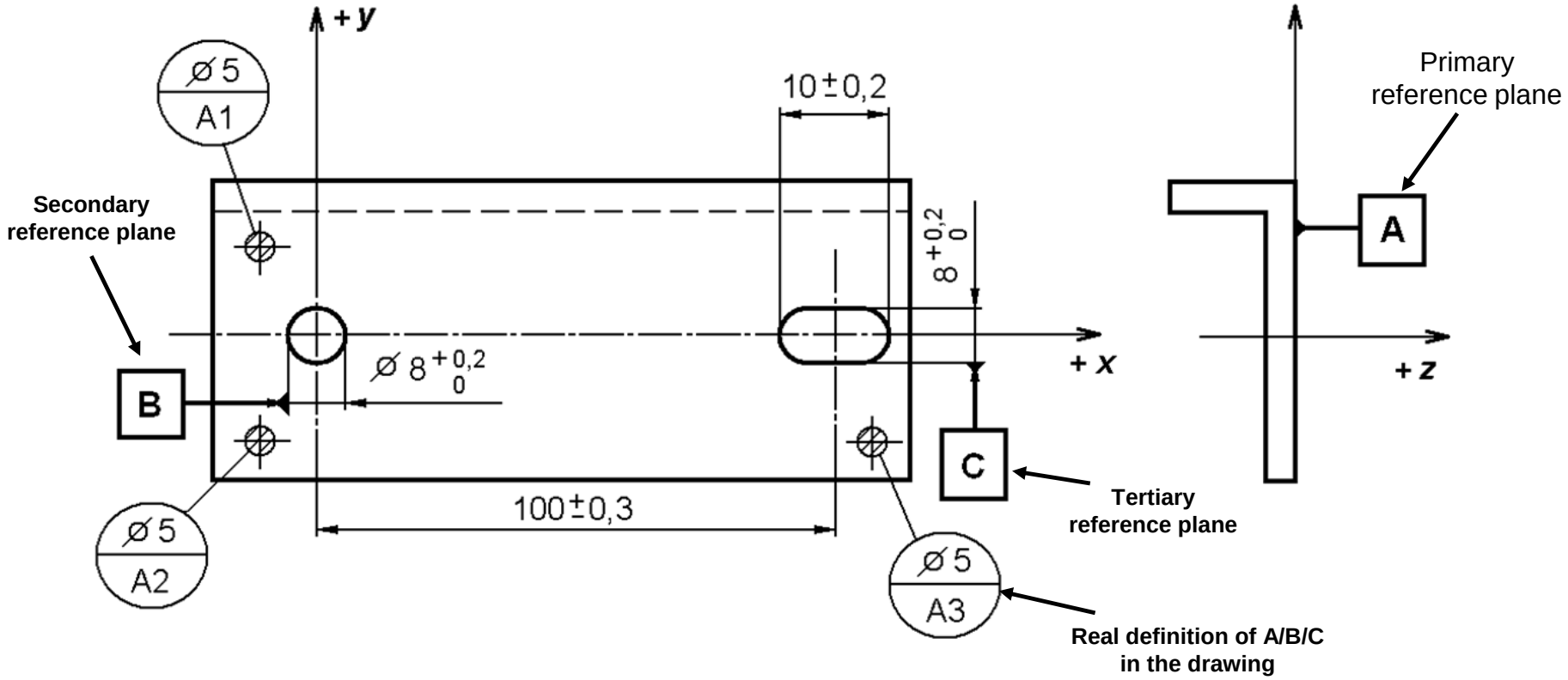
Datum reference frame

To positioning of the parts, **6°** degrees of freedom must be fix. This is achieved through 3 reference planes A/B/C. **A** is primary, **B** is secondary and **C** is tertiary. Standardly primary reference plane A fix the most degrees of freedom (3 °), C takes the least degrees of freedom (1 °). 3 + 2 + 1 = 6 are considered as all 6 degrees of freedom.

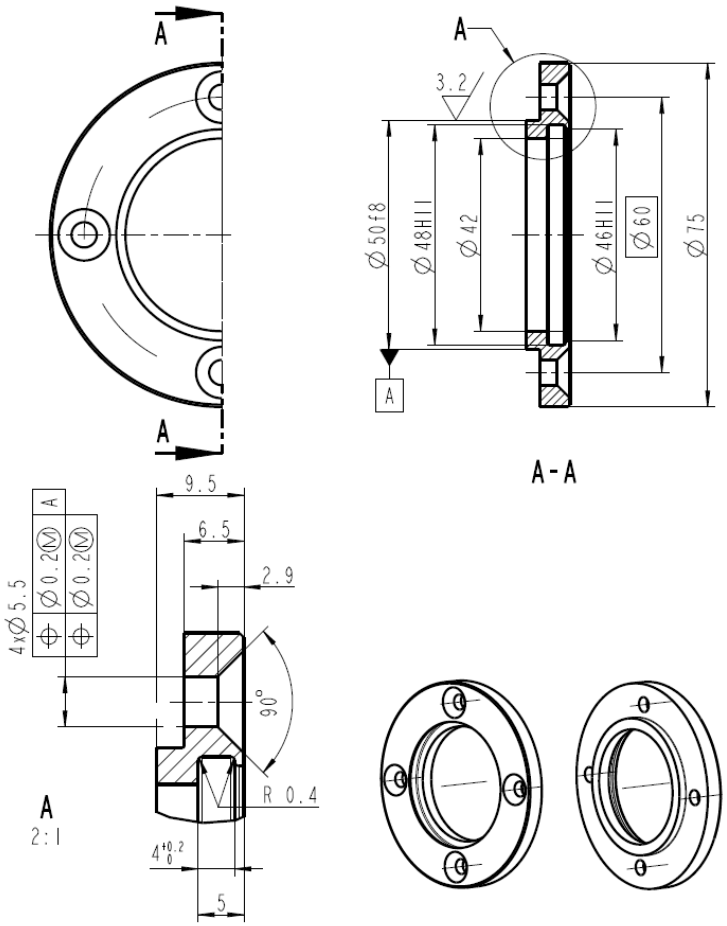
Datum reference frame - princip



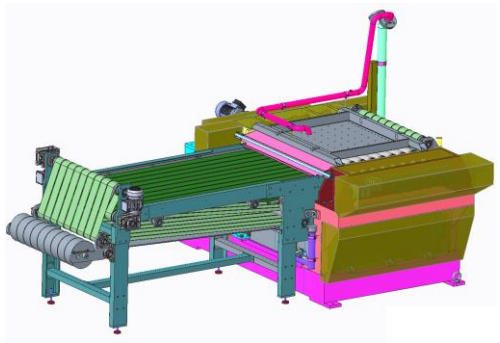
Example 1. definition of datum reference systém in the drawing

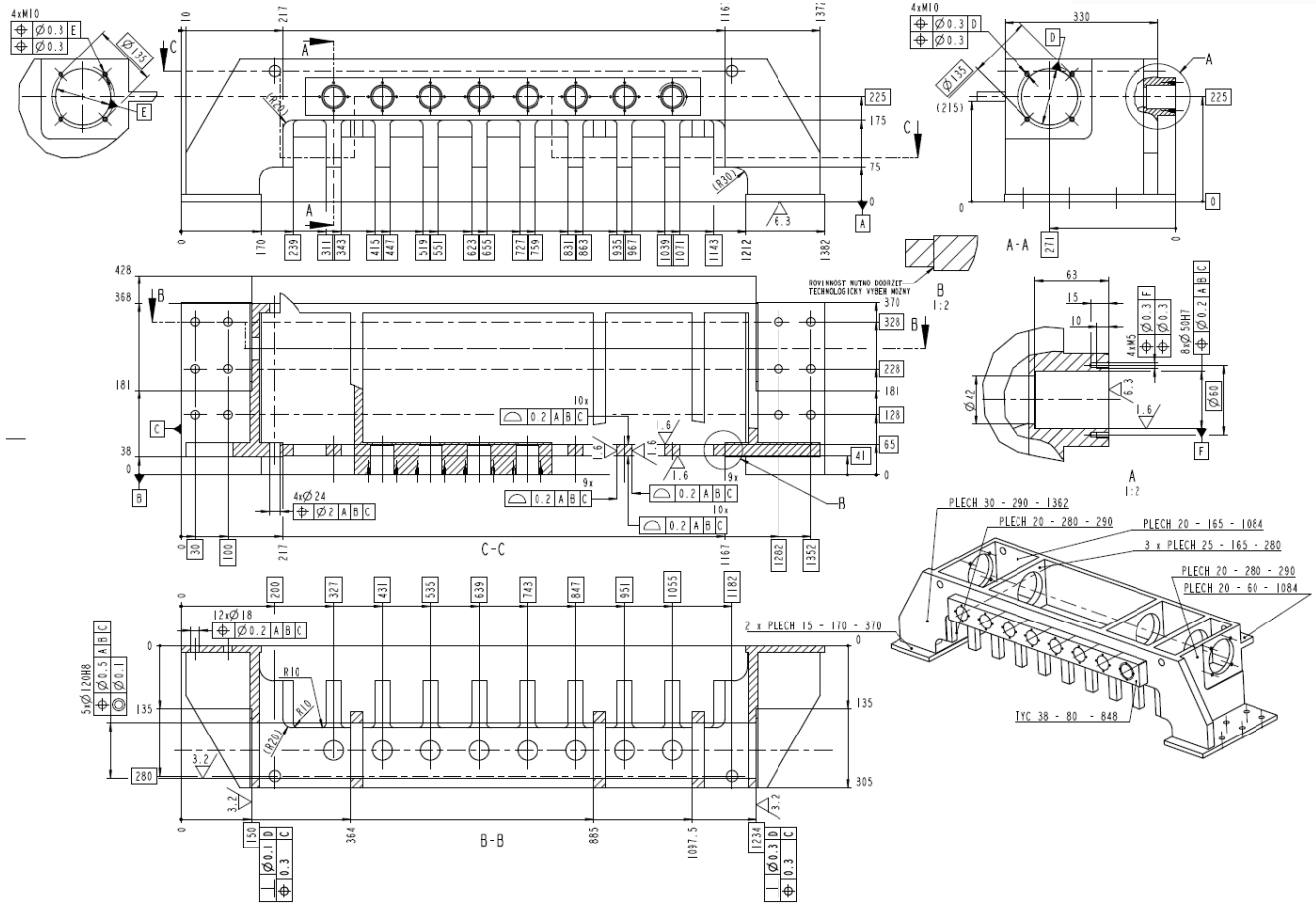


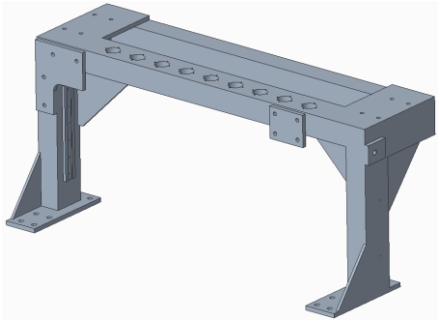
Example 2:


A
A
3.2
Ø50f8
Ø48H11
Ø42
Ø46H11
Ø60
Ø75
A
A-A
9.5
6.5
2.9
4xØ5.5
Ø0.2 M A
Ø0.2 M
90°
R 0.4
A
2:1
4 +0.2 0
5

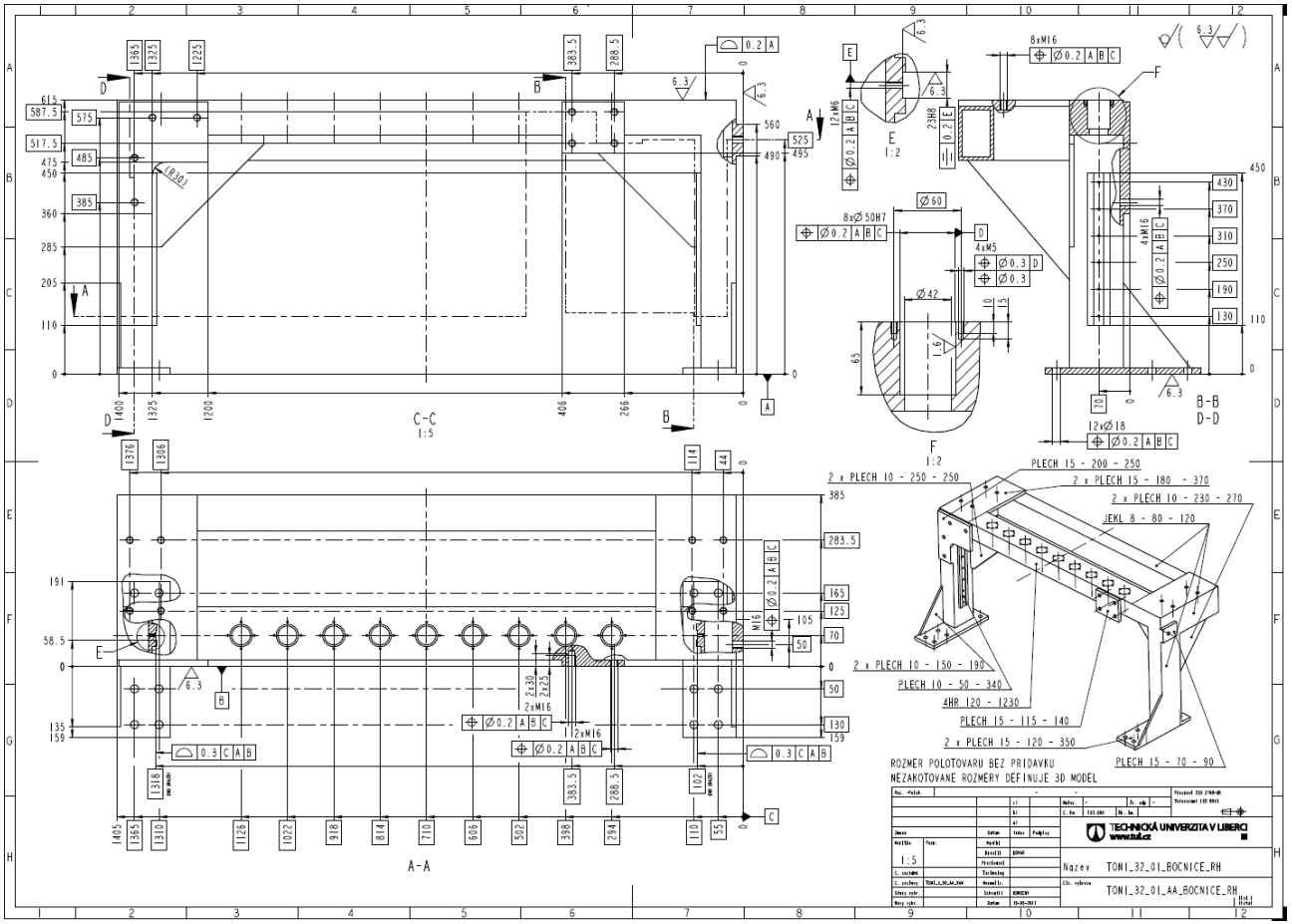
Example 3:




C-C
B-B
A-A
PLECH 30 - 290 - 1362
PLECH 20 - 280 - 290
PLECH 20 - 165 - 1084
3 x PLECH 25 - 165 - 280
PLECH 20 - 280 - 290
PLECH 20 - 60 - 1084
2 x PLECH 15 - 170 - 370
TYC 38 - 80 - 848



Example 4:


C-C
1:5
A-A
B-B
D-D
E
1:2
F
1:2
2 x PLECH 10 - 250 - 250
PLECH 15 - 200 - 250
2 x PLECH 15 - 180 - 370
2 x PLECH 10 - 230 - 270
JEKL 8 - 80 - 120
2 x PLECH 10 - 150 - 190
PLECH 10 - 50 - 340
4HR 120 - 1230
PLECH 15 - 115 - 140
2 x PLECH 15 - 120 - 350
PLECH 15 - 70 - 90
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Conclusion

CAD documentation is the main source of information about the product. It consists of 3D data and 2D drawings. 3D data is used for the production of the part, but also for many other operations. The 2D drawing documentation is used to record all product information that is not recorded in the 3D document model.

Questions:

- Define the principles of dimensioning in the drawings.
- What styles of dimensioning we have.
- Why we use the reference coordinate system.

Topic of the next lecture:

„ Determination of tolerances“

Thank You

Used literature and sources of information:

http://nvlpubs.nist.gov/nistpubs/jres/104/4/html/j44mac.htm#c1

http://www.mitcalc.com/doc/tolanalysis1d/help/cz/tolanalysis1dtxt.htm

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