1 Diagrams

Overview

This chapter provides boiler plate elements for diagrams: scales with values and title as well as grid elements are available for these types:

- linear
- logarithmic with various unit lengths
- powers and roots
- trigonometric functions
- projective scale

Samples of diagrams created with these elements demonstrate usage and style.[1)]

1 Make construction lines visible in FrameMaker with **View > Color > Views** : Graphic-construction.

Graphic elements

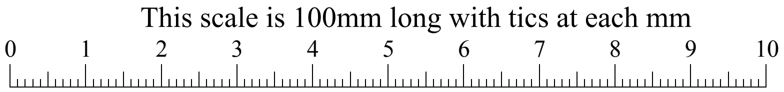
Scales for diagrams

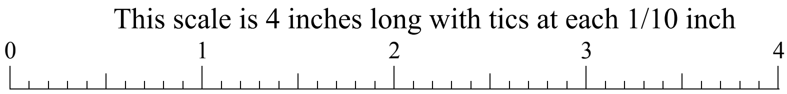
The following scales can be used for nice diagrams. All scales comprise these elements:

- Tic marks
- Axis (the spine) - not present in all templates
- Figures (using character format **x-figure**)
- Title (using character format **x-title**)

Adjust a scale to your needs

To adjust a scale to your needs (e.g. to make an inch ruler):





- Make a copy of the desired scale (in this case, the linear scale).
- Ungroup the elements (you get the basic elements).
- Use a large zoom factor for positioning.
- Do not use spacing smaller than 2mm in diagrams when printed on an ordinary laser printer.

Note: *Be very careful manipulating the ungrouped tic marks! Remember that there is **only one undo** in FrameMaker. The arrangement of the tic marks is the core of the boilerplate scales!*

Adjust the tic marks[2)]

- Adjust the length of the tic-mark cluster (100mm ➔ 254mm)
- Ungroup the tic mark cluster and delete all unneeded tic marks
- Group the tic marks

Adjust the figures

- Ungroup the Figures
- Remove the un-needed figures
- Redistribute the figures horizontally
- Group the figures

Adjust the title

- Select the title text and change it
- Select the title and then the tic marks
- Align the title to the tic marks

Put it together again

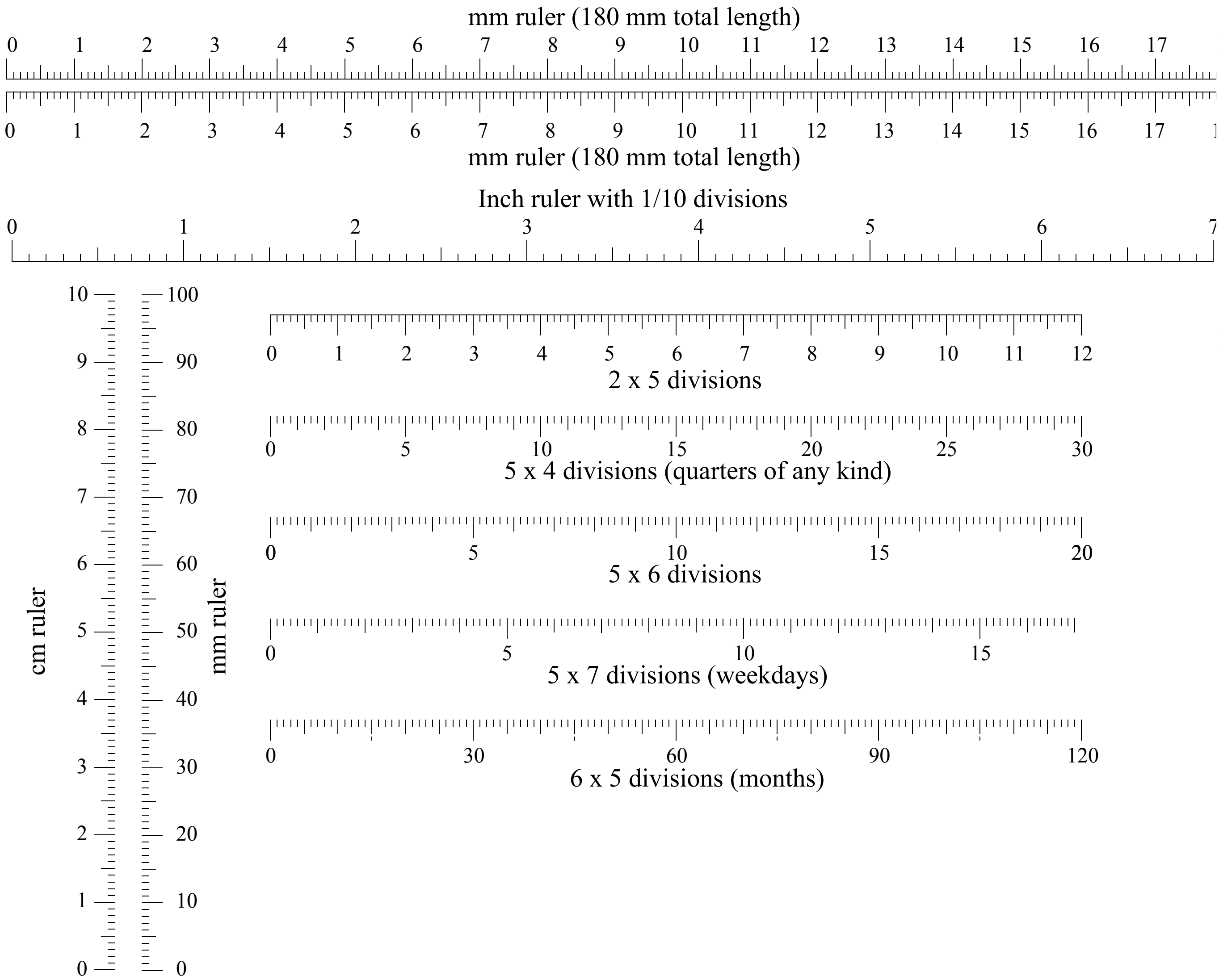
- Select all four elements of the adjusted scale
- Group the elements to prevent accidental misalignment.

2 An object may not have its centre of gravity outside a frame (or it will no more belong to the frame). Hence it may be necessary to first ungroup the tic mark cluster and remove any unneeded tics, re-group and adjust the length.

Scales and grid elements

Linear scales

Linear scales can be set up with FrameMaker tools without much work. For your convenience, some items are prepared here.



Linear grids

The grids have these properties:

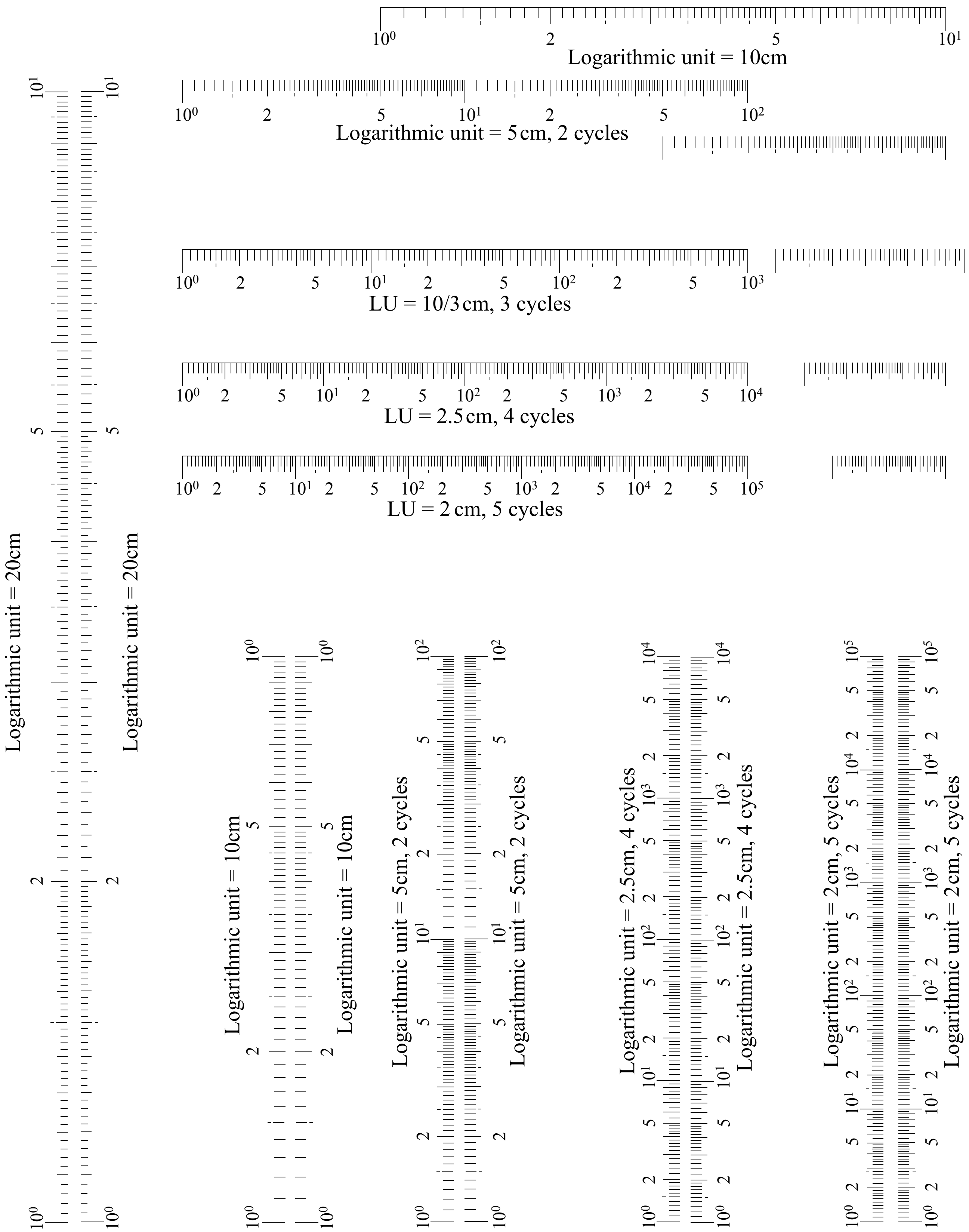
- Divisions at 1 cm, line 0.3 pt, black
- Subdivisions at 0.2 cm, line 0.3 pt, 40% gray

6-divisions for months, years etc.

7-divisions for weekdays

4-divisions for quarters of any kind

Logarithmic scales



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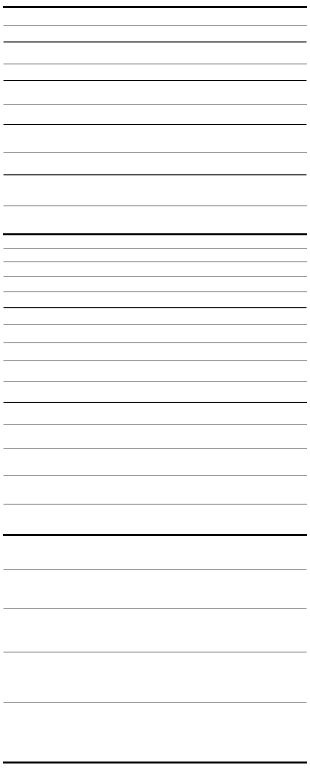
E:\FM-course\handout\Aside\diagrams.fm

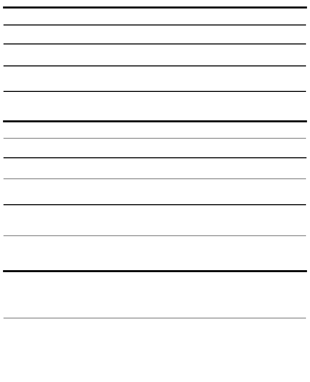
Logarithmic grids

1, 2 and 5 - line 0.6 pt, black
3, 4, 6, 7, 8, 9 - line 0.3 pt, black
Subdivisions 0.3 pt, 40% gray

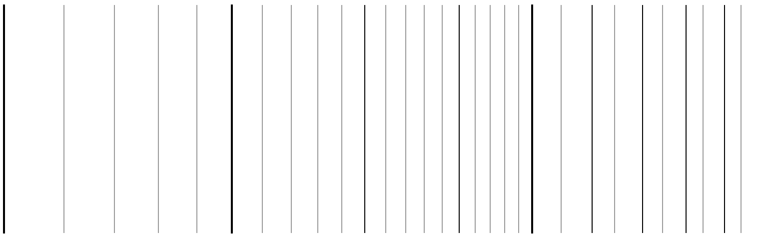
Logarithmic unit = 10 cm



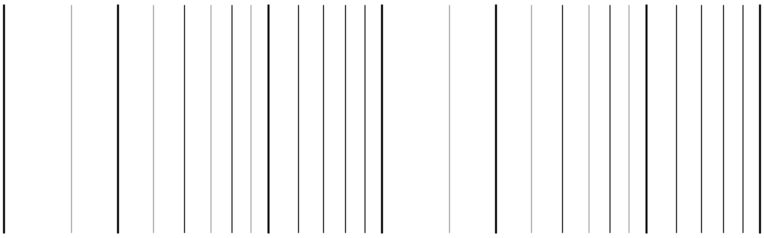
Logarithmic unit = 5 cm



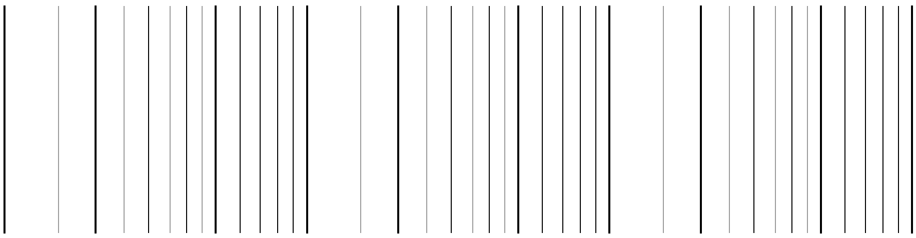
Logarithmic unit = 10 cm (1 cycle)



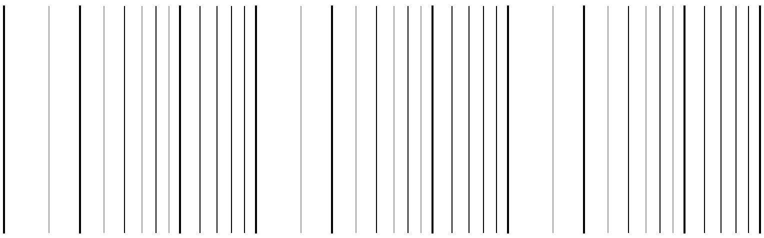
Logarithmic unit = 5 cm (2 cycles)



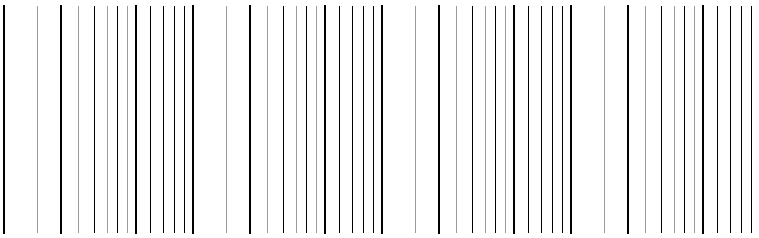
Logarithmic unit = 4 cm (3 cycles)



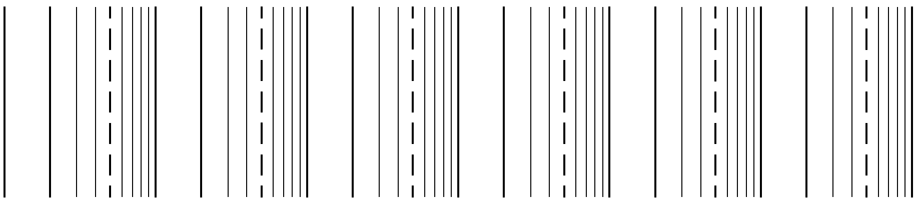
Logarithmic unit = 10/3 cm (3 cycles)



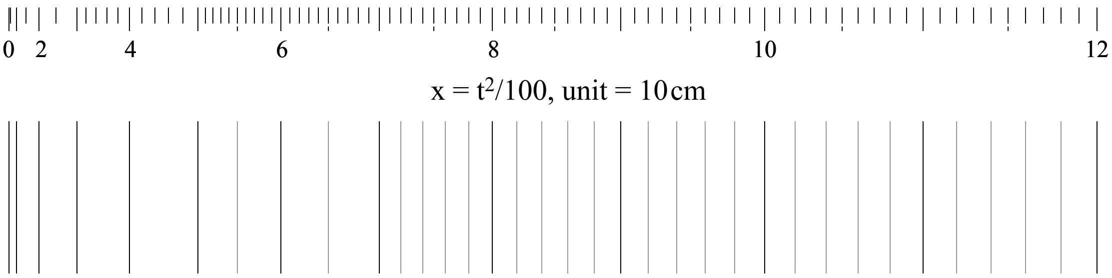
Logarithmic unit = 2.5 cm (4 cycles)



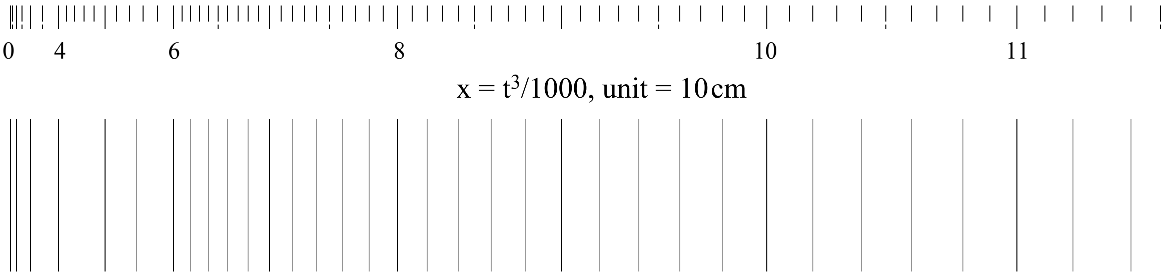
Logarithmic unit = 2 cm (6 cycles)



Powers

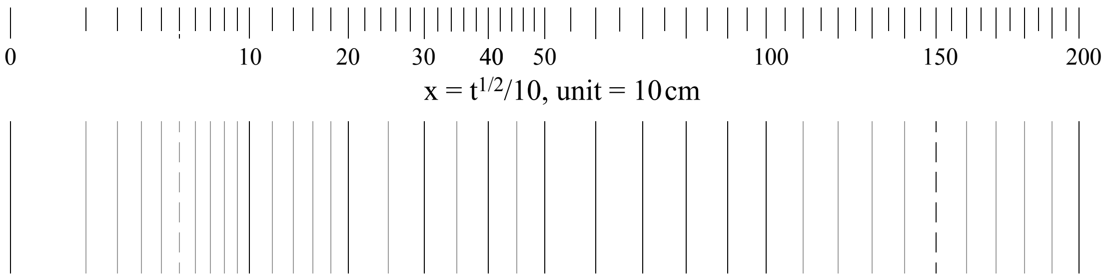


$x = t^2/100$, unit = 10 cm

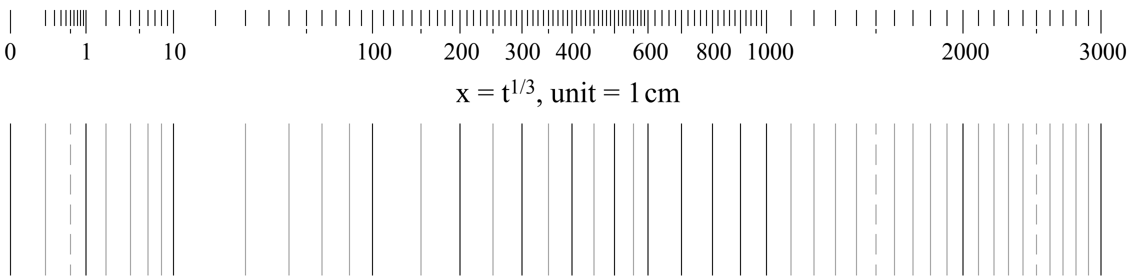


$x = t^3/1000$, unit = 10 cm

Roots

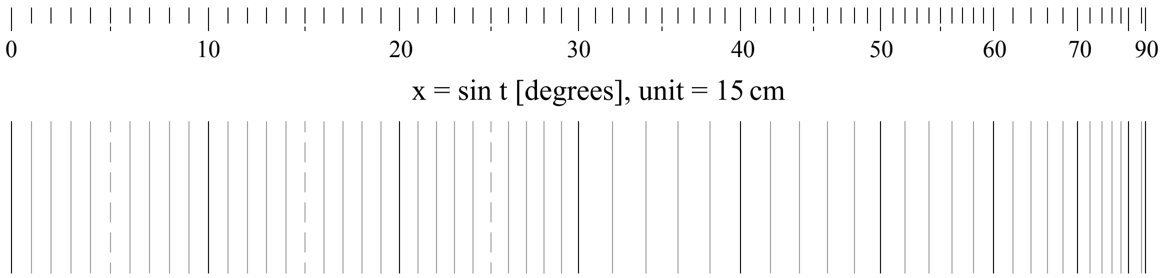


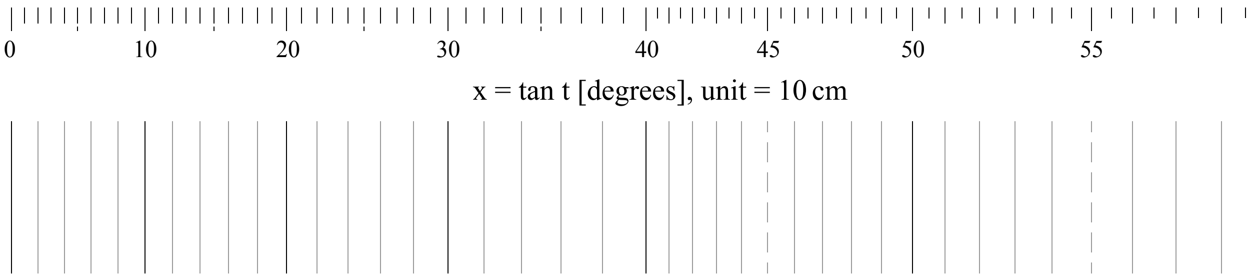
$x = t^{1/2}/10$, unit = 10 cm



$x = t^{1/3}$, unit = 1 cm

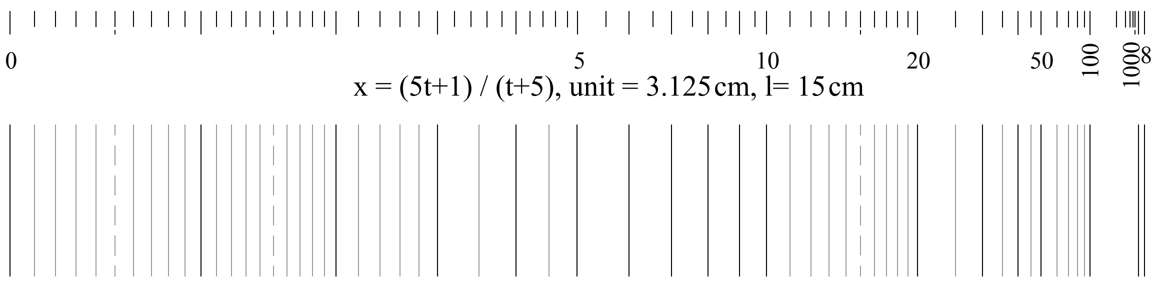
Trigonometric functions





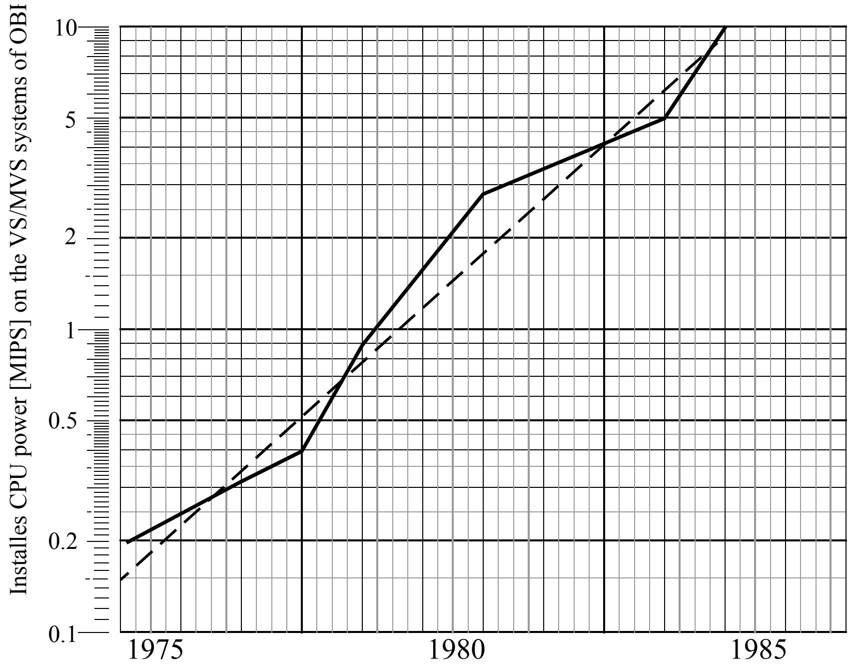
Projective scale

Projective scales result from the perspective distortion of a linear scale. For a given length there exist an infinite number of scales. For these scales the *unit* has no direct relation to any length on the scale.



Examples

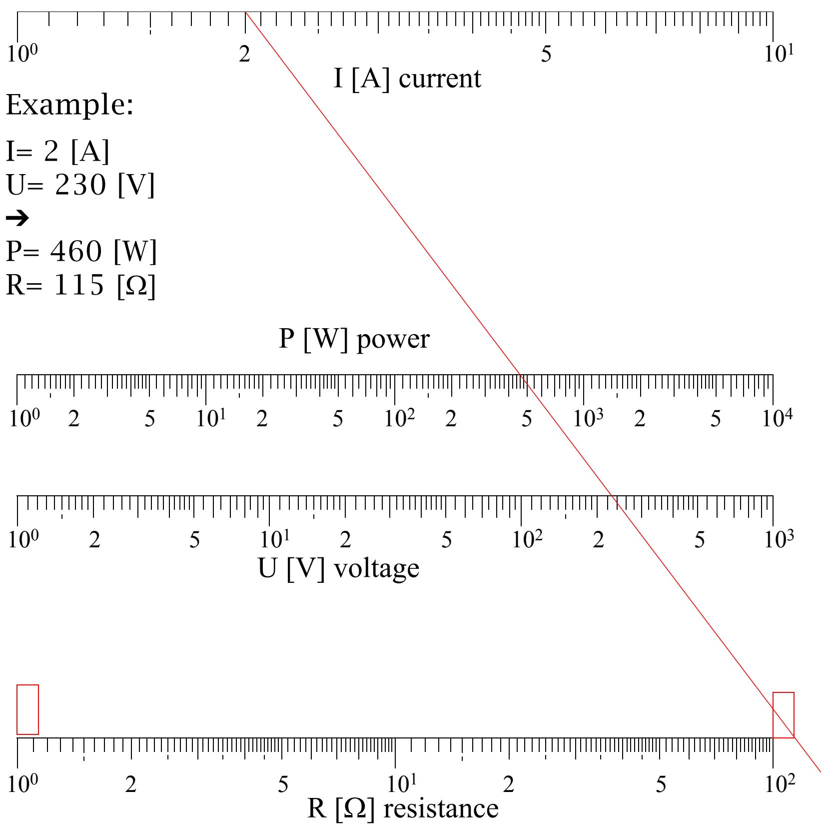
Diagram



Source: Klaus Daube, OBR-DTA report 27, Zürich 1988-05-06

Nomograph of Ohm’s law

$P = U \cdot I; R = U/I$



Example:

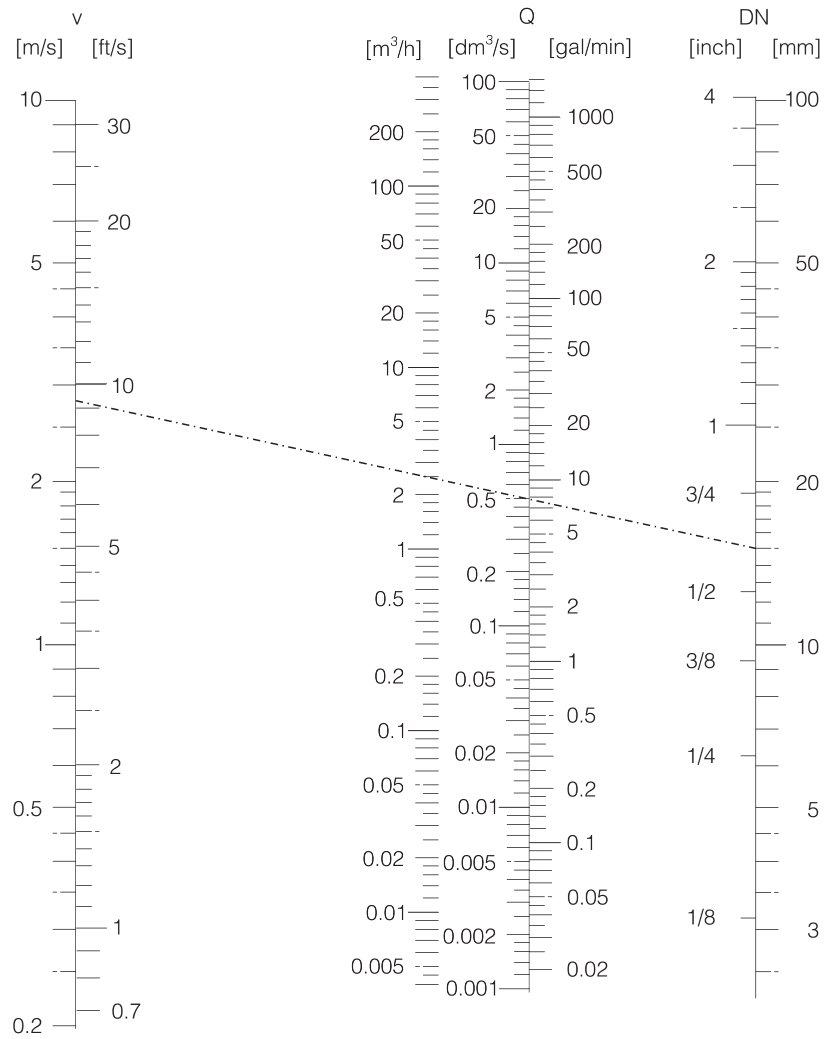
I= 2 [A]
U= 230 [V]
➔
P= 460 [W]
R= 115 [Ω]

Nomograph of flow properties

General formula $Q = v\frac{\pi}{4}d^2$

Formula with dimensions $Q[\mathrm{dm^3/min}] = v[\mathrm{m/s}]60[\mathrm{s/min}]10[\mathrm{dm/m}]\frac{\pi}{4}d^2[\mathrm{mm^2}]10^{-4}[\mathrm{dm^2/mm^2}]$

Constants 1 USgal = 3.785 dm^3; 1 ft = 0.305 m



Example Q= 30 dm^3/min., DN 15 ➔ v = 2.8 m/s (exactly: 2.83) or 9.3 ft/s.

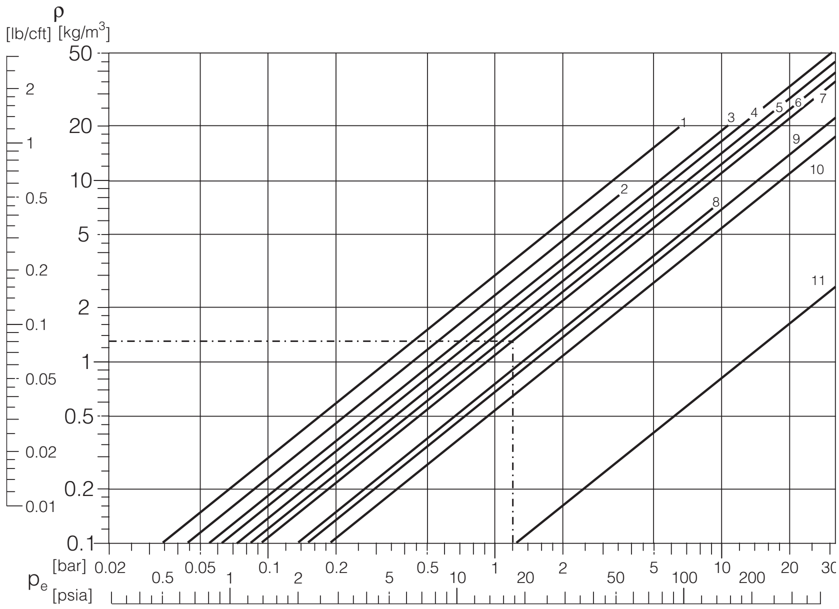
Density of gases

Formula

For temperatures aroung 0 ˚C be valid: $\rho_t = \rho_0 \frac{273\ [°C]}{273 + t\ [°C]}$

Constants

1 [lb/cft] = 16.02 [kg/m³]; 1 [psia] = 0.069 [bar]



Nr	German	English	Nr	German	English
1	Chlorgas	Chlorine	7	Acetylene	Acetylene
2	Butan	Butane	8	Ammoniak	Ammonia
3	Porpan	Propane	9	Methan	Methane
4	Kohlendioxyd	Carbon dioxide	10	Stadtgas	City gas
5	Luft	Air	11	Wasserstoff	Hydrogen
6	Stickstoff	Nitrogen			

Example

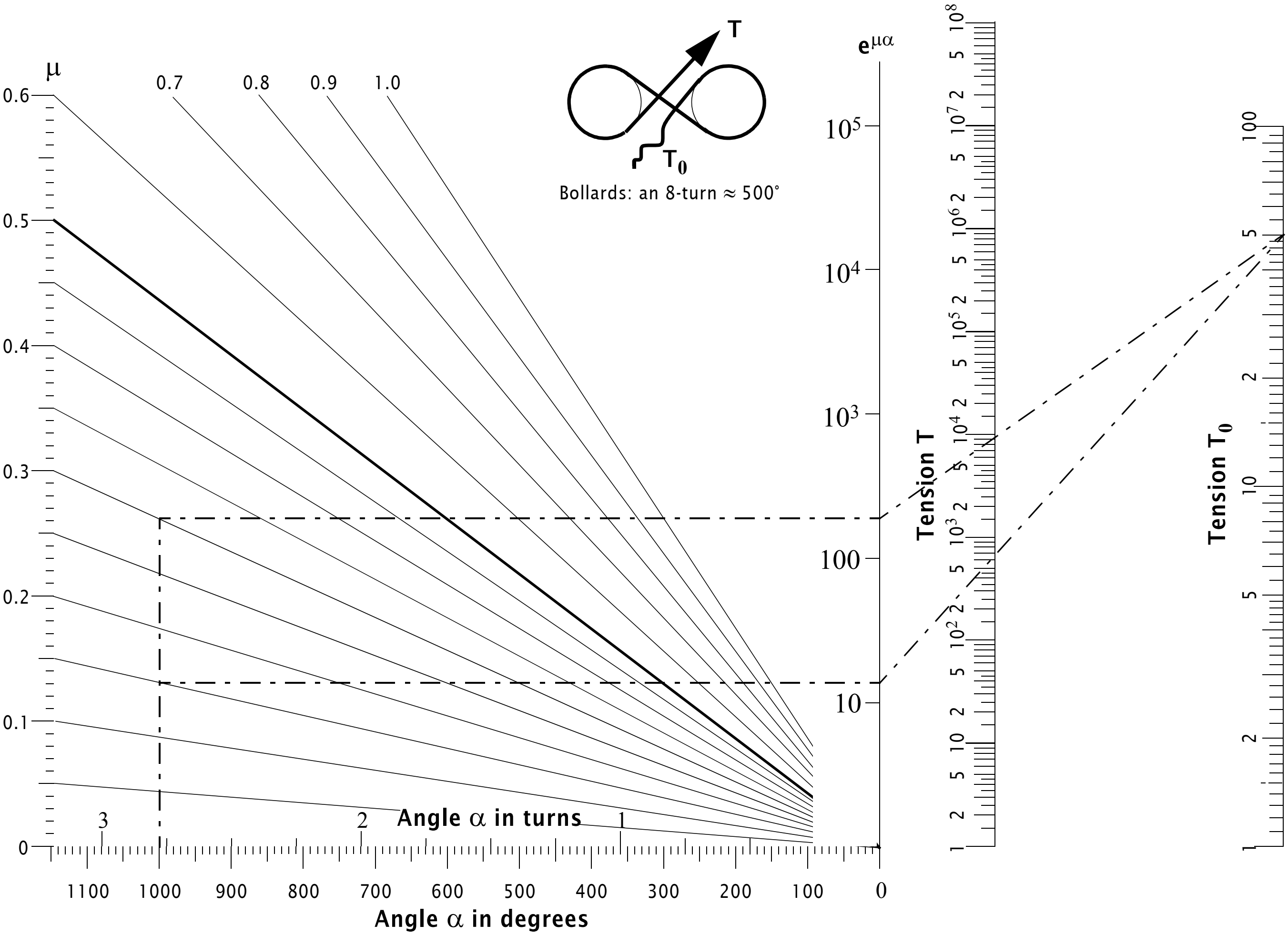
Density of acetylen (7) ati 12 [bar] absolute pressure is 13 [kg/m³] at 0 [˚C].
At 50 [˚C] it is according to the formula 11 [kg/m³].

Nomograph for enlacement friction

Enlacement friction is present for example in

- A rope round a capstan in a harbour (friction with slip)
- A rope turned in 8-shape round 2 bollards in a harbour (initially friction with slip, then without slip)
- Leather band on pulley

General formula $T = T_0 e^{\mu\alpha}$



Example $\mu = 0.3$, $\alpha = 1000^\circ$ (2 8-turns): $e^{\mu\alpha} \approx 200$; $T_0 = 50$ ➔ $T = 10'000$

Note: *T_0 and T use the same dimension: kg, lb, ton or whatever.*

Some values for μ

without slip, dry		with slip, dry	
Material-pair	**μ**	**Material-pair**	**μ**
Steel - steel	0.15	Steel-steel	0.1
Metal on wood	0.5 ...0.6	Metal on wood	0.2...0.5
Leather on metal	0.6	Leather on metal	0.25
Textile on cast iron		Textile on cast iron	0.3...0.5
Steel rope on bollard	0.15	Steel rope on capstan	0.13