Seminar 1:
How to draw the tolerance zone by nominal and limited dimensions

Standardization and measurement assurance of engineering production

Step 1: Example

we have shaft with:

- Nominal diameter= 25 mm
- Max limited dimension =25.015 mm
- Min limited dimension =25.005 mm

It is necessary to:

1) calculate limited deviations

2) draw the tolerance zone of the dimension

Step 2: Calculation

We know two limited deviations:

- Upper deviation: es=dmax- dn
- Lower deviation: ei=dmin-dn

dn, dmax & dmin are given:

dn=25 mm

dmax=25.015 mm

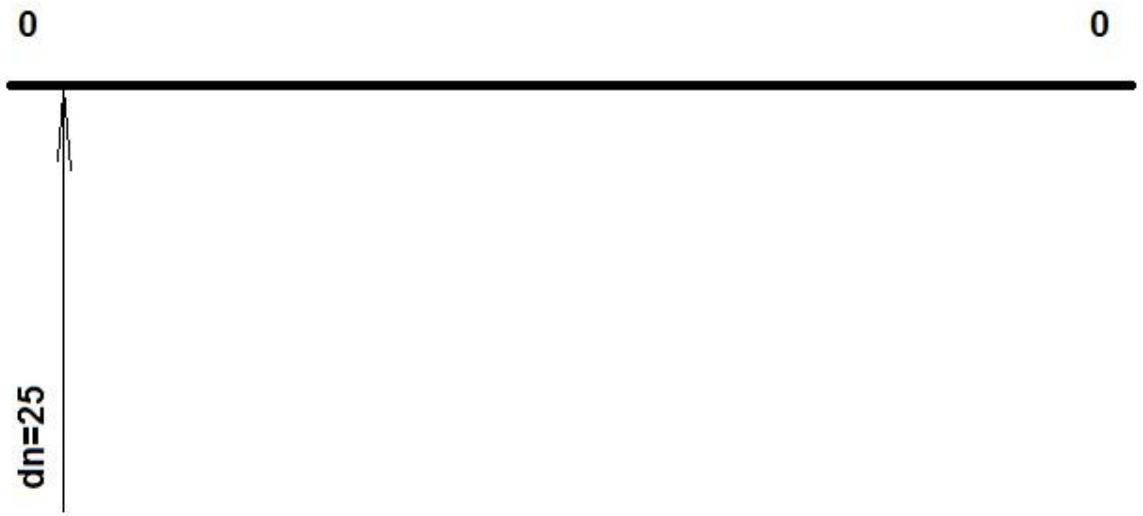
dmin=25.005 mm

So es= 25.015-25.000=0.015 mm=15μm (micrometers)

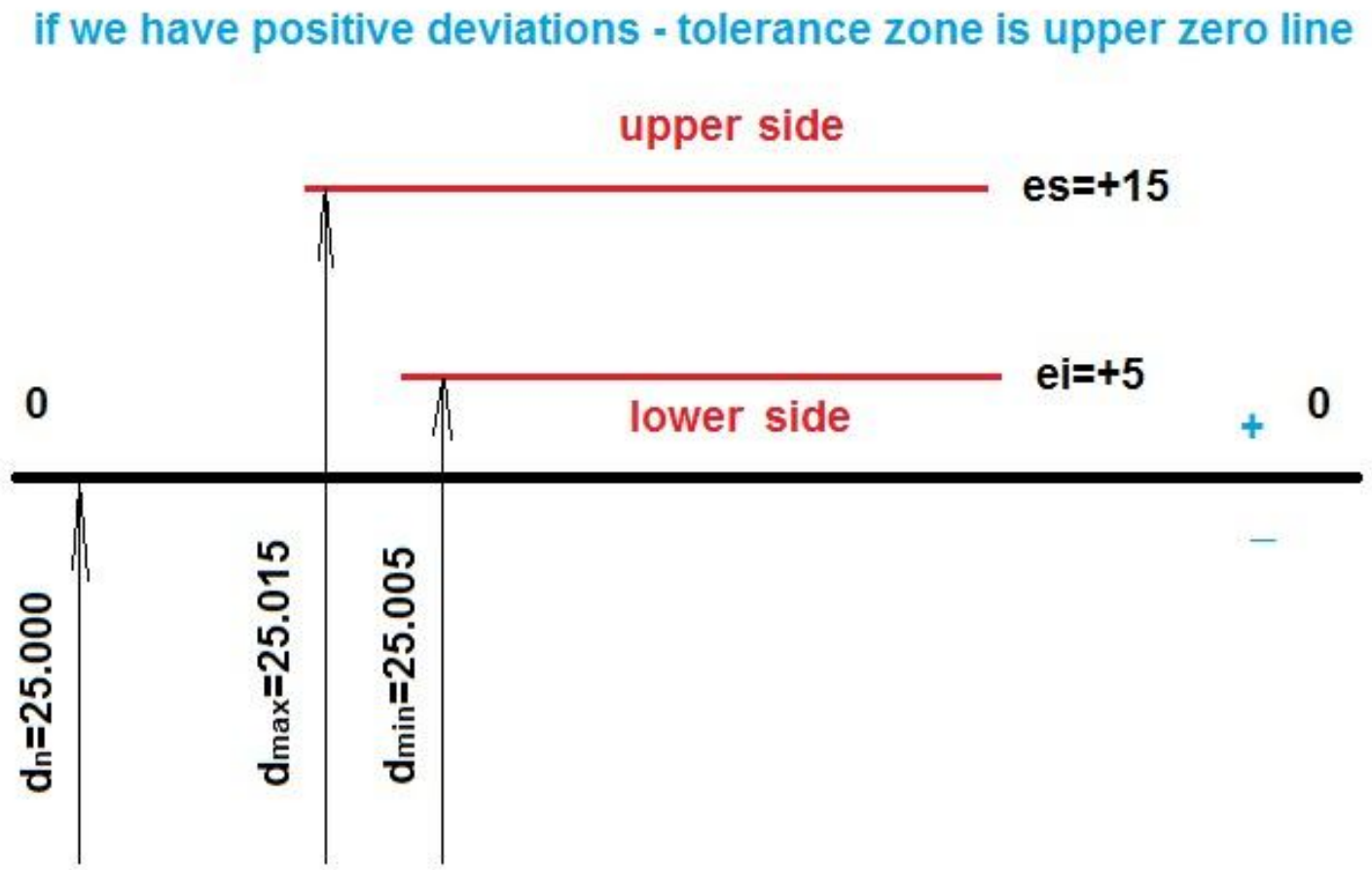
ei=25.005-25.000=0.005 mm=5 μm

Step 3: Drawing zero line

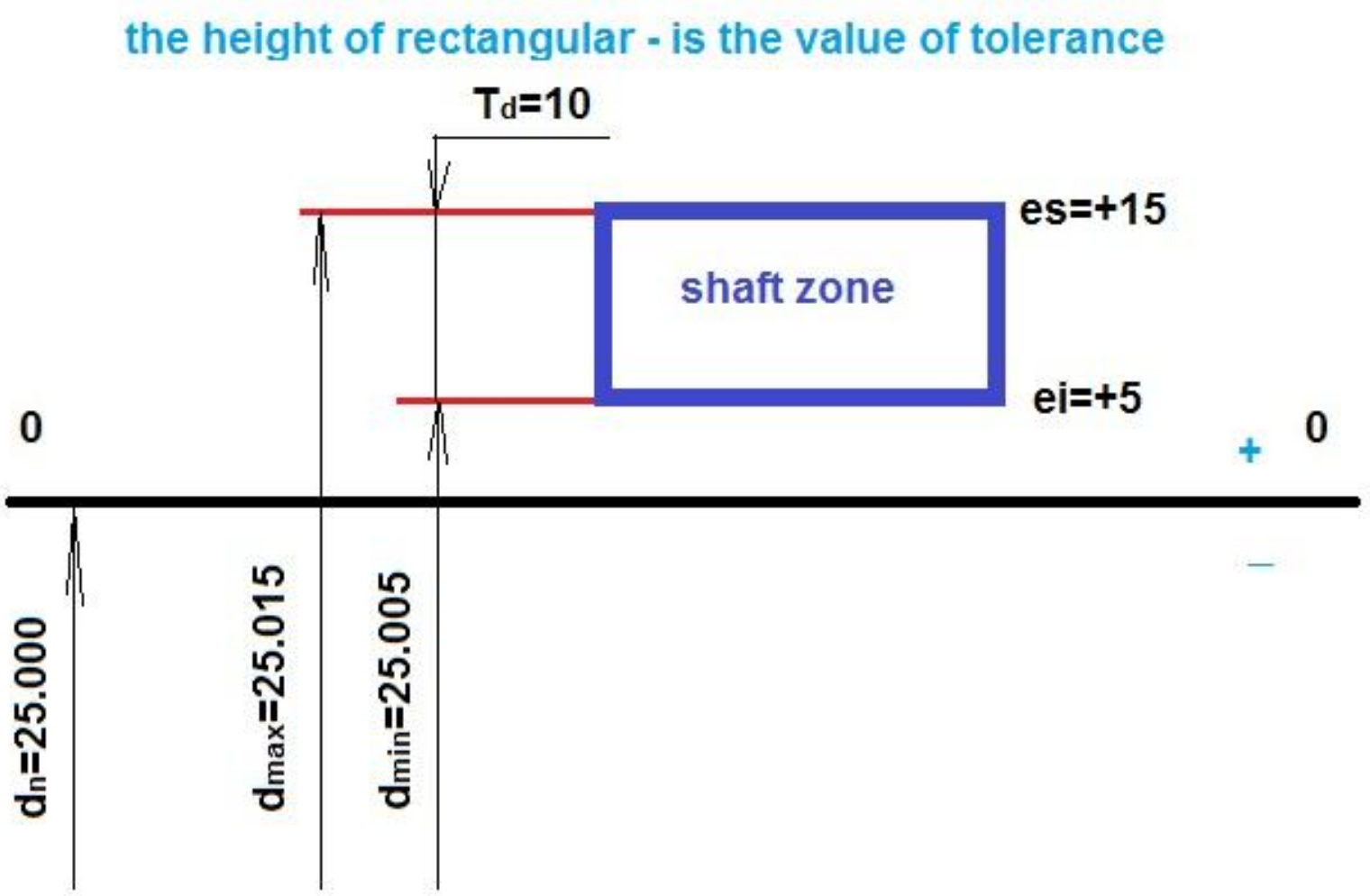
draw the zero line -
level of a nominal diameter



Step 4: Drawing the boundaries of tolerance zone



Step 5: Drawing the zone & calculate the tolerance

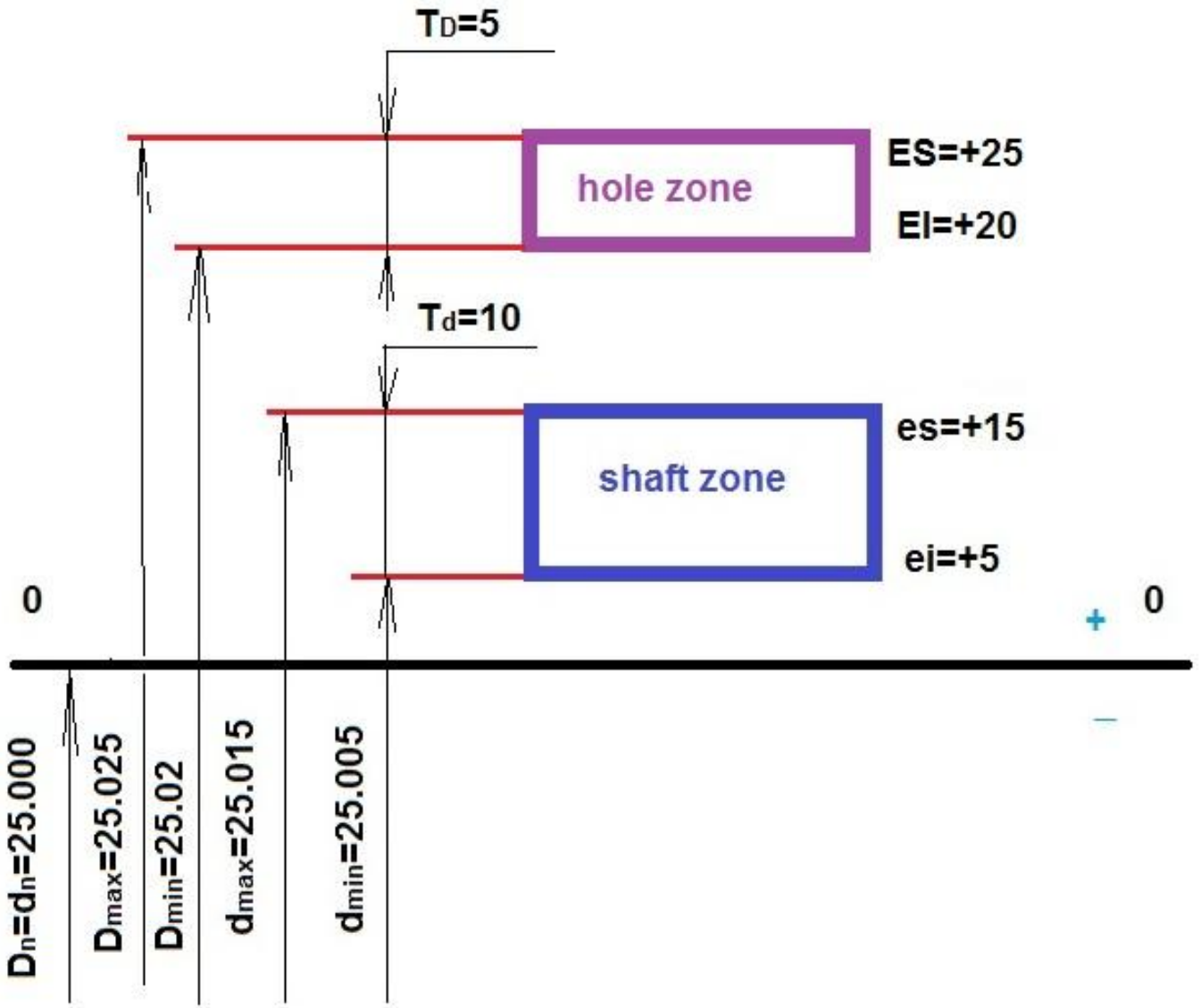


Step 6: Tolerance zones for joint

For example we have two joint parts (details):

- shaft $\varnothing 25^{+0.015}_{+0.005}$
- bush $\varnothing 25^{+0.025}_{+0.02}$

Step 7: Drawing the second zone



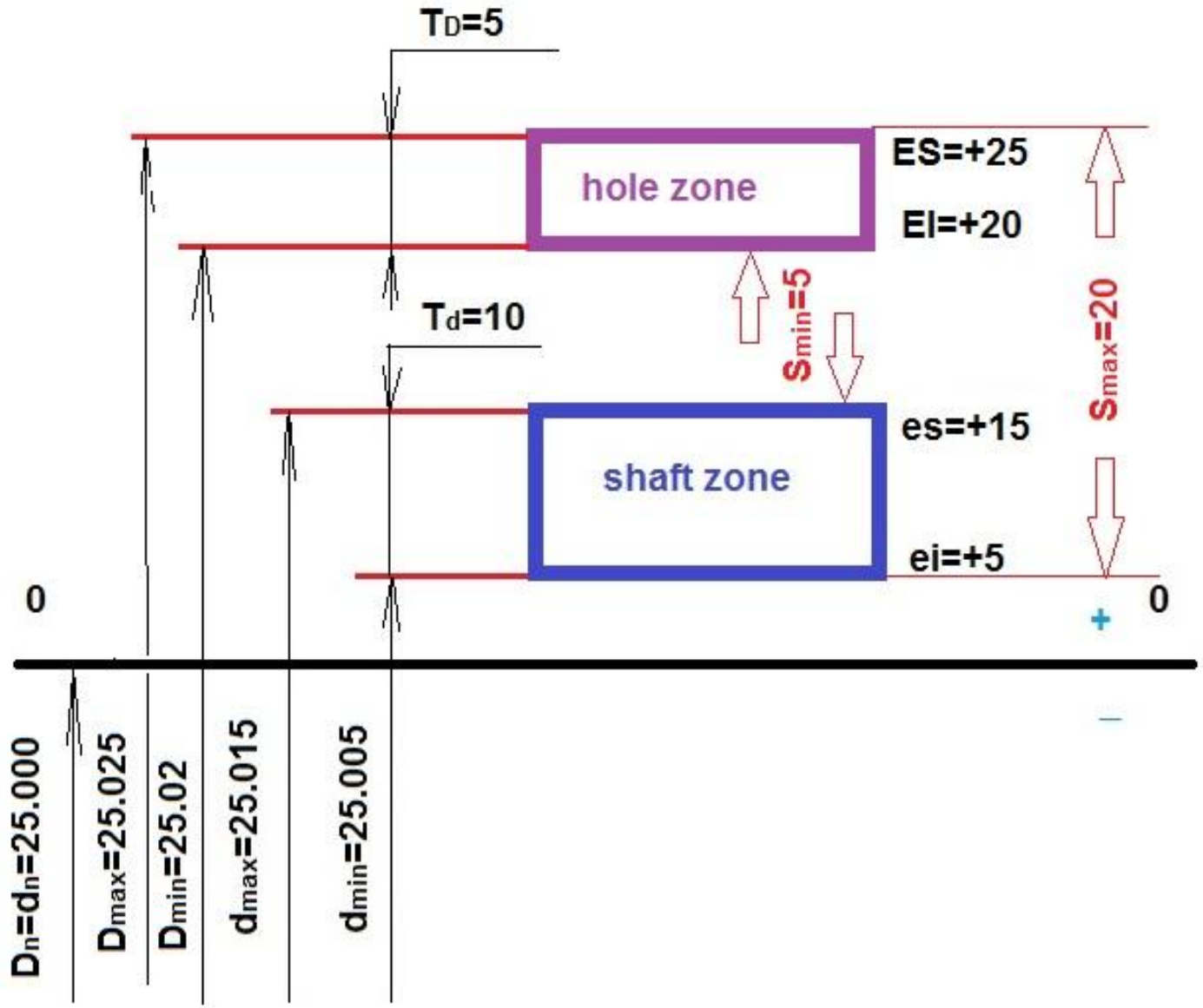
Step 8: Defining of the fit type

Some rules:

- if hole zone upper than shaft zone – it is clearance
- if shaft zone upper than hole zone – it is interference
- if zones are particularly or fully intersected – it is transition fit

Step 9: Calculate limited clearances (interferences)

we have clearance fit



Step 10: Calculation of fit tolerance

The fit tolerance equal to difference between maximum & minimum clearances (interferences) & also equal to sum of two details tolerances:

$$T_S = S_{max} - S_{min} = 20 - 5 = 15 = T_D + T_d$$