



NF Wire Forum



Deutsches
Kupferinstitut
Copper Alliance



Drawing process

What can Balloffet do to reduce wire breakage



Wire breaks – the view from the die producer

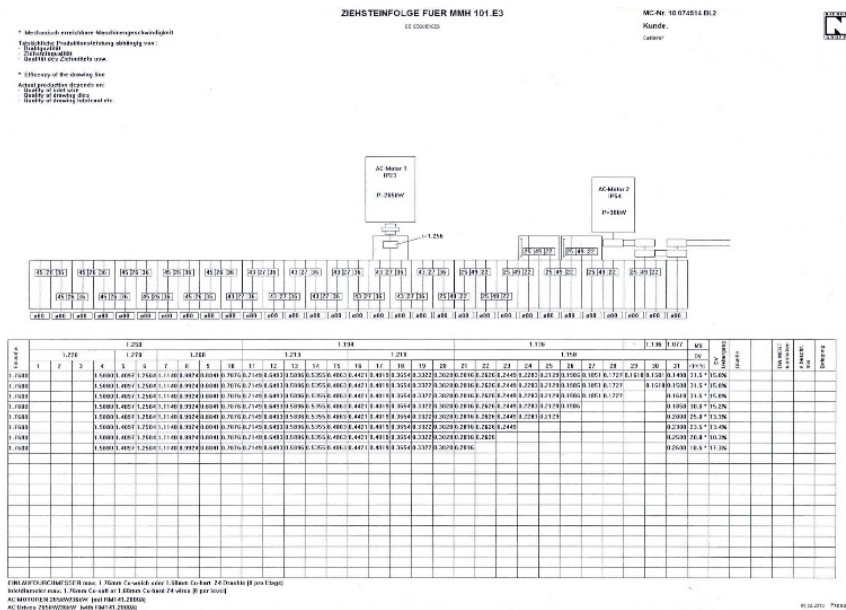
1. Wrong diameter
2. Geometry not respected
3. Rough polishing
4. Dies are not cleaned
5. Mishandling on dies (wrong in die holder)
6. Imperfect technical matching – drawing machine parameter / die sequence
7. Dies are in the wrong position
8. Elongation problems and/or unsuitable slip
9. Lack of die maintenance, extreme die wear, deep drawing ring,
10. irregular die wear

Balloffet technical check list on drawing die parameters to reduce risks of wire breakages.



Potential root causes analysis :

- 1. Imperfect technical matching:
 - machine parameter ./ die sequence



Balloffet Check list of possible actions :

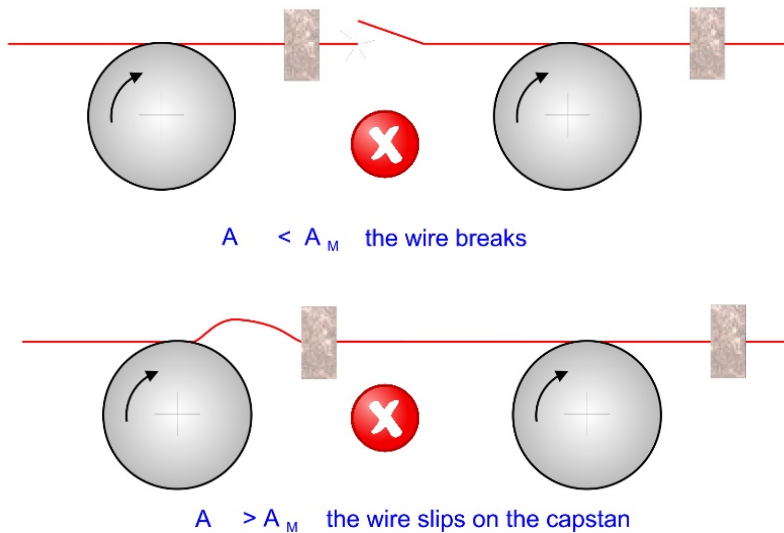
- 1. Complete die sequence calculation
 - sizes
 - Elongation
 - slip

Die set control		
Ø	K	Elong %
0.2	Final die	
0.2129	1.07233443	14.99%
0.2283	1.07271134	15.07%
0.2449	1.0722744	14.98%
0.2626	1.07235339	14.99%
0.2816	1.07244318	15.01%
0.302	1.1	21.00%
0.3322	1.0999398	20.99%
0.3654	1.09989053	20.98%
0.4019	1.10002488	21.01%
0.4421	1.09997738	21.00%
0.4863	1.10117212	21.26%
0.5355	1.10102708	21.23%
0.5896	1.10125509	21.28%
0.6493	0	-100.00%

Balloffet technical check list:

Potential root cause analysis :

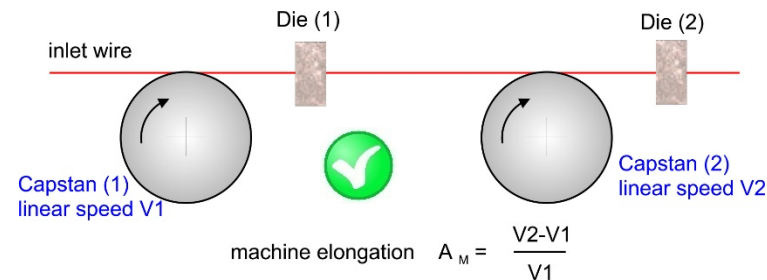
2. Elongation problems and/or wrong slip.



Balloffet Check list of possible actions :

2. Controle by Balloffet of :

- Die set elongation in accordance the machine specification.
- Difference between die elongation and machine elongation = theoretical slip depending on type and size of drawn material .



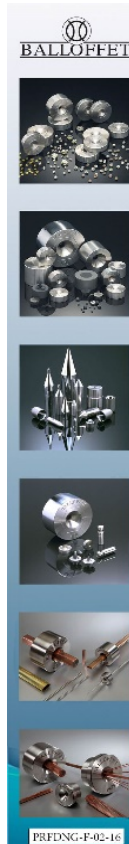
Balloffet technical check list:

Potential root cause analysis :

3. Die issues

- wrong Diameter
- unsuitable geometry
- rough polishing
- wrong tolerances

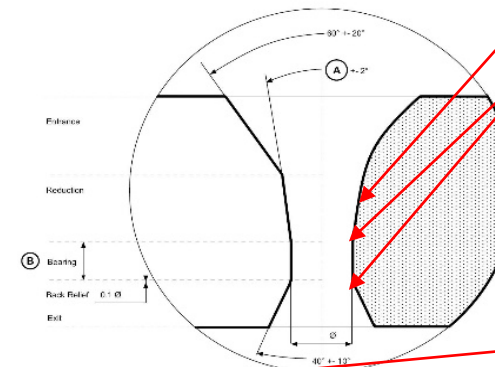
Balloffet Check list of possible actions :



Typical profile

**Single Crystal
Diamond dies
over 100 µ**

NSCD : Natural Single Crystal Diamond
or
SSCD : Synthetic Single Crystal Diamond



Size Range (mm)	Soft Material		Hard Material		Standard Tolerance (mm)	Tightest Tolerance (on request)	Out of roundness (µm)	Standard Casing Ø x H (mm)
	A	B	A	B				
> 0.10 - 0.20					1.0	0.8	0.8	25 or 28 x 8 or 6
> 0.20 - 0.50					2.0	1.0	1.0	25 or 28 x 8 or 6
> 0.50 - 1.00					2.5	1.5	1.3	25 or 28 x 10 or 8
> 1.00 - 1.50	18°	0.3 - 0.5 Ø	14°	0.4 - 0.6 Ø	3.0	2.0	1.5	25 or 28 x 12 or 10
> 1.50 - 2.00					3.0	2.0	1.5	25 or 28 x 12 or 10
> 2.00					3.5	2.5	2.0	25 or 28 x 14 or 12

These tolerances can only be achieved by using the same measurement methods.

Tightest Tolerance : This level of precision can be reached under special conditions. Please contact BALLOFFET for any further information

Above data are suggested by BALLOFFET. All other specifications or special requirement(s) must be agreed by BALLOFFET before placing an order.

Balloffet technical check list:

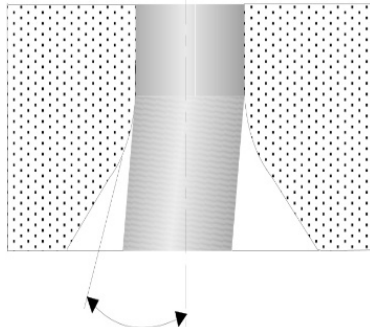
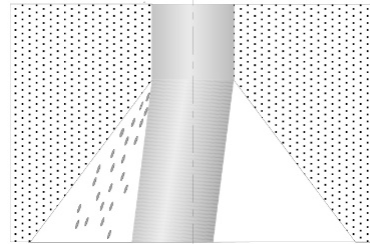
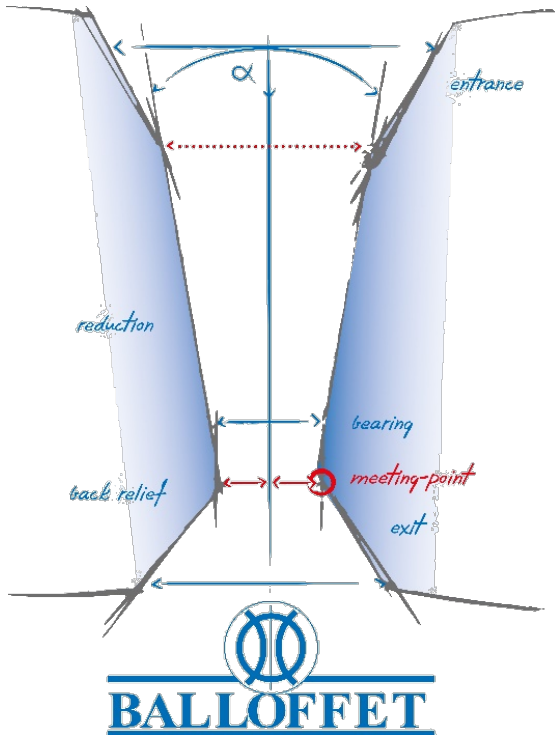


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Potential root cause analysis :



4. Die issues



Balloffet Check list of possible actions :

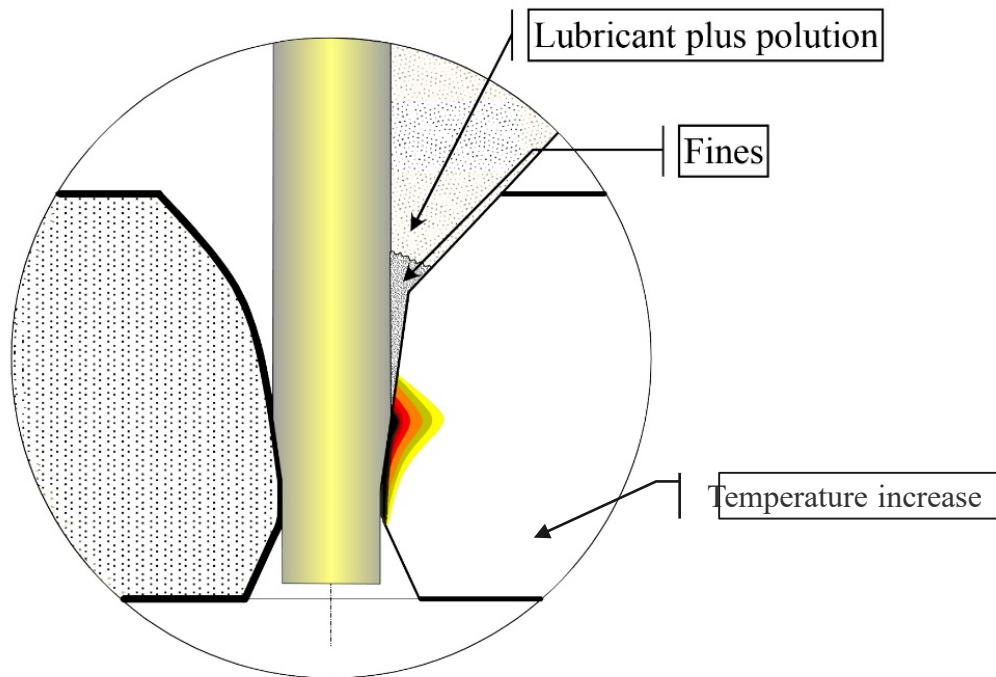
4 . Securing a premium quality on :

- Die Size \varnothing with adapted tolerances
- Die geometry
- Die blending
- Mirror polishing
 - same size (from the same position) and
 - inside the same die set in the machine.

Balloffet technical check list:

Potential root cause analysis :

5 . Lack or incorrect lubrication



Balloffet Check list of possible actions :

5. Necessary to do:

- clean regularly the dies during the process
- controle the process – not producing fines
- lubricate continuously the dies during the process
- cool the dies by the lubrication to avoid thermal shocks.

Balloffet technical check list:

Potential root cause analysis :

6. Lack or perfect filtration and die cleaning.



Balloffet Check list of possible actions :

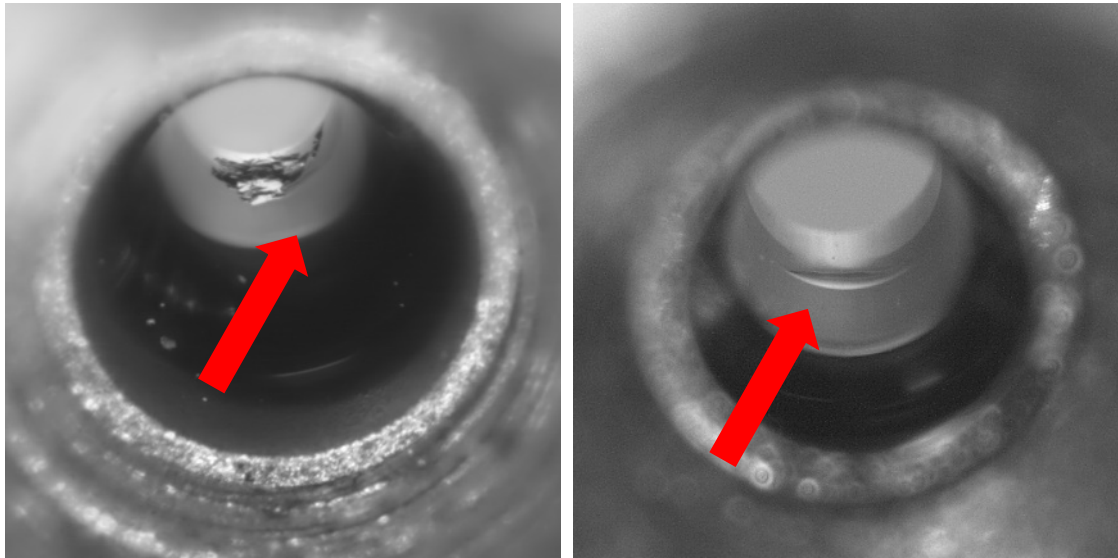
6 . Technical awareness about the necessity to :

- Limit as much as possible the quantity of metallic fines
- Die cleaning (with oriented jet of lubricant) during the drawing process

Balloffet technical check list:

Potential root cause analysis :

7 . Extreme drawing parameters (high speed, ultra-fine sizes, reduced slip,...)



Balloffet Check list of possible actions :

7 . Use the diamond die as a diagnostic tool:

- dies keep some visual records of the drawing conditions:
 - thermal shock
 - diamond pull out
 - impact point
 - orientation problems ...

For more information:

www.balloffetdie.com

For detailed questions:

balloffet@balloffetdie.com

Thanks for your attention