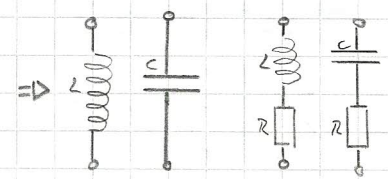
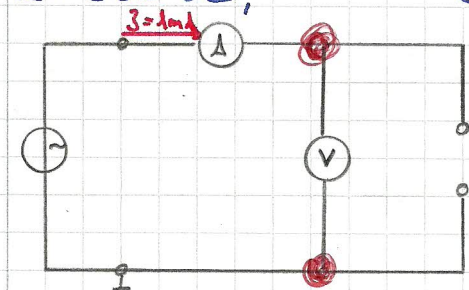


$R = 330 \Omega$ ;

$C = 3,3 \mu F$



$Z = \frac{U_{eff}}{I_{eff}} = \frac{U}{I}$

Unabhängig von Amplitude!  $\Rightarrow U \uparrow \Rightarrow I \uparrow$

①  $I = 1 \text{ mA}$

U wird in mV gemessen!

$Z_L = \frac{U_L}{I}$   
 $Z_C = \frac{U_C}{I}$

Stromwiderstand selbst ermitteln!

f/Hz	50	100	200	300	400	500	750	1000	
$Z_L/\Omega$	33,57	66,52	126,87	188,25	258,67	319,99	478,93	635,6	✓
$Z_C/\Omega$	996	487,54	240,87	161,85	123,35	100,11	68,51	48,55	✓
$L/mH$	107	106	101	100	103	102	102	101	Mittelwert 103
$C/\mu F$	3,2	3,3	3,3	3,3	3,2	3,2	3,1	3,3	3,2

$Z_C = \frac{1}{\omega C} = \frac{1}{2\pi f \cdot C} \Rightarrow C = \frac{1}{2\pi f \cdot Z_C} = \frac{1}{2\pi \cdot 50 \text{ Hz} \cdot 996 \Omega} \approx \underline{\underline{3,2 \mu F}}$  ✓

$Z_L = \omega \cdot L = 2\pi f L \Rightarrow L = \frac{Z_L}{2\pi f} = \frac{33,57 \Omega}{2\pi \cdot 50 \text{ Hz}} = \underline{\underline{107 \text{ mH}}}$  ✓

Graphisch side Diagramm!

②

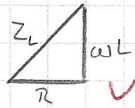
$$\omega L = R$$

$$\Rightarrow f_L = \frac{R}{2\pi L} = \frac{330\Omega}{2\pi \cdot 100\text{mH}} = \underline{525,2 \text{ Hz}} \quad \checkmark$$

$$\frac{1}{\omega C} = R$$

$$\Rightarrow f_C = \frac{1}{2\pi \cdot R \cdot C} = \frac{1}{2\pi \cdot 330\Omega \cdot 3,3\mu\text{F}} = \underline{146,1 \text{ Hz}} \quad \checkmark$$

Winkelsandwiesdreieck:



$$\rightarrow Z_L \text{ müsste (da } \omega L = R) = \sqrt{2} \cdot R \sin = 466\Omega$$

$f_{L/\text{Hz}}$	525,2
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$Z_{L/\Omega}$	466,8 $\checkmark$
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$f_{C/\text{Hz}}$	146,1
-------------------	-------

$Z_{C/\Omega}$	423,7 $\checkmark$
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$\checkmark \rightarrow$  kein Fehler! bzw. Messungsgangfehler!

③

$$a) (2R)^2 = R^2 + (\omega L)^2$$

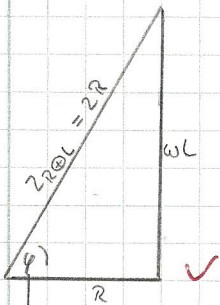
$$4R^2 = R^2 + \omega^2 L^2$$

$$3R^2 = \omega^2 L^2$$

$$f = \frac{\sqrt{3 \frac{R^2}{L^2}}}{2\pi}$$

$$\left| \omega = 2\pi f \right.$$

$$= \frac{\sqrt{3 \cdot \frac{(330\Omega)^2}{(100\text{mH})^2}}}{2\pi} = \underline{309,69 \text{ Hz}} \quad \checkmark$$



$\phi =$  Phasenunterschied

$f_{L/\text{Hz}}$	309,7
-------------------	-------

$Z_{L/\Omega}$	675,2 $\checkmark$
----------------	--------------------

$$b) (2R)^2 = R^2 + \left(\frac{1}{\omega C}\right)^2$$

$$3R^2 = \left(\frac{1}{\omega C}\right)^2$$

$$f = \frac{1}{2\pi \cdot \sqrt{3} \cdot R \cdot C} = \frac{1}{2\pi \cdot \sqrt{3} \cdot 330\Omega \cdot 3,3\mu\text{F}} = \underline{84,37 \text{ Hz}} \quad \checkmark$$

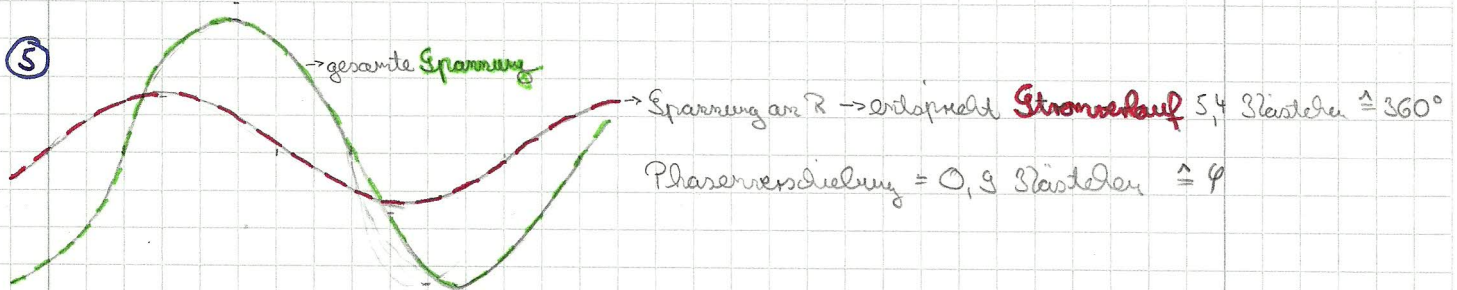
$f_{C/\text{Hz}}$	84,37
-------------------	-------

$Z_{C/\Omega}$	651,1 $\checkmark$
----------------	--------------------

④  $S = 1 \text{ mV}$  Schwereleiterstände sofort errechnet mit Messung von  $U$  in mV!

$f/\text{Hz}$	50	100	200	300	400	500	750	1000
$\frac{Z_{(R)} \cdot Z_{(C)}}{Z_{(R)}}$	328,68	330,87	348,80	377,06	412,65	459,14	577,4	727,6
$\frac{Z_{(R)} \cdot Z_{(L)}}{Z_{(R)}}$	1017,4	574,6	338,98	357,68	336,83	330,89	323,12	316,54

Graphisch siehe Diagramm!



Spule: 5,4 Blästchen  $\hat{=} 360^\circ$

Phasenverschiebung 0,9 Blästchen

$$f = 309,7 \text{ Hz}$$

$$U = 683,3 \text{ mV}$$

$$U_C = 536,2 \text{ mV}$$

$$U_R = 324,3 \text{ mV}$$

$$\varphi = 60^\circ \quad \checkmark$$

Stromlauf: 5,9 Blästchen  $\hat{=} 360^\circ$

Phasenverschiebung = 1 Blästchen

$$f = 84,4 \text{ Hz}$$

$$U = 655,6 \text{ mV}$$

$$U_C = 523,8 \text{ mV}$$

$$U_R = 315,5 \text{ mV}$$

$$\varphi = 61,0^\circ \quad \checkmark$$

Spannungs-Beige-Diagramme siehe Diagramme!

Unterschied zwischen  $\varphi_{\text{Cari}}$  und  $\varphi_{\text{Aust}}$ :

$$\Delta\varphi = 0^\circ \quad \checkmark$$

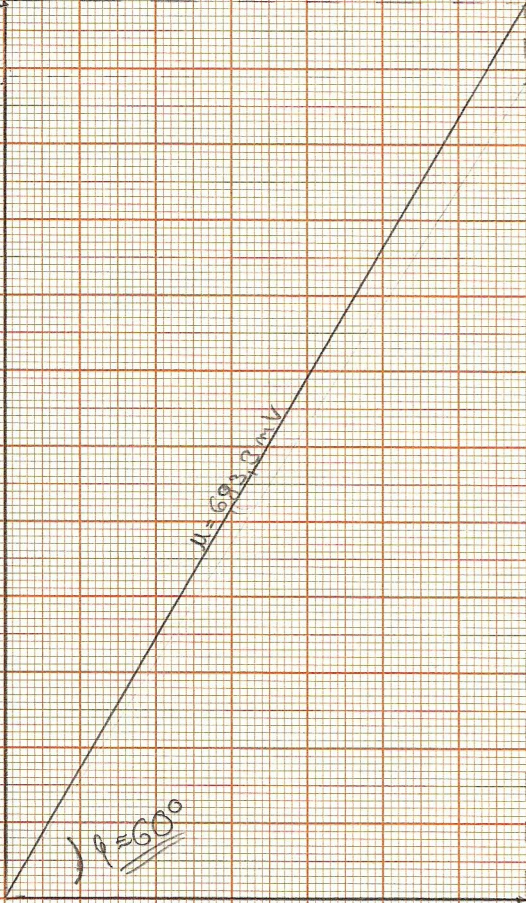
$$\Delta\varphi = \approx 0,8^\circ$$

↳ Reihen-/Ness- / Blase ungenügend

# zu ⑤ Spannungs - Ieger - Diagramme

Spule:

$U_1 = 386,2 \text{ mV}$



Strommeter:

$U_0 = 549,8 \text{ mV}$

