Elektronische signalen 2

Verschilversterker

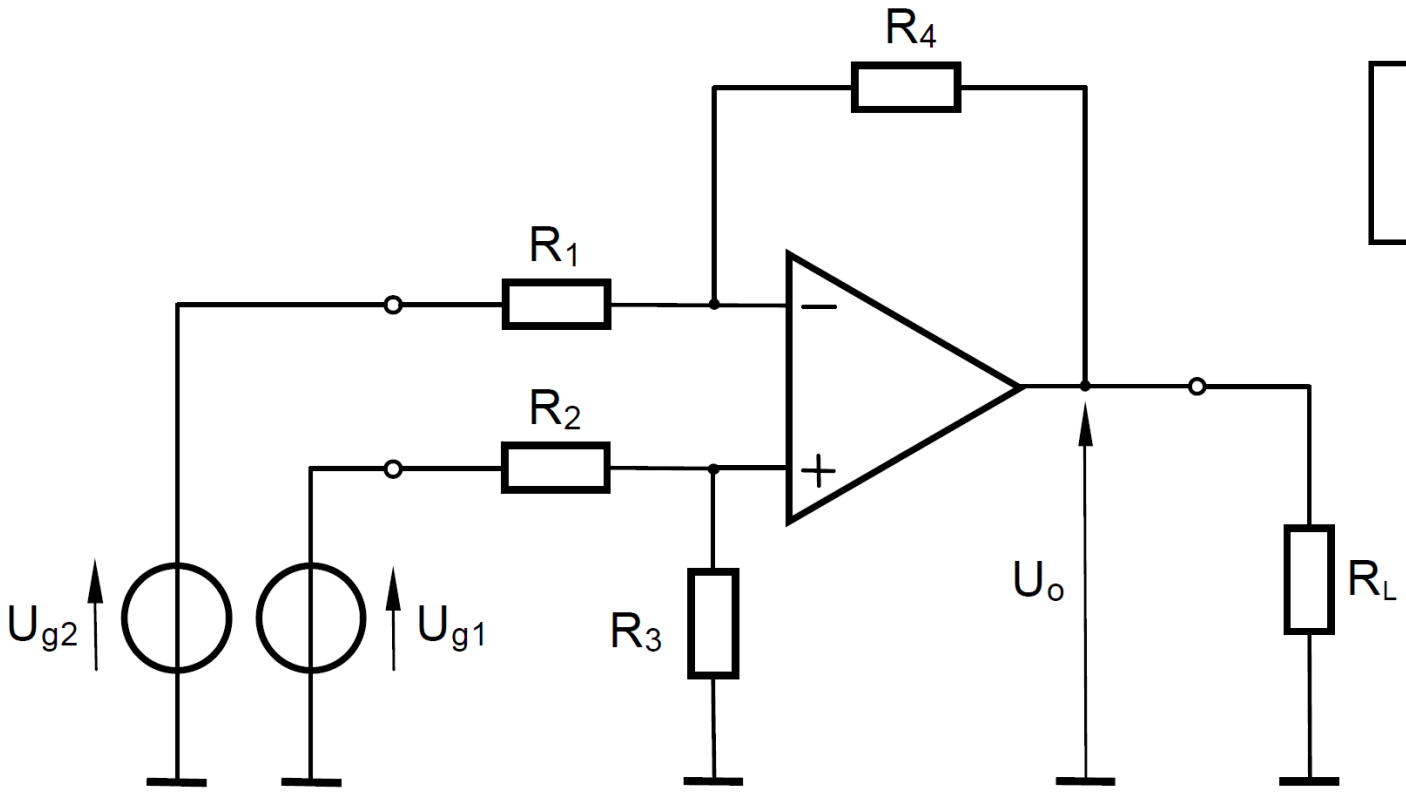
P. Debbaut

Principeschema

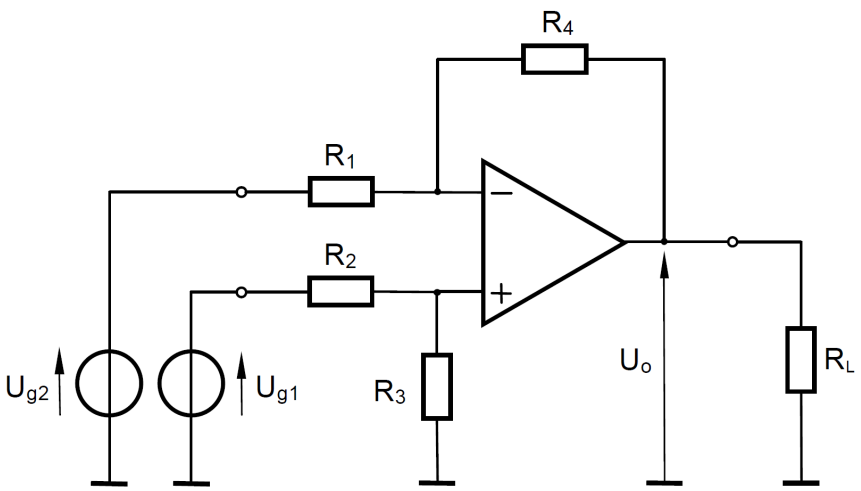
* Voedingsspanningen niet getekend!

Voorwaarde voor correcte werking:

$$R_1 = R_2$$
$$R_3 = R_4$$



Berekening uitgangsspanning



Superpositiemethode

Stap 1: stel U_{g1}=0

$$U'_o = -U_{g2}\frac{R_4}{R_1}$$

Stap 2: stel U_{g2}=0

$$U''_o = U_{g1}\frac{R_3}{R_2+R_3}\left(1+\frac{R_4}{R_1}\right)$$

Met R_1=R_2 en R_3=R_4 wordt dit:

$$U''_o = U_{g1}\frac{R_4}{R_1+R_4}\left(\frac{R_1+R_4}{R_1}\right) = U_{g1}\frac{R_4}{R_1}$$

Stap 3: samentellen deelresultaten

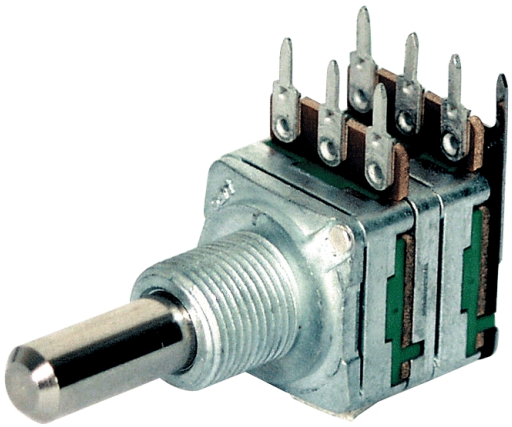
$$U_o = U'_o + U''_o$$

$$U_o = U_{g1}\frac{R_4}{R_1} - U_{g2}\frac{R_4}{R_1}$$

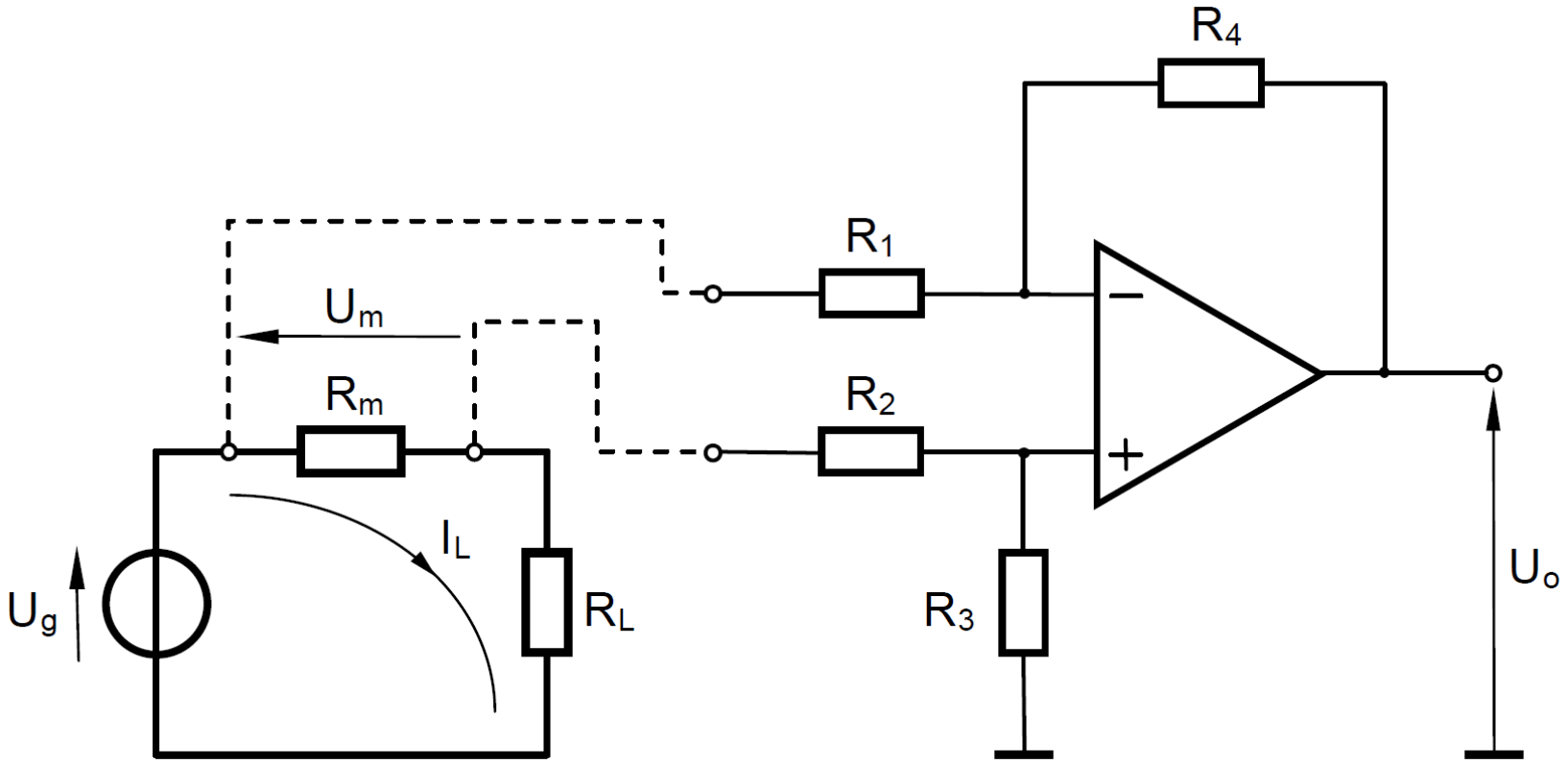
$$\boxed{U_o = (U_{g1} - U_{g2})\frac{R_4}{R_1}}$$

Eigenschappen

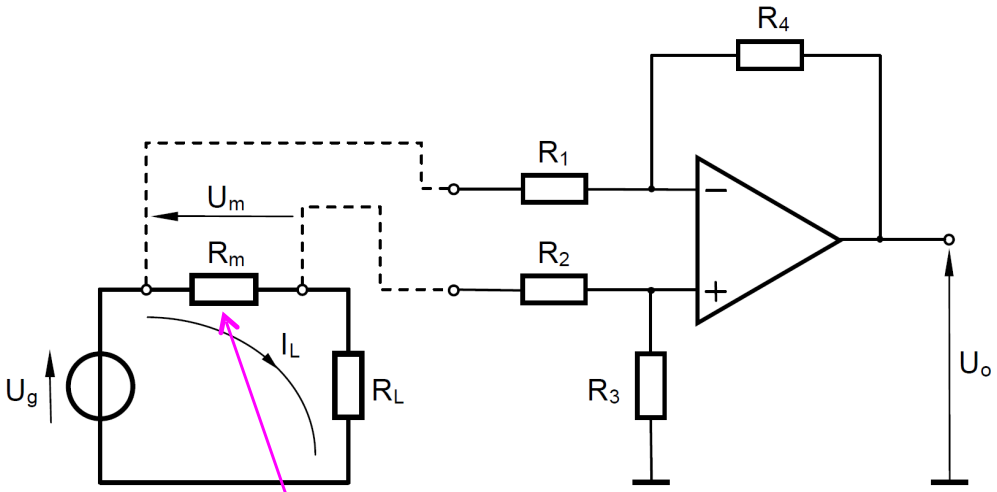
- goedkoop en werkt vrij goed
- ingangsweerstand relatief laag en ≠ voor beide ingangen
- versterking aanpassen → tandempotmeter



Toepassing - stroomsensor



Verband belastingsstroom I_L – uitgangsspanning U_o



$$U_o = (U_{g1} - U_{g2})\frac{R_4}{R_1}$$

$$U_m = -(U_{g1} - U_{g2})$$

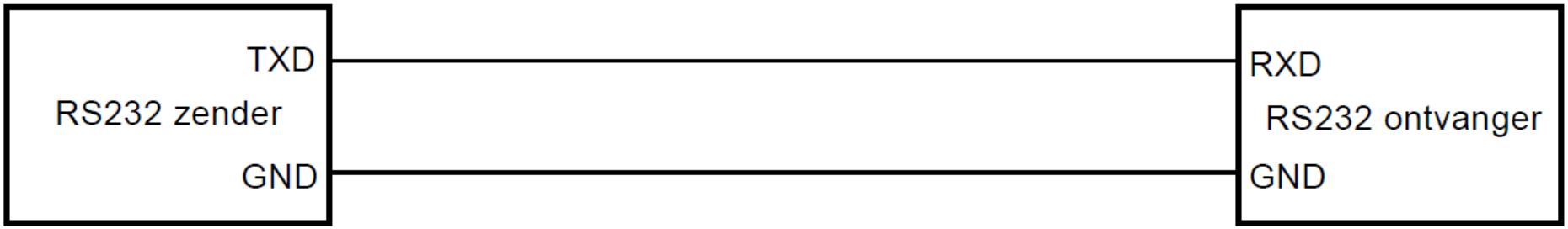
$$U_o = -U_m \frac{R_4}{R_1}$$

schaalfactor

$$\boxed{U_m = I_L . R_m}$$

$$\boxed{U_o = -I_L . R_m \frac{R_4}{R_1} = -C_{te} . I_L}$$

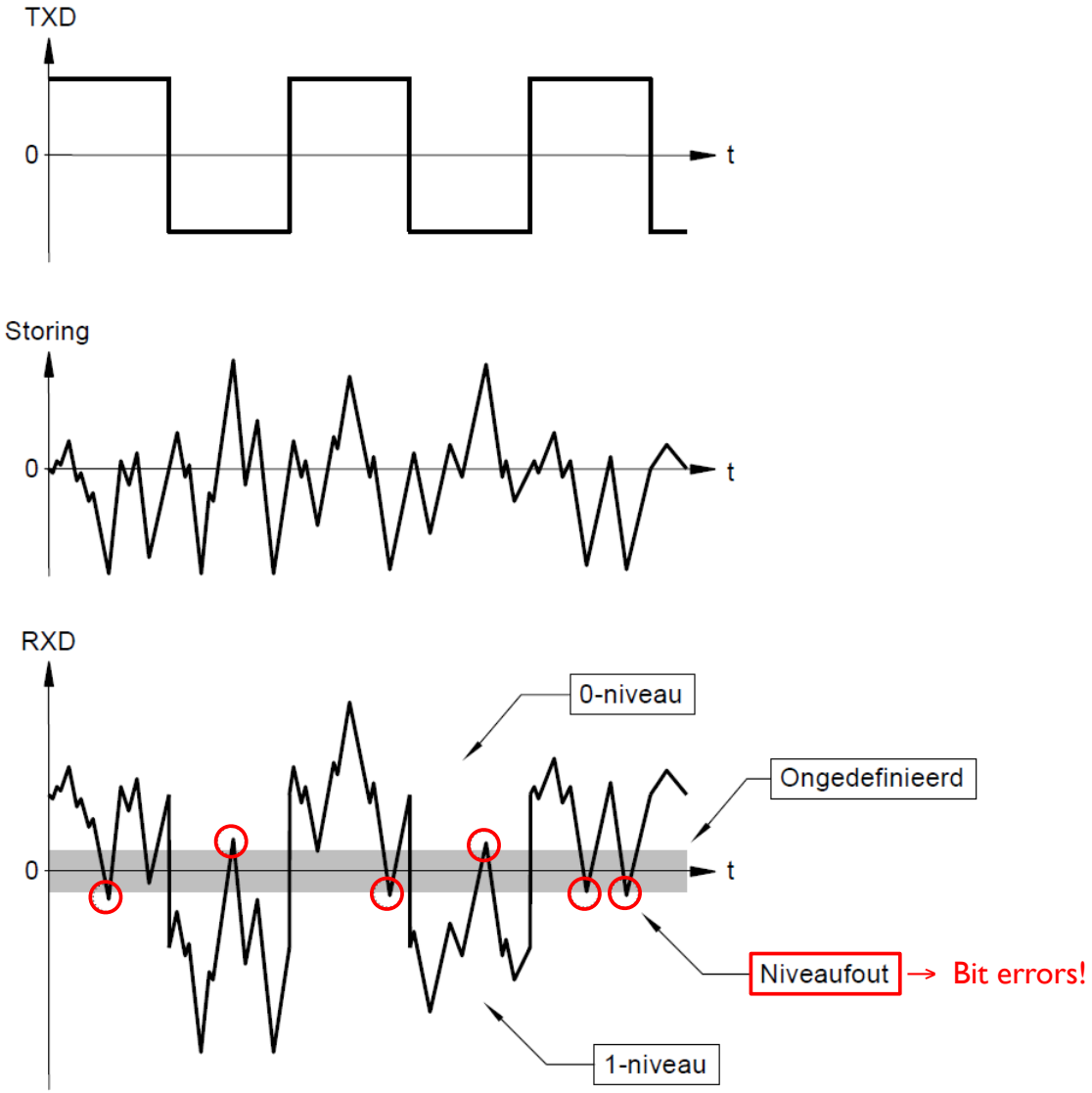
Single-ended signaling



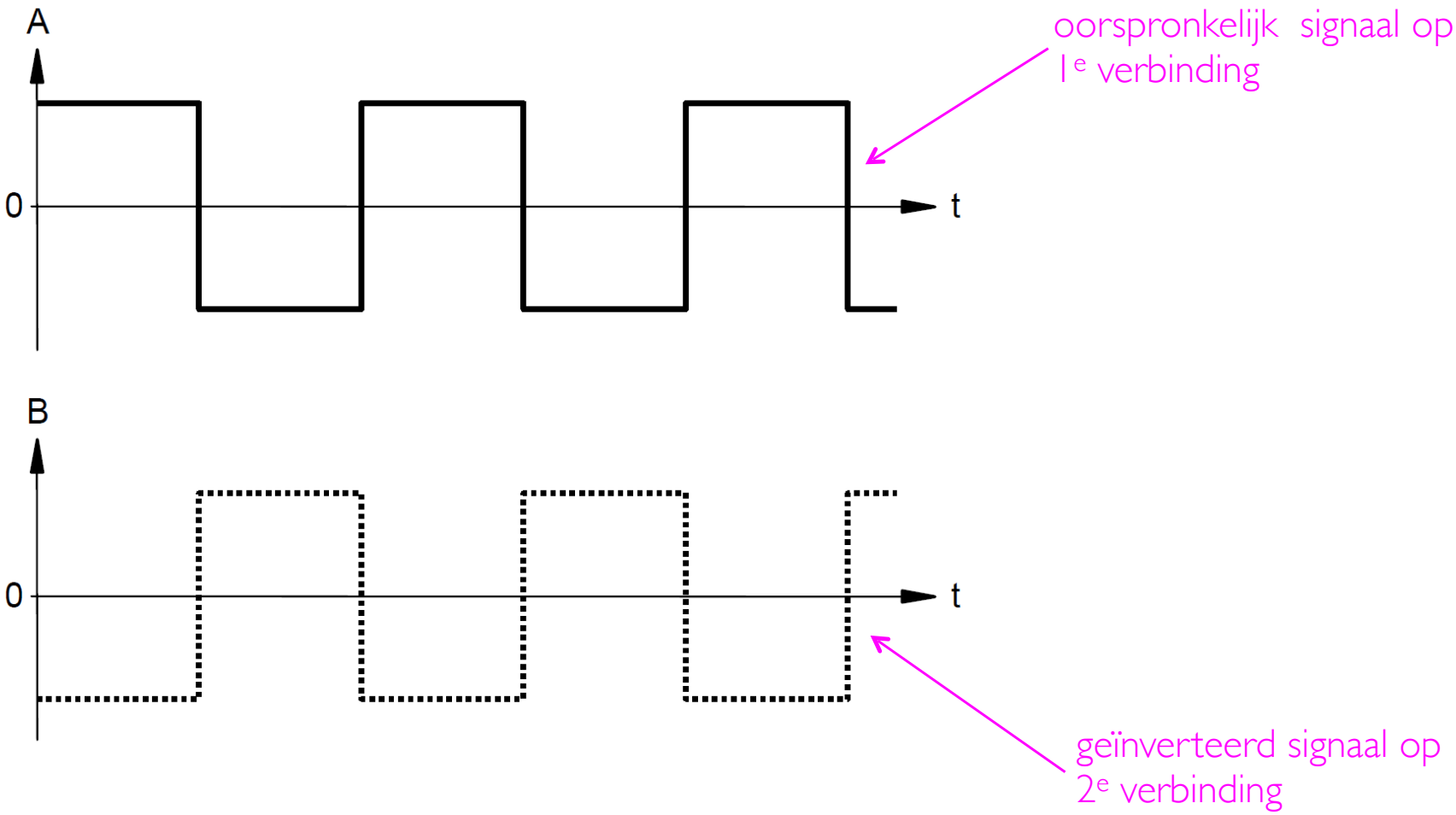
RS232 seriële communicatie

Niveau	Zender grenswaarden	Ontvanger grenswaarden
0 (Space status)	+5V...+15V	+3V...+25V
1 (Mark status)	-5V...-15V	-3V...-25V
Ongedefinieerd	-	-3V...+3V

Fouten bij single-ended signaling

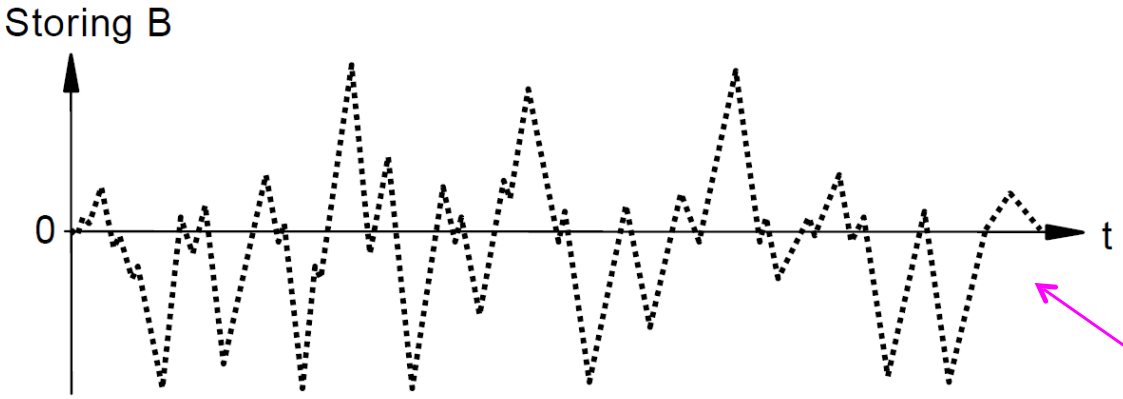


Differential signaling vb. RS485



Differential signaling vb. RS485

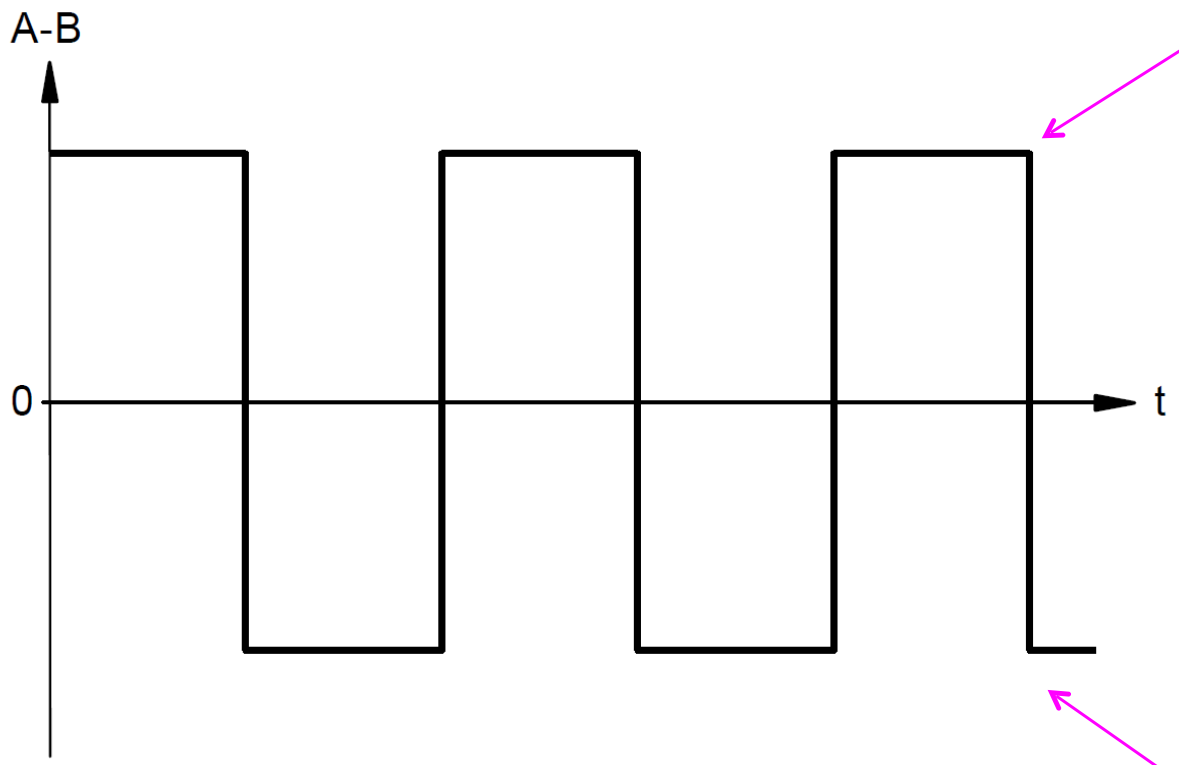
storing op 1e verbinding



identieke storingen op 1e en 2e verbinding!

storing op 2e verbinding

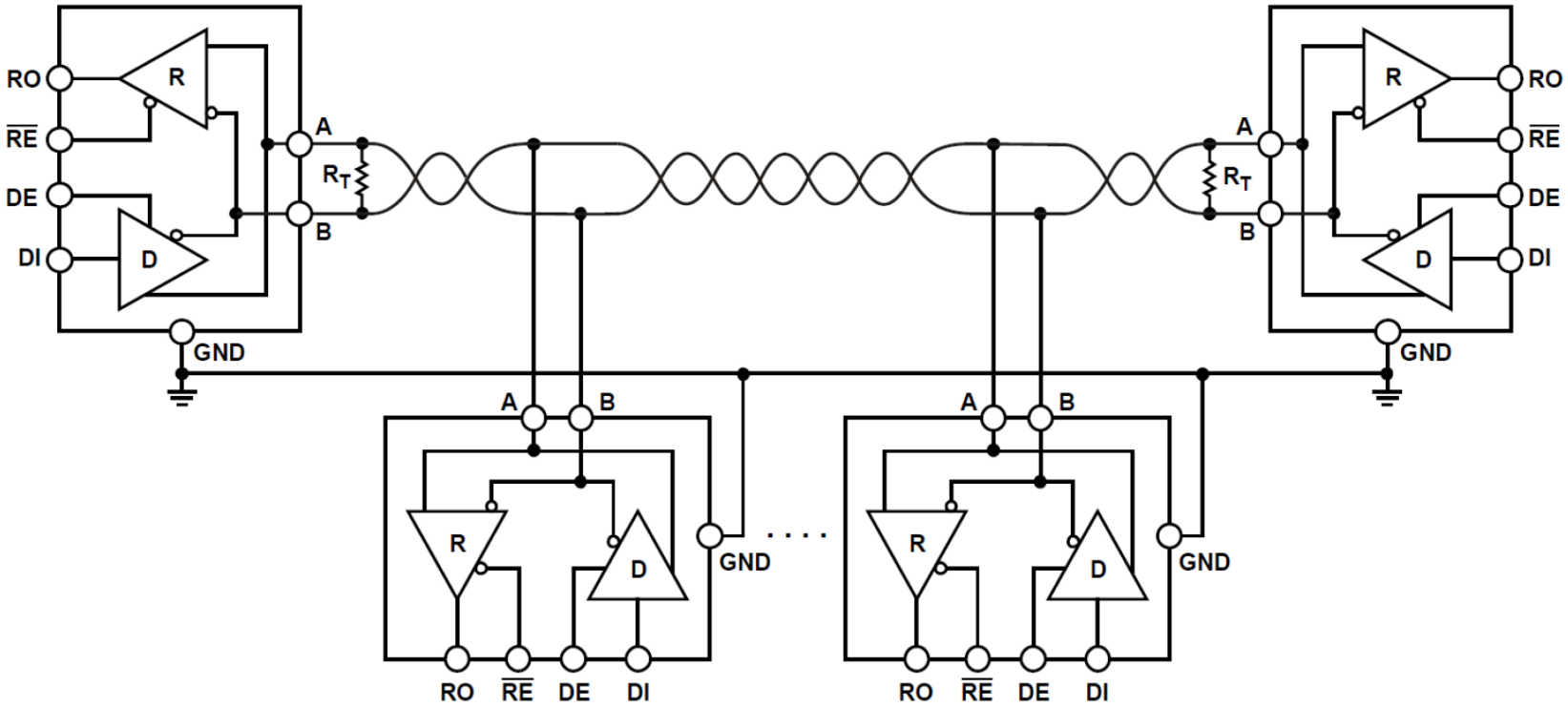
Differential signaling vb. RS485



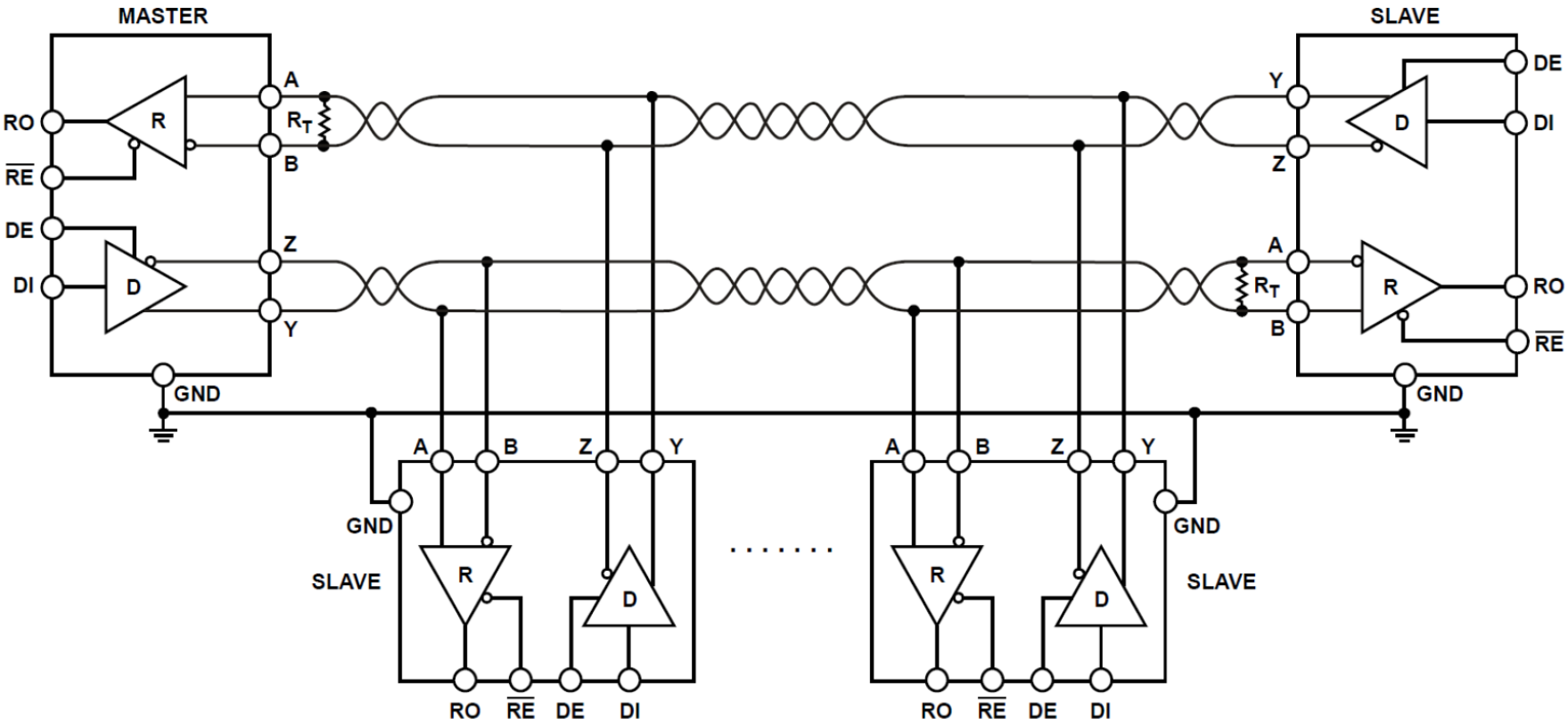
storingsvrij uitgangssignaal verschilversterker

storingen heffen elkaar op

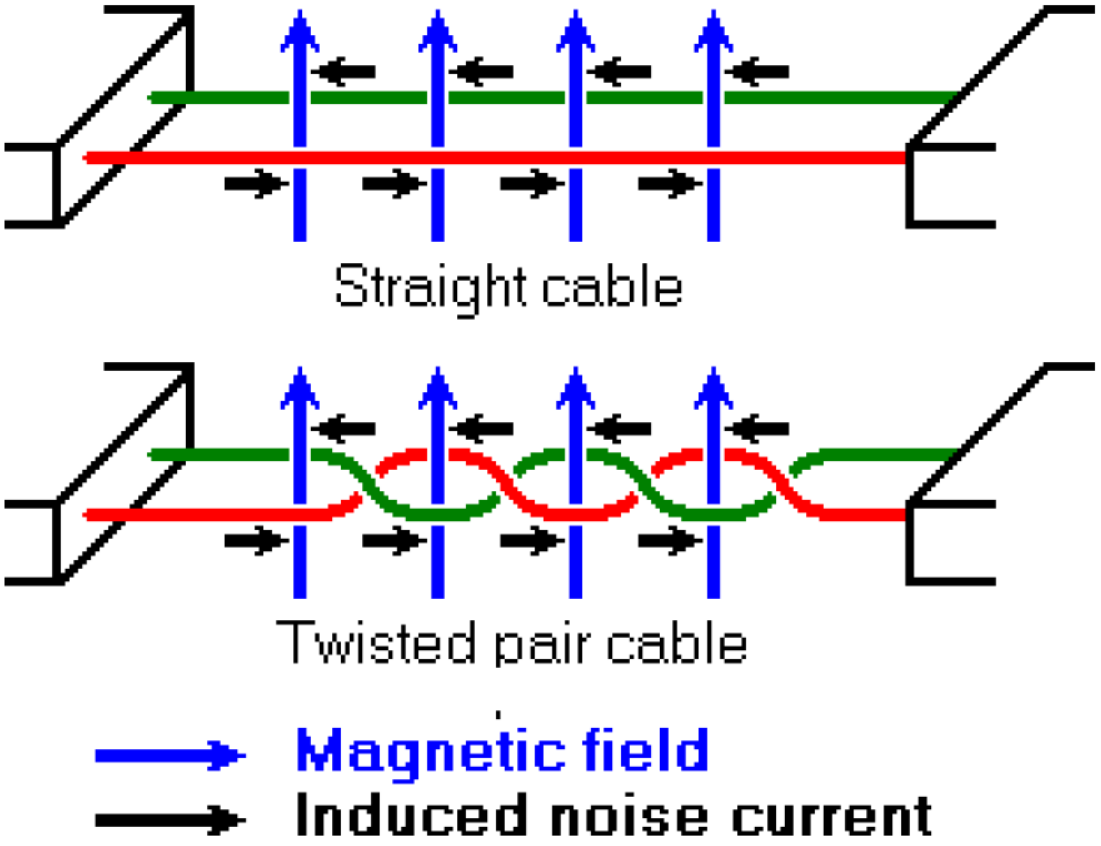
Half-duplex RS-485 bus communicatie



Full-duplex RS-485 bus communicatie

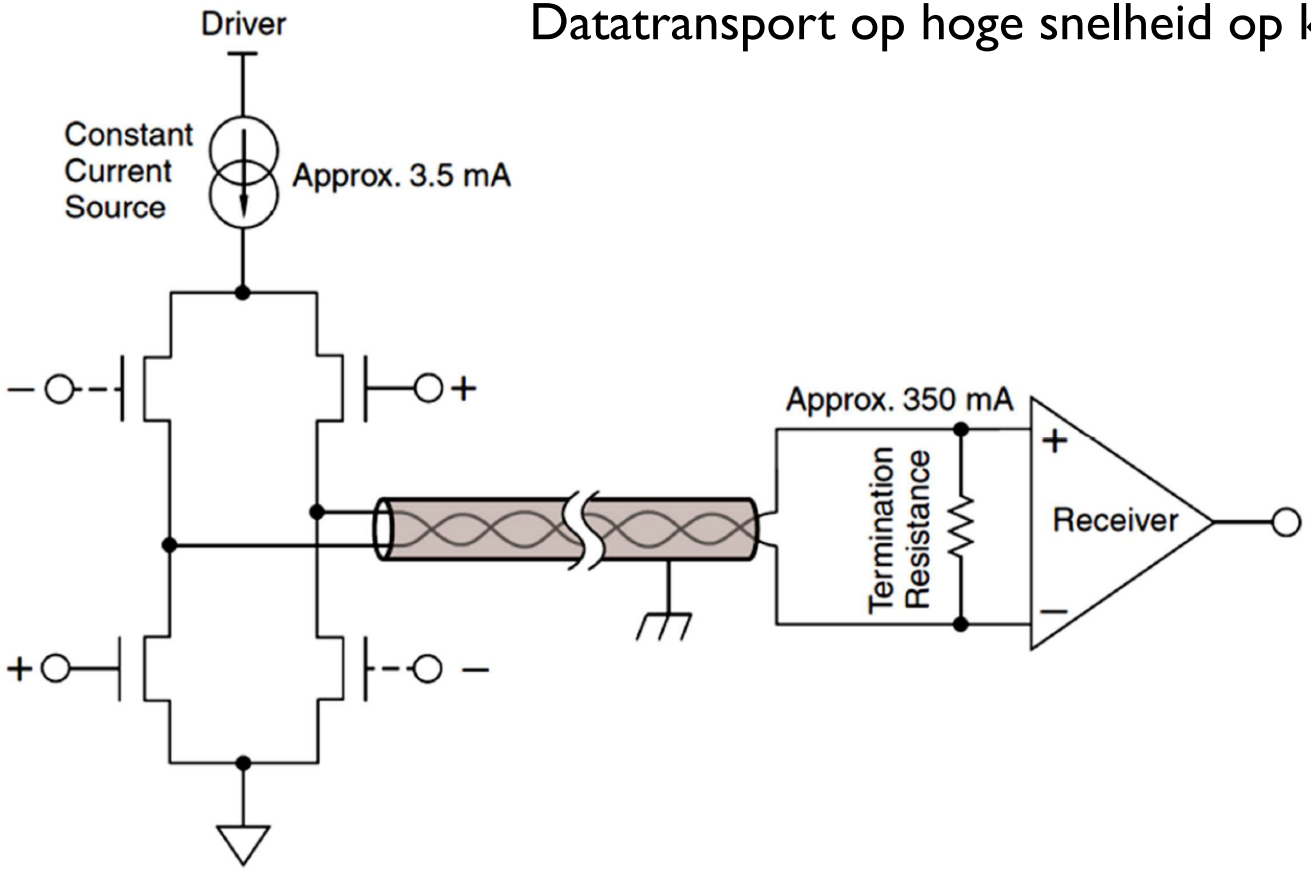


Twisted pair cable (UTP en STP)

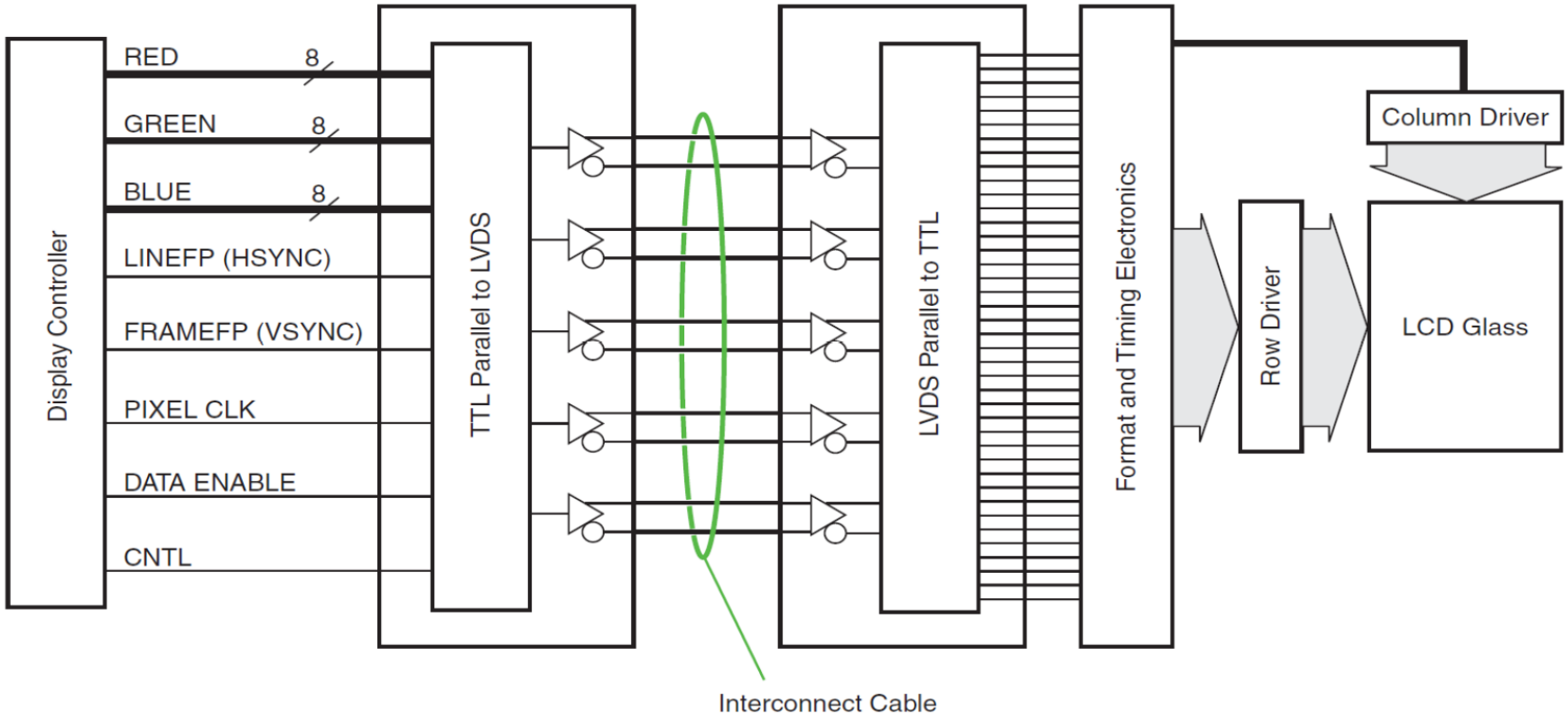


LVDS Low Voltage Differential Signaling

Datatransport op hoge snelheid op korte afstand



LVDS Low Voltage Differential Signaling



Aansturing van een LCD-display via LVDS