

71 { (R) (ower)+ 1.3.33 ævi ri<+/-C]ÅPx (Electrician) - +/-i <+/-C]ÅE+/- +|i(R)v E rxi +(R) |i(R)vE E
|E(R) (Laws of resistance and various types of resistors)=qP : < {` E +xi +{ Vx EM :*|i(R)v E x E æix il
'z {nl E |i(R)v E i+/-x E(R)x*EbC](R) E |i(R)v +(R) ' E æS æv æix*n M b] (x + +n) EbC](R) E |i(R)v +(R)
' E Mhx E(R)x*'z |E(R) E |i(R)v E 'J E(R)x *|i(R)v E x (Laws of resistance): BE S+/-E u(R) =i{z|i(R)v
R xx E(R)E {(R) x(R) E(R)i **S+/-E E |i(R)v 'r =E +/-æ< E x{i i **S+/-E E |i(R)v =E +x|| E] E lj+/- E
'IGx{ii **S+/-E E |i(R)v =E {nl {(R) x(R) E(R)i * V E æxi ** S+/-E E i{ {(R) x(R) E(R)i *+ +xi E(R)E E
+xnJ E(R)E E Ei E Va = RLV (rho - OE E 'h) - l(R) V ExbE](R) E {nl E Mh{(R) x(R) +(R) =E 'P'] (R)]x
(resistance) +l'i(R)vEi (resistivity) E deg{ Vx Vi *n +/-æ< 1](R) +(R) lj+/- 'a' = 1m2 i R = r<+/- E {nl E
'P'` |i(R)v = {nl E 1 x](R) E' {(R)i {P' E æS |i(R)v E deg{ {(R)'i E V Ei* (+l' E BEE x E = {nl E x cm +/-i
*)(Fig 1)'xx {nl E |i(R)v E i+/-x (Comparison of theresistance of different materials) : 'ti E S+/-E E
deg{ +vE i'h {nl E +/- (Fig 2) EU i+/-xiE Sx |nxE(R)i * |n`Pi S+/-E x +x|| E] E lj+/- ilx |i(R)v E * Sn E
i(R) æ +vE VæE iæ E EUE +(R) B+/-x E +(R) E *]+/- i(R) E i+/-x Sn E i(R) {S Mx +vE +/-æ * SE 'z vi 'z
S+/-Ei xv(R)h E i =xE |i(R)v xv(R)h z x S 'z vi+ E |i(R)v xv(R)h, 'ti {(R)}l |iE vi E BE xE]Eb |M E(R)E
YiE V Ei * n +{ +vE v(R)h vi+ E BE xE+E(R) E]Eb E E] E(R) =x BE æ](R) BE BE E(R)E Vb i+{E Yi M
E =x 'z j E v(R) |'i M*(Fig 3) Yi E LaR=jE E Sl {ri metre Lohm R x metre a2= metreohmLaR=<+/- 'P'`
|i(R)v E jE Ohm meter (m) i *iæ E i+/-x EU v(R)h vi+ E |i(R)v (Fig 4) UcOj u(R) |n`Pi E M * Sn iæ E
i+/-x =k S+/-E *CE < |i(R)v E i * x<G E |i(R)v iæ Ei+/-x 60 Mx * <+/- n <xE BE æ](R) BE BE E(R)E
72Vc V i x<G E i+/-x iæ 60 Mx +vE v(R)|'i E(R)M* |i(R)vE (Resistors)=qP : < {` E +xi +{ Vx EM :*'z
|E(R) E |i(R)vE E (R)Sx il 'P'i+ E 'hx E(R)x*v(R)h i: E Ei E BE n M< +/-æ< E S+/-E E|i(R)v =E +x|| E]
E lj+/- E 'IGx{i i *(Fig 5) {(R) : <+/-C]ÅPx (NSQF Pvi - 2022) - + 1.3.33 ævi rin(R) E(R)E V |i(R)v E
|i E(R)i {nl E |Ei <+/- +æ E Ei E i(R) E |i(R)v* arealength = x +/-æ< /lj+/- x (n M {nl) metre a(metres) L
= R(ohms)2< = Ra L Ohm - meterV (OE +l(R) =SS(R)h (R)), BE l(R)E 'H E(R)i *L i(R) E](R) +/-æ< a
'M](R) lj+/- æ BE v(R)h Elx E E(R) Ei ; i(R) Vix æcM, =E |i(R)v =ix E M; i(R) E G CPx+/- ljVix U] M,
=E |i(R)v =ix +vE M *<E 'jE x l{i E(R) Ei : E vi S+/-EE 'ti |i(R)v =E +x|| E] E lj+/- E 'IGx{i i* |i(R)vE
(Resistors): <+/-C]ÅxE {(R)}l ={M x '+/-æ x x1G (assive)]E * |i(R)vE E +Å (|i(R)v)E 'P'] x E l æx Vi *
{(R)}l |i(R)vE ={ME(R)x E =qP i v(R) E 'P'] x iE i E(R)x 'Ui '+/-j] {ix (IR) ={+/-æv E(R)x * |i(R)vE E

PCixv(R)h (rating) 0.1W Eb \cdot iE Ei \cdot |i(R)vE {ÄS |E(R) E i :1i(R)-Eb+/-i |i(R)vE (Wire-wound resistors)2E α x Vx |i(R)vE (Carbon composition resistors)3vi \cdot +/- |i(R)vE (Metal film resistors)4E α x \cdot +/- |i(R)vE (Carbon film resistors)5'P¹ |i(R)vE (Special resistors)1i(R)-Eb+/-i |i(R)vE (Wire-wound resistors)i(R)-Eb+/-i |i(R)vE E (R)E {+/-x, α E+/-<], n α {(R)<in V (R)vi E(R) ES(R) i(R)i |i(R)v i(R) (x<G xExE+/-G ,h) E Eb+/-i E(R) = {M E(R)i B α xB Vi *Fig 1 < |E(R) E |i(R)vE nP M * <E< = {ME M +x + 'hi (bare) i(R) xi: 'ti(R)v {nl {(R) α r (R)i * i(R)-Eb+/-i |i(R)vEi =SS v(R) E +x|M E+/-B = {M EB Vi * BE \cdot] 100 \cdot] +vE * 2E α x Vx |i(R)vE (Carbon composition resistors) 'Ui |i(R)v E x E +/-B + 'PE +x{i I E α x α vE E deg{ Sh 'ti(R)v O E I ,i Oj<b

73 α xB Vi * Fig 2 E α x Vx |i(R)vE E (R)Sx nPM< *E α x |i(R)vE 1 +À 22 M+À E x +/-i *E α x \cdot +/- |i(R)vE 1 +À 10 M+À il 1W iE +/-i, il 85 degC 155 degC iE E E(R) Ei *|i(R)vE E =xE E E {I 'MEi E V Ei V1 I(R) |i(R)vE2{(R)'i |i(R)vEi(R) |i(R)vE (Fixed resistors): I(R) |i(R)vE ' V,|i(R)vE E xj x I(R) i * <x |i(R)vE BE VbÃ+/-bÃ E 'l (R)i * (Fig 1 4){(R)'i |i(R)vE (Variable resistors) (F i g 5): {(R)'i|i(R)vE ']E +/-i i Vx { {E E i |i(R)v x E 'z i(R) {(R)] E V Ei * <x'](R) |i(R)vE (R)+/- deg{ '](R) Ei *|i(R)v i{, '+/-]i, |EP {(R) x(R) E(R)i (Resistancedepends upon temperature, voltage light): 'P¹|i(R)vE α xB Vi , VxE |i(R)v i{, '+/-]i il |EPE I {(R)'ix i * { '(R) : <+/-C]ÅPx (NSQF Pvi - 2022) - + 1.3.33 α vi ri3vi \cdot +/- E |i(R)vE (Metal film resistors) (Fig 3)vi \cdot +/- |i(R)vE, n |G α x Vi *] \cdot +/- |i(R)vE,vi , il Sh EÄS E I +/-{i EB Vi V (R)E+v(R) \cdot +/- E(R) {E Vi * (Fig 3)vi \cdot +/- |i(R)vE 1 +À 10M iE 1 W +/-i *4 E α x \cdot +/- |i(R)vE (Carbon film resistors) (Fig 4)< |E(R) , (R)E +v(R)/] \rightarrow α {(R) E α x E {i+/- {(R)i Exl{i E Vi * {z E +/- α < E α fÃx E +/-B { 'E >{(R)'P¹] |G u(R) BE Ì{+/- JS E] Vi *|i(R)vE E +/-B SxEx Eb (Marking codes for resistors)=qP : < { E +xi +{ Vx EM :*|i(R)vE {(R) (R)M E Ebi +Ex E 'J E(R)x*|i(R)v E x E +/-B +I(R) il J Eb E 'J E(R)x*|i(R)vE E +/-B '(R)i x E S α xx *(R)M Eb E B |i(R)vE E |i(R)v il 'hi (]+/-(R)) E x (Resistance and tolerance value of colour codedresistors)'{(R)E deg{ |i(R)v E x il 'hi (]+/-(R)) E x,(R)M E Eb +I(R) il +EE Eb |i(R)vE {(R) +Ei(R)i *x E Ei E(R)x E +/-B (R)M E Eb E n IE +E il]+/-(R) E IS 8186 E +x(R)] α +/- 1 n MB *

74] α +/- 1(R)M E Mi E IEi +E il]+/- (R) E x(R)M |l ui ii Sil α hb/ α hb/ α hb/ α hb/b] b] b] b]|| uiMhE]+/-(R)+E +E(R)Vi---- 1 0-2+/- 10 %'h---- 1 0-1+/- 5 %E+/-0 1 -- -(R)111 0 +/- 1 %+/+/-22 1

02+/- 2 %x(R)M33 1 03---{+/-44 1 04---(R)55 1 05---x+/-66 1 06---Mx77 1 07---v(R)88 1 08---jn99 1
09---E< x---- -- +/- 2 0 %n IE +E il]+/- (R) (R)M Eb |i(R)vE Fig 1 nP MB+x(R) E (R)M E +/-{x
E B 4 Rhb i *|l Rhb |i(R)vE JE E BE (R) E xE] Ei * ui,ii B' Sil (R)M E Rhb Fig 1 nP MB *|l n (R)M E
Rhb, |i(R)v E +EE x |l n +E EEi E(R)i * i(R) (R)M, Rhb MhE E Ei E(R)i * 'i'E|i(R)v x E Yi E(R)x E +/-B
|l n +E E MhE MhE Vi * (R)M E Sl Rhb]+/- (R) E |lPi Ei E(R)i*=n(R)h|i(R)v E x (Resistance value) : n
|i(R)vE (R)M ERhb, < G i +/-+/-, (R), i(R) il 'h |l (R)M ui (R)M ii (R)M Sil (R)M+/-+/-Mxx(R)M 'h 2 7
1000(103) +/- 5 %|i(R)vE E x 27,1000 +Å , + 5% 'hi (]+/- (R)) El]+/- (R) ('hi) E x (Tolerance value): Sl
Rhb(]+/- (R)), |i(R)v E {(R) E Ei E(R)i , V =E 'i'Ex * =(R)Ci =n(R)h]+/- (R) (U)] + 5% * 27000 E+5%
1350 +Å * <+/-B |i(R)vE E x 25650 +Å il28350 +Å E RS E x E M* 'hi (]+/- (R)) Exx x E |i(R)vE (I)
v(R)h x E |i(R)vE Mi *+/- + (R) v |i(R)v E {x (Methods of measuring low and medium resistance)=qP :
< { E +xi +{ Vx EM :*|i(R)v {x E 'xx 'v E x Rix*B](R) + (R) 'v+]](R) 'vÄ E 'hx E(R)x * {'(R) : <+/-C]ÄPx
(NSQF Pvi - 2022) - + 1.3.33 Rvi ri+/- |i(R)v {x E 'v (Methods of measuring lowresistance) : +/- |i(R)v
E {x |H xx ix 'v +/-Vi **'+/-]](R) + (R) B](R) 'v*''](R) u(R) xE +Yi E i+/-x 'v*E+/-'x JPYV*Px] |E(R) E
+](R)B](R) + (R) 'v+]](R) 'v (Ammeter and voltmetermethod) : 'v (R)+/- 'v * + (R) +/- |i(R)v E{x E +/-
+ivE |M +/- Vi *Fig 1 Rm { Vx +/- |i(R)v + (R) RV |i(R)v E V BE=SS 'v+]](R) * l n'] v(R) +{li BE v(R) R
i< ,h BE ={H B](R) Vi * +R x E +Yi|i(R)v ' v(R) V E B](R) A E u(R) { M< * Exx j u(R) reading
Ammeterreading Voltmeter = RmRm = Measured value

75v |i(R)v (Medium resistance) E {x E +/- xx ix'v |H i ** (R)W 'M E +](R)*'+/-]](R) + (R) B](R) 'v*'']x
JPYV 'v+](R) (Ohmmeter)=qP : < { E +xi +{ Vx EM :*,h |E(R) E +](R) E rxi (R)Sx, + (R) ={M E
Rix*Px] |E(R) E +](R) E rxi (R)Sx, + (R) ={M E Rix * {'(R) : <+/-C]ÄPx (NSQF Pvi - 2022) - + 1.3.33 Rvi
ri|i(R)v E {x (Measurement of resistances)v |i(R)v E {x, ={E(R) V E+/-'x JPYV, ']]x JPYV,{h i(R)
JPYV, [] +j RC, + (R) + { Ei >{(R) E ={E(R) 'P' bV<x +/- |i(R)v E {x {(R)Pri Ei *+/-Ex =SS |i(R)v E {x E
+/- M +](R) +l' M(R)V ={E(R) |M +i *+](R) (Ohmmeter)+](R) BE B ={E(R) V |i(R)v {x E(R)i * + {n
|E(R) E ,h +](R), v |i(R)v E {x E +/-, + (R)Px] |E(R) E + { V +/- |i(R)v E {x |H i *+{x +/-E deg{ + { n BE
+xi(R)E P'E +/- BEMMC +/-](R) + (R) BE v(R) x |i(R)v i *E] +](R) E ={M E(R)x {+/-, |i(R)v { E +/-B,E]
E(R)] E Rn E(R) nx SB + (R) E] E <+/-C]Ä+/-<]E E]](R) E bSV E Vx SB* n (R)JE +](R) E +{i E +{x (R)i

$i \cdot \frac{1}{R} \cdot \frac{1}{E(R)} + \frac{1}{R} : (R) S_x$ (Series type ohmmeter: construction) $(R) S_x$: BE $\frac{1}{R} \cdot \frac{1}{E(R)} E + \{ \text{Fig 1 } E + x(R) J$
 $\deg\{ \text{BE MMC } (b+x' +/ -) \{ M \times |i(R)v R1 \text{ BE } \frac{1}{R} (R) E + (R) A \text{ il } B E +/ - \text{ BE } M +/ - \} \frac{1}{R} x +/ - V + Y_i |i(R)v R X E$
 $\frac{1}{R} x v \times \frac{1}{R} + (R) \{ R2 E x_i(R) \text{ BE } P_x \} M |i(R)v_i V E_i E P_x \text{ li } V_x E +/ - = \{ M +/ - V_i \cdot E x' x \text{ (Working)} V \frac{1}{R} A + (R)$
 $B \} \frac{1}{R} x +/ - E +/ - \{ \text{li } (+Y_i |i(R)v R X = 0) E(R) n V_i \{ (R) \{ \frac{1}{R} + v E_i v(R) | \frac{1}{R} i \cdot \frac{1}{R} \} (R) \{ h E +/ - E(R) x \} \frac{1}{R} x i \cdot \frac{1}{R} P_x \} |i(R)v$
 $R2 E V_x u(R) \{ E \{ h \{ x v(R) \text{ (Ifsd)} \{ x E +/ - \frac{1}{R} x V_i \cdot E_i E E \{ h \{ x v(R) \text{ li } E \{ x \{ (R) P_x + P S_x E_i E V_i \cdot V \frac{1}{R}$
 $+ \} (R) E + Oh (A + (R) B \} \frac{1}{R} x +/ - J +/ - i b +/ - \{ E < v(R) | \frac{1}{R} i \times i^* < E(R) h \} (R) \frac{1}{R} \{ i \times i + (R) E_i E b +/ - E \frac{1}{R} + (R)$
 $(R) i^* < +/ - b +/ - E \frac{1}{R} (R) + x x i \text{ (alpha)} |i(R)v S_x E_i E V_i V E + l i E \{ (R) l h + Oh E \frac{1}{R} S + x x i |i(R)v (J +/ - |i(R)v)$
 $\cdot A + (R) B \} \frac{1}{R} x +/ - Y_i |i(R)v R X E \frac{1}{R} z x E V_b E(R) b +/ - v E S_x E x \{ (x) E V E_i \cdot + \} (R) E \{ (R) P_r i + v E_i (R) \frac{1}{R} (R)$
 $E \text{ li } \{ (R) x(R) E(R) i^* h b(R) x + l' = \{ M \frac{1}{R} (R) E + x_i(R) E |i(R)v v(R) v(R) E E_i \cdot < E(R) h \{ h \{ x v(R) E V_i + (R)$
 $\} \frac{1}{R} x +/ - A + (R) B E +/ - \{ l x x \{ (R) \{ P_x x \{ f i \cdot \text{Fig 1 } \{ (R) \frac{1}{R} P_x \} |i(R)v R2 u(R) \text{ BE } V_x \{ \{ i \cdot V x x i \frac{1}{R} (R) \frac{1}{R} +/ - j i | \frac{1}{R} E$
 $x(R) x \text{ BE } + x i M_i E(R) E_i \cdot n \frac{1}{R} (R) \frac{1}{R} +/ - j i \text{ BE } E V_i R2 E V_x P_x V_x E_i E E P_x \text{ li } \{ (R) x +/ - V E_i \cdot i \frac{1}{R} \frac{1}{R} (R) E$
 $| i l \{ x \text{ BE } = k \frac{1}{R} (R) x S^* \text{Fig 2 } E + x(R) \{ \{ x n x (R) \{ (R) P_x + (R) \frac{1}{R} + (R) + x x i + M^* + \{ \text{BE } + (R) J E \{ x i \cdot C E$
 $| i(R)v + (R) v(R) \frac{1}{R} i G \frac{1}{R} x v i \frac{1}{R} +/ - \deg\{ P_x E \{ \frac{1}{R} i \{ x + (R) + x i (R) \{ (R) x i \{ x i \cdot P_x \} | E(R) + \} (R) \text{ (Shunt type$
 ohmmeter) Fig 3 BE $P_x \} | E(R) + \{ E \{ (R) l + (R) J n J M^*$

$76 E x' x \text{ (Working)} V \frac{1}{R} A + (R) B E \} \frac{1}{R} x +/ - +/ - \{ \text{li } i (+Y_i |i(R)v R X = 0 \text{ ohms }) \{ v(R) P_x i^* n(R) + (R) n + Y_i$
 $|i(R)v R X = \alpha = (A + (R) B J +/ -) i v(R) E' +/ - \{ | \frac{1}{R} i + (R) R1 x E = S_i S_x E_i E E \{ h \{ x \{ (R) \{ S V E_i \cdot < +/ -$
 $P_x \} | E(R) E + \{ E P_x S_x \frac{1}{R} l E + (R) (v(R) P_x) + (R) + z i S_x \{ x E n x l + (R) i^* \{ h \{ x (\frac{1}{R} h v(R)) i^* V E \text{ (Fig 4)}$
 $n J M^* v x E |i(R)v \{ x u(R) | \frac{1}{R} \{ |i(R)v + (R) + Y_i |i(R)v E \frac{1}{R} i G + x \{ i \frac{1}{R} V_i i + (R) E_i E v x l i +/ - i = \{ M \text{ (Use)} : <$
 $| E(R) E + \{ +/ - x |i(R)v E E \{ x E +/ - P^1 E(R) = \{ H i^* < \{ \frac{1}{R} (R) E, \text{ MMC } \{ M_i + (R) P_x V_x E +/ - V_x |i(R)v R1$
 $E l \frac{1}{R} h V_b V_i \cdot + Y_i |i(R)v R X V \} \frac{1}{R} x +/ - A + (R) B E \} \frac{1}{R} x +/ - E (R) \{ (R) V_b V_i \{ E l x_i(R) \{ (R) l x l i E(R) i^* h b(R) x$
 $\frac{1}{R} (R) E x^1 E x E n(R) E(R) x E +/ - E V S \frac{1}{R} | M (R) i \{ P \frac{1}{R} x | E(R) E i^*$

$77 \{ (R) \text{ (ower)} + 1.3.34 \frac{1}{R} v i r i < +/ - C \} \frac{1}{R} P_x \text{ (Electrician)} - +/ - i < +/ - C \} \frac{1}{R} E +/ - + \frac{1}{R} \} x J P Y V - r x i + (R) = E + x | M$
 (Wheatstone bridge - principle and its application) $= q P : < \{ \frac{1}{R} E + x i + \{ V_x E M : \cdot \frac{1}{R} \} x J P Y V \{ (R) l E$
 $\{ (R) \frac{1}{R} i, (R) S_x | E \text{ (Function)} + (R) = \{ M \frac{1}{R} i x^* \frac{1}{R} \} x J P Y V u(R) + Y_i |i(R)v Y_i E(R) x^* \frac{1}{R} \} x J P Y V + Y_i |i(R)v E Y_i$
 $E(R) x E +/ - \text{ (For determining the unknown resistance by Wheatstone Bridge)} : \cdot J P Y V E x C P_x V_x \frac{1}{R} +/ -$
 $v(R) P_x x S^{**} + x i x |i(R)v E x \frac{1}{R} E \frac{1}{R} E Y_i x S^* E Y_i E(R) E J P Y V E x C P_x E < v(R) | \frac{1}{R} i x (R) ? \text{ (How to find no}$

current flows through the bridge connection?) BE { xj V EU <GB{(R) (BE B{(R)E n +/-J' M) E |' E Ei n Ei V M+/-'x {Ei |H E Vi * 25 <GB{(R) u(R) {h {x 'SU{nx '+/- M+/-'x{ '*'E ']]x JPYV BE xi(R) |i(R)v EV H M+/-'x{i JPYV ExCPx E BE {P x}x nax Vi * <={H{ E BE lbE 'SU{ E VS Ex I i * +vE 'SU{x {(R) {(R)'i |i(R)v E Vx E Vi * M+/-'x{ E Px}|i(R)vE E J+/- (R)J E(R) +xi +(R) || Vx E Vi *JPYV E ix V xE/|| |i(R)vE E ax i * ']]xJPYV u(R) {x lli E 'r E +/- {E |i(R)v E +i +/- (R)J Vi *I{ M+/-'x { E ={M JPYV ExCPx v(R) E Px VxE xPSi E(R)x i * +li JPYV ExC](R) u(R) Vc nx xi(R)PJ+ '' axn i * < ''I E x +'E(R)E E x {(R) (R)J M +(R) ']]xJPYV E+/-i ']]x JPYV +/-MM 1.0 ohm 1.0 M ohm {(R) E {x |H i * (Fig 1) |i(R)vE , Q +(R) S { xj E +xi(R)EM il R ' +Yi |i(R)v VE {x E(R)x *{ xj E Vx +x{i Vx iE E Vi 'S E axn li M+/-'x{(R)EbM E Px Vx <EEi i *|i(R)vE +(R) Q +x{i V E+/-i * +(R) Q E {n {(R)'lii E(R)i V |i(R)v x E BE {(R) |{i E+(R) S x E |i(R)v M nPE |i(R)v S u(R) xv(R)i EV E* R = Q S Mh E Vi *Q+x{i E Mhx E (R)+/-i E +/- 1,10, 100 +I' 1000(R)J Vi *S {(R)'i |i(R)v * S(R) nPE |i(R)v E ,h Vc B * SE x E S(R) nPE |i(R)v <E< E Vx u(R) BE + E{n 1.0 + 9999 + iE (R)J Vi *=n(R)h E +/-B = 10 ohm, Q = 100 ohm, S = 7ohm.iæ, 78{(R) (ower)+ 1.3.35 & 1.3.36 ævi ri<+/-C]ÅPx (Electrician) - +/-i <+/-C]ÅE+/- +|i(R)v {(R) i{x 'vi E |' (Effect of variation of temperature on resistance)=qP : < { E +xi +{ Vx EM :*S+/-E E 'ti |i(R)v Ex E(R)E {(R) x(R) E(R)i {1} E(R)x*|i(R)v E i{x MhE (E-BiB]) aix *{nl E |i(R)v +vEP i{x {(R) x(R) E(R)i +(R) {nl E+x deg{ an+/-i *V r BE l(R)E V S+/-E E {nl E |Ei +(R) 'P1] |i(R)v+I' |i(R)vEi E+/-i * i{ {(R) |i(R)v E x(R)i xx 'i(R) {1} E V (R) *|i(R)v {(R) i{x E |' (Effect of temperature on resistance) : |i(R)v E +{IE x Vx {+/- æi M ' vi+ E +/-MM E(R) E i{ {(R) n M * {nl E |i(R)v=SS +I' +/- i{ {(R) {(R)'lii i *+vEi(R) Væ {nl E i{ 'r i =E |i(R)v 'ri +/-Ex EU +x {nl i{ 'r x {(R) |i(R)v E i*|iE +P i{ {(R)'ix V {(R)h |i(R)v |' i = i{ MhE Ei * Pæn vxiE +(R) @hiE i{ E |i(R)v 'r, E E nPi E(R)i *Væ i{ 'r {nl E |i(R)v 'r i i{ MhE vxiEi * Pr vi+ V Sn, iæ, B+/-x, {i+/- <inE +/- ={H * EU ,i vi+ V (R)E, Mxx <in E +/- i{ 'r BE |i(R)v 'r +{IEi E +(R) +xi i *Væ i{ 'r {nl E |i(R)v E i <E i{ MhE @hiEi * 'ti +{]-, (R)vE V EMV, (R)æ(R), ES +SE <in {(R)+(R) S+/-E V Eæx {(R) +PE deg{ |' *BE S+/-E E |i(R)v E i{ MhE (alphaalphaalphaalphaalpha) (Temperaturecoefficient of resistance (alphaalphaalphaalphaalpha) of a conductor) : x BEvi S+/-E R0 E 0 degC {(R) |i(R)v +(R) <E tC iE i{IE Vi * il < i{ {(R) |i(R)v Rt V x i{ {(R)E +/- |i(R)v 'r E +/- xx |{i i :*<E |(R)E |i(R)v E x{i *i{ 'r E x{i *S+/-E E {nl E |Ei {(R)<+/- (Rt Ro) = Ro t alpha.....(i)V alpha (B+/-j)

BE I(R)E V S+/-E E |i(R)v E i{ MhEEi *{x& ´´Si E(R)h +/-i t RR = t R R - R = alpha000tlf Ro= 1, t = 1
 degC, then alpha = R = Rt Ro.<+/- {nl E i{ MhE E |i 0C i{ ´r E +/- |i +|i(R)v ´r u(R) {(R)¹i E V Ei *E(R)h
 (1) Yi i E RT = Ro(1+alpha t)(ii)|i(R)E i{ {(R) alpha E x(R)i E nJi BE n M i{ {(R)|i(R)v E i{ MhE E n
 M i{ {(R) |i bO x]O] i{{{(R)´ix |i+ |i(R)v x ´+/- {(R)´ix {(R)¹i E(R)Ei *n R0 Yi x i t1oC i{ {(R) |i(R)v R1 +(R)
 t2oC {(R) +Yi|i(R)v R2 ¢xv E xx |E