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# List of Symbols

<i>Symbol</i>	<i>Description</i>
$a$	distance of measurement place
$c$	specific heat capacity of thread material
$c_{\text{air}}$	specific heat capacity of air
$c_f$	air friction coefficient
$c_p$	specific heat capacity of polymer
$d$	diameter of capillary hole of spinneret
$d_f$	dampening factor
$d_q$	standard deviation
$d_q^2$	quadratic dispersion (variance)
$ddr$	draw down ratio
$\frac{d}{dx}, \frac{d}{dt}$	derivatives in ordinary DEs
$\frac{d^u}{dt^u}$	$u^{\text{th}}$ derivative to the time, LAPLACIAN $p$
$dx, dt, dt^u,$ $dl, dm, dp,$ $dT^t_o, dT, dT_y$ $dM, dS_y$ $d\alpha$	infinitesimal quantity of the appropriate size infinitesimal quantity of the appropriate size infinitesimal quantity of the appropriate size infinitesimal quantity of the appropriate size infinitesimal quantity of the appropriate size
$e$	asymmetry parameter
$e^{\mu\alpha}, e^{\mu\alpha_m}, e^{\mu_m\alpha_m}$	rope friction factor
$e^{j\varphi(\omega)}$	factor of the phase shift between cause- and effect oscillation in the complex plane
$f$	HERRMAN's orientation factor (Chap. 3)
$f$	disturbance frequency, frequency in the dimension Hz
$f_{\text{am}}$	amorphous orientation factor

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$f_{cr}$	crystalline orientation factor
$f_c$	critical frequency
$f_{ch}$	critical frequency of heat transfer dynamic
$f_{c1}, f_{c2}$	critical frequencies of drafting zones 1 and 2
$f_m$	mains frequency
$\Delta f_m$	mains frequency change
$f_P, f_{P1}, f_{P2}$	frequencies of the changes
$f_{ts}$	frequency of traverse motion thread guide
$\widetilde{\Delta f_m}$	sinusoidal mains frequency change
$f(t)$	time dependent function
$f_x, f_y$	components of external force density, cartesian coordinates
$g$	gravitational acceleration
$g(y)$	reduced stream function, cartesian coordinates
$h$	glass level
$h_m$	glass level, mean value
$\Delta h$	glass level change
$h(r)$	reduced stream function, radial coordinates
$i$	running (sequence) index
$i \cdot \Delta t$	time shift (power density spectrum)
$j$	imaginary unit $j^2 = -1$
$k$	running (sequence) index
$k$	BOLTZMANN constant (Chap. 3)
$k$	transfer factor of heating transformer (Chap. 4)
$k(y)$	force density function
$k \cdot \Delta t$	time shift (correlation function)
$l$	length of the appropriate zone or roll setting
$l_m$	length of the appropriate zone or roll setting, mean value
$\Delta l$	length change of the appropriate zone or roll setting
$\widetilde{\Delta l}$	sinusoidal length change of the appropriate zone or roll setting
$l_b$	length of bobbin
$l_{ext}$	input line extension
$l_{ext}/l_m$	extension factor
$l_f$	middle staple length of fibres
$l_h$	high of traverse motion triangle

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$l_s$	distance from spinneret
$l_t$	thread length of one twist
$l_u$	stretched, untwisted length of one twist
$l_0$	length of unloaded fibre/yarn/thread
$l_1$	length of $F$ loaded fibre/yarn/thread
$l_1, l_2, l_3$	lengths of heated godet systems
$l_1$	length of the roll setting zone 1
$l_{1m}$	length of the roll setting zone 1, mean value
$\Delta l_1$	length change of the roll setting zone 1
$l_2$	length of the roll setting zone 2
$l_{2m}$	length of the roll setting zone 2, mean value
$\Delta l_2$	length change of the roll setting zone 2
$l_{Tg}$	distance spinneret-glass transition point
$m$	running (sequence) index
$n$	running (sequence) index
$n$	AVRAMI exponent (crystallisation rate, Chap. 3)
$n_b$	revolution number of bobbin motor
$n_{bm}$	revolution number of bobbin motor, mean value
$\Delta n_b, \Delta n_{b1}, \Delta n_{b2}$	revolution number changes of bobbin motor
$\Delta n$	sinusoidal revolution number change of bobbin motor
$n_b$	revolution number of bobbin
$n_i$	revolution number of input drawing godet
$n_o$	revolution number of output drawing godet
$n_p$	revolution number of motor spinning pump
$n_s$	revolution number of false twist spindle
$n_{sm}$	revolution number of false twist spindle, mean value
$\Delta n_s$	revolution number change of false twist spindle
$\Delta n_s$	sinusoidal revolution number change of false twist spindle
$p_e$	pressure of melt from extruder
$p_s$	pressure of melt before the spinneret
$p^u = \frac{d^u}{dt^u}$	LAPLACIAN
$p_\nu$	zero value of the integrand of Eq. 2.42
$p_x, p_y$	components of pressure gradient, cartesian coordinates
$q$	number of worker-angle-stripper pairs (roller top card, Chap. 4)

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$q_i$	cross section of capillary hole
$q_{im}$	cross section of capillary hole, mean value
$\Delta q_i$	cross section change of capillary hole
$\widetilde{\Delta q_i}$	sinusoidal cross section change of capillary hole
$q_o$	throughput of one single filament
$q_s$	cross section of ready formatted fibre
$q_{sm}$	cross section of ready formatted fibre, mean value
$\Delta q_s$	cross section change of ready formatted fibre
$\widetilde{\Delta q_s}$	sinusoidal cross section change of of ready formatted fibre
$\dot{q}_s$	derivative of $q_s$ to $t$
$q_x, q_y$	components of heat flow
$r_g$	gear ratio
$s$	length of capillary hole of spinneret
$t$	running time
$\Delta t$	time interval
$\Delta t_1$	necessary time shift between time functions of tensile force and fineness to continuous quotient calculation to fineness related yarn tensile force (Fig. 6.16)
$t_0$	time to the start point zero
$tm_a$	amplitude of traverse motion at winder
$tm_f$	frequency of traverse motion at winder
$u$	order of the LAPLACIAN
$v$	fibre/yarn/thread velocity
$v_0$	extrusion velocity
$v_a$	velocity of quenching air
$\Delta v_a$	velocity change of quenching air
$\widetilde{\Delta v_a}$	velocity change of quenching air
$v_{air}$	air velocity
$v_c$	coefficient of variation (Chap. 6)
$v_i$	velocity of input fibre/yarn/thread or godet or present velocity of twisted thread in texturing zone
$v_{input}$	velocity of input fibre mass
$v_{im}$	velocity of input fibre/yarn/thread or godet or present velocity of twisted thread in texturing zone, mean values

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$\Delta v_i$	velocity change of input fibre/yarn/thread or godet or present velocity change of twisted thread the texturing zone
$\widetilde{\Delta v_i}$	sinusoidal velocity change of input fibre/yarn/thread
$v_i(t)$	velocity of input fibre/yarn/thread or godet, time function
$v_{i1}(t)$	velocity of input fibre/yarn/thread, level 1, time function
$v_{i2}(t)$	velocity of input fibre/yarn/thread, level 2, time function
$v_o$	velocity of output or take-down velocity of fibre/yarn/thread or godet
$v_{\text{output}}$	velocity of output fibre mass
$v_{\text{om}}$	velocity of output fibre/yarn/thread or godet, mean value
$\Delta v_o$	velocity change of output fibre/yarn/thread or godet
$\widetilde{\Delta v_o}$	sinusoidal velocity change of output fibre/yarn/thread or godet
$v'_o$	velocity of twisted thread in the peel off moment
$v_o(t)$	velocity of output fibre/yarn/thread or godet, time function
$v_{o1}(t)$	velocity of output fibre/yarn/thread, level 1, time function
$v_{o2}(t)$	velocity of output fibre/yarn/thread, level 2, time function
$v_s$	take-down (spinning) velocity of formatted fibre
$v_{\text{sm}}$	take-down (spinning) velocity of formatted fibre, mean value
$\Delta v_s, \Delta v_{s1}, \Delta v_{s2}$	take-down (spinning) velocity changes of formatted fibre
$\widetilde{\Delta v_s}$	sinusoidal take-down (spinning) velocity change of formatted fibre
$v_{\text{tm}}$	linear velocity of traverse motion thread guide, mean value
$v_0, v_B$	(initial) quenching air velocity
$v_L$	take-up velocity
$v_x, v_y$	velocity components of air, cartesian coordinates
$v_x, v_r$	velocity components of air, radial coordinates
$v_z$	velocity of middle drafting godet or input velocity of untwisted thread in texturing zone

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$v_{zm}$	velocity of middle drafting godet or velocity of input dead time line or velocity of the tensionless fibre/yarn/thread or input velocity of untwisted thread in texturing zone, mean values
$\Delta v_z$	velocity change of middle drafting godet or velocity change of input dead time line or input velocity change of untwisted thread in texturing zone
$\widetilde{\Delta v_z}$	sinusoidal velocity change of untwisted thread in texturing zone
$v'_z$	velocity of twisted thread in texturing zone
$v_{  }, v_{\perp}$	axial and cross air velocity
$w$	bending tongue shift
$w_m$	bending tongue shift, mean value
$\Delta w$	bending tongue shift change
$\widetilde{\Delta w}$	sinusoidal bending tongue shift change
$x$	coordinate in fibre direction, distance from spinneret (Chap. 3)
$x(t)$	time function (Chap. 2)
$\bar{x}$	mean value of the time function (Chap. 2)
$\Delta x$	cause variable (Chap. 2)
$x_0$	length measurement corresponding to Eqs. 5.96, 5.97
$x_1, \dots, x_n,$	discrete values of the time function $x(t)$ (Chap. 2)
$x_i, x_{i+k}$	
$x_i$	input fibre mass/time (carding engines, Figs. 4.15, 4.18)
$x_{im}$	input fibre mass/time (carding engines), mean value
$\Delta x_i$	input fibre mass/time change (carding engines, Figs. 4.16, 4.18)
$\widetilde{\Delta x_i}$	sinusoidal input fibre mass/time change (carding engines)
$\Delta x, \Delta x_1, \dots, \Delta x_n,$	partial fibre mass/time changes (roller top card, Figs. 4.16, 4.17)
$\Delta x_{i1}, \Delta x_{i2}$	
$x_o$	output fibre mass/time (carding engines, Figs. 4.15, 4.18)
$x_{om}$	output fibre mass/time (carding engines), mean value
$\Delta x_o$	output fibre mass/time change (carding engines, Figs. 4.16, 4.18)
$\widetilde{\Delta x_o}$	sinusoidal output fibre mass/time change (carding engines)

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$\Delta x_{o2}$	partial fibre mass/time change (roller top card, Fig. 4.16)
$x_s$	distance to solidification point
$\widetilde{\Delta x}(\omega)$	vector of the sinusoidal disturbance of the independent cause variable
$y(t)$	time function (Chap. 2)
$y_1, \dots, y_n, y_{i+k}$	discrete values of the time function $y(t)$ (Chap. 2)
$\bar{y}$	mean value of the time function (Chap. 2)
$\Delta y$	effect variable (Chap. 2)
$\Delta y_1, \Delta y_2, \dots, \Delta y_n$	partial fibre mass/time changes (roller top card, Figs. 4.16, 4.17)
$\widetilde{\Delta y}(\omega)$	vector of the sinusoidal disturbance of the dependent response (effect) variable
$\widetilde{\Delta y}(\omega_0)$	vector of the sinusoidal disturbance of the dependent response (effect) variable for $\omega_0$
$\widetilde{\Delta y}(\omega_1)$	vector of the sinusoidal disturbance of the dependent response (effect) variable for $\omega_1$
$\widetilde{\Delta y}(\omega_2)$	vector of the sinusoidal disturbance of the dependent response (effect) variable for $\omega_2$
$\widetilde{\Delta y}(\omega_3)$	vector of the sinusoidal disturbance of the dependent response (effect) variable for $\omega_3$
$z$	number of capillary holes of spinneret or number of total twists in the zone $l_m$ or number of thread wraps around heated godets
$z_i$	number of fibres in cross section of coming in sliver
$z_{im}$	number of fibres in cross section of coming in sliver, mean value
$\Delta z_i$	change of number of fibres in cross section of coming in sliver
$\widetilde{\Delta z}_i$	sinusoidal change of number of fibres in cross section of coming in sliver
$z_o$	number of fibres in cross section of coming out sliver
$z_{om}$	number of fibres in cross section of coming out sliver, mean value
$z_z$	number of fibres in cross section of coming out/in sliver from/to drafting zones 1/2
$z_{zm}$	number of fibres in cross section of coming out/in sliver from/to drafting zones 1/2, mean value

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$\Delta z_z$	change of number of fibres in cross section of coming out/in sliver from/to drafting zones 1/2
A	actuator device
A	filament cross section
$A_a, B_a, C_a, E_a$	abbreviation factors in the Eqs. 5.23, 5.24
$A_b, B_b, C_b$	abbreviation factors in the Eqs. 5.38, 5.39
$A_s$	surface of glass melt
$A_{zm}$	to the fineness related rise of the force-elongation-curve of fibre/yarn/thread
ACF	auto-correlation function
APSF	auto-power density spectrum function
B	width of filament bundle in multifilament spinning, quenching air direction
$C_1, C_2, C_3$	constants
CAC	coordination automatic controller
CC	coordination controller
CCF	cross-correlation function
CPCD	connection programmed controller device
CV	coefficient of variation (Chap. 3)
D	filament diameter (Chap. 3)
D	wind-up/godet diameter
$D_m$	wind-up/godet/friction element diameter, mean value
$\Delta D$	wind-up/godet diameter change
$\widetilde{\Delta D}$	sinusoidal wind-up diameter change
$D_0$	diameter of capillary hole
$D_i$	diameter of input godet
$D_o$	diameter of output godet
$D_L$	filament diameter at take-up distance $L$ (Chap. 3)
$D_y$	fibre/yarn/thread diameter
$De$	<i>Deborah</i> number
DE	differential equation
DR	draw ratio
DMCC	digital multi channel controller
DPP	data processing peripherals
E	elongational elastic modulus (melt)
$E_y$	elastic modulus of fibre/yarn/thread
$E_{yi}$	elastic modulus of input fibre/yarn/thread



*continuation*  
*Symbol*

*Description*

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$E_{yim}$	elastic modulus of input fibre/yarn/thread, mean value
$E_{yo}$	elastic modulus of output fibre/yarn/thread
$E_{yom}$	elastic modulus of output fibre/yarn/thread, mean value
$E_a$	activation energy (ARRHENIUS)
EDPS	electronic data processing system
$F, F_1, F_2$	tensile forces of fibre/yarn/thread
$F_m$	tensile force of fibre/yarn/thread, mean value
$\Delta F$	tensile force change of fibre/yarn/thread
$\widetilde{\Delta F}$	sinusoidal tensile force change of fibre/yarn/thread
$\Delta F_1$	tensile force change (amplitude) of fibre/yarn/thread
$F(t)$	tensile force of fibre/yarn/thread, time function
$F_m$	mean value of $F(t)$
$F_i$	discontinuous value of time function $F(t)$
$F_1(t)$	tensile force of fibre/yarn/thread, level 1, time function
$F_2(t)$	tensile force of fibre/yarn/thread, level 2, time function
$F_b$	tensile force at break of fibre/yarn/thread
$F_{T_g}$	tensile force of fibre/yarn/thread at the glass transition temperature $T_g$
$F_i$	discontinuous value of time function $F(t)$ (Chap. 6)
$F_i$	tensile force of fibre/yarn/thread at friction thread line input
$F_o$	tensile force of fibre/yarn/thread at friction thread line output
$F_0$	initial force (at capillary)
$F_{drag}$	air drag tensile force
$F_{inert}$	inertial tensile force
$F_{grav}$	gravitational tensile force
$F_{surf}$	surface tensile force
$F_{rheo}$	(rheological) fibre force
$F_L$	take-up force at distance $L$
$F_y$	yarn tensile force (drawing process)
FT	false twist
$G$	modulus (upper convected MAXWELL model)
$G(p)$	dynamic transfer function
$G_1(p)$	dynamic transfer function drafting zone 1
$G_2(p)$	dynamic transfer function drafting zone 2

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$G_D(p)$	dynamic transfer function of two steps drafting process
$G_1(p) \dots G_5(p)$	dynamic transfer functions of FT-texturing process
$ G_1(jf)  \dots  G_5(jf) $	normalized amplitude frequency responses of FT-texturing process
$G_{fc}(p)$	dynamic transfer function of stationary flat card
$G_{fc}(j\omega)$	complex frequency response of stationary flat card
$ G_{fc}(j\omega) $	amplitude frequency response of stationary flat card
$ G_{fc}(j\lambda_o) $	amplitude frequency response of stationary flat card (Fig. 4.19)
$G_{rc}(p)$	dynamic transfer function of roller top card
$G_{W1}(p) \dots G_{Wq}(p)$	dynamic transfer functions of worker-angle-stripper-pairs
$G(j\omega)$	complex frequency response
$ G(j\omega) $	amplitude frequency response
$G(jf)$	complex frequency response
$ G(jf) $	amplitude frequency response
$ G[j(f/f_c)] $	normalized amplitude frequency response
$G_D(j\omega)$	complex frequency response of two steps drafting process
$ G_D(j\omega) $	amplitude frequency response of two steps drafting process
$G_i$	abbreviation for dynamic transfer function $G_i(p)$
$G_1 \dots G_{18}$	single transfer elements of functional block diagram according to Fig. 4.12 and Table 4.2, abbrev. for dynamic transfer functions $G_1(p) \dots G_{18}(p)$
$G_{z1} \dots G_{z9}$	disturbance transfer functions (Table 4.3), abbrev. for dynamic transfer functions $G_{z1}(p) \dots G_{z9}(p)$
$ G_{z1}  \dots  G_{z9} $	disturbance amplitude frequency responses (Table 4.3, Fig. 4.13), abbrev. for amplitude frequency responses $ G_{z1}(jf)  \dots  G_{z9}(jf) $
$Gr$	GRASHOF number
$\Delta H$	heat of fusion
$I_h$	heating current
$I_{hm}$	heating current, mean value
$\Delta I_h$	heating current change
$\text{Im}(\omega)$	imaginary part of complex frequency response
$K$	fibre mass distribution coefficient (roller top card, Fig. 4.17)

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$K_a$	fibre mass distribution coefficient (roller top card, Fig. 4.16)
$K_F(\tau)$ , $K_F(k \cdot \Delta t)$	single values of ACF of time function $F(t)$ for $\tau$ or $k \cdot \Delta t$
$K_h$	polymer specific constant for the heat transfer
$K_p$	polymer specific constant for conversion fibre/yarn/thread fineness to diameter
$K(T, \sigma)$	crystallisation rate
$K_{\max}$	crystallisation rate constant
$K(\tau)$	auto- or cross-correlation function, integral representation
$K(k \cdot \Delta t)$	auto- or cross-correlation function, sum representation
$K_{FT_{t_0}}(\tau)$	cross-correlation function of $F(t)$ and $T_{t_0}(t)$
$K_{FT_{t_0}}(0)$	start value of $K_{FT_{t_0}}(\tau)$ for $\tau = 0$
$K_{F\sigma}(\tau)$	cross-correlation function of $F(t)$ and $\sigma(t)$
$K_{F\sigma}(0)$	start value of $K_{F\sigma}(\tau)$ for $\tau = 0$
$K_{T_{t_0}\sigma}(\tau)$	cross-correlation function of $T_{t_0}(t)$ and $\sigma(t)$
$K_{T_{t_0}\sigma}(0)$	start value of $K_{T_{t_0}\sigma}(\tau)$ for $\tau = 0$
$K_s$	shortening factor (false twist texturing process)
$K_S$	amplification factor of transfer element $G_4$
$K_{\overline{S}}$	amplification factor of transfer element $G_8$
$K_{K(T_0)}$	amplification factor of transfer element $G_9$
$K_K$	amplification factor of transfer element $G_{12}$
$K_U$	amplification factor of transfer element $G_{13}$
$K_{W1}$ , $K_{W2}$	polymer specific constants in Eqs. 5.96, 5.97
$K_{\overline{U}}$	amplification factor of transfer element $G_{14}$
$L$	LAPLACE-transformation
$L_{-1}$	LAPLACE-retransformation
$L$	take-up distance, length of take-up channel (Chap. 3)
$L_c$	cooling length
$L_{cl}$	necessary cutting length of fibre/yarn/thread
$L_d$	delay thread length
$L_{dv}$	delay thread length for a velocity disturbance $\Delta v_i$
$L_{d\mu}$	delay thread length for a velocity disturbance $\Delta \mu$
$L_{gl}$	necessary gauge length of fibre/yarn/thread
$M$	measuring device
$M$	molecular weight (Chap. 3)
$M$	fibre/yarn/thread mass at the friction element (Chap. 5)
MC	micro computer
MP	micro processor

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
MPC	micro processor controller
MVC	measuring value computer
MVCO	measuring value concentrator
$N$	number of filaments in fibre bundle
$N(\theta)$	orientational distribution function
$N_a$	abbreviation factor in Eq. 5.56
$N_h$	heating power
$N_{hm}$	heating power, mean value
$\Delta N_h$	heating power change
$Nu$	NUSSELT number
PA	poly(amide)
PET	poly(ethylene terephthalate)
PP	poly(propylene)
PCD	programmable controller device
$P_i$	LEGENDRE polynomials
$Pr$	PRANDTL number
$Q$	mass throughput of polymer
$Q_{air}$	(mass) flow rate of air
$Q_i$	glass mass inflow
$\Delta Q_i, \Delta Q_{i1}, \Delta Q_{i2}$	glass mass inflow changes
$\overline{\Delta Q_{i1}}$	sinusoidal glass mass inflow change
$Q_s$	throughput through the spinneret
$\Delta Q_s$	throughput change through the spinneret
$\overline{\Delta Q_s}$	sinusoidal throughput change through the spinneret
$Q_{sm}$	throughput through the spinneret, mean value
$\Delta Q_s, \Delta Q_{s1}, \Delta Q_{s2}$	throughput changes through the spinneret
$Q_p$	throughput through the spinning pump
$R$	gas constant (Chap. 3)
$R$	filament (fibre) radius (Chap. 3)
$R$	reduction factor (Chap. 5)
$R_y$	fineness related tensile force $F/Tt_1$
$R_0$	radius of capillary hole, initial filament radius
$R_1, R_2$	inner and outer radius of radially symmetric filament bundle
$Re, Re_{  }, Re_{\perp}$	REYNOLDS number, related to $v_{  }, v_{\perp}$
$Re_{T_g}$	fineness related tensile force of fibre/yarn/thread at the glass transition temperature $T_g$

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$\Delta R_{T_g}$	fineness related tensile force change of fibre/yarn/thread at the glass transition temperature $T_g$
$\text{Re}(\omega)$	real part of frequency response
$R_h$	heating resistance
$R_{hm}$	heating resistance, mean value
$\Delta R_h$	heating resistance change
$R_s$	flow resistance of spinneret holes
$\text{Res}[S(p)]$	residue of $S(p)$
$S_y$	surface of disc-shaped pice
$S(\omega), S(f)$	power density spectrum function
$S_F(f)$	single value of the APSF of time function $F(t)$ for $f$
$S(p)$	abbreviation of the integrand of Eq. 2.42
$T$	temperature or time period of the integration range
$T_A$	necessary maximum analysis time
$T_1, T_2, \dots, T_n$	thread temperatures $T_y$ after pass of single heating and cooling lines
$T_0$	extrusion temperature, initial temperature
$T_a, T_{air}$	temperature of air
$T_b$	temperature at beginning of heat transfer
$T_{bf}$	bobbin formation time
$T_c$	time constant
$T_{ch}$	time constant of heat transfer dynamic
$T_{c1}, T_{c2}$	time constants (stationary flat card)
$T_{cd1}, T_{cd2}$	time constants of drafting zones 1 and 2
$T_d, T_{d1}, T_{d2}$	dead (transport) times
$T_H$	time constant of transfer element $G_4$
$T_{\bar{H}}$	time constant of transfer element $G_7$
$T_h$	time constant of transfer element $G_9$
$T_{K1}, T_{K2}$	time constants of transfer element $G_{12}$
$T_U$	time constant of transfer elements $G_{13}, G_{14}$
$T_e$	temperature of melt from extruder
$T_f$	temperature of filament
$T_g$	glass transition temperature
$T_g$	temperature of glass melt
$T_{gm}$	temperature of glass melt, mean value
$\Delta T_g$	temperature change of glass melt
$\widetilde{\Delta T_g}$	sinusoidal temperature change of glass melt
$T_h$	temperature of heat medium
$T_{hg}$	temperature of heated godet
$T_m$	melt temperature

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$T_D$	twist density
$T_{Dm}$	twist density, mean value
$\Delta T_D$	twist density change
$\widetilde{\Delta T_D}$	sinusoidal twist density change
$\dot{T}_D$	derivative of $T_D$ to $t$
$T_P$	cycle duration
$T_{P1}$	cycle duration, correlating to circuit frequency $\omega_1$
$T_{P2}$	cycle duration, correlating to circuit frequency $\omega_2$
$T_r$	temperature of cool medium
$T_s$	temperature of the spinneret
$T_{sm}$	temperature of the spinneret, mean value
$\Delta T_s, \Delta T_{s1}, \Delta T_{s2}$	temperature changes of the spinneret
$\widetilde{\Delta T_s}$	sinusoidal temperature change of the spinneret
$T_y$	temperature of fibre/yarn/thread
$T_{ym}$	temperature of fibre/yarn/thread, mean value
$\Delta T_y$	temperature change of fibre/yarn/thread
$TN$	tenacity of fibre/yarn/thread
$Tt$	fineness (titre) of fibre/yarn/thread
$Tt_m$	fineness (titre) of fibre/yarn/thread, mean value
$\Delta Tt$	fineness (titre) change of fibre/yarn/thread
$\widetilde{\Delta Tt}$	sinusoidal fineness (titre) change of fibre/yarn/thread
$Tt_f$	fineness of single fibre
$Tt_{fm}$	fineness of single fibre, mean value
$\Delta Tt_f$	fineness change of single fibre
$\widetilde{\Delta Tt_f}$	sinusoidal fineness change of single fibre
$Tt_i$	fineness of input fibre/yarn/thread
$Tt_{ii}$	fineness of input fibre/yarn/thread before the $i^{\text{th}}$ elongation step
$Tt_{im}$	fineness of input fibre/yarn/thread, mean value
$Tt_o$	fineness of output fibre/yarn/thread
$Tt_{om}$	fineness of output fibre/yarn/thread, mean value
$\Delta Tt_o$	fineness change of output fibre/yarn/thread
$\widetilde{\Delta Tt_o}$	sinusoidal fineness change of output fibre/yarn/thread
$\dot{T}t_o$	derivative of $Tt_o$ to $t$
$\dot{T}t_{om}$	derivative of $Tt_{om}$ to $t$
$\Delta \dot{T}t_o$	derivative of $\Delta Tt_o$ to $t$
$\widetilde{\Delta Tt_o}(\omega)$	vector of sinusoidal disturbances of the effect variable $Tt_o$ for $\omega$
$Tt_o(t)$	fineness of fibre/yarn/thread, time function
$Tt_{om}$	mean value of $Tt_o(t)$
$Tt_{oi}, Tt_{o(i+k)}$	discontinuous values of time function $Tt_o(t)$

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$Tt_{oi}$	fineness of output fibre/yarn/thread after the $i^{\text{th}}$ elongation step
$Tt_0$	fineness of unloaded fibre/yarn/thread
$Tt_{0m}$	fineness of unloaded fibre/yarn/thread, mean value
$\Delta Tt_0$	fineness change of unloaded fibre/yarn/thread
$Tt_1$	fineness of $F$ loaded fibre/yarn/thread
$Tt_{1m}$	fineness of loaded fibre/yarn/thread, mean value
$\Delta Tt_1$	fineness change of loaded fibre/yarn/thread
$Tt_L$	filament fineness at take-up distance $L$
$Tt_s$	fineness of ready formatted fibre
$Tt_{sm}$	fineness of ready formatted fibre, mean value
$\Delta Tt_s, \Delta Tt_{s1}, \Delta Tt_{s2}$	fineness changes of ready formatted fibre
$\widetilde{\Delta Tt_s}$	sinusoidal fineness change of ready formatted fibre
$\dot{T}t_s$	derivative of $Tt_s$ to $t$
$Tt_z$	sliver fineness at output/input of drafting zones 1/2
$Tt_{zm}$	sliver fineness at output/input of drafting zones 1/2 or fineness of the tensionless fibre/yarn/thread or fibre/yarn/thread fineness of dead time line input, mean values
$\Delta Tt_z$	sliver fineness change at output/input of drafting zones 1/2 or fibre/yarn/thread fineness change of dead time line input
$U^*$	activation energy for segment motion
$U_h$	heating voltage
$U_{hm}$	heating voltage, mean value
$\Delta U_h$	heating voltage change
$\widetilde{\Delta U_h}$	sinusoidal heating voltage change
$U_m$	mains voltage
$\Delta U_m$	mains voltage change
$\widetilde{\Delta U_m}$	sinusoidal mains voltage change
$V$	draft of sliver
$V_1$	draft of sliver drafting zone 1
$V_2$	draft of sliver drafting zone 2
$W$	width of filament bundle in multifilament spinning, perpendicular to quenching direction
$W_a$	abbreviation factor in Eq. 5.56
$X_c$	crystallinity

<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$\alpha$	heat transfer coefficient
$\alpha_1$	heat transfer coefficient thread/metallic surface
$\alpha_2$	heat transfer coefficient thread/surrounding air
$\alpha_{rt}$	resistance-temperature coefficient of the Pt-Rh-spinneret oven
$\alpha$	angle of wrap
$\alpha_m$	angle of wrap, mean value
$\Delta\alpha$	angle of wrap change
$\beta$	parameter (to force density) in multifilament theory
$\gamma$	parameter (to force density) in multifilament theory
$\Delta n$	(total) birefringence
$\Delta n_{am}$	amorphous birefringence
$\Delta n_{cr}$	crystalline birefringence
$\Delta_i$	birefringence of input fibre/yarn/thread
$\Delta_o$	birefringence of output fibre/yarn/thread
$\frac{\partial}{\partial x}, \frac{\partial}{\partial y}$	derivatives in partial DEs
$\frac{\partial}{\partial z}, \frac{\partial}{\partial t}$	derivatives in partial DEs
$\frac{\partial\Phi}{\partial v_s}, \frac{\partial\Phi}{\partial v_i}, \frac{\partial\Phi}{\partial l}$	partial derivatives from $\Phi$ to the appropriate sizes
$\frac{\partial\Phi}{\partial q_s}, \frac{\partial\Phi}{\partial q_i}, \frac{\partial\Phi}{\partial \rho}$	partial derivatives from $\Phi$ to the appropriate sizes
$\frac{\partial\Phi}{\partial T_D}, \frac{\partial\Phi}{\partial n_s}, \frac{\partial\Phi}{\partial \mu}$	partial derivatives from $\Phi$ to the appropriate sizes
$\frac{\partial\Phi}{\partial v_z}, \frac{\partial\Phi}{\partial v_o}, \frac{\partial\Phi}{\partial Tt}$	partial derivatives from $\Phi$ to the appropriate sizes
$\epsilon, \varepsilon$	elongation of fibre/yarn/thread (in %, resp. logarithmic (HENCKY) measure)
$\Delta\epsilon$	elongation change of fibre/yarn/thread (in %)
$\epsilon_b$	elongation at break of fibre/yarn/thread (in %)
$\epsilon_o$	elastic (orientational) part of elongational deformation (HENCKY measure)



<i>continuation</i> <i>Symbol</i>	<i>Description</i>
$\varepsilon_{oi}$	reached orientation elongation of fibre/yarn/thread in the $i^{\text{th}}$ elongation step (HENCKY measure)
$\varepsilon_{o1}$	reached orientation elongation of fibre/yarn/thread at the glass transition point (HENCKY measure)
$\Delta\varepsilon_{o1}$	reached orientation elongation change of fibre/yarn/thread at the glass transition point (HENCKY measure)
$\varepsilon_{omax}$	maximum orientation elongation of fibre/yarn/thread (HENCKY measure)
$\varepsilon_v$	viscous part of elongational deformation (HENCKY measure)
$\dot{\varepsilon}_v$	viscous elongational deformation rate (HENCKY measure)
$\varepsilon(t)$	elongation of fibre/yarn/thread, time function
$\varepsilon_1, \varepsilon_2$	elongations (in %) correlated with $F_1$ and $F_2$
$\varepsilon_m$	emissivity (heat radiation)
$\eta$	elongational viscosity
$\eta_{app}$	apparent elongational viscosity
$\eta_{air}$	dynamic viscosity of air
$\eta_e$	viscosity of melt from extruder
$\eta_s$	viscosity of melt in the spinneret
$\eta_h$	heating yield
$\theta$	angle
$\lambda$	relaxation time
$\lambda_{air}$	heat conductivity of air
$\lambda_f$	wavelength of disturbance
$\lambda_i$	wavelength of disturbance effect in an input web
$\lambda_o$	wavelength of disturbance effect in an output web
$\mu$	coefficient of friction between fibre/yarn/thread and fixed friction guide or false twist spindle
$\mu_m$	coefficient of friction between fibre/yarn/thread and fixed friction guide or false twist spindle, mean values
$\Delta\mu$	change of coefficient of friction between fibre/yarn/thread and fixed friction guide or false twist spindle
$\widetilde{\Delta\mu}$	sinusoidal change of coefficient of friction between fibre/yarn/thread and fixed friction guide or false twist spindle

continuation

*Symbol**Description*


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$\nu_{\text{air}}$	kinematic viscosity of air
$\varrho_{\text{air}}$	density of air
$\varrho$	density of polymer or thread material
$\varrho_{\text{m}}$	density of polymer, mean value
$\Delta\varrho$	density change of polymer
$\widetilde{\Delta\varrho}$	sinusoidal density change of polymer
$\varrho_{\text{am}}$	mass density of amorphous polymer
$\varrho_{\text{cr}}$	mass density of crystalline polymer
$\varrho_{\text{m}}$	mass density of glass
$\varrho_{\text{p}}$	mass density of polymer
$\sigma$	filament stress
$\sigma(t)$	fineness related tensile force of fibre/yarn/thread, time function
$\sigma_{\text{m}}$	mean value of $\sigma(t)$
$\sigma_{\text{i+k}}$	discontinuous value of time function $\sigma(t)$
$\sigma_{\text{T}_g}$	tension $F_{\text{T}_g}/Tt_{\text{s}}$ of fibre/yarn/thread at the glass transition point
$\sigma_{\text{SB}}$	STEPHAN-BOLTZMANN constant
$\sigma_{\text{surf}}$	surface tension (specific surface energy)
$\tau$	time shift (correlation function)
$\tau_{\text{f}}$	shear stress at filament surface
$\varphi$	phase shift angle
$\varphi_{\text{a}}$	humidity of quenching air
$\varphi_1$	phase shift angle, correlating to circuit frequency $\omega_1$
$\varphi_2$	phase shift angle, correlating to circuit frequency $\omega_2$
$\varphi_3$	phase shift angle, correlating to circuit frequency $\omega_3$
$\varphi(\omega), \varphi(f)$	phase frequency responses
$\Phi$	fluidity
$\Phi$	symbol for a nonlinear differential equation
$\Phi(x, r)$	potential flow function, radial coordinates
$\Psi(x, y)$	potential flow function, cartesian coordinates
$\omega$	circular/excitation frequency
$\omega_0$	circular/excitation frequency, level 0
$\omega_1$	circular/excitation frequency, level 1
$\omega_2$	circular/excitation frequency, level 2

*continuation**Symbol**Description*

---

 $\omega_3$ 

circular/excitation frequency, level 3

 $\omega_c$ 

critical (circular) frequency

 $\lrcorner$ 

step

 $\perp$ 

impulse

# Index

- A-priori knowledge, 16, 27, 166, 172, 184, 241, 242, 292
- Acceleration force
  - melt spinning process, 167, 168
- Air
  - properties, 80
  - quenching profile, effect on fibre formation, 87, 92, 117
- Air friction force
  - melt spinning process, 167, 168
- Air friction, coefficient, 56
  - definition, 52
  - examples, 57
  - friction forced take-up, 124
  - limitation to fineness, 136
  - minimise, 137
  - model of fibre formation, 80
  - multifilament model, 103
- Amplification factor
  - FT-texturing process
    - twist density, 250–252
  - generally, 206
  - melt spinning process
    - orientation elongation, 169
    - steady state, 169
    - step response (function), 160, 163
- Amplitude frequency response
  - definition, 19–21, 27, 33, 34, 38
  - drafting process (one step), 191
  - estimation, 192, 193
  - oscillations  $\widetilde{\Delta T}t_f$ , 192
  - oscillations  $\widetilde{\Delta v}_i$ , 192
  - oscillations  $\widetilde{\Delta v}_o$ , 191
  - oscillations  $\widetilde{\Delta z}_i$ , 192
  - drafting process (two steps), 201
  - estimation, 196, 197, 199, 201
  - oscillations  $\widetilde{\Delta v}_z$ , 201, 202
  - oscillations  $\widetilde{\Delta z}_i$ , 195
  - drawing process
    - oscillations  $\widetilde{\Delta v}_i$ , 38, 39, 41
    - fibre/yarn/thread formation distance
      - common normalised, 158–160, 163
      - estimation, 157, 158, 166
      - normalised oscillations  $\widetilde{\Delta T}t_s/\widetilde{\Delta l}$ , 163
      - oscillations  $\widetilde{\Delta l}$ , 156
      - oscillations  $\widetilde{\Delta q}_i$ , 154
      - oscillations  $\widetilde{\Delta v}_i$ , 153
      - oscillations  $\widetilde{\Delta v}_s$ , 152
      - oscillations  $\widetilde{\Delta \rho}$ , 155
      - fibre/yarn/thread input line
        - oscillations  $\widetilde{\Delta v}_i/v_{im}$ , 229
      - fibre/yarn/thread tensile force, 280
      - measuring sensor, 283, 284
      - fibre/yarn/thread transport process
        - dead time thread line, 213
        - friction thread line, 215
        - friction thread line
          - estimation, 226, 227
          - oscillations  $\widetilde{\Delta v}_i$ , 222, 224
          - oscillations  $\widetilde{\Delta \mu}$ , 225
      - FT-texturing process
        - estimation, 252
        - twist density oscillations  $\widetilde{\Delta T}_D/T_{Dm}$ , 247, 249, 252–256
      - generally, 9
      - glass fibre spinning process
        - fineness disturbance causes, 178–180
        - measuring and estimation volume
          - disturbance estimation, 204
          - series of delay and dead time thread lines
            - estimation, 218, 221
            - oscillations  $\widetilde{\Delta v}_i$ , 217, 218, 220
      - stationary flat card, 188, 189
    - Amplitude ratio, 19, 21, 38, 41, 173, 282
    - Amplitude shift, maximum, 285

- Amplitude spectrum, 25
- Amplitude vector, 19
- Analysis
  - generally, 1, 2
  - process dynamics, 1
- Auto-correlation function, ACF, 23–25, 287–295
  - estimation rules, 289–294
  - fibre/yarn/thread tensile force time function, 288–300
- Auto-power density spectrum function, APSF, 24, 25, 287–301
- Automatic control, 3, 4, 18, 31, 149, 177, 180, 182, 183, 190, 212, 228
  
- Balance equations
  - energy (heat), 47, 95, 105, 106
  - mass, 45
  - model of fibre formation, 79
  - momentum, 50, 95, 96, 103
- Behaviour
  - dynamic
    - carding engines, 182
    - differential equation, DEq., 28
    - drafting process, 189, 190, 192, 199, 200
    - drawing process, 31, 38, 41
    - fibre/yarn/thread formation distance, 152, 157, 158, 162
    - fibre/yarn/thread heating/cooling, 263, 268, 276
    - fibre/yarn/thread transport process, 210, 221
    - frequency-depending, 18, 21
    - FT-texturing process, 249, 255
    - generally, 33, 36, 38
    - glass fibre spinning process, 173
    - melt spinning process, 168
    - necessary measuring and gauge lengths, 206
    - spun yarn spinning process, 182
    - stationary flat card, 183, 188
    - technological process, 7, 9, 15, 16
    - tensile force/fineness measurement, 301
    - test signals, 27
    - time-depending, 17
  - force-elongation of fibre/yarn/thread, 145, 210, 221, 278
  - material, 10, 11
  - rheological, 10
  - time, 287
- Birefringence
  - amorphous, 67
  - crystalline, 67
  - definition, 67
  - fibre/yarn/thread drawing process, 6
  - melt spun fibre/yarn/thread, 166
  - model of fibre formation, 80
  - stress-optical law, 67
- Bobbin structure
  - traverse motion influence, 240
- Breaking elongation
  - drawn fibre/yarn/thread, 6
  - melt spun fibre/yarn/thread, 166
- Breaking force
  - drawn fibre/yarn/thread, 6
  - melt spun fibre/yarn/thread, 166
  
- Carrier frequency, 204
- Cause disturbance, 17, 206
- Cause oscillation, 18–20, 38, 41, 161
- Cause quantity, 9, 173, 278
- Cause variable
  - delay line length
    - traverse motion at winder, 233, 236
  - generally, 17
  - input velocity
    - drawing process, 31
    - melt spinning process, 146–149
  - periodic, 17
  - possible test signals, 27
  - several
    - fibre/yarn/thread formation distance, 157, 158
    - glass fibre spinning process, 181
    - spun yarn spinning process, 182
  - sinusoidal, 18, 19, 21, 33
  - spinneret temperature
    - glass fibre spinning process, 171
  - step-like, 17, 33, 37
  - stochastic, 21
- Cause vector, 19
- Cause-effect relation(s)
  - drawing process, 5
  - fibre/yarn/thread tensile force, 280, 301
  - fibre/yarn/thread transport process
    - delay and dead time thread lines, 217, 221
  - generally, 1, 2, 7, 13–16, 23, 27, 41, 149, 157
  - glass fibre spinning process
    - fibre/yarn/thread fineness, 173
  - melt spinning process
    - fibre/yarn/thread fineness, 146, 149

- Cause-effect-blocks, 27
- Cause-effect-scheme
  - generally, 27, 149
  - glass fibre spinning process
    - fibre/yarn/thread fineness, 170–172
    - melt spinning process, 146, 168
    - fibre/yarn/thread orientation, 166, 167, 169
- Change of stored mass
  - drawing process, 30
  - fibre/yarn/thread formation, 292
  - fibre/yarn/thread formation distance, 150
- Change(s)/fluctuation(s)
  - aperiodic, 17
  - continuous, 26
  - course, temporal, 9
  - determined, 5
  - example drawing process, 30
  - generally, 9, 10, 13, 15, 21, 31, 33
  - non determined, stochastic, 22
  - periodic, sinusoidal, 9, 41
- Circular frequency, 9
- Coefficient of variation, 205, 206, 286
- Combination evaluation, 301–309
  - $F(t)$ ,  $Tt_o(t)$ ,  $\sigma(t)$ , 301
  - identification matrix, 308
- Combination measurement, 301–309
  - technological scheme, 302
- Complex frequency response
  - drafting process
    - one step, 191, 192
    - two steps, 195–197, 200–202
  - fibre/yarn/thread tensile force, 280
  - fibre/yarn/thread transport process
    - dead time thread line, 213
    - friction thread line, 215
  - FT-texturing process
    - twist density oscillations, 247, 248
  - generally, 9, 17–21, 27, 28, 33
  - glass fibre spinning process
    - fibre/yarn/thread fineness, 177
  - imaginary part, 18
  - LAPLACE-transformation, 34
  - melt spinning process
    - fibre/yarn/thread formation distance, 152–159, 163, 165, 166
  - real part, 18
  - roller top card, 186
  - stationary flat card, 188
- Complex function, 18
- Complex number
  - absolute value, 19
  - vector addition, 166
- Complex plane, 18
- Condition
  - dynamic measurement
    - fibre/yarn/thread tensile force, 292–294
  - fibre/yarn/thread breakage, 279
  - fibre/yarn/thread input line
    - fibre/yarn/thread tensile force dampening, 230, 232
- Constant, material specific
  - conversion diameter/fineness of fibre/yarn/thread, 246
  - glass fibre spinning process, 175
  - heating/cooling polymer fibre/yarn/thread, 275, 276
- Constant, material-specific
  - heating/cooling polymer fibre/yarn/thread, 262
- Constitutive equations, 59
  - MAXWELL model, 82
  - PHAN-TIEN-TANNER model, 82
  - MAXWELL model, 62
  - NEWTON model, 60
  - PHAN-TIEN-TANNER model, 64
  - model of fibre formation, 79
  - upper convected MAXWELL model, 63
- Continuity equation, 11, 30, 45
- Correlation function, 21–24
- Critical frequency
  - drawing process, 41
  - fibre/yarn/thread heating/cooling, 263
    - heated godets, 269, 274
    - PA and PET, 264
  - fibre/yarn/thread input line, 231
  - fibre/yarn/thread tensile force/measuring sensor, 279, 282, 283, 285
  - fineness changes, 206
    - drafting processes, 193, 196
    - fibre/yarn/thread formation distance, 162–164
    - fibre/yarn/thread formation/processing processes, 165, 208
    - traverse motion at winder, 161, 164
  - FT-texturing process
    - texturing/setting zone, 249, 257
  - generally, 40, 41, 204, 206, 208
  - melt spinning process

- fibre/yarn/thread formation
  - distance, 158, 160
- twist density changes
- FT-texturing process, 248
- Cross section area
  - FT-texturing process
- twisted yarn, 245
- Cross-correlation function, CCF, 24, 303, 304, 307–309
- Cross-power density spectrum function, CPSF, 24, 303
- Crystallinity
  - fibre/yarn/thread drawing process, 6
  - two-phase model, mass density, 69
- Crystallisation
  - AVRAMI approximation, 69
  - crystallinity, 68
  - model of fibre formation, 79
  - rate, 68
  - dependence on stress, 68
- Cut length, necessary, *see* Fibre/yarn/thread measuring and gauge lengths
- Cycle duration
  - of carrier frequency oscillation, 204
  - of disturbance oscillations, 186, 204, 218
  - of periodic change, 289, 291, 293, 294
- Dampening
  - drafting process (one step)
    - fineness changes  $\Delta T t_o$ , 193
  - drafting process (two steps)
    - fineness changes  $\Delta T t_o$ , 199, 204
  - drawing process
    - fineness changes  $\Delta T t_o$ , 41
  - extended input line
    - fibre/yarn/thread tensile force, 295
  - fibre/yarn/thread input line
    - tensile force and elongation changes, 227–232
  - friction thread guide lines
    - fineness changes  $\widetilde{\Delta T t_o}$ , 224, 227
  - FT-texturing process
    - twist density oscillations  $\widetilde{\Delta T_D}/T_{Dm}$ , 249, 253, 254
  - heated godets
    - fibre/yarn/thread temperature changes, 274
  - measurement conditions, 204
  - measuring sensor
    - fibre/yarn/thread tensile force, 283–285
  - series of delay and dead time thread lines
    - fineness changes  $\widetilde{\Delta T t_o}$ , 219, 221
- Dampening factor
  - measuring sensor, 283, 284
- Dead time behaviour
  - carding engines, 182
  - stationary flat card, 188
- Dead time thread line
  - fibre/yarn/thread transport process, 210–213, 216–218, 221
- Deborah-number
  - definition, 139
- Deformation
  - HENCKY measure, 59
  - network deformation concept, 74
  - standard models, 60
  - visco-elastic, 62
  - viscous, 60
- Delay of first order
  - definition, 157
  - differential action, 161, 164, 206
  - generally, 158
  - proportional action, 192, 206, 247, 263
  - generally, 157
- Delay thread length, 41, 218, 227
- Delay thread line
  - fibre/yarn/thread transport process, 210, 211, 216–218, 220, 221, 223, 227, 233
- Density
  - fibre/yarn/thread material, 149, 190, 260, 261
  - glass, 175
  - influence to fibre/yarn/thread fineness, 155
  - PA, 246, 262
  - PET, 246, 262
- Diameter
  - bobbin
    - glass fibre spinning process, 173, 175, 177, 178, 181
    - melt spinning process, 148
  - fibre/yarn/thread
    - conversion to fineness, 261
    - heating/cooling process, 260–262
  - filament
    - melt spinning process, 150
  - friction element
    - friction thread line, 214, 222, 224, 226
  - godet

- dead time thread line, 216, 221
- godets
- drawing process, 6
- roller
- roller top card, 187
- transport godet
- dead time thread line, 212
- twisted yarn
- conversion to fineness, 246
- FT-texturing process, 245, 246, 258
- Die, *see* Spinneret, spinning die
- Differential
  - temporal, 15, 16
- Differential action
  - drafting process (two steps), 200
  - fibre/yarn/thread formation distance
  - disturbance  $\Delta l$ , 158, 160, 161, 163, 164
  - frequency condition, 206
  - friction thread line, 227
- Differential equation, DEq.
  - analysis, 32
  - drafting process, 190
  - drafting zone, 189
  - drawing process, 30
  - fibre/yarn/thread fineness, 15
  - linearised, 31
  - methodical, 31
  - solution, 16, 31–33, 35
  - dynamic model, 15, 16, 34
  - fibre mass exchange processes, 151, 190
  - fibre/yarn/thread heating/cooling, 12
  - fibre/yarn/thread transport process
  - dead time thread line, 212
  - delay thread line, 210, 228, 233
  - friction thread line, 215
  - generally, 210
  - thread traverse motion at winder, 233, 235, 236
  - FT-texturing process
  - twist density, 242, 244, 246, 257
  - generally, 15, 16, 26, 28
  - solution, 17
  - heat transfer to fibre/yarn/thread, 259–261
  - heated godets, 266
  - homogeneous, 32
  - melt spinning process
  - fibre/yarn/thread formation distance, 149, 151–153, 155–157, 165, 182
  - methodical, 149
  - methodical, 27, 28, 30
  - ordinary, 26
  - partial, 26
  - solution
  - LAPLACE-transformation, 151
  - methodical, 16, 17, 27, 28, 33
  - sinusoidal disturbance, 18, 21
- Disturbance
  - amplitude, 22
  - analysis, 22, 37, 40, 41
  - drawing process, 302
  - aperiodic, 9, 17
  - cause variable, 17
  - circular frequency, 10
  - dampening, 38, 41
  - determined, 21, 22
  - effect variable, 17
  - evaluation
  - identification matrix, 307–309
  - frequency, 41, 160, 162, 180, 186–188, 205, 206, 218, 219, 221, 224, 231, 248, 250, 274, 295
  - impulse-like, 17
  - periodic, 9, 10, 17, 39, 40
  - process interruption, 14
  - signal, 17
  - sinusoidal, 9, 18, 21
  - step response, 16
  - step-like, 8, 9
  - stochastic, 7, 17, 21
  - transfer, 41
  - carding engines, 183
  - delay and dead time thread lines, 218, 219, 221
  - drafting process, 189, 191–194, 196, 199–201, 204
  - drawing process, 41, 306, 308
  - fibre/yarn/thread E-modulus, 282
  - fibre/yarn/thread formation distance, 152–155, 157–166
  - fibre/yarn/thread input line, 227, 229–232
  - fibre/yarn/thread tensile force, 278–280, 295
  - friction thread guide, 223, 224, 226, 227
  - friction thread line, 222, 223
  - FT-texturing process, 242, 248–251, 253, 257
  - glass fibre spinning process, 172, 173, 178–181
  - heated godets, 274



- melt spinning process, 149, 152–156, 168, 169
- necessary measuring and gauge lengths, 204–207, 292
- roller top card, 184, 186, 187
- stationary flat card, 188, 189
- traverse motion, 156, 161, 233, 235, 236
- Drafting process, *see* Sliver drafting process
- Drafting zone, 190, 192–194, 196, 199, 200, 204
  - length, 194, 199
- Draw down ratio, 43, 142, 143
- Draw ratio
  - machine draw ratio, 75
  - network deformation concept, 74
- Drawing process, 5
  - dynamic model, 7, 9, 15, 30, 31, 36, 39–41
  - fineness/tensile force correlation evaluation, 302, 306
  - hot, 6
  - periodic disturbance, 10
  - step-like disturbance, 8
  - technological scheme, 6
- Drawing tensile force, *see* Fibre/yarn/thread tensile force
- Drawing zone, 6, 30, 31, 37, 38, 41, 42, 190, 216, 305–308
  - length, 6, 30, 31
- Dynamic characteristic function, 28
- Dynamic transfer function, *see* Complex frequency response
  
- E-modulus
  - melt, 73, 140
- Effect disturbance, 17
- Effect oscillation, 18–20, 38, 40, 161
- Effect quantity, 9, 278
- Effect variable, 27, 31, 33, 37, 38, 41, 146, 157, 158, 206, 213, 281, 282
- Effect vector, 19
- Elastic modulus, E-modulus
  - fibre/yarn/thread tensile force
  - combination measurements, 305–308
  - connection to fineness, 280, 282
  - inner fibre/yarn/thread unevenness, 145
- Elongation to break
  - maximum possible, 75
- Energy balance
  - fibre/yarn/thread formation process, 11
  - mathematical model, 16, 27
- Energy equation, 47
- Energy transfer
  - drawing process, 258
  - process, 13
- Evenness power
  - carding engines, 183
  - drafting process, 193, 196, 199, 204
  - roller top card, 186, 187
  - stationary flat card, 188, 189
- Excitation
  - step-like, 32, 33
- Excitation frequency
  - amplitude frequency response, 19
  - phase frequency response, 20
  - sinusoidal, 33, 38
  - steady state, 38, 40
  - transfer locus, 18, 19
- Experiment
  - actively, 17, 27, 28
- Extension factor
  - fibre/yarn/thread input line, 231
  
- False twist texturing process, 241–258
  - amplitude frequency responses, 247, 249–255
  - differential equation, DEq., 246
  - dynamic transfer functions, 246
  - dynamics of twist generation, 241
  - phase frequency responses, 247, 256
  - technological scheme, 242
  - twist density, 244
- Fibre/yarn/thread
  - generally, 1, 2, 145, 182, 193
- Fibre/yarn/thread birefringence, 6
- Fibre/yarn/thread break
  - breakage limit, 278
  - condition, 279
  - elongation, 6
  - melt spinning process, 166
  - force, 6
  - frequency, 228
  - generally, 13, 221, 233
  - tensile force
  - melt spinning process, 166
- Fibre/yarn/thread elongation, 6
- Fibre/yarn/thread fineness
  - connection to elongation, 280, 281
  - connection to fineness, 280
  - connection to tensile force, 280–282
  - drawing process, 15, 30, 36, 37

- maximum possible, 132
- melt spinning process, 146, 147, 160
- minimum possible, 134
- Fibre/yarn/thread formation, 1–5, 10, 11, 42
  - balance equations, 45
  - crystallisation, 68
  - definition, 43
  - deformation models, 59
  - heat transfer, 53
  - model equations, 78
  - momentum transfer, 56
  - orientation, 65
  - simulation
    - diameter vs. distance, 85
    - draw ratio, 88
    - elongation to break, 84, 87
    - stress tension vs. distance, 85, 86
    - temperatur vs. distance, 86, 87
    - temperature vs. distance, 85
    - velocity vs. distance, 83, 85–87
  - solidification, 65
  - structure development, 65
  - velocity vs. distance, 82, 92
- Fibre/yarn/thread formation distance
  - time constants/critical frequencies, 162
- Fibre/yarn/thread formation process
  - formation and processing lines
    - time constants and critical frequencies, 206
  - spun yarn spinning process, 182
    - generally, 182
    - roller top card, 182
    - stationary flat card, 182
  - time constants/critical frequencies, 165
- Fibre/yarn/thread guide elements
  - fibre/yarn/thread transport process, 209
    - friction thread line, 213, 222–227
- Fibre/yarn/thread heating/cooling
  - differential equation, DEq., 261–263
  - dynamic model, 259, 260, 262
  - fineness
    - generally, 261
  - generally, 11, 258, 259, 263
  - heated godets, 259, 265–275
  - melt spinning process, 259
  - PA-threads, 262–264
  - PET-threads, 262–264
  - time constants/critical frequencies, 264
- Fibre/yarn/thread measuring and gauge lengths
  - generally, 204, 205
    - necessary cut length, 204, 205, 207
      - melt spinning processes, 207
    - necessary gauge length, 204, 205, 207
      - melt spinning processes, 207
    - necessary gauge lengths, 205
      - melt spinning processes, 207
  - necessary measuring length, 204
- Fibre/yarn/thread nomogram
  - relation velocity/wavelength/disturbance frequency, 219
- Fibre/yarn/thread orientation
  - melt spinning process, 146
- Fibre/yarn/thread processing, 1–5, 42
  - time constants/critical frequencies, 165
- Fibre/yarn/thread properties, 3, 7, 10, 145
  - bulkiness
    - FT-texturing process, 249
  - drawing process, 8, 9, 36
  - E-modulus, 305
    - FT-texturing process, 243
  - elongation, 233
  - elongation to break, 74
  - fineness, 233
    - drafting process, 190
    - glass fibre spinning process, 172
    - melt spinning process, 204
  - melt spinning process, 146
  - model of fibre formation, 80
  - orientation, 166, 169
    - melt spinning process, 169
  - stress strain, 278
  - tenacity, 76
  - unevenness, 112
- Fibre/yarn/thread tensile force
  - analysis, 278
    - time function, 301
  - combination measurements
    - analysis, 303
    - evaluation, 301
  - connection to elongation, 277
  - connection to fineness, 280–282, 302
  - correlation functions
    - analysis, 303–307, 309
  - dampening
    - fibre/yarn/thread input line extension, 229, 232
  - drawing process, 8, 9

- fibre/yarn/thread breakage, 278, 279
- fibre/yarn/thread elongation, 227–230
- FT-texturing process, 243
- generally, 277–279
- indicator process stability, 278
- man-made fibres structure, 278
- measurements, 277, 279
- measuring sensors, 282, 284, 285
- process dynamics, 277, 278
- thread friction line, 226
- time function
  - evaluation, 285, 287, 288, 292, 295
- traverse motion at winder, 233
- Fibre/yarn/thread tensile stress
  - combination measurements
    - drawing process, 302–304
    - evaluation, 301, 302
  - connection to tensile force, 280
  - correlation functions
    - analysis, 303, 305, 307
  - FT-texturing process, 248
  - general, 280, 281
  - melt spinning process, 167, 168
  - synchronous calculation, 301
- Fibre/yarn/thread tensile testing, 166
- Fibre/yarn/thread transport lines
  - dead time thread line, 210–213
  - delay and dead time thread lines, 215–221
  - delay thread line, 210, 211
  - differential equation, DEq., 210
  - fibre/yarn/thread transport process, 210
  - friction thread line, 210, 213–215
  - generally, 209, 210, 277, 278, 280
  - tensile force/elongation dampening
    - generally, 227, 228, 232
    - input line extension, 228–232
- Fibre/yarn/thread traverse motion
  - melt spinning process, 156
- Fibre/yarn/thread unevenness, 221
  - combination measurements
    - correlation function analysis, 305, 306
    - drawing process, 301–306
    - evaluation, 301, 302
    - identification matrix, 307–309
    - drafting process, 182, 183
  - E-modulus, 145, 169
  - fineness, 145
    - carding engines, 182, 183
    - drafting process, 190, 191, 193
    - drawing process, 30, 31, 37, 38, 41
    - fibre/yarn/thread transport process, 227
    - generally, 288
    - glass fibre spinning process, 180, 181
    - measurements, 25
    - traverse motion at winder, 233–240
  - measuring, 210
  - molecular structure
    - melt spinning process, 233
  - roving
    - stationary flat card, 182
  - sliver fineness
    - drafting process, 199
  - tensile force
    - fibre/yarn/thread elongation, 227, 278, 301, 306
    - fibre/yarn/thread transport process, 209, 210
  - twist density, 254
  - FT-texturing process, 241–246, 248–251, 253–258
  - PA-threads, 251, 253
  - PET-threads, 251, 253
- Filament
  - drawing process, 30
  - melt spinning process, 11, 146, 276
    - cooling, 11, 12, 275, 276
    - fineness, 11, 274–276
    - throughput, 275
- Fineness, *see* Fibre/yarn/thread fineness
  - definition, 46
- Flow resistance
  - capillary hole spinneret, 148, 172
- Fluctuation range, 286
- Fluctuation(s), *see* Change(s)/fluctuation(s)
- Fluidity
  - definition, 61
- Forces
  - acting on fibre, balance, 50
  - air drag, friction, 52
  - gravitation, 51
  - inertia, 51
  - rheological, 59
  - surface tension, 50
- Frequency, 17, 27, 33
  - complex, 34
- Frequency condition
  - for dynamic measurements, 283

- for undamped disturbance transfer, 206
- Frequency range, 16–18, 20, 28, 29, 34, 38, 40, 166, 180, 181, 199, 205, 215, 226, 250–252, 284, 285
- Friction coefficient
  - fibre/yarn/thread transport process
  - thread guide, 222, 223, 225–227
  - FT-texturing process
  - magnetic spindle, 256
- Friction thread line
  - fibre/yarn/thread transport process, 210, 213–215, 222, 224–226
  - FT-texturing process, 245, 254
- FT-texturing process, *see* False twist texturing process
- Functional block diagram
  - generally, 149
  - glass fibre spinning process
  - fibre/yarn/thread fineness, 172–174, 176, 177
  - roller top card
  - fibre mass, 185
  - worker-angle-stripper-pair
  - fibre mass, 184, 185
- Gauge length, necessary, *see* Fibre/yarn/thread measuring and gauge lengths
- Glass fibre spinning process, 170–181
  - amplitude frequency responses, 179
  - cause-effect-scheme, 172
  - disturbance causes, disturbance frequencies, disturbance wavelengths, 207
  - dynamic disturbance transfer functions, 178
  - dynamic transfer functions, 176
  - functional block diagram, 174
  - technological scheme, 171
- Glass level, 170, 172, 174, 175, 177, 178, 180
- Glass transition temperature, 65, 167, 168
  - PA 6, 167
  - PET, 167
- Godets, heated
  - fibre/yarn/thread temperature oscillations, 268, 272, 274
  - heating yield, 268, 273, 274
  - mean value of fibre/yarn/thread temperature, 268, 269, 271
  - minimal fibre/yarn/thread wraps, 270
  - minimum fibre/yarn/thread wraps, 268, 269
  - time transient function of fibre/yarn/thread temperature, 266, 267
- GRASHOF number
  - definition, 53
- HAGEN-POISEUILLE-law, 148, 171
- Heat balance, 260
- Heat capacity
  - specific, 260, 262, 275
  - temperature dependence, 71
- Heat coefficient, 263
- Heat conduction, 258, 259
- Heat conductivity, 275
- Heat convection, 11, 258, 259
- Heat exchange, 259–261, 263
- Heat radiation, 258
- Heat transfer, 53
  - NUSSELT number, 54
  - definition, 48
  - examples, 56
  - conduction, 49, 106
  - convection, 11
  - forced, 54, 106
  - free, 53
  - differential equation, DEq., 259, 266
  - example, 12
  - fibre/yarn/thread diameter, 261
  - fibre/yarn/thread heating/cooling, 11, 262, 263
  - fibre/yarn/thread melt spinning, 275
  - fibre/yarn/thread-heated godet, 259, 274
  - heat transfer coefficient, 48
  - radiation, 49, 53
  - specific constant, 266
  - time constant, 263
- Heat transfer coefficient, 260, 262, 269, 275
  - fibre/yarn/thread-air, 263, 265
  - fibre/yarn/thread-metallic surface, 263, 265
- Heat transport, 258
- Heating yield
  - heat transfer to fibre/yarn/thread
  - heated godets, 268, 273, 274
- HENCKY measure
  - definition, 59
- High speed
  - melt spinning process, 156, 166
  - correlation analysis, 305

- forces, 167
- orientation elongation, 169
- tensile force measurement, 285
- time constants/critical frequencies, 206
- Hole diameter
  - spinneret
  - melt spinning process, 148, 154
- Hole temperature
  - spinneret
  - glass fibre spinning process, 171
- Identification matrix to the unevenness analysis, 307–309
- Impulse response (function), 17, 236
- Information technique, 13
- Injection velocity, 149
- Input cross sectional area
  - drafting process, 190, 194
- Input size
  - drawing process
  - combination measurements, 306
  - glass fibre spinning process, 177
- Input velocity
  - drafting process, 190, 192, 194
  - disturbance, 199
  - drawing process, 8, 9, 16, 30, 36, 37, 39–41
  - fibre/yarn/thread input line
  - disturbance dampening, 231, 232
  - fibre/yarn/thread elongation, 230
  - fibre/yarn/thread transport process
  - dampening disturbances, 227, 229
  - disturbance, 219–221, 224, 226
  - friction thread line, 224
  - FT-texturing process, 243, 245, 250, 253, 258
  - melt spinning process, 169
  - disturbance, 154
  - injection velocity, 149, 154
- Know-how
  - process, 1, 2
- Know-why
  - process, 1
- LAPLACE-retransformation, 29, 34
- LAPLACE-transformation, 29, 34, 151
  - convolution integral, 236
  - LAPLACIAN (LAPLACE-operator), 34, 151, 157, 244
  - residue theorem, 35, 213
- LEGENDRE polynomials, 66
- Length of the fibre/yarn/thread formation distance, 156–157
  - influence to the fibre/yarn/thread fineness, 162, 164
- Magnetic spindle speed (FT-texturing)
  - influence to twist density, 242, 243, 252
  - maximum eligible, 248–250
- Man-made fibres
  - heating/cooling
  - heated godets, 265
- Mass balance
  - dynamic equation, 15, 30
  - melt spinning process, 11
- Mass density
  - amorphous, crystalline, 69
  - temperature dependence, 70
- Mass discharge/time
  - drawing process, 30
  - fibre/yarn/thread formation, 150
- Mass inflow/time
  - drawing process, 30
  - fibre/yarn/thread formation, 150
- Mass storage
  - drawing process, 30
  - fibre/yarn/thread formation, 150
- Material properties
  - elongational viscosity, 71
  - heat capacity, 71
  - mass density, 70
  - model of fibre formation, 80
- Mean value
  - angle of wrap, 222
  - cross-correlation coefficient, 308
  - fibre/yarn/thread E-modulus, 306, 308
  - fibre/yarn/thread fineness, 15, 199, 201, 216, 222, 234, 240, 281, 304, 306, 308
  - fibre/yarn/thread length, 234
  - fibre/yarn/thread temperature, 259, 268
  - fibre/yarn/thread tensile force, 232, 277, 278, 281, 285, 286, 288, 304, 306
  - fibre/yarn/thread velocity, 216, 222, 234, 252
  - friction coefficient, 222, 227
  - generally, 7, 9, 13, 15, 17, 22, 31, 33, 150, 151, 188, 205, 206
  - godet diameter, 222
  - roll setting, 191
  - thread guide velocity, 234

- twist density, 248
- Measurement
  - combination
    - fibre/yarn/thread tensile force and fineness, 301, 305
  - dynamic, 221
    - fibre/yarn/thread tensile force, 277
  - fibre/yarn/thread tensile force unevenness, 25
  - generally, 27, 204
- Measuring and estimation volume, necessary
  - auto-correlation and power density spectrum functions, 292–294
  - melt spinning processes, 204–207
- Measuring length, necessary, *see* Fibre/yarn/thread measuring and gauge lengths
- Measuring sensor
  - fibre/yarn/thread fineness, 282, 309
  - fibre/yarn/thread tensile force, 209, 279, 282, 285, 307, 309
- Measuring size, 204
- Melt spinning process, 146–170
  - disturbance causes, disturbance frequencies, disturbance wavelengths, 207
    - fibre/yarn/thread formation distance
      - time constants  $T_c$  and critical frequencies  $f_c$ , 165
    - fibre/yarn/thread formation distance (simplified), 150
      - differential equation, DEq., 151
    - technological scheme, 147
  - Melt spinning process, target quantity fineness
    - cause-effect-scheme, 148
    - disturbance  $\Delta l$ , 156
      - amplitude frequency response, 156
      - complex frequency response, 156
      - dynamic transfer function, 156
      - phase frequency response, 157
      - step response, 157
    - disturbance  $\Delta q_i$ , 154
      - amplitude frequency response, 154
      - complex frequency response, 154
      - dynamic transfer function, 154
      - phase frequency response, 155
      - step response, 155
    - disturbance  $\Delta v_i$ , 153
      - amplitude frequency response, 153
      - complex frequency response, 153
      - dynamic transfer function, 153
      - phase frequency response, 153
      - step response, 153
    - disturbance  $\Delta v_s$ , 152
      - amplitude frequency response, 152
      - complex frequency response, 152
      - dynamic transfer function, 152
      - phase frequency response, 152
      - step response, 152
    - disturbance  $\Delta \rho$ , 155
      - amplitude frequency response, 155
      - complex frequency response, 155
      - dynamic transfer function, 155
      - phase frequency response, 156
      - step response, 156
  - fibre/yarn/thread formation distance
    - disturbance evaluation, 157–166
    - normalised amplitude frequency responses, 158, 159
    - normalised complex frequency responses, 158
    - normalised phase frequency response, 163
    - normalised step responses, 159, 161, 163
    - normalised transfer locus, 159
- Melt spinning process, target quantity orientation
  - cause-effect-scheme, 166, 169
  - estimation disturbance transfer, 168
  - solidification point, 168
- Methodology
  - process analysis, 22
    - approach, 16, 22, 26
    - dynamic model, 26
    - experimental, 26
    - mixed, 26
    - steady state model, 26
    - theoretical, 26
- Model of single fibre formation
  - boundary conditions, 80
  - set of equations, 78
  - shooting procedure, 81
- Modelling, model, 78, 80
  - definition, 5, 10, 13–15
    - dynamic mathematical model, 16
    - dynamic model, 15
    - mathematical model, 15, 16, 18
    - steady state model, 15
  - drafting process, 190
  - drawing process
    - application, 36
    - example, 30, 31

- fibre/yarn/thread formation processes, 3, 11
- fibre/yarn/thread cooling, 11
- thermoplastic polymers, 3
- fibre/yarn/thread heating/cooling, 258, 259
- melt spinning process, 274, 275
- fibre/yarn/thread processing processes, 3
- fibre/yarn/thread tensile force, 280
- fibre/yarn/thread transport process, 209, 210
- application, 217, 218
- dead time thread line, 211, 212
- delay and dead time thread lines, 215, 221
- delay thread line, 210
- fibre/yarn/thread input line, 229
- friction thread line, 213, 215, 222, 226, 227
- traverse motion at winder, 233
- FT-texturing process, 241
- twist density, 242, 246, 249, 255–258
- generally, 1–3, 9
- glass fibre spinning process
- fibre/yarn/thread fineness, 173
- goal, 10
- melt spinning process, 146
- fibre/yarn/thread fineness, 146, 149
- fibre/yarn/thread formation distance, 150, 151, 154, 156, 162–164
- process analysis
- methodical, 26–29
- stationary flat card, 188
- Momentum balance, 11, 16, 27
- Multifilament melt spinning
- geometry, 91
- model
- boundary conditions, 107
- cell method, 94
- continuum method, 95
- minimum selfsucking air, 100
- principle, 93
- peculiarities, 90
- simulation
- adapted mass throughput, 119
- elongation to break, 116
- quenching air profile, 117
- retarded cooling, 121
- solidification distance, 115, 123
- temperature vs. distance, 115
- uneven fibre properties, 112, 114
- spunbonded nonwoven process, 124
- Natural frequency
- tensile force measuring sensor, 283–285
- Network deformation concept
- elongation to break, 74
- independent deformation steps, 76
- master curve, 78
- NUSSELT number
- definition, 48, 275
- examples, 54
- model of fibre formation, 80
- Operating point, 7, 30
- technological, 8, 9, 17, 22, 151, 162, 204, 239
- glass fibre spinning process, 175
- Orientation
- birefringence, 67
- distribution function, 66
- Herrman's orientation factor, 66
- Legendre polynomials, 66
- Orientation elongation, 166–169, 244
- Orifice diameter
- spinneret
- melt spinning process, 276
- Orifice throughput
- spinneret
- melt spinning process, 275
- Output size
- glass fibre spinning process, 177
- Output velocity
- drafting process, 190, 191, 194
- drawing process, 6, 8, 10, 30, 31, 36, 38
- fibre/yarn/thread formation/processing processes, 206
- fibre/yarn/thread tensile force
- connection to fineness, 281, 282, 307
- fibre/yarn/thread transport process, 218, 223–225
- FT-texturing process, 243, 245, 250, 252–254
- melt spinning process, 149
- web of stationary flat card, 188
- Parameter
- asymmetry traverse motion triangle, 234
- disturbances, 309
- drawing process, 5
- mathematical, 12, 26–28, 37

- process, 2, 4, 10
- Partial differentiation
  - differential equation, DEq., 26
  - fibre/yarn/thread input line, 229
  - friction thread line, 215
  - FT-texturing process, 246, 258
  - generally, 151
- Phase frequency response, 20, 42
  - definition, 20, 21, 27, 34, 38
  - delay fibre/yarn/thread length, 41
  - drafting process (one step), 191
  - estimation, 192
  - drafting process (two steps), 201
  - estimation, 196
  - drawing process
    - oscillations  $\widetilde{\Delta v_i}$ , 38, 40
  - fibre/yarn/thread formation distance
    - common normalised, 159, 160
    - estimation, 157, 158, 161, 162, 164, 166
    - normalised  $\widetilde{\Delta T t_s / \Delta l}$  changes, 163
    - normalised oscillations  $\widetilde{\Delta T t_s / \Delta l}$ , 163
    - oscillations  $\widetilde{\Delta l}$ , 157
    - oscillations  $\widetilde{\Delta q_i}$ , 155
    - oscillations  $\widetilde{\Delta v_i}$ , 153
    - oscillations  $\widetilde{\Delta v_s}$ , 152
    - oscillations  $\widetilde{\Delta \rho}$ , 156
  - fibre/yarn/thread tensile force, 280
  - fibre/yarn/thread transport process
    - dead time thread line, 213
    - friction thread line, 215
    - FT-texturing process
      - estimation, 248, 256, 257
      - twist density oscillations, 247, 248
    - generally, 9
    - glass fibre spinning process
      - fibre/yarn/thread fineness, 178
    - series of delay and dead time thread lines
      - oscillations  $\widetilde{\Delta v_i}$ , 217
    - stationary flat card, 188
- Phase shift, 9, 18, 19, 173, 305, 307
- Phase shift angle
  - calculation, 20
  - drawing process
    - estimation, 38
    - fibre/yarn/thread tensile force, 9
  - fibre/yarn/thread formation distance
    - estimation, 161, 162, 164
  - generally, 10, 17, 18, 20, 21, 40
  - series of delay and dead time thread lines
    - oscillations  $\widetilde{\Delta v_i}$ , 218
- Physical-analytical relationship, 28, 242
- Power density spectrum function, 21, 22, 24, 25
- Power density value, 291–294
- Process
  - automatic control, 3
  - automation, 2
  - control
    - generally, 1
  - dynamic behaviour, 2, 9, 16–25
  - efficiency, 2
  - fibre/yarn/thread tensile force
    - generally, 277
  - model
    - generally, 1
  - quality, 2
  - stability
    - cause tensile force, 277–309
  - steady state behaviour, 2
  - technological, 2, 241
    - analytic model, 2
    - carding engines, 182–189
    - definition, 5, 13
    - drafting, 182, 183, 189–204
    - drawing, 5–10, 15, 16, 30, 31, 36, 38–41, 165, 189
    - dynamics, 7, 16
    - fibre/yarn/thread formation, 145, 166, 170
    - fibre/yarn/thread heating/cooling, 258–276
    - fibre/yarn/thread processing, 209–258
    - fibre/yarn/thread transport, 209
    - FT-texturing, 241–258
    - generally, 6, 7, 13, 30
    - glass fibre spinning, 170–181
    - melt spinning, 145–170
    - roller top card, 183–187
    - spun yarn spinning, 182–204
    - stationary flat card, 187–189
- Process analysis
  - combination measurements tensile force & fineness, 309
  - combination measurements tensile force and fineness, 301
  - dampening tensile force in input lines, 232
  - dynamic, 1, 28, 29
  - dynamic model, 26



- evaluation of tensile force time function, 285–301
- fibre/yarn/thread heating/cooling, 258–276
- fibre/yarn/thread transport process, 209, 210, 215
- – dampening tensile force in input lines, 227
- – dead time thread line, 211–213
- – delay and dead time thread lines, 216–221
- – delay thread line, 210–211
- – fibre/yarn/thread guide elements, 222–227
- – friction thread line, 213–215
- fibre/yarn/thread unevenness
- – measuring and test conditions, 204–206
- FT-texturing, 241–258
- generally, 1, 2, 13, 14, 17, 21, 22, 26
- introduction example melt spinning, 10–12
- mathematical description, 1
- methodical, 2, 15, 26, 27, 29
- modelling, 15
- motive, 1, 14
- steady state model, 26
- tensile force measuring sensors, 282–285
- traverse motion at winder, 233–241
- Process characteristic, 6, 7
- Process dynamics
  - definition, 7
- Process thinking, 4
- Process variable
  - drafting process, 190, 196
  - evaluation, 303
  - fibre/yarn/thread transport process lines, 209, 218, 223
  - FT-texturing process, 242–244, 248, 249, 252
  - generally, 6, 7, 10, 13–16, 22, 27, 29–31, 36, 145, 285, 305
  - glass fibre spinning process, 171, 177, 178, 181
  - measurement, 285
  - melt spinning process, 146, 147, 149, 157, 164, 166, 168
- Process, technological
  - melt spinning, 10, 11
- Processing mode
  - dynamic, 16, 30
  - steady state, 16
- Product characteristic, 6, 7
- Product quality, 2, 6, 7, 228, 232, 242, 277, 305
- Product variable
  - drafting process, 190, 194, 196
  - evaluation, 303, 307
  - fibre/yarn/thread fineness
    - – connection to tensile force, 280
  - fibre/yarn/thread tensile force, 292
  - – measurement, 277
  - fibre/yarn/thread transport process lines, 209, 210, 218, 223
  - FT-texturing process, 241–244, 248, 249
  - generally, 6, 7, 13–16, 22, 27, 29–31, 36, 145, 204, 206, 285, 301, 305, 307
  - glass fibre spinning process, 172, 173
  - measurement, 285
  - melt spinning process, 146, 147, 149, 157, 164, 166, 167, 170, 274
- Proportional action
  - drafting process, 192
  - fibre/yarn/thread formation distance, 157
  - fibre/yarn/thread heating/cooling, 263
  - FT-texturing process, 247
  - generally, 182, 206
- Quadratic dispersion (variance), 205, 286, 295
- Reduction factor
  - fibre/yarn/thread tensile force/elongation
  - – fibre/yarn/thread input line, 229–231
- Residue
  - LAPLACE-transformation, 35
- Residue theorem
  - LAPLACE-transformation, 35
- Resistance
  - flow in capillary holes, 148
  - flow in spinneret (glass fibre spinning), 171
  - OHM'S heating, 149, 170, 173, 175, 177
- REYNOLDS number
  - definition, 52
- Rheology
  - MAXWELL model, 62
  - NEWTON model, 60
  - PHAN-TIEN-TANNER model, 64

- upper convected MAXWELL model, 63
- Ring twister
  - fibre/yarn/thread input line extension, 232
- Roller top card, 182–187
  - dynamic transfer function, 184, 186
  - dynamic transfer properties, 183, 186
  - functional block diagram, 185
  - worker-angle-stripper pair, 185
  - technological scheme, 184
- Rope friction factor
  - friction thread line, 213
  - FT-texturing process, 243
- Shortening factor
  - FT-texturing process, 244
- Signal
  - analysis, 9, 13
  - auto-correlation function, 14, 21–25, 295–301
  - cross-correlation function, 303–309
  - fibre/yarn/thread tensile force time function, 295–301
  - generally, 149, 277
  - glass fibre spinning process, 173
  - melt spinning process, 149
  - power density spectrum function, 14, 21–25, 295–301
  - disturbance, 17
  - information content, 13, 31
  - fibre/yarn/thread fineness, 25
  - measurement
    - fibre/yarn/thread fineness, 307, 309
    - fibre/yarn/thread tensile force, 278, 307, 309
  - frequency condition, 204
  - generally, 277
  - measuring sensor
    - critical frequency, 285
    - transmission properties, 285
  - process, 14
  - process analysis, 13
  - process definition, 13
  - synchronous measuring, 301, 302, 307
  - test, 27
  - aperiodic determined, 27
  - classification, 28
  - disturbance, 17
  - periodic determined, 27, 28
  - sinusoidal, 27
  - stochastic, 27, 28
  - transmission, 283
- Sliver drafting process, 189–204
  - amplitude frequency responses, 191, 192, 195, 201, 202
  - complex frequency responses, 195, 201
  - differential equation, DEq., 191
  - dynamic transfer functions, 194, 195, 200
  - phase frequency responses, 195, 198, 201, 203
  - step response functions, 192, 195, 198, 201, 203
  - technological scheme, 191, 193
  - transfer locuses, 197, 202
- Solidification
  - distance, 47, 58, 62, 83, 84, 92, 115, 123
  - temperature, 65
- Span, maximal, 237, 239
- Spectral analysis method, 27
- Spectrograph, 25
- Speed
  - drawing process
  - godets, 6
  - fibre/yarn/thread transport process
    - godets, 217
    - FT-texturing process
      - false twist spindle, 242, 243, 248–250, 252
    - glass fibre spinning process
      - bobbin, 175, 177, 178, 180
    - melt spinning process
      - bobbin, 147
      - spinning pump, 148
    - roller top card
      - roller, 187
- Spinnability
  - capillary break, 138
  - failure behaviour, 135, 138, 141
  - melt fracture, 134
- Spinneret distance
  - melt spinning process, 259, 275, 276
  - fibre orientation, 168
- Spinneret, spinning die
  - glass fibre spinning process
    - example, 175
    - generally, 170, 172, 173
    - temperature, 171–175, 177, 178
    - throughput, 170–172, 175, 207
  - melt spinning process, 11, 149
  - fibre/yarn/thread formation
    - distance, 167, 170, 259, 275, 276

- fibre/yarn/thread heating/cooling, 274
- generally, 146–148
- hole diameter, 154
- temperature, 148, 167, 275, 276
- throughput, 146, 149, 167, 169, 275
- Spinning die, *see* Spinneret, spinning die
- Spinning velocity
  - glass fibre spinning process, 172, 175, 177, 180
  - melt spinning process, 149, 167–169, 275
- Spinning way, 274–276
- Standard deviation, 286
- Standard function
  - dynamic, 9
- Stationary flat card, 182, 183, 187–189
  - amplitude frequency response, 188, 189
  - dynamic model, 188
  - dynamic transfer function, 187
  - dynamic transfer properties, 183
  - pertinent wavelength, 189
  - technological scheme, 187
  - time constant, 188
- Statistic characteristic function, 22, 24
- Step response (function), time transient function
  - definition, 16, 17, 27, 29
  - drafting process (one step), 191
    - estimation, 192
    - step  $\Delta T t_f$ , 192
    - step  $\Delta v_i$ , 192
    - step  $\Delta v_o$ , 191
    - step  $\Delta z_i$ , 192
  - drafting process (two steps)
    - estimation, 196, 200, 201
    - step  $\Delta v_z$ , 201, 203
    - step  $\Delta z_i$ , 195, 198
  - drawing process
    - fibre/yarn/thread tensile force, 9
    - fineness  $\Delta T t_o$ , 32, 36
  - fibre/yarn/thread formation distance
    - common normalised, 159–161
    - estimation, 157, 158, 160, 165
    - generally, 165
    - normalised, step  $\Delta l$ , 163
    - step  $\Delta l$ , 157
    - step  $\Delta q_i$ , 155
    - step  $\Delta v_i$ , 153
    - step  $\Delta v_s$ , 152
    - step  $\Delta \varrho$ , 156
  - fibre/yarn/thread heating/cooling
    - basic equation, 261
  - fibre/yarn/thread tensile force
    - calculation, 280, 282
  - fibre/yarn/thread transport process
    - dead time thread line, 213
  - fibre/yarn/thread traverse motion, 235
    - glass fibre spinning process
  - fibre/yarn/thread fineness, 173, 177, 178
    - LAPLACE-transformation, 34
    - spun yarn spinning process
    - generally, 182
- Step-like disturbance, 8, 9, 16, 162, 165, 201
- Structure
  - system, 27
- System
  - analysis, 9, 13, 21, 22, 27, 33
  - dynamic, 22, 26
  - experimental, 26
  - generally, 16, 17
  - heated godets, 259, 265, 268, 269, 274
  - methodical, 26, 27
  - mixed, 26
  - steady state, 26
  - theoretical, 26
  - traverse motion at winder, 239, 240
  - automatic control, 3, 18
  - data processing, 3
  - drafting process, 182, 183, 189–191, 193, 199
    - dynamic transfer function, 191
    - mass storage, 190
    - one step, 191, 199
    - time constant, 193
    - two steps, 193, 195–199, 201–204
  - drafting process (two steps), 201
  - drawing process, 38
    - dynamic, 18
    - dynamic behaviour, 18, 21, 27, 38, 41, 193
    - fibre/yarn/thread formation distance, 157, 158
    - spun yarn spinning process, 182
  - dynamic model, 16
  - dynamic properties, 16, 27, 40
  - fibre/yarn/thread transport process
    - delay thread length, 218, 223, 233
  - FT-texturing process
  - twist density changes, 255

- generally, 9, 16, 41
- heat inertia
- glass fibre spinning process, 180
- heating/cooling of fibres/yarns, 274
- investigation
- experimental, 27
- stochastic, 22
- measuring sensor
- fibre/yarn/thread tensile force, 283
- generally, 283, 285, 309
- melt spinning process
- analysis, 149
- process analysis, 13, 14
- resonance frequency
- glass fibre spinning process, 180
- roller top card, 182
- structure, 27
- technological
- definition, 13, 30
- time constant, 204
- fibre/yarn/thread formation distance, 158, 160, 162–164
- transfer properties, 204
- traverse motion at winder, 160, 164
- fibre/yarn/thread fineness changes, 241
  
- Take-down velocity, 147, 152, 153, 205, 207
- Take-up velocity, 146, 162, 164, 249
- Target quantity
- fibre/yarn/thread fineness, 171
- drawing process, 15
- glass fibre spinning process, 172, 174, 181
- melt spinning process, 146, 148
- fibre/yarn/thread orientation, 167
- Technical mechanics, 4, 7
- Technological scheme
- combination measurement in drawing process, 302
- dead time thread line, 212
- delay thread line, 211
- drawing process, 6, 8
- fibre/yarn/thread input line, 228
- friction thread line, 213, 214
- FT-texturing process, 243
- glass fibre spinning process, 170, 171
- heated godet roll systems, 265
- melt spinning process, 146, 147, 167
- one step sliver drafting process, 191
- roller top card, 183, 184
- stationary flat card, 187
- traverse motion at winder, 234, 235
- two steps sliver drafting process, 193
- Temperature
- fibre/yarn/thread, 6, 167
- cooling, 12, 258, 261, 275, 276
- heating, 259–262, 265, 267–269, 271, 272, 274
- glass melt, 173–175, 177
- glass transition, 167, 168
- godet, 6, 259, 265, 268, 269, 274
- heat conduction, 258
- heat medium, 260
- melt, 12, 207, 274, 275
- oven (glass melt), 170
- spinneret, 148, 167, 171–173, 175, 177, 178, 275, 276
- surrounding air, 12, 265
- surrounding medium, 261, 263, 265, 275, 276
- texturised yarn, 243
- Tensile force, *see* Fibre/yarn/thread tensile force
- Tensile stress, *see* Fibre/yarn/thread tensile stress
- Test signal, 27
- aperiodic determined, 27
- classification, 28
- periodic, 28
- periodic determined, 27
- stochastic, 28
- Textile technology, 4
- Textile testing, 4
- Texturing, *see* False twist texturing process
- Thread, *see* Fibre/yarn/thread ...
- Time behaviour, 16, 17, 287
- dead time, 182, 188
- Time constant
- drafting process, 193, 196
- drawing zone, 38, 41
- fibre/yarn/thread formation distance, 157, 158, 160, 162–164
- fibre/yarn/thread formation process, 168
- fibre/yarn/thread formation/processing processes, 165, 206, 208
- fibre/yarn/thread heating/cooling, 263, 264, 269, 274
- FT-texturing process, 248, 249, 257
- glass fibre spinning process, 173, 175
- stationary flat card, 187, 188
- system, 37, 38, 204

- Time expense, 28
- Time function
  - analysis
  - auto-correlation function, 22, 23
  - correlation/power density spectrum functions, 292
  - cross-correlation function, 23, 24, 221
  - fibre/yarn/thread tensile force, 232, 282, 295–301
  - generally, 287
  - power density spectrum function, 24, 25
  - combination measurements
  - fibre/yarn/thread tensile force and fineness, 301–307
  - definition, 13, 17
  - fibre/yarn/thread tensile force, 277–279, 283, 285
  - evaluation, 285–294
  - generally, 13, 16, 17
  - measuring, 289
  - response function, 27
  - impulse response, 17
  - step response, 17
  - stochastic, 22
  - traverse motion at winder
  - change  $\Delta l$ , 235–237
- Time range, 16–18, 24, 28, 29, 34, 165, 210
- Time shift
  - correlation function, 22–24, 288, 289, 294, 304
  - generally, 165
  - short time, 204
- Time transient function, *see* Step response (function), time transient function
- Transfer locus
  - drafting process (two steps)
  - evaluation, 196, 197, 201, 202
  - drawing process
  - fibre/yarn/thread fineness, 38–40
  - generally, 18–21
  - melt spinning process
  - fibre/yarn/thread fineness, 159, 163
- Transfer properties, dynamic, 30
  - drafting process, 195
  - melt spinning process, 149
  - roller top card, 183
  - tensile force measuring sensor, 283
- Transition behaviour, dynamic, 7, 9
- Transition time, 37
- Transport time, 182, 183, 185–187, 219
- Traverse motion triangle
  - asymmetric, 233, 239
  - eccentricity, 237
  - fibre/yarn/thread length shifts, 236
  - height, 234, 237
  - symmetric, 241
  - thread guide, 234
  - frequency, 234
- Twist density  $T_D$ 
  - FT-texturing process
    - changes  $\Delta n_s$ , 252
    - changes  $\Delta T t$ , 255
    - changes  $\Delta v_o$ , 254
    - changes  $\Delta v_z$ , 253
    - changes  $\Delta \mu$ , 256
    - dampening, 249
    - differential equation, DEq., 242, 244, 246
    - dynamic transfer function, 246
    - evaluation, 250, 252, 254–256
    - generally, 241, 242, 258
    - limit condition, 248, 249
    - phase frequency responses, 257
    - steady state relation, 244
- Twists per time unit
  - FT-texturing process, 244
- Unevenness
  - analysis
  - combination measurements, 305, 306
  - fibre/yarn/thread fineness, 288
  - identification matrix, 306–309
  - fibre/yarn/thread, 145, 221
  - fibre/yarn/thread E-modulus, 169
  - fibre/yarn/thread fineness
    - glass fibre spinning process, 181
    - transport process, 227
  - roving fineness
    - carding engines, 182, 183
    - stationary flat card, 182
  - sliver fineness
    - drafting process, 199
  - tensile force
    - fibre/yarn/thread elongation, 227, 278, 301, 306
    - fibre/yarn/thread transport process, 209, 210
- Uniformity (evenness) tester, 25
- Variance, *see* Quadratic dispersion (variance)

- Viscosity, elongational
- apparent, 139–141
  - dependence on crystallinity, 72
  - dependence on molecular weight, 72
  - temperature dependence, 71
- Wavelength
- disturbance of fibre/yarn/thread, 205, 207, 218, 219, 221, 223, 224, 227
- disturbance of sliver, 189
  - output web, 188
- Worker-angle-stripper-pair, 183–187
- dynamic transfer function, 185
  - functional block diagram, 184, 185
- Yarn, *see* Fibre/yarn/thread ...