

ISO 23365:2022-07 (E)

Heavy commercial vehicles and buses - Definitions of properties for the determination of suspension kinematic and compliance characteristics

Contents		Page
	Foreword	vi
	Introduction	vii
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Principle	4
5	Variables	5
5.1	Reference system.....	5
5.2	Variables to be determined.....	5
5.2.1	Vehicle geometry.....	5
5.2.2	Motion variables.....	5
5.2.3	Forces and moments.....	5
5.2.4	Steering geometry.....	6
5.2.5	Kinematics.....	6
5.2.6	Compliances.....	7
5.2.7	Ride and roll stiffness.....	7
5.2.8	Force reactions.....	8
6	Measuring equipment	8
6.1	Measurement accuracy.....	8
6.2	Derived variable accuracy.....	9
7	Suspension parameter measurement guidance	9
7.1	Steering geometry.....	9
7.1.1	Steering ratio.....	9
7.1.2	Overall steering ratio (i_S).....	10
7.1.3	Ackermann error.....	11
7.1.4	Inclination angle (ε_W).....	11
7.1.5	Camber angle (ε_V).....	11
7.1.6	Castor angle (τ).....	11
7.1.7	Castor offset at ground (n_k).....	11
7.1.8	Castor offset at wheel centre (n_T).....	12
7.1.9	Steering-axis inclination angle (σ).....	12
7.1.10	Steering-axis offset at ground (r_k).....	12
7.1.11	Steering-axis offset at wheel centre (r_σ).....	12
7.1.12	Normal steering-axis offset at ground (q_T).....	13
7.1.13	Normal steering axis offset at wheel centre (q_W).....	13
7.1.14	Scrub radius (r).....	13
7.2	Kinematics.....	14
7.2.1	General.....	14
7.2.2	Ride track change (b_z).....	15
7.2.3	Ride track change gradient (b_z').....	15
7.2.4	Ride steer (δ_z).....	16
7.2.5	Ride steer gradient (δ_z').....	16
7.2.6	Total ride toe ($\delta_{z(R-L)}$).....	16
7.2.7	Total ride toe gradient ($\delta_{z(R-L)'}'$).....	16
7.2.8	Ride camber (ε_{Vz}).....	16
7.2.9	Ride camber gradient (ε_{Vz}').....	16
7.2.10	Ride castor (τ_z).....	17
7.2.11	Ride castor gradient (τ_z').....	17
7.2.12	Roll steer (δ_{φ_V}).....	17

7.2.13	Roll steer gradient (δ_{ϕ_V})	17
7.2.14	Roll camber ($\epsilon_{V\phi_V}$)	17
7.2.15	Roll camber gradient ($\epsilon_{V\phi_V}$)	17
7.3	Compliances	18
7.3.1	General	18
7.3.2	Longitudinal force compliance, with suspension torque ($x_{\bar{F}_X}$)	18
7.3.3	Longitudinal force compliance, without suspension torque ($x_{\bar{F}_{XW}}$)	19
7.3.4	Longitudinal force camber compliance, with suspension torque ($\epsilon_{V\bar{F}_X}$)	19
7.3.5	Longitudinal force camber compliance, without suspension torque ($\epsilon_{V\bar{F}_{XW}}$)	19
7.3.6	Longitudinal force steer compliance, with suspension torque ($\delta_{\bar{F}_X}$)	20
7.3.7	Longitudinal force steer compliance, without suspension torque ($\delta_{\bar{F}_{XW}}$)	20
7.3.8	Longitudinal force windup compliance, with suspension torque ($\tau_{\bar{F}_X}$)	20
7.3.9	Longitudinal force windup compliance, without suspension torque ($\tau_{\bar{F}_{XW}}$)	20
7.3.10	Lateral force compliance at the wheel centre ($y_{\bar{F}_{YW}}$)	21
7.3.11	Lateral force compliance at the contact centre ($y_{\bar{F}_Y}$)	21
7.3.12	Lateral force camber compliance ($\epsilon_{V\bar{F}_Y}$)	21
7.3.13	Lateral force steer compliance ($\delta_{\bar{F}_Y}$)	21
7.3.14	Aligning moment camber compliance ($\epsilon_{V\bar{M}_Z}$)	22
7.3.15	Aligning moment steer compliance ($\delta_{\bar{M}_Z}$)	22
7.4	Ride and roll stiffness	22
7.4.1	General	22
7.4.2	Ride rate (K_Z)	22
7.4.3	Suspension ride rate (K_{ZK})	23
7.4.4	Roll stiffness (K_{ϕ_V})	23
7.4.5	Suspension roll stiffness (K_{ϕ_K})	23
7.4.6	Auxiliary roll stiffness ($K_{\phi_V,aux}$)	24
7.4.7	Auxiliary suspension roll stiffness ($K_{\phi_K,aux}$)	24
7.4.8	Vertical displacement tandem axle load redistribution stiffness (K_{tz})	24
7.4.9	Vertical suspension displacement tandem axle load redistribution stiffness (K_{tzK})	25
7.4.10	Tandem axle twist stiffness (K_{ϕ_t})	25
7.4.11	Tandem axle suspension twist stiffness (K_{ϕ_tK})	25
7.4.12	Tyre normal stiffness (K_{ZT})	25
7.5	Force reactions	25
7.5.1	Anti-squat and anti-dive force gradient ($\bar{F}_{Z\bar{F}_X}$)	25

7.5.2	Jacking force gradient ($\bar{F}_{Z\bar{F}_Y}'$).....	26
7.5.3	Longitudinal force tandem axle load redistribution gradient ($W_{Dt\bar{F}_{XT}}'$).....	26
8	Data presentation	26
8.1	Steering ratio	26
8.2	Kinematic properties	30
8.3	Compliance properties	31
8.4	Ride and roll stiffness properties	32
8.5	Force reaction properties	32
Annex A (informative) Mathematic fit of steering ratio as a function of steering wheel angle		34
Bibliography		35