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Katalog



**HAVALI
KALDIRMA
EKİPMANLARI**



1 Gearbox

Sealed planetary gearbox complies with heavy duty cycles, gears are heat treated and mounted on high strength low friction bearings to extend its life span.

2 Load Chain & Chain Guide

G80 load chain applied. The chain guide leads load chain working rapidly and smoothly on sprocket without twisting.

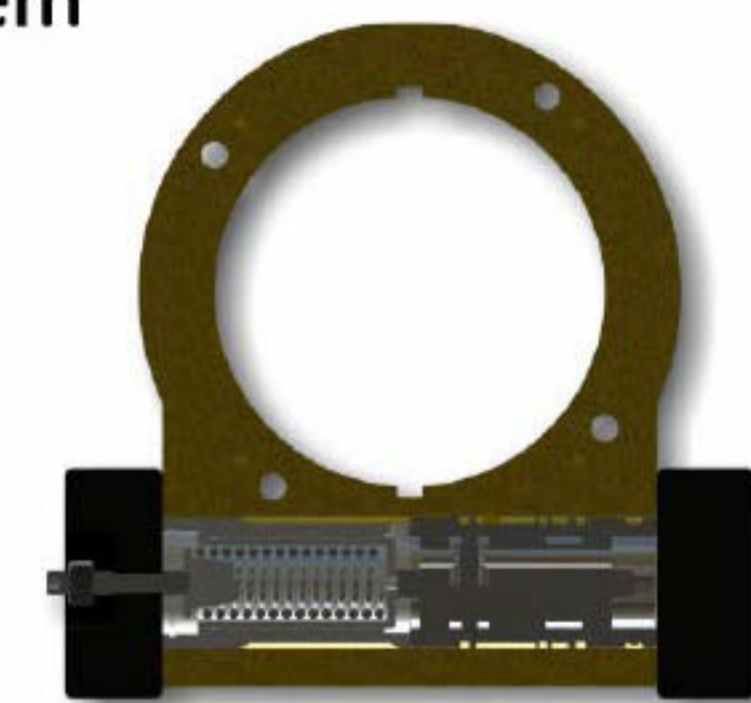
3 Controller

ToggleCord (TC) & Pendant Control (PC, Optional) for users choice. They can offer dual speed control with accurate & precise positioning of loads.

4 Brake

Non-asbestos disc brake is applied automatically when the air shut-off.

5 Main Air Supply Shut - Off Type Overload Limiter System



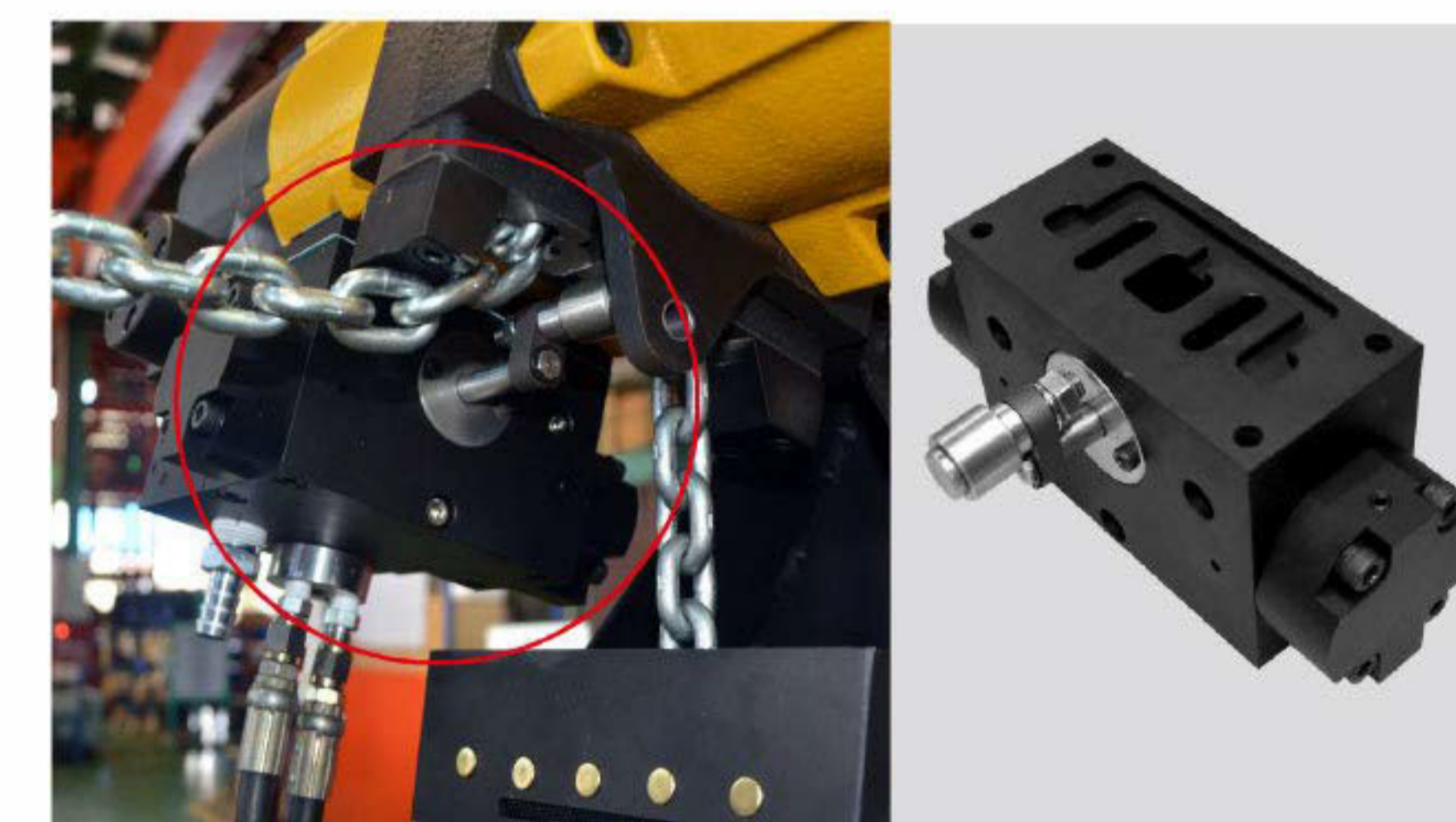
Two overload limiter devices for extra safety - a Mechanical Clutch type [MCT] & a Main Air Supply Shut-off [MASSO] valve type. These devices are pre-set at the factory to an overload limit capacity value of the hoist rated WLL x 125% and are adjustable.

Explosion-Proof Classification and Marking			
Type	Ex Environment	Marking	Model (e.g.)
With increased spark protection	Zone 1	II 2G Ex h IIB T4 Gb II 2D Ex h III B T135° C Db	VT 025Ex
Standard	Zone 2	II 3G Ex h IIA T4 Gc II 3D Ex h III B T135° C Dc	VT-025

The main air supply shut - off overload limiter device MASSO valve which is integrated into the air motor monitors the air pressure differential between the incoming air pressure and the exhaust air pressure.

When the overload limit capacity is reached the reduced exhaust air pressure is sensed and the higher incoming air pressure over comes the valve spring tension and closes the valve thereby closing the supply of air to the brake which then engages. However the hoist can still function in the DOWN mode to allow the load to be lowered.

6 Upper and Lower Load Chain Travel Limit Switch System (LSS)



To ensure that the load chain and hoist body are not damaged which can compromise safety, it is essential to limit the maximum up/down travel limits of the load chain and load hook.

Chain stops are attached to the load chain at the UP/DOWN travel limit points on either end of the load chain. Such Chain Stops activate the limit switch when the UP/DOWN chain travel points are reached.

When activated the limit switch mechanically closes the main air supply control piston to stop the air supply to the air motor.

When the hoist is operated in the reverse direction from the limit point the pressure on the limit switch is released which allows the main air supply control piston spring to open the main air valve and the hoist to operate.

Such LSS is incorporated into both the pendant control and toggle cord operating control types of VT hoists.

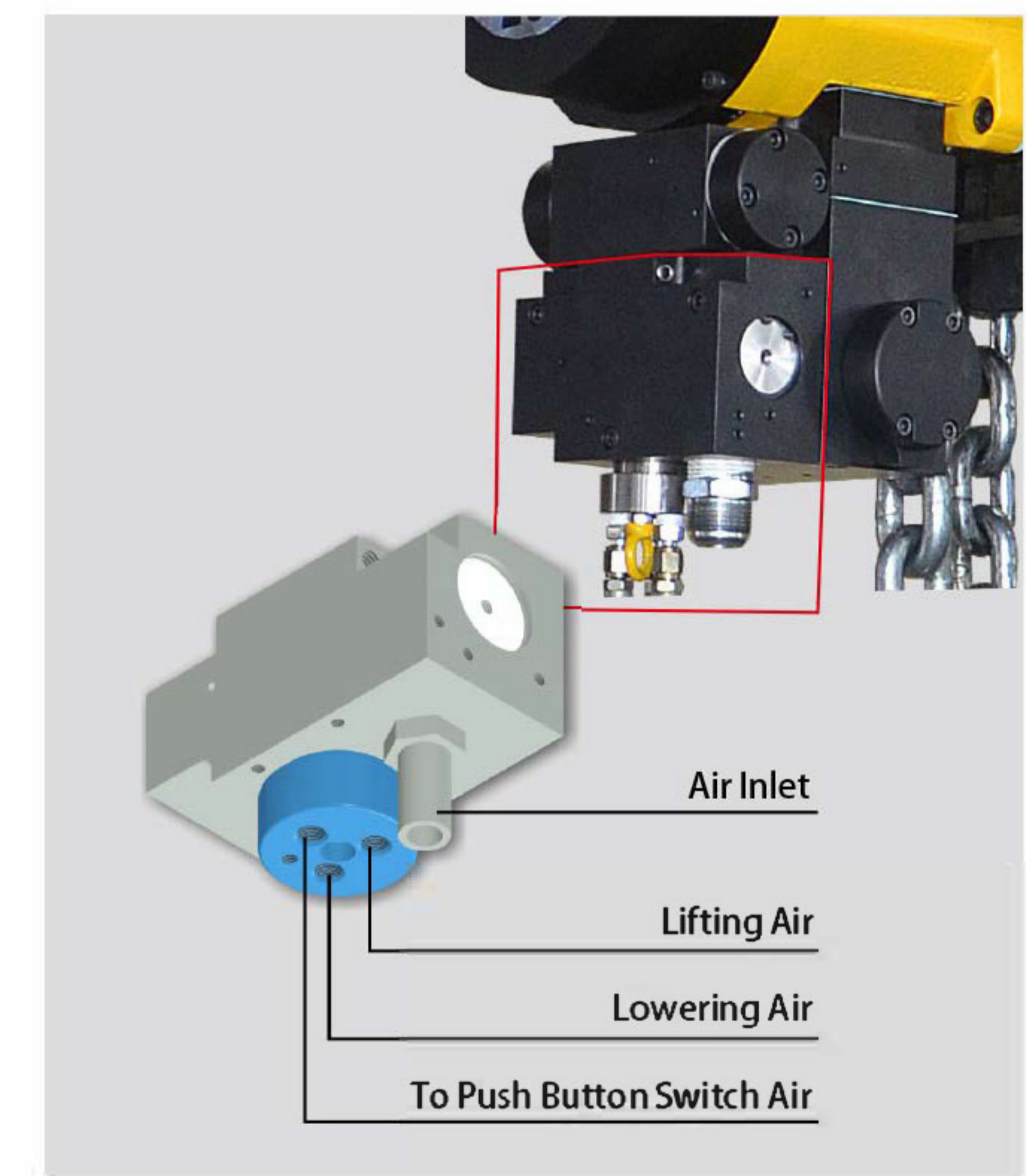
7 Hoist Housing

High strength FCD cast-iron housing ensures shocks, bumps and corrosion resistance.

8 Air-Lift Motor

Motor rotor vanes are lifted by specially directed compressed air stream ensuring high starting torque and optimum motor performance.

9 Emergency Stop Device (Optional)

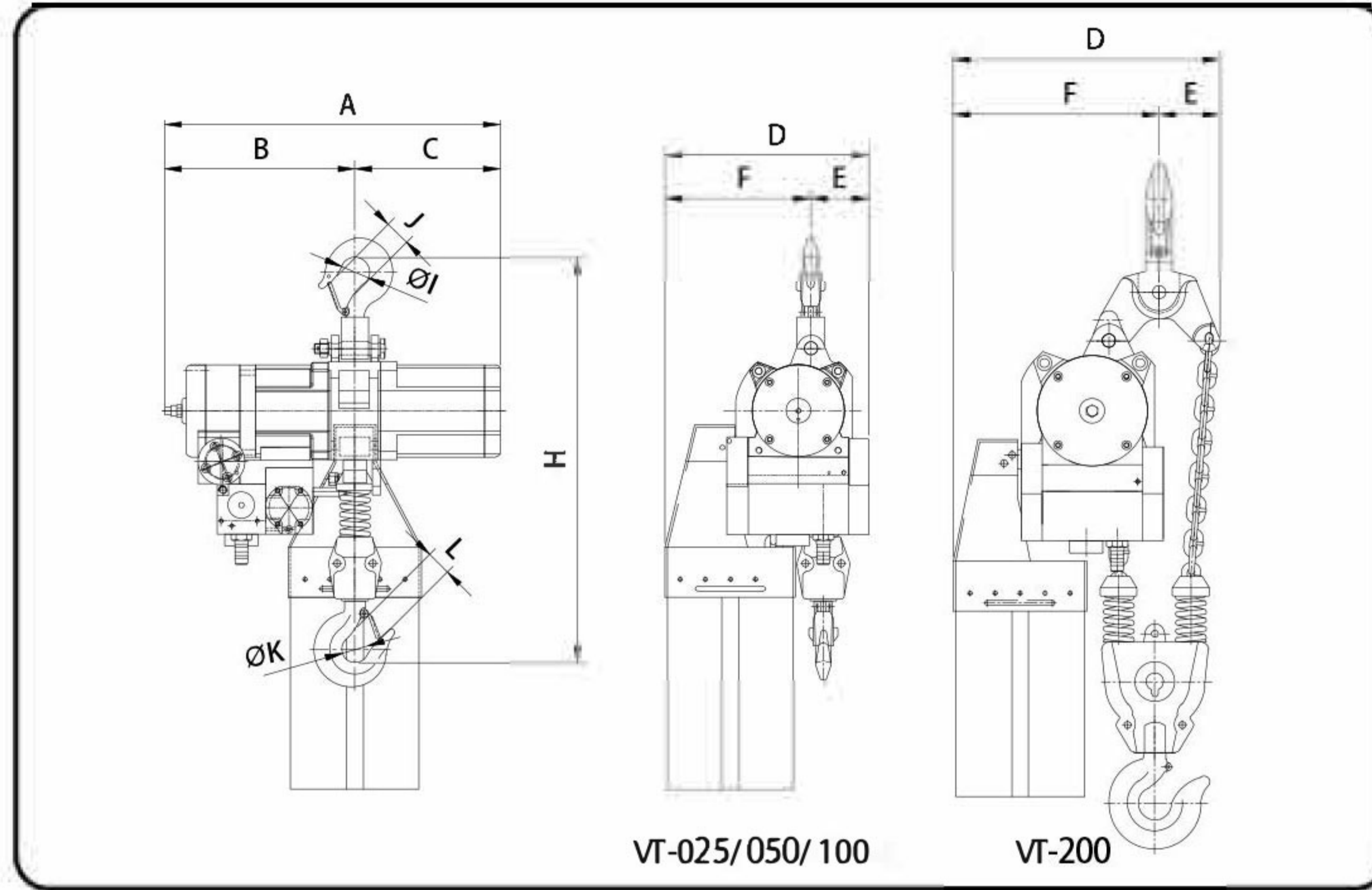


The air stream from either the Red or Blue hose ports, as indicated above, operate and activate the Emergency Stop Valve when the Emergency Stop Button on the Pendant Control Handle is depressed.

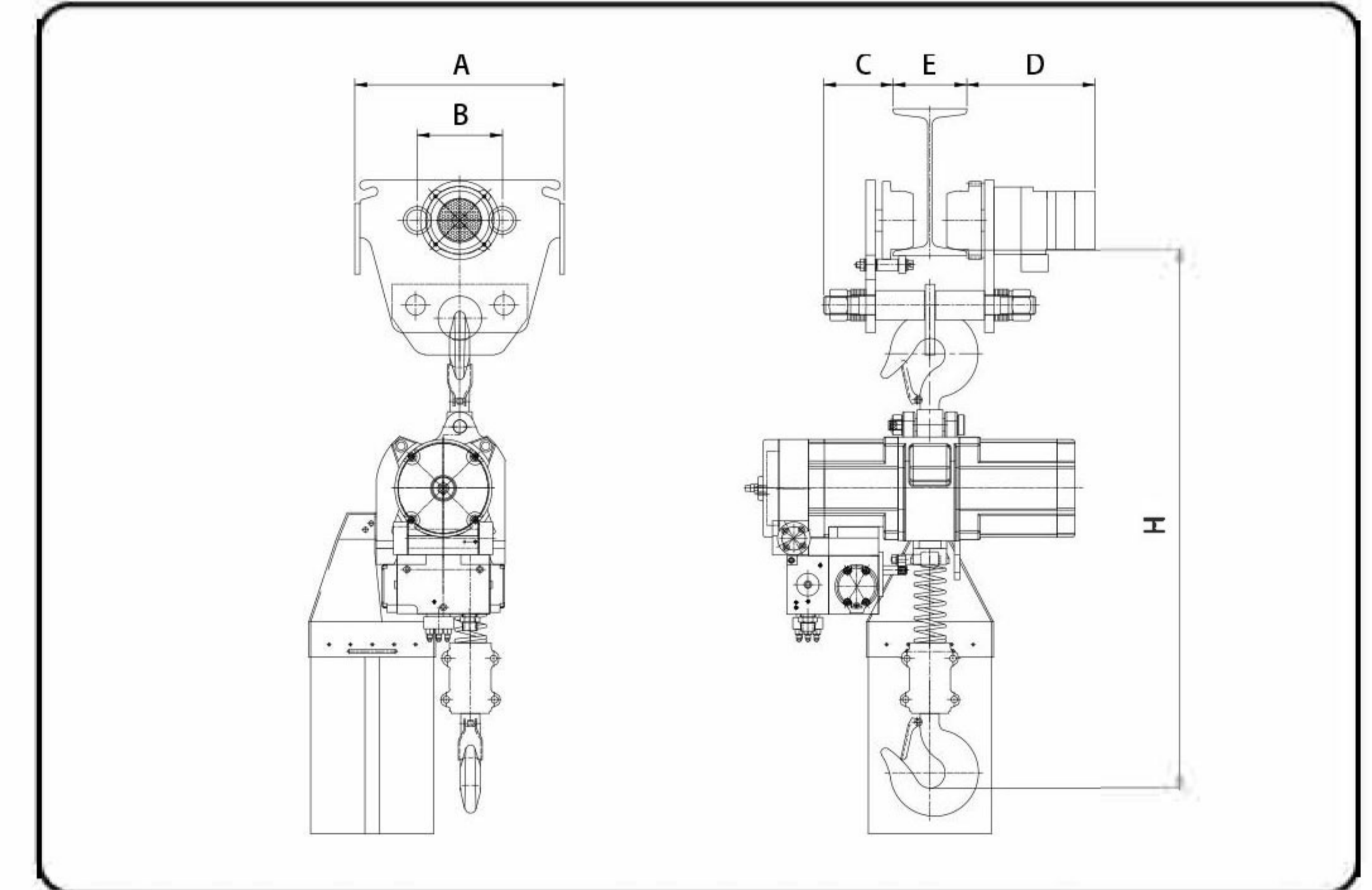
On activation the Emergency Stop Valve located on the air motor housing shuts-off the incoming main air supply to the air motor.



VT Series



Hoist with trolley



Model	Capacity (ton)	Fall no.	Dimension (mm)											N.W. (kg)
			H	A	B	C	D	E	F	I	J	K	L	
VT-025 VT-025Ex	0.25	1	615	371	197	174	244	70	174	40	32	40	32	32
VT-050 VT-050Ex	0.5	1	615	402	228	174	244	70	174	40	32	40	32	36
VT-100 VT-100Ex	1	1	620	460	255	205	251	65	186	40	32	40	32	51
VT-200 VT-200Ex	2	2	840	460	255	205	319	73	246	46	40	46	40	60

● Ex: Zone 1 ; Blank: Zone 2

Model	Capacity (ton)	Dimension (mm)					
		H	A	B	C	D	E
VT-025+PT050 VT-025Ex+PT-050Ex	0.25	590	236	89	35	35	50~150
VT-050+PT050 VT-050Ex+PT-050Ex	0.5	590	236	89	35	35	50~150
VT-100+AT-100 VT-100Ex+AT100Ex	1	621	294	116	95	208	75~125
VT-200+AT-200 VT-200Ex+AT 200Ex	2	751	322	135	100	209.5	100~150

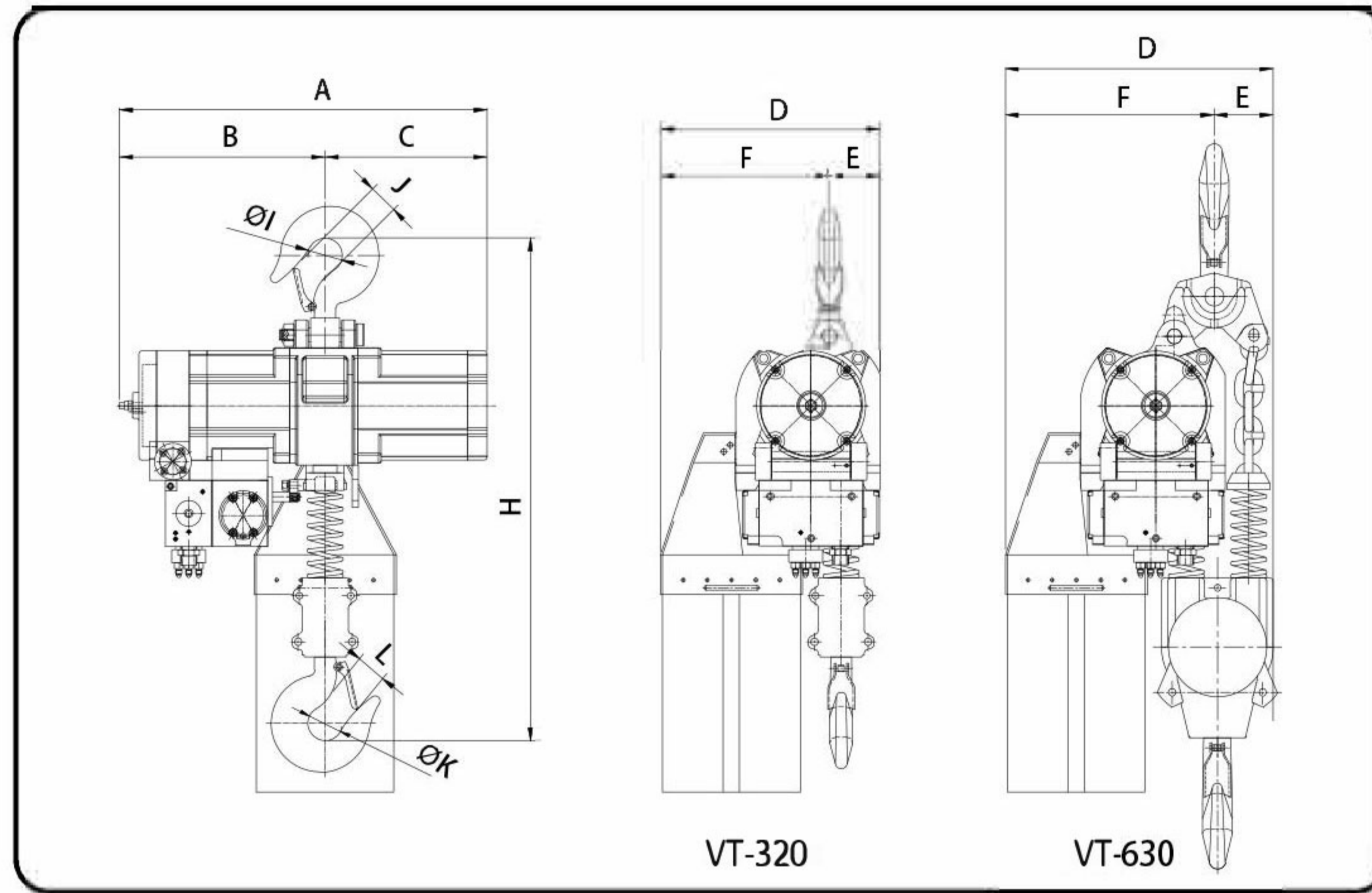
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Model	Capacity (ton)	Fall no.	Load chain (m m)	Lift (m)	Classification	Operation	Working air pressure (kg/cm²)	Motor (kw)	Speed (m/min)	Air consumption (m³/min)	Brake type	Li mit switch	Air inlet (in)	Level of noise (dB)		Main line airsupply (in)
														Load	No load	
VT-025 VT-025Ex	0.25	1	Ø6.3x19.1	3	2m	Toggle Cord (TC) or Pendant Control (PC)	6	1.5	18	2	Disktype brake	Upper /Lower limit	1/2"	85	82	3/4"
							4	0.8	8	1						
VT-050 VT-050Ex	0.5	1	Ø6.3x19.1	3	2m	Toggle Cord (TC) or Pendant Control (PC)	6	1.5	11	2	Disktype brake	Upper /Lower limit	1/2"	85	82	3/4"
							4	0.8	5	1						
VT-100 VT-100Ex	1	1	Ø7.1x20.2	3	2m	Toggle Cord (TC) or Pendant Control (PC)	6	2.0	7.6	2	Disktype brake	Upper /Lower limit	1/2"	85	82	3/4"
							4	1.0	3.4	1						
VT-200 VT-200Ex	2	2	Ø7.1x20.2	3	2m	Toggle Cord (TC) or Pendant Control (PC)	6	2.0	3.8	2	Disktype brake	Upper /Lower limit	1/2"	85	82	3/4"
							4	1.0	1.7	1						

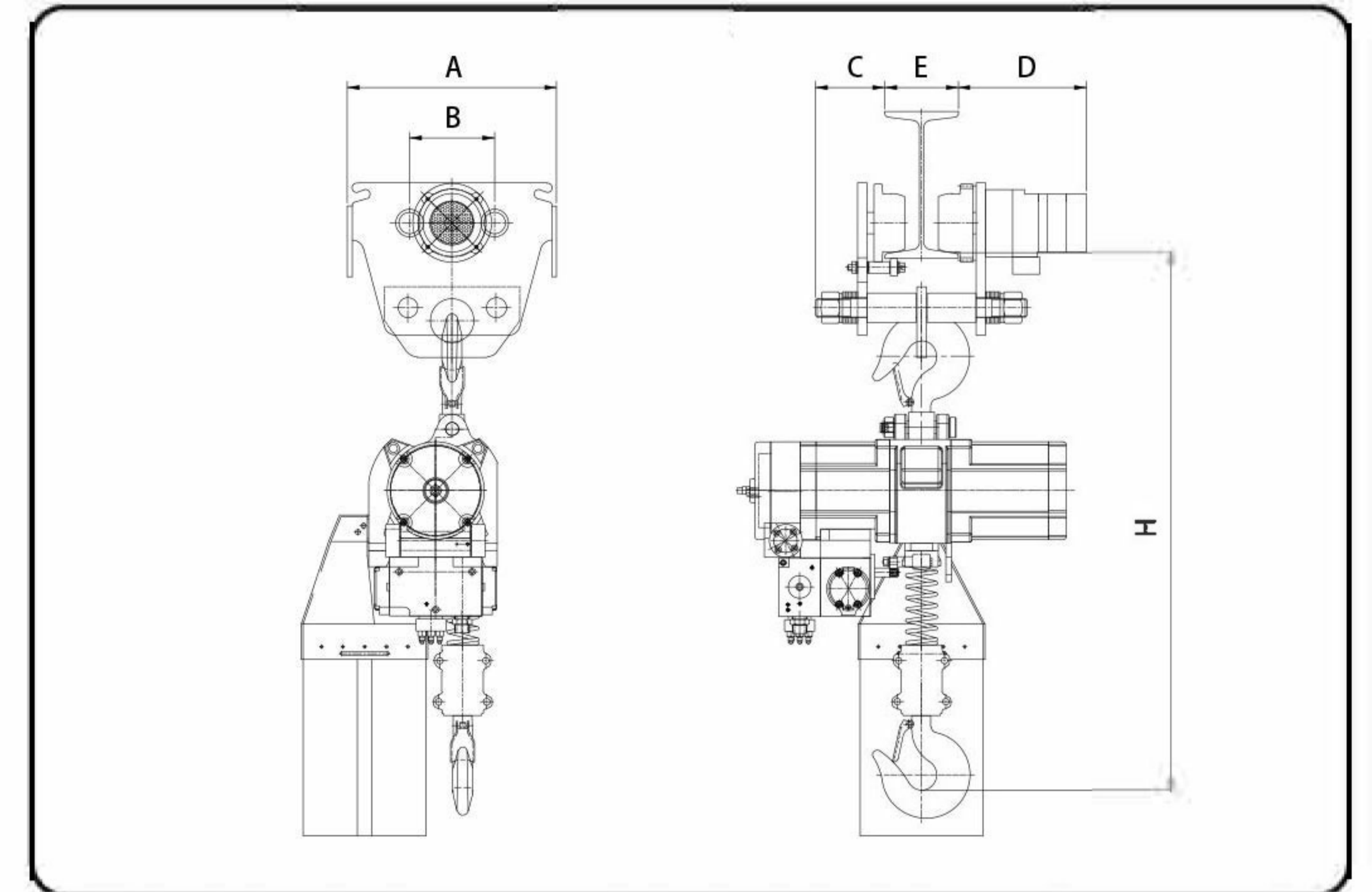
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VT Series



Hoist with trolley



Model	Capacity (ton)	Fall no.	Dimension (mm)											N.W. (kg)
			H	A	B	C	D	E	F	I	J	K	L	
VT-320 VT-320Ex	3.2	1	814	559	313	246	334	77	257	52	47	52	47	108
VT-630 VT-630Ex	6.3	2	1022	559	313	246	334	77	257	62	52	62	52	138

● Ex: Zone 1 ; Blank: Zone 2

Model	Capacity (ton)	Dimension (mm)					
		H	A	B	C	D	E
VT-320+AT320 VT-320Ex+AT-320Ex	3.2	902	356	144	117.5	217	125~175
VT-630+AT 630 VT-630Ex+AT-630Ex	6.3	1125	386	183	132.5	219	125~175

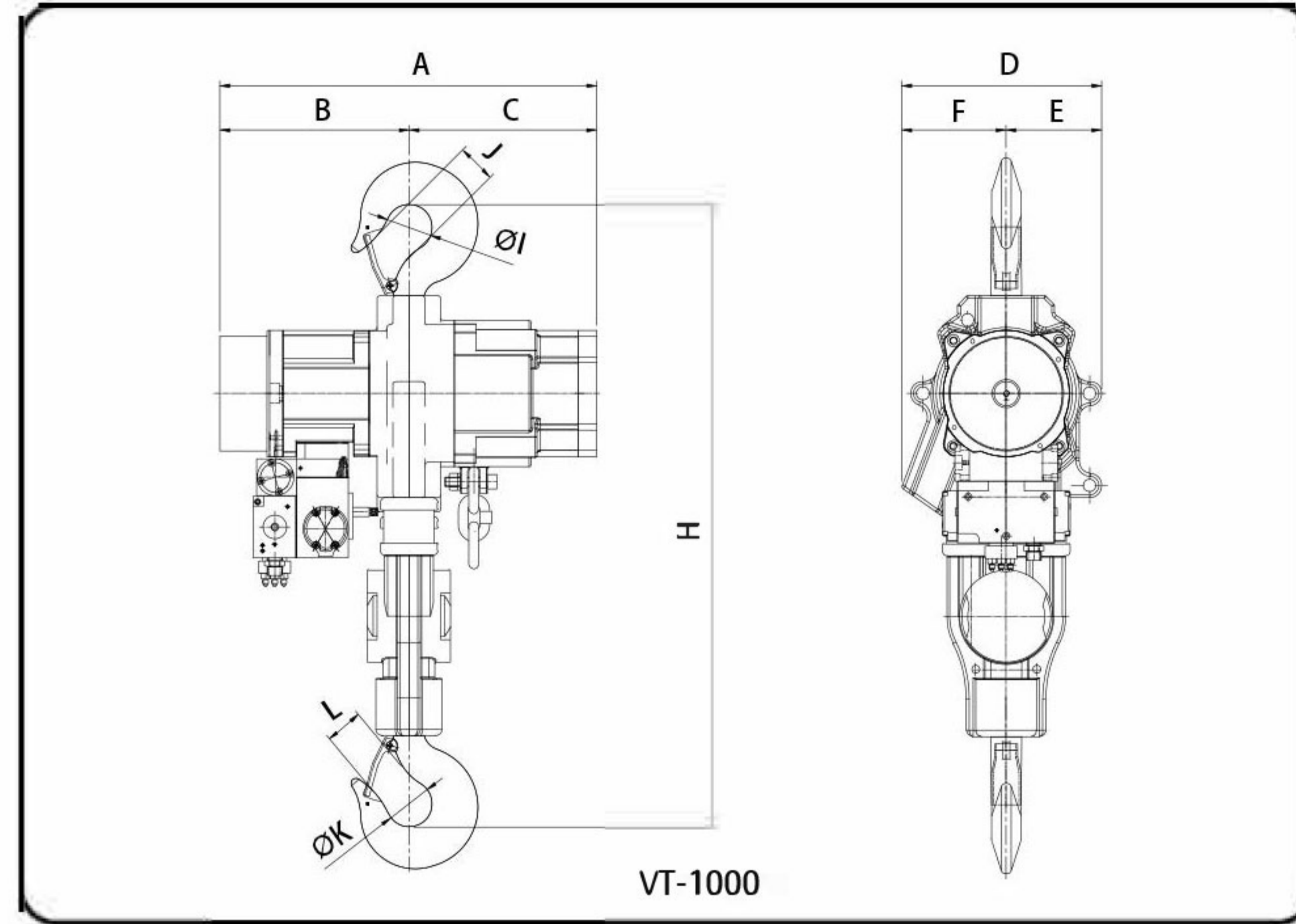
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Model	Capacity (ton)	Fall no.	Load chain (mm)	Lift (m)	Classification	Operation	Working air pressure (kg/cm²)	Motor (kw)	Speed (m/min)	Air consumption (m³/min)	Brake type	Limit switch	Airinlet (in)	Level of noise (dB)		Main line airsupply (in)		
														Load	No load			
VT-320 VT-320Ex	3.2	1	Ø13x36	3	2m	Toggle Cord (TC) or Pendant Control (PC)	6	3.5	4.8	4	Disk type brake	Upper/Lower limit	3/4"	90	87	2"		
							4	1.8	2.2	2								
VT-630 VT-630Ex	6.3	2	Ø13x36	3	2m		6	3.5	2.4	4				3/4"	90		87	2"
							4	1.8	1.1	2								

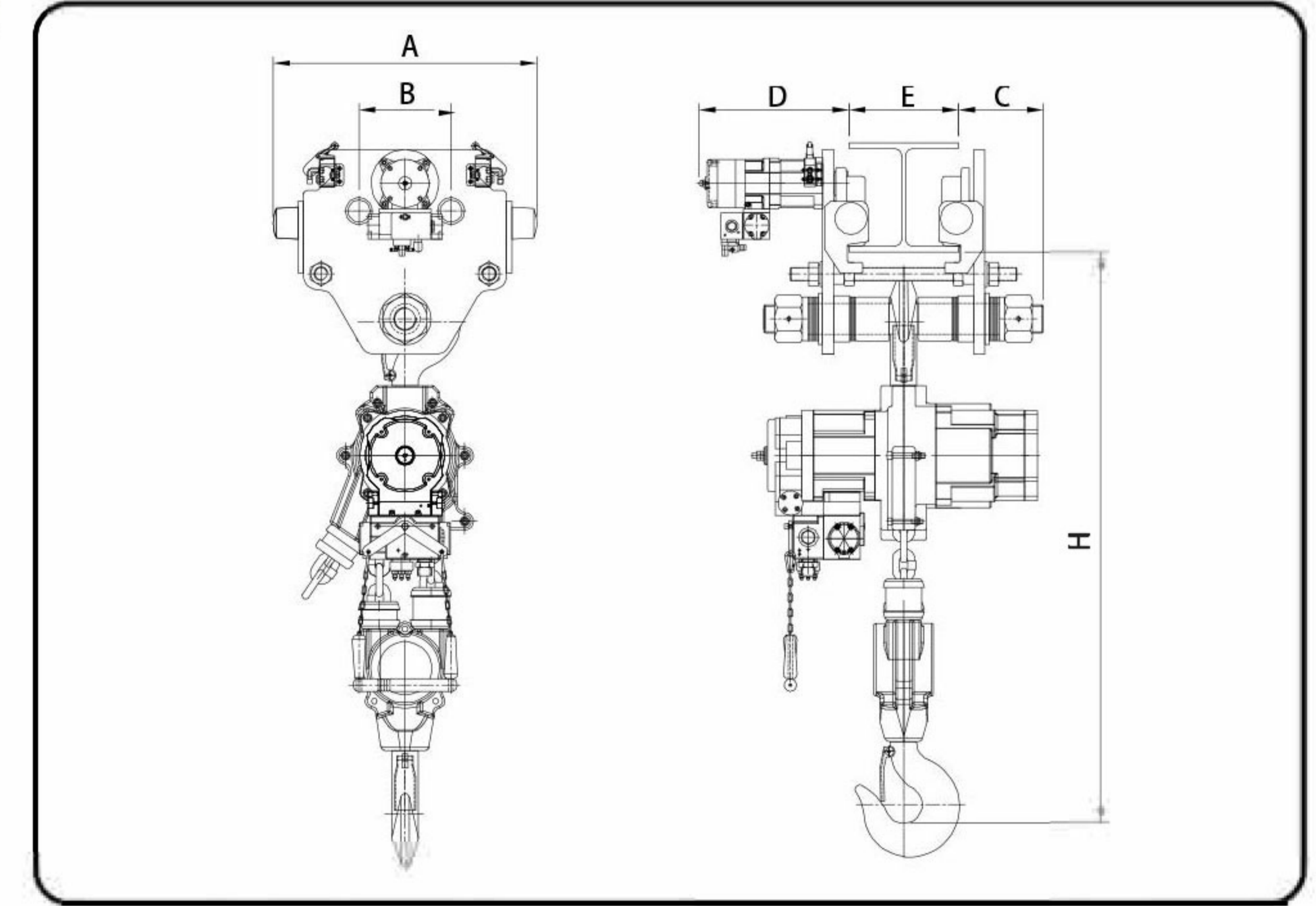
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VT Series



Hoist with trolley



Model	Capacity (ton)	Fall no.	Dimension (mm)											N. W. (kg)
			H	A	B	C	D	E	F	I	J	K	L	
VT-1000 VT-1000Ex	10	2	1100	616	308	308	326	156	170	85	70	85	70	186

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Model	Capacity (ton)	Dimension (mm)					
		H	A	B	C	D	E
VT-1000+AT 1000 VT-1000Ex+AT-1000Ex	10	1191	601	210	194	342	250~300

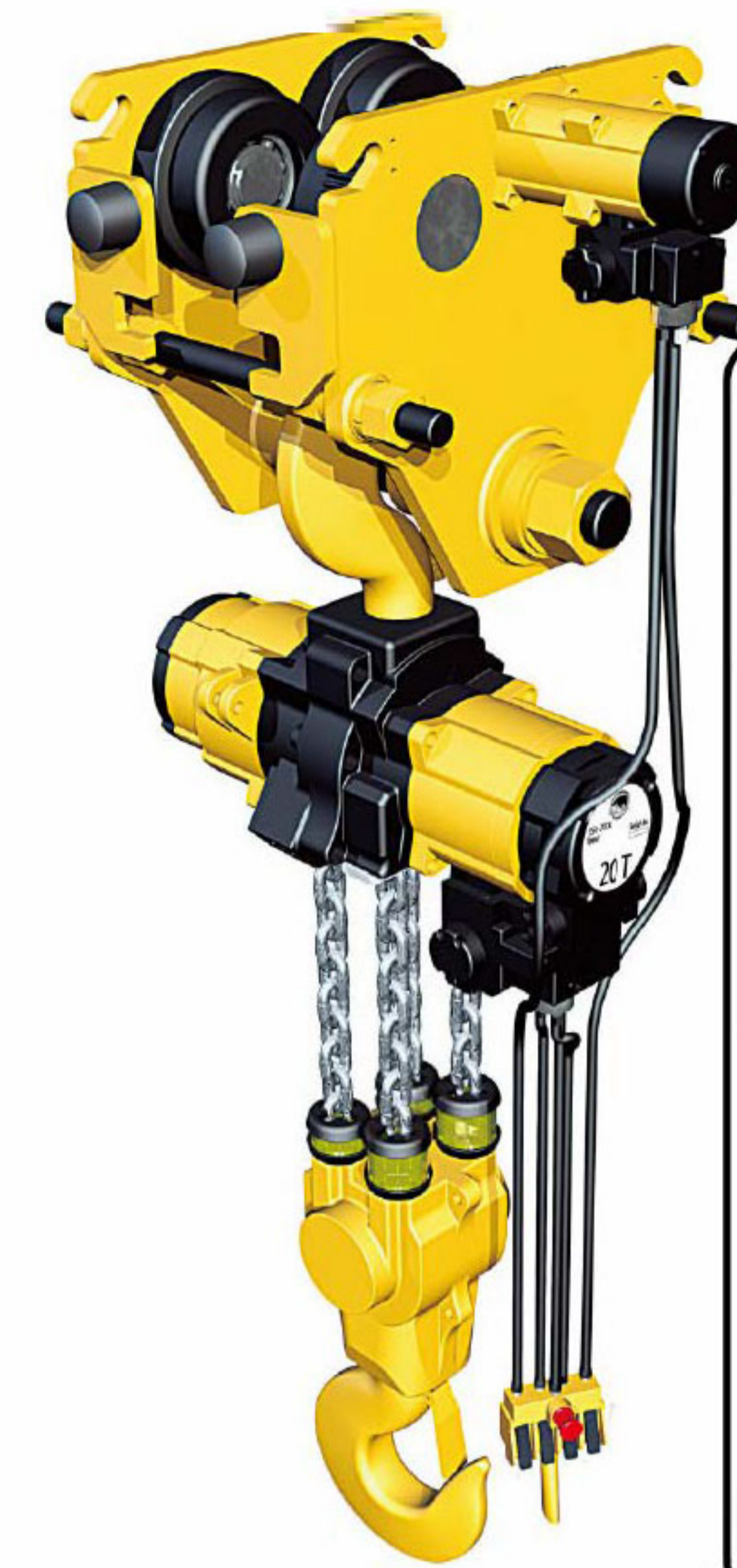
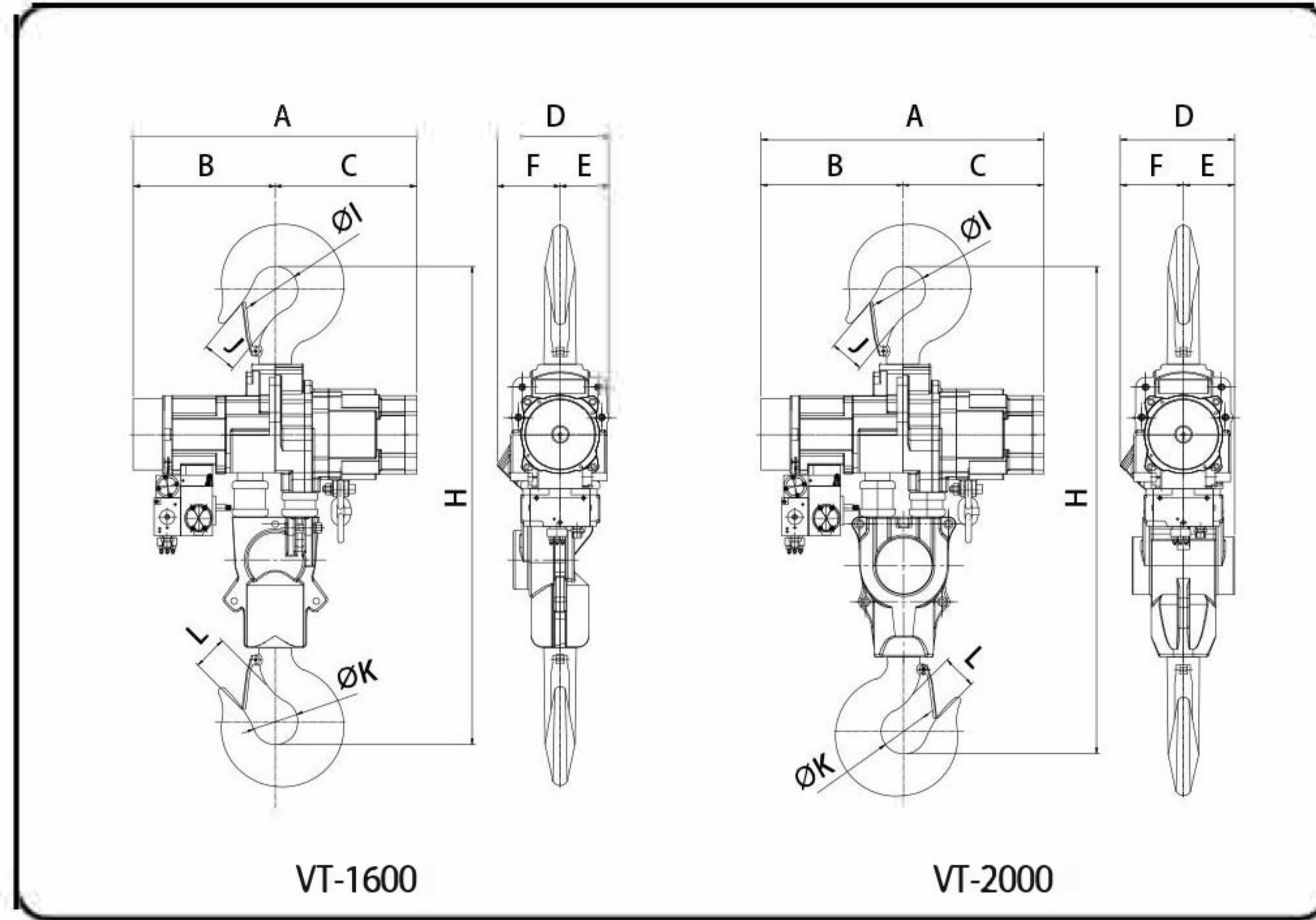
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Model	Capacity (ton)	Fall no.	Load chain (mm)	Lift (m)	Classification	Operation	Working air pressure (kg/cm ²)	Motor (kw)	Speed (m/min)	Air consumption (m ³ /min)	Brake type	Limit switch	Air inlet (in)	Level of noise (dB)		Main line air supply (in)
														Load	No load	
VT-1000 VT-1000Ex	10	2	Ø16x45	3	1Bm	Toggle Cord (TC) or Pendant Control (PC)	6	3.5	1.6	4	Disk type brake	Upper/Lower limit	1"	90	87	2"
							4	1.8	0.7	2						

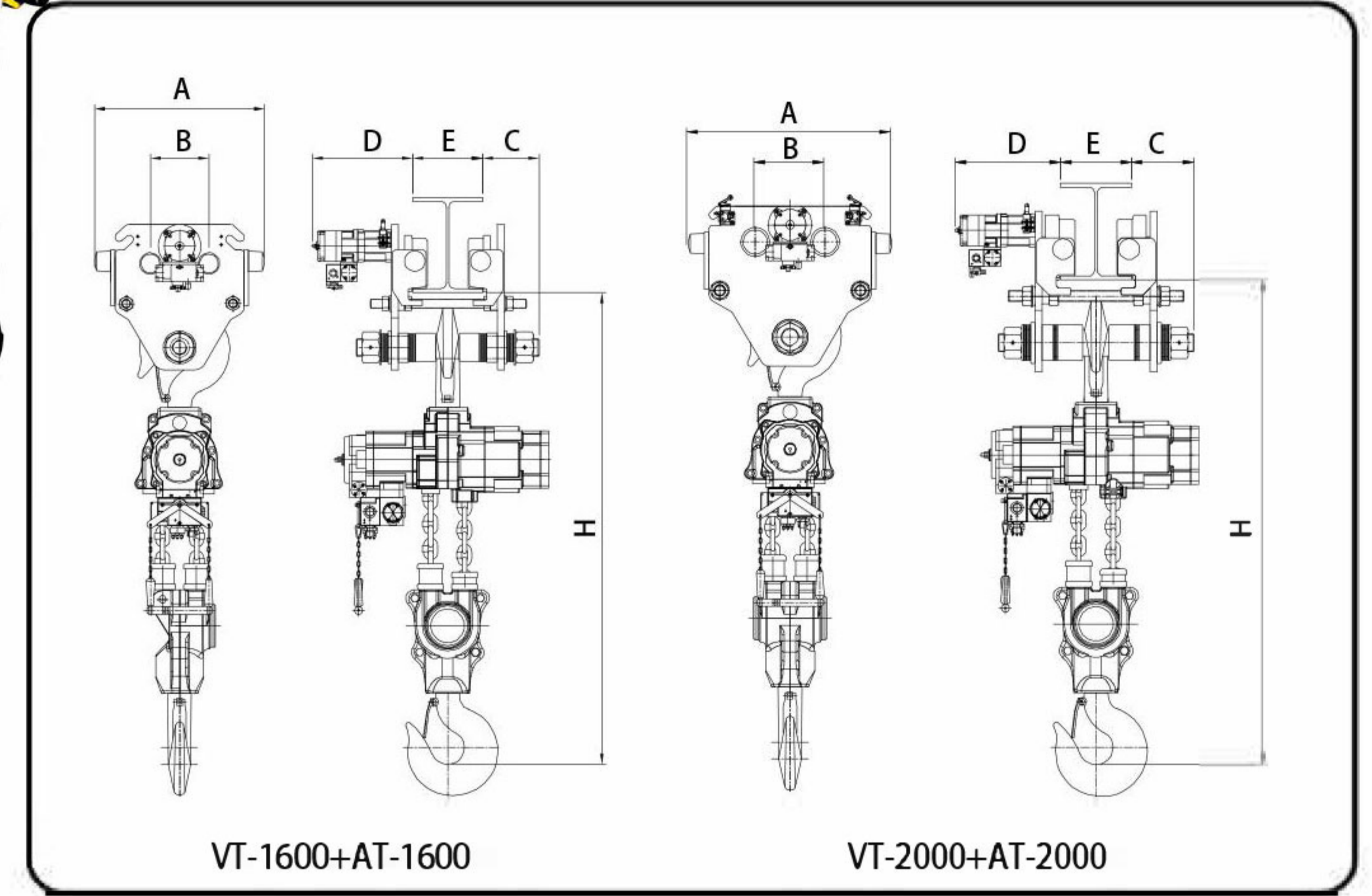
● Ex: Zone 1 ; Blank: Zone 2



VT Series



Hoist with trolley



Model	Capacity (ton)	Fall no.	Dimension (mm)											N.W. (kg)
			H	A	B	C	D	E	F	I	J	K	L	
VT-1600 VT-1600Ex	16	3	1200	746	374	372	295	129	166	100	78	100	78	327
VT-2000 VT-2000Ex	20	4	1360	746	374	372	301	135	166	120	90	120	90	383

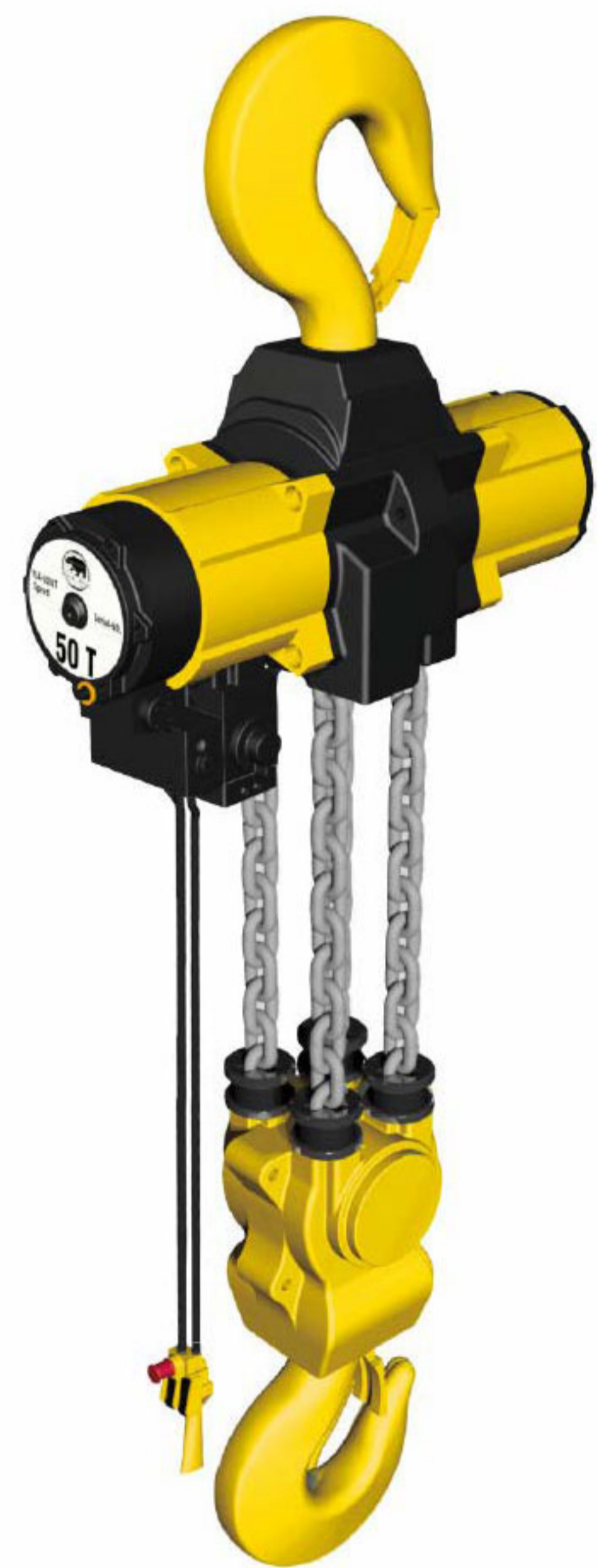
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Model	Capacity (ton)	Dimension (mm)					
		H	A	B	C	D	E
VT-1600+AT1600 VT-1600Ex+AT-1600Ex	16	1360	609	210	202	360	250~300
VT-2000+AT2000 VT-2000Ex+AT-2000Ex	20	1458	718	246	220	372	250~300

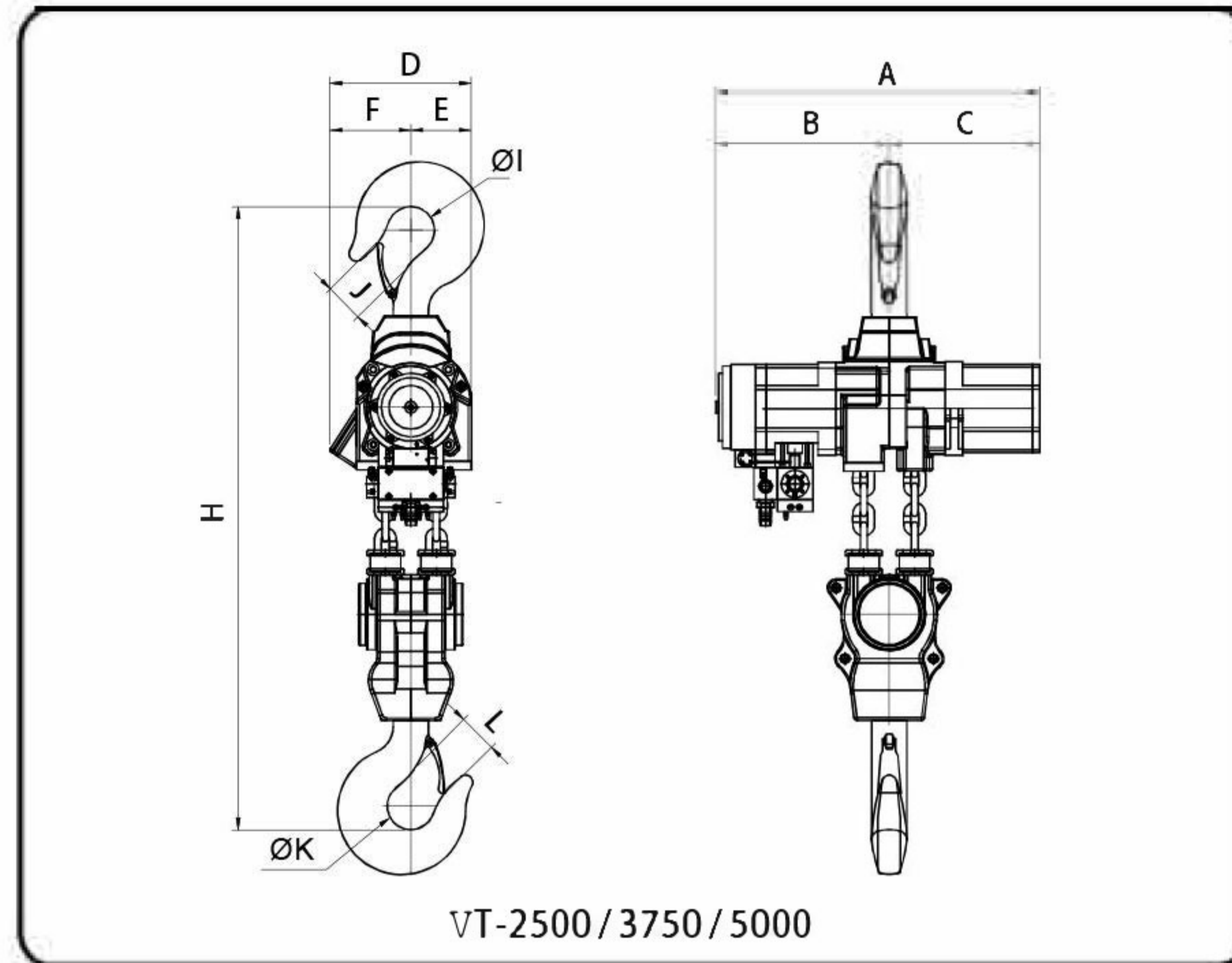
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Model	Capacity (ton)	Fall no.	Load chain (mm)	Lift (m)	Classification	Operation	Working air pressure (kg/cm ²)	Motor (kw)	Speed (m/min)	Air consumption (m ³ /min)	Braketype	Limit switch	Air inlet (in)	Level of noise (dB)		Main line air supply (in)
														Load	No load	
VT-1600 VT-1600Ex	16	3	Ø16x45	3	1Bm	Toggle Cord (TC) or Pendant Control (PC)	6	3.5	1.0	4	Disk type brake	Upper/Lower limit	1"	90	87	2"
							4	1.8	0.4	2						
VT-2000 VT-2000Ex	20	4	Ø16x45	3	1Bm		6	3.5	0.72	4				90	87	
							4	1.8	0.3	2						

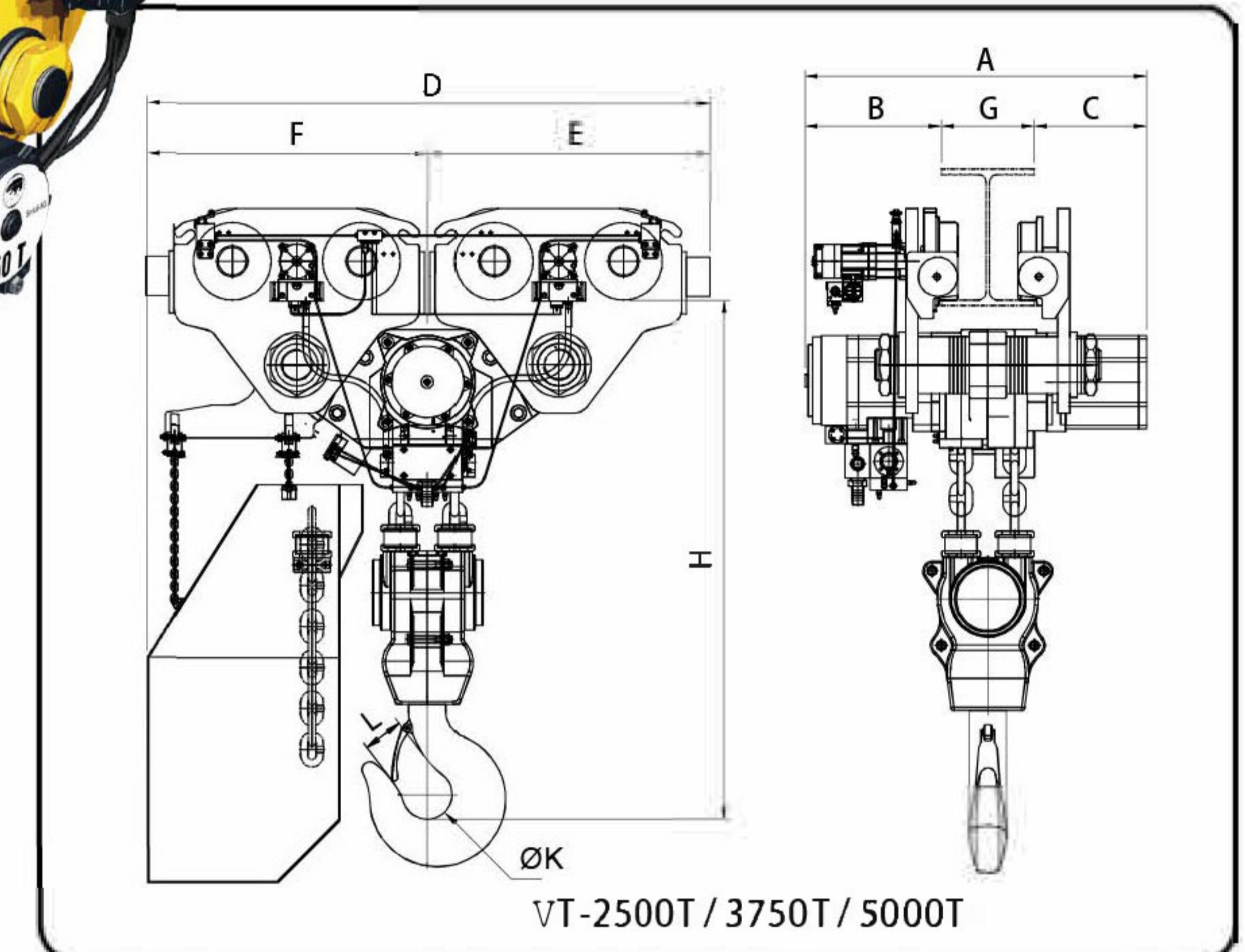
● Ex: Zone 1 ; Blank: Zone 2



VT Series



Hoist with trolley



Model	Capacity (ton)	Fall no.	Dimension (mm)											N.W. (kg)
			H	A	B	C	D	E	F	I	J	K	L	
VT-2500 YSA2500Ex	25	2	1561	983	481	502	426	131	295	140	113	140	113	580
VT-3750 VT-3750Ex	37	3	1840	1163	541	622	516	126	390	150	120	150	120	880
VT-5000 VT-5000Ex	50	4	1840	1163	571	592	426	161	265	160	130	160	130	980

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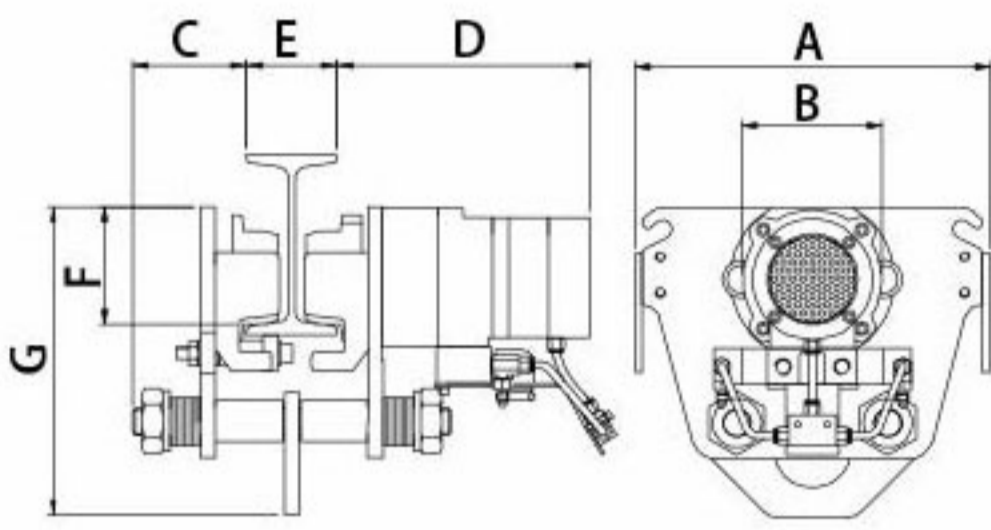
Model	Capacity (ton)	Fall no.	Load chain (mm)	Lift (m)	Classification	Operation	Working air pressure (kg/cm ²)	Motor (kw)	Speed (m/min)	Air consumption (m ³ /min)	Braketype	Limitswitch	Air inlet (in)	Level of noise (dB)		Main line air supply (in)
														Load	No load	
VT-2500 VT-2500Ex	25	2	Ø23.5 x 66	3	1Bm	Toggle Cord (TC) or Pendant Control (PC)	6	6.3	1.25	6.5	Disk type brake	Upper/Lower limit	1½"	85	82	2"
VT-2500T VT-2500TEx														85	82	
VT-3750 VT-3750Ex	37	3	Ø23.5 x 66	3	1Bm		6	6.3	0.75	6.5			1½"	85	82	2"
VT-3750T VT-3750TEx														85	82	
VT-5000 VT-5000Ex	50	4	Ø23.5 x 66	3	1Bm		6	6.3	0.55	6.5			1½"	85	82	2"
VT-5000T VT-5000TEx														85	82	

● Ex: Zone 1 ; Blank: Zone 2

Model	Capacity (ton)	Fall no.	Dimension (mm)											N.W. (kg)
			H	A	B	C	D	E	F	G	K	L		
VT-2500T VT-2500TEx	25	2	1177	1029	352	377	1264	632	632	200~300	140	113	1000	
VT-3750T VT-3750TEx	37	3	1425	1174	431	443	1674	837	837	200~300	150	120	1500	
VT-5000T VT-5000TEx	50	4	1425	1174	431	443	1674	837	837	200~300	160	130	1650	

Model	Capacity (ton)	Motor (kw)	Working air pressure (kg/cm ²)	Traversing Speed (m/min)	Air consumption (m ³ /min)	Brake type	Air inlet (in)
VT-2500 VT-2500Ex	25	1.5	6	14	2.6	Disk type brake	1/2"
VT-3750 VT-3750Ex	37	1.5	6	14	2.6		1/2"
VT-5000 VT-5000Ex	50	1.5	6	14	2.6		1/2"

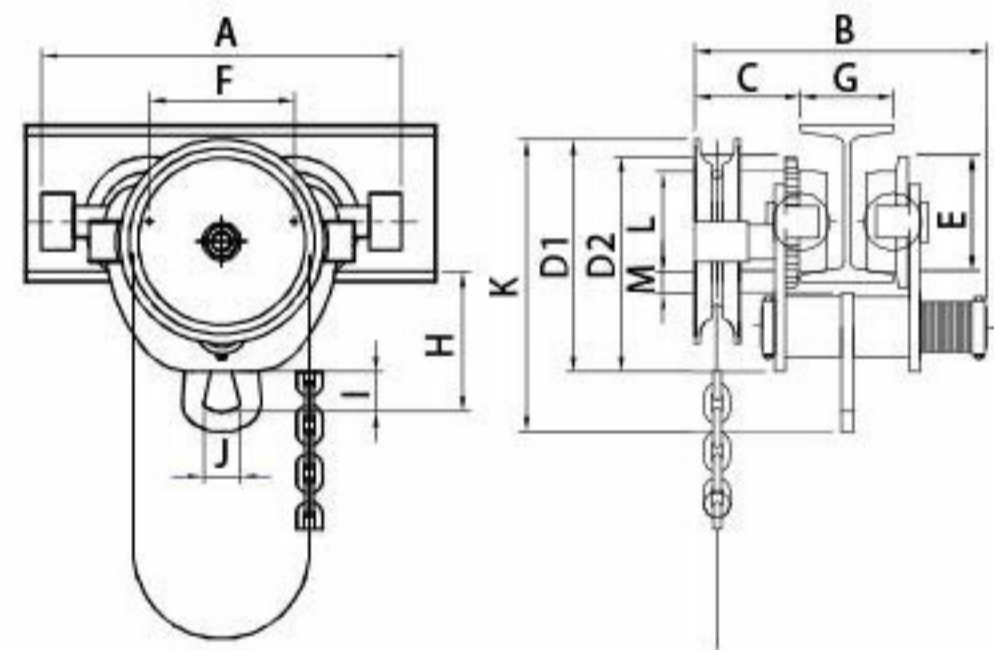
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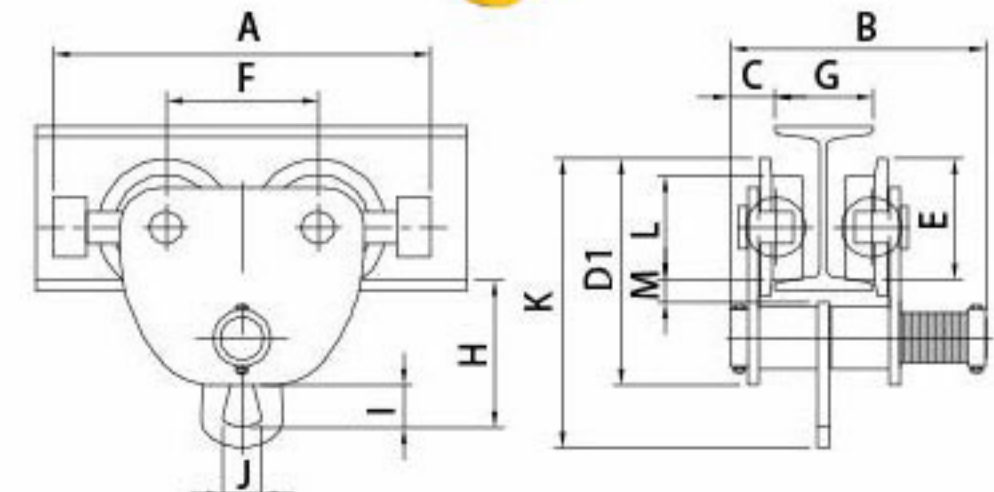
Model	Capacity (ton)	Dimension (mm)							Min radius of curve (m)	N.W. (kg)
		A	B	C	D	E	F	G		
VT-100 VT-100Ex	1	294	116	95	208	75-125	98	256	1.0	34
VT-200 VT-200Ex	2	322	135	100	209.5	100-150	116	279	1.3	38
VT-320 VT-320Ex	3.2	356	144	117.5	217	125-175	119	297	1.5	50
VT-630 VT-630Ex	6.3	386	183	132.5	219	125-175	169	521	2.2	140
VT-1000 VT-1000Ex	10	601	210	194	342	250-300	220	466	3.8	220
VT-1600 VT-1600Ex	16	609	210	202	360	250-300	220	466	4.0	240
VT-2000 VT-2000Ex	20	718	246	220	372	250-300	228	565	4.4	285

Model	Capacity (ton)	Motor (Kw)	Working air pressure (kg/cm ²)	Traversing Speed (m/min)	Air consumption (m ³ /min)	Brake type	Air inlet (in)
VT-100 VT-100Ex	1	0.2	6	20	0.6	Disk type brake	1/2"
VT-200 VT-200Ex	2	0.2	6	20	0.6		1/2"
VT-320 VT-320Ex	3.2	0.2	6	20	0.6		1/2"
VT-630 VT-630Ex	6.3	0.2	6	20	0.6		1/2"
VT-1000 VT-1000Ex	10	0.7	6	12	1.3		1/2"
VT-1600 VT-1600Ex	16	0.7	6	12	1.3		1/2"
VT-2000 VT-2000Ex	20	0.7	6	12	1.3		1/2"

● Ex: Zone 1 ; Blank: Zone 2



Model	Capacity (ton)	Dimensions (mm)														Min radius of curve (m)	N.W. (kg)
		A	B	C	D1	D2	E	F	H	I	J	K	L	M	G		
VT-050 VT-050Ex	0.5	236	266	81	150	151	69	89	115	33	28	199	60	32	50-150	1	8.8
VT-100 VT-100Ex	1	259	273	84	170	167	78	100	125	35	31	221	70	29	75-150	1	13.5
VT-200 VT-200Ex	2	289	309	91	224	207	91	116	171	55	56	301	80	31	100-175	1.3	19.8
VT-300 VT-300Ex	3	312	346	96	241	239	103	130	215	79	60	355	90	35	100-200	1.5	30.3
VT-500 VT-500Ex	5	352	350	98	235	251	117	140	218	84	60	370	100	33	125-200	1.6	37
VT-750 VT-750Ex	7.5	410	382	110	280	292	135	184	260	103	76	435	120	40	150-200	2.2	64
VT-1000 VT-1000Ex	10	440	389	114	301	322	152	197	275	105	76	467	140	35	150-200	2.2	86

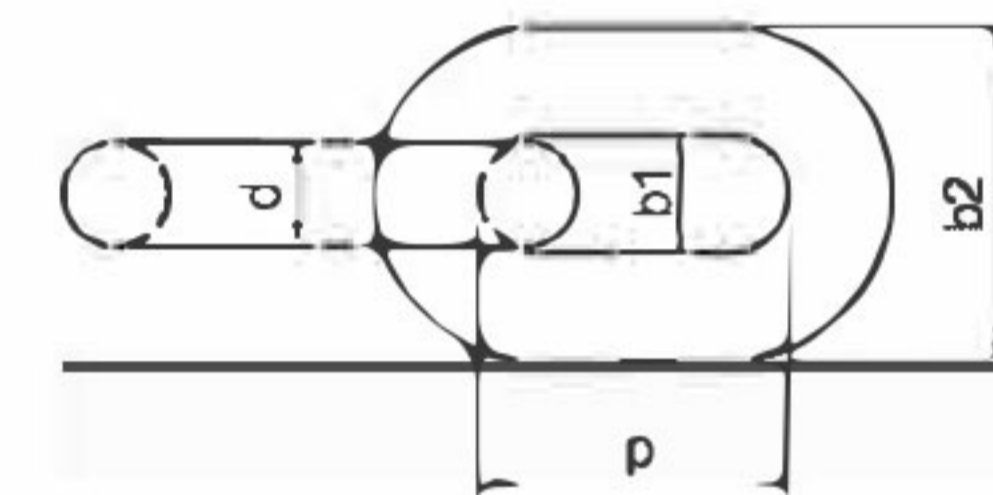


Model	Capacity (ton)	Dimensions (mm)														Min radius of curve (m)	N.W. (kg)
		A	B	C	D1	E	F	H	I	J	K	L	M	G			
VT-050 VT-050Ex	0.5	236	220	35	151	69	89	115	33	28	199	60	32	50-150	1	6.4	
VT-100 VT-100Ex	1	259	227	39	167	78	100	125	35	31	218	70	29	75-150	1	10.6	
VT-200 VT-200Ex	2	289	260	43	207	91	116	171	55	56	284	80	31	100-175	1.3	16.8	
VT-300 VT-300Ex	3	312	300	50	239	103	130	215	79	60	353	90	35	100-200	1.5	25.8	
VT-500 VT-500Ex	5	352	304	52	251	117	140	218	84	60	370	100	33	125-200	1.6	32.6	
VT-750 VT-750Ex	7.5	410	343	72	292	135	184	260	103	76	435	120	40	150-200	2.2	59.5	
VT-1000 VT-1000Ex	10	440	350	75	322	152	197	275	105	76	467	140	35	150-200	2.2	81.4	

Chain Bucket No. Selection Table

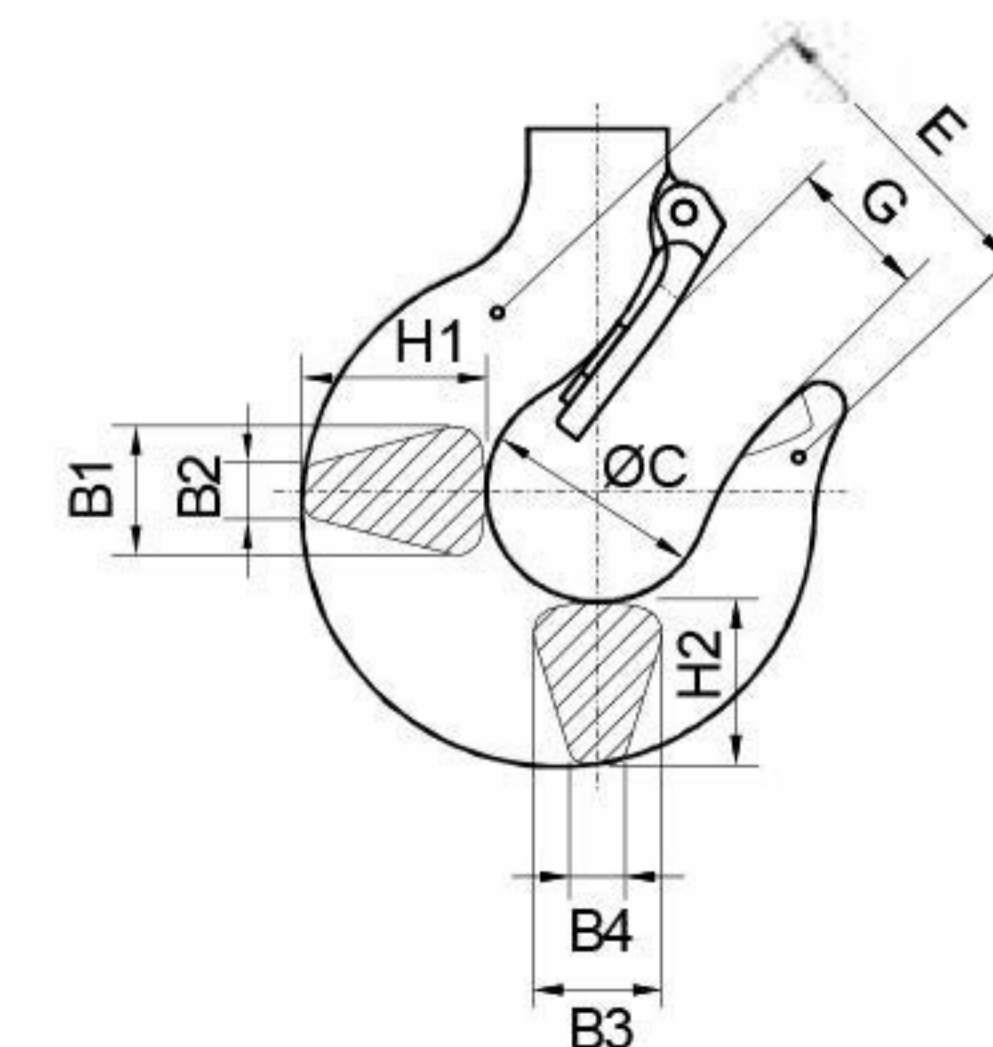
Model	Chain Size (mm)	Lift (m)										Bucket No.	Bucket Size (mm)	Material
		≤3	≤6	≤12	≤20	≤24	≤30	≤40	≤45	≤50	≤60			
		VT-025(Ex)	Ø6.3			YA#1		YA#6		YA#7				
VT-050(Ex)	Ø6.3			YA#1		YA#6		YA#7		YA#8		YA#2	180x154x222	Canvas
VT-100(Ex)	Ø7.1			YA#2	YA#4		YA#9		YA#10			YA#3	210x210x320	Canvas
VT-200(Ex)	Ø7.1	YA#2	YA#4	YA#9	YA#10		YA#12					YA#4	180x154x302	Canvas
VT-320(Ex)	Ø13			YA#3	YA#5		YA#13		YA#14	YA#15		YA#5	210x210x560	Canvas
VT-630(Ex)	Ø13	YA#3	YA#5	YA#13	YA#14	YA#15	YA#16					YA#6	216x216x450	Canvas
												YA#7	250x200x660	Steel
												YA#8	250x200x830	Steel
												YA#9	180x154x570	Canvas
												YA#10	270x190x695	Steel
												YA#11	270x190x850	Steel
												YA#12	270x190x1000	Steel
												YA#13	300x300x607	Steel
												YA#14	300x300x940	Steel
												YA#15	300x300x1000	Steel
												YA#16	300x300x1200	Steel

Load Chain



Diameter d (mm)	Model Reference Being Used	Inner Length p (mm)	Inner Width b1 (mm)	Outer Width b2 (mm)	Breaking Load (kN)
Ø6.3	VT-025(Ex), VT-050(Ex)	19.1	7.9	21.4	50
Ø7.1	VT-100(Ex), VT-200(Ex)	20.2	8.1	23.2	63.3
Ø13	VT-320(Ex), VT-630(Ex)	36	15.6	44.2	212
Ø16	VT-1000(Ex), VT-1600(Ex) VT-20	45	19.2	54.4	322
Ø23.5	VT-2500(Ex), VT-3750(Ex) VT-5000(Ex), VT-2500T(Ex) VT-3750T(Ex), VT-5000T(Ex)	66	27	76.6	750

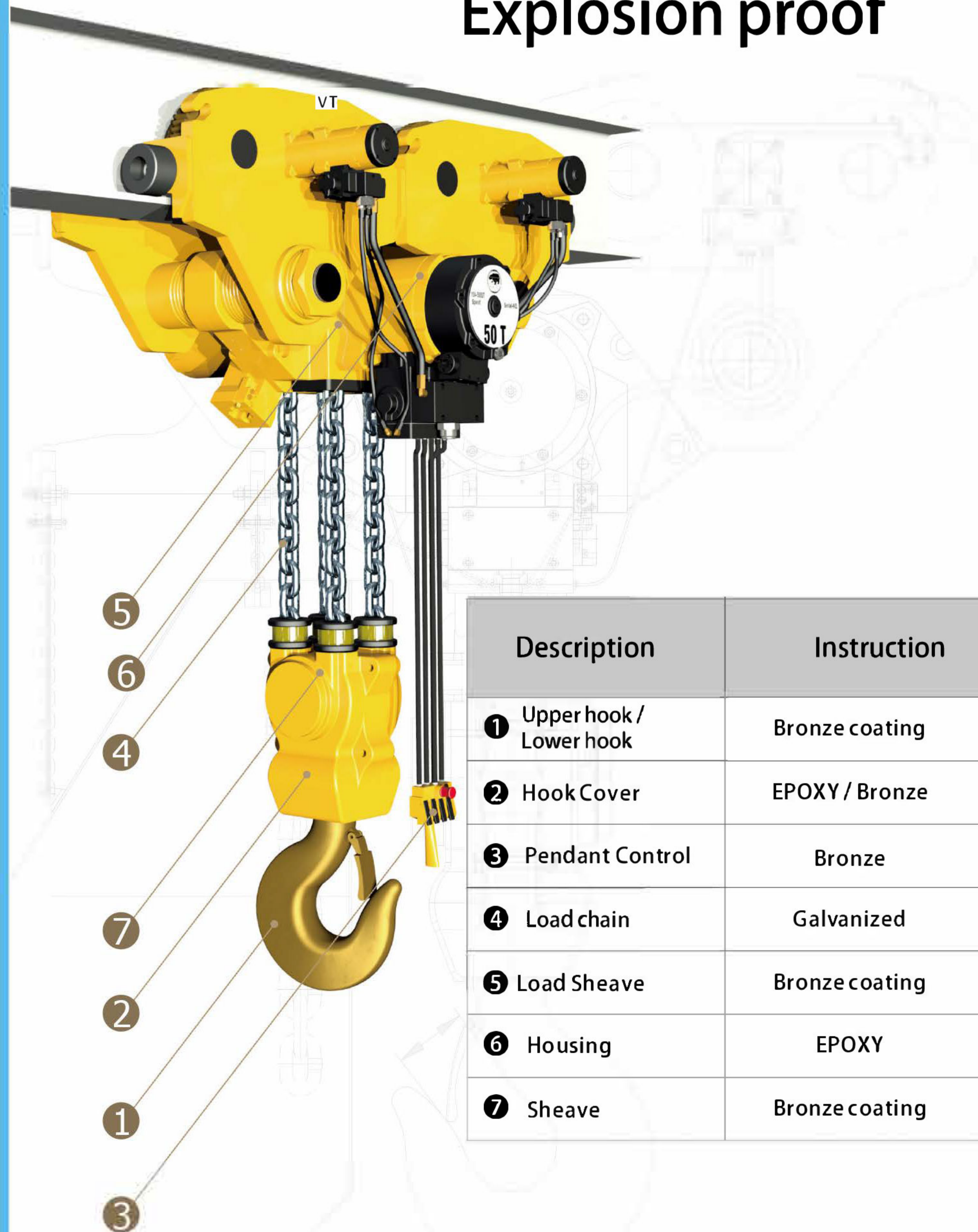
Hook



Model	Capacity (ton)	T/B	Dimensions (mm)								Allow Stress (kg/mm ²)	Hook Block Weight (kg)	
			H1	B1	B2	H2	B3	B4	C	G			E
VT-025(Ex) VT-050(Ex) VT-100(Ex)	0.25 0.5, 1	T/B	33	23	9	29	23	9	40	28	60	70	10
VT-200(Ex)	2	T/B	45	31	10	41	31	10	46	36	75	70	10
VT-320(Ex)	3.2	T/B	55	34	19	48	34	19	52	40	90	70	10
VT-630(Ex)	6.3	T/B	66	44	23	60	44	23	62	45	100	70	20
VT-1000(Ex)	10	T/B	85	61	22	77	61	22	85	62	140	100	90
VT-1600(Ex)	16	T/B	100	70	28	95	65	28	100	70	133	100	160
VT-2000(Ex)	20	T/B	120	85	32	110	83	32	120	82	165	100	220
VT-2500T(Ex)	25	B	138	98	36	128	93	36	140	105	220	100	420
VT-3750T(Ex)	37	B	150	115	55	140	110	55	150	112	230	100	510
VT-5000T(Ex)	50	B	168	120	70	150	120	70	160	122	240	100	680

● T=Top hook / B=Bottom hook

Explosion proof



	Description	Instruction
1	Upper hook / Lower hook	Bronze coating
2	Hook Cover	EPOXY / Bronze
3	Pendant Control	Bronze
4	Load chain	Galvanized
5	Load Sheave	Bronze coating
6	Housing	EPOXY
7	Sheave	Bronze coating

Pneumatic hoists utilize compressed air as a power source to their integrated air motors and therefore, unlike electrically powered hoists, pneumatically powered chain hoist motors are electric spark-free. This makes pneumatic chain hoists safe for use in wet and hazardous flammable environments & atmospheres.

Further special preparation of this Ex range of pneumatic hoists makes them suitable and certified for use in such hazardous environments & atmospheres in accordance with the ATEX regulations (ATEX Directive 2014/34/EU) by the use of special non-sparking materials for certain components to prevent spark generation in the event of surface impact contact. The temperature operating range of the Ex hoists min & max environmental temperatures -20 ~ +60 Deg. C

Our hoists in their various formats are suitable for use in mines, shipyards, power plants, cement plants, onshore & offshore oil industries & gas production platforms.



■ Air Flow System



Air Compressor

Air Pressure Source



Air Tank



F.R.L Unit

Air Purification



Air Dryer

Compressed Air Available to The Hoist



- Compressor : above 30hp to match air storage supplement.
- Air Filter : need to clean & replace regularly.
- Pressure Regulator: 8kg / cm² at least.
- Lubricator : 6 drops/min or more adjusted according to operating status.
- Connect the main air supply hose to the main air inlet of the hoist. Supply hose i.d. sizes :
0.25 ton ~ 2 ton : i.d. 1/2" ; 3.2 ton ~ 6.3 ton : i.d. 3/4" ;
10 ton ~ 20 ton : i.d. 1" ; 25 ton ~ 50 ton : i.d. 1 1/2".
- Air supply pressure range needs to be Working Air Pressure 4~6 Kg / cm². The hoist performance and lifting / lowering speed is affected by the W.A.P.
- Use a dedicated air supply line to the hoist to prevent air starvation to the hoist which can occur if used on the same air supply line as other pneumatic equipment.

■ Federation Europeenne De La Manutention

	Cubic mean value Definitions	Average operating time per day in hours							
		0.25-0.5	0.5-1	1-2	2-4	4-8	8-16	>16	
1 (light)	(k ≤ 0.50) Mechanisms or parts thereof, usually subject to very small loads and in exceptional cases only to maximum loads.	0.25-0.5	0.5-1	1-2	2-4	4-8	8-16	>16	
2 (medium)	(0.50 < k ≤ 0.63) Mechanisms or parts thereof, usually subject to small loads but rather often to maximum loads.	0.12-0.25	0.25-0.5	0.5-1	1-2	2-4	4-8	8-16	>16
3 (heavy)	(0.63 < k ≤ 0.80) Mechanisms or parts thereof, usually subject to medium loads but frequently to maximum loads.	≤ 0.12	0.12-0.25	0.25-0.5	0.5-1	1-2	2-4	4-8	8-16
4 (very heavy)	(0.80 < k ≤ 1) Mechanisms or parts thereof, usually subject to maximum or almost to maximum loads.	≤ 0.12	0.12-0.25	0.25-0.5	0.5-1	1-2	2-4	4-8	
Classification of Mechanisms FEM 9.511		1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m

■ ISO/FEM (9.511)

Classification of mechanisms into groups

1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m
M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8

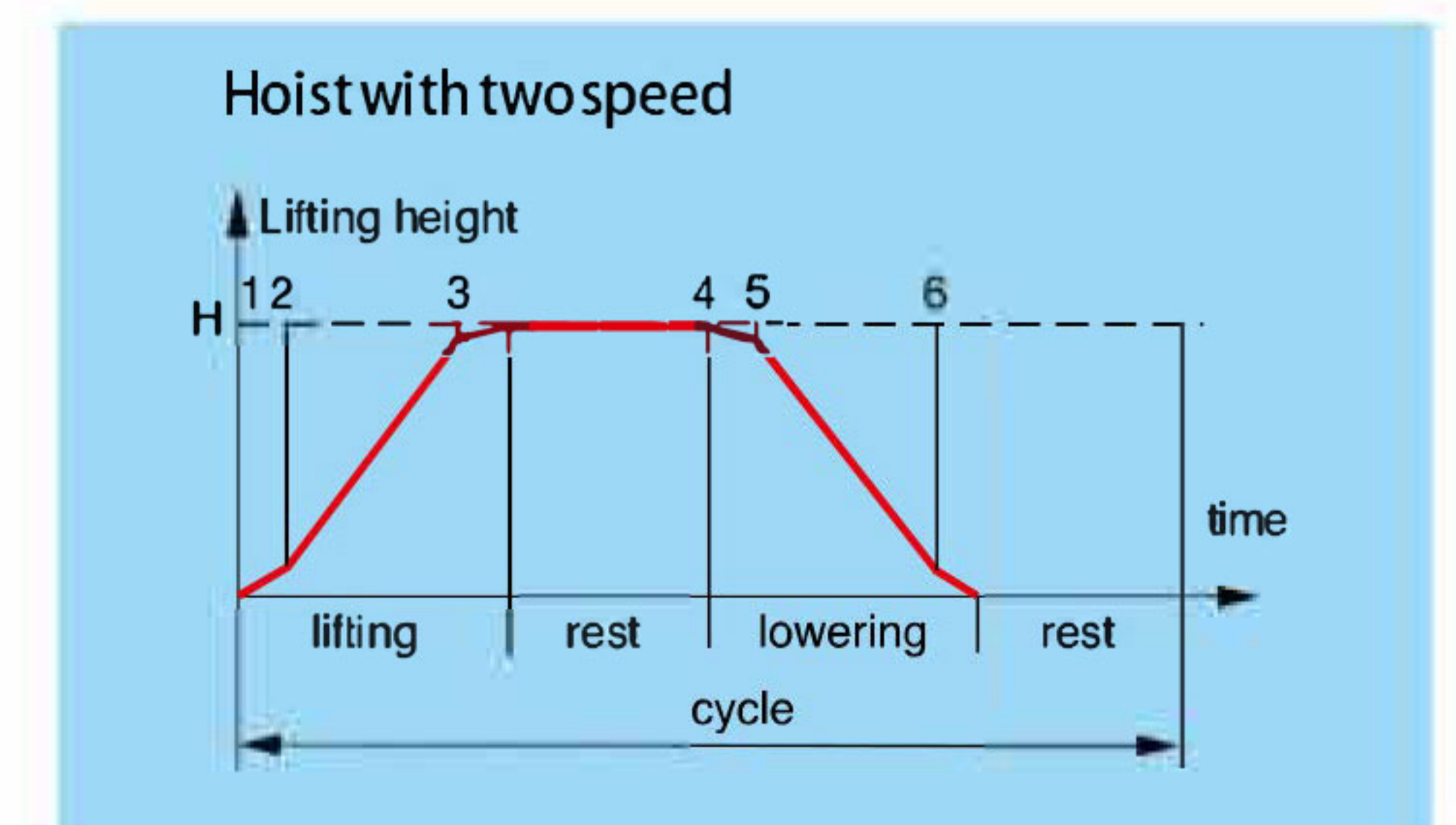
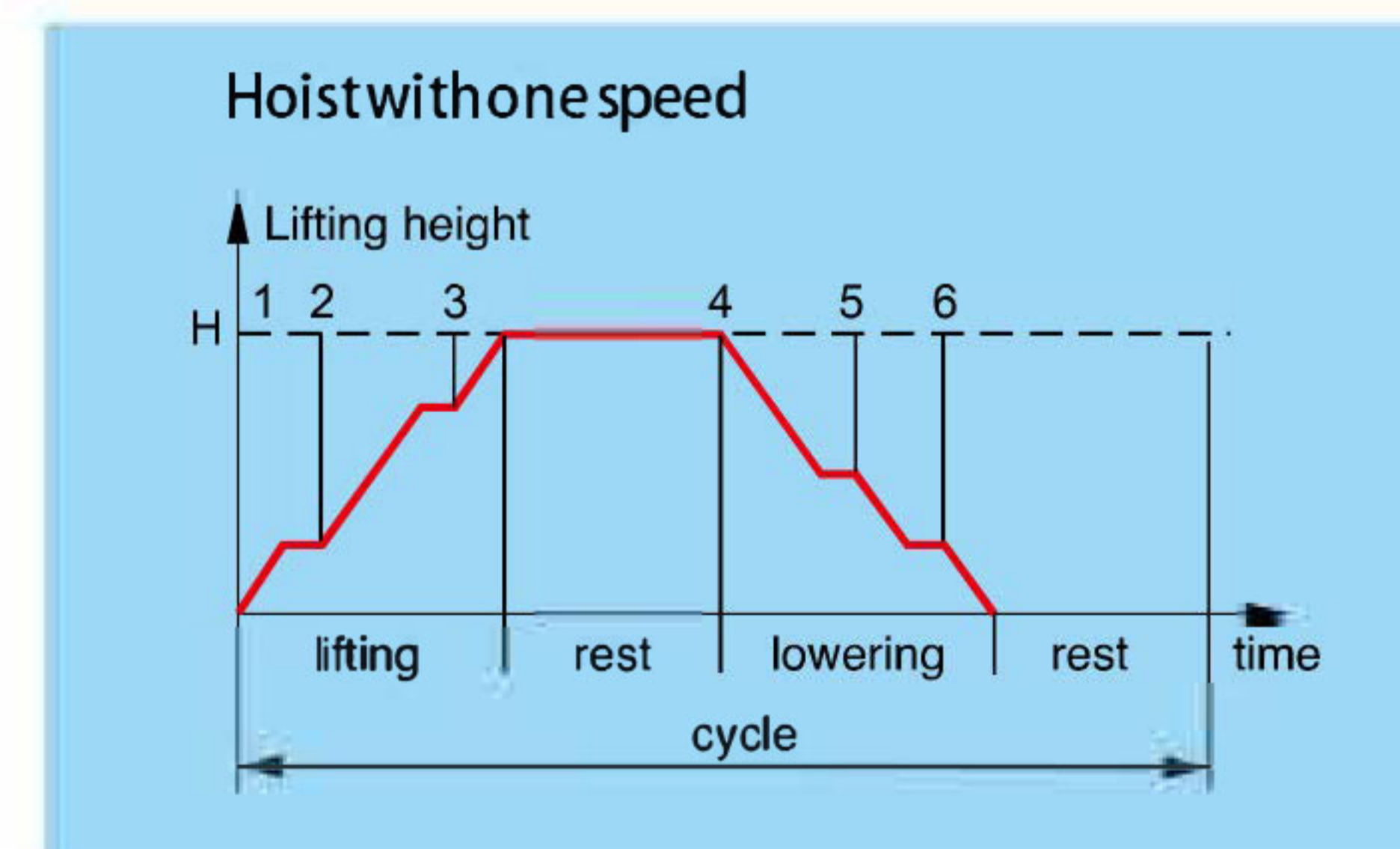
Class of operation time

Class of operation time	Average operating time per day (in hours)	Calculated total operating time in hours
V0.06 T0	≤ 0.12	200
V0.12 T1	≤ 0.25	400
V0.25 T2	≤ 0.5	800
V0.5 T3	≤ 1	1600
V1 T4	≤ 2	3200
V2 T5	≤ 4	6300
V3 T6	≤ 8	12500
V4 T7	≤ 16	25000
V5 T8	≤ 16	50000

Classification of mechanisms

Load spectrum	Cubic mean value	Class of operation time									
		V0.06	V0.12	V0.25	V0.5	V1	V2	V3	V4	V5	
		T0	T1	T2	T3	T4	VT	T5	T6	T7	T8
		Average operating time per day in hours									
		≤ 0.12	≤ 0.25	≤ 0.5	≤ 1	≤ 2	≤ 4	≤ 8	≤ 16	>16	
1 L1	k ≤ 0.50			1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	
2 L2	0.50 < k ≤ 0.63		1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m	
3 L3	0.63 < k ≤ 0.80	1 Dm	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m		
4 L4	0.80 < k ≤ 1.00	1 Cm	1 Bm	1 Am	2 m	3 m	4 m	5 m			

■ Operation Cycle



havasis

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