Modular light crane systems
“VS” SERIES
Suspended cranes and monorails

- manual or electric travelling
- capacity up to 2.000 kg
- span up to 10 m
- suspension distance up to 10 m

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VHT
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"Innovation by tradition"

Thanks to the broad experience of designers and production expertise in the field of lifting, VHT is able to offer to the global market updated technological efficient and reliable models of light crane systems.
*The modular light crane systems **"VS"**, as far as light crane trolley is concerned, in mono beam and bi-beam execution and the hanging mono rail, in a manual or electric sliding execution for **capacity up to 2000 kg** and with **wheelbase suspension up to 10 m,** they are designed and produced thanks to technics of design of forefront, for which it is used a system CAD 3D integrated with calculation methods once parts ended.*
Strict tests on their life and reliability of modular light systems "VS" Series grant the legislative and design data feedback, in a high quality standard.

A RIGOROUS PROCESS CONTROL

VHT www.vhtitaly.com *produces electric wire rope hoists "VF" in a highly serialized way, with the benefits of industrialized production processes controlled by **a quality system conducted** in compliance with **UNI EN ISO 9001:2015***

LIGHT CRANE SYSTEMS VHT "VS" SERIES MANUAL OR ELECTRICAL

***Modular light crane systems "VS" Series**, at translation and manual and/or electrical sliding are designed for moving materials and goods in a store that is to help operative position.*

***Light crane systems have the following functions**:*

- ***lifting** load in vertical, through the lifting components which are formed generally with a chain hoist and through lifting devices fit for such activity;*
- ***translation** load, through a trolley with hoist, either electrical or manual, which moves along the main beam in **"VS"** bar of a light crane systems or of a monorail;*
- ***sliding** load, through trolleys, manual or electrical, which slide on rail built it in **"VS"** bar too, positioned higher than the floor so it is completely free and available for the activities below, of the crane either of the monorail either the ways, in order to avoid redundant knots they are hanging through spherical bulbs which form rocking hinge with a wide level of movement, also thanks to adjustable tie-rod and cross bar with clamps.*

Light crane systems “VS” Series

Security, reliability and …competitive advantages

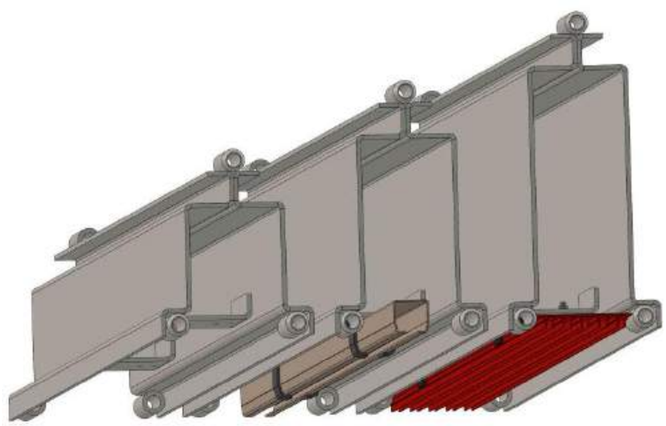
SECURITY AND RELIABILITY OF LIGHT SYSTEM

3 YEARS OF LIEN FROM DELIVERY.

***Modular light crane systems “VS” Series**, with manual or electric sliding, designed and produced by for capacity **up to 2000 kg** and **wheelbase suspension up to 10 m** are characterized by a new patented planning and by a modern design and moreover, they grant high security levels and reliability in time, thanks to an evolving plan conducted according to a strict “FMECA ANALYSIS” (Failure Mode, Effects, and Criticality Analysis)”.*

MODULAR PATENTED PARTS OF LIGHT SYSTEM

*The innovative idea of such **patented system** and the availability of many **modular parts** allow the production of a wide range of **light system “VS” Series**. They mark out **high versatility for use** and that is why they achieved a primacy of **modernity**, proved by technical and forefront distinctiveness formed by the following basic requirements:*

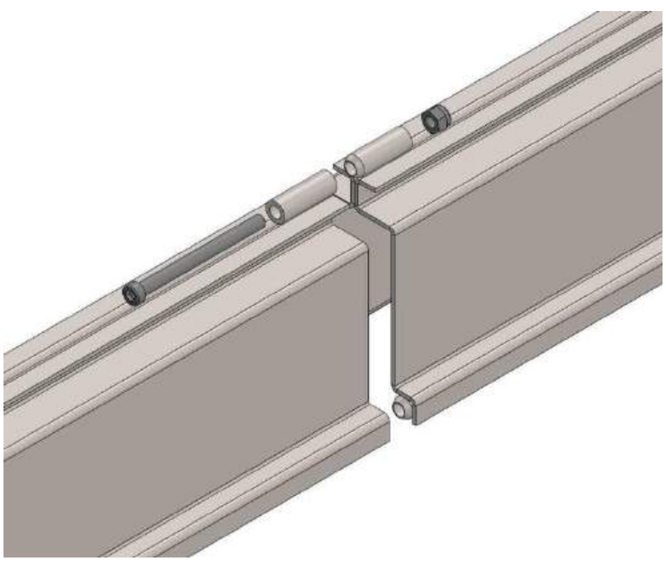


***Beam in modular bar “VS”** (patent)*

Formed by two bars of steel plate at high durability, shaped through press-bending or cold- forming and coupling them mirror-like in order to form a bearing structure at high rigidity..

Beam VS, designed on purpose to realize lifting and moves patented systems “light crane systems” of high performance, is able to go over technical limits typical of known solutions, summing up the following technical details:

- *high flow of travelling trolley a and of lifting components;*
- *use of translation manual or electrical trolleys series with easy checking wheels;*
- *easy, fast and safe coupling at highness of modular parts which forms the system;*
- *high accessibility and visibility of maintenance activities and inspection at a certain highness of the whole parts of system;*
- *easy electrification of translation and lifting components, with jib system and/or blindo trolley incorporated in the bulks of beam without lost of bulks below nor loss of balance;*
- *high modular structure due to the possibility of connection between sections of different size.*



Beams “VS” joint system

Beam VS crops, in modular patented profile by can be connected among them through bolted joints at high durability, in order to form nonstop beams thought for the realization of monorail or running ways and also of suspended bridge crane.

Joint systems of VS beams give to the whole system “light crane systems” the best functionality and reliability as they are distinguished by the following technical details:

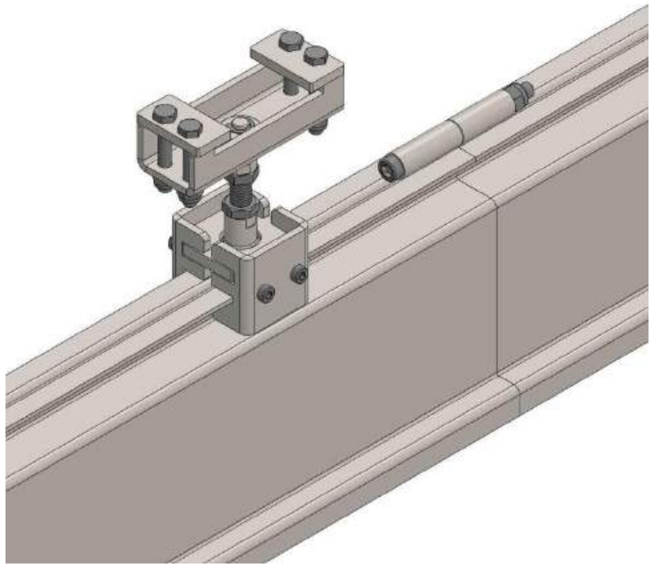
- *perfect lining up of profiles, thanks to the precise centring given by the frustum conic compasses;*
- *easy fitting up and inspection, thanks to high accessibility to the fixing screw;*
- *high security against unscrewing, thanks to the use of braked nut and auto blocking;*
- *great resistance against oxidation thanks to the use of bolted and galvanized joints.*

Suspension system of “VS Beams”

VS beams, in modular patented profile VHT, used to produce monorail or running ways that is the beams for suspended bridge crane, are always hanging on through articulated joints (hinges) formed by head spherical compasses provided with threated hole.
Articulated suspension rock with a wide level (max. 8°), minimizing horizontal forces and stress on support structures.

Suspension system is formed by:

- *Suspension crossbar, with fixing clamps for supporting structures, provided with central hole where spherical head compass lodges;*
- *Threaded tie-rod, to adjust the flat level of beams VS it is provided for the connection within the threaded hole of spherical compass and it is provided with security stop of running against unscrewing;*
- *Bracket of suspension of beam VS. it is formed by two half-brackets, connected between them through bolted joints, within which is located the support where another spherical head compass lodges with a threaded hole.*



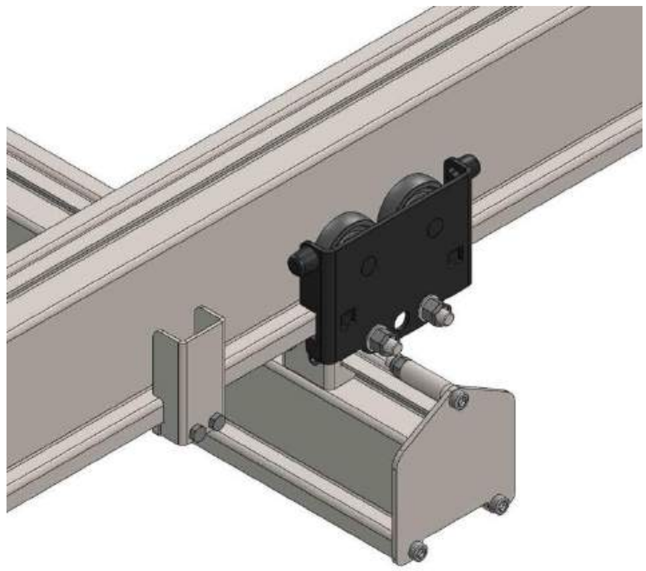
Translation system/ sliding for “VS beams”

In order to allow horizontal movements on VS beams, of hoist translation and sliding crane, standard trolleys VHT are used, model VT in a manual push execution “VT-S” either in electrical execution “VT-E”.

“VT” trolleys that slide on the lower wings of VS beams, according to their capacity, can be simple, double an multiple as well, with a balance and their characteristics are deducible from electrical chain hoist paper VHT, model VK.

To complete translation system and sliding system adjustment limiting system are available and stop terminal of trolleys and crane as well:

- *Limiting running devices, formed by brackets with clamp designed to adjust the run of trolleys “VT” along the length of beams VS;*
- *Stop terminals, fixed at the end of the beams VS through bolted joints, define the very end of “VT” trolley running.*



Power system

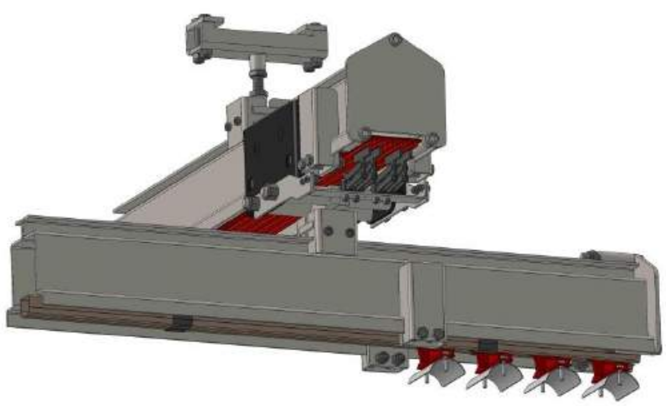
Electrical power system of sliding accessories along all kind of beam VS can be done indifferently through:

- *“Bus bar” quadruples flat, with block plug protected from risks of accidental contact. Without bulks below allow in a long run practical multiple and safe power supply of several uses;*

or

- *With a flexible festoon line cable system with trolleys positioned inside the “VS” profile.*

In both cases electric supply system are located in the designed protected space in the lower part of VS beam.
That system patented by VHT, is extremely safe and flexible to use, and also it is easy for maintenance and to inspect.



Light crane systems VHT "VS" Series

Safety, reliability and … competitive advantages

Surface finishing

*To protect the structures from atmospherically elements and from those of the environment (powder, gases, etc.),electro welded structures of light crane systems **"VS" Series**, are provided with surface finishing treatment suitable for environment protected from inclemency of weather. Treatment consists of painting cycle which consists of application of thickness 60 µm of grey semi glossy enamel RAL 7005 for beam "VS" of running light way and of mono rail and yellow RAL 1007 for light crane beam "VS" with following drying up in furnace.*

Legislative compliance

Legislative frame:

*Every **light system crane "VS"** is designed and built by VHT according to the **Basic Security Requirements** in **Annex I** of **Machinery Directive 2006/42/EC** and, according to **Annex II** of the same document, they can be put onto the market in the following ways:*

- *Completed with lifting unity (hoist), namely they can operate in autonomy, thus provided with **Declaration CE of Conformity -Annex IIA** and of **Branding CE** of **Annex III** of the same directive;*
- *Uncompleted as they are addressed to be completed of missing parts (such as hoist) by the customer. In this case, **light system "VS"** does not have **Branding CE** and it is provided with **Declaration od incorporation** of **Annex IIB** of **Machinery Directive 2006/42/EC**.*

*Moreover, possible electric equipment of **light crane systems "VS"** are conformed to **Low Voltage Directive 2014/35/UE and to Electromagnetic Compatibility Directive 2014/30/UE.***

Legislative frame:

***Light crane systems "VS" Series** are produced according to the following main technical rules and standards:*

- *EN ISO 12100:2010 "Basic principles and general principles in designing"*
- *EN ISO 13849-1:2008 "remote control parts related to security"*
- *EN 13135:2013 "Lifting items - Security - Designing – Equipment requirements"*
- *EN 13001-1:2009 "Lifting items – General principles for design - Part 1 – General Principles and requirements"*
- *EN 13001-2:2011 "Lifting items - General principles for design - Part 2 – Load operations"*
- *EN 13001-3-1:2012 "Lifting items - General principles for design - Part 3-1 – Borderline conditions"*
- *EN 16852 "Cranes - Light crane systems"*
- *EN 60204-32:2008 "Safety of electric equipment of lifting machine"*
- *EN 60529:1997 "Protection levels of package (Codes IP)"*
- *ISO 4301-1:1988 "Lifting items. Classification. Dates"*
- *FEM 9.755/93 "Period of safety work"*
- *FEM 9.771/2012 "Moving light system"*
- *FEM 9.941/95 "Remote control Symbols"*

Service group:

- *Structures and mechanisms of **light crane systems "VS"** are measured in accordance with ISO 4301-1 standard in service group A5.*

Protection and electric parts insulation:

- *Cables: according to CEI 20/22 II – maximum insulation power 450/750 V*
- *Shunt box: minimum protection IP65 – maximum insulation power 1.500 V*
- *Protections and insulations different from standard: providing on demand.*

***Power supply** (when provided):*

- *Possible electric equipment on board of light crane systems "VS" (cables, shunt box, blindo trolley and possible disconnecting switch) it is provided with a three phase alternated power supplied with a power net of maxi. 600 V+/- 10%.*
- *Equipment for power supplies different from the standard are available on demand.*

Environment conditions of use in standard execution:

- *Operation temperature: minimum - 10° C; maximum + 40°C*
- *Relative humidity maximum: 90%*
- ***Light crane systems "VS" Series** must be located in a covered environment, well ventilated, without corrosive fumes (acid fumes, salted fumes, etc.).*
- *Special Executions, for different environmental conditions for outdoor operation are available on demand.*

Noises - Vibrations:

- *During translation and manual sliding with full load, in worst working conditions, the **light system crane model "VS** produces a minimal noise, as well as the light vibrations produced that are not dangerous for personnel's health.*

Special Execution

*On demand, every light crane systems **"VS" Series are available in the following special execution**:*

- *Special painting anti corrosive or specified by the customer.*
- *Execution for outdoor operation or in maritime environment (such as: roof for protection of hoist/trolley, anti-wind system for blocking moving parts).*

Customer commitments and installer of light crane systems "VS" Series

Preparing installation area – Installation and setting up

*In order to allow the installation of **light crane systems "VS" Series** where they will be used, the customer or master must pretend that these operations are executed preliminary:*

- *Verify adequacy and suitability of possible structures for support and of fixing surfaces, such as plinths, columns, walls, floors, machinery, etc., demanding relative identity papers signed by an **expertise engineer** (definition and skills according to ISO 9927-1 standard), verifying also the lack of evident faults;;*
- *Verify suitability of manoeuvring spaces (translation and sliding) of systems themselves, especially when they work in areas where there are more structures or operative machines;*
- *Verify suitability and the correct functioning of electric power net supply system:*
  - *Correspondence of power net supply with the estimated engines power;*
  - *Presence and suitability of disconnecting switch of electric line;*
  - *Suitability of cable section of electric power and suitability of grounding.*
- *Prearrange masses for **dynamic** test (equal to capacity x 1,1) and **static** (equal to capacity x 1,25);*
- *Prearrange the equipment for sling and for mass lifting for load tests.*

Installation

*Installation for **light crane systems "VS" Series**, when it is not properly executed, can lead to **important risks for personnel safe,** exposed during fitting and use phases. Therefore, **installers on lifting equipment must be experts and they must have proved knowledge and experience**, taking into consideration that:*

- *Environmental characteristics of working area (ex.: fitness of floor, etc.);*
- *Height of working level in comparison with load level;*
- *Sizes and weight of parts to install, and also available space to moves the parts.*

Before proceeding with coupling parts and with the setting up of light system, the installer in charge must be sure that the characteristics of light system would be suitable for the foreseen use and especially:

- *Capacity of light system is ≥ then load to lift.*
- *Characteristics of fixing structures (beam, attics, floor, columns, wall, etc.) are "Considered suitable" by customer and by expert engineer, or by the customer himself in charge.*
- *Characteristics of lifting equipment (trolley/hoist), when they are not part of supplying, are compatible with those of light system according to:*
  - *Hoist capacity: must be ≤ then capacity of light system;*
  - *Trolley and hoist weight: must be ≤ then those maximum admitted;*
  - *Speed of lifting/translation: must be ≤ then those maximum admitted;*
  - *Bulk of trolley/hoist shape: must be ≤ then those maximum admitted;*
  - *Reaction on trolley wheels: must be ≤ then those maximum admitted;*
- *The installer must follow strictly the instructions in the handbook of light crane systems and relative hoist.*

Setting up

*After installing **light crane systems "VS" Series** the right commitment of designed installer is:*

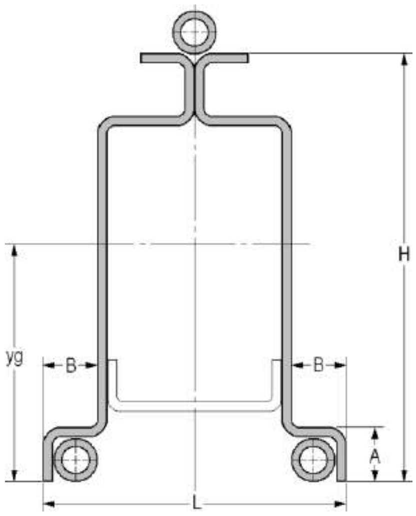
- *Making the **setting up as the handbook** indicate, making sure that all the safety items provided are installed properly and also that they meet the operative requirements and providing, when it is needed, to their adjustment.*
- *Especially, the installer has to be sure of the proper installation and functioning of the following items:*
  - *Running stop matches:*
    - *Lifting: hoist stop running, that must be adjusted to avoid the hook touching the ground;*
    - *translation: trolley stop matches on crane beam or on the monorail, that must be located to avoid collision and meddling on lifting items (trolley and hoist) with the structures of the system or with outer structures;*
    - *Lifting: crane stops matches or of cranes, that must be adjusted to avoid meddling and collision with possible structures on their sliding path..*
  - *anti-collision devices in case of more sliding crane on the same running way.*
- *Writing the relation **"Test of proper installation"** of light crane systems, deciding the **Suitability of use***
- *Arranging the whole drafting, of all its parts, as the **Record Control** provides for.*

After installation, customer must, when it provided, make a statement of lifting equipment installation to the authority in charge as the current law provides.

Competitive advantages of light crane systems VHT "VS" Series

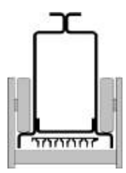
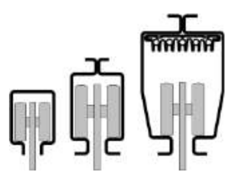
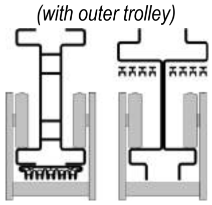
*Range of **light crane systems "VS" Series**, achieved through coupling modular parts patented, allow the production with capacity up to **2.000 kg** and wheelbase suspension up to **10 m**.*

*A basic element and typical which is the **"competitive advantage" of light crane systems** VHT, is the **patented profile "VS"**, produced with folded plate and with a section bar in three different size whose characteristic data are the following:*



Static characteristic and dimensional data, of beams VS				
beam VS kind		150	210	270
Static data	**Jx** (cm⁴)	393	1026	2071
	Jy (cm⁴)	309	402	495
	yg (cm)	8,36	11,56	14,70
	Wx (cm³)	47,0	88,7	140,9
	Wy (cm³)	44,1	57,4	70,7
	Mass (kg/m)	15,0	18,7	22,6
Elastic constant "e" = 99,20635 / Jx		0,2524	0,0967	0,0479
Dimensional data	**H** (mm)	150	210	270
	L (mm)	140		
	A (mm)	25		
	B (mm)	24		

*Technical details and consequent competitive advantages of **modular patented profile** VHT it is useful to compare the solution commonly used that does not take advantages of the same innovative feature.*

Comparison between the technical details of patented profile VHT and the solutions commonly used				
Technical Details ⇩	***Patented profile*** VHT *Beam "VS" in folded or edged plate (with outer trolley)* 	***Examples of solutions usually used in the construction of suspended systems*** *Beam in laminated profile IPE – HEA (with outer trolley)* 	*Beam in folded or sectioned plate* *at "close channel" (with internal trolley)* 	*at "I" (with outer trolley)* 
Low ruggedness of sliding surfaces of trolleys wheels	*Yes*	*No*	*Yes*	*Yes*
Reduced dimensional tolerances and structural and checked structure	*Yes*	*No*	*Yes*	*Yes*
Easy treatment, od sandblast and painting, within the profile	*Yes*	*Yes*	*No*	*No*
High profile stability at horizontal forces caused by non-vertical pulling	*Yes*	*Yes*	*No*	*Yes*
Use of pushing translation trolleys series of small bulk	*Yes*	*Yes*	*Yes*	*No*
Use of electric trolleys of translation of small bulk	*Yes*	*Yes*	*No*	*No*
Introduction of blindo trolley within the profile without limiting the bulky	*Yes*	*No*	*Possible in rare cases*	*No*
Easy inspection of blindo trolley with relative slithering skates	*Yes*	*Yes*	*No*	*Yes*
Easy inspection of wheels of translation trolley	*Yes*	*Yes*	*No*	*Yes*
Easy inspection of profile interior for to check corrosion	*Yes*	*Yes*	*No*	*No*
Connection among them of all the profiles of range with different heights	*Yes*	*No*	*Possible in rare cases*	*No*
Introduction within the profile of counterbalances	*Yes*	*No*	*No*	*Possible in some cases*
Introduction within the profile of electrical and air pneumatic items	*Yes*	*No*	*No*	*Possible in some cases*

Classification, principle of choice and limit of use

The light crane systems "VS" Series *are measured and classified according to the* ***EN 13001-1*** *standard, in order to operate in accordance with the relative criteria of service group* ***A5*** *according to* ***ISO 4301-1*** *standard.*

To choose the proper structure system according to the service designed, we have to take in consideration the following factors:

1. ***Light crane systems capacity:*** *is determined by heaviest load to lift;*
2. ***Load system (Q):*** *it is the condition of stress in accordance wit the percentage of exploitation of capacity (average of loads to lift);*
3. ***Functional criteria:*** *operative conditions that characterized the use of light crane systems, that is:*
   a. ***Functional dimensions:*** *height, width and length of installation area of suspended crane or of the monorail and also the relative suspension points, that establish characteristics of "VS" beam able to warrant the functional front of the space used in accordance with the bulks;*
   b. ***Load kind:*** *fragile or not determines for its location the proper speed of moves (lifting and translation). In certain case it is absolutely necessary to use hoist with two speed with low speed for location;*
   c. ***Area of use:*** *light crane systems are provided for indoor service and/or in covered areas, protected from atmospherically elements and in lack of wind;*
   In case of outdoor use it is necessary to foreseen proper precautions in accordance with the surface treatment (sandblast – painting) and also a handbrake of mobile items and a proper protection roof for trolley-hoist;
   d. ***Frequency and procedure of use:*** *light crane systems must be characterized by rigidity, that is an inflexion sweep, more o less elevate according to conditions of use. They influence the choice of the kind of beam profile "VS", of the kind of translation which can be manual or electrical according to the characteristics of volumes to move and to frequency of use. When the use is heavy (frequent moves and continues) with load almost full, the system rigidity must be high, as it is the worker's weariness due to the manual moves, also in accordance with suggestions of the following frame:*

Capacity (kg)	**wheelbase suspension or span** (m) 2	3	4	5	6	7	8	9	10
125									
250									
500									
1.000									
2.000									

Recommended use for manual moves

Field of use in excellent conditions for translation **moves or manual sliding of loads that are normally almost full** and/or for frequent moves

Field of use **admitted** for moves of **translation or manual sliding** of loads **randomly full loaded** with occasional moves

   e. ***Maximum number of operative cycles C_A calculated wit the following formula:***

C_A= C/h x Ti x G/year x A

where: **C/h** = operative cycles (N° of cycles per hour)
It is the number of complete operations (lifting and moves) in one hour
Tu = Time of use (hours)
Time of use of equipment during the whole day
D/year = Days per year (N°)
Number of working annual days of machine use
Y = Year of service (N°)
Number of years, not less then 10 years, according to life of equipment is calculated

Operative cycles of service group ISO A5 according to Load System (Q)		
Load system (Q) according to EN 13001-1 standard **Q**	% of load max. (exploitation % of capacity)	Operative cycles (n°) of light system in service group A5 according to ISO 4301-1 standard
Q_0	> 25% ≤ 32%	> 2.000.000 ≤ 4.000.000
Q_1	> 32% ≤ 40%	> 1.000.000 ≤ 2.000.000
Q_2	> 40% ≤ 50%	> 500.000 ≤ 1.000.000
Q_3	> 50% ≤ 63%	> 250.000 ≤ 500.000
Q_4	> 63% ≤ 80%	> 125.000 ≤ 250.000
Q_5	>80% ≤ 100%	> 63.000 ≤ 125.000

It is possible to check characteristics of beam ***in light crane systems "VS" Series within the frame*** *"CHARACTERISTICS AND TECHNICAL DATA", on capacity and also on other factors, determinate or calculated, that characterized the use designed (Load System and service Group ISO)*

Example:

- Execution of light system ⇒ light crane systems at manual sliding - model "VS-M"
- height from the ground of beam "VS" ⇒ H (m) = 3 m
- length beam "VS" and middle running (X_{lin}) ⇒ length (m) = 5 m, with middle running of load along the beam X_{lin}= 2,5 m
- maximum load to lift: 500 kg ⇒ capacity of light crane systems "VS" Series = 500 kg
- load average to lift: 300 kg ⇒ load system = Q_3
- up and down operation in one hour ⇒ N° cycles per hour C/h = 20
- use on a working schedule ⇒ Tu (hours) = 8
- annual working day: 250 ⇒ D/year = 250

Calculation of number of operative cycles (C_A) achievable in 10 years:

C_A = C/h x Ti x D/year x 10 = 20 x 8 x 250 x 10 = 400.000 cycles (correspondent to U5 group of EN 13001-1 standard)

In accordance with the determined and calculated factors, the service group is: Q3 - U5 - $D_{lin\,2}$- D_{ang3}, according to EN 13001-1 standard, equal to ISO M5 .

Design of light crane systems VHT "VS" SERIES

*To design **a light crane systems "VS"** it is necessary to select beams and the relative proper suspensions.*

***Selection of beams "VS"**, through the definition of functional criteria (K); (S); (ΣQ o Q_{eq}):*

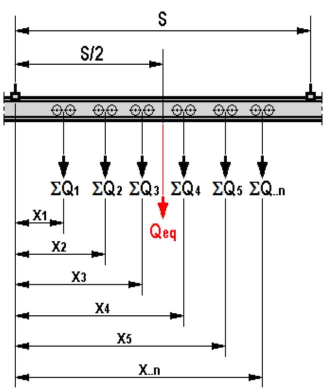
1. *Choose rigidity factor (K) according to the designed use, and to the following instructions:*

Rigidity factor K	Rigidity	Recommended use of beams "VS", for running ways, mono rail and light crane, according to their rigidity
≥ 355 < 450	low	Usual manual moves of reduced loads according to the maximum capacity, with a lifting speed ≤ 4 m/min. Use unsuitable for any length of running ways nor for crane wit a span G > di 8 m
≥ 450 < 560	medium	Usual manual moves of loads next to maximum capacity, with lifting speed ≤ 8 m/min. Not recommended use for running ways with wheelbase suspension S > di 8 m
≥ 560 ≤ 710	high	Usual precise moves, with manual or electric manual or electric translation, of loads wit max. capacity and/or with a lifting speed up to 16 m/min (recommended rigidity by the EN 1993-6:2007 standard: K_{min} = 600)
Nota: Rigidity factor K is inverse proportion to the sweep of elastic deformation. Therefore, more the K factor is high the more rigid would be the beam, minimizing the sweep. K = S • 1000 / f; where (S) is the wheelbase suspension or the span, while (f) is the elastic deformation sweep.		

2. *Establish the wheelbase (S) of suspension, of running ways and mono rail, or of the suspended crane span;*

3. *Establish, according the cases, the summation of loads (ΣQ) or the equal load (Q_{eq}), that are:*
   - *For suspended cranes or monorail that the summation of loads ΣQ = capacity + hoist mass and accessories;*
   - *For running ways on which just one crane slides and the summation of loads ΣQ = capacity + hoist mass and accessories + ½ mass of crane and accessories (trolleys, etc.);*
   - *For running ways on which several cranes are sliding, it is necessary calculate the equal load (Q_{eq}) which result in middle suspension (S/2) from the summation of several loads (ΣQ), in accordance with the wheelbase suspension (S) and from the distance of each load from the suspension (x..),*
     the equal load (Q_{eq}) can be calculated through the related formula described in the frame below.

4. *Select the beam "VS", in accordance with the functional and specific criteria, using the frame of pag 11.*



Determination of the equivalent load (Qeq) on runways with multiple loads

The equivalent load resulting in the centerline of the suspensions is determined as follows:

$$Q_{eq} = \frac{\Sigma Q_1 \cdot x_1^2 \cdot (S-x_1)^2 + \Sigma Q_2 \cdot x_2^2 \cdot (S-x_2)^2 + \Sigma Q_3 \cdot x_3^2 \cdot (S-x_3)^2 + \Sigma Q_4 \cdot x_4^2 \cdot (S-x_4)^2 + \Sigma Q_5 \cdot x_5^2 \cdot (S-x_5)^2 + \Sigma Q_{..n} \cdot x_{..n}^2 \cdot (S-x_{..n})^2}{0{,}0625 \cdot S^4}$$

where:

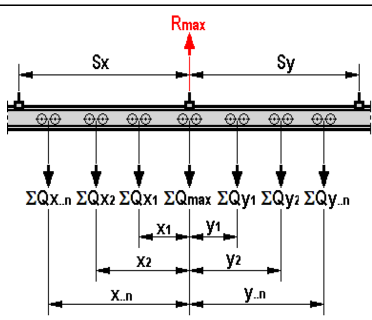
Q_{eq} (kg) = equivalent load that must always be: Q_{eq} ≤ di 2.500 kg;
S (m) = suspension distance;
S/2 (m) = suspension centerline;
da ΣQ_1 a $\Sigma Q_{..n}$ (kg) = loading summaries on the various trolleys;
da x_1 a $x_{..n}$ (m) = distance of the loading summaries from the suspensions

Note:

- consider the summation of the loads (ΣQ..) and the distances from the suspensions (x..) relative to the actual number of trolleys that at the same time operate within the same span of the runways
- place the bridges with the highest loading summits (ΣQ..) at the center of the suspension (S) of the span

***Test of suitability of suspensions**, in accordance with the maximum reaction (R_{max})*

The maximum reaction on suspension (R_{max}), as a result of summation of several sliding loads (ΣQ..) on running ways "VS", in accordance with the wheelbase suspension (Sx; Sy) and with the distance of each load from the suspension in question (x..; y..), it can be calculated using the formula on the frame below.



Determination of the maximum suspension reaction (Rmax)

The value of the maximum reaction on the suspension is determined as follows:

$$R_{max} = \Sigma Q_{max} + \frac{\Sigma Q x_1 \cdot (Sx - x_1)}{Sx} + \frac{\Sigma Q x_2 \cdot (Sx - x_2)}{Sx} + \frac{\Sigma Q x_{..n} \cdot (Sx - x_{..n})}{Sx} + \frac{\Sigma Q y_1 \cdot (Sy - y_1)}{Sy} + \frac{\Sigma Q y_2 \cdot (Sy - y_2)}{Sy} + \frac{\Sigma Q y_{..n} \cdot (Sy - y_{..n})}{Sy}$$

where:

R_{max} (kg) = maximum reaction on the suspension, verifying that: R_{max} is ≤ di 2.500 kg
ΣQ_{max} (kg) = maximum summation of load due to the bridge with greater load placed on the suspension + ½ of the weight of the "VS" profile of the two bays (Sx + Sy) of the runway;
da ΣQx_1 a $\Sigma Qx_{..n}$ (kg) = summation of loading on the different carriages present in the span Sx;
da ΣQy_1 a $\Sigma Qy_{..n}$ (kg) = summation of loading on the different carriages present in the span Sy;
da x_1 a $x_{..n}$ (m) = distance from the suspensions of the load summation of the span Sx;
da y_1 a $y_{..n}$ (m) = distance from the suspensions of the load summation of the span Sy;

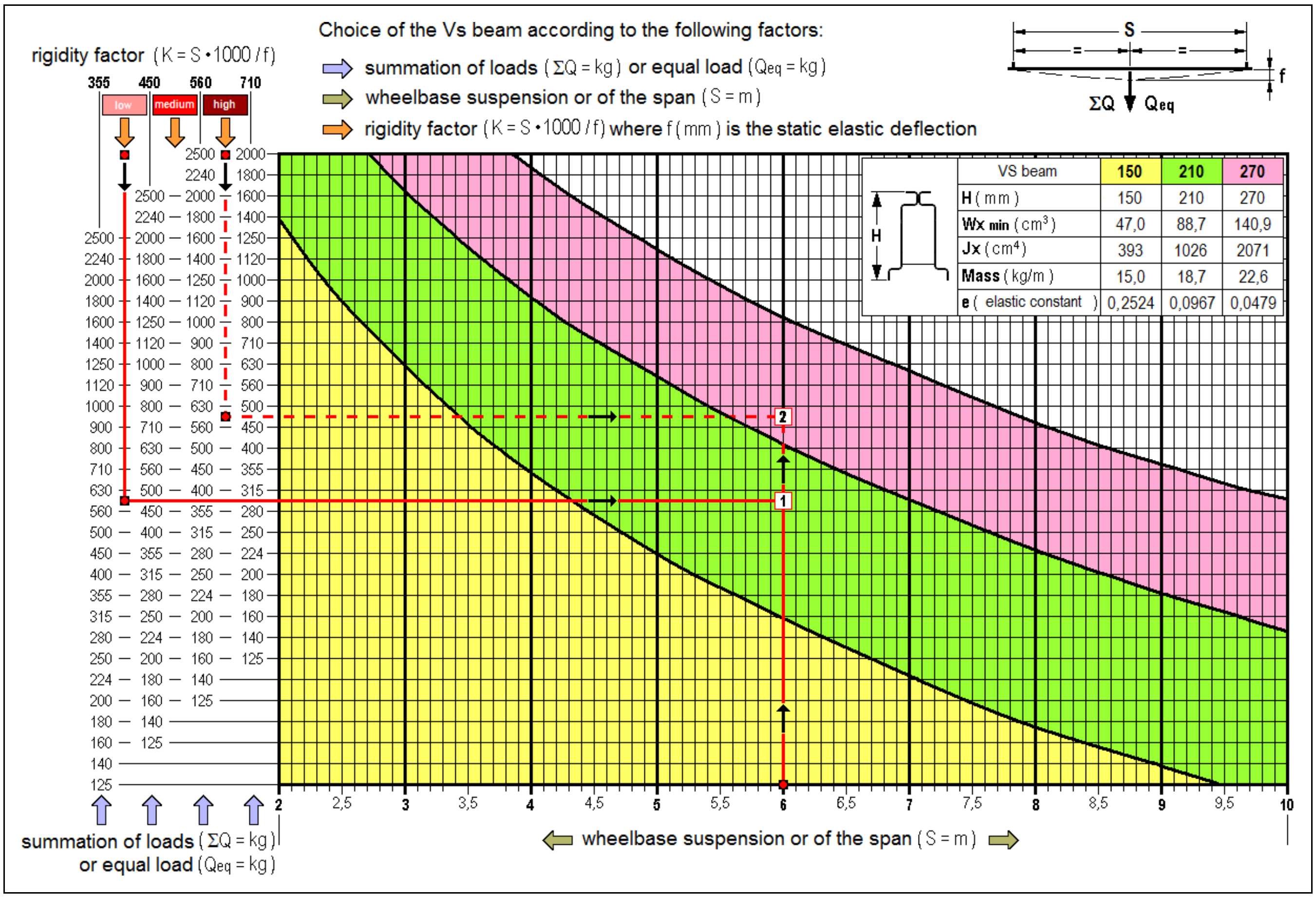
Note:

- if R_{max} ≤ di 1.600 kg use the suspension Ø 16; in the case where R_{max} is > di 1.600 kg and ≤ di 2.500 kg use the suspension Ø 20.
- in the calculation of the maximum suspension reaction (R_{max}) consider:
  - the summation of the loads (ΣQ..) and the distances from the suspension in question (x..; y..) relative to the actual number of trolleys that at the same time can operate within the two bays (Sx + Sy) of the runway;
  - the max. summation of load (ΣQ_{max}) due to the bridge with greater load ΣQ placed on the suspension, to which is added ½ of the weight of the "VS" profile constituting the two bays (Sx + Sy) of the runway

Design of light crane systems VHT "VS" SERIES

***Choice of VS beams** with centre stress suspension (S/2) due to summation of loads (ΣQ = kg) or to the equal load (Q_{eq} = kg) **in accordance with** the wheelbase suspension or of the span (S = m) and of rigidity factor (K = S • 1000 / f).*

The following frame it is the tool to choose the proper beam "VS" for crane trolley and mono rail.



VS beam	150	210	270
H (mm)	150	210	270
Wx min (cm³)	47,0	88,7	140,9
Jx (cm⁴)	393	1026	2071
Mass (kg/m)	15,0	18,7	22,6
e (elastic constant)	0,2524	0,0967	0,0479

Guide for choosing beam VS used as "crane beam":

1. chose the **rigidity factor K** according to the use;
2. establish the **span** (S = m);
3. establish the **summation of loads** (ΣQ = kg) as follow:
   - **ΣQ** = capacity (kg) + mass of hoist and accessories (kg);
4. Chose the "crane beam" as it is described in the frame.

Guide for choosing VS beams used as "running ways":

1. chose the **rigidity factor K** according to the use;
   Note: never use VS beams "low rigidity" for running ways;
2. establish the maximum wheelbase **suspension** (S = m);
3. establish the **summation of loads** (ΣQ = kg) as follow:
   - **ΣQ** = capacity (kg) + mass of hoist and accessories (kg);
     + ½ mass of crane and accessories (trolleys, etc.);
4. Chose the "running ways" as described in the frame.

Examples of choice (red frame) **of a "crane beam"** with **span G = 6 m** stressed in centre with **summation of loads ΣQ ≅ 540 kg** (capacity = 500 kg + mass hoist with trolley ≅ 40 kg):

- To move with a speed of lifting of 4 m/min loads mainly reduced then the full load and randomly next to the maximum load, the required rigidity low and the beam VS is of the kind **210**.
- To move instead frequently loads next to full load and/or for precise location and/or with high speed and/or with electric translation, rigidity must be **high** and the beam VS is of the kind **270**.

The effective rigidity factor K of beam VS (K = S • 1000 / f)

- According to the **summation of loads** (ΣQ = kg) **in centre**;
- According to the wheelbase suspension or span (G = m);
- And according to the criteria **"e"** (elastic constant of beams VS)

The result of the formula: $K = \frac{1.000.000}{e \cdot \Sigma Q \cdot S^2}$ Where e = 99,20635 / Jx

Example of test of effective factor K rigidity:

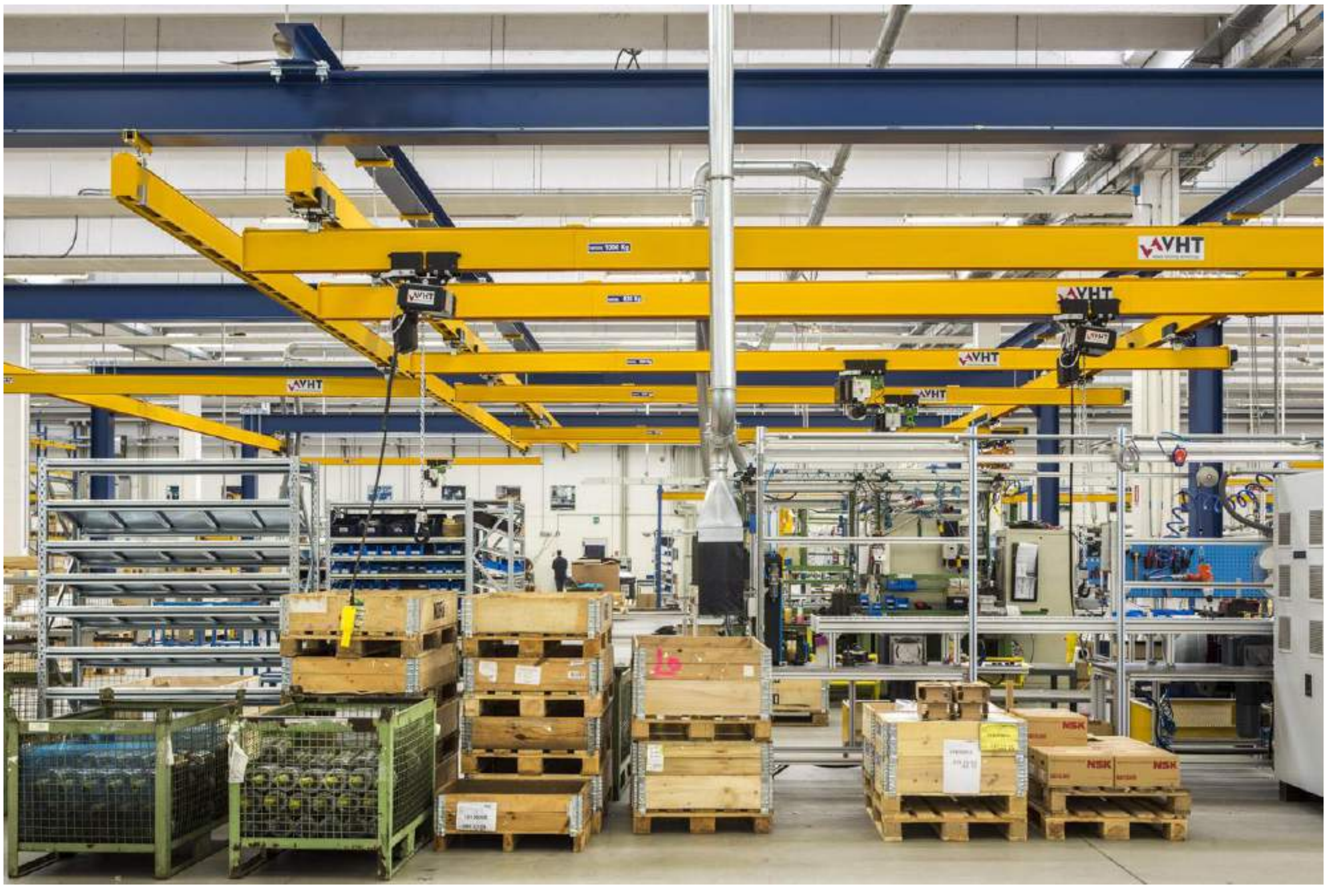
- for summation **ΣQ = 540 kg** and span **G= 6 m**
  chose the beam VS kind **210** (example in frame 1),
  rigidity effective factor **K** is:

  K = 1.000.000 / (e • ΣQ • S²)
  K = 1.000.000 / (0,0967 • 540 • 6²); **K = 531,95**.

  Therefore the effective rigidity of beam is **medium**.

  The static elastic deflection of beam **210** is:
  f = S • 1000 / K; f = 6 • 1000 / 531,95; **f = 11,28 mm**
- using instead the beam VS of the kind **270** (example 2 in the frame),
  rigidity effective factor **K** is:
  K = 1.000.000 / (0,0479 • 540 • 6²); **K = 1073,9** (>> di 710).
  Therefore, the effective rigidity of the beam is very **high** while the static deflecction will be: s = 6 • 1000 / 1073,9; **s = 5,59 mm**

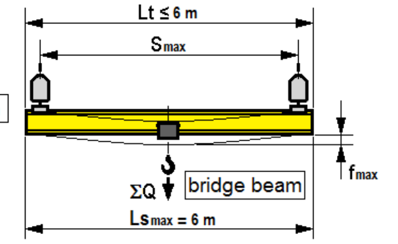
Design of light crane systems VHT "VS" SERIES

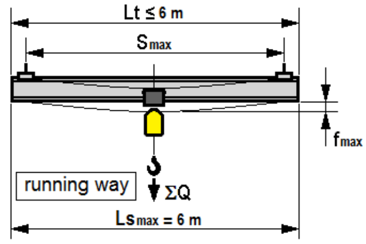


Design of light crane systems VHT "VS" SERIES

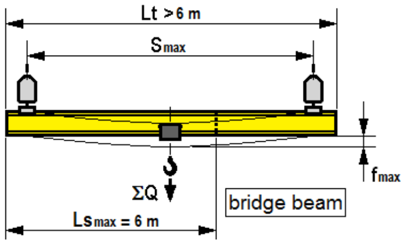
Maximum wheelbase suspension or span of the beams VS *(S_{max} = m)*
According to rigidity factor (K = S • 1000 / f)
and to the summation of loads (ΣQ = kg) or of the equal load (Q_{eq} = kg)

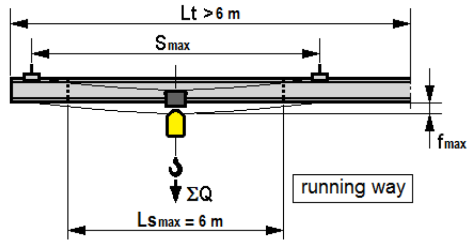
bridge beam and running way without junction





bridge beam and running way with junction





- **max. static elastic deflection** (f_{max} = mm) **of the beam VS is given by the formula:** **$f_{max} = S_{max} \cdot 1000 / K$**.
- **max. length of single parts of beams VS è: Ls_{max} = 6 m** (beam of length Lt > of 6 m are produced with bolted junction)
- **max. wheelbase suspension of a beam VS used for a crane is S_{max} = 9,70 m** (equal to the maximum span of the crane)
- **max. length of beam VS used for a crane is: Lt = 10 m** (produced with two beams VS connected between them with a bolted junction)
- **max. wheelbase suspension of a beam VS used as a mono rail or for running way is: S_{max} = 10 m**

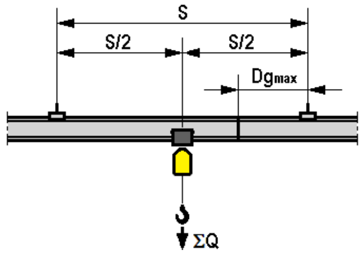
Maximum wheelbase suspensions or span (S_{max} = m) **of beams VS as:** **150** | **210** | **270**

Summation load (ΣQ = kg) **Or equal load** (Q_{eq} = kg) **In middle suspension**	**Rigidity factor** (K = S • 1000 / f) — 150: **Rigidity K** 710 high	560 medium	450 low	355	210: **Rigidity K** 710 high	560 medium	450 low	355	270: **Rigidity K** 710 high	560 medium	450 low	355
2500	1,49	1,68	1,88	2,11	2,41	2,72	3,03	3,41	3,43	3,86	4,31	4,85
2240	1,58	1,78	1,98	2,23	2,55	2,87	3,20	3,61	3,62	4,08	4,55	5,12
2000	1,67	1,88	2,10	2,36	2,70	3,04	3,39	3,82	3,83	4,32	4,82	5,42
1800	1,76	1,98	2,21	2,49	2,84	3,20	3,57	4,02	4,04	4,55	5,08	5,72
1600	1,87	2,10	2,35	2,64	3,02	3,40	3,79	4,27	4,29	4,83	5,38	6,06
1400	2,00	2,25	2,51	2,82	3,23	3,63	4,05	4,56	4,58	5,16	5,76	6,48
1250	2,11	2,38	2,65	2,99	3,41	3,84	4,29	4,83	4,85	5,46	6,09	6,86
1120	2,23	2,51	2,80	3,16	3,61	4,06	4,53	5,10	5,12	5,77	6,44	7,25
1000	2,36	2,66	2,97	3,34	3,82	4,30	4,79	5,40	5,42	6,11	6,81	7,67
900	2,49	2,80	3,13	3,52	4,02	4,53	5,05	5,69	5,72	6,44	7,18	8,08
800	2,64	2,97	3,32	3,73	4,27	4,80	5,36	6,03	6,06	6,83	7,61	8,57
710	2,80	3,16	3,52	3,96	4,53	5,10	5,69	6,41	6,44	7,25	8,08	9,10
630	2,98	3,35	3,74	4,21	4,81	5,41	6,04	6,80	6,83	7,69	8,58	9,66
560	3,16	3,55	3,96	4,46	5,10	5,74	6,41	7,21	7,25	8,16	9,10	10,00
500	3,34	3,76	4,20	4,72	5,40	6,08	6,78	7,63	7,67	8,63	9,63	
450	3,52	3,96	4,42	4,98	5,69	6,41	7,15	8,05	8,08	9,10	10,00	
400	3,73	4,21	4,69	5,28	6,03	6,79	7,58	8,53	8,57	9,65		
355	3,96	4,46	4,98	5,61	6,41	7,21	8,05	9,06	9,10	10,00		
315	4,21	4,74	5,29	5,95	6,80	7,66	8,54	9,62	9,66			
280	4,46	5,03	5,61	6,31	7,21	8,12	9,06	10,00	10,00			
250	4,72	5,32	5,93	6,68	7,63	8,59	9,59					
224	4,99	5,62	6,27	7,06	8,06	9,08	10,00					
200	5,28	5,95	6,63	7,47	8,53	9,61						
180	5,57	6,27	6,99	7,87	9,00	10,00						
160	5,91	6,65	7,42	8,35	9,54							
140	6,31	7,11	7,93	8,93	10,00							
125	6,68	7,52	8,39	9,45								

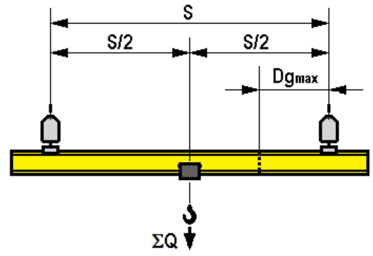
Design of light crane systems VHT "VS" SERIES

Maximum distance of the junction from suspensions *(Dg_{max} = mm)*
In accordance with the Wheelbase suspension or the span (G = m)
and to the summation of loads (ΣQ = kg) or of the equal load (Q_{eq} = kg)

Scheme for runways for single-girder bridge cranes or for monorail



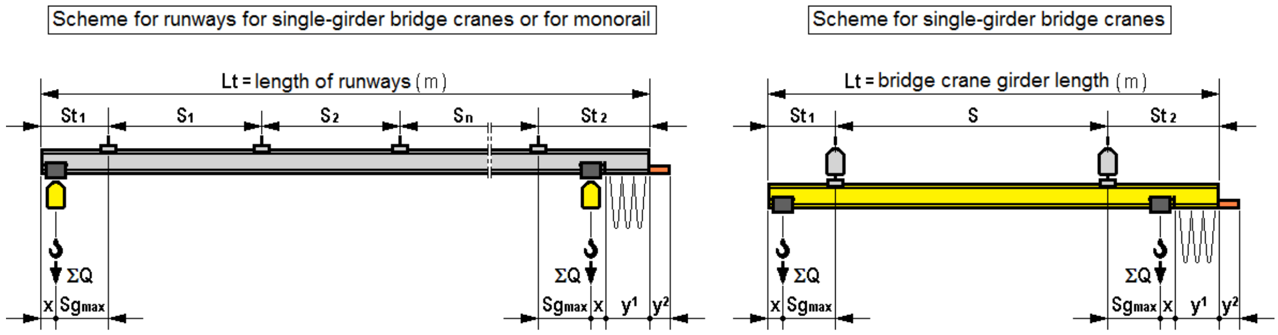
Scheme for single-girder bridge cranes



Summation of loads (ΣQ = kg) Or equal load (Q_{eq} = kg) in centre suspension	Beam VS 150 – Maximum distance of junction (Dg_{max} = mm) from suspension — wheelbase suspension (S = m)															
	≤ 2,0	> 2,0 ≤ 2,5	> 2,5 ≤ 3,0	> 3,0 ≤ 3,5	> 3,5 ≤ 4,0	> 4,0 ≤ 4,5	> 4,5 ≤ 5,0	> 5,0 ≤ 5,5	> 5,5 ≤ 6,0	> 6,0 ≤ 6,5	> 6,5 ≤ 7,0	> 7,0 ≤ 7,5	> 7,5 ≤ 8,0	> 8,0 ≤ 8,5	> 8,5 ≤ 9,0	> 9,0 ≤ 9,5
2500	245	237														
2240	278	268														
2000	320	306														
1800	365	346														
1600	427	400	385													
1400	518	473	452													
1250	626	551	520													
1120	800	647	600	574												
1000	1000	782	701	663												
900	1000	987	823	764	730											
800	1000	1250	1016	907	854											
710	1000	1250	1500	1107	1014											
630	1000	1250	1500	1474	1234	1144										
560	1000	1250	1500	1750	1600	1388										
500	1000	1250	1500	1750	2000	1776	1565									
450	1000	1250	1500	1750	2000	2250	1974									
400	1000	1250	1500	1750	2000	2250	2500	2337								
355	1000	1250	1500	1750	2000	2250	2500	2750	3000							
315	1000	1250	1500	1750	2000	2250	2500	2750	3000							
280	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250						
250	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500					
224	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750				
200	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750				
180	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000			
160	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250		
140	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	
≤ 125	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750

Design of light crane systems VHT "VS" SERIES

Maximum hook bounce *(Sg_{max} = mm) acceptable for just one lifting device*
in accordance to the wheelbase suspension or to the span (S = m) and to the summation od loads (ΣQ = kg)



bridge crane girder length: $Lt = S + St_1 + St_2$
length of runways: $Lt = \Sigma(S_1 + S_2 + S_n) + St_1 + St_2$

maximum beam overhangs:
- $St_{1\,max} = Sg_{max} + x$
- $St_{2\,max} = Sg_{max} + x + y^1$ (with festooned power supply)
- $St_{1\,min}$ e $St_{2\,min}$ = 150 (mm)

quote x (mm)	150	250	500
capacity (kg)	≤ 500	> 500 ≤ 1000	>1000 ≤ 2000

$y^1 = \left(\frac{S + 2St_1\,(m)}{1{,}2} - 1\right) \cdot 90$ = (mm) festooned power supply
$y^2 = 270$ (mm) blindo trolley power supply box

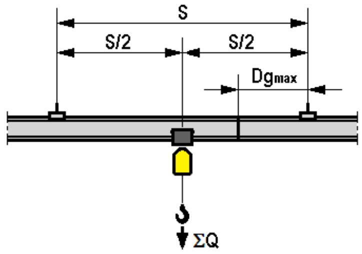
Beam VS 150 – Max. hook bounce (Sg_{max} = mm)

Summation of loads (ΣQ = kg) **Stressed with bounce**	Wheelbase suspension (S = m)														
	≥ 2,0 < 2,5	≥ 2,5 < 3,0	≥ 3,0 < 3,5	≥ 3,5 < 4,0	≥ 4,0 < 4,5	≥ 4,5 < 5,0	≥ 5,0 < 5,5	≥ 5,5 < 6,0	≥ 6,0 < 6,5	≥ 6,5 < 7,0	≥ 7,0 < 7,5	≥ 7,5 < 8,0	≥ 8,0 < 8,5	≥ 8,5 < 9,0	≥ 9,0 < 9,5
2500	7	11													
2240	7	12													
2000	8	13													
1800	9	15													
1600	10	17	24												
1400	12	19	28												
1250	13	21	31												
1120	15	24	35	48											
1000	18	28	41	56											
900	20	31	45	62	81										
800	22	35	51	70	91										
710	25	40	57	78	102										
630	28	45	65	88	115	146									
560	33	51	74	100	131	165									
500	37	57	82	112	146	185	188								
450	41	63	91	124	162	205	209								
400	46	71	103	140	182	230	235	235							
355	51	80	115	157	205	258	265	265	265						
315	58	90	130	176	230	290	298	298	298						
280	65	101	146	198	258	325	336	336	336	336					
250	73	113	163	221	287	362	376	376	376	376	376				
224	81	126	181	246	319	402	420	420	420	420	420	420			
200	90	141	202	274	356	448	470	470	470	470	470	470			
180	100	156	224	303	393	494	522	522	522	522	522	522	522		
160	112	175	250	338	439	551	588	588	588	588	588	588	588	588	
140	128	199	284	383	496	622	671	671	671	671	671	671	671	671	671
≤ 125	143	221	316	426	550	689	752	752	752	752	752	752	752	752	752

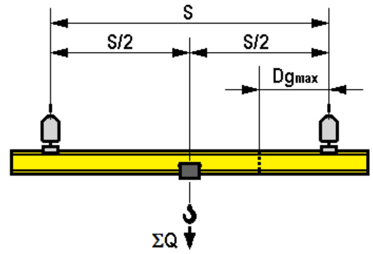
Design of light crane systems VHT "VS" SERIES

Maximum distance of the junction from suspensions *(Dg_{max} = mm)*
In accordance with the Wheelbase suspension or the span (G = m)
and to the summation of loads (ΣQ = kg) or of the equal load (Q_{eq} = kg)

Scheme for runways for single-girder bridge cranes or for monorail



Scheme for single-girder bridge cranes



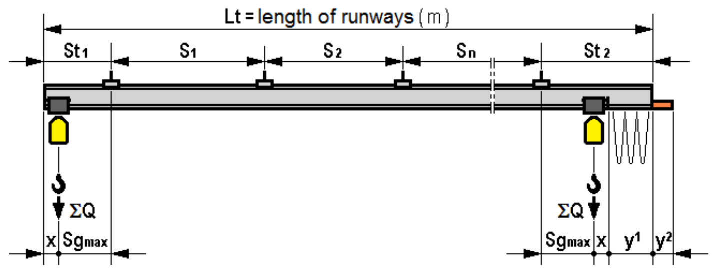
Beam VS 210 – Max. distance of junction (Dg_{max} = mm) **from suspension**

Summaion of loads (ΣQ = kg) **Or equal load** (Q_{eq} = kg) **in centre suspension**	**wheelbase suspension** (S = m)																
	≤ 2,0	> 2,0 ≤ 2,5	> 2,5 ≤ 3,0	> 3,0 ≤ 3,5	> 3,5 ≤ 4,0	> 4,0 ≤ 4,5	> 4,5 ≤ 5,0	> 5,0 ≤ 5,5	> 5,5 ≤ 6,0	> 6,0 ≤ 6,5	> 6,5 ≤ 7,0	> 7,0 ≤ 7,5	> 7,5 ≤ 8,0	> 8,0 ≤ 8,5	> 8,5 ≤ 9,0	> 9,0 ≤ 9,5	> 9,5 ≤ 10
2500	369	350	339	332													
2240	427	400	385	376	370												
2000	502	461	441	428	420												
1800	595	530	502	485	474	466											
1600	756	628	584	560	544	533											
1400	1000	782	701	663	640	624	612										
1250	1000	1010	833	772	738	716	700										
1120	1000	1250	1016	907	854	822	800	783									
1000	1000	1250	1500	1095	1005	955	923	899									
900	1000	1250	1500	1381	1190	1110	1061	1028	1004								
800	1000	1250	1500	1750	1513	1339	1256	1204	1168	1141							
710	1000	1250	1500	1750	2000	1709	1525	1433	1375	1333							
630	1000	1250	1500	1750	2000	2250	1974	1754	1646	1577	1528						
560	1000	1250	1500	1750	2000	2250	2500	2337	2032	1898	1814	1754					
500	1000	1250	1500	1750	2000	2250	2500	2750	3000	2367	2191	2084	2010				
450	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	2763	2517	2381	2288			
400	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	3026	2811	2679		
355	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4046	3418	3193	
315	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	3948
280	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000
250	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000
224	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000
200	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000
180	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000
160	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000
≤ 140	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000

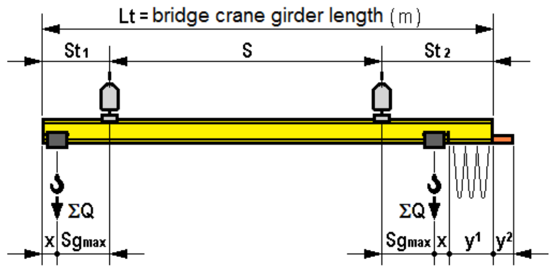
Design of light crane systems VHT "VS" SERIES

Maximum hook bounce *(Sg_{max} = mm) acceptable for just one lifting device in accordance with wheelbase suspension or with the span (S = m) and with the summation of loads (ΣQ = kg)*

Scheme for runways for single-girder bridge cranes or for monorail



Scheme for single-girder bridge cranes



bridge crane girder length: $Lt = S + St_1 + St_2$
length of runways: $Lt = \Sigma(S_1 + S_2 + S_n) + St_1 + St_2$

maximum beam overhangs:
- $St_{1\,max} = Sg_{max} + x$
- $St_{2\,max} = Sg_{max} + x + y^1$ (with festooned power supply)
- $St_{1\,min}$ e $St_{2\,min}$ = 150 (mm)

quote x (mm)	150	250	500
capacity (kg)	≤ 500	> 500 ≤ 1000	>1000 ≤ 2000

$y^1 = \left(\frac{S + 2St_1\,(m)}{1,2} - 1\right) \cdot 90$ = (mm) festooned power supply
y^2 = 270 (mm) blindo trolley power supply box

Beam VS 210 – Max. hook bounce (Sg_{max} = mm)

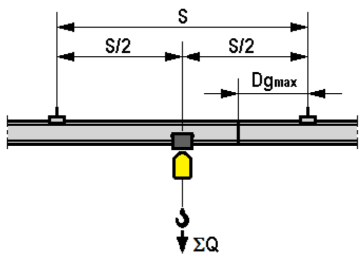
wheelbase suspension (S = m)

Summation of loads (ΣQ = kg) Stressed with bounce	≥ 2,0 < 2,5	≥ 2,5 < 3,0	≥ 3,0 < 3,5	≥ 3,5 < 4,0	≥ 4,0 < 4,5	≥ 4,5 < 5,0	≥ 5,0 < 5,5	≥ 5,5 < 6,0	≥ 6,0 < 6,5	≥ 6,5 < 7,0	≥ 7,0 < 7,5	≥ 7,5 < 8,0	≥ 8,0 < 8,5	≥ 8,5 < 9,0	≥ 9,0 < 9,5	≥ 9,5 < 10	10
2500	8	13	19	27													
2240	9	15	22	30	39												
2000	10	16	24	33	44												
1800	11	18	27	37	49	62											
1600	13	21	30	42	55	70											
1400	14	24	35	48	63	80	99										
1250	16	26	39	53	70	89	111										
1120	18	29	43	59	78	100	124	150									
1000	22	35	51	69	91	115	142	172									
900	25	39	56	77	101	127	157	190	197								
800	28	44	63	86	113	143	177	214	222	222							
710	31	49	71	97	127	161	199	240	250	250							
630	35	56	80	109	143	181	223	270	282	282	282						
560	41	64	92	124	162	205	253	306	317	317	317	317					
500	46	71	102	139	182	229	283	341	355	355	355	355	355				
450	51	79	114	154	201	254	313	378	394	394	394	394	394	394			
400	57	89	128	173	226	285	351	423	444	444	444	444	444	444	444		
355	64	100	143	195	253	320	393	474	500	500	500	500	500	500	500	500	
315	72	112	161	219	284	359	441	531	563	563	563	563	563	563	563	563	563
280	81	126	181	245	319	401	493	593	634	634	634	634	634	634	634	634	634
250	90	140	202	273	355	447	548	659	710	710	710	710	710	710	710	710	710
224	100	156	224	303	394	495	607	729	792	792	792	792	792	792	792	792	792
200	112	174	250	338	438	550	673	807	887	887	887	887	887	887	887	887	887
180	124	193	276	373	483	605	740	886	986	986	986	986	986	986	986	986	986
160	139	216	308	416	537	673	821	981	1109	1109	1109	1109	1109	1109	1109	1109	1109
140	158	245	349	469	606	756	921	1098	1267	1267	1267	1267	1267	1267	1267	1267	1267
≤ 125	176	272	387	520	669	833	1012	1204	1408	1419	1419	1419	1419	1419	1419	1419	1419

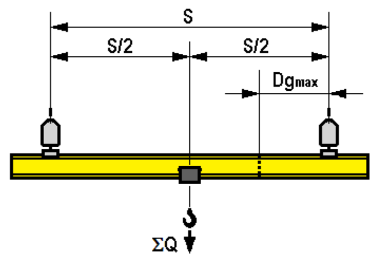
Design of light crane systems VHT "VS" SERIES

Maximum distance of the junction from suspensions *(Dg_{max} = mm)*
In accordance with the Wheelbase suspension or the span (G = m)
and to the summation of loads (ΣQ = kg) or of the equal load (Q_{eq} = kg)

Scheme for runways for single-girder bridge cranes or for monorail



Scheme for single-girder bridge cranes

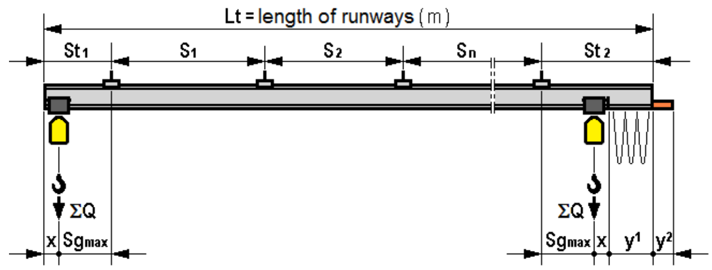


Summation of loads (ΣQ = kg) Or equal load (Q_{eq} = kg) in centre suspension	Beam VS 270 – Max. distance of junction (Dg_{max} = mm) from suspension — Wheelbase suspension (S = m)																
	≤ 2,0	> 2,0 ≤ 2,5	> 2,5 ≤ 3,0	> 3,0 ≤ 3,5	> 3,5 ≤ 4,0	> 4,0 ≤ 4,5	> 4,5 ≤ 5,0	> 5,0 ≤ 5,5	> 5,5 ≤ 6,0	> 6,0 ≤ 6,5	> 6,5 ≤ 7,0	> 7,0 ≤ 7,5	> 7,5 ≤ 8,0	> 8,0 ≤ 8,5	> 8,5 ≤ 9,0	> 9,0 ≤ 9,5	> 9,5 ≤ 10
2500	467	433	416	405	398	392	388										
2240	552	500	475	460	450	443	438	434									
2000	677	584	548	527	514	504	497	492									
1800	933	686	630	600	582	570	560	553	547								
1600	1000	846	745	700	673	655	642	632	625	618							
1400	1000	1250	925	843	800	772	753	739	728	719							
1250	1000	1250	1184	1005	935	894	867	847	832	820	810						
1120	1000	1250	1500	1237	1105	1040	1000	971	950	934	921	910					
1000	1000	1250	1500	1750	1355	1234	1169	1126	1096	1073	1055	1040	1028				
900	1000	1250	1500	1750	1866	1486	1372	1305	1260	1227	1201	1181	1165	1151			
800	1000	1250	1500	1750	2000	2100	1693	1565	1490	1438	1400	1370	1346	1327	1311		
710	1000	1250	1500	1750	2000	2250	2500	1961	1804	1713	1651	1605	1570	1541	1518	1498	
630	1000	1250	1500	1750	2000	2250	2500	2750	2316	2101	1985	1907	1850	1805	1770	1741	1717
560	1000	1250	1500	1750	2000	2250	2500	2750	3000	2846	2475	2313	2211	2137	2081	2036	2000
500	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	2961	2710	2567	2469	2396	2339
450	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	3733	3183	2973	2840	2744
400	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4200	3617	3387
355	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000
315	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000
≤ 280	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000

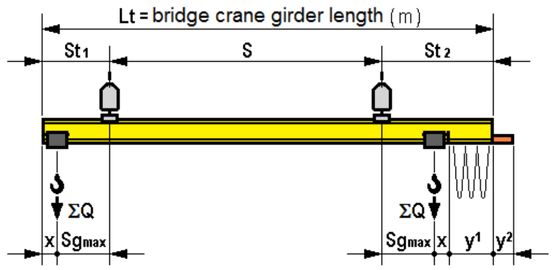
Design of light crane systems VHT "VS" SERIES

Maximum hook bounce *(Sg_{max} = mm) acceptable for just one lifting device in accordance with the wheelbase suspension or wit the span (S = m) and with summation of loads (ΣQ = kg)*

Scheme for runways for single-girder bridge cranes or for monorail



Scheme for single-girder bridge cranes



bridge crane girder length: $Lt = S + St_1 + St_2$
length of runways: $Lt = \Sigma(S_1 + S_2 + S_n) + St_1 + St_2$

maximum beam overhangs:
- $St_{1\,max} = Sg_{max} + x$
- $St_{2\,max} = Sg_{max} + x + y^1$ (with festooned power supply)
- $St_{1\,min}$ e $St_{2\,min}$ = 150 (mm)

quote x (mm)	150	250	500
capacity (kg)	≤ 500	> 500 ≤ 1000	>1000 ≤ 2000

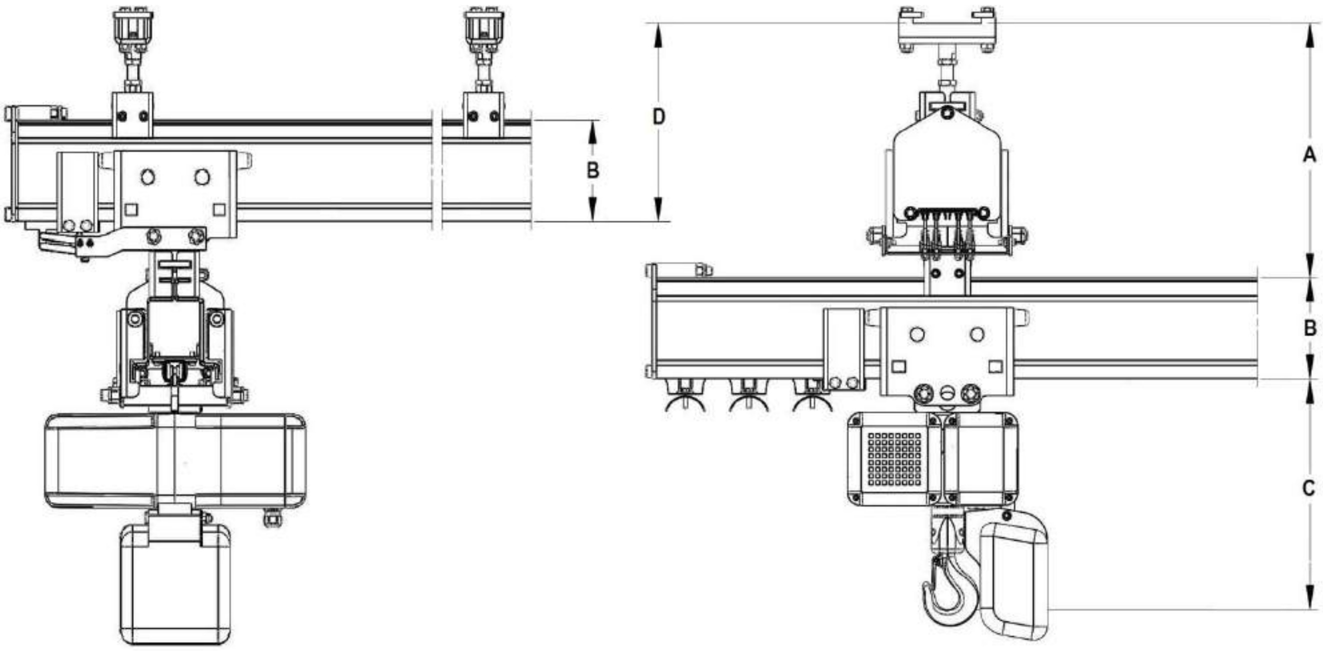
$y^1 = \left(\frac{S + 2St_1\,(m)}{1{,}2} - 1\right) \cdot 90$ = (mm) festooned power supply
$y^2 = 270$ (mm) blindo trolley power supply box

Beam VS 270 – Max. hook bounce (Sg_{max} = mm)

Summation of loads (ΣQ = kg) Stressed with bounce	Wheelbase suspension (S = m) ≥ 2,0 < 2,5	≥ 2,5 < 3,0	≥ 3,0 < 3,5	≥ 3,5 < 4,0	≥ 4,0 < 4,5	≥ 4,5 < 5,0	≥ 5,0 < 5,5	≥ 5,5 < 6,0	≥ 6,0 < 6,5	≥ 6,5 < 7,0	≥ 7,0 < 7,5	≥ 7,5 < 8,0	≥ 8,0 < 8,5	≥ 8,5 < 9,0	≥ 9,0 < 9,5	≥ 9,5 < 10	10
2500	10	16	23	32	43	54	67										
2240	11	18	26	36	48	61	75	91									
2000	12	20	29	40	53	68	84	102									
1800	14	22	33	45	59	75	93	113	135								
1600	15	25	37	50	66	84	105	127	152	176							
1400	17	28	42	57	76	96	120	145	173	201							
1250	20	32	47	64	85	108	134	162	193	225	225						
1120	22	35	52	72	94	120	149	181	215	252	252	252					
1000	27	42	61	84	109	138	171	207	246	282	282	282	282				
900	30	47	68	93	121	154	190	229	273	313	313	313	313	313			
800	34	53	76	104	136	172	213	257	306	352	352	352	352	352	352		
710	38	60	86	117	153	194	239	289	344	397	397	397	397	397	397	397	
630	43	67	97	132	172	218	269	325	386	447	447	447	447	447	447	447	447
560	49	77	110	150	196	247	304	367	436	503	503	503	503	503	503	503	503
500	55	86	123	168	218	276	340	410	486	564	564	564	564	564	564	564	564
450	61	95	137	186	242	305	376	453	537	626	626	626	626	626	626	626	626
400	68	107	153	208	271	342	421	507	601	702	705	705	705	705	705	705	705
355	77	120	172	234	304	383	471	567	672	784	794	794	794	794	794	794	794
315	87	135	194	262	341	429	527	634	750	875	895	895	895	895	895	895	895
280	97	151	217	294	381	480	588	707	835	972	1006	1006	1006	1006	1006	1006	1006
250	108	169	242	327	424	533	653	783	924	1075	1127	1127	1127	1127	1127	1127	1127
224	121	188	268	363	470	589	721	864	1017	1181	1258	1258	1258	1258	1258	1258	1258
200	135	209	299	403	521	653	797	953	1121	1299	1409	1409	1409	1409	1409	1409	1409
180	149	231	329	444	573	717	873	1043	1224	1416	1566	1566	1566	1566	1566	1566	1566
160	167	258	367	494	636	794	965	1149	1346	1553	1761	1761	1761	1761	1761	1761	1761
140	189	292	415	556	714	888	1077	1279	1492	1717	1952	2013	2013	2013	2013	2013	2013
≤ 125	210	324	459	613	785	974	1177	1394	1623	1862	2111	2254	2254	2254	2254	2254	2254

Technical data – Overall dimensions

Of light crane systems VHT "VS" SERIES



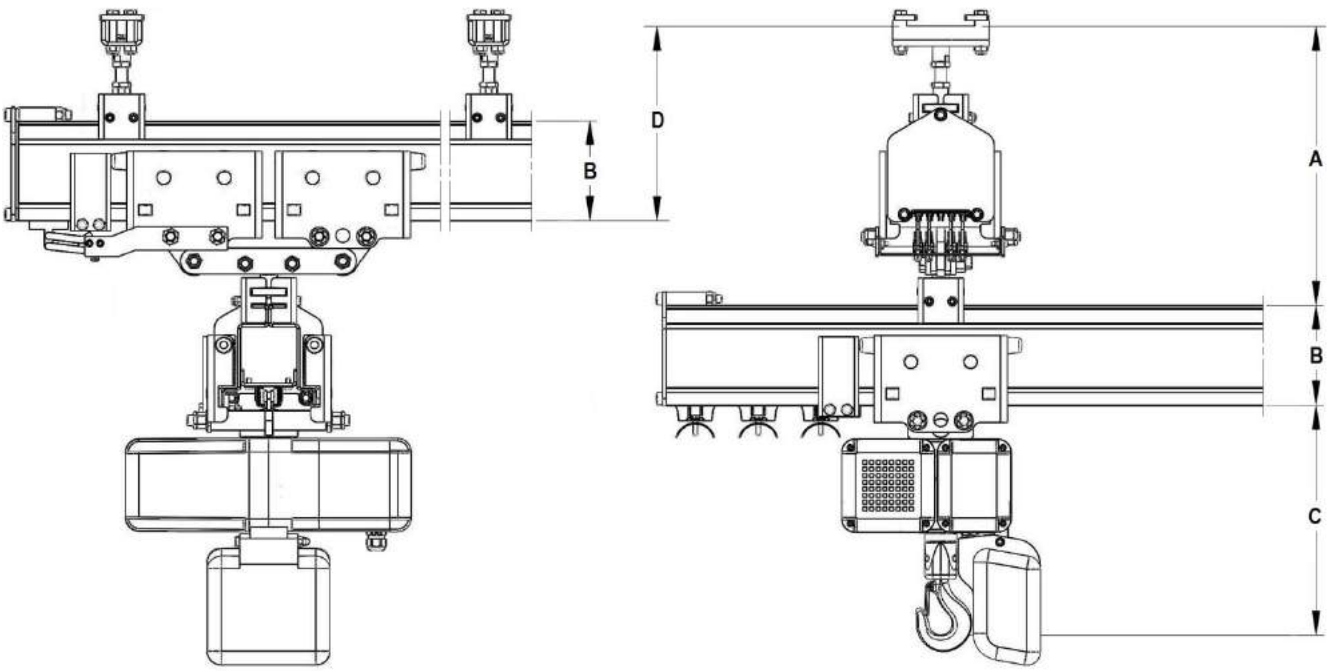
Bridge sliding with single push trolley – Translation of the hoist with single push trolley

VS beams	**A** min. (mm)	**B** (mm)	**D** min. (mm)
150	380	150	295
210	440	210	355
270	500	270	415

Dimensions of the hoist	
Hoist type	**C** (mm)
VK2	345
VK3	405

Technical data – Overall dimensions

Of light crane systems VHT "VS" SERIES



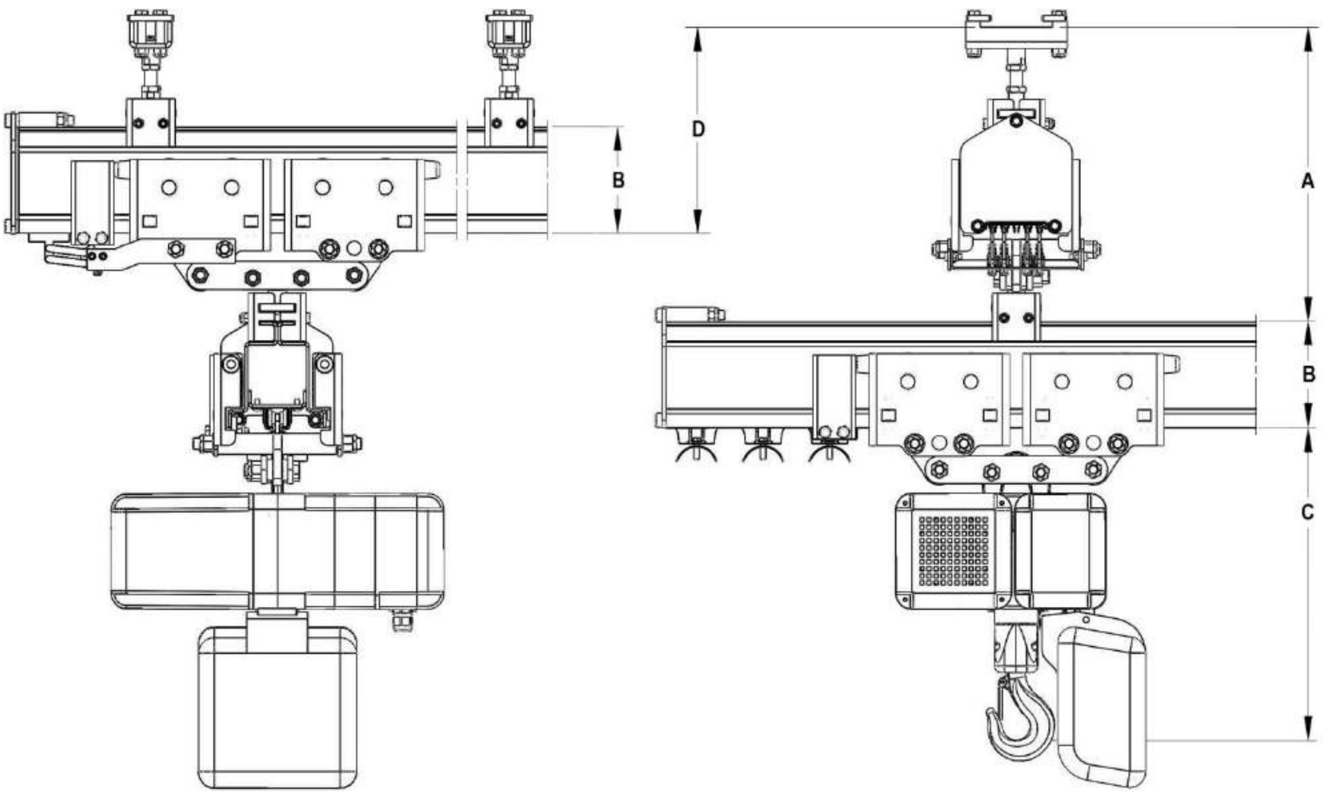
Bridge sliding with double push trolleys – Translation of the hoist with single push trolley

VS beams	**A** min. (mm)	**B** (mm)	**D** min. (mm)
150	420	150	295
210	480	210	355
270	540	270	415

Dimensions of the hoist	
Hoist type	**C** (mm)
VK2	345
VK3	405

Technical data – Overall dimensions

Of light crane systems VHT "VS" SERIES



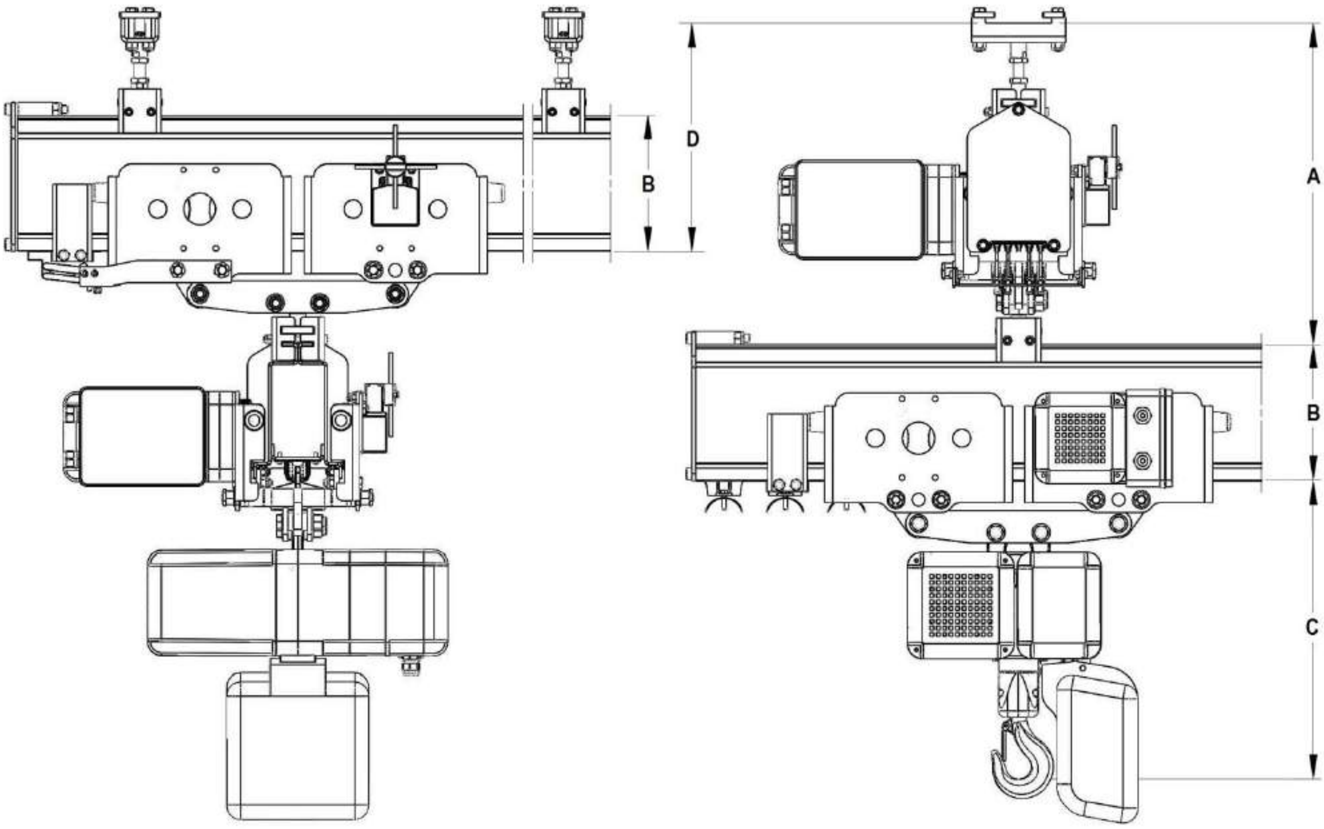
Bridge sliding with double push trolleys - Translation of the hoist with double push trolley

VS beams	A min. (mm)	B (mm)	D min. (mm)
150	420	150	295
210	480	210	355
270	540	270	415

Dimensions of the hoist	
Hoist type	**C** (mm)
VK3	450
VK4	540

Technical data – Overall dimensions

Of light crane systems VHT "VS" SERIES



Bridge sliding with double electric trolleys - Translation of the hoist with double electric trolley

VS beams	**A** min. (mm)	**B** (mm)	**D** min. (mm)
150	440	150	295
210	500	210	355
270	560	270	415

Dimensions of the hoist	
Hoist type	**C** (mm)
VK3	465
VK4	555