# Modular light crane systems Stemes S

# 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











## "Innovation by tradition"

Thanks to the broad experience of designers and production expertise in the field of lifting, where 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.

www.vhittaly.com produces electric wire rope hoists "VF" in a



by a quality system conducted in compliance with UNI EN ISO 9001:2015

highly serialized way, with the benefits of industrialized production processes controlled

LIGHT CRANE SYSTEMS WHT "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 VIII "VS" Series Security, reliability and ...competitive advantages

#### SECURITY AND RELIABILITY OF LIGHT SYSTEM

3 YEARS OF LIEN FROM DELIVERY.

MODULAR PATENTED PARTS OF LIGHT SYSTEM **Modular light crane systems "VS" Series**, with manual or electric sliding, designed and produced by **WHT** 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)".

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 VIII)

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 VIII 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 VVHT, 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 what 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 VYHT, 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 WHT, is extremely safe and flexible to use, and also it is easy for maintenance and to inspect.









### Light crane systems VIII "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 <u>WHT</u> 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  $\geq$  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  $\leq$  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.



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 WHT, is the patented profile "VS", produced with folded plate and with a section bar in three different size whose characteristic data are the following:



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

| Comparison betwee   | n the technical details               | of patented profile 🚧                  | $^{ m III}$ and the solutions co       | ommonly used                |
|---|---------------------------------------|--|--|-----------------------------|
|   | Patented profile                      | Examples of solutions u                | usually used in the construction       | n of suspended systems      |
|   | Beam "VS"<br>in folded or edged plate | Beam in laminated profile<br>IPE – HEA | Beam in folded c<br>at "close channel" | r sectioned plate<br>at "I" |
|   | (with outer trolley)                  | (with outer trolley)                   | (with internal trolley)                | (with outer trolley)        |
| Technical Details<br>다  |                                       | ШШ                                     | ŗţ                                     |                             |
| Low ruggedness of sliding surfaces<br>of trolleys wheels                        | Yes                                   | No                                     | Yes                                    | Yes                         |
| Reduced dimensional tolerances and<br>structural and checked structure          | Yes                                   | No                                     | Yes                                    | Yes                         |
| Easy treatment, od sandblast and<br>painting, within the profile                | Yes                                   | Yes                                    | No                                     | No                          |
| High profile stability at horizontal<br>forces caused by non-vertical pulling   | Yes                                   | Yes                                    | No                                     | Yes                         |
| Use of pushing translation trolleys<br>series of small bulk                     | Yes                                   | Yes                                    | Yes                                    | No                          |
| Use of electric trolleys of translation<br>of small bulk                        | Yes                                   | Yes                                    | No                                     | No                          |
| Introduction of blindo trolley within<br>the profile without limiting the bulky | Yes                                   | No                                     | Possible in rare cases                 | No                          |
| Easy inspection of blindo trolley with<br>relative slithering skates            | Yes                                   | Yes                                    | No                                     | Yes                         |
| Easy inspection of wheels of<br>translation trolley                             | Yes                                   | Yes                                    | No                                     | Yes                         |
| Easy inspection of profile interior for<br>to check corrosion                   | Yes                                   | Yes                                    | No                                     | No                          |
| Connection among them of all the<br>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:

| I | Capacity | w | heel | base | sus | oens | ion o | or spa | an (n | 1) |   | Recommended use for manual moves  |  |  |  |  |  |  |  |  |
|---|----------|---|------|------|-----|------|-------|--------|-------|----|---|---|--|--|--|--|--|--|--|--|
|   | ( kg )   | 2 | 3    | 4    | 5   | 6    | 7     | 8      | 9     | 10 |   | Field of the in succeiver different of the second time reserves on menual eligibles of leads that |  |  |  |  |  |  |  |  |
|   | 125      |   |      |      |     |      |       |        |       |    | Field of use in excellent conditions for translation moves or manual sliding of loads th are normally almost full and/or for frequent moves |   |  |  |  |  |  |  |  |  |
|   | 250      |   |      | ļ    | ļ   |      |       |        |       |    |   |   |  |  |  |  |  |  |  |  |
|   | 500      |   |      | ļ    | ļ   |      |       |        | ļ     | Ļ  |   | Field of use admitted for moves of translation or manual sliding of loads randomly full           |  |  |  |  |  |  |  |  |
|   | 1.000    |   |      |      |     |      |       |        |       |    |   |   |  |  |  |  |  |  |  |  |
|   | 2 000    |   |      |      |     |      |       |        |       |    |   |   |  |  |  |  |  |  |  |  |

e. Maximum number of operative cycles C<sub>A</sub> calculated wit the following formula:

|                        | 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 cycl   | es of service group ISO A5 according to Load System ( Q )                             |
| m ( Q ) according to F | N 13001-1 standa |   |

| Load           | system (Q) according to EN 13001-1 standard | Operative evelop ( $n^{\circ}$ ) of light system in convice aroun A5 according to ISO 4301.1 standard |
|----------------|---|---|
| Q              | % of load max. (exploitation % of capacity) |   |
| Q              | > 25% ≤ 32%                                 | > 2.000.000 ≤ 4.000.000   |
| <b>Q</b> 1     | > 32% ≤ 40%                                 | > 1.000.000 ≤ 2.000.000   |
| Q <sub>2</sub> | > 40% ≤ 50%                                 | > 500.000 ≤ 1.000.000   |
| Q₃             | > 50% ≤ 63%                                 | > 250.000 ≤ 500.000   |
| Q4             | > 63% ≤ 80%                                 | > 125.000 ≤ 250.000   |
| Q₅             | >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  $\Rightarrow$  light crane systems at manual sliding - model "VS-M"
  - height from the ground of beam "VS"  $\Rightarrow$  H (m) = 3 m
  - length beam "VS" and middle running (Xin)⇒ length (m) = 5 m, with middle running of load along the beam Xin= 2,5 m

 $\Rightarrow$  load system = Q<sub>3</sub>

- maximum load to lift: 500 kg ⇒ capacity of light crane systems "VS" Series = 500 kg
- load average to lift: 300 kg

 $C_A = C/h$ 

- up and down operation in one hour  $\Rightarrow$  N° cycles per hour C/h = 20
- use on a working schedule
- $\Rightarrow$  Tu (hours) = 8 annual working day: 250  $\Rightarrow$  D/vear = 250

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

CA = 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 - Din 2- Dang3, according to EN 13001-1 standard, equal to ISO M5 .



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); ( $\Sigma Q \circ Q_{eq}$ ):

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 $\leq$ 4 m/min.<br>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.<br>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 <sub>min</sub> = 600) |
| Nota: Rigidity factor | r K is inverse p  | roportion to the sweep of elastic deformation.   |
| Therefore, mo         | ore 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 ( $\Sigma Q$ ) or the equal load ( $Q_{eg}$ ), that are:
  - For suspended cranes or monorail that the summation of loads  $\Sigma Q$  = 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<sub>eq</sub>) 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<sub>ea</sub>) 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.



#### Test of suitability of suspensions, in accordance with the maximum reaction (R<sub>max</sub>)

The maximum reaction on suspension ( $R_{max}$ ), as a result of summation of several sliding loads ( $\Sigma Q_{..}$ ) 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.



- in the calculation of the maximum suspension reaction (Rmax) 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 ( $\Sigma Q_{max}$ ) due to the bridge with greater load  $\Sigma Q$  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





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

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



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

- chose the rigidity factor K according to the use; 1.
- 2. establish the **span** ( S = m );

3

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

Examples of choice (red frame) of a "crane beam" with span G = 6 m stressed in centre with summation of loads  $\Sigma Q \cong 540$  kg (capacity = 500 kg + mass hoist with trolley  $\cong 40$  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 ( $\Sigma Q = kq$ ) in centre;
- According to the wheelbase suspension or span (G = m);
- And according to the criteria "e" (elastic constant of beams VS) •

K = <u>1.000.000</u>

e·ΣQ·S

The result of the formula:

Where e = 99,20635 / Jx

#### Example of test of effective factor K rigidity:

- for summation **SQ** = 540 kg and span G= 6 m chose the beam VS kind **210** (example in frame 1), rigidity effective factor K is:
  - $K = 1.000.000 / (e \cdot \Sigma Q \cdot S^2)$

K = 1.000.000 / (0,0967 • 540 • 6<sup>2</sup>); 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 6<sup>2</sup>); 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









#### Maximum wheelbase suspension or span of the beams VS ( $S_{max} = m$ )

According to rigidity factor  $(K = S \cdot 1000 / f)$ 

and to the summation of loads ( $\Sigma Q = kg$ ) or of the equal load ( $Q_{eq} = kg$ )



- 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<sub>max</sub> = 6 m (beam of length Lt > of 6 m are produced with bolted junction)
- $\label{eq:max} \textbf{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<sub>max</sub> = 10 m

|  | Maxii | mum wheel | ams VS as: | 150  | 210   | 270                 |              |       |       |                     |         |       |
|--|-------|-----------|------------|------|-------|---------------------|--------------|-------|-------|---------------------|---------|-------|
| Summation load                                   |       |           |            |      | Rigio | dity factor (       | K = S • 1000 | 0/f)  |       |                     |         |       |
| ( ΣQ = kg )                                      |       | Rigic     | lity K     |      |       | Rigio               | lity K       |       |       | Rigio               | lity K  |       |
| Or equal load                                    | 710   | 560       | 450        | 355  | 710   | 560                 | 450          | 355   | 710   | 560                 | 450     | 355   |
| ( Q <sub>eq</sub> = kg )<br>In middle suspension | hig   | ih med    | lium le    | w    | hiç   | jh <mark>mec</mark> | lium la      | w     | hig   | jh <mark>mec</mark> | lium le | wo    |
| 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 |       |                     |              |       |       |                     |         |       |



#### **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 $(\Sigma Q = kg)$ or of the equal load $(Q_{eq} = kg)$



|  | Beam VS 150 – Maximum distance of junction (Dgmax = mm) from suspension |       |       |       |       |       |       |          |                  |        |       |       |       |       |       |          |
|--|---|-------|-------|-------|-------|-------|-------|----------|------------------|--------|-------|-------|-------|-------|-------|----------|
| Summation<br>of loads<br>$(\Sigma Q = kg)$<br>Or equal<br>load<br>$(Q_{eq} = kg)$<br>in centre<br>suspension | ≤ 2,0   | > 2,0 | > 2,5 | > 3,0 | > 3,5 | > 4,0 | wheel | base sus | pension(<br>>5,5 | S = m) | > 6,5 | > 7,0 | > 7,5 | > 8,0 | > 8,5 | > 9,0    |
| 2500   | 245   | 237   | ,0    | ,0    | _,v   | ,v    | ,0    | ,0       | ,0               | ,      | _ ,0  | ,     |       | ,0    | ,0    | <u> </u> |
| 2300   | 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     |





#### **Maximum hook bounce** (Sg<sub>max</sub> = 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 ( $\Sigma Q = kg$ )



| Summation<br>of loads<br>(∑Q = kg) |                |                |                |                |                |                |                |                |                |                |                |                |                |                |                |
|------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Stressed with bounce               | ≥ 2,0<br>< 2,5 | ≥ 2,5<br>< 3,0 | ≥ 3,0<br>< 3,5 | ≥ 3,5<br>< 4,0 | ≥ 4,0<br>< 4,5 | ≥ 4,5<br>< 5,0 | ≥ 5,0<br>< 5,5 | ≥ 5,5<br>< 6,0 | ≥ 6,0<br>< 6,5 | ≥ 6,5<br>< 7,0 | ≥ 7,0<br>< 7,5 | ≥ 7,5<br>< 8,0 | ≥ 8,0<br>< 8,5 | ≥ 8,5<br>< 9,0 | ≥ 9,0<br>< 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            | 070            |                |                |                |                |
| 250                                | 73             | 113            | 163            | 221            | 287            | 362            | 376            | 376            | 3/6            | 3/6            | 3/6            | 100            |                |                |                |
| 224                                | 81             | 126            | 181            | 246            | 319            | 402            | 420            | 420            | 420            | 420            | 420            | 420            |                |                |                |
| 200                                | 90             | 141            | 202            | 2/4            | 356            | 448            | 470            | 470            | 470            | 470            | 470            | 470            | 500            |                |                |
| 180                                | 100            | 156            | 224            | 303            | 393            | 494            | 522            | 522            | 522            | 522            | 522            | 522            | 522            | 500            |                |
| 160                                | 112            | 1/5            | 250            | 338            | 439            | 551            | 588            | 588            | 588            | 588            | 588            | 588            | 588            | 588            | 074            |
| 140                                | 128            | 199            | 284            | 383            | 496            | 622            | 6/1            | 6/1            | 6/1            | 6/1            | 6/1            | 6/1            | 6/1            | 6/1            | 6/1            |
| ≤ 125                              | 143            | 221            | 316            | 426            | 550            | 689            | 752            | 752            | 752            | 752            | 752            | 752            | 752            | 752            | 752            |



#### **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 $(\Sigma Q = kg)$ or of the equal load $(Q_{eq} = kg)$



|   | Beam VS 210 – Max. distance of junction (Dg <sub>max</sub> = mm) from suspension |                |                |                |                |                |                |                |                |                |                |              |              |                |                |                |               |
|---|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|--------------|----------------|----------------|----------------|---------------|
| Summaion<br>of loads<br>(∑Q = kg)<br>Or equal<br>load<br>(Q <sub>eq</sub> = kg) |  |                |                |                |                |                | wł             | neelbase       | suspens        | ion (S =       | m)             |              |              |                |                |                |               |
| in centre<br>suspension   | ≤ 2,0  | > 2,0<br>≤ 2,5 | > 2,5<br>≤ 3,0 | > 3,0<br>≤ 3,5 | > 3,5<br>≤ 4,0 | > 4,0<br>≤ 4,5 | > 4,5<br>≤ 5,0 | > 5,0<br>≤ 5,5 | > 5,5<br>≤ 6,0 | > 6,0<br>≤ 6,5 | > 6,5<br>≤ 7,0 | >7,0<br>≤7,5 | >7,5<br>≤8,0 | > 8,0<br>≤ 8,5 | > 8,5<br>≤ 9,0 | > 9,0<br>≤ 9,5 | > 9,5<br>≤ 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 <sup>₩</sup>#<sup>™</sup> "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 ( $\Sigma Q = kg$ )



|                                    | Beam VS 210 – Max. hook bounce (Sg <sub>max</sub> = mm) |                |                |                |                |                |                |                |                |              |                |                |                |                |                |              |      |
|------------------------------------|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|----------------|----------------|----------------|----------------|----------------|--------------|------|
| Summation<br>of loads<br>(ΣQ = kq) |   |                |                | _              |                | _              | wl             | neelbase       | suspens        | sion (S =    | m)             | _              |                |                |                | _            |      |
| Stressed with bounce               | ≥ 2,0<br>< 2,5  | ≥ 2,5<br>< 3,0 | ≥ 3,0<br>< 3,5 | ≥ 3,5<br>< 4,0 | ≥ 4,0<br>< 4,5 | ≥ 4,5<br>< 5,0 | ≥ 5,0<br>< 5,5 | ≥ 5,5<br>< 6,0 | ≥ 6,0<br>< 6,5 | ≥6,5<br><7,0 | ≥ 7,0<br>< 7,5 | ≥ 7,5<br>< 8,0 | ≥ 8,0<br>< 8,5 | ≥ 8,5<br>< 9,0 | ≥ 9,0<br>< 9,5 | ≥ 9,5<br><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 |



#### **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 $(\Sigma Q = kg)$ or of the equal load $(Q_{eq} = kg)$



|  |       |   |               |              | E            | Beam VS      | 270 – Ma     | ıx. distar    | ice of jur | iction (De    | g <sub>max</sub> = mm | n) from s | uspensio | n     |       |       |       |
|--|-------|---|---------------|--------------|--------------|--------------|--------------|---------------|------------|---------------|-----------------------|-----------|----------|-------|-------|-------|-------|
| Summation<br>of loads<br>$(\Sigma Q = kg)$<br>Or equal<br>load<br>$(Q_{eq} = kg)$<br>in centre<br>suspension | ≤ 2,0 | > 2,0   | > 2,5         | > 3,0        | > 3,5        | > 4,0        | Wi<br>> 4,5  | > 5,0         | suspens    | sion (S =     | m)                    | > 7,0     | > 7,5    | > 8,0 | > 8,5 | > 9,0 | > 9,5 |
| 2500   | 467   | ≥ ∠,3<br>//33   | ≥ 3,0<br>//16 | ≥ 3,3<br>405 | ≥ 4,0<br>308 | ≥ 4,3<br>302 | ≥ 5,0<br>388 | ≥ <u>3</u> ,3 | ≥ 0,0      | <b>≤ 0,</b> 3 | ≤ <i>1</i> ,0         | 51,3      | ≥ 0,0    | ≥ 0,3 | ≥ 9,0 | ≥ 9,3 | 5 10  |
| 2300   | 552   | 500   | 475           | 460          | 450          | 443          | 438          | 434           |            |               |                       |           |          |       |       |       |       |
| 2000   | 677   | 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 <sup>₩₩</sup> "VS" SERIES

**Maximum hook bounce** (Sg<sub>max</sub> = mm) acceptable for just one lifting device in accordance with the wheelbase suspension or wit the span (S = m) and with summation of loads ( $\Sigma Q = kg$ )



|                                    |                |                |                |                | Beam VS 270 – Max. hook bounce (Sg <sub>max</sub> = mm) |                |                |                |                |              |                |                |                |              |                |              |      |
|------------------------------------|----------------|----------------|----------------|----------------|---|----------------|----------------|----------------|----------------|--------------|----------------|----------------|----------------|--------------|----------------|--------------|------|
| Summation<br>of loads<br>(ΣQ = kq) |                |                |                |                |   |                | w              | heelbase       | suspens        | sion (S =    | m)             |                |                |              |                |              |      |
| Stressed<br>with bounce            | ≥ 2,0<br>< 2,5 | ≥ 2,5<br>< 3,0 | ≥ 3,0<br>< 3,5 | ≥ 3,5<br>< 4,0 | ≥ 4,0<br>< 4,5  | ≥ 4,5<br>< 5,0 | ≥ 5,0<br>< 5,5 | ≥ 5,5<br>< 6,0 | ≥ 6,0<br>< 6,5 | ≥6,5<br><7,0 | ≥ 7,0<br>< 7,5 | ≥ 7,5<br>< 8,0 | ≥ 8,0<br>< 8,5 | ≥8,5<br><9,0 | ≥ 9,0<br>< 9,5 | ≥ 9,5<br><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 VIII "VS" SERIES



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

| VS beams | beams A min. (mm) B (mm) |     | D min. (mm) |  |
|----------|--------------------------|-----|-------------|--|
| 150      | 380                      | 150 | 295         |  |
| 210      | <b>210</b> 440           |     | 355         |  |
| 270      | 500                      | 270 | 415         |  |

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







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

| VS beams | A min. (mm) | <b>B</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 ₩₩₩ "VS" SERIES



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

| VS beams | A min. (mm) | <b>B</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 ₩ "VS" SERIES



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

| VS beams | A min. (mm) | <b>B</b> (mm) | D min. (mm) | Dimensions of | of the hoist |
|----------|-------------|---------------|-------------|---------------|--------------|
| 150      | 440         | 150           | 295         | Hoist type    | <b>C</b> (mm |
| 210      | 500         | 210           | 355         | VK3           | 465          |
| 270      | 560         | 270           | 415         | VK4           | 555          |

**C** (mm)



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