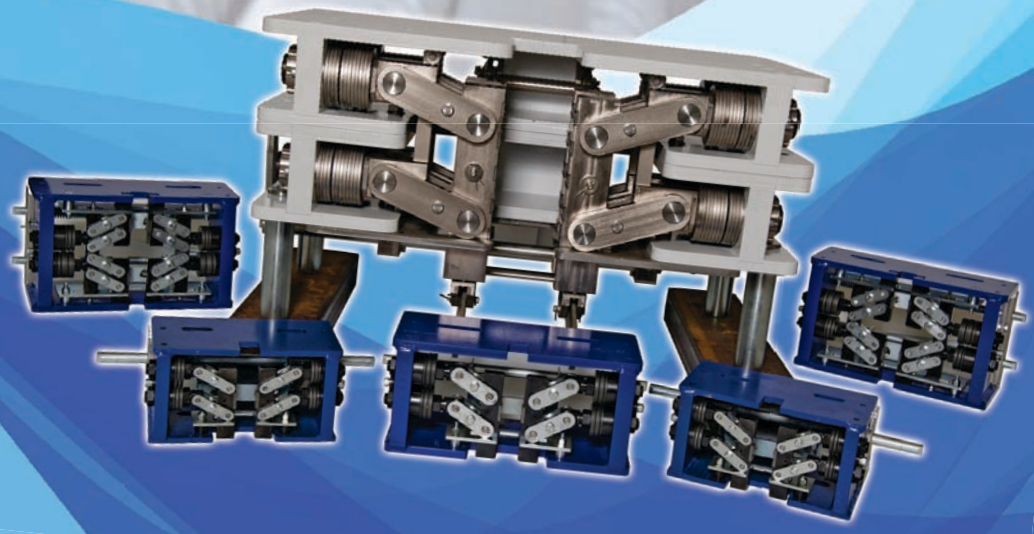
Applications and Layout Data
for the VG Range of Safety Gears
Version 3.0



Serving the lift industry since 1996

Operation and Installation Manual

ATWELL INTERNATIONAL

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General Information

VG safety gears consist of a pair of end assemblies which can bolt directly to the buffer channels or car frame. However, the top plate of the safety gear must be supported by an intermediate mounting plate if the distance between the car frame supports is too great. The maximum unsupported distance and the principal dimensions of the VG range are shown in Figure TD1.0. All channels and/or support plates **must** extend the full depth of the safety gear top plate (see figure TD 1.7.2)

Each end assembly has two spring loaded linkage mechanisms which carry and engage the gripping elements. The linkage mechanisms are designed to centralise the safety gear when it is engaged. This feature, in conjunction with large running clearances, means that VG safety gears can be used with spring loaded roller guide shoes, sliding shoes or solid rollers.

The force needed to operate a pair of downward acting safety gear end assemblies is approximately 30 Newtons (disregarding the force of any torsion springs fitted) and several pairs can be operated by a single over-speed governor. The actuating arm may be mounted on either side of the safety gear depending on the location of the over-speed governor. The end assemblies are connected together by a screwed rod for easy and accurate synchronisation of the end assemblies.

The force needed to release the safety gear is also very low. This enables the safety gear to be disengaged by the lift machine and not to require special lifting tackle.

The braking force is controlled by the compression of the spring stacks. These are adjusted in accordance with the certification tests carried out by BSI. Tests were carried out on guide rails with a superior surface finish as this represents the best practice in modern guide rail technology. If the safety gear is used on rails with a standard finish, or if used with a mass different from that shown on the label, the braking force may need to be adjusted on site. (See relevant installation and adjustment data)

To comply with the harmonised version of EN81, a lift must prevent "uncontrolled upward movement". As all VG safety gears can be inverted to brake in the upward direction, code compliance can be obtained by fitting separate "upward acting" safety gear in tandem with a standard "downward acting" safety. This additional safety can either be attached directly to the downward acting safety gear or mounted separately on top of the crown channels. The VG range of safety gears can also be used as the braking means and as a complete solution to EN81-20/50:2014 when used in conjunction with the VG Overspeed Governor.

The VG-5 safety gear is bi-directional safety gear and has two independent braking mechanisms within a common housing. Both bi-directional and "combined" safety gears can be operated from a single friction type, bi-directional over-speed governor.

VG-2a, VG-5 and VG-6 safety gears have a common footprint and mounting dimensions. The VG-4 has a narrower footprint more suited to smaller lifts. The VG-4 can be fitted with an extended shaft to match the rest of the VG range.

Guidance Notes

2.1 Over-speed governors

VG safety gears can be operated by either "friction"or "drop-jaw" type overspeed governors. However, when bi-directional operation is required, either a bi-directional VG governor or friction governor capable of operating in both directions is required.

These governors have different operating characteristics which must be considered when deciding on which type of governor is best suited for a specific application. The preferred option is to fit a VG governor as this is technically superior to friction types.

Regardless of which type of governor is fitted, EN81 requires that it must generate twice the force needed to engage the safety gear. This must include the force needed to centralise the lift car prior to engaging the safety gear plus the inertia spring force.

2.1.1 Friction Governors

These governors can operate in both directions and hence can be used to detect an over-speed in either the "up" or "down" directions. They operate by locking the governor wheel using a latch which engages when the governor reaches a specific speed. The force generated by the governor will depend on:-

1. The governor rope tension. This is controlled by the tension weight, the size of the governor rope and the length of travel. (refer to section TD1.9 for design formulae)
2. The travel of the lift car. As stated above, this can become a major factor in the governor force generated in both directions of travel.
3. The groove profile of the governor. Normally these are "V" grooves.
4. The rope speed over the governor wheel. The higher the speed, the lower the force generated by the governor. However, manufacturers do not produce any data for this reduction.
5. The direction of travel. The governor generates a much higher force in the "down" direction than in the "up" direction. (refer to section TD1.9 for design formulae)

Despite the above, friction governors are very popular because of their low-cost and bi-directional properties. However, they will reset following a safety gear test if there is counterweight "bounce" after the lift car has come to rest. In turn, the safety gear can be released thereby permitting the car to start downwards again if the machine brake is held open.

Counterweight "bounce" will occur if the car deceleration is too severe or the overall compliance of the lift installation is too soft.

However, it should be noted:-

This cannot happen under the "free fall" conditions which both safety gears and governors have been tested and certified.

2.1.2 VG Drop Jaw Governor

This governor uses digital technology for speed measurement and has a built-in control system for detecting uncontrolled movement and overspeed in the "up" direction. When triggered, a drop-weight is released which operates a linkage system to clamp the governor rope between spring loaded jaws. The governor force generated depends on:-

1. The spring force in the clamping jaws. Four compression springs are fitted as standard but these can be increased to six if required.
2. The speed of the rope passing through the gripping elements. As with a friction type, the higher the speed, the lower the force generated. Use is made of the speed versus friction coefficient given in EN81 to determine the minimum braking force.
3. The groove profile of the gripping elements. The standard groove is semi-circular with a 50% undercut. The undercut can be increased to either 63% or 75% to increase the braking force.

As the gripping force does not depend on the governor rope tension, a lighter tension weight can be used than on friction type governors. However, this must have an integral lock-down mechanism to react the force generated in the "up" direction.

Regardless of any car or counterweight "bounce", a drop-jaw governor will keep the safety gear fully engaged after it has operated.

Drop jaw type governors are considered more reliable and are the preferred option over friction types.

2.2 Governor Rope Attachment

The total movement of the actuating arm to fully engage a VG safety gear is 44 mm. The first 30 mm brings the jaws into contact with the guide rail and braking commences during the final 14 mm.

The governor rope can be attached either directly to the actuating arm or indirectly via an anchorage bracket bolted to the car frame as per accessory kits SK2 and SK10.

a) If the governor rope is attached directly to the actuating arm, the maximum force from the governor must not exceed 300 Newtons. If the force is greater than 300 Newtons, then accessory kit SK3, or similar device, must be fitted to avoid damage to the actuating arm. (data sheet TD1.3)

b) The preferred governor connection is via accessory kits SK2 or SK10. (see data sheets TD1.2 and TD1.10) These have been designed to operate with governors producing a force between 300 and 600 Newtons (maximum 900 Newtons) and to limit the vertical movement to 44 mm.

As the force produced in the "down" direction by a friction governor is nominally five times that in the "up" direction, these accessories may need strengthening if double acting safety gears are used. If a customer prefers a friction governor, stronger versions of the kits are available to special order.

However, the accessories are ideally suited for the VG digital governor as this produces the same force in both "up" and "down" directions.

2.3 Inertia Springs

To ensure the safety gear does not operate during normal lift service, a force is required to overcome the governor rope system inertia. This force is normally provided either by an "inertia spring" fitted to the safety gear or by a "bomb release" mechanism. For a bi-directional safety gear, two inertia springs will be required, one for the up direction and one for the down direction.

The governor must generate sufficient force to:-

a) Overcome the inertia springs

b) Centralise the safety gear against any lateral force L_x

c) Move the connecting linkage and accessory kits

d) Lift the gripping elements into contact with the guide rail.

According to EN81, the minimum force generated must be twice the sum of all these elements.

a) Inertia springs - Torsion springs are included as standard across the entire VG range to act as "inertia springs" and biasing springs when brake units are inverted for upward operation. Two strengths of spring can be fitted depending on the application.

Two light springs are recommended when a safety gear is used in the "up" direction and one on a "down" acting safety gear. These will produce a force of 100 Newtons in both up and down directions and hence are suitable for lift travels up to 40 metres.

These springs can be augmented by auxiliary inertia springs kits SK2 and SK3 can be fitted to increase the maximum lift travels up to 100 metres.

b) When used with roller guide shoes which may permit the lift car to "float", the governor will have to overcome any lateral force L_x generated by a car imbalance.

c) The mass of the connecting linkages used in various accessory kits must be taken into account. This will increase the force needed to engage a "down" safety gear but reduce the force needed in the "up" direction.

d) The force needed to engage a "down" safety gear is approximately 15 Newtons per end assembly. The force to engage in the "up" direction is minus 15 Newtons when it is inverted. This force is deducted from the inertia spring force.

When duplexing VG safety gears, it may be necessary to reduce the number of torsion springs fitted to each end assembly. These can either be removed or left in place but disengaged.

A spread sheet program (4.3.1) is available for checking code compliance (by Atwell International) of different combinations of inertia springs and accessory kits.

2.4 Guide Rail Type

VG safety gears were type-tested using class one rails from SAVERA having with a super-brushed finish. These rails have a lower friction coefficient than standard machined guide rails. However, all VG safety gears can be used with rails having a coarser surface finish. To compensate for different surface finishes, the braking force can easily be adjusted on site should this prove to be necessary.

If the safety gears are to be used on existing guide rails, these may have become work-hardened and/or have developed a hard oxide coating. Under these conditions, it may be necessary to increase the clamping force to enable the carbide inserts to break through any hard surface.

2.5 Carbide Toothed Inserts

All current models of VG safety gears use a common carbide toothed insert. On both dry and lubricated guides, these have demonstrated a consistency of braking force and superior wear characteristics to conventional gib materials.

The inserts brake by a combination of sliding friction and shearing as the teeth grip the guide rail. The teeth produce 8 shallow grooves some 0.15 mm deep by 0.25 mm wide in the rail surface. Guided by the gib stabilisers, these grooves remain parallel to the rail front edge and can be easily dressed smooth using emery paper.

These grooves do not detract from the performance of either sliding or rolling guide shoes or reduce the braking force of VG safety gears.

The **minimum** life expectancy of a VG safety gear is 10 full-load, full-speed drop tests. However, it is recommended that after each safety gear test the inserts are inspected for any signs of damage or wear.

During a public demonstration at the Augsburg International Lift Exhibition in 2007, a VG-4 safety gear was drop-tested repeatedly at 2 m/sec over the same section of guide rail. After 150 tests, the grooves had increased to only 0.4 mm deep and there was no loss of braking force. After testing was discontinued, both the guide rail and inserts were still serviceable.

2.6 Guide Rail Lubricant

VG safety gears have been certified using different lubricants to determine their sensitivity to different types of rail lubricant. These include a mineral oil to ISO grade 68, an extreme pressure gear oil and a 15-50 multi-grade engine oil. Tests have also been carried out using other oils and greases on a hydraulic test rig with different braking materials.

As a result of these tests it has been confirmed that VG safety gears are insensitive to the grade of oil used. Furthermore, there is no significant braking difference between lubricated and non-lubricated guide rails.

A reduction of up to 25% of the braking force may be encountered when the carbide inserts operate on high alloy steels lubricated with grease. Consequently, a down-rating of the braking capacity of the safety gears must be allowed for when used on special applications involving high alloy steels lubricated using grease.

2.7 Ascending Car Over-speed Protection

All VG safety gears can be inverted to operate in either the "up" or "down" directions. To comply with EN81, a lift manufacturer can choose either:-

a) Separate Safety gears

One safety gear is used to brake in the "up" direction and an additional and separate safety gear used to brake in the "down" direction. The safety gears can either be combined in tandem below the lift car or alternatively, mounted separately with the "upward" braking safety gear fitted to the crown channels.

Examples of the different methods of combining "up" and "down" safety gears are illustrated in figures TD1.4 to TD1.6. Examples of safety gears mounted in tandem below the lift car are illustrated in figures TD1.10.1 and TD1.10.2.

The preferred arrangement is to have the "downward" safety gear mounted below the car and the "upward" acting mounted onto the crown channels. Mounted in this way, the safety gears are inherently stable and the loads imposed on the holding down bolts are low.

When combining safety gears below the lift car it is recommended that the flanges of the buffer channels be strengthened by fitting an adapter plate between the buffer channels and the safety gear. This is suitable for a maximum (P+Q) of 4500 kg. At higher loads, additional bracing will need to be incorporated and technical assistance from Atwell International must be obtained.

b) Bi-directional safety gear

The VG-5 is a bi-directional safety gear and is illustrated in Figures TD1.7 and TD1.7.1. Essentially it combines two braking elements within a common housing. One mechanism is designed to brake in the "up" direction and the other in the "down" direction. Normally the VG5 should only be fitted below the lift car. If required to be mounted above the lift car, technical assistance from Atwell International must be obtained.

It is recommended that the VG-5 is mounted onto an intermediate adapter plate as per TD1.7.2 in order to strengthen the flanges on the buffer channels.

Regardless of whether separate safety gears or a bi-directional unit is used, the **Braking Force** needed in the "up" direction is substantially less than that required in the "down" direction. The braking force required to decelerate a lift car at 0.5g in the "up" direction is approximately half that required in the "down" direction. All bi-directional and combined safety gears are adjusted to generate 50% braking force in the up direction.

Both separate and bi-directional safety gears can be operated by a single friction type governor. However, to generate sufficient force in the up direction**, the mass of the governor rope tension weight may need to be increased. Furthermore, it should be fitted with a "lockdown" device to prevent it losing tension. A lock-down kit for attachment to a standard tension weight is available. See accessory kit SK8.**

2.7A Duplexing VG safety gears

VG safety gears were designed to stack together or "duplexed". This could be in the form two "down" units (TD1.4.1/2) or one "up" and one "down" (TD1.10.1/2).

When two "down" brake units are duplexed, the total number of torsion springs fitted must be checked using the spread sheet program TD-4.3.1 (Atwell International). Furthermore, additional bracing may be required to ensure stability of the two brake units in both planes. (see TD1.5)

Guidance Notes

2.8 Environmental Protection

VG safety gears have been designed to operate in a benign environment and exposed to temperate climatic conditions. Consequently, environmental protection is achieved by zinc plating to a commercial standard, chemical blacking or by painting.

Should the safety gear be required to operate under more severe climatic conditions, then special finishes may be required and these are available to special order. All special operating environments should be brought to the attention of Atwell International.

Design Features

1. 6 mm running clearance both sides - suitable for roller guide shoes or sliding shoes
2. Certified for both lubricated and dry rails on class one guide rails.
3. All single models can be duplexed to double their braking capacity.
4. VG safety gears can be inverted to prevent "upward falling". Either tandem mounted or separately mounted.
5. Special "dual acting" safety gear for upward and downward protection.
6. "See through" design for ease of inspection and maintenance.
7. Surface mounted for ease of design and installation.
8. Large running clearances between safety gear frame and guide fixings
9. Simple and accurate braking force adjustment to suit on-site conditions.
10. Rail widths 9 to 19 mm as standard - other widths to special order
11. Special configurations accommodated by means of accessory kits
12. Low operating force – up to 8 end assemblies can be operated by a single friction type governor.
13. Technical support by Atwell International.
14. Non-handed and universal design
15. Low release force after engagement
16. Common mounting across complete VG range.
17. Common spares on critical components across range.

The VG range was re-certified in 2013 and in 2018 to the latest EN81 requirements:

a) To harmonise the maximum governor tripping speed across the range. *All VG safety gears with toothed inserts can now operate at a maximum governor tripping speed of 5m/sec*.*

b) To restrict the disc spring compression to 75% of its maximum value. *This will permit harmonisation of the load ratings between the ANSI and EN81 codes.*

c) To allow different values of (P+Q) at different governor tripping speeds. *The entire range can now benefit from the enhanced braking effect at lower operating speeds.*

d) To have common values of (P+Q) for lubricated and non-lubricated guide rails. *The previous minor rating differences between lubricated and non-lubricated guide rails have been eliminated.*

The revised "down" ratings for the range are shown in the table on the next page.

*except for the VG8

Design Features

Governor Speed m/sec	Maximum Value of (P+Q) kg				
	VG-2a	VG-5	VG-6	VG6E	VG8
0.5	3850	2800	5600	5600	2789
1.0	3530	2630	5250	5500	
1.5	3275	2490	4980	5260	2668
2.0	3010	2350	4690	5100	2546
2.5	2770	2210	4420	4900	
2.63					2425
3.0	2545	2080	4160	4700	
3.5	2340	1955	3910	4500	
4.0	2130	1840	3680	4320	
5.0				3970	

Notes:
1 The above (P+Q) loads are nominal values. These can be exceeded by a maximum value of 7.5% as permitted in EN81.
2 The above values of (P+Q) can be doubled when a safety gear is being used as an upward acting brake.
3 Duplexing of VG safety gears has been verified under drop test conditions to double the above ratings.
4 Non-standard rail widths (greater or smaller than 16 mm) are available to special order.
5 Safety gears can be used on guide rails other than Savera Class one. This may require some on-site adjustment to the braking force.

Accessory Kits

The modular nature of the VG range means that several different mounting arrangements are possible by selecting from a range of accessory kits. The following is a list of the kits currently available. The diagrams show typical assemblies using standard kits.

Atwell International can provide technical assistance to lift manufacturers on special applications. For example, figure TD1.8 illustrates a special car lift arrangement on a four guide system. This required double-duplexed VG safety gears in the down direction and single VG safety gears in the up direction.

SK1 Standard Operating Kit - Figure TD1.1

This kit comprises of the actuating arm, transfer arms and clevis assemblies needed to operate a standard downward acting safety gear. It should be noted that the connecting rod between pairs of safety gears and the actuating rod is normally supplied by the car manufacturer but can be supplied to special order.

SK2 Inertia Bracket Assembly - Figure TD1.2

This is used for an indirect connection between the safety gear actuating rod and the governor rope. The position of the governor rope is offset by 61 mm from the actuating rod.

The bracket is used only with downward acting safety gears which require a car-top connection. It must be bolted to the car sling as illustrated. The assembly does not include the connecting rods or wedge sockets (kit SK9) as standard although these are available to order. The bracket has an auxilliary inertia spring to increase the maximum lift travels up to 75 metres.

SK3 Auxiliary Inertia Spring Assembly - Figure TD1.3

These are used:-

1. To balance the mass of the connecting linkages on various applications such as TD 1.4, TD 1.6 and TD 1.8.
2. To oppose the force exerted by the governor on the safety gear linkage and operating arm. This is done by adjusting the stop springs inside the spring assembly
3. To provide an auxiliary inertia force on lifts with long travels when the torsion springs may not provide a sufficiently high force.

The spring assembly bolts directly to the safety gear as illustrated in TD1.3. There are two versions of this kit. The standard version SK3 is suitable for all safety gears fitted with normal length connecting shafts. (refer to dimension “C” in figure TD1.0) However, safety gear VG-4 can be fitted with an extended shaft to enable it to work with the VG-2a for upward movements. The kit for this is SK3E.

Accessory Kits

SK4 Pivot Bracket Assembly - Figure TD1.4

The pivot bracket is bolted direct to the car frame and is used to connect separate "up" and "down" safety gears requiring an indirect connection to the governor rope. The offset of 61 mm from the actuating rod is common with the inertia bracket assembly SK2. This bracket assembly can withstand a maximum governor force of 1200 Newtons.

It is recommended that the auxiliary spring kit SK3 is fitted to protect the operating linkage from being subjected to an excessive governor force.

The assembly is supplied with slotted link plates and clevises to connect top and bottom safety gears and the governor. The kit does not include the connecting rods or wedge sockets (kit SK9) as standard although these can be supplied if required.

SK5 Double stacking kit (duplexing) - Figure TD1.5

This kit is used to connect two safety gears working in tandem to double the load carrying capacity of the safety gear. Each kit comprises the additional clevises and linkages to enable the safety gears to be operated by a single governor.

When duplexing a pair of safety gears, only one standard operating kit SK1 and Switch kit SK7 will be provided for each duplexed pair.

SK6 Up-Down Connection kit - Figure TD1.6

Used to connect 2 sets of safety gears, one set fitted beneath the lift car to work in the down direction and the other mounted on the crown channels to work in the up direction. The kit includes the linkages and clevises to connect the separate "up" and "down" safety gears together. The kit does not include the connecting rod or wedge sockets (kit SK9) although these are available to special order.

It is recommended that the auxiliary spring kit SK3 is fitted to prevent the safety gear operating linkage from being subjected to an excessive governor force.

SK6C Combined Safety Linkage Kit - Figure TD 1.7

Actuating linkage for "combined" safety gears acting as bi-directional devices. Linkage kits are available for different combinations of VG safety gears.

SK7 Switch Kit

Safety switch, operating cam and fixings to connect to the safety gear. One kit is normally supplied for each set of safety gears.

SK8 Lock-down Kit

This is should be fitted to the tension weight used with all bi-directional governors to prevent it from lifting. The device is supplied with the fixing bolt to secure the unit to the tension weight but not for securing the device to the lift well or bracket structure.

SK9 Wedge Sockets

A pair of wedge sockets to suit 6-8 mm diameter governor rope.

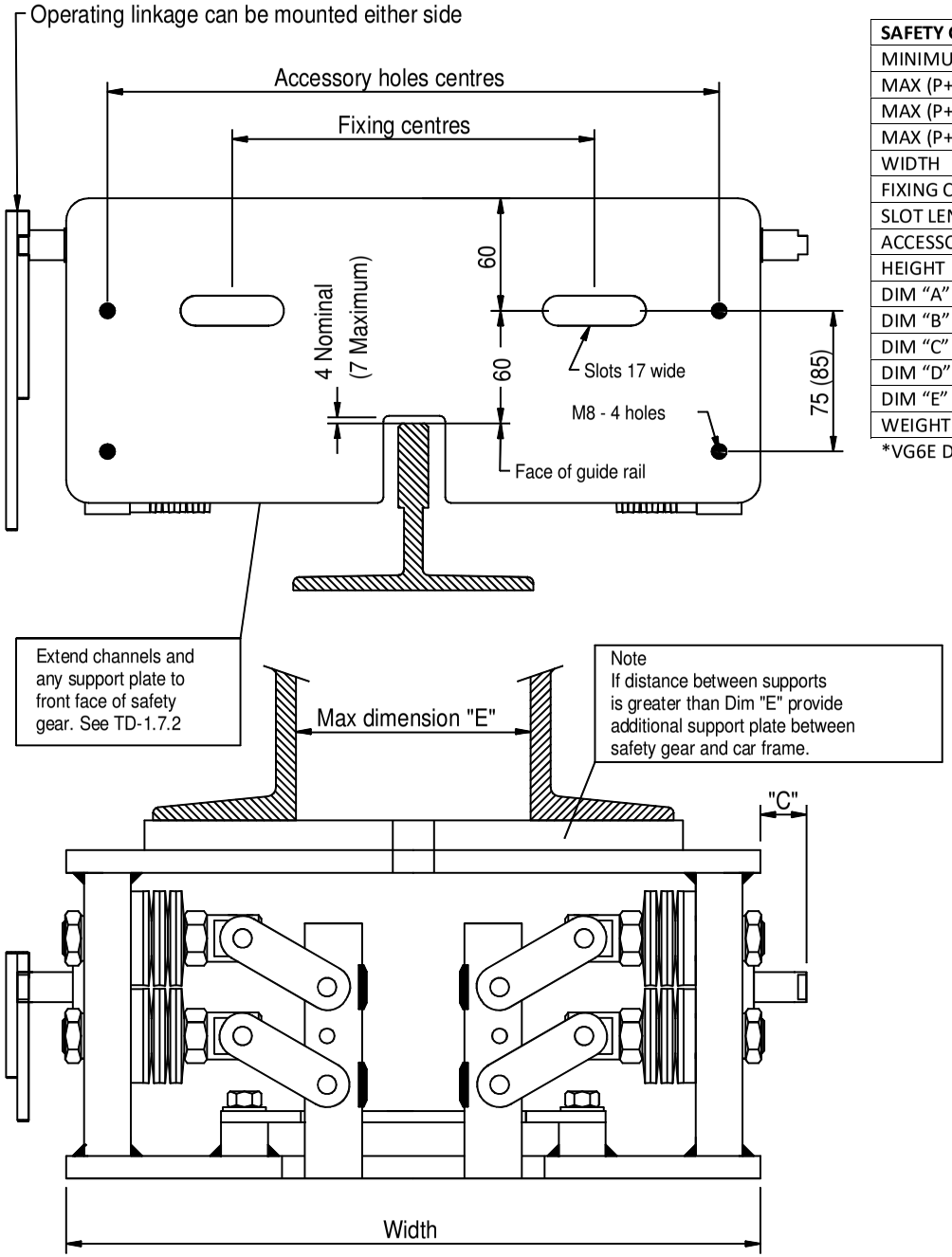
SK10

This is a bi-directional version of kit SK2 but without an inertia spring. The kit is fitted with a balance spring to offset the mass of the connecting rod or link (provided by the lift manufacturer). The inertia spring force is provided by the torsion springs fitted as standard to VG safety gears.

The kit can be used for combined safety gears fitted below the car or with dual acting safety gears. Examples of different applications is given in Figures 1.10.1 to 1.10.3.

AK- 7 Bi-directional kit

A kit of parts for the VG-5 bi-directional safety gear. The kit includes the actuating kits, switch kits and torsion springs. The kit can also be specified for combined safety gears. These have different link plates to suit the different sizes of safety gear.



SAFETY GEAR	VG2a	VG5	VG6*
MINIMUM MASS	900 kg	850 kg	2000 kg
MAX (P+Q) @ 1 m/sec	3530kg	2630 kg	5250 kg
MAX (P+Q) @ 2 m/sec	3010 kg	2350 kg	4690 kg
MAX (P+Q) @ 4 m/sec	2130 kg	1840 kg	3680 kg
WIDTH	370	370	370
FIXING CENTRES	186	186	186
SLOT LENGTH	70	70	70
ACCESSORY CENTRES	328	328	328
HEIGHT	176	225	176
DIM "A"	41	41	41
DIM "B"	115	56/168	115
DIM "C"	25	25	25
DIM "D"	77	63/161	77
DIM "E"	125	200	100
WEIGHT (per frame)	23.5 kg	30 kg	24 kg

*VG6E Dimensions on request

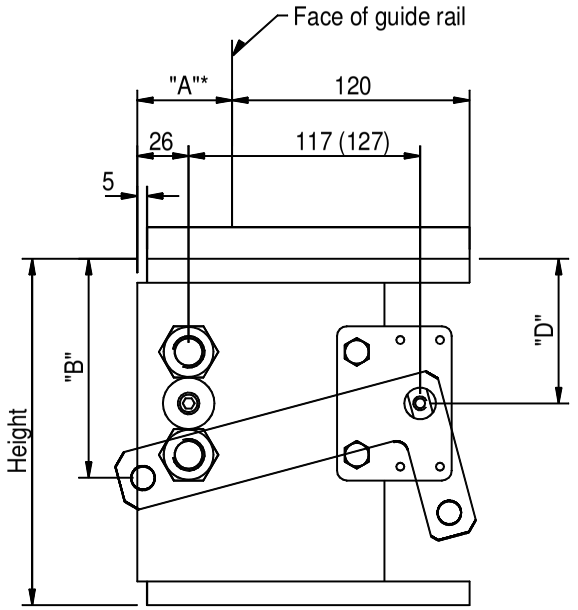


Figure TD1.01 VG8 Dimensional Drawing

SAFETY GEAR DETAILS	VG-8
Minimum Mass	400Kg
Max (P+Q) trip @ 2.63m/sec	2650Kg
Guide rails	T73 - T89 dry or oiled
Weight	7.3Kg per unit
Height	76mm
Fixing centres	200mm
Slot length	25mm

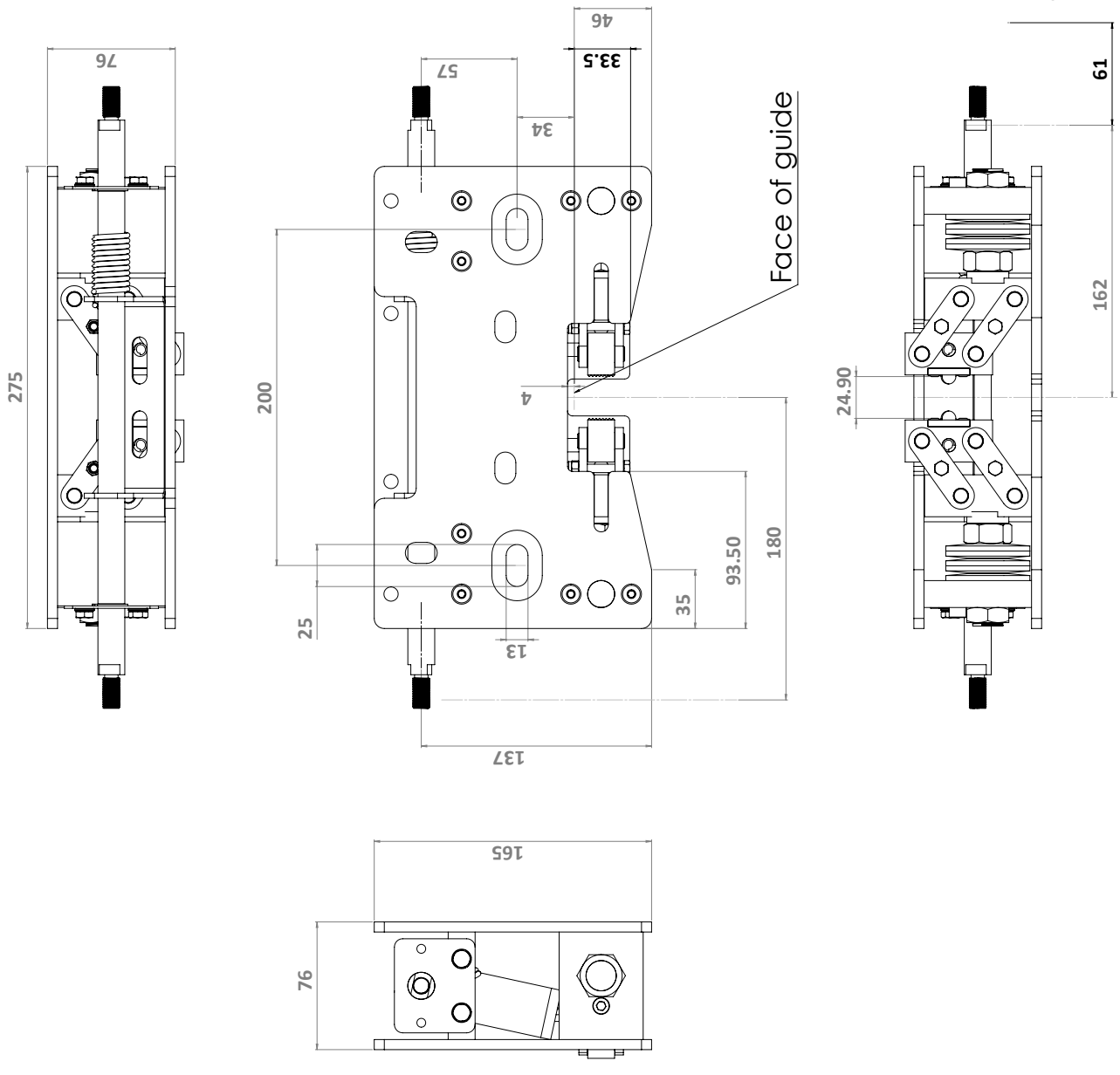
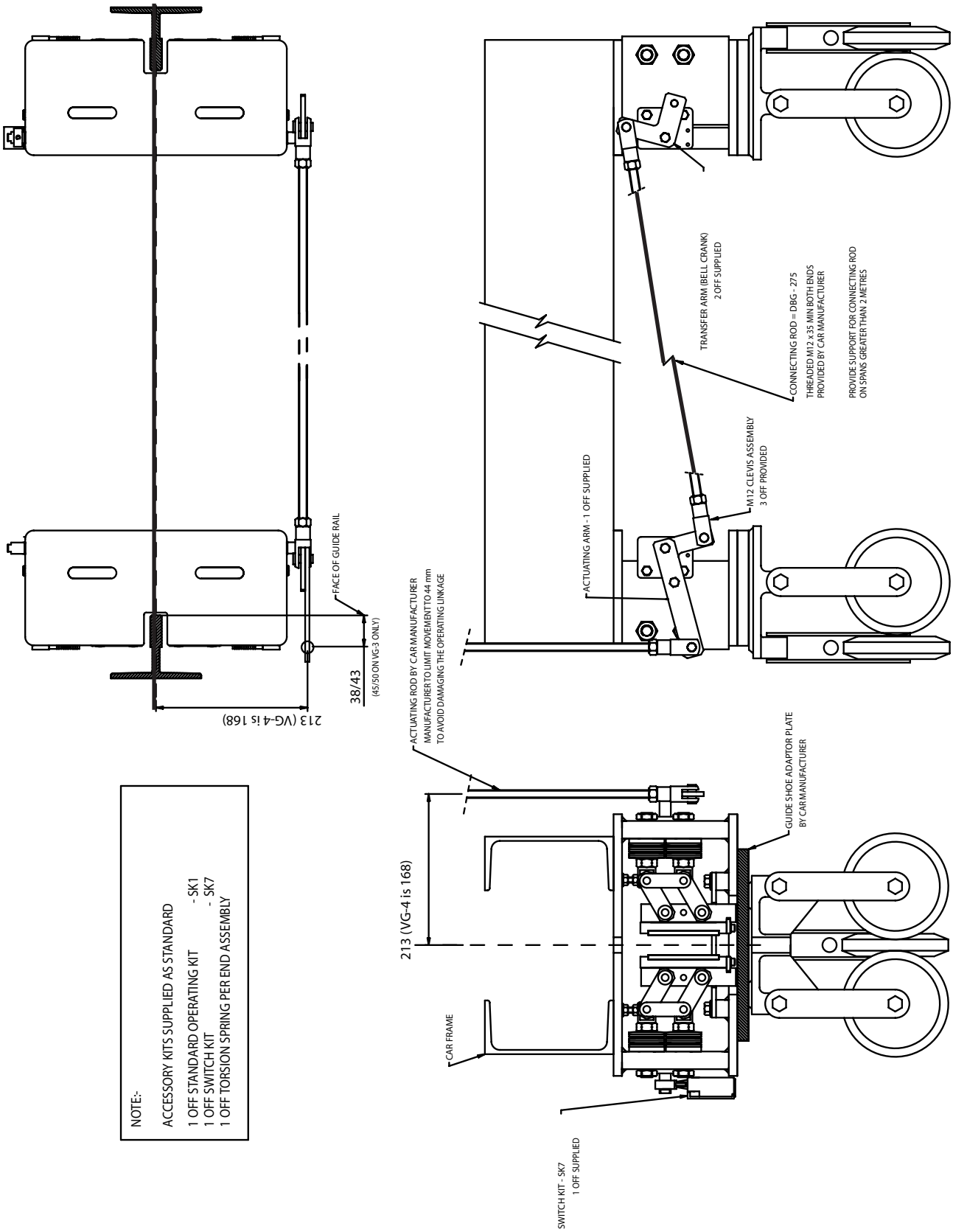
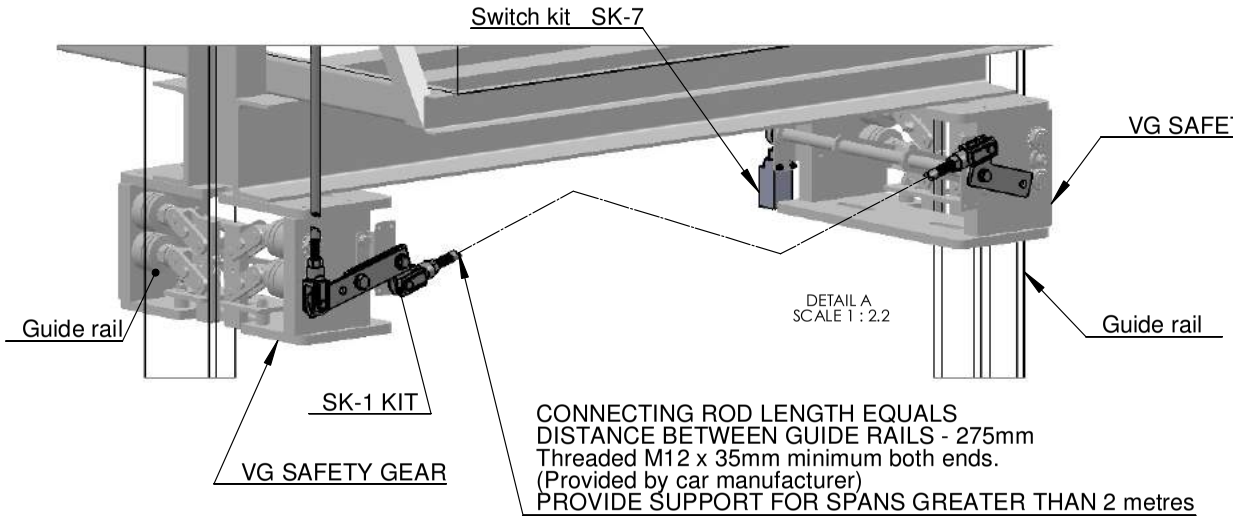


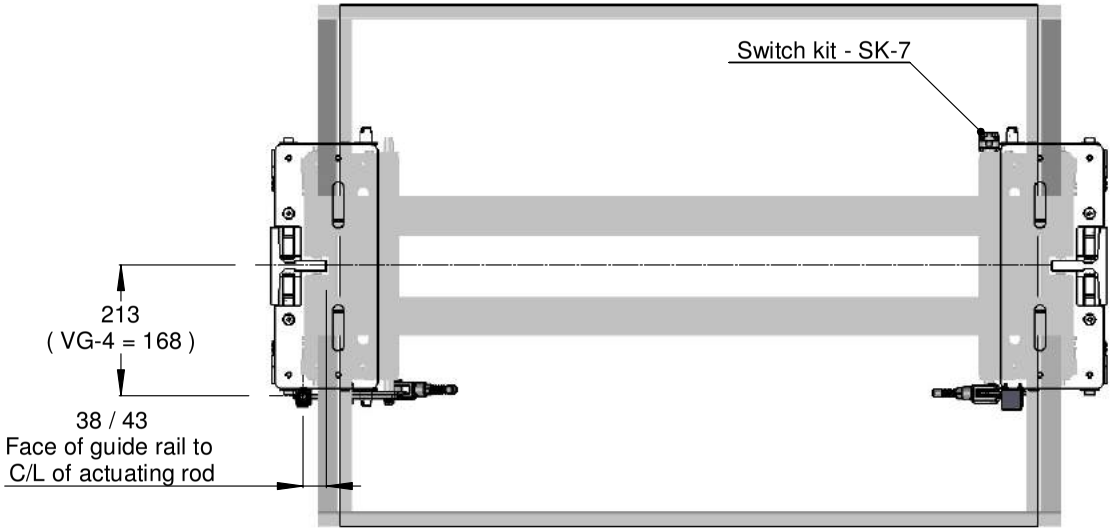
Figure TD1.1 Standard Equipment - Kits SK1 and SK7 - Year 2000 - Issue B

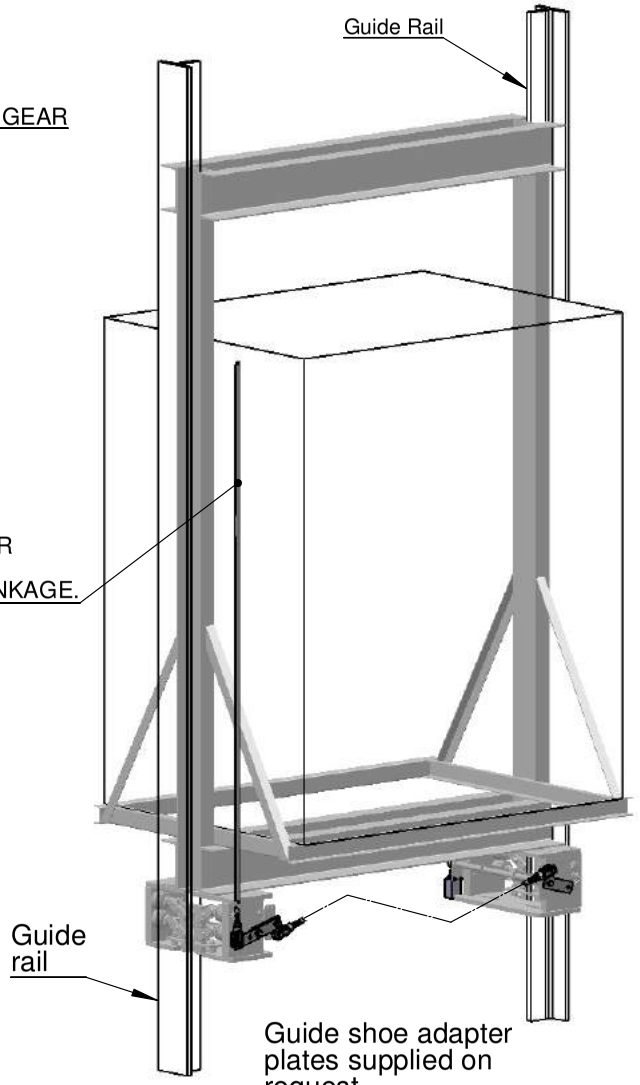




NOTE:
ACESSORY KITS SUPPLIED AS STANDARD:
One off x Standard operating kit SK-1
One off x Switch kit SK-7

ACTUATING ROD BY CAR MANUFACTURER
MOVEMENT TO BE RESTRICTED TO 44mm
TO PREVENT DAMAGE TO OPERATING LINKAGE.





See sheet 1 of 2 for dimension information.

STANDARD EQUIPMENT FOR VG SAFETY GEARS.

Figure TD1.1 Standard Equipment - Kits SK1 and SK7 - Year 2000 - Issue B – Sheet 2

Figure TD1.2 Inertia Bracket Assembly - Kit SK2 - Year 2004 - Issue D

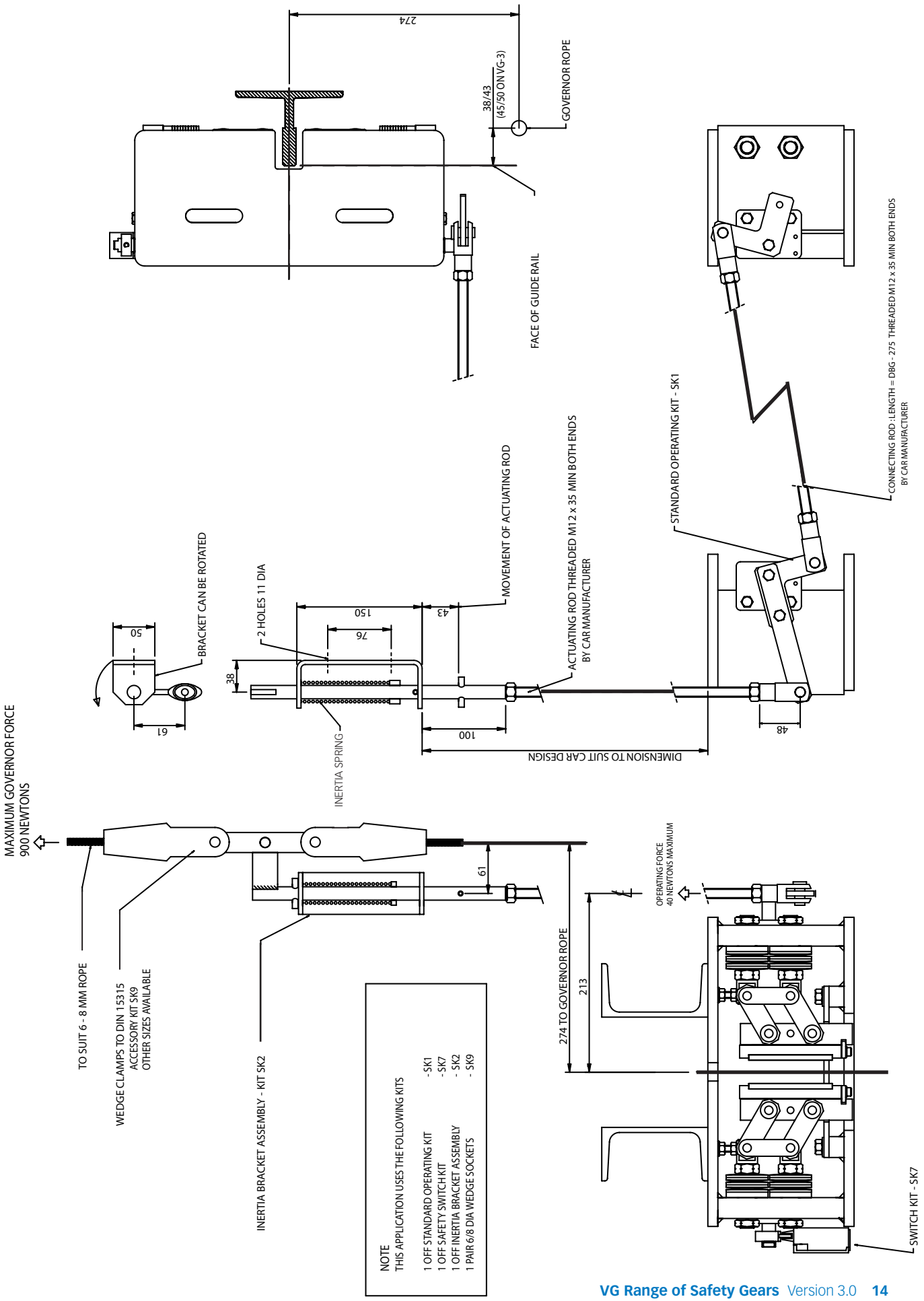


Figure TD1.2 Inertia Bracket Assembly - Kit SK2 - Year 2004 - Issue D – sheet 2

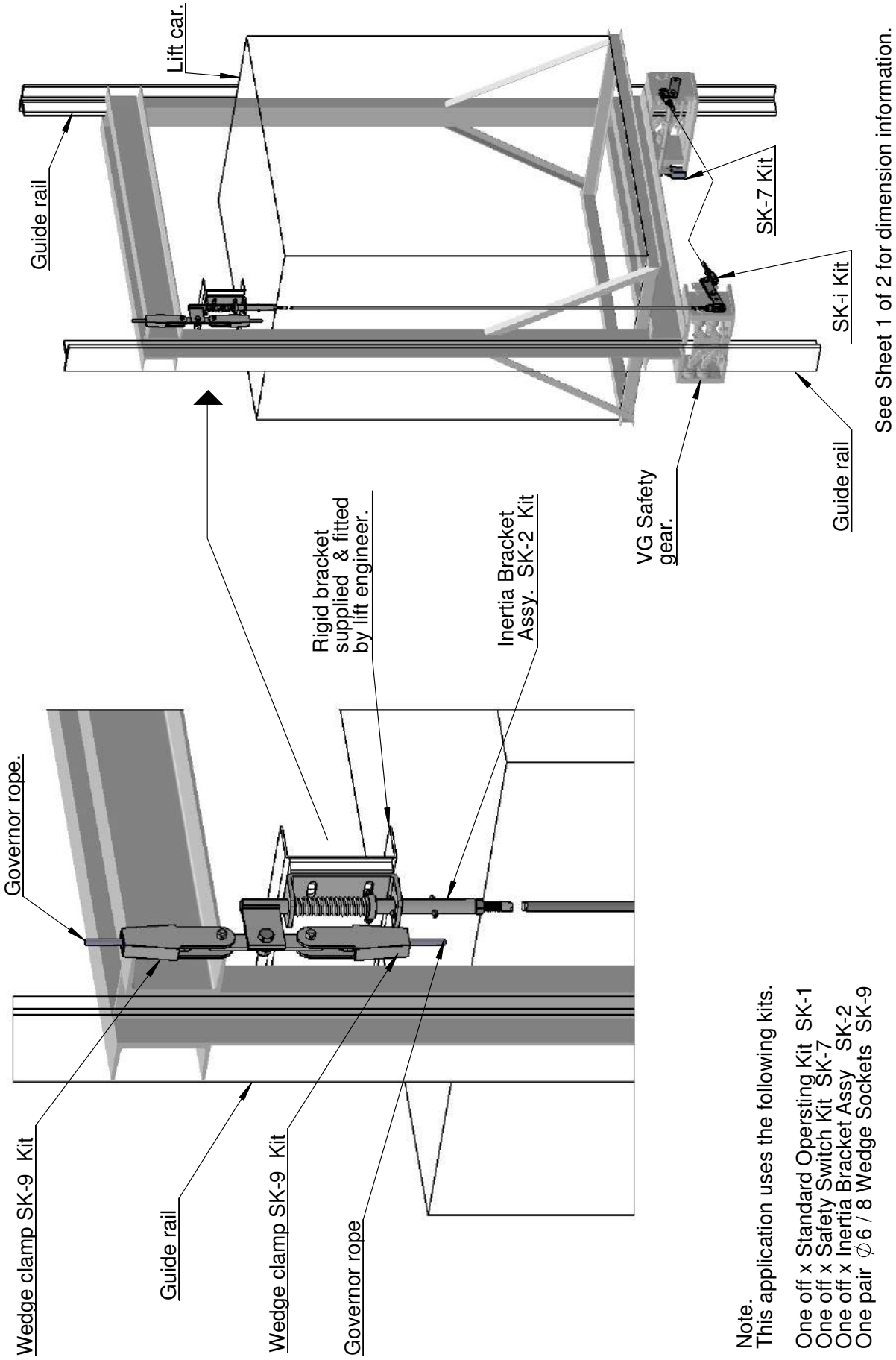


Figure TD1.3 Auxiliary Inertia Spring Kit SK3 - Year 2009 - Issue D

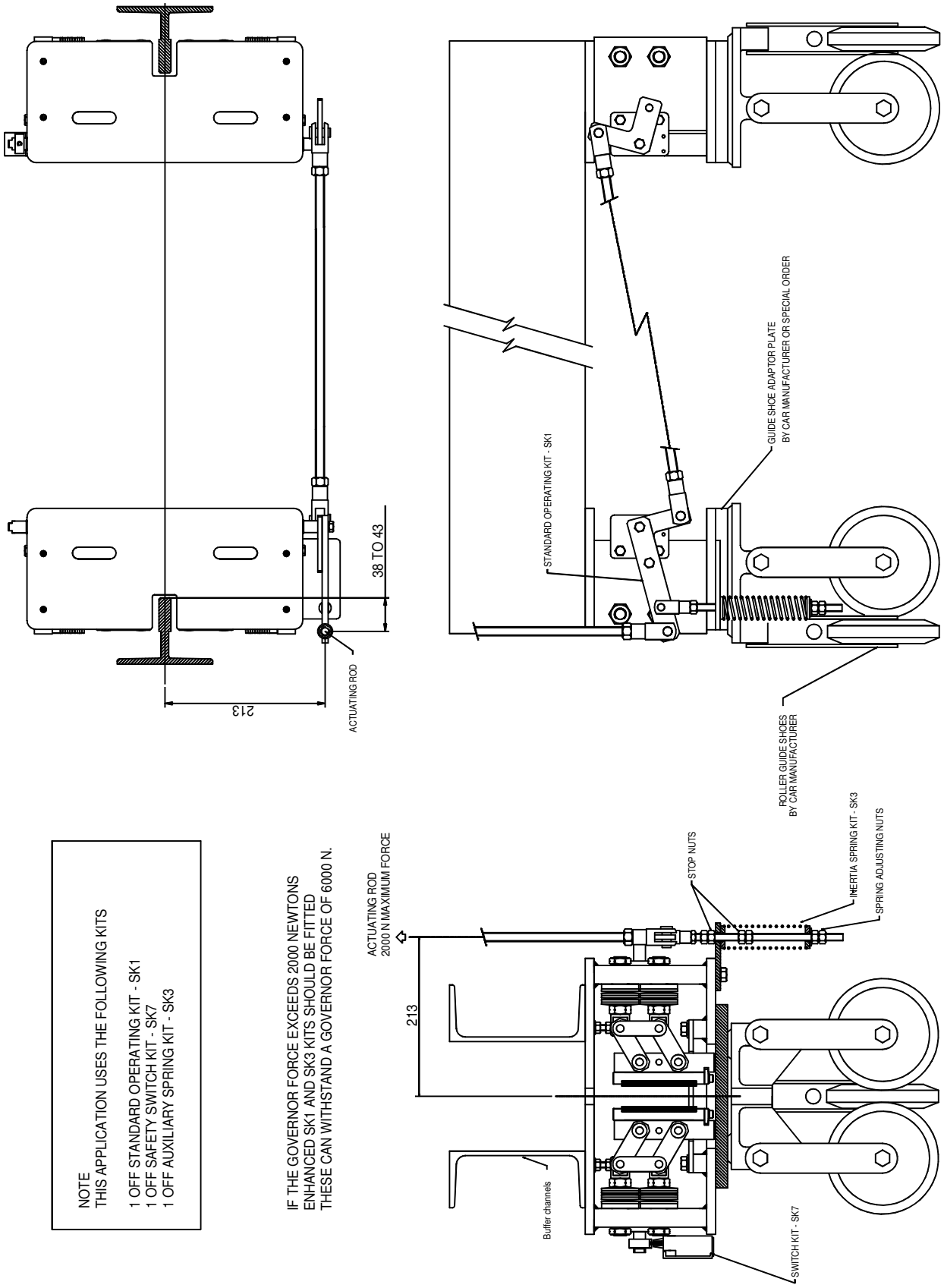


Figure TD1.4 Dual acting safety gears - indirect connection - Year 2010 - Issue E

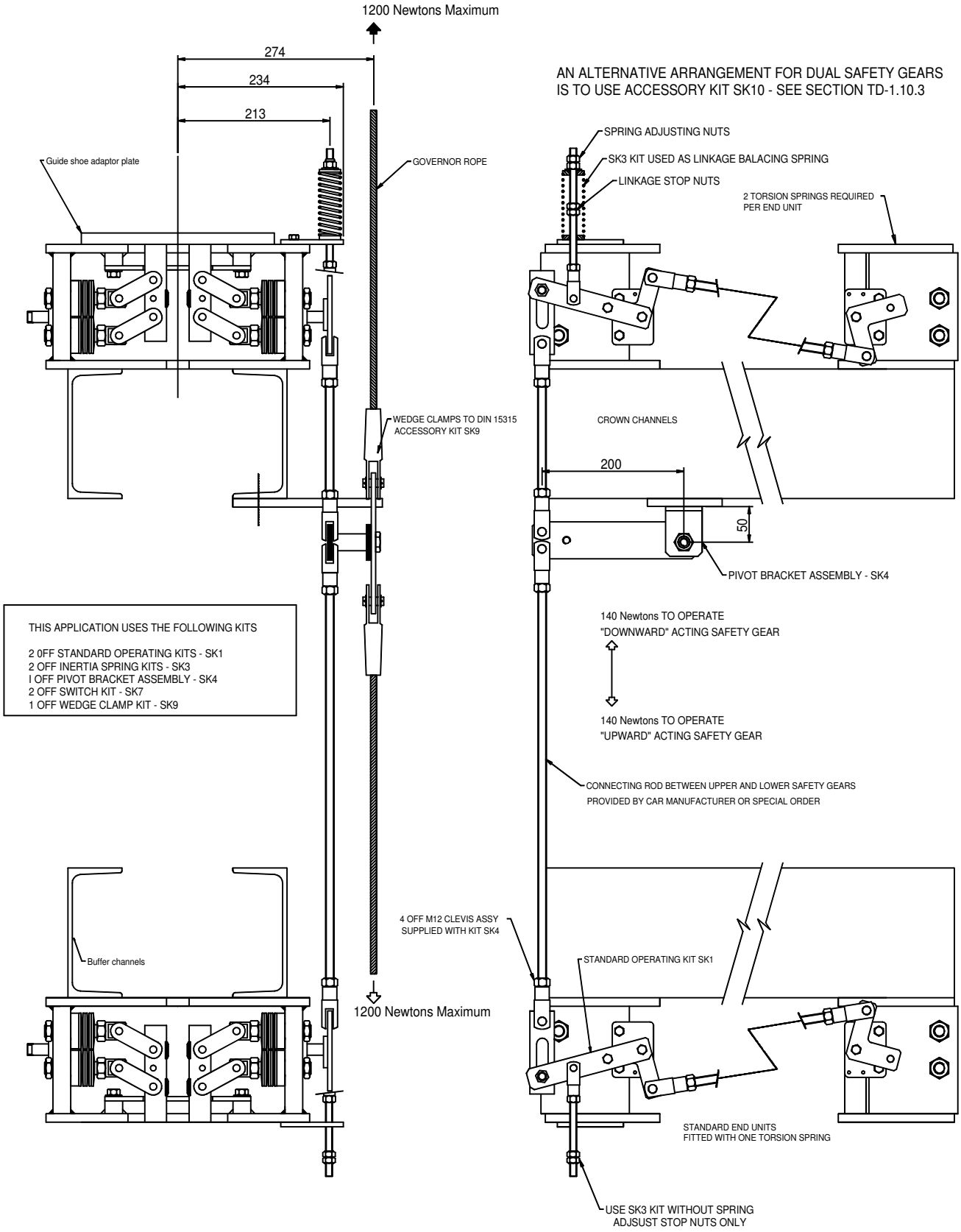


Figure TD1.4 Dual acting safety gears - indirect connection - Year 2010 - Issue E – sheet 2

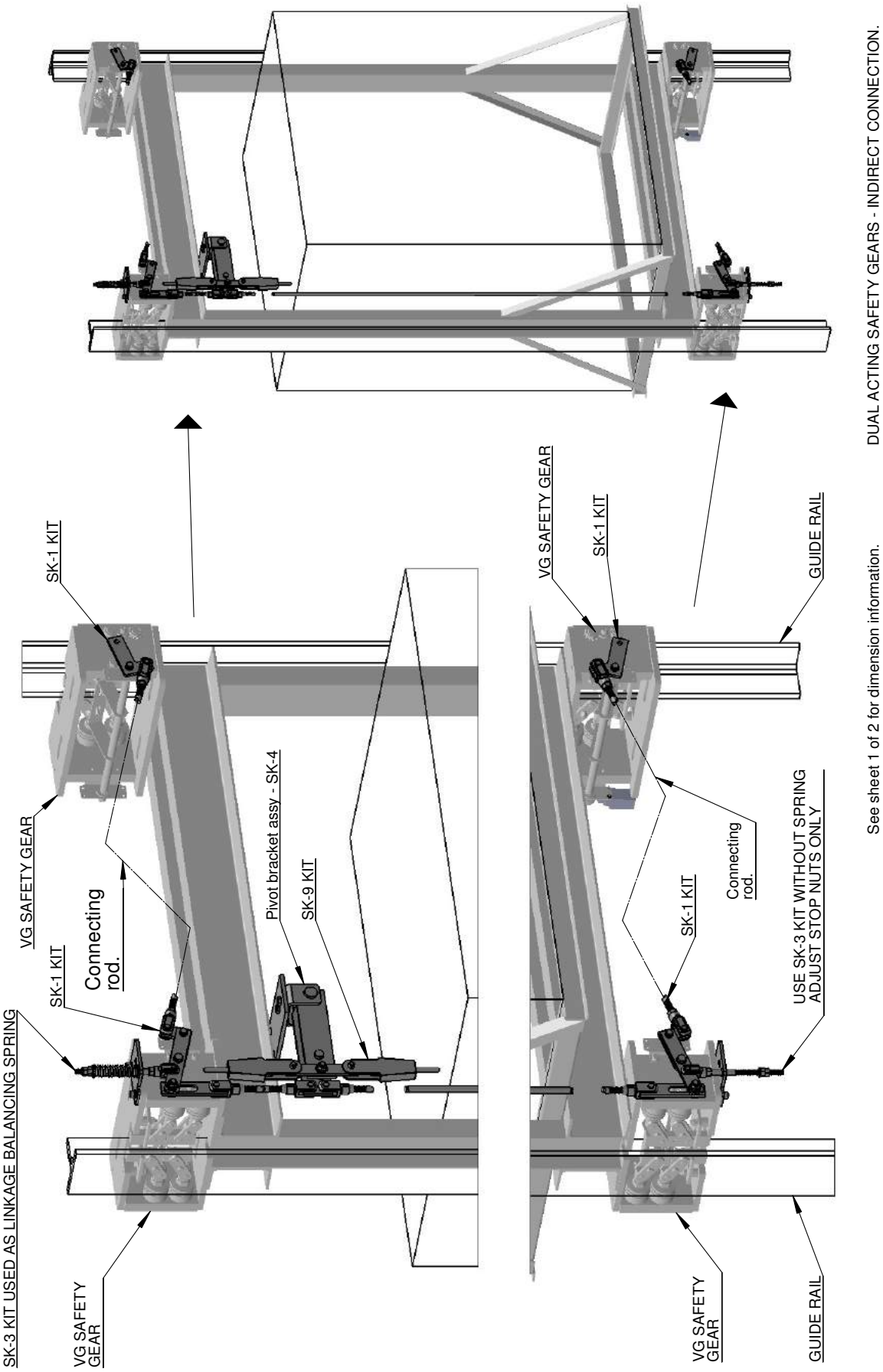


Figure TD1.4.1 Duplex Dual Acting Safety Gears - Indirect connection - Year 2010 - Issue B

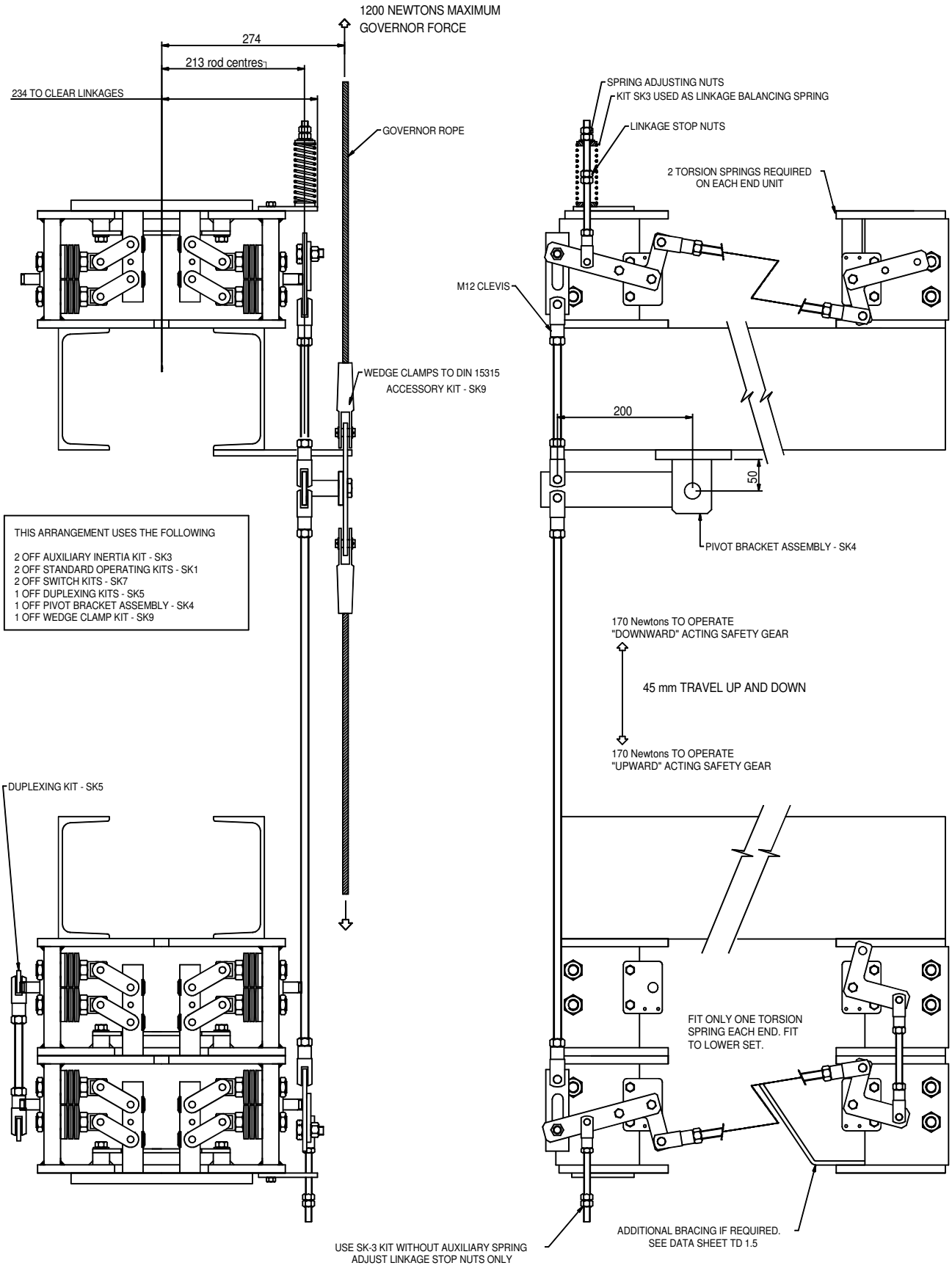


Figure TD1.4.1 Duplex Dual Acting Safety Gears - Indirect connection - Year 2010 - Issue B – sheet 2

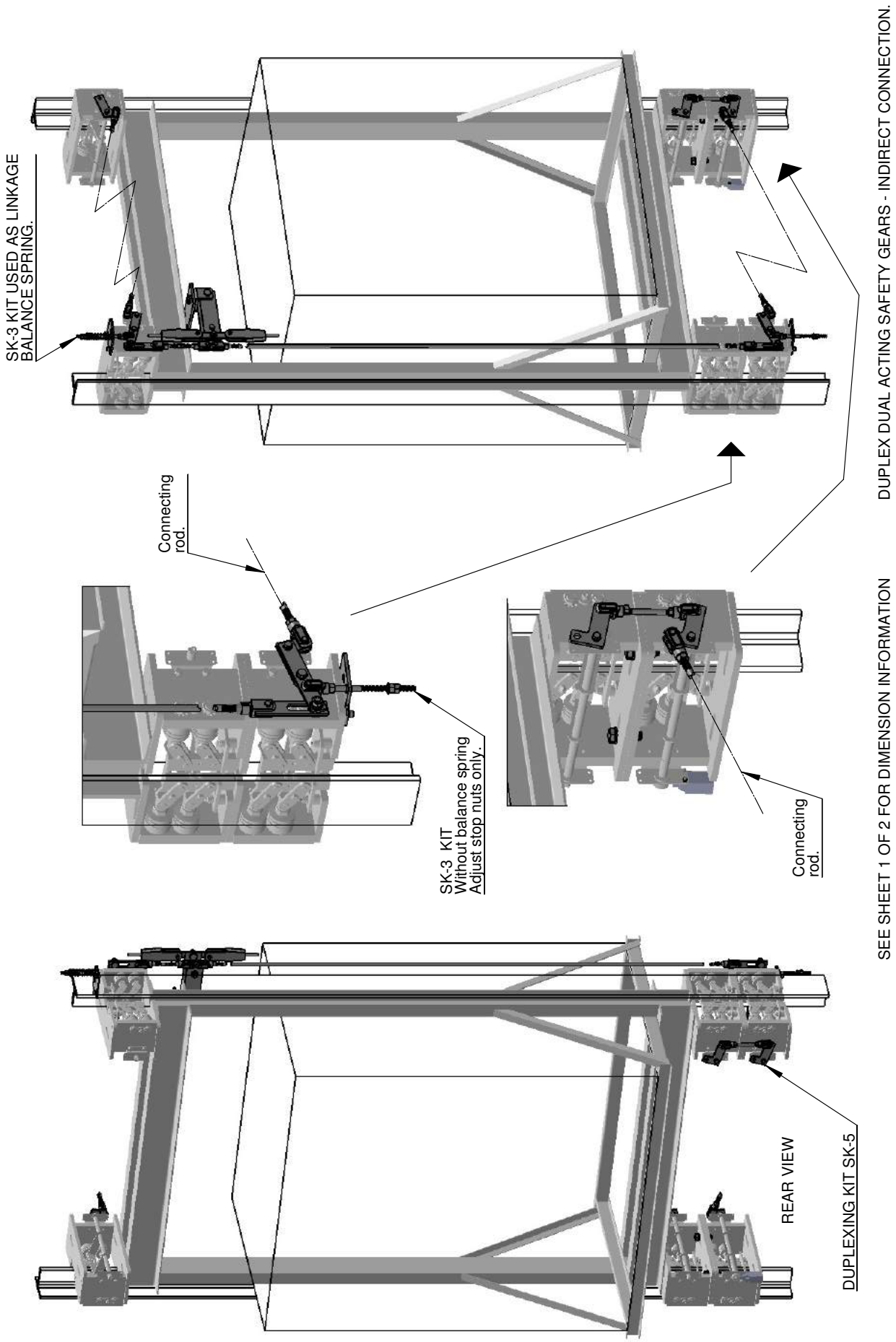


Figure TD1.4.2 Duplex dual acting safety gears - direct connection - Year 2011 - Issue A

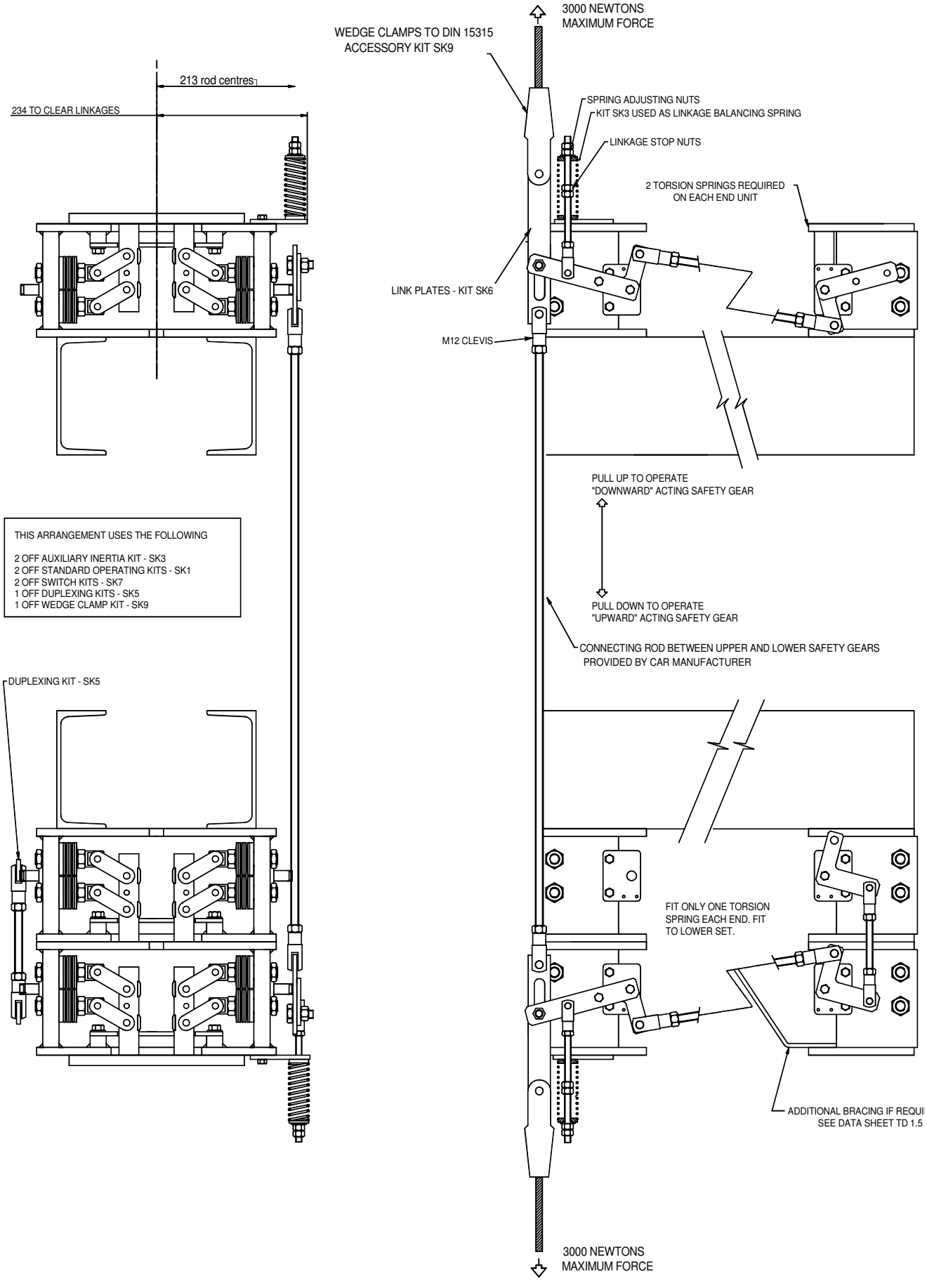


Figure TD1.4.2 Duplex dual acting safety gears - direct connection - Year 2011 - Issue A – sheet 2

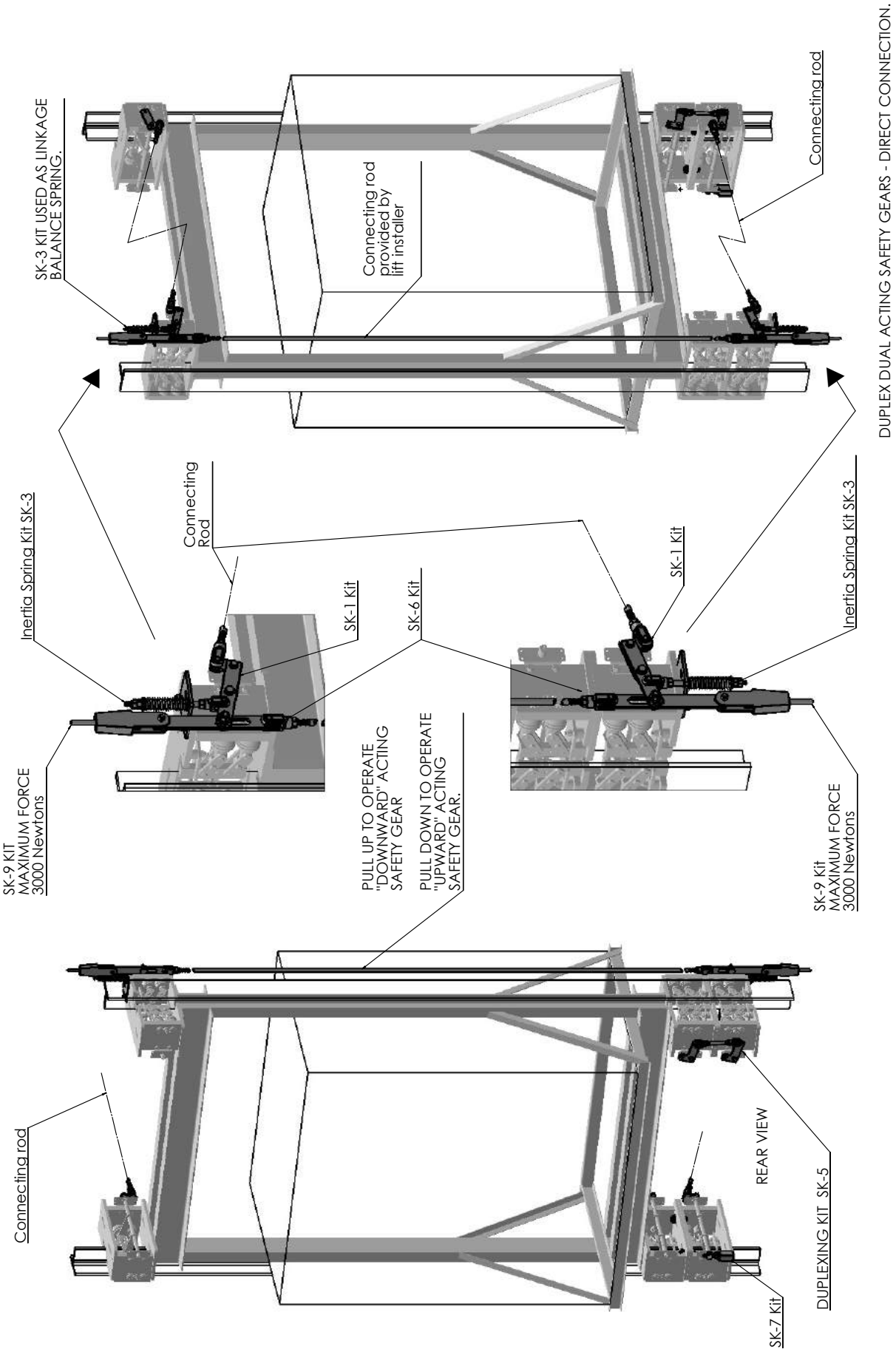


Figure TD1.5 Duplex Operation - Kit SK5 - Year 2011 - Issue C

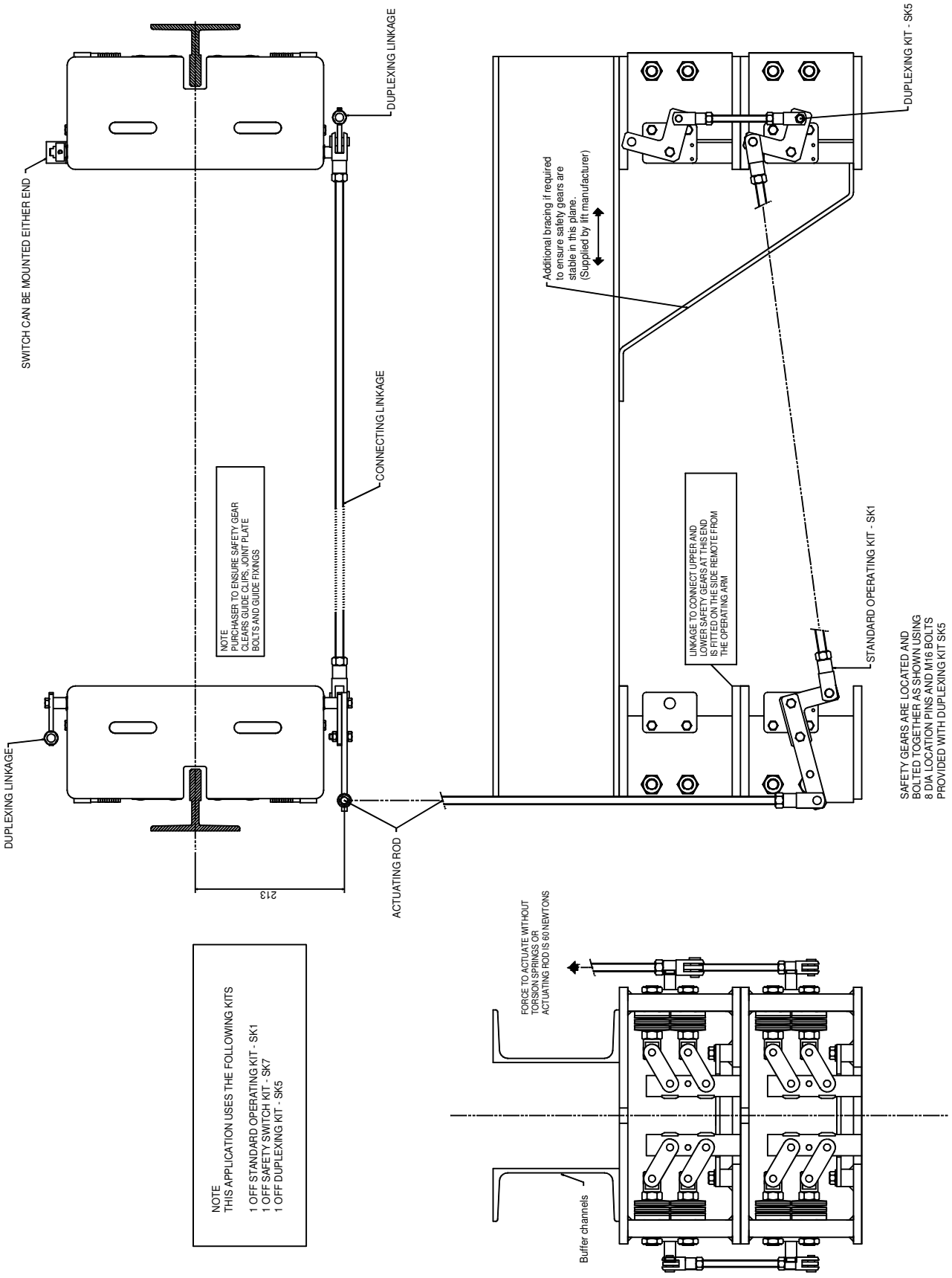


Figure TD1.6 Dual acting safety gear - direct connection - Year 2011 - Issue F

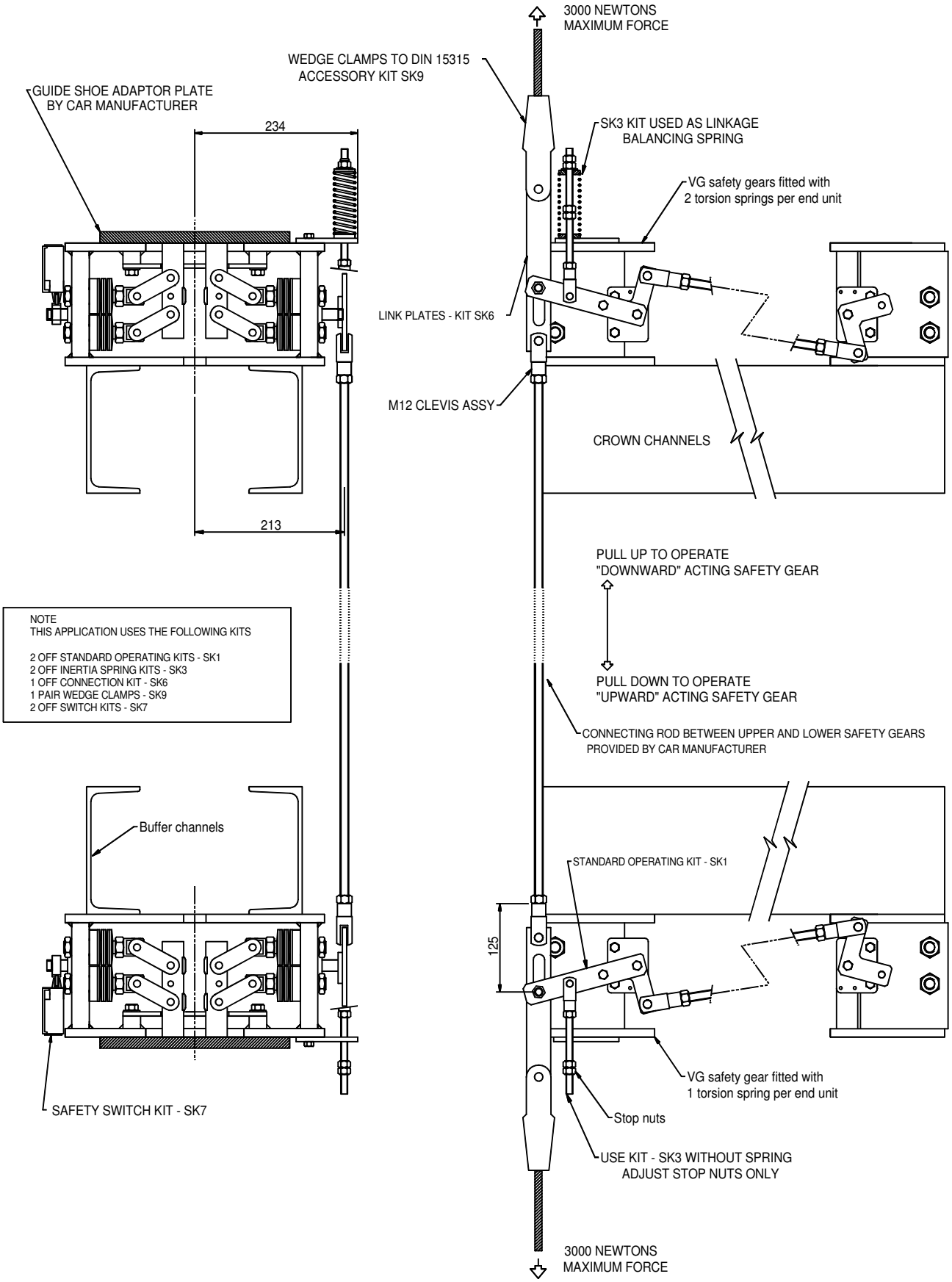
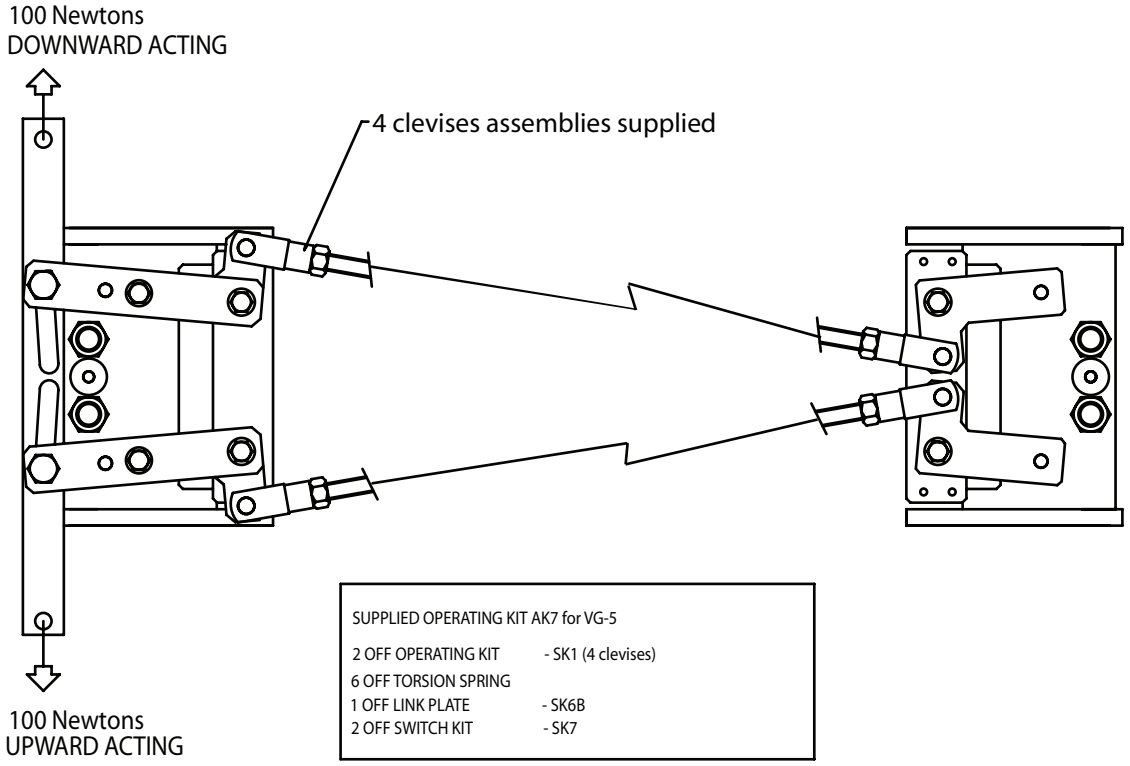
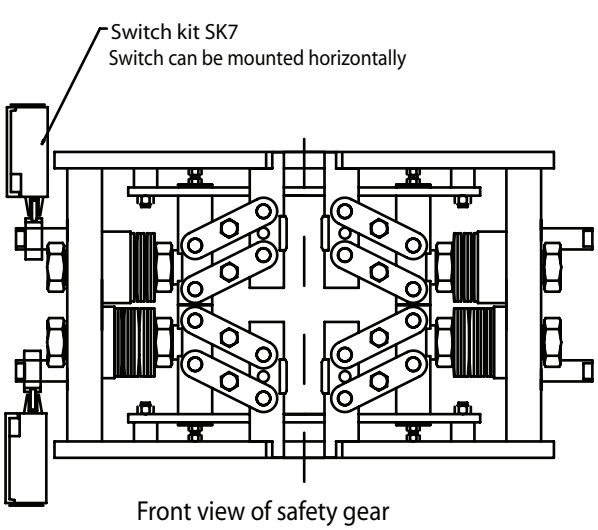
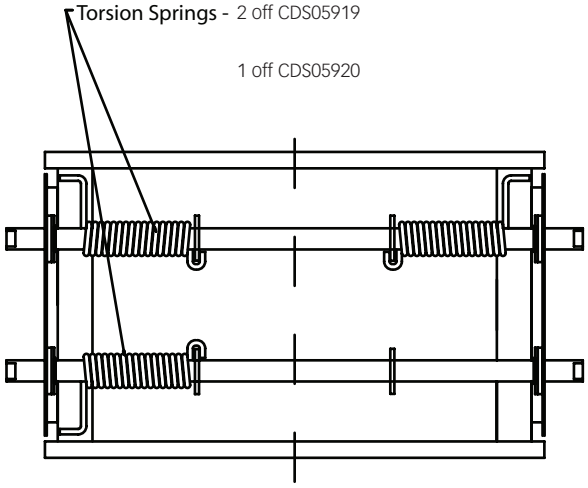


Figure TD1.7 VG-5 Bi-directional safety gear - Year 2002 - Issue E





Front view of safety gear



Rear view of safety gear

NOTE!

The VG-5 is fitted with integral inertia springs as illustrated. These have been designed to provide a 100 Newtons force at the operating linkage. This force is used to overcome governor system inertia. EN-81 requires the governor to generate a minimum force of 300 Newtons. The integral inertia springs are suitable for lift travels up to 50 metres when used with kit SK10

Figure TD1.7.1 VG5 with bi-directional Kit SK10 - Year 2004 - Issue D

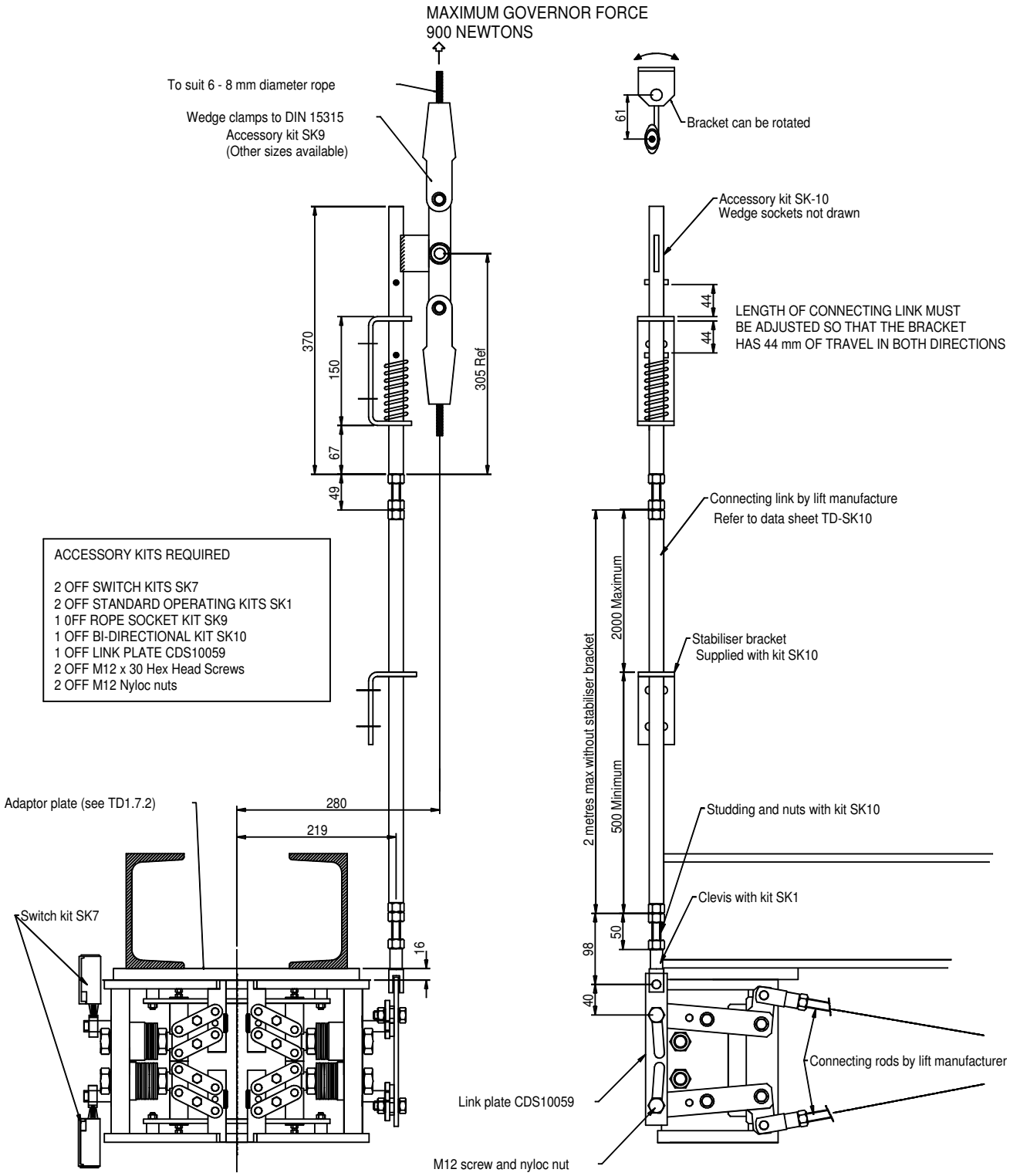
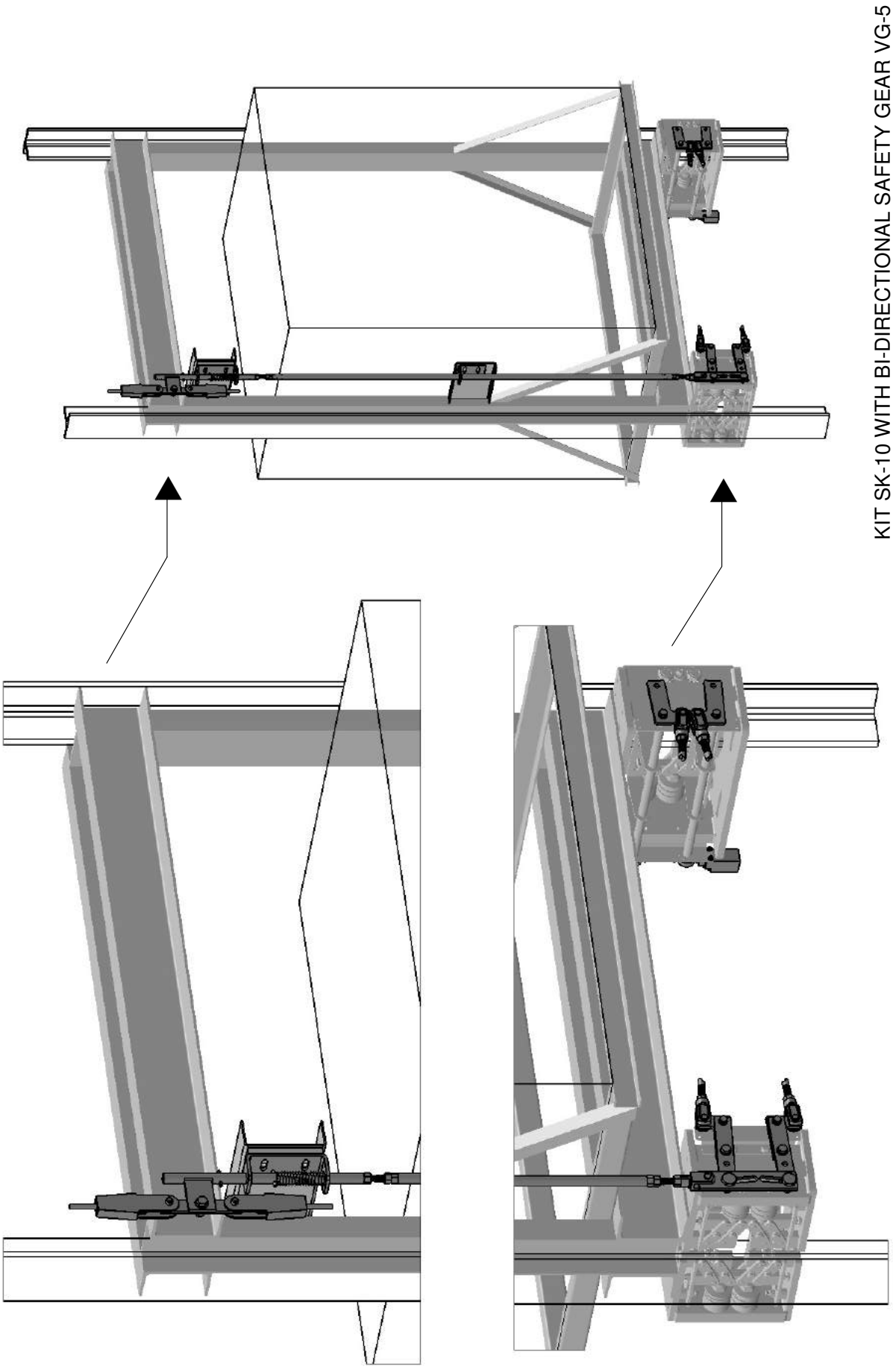
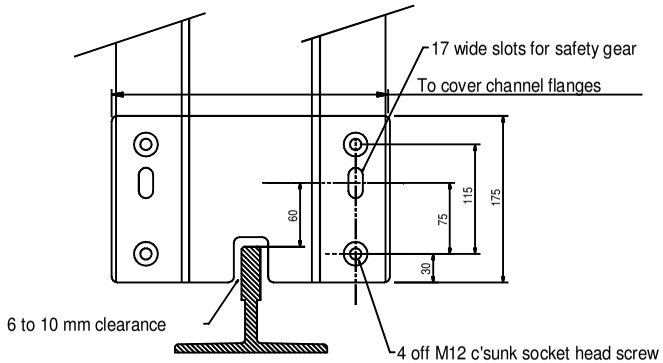


Figure TD1.7.1 VG5 with bi-directional Kit SK10 - Year 2004 - Issue D – sheet 2





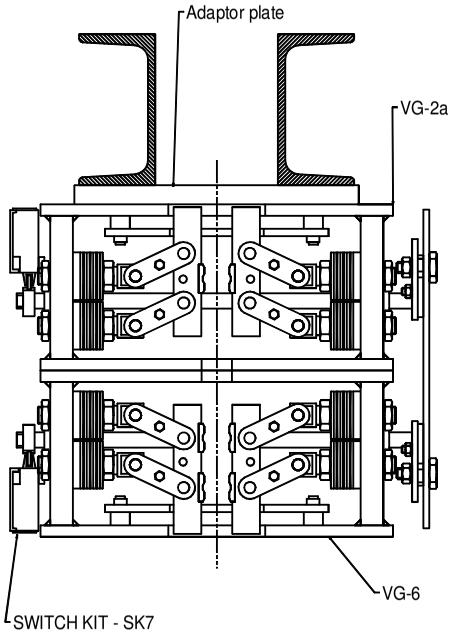
RECOMMENDED DESIGN OF ADAPTOR PLATE

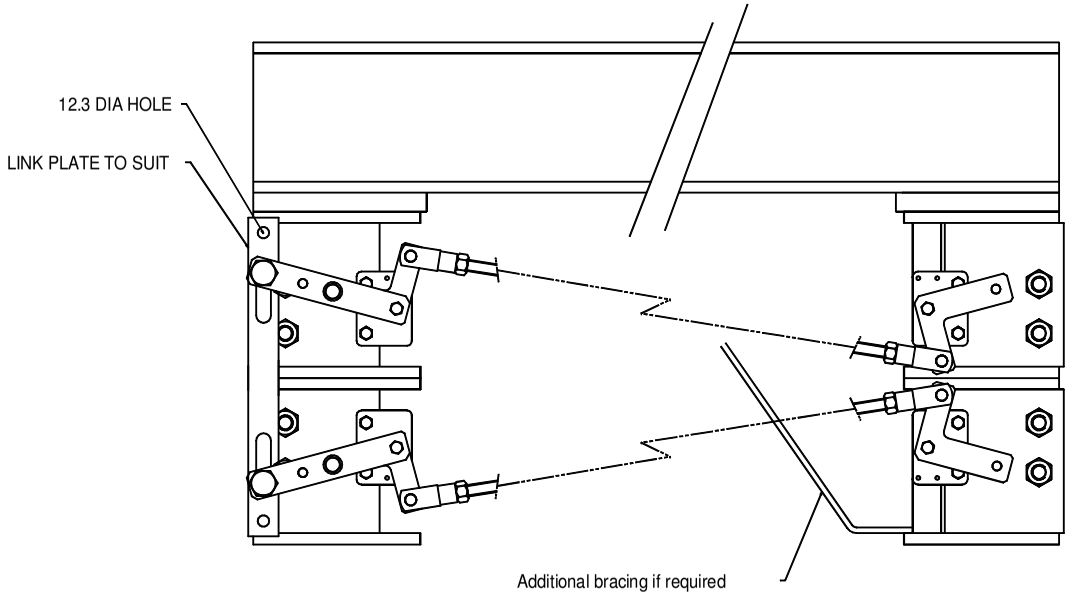
Notes

When combining safety gears beneath the lift car ensure that an adaptor plate 16 mm thick is fitted between the buffer channels and the safety gear to strengthen the channel flanges as per data sheet TD-2.1

A minimum of 4 fixings should be provided to secure the adaptor plate to the buffer channels using M12 countersunk screws as illustrated. Additional bracing may be required to stabilise the end units.

It is recommended that the inverted VG-2a safety gear is strengthened as per data sheet TD-2.1





SUITABLE FOR A MAXIMUM (P+Q) OF 4500 kg
PLEASE SEEK ADVICE AT HIGHER LOADS

CONNECTION KIT AK7 for COMBINED SAFETY GEARS
2 OFF STANDARD OPERATING KIT - SK1
1 OFF COMBINED ACTUATING KIT - SK6C
2 OFF SWITCH KIT - SK7

Figure TD1.8 Special Four guide rail lift - Year 2011 - Issue E

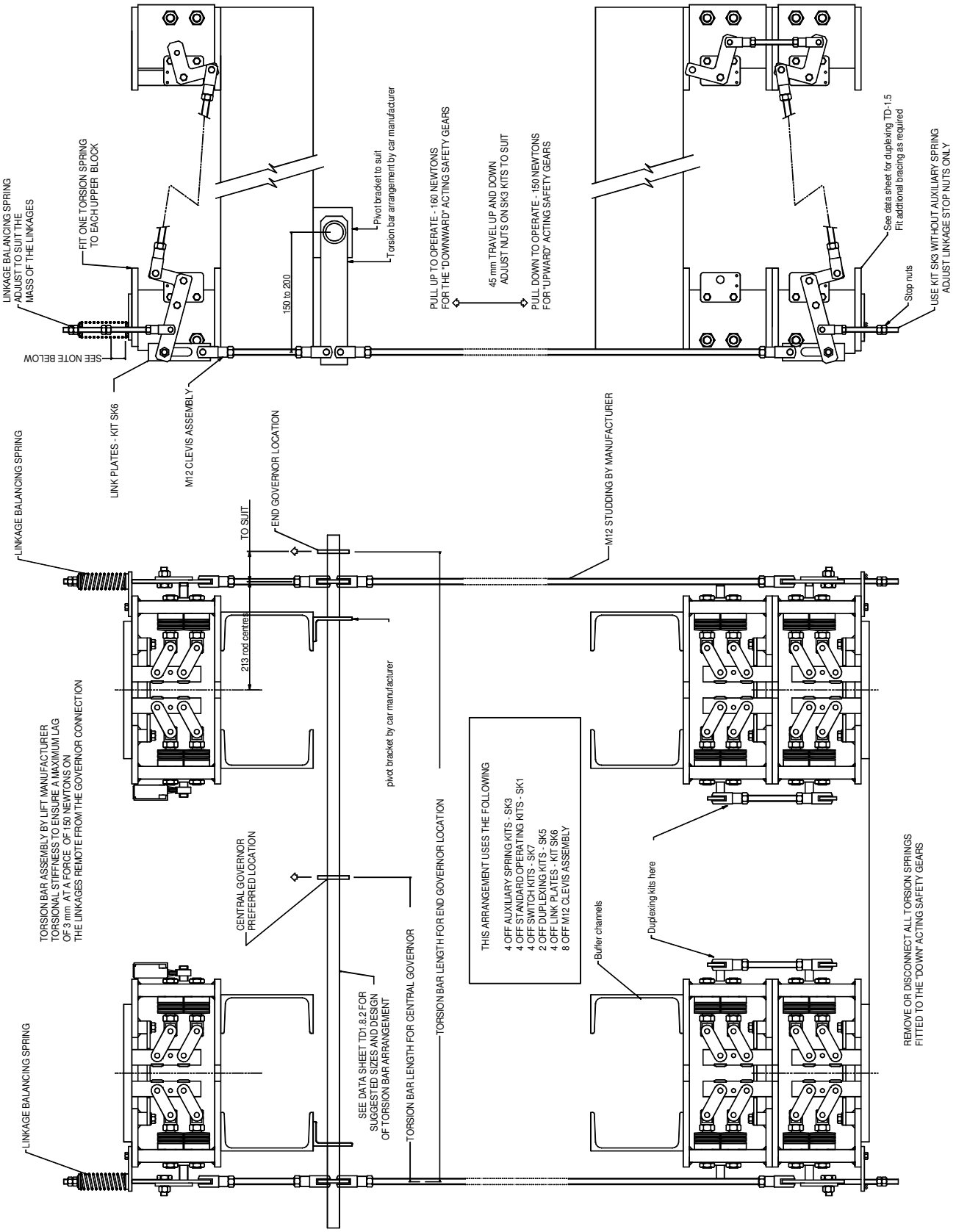


Figure TD1.8.1 Special Four guide rail lift - General layout - Year 2011 - Issue C

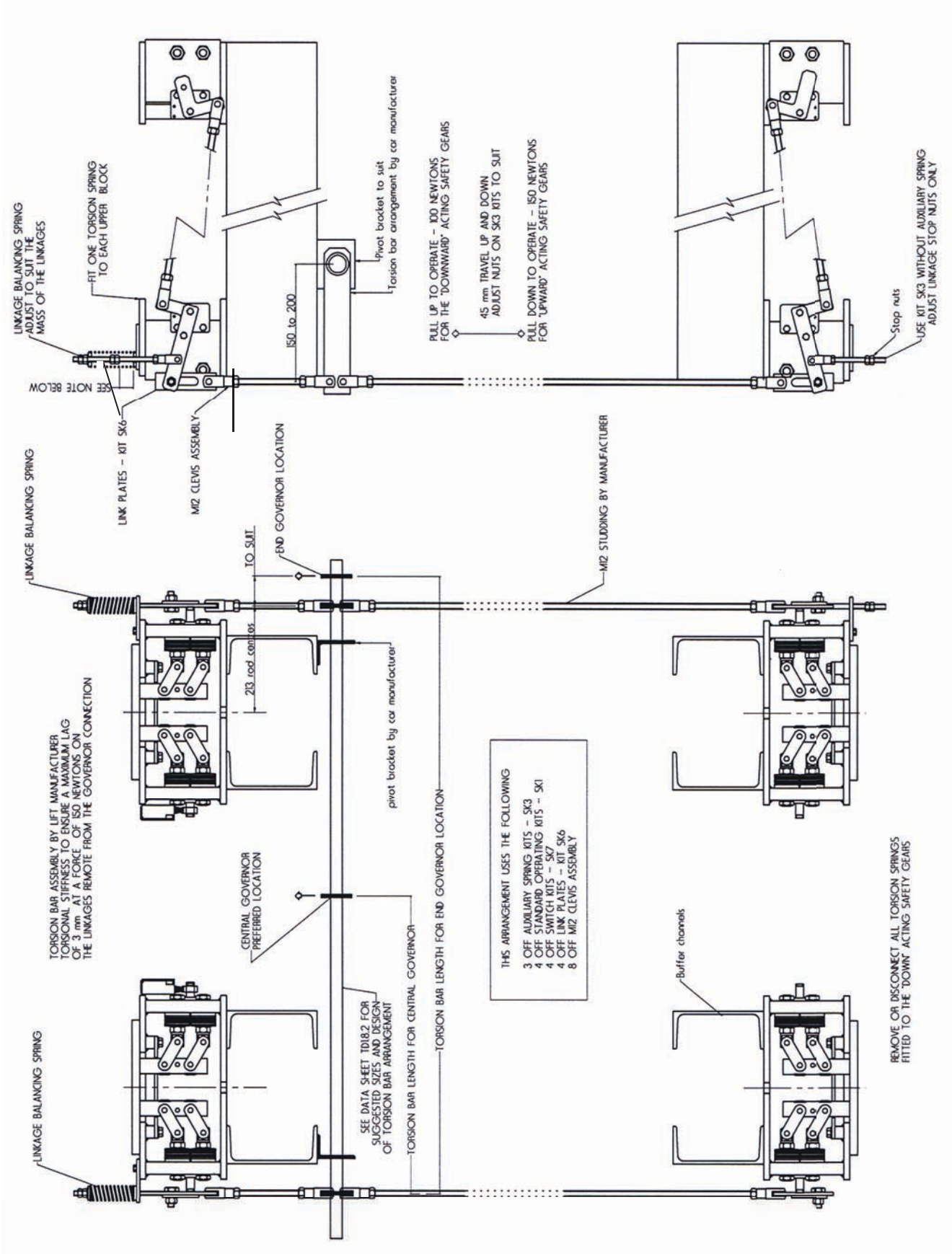


Figure TD1.8.4 Special Four guide rail lift - General layout - Year 2010 - Issue A

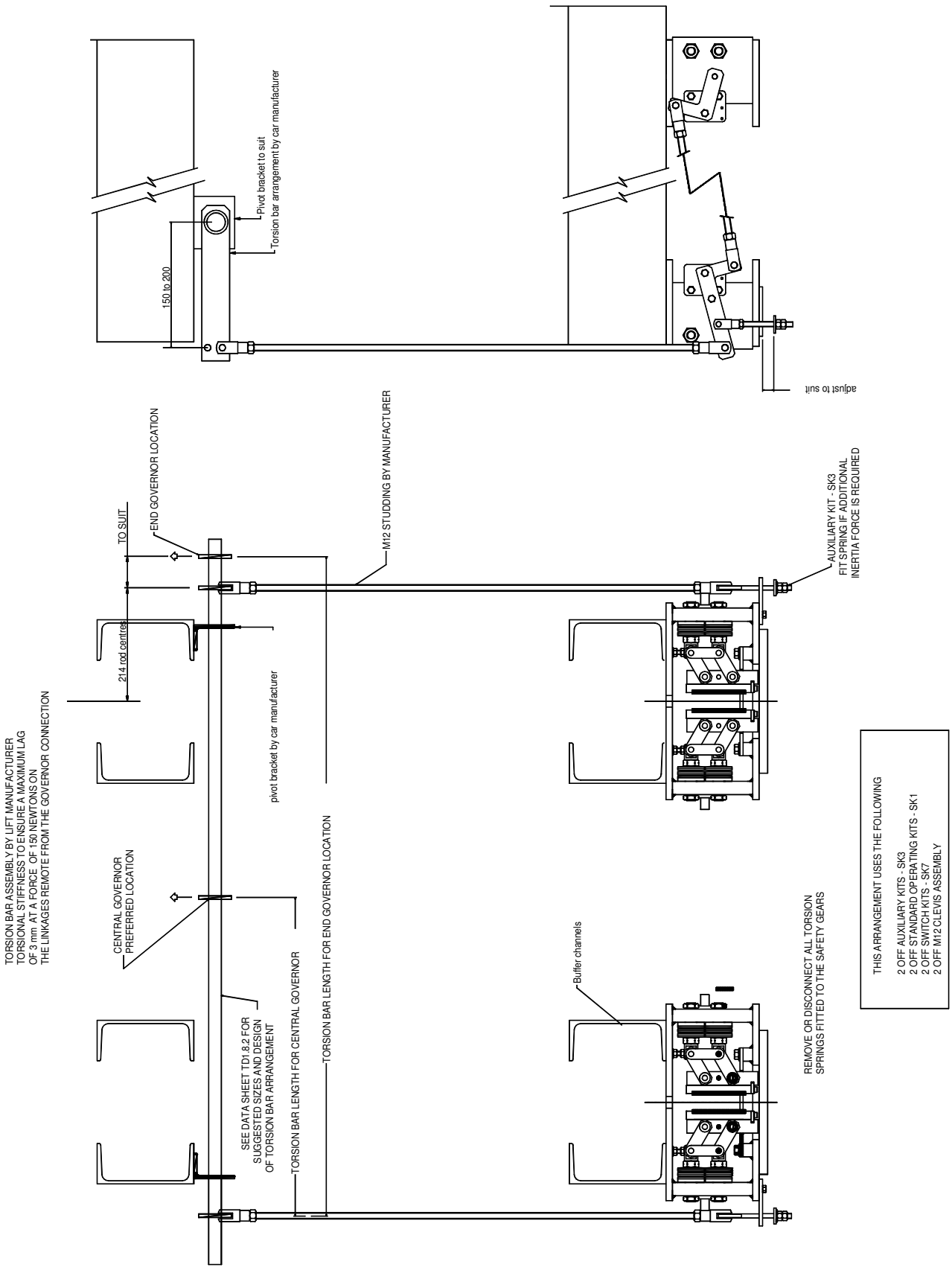


Figure TD1.9 Friction type Governor Forces - Year 2010 - Issue E

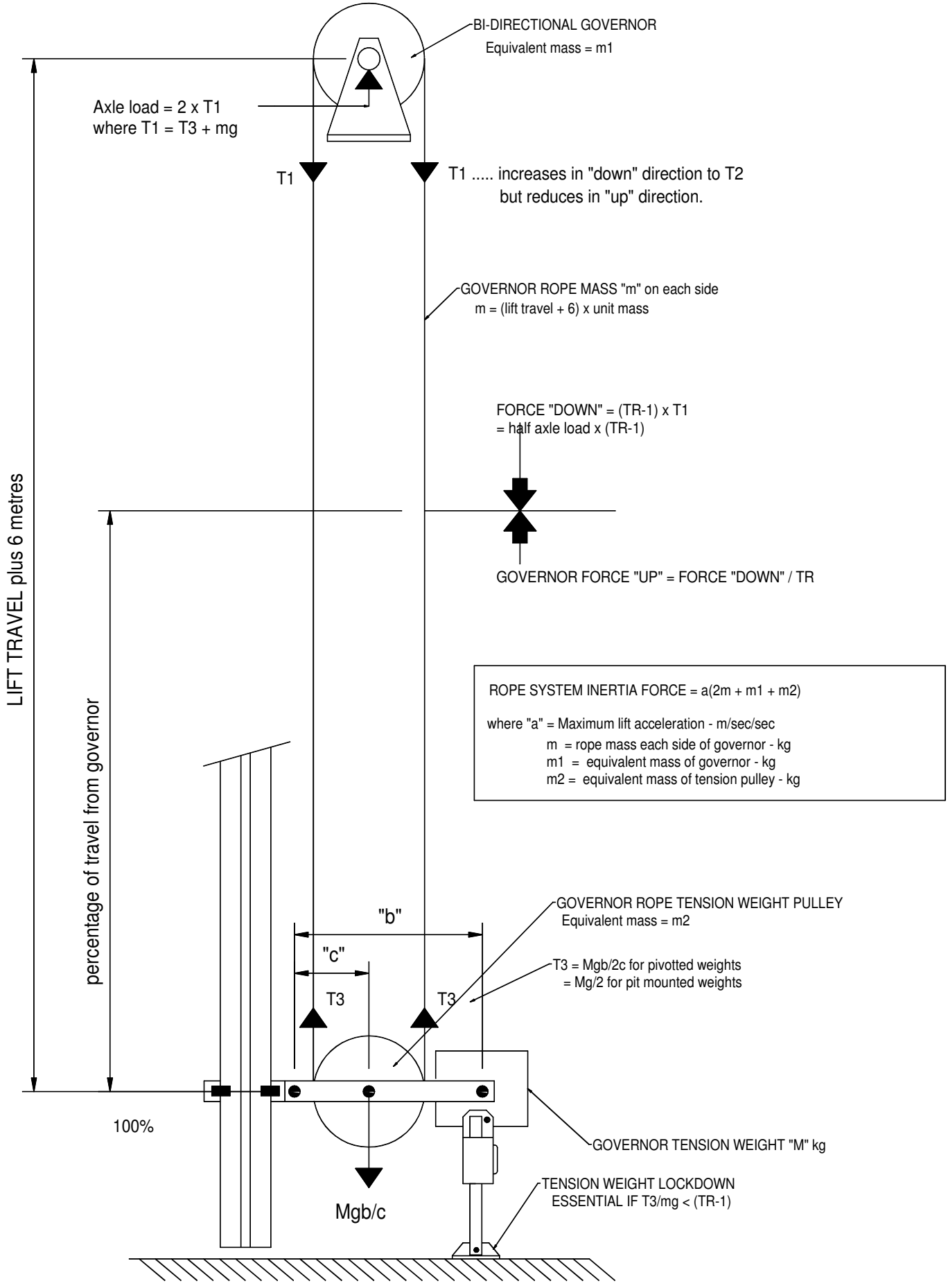


Figure TD1.9.6 VG Governor and Safety Gear – Forces with Kit SK10 – Year 2010 – Issue A

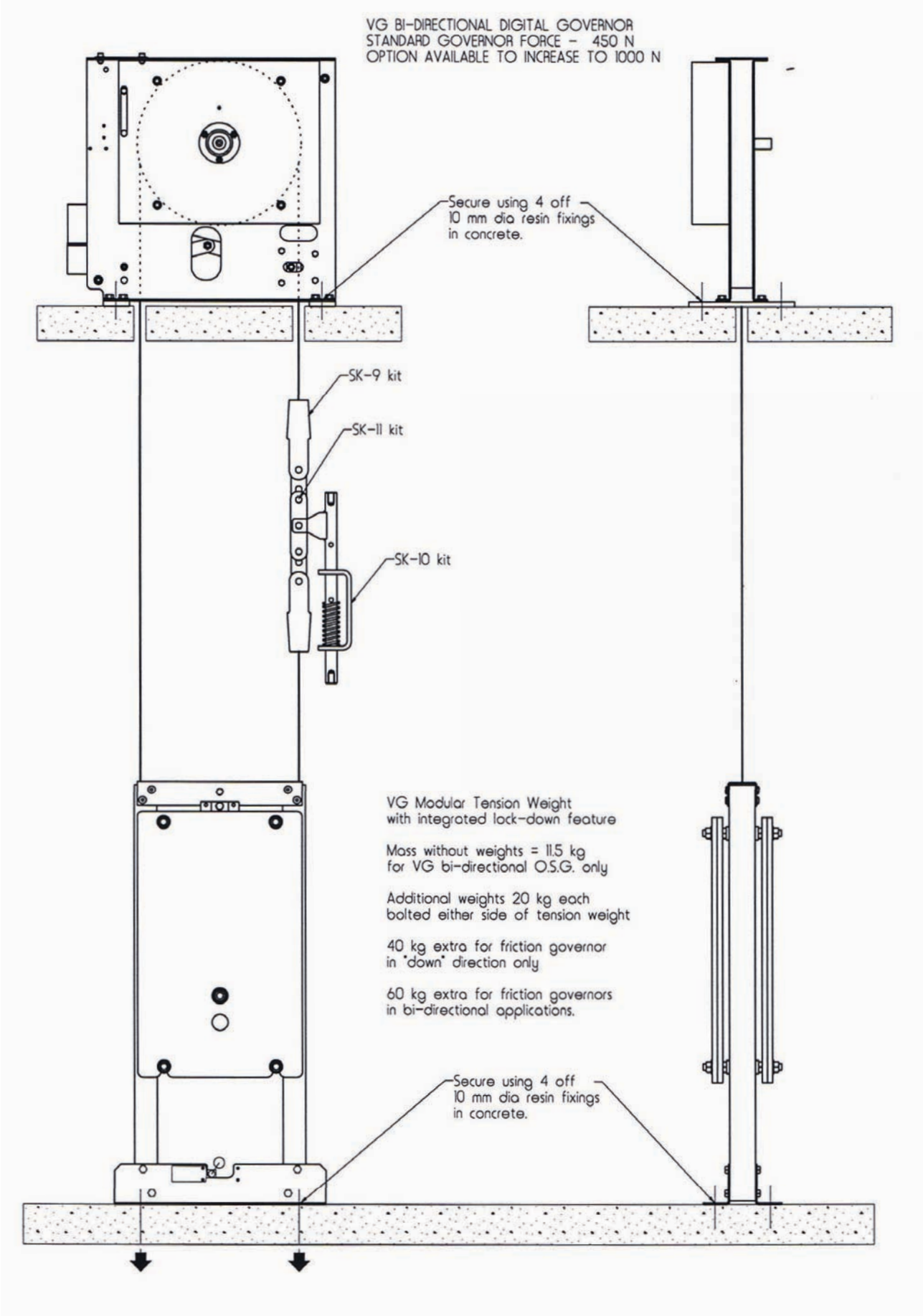


Figure TD1.10.1 Kit SK10 for combined VG-2a and VG-6 safety gears - Year 2011 - Issue F

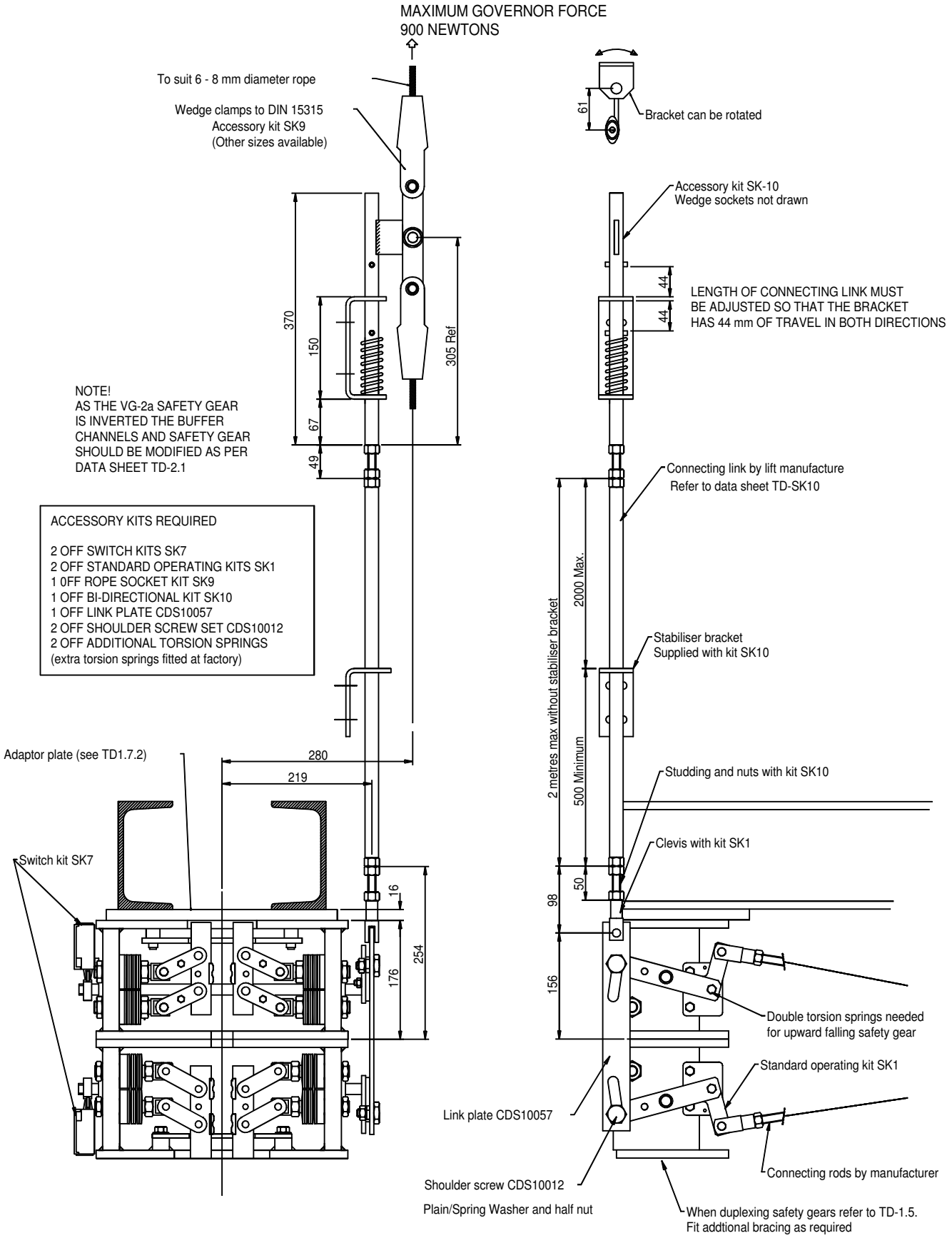


Figure TD1.10.1 Kit SK10 for combined VG-2a and VG-6 safety gears - Year 2011 - Issue A – sheet 2

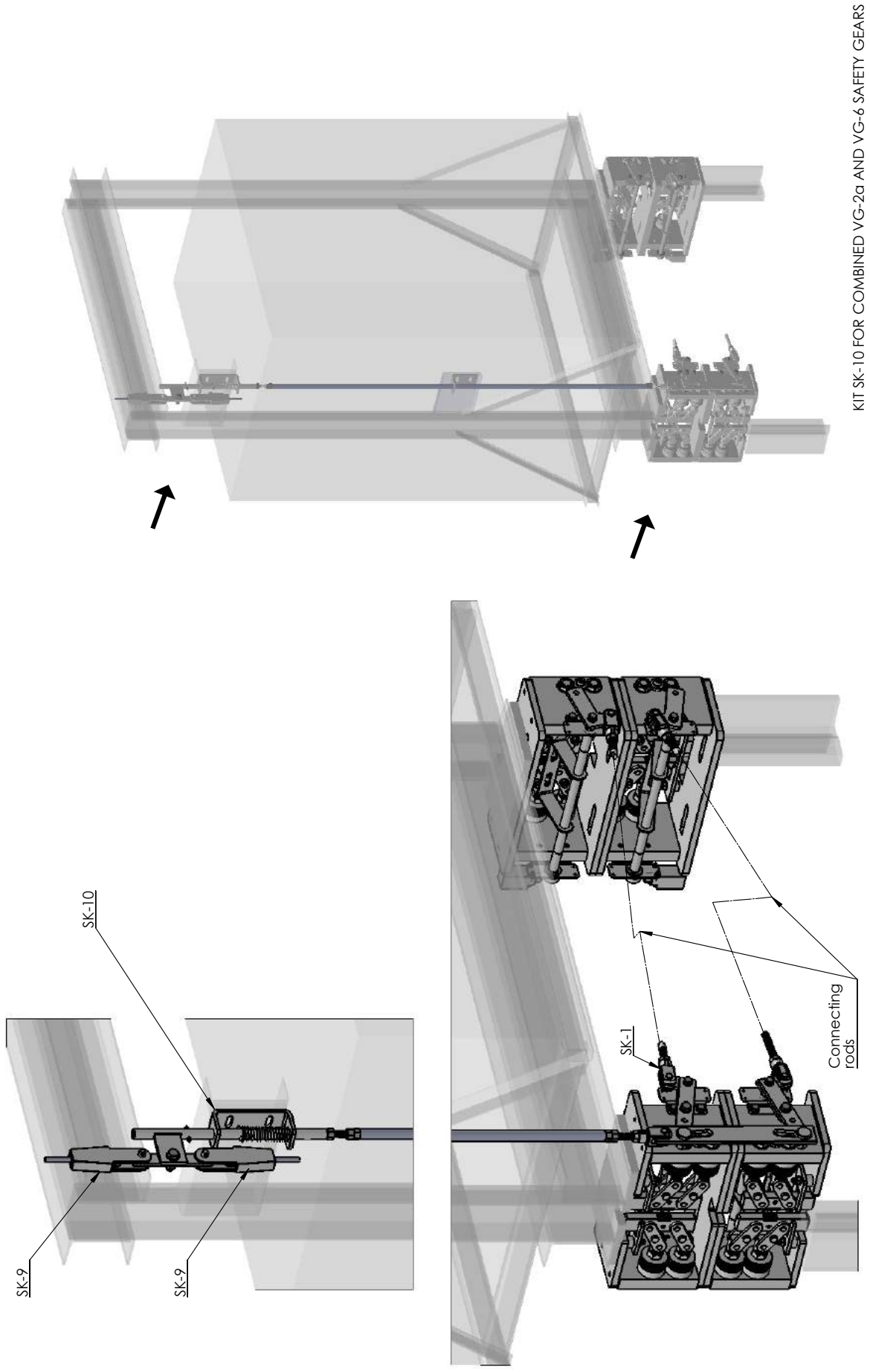


Figure TD1.10.3 Kit SK10 with dual acting safety gears - Year 2005 - Issue F

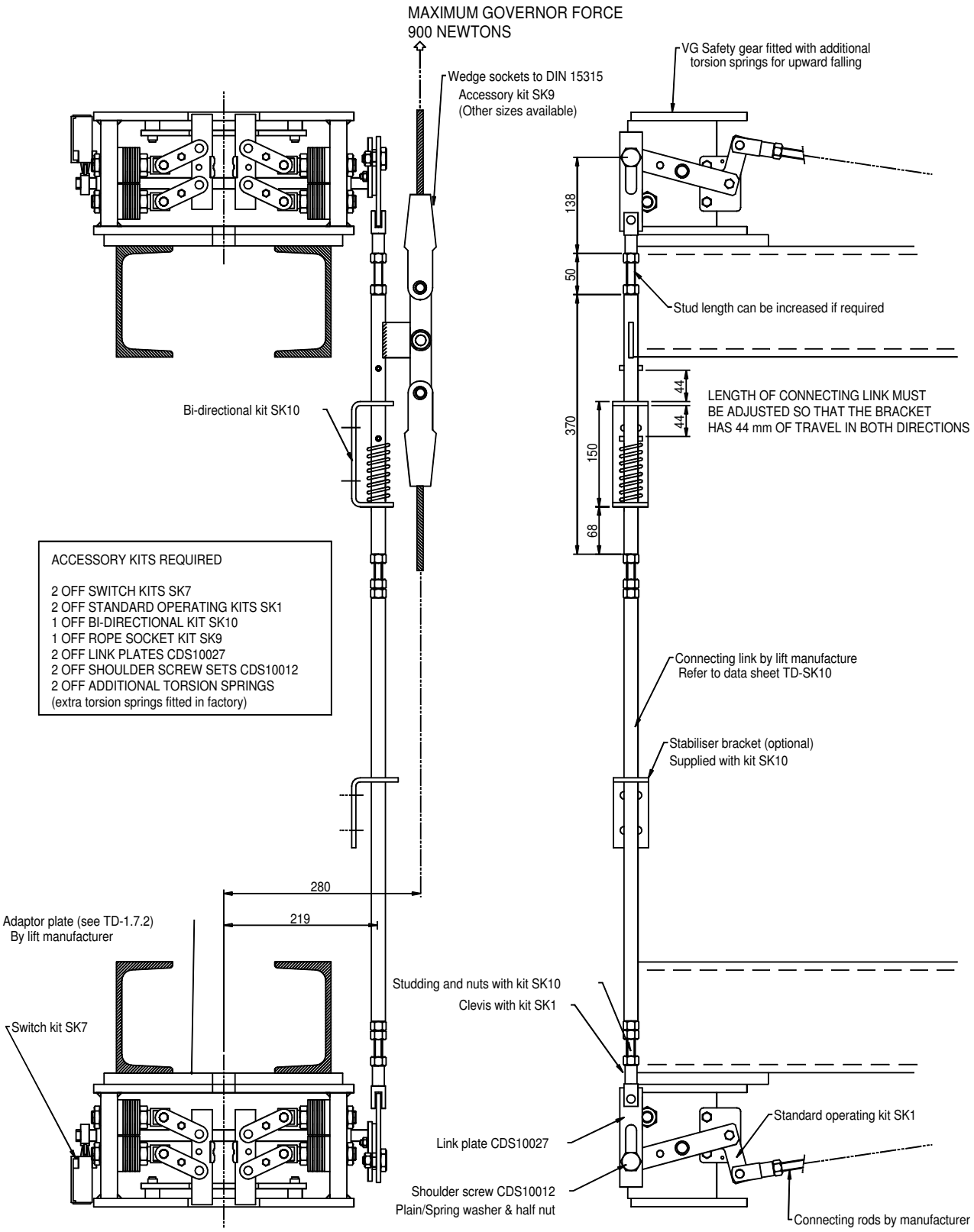


Figure TD1.10.3 Kit SK10 with dual acting safety gears - Year 2005 - Issue F – sheet 2

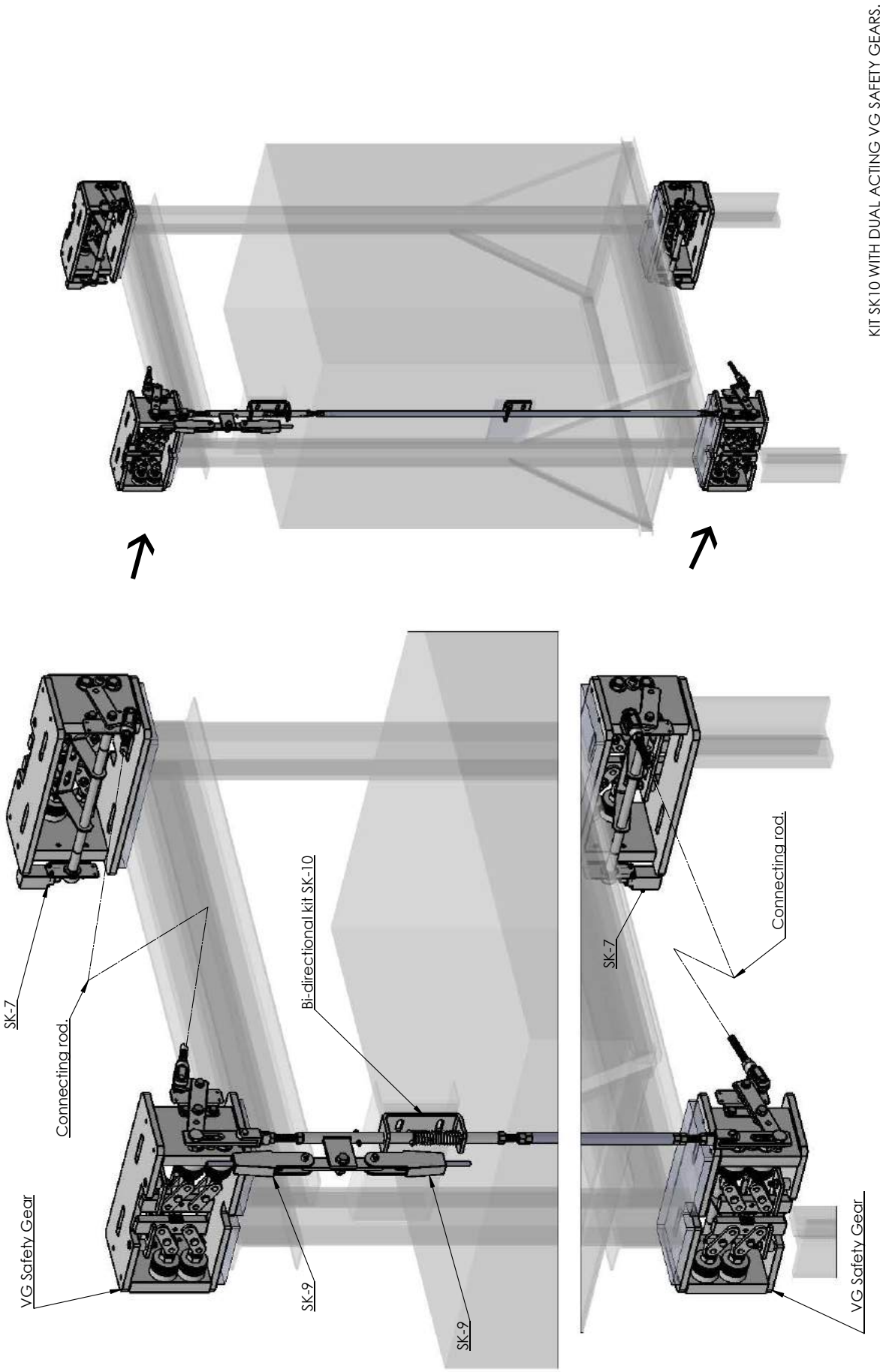
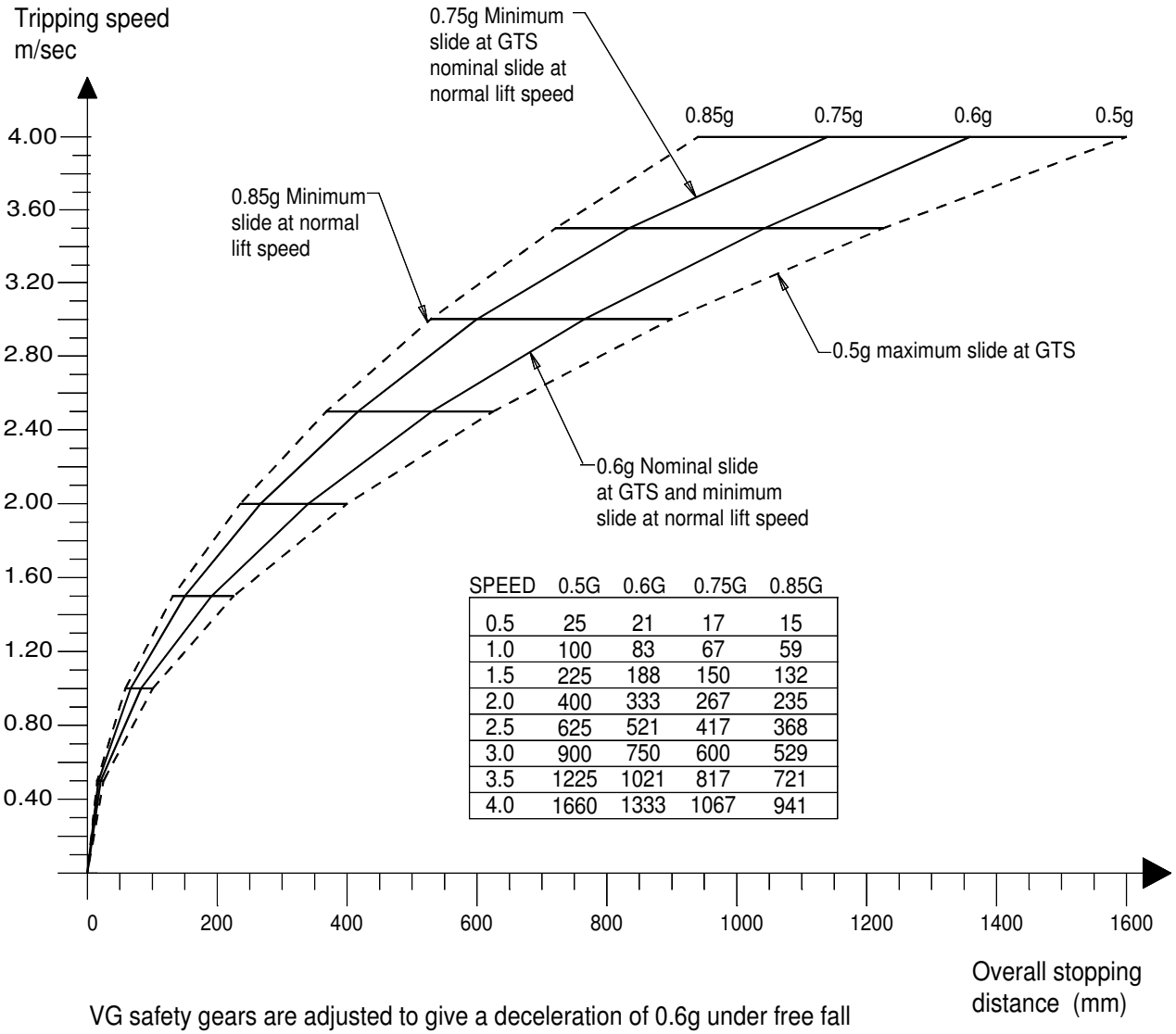


Figure TD2.8 Tripping Speed versus Braking Distance - Year 2011 – issue A



SPEED	0.5G	0.6G	0.75G	0.85G
0.5	25	21	17	15
1.0	100	83	67	59
1.5	225	188	150	132
2.0	400	333	267	235
2.5	625	521	417	368
3.0	900	750	600	529
3.5	1225	1021	817	721
4.0	1660	1333	1067	941

VG safety gears are adjusted to give a deceleration of 0.6g under free fall conditions at the maximum governor tripping speed.(GTS) The above graphs give the braking distance of the safety gear for different deceleration rates and test speeds.

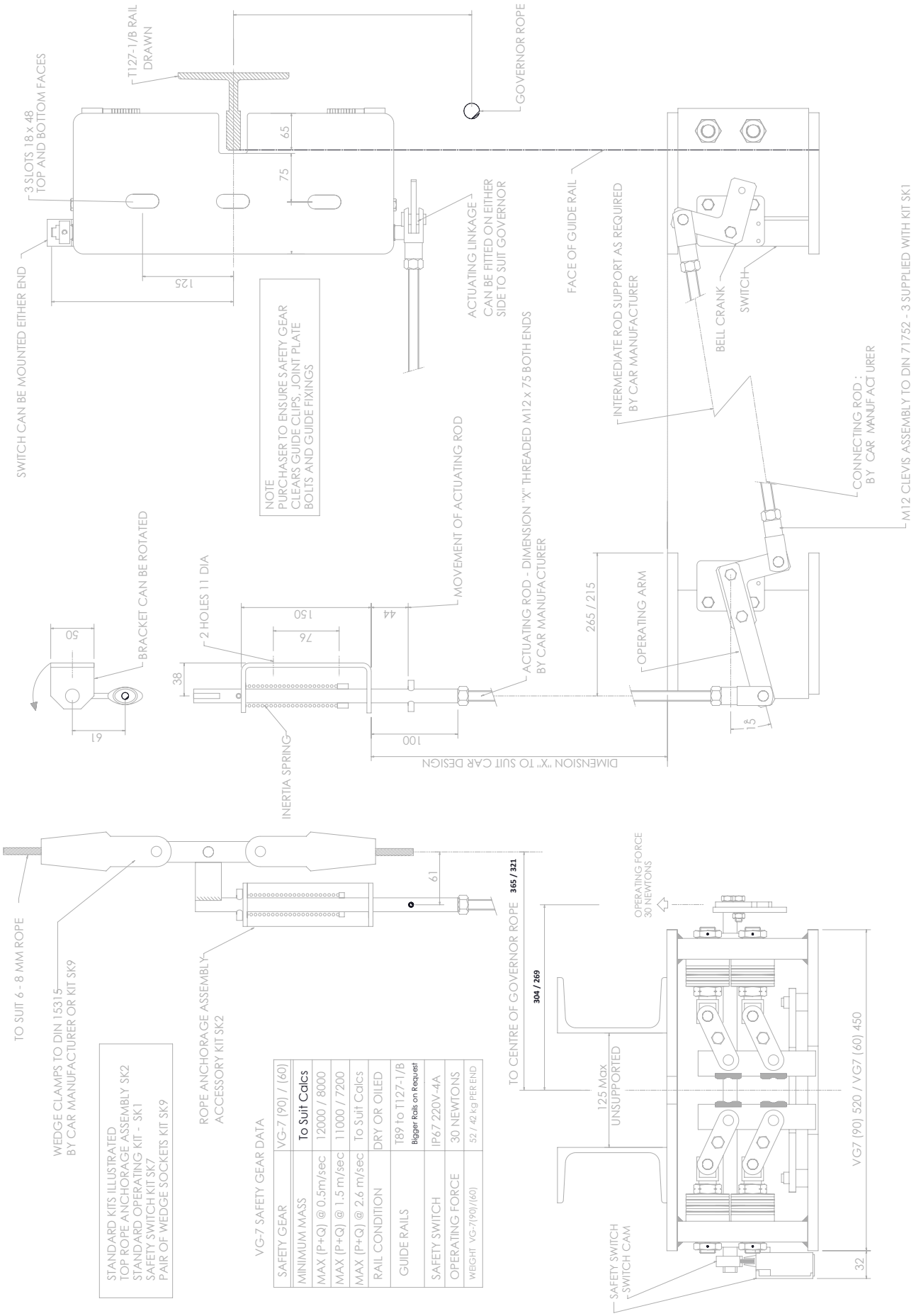
When the safety gear is tested at a lower speed with the counterweight attached an allowance must be made for the enhanced braking effect due to the different test speed.

To compensate for the effect of the counterweight, the test load must be 125% of the contract load

Due to the enhanced braking effect of progressive safety gears, the deceleration will increase to around 0.75g when tested at the normal lift speed.

For more accurate information and a worked example, please refer to technical dossier TD-2.8 and its computer programme TD-2.8

Figure TD7.2 Outline Dimensions A



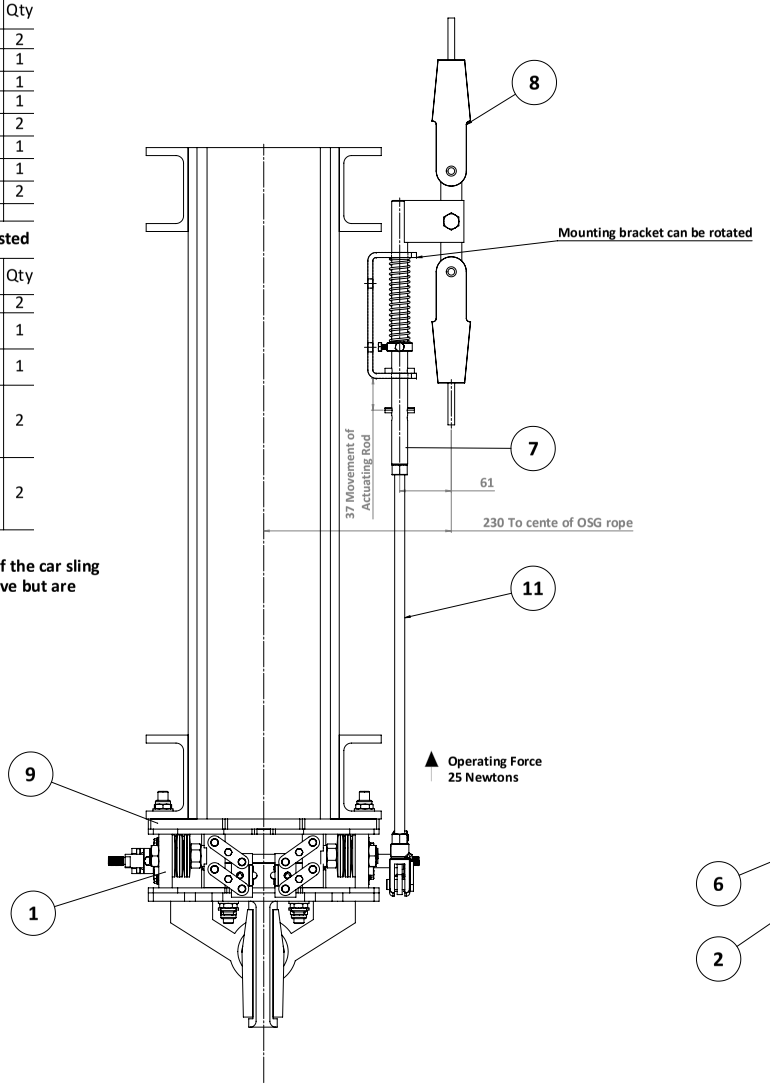
Items Supplied With Application TD-8.3

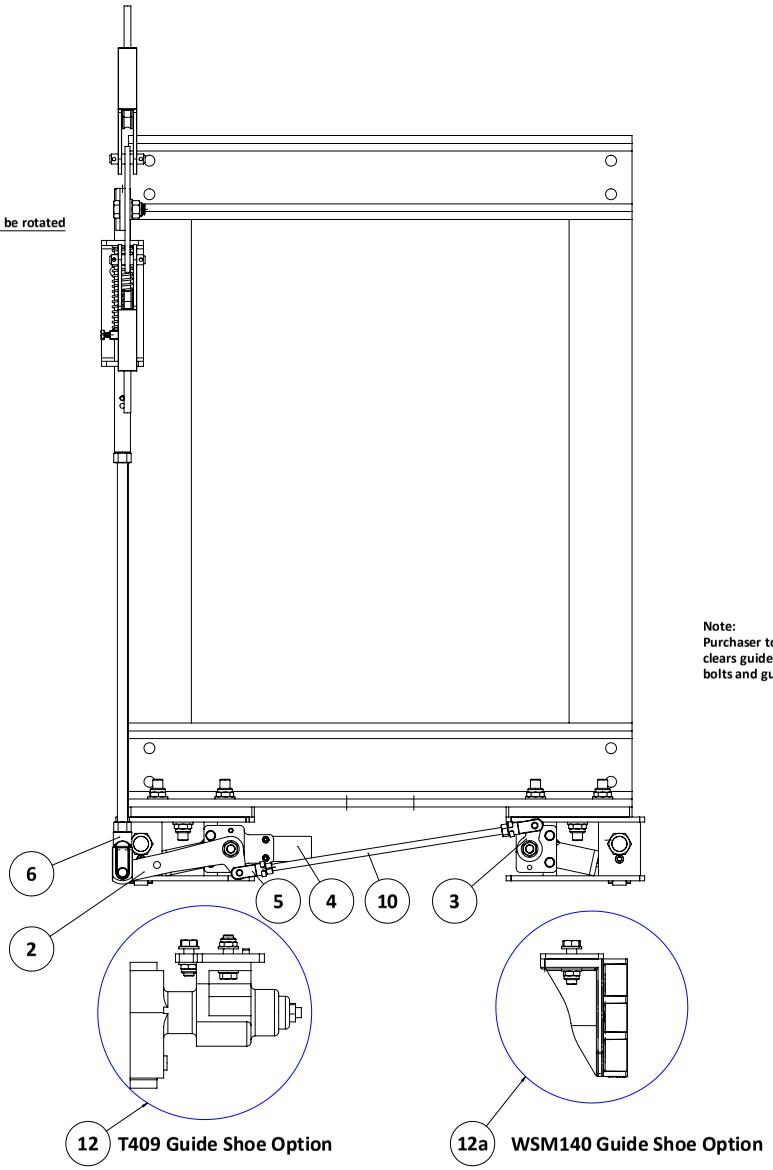
Item No.	Description	Qty
1	VG8 Frame	2
2	Actuating Arm 01948	1
3	Slave Arm 01947	1
4	Safety Switch	1
5	M8 Clevis Assembly	2
6	M12 Clevis Assembly	1
7	Inertia Bracket assembly	1
8	6 / 8mm rope Sockets	2

Optional Equipment Supplied as Requested

Item No.	Description	Qty
9	VG8 to Car Sling Adapter Plate	2
10	Horizontal Connection Rod M8 Studding (DBG - 200mm)	1
11	Vertical Connection Rod M12 Studding (3mtr)	1
12	T409 Guide Shoe c/w 16mm Liner & VG8 To Guide Shoe Adapter Plate*	2
12a	WSM140 Guide Shoe c/w 16mm liner & VG8 to Guide Shoe Adapter Plate*	2

*** Additional Guide Shoes for the top of the car sling are not included in the kits shown above but are quoted separatley.**





Note:
Purchaser to ensure safety gear clears guide clips, joint plates bolts and guide fixings

Figure TD8.3 VG8 Down Acting Safety Gear

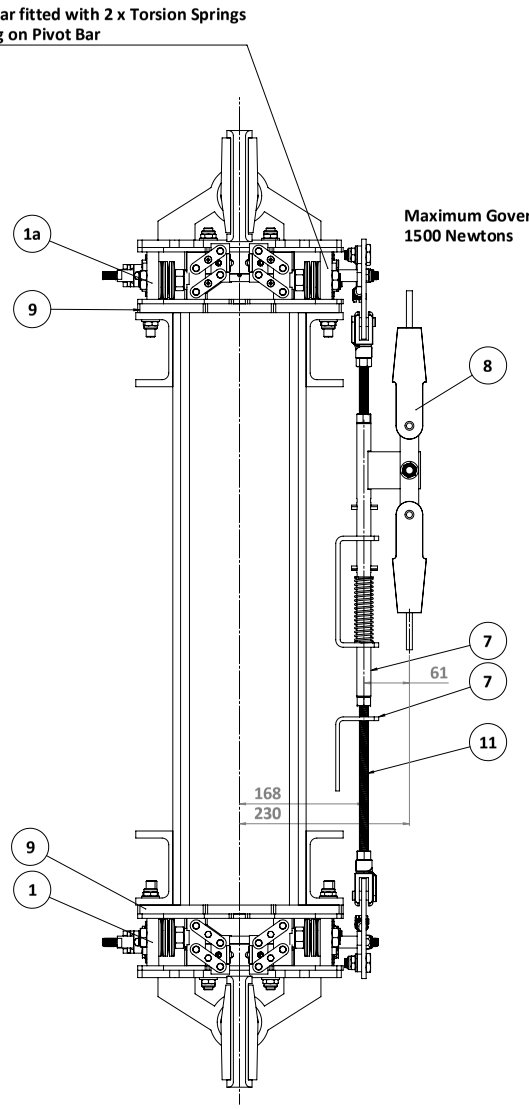
Items Supplied With Application TD-8.4

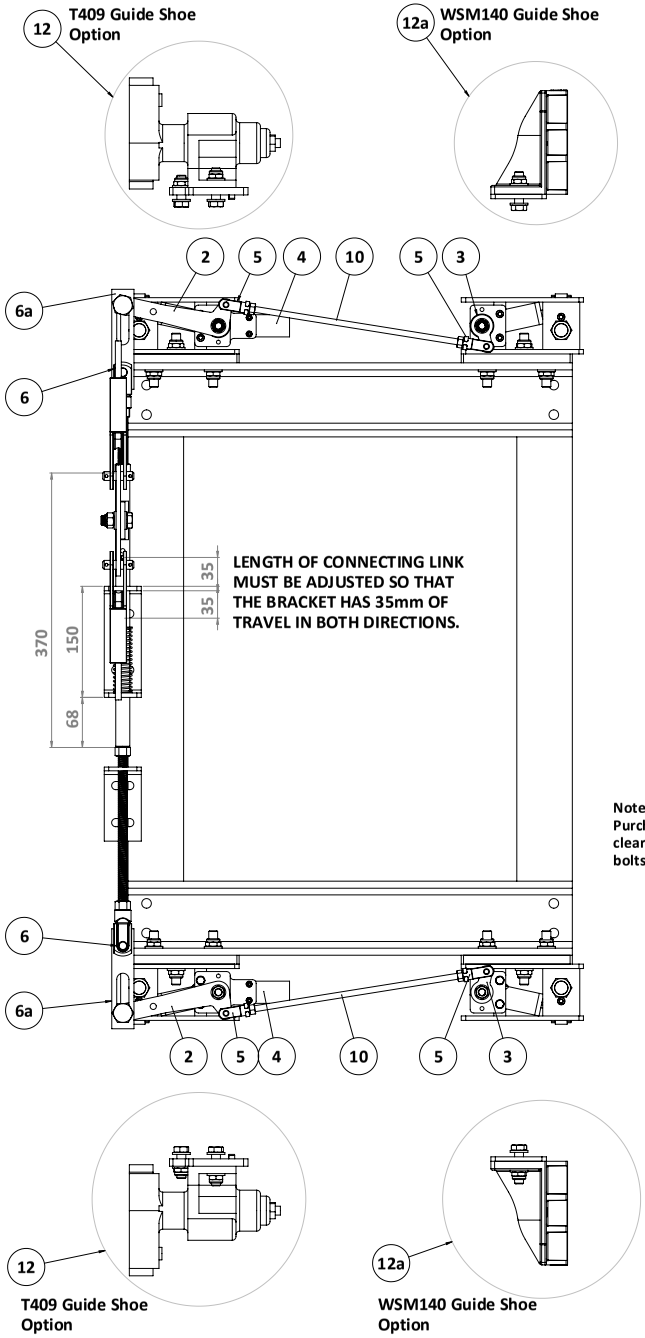
Item No.	Description	Qty
1	VG8 Frame (Down)	2
1a	VG8 Frame (Up)	2
2	Transfer Arm 01948	2
3	Slave Arm 01947	2
4	Safety Switch	2
5	M8 Clevis Assembly	4
6	M12 Clevis Assembly	2
6a	Link Plate Assembly 10027	2
7	Bi-directional Kit	1
8	6/8mm rope sockets	2

Optional Equipment Supplied as Requested

9	VG8 to Sling Adapter Plate	4
10	Horizontal Connection Rods M8 Studding (DBG - 200mm)	2
11	Vertical Connection Rod M12 Studding (3mtr)	1
12	T409 Guide Shoe, C/W 16mm liner & VG8 to Guide Shoe Adapter Plate*	4
12a	WSM140Guide Shoe C/W 16mm Liner & VG8 to Guide Shoe Adapter Plate*	4

*** Guide Shoes supplied as a kit of 4 Guide Shoes Plus 4 Adaptor Plates.**





Note:
Purchaser to ensure safety gear clears guide clips, joint plates bolts and guide fixings

Figure TD8.4 VG8 Bi-Directional Acting Safety Gear

Items Supplied With Application TD-8.5

Item No.	Description	Qty
1	VG8 Frame (Down)	2
1a	VG8 Frame (Up)	2
2	Transfer Arm 01923	2
2a	Actuating Arm 01924	2
3	Slave Arm 01947	2
4	Safety Switch	2
5	M8 Clevis Assembly	4
6	M12 Clevis Assembly	1
6a	Link Plate Assembly 1941	1
7	Bi-directional Kit	1
7a	Inverted Mounted Fixing Kit	2
8	6/8mm rope sockets	2

Optional Equipment Supplied as Requested

9	VG8 to Sling Adapter Plate	2
10	Horizontal Connection Rods M8 Studding (DBG - 200mm)	2
11	Vertical Connection Rod M12 Studding (3mtr)	1
12	T409 Guide Shoe, C/W 16mm liner & VG8 to Guide Shoe Adapter Plate*	2
12a	WSM140Guide Shoe C/W 16mm Liner & VG8 to Guide Shoe Adapter Plate*	2

*** Additional Guide Shoes for the top of the car sling are not included in the kits shown above but are quoted separatley.**

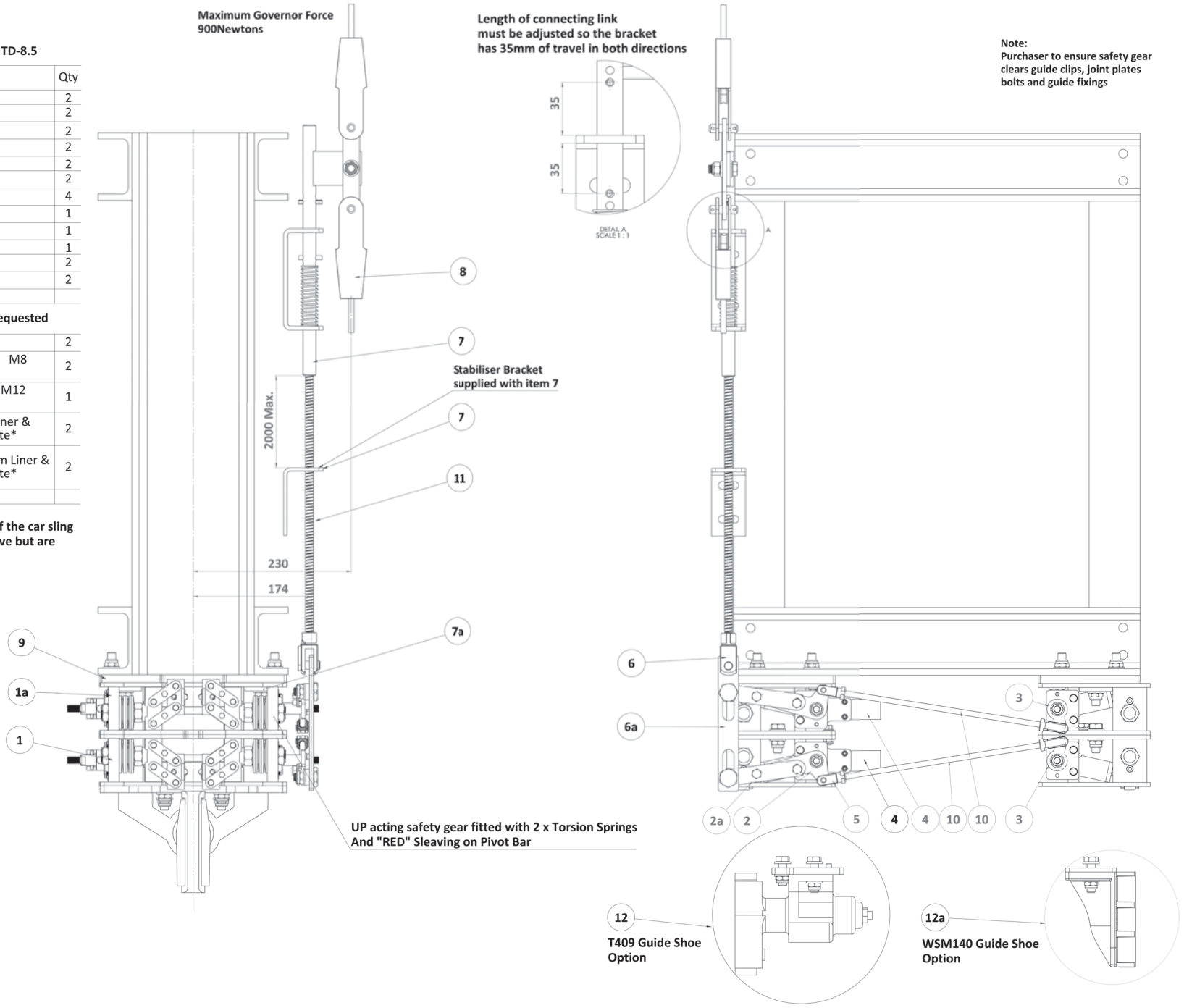


Figure TD8.5 VG8 Bi-Directional Acting Safety Gear

This data sheet meets the requirements of EN81 and illustrates the performance curves for different test speeds. Four curves are illustrated:-

a. A solid curve based on a "free fall" average deceleration of 0.6g at the governor tripping speed (GTS). All progressive safety gears must be adjusted on this basis.

b. A solid curve based on a deceleration of 0.75g. This is the expected deceleration of an EN rated safety gear when tested at the normal lift speed or lower. This curve also represents the maximum deceleration under free fall conditions at the governor tripping speed.

c. A dotted curve based on a deceleration of 0.85g. This represents the maximum deceleration (minimum slide) when tested at the normal lift running speed.

d. A dotted curve based on a deceleration of 0.5g. This represents the minimum deceleration (maximum slide) of a safety gear under free fall conditions.

The data on which these curves have been constructed is also given.

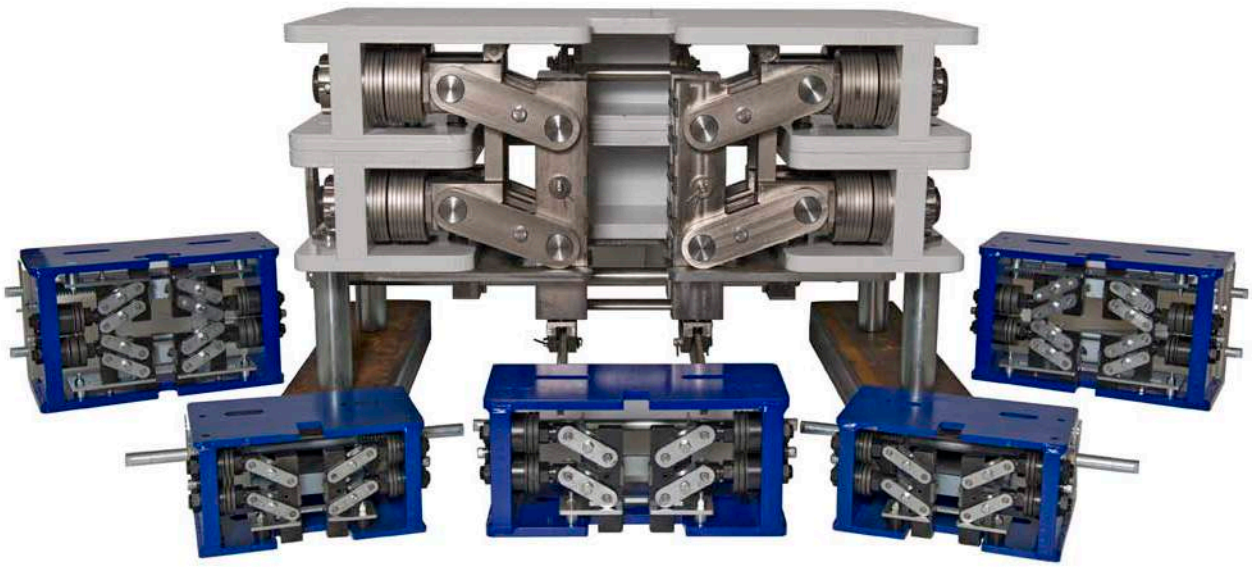
For example, if a VG safety gear is set to suit 4 m/sec GTS, the braking force would be adjusted to achieve an average deceleration of 0.6g. This would result in a nominal braking distance of 1333 mm. However, as brake friction can vary, the average deceleration could be a low as 0.5g with a corresponding braking distance of 1600 mm or as high as 0.75g with a braking distance of only 1067 mm. This means that, providing the braking distance is between 1067 mm and 1600 mm, the safety gear is working within expected limits and no adjustment is required.

When testing a safety gear with the counterweight attached and at a lift speed of say 3.5 m/sec, the safety gear will produce an average deceleration of 0.75g and a nominal braking distance of 817 mm. However, due to the accepted variation of friction, the safety gear could produce a deceleration between 0.6g and 0.85g with a braking distance between 721 mm and 1021 mm. Similarly, if tested at 3 m/sec, the braking distance could be between 529 and 750 mm.

The above curves are based on a test load 125% which will offset the effect of the counterweight. If tested with only a full load, the braking effect will be enhanced by the mass of the counterweight.

The hoist machine must be kept running in order eliminate the braking effect of the drive system. For geared installations it is likely that rope slip will take place. However, for gearless applications it is likely that that the lift ropes will go completely slack due to the high traction ratio. Care must be taken to ensure that the counterweight is not lifted excessively during a safety gear test as fall back can disengage friction type governors.

For a more rigorous and accurate analysis of the effect of testing safety gears under different loads and speed, please contact Atwell International.



VG

SAFETY GEARS
Special Projects

40 person funicular lift, with a total travel of 42 meters at 0.75 m/s, single VG Safety Gear end unit operating on a single guide rail angled at 32° to the horizontal.

Project References:

Urbis Centre Manchester
Tower Bridge
Toronto Airport Cargo
Rolls Royce
Moscow Airport Cargo
Oxford University
Heathrow Airport World Cargo
Cambridge University
Shenzhen Airport Cargo
Sizewell Nuclear Power Station
US Embassy Thailand
Natural History Museum
Harrods Store
BT Tower
Universal Studios – rollercoaster
Funicular Railways
Naval Ships
Commercial Ships
Oil Rigs
London Underground
Film Sets

To comply with the harmonized version of EN81-20/50:2014 a lift shall be provided with overspeed protection and protection against unintended car movement. The VG range of safety products can provide viable braking and monitoring solutions in accordance with these regulations.

The general provisions for a safety gear is that the lift car shall be provided with a safety gear capable of operating in the downward direction and capable of stopping a car carrying the rated load, at the tripping speed of the overspeed governor, even if the suspension devices break, by gripping the guide rails, and of holding the car there.

Atwell International along with its standard range of safety gears can offer bespoke solutions to meet most weights, speed and guide rail sections.

Duplexed 'Big Bertha' safety gear

Speed	= 0.33 m/s
P+Q	= 22 tonnes

Operating on a 2 guide rail system,
with a guide rail blade width of 100 mm.

Duplexed 'Colossus' safety gears

Speed	= 0.2 m/s
P+Q	= 160 tonnes

Operating on a single guide rail system,
with a guide rail blade width of 100 mm.

VG6 Triplex configuration

Speed	= 1.5 m/s
P+Q	= 11 tonnes

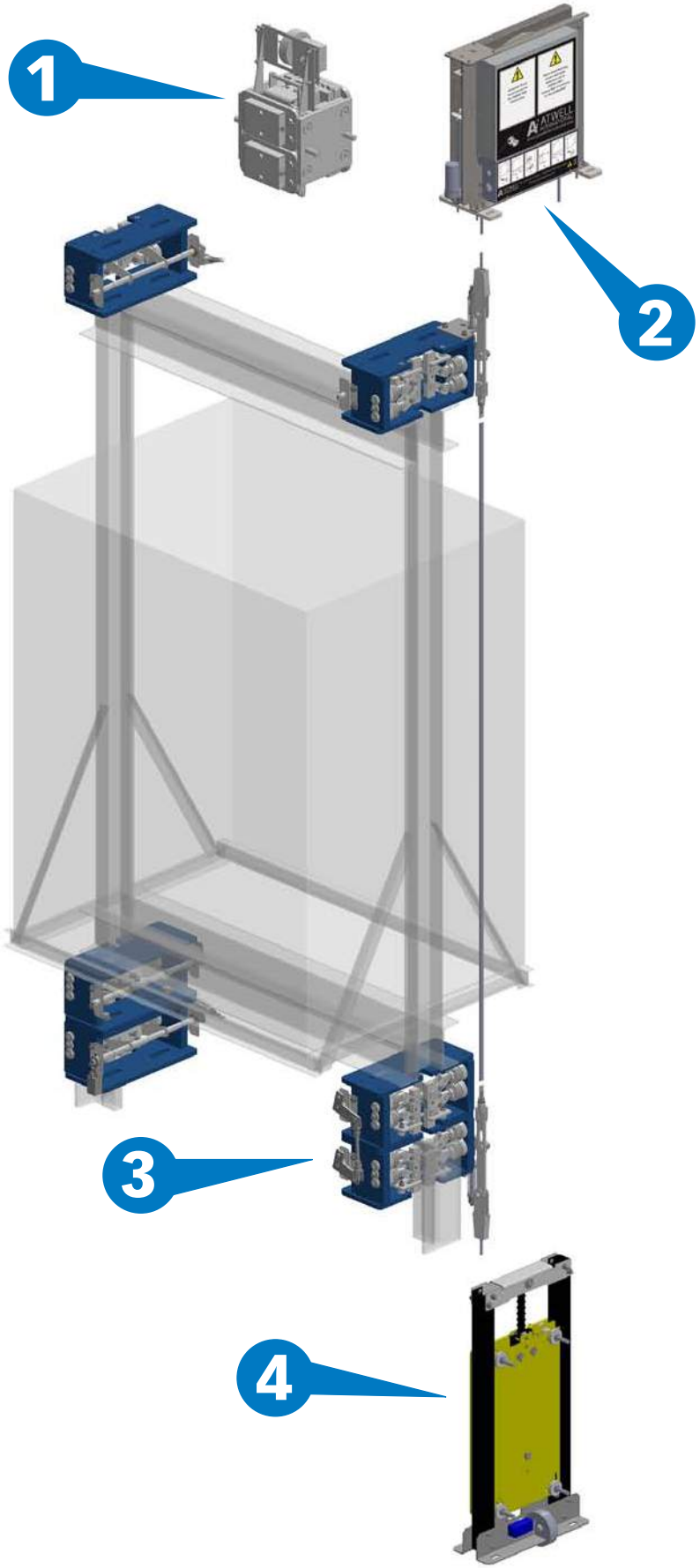
Operating on a 2 guide rail system,
with a guide rail blade width of 28.6 mm.

Duplexed 'Colossus MK2' safety gears

Speed	= 0.2 m/s
P+Q	= 100 tonnes

Operating on a 2 guide rail system,
with a guiderail blade width of 100mm.

Introducing Atwell's - EN81-20/50:2014 Solutions Using VG Safety Equipment



1

Rope Brakes

2

Overspeed Governor

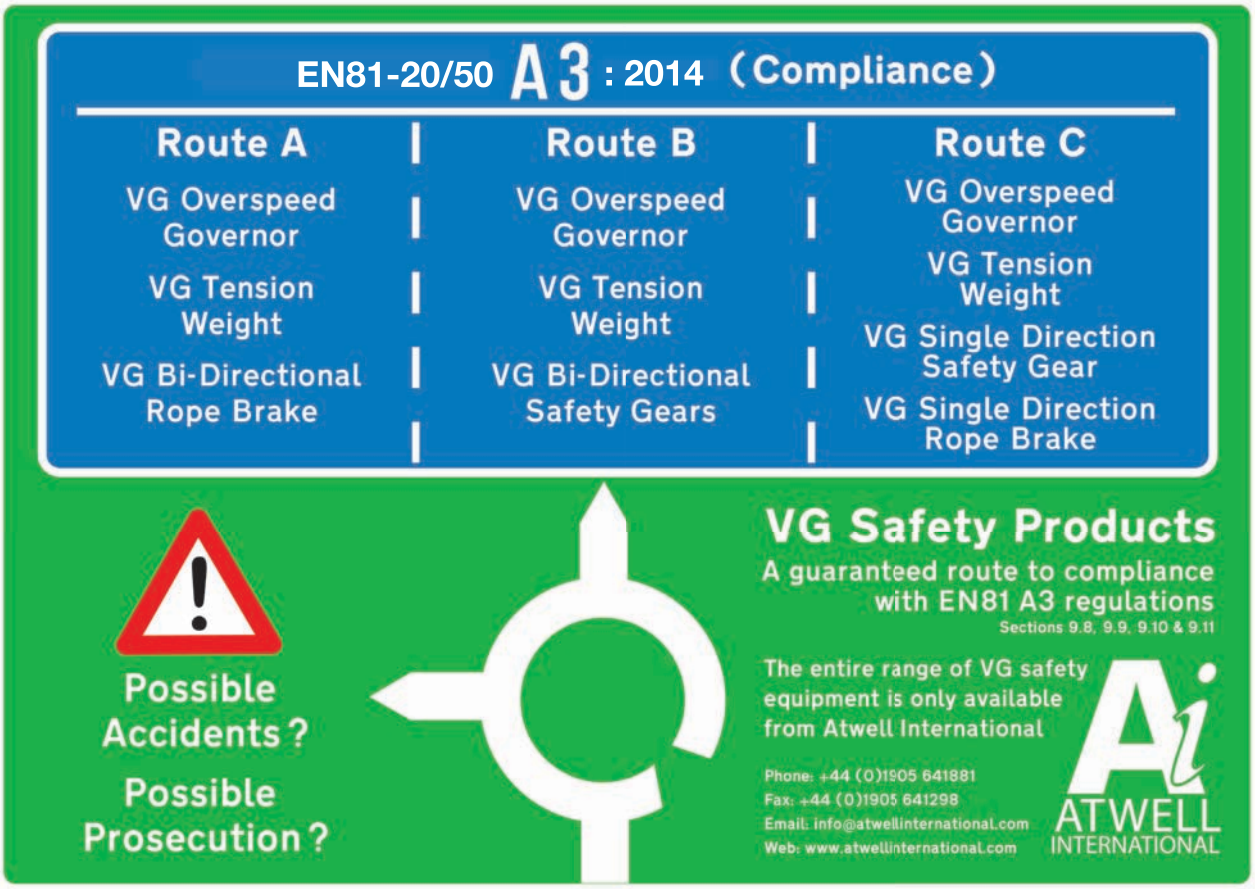
3

Safety Gears

4

Tension Weight

EN81-20/50:2014 (Compliance)



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