12

VEHICLE COMBINATIONS

CONTENTS

12.1. GENERAL INFORMATION

Preliminary information

The instructions below collect the procedures to be adopted when combining two or several ECO1000 vehicles to obtain the desired convoy.
If it is necessary to carry out operations that are not covered in this chapter, please contact our technical support department.

Safety precautions

ATTENTION
Before coupling the vehicles that will form the convoy, gather all of them into a safe area, i.e.:

- ***A flat, wide enough area.***
- ***Easily accessible to vehicles and to a convoy formed by them.***
- ***Easily accessible to operators and that allows them to work easily on the vehicles (for example, when making the connections).***

ATTENTION
Before coupling the vehicles and setting up the convoy stability points, set the modules to the "FULL LOW" position to prevent any abnormal shifting of the loading platform and the modules. See chapter 10.

WARNING
For any procedure that implies movement of the vehicle or of the convoy, ensure the manoeuvre area is free of people and/or property.

Driving and steering
Lifting / Lowering

If all the operating instructions for the ECO1000 vehicle coupling, here reported, are correctly met and the convoy is properly set up according to a stability configuration (see paragraph 12.5), the driving and steering manoeuvres as well as lifting and lowering operations stay the same as for the single vehicle. Refer to chapters 9 and 10.

Use the radio control of the module ECO1000 defined as MASTER to drive, lift/lower and, in general, control the convoy from remote.

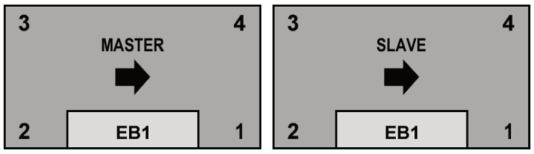
NOTE
More information on defining a module as MASTER or as SLAVE at paragraph 12.4.

12.2. COMBINATION TYPES

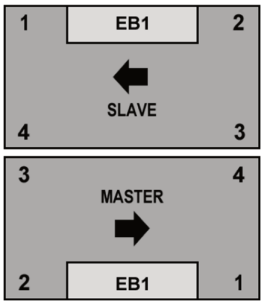
Combination types

The ECO1000 modules can be combined with each other to form a convoy.
The types of convoy that can be obtained are as follows:

1. **C4-22**; **C6-24**; **C8-26**; **C8-44**; **C10-46**; **C12-66** (with mechanical coupling).

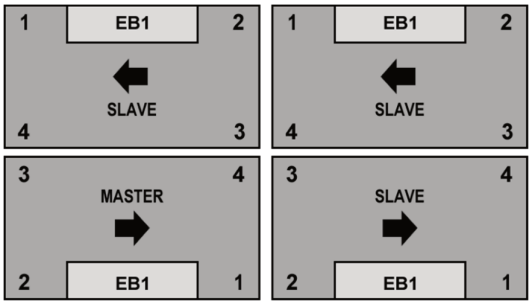


2. **L2-2**; **L4-4**; **L6-6** (with mechanical coupling).

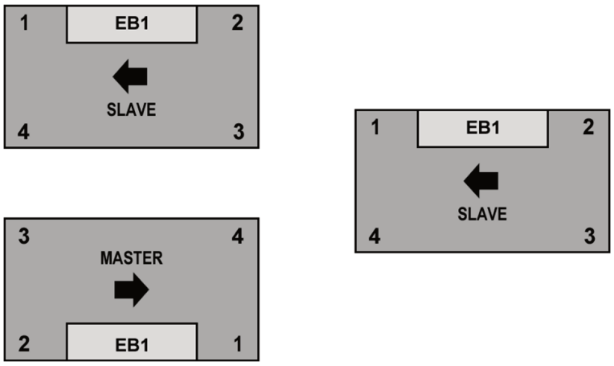


3. **L6-24**; **L8-26**; **L8-44**; **L10-46**; **L12-66** (with mechanical coupling)**.**

INDICATIVE FIGURES



4. **General compound combination** (without mechanical coupling)**.**



C	10	-	46
Type of setup	**No. of convoy axle lines**		**No. of axle lines per vehicle**
C: longitudinal coupling. **L**: side-by-side coupling	In this case, 10 axle lines.		In this case, one vehicle with 4 and one with 6 axle lines.

Continued ➔

Continued "Combination types" ➔

Combination types

NOTE
The layout of the MASTER and SLAVE modules is purely indicative.

NOTE
For more information about MASTER and SLAVE modules, see paragraph 12.4.

ATTENTION
For side-by-side combinations, arrange the vehicles in such a way their normal forward travel direction is opposite, as shown by the arrows in the figures above.
In this way, the control boards installed on the [EB1] electric cabinets of each ECO1000 module remain accessible for the electronic configuration of the modules (see paragraph 12.4).

12.3. CONNECTIONS

Preliminary information

In order to form a convoy, the ECO1000 vehicles must be hydraulically and electrically connected to each other.
If the size of the transported load allows it, i.e. if the modules within the convoy are close enough, they can be connected mechanically by means of beams and pins for enhanced convoy cohesion.

NOTE
It is recommended to assemble the convoy starting with the mechanical connections, where possible, since they require handling the vehicles. Then proceed to the electrical and hydraulic connections.

12.3.1 Mechanical connection

Safety rules

The mechanical connection allows the modules to be joined in both longitudinal and transverse directions depending on the chosen configuration. See the operating procedures described in the following paragraphs.
If it is necessary to connect in both directions, the longitudinal connection must be made first, as it involves inserting a pin inside two coupling combs (one per module) that must fit together exactly.

WARNING
The vehicles shall be coupled by qualified staff only.

WARNING
Carry out the operations below with the vehicle completely unloaded.

WARNING
For any procedure that implies movement of the vehicle, ensure the manoeuvre area is free of people and/or property: crushing hazard.

Continued ➔

Continued ➔

Safety rules

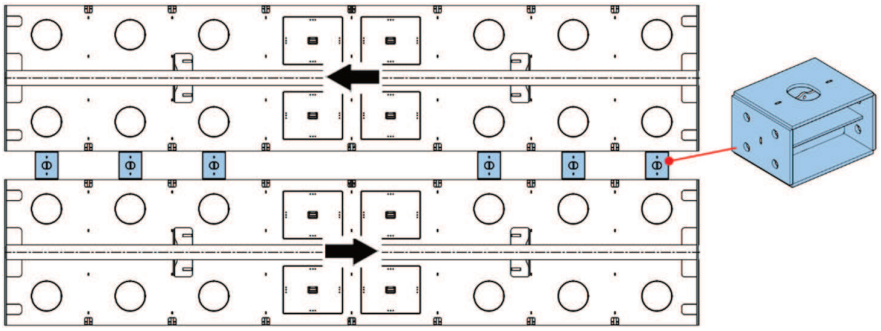
WARNING
Pay the utmost attention and do not work on moving vehicles, parts or mechanisms: hand crushing hazard.

12.3.1.1. Side-by-side mechanical coupling

Preliminary information

Install the side-by-side coupling boxes and secure them on the "shared" side of both of the vehicles, one box per axle line of the convoy.
Consider the setup L6-6 reported in the figure as for example (6 axle lines, 6 boxes):

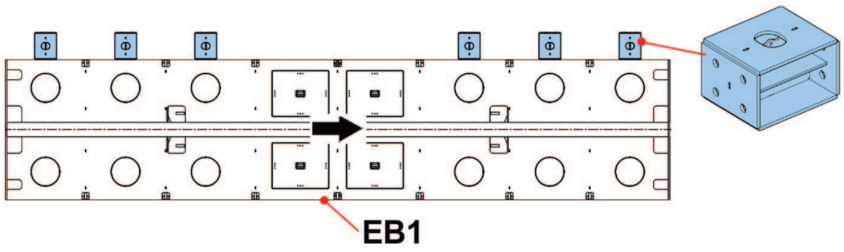
Side-by-side coupling box kit ➔ Cometto code 343.7106.



Operating procedure

1) Install the coupling boxes on the side opposite to the electric panel [**EB1**] of one of the two vehicles to be connected together.
On the right and on the left sides of the frame, at each axle line, there are 4 through-holes prepared for installing the boxes. Use the fasteners provided in the kit, but do not tighten the screws fully yet.

WARNING
Handle the side-by-side coupling boxes using appropriate lifting equipment.



= normal forward travel direction of the vehicle.

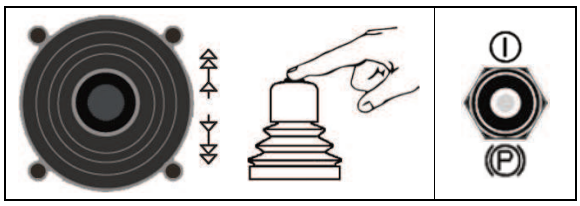
2) Start the engine of the second module (see chapter 8).

Continued ➔

Continued “Side-by-side mechanical coupling” ➔

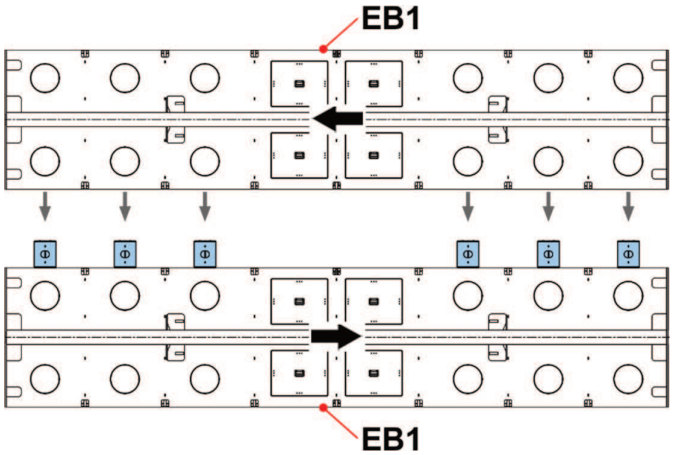
Operating procedure

3) Disengage the parking brake of the latter module using the respective radio control: press and hold the button on the end of the joystick ⏮ ⏭ (“Dead man” button) and operate the Ⓟ selector switch (lever down); then release both controls.



4) Arrange the vehicle as parallel as possible to the first one, but with the normal forward travel direction in the opposite direction: in this way, the electric panels [**EB1**] of both vehicles remain on the outer sides, not shared with other modules, and are accessible in order to carry out the electronic configuration of the convoy and check the status of individual modules.

5) Try to align the ends of the two vehicles and bring the second closer to the first, using parallel steering (see driving instructions in chapter 9).



6) Drive and lift or lower the vehicle when necessary (see chapter 10) until it is level with the other one and the holes on the frame fit those on the side-by-side coupling boxes.

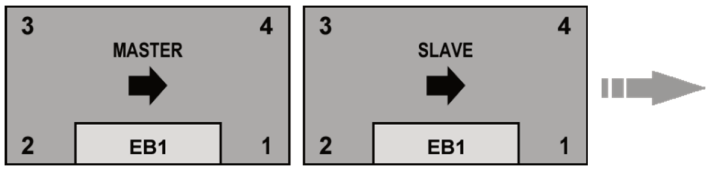
7) Push the module in close contact against the coupling boxes and switch off the vehicle: turn the general key on the panel [**EB-I/K**] in position 0.

8) Fix the boxes to the frame of the second module as well. Use the fasteners provided in the kit and tighten the screws on both sides of the boxes. See paragraph 13.9 for the tightening torque (M30 screws).

12.3.1.2. Longitudinal mechanical connection

Preliminary information

Consider a type “C” setup:



Rear module Front module

Operating procedure

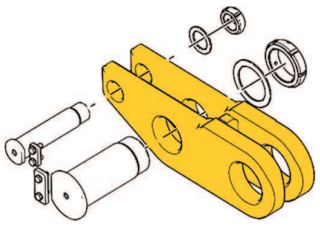
1) Install the coupling hinge on the coupling comb at the head or at the tail of the vehicle. Use the fasteners included in the kit.
   - Install the hinge on the head comb (for rear vehicles, in longitudinal combinations).
   - Install the hinge on the tail comb (for front vehicles, in longitudinal combinations).

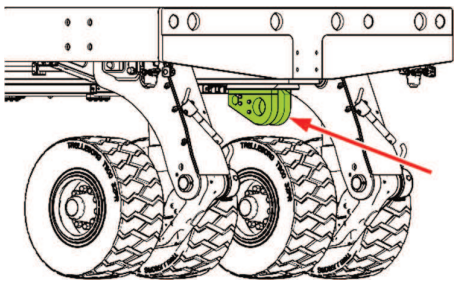
   Longitudinal coupling hinge kit ➔ Cometto code 343.7131.

   Fastening of the hinge: fasten as tight as possible the two ring nuts and fix them by fastening the grub screws with the tightening torque set in the table below:

RING NUT	Grub screw	Tightening torque
M50	M8	18 Nm
M100	M10	35 Nm

Longitudinal coupling hinge kit





Continued ➔

Continued “Longitudinal mechanical connection” ➔

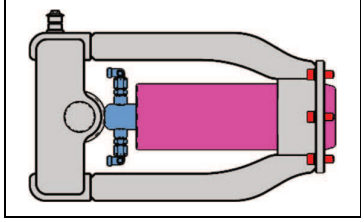
LONGITUDINAL coupling – operating procedure

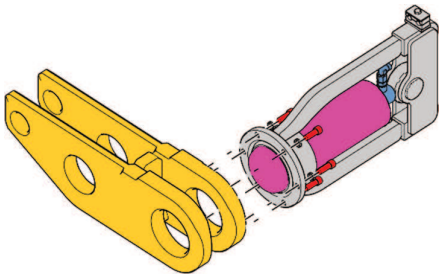
2) Secure the hydraulic puller and hinge pin assembly to the hinge installed on the front module. Connect the puller to the vehicle hydraulic system: the couplings are at the tail of the vehicle, underneath the loading platform.

Hinge pin hydraulic puller kit ➔ Cometto code 309.5599.01.

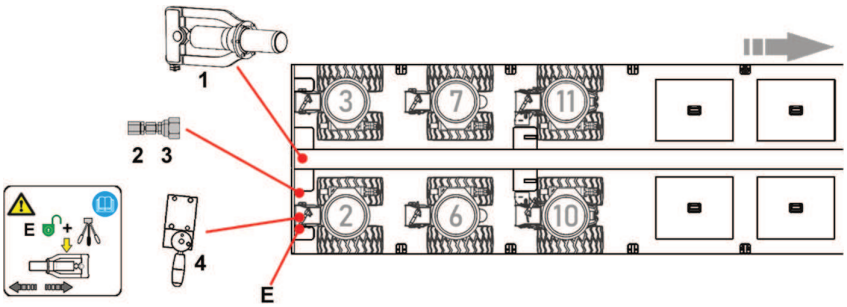
Fastening of the hydraulic puller: the kit includes M12 screws, see paragraph 13.9.

Hinge pin hydraulic puller kit





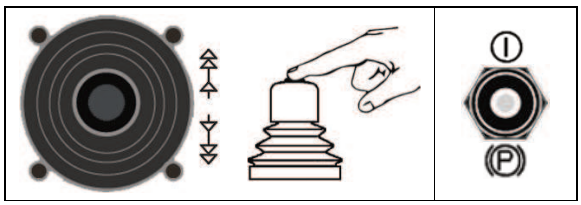
INDICATIVE FIGURE



1	Hinge pin hydraulic puller kit.
2 3	Hydraulic quick couplings.
4	Hydraulic puller distributor lever.
E	Tap [**E**].

3) Start the Diesel engine of the front module (see chapter 8).

4) Disengage the parking brake of the front module using the respective radio control: press and hold the button on the end of the joystick ⏮ ⏭ (“Dead man” button) and operate the Ⓟ selector switch (lever down); then release both controls.



5) Bring the front module close to the rear module until the holes of the coupling hinges match. Set the modules, as far as possible, to the same height (see chapter 10).
Where necessary, perform steps 3) and 4) on the rear module too and move both vehicles; then, turn off the Diesel engine of the rear module.

6) Without turning off the Diesel engine of the front module, engage the parking brake: operate selector switch Ⓟ (lever down).

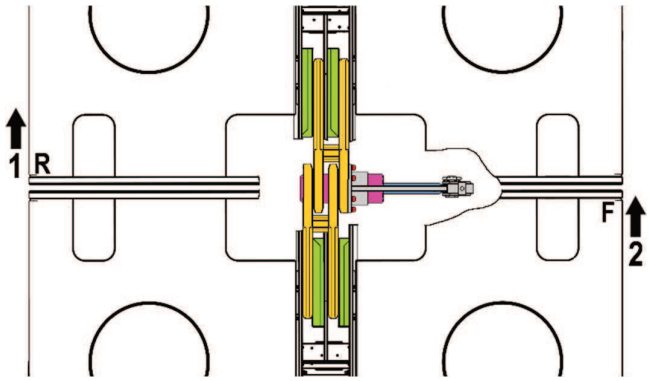
Continued ➔

Continued ➔

LONGITUDINAL coupling – operating procedure

7) Open tap [**E**] of the front module and operate the hydraulic puller distributor lever to insert the pin into the hinges.

INDICATIVE FIGURE



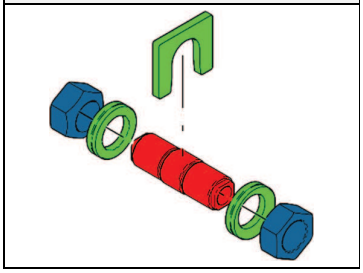
1	Front vehicle (normal forward travel direction).
2	Rear vehicle (normal forward travel direction).
R	Front vehicle rear side.
F	Rear vehicle front side.

8) Close tap [**E**]. The Diesel engine can now be turned off.
9) Pass the tie rods through the holes on the front and rear sides of the vehicles and fit the shim plates in between, as shown in the figure below.

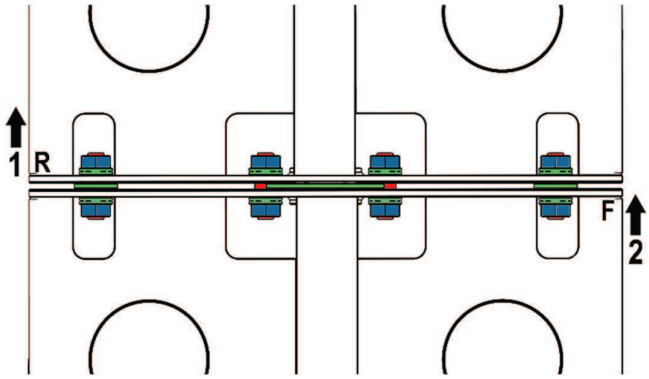
Coupling tie rod kit ➔ Cometto code 343.7130.

Fastening of the tie rods: thoroughly fasten the nuts. Periodically check the tightness of the fastenings, when the convoy is unloaded and still.

Coupling tie rod kit



INDICATIVE FIGURE



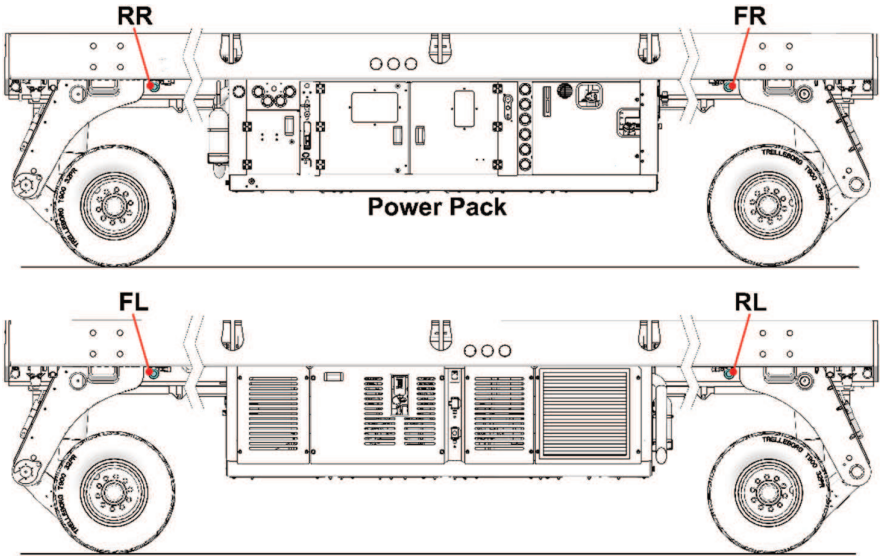
1	Front vehicle (normal forward travel direction).
2	Rear vehicle (normal forward travel direction).
R	Front vehicle rear side.
F	Rear vehicle front side.

12.3.2 Hydraulic connection

Hydraulic quick couplings

Each ECO1000 vehicle is equipped with four quick couplings for the hydraulic connection of the modules by means of hoses. There are two on each side, one on the head and one on the tail, as shown in the figure.

INDICATIVE FIGURE



If ECO1000 modules are mechanically connected, depending on the combination type and on the convoy stability setup, the hoses in one of the following kits should be used:

- **Side-by-side hydraulic coupling kit** ➔ Cometto code 343.7268.
- **Longitudinal hydraulic coupling kit** ➔ Cometto code 343.7269.

If greater distances, which do not allow a mechanical connection, occur among the modules of a same convoy, use the proper hoses which may be included in your order (generic Cometto code **589.**[…]).

NOTE
For the purposes of this manual, the hydraulic quick couplings were named based on their position on the vehicle:

- ***FR** = Front Right.*
- ***FL** = Front Left.*
- ***RR** = Rear Right.*
- ***RL** = Rear Left.*

NOTE
See the convoy stability setups in paragraph 12.5.

NOTE
Cover any unused couplings with the respective caps.

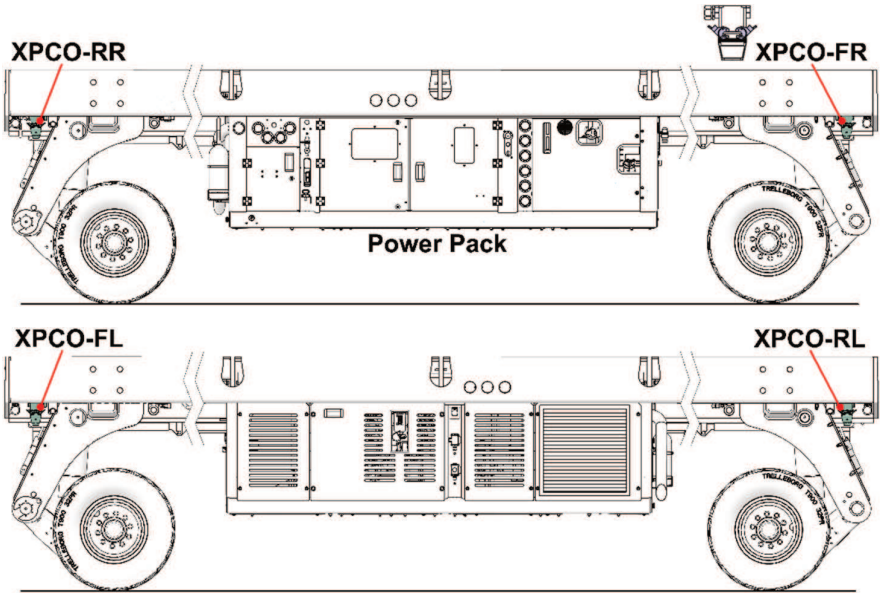
12.3.3 Electrical connection

Electrical connectors

Each ECO1000 vehicle is equipped with four [**XPCO**] sockets located at the corners of the vehicle, for the electrical connection of the modules by cable.

- **[XPCO] connection cable kit** ➔ Cometto code 360.4531.
- **[XPCO] adapter cable kit** ➔ Cometto code 360.4713.
  This cable can be used to join two [XPCO] connection cables if the distance between the two ECO1000 vehicles within the convoy is too long for a single connection cable.

INDICATIVE FIGURE



NOTE
The connection cable kit shown here is suitable for couplings with mechanical connection of vehicles in convoy. If your supply includes remote couplings, please use the appropriate kits included with it.

NOTE
Cover any unused connectors with the respective caps.

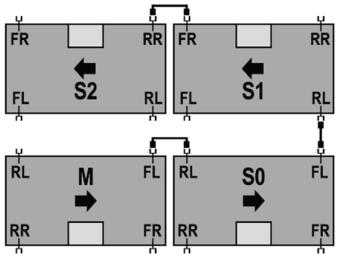
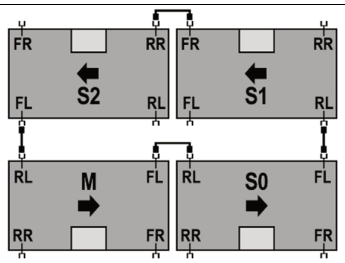
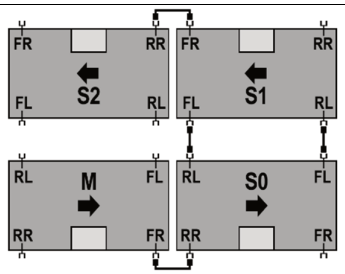
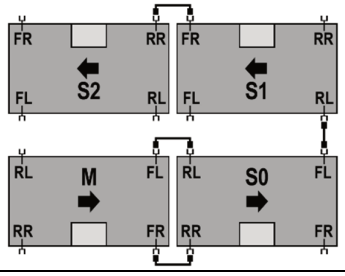
Continued ➔

Continued “Electrical connection” ➔

Electrical connection rules

The vehicles can be electrically connected to each other using any socket, provided that the connection cable allows it. However, the following rules should be observed:

1. **The electrical connection between any two vehicles must be ensured by just one cable**.
2. **Always connect the vehicles in linear series only (electrical) and not in loop**.
   In a 2-module setup, this condition leads back to rule no. 1.
3. **The MASTER module must always be one of the ends of the series connection**. Therefore, each SLAVE module must communicate with the MASTER module via just one [**XPCO**] connector. However, the communication line to the MASTER can include other SLAVE modules.
   Just one connector of the MASTER module is used for electrical connection.

	OK ✓	Correct connection example: the vehicles are connected in a linear series from MASTER (**M**) to SLAVE (**S2**). The MASTER represents one end of the series and each pair of vehicles in connected by just one cable.
	NO ✗	Loop connection: the MASTER module (**M**) has two connectors used; each SLAVE module can communicate with the MASTER via two connectors. For example, module (**S2**) communicates with the MASTER directly via connector (**FL**) and indirectly via connector (**RR**), passing through SLAVES (**S1**) and (**S0**).
	NO ✗	SLAVE modules (**S0**) and (**S1**) are connected with two cables.
	NO ✗	The MASTER (**M**) and SLAVE (**S0**) modules are connected with two cables.

NOTE
Determine clearly the connector used by the MASTER module to communicate with the SLAVE modules and vice versa; this is essential for the correct vehicle setting in the combination.
For more information about the procedures and how to define a MASTER or SLAVE module, see paragraph 12.4.

12.4. MODULE ELECTRONIC SETUP FOR COUPLING

Preliminary conditions

During the electronic configuration of the convoy modules, remember to set:

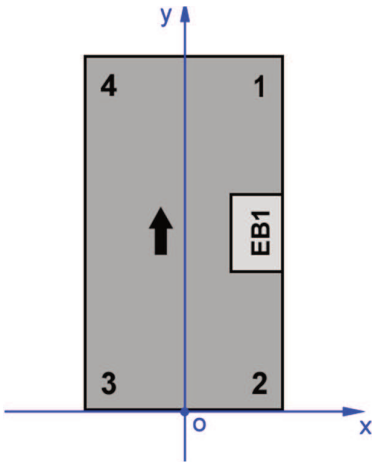
- Just one MASTER module: this is the reference vehicle based on which the electronic program will adjust the convoy control and driving system.
  Once the configuration is complete and after making all the mechanical, hydraulic and electrical connections between the modules, it will be possible to drive, lift/lower and, generally, control the entire convoy from the radio control of the MASTER module.
- One or several SLAVE modules (depending on the type of convoy to be obtained): these are all the vehicles that are part of the convoy, except for the MASTER vehicle.

NOTE
The driving, lifting/lowering and pressure, stability and height control instructions provided in this Use and Maintenance Manual and referring to a single ECO1000 vehicle, also remain valid for the driving and control of any suitably assembled and configured convoy.

Also, please take into account which is the reference system of the single module and which is the reference system of the convoy.

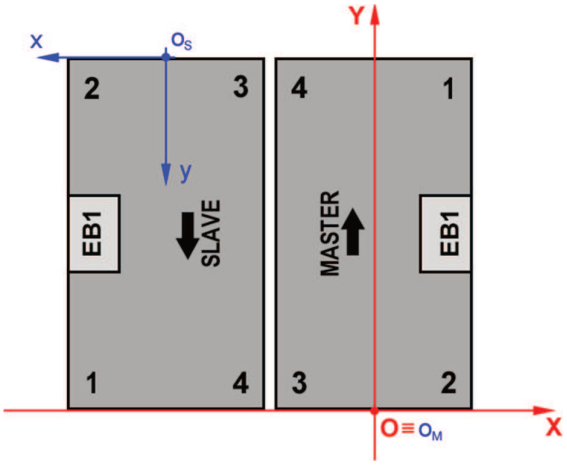
Single module reference system

For each vehicle shall be considered the “o (x, y)” reference system with the origin on the centerline, at the tail of the vehicle, as shown in the figure:



Convoy reference system

The MASTER vehicle reference system “o_M (x, y)” shall be adopted as the reference system of the entire convoy, “O (X, Y)”. Compared to the latter, the reference system of a SLAVE vehicle, “o_S (x, y)”, can be transposed or transposed and rotated.

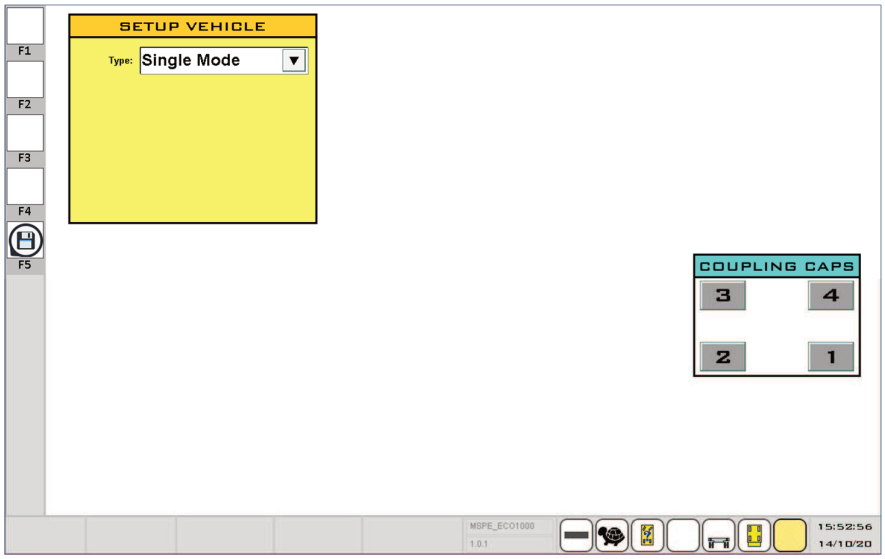


Continued ➔

Continued “Module electronic setup for coupling” ➔

Opening the configuration (setup) page

Open the “Setup vehicle” page from the [**EB1**] panel display. Press the following keys from the start screen: **F2 ➔ Password ➔ Enter ➔ F4 ➔ F1 ➔ F2**.

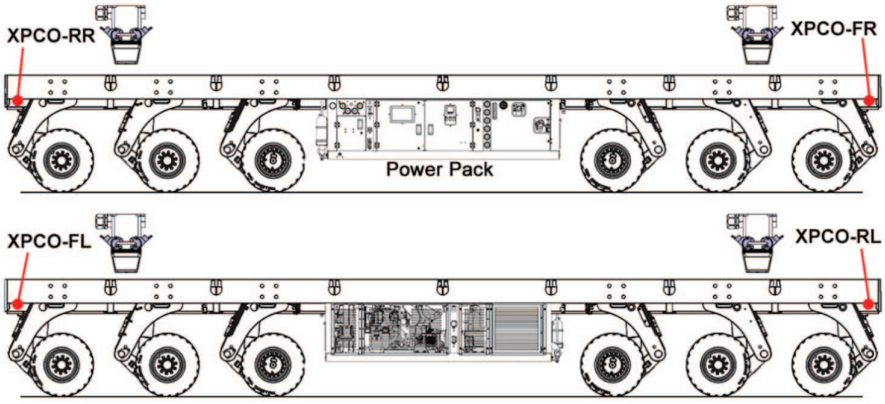


NOTE
*The vehicle is set by default to “**Single Mode**”.*

- “COUPLING CAPS” field.
  The area shows an indicative representation of the four [**XPCO**] sockets in the vehicle. When a socket is in communication with another vehicle via the [**XPCO**] pairing cable, the corresponding box automatically turns green.

1 =	[**XPCO-FR**]
2 =	[**XPCO-RR**]
3 =	[**XPCO-RL**]
4 =	[**XPCO-FL**]

INDICATIVE FIGURE



NOTE
See the electrical connection at paragraph 12.3.3.

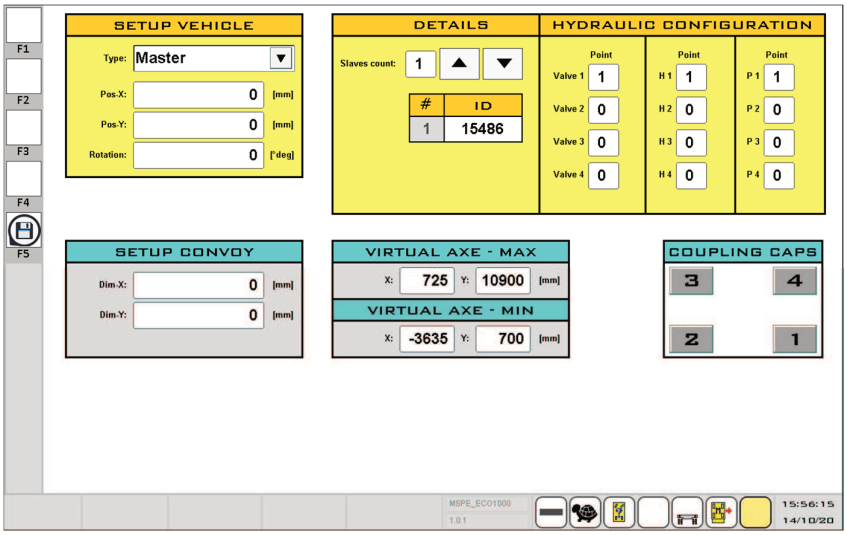
12.4.1 Setting up a MASTER module

Procedure

1) From the “Setup vehicle” page, open the “Type” drop-down menu and select “**Master**”.

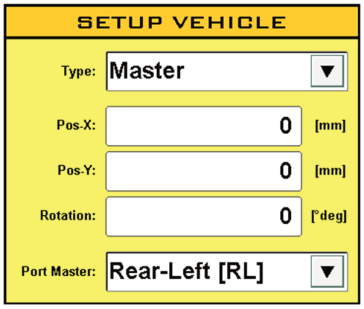
2) The following screen is displayed:

INDICATIVE FIGURE



3) “SETUP VEHICLE” field (configure the vehicle).

INDICATIVE FIGURE



Pos-X	[mm]	Shifting in the x-direction of the vehicle reference system, “o (x, y)”, compared to the convoy reference system, “O (X, Y)”. For the MASTER module, the two systems coincide: **Pos-X** = 0 mm
Pos-Y	[mm]	Shifting in the y-direction of the vehicle reference system, “o (x, y)”, compared to the convoy reference system, “O (X, Y)”. For the MASTER module, the two systems coincide: **Pos-Y** = 0 mm
Rotation	[°]	Rotation of the vehicle reference system, “o (x, y)”, compared to the convoy reference system, “O (X, Y)”. For the MASTER module, the two systems coincide: **Rotation** = 0 °

NOTE
A numeric keypad will be displayed when clicking on the fields. Press enter to close the keypad.

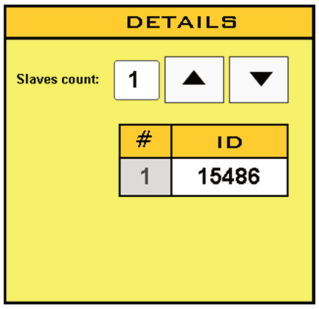
Continued ➔

Continued "Setting up a MASTER module" ➔

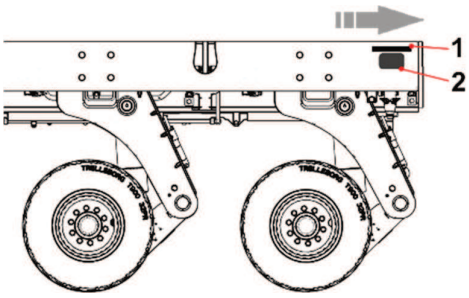
Procedure

4) "DETAILS" field.

INDICATIVE FIGURE



Slaves count	Use the arrows to set the number of SLAVE modules (from a minimum of one to a maximum of three) that, together with the MASTER module, will form the convoy. **Slaves count = 1 ÷ 3.**
# – ID	To the table will be added as many lines as the number of SLAVE modules set in the "Slaves count" field; up to a maximum of 3 lines in addition to the header. Enter the last 5 digits of the chassis number for every vehicle set as a SLAVE module within the convoy.



NOTE
*The chassis number (**1**) is located above the CE plate (**2**), on the front right side of the vehicle.*

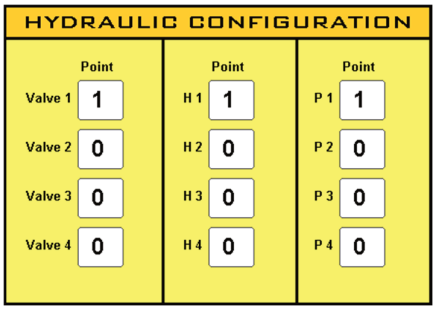
Continued ➔

Continued ➔

Procedure

5) From the "HYDRAULIC CONFIGURATION" field it is possible to link the hydraulic point control of the convoy to that of the single modules included in the convoy.

INDICATIVE FIGURE



Valve (**n**) (hydraulic distributors)	Indicate which hydraulic point, "**Point**", of the convoy will lower/raise when "**Valve** (**n**)" of the MASTER module is operated. **Valve** (**n**) = **0** ➔ when module distributor "**n**" is operated, none of the convoy points lowers/raises; the distributor is off. ***ATTENTION*** ***For improved safety, link the lifting/lowering of the convoy hydraulic point to only one distributor of one of the modules, regardless of whether that convoy hydraulic point includes several hydraulic points associated with one or several modules, either MASTER or SLAVE.***
H (**n**) (height sensors)	The height of a convoy hydraulic point is estimated based on the height of the hydraulic point/s of the module/s included in it. The latter is detected by lifting potentiometers. Indicate the hydraulic point, "**Point**", for which the lifting potentiometer, "**H**(**n**)", of the MASTER module will estimate the height. **H** (**n**) = **0** ➔ the height measured by lifting potentiometer "**n**" will not be considered in estimating the height of the convoy hydraulic point. *NOTE* *The height of the convoy points can be estimated using one or several MASTER/SLAVE module potentiometers. In the second case, the height of the convoy point will be determined as an average of the measured values.* *NOTE* *The height can only be estimated because every hydraulic point includes several suspensions but only the two at the head and at the tail of each ECO1000 vehicle are equipped with lifting potentiometers.*
P (**n**) (pressure sensors)	Each convoy hydraulic point consists of several MASTER/SLAVE module hydraulic points hydraulically connected to each other. If they are connected, the hydraulic oil pressure at these points remains approximately constant. Indicate the hydraulic point,"**Point**", for which pressure transducer "**P** (**n**)" of the MASTER module will determine the pressure. **P** (**n**) = **0** ➔ the pressure measured by transducer "**n**" will not be used. *NOTE* *If the convoy hydraulic points are particularly spread out, (for example, over two modules or that include all 4 points of the module), it is recommended to determine the pressure as an average of the measurements obtained from several transducers. The same point number, "**Point**", will be displayed in several boxes corresponding to different "**P** (**n**)".*

NOTE
The values in the boxes may range from 1 to 4, since there can be a maximum of only 4 hydraulic stability points.

Continued ➔

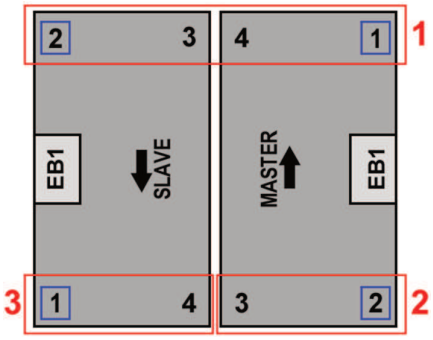
Continued "Setting up a MASTER module" ➔

Procedure

Example.

Considering the L6 - 6 setup on three stability points. The convoy hydraulic point control and management shall be linked as follows:

- (Point **1**_CONVOY) = (Point **1**_MASTER) + (Point **2**_SLAVE).
- (Point **2**_CONVOY) = (Point **2**_MASTER).
- (Point **3**_CONVOY) = (Point **1**_SLAVE).



Fill in the "HYDRAULIC CONFIGURATION" fields of the MASTER and SLAVE modules as follows:

MASTER

HYDRAULIC CONFIGURATION									
	Point		Point		Point				
Valve 1	1	H 1	1	P 1	1				
Valve 2	2	H 2	2	P 2	2				
Valve 3	0	H 3	0	P 3	0				
Valve 4	0	H 4	0	P 4	0				

SLAVE

HYDRAULIC CONFIGURATION									
	Point		Point		Point				
Valve 1	3	H 1	3	P 1	3				
Valve 2	0	H 2	1	P 2	1				
Valve 3	0	H 3	0	P 3	0				
Valve 4	0	H 4	0	P 4	0				

Distributor 1 of the MASTER module will be used to lift/lower Point **1**_CONVOY (**Valve 1** = **1**). Distributor 2 of the MASTER module will be used to lift/lower Point **2**_CONVOY (**Valve 2**= **2**).
Lifting potentiometer 1 of the MASTER module will be used to estimate the height of Point **1**_CONVOY (**H 1** = **1**). Lifting potentiometer 2 of the MASTER module will be used to estimate the height of Point **2**_CONVOY (**H2**= **2**).
Pressure transducer 1 of the MASTER module will be used to measure the pressure at Point **1**_CONVOY (**P 1** = **1**). Pressure transducer 2 of the MASTER module will be used to measure the pressure at Point **2**_CONVOY (**P 2** = **2**).

Distributor 1 of the SLAVE module will be used to lift/lower Point **3**_CONVOY (**Valve 1** = **3**).
Lifting potentiometer 1 of the SLAVE module will be used to estimate the height of Point **3**_CONVOY (**H 1** = **3**). Lifting potentiometer 2 of the SLAVE module will be used to estimate the height of Point **1**_CONVOY (**H 2** = **1**).
Pressure transducer 1 of the SLAVE module will be used to measure the pressure at Point **3**_CONVOY (**P 1** = **3**). Pressure transducer 2 of the SLAVE module will be used to measure the pressure at Point **1**_CONVOY (**P 2** = **1**).

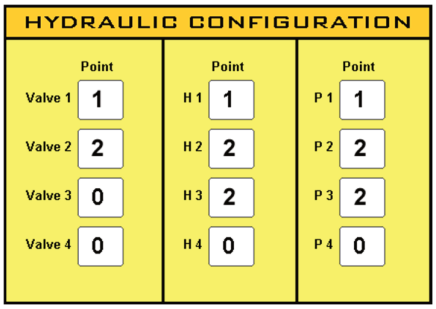
NOTE
*The lifting/lowering of Point **1**_CONVOY is controlled by distributor 1 of the MASTER module. However, since this point is very spread out, its height and pressure values are calculated as an average of the measurements obtained from the lifting potentiometers and pressure transducers of Point **1**_MASTER and Point **2**_SLAVE.*

Continued ➔

Continued ➔

Procedure

To obtain the height and pressure of Point **2**_CONVOY as the average of the heights and pressures, respectively, of points 2 and 3 of the MASTER module, fill in the "HYDRAULIC CONFIGURATION" field as follows:

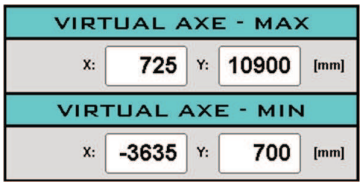


Note that **Valve 3** = **0**, according to the information on the previous page.

NOTE
The example continues with the configuration of the SLAVE module, in paragraph 12.4.2.

6) The information entered in the "VIRTUAL AXE" field shall be used by the control program to control the suspension steering.

INDICATIVE FIGURE



MAX	[mm]	Enter the coordinates of the centre of the suspension with respect to the convoy reference system, "O (X, Y)", in fields "**X**" and "**Y**", such that: **S** = **X** + **Y**= S_{MAX} I.e., the sum of the coordinates of the centre of any other convoy suspension with respect to the convoy reference system, is less than S_{MAX}.
MIN	[mm]	Enter the coordinates of the centre of the suspension with respect to the convoy reference system, "O (X, Y)", in fields "**X**" and "**Y**", such that: **S** = **X** + **Y**= S_{MIN} I.e., the sum of the coordinates of the centre of any other convoy suspension with respect to the convoy reference system, is more than S_{MIN}.

NOTE
Depending on the convoy vehicle layout, it may be necessary to consider virtual centers. These do not correspond to any real suspension in the convoy, but are necessary for the machine control software to be able to calculate suspension steering angles.
See the examples on the following pages for further explanation.

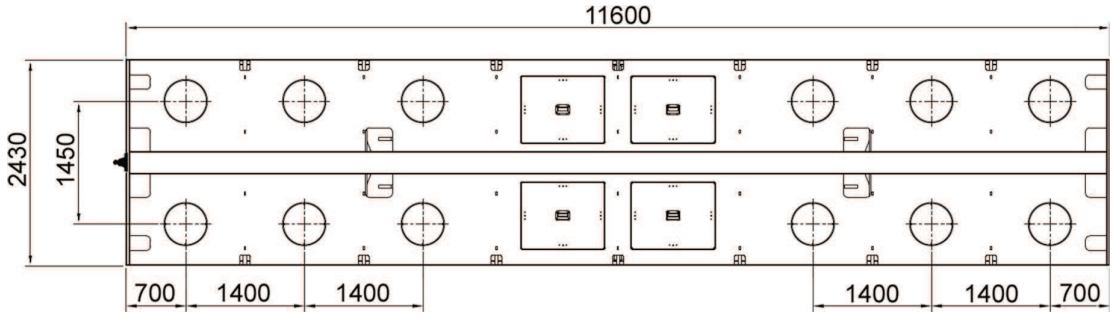
NOTE
With the sum of the coordinates we intend only to provide a method to univocally determine which are the centers of the MIN and MAX suspensions, real or virtual.
In the boxes of the "VIRTUAL AXE" field, always enter only the values of the X and Y coordinates of the MIN and MAX centers, never the result of their sum.

Continued ➔

Continued "Setting up a MASTER module" ➔

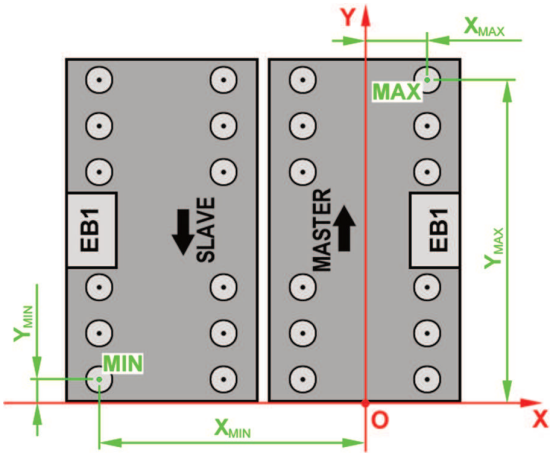
Procedure

For the following examples, consider an ECO1000 6/4 (6 axes) as an example. The useful dimensions (in millimetres) are shown in the figure below:



Example 1.

"L6-6" lateral configuration consisting of two 6-axes ECO1000 modules:



Add an intermediate thickness of about 500 mm due to the vehicle side coupling box; the coordinates are:

$X_{MAX} = 1450/2 = 725$ mm;
$Y_{MAX} = 11600 - 700 = 10900$ mm.

$X_{MIN} = -[(2430/2)\times 2 + 1450/2 + 500] = -3655$ mm;
$Y_{MIN} = 700$ mm.

It results that:

$S_{MAX} = X_{MAX} + Y_{MAX} = 725 + 10900 = 11625$ mm.
$S_{MIN} = X_{MIN} + Y_{MIN} = -3655 + 700 = -2955$ mm.

If we consider any other center of a suspension – generically defined by the coordinates (X_{GEN} , Y_{GEN}) – that is neither the MAX nor the MIN center and apply the sum of the coordinates, the result S_{GEN} will always be between S_{MIN} ed S_{MAX}, i.e.:

$S_{GEN} = X_{GEN} + Y_{GEN}$;
$S_{MIN} < S_{GEN} < S_{MAX}$.

In this way the MAX and MIN centers are uniquely determined.

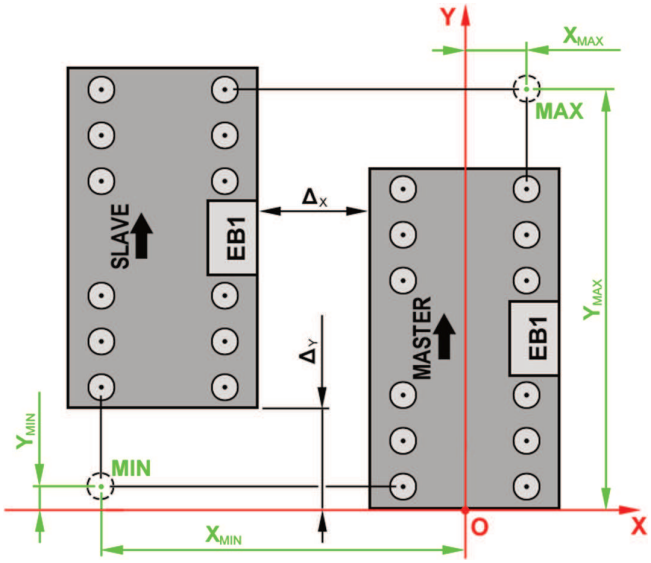
Continued ➔

Continued ➔

Procedure

Example 2.

Generic open compound configuration:



In this example it is necessary to consider virtual centers.
The centers of all suspensions must be inside a rectangle whose "MIN" and "MAX" vertices do not correspond with any real suspension: this is an artifice to allow the control software to set the correct steering angles according to the steering program selected by radio control.

$X_{MAX} = 1450/2 = 725$ mm;
$Y_{MAX} = (\Delta_Y + 11600 - 700)$ mm.

$X_{MIN} = -[(2430/2)\times 2 + 1450/2 + \Delta_X]$ mm;
$Y_{MIN} = 700$ mm.

It results that:

$S_{MAX} = X_{MAX} + Y_{MAX} = 725 + 10900 + \Delta_Y = (11625 + \Delta_Y)$ mm.
$S_{MIN} = X_{MIN} + Y_{MIN} = -3155 + \Delta_X + 700 = (-2455 + \Delta_X)$ mm.

If we consider any other virtual or real center of a suspension – generically defined by the coordinates (X_{GEN} , Y_{GEN}) – that is neither the MAX nor the MIN center and apply the sum of the coordinates, the result S_{GEN} will always be between S_{MIN} ed S_{MAX}, i.e.:

$S_{GEN} = X_{GEN} + Y_{GEN}$;

$S_{MIN} < S_{GEN} < S_{MAX}$.

In this way the MAX and MIN centers are uniquely determined.

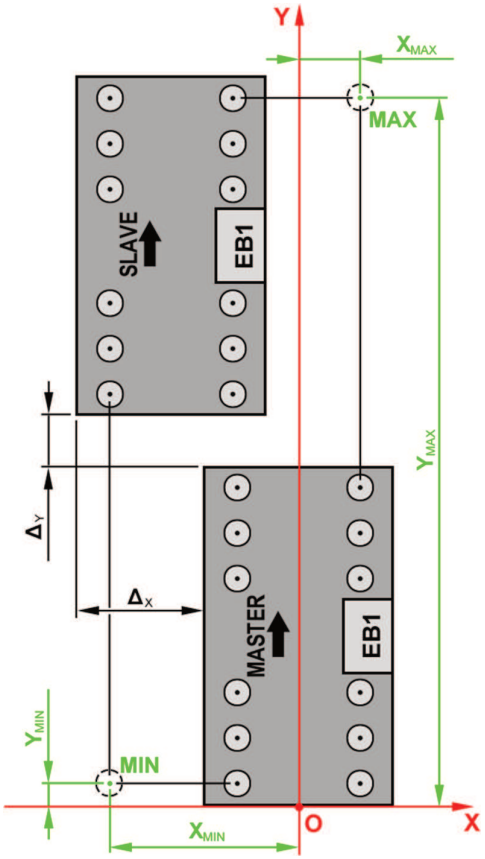
Continued ➔

Continued “Setting up a MASTER module” ➔

Procedure

Example 3.

Generic open compound configuration:



Also in this example, it is necessary to consider virtual centers:

$X_{MAX} = 1450/2 = 725$ mm;
$Y_{MAX} = (11600 + \Delta_Y + 11600 - 700)$ mm.

$X_{MIN} = -[2430/2 + \Delta_X - (2430 - 1450)/2]$ mm;
$Y_{MIN} = 700$ mm.

It results that:

$S_{MAX} = X_{MAX} + Y_{MAX} = 725 + 22500 + \Delta_Y = (23225 + \Delta_Y)$ mm.
$S_{MIN} = X_{MIN} + Y_{MIN} = -725 - \Delta_X + 700 = (-25 - \Delta_X)$ mm.

If we consider any other virtual or real center of a suspension – generically defined by the coordinates (X_{GEN} , Y_{GEN}) – that is neither the MAX nor the MIN center and apply the sum of the coordinates, the result S_{GEN} will always be between S_{MIN} ed S_{MAX}, i.e.:

$S_{GEN} = X_{GEN} + Y_{GEN}$;

$S_{MIN} < S_{GEN} < S_{MAX}$.

In this way the MAX and MIN centers are uniquely determined.

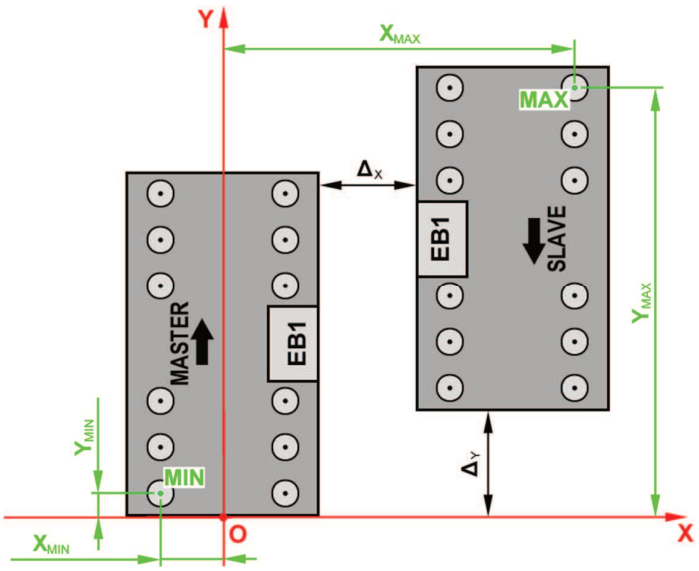
Continued ➔

Continued ➔

Procedure

Example 4.

Generic open compound configuration:



In this example it is not necessary to consider virtual centers; MIN and MAX correspond to two real centers capable of describing a rectangle in which all suspension centers are included:

$X_{MAX} = (2430/2 + \Delta_X + 2430/2 + 1450/2)$ mm;
$Y_{MAX} = (\Delta_Y + 11600 - 700)$ mm.

$X_{MIN} = -1450/2 = -725$ mm;
$Y_{MIN} = 700$ mm.

It results that:

$S_{MAX} = X_{MAX} + Y_{MAX} = 3155 + \Delta_X + 10900 + \Delta_Y = (14055 + \Delta_X + \Delta_Y)$ mm.
$S_{MIN} = X_{MIN} + Y_{MIN} = -725 + 700 = -25$ mm.

If we consider any other virtual or real center of a suspension – generically defined by the coordinates (X_{GEN} , Y_{GEN}) – that is neither the MAX nor the MIN center and apply the sum of the coordinates, the result S_{GEN} will always be between S_{MIN} ed S_{MAX}, i.e.::

$S_{GEN} = X_{GEN} + Y_{GEN}$;

$S_{MIN} < S_{GEN} < S_{MAX}$.

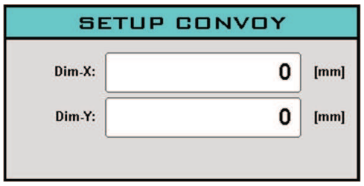
In this way the MAX and MIN centers are uniquely determined.

Continued ➔

Continued “Setting up a MASTER module” ➔

Procedure

7) “SETUP CONVOY” field: convoy overall dimensions.



Unused field. Set the values in both boxes to zero.
Dim-X = **Dim-Y** = 0 mm.

8) Save the settings by pressing **F5**.

If the settings are successfully saved, the program leaves the “Setup vehicle” page automatically. On the bottom right corner of the screen, near the machine status icons, will be displayed one of the following icons:

	This icon indicates that the vehicle is configured as MASTER and is currently on hold, until the SLAVE vehicle is defined.
	This icon indicates that the vehicle is configured as MASTER and communicates with the SLAVE vehicle (only if a SLAVE vehicle has been suitably configured and connected beforehand).

NOTE
If the operator leaves this page without saving, all changes will be lost and the program returns to the previously saved configuration.

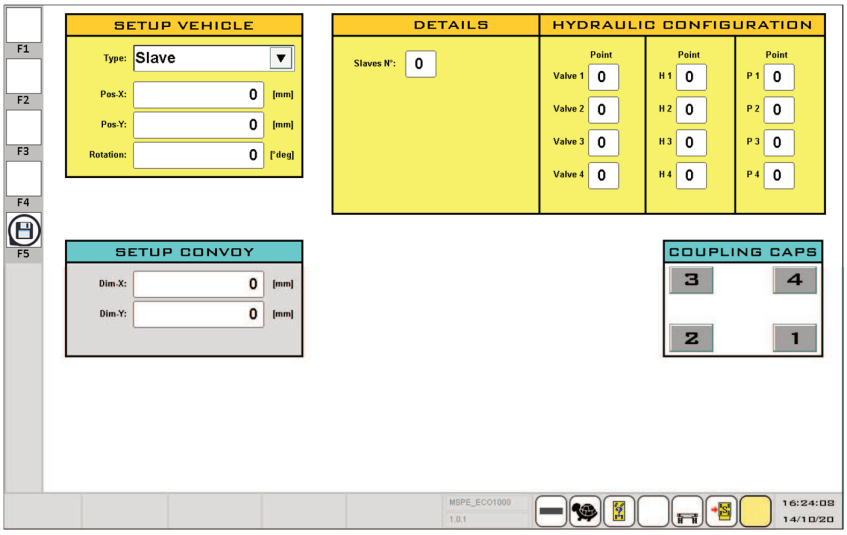
12.4.2 Setting up a SLAVE module

Procedure

1) From the “Setup vehicle” page, open the “Type” drop-down menu and select “**Slave**”.

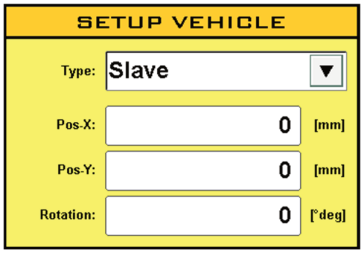
2) The following screen is displayed:

INDICATIVE FIGURE



3) “SETUP VEHICLE” field

INDICATIVE FIGURE



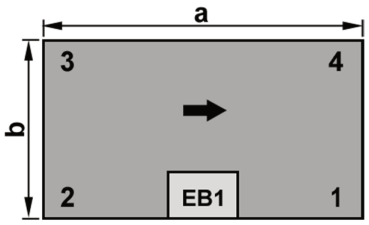
Pos-X	[mm]	Shifting in the x-direction of the vehicle reference system, “o (x, y)”, compared to the convoy reference system, “O (X, Y)”.
Pos-Y	[mm]	Shifting in the y-direction of the vehicle reference system, “o (x, y)”, compared to the convoy reference system, “O (X, Y)”.
Rotation	[°]	Rotation of the vehicle reference system, “o (x, y)”, compared to the convoy reference system, “O (X, Y)”.

Continued ➔

Continued "Setting up a SLAVE module" ➔

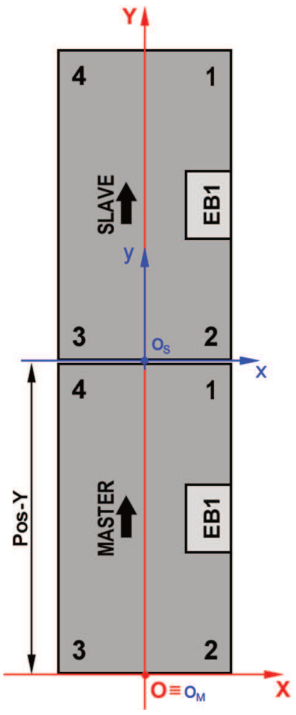
Procedure

Consider a generic frame with the following overall dimensions:



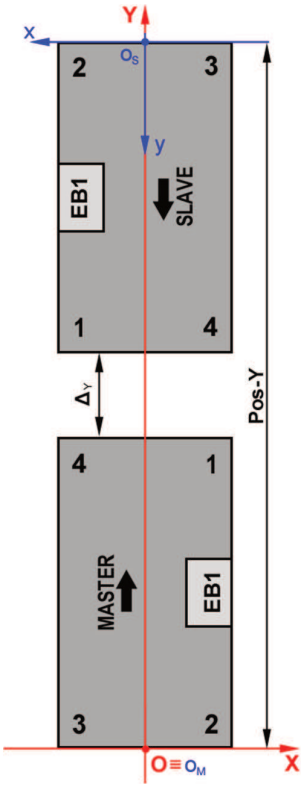
NOTE
*To evaluate **Pos-X** and **Pos-Y**, take into account both the vehicle dimensions and the thickness of the mechanical coupling elements, such as boxes and shim plates.*

Example 1: longitudinal configurations.
In the type C configuration the shim plates with a thickness of 20 mm are inserted between the two modules.



Generic type C configuration:

Pos-X	0 mm
Pos-Y	a + 20 mm
Rotation	0°



Generic open compound longitudinal configuration:

Pos-X	0 mm
Pos-Y	a + Δ_Y + a
Rotation	180°

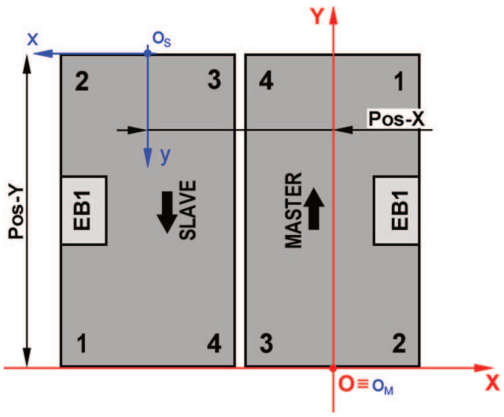
Continued ➔

Continued ➔

Procedure

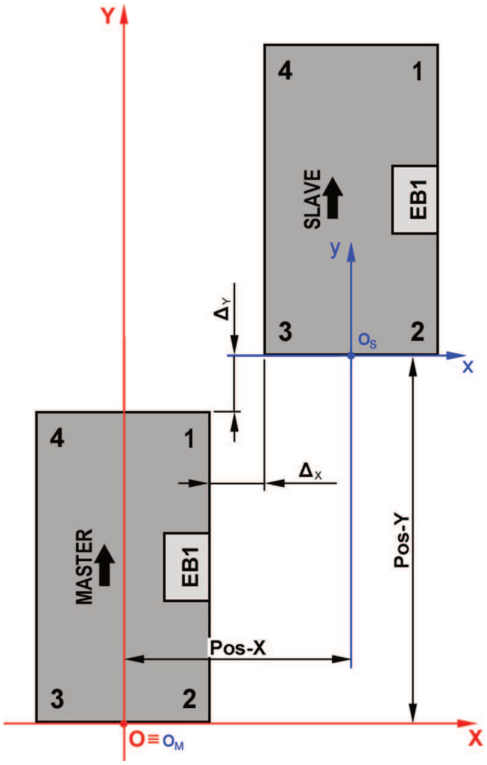
Example 2: generic type L configuration.

In the type L configuration the side coupling boxes with a thickness of 500 mm are inserted between the modules.



Pos-X	− (b/2 + 500 + b/2)
Pos-Y	a
Rotation	180°

Example 3: generic open compound configuration.



Pos-X	b/2 + Δ_X + b/2
Pos-Y	a + Δ_Y
Rotation	0°

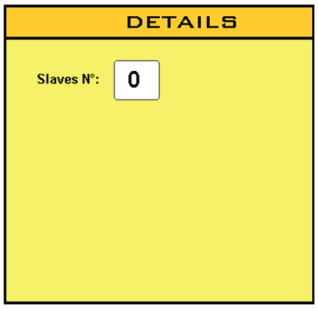
Continued ➔

Continued "Setting up a SLAVE module" ➔

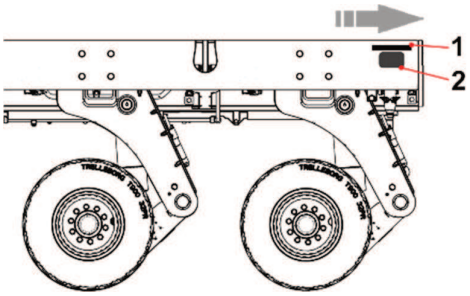
Procedure

4) "DETAILS" field.

INDICATIVE FIGURE



Slaves N°	• Write down the frame number last 5 digits of the module you are working on. • Check in the field "DETAILS" of the MASTER module which row contains the same 5 digits (column "**ID**") and write down the corresponding row number (column "**#**", numbers vary from a minimum of one to a maximum of three). • Calculate: (row_no.) – 1. • Enter the result inside the field "**Slaves N°**".



NOTE
*The chassis number (**1**) is located above the CE plate (**2**), on the front right side of the vehicle.*

NOTE
Further information under "DETAILS" of the MASTER module, section 12.4.1.

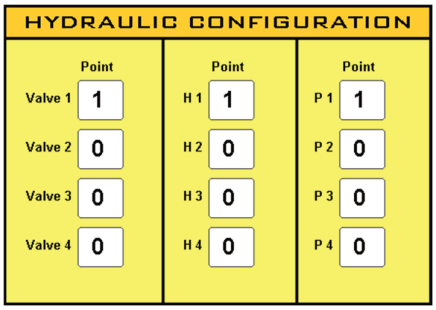
Continued ➔

Continued ➔

Procedure

5) From the “HYDRAULIC CONFIGURATION” field it is possible to link the hydraulic point control of the convoy to that of the single modules included in the convoy.

INDICATIVE FIGURE



Valve (**n**) (hydraulic distributors)	Just like for the MASTER module, indicate which hydraulic point, “**Point**”, of the convoy will lower/raise when “**Valve** (**n**)” of the SLAVE module is operated. ***ATTENTION*** ***For improved safety, link the lifting/lowering of the convoy hydraulic point to only one distributor, regardless of whether that convoy hydraulic point includes several hydraulic points associated with one or several modules, either MASTER or SLAVE.***
H (**n**) (height sensors)	Just like for the MASTER module, indicate the convoy hydraulic point, “**Point**”, for which the lifting potentiometer, “**H** (**n**)”, of the SLAVE module will estimate the height.
P (**n**) (pressure sensors)	Just like for the MASTER module, indicate the convoy hydraulic point, “**Point**”, for which pressure transducer “**P**(**n**)” of the SLAVE module will determine the pressure.

NOTE
The values in the boxes may range from 1 to 4, since there can be a maximum of only 4 hydraulic stability points.

NOTE
For more information on how to fill in the fields, see paragraph 12.4.1, point “HYDRAULIC CONFIGURATION” of the MASTER module.

Continued ➔

Continued "Setting up a SLAVE module" ➔

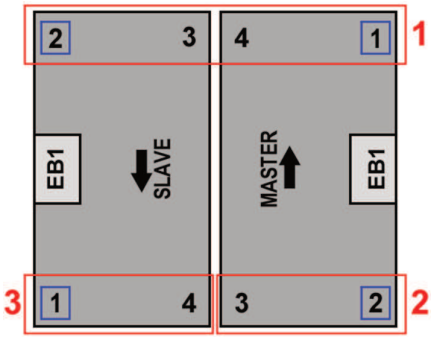
Procedure

Example.

Considering the L6 - 6 setup on three stability points. The convoy hydraulic point control and management shall be linked as follows:

- (Point **1**_CONVOY) = (Point **1**_MASTER) + (Point **2**_SLAVE).
- (Point **2**_CONVOY) = (Point **2**_MASTER).
- (Point **3**_CONVOY) = (Point **1**_SLAVE).

NOTE
The same example is reported in paragraph 12.4.1, concerning the MASTER module configuration.



Fill in the "HYDRAULIC CONFIGURATION" field of the MASTER and SLAVE modules as follows:

MASTER

HYDRAULIC CONFIGURATION			
	Point	Point	Point
Valve 1	1	H 1 1	P 1 1
Valve 2	2	H 2 2	P 2 2
Valve 3	0	H 3 0	P 3 0
Valve 4	0	H 4 0	P 4 0

SLAVE

HYDRAULIC CONFIGURATION			
	Point	Point	Point
Valve 1	3	H 1 3	P 1 3
Valve 2	0	H 2 1	P 2 1
Valve 3	0	H 3 0	P 3 0
Valve 4	0	H 4 0	P 4 0

Distributor 1 of the MASTER module will be used to lift/lower Point **1**_CONVOY (**Valve 1** = **1**). Distributor 2 of the MASTER module will be used to lift/lower Point **2**_CONVOY (**Valve 2**= **2**).
Lifting potentiometer 1 of the MASTER module will be used to estimate the height of Point **1**_CONVOY (**H 1** = **1**). Lifting potentiometer 2 of the MASTER module will be used to estimate the height of Point **2**_CONVOY (**H2**= **2**).
Pressure transducer 1 of the MASTER module will be used to measure the pressure at Point **1**_CONVOY (**P 1** = **1**). Pressure transducer 2 of the MASTER module will be used to measure the pressure at Point **2**_CONVOY (**P 2** = **2**).

Distributor 1 of the SLAVE module will be used to lift/lower Point **3**_CONVOY (**Valve 1** = **3**).
Lifting potentiometer 1 of the SLAVE module will be used to estimate the height of Point **3**_CONVOY (**H 1** = **3**). Lifting potentiometer 2 of the SLAVE module will be used to estimate the height of Point **1**_CONVOY (**H 2** = **1**).
Pressure transducer 1 of the SLAVE module will be used to measure the pressure at Point **3**_CONVOY (**P 1** = **3**). Pressure transducer 2 of the SLAVE module will be used to measure the pressure at Point **1**_CONVOY (**P 2** = **1**).

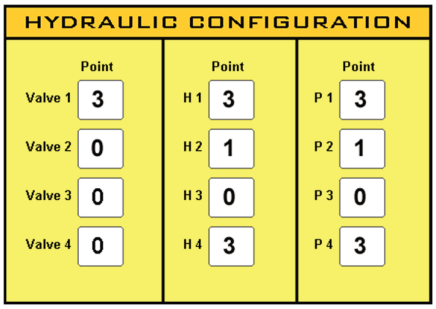
NOTE
*The lifting/lowering of Point **1**_CONVOY is controlled by distributor 1 of the MASTER module. However, since this point is very spread out, its height and pressure values are calculated as an average of the measurements obtained from the lifting potentiometers and pressure transducers of Point **1**_MASTER and Point **2**_SLAVE.*

Continued ➔

Continued ➔

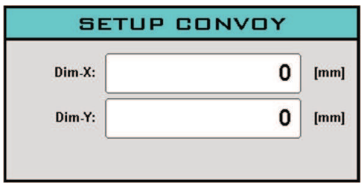
Procedure

To obtain the height and pressure of Point **3**_CONVOY as the average, respectively, of the heights and pressures of points 1 and 4 of the SLAVE module, fill in the "HYDRAULIC CONFIGURATION" field as follows:



Note that **Valve 4** = **0**, according to the information on the previous page.

6) "SETUP CONVOY" field: convoy overall dimensions.



Unused field. Set the values in both boxes to zero.

Dim-X = **Dim-Y** = 0 mm.

7) Save the settings by pressing **F5**.

If the settings are successfully saved, the program leaves the "Setup vehicle" page automatically. On the bottom right corner of the screen, near the machine status icons, will be displayed one of the following icons:

	This icon indicates that the vehicle is configured as SLAVE and is currently on hold, until the MASTER vehicle is defined.
	This icon indicates that the vehicle is configured as SLAVE and communicates with the MASTER vehicle (only if a MASTER vehicle has been suitably configured and connected beforehand).

NOTE
If the operator leaves this page without saving, all changes will be lost and the program returns to the previously saved configuration.

12.5. CONVOY STABILITY ON 3 AND 4 POINTS

Preliminary condition

Just like for single ECO1000 vehicles, the stability of the convoy can also be set on three or four hydraulic points. In this case, however, the hydraulic points may include suspensions belonging to one or several vehicles.
To modify and set up the hydraulic points of the convoy, operate taps [**11**] (2 units) – [**12**] (2 units) – [**13**] (2 units) – [**20**] – [**21**] (1) of the single vehicles and make the necessary hydraulic connections between the vehicles using hoses, as explained in the different sections of this paragraph 12.5.

NOTE
For more information on how to make the hydraulic connections between the vehicles, see paragraph 12.3.2.

WARNING
Before making any hydraulic connection and/or modifying any hydraulic point, set the convoy to the full-low position: unexpected convoy shifting hazard. See chapter 10.

ATTENTION
Just like for single ECO1000 vehicles, in order to avoid any unnecessary torsion stress on the convoy module chassis, it is recommended to opt for the 3-point stability condition.

Legend

The table below reports the Cometto codes of the module hydraulic coupling kits and hoses (the hose is part of the kit) and the identification number used in the following pages.

	COUPLING KIT		COUPLING HOSE	
1	**343.7269**	(longitudinal)	186.7730	5/8" x 1900 mm
2	**343.7268**	(side by side)	186.3078.01	5/8" x 800 mm

NOTE
If the distance between the modules is too big for the hoses here above mentioned, use the proper ones which may be included in your order, keeping in mind the suggestions "longitudinal" and "side by side".

Cover the hydraulic couplings with the respective caps if no hydraulic connection is needed:

CAP	
	176.0368

A red rectangle highlights the taps that must be closed in order to carry out a certain stability setup:

	Tap CLOSED

Other configurations

Should it be necessary to carry out configurations not covered in this manual, use the "COSMO" software supplied on a USB stick or contact our technical support office (contact information are reported in paragraph 1.9).

(1) = the number of hydraulic taps for stability configuration on 3 or 4 points varies from one to another vehicle type. Refer to paragraph 3.2.

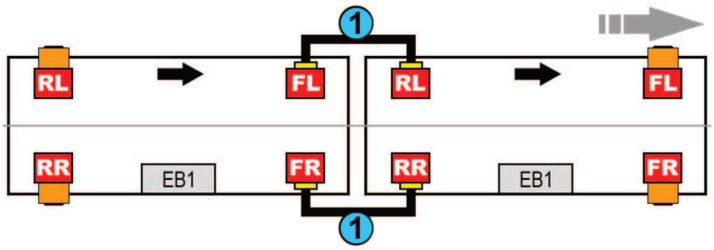
12.5.1 Type “C” setups

12.5.1.1. C4-22

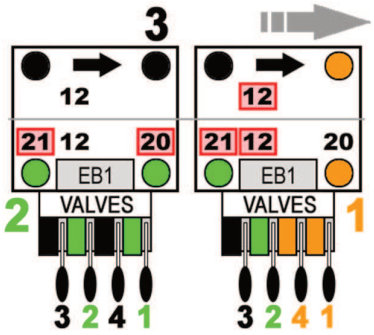
C4-22 – 3 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

The distributor block (**VALVES**) in the figure, indicates, for each convoy module:

- Which distributors can be used to lift/lower the hydraulic point of the convoy of the corresponding colour. For example, distributor (**1**) of the module on the left side of the figure will be used to lift/lower point (**2**) of the convoy (**Valve 1** = **2**).

  ATTENTION
  For improved safety, link the lifting/lowering of a convoy hydraulic point to only one module distributor, regardless of whether that convoy hydraulic point includes suspensions associated with one or several modules.

- Which pressure transducers measure the pressure at a certain hydraulic point of the convoy, respecting the same colour logic. For example, transducer 4 of the module on the left side of the figure will be used to measure the pressure at point (**3**) of the convoy (**P 4**= **3**).

The suspensions are represented as circles, coloured differently, according to the convoy hydraulic point to which they belong. Keeping in mind that only suspensions [**1**] – [**4**] on the front side and suspensions [**2**] – [**3**] on the rear side of each module are equipped with lifting potentiometers, the figure indicates which lifting potentiometers can be used to estimate the height of a particular point of the convoy. For example, potentiometer 4 (installed on suspension [**4**]) of the module on the right side of the figure will be used to estimate the height of point (**1**) of the convoy (**H 4** = **1**).

NOTE
For more information, see the “HYDRAULIC CONFIGURATION” point in the convoy module electronic configuration procedure, in paragraphs 12.4.1 and 12.4.2.

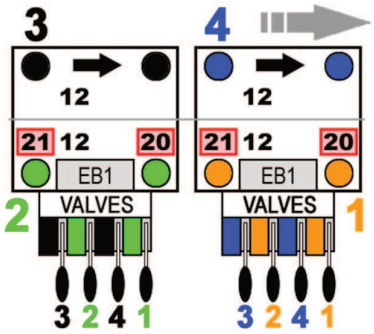
Continued ➔

Continued “C4-22” ➔

C4-22 – 4 stability points

Hydraulic connections: no hydraulic connection required between modules.
Cover all the hydraulic couplings with the respective caps.

Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

The distributor block (**VALVES**) in the figure, indicates, for each convoy module:

- Which distributors can be used to lift/lower the hydraulic point of the convoy of the corresponding colour. For example, distributor (**2**) of the module on the left side of the figure will be used to lift/lower point (**2**) of the convoy (**Valve 2** = **2**).

  ATTENTION
  For improved safety, link the lifting/lowering of a convoy hydraulic point to only one module distributor, regardless of whether that convoy hydraulic point includes suspensions associated with one or several modules.

- Which pressure transducers measure the pressure at a certain hydraulic point of the convoy, respecting the same colour logic. For example, transducer 2 of the module on the right side of the figure will be used to measure the pressure at point (**1**) of the convoy (**P 2** = **1**).

The suspensions are represented as circles, coloured differently, according to the convoy hydraulic point to which they belong. Keeping in mind that only suspensions [**1**] – [**4**] on the front side and suspensions [**2**] – [**3**] on the rear side of each module are equipped with lifting potentiometers, the figure indicates which lifting potentiometers can be used to estimate the height of a particular point of the convoy. For example, potentiometer **4** (installed on suspension [**4**]) of the module on the right side of the figure will be used to estimate the height of point (**4**) of the convoy (**H 4** = **4**).

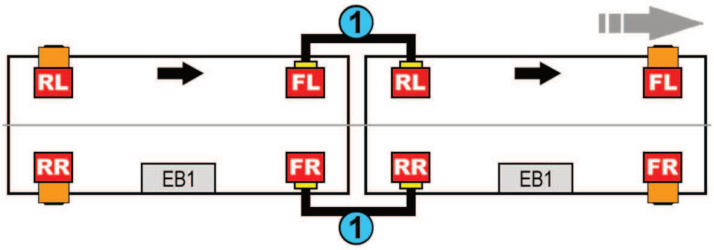
NOTE
For more information, see the “HYDRAULIC CONFIGURATION” point in the convoy module electronic configuration procedure, in paragraphs 12.4.1 and 12.4.2.

12.5.1.2. C6-24

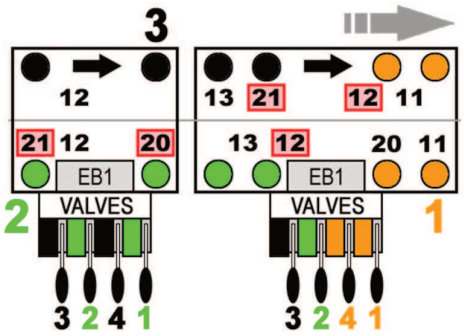
C6-24 – 3 stability points

INDICATIVE FIGURE

Hydraulic connections:



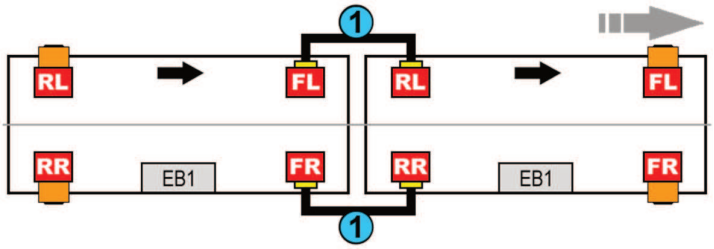
Taps and hydraulic points:



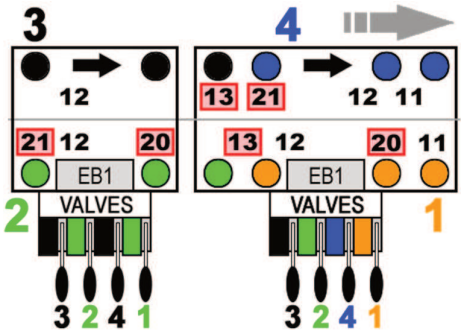
C6-24 – 4 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

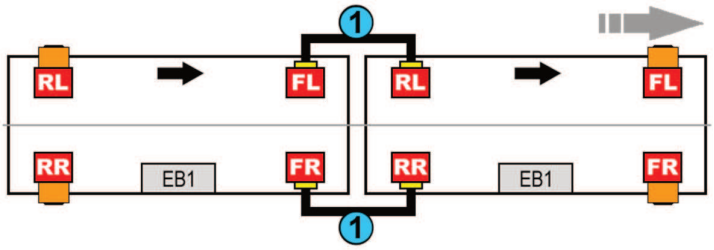
NOTE
See the examples in paragraphs 12.5.1.1, 12.5.2.1, 12.5.2.4.

12.5.1.3. C8-26

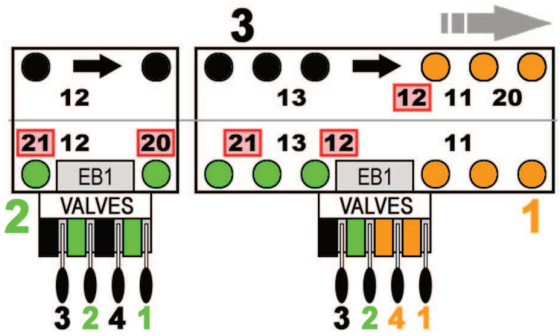
C8-26 – 3 stability points

INDICATIVE FIGURE

Hydraulic connections:



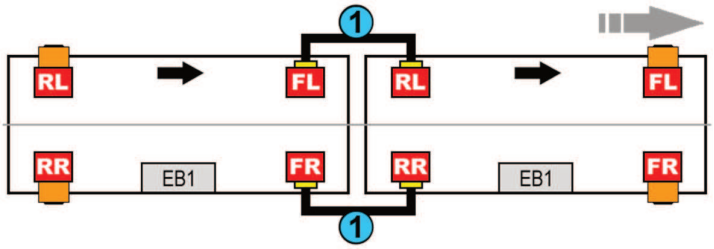
Taps and hydraulic points:



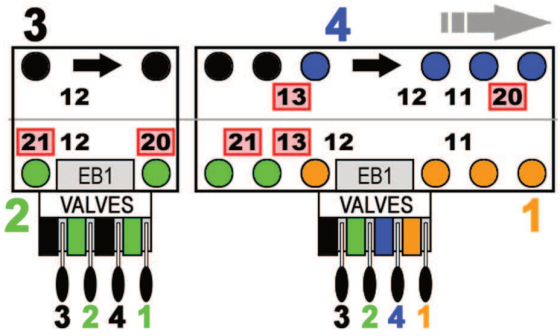
C8-26 – 4 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

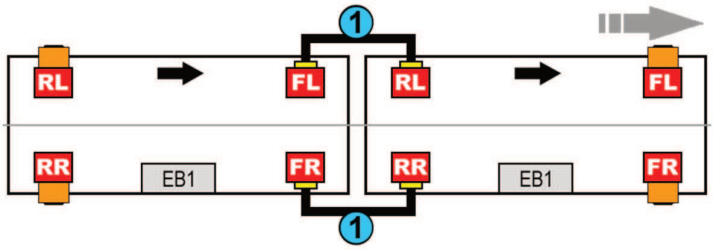
NOTE
See the examples in paragraphs 12.5.1.1, 12.5.2.1, 12.5.2.4.

12.5.1.4. C8-44

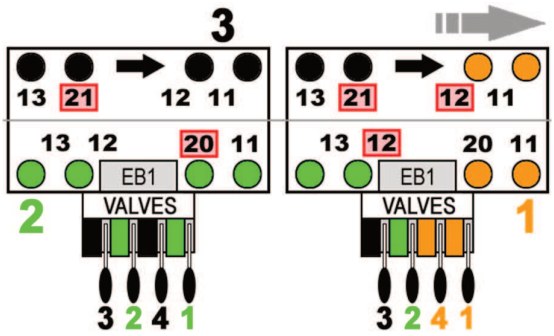
C8-44 – 3 stability points

Hydraulic connections:

INDICATIVE FIGURE



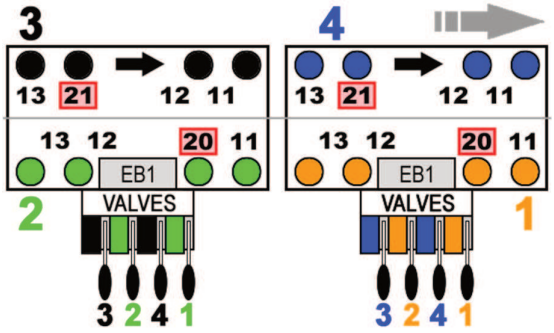
Taps and hydraulic points:



C8-44 – 4 stability points

Hydraulic connections: no hydraulic connection required between modules.
Cover all the hydraulic couplings with the respective caps.

Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

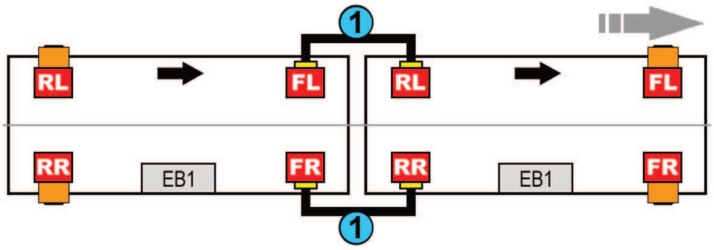
NOTE
See the examples in paragraphs 12.5.1.1, 12.5.2.1, 12.5.2.4.

12.5.1.5. C10-46

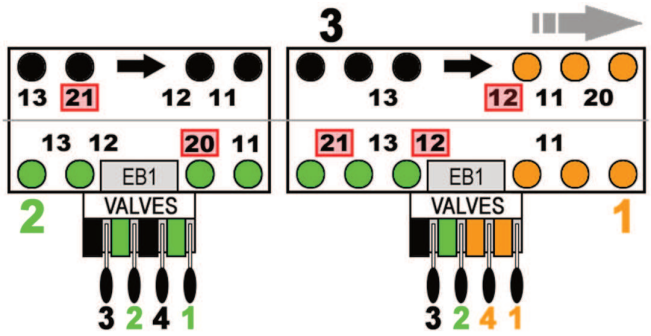
C10-46 – 3 stability points

Hydraulic connections:

INDICATIVE FIGURE



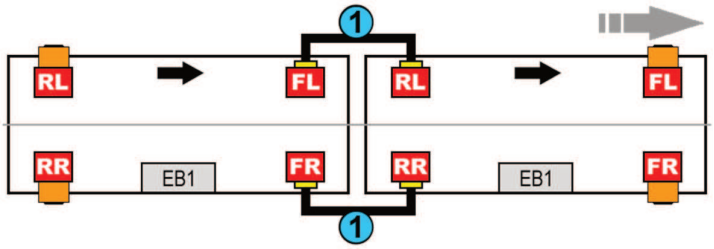
Taps and hydraulic points:



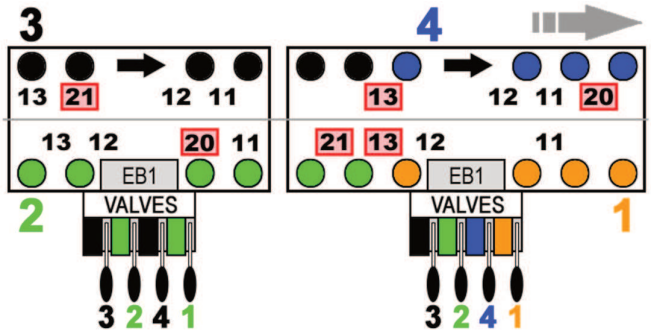
C10-46 – 4 stability points

Hydraulic connections:

INDICATIVE FIGURE



Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

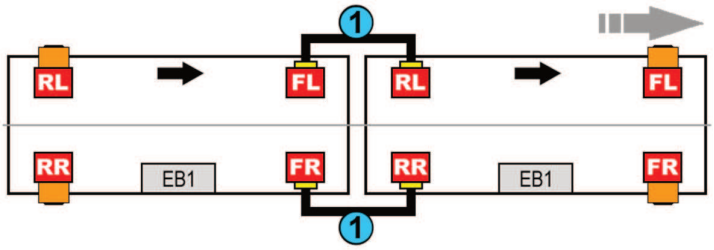
NOTE
See the examples in paragraphs 12.5.1.1, 12.5.2.1, 12.5.2.4.

12.5.1.6. C12-66

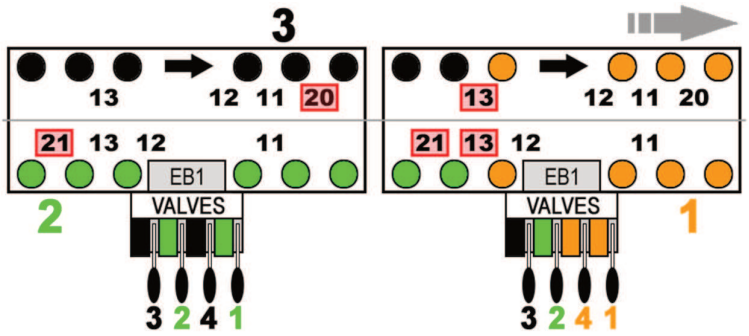
C12-66 – 3 stability points

Hydraulic connections:

INDICATIVE FIGURE



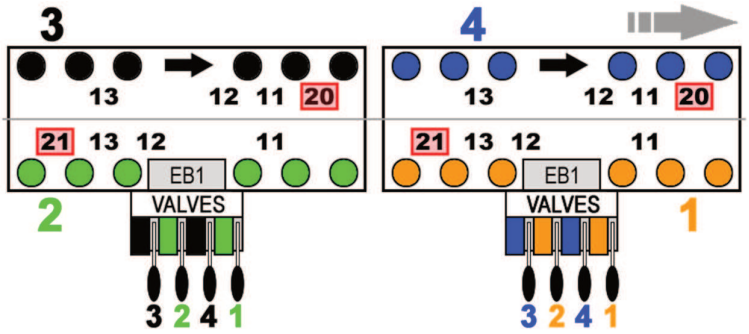
Taps and hydraulic points:



C12-66 – 4 stability points

Hydraulic connections: no hydraulic connection required between modules.
Cover all the hydraulic couplings with the respective caps.

Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

NOTE
See the examples in paragraphs 12.5.1.1, 12.5.2.1, 12.5.2.4.

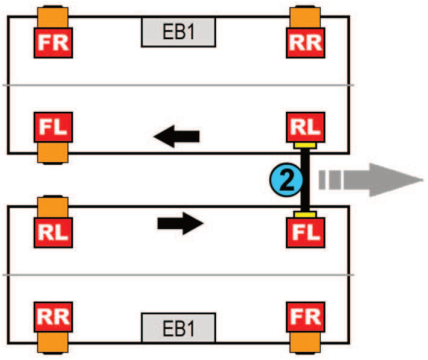
12.5.2 Type “L” setups

12.5.2.1. L2-2

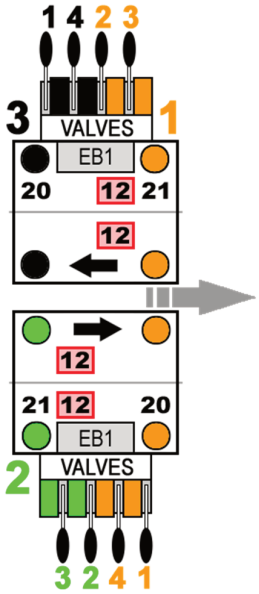
L2-2 – 3 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

The distributor block (**VALVES**) in the figure, indicates, for each convoy module:

- Which distributors can be used to lift/lower the hydraulic point of the convoy of the corresponding colour. For example, distributor (**4**) of the module at the bottom of the figure will be used to lift/lower point (**1**) of the convoy (**Valve 4** = **1**).

  ATTENTION
  For improved safety, link the lifting/lowering of the convoy hydraulic point to only one module distributor, regardless of whether that convoy hydraulic point includes suspensions associated with one or several modules.

- Which pressure transducers measure the pressure at a certain hydraulic point of the convoy, respecting the same colour logic. For example, transducer 1 of the module at the top of the figure will be used to measure the pressure at point (**3**) of the convoy (**P 1** = **3**).

Continued ➔

Continued ➔

How to read the representations

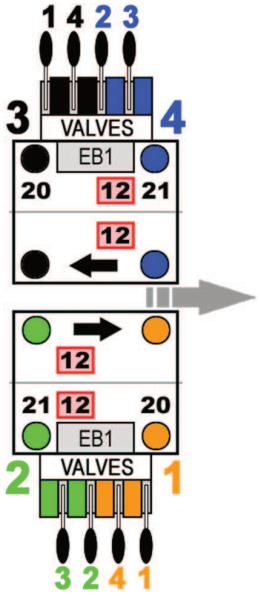
The suspensions are represented as circles, coloured differently, according to the convoy hydraulic point to which they belong. Keeping in mind that only suspensions [**1**] – [**4**] on the front side and suspensions [**2**] – [**3**] on the rear side of each module are equipped with lifting potentiometers, the figure indicates which lifting potentiometers can be used to estimate the height of a particular point of the convoy. For example, potentiometer 1 (installed on suspension [**1**]) of the module at the bottom of the figure and potentiometer 2 (installed on suspension [**2**]) of the module at the top of the figure will be used to estimate the height of point (**1**), as an average of the two measurements (**H 1** = **1**; **H 2** = **1**).

NOTE
For more information, see the "HYDRAULIC CONFIGURATION" point in the convoy module electronic configuration procedure, in paragraphs 12.4.1 and 12.4.2.

L2-2 – 4 stability points

Hydraulic connections: no hydraulic connection required between modules.
Cover all the hydraulic couplings with the respective caps.

Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

The distributor block (**VALVES**) in the figure, indicates, for each convoy module:

- Which distributors can be used to lift/lower the hydraulic point of the convoy of the corresponding colour. For example, distributor (**4**) of the module at the bottom of the figure will be used to lift/lower point (**1**) of the convoy (**Valve 4** = **1**).

  ATTENTION
  For improved safety, link the lifting/lowering of the convoy hydraulic point to only one module distributor, regardless of whether that convoy hydraulic point includes suspensions associated with one or several modules.

- Which pressure transducers measure the pressure at a certain hydraulic point of the convoy, respecting the same colour logic. For example, transducer 3 of the module at the top of the figure will be used to measure the pressure at point (**4**) of the convoy (**P 3** = **4**).

Continued ➔

Continued “L2-2” ➔

How to read the representations

The suspensions are represented as circles, coloured differently, according to the convoy hydraulic point to which they belong. Keeping in mind that only suspensions [**1**] – [**4**] on the front side and suspensions [**2**] – [**3**] on the rear side of each module are equipped with lifting potentiometers, the figure indicates which lifting potentiometers can be used to estimate the height of a particular point of the convoy. For example, potentiometer 2 (installed on suspension [**2**]) and potentiometer 3 (installed on suspension [**3**]) of the module at the top of the figure will be used to estimate the height of point (**4**) as an average of the two measurements (**H 2** = **4**; **H 3** = **4**).

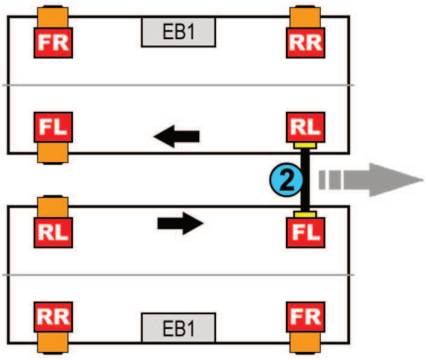
NOTE
For more information, see the “HYDRAULIC CONFIGURATION” point in the convoy module electronic configuration procedure, in paragraphs 12.4.1 and 12.4.2.

12.5.2.2. L4-4

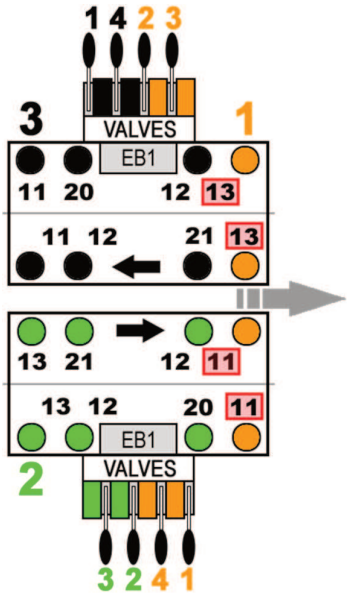
L4-4 – 3 stability points

Hydraulic connections:

INDICATIVE FIGURE



Taps and hydraulic points:



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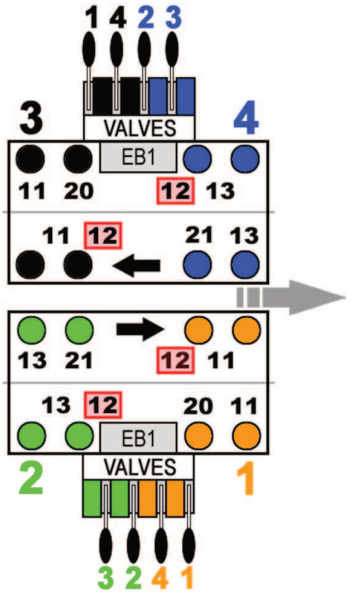
L4-4 – 4 stability points

Hydraulic connections: no hydraulic connection required between modules.
Cover all the hydraulic couplings with the respective caps.

Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

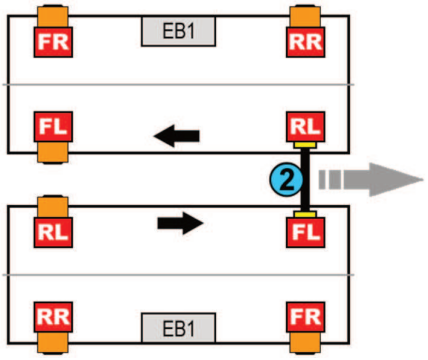
NOTE
See the examples in paragraphs 12.5.1.1, 12.5.2.1, 12.5.2.4.

12.5.2.3. L6-6

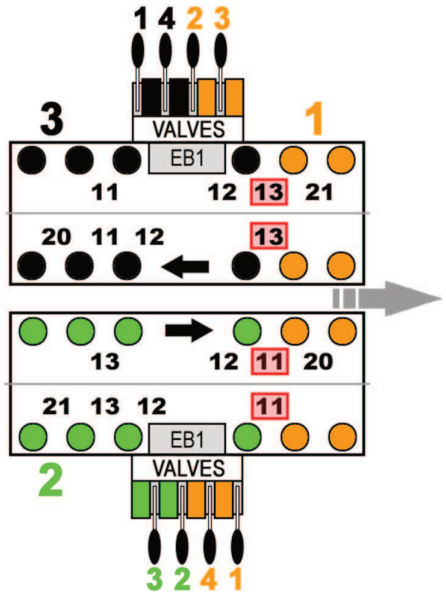
L6-6 – 3 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



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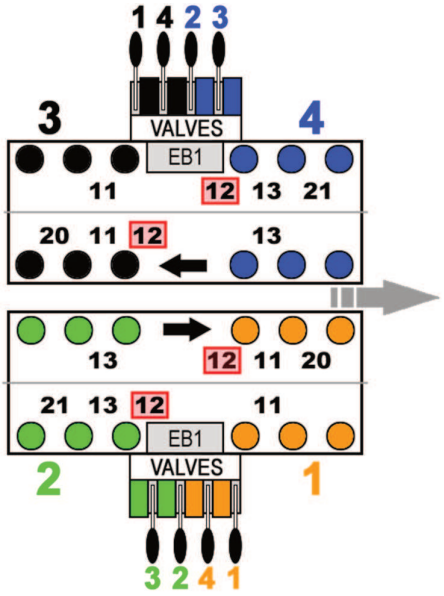
L6-6 – 4 stability points

Hydraulic connections: no hydraulic connection required between modules.
Cover all the hydraulic couplings with the respective caps.

Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

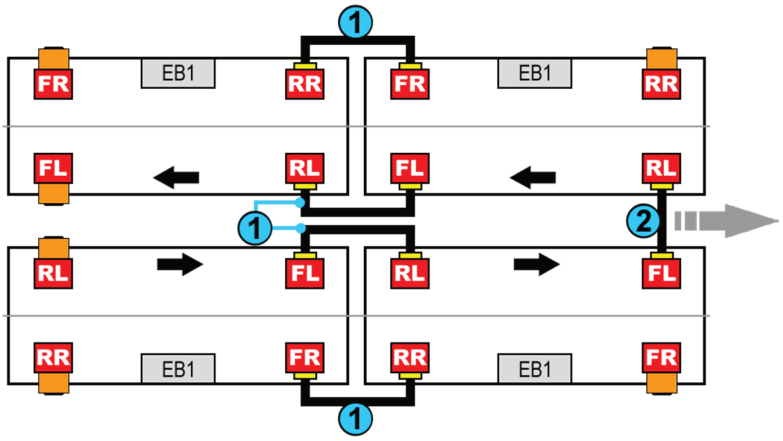
NOTE
See the examples in paragraphs 12.5.1.1, 12.5.2.1, 12.5.2.4.

12.5.2.4. L6-24

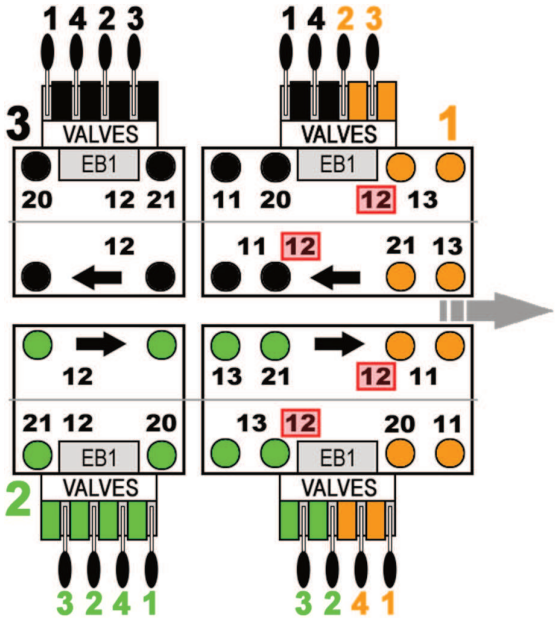
L6-24 – 3 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

The distributor block (**VALVES**) in the figure, indicates, for each convoy module:

- Which distributors can be used to lift/lower the hydraulic point of the convoy of the corresponding colour. For example, distributor (**4**) of the module at the top left corner of the figure will be used to lift/lower point (**3**) of the convoy (**Valve 4** = **3**).

ATTENTION
For improved safety, link the lifting/lowering of the convoy hydraulic point to only one module distributor, regardless of whether that convoy hydraulic point includes suspensions associated with one or several modules.

Continued ➔

Continued ➔

How to read the representations

- Which pressure transducers measure the pressure at a certain hydraulic point of the convoy, respecting the same colour logic. For example, transducer 3 of the module at the top right corner of the figure will be used to measure the pressure at point (**1**) of the convoy (**P 3** = **1**).

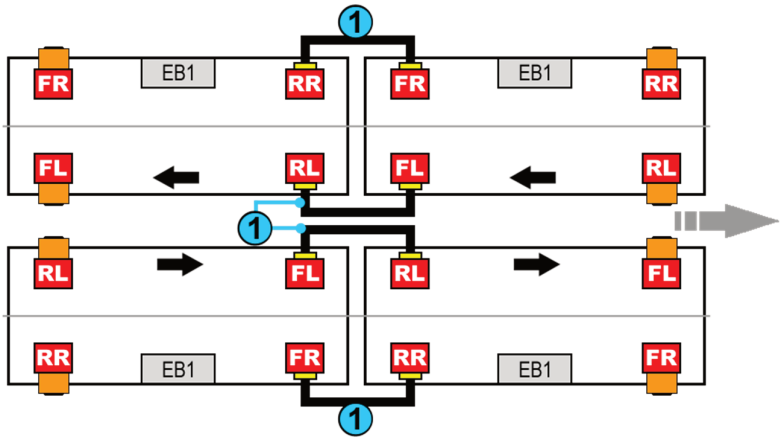
The suspensions are represented as circles, coloured differently, according to the convoy hydraulic point to which they belong. Keeping in mind that only suspensions [**1**] – [**4**] on the front side and suspensions [**2**] – [**3**] on the rear side of each module are equipped with lifting potentiometers, the figure indicates which lifting potentiometers can be used to estimate the height of a particular point of the convoy. For example, potentiometer 2 (installed on suspension [**2**]) of the module at the bottom left corner of the figure will be used to estimate the height of point (**2**) of the convoy (**H 2** = **2**).

NOTE
For more information, see the "HYDRAULIC CONFIGURATION" point in the convoy module electronic configuration procedure, in paragraphs 12.4.1 and 12.4.2.

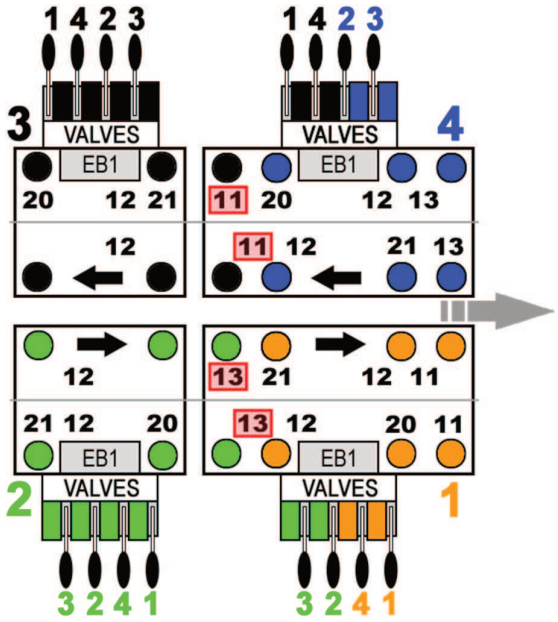
L6-24 – 4 stability points

Hydraulic connections:

INDICATIVE FIGURE



Taps and hydraulic points:



Continued ➔

Continued "L6-24" ➔

How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

The distributor block (**VALVES**) in the figure, indicates, for each convoy module:

- Which distributors can be used to lift/lower the hydraulic point of the convoy of the corresponding colour. For example, distributor (**4**) of the module at the top left corner of the figure will be used to lift/lower point (**3**) of the convoy (**Valve 4** = **3**).

  ATTENTION
  For improved safety, link the lifting/lowering of the convoy hydraulic point to only one module distributor, regardless of whether that convoy hydraulic point includes suspensions associated with one or several modules.

- Which pressure transducers measure the pressure at a certain hydraulic point of the convoy, respecting the same colour logic. For example, transducer 3 of the module at the top right corner of the figure will be used to measure the pressure at point (**4**) of the convoy (**P 3** = **4**).

The suspensions are represented as circles, coloured differently, according to the convoy hydraulic point to which they belong. Keeping in mind that only suspensions [**1**] – [**4**] on the front side and suspensions [**2**] – [**3**] on the rear side of each module are equipped with lifting potentiometers, the figure indicates which lifting potentiometers can be used to estimate the height of a particular point of the convoy. For example, potentiometer 2 (installed on suspension [**2**]) and potentiometer 3 (installed on suspension [**3**]) of the module at the top right corner of the figure, will be used to estimate the height of point (**4**), as an average of the two measurements (**H 2** = **4**; **H 3** = **4**).

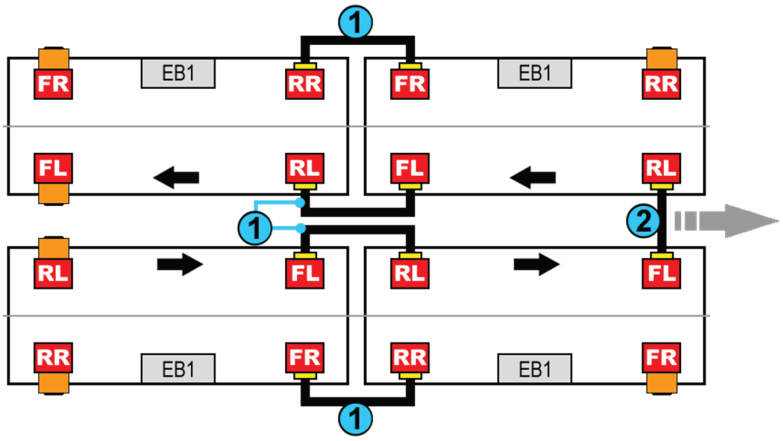
NOTE
For more information, see the "HYDRAULIC CONFIGURATION" point in the convoy module electronic configuration procedure, in paragraphs 12.4.1 and 12.4.2.

12.5.2.5. L8-26

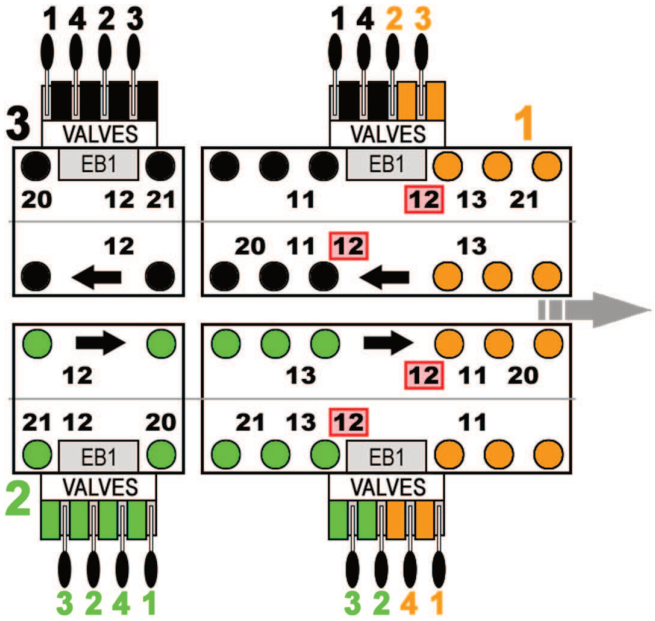
L8-26 – 3 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



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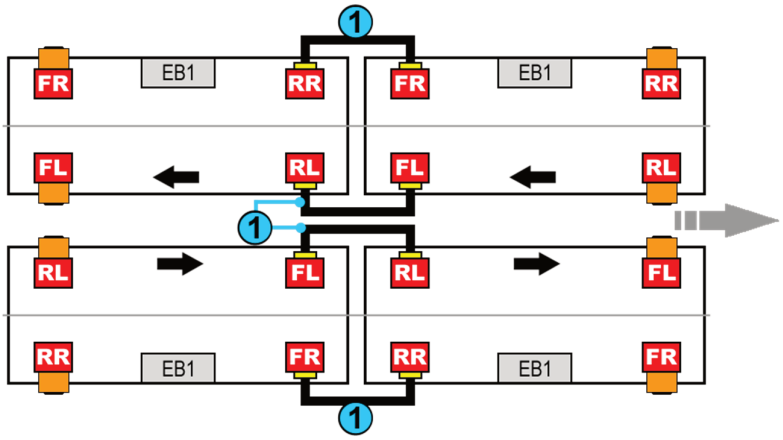
Continued “L8-26” ➔

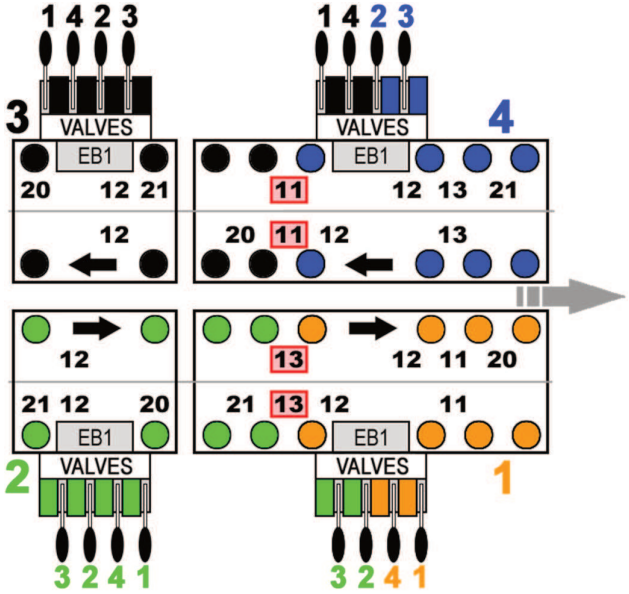
L8-26 – 4 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

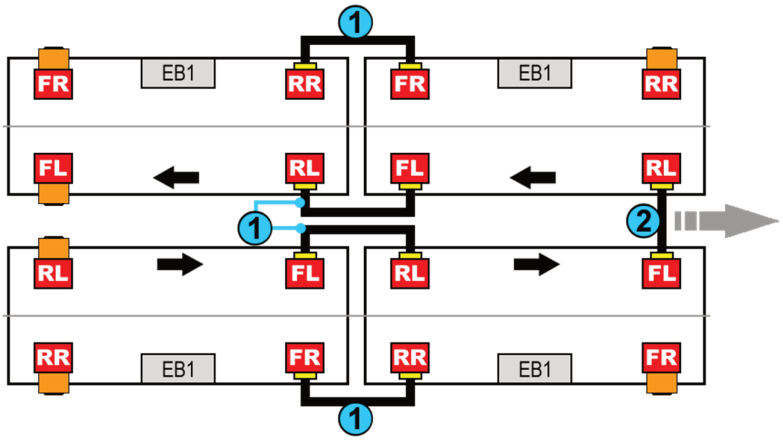
NOTE
See the examples in paragraphs 12.5.1.1, 12.5.2.1, 12.5.2.4.

12.5.2.6. L8-44

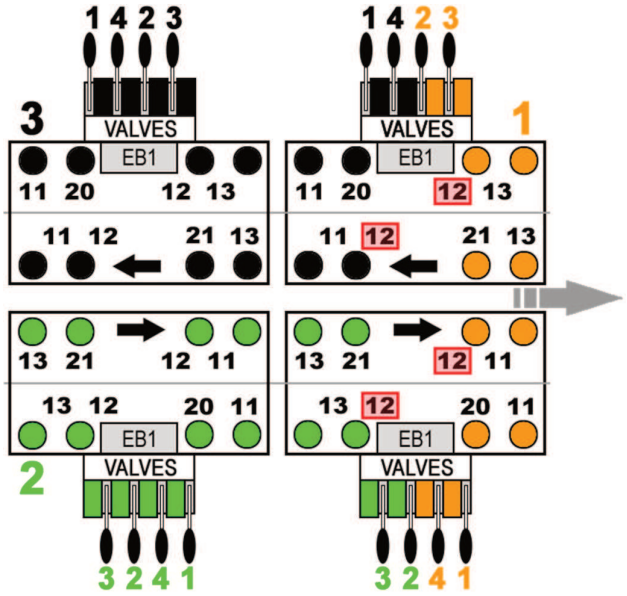
L8-44 – 3 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



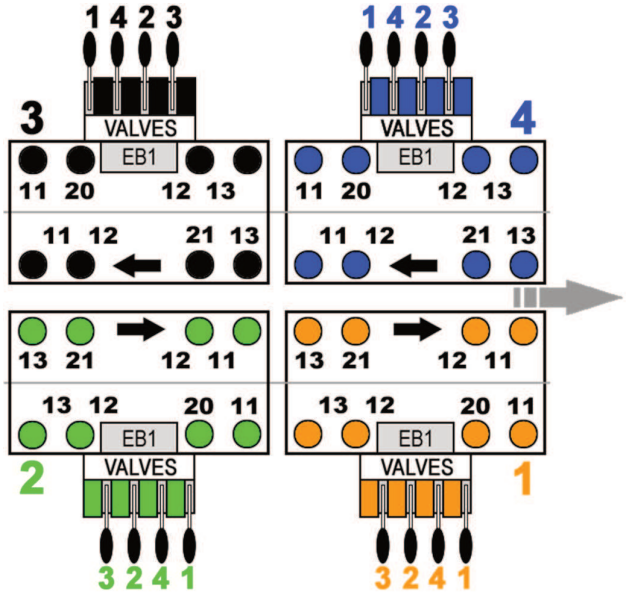
Continued ➔

Continued “L8-44” ➔

L8-44 – 4 stability points

Hydraulic connections: no hydraulic connection required between modules.
Cover all the hydraulic couplings with the respective caps.

Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

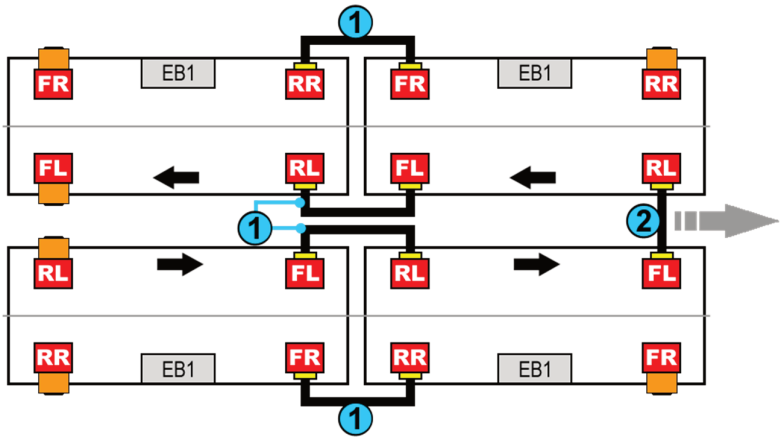
NOTE
See the examples in paragraphs 12.5.1.1, 12.5.2.1, 12.5.2.4.

12.5.2.7. L10-46

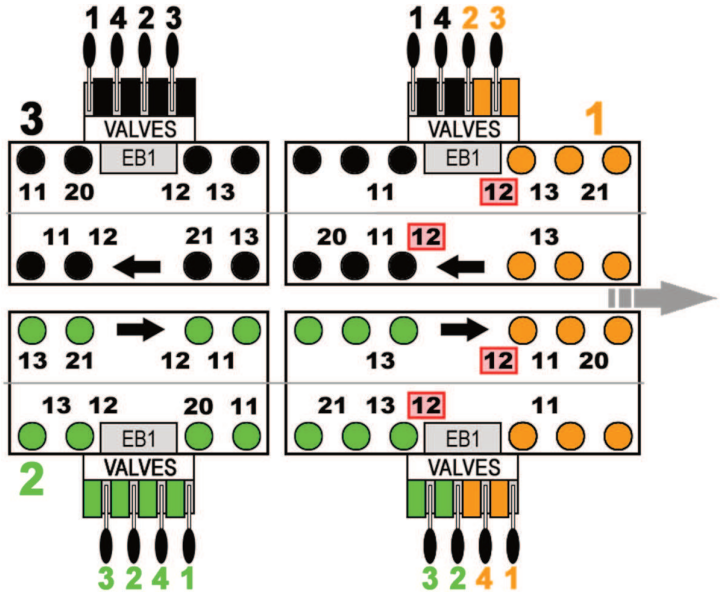
L10-46 – 3 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



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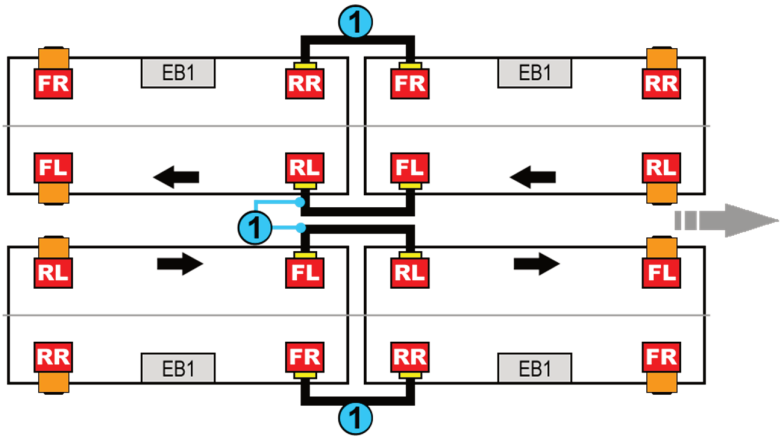
Continued “L10-46” ➔

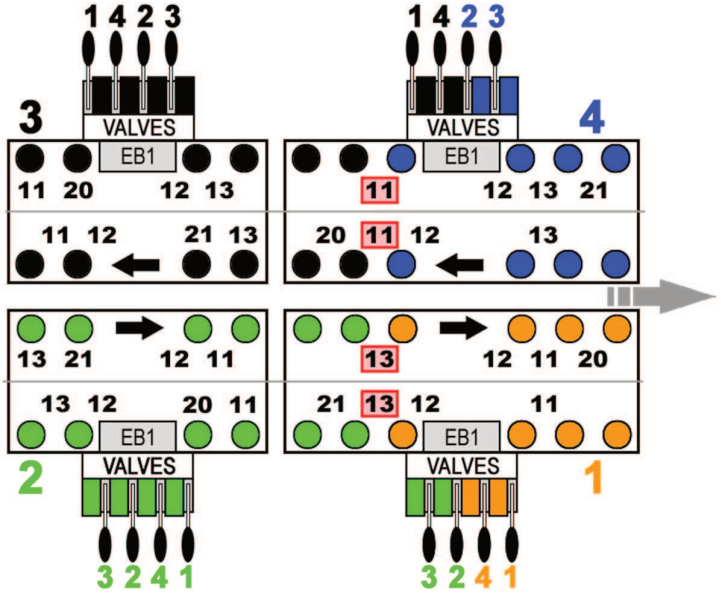
L10-46 – 4 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

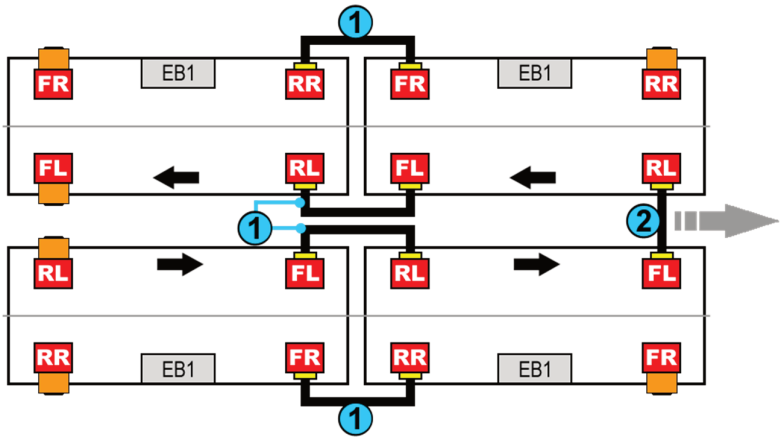
NOTE
See the examples in paragraphs 12.5.1.1, 12.5.2.1, 12.5.2.4.

12.5.2.8. L12-66

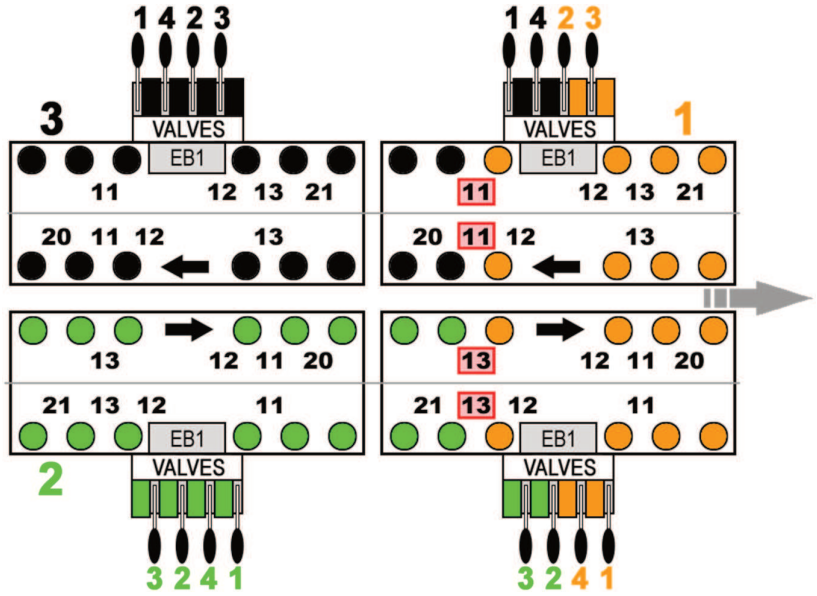
L12-66 – 3 stability points

INDICATIVE FIGURE

Hydraulic connections:



Taps and hydraulic points:



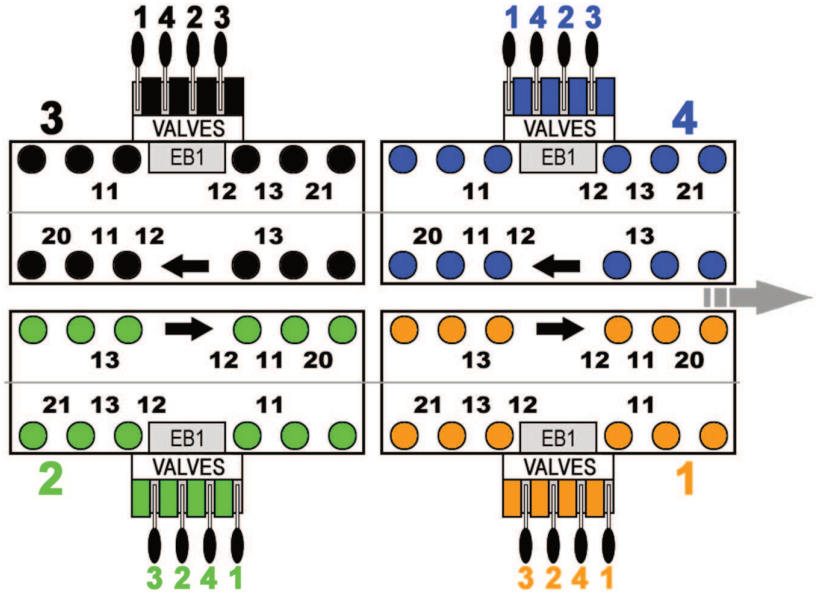
Continued ➔

Continued “L12-66” ➔

L12-66 – 4 stability points

Hydraulic connections: no hydraulic connection required between modules.
Cover all the hydraulic couplings with the respective caps.

Taps and hydraulic points:



How to read the representations

The representation of the hydraulic points is particularly important for the electronic configuration of the modules.

NOTE
See the examples in paragraphs 12.5.1.1, 12.5.2.1, 12.5.2.4.