



## Trolling & Flap option for Electronic engine remote control



**EC4**



**EC4HSM**

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# 1 Introduction

This manual describes the Trolling option for what is concerning operating instructions, programming, electrical installation and commissioning. For general information about how to install an electronic control system, please refer to the product manual for control levers EC3 & EC4.

The same Trolling option can be used either with levers EC3 & EC4.

## 2 General installation features

### 2.1 Description of the system and its parts

The electronic system with the trolling option is composed of:

- Up to 3 command stations
- N° 1 Actuator including trolling option
- Data communication cables which connect the command stations to the Actuators
- T CANBus connectors
- Electrical cables towards motor, gearbox and trolling valves

### 2.2 Trolling option in combination with Flap option

In case in addition to the trolling option it is required also the Flap option, the system must be added of the option kit which is composed of:

- Trim/Flap box
- N°1 data communication cable
- N°1 T CANBus connector
- Electrical cables towards Trim/Flap pump

### 2.3 Maximum extension of the system

The maximum configuration of the system is as shown in the following table:

Actuators	The maximum number of engines that the system can control is 2
Command stations	The maximum number of command stations in the installation is 3
80 meters	Maximum distance between cockpit and engine room

### 3 Pilot instructions

The command station for the standard electronic system or for the electronic system with the trolling option is the same.

It is possible to switch between standard operating mode and trolling mode and vice versa by simply depressing for 2 seconds the Command push button of the station which at the moment has the command of the electronic system (red command light = "ON"). Entering and exiting trolling mode can only occur with command levers in one of the three detent positions: forward, neutral or backward.

#### 3.1 Standard operating mode

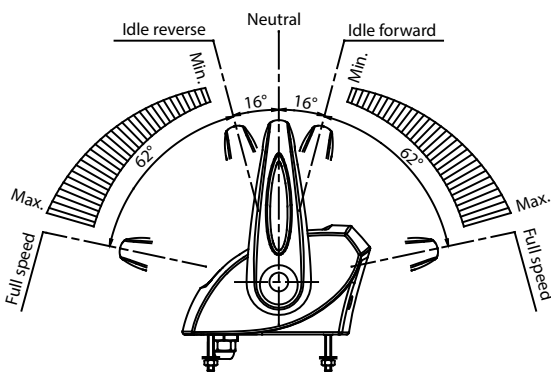
If you press down another time the command push-button, trolling is deactivated and the red LED displays a fixed red light and you are in standard operating mode. In standard operating mode, moving the lever from the neutral position, after 16° forward or reverse automatically the electronic system clutches-in respectively the forward or reverse gear. The accelerator lever has a stroke of 62° both in forward and backward direction for setting the motor RPM.

#### 3.2 Trolling mode

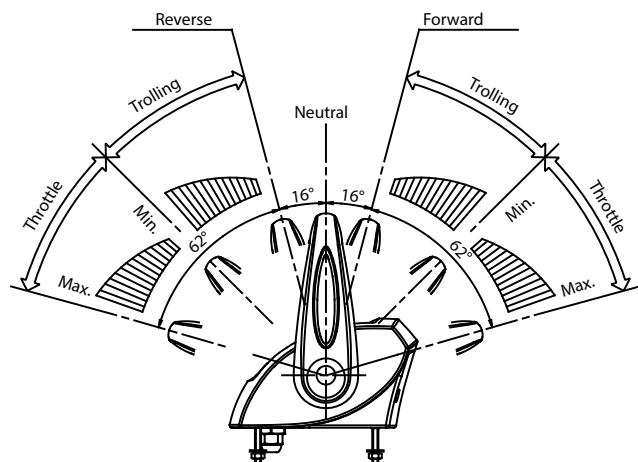
When trolling mode is active, the red LED flashes and the the behaviour of the lever is the following:

- moving the lever from the neutral position, after 16° forward or reverse automatically the electronic system clutches-in respectively the forward or reverse gear
- forward and reverse position are easily recognizable by the mechanical detents. At these lever's positions, gear is engaged with trolling working at 100%. With trolling = 100%, the boat should be standstill because no movement is transmitted to the propeller
- moving the lever from 16° to 48°, the trolling percentage progressively reduces and the propeller speed progressively increases
- when lever reaches 48°, trolling = 0%, the gear is completely engaged and the propeller rotates with motor at minimum speed
- from 48° to 80°, throttle speed increases from minimum to maximum (with gear completely engaged)

Lever functionality without trolling



Lever functionality with trolling enabled



 **To be noticed: at power on, trolling function is automatically active**

Trolling mode can be passed from one command station to the other, exactly like all the other system functions. If you acquire the command from another station where trolling was already activated, the trolling will automatically be enabled also on the station which has taken the command (inheritance of the command).

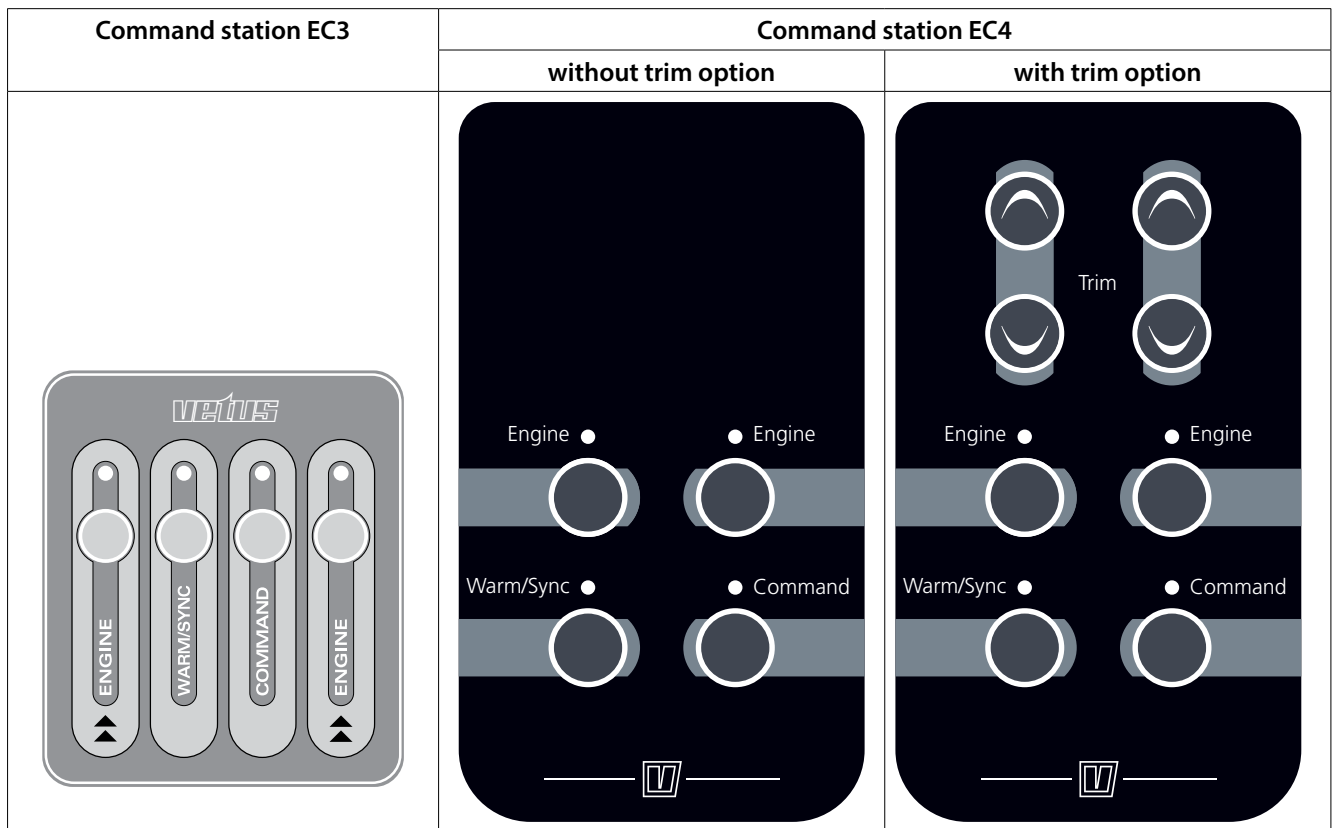
### Signals indicating that the system is in Trolling mode

When Trolling mode is activated the Command (red) LED is:

- fast blinking when at least one of the levers are in the trolling mode area
- slow blinking when both the levers are out of the trolling mode area. In this case trolling function will be activated as soon as one of the levers enters again into the trolling area.
- fixed light if trolling function is deactivated

### 3.3 Control keypad

On the command station it is mounted an electronic keypad with 4 push-buttons and 4 LEDs.



Description	LEDs colour
Engine (*)	Green
Warm/Sync	Orange
Command	Red
Engine (*)	Green

(\*) In installations with single engine, both the green LEDs are referring to the same engine. In systems with 2 engines the push button and the green LED on the right are referring to the starboard engine while the push button and the green LED on the left side are referring to the port engine.

It follows the table with the definition of LED and push buttons.

Push-button	LED	Description
	Engine	The left LED is for the port (left) engine, while the right LED is for the starboard (right) engine. If the LED has a fixed light on (green), the corresponding gearbox is in neutral position. If a command station has not the command, a blinking (green) LED indicates that the lever on the LED's side is synchronised with the lever of the station that at the moment has the Command.
	Command	If it is switched off, the Station has not the command. If it is switched on, the Station has the command.
	Warm/Sync	If it is blinking, the navigation system is in Warm-up mode; this means that the engines can be accelerated without clutching-in the gear. If the LED is fix lighted, the system is in Synchro mode.
Warm/Sync		When both the levers of the Station that has the command are in neutral position, if you press for 1,5 seconds the button Warm, it is activated the function Warm-up.
Command		If you press Command for 1,5 seconds the station takes the command, only if one of these two conditions are respected: <ul style="list-style-type: none"> <li>- both the lever of the station are in neutral</li> <li>- both the lever are synchronized with respect to the levers of the station that at the moment has the command</li> </ul>
All LEDs are lighted on		The control system isn't working correctly

### 3.4 Acquisition of the command

It is possible to acquire the command of the boat from any Station in the following cases:

- **The boat isn't moving**

1. Position both the levers in neutral and press Command for 1,5 seconds.
2. LED "Command" is now lighted on while the warm/synch LED is blinking. You are in Warm-up mode: throttle command is enabled but clutch command is disabled.
3. To take the command you must press for 1,5 seconds the Warm/Sync bush-button, afterwards the station acquires the command.

- **In navigation**

1. Synchronize the 2 levers of the Station which wants to acquire the command with respect to the Station which has the command.
2. When LEDs "Engine" of the station which wants to acquire the command are blinking, these levers are synchronised with the levers of the station which still has the command.
3. By pressing the pushbutton Command for 1,5 seconds, the new station takes the command.

**Important:** before taking the command, proof that all the passengers are safely on board.

### 3.5 Engine Warm-up

If both levers are in neutral, by pressing for 1,5 seconds the button Warm/Sync of the Station which has the command, you enter in Warm-up mode. If you move the lever, it is only affected the accelerator but not the gear. In Warm-up mode the LED Warm/Sync is blinking.

After positioning again both levers in neutral and pressing for 1,5 seconds the Warm/Sync, the system comes back to the normal operation mode.

### 3.6 Synchro mode

It is possible to command both engines at the same speed and direction with only one lever. This function can be activated only by the station which has the command.

With both levers in neutral position, press at the same time for 1,5 seconds the two "engine" push-buttons. The command of both engines is now on the right lever. In Synchro operation mode, the LEDs "Warm/Sync" and "Command" are lighted on.

From "Synchro" operation mode, if you position both levers in neutral, and press contemporaneously for 1,5 seconds the two "Engine" push buttons, the command of each engine is again assigned to the respective lever and LED "Warm/Sync" is switched off.

The same operation of synchronisation or de-synchronisation can be performed on the station which has the command, in case the RPM between the two motors doesn't differ more than 10%.

### 3.7 Fast Start-up Mode

This function is available on the first command station as described in section 8.1 of this manual. When the configuration FSM (Fast Start up Mode) is enabled, the command station with the FSM enabled takes automatically the command at the power on, only if this command station is in neutral position.

If the command station is not in neutral position, the command station will take the command as soon the neutral position will be reached.

## 4 Command station

Under the base of the command station there is an aluminium cap. Unscrewing it, you can access to a 4 poles dip-switch and you can make various settings relevant to the command station behaviour, as depicted in the station's adhesive stick. If you move switch 2 in ON position, the trolling function will be enabled.

#### Operations:

- unscrew the cap;
- set the dip-switch position according to the following table;
- screw again the cap.

**Dip-switch 1:**    OFF    Line termination disabled  
                          ON    Line termination enabled

**Dip-switch 2:**    OFF    Trolling disabled  
                          ON    Trolling enabled

**Dip-switch 3 & 4:** Definition of FSM and station address

	Dip-switch 3	Dip-switch 4
Address 1	OFF	OFF
Address FSM	ON	OFF
Address 2	OFF	ON
Address 3	ON	ON

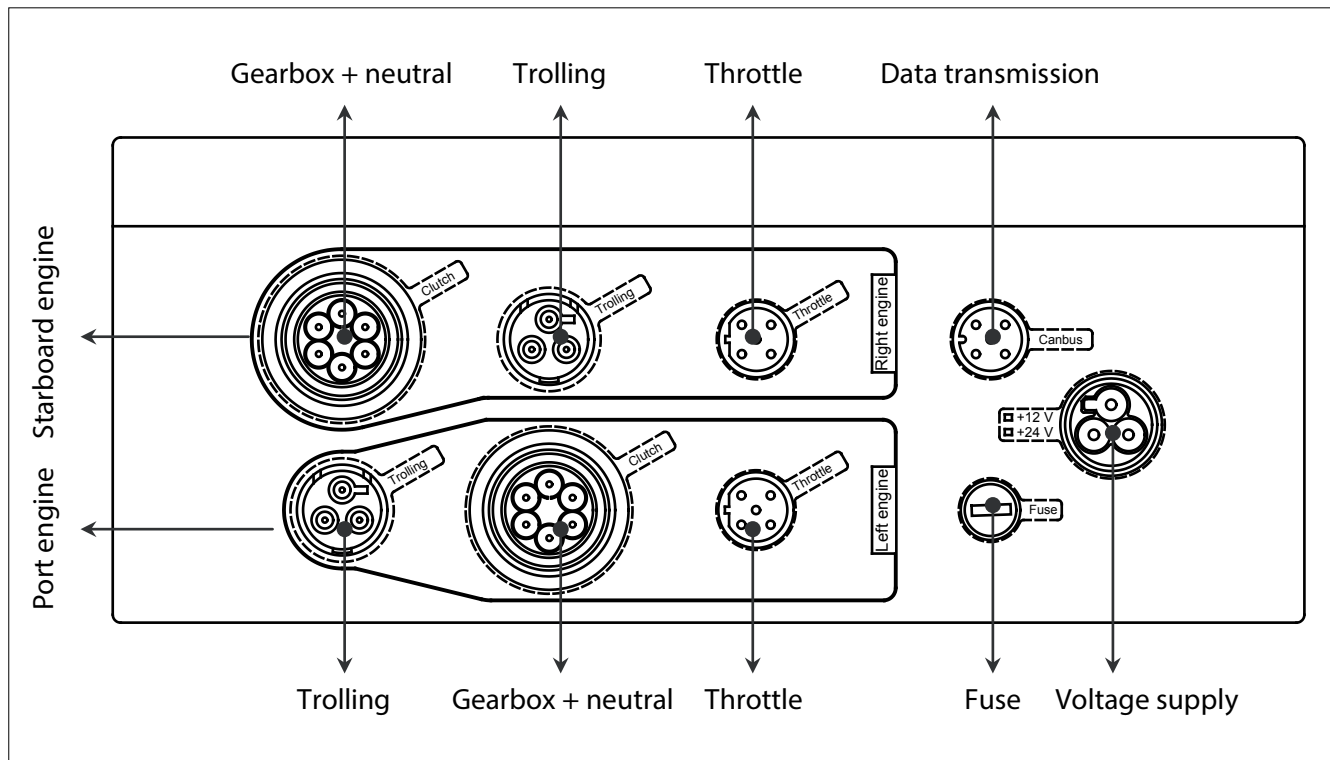


DIP switch configuration				
	1	2	3	4
1 st command station	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 st command station FSM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 nd command station	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 rd command station	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If trolling function is disabled by setting switch 2=OFF, trolling is not activable (on a command station that has the command, pressing the Command button will not produce any effect: its behaviour will be the one of a standard plant).

## 5 Actuator

The actuator for full electronic systems looks according to the below drawing.



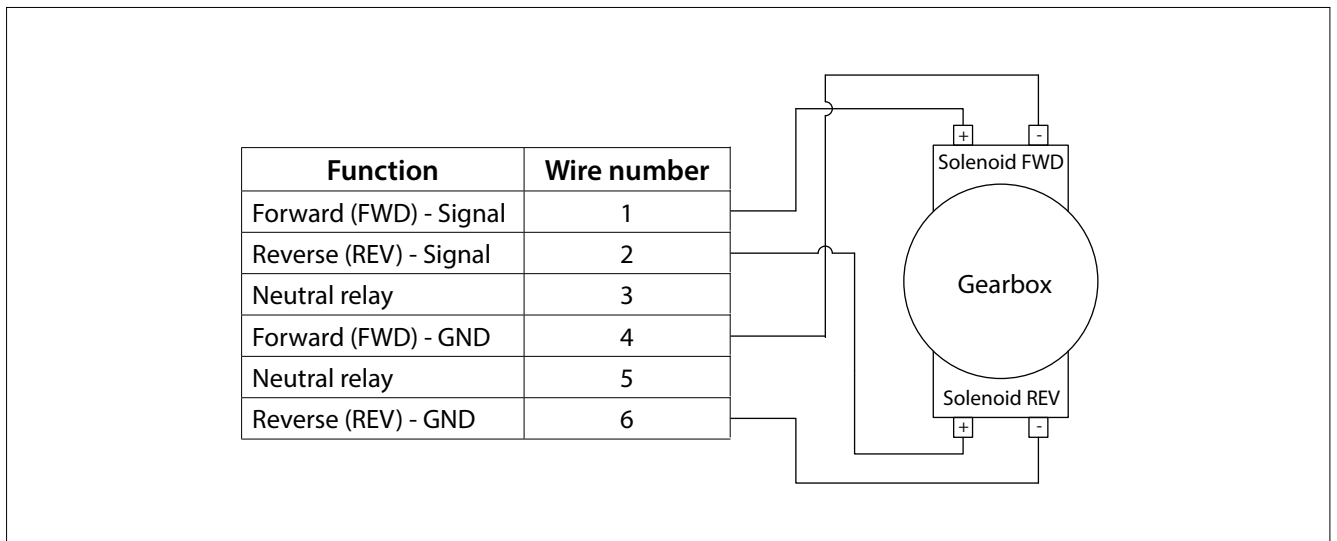
Per each engine it is necessary:

- N° 1 cable for the throttle.
- N° 1 cable 6 poles for the gearbox + neutral relay (code ECG3/6, ECG5/6 or ECG7/6 (see product manual EC3-EC4))
- N° 1 cable 2 poles for the PWM command of the trolling (2 wire used, code EC3T3M (see product manual EC3-EC4))

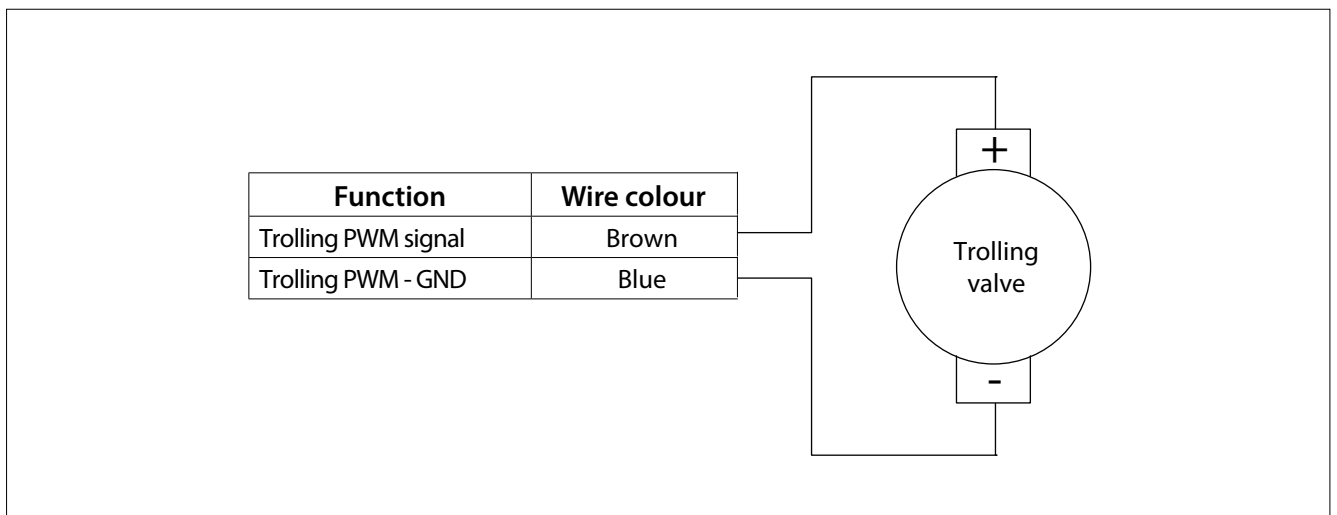


## 5.1 Wiring from the actuator box to gearbox with trolling option

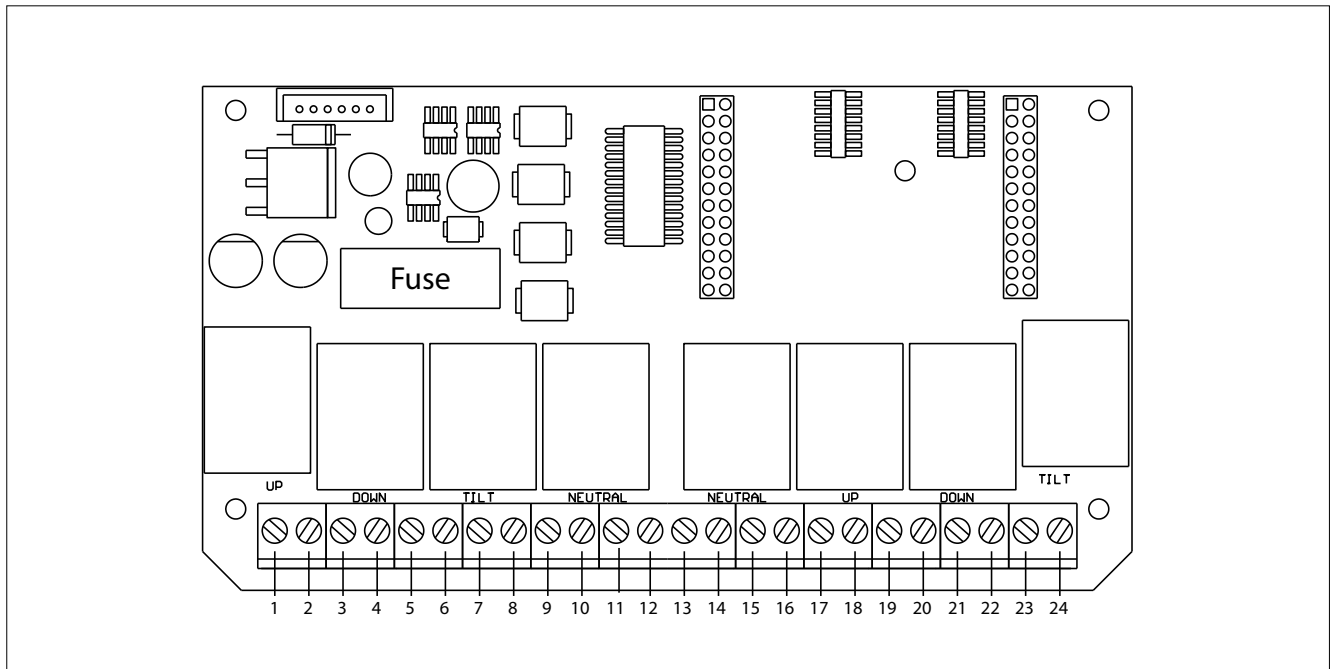
### Cabling of gearbox and neutral relay



### Cabling of the trolling valve



## 5.2 Relays PCB version 3.0 for electronic gearboxes with trolling option



Pin	Description
1	VDC
2	GND
3	(Not connected)
4	GND (connect to Wire ID 4 and 6 of "Gearbox + neutral" connectors, both left and right)
5	Connect to VDC (Pin 1)
6	Forward Left (Wire ID 1, "Gearbox + neutral" connector)
7	Backward Left (Wire ID 2, "Gearbox + neutral" connector)
8	(Not connected)
9	Neutral relais – NC contact – Left (Wire ID 3, "Gearbox + neutral" connector)
10	Neutral relais – COM – Left (Wire ID 5, "Gearbox + neutral" connector)
11	trolling Left (BROWN, "Trolling" connector)
12	trolling Left (GND, BLUE, "Trolling" connector)
13	(Not connected)
14	(Not connected)
15	trolling Right (BROWN, "Trolling" connector)
16	trolling Right (GND, BLUE, "Trolling" connector)
17	(Not connected)
18	(Not connected)
19	Neutral relais – COM – Right (Wire ID 5, "Gearbox + neutral" connector)
20	Neutral relais – NC contact – Right (Wire ID 3, "Gearbox + neutral" connector)
21	Connect to VDC (Pin 1)
22	Forward Right (Wire ID 1, "Gearbox + neutral" connector)
23	Backward Right (Wire ID 2, "Gearbox + neutral" connector)
24	(Not connected)

## 6 Programming of the Trolling functions

This chapter is dedicated to the specific parameters for setting up the trolling functionalities: for general programming of the actuator please refer to chapter 11 of the Lever EC3 - EC4 Product Manual.

### 6.1 Trolling actuator parameters

Flexball actuator for trolling control permits to adapt to every trolling valve system by correctly modifying a specific set of parameters, which are listed in the following table.



**Important note: don't modify these parameter unless you have completely understood their meaning and the trolling valve system. Personal injury and mechanical/electrical damages may occur!**

Parameter / display code	Min	Max	Def	Unit	Description
P0/S0	0	99	15	%	PWM % @ minimum trolling speed (P ->PORT (left), S -> STARBOARD (right) engine)
P1/S1	0	99	23	%	PWM % @ maximum trolling speed (P ->PORT (left), S -> STARBOARD (right) engine)
t2	0	99	0	%	PWM % during propeller start
t3	0	99	2	s/10	propeller start's time span
t4	0	99	0	%	RPM Engine % increment (related to minimum engine speed) reached @ maximum trolling speed
t5	0	1	0	-	PWM% @ neutral position, either 0 or P0/S0
t6	0	99	0	%	Reserved (not used)
t7	0	99	0	%	RPM Engine % increment (related to minimum engine speed) maintained after trolling speed ramp

#### Parameter "P0"/"S0"

This parameter defines the PWM percentage applied to the trolling valve when trolling is maximum (100%). It determines the minimum propeller speed. Default value is 14%.

P0 is for LEFT engine, S0 for RIGHT engine.

#### Parameter "P1"/"S1"

This parameter defines the PWM percentage applied to the trolling valve when trolling is minimum (0%). It determines the maximum propeller speed at the end of the trolling ramp. Default value is 21%.

P1 is for LEFT engine, S1 for RIGHT engine

#### Parameter "t2"

In order to reduce the time to start the boat, it might be necessary to give a quick "kick-off". Parameters "t2" and "t3" permit to apply a for a limited time (t3) a higher speed on the propeller. "t2" defines the percentage to be applied for a defined amount of time, before entering in trolling mode.

#### Parameter "t3"

It defines for how much time can be applied the "kick-off" before entering in trolling mode.

### Parameter "t4"

In some application it might be useful to slightly change the motor speed during the trolling ramp. When motor is idling, motor speed could be at its minimum. When the gear is engaged, it might be necessary to slightly increase the motor RPM to compensate an increase of the increased load of the shft + propeller, which are now clutched together with the motor. At the end of trolling ramp engine will reach the value imposed with this parameter: during trolling ramp the engine's speed will vary proportionally from "native" minimum speed to the one defines by parameter t4.



**Important note: don't exceed the maximum input speed for your trolling valve system!  
Check carefully its technical data and set t4 correctly!**

### Parameter "t5"

This parameter defines the current will flow through the trolling valve command when trolling function is active but the gearbox is in neutral state. If you leave it at 0, no current will flow in the trolling solenoid valve when the gearbox is in neutral position. If you set it to 1, the current that flows in neutral position is determined by S0/P0 parameter. On ZF gearboxes it is recommended to set t5=0 (default condition).

### Parameter "t6"

Reserved.

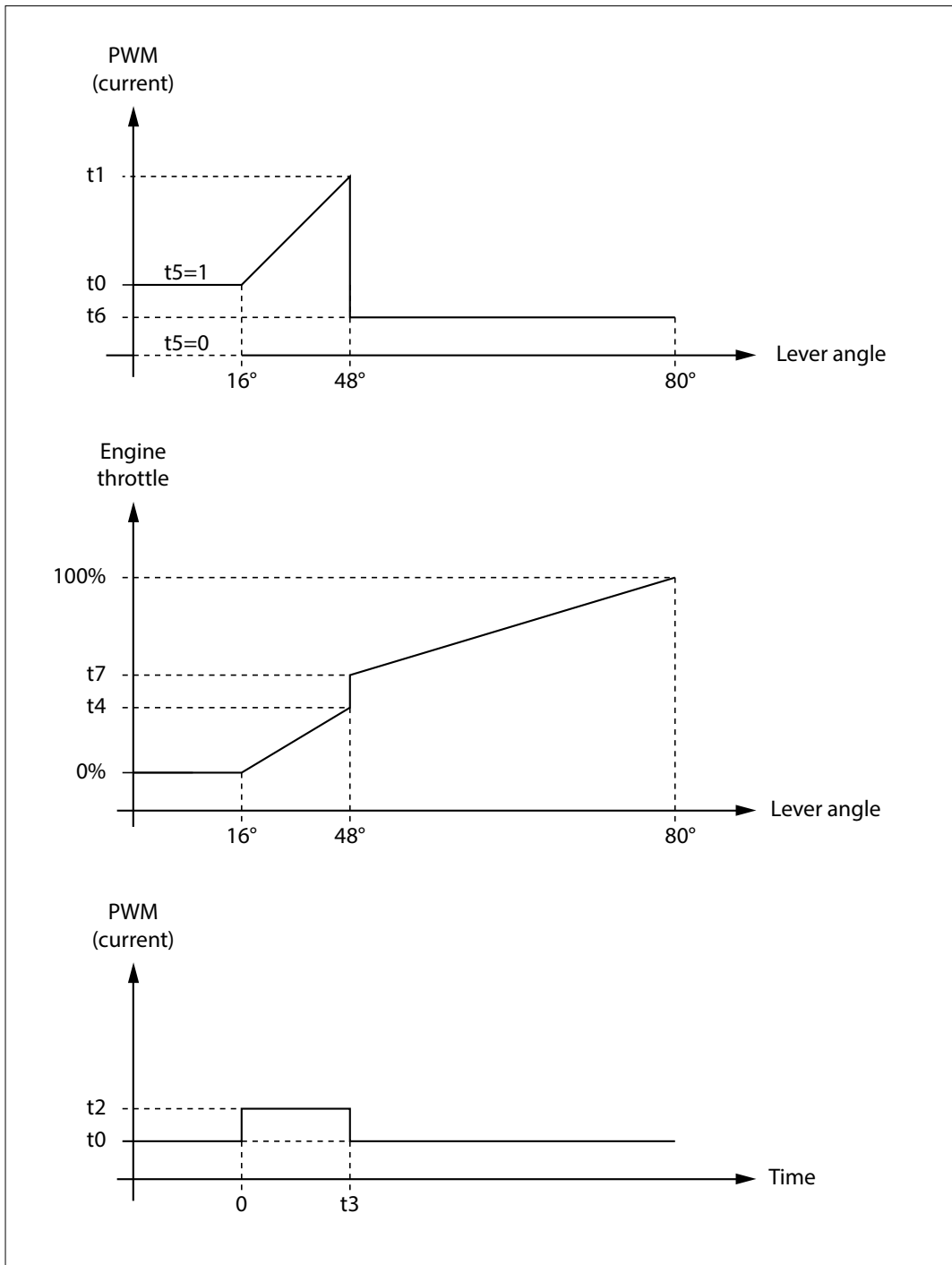
### Parameter "t7"

When trolling is activated, this parameter defines the minimum engine's RPM at the end of trolling speed ramp. When trolling is activated, if you set t4 equal to t7 no discontinuity will occur passing through trolling ramp zone and acceleration zone.



**Important note: once you have set t7 > 0, minimum speed will be increased also when the system is working in no trolling mode!**

The following pictures describe the trolling parameters effect in case trolling is active.



Notes:

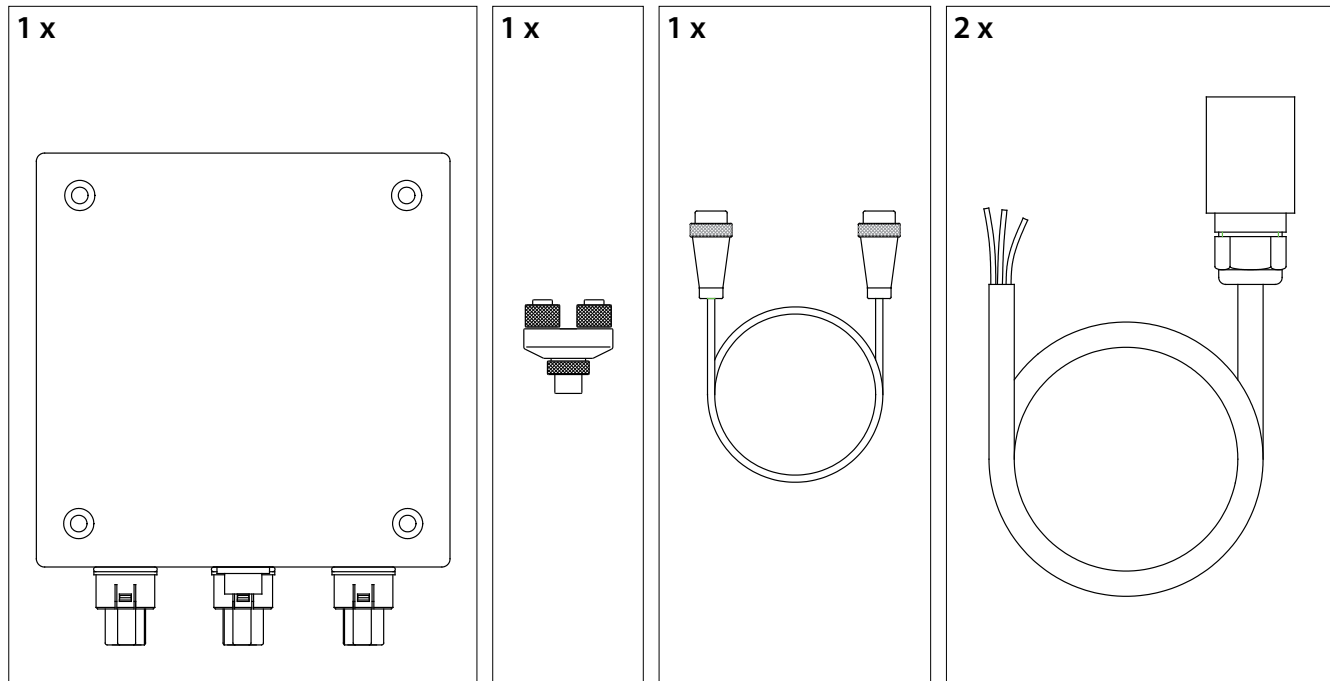
- In the third graph, time "0" is the instant at which the lever reaches the mechanical indent (gear engagement): no more lever movement is assumed;
- "t0" stands for both "P0" and "S0" parameters, "t1" stands for "P1" and "S1".

## 7 Flap actuator box option

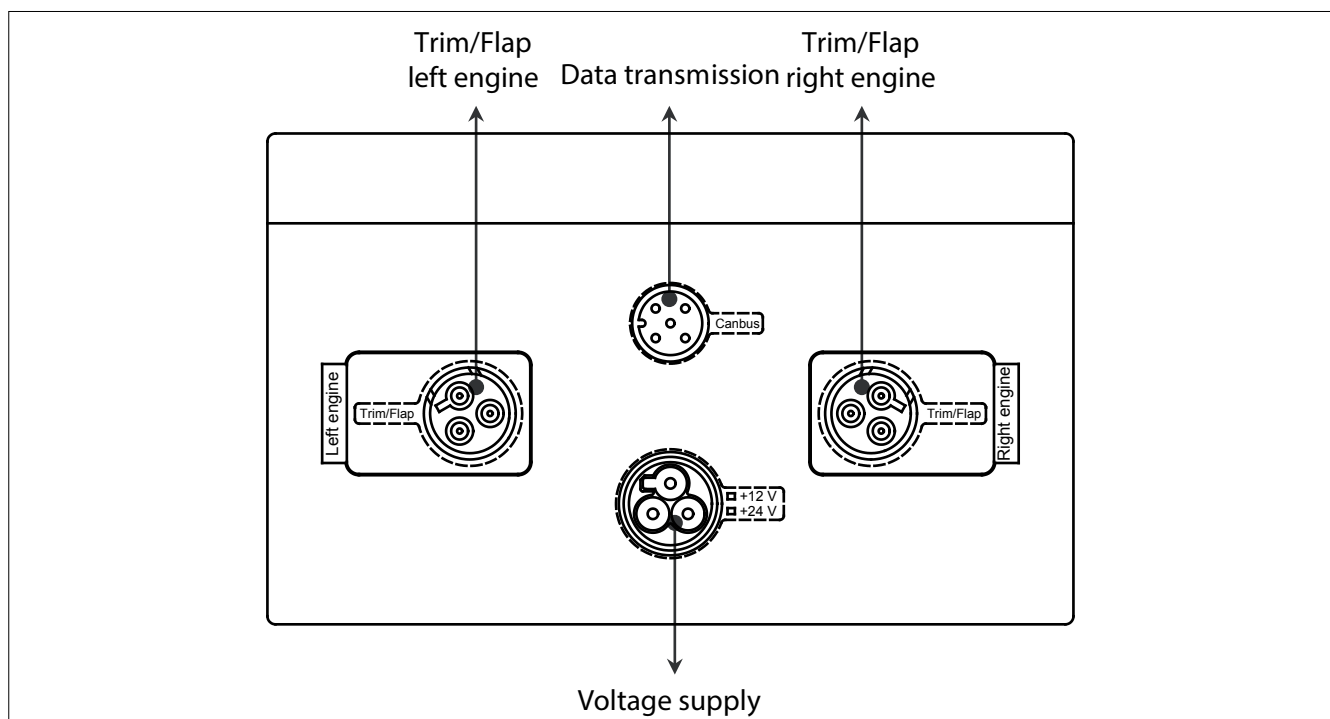
In case in addition to the trolling option it is required also the Flap option, the system must be added of the option kit which is composed of:

- Trim/Flap actuator box
- N°1 T CANBus connector
- N°1 data communication cable
- Electrical cables towards Trim/Flap pump

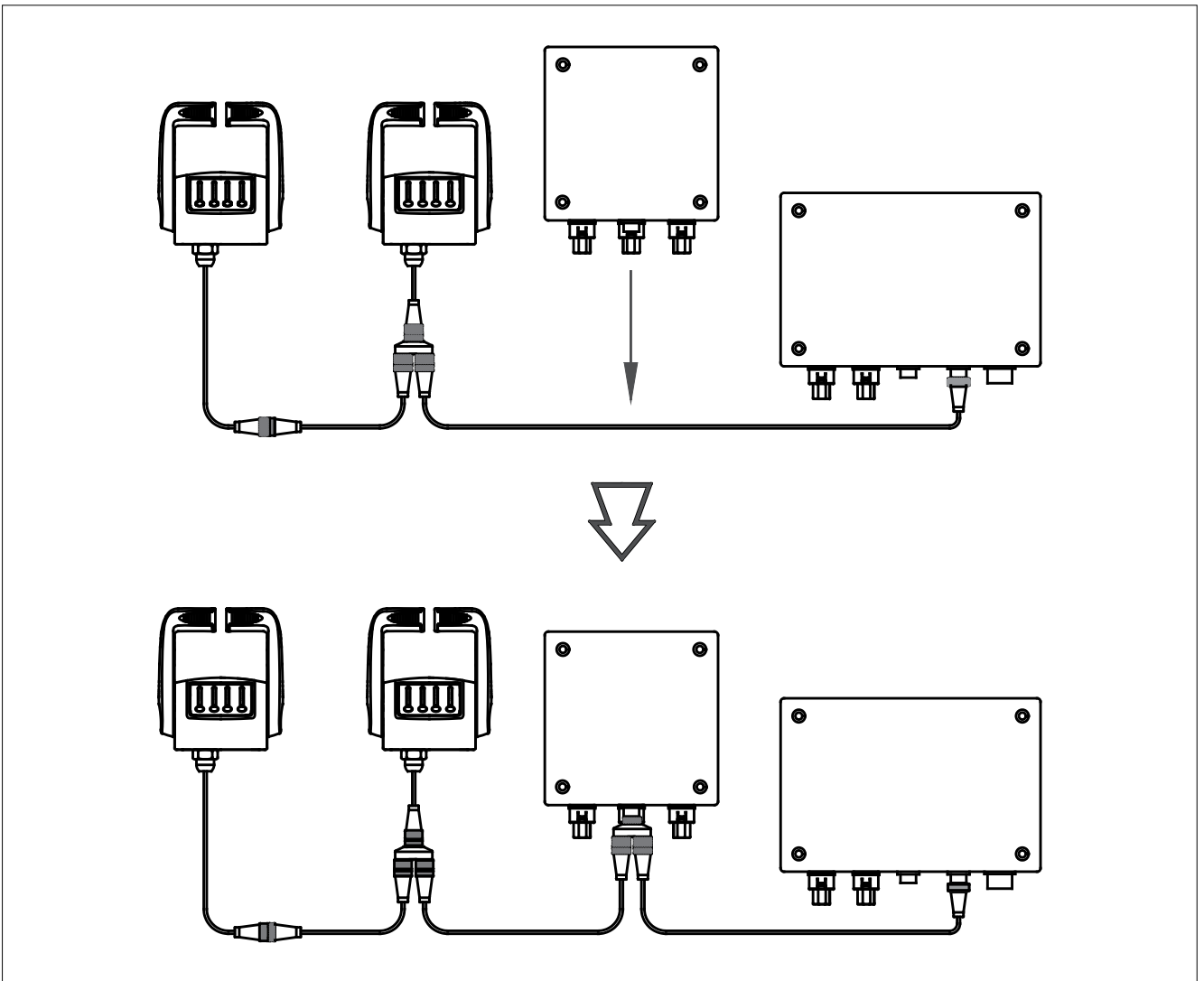
It follows here below a drawing of the installation kit:



The actuator for trim/flap option looks according to the below drawing:

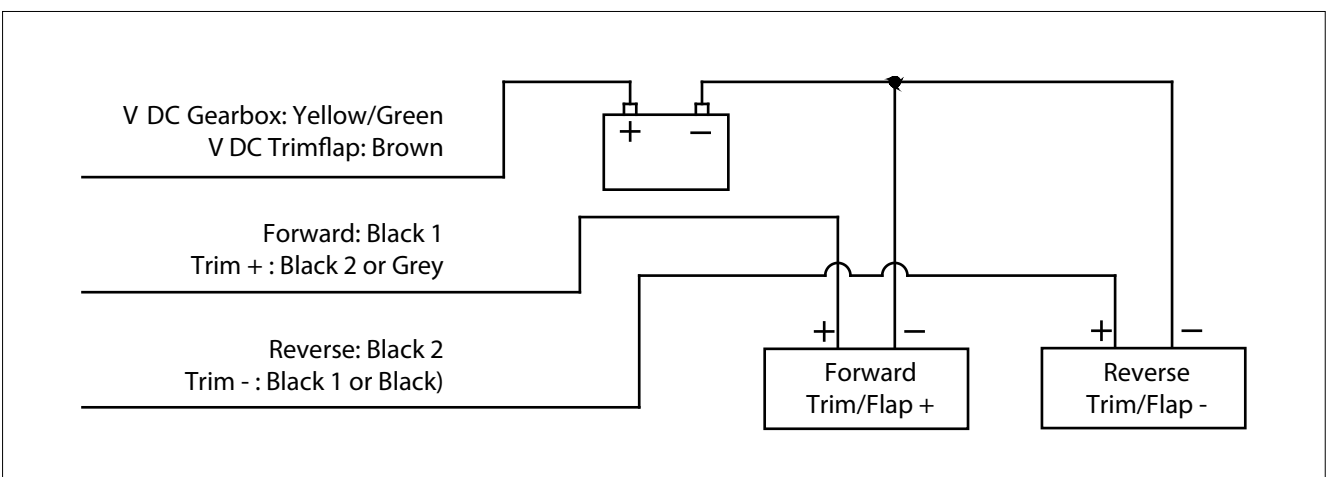


Installation scheme:



For all the instruction related to this function, please refer to the Lever EC3 - EC4 product Manual.

Wire number	Function
Yellow/green	Supply (external)
Black 1	TRIM/FLAP +
Black 2	TRIM/FLAP -



## 8 System types and installation schemes

The actual plant architecture is related to

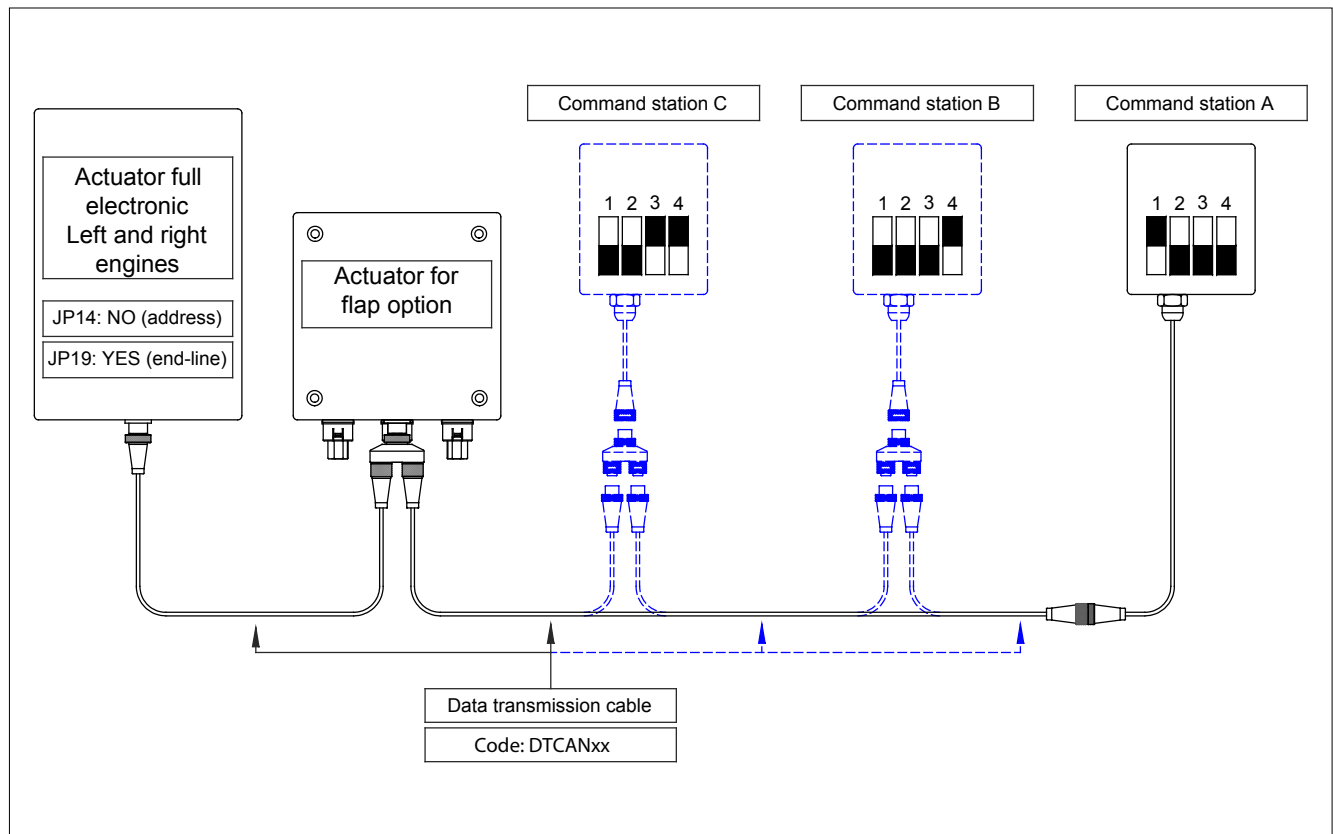
- type and quantity of engines;
- type of gearboxes;
- number of command stations.

Actuators and command stations, which communicate together through the CANBus network, must be configured in relation to where they are connected to the CANBus network. In the following installation schemes you can find:

- components necessary to build an installation;
- configuration of actuators and command stations in relation of their position on the CANBus network.

The following installation types and schemes cover the most common application cases.

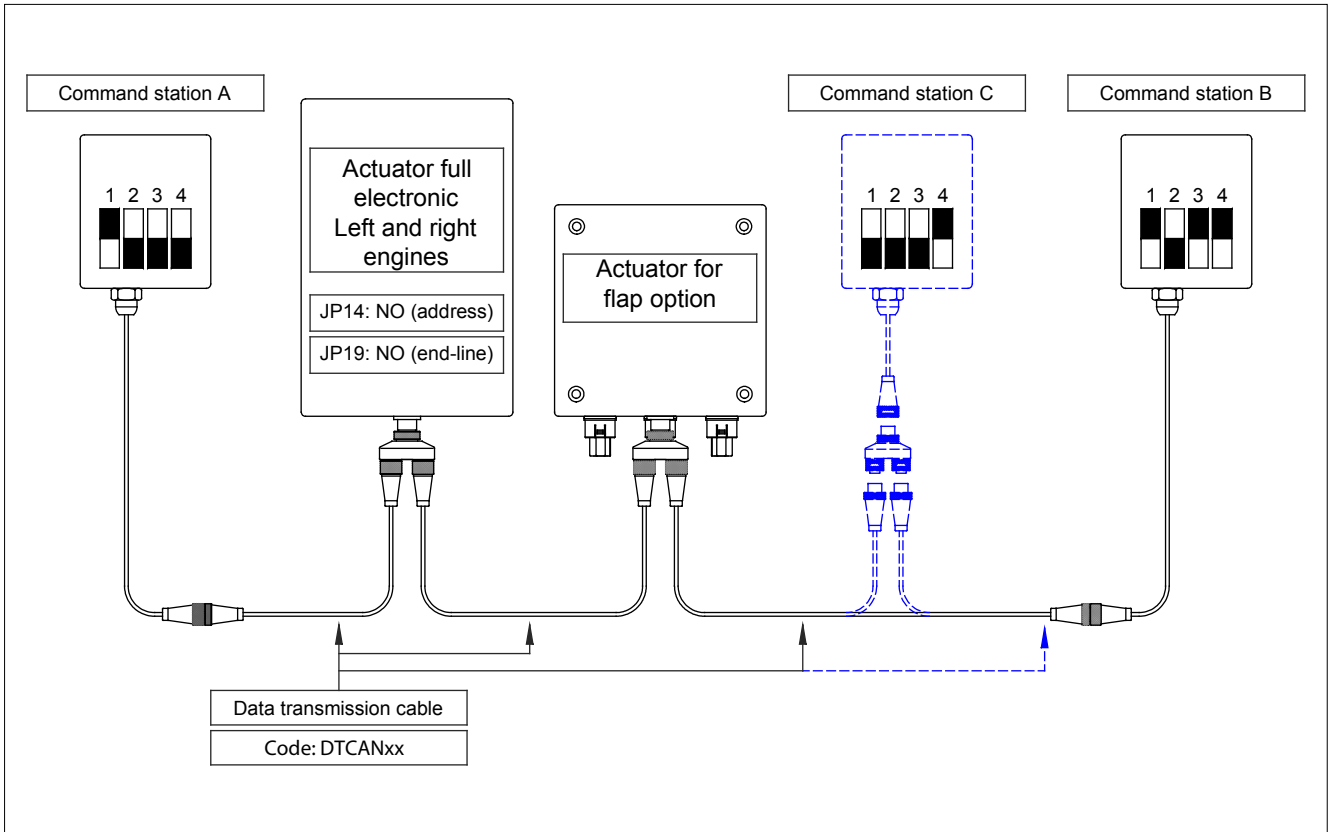
### 8.1 Installation with 2 mechanical actuators – solution A



This installation scheme is valid for systems with up to 3 command stations and 2 engines and gearboxes, full electronic



## 8.2 Installation with 2 mechanical actuators – solution B

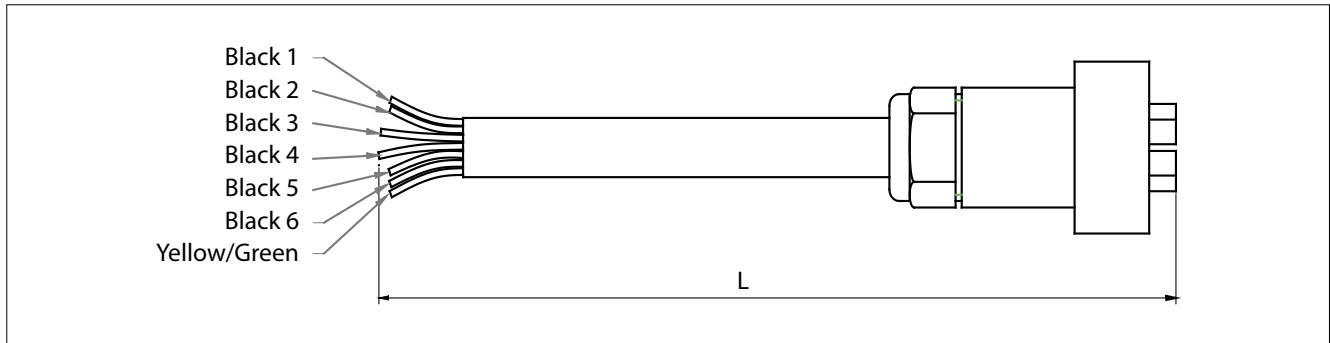


This installation scheme is valid for systems with up to 3 command stations and 2 engines and gearboxes, full electronic

## 9 Electrical cables

### 9.1 Cable actuator – gearbox + neutral relais

For the connection towards the gearbox solenoid driven.



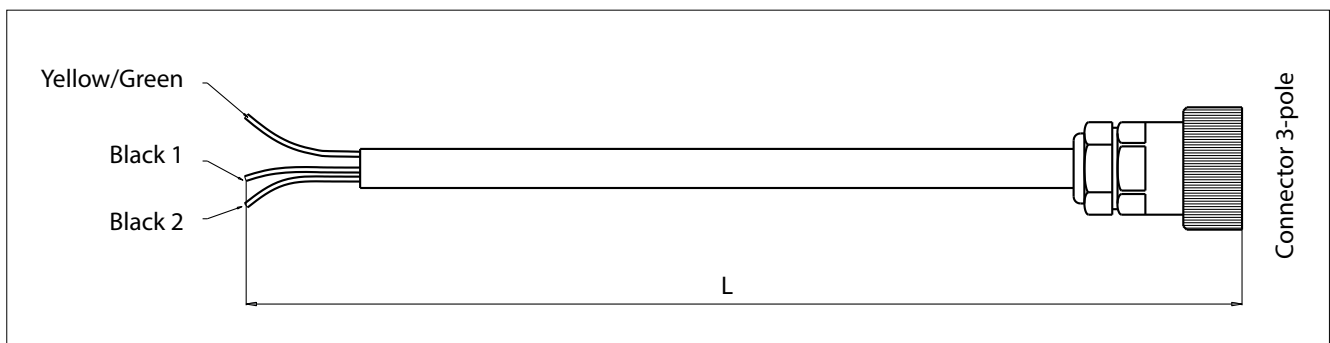
Length	Vetus code
L=3 m	ECG3/6
L=5 m	ECG5/6
L=7 m	ECG7/6

**Important:** this cable is without connector on gearbox side

### 9.2 Actuator – Trolling valve cable & Actuator box – Trim/flap cable

The same cable is used either to connect the Actuator to the Trolling valve and the Flap actuator box to the flap option.

- for the connection towards the trolling valve, use only back 1 and black 2 wires.
- for the connection between the Flap actuator box and trim/flap, please refer to the manual for the EC3 - EC 4 control lever"product manual".



Length	Vetus code
L=3 m	EC3T3M

**Important:** this cable is without connector on trolling valve side and on the flap/pump side





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