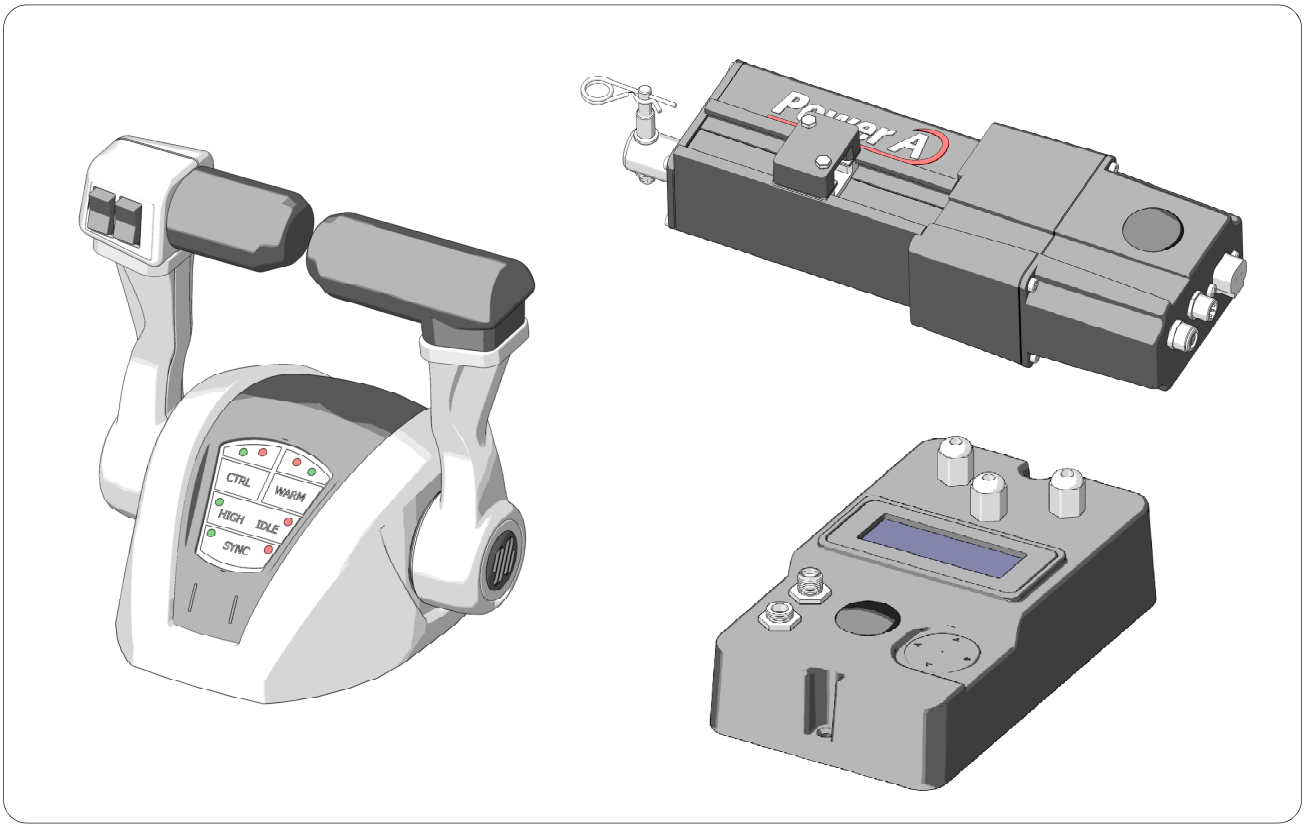
Installation and maintenance manual

ELECTRONIC CONTROL SYSTEM

Power A Mark II™



ENGLISH

CE

ULTRAFLEX

NMMA UCINA PARTNER MEMBER ABYC Setting Standards for Safer Boating® Member of CISQ Federation RINA ISO 9001:2000 Certified Quality System Member of CISQ Federation RINA ISO 14001 Certified Environmental System

(Dr. No. 28132/a 16/02/2015)

ULTRAFLEX

Dear Customer,

We would like to thank you for choosing an **ULTRAFLEX** product.

ULTRAFLEX has been a leader in steering systems for pleasure and professional boats for many years. **ULTRAFLEX** production is since ever synonimous of reliability and safety.

All **ULTRAFLEX** products are designed and manufactured to ensure the best performance.
To ensure your safety and to maintain a high quality level, **ULTRAFLEX** products are guaranteed only if they are used with original spare parts.

ULTRAFLEX and **UFLEX** Quality Management Systems are certified CISQ-IQNet by the Italian Shipping Registry (RINA), in conformity with the UNI EN ISO 9001:2008 rule. **ULTRAFLEX** certification No. 6669/02/S (former 420/96). **UFLEX** certification No. 8875/03/S.

ENGLISH

The quality management system involves all the company resources and processes starting from the design, in order to:
- ensure product quality to the customer;
- maintain and improve the quality standards constantly;
- pursue a continuous process improvement to meet the market needs and to increase the customer satisfaction

ULTRAFLEX Environmental Management System is certified CISQ-IQNet by the Italian Shipping Registry (RINA), in conformity with the UNI EN ISO 14001 rule. **ULTRAFLEX** certification No. EMS-1282/S.

Products for pleasure boats are constantly tested to check their conformity with the 2013/53/EU.

"**ULTRAFLEX** has over 80 years of experience in the marine industry and is a world leader in the production of mechanical, hydraulic and electronic steering systems, control boxes and steering wheels for any kind of pleasure, fishing or commercial boats.
The key factors which explain the increasing success of our products all over the world are the reliability of our products and the before and after sale service, the quality of the company organization and of the human resources and the continuous spending in research and development".

ULTRAFLEX S.p.A.
16015 Casella (Genova) Italia - Via Crose, 2

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DOCUMENT REVISIONS

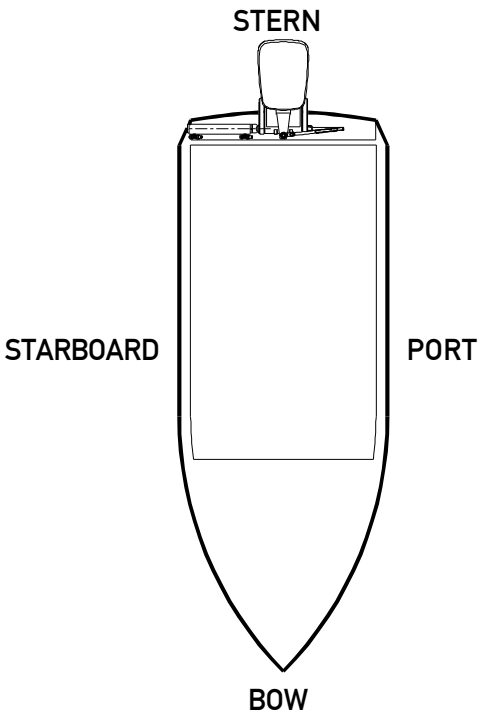
Rev.	Date	Revision description
0	02/09/2011	First edition

MANUAL USE AND SYMBOLS USED

THE INSTALLATION AND MAINTENANCE MANUAL is the document accompanying the product from sale to replacement and discharge. The manual is an important part of the product itself.
It is necessary to read carefully the manual, before ANY ACTIVITY involving the product, handling and unloading included.

In this manual the following symbols are used to ensure the user safety and to guarantee the correct product working:

⚠ DANGER	Immediate hazards which CAUSE severe personal injury or death.
⚠ WARNING	Denotes that a hazard exists which can result in injury or death if proper precautions are not taken.
⚠ CAUTION	Denotes a reminder of safety practices or directs attention to unsafe practices which could result in personal injury or damage to the craft or components or to the environment.
NOTICE	Important information for the correct installation and for maintenance, that does not cause any damage.
	The symbol aside indicates all the operations which must be carried out by qualified or skilled staff, in order to avoid hazards. We recommend training the staff in charge of the product installation and checking their knowledge.



The picture aside explains the meaning of some nautical words contained in this manual.

INFORMATIVE LETTER

This installation and maintenance manual is an integrant part of the product and should be easily available to staff in charge of use and maintenance.
The user must know the content of this manual.
ULTRAFLEX declines all responsibility for possible mistakes in this manual due to printing errors.
Although the main features of the type of product described are not subject to change, **ULTRAFLEX** Company reserves the right to modify any parts, details and accessories it deems necessary to improve the product or for manufacturing or commercial requirements, at any time and without being obliged to update this manual immediately.
ALL RIGHTS ARE RESERVED. Publishing rights, trademarks, part numbers and photographs of **ULTRAFLEX** products contained in this manual are **ULTRAFLEX** property. Great care has been taken in collecting and checking the documentation contained in this manual to make it as complete and comprehensible as possible. Nothing contained in this manual can be interpreted as warranty either expressed or implied - including, not in a restricted way, the suitability warranty for any special purpose. Nothing contained in this manual can be interpreted as a modification or confirmation of the terms of any purchase contract.

WARNING

To ensure the correct product and component working, the product must be installed by qualified staff.
In the event of part damage or malfunction, please contact the qualified staff or our Technical Assistance Service.

TECHNICAL ASSISTANCE SERVICE

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WARRANTY

ULTRAFLEX guarantees that its products are well designed and free from manufacturing and material defects, for a period of two years from the date of manufacturing.
For the products which are installed and used on working or commercial boats the warranty is limited to one year from the date of manufacturing.
If during this period the product proves to be defective due to improper materials and/or manufacture, the manufacturer will repair or replace the defective parts free of charge.
Direct or indirect damage is not covered by this warranty. In particular the company is not responsible and this warranty will not cover the damage resulting from incorrect installation or use of the product (except for replacement or repair of defective parts according to the conditions and terms above).
This warranty does not cover the products installed on race boats or boats used in competitions.
The descriptions and illustrations contained in this manual should be used as general reference only.
For any further information please contact our Technical Assistance Service.
ULTRAFLEX steering system components are marked CE according to the Directive 2013/53/EU.
We remind you that only CE marked steering systems must be used on the boats marked CE.

1 PRODUCT DESCRIPTION

This system is made up of a control station that allows the user to control engines, a configuration and diagnostic unit (control unit) and several components (throttle unit, shift unit, mechanical actuator) that allow enabling the controls given by the control station.
It is possible to install up to four control stations.
Installation is made easy by the pre-wired cables and the display interface on the control unit which allows configuring the system by following few simple steps. This interface also allows detecting any fault in the system, syncronizing the engine revolution number to reduce fuel consumption and noise, ensuring better sailing comfort.
The Docking function allows reducing the maximum engine revolutions ensuring easier and more precise manoeuvres. The High idle function allows increasing engine idling; the warm up function allows acceleration in neutral position.
The left lever of the control station can be provided with the trim switches that allow changing the boat trim keeping hands on the station itself.

CONTROL STATION

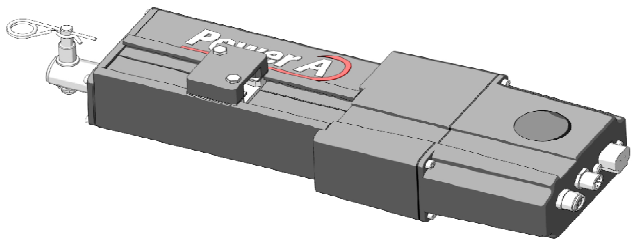
TWIN ENGINE WITH TRIM

TWIN ENGINE WITHOUT TRIM

SINGLE ENGINE WITH TRIM

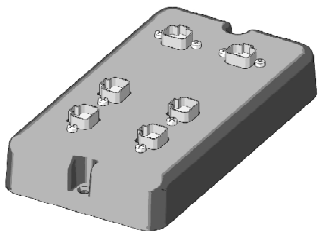
SINGLE ENGINE WITHOUT TRIM

MECHANICAL ACTUATOR

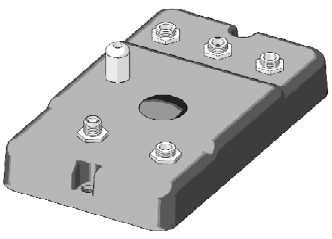


CONTROL UNIT

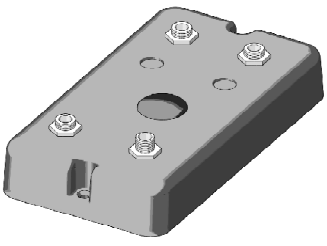
COMPONENTS



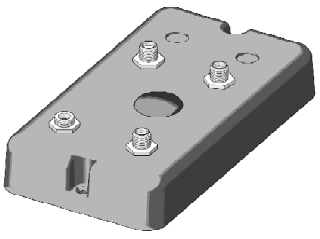
POWER UNIT



SHIFT UNIT



V-THROTTLE/ I-THROTTLE



SAEJ THROTTLE

1.1 Warnings for the correct use of the product

⚠ DANGER

This system is NOT flame-proof, therefore it must not be installed in explosion-prone areas.

⚠ WARNING

This product must be installed by skilled staff strictly following the indications provided in this manual.

1.2 Technical features of the system

The system *Power A Mark II™* can be installed on boats with single or twin gasoil or gasoline engine.
In case of boats with gasoline engines, the system must be installed outside the engine compartment since it is not flame-proof.
It can work regardless of the battery rated voltage: 12 or 24 VDC.
It is possible to control throttle and shift by using different elements according to the type of engine.
Some general technical features are detailed below:

☐ **SUPPLY VOLTAGE**
- Rated supply voltage: 12 VDC or 24 VDC
- Voltage range for normal operation: 10.8 V - 31.2 V
- Voltage range for operation in alarm condition: 9.0V - 10.8V
- Maximum supply voltage (if exceeded, the system can be damaged permanently): 36V

☐ **CURRENT ABSORPTION**
- Rated absorption in standby mode (engine keys out): 300 mA @ 12 VDC, 150 mA @ 24 VDC
- Rated absorption in rest mode (enabled system, no operations performed by means of the levers of the control station): 200 mA @ 12 VDC, 100 mA @ 24 VDC
- Rated absorption with maximum load (twin-engine system with mechanical interface throttle and shift): 20 A @ 12 VDC, 10 A @ 24 VDC

☐ **OPERATION TEMPERATURE**
Operation temperature: -20 +70°C

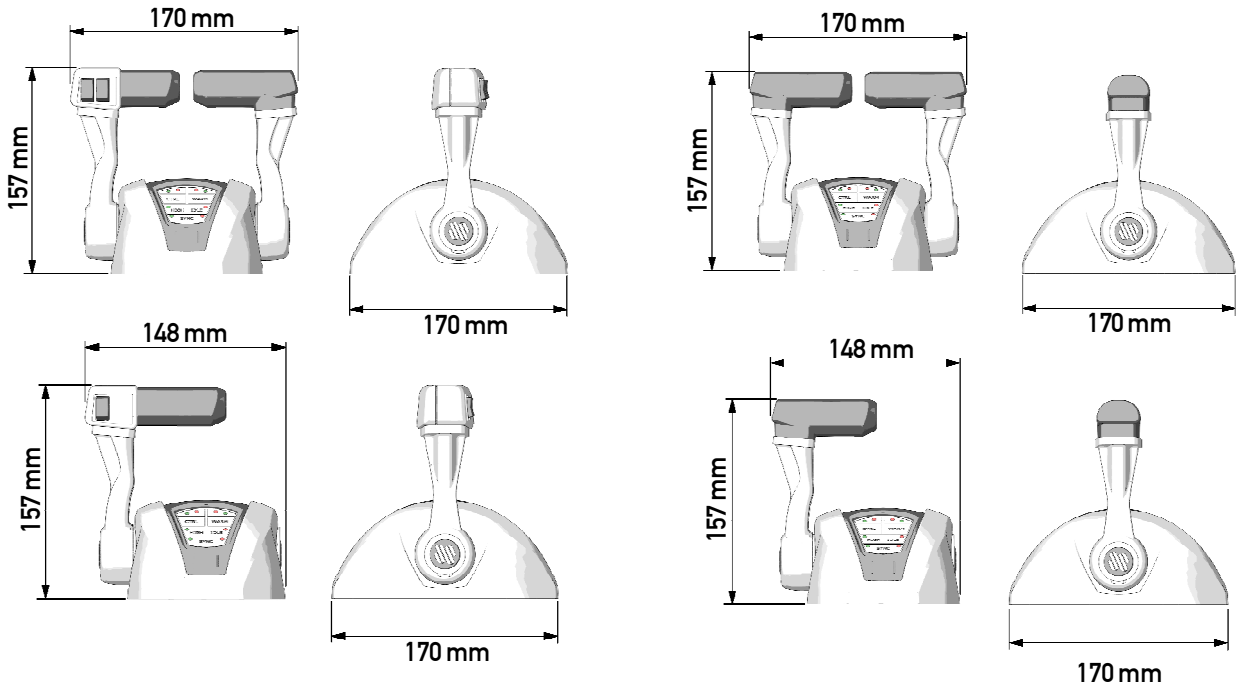
☐ **SYSTEM PROTECTIONS**
The system *Power A Mark II™* is protected against power supply and power cable polarity inversion.

☐ **OVERLOAD PROTECTIONS**
Overload protections must be placed by the installer (see paragraph 5.2 Power cable wiring).
Single-engine systems require a 15 A magneto-thermal protection, while twin-engine systems require a 20 A magneto-thermal protection.
Each component of the system is equipped with an internal protection.

☐ **COMPLIANCE WITH THE STANDARDS**
The systems complies with the European Directive 89/336/EC for electromagnetic emission (EMC) according to standard EN60945.

1.2.1 Technical features of the control station

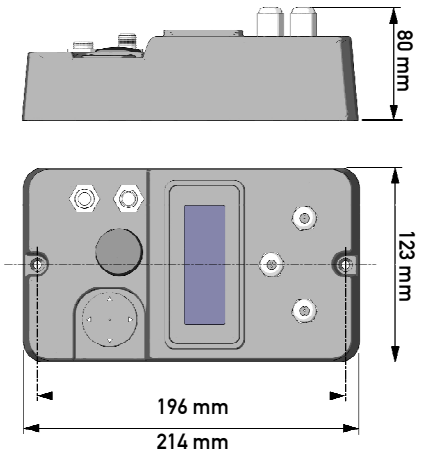
The control station is an exposed object and it falls within protection class IP66.
Light signals can be seen in any light condition and acoustic signals can be heard even in the heaviest conditions (maximum engine rotation).



1.2.2 Technical features of the control unit

The control unit is not an exposed object and it falls within protection class IP65.
It is equipped with a 4x20 character display whose brightness can be regulated by the user.

- Maximum current supported by the trim contacts: 8A
- Maximum current supported by the neutral safety contacts: 8A
- Key input voltage range: 6 - 32V
- Engine revolution input voltage range: 4 - 32V
- Engine revolution input frequency range: 0 - 5KHz.

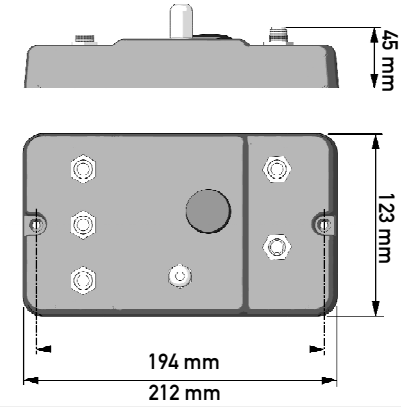


1.2.3 Technical features of the shift unit

The shift unit is not an exposed object and it falls within protection class IP65.
Features of solenoid connections:

- Maximum current supported without alarms: 3A
- Maximum current supported: 4A
- Protection against short circuit and solenoid disconnection.

Internal fuse

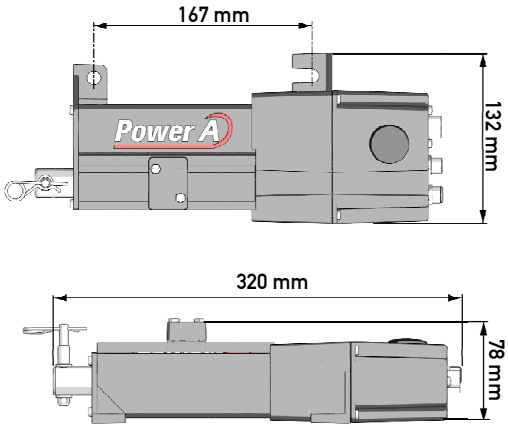


1.2.4 Technical features of the mechanical actuator

The mechanical actuator is not an exposed object and it falls within protection class IP65.

- Maximum mechanical load: 18Kg
- Cable maximum stroke: 80mm
- Stroke adjustment: 0.5 mm
- Protection against mechanical cable sticking

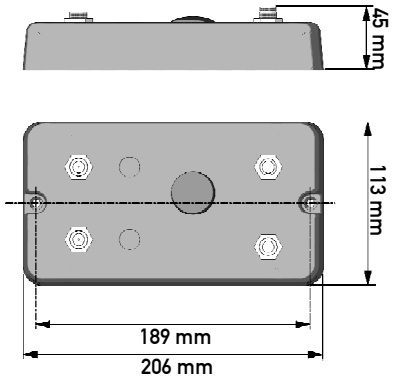
Internal fuse



1.2.5 Technical features of the V-throttle unit

The V-throttle unit is not an exposed object and it falls within protection class IP65.

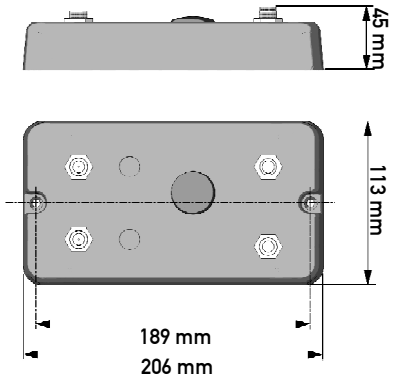
- Maximum voltage range of the full signal: 0-5V
- Maximum voltage range of the halved or redundancy signal : 0-2.5V
- Maximum current allowed on the full signal: 10 mA, output protection
- Maximum current allowed on the halved signal: 10 mA, output protection
- Maximum current allowed on contacts IVS: 50 mA
- Maximum current allowed on signal PWM: 20 mA



1.2.6 Technical features of the I-throttle unit

The I-throttle unit is not an exposed object and it falls within protection class IP65.

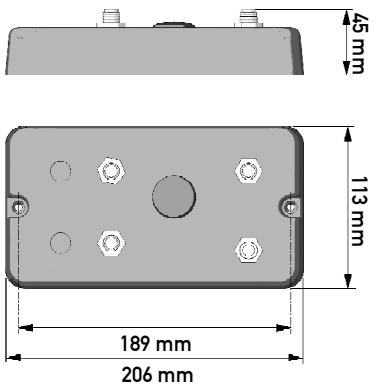
- Maximum current range of the signal: 4-20mA
- Maximum load allowed on current output: 1 KOhm



1.2.7 Technical features of the SAEJ-throttle unit

The SAEJ-throttle unit is not an exposed object and it falls within protection class IP65.

CAN communication protocol is in compliance with SAE J1939 or NMEA2000 standard.



ENGLISH

2 TRANSPORT

2.1 General warnings

The weight of each packaging is lower than 2kg (4.40 pounds). It can be handled manually.

⚠ WARNING

The staff in charge of handling the system should always use protective gloves and safety shoes.

2.2 Packaging contents

Before using the equipment check that the product has not been damaged during transport.
Also make sure that all the standard components are in the packaging. In the event of damage, notify the claim to the forwarder and inform the supplier.

⚠ CAUTION

The packaging must be disposed of according to the laws in force.

2.3 Mechanical actuator packaging contents

The actuator is supplied with a fixing pin with 2 split pins, 1 nut, 2 washers and a kit to connect mechanical cables.

3 SYSTEM CONFIGURATION

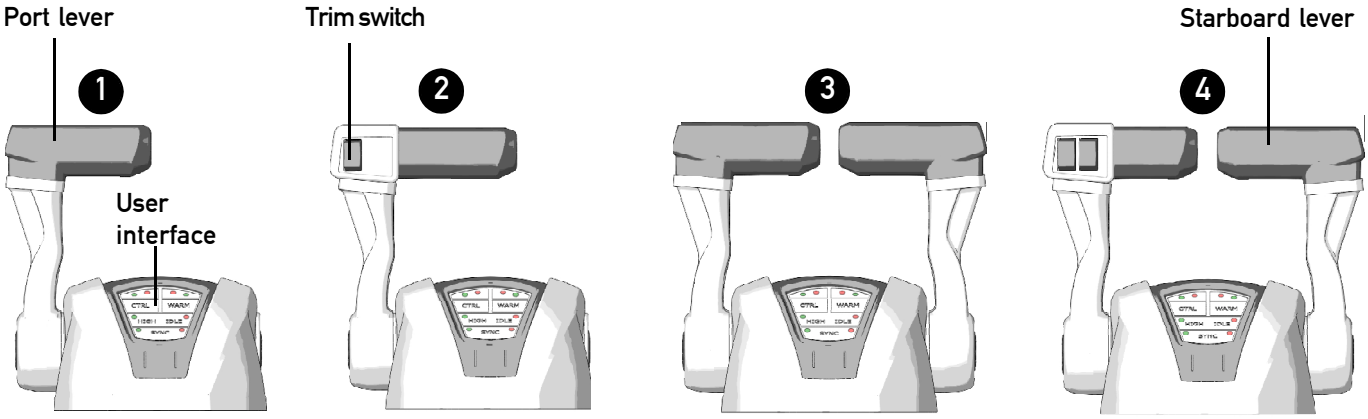
3.1 Description of components

The configuration of each component is described below:

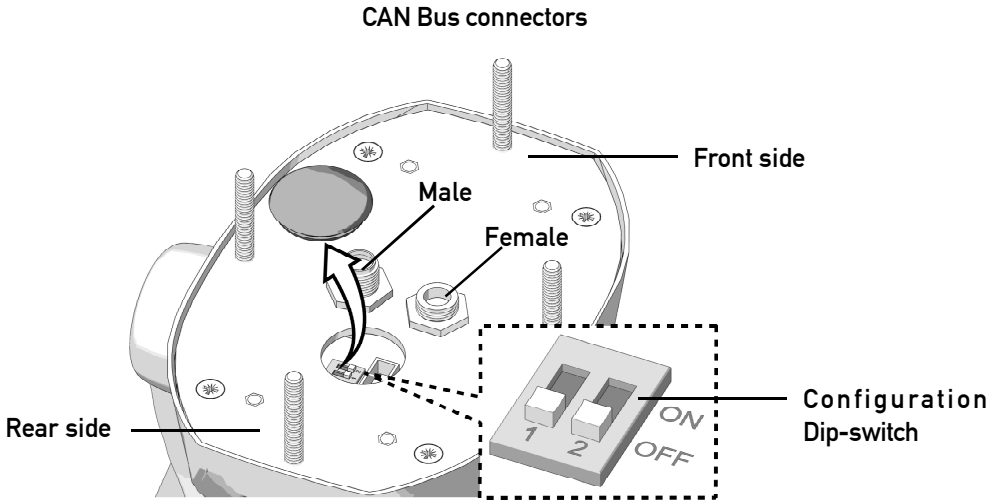
3.1.1 Control station

The control station is available in four standard versions:
1) Single engine without trim switches
2) Single engine with trim switches
3) Twin engine without trim switches
4) Twin engine with trim switches

For other non-standard versions, please contact Ultraflex spa.



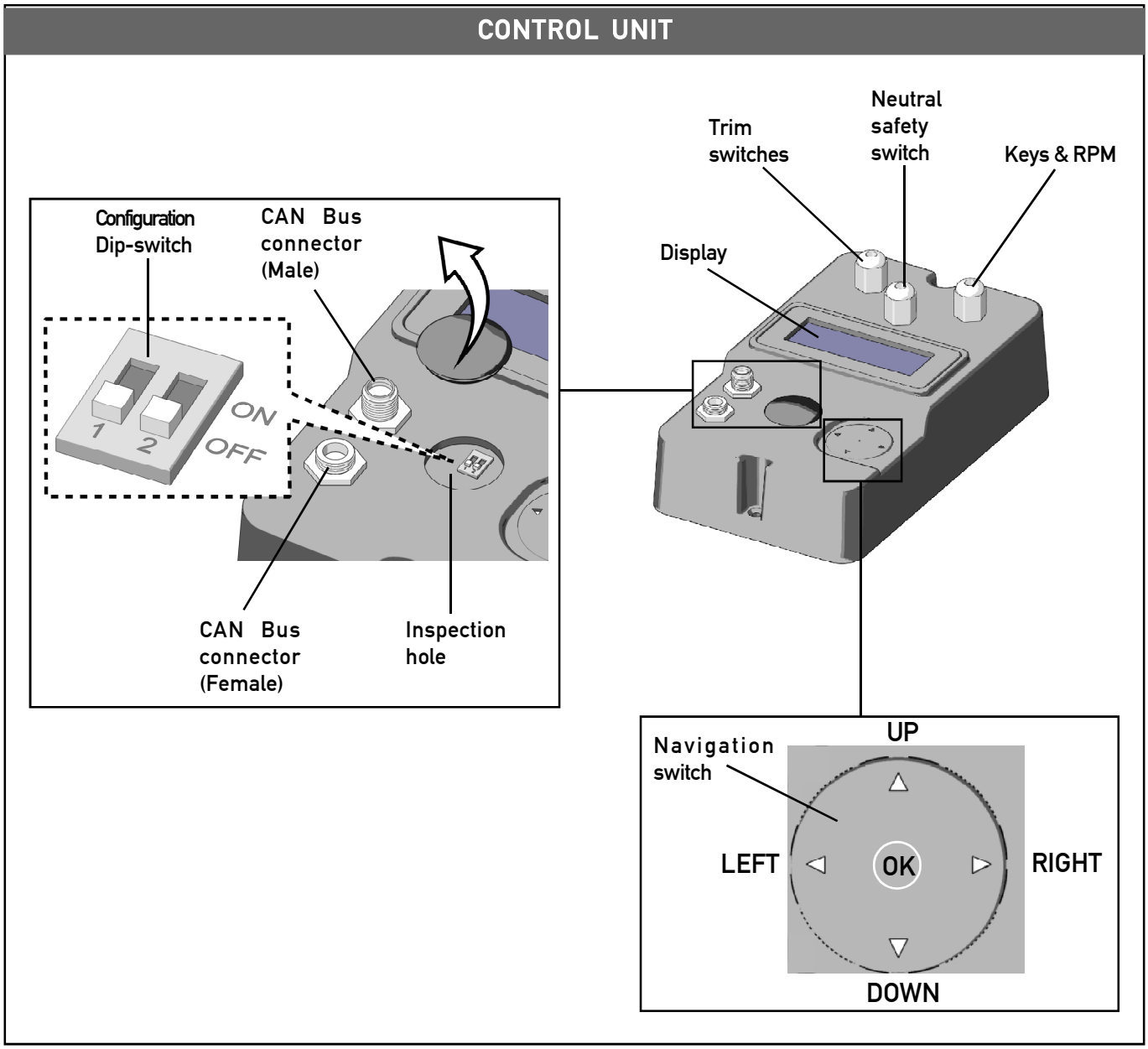
BOTTOM VIEW



The picture above allows recognizing the connectors and the dip-switches easily. It shows the lower part of the control station with the inspection hole containing the configuration dip-switches.

3.1.2 Control unit

The control unit is available in standard version only.

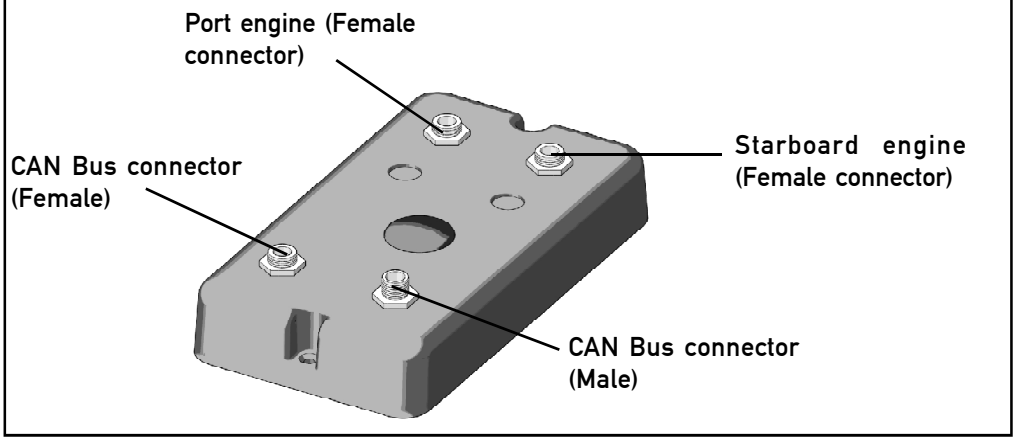


3.1.3 Throttle unit

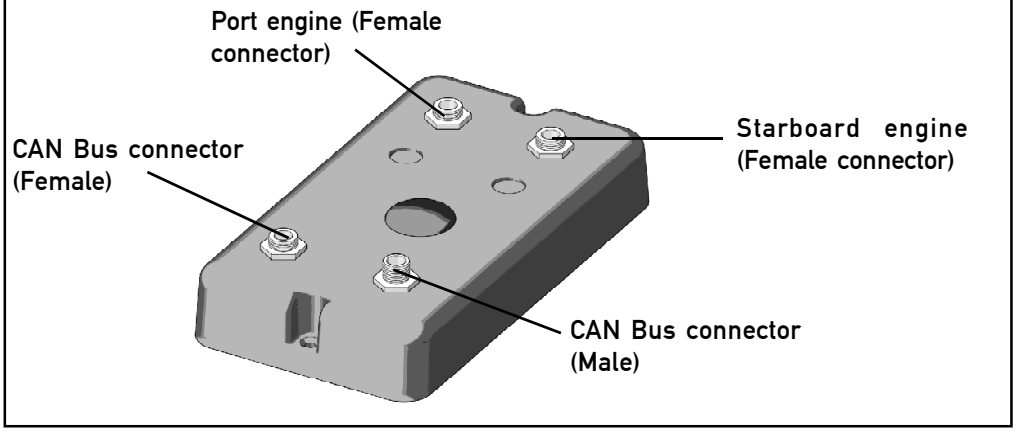
The throttle unit is available in three standard versions:
- V-throttle
- I-throttle
- SAEJ-throttle

For other personalized versions, please contact Ultraflex spa.

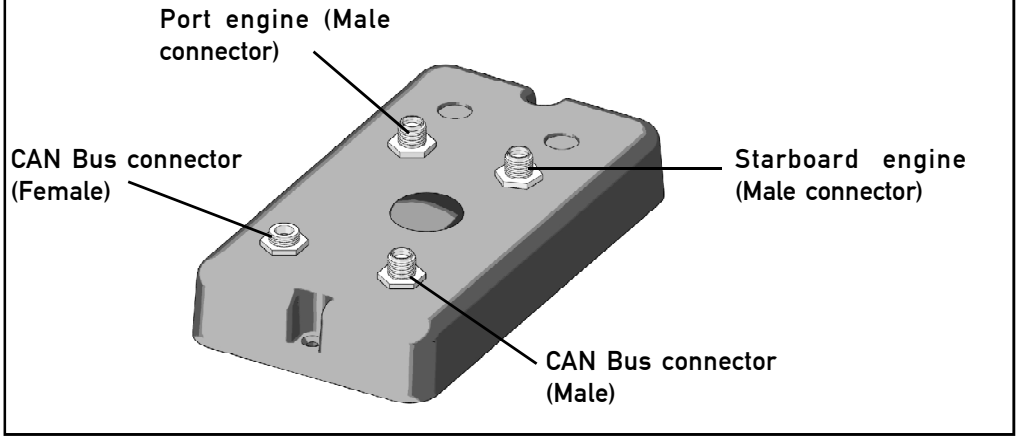
V-THROTTLE



I-THROTTLE



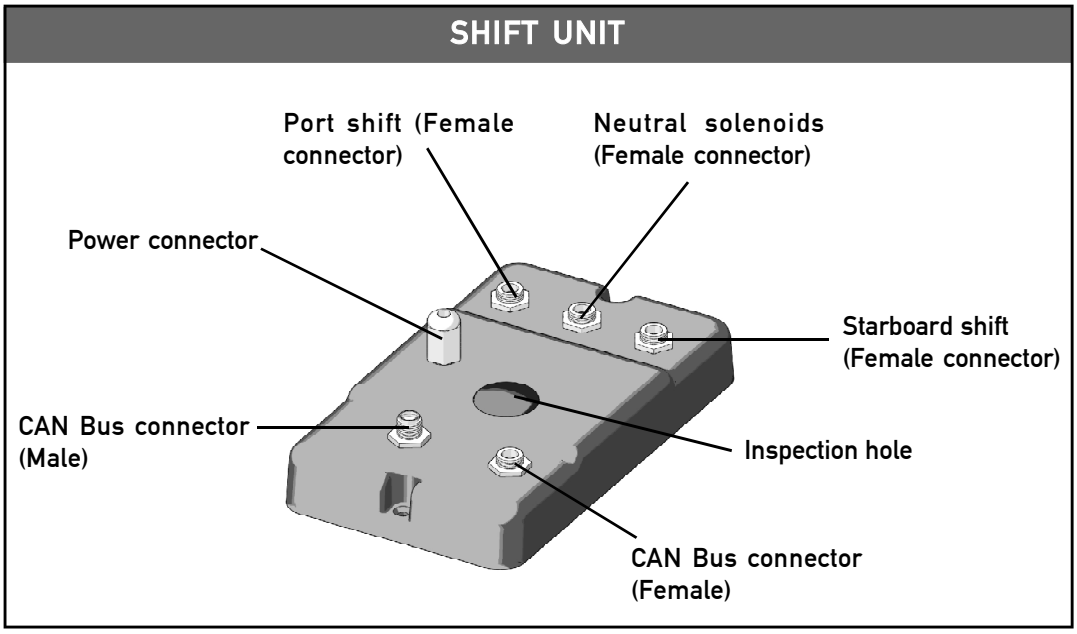
SAEJ-THROTTLE



ENGLISH

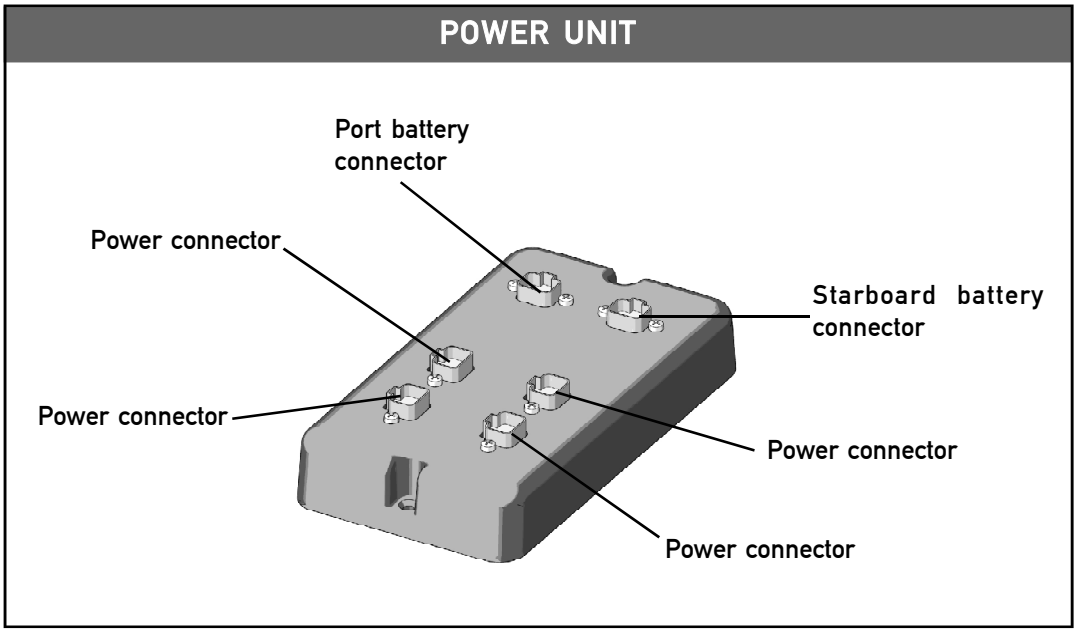
3.1.4 Shift unit

The shift unit is available in standard version only.



3.1.5 Power unit

The power unit is available in standard version only.



⚠ WARNING

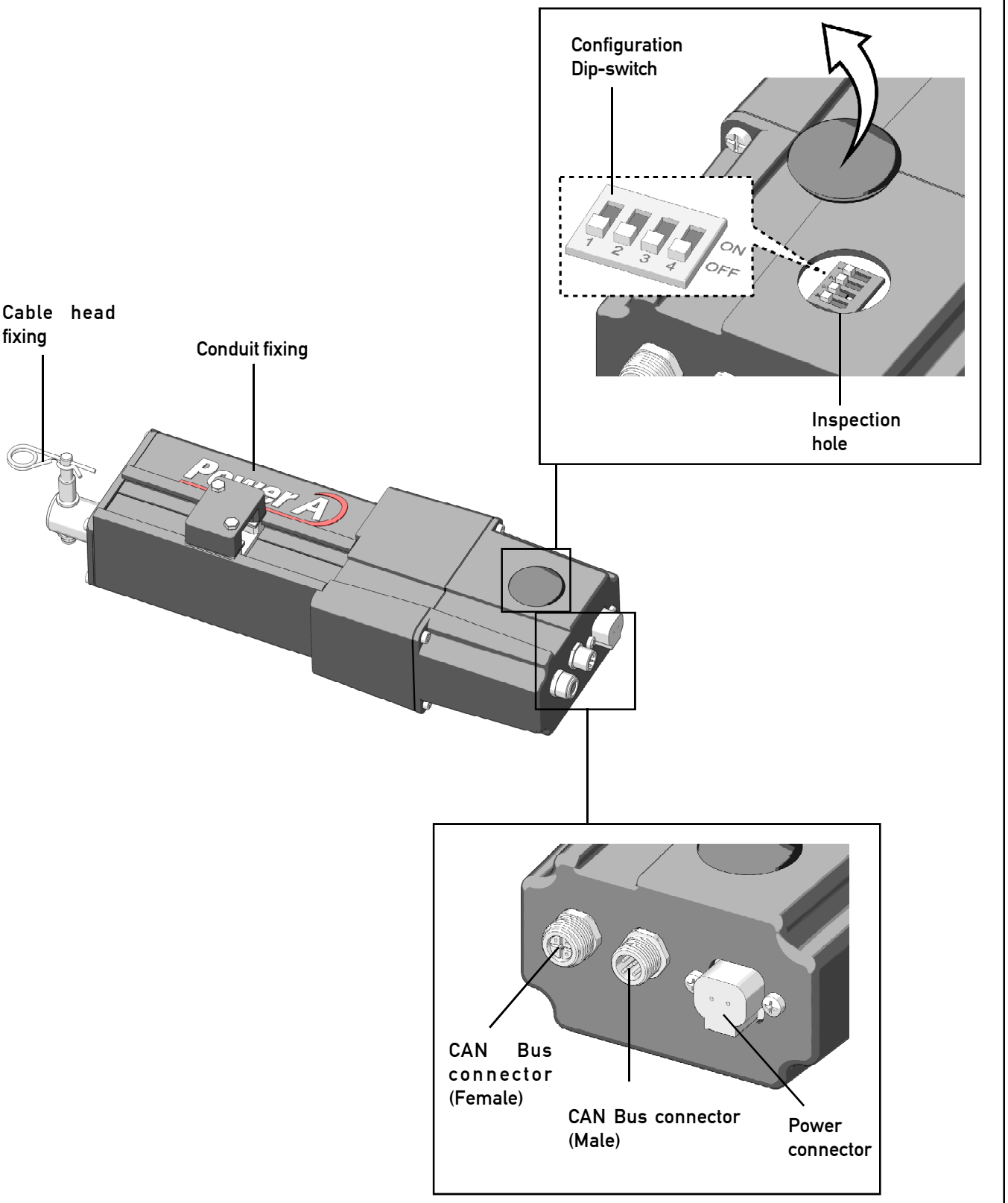
Warranty will be invalidated if power connectors are used to feed electronic components which are not part of the system Power A Mark II™ .

Any improper use of the Power Unit can damage the unit itself and the entire system Power A Mark II™.

3.1.6 Mechanical actuator

The mechanical actuator is available in standard version only.

MECHANICAL ACTUATOR



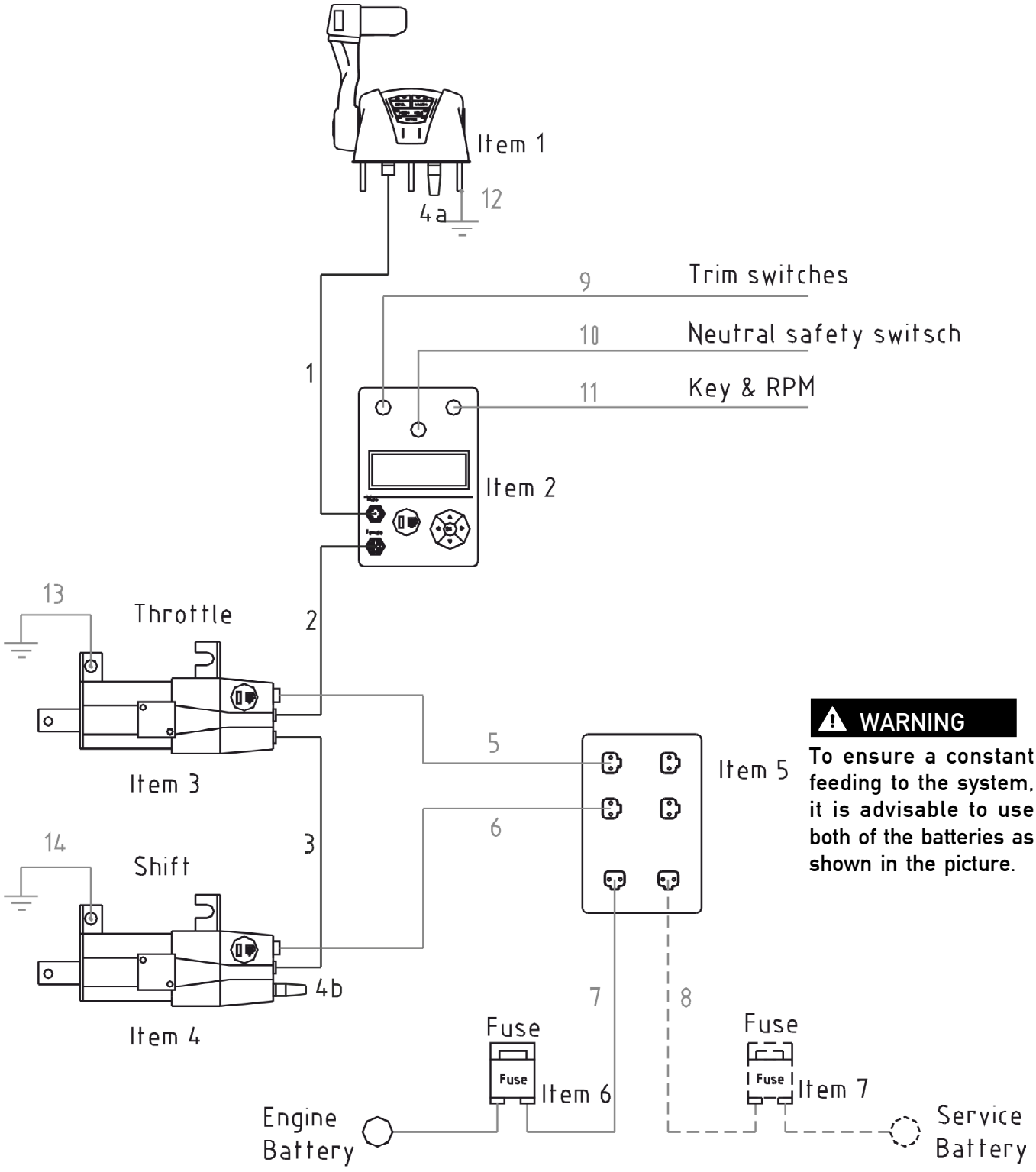
3.2 Installation diagrams

The following pages show the installation diagram of each component of the system.

3.2.1 Mechanical shift, mechanical throttle

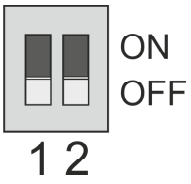
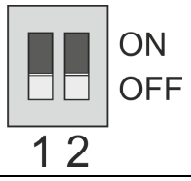
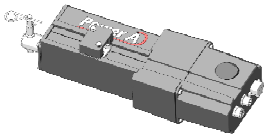
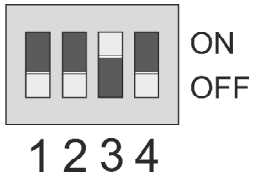
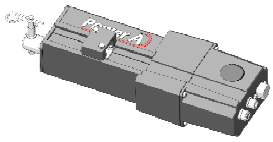
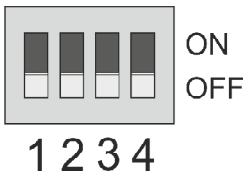
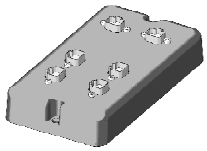
This page shows the installation diagram of the mechanical shift and the mechanical throttle for single-engine or twin-engine systems.

3.2.1.1 Single-engine system



⚠ WARNING

To ensure a constant feeding to the system, it is advisable to use both of the batteries as shown in the picture.

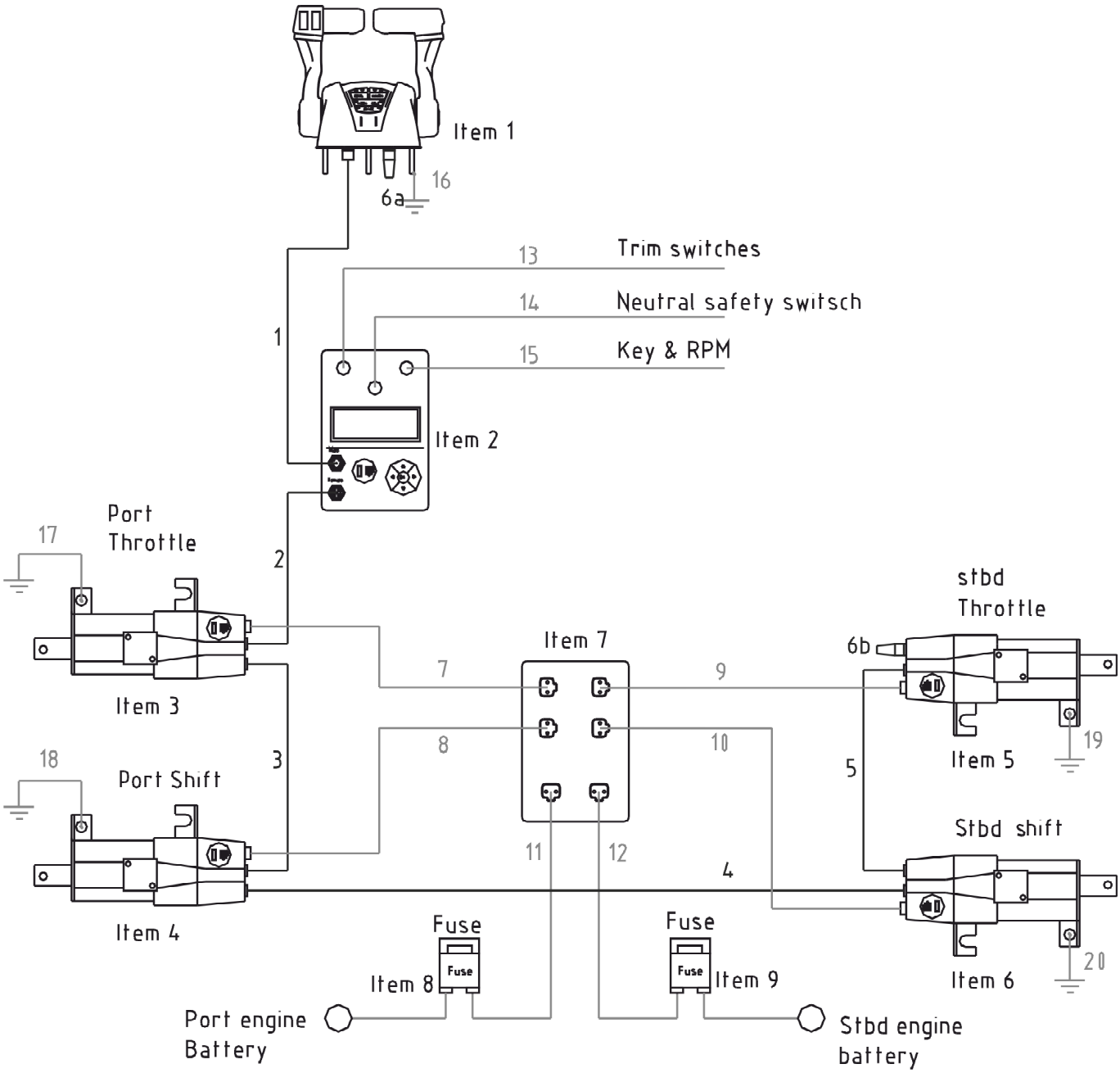
Item	Description	Picture	Dip-switch
1	Single-engine control station		
2	Control unit		
3	Mechanical actuator (throttle)		
4	Mechanical actuator (shift)		
5	Power unit		-
6,7	Fuse / Resettable braker	15A – Not supplied	

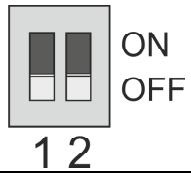
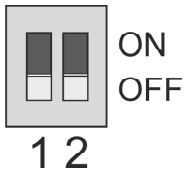
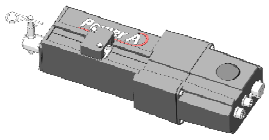
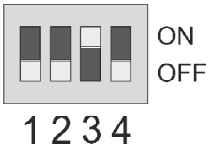
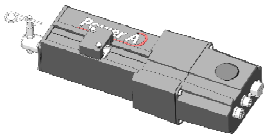
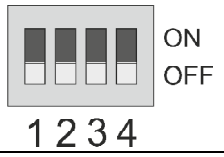
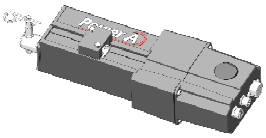
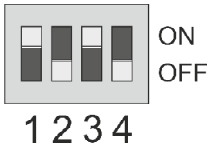
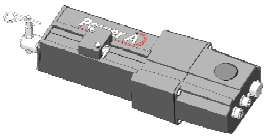
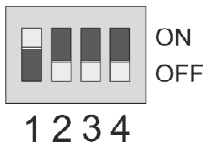
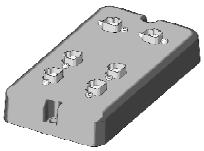
ENGLISH

Wiring:

Connection	Description	Reference paragraph
1, 2, 3	CAN cables	5.4
4a, 4b	Couple of CAN terminators	5.4
5, 6	Power extension cables	5.1
7	Main power cable	5.2
8	Main power cable (optional) needed when another power source is used (service battery)	5.2
9	Trim cables	5.7
10	Start inhibition switch cable (neutral safety)	5.10
11	Key signal cable and engine revolution cable	5.8, 5.9
12, 13, 14	Ground cable	5.3

3.2.1.2 Twin-engine system



Item	Description	Picture	Dip-switch
1	Twin-engine control station		
2	Control unit		
3	Mechanical actuator (port throttle)		
4	Mechanical actuator (port shift)		
5	Mechanical actuator (stbd throttle)		
6	Mechanical actuator (stbd shift)		
7	Power unit		-
8,9	Fuse / Resettable braker	20A – Not supplied	

ENGLISH

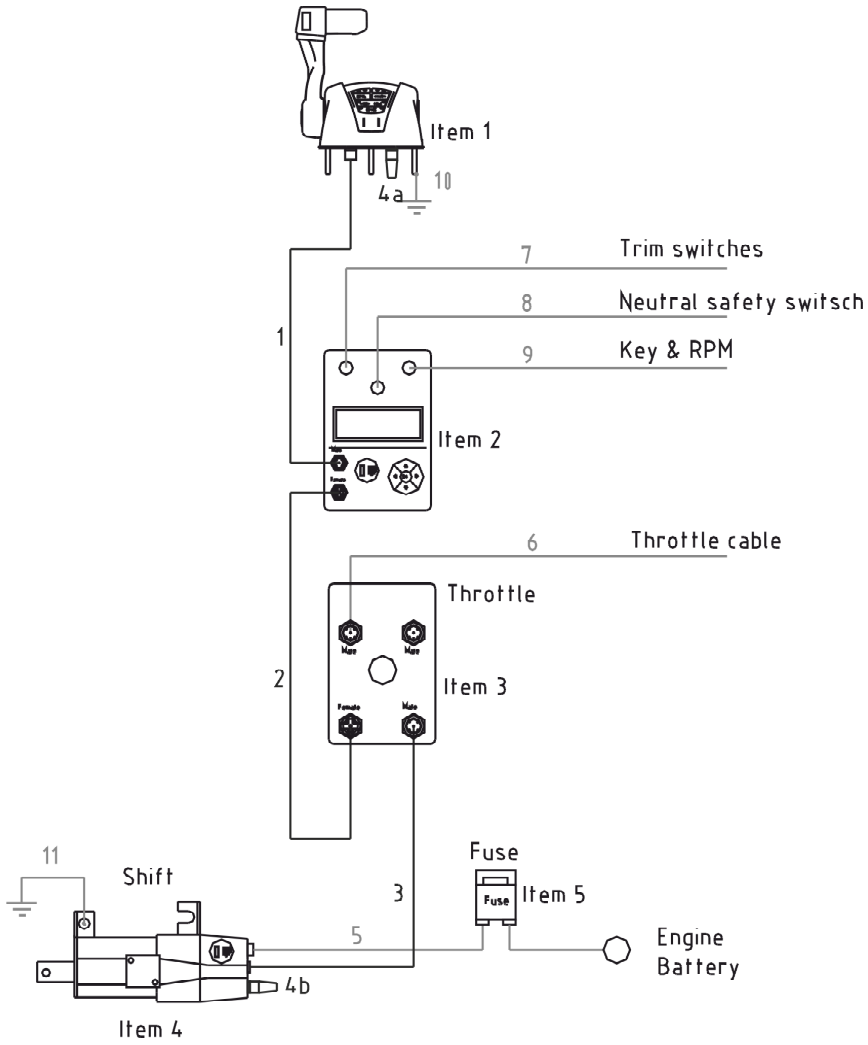
Wiring:

Connection	Description	Reference paragraph
1, 2, 3, 4, 5	CAN cables	5.4
6a, 6b	Couple of CAN terminators	5.4
7, 8, 9, 10	Power extension cables	5.1
11, 12	Main power cable	5.2
13	Trim cable	5.7
14	Start inhibition switch cable (neutral safety)	5.10
15	Key signal cable and engine revolution cable	5.8, 5.9
16, 17, 18, 19, 20	Ground cable	5.3

3.2.2 Mechanical shift, (analogic) electronic throttle

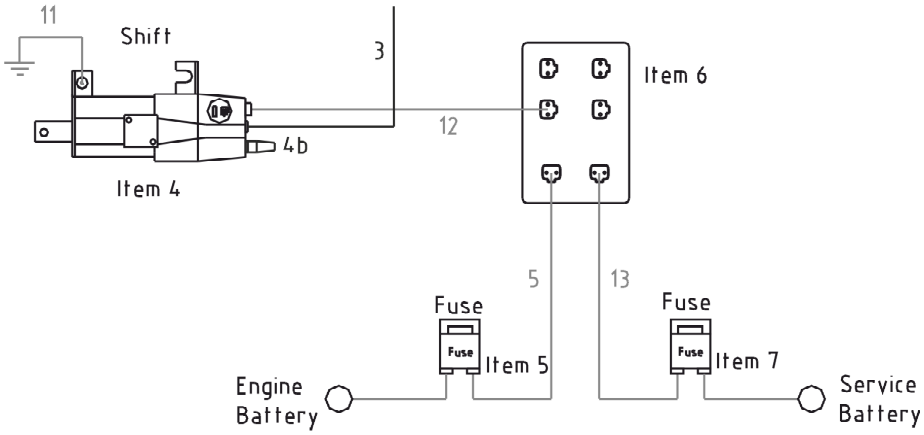
This page shows the installation diagram of the mechanical shift and the electronic throttle for single-engine or twin-engine systems.

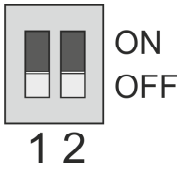
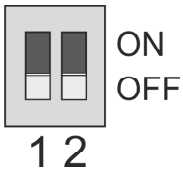
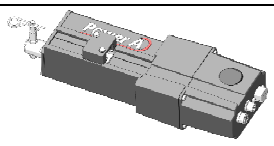
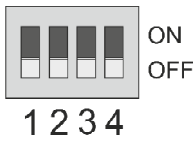
3.2.2.1 Single-engine system



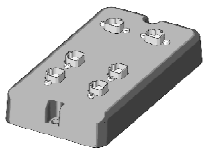
⚠ WARNING

To ensure a constant feeding to the system, it is advisable to use both of the batteries as shown in the picture.



Item	Description	Picture	Dip-switch
1	Single-engine control station		
2	Control unit		
3	V-throttle unit I-throttle unit		-
4	Mechanical actuator (shift)		
5	Fuse / Resettable braker	15A – Not supplied	

Optional

6	Power unit		-
7	Fuse / Resettable braker	15A - Not supplied	

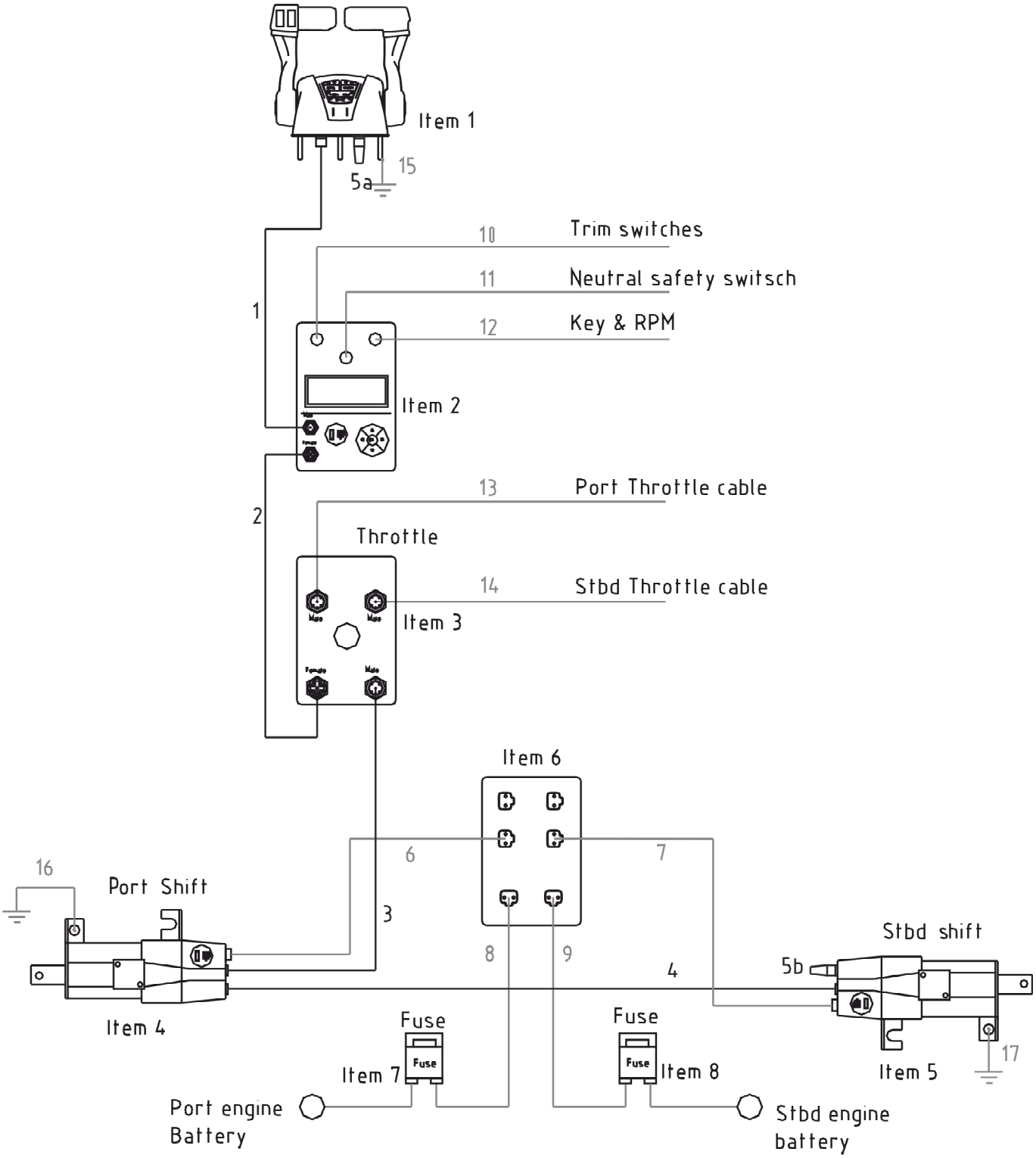
Wiring:

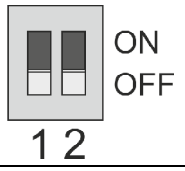
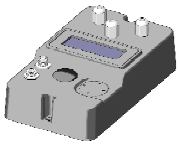
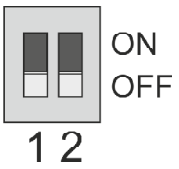
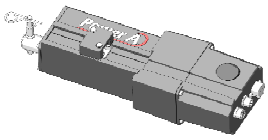
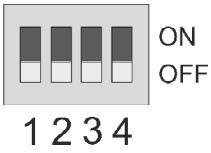
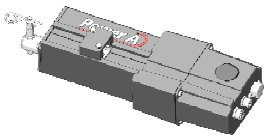
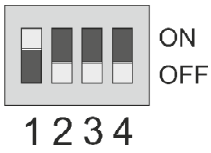
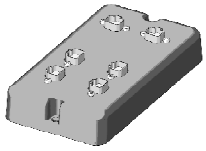
Connection	Description	Reference paragraph
1, 2, 3	CAN cables	5.4
4a, 4b	Couple of CAN terminators	5.4
5	Main power cable	5.2
6	Throttle cable	5.5
7	Trim cable	5.7
8	Start inhibition switch cable (neutral safety)	5.10
9	Key signal cable and engine revolution cable	5.8, 5.9
10, 11	Ground cable	5.3

Optional

12	Power extension cable	5.1
13	Main power cable	5.2

3.2.2.2 Twin-engine system



Item	Description	Picture	Dip-switch
1	Twin-engine control station		
2	Control unit		
3	V-throttle unit I-throttle unit		-
4	Mechanical actuator (port shift)		
5	Mechanical actuator (stbd shift)		
6	Power unit		-
7,8	Fuse / Resettable braker	20A – Not supplied	

ENGLISH

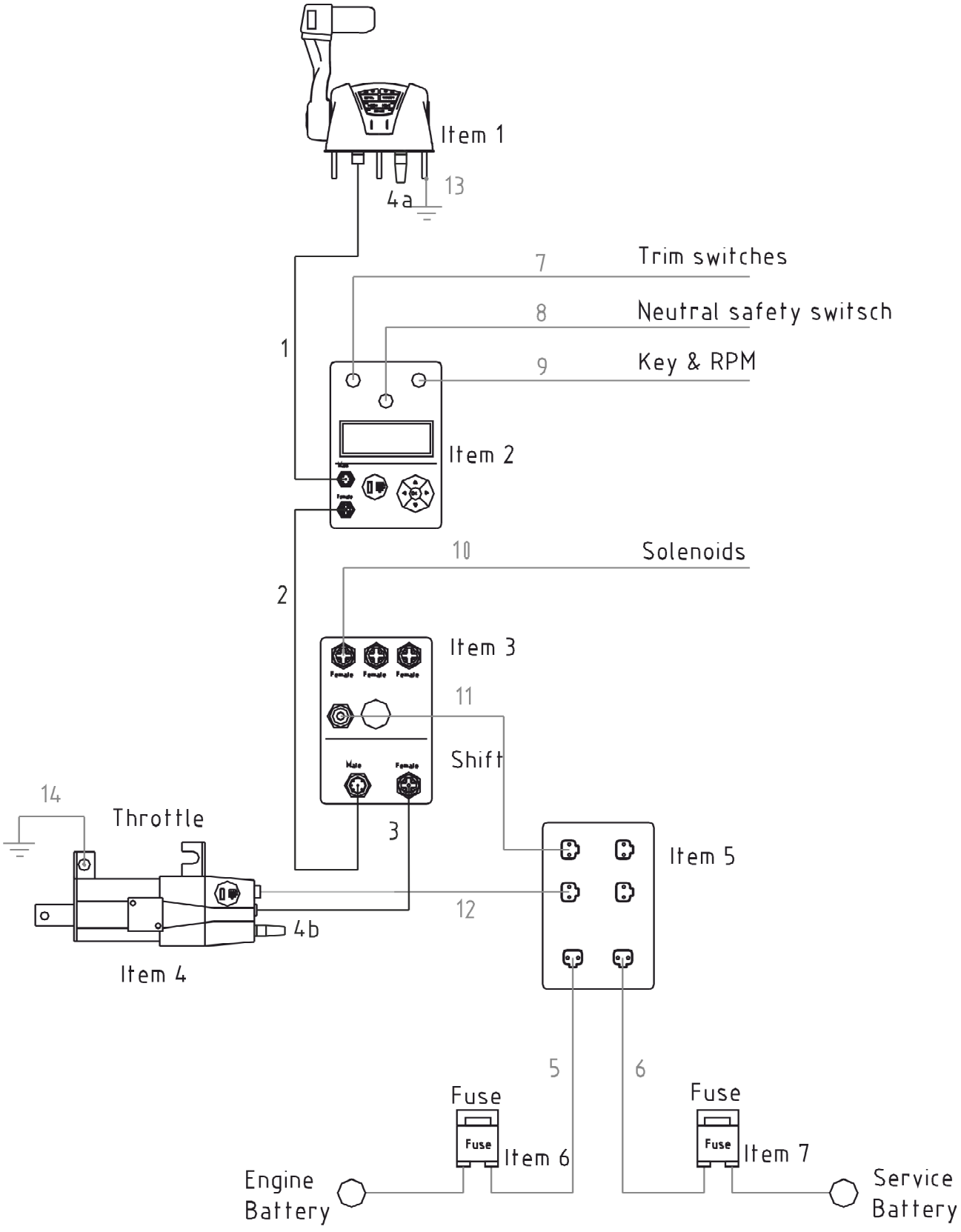
Wiring:

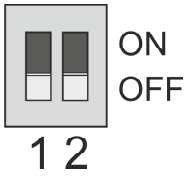
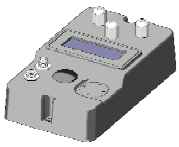
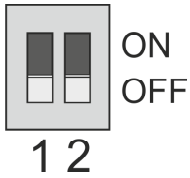
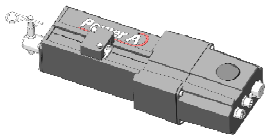
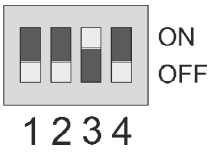
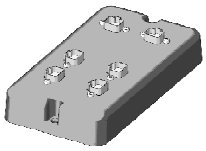
Connection	Description	Reference paragraph
1, 2, 3,4	CAN cables	5.4
5a, 5b	Couple of CAN terminators	5.4
6, 7	Power extension cable	5.1
8, 9	Main power cable	5.2
10	Trim cable	5.7
11	Start inhibition switch cable (neutral safety)	5.10
12	Key signal cable and engine revolution cable	5.8, 5.9
13,14	Throttle cable	5.5
15,16,17	Ground cable	5.3

3.2.3 Electric shift, mechanical throttle

This page shows the installation diagram of the electric shift and the mechanical throttle for single-engine or twin-engine systems.

3.2.3.1 Single-engine system

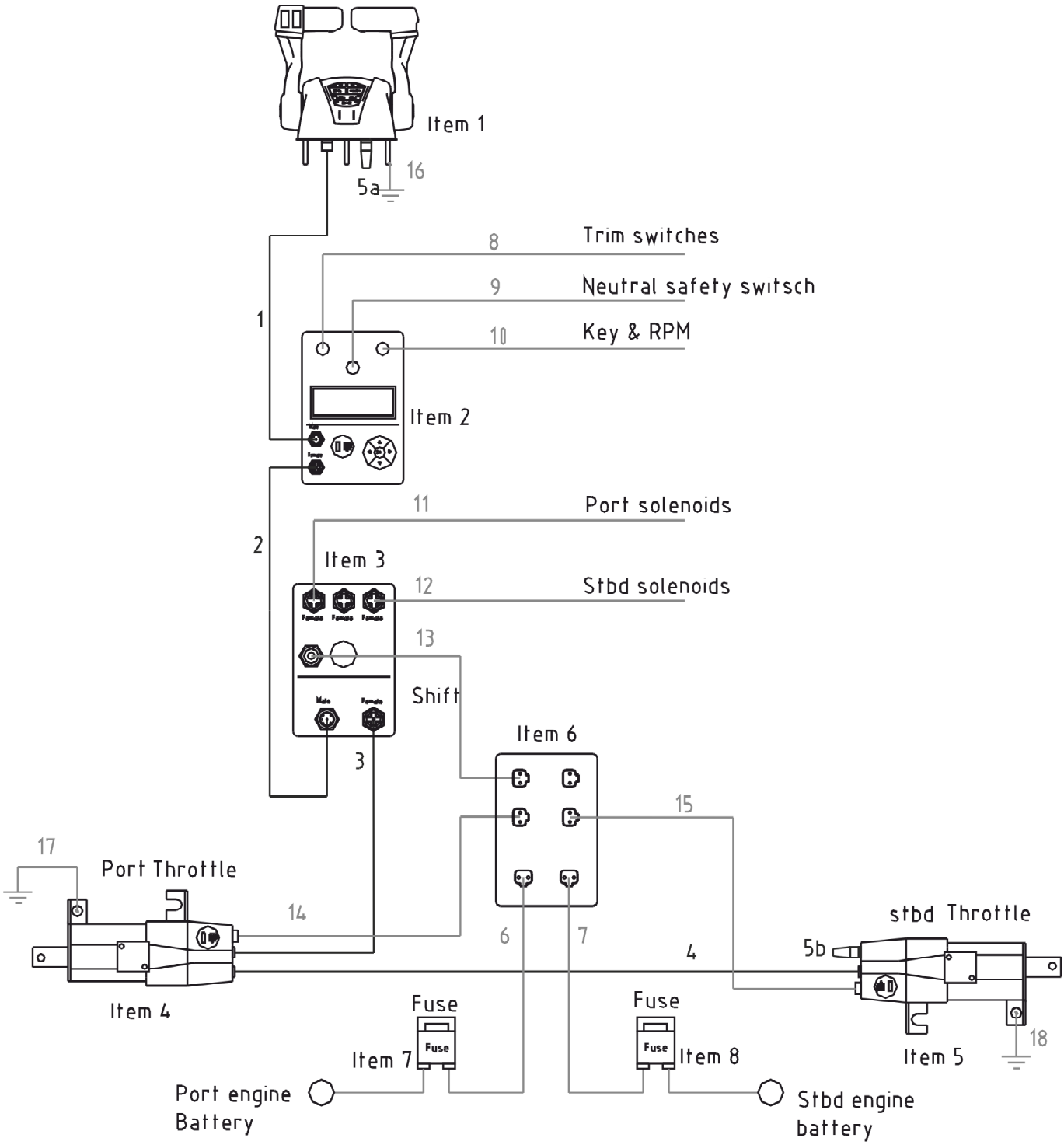


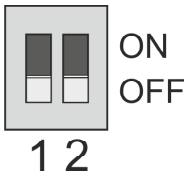
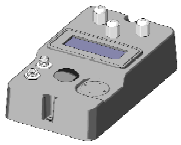
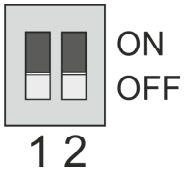
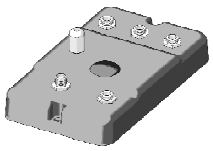
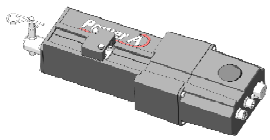
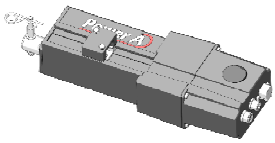
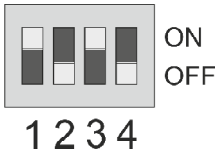
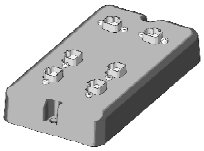
Item	Description	Picture	Dip-switch
1	Single-engine control station		
2	Control unit		
3	Shift unit		-
4	Mechanical actuator (throttle)		
5	Power unit		-
6,7	Fuse / Resettable braker	15A – Not supplied	

Wiring:

Connection	Description	Reference paragraph
1, 2, 3	CAN cables	5.4
4a, 4b	Couple of CAN terminators	5.4
5, 6	Main power cable	5.2
7	Trim cable	5.7
8	Start inhibition switch cable (neutral safety)	5.10
9	Key signal cable and engine revolution cable	5.8, 5.9
10	Shift solenoid cable	5.6
11,12	Power extension cables	5.1
13,14	Ground cable	5.3

3.2.3.2 Twin-engine system



Item	Description	Picture	Dip-switch
1	Twin-engine control station		
2	Control unit		
3	Shift unit		-
4	Mechanical actuator (port throttle)		
5	Mechanical actuator (stbd throttle)		
6	Power unit		-
7,8	Fuse / Resettable braker	20A – Not supplied	

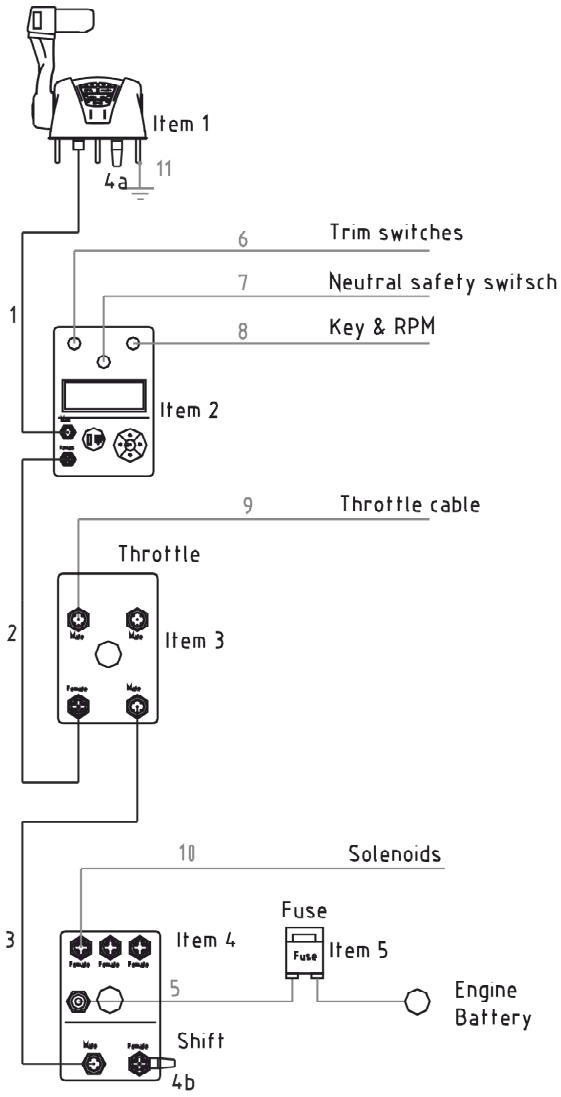
Wiring:

Connection	Description	Reference paragraph
1, 2, 3, 4	CAN cables	5.4
5a, 5b	Couple of CAN terminators	5.4
6, 7	Main power cable	5.2
8	Trim cable	5.7
9	Start inhibition switch cable (neutral safety)	5.10
10	Key signal cable and engine revolution cable	5.8, 5.9
11,12	Shift solenoid cable	5.6
13, 14, 15	Power extension cables	5.1
16,17,18	Ground cable	5.3

3.2.4 Electric shift, (analogic) electronic throttle

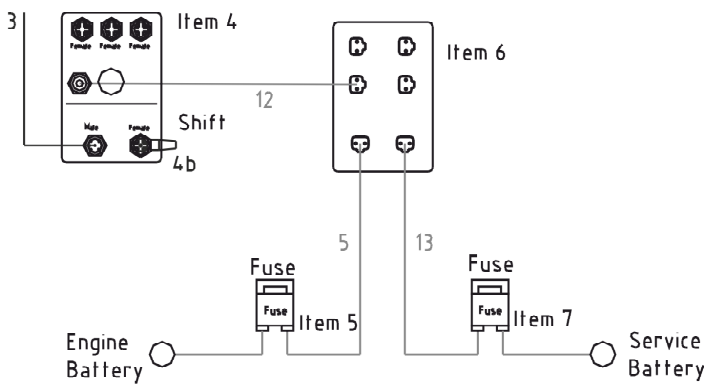
This page shows the installation diagram of the electric shift and the electronic throttle for single-engine or twin-engine systems.

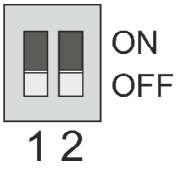
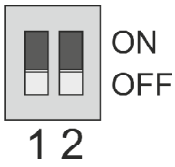
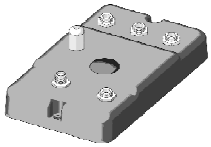
3.2.4.1 Single-engine system



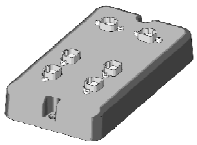
⚠ WARNING

To ensure a constant feeding to the system, it is advisable to use both of the batteries as shown in the picture.



Item	Description	Picture	Dip-switch
1	Single-engine control station		
2	Control unit		
3	V-throttle unit I-throttle unit		-
4	Shift unit		-
5	Fuse / Resettable braker	15A – Not supplied	

Optional

6	Power unit		-
7	Fuse / Resettable braker	15A – Not supplied	

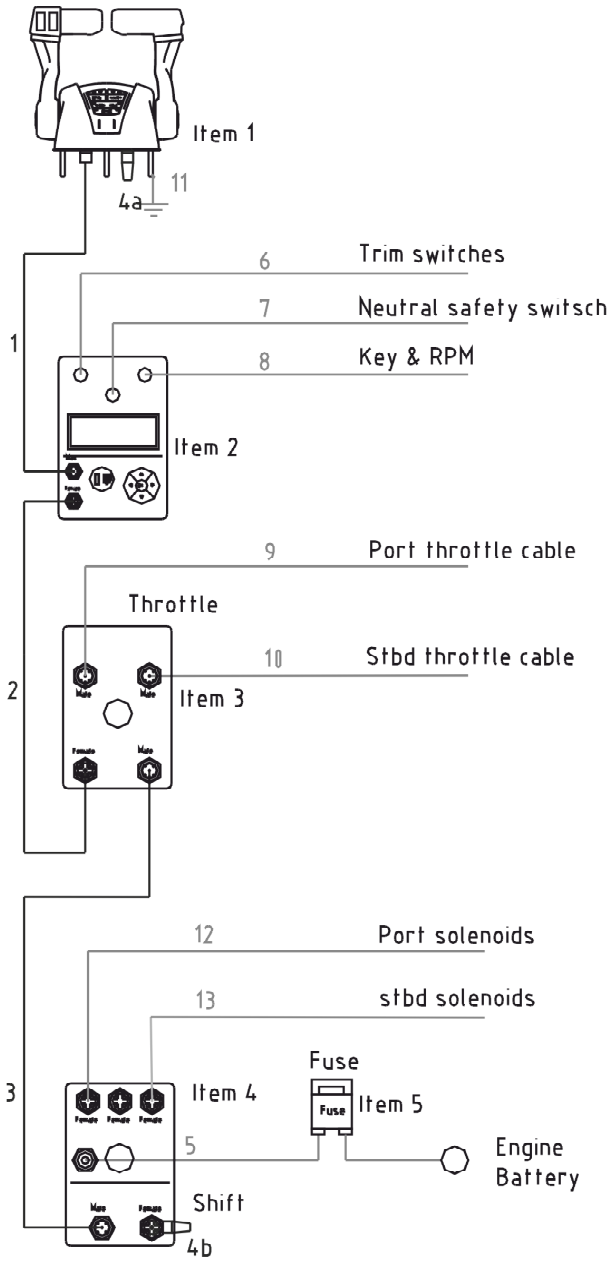
Wiring:

Connection	Description	Reference paragraph
1, 2, 3	CAN cables	5.4
4a, 4b	Couple of CAN terminators	5.4
5	Main power cable	5.2
6	Trim cable	5.7
7	Start inhibition switch cable (neutral safety)	5.10
8	Key signal cable and engine revolution cable	5.8, 5.9
9	Throttle cable	5.5
10	Shift solenoid cable	5.6
11	Ground cable	5.3

Optional

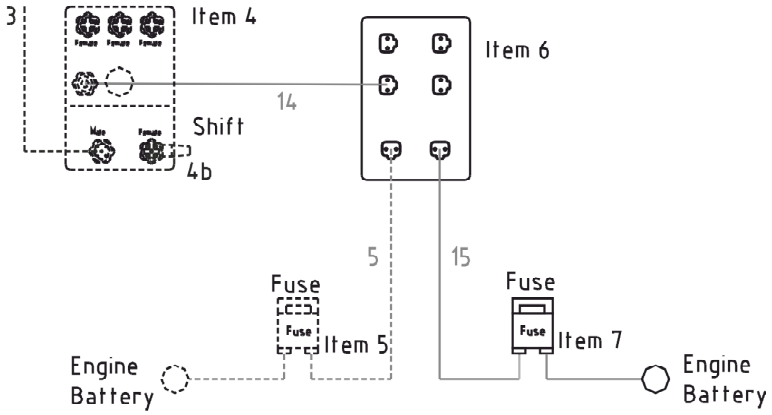
12	Power extension cable	5.1
13	Main power cable	5.2

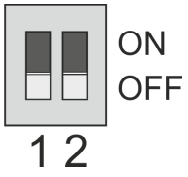
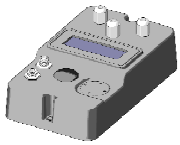
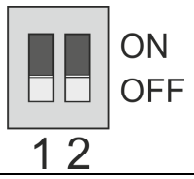
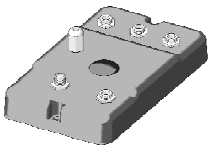
3.2.4.2 Twin-engine system



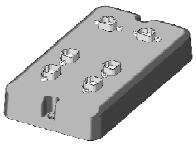
⚠ WARNING

To ensure a constant feeding to the system, it is advisable to use both of the batteries as shown in the picture.



Item	Description	Picture	Dip-switch
1	Twin-engine control station		
2	Control unit		
3	V-throttle unit I-throttle unit		-
4	Shift unit		-
5	Fuse / Resettable braker	20A – Not supplied	

Optional

6	Power unit		-
7	Fuse / Resettable braker	20A – Not supplied	

Wiring:

Connection	Description	Reference paragraph
1, 2, 3	CAN cables	5.4
4a, 4b	Couple of CAN terminators	5.4
5	Main power cable	5.2
6	Trim cable	5.7
7	Start inhibition switch cable (neutral safety)	5.10
8	Key signal cable and engine revolution cable	5.8, 5.9
9,10	Throttle cable	5.5
11	Ground cable	5.3
12,13	Shift solenoid cable	5.6

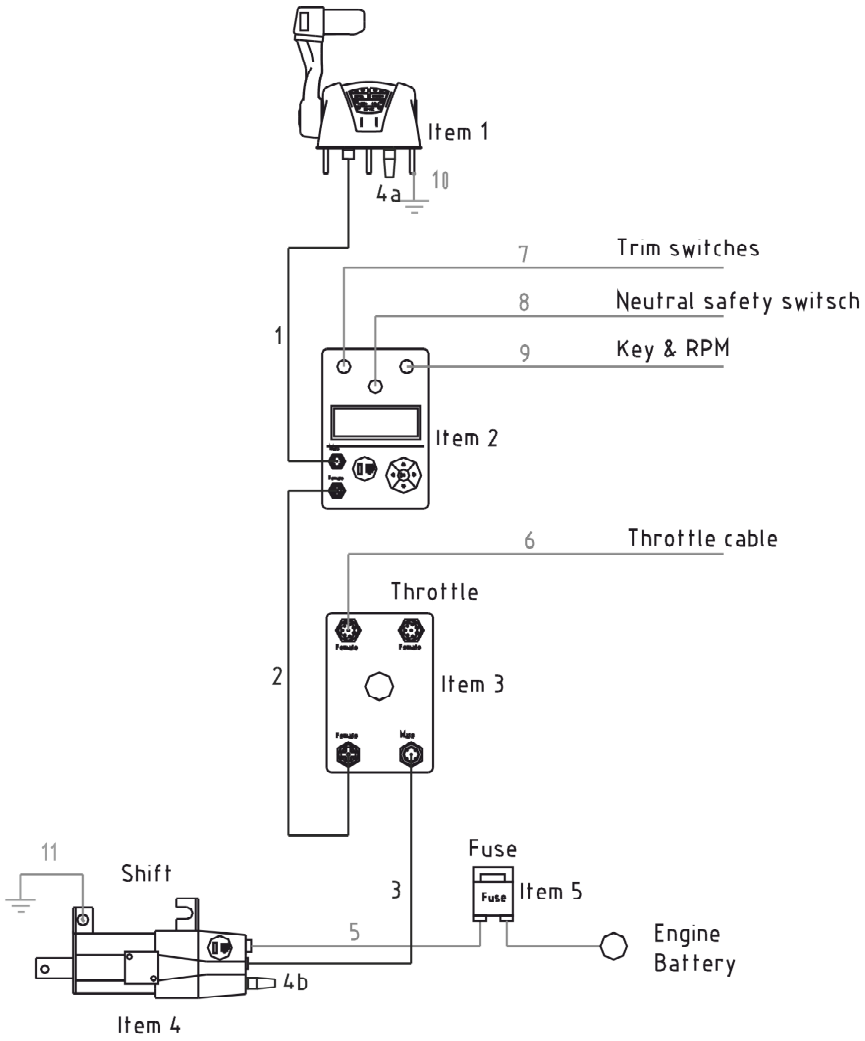
Optional

14	Power extension cable	5.1
15	Main power cable	5.2

3.2.5 Mechanical shift, SAE J1939/NMEA2000 throttle

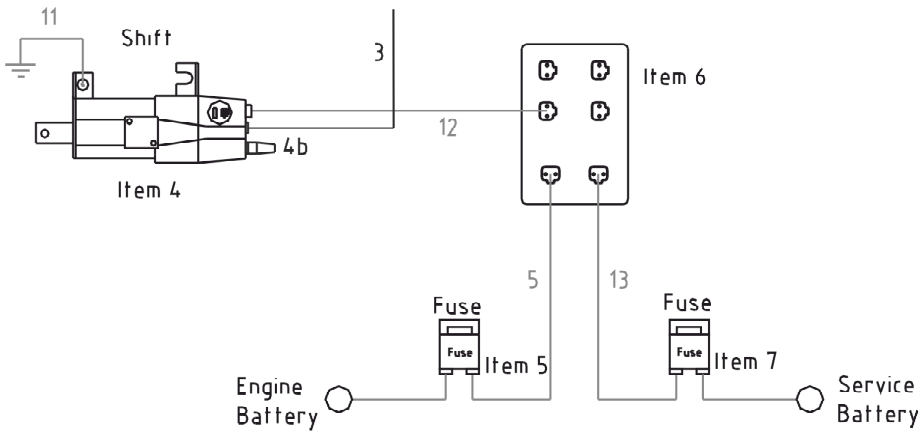
This page shows the installation diagram of the mechanical shift and the SAE J1939/NMEA2000 throttle for single-engine or twin-engine systems.

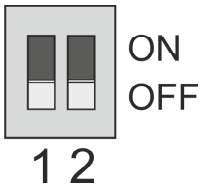
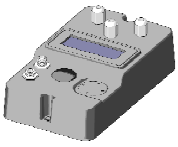
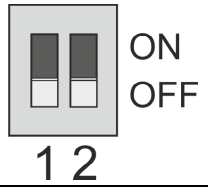
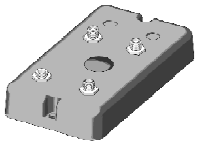
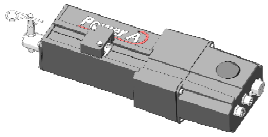
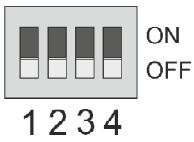
3.2.5.1 Single-engine system



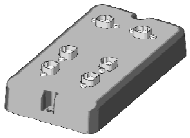
⚠ WARNING

To ensure a constant feeding to the system, it is advisable to use both of the batteries as shown in the picture.



Item	Description	Picture	Dip-switch
1	Single-engine control station		
2	Control unit		
3	SAEJ - throttle unit		-
4	Mechanical actuator (shift)		
5	Fuse / Resettable braker	15A – Not supplied	

Optional

6	Power unit		-
7	Fuse / Resettable braker	15A – Not supplied	

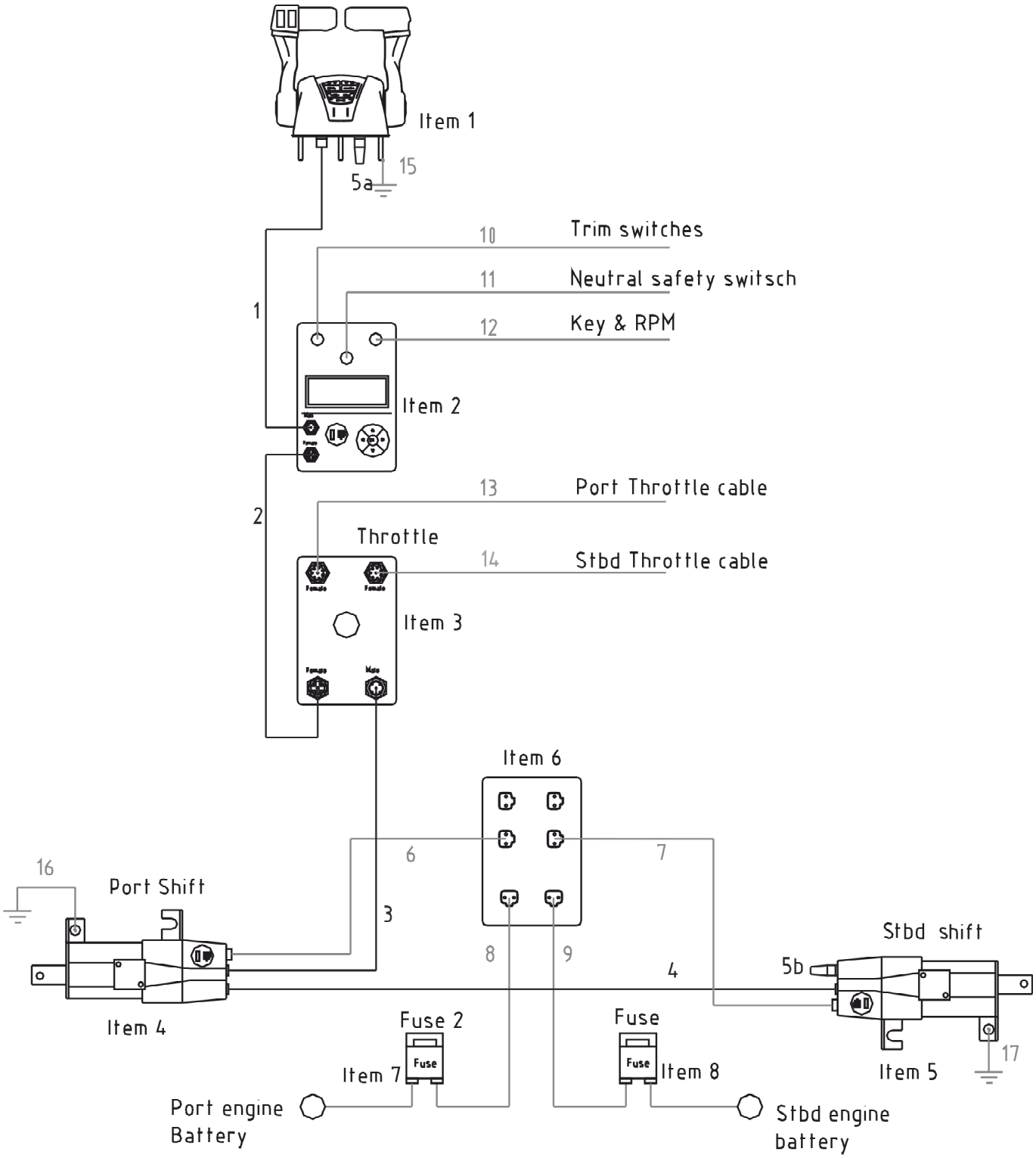
Wiring:

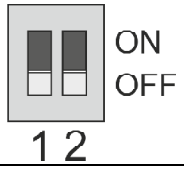
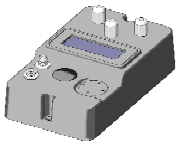
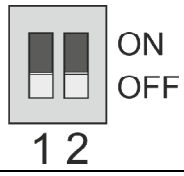
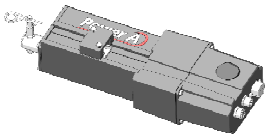
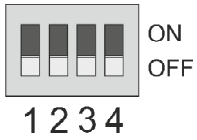
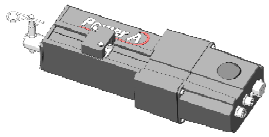
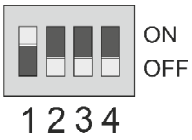
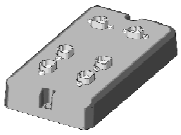
Connection	Description	Reference paragraph
1, 2, 3	CAN cables	5.4
4a, 4b	Couple of CAN terminators	5.4
5	Main power cable	5.2
6	Throttle cable	5.5
7	Trim cable	5.7
8	Start inhibition switch cable (neutral safety)	5.10
9	Key signal cable and engine revolution cable	5.8, 5.9
10, 11	Ground cable	5.3

Optional

12	Power extension cable	5.1
13	Main power cable	5.2

3.2.5.2 Twin-engine system



Item	Description	Picture	Dip-switch
1	Twin-engine control station		
2	Control unit		
3	SAEJ-throttle unit		-
4	Mechanical actuator (port shift)		
5	Mechanical actuator (stbd shift)		
6	Power unit		-
7,8	Fuse / Resettable braker	20A – Not supplied	

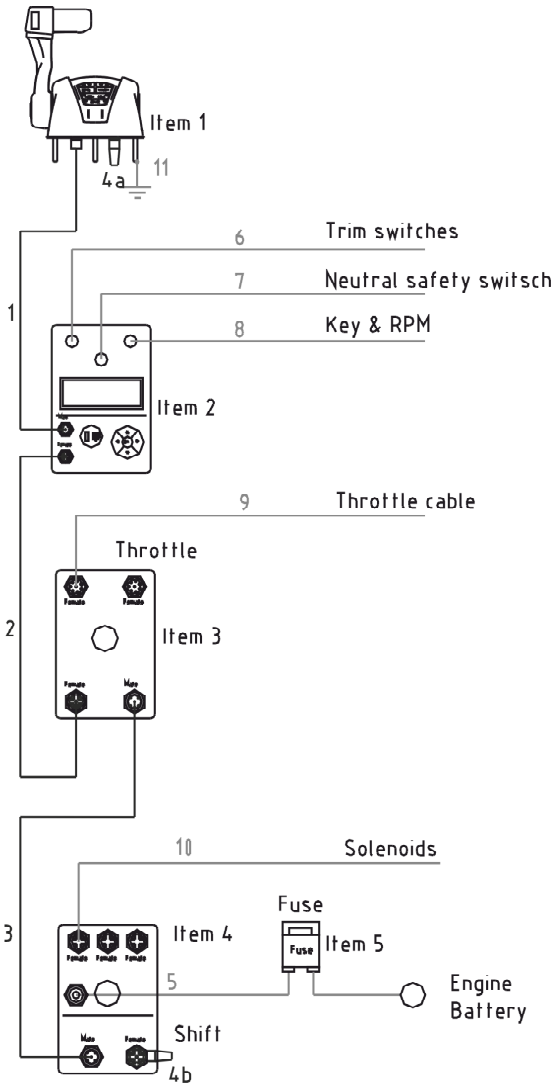
Wiring:

Connection	Description	Reference paragraph
1, 2, 3, 4	CAN cables	5.4
5a, 5b	Couple of CAN terminators	5.4
6, 7	Power extension cable	5.1
8, 9	Main power cable	5.2
10	Trim cable	5.7
11	Start inhibition switch cable (neutral safety)	5.10
12	Key signal cable and engine revolution cable	5.8, 5.9
13,14	Throttle cable	5.5
15, 16, 17	Ground cable	5.3

3.2.6 Electric shift, SAE J1939/NMEA2000 electronic throttle

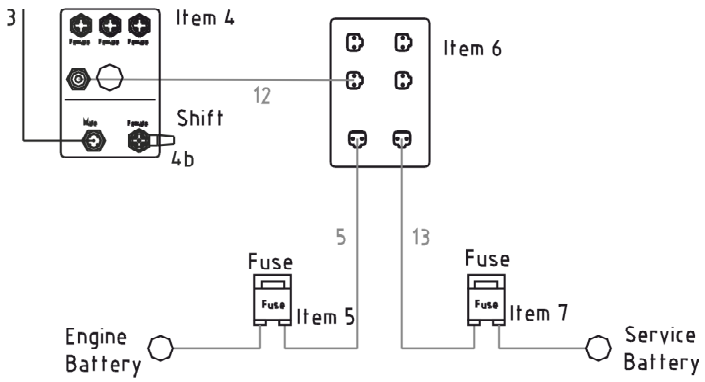
This page shows the installation diagram of the electric shift and the SAE J1939/NMEA2000 electronic throttle, for single-engine or twin-engine systems.

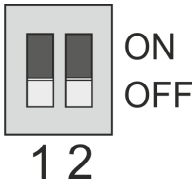
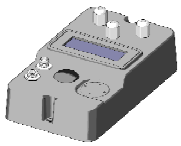
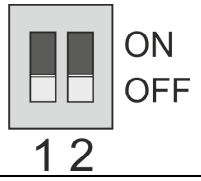
3.2.6.1 Single-engine system



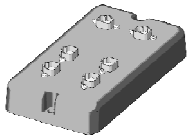
⚠ WARNING

To ensure a constant feeding to the system, it is advisable to use both of the batteries as shown in the picture.



Item	Description	Picture	Dip-switch
1	Single-engine control station		
2	Control unit		
3	SAEJ - throttle unit		-
4	Shift unit		-
5	Fuse / Resettable braker	15A – Not supplied	

Optional

6	Power unit		-
7	Fuse / Resettable braker	15A – Not supplied	

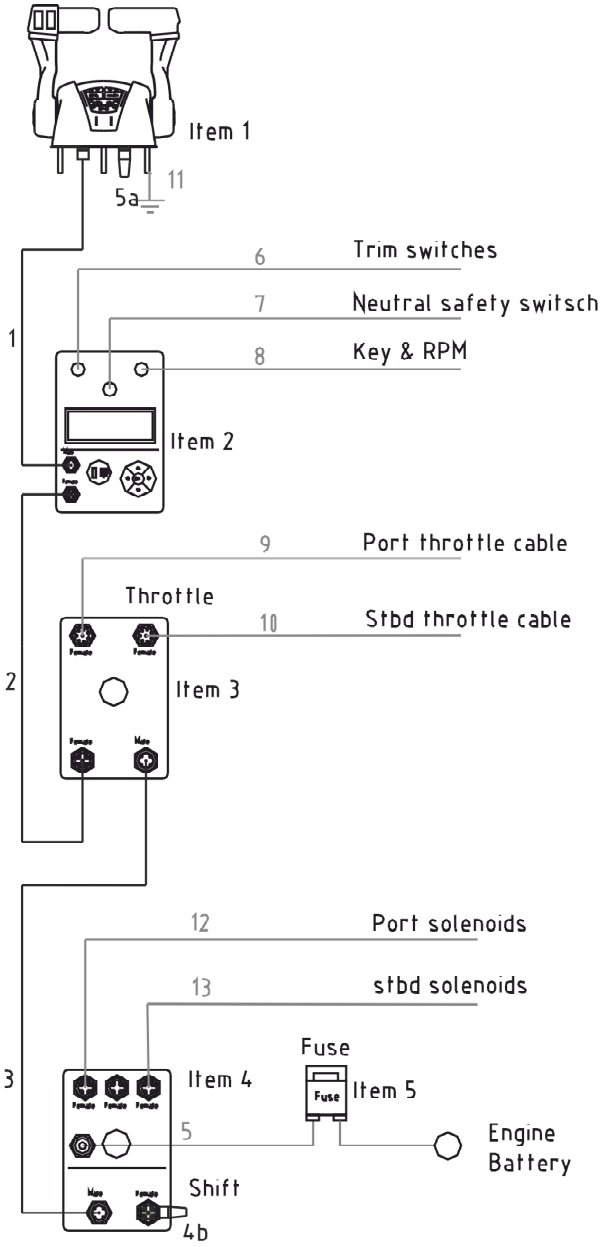
Wiring:

Connection	Description	Reference paragraph
1, 2, 3	CAN cables	5.4
4a, 4b	Couple of CAN terminators	5.4
5	Main power cable	5.2
6	Trim cable	5.7
7	Start inhibition switch cable (neutral safety)	5.10
8	Key signal cable and engine revolution cable	5.8, 5.9
9	Throttle cable	5.5
10	Shift solenoid cable	5.6
11	Ground cable	5.3

Optional

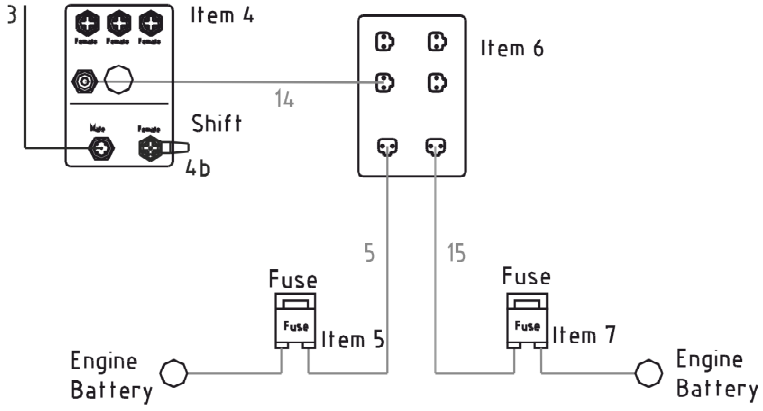
12	Power extension cable	5.1
13	Main power cable	5.2

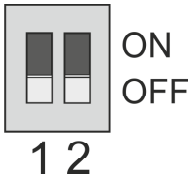
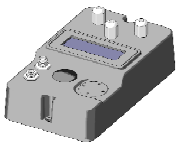
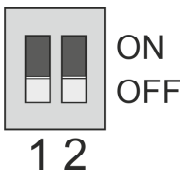
3.2.6.2 Twin-engine system



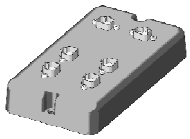
⚠ WARNING

To ensure a constant feeding to the system, it is advisable to use both of the batteries as shown in the picture.



Item	Description	Picture	Dip-switch
1	Twin-engine control station		
2	Control unit		
3	SAEJ - throttle unit		-
4	Shift unit		-
5	Fuse / Resettable braker	20A – Not supplied	

Optional

6	Power unit		-
7	Fuse / Resettable braker	20A – Not supplied	

Wiring:

Connection	Description	Reference paragraph
1, 2, 3	CAN cables	5.4
4a, 4b	Couple of CAN terminators	5.4
5	Main power cable	5.2
6	Trim cable	5.7
7	Start inhibition switch cable (neutral safety)	5.10
8	Key signal cable and engine revolution cable	5.8, 5.9
9, 10	Throttle cable	5.5
11	Ground cable	5.3
12, 13	Shift solenoid cable	5.6

Optional

14	Power extension cable	5.1
15	Main power cable	5.2

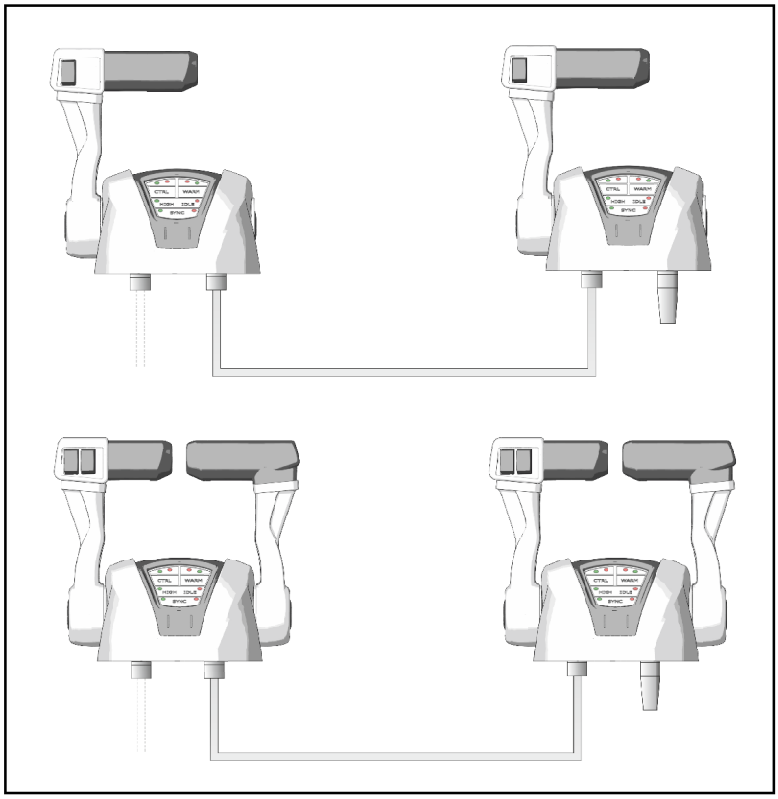
3.2.7 Systems with several control stations

If several control stations are installed, connect them putting the CAN terminator on the last station (see picture below).

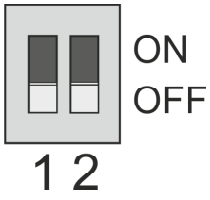
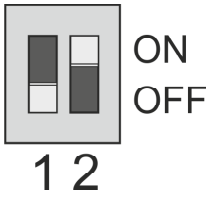
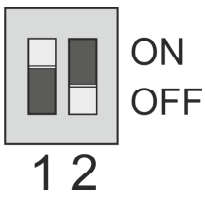
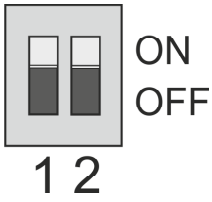
NOTICE

The wiring diagram of the systems provided with several control stations is exactly the same as the corresponding single-station systems, including the additional control stations and their communication CAN.

The diagram below can refer to a possible third or fourth station.



During installation, the control stations must be configured by means of the proper dip-switches below the inspection hole on the lower part of the control station.

Control station No.	1	2	3	4
Dip-switch				

⚠ WARNING

In case of several control stations with the same dip-switch configuration, the system will not work properly.

4 INSTALLATION OF THE SYSTEM COMPONENTS

This chapter describes the installation of the system components (drilling, milling, etc):

4.1 Necessary tools

Drill to make holes for cable passage and system fixing

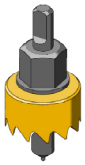
Small cross-head screwdriver

Allen wrench 2,5 mm [0,098 in.]

Small slotted screwdriver

Adjustable wrench 8 mm [0,315 in.]

Wire stripper



Hole saw (for 80mm hole)

Pliers

⚠ CAUTION

During installation, use stainless steel tools only to avoid the oxidation of the metallic parts.

4.2 Control station installation

INSTALLATION CONDITIONS

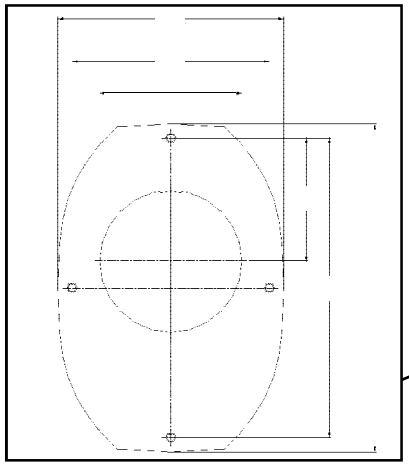
- The metal casing of the lever control must be connected to the ground system or to the hull in boats with metal hull, using a ground eyelet to be tightened to one of the four fastening pins.
- The upper part of the lever controls falls within protection class IP66, while the lower part falls within protection class IP65, therefore it is spray proof, but it cannot be immersed.
- The lever dip-switches must been configured before being installed (see chapter 3).

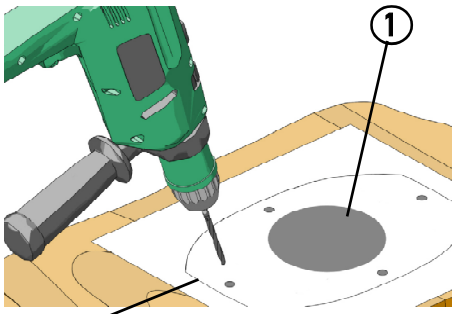
⚠ WARNING

Before drilling or cutting, make sure that the position and the tilting of the control station allow levers to move freely.

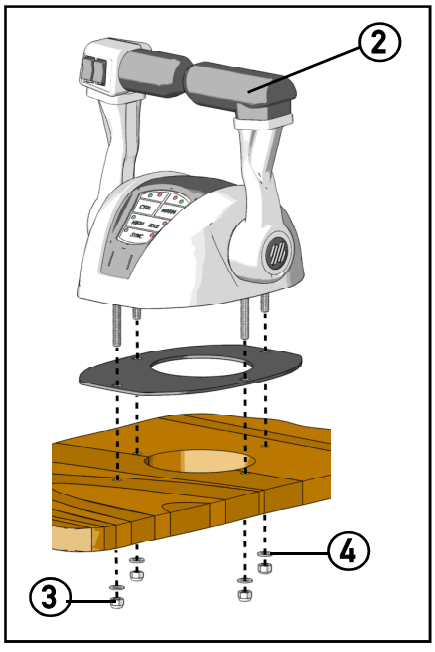
In order to install the lever on the dashboard, do as follows:

1 By using the supplied drilling template (1), make holes in the dashboard by means of a drill, then carry out the breaking by using a hole saw.



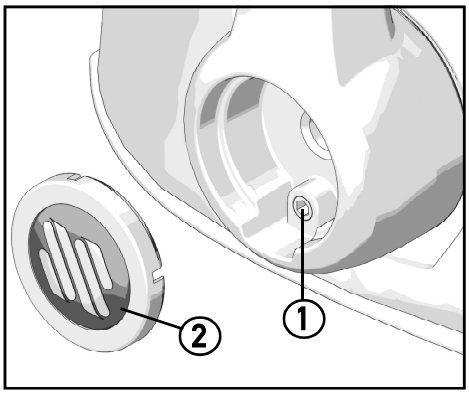


2 Position control station (2) on the dashboard with its seal and fix it by means of self-locking nuts (3) and washers (4).



4.2.1 Lever clutch adjustment

1 The levers are equipped with clutch in order to adjust their resistance to drive.
The clutch must be adjusted by means of the 2,5 mm socket head screw "1" located under the plug with the logo **ULTRAFLEX** "2" which is positioned laterally on the lever hub.
In neutral and shifted gear position, the clutch does not work but it works on the hardness of the levers during the throttle stroke.



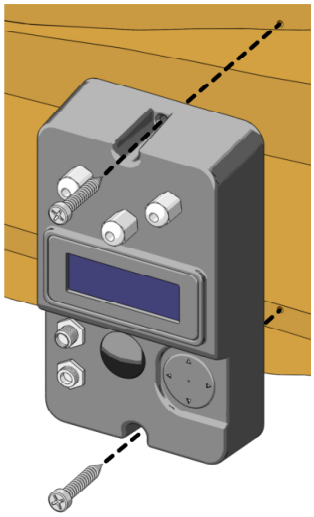
⚠ WARNING

In order to adjust the clutch correctly, it is necessary to position the lever in throttle position and then act on the socket head screw.

4.3 Control unit installation

Before reading this section, consider the instructions given in chapter 6 (page 83).

1 Fix the Control unit to the bulkhead by means of the two self-tapping screws shown in the picture.

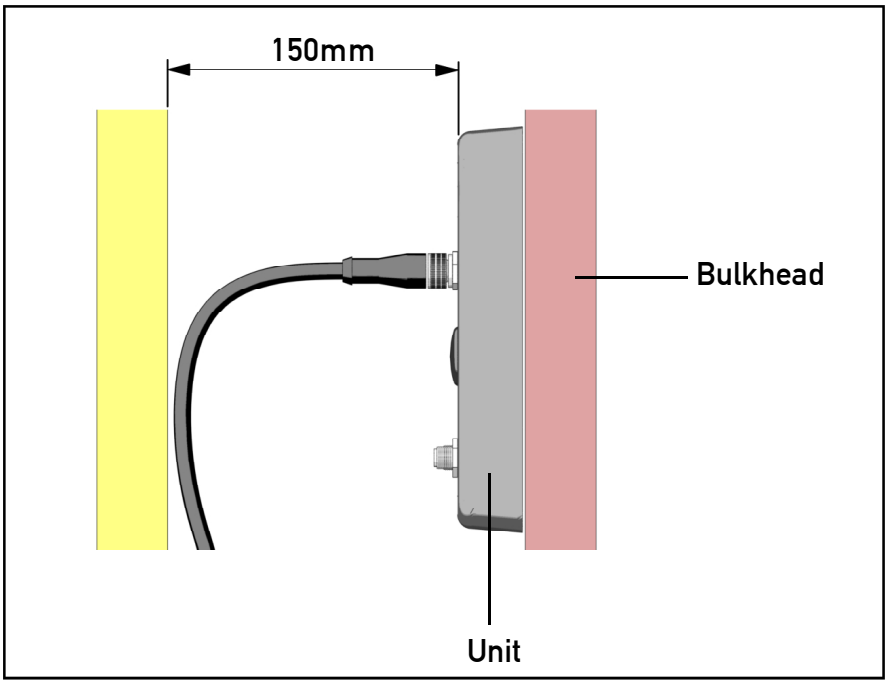


NOTICE

The Control unit should be installed on the bulkhead as shown in the picture, so that the display data can be easily read.

NOTICE

While installing the units (Control unit, Throttle unit, Shift unit, Power unit), it is necessary to leave 150mm over the unit itself to allow a correct cable bend.

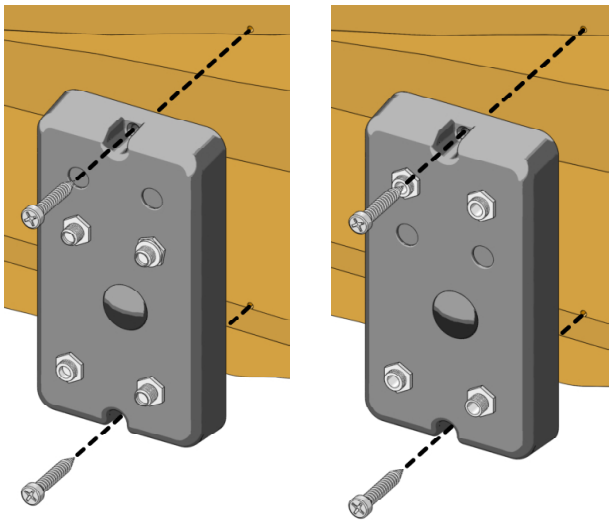


4.4 Throttle unit installation

1 Fix the Throttle unit to the bulkhead by means of the two self-tapping screws shown in the picture.

NOTICE

Please, refer to chapter 4.3 for the free spaces for cable passage.

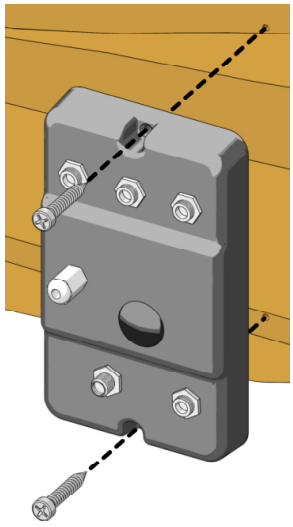


4.5 Shift unit installation

1 Fix the Shift unit to the bulkhead by means of the two self-tapping screws shown in the picture.

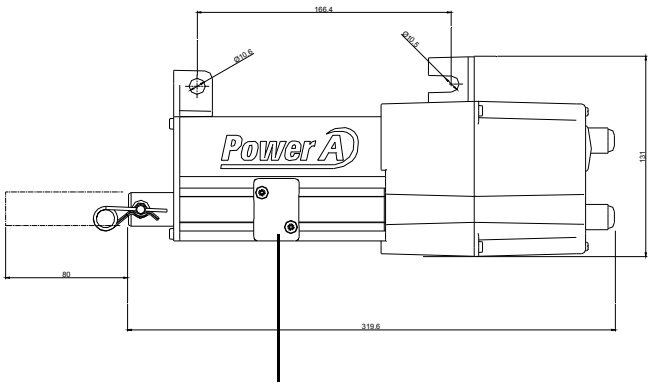
NOTICE

Please, refer to chapter 4.3 for the free spaces for cable passage.



4.6 Mechanical actuator installation

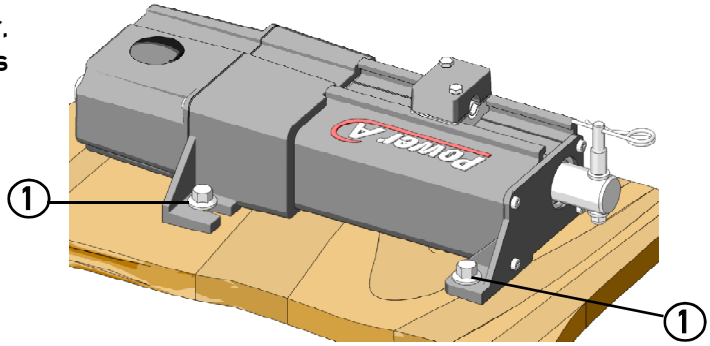
1 Adjust the position of the saddle according to the cable used.



WARNING

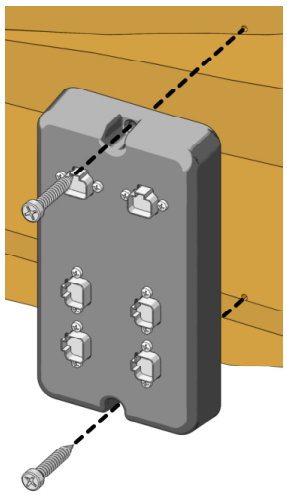
It is necessary to use C2, C8 or MachZero cables.

2 Make the holes in order to fix the actuator, then fix the actuator through the proper slots "1".



4.7 Power unit installation

1 Fix the Power unit to the bulkhead by means of the two self-tapping screws shown in the picture.



NOTICE

Please, refer to chapter 4.3 for the free spaces for cable passage.

5 SYSTEM WIRING

The system must be wired according to the instructions given in this chapter.

Different wirings are available for the system Power A Mark II™ , depending on the type of engine and shift to be used.
To connect cables following the correct order, it is advisable to divide them into different groups.

The first group includes all the power connections:

1 Connection of the component metal casings to the ground bar of the boat.
2 Connection of the system power cables to their power sources with all the safety devices (fuses).
3 Connection of the power extensions.
4 Connection of the shift cables (if any).

The cables listed above can share the same path (if possible) without causing any interference or failure in the system.

The second group includes all the service cables:

1 Connection of the engine key signals.
2 Connection of the start inhibition switches (neutral safety).
3 Connection of the trim switches.
4 Connection of the engine revolution cables.

In this case too, the cables of this group can share the same path.

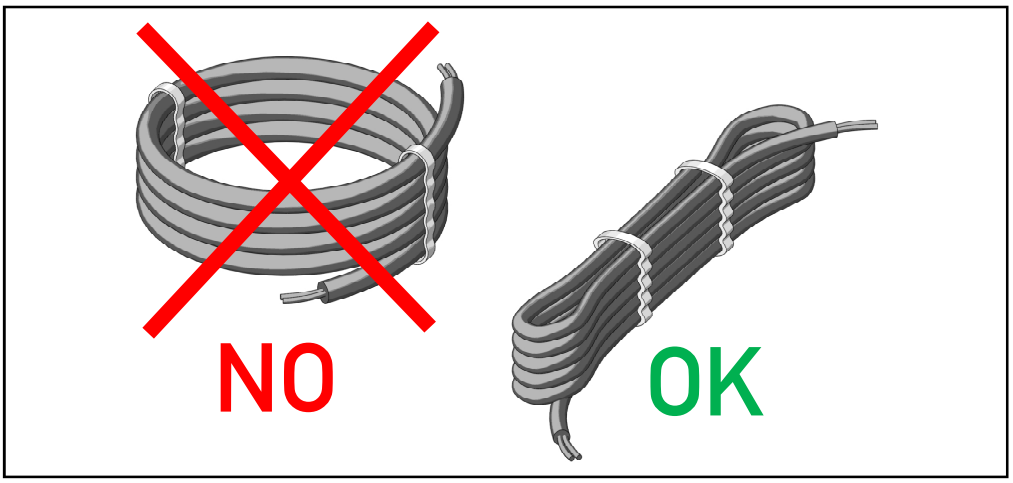
The last group includes signal cables:

1 CAN communication cables.
2 Throttle cables.

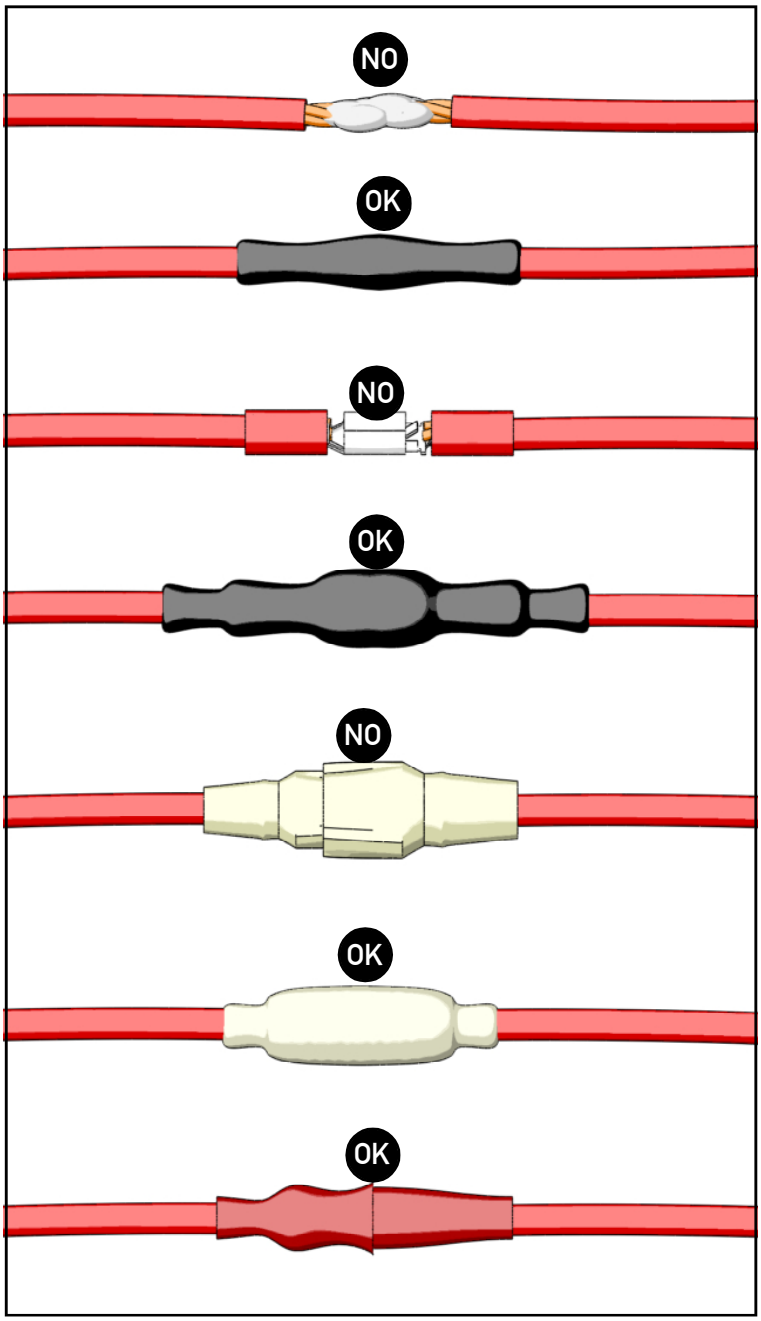
These last cables should never be installed in places with strong electromagnetic interferences to avoid damaging the integrity of the signal.
Therefore, the communication cables should follow paths different from the power cables.

The throttle cables inside the engine compartment or near engines will have to follow short paths in order to avoid areas affected by the strongest electromagnetic interferences (starter, electric pump of the common-rail) and high- temperature areas (exhaust manifolds, etc.).

Possible exceeding parts of the throttle cable must be properly stored without creating winding, which would worse insensitivity to the electromagnetic interferences.
To store the exceeding part of the cable, refer to the drawing below.



In case it is necessary and allowed to make an extension to one or more wires in order to carry out a connection, some basic rules must be observed strictly.
The above mentioned wires must be connected by means of suitable components. All connections must be water-proof. The picture below shows some kind of allowed and non-allowed connections.



Never use an uncovered welding.

A welding is allowed to be used only if properly covered by a thermoshrinking sheath.

Never connect non-insulated Faston connectors with each other.

A connection between non-insulated Faston connectors is allowed to be used, only if it is properly covered by a thermoshrinking sheath.

Never connect insulated Faston connectors with each other, if the resulting connection has such a size, which does not prevent water or dust from entering inside it.

A connection between insulated Faston connectors is allowed to be used, only if the connectors have a correct size or are provided with thermoshrinking sheath.

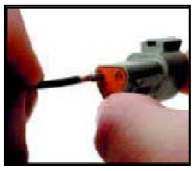
Faston shell connectors are allowed too, only if they are insulated and of right size.

⚠ WARNING

ULTRAFLEX is not to be held responsible for possible damages to things and/or people deriving from connections carried out uncorrectly.

NOTICE ABOUT DEUTSCH CONNECTOR ASSEMBLY

Step 1: Contact Removal



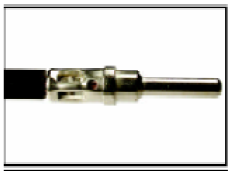
1. Remove wedgelock using needlenose pliers or a hook shaped wire. Pull wedge straight out.
2. To remove the contacts, gently pull wire backwards, while at the same time releasing the locking finger by moving it away from the contact with a screwdriver.
3. Hold the rear seal in place, as removing the contact may displace the seal

Step 2: Wire Stripping - Solid Contacts

Contact Part Number	Wire Gauge Range	Strip Length (inches)
0460-202-20141 0462-201-20141	20 AWG 20 AWG	.156-.218 .156-.218
0460-202-16141 0462-201-16141	16, 18 & 20 AWG 16, 18 & 20 AWG	.250-.312 .250 .312
0460-215-16141 0462-209-16141	14 AWG 14 AWG	.250-.312 .250-.312
0460-204-12141 0462-203-12141	12 & 14 AWG 12 & 14 AWG	.222-.284 .222-.284
0460-204-08141 0462-203-08141	8 & 10 AWG 8 & 10 AWG	.430-.492 .430-.492
0460-204-0490 0462-203-04141	6 AWG 6 AWG	.430-.492 .430-.492

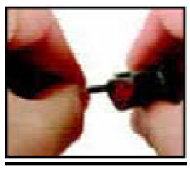
Step 3: Contact Crimping

Use Crimp Tool #HDT48-00



1. Strip insulation from wire. (See Step 2.)
2. Raise selector knob and rotate until arrow is aligned with wire size to be crimped.
3. Loosen locknut; turn adjusting screw in until it stops.
4. Insert contact with barrel up. Turn adjusting screw counter-clockwise until contact is flush with indentor cover. Tighten locknut.
5. Insert wire into contact. Contact must be centered between indicators. Close handles until crimp cycle is completed.
6. Release handles and remove crimped contact.
7. Inspect terminal to ensure that all strands are in crimp barrel. **Note:** Tool must be readjusted for each type/size of contact. Use HDT04-08 for size 8 and 4 contacts.

Step 4: Contact Insertion



1. Grasp crimped contact approximately (25,2 mm) one inch behind the contact barrel.
2. Hold connector with rear grommet facing you.
3. Push contact straight into connector grommet until a click is felt. A slight tug will confirm that contact is properly locked in place.
4. Once all contacts are in place, insert wedgelock with arrow pointing toward exterior locking mechanism. The wedgelock will snap into place. Rectangular wedges are not oriented. They may go in either way. **Note:** The receptacle is shown. Use the same procedure for the plug.

DEUTSCH INDUSTRIAL PRODUCTS DIVISION

LADD Exclusive Authorized U.S. Distributor

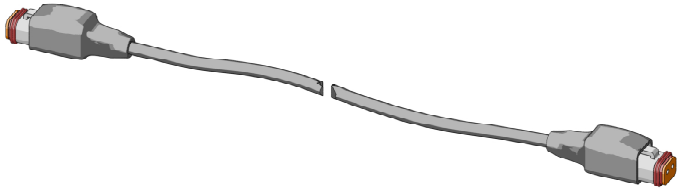
(800) 223-1236

Images from the Deutsch connector catalogue

ENGLISH

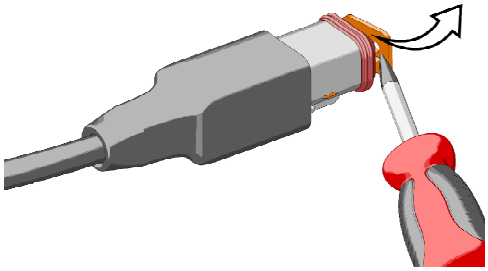
5.1 Wiring of the extension cables

The extension cables are used to supply the mechanical actuators and the shift unit. The power supply is taken from the power unit.

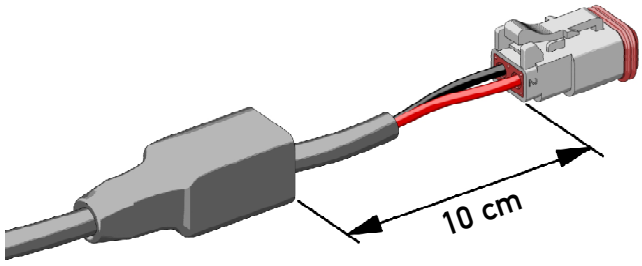


The extension cables are supplied in different lengths and provided with already wired plugs; if it is necessary to remove a plug from a cable end in order to make easier the cable passage into narrow cable ducts, please do as follows:

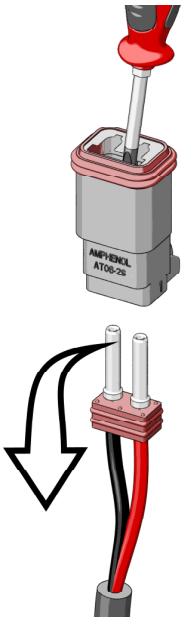
1 Remove the wedge lock inserted in the plug through a flat screwdriver by acting on the splits as shown in the picture:



2 Move at least 10 cm away the boot located between the cable and the rear part of the plug.



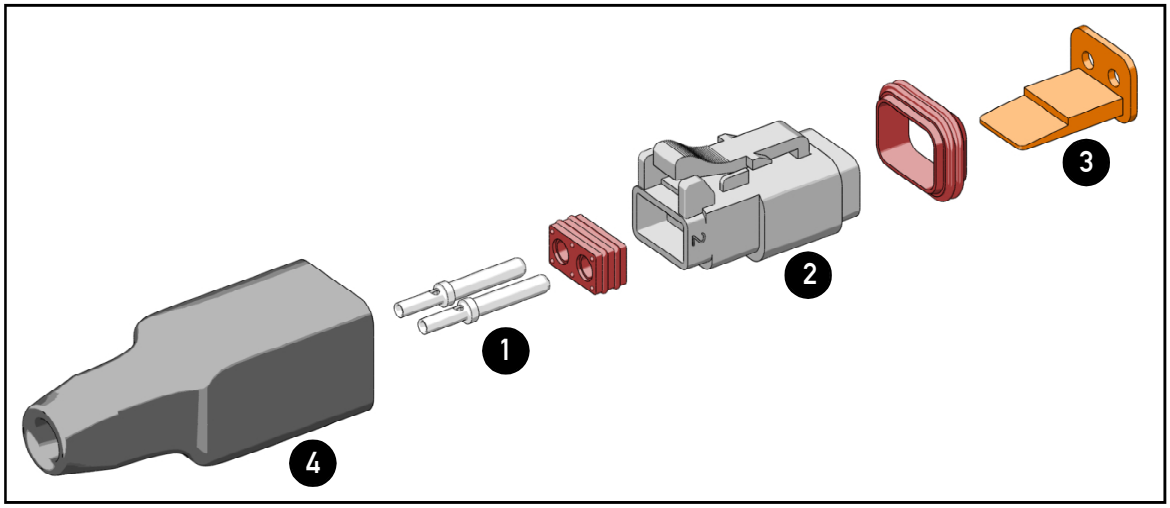
3 Extract the sockets from the plug by acting on the wedge lock, then remove the boot by paying attention not to loose the gaskets necessary to ensure the plug water-proof.



To reassemble the connector follow the steps described below (from point 4 to point 7).
The length of the extension power cables should be moderate, in order to reduce the voltage drops on the wires to a minimum.
It is advisable not to reduce the length of the extension cables, in case it is necessary, use suitable components to carry out a new termination on the cable.
The part-numbers making up the connector are listed below:

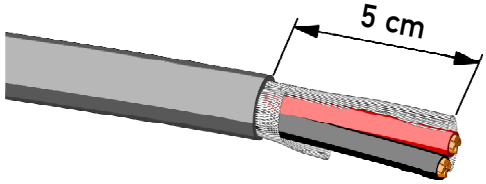
Item	Quantity	Description	Part Number / Alternative
1	2	Socket	Deutsch 0462-209-16141; Amphenol 65-54942-14
2	1	Plug	Deutsch DT06-2S; Amphenol AT06-2S
3	1	Wedge lock	Deutsch W2S; Amphenol AW2S
4	1	Boot	Deutsch DT2S-BT

The plug, the wedge lock and the boot of the connector previously disassembled can be re-used.

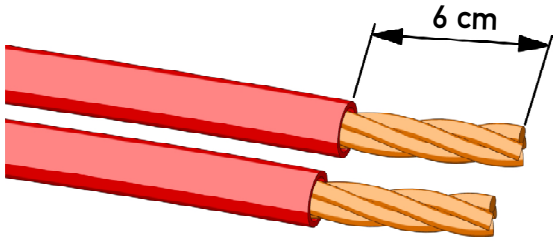


The procedure to insert the connector on the cable just cut is shown below:

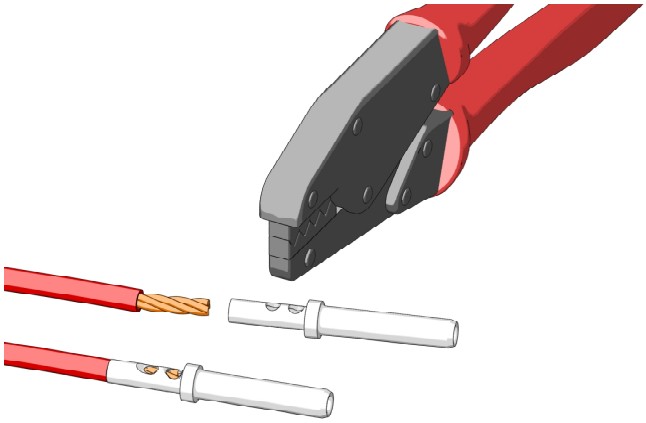
1 Remove about 5cm of cable external sheath.



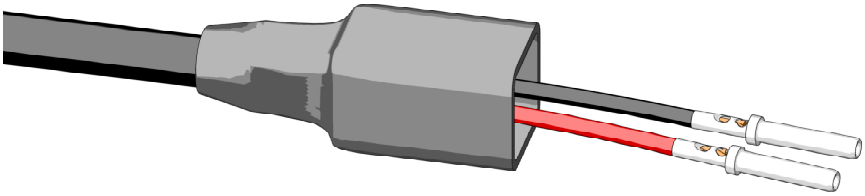
2 Strip the single wires for a lenght of about 6 mm.



3 Crimp the sockets on both wires and make sure that the wire is well inserted into the socket by using the proper inspection opening. To carry out this operation, use the suitable tool (Deutsch HDT1561).

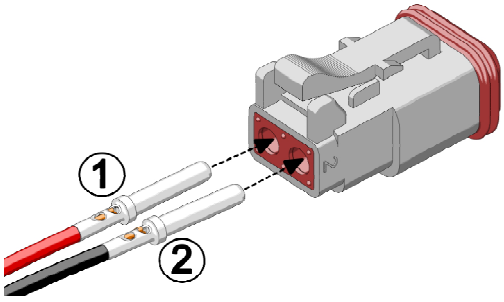


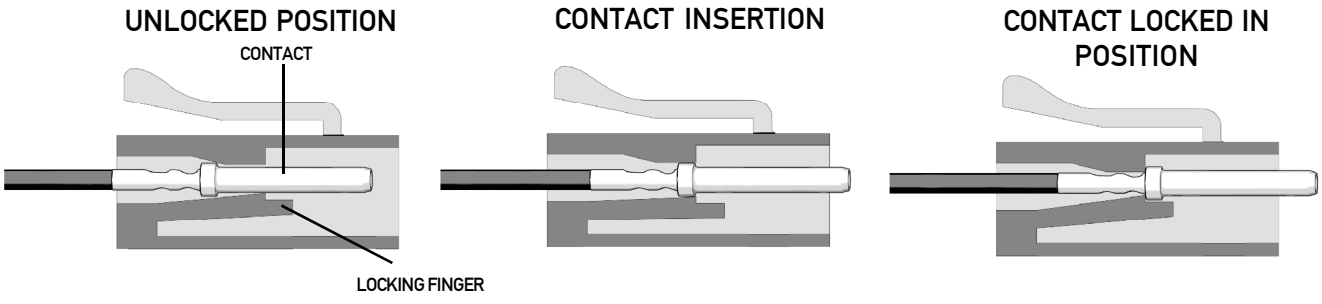
4 Insert the boot into the cable just crimped.



5 Insert the wires, on which the sockets have been crimped, into the plug according to the following scheme.

Position	Colour
1	Red wire
2	Black wire





6 Insert the wedge lock on the plug, until it adheres completely.

7 Move the boot, until it adheres to the plug.

⚠ WARNING

ULTRAFLEX is not to be held responsible for possible damages or malfunctions deriving from operation not workmanlike performed.
The extension power cables supplied by **ULTRAFLEX** are high-quality, saltiness- and oil-resistant cables. In case an extension power cable is not long enough, replace it with a longer one.

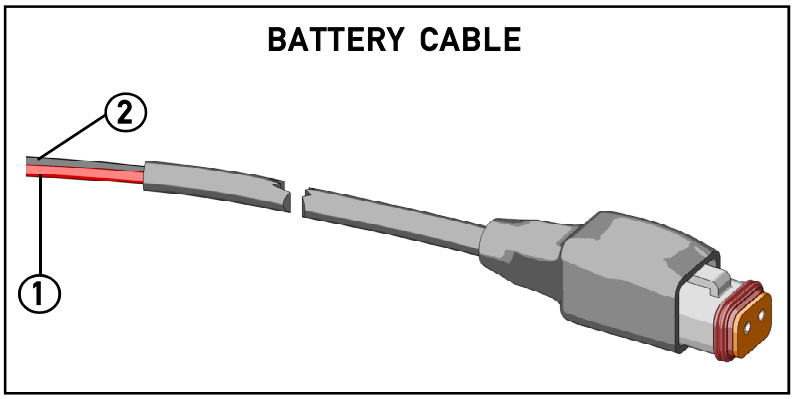
⚠ WARNING

It is forbidden to use cables different from the ones supplied by **ULTRAFLEX** even as extension of the already existing cables, in order to avoid the warranty decay and the idemnification from possible damages or malfunctions. The extension cables supplied by **ULTRAFLEX** are highly water-proof to be assembled in places subjected to salty water sprays.

⚠ WARNING

It is forbidden to insert intermediate connectors of any type (Faston connectors, wire terminals etc.) on the cable supplied by **ULTRAFLEX** even if properly waterproofed, in order to avoid the warranty decay and indemnification from possible damages or malfunctions.

5.2 Wiring of the main power cable



The main supply cable supplies the system Power A Mark II™ .
According to the number of available power sources, it is possible to use one or two cables.
Generally, they are connected to the power unit or directly to the mechanical actuator or to the shift unit, according to the configuration of the system (refer to the wiring diagrams described in paragraph 3).
The cable supplied by ULTRAFLEX is not provided with any device protecting against overcurrents. This device must be installed by the installer.
Only magneto-thermal switches that can be restored manually by the user of the boat are allowed as devices protecting against overcurrents.

⚠ WARNING

ULTRAFLEX is not to be held responsible for damages to things and/or people caused by the system Power A Mark II™ installed without suitable protection devices.

The wires have the following use:

Position	Colour	Use
1	Red	Positive wire
2	Black	Negative wire

If it is necessary to disassemble the connector already located on the cable, in order to make easier the passage of the cable into narrow cable ducts, follow the procedure described in paragraph 5.1 Wiring of the extension cables.

The wiring diagram of the main power cable varies according to the number of engines.

5.2.1 Single-engine boats

In boats provided with a single engine the power sources to supply the system are: the engine battery as main source and the service battery as minor source (optional).
To avoid malfunction due to the insufficient battery state of charge, the connection to the minor power source is advised too.
An APS (automatic power selector) able to supply the system through the more charged battery is incorporated inside the power unit of the system ***Power A Mark II™*** .

⚠ WARNING

Do not use other power sources as switching suppliers (DC/DC, AC/DC), inverters, alternator shunts, portable batteries, solar cells etc.

The power cable for the engine battery (main) must be connected after the battery disconnecting device by placing the protecting device on the positive wire.
The protecting device must have the following features:

1 The voltage rating must be equal to or higher than the battery voltage (12 or 24V).
2 The rated current value must be 15 A and and it must be standard (neither quick nor delayed).
3 The protecting device must be restorable manually and in an easy way by the user of the boat.
4 The protecting device must be ignition protected if installed in areas where this feature is required.
5 The wire located between the protecting device and the power source must have a section higher than or equal to AWG14 (2 mm2) and it must be red or brown.

The ground wire must be directly connected to the negative ground bar of the engine.

The power cable for the service battery (minor) must be connected after the main protecting device, normally installed to protect the other uses, by placing the protecting device on the positive wire
Thr protecting device must have the following features:

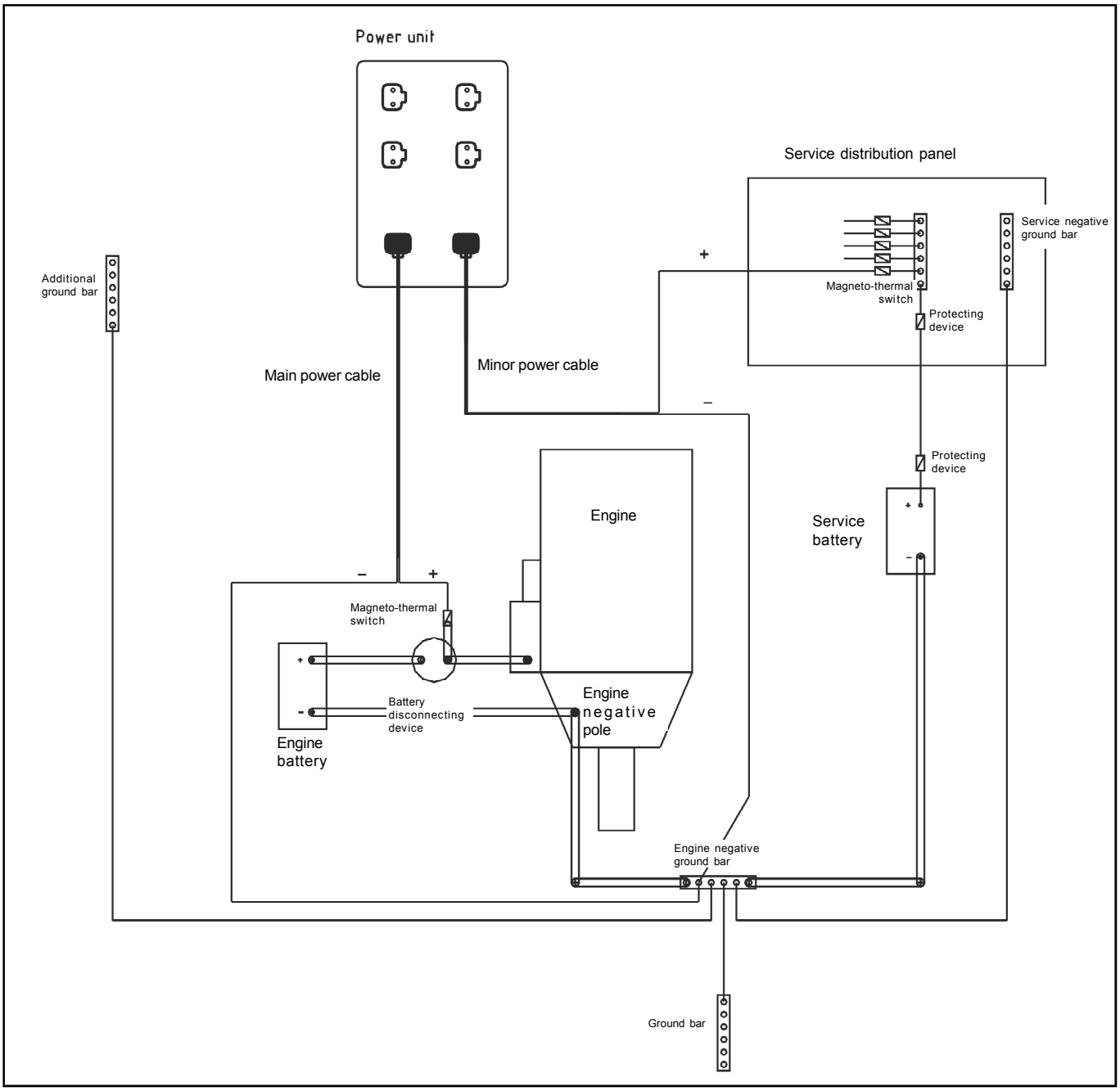
1 The voltage rating must be equal to or higher than the battery voltage (12 or 24V).
2 The rated current value must be 15 A and must be standard (neither quick nor delayed).
3 The protecting device must be restorable manually and in an easy way by the user of the boat.
4 The protecting device must be ignition protected, if installed in area where this feature is required
5 The wire located between the protecting device and the power source must have a section higher than or equal to AWG14 (2 mm2) and it must be red or brown.

⚠ WARNING

The ground wire must be however directly connected to the negative grund bar of the engine and not to the negative ground bar of the service battery.

The service battery can be used as minor power source only if:

1 its ground is shared with the one of the engine battery: the service battery can not be used, if it has a ground which is galvanically isolated from the battery ground.
2 the voltage rating is equal to the voltage rating of the engine battery.



NOTICE

It is possible that the negative ground bar is not used on the boat. In this case the ground common point of the main power cables should be the collection point of the battery ground cables, generally located near the battery disconnecting devices.
Always make sure that the ground cables are not connected in other points of the boat.

⚠ WARNING

The main power supply cable must be connected downstream the battery disconnecting device, otherwise the system will be on even after disconnecting the keys.
If this installation rule is not respected or the power supply is not protected properly, the product warranty will expire and the manufacturer will not be held responsible for personal injuries or damages to properties caused by malfunctions.

5.2.2 Twin-engine boats

In boats provided with two engines, the power sources supplying the system are the engine batteries.
In order to avoid malfunction due to the insufficient engine battery state of charge, both of them must be used.
An APS (automatic power selector) able to supply the system though the more charged battery is incorporated inside the power unit of the system *Power A Mark II™* .

⚠ WARNING

Do not use other power sources as switching suppliers (DC/DC, AC/DC), inverters, alternator shunts, portable batteries, solar cells etc.

The power cables must be connected after the respective battery disconnecting devices by placing the protecting device of each cable on the respective positive wire.

The protecting device must have the following features:

1 The voltage rating must be equal to or higher than the battery voltage (12 or 24V).
2 The rated current value must be 20 A and must be standard (neither quick nor delayed).
3 The protecting device must be restorable manually and in an easy way by the user of the boat.
4 The protecting device must be ignition protected, if installed in areas where this feature is required.
5 The wire located between the protecting device and the power source must have a section higher than or equal to AWG14 (2 mm^2) and it must be red or brown.

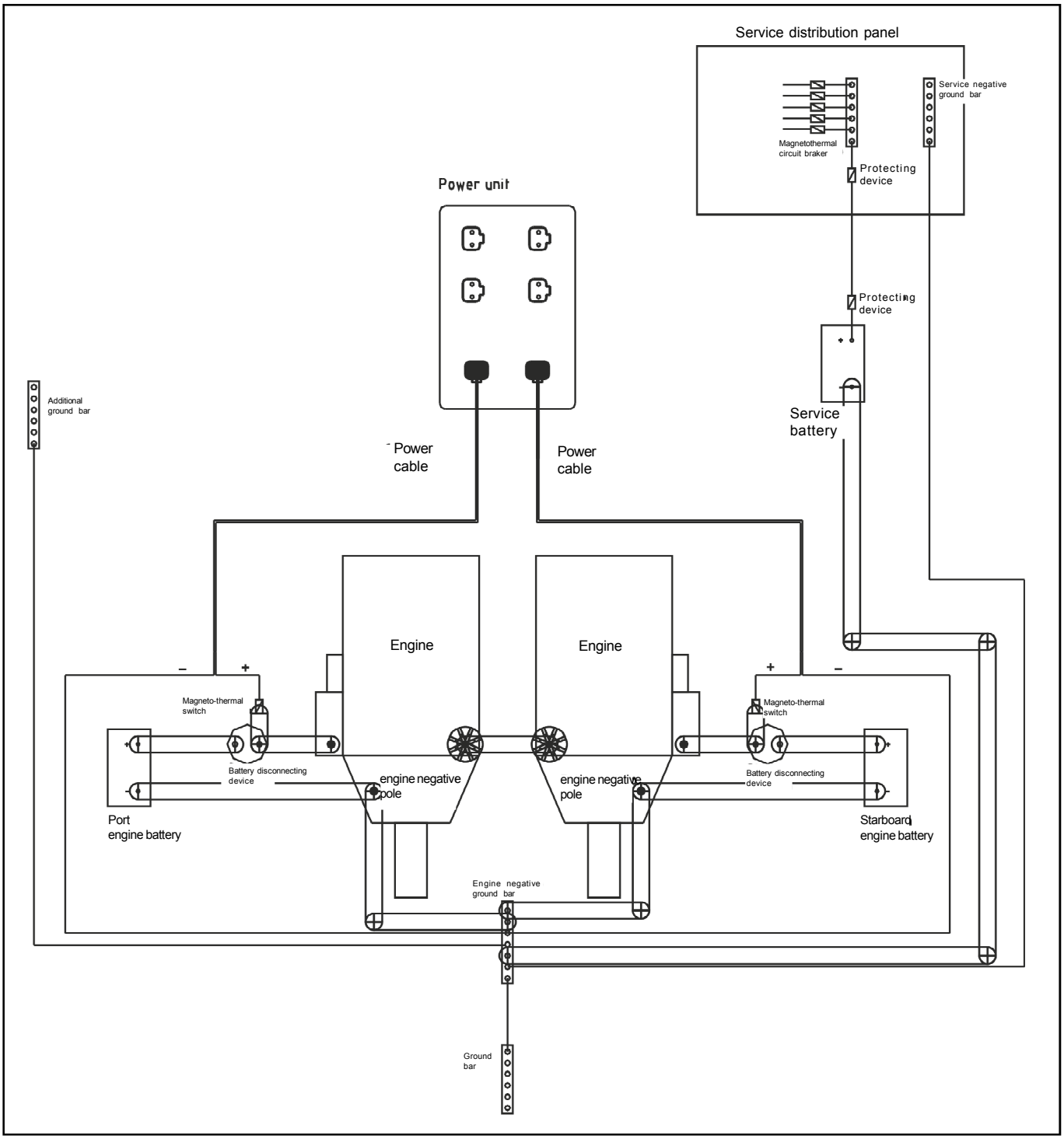
The ground cable must be connected directly to the negative ground bar of the engine.

NOTICE

It is possible that the negative ground bar is not used on the boat. In this case the ground common point of the main power cables should be the collection point of the battery ground cables, generally located near the battery disconnecting devices.
Always make sure that the ground cables are not connected in other points of the boat.

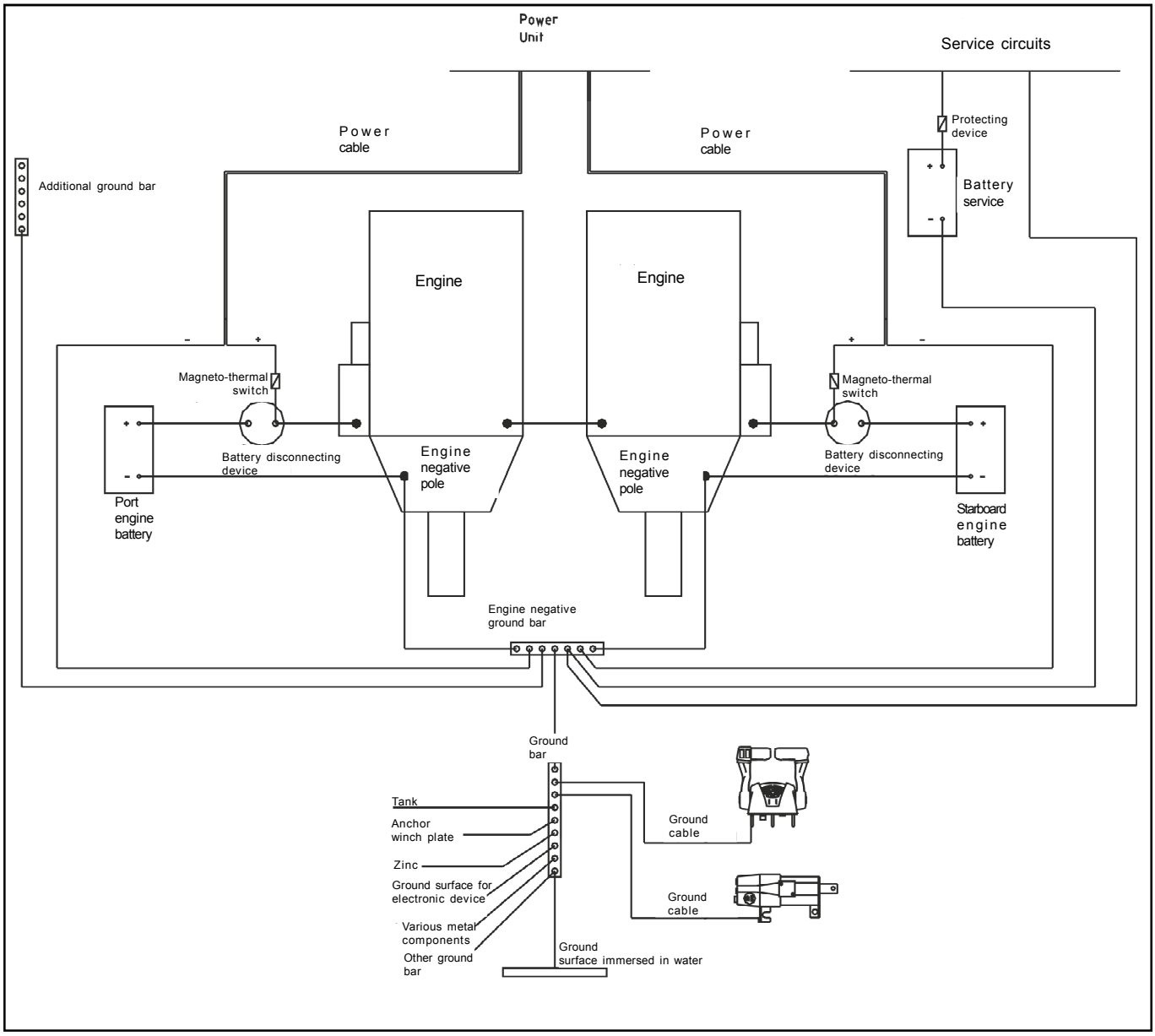
⚠ WARNING

The main power supply cable must be connected downstream the battery disconnecting device, otherwise the system will be on even after disconnecting the keys.
If this installation rule is not respected or the power supply is not protected properly, the product warranty will expire and the manufacturer will not be held responsible for personal injuries or damages to properties caused by malfunctions.


Service distribution panel
Service negative ground bar
Magnetothermal circuit braker
Protecting device
Power unit
Protecting device
Additional ground bar
Service battery
Power cable
Power cable
Engine
Engine
Magneto-thermal switch
Magneto-thermal switch
Battery disconnecting device
Battery disconnecting device
engine negative pole
engine negative pole
Port engine battery
Starboard engine battery
Engine negative ground bar
Ground bar

5.3 Wiring of the ground cables

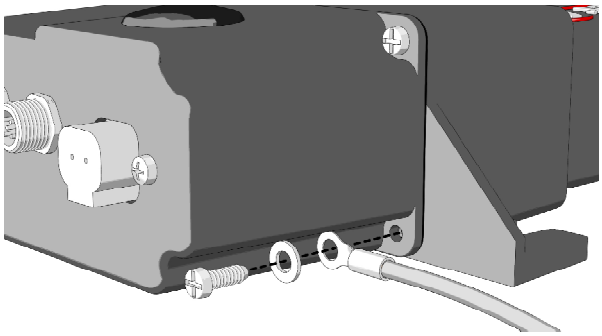
The ground cable is a single core cable used to connect the metal component casings to the ground bar of the boat.
The ground cable is supplied by **ULTRAFLEX** together with the control stations and the mechanical actuators.



To connect the ground cable, follow the steps below:

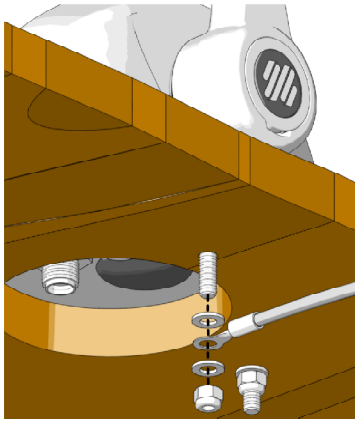
Mechanical actuator

1 Fix the eyelet of the ground cable to the casing of the mechanical actuator by loosening the screw shown in the picture and by inserting the washer and the screw supplied with the system.



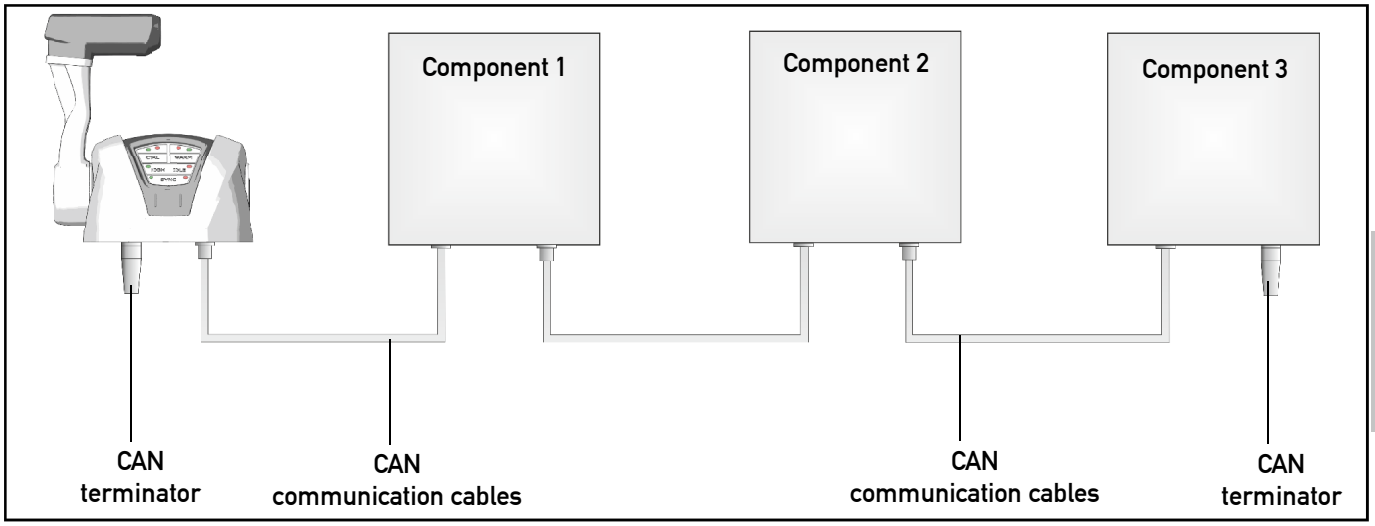
Control station

1 Fix the eyelet of the ground cable on the stud bolt fixing the control station between the two washers supplied with the system and tighten the nut on the stud bolt.

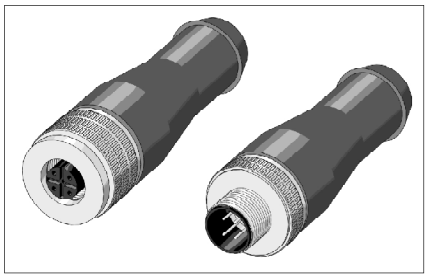


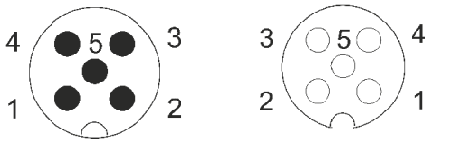
5.4 Wiring of the CAN cables

Each communication cable (CAN) is made up of a male connector located at one end and a female connector located at the other end. The DeviceNet cables are the standard cables used by CAN communication cables. In the same way, each component of the system Power A Mark II™ (with the exclusion of the Power unit) is provided with a couple of CAN connectors suitable for the interconnection with the DeviceNet cables.
The system communication cables are shielded cables. They are supplied already preassembled and they can not be modified by the installer.
The wiring diagram of the CAN cables follows the scheme shown below:



Component stands for: control station, control unit, V/I/SAEJ Throttle unit, shift unit, mechanical actuator. The power unit has no CAN connections.
The CAN communication network is a sequential connection involving all system components.
Each CAN male connector must be connected to the respective CAN female connector on the component and vice versa.
The CAN terminators must be placed at the beginning and at the end of the communication bus (see picture below).





M 12 male connector M 12 female connector

Pin assignment, 5-pos, A-coded

PIN	Core color	Signal DeviceNet
1	Shield	Drain
2	Red	V+
3	Black	V-
4	White	CAN_H
5	Blue	CAN_L

Some recommendations useful for the laying and the connection of the CAN communication cables are listed below:

- Do not bend the CAN cable too much near the connections: the radius of curvature of the can cable near the connections should be larger than 10 cm (4 inches).
- To connect the CAN cables, press slightly on the connector while tightening in order to make easier the connector coupling.
- The CAN connectors must be tightened only by using your hands. Any tools might damage the knurled ring nut of the connectors thus causing a possible oxidation of the surface.
- Do not tight the CAN connector until you are sure that it has been inserted correctly. A polarizing tooth is provided to help a correct insertion.

⚠ WARNING

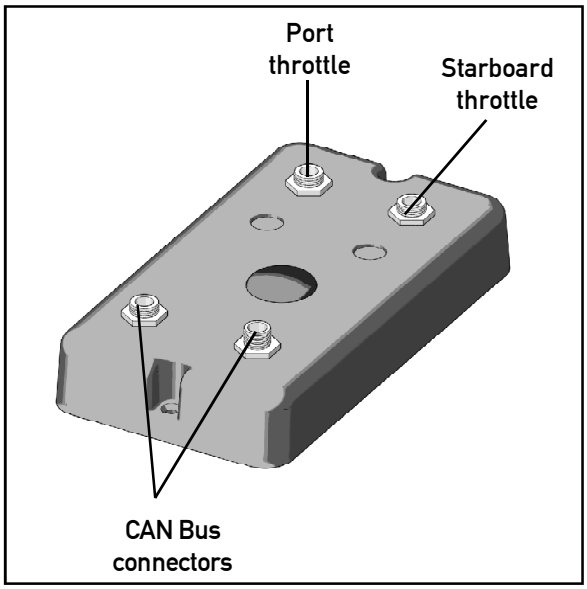
The system might not operate correctly without both terminators.
ULTRAFLEX is not to be held responsible for damages to the systems components deriving from an improper installation.

5.5 Wiring of the throttle cables

The wiring of the throttle electric cables varies according to the type of engine interface: analog interface (voltage, current, PWM) or digital interface (SAEJ1939, NMEA2000).
The twin-engine systems are always provided with a cable for each engine, regardless of the type of interface. The various type of connections are listed below.

5.5.1 Connection of the throttle cables with analog voltage interface

The engines whose throttle interface is a potentiometer or a power unit with continuous voltage input in a range between 0 and 5 Volt belong to this category.
The already preassembled end of the throttle cables must be connected to the V-throttle in the respective connectors as shown in the picture below:



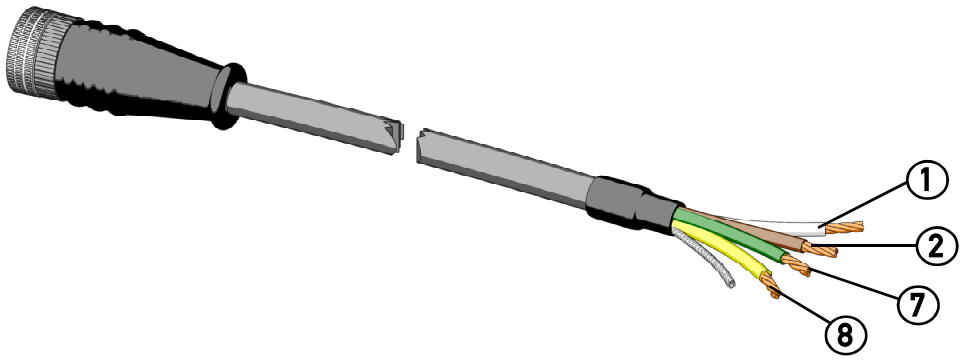
In case of single-engine systems the throttle cable must be connected to the connector at the top on the left.
In case of twin-engine systems the port throttle cable must be connected to the connector at the top on le left and the starboard throttle cable must be connected to the connector at the top on the right.
According to the code, the throttle cables are supplied with a connector for the connection to the engine interface (see picture), in order to make the connection easier.

In case the cables purchased are not provided with personalization (see picture), please refer to the connection table below:

Position on connector	Colour	Description	Abbreviation
1	**White**	**Negative whole trace**	**GND**
2	Brown	Positive whole trace	V
7	Green	Negative halved trace	GND
8	Yellow	Positive halved trace	V/2

If the analog interface of the engine power unit is a potentiometer, the redundancy trace must be connected too.
In case the analog interface does not require the redundancy trace, the green (7) and yellow (8) wires are not to be connected and they must be properly insulated.

THROTTLE CABLE



A non-insulated wire directly connected to the cable shielding (drain wire) is supplied with the throttle cables. This wire is useful, if the cable shield must be connected while installing, in oder to improve its insenitivity to electromagnetic interferences.
If the drain wire is not used for the connection, we recommend cutting it near the cable stripping.

While laying the cable, follow the recommendations listed at the beginning of chapter 5 (system wiring)

⚠ WARNING

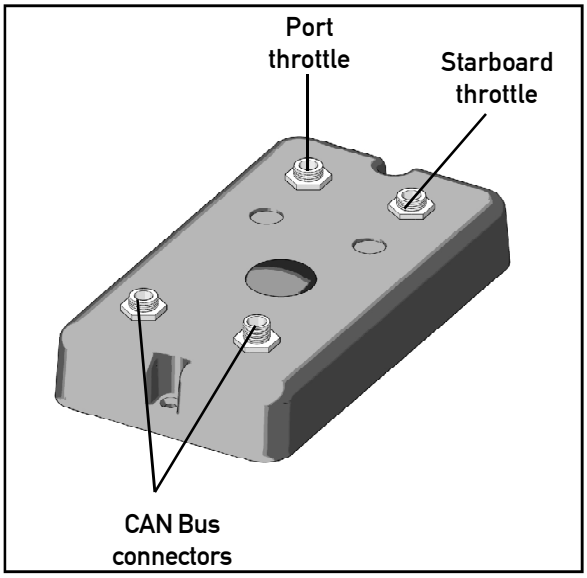
No kind of extension cable can be applied on the throttle cable.

NOTICE

The pinouts are valid unless any personalization is requested.

5.5.2 Cable connection for throttles with analog voltage interface and IVS switches

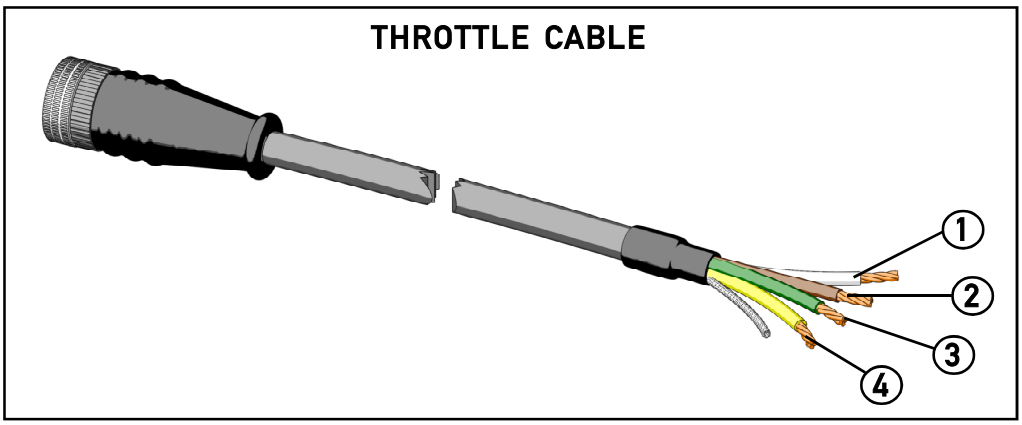
The engines whose throttle interface is a potentiometer or a power unit (with continuous voltage input), provided with Idle Validation Switch belong to this category.
The already preassembled ends of the throttle cables must be connected to the V-throttle intp the respective connector as shown in the picture below:



In case of single-engine systems connect the throttle cable to the connector at the top on the left.
In case of twin-engine systems connect the port throttle cable to the connector at the top on the left and the starboard throttle cable to the connector at the top on the right.
According to the code, the throttle cables are supplied with a connector for the connection to the engine interface (see picture), in order to make the connection easier.

If the cables purchased are not provided with personalization (see picture), please refer to the connection table below:

Position on connector	Colour	Description	Abbreviation
1	**White**	**Negative**	**GND**
2	Brown	Positive	V
3	Green	Idle validation switch	IVS
4	Yellow	Idle Validation Switch	IVS



A non-insulated wire directly connected to the cable shielding (drain wire) is supplied with the throttle cables. This wire is useful, if also the cable shield must be connected while installing in order to improve its

insensitivity to the electromagnetic interferences.
If the drain wire is not used for the connection, we recommend cutting it near the cable stripping.

While laying the cable, follow the recommendations listed at the beginning of chapter 5 (system wiring).

⚠ WARNING

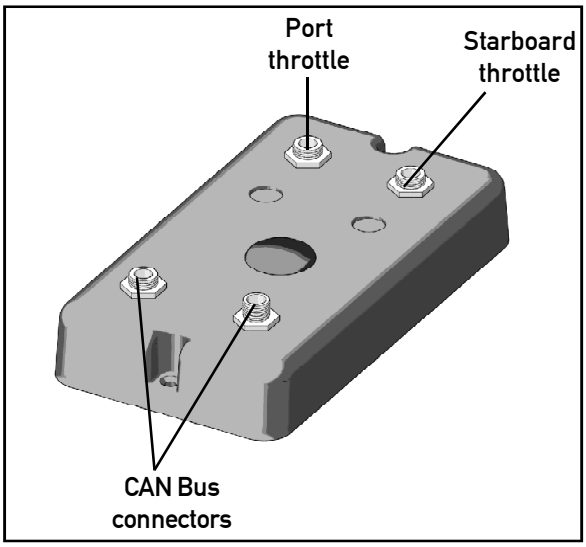
No kind of extension cable must be applied on the throttle cable.

NOTICE

The pinouts are valid, unless any personalization is requested.

5.5.3 Cable connection for throttles with analog current interface

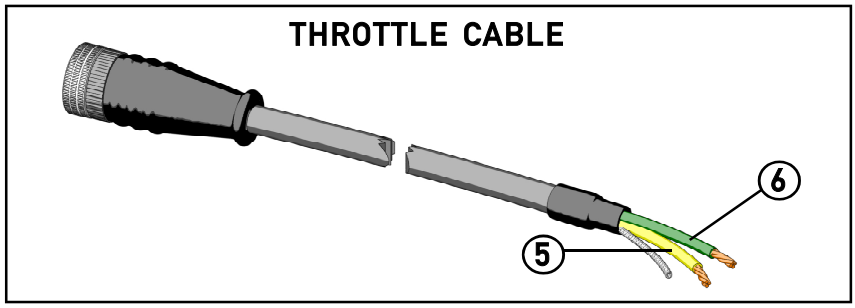
The engines whose throttle interface is a power unit with 4-20 mA current loop input belong to this category. The already preassembled end of the throttle cables must be connected to the I-throttle into the respective connectors as shown in the picture below:



In case of single-engine system, the throttle cable must be connected to the connector at the top on the left. In case of twin-engine system, the port throttle cable must be connected to the connector at the top on the left and the starboard throttle cable must be connected to the connector at the top on the right.
According to the code, the throttle cables are supplied with a connector for the connection with the engine interface (see picture), in order to make the connection easier.

In case the cables purchased are not provided with personalization (see picture), please refer to the connection table below:

Position on connector	Colour	Description	Abbreviation
5	Yellow	Current loop 4-20 mA	I
6	Green	Negative wire	GND



A non-insulated wire (drain wire) directly connected to the cable shielding is supplied with the throttle cables. This wire is useful, in case also the cable shield must be connected while installing in order to improve the insensitivity to the electromagnetic interferences.
If the drain wire is not used for the connection, we recommend cutting it near the cable stripping.

While laying the cable, follow the recommandations listed at the beginning of chapter 5 (system wiring).

⚠ WARNING

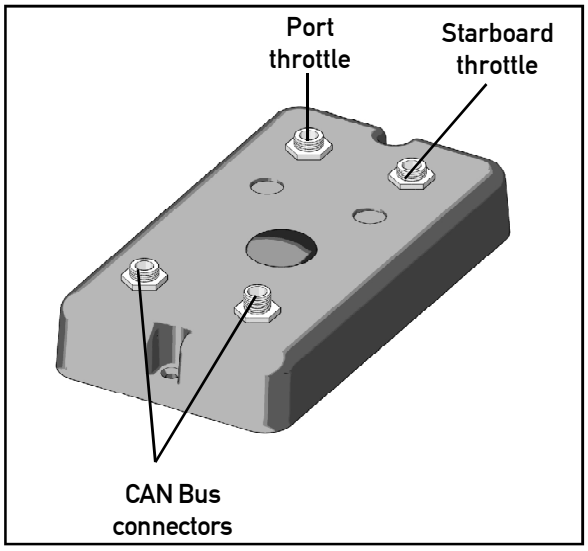
No kind of extension cable can be applied on the throttle cable.

NOTICE

The pinouts are valid, unless any personalization is requested.

5.5.4 Cable connection for throttles with analog PWM interface

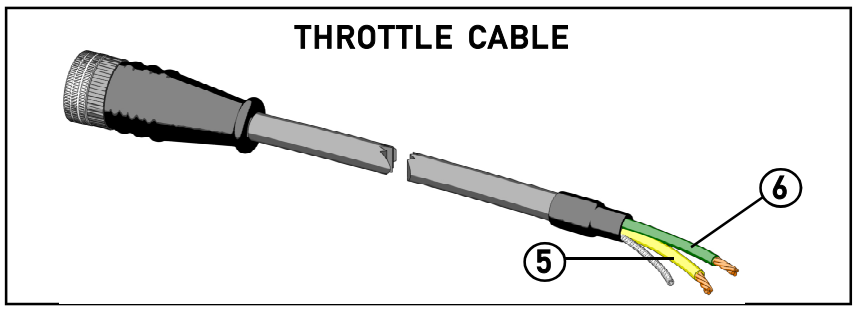
The engines whose throttle interface is a power unit with PWM input belong to this category.
The already preassembled end of the throttle cables must be connected to the V-throttle into the respective connector as shown in the picture below:



In case of single-engine systems, the throttle cable must be connected to the connector at the top on the left.
In case of twin-engine systems, the port throttle cable must be connected to the connector at the top on the left and the starboard throttle cable must be connected to the connector at the top on the right.
According to the code, the throttle cables are supplied with a connector for the connection to the engine interface (see picture), in order to make the connection easier.

If the cables purchased are not provided with personalization (see picture), please refer to the connection table below:

Position on connector	Colour	Description	Abbreviation
5	Yellow	PWM	PWM
6	Green	Negative wire	GND



A non-insulated wire directly connected to the cable shielding (drain wire) is supplied with the throttle cables This wire is useful, if also the cable shield must be connected while installing, in oder to improve its insensitivity to the electromagnetic interferences.
If the drain wire is not used for the connection, we recommend cutting it near the cable stripping.

While laying the cable, please follow the recommendations listed at the beginning of chapter 5 (system wiring).

⚠ WARNING

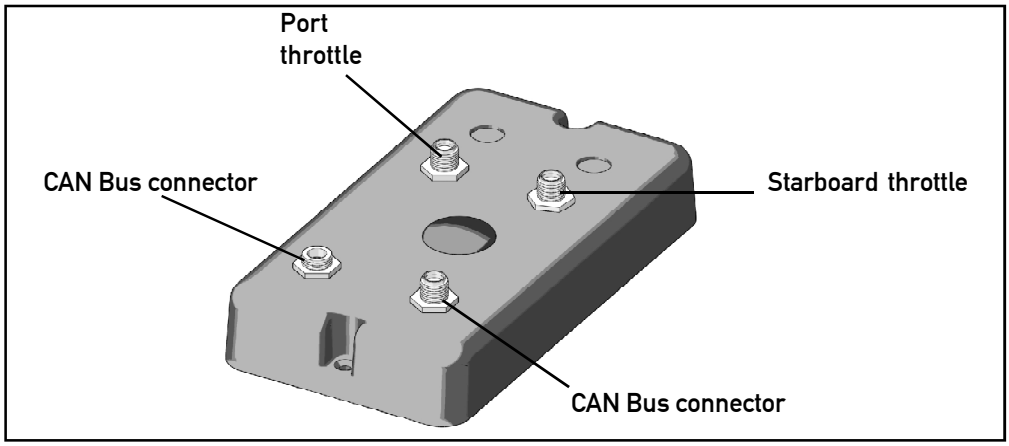
No kind of cable extension can be applied on the throttle cable.

NOTICE

The pinouts are valid, unless any personalization is requested.

5.5.5 Cable connection for throttles with digital interface SAE J1939 or NMEA2000

The engines whose power unit is provided with a CAN bus interface with SAE J1939 and NMEA2000 protocols belong to this category.
The already preassembled end of the throttle cables must be connected to the SAEJ-throttle into the respective connector as shown in the picture below:

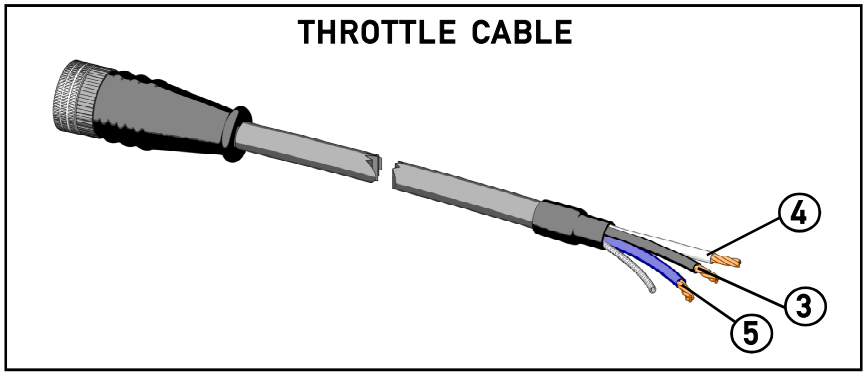


In case of single-engine systems, the throttle cable must be connected to the connector at the top on the left.
In case of twin-engine systems, the port throttle cable must be connected to the connector at the top on the left and the starboard throttle cable must be connected to the connector at the top on the right.
According to the code, the throttle cables are supplied with a connector for the connection with engine interface (see picture), in order to make the connection easier.

If the cables purchased are not provided with personalization (see picture), please refer to the connection table below:

Position on connector	Colour	Description	Abbreviation
1	None	Drain wire	SHIELD
3	Black	Negative power wire	GND
4	White	CAN H signal	CAN H
5	Blue	CAN L signal	CAN L

If the drain wire is not used for the connection, we recommend cutting it near the cable stripping.



While laying the cable, please follow the recommandations listed at the beginning of chapter 5 (system wiring).

⚠ WARNING

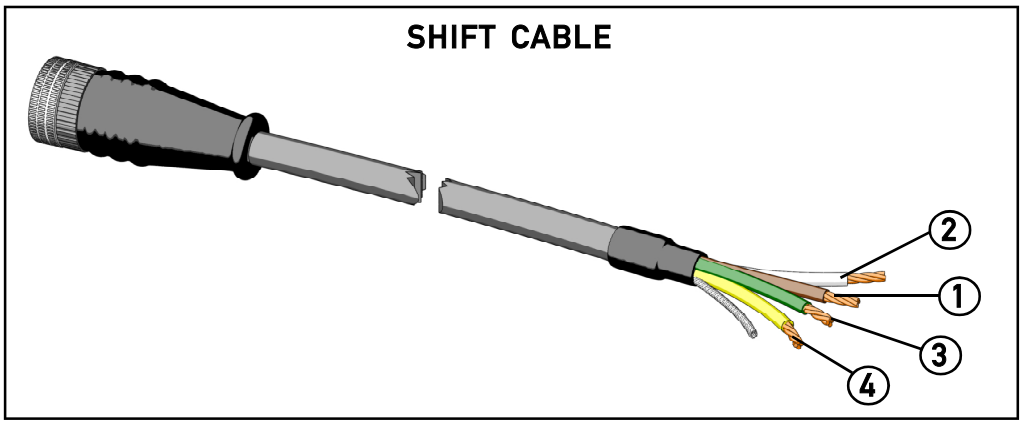
No kind of extension cable can be applied on the throttle cable.

NOTICE

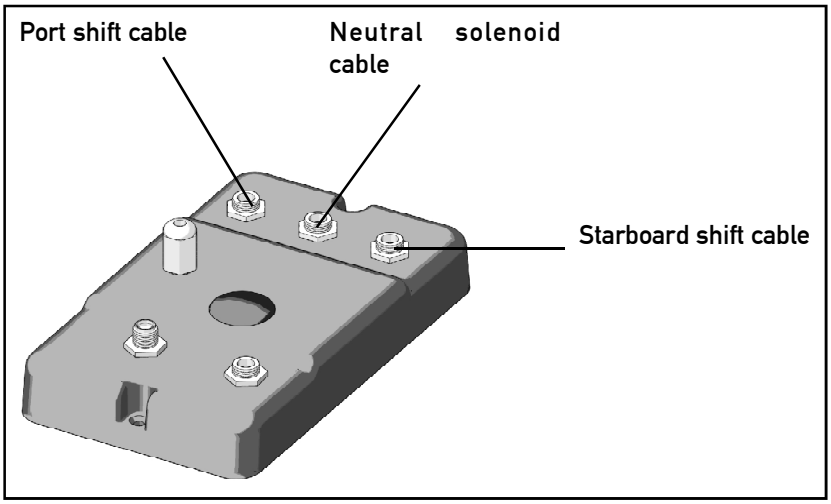
The pinouts are valid, unless any personalization is required.

5.6 Wiring of the shift cables

The cable for the connection to the shift solenoids is described below:



The shift cables must be connected to the shift unit in the positions shown in the picture below:



The cable is not provided with solenoid connectors, which are to be install by the installer.
There are two types of electric shift: a two-solenoid shift or a three-solenoid shift, as described below:

5.6.1 Two-solenoid shift

The most part of the electric interface shifts uses two solenoids: one for the ahead movement and the other for the astern movement.
In case of single-engine systems, connect only the cable to the connector at the top on the left.
In case of twin-engine systems, the port shift cable must be connected to the connector at the top on the left and the starboard shift cable must be connected to the connector at the top on the right.
Never connect the cables to the connector at the top in the center.
Each shift must be connected as described in the table below:

Wire	Colour	Description
1	**Brown**	**Ahead movement solenoid positive wire**
2	White	Ahead movement solenoid negative wire
3	Green	Astern movement solenoid negative wire
4	Yellow	**Astern movement solenoid positive wire**

In case the solenoids share the negative wire, the negative wires of the shift cable (white (2) and green (3) wires) must be joint together too.

5.6.2 Three-solenoid shift

In case the shift needs the neutral solenoid, the neutral solenoid cable must be connected too.
For the connection refer to the table below:

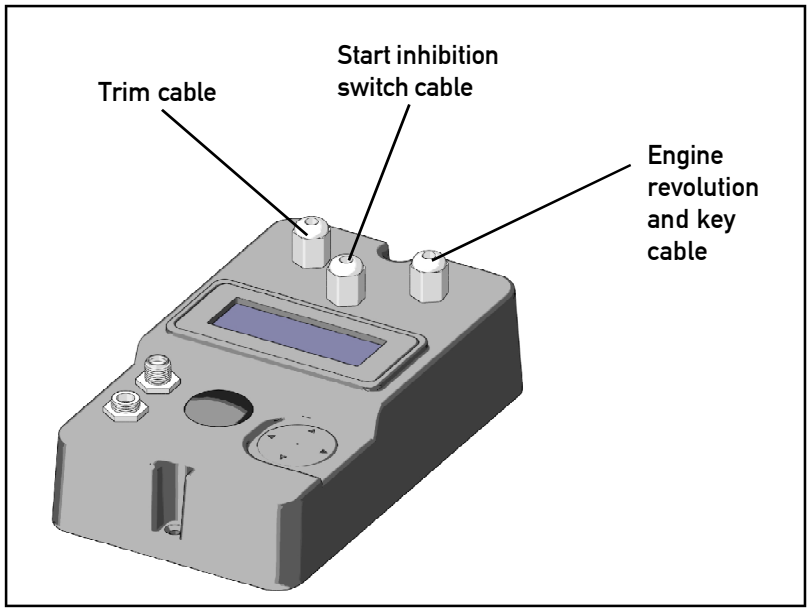
Wire	Colour	Description
1	**Brown**	**Port shift neutral solenoid positive wire**
2	White	Port shift neutral solenoid negative wire
3	Green	Starboard shift neutral solenoid negative wire
4	Yellow	**Starboard shift solenoid positive wire**

To connect the solenoids of both shifts, strip the neutral solenoid cable beyond the already existing stripping or extend the cable by using wires with section not lower than AWG 16 (1,3 mm2).
In case of single-engine boats, only the brown wire (1) as positive wire and the white wire (2) as negative wire must be connected.
The connection of the ahead and astern movement solenoids is similar to the connection of two-solenoid shifts, therefore refer to the previous paragraph (5.6.1 "Two-solenoid shift") for the connection.

5.7 Wiring of the trim cables

The trim cable must be connected only for those systems, where the trims can be controlled through the proper keys located on the lever of the control station.

The trim cable is positioned at the top on the left of the control unit and it can be recognized by the label.



The connection to be carried out are described in the table below:

Wire	Colour	Description
1	**White**	**Port Trim UP**
2	Red	Port Trim DOWN
3	Black	Port common wire
4	Blue	Starboard common wire
5	Green	Starboard Trim UP
6	**Orange**	**Starboard Trim DOWN**

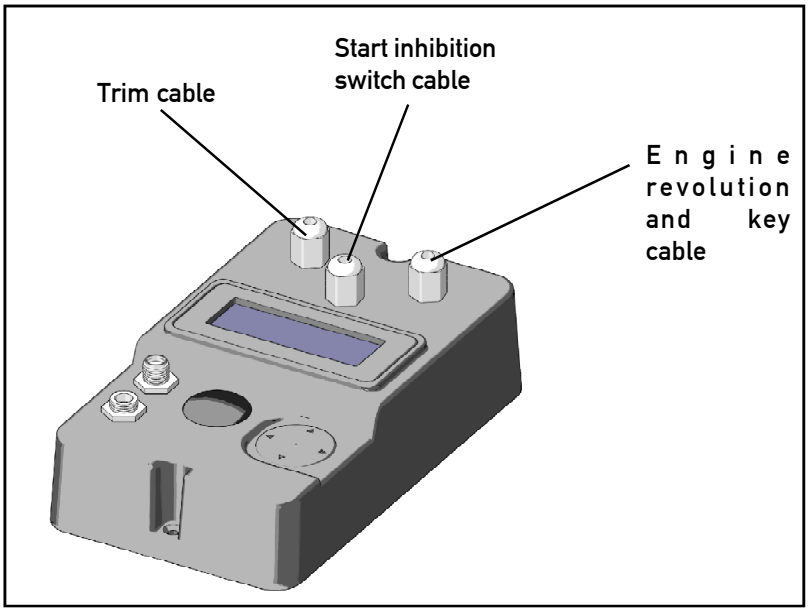
In case of single-engine systems, where only the engine trim is enabled, just connect the white (1), red (2) and black (3) wires.
The other wires are not to be connected.

The control unit is provided with a meter cable . In case the cable is not long enough to reach the key signal wires, the installer has to use extensions wires with minimum section: AWG20 (0.5 mm2).

5.8 Wiring of the engine key cables

The connection of the engine key cable is always necessary independently on the number of revolutions.

The key cable is located at the top on the right of the control unit and it can be recognized by the label. Also the engine revolution signal wires are located in the same cable.



The connections to be carried out are described in the table below:

Wire	Colour	Description
1	**Red**	**Port engine key**
2	Black	Port engine revolution negative wire
3	White	Port engine revolution positive wire
4	Green	Starboard engine revolution positive wire
5	Blue	Starboard engine revolution negative wire
6	**Orange**	**Starboard engine key**

Connect the key cables to the proper key positive wires.

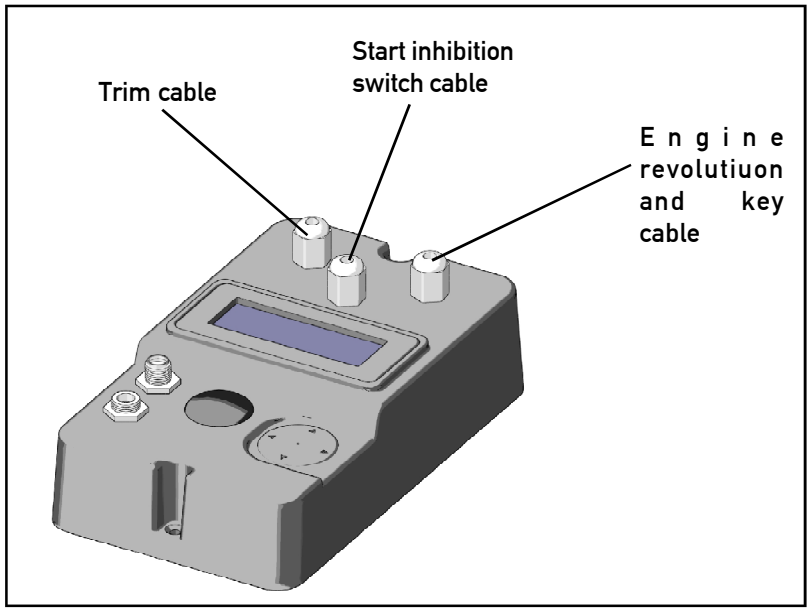
For the single-engine systems just connect the red wire (1),while the orange wire (6) can be left disconnected.

The control unti is provided with a meter cable. In case the cable is not long enough to reach key signal wires, the installer must use extension cables with minimum section: AWG20 (0,5 mm^2).
The wire sheath used can be neither black nor yellow.

5.9 Wiring of the engine revolution cables

The connection of the engine revolution cable is necessary only for twin-engine systems with mechanical interface throttle.
This connection is not required for systems with electric (voltage or current) or electronic (CAN bus SAEJ 1939 or NMEA2000) interface throttle.

The engine revolution cable is located at the top on the right of the control unit and it can be recognized by the label.
The wires of the engine key signals are located in the same cable.



The connection to be carried out are described in the table below:

Wire	Colour	Description
1	**Red**	**Port engine key**
2	Black	Port engine revolution negative wire
3	White	Port engine revolution positive wire
4	Green	Starboard engine revolution wire
5	Blue	Starboard engine revolution wire
6	**Orange**	**Starboard engine key**

The control unit is provided with a meter cable. In case the cable is not long enough to reach the engine revolution signal wires, the installer must use an extension cable with minimum section AWG20 (0,5 mm^2). The sheath used for wires 3 and 4 (positive) can be neither black nor yellow while the sheath used for wires 2 and 5 (negative) can be neither red nor brown.

All possible connection to detect the engine revolution signal according to the type of revolution transducer used are described below.

5.9.1 Revolution signal from alternator

The alternators of the inboard and sterndrive engines are provided with a proper W signal, which allows the engine revolutions to be counted.
Generally only a wire is present, whereas the ground is connected through the engine casing; in this case the black (2) and blue (5) wires must be connected to the engine ground bar or to the engine casing.
The connection to be carried out are described in the table below:

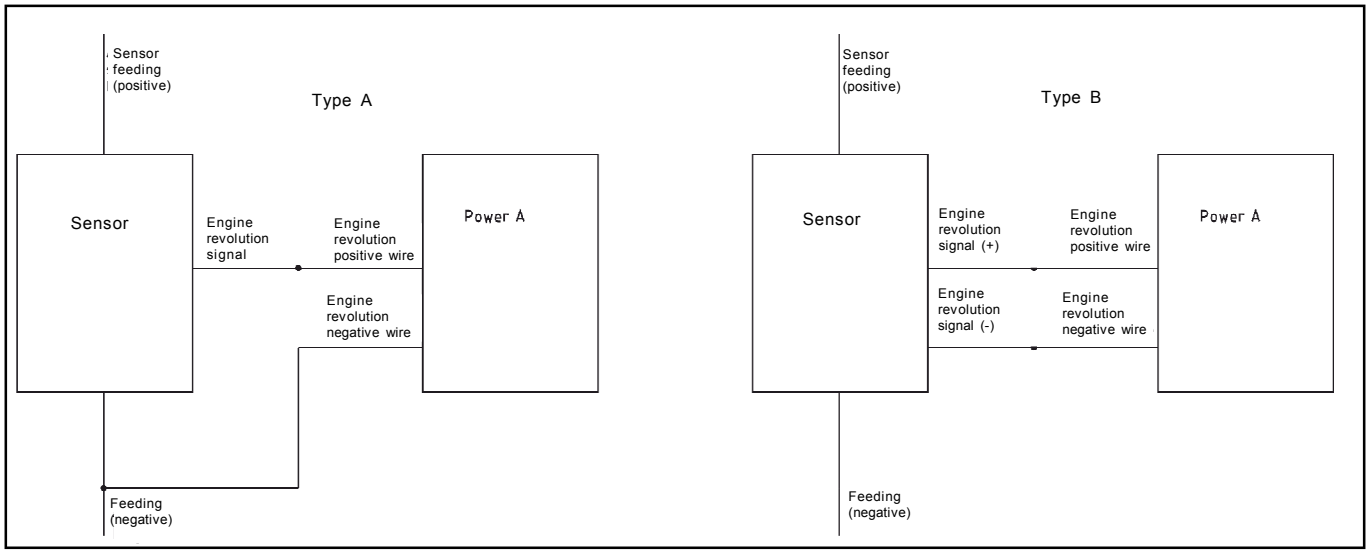
Wire	Colour	Use
1	**Red**	**Other use**
2	Black	Port engine negative wire
3	White	Positive wire of signal W from port engine
4	Green	Positive wire of signal W from starboard engine
5	Blue	Starboard engine negative wire
6	**Orange**	**Other use**

5.9.2 Revolution signal from dedicated sensor

A device detecting the engine shaft or the drive shaft revolutions may be installed on inboard engines of large size.
This device is generally splined on the engine shaft and shows the number of engine revolutions.
Different types of device are available (encoder, phonic wheels, magnetic pick-ups) and they can be grouped in two categories: passive sensors and active sensors.
The active sensors provide a variable electric signal having a width equal to the battery tension and a frequency proportional to the engine revolutions.
The passive sensors provide an electric contact (open or closed), whose opening/closing has a frequency proportional to the engine revolution.

5.9.2.1 Active sensors

The active sensors have a feed of their own (for the connection refer to the installation manual of the sensor) and a couple of wires for transmission of the engine revolution signal.
The negative wire can be shared with the sensor feeding negative wire (type A) or it can be separated (type B).



The connections to be carried out for the sensors type A are described in the table below:

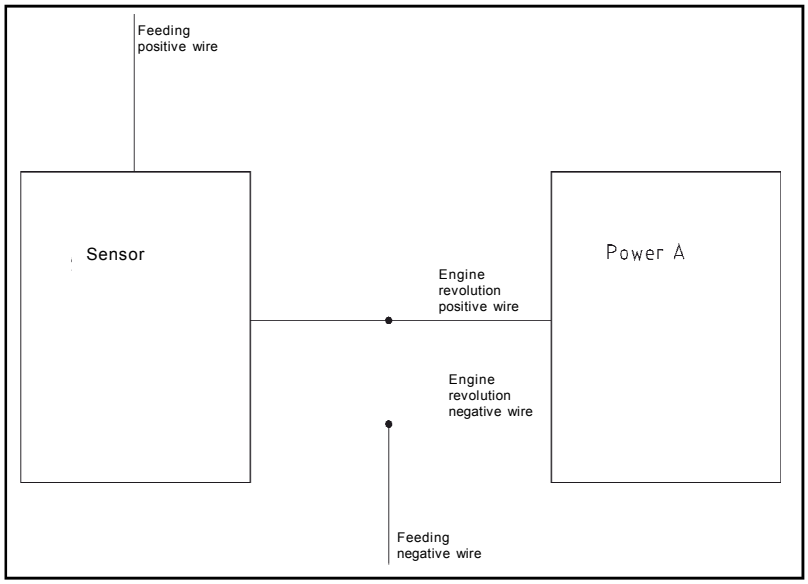
Wire	Colour	Use
1	**Red**	**Other use**
2	Black	Port sensor power negative wire
3	White	Port engine revolution signal
4	Green	Starboard engine revolution signal
5	Blue	Starboard sensor power negative wire
6	**Orange**	**Other use**

The connections to be carried out for the sensors type B are described in the table below:

Wire	Colour	Use
1	**Red**	**Other use**
2	Black	Port engine revolution signal (-)
3	White	Port engine revolution signal (+)
4	Green	Starboard engine revolution signal (+)
5	Blue	Starboard engine revolution signal (-)
6	**Orange**	**Other use**

5.9.2.2 Passive sensors

The passive sensors are provided with a couple of wires, which allow the revolution signal to be transmitted and they need no feeding (for the connection refer to the installation manual of the sensor).
The passive sensors are electric contacts, therefore no polarity must be respected.

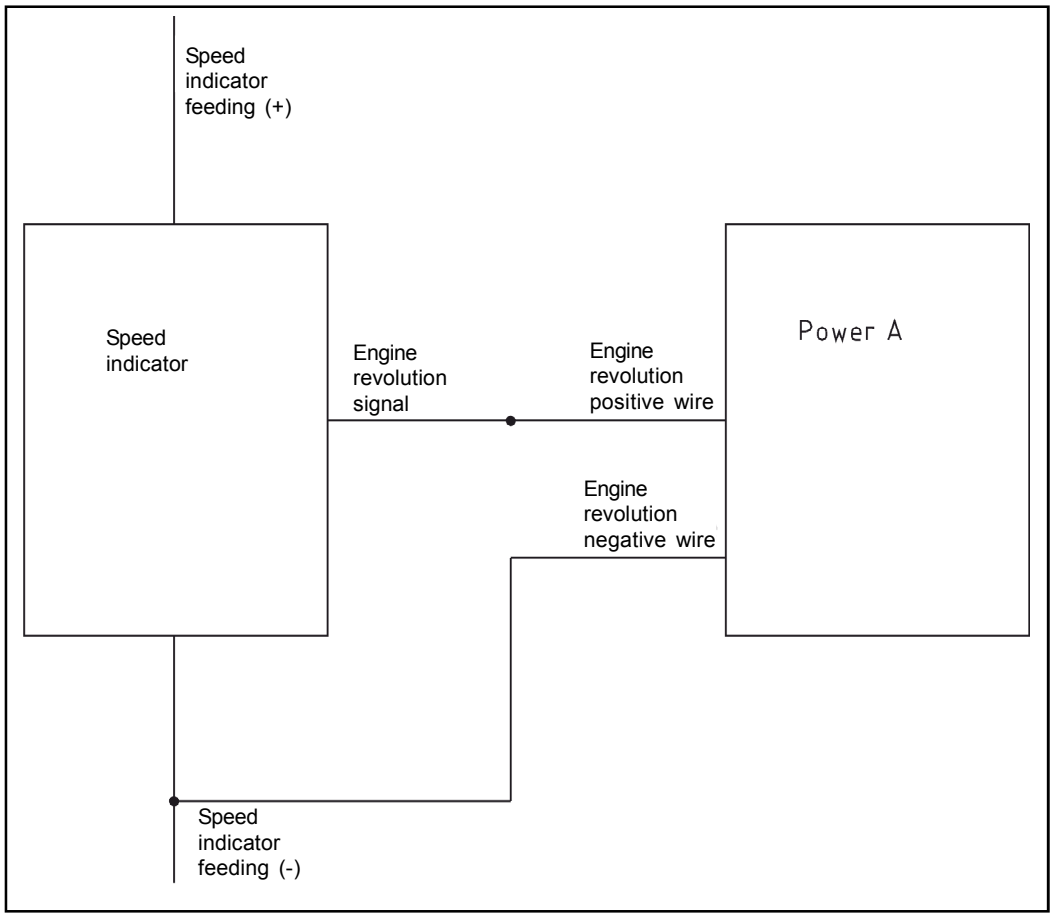


The connection to be carried out for the passive sensors are described in the table below:

Wire	Colour	Use
1	**Red**	**Other use**
2	Black	Power negative wire (ground bar)
3	White	Port engine revolution signal
4	Green	Starboard engine revolution signal
5	Blue	Power negative wire (ground bar)
6	**Orange**	**Other use**

5.9.3 Revolution signal from navigational instruments

In case of outboard engines, the engine revolution signal can be easily detected by the navigational instruments, only if the instruments are not digital (NMEA2000).
The revolution signal is a low power electric signal that can be easily be disturbed; therefore make sure this signal and system Power A Mark II™ are compatible before performing the connection.
The technical features of the revolution detecting interface of system Power A Mark II™ are described in paragraph 1.3 (Technical features of the system).



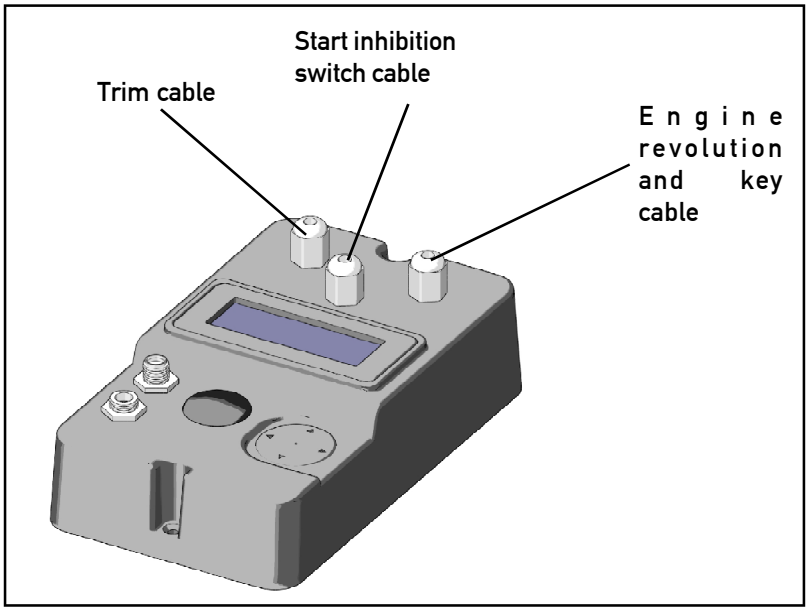
To connect to the speed indicator instruments follow the indications contained in the table below:

Wire	Colour	Use
1	Red	Other use
2	Black	Speed indicator negative wire
3	White	Port engine revolution signal
4	Green	Starboard engine revolution signal
5	Blue	Speed indicator negative wire
6	Orange	Other use

5.10 Wiring of the start inhibition switch cables

The start inhibition switch cable or neutral safety switch cable must be always connected in order to prevent the engine from being started, if all safety conditions are not ensured.
The connection is carried out through electric contacts, which are generally open and without polarity.

The start inhibition switch cable is located at the top in the middle of the control unit and it can be recognized by the label.



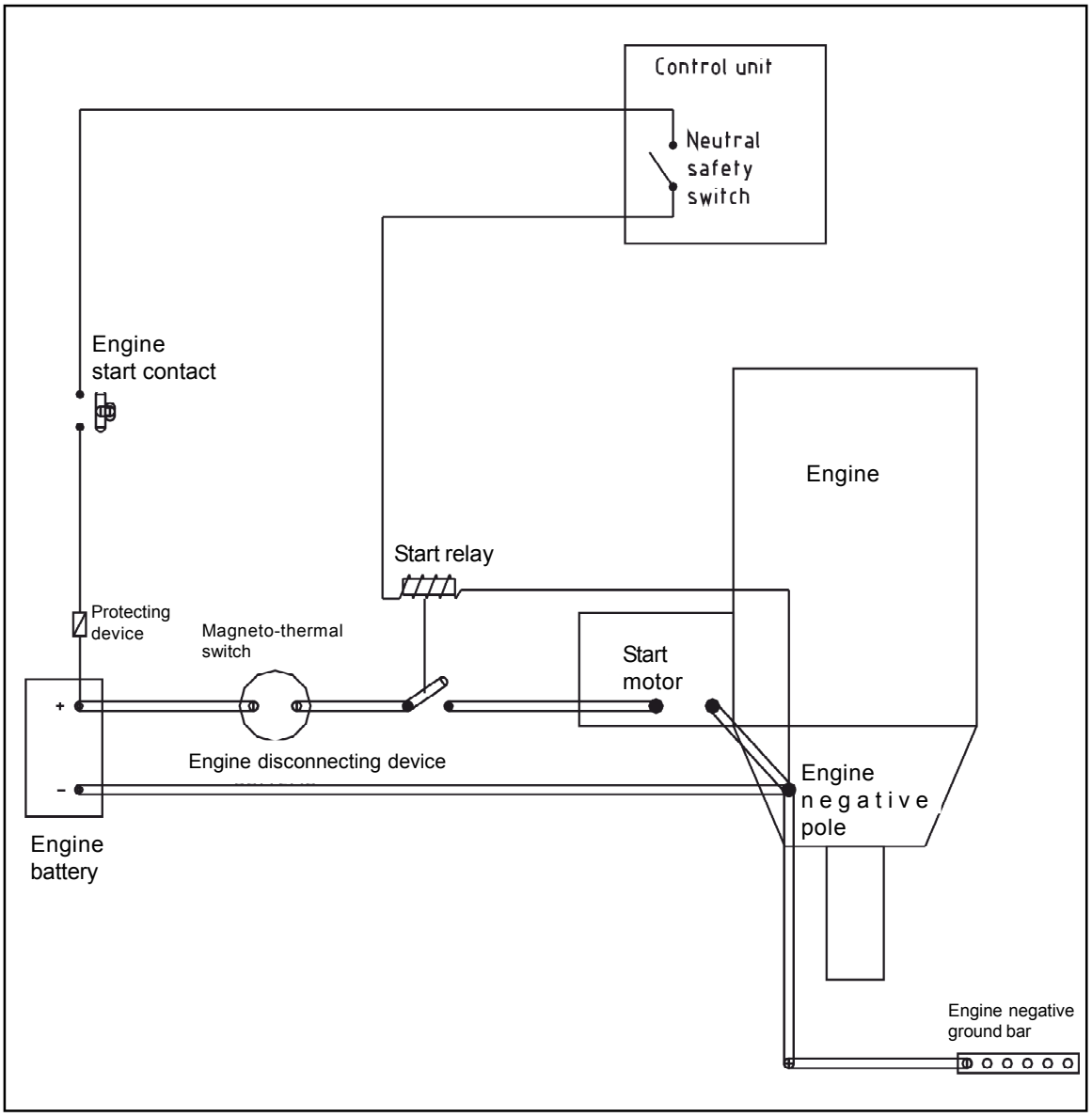
To ensure a correct operation, the start inhibition switch, the engine start contact and the starter enabling solenoid must be placed in series.
The diagram to be followed to connect the neutral safety switches is described in the picture on the next page.
In case of twin-engine boats, the diagram to be followed is similar for both engines.
The control unit is provided with a meter cable; if the cable is not long enough, the installer must use extension cables with minimum section AWG20 (0,5 mm2).
The wiring to be carried out for single-engine boats is described in the table below:

Wire	Colour	Use
1	**White**	**Neutral Safety switch**
2	Red	Neutral Safety switch
3	Green	Do not connect
4	Black	Do not connect

The wiring to be carried out for twin-engine boats is described in the table below:

Wire	Colour	Use
1	**White**	**Port Neutral Safety switch**
2	Red	Port Neutral Safety switch
3	Green	Starboard Neutral safety switch
4	Black	Starboard Neutral Safety switch

Wiring diagram:



⚠ WARNING

The product wiring must be connected as indicated in this chapter.
If this installation rule is not respected or the power supply is not protected properly, the product warranty will expire and the manufacturer will not be held responsible for personal injuries or damages to properties caused by malfunctions.

6 SETTING

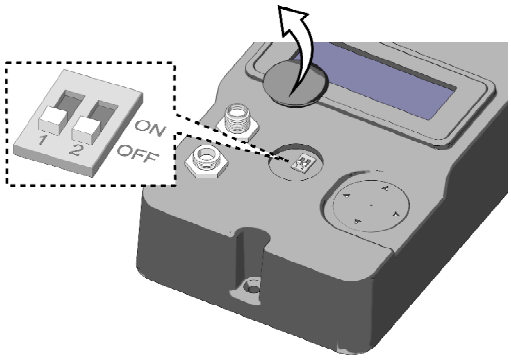
The system can be set only after being installed and connected, as shown in chapter 2. Control station must have been configured from 1 to 4. Mechanical actuators must have been configured as port or starboard shifts or throttles.

⚠ WARNING

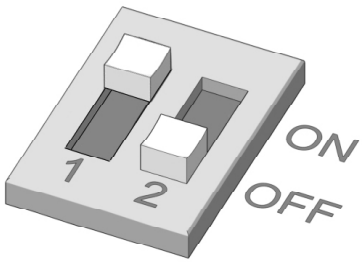
The control unit can be temporarily placed near components used for mechanical settings (e.g. mechanical actuators) so that setting is quicker and easier.
The control unit packaging contains a CAN extension cable to be used for provisional installation.
When the system is in setting mode, engine keys are ignored; therefore, it is not necessary to carry out the connections required by the control unit.
The control unit should be temporarily placed connecting the CAN bus instead of the network terminator and putting the network terminator on the control unit.
Once the control unit has been set, place it in its proper position as explained in the installation chapter and complete the system setting.
The CAN extension cable will not be used.

6.1 Enabling the setting mode (through the Control Unit)

1 When the system is off, remove the plastic plug of the Control Unit.

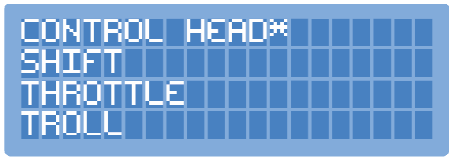


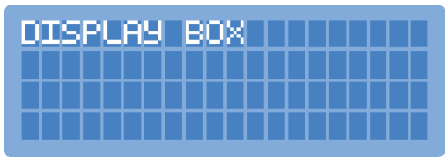
2 Switch dip 1 to "ON" position.



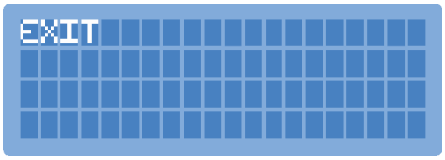
3 Turn the system on. All the control station leds light up.

4 By means of "Up" and "Down" arrows of the navigation switch, select the component to be set (control station, shift, throttle or control unit). The line of the selected component shows an asterisk.





5 Press "OK" in the middle of the navigation switch. In case of control station, it is possible to enter the submenu to select stations from 0 to 3.



Otherwise, it is possible to enter the submenu to select the actuator number.

6 Press "OK" in the middle of the navigation switch to select the control station or the actuator to be set.

7 Before carrying out other operations, wait until the message "CONNETTING..." disappears. If message "TIMEOUT "is displayed, the unit has not been installed in the system,it has not been configured or connected properly, or it is not powered.

6.2 Select and change a parameter

It is possible to scroll parameters by means of arrows "Up" and "Down" of thenavigation switch; select a parameter by means of key "OK"; increase a value by means of the right arrow and decrease it by means of the left arrow. Function "EXIT" allows going back to the previous menu. Function "SAVE" allows saving the set values.

6.3 Control station parameters

The parameters which can be set on the control station are the following ones:

Function	Original value	Allowed value range
Engine number	1 single engine, 2 twin engine	1 – 2
Acceleration curve	0	0 - 3

6.3.1 Engine number

Number of engines in the system. Values 1 and 2 are allowed.

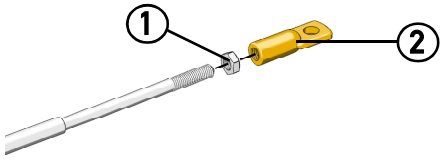
6.3.2 Acceleration curve

It is the function connecting the lever angle and the acceleration percentage. It is possible to select one of the four available options.

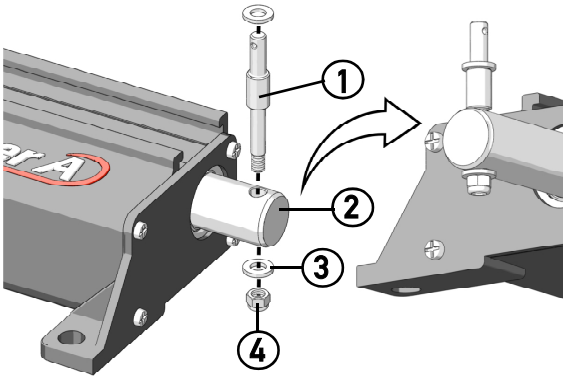
6.4 Mechanical actuator parameters

In order to install the mechanical cable on the actuator, do as follows:

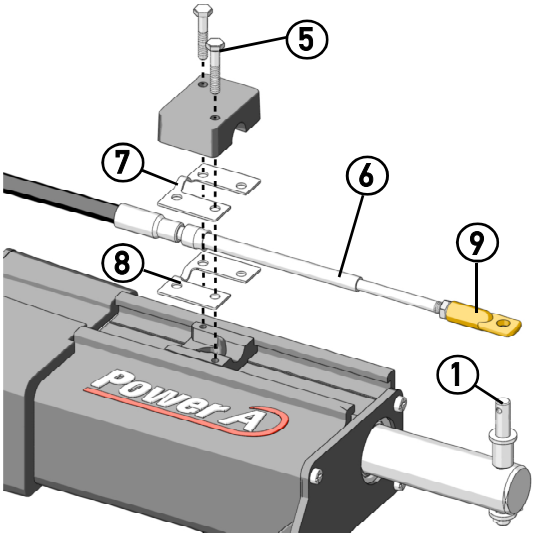
1 Insert nut (1), screw cable terminal (2) and lock nut (1).



2 Insert the check pin of the cable head "1" on the actuator rod "2"and lock it by means of the proper washer "3" and nut "4".



5 Position cable "6" in the fixing system by interposing the two plates "7" and "8" and at the same time insert the cable head "9" on the proper pin with washer on rod "1".
If a connection to the Mercruiser stern drive cables needs to be performed, use the plastic adapters instead of fixing plates "7" and "8".
The sheath fixing system must be fastened to the actuator by means of screws "5". If the actuator works as a shift, put it in neutral position; if the actuator works as a throttle, put it in throttle at idle position.



12 After fixing the sheath, insert the proper split pin "10".

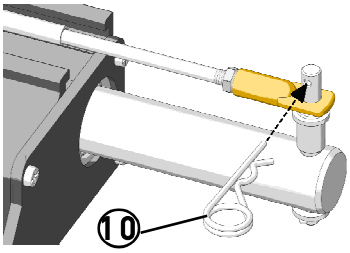


TABLE OF THE ACTUATOR CONFIGURATIONS

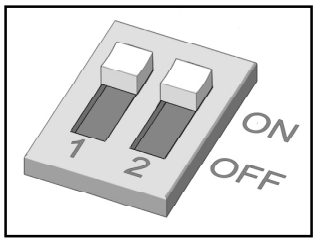
PORT SHIFT	STARBOARD SHIFT	PORT THROTTLE	STARBOARD THROTTLE
ON / OFF 1 2 3 4	ON / OFF 1 2 3 4	ON / OFF 1 2 3 4	ON / OFF 1 2 3 4

6.4.1 Mechanical shift parameters

Function	Original value	Allowed value range
Forward	50mm	0-80mm
Neutral	40mm	0-80mm
Reverse	30mm	0-80mm
Proportional pause	1 sec	0-12 sec

⚠ WARNING

During the selection and change of Forward, Neutral and Reverse parameters, the stem of the mechanical actuator moves according to the set value!
To prevent the stem from moving, switch dip 2 to "ON" position.
Never change a parameter while the mechanical cable is connected without having switched dip 2 to "ON".



The stroke of the mechanical actuator stem is 80mm: 0mm indicates that the stem is completely retracted; 80mm indicates that it is completely extended.

6.4.1.1 Forward

"Forward" is the point where the stem stops when the forward movement is selected. If the Forward value is higher than the Neutral value, the mechanical cable is pulled when enabling the forward movement; it is pushed when enabling the reverse movement.

6.4.1.2 Neutral

"Neutral" is the point where the stem stops when the neutral position is selected. DO NOT change the original value. It must be between the Forward and Reverse values.

6.4.1.3 Reverse

"Reverse" is the point where the stem stops when the reverse movement is selected. If the Reverse value is higher than the Neutral value, the mechanical cable is pulled when enabling the reverse movement; it is pushed when enabling the forward movement.

6.4.1.4 Proportional pause

It is the maximum duration of the pause during the movement-neutral position shifting.
This pause is enabled each time the lever shifts from the movement position to the neutral position. In case of shifting from the forward movement to the neutral position, the pause limit value is proportional to the throttle average value in the last 30 sec. (see the example below). In case of shifting from the reverse movement to the neutral position, the set limit value is halved.

Examples:

a) if the set value is 0, there will be no pause;
b) if the set value is 10 seconds and the throttle average value in the last 30 seconds is 50%, the pause will be 5 seconds (50% of 10);
c) if the set value is 10 seconds and the throttle average value in the last 30 seconds is 0%, the pause will be 0 seconds (0% of 10);
d) if the set value is 10 seconds and the throttle average value in the last 30 seconds is 100%, the pause will be 10 seconds (100% of 10).

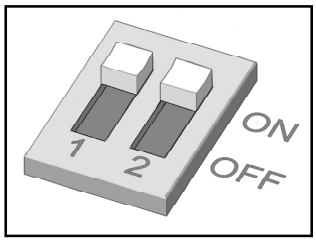
Referring to the examples above, in case of shifting from the reverse movement (acceleration) to the neutral position, values would be: a) 0 seconds, b) 2.5 seconds, c) 0 seconds, d) 5 seconds.

6.4.2 Mechanical throttle parameters

Function	Original value	Allowed value range
Min	0mm	0-80mm
Max	35mm	0-80mm
High idle	10%	0-50%

⚠ WARNING

During the selection and change of Min, Max and High Idle parameters, the stem of the mechanical actuator moves according to the set value!
To prevent the stem from moving, switch dip 2 of the station with display to "ON" position.
Never change a parameter while the mechanical cable is connected without having switched dip 2 to "ON".



The stroke of the mechanical actuator stem is 80mm: 0mm indicates that the stem is completely retracted; 80mm indicates that it is completely extended.

6.4.2.1 Min

Min. is the point where the stem stops when the accelerator is at idle. If the Min. value is higher than the Max. value, the mechanical cable is pushed during acceleration.

6.4.2.2 Max

Max. is the point where the stem stops when the accelerator is at idle. If the Max. value is higher than the Min. value, the mechanical cable is pulled during acceleration.

6.4.2.3 High idle

It replaces idling when the relevant function is enabled.

⚠ WARNING

A too high value can wear the shift in a short time; please, refer to the engine manual in order to check the correct value.

6.4.2.4 Control Unit parameters

Function	Original value	Allowed value range
Engine number	2	1-2

6.4.2.5 Engine number

Number of engines in the system. Values 1 and 2 are allowed.

6.5 Electronic shift parameters

Function	Original value	Allowed value range
Engine number	2	1-2
Insertion pause	0,5 sec	0-5 sec
Reversal pause	0 sec	0-5 sec
Proportional pause	1 sec	0-12 sec

6.5.1 Engine number

Number of engines in the system. Values 1 and 2 are allowed.

6.5.2 Insertion pause

It is the time (shifting delay for the hydraulic shift) between the movement shifting and the acceleration start.

6.5.3 Proportional pause

It is the maximum duration of the pause during the movement-neutral position shifting.
This pause is enabled each time the lever shifts from the movement position to the neutral position. In case of shifting from the forward movement to the neutral position, the pause limit value is proportional to the throttle average value in the last 30 sec. (see the example below). In case of shifting from the reverse movement to the neutral position, the set limit value is halved.

Examples:

a) if the set value is 0, there will be no pause;
b) if the set value is 10 seconds and the throttle average value in the last 30 seconds is 50%, the pause will be 5 seconds (50% of 10);
c) if the set value is 10 seconds and the throttle average value in the last 30 seconds is 0%, the pause will be 0 seconds (0% of 10);
d) if the set value is 10 seconds and the throttle average value in the last 30 seconds is 100%, the pause will be 10 seconds (100% of 10).

Referring to the examples above, in case of shifting from the forward movement (acceleration) to the neutral position, values would be: a) 0 seconds, b) 2.5 seconds, c) 0 seconds, d) 5 seconds.

6.5.4 Reversal pause

During movement reversal, it is the minimum time (delay) during the forward-neutral-reverse shifting (or viceversa).

NOTICE

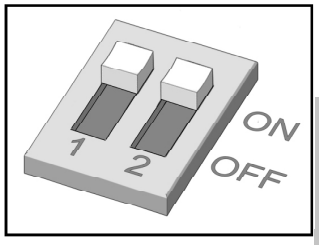
The two pauses described in paragraphs 6.4.3 and 6.4.4 are indepent from each other and they can be added.

6.6 Electronic voltage throttle parameters

Function	Original value	Allowed value range
Engine number	2	1-2
Min	0.5V	0-5V
Max	4.5V	0-5V
High idle	10%	0-50%
Idle validation switch (IVS)	5V	0-5V
IVS status	1	1-0 (binary)

⚠ WARNING

During the selection and change of parameters, the voltage on the connector contacts terminating throttle wirings changes according to the set value!
To ensure the minimum output voltage, switch dip 2 to "ON" position.
Never change a parameter while the connector is inserted without having switched dip 2 to "ON".



6.6.1 Engine number

Number of engines in the system. Values 1 and 2 are allowed.

6.6.2 Min

Voltage supplied with throttle at idle (0%).

6.6.3 Max

Voltage supplied with accelerator at maximum speed (100%).

6.6.4 High idle

It replaces idling when the relevant function is enabled.

⚠ WARNING

A too high value can wear the shift in a short time; please, refer to the engine manual in order to check the correct value.

6.6.5 Idle validation switch

When a specific voltage value is reached, the throttle idle switch turns from open to closed position, for engine central units which need this function.

6.6.6 IVS condition

The Idle Validation Switch can be set as usually closed (value 1) or usually open (value 0).

6.7 How to exit the calibration mode

In order to exit the calibration mode, put the dip-switches on the control unit to their original position (OFF-OFF), then turn the system off and on again by means of the main switch.

6.8 Electronic throttle parameters

6.8.1 Caterpillar

Use PWM throttle unit (code 42020U) instead of V throttle unit.

Throttle cable

Length	Code
2 metres	42043G
4 metres	42044J

NOTICE

The cable is supplied without the connector for the direct connection to the engine. For further explanations please contact the Technical Assistance Service.

Calibration

Function	Value
Min	8 %
Max	92 %
High idle	10 %

NOTICE

The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

6.8.2 CMD VW

TDI 4, TDI 5, TDI 6

Use V throttle unit (code 42018H).

Throttle cable

Length	Code
2 metres	42033D
4 metres	42034F

NOTICE

The cable is supplied with the connector for the direct connection to the engine.

Calibration

Function	Value
Min	0.44 V
Max	4.44 V
High idle	10 %
IVS value	0.48 V
IVS hys	0.01 V
IVS type	Normally closed

NOTICE

The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

6.8.3 Cummins

QSK19 MCRS, QSK38, QSK50, QSK60 HPI, QSK60 HCRS

Use V throttle unit (code 42018H).

Throttle cable

Length	Code
2 metres	42029N
4 metres	42030X

NOTICE

The cable is supplied without the connector for the direct connection to the engine. For further explanations please contact the Technical Assistance Service.

Calibration

Function	Value
Min	0.65 V
Max	4.2 V
High idle	10 %

NOTICE

The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

6.8.4 Cummins Mercruiser Diesel

QSC 8.3

Use V throttle unit (code 42018H).

Throttle cable

Length	Code
2 metres	42035H
4 metres	42036K

NOTICE

The cable is supplied with the connector for the direct connection to the engine.

Calibration

Function	Value
Min	0.8 V
Max	4.2 V
High idle	10 %

NOTICE

The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

6.8.5FPT

Cursor

Use SAEJ throttle unit (code 42022Y).

Throttle cable

Length	Code
1 metre	42340N
3 metres	42341R
4 metres	42358J
5 metres	42342T
7 metres	42343V

NOTICE

The cable is supplied with the connector for the direct connection to the engine by means of connector JD.

Calibration

Function	Value
Minimum	Vedi nota
Maximum	Vedi nota
High idle	10 %
Address	27

NOTICE

The minimum and maximum number of revolutions of the engine can be found in the relevant manual.
The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

It is possible to control this engine by means of an interface (voltage) too:

Use V throttle unit (code 42018H).

Throttle cable (connector JD)

Length	Code
2 metres	42348F
4 metres	42349H

NOTICE

The cable is supplied with the connector for the direct connection to the engine by means of connector JD.

Throttle cable (connector JINV)

Length	Code
2 metres	42350S
4 metres	42351U

NOTICE

The cable is supplied with the connector for the direct connection to the engine by means of connector JINV.

ENGLISH

Calibration

Function	Value
Min	0.5 V
Max	4.5 V
High idle	10 %

NOTICE

The indicated high idle value is 10%. The user can change it as he pleases.

NEF

Use SAEJ throttle unit (code 42022Y).

Throttle cable

Length	Code
1 metre	42340N
3 metres	42341R
4 metres	42358J
5 metres	42342T
7 metres	42343V

NOTICE

The cable is supplied with the connector for the direct connection to the engine by means of connector JD.

Calibration

Function	Value
Minimum	See note
Maximum	See note
High idle	10 %
Address	0B

NOTICE

The minimum and maximum number of revolutions of the engine can be found in the relevant manual.
The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

It is possible to control this engine by means of an interface (voltage) too:

Use V throttle unit (code 42018H).

Throttle cable (connector JD)

Length	Code
2 metres	42348F
4 metres	42349H

NOTICE

The cable is supplied with the connector for the direct connection to the engine by means of connector JD.

Throttle cable (connector JINV)

Length	Code
2 metres	42350S
4 metres	42351U

NOTICE

The cable is supplied with the connector for the direct connection to the engine by means of connector JINV.

Calibration

Function	Value
Min	0.5 V
Max	4.5 V
High idle	10 %

NOTICE

The indicated high idle value is 10%. The user can change it as he pleases.

6.8.6 Hyundai Seasall

S250

Use V throttle unit (codice 42018H).

Throttle cable

Length	Code
2 metres	42088P
4 metres	42089S

NOTICE

The cable is supplied with the connector for the direct connection to the engine.

Calibration

Function	Value
Min	0.74 V
Max	4.14 V
High idle	10 %

NOTICE

The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

6.8.7 John Deere

Use V throttle unit (code 42018H).

Throttle cable

Length	Code
2 metres	42029N
4 metres	42030X

NOTICE

The cable is supplied without the connector for the direct connection to the engine. For further explanations please contact the Technical Assistance Service.

Calibration

Function	Value
Min	0.5 V
Max	4.5 V
High idle	10 %

NOTICE

The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

6.8.8 Lombardini

Use V throttle unit (code 42018H).

Throttle cable

Length	Code
2 metres	42039S
4 metres	42040A

NOTICE

The cable is supplied with the connector for the direct connection to the engine.

Calibration

Function	Value
Min	0.7 V
Max	4.4 V
High idle	10 %

NOTICE

The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

6.8.9 MTU

Use I throttle unit (code 42019K).

Throttle cable

Length	Code
2 metres	42043G
4 metres	42044J

NOTICE

The cable is supplied without the connector for the direct connection to the engine. For further explanations please contact the Technical Assistance Service.

Calibration

Function	Value
Min	4 mA
Max	20 mA
High idle	10 %

NOTICE

The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

6.8.10 Perkins

M250/350C

Use PWM throttle unit (code 42020U).

Throttle cable

Length	Code
2 metres	42374G
4 metres	42373E

NOTICE

The cable is supplied with the connector for the direct connection to the engine.

Calibration

Function	Value
Min	8 %
Max	92 %
High idle	10 %

NOTICE

The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

6.8.11 VM motori

Use SAEJ throttle unit (code 42022Y).

Throttle cable

Length	Code
1 metre	42336Y
2 metres	42045L
3 metres	42337A
4 metres	42046N
5 metres	42338C
7 metres	42339E

NOTICE

The cable is supplied without the connector for the direct connection to the engine. For further explanations please contact the Technical Assistance Service.

Calibration

Function	Value
Minimum	See note
Maximum	See note
High idle	10 %
Address	27

NOTICE

The minimum and maximum number of revolutions of the engine can be found in the relevant manual.
The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

It is possible to control this engine by means of an interface (voltage) too:

Use V throttle unit (code 42018H).

Throttle cable

Length	Code
2 metres	42352W
4 metres	42353Y

NOTICE

The cable is supplied with the connector for the direct connection to the engine by means of connector JD.

Calibration

Function	Value
Min	0.8 V
Max	4.2 V
High idle	10 %

NOTICE

The indicated high idle value is 10%. The user can change it as he pleases.

6.8.12 Yanmar

4BY, 6BY

Use V throttle unit (code 42018H).

Throttle cable

Length	Code
2 metres	42041C
4 metres	42042E

NOTICE

The cable is supplied with the connector for the direct connection to the engine.

Calibration

Function	Value
Min	1.0 V
Max	4.4 V
High idle	10 %

NOTICE

The indicated high idle value represents the 10% of the throttle range. The user can change it as he pleases.

IMPORTANT!

The values indicated previously can vary without notice. **ULTRAFLEX** is not to be held responsible for personal injuries or damages to properties caused by incorrect values indicated in the manual or introduced by the installer.

7 SYSTEM START AND CHECK

Once the installation and configuration of the system have been completed, we recommend checking the correct operation of the system itself.
The tests described below allow possible failures or installation and configuration errors to be pointed out.

⚠ WARNING

While carrying out the tests, the engines must be off, unless otherwise specified.

7.1 System start

Supply the systems by enabling all the magneto-thermal switches used on the main power cables.
When the magneto-thermal switch (or the first one, in case more than one battery is available) is enabled, the system positions ifself on stand-by condition: throttles at idle, shifts in neutral.
Before reading the diagnostics, enable the board keys: the system enables and waits for controls (station enabling blinking green leds on control station board).
In case of single-engine system, only a key must be enabled, while for twin-engine systems both board keys must be enabled.
The installer can then control the boat by moving the levers to neutral position and by pressing the station enabling key.
If there are no faults, the system will be enabled: the led blinking and the acoustic signalling stop on all control stations.
Then read the diagnostics pages concerning the control unit to check that the different components of the system operate correctly or to understand the origin of possible faults.

7.2 Diagnostics pages

In case of single-engine system, the control unit display shows the following page:

The letter on the left shows the current position of the shift:

N	Neutral
W	Neutral with warm-up mode
F	Ahead movement
R	Astern movement
ER	Error: fault on the shift

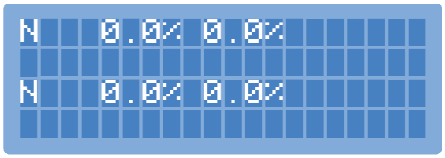
The percentage value in the center shows the current position of the throttle:

0.0%	Throttle at idle
100.0%	Throttle at maximum
ER	Error: fault on the throttle

The percentage value on the right shows the acceleration percentage set by means of the lever on the control station:

NC	Station not controlled
0.0%	Lever at idle
100.0%	Lever at maximum

In case of twin-engine system, the control unit display shows this page:



The first line contains information about the port engine, the second line gives information about the starboard engine.
The following description is valid for both engines:

the letter on the left shows the current position of the shift:

N	Neutral
W	Neutral with warm-up mode
F	Ahead movement
R	Astern movement
ER	Error: fault on the shift

The percentage value in the center shows the current position of the throttle:

0.0%	Throttle at idle
100.0%	Throttle at maximum
ER	Error: fault on the throttle

The percentage value on the right shows the acceleration percentage set by means of the lever on the control station:

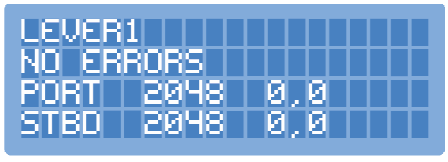
NC	Station not controlled
0.0%	Lever at idle
100.0%	Lever at maximum

By pressing the right arrow of the navigation switch, the diagnostics page of control station No.1 is displayed.

7.3 Diagnostics page of control station No. 1

If the system is not provided with control station marked with No. 1 (configuration dip-switch 00), the diagnostics page is displayed as follows:

If the system is provided with control station marked with No. 1 (configuration dip-switch 00), the diagnostics page is displayed as follows:



The first line shows what control station is subject to diagnosis (in this case page No. 1).

The second line shows, if there are some errors (**FAULT ACTIVE**), in that case the error can be selected analyzed. Refer to troubleshooting (chapter 9) for the fault analysis.

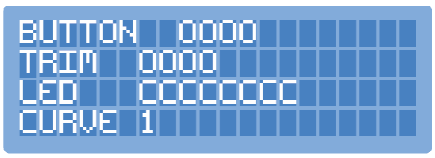
The third line shows:
- the reference engine (PORT) on the left,
- the value read by the lever sensor in the center: it varies from 0 to 4095 according to the port lever position,
- the lever angle in degrees on the right: it varies from -80,0 to +80,0 (total lever stroke) according to the position of the port lever.

In case of single-engine systems, the third line shows the condition of the single engine.

The four line shows:
- the reference engine (STBD) on the left,
- the value read by the lever sensor in the center: it varies from 0 to 4095 according to the position of the starboard lever,
- the lever angle in degrees on the right: it varies from -80,0 to +80,0 according to the starboard lever position.

In case of single-engine systems, the fourth line is displayed as follows:

By pressing key DOWN on the navigation switch, the menu of control station No. 1 is displayed:



The first line allows the operation of the control station No. 1signalling board to be checked. By pressing one of the four keys located on the board, the respective character changes from value "0" to value "C" according to the following scheme:

- By pressing the station enabling key CTRL only, the line is displayed as follows:

- By pressing the station enabling key WARM only, the line is displayed as follows:

- By pressing the station enabling key HIGH IDLE only, the line is displayed as follows:

- By pressing the station enabling key SYNC only, the line is displayed as follows:

By pressing a combination of these keys, a combination of the previous messages is displayed.
A key does not operate, when the corresponding character remains "0", after the respective key has been pressed.
This function is useful to detect possible malfunction of the board keys.

The second line allows the operation of the control station No. 1 trim keys to be checked. By pressing one of the four keys on the port lever the respective character changes from value "0" to value "C" according to the following scheme:

Single-engine system

- by pressing key TRIM UP only, the line is displayed as follows:

- by pressing key TRIM DOWN only, the line is displayed as follows:

Twin-engine system

- by pressing key TRIM UP of the port engine only, the line is displayed as follows:

- by pressing key TRIM DOWN of the port engine only, the line is diplayed as follows:

- by pressing key TRIM UP of the starboard engine only, the line is displayed as follows:

- by pressing key TRIM DOWN of starboard engine, the line is displayed as follows:

By pressing a combination of these keys, a combination of the previous messages is displayed.
A key does not operate, when the corresponding character remains "0", after the respective key has been pressed.
This function is useful to detect possible malfunction of the trim key operation.

The third line allows the LED operation of the signalling board to be checked.
When a LED lights up, the respective character changes from value "0" to value "C" according to the following scheme:

- if the left station enabling LED is on, the line is displayed as follows:

- if the right station enabling LED is on, the line is displayed as follows:

- if the left WARM LED is on, the line is displayed as follows:

- if the right WARM LED is on, the line is displayed as follows:

- if the HIGH IDLE LED is on, the line is displayed as follows:

- if the SYNC LED is on, the line is displayed as follows:

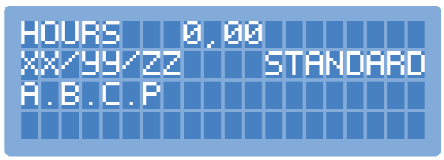
- if the TROLL LED is on, the line is displayed as follows:

- if the DOCK LED is on, the line is displayed as follows:

If more LEDs are on, a combination of the previous messages is displayed.
A non-operationg LED is off, even if the respective character is "C".
A blinking LED alternates value "0" with value "C".
This function is useful to detect possible malfunction of the board led operation.

The fourth line shows, what typical curve has been set for the throttle.

By pressing key DOWN on the navigation switch, the menu of the control station No. 1 is displayed:



The first line displays the number of system operating time in hours and hundredths of an hour.

The second line shows the software loading date according to the scheme month/day/ year.

The third line shows the software version.
A, B, C are decimal numbers.

7.4 Diagnostics pages of control station No.2, 3, 4

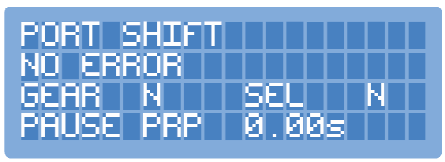
The diagnostics pages of the next control stations follow the same rules applied for station No. 1: therefore refer to paragraph 7.3 for any information.

7.5 Diagnostics pages of port shift (port shift or single-engine)

The diagnostics page of the port shift changes according to the type of shift (mechanical or electric) installed in the system.

Mechanical shift:

The diagnostics page is displayed as follows:



The first line shows which shift is subject to diagnosis: the port shift in case of twin-engine system or the only one in case of single-engine system.

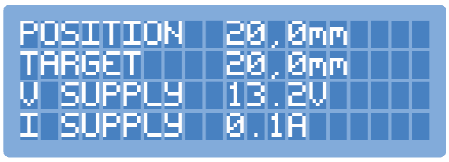
The second line shows if there are some errors (**FAULT ACTIVE**), in that case the error can be selected and analyzed. Refer to troubleshooting (chapter 9) to analyze the fault.

The third line displays:

the current position of the shift, on the left, next to GEAR, :
N Neutral
W Neutral with warm-up mode
F Ahead movement
R Astern movement
ER Error: fault on the shift

the current position of the lever,on the right, next to SEL, :
N Neutral
W Neutral with warm-up mode
F Ahead movement
R Astern movement
ER Error: fault on the shift

The fourth line displays the current value of the proportional pause in seconds and hundredths of a second.
By pressing key DOWN on the navigation switch, the remaining menu of the port shift is displayed:



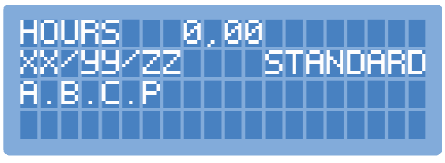
The first line shows the current position of the cable (in millimeters) as to the neutral position.

The second line shows the position required for the cable (in millimeters) as to the neutral position.
The position of the mechanical cable may differ from the target value because of possible clearance on the mechanical cables or stickings of the cable itself.
If the difference is higher than 1.5mm, the system generates an alarm signalling that the target position has been not reached.

The third line displays the supply voltage on the mechanical actuator.
If the voltage detected is lower than 12V when the engine is on, check the batteries and the alternator.

The fourth line displays the current absorbed by the mechanical actuator.
The value of the current absorbed by the mechanical actuator helps to understand if the mechanical cables are free or have some stickings .
Generally the current absorbed by the mechanical actuator to shift a mechanical cable is not higher than continuous 10A (absorption peaks are allowed).

By pressing key DOWN on the navigation switch, the remaining menu of the port shift is displayed:



ENGLISH

The first line displays the system operating time in hours and hundredths of an hour.

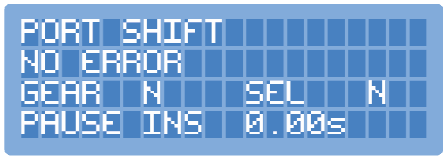
The second line displays the software loading date according to the scheme month/day/year.

The third line displays the software version.
A, B, C are decimal numbers.

Electric shift

Even if the shift unit can control two shifts, the diagnostics page of each shift are separated.

The diagnostics page is displayed as follows:



The first line shows which shift is subject to diagnosis: the port shift, in case of twin-engine system or the only one in case of single-engine system.

The second line shows if there are some errors (**FAULT ACTIVE**), in that case the error can be selected and analyzed. Refer to troubleshooting (chapter 9) to analyze the fault.

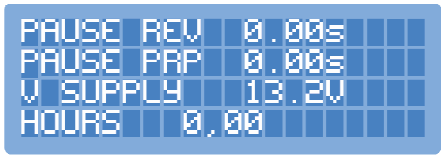
The third line displays:

the current position of the shift, on the left, next to GEAR:
N Neutral
W Neutral with warm-up
F Ahead movement
R Astern movement
ER Error: fault on the shift,

the current position of the lever, on the right, next to SEL:
N Neutral
W Neutral with warm-up mode
F Ahead movement
R Astern movement
ER Error: fault on the shift

The fourth line displays the current value of the shifting pause (time spending from the gear shifting and the acceleration) in seconds and hundredths of a second.

By pressing key DOWN on the navigation switch, the remaining menu of the port shift is displayed:



The first line shows the current value of the shifting pause in seconds and hundredths of a second.

The second line displays the current value of the proportional pause in seconds and hundredths of a second.

The third line displays the supply voltage on the mechanical actuator.
If the voltage detected is lowered than 12V, when the engine is on, check the batteries and the alternator.

The fourth line displays the operating time in hours and hundredths of an hour.

By pressing key DOWN on the navigation switch, the remaining menu of the port shift is displayed:

The first line displays the software loading data according to the scheme month/day/year.

The second lines displays the software version.
A, B, C are decimal numbers.

7.6 Diagnostics page of starboard shift (twin-engine systems)

The diagnostics page of starboard shift for the single-engine systems is displayed as follows:

The diagnostics page of starboard shift for the twin-engine systems is similar to the port shift one.

7.7 Diagnostics page of the port throttle (port throttle or single-engine)

The diagnostics page of the port throttle changes according to the type of throttle (mechanical, analog or digital electronic) installed in the system.

Electronic voltage throttle

The diagnostics page is displayed as follows:

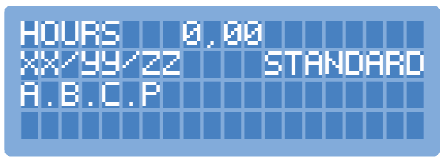
The first line displays which throttle is subject to diagnosis: the port throttle in case of twin-engine system or the only one in case of single-engine system.

The second line displays if there are some errors (**FAULT ACTIVE**), in that case, the error can be selected and analyzed. Refer to troubleshooting (chapter 9) to analyze the fault.

The third line displays no messages or displays:
HI If High Idle function is enabled;
DOCK If Docking function is enabled;
SYNC If Autosync function is enabled

The fourth line displays:
- the output voltage on the throttle in Volt and hundredths of a Volt, on the left, next to OUT
- the Idle Validation Switch value (0 open, 1 closed), on the right, next to IVS.

By pressing key DOWN on the navigation switch, the remaining menu of the port throttle is displayed:



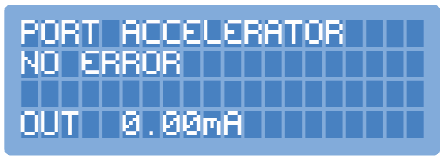
The first line displays the operating time in hours and hundredths of an hour.

The second line displays the software loading date according to the scheme month/day/year.

The third line displays the software version.
A, B, C are decimal numbers.

Electronic current throttle

The diagnostics page is displayed as follows:



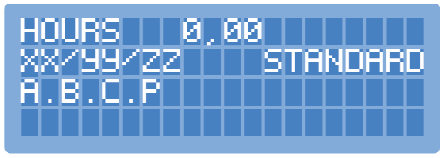
The first line shows which throttle is subject to diagnosis: the port throttle in case of twin-engine system or the only one in case of single-engine system.

The second line shows if there are some errors (**FAULT ACTIVE**), in that case the error can be selected and analyzed. Refer to troubleshooting (chapter 9) to analyze the fault.

The third line displays no messages or displays:
HI If High Idle function is enabled;
DOCK If Docking function is enabled;
SYNC If Autosync function is enabled

The fourth line displays:
the output currrent value on the throttle in mA and hundredths of a mA, next to OUT,

By pressing key DOWN on the navigation switch, the remaining menu of the port throttle is displayed:



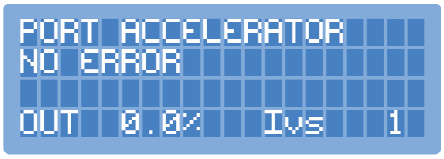
The first line displays the system operating time in hours and hundredths of an hour.

The second line displays the software loading date according to the scheme month/day/year.

The third line displays the software version.
A, B, C are decimal numbers.

PWM electronic throttle

The diagnostics page is displayed as follows:



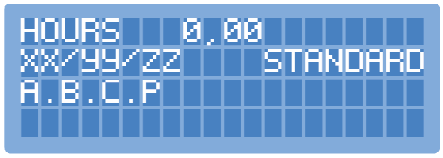
The first line shows which throttle is subject to diagnosis: the port throttle in case of twin-engine system or the only one in case of single-engine system.

The second line shows if there are some errors (**FAULT ACTIVE**), in that case the error can be selected and analyzed. Refer to troubleshooting (chapter 9) to analyze the fault.

The third line displays no messages or displays:
HI If High Idle function is enabled;
DOCK If Docking function is enabled;
SYNC If Autosync function is enabled

The fourth line displays:
- the output PWM value on the throttle in percentage and tenths of a percentage, on the left, next to OUT,
- the Idle Validation Switch value (0 open, 1 closed), on the right, next to IVS.

By pressing key DOWN on the navigation switch, the remaining menu of the port throttle is displayed:



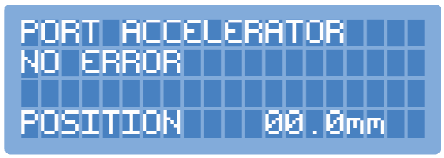
The first line displays the system operating time in hours and hundredths of an hour.

The second line displays the software loading date according to the scheme month/day/year.

The third line displays the software version.
A, B, C are decimal numbers.

Mechanical throttle

The diagnostics page is displayed as follows:



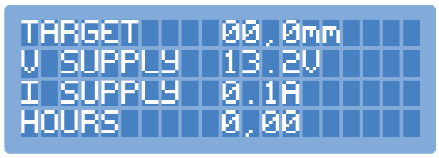
The first line shows which throttle is subject to diagnosis: the port throttle in case of twin-engine system or the only one in case of single-engine system.

The second line shows if there are some errors (**FAULT ACTIVE**), in that case the error can be selected and analyzed. Refer to troubleshooting (chapter 9) to analyze the fault.

The third line displays no messages or displays:
HI If High Idle function is enabled;
DOCK If Docking function is enabled;
SYNC If Autosync function is enabled

The fourth line displays. next to POSITION, the current position of the mechanical cable (in millimeters and tenths of a millimeter) as to the idle position.

By pressing key DOWN on the navigation switch, the remaining menu of the port throttle is displayed:



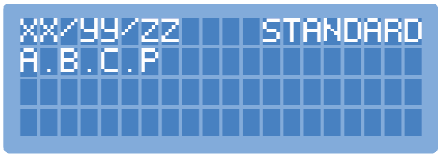
The first line (TARGET) displays the position required for the cable (in millimeters ot tenths of millimeter) as to the idle position.
The position of the mechanical cable may differ from the target value because of clearance of the mechanical cables or sticking of the cable itself.
If the difference is higher than 1.5mm, the system generates an alarm signalling that the target position has been not reached.

The second line displays the supply voltage on the mechanical actuator.
If the voltage detected is lower than 12V when the engine is on, check the batteries and the alternator.

The third line displays the current absorbed by the mechanical actuator.
The current absorbed by the mechanical actuator helps to understand if the mechanical cables are free or have some stickings.
Generally the current absorbed by the mechanical actuator to shift a mechanical cable is not higher than continuous 10A (absorption peaks are allowed).

The fourth line displays the system operating time in hours and hundredths of an hour.

By pressing key DOWN on the navigation switch, the remaining menu of the port throttle is displayed:



The first line displays the software loading date according to the scheme month/day/year.

The second line displays the software version.
A, B, C are decimal numbers.

7.8 Diagnostics page of stbd throttle (starboard throttle)

The diagnostics page of the starboard throttle in single-engine systems is displayed as follows:

The diagnostics page of starboard throttle in twin-engine systems is similar to the one of the port throttle.

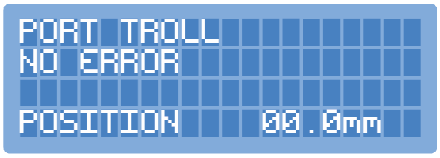
7.9 Diagnostics page of the port troll (port troll)

If the system is not provided with a trolling valve, the diagnostics page is displayed as follows:

The page is different according to the type of trolling valve installed in the system:

Mechanical trolling valve

The diagnostics page is displayed as follows:

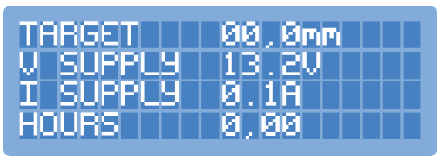


The first line shows which trolling valve is subject to diagnosis: the port trolling valve in case of twin-engine system or the only one in case of single-engine system.

The second line shows if there are some errors (**FAULT ACTIVE**), in that case the error can be selected and analyzed. Refer to troubleshooting (chapter 9) to analyze the fault.

The third line displays, next to POSITION, the current position of the mechanical cable (in millimteres and tenths of a millimeter mm) as to the troll disabled.

By pressing key DOWN on the navigation switch, the remaining menu of the port troll is displayed:



ENGLISH

The first line displays the position required for the cable (in millimeters and tenths of a millimeter) as to the troll disabled.
The position of the mechanical cable may differ from the target value because of clearance on the mechanical cables or stickings of the cable itself.
If the difference is higher than 1.5mm, the system generates an alarm signalling that the target position has been not reached.

The second line displays the supply voltage on the mechanical actuator.
If the voltage detected is lower than 12V when the engine is on, check the batteries and the alternator.

The third line displays the current absorbed by the mechanical actuator.
The current absorbed by the mechanical actuator helps to understand, if the mechanical cables are free or have some stickings.
Generally the current absorbed by the mechanical actuator to shift a mechanical cable is not higher than continuous 10A (absorption peaks are allowed).

The fourth line displays the system operating time in hours and hunderdths of an hour.

By pressing key DOWN on the navigation switch, the remaining menu of the port troll is displayed:

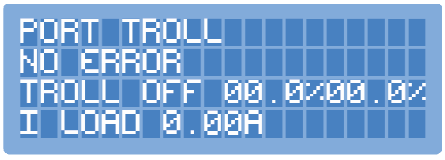
The first line displays the software loading date according to the scheme month/day/year.

The second line displays the software version.
A, B, C are decimal numbers.

Electric troll

Even the shift unit can control two trolling valves, the diagnostics page of each troll are separated.

The diagnostics page is displayed as follows:



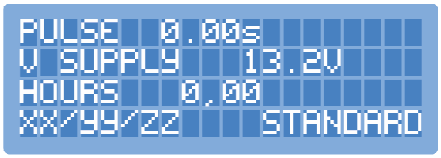
The first line shows which troll is subject to diagnosis: the port troll in case of twin-engine system or the only one in case of single-engine system.

The second line shows if there are some errors (**FAULT ACTIVE**), in that case the error can be selected and analyzed. Refer to troubleshooting (chapter 9) to analyze the fault.

The third line displays:
- the current condition of the troll, on the left, next to TROLL:
  ON enabled
  OFF disabled
- the current troll percentage in the center: 0% stands for minimum troll operation (troll maximum speed) and 100% stands for maximum troll operation (troll minimum speed).
- the troll percentage required according to the lever angle in the center: 0% stands for minimum troll operation (lever at idle) and 100% stands for maximum troll operation (lever at maximum).

The fourth line displays the current value in Ampere and hundredths of a Ampere absorbed by the troll proportional solenoid.

By pressing the key DOWN on the navigation switch, the remaining menu of the port troll is displayed:



The first line displays the current value of the troll pulse duration in seconds and hundredths of a second.

The second line displays the supply voltage on the shift unit.
If the voltage detected is lower than 12V, when the engine is on, check the batteries and the alternator.

The third line displays the system operating time in hours and hundredths of an hour.

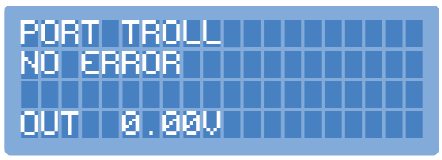
The fourth line displays the software loading date according to the scheme month/day/year.

By pressing key DOWN on the navigation switch, the remaining menu of the port troll is displayed

The line displays the software version.
A, B, C are decimal numbers.

Electronic voltage troll

The diagnostics page is displayed as follows:

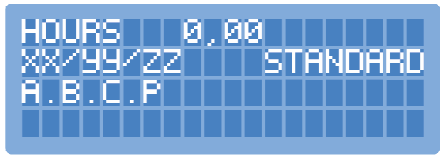


The first line displays which troll is subject to diagnosis: the port troll in case of twin-engine system or the only one in case of single-engine system.

The second line shows if there are some errors (**FAULT ACTIVE**), in that case the error must be selected and analyzed. Refer to troubleshooting (chapter 9) to analyze the fault.

The third line displays next to OUT, the output voltage value on the throttle in Volt and hundredths of a Volt.

By pressing key DOWN on the navigation switch, the remaining menu of the port troll is displayed:



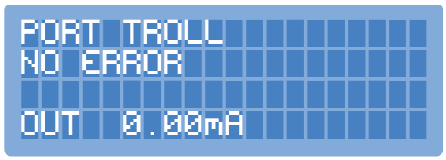
The first line displays the system operating time in hours and hundredths of an hour.

The second line displays the software loading date according to the scheme month/day/year.

The third line displays the sotware version.
A, B, C are decimal numbers.

Electronic current troll

The diagnostics page is displayed as follows:

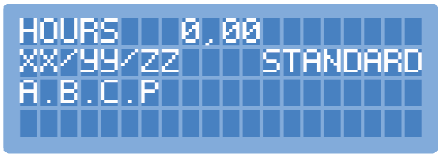


The first line shows which troll is subject to diagnosis: the port troll in case of twin-engine system or the only one in case of single-engine system.

The second line shows, if there are some errors (**FAULT ACTIVE**), in that case the error must be selected and analyzed. Refer to troubleshooting (chapter 9) to analyze the fault.

The third line displays:
next to OUT, the output current value on troll in mA and hundredths of a mA.

By pressing key DOWN on the navigation switch, the remaining menu of the port troll is displayed:



The first line displays the system operating time in hours and hunderdths of an hour.

The second line displays the software loading date according to the scheme month/day/year.

The third line displays the software version.
A, B, C are decimal numbers.

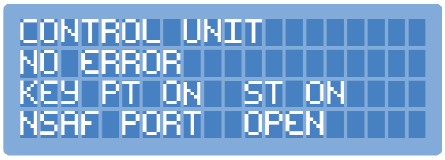
7.10 Diagnostics page of stbd troll (starboard troll)

The diagnostics page of the starboard troll in single-engine systems is displayed as follows:

The diagnostics page of the starboard troll in twin-engine systems is similar to the one of the port troll.

7.11 Diagnostics page of the control unit

The diagnostics page of the control unit is displayed as follows:



The first line shows that the control unit is subject to diagnosis.

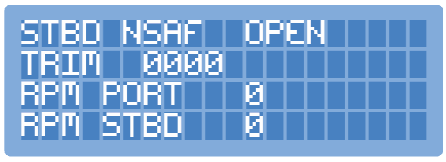
The second line shows if there are some errors (**FAULT ACTIVE**), in that case the error can be selected and analyzed. Refer to troubleshooting (chapter 9) to analyze the fault.

The third line displays:
- the condition of the single-engine or port engine key (**ON** or **OFF**), on the left
- the condition of the starboard engine key (**ON** or **OFF**), on the right

In case of single-engine systems, the third line is displayed as follows:

The fourth line displays the condition of the single-engine or port start inhibition switch (**OPEN** or **CLOSED**)

By pressing key DOWN on the navigation switch, the remaining menu of control unit is displayed:



The first line displays the condition of the starboard start inhibition switch (**OPEN** or **CLOSED**). In the single-engine systems, the line is always displayed as follows:

The second line allows the trim control on the control unit to be checked, therefore by pressing one of the four keys located on the port lever, the respective character changes from value "0" to value "C" according to the following scheme:

Single-engine systems

- by pressing key TRIM UP only, the line is displayed as follows:

- by pressing key TRIM DOWN only, the line is displayed as follows:

Twin-engine systems

- by pressing key TRIM UP only of the port engine, the line is displayed as follows:

- by pressing key TRIM DOWN of port engine only, the line is displayed as follows:

- by pressing key TRIM UP of sternboard engine only, the line is displayed as follows:

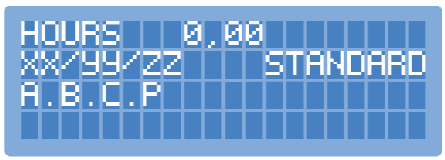
- by pressing key TRIM DOWN of sternboard engine only, the line is displayed as follows:

By pressing a combination of keys, a combination of the previous messages is displayed.

The third line displays the number of revolution of the port engine in pulses.
The installer can count the right number of revolution by multiplying the number of pulses read by the number of polar couple of the alternator or by the adaptation factor (No. of pulses per engine revolution) given by the sensor used to detect the engine revolutions.
If the engine revolution cable is not connected to the system, the line is displayed as follows:

The fourth line displays the number of revolutions of starboard engine in pulses.
The installer can count the right number of revolutions by multiplying the number of pulses read by the number of polar couple of the alternator or by the adaptation factor (No. of pulses per engine revolution) given by the sensor used to detect the engine revolutions.
If the engine revolution cable has been not connected to the system, the line is always displayed as follows:

By pressing key DOWN on the navigation switch, the remaining menu of control unit is displayed as follows:



The first line displays the system operating time in hours and hundredths of an hour.

The second line displays the software loading date according to the scheme month/day/year.

The third line displays the software version.
A, B, C are decimal numbers.

7.12 General operating tests

Even if the diagnostics reading has pointed out no troubles, a general operating test of the system just installed on the boat must be carried out.
A series of actions to be carried out to check the correct operation of the system is described below.

⚠ WARNING

Before carrying out the general operating test, read carefully the owner manual in order to understand well how the required actions are to be performed.

⚠ WARNING

To perform some tests it is necessary to start the engines, to put into gear, to accelerate the engines and to use a trolling valve (if present).

⚠ WARNING

If the tests are carried out when the boat is outside the water, use suitable means to avoid any contacts with the engines enabled.

⚠ WARNING

A check box is located next to each test to be performed. We suggest to you to mark the tests that have been already done.

At the end of the check, possible malfunctions or faults might be solved by reading the troubleshooting.

Single-engine system:

1 ❑ When the system is on, enable the board key and check that the port station enabling LED blinks and the acoustic signalling is audible.

2 ❑ Enable the station (press key CTRL with the lever in neutral position) and check that the station is enabled and no faults are signalled.

3 ❑ Enable the warm-up mode (press key WARM with the lever in neutral position) and check that the mode is enabled. Disable the warm-up mode.

4 ❑ Enable the high idle mode (press key HIGH IDLE) and check that the mode is enabled. Disable the high idle mode.

5 ❑ Enable the docking mode (press key SYNC for a long time) and check that the mode is enabled. Disable the docking mode.

6 ❑ If the system is provided with a trolling valve: enable the troll mode (press key HIGH IDLE for a long time) and check that the mode is enabled. Disable the troll mode.

7 ❑ Change the board brightness (press key WARM for a long time) until the brightness desired has been reached.

8 ❑ Press trim keys and check their right operation.

9 ❑ If the system is provided with more than a control station, disable the first station and repeat the actions from point 2 to point 8 for each additional station.

10 ❑ Enable a control station, then enable the warm-up mode and move the lever to forward position while leaving the throttle at idle: try to start the engine. The test is passed, if the engine does NOT start.

11 ❑ Move the lever to neutral position, disable the warm-up mode and start the engine. Now the engine has to start. Check that the engine revolution are at idle and that the shift is in neutral position.

12 ❑ Enabled the warm-up mode and the high idle mode and check that the number of engine revolutions set is correct when the engine is on.

13 ❑ In warm-up mode, disable the high idle mode and accelerate the engine by means of the lever. Check that the engine reaches the maximum number of revolutions when the lever has been completely moved to forward position (the value referring to the maximum number of revolutions is contained in the engine instructions).

14 ❑ Always in warm-up mode, move the lever to idle and check that the engine turns at idle.

15 ❑ Always in warm-up mode, act on the lever and check that the acceleration curve set is suitable for the features of the engine.

16 ❑ Always in warm-up mode, act on the lever by gradually increasing the lever angle and check that also the number of revolutions of the engine are increased gradually until the maximum number of revolutions allowed are reached.

17 ❑ Always in warm-up mode, repeat this action by moving again the lever to idle and then to neutral position.

18 ❑ Disable the warm-up mode and put into the forward gear. Check that the gear is really shifted.

19 ❑ Move to neutral position and check that the gear has not been shifted.

20 ❑ Put into the reverse gear and check that the gear is really shifted.

21 ❑ Move to neutral position and check that the gear has not been shifted.

<u>If the system is provided with a trolling valve:</u>

22 ❑ By keeping the lever in neutral position, enable the troll mode and check that is has been really enabled.

23 ❑ Always in troll mode, put into forward movement and check that the propeller revolutions are at idle set.

24 ❑ Always in troll mode, use the lever to increase its angle up to the troll lever angle end. Check that the prepeller has the number of revolutions that it would have at idle without the troll mode enabled (this value can be found in the engine instructions).

25 ❑ Always in troll mode, move the lever at idle and check that the number of propeller revolutions reaches the desired idle speed.

26 ❑ Always in troll mode, act gradually on the lever angle and check that also the propeller revolutions increase gradually, until the maximum number of revolutions allowed in troll mode is reached.

27 ❑ Always in troll mode, repeat the action by moving the lever to idle and then to neutral position.

Twin-engine systems:

1 ❑ When the system is on, enable the board key of the port engine and check that the port station enabling LED blinks and the acoustic signalling is audible.

2 ❑ Enable the board key of the starboard engine and check that the starboard station enabling LED blinks and the acoustic signalling is audible.

3 ❑ Enable the station (press key CTRL with the levers in neutral position) and check that the station is enabled on both sides and that no faults are signalled.

4 ❑ Enable the warm-up mode (press key WARM with the levers in neutral position) and check that the mode is enabled on both sides. Disable the warm-up mode.

5 ❑ Enable the high idle mode (press key HIGH IDLE) and check that the mode is enabled on both sides. Disable the high idle mode.

6 ❑ Enable the docking mode (press key SYNC for a long time) and check that this mode is enabled on both sides. Disable the docking mode.

7 ❑ Enable the autosync mode (press key SYNC) and check that the mode is enabled. Disable the autosync mode.

8 ❑ If the system is provided with a trolling valve: enable the troll mode (press key HIGH IDLE for a long time) and check that the mode is enabled on both sides. Disable the troll mode.

9 ❑ Change the brightness of the board (press key WARM for a long time) until the brightness desired has been reached.

10 ❑ Press the trim keys and check their operation.

11 ❑ If the system is provided with more than a control station, repeat the actions from point 3 to pont 10 for each additional station.

12 ❑ Enable a control station, then enable the warm-up mode and move the levers to forward position while leaving the throttles at idle: try to start the engines. The test is passed, if the engines do NOT start

13 ❑ Move the levers back to neutral position, disable the warm-up mode and start the engines. Now the engines have to start. Check that the engine revolutions are at idle and the shifts are in neutral position.

14 ❑ Always in warm-up mode, enable the high idle mode and check that the number of the engine revolutions set are correct when the engines are on.

15 ❑ Always in warm-up mode, disable the high idle mode and accelerate the engines by means of the levers. Check that when the lever is in forward position, the engines reach really the maximum number of revolutions (this value can be found on the engine instructions).

16 ❑ Always in warm-up mode, move the levers at idle and check that also the engines turn really at idle speed.

17 ❑ Always in warm-up mode, act on the levers and check that the acceleration curve set is suitable for the features of the engines.

18 ❑ Always in warm-up mode act on the levers by increasing gradually their angle and check that the engines increase gradually the number of revolutions, until the maximum number of revolutions allowed is reached.

19 ❑ Always in warm-up mode, repeat the action by moving the levers back to idle and then to neutral position.

20 ❑ Always in warm-up mode, enable the autosync mode and check its operation by observing the boat speed indicator. We recommend performing this test with the boat on the sea. Disable the autosync mode.

21 ❑ Disable the warm-up mode and put into forward gear after checking that the gears are really shifted.

22 ❑ Move back to neutral position and check that the gears are no longer shifted.

23 ❑ Put into reverse gear after checking that the gears are really shifted.

24 ❑ Move back to neutral position and check that the gears are no longer shifted.

<u>If the system is provided with trolling valves:</u>

25 ❑ By keeping the levers in neutral position, enable the troll mode by checking that it has been enabled on both sides.

26 ❑ Always in troll mode, put into forward gear and check that the propellers turn at the idle speed set.

27 ❑ Always in troll mode, use the levers to increase their angles up to the troll lever angle end. Check that the prepellers have the number of revolutions that they would have at idle without the troll mode enabled (this value can be found in the engine instructions)

28 ❑ Always in troll mode, move the levers to idle and check that the number of propeller revolutions reach the idle speed set.

29 ❑ Always in troll mode, act on the levers thus increasing gradually their angle and check that also the number of the propeller revolutions increases gradually, until the maximum number of revolutions allowed in troll mode is reached.

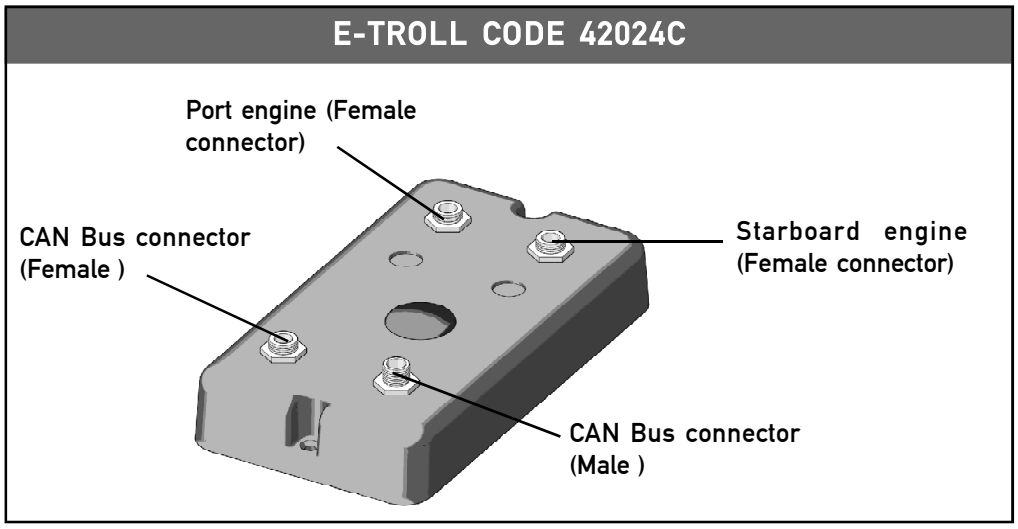
30 ❑ Always in troll mode, repeat the action by moving the levers to idle and then to neutral position.

8 TROLL

8.1 Description of the troll components

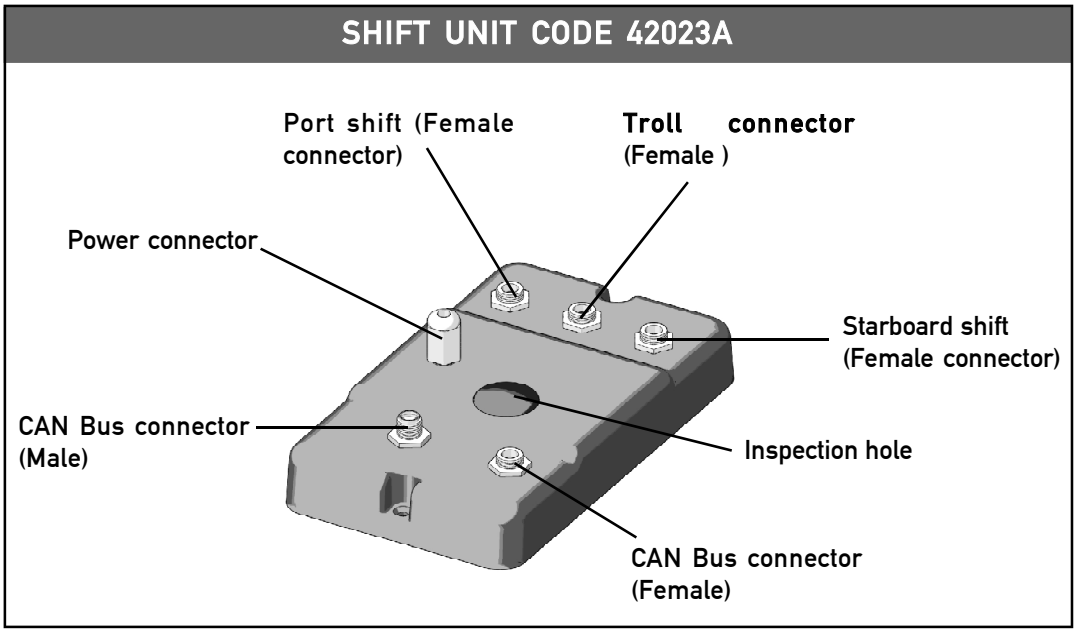
8.1.1 Troll with electronic interface

The troll unit for trolling valve with electronic interface (0-5V, 4-20mA) is available in standard version:
E-troll CODE 42024C
For other version, please contact **ULTRAFLEX** .



8.1.2 Troll with electric interface

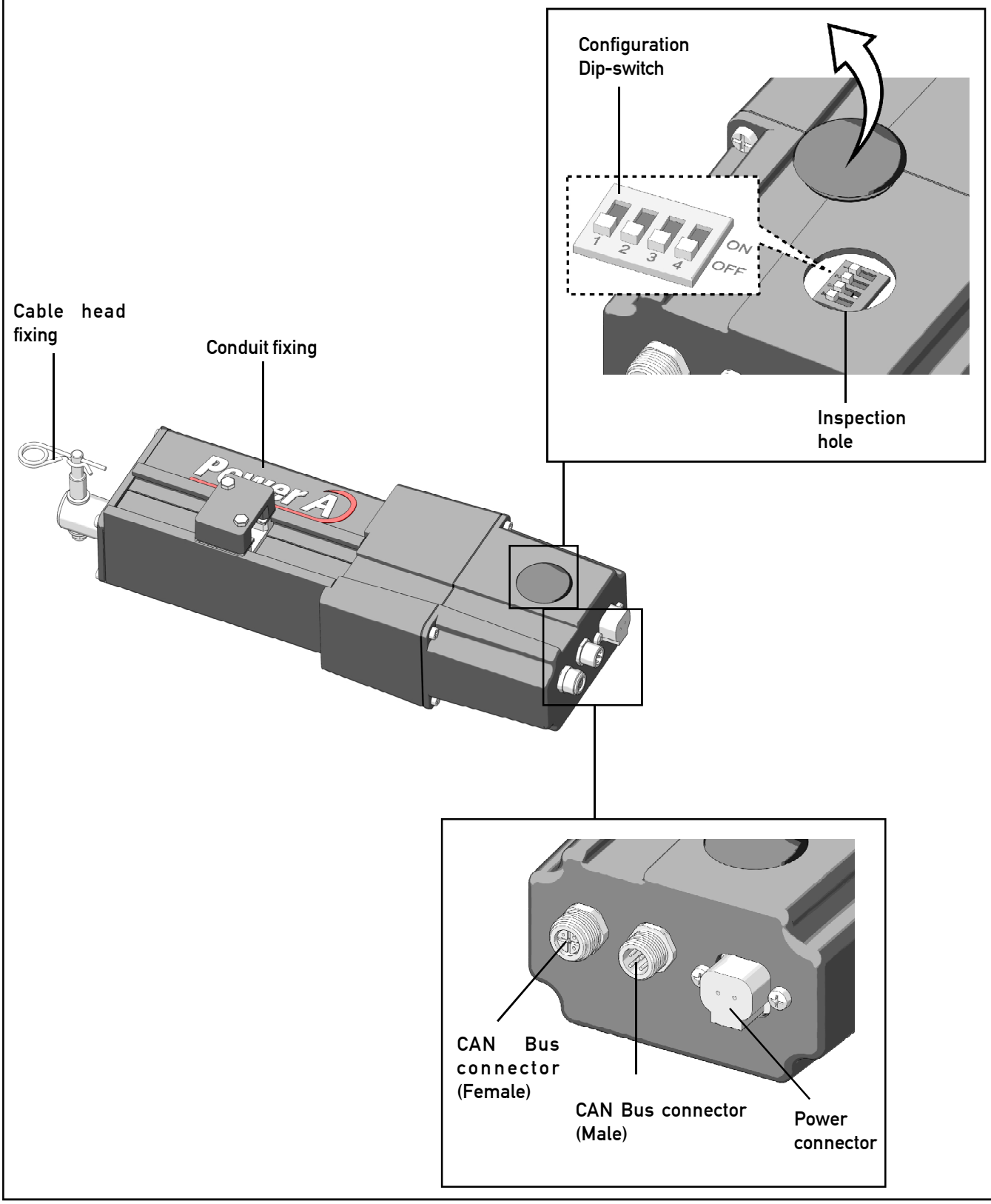
For trolling valve with electric interface (proportional solenoid valves) the following shift unit is used:
Shift Unit CODE 42023A
For other versions, please contact **ULTRAFLEX** .



8.1.3 Mechanical troll

For mechanical trolling valve, the standard mechanical actuator is used.
Mechanical actuator CODE 42027J

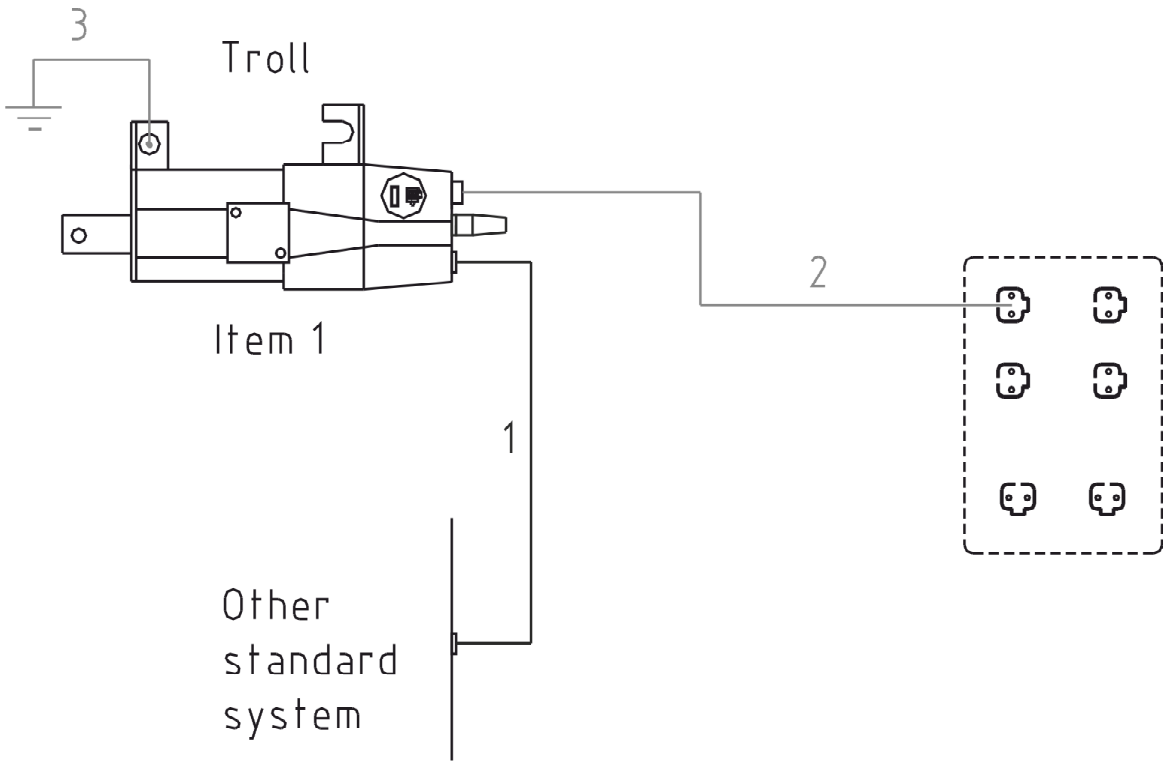
MECHANICAL ACTUATOR CODE 42027J

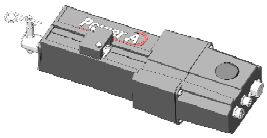
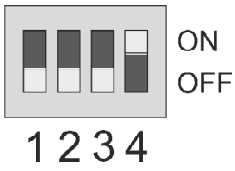


8.2 Installation

8.2.1 Mechanical troll

8.2.1.1 Single-engine system

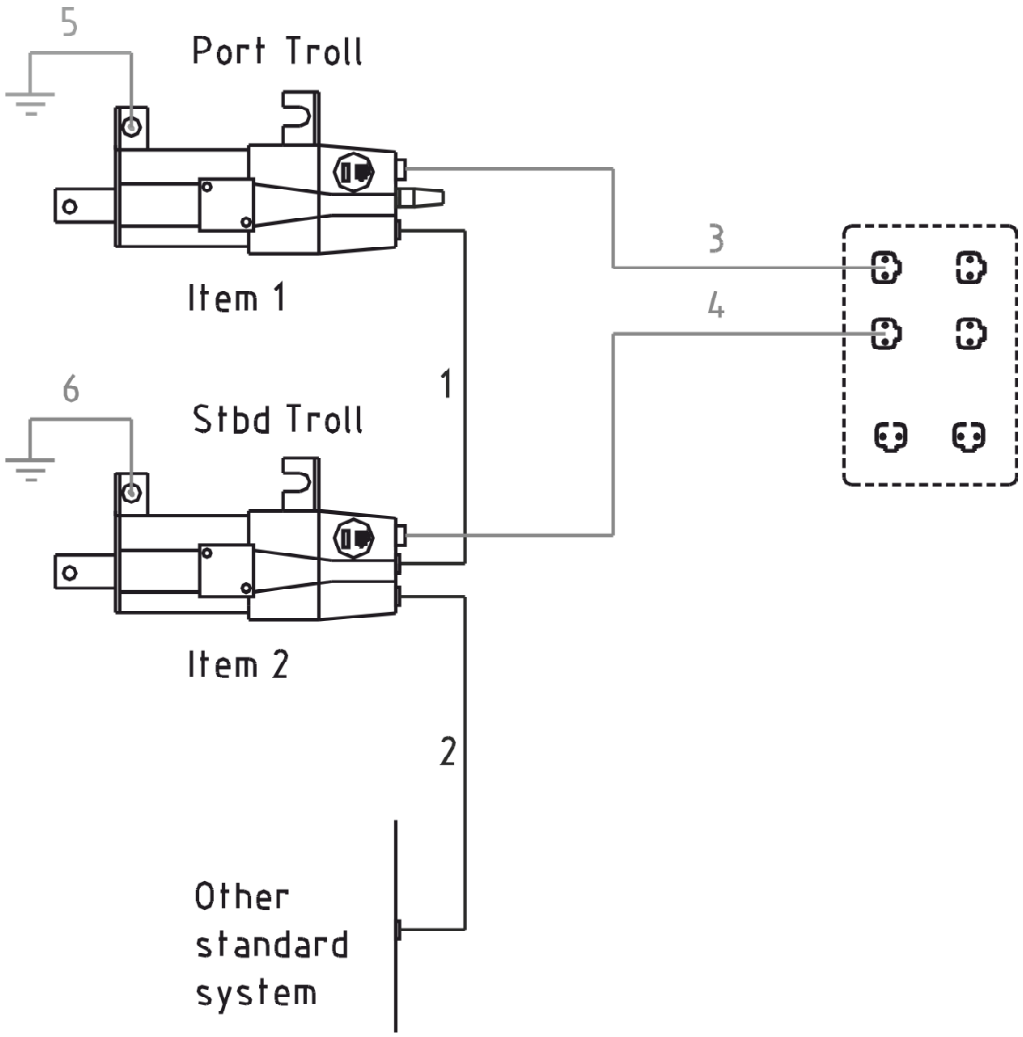


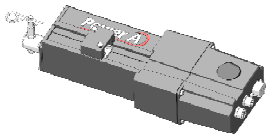
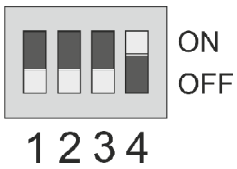
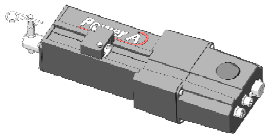
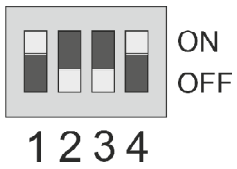
Item	Description	Figure	Dip-switch
1	Mechanical actuator		

Wiring:

Connection	Description	Reference
1	Cable CAN	5.4
2	Power extension cables	5.1
3	Ground connecting cable	5.3

8.2.1.2 Twin-engine system



Item	Description	Figure	Dip-switch
1	Mechanical actuator (port shift)		
2	Mechanical actuator (stbd shift)		

Cablaggi: (wiring)

Connection	Description	Reference
1,2	Cable CAN	5.4
3,4	Power extension cables	5.1
5,6	Ground connecting cable	5.3

⚠ WARNING

If the power unit is provided with no free connectors for the connection of supply cable extensions, use another power unit by connecting it as decribed in section 8.3.

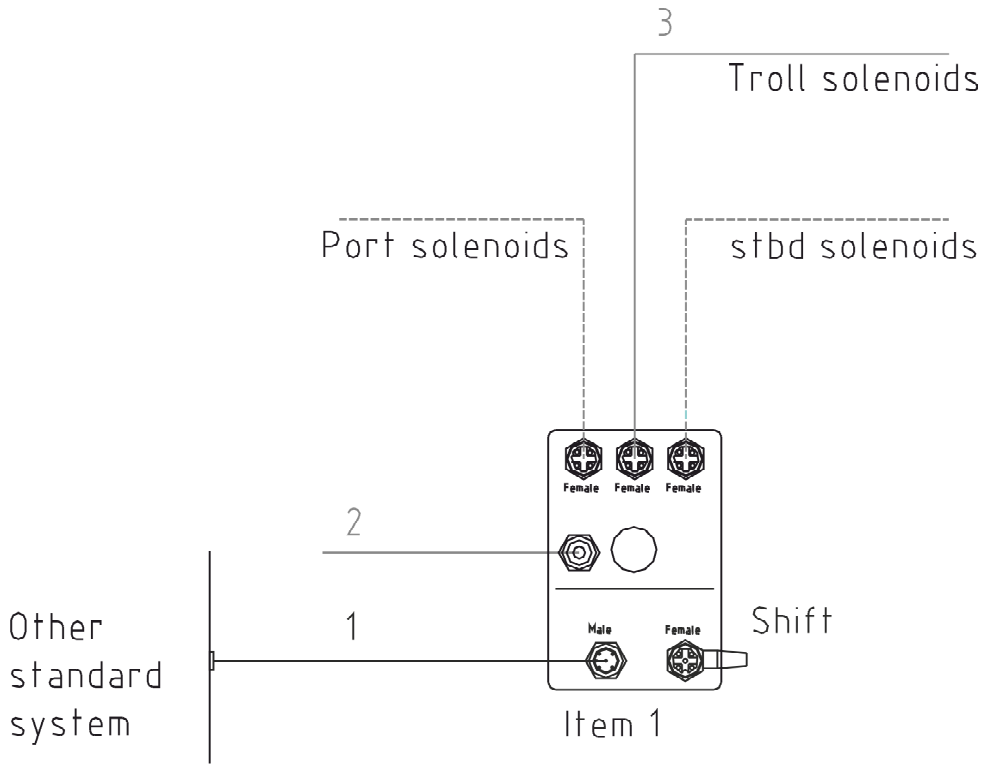
8.2.2 Electric troll

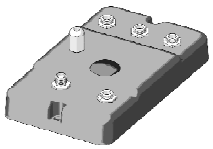
8.2.2.1 System with solenoid valve shift (single and twin-engine)

In the system is already provided with a shift unit to interface with the shift solenoid valves: add only the troll cable to controll the trolling valve (for the wiring refer to section 3).

The cable used with the electric troll interfaces with to engines therefore it is the only one both for single-engine and twin-engine systems.

8.2.2.2 System with mechanical shift (single and twin-engine)



Item	Description	Figure	Dip-switch
1	Shift unit		-

Wiring:

Connection	Description	Reference
1	Cable CAN	5.4
2	Power extension cables	5.1
3	Ground connecting cable	5.3

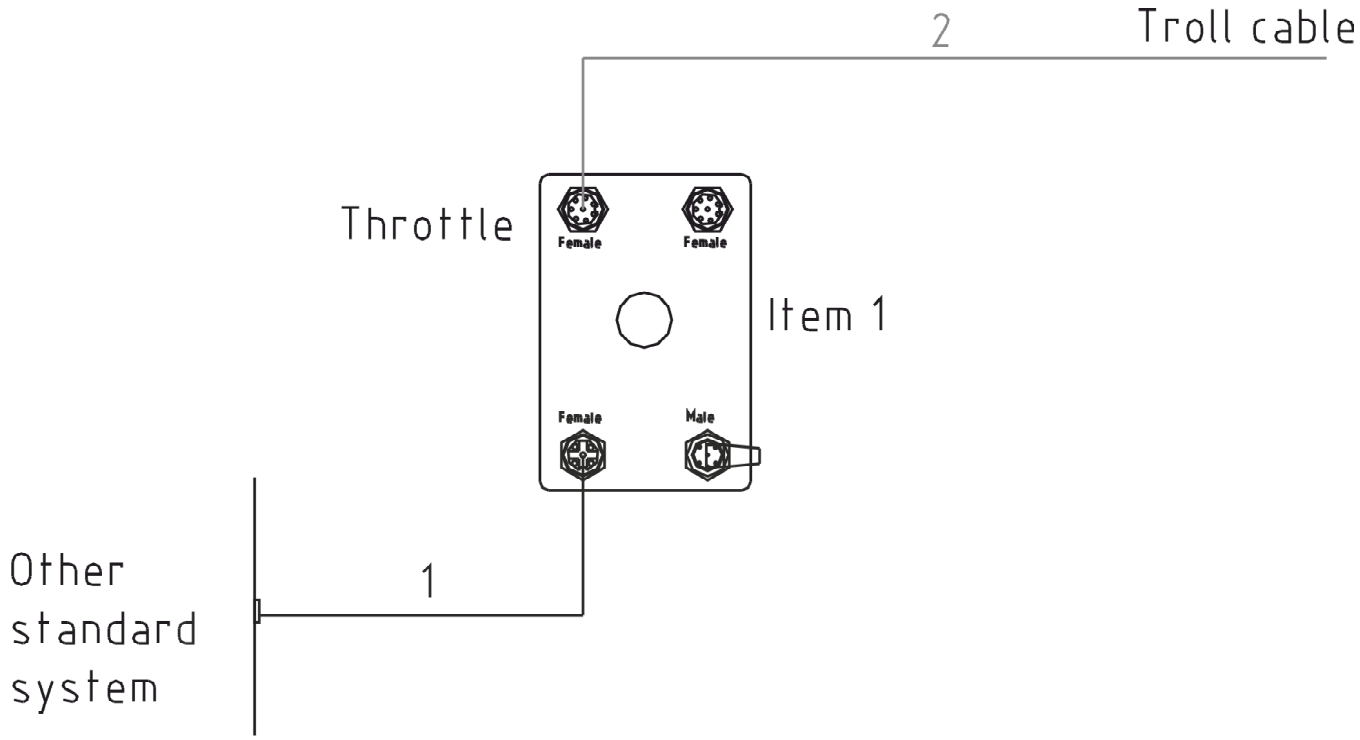
The cable used with the electric troll interfaces with 2 engines, therefore it is the only one both for single-engine and twin-engine systems

⚠ WARNING

If the power unit is provided with no more free connectors for the connection of the supply cable extensions, please use another power unit by connecting it as described in section 8.3.

8.2.3 Electronic troll

8.2.3.1 Single-engine system

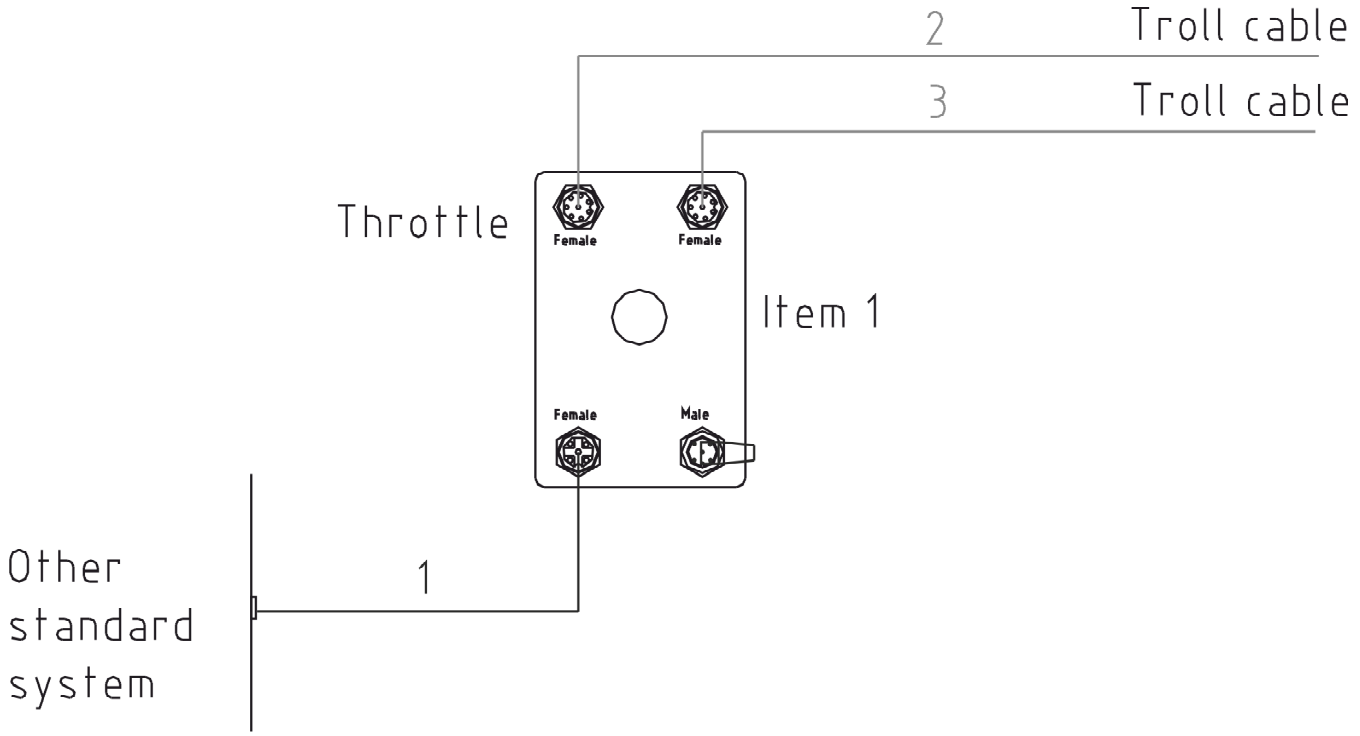


Item	Description	Figure	Dip-switch
1	E-Troll unit		-

Wiring:

Connection	Description	Reference
1	Cables CAN	5.4
2	Troll electric cables	8.3

8.2.3.2 Twin-engine system



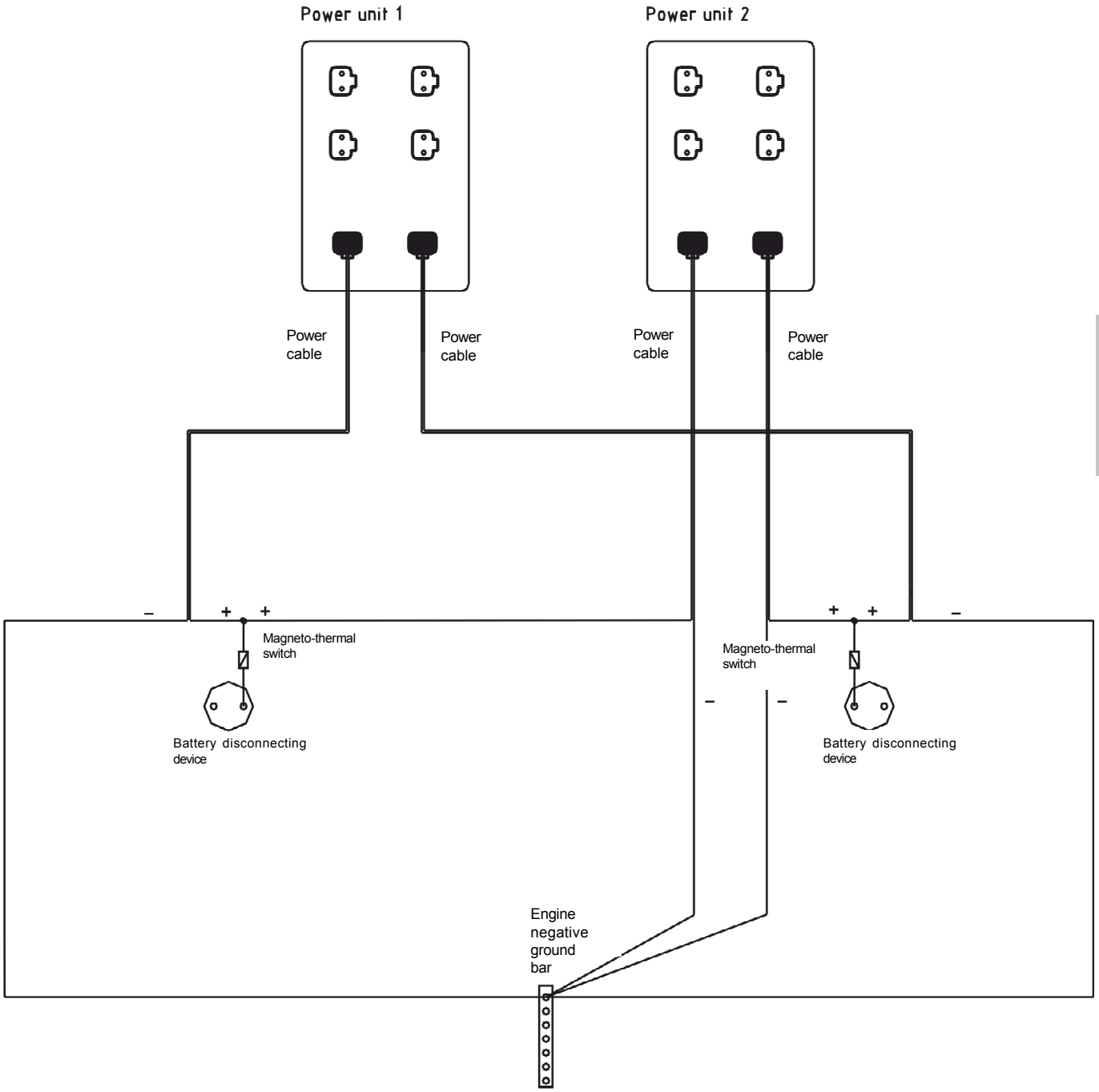
Item	Description	Figure	Dip-switch
1	E-Troll unit		-

Wiring:

Connection	Description	Reference
1	Cables CAN	5.4
2,3	Troll electric cables	8.3

8.3 System wiring

If there are no available outlets on the power unit, install another power unit as shown in the picture below.

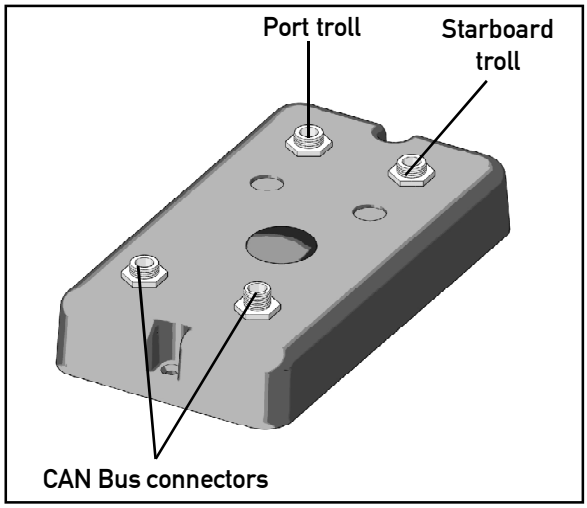


To wire the troll system, refer to what described in section 5 concerning the laying of the electric cables.

In case of mechanical troll, to lay the electric cables of the mechanical actuator, the communication cable and the supply cable, refer to section 5.
For the mechanical cable, please refer to section 6, in which the the operation to connect the cables to the actuator are described.

8.3.1 Connection of the cables for electronic trolling valve with analog voltage interface

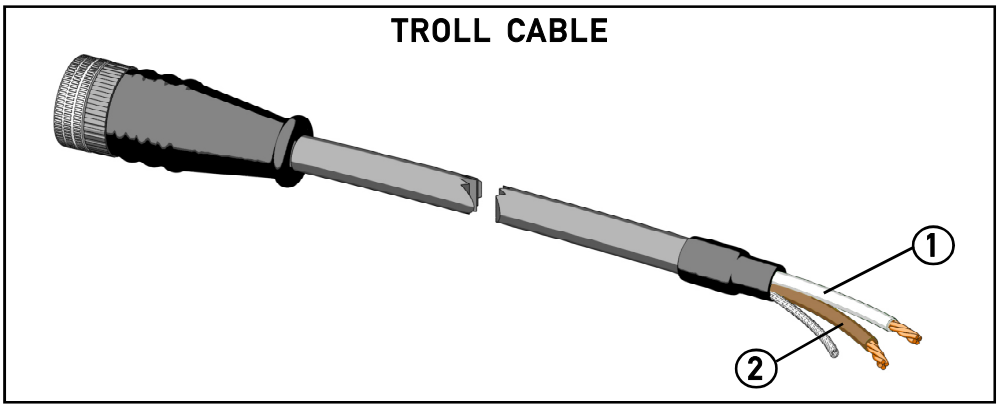
The trolling valves whose throttle interface is provided with a continuous voltage input in a range between 0 and 5 Volt belong to this category.
The already preassembled end of the throttle cables must be connected to the E-troll into the porper connector as shown in the figure below:



In case of single-engine system, connect the troll cable to the connector at the top on the left.
In case of twin-engine system, connect the port troll cable to the connector at the top on the left and the starboard troll cable to the connector at the top on the right.

The diagram of the troll cables is shown in the table below:

Position on connector	Colour	Description	Abbreviation
1	White	Negative wire	GND
2	Brown	Positive wire	V



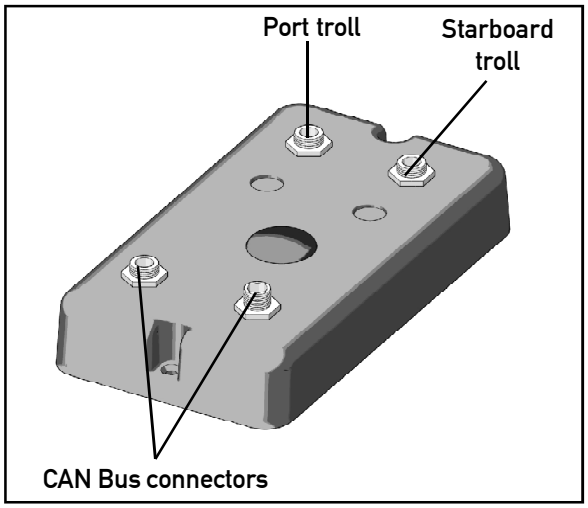
A non-insulated wire directly connected to the cable shielding (drain wire) is supplied with the troll cables.This wire is useful, if the cable shield must be connected while installing, in oder to improve its insenitivity to electromagnetic interferences.
While laying the cable, follow the recommendations listed at the beginning of chapter 5 (system wiring).

⚠ WARNING

No kind of extension cable can be applied on the throttle cable.

8.3.2 Connection of the cables for electronic trolling valve with analog current interface

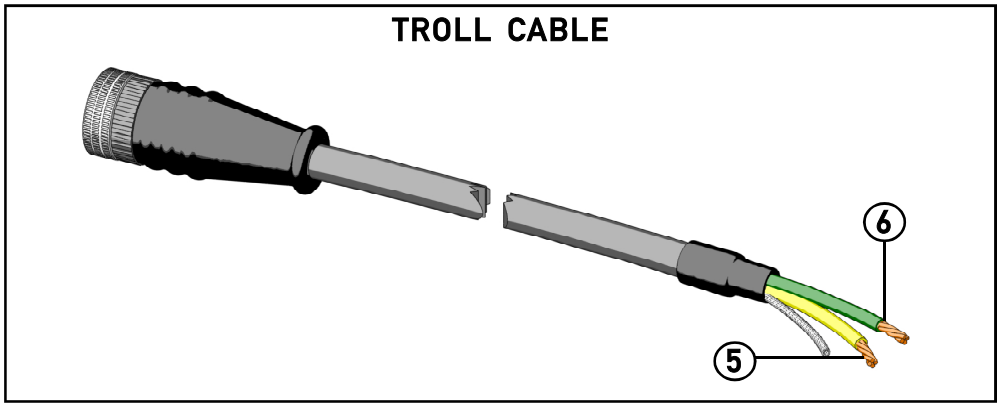
The trolling valves whose throttle interface is provided with a continuous current input in a range between 4 and 20 mA belong to this category.
The already preassembled end of the throttle cables must be connected to the E-troll into the proper connector as descibed in the figure below:



In case of single-engine system, connect the troll cable to the connector at the top on the left.
In case of twin-engine system, connect the port troll cable at the top on the left and the starboard troll cable to the connector at the top on the right.

The diagram of the troll cables is shown in the table below:

Position on connector	Colour	Description	Abbreviation
5	Yellow	Current loop 4-20 mA	I
6	Green	Negative	GND



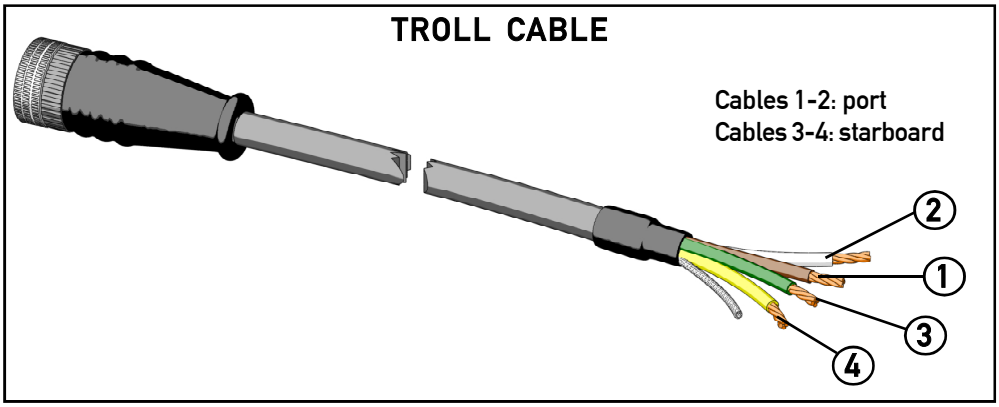
A non-insulated wire directly connected to the cable shielding (drain wire) is supplied with the troll cables.This wire is useful, if the cable shield must be connected while installing, in oder to improve its insenitivity to electromagnetic interferences.

⚠ WARNING

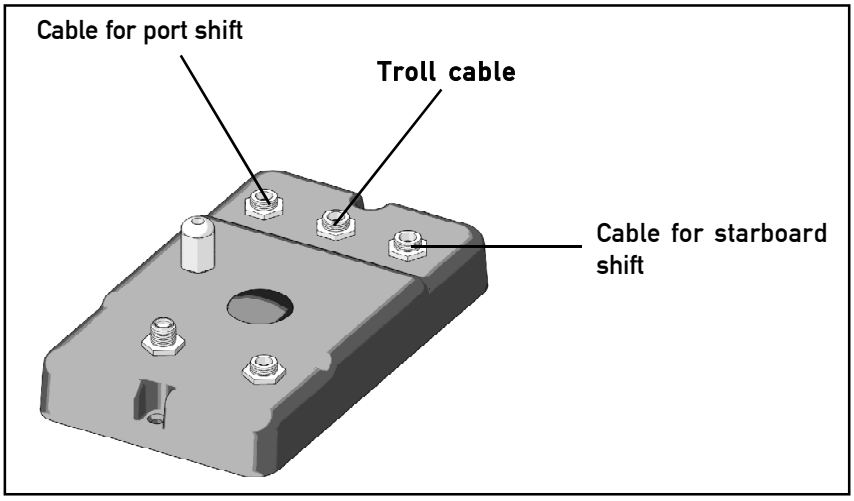
No kind of extension cable can be applied on the throttle cable.

8.3.3 Connection of the cables for the electric trolling valve (proportional solenoid valve)

The cable for the connection to the troll solenoid valves is shown below:



The troll electric cable must be connected to the shift unit into the central connector:



The cable is not provided with the connectors for the solenoid valves, which must be provided by the installer.
To carry out the connection, refer to the table below:

Position on connector	Colour	Description
1	Brown	Port troll solenoid positive wire
2	White	Port troll solenoid negative wire
3	Green	Starboard troll solenoid negative wire
4	Yellow	Starboard troll solenoid positive wire

9 TROUBLESHOOTING

This section is conceived for the boat installer: some indications useful to solve installation problems and to point out possible malfunction of the components are given below.
The possible problems and their relative solutions are divided per subject and are listed in the same order followed in the procedure for the final check of the product installation described in section 7.12 (General operating tests).
This section supplies indications to solve possible problems and give information to be reported to the technical customer care, in case the problem can not be solved by your own.
The installer and the user must pay attention to the warnings described in this chapter, in order to protect their safety.
To perform some operations, the suitable instruments must be available (multimeter, tools, etc.).
In this section problems due to a wrong configuration of the system are not taken into consideration. Therefore, we ask the installer to check that all the components equipped with configuration dip-switch are configured correctly and the configuration values on the control unit (number of engines, troll enabled, second station, etc.) are set correctly by following what described in sections 3 an 6.

1A **When the system is on, while turning the key, the respective station enabling LED does not blink and the acoustic signalling is not audible.**

1. Check that the key signal is connected to the right key wire. See section 5.8.

2. Check that the system is supplied.
   By using a multimeter, measure the voltage after the magneto-thermal switch: is the voltage detected equal to the battery voltage?
   NO: The magneto-thermal switch is off or the electric connection to the magneto-thermal switch is wrong or defective or the magneto-thermal switch does not work.
   YES: Check the main supply cable integrity.
   Check, if the battery voltage is present on the cable supplying the system power unit (if no power unit is installed, refer to the shift unit or to the mechanical actuator).
   (For the cable pin out refer to section 5.1)
   Is the voltage detected equal to the battery voltage (a little potential drop lower than 0.5V is allowed)?
   NO: The main supply cable is badly connected or damaged.
   YES: Check that the control station is supplied.
   The control station is supplied by means of the communication bus. Therefore, it is necessary to check that the battery voltage reaches the control station through the cables Devicenet coming from the supply source. For the connector pin out refer to the figure contained in section 5.4.
   For both connectors located on the cables connected to the control station, check if the battery voltage between pin 2 (positive) and pin 3 (negative) is present. Is there voltage?
   NO: The problem concerns the cable Devicenet or the component providing the supply (mechanical actuator or shift unit), repeat the above described operation for each cable DeviceNet by going along the communication bus, until the supply sources are reached.
   YES: The control station is defective and it must be replaced.

1B **When the system is on, while turning the key the respective station enabling LED does not blink, but the acoustic signalling is audible.**

The signalling board LED of the control station may not work.
Read the diagnostics on that control station page and check if the led is blinking.
The control station is defective and it must be replaced.

1C **When the system is on, while turning the key, the respective station enabling LED blinks, but the acoustic signalling is not audible.**

The warning buzzer of the control station signalling board does not work.
The control station is defective and it must be replaced.

2 **By pressing key CTRL the station can not be controlled.**

1. Check if the control lever is in neutral position.
   If not: move it to neutral position and try to enable the station again.
2. Read the diagnostics on that control station page and check if the key CTRL works.
   Refer to line BUTTON in section 7.3: press the key, if the word "C000" is not displayed, the key does not work and the control station must be raplaced.
3. The system is provided with a mechanical actuator working as throttle: read the throttle diagnostic page and check if there are any failures.
   If the position of the actuator stem does not correspond to the throttle idle, an error named **warning position** is generated and a difference higher tha 1 mm can be detected between the target position (TARGET) and the real position (POSITION).
   In case of positioning error: disable the system and try to disconnect the mechanical cable from the actuator and then enable the system by checking if the mechanical actuator moves to idle position. In this case the problem concerns the mechanical cable moving the throttle. Try to move the mechanical cable by your hands to check if there are any cable stickings.
4. If the system is provided with mechanical actuator working as shift: read the shift diagnostic page and check if there are any failures.
   If the position of the actuator stem does not correspond to neutral position, an error named **warning neutral pos** is generated an a difference higher than 1 mm can be detected between the target position (TARGET) and the real (POSITION).
   In case of positioning error: disable the system and try to disconnect the mechanical cable from the actuator and the enable the system again by checking if the mechanical actuator moves to neutral position. In this case the problem concerns the mechanical cable moving the shift. Try to move the mechanical cable by your hands to check if there are any cable stickings.
5. Read the diagnostics and check if any failures are detected, then contact the customer care service.

3A **By pressing key WARM, the warm-up mode can not be enabled.**

1. Check if the control lever is in neutral position.
   If not: move it to neutral position and enable the mode.
2. Read the diagnostics on that control station page and and check if key WARM works.
   Refer to line BUTTON in section 7.3: press the key, if the word "0C00" is not displayed, the key does not work and the control station must be replaced.
3. Read the diagnostics and check if any failures are detected, then contact the customer care service.

3B **By pressing key WARM, the warm-up mode can not be disabled.**

1. Check if the control lever is in neutral position.
   If not: move it to neutral position again and try to disable the mode.
2. Read the diagnostics on that control station page and check if key WARM works.
   Refer to line BUTTON in section 7.3: press the key, if the word "0C00" is not displayed, the control station must be replaced.
3. Read the diagnostics and check if any failures are detected, then contact the customer care service.

4 **By pressing key HIGH IDLE, the high idle mode can not be enabled.**

1. Read the diagnostics on that control station page and check if key HIGH IDLE works.
   Refer to line BUTTON in section 7.3: press the key, if the word "00C0" is not displayed, the control station must be replaced.
2. Read the diagnostics and check if any failures are detected, then contact the customer care service.

5 **By pressing key SYNC, the autosync can not be enabled (only for twin-engine systems).**

1. Are warm-up, docking and high idle modes enabled?
   If they are: disable them and try to insert the autosync mode.
2. Read the diagnostics on that control station page and check if key SYNC works.
   Refer to line BUTTON in section 7.3: press the key, if the word "000C" is not displayed, the control station must be replaced.
3. Read the diagnostics and check if any failures are detected, then contact the customer care service.

6 **The autosync mode does not work correctly (only for twin-engine systems).**

1. Read the diagnostics on the control unit page and check if the system detects correctly the engine revolutions; otherwise check the electric connections by following carefully what described in section 5.9.

7 **By pressing key SYNC for a long tine, the docking mode can not be enabled.**

1. Check if the control lever is in neutral position.
   If not: move it to neutral position again and try again to enable the mode.
2. Are warm-up, docking and high idle modes enabled?
   If they are: disable them and try to enable the mode.
3. Read the diagnostics and check if any failures are detected, then contact the customer care service.

8 **By pressing key HIGH IDLE for a long time, the trolling mode can not be enabled.**

1. Check if the control lever in in neutral position.
   If not: move it to neutral position and try to enable the mode again.
2. Are warm-up, docking and high idle enabled?
   If they are: disable them and try to enable the mode.
3. Read the diagnostics on that control station page and check if key HIGH IDLE works.
   Refer to line BUTTON in section 7.3: press the key, if the word "00C0" is not displayed, the control station must be replaced.
4. If the system is provided with mechanical actuator working as trolling valve: read the throttle diagnostic page and check if there are any failures.
   If the actuator stem position does not correspond to the troll idling, an error named **warning position** is generated and a difference higher than 1mm can be detected between the target position (TARGET) and the real position (POSITION).
   In case of positioning error: diasable the system and try to disconnect the mechanical cable from the actuator and then enable the system again by checking if the mechanical actuator moves to idle position. In this case the problem concerns the mechanical cable moving the throttle. Try to move the mechanical cable by your hands to check if there are any cable stickings.
5. Read the diagnostics and check if any failures are detected, then contact the customer care service.

9 **By pressing key WARM, the brightness of the board can not be modified.**

1. Read the diagnostics on that control station page and check if key WARM works.
   Refer to line BUTTON in section 7.3: press the key, if the word "0C00" is not displayed, the key does not work and the control station must be replaced.
2. Read the diagnostics and check if any failures are detected, then contact the customer care service.

10A **By pressing key trim up, the trim can not be enabled.**

1. Read the diagnostics on that control station page and check if key TRIM UP works.
   Refer to line TRIM in section 7.3: press the key, if the word "C000" for port engine or the word "00C0" for the starboard engine do not appear, the key does not work and the control station must be replaced.
   If the key works: the problem may concern the wiring (refer to section 5.7) or the trim itself.

10B **By pressing key trim down, the trim can not be enabled.**

1. Read the diagnostics on that control station and check if key TRIM DOWN works.
   Refer to line TRIM in section 7.3: press the key, if the word "0C00" for the port engine or "000C" for the starboard engine, the key does not work, the control station must be replaceduita.
   If the key works, the problem may concern the wiring (refer to section 5.7) or the trim itself.

ENGLISH

11 By pressing key CTRL for a long time, the control station can not be disabled.

1. Check if the control lever is in neutral position.
   If not: move it to neutral position and try to disable the station again.
2. Read the diagnostics on that control station page and check if key CTRL works.
   Refer to line BUTTON in section 7.3: press the key, if the word "C000" is not displayed the key does not work and the control station must be replaced.
3. If the system is provided with a mechanical actuator working as throttle: read the throttle diagnostic page and check if there are any failures.
   If the actuator stem position does not correspond to the throttle idling, an error named **warning position** is generated and a difference higher than 1mm can be detected between the target position (TARGET) and the real position (POSITION).
   In case of positioning error; disable the system and try to disconnect the mechnical cable from the actuator and then enable the system by checking if the mechanical actuator moves to idle position again. In this case the problem concerns the mechanical cable moving the throttle. Try to move the mechanical cable by your hands to detect any cable stickings.
4. If the system is provided with mechanical actuator working as shift; read the shift dagnostic page and check if there are any failures.
   If the actuator stem position does not correspond to the neutral position, an error named **warning neutral pos** is generated and a difference higher than 1 mm can be detected between the target position (TARGET) and the real position (REAL) .
   In case of positioning error: disable the system and try to disconnect the mechanical cable from the actuator and then enable the system by checking if the mechanical actuator moves to neutral position again. In this case the problem concerns the mechanical cable moving the shift. Try to move the cable by your hands to chck if there are any cable stickings.
5. Read the diagnostics and check if any failures are detected, then contact the customer care service.

12 The engine does not start.

1. Check if the control lever is in neutral position.
   If not: move it to neutral position and try to restart the engine.
2. Read the diagnostics on the main page, if the shift is in neutral position and the throttle is at idle.
   If the previous conditions do not occur, search for possible reasons (see points 3 and 4).
3. If the system is provided with a mechanical actuator working as throttle: read the throttle diagnostic page and check if there are any failures.
   If the actuator stem position does not correspond to throttle idle, an error is generated named **warning position** and a difference higher than 1mm can be detected between the target position (TARGET) and the real position (POSITION)
   In case of positioning error: disable the system and try to disconnect the mechanical cable from the actuator and then enable the system again by checking, if the mechanical actuator moves to idle position. In this case the problem concerns the mechanical cable moving the throttle. Try to move the cable by your hands to chck if there are any cable stickings.
4. If the system is provided with a mechanical actuator working as shift: read the shift diagnostic page and check if there are any failures.
   If the actuator stem position does not correspond to the neutral position, an error named **warning neutral pos** is generated and a difference higher than 1mm can be detected between the target position (TARGET) and the real position (POSITION).
   In case of positioning error: disable the system and try to disconnect the mechanical cable from the actuator and then enable the system again by checking, if the mechanical actuator moves to idle position. In this case the problem concerns the mechanical cable moving the shift. Try to move the cable by your hands to check if there are any cable stickings.

5. Check thant the start inhibition switch has been connected correctly.
6. Read the diagnostics on the control unit page, the value following NSAF PORT. Is the word CLOSED displayed?
   NO: It means that there are not the conditions to close the contact and therefore to start the engine: repeat stemps from 1 to 5.
   YES: Disconnect the start inhibition switch from the system and by using a multimeter, check if the start inhibition switch is really closed. If it is open, the control unti is faulty and it must be replaced.

13 The engine idle is too high.

1. Read the diagnostics on the main page and check if the throttle is really at idle. If this condition does not occur, search for possible reasons (see points 2 and 3).
2. If the system is provided with a mechanical actuator working as throttle: read the throttle diagnostic page and check if there are any failures.
   If there are no failures, try to modify the mechanical actuator stroke by calibrating it (please follow all the warnings listed in section 6.4).
3. If the system is provided with a V-throttle working as throttle: read the throttle diagnostic page and check if there are any failures.
   If there are any failures, check the throttle wiring and in particular the condition of the electric connection.
   Many engine power units allow the gear to be put into, even when there are a wrong electric signal and therefore they supplies a high idle to allow the user to sail back to harbor in case of problems.

14 The high idle engine revolution value is not correct.

1. If the system is provided with a mechanical actuator working as throttle and there are no failures, try to modify the high idle mechanical actuator stroke bycalibrating it (please follow all the warnings listed in section 6.4).
2. If the system is provided with a V-throttle working as throttle and there are no failures, check and change the voltage value corresponding to the high idle (please follow all the warnings listed in section 6.6).

15 The engine does not reach the maximum number of revolution.

1. If the system is provided with a mechanical actuator working as throttle, check that the stem carries out its stroke completely and compare the POSITION value (real position) with the TARGET (target position) value displayed in the throttle diagnostic page.
2. If there are no failures, try to change the mechanical actuator stroke by calibrating it (please follow the warnings described in section 6.4).
3. If the system is provided with a V-throttle acting as throttle and there are no failures: measure the output voltage of the V-throttle cable by means of a multi meter, when the lever is in maximum stroke position.
   Then check if this value correspond to the value set in the diagnostics.
   If there are a difference between the voltage value read by the multimeter and the voltage set on the control unit, please contact the service.

16 **The engine does not work at idle.**

1. If the system is provided with a mechanical actuator working as throttle, check that the cable gland is well fastened and that the cable has not an exceeding clearance.
2. If there are no failures, try to change the mechanical actuator stroke by calibrating it (please follow the wornings listed in section 6.4).

17 **The acceleration curve is not correct.**

1. Change the configuration of the acceleration curve on the control station page of the control unit (refer to section 6.3).

18 **The engine acceleration is not smooth, it is difficult to adjust the engine revolutions fine.**

1. If the system is provided with a mechanical actuator working as throttle, check that the cable can run freely along the sheath, without stickings and that it has not an exceeding claerance.
2. If there are no failures, compare the POSITION value (real position) with th TARGET value (target position) on the throttle diagnostic page to detect possible differences.

19 **The engine does not accelerate.**

1. Read the diagnostic on the main page and check if the position of the actuator controlling the shift is in neutral position (in case the warm-up mode is not enabled).
2. If the system is provided with a mechanical actuator working as throttle: read the throttle diagnostic page and check if there are any failures.
   If the actuator stem position does not correspond to the throttle idling, an error named **warning position** is generated and a difference higher than 1mm can be detected between the target poition (TARGET) and the real position (POSITION).
   In case of positioning error: disable the system and try to disconnect the mechanical cable from the actuator and then enable the system again by checking if the mechanical actuator moves to idle position again. In this case the problems concerns the mechanical cable moving the throttle. Try to move the mechanical cable by your hands to detect any cable stickings.

20A **The shift does not enable the forward movement.**

1. Check that the warm-up mode is not enabled, otherwise disable it.
2. Read on the diagnostics on the main page, if the position of the actuator controlling the shift is calibrated correctly. Otherwise recalibrate the mechanical actuator controlling the shift.
3. If the system is provided with a mechanical actuator working as shift: read the shift diagnostic page and check if there are any failures.
   If the actuator stem is not in forward movement position, an error named **warning fw pos** is generated and a difference higher than 1mm can be detected between the target position (TARGET) and the real position (POSITION).
   In case of positioning error: disable the system and try to disconnect the mechanical cable from the actuator and to shift the forward movement with your hands. If this is not possible, the problem concerns the mechanical cable moving the shift.
   On some shifts, above all in outboard engines, the gear is shifted only when the engine is on; therefore, if you try to shift the gear when the engine is off, the alarm (warning fw position) is generated.

4. If the system is provided with a shift unit working as shift: read the shift diagnostic page and check if there are any failures.
   If the solenoid valve for the forward movement is disconnected or short-circuited, an error named **fw feedback fault** is generated.
   In this case, check the solenoid valve connection again.

20B The shift does not enable the reverse movement.

1. Check that the warm-up mode is not enabled, otherwise disable it.
2. Read on the diagnostics on the main page, if the position of the actuator controlling the shift is calibrated correctly. Otherwise recalibrate the mechanical actuator controlling the shift.
3. If the system is provided with a mechanical actuator working as shift: read the shift diagnostic page and check if there are any failures.
   If the actuator stem is not in forward movement position, an error named **warning rw pos** is generated and a difference higher than 1mm can be detected between the target position (TARGET) and the real position (POSITION).
   In case of positioning error: disable the system and try to disconnect the mechanical cable from the actuator and to shift the forward movement with your hands. If this is not possible, the problem concerns the mechanical cable moving the shift.
   On some shifts, above all in outboard engines, the gear is shifted only when the engine is on; therefore, if you try to shift the gear when the engine is off, the alarm (warning rw position) is generated.
4. If the system is provided with a shift unit working as shift: read the shift diagnostic page and check if there are any failures.
   If the solenoid valve for the reverse movement is disconnected or short-circuited, an error named **rw feedback fault** is generated.
   In this case, check the solenoid valve connection again.

21 The shifts does not move back to neutral position.

1. Read the diagnostics on the main page and check if the position of the actuator controlling the shift is calibrated correctly; otherwise, calibrate the mechanical actuator moving the shift again.
2. If the system is provided with a mechanical actuator working as shift: read the shift diagnostic page and check if there are any failures.
   If the actuator stem is not in neutral position, an error named **warning neutral pos** is generated and a difference higher than 1mm can be detected between the target position (TARGET) and the real position (POSITION).
   In case of positioning error: disable the system and try to disconnect the mechanical cable from the actuator and to disengage the gear with your hands. If this is not possible, the problem concerns the mechanical cable moving the shift.
   On some shifts, above all in outboard engines, the gear is disengaged only when the engine is on; therefore, if you try to disengage the gear when the engine is off, the alarm (warning neutral position) is generated.

If the system is provided with a trolling valve:

22 **The trolling valve can not be enabled.**

1. Read the diagnostic on the troll page and check if the troll option has been configurated.
2. If the system is provided with a mechanical actuator working as trolling valve: read the troll actuator diagnostic page and check if there are any failures.
   If the actuator stem is not in idle position, an error named **warning position** is generated and a difference higher than 1mm can be detected between the target position (TARGET) and the real position (POSITION).
   In case of positioning error: disable the system and try to disconnect the troll mechanical cable and to move it by your hands. If it is impossible, the problem concerns the mechanical cable moving the troll.
3. If the system is provided with a shift unit to control the trolling valve: read the shift unit diagnostic page and check if there are any failures.
   If the troll solenoid valve is disconnected or short-circuites, an error named **nt feedback fault**. is generated. In this case, check the solenoid valve connection again.

23 **The trolling valve can not be disabled.**

1. If the system is provided with a mechanical actuator working as trolling valve: read the troll actuator diagnostic page and check if there are any failures.
   If the actuator stem is not in idle position, an error named **warning position** is generated and a difference higher than 1mm can be detected between the target position (TARGET) and the real position (POSITION).
   In case of positioning error: disable the system and try to disconnect the troll mechanical cable and to move it by your hands. If it is impossible, the problem concerns the mechanical cable moving the troll.
2. Read the diagnostics on the troll actuator page and check, if the position of the actuator controlling the trolling valve is well calibrated. Otherwise, recalibrate the mechanical troll controlling the trolling valve.

10 SAFETY WARNINGS

This section shows the safety rules which must be followed for the correct equipment operation.
We recommend reading this section and the other manuals supplied with the steering system components carefully.

10.1 Safety standards during installation and use

RESPECT STRICTLY the following safety rules:
ULTRAFLEX declines all responsibility in case the user does not follow these rules and it is not responsible for negligence during the use of the system.

⚠ DANGER

- **DO NOT PUT HANDS BETWEEN THE MOVING PARTS.**
- Do not disable the safety devices.
- Do not modify or add devices to the system, without **ULTRAFLEX** written authorisation or technical intervention which will prove the modification.
- Do not use the equipment for a purpose different from the one it has been designed for, which is specified in the installation and maintenance manual.
- Do not let non-specialized staff perform the installation.

⚠ WARNING

- When the system is installed, clean thoroughly to prevent foreign bodies from entering it. Even the smallest object could damage the system permanently.
- Avoid contact between cables and heat sources.

10.2 Clothing

⚠ WARNING

During installation, inspection or maintenance, IT IS STRICTLY FORBIDDEN to wear necklaces, bracelets or clothes which could get caught in the moving parts.

11 MAINTENANCE

11.1 Routine maintenance

The routine maintenance consists in a series of periodical checks and actions to keep the product in optimum operating condition thus avoiding that the external environment may jeopardize its operation and safety.

⚠ WARNING

If the maintenance checks are not carried out, Poor maintenance may result in loss of steering and cause property damage and/or personal injury.

11.1.1 Cleaning

Ordinary cleaning ensures good operation and optimum product aesthetics.
Only the control station and the control unit need to be washed.
We recommend using no aggressive products that might damage the metal parts or the external plastic parts of the control station.
After using the boat, wash the exposed control stations with fresh water.
The display glass and the navigation switch located on the control unit must be kept clean by using a wet cloth.

11.1.2 One month after product installation

The routine maintenance for the first month includes:
- Check of the mechanical actuator calibration;
- Check of the mechanical actuator carriage tightening;
- Greasing (by using a marine lubrication) of the mechanical actuator stems;
- Cleaning operations.

11.1.3 Every three months

Every three months the following operations are required:
- Check of the mechanical actuator calibrations;
- Check of the mechanical actuator carriage tightening;
- Greasing (by using a marine lubrication) of the mechanical actuator stems;
- Cleaning operations.

11.1.4 Every year

Every year:
- Check possible damages or deterioration on the mechanical cables of the mechanical actuators.

NOTICE

Every three year, replace the split pin of the mechanical actuator.

- Check of possible damages or deterioration on the electric cable of the system.
- Check of the correct insertion and/or tightening of all connectors located on the system.
  When checking the electric cables, make sure that the interconnections have not been damaged while handling them.
  Check that the ground connections have no surface oxidation. In that case, we recommend using sprays or common products to protect and preserve the electric contacts.
- Check of the components fastening the system.
- Check the absence of corrosion or damage on the system components.
- Check of the functions by means of the tests described in paragraph 7.2.

11.2 Extraordinary maintenance

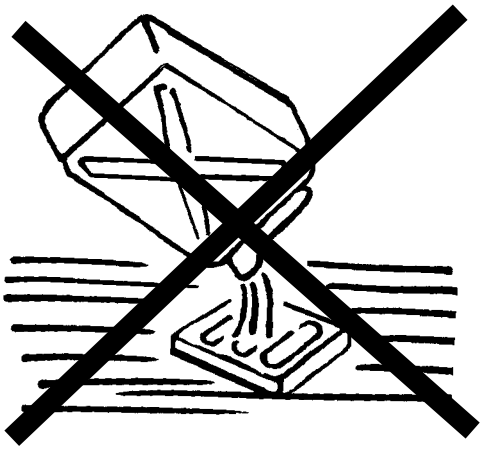
Technical Assistance

For any information or for assistance with unusual applications, please contact our Technical Assistance Service (See paragraph "Informative letter").

12 DISMANTLING

12.1 Dismantling

When for any reason, the system is put out of service, it is necessary to follow some rules in order to respect the environment.
Sheaths, pipelines, plastic or non-metallic components must be disassembled and disposed of separately.



ENCLOSURES

Cable compatibility:

Mercruiser stern drive cable: use the 2 bushes provided to adapt it to the locking system.

C2, C7, C8 and MACHZero cables, use the adaptors included in each actuator.

Mounting of adapters on cables:

Mercruiser stern drive cable: insert the two pressure bushes on the cable cylinder, mount the cable on the locking system according to the procedure described in paragraph 6.4

C2, C7, C8 and MACHZero cables: follow the instructions described in paragraph 6.4 mount the cable on the locking system according to the procedure described in paragraph 6.4.

Power A Mk2 Drilling template