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CONTROLS

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Global Manufacturing Facilities

From 2003 member of **WRControls Group**, with production facilities in Europe and Asia, **Flexball Italiana** offers since 50 years its experience both in the professional and pleasure boat sector, constantly focusing on design, production, innovation and quality improvement of mechanical and electronic controls.





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1

Electronic
control
systems



ELECTRONIC CONTROL 3500 SERIES 4500 SERIES

Electronic control systems Series 3500 and Series 4500 combine mechatronic solutions and digital communication technologies which permit to build modular systems, flexible, reliable and easy to install.



Just a few devices create a complete electronic control system. The electronic system fundamentally consists of 4 elements which vary in amount and type, depending on installation requirements:

- control stations
- actuators
- data transmission cables to connect together actuators and control stations
- cables between actuator and motor and between actuator and gearbox.

The link between the various devices is via a simple 4-pin cable that carries all the information thru digital CANBus communication.

In case of motors with mechanical interface, push-pull cables transfer the motion from the actuators to the throttle on the motor and on the gearbox.

In the case of motors and gearboxes with electronic interface, a simple electrical wire performs their connection to the actuator.

On all Flexball electronic control systems can be mounted either lever Series 3500 or lever Series 4500.

The systems are configured to interface to different types of motors and gearboxes and their possible combinations.

MOTORS COMPATIBILITY

- Voltage: Cummins, Detroit Diesel, Scania, FNM, Lombardini, Deutz Vetus
- 4-20 mA current: MAN, MTU, Isotta Fraschini
- PWM: Caterpillar, Scania.

KEY FEATURES

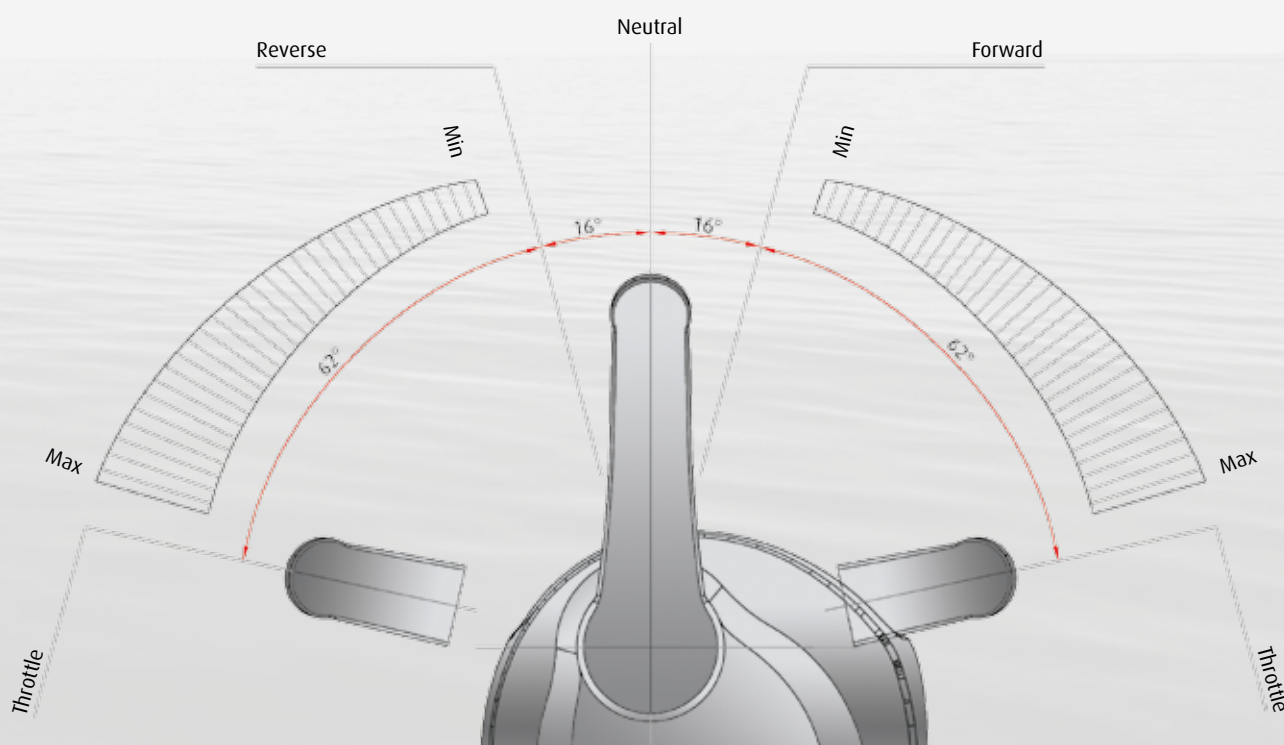
- With up to 3 control stations in the basic version, the system can be extended up to 7 control stations
- Fast Start-up Mode Function
- Synchro function that can be activated either in neutral or when sailing
- Trolling control
- Trim/Flap and Synchro Trim/Flap function
- Starting inhibition if the gear isn't in neutral
- Advanced functions for fast and safe commissioning
- Interface to frequency converters in hybrid propulsion systems
- Programmable delays at clutch in or clutch out
- Emergency safety devices directly on the actuator, in the case of systems with mechanical interface.

MAIN FEATURES

- Electronic control system in drive by wire technology
- Maximum distance between deck and engine room can be more than 60 meters
- Fast and easy installation
- EMC and CE Certified
- Operation with instant plug and play
- Limited number of components
- Digital Data Transmission
- Setting of operating parameters either via keypad or via PC.

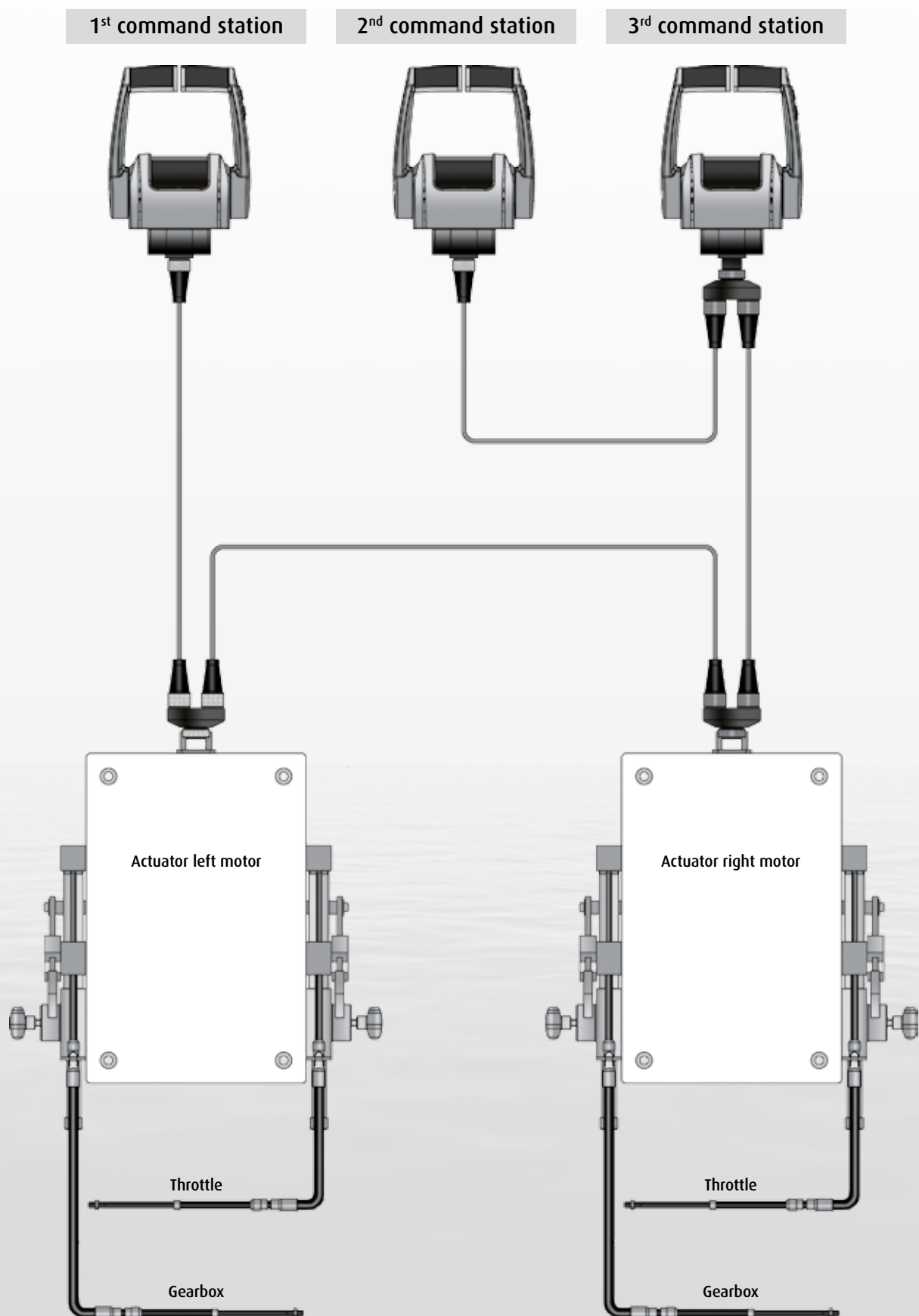
TECHNICAL FEATURES

- Supply voltage from 9.0 to 32 Vdc (multi-voltage supply)
- Max input current: 5 A
- Current at idle: 0.5 A
- Operating temperature: -10 to $+85$ °C
- Mechanical generated force at nominal conditions: 250 N (25 kg) with absorption of 1.5 A
- Maximum generated force: 450 N (45 kg) with absorption of 5 A and for a time less than 1 second
- Gearbox stroke – forward: it can be set between 5 and 40 mm
- Gearbox stroke – reverse: it can be set between 5 and 40 mm
- Maximum throttle stroke: 80 mm.



The diagram below represents a system configured with:

- n. 2 actuators • n. 3 control stations
- data transmission cables between levers, lever and actuator and between actuators
- motor and gearbox connection cables which, depending on the type of motor and gearbox, can be mechanical or electronic.



SYSTEM CONFIGURATIONS

The system types listed below always refer to the diagram on the previous page and are based on the following conditions:

- The distance between the various devices and specifically the distance between levers, lever and actuator or between actuators is = 7.5 m; in case you need longer cables (especially between the deck and the engine room) they must be defined when ordering.
- All electrical wirings to connect the actuator to the motor and the actuator to the gearbox, are as standard 3 meters. If longer cables were required, it must be communicated when ordering. There are specific cablings for mo-

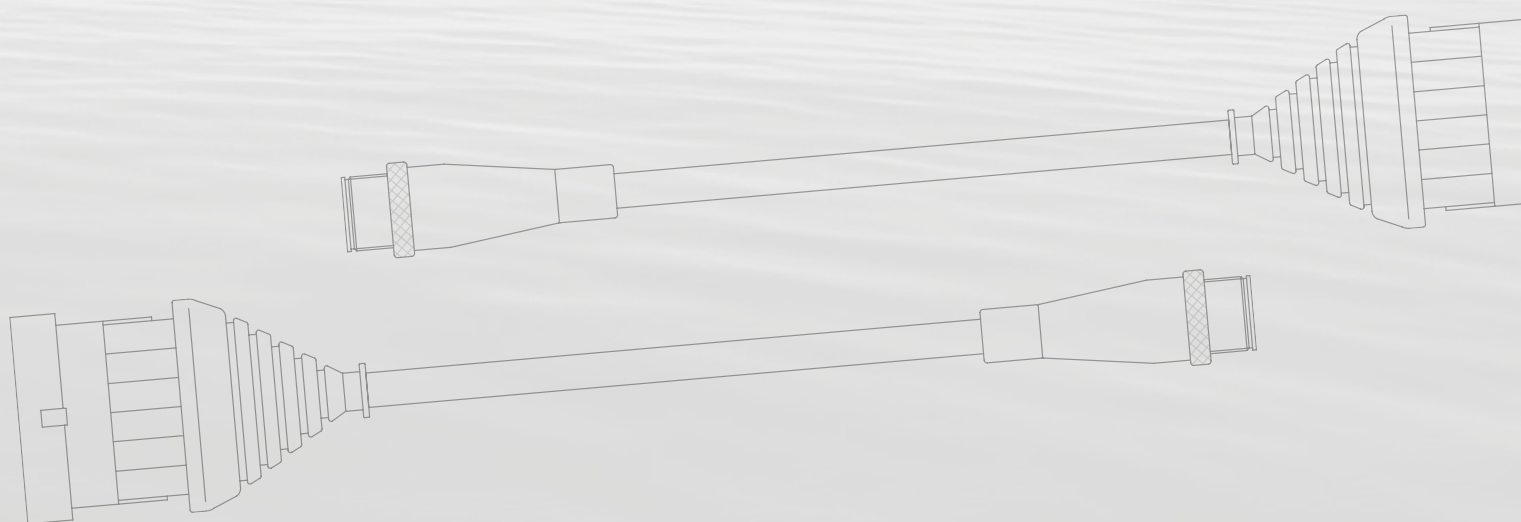
tors like FNM, FPT, Nanni Diesel, Vetus, etc. In this case you must communicate the specific type of motor you need to command.

The system configurations are classified according to the possible combinations of:

- motor types
- gearbox types
- number of engines
- number of levers
- options.

The following table lists all the types of electronic systems. The most common ones are highlighted in gray.

SYSTEM TYPE	ID
• Mechanical throttle and mechanical gearbox	MM
• Electronic voltage throttle and mechanical gearbox	VM
• CANBus throttle and mechanical gearbox	CM
• Electronic PWM throttle and mechanical gearbox	WM
• Electronic current throttle and mechanical gearbox	IM
• Mechanical throttle and electronic gearbox	ME
• Electronic voltage throttle and electronic gearbox	VE
• CANBus throttle and electronic gearbox	CE
• Electronic PWM throttle and electronic gearbox	WE
• Electronic current throttle and electronic gearbox	IE
• Electronic voltage throttle and trolling gearbox	VT
• CANBus throttle and trolling gearbox	CT
• Trim/Flap option	F
• Interface towards frequency converter on hybrid propulsion systems	T



Now it follows a list of complete system configurations. The prefix 3500 or 4500 defines the type of control lever to be mounted on the boat. For example, the 4500-MM22F indicates a system with two mechanical motors, two mechanical gearboxes, trim/flaps option and two control stations 4500 Series.

COD. MM Electronic control systems compatible with mechanical motors and mechanical gearboxes

TROTTL MECHANICAL – GEARBOX MECHANICAL			
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP	WITH HYBRID MOTOR OPTION
• 1 motor, 1 command station	3500-MM11 4500-MM11	3500-MM11F 4500-MM11F	3500-MM11H 4500-MM11H
• 1 motor, 2 command stations	3500-MM12 4500-MM12	3500-MM12F 4500-MM12F	3500-MM12H 4500-MM12H
• 2 motors, 1 command station	3500-MM21 4500-MM21	3500-MM21F 4500-MM21F	3500-MM21H 4500-MM21H
• 2 motors, 2 command stations	3500-MM22 4500-MM22	3500-MM22F 4500-MM22F	3500-MM22H 4500-MM22H
• 2 motors, 3 command stations	3500-MM23 4500-MM23	3500-MM23F 4500-MM23F	3500-MM23H 4500-MM23H

COD. VM Electronic control systems compatible with electronic voltage motors Hyundai, Deutz, FNM, Vetus, Nanni Diesel, Lombardini, Cummins, etc. and mechanical gearboxes

TROTTL ELECTRONIC (V) – GEARBOX MECHANICAL			
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP	WITH HYBRID MOTOR OPTION
• 1 motor, 1 command station	3500-VM11 4500-VM11	3500-VM11F 4500-VM11F	3500-VM11H 4500-VM11H
• 1 motor, 2 command stations	3500-VM12 4500-VM12	3500-VM12F 4500-VM12F	3500-VM12H 4500-VM12H
• 2 motors, 1 command station	3500-VM21 4500-VM21	3500-VM21F 4500-VM21F	3500-VM21H 4500-VM21H
• 2 motors, 2 command stations	3500-VM22 4500-VM22	3500-VM22F 4500-VM22F	3500-VM22H 4500-VM22H
• 2 motors, 3 command stations	3500-VM23 4500-VM23	3500-VM23F 4500-VM23F	3500-VM23H 4500-VM23H

COD. CM Electronic control systems compatible with CANBus motors FPT, Nanni Diesel, Toyota, VM, etc. and mechanical gearboxes

TROTTL CANBUS – GEARBOX MECHANICAL		
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP
• 1 motor, 1 command station	3500-CM11 4500-CM11	3500-CM11F 4500-CM11F
• 1 motor, 2 command stations	3500-CM12 4500-CM12	3500-CM12F 4500-CM12F
• 2 motors, 1 command station	3500-CM21 4500-CM21	3500-CM21F 4500-CM21F
• 2 motors, 2 command stations	3500-CM22 4500-CM22	3500-CM22F 4500-CM22F
• 2 motors, 3 command stations	3500-CM23 4500-CM23	3500-CM23F 4500-CM23F

COD. WM Electronic control systems compatible with electronic PWM motors Caterpillar, Deutz, Scania, etc. and mechanical gearboxes

TROTTLER PWM – GEARBOX MECHANICAL		
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP
• 1 motor, 1 command station	3500-WM11 4500-WM11	3500-WM11F 4500-WM11F
• 1 motor, 2 command stations	3500-WM12 4500-WM12	3500-WM12F 4500-WM12F
• 2 motors, 1 command station	3500-WM21 4500-WM21	3500-WM21F 4500-WM21F
• 2 motors, 2 command stations	3500-WM22 4500-WM22	3500-WM22F 4500-WM22F
• 2 motors, 3 command stations	3500-WM23 4500-WM23	3500-WM23F 4500-WM23F

COD. IM Electronic control systems compatible with electronic current motors Caterpillar, Deutz, Isotta Fraschini, etc. and mechanical gearboxes

TROTTLER CURRENT (I) – GEARBOX MECHANICAL		
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP
• 1 motor, 1 command station	3500-IM11 4500-IM11	3500-IM11F 4500-IM11F
• 1 motor, 2 command stations	3500-IM12 4500-IM12	3500-IM12F 4500-IM12F
• 2 motors, 1 command station	3500-IM21 4500-IM21	3500-IM21F 4500-IM21F
• 2 motors, 2 command stations	3500-IM22 4500-IM22	3500-IM22F 4500-IM22F
• 2 motors, 3 command stations	3500-IM23 4500-IM23	3500-IM23F 4500-IM23F

COD. ME Electronic control systems compatible with mechanical motors and electronic solenoid gearboxes

TROTTLER MECHANICAL – GEARBOX ELECTRONIC			
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP	WITH HYBRID MOTOR OPTION
• 1 motor, 1 command station	3500-ME11 4500-ME11	3500-ME11F 4500-ME11F	3500-ME11H 4500-ME11H
• 1 motor, 2 command stations	3500-ME12 4500-ME12	3500-ME12F 4500-ME12F	3500-ME12H 4500-ME12H
• 2 motors, 1 command station	3500-ME21 4500-ME21	3500-ME21F 4500-ME21F	3500-ME21H 4500-ME21H
• 2 motors, 2 command stations	3500-ME22 4500-ME22	3500-ME22F 4500-ME22F	3500-ME22H 4500-ME22H
• 2 motors, 3 command stations	3500-VM23 4500-VM23	3500-VM23F 4500-VM23F	3500-VM23H 4500-VM23H

COD. VE

Electronic control systems compatible with electronic voltage motors Hyundai, Deutz, FNM, Vetus, Nanni Diesel, Lombardini, Cummins, etc. and electronic solenoid gearboxes

TROTTLER ELECTRONIC (V) – GEARBOX ELECTRONIC			
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP	WITH HYBRID MOTOR OPTION
• 1 motor, 1 command station	3500-VE11	3500-VE11F	3500-VE11H
	4500-VE11	4500-VE11F	4500-VE11H
• 1 motor, 2 command stations	3500-VE12	3500-VE12F	3500-VE12H
	4500-VE12	4500-VE12F	4500-VE12H
• 2 motors, 1 command station	3500-VE21	3500-VE21F	3500-VE21H
	4500-VE21	4500-VE21F	4500-VE21H
• 2 motors, 2 command stations	3500-VE22	3500-VE22F	3500-VE22H
	4500-VE22	4500-VE22F	4500-VE22H
• 2 motors, 3 command stations	3500-VE23	3500-VE23F	3500-VE23H
	4500-VE23	4500-VE23F	4500-VE23H

COD. CE

Electronic control systems compatible with CANBus motors FPT, Nanni Diesel, Toyota, VM, etc. and electronic solenoid gearboxes

TROTTLER CANBUS – GEARBOX ELECTRONIC			
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP	WITH HYBRID MOTOR OPTION
• 1 motor, 1 command station	3500-CE11	3500-CE11F	3500-CE11H
	4500-CE11	4500-CE11F	4500-CE11H
• 1 motor, 2 command stations	3500-CE12	3500-CE12F	3500-CE12H
	4500-CE12	4500-CE12F	4500-CE12H
• 2 motors, 1 command station	3500-CE21	3500-CE21F	3500-CE21H
	4500-CE21	4500-CE21F	4500-CE21H
• 2 motors, 2 command stations	3500-CE22	3500-CE22F	3500-CE22H
	4500-CE22	4500-CE22F	4500-CE22H
• 2 motors, 3 command stations	3500-CE23	3500-CE23F	3500-CE23H
	4500-CE23	4500-CE23F	4500-CE23H

COD. WE

Electronic control systems compatible with electronic PWM motors Caterpillar, Deutz, Scania, etc. and electronic solenoid gearboxes

TROTTLER PWM – GEARBOX ELECTRONIC		
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP
• 1 motor, 1 command station	3500-WE11	3500-WE11F
	4500-WE11	4500-WE11F
• 1 motor, 2 command stations	3500-WE12	3500-WE12F
	4500-WE12	4500-WE12F
• 2 motors, 1 command station	3500-WE21	3500-WE21F
	4500-WE21	4500-WE21F
• 2 motors, 2 command stations	3500-WE22	3500-WE22F
	4500-WE22	4500-WE22F
• 2 motors, 3 command stations	3500-WE23	3500-WE23F
	4500-WE23	4500-WE23F

COD. IE

Electronic control systems compatible with electronic current motors Caterpillar, Deutz, Isotta Fraschini, etc. and electronic solenoid gearboxes

TROTTLER CURRENT (I) – GEARBOX ELECTRONIC		
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP
• 1 motor, 1 command station	3500-IE11 4500-IE11	3500-IE11F 4500-IE11F
• 1 motor, 2 command stations	3500-IE12 4500-IE12	3500-IE12F 4500-IE12F
• 2 motors, 1 command station	3500-IE21 4500-IE21	3500-IE21F 4500-IE21F
• 2 motors, 2 command stations	3500-IE22 4500-IE22	3500-IE22F 4500-IE22F
• 2 motors, 3 command stations	3500-IE23 4500-IE23	3500-IE23F 4500-IE23F

COD. VT

Electronic control systems compatible with electronic voltage motors Hyundai, Deutz, FNM, Vetus, Nanni Diesel, Lombardini, Cummins, etc. and trolling gearboxes

TROTTLER VOLTAGE (V) – GEARBOX TROLLING		
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP
• 1 motor, 1 command station	3500-VT11 4500-VT11	3500-VT11F 4500-VT11F
• 1 motor, 2 command stations	3500-VT12 4500-VT12	3500-VT12F 4500-VT12F
• 2 motors, 1 command station	3500-VT21 4500-VT21	3500-VT21F 4500-VT21F
• 2 motors, 2 command stations	3500-VT22 4500-VT22	3500-VT22F 4500-VT22F
• 2 motors, 3 command stations	3500-VT23 4500-VT23	3500-VT23F 4500-VT23F

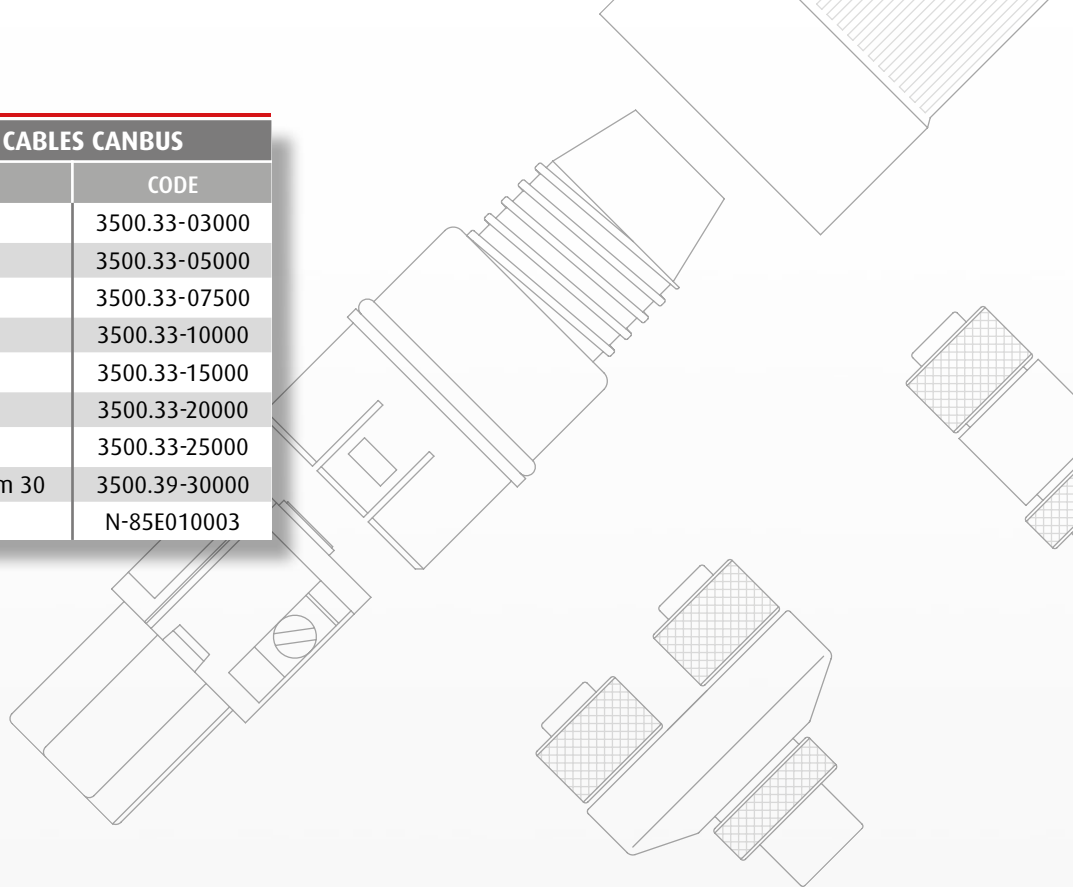
COD. CT

Electronic control systems compatible with CANBus motors FPT, Nanni Diesel, Toyota, VM, etc. and trolling gearboxes

TROTTLER CANBUS – GEARBOX TROLLING		
	WITHOUT TRIM/FLAP	WITH TRIM/FLAP
• 1 motor, 1 command station	3500-CT11 4500-CT11	3500-CT11F 4500-CT11F
• 1 motor, 2 command stations	3500-CT12 4500-CT12	3500-CT12F 4500-CT12F
• 2 motors, 1 command station	3500-CT21 4500-CT21	3500-CT21F 4500-CT21F
• 2 motors, 2 command stations	3500-CT22 4500-CT22	3500-CT22F 4500-CT22F
• 2 motors, 3 command stations	3500-CT23 4500-CT23	3500-CT23F 4500-CT23F

DATA TRANSMISSION CABLES CANBUS

DESCRIPTION	CODE
• Length m 3	3500.33-03000
• Length m 5	3500.33-05000
• Length m 7.5	3500.33-07500
• Length m 10	3500.33-10000
• Length m 15	3500.33-15000
• Length m 20	3500.33-20000
• Length m 25	3500.33-25000
• Extension cable male/female m 30	3500.39-30000
• CANBus "T" splitter	N-85E010003



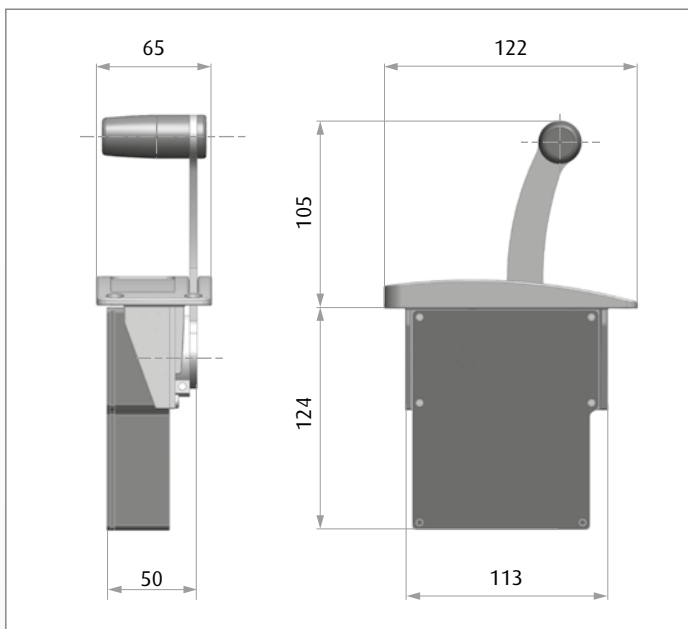
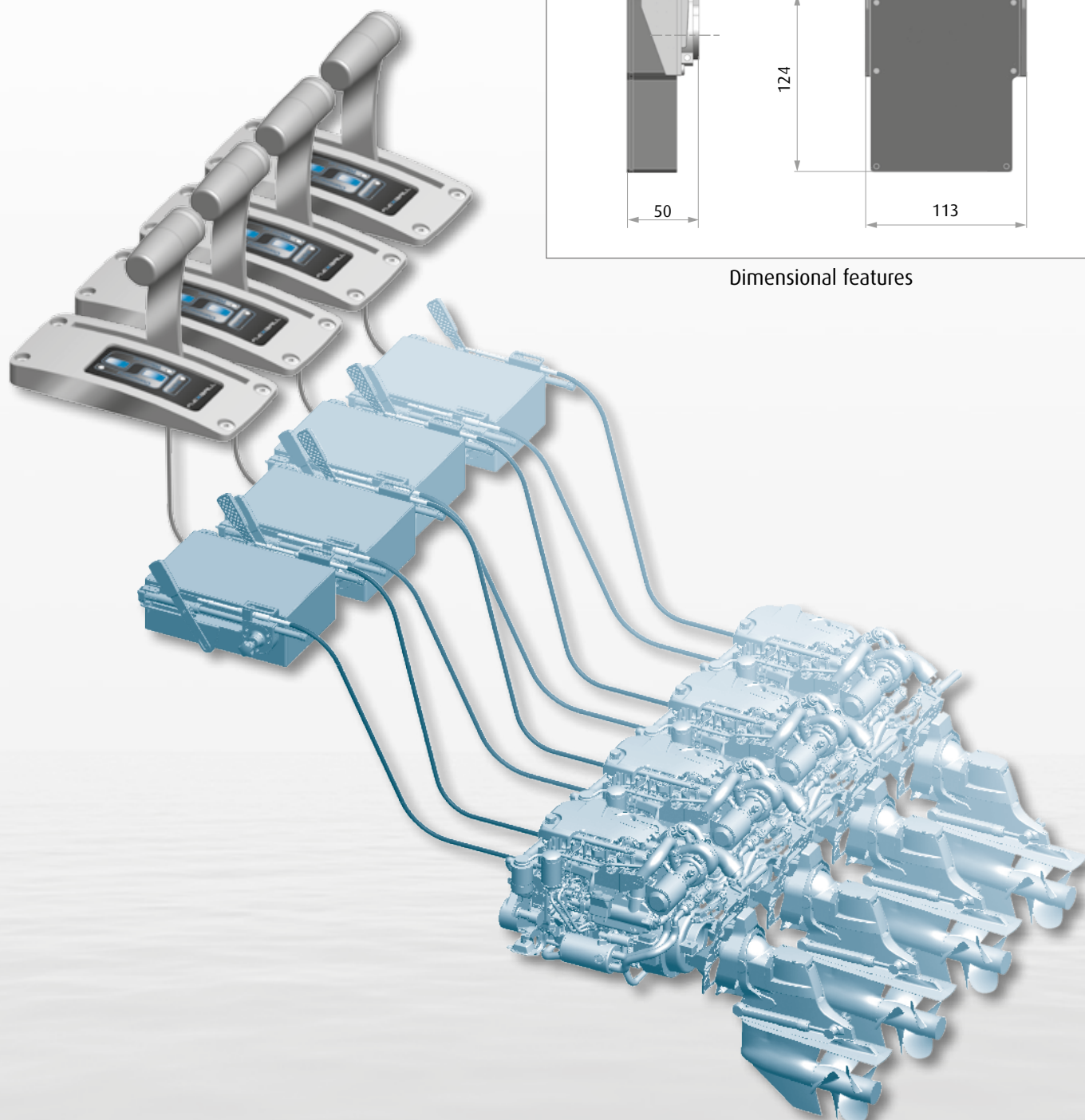
ELECTRONIC CONTROL 4000 SERIES

Modular control for single and side by side mounting.



- Suitable for all types of engines
- Easy mounting
- Reliable
- Precise
- Simple
- Reactive

INSTALLATION SCHEME



Dimensional features

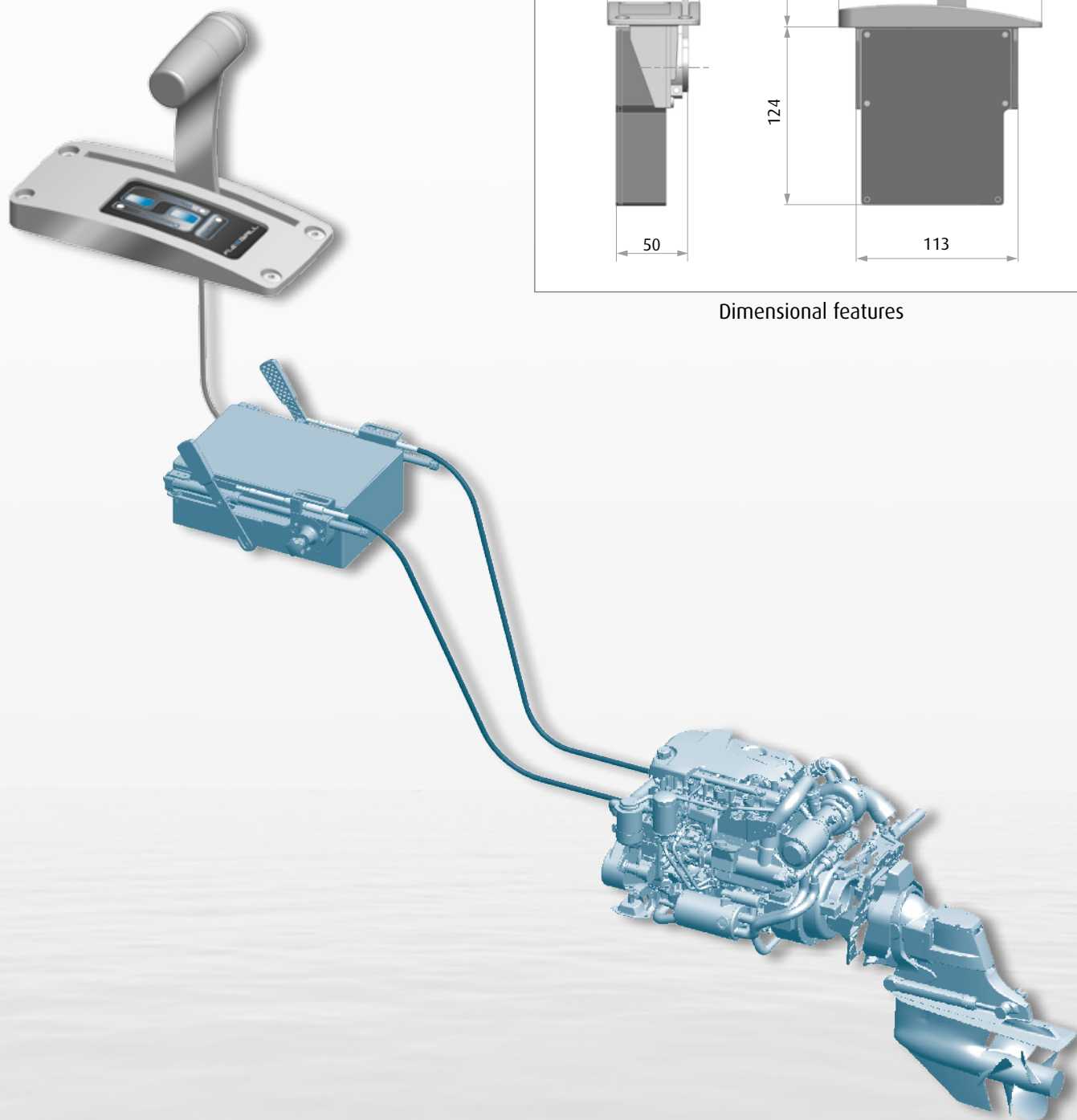
4000 WAVE

Make your navigation easier.
Your good old engine
has never been so easy
to control.
Enjoy the new Flexball
electronic control.



- Affordable price
- Suitable for all types of engines with mechanical control
- Easy mounting
- Reliable
- Precise
- Simple
- Reactive

INSTALLATION SCHEME



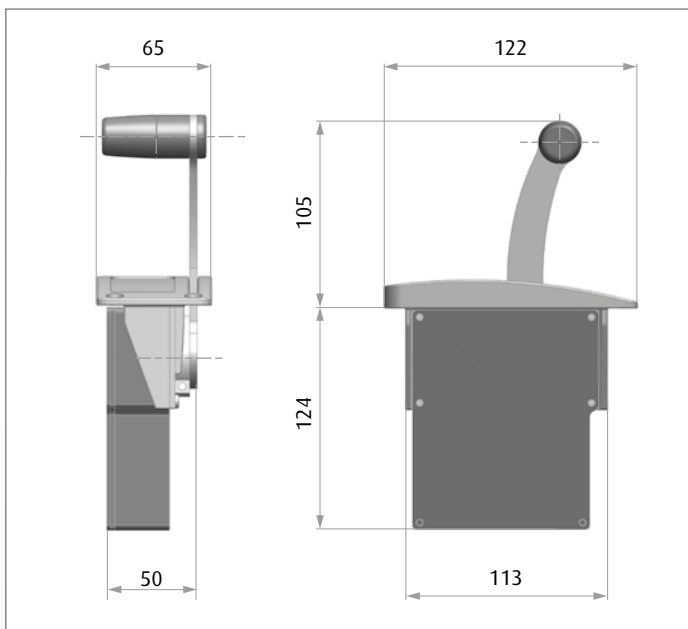
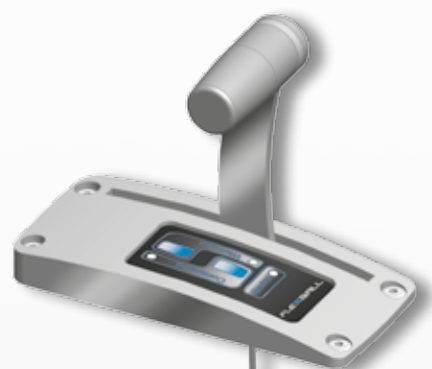
4000 HYDROJET

All functions in a single lever.
Enjoy the new Flexball
electronic control.

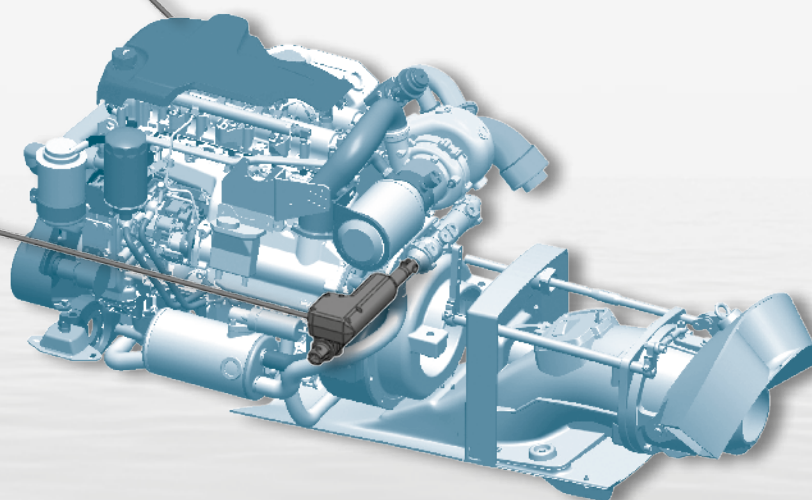
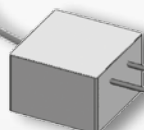


- Suitable for all type of engines
- Easy mounting
- Reliable
- Precise
- Simple
- Reactive

INSTALLATION SCHEME



Dimensional features





Electronic
and hybrid
propulsion

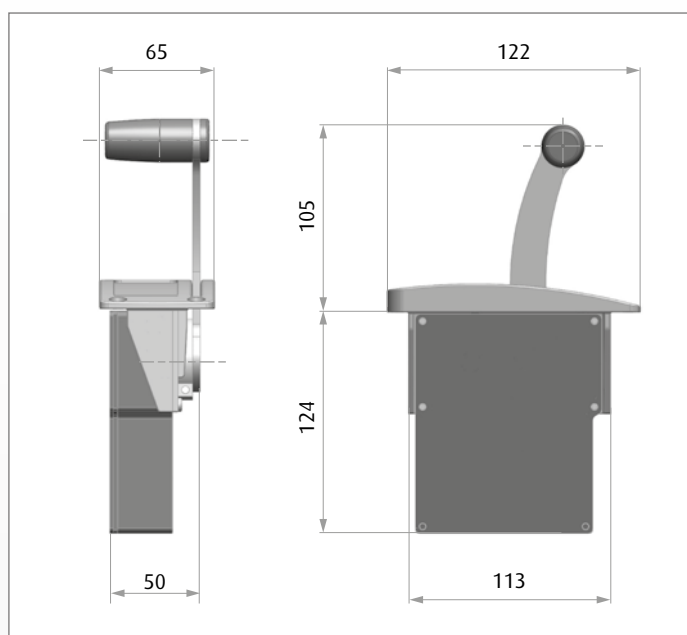
▼ 4000 ELT

Make your navigation easier.
Your electric motor has never
been so easy to control.
Enjoy the new Flexball
electronic control.



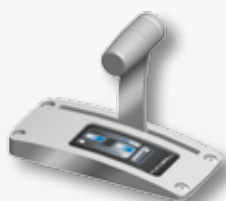
- Suitable for all types of electric motors
- Easy mounting
- Reliable
- Precise
- Simple
- Reactive

INSTALLATION SCHEME

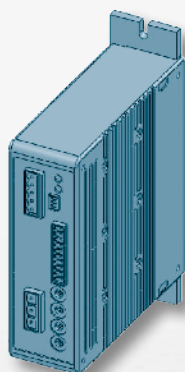


Dimensional features

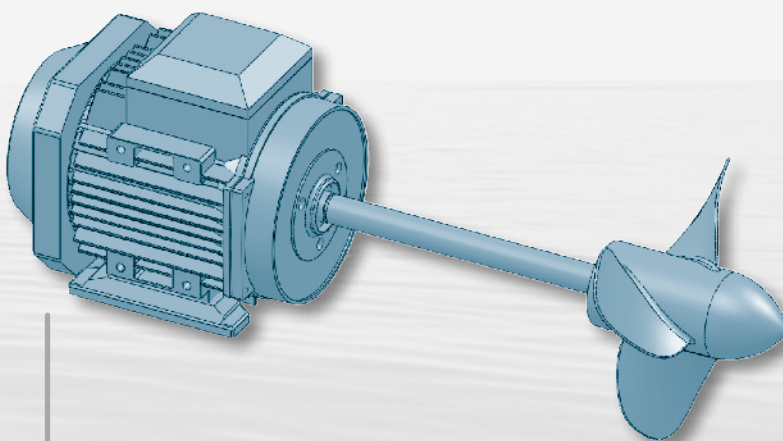
4000 ELT



MOTOR CONTROLLER

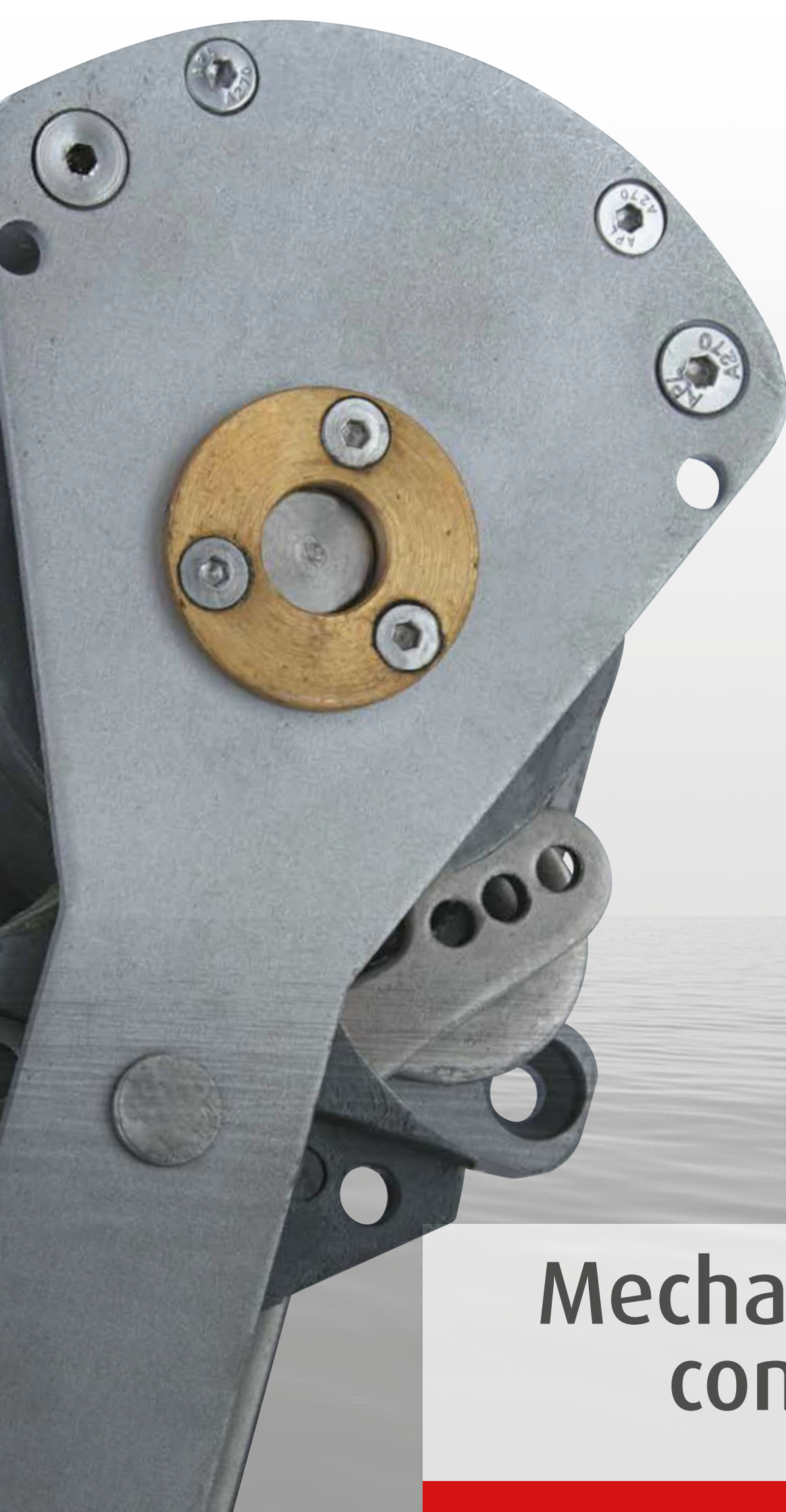


ELECTRIC MOTOR



- Power supply from 9 to 32 Vdc
- Voltage, current or CANBus signals towards the motor controller
- 3 relay output free programmable, typically used for Forward, Reverse and Neutral commands





3

**Mechanical
controls**

COMMAND LEVER 3000 SERIES

These mechanical lever controls are available in several versions and fulfil all the possible application requirements including pleasure boats, passenger boats and profes-

sional vessels. There are also available versions for the direct control of electronic and CANBus motors.



OPERATION

Single lever with dual action for the sequence command of gearbox and throttle.

The button, when inserted into the body of the lever, disengages the gearbox and enables the acceleration of the engine in neutral (warm-up).

STROKES

From 60 to 80 mm both for gearbox and throttle (you can get a fine regulation by tuning the slot inside the lever).

MOVEMENTS

Extremely smooth and precise, due to the bearings and sintered bronze bushings; there are no plastic parts.

AESTHETICS

- Body box is available chrome plated, painted black or stainless steel (only for the version with 1 motor).
- Lever can be either chrome or stainless steel. Handle and button for warm-up are available red or black.

COMMAND CABLES

Command levers Series 3000 can be used with conventional push-pull cables E3 (thread 10/32), E4 (thread 1/4 x 28) E6 (thread M6) and the very performing Flexball cables Series 70 (M6 thread).

VERSIONS

- 3000.1 model for one motor or 3000.2 model for two motors for boats with a single command station
- in case of boats with more command stations:
3033.1 to be connected with one or more repeater levers
3030.1, in case of boats with 1 motor 3033.2 to be connected with one or more repeater levers 3030.2, in case of boats with 2 motors.

All models can be single or coupled. The results are the following combinations:



PRODUCT RANGE

DESCRIPTION	CODE
• Command lever inox for 1 motor; red handle	3000.1-XR
• Master inox for 1 motor; red handle	3033.1-XR
• Repeater inox for 1 motor; red handle	3030.1-XR
• Command lever chrome plated for 1 motor; red handle	3000.1-CR
• Command lever black for 1 motor; red handle	3000.1-SR
• Command lever chrome plated for 2 motor; red handles	3000.2-CR
• Command lever black for 2 motors; red handles	3000.2-SR
• Master chrome plated for 1 motor; red handle	3033.1-CR
• Master black for 1 motor; red handle	3033.1-SR
• Master chrome plated for 2 motors; red handles	3033.2-CR
• Master black for 2 motors; red handles	3033.2-SR
• Repeater chrome plated for 1 motor; red handle	3030.1-CR
• Repeater black for 1 motor; red handle	3030.1-SR
• Repeater black for 2 motors; red handles	3030.2-CR
• Repeater black for 2 motors; red handles	3030.2-SR
• Sliding device for 2 command stations	3000-SEL
• Connecting kit (2 clamps + 2 forks) for cables E3 Series (thread 10/32)	3000-E3
• Connecting kit (2 clamps + 2 forks) for cables E4 Series (thread 1/4 x 28)	3000-E4
• Connecting kit (2 clamps + 2 forks) for cables Flexball 70 (thread M6 x 1)	3000-70

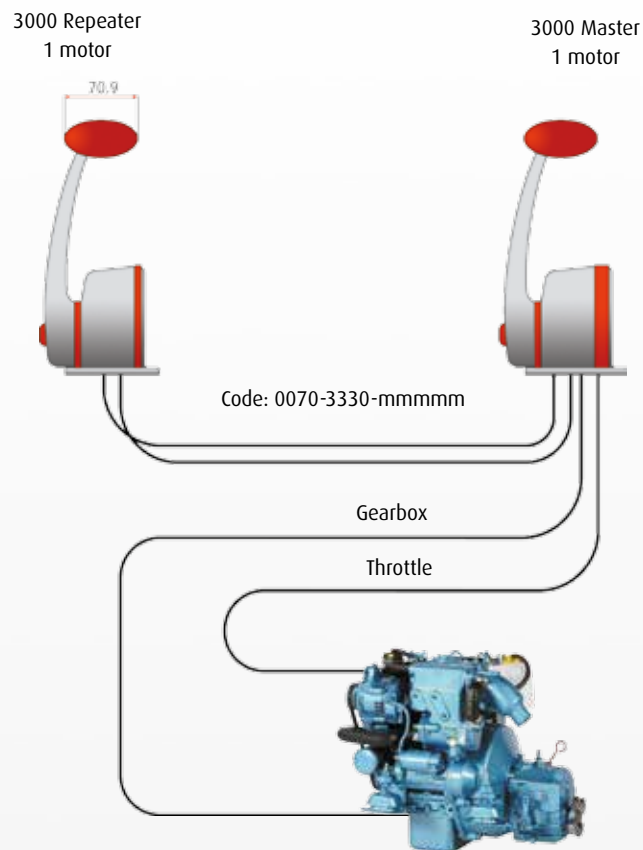
SYSTEMS WITH TWO COMMAND STATIONS

There are two different philosophies and methods for connecting together levers 3000:

- Master/repeater: a master command station is connected to a repeater command station. In this case when moving one command station the other one follows automatically the movements of the first station.
- Sleigh: command stations are identical and are not directly linked together. The selection of the command is done through a slide which is mounted near the engine. The station at the moment not in use must be kept in neutral position.

The solution master/repeater is absolutely the best in term of performance.

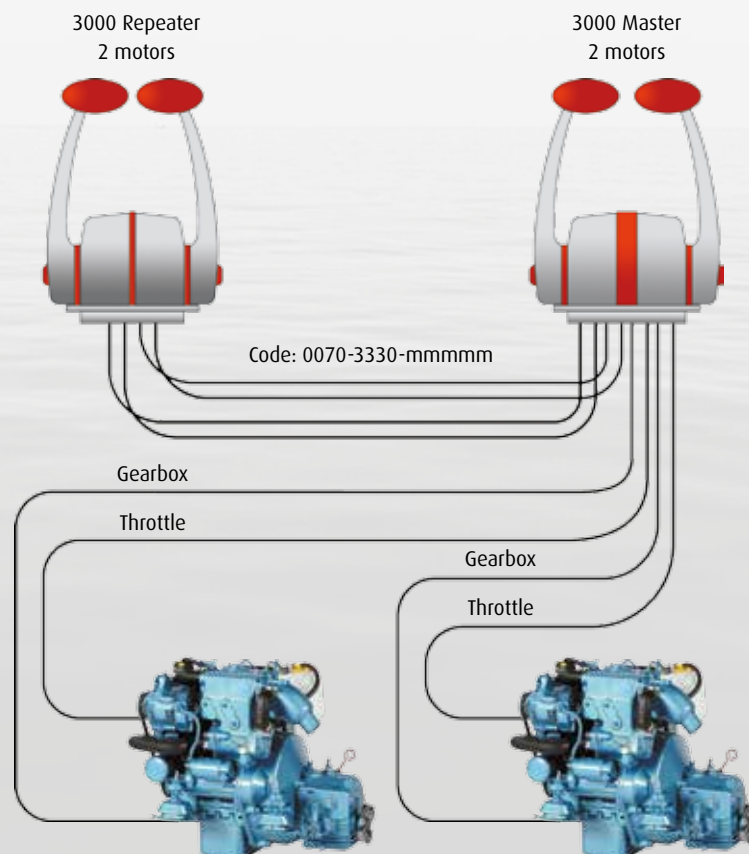
INSTALLATION SCHEME FOR 2 COMMAND STATIONS AND 1 MOTOR



Note:

mmmmm is the cable length in mm

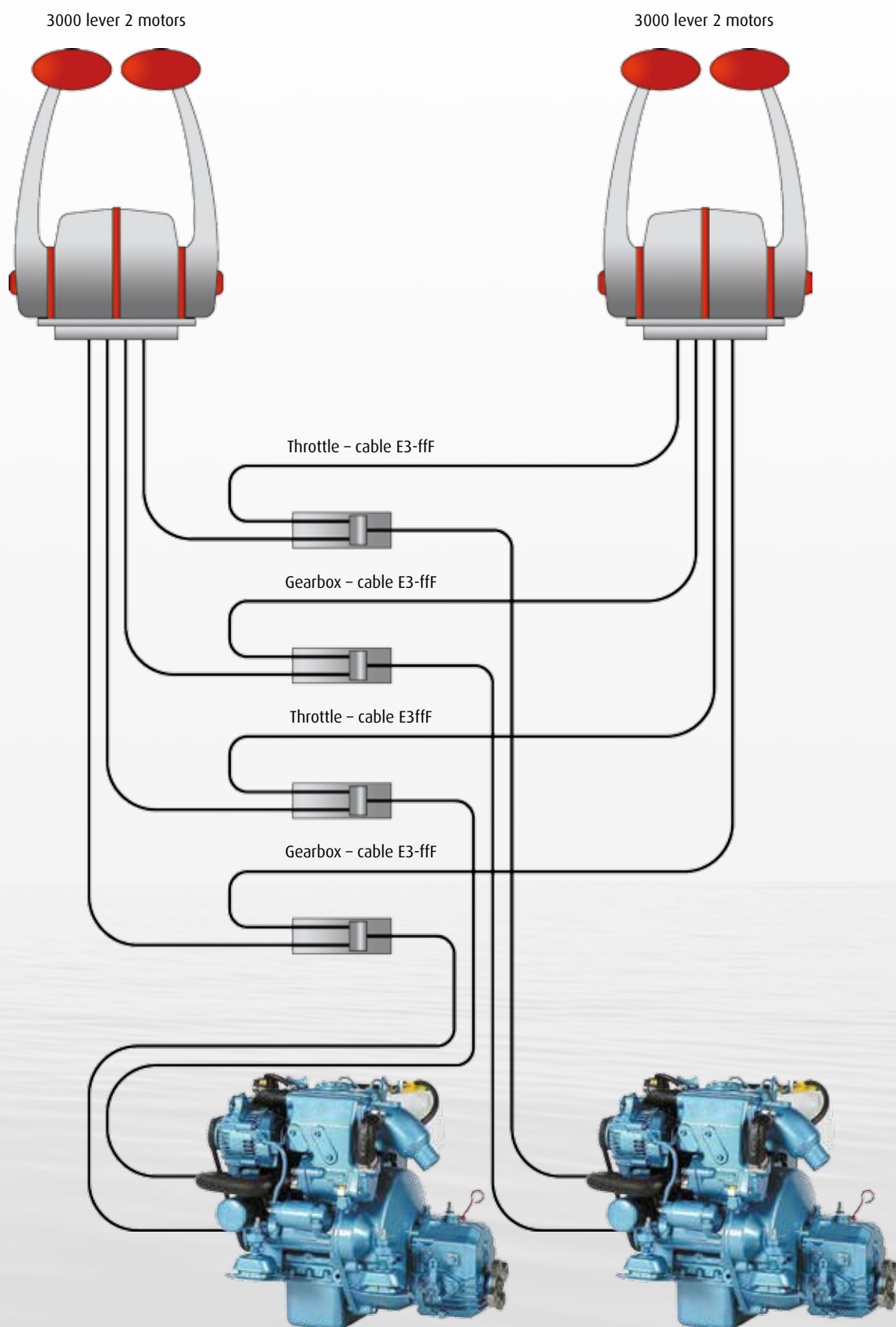
INSTALLATION SCHEME FOR 2 COMMAND STATIONS AND 2 MOTORS



Note:

mmmmm is the cable length in mm

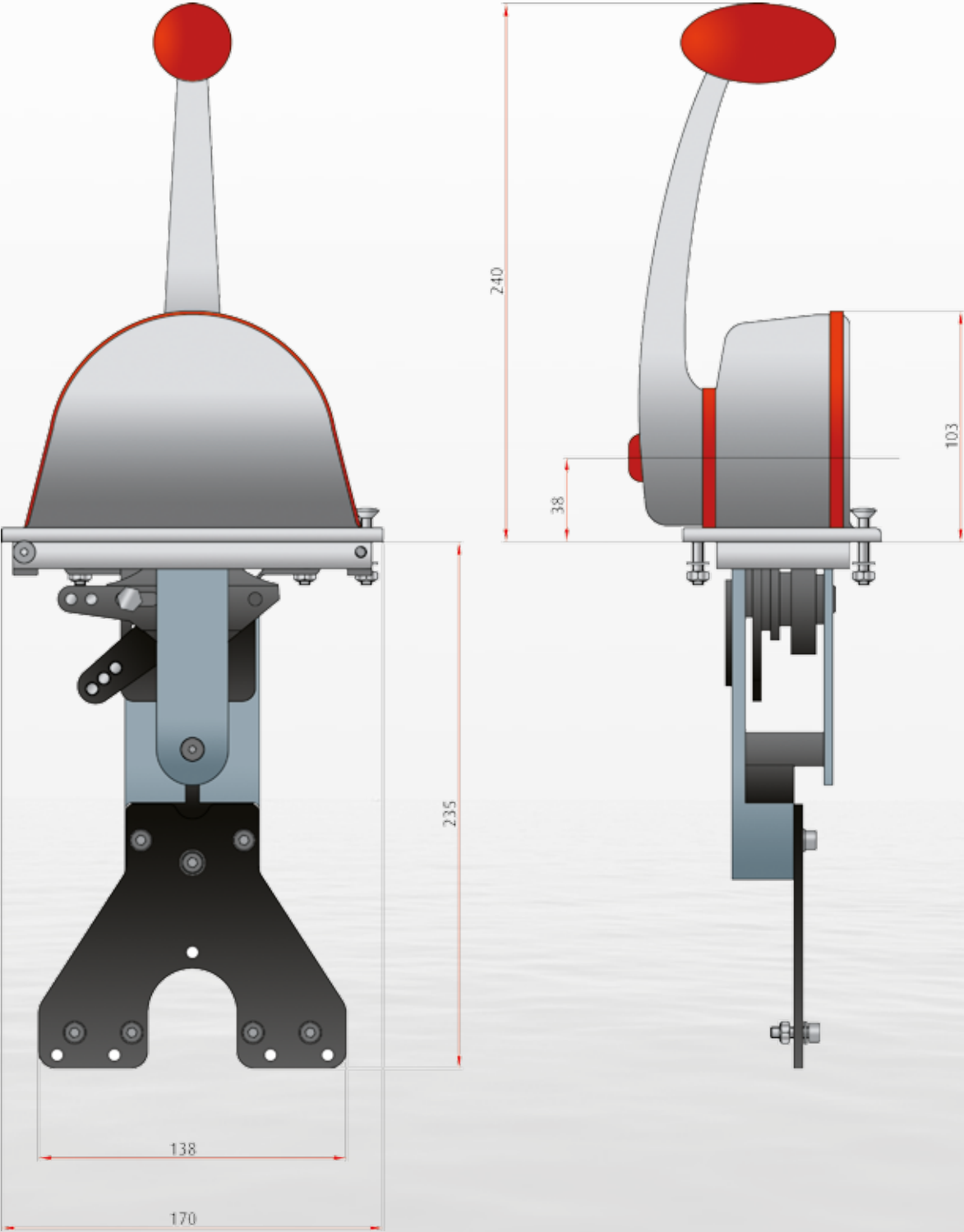
INSTALLATION SCHEME FOR 2 INDEPENDENT COMMAND STATIONS



Note:

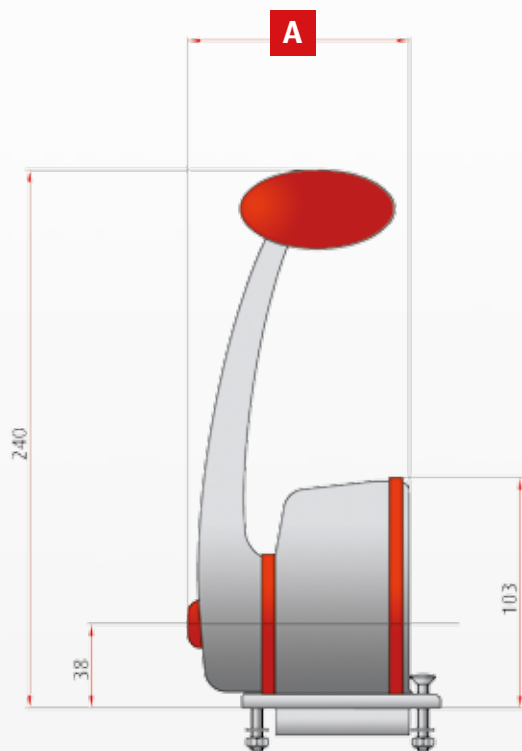
ff is the cable length in feet. Example: cable E3 L=10 feet → E3-10F

OVERALL DIMENSIONS

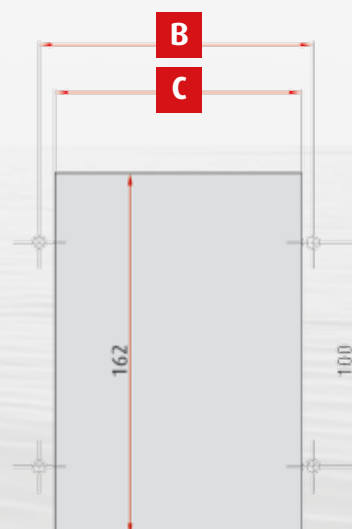
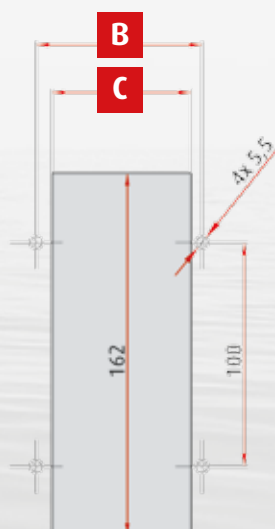
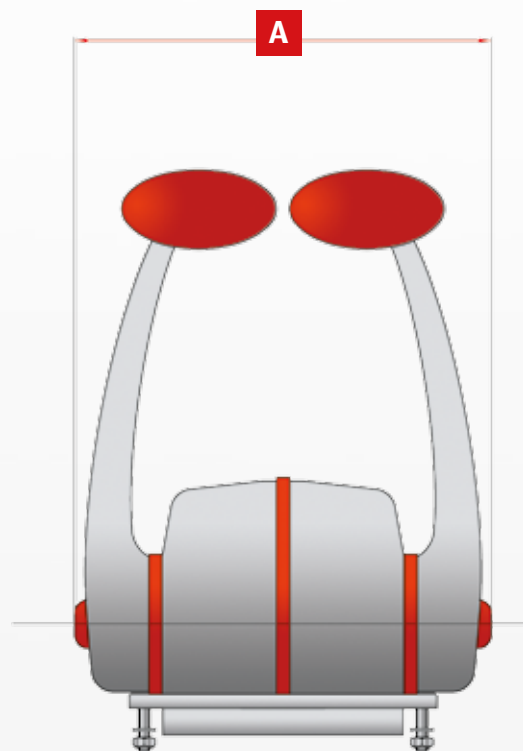


DIMENSIONS, FOOTPRINTS AND DRILLING MASKS

3000 Lever for 1 motor
3000 Repeater for 1 motor

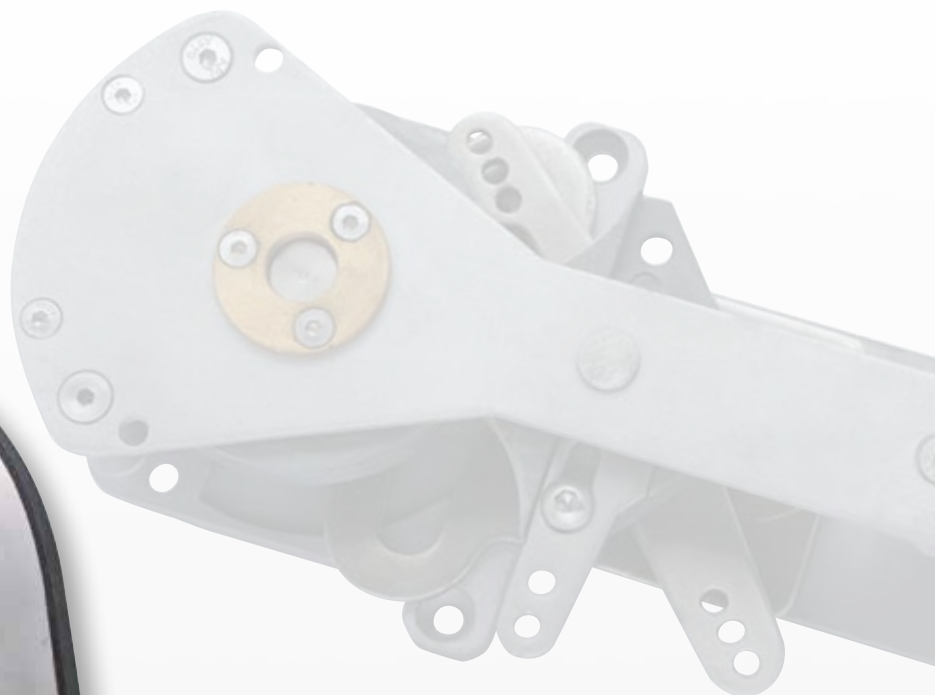


3000 Lever for 2 motors
3000 Repeater for 2 motors



REFERENCE	LEVER FOR 1 MOTOR REPEATER FOR 1 MOTOR	LEVER FOR 2 MOTORS REPEATER FOR 2 MOTORS	LEVER MASTER 1 MOTOR	LEVER MASTER 2 MOTORS
A	100	186	115	218
B	75	122	90	154
C	62	110	77	141

MECHANICAL CABLES AVAILABLE WITH LEVERS SERIES 3000



COD. 0070-GM-mmmmm

- Flexball type 70 with form M terminal

COD. 0070-GF-mmmmm

- Flexball type 70 with form F terminal

COD. E4-fff

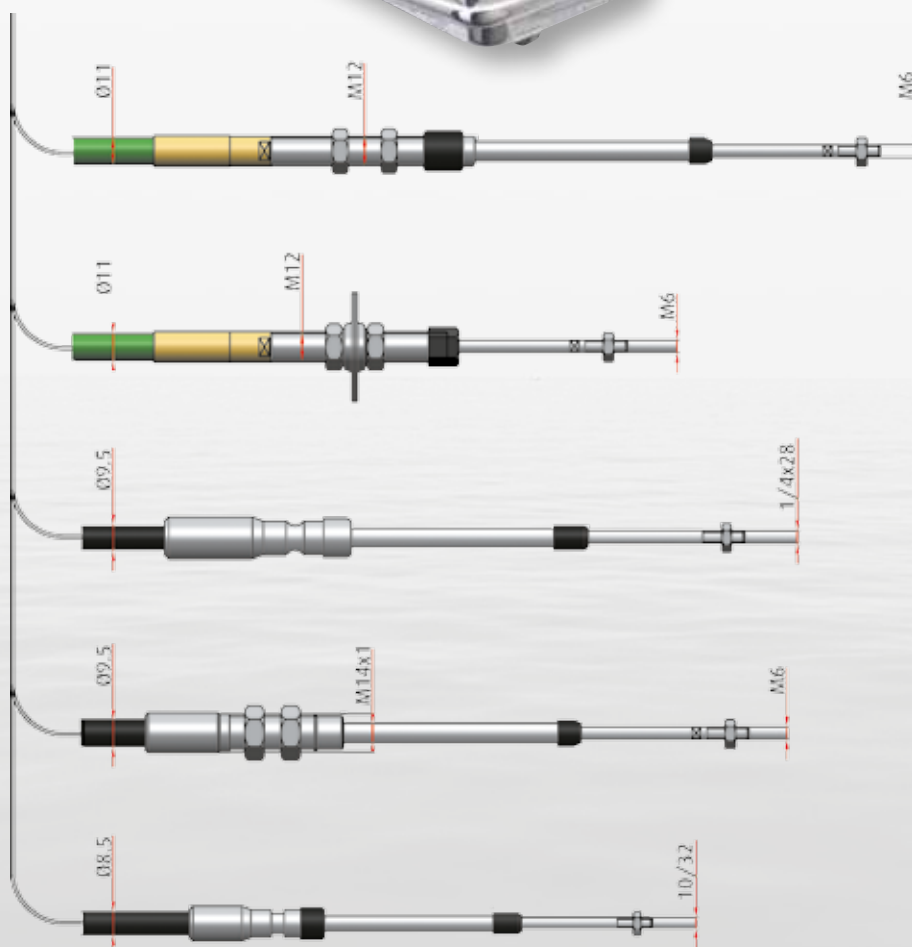
- Push-pull cable E4

COD. E6-mm.mmM

- Push-pull cable E6

COD. E3-fff

- Push-pull cable E3



Note:

mmmmmm is the length in mm

Example: Flexball 70 L=4 m → 0070-GF-04000

mm.mm is the length in meters

Example: E6 L=4,5 m → E6-04.50M

fff is the length in feet

Example: E3 L=10 feet → E3-10F

COMMAND LEVER 3000

WITH TROLLING VALVE CONTROL

Command lever for the control of throttle, gearbox and trolling valve; the system can be configured for more command stations.

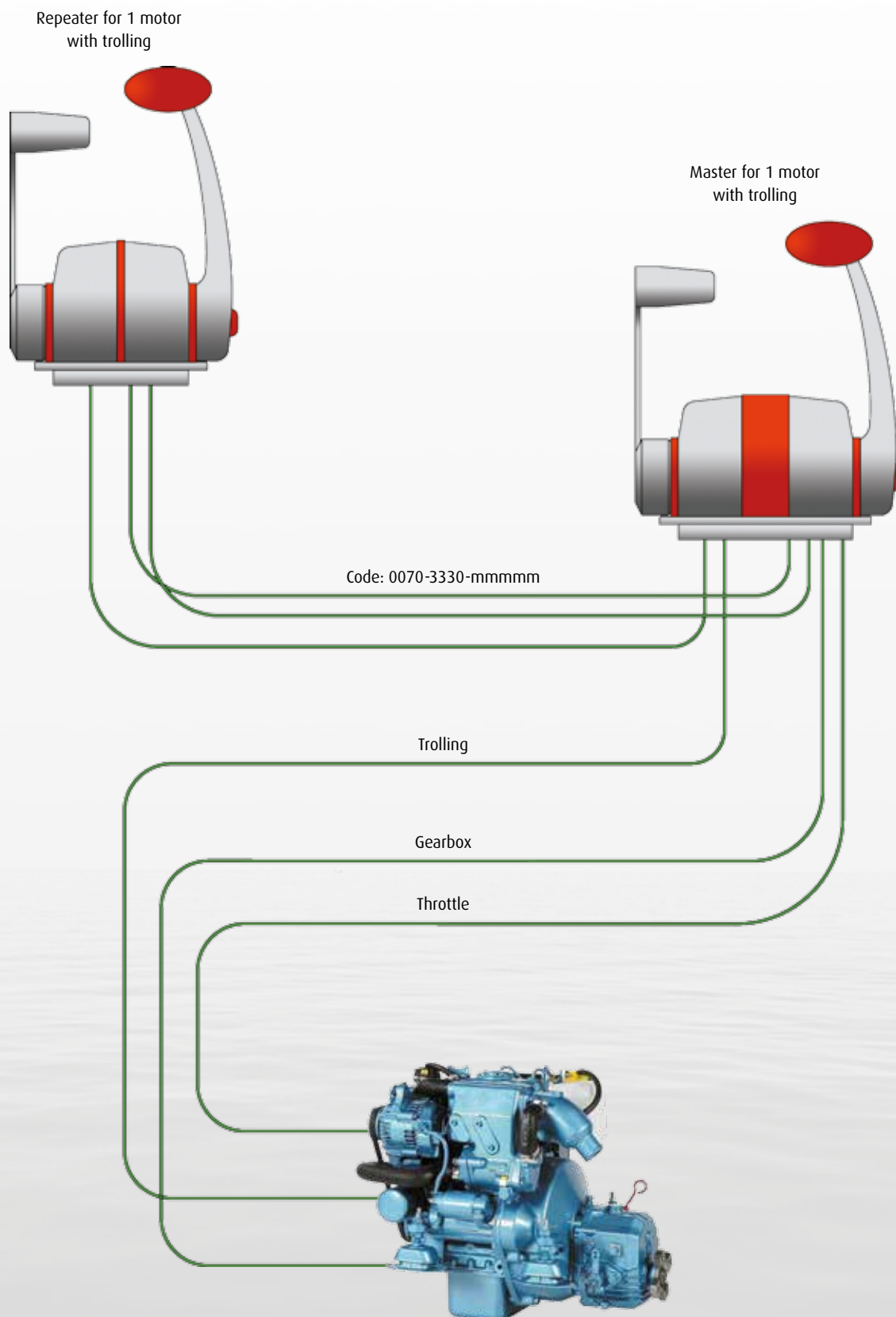
It is very indicated for fishing on professional and pleasure boats as well.



PRODUCT RANGE

DESCRIPTION	CODE
• Single lever chrome plated for 1 motor + trolling; red handle	30090.1-CR
• Single lever black for 1 motor + trolling; red handle	30090.1-SR
• Master chrome plated for 1 motor + trolling; red handle	3390.1-CR
• Master black for 1 motor + trolling; red handle	3390.1-SR
• Repeater chrome plated for 1 motor + trolling; red handle	3090.1-CR
• Repeater black for 1 motor + trolling; red handle	3090.1-SR

INSTALLATION SCHEME FOR 2 COMMAND STATIONS



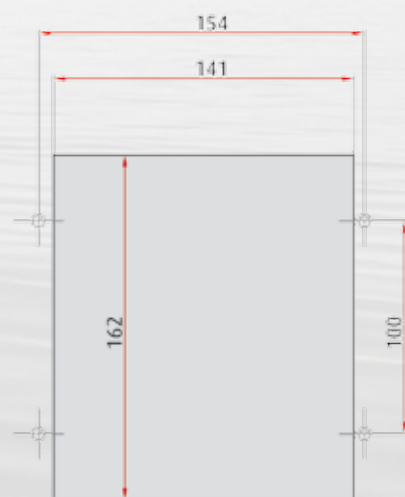
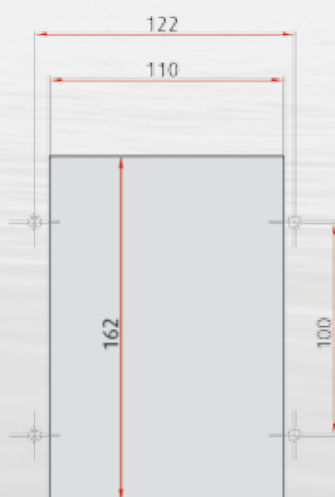
Note:
mmmmm is the length in mm

DIMENSIONS, FOOTPRINTS AND DRILLING MASKS

Repeater single lever
+ trolling for 1 motor

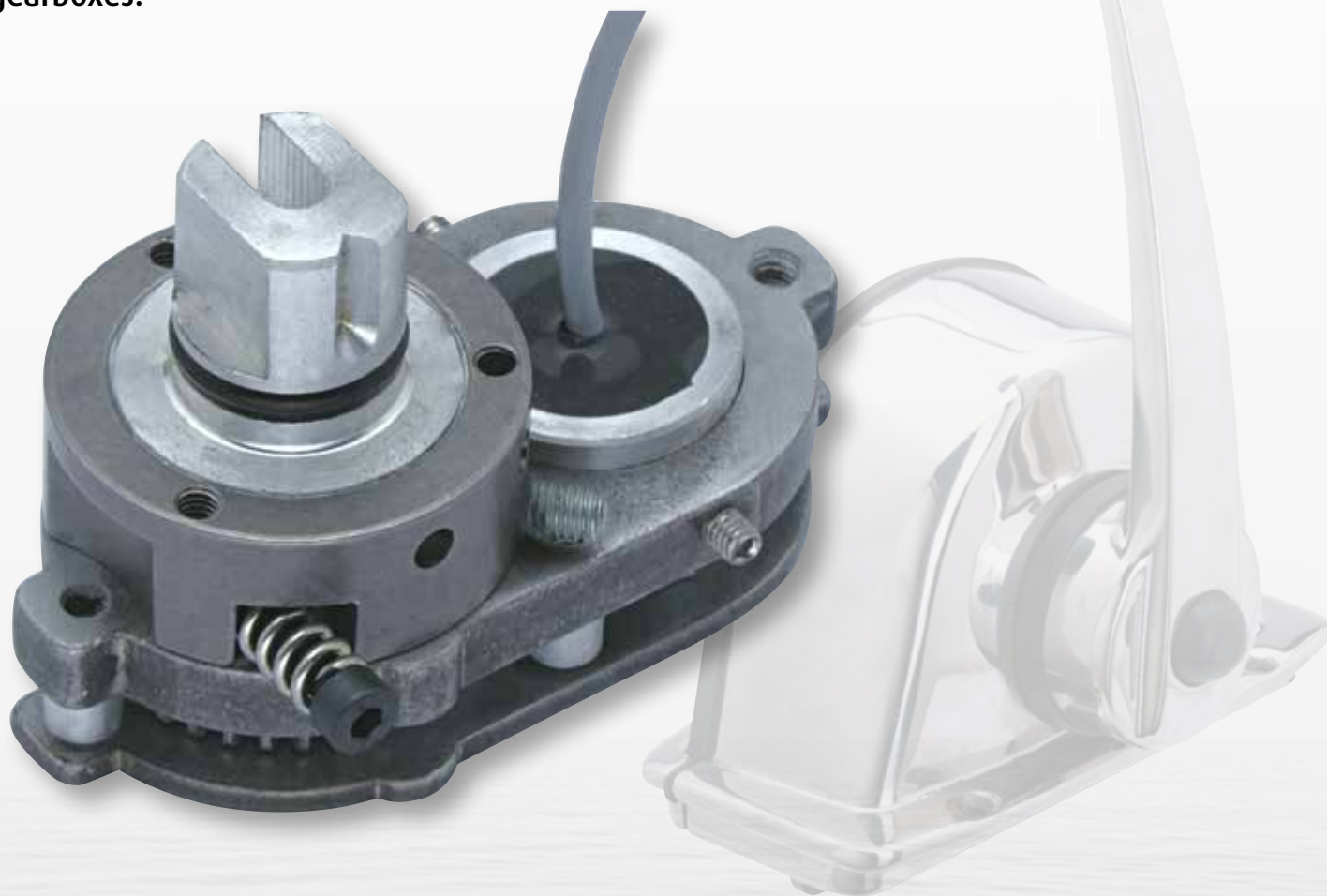


Master single lever
+ trolling for 1 motor



COMMAND LEVER 3000 WITH ELECTRONIC THROTTLE CONTROL

Lever 3000-ELT is an hybrid control lever which allows you to interface directly to the new electronic and CANBus common-rail engines, combined with mechanical gearboxes.



COMPONENTS AND TECHNICAL SPECIFICATIONS

With lever 3000-ELT it is possible to set up large installations that would be impossible to achieve with traditional mechanical systems:

- thanks to the electronic transmission of the signal, the control of electronic motors is fast, secure and easy to install
- the command of the gearbox is either via a Flexball cable, thus ensuring the requirements of precise handling and reliability that are typical of the Flexball cable, or through a standard push-pull cable.

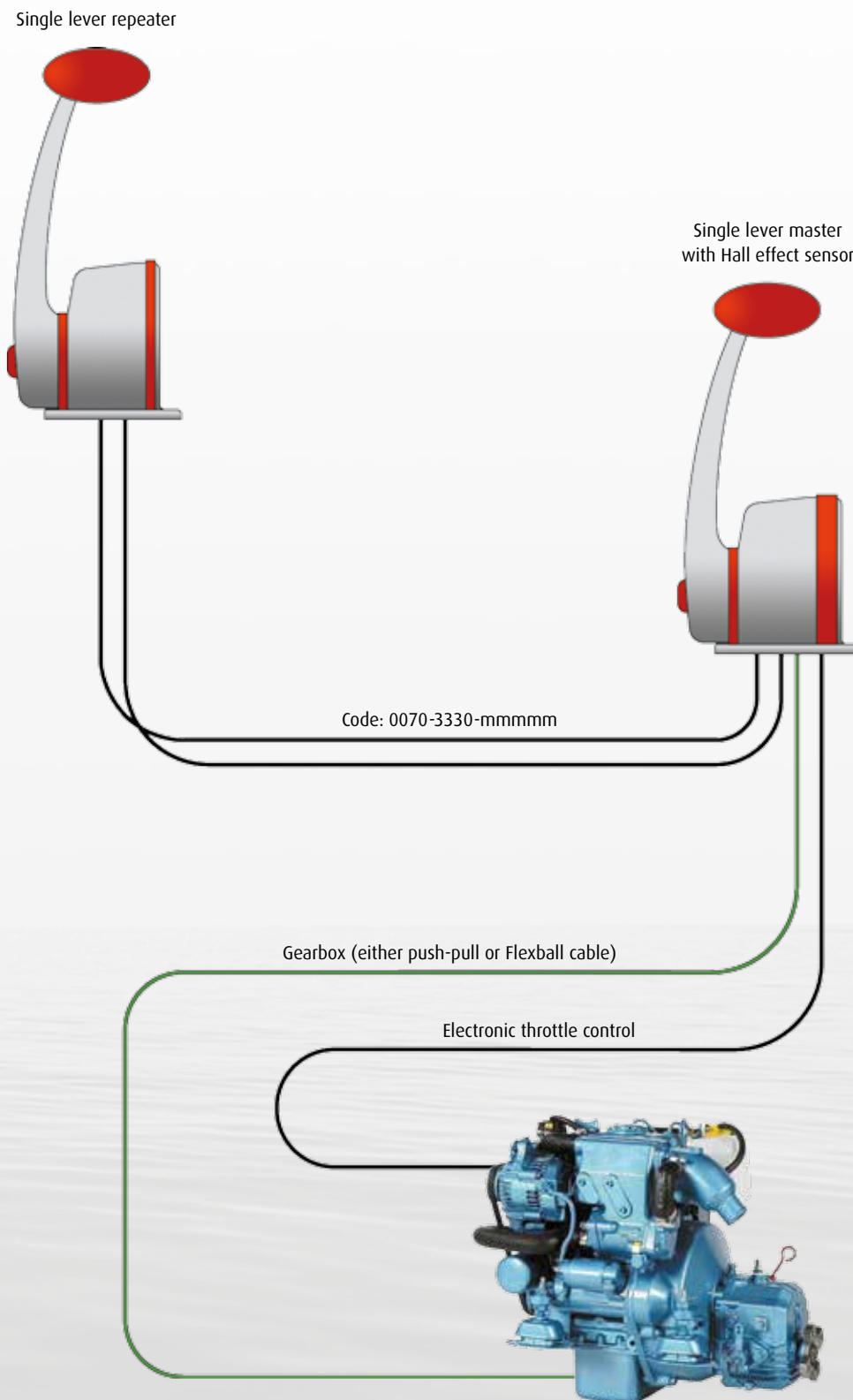
This solution has further advantages in case of installations with multiple control stations (see diagram on next page). With this control system it is very easy to make a perfect change of command from one station to another, also during navigation.

Since the levers are mechanically bounded to each other, when moving a lever, the other follows.

In the transition from one station to the other, the pilot finds the lever on which he has just come, exactly in the same position of the lever that he has left and the engine's working conditions remain unchanged.

Lever 3000-ELT is compatible with all electronic engines with voltage, current and CANbus interface.

INSTALLATION SCHEME



Note:
mmmmmm is the length in mm

▼ ENGINE CONTROL LEVER 3200

Trusty and robust control for single or twin engine installation.

▼ 3200.1 single

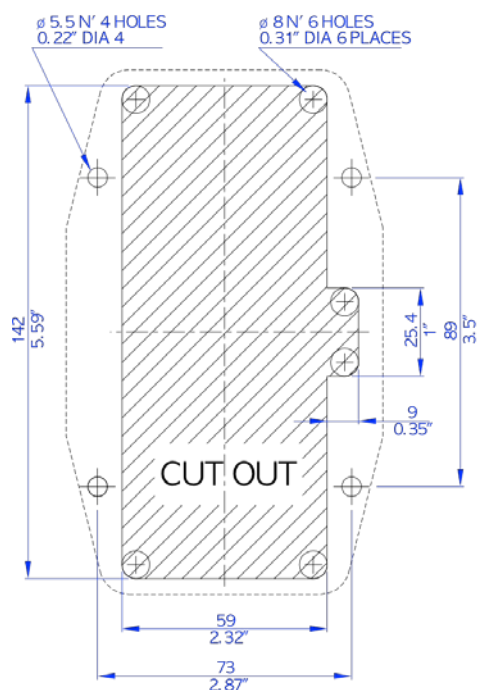


▼ 3200.2 twin

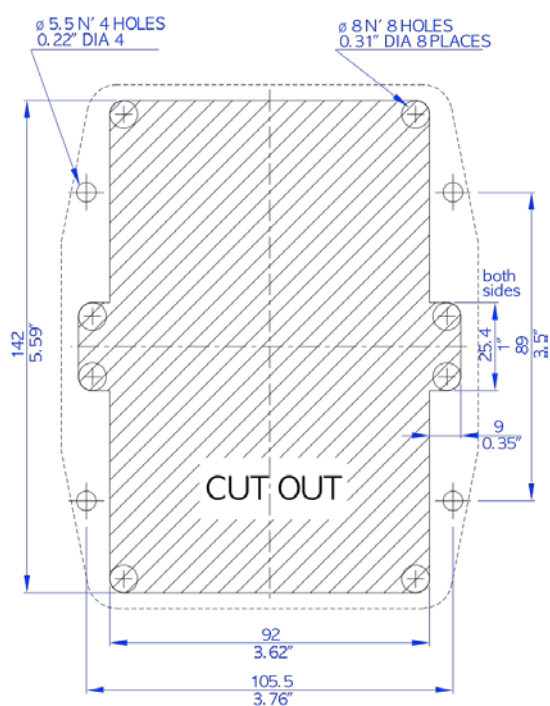


- Double action (throttle/shift control)
- Warm-up function
- Starting in gear prevention through a neutral safety switch (option)
- Adjustable shift control stroke
- Suitable for inboard, outboard and stern drive configuration

3200.1 Single control template



3200.2 Twin control template



To be noticed: drawings above are not to scale

COMMAND SYSTEM 590 SERIES



- Lever mixed right, available with interlock
- 1 throttle + 1 gearbox



- Lever double throttle



- Lever mixed left, available with interlock
- 1 throttle + 1 gearbox



- Lever double gearbox

TECHNICAL FEATURES

It is a system with double lever for deck mounting with limited external dimensions and with a simple and modern style. All the mechanism is under the desk and it is available with interlock system between the throttle and

the gearbox. It is also available with an adjustable friction on both levers. The internal mechanism allows a serial connection between two command stations.

Material used: stainless steel.

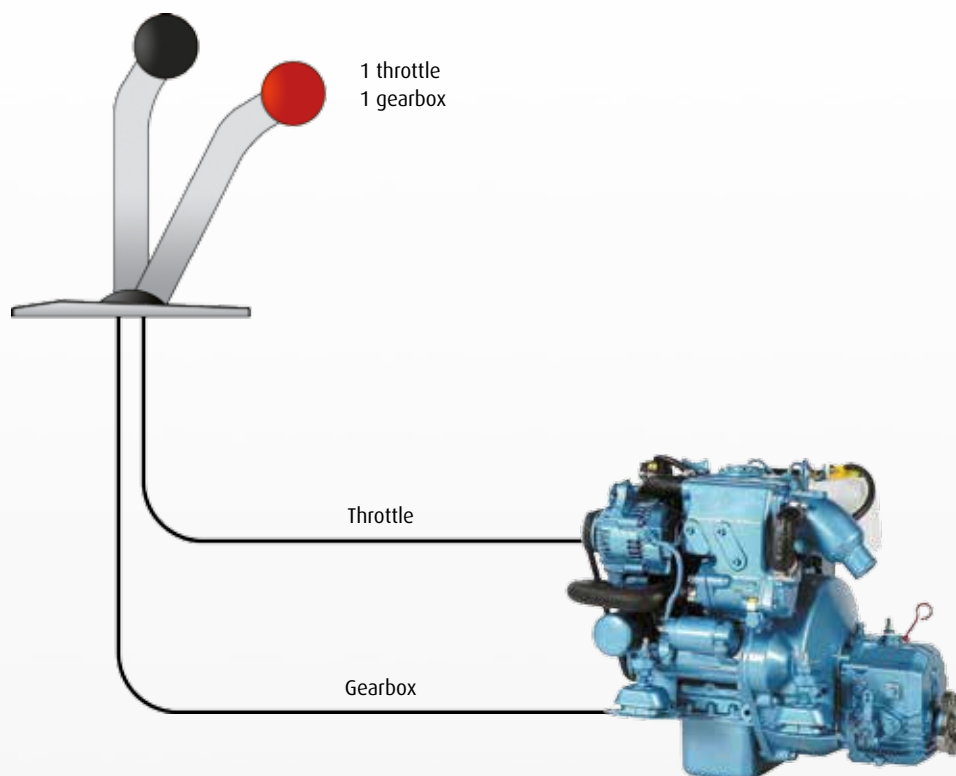
DESCRIPTION

- Control lever Series 590 mixed right
- Control lever Series 590 mixed right with interlock
- Control lever Series 590 mixed left
- Control lever Series 590 mixed left with interlock
- Control lever Series 590 double throttle
- Control lever Series 590 double gearbox

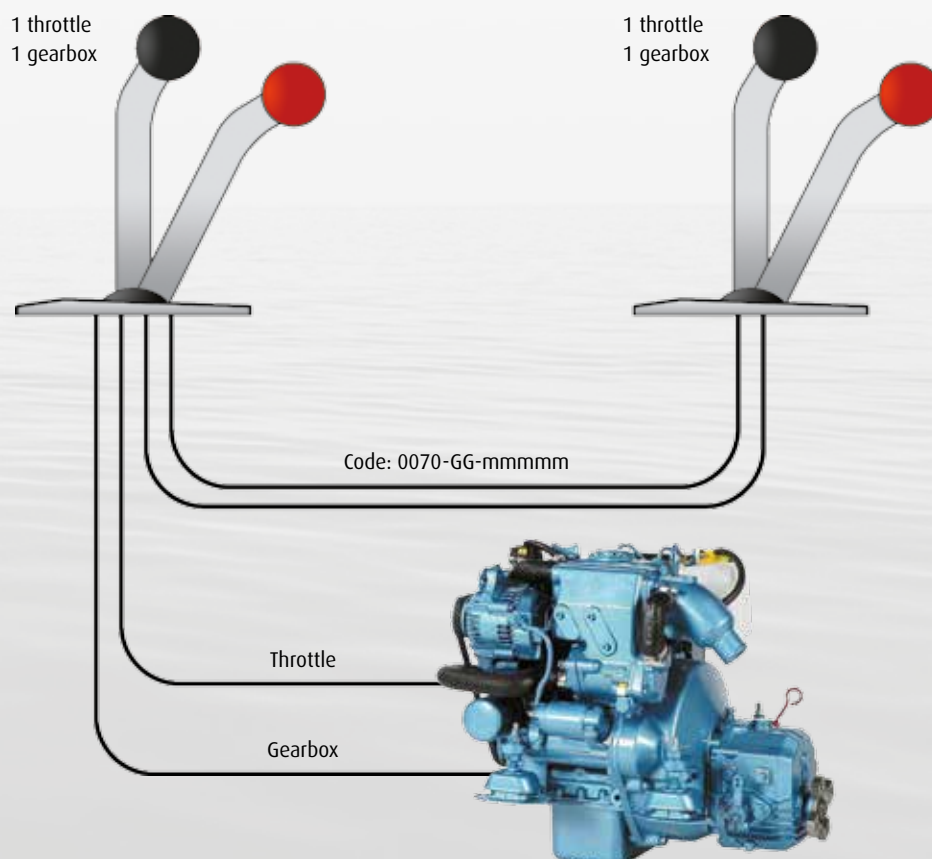
CODE

0590-MDX-INOX
0590-MDX-INT
0590-MSN-INOX
0590-MSN-INT
0590-DGS-INOX
0590-DIN-INOX

INSTALLATION SCHEME WITH ONE COMMAND STATION

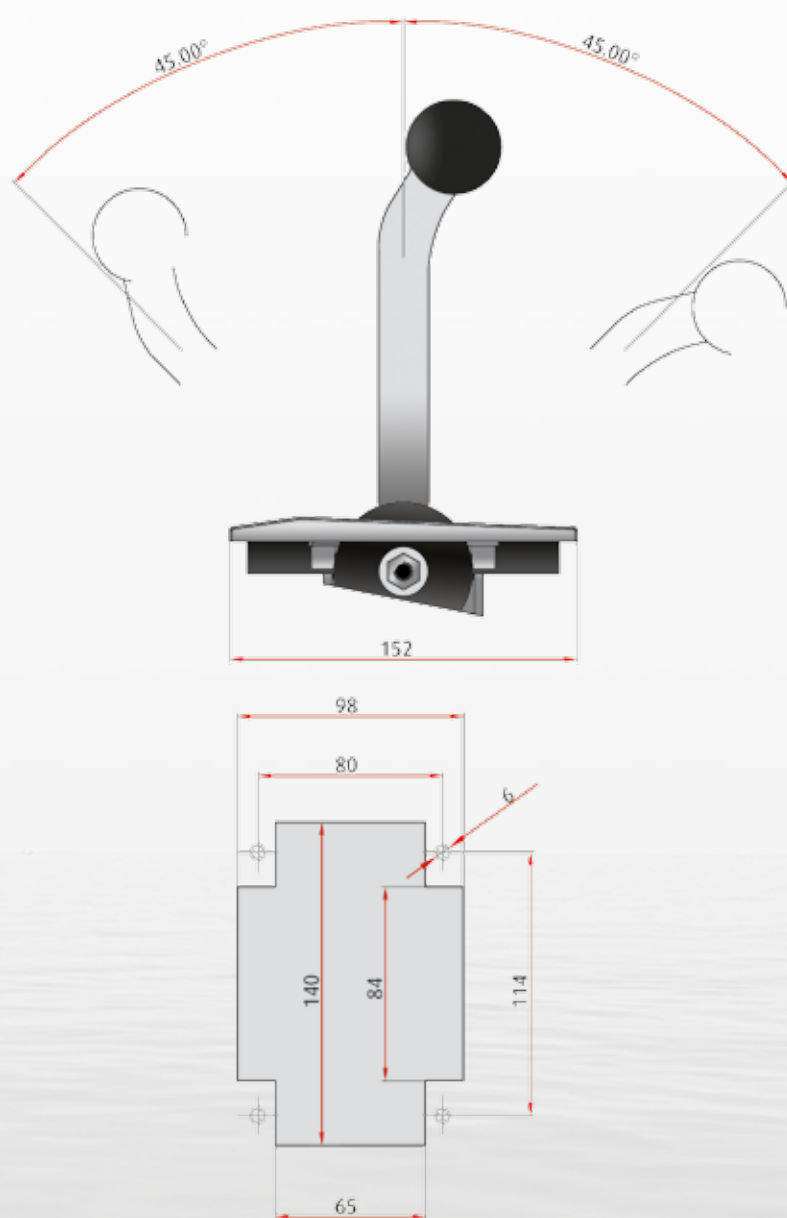
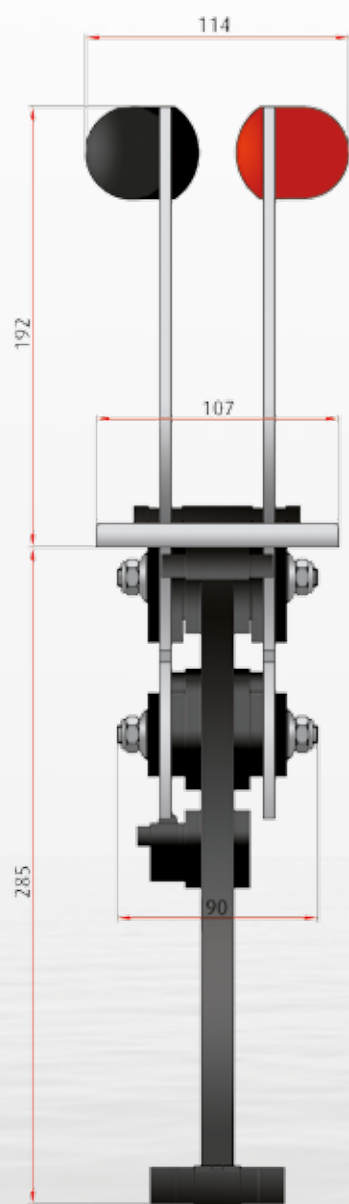


INSTALLATION SCHEME WITH TWO COMMAND STATIONS

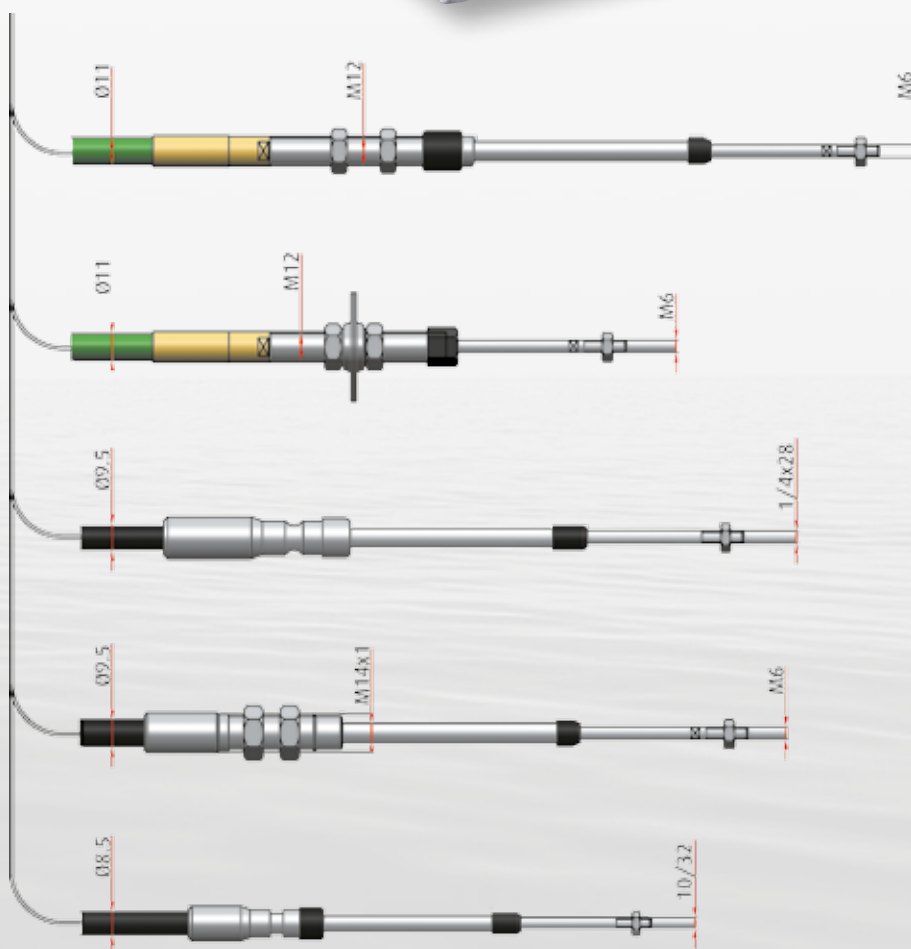


Note:
mmmmmm is the length in mm

DIMENSIONS, FOOTPRINTS AND DRILLING MASKS



MECHANICAL CABLES AVAILABLE WITH LEVERS SERIES 590



COD. 0070-FM-mmmmm

- Flexball cable type 70 with form M terminal

COD. 0070-FF-mmmmm

- Flexball cable type 70 with form F terminal

COD. E4-fff

- Push-pull cable E4

COD. E6-mm.mmM

- Push-pull cable E6

COD. E3-fff

- Push-pull cable E3

Note:

mmmmmm is the length in mm

Example: Flexball 70 L=4 m → 0070-GF-04000

mm.mm is the length in meters

Example: E6 L=4,5 m → E6-04.50M

ff is the length in feet

Example: E3 L=10 feet → E3-10F

MULTILEVER CONTROL SYSTEM

350 SERIES



It is a very simple and modular control system that can be used either as throttle or gearbox command lever in different combinations. Maximum system configuration is 6 control levers.

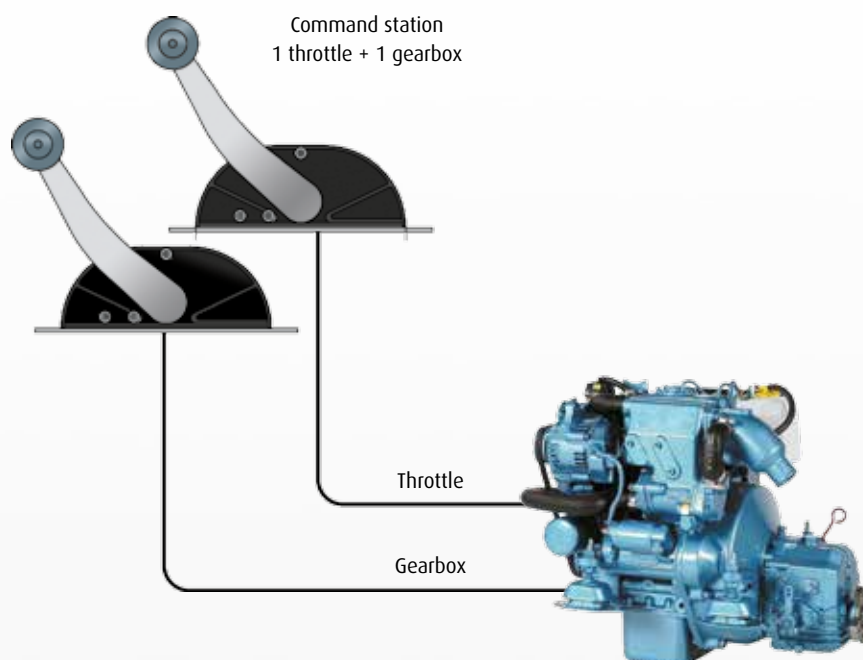
TECHNICAL FEATURES

- available with different lever lengths
- suitable for application on off-shore boats
- internal mechanism in stainless steel
- moving on bushes
- external house in aluminium black painted
- fixing mask in stainless steel polished.

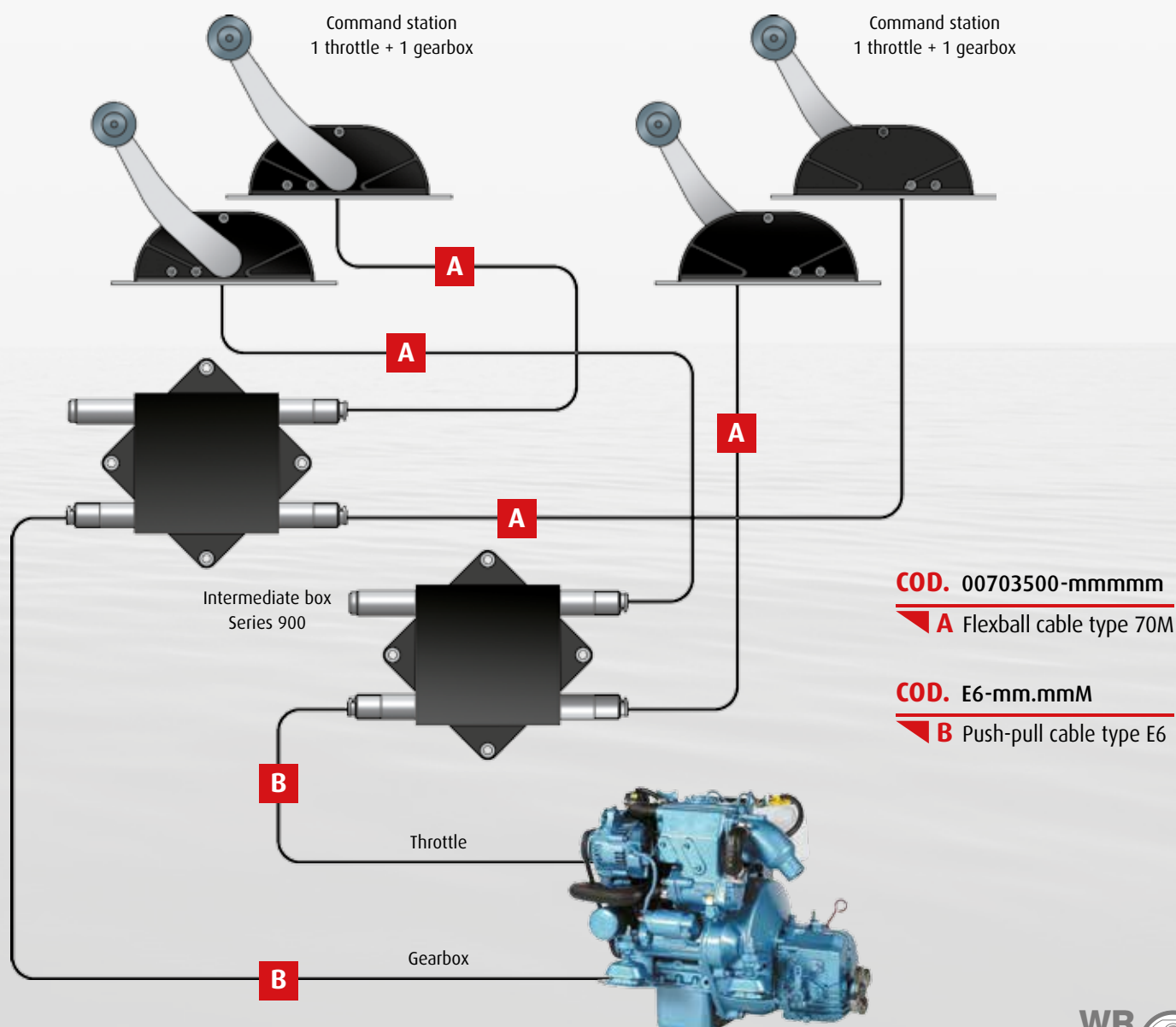
PRODUCT RANGE

DESCRIPTION	CODE
Lever for throttle command	
• Control unit with lever L=180 mm, push version	350.00
• Control unit with lever L=150 mm, push version	350.01
• Control unit with lever L=125 mm, push version	350.02
• Control unit with lever L=200 mm, push version	350.03
• Control unit with lever L=180 mm, pull version	351.00
• Control unit with lever L=150 mm, pull version	351.01
• Control unit with lever L=125 mm, pull version	351.02
• Control unit with lever L=200 mm, pull version	351.03
Lever for gearbox command	
• Control unit with lever L=180 mm, push version	355.00
• Control unit with lever L=150 mm, push version	355.01
• Control unit with lever L=125 mm, push version	355.02
• Control unit with lever L=200 mm, push version	355.03
• Control unit with lever L=180 mm, pull version	356.00
• Control unit with lever L=150 mm, pull version	356.01
• Control unit with lever L=125 mm, pull version	356.02
• Control unit with lever L=200 mm, pull version	356.03
Accessories	
• Fixing mask for single lever	1135.01
• Fixing mask for two levers	1135.02
• Fixing mask for three levers	1135.03
• Fixing mask for four levers	1135.04
• Fixing mask for five levers	1135.05
• Fixing mask for six levers	1135.06

INSTALLATION SCHEME FOR ONE COMMAND STATION

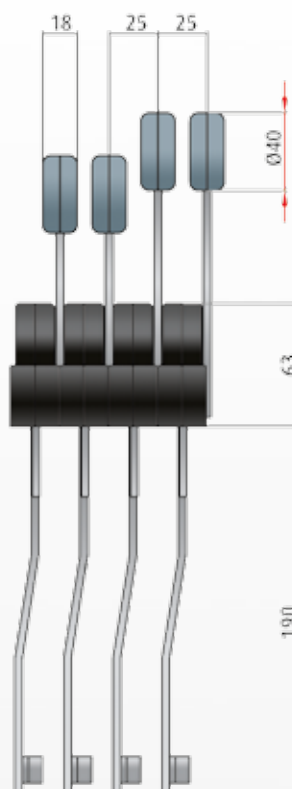
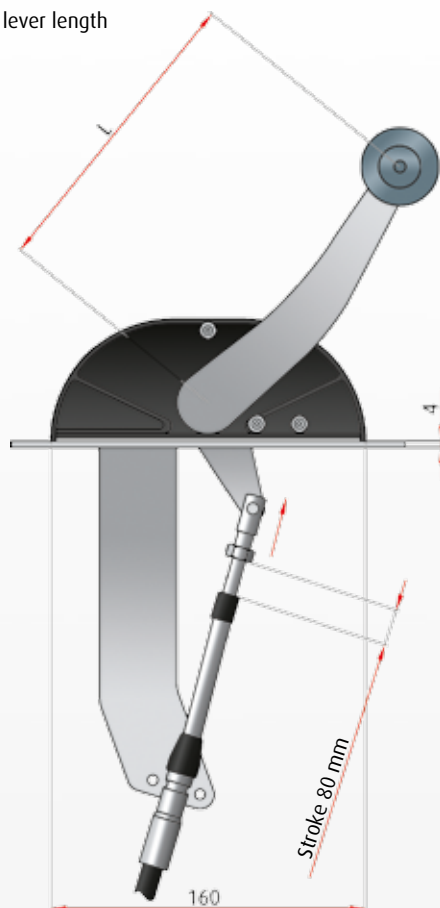


INSTALLATION SCHEME FOR TWO COMMAND STATIONS

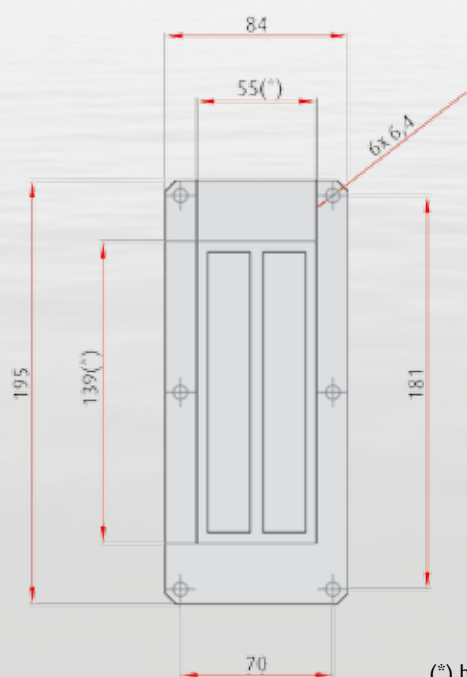


DIMENSIONS AND DRILLING MASKS

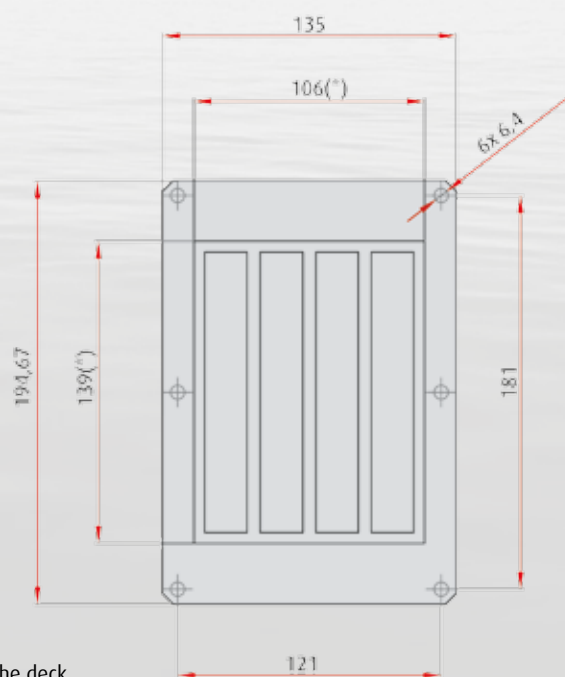
L = lever length



DRILLING MASK FOR TWO LEVERS



DRILLING MASK FOR FOUR LEVERS



(*) hole to be cut to on the deck

CONTROL LEVER WITH RACK 900 SERIES

This is a series of control levers with robust and essential design, based on a rack and pinion mechanism, indicated for heavy duty applications.

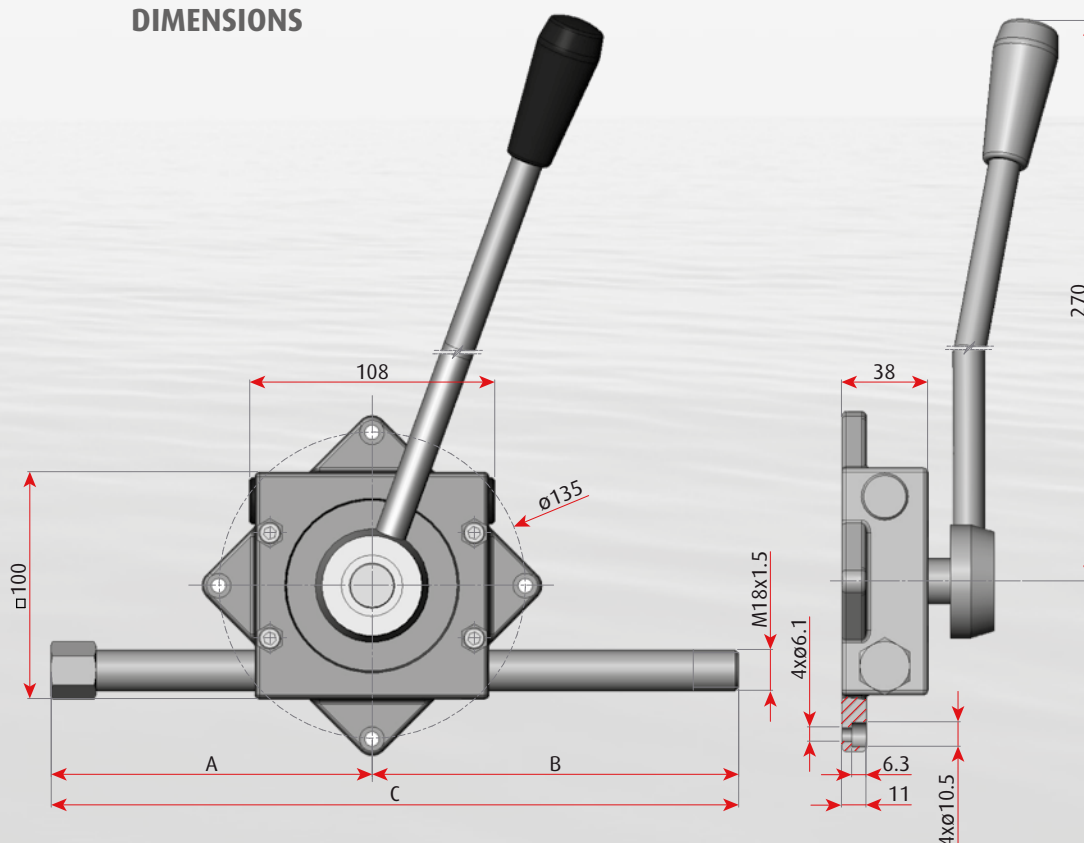


STROKE	A	B	C
50	90	110	200
70	110	130	240
100	140	152	292
125	168	177	342
150	190	202	392

Control levers Series 900 are suitable to command winches, very heavy gearboxes, big and small cranes.

Control lever Series 900 are available with single lever (one cable can be connected), with single lever + locking device, with two levers (two cables can be connected) and with two levers + locking device.

DIMENSIONS





CONTROL LEVER WITH RACK E95 SERIES

This is a series of control levers with robust and essential design, based on rack and pinion mechanism, are indicated for heavy duty applications. Control levers Series 900 are suitable to command winches and hydraulic pumps.

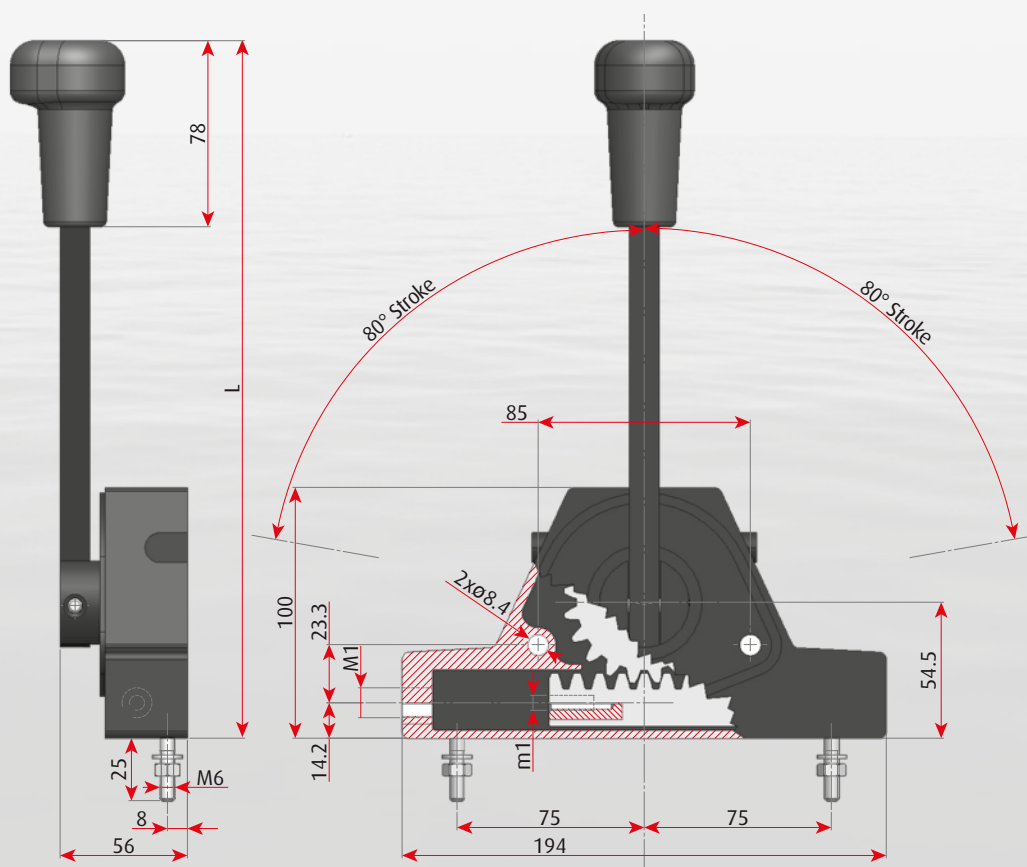
TECHNICAL FEATURES

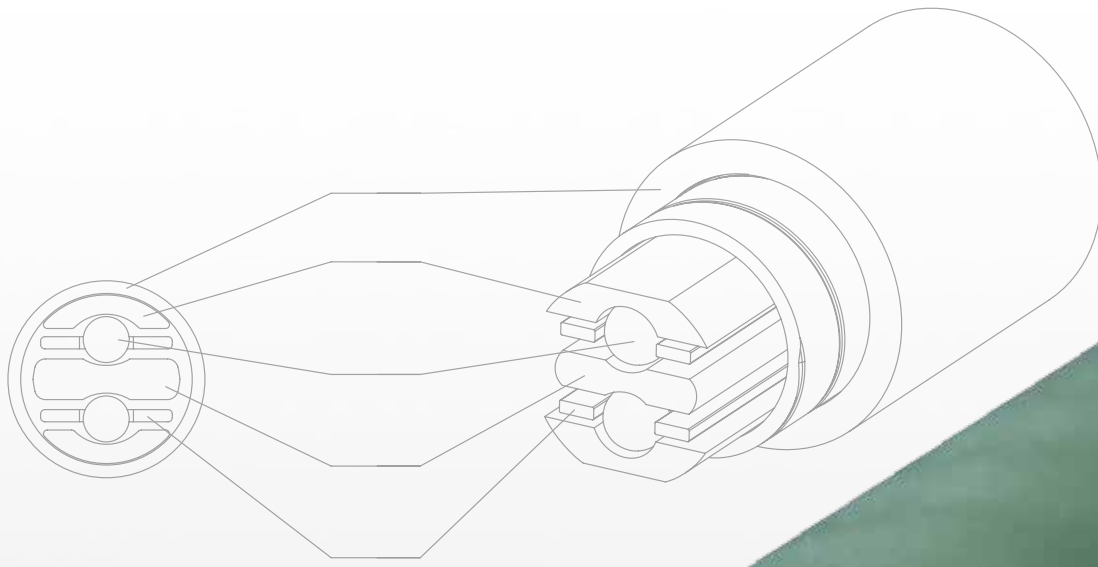
It is possible to connect either push-pull or Flexball cables. Different way of fixing are available: either wall or deck mounting.

- Maximum stroke: 85 mm
- Maximum working load: 120 kg
- Lever ratio: 7,3:1.

It is available with or without adjustable friction, with fix or oscillating command lever.

DIMENSIONS



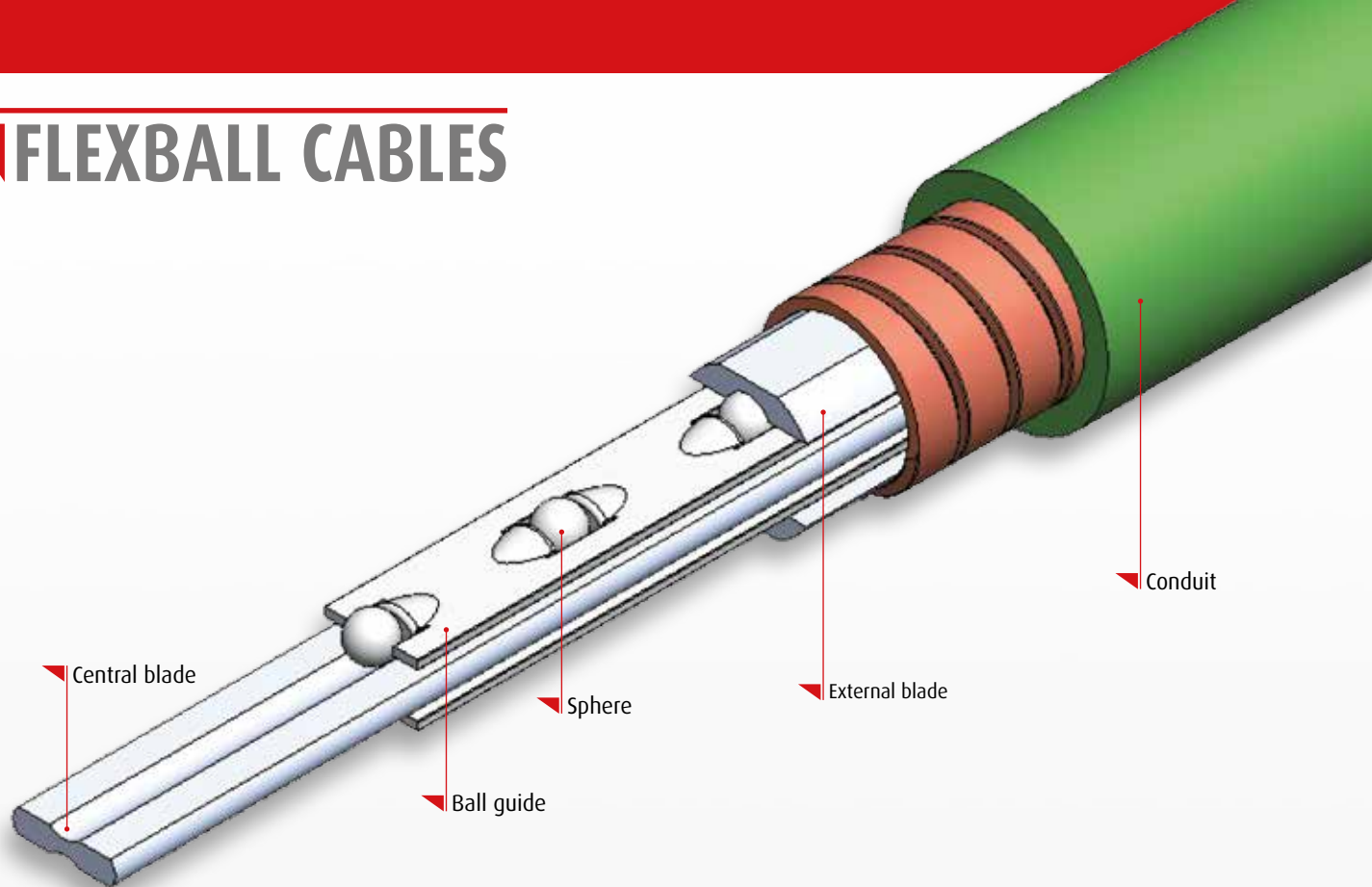


4



Flexball
cables

FLEXBALL CABLES



The **Flexball cable**, recognizable from the green colour of the plastic cover, is an extremely flexible and sliding cable. It has a very robust and reliable construction, with very high performances. If mounted properly, a Flexball cable can work “for ever”.

Flexball cables are mainly used on boat in which long distances have to be covered, high loads have to be transmitted and the reliability is a “key word”.

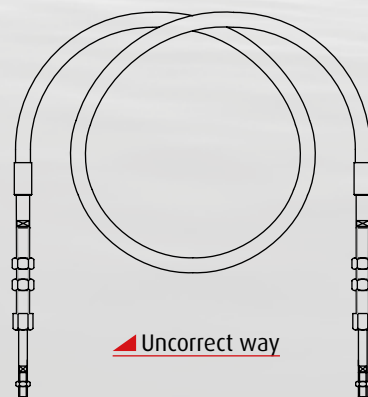
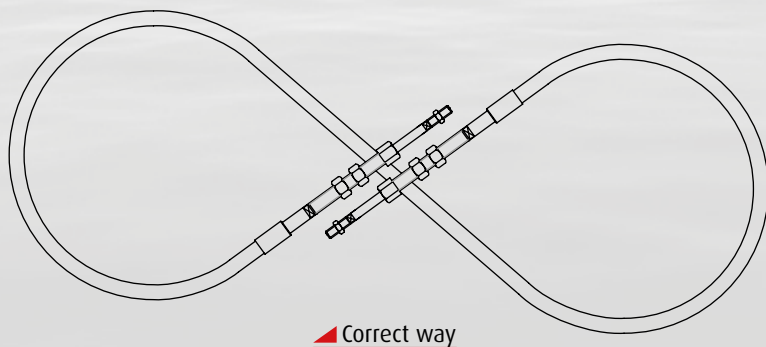
The Flexball cable is made with a central blade that runs on two lines of spheres guided by two external blades.

Materials used change according to the application: for industrial application terminals are in steel zinc while for marine applications terminals are either made with brass or stainless steel. Internal blades are stainless steel AISI304L for any kind of applications.

Flexball cables are used in any kind of special applications. If this is the case, please feel free to contact our technical department.

For a proper mounting, look at our “Mounting instructions”.

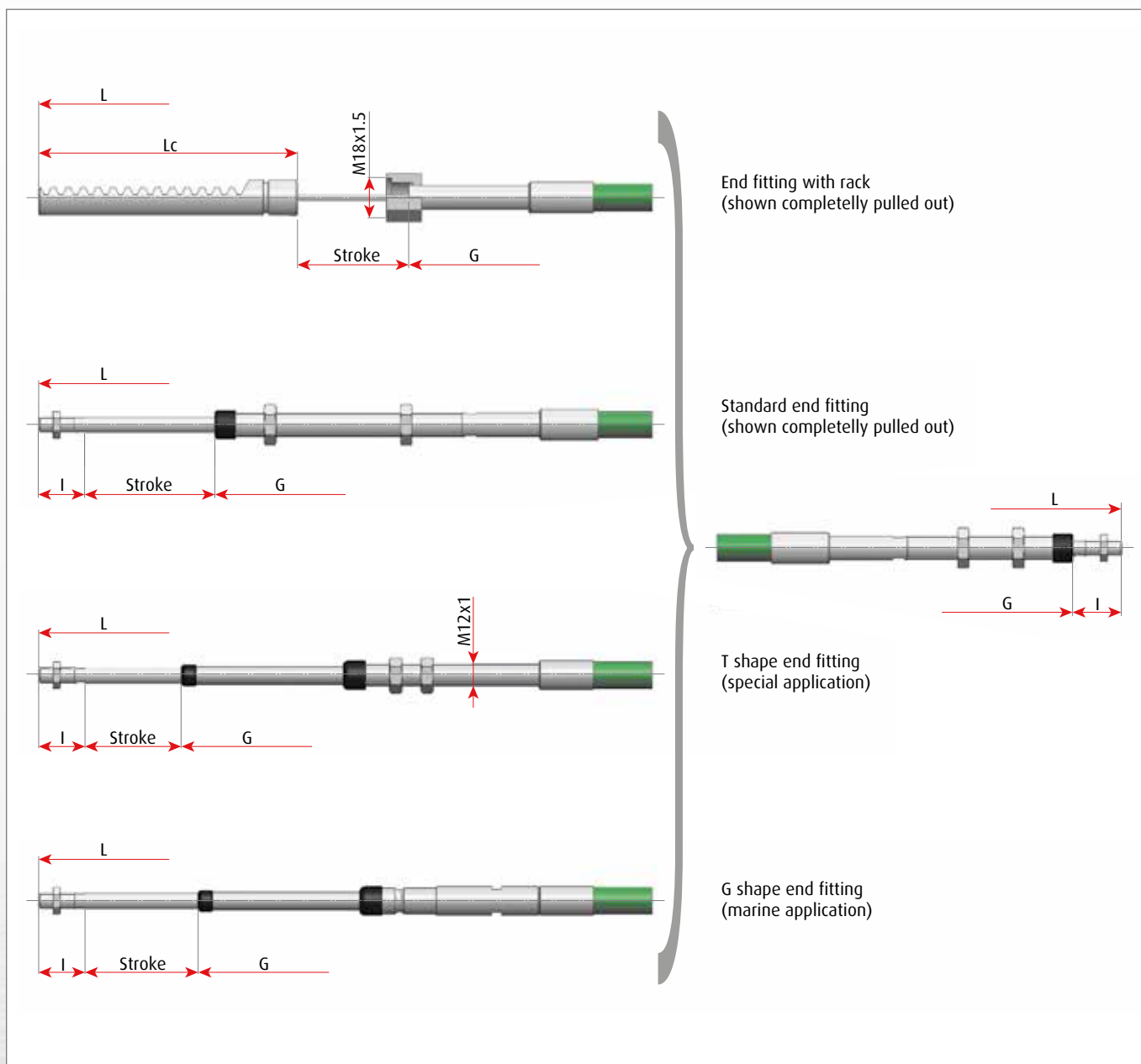
The **Flexball cable** is delivered in a proper box and bent with an “8” shape to respect its minimum bending radius. Once received, it should be opened and stored in a straight line. If not possible, we suggest to leave it in the box like you have received it. Flexball cable must not be stored in a circular way, otherwise it can be seriously damaged.



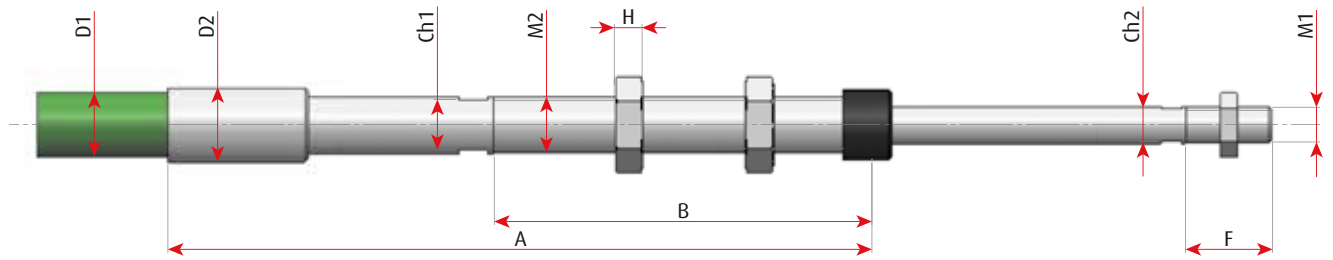
PRODUCT RANGE

The **Flexball cable** is available in different sizes, from type 55 which has a conduit diameter of 9.5 mm, to type 160 that has a conduit diameter of 24.3 mm.

The **Flexball cables** are available with several types of end fittings to fit the different application requirements.



STANDARD FLEXBALL END FITTING DIMENSIONS



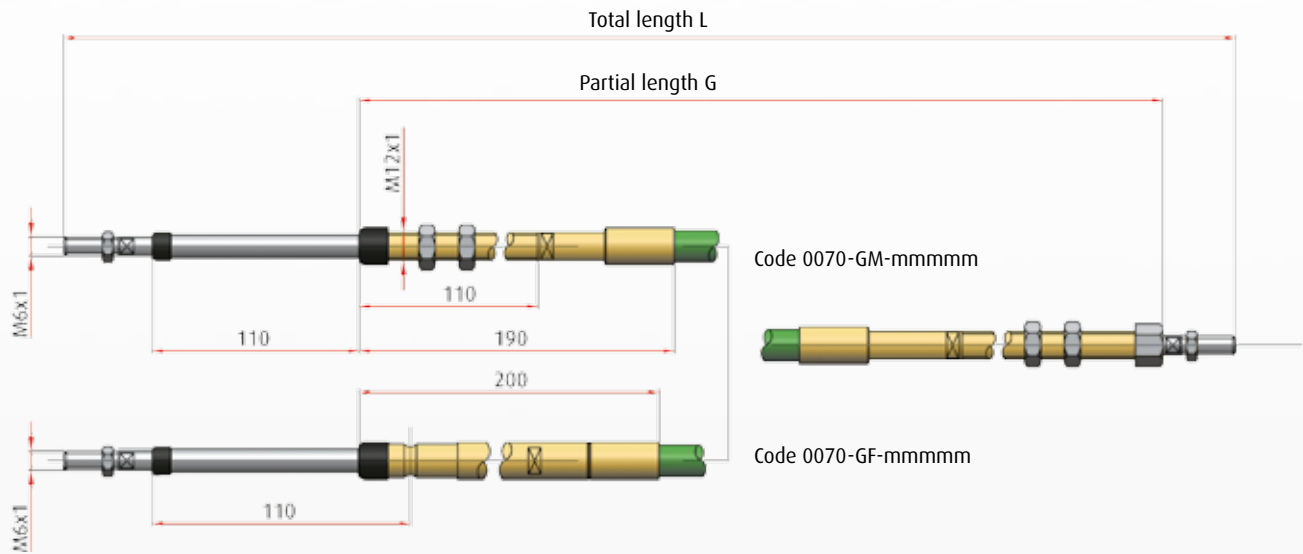
Type	Stroke	M1	M2	Ch.1	Ch.2	A	B	I	D1	D2	F	R.min	Max load (N)		η
													Push	Pull	
70	50	M7x1 (M6x1)	M12x1	11	6	142	55	38	11.3	13	30	140	1600	2800	90%
	70					157	70								
	100					187	100						1400		
	150					237	150						600		
	200					292	200						250		
95	50	M10x1.5	M16x1.5	14	9	163	70	38	14.3	16	30	160	2800	5000	90%
	70					183	90								
	100					213	120						2500		
	150					263	170						1400		
	200					313	220						600		

Linear meter weight:

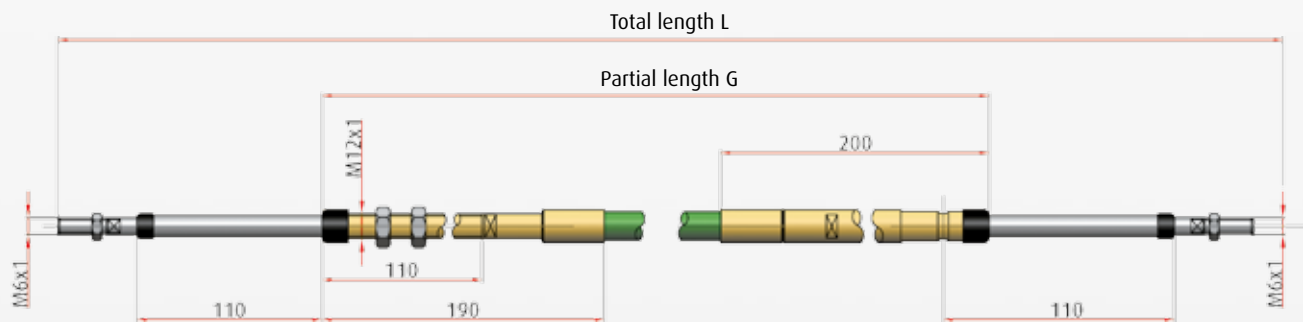
- Flexball cable type 70: 320 gr
- Flexball cable type 95: 518 gr

SPECIAL TERMINALS FOR FLEXBALL CABLE TYPE 70

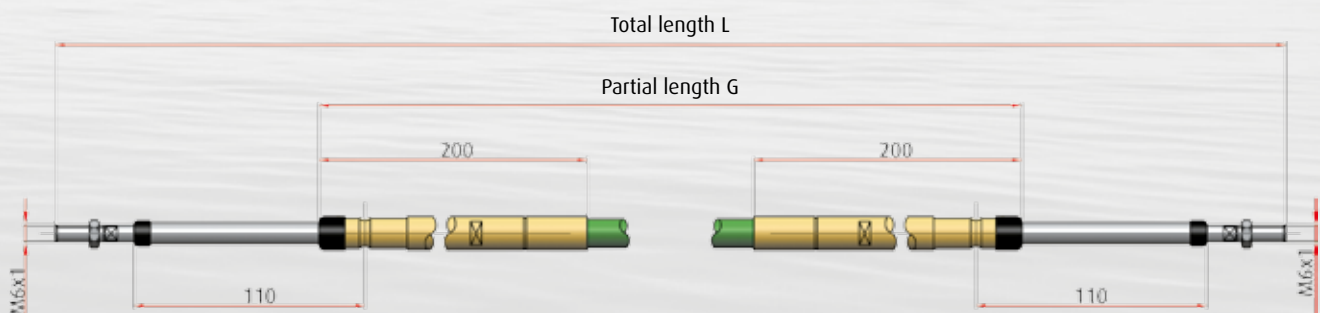
Flexball cable with terminal shape F and stroke 100 mm on one side and terminal shape M or shape G on the other side



Flexball cable with terminal M on one side and terminal G on the other side



Flexball cable with both terminals G shape, code 0070-GG-mmmmm



Note:

mmmmmm is the length in mm











5

Push-pull
cables

Flexball offers a full range of push-pull cables both for the pleasure boats and for the professional boats sector. All cables are supplied with either brass or stainless steel terminals.

Type	Code	Stroke (mm)	Thread 1 st end	Thread 2 nd end	Conduit diameter	Application
E2	E2-fff	80	10/32 UNF	10/32 UNF	7	Volvo Penta®: inboard, sterndrive
						
E3	E3-fff	80	10/32 UNF	10/32 UNF	8	Volvo Penta®: inboard, sterndrive
						
E4	E4-ff.fff	80	1/4X28 UNF	1/4X28 UNF	9,5	Volvo Penta®: inboard, sterndrive
						
E6	E6-mm.mmM	80	M6	M6	9,5	Special applications
						
E5	E5-ff.fff	80	-	-	7	Mercury® – Mercruiser® – Mariner®
						
E14	E14-ff.fff	80	-	-	7	Johnson® – Evinrude® – OMC®
						

HOW TO ORDER

With the exception of E6 cables, which are used for special applications, the length of all the other cable is in feet.

To convert feet to meters multiply by 0.305 and round to the nearest quarter of a meter.

To convert meters to feet, divide by 0.305 and round up to next foot.

If for example we need to use a 4.5 meter cable, the length in feet is:

4.5: 0.305 = 14.75

so, rounding to the next foot, the length to order is 15 feet.

For installations with outboard motors it is advisable to add 1 meter (3 feet) to the measured length; this will allow the proper movement of the engine.

The ordering code structure of the cable is as follows:

E	x	-	f	f	F
---	---	---	---	---	---

The parameters which must be filled into the table to specify the cable are x and ff:

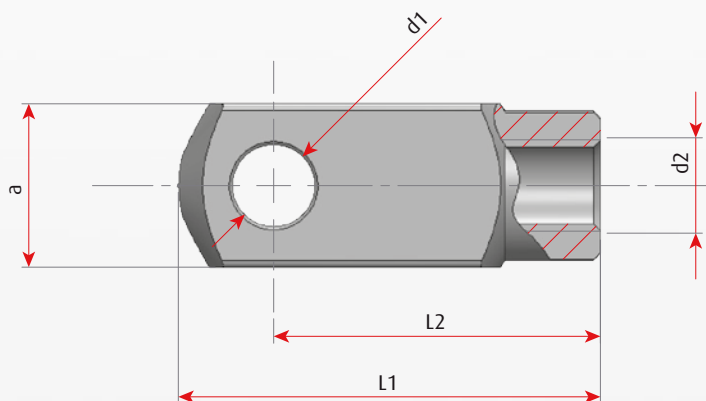
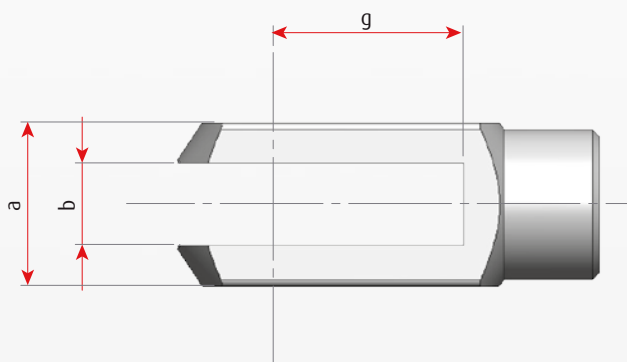
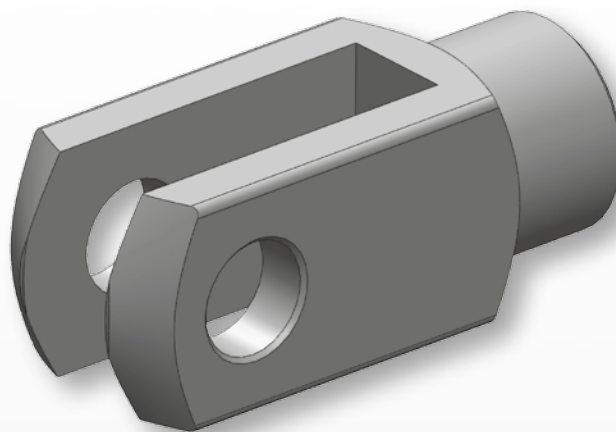
- x = 1,2,3,4, 5 identifies the type of cable
- ff is the cable length in feet

For example, if we order 13-feet cable type E5, the code is: E5-13F

ACCESSORIES

CLEVIS

To determine the right size of the fork, look at the dimension "M1" on the drawings and tables of Flexball, pull and push-pull cables.

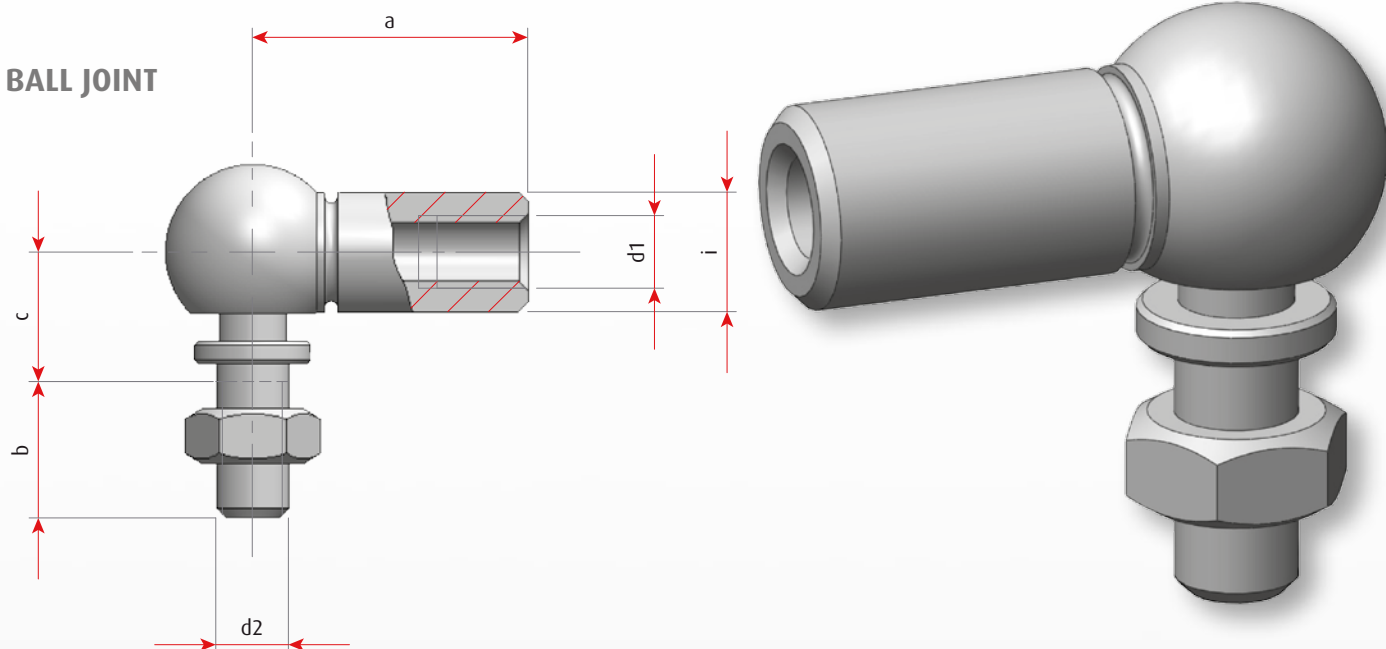


Type	B	d1	d2	g	a	L1	L2	Fork code	Fork + Pin code
6x24	6	6	M5	24	12	43	36	D-0099.01.04.02	0-0099.01.00.09
			M6					D-0099.01.04.04	0-0099.01.00.11
			M7					D-0099.01.04.05	0-0099.01.00.13
			1/4x28					D-0099.01.04.10	
8x32	8	8	M6	32	16	58	48	D-0099.01.06.05	
			M7					D-0099.01.06.03	0-0099.01.00.20
			M8					D-0099.01.04.05	
			1/4x28					D-0099.01.06.07	
10x40	10	10	M10	40	20	72	60	D-0099.01.08.03	0-0099.01.00.26

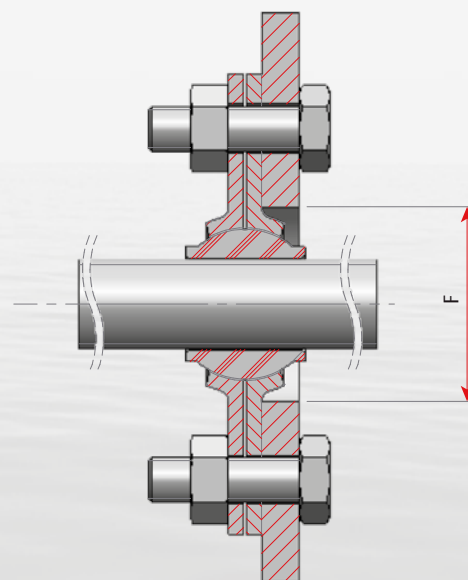
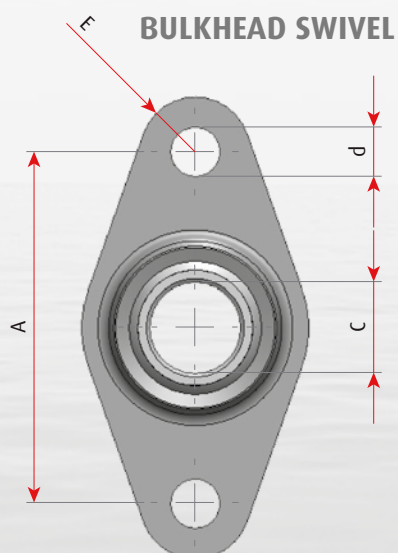
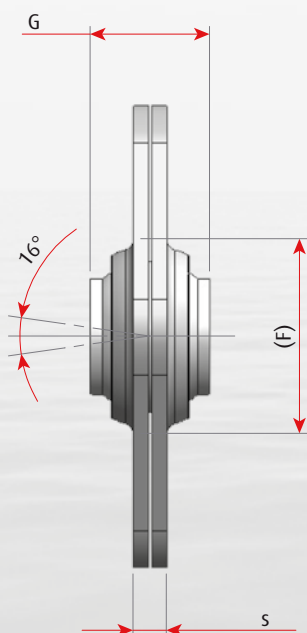
Note:

Accessories with thread M5 can be used on cables with rod thread 10/32 UNF

BALL JOINT



Type	a	i	d1	d2	c	b	Code
AS8	22	10	M5	M5	9	7	D-0099.04.01.00
AS10	25	12	M6	M6	11	8	D-0099.04.03.00
AS13	30	14	M6	M8	13	12	D-0099.04.07.02
			M7	M7			D-0099.04.06.00
			M7	M8			D-0099.04.07.01
			M8	M8			D-0099.04.07.00
AS16	35	16	M10	M10	16	14	D-0099.04.09.00



Note:

"F" is the dimension of the hole that has to be drilled on the bracket where the bulkhead swivel will be fixed. The above picture shows the correct mounting of the bulkhead against the bracket.

Type	A	b	C	D	F	G	s	Ch	Code
70	40	6.2	12.2	32	25	16	4	17	0-0099.03.00.01
95	52	8.2	16.2	38	34	22	5	25	0-0099.03.00.07

A close-up photograph of a mechanical steering component, likely a steering knuckle or a similar part. The component is dark-colored, possibly black or dark grey, and features a large, prominent red number '6' in the upper right corner. The component has a central cylindrical part with a flange and a smaller cylindrical part extending from it. Several bolts are visible, securing the component. The background is a light, neutral color.

6

Mechanical
steerings

STEERING S6 SERIES

Series S6 is a compact and robust steering for boats equipped with motors up to 40 kW (55 hp).

TECHNICAL FEATURES

- complete rotation with 2.5 turns of the steering wheel
- maximum wheel diameter: 375 mm
- maximum working load 1200 N (120 kg).



S6 SYSTEM COMPONENTS	CODE
• Helm including bezel kit	SM6-10
• Link arm, inox	SA-0001
• Connecting rod for 2 engines, inox	SA-0003
• Cable for steering Series SM6	SC6-fff

Note:

ff is the cable length in feet. Example: cable SC6 L=10 feet → SC6-10F

STEERING S7 SERIES

Series S7 is a robust steering for outboard motorboats up to 9 meters and inboard motorboats up to 10.50 meters.

SM7-20 version has a double helm that is mandatory for boats which reach speeds above 50 knots.

TECHNICAL FEATURES

- planetary gearbox for higher forces and high precision (low backlash)
- complete rotation with 4 turns of the steering wheel
- maximum wheel diameter: 400 mm
- maximum working load 5000 N (500 kg).



S6 SYSTEM COMPONENTS	CODE
• Single helm	SM7-10
• Double helm	SM7-20
• Bezel 90°	SM7-01
• Bezel 20°	SM7-02
• Link arm, inox	SA-0001
• Connecting rod for 2 engines, inox	SA-0003
• Cable for steering Series SM7	SC7-fff

Note:

ff is the cable length in feet. Example: cable SC7 L=10 feet → SC7-10F

ACCESSORIES

COD. SA-0001

Link arm inox

- connect the cable to the engine
- stainless steel arm with self-lubricated terminals
- the kit consists of sealing for dust protection and stainless steel self-locknuts.



COD. SA-0003

Connecting rod for 2 engines inox

- to be used to secure a rigid connection of two engines
- threaded rod at both ends, with the possibility of adjustment in function of the distance between the two engines
- the kit includes tie rod, ball joints and stainless steel self-locknuts.



Bezels for steering Series S7

Available in two versions:

COD. SM7-01

Kit for bezel 90°

Cod. SM7-01

COD. SM7-02

Kit for bezel 20°

Both kits contain:

- nuts
- screws
- fastening material.



Cod. SM7-02

SELECTION GUIDE

Steering: for security reasons, select the appropriate steering in terms of engine power, speed, keel, etc. The engine's power must never exceed the power specified by the manufacturer of the boat.

Cable for the first installation: the cable length is determined by the sum of the path of the cable through the boat, removing 10 cm per each curve. To obtain the length in feet, divide by 30.5 and round to the next full length.

Spare-part cable: the cable length is determined by the length "D" of the conduit, as shown in the drawing, plus other 56 cm. To obtain the length in feet, divide by 30.5 and round to the next full length.

Example:

- $(D = 400 \text{ cm}) + (56 \text{ cm}) = 456 \text{ cm}$
 - $456 \text{ (cm)} / 30.5 = 14.75 \text{ feet}$
- so, rounding to the next foot, the length to order is 15 feet





STEERING CABLES

Flexball offers a complete range of cables for mechanical steering systems.

According to the following specification:

- cables from 6 to 30 feet
- stainless steel terminals
- maximum stroke 230 mm
- minimum bending radius: 200 mm.

Type	Code	Conduit diameter	Application
SC6	SC6-ffF	12.5	Flexball: SM6 Teleflex® Compact®, Ultraflex® T67, Morse® C230®, C231®
			
SC7	SC7-ffF	14.7	Flexball: SM7 Teleflex®: Safe-TQC®/NFB® Ultraflex®: T85, T71FC, T72FC, T73NRFC, T74NRFC, T81FC, T82FC, T83NRFC, T84NRFC
			

Notes





Flexball Italiana S.r.l.
Via San Luigi 13/A
10043 - Orbassano (To) Italy

Tel 0039.011.90.38.900
Fax 0039.011.90.38.747
info@flexballitaliana.com
www.flexballitaliana.com

