CADDIAN dictionary

Gestures were chosen in part from those common to divers and in part from everyday ones: in fact, the gestures should be feasible in the underwater environment and should be as intuitive as possible. However all diving agencies or organizations around the globe teach their divers hand signals, making some of them to vary from region to region: we chose the most famous and common ones [9] [10] [11] [12] [13].

The following list contains all the CADDIAN gestures. In most cases, the gestures have been chosen so as to be affine to natural/instinctive meaning. In other cases, the memorization of the meaning of a gesture is possible, through the association of objects pertaining to the action you want to perform such as in the "Take a photograph" case: the diver shows three fingers, which can be associated to the tripod used to stabilize and elevate a camera.

Each CADDIAN message has been catalogued and described as follows:

Title
The name of the command

CADDIAN written form
The CADDIAN symbol used to write the command on documents

Type
It can be static or dynamic: in case of a dynamic gesture, the images showed have to be seen as a sequence

Hands
It describes which hand is involved in the gesture

Palm/back
It describes if the hand shows the palm or the back to the camera

Fingers
Fingers extended; the number identifies the finger while the letter the hand. For example 1R is the thumb of the right hand.

Notes
Self-explaining

Images
List of Sample Image representing the gesture

Start command

CADDIAN written form (symbol): A

Semantics: start a command/message
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 2R,3R
Notes: none

CADDIAN written form (symbol): ∀

Semantics: end of communication
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 2R
Notes: none
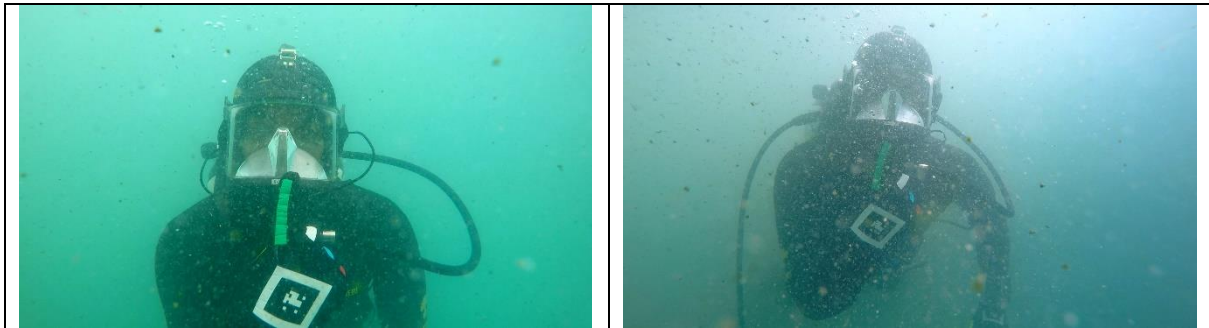
CADDIAN written form (symbol): Δ

Semantics: general evacuation
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 1R,2R
Notes: none

CADDIAN written form (symbol): Ø

Semantics: abort a mission
Type: dynamic gesture (images below form a sequence)
Hands: R, L
Palm/back: both palms to camera
Fingers: 1R, 2R, 3R, 4R, 5R and 1L, 2L, 3L, 4L, 5L
Notes: very similar to *Cold* [except for dynamic and height respect to body]

CADDIAN written form (symbol): E

Semantics: I have an ear-related problem
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 1R
Notes: none

CADDIAN written form (symbol): B_2

Semantics: I'm out of air
Type: static gesture
Hands: R
Palm/back: back lightly oriented to camera
Fingers: 1R,2R,3R,4R,5R
Notes: none

Cold

CADDIAN written form (symbol): C_1

Semantics: I'm cold
Type: static gesture
Hands: both
Palm/back: back to camera
Fingers: 1R, 2R, 3R, 4R, 5R and 1L, 2L, 3L, 4L, 5L
Notes: very similar to *Abort mission* [except for static and height respect to body]

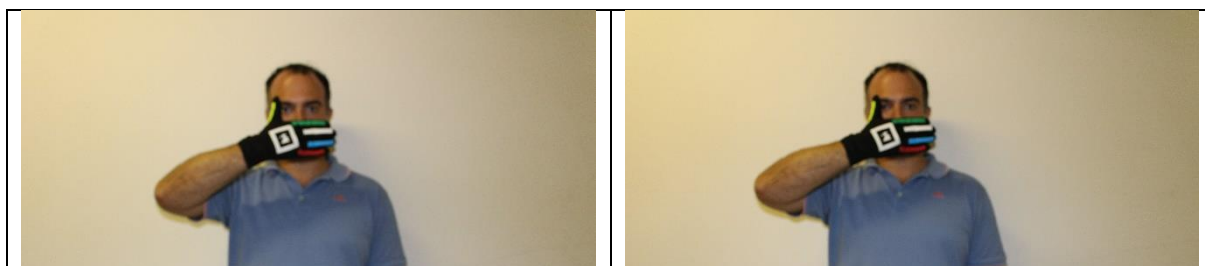**CADDIAN written form (symbol):** B_3

Semantics: I'm out of breath
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 1R,2R,3R,4R,5R
Notes: none

Not ok

CADDIAN written form (symbol): ƀ

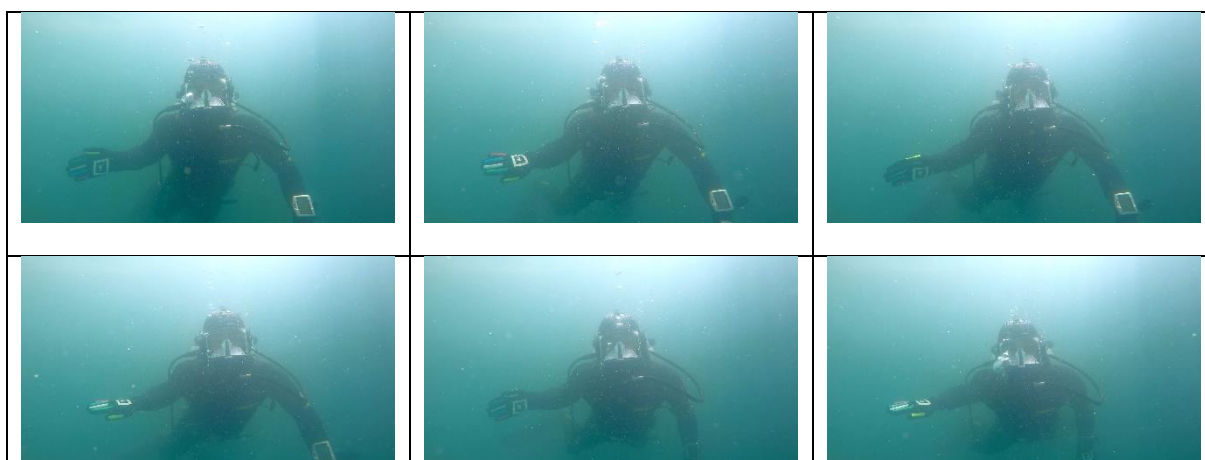**Semantics:** I'm not ok, something is wrong on me
Type: dynamic gesture (images below form a sequence)
Hands: R
Palm/back: back and palm alternatively to camera
Fingers: 1R,2R,3R,4R,5R
Notes: none

CADDIAN written form (symbol): $\mathbf{P_g}$

Semantics: danger, something is wrong [environment]
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: fist
Notes: none
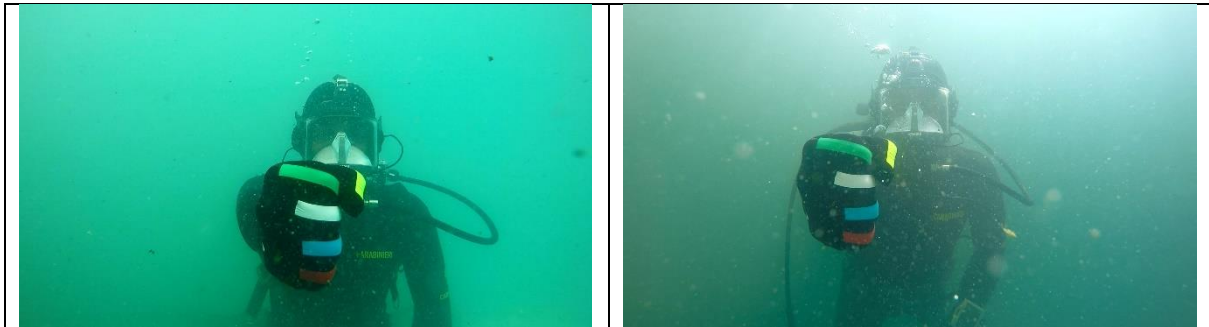
Cramp

CADDIAN written form (symbol): **K**

Semantics: I have a cramp
Type: static gesture
Hands: R
Palm/back: palm to camera
Fingers: 1R,2R, 3R, 4R, 5R all bent
Notes: none

Vertigo

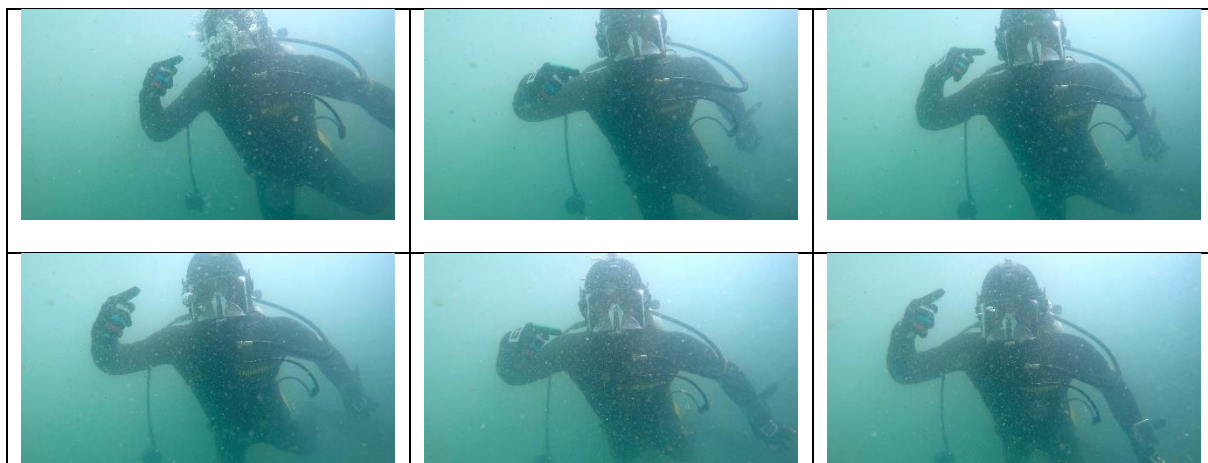**CADDIAN written form (symbol):** V

Semantics: I have vertigo
Type: dynamic gesture (images below form a sequence)
Hands: R
Palm/back: back to camera
Fingers: 1R
Notes: none

You

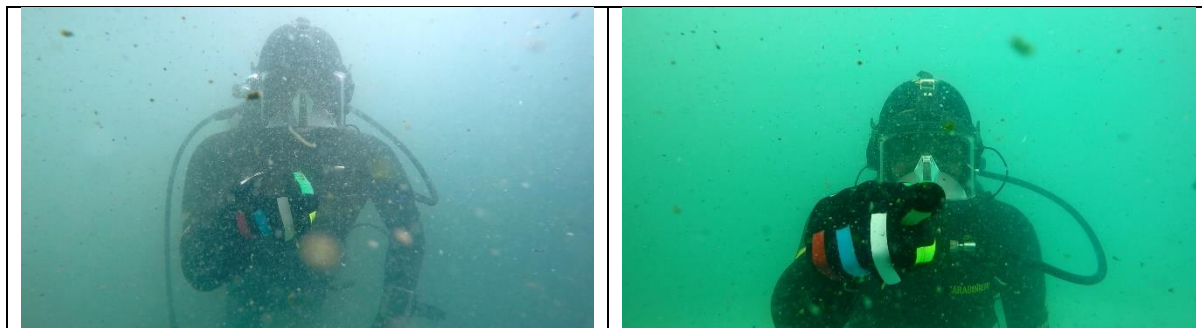**CADDIAN written form (symbol):** Y

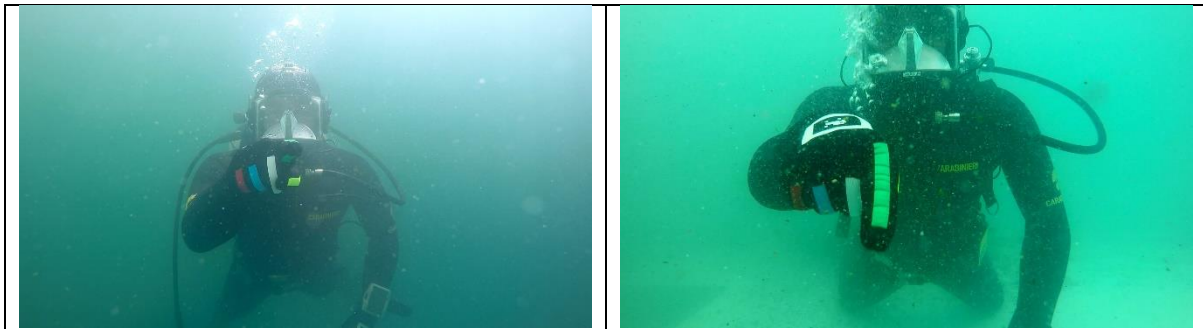**Semantics:** You, the robot
Type: static gesture
Hands: R
Palm/back: both perpendicular to camera or back to camera (see third image) [to be decided]
Fingers: 1R
Notes: it is the same gesture for *Back*

Take

CADDIAN written form (symbol): **T**

Semantics: take
Type: static gesture
Hands: R
Palm/back: back lightly to camera
Fingers: 1R, 2R, 3R, 4R, 5R
Notes: none

I or *me*

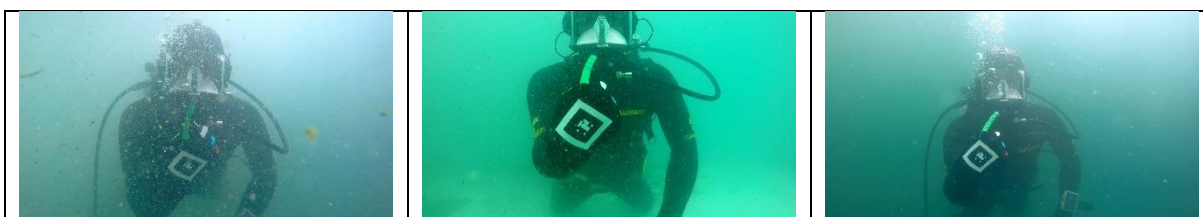**CADDIAN written form (symbol):** **M** or **I**

Semantics: me, I (the diver)
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 1R
Notes: it is the same gesture for *Forward*

Boat

CADDIAN written form (symbol): **B**

Semantics: boat
Type: static gesture
Hands: both
Palm/back: both palms to camera
Fingers: 1R,2R, 3R, 4R, 5R, 1L, 2L, 3L, 4L, 5L
Notes: none

Point of interest

CADDIAN written form (symbol): **P**

Semantics: point of interest
Type: static gesture
Hands: both
Palm/back: both backs to camera
Fingers: both fists
Notes: crossed arms
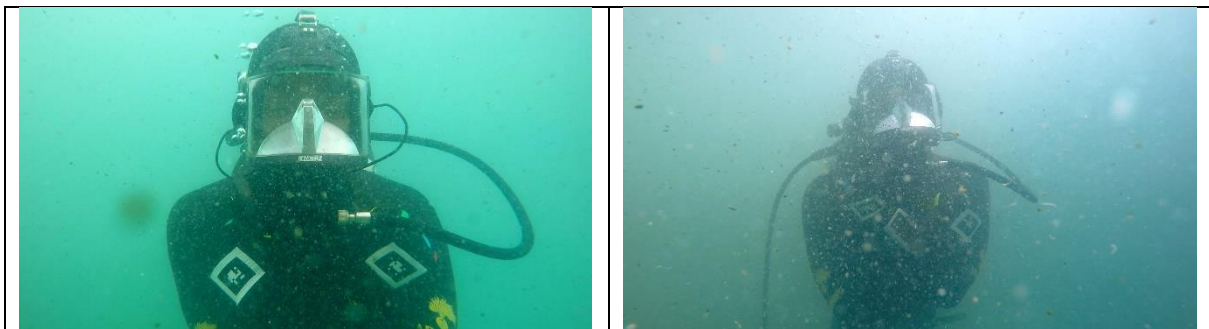
Here

CADDIAN written form (symbol): **H**

Semantics: here
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 1R
Notes: none

Go

CADDIAN written form (symbol): G

Semantics: go
Type: dynamic gesture (images below form a sequence)
Hands: R
Palm/back: back to camera
Fingers: 1R, 2R, 3R, 4R, 5R
Notes: none
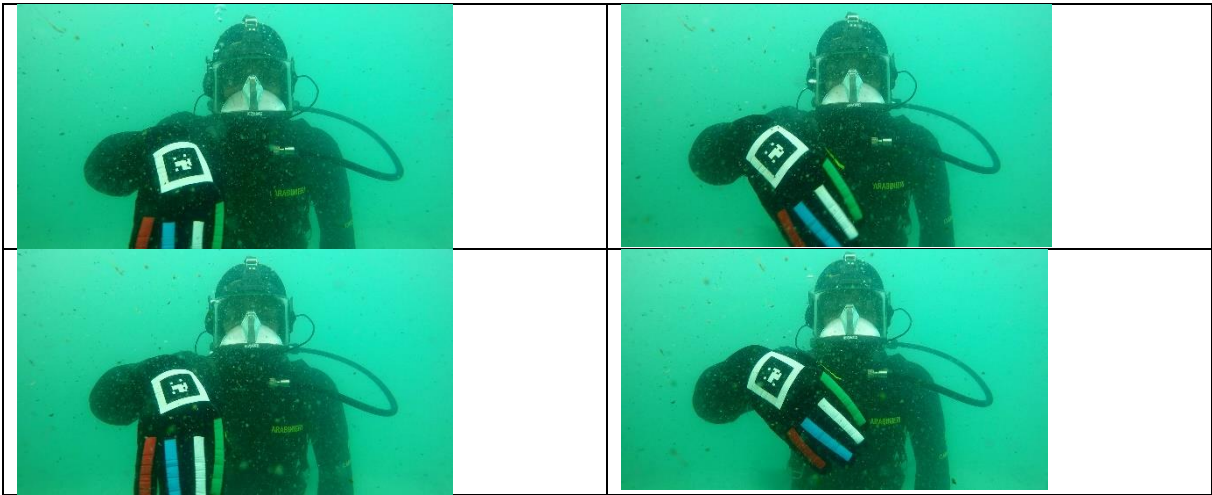
Forward

CADDIAN written form (symbol): forward

Semantics: forward
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 1R
Notes: it is the same gesture for *Me or I*

Back

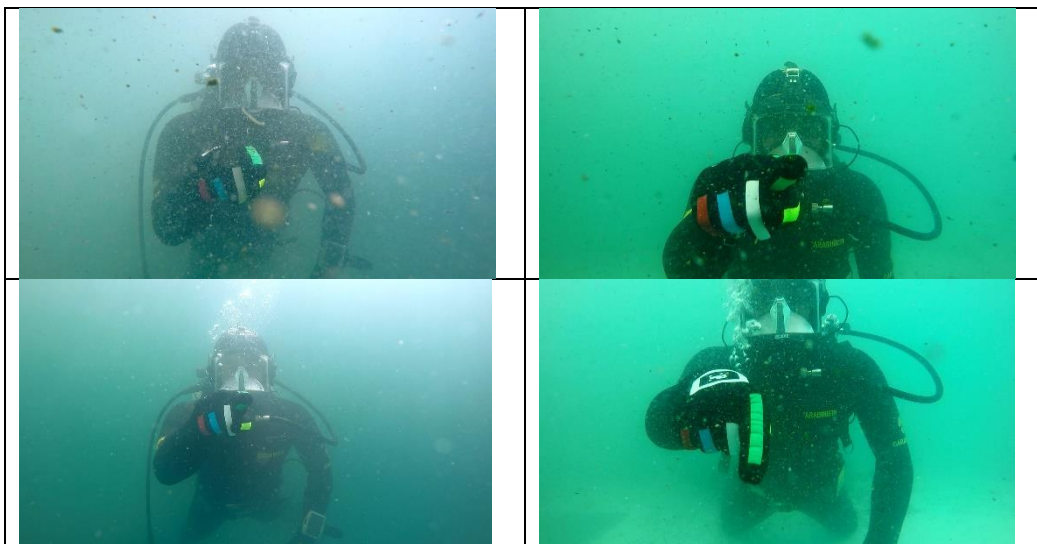**CADDIAN written form (symbol): back**

Semantics: back
Type: static gesture
Hands: R
Palm/back: both perpendicular to camera or back to camera (see third image) [to be decided]
Fingers: 1R
Notes: it is the same gesture for *You [robot]*

Left

CADDIAN written form (symbol): left

Semantics: left
Type: static gesture

Hands: R
Palm/back: palm to camera
Fingers: 1R, 2R, 3R, 4R, 5R
Notes: none

Right

CADDIAN written form (symbol): right
Semantics: right
Type: static gesture
Hands: L
Palm/back: palm to camera
Fingers: 1L, 2L, 3L, 4L, 5L
Notes: none

Down

CADDIAN written form (symbol): down
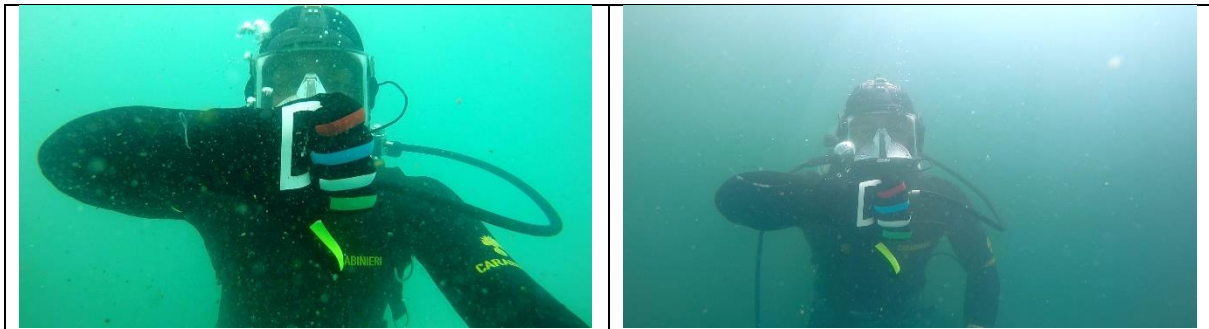**Semantics:** down
Type: static gesture
Hands: R
Palm/back: palm to camera
Fingers: 1R
Notes: it is the same gesture for *Switch off, decrease*

Switch off, decrease

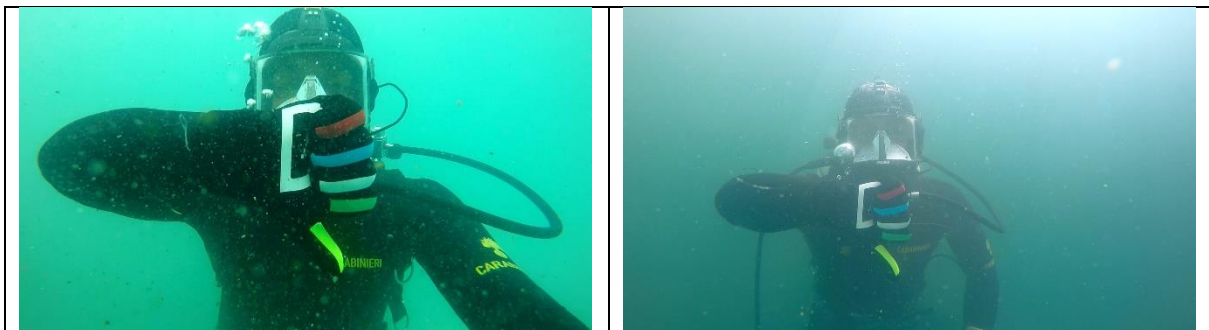**CADDIAN written form (symbol):** ▬

Semantics: switch off, decrease
Type: static gesture
Hands: R
Palm/back: palm to camera
Fingers: 1R
Notes: it is the same gesture for *Down*

Up

CADDIAN written form (symbol): up

Semantics: up
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 1R
Notes: it is the same gesture for *Switch on, increase*

Switch on, increase

CADDIAN written form (symbol): ✚

Semantics: switch on, increase
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 1R
Notes: it is the same gesture for *Up*

Follow

CADDIAN written form (symbol): F

Semantics: follow
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 2R, 3R or 2R, 2L
Notes: two candidate gestures

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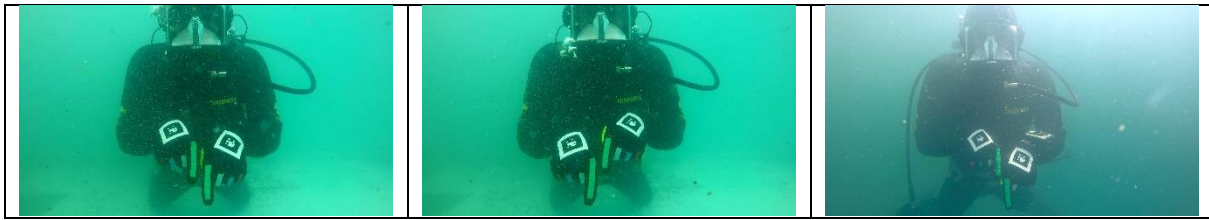
No or *Stop*

CADDIAN written form (symbol): **no**

Semantics: no [answer], stop doing [alone or with do command]
Type: static gesture
Hands: R
Palm/back: palm to camera
Fingers: 1R, 2R, 3R, 4R, 5R
Notes: none

Ok or *Let's go*

CADDIAN written form (symbol): **ok**

Semantics: ok [answer], let's go/continue with do command
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 3R, 4R, 5R AND 1R,2R bent and touching
Notes: none

CADDIAN written form (symbol): **D**
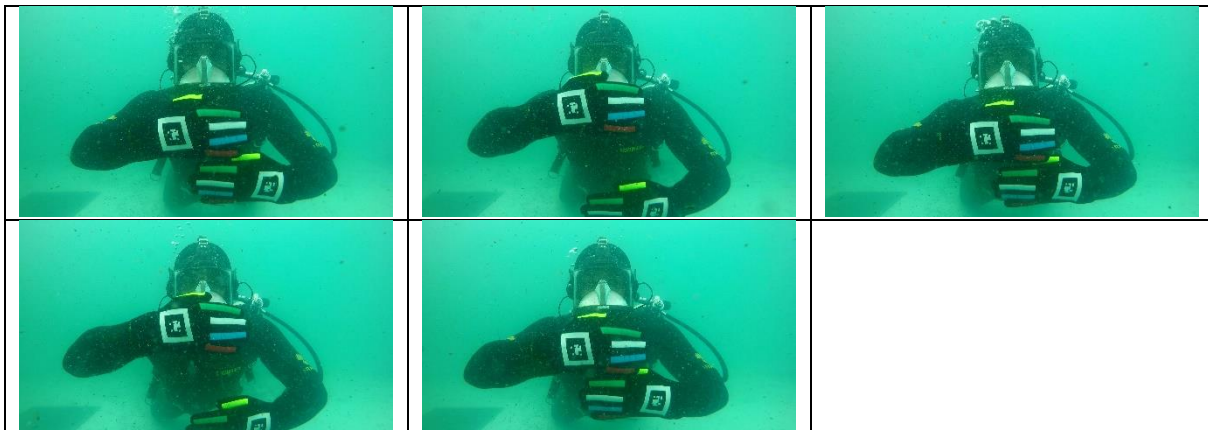
Semantics: do
Type: dynamic gesture (images below form a sequence)
Hands: R, L
Palm/back: back to camera
Fingers: 1R, 2R, 3R, 4R, 5R and 1L, 2L, 3L, 4L, 5L
Notes: none

Carry

CADDIAN written form (symbol): **carry**

Semantics: carry a tool
Type: static gesture
Hands: R, L
Palm/back: both backs to camera
Fingers: both fists
Notes: fists stacked

Lights

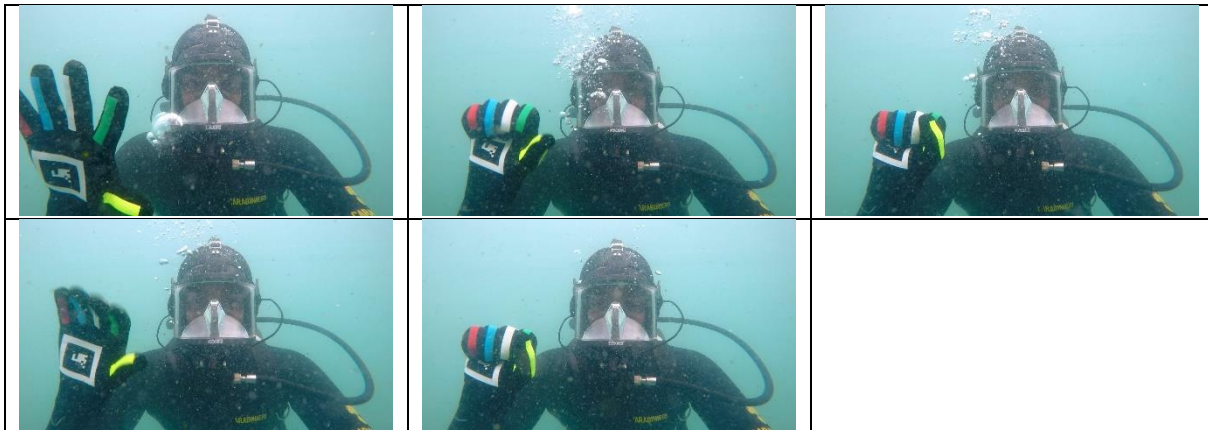**CADDIAN written form (symbol): L₁**

Semantics: lights
Type: dynamic gesture (images below form a sequence)
Hands: R
Palm/back: palm to camera
Fingers: 1R, 2R, 3R, 4R, 5R intermitting
Notes: none

Air

CADDIAN written form (symbol): A₁

Semantics: air [referring also to the on board cylinder]
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 1R, 2R, 3R, 4R, 5R all bent
Notes: none

Speed

CADDIAN written form (symbol): S

Semantics: speed of CADDY

Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 2R, 5R
Notes: none

End for

CADDIAN written form (symbol): end
Semantics: end of for cycle of CADDIAN
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: 1R, 2R, 3R, 4R, 5R
Notes: none

Come

CADDIAN written form (symbol): C

Semantics: come
Type: static gesture
Hands: R, L
Palm/back: palm to camera
Fingers: 2R, 2L
Notes: none

CADDIAN written form (symbol): L

Semantics: level [referring to CADDY depth level]
Type: static gesture
Hands: R
Palm/back: palm to camera
Fingers: 1R, 2R
Notes: none

CADDIAN written form (symbol): const

Semantics: constant referred to level
Type: static gesture
Hands: R
Palm/back: back lightly to camera
Fingers: 1R, 2R, 3R, 4R, 5R
Notes: none
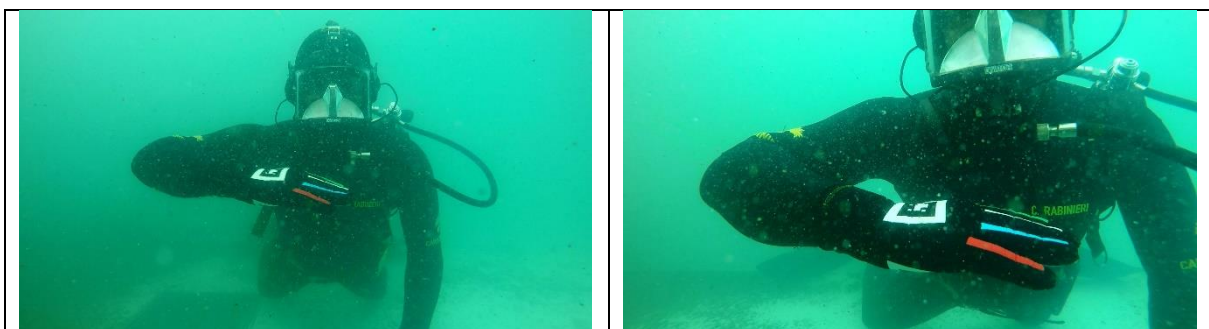
CADDIAN written form (symbol): free
Semantics: free referred to level
Type: static gesture
Hands: R
Palm/back: palm to camera
Fingers: 1R, 5R
Notes: none

CADDIAN written form (symbol): limit
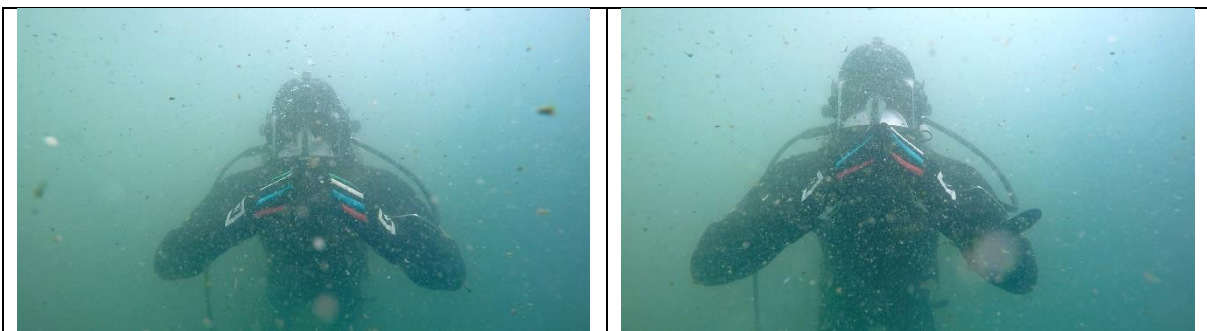**Semantics:** limit referred to level
Type: static gesture
Hands: R, L
Palm/back: back slightly to camera
Fingers: 1R, 2R, 3R, 4R, 5R and 1L, 2L, 3L, 4L, 5L
Notes: none

CADDIAN written form (symbol): U

Semantics: I do not know, I have no idea of something [used also in question]
Type: static gesture
Hands: R, L
Palm/back: both palms to camera
Fingers: 1R, 2R, 3R, 4R, 5R and 1L, 2L, 3L, 4L, 5L
Notes: none

Low on air

CADDIAN written form (symbol): low

Semantics: low air level
Type: static gesture
Hands: R or L [to be decided]
Palm/back: palm to camera
Fingers: fist
Notes: none

Reserve

CADDIAN written form (symbol): reserve

Semantics: air on reserve (50 bar left)
Type: static gesture
Hands: R
Palm/back: palm to camera
Fingers: fist
Notes: none
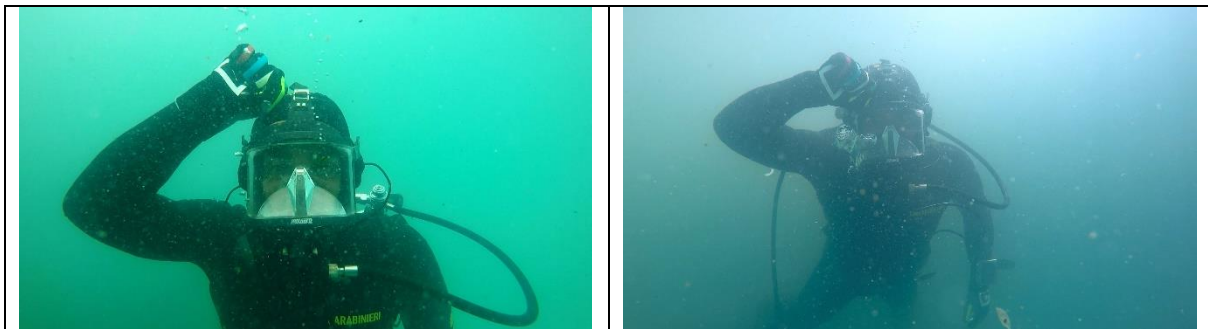
Tessellation, mosaicing

CADDIAN written form (symbol): **Te**

Semantics: tessellation/mosaicing
Type: static gesture
Hands: R, L
Palm/back: both backs to camera
Fingers: 1R, 2R, 3R, 4R, 5R and 1L, 2L, 3L, 4L, 5L
Notes: none

Take a photo

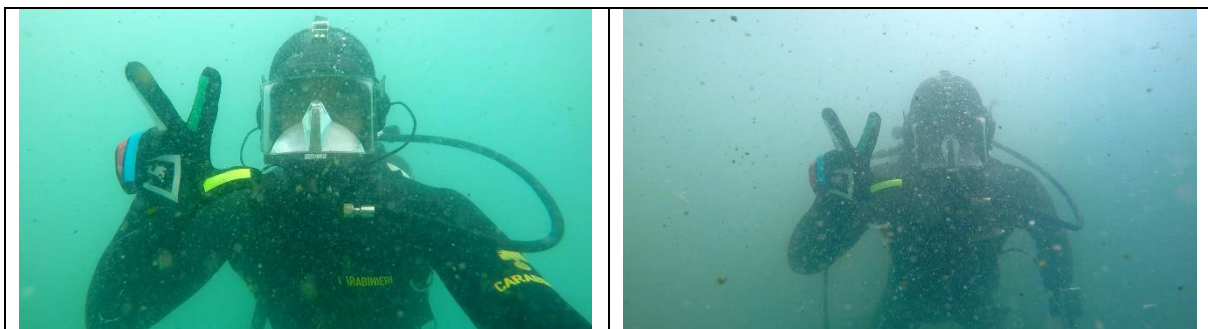**CADDIAN written form (symbol):** **Fo**

Semantics: take a photo
Type: static gesture
Hands: R
Palm/back: palm to camera
Fingers: 1R, 2R, 3R
Notes: none

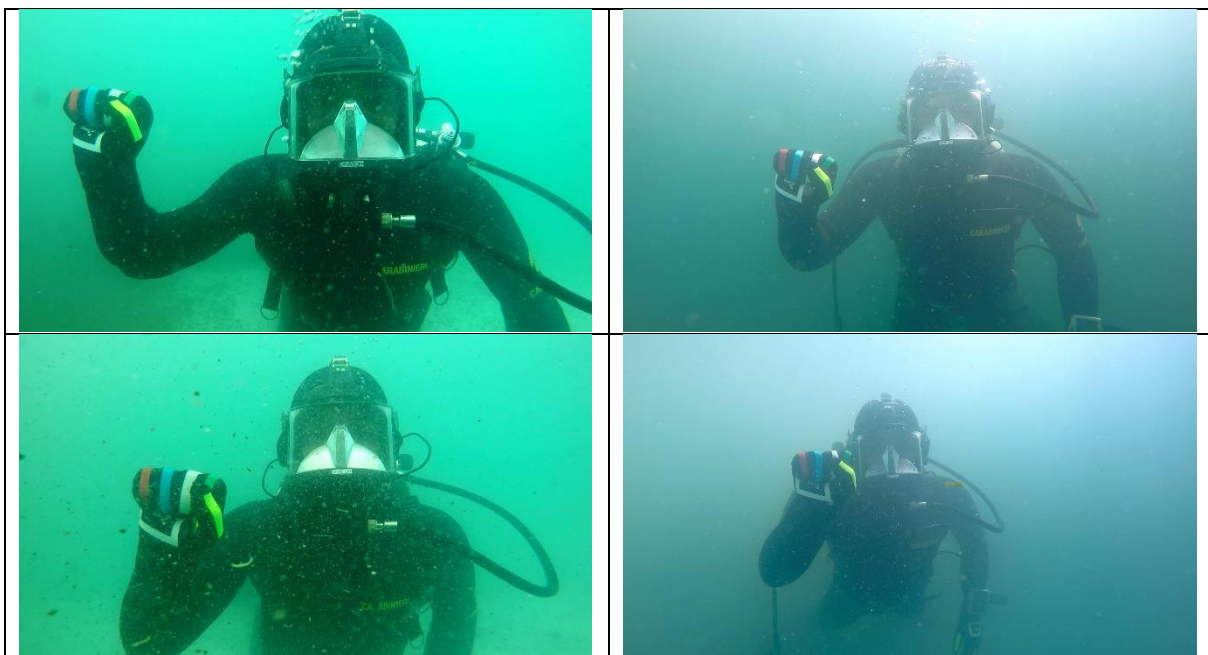**CADDIAN written form (symbol): wait**
Semantics: wait
Type: static gesture
Hands: R
Palm/back: palm to camera
Fingers: fist
Notes: it is the same gesture for the natural number *Zero*

Check

CADDIAN written form (symbol): check
Semantics: check the list of the commands issued to CADDY

Type: static gesture
Hands: R, L
Palm/back: palm to camera
Fingers: 1R and 1L
Notes: none

Turn

CADDIAN written form (symbol): turn
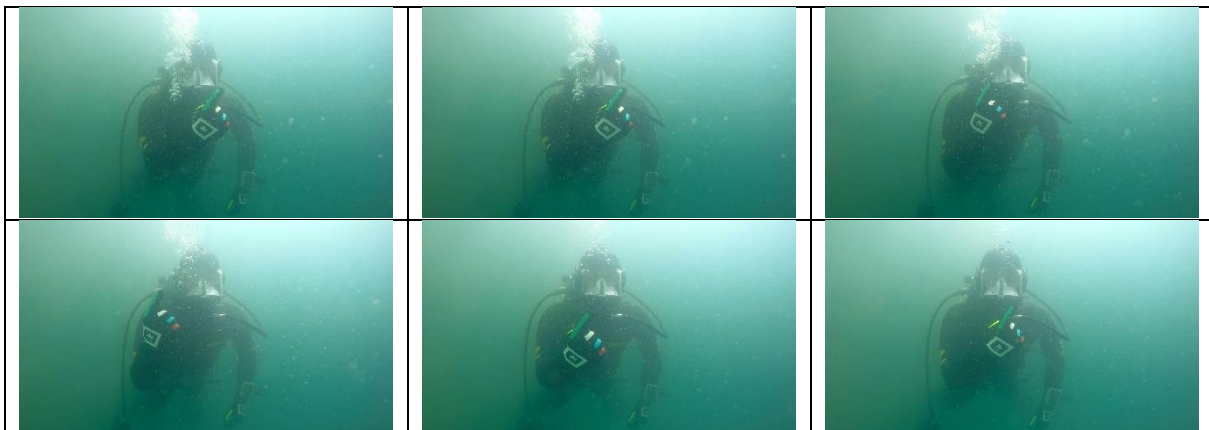**Semantics:** turn the robot of 180° degrees
Type: dynamic gesture [images form a sequence]
Hands: R
Palm/back: back to camera
Fingers: 2R
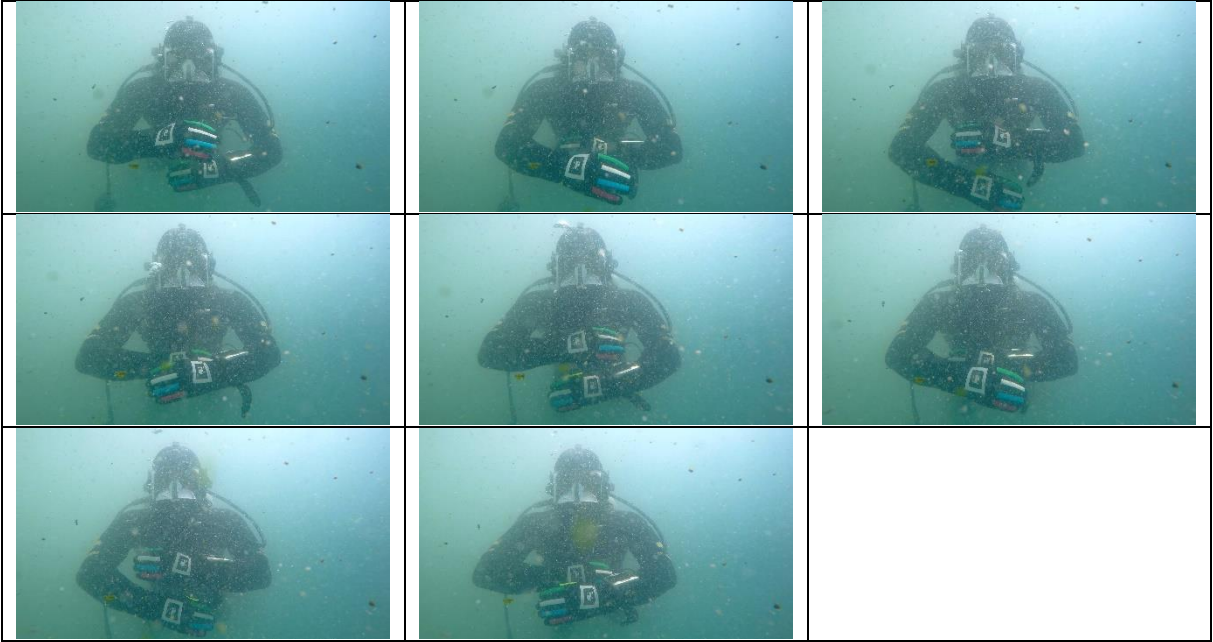**Notes:** if palm to camera it is the same gesture for the natural number *One*
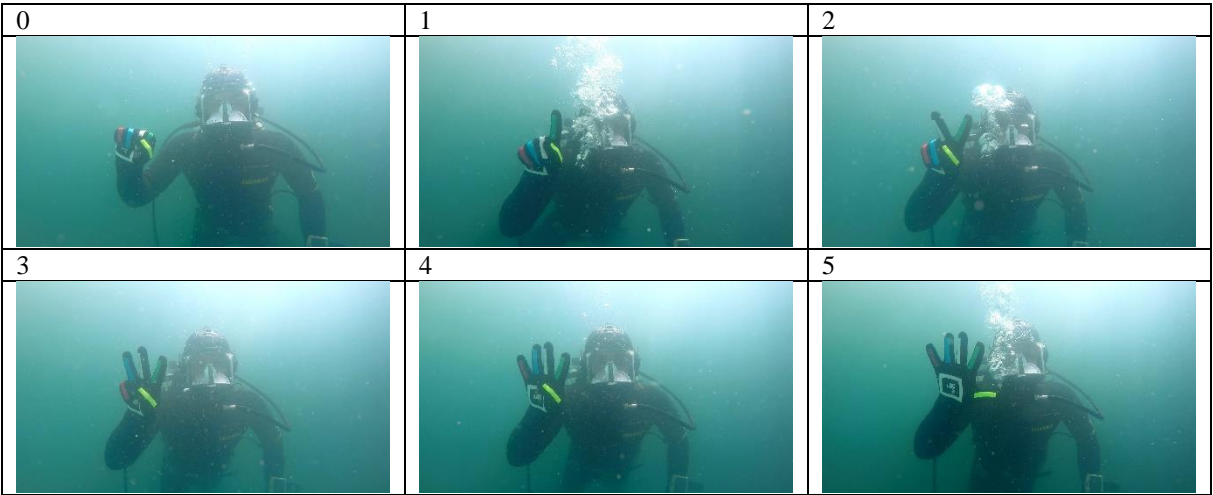

For

CADDIAN written form (symbol): for
Semantics: starts a for cycle

Type: dynamic gesture [images form a sequence]
Hands: R, L
Palm/back: back to camera
Fingers: 1R, 2R, 3R, 4R, 5R and 1L, 2L, 3L, 4L, 5L
Notes: none

Numbers, digits

CADDIAN written form (symbol): **1,2,3,4,5,6,7,8,9,0**
Semantics: numbers
Type: static gesture
Hands: R
Palm/back: palm to camera
Fingers: various [see images]
Notes: none

0	1	2
3	4	5

6	7	8
9		

Numbers delimiter

CADDIAN written form (symbol): Ψ

Semantics: delimits a number
Type: static gesture
Hands: R
Palm/back: back to camera
Fingers: fist
Notes: none