ROTARY CONTROLS

1. GENERAL FEATURES

ELESA-CLAYTON rotary controls are used to set and regulating a wide variety of machine functions. The device consists of:

- a handwheel/knob, to manoeuvre the control spindle, thus changing the position of the machine element
- a position indicator, which provides the position of the machine element.

2. POSITION INDICATORS

ELESA-CLAYTON position indicators can be classified according to the type of reading or movement:

2.1 *Types of reading*

ANALOGUE: the reading is displayed by means of two rotating pointers over a graduated dial.

DIGITAL-ANALOGUE: the reading is directly displayed by means of a roller counter and a rotating pointer over a graduated dial.

DIGITAL: the reading is directly displayed by means of a roller counter.

The analogue indicators are normally provided with a graduated dial and two pointers which indicate the number of turns and part of a turn made by the control spindle starting from an initial position zero. In general these indicators are used to regulate flows, capacities, strokes, setting of speed variators, etc.

The indicators with digital-analogue, digital and LCD digital reading are provided with a roller counter or a display which indicates the linear displacement of the machine element connected to the control spindle from the initial position zero.

2.2 *Types of movement*

GRAVITY (page 464): is used when the handwheel spindle is horizontal or max 60° inclined. The rotation of the handwheel with the indicator makes the pointers move while the dial, appropriately counterbalanced, is kept still by the gravity force.

POSITIVE DRIVE (page 470): is used on spindles in any position. The rotation of the handwheel with the indicator makes the pointers move while the dial is kept still by an anchor pin fitted to the machine.

DIRECT DRIVE (page 488): is used on control spindles in any position, the indicator is directly mounted on the control spindle and is kept in position by means of a referring back pin.

2.3 The indicators are normally supplied separately from their relative handwheels/knobs, except integral models, whose indicator is fitted in during the production.

TYPES OF READING	***ANALOGUE***		
TYPES OF MOVEMENT	***GRAVITY***		***POSITIVE DRIVE***
POSITION INDICATORS SERIES	**GA11 GA12**	**MBT.50-GA11 MBT.70-GA12**	**PA11 PA12**
			

3. HOW TO SELECT THE ROTARY CONTROL

3.1 Choice of the type of reading (see 2.1). Establish if is necessary to display a number of turns or a linear displacement. For the first application choose an analogue indicator. For the second one choose a digital-analogue, digital or LCD digital indicator.

3.2 Establish the indicator and the spindle position on which depends the choice of the requested movement: gravity, positive drive or direct drive (see 2.2).

3.3 Establish the required ratio for analogue types or the reading after one revolution for the following types: digital-analogue, digital and LCD digital.

3.4 Establish the direction of rotation. For clockwise increasing readings (right) = D. For anticlockwise increasing readings (left) = S.

3.5 Consider the conditions of use of the handwheel i.e. outdoors, vibrations, corrosive environments, etc. See the complete data on the page of the chosen indicator.

3.6 Choose the appropriate handwheel/knob for the application considering the diameter and the grip required to transmit the necessary torque. Other factors to take into consideration are the control spindle diameter and whether a handle is required for quick operations.

4. SPECIAL EXECUTIONS

4.1 The ELESA-CLAYTON position indicators standard range available on this catalogue satisfies most applications. Changes to adapt the indicator to particular applications are possible, for example:

- special dials for indicators with analogue or digital-analogue reading, on customers indications
- stainless steel metal parts for application on machines and equipment where laws or particular hygienic and environmental factors make it mandatory to use corrosion resistant materials
- gravity indicators with analogue reading with glycerine-filling for high vibration applications, which may interfere with the reading, or to avoid condensation on the indicator window
- special ratio on request and for sufficient quantities, developed by ELESA Technical Department.

DIGITAL-ANALOGUE		*DIGITAL*		
GRAVITY	*POSITIVE DRIVE*	*DIRECT DRIVE*		
GW12	**PW12**	**DD51**	**DD52**	**DD52R**
				

GRAVITY INDICATORS

1. FEAUTURES

1.1 Suitable for use on control spindles with horizontal or max 60° inclined position.

1.2 The movement is housed in a sealed case (fig. 1). It consists of a counterweight system, fitted on a precision ballrace, which rotates on a central spindle integral with the indicator case, fitted on the handwheel/knob (see table below). At the end of the spindle there is a red pointer, which rotates with the handwheel/knob. A series of gears with different ratios transmits the rotation of the spindle to a black pointer. On the counterweight is also fixed a graduated dial. If the indicator is fitted on spindles with horizontal position (or max 60° inclined) the dial is kept still by the gravity force and the pointers rotate over it when the handwheel/knob turns.

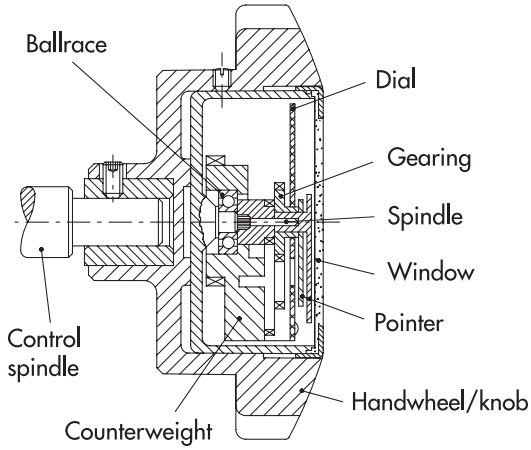


Fig.1

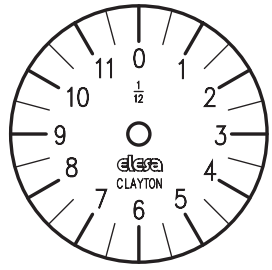


Fig.2

2. RATIOS

2.1 Each complete turn of the big pointer (red) corresponds to a fraction of turn of the small pointer (black). The number of turns of the red pointer to make the black pointer to carry out one complete turn is the ratio of the indicator.

Example: a ratio of 12:1 means that to 12 turns of the red pointer correspond to a complete turn of the black pointer (fig. 2).

12 turns of the handwheel cover the entire setting range. For each turn of the handwheel, the black pointer indicates 1/12 of the entire dial.

3. CHOICE OF THE INDICATOR RATIO

3.1 Set the control spindle to the initial or referring position.

3.2 Count the number of turns of the control spindle to cover the entire setting range.

3.3 The result of this operation is the ratio. Should it not correspond to a standard ratio, choose the next highest one.

POSSIBLE ASSEMBLY HANDWHEELS - INDICATORS								
HANDWHEELS/KNOBS		**IZN.**	**MBT.**	**VHT.**	**VDSC+I.**	**VDC.**	**VRTP.**	**VAD.**
INDICATORS	**page**	**475**	**476**	**477**	**482**	**480**	**484**	**478**
GA11	467	•	•	•		•	•	
GA12	467	•	•	•	•	•	•	•
GW12	469	•	•	•	•	•	•	•
MBT.50/GA11	468	INTEGRAL (indicator fitted in)						
MBT.70/GA12	468							

3.4 For an optimal dial reading, and therefore for a more precise reading we recommend to choose a ratio which is as near as possible to the handwheel turns required to cover the entire setting range. For instance, if 11 turns are required, the ratio 12:1 is the most convenient, because 11/12 of the available graduation will be used. If 24:1 ratio would be chosen, only 11/24 of the graduation would be used and reading would be less accurate.

3.5 Indicators with standard ratios are normally on stock to suit most requirements.

4. DIALS

4.1 Dials are available for all standard ratios in both clockwise (D) or anticlockwise (S) configurations.

4.2 Standard dials give a number which can be translated by means of conversion tables to the value of the set-up executed.

4.3 On request and for sufficient quantities special dials with marks or customised graduations can be supplied to have a direct reading.

Example of gravity indicator description

Series					Ratio					Clockwise graduations (Right)
G	A	1	1	-	0	0	1	2	-	D

5. ACCURACY

5.1 The gravity indicator is more accurate when used on horizontal control spindles. It can be however used on spindles max 60° inclined, but the accuracy decreases as the angle of inclination $\alpha°$ increases (fig. 3).

6. ASSEMBLY INSTRUCTIONS

6.1 If the hole of the handwheel/knob hub or boss needs to be reamed for coupling to the control spindle, please refer to the handwheel/knob relevant page for further details and advice.

6.2 Assembly of the indicators to handwheels/knobs:

- couple the handwheel to the control spindle by means of a pin or a grub screw
- set the control spindle to the initial or referring position, by rotating the handwheel
- turn the indicator, by keeping it in the hands, until the pointers are in zero position
- fit the zeroed indicator into the handwheel/knob and uniformly tighten the radial securing screws with a moderate torque to prevent distortion of the indicator case and thus locking the movement.

6.3 Assembly of integral indicators (built-in in the handwheel):

- set the control spindle to the initial or referring position
- turn the indicator, by keeping it in the hands, until the pointers are in zero position
- couple the integral indicator to the control spindle by tightening the grub screw, after checking that spindle and indicator are in zero position.

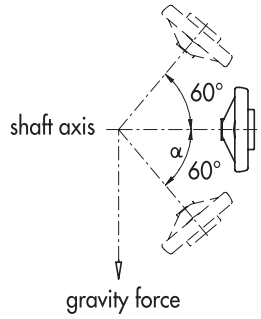


Fig.3

POSITIVE DRIVE INDICATORS

1. FEATURES

1.1 Suitable for use on control spindles in any position.

1.2 The movement is housed in a sealed case (fig. 4). The handwheel/knob, containing the indicator (see table belows), is coupled to the control spindle. On the rear of the handwheel/knob a flange with internal crown gear wheel (shrouded) is fitted to the machine frame by means of an anchor pin (or similar). By so doing, during handwheel rotation, the flange is integral with the machine. The rotation of the handwheel causes the planet pinion to rotate, transmitting in this way the movement inside the indicator case. The rotation is then transmitted to both pointers by means of a gearing, while the graduated dial remains still thanks to the fixing to the machine frame by means of the anchor pin.

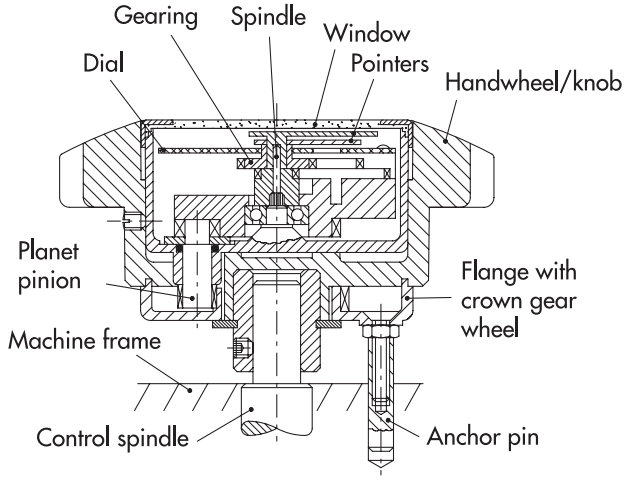


Fig.4

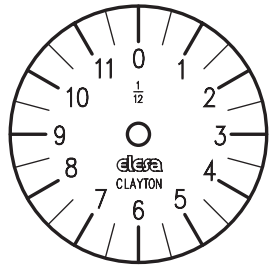


Fig.5

2. RATIOS

2.1 Each complete turn of the big pointer (red) corresponds to a fraction of turn of the small pointer (black). The number of turns of the red pointer to make the black pointer to carry out one complete turn is the ratio of the indicator.
Example: a ratio of 12:1 means that to 12 turns of the red pointer correspond to a complete turn of the black pointer (fig. 5).
12 turns of the handwheel cover the entire setting range.

For each turn of the handwheel, the black pointer indicates 1/12 of the entire dial.

POSSIBLE ASSEMBLY HANDWHEELS INDICATORS						
HANDWHEELS/KNOBS		**MBT.**	**VHT.**	**VDC.**	**EWW+IEL**	**VAD.**
INDICATORS	**page**	**476**	**477**	**480**	**483**	**484**
PA11	**473**	•	•			•
PA12	**473**	•	•	•	•	•
PW12	**474**	•	•	•	•	•

3. CHOICE OF THE INDICATOR RATIO

3.1 Set the control spindle to the initial or referring position.

3.2 Count the number of turns of the control spindle to cover the entire setting range.

3.3 The result of this operation is the ratio. Should it not correspond to a standard ratio, choose the next highest one.

3.4 For an optimal dial reading, and therefore for a more precise reading we recommend to choose a ratio which is as near as possible to the handwheel turns required to cover the entire setting range. For instance, if 11 turns are required, the ratio 12:1 is the most convenient, because 11/12 of the available graduation will be used. If 24:1 ratio would be chosen, only 11/24 of the graduation would be used and reading would be less accurate.

3.5 Indicators with standard ratios are normally on stock to suit most requirements.

4. DIALS

4.1 Dials are available for all standard ratios in both clockwise (D) or anticlockwise (S) configurations.

4.2 Standard dials give a number which can be translated by means of conversion tables to the value of the set-up executed.

4.3 On request and for sufficient quantities special dials with marks or customised graduations can be supplied to have a direct reading.

Example of positive drive indicator description

Series					Ratio					Clockwise graduations (Right)
P	A	1	1	-	0	0	1	2	-	D

5. ASSEMBLY INSTRUCTIONS

5.1 Drill a bore in the machine frame for the rear anchor pin of the flange.

5.2 Set the control spindle to the initial or referring position.

5.3 Remove the black protection cap of the planet pinion, turn the latter until the pointers are in zero position.

5.4 Take the chosen handwheel/knob and mount the supplied anchor pin on the screw protruding from the rear flange. Be sure that the hole for the indicator planet pinion is at 12 o'clock. Turn the rear flange and position the anchor pin in line with the referring bore drilled on the machine.

5.5 Gently fit the zeroed indicator into the handwheel/knob, inserting the planet pinion smoothly into the corresponding hole. To make the fitting of the indicator easier, gently turn by some degrees the rear flange until the planet pinion is geared to the internal crown gear wheel. Check that the indicator is zeroed and that the screw for the anchor pin is in the correct position.

5.6 Uniformly tighten the lateral grub screws for fixing the indicator case with a moderate torque, to prevent distortion of the case itself and thus locking the movement.

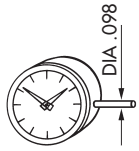
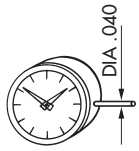
5.7 Adjust the height of the anchor pin so that no undue strain is caused to the flange and tighten the locknut.

5.8 Couple the handwheel with the indicator to the zeroed control spindle. Be sure that the indicator pointers are in zero position and that the anchor pin is in line with the referring bore on the machine. Pin the handwheel on the spindle.

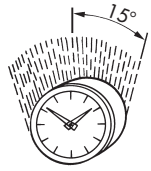
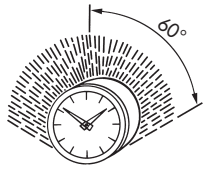
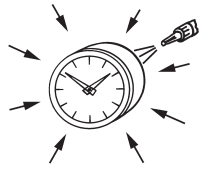
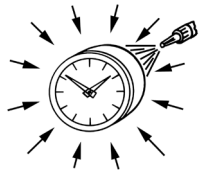
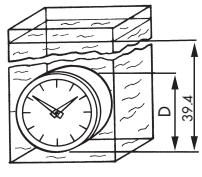
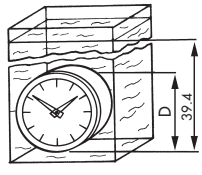
5.9 Check the right functioning of the indicator over all the rotation range.

IP PROTECTION CLASSIFICATION FOR CASES

According to International Standard IEC 529 (see note below)

Symbol	1st digit Protection against intrusion of external particle matter.		
IP	0		No protection.
	1		Protection against ingress of large solid foreign bodies, Ø larger than 50 mm (hands)
	2		Protection against ingress of medium size solid foreign bodies, Ø larger than 12 mm (fingers)
	3		Protection against ingress of small solid foreign bodies, Ø larger than 2.5 mm (tools, wires).
	4		Protection against ingress of small solid foreign bodies, Ø larger than 1 mm (tools, wires).
	5		Protection against harmful deposits of dust, which cannot enter in an amount sufficient to interfere with satisfactory operation.
	6		Complete protection against ingress of dust.

As a specification for cases of rotary controls does not exist, we refer to International Standard IEC 529 for protection classification of cases for electrical machines, devices or materials.

2nd digit Protection against penetration of liquids.		
0		No protection.
1		Protection against drops of condensed water falling vertically.
2		Protection against drops of liquid falling at an angle equal to or smaller than 15° with respect to the vertical.
3		Protection against drops of liquid falling at an angle equal to or smaller than 60° with respect to the vertical.
4		Protection against liquid splashed from any direction.
5		Protection against water jets projected by a nozzle from any direction.
6		Protection against water from heavy sea on ship's decks.
7		Protection against immersion in water under stated conditions of pressure and time.
8		Protection against indefinite immersion in water under stated conditions of pressure.