

## ROTARY MANIPULATORS

MAN10-MAN20-MAN30-MAN40-MAN50

# MAN



- Aluminium housing with sealed steel plates.
- Possibility of mounting the unit in any plane.
- Complete mechanical synchronization of cycle.
- High precision positioning.
- Positive acceleration control of moving masses.
- Short transfer time and reduced pauses.
- Nitrided steel cams.
- Long-life lubrication.
- Worm gear reducer directly mounted on housing.
- Cam shaft with taper roller bearings.
- Reducer with built-in clutch torque limiter.



**COLOMBO FILIPPETTI**  
COLLABORATIVE ENGINEERING

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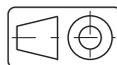


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The units of measurement correspond with System International /Severity Index SI General tolerances of manufacture are conform to UNI – ISO 2768-1 UNI EN 22768-1  
Illustrations and drawings according to UNI 3970 (ISO 128-82).



Method of projection of the drawings.

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## 1 - General information

### 1.1 Description

The MAN family manipulators, featuring a single cam globoidal and flat combined, can turn uniform rotating motion into an appropriate and ordered series of movements, linear intermittent and rotating intermittent (indexing version) or oscillating intermittent (oscillating version) of the output shaft on which they are installed. Synchronised oscillation and translation movements of the output shaft are obtained by means of the globoidal contour and the flat slot contour of the cam, respectively. The size of the cam driven unit allows to obtain the wide range of movements typical of pick & place operations.

Direct motion transformation by means of the cam and feeler point mechanical members allows control of the acceleration of intermittent movements and guarantees positive drive during the entire cycle. This in turn grants the mechanisms accuracy, speed, gentle movements, low vibration and a noiseless operation.

The manipulators are characterised by simple construction, compactedness, oil-bath lubrication of internal components, easy installation and ample diversification of the output shaft movement cycles.

These features grant reliability and flexibility of use in applications that include machine loading-unloading, handling in assembly operations and transfer to conveyor belts and intermittent rotary tables.

### 1.2 Dangerous area

Since this is a positive drive machine, the gripper arm which may be installed moves all the time in its area. During ordinary operation it can be stopped only after: drive motor overload, operation of the safety clutch possibly installed or breakdown of mechanical parts.

**In any case, the operator must stay clear of the dangerous area during operation.**

### 1.3 Series, strokes, rotations

MAN manipulators are available in five series:

- MAN 10 - MAN 20 - MAN 30 - MAN 40 - MAN 50

For each series, the rotations and strokes listed in **Tab. 1** and **Tab. 2** have been standardised.

Tab. 1 Rotations

One-way Rotation	Number of Stations	2	3	4
	Rotation Angle	180°	120°	90°
Oscillating Rotation	Oscillation Angle	180°	120°	90°

It is possible to have stations and oscillation angles different from the standardised ones, within the max. limit of 180°.

Tab. 2 Strokes

Series	Max. linear stroke [ mm ]	Standardised linear strokes [ mm ]
<b>MAN 10</b>	45	40 - 30 - 20 - 10
<b>MAN 20</b>	65	60 - 45 - 30 - 15
<b>MAN 30</b>	85	70 - 60 - 40 - 20
<b>MAN 40</b>	110	90 - 70 - 50
<b>MAN 50</b>	165	140 - 110 - 80

We can supply, upon request and within the maximum stroke limit, strokes that are different from the standardised or normalised ones.

**NB:** For **B01U** and **B02U** type movements, maximum stroke and rotation values cannot be reached at the same time in the same mechanism. Please turn to **Tab. 6** on **Page 11**.

## 1.4 Denomination of the planes

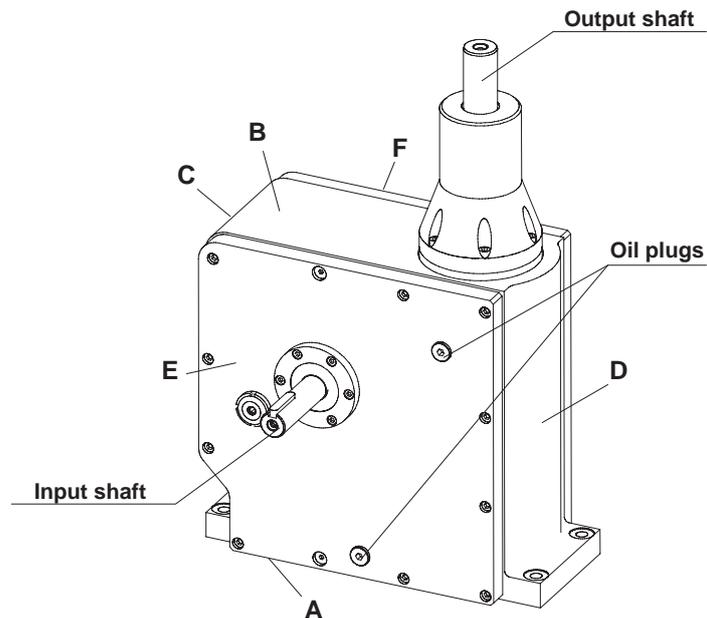


Fig. 1

## 1.5 Installation

Access for maintenance operations must be provided for when designing an application with MAN manipulators. In addition, it is always best to block the case in the direction of the movement reaction forces so that the fastening screws are stressed only by traction forces (see Fig. 2).

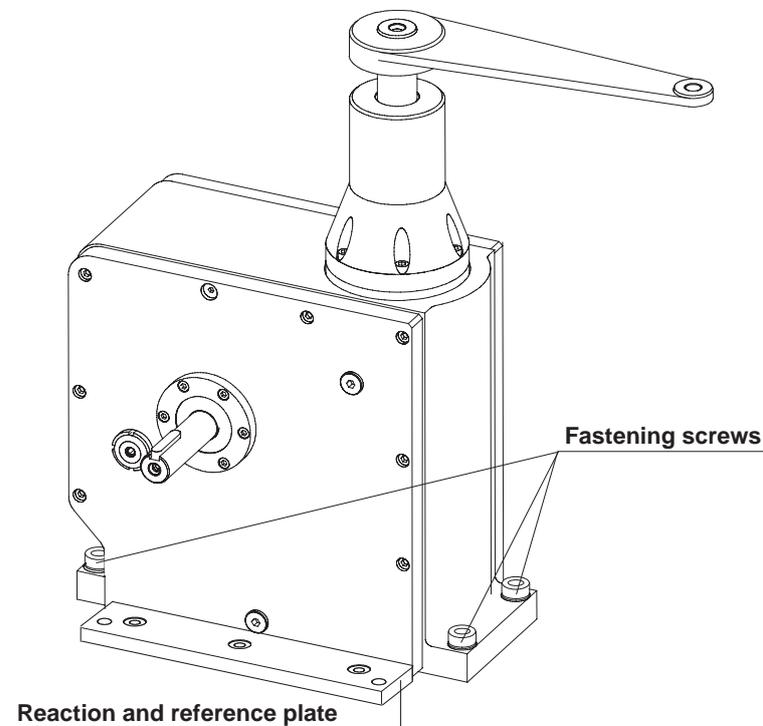


Fig. 2

The use of clearance-free couplings and transmissions, both at the input and output points, is recommended in order to avoid premature wear caused by vibrations.

To guarantee the output selected accelerations, constant input rotation speed and proper transmission rigidity capable of absorbing the torsion caused by mechanism reversal must be ensured.

## 1.6 Examples of applications

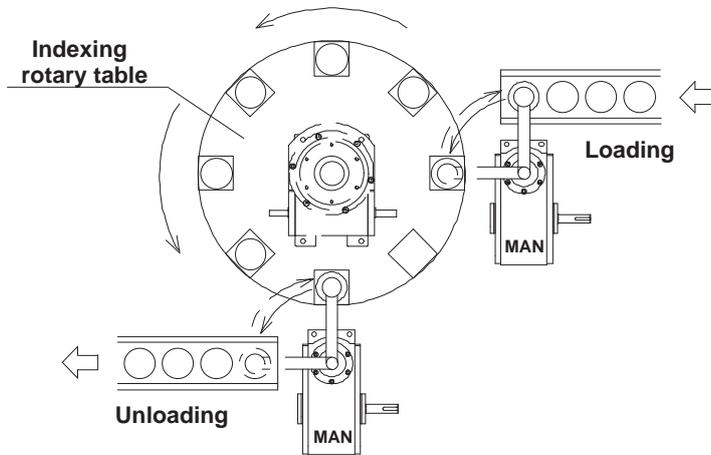


Fig. 3

Manipulators with type “B1” movements sequence

- Oscillation angle 90°
- Linear stroke 85 mm

Application: Loading and unloading pieces on a rotary table operated intermittently by an 8-station Rig 06

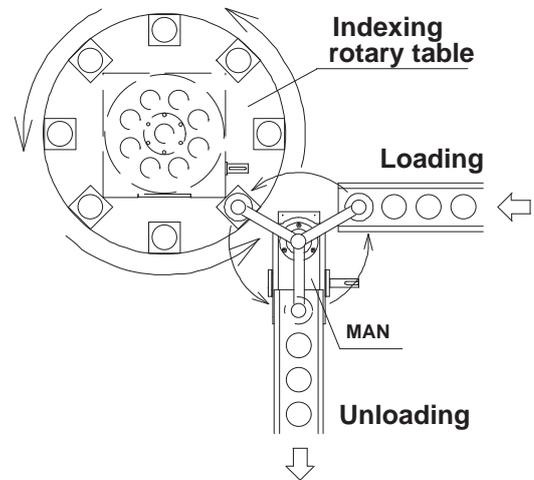


Fig. 4

Manipulators with type “A1” movements sequence

- Rotation angle 120°
- Linear stroke 85 mm

Application: Loading and unloading pieces on a rotary table operated intermittently by an 8-station IR 301

### Intermittent linear conveyor belt

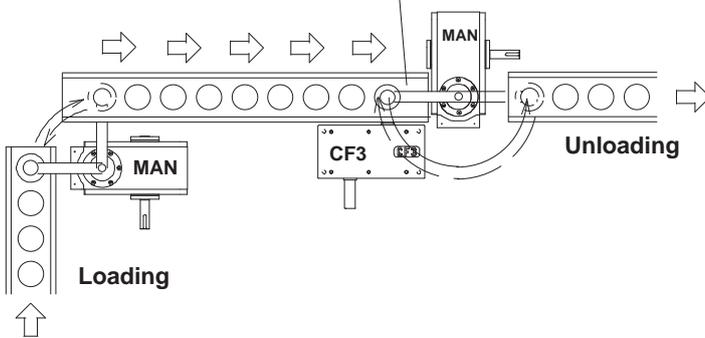


Fig. 5

Manipulators with type “B1” movements sequence

- Oscillation angle 90° and 180°
- Linear stroke 70 mm

Application: Loading and unloading pieces on a linear conveyor with step operated intermittently by a 2-station CF3 indexing device .

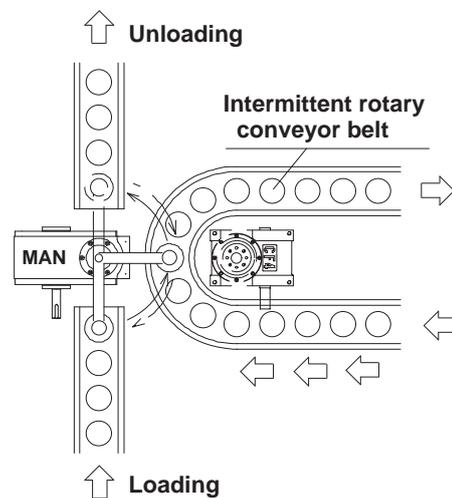


Fig. 6

Manipulators with type “B1” movements sequence

- Rotation angle 90°
- Linear stroke 85 mm

Application: Loading and unloading pieces on a rotary conveyor operated intermittently by a 12-station CF4

## 2 - OPERATING MODES

### 2.1 Continuous operation

The complete cycle that produces a one-way or oscillating output rotation is carried out during a single rotation of the input shaft. As a result, movement and stop periods are distributed along the 360° rotation of the cam, according to the desired cycle.

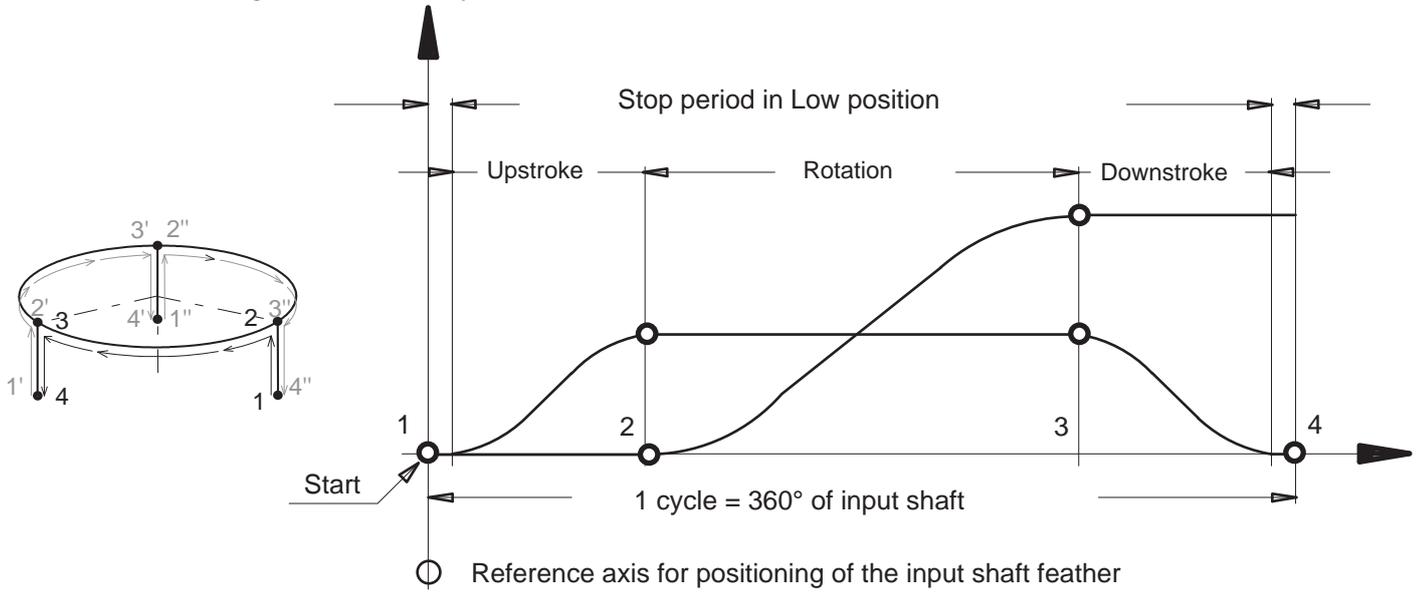


Fig. 7 Cycle with one-way rotation output.

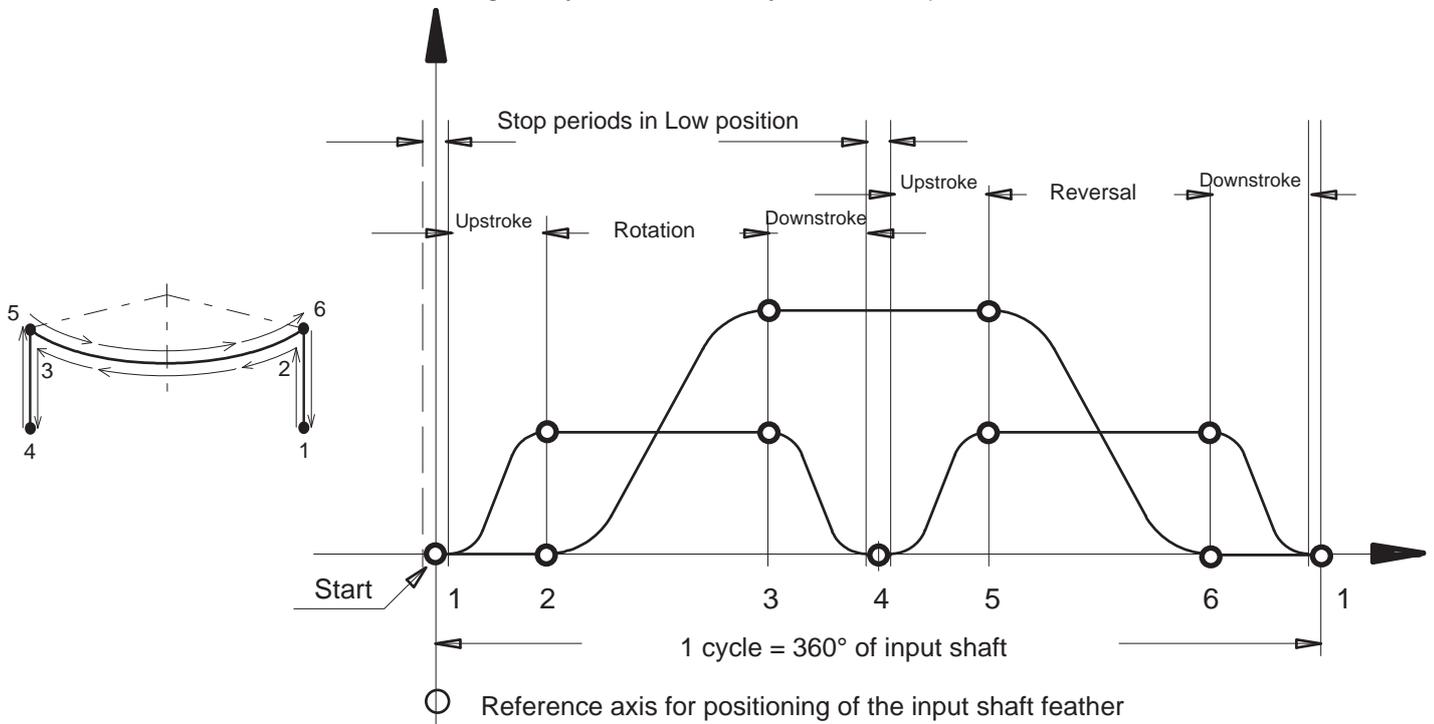


Fig. 8 Cycle with oscillating rotation output.

In applications of this kind, which call for perfect synchronisation between manipulator movements and those of the pieces being handled, a single motorisation drives the entire machine. As a result, the manipulator cycle must be integrated and harmonised with the cyclogram of the machine.

## 2.2 Intermittent operation with one-way input direction of rotation

Exactly as for the continuous operation, the complete cycle, either with a one-way or oscillating output rotation, is carried out in a single turn of the input shaft, and movement and stop periods are distributed along the 360° of the cam rotation according to the desired cycle (see **Fig. 7** and **Fig. 8**).

In this type of application, synchronisation of the manipulator movements with those of the pieces being handled is carried out by means of electrical timing.

The manipulator, equipped with its own motorisation, is usually stopped at each cycle in one of its single points, but always in connection with a pause in the movements, and does not start again until it receives the consent to carry out a new cycle.

In this manner, machine and manipulator cycles can be optimised, introducing at the same time an element of safety; the manipulator starts only if all conditions are such as to allow its cycle to be carried out without any problems.

## 2.3 Intermittent operation with reversal of input direction of rotation.

The complete cycle which can only be with an oscillating output rotation, is carried out in two strokes.

The first period, realised in a complete cycle of the cam, produces only half the cycle (from point 1 to point 4, going).

The second period, realised in a complete cam cycle with reversed direction of rotation, produces the other half of the cycle, essentially repeating the first period in the opposite direction. (from point 4 to point 1, return).

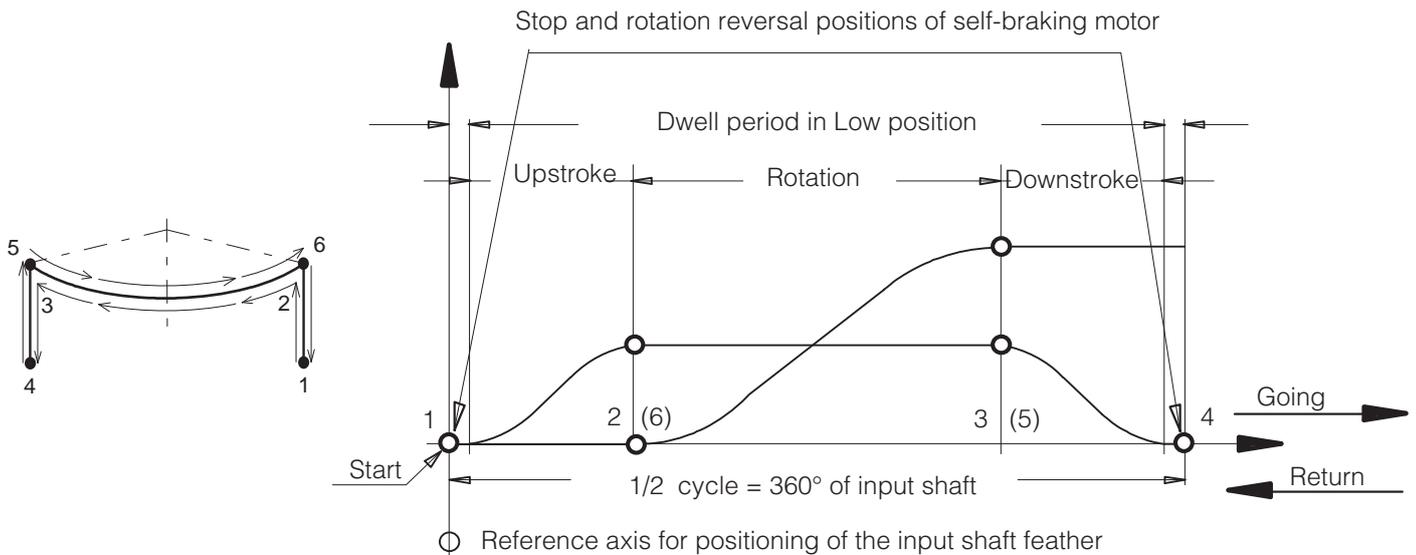


Fig. 9 Cycle with oscillating rotation output

In this type of application the motor is stopped every 1/2 cycle in the movement dwell positions (points 1 and 4), then it is started again in the opposite direction of rotation.

Advantages consist in the possibility of generating an output oscillation with bigger angles and smaller pressure angles on the cam. This in turn cuts down on the stress and sometimes allows the use of smaller mechanism sizes compared to the continuous operation shown in **Fig. 8**, which carries out the same cycle with one-way input direction of rotation.

## 2.4 Movements overlap

Usually when describing the cycle of a manipulator, it is understood that each movement starts right where the previous movement ends. In the representation of movement, this situation is marked by a sharp corner where the direction of rotation changes.

On the other hand, the overlapping of movements produces, wherever it occurs, a fillet in the change of direction.

Where application data allows it, it is best to have an overlap of consecutive movements, since this allows to increase strokes and/or the rotation and oscillation angles. Or, as an alternative, decreasing the angle of pressure causes a reduction in the stress and a general improvement in the movements.

Positions **2 - 5** The manipulator starts its rotation while the upstroke still has to cover **a** (mm) in order to finish its stroke.

Positions **2' - 5'** The manipulator ends its linear upstroke while **b**° of rotation have already been covered.

Positions **3 - 6** The manipulator starts its linear downstroke while it still has to cover **b**° of rotation.

Positions **3' - 6'** The manipulator ends its rotation while **a** (mm) of linear downstroke have already been covered.

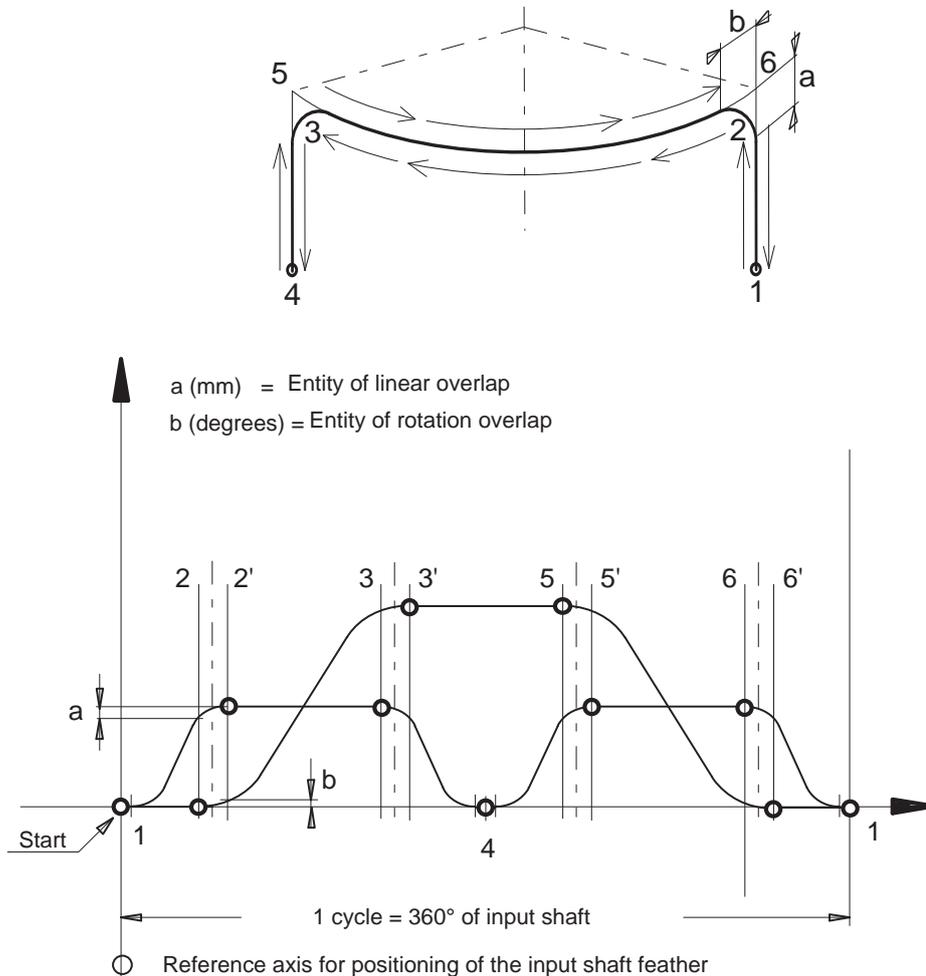


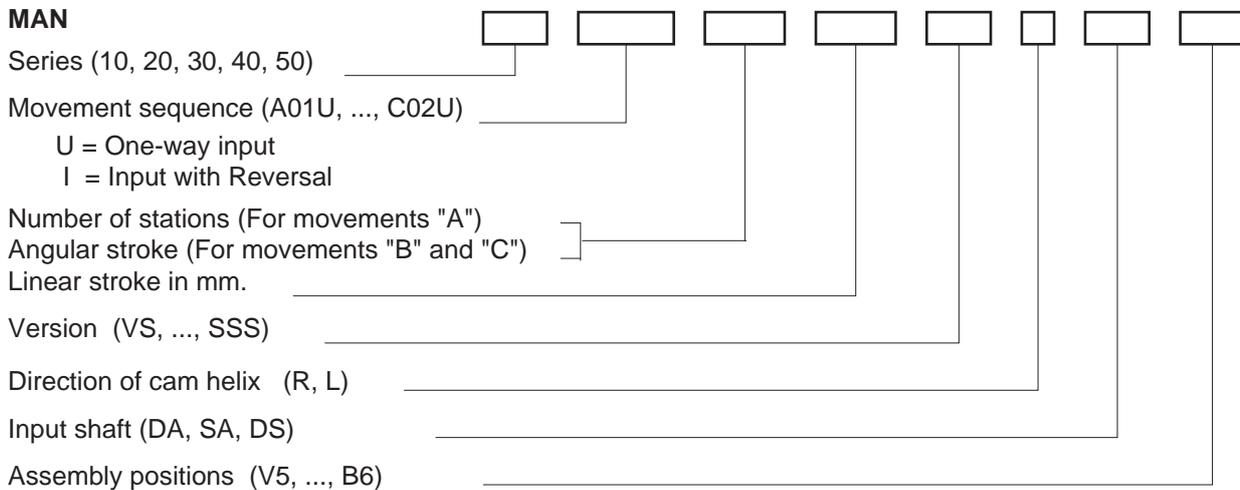
Fig. 10 Movements overlap.

In these applications, once values **a** (mm) or **b** (degrees) of the overlap allowed by the application are established, we can determine the cam angles that produce them.

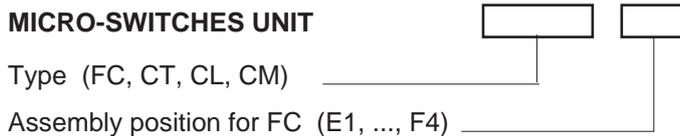
## 3 - Designations

Designation of MAN rotary manipulators is made up of alpha-numerical groups according to the diagram shown below.

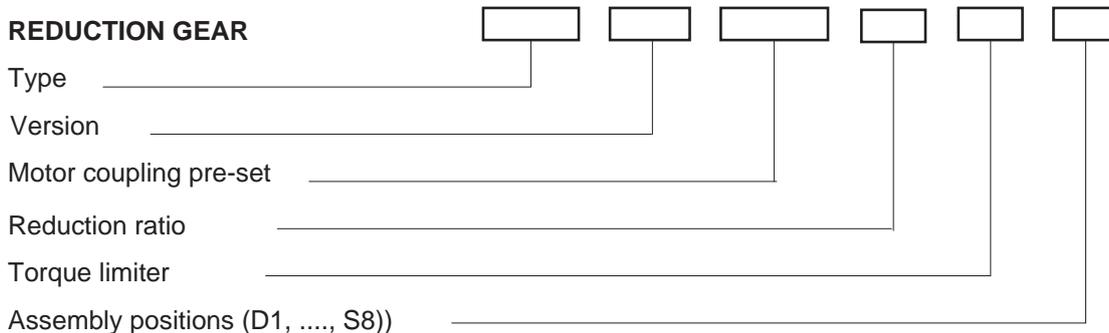
### MAN



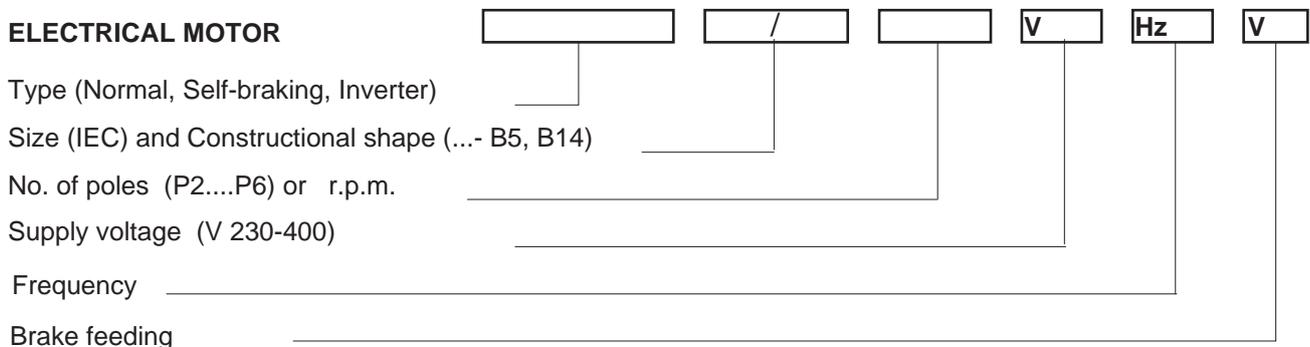
### MICRO-SWITCHES UNIT



### REDUCTION GEAR



### ELECTRICAL MOTOR



**Example of designation** for a rotary manipulator series MAN 40, 3 stations, 110-mm upstroke, movement sequence A02U, standard version, D rotations, DA entry, Assembly in V5.

**Rotary manipulator MAN-40-A02U-3-110-VS-D-DA-V5**

In addition, the designation must be completed with the complete designation of the required accessories (micro-switches unit, reduction gear, motor, etc.) as shown in this page.

## 4 - Characteristic data and sizes

### 4.1 Overall dimensions

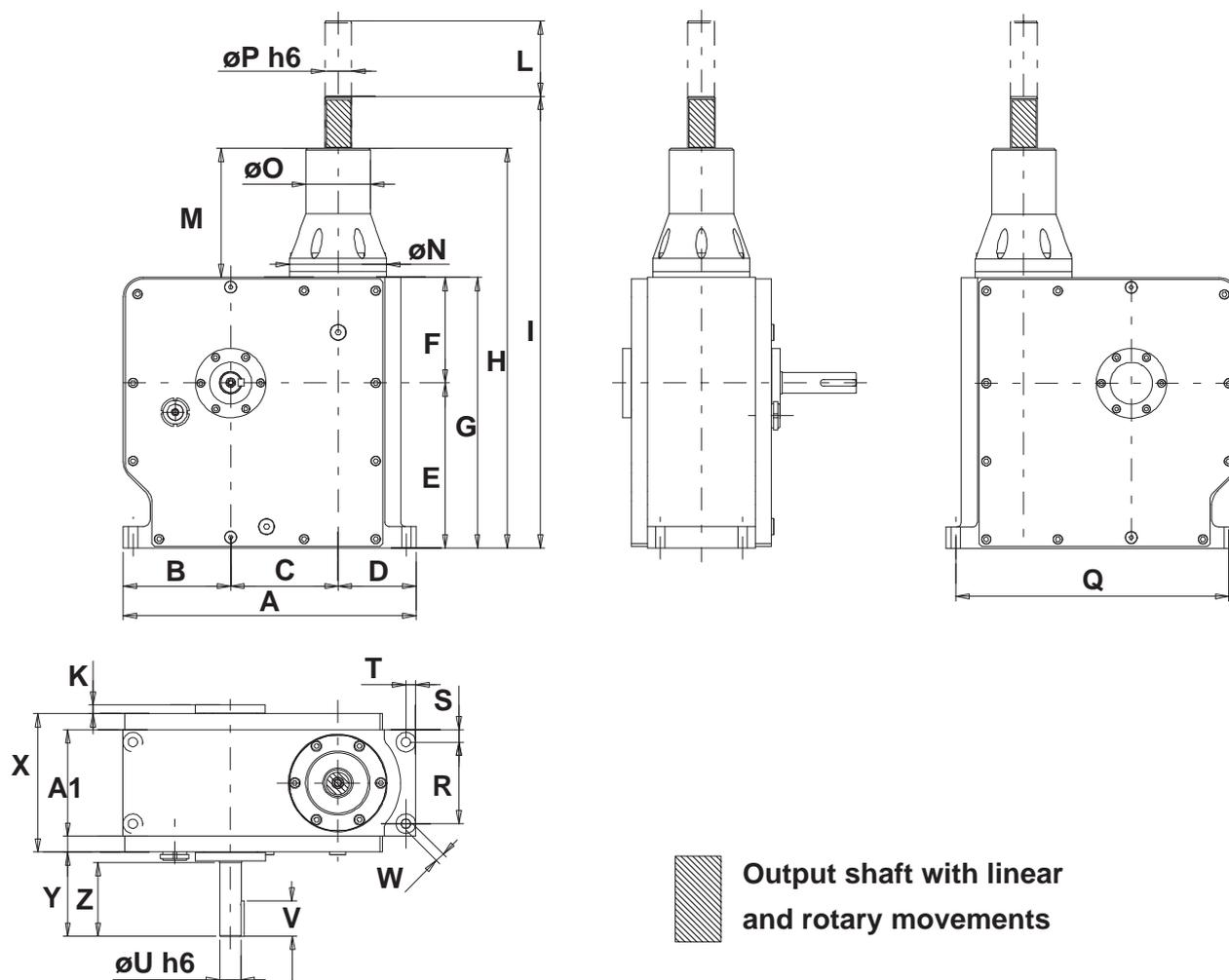


Fig. 11

Tab. 3

Series	A	B	C	D	E	F	G	H	I	K	L <sub>MAX</sub>	M	N
MAN 10	210	75	75	60	100	75	175	250	280	7,5	45	75	77
MAN 20	265	96	95	74	133	97	230	330	375	7,5	65	100	86
MAN 30	327	120	120	87	186	119	305	450,5	509	7,5	85	145,5	108
MAN 40	430	158	153	119	243	157	400	601,5	664	10,5	110	205,5	128
MAN 50	545	205	200	140	320	195	515	788,5	871	12	165	273,5	140

Series	O	P <sub>h6</sub>	Q	R	S	T	U <sub>h6</sub>	V	W	X	Y	Z	A1	Weight [Kg]
MAN 10	45	18	190	60	13,5	10	14	35	9	117	50	40	87	15
MAN 20	55	25	242,5	90	10	11,5	18	36	8,5	140	50,5	43	110	40
MAN 30	72	30	305	92	14	11	24	45	10,5	150	62	50	120	50
MAN 40	84	40	390	115	15,5	20	28	55	13	186	75	60	146	103
MAN 50	100	45	505	140	20	20	32	75	14	225	97	80	185	192

**N.B.** The input shaft keyway is in the position shown in **Fig. 11** when the movement is at the start of the cyclogram (point 1 - 0° of the cycle).

The input and output shafts are equipped with a threaded blind hole according to UNI ISO 9321.

Upon request, MAN manipulators can be supplied with an output shaft with through hole.

## 4.2 Load capacity

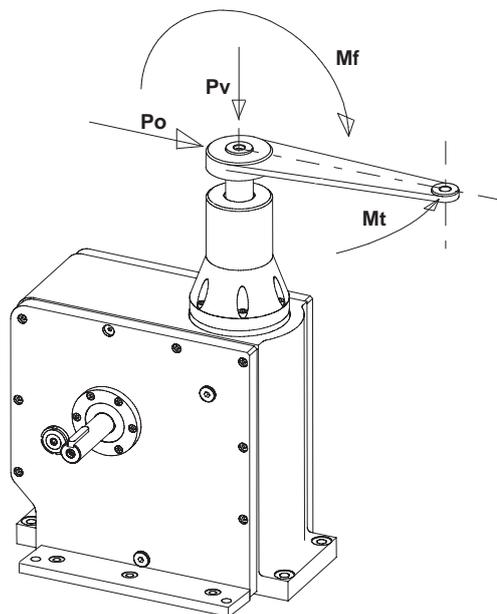


Fig.12

Tab. 4

Series	Static loads allowed				Dynamic loads	
	Radial $P_o$ [N]	Axial $P_v$ [N]	Over-turning $M_f$ [Nm]	Tangential $M_t$ [Nm]	Rotation $M_t$ [Nm]	Lifting $P_v$ [N]
MAN 10	120	298	10	31	17	190
MAN 20	400	347	45	40	21	245
MAN 30	690	397	100	50	25	290
MAN 40	850	850	160	107	50	750
MAN 50	895	1240	250	217	100	1100

## 4.3 Manipulators precision

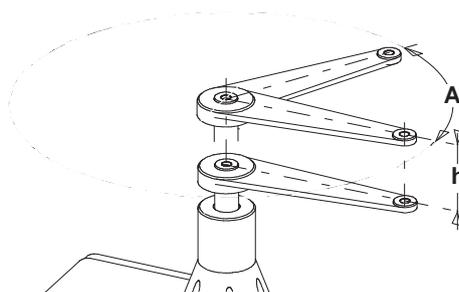


Fig. 13

Tab. 5

Series	Precision of linear stroke $h$ [mm]	Precision of rotation on radius $R=100 A$ [mm]
MAN 10	$\pm 0.10$	$\pm 0.080$
MAN 20	$\pm 0.12$	$\pm 0.070$
MAN 30	$\pm 0.13$	$\pm 0.050$
MAN 40	$\pm 0.14$	$\pm 0.035$
MAN 50	$\pm 0.15$	$\pm 0.030$

## 5 - Standard movements

Tab. 6

Series	Max. angle [degrees]	Linear strokes [mm]			
		Sequence A01U – A02U	Sequence B01.. – B02..	Sequence B01.. – B02..	Sequence C01U – C02U
		without overlap	without overlap	with overlap	without overlap
MAN 10	90	45	30	43 di (45)	45
	120		30	39 di (45)	
	180		20	35 di (45)	
MAN20	90	65	65	65 di (65)	65
	120		45	60 di (65)	
	180		30	53 di (65)	
MAN30	90	85	70	84 of (85)	85
	120		70	81 of (85)	
	180		40	65 of (85)	
MAN40	90	110	70	95 of (110)	110
	120		70	85 of (110)	
	180		50	61 of (110)	
MAN50	90	165	110	151 of (165)	165
	120		110	138 of (165)	
	180		80	103 of (165)	

Standard movements can be used with both continuous and intermittent operation.

Stop periods in the represented cyclograms have been programmed in points **1** and **4** only for example purposes.

Dwell periods can usually be positioned in each one of the single points indicated with numbers **1, 2, 3, 4, 5, 6**. For dwell periods positioned in points of the cycle different than the anticipated ones, for example, half-way through a movement, please contact our technical office.

Reversing the direction of rotation of the input shaft on the manipulator causes a reversal of the chronological sequence of cycle periods as well. This means covering the cyclogram from right to left.

### 5.1 Type "A" movements sequence

Movement **A01U** (One-way motor rotation)

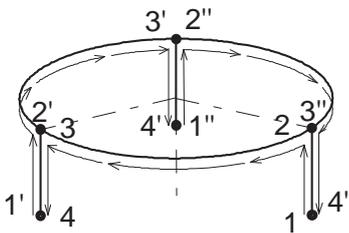
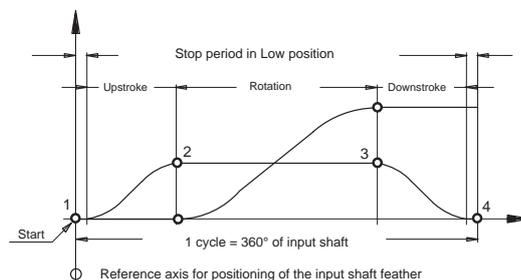


Fig. 14



Movement **A02U** (One-way motor rotation)

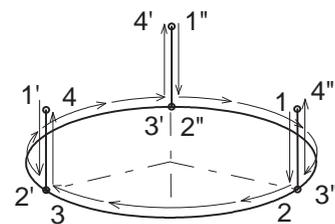
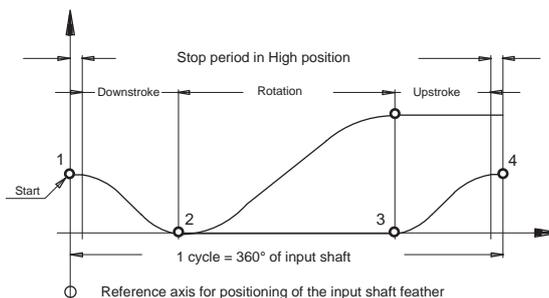
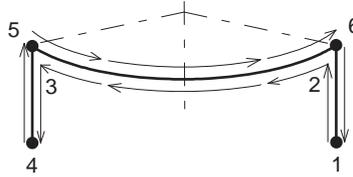


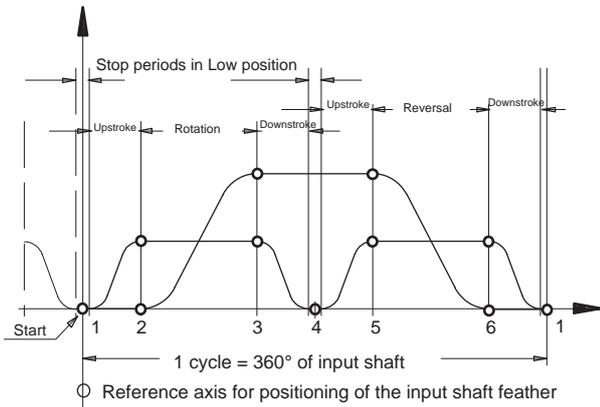
Fig. 15



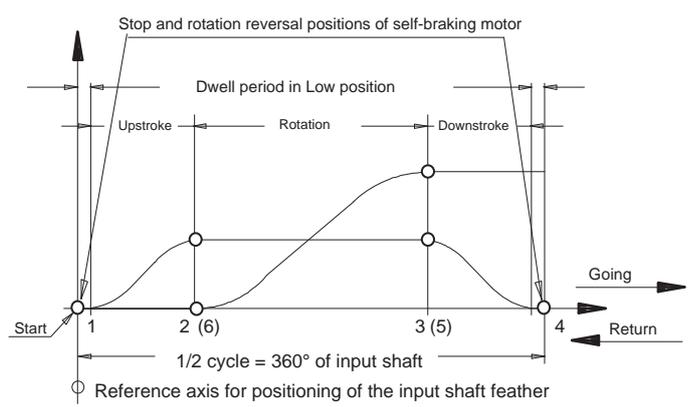
## 5.2 Type "B" movements sequence



One-way motor rotation "B01U"



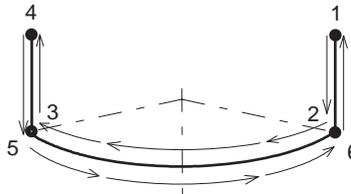
Reversal motor rotation "B01I"



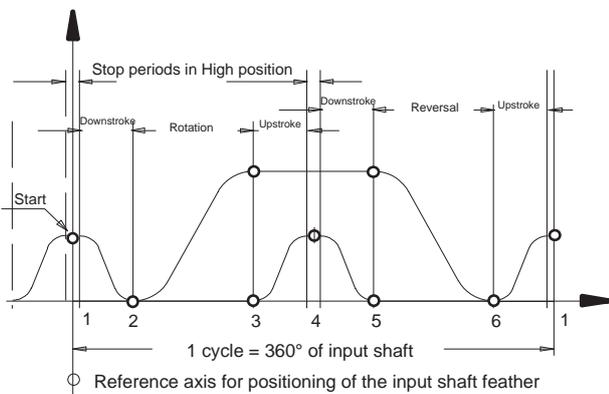
Movement B01..

Fig. 16

Movement B02..



One-way motor rotation "B02U"



Reversal motor rotation "B02I"

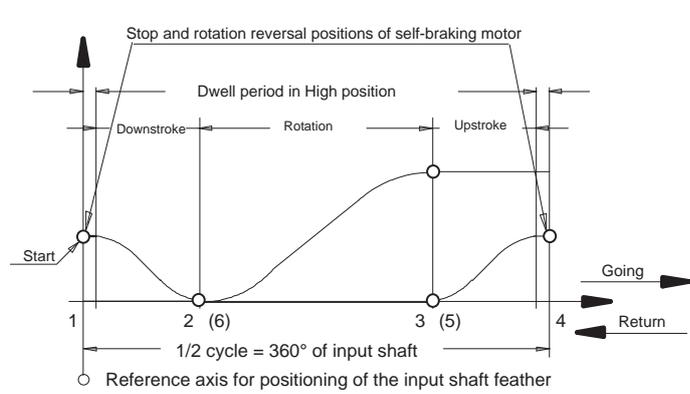


Fig. 17



## 5.3 Type "C" movements sequence

Movement **C01U** (One-way motor rotation)

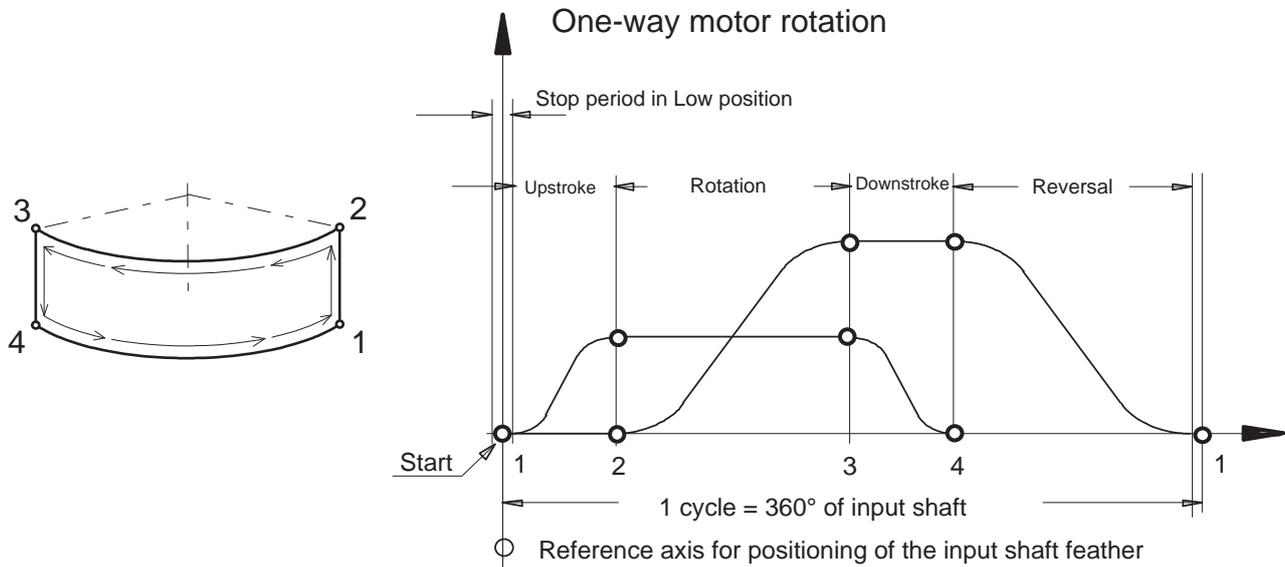


Fig. 18

Movement **C02U** (One-way motor rotation)

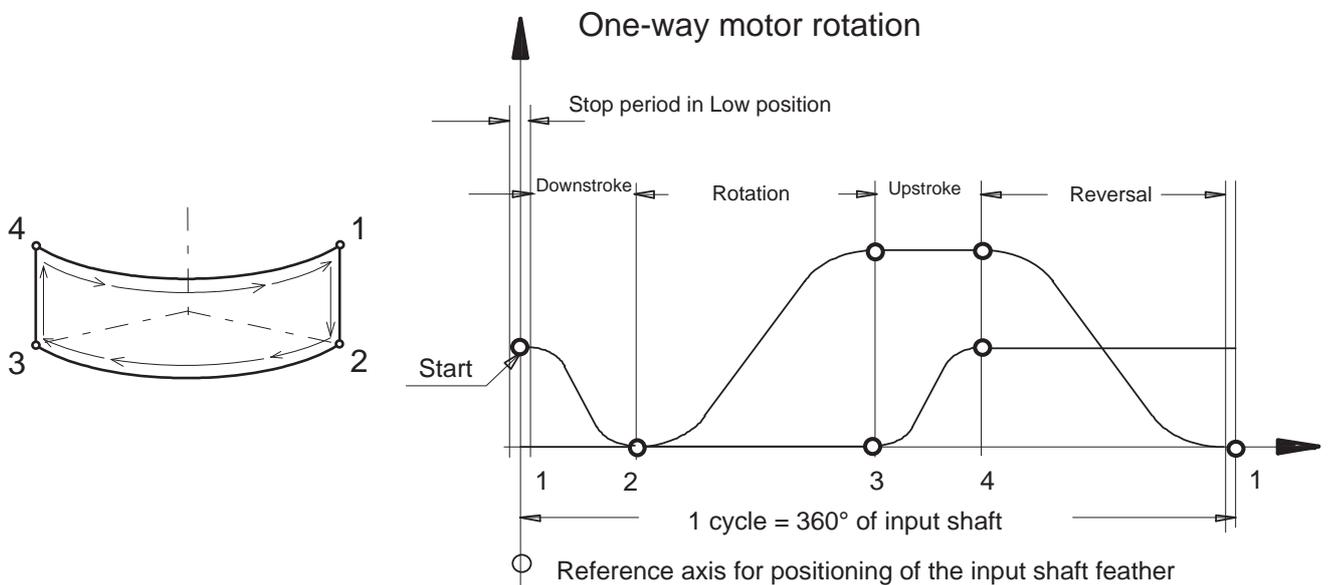


Fig. 19

In addition to standard movement sequences and strokes, a great number of other sequences with linear strokes and special rotations can be obtained with MAN manipulators.

## 6 - Assembly instructions

### 6.1 Versions

MAN manipulators are available in the following versions.

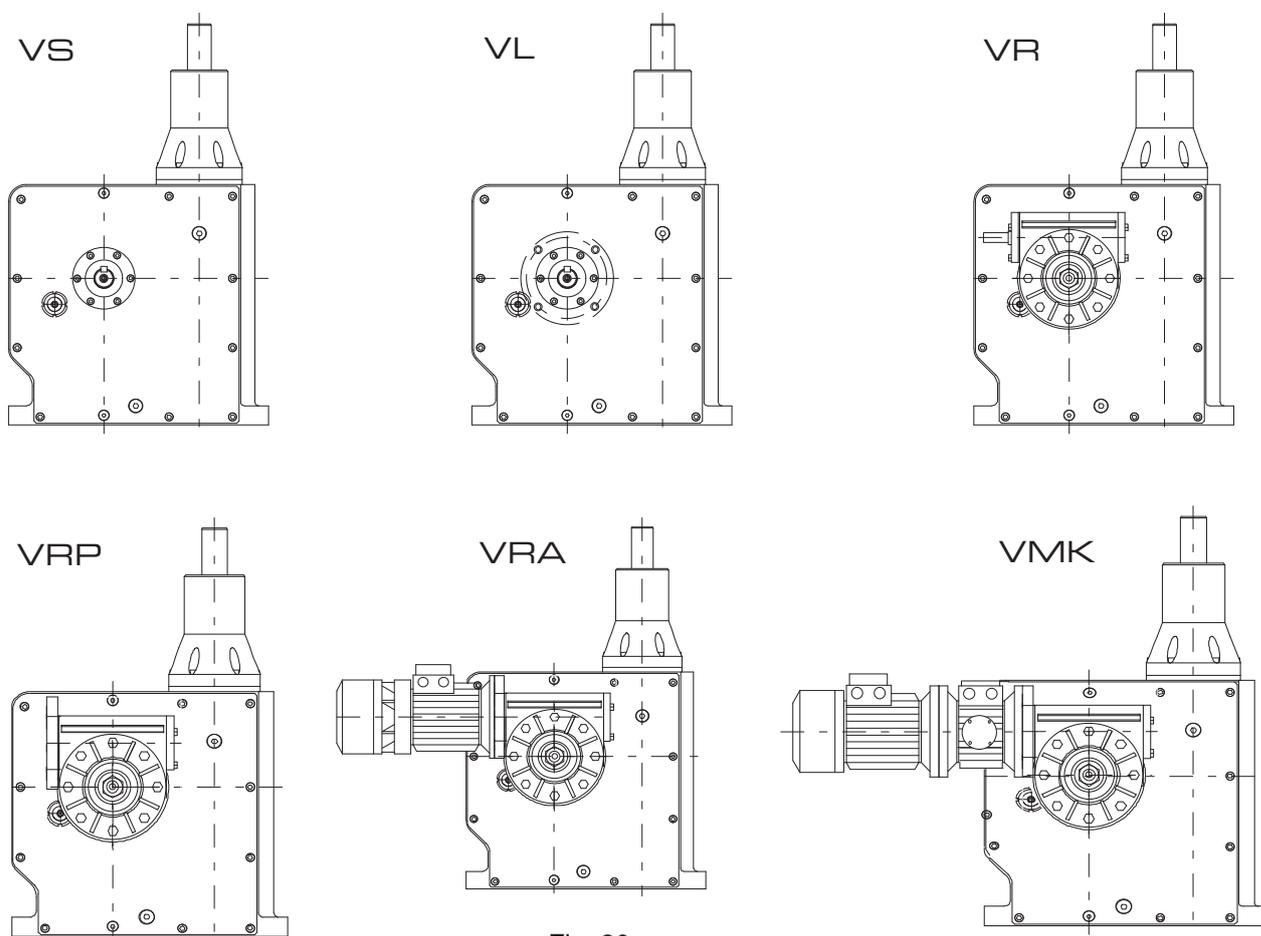


Fig. 20

<b>VS</b> (---)	Standard version
<b>VX</b> (---)	Special version
<b>VL</b> (---)	Version with long-shaft pre-set for reduction gear coupling
<b>VR</b> (LR)	Version with reduction gear
<b>VRP</b> (LRP)	Version with reduction gear pre-set for motor coupling
<b>VRA</b> (LRA)	Version with reduction gear and self-braking motor
<b>VMK</b> (LMK)	Version with reduction gear motor and brake clutch
<b>VRX</b> (---)	Version with special reduction gear

Only for versions that require the reduction gear, whenever this is requested with built-in clutch torque limiting device, after the first letter of the code "V" must be inserted the letter "L".

## 6.2 Directions of rotation

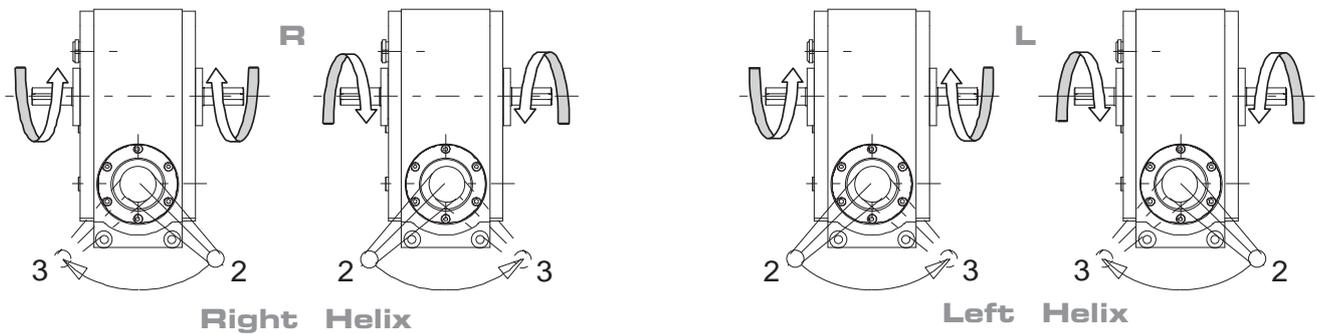


Fig. 21

The right **R** or left **L** helix directions for the one-way or oscillating manipulators, indicate the direction in which the output shaft rotates in the first turn it carries out when the input shaft rotates from its base position point 1 at  $0^\circ$ , as represented in diagrams of **Par. 5**. (Standard movements). The rotations marked with “**R**” are standard for MAN manipulators.

## 6.3 Input shafts

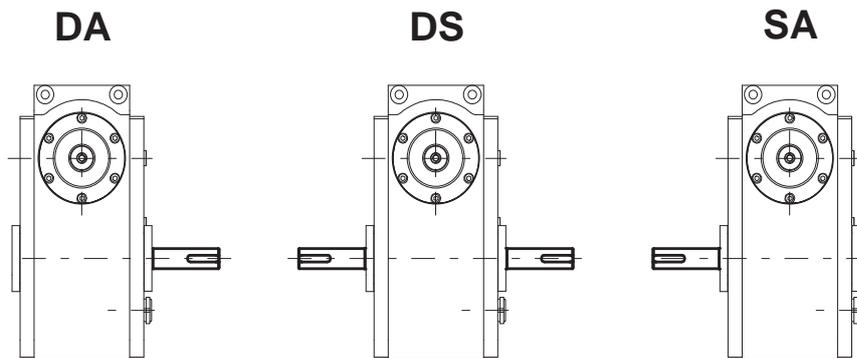


Fig. 22

Unless otherwise requested, MAN manipulators are furnished with the input shaft in position **DA**, which is supplied as standard. Shaft projected on both sides **DS** and left shaft **SA** shown above are available as options.

## 6.4 Assembly positions

MAN manipulators can be installed in all positions because they have “long-life” lubrication. As a result they are already supplied with the proper amount of lubricant according to the various assembly positions specified at the time of order. A yellow label fixed to the case certifies that the manipulators are lubricated and lists the type of lubricant used. For reduction gears and other power-drive components, please follow the instructions and supply conditions established by the manufacturer.

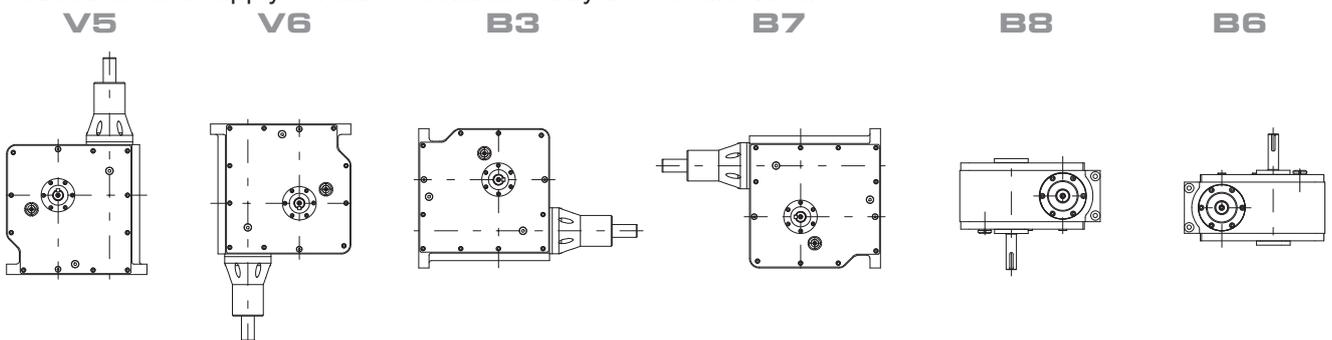


Fig. 23

Unless otherwise specified, the manipulators are supplied for installation in position **V5**, which is the standard position.

## 7 - Applications of cams for limit switches

When the application calls for stopping the motor at each cycle, either to prolong dwell times or to reverse the direction of rotation, a limit switch unit such as the one shown in **Fig. 24** can be used for that purpose.

The cams for limit switches are built in three standard shapes, each one suited to the type of limit switch used. Such cams are catalogued as shown in **Fig. 25**.

### 7.1 Overall dimensions

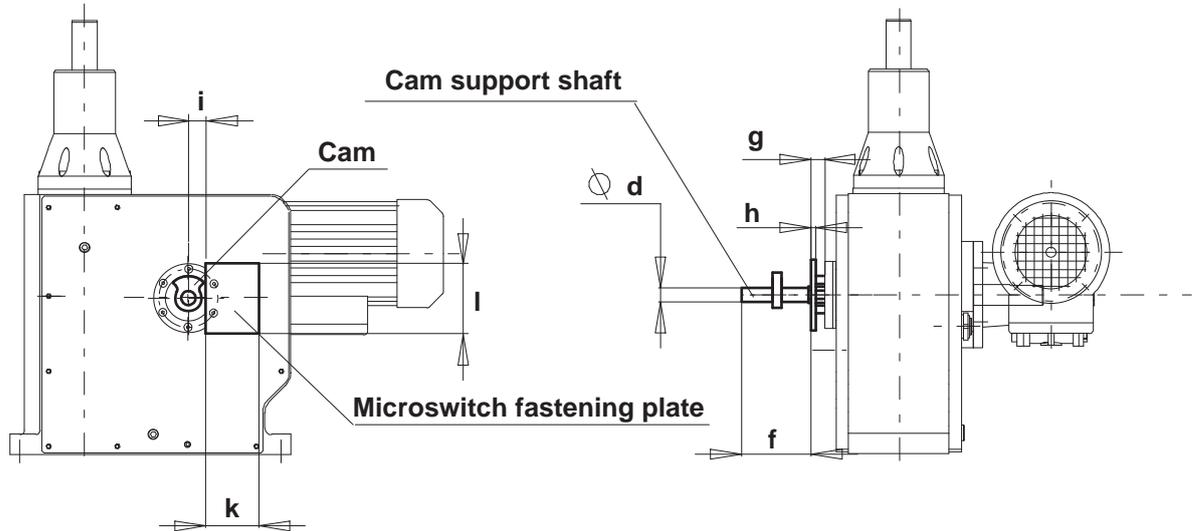


Fig. 24

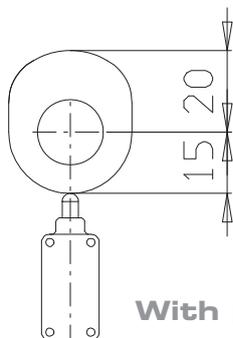
Tab. 7

Series	Ød	f	g	h	i	k	l
MAN10	16	77	15	5	15	60	80
MAN20	16	77	15	5	15	60	80
MAN30	16	77	15	5	15	60	80
MAN40	16	77	16	5	15	60	80
MAN50	16	77	17	5	15	60	80

Cam shape depends on the type of limit micro-switch.

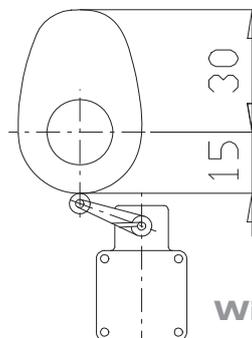
### 7.2 Types of control cams for limit switch

**CT**



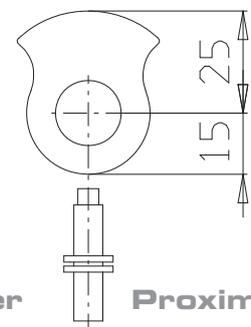
With plunger

**CL**



With roller lever

**CM**



Proximity

D4B 1171-DIN 43694 shape B

D4B 1111-DIN 43694 shape A/B

E2E2 - X2B1 o TLE-X5BI-G

Fig. 25

Searching for phase position on the limit switch cam must be carried out necessarily by the manipulator unit operator, according to the stops and control points desired.



ATTENTION: the phase cam is not a safety device.



## 7.3 FC type compact microswitch unit

The manipulator can be supplied with the **FC3** detection unit, which is made up of three microswitches with 3 cams capable of supplying three signals in certain positions of the movement cycle. If necessary, we can supply **FC** detection units with additional microswitches and cams. The illustrations below show the foreseen positions for the micro unit. All positions refer to the manipulator, not to the reduction gear.

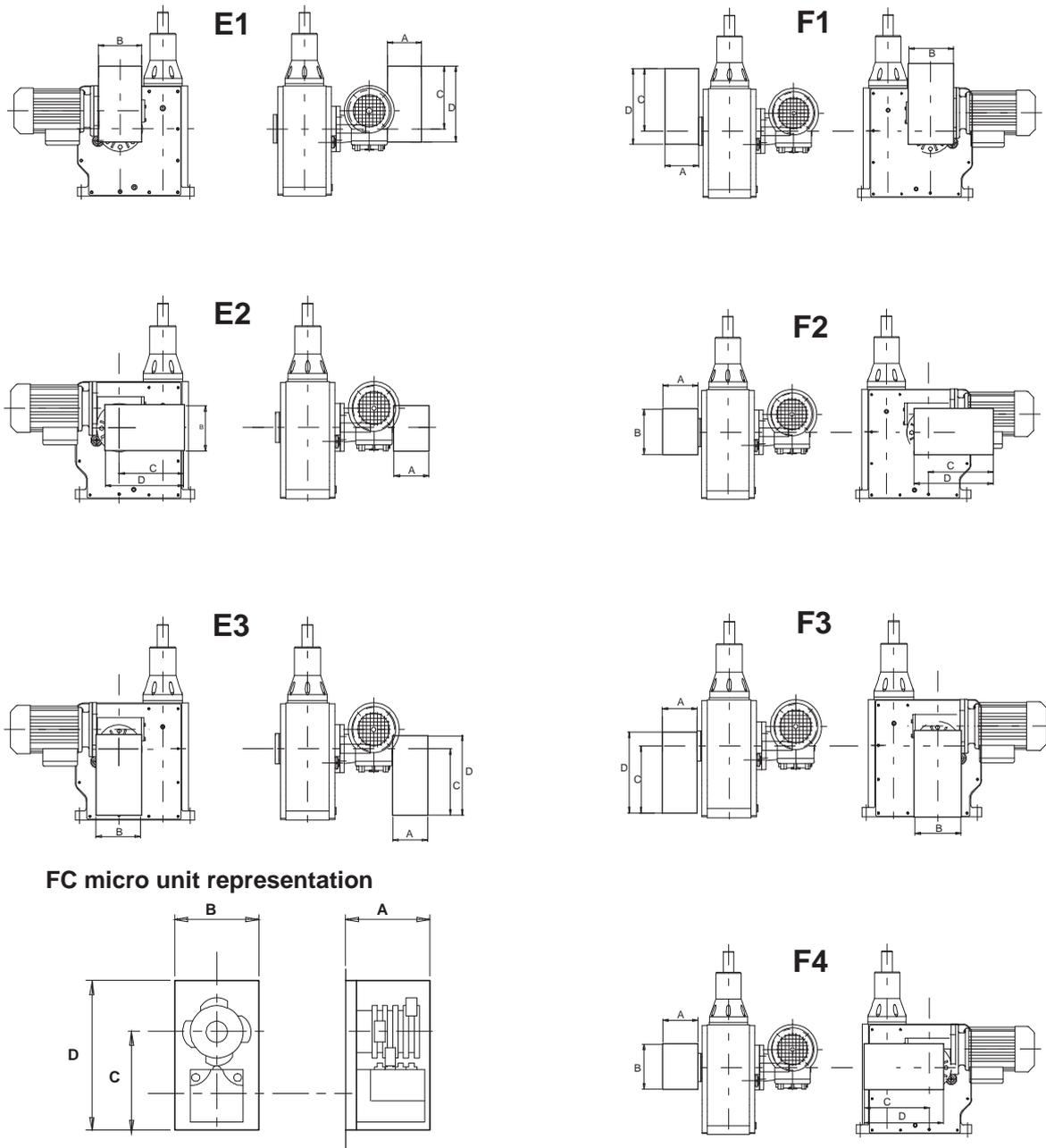


Fig. 26 Assembly positions  
Tab. 8 Overall dimensions

FC Unit	B	C	D	A
FC2	100	112	162	65
FC3				65
FC4				80
FC5				95



ATTENTION: the phase cam is not a safety device.



## 8 - Motorisation

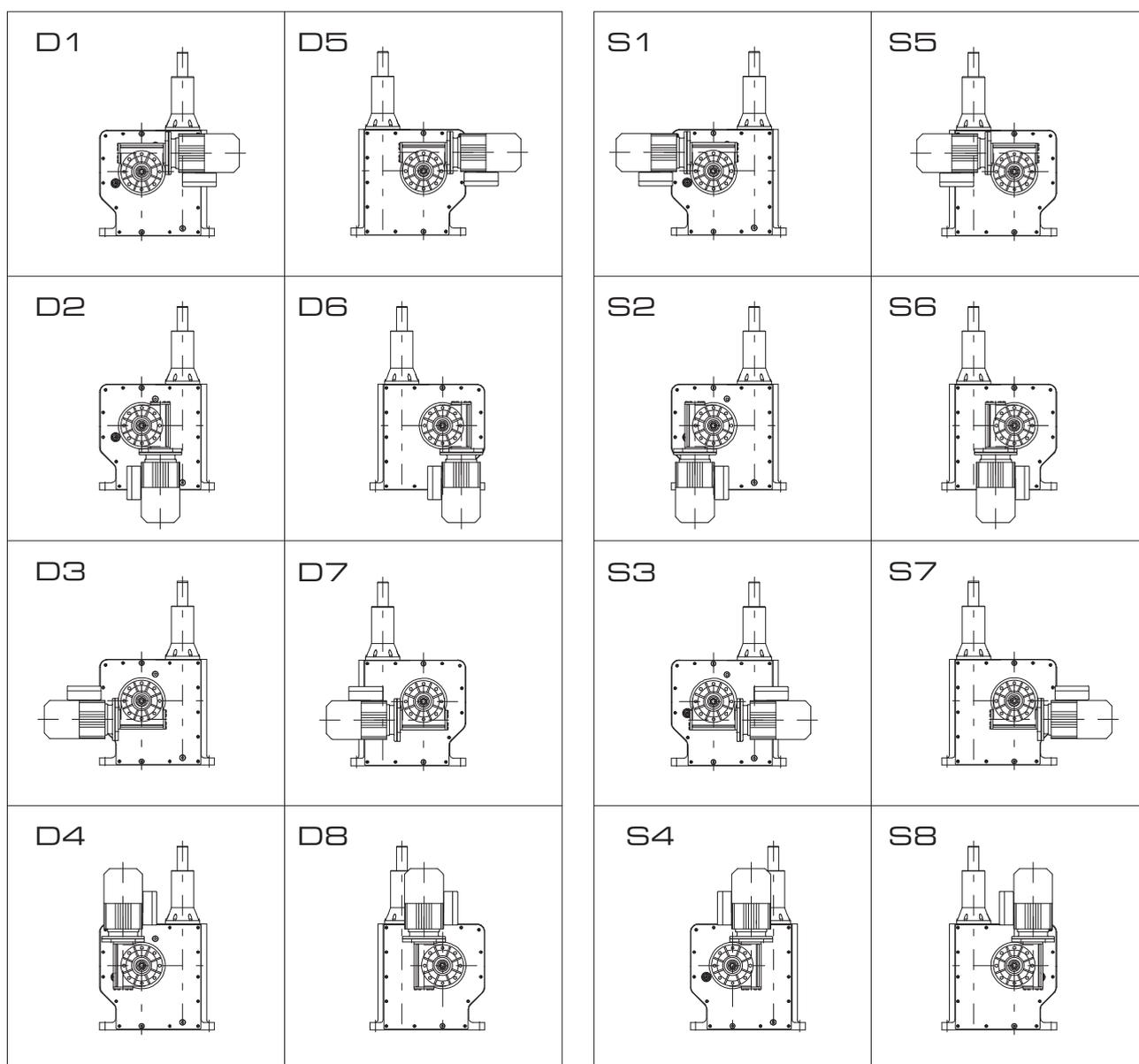
### 8.1 Reduction gear assembly positions

MAN rotary manipulators can be supplied, upon request, equipped with an external worm screw reduction gear with clutch torque limiting device. Speeds from 7 to 50 cycles per minute can be obtained with the use of different reduction gears, in full compatibility with the loads applied to the output shaft. The reduction gears can be installed in 16 different positions.

At the time of the order, and in addition to the desired assembly position, the instructions described on **Page 8, Par. 3.3** and **3.4** must also be communicated :

- Cycles per minute with rotary manipulator in constant operation or the reduction gear ratio.
- IEC dimensions of the motor flange, if the reduction gear must be supplied with motor coupling but without the motor itself.
- Technical data pertaining to the motor

If the MAN manipulator must be equipped with operations other than those already described, such as brakes-clutch, speed variators, etc., an evaluation of compatibility and a complete description are required

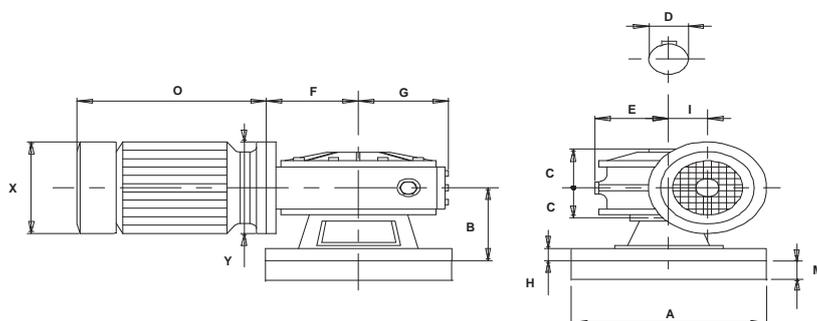


at the time of order.

Fig. 27

## 8.2 Standard reduction gear motor - Overall dimensions

Fig. 28 - STM "RMI" Reduction gear motor - Version with flange.



Tab. 9

SERIES	STM RI RMI	Worm Screw Reduction Gear				Motor 4P-V230/400 - Hz50						
		Overall dimensions [mm]				Ratios		Self-braking		Overall dimens.[mm]		
		A	F	G	B	100-80-70	56-49	I.E.C	kW	O	X	Y
MAN 10	28 f1	A	70	F	45	100-80-70	56a	0.06	135	110	80	
	LCB	B	49	G	40	56-49	56a	0.06	135	110	80	
		C	30	H	5	40-28-20	56b	0.09	176	110	120	
	©	D	14	I	28	15-10-7	56b	0.09	176	110	120	
		E	35	M	15	---	---	---	---	---	---	
MAN 10 MAN 20	40 f1	A	106	F	64	80-70	56b	0.09	176	110	120	
	LCB	B	69	G	63	56-49	63a	0.12	225	124	140	
		C	41	H	9	40-28-20	63b	0.18	225	124	140	
	©	D	19	I	40	15-10-7	63b	0.18	225	124	140	
		E	59	M	15	---	---	---	---	---	---	
MAN 30	50 f1	A	125	F	77	80-70	63b	0.18	235	123	140	
	LCB	B	93	G	74	56-49	71a	0.25	270	138	160	
		C	49	H	10	40	71a	0.25	270	138	160	
	©	D	24	I	50	28-20	71b	0.37	270	138	160	
		E	69	M	14	15-10-7	71b	0.37	270	138	160	
MAN 40	70 f1	A	175	F	100	80-70	71b	0.37	270	138	160	
	LCB	B	116	G	92	56-49	80a	0.55	295	156	200	
		C	60	H	10	40	80b	0.75	295	156	200	
	©	D	28	I	70	28-20	90s	1.1	315	176	200	
		E	87	M	12	15-10-7	90L	1.5	340	176	200	
MAN 50	85 f1	A	200	F	116	80	80a	0.55	295	156	200	
	LCB	B	141	G	111	70	80b	0.75	295	156	200	
		C	61	H	12	56-49-40	90s	1.1	315	176	200	
	©	D	32	I	85	28	90L	1.5	340	176	200	
		E	105	M	-	20-15-10-7	100a	2.2	381	192	250	

NB: Upon request, MAN manipulators can be equipped with motors and reduction gears of mark and type different from those supplied with the standard version, or as an alternative they can be delivered only prepared for their keying.

LCB = Clutch torque limiting device available upon request.

© = Additional plate with M thickness for reduction gear keying.

## 9 - Lubrication

Oil-bath lubrication was studied very carefully in order to cut down as much as possible on maintenance operations. In manipulators running at low to medium speeds (< 200 cycles per minute), “long-life” lubrication with mineral oil is used. Two holes in the body of the mechanism are provided for oil top-up and drain, respectively. In that case the mechanism already hold the right amount of lubricant and no other routine maintenance is required, provided there be no leaks or external pollution. This allows greater installation flexibility.

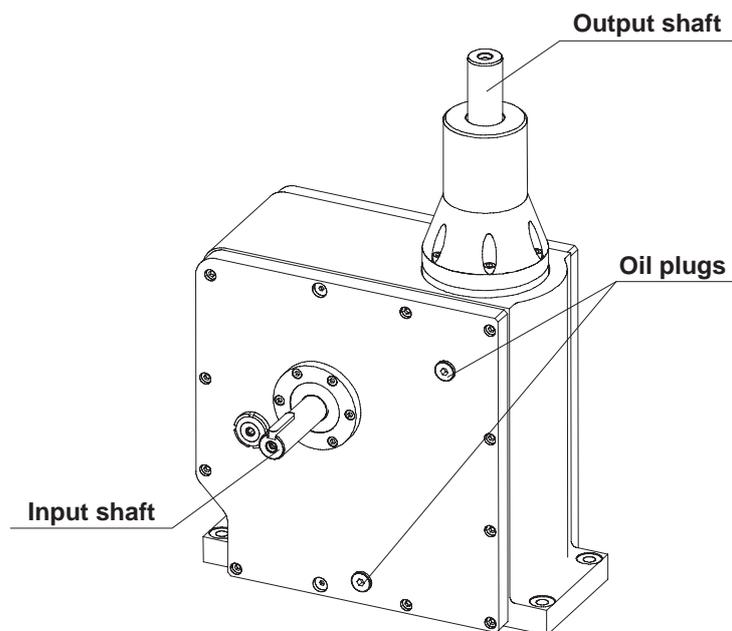


Fig. 29

### 9.1 Amount of lubricant

Tab. 10

Series	MAN 10	MAN 20	MAN 30	MAN 40	MAN 50
Quantity of oil [kg]	1	2	5	9	19

In case of MAN manipulators running at medium to high speeds (> 200 cycles per minute), the lubricant must be replaced periodically. The housings are equipped, upon request, with the following plugs: oil top-up, level and drain, and they are supplied without the lubricant. It will be Purchaser’s responsibility to top up with the right amount of oil before starting the equipment for the first time. Unless leaks or external pollution occur, the lubricant must be replaced every 8.000 work hours. Avoid letting more than 2 years go by between one lubricant change and the next.

### 9.2 Lubricants conversion table

Tab. 11

ISO/UNI	VG 150	FINA	GIRAN 150
AGIP	BLASIA 150	MOBIL	MOBIL GEAR 629
BP	ENERGOL GR 150 XP	SHELL	OMALA OIL 150
ESSO	SPARTAN EP 150		

When changing the lubricant, wait until the oil has cooled down before unscrewing the plugs and removing the oil. Always filter the oil with a clean filter or a fine screen when topping up.

## 10 - APPENDIX

### 10.1 Fixing plate for gripper arm

Overall dimensions.

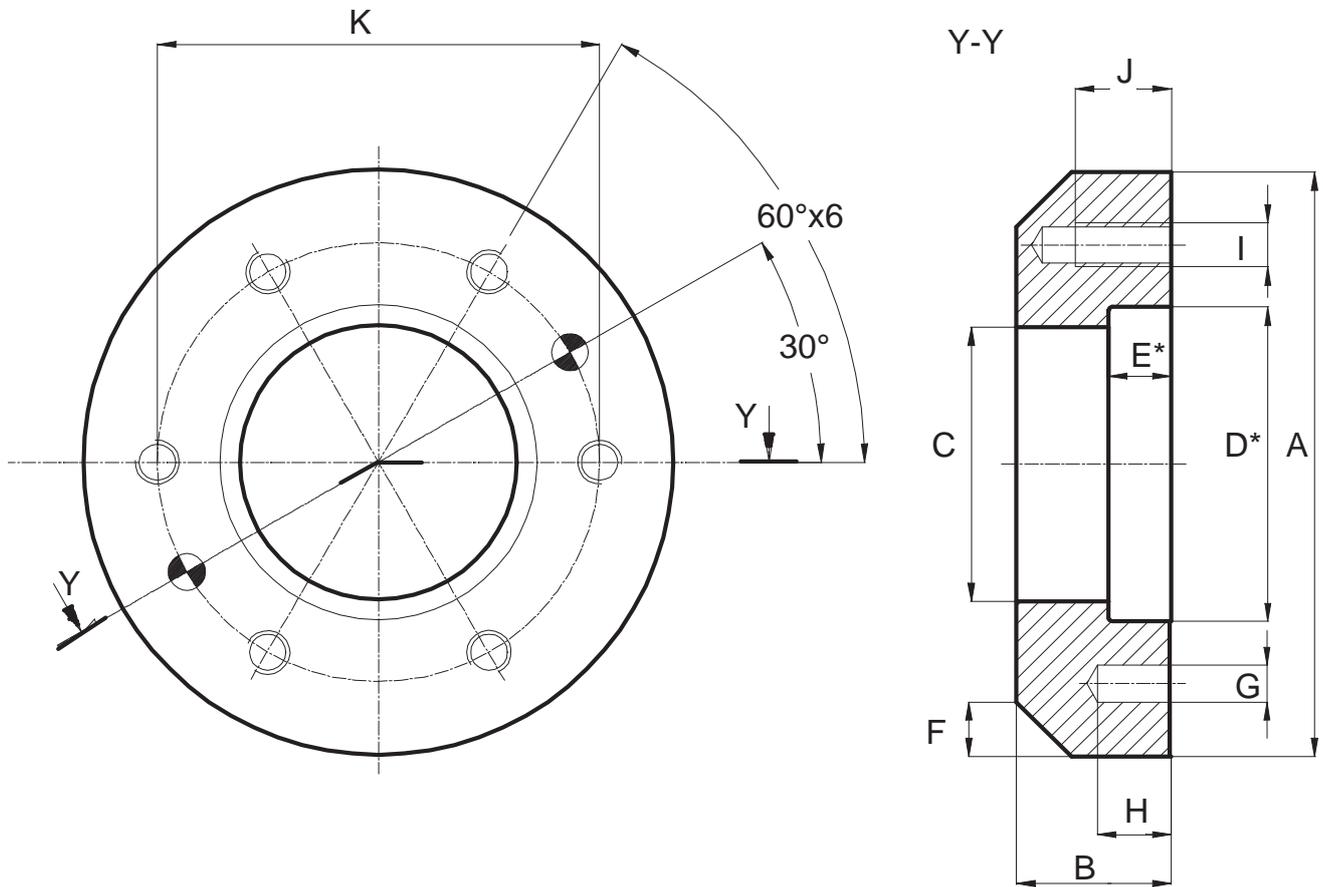


Fig. 30

Tab. 10

SERIES	Tapered ring coupling TOLLOK	A	B	C	D*	E*	F	G	H	I	J	K
MAN 10	---	---	---	---	---	---	---	---	---	---	---	---
MAN 20	---	---	---	---	---	---	---	---	---	---	---	---
MAN 30	TLK 133-30x55x34	145	23	Ø55 H7	---	---	10 x 45°	Ø8 H7	18	M10	14	Ø110
MAN 40	TLK 133-40x65x74	160	36	Ø65 H7	Ø76	13	15 x 45°	Ø8 H7	20	M10	23	Ø120
MAN 50	TLK 133-45x75x84	160	42	Ø75 H7	Ø86	17	15 x 45°	Ø10 H7	20	M12	26	Ø120

(\*) Valid only for MAN 40 and MAN50

On request a plate is assembled to the manipulator's output shaft, it has been made as a support to the base to facilitate anchoring of the gripper arm.

This is not foreseen for MAN 10 and MAN 20.







[to create]

in movement with the times

# Products

Cam Mechanisms and special products



Compact double spherical cam mechanism for mechanical automation



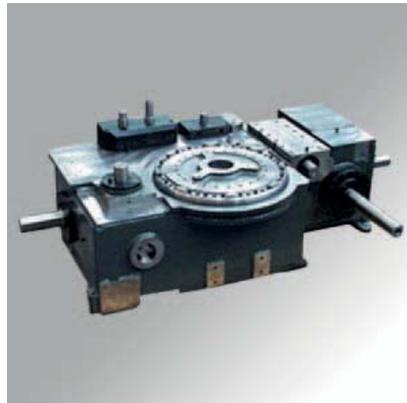
Combination of flat cam and globoidal profiled cam



Barrell shaped cam



Globoidal cam mechanism with four synchronized intermittent movements. Bilateral outputs.



Mechanism with different cams producing seven synchronized intermittent and oscillating movements in output



Parallel shaft mechanism with flat cam



Flat cam with conjugate profiles

... the culture of precision

