INDEXING ROTARY TABLES

IR201 - IR251 - IR301 - IR401 - IR601 - IR801

IR TABLES

- Cuboid shaped; super strong; cast iron housing; logical range.
- Machined outer faces with mounting holes to 6 sides.
- Indexed output plate with fixed central through hole.
- Input shaft located in taper roller bearings.
- Worm gear reducer directly mounted on housing.
- Precise, repeating index motion
- Self locking dwell position ensuring no play in station.
- Gentle motion and very quiet drive.
- Bi-directional sense of motion.
- High load bearing capacity.
- Absolutely regular operation at any speed.
- Possibility of mounting unit in any plane.
- Very low maintenance.
- Large range of standard movements.

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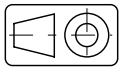
The units of measurement correspond with System International /Severity Index SI General tolerances of manufacture are conform to UNI – ISO 2768-1 UNI EN 22768-1
Illustrations and drawings according to UNI 3970 (ISO 128-82).
Method of projection of the drawings.



- 1 - TECHNICAL NOTES

1.1. - GENERAL

COLOMBO FILIPPETTI "IR" series INDEXING ROTARY TABLES are mechanical units with perpendicular axes, which transform the uniform rotary motion of the input (drive) shaft into a one-way rotary indexing motion of the (driven) plate by means of a cylindrical cam drive with conjugate profiles and roller follower.
A simple design, the direct transmission of motion: laws of motion with accelerations defined mathematically and tested over a large number of applications; the use of modern techniques in the projecting and engineering; thorough and regular inspection of the parts throughout the operations of the production cycle: along with an extensive experience in calculation, manufacture and possible applications of camdriven mechanisms; all go into making these INDEXING TABLES a high quality product, the characteristics of which enable it to meet in full the requirements of all types of applications, and which may be summarised as follows:

- **Compact, rigid, functional structures.**
- **Accurate and repeatable positioning.**
- **Self-locking stops, without play.**
- **Smooth movements and silent drive.**
- **Bi-directional rotation.**
- **High bearing capacity.**
- **Smooth running at all speeds.**
- **Versatile and simple application.**
- **Reduced maintenance.**
- **Low running costs (low power consumption.)**
- **Ample range of models.**

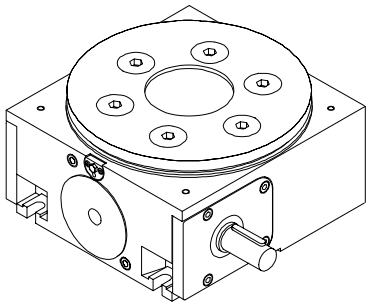


Fig.1 Series IR 201 - IR 251 - IR 301 INDEXING TABLE

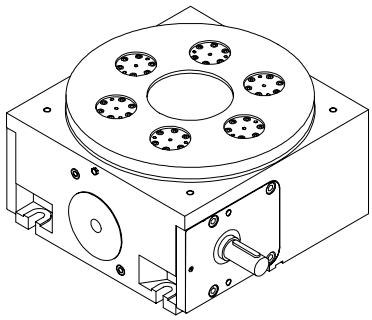


Fig.2 Series IR 401 - IR 600 - IR 801 INDEXING TABLE

1.2. - DESIGN PRINCIPLES

A functional, compact and sturdy design, which encloses also the power drive within reduced dimensions. The rotary plate of the indexing table provides anchoring at the widest centre distances of the parts to be subjected to intermittent rotation and is fitted with a large-diameter bearing which can bear considerable axial and tilting loads while retaining high levels of accuracy and rigidity. The camshaft, which undergoes alternatively both radial and axial loads during the operation of the INDEXING TABLE, is located by heavily oversized taper roller bearings.
The internal gearing consists of a cylindrical cam with hardened and ground conjugate profiles, with always at least two of the roller followers on the crown gear roll opposite each other. The crown gear follower rollers are housed in the rotary plate of special size and design. This system ensures the transmission of high torque in a simple and direct manner and controls positively and constantly the plate motion throughout the cycle of displacement and dwell. It enforces the execution of laws of motion; displacement, speed and acceleration defined in the blueprint stage and which are proven the best in an ample range of applications. It also ensures accurate plate locking during dwell periods (zero radial motion of the crown gear and plate) and completely avoids the need for any in-station holding system. The fixed central hub, has a through hole through which one can pass auxiliary mechanical drives, electric, pneumatic or hydraulic controls for the actuation of additional movements to the upper part and axially to the table; or a column to support tooling which must remain stationary whilst the plate turns. All internal parts are protected with rotary packing or labyrinths to prevent the ingress of water, sludge, swarf. The rollers can be made to slide out of their housings by drawing them upwards and are therefore easy to inspect and replace in case of need. Other parts of the INDEXING TABLE may be inspected easily through the front cover. The lubrication of the internal mechanical parts is effected, whenever possible, with long-life lubricants, and with mineral lubricants in all other cases.

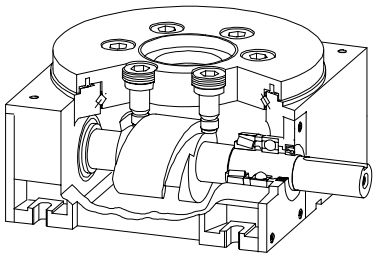


Fig.3 Representation of the main parts of the INDEXING TABLE

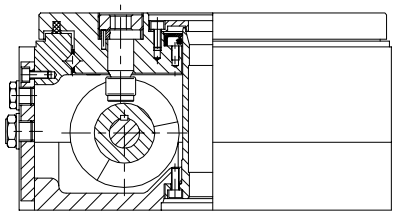


Fig.4 Sectional view of an INDEXING TABLE

1.3. - THE LAWS OF MOTION

Project engineers who are called on to meet the requirements of high outputs are constantly being urged to provide increasingly faster and more reliable machines and automatic systems, which therefore require a thorough examination of the handling and displacing speeds of products and equipment.

For many years, Colombo Filippetti have pioneered the design, engineering and application analysis of cam systems. The result is that C-F have adopted and standardised laws of motion which have the best kinematic and dynamic properties from both theoretical and practical viewpoints. This standardisation assures a high quality comparison between index drives of different types, magnitudes and variety. Standard LAWS OF MOTION take their names from the shapes of the acceleration curves that characterise them, namely:

- THE SINUSOIDAL

This curve is generally known as the cycloidal. It presents the highest maximum acceleration value of all standard curves, but has the smoothest transition between zero acceleration and maximum acceleration.

- THE MODIFIED SINUSOIDAL

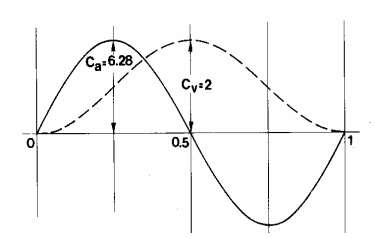
This curve is the result of a combination of sinusoidal acceleration and cosinusoidal acceleration curves. Its most important characteristic is that it has, among the standard curves, the smoothest transition between maximum acceleration and maximum deceleration values.

- THE MODIFIED TRAPEZOIDAL

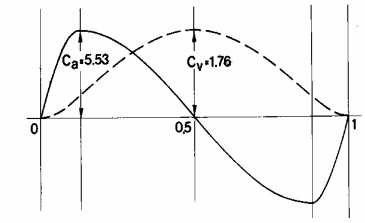
This curve is the result of a combination of the sinusoidal and constant acceleration curves; its main characteristic is that of having the lowest maximum acceleration of the standard curves.

- THE MODIFIED SINUSOIDAL WITH CONSTANT-SPEED SECTION

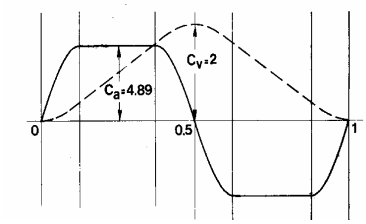
For some applications, this curve is an improvement on the modified sinusoidal curve. The addition of a section with constant velocity (zero acceleration) in the middle part of the acceleration curve, reduces the maximum speed and makes it appropriate for long stroke applications.
As one can see from their graphic representation, all these LAWS OF MOTION have some important characteristics in common: the acceleration and speed curves are continuous, without sudden variations throughout the period of motion; they are symmetrical and the axis of symmetry coincides with the middle of the movement; the initial and final speed and acceleration values are nil.



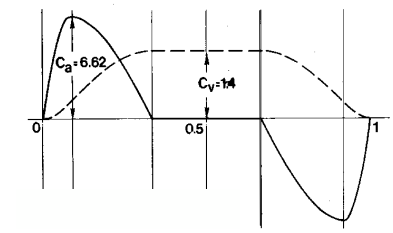
SINUSOIDAL Acc.



MODIFIED SINUSOIDAL Acc.



MODIFIED TRAPEZOIDAL Acc.



MODIFIED SINUSOIDAL Acc.
WITH CONSTANT-SPEED SECTION

Fig.5 Diagrams indicating speed and acceleration of the standard curves.

- 2 - APPLICATIONS OF THE INDEXING TABLES

A correct application of the INDEXING TABLES is linked to the choice of the proper size and of suitable system components, as well as to the knowledge of the distinguishing and characteristic elements of their internal mechanisms. In this chapter the definitions are given of the distinguishing elements of the INDEXING TABLES and some overall indications are provided, with the aim of helping in exploiting their characteristics in full.

2.1. - NUMBER OF STATIONS

On INDEXING TABLES the number of stops (indexes) which the plate effects to perform one complete turn is called "NUMBER OF STATIONS" and is indicated with the letter "S". The extent of rotation the plate undergoes during a cycle corresponds to the displacement from one station to the next and is called "ANGULAR TRAVEL". Its value is expressed by the relation H =360° /S (degrees).

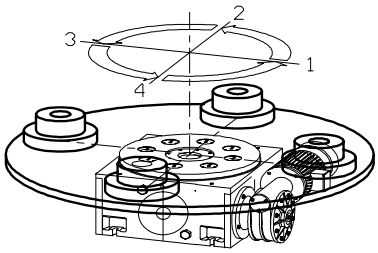


Fig.6 4 station INDEXING TABLE . S=4 H°=90

In rotary applications the number of stations is generally determined by the number of operations to be performed on the piece to be machined, including the loading and unloading stations, or else by the angular distance existing between the position where the workpiece is grasped and the position where it is released. In applications for conveyors and linear carousels, the determining element is the pitch or linear distance between two subsequent stations. In applications of this sort the correct choice must fall on tables with the lowest possible number of "S" stations consistent with any other design requirement, such as overall dimensions or minimum conveyor reversal radius. It is along these lines that one must proceed in order to reduce the torque which, other factors being equal, the INDEXING TABLE must undergo.

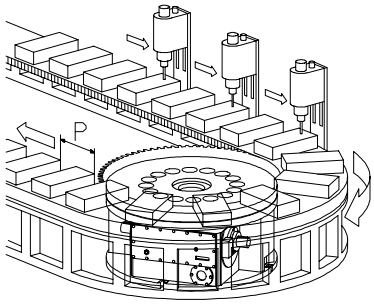


Fig.7 Vertical-axis carousel
P = feed pitch

2.2. - ANGLES OR PERIODS OF DISPLACEMENT AND DWELL

On INDEXING TABLES a complete cycle consists of the displacement of the (driven) plate from one station to the next and of a period of halt in the station; a complete cycle is generally produced by a 360° (degree) rotation of the input (drive) shaft on which the cam is keyed.

The angle of rotation of the cam which causes the plate to turn from one station to the next is called PERIOD OF DISPLACEMENT and is indicated with the symbol "B°"; the residual angle of rotation of the cam which keeps the plate stationary at the station achieved is called PERIOD OF DWELL and is indicated with the symbol "Bp°". As a rule, therefore, the equation B° + Bp° = 360° (degrees) applies.

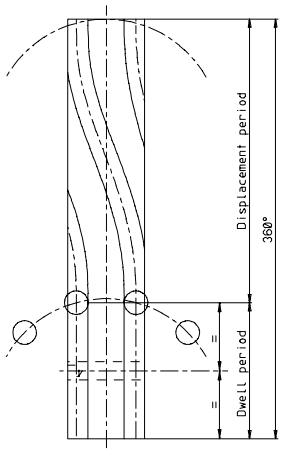


Fig.8 Representation of the development of the cam profile

The PERIOD OF DISPLACEMENT and the PERIOD OF DWELL determine the cycle TIME OF DISPLACEMENT and TIME OF DWELL respectively, both being a function of the drive shaft's speed of rotation.

In order to optimise the ratio between TIME OF DISPLACEMENT and TIME OF DWELL, one may interrupt the drive during the PERIOD OF DWELL of each cycle by means of a limit switch cam keyed directly to the drive shaft. This ensures that the driven plate halts in the station for an indefinite time that can be varied to meet actual requirements. The subsequent cycle will be executed only after a manual or automatic signal is given to cause re-engagement of the power drive.

If the sense of rotation of the motor is reversed at each halt in station, then instead of one way indexing, one obtains intermittent rocker motion of the plate. The amplitude of oscillation will be the same as the angular travel H° = 360° /S (degrees).

2.3. - CONSIDERATIONS WITH REGARD TO SIZE

In the majority of applications, the criteria which determines the choice of size of an INDEXING TABLE, is the torque due to the inertia of the components being indexed, and the torque due to the forces required to overcome the friction of the bearings and of the drives. In addition to these two types of load, torque may arise due to unbalanced weights (a condition which arises frequently in applications with a horizontal rotary axis) as well as torque due to external or work forces at times arising during the period of displacement e.g. braking action and/or other resistance to motion. The sum total is the torque required by the application during the period of displacement.
During the period of rest, the presence of torque may arise due to unbalanced loads, but more often to forces or components of forces caused by machining carried out on the pieces during the halt at the stations.
These two sets of torque must be considered and checked separately, since they act at different times of the cycle.

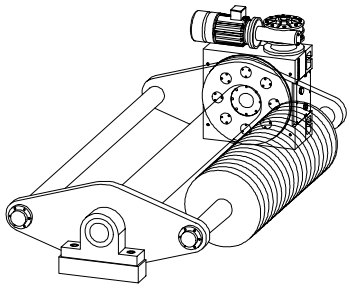


Fig.9 Application of INDEXING TABLE where traversing of an unbalanced load is required.

Further checks must be carried out to ascertain whether the loads which the indexing plate, and particularly the main bearing, must support are admissible. Such loads may be broken down into axial, radial, tilting and tangential loads. Since all mechanical systems are elastic: when necessary to accelerate and decelerate masses, as in the case of the INDEXING TABLES, vibrations occur. Such vibrations, unless they are controlled, can have a critical effect on bearing life of the INDEXING TABLE. Control of vibration depends in part on the rigidity of the table support and anchor structure and partly on the rigidity of the WORKPIECE HOLDER PLATE-INDEXING TABLE system.
The ratio Rje/Ra is a reliable indicator of rigidity obtained in practice. Rje is the Equivalent Inertia Radius (or Radius of Gyration in mathematical terms) and is the notional radius at which a point concentrated mass (of magnitude equal to the sum of all masses involved in the intermittent motion) acts about the axis of rotation, such that its resulting moment of inertia is equal to the sum total inertia of all the various individual masses about the same axis.
Ra is the RADIUS of ACTUATION of the table and is thus the radius of the pitch circle on which the cam follower rollers are arranged.
Rje/Ra ≅ 1.5 ensures an extremely high rigidity in the majority of applications.
Rje/Ra ≅ 3 is the normal limit and it is advisable not to exceed this value without more thorough testing.
Other types of load the magnitude of which intensity is difficult to evaluate and which are sometimes applied to the INDEXING TABLE, arise from a hasty design and wrong choice of driving components.
In practice, irregularities due to backlash in the drive; elasticity of the mechanical parts; variations in input shaft rotational speed and emergency stops during the traversing period, are revealed through noise, shock, jerks and vibrations on the INDEXING TABLE and are all visible signs of malfunction.

- 3 - THE COMPONENTS OF THE SYSTEM

In the motion which takes place on INDEXING TABLES, moving parts must be subjected at each cycle to acceleration from rest position to maximum speed and deceleration from maximum speed to rest.
In order to impart movement to such masses, the "IR" INDEXING TABLE must exercise an alternatively positive (acceleration phase) and negative (deceleration phase) torque, whose progress in time is theoretically similar to that of the acceleration curve of the law of motion adopted.

3.1. - ELEMENTS PERFORMING INTERMITTENT MOTION

The entire system undergoing intermittent motion must be as rigid as possible. Clearance or elasticity in the keying and anchoring to the indexing plate may cause dynamic shocks which in addition to boosting uncontrollably the torque required from the INDEXING TABLE, with torque peaking, give rise to vibrations, which may affect the functioning of the application.
For this reason, it is recommended to use rigid connections, anchors locked with large numbers of securing screws, which must be protected against shaking loose by means of anaerobic cements or other systems. Also indispensable is the use of hardened parallel pins which are pressed into matched housings on assembly and precision-bored.
One should absolutely avoid resorting to system outside the table to retain the plate in place.
In the majority of cases, such system consists of tapered pins, which lock into holes, or grooves provided in the outer edge of the rotary plate and are engaged during the rest period. Such systems are generally outdated today. Occasionally where other associated equipment is operated in the rest period and/or which produce very high loads; there may be a case, but ingenuity is required for the design.
It is evident that the force which these devices (pins) exercise when they are actuated gives rise, if there is even the slightest inaccuracy in the fit of the seats, to a high torque, which when applied to the perfectly tight fit between cam and follower roller in "IR" INDEXING TABLES, may rapidly lead to breakage of the roller or its pin and damage the cam profile.

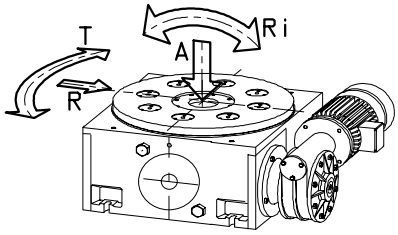


Fig.10 Representation of the loads which act on the bearing of the indexing plate
A axial R radial
T tangential Ri tilting

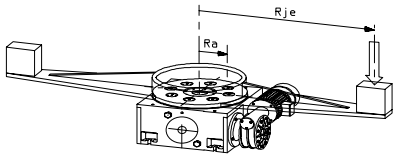


Fig.11 Realisation of equivalent inertia radius and radius of actuation

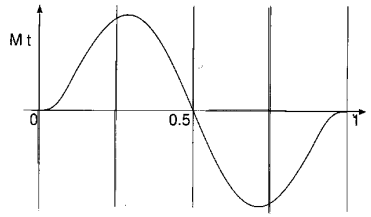


Diagram of torque due to inertia of the modified sinusoidal acceleration law

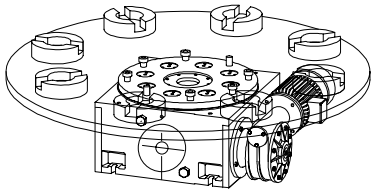


Fig.12 Plate anchoring with screws and pins.

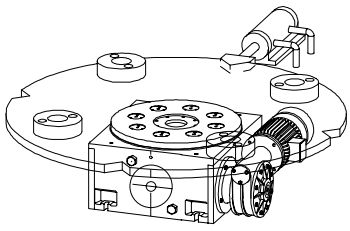


Fig.13 Position registration of the plate by means of external hydraulic or pneumatic system.

3.2. - POWER DRIVE ELEMENTS

The drive components, in addition to powering the INDEXING TABLES, must ensure that the input shaft turns at steady speed.
This is necessary because, as we have seen, the torque required by the INDEXING TABLE is of variable magnitude throughout each cycle. This tends to affect the input shaft speed of rotation causing throbbing during the stop go cycle.
Thus, we recommend the drive components to be rigid, oversized (compared with theoretical torque requirements) and of minimal backlash.

The standard and best way to power the INDEXING TABLE, is to directly key fit the output shaft of the crown wheel of a worm speed reducer of minimal backlash to the INDEXER TABLE input shaft.
This extremely compact option, stabilises the rotational speed because the worm reduction gear acts as a friction brake in the deceleration phase of the cycle, and thereby dissipates index system kinetic energy which would otherwise be seen by the input shaft drive.

On the high speed (low torque) shaft side of the worm gear, chain; toothed belt, mechanical speed variator; clutch/brake couplings or directly coupled electric motors may be connected without problem.
When it is not possible to use a worm gear speed reducer, a flywheel must be mounted to the input shaft of the INDEXING TABLE in order to minimise rotational speed variation.
All steady-speed rotary parts, including the shaft and the cam itself contribute to supplying a part of the necessary kinetic energy.

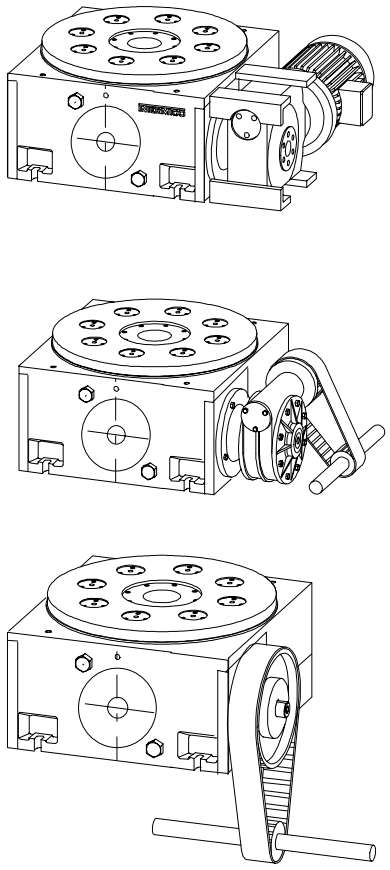


Fig.14 Power drive of the INDEXING TABLE

3.3. - HALTING OF THE POWER DRIVE DURING THE DWELL PERIOD

There are two ways in which INDEXING TABLES are used:
(a) with the cam turning continuously at steady speed, and hence the rate of intermittence is defined by the fixed relationship between the displacement period and the rest (or dwell) period of the cam when driven at any speed.
(b) with the cam itself stopped in each cycle in the cam dwell period. The rate of intermittence is then settled by the length of time the cam is stationary plus the dwell period.

These two ways of using the INDEXING TABLES meet the requirements of two different types of application. The first prevails when the machine cycle is performed in full, with a system of mechanical synchronisation, in one revolution of the input (cam) shaft. Part of this single revolution is for the index movement from 1 station to the next.

The second is followed in applications where long rest times are required to comply with the rates involved in the production technique.
Only at the end of all the work operations is a signal generated to cause the table to take up the next position.

The programming of rests in this case, is facilitated by means of a small limit switch control cam which is directly attached to the INDEXING TABLE input shaft. This control cam is positioned in such a way as to cause drive disconnection and stopping in the cam dwell period. No further motion occurs until the work complete or 'go' signal is generated.
It is possible to extend and vary the length of the rest period by means of a simple self-braking motor, provided that the motor has sufficient capacity to meet the demands.
This clearly depends mostly on the motor itself and its brake size. A rough guide is for stop requirements of between 15 to 30 per minute, for this drive method to be adequate.

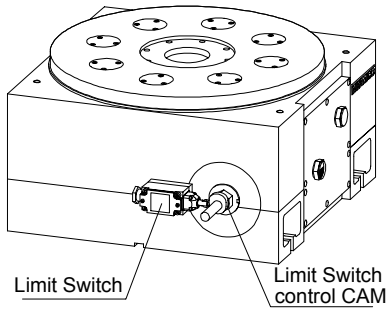


Fig.15 Representation of the limit switch units for stopping the INDEXING TABLE in the dwell period.

ATTENTION: the phase cam is not a safety device.

If the number of stops per minute is higher, one can go up to 70 to 90 actions a minute by using a clutch-brake unit fitted between the motor and the reduction gear which, while the motor turns continuously, alternately connects and disconnects/brakes the INDEXING TABLE CAM in its low torque area.
It thus becomes simple to optimise the two cycle periods, making them functional: limiting the rest period to actual machining times, and the go time to the minimum required to effect the displacement of the masses. In an application executed following these criteria a safety factor is automatically introduced: the INDEXING TABLE does not start unless all operations which should have taken place during the rest period have actually been concluded and each of the tools used has returned to its end-of-cycle position.

Self-breaking motor

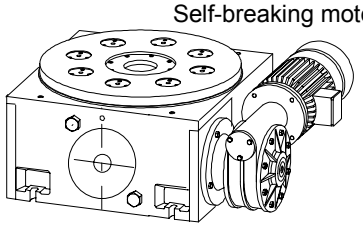
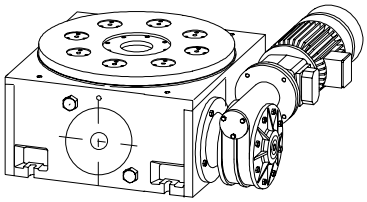


Fig.16 Power drive with self-braking motor.



clutch-brake unit.

Fig.17 Power drive with normal motor and clutch-brake.

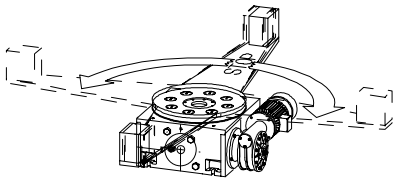


Fig.18 Emergency locking with INDEXING TABLE away from the station.

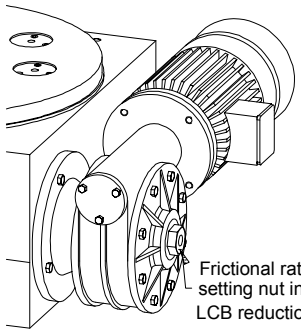


Fig.19 Reduction gear with built-in torque limiter for IR tables up to size 800.

3.4. - HALTING OF THE POWER DRIVE DURING THE DISPLACEMENT PERIOD

During the normal operation of the rotary table, emergencies may arise which, if not caused by the machine operator or a central control unit, may depend on mains voltage drops or accidental cut-outs. Whatever the reason, the result is always that of causing an immediate power stop. Therefore, if when an emergency occurs the INDEXING TABLE is at a station, i.e., during the rest period, there are no problems since the plate is already at a standstill because of a programmed stop. If, on the contrary, when an emergency occurs, the INDEXING TABLE is in a displacement phase, damage may occur. The masses which the plate is displacing release their kinetic energy almost instantaneously. As the effect of a theoretically infinite deceleration, the resulting shock is of very high intensity and may cause breakage or serious damage to the power drive parts involved. The same situation arises during restart after an emergency, or in any case when starting up the INDEXING TABLE while it is in the displacement period.
In order to overcome this sort of trouble, it becomes necessary to insert a torque limiting coupling in the most suitable position of the kinematic power chain.
The limiter is rated in such a way as to enable, under standard operating conditions, an absolutely rigid transmission of motion without slipping, but yet to have a maximum rating less than the maximum permitted for the INDEXING TABLE and other transmission parts.
This limiter makes it possible to overcome, both during the emergency stop and during restart of the production cycle, the overload shocks and thus to prevent breakage of the mechanical driving parts.

3.5.- USE OF THE FRICTIONAL TORQUE LIMITER

Colombo-Filippetti has found that a friction torque limiter, of suitable type, may be used with advantage.
The use of a friction torque limiter is achieved by one single device and which has significance in the economy of use of the INDEXING TABLE. The torque limiter rating is of importance in the correct operating of the INDEXING TABLE. It is the actual practical use of the INDEXING TABLE which tests the limiter rating.
In use, this test must be performed each time such abnormal conditions as noise, vibrations and shocks occur on arrival of the table at the station during the normal operation of the INDEXING TABLE.
These shortcomings may depend on slipping of the torque limiter which, while it is indispensable in cases of emergency stops and subsequent restarts, cause the cam to loose control of the movement during normal motion.
Slipping of the limiter causes an initial slowing of the table rotational speed, but also a subsequent increase of its final speed. The result in practice is that the kinetic energy of the rotating masses drags the cam and not vice-versa.

4.1 - TABLE OF DYNAMIC CAPACITIES -(TABLE1)

TABLE CODE				Static torque **Ms** [daN m]	Dynamic torque (at output) cycles/min **Mu** [daN m]					Coeff. of velocity **Cv**	Coeff. of accel. **Ca**	Coeff. of Transm. **K**	No. and type of rollers
Series	No. of stations **S**	Index Angle **B°**	Dwell Angle **Bp°**		**15** cicli/1	**25** cicli/1	**50** cicli/1	**75** cicli/1	**100** cicli/1				
IR 201	2	345	15	4.1	4.0	3.8	3.4	3.8	3.4	1.76	5.53	0.52	6-12H
IR 251				12.3	12.2	12.0	12.0	11.6	10.3				6-16H
IR 301				24.9	24.7	24.4	24.0	23.2	20.6				6-22H
IR 401				80.0	80.0	79.5	79.1	77.3	75.6				6-28H
IR 601				241.0	240.7	240.2	237.1	234.0	224.6				6-35H
IR 801				617.1	616.0	608.2	603.1	584.9	565.6				6-52H
IR 201	3	330	30	5.4	5.3	5.1	5.1	4.3	5.1	1.76	5.53	0.36	6-12H
IR 251				15.5	15.5	15.5	14.2	14.6	12.9				6-16H
IR 301				31.4	31.4	31.1	31.1	29.2	25.9				6-22H
IR 401				88.7	88.7	88.6	88.1	87.3	86.3				6-28H
IR 601		310	50	344.6	344.5	344.1	342.8	341.7	338.4			0.38	6-45H
IR 801				816.1	815.6	814.3	808.7	800.5	789.7				6-65H
IR 201	4	270	90	5.8	5.7	5.6	5.3	4.8	4.2	1.76	5.53	0.33	8-12H
IR 251				21.1	21.0	20.9	20.3	19.3	19.3				8-16H
IR 301				28.7	28.7	28.6	27.8	26.5	25.7				8-22H
IR 401		345	15	90.2	90.1	90.1	89.0	86.9	85.8			0.26	8-28H
IR 601				467.9	467.7	467.3	465.5	462.4	458.2				8-45H
IR 801				1177.1	1176.4	1175.1	1168.2	1157.0	1141.4				8-65H
IR 201	5	270	90	6.7	6.7	6.6	6.0	5.7	3.4	1.76	5.53	0.26	10-12H
IR 251				22.7	22.7	22.5	22.3	21.2	22.3				10-16H
IR 301				32.8	32.8	32.8	32.6	30.8	30.8				10-22H
IR 401		330	30	100.6	100.5	100.4	99.5	98.4	96.1			0.22	10-28H
IR 601				514.3	514.2	513.8	512.4	509.9	506.5				10-45H
IR 801				1288.2	1287.6	1286.4	1281.0	1271.9	1259.1				10-65H
IR 201	6	270	90	7.4	7.4	7.3	7.1	6.4	5.7	1.76	5.53	0.22	12-12H
IR 251				29.8	29.8	29.7	29.7	29.7	29.6				6-22H
IR 301				72.9	72.9	72.9	72.2	72.3	71.4				6-28H
IR 401		310	50	173.8	173.7	173.6	173.0	172.1	171.6			0.19	6-35H
IR 601				421.7	421.5	421.6	421.1	419.8	417.5				6-45H
IR 801				1063.4	1063.0	1062.2	1058.8	1052.0	1045.2				6-65H
IR 201	7	270	90	13.1	13.1	13.0	12.8	12.4	12.2	1.76	5.53	0.19	7-16H
IR 251				28.3	28.3	28.3	28.1	27.5	26.9				7-22H
IR 301				77.8	77.7	77.6	77.2	77.2	75.9				7-28H
IR 401		310	50	183.8	183.7	183.7	183.2	182.0	181.4			0.16	7-35H
IR 601				421.8	421.6	421.7	421.7	420.5	419.1				7-45H
IR 801				1115.3	1115.0	1114.4	1111.0	1105.8	1098.2				7-65H
IR 201	8	270	90	13.9	13.9	13.9	13.9	13.2	12.8	1.76	5.53	0.16	8-16H
IR 251				32.2	32.2	32.2	32.2	32.2	32.1				8-22H
IR 301				81.5	81.5	81.3	80.9	80.8	79.3				8-28H
IR 401		310	50	191.2	191.2	191.2	190.9	190.6	188.7			0.14	8-35H
IR 601				421.8	421.8	421.9	421.4	421.1	420.4				8-45H
IR 801				1153.4	1153.2	1152.6	1149.6	1144.9	1138.9				8-65H
IR 201	9	270	90	14.6	14.6	14.6	14.2	13.9	13.3	1.76	5.53	0.15	9-16H
IR 251				30.9	30.9	30.8	30.5	30.0	30.5				9-22H
IR 301				84.3	84.3	84.3	83.8	83.6	83.8				9-28H
IR 401		310	50	197.3	196.9	196.8	196.4	196.3	194.5			0.13	9-35H
IR 601				421.8	421.7	421.7	421.3	420.4	419.4				9-45H
IR 801				1182.0	1181.7	1181.2	1178.7	1174.3	1168.7				9-65H
IR 201	10	270	90	15.2	15.2	15.2	15.0	14.4	13.7	1.76	5.53	0.13	10-16H
IR 251				31.8	31.7	31.7	31.7	30.8	30.8				10-22H
IR 301				86.6	86.6	86.5	86.2	85.9	85.7				10-28H
IR 401		310	50	201.3	201.3	201.2	200.8	200.8	199.0			0.11	10-35H
IR 601				421.8	422.8	421.8	421.7	421.8	420.4				10-45H
IR 801				1203.6	1203.5	1202.9	1200.7	1196.8	1192.5				10-65H
IR 201	12	270	90	9.4	9.4	9.3	9.2	8.8	8.5	1.76	5.53	0.11	12-12H
IR 251				25.8	25.8	25.8	25.7	25.7	25.7				12-16H
IR 301				44.3	44.3	44.3	44.3	44.2	42.8				12-22H
IR 401		310	50	154.1	154.1	154.1	153.7	153.6	153.0			0.10	12-28H
IR 601				421.8	421.8	421.7	421.5	421.5	420.4				12-45H
IR 801				1233.8	1233.7	1233.3	1231.5	1228.1	1224.0				12-65H
IR 201*	16	270	90	9.8	9.8	9.8	9.6	9.6	9.6	1.76	5.53	0.08	8-12H
IR 251*				26.2	26.2	26.2	26.0	25.9	25.7				8-16H
IR 301*				46.1	46.1	46.1	46.1	45.8	45.0				8-22H
IR 401*		310	50	224.4	224.4	224.4	224.3	224.2	223.9			0.07	8-35H
IR 601				366.2	366.2	366.1	365.7	365.0	364.6				16-35H
IR 801				864.3	864.3	864.4	863.8	863.8	863.3				16-52H

On demand INDEXING TABLE with special movement can be supplied. The IR Rotary table denoted by (*) with a complete rotation of the input shaft produce two complete cycles of the output shaft: "displacement-dwell, displacement-dwell".

4.2. - STATIC LOAD BEARING CAPACITIES

The main bearing of the IR series INDEXING TABLES is a ball bearing or a crossed cylindrical roller bearing located on an outer circumference of the indexing plate and able to support high axial, radial and tilting loads while keeping accuracy levels constant.

Machining of workpieces carried out with special machine tools makes it possible to achieve consistently very high degrees of accuracy with high quality levels. Of special importance in this context is the machining accuracy of the cam profile, which is ground after the heat hardening treatment. This assures resistance to wear and to heavy tangential loads; very close indexing tolerances and lack of backlash when stopping.
The table below shows the maximum admissible loads on the indexing plate and the accuracy of the INDEXING TABLES for every table size.

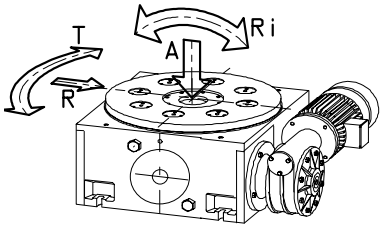


Fig. 20 Direction of static forces

A= Axial
B= Radial
C= Tangential
D= Tilting

TAB.2

Serie	Load Capacity				Plate accuracy							Mass Of the table
	Static coeff.		Dynamic coeff.		Concentricity		flatness		Indexing			
	Coa [daN]	Cor [daN]	Ca [daN]	Cr [daN]	[mm]	sul ∅	[mm]	sul ∅	1 cycle/g [mm]	2 cycle/g [mm]	sul ∅	[kg]
IR 201	1210	610	1220	630	±0.02	68	±0.02	185	±0.03	±0.06	185	17.5
IR 251	1440	720	1440	690	±0.02	80	±0.02	220	±0.03	±0.06	220	29.5
IR 301	1930	960	1840	920	±0.02	100	±0.02	274	±0.03	±0.06	274	55
IR 401	2530	1270	2010	1190	±0.03	120	±0.03	344	±0.03	±0.06	344	95
IR 601	3530	1760	3250	1520	±0.03	160	±0.03	460	±0.03	±0.06	460	250
IR 801	7800	3900	6800	3300	±0.04	225	±0.03	620	±0.03	±0.06	620	485

Note: Plate accuracy exceeding those tabulated above are available on demand.

Recommended table anchoring system

The INDEXING TABLES of this series are designed with a locating diameter situated on the underside and which is exactly co -axial with the axis of rotation of the indexing plate.

Two slots, also on the underside and perpendicular to the axis of rotation, enable the use of precision blocks (DIN 84 – DIN 912). With these two elements a very rigid torsional anchorage and a quick and accurate alignment of the table to the structure is obtained without any need to resort to control equipment. The standard securing arrangement consists of four bolts.

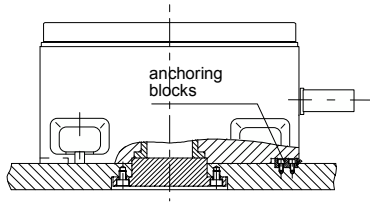


Fig. 21 An anchoring system

TABLE 3 - BLOCKS

DIN 6322/B	b	h	l	t
IR 201	10	8	20	4
IR 251	10	8	20	4
IR 301	10	8	20	4
IR 401	14	10	22	4
IR 601	16	10	22	4
IR 801	18	10	22	4

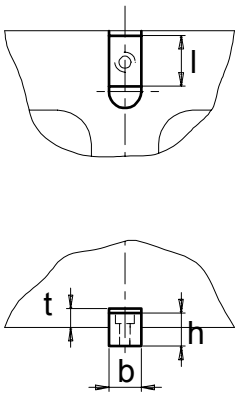
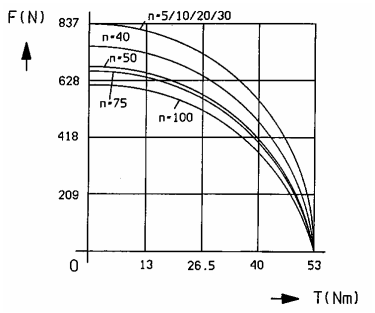


Fig.22 Dimensions of the blocks

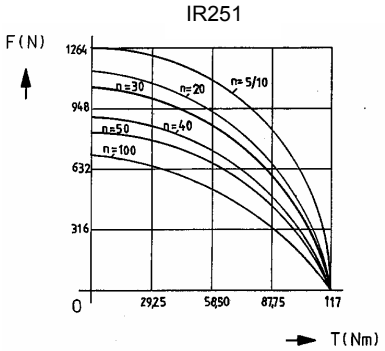
Radial loads on the shafts

When drive power to the cam input shaft is by means of a drive which generates radial loads on the shaft end such loads must be less than the maximum permitted values shown in the graph below.
In addition to the taper roller bearings, a projecting shaft supporting ball bearing is added in the position shown below.

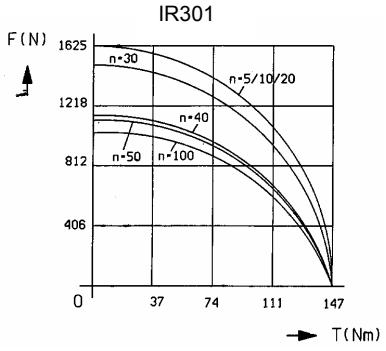
IR201



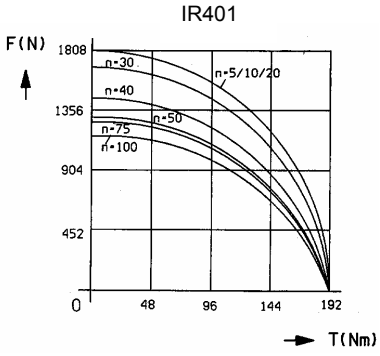
IR251



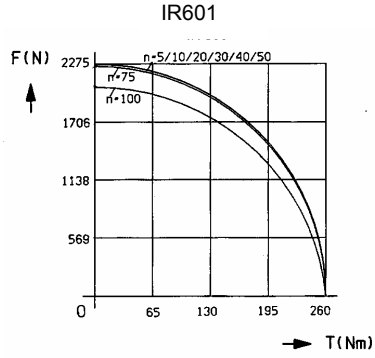
IR301



IR401



IR601



IR801

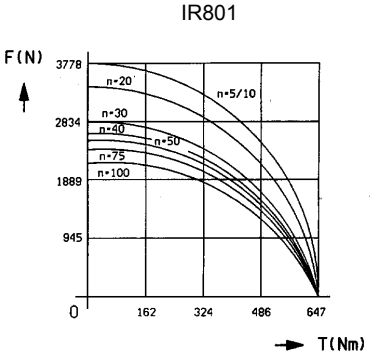


Fig.23 Admissible radial loads and torque on the input shafts of the INDEXING TABLE.

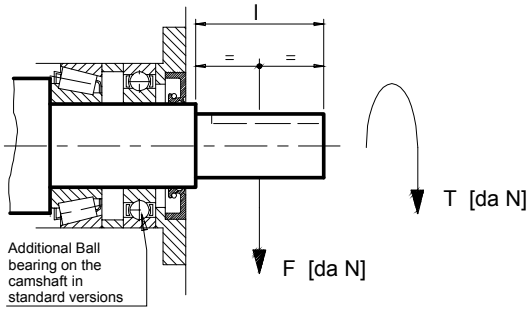


Fig. 24

4.3.- VERSIONS

IR-201, IR-251, IR-301, IR-401, IR-601, IR-801 series INDEXING TABLES can be supplied in the following versions:

VS = Standard Version
VL = Version with long shaft pre-set for small reduction gear coupling (page. 27)
VL1 = Version with long shaft pre-set for large reduction gear coupling (page. 27)
VX = Non standard Version
VR = Version with reduction gear
VRP = Version with reduction gear pre-set for motor coupling
VRM = Version with reduction gear and motor
VRA = Version with reduction gear and self-braking motor
VMW = Version with reduction gear and motorised speed variator
VAW = Version with reduction gear and self-braking speed variator
VMK = Version with reduction gear clutch brake and motor
VRX = Version with reduction gear and/or non standard motor

NOTE. In cases when the worm screw reduction gear is required fitted with a torque limiter, after the letter "V" of the code add letter "L".
For a description of the use of the torque limiter, see sections 3.4 and 3.5 of this catalogue.

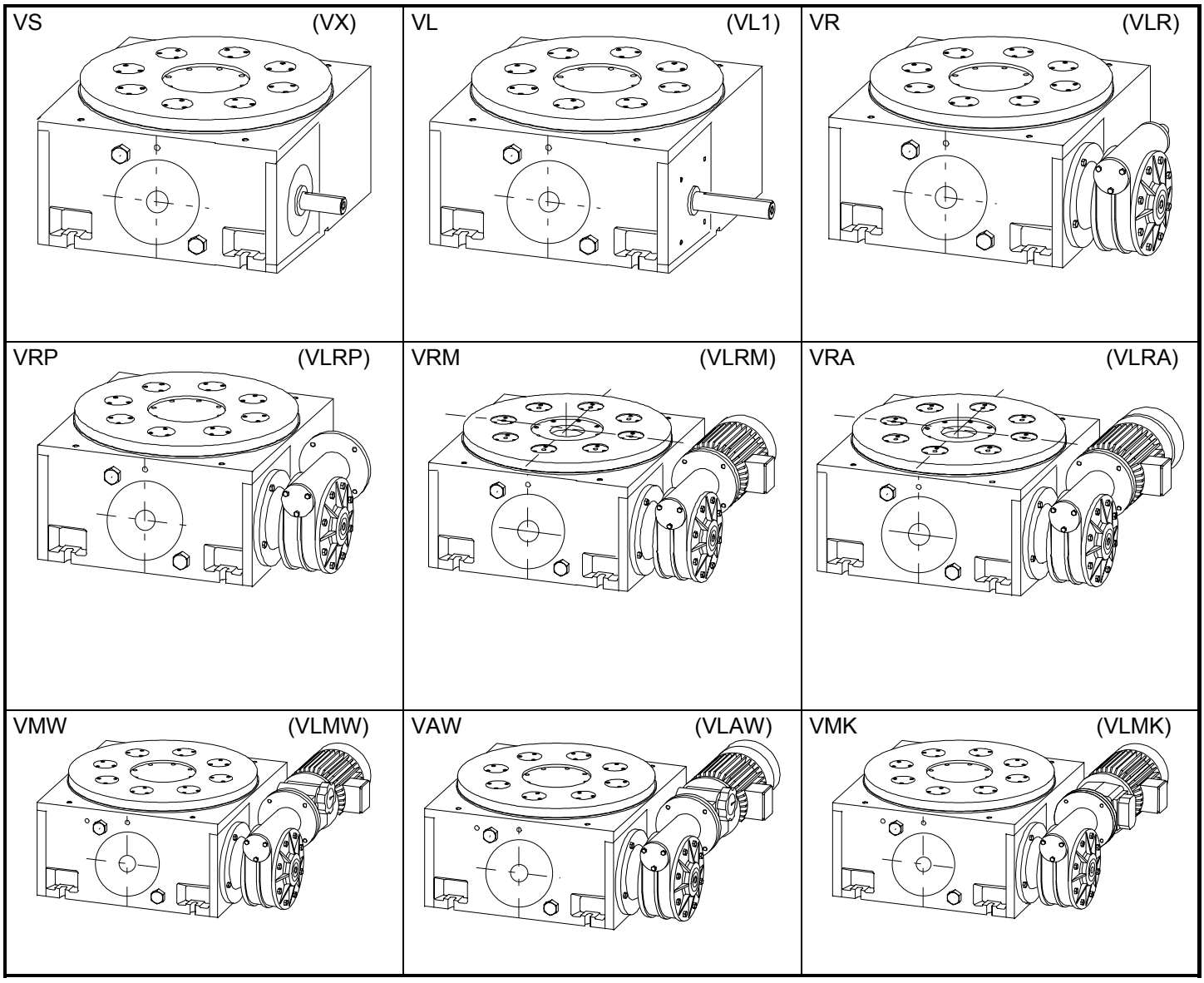


Fig. 25

4.4 - OVERALL DIMENSIONS IR 201

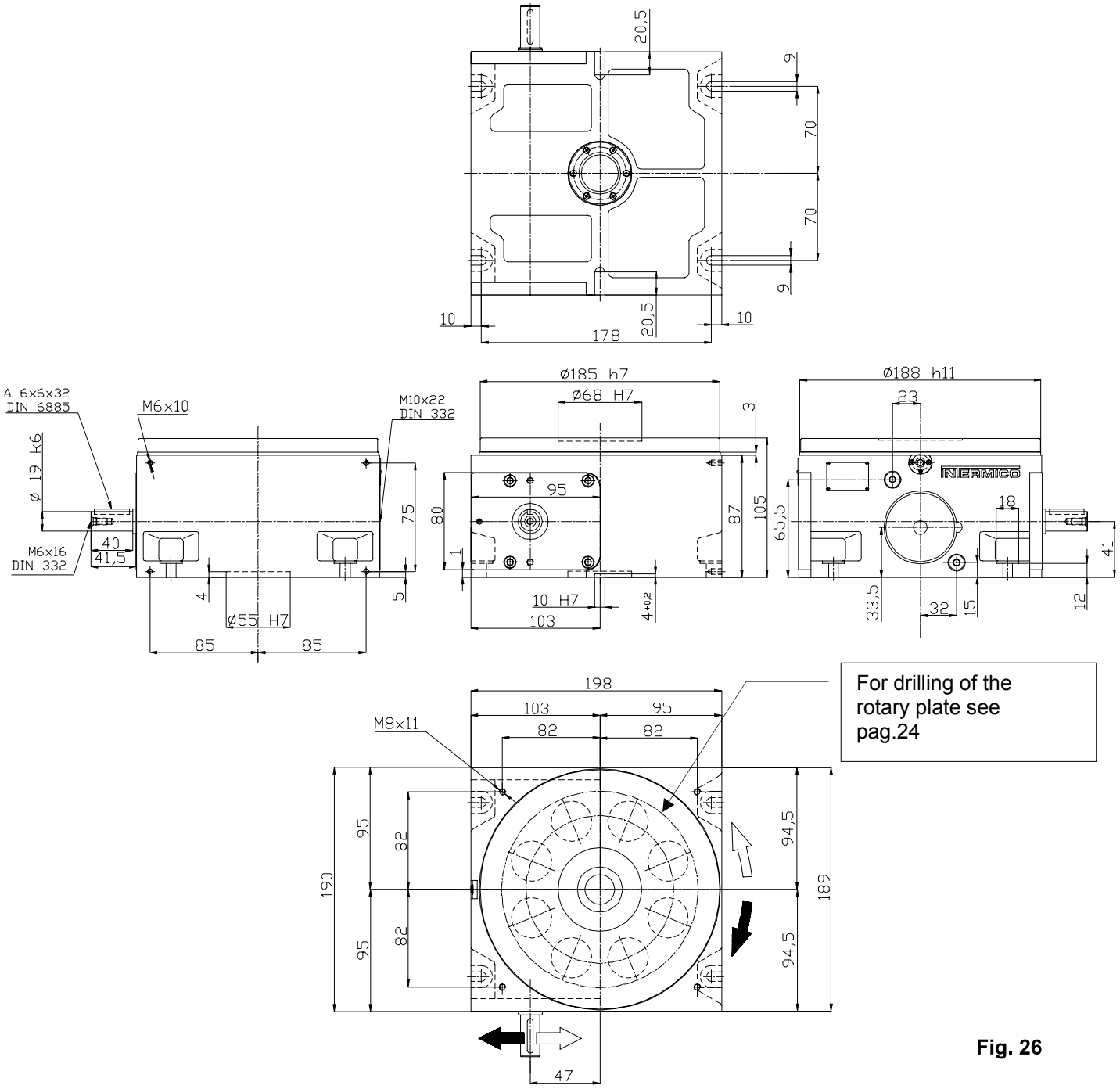


Fig. 26

NOTES:

- Directions of rotations as shown by arrows.
- The input shaft feather key is in the position shown on the figure when the table is halfway through rest time.
- The securing holes on the indexing plate are optional and executed by request.
- The anchoring holes of the table situated on faces C-D, are optional and executed by request.

-OUTPUT VERSIONS: VCS - VCT - VCP - VCR

VCS Version

Standard version
The table is supplied without centre column.
Locating diameter above ∅68 H7 [mm] – locating diameter below ∅55 H7 [mm].
Diameter Ø68 H7 rotates with the indexing plate.
Rotary plate with standard drilling. (page 24)

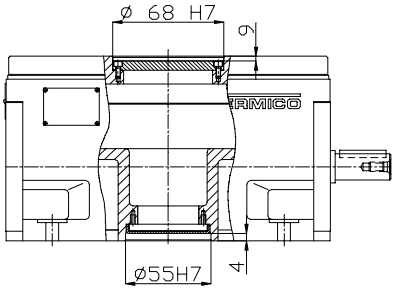


Fig. 27

VCT Version

Fixed through centre column.
Anchoring is not foreseen in this column.
Locating diameter above ∅68 H7 [mm] – locating diameter below ∅55 H7 [mm].
Diameter Ø68 H7 rotates with indexing plate.
Column through hole Ø 25 [mm].
Rotary plate with standard drilling. (page 24)

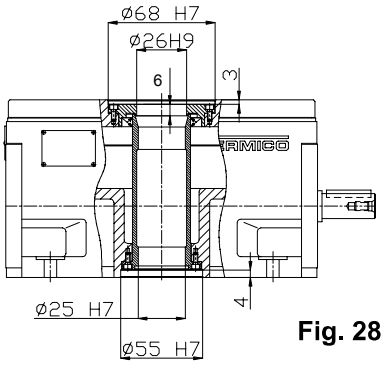


Fig. 28

VCP Version

Fixed projecting centre column ∅32x25 [mm].
Centre through hole ∅18 [mm].
Locating above ∅32 h8 [mm] - / ∅68 H7 [mm].
Locating below ∅55 H7 [mm].
N° 4 threaded holes M4 depth 8, placed at 90°, distance between centres 25 [mm], alignment shown in figure.
Diameter Ø68 H7 rotates with indexing plate.
Rotary plate with standard drilling. (page 24)

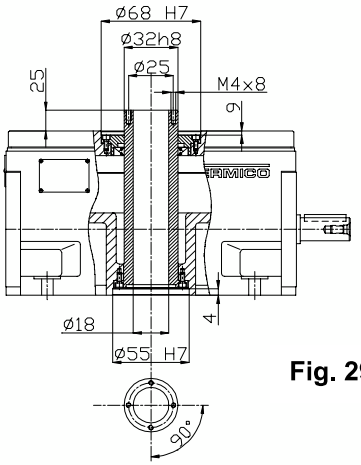


Fig. 29

VCR Version

Rotary centre column ∅68 H7 [mm].
Centre through hole ∅25 [mm].
Locating above ∅68 H7 [mm] – locating below ∅55 H7 [mm].
Diameters Ø68 H7, Ø25 H7, e Ø32 h8 rotate with indexing plate.
Rotary plate with standard drilling. (page 24)

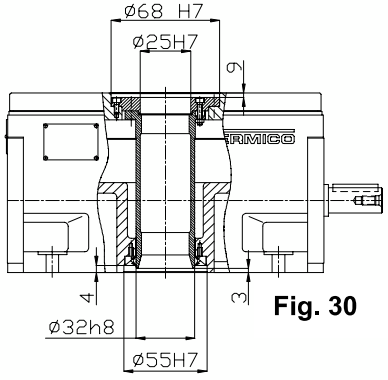


Fig. 30

NOTES:

If the rotating plate is required without fixing holes, replace the letter C with the letter N. (example VCS becomes VNS)

4.5 - OVERALL DIMENSIONS IR 251

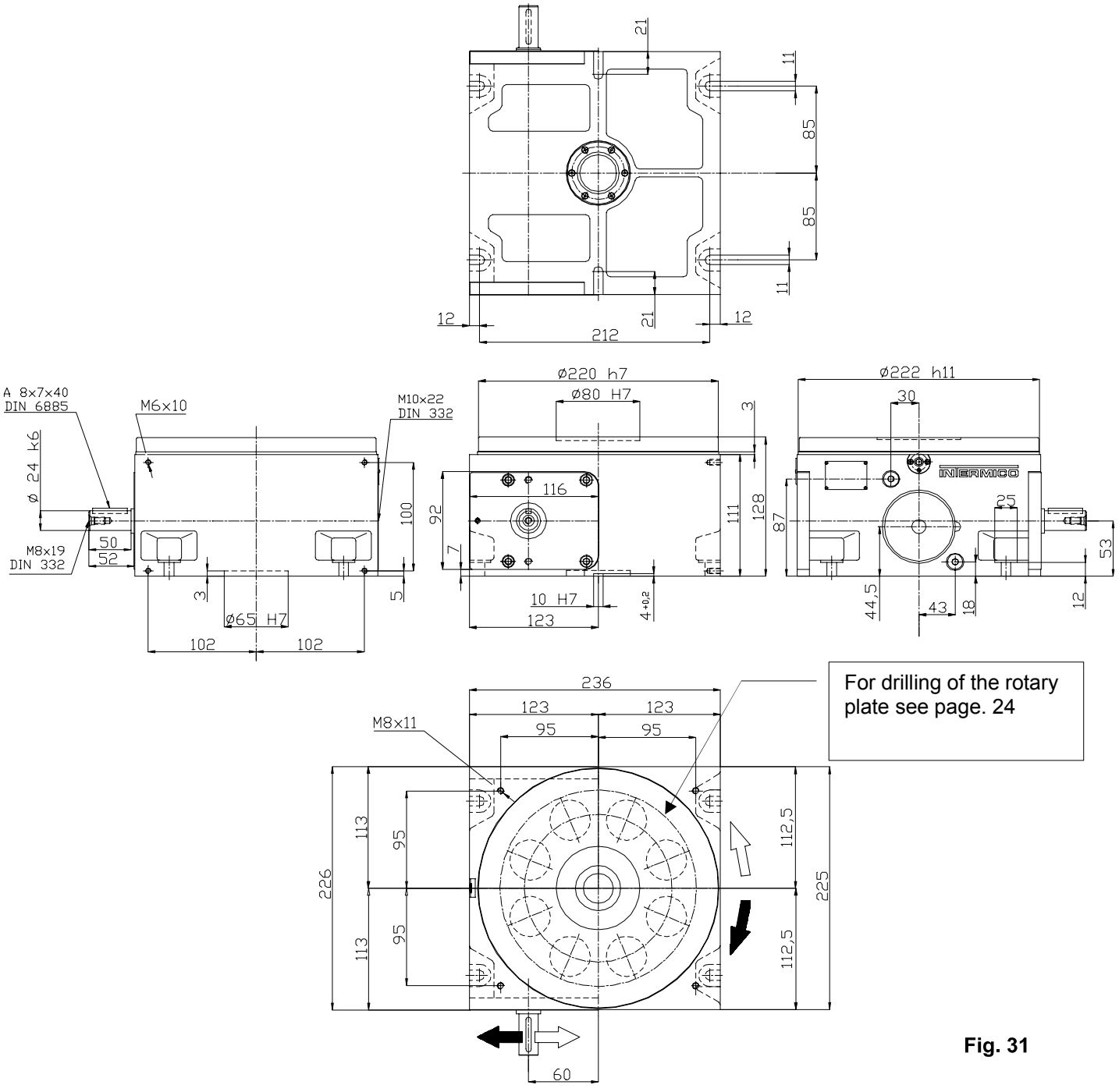


Fig. 31

NOTES:

- Directions of rotations as shown by arrows.
- The input shaft feather key is in the position shown on the figure when the table is halfway through rest time.
- The securing holes on the indexing plate are optional and executed by request.
- The anchoring holes of the table situated on faces C-D, are optional and executed by request.

- OUTPUT VERSIONS: VCS – VCT – VCP – VCR

VCS VERSION

Standard version
The table is supplied without centre column.
Locating diameter above ∅80 H7 [mm] – locating diameter below ∅65 H7 [mm].
Diameter Ø80 H7 rotates with the indexing plate.
Rotary plate with standard drilling. (page 24)

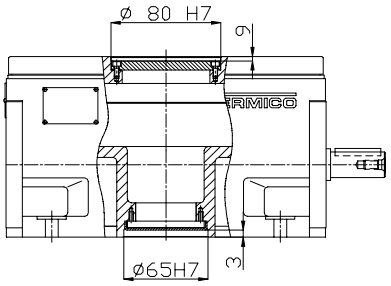


Fig. 32

VCT Version

Fixed through centre column
Anchoring is not foreseen in this column.
Locating diameter above ∅80 H7 [mm] – locating diameter below ∅65 H7 [mm].
Diameter Ø80 H7 rotates with indexing plate.
Column through hole Ø 30 [mm].
Rotary plate with standard drilling. (page 24)

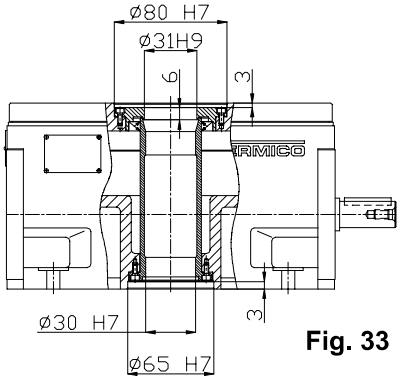


Fig. 33

VCP Version

Fixed projecting centre column ∅38x25 [mm].
Central through hole ∅22 [mm].
Locating above ∅38 h8 [mm] - / ∅80 H7 [mm].
Locating below ∅65 H7 [mm].
N° 4 threaded holes M5 depth 10, placed at 90°, distance between centres 30 [mm], alignment shown in figure.
Diameter Ø80 H7 rotates with indexing plate.
Rotary plate with standard drilling. (page 24)

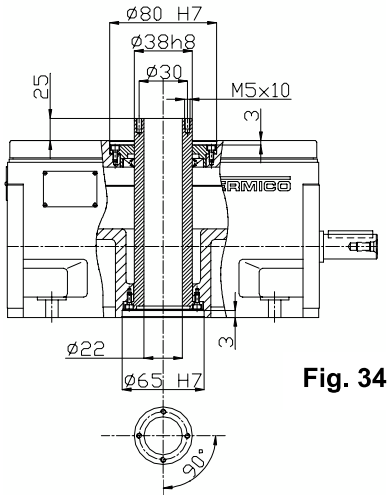


Fig. 34

VCR Version

Rotary centre column ∅80 H7 [mm].
Centre through hole ∅30 [mm].
Locating above ∅80 H7 [mm] – locating below ∅65 H7 [mm].
The diameters Ø80 H7, Ø30 H7, e Ø38 h8 rotate with indexing plate
Rotary plate with standard drilling. (page 24)

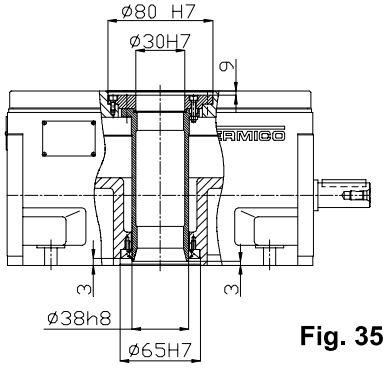


Fig. 35

NOTES:

If the rotating plate is required without fixing holes, replace the letter C with the letter N. (example VCS becomes VNS)

4.6 - OVERALL DIAMENSIONS IR 301

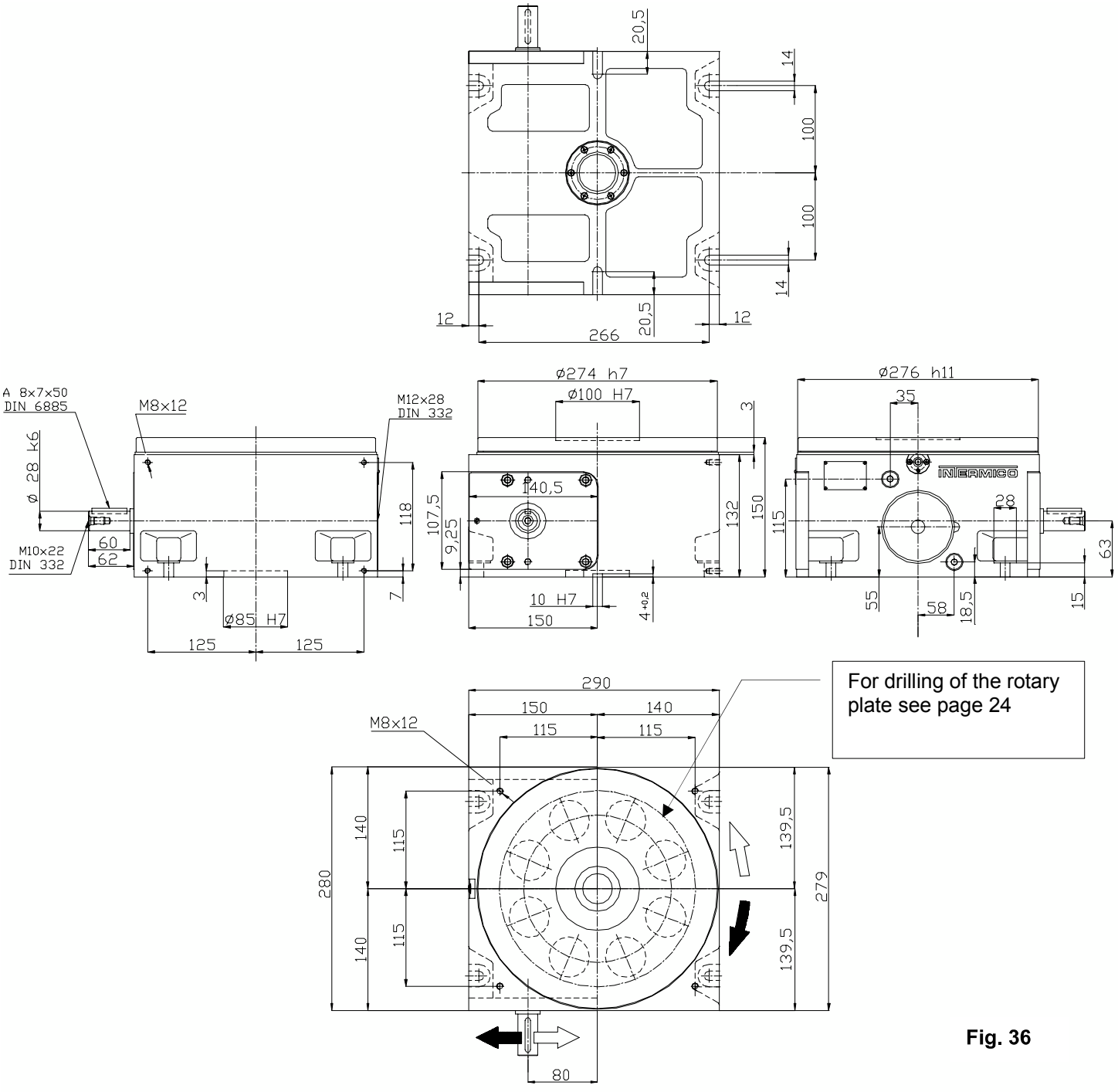


Fig. 36

NOTES:

- Directions of rotations as shown by arrows.
- The input shaft feather key is in the position shown on the figure when the table is halfway through rest time.
- The securing holes on the indexing plate are optional and executed by request.
- The anchoring holes of the table situated on faces C-D, are optional and executed by request.

- OUTPUT VERSIONS: VCS - VCT - VCP - VCR

VCS Version

Standard version
The table is supplied without centre column.
Locating above ∅100 H7 [mm] – locating below ∅85 H7 [mm].
Diameter Ø100 H7 rotates with indexing plate.
Rotary plate with standard drilling. (page 24)

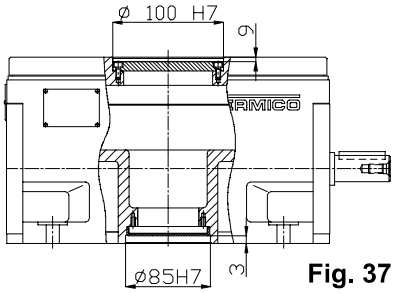


Fig. 37

VCT Version

Fixed through centre column
Anchoring is not foreseen in this column.
Locating above ∅100 H7 [mm] – locating below ∅85 H7 [mm].
Diameter Ø100 H7 rotates with indexing plate.
Column through hole Ø 48 [mm].
Rotary plate with standard drilling. (page 24)

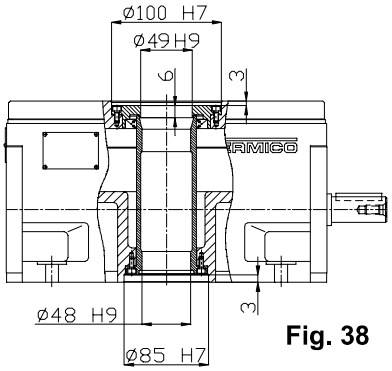


Fig. 38

VCP Version

Fixed projecting centre column ∅56x25 [mm].
Centre through hole ∅34 [mm].
Locating above ∅56 h8 [mm] - / ∅100 H7 [mm].
Locating below ∅85 H7 [mm].
N° 6 threaded holes M6 depth 12, placed at 60°, distance between centres 45 [mm], alignment shown in figure.
Diameter Ø100 H7 rotates with indexing plate
Rotary plate with standard drilling. (page 24)

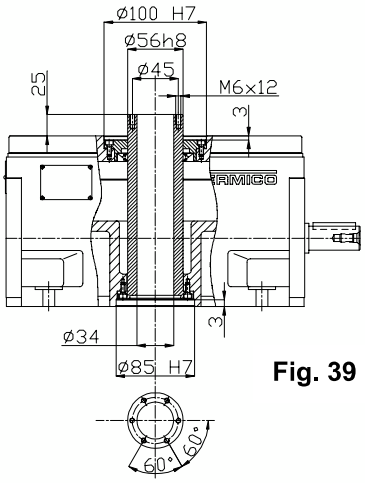


Fig. 39

VCR Version

Rotary centre column ∅100 H7 [mm].
Centre through hole ∅48 [mm].
Locating above ∅100 H7 [mm] – locating below ∅85 H7 [mm].
Locating above Ø100 H7, Ø48 H9, e Ø56 h8 rotate with indexing plate.
Rotary plate with standard drilling. (page 24)

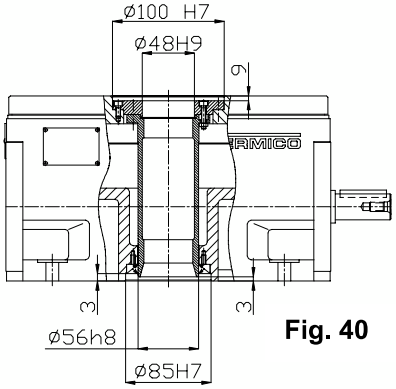
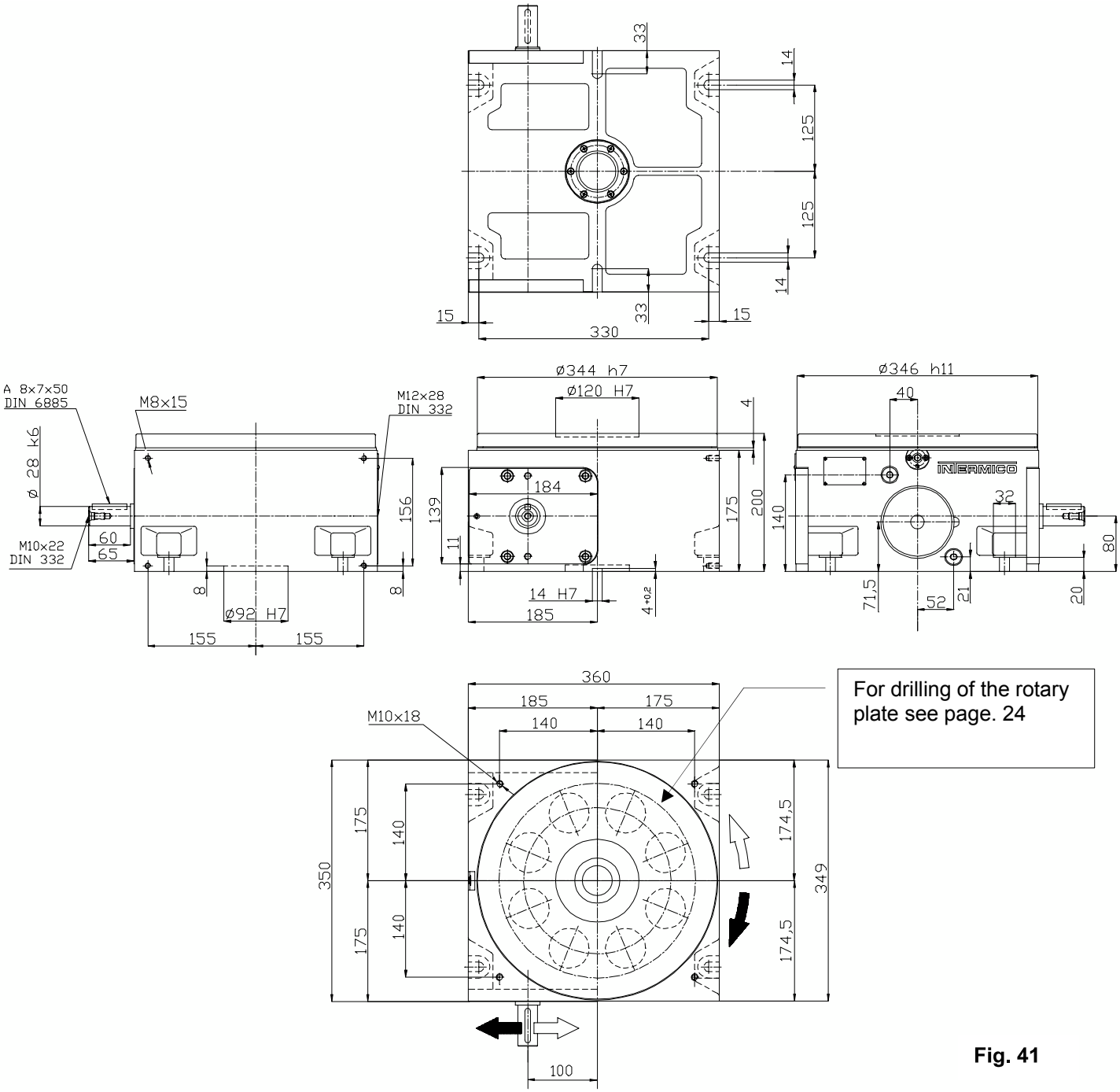


Fig. 40

NOTES:

If the rotating plate is required without fixing holes, replace the letter C with the letter N. (example VCS becomes VNS)

4.7 – OVERALL DIAMENSIONS IR 401



For drilling of the rotary plate see page. 24

Fig. 41

NOTES:

- Directions of rotations as shown by arrows.
- The input shaft feather key is in the position shown on the figure when the table is halfway through the rest time.
- The securing holes on the indexing plate are optional and executed by request.
- The anchoring holes of the table situated on faces C–D, are optional and executed by request.

- OUTPUT VERSIONS: VCS - VCT - VCP - VCR

VCS Version

Standard version
The table is supplied without centre column.
Locating above ∅120 H7 [mm] – locating below ∅92 H7 [mm].
Diameter Ø120 H7 rotates with indexing plate.
Rotary plate with standard drilling. (page 24)

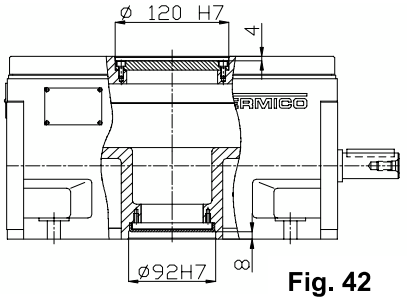


Fig. 42

VCT Version

Fixed through centre column
Anchoring is not foreseen in this column
Locating above ∅120 H7 [mm] – locating below ∅92 H7 [mm].
Diameter Ø120 H7 rotates with indexing plate
Column through hole Ø 53 [mm].
Rotary plate with standard drilling. (page 24)

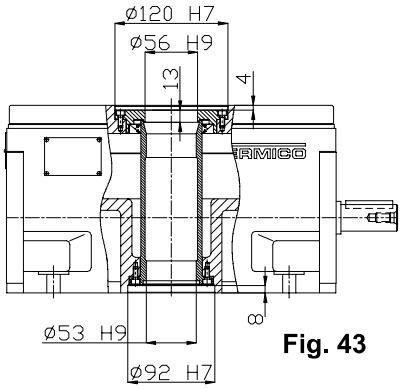


Fig. 43

VCP Version

Fixed projecting centre column ∅65x25 [mm].
Centre through hole ∅43 [mm].
Locating above ∅65 h8 [mm] - / ∅120 H7 [mm].
Locating below ∅92 H7 [mm].
N° 6 threaded holes M6 depth 12, placed at 60°, distance between centres 54 [mm], alignment shown in figure
Diameter Ø120 H7 rotates with indexing plate
Rotary plate with standard drilling. (page 24)

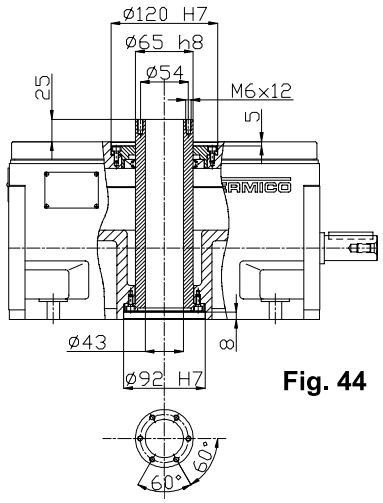


Fig. 44

VCR Version

Rotary centre column ∅120 H7 [mm].
Centre through hole ∅53 [mm].
Locating above ∅120 H7 [mm] – locating below ∅92 H7 [mm].
Diameter Ø120 H7, Ø56 H9, e Ø65 h8 rotate with indexing plate
Rotary plate with standard drilling. (page 24)

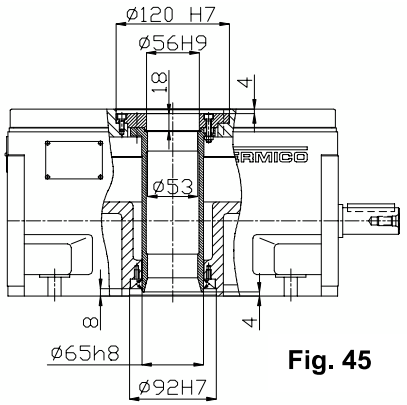
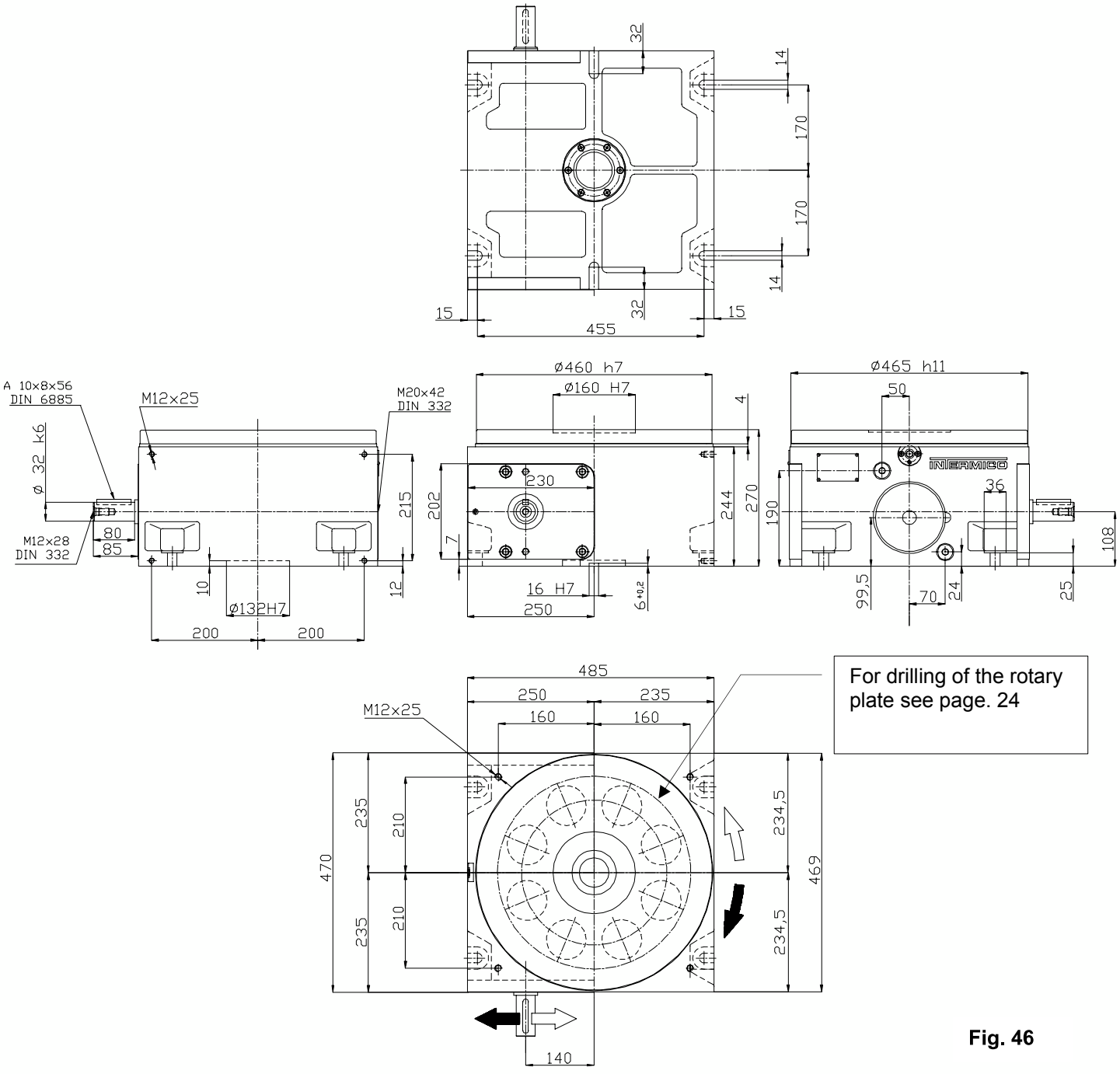


Fig. 45

NOTES:

If the rotating plate is required without fixing holes, replace the letter C with the letter N. (example VCS becomes VNS)

4.8 – OVERALL DIAMENSIONS IR 601



For drilling of the rotary plate see page. 24

Fig. 46

NOTES:

- Directions of rotations as shown by arrows.
- The input shaft feather key is in the position shown on the figure when the table is halfway through the rest time.
- The securing holes on the indexing plate are optional and executed by request.
- The anchoring holes of the table situated on faces C–D, are optional and executed by request.

- OUTPUT VERSIONS: VCS - VCT - VCP - VCR

VCS Version

Standard version.
The table is supplied without centre column
Locating above ∅160 H7 [mm] – locating below ∅132 H7 [mm].
Diameter Ø160 H7 rotates with indexing plate
Rotary plate with standard drilling. (page 24)

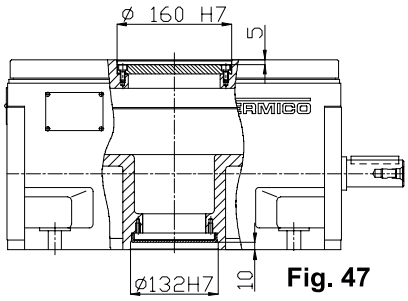


Fig. 47

VCT Version

Fixed through centre column
Anchoring is not foreseen in this column.
Locating above ∅160 H7 [mm] – locating below ∅132 H7 [mm].
Diameter Ø160 H7 rotates with indexing plate
Column through hole Ø 76 [mm].
Rotary plate with standard drilling. (page 24)

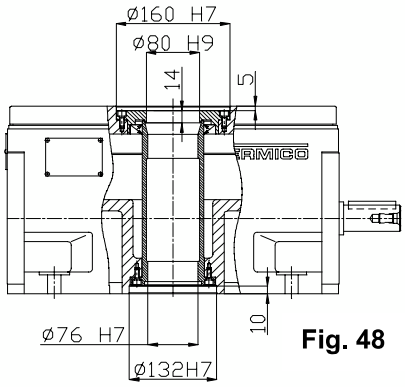


Fig. 48

VCP Version

Centre column fixed projecting ∅95x25 [mm].
Centre through hole ∅69 [mm].
Locating above ∅95 h8 [mm] - / ∅160 H7 [mm].
Locating below ∅132 H7 [mm]
N° 8 threaded holes M8 depth 16, placed at 45°, on distance between centres 82 [mm], alignment shown in figure
Diameter Ø160 H7 rotates with indexing plate
Rotary plate with standard drilling. (page 24)

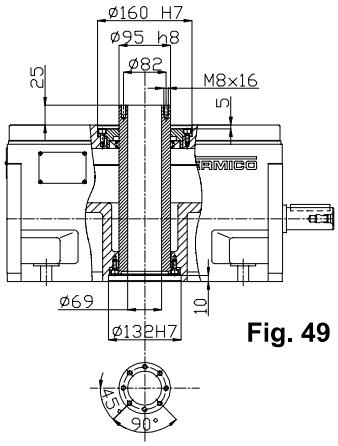


Fig. 49

VCR Version

Rotary centre column ∅160 H7 [mm].
Centre through hole ∅76 [mm].
Locating above ∅160 H7 [mm] – locating below ∅132 H7 [mm].
Diameter Ø160 H7, Ø80 H9, e Ø95 h8 rotate with indexing plate.
Rotary plate with standard drilling. (page 24)

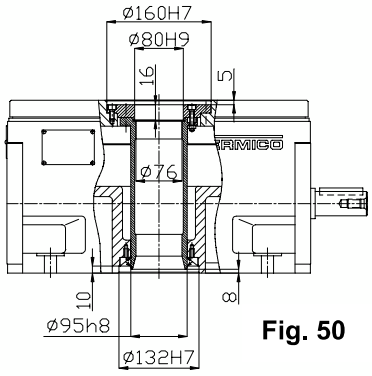


Fig. 50

NOTES:

If the rotating plate is required without fixing holes, replace the letter C with the letter N. (example VCS becomes VNS)

4.9 - OVERALL DIAMENSIONS IR 801

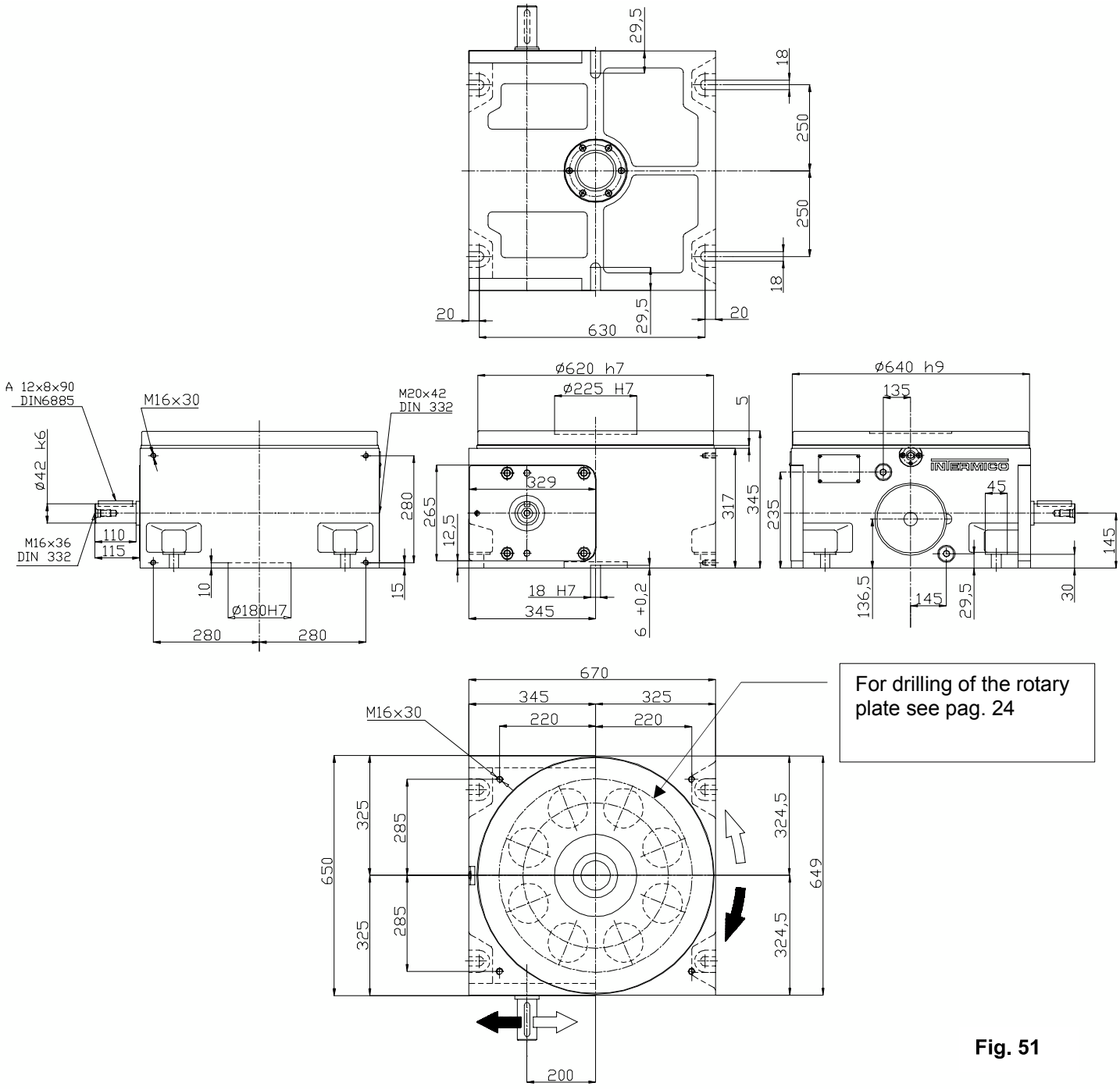


Fig. 51

NOTES:

- Directions of rotations as shown by arrows.
- The input shaft feather key is in the position shown on the figure when the table is halfway through the rest time.
- The securing holes on the indexing plate are optional and executed by request.
- The anchoring holes of the table situated on faces C–D, are optional and executed by request

– OUTPUT VERSIONS: VCS – VCT – VCP – VCR

VCS Version

Standard version
The table is supplied without centre column
Locating above ∅225 H7 [mm] – locating below ∅180 H7 [mm].
Diameter Ø225 H7 rotates with indexing plate
Rotary plate with standard drilling. (page 24)

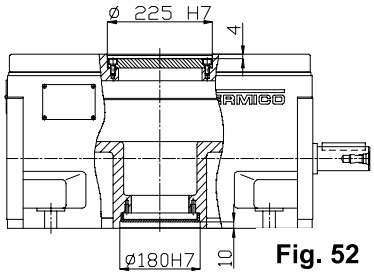


Fig. 52

VCT Version

Fixed through centre column.
Anchoring is not foreseen in this column.
Locating above ∅225 H7 [mm] – locating below ∅180 H7 [mm].
Diameter Ø225 H7 rotates with indexing plate.
Column through hole Ø 125 [mm].
Rotary plate with standard drilling. (page 24)

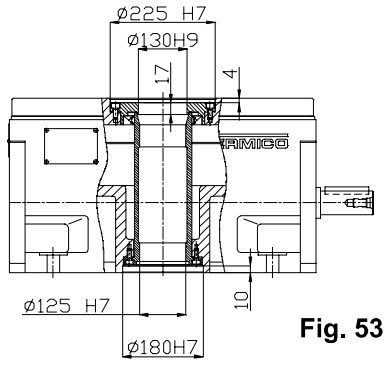


Fig. 53

VCP Version

Centre column fixed projecting ∅150x25 [mm].
Centre through hole ∅100 [mm].
Locating above ∅150 h8 [mm] / Ø225 H7 [mm].
Locating below ∅180 H7 [mm].
N° 8 threaded holes M10 depth 20, placed at a 45°, on distance between centres 125 [mm], alignment shown in figure
Diameter Ø225 H7 rotates with indexing plate.
Rotary plate with standard drilling. (page 24)

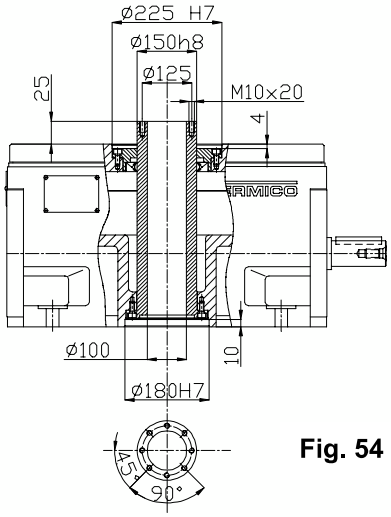


Fig. 54

VCR Version

Centre column rotates ∅225 H7 [mm].
Centre through hole ∅125 [mm].
Locating above ∅225 H7 [mm] – locating below ∅180 H7 [mm].
Diameter Ø225 H7, Ø125 H9, e Ø150 h8 rotate with indexing plate.
Rotary plate with standard drilling. (page 24)

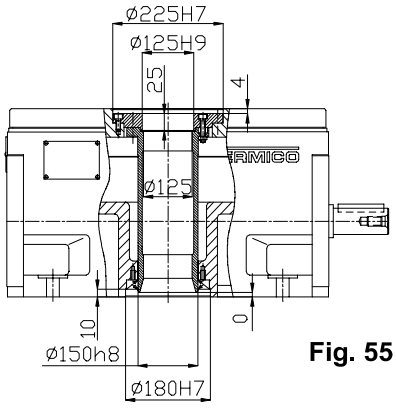


Fig. 55

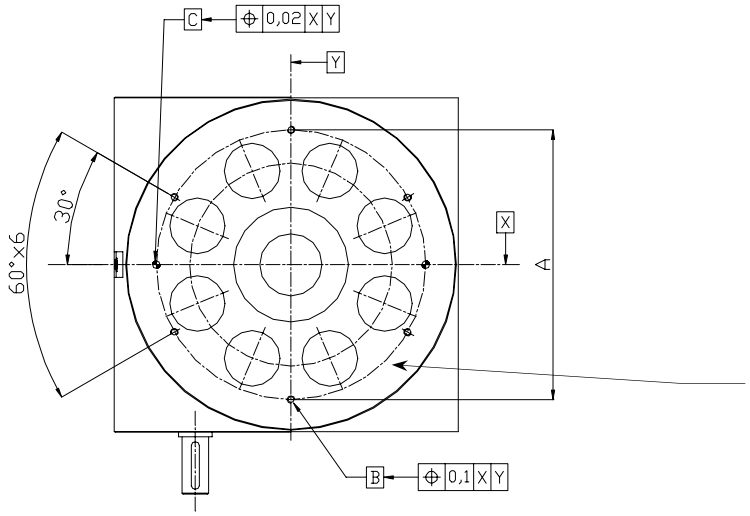
NOTES:

If the rotating plate is required without fixing holes, replace the letter C with the letter N. (example VCS becomes VNS)

4.10 - STANDARD DRILLING OF THE ROTARY PLATE

The indexing plate can be supplied with drilling according to the sketch below.
Note: The figures of the tables represented below are in dwell position.

IR 201 - IR 251 - IR 301 - IR 401



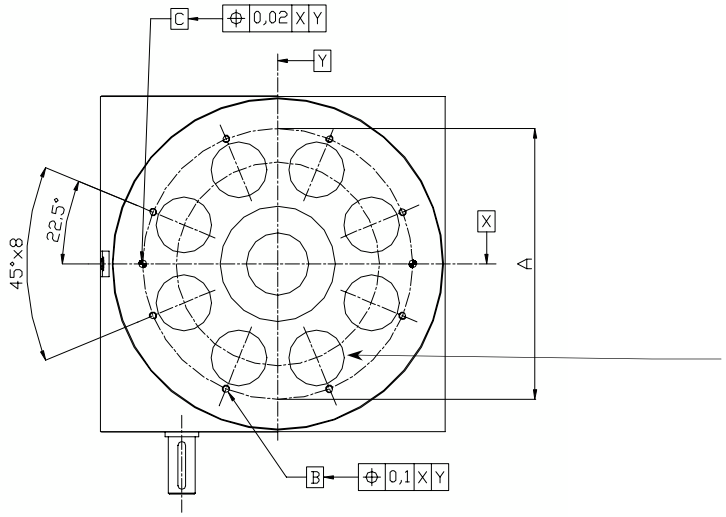
TAB. 4

Table	A	B	C
IR 201	Ø 136	M6x12	Ø6 H7x12
IR 251	Ø 171	M6x12	Ø6 H7x12
IR 301	Ø 223	M8x16	Ø8 H7x16
IR 401	Ø 282	M8x16	Ø8 H7x16

A schematic representation of cam followers. For dimensions and quantity see the specific paragraph at page 25.

Fig. 56

IR 601 - IR 801



TAB. 5

Table	A	B	C
IR 601	Ø 383	M12x20	Ø12 H7x20
IR 801	Ø 530	M16x25	Ø16 H7x25

A schematic representation of cam followers. For dimensions and quantity see the specific paragraph at page 25.

Fig. 57

IMPORTANT: When ordering please indicate the execution of standard drilling.

4.11 - POSITION OF THE CAM FOLLOWERS

One of the characteristics of the INDEXING TABLES of the series IR is the possibility of inspection and if necessary the replacement of the cam followers without disassembling the table. This is possible due to a design solution, by stiffening the rollers has allowed accessibility to them from the top indexing plate.

The table below shows the elements that individualise the quantity, the dimensions and the positions in which access discharges are foreseen to the cam followers of the standard tables; fixed that the table is in the conditions represented and is in station in the pause period.

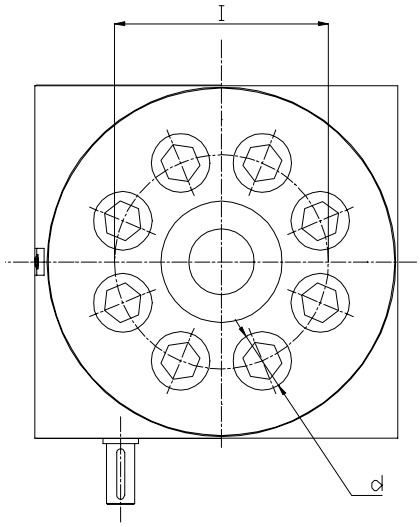
TAB. 6

SERIES	N° HINGES	α (degrees)	l (mm)	d * (mm)
IR 201	6 a 60°	30°	98	29
	8 a 45°	22.5°		29
	9 a 40°	20°		29
IR 251	6 a 60°	30°	126	37
	8 a 45°	22.5°		37
	9 a 40°	20°		37
IR 301	6 a 60°	30°	168	43
	8 a 45°	22.5°		43
	9 a 40°	20°		43
	10 a 36°	18°		43
	12 a 30°	15°		37
IR 401	6 a 60°	30°	212	58
	8 a 45°	22.5°		58
	9 a 40°	20°		58
	10 a 36°	18°		58
IR 601	6 a 60°	30°	300	68
	8 a 45°	22.5°		68
	9 a 40°	20°		68
	10 a 36°	18°		68
	12 a 30°	15°		68
	16 a 22.5°	11.25°		68
IR 801	6 a 60°	30°	410	100
	8 a 45°	22.5°		100
	9 a 40°	20°		100
	10 a 36°	18°		100
	12 a 30°	15°		100
	16 a 22.5°	11.25°		100

* NOTES: It is sometimes possible that in certain cases, for technical working reasons, the diameter of the pins indicated in the above table vary depending on the application. Therefore it is important to ask our technical office for confirmation.

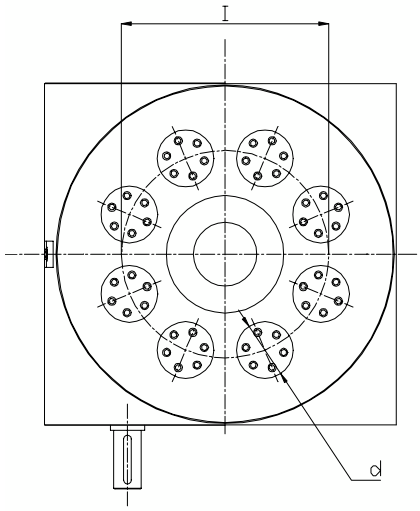
IR 201 - IR 251 - IR 301

Fig.58 Position of discharges



IR 401 - IR 601 - IR 801

Fig.59 Position of discharges



5.1. -INSTALLATION POSITIONS OF THE GEAR MOTOR

The INDEXING TABLES in the versions with standard power drive are fitted with specifically selected worm screw reduction gears which are keyed directly onto the input shaft.
These reduction gears in the "LCB" version are supplied with a built-in clutch which has the purpose of slipping the crown gear against its shaft when the rated torque is exceeded.
This solution combines two important elements in the power drive group: safety from shock due to overload and compact drive.
The range of reduction ratios available with the standard reduction gears makes it possible to obtain set operating speeds within the range of 3 to 200 (cycles/1').
A number of other power drive solutions, which make it possible to use most of the products currently to be found on the market, are available as options. Please consult us for any information and explanations: we are at your disposal for the most suitable solution to your specific problem.
The reduction gear can be mounted on the ROTARY TABLE in the standard positions illustrated below.

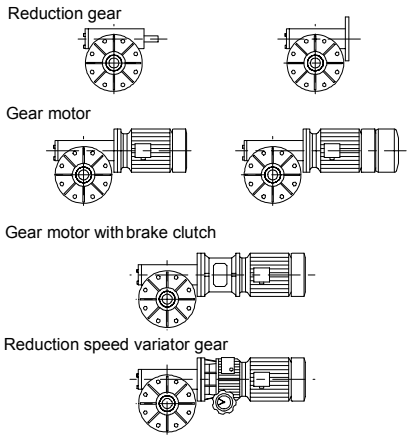


Fig.60 Possible power drive system

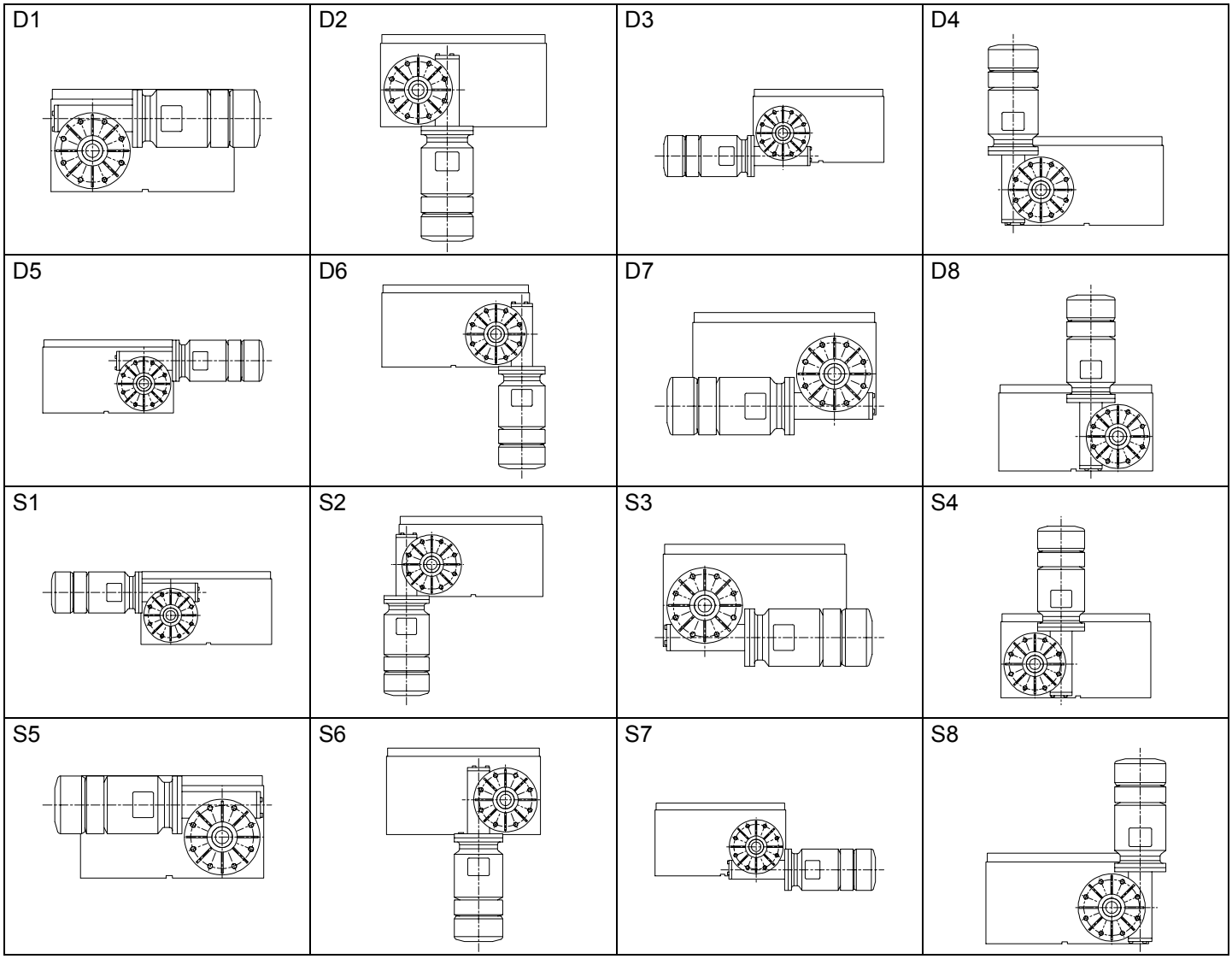


Fig. 61 Starting from VR versions, if on the order the position of the reduction gear or gear motor is not indicated, the table will be given with the gear motor in D1 position. For packing and delivery reasons the reduction gears are put in D1, D7, or S3, S5 position. It will be care of the installer to position them in the correct position required.

5.2 - OVERALL DIMENSIONS OF STANDARD GEAR MOTORS

TABLE 7

Intermico TABLES Series	STM. RI RMI	WORM SCREW REDUCTION GEAR Overall dimensions [mm]				ratios	4 POLE - 230/400 V - 50Hz motor Self-braking I.E.C.	CV	Overall dimensions [mm] O	X	Y	STM. CBF	WORM SCREW REDUCTION GEAR + PRE-REDUCTION Overall dimensions [mm]				ratios	4-POLE 220/380-V 50-Hz motor Self-braking I.E.C.	CV	Overall dimensions [mm] O	X	Y
IR 201	28 FL LCB	A	70	F	45	100-80-70	*50a	0,05	135	100	80	-	-				-	-				
		B	49	G	40	56-49	*50a	0,05	135	100	80											
		C	30	H	5	40-28-20	56b	0,12	176	108	120											
		D	14	I	28	15-10-7	56b	0,12	176	108	120											
		E	35																			
IR 201 IR 251	40 F1 LCB	A	106	F	64	80-70	56b	0,12	176	108	120	40 F1 LCB	A	106	F	108	444-400	*50a	0,05	135	100	80
		B	69	G	63	56-49	63a	0,18	225	124	140		B	69	G	59	350-200	*50a	0,05	135	100	80
		C	41	H	9	40-28-20	63b	0,25	225	124	140		C	41	H	9	217-171	56b	0,12	176	108	120
		D	19	I	40	15-10-7	63b	0,25	225	124	140		D	19	I	57	135-106	63a	0,18	225	124	140
		E	59										E	78	L	7	86	63a	0,18	225	124	140
IR 251 IR 301	50 F1 LCB	A	125	F	77	80-70	63b	0,25	225	124	140	50 F1 LCB	A	125	F	134	400	56b	0,12	176	108	120
		B	93	G	72	56-49-40	71a	0,33	301	141	160		B	93	G	69	350-200	56b	0,12	176	108	120
		C	49	H	11	28-20-15	71b	0,50	301	141	160		C	49	H	11	217-171	63a	0,18	225	124	140
		D	24	I	50	10-7	71b	0,50	301	141	160		D	24	I	69	135-106	63b	0,25	225	124	140
		E	69										E	97	L	9	86	71a	0,33	301	141	160
IR 301 IR 401	70 F3 LCB	A	160	F	99	80	71a	0,33	301	141	160	70 F3 LCB	A	160	F	165	444-400	63a	0,18	225	124	140
		B	101	G	92	70-56	71b	0,50	301	141	160		B	101	G	93	350-280	63a	0,18	225	124	140
		C	60	H	11	49-40	80a	0,75	326	160	200		C	60	H	11	217	63b	0,25	225	124	140
		D	28	I	70	28-20-15	80b	1,00	326	160	200		D	28	I	88	171	71a	0,33	301	141	160
		E	87			10-7	80b	1,00	326	160	200		E	127	L	18	135-106	71b	0,50	301	141	160
IR 401 IR 601	85 FL LCB	A	200	F	116	80	80a	0,75	326	160	200	85 FL LCB	A	200	F	193	444-400	63b	0,25	225	124	140
		B	100	G	111	70-56	80b	1,00	326	160	200		B	100	G	116	350	63b	0,25	225	124	140
		C	61	H	13	49-40	90s	1,50	385	180	200		C	61	H	13	280-217	71b	0,50	301	141	160
		D	32	I	85	28-20	90l	2,00	385	180	200		D	32	I	107	171	80a	0,75	326	160	200
		E	105			15-10	90l	2,00	385	180	200		E	145	L	29	135-106	80b	1,00	326	160	200
IR 601	110 F1 LCB	A	200	F	145	80	90s	1,50	385	180	200	110 F1 LCB	A	200	F	239	444-400	80a	0,75	326	160	200
		B	115	G	142	70-56	90l	2,00	385	180	200		B	115	G	142	350-280	80b	1,00	326	160	200
		C	78	H	13	49-40	100a	3,00	420	200	250		C	78	H	13	217-171	90s	1,50	385	180	200
		D	42	I	110	28-20	100b	4,00	420	200	250		D	42	I	140	135	90L	2,00	385	180	200
		E	135			15-10	100b	4,00	420	200	250		E	190	L	43	106	100a	3,00	420	200	258
IR 801	110 F2 LCB	A	270	F	145	100-80	90s	1,50	385	180	200	110 F2 LCB	A	270	F	239	444-400	80a	0,75	326	160	200
		B	132	G	142	70-56	90l	2,00	385	180	200		B	132	G	142	350-280	80b	1,00	326	160	200
		C	78	H	14	49-40	100a	3,00	420	200	250		C	78	H	14	217-171	90s	1,50	385	180	200
		D	42	I	110	28-20	100b	4,00	420	200	250		D	42	I	140	135	90L	2,00	385	180	200
		E	135			15-10	100b	4,00	420	200	250		E	190	L	43	106	100a	3,00	420	200	258
IR 801	130 FL	A	300	F	163	100-80	90l	2,00	385	180	200	-	-				-	-				
		B	150	G	159	70-56	100a	3,00	420	200	250											
		C	90	H	18	49-40	100b	4,00	420	200	250											
		D	48	I	130	28	112a	5,50	440	224	250											
		E	150			20-15-10	132a	7,50	500	261	300											

(*) Normal (no self-braking) motor LCB o LFB = Optional frictional torque limiter

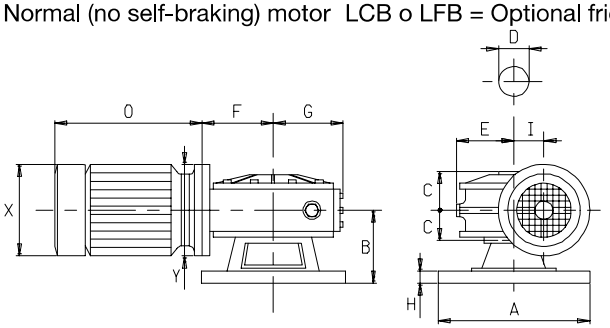


Fig. 62 STM RMI Reduction gear flanged version

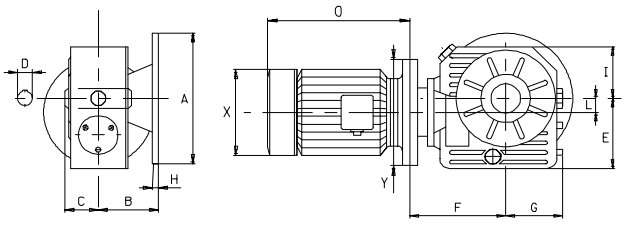


Fig.63 STM CBF Reduction gear with pre-reduction, flange version

On demand the INDEXING TABLE may be supplied with motor and/or reduction gears of non standard brands and types. Alternatively, they may be supplied pre set for customers mounting of non standard types.

5.3. - CAMS FOR LIMIT SWITCHES TYPES, OVERALL DIMENSIONS AND LOCATIONS

As we have seen in earlier sections, applications for INDEXING TABLES frequently require a cam-limit switch unit to interrupt the motor drive at each cycle.
The stop can have the function of extending the rest period of the cycle and/or of reversing the sense of rotation of the motor and consequently of the INDEXING TABLE and in which case will operate as a rocker unit.
Limit switch cams are available in three standard shapes, each suitable for a particular type of limit switch as follows: for some applications, for example when oscillating motion is required, it is advisable to fit the IR table with either FC or FCR micro groups. The dimensions are shown on page 29

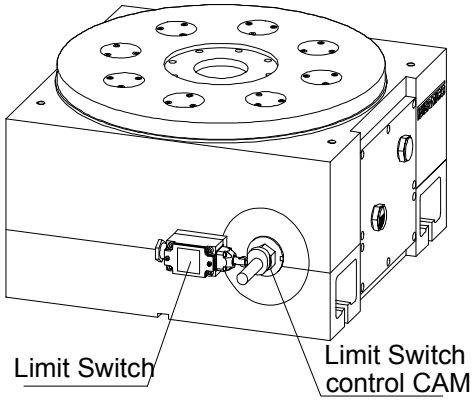
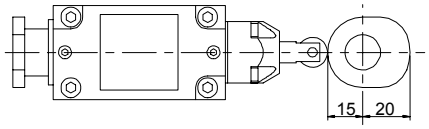
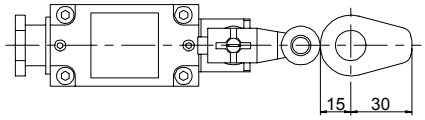


FIG.64

CT cam for push operated limit switch with roller D4B 1171-DIN43694 FORM B



CL cam for lever operated limit switch with roller D4B 1111- IN43694 FORM A/B



CM cam for proximity limit switch E2E2 - X2B1 o TLE X5BI-G CENELEC (EN 50008)

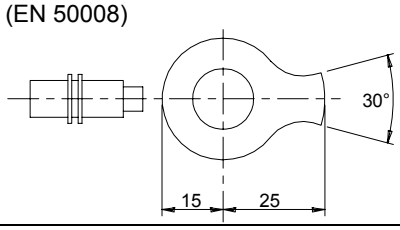


Fig.65

On INDEXING TABLES the feather key of the input shaft always halfway along the cam's rest period. An "indicator notch" executed on both exposed front and rear end faces of the input shaft reveals its position and makes it possible to identify the exact point where the limit switch must be operated.
A plate is used as a support for the limit switch, while a pin screwed into the main shaft head end thread serves as a holder for one or more limit switch operating cams.
These cams are secured to the pin and kept in place by means of grub screws.

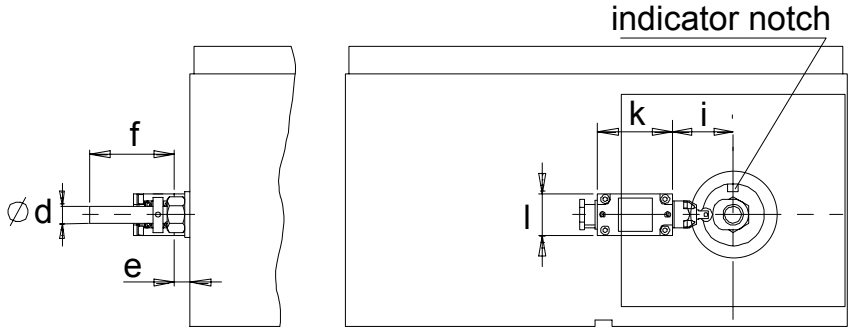


Fig.66

TABLE 8

Serie	d	e	f	i	k	l
IR 201	16	15	80	60	75	42
IR 251	16	15	80	60	75	42
IR 301	16	15	80	60	75	42
IR 401	16	15	80	60	75	42
IR 601	16	15	80	60	75	42
IR 801	16	15	80	60	75	42

5.4 FC and FCR MICRO GROUPS

Simple microgroups permit identification only of the fact that the cam is in a certain position. If this position be the dwell period, the IR table must be in ANY one of perhaps several stations. It is sometimes necessary to know which particular station e.g. tables where oscillation between stations is required which is achieved by motor reversal.
For machine start-up and for prevention of possible over-run, extra positional information is needed.
One may also need several separate control signals for processes which are to be synchronised with the IR cam position.

FC are microgroups driven by the camshaft in ratio 1:1. These groups cannot distinguish particular station positions but can provide up to 6 control microcams as standard; each of which is synchronised with the IR camshaft.

TAB.9

Type of FC	N° Push Switch	A	B	C	D
FC2	2	46	200	66	125
FC3	3	60	200	66	125
FC4	4	95	200	66	125
FC5	5	95	200	66	125
FC6	6	95	200	66	125

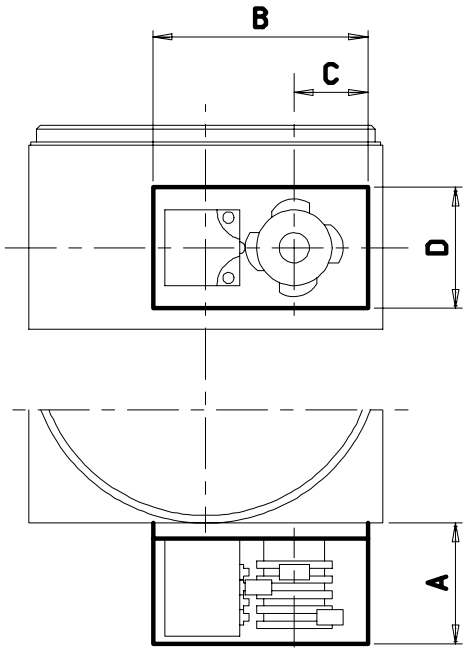


Fig.67 Overall dimensions of FC limit switch groups

FCR are microgroups driven by the camshaft in various ratio; none of which is 1:1. the result is that these can identify particular stations and detect oscillator over-run.
Standard types are shown in the following table. Other possibilities exist to satisfy individual needs.

TAB.10

SIZE OF FCR	TYPE OF IR table	I	Q	E	F	G	H	L	M	N	P
A	IR 201	83	41	210	102	86	115	70	25	36	6,5
A	IR 251	96	53	210	102	86		70	25	36	6,5
A	IR 301	116	63	210	102	86		70	25	36	6,5
A-B	IR 401	136	80	210 --- 270	102 --- 142	86 --- 120		70 --- 105	25 --- 110	36 --- 44,5	6,5
B	IR 601	176	108	270	142	120		105	110	44,5	6,5
B	IR 801	236	145	270	142	120		105	110	44,5	6,5

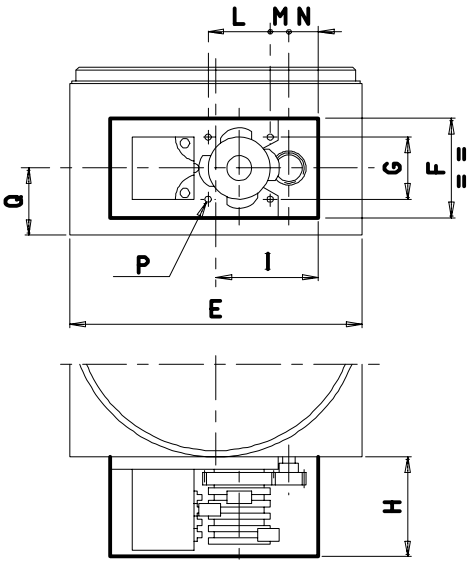


Fig.68 Overall dimensions of FCR limit switch groups.

TAB.11

N. OF MICRO CAMS.	WIDTH H	TRANS RATIO	APPLICATIONS
4	115	0,75	IR Oscillating Table(0°-180°, 0°-120°, 0°-90°, 0°-60°)
2	115	0,50	IR Indexing Table 2 Stations
3	115	0,33	IR Indexing Table 3 Stations
4	115	0,25	IR Indexing Table 4 Stations
5	115	0,20	IR Indexing Table 5 Stations
6	115	0,16	IR Indexing Table 6 Stations

ATTENTION: the phase cam is not a safety device.

AN EXAMPLE OF APPLICATION FOR OSCILLATING ROTARY TABLES

Ex.: A 2 station oscillating table (180° rotation) with index period: ß°=330°

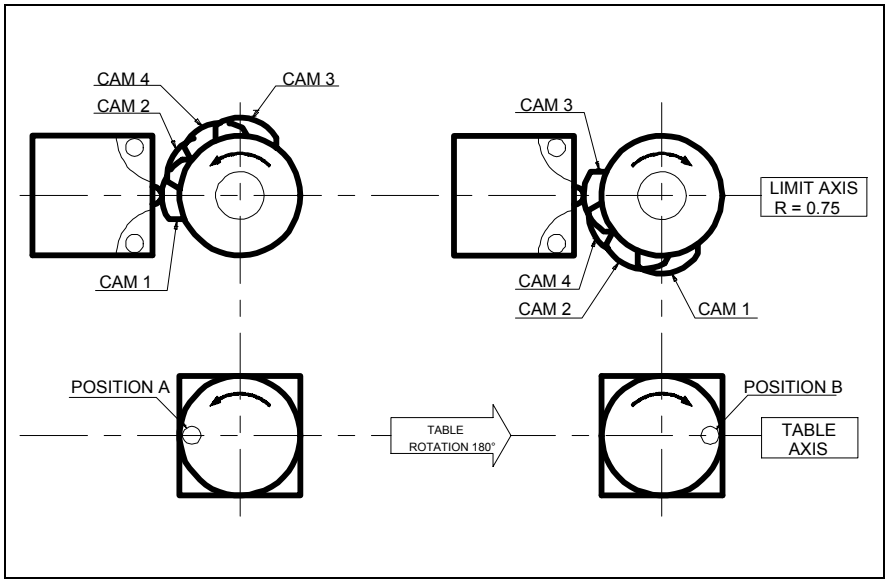


Fig.69

Tab.12

LIMIT SWITCH FUNCTIONS		
1	Micro stop	**POSITION. A**
2	Micro over run	**POSITION. A**
3	Micro stop	**POSITION. B**
4	Micro over run	**POSITION. B**

AN EXAMPLE OF APPLICATION FOR INDEXING ROTARY TABLES

Ex.: A 4 station indexing table (90° rotation) with index period: ß°=270°

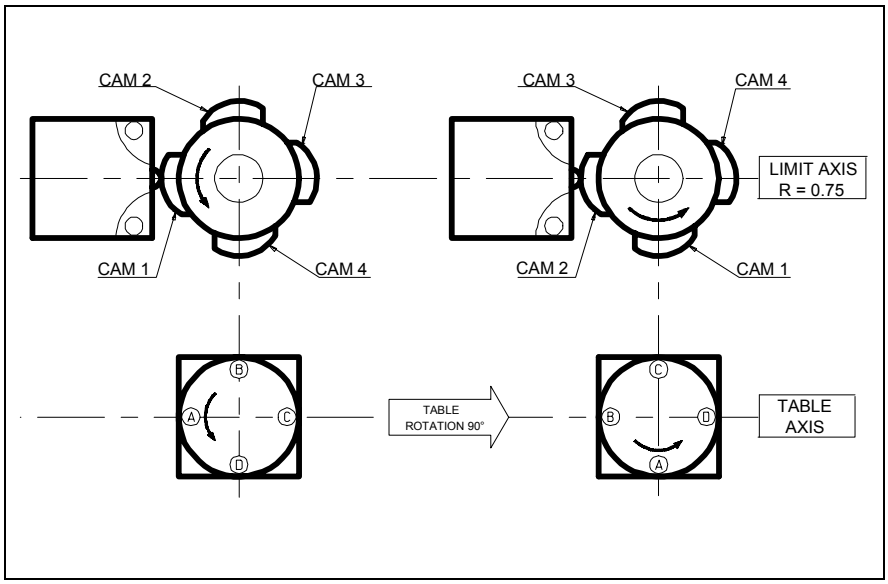


Fig.70

Tab.13

LIMIT SWITCH FUNCTIONS		
1	Micro stop	**STATION. A**
2	Micro stop	**STATION. B**
3	Micro stop	**STATION. C**
4	Micro stop	**STATION. D**

5.5 - LUBRICATION

In the absence of any external pollution, the internal components of INDEXING TABLES in assembly positions V6 - B3 - B6 - B7 - B8 receive long life lubrication with MOBIL synthetic grease MOBILITH SHC PM:.

An exception to this is the assembly position V5, where lubrication advised is mineral oil ISO VG220.

Grease-lubricated INDEXING TABLES are supplied complete with lubricant in the quantity required for the assembly position involved: if they are installed in another position than shown, it is important to add the difference between the two quantities, as indicated in table N°1, but only use the same synthetic grease type, through the filling holes.

The oil-lubricated INDEXING TABLES are supplied without any lubricant. It is up to the customer to fill with the required amount of lubricant before starting up. Frequency of lubrication, unless leakage or external pollution occur, is as shown on Table No 15.

Lubrication is separate on reduction gear units, gear motors, speed variators, etc. and the directions of the manufacturers of these products must be followed

Fig.71
Points of lubrication

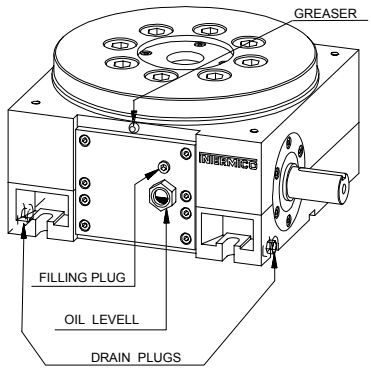
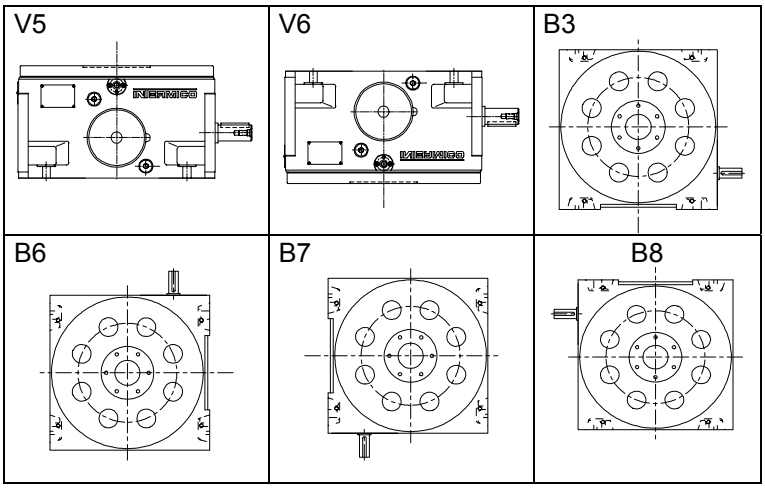


Fig. 72 – Assembly positions.



Only for assembly position V5, the bearing of the indexing plate must be lubricated via the greasers every 1600 (h) with 8 cm^3 of ISO XM1 mineral grease. The Indexing Table is delivered with this bearing already lubricated, therefore it does not require lubrication for the first 1600 (h) of operation.

TAB. 14 - AMOUNT OF LUBRICANT IN (kg)

Series	*V5	V6	B3	B6,B7	B8
IR-201	0,4	1	1	1	1
IR-251	0,6	1,5	1,5	1,5	1,5
IR-301	1	3	3	3	3
IR-401	2	8	4	4	4
IR-601	6	14	7	7	7
IR-801	17	20	10	10	10
* oil lubrication					

TAB. 15 – Lubrication frequency

Temperature Oil (°C)	Lubrication frequency (h)
< = 65	8000
65 - 80	4000
80 - 95	2000

If not indicated otherwise the IR ROTARY TABLES are supplied in the standard form “V5” and as such do not require specifying.

TAB. 16 – Lubricant advised:

ISO-L-CKC 220 according to ISO 6743-6 DIN 51517 Part 3 group CLP with ISO VG 220.

AGIP	Blasia 220	**FINA**	Giran 220
BP	Energol Gr-XP 220	**MOBIL**	Mobilgear 630
CASTROL	Alpha SP 220	**SHELL**	Omala Oil 220
CHEVRON	NL Gear Compound 220	**TOTAL**	Carter EP 220
ESSO	Spartan EP 220		

5.6 – ORDERING CODE

The ordering code for IR TABLES is composed of an alphanumerical combination according to the chart here below.
When ordering, please proceed accordingly in order to avoid misunderstanding or delays in delivery.

INDEXING TABLE

IR	H					1	2B	3	4		

Type of roller
Number of stations
Angle of displacement
Version
Output version
Face with input shaft
Face of indexing plate
Face with securing holes
Face with oil filling plug (LV long-life lubrification)
Underside after assembly
Assembly position of the reduction gear (do not fill in for version VS and VL)

Limit switch control cam, limit switch and connections type: ☐

REDUCTION GEAR ☐ ☐ ☐ ☐

Type
Version
Reduction ratio
Built-in torque limiter

CLUTCH-BRAKE UNIT

Type ☐ Series ☐

MOTOR

Normal self-braking motor		kW	P	V	Hz	

Size and version
Power
No. of poles
Voltage (V.)
Frequency
Brake supply (V.)

N.B. List any possible special power drive characteristics. For the "VSP" version only, indicate the size and version of the motor by ticking the polarity-voltage-frequency boxes.

ASSEMBLY POSITION

		A	B	C	D	E	F
Face with input shaft	1					☐	☐
Face of the indexing plate	2		☐				
Face with securing hole	3	☐	☐	☐	☐	☐	☐
Face with oil filling plug	4			☐	☐	☐	☐
Underside after assembly	5	☐	☐	☐	☐	☐	☐

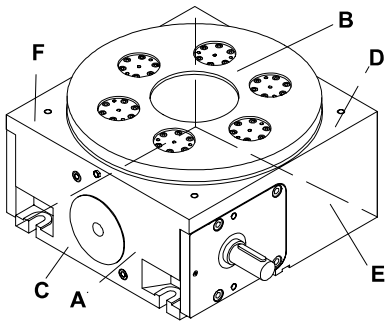


Fig. 73 Faces of the table

[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

COLOMBO FILIPPETTI

COLLABORATIVE ENGINEERING