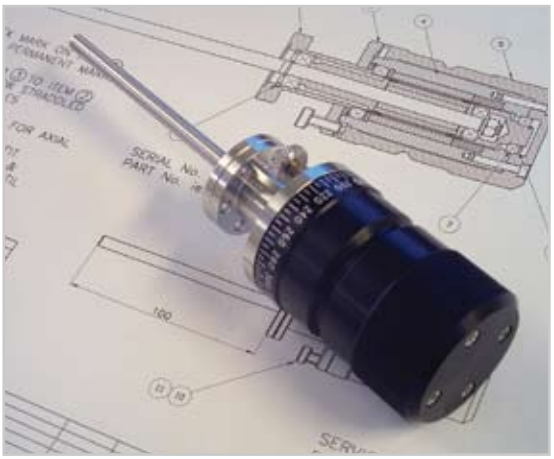
Rotary Drives

Rotary Drives



Introduction to Rotary Drives

Many vacuum processes require a sample or other component to be rotated. This can range from something as simple as spinning an attenuating chopper wheel, to accurately moving a sample to face from one analyser to another. VG Scienta have a wide range of rotary drives to fulfill most customer requirements.

Rotary Actuation Methods

There are several different methods of achieving rotation in vacuum. The two most common arrangements are:

A vacuum-tight seal on a mechanical drive that moves through the vacuum wall

or

A magnetic coupling that transfers motion from air-side to vacuum-side.

The more standard versions are discussed in this section but please bear in mind that we create a large number of custom rotary drives for many different applications, so please contact our sales department if you feel you have a requirement that is not covered in this section.

All the drives contained in this section cover different aspects of in-vacuum rotation. These range from simple manual drives with relatively low resolution and torque capacity to high performance drives that are capable of carrying high loads or have high speed or torque specifications. Many of these can be motorised with stepper or DC motors; they are listed as order code options where available.

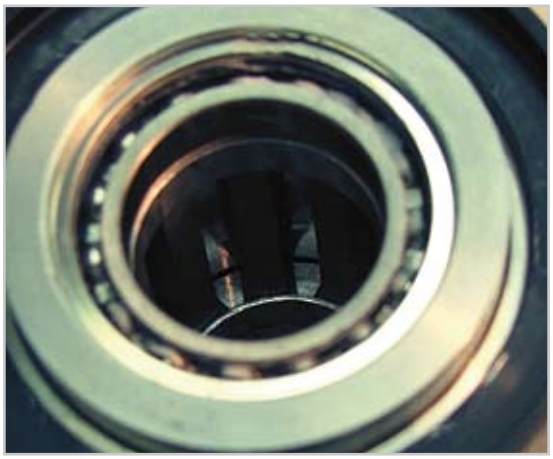
Rotary Actuation Methods

There are two standard methods of achieving rotary motion within the vacuum envelope.

Magnetic Coupling

Magnetically-coupled drives use a high strength rare-earth magnetic coupling to transfer the rotational forces into the vacuum envelope. This is achieved without any dynamic seals or bellows. The vacuum enclosure, complete with Conflat flange, can be machined from a single billet of material. Thus many of the problems associated with conventional stainless steel drive bellows, such as leaks to atmosphere, are completely eliminated.

The use of high strength rare-earth magnets gives exceptional levels of torsional rigidity. However, if the recommended input torque is exceeded, the magnetic coupling will simply 'cog' over to the next position. As there is no actual mechanical connection, the drive will not be damaged. All magnetically-coupled drives are extremely robust and utilise large, highly specified, bearings to ensure long service life. All drives are fitted with magnetic shielding as standard.



Magnetic coupling.

Bellows coupling.

Bellows Sealed Drives

Bellows sealed drives can be mounted in any orientation and are the most widely used form of actuation. A vacuum-side shaft extends into the air-side space within a vacuum enclosed metal sheath. A 30º bend is put in the shaft on the actuation side (but still under vacuum).This bend is contained within a sealed bellows unit and welded into the sheath and capped at one end. Between the cap and shaft is a ball socket joint that allows the bellows to 'wobble' when rotational force is applied to the shaft. The bent shaft connection on the actuation side causes the bellows to wobble allowing a rotational force to be applied to shaft within the vacuum envelope.

The 'wobble' method of actuation is more than capable of handling lighter workloads that do not require high torque or continuous high speed (see individual drive specification for details).

Rotary Drives

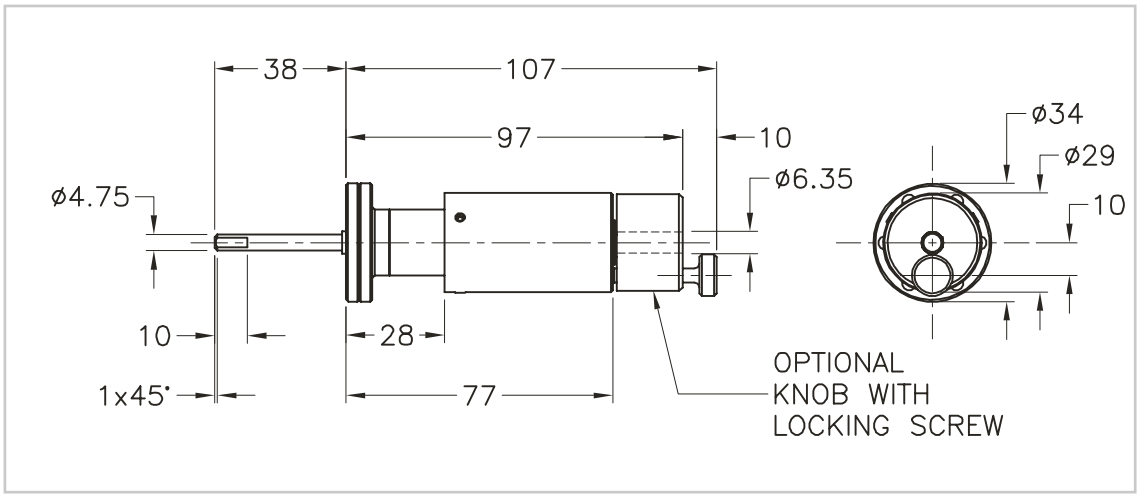
Rotary Drives Comparison Chart							
Order Code	Actuation	Max Speed rpm	Torque (Nm) at Max Speed	Torque (Nm) at 10rpm	Resolution (degrees)	Flange OD	Secondary Motion
ZRD93	Manual	300	0.012	0.01	-	34 mm	-
ZRD93P	Shaft	300	0.012	0.01	-	34 mm	-
ZRD932	Manual	300	0.012	0.01	-	70 mm	-
ZRD93K	Manual	300	0.012	0.01	-	SKF25	-
ZRD91	Manual	500	0.12	0.5	1	34 mm	-
ZRD91M	Stepper Motor	500	0.12	0.3	0.9	34 mm	-
ZRD91DCM	DC Motor(3)	300	0.12	0.3	-	34 mm	-
ZRD91MG	Stepper Motor	300	0.3	0.5	0.18	34 mm	-
ZRD94	Manual	400	0.08	0.4	5	34 mm	-
ZRD942	Manual	400	0.08	0.4	5	70 mm	-
ZRD94K	Manual	400	0.08	0.4	5	SKF25	-
ZRD6	Manual	300	0.8	5	-	70 mm	-
ZRD6MI	Stepper Motor	300	0.38	0.43	0.9	70 mm	-
ZRD6DCMI	DC Motor(3)	300	0.38	0.43	-	70 mm	-
ZRD6MGI	Stepper Motor	165	0.8	2	0.1	70 mm	-
ZRD7	Manual	300	0.8	5	1	70 mm	-
ZRD7MI	Stepper Motor	300	0.38	0.43	0.9	70 mm	-
ZRD7DCMI	DC Motor(3)	300	0.38	0.43	-	70 mm	-
ZRD7MGI	Stepper Motor	165	0.8	2	0.1	70 mm	-
ZRD1	Manual	500	0.5	5	0.1	70 mm	-
ZRD2	Manual	500	0.5	5	0.1	70 mm	12 mm
ZRD224	Manual	500	0.5	5	0.1	70 mm	24 mm
ZRDPMK(1)	Stepper Motor	16	4	4	0.01	-	-
ZRDSMK(2)	Stepper Motor	-	-	-	-	-	12 mm
ZRDPDCMK(3)	DC Motor(3)	-	-	-	-	-	-
ZMRD93	Manual	10.0	0.5	0.5	-	34 mm	-
ZMRD93L	Manual	10.0	0.5	0.5	-	34 mm	-
ZMRD91	Manual	10.0	0.5	0.5	-	34 mm	-
ZMRD91L	Manual	10.0	0.5	0.5	-	34 mm	-
ZMRD91M	Stepper Motor	500	0.2	0.25	-	34 mm	-
ZMRD91ML	Stepper Motor	500	0.2	0.25	-	34 mm	-
ZMRD91D	DC Motor(3)	500	0.5	0.5	-	34 mm	-
ZMRD91DL	DC Motor(3)	500	0.5	0.5	-	34 mm	-
ZMRD6	Manual	40.0	4.0	4.0	-	70 mm	-
ZMRD6L	Manual	40.0	4.0	4.0	-	70 mm	-
ZMRD6M	Stepper Motor	500	4.0	4.0	-	70 mm	-
ZMRD6ML	Stepper Motor	500	4.0	4.0	-	70 mm	-
ZMRD6D	DC Motor(3)	500	0.8	0.8	-	70 mm	-
ZMRD6DL	DC Motor(3)	500	0.8	0.8	-	70 mm	-

(1) The ZRDPMK is a stepper motor upgrade for the primary axis of the RD1, RD2 or RD224 rotary drives.
(2) The ZRDSMK is a stepper motor upgrade for the secondary axis of the RD2 rotary drive.
(3) DC Motor supplied with power supply - see page 375.

Introduction to the RD93 Series Rotary Drive

- Torque 0.1Nm hand turned
- Torque 0.01Nm at 300 rpm
- Range of HV and UHV flanges
- Fully bakeable to 250 ºC standard, 400 ºC with actuator removed
- Dimensionally compatible to other miniature drives
- Thrust 16N

The RD93 series of miniature rotary drives are supplied as standard with a hand operating knob and locking screw (except the RD93P). This can easily be removed for direct coupling of the output shaft to a drive system. Please note that we do not provide motorised versions of these drives.



All dimensions in mm.

RD93 Series			
Flange OD mm	Flange OD inch	Shipping Weight kg	Order Code
34	1.33	0.3	ZRD93
34	1.33	0.3	ZRD93P(1)
70	2.75	0.5	ZRD932
40(2)	1.56	0.3	ZRD93K(2)

(1) The ZRD93P is identical to the ZRD93 except that it does not have the operating knob.
(2) SKF25 flange.

RD93 Accessories	
Drive Code	Lubrication Kit
ZRD93	ZHPTSLK
ZRD93P	ZHPTSLK
ZRD932	ZHPTSLK
ZRD93K	ZHPTSLK

Rotary Drives - RD91 Series

Typical uses: high speed shutter or chopper drives, in-vacuum transport/transfer and positioning devices.

The RD91 drive is supplied as standard with a graduated handwheel and Vernier scale in 1° increments for accurate positioning. A standard locking screw mechanism allows the drive to be held in position if required.

For automatic operation, there are three versions that incorporates either stepper motor, or an integrated stepper motor with gearbox, or a DC motor drive. This allows a range of speeds, torques, and accuracies to be achieved.

The drive is fully bakeable to +250 °C as standard (motor/gearbox removed) or to +400 °C with some dismantling.

Introduction to the RD91 Series Rotary Drive

The RD91 Series of miniature rotary drives has been designed for high precision use.

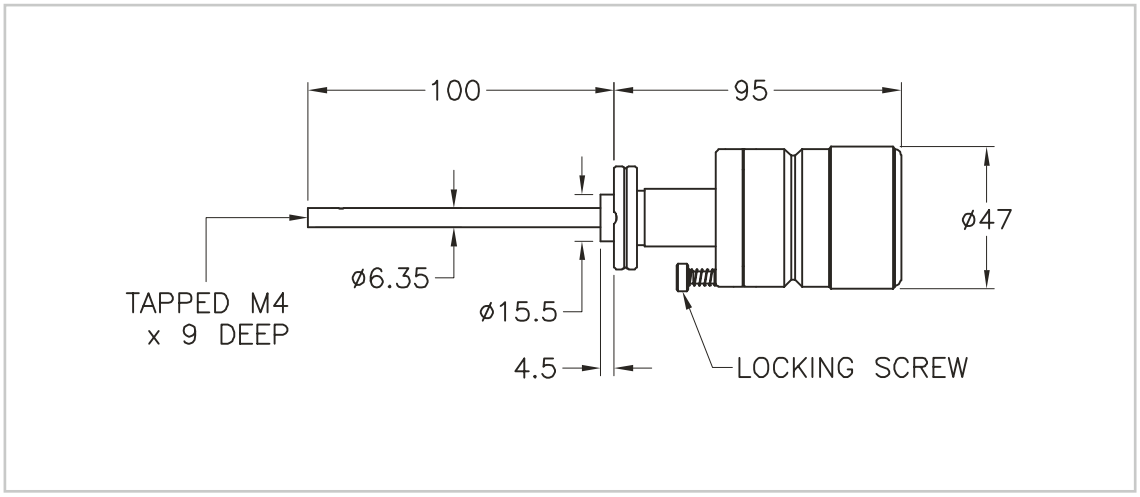
- Mounting flange 34 mm OD
- High precision
- Continuous rotation
- High speed, low torque
- Angular resolution 1°
- Robust
- Manual or motorised

RD91 Series									
Flange OD mm	Flange OD inch	Type of Operation	Resolution	Torque at: 500 rpm	Torque at: 10rpm	Thrust	Gearbox Ratio	Shipping Weight kg	Order Code
34	1.33	Manual	1 degree	0.1 Nm	0.5 Nm	10 N	-	1.5	ZRD91
34	1.33	Stepper Motorised(1)	0.9 degree(2)	0.1 Nm	0.3 Nm	10 N	-	2.5	ZRD91M
34	1.33	Stepper Motorised(1)	0.18 degree(2)	0.3 Nm(at 300rpm)	0.5 Nm	10 N	5:1	3.0	ZRD91MG
34	1.33	DC Motorised(3)	-	0.3 Nm(at 300rpm)	0.5 Nm	10 N	-	4.0	ZRD91DCM

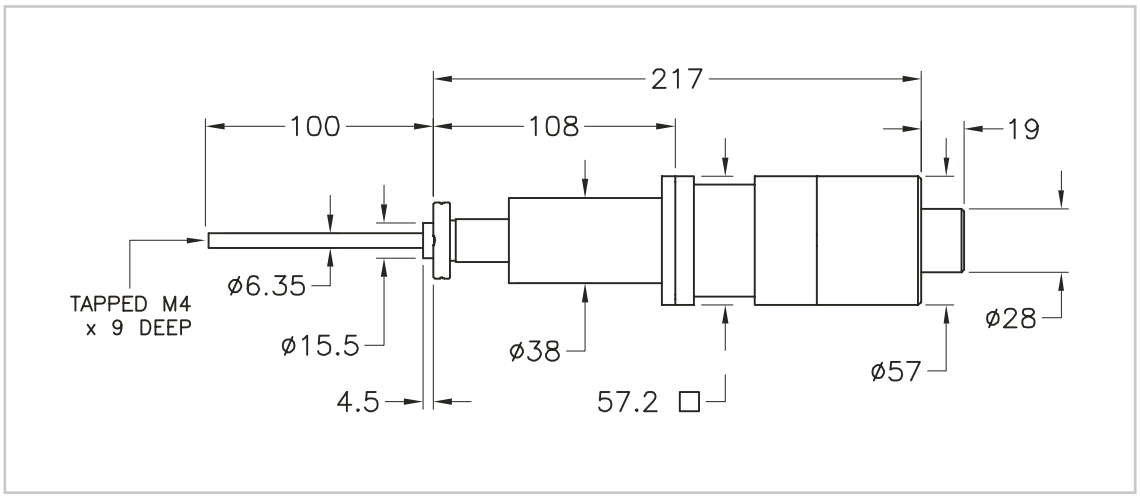
(1) Drive is assembled to stepper motor and is supplied with a wired connector to suit VG Scienta's stepper motor control system. A separate mating connector is available. See pages 376 to 379.
(2) When motorised, this has a resolution of one stepper motor half step.
(3) DC motor supplied with power supply - see page 375.

RD91 Accessories	
Drive Code	Lubrication Kit
ZRD91	ZHPTSLK
ZRD91M	ZHPTSLK
ZRD91DCM	ZHPTSLK

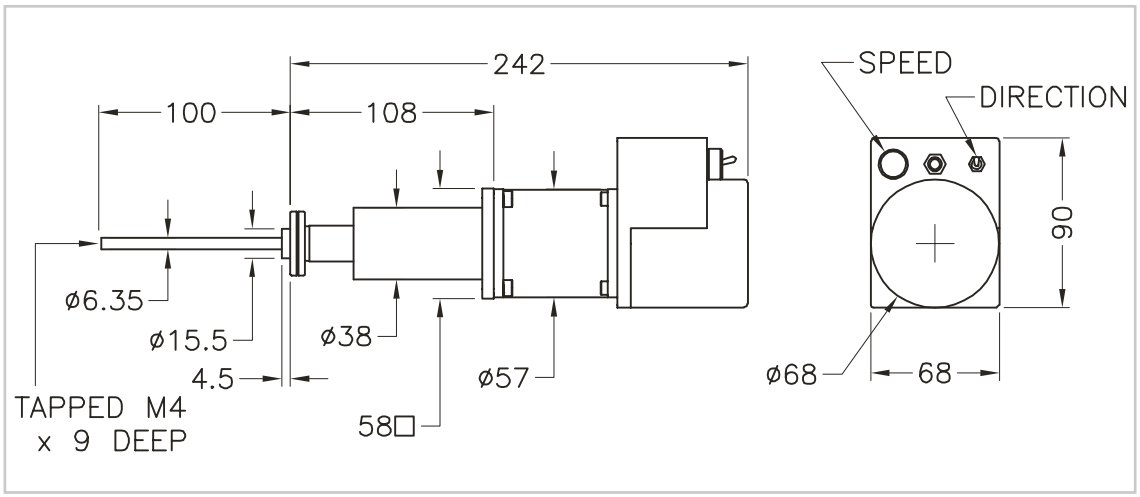
All dimensions in mm.



ZRD91 rotary drive.

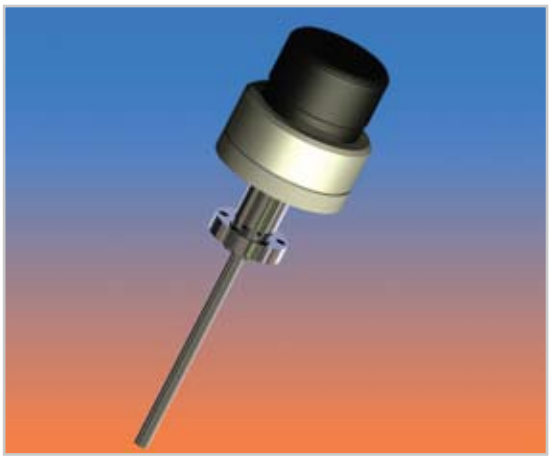


ZRD91MG rotary drive with stepper motor and gearbox.



ZRD91DCM rotary drive with DC motor.

RD91 Rotary Drive Slipping Brake Accessory



IMPORTANT PRODUCT INFORMATION

Please Note - When the brake is fitted to an RD91, the handwheel graduations are no longer visible and the position lock cannot be operated.

Slipping Brake Accessories	
Description	**Order Code**
RD91 Rotary Drive Slipping Brake	ZRD91SB

Introduction to the Rotary Drive Slipping Brake

- Easily fitted to existing RD91 drives (can be field retro-fitted by the customer)
- Easily adjusted in the torque range 0-0.5 Nm (Allen key)
- Fully bakeable to 250 ºC without dismantling

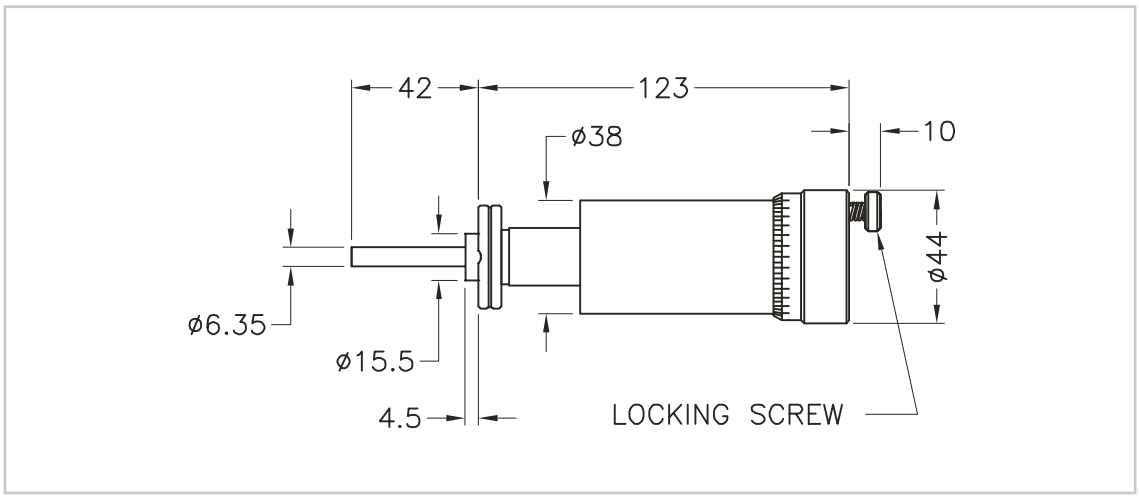
This accessory allows the rotation of an RD91 rotary drive to be controlled with a variable friction device. This device is essential for holding unwanted drive rotations in check, for example when loads that are subjected to gravity would otherwise cause the drive to move.

Typical applications include a vertically mounted rack with a horizontally mounted pinion on an RD91 rotary drive. These devices can be used with the LPR and RLRP linear rack and pinion drives when they are mounted vertically.

Introduction to the RD94 Rotary Drive Series

- Top cap graduated in 5º intervals
- Low angular backlash of ± 1º
- Position lock
- Fully bakeable to 250 ºC without dismantling
- Solid 6.35 mm (1/4 inch) shaft
- 42 mm internal shaft length
- Also available on KF25 flange
- Also available on 70FC flange
- Excellent Torque characteristics:
  0.4Nm @ 10 rpm (56 oz in)
  0.08 Nm @ 400 RPM (the maximum speed)

The drive is supplied as standard with a graduated handwheel and Vernier scale in 1º increments for accurate positioning. A standard locking screw mechanism allows the drive to be held in position if required.



All dimensions in mm.

RD94 Series			
Flange OD mm	Flange OD inch		Order Code
34	1.33		ZRD94
70	2.75		ZRD942
40	1.57		ZRD94K(1)

(1) KF25 mounting flange.

Precision Rotary Drives - RD6, RD6L and RD7 Series

Introduction to the RD6, RD6L and RD7 Series Rotary Drives

- Continuous rotation
- Angular repeatability of 0.5º
- High speed/medium torque
- Rotation lock
- Bakeable to 230 ºC (motor and gearbox removed), and to 400 ºC (partially dismantled)
- Axial load 40 N

The RD6 Drive

The RD6 rotary drive is supplied with a plain (un-graduated) handwheel which includes a position lock and a vee groove for easy motorisation.

The RD6L Drive

The RD6L is an extended life version of the standard RD6 drive. A modified mechanical arrangement results in approximately 10 times the cycle life (30 million revolutions) compared to the standard unit.

The RD7 Drive

As RD6 above, except the rotational shaft is longer (256 mm instead of 100 mm) and the hand wheel has 1.0º graduations. Special versions of the RD7 have incorporated items such as extended bearing housings to support longer shaft lengths. Please contact VG Scienta technical sales department for more information.

RD6, RD6L and RD7 Series

Flange OD mm	Flange OD inch	Type of Rotation	Resolution in Degrees	Torque Nm 300rpm	Torque Nm 10rpm	Gearbox Ratio	Shipping Weight kg	Order Code
70	2.75	Manual	-	0.8	5.0	-	2.3	ZRD6
70	2.75	Manual	-	0.8	5.0	-	2.3	ZRD6L
70	2.75	Stepper Motor	0.9	0.38	0.43	-	3.7	ZRD6MI(1)
70	2.75	Stepper Motor	0.9	0.38	0.43	-	3.7	ZRD6LMI(1)
70	2.75	DC Motor	-	0.38	0.43	-	4.0	ZRD6DCMI(2)
70	2.75	DC Motor	-	0.38	0.43	-	4.0	ZRD6LDMI(2)
70	2.75	Stepper Motor with Gearbox	0.1	0.8	2.0	9:1	4.0	ZRD6MGI(1)
70	2.75	Stepper Motor with Gearbox	0.1	0.8	2.0	9:1	4.0	ZRD6LMGI(1)
70	2.75	Manual	1.0	0.8	5.0	-	2.6	ZRD7
70	2.75	Manual	1.0	0.8	5.0	-	2.6	ZRD7L
70	2.75	Stepper Motor	0.9	0.38	0.43	-	3.7	ZRD7MI(1)
70	2.75	Stepper Motor	0.9	0.38	0.43	-	3.7	ZRD7LMI(1)
70	2.75	DC Motor	-	0.38	0.43	-	4.0	ZRD7DCMI(2)
70	2.75	DC Motor	-	0.38	0.43	-	4.0	ZRD7LDMI(2)
70	2.75	Stepper Motor with Gearbox	0.1	0.8	2.0	9:1	4.0	ZRD7MGI(1)
70	2.75	Stepper Motor with Gearbox	0.1	0.8	2.0	9:1	4.0	ZRD7LMGI(1)

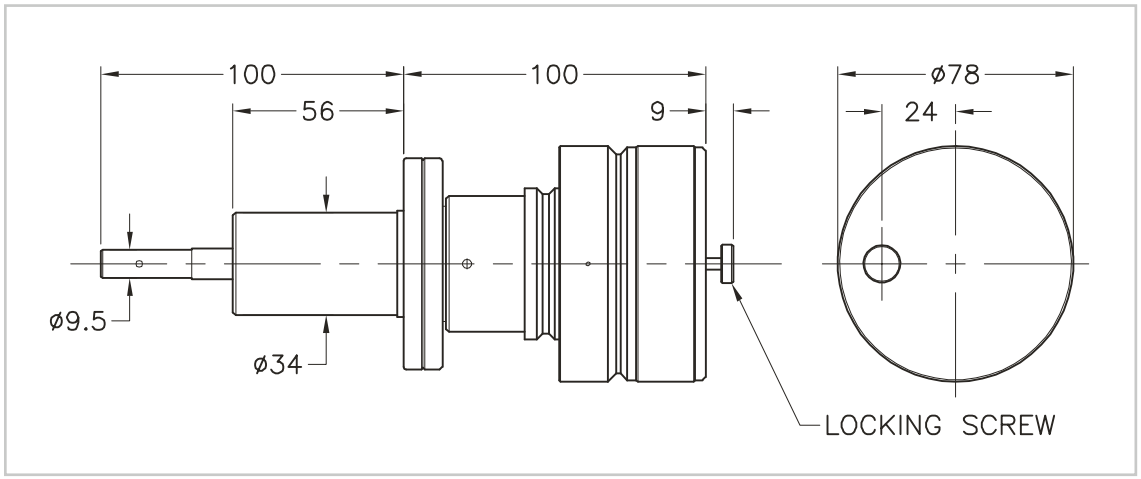
(1) Drive is assembled to stepper motor and is supplied with a wired connector to suit VG Scienta's stepper motor control system. A separate mating connector is available. See pages 376 to 379.

(2) DC motor supplied complete with power supply - see page 375.

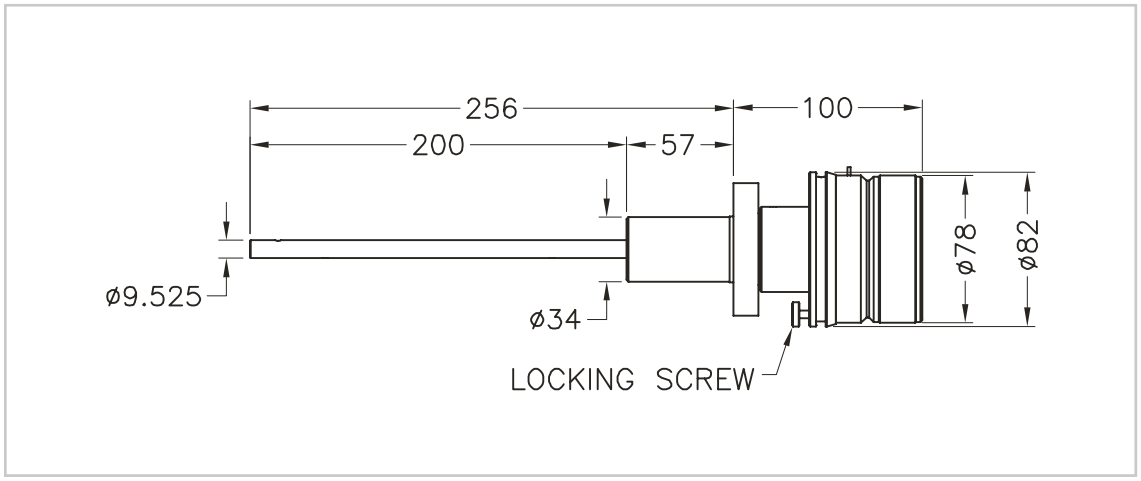
Motorisation

The RD6, RD6L and RD7 can be supplied with either an inline stepper motor or integrated inline stepper motor and gearbox combination. This allows a wide range of speeds, torques and accuracies to be achieved from a single range of drives. Motor achieves 400 half steps per revolution.

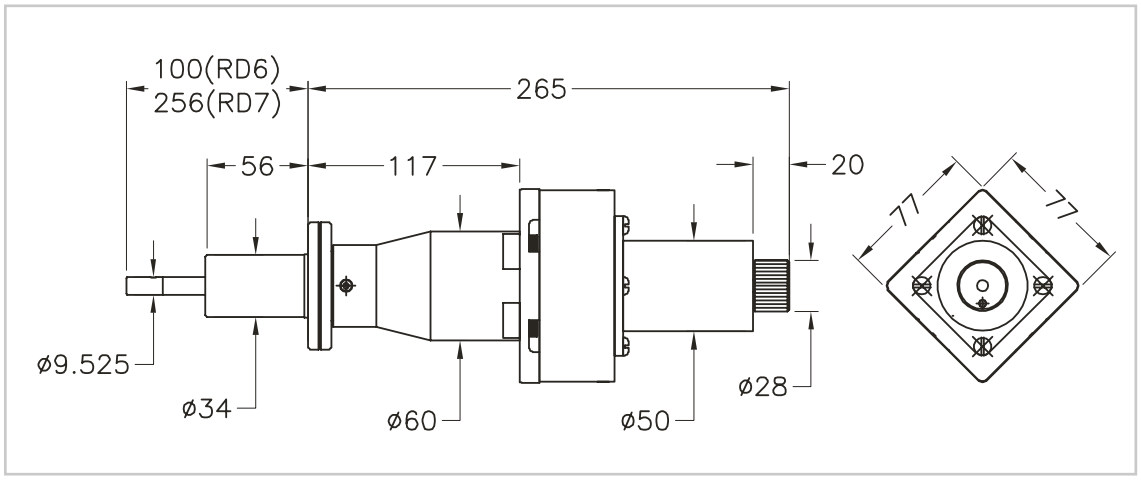
All dimensions in mm.



ZRD6 precision manual rotary drive.



ZRD7 precision manual rotary drive.



ZRD6 and ZRD7 precision rotary drive with inline motor and gearbox (ZRD6MGI and ZRD7MGI).

Rotary Drives - RD1 Series

IMPORTANT PRODUCT INFORMATION

Listed below are some of the available spares and accessories for current rotary drives, plus discontinued units. For major repairs and service we recommend that you return the drives to the factory. Please contact the Service Department or your local Agent for further details.

1 The new RD1 and RD2 motor kits will not fit to an old type RD1S or RD2S rotary drive

2 The old RD1S and RD2S motor kits will not fit to the new style RD1 or RD2 rotary drives.

Remember to choose the correct motor kit to suit the drive that you have.

Please note that if the RD1 drive is ordered with the motor kit then the drive will be supplied assembled to the motor kit.

Introduction to the RD1 Series Rotary Drives

- Low backlash
- Continuous rotation to 500 rpm
- 70 mm OD flange
- Graduated handwheel with Vernier scale
- Axial thrust: rotary shaft 40N, linear shaft 20 N
- Long life bellows
- Bakeable to 230 °C (motors removed)
- Optional stepper motor kits with encoders

The RD1, RD2 and RD224 ranges of rotary drives have been optimised for high precision and low backlash and are the only series of rotary drives approved for use with VG Scienta sample handling.

The RD1 Primary Drive

The RD1 is a low backlash drive providing continuous primary rotation to the 9.52 mm diameter shaft. The movement is operated by the handwheel with 1° divisions and a Vernier scale to provide manual resolution of 0.1°. A position lock is fitted. The main shaft can be extended to suit custom requirements, and an extended bearing housing can be fitted to support longer shafts. Motorisation is available to give 0.01° resolution in half step mode. Adjustable microswitches are included with the R1 motor kit.

RDI Series Drive and Motorisation

Flange OD mm	Flange OD inch	Rotation Range Degrees	Resolution Degrees	Torque Nm 500 rpm	Torque Nm 10 rpm	Shipping Weight kg	Order Code
70	2.75	360(*)	0.1	0.5	5.0	3.0	ZRD1
Stepper Motor Kit R1		+/-168	0.01	4 at 16 rpm max		2.0	ZRDPMK(1)(2)
DC Motor Kit R1		+/-168	-	4 at 16 rpm max		3.0	ZRDPDCMK(3)

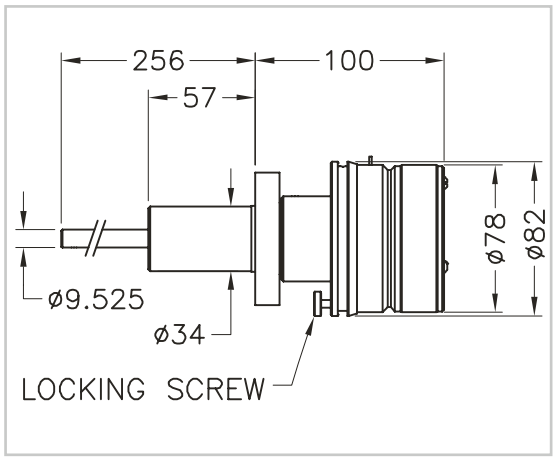
(1) Drive is assembled to stepper motor and is supplied with a wired connector to suit VG Scienta's stepper motor control system. A separate mating connector is available. See pages 376 to 379.

(2) Encoded motor version available; order code is ZRDPMKE.

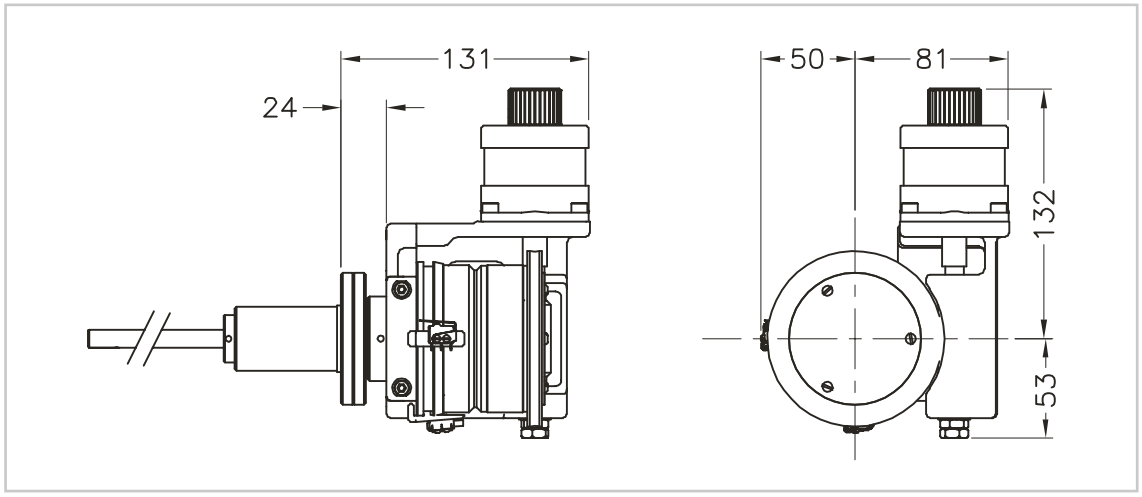
(3) DC motor supplied complete with power supply - see page 375.

(*) Continuous rotation where fixtures on the end of the rotary drive allow this.

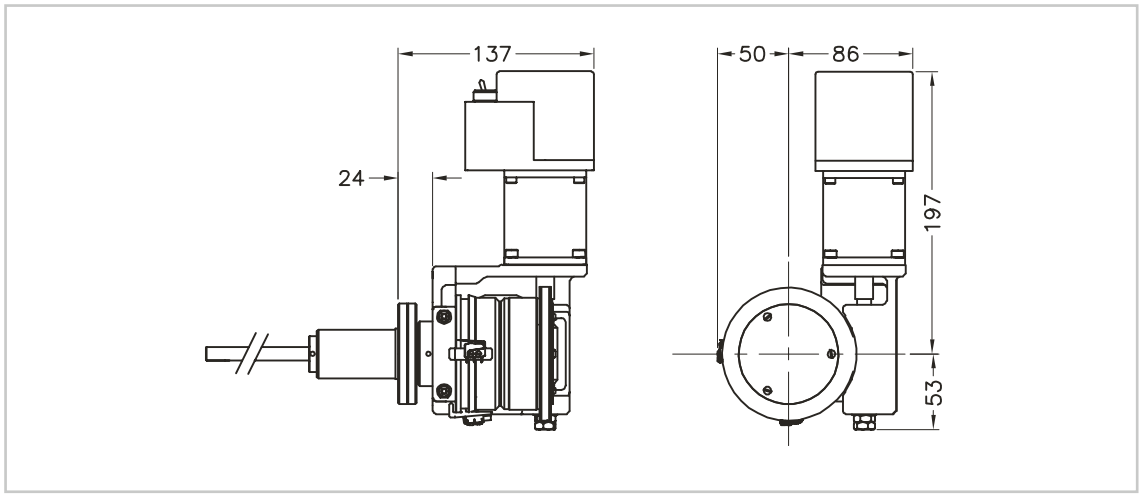
All dimensions in mm.



ZRDI Manual rotary drive.



ZRDI fitted with ZRDPMK stepper motor kit.



ZRDI fitted with ZRDPDCMK DC motor drive kit.

Rotary Drives - RD2 Series

IMPORTANT PRODUCT INFORMATION

Listed below are some of the available spares and accessories for current rotary drives, plus discontinued units. For major repairs and service we recommend that you return the drives to the factory. Please contact the Service Department or your local Agent for further details.

1 The new RD1 and RD2 motor kits will not fit to an old type RD1S or RD2S rotary drive

2 The old RD1S and RD2S motor kits will not fit to the new style RD1 or RD2 rotary drives.

Remember to choose the correct motor kit to suit the drive that you have.

Introduction to the RD2 Series Rotary Drives

- Low backlash
- Continuous rotation to 500 rpm
- 70 mm OD flange
- Graduated handwheel with Vernier scale
- Axial thrust: rotary shaft 40 N, linear shaft 20 N
- Linear shaft movements of 12 and 24 mm
- Long life bellows
- Bakeable to 230 °C (motors removed)
- Optional stepper motor kits

The RDI, RD2 and RD224 ranges of rotary drives have has been optimised for high precision and low backlash and are the only series of rotary drives approved for use with VG Scienta sample handling.

The RD2 Primary and Secondary Drive

The RD2 uses the same primary axis movement as the RD1 and has the full RD1 options of extended shafts and motorisation. In addition, the RD2 is fitted with a high resolution actuator to give 12 mm linear movement. This operates the azimuthal (R2) or tilt (R3) movements of most standard VG Scienta sample holders. The standard linear resolution is 0.02 mm, but angular graduations can be supplied. The secondary axis can also be motorised to give 0.05 microns resolution in half step mode. Adjustable microswitches are included with the R2 motor kit.

RD2 Series Drive and Motorisation

Flange OD mm	Flange OD inch	Rotation Primary Degrees	Rotation Secondary Motion	Resolution Primary Degrees	Resolution Secondary mm	Torque Primary Nm 500 rpm	Torque Primary Nm 10 rpm	Shipping Weight kg	Order Code
70	2.75	360(*)	12mm	0.1	0.02	0.5	5.0	3.0	ZRD2
70	2.75	360(*)	24mm	0.1	0.02	0.5	5.0	3.0	ZRD224
Stepper Motor Kit R1		+/-168	-	0.01	-	4 at 16 rpm max		2.0	ZRDPMK(1)(2)
Stepper Motor Kit R2		-	12mm	0.01	18 steps per	-	-	1.0	ZRDSMK(1)
		linear			0.005 mm	9:1	-	-	
DC Motor Kit R1		+/-168	-	-	-	4 at 16 rpm max		3.0	ZRDPDCMK(3)

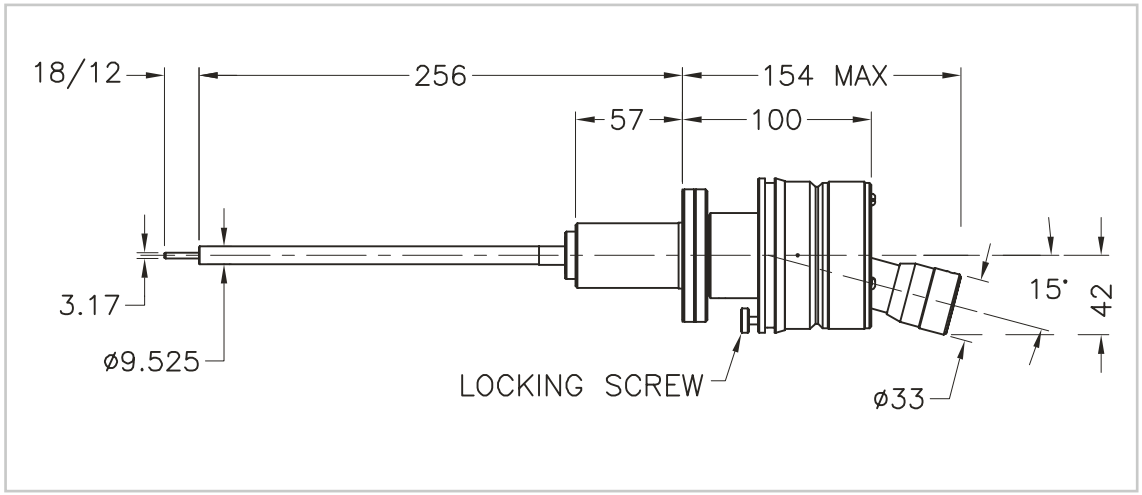
(1) Drive is assembled to stepper motor and is supplied with a wired connector to suit VG Scienta's stepper motor control system. A separate mating connector is available. See pages 376 to 379.

(2) Encoded motor version is available for the primary drive; order code is ZRDPMKE.

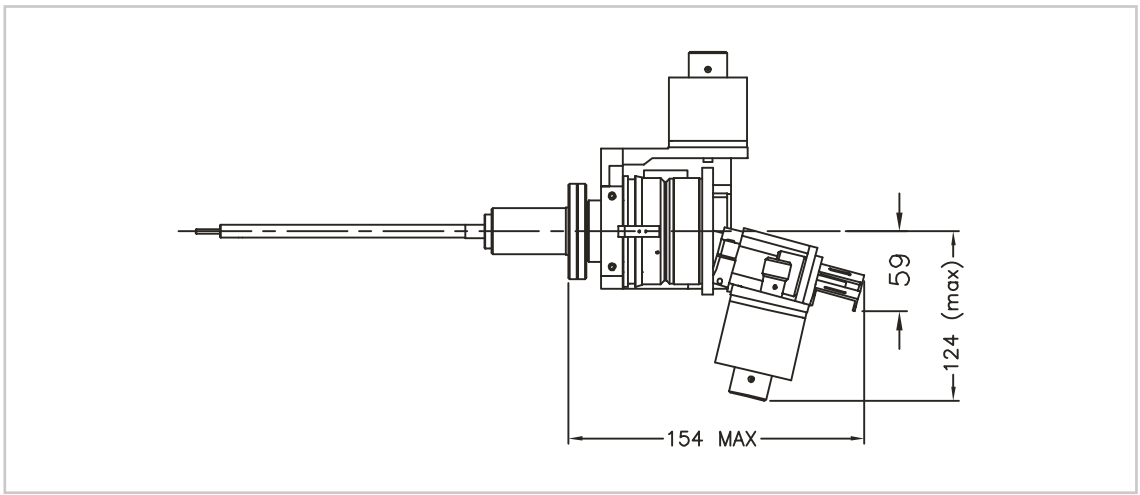
(3) DC motor supplied complete with power supply - see page 375.

(*) Continuous rotation where fixtures on the end of the rotary drive allow this.

All dimensions in mm.



ZRD2 manual primary and secondary rotary drive.



ZRD2 with both primary and secondary drive axis fitted with stepper motors. For details of motorisation of the primary rotation only, see drawings on page 221.

Rotary Drive Primary and Full Secondary - RD224 Series

IMPORTANT PRODUCT INFORMATION

Listed below are some of the available spares and accessories for current rotary drives, plus discontinued units. For major repairs and service we recommend that you return the drives to the factory. Please contact the Service Department or your local Agent for further details.

1 The new RD1 and RD2 Motor kits will not fit to an old type RD1S or RD2S rotary drive

2 The old RD1S and RD2S Motor kits will not fit to the new style RD1 or RD2 rotary drives.

Remember to choose the correct motor kit to suit the drive that you have.

Introduction to the RD224 Series Primary and Full Secondary Drive

- Low backlash
- Continuous rotation to 500 rpm
- 70 mm OD Flange
- Graduated handwheel with Vernier scale
- Axial thrust rotary shaft 40 N, linear shaft 20 N
- Linear shaft movements of 24 mm
- Long life bellows
- Bakeable to 230 °C (motors removed)
- Optional stepper motor kits

The RD1, RD2 and RD224 ranges of rotary drives have been optimised for high precision and low backlash and is the only series of rotary drives approved for use with VG Scienta sample handling.

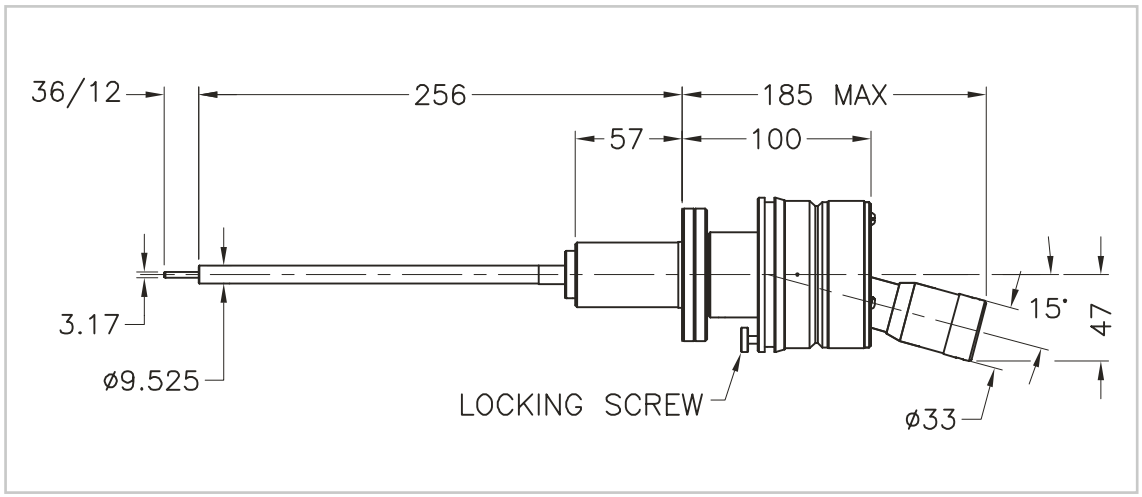
The RD224 uses the same primary axis movement as the RD1. The secondary movement is similar to that used on the RD2 but the travel has been increased to 24 mm linear motion. This operates the SH2F sample holder through ± 180° of azimuthal (R2) rotation. Both primary and secondary rotation axes can be motorised (stepper motor).

RD224 Series Drive and Motorisation

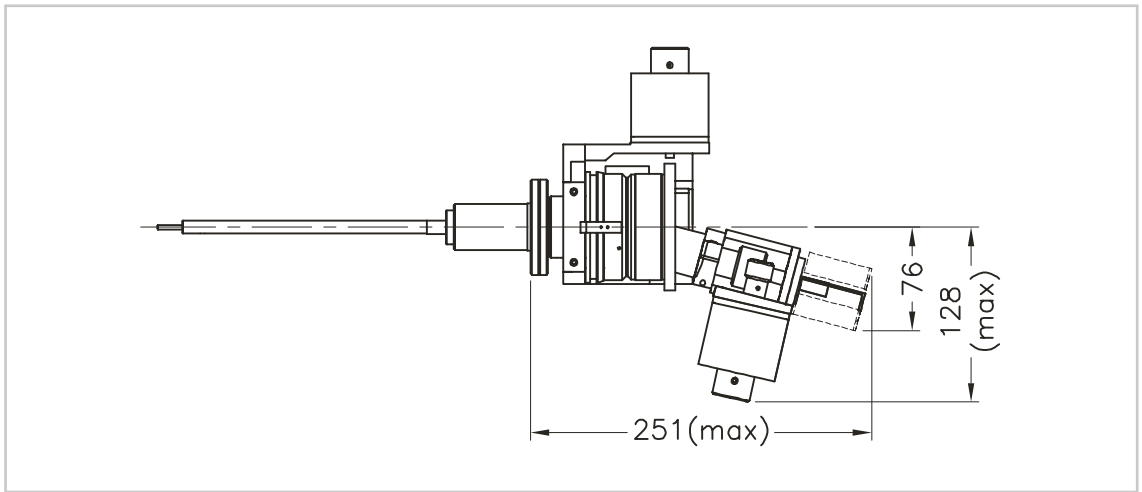
Dimensions mm	Dimensions inch	Rotation Primary degrees	Rotation Secondary motion	Resolution Primary degree	Resolution Secondary mm	Torque - Primary Nm 500 rpm	Torque - Primary Nm 10 rpm	Shipping Wt kg	Order Code
70	2.75	360(*)	24 mm	0.1	0.02	0.5	5.0	3.0	ZRD224
Stepper Motor Kit R1		+/-168	-	0.01	-	4 at 16 rpm max		2.0	ZRDPMK(1)(2)
Stepper Motor Kit R2		- linear	12 mm	0.01	18 steps per 0.005 mm	- 9:1	- -	1.0 -	ZRDSMK22(1)(3)
DC Motor Kit R1		+/-168	-	-	-	4 at 16 rpm max		3.0	ZRDPDCMK(4)

(1) Drive is assembled to stepper and is supplied with a wired connector to suit VG Scienta's stepper motor control system. A separate mating connector is available. See pages 376 to 379.
(2) Encoded motor version is available for primary drive; order code is ZRDPMKE.
(3) ZRDSMK22 is supplied with encoded stepper motor.
(4) DC motor supplied complete with power supply, see page 375.
(*) Continuous rotation where fixtures on the end of the rotary drive allow this.

All dimensions in mm.



ZRD224 primary and full secondary motion manual rotary drive.



ZRD224 with primary and secondary motion motorised. For details of motorisation of the primary rotation only, see drawings on page 221.

Magnetically-coupled Rotary Drives - MRD Series

Introduction to Magnetic Rotary Drives

- Vacuum enclosure machined from single piece of 316 stainless steel
- No vacuum seals or bellows - no leaks to atmosphere
- Exceptional torsional rigidity
- Zero angular backlash under low load/ acceleration
- Cannot be damaged by application of excessive torque
- Long service life
- Bakeable to 250 °C (standard UHV drive)
- Stepper motor can be fitted/removed in minutes

Many vacuum processes require a sample or other component to be rotated. This can range from something as simple as spinning an attenuating chopper wheel to accurately moving a sample face from one analyser to another.

The new MRD Series Magnetic Rotary Drive uses a high strength rare-earth magnetic coupling to transfer the rotational forces into the vacuum envelope. This is achieved without any dynamic seals or bellows. The vacuum enclosure, complete with CF flange, is machined from a single billet of material. Therefore many of the problems associated with conventional stainless steel drive bellows, such as leaks to atmosphere, are completely eliminated.

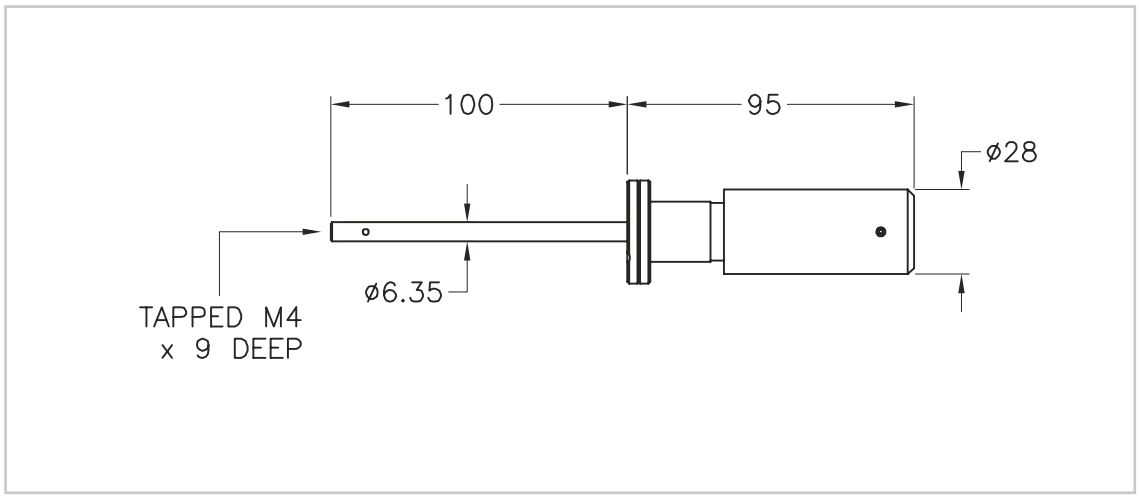
MRD Series Magnetic Rotary Drives employ high strength rare-earth magnets to give exceptional levels of torsional rigidity. However, if the recommended input torque is exceeded, the magnetic coupling will simply 'cog' over to the next position. As there is no actual mechanical connection the drive will not be damaged. All MRD series magnetic rotary drives are extremely robust and utilise large, highly specified bearings to ensure long service life. All drives are fitted with magnetic shielding as standard.

MRD Series Magnetic Rotary Drives are available in both manual and motorised options. The motor kits are designed to be easily removed or replaced in minutes for bakeout purposes, and motor kits can be easily retrofitted to most manual drives.

Manual Magnetic Rotary Drive Range - MRD93 Series

- Manual operation only
- Single piece vacuum housing
- Standard drive is bakeable to 250 ºC
- Extended life version available
- Special bearing options and shaft lengths are available

All dimensions in mm.



ZMRD93 manual magnetically-coupled rotary drive.

Technical Data: ZMRD93	
Leak Rate	$<1x10^{-10}$ mbar $l.s^{-1}$
Pressure Range	$1x10^{-10}$ mbar - 2 bar absolute
Temperature Range	250 °C standard UHV drives
	200 °C Extended life drives
Materials	Body - 316 stainless steel
	Mechanical parts - aluminium alloy - grade 6082
	Bearings - stainless steel
	Magnets - sintered rare-earth
Lubrication	Dry film molybdenum disulphide (standard UHV drives)
	UHV compatible lubricant (extended life drives)
Actuation	Manual
Options	Ceramic bearing options, special shaft length/diameters, available on request.

MRD93 Magnetically-coupled Rotary Drive								
Flange OD mm	Flange OD inch	Type of Operation	Breakaway Torque Nm	Thrust N	Max Rotation RPM	Shipping Weight gg	Order Code Standard UHV	Order Code Extended Life
34	1.33	Manual	0.5	10.0	1000	0.3	ZMRD93	ZMRD93L

Manual and Motorised Magnetic Rotary Drive - MRD91 Series

Introduction to Magnetic Rotary Drives:

- Vacuum enclosure machined from single piece of 316 stainless steel
- No vacuum seals or bellows - no leaks to atmosphere
- Exceptional torsional rigidity
- Zero angular backlash under low load/ acceleration
- Cannot be damaged by application of excessive torque
- Long service life
- Bakeable to 250 °C (standard UHV drive)
- Motor can be fitted/removed in minutes
- Manual drive has V-groove in drive knob for alternative motorisation

Technical Data: ZMRD91	
Leak Rate	$<1 \times 10^{-10}$ mbar l.s^{-1}
Pressure Range	1×10^{-10} mbar - 2 bar absolute
Temperature Range	250 °C Standard UHV drives (with motor/gearbox removed)
	200 °C Extended life drives (with motor/gearbox removed)
Materials	Body - 316 stainless steel
	Mechanical parts - aluminium alloy - grade 6082
	Bearings - stainless steel
	Magnets - sintered rare-earth
Lubrication	Dry film molybdenum disulphide (standard UHV drives)
	UHV compatible lubricant (extended life drives)
Actuation	Manual, Stepper Motor, Encoder, DC Motor
Options	Ceramic bearing options, special shaft length/diameters, available on request.

MRD91 Magnetically-coupled Rotary Drives

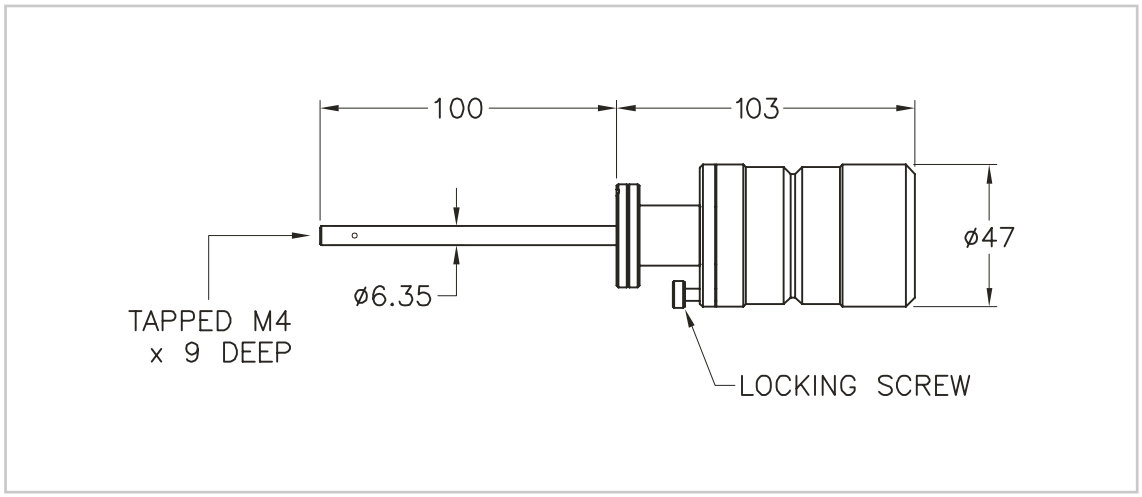
Flange OD mm	Flange OD inch	Type of Operation	Breakaway Torque Nm	Thrust N	Max Rotation RPM	Shipping Weight kg	Order Code Standard UHV	Order Code Extended Life
34	1.33	Manual	0.5	10.0	1000	0.7	ZMRD91	ZMRD91L
34	1.33	Stepper Motor	0.5	10.0	1000	1.0	ZMRD91M(1)	ZMRD91ML(1)
34	1.33	DC Motor	0.5	10.0	1000	1.0	ZMRD91D(2)	ZMRD91DL(2)
34	1.33	Encoded Stepper	0.5	10.0	1000	1.0	ZMRD91ME(1)	ZMRD91LE(1)

(1) Drive is assembled to stepper motor and is supplied with a wired connector to suit VG Scienta's stepper motor control system. A separate mating connector is available. See pages 376 to 379.

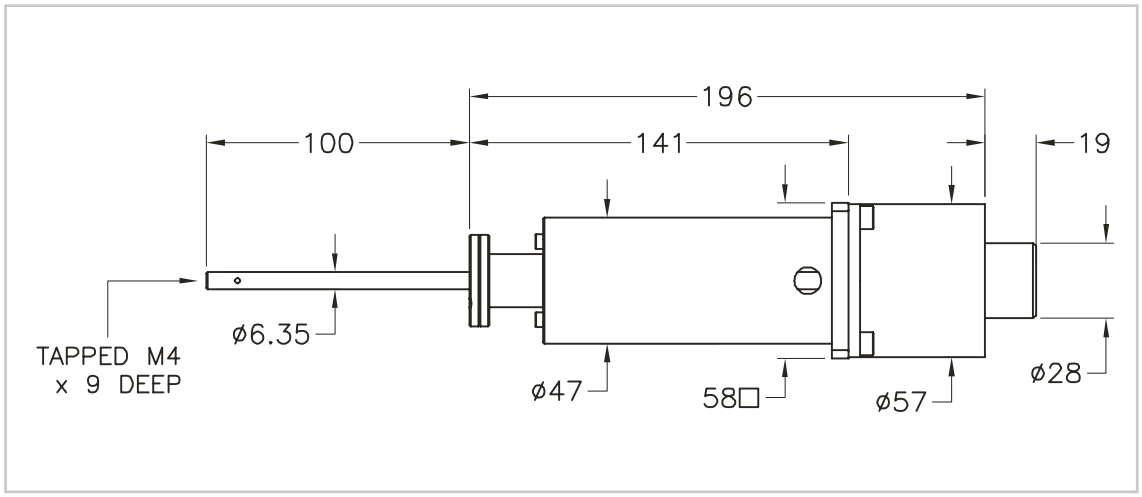
(2) DC motor supplied complete with power supply - see page 375.

Manual and Motorised Magnetic Rotary Drive - MRD91 Series

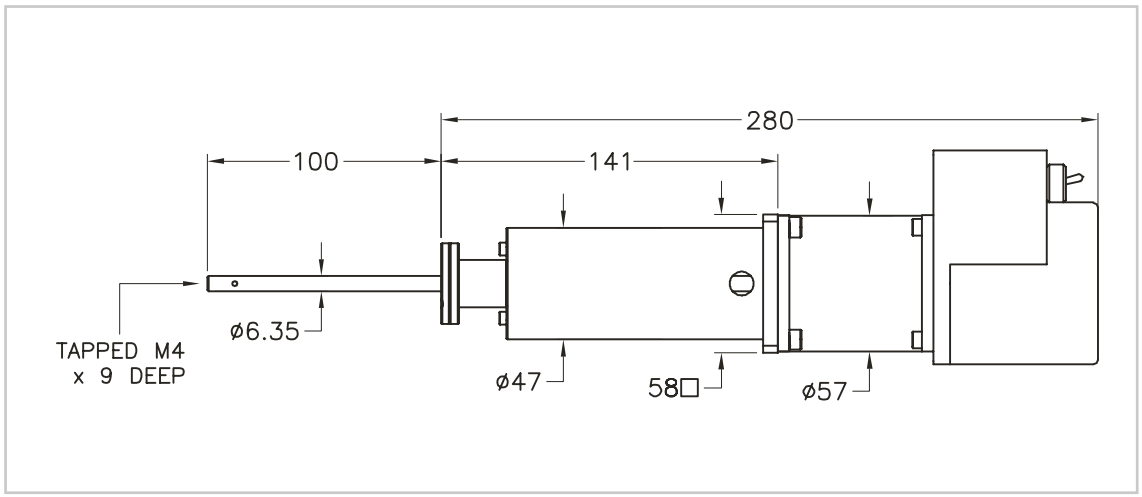
All dimension in mm.



ZMRD91 manual operation.



ZMRD91M stepper motor drive.



ZMRD91D DC motor drive.

Manual and Motorised Long-Life Magnetic Rotary Drives - MRD6 Series

- Vacuum enclosure machined from single piece of 316 stainless steel
- No vacuum seals or bellows - no leaks to atmosphere
- Exceptional torsional rigidity
- Zero angular backlash under low load/ acceleration
- Cannot be damaged by application of excessive torque
- Long service life
- Bakeable to 250 °C (standard UHV drive)
- Motor can be fitted/removed in minutes
- Manual drive has V-groove in drive knob for alternative motorisation

Technical Data: ZMRD6	
Leak Rate	$<1x10^{-10}$ mbar $l.s^{-1}$
Pressure Range	$1x10^{-10}$ mbar - 2 bar absolute
Temperature Range	250 °C Standard UHV drives (with motor/gearbox removed)
	200 °C Extended life drives (with motor/gearbox removed)
Materials	Body - 316 stainless steel
	Mechanical parts - aluminium alloy - grade 6082
	Bearings - stainless steel
	Magnets - sintered rare-earth
Lubrication	Dry film molybdenum disulphide (standard UHV drives)
	UHV compatible lubricant (extended life drives)
Actuation	Manual, Stepper Motor, Encoder, DC Motor
Options	Ceramic bearing options, special shaft length/diameters, available on request.

MRD6 Magnetically-coupled Rotary Drives

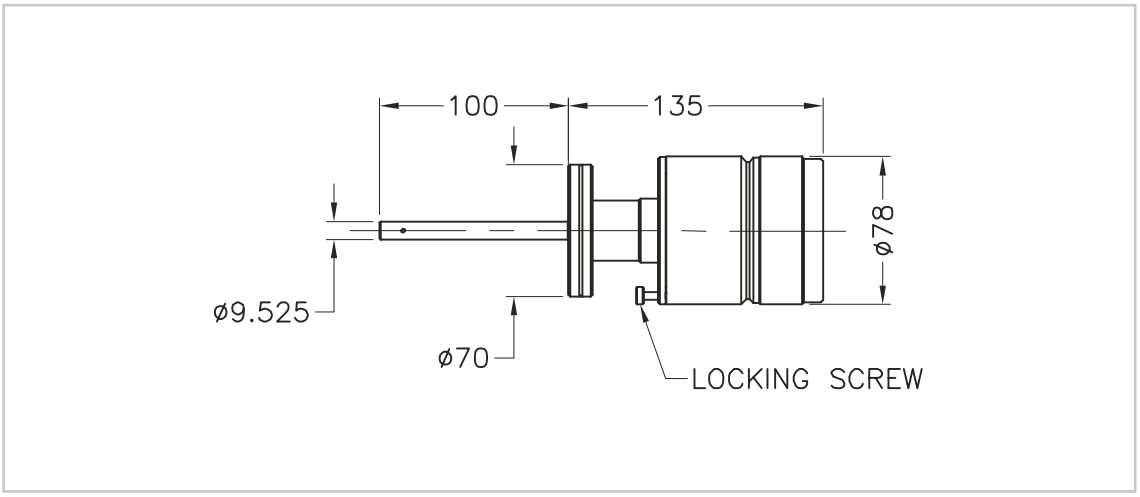
Flange OD mm	Flange OD inch	Type of Operation	Breakaway Torque Nm	Thrust N	Max Rotation RPM	Shipping Weight kg	Order Code Standard UHV	Order Code Extended Life
70	2.75	Manual	4.0	10.0	500	2.0	ZMRD6	ZMRD6L
70	2.75	Stepper Motor	4.0	10.0	500	2.3	ZMRD6M(1)	ZMRD6ML(1)
70	2.75	DC Motor	4.0	10.0	500	2.5	ZMRD6D(2)	ZMRD6DL(2)
70	2.75	Encoded Stepper	4.0	10.0	500	2.3	ZMRD6DME(1)	ZMRD6MEL(1)

(1) Drive is assembled to stepper motor and is supplied with a wired connector to suit VG Scienta's stepper motor control system. A separate mating connector is available. See pages 376 to 379.

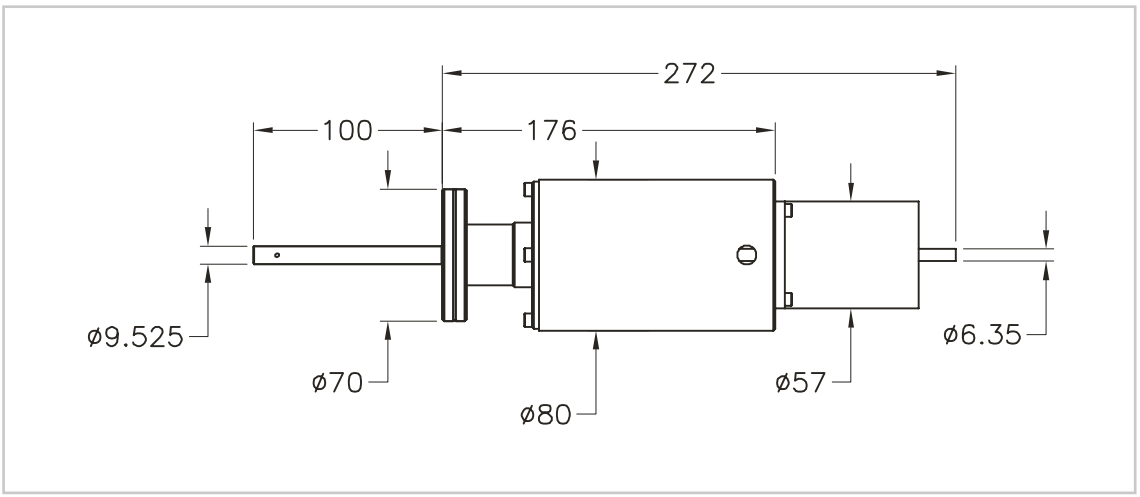
(2) DC motor supplied complete with power supply - see page 375.

Manual and Motorised Long-Life Magnetic Rotary Drives - MRD6 Series

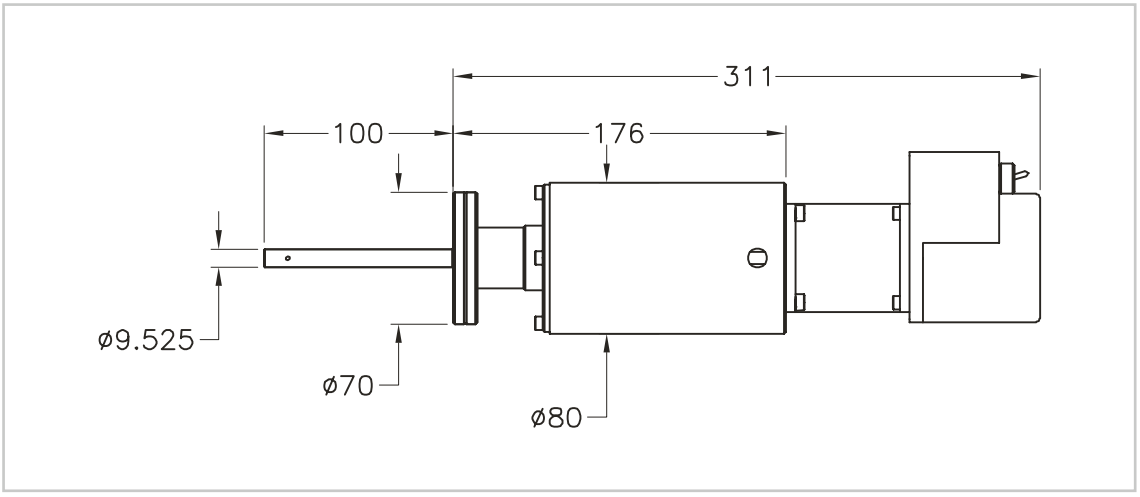
All dimensions in mm.



ZMRD6 manual drive.

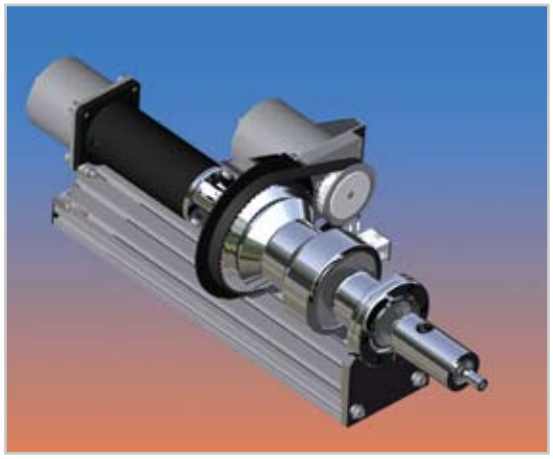


ZMRD6M Stepper motor drive.



ZMRD6D DC motor drive.

Hollow Magnetic Rotary Drives



In addition to our standard magnetic drive range, VG Scienta works on a great many bespoke product variants. The new coaxial hollow magnetic drive originally started as a bespoke drive for a customer requirement but has great potential for use in semiconductor and deposition applications.

The assembly features two concentrically running drives. One, based on our standard MRD91, fits through a wide bore hollow version of our MRD6. This allows, for example, the sample and the table to be rotated in the same or opposite directions as well as at different speeds. One of the benefits of this design is that the MRD6 has a high torque of approximately 4 Nm.

For more information on hollow magnetic drives please contact your local sales representative.

Differentially Pumped Rotary Feedthroughs - DPRF Series

Introduction to the DPRF Range

Differentially pumped rotary feedthroughs (DPRF's) are of annular construction to enable a probe or similar device to be inserted into a UHV environment and rotated.

There are three versions of DPRF; coarse, manual high precision, and motorised high precision. The coarse version uses a steel bar to attain manual rotation, the high precision version uses a worm and wheel gearing to attain manual rotation, and the motorised version uses a stepper motor linked to the worm and wheel to obtain driven rotation. All of the DPRF's have high thrust and radial load capacities; see technical information for more details.

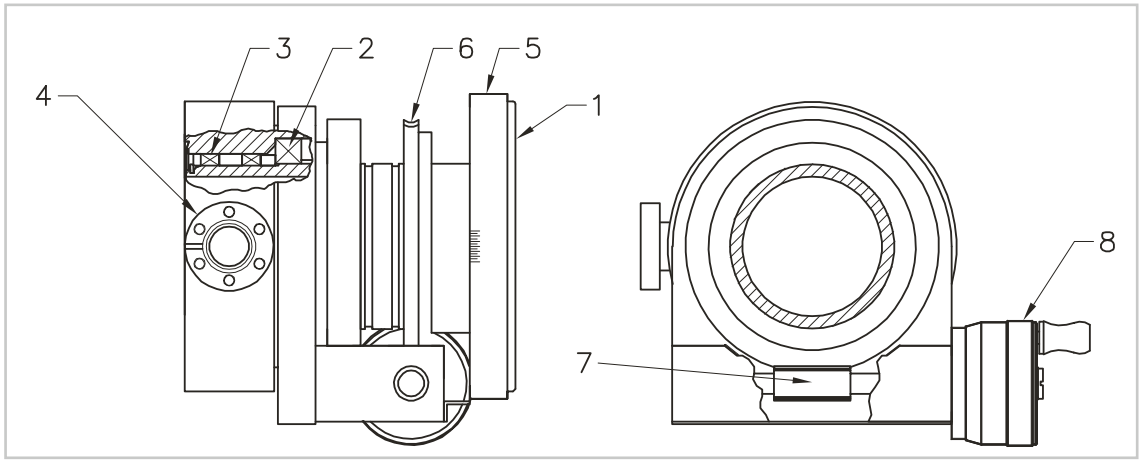
The DPRF may be used in conjunction with an appropriate high precision translator (see the manipulation section later in this catalogue). In this case you have the option of including an internal bearing support tube as part of the rotating assembly. This is recommended when the item that is required to be rotated needs additional support. As an example, a DPRF coupled to an Omniax manipulator with a rotating support tube is used to hold and rotate the liquid helium cryostat in the Cryoax manipulator.

Method of Operation

The vacuum envelope is constructed from stainless steel and all non-demountable joints are welded.

The rotating member (1) is supported by two deep groove ball bearings (2) and is sealed to the housing by two separated PTFE 'U' seals (3), the sealing surfaces having a super polished sealing surface. The interspace between the two 'U' seals is connected to a 34 mm OD mini flange (4) projecting radially from the body.

The differential pumping connection is made to this flange. An engraved protractor ring (5) is adjustable for rotary position. The precision and motorised DPRF's have a gear system (6 and 7) which drives the rotating housing either by means of a calibrated handwheel (8) or by means of a stepper motor.



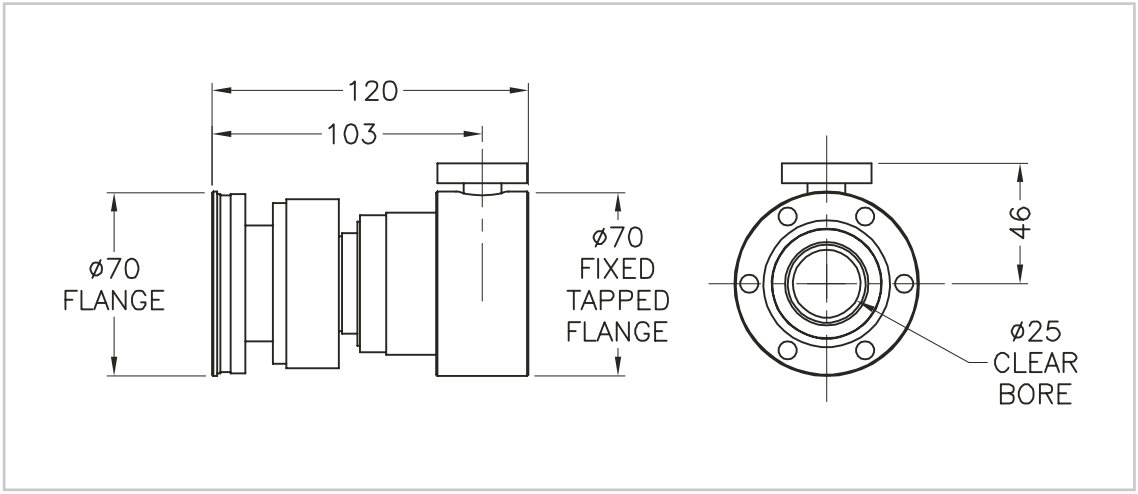
Main components of the DPRF rotary feedthrough.

Differentially Pumped Rotary Feedthrough - DPRF25 Series

Introduction to the DPRF25 Range

- Continuous rotation
- 25 mm clear bore on 70mm OD Conflat flanges
- 55 mm clear bore versions on 114 mm OD Conflat flanges
- Interspace pumping to 10^{-2} mbar via 34 mm OD Conflat flange
- Coarse or High Precision versions
- Replaceable PTFE seals
- Fully bakeable
- Optional stepper motor and DC motor versions

All dimensions in mm.



ZDPRF25 manual rotary feedthrough.

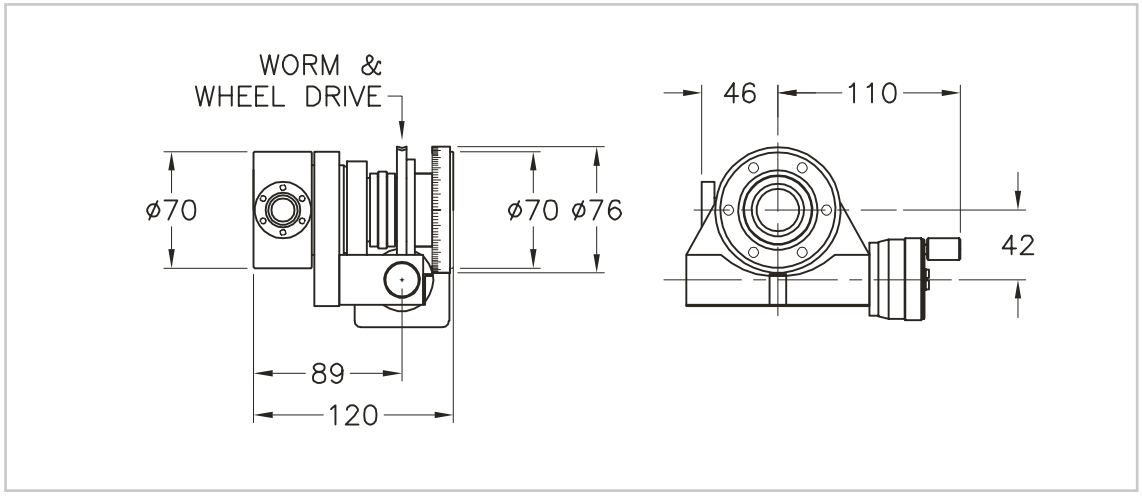
ZDPRF25 Series Rotary Feedthrough

Flange OD mm	Flange OD inch	Rot Flange Holes	Fixed Flange Holes	Type	Resolution Degrees	Max Rotation Speed	Torque to Rotate	Maximum Load Axial	Maximum Load Radial[3]	Bakeout Temp °C	Shipping Wt kg	Order Codes
70	2.75	Clear	TappedM6	Manual	2.0	-	4 Nm	80 kg	9 Nm	230	3.5	ZDPRF25
70	2.75	Clear	Tapped M6	High Precision	0.05	1.5 rpm	0.2 Nm	80 kg	9 Nm	230	4.0	ZDPRF25H
70	2.75	Clear	Tapped M6	Stepper Motor	0.01	3.0 rpm	-	80 kg	9 Nm	230[1]	5.5	ZDPRF25M[2]
70	2.75	Clear	Tapped M6	DC Motor	-	3.0 rpm	-	80 kg	9 Nm	230[1]	7.0	ZDPRF25D[4]

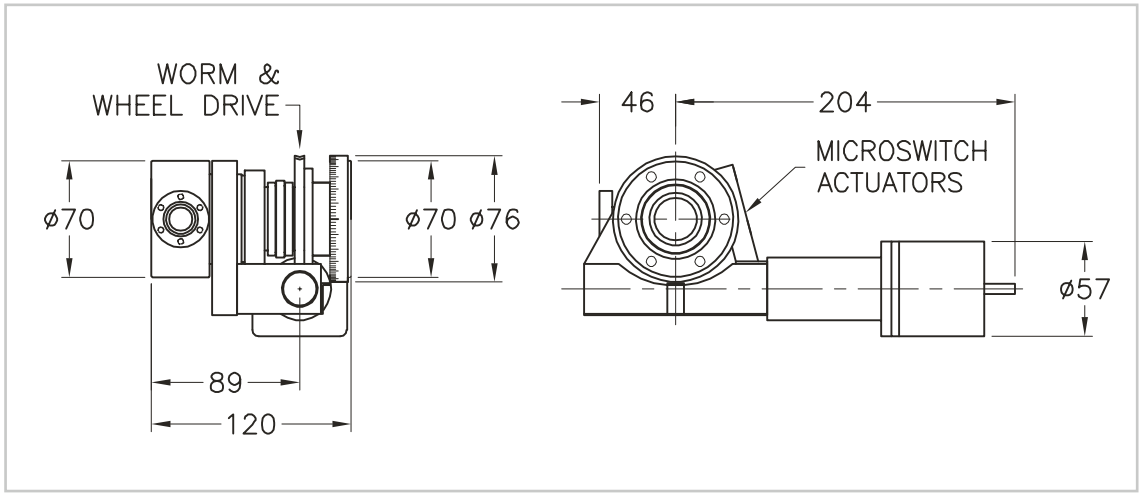
(1) With stepper motor removed from drive.
(2) Drive is assembled to stepper motor and is supplied with a wired connector to suit VG Scienta's stepper motor control system. A separate mating connector is available. See pages 376 to 379.
(3) Radial load is given as a force acting at a distance from the mounting flange.
(4) DC motor supplied complete with power supply - see page 375.

Differentially Pumped Rotary Feedthrough - DPRF25 Series

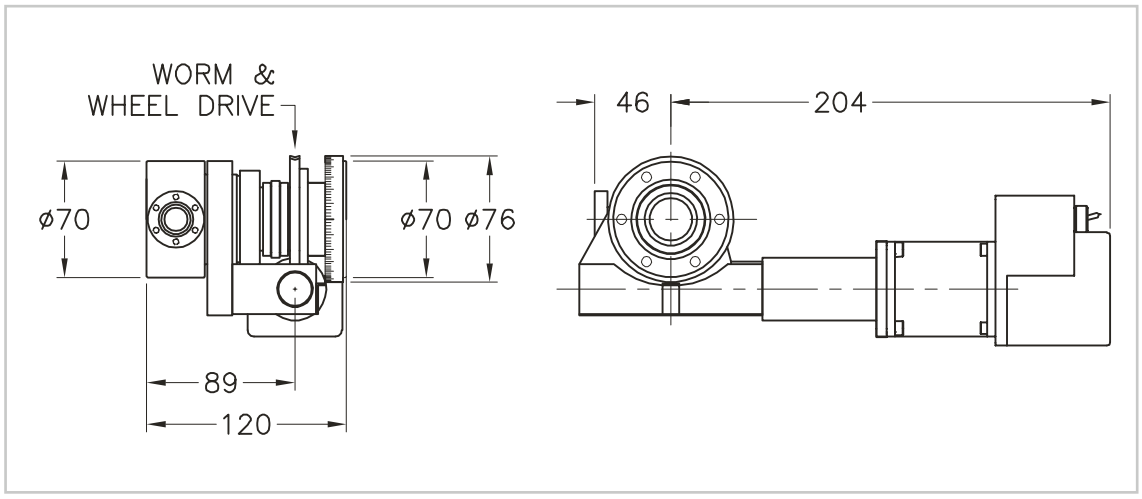
All dimensions in mm.



ZDPRF25H high precision manual handwheel drive.



ZDPRF25M high precision stepper motor drive.



ZDPRF25D high precision DC motor drive.

Differentially Pumped Rotary Feedthrough - DPRF25 Series

IMPORTANT PRODUCT INFORMATION

Apart from regular lubrication as outlined in the operating instructions, there are few serviceable parts on a DPRF. The only parts that can be replaced are the PTFE seals which are used (and should be changed) in pairs. The seals are described in the table below. Any damage to the sealing surfaces will not be cured by changing the seals and the unit must then be returned to the factory for repairs. Please contact the Service Department or your local agent for further details.

ZDPRF25 Series - Spares and Accessories

DPRF Drive Order Code	Spare Seals Order Code	Seal Qty	Nut and Bolt Kit Order Code Flange[1] Top	Bottom	Pump Port
ZDPRF25	XSMS07	2	ZM6B35	ZM6B25	ZM4B20
ZDPRF25H	XSMS07	2	ZM6B35	ZM6B25	ZM4B20
ZDPRF25M	XSMS07	2	ZM6B35	ZM6B25	ZM4B20
ZDPRF25D	XSMS07	2	ZM6B35	ZM6B25	ZM4B20

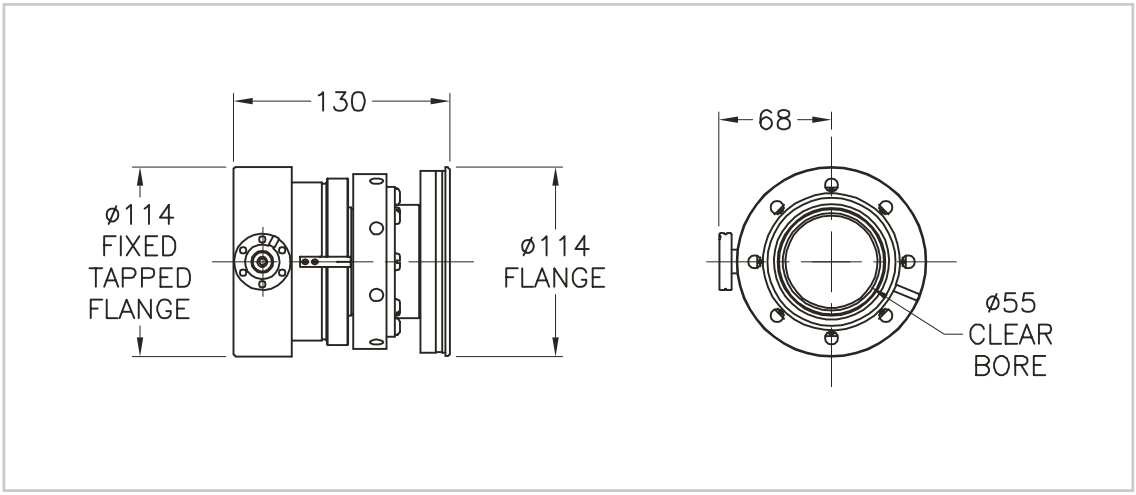
(1) Top is taken to mean rotating flange, and bottom to mean fixed body flange.

Differentially Pumped Rotary Feedthrough - DPRF55 Series

Introduction to the DPRF55 Range

- Continuous rotation
- 55 mm clear bore versions on 114 mm OD Conflat flanges
- Interspace pumping to 10^{-2} mbar via 34 mm OD Conflat flange
- Coarse or High Precision versions
- Replaceable PTFE seals
- Fully bakeable
- Optional stepper motor and DC motor versions
- Optional double differentially - pumped version

All dimensions in mm.



ZDPRF55 manual rotary feedthrough.

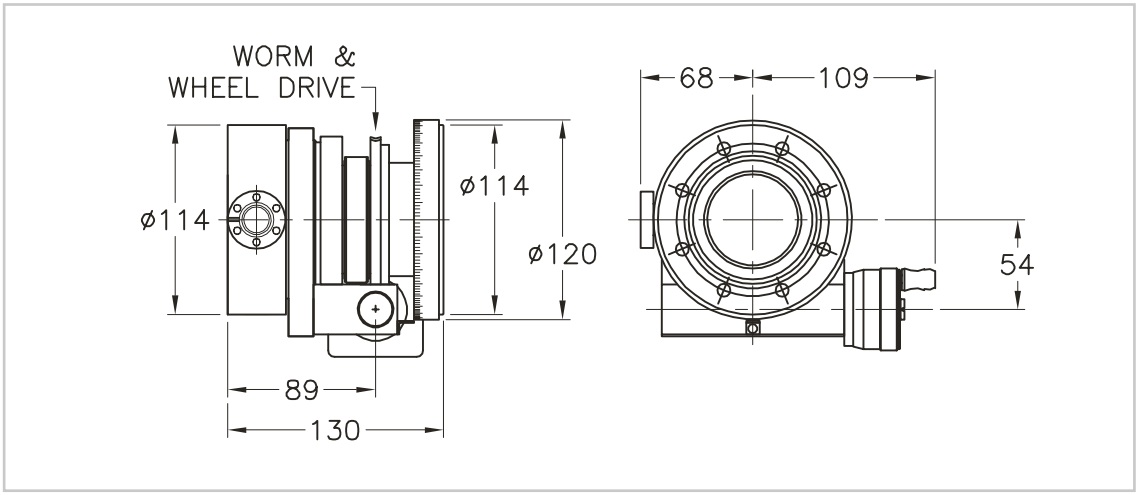
ZDPRF55 Series Rotary Feedthrough

Flange OD mm	Flange OD inch	Rot Flange Holes	Fixed Flange Holes	Type	Resolution Degrees	Max Rotation Speed	Torque to Rotate	Maximum Load Axial	Maximum Load Radial[3]	Bakeout Temp °C	Shipping Wt kg	Order Code
114	4.50	Clear	Tapped M8	Manual	2.0	-	8 Nm	130 kg	10 Nm	230	4.5	ZDPRF55
114	4.50	Clear	Tapped M8	High Precision	0.05	1.0 rpm	0.2 Nm	130kg	10 Nm	230	5.0	ZDPRF55H
114	4.50	Clear	Tapped M8	Stepper Motor	0.0075 per half step	2.0 rpm	-	130 kg	10 Nm	230[1]	6.5	ZDPRF55M[2]
114	4.50	Clear	Tapped M8	DC Motor	-	2.0 rpm	-	130 kg	10 Nm	230[1]	8.0	ZDPRF55D[4]

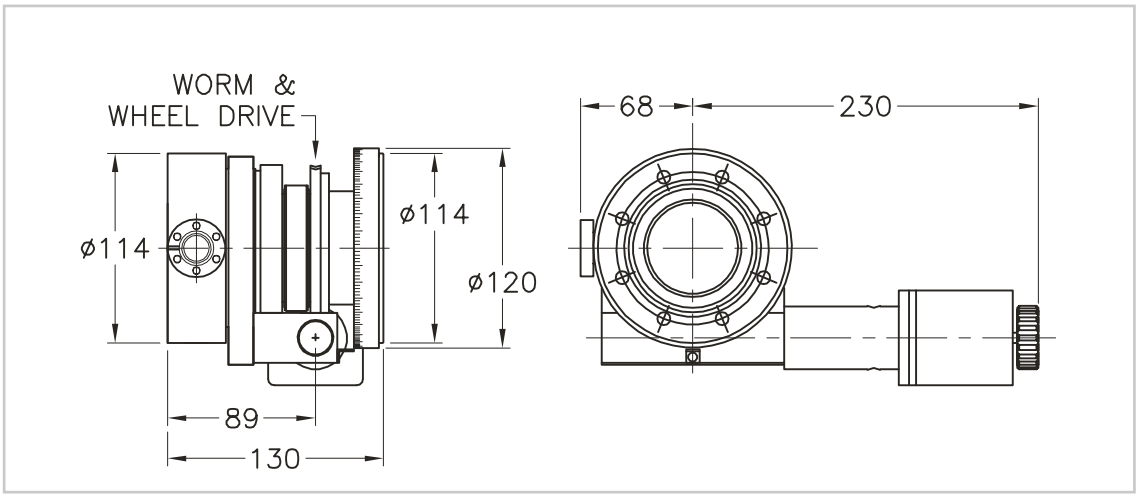
(1) With stepper motor removed from drive.
(2) Drive is assembled to stepper motor and is supplied with a wired connector to suit VG Scienta's stepper motor control system. A separate mating connector is available. See pages 376 to 379
(3) Radial load is given as a force acting at a distance from the mounting flange.
(4) DC motor supplied complete with power supply - see page 375.

Differentially Pumped Rotary Feedthrough - DPRF55 Series

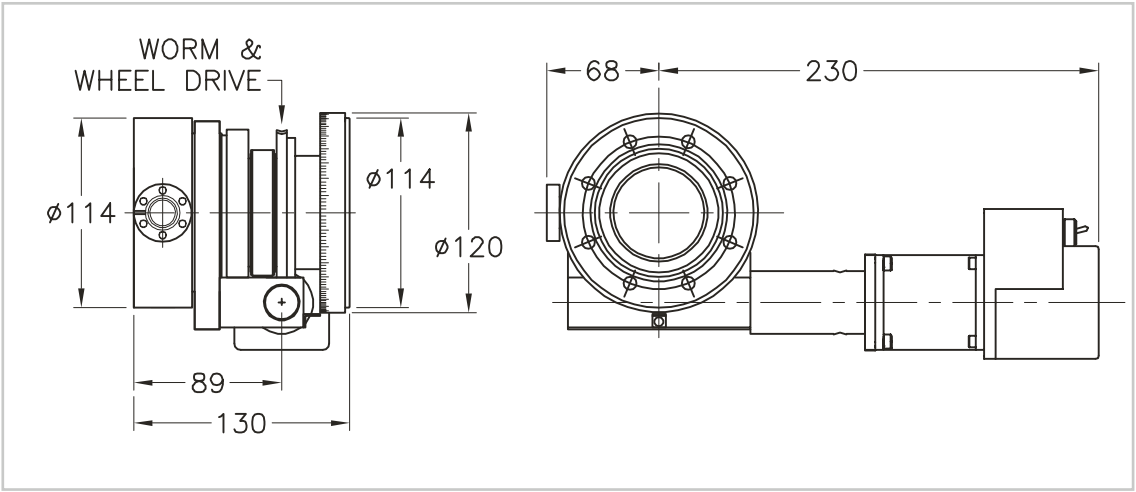
All dimensions in mm.



ZDPRF55H high precision manual handwheel drive.



ZDPRF55M high precision stepper motor drive.



ZDPRF55D high precision DC motor drive.

Differentially Pumped Rotary Feedthrough - DPRF55 Series

IMPORTANT PRODUCT INFORMATION

Apart from regular lubrication as outlined in the operating instructions, there are few serviceable parts on a DPRF. The only parts that can be replaced are the PTFE seals which are used (and should be changed) in pairs. The seals are described in the table below. Any damage to the sealing surfaces will not be cured by changing the seals and the unit must then be returned to the factory for repairs. Please contact the Service Department or your local agent for further details.

ZDPRF55 Series - Spares and Accessories

DPRF Drive Order Code	Spare Seals Order Code	Seal Qty	Nut and Bolt Kit Order Code Flange[1] Top	Bottom	Pump Port
ZDPRF55	XSMS03	2	ZM8B45	ZM8B30	ZM4B20
ZDPRF55H	XSMS03	2	ZM8B45	ZM8B30	ZM4B20
ZDPRF55M	XSMS03	2	ZM8B45	ZM8B30	ZM4B20
ZDPRF55D	XSMS03	2	ZM8B45	ZM8B30	ZM4B20

(1) Top is taken to mean rotating flange, and bottom to mean fixed body flange.

Rotating Platforms - RP Series

- Low torque to rotate
- Stainless steel construction
- Adaptor flange needed for manipulators with tapped flanges
- Easy to use with wormwheel and motorised versions available
- Four drive options:
  - C - Coarse version (manual, no gearing)
  - H - High precision - worm and wormwheel
  - M - Motorised - stepper motor
  - D - DC motorisation

Introduction to Rotating Platforms

- Stable and repeatable 360° continuous rotation
- Precision ball bearings and quality PTFE seals
- Two stage differential pumping for UHV performance
- Provides eucentric rotation for sample manipulation
- High load carrying capability
- Good rotation resolution

This device allows UHV equipment to be rotated about the flange axis for concentric polar rotation (eucentric motion about the flange axis). Applications include sample imaging (XPS, AES or SIMS), structural or ion/neutral/atom scattering experiments.

The RP100 provides primary rotation for other components in mix and match applications. Used in pairs, the rotating platform makes an ideal seal for rotation of UHV chambers, for example around the incoming beam of a synchrotron experiment.

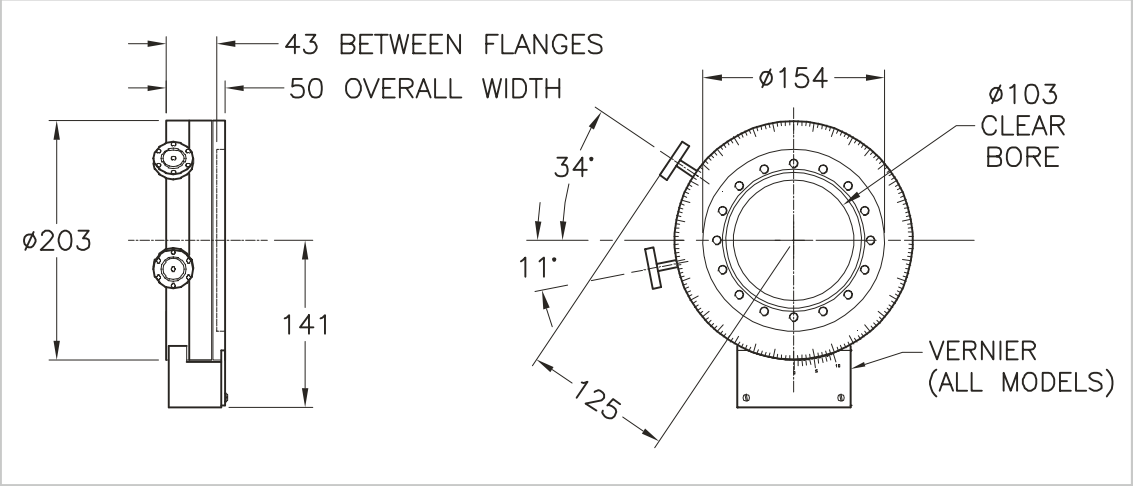
RP Series Rotating Platforms	
Description	**Order Code**
Coarse Version 100 mm bore Rotating Platform	ZRP100C
High Precision 100 mm bore Rotating Platform	ZRP100H
Motorised 100 mm bore Rotating Platform with stepper motor fitted	ZRP100M(1)
Motorised 100 mm bore Rotating Platform with encoded stepper motor fitted	ZRP100E(1)
Motorised RP100 with DC motor fitted	ZRP100DC(2)
Straight adaptor flange 90 mm long with clearance holes (for mounting an Omniax manipulator)	ZBS1090

(1) Drive is assembled to stepper motor and is supplied with a wired connector to suit VG Scienta's stepper motor control system. A separate mating connector is available. See pages 376 to 379.

(2) DC motor supplied complete with power supply - see page 375.

For specifications and dimension see page 241 and 242.

All dimension in mm.

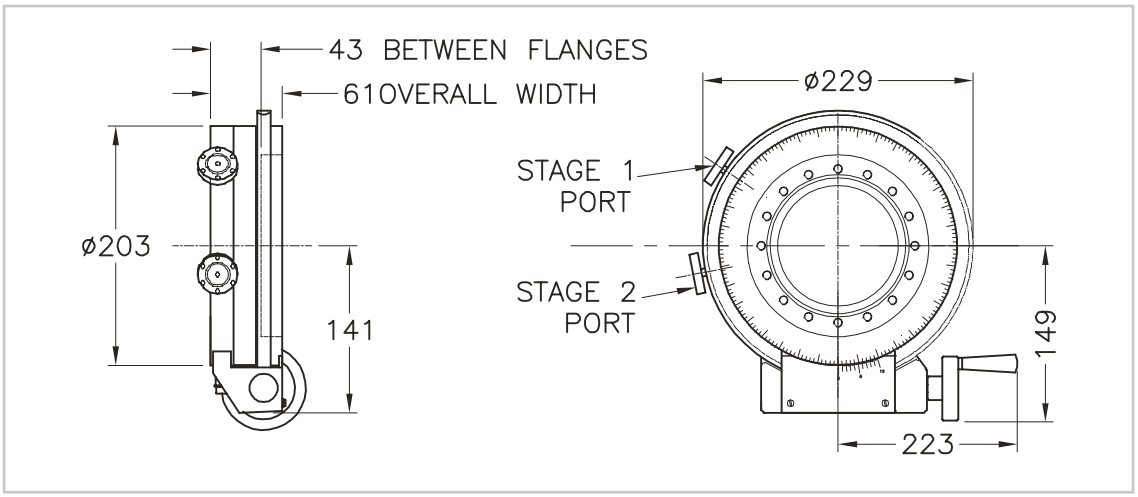


ZRP100C basic manual rotating platform. A pin spanner is used to rotate the payload.

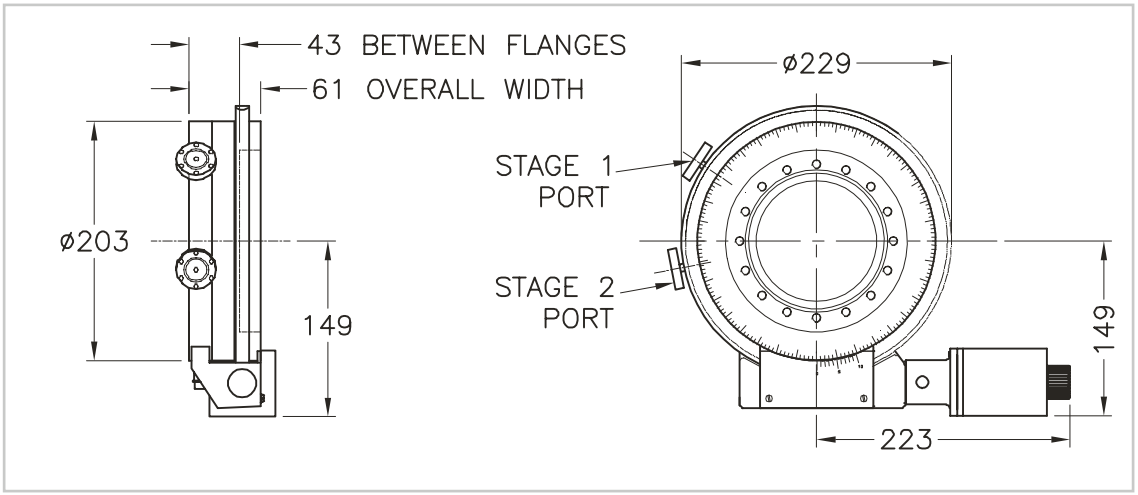
Specifications for Rotating Platform	
Bore	102.5 mm (4.03")
Flanges	152 FC (6"), both with tapped holes
Distance Between Flanges	42.6 mm (all models)
Drive Options	Coarse - pin spanner (provided) High Precision - worm and wormwheel Motorised - stepper motor
Differential Pumping	Two stage via 34 FC pumping ports
Interspace Pressure	First stage 10^{-2} mbar, second stage 10^{-5} mbar
Payload Limits	Vertical - 80 kg at 20 mm polar offset or 120 kg with centralised load Horizontal - 20 kg at 100 mm flange offset and 20 mm polar offset Inverted - 60 kg at 20 mm polar offset or 90 kg with centralised load
Seals	Spring energised with long-life PTFE compound
Bearing Type	Twin integral races
Rotation Resolution	0.05° divisions with Vernier (0 to 360°)
Worm and Wormwheel Gearing	1 turn = 2°
Motor Resolution	0.005° per half step
Approx Torque to Rotate	8 Nm, 0.3 Nm (at worm shaft input)
Operating Pressure Range	Atmosphere to 10^{-11} mbar
Bakeout Temperature	150 °C

Rotating Platforms - RP Series

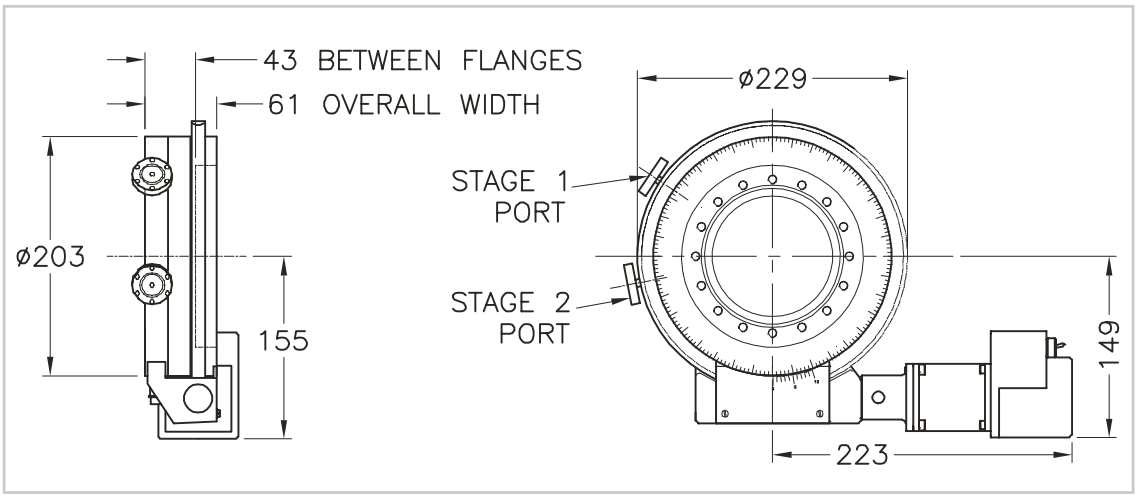
All dimension in mm.



ZRP100H high precision manual rotating platform.



ZRP100M Stepper motor driven rotating platform.



ZRP100D rotating platform driven by DC motor.