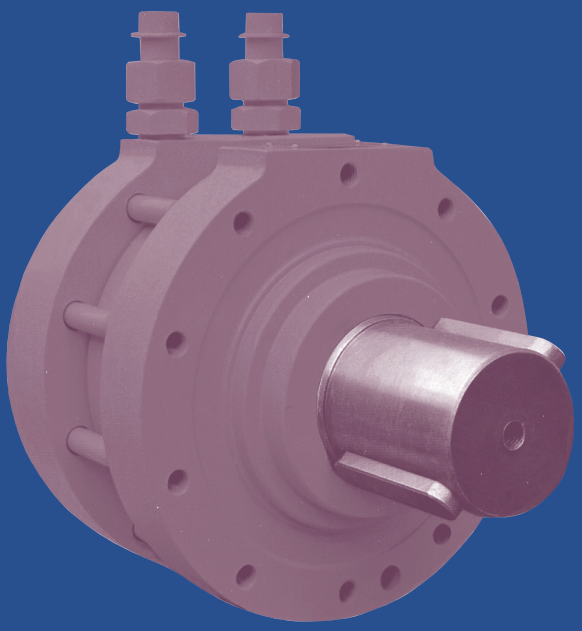
Kawasaki

HR

SERIES

Rotary Actuator



KPM

Kawasaki Precision Machinery

FEATURES

The Kawasaki rotary actuator is suitable to be used for mechanical function involving limited rotation.

- Available of large torque without cumbersome linkages.
- Available of special type such as those with the outer stopper and buffer valve.

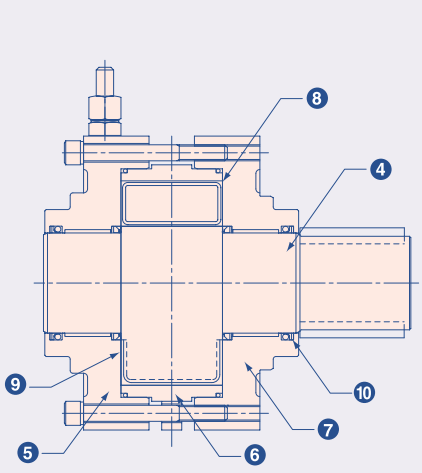
ORDERING CODE

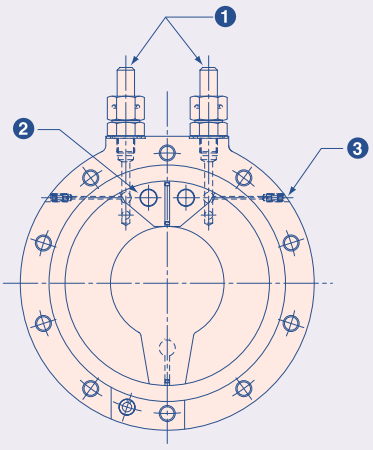
HR - **08** **S** - **04** - **1** **1** **C** - **402**

- **HR**: Rotary actuator
- **08**: Diameter of vane
- **S**: Number of vanes
  - **S**: Single
  - **D**: Double
- **04**: Width of vane
- **1**: Shaft type
  - **1**: Single-output-end shaft
  - **2**: Double-output-end shaft
- **1**: Shaft output end shape
  - **1**: Single-keyed (to JIS B1301-1965)
  - **2**: Splined (to JIS D2001-1959)
  - **3**: Double-keyed (to JIS B1301-1965)
- **C**: Design number
- **402**: Detailed model code (Determined as per detailed specifications)
  - example: "**402**"····· without buffer

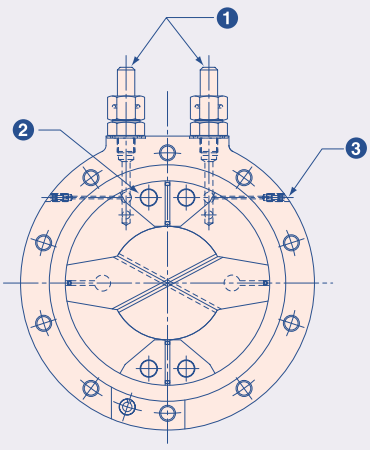
CONSTRUCTION

Single-vane type





Double-vane type



❶ Operating fluid port
❷ Abutment
❸ Air vent
❹ Wingshaft
❺ End cover (A)
❻ Reservoir
❼ End cover (B)
❽ Vane seal
❾ C-type vane seal
❿ Shaft seal

Note: The number of keys of the wingshaft is one in the single-vane type, and two in the double-vane type.

OPERATION PRINCIPLE

Fig1.
Vane position
in actuation

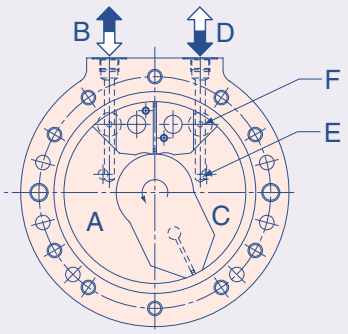
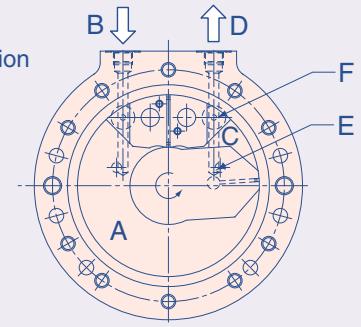


Fig2.
Vane position
in buffer function



1. Reciprocating rotary motion

The high-pressure oil supplied into Chamber A through Port B rotates the wingshaft counterclockwise displacing the low-pressure oil out of Port D through Ports E and F.

Conversely, if high-pressure oil is supplied into Chamber C through Port D, the wingshaft rotates clockwise with the low-pressure oil being displaced out of B. (Fig.1)

2. Buffer function

Models HR-17D and HR-20S are provided with the buffer mechanism as described below. (Models HR-08,HR-11,and HR-15 are not.)

(1) A check ball is assembled in Port F. So, when the low-pressure oil is displaced, it is let out through Port E with Port F closed by the check ball.

(2) When the wingshaft rotates until 10-20 deg. before the shaft travel end, the vane of the wingshaft passes Port E. And the confined oil is displaced through E via the narrow clearance between the vane and the end cover. (Fig.2)

(3) As a result, Chamber C is intermittently pressurized higher than the inlet high pressure in Chamber A. The reverse acceleration consequently generated decelerates the wingshaft, and the rotating speed becomes moderately slow.

Special types enable speed control of the wingshaft after the buffer effect.

PRECAUTION ON INSTALLATION

1. Be sure that neither radial nor thrust load is directly applied to the shaft output end. If such loads are unavoidable, install separate bearings to support them.
2. The rotary actuator must be operated within the stroke range of the specified total shaft travel.
3. When the rotary actuator is operated exceeding the maximum angular travel due to the moment of inertia of the attached equipment, provide an external stopper to prevent over-loading the abutment. (Excluding special types with the outer stopper.)
4. In case deceleration is achieved utilizing the hydraulic circuit, prevent the circuit pressure from exceeding the rated pressure due to the moment of inertia of the equipment in the circuit.
5. For disassembly and reassembly, use special tools designed for this unit, with particular care taken against any damage to the sealing part.

SPECIFICATION

Standard type

Model	Rated pressure MPa (kgf/cm²)	Output torque N·m (kgf·m)			Total shaft travel rad. (deg.)	Displacement for total travel cm³	Dislacement per radian cm³/rad.	Mass kg
		at 6.9 MPa (70kgf/cm²)	at 10.8 MPa (110kgf/cm²)	at 13.7 MPa (140kgf/cm²)				
HR-08S-04-11C-402	13.7 (140)	108 (11)		226 (23)	4.9 (280)	102	20.8	7
HR-11S-06-11D-402		294 (30)		628 (64)	4.9 (280)	280	57.3	17
HR-15S-08-11D-402		794 (81)		1,716 (175)	4.9 (280)	753	154	35
HR-20S-10-12J		2,256 (230)		4,805 (490)	3.3 (190)	1,450	438	90
HR-20S-18-12E	6.9 (70)	3,972 (405)	——	——	3.3 (190)	2,500	755	105
HR-20S-18-13E		3,972 (405)	——	——	3.3 (190)	2,500	755	105
HR-20S-18-23E	10.8 (6.9) (110 (70))	3,972 (405)	6,374 (650)	——	3.3 (190)	2,500	755	105
HR-08D-04-13C-402	13.7 (140)	245 (25)		510 (52)	1.7 (100)	73	41.6	8
HR-11D-06-13D-402		677 (69)		1,422 (145)	1.7 (100)	200	115	18
HR-15D-08-13D-402		1,814 (185)		3,825 (39)	1.7 (100)	538	308	37

*If operated using only one of the double-output ends, the HR-20S-18-23 should be used at 6.9 MPa (70kgf/cm²) and below.

Special type

Model	Rated pressure MPa (kgf/cm²)	Output torque N·m (kgf·m)			Total shaft travel rad. (deg.)	Displacement for total travel cm³	Dislacement per radian cm³/rad.	Mass kg
		at 6.9 MPa (70kgf/cm²)	at 10.8 MPa (110kgf/cm²)	at 13.7 MPa (140kgf/cm²)				
HR-17D-06-12A-501B	13.7 (140)	1,471 (150)		3,109 (317)	1.57 (90)	395	252	71
HR-20S-10-12i-525F		2,256 (230)		4,805 (490)	1.59 (91)	695	438	148

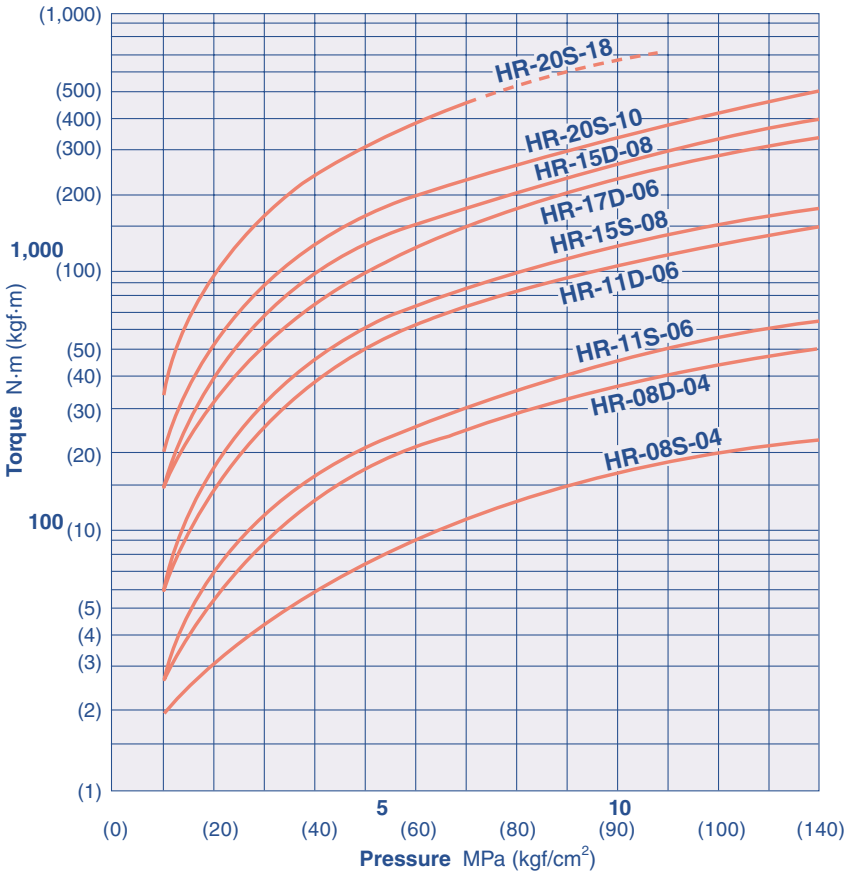
*These two types are provided with the outer stopper and buffer valve.

WORKING FLUID

- It is recommended that the anti-wear type hydraulic fluid be used as working fluid.
- Some kinds of fire-resistant fluid such as phosphate ester and water glycol require restriction of operating conditions as well as special materials of seal, paint and metal. Therefore, please consult us in advance for our advice indicating the kind of fluid used and specification.

PERFORMANCE

Output torque curve



Maximum internal leakage (cm³/min.)

at 40mm²/S (40 cSt)

	6.9 MPa (70kgf/cm²)	13.7 MPa (140 kgf/cm²)
HR-08S-04	50	100
HR-11S-06	60	120
HR-15S-08	75	150
HR-20S-10	125	250
HR-20S-18	210	420
HR-08D-04	100	200
HR-11D-06	120	240
HR-15D-08	150	300
HR-17D-06	145	290

Calculation formula

1. Output torque calculation formula

Output torque (N·m) = Operating pressure (MPa) x Displacement (cm^3/rad.) x Mechanical efficiency

{Output torque (kgf·m) = Operating pressure (kgf/cm^2) x Displacement (cm^3/rad.) x Mechanical efficiency x 10^{-2}}

2. Required oil flow calculation formula

Oil flow (L/min.) = Displacement (cm^3/rad.) x Required angular velocity (rad./min.) x 10^{-3} + Leaked oil (L/min.)

{Oil flow (L/min.) = π/180 x Displacement (cm^3/rad.) x Required angular velocity (deg./min.) x 10^{-3} + Leaked oil (L/min.)}

◆Reference

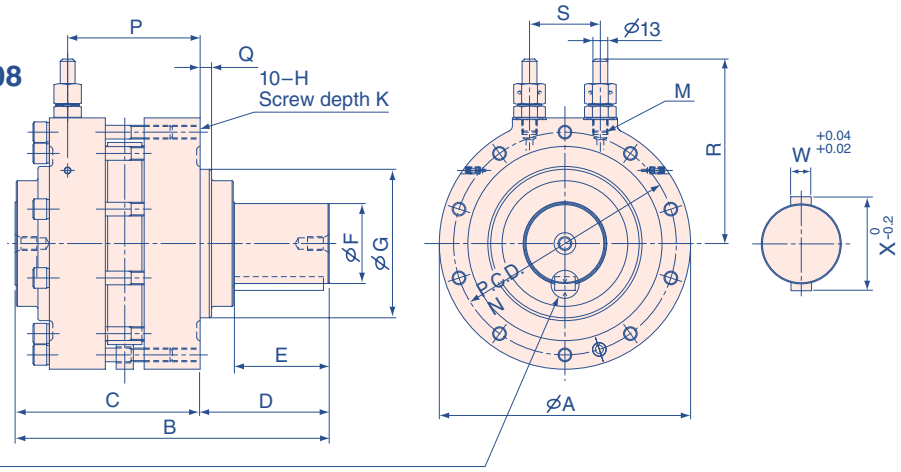
Data are indicated in both the SI units and the engineering units.
The relationship between these two units are shown below for reference.

SI units	Engineering units
9.80665 MPa	100 kgf/cm²
9.80665 N·m	1 kgf·m
1 mm² /s	1 cSt
π radian	180 deg.

DIMENSIONS

Standard type

HR-08$^{S}_{D}$-04, HR-11$^{S}_{D}$-06, HR-15$^{S}_{D}$-08

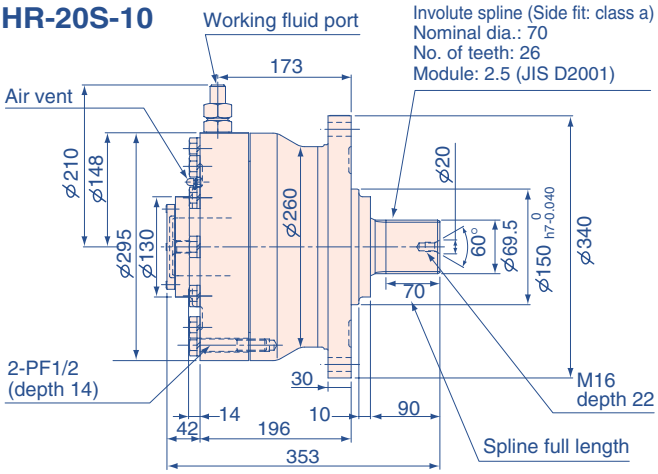


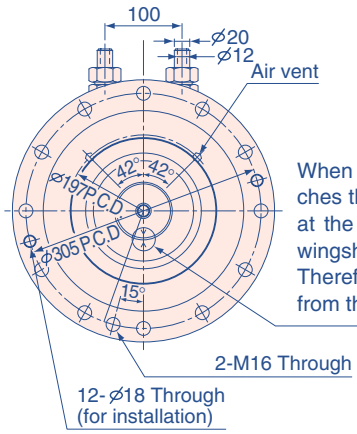
When the V mark on the wingshaft matches that on the end cover, it is positioned at the stroke center. (The V mark on the wingshaft is put on the vane center line.)

Model	A	B	C	D	E	F	G	H	K	M	N	P	Q	R	S	W	X
HR-15$^{S}_{D}$-04	130	180	102	78	52	32j6	65h7	M10	16	PF1/4	110	64	8	117	32	10	35.5
HR-11$^{S}_{D}$-06	175	220	130	90	66	45j6	100h7	M12	19	PF1/4	150	90	14	140	44	12	48.5
HR-15$^{S}_{D}$-08	220	275	162	113	83	70j6	130h7	M12	22	PF1/4	195	116	10	163	62	18	76

Note: The above diagrams show the construction of a single-vane type.
The number of the keys of the wingshaft is one in the single-vane type, and two in the double-vane type.

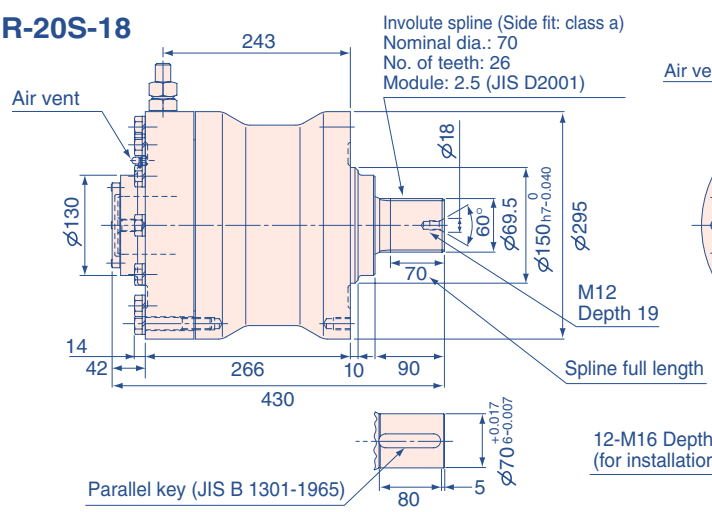
HR-20S-10

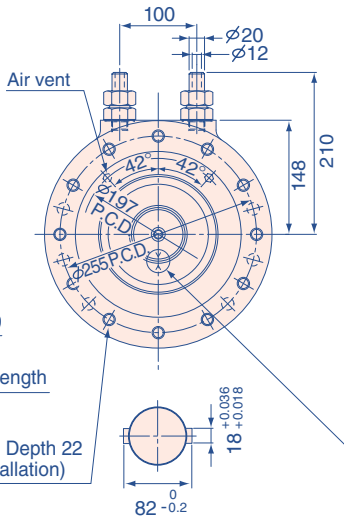




When the V mark on the wingshaft matches that on the end cover, it is positioned at the stroke center. (The V mark on the wingshaft is put on the vane center line.) Therefore, the wingshaft rotates ±95 deg. from this position to both ends.

HR-20S-18

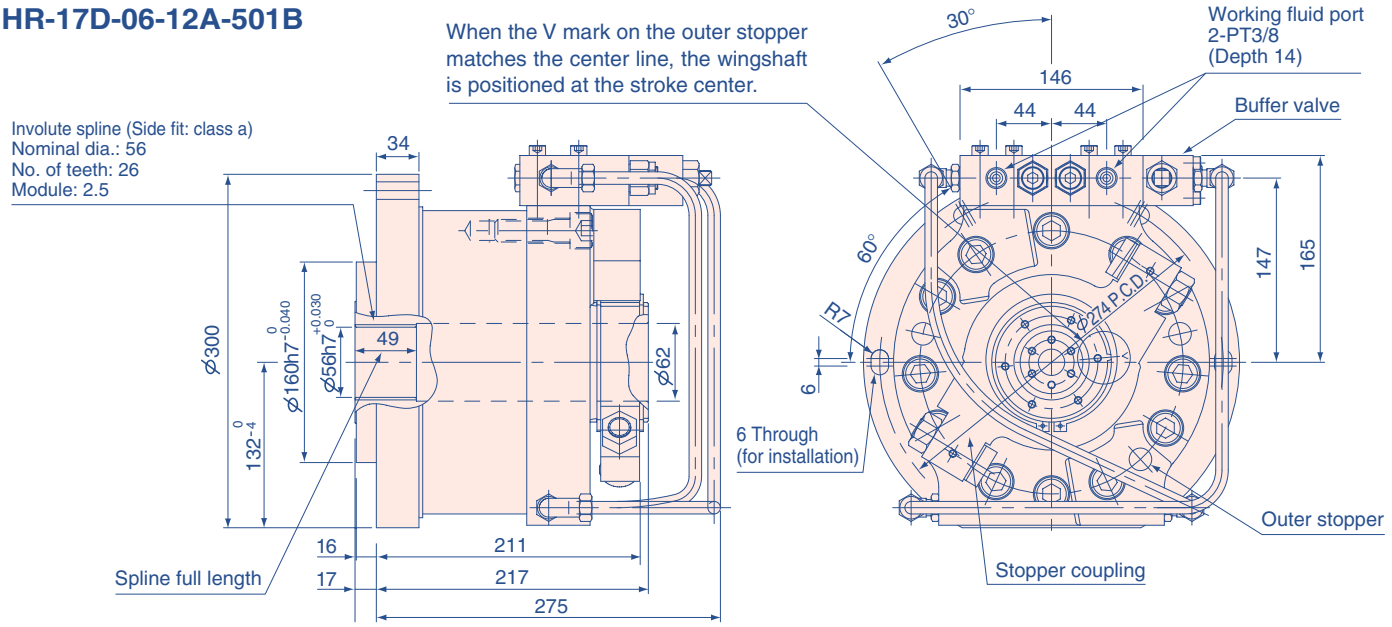




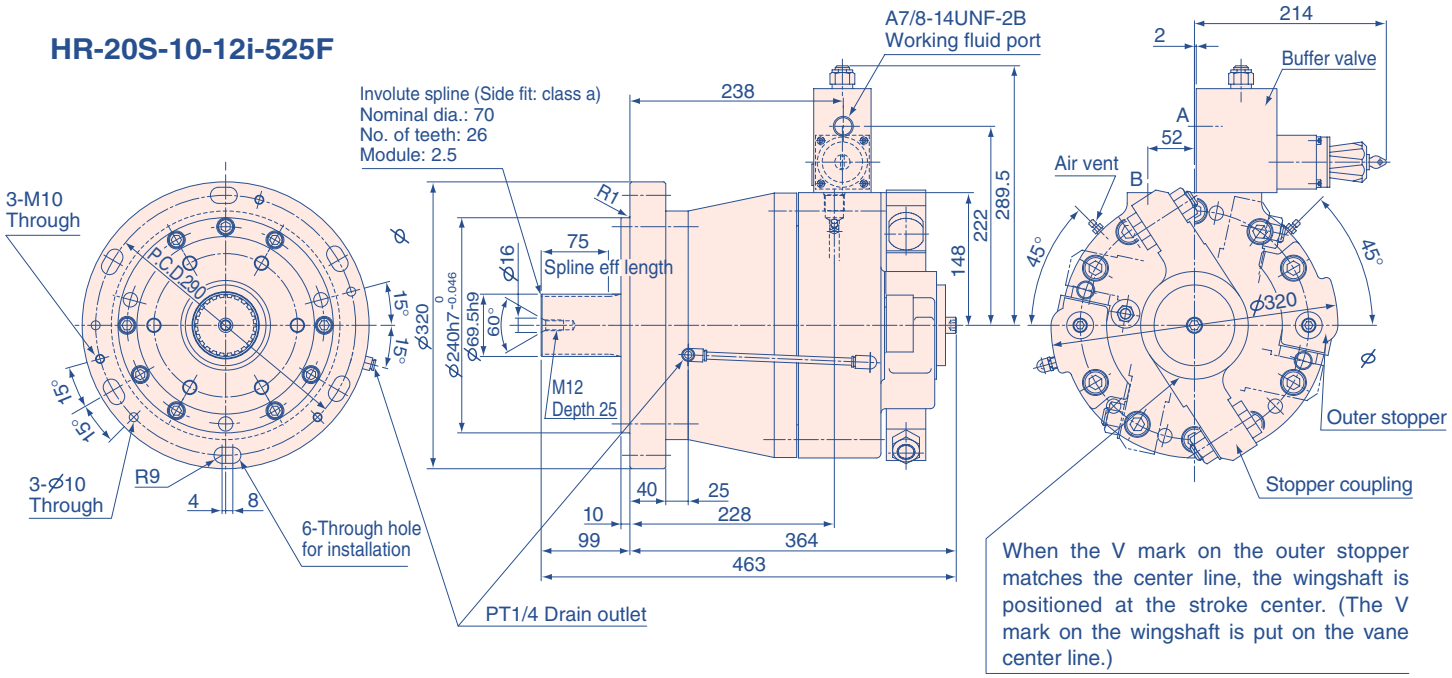
When the V mark on the wingshaft matches that on the end cover, it is positioned at the stroke center. (The V mark on the wingshaft is put on the vane center line.) Therefore, the wingshaft rotates ±95 deg. from this position to both ends.

Special type

HR-17D-06-12A-501B



HR-20S-10-12i-525F



WHEN INQUIRING

When inquiring about the Kawasaki rotary actuator, please inform us of the following items.

1. Application
2. Model
3. Output Torque N·m (kgf·m)
4. Working Pressure MPa (kgf/cm²)
5. Total Shaft Travel rad. (deg.)
6. Angular Velocity rad./s (deg./s)
7. Frequency
8. Kind of Working Fluid
9. Fluid temperature °C