Email: sales@impulseautomation.co.uk
Website: www.impulseautomation.co.uk

Rotary Solenoids Technical Notes

1. Definitions according to VDE 0580*

1.1 Rotary solenoids

A **single acting rotary solenoid** is a unit that utilises a rotary motion from a neutral position through energization of the solenoid. Return action follows through other means.

Reversing rotary solenoid (without neutral position). The rotary motion is from one end position to the other when energization occurs. The end position in one direction is therefore the start position for the other direction.

1.2 Mechanical data

The **torque** of the solenoid is given by the useful force generated in the direction of motion, taking account of friction loss, multiplied by the length of the actuating arm.

Starting torque (M_A) is measured in the start position of the armature.

End torque (M_E) is measured 5° before the end position.

Angle of rotation is the angle moved through from start to end position.

The **start position** is the position of the armature before commencing rotation (or else after completion of return action).

The **end position** is the selected position of the armature after energizing.

2. Mounting instructions

For fixing purposes, 2 or 3 threaded holes are provided on both flanges (see diagrams). The following points are to be particularly observed:

- Selection of screws should take account of the depth of thread indicated in the diagram. Forced tightening of a screw or boring out of the threaded holes can result in damage to the winding.
- Hard blows on the bearing mounted spindle should be avoided.
- In order to increase the life expectancy of rotary solenoids we recommend that the additional inertia forces resulting from the internal stops are eliminated by external stops.
- If the cooling process is enhanced by using additional cooling surfaces, e.g. by mounting on a large surface plate, then a higher relative duty cycle is permissible.
- Blind holes are provided with a rust protection that contains oil. Note that when you use screws with safety varnish.

3. Force take off from the output spindle

We recommend that a clamp type coupling is used for force take off.
If the coupling selected involves machining of the spindle (hole, keyway, slot) it should be ensured that the spindle is secured to the solenoid and the bearings are protected against the ingress of swarf.

4. Function description

The rotary solenoid has a rotational armature that is mounted on a spindle supported at each end by all bearings and can move between two internal limit stops. The armature and the core are inclined, relative to the armature shaft centre line, with an air gap in between. When the coil is energized the tendency is for the rotary armature to try to close this gap and rotational motion occurs until an end stop is reached. The return action for the armature can be achieved either by a return spring or by a second rotary solenoid – supplied as a reversing solenoid.

* Based on VDE 0580/1/94. The abstracts are reproduced with the approval of VDE-Verlag-GmbH, Berlin, Germany.

Information shown in these data sheets are for guidance purposes only, no liability is accepted for any errors or omissions.
The designer or user is solely responsible for the safe and proper use of these parts, assemblies or equipment described.

Email: sales@impulseautomation.co.uk
Website: www.impulseautomation.co.uk

5. Angle of rotation

Standard types are produced with angular travels of 25°, 35°, 45°, 65°, or 95°. The angle of rotation is subject to manufacturing tolerance of +3°.

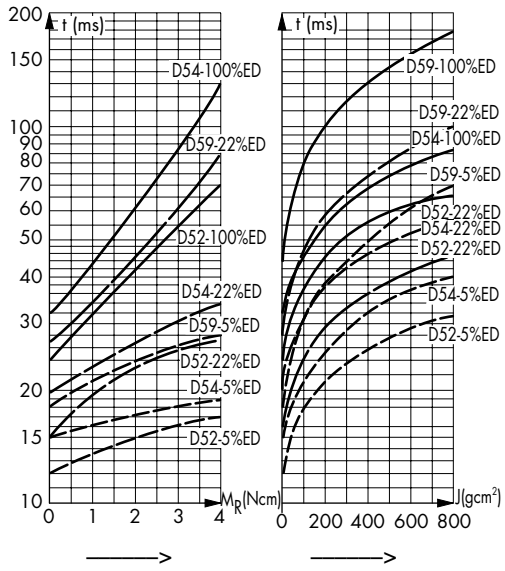
6. Actuation time

Typical relationships between the actuation time, angle of rotation and relative duty cycle for our rotary solenoids are given in the following extracts.

Typical actuation times for unloaded rotary solenoids

Drehwinkel Angle of rotation	ED % Duty Cycle %	Typische Anzugszeit (ms)/Typical actuation time (ms)								
		D2	D3	D5	D6	D7	D9	E3	E5	E9
25°	100	10	15	24	30	43	60	15	24	70
25°	5	5	7	12	15	26	34	7	12	35
45°	100	14	20	32	40	54	70	20	32	80
45°	5	6	9	15	19	25	37	9	15	40
95°	100	20	30	45	57	68	84	30	45	85
95°	5	8	12	19	24	38	42	12	19	45

When the solenoid is loaded the actuation time will be considerably influenced by the resisting torque (including frictional effects) and the inertia of any coupled parts.
The following diagram shows this dependence for solenoid types D 52 (25° angle of rotation), D 54 (45° angle of rotation) and D 59 (95° angle of rotation) with coils for 100 %, 22 % and 5 % duty cycle.



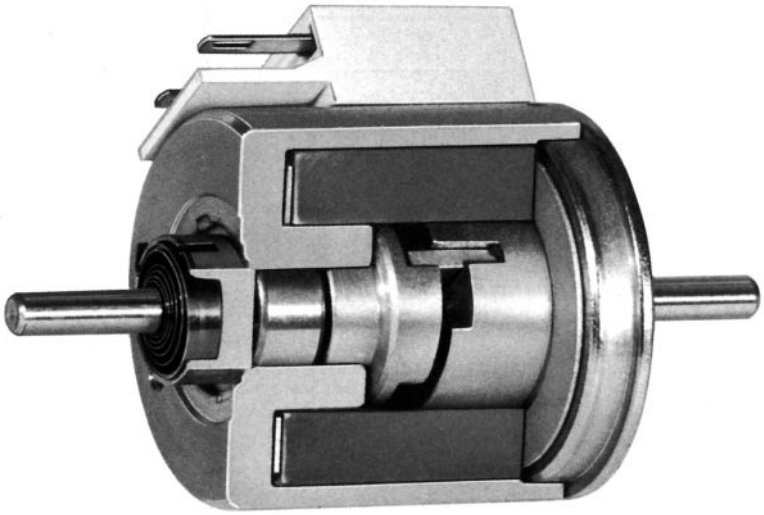
Actuation time

Dynamic moment of inertia

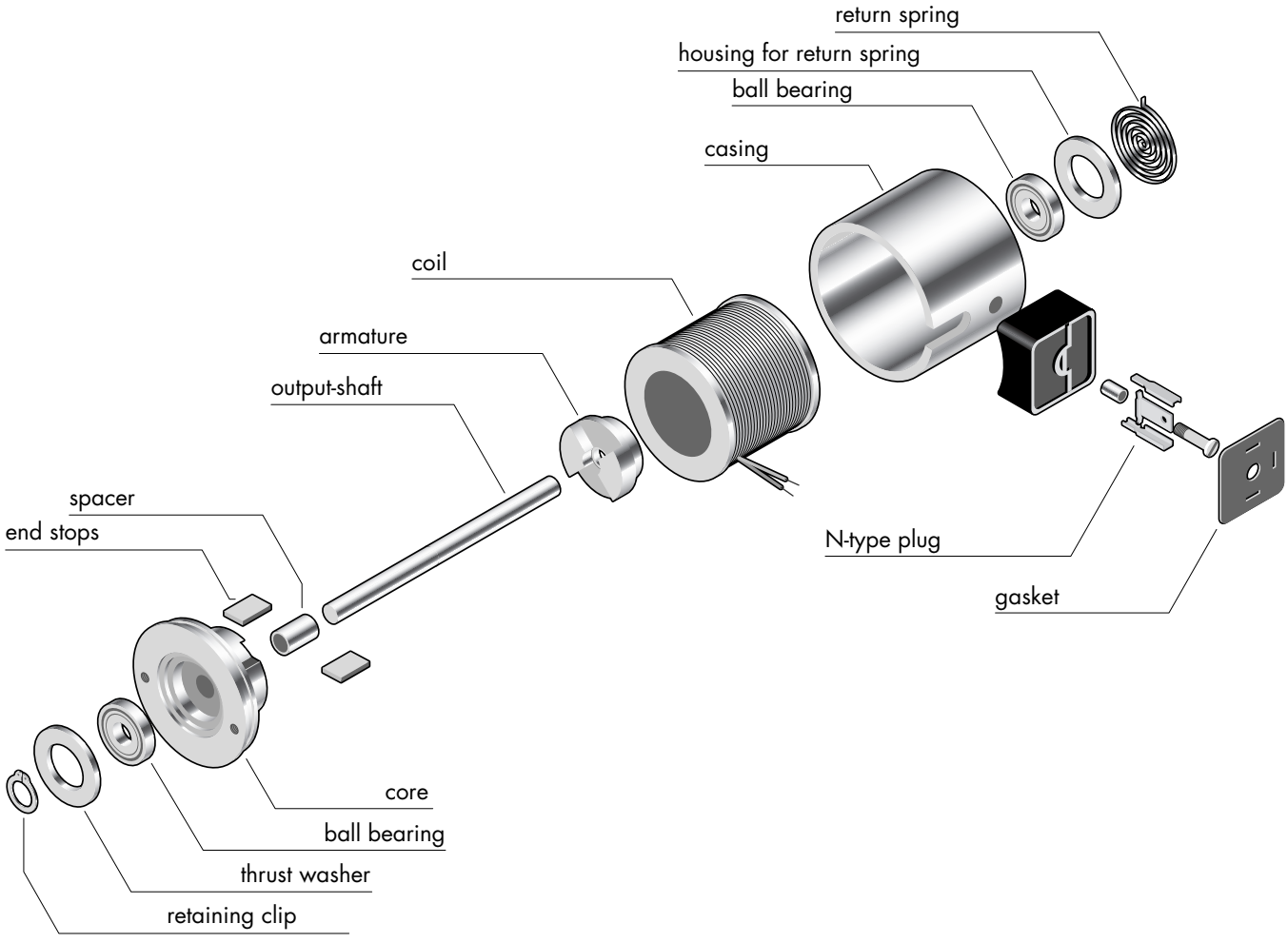
Information shown in these data sheets are for guidance purposes only, no liability is accepted for any errors or omissions.
The designer or user is solely responsible for the safe and proper use of these parts, assemblies or equipment described.

Email: sales@impulseautomation.co.uk
Website: www.impulseautomation.co.uk

7. Detailed diagram of a rotary solenoid, series D



Sectional view

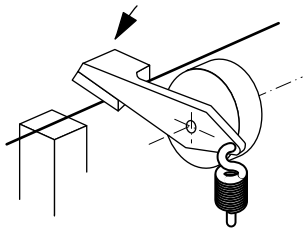
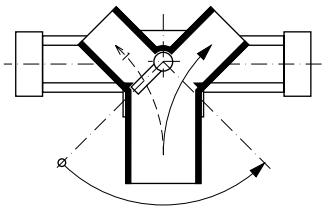
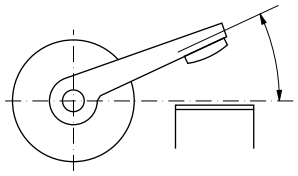
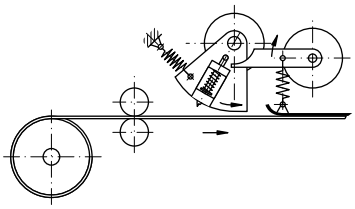
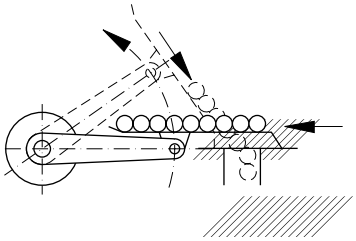
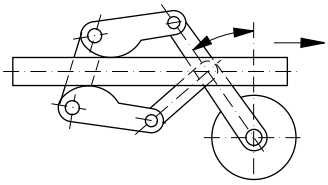
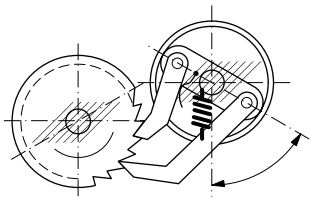
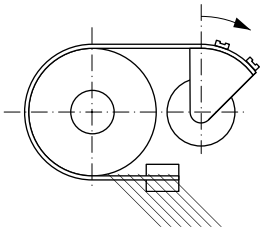
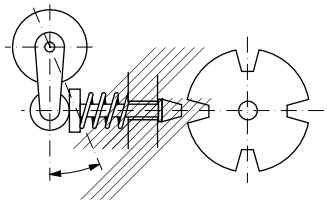
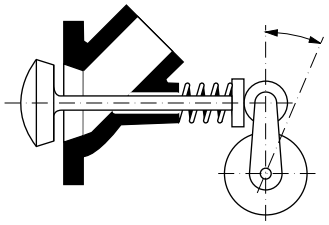
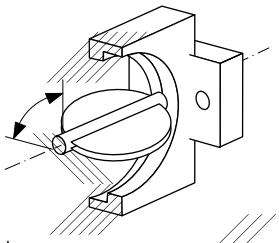
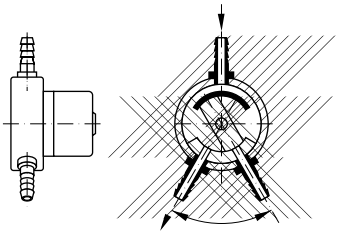
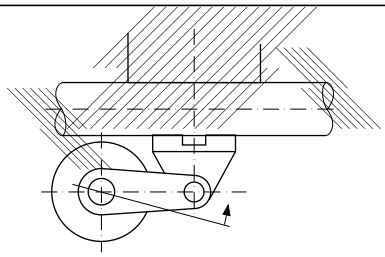
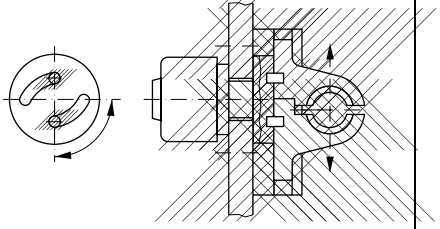
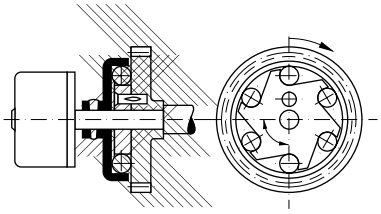


Information shown in these data sheets are for guidance purposes only, no liability is accepted for any errors or omissions.
The designer or user is solely responsible for the safe and proper use of these parts, assemblies or equipment described.

Email: sales@impulseautomation.co.uk
Website: www.impulseautomation.co.uk

8. Examples of application

A wide range of application possibilities exists for rotary solenoids e.g. sorting mechanisms, counting devices, throttle valves, etc. Due to the symmetric rotational features of the solenoids they are insensitive to the effects of linear acceleration and are conequently well suited to a variety of transport system applications, e.g. road vehicles, aircraft and ships.

 Cutter	 Sorting mechanism	 Stamp
 Automatic paper or textile feed mechanism	 Tablet transportation, in a packaging plant	 Material feed mechanism
 Ratchet	 Band Brake	 Location
 Valve	 Throttle valve	 Hydraulic control valve
 Clamp	 Leadscrew Lock Nut	 Index location

Information shown in these data sheets are for guidance purposes only, no liability is accepted for any errors or omissions.
The designer or user is solely responsible for the safe and proper use of these parts, assemblies or equipment described.