

ISO 21049:2004-02 (E)

Pumps - Shaft sealing systems for centrifugal and rotary pumps

Contents		Page
Foreword		vi
Introduction		vii
1	Scope	1
2	Normative references	1
3	Terms and definitions	3
4	Sealing systems	10
4.1	Seal categories, types and arrangements	10
4.1.1	General	10
4.1.2	Seal categories	10
4.1.3	Seal types	11
4.1.4	Seal arrangements	11
4.1.5	Seal orientations	12
4.2	Objectives	12
4.3	Specifying and/or purchasing a sealing system	12
5	General	19
5.1	Unit responsibility	19
5.2	Dimensions	20
6	Design requirements	20
6.1	Common design requirements (all categories)	20
6.1.1	General information	20
6.1.2	Seal chamber and gland plate	23
6.1.3	Cartridge seal sleeves	30
6.1.4	Mating rings	32
6.1.5	Flexible elements	34
6.1.6	Materials	34
6.2	Design requirements (category-specific)	38
6.2.1	Category 1 seals	38
6.2.2	Category 2 seals	39
6.2.3	Category 3 seals	40
7	Specific seal configurations	41
7.1	Arrangement 1 seals	41
7.1.1	Seal sleeves	41
7.1.2	Seal chamber and gland plate	41
7.2	Arrangement 2 seals	41
7.2.1	General	41
7.2.2	Seal sleeves	42
7.2.3	Seal chamber and gland plates	42
7.2.4	Contacting wet seals with a liquid buffer fluid (2CW-CW)	43
7.2.5	Seal chamber and gland plates for contacting wet inner seal with a dry-running containment seal (2CW-CS)	43
7.2.6	Seal chamber and gland plates for non-contacting inner seal with a dry-running containment seal (2NC-CS)	44
7.3	Arrangement 3 seals	44
7.3.1	General	44

7.3.2	Seal sleeves	45
7.3.3	Seal chamber and gland plates	45
7.3.4	Contacting wet seal configurations with a liquid barrier fluid (3CW-FB, 3CW-FF, 3CW-BB)	45
7.3.5	Standard seal types and arrangements for non-contacting seal configurations with a gas barrier fluid (3NC-FB, 3NC-FF, 3NC-BB)	46
8	Accessories	46
8.1	Auxiliary piping systems	46
8.2	Mechanical seal flush/cooling systems (Group I)	49
8.3	Quench systems (Group II)	50
8.4	Cooling-water systems (Group III)	50
8.5	Accessories and auxiliary system components	51
8.5.1	Cyclone separator	51
8.5.2	Flow control orifice	52
8.5.3	Seal flush coolers	53
8.5.4	Barrier/buffer fluid reservoirs	53
8.5.5	Barrier/buffer-fluid selection criteria	57
8.6	Barrier/buffer fluid and seal flush positive-circulating devices	57
8.6.1	General	57
8.6.2	Internal circulating device	57
8.6.3	External circulating pump	57
8.6.4	External seal flush systems	57
8.6.5	Condensate collection reservoir	58
8.6.6	Barrier/buffer-gas supply systems	58
9	Instrumentation	59
9.1	General	59
9.2	Temperature-indicating gauges	59
9.3	Thermowells	59
9.4	Pressure gauges	59
9.5	Switches	60
9.5.1	Alarm, trip and control switches	60
9.5.2	Pressure switches	60
9.5.3	Level switches	61
9.5.4	Flow switches	61
9.6	Level indicators	61
9.7	Flow instruments	61
9.7.1	Flow indicators	61
9.7.2	Flow meters	61
9.7.3	Flow transmitters	61
9.8	Relief valves	61
9.9	Regulators	62
9.10	Pressure amplifiers	62
10	Inspection, testing and preparation for shipment	62
10.1	General	62
10.2	Inspection	62
10.3	Testing	63
10.3.1	Seal qualification testing	64
10.3.2	Hydrostatic test for pressure-containing mechanical seal parts and accessories	77
10.3.3	Test of job seal by seal manufacturer	78
10.3.4	Air test	78
10.3.5	Test of job seal by pump manufacturer	78
10.4	Preparation for shipment	79
11	Data transfer	79
11.1	General	79
11.2	Proposal data	80
11.3	Contract data	81
	Annex A (informative) Recommended seal selection procedure	85

Annex B (informative) Typical materials standards for seal chamber and mechanical seal components	130
Annex C (normative) Mechanical seal data sheets	137
Annex D (informative) Mechanical seal codes	146
Annex E (normative) Seal and pump vendor interface responsibilities	148
Annex F (informative) Heat generation and heat soak calculations	150
Annex G (normative) Standard flush plans and auxiliary hardware	157
Annex H (informative) Inspector checklist for all seals	188
Annex I (normative) Form for mechanical seal qualification test	189
Annex J (normative) Mechanical seals data requirements form	192
Bibliography	193