



Operation & Maintenance Manuals Volume 2

Fernvale Clarifier Upgrade



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Instrumentation



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services

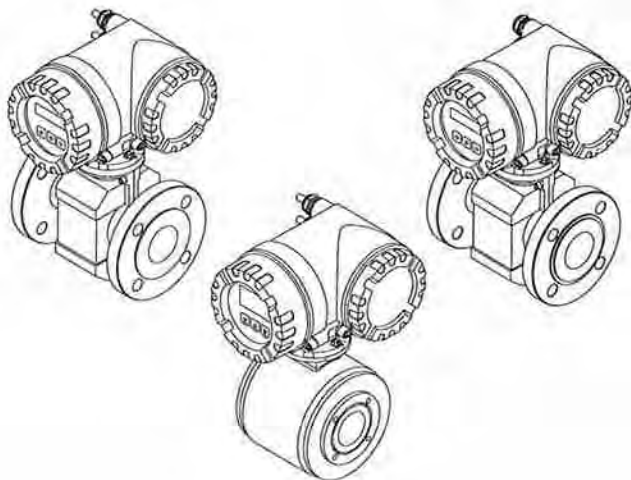


Solutions

Brief Operating Instructions

Proline Promag 50

Electromagnetic Flow Measuring System



These Brief Operating Instructions are not intended to replace the Operating Instructions provided in the scope of supply. Detailed information is provided in the Operating Instructions and the additional documentation on the CD-ROM supplied.

The complete device documentation consists of:

- These Brief Operating Instructions
- Depending on the device version:
 - Operating Instructions and the Description of Device Functions
 - Approvals and safety certificates
 - Special safety instructions in accordance with the approvals for the device (e.g. explosion protection, pressure equipment directive etc.)
 - Additional device-specific information

1 Safety instructions

1.1 Designated use

- The measuring device is to be used only for measuring the flow of conductive liquids in close pipes. A minimum conductivity of 20 $\mu\text{S}/\text{cm}$ is required for measuring demineralized water. Most liquids can be measured as of a minimum conductivity of 5 $\mu\text{S}/\text{cm}$.
- Any use other than that described here compromises the safety of persons and the entire measuring system and is, therefore, not permitted.
- The manufacturer is not liable for damage caused by improper or non-designated use.

1.2 Installation, commissioning and operation

- The measuring device must only be installed, connected, commissioned and maintained by qualified and authorized specialists (e.g. electrical technicians) in full compliance with the instructions in these Brief Operating Instructions, the applicable norms, legal regulations and certificates (depending on the application).
- The specialists must have read and understood these Brief Operating Instructions and must follow the instructions they contain. If you are unclear on anything in these Brief Operating Instructions, you must read the Operating Instructions (on the CD-ROM). The Operating Instructions provide detailed information on the measuring device.
- The measuring device should only be installed in a de-energized state free from outside loads and strain.
- The measuring device may only be modified if such work is expressly permitted in the Operating Instructions (on the CD-ROM).
- Repairs may only be performed if a genuine spare parts kit is available and this repair work is expressly permitted.
- If performing welding work on the piping, the welding unit may not be grounded by means of the measuring device.

1.3 Operational safety

- The measuring device is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. Relevant regulations and European standards have been observed.
- The manufacturer reserves the right to modify technical data without prior notice. Your Endress+Hauser distributor will supply you with current information and updates to these Operating Instructions.
- The information on the warning notices, nameplates and connection diagrams affixed to the device must be observed. These contain important data on the permitted operating conditions, the range of application of the device and information on the materials used.
- If the device is not used at atmospheric temperatures, compliance with the relevant margin conditions as specified in the device documentation supplied (on CD-ROM) is mandatory.
- The device must be wired as specified in the wiring and connection diagrams. Interconnection must be permitted.

1.4 Safety conventions



Warning!

"Warning" indicates an action or procedure which, if not performed correctly, can result in injury or a safety hazard. Comply strictly with the instructions and proceed with care.



Caution!

"Caution" indicates an action or procedure which, if not performed correctly, can result in incorrect operation or destruction of the device. Comply strictly with the instructions.



Note!

"Note" indicates an action or procedure which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.

2.2 Installation conditions

2.2.1 Dimensions

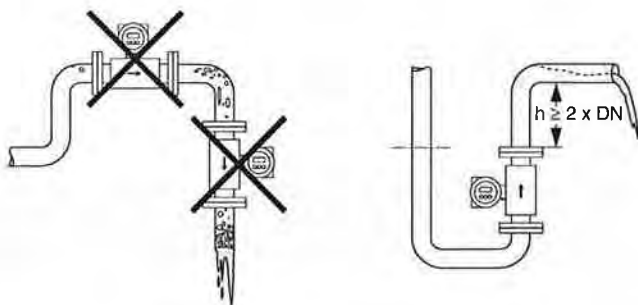
For the dimensions of the measuring device, see the associated Technical Information on the CD-ROM.

2.2.2 Mounting location

The accumulation of air or formation of gas bubbles in the measuring tube can result in an increase in measuring errors.

For this reason avoid the following mounting locations in the pipe:

- At the highest point of a pipeline. Risk of air accumulating!
- Directly upstream from a free pipe outlet in a down pipe.

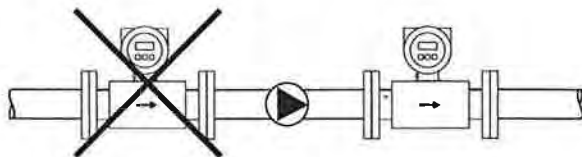


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Installation of pumps

Do not install the sensor on the intake side of a pump. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. It might be necessary to use pulse dampers in systems incorporating piston pumps, piston diaphragm pumps or peristaltic pumps.

Information on the measuring system's pressure tightness and resistance to vibration and shock can be found in the Operating Instructions of the CD-ROM.



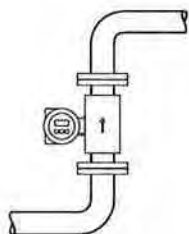
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2.2.3 Orientation

An optimum orientation helps avoid gas and air accumulations and buildup in the measuring tube. The measuring device, nevertheless, supplies a range of functions and tools to measure problematic fluids correctly:

- Electrode cleaning circuitry (ECC) to prevent electrically conductive deposits in the measuring tube, e.g. for fluids causing buildup
- Empty pipe detection (EPD) for detecting partially filled measuring tubes, e.g. in the case of degassing fluids or varying process pressures
- Exchangeable measuring electrodes for abrasive fluids (only Promag W)

Vertical orientation



This orientation is optimum for self-emptying piping systems and when using empty pipe detection (EPD) or open electrode detection (OED).

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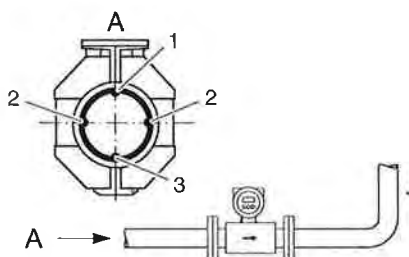
Horizontal orientation

The measuring electrode plane should be horizontal. This prevents brief insulation of the two electrodes by entrained air bubbles.



Caution!

In the case of horizontal orientation, empty pipe detection only works correctly if the transmitter housing is facing upwards. Otherwise there is no guarantee that empty pipe detection will respond if the measuring tube is only partially filled or empty.



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1. EPD electrode for empty pipe detection (not for Promag H, DN 2 to 15, 1/12" to 1/2").
2. Measuring electrodes for signal detection
3. Reference electrode for potential equalization (not for Promag H)

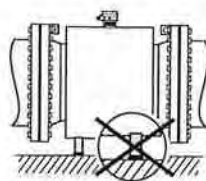
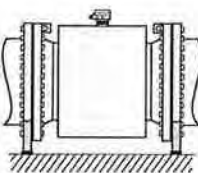
2.2.5 Foundations, supports

If the nominal diameter is $DN \geq 350$ ($\geq 14"$), mount the sensor on a foundation of adequate load-bearing strength.



Caution!

Risk of damage! Do not support the weight of the sensor on the metal casing. This would buckle the casing and damage the internal magnetic coils.

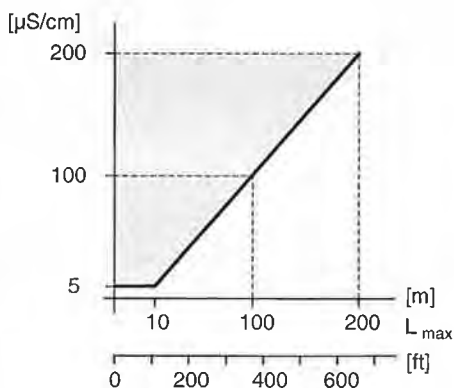
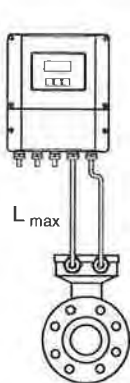


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2.2.6 Length of connecting cable

Comply with the following instructions in order to ensure correct measuring results:

- Secure the cable run or route the cable in an armored conduit. Movement of the cable can falsify the measuring signal, particularly if the fluid conductivity is low.
- Route the cable well clear of electrical machines and switching elements.
- Ensure potential equalization between the sensor and transmitter, if necessary.
- The permissible cable length L_{\max} depends on the fluid conductivity.



Gray shaded area = permissible range

L_{\max} = length of connecting cable in [m]/[ft]

Fluid conductivity in $[\mu\text{S/cm}]$

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2.3.3 Screw tightening torques (Promag L)

Please note the following:

- The tightening torques listed below are for lubricated threads only.
- Always tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.
- The tightening torques listed below apply only to pipes not subjected to tensile stress.

Promag L tightening torques for EN (DIN)

Nominal diameter [mm]	EN (DIN) Pressure rating [bar]	Threaded fasteners	Max. tightening torque		
			Hard rubber [Nm]	Polyurethane [Nm]	PTFE [Nm]
50	PN 10/16	4 × M 16	-	15	40
65*	PN 10/16	8 × M 16	-	10	22
80	PN 10/16	8 × M 16	-	15	30
100	PN 10/16	8 × M 16	-	20	42
125	PN 10/16	8 × M 16	-	30	55
150	PN 10/16	8 × M 20	-	50	90
200	PN 10	8 × M 20	-	65	130
250	PN 10	12 × M 20	-	50	90
300	PN 10	12 × M 20	-	55	100
350	PN 6	12 × M 20	111	120	-
350	PN 10	16 × M 20	112	118	-
400	PN 6	16 × M 20	90	98	-
400	PN 10	16 × M 24	151	167	-
450	PN 6	16 × M 20	112	126	-
450	PN 10	20 × M 24	153	133	-
500	PN 6	20 × M 20	119	123	-
500	PN 10	20 × M 24	155	171	-
600	PN 6	20 × M 24	139	147	-
600	PN 10	20 × M 27	206	219	-
700	PN 6	24 × M 24	148	139	-
700	PN 10	24 × M 27	246	246	-
800	PN 6	24 × M 27	206	182	-
800	PN 10	24 × M 30	331	316	-
900	PN 6	24 × M 27	230	637	-
900	PN 10	28 × M 30	316	307	-
1000	PN 6	28 × M 27	218	208	-
1000	PN 10	28 × M 33	402	405	-
1200	PN 6	32 × M 30	319	299	-
1200	PN 10	32 × M 36	564	568	-
1400	PN 6	36 × M 33	430	-	-

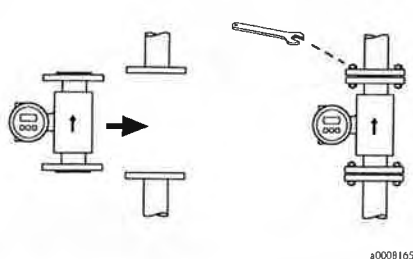
Promag L tightening torques for AWWA

Nominal diameter		AWWA Pressure rating	Threaded fasteners	Max. tightening torque					
[mm]	[inch]			Hartgummi		Polyurethane		PTFE	
				[Nm]	[lbf · ft]	[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
700	28"	Class D	28 × 1 ¼"	247	182	292	215	-	-
750	30"	Class D	28 × 1 ¼"	287	212	302	223	-	-
800	32"	Class D	28 × 1 ½"	394	291	422	311	-	-
900	36"	Class D	32 × 1 ½"	419	309	430	317	-	-
1000	40"	Class D	36 × 1 ½"	420	310	477	352	-	-
1050	42"	Class D	36 × 1 ½"	528	389	518	382	-	-
1200	48"	Class D	44 × 1 ½"	552	407	531	392	-	-
1350	54"	Class D	44 × 1 ¾"	730	538	-	-	-	-
1500	60"	Class D	52 × 1 ¾"	758	559	-	-	-	-
1650	66"	Class D	52 × 1 ¾"	946	698	-	-	-	-
1800	72"	Class D	60 × 1 ¾"	975	719	-	-	-	-
2000	78"	Class D	64 × 2"	853	629	-	-	-	-
2150	84"	Class D	64 × 2"	931	687	-	-	-	-
2300	90"	Class D	68 × 2 ¼"	1048	773	-	-	-	-

Promag L tightening torques for AS 2129

Nominal diameter		AS 2129 Pressure rating	Threaded fasteners	Max. tightening torque		
[mm]				Hard rubber [Nm]	Polyurethane [Nm]	PTFE [Nm]
350		Table E	12 × M 24	203	-	-
400		Table E	12 × M 24	226	-	-
450		Table E	16 × M 24	226	-	-
500		Table E	16 × M 24	271	-	-
600		Table E	16 × M 30	439	-	-
700		Table E	20 × M 30	355	-	-
750		Table E	20 × M 30	559	-	-
800		Table E	20 × M 30	631	-	-
900		Table E	24 × M 30	627	-	-
1000		Table E	24 × M 30	634	-	-
1200		Table E	32 × M 30	727	-	-

2.4 Installing the W sensor



Note!
Screws, nuts, seals, etc. are not included in the scope of supply and must be supplied by the customer.

The sensor is installed between the two pipe flanges:

- The requisite torques must be observed → 18
- If grounding disks are used, follow the mounting instructions which will be enclosed with the shipment.
- To comply with the device specification, a concentric installation in the measuring section is required

2.4.1 Seals

Comply with the following instructions when installing seals:

- Hard rubber lining → additional seals are **always** necessary.
- Polyurethane lining → **no** seals are required.
- For DIN flanges, use only seals according to EN 1514-1.
- Make sure that the seals do not protrude into the piping cross-section.



Caution!

Risk of short circuit!

Do not use electrically conductive sealing compounds such as graphite! An electrically conductive layer could form on the inside of the measuring tube and short-circuit the measuring signal.

2.4.2 Ground cable

If necessary, special ground cables can be ordered as accessories for potential equalization.

Nominal diameter [mm]	EN (DIN) Pressure rating [bar]	Threaded fasteners	Max. tightening torque [Nm]	
			Hard rubber	Polyurethane
450	PN 16	20 × M 27	198	196
450	PN 25	20 × M 33	256	253
500	PN 6	20 × M 20	119	123
500	PN 10	20 × M 24	155	171
500	PN 16	20 × M 30	275	300
500	PN 25	20 × M 33	317	360
600	PN 6	20 × M 24	139	147
600	PN 10	20 × M 27	206	219
600 *	PN 16	20 × M 33	415	443
600	PN 25	20 × M 36	431	516
700	PN 6	24 × M 24	148	139
700	PN 10	24 × M 27	246	246
700	PN 16	24 × M 33	278	318
700	PN 25	24 × M 39	449	507
800	PN 6	24 × M 27	206	182
800	PN 10	24 × M 30	331	316
800	PN 16	24 × M 36	369	385
800	PN 25	24 × M 45	664	721
900	PN 6	24 × M 27	230	637
900	PN 10	28 × M 30	316	307
900	PN 16	28 × M 36	353	398
900	PN 25	28 × M 45	690	716
1000	PN 6	28 × M 27	218	208
1000	PN 10	28 × M 33	402	405
1000	PN 16	28 × M 39	502	518
1000	PN 25	28 × M 52	970	971
1200	PN 6	32 × M 30	319	299
1200	PN 10	32 × M 36	564	568
1200	PN 16	32 × M 45	701	753
1400	PN 6	36 × M 33	430	398
1400	PN 10	36 × M 39	654	618
1400	PN 16	36 × M 45	729	762
1600	PN 6	40 × M 33	440	417
1600	PN 10	40 × M 45	946	893
1600	PN 16	40 × M 52	1007	1100
1800	PN 6	44 × M 36	547	521
1800	PN 10	44 × M 45	961	895
1800	PN 16	44 × M 52	1108	1003
2000	PN 6	48 × M 39	629	605
2000	PN 10	48 × M 45	1047	1092
2000	PN 16	48 × M 56	1324	1261

* Designed acc. to EN 1092-1 (not to DIN 2501)

Nominal diameter [mm]	JIS Pressure rating	Threaded fasteners	Max. tightening torque [Nm]	
			Hard rubber	Polyurethane
100	20K	8 × M 20	56	48
125	10K	8 × M 20	60	51
125	20K	8 × M 22	91	79
150	10K	8 × M 20	75	63
150	20K	12 × M 22	81	72
200	10K	12 × M 20	61	52
200	20K	12 × M 22	91	80
250	10K	12 × M 22	100	87
250	20K	12 × M 24	159	144
300	10K	16 × M 22	74	63
300	20K	16 × M 24	138	124

Promag W tightening torques for AWWA

Nominal diameter		AWWA Pressure rating	Threaded fasteners	Max. tightening torque			
				Hard rubber		Polyurethane	
[mm]	[inch]			[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
700	28"	Class D	28 × 1 ¼"	247	182	292	215
750	30"	Class D	28 × 1 ¼"	287	212	302	223
800	32"	Class D	28 × 1 ½"	394	291	422	311
900	36"	Class D	32 × 1 ½"	419	309	430	317
1000	40"	Class D	36 × 1 ½"	420	310	477	352
1050	42"	Class D	36 × 1 ½"	528	389	518	382
1200	48"	Class D	44 × 1 ½"	552	407	531	392
1350	54"	Class D	44 × 1 ¾"	730	538	633	467
1500	60"	Class D	52 × 1 ¾"	758	559	832	614
1650	66"	Class D	52 × 1 ¾"	946	698	955	704
1800	72"	Class D	60 × 1 ¾"	975	719	1087	802
2000	78"	Class D	64 × 2"	853	629	786	580

Promag W tightening torques for AS 2129

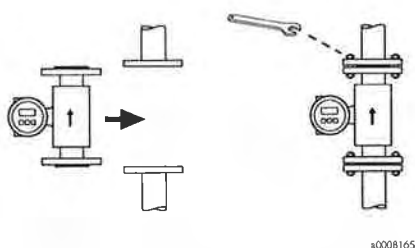
Nominal diameter [mm]	AS 2129 Pressure rating	Threaded fasteners	Max. tightening torque [Nm] Hard rubber
50	Table E	4 × M 16	32
80	Table E	4 × M 16	49
100	Table E	8 × M 16	38
150	Table E	8 × M 20	64
200	Table E	8 × M 20	96
250	Table E	12 × M 20	98
300	Table E	12 × M 24	123

2.5 Installing the Promag P sensor



Caution!

- The plates mounted on the two sensor flanges protect the PTFE which is turned over the flanges and, consequently, should not be removed until **immediately prior** to mounting the sensor.
- The protective plates must always remain mounted while the device is in storage.
- Make sure that the lining at the flange is not damaged or removed.



Note!

Screws, nuts, seals, etc. are not included in the scope of supply and must be supplied by the customer.

The sensor is installed between the two pipe flanges:

- The requisite torques must be observed → 25
- If grounding disks are used, follow the mounting instructions which will be enclosed with the shipment.

2.5.1 Seals

Comply with the following instructions when installing seals:

- **No** seals are required for PFA or PTFE measuring tube lining.
- For DIN flanges, only use seals to DIN EN 1514-1.
- Make sure that the mounted seals do not protrude into the piping cross-section.



Caution!

Risk of short circuit! Do not use electrically conductive sealing compounds such as graphite! An electrically conductive layer could form on the inside of the measuring tube and short-circuit the measuring signal.

2.5.2 Ground cable

If necessary, special ground cables can be ordered as accessories for potential equalization.

2.5.4 Tightening torques for threaded fasteners (Promag P)

Please note the following:

- The tightening torques listed below are for lubricated threads only.
- Always tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.
- The tightening torques listed below apply only to pipes not subjected to tensile stress.

Promag P tightening torques for EN (DIN)

Nominal diameter [mm]	EN (DIN) Pressure rating [bar]	Threaded fasteners	Max. tightening torque [Nm]	
			PTFE	PFA
15	PN 40	4 × M 12	11	–
25	PN 40	4 × M 12	26	20
32	PN 40	4 × M 16	41	35
40	PN 40	4 × M 16	52	47
50	PN 40	4 × M 16	65	59
65 *	PN 16	8 × M 16	43	40
65	PN 40	8 × M 16	43	40
80	PN 16	8 × M 16	53	48
80	PN 40	8 × M 16	53	48
100	PN 16	8 × M 16	57	51
100	PN 40	8 × M 20	78	70
125	PN 16	8 × M 16	75	67
125	PN 40	8 × M 24	111	99
150	PN 16	8 × M 20	99	85
150	PN 40	8 × M 24	136	120
200	PN 10	8 × M 20	141	101
200	PN 16	12 × M 20	94	67
200	PN 25	12 × M 24	138	105
250	PN 10	12 × M 20	110	–
250	PN 16	12 × M 24	131	–
250	PN 25	12 × M 27	200	–
300	PN 10	12 × M 20	125	–
300	PN 16	12 × M 24	179	–
300	PN 25	16 × M 27	204	–
350	PN 10	16 × M 20	188	–
350	PN 16	16 × M 24	254	–
350	PN 25	16 × M 30	380	–
400	PN 10	16 × M 24	260	–
400	PN 16	16 × M 27	330	–
400	PN 25	16 × M 33	488	–
450	PN 10	20 × M 24	235	–
450	PN 16	20 × M 27	300	–

Promag P tightening torques for JIS

Nominal diameter [mm]	JIS	Threaded fasteners	Max. tightening torque [Nm]	
	Pressure rating		PTFE	PFA
25	10K	4 × M 16	32	27
25	20K	4 × M 16	32	27
32	10K	4 × M 16	38	–
32	20K	4 × M 16	38	–
40	10K	4 × M 16	41	37
40	20K	4 × M 16	41	37
50	10K	4 × M 16	54	46
50	20K	8 × M 16	27	23
65	10K	4 × M 16	74	63
65	20K	8 × M 16	37	31
80	10K	8 × M 16	38	32
80	20K	8 × M 20	57	46
100	10K	8 × M 16	47	38
100	20K	8 × M 20	75	58
125	10K	8 × M 20	80	66
125	20K	8 × M 22	121	103
150	10K	8 × M 20	99	81
150	20K	12 × M 22	108	72
200	10K	12 × M 20	82	54
200	20K	12 × M 22	121	88
250	10K	12 × M 22	133	–
250	20K	12 × M 24	212	–
300	10K	16 × M 22	99	–
300	20K	16 × M 24	183	–

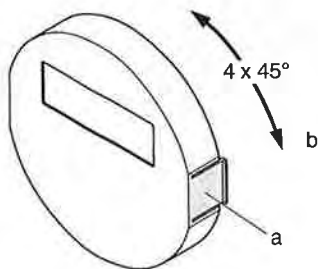
Promag P tightening torques for AS 2129

Nominal diameter [mm]	AS 2129	Threaded fasteners	Max. tightening torque [Nm]	
	Pressure rating		PTFE	
25	Table E	4 × M 12	21	
50	Table E	4 × M 16	42	

Promag P tightening torques for AS 4087

Nominal diameter [mm]	AS 4087	Threaded fasteners	Max. tightening torque [Nm]	
	Pressure rating		PTFE	
50	PN 16	4 × M 16	42	

2.7.2 Turning the onsite display



- a. Press in the side latches on the display module and remove the module from the cover plate of the electronics compartment.
- b. Turn the display to the desired position (max. $4 \times 45^\circ$ in both directions) and reset it onto the cover plate of the electronics compartment.

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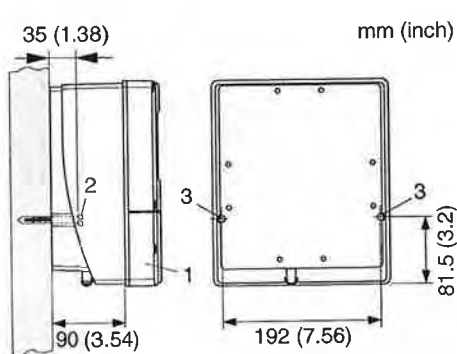
2.7.3 Installing the wall-mount housing



Caution!

- Make sure that the ambient temperature does not exceed the permitted range.
- Always install the wall-mount housing in such a way that the cable entries point downwards.

Mounted directly on the wall



A0007542

1. Connection compartment
2. Securing screws M6 (max. \varnothing 6.5 mm (0.25")); screw head max. \varnothing 10.5 mm (0.4")
3. Housing bores for securing screws

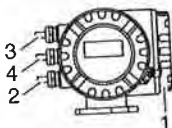
2.8 Post-installation check

- Is the measuring device damaged (visual inspection)?
- Does the device correspond to specifications at the measuring point, including process temperature and pressure, ambient temperature, minimum fluid conductivity, measuring range, etc.?
- Does the arrow on the sensor nameplate match the actual direction of flow through the pipe?
- Is the position of the measuring electrode plane correct?
- Were all screws tightened to the specified torques when the sensor was installed?
- Were the correct seals used (type, material, installation)?
- Are the measuring point number and labeling correct (visual inspection)?
- Were the inlet and outlet runs respected?
 - Inlet run $\geq 5 \times DN$
 - Outlet run $\geq 2 \times DN$
- Is the measuring device protected against moisture and direct sunlight?
- Is the sensor adequately protected against vibration (attachment, support)?
Acceleration up to 2 g by analogy with IEC 600 68-2-8

3.1 Connecting the various housing types

Wire the unit using the terminal assignment diagram inside the cover.

3.1.1 Compact version

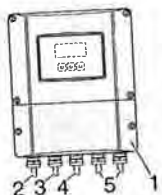


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Transmitter connection:

- 1 Connection diagram inside the connection compartment cover
- 2 Power supply cable
- 3 Signal cable or fieldbus cable
- 4 Optional

3.1.2 Remote version (transmitter): non-Ex Zone, Ex Zone 2, Class I Div. 2



A0012690

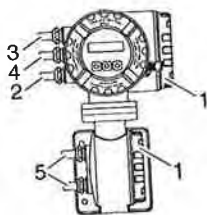
Transmitter connection:

- 1 Connection diagram inside the connection compartment cover
- 2 Power supply cable
- 3 Signal cable
- 4 Fieldbus cable

Connecting the connecting cable (→ 36):

- 5 Sensor/transmitter connecting cable

3.1.3 Remote version (transmitter): Ex Zone 1, Class I Div. 1



A0008218

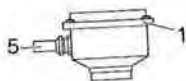
Transmitter connection:

- 1 Connection diagram inside the connection compartment cover
- 2 Power supply cable
- 3 Signal cable or fieldbus cable
- 4 Optional

Connecting the connecting cable (→ 36):

- 5 Sensor/transmitter connecting cable

3.1.4 Remote version (sensor)



A0008037

Transmitter connection:

- 1 Connection diagram inside the connection compartment cover

Connecting cable connection:

- 5 Sensor/transmitter connecting cable

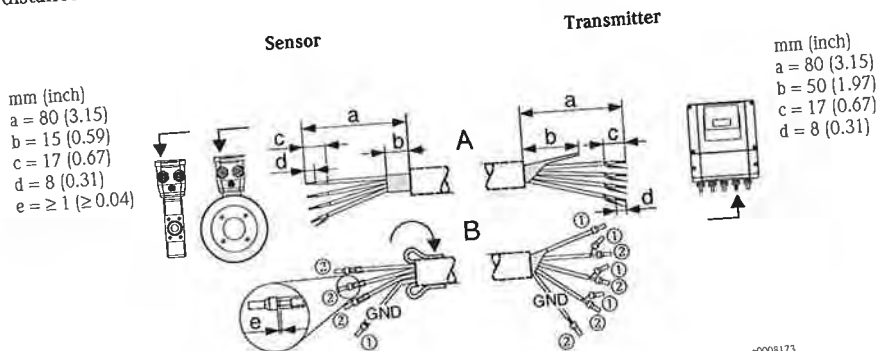
3.2.2 Promag H connecting cable

Connecting cable termination

Terminate the signal and coil current cables as shown in the figure below (Detail A).
Fit the fine-wire cores with cable end ferrules (Detail B).

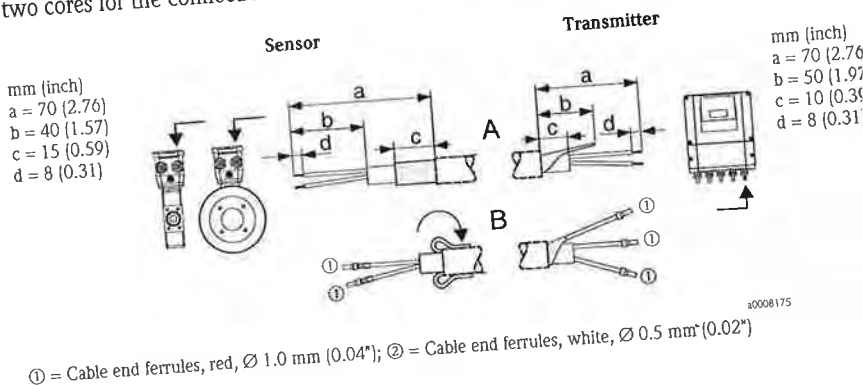
Signal cable termination

Make sure that the cable end ferrules do not touch the wire shields on the sensor side! Minimum distance = 1 mm (0.04 in), exception "GND" = green cable.



Coil current cable termination

Insulate one core of the three-core cable at the level of the core reinforcement; you only require two cores for the connection.



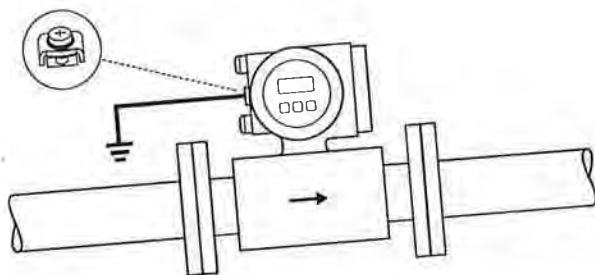
3.3 Potential equalization

Perfect measurement is only ensured when the medium and the sensor have the same electrical potential. Most sensors have a reference electrode installed as standard, which guarantees the required potential connection. This usually means that the use of ground disks or other measures are unnecessary.

- Promag L, Promag W and Promag P
Reference electrode available as standard.
- Promag H
 - No reference electrode available. There is always an electrical connection to the fluid via the metal process connection.
 - In the case of plastic process connections, potential equalization must be ensured through the use of grounding rings.

Standard situation

Potential equalization takes place via the ground terminal of the transmitter when using the device in metal, grounded pipes.



Note!

Potential equalization for other areas of application → Operating Instructions on the CD-ROM

4 Hardware settings

This section only deals with the hardware settings needed for commissioning. All other settings (e.g. output configuration, write protection, etc.) are described in the associated Operating Instructions on the CD-ROM.



Note!

No hardware settings are needed for measuring devices with HART or FOUNDATION Fieldbus-type communication.

4.1 Device address

Has to be set for measuring devices with the following communication methods:

- PROFIBUS DP/PA

The device address can be configured via:

- Miniature switches → see description below
- Local operation → see **Software settings section** → 48

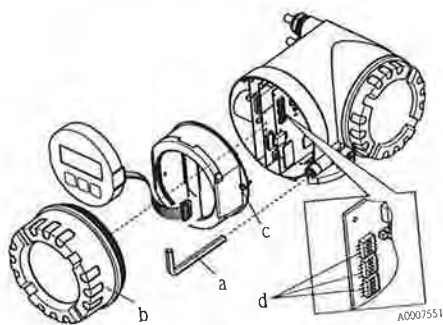
Addressing via miniature switches



Warning!

Risk of electric shock! Risk of damaging the electronic components!

- All the safety instructions for the measuring device must be observed and all the warnings heeded → 34.
- Use a workspace, working environment and tools purposely designed for electrostatically sensitive devices.



Warning!

Switch off the power supply before opening the device.

- a. Loosen the cheese head screw of the securing clamp with an Allen key (3 mm)
- b. Unscrew cover of the electronics compartment from the transmitter housing.
- c. Loosen the securing screws of the display module and remove the onsite display (if present).
- d. Set the position of the miniature switches on the I/O board using a sharp pointed object.

Installation is the reverse of the removal procedure.

4.2 Terminating resistors

Note!

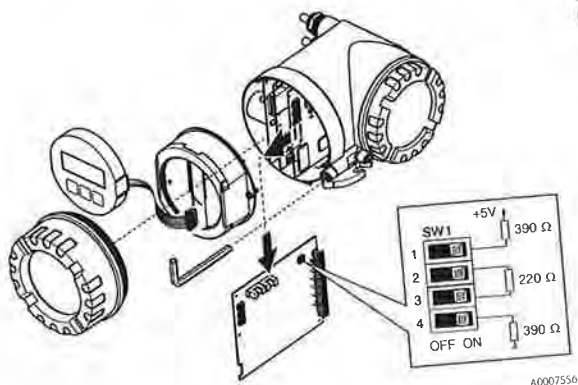
If the measuring device is used at the end of a bus segment, termination is required. This can be performed in the measuring device by setting the terminating resistors on the I/O board. Generally, however, it is recommended to use an external bus terminator and not perform termination at the measuring device itself.

Has to be set for measuring devices with the following communication methods:

- PROFIBUS DP
 - Baudrate ≤ 1.5 MBaud \rightarrow Termination can be performed at the measuring device, see graphic
 - Baudrate > 1.5 MBaud \rightarrow An external bus terminator must be used

- Warning!**
Risk of electric shock! Risk of damaging the electronic components!
- All the safety instructions for the measuring device must be observed and all the warnings heeded \rightarrow 34.
 - Use a workspace, working environment and tools purposely designed for electrostatically sensitive devices.

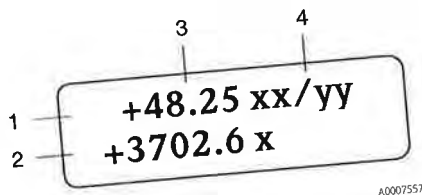
Setting the terminating switch SW1
on the I/O board:
ON - ON - ON - ON



A0007556

5.2 Operation

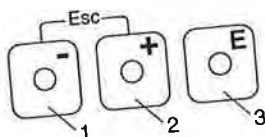
5.2.1 Display elements



Display lines/fields

1. Main line for primary measured values
2. Additional line for additional measured variables/status variables
3. Current measured values
4. Engineering units/time units

5.2.2 Operating elements



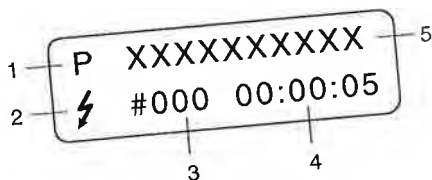
Operating keys

1. (-) Minus key for entering, selecting
2. (+) Plus key for entering, selecting
3. Enter key for calling the function matrix, saving

When the +/- keys are pressed simultaneously (Esc):

- Exit the function matrix step-by-step:
- > 3 sec. = cancel data input and return to the measured value display

5.2.3 Displaying error messages



1. Type of error:
P = Process error, S = System error
2. Error message type:
⚡ = Fault message, ! = Notice message
3. Error number
4. Duration of the last error that occurred:
Hours: Minutes: Seconds
5. Error designation
List of all error messages, see associated Operating Instructions on the CD-ROM

5.4 Calling the Commissioning Quick Setup

All the functions needed for commissioning are called up automatically with the Quick Setup. The functions can be changed and adapted to the process in question.

1. $\boxed{\text{E}}$ → Enter the function matrix (starting with measured value display)
2. $\boxed{\text{Q}}$ → Select the group QUICK SETUP
 $\boxed{\text{E}}$ → Confirm selection
3. QUICK SETUP COMMISSIONING function appears.
4. Intermediate step if configuration is blocked:
 $\boxed{\text{Q}}$ → Enter the code **50** (confirm with $\boxed{\text{E}}$) and thus enable configuration
5. $\boxed{\text{Q}}$ → Go to Commissioning Quick Setup
6. $\boxed{\text{Q}}$ → Select YES
 $\boxed{\text{E}}$ → Confirm selection
7. $\boxed{\text{E}}$ → Start Commissioning Quick Setup
8. Configure the individual functions/settings:
 - Via $\boxed{\text{Q}}$ -key, select option or enter number
 - Via $\boxed{\text{E}}$ -key, confirm entry and go to next function
 - Via $\boxed{\text{Q}}$ -key, return to Setup Commissioning function (settings already made are retained)



Note!

Observe the following when performing the Quick Setup:

- Configuration selection: Select the ACTUAL SETTING option
- Unit selection: This is not offered again for selection after configuring a unit
- Output selection: This is not offered again for selection after configuring an output
- Automatic configuration of the display: select YES
 - Main line = Mass flow
 - Additional line = Totalizer 1
 - Information line = Operating/system conditions
- If asked whether additional Quick Setups should be executed: select NO

All the available functions of the measuring device and their configuration options as well as additional Quick Setups, if available, are described in detail in the "Description of Device Functions" Operating Instructions. The related Operating Instructions can be found on the CD-ROM.

The measuring device is ready for operation on completion of the Quick Setup.

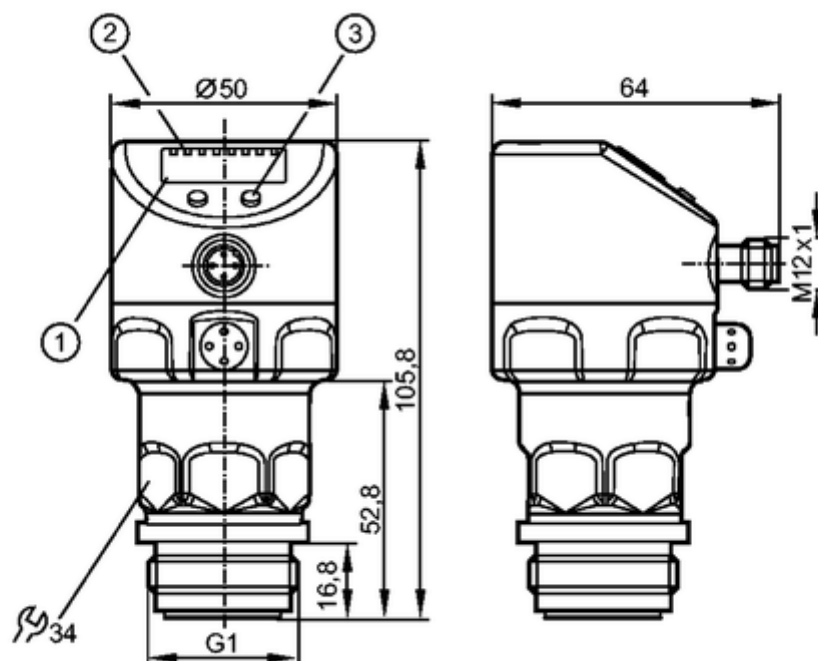
Promag 50

Commissioning

e Promag 50

efectorsoo**PI2796**

PI-2.5-REA01-MFRKG/US/ /P

Pressure sensors

1: 4-digit alphanumeric display

2: LEDs

3: Programming button



EHEDG Certified



Made in Germany

Product characteristics

Combined pressure sensor

Connector

Process connection: G 1 A / Aseptoflex Vario

Display units:

bar, kPa, psi, inH₂O, mWS, % of the span

Function programmable

2-wire connection technology:

analogue output

3-wire connection technology:

2 outputs

OUT1 = switching output

OUT2 = switching output or analogue output

4-digit alphanumeric display

Measuring range: -0.124...2.500 bar / -1.8...36.27 psi

Application

Application

Type of pressure: relative pressure
 Hygienic systems, viscous media and liquids with suspended particles
 Liquids and gases

Pressure rating

20 bar

290 psi

Bursting pressure min.

50 bar

725 psi

Medium temperature [°C]

-25...125 (145 max. 1h)

Electrical data		
Electrical design	2 wires DC / 3 wires DC PNP/NPN	
Operating voltage [V]	20...32 DC (2L) / 18...32 DC (3L)	
Current consumption [mA]	3.6...21 (2L) / < 45 (3L)	
Insulation resistance [MΩ]	> 100 (500 V DC)	
Protection class	III	
Reverse polarity protection	yes	
Outputs		
Output	2-wire connection technology: analogue output 3-wire connection technology: 2 outputs OUT1 = switching output OUT2 = switching output or analogue output	
Output function	1 x normally open / normally closed programmable + 1 x normally open / normally closed programmable or 1 x analogue (4...20 / 20...4 mA, scalable)	
Current rating [mA]	--- (2L) / 250 (3L)	
Voltage drop [V]	--- (2L) / < 2 (3L)	
Short-circuit protection	pulsed	
Overload protection	yes	
Switching frequency [Hz]	--- (2L) / 125 (3L)	
Analogue output	I: 4...20 mA (Ineg: 20...4 mA)	
Max. load [Ω]	300 (2L) / max. (U _b - 10 V) x 50 (3L)	
Measuring / setting range		
Measuring range	-0.124...2.500 bar	-1.8...36.27 psi
Setting range		
Set point, SP	-0.120...2.500 bar	-1.74...36.27 psi
Reset point, rP	-0.124...2.496 bar	-1.80...36.21 psi
Analogue start point, ASP	-0.124...1.880 bar	-1.80...27.27 psi
Analogue end point, AEP	0.500...2.500 bar	7.26...36.27 psi
in steps of	0.002 bar	0.03 psi
Factory setting	SP1 = 0.624 bar; rP1 = 0.574 bar SP2 = 1.874 bar; rP2 = 1.824 bar ASP = 0.000 bar; AEP = 2.500 bar	
Accuracy / deviations		
Accuracy / deviations (in % of the span) Turn down 1:1		
Switch point accuracy	< ± 0.2	
Characteristics deviation *)	< ± 0.2	
Linearity	< ± 0.15	
Hysteresis	< ± 0.15	
Repeatability **)	< ± 0.1	
Long-term stability ***)	< ± 0.1	
Temperature coefficients (TEMPCO) in the temperature range 0...70° C (in % of the span per 10 K)		
Greatest TEMPCO of the zero point	< ± 0.05	
Greatest TEMPCO of the span	< ± 0.15	
Reaction times		
Power-on delay time [s]	1 (2L) / 0.5 (3L)	
Min. response time switching output [ms]	--- (2L) / 3 (3L)	

Damping for the switching output (dAP) [s]	0.00...30.00
Damping for the analogue output (dAA) [s]	0.01...99.99
Step response time analogue output [ms]	45 (2L) / 7 (3L)
Integrated watchdog	yes

Interfaces

IO-Link Device

Transfer type	COM2 (38.4 kBaud)
IO-Link revision	1.0
IO-Link Device ID	159 d / 00 00 9F h
Profiles	no profile
SIO mode	yes
Required master port type	A
Process data analogue	1
Process data binary	2
Min. process cycle time [ms]	2.3

Environment

Ambient temperature [°C]	-25...80
Storage temperature [°C]	-40...100
Protection	IP 67 / IP 68 / IP 69K

Tests / approvals

EMC	EN 61000-4-2 ESD:	4 kV CD / 8 kV AD
	EN 61000-4-3 HF radiated:	10 V/m
	EN 61000-4-4 Burst:	2 kV
	EN 61000-4-5 Surge:	0.5/1 kV
	EN 61000-4-6 HF conducted:	10 V
Shock resistance	DIN IEC 68-2-27:	50 g (11 ms)
Vibration resistance	DIN IEC 68-2-6:	20 g (10...2000 Hz)
MTTF [Years]	160	

Mechanical data

Process connection	G 1 A / Aseptoflex Vario	
Materials (wetted parts)	ceramics (99.9 % Al ₂ O ₃); PTFE; stainless steel 316L / 1.4435; surface characteristics: Ra < 0.4 / Rz 4	
Housing materials	stainless steel 316L / 1.4404; FPM (Viton); PTFE; PBT (Pocan); PEI; PFA	
Switching cycles min.	100 million	
Weight [kg]	0.314	

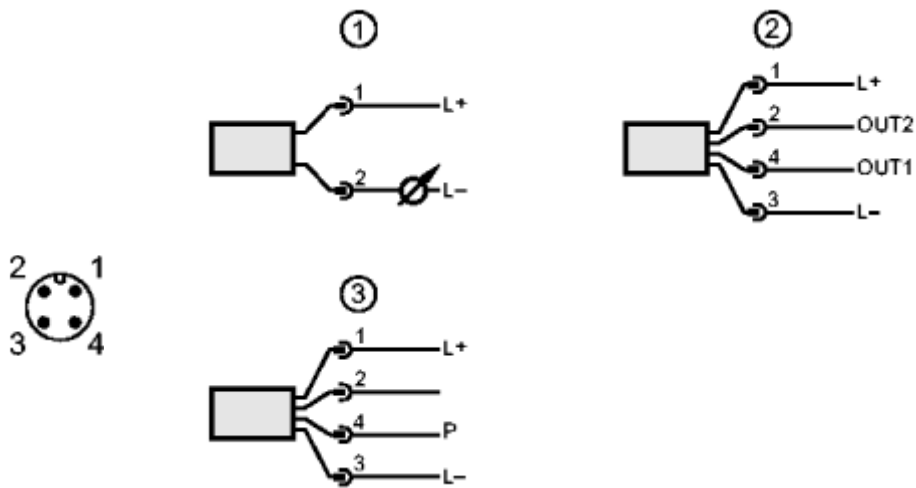
Displays / operating elements

Display	Display unit	LED green
	Switching status	LED yellow
	Function display	4-digit alphanumeric display
	Measured values	4-digit alphanumeric display

Electrical connection

Connection	M12 connector; gold-plated contacts
------------	-------------------------------------

Wiring



Remarks

Remarks

(2L) = value for 2-wire operation
(3L) = value for 3-wire operation
) linearity, incl. hysteresis and repeatability;
(limit value setting to DIN 16086)
) with temperature fluctuations < 10 K
) in % of the span per year

Pack quantity [piece]

1

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ifm electronic



Operating instructions
Electronic pressure sensor

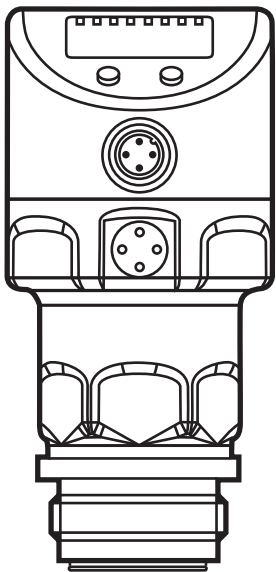
efector500[®]

PI27xx

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1 Preliminary note

1.1 Symbols used

- Instructions
- > Reaction, result
- [...] Designation of pushbuttons, buttons or indications
- Cross-reference
-  Important note
Non-compliance can result in malfunction or interference.
-  Information
Supplementary note.

2 Safety instructions

- Please read this document prior to set-up of the unit. Ensure that the product is suitable for your application without any restrictions.
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property can occur.
- Check the compatibility of the product materials (→ chapter 12 Technical data) with the media to be measured in all applications.

For the scope of validity cULus:

The device shall be supplied from an isolating transformer having a secondary Listed fuse rated either

- a) max 5 amps for voltages 0~20 Vrms (0~28.3 Vp) or
- b) 100/Vp for voltages of 20~30 Vrms (28.3~42.4 Vp).

The Sensor shall be connected only by using any R/C (CYJV2) cord, having suitable ratings.

3 Functions and features

The unit measures and monitors the system pressure in a plant.

3.1 Applications

Type of pressure: relative pressure

Order no.	Measuring range		Permissible overpressure		Bursting pressure	
	bar	PSI	bar	PSI	bar	PSI
PI2793	-1...25	-14.4...362.7	100	1450	350	5075
PI2794	-1...10	-14.5...145	50	725	150	2175
PI2795	-1...4	-14.5...58	30	435	100	1450
PI2796	-0.124...2.5	-1.8...36.27	20	290	50	725
PI2797	-0.05...1	-0.73...14.5	10	145	30	435
PI2799	-1...1	-14.5...14.5	10	145	30	435
	mbar	inH2O	bar	inH2O	bar	inH2O
PI2798	-12.4...250	-5.0..100.4	10	4015	30	12044
PI2789	-5...100	-2.00...40.16	4	1606	30	12044



Avoid static and dynamic overpressure exceeding the given overload pressure by taking appropriate measures.

The indicated bursting pressure must not be exceeded.

Even if the bursting pressure is exceeded only for a short time, the unit may be destroyed. ATTENTION: Risk of injury!

Not suitable for use where the criteria for paragraph D10.1.2/74-03 of the 3A standard 74-03 have to be met.

4 Function

- The unit displays the current system pressure.
- It generates output signals according to the operating mode and the parameter setting.
- It moreover provides the process data via IO-Link.
- The unit is laid out for fully bidirectional communication. So, the following options are possible:
 - Remote display: reading and display of the current system pressure.
 - Remote parameter setting: reading and changing the current parameter setting.

- Using the FDT service program ifm Container, the current parameter settings can be stored and transferred to other units of the same type.

The program library of the available DTM objects can be found at www.ifm.com
→ Service → Download.

Device-specific parameter lists for IO-Link parameter setting are available at:
www.ifm.com

4.1 Operating modes

The operating mode is defined by the wiring (→ 6 Electrical connection) and automatically recognised.

4.1.1 2-wire operation

OUT2 (pin 2)	analogue signal proportional to pressure 4...20 mA or 20...4 mA
---------------------	---

4.1.2 3-wire operation

OUT1 (pin 4)	<ul style="list-style-type: none"> • switching signal for system pressure limit value • communication via IO-Link
OUT2 (pin 2)	3 options: <ul style="list-style-type: none"> • switching signal for system pressure limit value • analogue signal proportional to pressure 4...20 mA • analogue signal proportional to pressure 20...4 mA

4.2 Switching function (only for 3-wire operation)

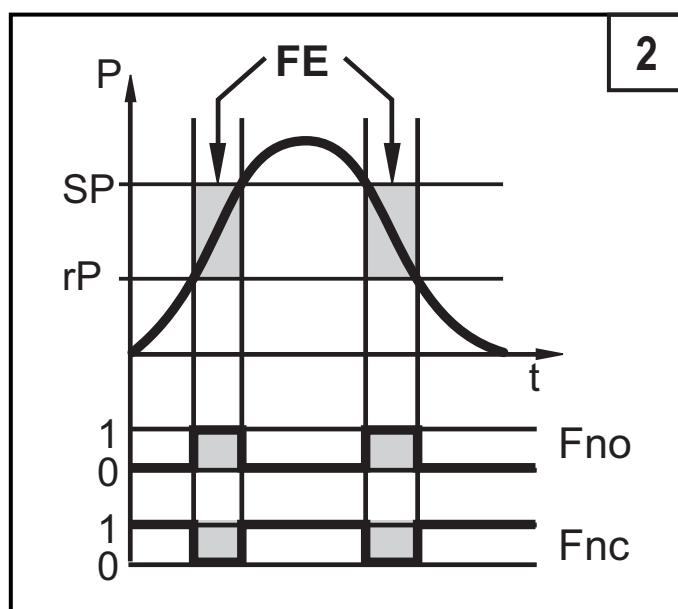
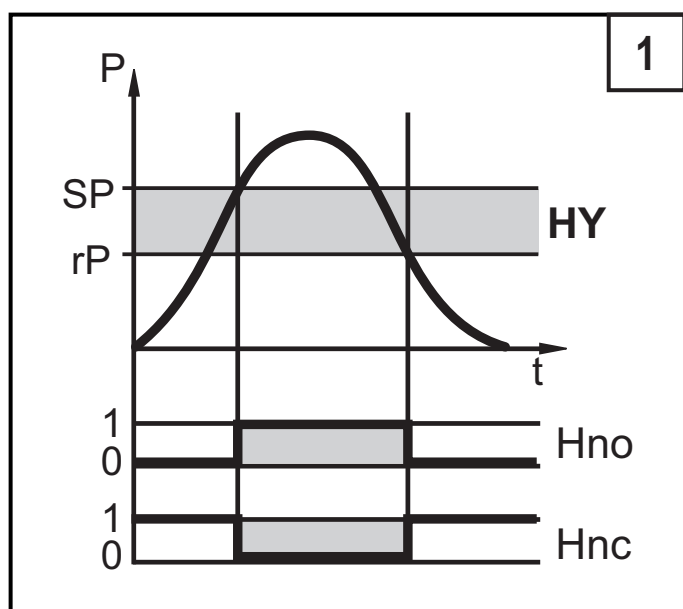
OUTx changes its switching state if it is above or below the set switching limits (SPx, rPx). The following switching functions can be selected:

- Hysteresis function / normally open: [OUx] = [Hno] (→ fig. 1).
- Hysteresis function / normally closed: [OUx] = [Hnc] (→ fig. 1).

First the set point (SPx) is set, then the reset point (rPx) with the requested difference.

- Window function / normally open: [OUx] = [Fno] (→ fig. 2).
- Window function / normally closed: [OUx] = [Fnc] (→ fig. 2).

The width of the window can be set by means of the difference between SPx and rPx. SPx = upper value, rPx = lower value.



P = system pressure; HY = hysteresis; FE = window

4.3 Analogue function

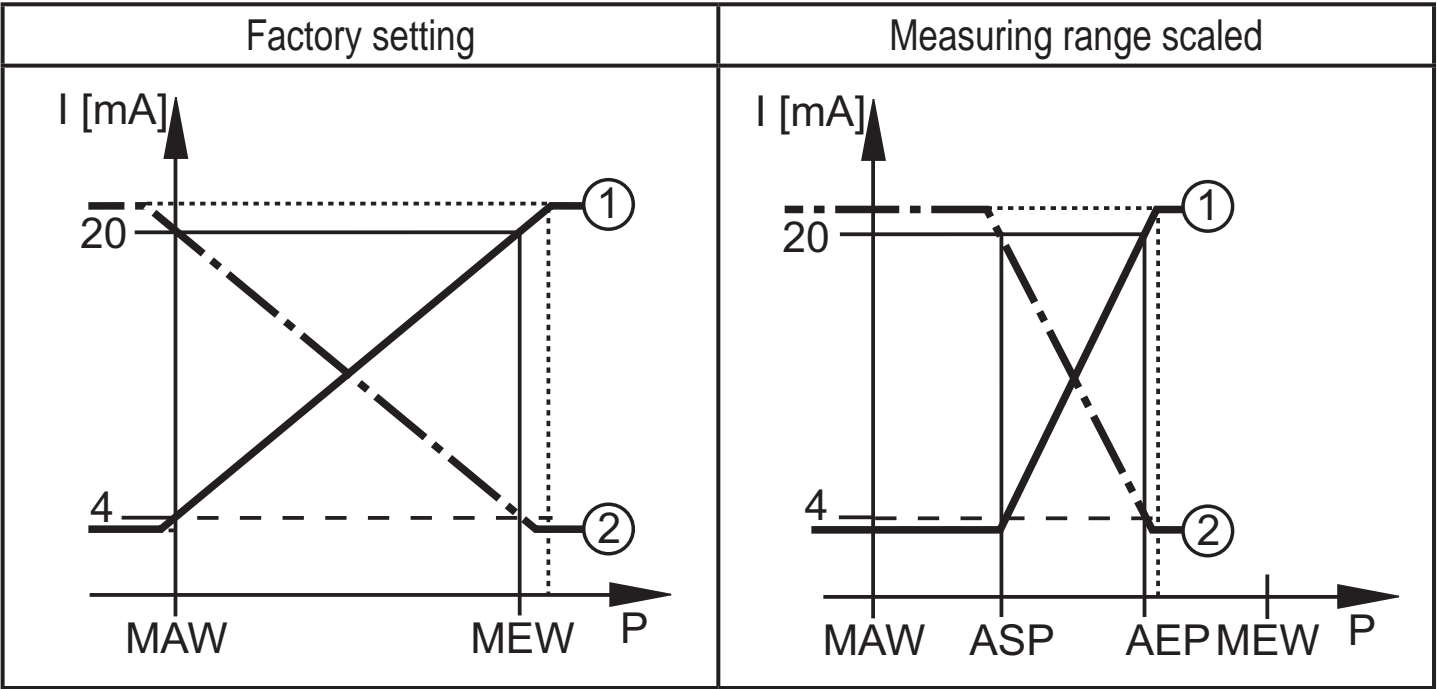
The analogue output can be configured.

- [OU2] defines whether the set measuring range is provided as 4...20 mA ([OU2] = [I]) or as 20...4 mA ([OU2] = [InEG]).

Scaling can be set by means of the teaching process or by entering a value for the ASP and AEP parameters.

- Teaching the analogue start point [tASP] or setting the parameter [ASP] defines at which measured value the analogue signal is 4 mA (20 mA at [InEG]).
- Teaching the analogue end point [tAEP] or setting the parameter [AEP] defines at which measured value the output signal is 20 mA (4 mA at [InEG]).

Minimum distance between [ASP] and [AEP] = 25 % of the final value of the measuring range (turn-down 1:4); for PI2799: 25 % of the measuring span.



P = system pressure , MAW = initial value of the measuring range, MEW = final value of the measuring range

①: [OU2] = [I]; ②: [OU2] = [InEG]

In the set measuring range the output signal is between 4 and 20 mA ([OU2] = [I]) or between 20 and 4 mA ([OU2] = [InEG]).

It is also indicated:

- System pressure above the measuring range:
 - Output signal > 20 mA at [OU2] = [I].
 - Output signal 4 to 3.8 mA at [OU2] = [InEG].
- System pressure below the measuring range:
 - Output signal 4 to 3.8 mA at [OU2] = [I].
 - Output signal > 20 mA at [OU2] = [InEG].

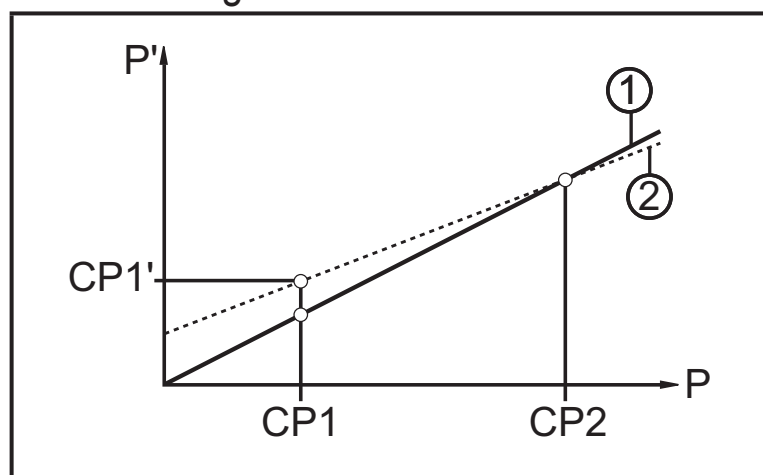
4.4 Customer-specific calibration

The customer-specific calibration changes the curve of measured values compared to the real measured values (shifting / change of the gradient; → 9.4.6 [CAL]).

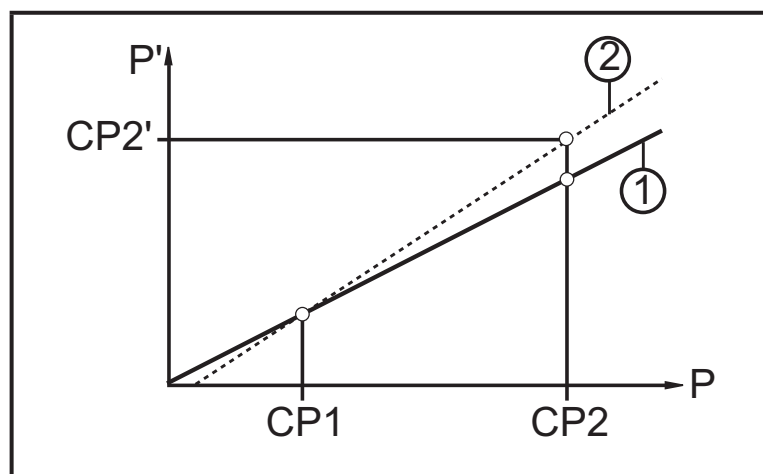
- Two calibration points can be defined (CP1, CP2). The two points are independent of each other.
- The two calibration points must be within the scaled measuring range (→ 4.3 Pressure monitoring / analogue function).
- The zero point calibration [COF] influences the calibration of the curve of measured values. Recommendation: set [COF] to 0 (→ 9.4.1 [COF]), then calibrate the curve of measured values.

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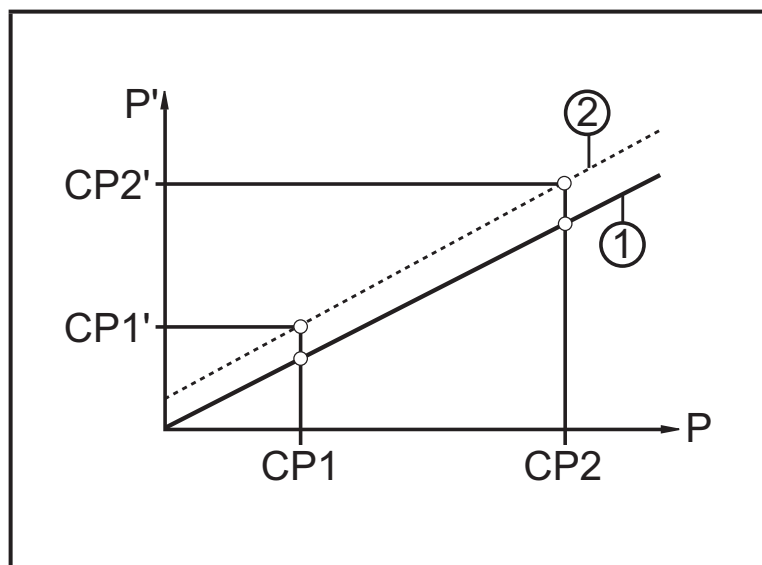
After a change the calibration can be reset to factory setting (→ 9.5.2 [rES]).



- P = measured pressure;
P' = modified measured value
- CP1 = calibration point 1;
CP1' = modified measured value for CP1
- CP2 = calibration point 2;
- 1 = curve of measured values at factory setting
- 2 = curve of measured values after calibration



- P = measured pressure;
P' = modified measured value
- CP1 = calibration point 1;
CP2 = calibration point 2;
CP2' = modified measured value for CP2
- 1 = curve of measured values at factory setting
- 2 = curve of measured values after calibration



- P = measured pressure;
P' = modified measured value
- CP1 = calibration point 1;
CP1' = modified measured value for CP1
- CP2 = calibration point 2;
CP2' = modified measured value for CP2
- 1 = curve of measured values at factory setting
- 2 = curve of measured values after calibration

5 Installation



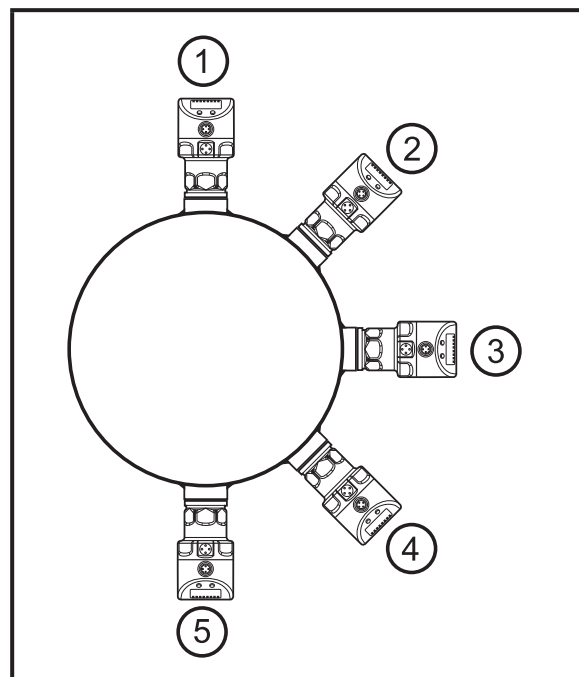
Before installing and removing the unit: make sure that no pressure is applied to the system. Please consider when the system pressure is displayed in % of the span: "0" does not mean that no pressure is applied to the system!

Use in hygienic areas to 3A

Orientation of the unit in pipes and tanks

For optimised cleaning of the measuring element according to the 3A criteria for hygienic areas please take the following into account:

Do not install the unit at the lowest point of the pipe or tank (see fig., position 5) in order that the medium can run off the area of the measuring element.



Use in hygienic areas to EHEDG

- Make sure that the sensors are integrated into the system in accordance with EHEDG.

The unit can be fixed to different process connections. Options are as follows:

1	Installation using an adapter with sealing ring (order no. E332xx / E333xx) The adapters are supplied with EPDM O-ring (order no. E30054). More sealing rings are available as accessories: FKM O-ring (order no. E30123); PEEK sealing ring (order no. E30124). Concerning installation → Installation instructions attached to the adapter.
2	Installation using an adapter with metal-to-metal seal Order no. E337xx / E338xx Concerning installation → Installation instructions attached to the adapter.
3	Installation using a welding adapter <ul style="list-style-type: none"> • Order no. E30122 • Order no. E30130; adapter with leakage port The adapters are supplied with EPDM O-ring (order no. E30054). More sealing rings are available as accessories: FKM O-ring, order no. E30123. Concerning installation → Installation instructions attached to the adapter.
4	Installation to G 1 flange The sealing ring on the sensor is used as process seal. The upper sealing area on the process connection must be flush with the tapped hole and have a surface characteristic of min. Rz 6.3. <ul style="list-style-type: none"> ▶ Grease the sensor thread with a suitable paste. ▶ Insert the unit into the process connection. ▶ Tighten it using a spanner. Tightening torque: 35 Nm.

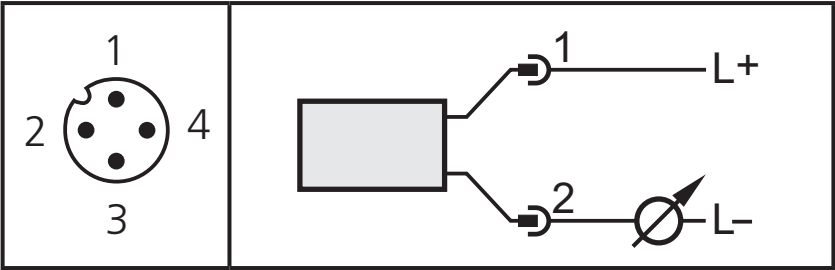
6 Electrical connection



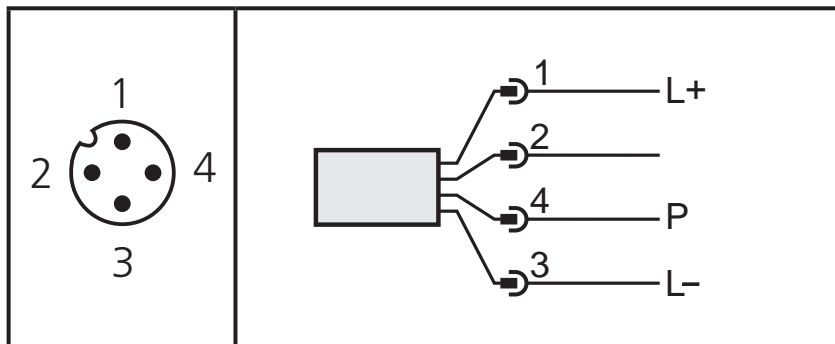
The unit must be connected by a qualified electrician.
 The national and international regulations for the installation of electrical equipment must be adhered to.
 Voltage supply according to EN 50178, SELV, PELV.

- ▶ Disconnect power.
- ▶ Connect the unit as follows:

6.1 Connection for 2-wire operation

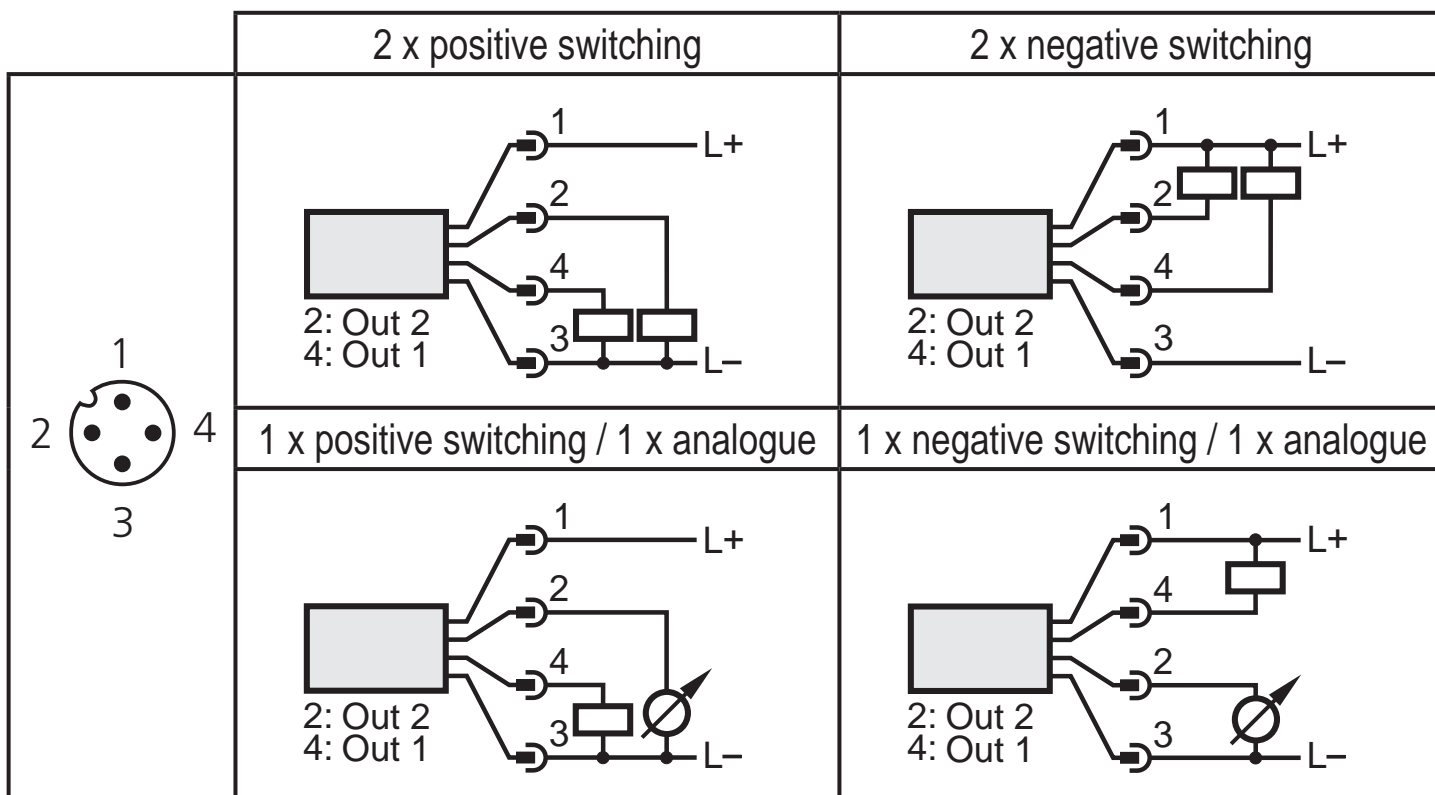


6.2 Connection for IO-Link parameter setting



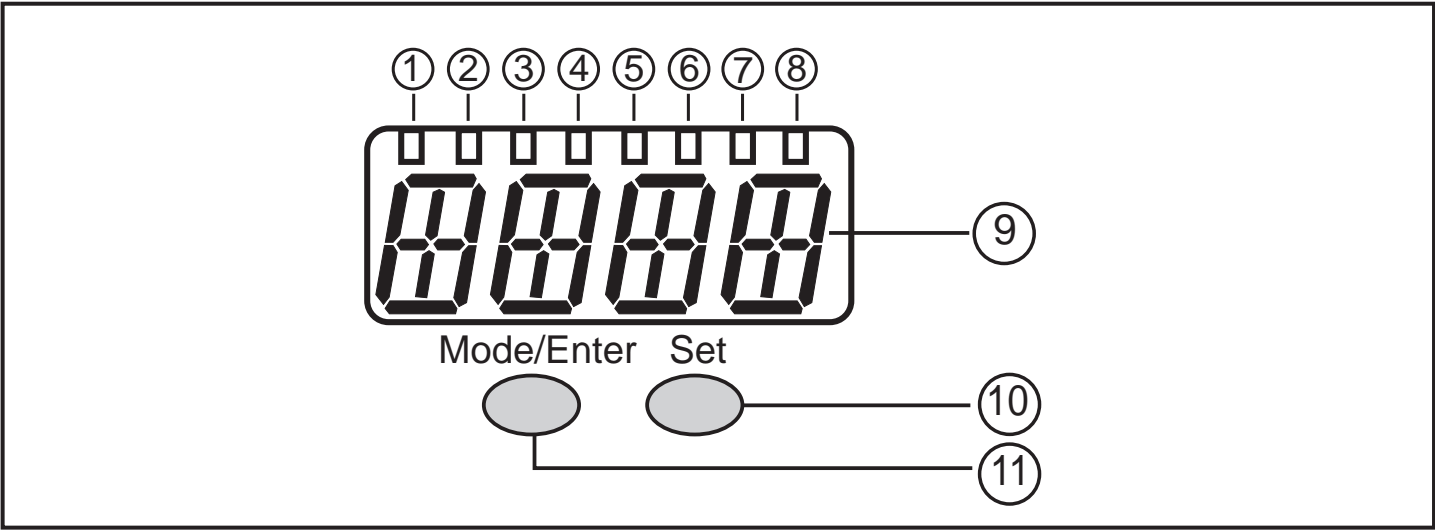
Pin 1	Ub+
Pin 2	Output function according to the OU2 setting
Pin 3	Ub- for programming mode
Pin 4 (P)	Communication via IO-Link

6.3 Connection for 3-wire operation



Pin 1	Ub+
Pin 3	Ub-
Pin 4 (OUT1)	<ul style="list-style-type: none"> • Binary switching output pressure monitoring • Communication via IO-Link
Pin 2 (OUT2)	Binary switching output pressure monitoring or analogue output for system pressure.

7 Operating and display elements



1 to 8: Indicator LEDs

- LED 1 to LED 5 = system pressure in the specified unit of measurement.
- LED 6 = System pressure in % of the set scaling of the analogue output if [OU2] is configured as analogue output.
System pressure in % of the final value of the measuring range if [OU2] is configured as switching output.
- LED 7 = switching status OUT2 (lights if output 2 is switched).
- LED 8 = switching status OUT1 (lights if output 1 is switched)

9: Alphanumeric display, 4 digits

- Display of the current system pressure.
- Indication of the parameters and parameter values.

10: Set pushbutton

- Setting of the parameter values (scrolling by holding pressed; incrementally by pressing once).

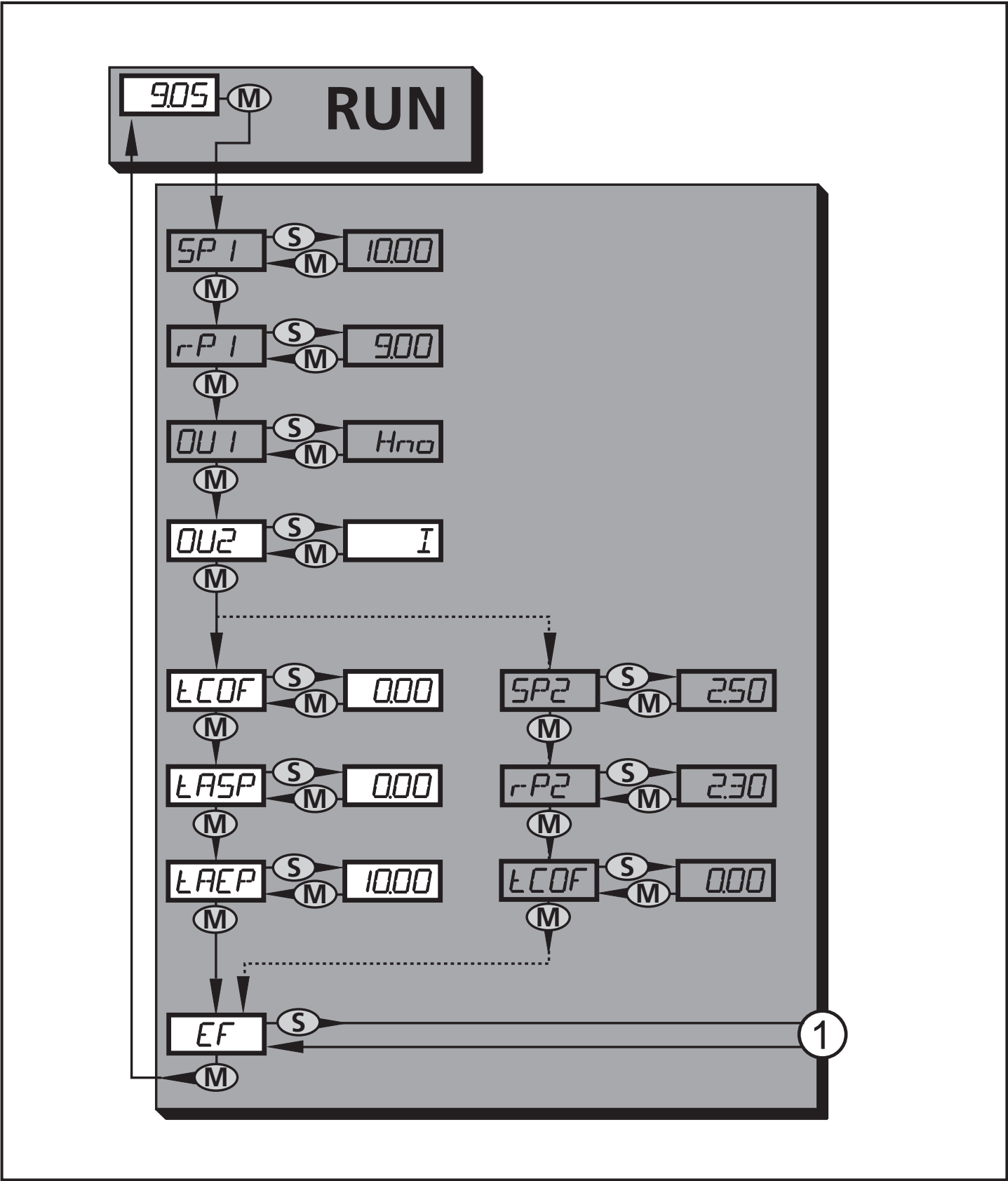
11: Mode/Enter button

- Selection of the parameters and acknowledgement of the parameter values.

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8 Menu

8.1 Menu structure: main menu



1: Change to menu level 2 (extended functions)
Menu items highlighted grey (**SP1**) are not active in 2-wire operation.

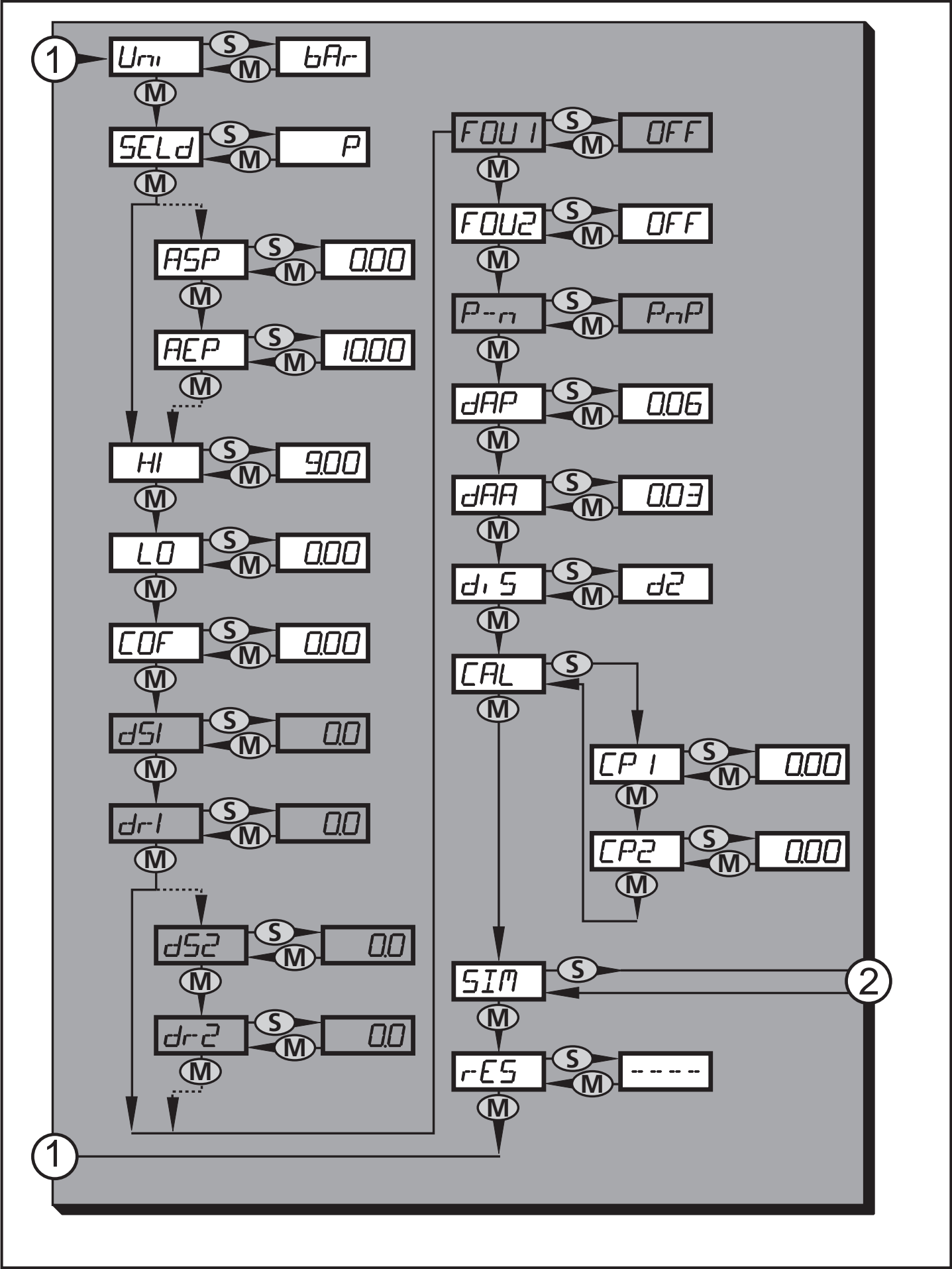
8.2 Explanation of the main menu

SP1/rP1*	Upper / lower limit value for system pressure at which OUT1 switches.
OU1*	Output function for OUT1: <ul style="list-style-type: none"> Switching signal for the pressure limit values: hysteresis function [H ..] or window function [F ..], either normally open [. no] or normally closed [. nc].
OU2	Output function for OUT2: <ul style="list-style-type: none"> Switching signal for the pressure limit values: hysteresis function [H ..] or window function [F ..], either normally open [. no] or normally closed [. nc]; (only available for 3-wire operation). Analogue signal for the current system pressure: 4...20 mA [I], 20...4 mA [InEG].
tCOF	Teach zero-point calibration.
tASP	Teach analogue start point for system pressure: set measured value at which 4 mA is provided (20 mA if [OU2] = [InEG]).
tAEP	Teach analogue end point for system pressure: set measured value at which 20 mA is provided (4 mA if [OU2] = [InEG]).
SP2/rP2*	Upper / lower limit value for system pressure at which OUT2 switches.
EF	Extended functions / opening of menu level 2.

* menu items not active in 2-wire operation

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8.3 Menu structure: level 2 (extended functions)

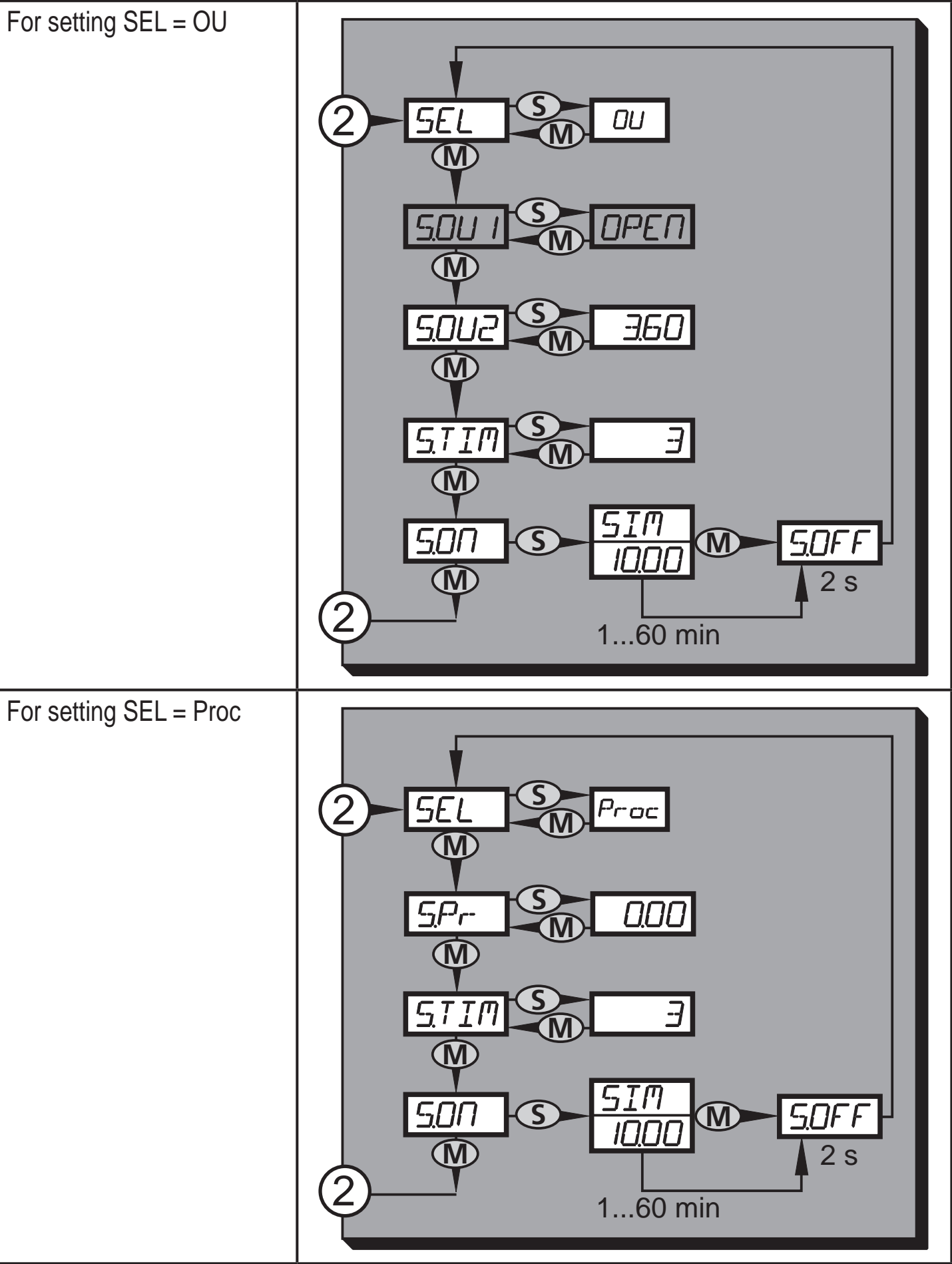


8.4 Explanation of the menu level 2

Uni	Standard unit of measurement for system pressure.
SELd	Display mode: • Pressure in the unit set in [Uni]. • Pressure in % of the set scaling of the analogue output.
ASP	Analogue start point for system pressure: measured value at which 4 mA is provided (20 mA if [OU2] = [InEG]).
AEP	Analogue end point for system pressure: measured value at which 20 mA is provided (4 mA if [OU2] = [InEG]).
HI	Maximum value memory for system pressure.
LO	Minimum value memory for system pressure.
COF	Zero-point calibration.
dS1*	Switch-on delay for OUT1.
dr1*	Switch-off delay for OUT1.
dS2*	Switch-on delay for OUT2; only active if [OU2] = [Hnc], [Hno], [Fnc] or [Fno].
dr2*	Switch-off delay for OUT2; only active if [OU2] = [Hnc], [Hno], [Fnc] or [Fno].
FOU1*	Behaviour of output 1 in case of an internal fault.
FOU2	Behaviour of output 2 in case of an internal fault.
P-n*	Switching logic for the outputs: pnp or npn.
dAP	Damping for switching outputs and display.
dAA	Damping for analogue output (OUT2); also has effect on the IO-Link process value.
diS	Update rate and orientation of the display.
CAL	Calibration function (setting the curve of measured values).
CP1	Calibration point 1
CP2	Calibration point 2
SIM	Change to menu level 3 (simulation)
rES	Restore factory settings.

* menu items not active in 2-wire operation

8.5 Menu structure: level 3 (simulation)



2: Change to menu level 2 (extended functions)
Menu items highlighted grey (S.OU1) are not active in 2-wire operation.

8.6 Explanation of the menu level 3

For setting SEL = OU	
SEL	Status to be simulated: • Output functions [OU].
S.OU1*	Simulation values for OUT1; only active for 3-wire operation and if [SEL] = [OU]. • Output inactive [OPEN] or output active [CLOS].
S.OU2	Simulation values for OUT2; only active if [SEL] = [OU]. • For 3-wire operation and if OUT2 has been configured as switching output: output inactive [OPEN] or active [CLOS]. • If OUT2 is set as analogue output: analogue signal between 3.6 and 21.1 mA (depending on the set value → 9.6.2).
S.TIM	Time for the simulation process in minutes.
S.ON	Start of the simulation process. During the simulation process the display alternately shows [SIM] and the current operation indication (9.6.4)→. If the simulation process is aborted (press [Mode/Enter] or [Set] briefly), [S.OFF] is indicated for 2 s, then [SEL] is active again.

* menu item not active in 2-wire operation

For setting SEL = Proc	
SEL	Status to be simulated: • Process value [Proc].
S.Pr	Simulation of a process value; only active if [SEL] = [Proc]. • Any value between initial value of the measuring range and final value of the measuring range.
S.TIM	Time for the simulation process in minutes.
S.ON	Start of the simulation process. During the simulation process the display alternately shows [SIM] and the current operation indication (→ 9.6.4). If the simulation process is aborted (press [Mode/Enter] or [Set] briefly) [S.OFF] is indicated for 2 s, then [SEL] is active again.

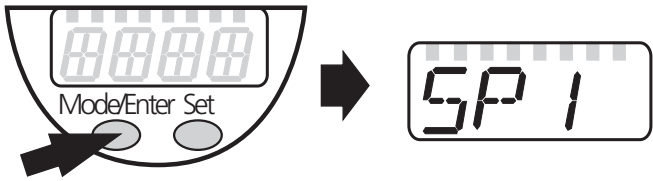
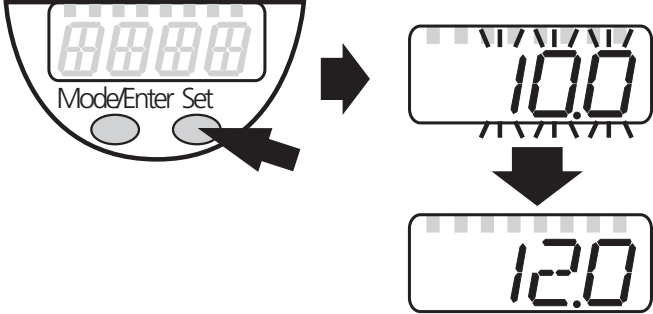
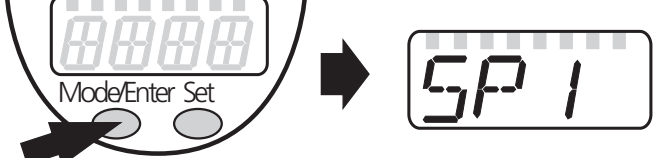
9 Parameter setting

During parameter setting the unit remains in the operating mode. It continues its monitoring function with the existing parameters until the parameter setting has been completed.

Exceptions: changes to the parameters COF (→ 9.4.1), CP1 and CP2 (→ 9.4.7) take effect immediately.

9.1 General parameter setting

3 steps must be taken for each parameter setting:

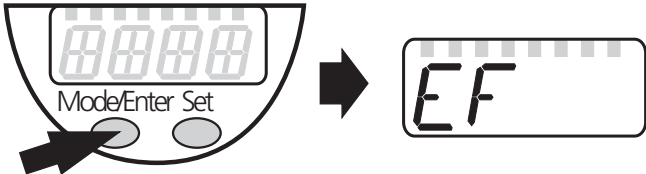
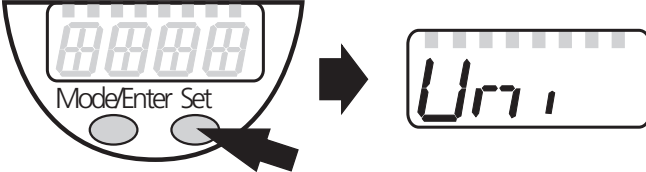
1	Select parameter <ul style="list-style-type: none"> ▶ Press [Mode/Enter] until the requested parameter is displayed. <p>If the main menu is protected by an access code, [Cod0] flashes in the display.</p> <ul style="list-style-type: none"> ▶ Press [Set] and keep it pressed until the valid code no. is displayed. ▶ Press [Mode/Enter] briefly. <p>On delivery by ifm electronic: no access restriction.</p>	
2	Set parameter value <ul style="list-style-type: none"> ▶ Press [Set] and keep it pressed. <ul style="list-style-type: none"> > Current setting value of the parameter flashes for 5 s. > After 5 s: setting value is changed: incrementally by pressing the button once or continuously by keeping the button pressed. 	 <p>Numerical values are incremented continuously. For reducing the value: let the display move to the maximum setting value. Then the cycle starts again at the minimum setting value.</p>
3	Acknowledge parameter value <ul style="list-style-type: none"> ▶ Press [Mode/Enter] briefly <ul style="list-style-type: none"> > The parameter is displayed again. <p>The new setting value is stored.</p>	
Set other parameters <ul style="list-style-type: none"> ▶ Start again with step 1. 		
Finish parameter setting <ul style="list-style-type: none"> ▶ Press [Mode/Enter] several times until the current measured value is displayed or wait for 15 s. > The unit returns to the operating mode. 		



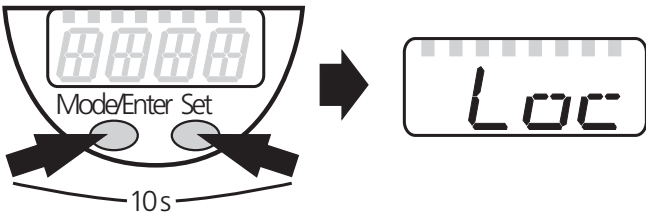
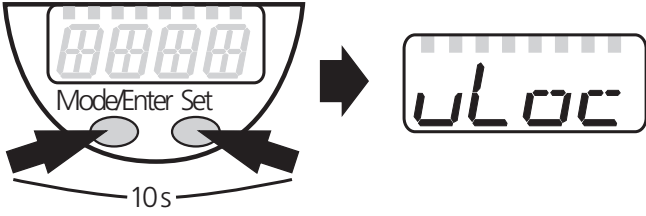
For 2-wire operation those menu items referring to switching functions are not active (→ 8 Menu structure); for some menu items those parameter values referring to switching functions cannot be selected.

- If [SLoc] is displayed when attempting a modification of a parameter value, the sensor is locked via software. This locking can only be removed via a parameter setting software.
- When parameter setting with the user interface of the ifm Container program, the values can be directly entered in the specified fields.
- For IO-Link parameter setting → device-specific parameter lists at: www.ifm.com
- Change from menu level 1 to menu level 2:

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<p>► Press [Mode/Enter] until [EF] is displayed.</p>	
<p>► Press [Set] briefly > The first parameter of the submenu is displayed (here: [Uni]).</p> <p>If the menu level 2 is protected by an access code, "Cod1" flashes in the display.</p> <p>► Press [Set] and keep it pressed until the valid code no. is displayed.</p> <p>► Press [Mode/Enter] briefly.</p> <p>On delivery by ifm electronic: no access restriction.</p>	

- Locking / unlocking
The unit can be locked electronically to prevent unintentional settings.




<p>► Make sure that the unit is in the normal operating mode.</p> <p>► Press [Mode/Enter] + [Set] for 10 s.</p> <p>> [Loc] is displayed.</p>	
<p>During operation: [Loc] is briefly displayed if you try to change parameter values.</p>	
<p>For unlocking:</p> <p>► Press [Mode/Enter] + [Set] for 10 s.</p> <p>> [uLoc] is displayed.</p>	

On delivery: unlocked.

- Timeout:


If no button is pressed for 15 s during parameter setting, the unit returns to the operating mode with unchanged values.

9.2 Configure display (optional)

<p>► Select [Uni] and set the unit of measurement:</p> <ul style="list-style-type: none"> - [bAr], [mbAr]. - [MPa], [kPa]. - [PSI] (only PI2793, PI2794, PI2795, PI2796, PI2797, PI2799). - [InHO] (only PI2789, PI2796, PI2797, PI2798, PI2799). - [mWS] (only PI2796, PI2797, PI2799). - [mmWS] (only PI2789 and PI2798). 	
<p>► Select [SEld] and set type of indication:</p> <ul style="list-style-type: none"> - [P]: system pressure in the unit set in Uni. - [P%]: system pressure in % of the set scaling of the analogue output; the following applies: 0% = ASP value / 100% = AEP value. <p>If OU2 has been configured as switching output, [ASP] and [AEP] are not active. In this case the following applies: 0% = initial value of the measuring range/ 100% = final value of the measuring range.</p> <p>If [SEld] = [P%] please take the following into account: "0" does not mean that no pressure is applied to the system!</p>	
<p>► Select [diS] and set the update rate and orientation of the display:</p> <ul style="list-style-type: none"> - [d1]: update of the measured values every 50 ms. - [d2]: update of the measured values every 200 ms. - [d3]: update of the measured values every 600 ms. - [rd1], [rd2], [rd3]: display as for d1, d2, d3; rotated by 180° - [OFF] = The measured value display is deactivated in the Run mode. <p>Touching one of the buttons indicates the current measured value for 15 s. Pressing the [Mode/Enter] button again activates the display mode. The LEDs remain active even if the display is deactivated. Error messages are displayed even if the display is deactivated.</p>	

9.3 Set output signals

9.3.1 Set output functions

<p>► Select [OU1] and set the switching function:</p> <ul style="list-style-type: none"> - [Hno] = hysteresis function/NO, - [Hnc] = hysteresis function/NC, - [Fno] = window function/NO, - [Fnc] = window function/NC. 	
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<ul style="list-style-type: none"> ▶ Select [OU2] and set the function: <ul style="list-style-type: none"> - [Hno] = hysteresis function/NO, - [Hnc] = hysteresis function/NC, - [Fno] = window function/NO, - [Fnc] = window function/NC. - [I] = current signal proportional to pressure 4...20 mA. - [InEG] = current signal proportional to pressure 20...4 mA. 	OU2
---	-----

9.3.2 Set switching limits

▶ Select [SP1] / [SP2] and set the value at which the output switches.	SP1 SP2
▶ Select [rP1] / [rP2] and set the value at which the output switches back. rPx is always smaller than SPx. The unit only accepts values which are lower than the value for SPx.	r-P1 r-P2

9.3.3 Scale analogue value for OUT2

<ul style="list-style-type: none"> ▶ Set the minimum pressure requested in the system. ▶ Press [Mode/Enter] until [tASP] appears. ▶ Press [Set] and keep it pressed. > Current setting value flashes. ▶ Release [Set] when the display stops flashing. > New setting value is displayed. ▶ Press [Mode/Enter] briefly. > The current system pressure is defined as start value for the analogue signal. 	LASP
<ul style="list-style-type: none"> ▶ Set the maximum pressure requested in the system. ▶ Press [Mode/Enter] until [tASP] appears. ▶ Press [Set] and keep it pressed. > Current setting value flashes. ▶ Release [Set] when the display stops flashing. > New setting value is displayed. ▶ Press [Mode/Enter] briefly. > The current system pressure is defined as end value for the analogue signal. 	LAEP
<p>ASP / AEP can only be set automatically within defined limits (→ 12.1 Setting ranges). If automatic setting is carried out at an invalid pressure value, [UL] or [OL] is displayed. After acknowledgement by [Mode/Enter] [Err] flashes, the ASP value / AEP value is not changed.</p>	

<p>As an alternative:</p> <ul style="list-style-type: none"> ▶ Select [ASP] and set the measured value at which 4 mA is provided (20 mA at [OU2] = [InEG]). ▶ Select [AEP] and set the measured value at which 20 mA is provided (4 mA at [OU2] = [InEG]). <p>Minimum distance between ASP and AEP = 25 % of the final value of the measuring range (turn-down 1:4).</p>	<p>ASP AEP</p>
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9.4 User settings (optional)

9.4.1 Carry out zero point calibration


<ul style="list-style-type: none"> ▶ Select [COF] and set a value between -5% and 5% of the final value of the measuring range. The internal measured value "0" is shifted by this value. 	<p>COF</p>
<p>As an alternative: automatic adjustment of the offset in the range 0 bar $\pm 5\%$.</p> <ul style="list-style-type: none"> ▶ Make sure that no pressure is applied to the system. ▶ Press [Mode/Enter] until [tCOF] appears. ▶ Press [Set] and keep it pressed. > The current offset value (in %) flashes briefly. > The current system pressure is displayed. ▶ Release [SET]. ▶ Press [Mode/Enter] briefly (= to confirm the new offset value). 	<p>tCOF</p>

9.4.2 Setting of the error behaviour of the outputs

<ul style="list-style-type: none"> ▶ Select [FOU1] and set the value: <ul style="list-style-type: none"> - [On] = output 1 switches ON in case of a fault. - [OFF] = output 1 switches OFF in case of a fault. - [OU] = output 1 switches irrespective of the error as defined with the parameters SP1, rP1 and OU1. ▶ Select [FOU2] and set the value: <ul style="list-style-type: none"> - [On] = output 2 switches ON in case of a fault, the analogue signal goes to the upper end stop value. - [OFF] = output 2 switches OFF in case of a fault, the analogue signal goes to the lower end stop value. - [OU] = Output 2 switches irrespective of the error as defined with the parameters SP2, rP2 and OU2. The analogue signal corresponds to the measured value. 	<p>FOU1 FOU2</p>
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Error indications → 10.3


9.4.3 Set delay for the switching outputs

<p>[dS1] / [dS2] = switch-on delay for OUT1 / OUT2. [dr1] / [dr2] = switch-off delay for OUT1 / OUT2.</p> <p>► Select [dS1], [dS2], [dr1] or [dr2] and set a value between 0.1 and 50 s (at 0.0 the delay time is not active).</p>	
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9.4.4 Set switching logic for the switching outputs

<p>► Select [P-n] and set [PnP] or [nPn].</p>	
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9.4.5 Set damping for the switching signal

<p>► Select [dAP] and set a value between 0.00 and 30.00 s; (at 0.00 [dAP] is not active).</p> <p>dAP value = response time between pressure change and change of the switching status in seconds.</p> <p>[dAP] influences the switching frequency: $f_{\max} = 1 \div 2dAP$.</p> <p>[dAP] also has an effect on the display.</p>	
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9.4.6 Set damping for the analogue signal

<p>► Select [dAA] and set a value between 0.01 and 99.99 s; (at 0.00 [dAA] is not active).</p> <p>dAA value = response time between pressure change and change of the analogue signal in seconds.</p>	
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9.4.7 Calibrate curve of measured values

<p>► Set a defined reference pressure between ASP and AEP in the system.</p> <p>► Select [CAL].</p> <p>► Press [Set] briefly.</p> <p>> [CP1] is displayed.</p> <p>► Press [Set] for 5 s.</p> <p>> The pressure measured by the unit is displayed.</p> <p>► Press [Set] until the set reference pressure is indicated (measured pressure = reference pressure) or the corresponding analogue signal is provided on OUT2.</p> <p>Maximum correction value = $\pm 2\%$ of the final value of the measuring range.</p> <p>► Press [Mode/Enter] briefly.</p> <p>> [CP1] is displayed.</p> <p>► Press [Mode/Enter] briefly.</p> <p>> [CP2] is displayed.</p> <p>Continue with a) or b)</p>	
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<p>a) Finish calibration:</p> <ul style="list-style-type: none"> ▶ Press [Mode/Enter] briefly. > [CAL] is displayed. <p>b) Change a 2nd point on the curve of measured values</p> <ul style="list-style-type: none"> ▶ Set a second defined reference pressure in the system. Minimum distance between the calibration points CP1 and CP2 = 5 % of the final value of the measuring range. ▶ Press [Set] for 5 s. > The pressure measured by the unit is displayed. ▶ Press [Set] until the set reference pressure is indicated (measured pressure = reference pressure) or the corresponding analogue signal is provided on OUT2. Maximum correction value = $\pm 2\%$ of the final value of the measuring range. ▶ Press [Mode/Enter] briefly. > [CP2] is displayed. ▶ Press [Mode/Enter] briefly. > [CAL] is displayed, the process is finished. 	CP2
--	-----

9.5 Service functions

9.5.1 Read min/max values for system pressure

<ul style="list-style-type: none"> ▶ Select [HI] or [LO] and press [Set] briefly. [HI] = maximum value, [LO] = minimum value. <p>Delete memory:</p> <ul style="list-style-type: none"> ▶ Select [HI] or [LO]. ▶ Press [Set] and keep it pressed until [----] is displayed. ▶ Press [Mode/Enter] briefly. 	HI LO
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9.5.2 Reset all parameters to factory setting



<ul style="list-style-type: none"> ▶ Select [rES]. ▶ Press [Set] and keep it pressed until [----] is displayed. ▶ Press [Mode/Enter] briefly. <p>It is recommended to take down your own settings in the table before carrying out a reset (→13 Factory setting).</p>	r-ES
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9.6 Simulation function

9.6.1 Open menu level 3 (simulation)


<ul style="list-style-type: none"> ▶ Select [EF] and press [Set] briefly (= to open menu level 2). ▶ Select [SIM] and press [Set] briefly (= to open menu level 3). > [SEL] is displayed. 	EF SIM
---	-----------

9.6.2 Set simulation value


<p>Output states</p> <p>If [SEL] is active:</p> <ul style="list-style-type: none"> ▶ Press [Set] and keep it pressed until [OU] is displayed. ▶ Press [Mode/Enter] briefly. > [S.OU1] is displayed (in 2-wire operation [S.OU2] is displayed). ▶ Press [Set] to set the requested value: <ul style="list-style-type: none"> - [OPEN] = output 1 not active / open. - [CLOS] = output 1 active / closed. ▶ Press [Mode/Enter] briefly. > [S.OU2] is displayed. ▶ Press [Set] to set the requested value: <ul style="list-style-type: none"> • If [OU2] = [Hnc], [Hno], [Fnc] or [Fno] (not in 2-wire operation): <ul style="list-style-type: none"> - [OPEN] = output 2 not active / open. - [CLOS] = output 2 active / closed. • If [OU2] = [I] or [InEG]: <ul style="list-style-type: none"> - 3.60...21.10 mA in steps of 0.01 mA. ▶ Press [Mode/Enter] briefly. 	
<p>Process value</p> <p>If [SEL] is active:</p> <ul style="list-style-type: none"> ▶ Press [Set] and keep it pressed until [Proc] is displayed. ▶ Press [Mode/Enter] briefly. > [S.Pr] is displayed. ▶ Press [Set] to set the requested pressure value. ▶ Press [Mode/Enter] briefly. 	

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9.6.3 Set time for simulation

<ul style="list-style-type: none"> ▶ Select [S.TIM] and set the value between 1...60 minutes. 	
--	---

9.6.4 Start simulation

<ul style="list-style-type: none"> ▶ Select [S.ON]. ▶ Press [Set] and keep it pressed until the display alternately shows [SIM] and the current operation indication. <p>Current operation indication:</p> <ul style="list-style-type: none"> - Current system pressure if [SEL] = [OU]. - Simulated measured value set in [S.Pr] if [SEL] = [Proc]. <p>After the simulation time has elapsed [S.OFF] is displayed for 2 s, then [SEL].</p>	
<p>Abort simulation:</p> <ul style="list-style-type: none"> ▶ Press [Mode/Enter] or [Set] briefly. > [S.OFF] is displayed for 2 s, then [SEL]. 	

10 Operation

After power on, the unit is in the Run mode (= normal operating mode). It carries out its measurement and evaluation functions and provides output signals according to the set parameters.

Operating indicators → Chapter 7 Operating and display elements.

10.1 Read set parameters

- ▶ Press [Mode/Enter] until the requested parameter is displayed.
- ▶ Press [Set] briefly.
- > The unit displays the corresponding parameter value for approx. 15 s. After another 15 s the parameter is displayed again, then the unit returns to the Run mode.

10.2 Change the display in the Run mode

- ▶ Press [Set] briefly in the Run mode.
- > The unit indicates the current measured value in the selected type of indication for approx. 15 s:
 - System pressure in the unit set in Uni.
 - System pressure in % of the set scaling of the analogue output if [OU2] is configured as analogue output.
 - System pressure in % of the final value of the measuring range if [OU2] is configured as switching output.

10.3 Self-diagnosis / error indications

The unit has many self-diagnostic options.

- It monitors itself automatically during operation.
- It indicates warnings and faults via IO-Link and via display (even if the display is deactivated).
- If a fault is found, the outputs are set according to the set parameters FOU1 and FOU2 (→ 9.4.2).

Display	IO-Link event number	IO-Link PDValid	IO-Link Device-Status ldx 36	Type of fault	Corrective measures
-/-*	0x5111	no	2**	Supply voltage too low.	<ul style="list-style-type: none"> ▶ Check / correct the supply voltage. ▶ In 2-wire operation: Check / correct the connected load.
SC1	0x8CB3	yes	2**	Excessive current switching output 1.	<ul style="list-style-type: none"> ▶ Check switching output 1 for short-circuit or excessive current; remove the fault.
SC2	0x8CB4	yes	2**	Excessive current switching output 2.	<ul style="list-style-type: none"> ▶ Check switching output 2 for short-circuit or excessive current; remove the fault.
Para	0x1810/ 0x1Fxx	no	2**	Parameter setting fault via IO-Link; setting of one parameter outside the permitted area.	<ul style="list-style-type: none"> ▶ Define the parameters via IO-Link event number 0x1Fxx. ▶ Change parameters via IO-Link or setting buttons. ▶ Reset all parameters to factory setting (→ 9.5.2).
OL	0x8C10	yes	2**	Process value too high.	<ul style="list-style-type: none"> ▶ Check / reduce system pressure.
UL	0x8C30	yes	2**	Process value too low.	<ul style="list-style-type: none"> ▶ Check / increase the system pressure.
E100	0x5000	no	4**	Internal sensor error detected.	<ul style="list-style-type: none"> ▶ Replace the unit.
W531	0x8CA1	yes	2**	Analogue output at the upper limit (20.5 mA).	<ul style="list-style-type: none"> ▶ Increase AEP value if possible (for [OU2] = [InEG] ASP value) or reduce system pressure.
W530	0x8CA0	yes	2**	Analogue output at the lower limit (3.8 mA).	<ul style="list-style-type: none"> ▶ Reduce ASP value if possible (for [OU2] = [InEG] AEP value) or increase system pressure.

* In case of undervoltage (fault no. W403) the display shows nothing

** 2 = Out of Spec / 4 = Failure

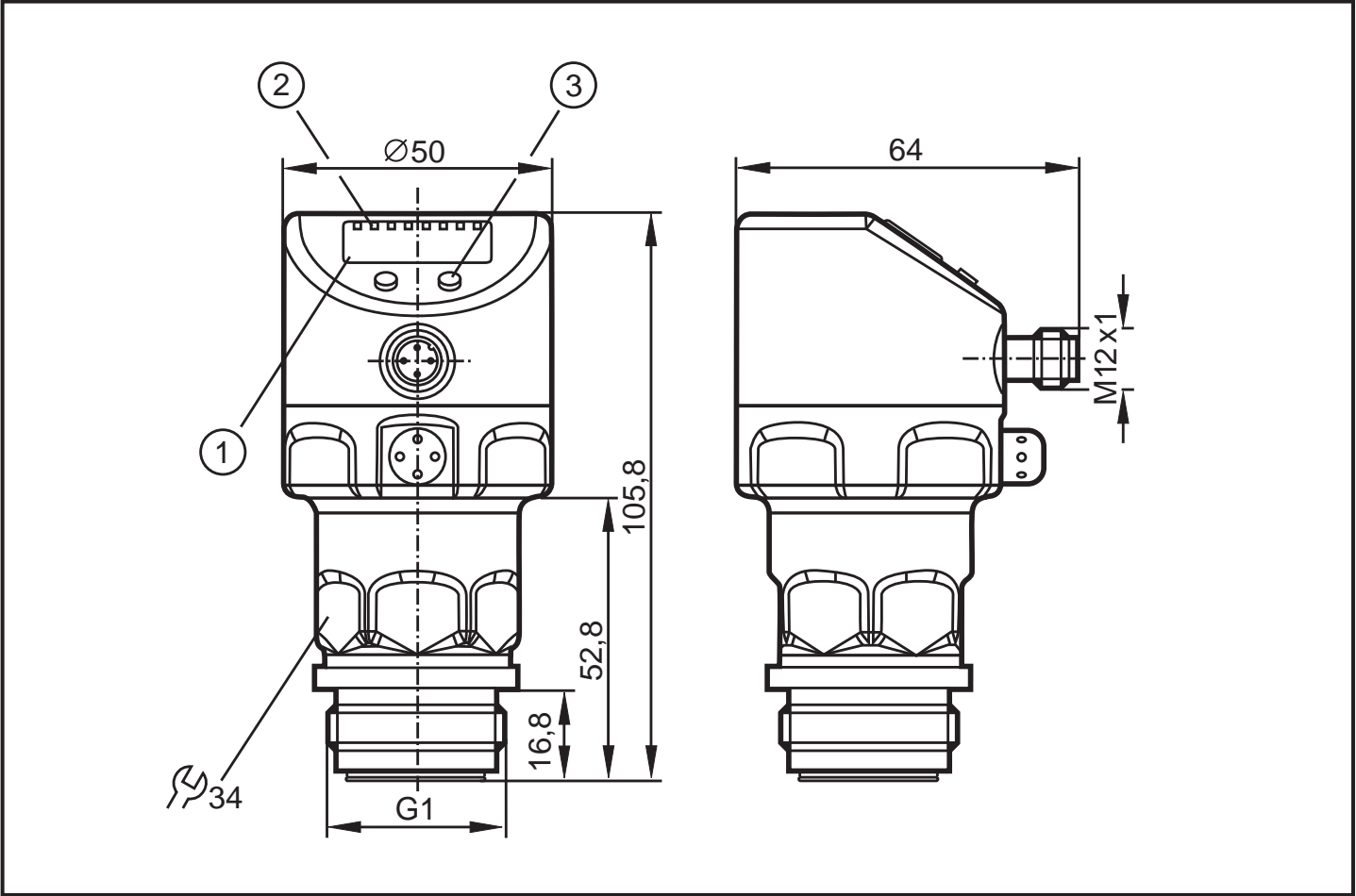
Display	IO-Link event number	IO-Link PDValid	IO-Link Device-Status Idx 36	Type of fault	Corrective measures
W532	0x8CA5	yes	2**	Load at analogue output too high.***	► Reduce load at output 2 or increase the supply voltage.
W203	0x1822	yes	2**	Error during the temperature compensation of the pressure measurement.	The unit uses a higher temperature coefficient (i.e. with reduced accuracy). ► Replace the unit.
W703	0x8CC2	yes	2**	Medium temperature too high (> 150 °C).	Reduce the medium temperature.
W704	0x8CC3	yes	2**	Medium temperature too low (< -30 °C).	Increase the medium temperature.
W161	0x4210	yes	2**	Unit temperature too high (> 90°C).	Unit outside the specification. ► Do not insulate the installation.
W162	0x4220	yes	2**	Unit temperature too low (< -30 °C).	Unit outside the specification. ► Insulate the installation.

* In case of undervoltage (fault no. W403) the display shows nothing

** 2 = Out of Spec / 4 = Failure

*** This message is only displayed for 3-wire operation. For 2-wire operation undervoltage is detected and displayed. If OU2 is not used for the application, the message can be suppressed by defining a switching function for OU2 (→ 9.3.1).

11 Scale drawing



Dimensions in mm
1: Display
2: LEDs
3: Programming button

12 Technical data

	2-wire operation	3-wire operation
Operating voltage [V]	20...32 DC	18...32 DC
Current consumption [mA]	3.6...21	< 45
Current rating [mA]	---	250
Analogue output	4...20 mA / 20...4 mA	
Max. load [Ω]	300	(Ub - 10) x 50
Step response time analogue output [ms]	45	7
Voltage drop [V]	---	< 2
Min. response time switching output [ms]	---	3
Switching frequency [Hz]	---	125
Power-on delay time [s]	1	0.5

Short-circuit protection; reverse polarity protection / overload protection, integrated watchdog

IO-Link Device

Transfer typeCOM2 (38.4 kBaud)

Accuracy / deviations (in % of the span)¹⁾

	PI279x	PI2789
Switch point accuracy [%]	< ± 0.2	< ± 0.5
Characteristics deviation (linearity, incl. hysteresis and repeatability) ²⁾	< ± 0.2	< ± 0.5
Linearity	< ± 0.15	< ± 0.25
Hysteresis	< ± 0.15	< ± 0.2
Repeatability (in case of temperature fluctuations < 10 K)	< ± 0.1	< ± 0.1
Long-term stability (in % of the span per year)	< ± 0.1	< ± 0.1

Temperature coefficients (TC) in the compensated temperature range 0 ...70°C (in % of the span per 10 K)

	PI279x	PI2789
Greatest TEMPCO of the zero point	< ± 0.05	< ± 0.1
Greatest TEMPCO of the span	< ± 0.15	< ± 0.2

Materials (wetted parts)

..... stainless steel 316L / 1.4435, surface characteristics: Ra < 0.4 / Rz 4
ceramics (99.9 % Al₂O₃); PTFE

Housing materials..... high-grade stainless steel (316L/1.4404); FPM (Viton); PTFE; PBT (Pocan); PEI; PFA

Protection rating IP 67 / IP 68 / IP 69K

Protection classIII

Insulation resistance [MΩ]> 100 (500 V DC)

Shock resistance [g] 50 (DIN IEC 68-2-27, 11 ms)

Vibration resistance [g] 20 (DIN IEC 68-2-6, 10 - 2000 Hz)

Switching cycles min. 100 million

Ambient temperature [°C] -25 ... 80

Medium temperature [°C] -25...125 (145 max. 1 h)

Storage temperature [°C]..... -40...100

EMC EN 61000-4-2 ESD: 4 / 8 kV

EN 61000-4-3 HF radiated: 10 V/m

EN 61000-4-4 Burst: 2 kV

EN 61000-4-5 Surge: 0.5 / 1 kV

EN 61000-4-6 HF conducted: 10 V

¹⁾ All indications are referred to a turn-down of 1:1²⁾ Limit value setting to DIN 16086

12.1 Setting ranges

		SP1 / SP2		rP1 / rP2		ASP		AEP		ΔP
		min	max	min	max	min	max	min	max	
PI2789	mbar	-4.8	100.0	-5.0	99.8	-5.0	75.0	20.0	100.0	0.1
	kPa	-0.48	10.00	-0.50	9.98	-0.50	7.50	2.00	10.00	0.01
	inH ₂ O	-1.92	40.16	-2.00	40.08	-2.00	30.12	8.04	40.16	0.04
	mmWS	-49	1020	-51	1018	-51	765	204	1020	1
PI2793	bar	-0.96	25.00	-1.00	24.96	-1.00	18.74	5.24	25.00	0.02
	PSI	-13.8	362.7	-14.4	362.1	-14.4	271.8	76.2	362.7	0.3
	MPa	-0.096	2.500	-0.100	2.496	-0.100	1.874	0.524	2.500	0.002
PI2794	bar	-0.98	10.00	-1.00	9.98	-1.00	7.50	1.50	10.00	0.01
	PSI	-14.2	145.0	-14.5	144.7	-14.5	108.7	21.8	145.0	0.1
	MPa	-0.098	1.000	-0.100	0.998	-0.100	0.750	0.150	1.000	0.001
PI2795	bar	-0.990	4.000	-1.000	3.990	-1.000	3.000	0.000	4.000	0.005
	PSI	-14.35	58.00	-14.50	57.85	-14.50	43.50	0.00	58.00	0.05
	kPa	-99.0	400.0	-100.0	399.0	-100.0	300.0	0.0	400.0	0.5
PI2796	bar	-0.120	2.500	-0.124	2.496	-0.124	1.880	0.500	2.500	0.002
	PSI	-1.74	36.27	-1.80	36.21	-1.80	27.27	7.26	36.27	0.03
	kPa	-12.0	250.0	-12.4	249.6	-12.4	188.0	50.0	250.0	0.2
	inH ₂ O	-48	1004	-50	1002	-50	755	201	1004	1
	mWS	-1.22	25.49	-1.26	25.45	-1.26	19.17	5.10	25.49	0.01
PI2797	mbar	-48	1000	-50	998	-50	750	200	1000	1
	PSI	-0.70	14.50	-0.73	14.47	-0.73	10.88	2.90	14.50	0.01
	kPa	-4.8	100.0	-5.0	99.8	-5.0	75.0	20.0	100.0	0.1
	inH ₂ O	-19.2	401.6	-20.0	400.8	-20.0	301.2	80.4	401.6	0.4
	mWS	-0.49	10.20	-0.51	10.18	-0.51	7.65	2.04	10.20	0.01
PI2798	mbar	-12.0	250.0	-12.4	249.6	-12.4	187.4	50.0	250.0	0.2
	kPa	-1.20	25.00	-1.24	24.96	-1.24	18.74	5.00	25.0	0.02
	inH ₂ O	-4.8	100.4	-5.0	100.2	-5.0	75.2	20.1	100.4	0.1
	mmWS	-122	2550	-126	2546	-126	1912	510	2550	2

ΔP = step increment

		SP1 / SP2		rP1 / rP2		ASP		AEP		ΔP
		min	max	min	max	min	max	min	max	
PI2799	mbar	-998	1000	-1000	998	-1000	500	-500	1000	1
	PSI	-14.45	14.50	-14.50	14.45	-14.50	7.25	-7.25	14.50	0.05
	kPa	-99.8	100.0	-100.0	99.8	-100.0	50.0	-50.0	100.0	0.1
	inH ₂ O	-400	401	-401	400	-401	201	-201	401	1
	mWS	-10.18	10.20	-10.20	10.18	-10.20	5.10	-5.10	10.20	0.01

ΔP = step increment

More information at www.ifm.com

13 Factory setting

	Factory setting	User setting
SP1	25% VMR *	
rP1	23% VMR *	
OU1	Hno	
OU2	I	
SP2	75% VMR *	
rP2	73% VMR *	
COF / tCOF	0.0	
ASP / tASP	0% VMR * PI2799: -1 bar	
AEP / tAEP	100% VMR *	
Uni	bAr / mbAr	
SELd	P	
dS1	0.0	
dr1	0.0	
dS2	0.0	
dr2	0.0	
FOU1	OUT	
FOU2	OUT	
P-n	pnP	
dAP	0.06	
dAA	0.03	
dis	d2	
CP1	0.00	
CP2	0.00	

* = the indicated percentage of the final value of the measuring range (VMR) of the respective sensor (for PI2799 the percentage of the measuring span) is set.



MXD75 MULTI PARAMETER ANALYSER

EASY OPERATION GUIDE FOR CALIBRATING ROYCE DISSOLVED OXYGEN SENSORS

1. Remove DO Probe from Process.
2. Place Sensor down at angle shown.



3. Inspect Sensor tip and ensure membrane is intact and not torn.
4. If membrane is damaged, remove sensor and replace membrane, re-charge sensor with gel (You Tube search "roycewater" for video on recharging Royce DO Sensor).



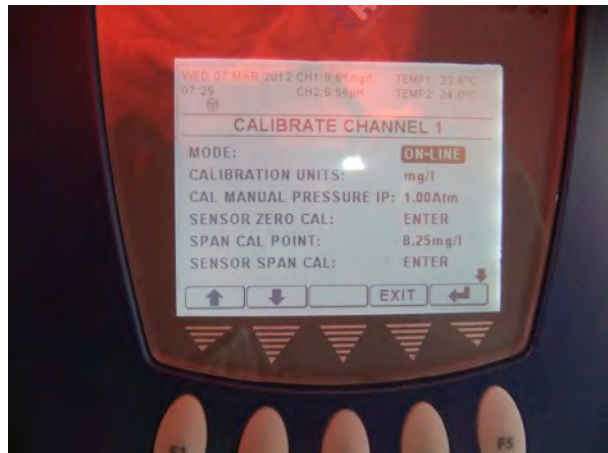
5. On the MXD Analyser press F2 Button below the CAL screen message.



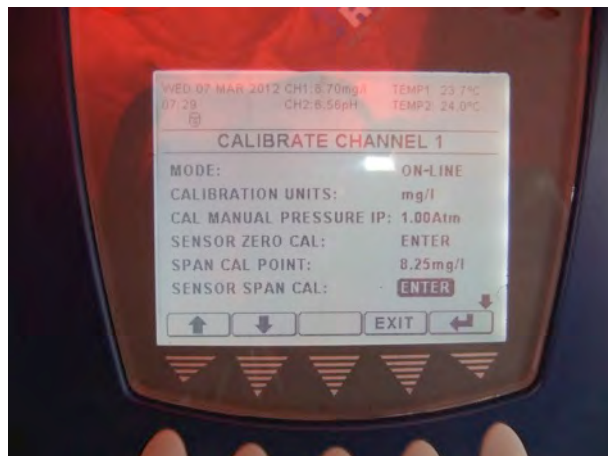
6. The Display will show Channels that can be Calibrated eg DO; pH; Conductivity; Suspended Solids etc.
7. Use F1 and F2 (UP and DOWN Arrows) to select Channel being calibrated.
8. Press F5 (ENTER) Button.



9. Screen will change to display list of parameters. *Most parameters will be preset by Supplier and should resemble as shown in photo on right. To change parameter, press F5 (ENTER) Button and use F1 and F2 (UP and DOWN Arrows) Buttons to select new parameter. Press F5 (ENTER) Button to accept new parameter.*



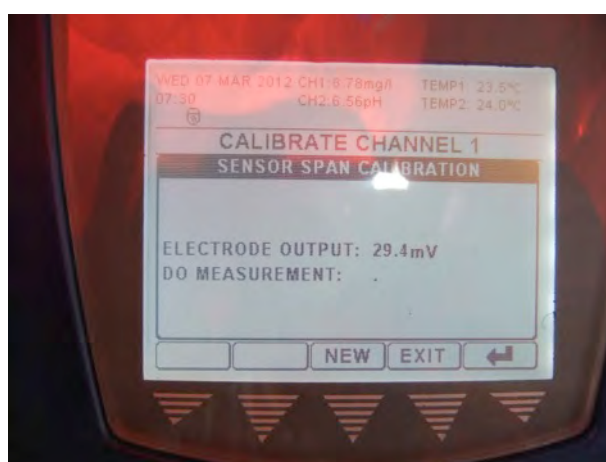
10. To do an AIR CALIBRATION (normal procedure), scroll down to SENSOR SPAN CAL using F2 (Down Arrow) Button. Press F5 (ENTER) Button.



11. Message in right photo will be displayed. Electrode Output is usually between 25 and 35mV. The higher the mV, the healthier the Sensor. Ensure that on a sunny day, the Sensor tip is protected from direct sunlight by placing it in a shadow or covering it with a loose cloth. Press F5 (Enter) Button to start calibration.



12. Message on right will be displayed. Please wait.....



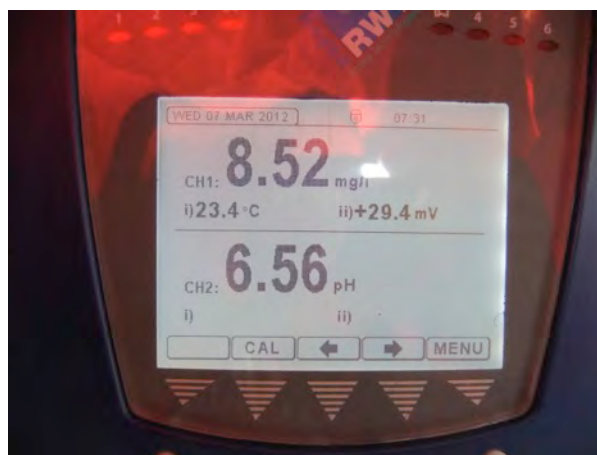
13. If Calibration was successful, message on right will be displayed. Press F5 (ENTER) Button.
14. If SENSOR CONDITION: FAULT is displayed,; 1) Re-charge Sensor or 2) RESET USER CALIBRATION as described below. In both cases repeat Air calibration as described from point 5 above.



15. Continued from 13 above – Message on right will be displayed. Press F4 (EXIT) Button.



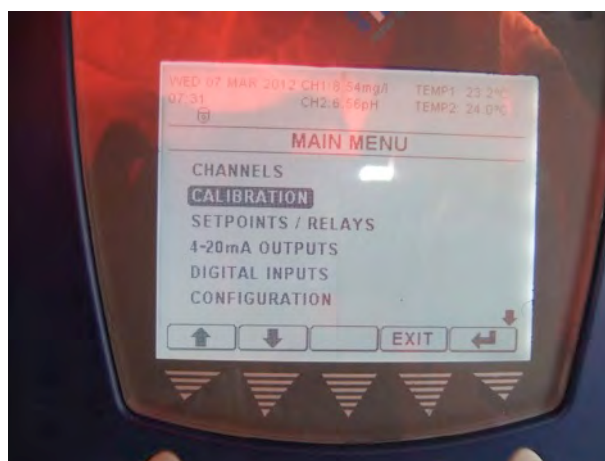
16. Display will return to normal Measurement screen.



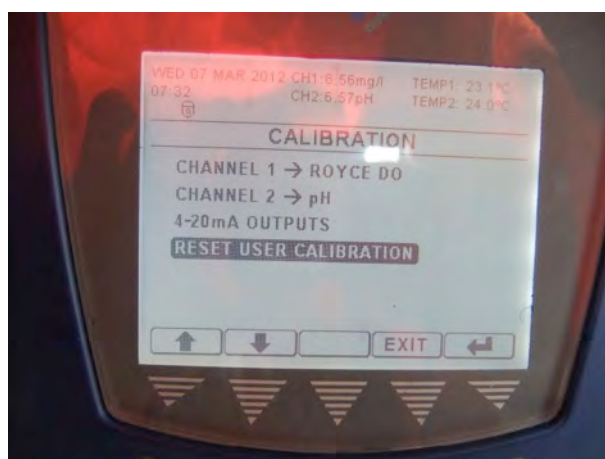
17. If DO measurements are required at very low levels (Full Operating range between 0.00 and 0.50mg/l), a Zero can be performed to ensure better resolution at these DO Levels. Select SENSOR ZERO CAL and follow instructions. It is **very important** that at SENSOR ZERO CAL the sensor is placed in a totally Oxygen free solution.



18. If you are uncertain if the Calibration has been successful or perhaps an incorrect button has been used during the normal Calibration procedure eg. SENSOR ZERO CAL instead of SENSOR SPAN CAL, you can reset the User Calibration. From the Normal Measurement Screen press the F5 (Menu) button. The screen on right will appear. Using the F2 (DOWN ARROW) Button, select CALIBRATION and press the F% (ENTER) Button.



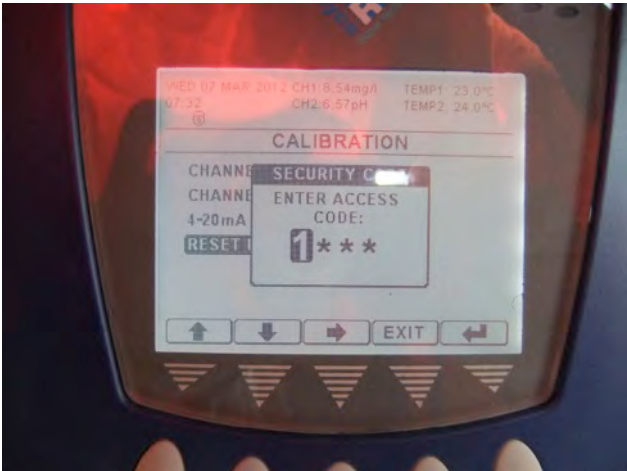
19. Message on right will appear. Use F2 (DOWN) Button to scroll to RESET USER CALIBRATION and press F% (ENTER) Button.



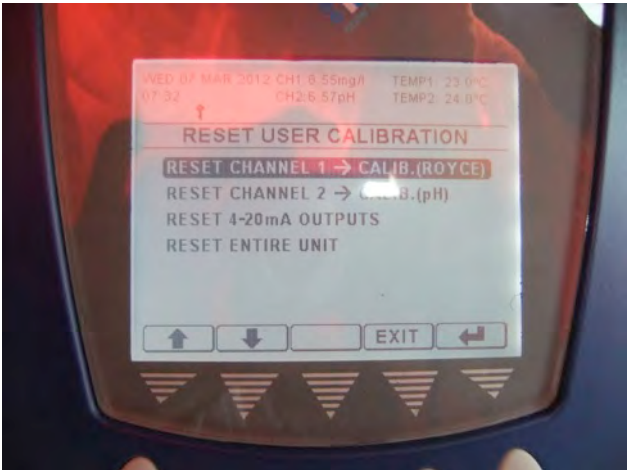
20. Message on right will appear.



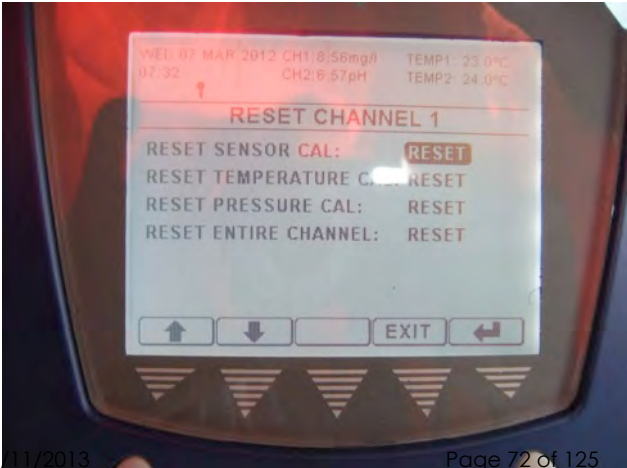
21. Use F1 (UP) Button to change to 1. Press F5 (ENTER) Button.

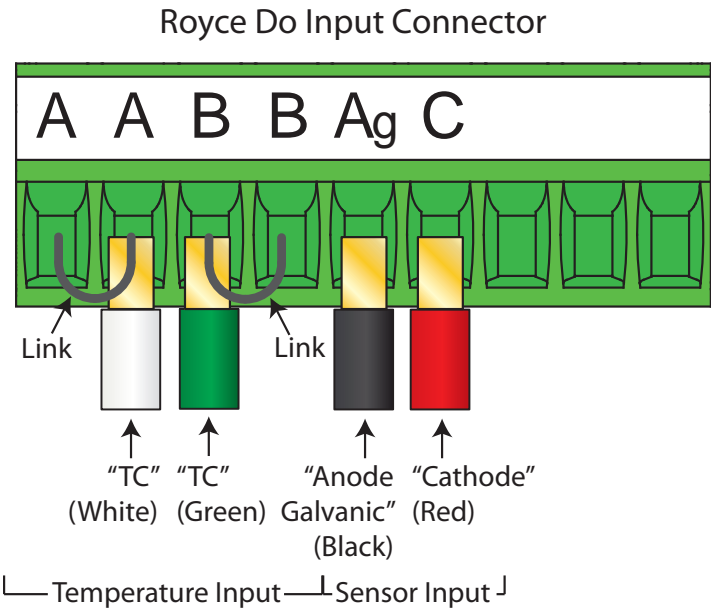


22. Use F2 (DOWN) Button to select Channel. Press F5 (ENTER) Button.



23. Select RESET SENSOR CAL and press F5 (ENTER) Button. Sensor calibration will reset. Press F4 (EXIT) button to return to Normal Measurement Screen.





**Royce Water Dissolved Oxygen
Connection Details**

RWT 73/75 SERIES

Instrumentation to meet your Process Requirements



The innovative RWT73/75 series of process instruments brings a new dimension to analytical process measurements with the modular design to meet ever changing process requirements.



FEATURES

RWT73 Compact 96 DIN IP66 Panel mount option

RWT75 IP66 Surface / Pipe mount version

QVGA Backlit LCD display provides clear indication as single or multiple measurements

Parameters include:

- Dissolved Oxygen Measurement (up to 3 Inputs)
- Contacting and Electrodeless Conductivity
- pH
- ORP/Redox

Up to 3 measured parameters with User selectable bar graph display option

Plug and play card detection for simple measurement and output expansion upgrades

SD card interface allows trouble free saving of configuration and simplifies software updates

Base models include 2 relay outputs and a single isolated 4-20mA current output

Can be expanded up to 6 relay outputs and 6 isolated 4-20mA current outputs

Relays are fully configurable including on/off, time or pulse proportional operation

8 Independent programmable digital inputs with user selectable operations

Dedicated error page provides up to date controller status

85-265v or 18-32v Supply options (AC or DC)

RWT 73 Instrument Specification

Input Expansion Slots

3 slots, user configurable with any combination of available input add-in cards.

Output Expansion Slots

1 slot, user configurable with an additional output option add-in card.

Ambient Operating Temperature

-20°C to +50°C (-4°F to +122°F) for full specification.

Display

3³/₄" QVGA back lit LCD module.

Buttons

5 tactile feedback, micro-switched, silicone rubber.

Alarm LED's

2 Yellow LED's located above the main display area for instrument's alarm status, a lit LED indicates an alarm condition.

Digital Inputs

8 contact closures for remote activation of user defined operations. Can be configured to operate in either normally open or normally closed modes.

Current Output Options

1 as standard, expandable up to a total of 4 or 6 depending on the number of relays.

Current Output Specification

Each selectable 0-20mA or 4-20mA into 1000 ohms max, fully isolated to 2kV. Expandable up to 5% of any operating range and offset anywhere in that range.

Current Output Adjustment

±0.01 mA, 3 point 0-4-20 mA for remote monitor calibration.

Setpoints and Control

Relays Options

2 change over relays as standard, expandable up to a total of either 4 change over relays, or 4 change over relays + 2 normally open relays depending on the number of current outputs.

Setpoints and Control

Relays Specification

Fully configurable setpoints with volt free contacts for each relay. Rated at 5A at 30V DC / 5A at 250V AC.

Setpoint LED's

6 Red LED's located above main display area for setpoint status indication, a lit LED indicates the relay is energised.

Setpoint Modes

On/Off, Time Proportioning, Pulse Proportioning, Band and Latch. Delay timer adjustable from 00:00 to 59:59 mm:ss.

Hysteresis 0 to 9.9%.

Dose alarm timer, with supplementary initial charge function. Both adjustable from 00:00 to 59:59 mm:ss.

Adjustable cycle time and proportional band in proportional modes.

Setpoint Cleaning

Cleaning mode with adjustable duration (max 10 minutes) and interval times (max 24 hours), auto offline function with recovery timer.

Setpoint Alarm

Unit or channel alarm mode, whereby the relay can be energised under certain set conditions.

SD Card Interface

Enables backing up and restoring of instrument configuration and on site upgrading of instrument software. (NB. SDHC and SDXC card formats not currently supported).

EMC

2004/108/EC using BS EN 61326: 2006.

Low Voltage Directive

2006/95/EC using BS EN 61010-1: 2001.

Power Supply

Universal 80-265v AC or DC, 15W max. LV Option 18-32v AC or DC, 20W max.

Instrument Housing

UL 94-VO PC/ABS.

Ingress Protection Rating

IP66 to the front when panel mounted.

Weight

Maximum 880 grams (instrument only).

Dimensions Front

128 x 116 x 23 mm (H,W,D).

Dimensions Rear

89 x 89 x 161 mm (H, W, D), including connectors.

RWT 75 Instrument Specification

Input Expansion Slots

3 slots, user configurable with any combination of available input add-in cards.

Output Expansion Slots

1 slot, user configurable with an additional output option add-in card.

Ambient Operating Temperature

-20°C to +50°C (-4°F to +122°F) for full specification.

Display

3³4" QVGA back lit LCD module.

Buttons

5 tactile feedback, micro-switched, silicone rubber.

Alarm LED's

2 Yellow LED's located above the main display area for instrument's alarm status, a lit LED indicates an alarm condition.

Digital Inputs

8 contact closures for remote activation of user defined operations. Can be configured to operate in either normally open or normally closed modes.

Current Output Options

1 as standard, expandable up to a total of 4 or 6 depending on the number of relays.

Current Output Specification

Each selectable 0-20mA or 4-20mA into 1000 ohms max, fully isolated to 2kV. Expandable up to 5% of any operating range and offset anywhere in that range.

Current Output Adjustment

±0.01 mA, 3 point 0-4-20 mA for remote monitor calibration.

Setpoints and Control

Relays Options

2 change over relays as standard, expandable up to a total of either 4 change over relays, or 4 change over relays plus 2 normally open relays depending on the number of current outputs.

Setpoints and Control

Relays Specification

Fully configurable setpoints with volt free contacts for each relay. Rated at 5A at 30v DC / 5A at 250v AC.

Setpoint LED's

6 Red LED's located above main display area for setpoint status indication, a lit LED indicates the relay is energised.

Setpoint Modes

On/Off, Time Proportioning, Pulse Proportioning, Band and Latch.

Delay timer adjustable from 00:00 to 59:59 mm:ss.

Hysteresis 0 to 9.9%.

Dose alarm timer, with supplementary initial charge function. Both adjustable from 00:00 to 59:59 mm:ss.

Adjustable cycle time and proportional band in proportional modes.

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Cleaning mode with adjustable duration (max 10 minutes) and interval times (max 24 hours), auto offline function with recovery timer.

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EMC

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Low Voltage Directive

2006/95/EC using BS EN 61010-1: 2001.

Power Supply

Universal 80-265V AC or DC, 15W max. LV Option 18-32 V AC or DC, 20W max.

Instrument Housing

UL 94-VO PC/ABS.

Ingress Protection Rating

IP66

Weight

Maximum 2.7 kilograms (instrument only).

Dimensions

331 x 242 x 110 mm (H, W, D) excluding mounting brackets.

Contacting Conductivity Measurement

Displays conductivity, resistivity, ppm and temperature units
Measured process & temperature can be displayed together

Compliant with current USP requirements

Full ultra pure water temperature compensation

Ultra pure water to solution concentration measurement

Auto range, remote range or single range operation

The contacting conductivity input allows connection with LTH contacting conductivity cells with a cell constant of $K=0.01, 0.1, 1.0$ and 10 . It is also possible to use other manufacturer's conductivity cells with a cell constant between $K=0.01$ and 10 . This offers a wide operating range of conductivity measurement from ultra pure water at 0.0551S/cm (Micro Siemens/cm) to solution concentration measurements of up to 1000mS/cm (Millisiemens/cm). The MXD70 series can be set for single range, auto range or remote ranging via external digital inputs.

The digital inputs can be allocated to the Contacting Conductivity channel and one of the following functions can be selected: Off line, Range change, Switch Set Up, Interlock, Flow switch input, Tank Level switch.

The relays can be configured for operation on either Sensor or temperature input or as an Alarm relay. The relay can trigger as a High, Low, Band, Latch High, Latch Low or USP operation. Under USP operation this allows the transmitter to alarm when water is non-compliant.

Automatic temperature compensation is available as standard on all versions. For applications where temperature compensation needs to be applied to the measurement the linear slope is adjustable for changes due to dissolved salts and a fixed curve for the pure water contribution.

For applications where temperature compensation is not required it can be switched out.

Conductivity Input Card Specification

Conductivity Sensor

Any LTH conventional conductivity cell. Other manufacturer's cells can be accommodated.

Connection Cable

Up to 100 metres of LTH 54D cable.

Ranges of Measurement

$0-0.999\text{ pS/cm}$ to $0-999.9\text{ mS/cm}$ ($K=0.01$ to 10.0).

$0-99.99\text{ KQ/cm}$ to $0-99.99\text{ MQ/cm}$ ($K=0.01$ to 1.0).

$0-0.999\text{ ppm}$ to $0-99.99\text{ ppt}$. (parts per thousand).

See the following range / cell constant table for further information.

Cell Constant Adjustment

$\pm 50\%$ of nominal cell constant.

Conductivity Accuracy

$\pm 0.5\%$ of range.

Linearity

$\pm 0.1\%$ of range.

Repeatability

$\pm 0.1\%$ of range.

Operator Adjustment (Conductivity)

$\pm 10\%$ slope (gain) adjustment for solution calibration.

Temperature Sensor

Pt100 or Pt1000 RTD. Up to 100 metres of cable. Temperature sensor can be mounted in the conductivity cell or separately.

Range of Temperature

Measurement -50°C to $+160^\circ\text{C}$ (-58°F to $+320^\circ\text{F}$)

for full specification.

Temperature Accuracy

0.2°C (When using a 4 wire M1000).

Operator Adjustment (Temperature)

$\pm 50^\circ\text{C}$ or $\pm 122^\circ\text{F}$

Range of Temperature

Compensation -10°C to $+150^\circ\text{C}$ ($+14^\circ\text{F}$ to $+302^\circ\text{F}$)

for full specification.

Temperature Compensation Type

Fixed UPW curve plus variable slope $0 - 3.9\%/^\circ\text{C}$ over -10 to $+150^\circ\text{C}$. Selectable In or Out.

Temperature Compensation Base

Selectable at 20°C or 25°C .

USP Function

USP monitoring available on associated setpoints. USP pre-trigger facility also available.

Input filter

Filter sensor reading by taking running average over time period selected (User selectable 10 seconds to 5 minutes).

Range & Sensor Compatibility Tables

CONDUCTIVITY RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 9.999 RS/cm	✓	✓	x	x
0 to 99.99 RS/cm	✓	✓	✓	x
0 to 999.9 RS/cm	x	✓	✓	✓
0 to 9.999 mS/cm	x	x	✓	✓
0 to 99.99 mS/cm	x	x	Note 1	✓
0 to 999.9 mS/cm	x	x	x	Note 1

RESISTIVITY RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 99.99 Idl-cm	x	✓	✓	x
0 to 999.9 Idl-cm	✓	✓	x	x
0 to 9.999 MS"-cm	✓	✓	x	x
0 to 99.99 MS"-cm	✓	x	x	x

TOTAL DISSOLVED SOLIDS RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 9.999 ppm	✓	✓	x	x
0 to 99.99 ppm	✓	✓	✓	x
0 to 999.9 ppm	x	✓	✓	✓
0 to 9999 ppm	x	x	✓	✓
0 to 99.99 ppt	x	x	✓	✓

Note 1: The maximum measurement range will be limited by the solution temperature.

With the temperature compensation slope set to 2%/°C, this will derate linearly from full scale at 25°C to 50% of scale at 100°C.

Electrodeless Conductivity Measurement

Displays conductivity, % solution concentration, salinity and temperature units

Able to simultaneously display conductivity, % solution concentration, salinity and °C

Ideal for cooling tower bleed, rinse water and solution concentration applications

Preset curves stored for common chemicals and salinity

2 independent custom curves offering up to 9 points can be entered.

Adjustable temperature compensation slope

Covering a wide range of conductivity measurement, from water (200 pS/cm) to solution concentration measurements (1,000 mS/cm), it is possible to display the readings in conductivity and/or % concentration. Preset curves are stored in the instrument for common acids, alkalis or salinity and there is also the facility to program two independent custom curves into the instrument. The unit can be set for single range, auto range or remote ranging via an external switch, allowing automatic selection between different chemicals. The instrument can be used with any LTH Electrodeless conductivity sensor.

The digital inputs can be allocated to the Electrodeless Conductivity channel and one of the following functions can be selected: Off-line, Range change, Switch Set Up, Interlock, Flow switch input, Tank Level switch.

The relays can be configured for operation on either sensor or temperature input or as an alarm relay. The relay can trigger as a High, Low, Band, Latch High, Latch Low.

Both measurement inputs and current outputs can be individually calibrated from the front key pad. The user can optimize readings using the sensor solution calibration which enables the user to adjust the sensor reading to match a known standard solution or a titrated solution concentration. An off-line facility allows the instrument to be adjusted without disturbing external processes.

Automatic temperature compensation can be applied to the measurement using an adjustable linear slope.

In the solution concentration mode the instrument automatically sets the correct solution slope. For applications where temperature compensation is not required it can be switched out. Alternatively a manual temperature can be entered, if required.

Electrodeless Conductivity Input Card Specification

Measurement Input

ECS20 or ECS40 Series electrodeless conductivity sensor.

Connection Cable

Up to 100 metres LTH 54E or 54H cable.

Ranges of Measurement

0-999.9pS/cm, 0-9.999mS/cm,

0-99.99mS/cm,

0-999.9mS/cm

0-999.9 ppm, 0-9999 ppm. 0-

99.99 ppt (parts per thousand).

0 to 16.00% NaOH - Sodium Hydroxide

0 to 30.00% NaCl - Sodium Chloride

0 to 15.00% HCl - Hydrochloric Acid

0 to 25.00% H₂SO₄ - Sulphuric Acid

0 to 25.00% H₃PO₄ - Phosphoric Acid

0 to 25.00% HNO₃ - Nitric Acid

0 to 41.00 ppt Salinity

0 to 99.9% Custom range. Defined by a user entered 2 to 9 point curve.

(Two independent curves per ECS channel).

Range Selection

Internal single or auto range, or external range selection via digital inputs.

Cell Constant Adjustment

Fully adjustable from K=00.00 to 10.00

Conductivity Accuracy

±1% of range.

Linearity

+0.1% of range.

Repeatability

+0.1% of range.

Operator Adjustment (Conductivity)

Conductivity ±10% slope.

Solution ±20% offset.

Temperature Sensor

Pt1000 RTD input. Up to 100 metres of cable. Temperature sensor can be mounted in the sensor or separately.

Range of Temperature Measurement

-50°C to +160°C (-58°F to +320°F)

for full specification.

Temperature Accuracy

0.2°C (When using a 4 wire PT1000)

Operator Adjustment

(Temperature) ± 50°C or ± 122°F

Range of Temperature Compensation

-10°C to +150°C (+14°F to +302°F)

for full specification.

Temperature Compensation Type

Variable slope 0 - 3.9%/°C over -10 to +150°C. Selectable In or Out.

Temperature Compensation Base

Selectable at 20°C or 25°C.

Input filter

Filter sensor reading by taking running average over time period selected (User selectable 10 seconds to 5 minutes)

pH/ ORP (Redox) Measurement

Differential input for excellent noise rejection

Accepts pH glass or Antimony and Redox (ORP) Electrodes.

Able to simultaneously display the pH reading, temperature and electrode my.

Dose alarm timer prevents overdosing.

Automatic sensor cleaning

By providing the user with the flexibility to select either glass or Antimony pH sensors or Redox input and operating with single ended or differential inputs, means a single instrument may be used for the majority of pH and Redox applications. Temperature compensator selection of Pt100 or Pt1000 allows the instrument to be used with almost any pH sensor system.

Both measurement inputs and current output can be individually calibrated from the front panel. An off-line facility allows the instrument to be adjusted without disturbing external processes.

The digital inputs can be allocated to the pH/Redox channel and one of the following functions can be selected: Off line, Switch Set Up, Interlock, Flow switch input, Tank Level switch, Clean.

The relays can be configured for operation on either sensor or temperature input or as an alarm relay. The relay can trigger as a High, Low, Band, Latch High or Latch Low operation.

Both measurement inputs and current outputs can be individually calibrated from the front panel. The RWT 73/75 series offers a choice of Automatic or Manual pH Electrode calibration. For applications requiring accurate measurements it is possible to calibrate the instrument and sensor to either a standard solution or a titrated solution concentration. An off-line facility allows the instrument to be adjusted without disturbing external processes.

For applications which require automatic sensor cleaning, set point relays can be configured as a clean initiator.

The clean duration, recovery time and interval period are all programmable. During the clean and recovery periods it is possible for the instrument to go off-line and hold the current outputs and disable the control relays. The clean cycle and off-line mode may also be initialised remotely via the digital input.

Automatic temperature compensation can be applied to the measurement using an adjustable linear slope. For applications where temperature compensation is not required it can be switched out. Alternatively a manual temperature can be entered, if required.

pH / Redox Input Card Specification

Measurement Input

Single ended or differential with solution ground. Up to 100 metres cable.

pH

Separate glass and reference electrode pair.
Combination electrode.

Redox

Separate glass and reference electrode pair.
Combination electrode.

Other manufacturer's sensors can be accommodated.

Ranges of Measurement

0.00 to 14.00pH / -1999mV to +1999mV.

Accuracy

±0.05 pH. ±3mV.

Linearity

±0.1% of range.

Repeatability

±0.1% of range.

Operator Adjustment

	Slope	Offset
pH	60-120%	3 to 11 pH
Antimony	60-120%	-4 to +4pH
Redox	NA	-400mV to +400mV

Calibration Methods

Automatic 4pH / 9pH Buffer Calibration.
Manual Slope and Offset Adjustment.
Both methods indicate post-calibration electrode condition.

Custom Buffer

13 point 4pH / 9pH custom buffer entry pre-loaded with standard LTH buffers.

Calibration Timer

Inbuilt calibration count down timer which will trigger an alarm when calibration interval has expired.

Sensor Input filter

Adjustable filter that averages the sensor input over a user selectable time (10 seconds to 5 minutes).

Temperature Sensor

Pt100, Pt1000 RTD input. Up to 100 metres of 4 wire cable. Temperature sensor can be mounted in the sensor or separately.

Range of Temperature

Measurement -50°C to +160°C (-58°F to +320°F)

for full specification.

Temperature Accuracy

±0.2°C

(When using a 4 wire PT1000).

Operator Adjustment (Temperature)

±50°C or ±122°F.

Temperature Compensation Type

Automatic or manual -20°C to +160°C.

Input filter

Filter sensor reading by taking running average over time period selected (User selectable 10 seconds to 5 minutes)

Dissolved Oxygen Measurement

Measurement of % saturation, ppm and temperature

Able to simultaneously display % saturation, concentration, temperature and pressure

Accepts virtually any Galvanic or Polarographic dissolved oxygen sensor

Active or manual pressure compensation

Adjustable membrane compensation along with bias voltage

Salinity compensation

Automatic sensor cleaning

For quick configuration two default set-ups are stored within the instrument for operation with either a galvanic or a polarographic sensor.

By providing the user with the flexibility to select either galvanic (Mackereth) or polarographic (Clark) sensors, temperature compensator selection of Pt100, Pt1000, 1K ohm or 22K ohm thermistor and providing software selection of bias voltage and membrane co-efficient, a single instrument may be used with virtually any dissolved oxygen sensor.

The relays can be configured for operation on either Sensor or temperature input or as an Alarm relay. The relay can trigger as a High, Low, Band, Latch High or Latch Low operation.

New features include the Latch relay operation where the control relay can have a high and a low setting. This is particularly useful where the instrument is controlling an aerator.

In this mode the relay is energised when the dissolved oxygen level falls below the low level and remains energised until the high setting is reached. The relay will not energise again until the level falls back below the low setting.

The isolated current outputs provide retransmission of the measurement as 0/4-20 mA signals and can be configured as % saturation ppm or temperature.

Both measurement inputs and current output can be individually calibrated from the front panel. An off-line facility allows the instrument to be adjusted without disturbing external processes.

The digital inputs can be allocated to the Dissolved Oxygen channel and one of the following functions can be selected: Off line, Switch Set Up, Interlock, Flow switch input, Tank Level switch, Clean and Calibration.

Dissolved Oxygen Input Card Specification

Measurement Input

Royce 95A Galvanic
Galvanic (Mackereth) - 0 to 4.000mA
Or

Polargraphic (Clark) - 0 to 500.0nA

Ranges of Measurement

0 - 199.9% Saturation

0 - 30.00 ppm Concentration

0 - 9999 mBar pO₂ (Partial Pressure
of Oxygen) (Calibration specific)

0 - 999.9 mmHg

(Millimetres of Mercury) (Calibration specific)

0-30.00 mg/l Milligrams per Litre

Probe Current (NA or nA)

Sensor Bias Voltage

User defined -1.000V to +1.000V, ± 1 mV
Resolution, ± 3 mV Output Accuracy.

Membrane Correction Factor

User defined 0 to 9999

Sensor Connection Cable

Up to 100 metres

Accuracy

± 3 pA (Galvanic Mode)

+1.0nA (Polargraphic Mode)

Linearity

$\pm 0.1\%$ of Range

Hepeatability

$\pm 0.1\%$ of Range

Calibration

Automatic Zero (offset) and Span (slope)
calibration with user entered span
calibration point and post-calibration
sensor condition indication.

Calibration Timer

Inbuilt calibration count down timer which
will trigger an alarm when calibration
interval has expired.

Sensor Input Filter

Adjustable filter that averages the
sensor input over a user selectable
time (10 seconds to 5 minutes).

Temperature Sensor

Pt100, Pt1000 RTD or 1kohm, 22kohm
thermistor inputs. Up to 100 metres of 4
wire cable. Temperature sensor can be
mounted in the sensor or separately.

Range of Temperature Measurement

-50°C to +160°C (-58°F to +320°F)
for full specification.

Temperature accuracy

$\pm 0.2^\circ\text{C}$

(When using a 4 wire PT1000).

Operator Temperature Adjustment

$\pm 50^\circ\text{C}$ or $\pm 122^\circ\text{F}$.

Temperature Compensation

Automatic or manual -20°C to +160°C.

Pressure Compensation

Automatically from external 4-20mA
pressure transducer input (Direct or 24V
loop powered from the instrument) with
user scaling and selectable pressure
damping, or manually via user entered value.

Salinity Compensation

User Programmable from 0-40.0 ppt.

Input filter

Filter sensor reading by taking running
average over time period selected
(User selectable 10 seconds to 5 minutes)

Royce Water Technologies Pty Limitedemail: contact@roycewater.com.au web: www.roycewater.com.au**Order Codes****Type No Part No Description****Input Card Options**

RWT 73	7300	RWT 73 Series IP66 Panel mounted base instrument fitted with 1 x 4-20mA and 2 x relay outputs. Requires 85-265v supply. Input and output expansion cards to be ordered separately.
RWT 75	7500	RWT 75 Series IP66 Surface mounted base instrument fitted with 1 x 4-20mA and 2 x relay outputs. Requires 85-265v supply. Input and output expansion cards to be ordered separately.
RWT 73	7324	RWT 73 Series IP66 Panel mounted base instrument fitted with 1 x 4-20mA and 2 x relay outputs. Requires 18-32v supply. Input and output expansion cards to be ordered separately.
RWT 75	7524	RWT 75 Series IP66 Surface mounted base instrument fitted with 1 x 4-20mA and 2 x relay outputs. Requires 18-32v supply. Input and output expansion cards to be ordered separately.

MXD7OCC	1001	Contacting conductivity input PCB.
MXD7OEC	1201	Electrodeless conductivity input PCB.
MXD7OPR	2001	pH / ORP (Redox) input PCB.
MXD7ODO	4001	Royce Dissolved Oxygen input PCB.

Expansion Card options

MXD70112R	7012	1 x 4-20mA / 2 x Relay outputs expansion PCB.
MXD7031	7030	3 x 4-20mA output expansion PCB.
MXD70314R	7034	3 x 4-20mA / 4 x Relay outputs expansion PCB.
MXD70512R	7052	5 x 4-20mA / 2 x Relay outputs expansion PCB.
MXD75EK1	7501	MXD75 Expansion kit 1 for use with expansion cards 7012, 7030, 7034. (3x input or any output)
MXD75EK2	7502	MXD75 Expansion kit 2 for use with expansion card 7052 MXD70512R.

These products comply with current European Directives

Royce Water Technologies Pty Limited reserves the right to make changes to this data sheet or the product without notice, as part of our policy of continued developments and improvements. All care has been taken to ensure the accuracy of information contained in this data sheet. However we cannot accept responsibility for any errors or damages resulting from errors or inaccuracies of information contained herein.



Issue: 1009



Royce Parts Per Million Dissolved Oxygen Systems

Maintenance Free Dissolved Oxygen Control System



MODEL 9110/9120/9210/9220 ANALYZER

The Royce line of PPM level dissolved oxygen (DO) analyzers is the largest, most varied line in the world. Features like microprocessor-based intelligent electronics, with a choice of rugged, patented self-cleaning sensors, or maintenance free disposable cartridge sensors, make the totally waterproof Royce line of PPM DO analyzers the best available – anywhere.

The Royce Models 9110 & 9120 are designed to offer the latest Royce Dissolved Oxygen design technology in an affordable package. They also have the capacity to provide advanced features found in other Royce Models and incorporate the latest Modbus communications (Profibus DP is optional). The 9110 is Single Channel and the 9120 is Dual Channel. Both can use the Royce Model 99 (Standard) cartridge DO sensor and the Model 95 rechargeable DO sensor. Air and water jet cleaning are optionally available.

The Royce Models 9210 & 9220 analyzers incorporate the same technological advances as the Models 9110 and 9120. They also have the capacity to provide the advanced features found in other Royce Models and incorporate the latest Modbus communications (Profibus DP is optional). The 9210 is Single Channel & the 9220 is Dual Channel. Both use the exclusive Royce Model 96 Electro-Chemical Self-Cleaning sensor. Air and water jet cleaning are optionally available.



MODEL 9200 ANALYZER

The Model 9200 Continuous DO analyzer provides the ultimate level of monitoring accuracy and aeration control available anywhere in the world. The analyzer is provided standard with everything available on the Model 9210/9220. It also offers menu directing setup and trend graphing on the display, simultaneous DO and temperature readout on the display, standard automatic sensor membrane self-cleaning, digital AND analog outputs, a sensor output voltage mode, and four programmable setpoint relays. Used with the Model 96A DO sensor, the Model 9200 has become the benchmark analyzer for the DO monitoring & blower control market in the 21st century.

The Model 9200/96A system, completed the 2002 Instrument Testing Association's (ITA) comparative DO test with outstanding results. Test results are available. Contact Royce Technologies for more information.

MODEL 9110/9120 ANALYZER SPECIFICATIONS**Channels:**

9110 is Single Channel

9120 is Dual Channel

Sensor Type:

Model 95 or Model 99 Sensors

Dissolved Oxygen:

Ranges, 0 – 99 mg/l

Resolution, 0.01 mg/l from 0 – 9.99

0.1 mg/l from 10.0 – 99.0

Accuracy, +/- 0.1 mg/l

Temperature:

0 – 50°C x 0.1°C or

32 – 122°F x 1°F

Accuracy +/- 1% of reading

Stability:

.1 mg/l

Input Power:

80 – 260 VAC, 50 – 60 Hz or 12 VDC

Outputs:

Two Per Channel Isolated 4 – 20 mA for D.O. & Temp.

600 ohms maximum

Two Relays Per Channel with programmable hysteresis

10A resistive @ 250VAC

RS – 485 & Modbus (Standard)

Profibus DP (Optional)

Readout Device:

Harsh environment, 4 line, 20 Character,

LCD digital display Backlit

Display:

DO and Temperature (Each Channel)

Calibration:

Automatic, calibrates for DO, altitude, salinity

Enclosure:

NEMA 4X (IP65)

Weight:

5.5 lbs., 2.5 kg

MODEL 9210/9220 ANALYZER SPECIFICATIONS**Channels:**

9210 is Single Channel

9220 is Dual Channel

Sensor Type:

Model 96 Patented Electrochemical Self Cleaning Sensor

Dissolved Oxygen:

Ranges, 0 – 99 mg/l

Resolution, 0.01 mg/l from 0 – 9.99

0.1 mg/l from 10.0 – 99.0

Accuracy +/- 0.1 mg/l

Temperature:

0 – 50°C x 0.1°C or

32 – 122°F x 1°F

Accuracy +/- 1% of reading

Stability:

.1 mg/l

Input Power:

80 – 260 VAC, 50 – 60 Hz or 12 VDC

Outputs:

Two Per Channel Isolated 4 – 20 mA for D.O. & Temp.

600 ohms maximum

Two Relays Per Channel with programmable hysteresis

10A resistive @ 250VAC

RS – 485 & Modbus (Standard)

Profibus DP (Optional)

Readout Device:

Harsh environment, 4 line, 20 Character,

LCD digital display Backlit

Display:

DO and Temperature (Each Channel)

Calibration:

Automatic, calibrates for DO, altitude, salinity

Enclosure:

NEMA 4X (IP65)

Weight:

5.5 lbs., 2.5 kg

Model 9200 Analyzer

FEATURES

- Microprocessor based electronics
- Range 0 – 99.9 PPM and % Saturation 0 – 99.9%
- Simple calibration with “help screen” prompts
- Automatic temperature, altitude, salinity compensation
- Individual DO and temperature outputs
- 4 programmable relays
- One step, push button calibration
- Electronic self diagnostics for sensor and analyzer
- Electrochemical self cleaning sensor (Standard)
- Standard 24 hour trend graph
- Backlit display



MODEL 9200 ANALYZER

Electrochemical Sensor Cleaning

This patented feature provides an automatic cleaning function for the DO sensor membrane. Cleaning occurs on a timed basis programmed into the Model 9200 by the operator. This cleaning process discourages growth on the membrane allowing maintenance-free operation for up to six months, (depending upon the sensor operating environment). A Model 96A sensor is required for operation of this standard feature on Model 9200/9210/9220 analyzers.

Time Delay Control

In applications where the simple set point relay method of aeration control is inappropriate, the Model 9200 analyzer relays may be programmed to pulse at predetermined intervals when setpoints are exceeded. This is often used with positional control systems for weirs, gates, etc. It is a standard feature on the Model 9200 analyzer.

SPECIFICATIONS

Dissolved oxygen:

Ranges, 0 – 99.9 mg/l (PPM)
0 – 100% Saturation
Resolution, 0.01 mg/l
1% Saturation
Accuracy, ± 0.1 mg/l or 1% Saturation

Temperature - selectable:

0 – 50°C x .1°C or
23 – 122°F x 1°F Accuracy
+/- 0.2° C Compensation
 $\pm 1\%$ of reading

Stability:

.1mg/l

Input Power:

Switch Selectable 115/230 VAC, 50/60 Hz

Readout Device:

Harsh environment, 2.5" x 4.5" graphical
LCD digital display

Outputs:

One Isolated 4 – 20 mA Output for DO
One Isolated 4 – 20 mA Output for Temperature
One RS-485 digital, isolated
4 Standard setpoint relays with programmable hysteresis
All relays are Form C rated 250 VAC at 6 Amps resistive

Display:

DO, temperature, relay status, trend graph and
programming menus

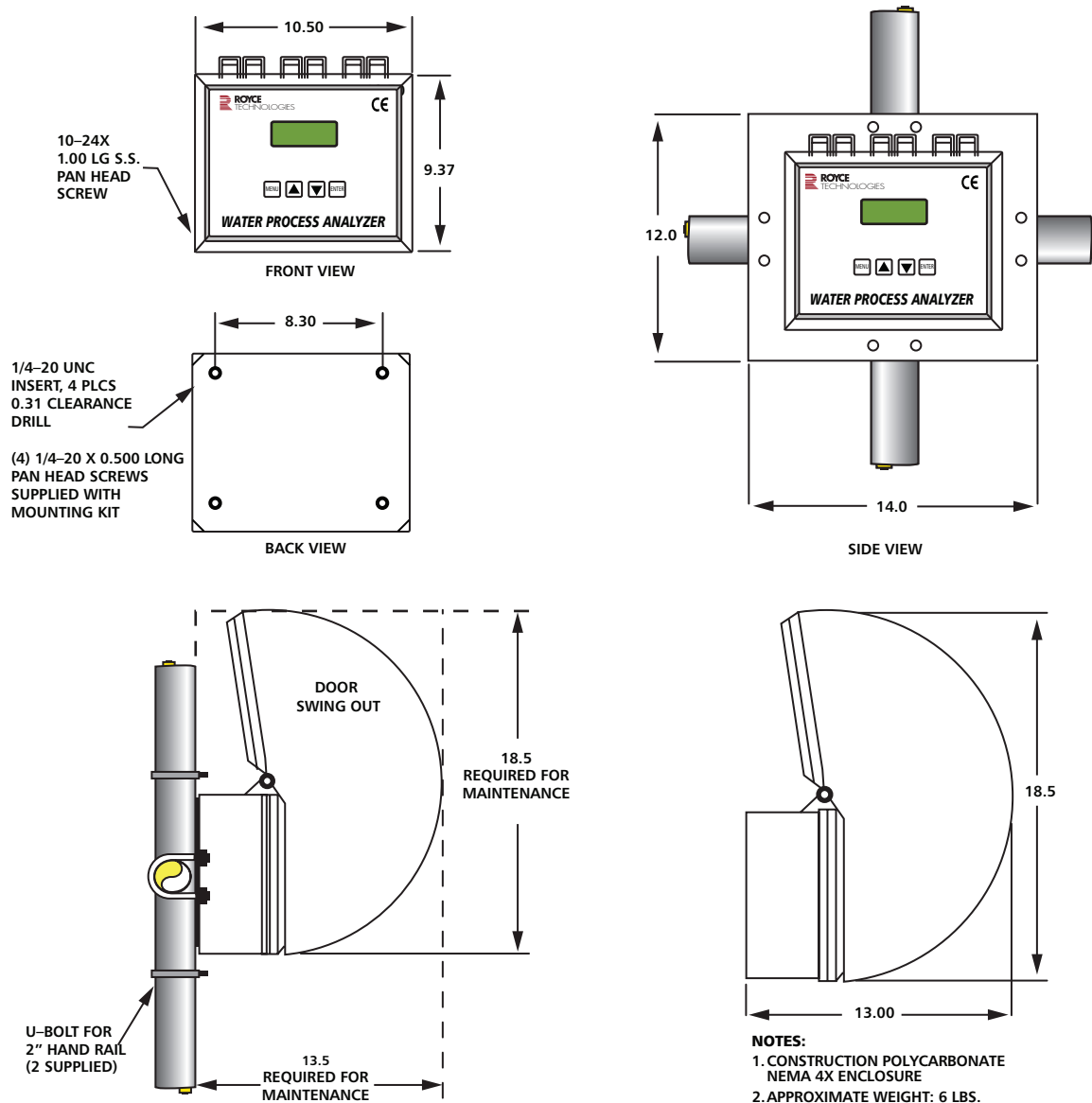
Calibration:

Automatic, one step push button calibrates for DO,
altitude, salinity

Enclosure: NEMA 4X (IP65)

Weight: 8.7 lbs., 3.95 kgm

MODEL 9110/9120/9210/9220 AND 9200 MOUNTING INFORMATION



Series 90 DO Sensors



The Royce Models 95A and 96A Sensors are the latest sensor developments in the field of continuous DO monitoring and control. The small silhouette, and rugged construction of the Models 95A/96A create a unique sensor for the rough applications found in the wastewater treatment, ground water, aquaculture, and oceanographic industries. Both sensors contain precision internal circuitry and use the proven galvanic method of measurement.

The Model 96A Sensor is unique in that it incorporates a dual cathode, dual anode system which gives it the ability to perform the Royce patented electrochemical self-cleaning function when used in conjunction with the Model 9200/9210/9220 Analyzers.

The Model 95A is a rugged rechargeable sensor that comes supplied with membranes and KCL gel solution with a system purchase that should last for five years with normal use. The Model 99 offers the convenience of a maintenance-free disposable sensor cartridge.

The Model 95A and 99A Sensors were specifically developed for the Model 9110/9120 continuous monitoring analyzer.

The trim, reliable mounting bracket assembly employed with the Royce line of Series 90 DO Sensors is simple to install and allows for easy access to the sensor for quick maintenance. A narrow profile sensor/collar arrangement allows for a standard PVC pipe installation from any standard rail. This configuration dramatically reduces the potential of rag fouling.

FEATURES

- Platinum cathode, lead anode
- Automatic temperature compensating
- Can be easily rebuilt in the field
- No special tools required
- Patented electrochemical self-cleaning available (Model 96A only)
- Jet-cleaning available

SPECIFICATIONS

Measuring principal:

Galvanic

Cathode/Anode material:

Platinum/Coiled Pure Lead

Electrolyte:

Potassium Chloride gel

Repeatability:

$\pm 1\%$ (at constant temperature)

Response time:

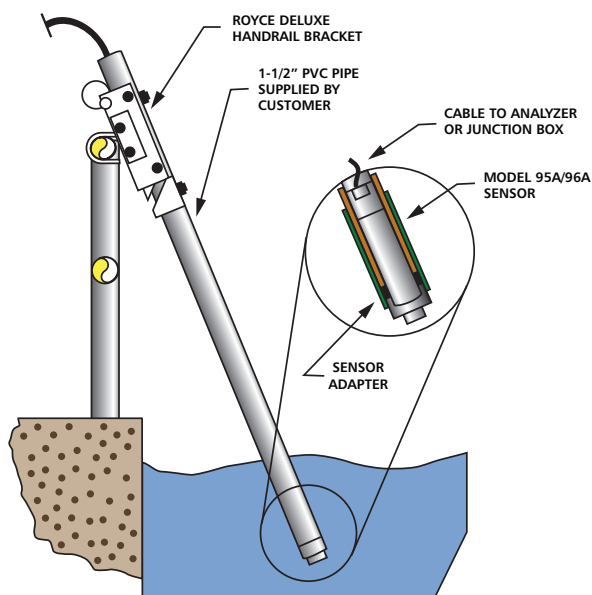
Using 1 mil membrane - PPM 99% of actual,
from air calibration < 30 seconds

Temperature accuracy:

$\pm .2^{\circ}\text{C}$

Sample flow requirements:

0.4 feet per second with 1 mil membrane

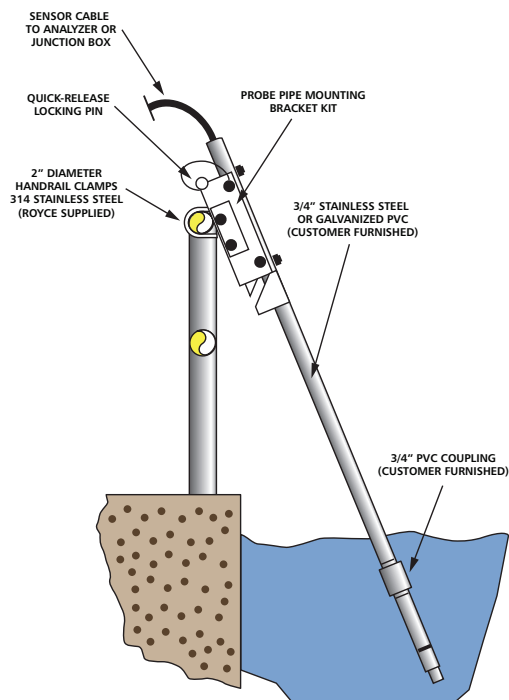


Model 99 Replaceable Cartridge DO Sensor



MODEL 99 CARTRIDGE DISSOLVED OXYGEN SENSOR

The Model 99 replaceable Dissolved Oxygen Cartridge was specifically designed to answer the needs of plants that did not want to recharge sensors. It utilizes the same proven technology and basic design criteria found in all the Royce sensors. Rugged, easy to use, quick changing and with all the accuracy and reliability users have come to trust in Royce Technologies.



SENSOR MOUNTING

FEATURES

- Economical initial price
- Rugged Noncorrosive construction
- Long lived cartridge
- Galvanic in operation
- Temperature compensated
- 1 or 2 mil membranes available
- Jet-cleaning available

SENSOR SPECIFICATIONS

Cathode type and material:

Galvanic - Platinum

Anode material:

Coiled lead wire

Electrolyte:

Potassium Chloride gel

Repeatability:

$\pm 1\%$ (at constant temperature)

Response time:

Using 1 mil membrane - PPM 99% of actual, from air calibration in 60 seconds

Temperature accuracy:

$\pm .2^{\circ}\text{C}$

Sample flow requirements:

0.4 feet per second with 1 mil membrane

Dimensions:

1.2" Dia. x 5.8" long

Weight:

(w/25 cable) .5 lbs., 22 kgm

JB-91 Junction Box



Construction:

Polystyrene NEMA 4X
(IP65)

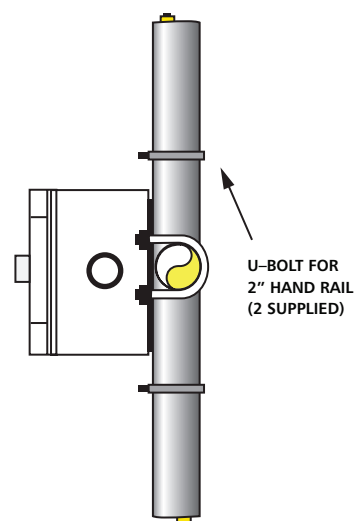
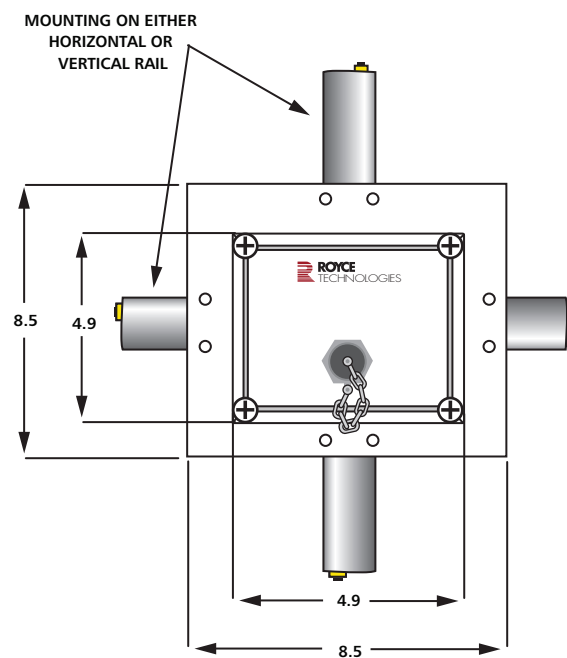
Options:

Rail Mounting Kit

Weight:

JB-91: 2 Lbs
With rail mount kit: .5 Lbs

RAIL KIT OUTLINE AND MOUNTING



"Jet Clean" Sensor Membrane Cleaning System



COMPRESSOR SPECIFICATIONS

Type:

Air Compressor, Light, Noncontinuous duty

Pressure supplied:

40 to 60 PSIG

Temperature limits:

0 to 50°C

Enclosure:

NEMA 4X, 14"W x 12"H x 6"D

Input power:

115/230 VAC, 60/50 Hz

Weight:

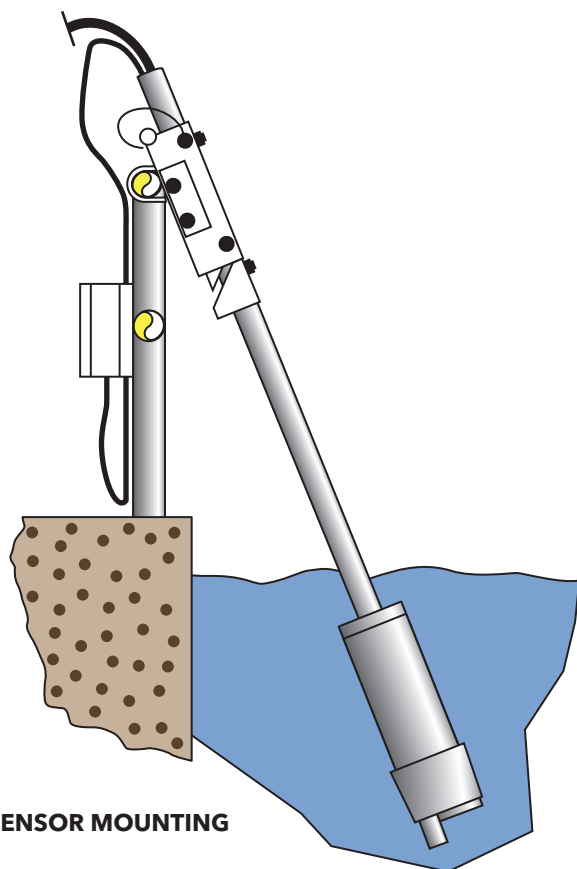
23 pounds (10,4 kgms)

26 pounds (11.8 kgms) with rail kit

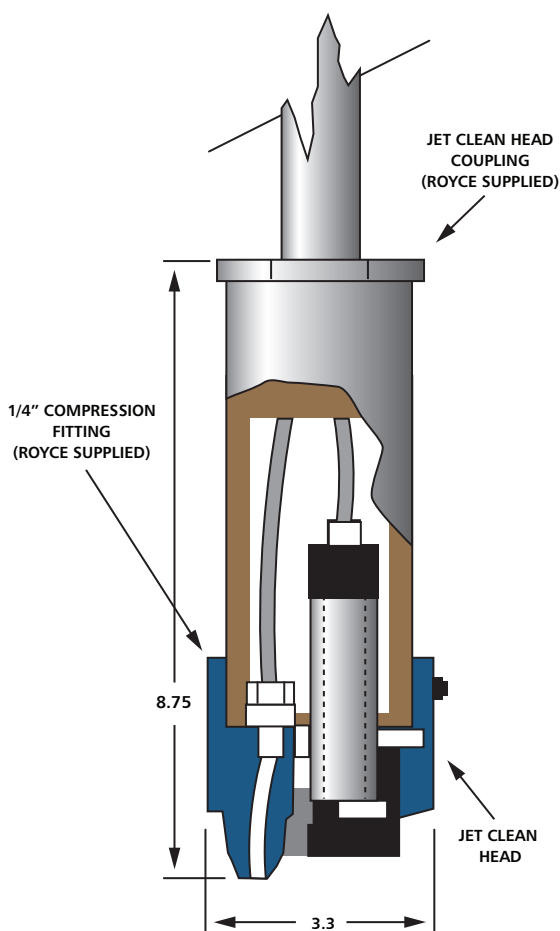
Options:

Heater (Recommended for -10°C)

Rail Mounting Kit

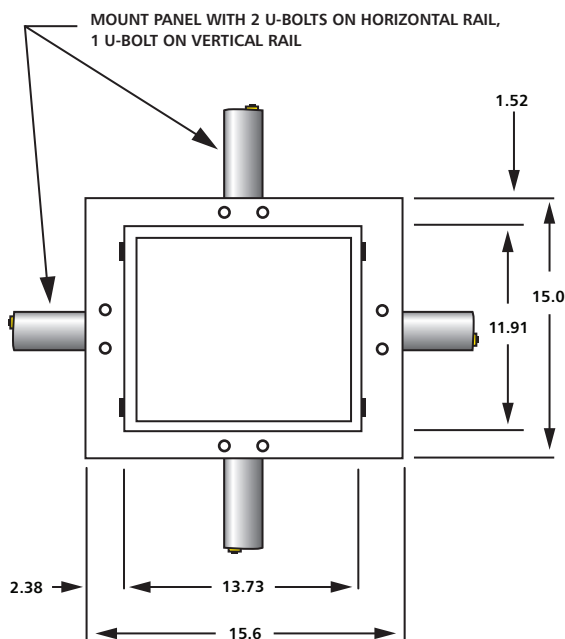


SENSOR MOUNTING

JET HEAD SENSOR ASSEMBLY

The Royce Jet-Clean sensor Cleaning System is designed for the purpose of cleaning the DO membrane which may be soiled by organic, inorganic, or biological debris. The system can be configured in two ways:

1. For plants with house air or water (minimum pressure must be 30 psi), a simple solenoid can be used to supply a periodic high pressure wash stream across the electrode measuring surface;
2. A miniature industrial, rail mounted, compressor system can be supplied that will periodically supply 65 psi of air across the membrane surface. No matter which method of cleaning is used all Royce DO analyzers are programmed to allow the user to adjust their preferred cleaning cycle time. The DO sensor is mounted in a molded epoxy "jet head" which is contoured in order not to collect rags or other debris.

COMPRESSOR OUTLINE & MOUNTING

Royce, a Xylem brand, provides high quality monitoring and control instrumentation and sensors specifically designed for municipal and industrial wastewater treatment applications. Recognized throughout the wastewater treatment industry as experts in the biological wastewater treatment process.

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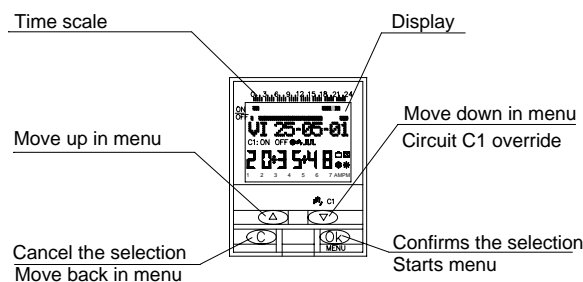
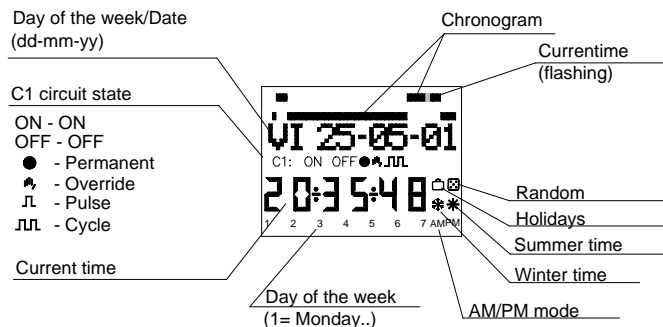
151 Graham Road
PO Box 9010
College Station, Texas
77842-9010

(979) 690-1711
(800) 653-1711 USA/Canada
FAX (979) 690-0440

www.roycetechnologies.com
E-mail: royce@xylem-inc.com

Publication 37600612

Electrical



DESCRIPTION

The DATA LOG is a digital time switch with 1 changeover switch and potential free designed for the control of any electrical installation. Its possibilities include short-duration (1-59 seconds) switching, repeating cycles, random programming, automatic summer-winter time change and a time counter. Its menus can be displayed in 5 languages and it displays a chronogram of that day's programming. This divided into 48 sections, each section representing 30 minutes. The section corresponding to the current time flashes.

INSTALLATION

ATTENTION: Electrical devices must be installed and assembled by authorized installer.

VERY IMPORTANT: The switch is protected internally against interference by a safety device. However, particularly strong electromagnetic fields may alter its operation. Such interference can be avoided by adhering to the following recommendations during installation:

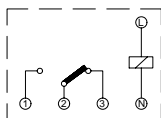
- The device should not be installed near inductive loads (motors, transformers, contactors, etc..)
- A separate power line is recommended (equipped with a network filter if necessary).
- Inductive loads should be equipped with interference suppressors (varistor, RC filter).

If the timer switch is to be used in combination with other devices in an installation, it is necessary to verify that no parasitic disturbances will be caused by the group

ASSEMBLY: They should be installed in switchboard cabinets made of 35mm symmetric sections in accordance with EN 50 022.

CONNECTION

connection scheme



STARTING UP

The DATA LOG's factory settings include the current date and time and the following:

Time:	Central European time (E.U.)
Clock:	24 h mode
Winter-summer time change	Automatic (last Sunday in March)
Summer-winter time change	Automatic (last Sunday in October)
Holidays:	NO (off)
Random mode:	NO (off)
C1 counter:	Zeroed (0000 hours)
Programs:	None (memory empty)

PROGRAMMING

Programming is menu-based (text messages).

If operations are programmed for the same time, remember that some have priority over others

The order of priority is as follows: PERMANENT MODE → HOLIDAY PROGRAM → RANDOM PROGRAM → PULSE ON → PULSE OFF → PROGRAMMING OFF → PROGRAMMING ON → CYCLE PROGRAMMING

The information being programmed always flashes on display.

Pressing the "OK" key brings up the PROGRAM MENU. If the language used is not right, reset the timer.

RESET

When all four keys are held down for more than 3 seconds, all existing programming is deleted and the LANGUAGE menu appears.

LANGUAGE SELECTION

Use the UP Δ and DOWN ∇ keys to choose a language and confirm pressing "OK". The DATE YEAR menu then appears automatically.

(See example)

CLOCK SETTING

Press "OK" to go into the MENU PROGRAM and use the Δ and ∇ keys to select the MENU DATE. Confirm with "OK" to go into DATE YEAR. The numbers for the year flash on display and are changed with the Δ and ∇ keys. Confirm with the "OK" key. The figures for MONTH and DATE are entered in the same way. Press "OK" to save the date (dd, mm, yy), the day of the week will be set automatically and the display will change automatically to TIME programming. Use the Δ and ∇ keys to change, first, the hours, confirm with "OK", then repeat for the minutes. Press "OK" and the MENU PROGRAM will appear. (See example)

If you first wish to check the information entered, press the "C" key and the timer goes back into normal mode.

BASIC PROGRAMMING

PROGRAM MENU

In normal mode, press the "OK" key to bring up the MENU PROGRAM. Press "OK" again and the display will show PROGRAM PROG 01.

ON-OFF PROGRAMMING

Press the "OK" key again and you will see on display PROG 01: PROGRAM. Confirm pressing "OK" and the display will show PROG 01: C1: ON.

Use the Δ and ∇ keys to choose switch type ON-OFF, PULSE or CYCLE. Confirm the choice with the "OK" key. The display automatically shows MO:

YES. If you want the switch to be carried out on Monday, press "OK," otherwise, press either of the Δ and ∇ keys and the display will show MO: NO.

Press "OK" and carry out the same process for the other days of the week, one after the other, confirming them in the same way.

When you have selected the days, you then need to set the time at which the switch will take place. Use the Δ and ∇ keys to set the hours and confirm with "OK," then do the same for the minutes. When you confirm the time pressing "OK," the display will show PROGRAM PROG 02: confirm the choice with the "OK" key the display will show PROG 02: PROGRAM. Press "OK" again and the display will show PROG 02 C1: ON. Follow the same steps as for Program 01. There are 50 memory spaces (PROG 01 to PROG 50). (See example)

When you have finished programming, press the "C" repeatedly until the normal display appears.

VIEWING PROGRAMMED SWITCHES

Press "OK" to go into the MENU PROGRAM, then "OK" again to bring up PROGRAM PROG 01 on display. Press the Δ and ∇ keys to see all the programs (1 to 50).


CHANGING OR DELETING SWITCHES

Press "OK" to go into the PROGRAM menu, then "OK" again to bring up PROGRAM PROG 01 on display. Use the Δ and ∇ keys to select the program you wish to change (1 to 50) and when you have it, press "OK" and the program will be shown on display with the word MODIFY. The Δ and ∇ keys change between CLEAR and MODIFY. Choose your option and press the "OK" key.



If you chose CLEAR, the program will be eliminated and the display will show PROGRAM and the program deleted (PROG XX).



If you have chosen MODIFY, pressing "OK" brings up the type of switch selected (ON-OFF / PULSE / CYCLE) and you should carry on as described in the section on PROGRAMMING. To return to normal operation, press the "C" key repeatedly until the normal operating display is shown.

MANUAL ACTIVATION

The C1 circuit can be temporarily activated or deactivated by pressing the ∇ key. A  symbol will be shown on display until a programmed switch takes place.

It is also possible to activate or deactivate (any programmed manoeuvre is made) the circuit permanently by following these steps:

Press the "OK" key to go into the PROGRAM menu and use the Δ and ∇ keys to change the 2nd line on the display until you see MANUAL. Confirm by pressing "OK" and the display will show MANUAL C1: ON. Use the Δ and ∇ keys to choose between ON – OFF – ON  (Permanent) – OFF  (Permanent). Confirm by pressing "OK" and go back to normal mode by pressing the "C" key repeatedly. To change out of permanent mode, repeat this operation and select ON or OFF.

In the ON  and OFF  positions, you can also change the state of the circuit by pressing the ∇ key, in normal mode.

The symbols for activated options are shown on display.

ADVANCE PROGRAMMING. SPECIAL FUNCTIONS (EXTRAS)**PULSE PROGRAMMING**

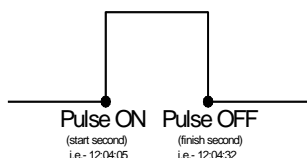
With pulse programming, switches from 1 to 59 seconds can be carried out, with both ON and OFF pulses.

In normal mode, press the "OK" key to go into the MENU PROGRAM. Press "OK" and the display will show: PROGRAM PROG 01.

Press the "OK" key again and the display will show PROG 01: PROGRAM. Press "OK" again and PROG 01: C1: ON appears. Use the Δ and ∇ keys to select PULSE, press "OK" to confirm and the display will show MO: YES. If you want the switch to be carried out on Monday, press "OK," otherwise, press either of the Δ and ∇ keys and the display will show MO: NO. Press "OK" and carry out the same process for the other days of the week, one after the other, confirming them in the same way.

When you have selected the days, you then need to set the time at which the switch will take place. Use the Δ and ∇ keys to set the hours and confirm with "OK." Now do the same for the minutes and when you confirm by pressing "OK," the display will show PULSE ON: choose the second when the circuit is to be connected using Δ and ∇ and confirm with "OK." The display will show PULSE OFF. Use Δ and ∇ to select the second at which the circuit is to be switched off and press "OK" again to confirm.

If you want an "on" pulse, take care to set PULSE ON before PULSE OFF and the other way round for an "off" pulse.

**WINTER / SUMMER TIME CHANGE**

To go into the MENU, press the "OK" key and use the Δ and ∇ keys to find the EXTRAS option. Confirm with "OK" and you will see EXTRAS SEASON on display, press "OK" again and 3 options are displayed: AUTO, MANUAL and DO NOT USE. Move between them with the Δ and ∇ keys and confirm by pressing "OK."

AUTO (the clock is automatically changed on the last Sunday in March and the last Sunday in October).

No changes are possible with this option. When you select it, the display shows SEA AUTO W \rightarrow S and the date of the change from winter to summer time (last Sunday in March). When "OK" is pressed, SEA AU W \rightarrow S DATE appears and when the Δ or ∇ key is pressed, the time of the change (02:00:00) is shown. When you press "OK" again, you will see SEA AUTO S \rightarrow W and the date of the summer-to-winter time change (last Sunday in October). Pressing "OK" shows the date again and the Δ or ∇ key lets you see the time when the change will happen (03:00:00). Press "C" or "OK" to go back to the EXTRAS HOLIDAYS.

MANUAL (Allows you to choose the date and time for the time change).

When you select this option, the display shows SEA MANUAL W \rightarrow S and the date of the winter-to-summer time change. Press "OK" and you can change the month with the Δ and ∇ keys. When you confirm this "OK", you see LS (for "Last Sunday"): YES. If you want to set the last Sunday of the chosen month for the change, press "OK," otherwise change to LS: NO using the Δ and ∇ keys and confirm with "OK."

If you accept LS: NO, the next display allows you to choose the day of the month when the change will take place, followed by the hours and minutes. When you confirm with "OK," the summer-to-winter time change (S \rightarrow W) is shown - program in the same way. "OK" takes you back to the EXTRAS HOLIDAYS.

DO NOT USE (no time change will be made)

If you select this option and confirm "OK", no time change will be made and you will be taken back to the EXTRAS HOLIDAYS.


If there are any switches programmed during the period of the time change, they will be duplicated or not carried out, depending on the time change in question.

HOLIDAY PROGRAM

This allows you to cancel programs and switch the circuit OFF for a set period of time. When this time has passed, programming is re-established.

Press "OK" to go into the MENU PROGRAM, use the Δ and ∇ keys to find EXTRAS, press "OK" and use the Δ and ∇ keys again to find HOLIDAYS.

Accept "OK" and the display will show HOLIDAYS BEGIN and press OK again to see BEGIN HOUR. Use Δ and ∇ to enter the hour at which the holiday period is to begin, press "OK" and then enter MINUTE, MONTH and DAY in the same way. Confirm the setting with "OK" and the display will show HOLIDAYS END. Program this in the same way as for HOLIDAYS BEGIN, entering your chosen HOUR, MINUTES, MONTH and DAY for the holiday period to end. When you press "OK" to confirm the last of these, you will see EXTRAS RANDOM on display – press the "C" key repeatedly to go back to normal working.

During the holiday period, the symbol  is displayed on display.

DEACTIVATING THE HOLIDAY PROGRAM


To deactivate the holiday program, go into EXTRAS HOLIDAYS and with HOLIDAYS BEGIN on the display, use the Δ and ∇ keys to select CLEAR, then press "OK" and the program will be erased. Press "C" repeatedly to go back to normal operation.

RANDOM PROGRAMS

The DATA LOG can carry out random "ON" and "OFF" switches. Random programs work between 07:00 and 24:00.

The program RANDOM \rightarrow 1 carries out random switches of variable duration, between 10 minutes and 1 hour.

The program RANDOM \rightarrow 1 carries out random switches of variable duration, between 2 and 4 hours.

From the normal operating display, press "OK" and use Δ and ∇ to find EXTRAS RANDOM. Press "OK" again and you will see RANDOM \rightarrow 1. Use Δ and ∇ to choose between the options \rightarrow 1, \rightarrow 2 or STOP, which deactivates the random program. Press "OK" to confirm and press the "C" key repeatedly to go back to normal operating mode. If one of the random programs has been selected, the symbol  will be displayed on display.

In random mode, programmed switches are not carried out.

COUNTER

To monitor the length of time (number of hours) the circuit has been active (C1 ON), selecting the EXTRAS COUNTER option displays the number of hours to 4 figures (up to 9999 hours). This counter is not zeroed when the device is reset.

In normal operating mode, press "OK" and use the Δ and ∇ keys to find EXTRAS COUNTER. Pressing "OK" again brings up COUNTER C1 on display and the number of hours the circuit has been on to four figures.

Press "C" repeatedly to go back to normal operation.

If you wish to erase the counter, from the display showing the number of "ON" hours, press "OK" and CONT C1 CLEAR will be displayed on display.

Press "OK" again and the display will show CLEAR C1 YES. Use Δ and ∇ to choose between YES and NO and confirm pressing "OK". Press the "C" key repeatedly to go back to normal operating mode.

12 (AM – PM) or 24-HOUR TIME MODE

You can choose between the time being displayed in AM : PM or 24-hour format. In normal operating mode, press "OK" and use Δ and ∇ to find EXTRAS 12/24H. From this menu, choose 12H or 24H and confirm with "OK". Press the "C" key repeatedly to return to normal operating mode. If the 12h function has been chosen, AM or PM will be shown on display, depending on the current time.

CYCLE PROGRAMMING

A cycle is a sequence of repetitive switches.

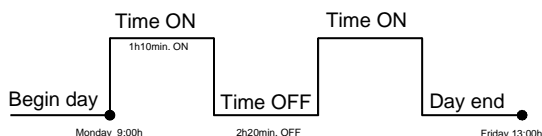
Each programmed cycle takes up two memory spaces (PROG X, PROG X+1). Go into the MENU PROGRAM and press "OK." Use the Δ and ∇ keys to choose a program (PROG XX), press "OK" again and PROG (XX) PROGRAM will be displayed. Confirm with "OK" and C1:ON will be displayed. Select CYCLE, press "OK," and you will see DAY BEG MO: YES (to allow you to select the starting day for the cycle). If you want it to begin on Monday, press "OK," otherwise use the Δ and ∇ keys until DAY BEG MO: NO appears on the display. Press "OK" to accept and repeat the operation for the other days of the week, selecting and confirming them in the same way.

When you have chosen the days, you need to select the start time for the cycle, beginning with the hour. Use the Δ and ∇ keys to enter the hour and confirm with "OK." Enter the cycle start minutes in the same way, and when you confirm "OK", DAY END MO: YES (to allow you to select the last day for the cycle) will be displayed. Repeat the same procedure to enter the days, hours and minutes for conclusion of the cycle.

Next, the cycle connection time (TIME ON) needs to be programmed. Enter the figures for hours and minutes (maximum 23 hours 59 minutes.- minimum 0 hour 1 minute) and then the cycle disconnection time (TIME OFF) in hours and minutes (maximum 23 hours 59 minutes.- minimum 0 hour 1 minute). (See example)

Before programming, check that the next memory program is free. It is not free, option CYCLE will not then be available. CYCLE programs are not permitted in memory program 50. Do not program overlapped cycles, as during the execution of one cycle, the overlapped cycle will not start.

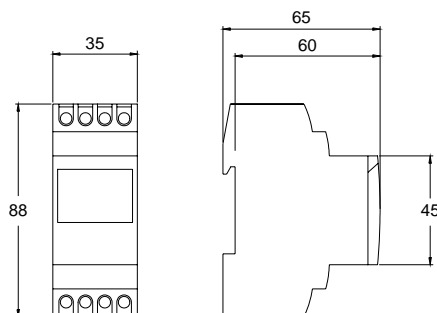
Cycles are shown in chronogram as ON from beginning to the end.



TECHNICAL FEATURES

Power supply :	As indicated on the device
Switching capacity :	16 (10)A/250V
Maximum recommended loads:	
Incandescent lamps.-	3000 W.
Uncompensated fluorescent lamps.-	1200 W.
Compensated fluorescent lamps.-	1200 W. 150 μ F.
Low-voltage halogen lamps.-	1000 VA.
Halogens (230 V).-	2500 W.
Low-consumption lamps.-	10X23 W.
Contact type and material:	Changeover AgSnO ₂
Power consumption:	6 VA 1 circuit (approx.1 W)
Number of programs:	50
Type of programs:	ON OFF PULSE (1 to 59 seconds) CYCLES (from 1 minute to 23hours 59 minutes, in ON or OFF times)
Switching accuracy:	Better than 1 second
Operating accuracy:	$\leq \pm 1$ s/day at 23°C
Reserve battery:	5 years. (Lithium Battery)
Working temperature:	-10 °C to +45 °C
Protection type:	IP 20 according to EN 60529
Protection class:	II according to EN 60335 when mounting as intended

DIMENSIONS



A016.17.51249



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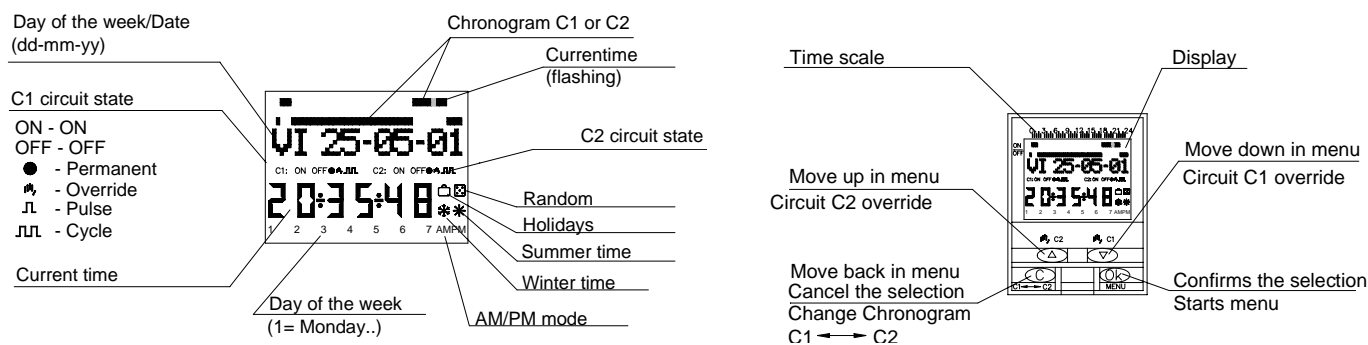
Lérida, 61 Tel.: + 34 91 567 22 77

E-28020 MADRID Fax + 34 91 571 40 06

E-mail: info@orbis.es

http://www.orbis.es

Active: 21/11/2013



DESCRIPTION

The DATA LOG 2 is a digital time switch with 2 independent changeover and potential free circuits designed to control of any electrical installation. Its possibilities include short-duration (1-59 seconds) switching, repeating cycles, random programming, automatic summer-winter time change and a time counter.

Its menus can be displayed in 5 languages and it displays a chronogram that shows in the display the programming of current day, both circuit C1 and C2. To change chronogram from C1 to C2, just press key "C" (C1 – C2). This divided into 48 section, each section representing 30 minutes. The section corresponding to the current time flashes.

INSTALLATION

ATTENTION: Electrical devices must be installed and assembled by authorized installer.

VERY IMPORTANT: The switch is protected internally against interference by a safety device. However, particularly strong electromagnetic fields may alter its operation. Such interference can be avoided by adhering to the following recommendations during installation:

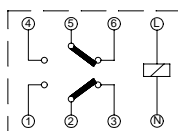
- The device should not be installed near inductive loads (motors, transformers, contactors, etc..)
- A separate power line is recommended (equipped with a network filter if necessary).
- Inductive loads should be equipped with interference suppressors (varistor, RC filter).

If the timer switch is to be used in combination with other devices in an installation, it is necessary to verify that no parasitic disturbances will be caused by the group

ASSEMBLY: They should be installed in switchboard cabinets made of 35mm symmetric sections in accordance with EN 50 022.

CONNECTION

connection scheme



STARTING UP

The DATA LOG's factory settings include the current date and time and the following:

Time:	Central European time (E.U.)
Clock:	24 h mode
Winter-summer time change	Automatic (last Sunday in March)
Summer-winter time change	Automatic (last Sunday in October)
Holidays:	NO (off)
Random mode:	NO (off)
C1 counter:	Zeroed (0000 hours)
C2 counter:	Zeroed (0000 hours)
Programs:	None (memory empty)

PROGRAMMING

Programming is menu-based (text messages).

If operations are programmed for the same time, remember that some have priority over others

The order of priority is as follows: PERMANENT MODE → HOLIDAY PROGRAM → RANDOM PROGRAM → PULSE ON → PULSE OFF → PROGRAMMING OFF → PROGRAMMING ON → CYCLE PROGRAMMING

The information being programmed always flashes on display.

Pressing the "OK" key brings up the PROGRAM MENU. If the language used is not right, reset the timer.

RESET

When all four keys are held down for more than 3 seconds, all existing programming is deleted and the LANGUAGE menu appears.

LANGUAGE SELECTION

Use the UP Δ and DOWN ∇ keys to choose a language and confirm pressing "OK." The DATE YEAR menu then appears automatically. (See example)

CLOCK SETTING

Press "OK" to go into the MENU PROGRAM and use the Δ and ∇ keys to select the MENU DATE. Confirm with "OK" to go into DATE YEAR. The numbers for the year flash on display and are changed with the Δ and ∇ keys. Confirm with the "OK" key. The figures for MONTH and DATE are entered in the same way. Press "OK" to save the date (dd, mm, yy), the day of the week will be set automatically and the display will change automatically to TIME programming. Use the Δ and ∇ keys to change, first, the hours, confirm with "OK", then repeat for the minutes. Press "OK" and the MENU PROGRAM will appear. (See example)

If you first wish to check the information entered, press the "C" key and the timer goes back into normal mode.

BASIC PROGRAMMING**PROGRAM MENU**

Both circuits can be programmed in the same program (Prog 1 to Prog 50), with the same or different type of switch for each circuit (excepting CYCLE). To programm only in one of the circuits select " ---- " in type of switch in the other one.
In normal mode, press the "OK" key to bring up the MENU PROGRAM. Press "OK" again and the display will show PROGRAM PROG 01.

ON-OFF PROGRAMMING

Press the "OK" key again and you will see on display PROG 01: PROGRAM. Confirm pressing "OK" and the display will show PROG 01: C1: ON. Use the Δ and ∇ keys to choose switch type ON-OFF, PULSE, CYCLE or " ---- ". The selection made is validated with key " OK " and the display shows PROG 01 C2 ----, with the keys Δ and ∇ select the type of switch for circuit 2: On, OFF, PULSE, CYCLE or " ---- ". Validate with " OK ". If in both circuits the selection is " ---- ", circuit 2 is then automatically changed to ON. Confirm the choice with the "OK" key. The display automatically shows MO : YES. If you want the switch to be carried out on Monday, press "OK," otherwise, press either of the Δ and ∇ keys and the display will show MO : NO. Press "OK" and carry out the same process for the other days of the week, one after the other, confirming them in the same way. When you have selected the days, you then need to set the time at which the switch will take place. Use the Δ and ∇ keys to set the hours and confirm with "OK," then do the same for the minutes. When you confirm the time pressing "OK," the display will show PROGRAM PROG 02: confirm the choice with the " OK "key the display will show PROG 02: PROGRAM. Press "OK" again and the display will show PROG 02 C1 : ON. Follow the same steps as for Program 01. There are 50 memory spaces (PROG 01 to PROG 50). (See example)
When you have finished programming, press the "C" repeatedly until the normal display appears.


VIEWING PROGRAMMED SWITCHES





Press "OK" to go into the MENU PROGRAM, then "OK" again to bring up PROGRAM PROG 01 on display. Press the Δ and ∇ keys to see all the programs (1 to 50).



CHANGING OR DELETING SWITCHES

Press "OK" to go into the PROGRAM menu, then "OK" again to bring up PROGRAM PROG 01 on display. Use the Δ and ∇ keys to select the program you wish to change (1 to 50) and when you have it, press "OK" and the program will be shown on display with the word MODIFY. The Δ and ∇ keys change between CLEAR and MODIFY, Choose your option and press the "OK" key.
If you chose CLEAR, the program will be eliminated and the display will show PROGRAM and the program deleted (PROG XX).
If you have chosen MODIFY, pressing "OK" brings up the type of switch selected (ON-OFF / PULSE / CYCLE) and you should carry on as described in the section on PROGRAMMING. To return to normal operation, press the "C" key repeatedly until the normal operating display is shown.

MANUAL ACTIVATION

In normal mode, the circuits can be activated or deactivated temporally: C1 with key ∇ and C2 with key Δ ; display shows symbol , and the circuits stays in this position until next programmed switch. Also the circuits can be permanently activated or deactivated (programmed switches are not ejected) following next steps:

Press key " OK " to enter MENU PROGRAM with keys Δ and ∇ change second line in display to MANUAL. Press key " OK " to validate selection and display shows MANUAL C1: ON, with keys Δ and ∇ select ON, OFF, ON , OFF  or " ---- ". Validate selection by pressing " OK " and display shows MANUAL C2: ---- with keys Δ and ∇ select ON, OFF, ON , OFF  or " ---- ". Confirm by pressing "OK" and go back to normal mode by pressing the "C" key repeatedly. To change out of permanent mode, repeat this operation and select ON or OFF.

In the ON  and OFF  positions, you can also change the state of the circuit by pressing the Δ and ∇ keys, in normal mode. The symbols for activated options are shown on display.

ADVANCE PROGRAMMING. SPECIAL FUNCTIONS (EXTRAS)**PULSE PROGRAMMING**

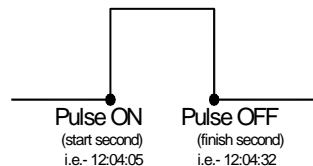
With pulse programming, switches from 1 to 59 seconds can be carried out, with both ON and OFF pulses.

In normal mode, press the "OK" key to go into the MENU PROGRAM. Press "OK" and the display will show: PROGRAM PROG 01 .

Press the "OK" key again and the display will show PROG 01: PROGRAM. Press "OK" again and PROG 01: C1: ON appears. Use the Δ and ∇ keys to select PULSE. Press " OK " and the display will show PROG 01: C2 ---- . Use the Δ and ∇ keys to choose type of switch for canal 2: ON-OFF, PULSE, CYCLE or " ---- ". Press "OK" to confirm and the display will show MO : YES. If you want the switch to be carried out on Monday, press "OK," otherwise, press either of the Δ and ∇ keys and the display will show MO : NO. Press "OK" and carry out the same process for the other days of the week, one after the other, confirming them in the same way.

When you have selected the days, you then need to set the time at which the switch will take place. Use the Δ and ∇ keys to set the hours and confirm with "OK." Now do the same for the minutes and when you confirm by pressing "OK," the display will show PULSE ON : choose the second when the circuit is to be connected using Δ and ∇ and confirm with "OK". The display will show PULSE OFF. Use Δ and ∇ to select the second at which the circuit is to be switched off and press "OK" again to confirm.

If you want an "on" pulse, take care to set PULSE ON before PULSE OFF and the other way round for an "off" pulse.

**WINTER / SUMMER TIME CHANGE**

To go into the MENU, press the "OK" key and use the Δ and ∇ keys to find the EXTRAS option. Confirm with "OK" and you will see EXTRAS SEASON on display, press "OK" again and 3 options are displayed: AUTO, MANUAL and DO NOT USE. Move between them with the Δ and ∇ keys and confirm by pressing "OK."

AUTO (the clock is automatically changed on the last Sunday in March and the last Sunday in October).

No changes are possible with this option. When you select it, the display shows SEA AUTO W \rightarrow S and the date of the change from winter to summer time (last Sunday in March). When "OK" is pressed, SEA AU W \rightarrow S DATE appears and when the Δ or ∇ key is pressed, the time of the change (02:00:00) is shown. When you press "OK" again, you will see SEA AUTO S \rightarrow W and the date of the summer-to-winter time change (last Sunday in October). Pressing "OK" shows the date again and the Δ or ∇ key lets you see the time when the change will happen (03:00:00). Press "C" or "OK" to go back to the EXTRAS HOLIDAYS.

MANUAL (Allows you to choose the date and time for the time change).

When you select this option, the display shows SEA MANUAL W \rightarrow S and the date of the winter-to-summer time change. Press "OK" and you can change the month with the Δ and ∇ keys. When you confirm this " OK ", you see LS (for "Last Sunday"): YES. If you want to set the last Sunday of the chosen month for the change, press "OK," otherwise change to LS: NO using the Δ and ∇ keys and confirm with "OK."

If you accept LS: NO, the next display allows you to choose the day of the month when the change will take place, followed by the hours and minutes. When you confirm with "OK," the summer-to-winter time change (S → W) is shown - program in the same way. "OK" takes you back to the EXTRAS HOLIDAYS.

DO NOT USE (no time change will be made)

If you select this option and confirm "OK", no time change will be made and you will be taken back to the EXTRAS HOLIDAYS.

If there are any switches programmed during the period of the time change, they will be duplicated or not carried out, depending on the time change in question.

HOLIDAY PROGRAM

This allows you to cancel programs and switch the circuit OFF for a set period of time. When this time has passed, programming is re-established. Press "OK" to go into the MENU PROGRAM, use the Δ and ∇ keys to find EXTRAS, press "OK" and use the Δ and ∇ keys again to find HOLIDAYS. Accept "" OK " and the display will show HOLIDAYS BEGIN and press OK again to see BEGIN HOUR. Use Δ and ∇ to enter the hour at which the holiday period is to begin, press "OK" and then enter MINUTE, MONTH and DAY in the same way. Confirm the setting with "OK" and the display will show HOLIDAYS END. Program this in the same way as for HOLIDAYS BEGIN, entering your chosen HOUR, MINUTES, MONTH and DAY for the holiday period to end. When you press "OK" to confirm the last of these, you will see EXTRAS RANDOM on display – press the "C" key repeatedly to go back to normal working.

During the holiday period, the symbol \square is displayed on display.

DEACTIVATING THE HOLIDAY PROGRAM

To deactivate the holiday program, go into EXTRAS HOLIDAYS and with HOLIDAYS BEGIN on the display, use the Δ and ∇ keys to select CLEAR, then press "OK" and the program will be erased. Press "C" repeatedly to go back to normal operation.

RANDOM PROGRAMS

The circuit C1 du DATA LOG 2 can carry out random "ON" and "OFF" switches. Random programs work between 07:00 and 24:00.

The program RANDOM → 1 carries out random switches of variable duration, between 10 minutes and 1 hour.

The program RANDOM → 1 carries out random switches of variable duration, between 2 and 4 hours.

From the normal operating display, press "OK" and use Δ and ∇ to find EXTRAS RANDOM. Press "OK" again and you will see RANDOM → 1. Use Δ and ∇ to choose between the options → 1, →2 or STOP, which deactivates the random program. Press "OK" to confirm and press the "C" key repeatedly to go back to normal operating mode. If one of the random programs has been selected, the symbol \square will be displayed on display.

In random mode, programmed switches are not carried out.

COUNTER

To monitor the length of time (number of hours) the circuit C1 or C2 has been active (C1 ON) or (C2 ON), selecting the EXTRAS COUNTER option displays the number of hours to 4 figures (up to 9999 hours). This counter is not zeroed when the device is reset.

In normal operating mode, press "OK" and use the Δ and ∇ keys to find EXTRAS COUNTER. Pressing "OK" again brings up COUNTER C1 on display and the number of hours the circuit has been on to four figures. Use Δ and ∇ to select COUNTER C2.

Press "C" repeatedly to go back to normal operation.

If you wish to erase the counter, from the display showing the number of "ON" hours, press "OK" and CONT C1 CLEAR or CONT C2 CLEAR will be displayed on display. Press "OK" again and the display will show CLEAR C1 YES or CLEAR C2 YES. Use Δ and ∇ to choose between YES and NO and confirm pressing "OK". Press the "C" key repeatedly to go back to normal operating mode.

12 (AM – PM) or 24-HOUR TIME MODE

You can choose between the time being displayed in AM : PM or 24-hour format. In normal operating mode, press "OK" and use Δ and ∇ to find EXTRAS 12/24H. From this menu, choose 12H or 24H and confirm with "OK". Press the "C" key repeatedly to return to normal operating mode. If the 12h function has been chosen, AM or PM will be shown on display, depending on the current time.

CYCLE PROGRAMMING

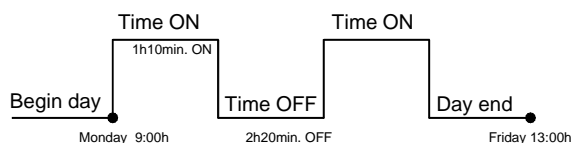
A cycle is a sequence of repetitive switches. Each programmed cycle takes up two memory spaces (PROG X, PROG X+1).

Go into the MENU PROGRAM and press "OK." Use the Δ and ∇ keys to choose a program (PROG XX), press "OK" again and PROG (XX) PROGRAM will be displayed. Confirm with "OK" and C1:ON will be displayed. Select CYCLE. To programm cycles in circuit 2, select " ---- " and validate by pressing key " OK ", then displays shows C2: ON, with keys Δ and ∇ select CYCLES. Press "OK," and you will see DAY BEG MO: YES (to allow you to select the starting day for the cycle). If you want it to begin on Monday, press "OK," otherwise use the Δ and ∇ keys until DAY BEG MO: NO appears on the display. Press "OK" to accept and repeat the operation for the other days of the week, selecting and confirming them in the same way.

When you have chosen the days, you need to select the start time for the cycle, beginning with the hour. Use the Δ and ∇ keys to enter the hour and confirm with "OK." Enter the cycle start minutes in the same way, and when you confirm " OK ", DAY END MO: YES (to allow you to select the last day for the cycle) will be displayed. Repeat the same procedure to enter the days, hours and minutes for conclusion of the cycle.

Next, the cycle connection time (TIME ON) needs to be programmed. Enter the figures for hours and minutes (maximum 23 hours 59 minutes.- minimum 0 hour 1 minute) and then the cycle disconnection time (TIME OFF) in hours and minutes (maximum 23 hours 59 minutes.- minimum 0 hour 1 minute). (See exemple)

Before programming, check that the next memory program is free. It is it not free, option CYCLE will not then be available. CYCLE programs are not permitted in memory program 50. Do not program averlaped cycles, as during the execution of one cycle, the overlaped cycle will not start. Cycles are shown in chronogram as ON from beginning to the end.

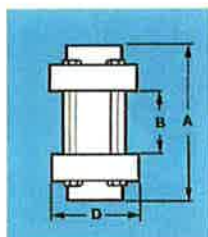


Indicators

Cylinder Glass – Plastic - Threaded



Model 120



Model	End Material
120	Polypropylene
121	PVC
122	Teflon (1" Max)

These units utilize a double wall construction and are used to indicate flow or clarity of highly corrosive or ultra-pure liquids (with Teflon seals) compatible with Pyrex Glass.

Unit Size	Dimensions in Inches			Wt. Lbs
	B	A	D	
1/2 3/4	2-1/4	4-3/4	2-1/2	1
1	2-1/2	5-1/4	3	1
1-1/4 1-1/2	2-1/2	5-7/8	3-1/2	2
2	3-1/8	7-3/8	4	3
3	2-3/8	3-3/8	5-1/2	5

Features

- ◆ Sizes 1/2" to 3" NPT
- ◆ Double Wall Cylinders
- ◆ No Metal Wetted Parts

Ratings

- ◆ Polypropylene: 50 psi @ 185°F
- ◆ PVC: Varies up to 140°F
- ◆ Teflon: Varies up to 225°F

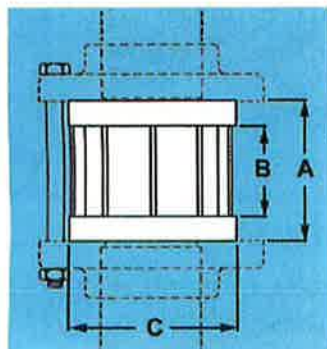
Materials

- ◆ Inner Glass: Borosilicate
- ◆ Outer Glass: Acrylic Plastic
- ◆ Seals: Viton O-Rings

Cylinder Glass – Plastic - Flanged



Model 220



Model	End Material
220	Polypropylene
221	PVC
222	Teflon
223	CPVC
224	Kynar (PVDF)

These units utilize a double wall construction and are used to indicate flow or clarity of highly corrosive or ultra-pure liquids (with Teflon seals) compatible with Pyrex Glass.

Unit Size	Dimensions in Inches			Wt lbs.
	A	B	C	
1-1/2	4-1/2	2-1/2	3-3/8	2
2	5	3	4-1/8	2
3	5-1/4	3-1/4	5-3/8	3
4	5-5/8	3-5/8	6-7/8	5
6	6-5/16	4-5/16	8-3/4	7
8	6-5/16	4-5/16	11	10

Features

- ◆ Sizes 1-1/2" to 8" Flanged
- ◆ To Fit 150lb ANSI & DIN
- ◆ Double Wall Cylinders
- ◆ No Metal Wetted Parts

Ratings

- ◆ Polypropylene: Varies to 185°F
- ◆ PVC: Varies up to 140°F
- ◆ Teflon: Varies up to 225°F
- ◆ CPVC: Varies up to 180°F
- ◆ Kynar: Varies up to 293°F

Materials

- ◆ Inner Glass: Borosilicate
- ◆ Outer Glass: Acrylic Plastic
- ◆ Seals: Viton O-Rings

Bourdon Tube Pressure Gauges Stainless Steel Series Model 232.50/233.50, without/with Liquid Filling

WIKA Data Sheet PM 02.02



Applications

- With liquid filled case for applications with high dynamic pressure pulsations or vibrations
- Suitable for corrosive environments and gaseous or liquid media that will not obstruct the pressure system
- Process industries: chemical/petro-chemical, power stations, mining, on- and offshore, environmental technology, mechanical engineering and plant construction

Special Features

- Excellent load-cycle stability and shock resistance
- All stainless steel construction
- Approval German Lloyd and Gosstandart
- Scale ranges up to 0 ... 1600 bar

Description

Design
EN 837-1

Nominal size
63, 100 and 160 mm

Accuracy class
63 mm: 1.6
100, 160 mm: 1.0

Scale ranges
63 mm: 0 ... 1 to 0 ... 1000 bar
100 mm: 0 ... 0.6 to 0 ... 1000 bar
160 mm: 0 ... 0.6 to 0 ... 1600 bar
or other equivalent units of pressure or vacuum



Bourdon Tube Pressure Gauge Model 232.50

Working pressure

63 mm:	Steady:	full scale value
	Fluctuating:	0.9 x full scale value
	Short time:	1.1 x full scale value
100, 160 mm:	Steady:	full scale value
	Fluctuating:	0.9 x full scale value
	Short time:	1.3 x full scale value

Operating temperature

Ambient:	-40 ... +60 °C without liquid filling
	-20 ... +60 °C gauges with glycerine filling
Medium:	+200 °C maximum without liquid filling
	+100 °C maximum with liquid filling

Temperature effect

When temperature of the pressure element deviates from reference temperature (+20 °C):
max. ± 0.4 %/10 K of true scale value

Ingress protection

IP 65 per EN 60 529 / IEC 529

WIKA Data Sheet PM 02.02 · 08/2006

Page 1 of 2

Stainless steel series model 232.30 see data sheet PM 02.04

WIKA

Part of your business

Standard features

Pressure connection

Material: stainless steel 316L

Lower mount (LM) or lower back mount (LBM)

63 mm: G ¼ B (male), 14 mm flats

100, 160 mm: G ½ B (male), 22 mm flats

Pressure element

Material: stainless steel 316L

< 100 bar: C-type

≥ 100 bar: helical type

Movement

Stainless steel

Dial

White aluminium with black lettering,

63 mm with pointer stop pin

Pointer

Black aluminium

Case

Natural finish stainless steel, with pressure relief in case top (63 mm) or in case back (100 and 160 mm),

ranges ≤ 16 bar with compensating valve to vent case

Window: Laminated safety glass

Bezel ring: Cam ring (bayonet type), natural finish stainl. steel

Liquid filling (for model 233.50): Glycerine 99.7 %

Special versions

Ammonia gauges (100 and 160 mm)

Scale in °C for refrigerant R 717 (NH₃),

Pressure ranges: -1 ... 0 ... 15 bar or -1 ... 0 ... 26 bar

Dimensions in mm

NS	Dimensions in mm											Weight in kg	
	a	b	b ₁	b ₂	D ₁	D ₂	e	f	G	h ± 1	SW	Mod. 232.50	Mod. 233.50
63	9.5	33	33	57	63	62	11.5	- 1)	G ¼ B	54	14	0.16	0.20
100	15.5	49.5	49.5	83	101	99	17.5	30	G ½ B	87	22	0.60	0.90
160	15.5	49.5 3)	49.5 2)	83 2)	161	159	17.5	50	G ½ B	118	22	1.10	2.00

Standard pressure entry with parallel thread and sealing to EN 837-1 / 7.3

1) Centre back pressure entry (CBM)

2) Plus 16 mm with pressure ranges ≥ 100 bar

3) Plus 16 mm with pressure range 1600 bar

Ordering information

Pressure gauge model / Nominal size / Scale range / Size and location of connection / Optional extras required

Modifications may take place and materials specified may be replaced by others without prior notice.
Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.

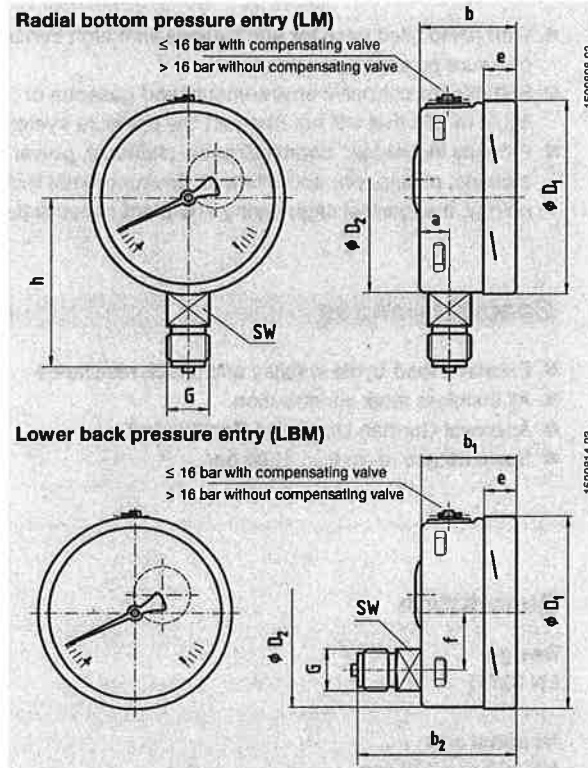


WIKAI Alexander Wiegand GmbH & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Phone (+49) 93 72/132-0
Fax (+49) 93 72/132-406
E-Mail info@wika.de
www.wika.de

Optional extras

- Other pressure connection
- Monel pressure system (model 26X.50)
- Pressure system stainless steel 1.4571
- 3-hole surface or panel mounting flange, stainless steel
- 3-hole panel mounting flange, stainless steel, polished
- Triangular bezel, stainless steel, polished, with clamp
- Ambient temperature -40 °C: silicon oil filling
- Alarm contacts (see data sheet AC 08.01)
- Transmitter (model 232.30 with combined transmitter model 89X.34, see data sheets PM 02.04 and AE 08.02)
- Version per ATEX Ex II 2 GD c

Standard version



Valves

Pressure Relief Valves

Fig 160-2

The Fig. 160-2 range of Relief Valves are of stainless steel construction and suitable for relieving excess pressures of liquids and gases where high discharge rates are not required. The stainless steel construction makes them ideal for use with a wide range of aggressive chemicals and gases.

The valve is supplied with a sealing dome on the adjusting screw to contain any hazardous products

Pressure adjustment is made by unscrewing the sealing dome, slackening the locknut on the adjusting screw, and rotating it clockwise to increase or anti-clockwise to decrease the blow off pressure.

316 Stainless Steel



Specifications

Connections:

10 - 50 mm BSP or NPT

Adjustable Ranges:

0 - 120 kPa, 200 - 700 kPa, 500 - 1700 kPa; Higher pressure ranges available on application.

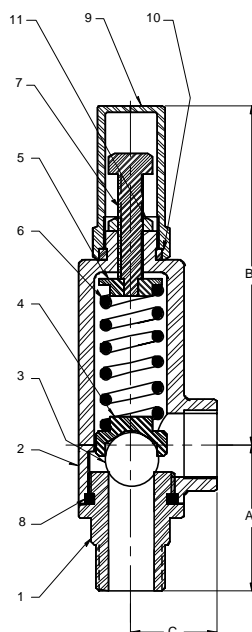
Temperature Ranges:

Nitrile seals: -50°C - 125°C

Viton seals: -40°C - 225°C

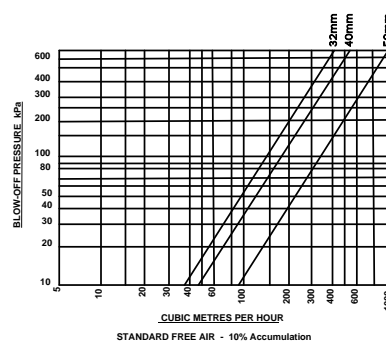
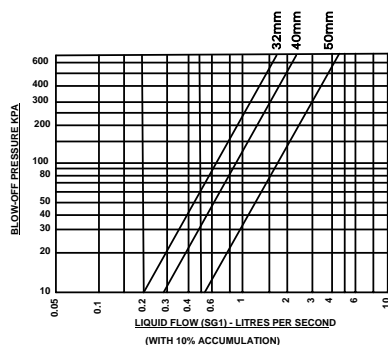
Materials

Item	Description	Material
11	Gasket 'O' Ring	Nitrile
10	Gasket 'O' Ring	Nitrile
9	Sealing Cap	Stainless Steel 316
8	Lock Nut	Stainless Steel 316
7	Adjusting Screw	Stainless Steel 316
6	Regulating Spring	Stainless Steel 304
5	Spring Pads	Stainless Steel 316
4	Spindle	Stainless Steel 316
3	Valve Plug	Stainless Steel 420c
2	Valve Body	Stainless Steel 316
1	Body	Stainless Steel 316



Dimensions

Valve Size mm	A	B	C	Mass kg
10	46	78	21	0.4
15	56	106	27	0.5
20	74	141	39	1
25	78	154	42	1.5
32	80	153	45	2
40	93	160	55	3
50	125	215	75	6



Pressure Relief Valves
Fig. 161

Fig. 161 Spring Loaded Relief Valve is available with right angle or globe type body and flanged connections.

It is suitable for relieving excess pressures of liquids and gases.

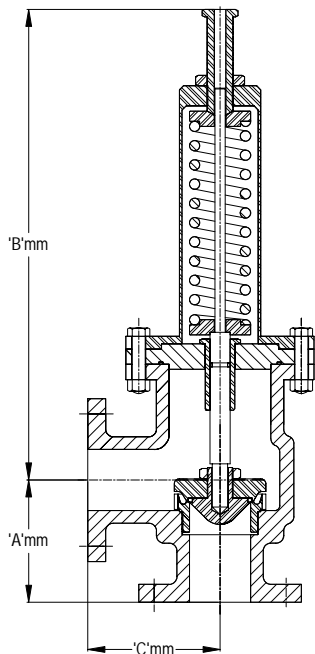
The valve disc is available with metal to metal seal or resilient 'O' Ring disc seal.

Fig. 161 Relief Valves can be custom manufactured in a range of materials and can be supplied with an easing lever. The valve seat and disc are contoured to improve lifting efficiency.

Pressure adjustment is made by rotating the adjusting screw clockwise to increase and anti-clockwise to decrease the blow off pressure.



Can be manufactured in a range of materials



Specifications

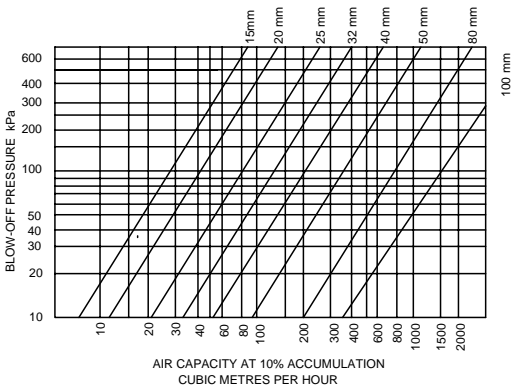
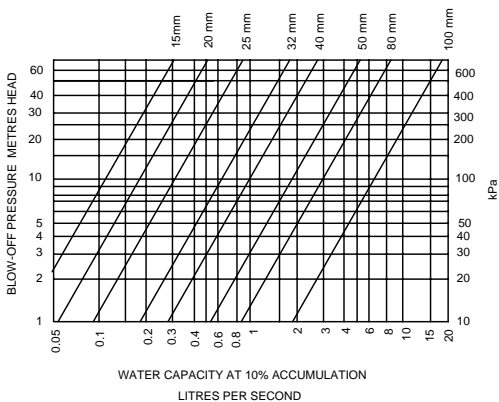
- Connections: Flanged
- Working Pressure: As per flange rating
- Adjustable Ranges: 0 - 120, 70 - 230, 200 - 700, 500 - 1100 kPa
- Temperature Range: 2 - 190°C

Materials

- Body, cover and Springcage: Cast Iron, Bronze, Steel or Stainless Steel
- Trim: Bronze or Stainless Steel
- Seals: Nitrile or Viton

Dimensions (mm) - Right Angle Style

Valve Size	A	B	C
65	143	459	133
80	152	606	165
100	178	584	172
150	216	660	216



Pump

Roto Pump



ROTO PUMPS LTD.

OPERATION AND MAINTENANCE MANUAL

PUMP MODEL	
PUMP SERIAL NO.	

Applicable for Pump Model: – RLCB / RLGB - 591

Enclosure:-

1. Installation/Operation and Maintenance Instruction for PC Pumps.
2. Trouble Shooting Chart.
3. Dismantling & Assembly Instructions.
4. Dimensional Drawings.
5. Cross Sectional & Dimensional Representation Drawings.
6. Exploded View of Universal Joints.

Works & Sales Operation:

B-15, Phase II extension
 Noida - 201305
 Uttar Pradesh (India)
 TEL: 0120 - 3043945, 46, 47, 48.
 FAX: 0120 - 2567957, 3043988.

ROTO/O&M/RL/JUN/08/MS01



INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

FOREWORD

Thank you for your patronage of the Roto Pumps Ltd. We are happy to inform you that your Roto progressive Cavity Pump has been designed, manufactured & tested to give you a long, smooth and trouble-free operation. To get the best performance from the equipment we request you to carefully study the manual before, during and after installation of the pump. This manual is an essential part of the equipment and should be available at all times to the plant personal and kept in a safe place in the plant premises.

Should you have any doubts or queries, please do not hesitate to contact our nearest dealer or service center. Our experienced engineers would be happy to offer to you expert advice, should any of the following considerations be overlooked, the safety of personal and satisfactory operation of the pump may be endangered.

GENERAL

1. Adequate ventilation must be provided in order to disperse dangerous vapors when pump is handling harmful or objectionable material.
2. Adequate lighting should be provided to ensure effective maintenance.
3. Usage with certain products may need a hosing facility to drain the pump to ease and simplify maintenance.
4. Suitable arrangement should be provided to carry out gland draining.
5. Adequate space must be provided for dismantling of the pump as per the dimensional drawing of the pump. (Refer enclosed dimensional drawing.)

STORAGE & HANDLING

HANDLING: For safe handling during installation and maintenance the following four points must be taken care of to avoid any damage to the component or personnel injury:

1. For lifting and assembling, use suitable lifting tackle and slings, if the pump or any of its component weighs more than 20 kg.
2. The position of slings will depend on specific pump model and mounted accessories
3. If eyebolts are provided, they should be used for lifting.
4. Experienced personnel should carry out handling.

STORAGE: Following points are advised for storage of pump and spares.

1. The Pump should be kept in moisture-free area, preferably, with protective covering.
2. Pump should be kept after draining out the pumping liquid and preferably after flushing it with water.
3. A small amount of light oil should be injected in the stuffing box after loosening the gland. For food application pumps, use a compatible vegetable or edible grease.
4. Anti rusting oil or suitable agent must be applied on metallic parts to be stored.
5. Refer manufacturer's instructions for storage of other items like gearbox, motor etc.

SYSTEM DESIGN AND INSTALLATION

SYSTEM DESIGN - At the system design stage, consideration must be given for the provision of filler plugs and installation of non-return and/or isolating valves. **ROTO PUMPS** are normally installed in a horizontal position with

base plates mounted on a flat surface, grouted in and bolted, thus ensuring firm fixing, thereby reducing noise and vibration.

After bolting down the base frame, unit should be checked for correct alignment of the pump to its prime mover.

If the pump is mounted in any other way than described above, confirmation of installation must be agreed with **ROTO**.

ELECTRICAL –

Electrical connections should only be made using equipment suitable for both rating and environment. Normally the **ROTO** Pump should be installed with starting equipment arranged to give direct on line starting to ensure maximum starting torque. When the motor is being wired and checked for direction of rotation, ensure that the motor is not coupled with the pump. If any wiring or control device is to be fitted on the electrical equipment they must be set in accordance with their specific instructions.

Protection of all electrical equipment should be ensured for minimum safety requirements as per environment and fluid being pumped in accordance with applicable safety rules.

Earthing points of electrical equipments should be connected when the pump is fitted with electrical drives and it is essential that these be correctly connected as per the electrical equipment manufacturer's recommendation

DUTY CONDITIONS

Pumps should only be installed on duties for which **ROTO** has specified materials of construction, fluid, flow rates, pressure, temperature, speed etc. If the duty is changed, **ROTO'S** recommendations should be sought immediately in the interest of safety, plant efficiency and pump life.

ROTATION

Consult **ROTO** or its authorized representative if the direction of rotation of pump has to be changed after installation.

GUARDS

In the interest of safety of personnel and in compliance with statutory requirement of various countries, the pump pulleys and couplings must be enclosed with proper guards in the interest of safety of personnel.

Specific pumps may have auger feed screws with a wide suction flange. If the pump installation requires that these cannot be enclosed care must be taken to ensure that personnel cannot gain access while the pump is in operation and emergency stops device must be fitted nearby.

IMPORTANT SAFETY MEASURES

DO'S

1. Always fill the pump with fluid and give few turns to provide necessary lubrication before starting when subject to prolonged stoppage.
2. Always use a pressure relief device on delivery line for system safety.
3. Use only direct on-line starters for meeting starting torque requirement of pump.
4. Uncouple pump while motor is being wired and checked for rotation, to prevent dry running of pump.
5. Always consult **ROTO** in case of any change in operating parameters, like temperature, viscosity, percentage of solids, liquid composition etc,



INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

6. Always use genuine **ROTO** spares for sustained pump performance and longer life of critical parts.

DON'TS

1. Never run the pump in a dry condition even for a few revolutions otherwise the rotor will damage the stator immediately.
2. Never run the pump against a closed inlet or outlet valve.
3. Never use foot valve for slurry applications.
4. Never vary flow rate by throttling suction and delivery line.
5. Never exceed recommended pump speed.
6. Never reverse the recommended direction of rotation of pump without consulting **ROTO**.
7. Never use local made or spurious spares that look alike but do not meet material standards or dimensional accuracy affecting life of critical components and performance of pump.
8. Care is required when adjusting the gland while pump is running.

COMMISSIONING - All nuts and bolts, securing flanges and base mounting fixtures, must be checked for tightness before operation. To eliminate vibration, the pump must be correctly aligned with the drive unit and the guards must be securely fixed in position. All the pipelines must be independently supported and use of expansion joints is desirable to eliminate the transmission of vibrations and stresses to the pipelines. When commissioning the plant, all the joints in the system must be checked thoroughly for leakage. If on starting, the pump does not appear to operate correctly, the pump must be shut down immediately and the cause of the malfunctioning must be established before operations are recommenced. It is recommended that depending upon plant system operation either a combined vacuum gauge and pressure gauge, or a vacuum gauge only, be fitted to the pump inlet port and a pressure gauge fitted to the outlet port to continuously monitor the pump operating conditions. It is further recommended that a pressure relief valve of adequate capacity should be installed on the discharge side of the pump.

START UP/RUNNING

DRY RUNNING - Pumps must be filled with liquid before starting (A threaded plug has been provided on the top of the pump housing for this purpose). The initial filling is not for priming purpose, but to provide the necessary lubrication of the stator until the pump primes itself. When the pump is stopped, sufficient liquid is normally trapped between the pumping elements to provide the necessary lubrication for restarting. If, however, the pump has been left standing for a long time or has been dismantled, it must be refilled with liquid and given a few turns before starting, to get sufficient lubrication between the rotor and stator.

If the pumping liquid is hazardous, then extreme care must be taken while initial filling of the pump using all safety and precautionary measures.

NEVER RUN THE PUMP IN A DRY CONDITION EVEN FOR A FEW REVOLUTIONS OTHERWISE THE STATOR WILL BE DAMAGED IMMEDIATELY

GLAND PACKING (Only For Gland Packed Pump)

The pump is normally fitted with gland packing, which required final adjustment during initial running period. Under normal working conditions the gland rings are to be tightened in a manner to permit a slight drip from the gland. This enhances life of the shaft as well as of gland packing. It

is important to note that the gland packing never be over tightened to arrest the leakage completely. This can lead to excessive heat generation that can cause permanent damage to shaft and packing. Adjustment by tightening should only be made when the pump is running. Indication of slight drip from the gland packing will only be evident if the pump is running delivery on gland or with suction on gland with a flooded suction. If the pump runs with a vacuum on the gland, a flushing connection (or greaser) with lantern ring is recommended.

Where lantern rings are fitted in stuffing box; the flushing liquid inlet or outlet should be connected for proper circulation of the liquid.

MECHANICAL SEAL - When the pump is supplied with mechanical seal, it may be necessary to ensure proper flushing & quenching arrangement as per the seal manufacturer's recommendations, enclosed with this manual.

GLAND GUARDS - In the interest of safety of personnel and in compliance with statutory requirements of various countries, the pumps are fitted with gland-guards that can be easily removed for adjustment of gland sealing. It is responsibility of the user to make sure that the guards are placed back in position after necessary adjustments have been made.

PUMP OPERATING TEMPERATURE - The surface temperature range depends upon factors like ambient temperature and temperature of the fluid being pumped. If the external pump surface temperature goes above 50°C, personnel must be made aware of these and suitable warnings or guarding must be employed.

INSPECTION

ADJUSTMENT OF GLAND PACKING - The gland packing should be inspected every day after starting the pump. Remove the gland guards to check the leakage. If the sealing is not proper it must be adjusted by tightening or loosening of gland nuts to attain the preferred level of sealing. Excessive tightening should be avoided, as it would result in excessive heat generation leading to permanent damage of both the packing and the drive shaft. Experienced personnel should carry gland adjustment carefully so that safety of the personnel is not endangered.

PERIODIC INSPECTION - To avoid unexpected failure of the pump, it is important that the pump is periodically dismantled and routine inspection of the pump is carried out as follows:

Inspection of the pumping elements for wear and tear, after every six months or if the discharge falls below acceptable levels.

Periodic bearings and universal joints inspection is necessary to maintain optimum performance. The most appropriate time to inspect is during periods of regular scheduled downtime for routine maintenance or for any other reason

MAINTENANCE OF WEARING COMPONENTS

ROTORS AND STATOR - The wear rate of these components depends on many factors, such as product abrasiveness, speed, pressure etc. One or possibly both items will need to be replaced, when the pump performance has reduced to an unacceptable level.

DRIVE SHAFT – STUFFING BOX - The wear rate under gland area of the drive shaft depends on various factors like



INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

product abrasiveness, extent of tightening of the packing and speed of the pump. Periodic inspection and maintenance of the gland will maximize the life of the shaft. Replacement of the gland packing or both the gland packing and the drive shaft will be necessary when the shaft sealing becomes difficult to achieve.

UNIVERSAL JOINT - Universal joints should be examined when the pump is dismantled for any reason or for routine maintenance during periods of regular scheduled equipment down time. The joints should be cleaned and renewed with fresh grease before assembly.

Use only recommended grease as per specifications in this manual.

PUMPSET - When a pump unit is dismantled and reassembled, it has to be ensured that the following steps, as applicable, are covered

1. Correct alignment of pump and driver.
2. Use of appropriate couplings and bushes.
3. Use of appropriate belts and pulleys.

EXPLOSIVE PRODUCTS/ HAZARDOUS ATMOSPHERE - In certain instances, the product being pumped may be of a hazardous nature. In these installations, considerations must be given to provide suitable protection and appropriate warnings to safeguard personnel and plant.

SPECIAL INSTRUCTIONS

ROTATION

The pumps are capable of taking rotation in both the directions but if a change of direction is required, consult ROTO or its authorized agents before doing so.

LUBRICATION

UNIVERSAL JOINTS

Universal joints should be examined when the pump is dismantled for any reason or for routine maintenance during periods of regular scheduled equipment down time. Clean the joints and use of the following recommended or equivalent grease. Ensure that Universal Joint Boot Seal should be packed with 300 gms. of grease.

1. ELF Epexa 00
2. Balmerol Supertec PD-00
3. ESSO liquid grease S 420
4. Fuchs Renosed GFB
5. Total Multis EP200
6. OMEGA 58 alternatively Kuberoil 4UH1 460 (For Food Applications only)

Whenever Boot seal of EPDM materials are recommended or used, please ensure that only the following Silicone Grease compound is used for such applications.

1. OKS 1140 / 1144 or alternatively UNISILKON L50/2

NOTE: The above Greases also comply with food applications.



TROUBLE SHOOTING

APPLICABLE FOR POSITIVE DISPLACEMENT PUMPS		TYPE OF FAILURE	FAILURE TO DELIVER LIQUID	PUMP DOES NOT DELIVER RATED CAPACITY	PUMP DOES NOT DEVELOP RATED PRESSURE	PUMP LOOSES LIQUID AFTER STARTING	PUMP OVERLOADS PRIMER	VIBRATION	STUFFING BOX OVERHEATS	BEARING OVERHEATS	BEARINGS WEAR RAPIDLY	MOTOR HEATING UP	SEIZED PUMP	IRREGULAR DELIVERY	PUMP DOES NOT PRIME	NOISY PUMP
REASONS FOR FAILURE																
1	Wrong direction of rotation															
2	Air or vapour pocket in suction line															
3	Inlet or suction pipe insufficiently submerged															
4	N.P.S.H. available too low															
5	Pump not upto rated speed															
6	Total head greater than design															
7	Air leak in suction line or stuffing box															
8	Viscosity greater than rated															
9	Gas or vapour in liquid															
10	Liquid Seal lantern ring plugged															
11	Lantern Ring not properly located															
12	Speed too high															
13	Viscosity &/or specific gravity higher than rated															
14	Starved suction															
15	Misalignment															
16	Worn or loose bearings															
17	Bent shaft															
18	Improper location of discharge valve															
19	foundation not rigid															
20	packing too tight															
21	Packing not lubricated															
22	Wrong grade packings															
23	Insufficient cooling water															
24	Box badly packed															
25	Oil level too low/high															
26	Wrong grade of oil															
27	Dirt in bearings															
28	Moisture in oil															
29	Failure of oiling system															
30	Bearing too tight															
31	Oil Seals too close fit															
32	Excessive thrust															
33	Lack of lubrication															
34	Bearing badly installed															
35	Too much cooling															
36	Too much grease in the bearings															
37	Pipes exert forces on pump															
38	Relief valve spring badly adjusted															
39	Relief valve jammed															
40	If low viscosity too low discharge pressure															
41	viscosity lower than rated															



DISMANTLING & ASSEMBLY INSTRUCTIONS

FOR RLCB / RLGB – 591 PUMP

Before disassembling, isolate all electrical circuits. Close all isolation valves on the suction and discharge lines to the pumps for prevention of liquid escaping from the pipe work system. The persons carrying out the work should be adequately trained in general workshop practice, relevant to the class of work involved & taking care of safety measures. Described below is a step-by-step procedure for disassembly. Part numbers are mentioned in brackets and can be referred to in the attached cross-sectional drawings. Remove the Pump from the base plate. Remove the Gland Guards (7620).

DISMANTLING INSTRUCTIONS: -

1. Unscrew the Hex. Nuts (15) fitted to the Tie Rods (7710) and remove the Spring Washers (16), Punched Washers (36), End Cover (5310), Tie Rods (7710) and Foot (0760).
2. To remove the Bonded Stator (2220) from the Pump Housing (5010), hold the Stub Shaft (4400) stationary and rotate the Stator (2220) in clockwise direction looking from the drive end. If the Bonded Stator (2220) offers some resistance, pour some water or soap solution into the Bonded Stator (2220) through the opening in the Pump Housing (5010) to ease the stiffness. Move out the Bonded Stator (2220) from the Rotor (2500), away from the Pump Housing (5010).
NOTE: Soap solution should not be used in case the stator material is of Natural rubber.
3. Unscrew the Four Hex. Head Bolts and Nuts (09,10) holding the Pump Housing (5010) to Pump Lantern (1200) and remove the Spring Washers (11) and Punched Washers (37). Withdraw the Pump Housing (5010), taking care of any undue rubbing with the Rotor (2500) & Coupling Rod (2610). Rotor (2500) must be protected by covering with some soft material like cloth.
4. In order to dismantle the Rotor (2500) from the Coupling Rod (2610), Universal Joint (20) has to be dismantled (**Refer Exploded View of Universal Joint: RUJA 013 DRG. NO. EV-22-001-01**)
Remove BSR Retaining Ring (1922), Boot Seal Retainer (2810), drag out the Boot Seal (1510) & collect the grease. Remove the Spring Pin (01) from the Rotor (2500) & Coupling Rod (2610) head joint and then knock out the U.J.Pins (2920) from UJ Head (4010). Dismantle the Rotor (2500) from the Coupling Rod (2610) after taking out the Circlips (05) from Rotor (2500) and Coupling Rod (2610). Slip out the UJ Rings (4202) and remove the 'O' Rings (03).
5. Repeat Step 4 for other Universal joint (20) to dismantle from the Coupling Rod (2610) and the Stub Shaft (4400).
6. Collect the Stuffing Box Gasket (8120). Slip out the Stuffing Box (5810) & Gland assembly. Unscrew Hex. Nuts (08) to remove the Gland (5410) and Gland Packing (7500) from the Stuffing Box (5810). (**Refer Gland Packing Arrangement DRG NO: CS-32-021-00**)

Note: -

In case of Mechanical seal, proceed as under:

(**Refer Single Mechanical Seal Arrangement DRG NO: CS-32-023-00**)

- Unscrew Hex. Nuts (32) connecting Seal Plate (5452) and Mechanical Seal Housing (5861). Remove the Mechanical Seal Housing (5861) and collect 'O' rings (8190). Now remove setscrews from the drive collar of Mechanical seal (30) and take out Mechanical seal (30). Remove Seal Plate (5452) along with Stationary seat of Mechanical seal (30).

7. Slide out Pin Retainer (2850) and knockout Dowel pin (2930), connecting Stub Shaft (4400) to the Motor Shaft.
8. Pull out the Stub Shaft (4400) from the Motor Shaft.
9. Unscrew Hex. Head Bolts, Nuts, Spring Washers and Punched Washers (41, 42, 43, 44) to detach Motor (40) from the Pump Lantern (1200).

Note: -

1. Clean all the parts and check them for wear / damage. The worn out / damaged parts should be replaced with original **ROTO** Spares. It is always suggested to replace the old 'O' rings and gaskets of the pump with new ones.
2. In order to dismantle the parts, use suitable antirust compound on the metallic surfaces of component.

ASSEMBLY INSTRUCTIONS: -

1. Locate the Stub Shaft (4400) on to the Motor Shaft and push Pin Retainer (2850) over the Stub Shaft (4400) towards the Motor Shaft.
2. Align the Stub Shaft (4400) such that the hole in the Motor Shaft is in line with Stub Shaft locating holes. Insert Dowel Pin (2930) through Stub Shaft (4400) and Motor Shaft. Locate Pin Retainer (2850) over Dowel Pin (2930) and secure it tightly.
3. Assemble Geared Motor (40), locating it on Pump Lantern (1200) and securing with Hex. Bolts, Nuts and Washers (41, 42, 43, 44), while keeping the Geared Motor (40) supported from overhead.
4. Insert the Gland Packing (7500) in the Stuffing Box (5810) and locate the gland (5410) as shown. Secure the Gland (5410) and Stuffing box (5810) with the help of Hex. Nuts (08). Insert the Gland (5410) assembly over the Stub Shaft (4400) as shown. (**Refer Gland Packing Arrangement DRG NO: CS-32-021-00**)

In case of Mechanical seal, proceed as under:

(**Refer Single Mechanical Seal Arrangement DRG NO: CS-32-023-00**)

- Locate Stationary Seat with Seal Ring in the Seal Plate (5452) in position applying even pressure. In case of Teflon O-ring with Stationary Seat, fitment shall be made by applying pressure on to the Stationary Seat under a small press or a drill machine spindle, using a soft pack on the face of the seat, while driving the Stationary seat in the seal plate (5452).
- Fit the Seal Plate (5452) with Mechanical Seal Housing (5861) after putting the O' ring (8190) and



DISMANTLING & ASSEMBLY INSTRUCTIONS

FOR RLCB / RLGB – 591 PUMP

locate the assembly in place. Measure distance 'L1' from shaft end to the face of the stationary seat. Now take out the Mechanical Seal Housing assembly with Seal Plate (5452). If the operating length of the mechanical seal is 'L2', mark a distance 'L' on the Stub Shaft (4400) equal to 'L1-L2' from UJ end of the Stub Shaft (4400).

(Refer Dimensional Representation for the Fitment of Mechanical Seal)

- Take out Seal Plate (5452) from the Seal Housing (5861) by unscrewing the nuts (32).
 - Slide over the Seal Plate (5452) with stationary seat on to the Stub Shaft (4400) towards Pump Lantern (1200) side.
 - Insert Rotary Part of the Mechanical Seal (30) on to the Stub Shaft (4400), taking extreme care not to damage any part of the Seal (30).
 - Now tighten the drive collar of Mechanical Seal (30) in place, on the mark at distance 'L' over the Stub Shaft (4400), with set screws. In case the Shaft is hard chrome plated, tighten the set screws on the Stub Shaft (4400) after removing plating at places to be screwed, by a small hand grinder.
 - Now fit Mechanical Seal Housing (5861) between the Pump Housing (5010) and Pump Lantern (1200). Pull Seal Plate (5452) to the Seal Housing (5861) and tighten in place with Hex. Nuts (32) and Spring Washers (34).
5. To assemble Universal Joint (20), proceed as under:
(Refer Exploded View of Universal Joint: RUJA 013 DRG. NO. EV-22-001-01)
Clean the internal surface of UJ Head (4010) and place the BSR retaining Ring (1922) and Boot Seal Retainer (2810) over the Stub Shaft (4400). Offer the UJ Head (4010) to Stub Shaft (4400) and after alignment of UJ Head (4010) and Stub Shaft (4400) holes. Place the 'O' Rings (03) in their respective grooves in the Stub Shaft (4400) and Coupling Rod (2610). Place External Circlip (05) and Boot Seal Retainer (2810) over the Stub Shaft (4400) prior to the fitting of UJ Rings (4202). Insert the UJ Ring (4202) over the Stub Shaft (4400) and place the Circlip (05) in position.
 6. Offer the Coupling Rod (2610) to the UJ Head (4010) fitted on the Stub Shaft (4400). Taking care of alignment of UJ Head (4010) and Coupling Rod (2610) holes, insert the UJ Pin (2920) and lock it by Spring Pin (01).
 7. Repeat step 5 and 6 for connecting the Coupling Rod (2610) and Rotor (2500).
 8. Now drag the Boot Seal (1510) in its position taking care that the left end of it rests on the grooves in the Stub Shaft (4400). Pour grease inside the joint to fill complete volume of Universal Joint and then locate the right side of Boot Seal (1510) in the groove provided in the Coupling Rod (2610).
(For Qty. of grease to be filled, please Refer LUBRICATION: UNIVERSAL JOINTS in SPECIAL INSTRUCTIONS Column of this Manual)

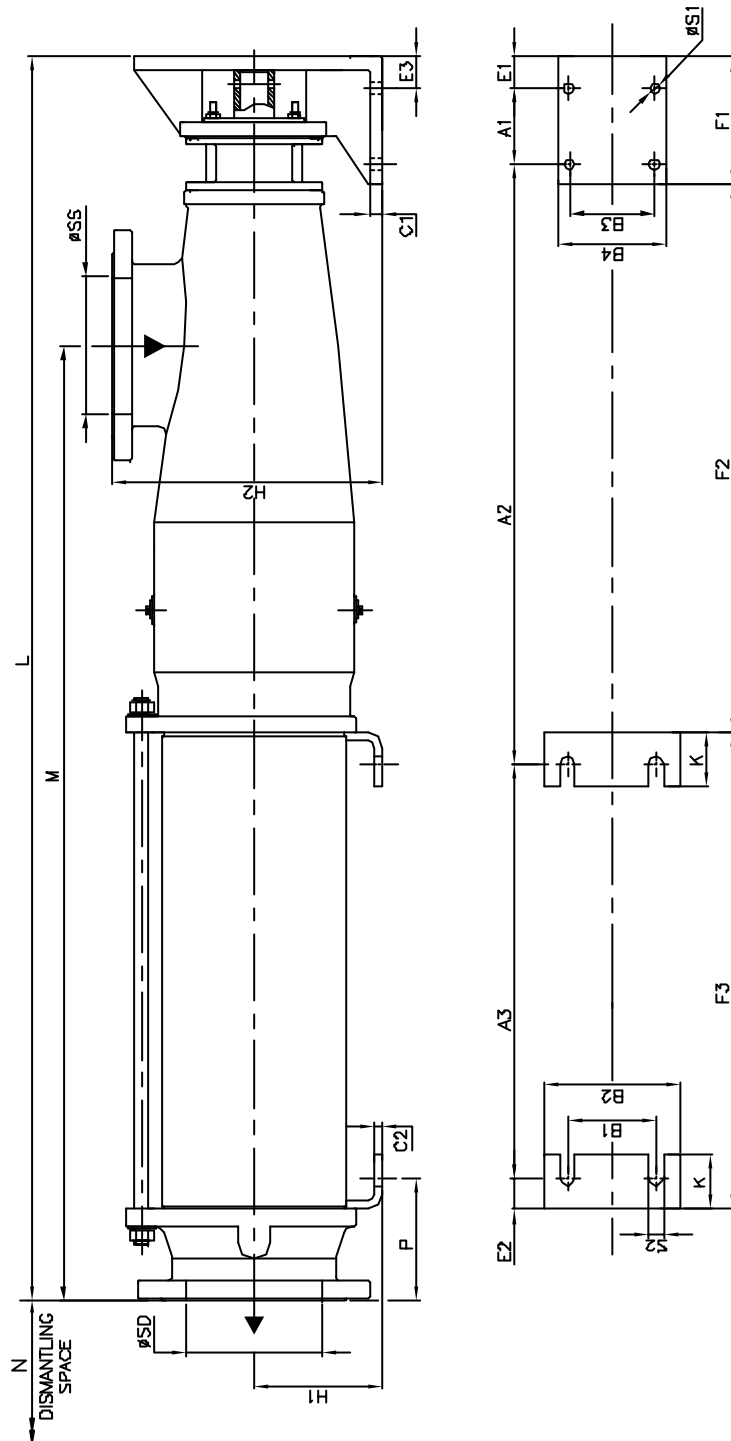
Now complete the UJ assembly (20) by putting the Boot Seal Retainers (2812) in position and secure them with the help of BSR Retaining Ring (1922) at both sides of the Universal Joint (20).

9. Repeat the same for other Universal Joint connecting Coupling Rod (2610) and Rotor (2500).
10. Place the Stuffing Box Gasket (8120) at its location, and drag the Pump Housing (5010) without touching the Rotor (2500) and Coupling Rod (2610). Secure the Pump Housing (5010) to the Pump Lantern (1200) with the help of Hex. bolts, Nuts, Spring washers and Punched washers (09,10,11,37), locating Stuffing Box (5810), in position, between Pump Lantern (1200) and Pump Housing (5010).
11. To assemble the Bonded Stator (2220), apply some water or soft / liquid soap solution into the Bonded Stator (2220) to provide lubrication.
Soap solution should not be used in case the stator material is of Natural rubber.
Hold the Stub Shaft (4400) stationary, rotate the stator (2220) in clockwise direction over the Rotor (2500) and at the same time pushing the Stator (2220) towards the Pump Housing (5010), till it butts with the Pump Housing (5010).
12. Place the Foot (0760) in the position, as shown and offer the End Cover (5310) to Bonded Stator (2220). Thread up Hex. Nuts, Spring washers and Punched washers (15, 16, 36), one each on the four Tie Rods (7710).
13. After total assembly of the pump, put it on a flat surface to check that Feet (0760) are laying co-planar. The suction flange of the Pump Housing (5010) should be perpendicular to the flat surface.
14. Place the Gland Guards (7620) in its position. Ensure that all the fasteners except Gland (5410) and Hex. Nuts (08) are tightened properly.



DIMENSIONAL DRAWING OF RLCB/RLGB SERIES PUMPS

DRG. NO.
DD-54-001-01



TYPE AND SIZE OF PUMP	BASIC DIMENSIONS																		FLANGE DIMENSIONS									
	A1	A2	A3	B1	B2	B3	B4	C1	C2	E1	E2	E3	F1	F2	F3	H1	H2	K	L	M	N	P	øS1	S2	øSS	RATING (BAR)	øSD	RATING (BAR)
RLCB\ RLGB-541	34	290	264	75	104	75	104	6		38	26	40	87	249	316	90	170	40	724	510	350	96	12	12	50		50	
RLCB\ RLGB-571	65	336	362	85	115	85	115	12		29	30	31	109	291	422	112	212		897	649	450	103			65		65	
RLCB\ RLGB-581	65	415	282	83	120	125	160	8		33	25	35	120	368	332	130	262	44	907	662	480	110	15	15	80		80	16
RLCB\ RLGB-591			522												572				1147	902	720							
RLCB\ RLGB-611	75	595	562	83	120	125	160	8		30	28	32	127	545	718	130	272	44	1477	1202	750	113	15	15	100		100	
RLCB\ RLGB-631			715												771				1530	1255	850				125		125	
RLCB\ RLGB-671	80	803	827	100	150	130	200	16	10	33	36	35	148	732	899	150	330	63	1880	1521	950	135	19	19	125		125	
RLCB\ RLGB-711	112	1038	1108	130	200	175	245	20	12	46	46	48	188	962	1200	190	400	80	2486	2059	1250	180	23	23	200		200	

NOTE: 1 : FLANGE DIMENSIONS ARE AS PER BS: 4504.

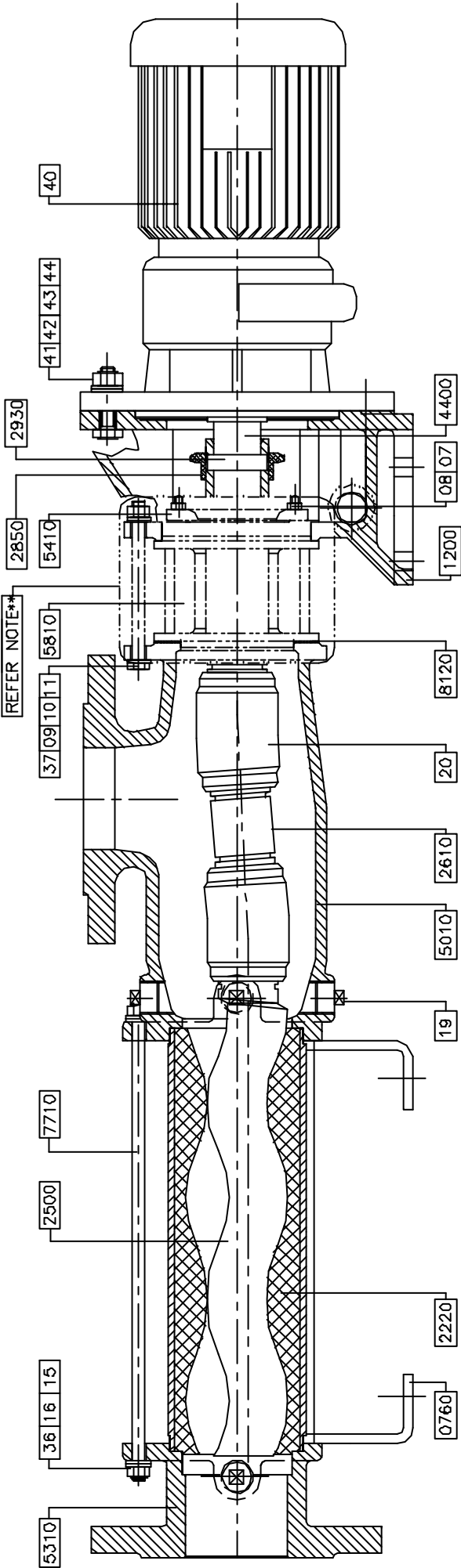
2 : REFER RN STANDARD RN-10-186 FOR MOTOR SELECTION FOR RLCB-541 & 571
AND RN-10-174 FOR OTHER PUMP MODELS AGAINST THEIR RESPECTIVE BEARING BRACKET SIZES.

D1	D-227-2006	RLCB/ RLGB 581/ 591 ADDED	SKS	03.02.07	DATE	05.08.06	CHECKED	APPS	APPROVED	SKS	SHEET NO.	01	NO. OF SHEETS	01
00	C-168-2006	NEW RELEASE	SKS	05.08.06	DATE	05.08.06	DRAWN	APPS	APPROVED	SKS	SHEET NO.	01	NO. OF SHEETS	01
ALT. NO.	ALT. NOTE NO.	ALTERATION	SIGN	DATE	05.08.06	DATE	DRAWN	APPS	APPROVED	SKS	SHEET NO.	01	NO. OF SHEETS	01



CROSS SECTIONAL DRAWING OF RLCB- 541/571/591 PUMP

DRG. NO.
CS-45-001-02



NOTES:

- 1: (*) - NOT SHOWN IN DRAWING
2: (**) : REFER FOLLOWING DRAWINGS FOR DIFFERENT SEALING ARRANGEMENTS
- | | |
|--|-----------|
| GLAND PACKING ARRANGEMENT | CS-32-021 |
| GLAND PACKING AND LANTERN RING ARRANGEMENT | CS-32-022 |
| SINGLE MECHANICAL SEAL ARRANGEMENT | CS-32-023 |
| DOUBLE MECHANICAL SEAL ARRANGEMENT | CS-32-024 |

8120	STUFFING BOX GASKET	01	44	PUNCHED WASHER (FOR PART NO. 41)	04
*7950	NAME PLATE (ROTATIONAL)	01	43	SPRING WASHER (FOR PART NO. 41)	04
*7910	NAME PLATE	01	42	HEX. NUT (FOR PART NO. 41)	04
7710	TIE ROD	04	41	STUD/ HEX. HD. BOLT (FOR PART NO. 1200 & 40)	04
*7620	GLAND GUARD	02	40	GEARED MOTOR	01
**5810	STUFFING BOX	01	37	PUNCHED WASHER (FOR PART NO. 10)	04
**5410	GLAND	01	36	PUNCHED WASHER (FOR PART NO. 15)	12
5310	STRAIGHT THROUGH END COVER	01	*25	DRIVE SCREW (FOR PART NO. 7910 & 7950)	06
5010	PUMP HOUSING	01	20	UNIVERSAL JOINT	02
4400	STUB SHAFT	01	19	TAPER PLUG	03
2930	DOWEL PIN	01	16	SPRING WASHER (FOR PART NO. 15)	12
2850	PIN RETAINER	01	15	HEX. NUT (FOR PART NO. 7710, 5310, 5010 & 0760)	12
2610	COUPLING ROD	01	11	SPRING WASHER (FOR PART NO. 10)	04
2500	ROTOR	01	10	HEX NUT (FOR PART NO. 09)	04
2220	BONDED STATOR	01	09	HEX. HEAD BOLT (FOR PART NO. 5010 & 1200)	04
1200	PUMP LANTERN	01	**08	HEX NUT (FOR PART NO. 07)	02
0760	FOOT	02	**07	STUD (FOR PART NO. 5410 & 5810)	02
SEQ. NO.	DESCRIPTION	NO. OFF.	SEQ. NO.	DESCRIPTION	NO. OFF.

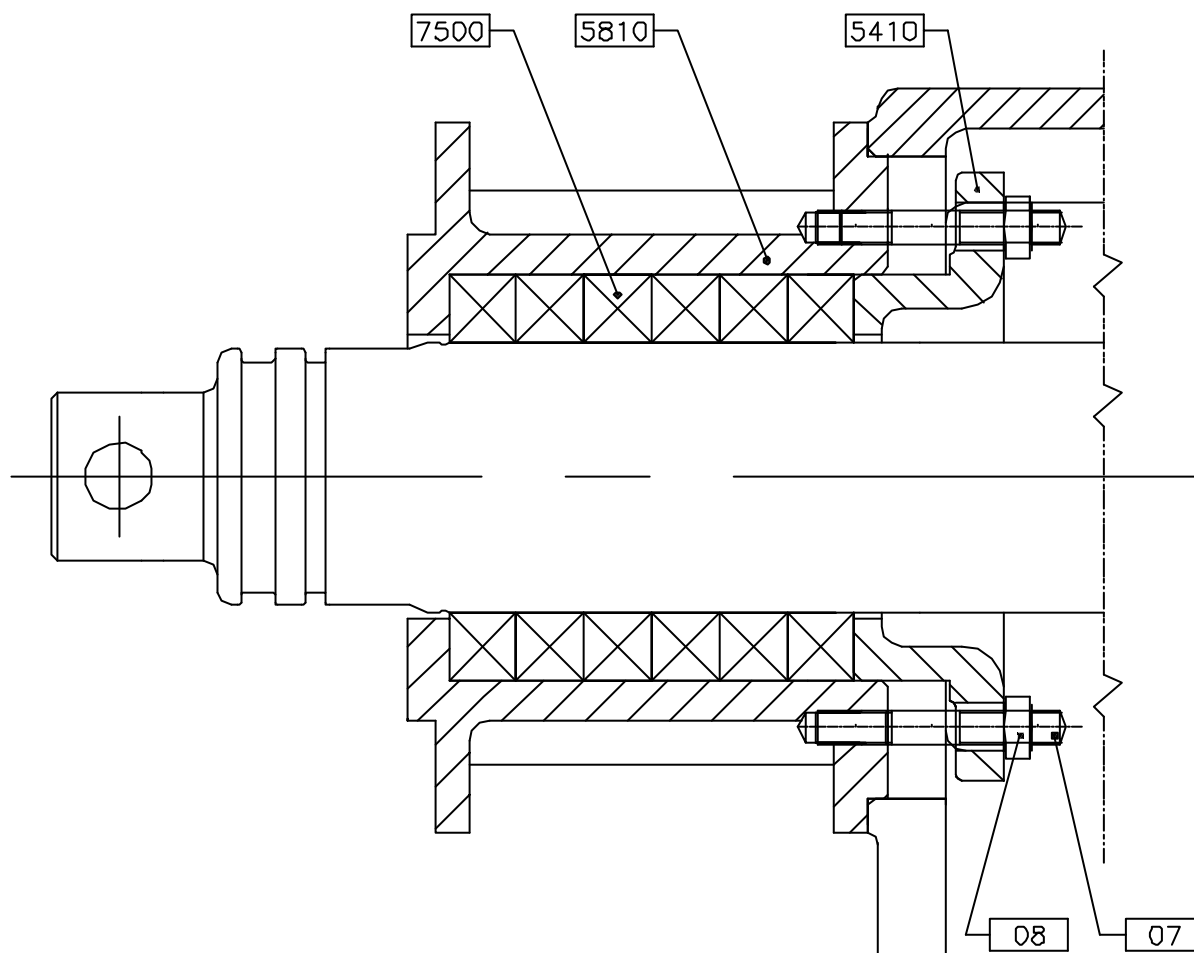
02 D-095-2007 DRG. REDRAWN AND POINT NO.2 ADDED IN NOTES.

ALT. NO.		ALT. NOTE NO.		ALTERATION		SIGN		DATE	
ALT. NO.	DATE	DRAWN	CHECKED	APPROVED	SHEET NO.	NO. OF SHEETS			
4/08/06	4/08/06	APS	APS	SKS	1	1			



GLAND PACKING ARRANGEMENT FOR M,D, & L SERIES PUMPS

DRG. NO.
CS-32-021-00

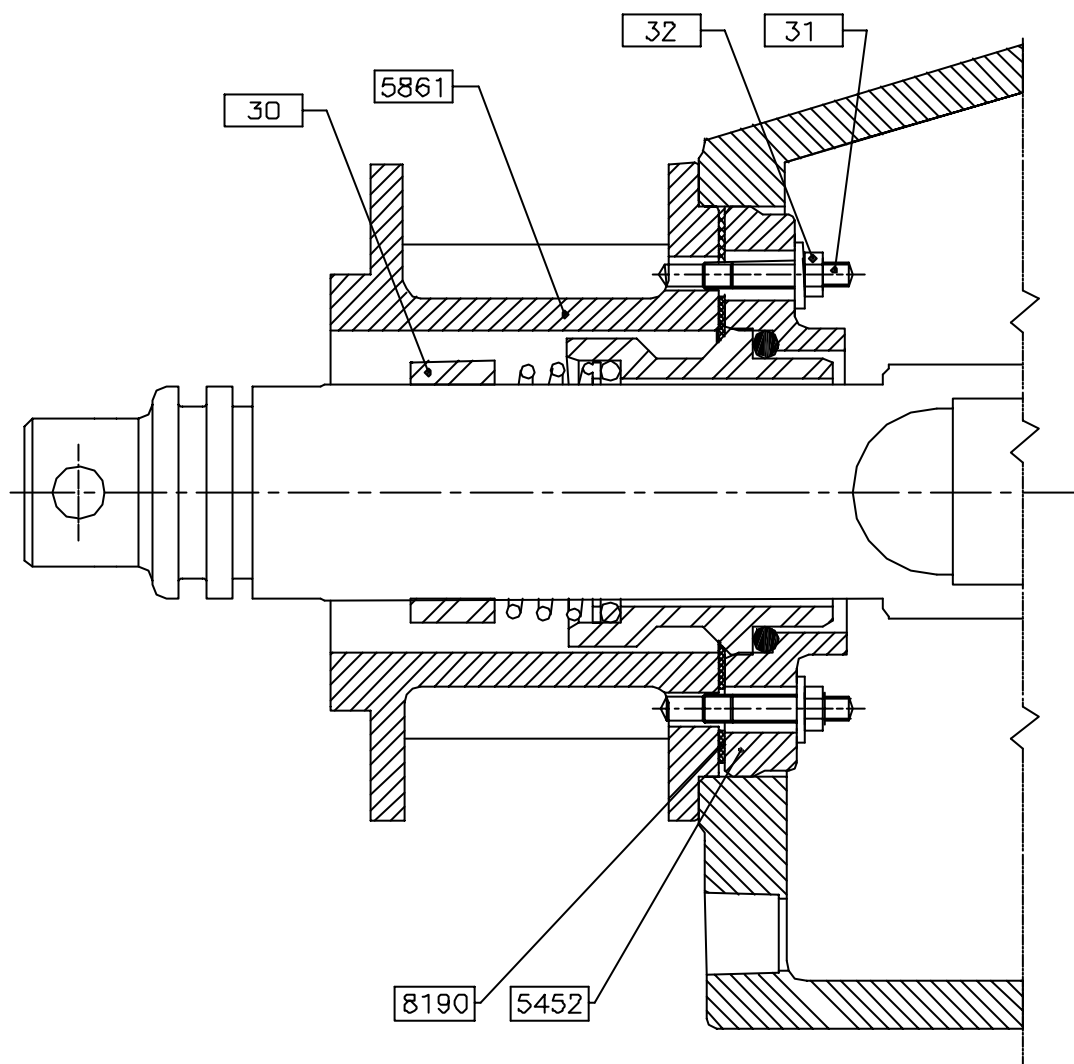


5410	GLAND	01
5810	STUFFING BOX	01
7500	GLAND PACKING	06
07	STUD (FOR PART NO. 5410 & 5810)	02
08	HEX. NUT (FOR PART NO. 07)	02
PART NO.	NOMENCLATURE	NO. OFF



SINGLE MECHANICAL SEAL ARRANGEMENT FOR M, D & L SERIES PUMPS

DRG. NO.
CS-32-023-00



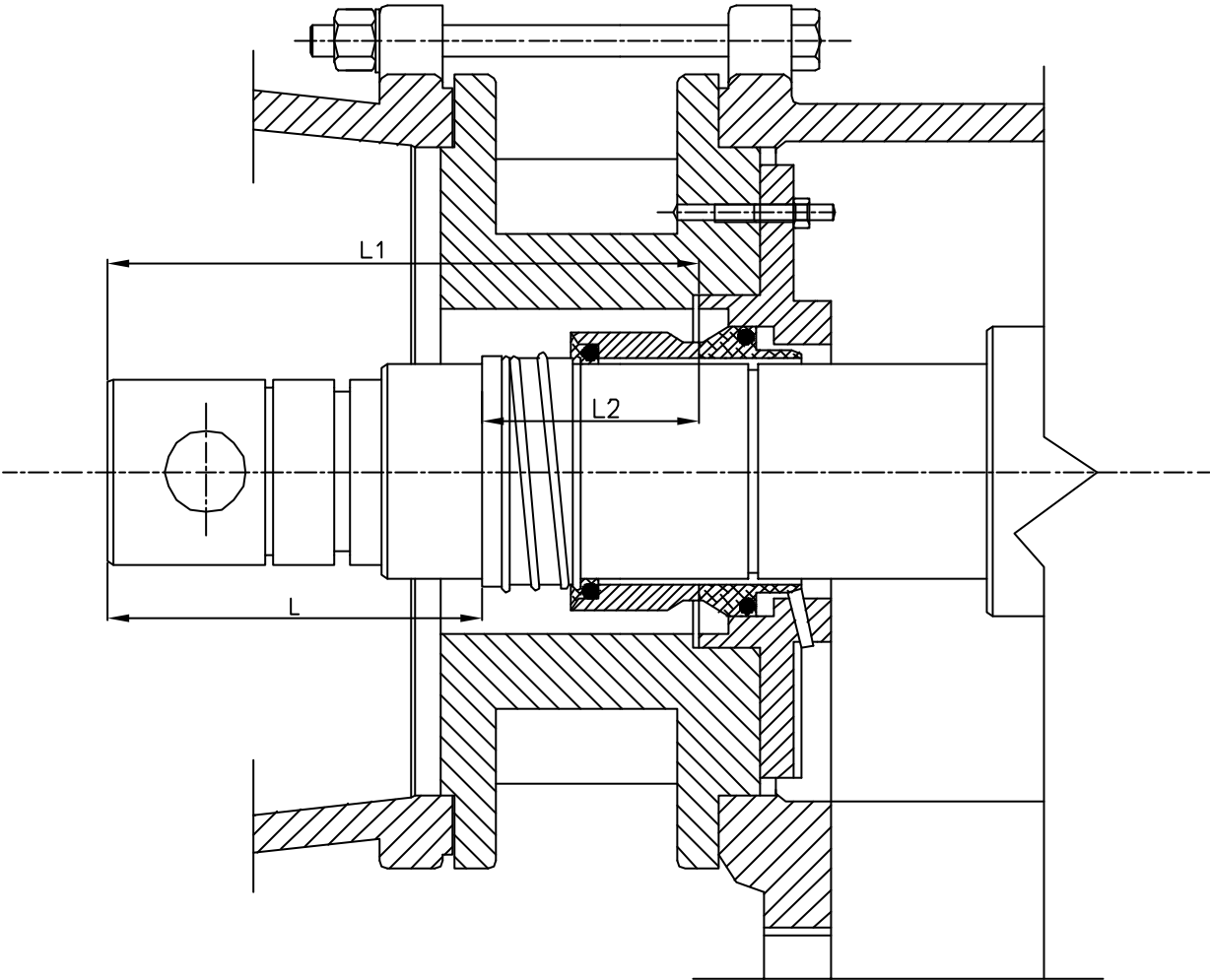
NOTE:—

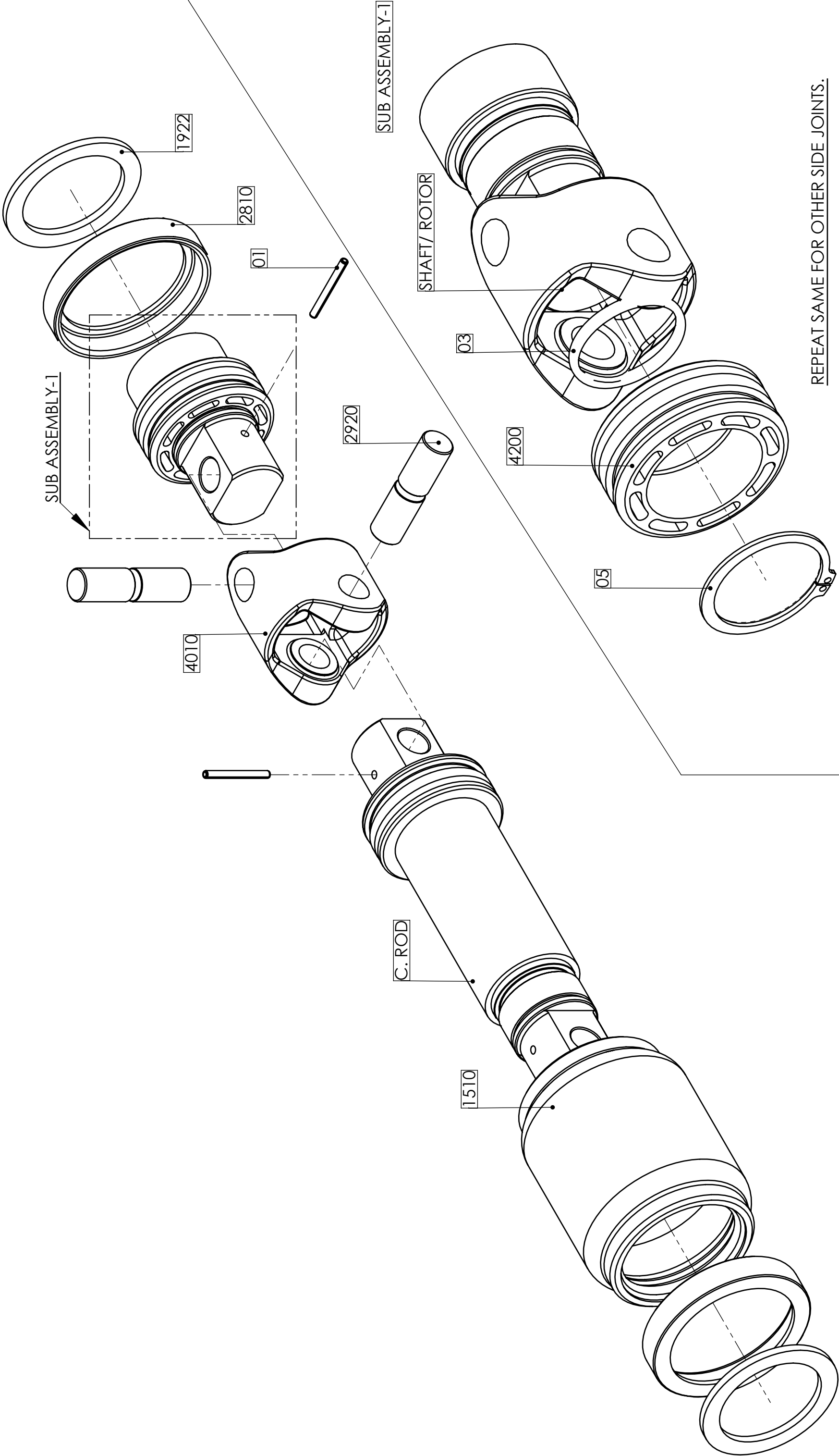
1. FOR ITEM NOS. 31 & 32, REPLACE ITEM NOS. 07 & 08 AS SHOWN IN CS DRAWINGS.
2. APPLICABLE API PLANS- 02, 11, 13, 61, 62, 31 & 32

5452	SEAL PLATE	01
5861	MECH. SEAL HOUSING	01
8190	SEAL PLATE GASKET/ O'RING	01
30	MECHANICAL SEAL	01
31	STUD (FOR PART NO. 5452 & 5861)	02
32	HEX. NUT (FOR PART NO. 31)	02
PART NO.	NOMENCLATURE	NO. OFF



DIMENSIONAL REPRESENTATION FOR THE FITMENT OF MECHANICAL SEAL FOR M, D AND L SERIES PUMPS





1922	B. S. R. RETAINING RING	02			
1510	BOOT SEAL	01	4200	UJ RING	02
05	CIRCLIP	02	4010	UJ HEAD	01
03	O' RING	02	2920	UJ PIN	02
01	SPRING PIN	02	2810	BOOT SEAL RETAINER	02
PART NO.	NOMENCLATURE	QTY.	PART NO.	NOMENCLATURE	QTY.

01	D-065-2008	ITEM NO. 4010 MENTIONED IN EXPLODED VIEW			
00	H-0119-2007	NEW RELEASE	APS	28.11.07	
ALT NO.	ALT NOTE NO.	ALTERATION	SIGN	DATE	
DATE	DRAWN	CHECKED	APPROVED	SHEET NO.	NO. OF SHEET
28.11.07	AMITRUP	APS	APS	1	1