

Dry Pumping Systems iXH, iXL and pXH INSTRUCTION MANUAL



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M56100880_N Original instructions

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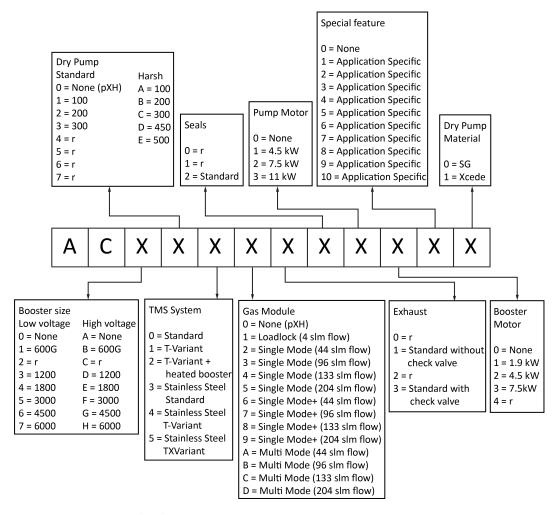
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Numbering matrix

iXH and pXH Dry Pumping Systems

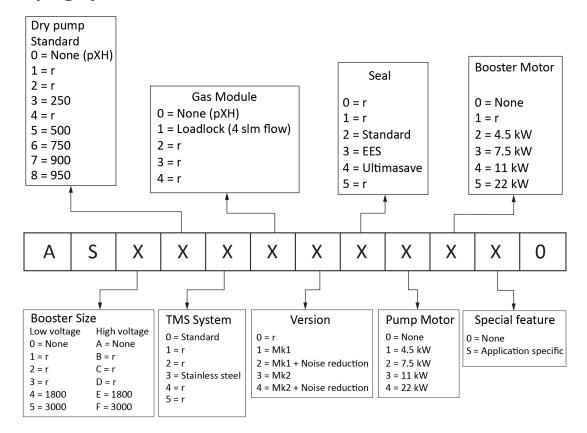


Where r = reserved for future use

■ Note:

This matrix allows product part numbers to be deciphered. Not every part number permutation is available as a product.

iXL Dry Pumping Systems



Where r = reserved for future use

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This matrix allows product part numbers to be deciphered. Not every part number permutation is available as a product.

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1. Safety and compliance

For safe operation from the start, read these instructions carefully before you install or commission the equipment and keep them safe for future use. Read all the safety instructions in this section and the rest of this manual carefully and make sure that you obey these instructions.

The instruction manual is an important safety document that we often deliver digitally. It is your responsibility to keep the instruction manual available and visible while working with the equipment. Please download the digital version of the instruction manual for use on your device or print it if a device will not be available.

1.1 Definition of Warnings and Cautions

Important safety information is highlighted as warning and caution instructions which are defined as follows. Different symbols are used according to the type of hazard.

WARNING:

If you do not obey a warning, there is a risk of injury or death.

CAUTION:

If you do not obey a caution, there is a risk of minor injury, damage to equipment, related equipment or process.

NOTICE:

Information about properties or instructions for an action which, if ignored, will cause damage to the equipment.

We reserve the right to change the design and the stated data. The illustrations are not binding.

1.2 Trained personnel

For the operation of this equipment "trained personnel" are:

- skilled workers with knowledge in the fields of mechanics, electrical engineering, pollution abatement and vacuum technology and
- personnel specially trained for the operation of vacuum pumps

1.3 Safety symbols

The safety symbols on the products show the areas where care and attention is necessary.

The safety symbols that we use on the product or in the product documentation have the following meanings:

<u> </u>	Warning/Caution An appropriate safety instruction must be followed or caution to a potential hazard exists.
	Warning - Heavy object Identifies a possible hazard from a heavy object.
	Warning - Dangerous voltage Identifies possible hazards from hazardous voltages.
	Warning - Hot surfaces Identifies a potential hazard from a hot surface.
	Warning - Protective earth (ground) Earth point for electrical equipment.
	Warning - Use protective equipment Use appropriate protective equipment for the task.
	Warning - Maximum angle of paired slings The maximum angle of the paired slings must not be more than 45°.
	Warning - Moving parts present Identifies parts that move. You must let the parts that turn stop before you remove the electrical power.
	Warning - Pressurised The equipment contains pressurised gases/liquids.
	Warning - Risk of explosion There is a risk of explosion when you do the task.
<u>_</u>	Warning - RF earth Earth point for radio equipment or antenna.

2. General description

2.1 Scope

This manual gives installation, operation and maintenance instructions for the iXH, iXL and pXH dry pumping systems. The pump must be used as specified in this manual. Read this manual before you install and operate the pump.

The units used in this manual agrees to the SI international system of units of measurement.

2.2 Overview

The iXH dry pump range is developed to meet the demanding requirements for process pumping solutions in the Semiconductor, Flat Panel and Solar industries. The range sets new standards for harsh process capability, reliability and decreases cost of ownership in low footprint packages.

The iXL pump range has been developed to meet cyclic loadlock duty applications used in the flat panel and solar industries.

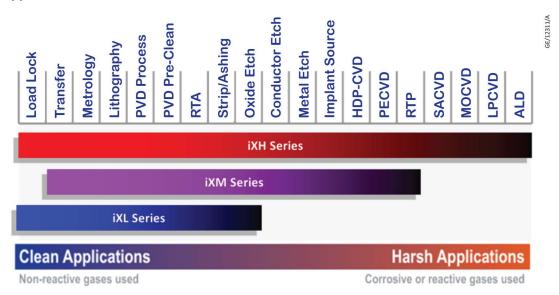
The pXH booster systems are not intended for use as stand-alone units. Each system must be backed using a applicable dry pump selected to match process and performance specifications.

2.3 Applications

2.3.1 Intended use

iXH, iXL and pXH systems are intended for use on the Semiconductor, Solar and FPD processes as shown in *Figure: Applications*.

Figure 1 Applications



The iXL dry pumping systems are intended for use on clean duty applications.

2.3.2 Non-intended use

The pump warranty will be invalid if the system is used on any other application. Contact your supplier if you are in doubt, for advice on the suitability of the system for any particular application.

2.4 Priority of control

You can control the system by one of the modules:

- the front control panel (refer to Figure: The front panel controls)
- a Pump Display Terminal (PDT)
- the system controller
- by the tool through the MicroTIM
- one of the serial interfaces.

Only one of these module can have control of the system at one time. When one of the module has control of the system, control requests from the others are denied.

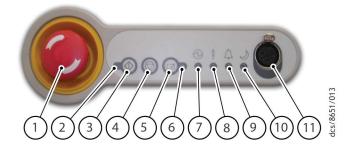
The pXH proximity booster can control or be controlled by the backing pump. Contact us for more information on how to control a pXH using an iXH or our other pumping system.

The PDT shows who is in control. LEDs are also given on the rear panel, front panel or PDT, which illuminate to indicate 'in control'.

2.5 Active utility control

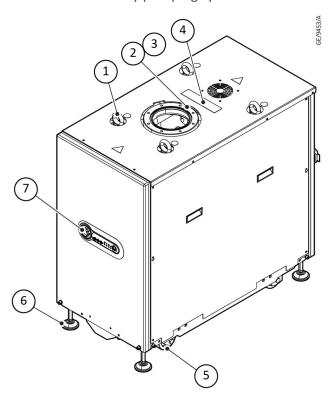
The Green Mode function decreases utility consumption of the system while on standby. The Green Mode functionality is controlled by the on/off process signal from the Tool Interface Module. Contact us for advice on application and activation.

Figure 2 The front panel controls



- 1. EMS button
- 3. Start button
- 5. Local control button
- 7. Power LED (green)
- 9. Alarm LED (red)
- 11. Pump Display Terminal (PDT) connection
- 2. Running LED (green)
- 4. Stop button
- 6. Local control LED (green)
- 8. Warning LED (amber)
- 10. Green Mode LED (green)

Figure 3 Front view of the dry pumping system



- 1. Lifting eyebolts (4 off)
- 3. RF Earth (ground) cable
- 5. Castors (4 off)
- 7. Front panel control

- 2. Pumped gas inlet connection
- 4. Extraction port
- 6. Levelling feet (4 off)

■ Note:

iXH 100, iXH 200H and iXH 610 variants have only two eyebolts provided for lifting.

Figure 4 The controls/connectors on the rear of the dry pumping system

- 1. Cooling water supply connection
- 3. Cooling water return connection
- 5. Exhaust gas outlet connection
- 7. Micro TIM connections (if installed)
- 9. Electrical supply connection
- 11. Ethernet connection
- 13. USB connection (if present)
- 15. Accessory interface
- 17. Warning LED (yellow)
- 19. Ethernet link LED (yellow)

- 2. Protective earth (ground) stud
- 4. RF earth (ground) stud
- 6. EMS interface
- 8. Nitrogen purge connection
- 10. Electrical connector locking mechanism
- 12. System interface
- 14. Micro TIM in control LED (green)
- 16. Running and Alarm LEDs (2 colours, either green or red)
- 18. Power LED (green)
- 20. Ethernet LAN LED (green)

3. Technical data

3.1 General technical data

Table 1 General technical data

Item	Description	Rating	Units
	Intended use	Indoor	
	Ambient temperature range: Operating Storage	5 to 40 -45 to 55	°C
Operating conditions	Maximum relative humidity:	80% for temperatures up to 31 °C decreasing linearly to 50% relative humidity at 40 °C	
	Maximum operating altitude	3000	m
	Pollution degree	2 (IEC 61010)	
	Pump, shaft and rotors	Cast Iron, Steel	
Materials in contact with process	Seals	PTFE and fluoroelastomer	
gas	Gas system	Stainless steel, aluminium, brass, PTFE and fluoroelastomer	
Materials in contact with process gas	Pump, shaft and rotors	Cast iron, stainless steel, coated cast iron (Xcede variant only)	

Table 2 Pump technical data

	Characteristics										
Pump**	Body dimensions Length x Width x Height (excludes exhaust enclosure)*	Mass (not in- cluding pack- aging)	Noise level (at ultimate)	Typical vibra- tion level at in- let	Initial force to push the pump†	Sustained force to push the pump†	Pump inlet flange (bol- ted)	Exhaust gas outlet	Extraction port diameter		
Units	mm	kg	dB(A)	mm/s	kg force	kg force			mm		
iXH100	784 x 390 x 526	260	< 70	< 1.5	< 20	< 4	ISO63	NW40	105		
iXH200H	901 x 390 x 526	287	< 70	< 1.5	< 20	< 4	ISO63	NW40	105		
iXH450H	1000 x 517 x 650	455	< 70	< 1.5	< 20	< 10	ISO63	NW40	105		
iXH500H	1000 x 517 x 650	490	< 70	< 1.5	< 20	< 10	ISO63	NW40	105		
iXH610	784 x 390 x 780	355	< 70	< 1.5	< 20	< 4	ISO100	NW40	105		
iXH1210/H/T	784 x 390 x 780	413 - 430	< 70	< 1.5	< 20	< 4	ISO100	NW40	105		
iXH1220H/T	901 x 390 x 780	455 - 460	< 70	< 1.5	< 20	< 4	ISO100	NW40	105		
iXH1820/H/T	901 x 390 x 780	471 - 487	< 70	< 1.5	< 20	< 4	ISO160	NW40	105		
iXH3030/T	915 x 517 x 966	619 - 624	< 70	< 1.5	< 20	< 10	ISO160	NW40	105		
iXH3045H	1000 x 517 x 966	776	70	< 1.5	< 20	< 10	ISO160	NW40	105		
iXH3050H	1000 x 517 x 966	811	70	< 1.5	< 20	< 10	ISO160	NW40	105		
iXH4545HT	1000 x 517 x 966	814	70	< 1.5	< 20	< 10	ISO200	NW40	105		
iXH4550HT	1000 x 517 x 966	849	70	< 1.5	< 20	< 10	ISO200	NW40	105		
iXH6045H/T	1080 x 517 x 966	860 - 865	74	< 1.5	< 20	< 10	ISO250	NW40	105		
iXH6050H/T	1080 x 517 x 966	899	70	< 1.5	< 20	< 10	ISO250	NW40	105		
pXH4500	1086 x 517 x 531	400	< 70	< 1.5	< 20	< 10	ISO200	ISO160	-		
pXH6000	1086 x 517 x 531	435	< 70	< 1.5	< 20	< 10	ISO250	ISO160	-		
iXL250Q	1092 x 390 x 830	515	< 64	< 1.5	< 20	< 10	ISO160	NW40	105		

	Characteristics										
Pump**	Body dimensions Length x Width x Height (excludes exhaust enclosure)*	Mass (not in- cluding pack- aging)	Noise level (at ultimate)	Typical vibra- tion level at in- let	Initial force to push the pump†	Sustained force to push the pump†	Pump inlet flange (bol- ted)	Exhaust gas outlet	Extraction port diameter		
Units	mm	kg	dB(A)	mm/s	kg force	kg force			mm		
iXL500Q	1186 x 517 x 966	817 - 821	< 70	< 1.5	< 20	< 10	ISO160	NW50	105		
iXL500R	1186 x 517 x 966	874	< 70	< 1.5	< 20	< 10	ISO160	NW50	105		
iXL750Q	1622 x 517 x 1031	918	< 70	< 1.5	22	< 10	ISO160	NW50	n/a		
iXL900R	1622 x 517 x 1031	1076	< 70	< 1.5	24.5	< 10	ISO160	ISO63	n/a		
iXL950R	1622 x 517 x 1031	1076 - 1084	< 70	< 1.5	24.5	< 10	ISO160	ISO63	n/a		
iXL900R Ulti- masave	1622 x 517 x 1429	1104	< 70	< 1.5	24.5	< 10	ISO160	ISO63	n/a		

^{*} Contact us for installation drawings.

^{**} Unless otherwise specified, T includes TX variants. This note applies throughout this manual.

[†] Measured in laboratory on level concrete surface.

3.2 Performance data

Table 3 Performance data

		Characteristics			
Pump	Typical peak pumping speed	Ultimate pressure (shaft seal purge only)	Maximum continuous in- let pressure		
Units	m ³ /h	mbar	mbar		
iXH100	100	< 3 x 10 ⁻²	1000		
iXH200H	215	< 3 x 10 ⁻²	1000		
iXH450H	500	< 3 x 10 ⁻²	1000*		
іХН500Н	500	< 3 x 10 ⁻²	1000*		
iXH610	665	< 5 x 10 ⁻³	1000		
iXH1210/H/T	1025 - 1065	< 5 x 10 ⁻³	1000		
iXH1210HTX	930	< 5 x 10 ⁻³	1000		
iXH1220H/T	1200 - 1250	< 5 x 10 ⁻³	1000		
iXH1820/H/T	1700 - 1900	< 5 x 10 ⁻³	1000		
iXH3030/T	2750 - 2900	< 5 x 10 ⁻³	1000*		
iXH3045H	3225	< 5 x 10 ⁻³	1000*		
iXH3050H	3200	< 5 x 10 ⁻³	1000*		
iXH4545HT	4450	< 5 x 10 ⁻³	1000*		
iXH4550HT	4220	< 5 x 10 ⁻³	1000*		
iXH6045H/T	5000 - 5200	< 5 x 10 ⁻³	1000*		
iXH6050H/T	5000 - 5200	< 5 x 10 ⁻³	1000*		
pXH4500	N/A	< 5 x 10 ⁻³ †	1000*		
pXH6000	N/A	< 5 x 10 ⁻³ †	1000*		
iXL250Q	1900	< 1 x 10 ⁻³	1000*		
iXL500Q	2150	< 5 x 10 ⁻³	1000*		
iXL500R	3100	< 5 x 10 ⁻³	1000*		
iXL750Q	2300	< 1 x 10 ⁻³	1000*		
iXL900R	3400	< 5 x 10 ⁻³	1000*		
iXL950R	3400	< 5 x 10 ⁻³	1000*		
·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	·		

^{*} Speed can be limited.

[†] Ultimate achieved when pXH used in conjunction with an appropriate backing pump. Contact us to discuss application. The pXH does not have a shaft seal purge.

3.3 Loading data

Figure 5 Centre of gravity and levelling foot loads

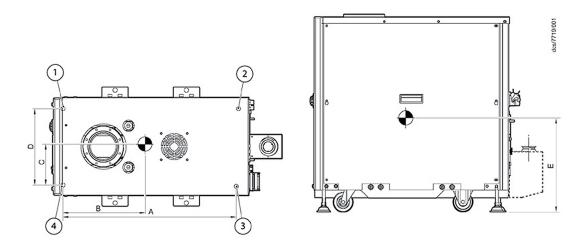


Table 4 Loading data (refer to Figure: Centre of gravity and levelling foot loads)

D	C	Load at levelling foot position							
Pump	Α	В	С	D	E	1	2	3	4
Units	mm	mm	mm	mm	mm	kg	kg	kg	kg
iXH100	697	295	165.5	311	280	80	59	51	70
iXH200H	814	403	165.5	311	261	77	76	66	68
iXH450H	924	443	220	427	323	122	112	106	115
iXH500H	924	422	220	427	324	137	115	109	129
iXH610	697	329	165.5	311	374	100	89	78	88
iXH1210/H/T	697	330	165.5	311	430	122	106	94	108
iXH1220H/T	814	457	165.5	311	430	107	136	120	94
iXH1820/H/T	814	400	165.5	311	433	134	127	112	118
iXH3030/T	829	395	230	436	545	183	147	131	164
iXH3045H	924	422	220.5	427	534	218	183	171	203
iXH3050H	924	409	220	427	524	233	185	174	219
iXH4545HT	924	422	220.5	427	539	228	192	180	214
iXH4550HT	924	411	220.5	427	529	243	195	183	228
iXH6045H/T	1004	398	220.5	427	549	269	177	166	252
iXH6050H/T	1004	388	220.5	427	539	285	179	168	267
pXH4500	990	460.5	225	438	325	110	96	90	104
pXH6000	990	422	224.5	438	326	128	95	90	122
iXL250Q	1038	421	130.5	261	463	154	103	103	154
iXL500Q	1110	483	220	427	470	239	184	173	225
iXL500R	1110	497	219	427	468	241	195	185	229

Pump	D	imension	to centre	of gravit	Load at levelling foot position				
Pullip	Α	В	С	D	E	1	2	3	4
Units	mm	mm	mm	mm	mm	kg	kg	kg	kg
iXL750Q	1547	730.9	169	338	512.2	215	244	244	215
iXL900R	1547	711.8	170.9	338	552.6	294	250	245	287
iXL950R	1547	711.6	171.2	338	548.6	296	253	246	289
iXL900R Ultima- save	1547	711.8	170.9	338	568.2	301	257	251	295

3.4 Nitrogen purge data

Table 5 Nitrogen purge data for iXH and iXL systems

Characteristics	Rating	Units
Nitrogen supply pressure	2.5 - 6.9	bar gauge
range	36 - 100	psi gauge
Nitrogen supply quality	Refer Note 1	
Nitrogen inlet connection	1/4 inch tube fitting	

Note: It is the customer's responsibility to make sure the pump purge gas is correct for the process gases and by-products being pumped. Where nitrogen is used as a purge gas, it should be normal industrial grade liquid nitrogen, or an equivalent standard, with an oxygen and water content no more than 4 ppm.

Table 6 Gas module types and flows

For iXH systems:

Gas module type	Description	Module sizes available	Total flow, harsh setting	Total flow, medium set- ting	Total flow with in- let purge	Total flow with exhaust purge	Total flow with in- let and exhaust purge	Units
Loadlock	Shaft seal only	4	4	-	-	-	-	-
Single mode	Gas ballast purge with	44	44	28	-	-	-	slm
	harsh/medium manual-	96	96	56	-	-	-	slm
	ly selected	133	133	78	-	-	-	slm
		204	204	133	-	-	-	slm
Single mode	Gas ballast purge with	44	44	28	60	-	-	slm
+	harsh/medium manual- ly selected + inlet purge	96	96	56	122	-	-	slm
	ly selected + lillet purge	133	133	78	173	-	-	slm
		204	204	133	264	-	-	slm
Multi mode	Gas ballast purge with	44	44	22	60	94	110	slm
	electronically selected harsh/medium + inlet purge + exhaust purge	96	96	34	122	146	172	slm
		133	133	65	173	183	223	slm
		204	204	*	264	254	314	slm

^{*} Contact us.

■ Note:

H variant pumps have Single Mode+ modules include the innovative Gas BusterTM inlet purge for improved powder handling.

For iXL systems: iXL systems are designed for use on clean applications only.

3.5 Electrical data

Table 7 General electrical data

Description	Rating	Units
Supply voltage 3-phase	either 200 - 230 or 380 - 460 (see rating plate)	V a.c.
Frequency	50/60	Hz
Wiring configuration	3 wire plus earth (ground)	
Voltage tolerance range	+/- 10%	
Installation category	II (IEC 60664)	
Input supply voltage unbalance	Should not exceed 2% when assessed over any 1 minute period	
Short circuit current rating (when installed with class T or class J fuses)	200	kA
Second protective earth (ground)	Must be installed with cross-sectional area equal to	
conductor	phase conductor size, up to 16 mm ²	
Maximum permitted overcurrent p	rotection for systems with the $Han^{^{@}}$ K 4/4 mains connec	tor*
• for 200 - 230 V systems	60	А
• for 380 - 460 V systems	35	Α
Typical earth leakage†		
For 200 - 230 V systems		
• iXL750Q	9	mA
 for all other systems 	< 5	mA
For 380 - 460 V systems		
• for iXL750Q	18	mA
• for iXL900R	< 50	
• for iXL950R	< 50	mA
 for all other systems 	< 10	mA

^{*} If overcurrent protection is used above the ratings in Table: Electrical data iXH100 to iXH610, Table: Electrical data iXH1210 to iXH3050H/HTX, Table: Electrical data iXH4545HT to pXH6000, Table: Electrical data for iXL pumps for systems with the Han®K 4/4, the minimum cable sizes no longer apply. Make sure that the pump cable size is appropriately rated and in accordance with local legislation and electrical regulations. Make sure that cable size is compatible with the mains connector, refer to Table: Electrical connections.

Note that higher leakage currents can occur:

Contact us for more information about configuration requirements for earth leakage reduction.

[†]Typical earth leakage values were measured at steady-state conditions.

i) in transient conditions such as power on or pump acceleration or

ii) with abnormal supply configurations such as a missing or earthed phase or unbalanced supply voltages.

Table 8 Electrical data iXH100 to iXH610

Characteristics	iXH100	iXH200H	іхн450н	іхн500н	iXH610	Units
Dry pump motor rating	4.5	7.5	11	11	4.5	kW
Mechanical booster motor rating	-	-	-	-	1.9	kW
Current rating						
 200 - 230 V systems 	21	38	44	44	28	А
• 380 - 460 V systems	11	20	23	23	14	А
Recommended branch circuit protect	ion	•		•		
 UL (200 - 230 V systems) 	25	45	55	55	35	А
• IEC (200 - 230 V systems)	25	40	45	45	30	Α
 UL (380 - 460 V systems) 	15	25	30	30	20	А
• IEC (380 - 460 V systems)	15	20	25	25	15	Α
Minimum cable size						
 200 - 230 V systems (or corresponding AWG size) 	6 (8)*	10 (6)	10 (6)	10 (6)	6 (8)*	mm ² (AWG)
 380 - 460 V systems (or corresponding AWG size) 	6 (8)*	6 (8)*	6 (8)*	6 (8)*	6 (8)*	mm ² (AWG)
Mains connector	Han [®] K 4/4	-				

^{*} The minimum geometric wire gauge for Han® K 4/4 is 6 mm 2 and minimum AWG size is 8 AWG

Table 9 Electrical data iXH1210 to iXH3050H/HTX

Characteristics	iXH1210	iXH1210 H/HT/HTX	iXH1220H/HT/HTX	iXH1820/H/T/HTX	iXH3030/T/TX	iXH3045H	iXH3050 H/HTX	Units
Dry pump motor rating	4.5	7.5	7.5	7.5	7.5	11	11	kW
Mechanical booster motor rating	4.5	4.5	4.5	4.5	7.5	7.5	7.5	kW
Current rating		•						
■ 200 - 230 V systems	28	38	38	38	44	63	63	Α
■ 380 - 460 V systems	14	20	20	20	23	32	32	Α
Recommended branch circuit protect	tion					•		
• UL (200 - 230 V systems)	35	45	45	45	55	80	80	Α
• IEC (200 - 230 V systems)	30	40	40 41 (HTX)	40 41 (HTX)	45 47 (TX)	65	65	А
 UL (380 - 460 V systems) 	20	25	25	25	30	40	40	Α
■ IEC (380 - 460 V systems)	15	20	20 21 (HTX)	20 21 (HTX)	25	35	35	Α
Minimum cable size		•						
 200 - 230 V systems (or corresponding AWG size) 	6 (8)*	10 (6)	10 (6)	10 (6)	10 (6)	25 (4)	25 (4)	mm ² (AWG)
 380 - 460 V systems (or corresponding AWG size) 	6 (8)*	6 (8)*	6 (8)*	6 (8)*	6 (8)*	10 (6)†	10 (6)†	mm ² (AWG)
Mains connector	Han® K 4/4	Han® K 4/4	Han® K 4/4	Han [®] K 4/4	Han® K 4/4	Han® 100 A module	Han® 100 A module	-

^{*} The minimum geometric wire gauge for Han® K 4/4 is 6 mm² and minimum AWG size is 8 AWG

Table 10 Electrical data iXH4545HT to pXH6000

Characteristics	iXH4545HT	iXH4550HT	iXH6045H/T	iXH6050H/T	pXH4500	pXH6000	Units	
Dry pump motor rating	11	11	11	11	-	-	kW	
Mechanical booster motor rating	7.5	7.5	7.5	7.5	7.5	7.5	kW	
Current rating	Current rating							
■ 200 - 230 V systems	63	63	63	63	28	28	А	
■ 380 - 460 V systems	32	32	32	32	14	14	А	
Recommended branch circuit protect	tion							
• UL (200 - 230 V systems)	80	80	80	80	35	35	А	
■ IEC (200 - 230 V systems)	65	65	65	65	30	30	А	
 UL (380 - 460 V systems) 	40	40	40	40	20	20	А	
■ IEC (380 - 460 V systems)	35	35	35	35	15	15	А	
Minimum cable size	1							
 200 - 230 V systems (or corresponding AWG size) 	25 (4)	25 (4)	25 (4)	25 (4)	6 (8)*	6 (8)*	mm ² (AWG)	
 380 - 460 V systems (or corresponding AWG size) 	10 (6)†	10 (6)†	10 (6)†	10 (6)†	6 (8)*	6 (8)*	mm ² (AWG)	
Mains connector	Han [®] 100 A module	Han [®] 100 A module	Han [®] 100A module	Han [®] 100A module	Han [®] K 4/4	Han [®] K 4/4	-	

^{*} The minimum geometric wire gauge for Han® K 4/4 is 6 mm² and minimum AWG size is 8 AWG.

[†] The minimum geometric wire gauge for Han® 100 A module is 10 mm² and minimum AWG size is 6 AWG.

Table 11 Electrical data for iXL pumps

Characteristics	iXL250Q	iXL500Q	iXL500R	iXL750Q	iXL900R	iXL950R	Units
Dry pump motor rating	7.5	11	11	22	22	22	kW
Mechanical booster motor rating	4.5	7.5	7.5	7.5	22	22	kW
Current rating							
■ 200 - 230 V systems	38	75	63	140	-	-	А
■ 380 - 460 V systems	20	40	32	78	63	73	А
Recommended branch circuit protection							
• UL (200 - 230 V systems)	50	100	80	170	-	-	Α
■ IEC (200 - 230 V systems)	35	80	65	140	-	-	Α
• UL (380 - 460 V systems)	25	50	40	95	80	100	Α
■ IEC (380 - 460 V systems)	20	50	35	80	63	80	Α
Minimum cable size							
 200 - 230 V systems (or corresponding AWG size) 	10 (8)	16 (6)	16 (6)	50 (1/0)	-	-	mm² (AWG)
 380 - 460 V systems (or corresponding AWG size) 	6 (8)*	10 (6) [†]	10 (6) [†]	25 (4)	16 (6)	16 (6)	mm ² (AWG)
Mains connector	Han [®] K 4/4	Han [®] 100 A module	Han® 100 A module	-			

^{*} The minimum geometric wire gauge for Han® K 4/4 is 6 mm² and minimum AWG size is 8 AWG.

■ Note:

Install to local, national and regional electrical requirements/codes.

Recommended fuse type:

Fuse Class gC (IEC 60269), UL class T, class J or class RK5, Bussmann type JJS or equivalent 12t characteristic rated to 600 V.

[†] The minimum geometric wire gauge for Han® 100 A module is 10 mm² and minimum AWG size is 6 AWG.

Table 12 Electrical connections

Description	Mating Connector description / external supply rating	Internal supply rating
Mains connection Refer to <i>Installation</i> on page 36 for wiring diagram	Refer to Electrical data on page 22 for the mains connector installed to each variant. Connector is one of: Harting Han® K 4/4-F finger safe 09 38 008 2703, 6-16 mm² fine stranded wire (VDE 0295 class 5, refer to Table: Wire assembly according to VDE 0295), 8.9 mm maximum insulation diameter Or Harting Han® Axial Screw module 100 A (2 off required), 09 14 002 2753 10-25 mm² or 09 14 002 2751, 16-35 mm² fine stranded wire (VDE 0295 class 5, refer to Table: Wire assembly according to VDE 0295) or Harting Han® Axial Screw module 200 A (3 off required), part number of mating half	
	applicable for 25 - 40 mm ² wire is 09 14 001 2763 or 09 14 001 2762 for 40 - 70 mm ² wire. Use fine stranded wire (VDE 0295 class 5, refer to <i>Table: Wire assembly according to VDE 0295</i>)	
PDT Interface (front)	XLR type 5-way plug	24 V d.c. 0.2 A
System Interface (rear)	XLR type 5-way plug	24 V d.c. 0.75 A*
Ethernet interface	Standard RJ45 type or Neutrik® EtherCon® RJ45	(IEEE802.3i 10 Base T Ethernet)
EMS interface External emergency stop switch Pin 1 - supply, Pin 2 - return (If there is no external connection a link plug must be installed to operate the	XLR type 6-way plug	24 V d.c. 100 mA
pump.) Internal emergency stop switch Pin 3 - common, Pin 4 - nor- mally open Comms 24 V supply Pin 5 - supply, Pin 6 - 0 V supply common Chassis	30 V a.c. 1 A, 60 V d.c. 0.55 A	24 V d.c. 0.75 A*

Description	Mating Connector description / external supply rating	Internal supply rating
Accessory interface Analog measurement for water flow meter Pin 1 - input, Pin 5 common Active accessory module Pin 3 - RS485 +, Pin 10 - RS485 — Pump running status contacts Pin 6 - Dry pump (normally open) Pin 14 - Mechanical booster	15-way D socket	
(normally open) Pin 15 - common	30 V a.c. 1 A, 60 V d.c. 0.5 A	
Gate valve Pin 4 - Gate valve drive transistor (open collector) Gate valve position sense Pin 7 - 'Closed', Pin 8 - 'Open' Power Supplies Pin 12 - Accessory 24 V supply Pin 13 - Accessory 24 V supply Pin 5 - 0 V supply common		24 V d.c. 0.75 A* 24 V d.c. 0.2 A

^{*} The System interface, the EMS interface and the Accessory interface have a combined current rating of 0.75 A.

Table 13 Wire assembly according to VDE 0295

Wire Size (mm²)	Fine stranded wires VDE 0295 class 5
6	84 x 0.30
10	80 x 0.40
16	128 x 0.40
25	200 x 0.40
35	280 x 0.40
50	400 x 0.40

3.6 Cooling water data

Table 14 Water cooling system data

Description	Rating	Units
Maximum supply pressure	6.9	barg
	100	psig

[†] This supply will be disconnected if an emergency stop occurs.

Description	Rating	Units
Maximum allowable system dif- ferential pressure	5.5	bar
Minimum necessary pressure dif- ferential across supply and return	Refer to Table: Water consumption data	
Supply temperature range	Refer to Table: Cooling water supply temperature	
Water type	Treated or non-corrosive industrial	
Maximum particle size	0.2	mm ²
Acidity	7.0 to 10.5	рН
Hardness	< 250	ppm of CaCO ₃ (< 250 mg of CaCO ₃ per litre)
Total dissolved solids (TDS)	< 1500	mg/l
Total suspended solids (TSS)	< 10	mg/l
Specific conductivity	2000	μs/cm
Materials in contact with cooling water	Stainless steel, Nitrile, PTFE and fluoroe- lastomer	
Water inlet connection	3/8 inch BSP male quick connector 1/2 inch BSP male quick connector (iXL900R and iXL950R only)	
Water outlet connection	3/8 inch BSP female quick connector 1/2 inch BSP female quick connector (iXL900R and iXL950R only)	

Table 15 Cooling water supply temperature

Cooling water supply temperature	Units	Applies to pump models
		iXH100
		iXH200H
		iXH610
10 - 30	°C	iXH1210/H/T
10 - 30		iXH1220H/T
		iXH1820/H/T
		iXH3030/T
		iXL250Q

Cooling water supply temperature	Units	Applies to pump models
		iXH450H
		iXH500H
		iXH3045H
		iXH3050H
		iXH4545HT
		iXH4550HT
		iXH6045H/T
10 - 25	°C	iXH6050H/T
		pXH4500
		рХН6000
		iXL500Q
		iXL500R
		iXL750Q
		iXL900R
		iXL950R

Table 16 Water consumption data

	Characteristics						
Pump	Minimum flow rate required (for low temp operation)	Typical water flow rate*	Rated Minimum pressure differential†				
Units	l/min	l/min	bar				
iXH100	2	2	1				
iXH200H	4	2.7	1				
iXH450H	6	6	1.25				
iXH500H	6	6	1.25				
iXH610	4	3	1				
iXH1210	5	4	1				
iXH1210H/T	6	4.2	1				
iXH1210HTX	10	9.4	1				
iXH1220H/T	7	4.7	1				
iXH1820	6	4.2	1				
iXH1820H	7	4.7	1				
iXH1820T	6	3.5	1				
iXH3030	8	7	1.5				
iXH3030T	8	8	1.5				
iXH3045H	12	11	2				
iXH3050H	12	11	2				
iXH4545HT	12	11	2				
iXH4550HT	12	11	2				

	Characteristics						
Pump	Minimum flow rate required (for low temp operation)	Typical water flow rate*	Rated Minimum pressure differential†				
Units	I/min	l/min	bar				
iXH6045H/T	12	11	2				
iXH6050H/T	12	11	2				
pXH4500	6	6	1.25				
pXH6000	6	6	1.25				
iXL250Q	7	6	1				
iXL500Q	12	11	2				
iXL500R	12	11	2				
iXL750Q	18	18	1				
iXL900R	14	14	1.4				
iXL950R	14	14	1.4				

^{*} Water consumption varies with pump operating temperature and water temperature, these figures measured at factory default internal pump temperature, 15 °C water inlet temperature and ultimate inlet pressure.

■ Note:

The Dry pump set point is the desired surface temperature of the internal low vacuum stage.

The Booster set point is the temperature of the booster stator at which additional cooling is deployed to control booster temperatures. The booster will not necessarily reach the set point temperature at ultimate conditions.

3.7 T variants

Table 17 Heater data

Description	Rating	Units
Exhaust heater control temperature	160	°C
Exhaust heater power consumption	0.2	kW
Typical booster heater control temperature	106 (145*)	°C
Typical booster heater power consumption	1	kW

^{*}iXH1210HTX only

3.8 Tracer gas analysis

Tracer gas fugitive emission testing has been carried out in accordance with the method given in Appendix A2 of SEMI S6 on four different systems, iXH100, iXH1820 and iXH6045H and iXL500Q.

[†] The TMS is a valved system and the 'Rated Min Pressure Differential' is possibly not correlate with water flow rates stated in the table under all operating conditions. The 'Rated Min Pressure Differential' is required to maintain adequate cooling water flow under adverse operating conditions.

Table 18 Tracer gas test parameters

Test parameters	
Tracer gas	SF ₆ (Sulphur Hexafluoride)
Tracer gas concentration	100% (2% for iXL500Q only)
Tracer gas release rate	2 slpm
Tracer gas release points	Tracer gas flow evenly split between 2 release points 1) exhaust flange on pump 2) exhaust elbow joint in exhaust extraction cover*

^{*} Except for iXL500Q.

Table 19 Tracer gas test system parameters

System parameters	iXH100	iXH1820	iXH6045H	iXL500Q	Units
Extraction flow rate:					
From port on top of enclosure	180	180	310	174	m ³ /h
From port on exhaust extraction kit	0	0	60	0	
Volume of enclosure	0.13	0.24	0.46	0.59	m ³
Free volume of enclosure	0.074	0.118	0.229	0.33	m ³
Air changes per minute	40.54	25.4	11.2	8.7	
Hardware configuration: - 100 mm duct connected to port on top of enclosure	✓	√	✓	✓	
- Exhaust extraction cover kit installed	✓	✓	✓	✓	
- 50 mm duct connected to exhaust extraction kit	х	x	✓	x	

Table 20 Worst case test results (iXH100/iXH1820/iXH6045H)

Process gas	Chemical name	Maximum gas flow (slm)	TLV (ppm)	25% TLV (ppm)	SF ₆ Re- lease rate (slm)	Maximum SF ₆ detected outside enclosure	ERC (ppm)	Pass/ Fail*
Chlorine	Cl ₂	1	0.5	0.125	2	0.079	0.04	Pass
Ammonia	NH ₃	10	25	6.25	2	0.079	0.40	Pass
Arsine	AsH ₃	0.1	0.05	0.0125	2	0.079	0.00	Pass
Boron Tri- chloride	BCl ₃	1	5	1.25	2	0.079	0.04	Pass
Carbon Mon- oxide	СО	1	25	6.25	2	0.079	0.04	Pass
Chlorine Tri- fluoride	CIF ₃	0.5	0.1	0.025	2	0.079	0.02	Pass
DCS	SiCl ₂ H ₂	2	5	1.25	2	0.079	0.08	Pass
Diborane	B ₂ H ₆	0.05	0.1	0.025	2	0.079	0.00	Pass

Process gas	Chemical name	Maximum gas flow (slm)	TLV (ppm)	25% TLV (ppm)	SF ₆ Re- lease rate (slm)	Maximum SF ₆ detected outside enclosure	ERC (ppm)	Pass/ Fail*
Fluorine	F ₂	4.5	1	0.25	2	0.079	0.18	Pass
Hydrogen	H ₂	150	4000	1000	2	0.079	5.93	Pass
Hydrogen Chloride	HCI	20	5	1.25	2	0.079	0.79	Pass
Hydrogen Fluoride	HF	2	3	0.75	2	0.079	0.08	Pass
Nitrogen Tri- fluoride	NF ₃	10	10	2.5	2	0.079	0.4	Pass
Phosphine	PH ₃	0.2	0.3	0.075	2	0.079	0.01	Pass
Silane	SiH ₄	6	5	1.25	2	0.079	0.24	Pass
Sulphur Hex- afluoride	SF ₆	2	1000	250	2	0.079	0.08	Pass
TEOS	SiC ₈ H ₂₀ O ₄	2	10	2.5	2	0.079	0.08	Pass
Tungsten Hexafluoride	WF ₆	1	3	0.75	2	0.079	0.04	Pass

Table 21 Worst case test results (iXL500Q)

Process gas	Chemical name	Maximum gas flow (slm)	TLV (ppm)	25% TLV (ppm)	SF ₆ Re- lease rate (slm)	Maximum SF ₆ detected outside enclosure	ERC (ppm)	Pass/ Fail*
Ammonia	NH ₃	30	35	8.75	2	0.034	0.51	Pass
Arsine	AsH ₃	0.1	0.05	0.0125	2	0.034	0.00	Pass
Boron Tri- chloride	BCl ₃	1	5	1.25	2	0.034	0.02	Pass
Carbon Mon- oxide	СО	1	25	6.25	2	0.034	0.02	Pass
Chlorine	Cl2	1	25	6.25	2	0.034	0.02	Pass
Chlorine Tri- fluoride	CIF ₃	0.5	0.1	0.025	2	0.034	0.01	Pass
DCS	SiCl ₂ H ₂	2	5	1.25	2	0.034	0.03	Pass
Diborane	B ₂ H ₆	0.05	0.1	0.025	2	0.034	0.00	Pass
Difluorome- thane	CH ₂ F ₂	0.2	1000	250	2	0.034	0.00	Pass
Fluorine	F ₂	10	2	0.5	2	0.034	0.17	Pass
Hydrogen	H ₂	150	4000	1000	2	0.034	2.55	Pass

Process gas	Chemical name	Maximum gas flow (slm)	TLV (ppm)	25% TLV (ppm)	SF ₆ Re- lease rate (slm)	Maximum SF ₆ detected outside enclosure	ERC (ppm)	Pass/ Fail*
Hydrogen Chloride	HCI	20	2	0.5	2	0.034	0.34	Pass
Hydrogen Flu oride	HF	2	2	0.5	2	0.034	0.03	Pass
Chlorine Tri- fluoride	CIF ₃	0.5	0.1	0.025	2	0.034	0.01	Pass
Methane	CH ₄	1	1000	250	2	0.034	0.02	Pass
Nitrogen Tri- fluoride	NF ₃	10	10	2.5	2	0.034	0.17	Pass
Nitrous Ox- ide	N ₂ O	15	50	12.5	2	0.034	0.26	Pass
Phosphine	PH ₃	0.2	1	0.25	2	0.034	0.00	Pass
Silane	SiH ₄	6	5	1.25	2	0.034	0.10	Pass
Silicone Tet- rachloride	SiCl ₄	0.1	2	0.5	2	0.034	0.00	Pass
Sulphur Hex- afluoride	SF ₆	2	1000	250	2	0.034	0.03	Pass
TEOS	SiC ₈ H ₂₀ O ₄	2	10	2.5	2	0.034	0.03	Pass
Tungsten Hexafluoride	WF ₆	3	3	0.75	2	0.034	0.05	Pass

^{*} where Pass indicates permitted enclosure (satisfies SEMI S2 criteria of less than 25.0% of the TLV)

The pumps tested represent the extremes of the full range of systems. The results in *Table: Worst case test results (iXH100/iXH1820/iXH6045H)* and *Table: Worst case test results (iXL500Q)* are therefore considered representative across the full range of iXH and iXL systems. Extraction flow rates required for each system are detailed in *Table: Extraction rates required by system variant*.

Table 22 Extraction rates required by system variant

System	Extraction rate required at top of enclosure (m³/h)	Extraction rate required at exhaust cover (m³/h)
iXH100	180	0
iXH200H	180	0
iXH450H	310	60
іХН500Н	310	60
iXH610	180	0
iXH1210/H/T	180	0
iXH1220H/T	180	0
iXH1820/H/T	180	0

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System	Extraction rate required at top of enclosure (m³/h)	Extraction rate required at exhaust cover (m³/h)
iXH3030/T	310	60
iXH3045H	310	60
iXH3050H	310	60
iXH4545HT	310	60
iXH4550HT	310	60
iXH6045H/T	310	60
iXH6050H/T	310	60
iXL250Q	180	60
iXL500Q	174	0
iXL500R	310	60
iXL750Q	N/A	N/A
iXL900R	N/A	N/A
iXL950R	N/A	N/A

4. Installation

4.1 Installation safety



WARNING: INSTALLATION SAFETY

Risk of injury or damage to equipment. Follow the safety instructions and make note of all appropriate precautions.



WARNING: EXPOSURE TO VACUUM

Risk of injury or death. Do not expose parts of the human body to the vacuum. Failure to do so can cause injury or death.



WARNING: DANGEROUS FUMES

Risk of injury. The pump and motor controller contains electrolytic capacitors. In some fault conditions dangerous fumes can be produced. Make sure that the pump and motor controller is operated in a well-ventilated area.



WARNING: OPERATION SAFETY

Risk of injury or damage to equipment. Do not operate the system with the enclosure panels removed.

Possible hazards on the system include electricity, hot surfaces, process chemicals, Fomblin® oil, nitrogen and water under pressure.

Refer to *Operation* on page 56 for detailed safety instructions and our Safety Manual Publication Number P40040100 'Vacuum Pump and Vacuum System Safety'.

- The system must be installed by engineers trained by us. We can train users to do the tasks given in this manual. Contact the local service centre or supplier for more information.
- Do not remove the temporary cover or blanking plate from the system inlet and exhaust until prepared to connect the system to the vacuum or exhaust extraction system. Do not operate the system unless the inlet and exhaust are connected to the vacuum and exhaust extraction system.
- Vent and purge the process system (if the system is to replace an existing pumping system) with nitrogen for 15 minutes before starting installation. Refer to Maintenance on page 65.
- Systems containing the Loadlock gas module must not be used with hazardous process gases. If unsure which gas module is installed to the system, find the product code number on the label on the rear of the pump. Refer to the product configurators at the start of this manual. If in doubt, contact us.
- Disconnect the components in the process system from the electrical supply to prevent accidental operation.

- Electricity, nitrogen and water supplies are possible hazardous energy sources. Lockout and tagout supply sources before you start maintenance.
- The system includes provision for ventilation extraction and secondary containment of oil and water leaks. Remove all the accidental overflows or spills immediately to avoid risk of slips.
- Obey all national and local rules and safety regulations when you install the system. Consult the Vacuum Pump and Vacuum System Safety manual (publication number P40040100) before you pump hazardous materials.
- Put and secure cables, hoses and pipework during installation to avoid possible trip hazard.
- Make sure that the installation area is clean and free from debris and contamination, such as oil, before you put the pump in position.

For the system to perform to specification, give appropriate facilities as given in this manual.

4.2 Position the system



WARNING: HEAVY OBJECT

Risk of injury and damage to the equipment. Use correct lifting equipment to move the system. Failure to do so can cause injury to people and damage to equipment. Castors installed to the iXL900R and iXL950R systems are for final positioning only. Do not use these for transportation. Refer to *Table: General technical data* for the mass of the system.

WARNING: TRANSPORTATION SAFETY

Risk of injury or damage to equipment. Do not exceed the topple angle of 10° when you move the system.

Wheel the system on its castors to move it into its operating position.



The castors are applicable for moving the pump to a short distances in the sub fab environment where the floor is flat and even.

In all cases a site risk assessment must be carried out to identify any obstacles or hazards which can cause manual handling issues or prevent safe location of the system.

If the floor surface is uneven or has obstacles the system should be lifted with correct lifting equipment.

If lifting the system is impractical or there are other site difficulties, contact us for further advice on manual handling options.



WARNING: PAIRED SLINGS

Risk of injury or damage to equipment. Make sure that the maximum angle between paired slings used to lift the system is 45°.

Install the system on a firm, non-combustible, level surface, capable of supporting pump mass, to make sure that it works correctly and the system is not damaged.

Level the pump to a maximum of 3° in any direction, measured at the pump inlet.

The castors are intended only to aid the movement of the system to the final operating position. The force to push a pump on castors varies because of the surface finish, cleanliness of the floor and any slopes or inclination. The user must do a risk assessment of the location to make sure that the system is moved safely. Obey all local and national manual handling guidelines when you move the system.

Use correct lifting equipment attached to all four lifting eyebolts to move the system near to its final operating position.

Note:

The iXH100, iXH200H and iXH 610 variants have two eyebolts for lifting. Figure: Front view of the dry pumping system

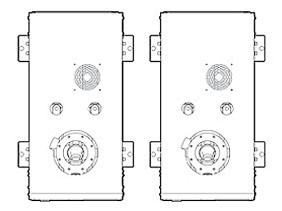
4.3 Install the system

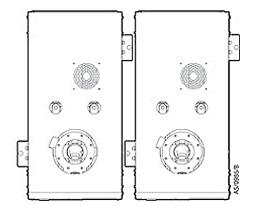
- Adjust the levelling feet to make sure that the system is level and is not supported by the castors. The suggested jacking height is 5 mm. Refer to Figure: Front view of the dry pumping system
- 2. Remove the lifting eyebolts and replace them with the lifting eyebolt hole plugs supplied with the systems.
- 3. Make sure that to the emergency stop button is accessible. Refer to *Figure: The front panel controls*. If you do not use an iXH disconnect Box, refer to *Accessories* on page 94.

Requirements to secure the system in place to prevent unwanted movement (for example, during an earthquake):

- The seismic brackets (Figure: Front view of the dry pumping system) are designed to withstand a level 4 earthquake in a ground floor installation (available as an accessory) Refer to Accessories on page 94
- The system can be attached to the floor with applicable bolts or studs (not supplied) through the 17.5 mm diameter hole in the seismic brackets.
- If vibration transmission to the floor is a possible problem, attach vibration isolators (not supplied) between the seismic brackets and the bolt or stud.
- Make sure that the bolt spacing is sufficient for the floor strength and expected loads.
- The system has mounting points to attach four seismic brackets. On smaller systems, two brackets can hold the system during an earthquake. The smaller systems can be attached as shown in Figure: Reduce the effective system footprint for example, to decrease the effective system footprint if necessary. Refer to Accessories on page 94 to select the correct seismic bracket kit for the system and for information about the systems which can be held with only two brackets.

Figure 6 Reduce the effective system footprint





4.4 Lubrication

The systems are given a charge of oil before it dispatched from the factory. It is not necessary to check and adjust the oil level.

4.5 Connect the system

4.5.1 Connect to the vacuum and exhaust system



WARNING: DANGEROUS SUBSTANCES

Risk of inhalation injury. Connect the exhaust to a applicable treatment plant to prevent the discharge of dangerous gases or vapours to the surrounding atmosphere.



WARNING: HOT SURFACES

Risk of burns. Do not touch the pump exhaust or check valve while the pump is running. The temperatures of pump parts can be high enough to cause harm. Let the pump to cool for 1 hour before you disconnect the pump.





Risk of fire or explosion. Do not operate the system with the exhaust pipeline blocked. If the exhaust pipeline is blocked, the system can give exhaust pipeline pressures of up to 10 bar (10×10^5 Pa). Note that a pressure spike up to a maximum 15 bar (15×10^5 Pa) can be given for less than 1 second in the exhaust pipeline on large pumps (iXH450H, iXH500H and iXL500*) if the inlet is instantaneously exposed to atmospheric pressure when the pump is running and the exhaust is blocked.

^{*} If you are not sure which dry pump was purchased, find the product code number on the label on the rear of the pump and refer to the product configurator at the front of this manual.



CAUTION: CONDENSATE DRAINAGE

Risk of damage to the equipment. Use a catchpot to prevent the drainage of condensate back into the system. Condensate that drains back into the system can damage the pump.

CAUTION: HIGH PRESSURE IN PIPELINE



Risk of damage to the equipment. The systems continuously have maximum exhaust line pressure limit. Operation above the limit can damage the pumping mechanism. The system has an exhaust pressure sensor which will give warnings and alarms when the pump is operated for at least 20 seconds above the limits given in *Table: Pump protection sensors*. The pump will continue to run with a warning present, however an alarm will cause the pump to stop.

iXL systems do not have an exhaust pressure sensor. The maximum continuous exhaust line pressure of these systems should not be more than 0.4 bar (g). You must provide an exhaust system with sufficient conductance to make sure that the exhaust pressure limit is not normally exceeded.

Do not reuse any O-ring or O-ring assembly and do not allow debris to get into the system during installation.

When you connect the system to the vacuum system, do the steps that follow:

- To get the best pumping speed use the minimum length of pipeline to connect the vacuum system to the pumping system. Make sure that the internal diameter of the pipe is not less than the system inlet port.
- All components in the vacuum pipeline must have a maximum pressure rating higher than the highest pressure that can be produced in the pumping system.
- Use flexible pipelines in the vacuum pipeline to reduce the transmission of vibration and to prevent loading of coupling joints. We recommend to use the braided flexible pipelines supplied by us.
- For T variants and systems containing the iXH450H and iXH500H dry pumps make sure that exhaust pipelines are rated for 160 °C at the point of connection to the pump. For all other pump variants make sure that pipelines are rated for 110 °C. We recommend the use of metal seals at any joint where the continuous operating temperature of the exhaust is higher than 160 °C.
- Give sufficient support to the vacuum/exhaust pipelines to prevent the transmission of stress to pipeline coupling joints.
- Use a pressure gauge in the inlet pipeline to make sure that the system operates correctly.
- The system inlet must be able to be isolated from the atmosphere and from the vacuum system if corrosive chemicals are pumped or produced.
- Install a check valve at the outlet of the iXH and iXL exhaust pipe to prevent the suck back of exhaust vapours after the system is shut down. The check valve also gives an additional reduction of the pulses in exhaust pressure.
- For dusty applications, use a low impedance inlet filter to limit the damage to the pump.

Refer to Figure: Connecting the pump inlet

- 1. Remove the temporary cover or blanking plate from the inlet of the system. Do not drop screws, tools etc. into the pump inlet.
 - a. Keep the nuts, bolts, washers and blanking plate for future use.
 - b. Keep the temporary cover for future use on non-contaminated pumps only.
 - c. The inlet O-ring is supplied with the pump and is installed underneath the inlet flange cover.

- 2. Use the O-ring supplied and applicable nuts, bolts and washers (not supplied) to connect the inlet flange (*Figure: Front view of the dry pumping system*) to the vacuum system. The inlet flange is not designed for use with a trapped O-ring or centering ring.
- 3. Use half claw clamps supplied by us when you connect an ISO style foreline flange to the system inlet. Refer to *Figure: Connecting the pump inlet*.
- 4. For iXH and iXL use the trapped O-ring seal and clamp supplied to connect the exhaust outlet (*Figure: The controls/connectors on the rear of the dry pumping system*) on the exhaust pipe, to the exhaust extraction system. For pXH systems the exhaust connection is situated underneath the product.

Note:

The system is supplied with a trapped O-ring or a metal seal based on pump type and expected exhaust temperatures. make sure that seals are always replaced with the same type.

Figure 7 Connecting the pump inlet

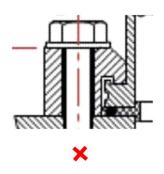


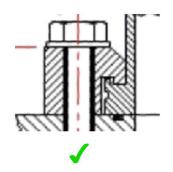


Undo screws

Remove cover

Do not use trapped O-ring or centering ring





Use half claw clamps supplied by us:

Flange diameter	Half claw clamp part no.	Quantity required	Tightening torque (Nm)
ISO63	C10007093	4	5
ISO100	C10007093	8	5
ISO160	C10011093	8	5
ISO200	C10011093	12	5
ISO250	C10011093	12	5

4.5.2 Connect to the factory extraction system (optional)

An extraction port is given on iXH and iXL500 systems to allow secondary exhaust ventilation. When connected, the airflow operates continuously and will extract substances of concern that can be released during a failure.

Refer to *Tracer gas analysis* on page 31 for necessary extraction rates for each pump model. Refer to *Accessories* on page 94 for the necessary exhaust extraction cover kit.

Refer to *Figure: Front view of the dry pumping system* for location of the extraction port. The pXH does not have facility for extraction.

4.5.3 Connect the nitrogen supply



WARNING: DANGEROUS SUBSTANCES

Risk of asphyxiation. A release of nitrogen can cause asphyxiation. The nitrogen supply must enable isolation in accordance with SEMI S2 Lockout and tagout requirements.



CAUTION: NITROGEN SUPPLY

Risk of damage to the equipment. Make sure that the nitrogen supply agrees with the requirements given in the *Technical data*. If it does not, the gas pipelines can be blocked or the system can be damaged.

Refer to *Figure: The controls/connectors on the rear of the dry pumping system* for location of the nitrogen purge port. The gas module inside the system can be adjusted to suit process demands. Refer to *Gas module configuration* on page 62 for instructions on gas module configuration. The pXH does not have the facility for a nitrogen purge.



Refer to Nitrogen purge data on page 20 for nitrogen supply requirements.

Flammable/pyrophoric materials



WARNING: FLAMMABLE GASES

Risk of injury and damage to the equipment. Obey the instructions and take note of any precautions given below to make sure that pumped gases do not enter their flammable ranges.

When flammable or pyrophoric materials are in the pump there can be additional risks. The user must assess and manage these risks as part of the process tool installation.

The severity of the risks and the necessary control measures will depend on if:

- the tool exhaust is in the flammable region
- this is part of normal process tool operation
- it can only occur in rare conditions.

The additional risks occur because all dry pumps must be considered a possible source of ignition caused by the heat of compression, or friction. If ignition occurs, the following can happen:

- High pressures can occur in the pump and possibly not be contained.
- A flame front can travel back up the foreline.
- A flame front can travel downstream from the exhaust of the pump.

Industry best practise suggests that the following measures will reduce the risks of pumping flammable mixtures and pyrophoric materials. The user must do a risk assessment and take appropriate measures:

- Do not let air enter the equipment.
- Make sure that the system is leak tight.

- Prevent the entry of the pump gases in the flammable range. To achieve this, supply sufficient inert gas purge to dilute the pump gases. For example, dilution with nitrogen to below one quarter LEL (Lower Explosive Limit) or, if that is not practical, to below 60% LOC (Limiting Oxidant Concentration).
- The gas module supplied with the pump is not intended as a safety feature. If necessary, install additional measures to monitor the flow of purge gas, for example external sensors. Do not use the systems that are installed with the load-lock gas module on applications pumping flammable or pyrophoric materials.

For more information refer to semiconductor pumping application guide (Publication no. P41100090) or contact us.

Gas purges



WARNING: HAZARDOUS GASES

Risk of injury and damage to the equipment. If you use inert gas purges to dilute the dangerous gases to a safe level, make sure that the pump is shut down if the inert gas supply fails.

- 1. Switch on the inert gas purge to remove air from the pump and the exhaust pipeline before you start the process.
- 2. Switch off the purge flow at the end of the process only after the remaining flammable gases or vapours have been purged from the exhaust pipeline.
 - If liquids that produce flammable vapours are present in the pump foreline, the inert gas purge to the system must be supplied for all the time liquid is present. Flammable liquids can possibly be present in the foreline because of condensation or can be carried over from the process.
 - To calculate the flow rate of inert gas necessary for dilution, use the maximum flow rate for the flammable gases/vapours that can occur. For example, if a mass flow controller is being used to supply flammable gases to the process, assume a flow rate for flammable gases that can possibly occur if the mass flow controller is fully open.
- 3. Measure the inert gas flow rate continuously.
 - If the flow rate falls below the requirement, stop the flow of flammable gases or vapours to the pump.

4.5.4 Connect to the electrical supply

Electrical supply safety



WARNING: ELECTRICAL SAFETY

Risk of electric shock. Make sure that the electrical installation of the pump agrees with all local and national safety requirements. It must be connected to a correctly fused and protected electrical supply with an earth (ground) point.



WARNING: HAZARDOUS VOLTAGES



Risk of electric shock. This equipment is applicable for Installation Category II as defined in IEC 60664-1. The system must be connected to an isolator that disconnects all current carrying conductors and can be locked out in the off position (LOTO). The isolator must be near the equipment, in easy reach of the operator and identified as the disconnect device for the equipment.



WARNING: HAZARDOUS VOLTAGES

Risk of electric shock. Isolate the electrical supply before disconnecting the electrical supply cable from the system.



WARNING: HAZARDOUS VOLTAGES

Risk of electric shock. Make sure that the system and the electrical supply cable are correctly protected against earth (ground) faults. Make sure that the earth (ground) conductor of the electrical supply cable is longer than the phase conductors in the connector.



WARNING: PROTECTIVE EARTH CONDUCTOR

Risk of electric shock. Install a second protective earth (ground) conductor (with a cross-sectional area at least equal to phase conductor size up to 16 mm²) to the protective earth (ground) stud. Refer to *Figure: The controls/connectors on the rear of the dry pumping system*.



WARNING: HAZARDOUS VOLTAGES

Risk of electric shock. All connections to the interface control must be double insulated or have equivalent protection. Do not connect voltages greater than 30 V a.c. or 60 V d.c. to the control/interface connections. If you do, the interface control will not give protection against electric shock.



WARNING: HAZARDOUS VOLTAGES

Risk of electric shock. The power wiring to the system must be properly protected and the routing must be away from possible hazards.



CAUTION: HAZARDOUS VOLTAGES

Risk of electric shock. All systems are supplied are already configured for the electrical supply. The system cannot be configured again between the low voltage (200 V to 230 V) and high voltage (380 V to 460 V) ranges.

CAUTION: ELECTRICAL SAFETY



This is an industrial (Class A) product as defined by EN61326. To make sure compliance with European Electromagnetic Compatibility (EMC) requirements for EMC emissions. Note that it is not intended for use in domestic buildings, or in properties directly connected to an electrical supply network which also supplies domestic buildings.



CAUTION: ELECTRICAL SAFETY

Risk of damage to equipment. Risk of damage to equipment. Do not connect voltages greater than specified in *Table: Electrical connections* to the control/interface connections as damage can be caused to the interface control.

Contact us if the system is to be used with a power supply in a different voltage range to what is specified on the rating plate.

Solid state electronics protects the system from motor overload and short circuits. The power wiring between the system and the electrical installation must be protected. When selecting overload protection, refer to *Electrical data* on page 22. Pump rating information can be found on the label on the rear of the pump.

If the electrical supply to the system is connected through an Earth Leakage Circuit Breaker (ELCB) or Residual Current Device (RCD) (depending on territory) it must be applicable for protection of equipment with a d.c. component in the fault current, and applicable for short duration switch-on surges, and for high leakage current (for example, type B, according to EN50178).

The secondary protective earth (ground) is necessary in case of failure of the primary earth and because pump filters can cause high earth leakage currents, refer to *Table: General electrical data*.

Mains supply cable connection



WARNING: HAZARDOUS VOLTAGES

Risk of electric shock. The Harting connector is not approved for connection and disconnection under load.

If further information is necessary on connecting the electrical supply, contact us.

Three different types of electrical supply connector are used on these systems. Refer to *Electrical data* on page 22 for details of the connector types and the systems to which they are installed. Some pump variants are supplied with the appropriate parts necessary to make up the mating half of the electrical connector. The connectors are also available as an accessory. Refer to *Accessories* on page 94. Refer to *Figure: The Harting Han® K 4/4 cable-mounted connector, Figure: The Harting 100A axial screw module cable-mounted connector* or *Figure: Customer connection kit - combination low volts iXL750Q* for the applicable electrical connector for the system. Obey the instructions that follows to make the electrical supply cable:

1. Attach the strain relief bush onto the connector outer cover.

- 2. Pass a applicable cable through the strain relief bush and cover. Refer to *Electrical data* on page 22 for applicable cable sizes and type. Cables must be bare-ended without ferrules for correct clamping in the connector block.
- 3. Before you start the assembly, use the hex (Allen) key as shown in the applicable figure. Make sure that the axial cone is screwed fully downward to completely open the contact chamber.
- 4. Carefully remove the cable insulation to the exact dimension specified in the figure. Do not twist the cable strands.
- 5. Refer to the applicable figure to identify the connections. Insert each wire completely into the contact chamber until the copper strands reach the bottom. Hold the cable in position while applying the recommended tightening torque.
- 6. Install the earth (ground) wire to the protective earth connection as shown in the applicable figure.

Note:

The protective earth connection on the $\operatorname{Han}^{\circ}$ 100A connector is on the hinged frame. It can be necessary to use one of the cable shoes (given in the connector kit) to install the protective earth (ground) wire. The cable shoe given for the 380 - 460 V systems is intended for 16 mm^2 wire. The kit for 200 - 230 V systems includes cable shoe options for 16 mm^2 , 25 mm^2 and 35 mm^2 cables - choose the most correct solution for the size of cable that is being used.

- 7. If coding pins are supplied, install them to the connector block according to voltage variant as shown in the appropriate figure.
- 8. Install the outer cover again to the connector block then tighten the strain relief bush.

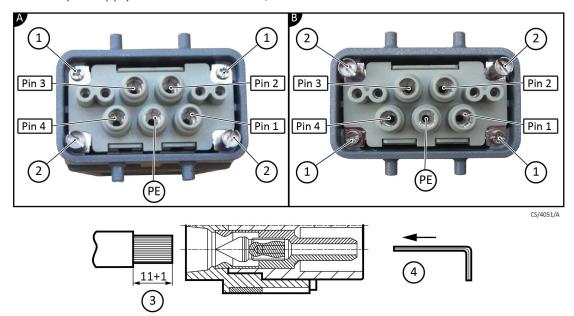
■ Note:

Harting (the manufacturer of the connector) states that after initial assembly, the recommended tightening torque must only be reapplied once in order to avoid damage to the individual cable strands.

- 9. The system has an electrical connector locking mechanism (*Figure: The controls/connectors on the rear of the dry pumping system*) which requires use of a correct screwdriver to release. Refer to *Figure: Electrical connector locking mechanism*, the system is supplied with a protective cover installed and the locking mechanism can be applied. To install the electrical supply cable:
- Slacken off the locking screw by a some turns to loosen the locking mechanism if necessary.
- Move the locking mechanism to the left as far as possible, lift it up so that it rotates around the pivot screw and clears the left hand lever.
- Push back both levers to release the protective cover.
- Remove the protective cover and install the electrical supply cable.
- Pull both levers back towards yourself to lock the electrical supply cable connector in place.
- Push the locking mechanism down as far as possible and push to the right so that it prevents the left hand lever from actuating.
- Tighten the locking screw to firmly hold the locking mechanism in place.

• Connect the other end of the electrical supply cable to the electrical supply through a applicable isolator.

Figure 8 Mains input supply connector - Han® K 4/4

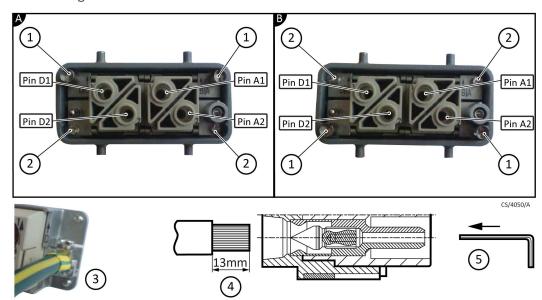


- A. Low volt pin configuration
- 1. Mounting screw
- 3. Insert stranded wire

- B. High volt pin configuration
- 2. Coding pin
- 4. 2.5 mm hex (Allen) key

	, ,	
Pin identification		
Pin 1	Phase 1	
Pin 2	Phase 2	
Pin 3	Phase 3	
Pin 4	Not connected	
PE	Protective earth	
Torque settings for connector pins		
Cable size (mm ²) Maximum torque setting (Nm)		
6	2	
10	3	
16	4	
	<u>'</u>	

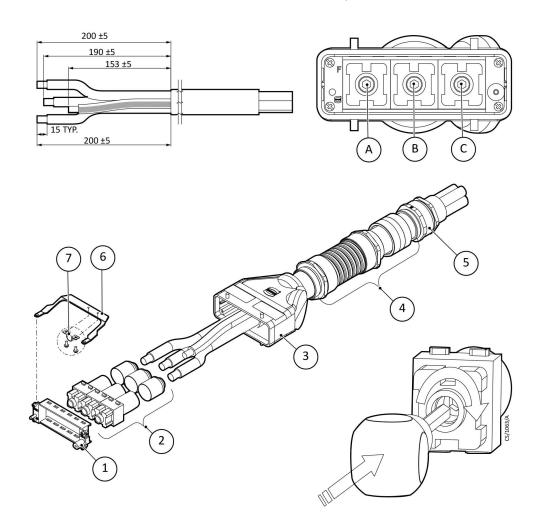
Figure 9 The Harting 100A axial screw module cable-mounted connector



- A. Low volt pin configuration
- 1. Coding pin
- 3. View from the cable side: connect the protective earth into the earth terminal
- B. High volt pin configuration
- 2. Mounting screw
- 4. Insert stranded wire
- 5. 4 mm hex (Allen) key

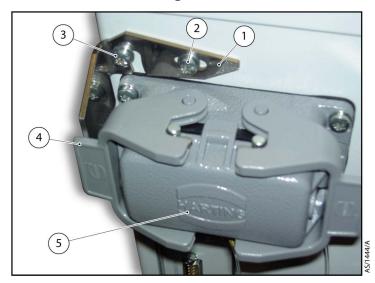
Pin identification		
Pin A1	Phase 1	
Pin A2	Phase 2	
Pin D1	Not connected	
Pin D2	Phase 3	
Torque settings for connector pins		
Cable size (mm²) Maximum torque setting (Nm)		
10	6	
16	6	
25	7	
35	8	

Figure 10 Customer connection kit - combination low volts iXL750Q



Item	Identification
Α	Phase 3
В	Phase 2
С	Phase 1
1	24 Frame hood 6 module A-F
2	200 A female insert 4-70 mm ²
3	24 hood M50
4	Conduit sleeve kit 50 mm LV iXL750
5	Cable gland M50 x 1.5
6	Earth term 24B LV con kit iXL750
7	Clamp for 10 mm cable diameter Ground Term

Figure 11 Electrical connector locking mechanism



Item	Control/connector identification
1	Electrical connector locking mechanism
2	Pivot screw
3	Locking screw
4	Lever (2 off)
5	Protective cover

4.5.5 Connect an additional RF earth (ground) (optional)

We recommend that you to connect an additional RF (Radio Frequency) earth if the system is operated in an area subject to high RF emissions:

- using a star washer to connect the end of the earth (ground) cable (Figure: Front view of the dry pumping system) connected to the system inlet to one of the bolts used to secure the inlet flange.
- connecting an additional earth (ground) cable to the RF earth (ground) stud
 (Figure: The controls/connectors on the rear of the dry pumping system). An
 applicable low-impedance cable must be used (for example, use braided cable).

4.5.6 Connect to the emergency stop circuit

The EMS (Emergency Stop) button on the front panel of the system (*Figure: The front panel controls*) is used to stop the pump in an emergency.

■ Note:

The EMS button, when used on its own, does not isolate the electrical supply to the system and so does not give an EMO (Emergency Off) function.

The system has an external emergency stop circuit that can be connected into the control equipment. In this case, the emergency stop control should be compliant with IEC 60947-5-5, a red self-latching mushroom push button on a yellow background.

If you operate the pumping system without connection to the control equipment, install the external EMS link plug (supplied) to the EMS connection on the rear of the pumping

system (*Figure: The controls/connectors on the rear of the dry pumping system*). If the EMS link plug is not installed the system will not operate.

If EMO functionality is required (for example, for the requirements of SEMI S2), install the pumping system in combination with our disconnect box. The disconnect box is available as an accessory. Refer to *Accessories* on page 94. Refer to the Disconnect Box manual for installation instructions and information about how the system can be shut down in an emergency.

For pumps that are installed into an integrated system and receive their power from that system, an emergency off can be achieved by the connection of the controlled stop circuit into the integrated system's emergency off circuit.

Refer to *Emergency stop* on page 61 for more information about pump behaviour after an emergency stop.

4.5.7 Connect and set up the cooling water



WARNING: ELECTRICAL HAZARD

Risk of injury and damage to the equipment. Do not turn on the cooling water supply until the electrical installation of the pump is complete. Failure to do so can cause condensation in the enclosure and a risk of electric shock.

Note:

For optimum water cooling, make sure that the cooling water supply meets the specification given in Cooling water data on page 28. Make sure water supplies are connected in parallel. Refer to Figure: The controls/connectors on the rear of the dry pumping system. We recommend use of quick connectors to decrease the risk of water spillage during connection and disconnection. Some pump variants are supplied with quick connector mating halves. The quick connector mating halves are available as an accessory kit. Refer to Accessories on page 94.

For minimum water consumption, control the cooling water flow to the system.

Obey the instructions that follows to connect the cooling water supply. Make sure that the system receives the correct water flow rate. Before you start, make sure that the electrical power supply to the system is set to off:

- 1. Use 3/8 inch BSP male pipe fittings to attach the female quick release connector to the cooling water supply hose.
- 2. Use 3/8 inch BSP male pipe fittings to attach the male quick release connector to the cooling water return hose.
- 3. Remove the dust caps from the cooling water inlet and outlet.
- 4. Connect the water return hose to the cooling water outlet (*Figure: The controls/connectors on the rear of the dry pumping system*).
- 5. Install a water flow meter into the water supply line close to the pump and then connect the water supply hose to the cooling water inlet (*Figure: The controls/connectors on the rear of the dry pumping system*).
- 6. Turn on the cooling water supply.
- 7. Switch on the electrical power to the system. The water valves in the pump cooling system will automatically open in a pre-determined sequence. When the power is

set to on, after 12 seconds all the main pump water valves will open for a period of 20 seconds.

8. While the main pump water valves are open, adjust the water flow rate so that it meets the requirements given in *Table: Water consumption data*.

■ Note:

All the water valves will close again after 20 seconds and the flow rate displayed by the water flow meter will decrease. If necessary, cycle the power to the pump to re-open the valves for a further 20 seconds to continue setting the water flow rate.

- 9. Remove the water flow meter after the water flow rate is set.
- 10. Do the inspection and leak check of the water hoses, pipelines and connections.
- 11. Turn off the water supply.

■ Note:

For iXL900R and iXL950R, use 1/2 inch BSP.

4.6 Install additional safety equipment



WARNING: HAZARDOUS GASES

Risk of injury. If the process tool or control system needs to know the total flow rate of nitrogen to the system for safety reasons, install applicable measurement equipment in the nitrogen supply pipeline.



WARNING: NITROGEN PURGE

Risk of injury. If you use the nitrogen purges to dilute dangerous gases to a safe level, make sure that the system shuts down if the nitrogen supply to the system fails.

If the sensors or microprocessors fail, the total flow rate of nitrogen displayed or output by the system can be incorrect. If it is necessary to know the total flow rate of nitrogen to the dry pump for safety reasons, install applicable measurement equipment in the nitrogen supply pipeline. If a rotameter is installed, make sure that it is applicable for use with nitrogen and that it is correctly calibrated.

If the nitrogen supply to the system fails, a warning message will be shown on the PDT (if installed) and will be sent to any interfacing system connected to the system. Make sure that the installation is configured so that it remains safe if there is a failure of the nitrogen supply to the system.

If an alarm condition occurs (and the system is not configured to 'run til crash' refer to *Automatic shut down* on page 60) the system will shut down automatically. Make sure that the installation remains safe if the system shuts down automatically.

5. Commission

5.1 Commission the system

WARNING: USE PROTECTIVE EQUIPMENTS



Risk of injury. During some application cycles the system can possibly exceed OSHA 1910.95 Occupational Noise Exposure Limits, the EU noise directive 2003/10/EC or other regional noise limits. A sound pressure survey must be conducted after installation. If necessary, set up controls to make sure that the relevant limits are not exceeded during operation and that precautions are taken to prevent personnel from exposure to high noise levels during operation.



WARNING: HOT SURFACES

Risk of burn injury. The exhaust of T variant systems will heat up to maximum temperature as soon as the electrical supply is switched on.

- 1. Switch on the external electrical supply and check that the POWER LEDs illuminate. If the LEDs do not go on, contact us. Refer to (Figure: The front panel controls and Figure: The controls/connectors on the rear of the dry pumping system)
- 2. Switch on the cooling water and nitrogen supplies.
- 3. Make sure that the exhaust extraction system is not blocked (for example, that valves in the exhaust extraction system are open).
- 4. Make sure that all openings to atmospheric pressure in the foreline vacuum system are closed.
- 5. Press the LOCAL CONTROL button (*Figure: The front panel controls*) and check that the green LOCAL CONTROL LED (*Figure: The front panel controls*) comes on and then remains continuously illuminated.
- 6. Press START button (*Figure: The front panel controls*).
- 7. If the system starts and continues to operate, continue at Step 8. If a warning or alarm condition is indicated:
 - Shut down the system: refer to *Shut down* on page 59.
 - Contact us.
- 8. Look at the pressure gauge in the inlet pipeline:
 - If the pressure is increasing, immediately shut down the system and contact us.
 - If the pressure is decreasing continue at Step 9.
- 9. After commissioning the system:
 - To continue to operate the system, refer to Start-up on page 56.
 - Otherwise, shut down the system, refer to Shut down on page 59.

5.2 Leak test the system



WARNING: GAS LEAKAGE

Risk of injury or damage to equipment. Leak test the system after installation and seal any leaks found to prevent leakage of dangerous substances out of the system and leakage of air into the system.

■ Note:

If further information on leak testing is necessary, contact supplier or us.

6. Operation

WARNING: HOT OBJECT



Risk of burn injury. Do not operate the system with the lifting eyebolts still installed or with any enclosure panels removed or damaged. Do not touch any parts of the pump(s) when the system is on. Surfaces of the pump(s) are very hot and can cause injury to people. In accordance with SEMI S2, hot surface warning labels are applied to the side panels of some iXH T variants. Testing has shown that accessible temperatures can exceed 65 °C in small areas at worst case pressure conditions at an ambient temperature of 40 °C. Under normal process operating conditions and an ambient below 25 °C, accessible enclosure temperatures are unlikely to reach this level.



WARNING: BLOCKED PIPELINE

Damage to equipment. Do not operate the pump if the pipeline is restricted or blocked as the pump will not operate correctly and can be damaged.

6.1 Start-up



WARNING: OPERATIONAL SAFETY

Risk of injury or damage to equipment. Make sure it is safe to start the system and there is no maintenance activity on components downstream of the system.



WARNING: ELECTRICAL HAZARD

Risk of electric shock. After the power is applied, all mains circuits will be energised.



WARNING: HOT SURFACES

Risk of burn injury. The exhaust of T variant systems will heat up to maximum temperature as soon as the electrical supply is switched on.



CAUTION: AUTOMATIC RESTART

Risk of injury or damage to equipment. The system is designed to ride through transient term power interruption and to automatically restart when the power is restored.



CAUTION: BLOCKED PIPELINE

Damage to equipment. Do not operate the pump if the pipeline is restricted or blocked as the pump will not operate correctly and can be damaged.

Refer to Priority of control on page 12.

- 1. Switch on the cooling water and nitrogen supply.
- 2. Switch on the electrical supply.
- 3. Make sure that the exhaust extraction system is not restricted and that valves in the exhaust extraction system are open.

The pump can be started using the MicroTIM, the PDT or the front panel control.

iXL500Q, iXL500R, iXL750Q, iXL900R and iXL950R systems: When started, the dry pump and booster in the pumping system will run a stepped start sequence:

- 1. operating initially at 80 Hz for 4 minutes.
- 2. automatically proceeding to full speed.

iXL900R and iXL950R system: When started from cold, the dry pump and booster can operate at reduced speed after the stepped start sequence. As the pump system reaches operating temperature it will automatically switch into 'Noise Reduction mode' which is the default process ready condition.

6.1.1 iXL900R and iXL950R dry pumping system noise reduction mode

When the iXL900R and iXL950R dry pumping system is not under gas load (example, at ultimate), the booster will automatically decrease to an operating speed of 50Hz (the dry pump will run at full speed). This decreases the noise made by suddenly applied gas loads such as fast opening of foreline inlet valve. Shortly after a gas load has been applied, the system will automatically respond to the demand by accelerating the booster to full speed.

6.1.2 iXL900R Ultimasave

The Ultimasave system saves electrical input power by lowering pump exhaust pressure when the dry pump operates in the no-flow (ultimate) condition between load-lock pump down cycles.

During pump down, the Ultimasave system automatically evacuates the Ultimasave vessel mounted on top of the system. The Ultimasave system detects when the pump-down phase is complete, and uses the vacuum in the Ultimasave vessel to evacuate the dry pump exhaust. The decreased exhaust operating pressure (kept by the exhaust check valve, which is factory installed as part of Ultimasave) reduces the work done by the pump mechanism. Typical power saving at ultimate (system power on iXL900R) is approximately 4 kW.

Ultimasave operates automatically, the system will detect the pump-down and ultimate phases of the load-lock cycle, user intervention is not necessary. The pressure equalisation can be heard and the system power, at ultimate, will drop. The Ultimasave system is tuned to use with the loadlock applications for which the iXL900R is intended. Use of the iXL900R on other applications can result in incorrect function of the Ultimasave system.

6.1.3 Start up through a MicroTIM

To operate the system through a MicroTIM:

- 1. If the system is to be operated by customer control equipment through the MicroTIM, make sure that no other devices have control of the system. If the system is controlled by any device, release the control before you start the pump with the MicroTIM.
- 2. Use the control equipment to set the pump start/stop signal to the interface connector and check that the Running LEDs are illuminated.
- 3. The MicroTIM takes control. The message 'MTIM IN CONTROL' will be displayed on the PDT if connected. The green 'Tool Control' LED (*Figure: The controls/connectors on the rear of the dry pumping system*) on the rear panel will illuminate.

6.1.4 Start up through a PDT

To operate the system through a PDT:

- Connect the PDT to the necessary PDT connection, front (Figure: The front panel controls) or rear (iXH/iXL only, Figure: The controls/connectors on the rear of the dry pumping system).
- Press the Control button to take the control with the PDT. The message 'PDT1 IN CONTROL' will be displayed if the front connection is used. The message 'PDT2 IN CONTROL' will be displayed if the rear connection of the iXH/iXL is used.
- Press START button (refer to Appendix A1 Pump display terminal on page 97 for more information).
- Press ENTER.
- The system will start, the Running LEDs on the pump and the Pump On LED on the PDT will flash whilst the pump is on and warming up. These LEDs will stop flashing and remain illuminated continuously when the pump has reached full speed.

6.1.5 Start up through the front panel control

To operate the system using the front panel controls (refer to *Figure: The front panel controls*):

Press and hold the 'Local Control' button (Figure: The front panel controls). The
Green 'Local Control' LED (Figure: The front panel controls) will illuminate
continuously when control is taken. The message 'Keys in Control' will be displayed
on the PDT if connected.

Press and hold the Start button (*Figure: The front panel controls*) until the pumps starts. The Running LED (*Figure: The front panel controls*) will flash while the pump starts and will remain illuminated continuously when the pump operates normally.

6.1.6 Restart the pump after an emergency stop or automatic shut down

■ Note:

If the system has automatically shut down because of high pump power, check that the pump is free to rotate before you restart the system. Contact your supplier.

If the emergency stop switch on the front panel is used to shut down the system, reset the emergency stop switch before restarting the system. Turn the emergency stop switch to reset it, then restart the system as described in *Start-up* on page 56.

If the system has been automatically shut down because of an alarm condition, the alarm condition must be corrected before restarting the system. Restart the system as described in *Start-up* on page 56.

6.2 Status indicators

Refer to Figure: The front panel controls and Figure: The controls/connectors on the rear of the dry pumping system.

6.3 Shut down



WARNING: SYSTEM CONTROL MODULE

Risk of injury or damage to equipment. If the system is shut down and is not isolated from the electrical supply, do not disconnect the PDT. Do not release control from the PDT or front panel. This can result in the system being started by another module.



WARNING: ROTATING PARTS

Risk of injury. Do not remove the inlet connections until the pump stops and the power has been isolated. The pump can take up to 3 minutes to completely stop.



CAUTION: CONDENSIBLE BYPRODUCTS

Risk of damage to equipment. If the pump is stopped without the nitrogen purge cycle (for example by using the EMS button) on processes that have condensible or solid by-products the pump possibly not restart.

The pump can only be stopped through the module in control of the pump. Only the item in control can stop the pump (refer to *Priority of control* on page 12). The pump can be shut down by one of:

- The MicroTIM
- The PDT
- The front panel controls



The EMS button will always stop the pump. It does not matter which item has control. Refer to Emergency stop on page 61.

If the pump is not required for some time, switch off the electrical supply and the cooling water supply.

6.3.1 Shut down modes

- Auto shut down introduces a nitrogen purge cycle which lasts for 15 minutes before the pump is shut down. This is the recommended shut down mode.
- Fast shut down immediately stops the pump without gas purge.
- Ramped shut down is an optional mode for this system. In some harsh applications, process residues can accumulate in the pump mechanism during shut

down and will make it difficult to restart the pump next time. To prevent this problem a special ramped shut down can be performed. Contact your supplier for more information.

6.3.2 Shut down through a MicroTIM

Use your control equipment to reset the pump start/stop signal to the interface connector. The Running LEDs will then go off, and the pump running status output signal will open.

6.3.3 Shut down through a PDT

- 1. Press the stop button on the PDT. Refer to *Appendix A1 Pump display terminal* on page 97 for more information.
- 2. Select 'Auto' or 'Fast shut down' mode.

6.3.4 Shut down through the front panel control operation

- Press and hold the stop button (Figure: The front panel controls) for 5 seconds to stop the pump in Auto shut down mode (recommended). Refer to Shut down modes on page 59.
- 2. Repeat in 10 seconds to stop the pump in Fast shut down mode. The running LED (*Figure: The front panel controls*) flashes while the pump slows down and then turn off when the pump has shut down.

6.4 Automatic shut down



CAUTION: LOSS OF WARRANTY

If 'Run 'til crash' is selected, the pumps can be damaged and warranties will be invalid on the system equipment.

Normally, if an alarm condition exists, the control system will shut down the system. For pumping systems that has a dry pump and booster combination, some alarms will only stop the booster, full system will not be stopped.

Notes:

If necessary, 'Run 'til crash' operation can be requested. In this mode of operation, most alarm conditions will be ignored and the pump(s) will continue to operate. For safety reasons, some alarms cannot be overridden and the system will automatically shut down even if 'Run 'til crash' has been selected. Refer to Table: Alarm actions.

'Run 'til crash' is automatically reset to 'off' when the electrical supply is removed.

The Tool Interface overrides the 'Run 'til crash' state selected provided it has control of the pump.

Table 23 Alarm actions

Alarm Description	Alarm stops dry pump	Alarm stops boos- ter pump	Alarm overrides 'Run 'til crash'
EMS or System Configuration (set-up) fault	Yes	Yes	Yes
Exhaust Pressure*	Yes	Yes	Yes
Booster Stator or End Cover Temperature†	No	Yes	No
Dry Pump Stator or End Cover Temperature*	Yes	Yes	No
Booster status†	No	Yes	Yes
Dry Pump status*	Yes	Yes	Yes

^{*} Not applicable to pXH, iXL250Q, iXL500Q, iXL500R, iXL750Q, iXL900R and iXL950R dry pumping systems.

6.5 Emergency stop



WARNING: HOT SURFACES

Risk of burn injury. For T variants only, the exhaust heaters will remain powered on even when the emergency stop is activated.

■ Note:

The emergency stop switch is not an electrical isolator.

To shut down the system in an emergency, press the emergency stop switch (*Figure: The front panel controls*). Alternatively, the emergency stop controls can be operated in the customer's own control system if the emergency stop circuit is connected to the system as given in *Connect to the emergency stop circuit* on page 51.

When emergency stop is selected:

- The dry pump and/or the booster pump is switched off.
- The solenoid-valve(s) in the Gas Module close, to switch off the supply of nitrogen to the pump.
- The solenoid-valve(s) in the temperature control manifold(s) de-energise with loss of temperature control.
- The PDT will display '1.01 ALARM/STOP ACTIVATED' (if connected) or it can display 'ALARM 186.01/ DP INV 0040 000 / EMS'.
- The Running LED will go off.
- The Alarm LED illuminates.
- For T variants, the exhaust heaters remain powered on.
- Booster heaters on T variants (where installed) switch off.

[†] Not applicable to dry pumping systems which do not have a booster.

6.6 Advanced control and monitoring

FABworks is a tool that can be used to monitor pumping systems over a network. For more information contact us.

For advanced applications, we have a tool that allows the pumping system configuration to be changed. For more information contact us.

For some applications it can be necessary to adjust the system operating temperatures to align with process demands. Contact us to discuss requirements and refer to *System operating temperature configuration* on page 63 for instructions on configuration.

6.7 Gas module configuration

The gas module configuration can be adjusted to suit process demands.

6.7.1 iXH single mode and single mode+

The iXH Single Mode gas module has 2 manually-adjustable operational modes:

- Medium
- Harsh

The Single Mode + gas module also has a further operational mode:

Harsh + Inlet

The factory default setting for all gas modules is Harsh, except for the iXH1220H and iXH1820H models which has the SM+96 gas module set to Medium.

Contact our service personnel for instructions on how to access the configuration menu (through the PDT) and for process-specific recommendations.

Obey the instructions that follows to change the gas module mode:

- 1. Remove the left hand side panel of the system.
- 2. Identify the gas module (Contact us for guidance).
- 3. Use a short flat-blade screwdriver to turn the adjustment screw on the front of the gas module by 1/4 turn.
- 4. If adjustment screw slot is vertical then turn clockwise for medium mode.
- 5. If adjustment screw slot is horizontal then turn anticlockwise for harsh mode.
- 6. Install side panel.
- 7. Access the Config menu on the PDT (access code is necessary, contact us).
- 8. Scroll down to Gas Process press ENTER.
- 9. Scroll through options Harsh / Med / Harsh + Inlet use ENTER to select desired option.
- 10. Scroll down to Default N₂ Setup press ENTER.
- 11. PDT displays: Set Default Yes (Press Enter) confirm default Press ENTER.

6.7.2 Multi mode

The iXH Multi Mode gas modules have a number of electronically-adjustable operational modes:

- Medium
- Harsh
- +Inlet purge
- +Exhaust purge

Contact our service personnel for instructions on how to access the configuration menu (through the PDT) and for process-specific recommendations.

Obey the instructions that follows to change the gas module mode:

- 1. Access the Config menu on the PDT (contact us for advice).
- 2. Scroll down to Gas Process press ENTER.
- 3. Scroll through options to choose gas process use ENTER to select desired option.
- 4. Scroll down to Default N₂ Setup press ENTER.
- 5. PDT displays: Set Default Yes (Press Enter) confirm default Press ENTER.

6.7.3 iXL variants

iXL500 variants has a gas module for LV shaft seal purge only. iXL250Q, iXL750Q, iXL900R and iXL950R variants are not installed with gas modules.

6.8 System operating temperature configuration

The system operating temperature configuration can be adjusted to suit process demands. Contact our service personnel for instructions on how to access the configuration menu (through the PDT) and for process-specific recommendations.

Obey the instructions that follows:

- 1. Access the Config menu on the PDT (requires an access code, contact us).
- 2. Scroll to Temp Setpoints press ENTER.
- 3. Scroll to Set DP Temp or Set MB Temp press ENTER.
- 4. Scroll to desired temperature Press ENTER.

■ Notes:

The Dry Pump set point is the desired surface temperature of the internal low vacuum stage.

The Booster set point is the temperature of the booster stator at which additional cooling is deployed to control booster temperatures. The booster will not necessarily reach the set point temperature at ultimate conditions.

Refer to *Table: Dry pump and booster temperature settings* for default temperature settings and ranges.

Table 24 Dry pump and booster temperature settings

Temperature Setting	Range in which temperature can be set (°C)	Default value (°C)
Dry pump		
Standard iXH variants	70 - 135	110

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Temperature Setting	Range in which temperature can be set (°C)	Default value (°C)
 iXH T variants containing 450H dry pump 	140 - 160	140
 iXH T variants containing 500H dry pump 	110 - 160	140
• iXH1210HTX	50 - 150	150
• iXH3030T	110 - 160	160
 All other iXH T variants 	110 - 150	150
• iXL250Q	-	105
• iXL 500	126 - 136	131
• iXL750Q, iXL900R and iXL950R dry pumps	-	120
Booster		
• iXH610 only	5 or 55	55
• iXH1210HTX only	-	140
• iXH TX variants	-	110
all other variants	5 - 100	100

7. Maintenance



WARNING: HAZARDOUS VOLTAGE

Risk of electric shock. Only personnel specially trained to perform electrical maintenance should attempt troubleshooting in electrical enclosures. These enclosures contain hazardous voltages and are not operator areas. Wait for a minimum of 4 minutes after switching off the electrical supply before touching any electrical component on the system.



WARNING: SYSTEM LEAKAGE

Risk of injury or damage to the equipment. Do a leak test of the system after maintenance. If leaks are found, seal them to prevent dangerous substances leaking out of the system or air getting in to the system.

7.1 Safety and maintenance frequency



WARNING: MAINTENANCE SAFETY

Risk of injury or damage to equipment. Obey the safety instructions and make note of all precautions. Failure to do so can cause injury to people and damage to equipment.



WARNING: HAZARDOUS MATERIAL

Risk of injury or death. Electricity and nitrogen are possible hazardous energy sources. Lockout/Tagout sources before you do any maintenance to the pump.



WARNING: HOT SURFACES

Risk of burns. Do not touch the pump exhaust and check valve (if installed) while the pump is in operation since the temperatures of these parts can cause burns. These parts will remain hot after the pump has stopped.





Risk of injury or death. Personal protective equipment should be checked and used as specified by its supplier. Hazardous chemicals that have been pumped are located in the pumps and piping. Use of correct protective gloves and clothing along with a respirator is recommended if contact with substances is possible. Particular caution should be exercised when you work with fluorinated materials which can possibly have been exposed to temperatures greater than 260 °C. Refer to our safety data sheets for more information.

 Make sure that the maintenance technician knows the safety procedures related to the products pumped.

- Allow the pumps to cool to a safe temperature before installing the lifting eye bolts or starting maintenance work.
- Vent and purge the system with nitrogen before starting maintenance work.
- Isolate the system and other components in the process system from the electrical supply so that they cannot be operated accidentally. Note that the emergency stop switch on the system is not an electrical isolator, unless a disconnect box accessory is installed.
- Wait for minimum 4 minutes after switching off the electrical supply before touching any electrical component on the system.
- Route and secure cables, hoses and pipelines during maintenance to prevent possible trip hazard or entrapment.
- Make sure that oil or water collected in the secondary containment drip tray is removed before you move the system.
- Remove the enclosure panels only with the use of a special tool when the system
 has been stopped and allowed to cool sufficiently. As an indication the system
 should be left for 1 hour with cooling water still connected with flow
 characteristics as given in *Technical data*.
- Wear the correct safety clothing when coming into contact with contaminated components. Dismantle and clean contaminated components inside a fume cupboard.
- Check the pump rotation direction again if the electrical supply has been disconnected.
- O-ring replacement intervals vary depending on the application.
- Dispose of components, grease and oil safely.
- Take care to protect sealing faces from damage.
- Do not touch or inhale the thermal breakdown products of fluorinated materials which can be present if the system has been overheated to 260 °C and above. These breakdown products are very dangerous. Fluorinated materials in the system can include oils, greases and seals. The system can have overheated if it was misused, if it malfunctioned or if it was in a fire. Our safety data sheets for fluorinated materials used in the pump are available on request.

The system requires little user maintenance. Pump protection sensors installed in the system do not require routine maintenance. The maintenance operations that can be carried out are described in the sections that follows. Other maintenance must be carried out by our service centres (refer to *Service* on page 92). The frequency of maintenance operations depends on the process. Adjust the frequency of maintenance operations according to user experience.

When maintaining the system use replacement parts, seals and fittings supplied by us. Refer to *Service* on page 92. Make sure that the nitrogen and cooling water supplies are connected in parallel and that they agrees the specifications given in *Technical data*. For more information contact us.

7.2 Relocate the dry pumping system for maintenance

WARNING: PROTECTIVE EQUIPMENT



Risk of injury or death. The substances collected in the exhaust pipe, elbow and check valve can be dangerous. Do not let these substances contact skin or eyes. Do not inhale vapours from these substances. Install blanking caps to the inlet and outlet flanges when moving the exhaust pipe, elbow or check valve around the workplace.

The majority of synthetic oils/grease can cause inflammation of the skin (dermatitis). Safety precautions must be taken to prevent prolonged skin contact with these substances. Use of correct protective gloves and clothing along with a respirator is recommended if contact with the substance is possible. System process gases and residue can be highly toxic. Take all necessary precautions when you handle the components that have, or can have, come into contact with them, including O-rings, lubricants and all exhaust accessories.



WARNING: HEAVY OBJECT

Risk of physical injury. Use correct lifting equipment to move the system. Failure to do so can cause injury to people and damage to the equipment.





Risk of toppling. Do not exceed the topple angle of 10° when you move the system. If the system topples it can cause personal injury or damage to the equipment. Move the system on its castors to its operating position. The system should only be moved for short distances over flat surfaces. If the floor surface is uneven or has obstacles the system should be lifted with correct lifting equipment. If lifting the system is impractical or there are other site difficulties, contact us for advice.



CAUTION: COOLING WATER TEMPERATURE

Risk of damage to equipment. Drain the cooling water from the system if transporting or storing it in conditions where the cooling water can freeze. Failure to do so can cause the cooling water to freeze in the system and damage the pump(s) and/or the cooling water pipelines.

To remove the system from its operating location and move it to another location for maintenance, obey the instructions that follows:

- 1. Purge the system and shut down as described in *Operation* on page 56 and allow the system to cool down.
- 2. Isolate the power and then disconnect the mating half from the electrical supply connector, then isolate the water and the gas purge supply.
- 3. To improve hot swapping, apply one of the possible improvements that follows:
 - When a pump running at operating temperature is stopped, leave the cooling water connected and flowing for a period of at least 30 minutes.
 - When a pump running at operating temperature is stopped, drain the water out of the cooling system immediately, following published procedures. It is

critical the water system is drained in 2 minutes of stopping the water flow to the pump.

Note:

When you drain the water system of a hot pump, make sure the water is drained into a correct container (for example, bottle or drum-like container with a small neck) to prevent splashing of the cooling water.

- When a pump running at operating temperature is stopped, disconnect only the water inlet hose and leave the outlet hose connected. This gives a release path for the pressure that can build up in the pump water system and prevents damage to the pump. This method also helps the pump temperature to be kept as high as possible if the pump is on a process tool and is only being temporarily stopped.
- 4. Switch off the nitrogen and cooling water supplies. Disconnect the nitrogen supply. Take care as any trapped gas under pressure is released. Disconnect the cooling water supply followed by the cooling water return.
- 5. Disconnect the inlet and outlet from the vacuum and exhaust systems and install blanking caps.
- 6. If necessary, disconnect the air extraction port from the factory extraction system.
- 7. If necessary disconnect any accessories from the system.
- 8. Adjust the levelling feet so that the system rests on the castors.
- 9. Move the system to the location where maintenance will be carried out. After maintenance is complete, re-install the system as described in *Installation* on page 36.

7.3 Draining the cooling water



WARNING: PERSONAL PROTECTIVE EQUIPMENT

Risk of injury. Use correct protective gloves and eye protection when yo do this procedure. Personal protective equipment (PPE) should be checked and used as specified by its supplier.



WARNING: HOT SURFACE

Risk of burn injury. The exhaust of T variant systems will heat up as soon as the electrical supply is switched on.

- 1. Relocate the system for maintenance as stated in *Relocate the dry pumping system for maintenance* on page 67.
- Connect a regulated clean dry air supply (5 barg or 73 psig) to the cooling water supply connection (*Figure: The controls/connectors on the rear of the dry pumping* system). Do not turn on the air supply yet.
- Connect a drain hose to the cooling water return connection (Figure: The controls/ connectors on the rear of the dry pumping system). Put the open end of the drain hose in a applicable collection container.
- 4. Turn on the clean dry air supply.

5. Monitor the drain hose outlet until no further cooling water is purged.

Install the external EMS link plug (supplied) to the EMS connection on the rear of the system (*Figure: The controls/connectors on the rear of the dry pumping system*). Failure to do so will result in being unable to purge the water system effectively.

- 1. Connect the system to an applicable mains electrical supply. The control system will now open each temperature control valve, purging the cooling water from all flow paths. After 2 minutes, remove the electrical supply. Wait for 10 seconds and then connect the electrical supply again and repeat the entire process. Continue repeating until no further cooling water is purged from the system.
- 2. The cooling water drain procedure is now complete. Disconnect the air supply, electrical supply and the drain hoses. Dispose of the drained cooling water appropriately.

7.4 General maintenance



CAUTION: ABRASIVE CLEANING MATERIALS

Risk of damage to equipment. Do not use cleaning materials based on strong alkalis, aggressive or chlorinated solvents. Do not use cleaning materials containing abrasives.

The system is given a charge of oil before it leaves the factory. It is not necessary to check or adjust oil levels between major overhauls.

- 1. We recommend carrying out a monthly visual inspection of the system in situ. Check that the cables, hoses and pipelines bringing services to the pump are in good condition and make sure that all connections are secure.
- 2. The maintenance that can be done on the system is as follows:
 - Inspect the connections, pipelines, cables and fittings inside the pump enclosure, refer to *Inspect the connections, pipelines, cables and fittings* on page 69.
 - Inspect and clean exhaust pipe, elbow, and check valve.

Contact us for more details and training.

■ Note:

The system is supplied with a trapped O-ring or a metal seal for the exhaust connection, based on pump type and anticipated exhaust temperatures. Make sure that seals are always replaced with the same type.

7.5 Inspect the connections, pipelines, cables and fittings



WARNING: LOCKOUT AND TAGOUT

Risk of injury or death. Electrical, nitrogen and water supplies are all potentially hazardous energy sources. Lockout/Tagout sources before you do the maintenance to the pump.

If the system is not relocated for maintenance, make sure all supplies are locked out and tagged out before starting the following procedure.

- 1. Remove the enclosure side and top panels.
- 2. Check that all the connections are secure, tighten any loose connections.
- 3. Do an inspection of all cables, pipelines, hoses and connections and check that they are not corroded or damaged and do not leak. Repair or replace any pipelines, hoses and connections that are corroded or damaged or which leak.
- 4. Install the enclosure side and top panels again.

7.6 Ultimasave maintenance

There are no specific maintenance activities necessary for the Ultimasave power reduction system.

Visually inspect the pipework and Ultimasave vessel for damage after maintenance or transport of the iXL system.

8. Fault finding

8.1 Warnings

The pump controller gives a warning when a problem is encountered. Once the problem that caused a warning has been corrected, the warning is cleared by the pump controller.

8.1.1 LED warning indicators

If the pump encounters a problem, warnings are indicated on the LEDs on the front control panel, the rear panel and on the PDT if installed.

The warning LEDs on the front control panel and rear panel illuminate continuously when a warning is given.

If a PDT is installed, the warning LED flashes to indicate a new warning. Refer to *Warning / Alarm display and acknowledgement* on page 98 for more information on how warnings are indicated and how they can be acknowledged using the PDT.

Once all the warnings are cleared, the warning LEDs extinguish.

8.1.2 PDT warnings

If a PDT is installed, each warning causes a warning message to be displayed. Refer to *Warning / Alarm display and acknowledgement* on page 98 for more information on how warnings are handled by the PDT.

Table: Warnings lists the warning messages that can be displayed on the PDT with possible causes and actions which should be taken.

Table 25 Warnings

Warning message on PDT	Action message on PDT
Warning 1.01 - Power interrupt on page 72	Check pwr supply
Warning 31.13 - Gas missing on page 73	See manual
Warning 31.01 - SYS CONFIG FAULT on page 73	See manual
Warning 35.10 - N2 Purge Low on page 73	Check N ₂ supply
Warning 35.11 - N2 Purge High on page 73	Check Gas Module
Warning 35.13 - Sensor missing on page 73	-
Warning 39.11 - Exh Press High on page 73	Exhaust Blocked Service Pump
Warning 39.13 - Sensor missing on page 74	-
Warning 51.13 - Sup Missing on page 74	See manual
Warning 54.11 - MB Temp High on page 74	See manual
Warning 54.13 - Sensor missing on page 74	-
Warning 55.13 - Sensor missing on page 74	-
Warning 57.11 - DP E/C Temp High on page 74	See manual

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Warning message on PDT	Action message on PDT
Warning 57.13 - Sensor missing on page 74	-
Warning 62.11 - MB E/C Temp High on page 75	See manual
Warning 62.13 - Sensor missing on page 75	-
Warning 63.11 - DP Temp High on page 75	See manual
Warning 63.13 - Sensor missing on page 75	-
Warning 70.11 - DP Temp 2 High on page 75	See manual
Warning 70.13 - Sensor missing on page 75	-
Warning 71.13 - AC Sup Missing on page 75	See manual
Warning 84.11 - Exh Temp High on page 75	See manual
Warning 84.13 - Sensor missing on page 76	-
Warning 152.01 - Valve Not Shut on page 76	Check Gate Valve
Warning 153.01 - Valve Not Open on page 76	Check Gate Valve
Warning 176.01 - MB INV xxxx yyyy on page 76	хххх уууу ааааааааааааааа
Warning 176.13 - No MB Inv Comms on page 76	See manual
Warning 186.01 - DP INV xxxx yyyy on page 76	хххх уууу ааааааааааааааа
Warning 186.13 - No DP Inv Comms on page 76	See manual
Warning 196.01 - DP Inv xxxx yyyy on page 76	Diag aaaa bbbb/zzzzzzzzzzzzz
Warning 196.01 - DP Not Running on page 77	See manual
Warning 196.13 - No DP Inv Comms on page 77	See manual
Warning 206.01 - DP Inv xxxx yyyy on page 77	Diag aaaa bbbb /zzzzzzzzzzzzzz
Warning 206.01 - DP Not Running on page 77	See manual
Warning 206.13 - No DP Inv Comms on page 77	See manual
Warning 314.11 - Speed Too Low on page 77	Stop Pump/Contact Service

Some of these warnings apply to pump sensors that are only present on certain system variants. Some of these warnings apply to accessories and can only be encountered if the particular accessory is installed.

Fault	Warning 1.01 - Power interrupt
Cause	There has been a brownout of the electrical supply to the pump lasting more than 1 second.
Remedy	Check the electrical supply.

Fault	Warning 31.13 - Gas missing
Cause	The gas module is not communicating with the pump controller.
Remedy	Contact us.
Fault	Warning 31.01 - SYS CONFIG FAULT
Cause	The wrong type of gas module has been installed.
Remedy	Contact us.
Fault	Warning 35.10 - N2 Purge Low
Cause	The Nitrogen supply flow rate is too low the supply can not be connected or switched on the supply line or filter is possibly blocked.
Remedy	Check the Nitrogen supply is connected and switched on and that pipelines and filters are not blocked.
Fault	Warning 35.11 - N2 Purge High
Cause	The Nitrogen supply flow rate is too high the gas module and PDT settings do not match.
Remedy	Check the gas module and PDT settings, refer to <i>Gas module configuration</i> on page 62.
Cause	The Nitrogen supply flow rate is too high the gas module can be faulty
Remedy	Contact us.
Fault	Warning 35.13 - Sensor missing
Cause	The transducer is disconnected or failed.
Remedy	Contact us.
Fault	Warning 39.11 - Exh Press High
Cause	 The pressure in the exhaust pipeline is too high. A valve in the pipeline is possibly shut. There is possibly process debris or condensation in the exhaust pipeline. You can have too many pumping systems connected to the exhaust pipeline.
Remedy	Refer to <i>Unplanned shut down and alarms</i> on page 81 to determine the exhaust pressure that caused the warning. Check that all valves in the exhaust line are open and consider whether process debris or condensation are likely.

Fault	Warning 39.13 - Sensor missing
Cause	The exhaust pressure transducer is not installed, or is disconnected or failed.
Remedy	Contact us.
Fault	Warning 51.13 - Sup Missing
Cause	There is a communication problem in the pump controller. Refer to <i>Pump</i> controller communications on page 87 for more information.
Remedy	Cycle the power to the pump. If the warning continues, contact us to replace the pump controller.
Fault	Warning 54.11 - MB Temp High
Cause	The temperature of the booster pump is too high.
Remedy	Check that cooling water is connected, set to on and is to specification given in <i>Cooling water data</i> on page 28.
Fault	Warning 54.13 - Sensor missing
Cause	The booster temperature sensor has possibly become disconnected or failed.
Remedy	Check that the sensor is installed and is correctly connected. <i>Cooling water data</i> on page 28
Fault	Warning 55.13 - Sensor missing
Cause	The dry pump temperature sensor is possibly disconnected or failed.
Remedy	Check that the sensor is installed and is correctly connected.
Fault	Warning 57.11 - DP E/C Temp High
Cause	The temperature of the dry pump end cover is too high.
Remedy	Check that cooling water is connected, switched on and is to specification given in <i>Cooling water data</i> on page 28.
Fault	Warning 57.13 - Sensor missing
Cause	The dry pump end cover temperature sensor has possibly become disconnected or failed.
Remedy	Check that the sensor is installed and is correctly connected.

Fault	Warning 62.11 - MB E/C Temp High
Cause	The temperature of the booster end cover is too high.
Remedy	Check that cooling water is connected, switched on and is to specification given in <i>Cooling water data</i> on page 28.
Fault	Warning 62.13 - Sensor missing
Cause	The booster end cover temperature sensor is possibly disconnected or failed.
Remedy	Check that the sensor is installed and is correctly connected.
Fault	Warning 63.11 - DP Temp High
Cause	The internal temperature of the pump is too high.
Remedy	Check that cooling water is connected, switched on and is to specification given in <i>Cooling water data</i> on page 28.
Fault	Warning 63.13 - Sensor missing
Cause	The dry pump temperature sensor is possibly disconnected or failed.
Remedy	Contact us.
Fault	Warning 70.11 - DP Temp 2 High
Fault Cause	Warning 70.11 - DP Temp 2 High The temperature of the pump is too high.
	·
Cause	The temperature of the pump is too high. Check that cooling water is connected, switched on and is to specification given in
Cause Remedy	The temperature of the pump is too high. Check that cooling water is connected, switched on and is to specification given in Cooling water data on page 28.
Cause Remedy Fault	The temperature of the pump is too high. Check that cooling water is connected, switched on and is to specification given in Cooling water data on page 28. Warning 70.13 - Sensor missing
Cause Remedy Fault Cause	The temperature of the pump is too high. Check that cooling water is connected, switched on and is to specification given in Cooling water data on page 28. Warning 70.13 - Sensor missing The dry pump temperature sensor is possibly disconnected or failed.
Cause Remedy Fault Cause Remedy	The temperature of the pump is too high. Check that cooling water is connected, switched on and is to specification given in Cooling water data on page 28. Warning 70.13 - Sensor missing The dry pump temperature sensor is possibly disconnected or failed. Check that the sensor is installed and is correctly connected.
Cause Remedy Fault Cause Remedy Fault	The temperature of the pump is too high. Check that cooling water is connected, switched on and is to specification given in Cooling water data on page 28. Warning 70.13 - Sensor missing The dry pump temperature sensor is possibly disconnected or failed. Check that the sensor is installed and is correctly connected. Warning 71.13 - AC Sup Missing
Cause Remedy Fault Cause Remedy Fault Cause	The temperature of the pump is too high. Check that cooling water is connected, switched on and is to specification given in Cooling water data on page 28. Warning 70.13 - Sensor missing The dry pump temperature sensor is possibly disconnected or failed. Check that the sensor is installed and is correctly connected. Warning 71.13 - AC Sup Missing The pump controller cannot communicate with the accessory module 1. Check that the accessory module is correctly connected to the pump and then cycle the power to the pump.
Cause Remedy Fault Cause Remedy Fault Cause Remedy	The temperature of the pump is too high. Check that cooling water is connected, switched on and is to specification given in Cooling water data on page 28. Warning 70.13 - Sensor missing The dry pump temperature sensor is possibly disconnected or failed. Check that the sensor is installed and is correctly connected. Warning 71.13 - AC Sup Missing The pump controller cannot communicate with the accessory module 1. Check that the accessory module is correctly connected to the pump and then cycle the power to the pump. 2. If this warning continues, contact us.

Fault	Warning 84.13 - Sensor missing
Cause	The exhaust pipe temperature sensor has possibly become disconnected or failed.
Remedy	Contact us.
Fault	Warning 152.01 - Valve Not Shut
Cause	The foreline gate valve has failed to close.
Remedy	Examine the wiring and air supply to the Gate valve. This warning will only clear when the valve has successfully been opened and closed.
Fault	Warning 153.01 - Valve Not Open
Cause	The foreline gate valve has failed to open.
Remedy	Examine the wiring and air supply to the Gate valve. This warning will only clear when the valve has successfully been closed and opened.
Fault	Warning 176.01 - MB INV xxxx yyyy
Cause	Booster Inverter gives a warning code.
Remedy	Refer to <i>Inverter warnings and alarms</i> on page 82 for more information.
Fault	Warning 176.13 - No MB Inv Comms
Cause	The pump controller cannot communicate with the booster inverter.
Remedy	Examine the wiring between the pump controller and the booster inverter.
Fault	Warning 186.01 - DP INV xxxx yyyy
Cause	Dry pump Inverter gives a warning code.
Remedy	Refer to <i>Inverter warnings and alarms</i> on page 82 for more information.
Fault	Warning 186.13 - No DP Inv Comms
Cause	The pump controller cannot communicate with the dry pump inverter.
Remedy	Examine the wiring between the pump controller and the dry pump inverter.
Fault	Warning 196.01 - DP Inv xxxx yyyy
Cause	DP 2nd Inverter gives warning code.
Remedy	Refer to <i>Inverter warnings and alarms</i> on page 82 for more information.

Fault	Warning 196.01 - DP Not Running
Cause	DP 2nd Inverter will not start up when requested.
	·
Remedy	Check Inverter Fault History.
Fault	Warning 196.13 - No DP Inv Comms
Cause	The pump controller cannot communicate with the dry pump 2nd inverter.
Remedy	Check the wiring between the pump controller and the dry pump inverter.
Fault	Warning 206.01 - DP Inv xxxx yyyy
Cause	DP 2nd Inverter gives warning code.
Remedy	Refer to <i>Inverter warnings and alarms</i> on page 82 for more information.
Fault	Warning 206.01 - DP Not Running
Fault Cause	Warning 206.01 - DP Not Running DP 2nd Inverter will not start up when requested.
Cause	DP 2nd Inverter will not start up when requested.
Cause Remedy Fault	DP 2nd Inverter will not start up when requested. Check Inverter Fault History. Warning 206.13 - No DP Inv Comms
Cause Remedy Fault Cause	DP 2nd Inverter will not start up when requested. Check Inverter Fault History. Warning 206.13 - No DP Inv Comms The pump controller cannot communicate with the dry pump 2nd inverter.
Cause Remedy Fault	DP 2nd Inverter will not start up when requested. Check Inverter Fault History. Warning 206.13 - No DP Inv Comms
Cause Remedy Fault Cause	DP 2nd Inverter will not start up when requested. Check Inverter Fault History. Warning 206.13 - No DP Inv Comms The pump controller cannot communicate with the dry pump 2nd inverter.
Cause Remedy Fault Cause Remedy	DP 2nd Inverter will not start up when requested. Check Inverter Fault History. Warning 206.13 - No DP Inv Comms The pump controller cannot communicate with the dry pump 2nd inverter. Check the wiring between the pump controller and the dry pump inverter.

8.2 Alarms

The pump controller gives an alarm when a serious problem is encountered.

The reason for the alarm selects if, the whole system or just the booster (if installed) will shut down. Refer to *Automatic shut down* on page 60 and *Unplanned shut down and alarms* on page 81 for more information about alarms.

If the system has shut down because of an alarm, correct the problem before you restart the pump.

When the problem that caused the alarm has been corrected, the alarm is cleared by the pump controller.

8.2.1 LED alarm indicators

Alarms are indicated on the LEDs on the front control panel, the rear panel and on the PDT if installed.

The alarm LEDs on the front control panel and rear panel illuminate continuously when an alarm is given.

If a PDT is installed, the alarm LED flashes to indicate a new alarm. Refer to *Warning / Alarm display and acknowledgement* on page 98 for more information on how alarms are indicated and how they can be acknowledged through the PDT.

Once all the alarms are cleared, the alarm LEDs extinguish.

8.2.2 PDT alarms

If a PDT is installed, each alarm causes an alarm message to be displayed. Refer to *Warning / Alarm display and acknowledgement* on page 98 for more information on how alarms are handled by the PDT.

Table: Alarms lists the alarm messages that can be displayed on the PDT with possible causes and actions to be taken.

Table 26 Alarms

Warning message on PDT	Action message on PDT	
Alarm 1.01 - Stop Activated on page 79	-	
Alarm 1.01 - Sys Config Fault on page 79	-	
Alarm 39.12 - Exh Press High on page 79	Exhaust Blocked Service Pump	
Alarm 54.12 - MB Temp High on page 79 See manual		
Alarm 57.12 - DP E/C Temp High on page 79	See manual	
Alarm 62.12 - MB E/C Temp High on page 79	See manual	
Alarm 63.12 - DP Temp High on page 80	See manual	
Alarm 70.12 - DP Temp 2 High on page 80	See manual	
Alarm 84.12 - Exh Temp High on page 80	See manual	
Alarm 174.10 - Booster Stopped on page 80	See manual	
Alarm 176.01 - MB INV xxxx yyyy on page 80	хххх уууу ааааааааааааа	
Alarm 176.01 - MB Not Running on page 80	See manual	
Alarm 176.13 - No MB Inv Comms on page 80	See manual	
Alarm 184.10 - Dry Pump Stopped on page 80	See manual	
Alarm 186.01 - DP INV xxxx yyyy on page 81	on page 81 xxxx yyyy aaaaaaaaaaaaaaaa	
Alarm 186.01 - DP Not Running on page 81	DP Not Running on page 81 See manual	
Alarm 186.13 - No DP Inv Comms on page 81	See manual	
Alarm 196.01 - DP Inv xxxx yyyy on page 81	Diag aaaa bbbb/zzzzzzzzzzzzzz	
Alarm 196.13 - No DP Inv Comms on page 81	See manual	
Alarm 314.12 - Speed Too Low on page 81	Do Not Restart /Contact Service	

Fault -	Alawa 1.01 Chan Astinated
Fault	Alarm 1.01 - Stop Activated
Cause	The emergency stop has been activated.
	There is a fault with the EMS circuit or the EMS link plug has not been installed or has come disconnected.
Remedy	If the EMS button has been used on the pump, refer to <i>Restart the pump after an emergency stop or automatic shut down</i> on page 58 to reset it. Otherwise check and reset the EMS circuit and restart the pump. The alarm message will remain on the display until the system is restarted.
Fault	Alarm 1.01 - Sys Config Fault
Cause	The pump system type has not set properly.
Remedy	Contact us for a service engineer to configure the pump system type correctly or replace the pump controller electronics.
Fault	Alarm 39.12 - Exh Press High
	Action message - Exhaust Blocked , Service Pump
Cause	The Exhaust pressure has reached maximum allowed.
Remedy	Refer to <i>Unplanned shut down and alarms</i> on page 81 to determine the exhaust pressure that caused the alarm. Refer to <i>Warning 39.11 - Exh Press High</i> on page 73 for causes and actions.
	ioi causes and actions.
Fault	Alarm 54.12 - MB Temp High
Fault	
Fault Cause	Alarm 54.12 - MB Temp High
	Alarm 54.12 - MB Temp High Action message - See manual The booster temperature has reached the maximum allowed so the booster has stopped. Refer to Unplanned shut down and alarms on page 81 to determine the
Cause	Alarm 54.12 - MB Temp High Action message - See manual The booster temperature has reached the maximum allowed so the booster has stopped.
Cause	Alarm 54.12 - MB Temp High Action message - See manual The booster temperature has reached the maximum allowed so the booster has stopped. Refer to Unplanned shut down and alarms on page 81 to determine the temperature that caused the alarm.
Cause Remedy	Adarm 54.12 - MB Temp High Action message - See manual The booster temperature has reached the maximum allowed so the booster has stopped. Refer to Unplanned shut down and alarms on page 81 to determine the temperature that caused the alarm. Refer to Warning 54.11 - MB Temp High on page 74 for causes and actions.
Cause Remedy Fault	Action message - See manual The booster temperature has reached the maximum allowed so the booster has stopped. Refer to Unplanned shut down and alarms on page 81 to determine the temperature that caused the alarm. Refer to Warning 54.11 - MB Temp High on page 74 for causes and actions. Alarm 57.12 - DP E/C Temp High The dry pump end cover temperature has reached the maximum allowed so the
Cause Remedy Fault Cause	Action message - See manual The booster temperature has reached the maximum allowed so the booster has stopped. Refer to <i>Unplanned shut down and alarms</i> on page 81 to determine the temperature that caused the alarm. Refer to <i>Warning 54.11 - MB Temp High</i> on page 74 for causes and actions. Alarm 57.12 - DP E/C Temp High The dry pump end cover temperature has reached the maximum allowed so the system has stopped.
Cause Remedy Fault Cause Remedy	Action message - See manual The booster temperature has reached the maximum allowed so the booster has stopped. Refer to Unplanned shut down and alarms on page 81 to determine the temperature that caused the alarm. Refer to Warning 54.11 - MB Temp High on page 74 for causes and actions. Alarm 57.12 - DP E/C Temp High The dry pump end cover temperature has reached the maximum allowed so the system has stopped. Refer to Warning 57.11 - DP E/C Temp High on page 74 for causes and actions.

Fault	Alarm 63.12 - DP Temp High
Cause	The dry pump internal temperature has reached the maximum allowed so the system has stopped.
Remedy	Refer to Warning 63.11 - DP Temp High on page 75 for causes and actions.
Fault	Alarm 70.12 - DP Temp 2 High
Cause	The dry pump temperature has reached the maximum allowed so the system has stopped.
Remedy	Refer to <i>Unplanned shut down and alarms</i> on page 81 to determine the temperature that caused the alarm. Refer to <i>Warning 70.11 - DP Temp 2 High</i> on page 75 for causes and actions.
Fault	Alarm 84.12 - Exh Temp High
Cause	The exhaust pipe temperature has reached the maximum allowed so the system has stopped.
Remedy	Refer to Warning 84.11 - Exh Temp High on page 75 for causes and actions.
Fault	Alarm 174.10 - Booster Stopped
Cause	Booster speed too low - rotor is possibly locked
Remedy	Contact us.
Fault	Alarm 176.01 - MB INV xxxx yyyy
Fault Cause	Alarm 176.01 - MB INV xxxx yyyy Booster Inverter gives an alarm and stopped the system.
	••••
Cause	Booster Inverter gives an alarm and stopped the system.
Cause Remedy	Booster Inverter gives an alarm and stopped the system. Refer to Inverter warnings and alarms on page 82 for more information.
Cause Remedy Fault	Booster Inverter gives an alarm and stopped the system. Refer to <i>Inverter warnings and alarms</i> on page 82 for more information. Alarm 176.01 - MB Not Running
Cause Remedy Fault Cause	Booster Inverter gives an alarm and stopped the system. Refer to Inverter warnings and alarms on page 82 for more information. Alarm 176.01 - MB Not Running Booster Inverter does not start up when requested.
Cause Remedy Fault Cause Remedy	Booster Inverter gives an alarm and stopped the system. Refer to Inverter warnings and alarms on page 82 for more information. Alarm 176.01 - MB Not Running Booster Inverter does not start up when requested. Check inverter fault history.
Cause Remedy Fault Cause Remedy Fault	Booster Inverter gives an alarm and stopped the system. Refer to Inverter warnings and alarms on page 82 for more information. Alarm 176.01 - MB Not Running Booster Inverter does not start up when requested. Check inverter fault history. Alarm 176.13 - No MB Inv Comms The pump controller cannot communicate with the booster inverter during
Cause Remedy Fault Cause Remedy Fault Cause	Booster Inverter gives an alarm and stopped the system. Refer to Inverter warnings and alarms on page 82 for more information. Alarm 176.01 - MB Not Running Booster Inverter does not start up when requested. Check inverter fault history. Alarm 176.13 - No MB Inv Comms The pump controller cannot communicate with the booster inverter during startup checks.
Cause Remedy Fault Cause Remedy Fault Cause Remedy	Booster Inverter gives an alarm and stopped the system. Refer to Inverter warnings and alarms on page 82 for more information. Alarm 176.01 - MB Not Running Booster Inverter does not start up when requested. Check inverter fault history. Alarm 176.13 - No MB Inv Comms The pump controller cannot communicate with the booster inverter during startup checks. Check the wiring between the pump controller and the booster inverter.

Fault	Alarm 186.01 - DP INV xxxx yyyy
Cause	Dry Pump Inverter gives an alarm and stopped the system.
Remedy	Refer to <i>Inverter warnings and alarms</i> on page 82 for more information.
Fault	Alarm 186.01 - DP Not Running
Cause	Dry Pump Inverter does not start up when requested.
Remedy	Check inverter fault history.
Fault	Alarm 186.13 - No DP Inv Comms
Cause	The pump controller cannot communicate with the dry pump inverter during start up checks.
Remedy	The pump controller cannot communicate with the dry pump inverter during start up checks.
Fault	Alarm 196.01 - DP Inv xxxx yyyy
Fault Cause	Alarm 196.01 - DP Inv xxxx yyyy DP 2nd Dry Pump Inverter gives an alarm and stopped the system.
Cause	DP 2nd Dry Pump Inverter gives an alarm and stopped the system.
Cause Remedy Fault	DP 2nd Dry Pump Inverter gives an alarm and stopped the system. Refer to <i>Inverter warnings and alarms</i> on page 82 for more information. Alarm 196.13 - No DP Inv Comms
Cause Remedy	DP 2nd Dry Pump Inverter gives an alarm and stopped the system. Refer to <i>Inverter warnings and alarms</i> on page 82 for more information.
Cause Remedy Fault Cause Remedy	DP 2nd Dry Pump Inverter gives an alarm and stopped the system. Refer to Inverter warnings and alarms on page 82 for more information. Alarm 196.13 - No DP Inv Comms The pump controller cannot communicate with the dry pump 2nd inverter. Check the wiring between the pump controller and the dry pump inverter.
Cause Remedy Fault Cause	DP 2nd Dry Pump Inverter gives an alarm and stopped the system. Refer to <i>Inverter warnings and alarms</i> on page 82 for more information. Alarm 196.13 - No DP Inv Comms The pump controller cannot communicate with the dry pump 2nd inverter.
Cause Remedy Fault Cause Remedy	DP 2nd Dry Pump Inverter gives an alarm and stopped the system. Refer to Inverter warnings and alarms on page 82 for more information. Alarm 196.13 - No DP Inv Comms The pump controller cannot communicate with the dry pump 2nd inverter. Check the wiring between the pump controller and the dry pump inverter.

8.3 Unplanned shut down and alarms

The system is installed with a number of pump protection sensors that will give warnings and alarms. Refer to *Table: Pump protection sensors*

Table 27 Pump protection sensors

Sensor	Warning condition caused	Alarm condition caused
Exhaust pressure transducer for iXH excluding systems containing the 450H dry pump for all systems containing iXH450H dry pump	0.35 barg (5 psig) 0.2 barg (3.2 psig)	0.55 barg (8 psig) 0.35 barg (5 psig)
DP TEMP		

Sensor	Warning condition caused		Alarm condition caused
- iXH systems containing 100 and 200 dry pumps:			
Standard	130 °	С	140 °C
T variants	160 °C		170 °C
- iXH systems containing 200H dry pump:			
Standard and T variants	160 °C		170 °C
- iXH3030:			
Standard	160 °	С	170 °C
T variant	170 °	С	180 °C
- iXH systems containing 450H and 500H dry pump	5:		
Standard and T variants	175 °C		185 °C
- iXL250Q	150 °C		165°C
- all iXL500 systems	139 °C		144 °C
- all iXL750Q, iXL900R and iXL950R systems	180°C		190°C
DP TEMP 2			
iXH3030T	140 °C		150°C
iXH4550HT	145 °C		155 °C
iXH6050HT	145 °C		155 °C
DP Endcover			
iXH3030T	100°C		110°C
MB Stator			
iXH610 only	60 °C		70 °C
iXH1210HTX	150 °C		160 °C
all other iXH and iXL variants	120 °C		130 °C
MB endcover, T variants only	100 °C		110 °C

Refer to *Automatic shut down* on page 60 for information about alarms and automatic shut down conditions.

If the system has an unplanned shut down, make sure that the cause of the shut down is identified and corrected before restarting. If in doubt, contact us.

■ Note:

The high temperature alarms on our systems are system protection trips and should be considered as an abnormal running condition. If a system has tripped due to any high temperature alarm the system should be investigated and the reason for the alarm established. Once the fault has been remedied the system should be left for a minimum of 30 minutes before attempting to restart.

8.4 Inverter warnings and alarms

The inverters used to drive the dry pump and booster can also give warnings and alarms if problems are identified. Inverter warning and alarm codes are displayed by the PDT if installed.

The alarm and warning codes are each reported as a 16-bit word encoded as 4 hexadecimal numbers. The codes are displayed as follows:

1234 5678

Where:

- The first 4 digits signify an Alarm code and,
- The second 4 digits signify a Warning code,
- Digits 1 8 are reported as hexadecimal digits from 0 to F.

To determine the cause of a warning or alarm, first decode each hexadecimal number. 0 indicates that there is no alert for that bit. Normally only codes of 1, 2, 4 or 8 for each bit are seen but if two or more events occur in the same bit then these will be added together.

For example:

5 = 1 + 4 so if code 5 is displayed it means that alerts 1 AND 4 are active.

B = 1 + 2 + 8 so if code B is displayed it means that alerts 1, 2 AND 8 are active.

To decode inverter warning and alarm codes, refer to *Table: Hexadecimal to digital* conversion to convert the hexadecimal digits into alert combinations and then refer to and *Table: Inverter warning codes*.

Table 28 Hexadecimal to digital conversion

BIT SET COMBINATIONS			
HEXADECIMAL	DECIMAL	Combination	
F	15	8+4+2+1	
E	14	8+4+2	
D	13	8+4+1	
С	12	8+4	
В	11	8+2+1	
Α	10	8+2	
9	9	8+1	
8	8	8	
7	7	4+2+1	
6	6	4+2	
5	5	4+1	
4	4	4	
3	3	2+1	
2	2	2	
1	1	1	

Table 29 Inverter alarm codes

INVERTER ALARMS					
BIT SET	Fault Code Combination	PDT reported fault name	Description		
	8	ACCELERATION_TO	If motor has not accelerated to a minimum speed of 10 Hz in 60 secs then drive will try to restart 3 times before giving alarm		
1	4	OVERLOAD_TO	Alarm given when dry pump speed is below 7 Hz for 3 minutes or 30 minutes for a booster		
	2	SC_MODE_INTERLOCK	Internal fault contact us		
	1	FLASH_DOWNLOAD_ FAULT	Internal fault contact us		
	8	SELF_TEST_FAULT	Inverter diagnostic registers also checked, as per <i>Table: Inverter diagnostic display text</i> , and text output as per that table. Self test fault can be because of invalid data value read for address, data rate, uninitialised analogue input channel.		
	4	OSTEST_FAULT	Internal fault contact us		
2	2	EEPROM_FAULT	Inverter diagnostic registers also checked, as per <i>Table: Inverter diagnostic display text</i> , and text output as per that table. EE-PROM Parameter Upload Incomplete or subsequent EEPROM communication failure.		
	1	PWM_TRIP	Inverter output switched off, active when drive not running. Restart pump or cycle power to reset.		
	8	MISSING_PHASE_TIMEOUT	Indicates a missing input phase - check power connections to pump and fuses in supply.		
3	4	EMS	Warning should appear first and then pump trips after 10 minutes. EMS has been activated. Check EMS button at front and EMS plug in the back of pump controller.		
	2	DESAT_FAULT	Internal fault contact us		
	1	UNDERT	Inverter is too cold. See warning register to determine source of problem.		

INVERTER ALARMS					
BIT SET Fault Code Combination PDT reported fault name			Description		
	8	OVERT	Motor/Drive system over temperature - refer to warning code to determine source. Check cooling.		
4	4	OVERI	Motor overcurrent		
	2	OVERV	Inverter overvoltage		
	1	Reserved	Reserved		

Table 30 Inverter warnings codes

	Inverter warnings				
BIT	Fault Code Combina- tion	Name	Description		
5	8	SELFTEST_WARNING	Inverter diagnostic registers also checked, as per <i>Table: Inverter diagnostic display text</i> , and text output as per that table. Reserved		
	4	Reserved	Condensation warning, indicates		
	2	LOWTW	that the inverter (water) temperature is lower than expected – possible causes include inverter water valve stuck open. Indicates that the inverter temper-		
	1	HIGHTW	ature is higher than expected – possible causes include no or low cooling water flow, inverter water valve stuck closed or water pipe to inverter blocked.		
6	8	HIGHTC	Controller temperature above upper limit / Controller temperature sensor open circuit - check water supply		
	4	HIGHTS	Inverter heat-sink temperature above upper limit / Inverter heat-sink temperature sensor open circuit - check water supply		
	2	HIGHTM	Motor temperature above upper limit / Motor temperature sensor open circuit - check water supply The loss of one of the three input phases has been detected - check		
	1	MISSING_PHASE	mains supply to drive or blown fuses		

	Inverter warnings				
BIT	Fault Code Combina- tion	Name	Description		
7	8	UTCREG	Upper controller temperature regulator active - current limit reduced - check cooling		
	4	UTSREG	Upper heat sink temperature regulator active - current limit reduced - check cooling		
	2	Reserved	Reserved		
	1	LVREG	Lower voltage regulator active - check mains voltage		
8	8	LOWVCC	Internal power supply fault - contact us		
	4	LOWTC	Low controller temperature - contact us		
	2	LOWTS	Low heatsink temperature - contact us		
	1	CAN LOSS	Normally due to loss of can bus communication on dual drive system, check usb lead is connected between master and slave drives.		

Example:

PDT shows:

0108 0200

This translates to:

alarm 1 in bit 2 - PWM_TRIP

alarm 8 in bit 4 - OVERT

warning 2 in bit 6 - HIGHTM.

This means the motor overheated and switched the output off.

The following text will be displayed if the condition is SELFTEST_WARNING, SELF_TEST_FAULT_, or EEPROM_FAULT____.

Table 31 Inverter diagnostic display text

Inverter diagnostic Register 1	Inverter diagnostic Register 2	Text display
0x8000	0x0000	INTERNAL_COMMS
0x4000	0x0000	P_CHARGE_WARNING
0x2000	0x0000	WATCHDOG_TIMEOUT
0x1000	0x0000	OSTEST_FAULT
0x0800	0x0000	EEPROM_LOW_VCC
0x0400	0x0000	EEPROM_WRITEFAIL
0x0200	0x0000	EEPROM_TIMEOUT
0x0100	0x0000	EEPROM_BYTECOUNT

Inverter diagnostic Register 1	Inverter diagnostic Register 2	Text display	
0x0080	0x0000	FLASH_BOOT_CRC	
0x0040	0x0000	FLASH_WRITE_FAIL	
0x0020	0x0000	FLASH_BLOCK_CRC_	
0x0010	0x0000	EXTERNAL_RESET	
0x0008	0x0000	SINK_TEMP_FAULT_	
0x0004	0x0000	CAL_DATA_INVALID	
0x0002	0x0000	EEPROM_BLOCK_CRC	
0x0001	0x0000	EEPROM_MAP_ID	
0x0000	0x0200	IGBT_OPEN_CCT	
0x0000	0x0100	MOTOR_OPEN_CCT	
0x0000	0x0010	MOTOR_SHORT_CCT_	
0x0000	0x0008	VOLTAGE_SENSOR	
0x0000	0x0004	CURRENT_SENSOR	
0x0000	0x0002	IGBT_OPEN_CCT	
0x0000	0x0001	IGBT_SHORT_CCT	
0x8000	0x0000	INTERNAL_COMMS	
0x4000	0x0000	P_CHARGE_WARNING	
0x2000	0x0000	WATCHDOG_TIMEOUT	
0x1000	0x0000	OSTEST_FAULT	
0x0800	0x0000	EEPROM_LOW_VCC	

8.5 Other problems

8.5.1 Pump controller communications

The pump controller has two processors that do separate functions. Under normal operation the two processors communicate with each other internally. Under fault conditions it is possible that the two processors can stop communicating. The behaviour of the system depends on its mode of operation prior to the communication failure. There can be no change in operation initially.

To minimise impact on process, the system will continue to operate normally if it was already in operation when the communication failure occurred. The gas valves and gate valves remain in the state that they were in prior to the communication failure and outputs to the MicroTIM are unaffected. However, the control can be released from the device that was 'in control' (for example PDT) and that stop requests will be ignored from all devices apart from the front panel controls.

To stop a system that has suffered a communication failure, use the EMS or use the front panel controls to 'take control' of the system and then stop it. In this situation, the warning LEDs on the pump will flash, the alarm LED will illuminate and the inlet Gate valve will close. It is not possible to use the Auto or Ramped shut down modes, the pump stops immediately without any gas purges. Any requests to start the pump will be rejected until the fault has been corrected. when the pump has stopped, cycle the

M56100880_N - Fault finding

power to the pump and attempt to restart it. Refer to *Table: Warnings* and *Table: Alarms* for actions if any warnings or alarms are given.

9. Decommissioning

9.1 Transportation

WARNING: OIL LEAKAGE



Do not drain the oil from the pump(s) if dangerous substances have been pumped or not. Blanking plates must be installed to seal all vacuum inlet and outlet ports (to prevent possible oil leakage). Make sure that the system is correctly labelled, if in doubt contact the supplier.

Follow the procedure given in *Storage* on page 90 and then read form HS1 and fill out form HS2, which can be found at the back of this manual.

10. Storage



WARNING: COOLANT CONDENSATION IN PIPELINE

Drain the cooling water from the system if transporting or storing it in conditions where the cooling water can freeze (refer to *Draining the cooling water* on page 68). Failure to do so can cause the cooling water to freeze in the system and damage the pump(s) and/or the cooling water pipelines.

Store the system as follows:

- 1. Follow the procedure given in *Relocate the dry pumping system for maintenance* on page 67.
- 2. Store the system in clean dry conditions until required.
- 3. When required for use, prepare and install the system as described in *Installation* on page 36 of this manual.

11. Disposal

WARNING: HAZARDOUS MATERIAL



Risk of damage to environment. Dispose of the system and any components safely and in accordance with all local and national safety and environmental requirements. This equipment can contain a lithium manganese dioxide battery which, under California law, requires notification for the presence of perchlorate: Perchlorate Material - special handling can apply, refer to www.dtsc.ca.gov/hazardouswaste/perchlorate/

Our products are supported by a world-wide network of our Service Centres. Each Service Centre offers a wide range of options including disposal. Refer to *Service* on page 92 for more information.

System materials applicable for recycling include cast iron, steel, PTFE, stainless steel, brass, aluminium, zinc alloy, nickel, mild steel, ABS, polyamide.

Take particular care with:

- Fluoroelastomers which have decomposed as the result of being subjected to high temperatures.
- Components which have been contaminated with dangerous process substances.
- Lithium battery.

12. Service

WARNING:



Risk of injury. When returning the system to our Service Centre or our other company, the requirements of *Service* on page 92 and of the Return of Equipment Procedure (refer to forms HS1 and HS2 at the rear of this manual) must be complied with.

■ Note:

Do not drain the oil from the system. Clearly state the pump is full of oil when completing form HS2.

Our products, spares and accessories are available from our companies and distributors world-wide. These centres employ service engineers who have undergone our comprehensive training courses. Order spare parts and accessories from our nearest company or distributor. When ordering, state for each part required:

- 1. Model and item number of the equipment
- 2. Serial number (if any)
- 3. Item number and description of the part.

Our products are supported by a world-wide network of our service centres. Each service centre offers a wide range of options including: equipment decontamination, service exchange, repair, rebuild and testing to factory specifications. Equipment that has been serviced, repaired or rebuilt is returned with a full warranty. Local service centres can also provide our engineers to support on-site maintenance, service or repair of equipment. For more information about service options, contact the nearest service centre or company.

12.1 Return the equipment or components for service

Before you send your equipment to us for service or for any other reason, you must complete a Declaration of Contamination Form. The form tells us if any substances found in the equipment are hazardous, which is important for the safety of our employees and all other people involved in the service of your equipment. The hazard information also lets us select the correct procedures to service your equipment.

If you are returning equipment note the following:

- If the equipment is configured to suit the application, make a record of the configuration before returning it. All replacement equipment will be supplied with default factory settings.
- Do not return equipment with accessories fitted. Remove all accessories and retain them for future use.
- The instruction in the returns procedure to drain all fluids does not apply to the lubricant in pump oil reservoirs.

Download the latest documents from *edwardsvacuum.com/HSForms/*, follow the procedure in HS1, fill in the electronic HS2 form, print it, sign it, and return the signed copy to us.



NOTICE:

If we do not receive a completed form, your equipment cannot be serviced.

13. Accessories



WARNING: INSTALLATION SAFETY

Risk of injury. When you install accessories in the system enclosure, make sure that the pump is switched off and Lockout and Tagout the electrical supply before removing the enclosure panels.



WARNING: HOT SURFACES

Risk of burn injury. The surfaces of the dry pump, booster and spools are very hot when the system is running. Let these surfaces cool to safe temperatures before you install accessories in the system enclosure.



CAUTION: INSTALLATION SAFETY

Risk of injury. The system power must be switched off when the MicroTIM or active accessories module is installed or removed. If it is not, these modules can be damaged. Refer to the accessory manual for more information.

Refer to the individual accessories manuals for information about installation.

The disconnect box (when installed), which agrees with the SEMI S2 requirements and is used:

- to energise and isolate the power to the system
- to isolate the electrical supply during an emergency
- for maintenance
- for troubleshooting the system

The photohelic switch/gauge, when installed, monitors the loss of extraction from the enclosure, which agrees with SEMI S2 requirements.

Table 32 Accessories

Description	Item Number		
Seismic bracket kits (refer to <i>Table: Seismic bracket kits</i>):	A50767000 or		
	A50768000		
Retrofit kit to enable installation of iXH in place of iH1000:			
For iXH1210 and iXH1210H/T	A50769000		
For iXH1220H/T	A50770000		
Exhaust extraction cover kit:			
For NW40 exhaust	A50780000		
For NW50 exhaust	A50791000		
Exhaust Check Valve Kits:			
NW40 (refer to Table: Exhaust check valve kits)	A50782000 or		
	A50787000		
NW50, PTFE Disc type (for iXL500Q, iXL500R and iXL750Q systems)	A50790000		

Description	Item Number
ISO63, Ball type (iXL900R and iXL950R)	A50833000
Nitrogen flow switches:	
Applicable for 0 - 60 slm	A50784000
Applicable for 0 - 204 slm	A50785000
Utilities kit (contains mating half quick connectors for cooling water and electri parts):	cal connector mating
Kit applicable for 380 - 460 V systems using the Harting Han® 100 A axial screw module mains connector	A50788000
Kit applicable for 200 - 230 V systems using the Harting Han® 100 A axial screw module mains connector	A50789000
Kit applicable for all systems using the Harting Han® K4/4 mains connector	A50795000
Electrical Connector mating part only	
Applicable for 380-460 V systems using the Harting Han® 100 A axial screw module mains connector	D37482833
Applicable for 200-230 V systems using the Harting Han® 100 A axial screw module mains connector	D37481833
Applicable for all systems using the Harting Han® K4/4 mains connector	D37480833
Applicable for 200 - 230 V systems using the Harting Han® 200 A axial screw module mains connector (COMBINATION SYSTEMS)	D37485835
Photohelic switch and gauge kit	A50803000
Disconnect box (used with photohelic):	
200 - 230 V 60 A maximum (applicable for systems with the Harting Han® K4/4 mains connector)	A50802000
380 - 460 V 60 A maximum (applicable for systems with the Harting Han® K4/4 mains connector)	EL0103008
200 - 230 V 100 A maximum (applicable for systems with the Harting Han® 100 A axial screw module mains connector)	A50804000
380 - 460 V 60 A maximum (applicable for systems with the Harting Han® 100 A axial screw module mains connector)	EL0103009
380 - 460 V 80 A maximum (applicable for systems rated over 60 A with the Harting Han® 100 A axial screw module mains connector)	K50005573
pXH drip tray (used to fully satisfy SEMI S2 requirements)	Contact us
Accessory modules:	
Active Accessory Module (AAM)*	D37480500
Passive Accessory Module (PAM)*	D37480550
PDT	D37280700
PDT holster	
PDT holster 1 pack	D37209800
PDT holster 10 pack	D37209801
PDT extension cable	
3.0 m	D37370591

Description	Item Number
5.0 m	D37370592
10.0 m	D37370595
15.0 m	D37370596
25.0 m	D37370597
iXL900R Ultimasave	M57727800

^{*}AAM includes a PAM

To hold the system using seismic brackets the correct brackets for each particular system needs to be ordered. Refer to *Table: Seismic bracket kits*.

Table 33 Seismic bracket kits

Seismic bracket kit	A50767000*	A50768000	M56930012	A50901000
Pumping system models	iXH100	iXH450H	iXL250Q	iXL900R
	iXH200H	iXH500H	iXL750Q	iXL950R
	iXH610	iXH3030/T		
	iXH1210/H/T	iXH3045H		
	iXH1220H/T	iXH3050H		
	iXH1820/H/T	iXH4545HT		
		iXH4550HT		
		iXH6045H/T		
		iXH6050H/T		
		pXH4500		
		рХН6000		
		iXL500Q		
		iXL500R		

^{*} The systems that use the seismic bracket kit A50767000 can be hold using only 2 seismic brackets if necessary, as described in Position the system on page 37.

■ Note:

To use an exhaust check valve on a system with an NW40 exhaust, the correct kit for the particular system needs to be ordered. Refer to Table: Exhaust check valve kits.

Table 34 Exhaust check valve kits

Exhaust Check Valve Kit	A50782000	A50832000
	iXH100	iXH450H
	iXH200H	iXH500H
	iXH610	iXH3045H
Durania a grata a andala	iXH1210/H/T	iXH3050H
Pumping system models	iXH1220H/T	iXH4545HT
	iXH1820/H/T	iXH4550HT
	iXH3030/T	iXH6045H/T
		iXH6050H/T

14. Appendix A1 Pump display terminal

The PDT accessory gives pump on/off and status reporting. Warnings and alarms are also indicated to the user. Up to two PDTs can be installed to iXH and iXL systems, up to one PDT can be installed to pXH systems.

Figure 12 Pump display terminal



14.1 LEDs

Local Control - Green illuminates continuously when the PDT has control of the pump.

Pump ON - Green (in the Pump Start button) illuminates to indicate that the pump is in operation.

Warning - Yellow illuminates to indicate that a pump warning is present. It flashes when a new warning occurs until it is acknowledged by pressing 'ENTER' when it goes continuous until the warning clears.

Alarm - Red illuminates to indicate that a pump alarm is present. It flashes when a new alarm occurs until it is acknowledged by pressing 'ENTER' when it goes continuous until the alarm clears.

14.2 Pump start / stop and control

To Start or Stop the pump the PDT must be in control, shown by the Local Control LED being illuminated.

To take or release control briefly press Control.

If something else is in control, error message 'Control locked' appears. Refer to 'Control Holder' in the Status menu.

Press Start button PDT displays:

Table 35 Pump start control

Pump State	Local Control LED	PDT display	Operator	Pump response
Stopped	On	START MENU Start Pump	Press ENTER to confirm	Pump Starts
Running	On	Pump Running Press CANCEL	Press CANCEL	No change (run- ning)
Stopped or Run- ning	Off	No PDT Control Press CANCEL	Press CANCEL	No change

Press Stop button PDT displays:

Table 36 Pump stop and control

Pump State	Local Control LED	PDT display	Operator	Pump response
Stopped	On	START MENU Start Pump	Press ENTER to confirm	Pump Starts
Running	On	Pump Running Press CANCEL	Press CANCEL	No change (run- ning)
Stopped or Run- ning	Off	No PDT Control Press CANCEL	Press CANCEL	No change

14.3 Warning / Alarm display and acknowledgement

Each new warning / alarm is displayed when it occurs, overwriting any text already present unless another unacknowledged warning / alarm is currently being displayed. The corresponding warning / alarm LED flashes to indicate a new warning / alarm.

Pressing ENTER acknowledges the warning / alarm currently displayed and the warning / alarm LED stops flashing. If available the display will show the suggested action, press ENTER again to clear.

If there is another new warning or alarm the warning / alarm LED will continue to flash and this is then displayed. Otherwise the display will revert to the original text from before the alarm(s) / warning(s) occurred.

If there are warnings / alarms still present, but they are all acknowledged, the corresponding LED remains continuously illuminated. The text indicating acknowledged warning / alarm conditions still present can be viewed in the Status menu, see below. Some alarms such as 1.01 STOP ACTIVATED remain present until the pump is manually started from the PDT or front panel controls.

Once all warning and alarm conditions have been removed, the corresponding LED is extinguished.

Out of date warnings are automatically acknowledged after 36 hours to prevent a buildup.

14.4 Menus

There are three menu buttons Normal, Status and Setup.

NR in the data part of a parameter indicates No Reading.

NP in the data part of a parameter indicates a parameter that is Not Present.

14.4.1 Normal menu

This menu is displayed when the PDT is first plugged into the pump, or accessed by pressing the Normal button. Up to 4 parameters are displayed, press up/down keys to scroll.

Table 37 Normal menu

Description	Typical Display
Serial Number	S/N 1234567
Control Holder	NONE IN CONTROL
Dry Pump current	DP CURRENT 1.1A
Booster current	MB CURRENT 1.1A

By default the 4 parameters displayed in the Normal menu are as shown above for the iXH, these can be changed through the Edit Display attributes menu, accessed from the SETUP menu. For the pXH, the default Normal menu is as shown below.

Table 38 pXH Normal menu

Description	Typical Display
Serial Number	S/N 1234567
Control Holder	NONE IN CONTROL
pXH booster current	PB CURRENT 1.1A
Dry pump current	DP Current NP

14.4.2 Status menu

- 1. Press the Status button to enter the menu. Press up/down keys to scroll.
- 2. Press CANCEL to return to Normal menu.

If a device is not installed the associated parameters will not be displayed. Parameters displayed:

Table 39 Status menu

Description	Typical Display	
Serial Number*	S/N 1234567	
Control Holder	NONE IN CONTROL	
Dry Pump current	DP CURRENT	1.1A
Booster current	MB CURRENT	1.1A
pXH Booster current	PB CURRENT	1.1A
Green Mode state	GREEN MODE STATE	Off
Gate valve open/closed state	GATE VALVE	Open
Remote Gate valve open/closed state	PB VALVE	Open
Dry pump stator reference temperature	TCS REF	100C
Dry Pump temperature	DP TEMP	100C
Dry Pump exhaust stage temperature	DP EXH STG	100C
Dry Pump End Cover temperature	DP E/C TEMP	100C

Description	Typical Display	
Dry Pump temperature 2	DP TEMP 2	100C
Booster Temperature	МВ ТЕМР	100C
Booster MB End Cover temperature	MB E/C TEMP	100C
pXH Booster Temperature	РВ ТЕМР	100C
pXH End cover Temperature	PB E/C TEMP	100C
N ₂ Flow Rate	N ₂ FLOW	44 slm
Dry Pump Power	DP POWER	1.1 kW
Booster Power	MB POWER	1.1 kW
pXH Booster Power	PB POWER	1.1 kW
Dry Pump speed in percent	DP SPEED	100 %
Dry Pump speed in Hz	DP SPEED	100 Hz
Booster speed in percent	MB SPEED	100 %
Booster speed in Hz	MB SPEED	100 Hz
pXH Booster speed in percent	PB SPEED	100 %
pXH Booster speed in Hz	PB SPEED	100 Hz
Dry Pump Inverter Temperature	DP INV TEMP	100C
Booster Inverter Temperature	MB INV TEMP	100C
pXH Booster Inverter Temperature	PB INV TEMP	100C
Dry Pump Exhaust pressure	EXHAUST	5 PSI
Dry Pump Exhaust Temperature	EXH PIPE	100C
Dry Pump Exhaust gas temperature	ЕХН ТЕМР	100C
Active gauge pressure	AG 1.1E-3 kPa	
Water Flow Rate	WATER	11.1 l/m
Run Hours	RUN HOURS	1000
pXH Run Hours	PB RUN HOURS	1000
Number of Pump Starts	PUMP STARTS	100
Time to Stop (seconds)	TIME TO STOP	900
Active Alarms and Warnings (if present)		

^{*} The PDT returns the serial number of the system it is plugged directly into. For example, if an iXH is used to control a pXH, the PDT can be plugged into one of the system. If it is plugged into the iXH, it returns the serial number of the iXH and if it is plugged into the pXH it returns the serial number of the pXH.

All warning and alarm codes from the iXH dry pump and booster are in the range 101.01 to 799.15.

All warning and alarm codes from the pXH booster are in the range 801.01 to 899.15.

14.4.3 SETUP menu

- 1. Press the Setup button to enter the menu. Menu title is shown at the top of the display. Press up/down keys to scroll.
- 2. Press ENTER to open a sub menu or CANCEL to return to Normal menu.

Table 40 SETUP menu

Description	Display
Commands menu*	Command Menu
Display Inverter Fault History menu	Inv Fault Hist
Software Version Display menu	S/W Version
Display Serial Number	Serial Num
Fit Accessory menu*	Fit Accessory
Edit IP configuration menu	IP Config
Edit Display attributes menu	Display Attr
Set Time and Date†	Set Clock
Display Pump Type	Show Pump type

^{*} This option requires a security code to access it.

Each sub menu is described below.

14.4.4 COMMANDS menu

Under the Setup menu.

- 1. Press up/down keys to scroll. Press ENTER to open a sub menu.
- 2. Press CANCEL to return to the SETUP menu.

Table 41 COMMANDS menu

Gate Valve (Open/Shut)*

MB Pump (On/Off)†

PB Pump (On/Off)†

Green Mode (On/Off)†

Green Level (Idle/Sleep/Hibernate/Mode4..8)*

Gas Valves*

Press the up/down keys to select the new settings. Press ENTER to accept. Press CANCEL to return to the COMMANDS menu.

GAS VALVES menu

- 1. Press up/down keys to scroll. Press ENTER to open a sub menu.
- 2. Press CANCEL to return to the SETUP menu. Settings do not appear if they are not installed.

Table 42 GAS VALVES menu

Set N₂ Seal
Set Inlet 1

[†] Time is set automatically when connected to a Fabworks network.

^{*} This option requires a security code to access it.

[†] The PDT must be in control to perform these functions.

Set Bypass
Set Exhaust 2

Press the up/down keys to select on / off. Press ENTER to accept. Press CANCEL to return to the GAS VALVES menu.

14.4.5 INV FAULT HIST (Display Inverter Fault History) menu

- 1. It is sub menu of the SETUP menu. Press up/down keys to scroll. Press ENTER to open a sub menu.
- 2. Press CANCEL to return to the SETUP menu.

Table 43 INV FAULT HIST (Display Inverter Fault History) menu

DP Inv Fault Hist (Dry Pump Inverter Fault History)

DP2 Inv Fault Hist (Dry Pump 2nd Inverter Fault History)

MB Inv Fault Hist (Booster Inverter Fault History)

PB Inv Fault Hist (pXH Booster Inverter Fault History)

Each inverter fault history has up to 32 entries, each has one alarm and one warning, where 1 is the most recent. Press up/down keys to scroll. Press CANCEL to return to the Inverter Fault History menu.

The inverter fault information is displayed in the format that follows:

DP Inv Fault nn

A:aaaa W:wwww

where nn is the number, aaaa is the alarm code, and wwww is the warning code.

Refer to *Inverter warnings and alarms* on page 82 for more information about inverter warnings and alarms.

14.4.6 SOFTWARE VERSION Display menu

- 1. This is a sub menu of the SETUP menu. Press up/down keys to scroll through the software version loaded in the processors.
- 2. Press CANCEL to return to the SETUP menu.

14.4.7 FIT ACCESSORY menu

- 1. This is a sub menu of the SETUP menu. Press up/down keys to scroll. Press ENTER to open a sub menu.
- Press CANCEL to return to the SETUP menu.

Table 44 FIT ACCESSORY menu

Gate Valve		
Water Sensor	(Analogue water flow)	
Active Gauge		
Exh Gas Temp	(Exhaust Gas Temperature)	

For an accessory press the up/down keys to select Fitted or Not Fitted. Press ENTER to accept. Press CANCEL to return to the COMMANDS menu.

Note:

Gate Valves have an option of Fitted No Feedback for use where position feedback switches are not installed to the gate valve.

To configure an accessory connected to the pXH, contact us.

14.4.8 IP Configuration menu

- 1. This is a sub menu of the SETUP menu. Press up/down keys to scroll. Press ENTER to open a sub menu.
- 2. Press CANCEL to return to the SETUP menu.

Table 45 IP Configuration menu

Host_Name	(display only)	
DHCP Enable	(Enabled / Disabled)*	
IP Address	(xxx.xxx.xxx.xxx)+	
Address Mask	(xxx.xxx.xxx)+	
DNS Server	(xxx.xxx.xxx)+	
Gateway	(xxx.xxx.xxx)+	
NTP Server	(display only)	
SMTP Server	(display only)	
MAC Address	(display only)	
Domain Name	(display only)	

^{*} Press the up/down keys to select Enabled or Disabled and press ENTER to accept or CANCEL to return to the IP Configuration menu.

Display only items press CANCEL to return to the IP Configuration menu.

For systems which has an iXH or iXL connected to a pXH, it is important to connect the PDT to the iXH or iXL to configure the iXH or iXL IP settings and to connect the PDT to the pXH i to configure the pXH IP settings.

14.4.9 Display attributes menu

- 1. This is a sub menu of the SETUP menu. Press up/down keys to scroll. Press ENTER to open a sub menu.
- 2. Press CANCEL to return to the SETUP menu.

Table 46 Display attributes menu

Normal display (Selects the parameters displayed in Normal)
Units...

- 1. Press up/down keys to scroll. Press ENTER to open a sub menu.
- 2. Press CANCEL to return to the Display attributes menu.
- 3. In each option the SELECT PARAMETER menu is opened, press up/down keys to scroll through the parameters. Press ENTER to select the parameter for display.
- 4. Press CANCEL to return to the SELECT LINE menu.

[†] For each address setting press the up/down keys to set the digit, press ENTER to accept and move to the next digit or CANCEL to move back to the previous digit. Pressing ENTER at the end of the line will accept the new setting and return to the Edit IP menu. Pressing CANCEL at the start of the line will cancel and return to the IP Configuration menu.

Table 47 SELECT LINE (Normal display selection menu)

Top Page 1...

Bottom Page 1...

Top Page 2...

Bottom Page 2...

- 1. Press up/down keys to scroll. Press ENTER to open a sub menu.
- 2. Press CANCEL to return to the Display attributes menu.
- 3. Press up/down keys to scroll through the units available in each option. Press ENTER to select the display units.
- 4. Press CANCEL to return to the UNITS menu.

■ Note:

The configuration options for the PDT are stored in the PDT itself and are not associated with the pump that the PDT is connected to. This means a user can transfer a PDT between pumps and keep the same settings. It also means that different units can be displayed on two PDTs connected to the same pump.

Table 48 UNITS (Units to display)

Pressure	(PSI/kPa)
Temperature	(Centigrade/Farenheit)
Speed	(RPM/Hz)
Active Gauge	(mBar/Torr/kPA)



EU Declaration of Conformity

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documentation@edwardsvacuum.com

The product specified and listed below

	Low Volt Systems	High Volt Systems
	(200-230 V)	(380-460 V)
iXH100	AC01txy2100m	ACA1txy2100m
iXH200H	AC0Btxy2200m	ACABtxy2200m
iXH450H	AC0Dtxy2300m	ACADtxy2300m
iXH500H	AC0Etxy2300m	ACAEtxy2300m
iXH610	AC11txy2110m	ACB1txy2110m
iXH610	-	ACB1txy2119m
iXH1210	AC31txy2120m	ACD1txy2120m
iXH1210H	-	ACDAtxy2229m
iXH1210H/HT/HTX	AC3Atxy2220m	ACDAtxy2220m
iXH1220H/HT/HTX	AC3Btxy2220m	ACDBtxy2220m
iXH1820/T	AC42txy2220m	ACE2txy2220m
iXH1820H/HTX	AC4Btxy2220m	ACEBtxy2220m
iXH3030/T/TX	AC53txy2230m	ACF3txy2230m
iXH3045H	AC5Dtxy2331m	ACFDtxy2331m
iXH3050H	AC5Etxy2331m	ACFEtxy2331m
iXH3050H	AC5E0B123300	ACFE0B123300
iXH3050HTX	AC5Etxy2330m	ACFEtxy2330m
iXH4545H	-	ACGDtxy0339m
iXH4545HT	AC6Dtxy2330m	ACGDtxy2330m
iXH4545HT	-	ACGDtB12339m
iXH4550HT	AC6Etxy2330m	ACGEtxy2330m
iXH6045H/HT	AC7Dtxy2330m	ACHDtxy2330m
iXH6045H	AC7Dt212331m	ACHDt212331m
iXH6045H	-	ACHDtxy0339m
iXH6050H/HT	AC7Etxy2330m	ACHEtxy2330m

Where t = 0, 1, 2, 3, 4 or 5 depending on TMS system

Where x = 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C or D depending on gas module type

Where y=1 means 'no check valve' and y=3 means 'check valve supplied'

Where m = 0 or 1 depending on the material of the dry pump

Is in conformity with the relevant requirements of European CE legislation:

2006/42/EC Machinery directive

Note: The safety objectives of the Low Voltage Directive 2014/35/EU were complied with in accordance with Annex 1 No. 1.5.1 of this directive.

2014/30/EU Electromagnetic compatibility (EMC) directive

Class A Emissions, Industrial Immunity

2006/66/EC Batteries directive

2011/65/EU Restriction of certain hazardous substances (RoHS) directive

as amended by Delegated Directive (EU) 2015/863

Based on the relevant requirements of harmonised standards:

EN 1012-2:1996 +A1:2009 Compressors and vacuum pumps. Safety requirements. Vacuum pumps

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control and laboratory

use. General requirements

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use. EMC requirements.

General requirements

This declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: 2022-05-03

You must retain the signed legal declaration for future reference

This declaration becomes invalid if modifications are made to the product without prior agreement.

Graham Rayner

VP Engineering, Semiconductor

Burgess Hill

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General Manager, Cheonan

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Declaration of Conformity

Edwards Ltd Innovation Drive Burgess Hill West Sussex RH15 9TW UK **Documentation Officer**

documentation@edwardsvacuum.com

This declaration of conformity is issued under the sole responsibility of the manufacturer.

	Low Volt Systems	High Volt Systems
	(200-230 V)	(380-460 V)
iXH100	AC01txy2100m	ACA1txy2100m
iXH200H	AC0Btxy2200m	ACABtxy2200m
iXH450H	AC0Dtxy2300m	ACADtxy2300m
iXH500H	AC0Etxy2300m	ACAEtxy2300m
iXH610	AC11txy2110m	ACB1txy2110m
iXH610	-	ACB1txy2119m
iXH1210	AC31txy2120m	ACD1txy2120m
iXH1210H	-	ACDAtxy2229m
iXH1210H/HT/HTX	AC3Atxy2220m	ACDAtxy2220m
iXH1220H/HT/HTX	AC3Btxy2220m	ACDBtxy2220m
iXH1820/T	AC42txy2220m	ACE2txy2220m
iXH1820H/HTX	AC4Btxy2220m	ACEBtxy2220m
iXH3030/T/TX	AC53txy2230m	ACF3txy2230m
iXH3045H	AC5Dtxy2331m	ACFDtxy2331m
iXH3050H	AC5Etxy2331m	ACFEtxy2331m
iXH3050H	AC5E0B123300	ACFE0B123300
iXH3050HTX	AC5Etxy2330m	ACFEtxy2330m
iXH4545H	-	ACGDtxy0339m
iXH4545HT	AC6Dtxy2330m	ACGDtxy2330m
iXH4545HT	-	ACGDtB12339m
iXH4550HT	AC6Etxy2330m	ACGEtxy2330m
iXH6045H/HT	AC7Dtxy2330m	ACHDtxy2330m
iXH6045H	AC7Dt212331m	ACHDt212331m
iXH6045H	-	ACHDtxy0339m
iXH6050H/HT	AC7Etxy2330m	ACHEtxy2330m

Where t = 0, 1, 2, 3, 4 or 5 depending on TMS system

Where x = 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C or D depending on gas module type

Where y=1 means 'no check valve' and y=3 means 'check valve supplied'

Where m = 0 or 1 depending on the material of the dry pump

The object of the declaration described above is in conformity with relevant statutory requirements:

Supply of Machinery (Safety) Regulations 2008

The objectives of the Electrical Equipment (Safety) Regulations 2016 are governed by Annex 1 1.5.1 of this regulation.

Electromagnetic Compatibility Regulations 2016 Class A Emissions, Industrial Immunity

Batteries and Accumulators (Placing on the Market) Regulations 2008

Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Relevant designated standards or technical specifications are as follows:

EN 1012-2:1996 +A1:2009 Compressors and vacuum pumps. Safety requirements. Vacuum pumps

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control and laboratory

use. General requirements

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use. EMC requirements.

General requirements

This declaration, based on the requirements of the listed Statutory Instruments and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: 2022-05-03

You must retain the signed legal declaration for future reference This declaration becomes invalid if modifications are made to the product without prior agreement.

Graham Rayner

VP Engineering, Semiconductor

BK Kim

General Manager, Cheonan

ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION

EMC (EU, UK): Class A Industrial equipment

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

RoHS (EU, UK): Material Exemption Information This product is compliant with the following Exemptions Annex III:

- 6(a) Lead as an alloying element in steel for machining purposes and in galvanised steel containing up to 0.35 % lead by weight
- 6(b) **Lead** as an alloying element in aluminium containing up to 0.4% by weight
- 6(c) Copper alloy containing up to 4% **lead** by weight
- 7(a) Lead in in high melting temperature type solder (i.e. lead based alloys containing 85% by weight or more lead)
- 7(c) I Electrical and electronic components containing **lead** in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound
- 7(c) II Lead in dielectric ceramic in capacitors for a rated voltage of 125 V AC or 250 V DC or higher
- 8(b) Cadmium and its compounds in electrical contacts
- 15 **Lead** in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages
- 34 **Lead** in cermet-based trimmer potentiometer elements

REACH (EU, UK)

This product is a complex article which is not designed for intentional substance release. To the best of our knowledge the materials used comply with the requirements of REACH. The product manual provides information and instruction to ensure the safe storage, use, maintenance and disposal of the product including any substance based requirements.

Article 33.1 Declaration (EU, UK)

This product contains Candidate List Substances of Very High Concern above 0.1%ww by article as clarified under the 2015 European Court of Justice ruling in case C-106/14.

- 1,2-dimethoxyethane (EDGME)
 - This substance is sealed within the case of the compact lithium coin cell battery and is essential to the long life and reliable performance of the battery.
- Cadmium (Cd)
 - This substance is present in electrical contacts.
- Lead (Pb)

This substance is present in certain steel / aluminium / brass / electrical or electronic components.

Additional Applicable Requirements

The product is in scope for and complies with the requirements of the following:

2012/19/EU Directive on waste electrical and electronic equipment (WEEE) Product conforms to Safety requirements for electrical equipment for measurement, control and UI 61010-1 3rd Edition laboratory use - Part 1: General requirements CCR Title 22 Division 4.5 This equipment may contain a lithium battery which requires notification for the Chapter 33: Perchlorates presence of Perchlorate Material: special handling may apply, refer to **Batteries** www.dtsc.ca.gov/hazardouswaste/perchlorate/ SEMI S2-0709 Environmental health and safety guideline for semiconductor manufacturing Equipment SEMI F47-0706 Specification for semiconductor processing equipment voltage sag immunity

材料成分声明

China Material Content Declaration

	有害物质 Hazardous Substances					
部件名称 Part name	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr VI)	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
机壳 Enclosure	Х	0	0	0	0	0
电机(泵和机械增压泵) Motors (pump and mechanical booster)	Х	0	0	0	0	0
泵和增压泵 Pump and booster	Х	0	0	0	0	0
电子元件和控件 Electronics and Controls	Х	0	Х	0	0	0
冷却系统 Cooling system	Х	0	0	0	0	0
吹扫系统 Purge system	Х	0	0	0	0	0

O: 表示该有害物质在该部件的所有均质材料中的含量低于 GB/T 26572 标准规定的限量要求。

O: Indicates that the hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.

X: 表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 标准规定的限量要求。

X: Indicates that the hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T26572.



EU Declaration of Conformity

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The product specified and listed below

	Low Volt Systems	High Volt Systems
	(200-230 V)	(380-460 V)
pXH4500	AC6000120300	ACG000120300
pXH4500	-	ACG000120310
pXH6000	AC7000120300	ACH000120300
iXL250Q	AS43001w2300	ASE3001w2300
iXL500Q	AS450zy23300	ASE50zy23300
iXL500Q	AS45313233S0	ASE5313233S0
iXL500R	AS550zy23300	ASF50zy23300
iXL750Q	AS4600yw4300	ASE600yw4300
iXL900R	-	ASF7002u4500
iXL900R	-	ASF700124550
iXL950R	-	ASF800224500
iXL950R	-	ASF8302245S0
EUV7K	-	ACH0t0120310

Where u = 2, 3, 4, 5 depending on exhaust evacuation (Ultimasave) / oil box evacuation configuration

Where w = 2,3 depending on oil box evacuation

Where y = 1, 2, 3, 4 depending on version

Where z = 1, 2, 3, 5, A or B depending on gas module type for iXL

Where t = 0, 1, 2, 3, 4 or 5 depending on TMS system

Is in conformity with the relevant requirements of European CE legislation:

2006/42/EC Machinery directive

Note: The safety objectives of the Low Voltage Directive 2014/35/EU were complied with in accordance

with Annex 1 No. 1.5.1 of this directive.

2014/30/EU Electromagnetic compatibility (EMC) directive

Class A Emissions, Industrial Immunity

2006/66/EC Batteries directive

2011/65/EU Restriction of certain hazardous substances (RoHS) directive

as amended by Delegated Directive (EU) 2015/863

Based on the relevant requirements of harmonised standards:

EN 1012-2:1996 +A1:2009 Compressors and vacuum pumps. Safety requirements. Vacuum pumps

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control and laboratory

use. General requirements

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use. EMC requirements.

General requirements

This declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: 2023-01-30

You must retain the signed legal declaration for future reference

This declaration becomes invalid if modifications are made to the product without prior agreement.

Graham Rayner

VP Engineering, Semiconductor

Burgess Hill

BK Kim

General Manager, Cheonan

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UK

Declaration of Conformity

Edwards Ltd Innovation Drive Burgess Hill West Sussex RH15 9TW **Documentation Officer**

documentation@edwardsvacuum.com

This declaration of conformity is issued under the sole responsibility of the manufacturer.

	Low Volt Systems	High Volt Systems
	(200-230 V)	(380-460 V)
pXH4500	AC6000120300	ACG000120300
pXH4500	-	ACG000120310
pXH6000	AC7000120300	ACH000120300
iXL250Q	AS43001w2300	ASE3001w2300
iXL500Q	AS450zy23300	ASE50zy23300
iXL500Q	AS45313233S0	ASE5313233S0
iXL500R	AS550zy23300	ASF50zy23300
iXL750Q	AS4600yw4300	ASE600yw4300
iXL900R	-	ASF7002u4500
iXL900R	-	ASF700124550
iXL950R	-	ASF800224500
iXL950R	-	ASF8302245S0
EUV7K	-	ACH0t0120310

Where u = 2, 3, 4, 5 depending on exhaust evacuation (Ultimasave) / oil box evacuation configuration

Where w = 2,3 depending on oil box evacuation

Where y = 1, 2, 3, 4 depending on version

Where z = 1, 2, 3, 5, A or B depending on gas module type for iXL

Where t = 0, 1, 2, 3, 4 or 5 depending on TMS system

The object of the declaration described above is in conformity with relevant statutory requirements:

Supply of Machinery (Safety) Regulations 2008

 $The\ objectives\ of\ the\ Electrical\ Equipment\ (Safety)\ Regulations\ 2016\ are\ governed\ by\ Annex\ 1\ 1.5.1\ of\ this\ regulation.$

Electromagnetic Compatibility Regulations 2016

Class A Emissions, Industrial Immunity

Batteries and Accumulators (Placing on the Market) Regulations 2008

Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Relevant designated standards or technical specifications are as follows:

EN 1012-2:1996 +A1:2009 Compressors and vacuum pumps. Safety requirements. Vacuum pumps

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control and laboratory

use. General requirements

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use. EMC requirements.

General requirements

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You must retain the signed legal declaration for future reference

This declaration becomes invalid if modifications are made to the product without prior agreement.

Graham Rayner

VP Engineering, Semiconductor

BK Kim

General Manager, Cheonan

751h

ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION

EMC (EU, UK): Class A Industrial equipment

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

RoHS (EU, UK): Material Exemption Information

This product is compliant with the following Exemptions

Annex III:

- 6(a) **Lead** as an alloying element in steel for machining purposes and in galvanised steel containing up to 0.35 % lead by weight
- 6(b) **Lead** as an alloying element in aluminium containing up to 0.4% by weight
- 6(c) Copper alloy containing up to 4% lead by weight
- 7(a) Lead in in high melting temperature type solder (i.e. lead based alloys containing 85% by weight or more lead)
- 7(c) I Electrical and electronic components containing **lead** in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound
- 7(c) II Lead in dielectric ceramic in capacitors for a rated voltage of 125 V AC or 250 V DC or higher
- 8(b) **Cadmium** and its compounds in electrical contacts
- 15 **Lead** in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages
- 34 Lead in cermet-based trimmer potentiometer elements

REACH (EU, UK)

This product is a complex article which is not designed for intentional substance release. To the best of our knowledge the materials used comply with the requirements of REACH. The product manual provides information and instruction to ensure the safe storage, use, maintenance and disposal of the product including any substance based requirements.

Article 33.1 Declaration (EU, UK)

This product contains Candidate List Substances of Very High Concern above 0.1%ww by article as clarified under the 2015 European Court of Justice ruling in case C-106/14.

- 1,2-dimethoxyethane (EDGME)
 - This substance is sealed within the case of the compact lithium coin cell battery and is essential to the long life and reliable performance of the battery.
- Cadmium (Cd)
 - This substance is present in electrical contacts.
- Lead (Pb)
 - This substance is present in certain steel / aluminium / brass / electrical or electronic components.
- Potassium perfluorohexane-1-sulphonate
 - This substance is present in Harting connector proprietary metal components.

Additional Applicable Requirements

The product is in scope for and complies with the requirements of the following:

2012/19/EU Directive on waste electrical and electronic equipment (WEEE)

Product conforms to Safety requirements for electrical equipment for measurement, control and

UL61010-1 3rd Edition laboratory use – Part 1: General requirements

CCR Title 22 Division 4.5 This equipment may contain a lithium battery which requires notification for the Chapter 33: Perchlorates presence of Perchlorate Material: special handling may apply, refer to

Batteries www.dtsc.ca.gov/hazardouswaste/perchlorate/

SEMI S2-0821* Environmental health and safety guideline for semiconductor manufacturing

Equipment

SEMI F47-0706 Specification for semiconductor processing equipment voltage sag immunity

pXH4500, pXH6000 and iXL500R comply with SEMI S2-0709. iXL250Q and iXL750Q do not conform to SEMI S2 standard.

^{*} EUV7K complies with SEMI S2-0818Ea.

材料成分声明

China Material Content Declaration

	有害物质 Hazardous Substances					
部件名称 Part name	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr VI)	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
机壳 Enclosure	Х	0	0	0	0	0
电机(泵和机械增压泵) Motors (pump and mechanical booster)	Х	0	0	0	0	0
泵和增压泵 Pump and booster	Х	0	0	0	0	0
电子元件和控件 Electronics and Controls	Х	0	X	0	0	0
冷却系统 Cooling system	Х	0	0	0	0	0
吹扫系统 Purge system	Х	0	0	0	0	0

- O: 表示该有害物质在该部件的所有均质材料中的含量低于 GB/T 26572 标准规定的限量要求。
- O: Indicates that the hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.
- X: 表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 标准规定的限量要求。
- X: Indicates that the hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T26572.

