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# Dry Pump System iXM

INSTRUCTION MANUAL

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## Associated publications

<b>Publication title</b>	<b>Publication number</b>
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Semiconductor pumping application guide	P41100090

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You must use this product as described in this manual. Read the manual before you install, operate, or maintain the product.

## CE Declaration of Conformity

Edwards Ltd  
Innovation Drive  
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RH15 9TW, UK

The following product

	<b>Low Volt Systems (200-230 V)</b>	<b>High Volt Systems (380-460 V)</b>
iXM1200 Standard	A56146958	A56146959
iXM1200 Customer special A	A56346958	-
iXM600 Standard	A56126958	A56126959
iXM200	A56106958	A56106959
iXM1200 Xcede Standard	A56156958	A56156959
iXM1200 Xcede customer special A	A56356958	-
iXM600 Xcede Standard	A56136958	A56136959
iXM200 Xcede Standard	A56116958	A56116959
iXM200T	A56706958	A56706959
iXM600T	A56726958	A56726959
iXM1200T	A56746958	A56746959
iXM3000 Standard	A56186958	A56186959
iXM3000 customer special A	A56386858	-
iXM3000 Xcede	A56196958	A56196959

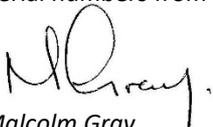
Is in conformity with the relevant requirements of European CE legislation:

2006/42/EC	Machinery directive
2014/35/EU	Low voltage directive (LVD) as applicable to electrical sub-assemblies
2014/30/EU	Electromagnetic compatibility (EMC) directive
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 Class A Emissions, Industrial Immunity

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: 8<sup>th</sup> April 2020.



Malcolm Gray  
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BK Kim  
General Manager  
Cheonan

## ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION

### EU EMC DIRECTIVE: CLASS A EQUIPMENT

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

### EU ROHS DIRECTIVE: MATERIAL EXEMPTION INFORMATION

This product is compliant with the following Annex III Exemptions:

- 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 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. piezoelectric 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

### EU REACH REGULATION COMPLIANCE

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 DECLARATION:

This product does contain 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) added to the Candidate List in June 2012

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) added to the Candidate List June 2013

As indicated by the applied RoHS exemption above, this substance is present in electronic componentry

- Lead (Pb) added to the Candidate List June 2018

As indicated by the applied RoHS exemption(s) above this substance is present in certain aluminium/brass/steel/electrical or electronic components

### ADDITIONAL INFORMATION

The products listed are also in scope for and comply with the requirements of the following:

UL61010-1 3 <sup>rd</sup> Edition	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements
SEMI S2-0715a	Environmental health and safety guideline for semiconductor manufacturing equipment
SEMI S2-1016*	Environmental health and safety guideline for semiconductor manufacturing equipment
SEMI S8-0915	Safety Guidelines for ergonomics engineering of semiconductor Manufacturing Equipment
SEMI F47-0706	Specification for semiconductor processing equipment voltage sag immunity

\*iXM3000

材料成分声明

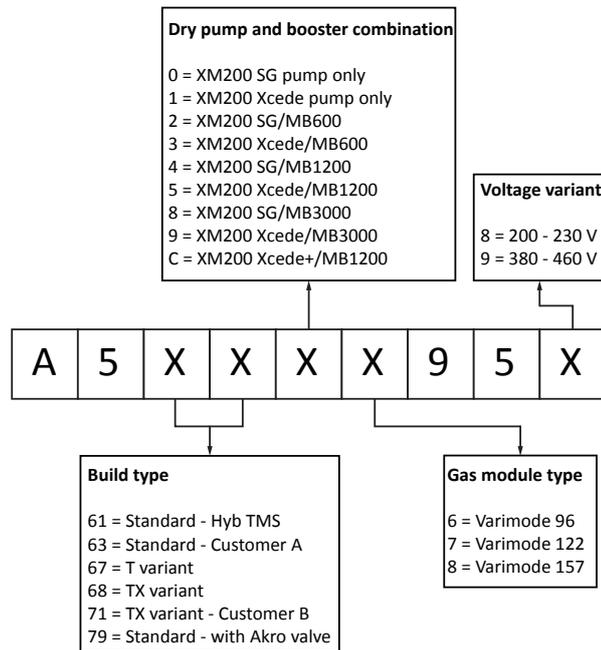
China Material Content Declaration

部件名称 Part name 	有害物质 Hazardous Substances					
	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	X	0	0	0	0	0
电机 (泵和机械增压泵) Motors (pump and mechanical booster)	X	0	0	0	0	0
泵和增压泵 Pump and booster	X	0	0	0	0	0
电子元件和控制件 Electronics and Controls	X	0	X	0	0	0
冷却系统 Cooling system	X	0	0	0	0	0
吹扫系统 Purge system	X	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.

# Numbering matrix



**Note:**

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

# Contents

<b>1. Safety and compliance.</b>	<b>8</b>
1.1 Definition of Warnings and Cautions.	8
1.2 Safety symbols.	9
<b>2. General description.</b>	<b>10</b>
2.1 Overview.	10
2.2 Applications.	11
2.3 Advanced control and monitoring.	12
2.4 Green Mode.	12
<b>3. Technical data.</b>	<b>13</b>
3.1 General technical data.	13
3.2 Operating and storage conditions.	13
3.3 Manufacturing materials.	14
3.4 Loading data.	15
3.5 Nitrogen purge data.	18
3.6 Electrical data.	18
3.7 Cooling water data.	21
3.8 Heater data.	22
3.9 Tracer gas analysis.	23
<b>4. Installation.</b>	<b>25</b>
4.1 Installation safety.	25
4.2 Unpack and inspect.	26
4.3 Position the system.	27
4.4 Install the system.	29
4.5 Lubrication.	31
4.6 Connect the system.	31
4.6.1 Connect to the vacuum and exhaust system.	31
4.6.2 Connect the pump inlet.	33
4.6.3 Connect the pump exhaust.	34
4.6.4 Connect to the factory extraction system (optional).	34
4.6.5 Connect the nitrogen supply.	35
4.6.6 Connect to the electrical supply.	36
4.6.7 Connect an additional RF earth (ground) (optional).	44
4.6.8 Connect to the emergency stop circuit.	45
4.6.9 Connect the cooling water supply.	45
4.6.10 Connect the accessories.	47
4.7 Install additional safety equipment.	48

<b>5. Commission.</b>	<b>49</b>
5.1 Commission the system.	49
5.2 Leak test the system.	50
5.3 Configure the system through a PDT.	50
5.3.1 Pump display terminal.	50
<b>6. Operation.</b>	<b>59</b>
6.1 Start-up.	59
6.1.1 Start up through a MicroTIM.	60
6.1.2 Start up through a PDT.	60
6.1.3 Start up through the front panel control.	61
6.1.4 Restart the system after a controlled stop or alarm condition.	61
6.1.5 Restart the pump after a controlled stop or automatic shut down.	62
6.2 Shut down.	62
6.2.1 Shut down modes.	63
6.2.2 Shut down through a MicroTIM.	63
6.2.3 Shut down through a PDT.	63
6.2.4 Shut down through the front panel control.	63
6.2.5 Controlled stop.	63
6.3 Gas module configuration.	64
6.3.1 iXM Varimode gas module adjustment procedure.	64
6.4 System operating temperature configuration.	65
<b>7. Maintenance.</b>	<b>66</b>
7.1 Inspect the connections, pipelines, cables and fittings.	67
<b>8. Fault finding.</b>	<b>68</b>
8.1 Warnings.	68
8.1.1 LED warning indicators.	68
8.1.2 PDT warnings.	68
8.2 Alarms.	76
8.2.1 LED alarm indicators.	76
8.2.2 PDT alarms.	76
8.2.3 Alarm conditions.	79
8.3 Unplanned shut down and alarms.	80
8.4 Events.	81
8.4.1 PDT Events.	81
8.5 Inverter warnings and alarms.	83
<b>9. Decommissioning.</b>	<b>85</b>
9.1 Decommissioning safety.	85
9.2 Relocate the system for decommissioning.	86
9.3 Drain the cooling water for decommissioning.	87
9.4 Transportation.	88

<b>10. Storage.</b> .....	<b>89</b>
<b>11. Disposal.</b> .....	<b>90</b>
<b>12. Service.</b> .....	<b>91</b>
12.1 Return the equipment or components for service .....	91
<b>13. Accessories.</b> .....	<b>93</b>
13.1 Disconnect box. ....	93
13.2 Accessory modules. ....	93
13.3 Pump Display Terminal (PDT). ....	93
13.4 PDT holster. ....	94
13.5 PDT extension cable. ....	94
13.6 Seismic restraint brackets. ....	94
13.7 Nitrogen flow switch assembly. ....	94
13.8 Interface modules. ....	95
13.8.1 MicroTIM. ....	95
13.8.2 EMS modules. ....	95
13.8.3 iGateway modules. ....	95
13.9 Exhaust check valve. ....	96
13.10 Exhaust extraction cover kit. ....	96
13.11 Constant flow water valves. ....	96
13.12 Water flow monitor assembly. ....	97

## List of Figures

Figure 1: Front view of system. . . . .	10
Figure 2: Controls/connectors on the rear of the system. . . . .	11
Figure 3: Applications. . . . .	12
Figure 4: Centre of gravity and levelling foot loads iXM200. . . . .	15
Figure 5: Centre of gravity and levelling foot loads iXM600 and iXM1200. . . . .	16
Figure 6: Centre of gravity and levelling foot loads iXM3000. . . . .	17
Figure 7: Reduce the effective system footprint. . . . .	30
Figure 8: Reduce the effective system footprint iXM3000. . . . .	31
Figure 9: Connect the pump inlet (iXM200 and iXM3000) . . . . .	33
Figure 10: Connect the pump inlet (iXM600 and iXM1200). . . . .	34
Figure 11: Mains input supply connector. . . . .	40
Figure 12: Method for connecting phase wires. . . . .	40
Figure 13: Coding pin configuration. . . . .	41
Figure 14: Mains connector on pump bulkhead. . . . .	41
Figure 15: Mains input supply connector - Han® K 4/4. . . . .	42
Figure 16: Protective Earth (PE) connection. . . . .	43
Figure 17: Electrical connector locking mechanism (iXM200, iXM600 and iXM1200). . . . .	44
Figure 18: Electrical connector locking mechanism. . . . .	44
Figure 19: Pump display terminal. . . . .	50
Figure 20: Front panel controls. . . . .	61

# 1. Safety and compliance

## 1.1 Definition of Warnings and Cautions

### NOTICE:



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 equipment must only be operated and maintained by trained personnel in the proper condition and as described in this instruction manual.

Obey local and state requirements and regulations. If you have any questions about safety, operation or maintenance of the device, please contact our nearest subsidiary.

Important safety information is highlighted as warning and caution instructions. Obey these instructions.



### WARNING:

If you do not obey a warning, there is a risk of injury or death. Different symbols are used according to the type of hazard.



### 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 pump or the system.

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

Keep the instructions for future use.

## 1.2 Safety symbols

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

The safety symbols that follow are used on the product or in the product documentation.

	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 dangerous 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.
	Warning - RF earth Earth point for radio equipment or antenna.

## 2. General description

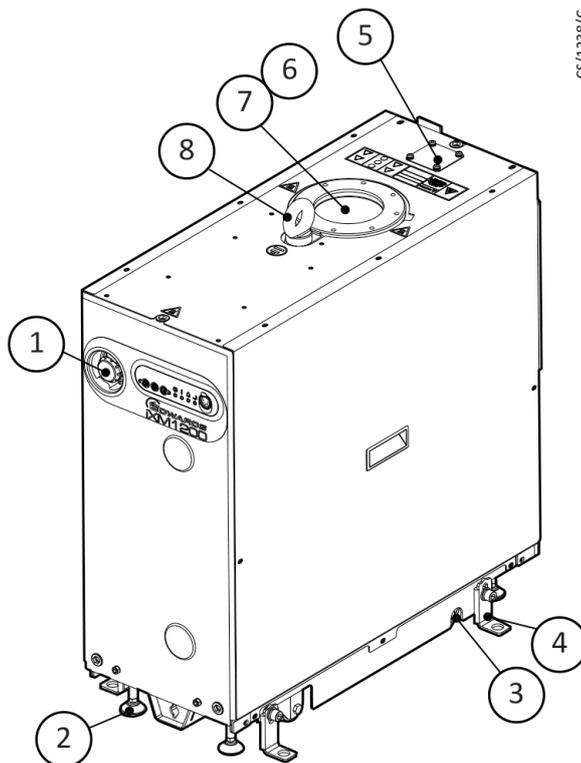
### 2.1 Overview

The iXM series of dry pumps are low energy systems. The range sets new standards for medium duty process, capability and reliability, with pumps designed to give low cost of ownership. The variants are designed for Etch and Plasma-Enhanced Chemical Vapor Deposition (PECVD) processes. The pumps are available in four capacity classes:

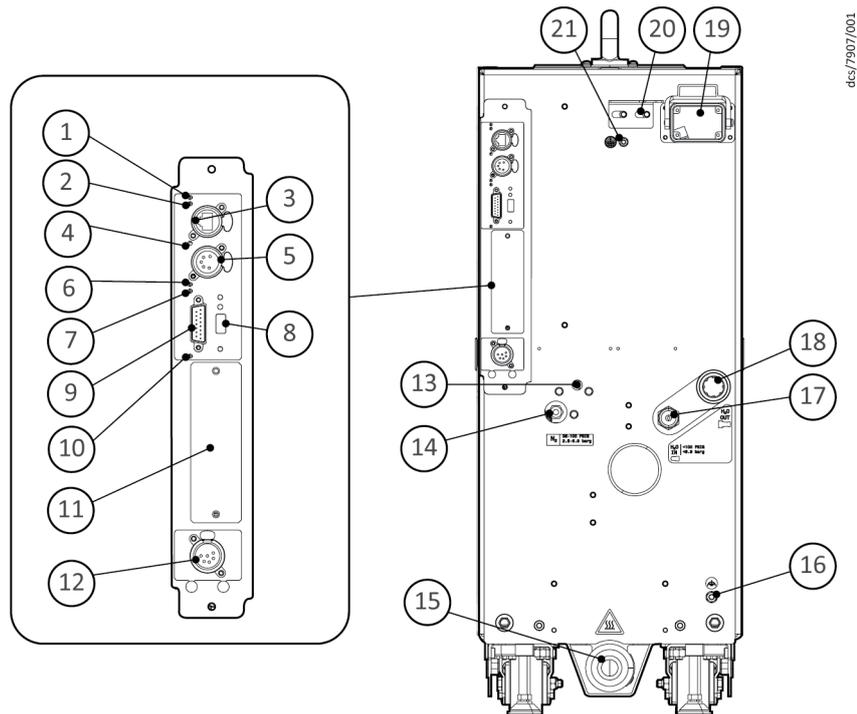
- 200 m<sup>3</sup>/hr
- 600 m<sup>3</sup>/hr
- 1200 m<sup>3</sup>/hr
- 3000 m<sup>3</sup>/hr

The pumps are compatible for 200 - 230 V or 380 - 460 V supply.

**Figure 1** Front view of system



- |                                |   |
|--------------------------------|---|
| 1. Front panel control         | 2. Levelling feet (4 off)               |
| 3. Castors (4 off)             | 4. Seismic bracket (4 off if installed) |
| 5. Extraction port             | 6. RF Earth (ground) cable              |
| 7. Pumped gas inlet connection | 8. Lifting eyebolt                      |

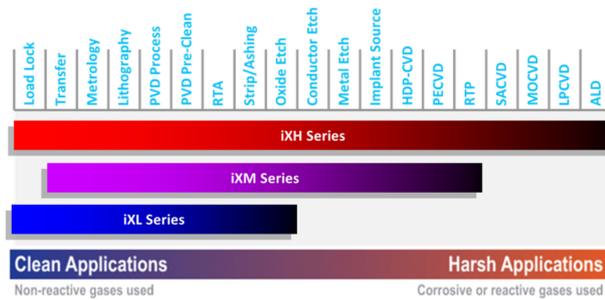
**Figure 2** Controls/connectors on the rear of the system

- |  |  |
|--|--|
| 1. Ethernet Local Area Network (LAN) LED (green)           | 2. Ethernet link LED (yellow)              |
| 3. Ethernet connection                                     | 4. Power LED (green)                       |
| 5. System interface connection                             | 6. Warning LED (yellow)                    |
| 7. Running and alarm LEDs (2 colours, either green or red) | 8. USB connection                          |
| 9. Accessory interface connection                          | 10. MicroTIM in control LED (green)        |
| 11. Micro TIM connection (if installed)                    | 12. EMS interface                          |
| 13. N <sub>2</sub> purge adjuster                          | 14. Nitrogen purge connection              |
| 15. Exhaust gas outlet                                     | 16. RF earth (ground) stud                 |
| 17. Cooling water supply connection                        | 18. Cooling water supply return            |
| 19. Electrical supply connection                           | 20. Electrical connector locking mechanism |
| 21. Protective earth (ground) stud                         |  |

## 2.2 Applications

The iXM pumping system is intended for use on applications as shown in [Figure: Applications](#).

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.

**Figure 3** Applications

## 2.3 Advanced control and monitoring

EdCentra is a scalable, networked sub-fab equipment fleet monitoring and data acquisition tool. EdCentra's comprehensive data capture lets the user improve operational efficiencies, through the:

- instantaneous monitoring of the equipment
- diagnostics functions such as historical trend analysis
- reporting on aggregated data

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

For some applications it can be necessary to adjust the system operating temperatures to align with process demands. Contact your supplier to discuss the requirements and refer to [System operating temperature configuration](#) on page 65 for instructions on configuration.

Contact us for more information.

## 2.4 Green Mode

The Green Mode function decreases utility consumption of the system while on standby.

The Green Mode functionality is controlled with a PDT accessory or the tool through a MicroTIM accessory. Refer to [Accessories](#) on page 93. Contact us for advice on application and activation of the available accessories.

### 3. Technical data

#### 3.1 General technical data

*Table 1 General technical data*

Characteristics	Units	3000	1200	1200T	1200TX	600 600T	200 200T	
Dimensions (L x W x H)	mm	1000 x 517 x 965	695 x 286 x 704				695 x 286 x 467	
Mass (not including packaging)	kg	570	245				145	
Noise level (at ultimate)	dB (A)	< 65	< 63					
Vibration test limit at inlet	mm s <sup>-1</sup>	< 1.5						
Initial force to push the pump	kg	< 20.0						
Sustained force to push the pump	kg	< 10.0						
Warm-up time to nominal pumping performance	hours	0.75	3		0.75 3 (T variant)			
Performance								
Typical peak pumping speed (no gas purge/cold pump)	m <sup>3</sup> h <sup>-1</sup>	2800	1030	930	600	200		
Average ultimate pressure								
No gas purge	mbar	0.001	0.0015					
At 44 slpm purge flow	mbar	0.0015	0.005				0.01	
At 96 slpm purge flow	mbar	0.003	0.02	-				
Ultimate pressure test limit								
▪ No gas purge	mbar	0.005						
▪ At 44 slpm purge flow	mbar	0.005	0.01				0.05	
▪ At 96 slpm purge flow	mbar	0.01	0.05	-	-	-	-	
Connections								
Pump inlet flange		ISO200	ISO100	ISO100	ISO100	ISO100	ISO63	
Exhaust gas outlet		NW40	NW25	NW25	NW25	NW25	NW25	

#### 3.2 Operating and storage conditions

**Table 2 Operating and storage conditions**

Parameter	Units	Value
Ambient operating temperature range	°C	5 to +40
Ambient storage temperature range	°C	-45 to +55
Maximum relative humidity	-	80% for temperatures up to 31 °C decreasing linearly to 50% relative humidity at 40 °C
Maximum operating altitude	m	2000
Enclosure protection when installed (IEC60529)	-	IP11D
Pollution degree (EN61010)	-	2
Intended use	-	Indoor

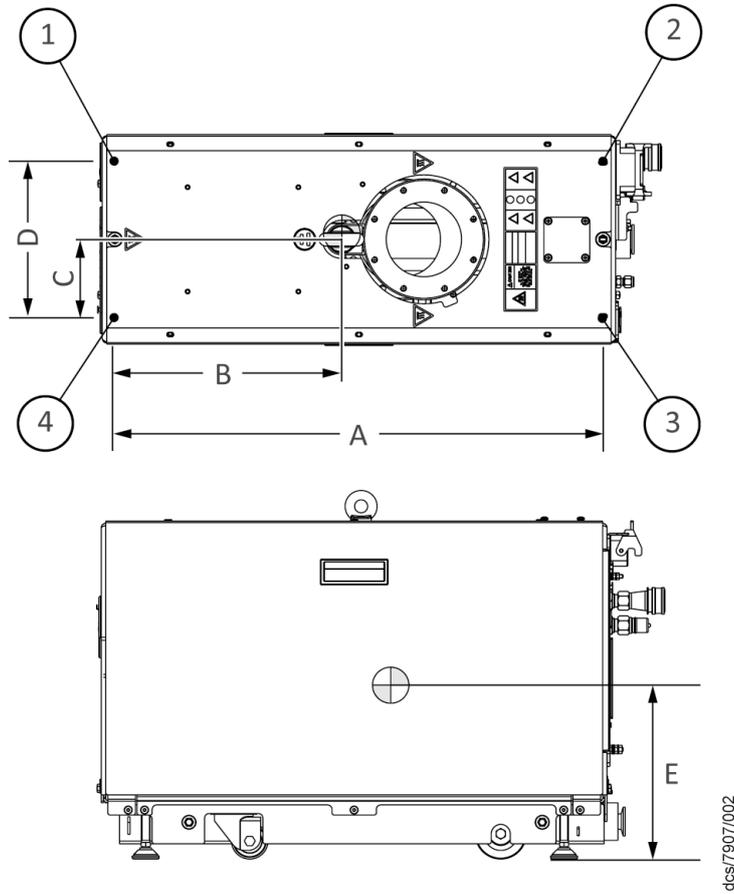
### 3.3 Manufacturing materials

**Table 3 Materials in contact with pumped gases**

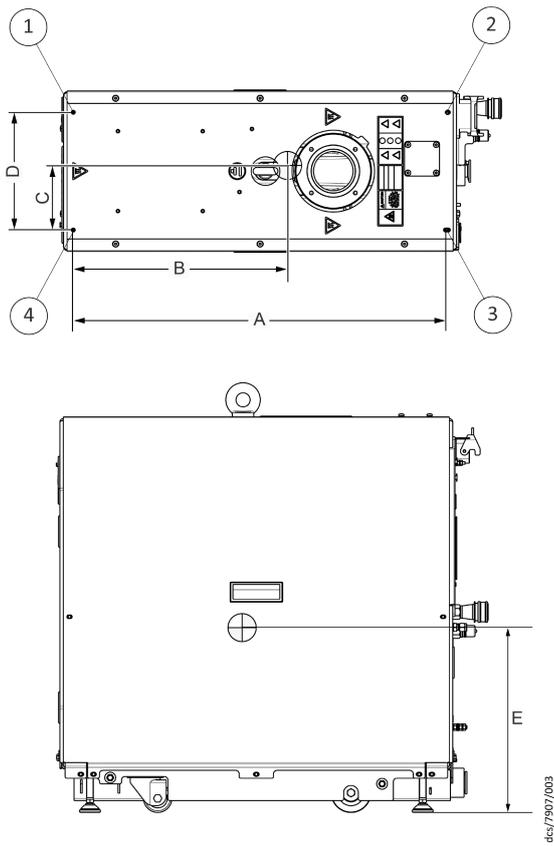
Material	Where used
Cast iron	Pump, shaft and rotors
Steel	
Coated cast iron (Xcede variant only)	
PTFE	Seals and gas system
Fluoroelastomer	
Stainless steel	Gas system
Aluminium	

### 3.4 Loading data

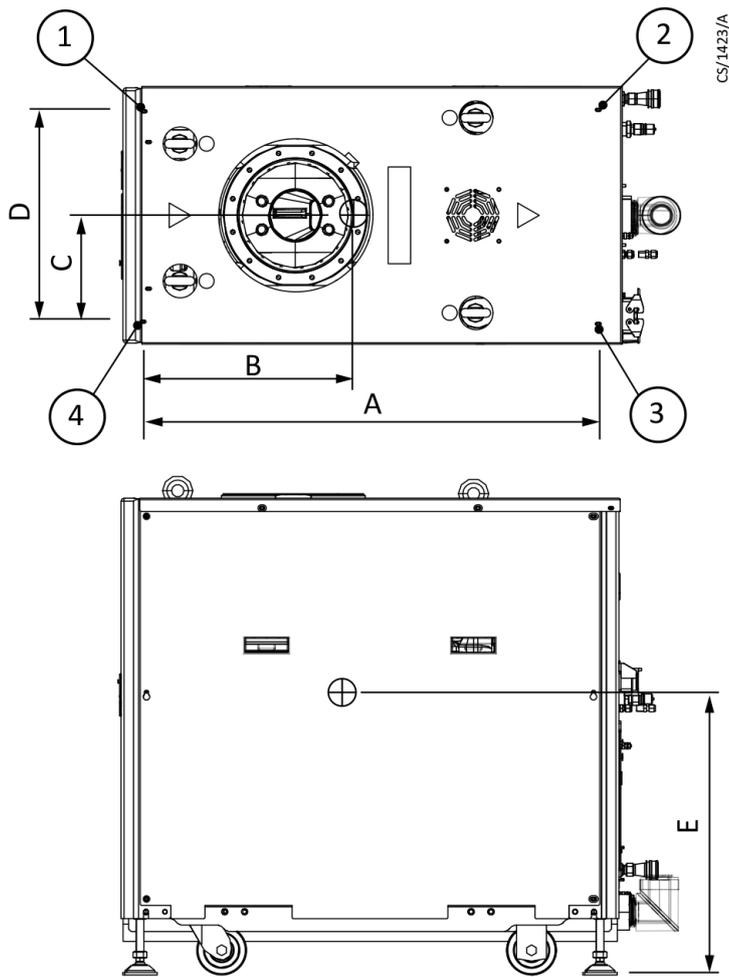
Figure 4 Centre of gravity and levelling foot loads iXM200



**Figure 5** Centre of gravity and levelling foot loads iXM600 and iXM1200



**Figure 6** Centre of gravity and levelling foot loads iXM3000



**Table 4** Loading data

Pump		3000	1200	1200T	1200TX	600 600T	200 200T	Units
Levelling foot loads*	1	156.8	57.5	56.6	57	57.5	39.9	kg
	2	131.1	51.7	60	61.3	51.7	34.1	
	3	124.8	64.3	65.1	66.1	64.3	32.8	
	4	157.3	71.5	65	65.2	71.5	38.3	
Centre of gravity*	A	924	588.6	588.6	588.6	588.6	575	mm
	B	415	278.7	298.4	300.4	278.7	266.5	
	C	216	81.8	86.8	87	81.8	111.2	
	D	427	183.6	183.6	183.6	183.6	218	
	E	573	322.1	326	326.9	322.1	214.1	

\* See also [Figure: Centre of gravity and levelling foot loads iXM200](#), [Figure: Centre of gravity and levelling foot loads iXM600 and iXM1200](#) and [Figure: Centre of gravity and levelling foot loads iXM3000](#).

### 3.5 Nitrogen purge data

*Table 5 Nitrogen purge data*

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

*\* 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*

Varimode 96 (Standard)								
Mode	Pump condition	Flow condition	Settable stages flow range			Fixed flow		Total flow
			4/5	5/6	6/7	Exh	SS	
Off	Off	Nominal individual flow	0	0	0	0	0	0
		Total flow	0					
Green	Running	Nominal individual flow	0	0	0	0	4	4*
		Total flow	0					
On-Min	Running	Nominal individual flow	1	3	4	4	4	16
		Total flow	8					
On-Nominal	Running	Nominal individual flow	2	15	19	4	4	44
		Total flow	36					
On-Max	Running	Nominal individual flow	5	37	46	4	4	96
		Total flow	88					

*\* Nitrogen flow reduction during Green Mode requires special configuration. Contact the supplier for advice on application and activation.*

### 3.6 Electrical data

*Table 7 Pump electrical data*

Characteristics	Units	3000	1200 1200T 1200TX	600 600T	200 200T
Rated system input power at maximum load	kW	4.7	4.8	4.8	3.0
Dry pump motor rating	kW	1.9	1.9	1.9	1.9
Mechanical booster motor rating	kW	4.5	1.9	1.9	-

Characteristics	Units	3000	1200 1200T 1200TX	600 600T	200 200T
Rated input supply current maximum load (200 V a.c.)	A (rms)	26	26	26	18
Rated input supply current maximum load (400 V a.c.)	A (rms)	14	14	14	11
Recommended branch circuit protection UL (200 - 230 V a.c. supply)	A	35	35	35	25
Recommended branch circuit protection UL (380 - 460 V a.c.)	A	20	20	20	15
Recommended mains conductor size (minimum)	mm <sup>2</sup> (Awg)	6 (10)	6 (10)	6 (10)	6 (10)
Mains connector	-	Han® K 4/4-F	Han® 40A		

 **Note:**

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

**Table 8 General electrical data**

Description	Units	Rating
Supply voltage 3-phase	V a.c.	200 - 230 or 380 - 460 (see rating plate)
Frequency range	Hz	50/60
Wiring configuration		3 wire plus earth (ground)
Branch circuit protection requirement		Current rating, refer to <a href="#">Table: Pump electrical data</a>
		Fuse Class gG (IEC 60269), UL class T, class J or class RK5, Bussmann type JJS or equivalent I2t characteristic rated to 600 V
Voltage tolerance range		± 10%
Installation category		II (IEC 60664)
Input supply voltage unbalance		Should not exceed 2% when assessed over any one minute period
Short circuit current rating (when installed with class T or class J fuses)	kA	30
Second protective earth (ground) conductor		Must be installed with cross-sectional area equal to phase conductor size, up to 16 mm <sup>2</sup>
Typical earth leakage*		
▪ for 200 - 230 V a.c. systems	mA	< 5

Description	Units	Rating
▪ for 380 - 460 V a.c. systems	mA	< 10

\* Typical earth leakage values were measured at steady-state conditions.

Note that higher leakage currents can occur:

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

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

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

**Table 9 Electrical connections**

Description	Mating connector description / external supply rating	Internal supply rating
Mains connection Refer to <a href="#">Installation</a> on page 25 for wiring diagram	Refer to <a href="#">Table: Pump electrical data</a> for the mains connector installed to each variant. Insert type is one of: Harting Han 40A, axial module, part number: 09 14 002 2701, 2.5 – 8 mm <sup>2</sup> fine stranded wire, Hood part number: 09 30 006 0442 or Insert type is : Weidmüller 1789980000, 2.5 – 8 mm <sup>2</sup> fine stranded wire, Hood part number : 1652680000 (VDE 0295 class 5, refer to <a href="#">Table: Wire assembly according to VDE 0295</a> ), 8.9 mm maximum insulation diameter or Han K 4/4-F finger safe 09 38 008 2703, 6-16 mm <sup>2</sup> fine stranded wire (VDE 0295 class 5, refer to <a href="#">Table: Wire assembly according to VDE 0295</a> ), 8.9 mm maximum insulation diameter	
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)
USB flash memory stick/drive	USB Type A flash stick only (no cable connection allowed)	5 V d.c. 100 mA
EMS interface External controlled stop button Pin 1 supply, Pin 2 - return Internal controlled stop button§	XLR type 6-way plug	24 V d.c. 100 mA

Description	Mating connector description / external supply rating	Internal supply rating
Pin 3 - common, Pin 4 - normally open Comms 24 V supply Pin 5 - supply, pin 6 - 0 V supply common Chassis	30 V a.c. 1A, 60 V d.c. 0.55 A	24 V d.c. 0.75 A*
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 (normally open) Pin 15 - common	15-way D socket      30 V a.c. 1A, 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.

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

§ If there is no external connection a link plug must be installed to operate the pump.

**Table 10 Wire assembly according to VDE 0295**

Wire size (mm <sup>2</sup> )	Wire size (Awg)	Fine stranded wires VDE 0295 class 5	UL style
6	10	84 x 0.30	1015
10	8	80 x 0.40	1015
16	6	128 x 0.40	1015

### 3.7 Cooling water data

**Table 11 Water cooling system data**

Description	Units	3000	1200 600/600T	1200T 1200TX	200 200T
Maximum supply pressure	barg	6.9			
	psig	100			
Necessary flow rate	litres/min	7	4	4 (5 <sup>*</sup> )	3
Maximum allowable system differential pressure	bar	5.5			
Minimum necessary pressure differential across supply and return	bar	0.75	0.75	1.0	0.75
Supply temperature range	°C	5 to 30			
Water type		Treated or non-corrosive industrial			
Maximum particle size	mm <sup>2</sup>	0.03			
Acidity	pH	6.5 to 8.0			
Hardness (< 100 mg of CaCO <sub>3</sub> per litre)	ppm of CaCO <sub>3</sub>	< 100			
Resistivity	ohm-cm	1 k ≤ ρ ≤ 1000 k			
Materials in contact with cooling water		Stainless steel and fluoroelastomer	Stainless steel, Nitrile, PTFE and fluoroelastomer		
Water inlet connection		3/8 inch BSP male quick connector			
Water outlet connection		3/8 inch BSP female quick connector			

*\* For iXM1200 TX variants, if continuous operation is required with 60 slm (Air) or more at the pumped gas inlet, 5 l/min is recommended. Please contact us for more information.*

### 3.8 Heater data

**Table 12 TX variant heater data**

Description	Units	Rating
Exhaust heater control temperature	°C	160
Exhaust heater power consumption		
iXM1200TX	W	110
Typical booster heater control temperature	°C	85
Typical booster heater power consumption		
iXM1200TX	kW	1.2

### 3.9 Tracer gas analysis

Tracer gas fugitive emission testing has been carried out in accordance with the SEMI S6 Standard.

**Table 13 Tracer gas test parameters**

Test parameters	
Tracer gas	N <sub>2</sub> O (Nitrous Oxide)
Tracer gas concentration	100%
Tracer gas release rate	5 slpm (standard litres per minute)
Tracer gas release points	Exhaust flange on the iXM200/iXM600/iXM1200 pump
Process gas	Nitrogen

**Table 14 Tracer gas test system parameters**

System parameters	Units	iXM3000	iXM1200 iXM600	iXM200
Extraction flow rate: From port on top of enclosure From port on exhaust extraction kit	m <sup>3</sup> /h	396.4	107.7	121.2
Volume of enclosure	m <sup>3</sup>	0.423	0.122	0.077
Free air volume of enclosure	m <sup>3</sup>	0.265	0.072	0.040
Air changes per minute		24.9	27.9	50.0
Hardware configuration: <ul style="list-style-type: none"> <li>▪ 100 mm duct connected to port on top of enclosure</li> <li>▪ Exhaust extraction cover kit installed</li> </ul>		Yes Yes	Yes Yes	Yes Yes

 **Note:**

The recommended extraction flow rate for iXM200, iXM600, iXM1200 is 180 m<sup>3</sup>/h.

**Table 15 Worst case test results**

Process gas	Chemical name	Maximum process gas flow (slm)	TLV/LEL (ppm)*	25% TLV/LEL (ppm)	N <sub>2</sub> O re-release rate (slm)	Maximum N <sub>2</sub> O detected outside enclosure (ppm)	ERC (ppm)	Pass/Fail†
Difluoromethane	CH <sub>2</sub> F <sub>2</sub>	0.2	1000	250	5	3	0.12	Pass
Methane	CH <sub>4</sub>	1	1000	250	5	3	0.60	Pass
Carbon Monoxide	CO	0.5	25	6.25	5	3	0.30	Pass
Hydrogen	H <sub>2</sub>	40	4000	1000	5	3	24.00	Pass
Nitrous Oxide	N <sub>2</sub> O	15	50	12.5	5	3	9.00	Pass

Process gas	Chemical name	Maximum process gas flow (slm)	TLV/LEL (ppm)*	25% TLV/LEL (ppm)	N <sub>2</sub> O re-lease rate (slm)	Maximum N <sub>2</sub> O de-tected outside enclosure (ppm)	ERC (ppm)	Pass/Fail†
Ammonia	NH <sub>3</sub>	10	25	6.25	5	3	6.00	Pass
Sulphur Hexa-fluoride	SF <sub>6</sub>	0.2	1000	250	5	3	0.12	Pass
Silicon Tetra-chloride	SiCl <sub>4</sub>	0.1	1	0.25	5	3	0.06	Pass
Fluorine	F <sub>2</sub>	0.3	1	0.25	5	3	0.18	Pass
Hydrogen Fluoride	HF	0.3	3	0.75	5	3	0.18	Pass
Hydrogen Chloride	HCl	0.4	5	1.25	5	3	0.24	Pass
Chlorine	Cl <sub>2</sub>	0.2	0.5	0.125	5	3	0.12	Pass
Ammonia	NH <sub>3</sub>	10	25	6.25	5	3	6.00	Pass
Arsine	AsH <sub>3</sub>	0.02	0.05	0.0125	5	3	0.01	Pass
Boron Trichloride	BCl <sub>3</sub>	1	5	1.25	5	3	0.60	Pass
Chloride Trifluoride	ClF <sub>3</sub>	0.04	0.1	0.025	5	3	0.02	Pass
DCS	SiCl <sub>2</sub> H <sub>2</sub>	1	5	1.125	5	3	0.60	Pass
Diborane	B <sub>2</sub> H <sub>6</sub>	0.02	0.1	0.025	5	3	0.01	Pass
Nitrogen Trifluoride	NF <sub>3</sub>	4	10	2.5	5	3	2.40	Pass
Phosphine	PH <sub>3</sub>	0.02	0.3	0.075	5	3	0.01	Pass
Silane	SiH <sub>4</sub>	2	5	1.25	5	3	1.20	Pass
TEOS	SiC <sub>8</sub> H <sub>20</sub> O <sub>4</sub>	2	10	2.5	5	3	1.20	Pass
Tungsten Hexa-fluoride	WF <sub>6</sub>	1	3	0.75	5	3	0.60	Pass

\* Threshold Limit Value (TLV)/Lower Explosive Limit (LEL) in Parts Per Million (PPM) 25% TLV/LEL (ppm)

† Where Pass indicates permitted enclosure (satisfies SEMI S2 criteria of less than 25% of the TLV)

## 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<sup>®</sup> oil, nitrogen and water under pressure.

Make sure that the system is applicable for the application. If there is any doubt, refer to the Vacuum Pump and Vacuum System Safety Manual (publication number P40040100), supplied with the system.

- 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 you start the installation. Refer to [Maintenance](#) on page 66.
- 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 dry pumping system. Refer 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 Unpack and inspect



### **WARNING: HEAVY OBJECT**

**Risk of injury or damage to equipment. Use suitable lifting equipment to move the pump. Attach the lifting equipment to the lifting eye. Do not use loose slings. Take care when you move the pump into position, its mass may make it difficult to slide. The fan cowl is shaped to provide a handhold for positioning the pump. Do not lift the pump using this handhold.**



### **CAUTION: ENVIRONMENTAL SAFETY**

**Risk of damage to environment. Obey all national and local legislation concerning the impact of the pump on the environment when you install or remove the pump.**

The pump is supplied fixed by metal brackets to a wooden pallet with a cardboard surround. These metal brackets should be removed and retained.

To unpack the pump, do the steps that follow:

1. Be careful when you unpack the pump to prevent the excessive shocks. The excessive shocks can damage the bearings and decrease the life of the pump. The pump is supplied with sealed inlets and outlets to prevent the entry of dust and vapour.
2. Do not remove the seals until the pump is ready to be installed on the vacuum system.
3. Open the cardboard box from the top, remove any excess packaging as required and remove the pump from the pallet at the fixing points using suitable lifting equipment.
4. If the pump is damaged, notify your supplier and the carrier in writing within three days. Give the supplier and the carrier the information that follows:
  - Item number of the pump
  - Order number
  - Supplier's invoice number
5. Retain all packing materials for inspection.
6. Do not use the pump if it is damaged.

7. Check that the package has the items given in *Table: Checklist of items*. If the items are missing, notify the supplier in writing in three days.
8. If the pump is not to be used immediately, store the pump in correct conditions as given in Storage.
9. It is advised to keep all packing materials for use to return the pump for service.

**Table 16 Checklist of items**

Quantity	Description	Check
1	iXM pump system	<input type="checkbox"/>
1(4)*	Eye bolts	<input type="checkbox"/>
1	Instruction manual (M56635880)	<input type="checkbox"/>

\*4 eye bolts are provided only for iXM3000

### 4.3 Position the system



#### **WARNING: HEAVY OBJECT**

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



#### **WARNING: TRANSPORTATION SAFETY**

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



#### **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°. Rotation of the eye bolts under load must be prevented.

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.

Make the pump level to a maximum of 3° in all directions, 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.

1. Give a firm, level platform, which is strong enough to support the weight of the pump and ancillary equipment.

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

 **Note:**

*The iXM3000 has four eyebolts. All other pump variants only have one eyebolt.*

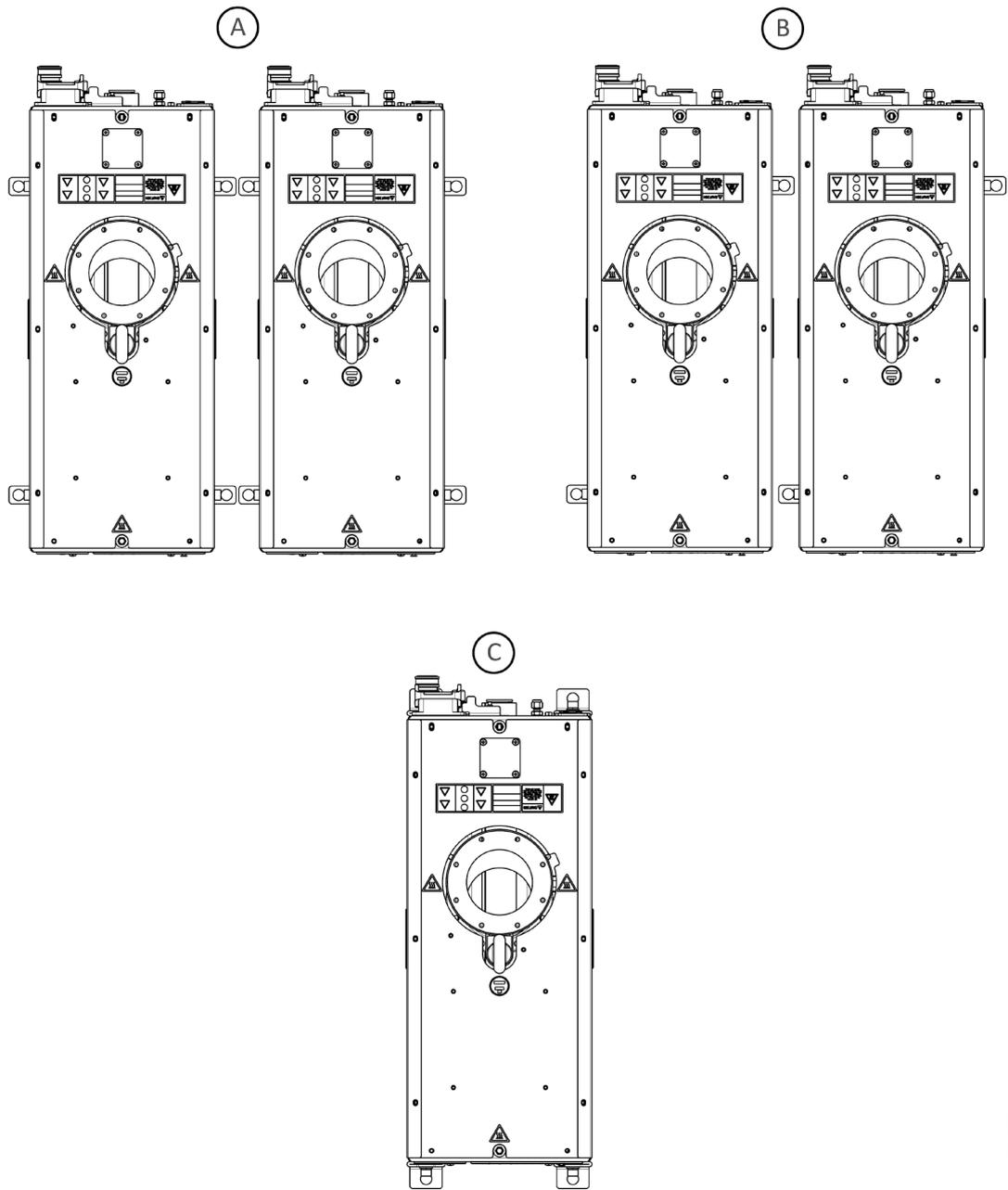
3. Adjust the levelling feet to make sure that the system is level and is not supported by the castors. The recommended jacking height is 5 mm. Refer to [Figure: Front view of the system](#)
4. Remove the lifting eyebolts and replace them with the lifting eyebolt hole plugs supplied with the system.
5. Make sure that the emergency stop button is accessible. Refer to [Figure: Front panel controls](#). If not, use a disconnect box, refer to [Accessories](#) on page 93.

## 4.4 Install the system

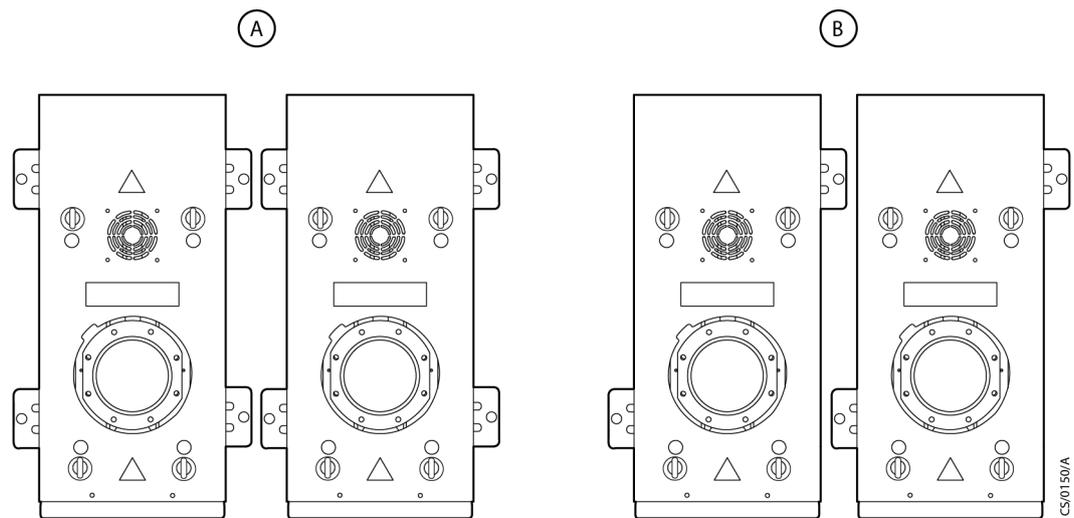
Requirements to secure the system in place to prevent unwanted movement (for example, during an earthquake):

- A minimum of 2 seismic brackets are necessary to secure the pump.
- The seismic brackets (*Figure: Front view of the system*) are designed to withstand a level 4 earthquake in a ground floor installation (available as an accessory). Refer to *Accessories* on page 93.
- There are seismic mounting points along the sides of the pump. If you have to consider space constraints, there are alternative seismic mounting points on the front and rear bulkhead.
- 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 as shown in view A of *Figure: Reduce the effective system footprint*. On smaller systems, two brackets can hold the system during an earthquake. The smaller systems can be attached as shown in view B of *Figure: Reduce the effective system footprint*, to decrease the effective system footprint. If necessary, view C of *Figure: Reduce the effective system footprint* and *Figure: Reduce the effective system footprint iXM3000* also shows an alternative way of reducing the system's footprint, where the seismic brackets are securing the system from the front and back. Refer to *Accessories* on page 93 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 7 Reduce the effective system footprint



dcsl7907/004

**Figure 8** Reduce the effective system footprint iXM3000

## 4.5 Lubrication

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

## 4.6 Connect the system

### 4.6.1 Connect to the vacuum and exhaust system



#### **WARNING: DANGEROUS SUBSTANCES**

Risk of inhalation injury. Connect the exhaust to an 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 high temperatures of pump parts can cause harm. Let the pump cool before you disconnect the pump.



#### **WARNING: PRESSURISED PIPING**

Risk of fire or explosion. Do not operate the system if the exhaust pipeline is blocked. If the exhaust pipeline is blocked, the system can supply exhaust pipeline pressures up to 10 bar ( $10 \times 10^5$  Pa).



#### **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. The pump will continue to run with a warning, however an alarm will cause the pump to stop. 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 follows:

- 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 diameter of 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 decrease the transmission of vibration and to prevent loading of coupling joints. We recommend to use the braided flexible pipelines.
- For T variants, make sure that the exhaust pipelines are rated for 130 °C at the point of connection to the pump.
- For TX variants, make sure that the exhaust pipelines are rated for 160 °C at the point of connection to the pump.
- For all other variants, make sure that the exhaust pipelines are rated for 110 °C.
- We recommend the use of seals at joints 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.
- Install a check valve to the outlet of the system exhaust pipe to prevent the suck back of exhaust vapours after the system is shut down. The check valve also provides additional reduction of the pulses in exhaust pressure.
- For dusty applications, use a low impedance inlet filter to limit the damage to the pump.

## 4.6.2 Connect the pump inlet

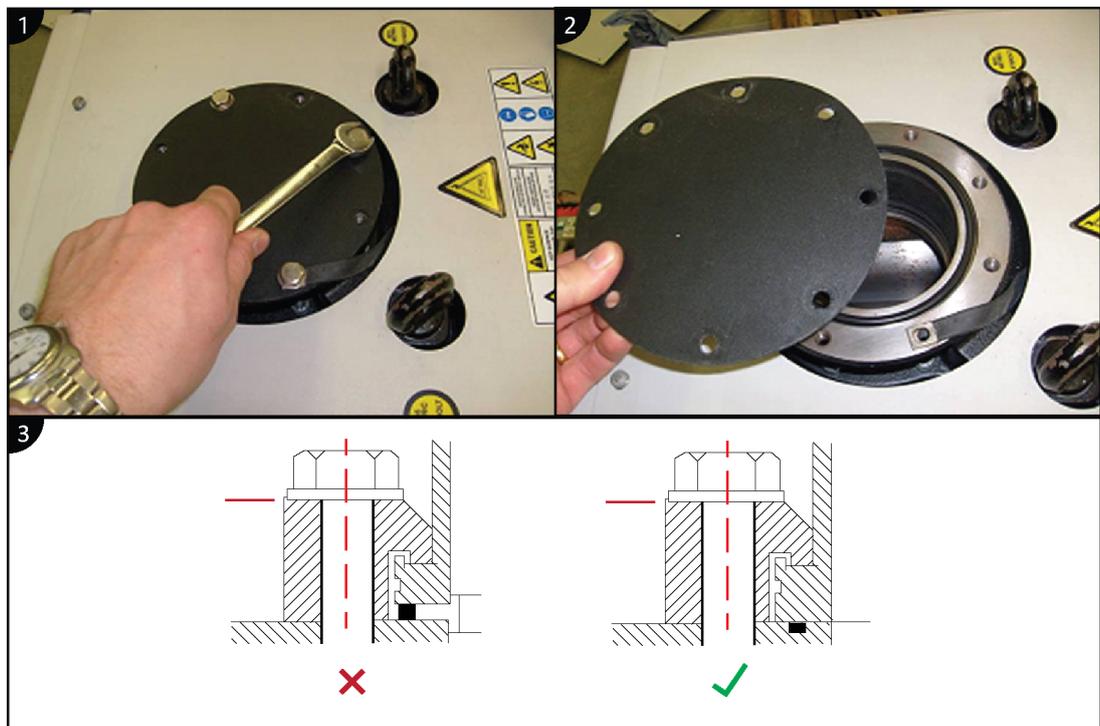


### CAUTION: O-RING SAFETY

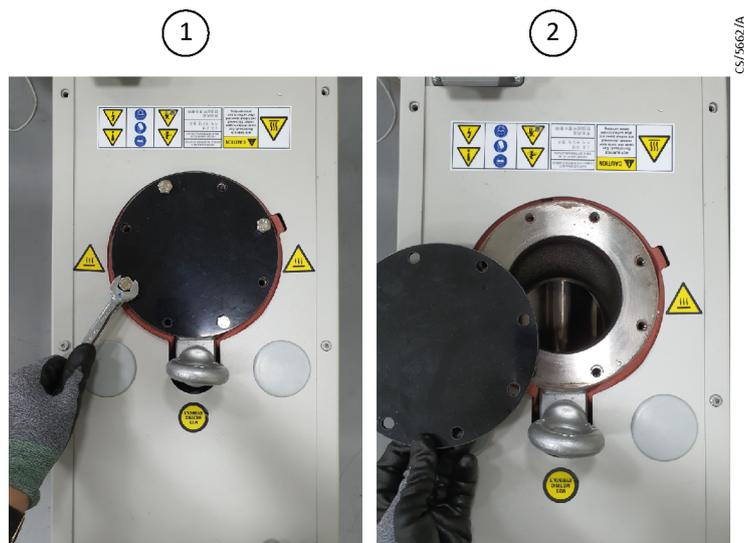
Risk of damage to the equipment. For iXM200 and iXM3000 variants, do not use a trapped O-ring or centering ring for installation. Use 8 half claw clamps to attach inlet piping and tighten it to a torque of 5.0 Nm.

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.
2. Connect the inlet flange (*Figure: Front view of the system*) to the vacuum system.
  - A. For iXM200 and iXM3000 variants, use the O-ring (supplied) and applicable nuts, bolts and washers (not supplied) to connect the inlet flange. The inlet O-ring is supplied with the pump and is installed underneath the inlet flange cover. Refer to *Figure: Connect the pump inlet (iXM200 and iXM3000)*.
  - B. For iXM600 and iXM1200 variants, use the trapped O-ring or centre ring (supplied) and applicable nuts, bolts and washers (not supplied) to connect the inlet flange. Refer to *Figure: Connect the pump inlet (iXM600 and iXM1200)*.
3. Use half claw clamps when you connect an ISO style foreline flange to the dry pumping system inlet. Refer to *Figure: Connect the pump inlet* and *Table: Half claw clamps*.

Figure 9 Connect the pump inlet (iXM200 and iXM3000)



CS/0529/A

**Figure 10** Connect the pump inlet (iXM600 and iXM1200)

1. Remove screws

2. Remove cover

**Table 17** Half claw clamps

Flange diameter	Half claw clamp part number	Quantity required	Tightening torque (Nm)
ISO63	C10007093	4	5
ISO100	C10007093	8	5
ISO200	C10011093	12	5

### 4.6.3 Connect the pump exhaust

**Note:**

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

Use the trapped O-ring seal and clamp supplied to connect the exhaust outlet on the exhaust pipe, to the exhaust extraction system. Refer to [Figure: Controls/connectors on the rear of the system](#)

### 4.6.4 Connect to the factory extraction system (optional)

An extraction port is given 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 23 for the necessary extraction rates. Refer to [Accessories](#) on page 93 for the necessary exhaust extraction cover kit.

Refer to [Figure: Front view of the system](#) for location of the extraction port.

## 4.6.5 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 requirements. If it does not, the gas pipelines can become blocked or the dry pumping system can be damaged.

Refer to [Figure: Controls/connectors on the rear of the system](#) for location of the nitrogen purge port. The gas module in the system can be adjusted to suit process demands. Refer to [Gas module configuration](#) on page 64.

Refer to [Table: Nitrogen purge data](#) for nitrogen supply requirements.

## Flammable/pyrophoric materials



### WARNING: FLAMMABLE GASES

Risk of injury and damage to the equipment. Obey the instructions and make note of precautions to make sure that the 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:

- 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 practice suggests that the following measures will decrease 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 dry pumping 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.

## 4.6.6 Connect to the electrical supply



### **WARNING: PROTECTIVE EARTH CONNECTION**

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

Contact us, if the system needs to be configured for use at different voltage range to what is specified on the rating plate.

Solid state electronics protects the system from motor overload and short circuits. Refer to [Electrical data](#) on page 18, when you select the overload protection. 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 RCD according to EN50178, supplementary protector according to UL1077, circuit breakers according to UL489, ground fault interrupter according to UL943).

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
- short duration switch-on surges
- high leakage current.

For example, type B RCD according to EN50178, supplementary protector according to UL1077, circuit breakers according to UL489, or ground fault interrupter according to UL943.

### 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 protected electrical supply and with a 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 you disconnect the electrical supply cable from the dry pumping system.



#### **WARNING: HAZARDOUS VOLTAGES**

Risk of electric shock. Make sure that the pump and electrical cables 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 as given in electrical connection [Table: Wire assembly according to VDE 0295](#), i.e. from 6 mm<sup>2</sup> to 10 mm<sup>2</sup>) to the protective earth (ground) stud, [Figure: Controls/connectors on the rear of the 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.

**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.

**WARNING: HOT SURFACE**

Risk of burn injury. The exhaust of the dry pumping system will heat up when the pump is in operation.

**CAUTION: ELECTRICAL SAFETY**

Risk of damage to equipment. Do not connect voltages greater than specified in this manual to the control/interface connections as damage can be caused to the interface control.

**WARNING: HAZARDOUS VOLTAGES**

Risk of electric shock. The secondary protective earth (ground) is required in case of failure of the primary earth and because pump filters can cause high earth leakage current. Refer to [Table: General electrical data](#).

**Note:**

*With respect to European Electromagnetic Compatibility (EMC) requirements for harmonics and flicker, the iXM must be treated as Class A (industrial) as defined by EN61326. The iXM is not intended for use in domestic buildings, or in properties directly connected to an electrical supply network which also supplies domestic buildings.*

*All systems are supplied already configured for the electrical supply. Low voltage (200 V a.c. to 230 V a.c.) and high voltage (380 V a.c. to 460 V a.c.) ranges cannot be reconfigured.*

**Mains supply cable connection****WARNING: HAZARDOUS VOLTAGES**

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

Refer to [Electrical supply safety](#) on page 37 before you connect the system to the mains supply.

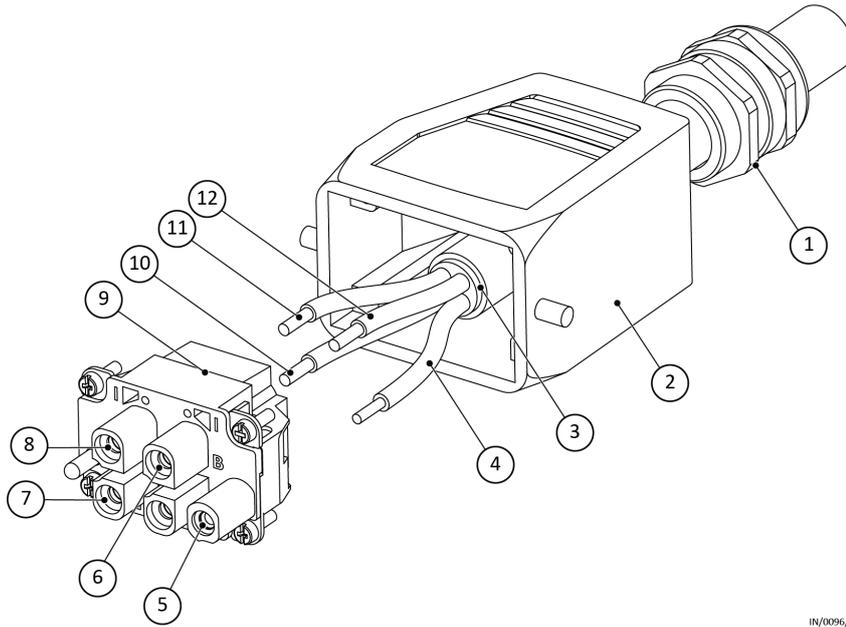
Two types of electrical supply connector are used on the system. Refer to [Electrical data](#) on page 18 for details of the connector types the systems to which they are connected.

To connect the electrical supply to the system through the connector supplied with the pump, use the procedure as follows. Refer to: [Figure: Mains input supply connector - Han®40A \(iXM200, iXM600 and iXM1200\)](#) to [Figure: Mains input supply connector - Han® K 4/4 \(iXM3000\)](#) for your connector type. To use a different connector than that supplied, follow the manufacturer's instructions.

When you prepare the electrical supply cable, make sure that the earth (ground) conductor is longer than the phase conductors. This will make sure that if the cable is accidentally dragged and the strain relief bush on the electrical supply connector mating half fails, the earth (ground) conductor will be the last conductor to be pulled from the connector.

1. Attach the cable gland onto the connector hood.
2. Put a applicable cable, through the cable gland and hood. The cross sectional area of the cable wires should be 6 mm<sup>2</sup>. Cables must be bare ended without ferrules for correct clamping in the connector block. Refer to [Table: Wire assembly according to VDE 0295](#)
3. Attach the coding pins to the connector block according to the branch supply voltage as shown in [Figure: Coding pin configuration](#) for connector type (200 V supply for low volts, 400 V supply for high volts).
4. Before you start the assembly, use the hex (Allen) key as shown in [Figure: Method for connecting phase wires](#) or [Figure: Mains input supply connector - Han® K 4/4 \(iXM3000\)](#). Make sure that the axial cone is screwed fully anticlockwise to completely open the contact chamber.
5. For the three live conductors (L1, L2, L3), carefully remove the cable insulation to the exact dimension specified in [Figure: Method for connecting phase wires](#). Do not twist the cable strands.
6. Refer to [Figure: Mains input supply connector - Han®40A \(iXM200, iXM600 and iXM1200\)](#) to identify the connections. Connect the three live conductors to the connector block: L1 to a1, L2 to a2 and L3 to b1. Insert each wire completely into the contact chamber until the copper stands reach the bottom.
7. Tighten the connection using an appropriate Allen key as shown to a torque of 2 Nm. Hold the cable in position while applying the recommended tightening torque. Refer to [Figure: Mains input supply connector - Han®40A \(iXM200, iXM600 and iXM1200\)](#) and [Figure: Mains input supply connector - Han® K 4/4 \(iXM3000\)](#).
8. Attach the earth (ground) wire to the protective earth connection on the connector block as shown in [Figure: Mains input supply connector - Han®40A \(iXM200, iXM600 and iXM1200\)](#) using the following:
  - Prepare the end of the 6 mm<sup>2</sup> earth wire to a strip length of 10 mm and twist the strands.
  - Insert the wire into the earth terminal block.
  - Tighten the connection using a flat blade screwdriver.
9. Install the outer cover to the connector block then tighten the cable gland
10. Connect the mating half to the electrical supply connector of the dry pump system ([Figure: Controls/connectors on the rear of the system](#)).
11. Attach a secondary protective earth (ground) conductor (with a cross-sectional area at least equal to phase conductor size) to the protective earth (ground) stud. Refer to [Figure: Mains connector on pump bulkhead](#).

**Figure 11** Mains input supply connector

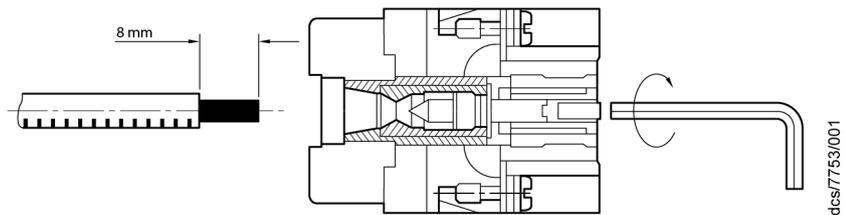


IN/0096/A

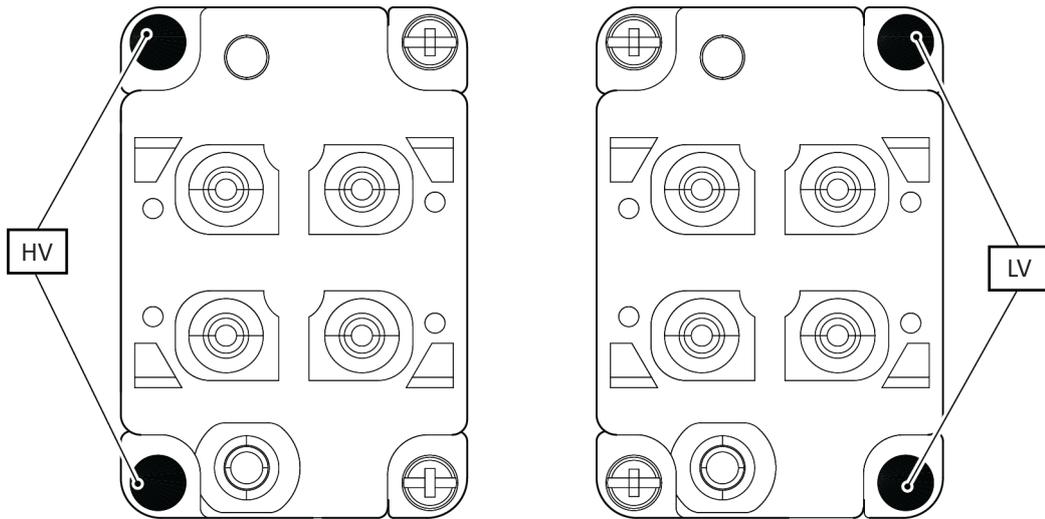
- |                       |          |
|-----------------------|----------|
| 1. Cable gland        | 2. Hood  |
| 3. 3-Phase main cable | 4. Earth |
| 5. Protective earth   | 6. B1    |
| 7. A2                 | 8. A1    |
| 9. Connector block    | 10. L2   |
| 11. L1                | 12. L3   |

Torque settings for connector pins	
Cable size (mm <sup>2</sup> )	Maximum torque setting (Nm)
6	2
10	3

**Figure 12** Method for connecting phase wires

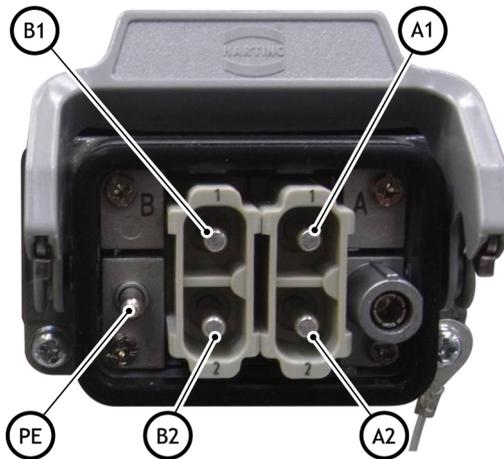


**Figure 13** Coding pin configuration



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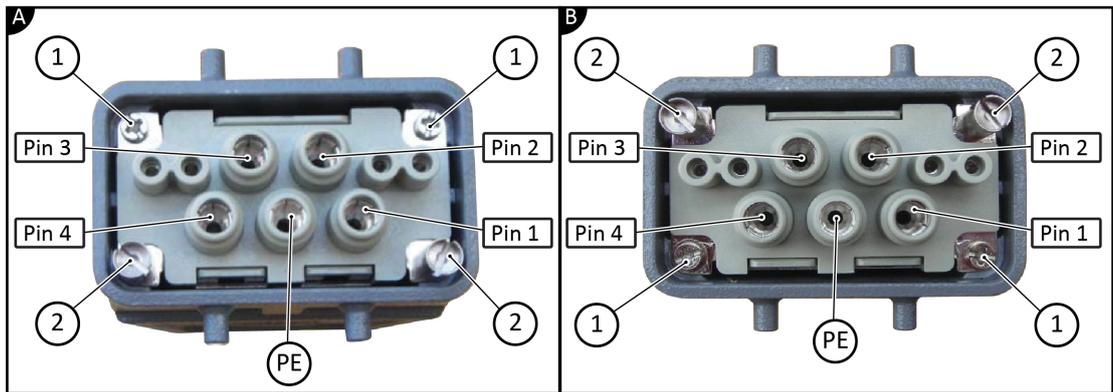
**Figure 14** Mains connector on pump bulkhead



dcs/6124/001

Pin identification	
Pin A1	Phase 1
Pin A2	Phase 2
Pin B1	Phase 3
Pin B2	Not connected
Pin PE	Protective earth

Figure 15 Mains input supply connector - Han® K 4/4



CS/4051/A

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 <sup>2</sup> )	Maximum torque setting (Nm)
6	2
10	3
16	4

**Figure 16** Protective Earth (PE) connection



### Electrical connector locking mechanism

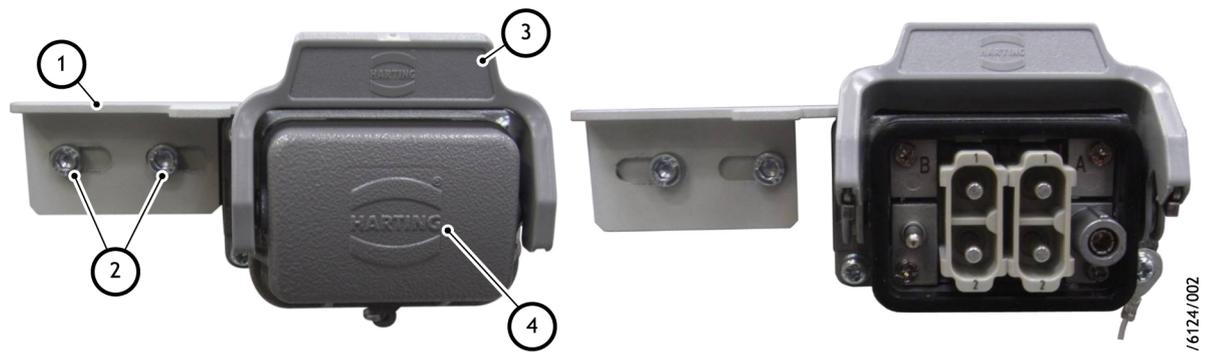
This product is approved permanently connected equipment and must be used as described below:

The pumping system has an electrical connector locking mechanism (*Figure: Controls/connectors on the rear of the system*). Use an applicable screwdriver to release.

The pumping system is supplied with a protective cover (*Figure: Electrical connector locking mechanism*) installed and the locking mechanism can be applied. Use the following instructions to install the electrical supply cable.

- Turn the locking screws to loosen the locking mechanism, if necessary.
- Move the locking mechanism as far as possible to the left.
- Push up the lever to release the protective cover.
- Remove the protective cover and attach the electrical supply cable.
- Pull the lever downwards to lock the electrical supply cable connector in place.
- Push the locking mechanism as far as possible to the right so that it prevents the lever from functioning.
- Tighten the locking screws to firmly hold the locking mechanism in place.
- Connect the other end of the electrical supply cable to the electrical supply through an isolator.

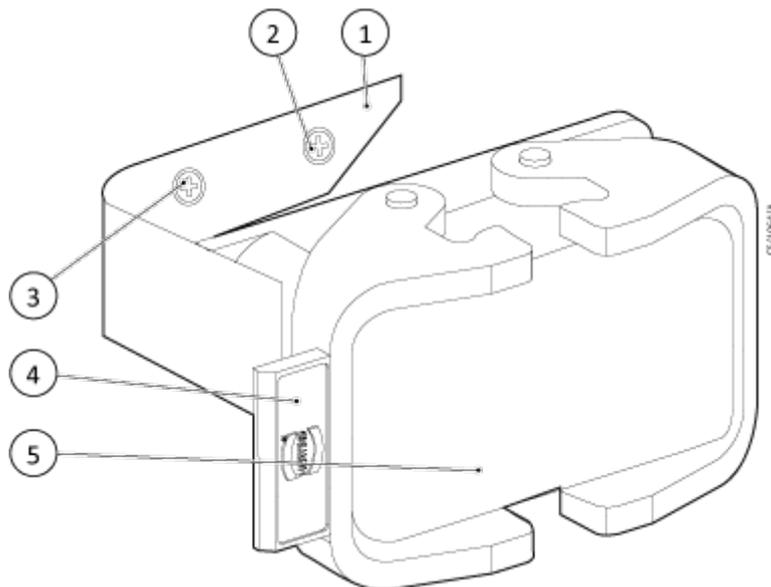
**Figure 17** Electrical connector locking mechanism (iXM200, iXM600 and iXM1200)



- |   |                     |
|---|---------------------|
| 1. Electrical connector locking mechanism | 2. Locking screws   |
| 3. Lever                                  | 4. Protective cover |

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**Figure 18** Electrical connector locking mechanism



- |   |                  |
|---|------------------|
| 1. Electrical connector locking mechanism | 2. Pivot screw   |
| 3. Locking screw                          | 4. Lever (2 off) |
| 5. Protective cover                       |                  |

#### 4.6.7 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:

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

## 4.6.8 Connect to the emergency stop circuit

The EMS (controlled stop) button on the front panel of the system is used to stop the pump in an emergency.

 **Note:**

*The EMS button (Figure: Front panel controls, item 1) when used on its own does not isolate the electrical supply to the system and does not give an EMO (Emergency Off) function.*

 **Note:**

*All references in this manual to the EMS button and/or to the EMS abbreviation, do not describe a rated controlled stop circuit. The EMS button is used as a controlled stop button in all our products. The same reason applies to the EMS link plug.*

The system has an external emergency stop circuit that can be connected into the control equipment. Refer to [Figure: Controls/connectors on the rear of the system](#) and [Table: Electrical connections](#). In this case, the controlled stop control should be compliant with IEC 60947-5-5, a red self-latching 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: Controls/connectors on the rear of the system](#)). If the EMS link plug is not installed the system will not operate.

### Emergency off (EMO) functionality

If EMO functionality is necessary (for example, for the requirements of SEMI S2), install the pumping system in combination with an our disconnect box.

The disconnect box is available as an accessory. Refer to [Accessories](#) on page 93. Refer to the disconnect box manual for installation instructions and information about how the pumping system can be shut down in an emergency. The photohelic switch/gauge (available as an accessory) monitors the loss of extraction from the enclosure, which agrees with SEMI S2 requirements.

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 on the pump into the integrated system's emergency off circuit.

Refer to [Controlled stop](#) on page 63 for more information about pump behaviour after a controlled stop.

## 4.6.9 Connect the cooling water supply



### **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 21. Make sure water supplies are connected in parallel. Refer to [Figure: Controls/connectors on the rear of the system](#). We recommend use of quick connectors to decrease the risk of water spills during connection and disconnection. Some pump variants are supplied with quick connector mating halves. The quick connector mating halves are also available as an accessory kit. Refer to [Accessories](#) on page 93.*

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

**Setting the cooling water flow rate - Method 1**

Before you start, make sure that the electrical power supply to the system is set to off.

To connect the cooling water supply:

1. Use a 3/8 inch BSP male pipe fitting to attach the female quick-release connector to the cooling water supply hose.
2. Use a 3/8 inch BSP female pipe fitting 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. Refer to [Figure: Controls/connectors on the rear of the 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. Refer to [Figure: Controls/connectors on the rear of the 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 shortly after power up (in 1 minute) 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 cooling system 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.

**Setting the cooling water flow rate - Method 2**

Use the following procedure to connect the cooling water supply and make sure that the system is receiving the correct water flow rate. Before you start, make sure that the electrical power supply to the system is switched off:

1. Use a 3/8 inch BSP male pipe fittings to attach the female quick-release connector to the cooling water supply hose.
2. Use a 3/8 inch BSP female pipe fitting 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: Controls/connectors on the rear of the system*). Install a water flow meter in the water supply line close to the pump and connect the water supply hose to the cooling water inlet (*Figure: Controls/connectors on the rear of the system*).
5. Turn on the cooling water supply.
6. Switch on the electrical power to the system. Wait for approximately 2 minutes. Use the Pump Display Terminal accessory (PDT) refer to *Pump Display Terminal (PDT)* on page 93 and press the Setup button. Under the Setup menu select the Test Mode option. Select Water On and press Enter. This command will open all the main pump water valves for approximately 30 seconds.
7. While the main pump water valves are open, adjust the water flow rate so that it meets the requirements given in *Table: Water cooling system data*. If more time is required to adjust the water flow rate, access the Test Mode option again and select Disabled. Press Enter. Access the Test Mode option one more time and select Water On same as before. Repeat this test until the water flow rate has been set to the required value.
8. Once the cooling water flow rate has been set, go to the Setup menu on the PDT. Select the Test Mode option. Select the option Disabled and press Enter. The valves should now close and the flow rate displayed by the water flow meter will decrease.
9. Switch off the electrical power to the system.
10. The water flow meter can now be removed.
11. Inspect the water hoses, pipelines and connections and check that there are no leaks.
12. Turn off the water supply

#### 4.6.10 Connect the accessories



##### **WARNING: INSTALLATION SAFETY**

Risk of injury. When you install accessories in the dry pumping 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.

## 4.7 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 dry pumping 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 is shown on the Pump Display Terminal (PDT) (if installed) and sent to any interface 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 [Alarm conditions](#) on page 79) 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. The noise level depends upon the process, duty cycle, installation or environment in which the system is being operated. 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 pump exhaust will heat up when the pump is in operation. Do not touch the pump surface.

Refer to [Figure: Front panel controls](#):

1. Switch on the external electrical supply and check that the POWER LEDs illuminate. If the Light-Emitting Diodes (LEDs) do not illuminate, contact us.
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 and check that the green Local Control LED illuminates and then remains continuously illuminated.
6. Press Start button.
7. If the dry pumping 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 62.
  - Contact us.
8. Monitor 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 59.
  - Otherwise, shut down the system, refer to [Shut down](#) on page 62.

## 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 more information on leak-testing is necessary, contact supplier or us.*

## 5.3 Configure the system through a PDT

### 5.3.1 Pump display terminal

The PDT accessory provides pump on or off and status reporting. Warnings and alarms are also indicated to the user. Up to two PDTs can be installed on the pump.

**Figure 19** Pump display terminal



#### LEDs

**Local Control:** Illuminates green continuously when the PDT has control of the pump.

**Pump On (in the Pump Start Button):** Illuminates (green) to indicate that the pump is in operation.

**Warning:** Illuminates yellow to indicate that a pump warning is present. It flashes when a new warning occurs until it is acknowledged by pressing Enter. It then illuminates continuously until the warning clears.

**Alarm:** Illuminates red to indicate that a pump alarm is present. It flashes when a new alarm occurs until it is acknowledged by pressing Enter. It then illuminates continuously until the alarm clears.

## 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 18 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 (running)
Stopped or Running	Off	No PDT Control Press CANCEL	Press CANCEL	No change

Press Stop  button PDT displays:

**Table 19 Pump stop and control**

Pump state	Local control LED	PDT display	Operator	Pump response
Stopped	On	PUMP Stopped Press CANCEL	Press CANCEL	No change (stopped)
Running	On	STOP MENU Fast Shutdown	If Auto Shutdown is necessary press down arrow. Press ENTER to confirm	Pump stops
Stopped or Running	Off	No PDT Control Press CANCEL	Press CANCEL	No change

## Warning and alarm display and acknowledgement

Each new warning and alarm is displayed as it occurs, overwriting any current display text unless another unacknowledged warning or alarm is being displayed. The corresponding Warning and Alarm LED flashes to indicate a new warning and alarm.

Press Enter to acknowledge the warning and alarm currently displayed. The Warning and 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 and Alarm LED will continue to flash and this is then displayed. Otherwise the display will revert to the original text from before the warning(s) and alarm(s) occurred.

If there are warnings and alarms still present, but all acknowledged, the corresponding LED remains continuously illuminated. The text indicating acknowledged warning and

alarm conditions still present can be viewed in the Status menu, refer to [Status menu](#) on page 52. 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 build-up.

## PDT 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'.

### Normal menu

This menu is displayed when the PDT is first plugged into the pump, or can be accessed when you press the Normal button. Up to four parameters are displayed, press up/down keys to scroll.

By default there are four parameters displayed in the Normal menu and these can be changed through the Edit Display attributes menu, accessed from the Setup menu.

**Table 20 Normal menu**

Description	Typical display
Serial number	S/N 1234567
Control holder	NONE IN CONTROL
Dry pump current	DP CURRENT 6 A
Booster current	MB CURRENT 3.5 A

### 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.

**Table 21 Status menu**

Description	Typical display
Serial number	S/N 1234567
Control holder	NONE IN CONTROL
Dry pump current	DP CURRENT 1.1 A
Booster current	MB CURRENT 1.1 A
Green Mode state	GREEN MODE STATE Off
Gate valve open or closed state	GATE VALVE Open
Remote gate valve open or close state	PB VALVE Open

Description	Typical display	
Dry pump stator reference temperature	TCS REF	100 °C
Dry pump temperature	DP TEMP	100 °C
Dry pump exhaust stage temperature	DP EXH STG	100 °C
Dry pump end cover temperature	DP EC TEMP	100 °C
Dry pump motor temperature	DP MTR TEMP	100 °C
Booster temperature	MB TEMP	100 °C
Booster motor temperature	MB MTR TEMP*	100 °C
Booster end cover temperature	MB EC TEMP	100 °C
Dry pump power	DP POWER	1.1 kW
Booster power	MB POWER	1.1 kW
N <sub>2</sub> flow rate	N <sub>2</sub> FLOW	44 slm
N <sub>2</sub> purge supply	N <sub>2</sub> SUPPLY	OK
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
Dry pump inverter temperature	DP INV TEMP	100 °C
Booster inverter temperature	MB INV TEMP	100 °C
Dry pump exhaust pressure	EXHAUST	5 PSI
Dry pump exhaust temperature	EXH PIPE	100 °C
Dry pump exhaust gas temperature	EXH TEMP	100 °C
Active gauge pressure	AG	1.1E-3 kPa
Water flow rate	WATER	11.1 l/m
Run hours	RUN HOURS	1000
Number of pump starts	PUMP STARTS	100
Time to stop (seconds)	TIME TO STOP	900
Active alarms and warnings (if present)		

\* In case of TX variants, booster temperature is displayed.

### 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 22 Setup menu**

Description	Display
Commands menu*	Command Menu...
Display Inverter Fault History menu	Inv Fault Hist...

Description	Display
Software Version Display menu	S/W Version...
Display Serial Number	Serial Num...
Display Serial Number for pXH	PB Serial Num...
Fit Accessory menu*	Fit Accessory...
Fit Accessory menu for pXH*	Fit PB Accessory...
Edit IP configuration menu	IP Config...
Edit configuration menu for pXH	PB IP Config...
Edit Display attributes menu	Display Attr...
Set Time and Date <sup>§</sup>	Set Clock...
Display Pump Type	Show Pump type...
Display Pump Type for pXH	Show PB type...
Gas Module type	Gas Module type
Test Mode	Test Mode...

\* This option requires a security code to access it.

§ Time is set automatically when connected to a Fabworks network.

### COMMANDS menu

1. Press up/down keys to scroll. Press ENTER to open a sub menu.
2. Press CANCEL to return to the SETUP menu.
3. Refer to [Table: COMMANDS menu](#). Press the up/down keys to select the new settings.
4. Press ENTER to accept.
5. Press CANCEL to return to the COMMANDS menu.

**Table 23** COMMANDS menu

Gate Valve (Open/Shut)*
MB Pump (On/Off) <sup>§</sup>
PB Pump (On/Off) <sup>§</sup>
Green Mode State (On/Off) <sup>§</sup>
Green Mode Level
Gas Valves*
Force Control
Set N <sub>2</sub> Warnings
USB...
Reset MicroTIM
Default reset
Store detail log

Test Mode
-----------

\* This option requires a security code to access it.

§ The PDT must be in control to perform these functions.

### ***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.
3. Refer to [Table: GAS VALVES menu](#). Press the up/down keys to select on/off.
4. Press ENTER to accept.
5. Press CANCEL to return to the GAS VALVES menu.

***Table 24 GAS VALVES menu***

Set N <sub>2</sub> Seal
Set Inlet 1
Set Bypass
Set Exhaust 2

### ***USB 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 25 USB menu***

USB acquire logs...
USB upgrade...
USB configuration...

### ***USB acquire logs menu***

Data Log: On-board data log which shows parameters, status and events.

Session Log: When a PC is connected, records the user ID of the person who is connected and the PC name. History of the configuration file updates on the pump.

Critical Logs: This option stores 22 minutes of data around a critical event (20 before and 2 after). Up to 4 critical events can be stored.

Configurations: It shows all the details of configuration software updates since the last default reset on the pump.

### ***USB upgrade menu***

This is used to update the existing executive software on the pump.

**USB configuration menu**

Contact us.

**Reset MicroTIM menu**

This command deletes all the stored configurations on the microTIM.

**INV FAULT HIST (Display Inverter Fault History) 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.

Refer to [Table: INV FAULT HIST \(Display Inverter Fault History\) menu](#). Each inverter fault history contains up to 32 entries, which 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:www

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

Refer to [Inverter warnings and alarms](#) on page 83 for more information about inverter warnings and alarms.

**Table 26 INV FAULT HIST (Display Inverter Fault History) menu**

DP Inv Fault Hst (Dry Pump Inverter Fault History)
MB Inv Fault Hst (Booster Inverter Fault History)

**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.

**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.
2. Press CANCEL to return to the SETUP menu.
3. Refer to [Table: FIT ACCESSORY menu](#). For an accessory press the up/down keys to select Fitted or Not Fitted and press ENTER to accept or CANCEL to return to the COMMANDS menu

**Note:**

*Gate valves additionally have an option of Fitted No Feedback for use where there are no position feedback switches installed to the gate valve.*

**Table 27 FIT ACCESSORY menu**

Gate Valve...	
PB Gate Valve...	
Water Sensor...	(Analog water flow)
PB Water Sensor...	(Analog water flow)
Active Gauge...	
PB Active Gauge...	
Exh Gas Temp...	(Exhaust Gas Temperature)
PB Exh Gas Temp...	(Exhaust Gas Temperature)
Remote Control	

**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.
3. Refer to [Table: IP Configuration menu](#). Display only items press CANCEL to return to the IP Configuration menu.

**Table 28 IP Configuration menu**

Host_Name...	(display only)
DHCP Enable...	(Enabled / Disabled)*
IP Address...	(xxx.xxx.xxx.xxx) <sup>§</sup>
Address Mask...	(xxx.xxx.xxx.xxx) <sup>§</sup>
Gateway...	(xxx.xxx.xxx.xxx) <sup>§</sup>
DNS Server...	(xxx.xxx.xxx.xxx) <sup>§</sup>
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.

§ 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. Press CANCEL at the start of the line to cancel and return to the IP Configuration.

**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 29 Display attributes menu**

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

**SELECT LINE (Normal display selection menu)**

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. Refer to [Table: SELECT LINE \(Normal display selection menu\)](#). 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.

**Table 30 SELECT LINE (Normal display selection menu)**

Top Page 1...
Bottom Page 1...
Top Page 2...
Bottom Page 2...

**UNITS (Units to display menu)**

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. Refer to [Table: UNITS \(Units to display\)](#). 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 31 UNITS (Units to display)**

Pressure...	(PSI/kPa/ mbar/Torr)
Temperature...	(Centigrade/Fahrenheit/ Kelvin)
Speed...	(RPM/Hz)
Active Gauge...	(mbar/Torr/kPA)

## 6. Operation

### 6.1 Start-up

#### **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 dry pumping system models. Testing has shown that accessible temperatures can exceed 65 °C in small areas in worst case pressure conditions at an ambient temperature of 40 °C. Under normal process operating conditions and an ambient temperature below 25 °C, accessible enclosure temperatures are unlikely to reach this level.

#### **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: ELECTRICAL HAZARD**



Risk of electric shock. Do not operate the pump with the enclosures removed or damaged.

#### **WARNING: HOT SURFACES**



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

#### **WARNING: 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.

The system can be controlled by a number of modules:

- The front control panel (*Figure: Front panel controls*)
- Pump Display Terminal (PDT)
- System Controller
- Tool through the MicroTIM
- One of the serial interfaces.

Only one module can control the system at a time. When the system is controlled by one module, control requests from the others are denied.

In addition to the control modules listed above, contact the supplier for more information on ways to control the dry pumping system or our other pumping system.

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

The pump, as supplied, can only be controlled using the front panel. The PDT and the MicroTIM are accessories. Refer to [Accessories](#) on page 93. The System Controller is part of an integrated pump and abatement system.

To start the system:

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.

### 6.1.1 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: Controls/connectors on the rear of the system*) on the rear panel will illuminate.

A MicroTim is available as an accessory. Refer to [Accessories](#) on page 93.

### 6.1.2 Start up through a PDT

To operate the system through a PDT:

1. Connect the PDT to the necessary PDT connection, front (*Figure: Front panel controls*) or rear (*Figure: Controls/connectors on the rear of the system*).
2. Press the Control button to take the control with the PDT. The message 'PDT1 IN CONTROL' is displayed if the front connection is used or the message 'PDT2 IN CONTROL' is displayed if the rear connection of the system is used. If something else is in control, error message 'Control locked' appears. Refer to 'Control Holder' in the Status menu.

3. Press the START button.
4. Press ENTER.

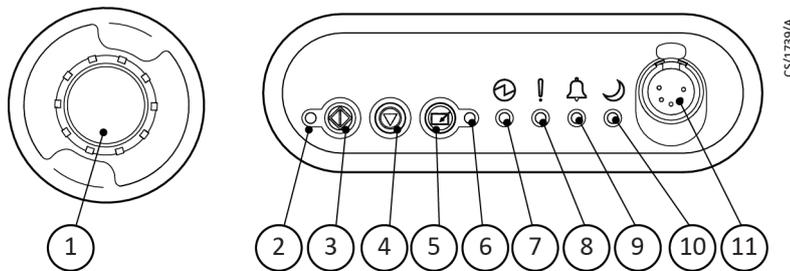
The system will start, the "Running LEDs" on the pump and the "Pump On LED" on the PDT will flash while the pump is on and warm up. These LEDs will stop flashing and remain illuminated continuously when the pump has reached full speed.

### 6.1.3 Start up through the front panel control

To operate the system through the front panel controls, refer to [Figure: Front panel controls](#).

1. Press and hold the local control button. The Green 'local control' LED will illuminate continuously when control is taken. The message 'Keys in Control' will be displayed on the PDT if connected.
2. Press and hold the start button until the pump starts. The Running LED will flash while the pump starts and will remain illuminated continuously when the pump operates normally.

**Figure 20** Front panel controls



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

### 6.1.4 Restart the system after a controlled stop or alarm condition

**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.*

1. If the EMS button on the front panel is used to shut down the system, the EMS button must be reset before restarting the system. Turn the EMS button to reset it then restart the system as described in [Start-up](#) on page 59.
2. If the system shut down automatically because of an alarm condition, the alarm condition must be corrected before you restart the system. Restart the system as described in [Start-up](#) on page 59

## 6.1.5 Restart the pump after a controlled 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 restarting the system. Contact your supplier.*

If the controlled stop button on the front panel has been used to shut down the system, reset the controlled stop button before restarting the system. Turn the controlled stop button to reset it, then restart the system as described in [Start-up](#) on page 59 .

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 59.

## 6.2 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 Pump Display Terminal. Do not release control from the Pump Display Terminal 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 and N<sub>2</sub> supply has been isolated. The pump can take up to three 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 byproducts the pump will possibly not restart.**

The pump can only be stopped through the module in control of the pump. The pump can be shut down by one of:

- The MicroTIM
- The PDT
- The front panel controls

 **Note:**

*The EMS button will always stop the pump. It does not matter which item has control. Refer to [Controlled stop](#) on page 63*

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

### 6.2.1 Shut down modes

- Auto shut down introduces a nitrogen purge cycle which lasts for 15~90 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.

### 6.2.2 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.

### 6.2.3 Shut down through a PDT

1. Press the Stop button on the PDT. Refer to [Table: Pump stop and control](#) for more information.
2. Select 'Auto' or 'Fast shut down' mode.

### 6.2.4 Shut down through the front panel control

1. Press and hold the STOP button ([Figure: Front panel controls](#)) for 5 seconds to stop the pump in 'Auto shut down' mode (recommended, refer to [Shut down modes](#) on page 63).
2. Repeat in 10 seconds to stop the pump in 'Fast shut down' mode. The running LED flashes while the pump slows down and will then turn off when the pump has shut down.

### 6.2.5 Controlled stop



#### **WARNING: HOT SURFACES**

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

#### Note:

*The controlled stop switch is not an electrical isolator.*

To shut down the system in an emergency, press the EMS button ([Figure: Front panel controls](#)). Alternatively, the controlled stop controls can be operated in the customer's own control system if the controlled stop circuit is connected to the system as described in [Connect to the emergency stop circuit](#) on page 45.

When controlled 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 pump display terminal will display '1.01 ALARM/STOP ACTIVATED' (if connected) or it can display 'ALARM 186.01/ DP INV 0040 000 / EMS'.
- For pXH booster pump, the PDT will display '801.01 ALARM/STOP ACTIVATED' (if connected) or it may display 'ALARM 825.01/ DP INV 0040 000 / EMS'.
- The Running LED will go off.
- The Alarm LED illuminates.
- For TX variants, the exhaust heaters remain powered on.
- Booster heaters on TX variants (where installed) switch off.

## 6.3 Gas module configuration

### 6.3.1 iXM Varimode gas module adjustment procedure

The factory default gas ballast flow setting for the Varimode gas module is 44 slm.

The default low warning set-point for the Varimode gas module while gas ballast is on is 10 slm, unless the pump is in green mode.

The gas ballast setting can be adjusted by the rotation of the gas ballast adjuster screw accessible from the rear of the pump enclosure.

If a different low warning set-point other than 10 slm is required after the variable ballast flow setting has been changed from its default nominal 44 slm setting, then:

1. With the PDT command, select the N<sub>2</sub> flow warning menu, provided that the pump is running and there is flow above 10 slm. Wait up to 30 seconds to make sure N<sub>2</sub> flow is in a steady state.
2. After a 5 second countdown delay, the pump will use the last spot reading of the N<sub>2</sub> flow rate to define a new low and high warning threshold near to the actual nominal flow selected. This will be stored on the parameter in the low and high warning thresholds and will be displayed on the PDT. The value stored will be 30% (configurable) less or more than the current flow value.
  - Use PDT up and down keys to change the low warning threshold in a range of 30% less than current nominal N<sub>2</sub> flow (with a minimum low warning threshold of 5 slm).
  - If the setting is attempted when a varimode gas module is not present, there is no valid flow reading at the start, then the PDT will display: 'CANNOT SET NO READING'.
  - If the flow fluctuates by more than 10 slm during the 5 second countdown delay, then the PDT will display: 'CANNOT SET FLOW CHANGING'. The countdown will then be cancelled and the setting is aborted.

If the flow reading goes beneath a value where calculating 30% less than the current flow will be below 5 slm, then the PDT will display 'CANNOT SET LOW READING'. The countdown will then be cancelled and the setting aborted.

## 6.4 System operating temperature configuration

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

Use the following procedure:

1. Access the Config menu on the PDT (requires an access code, contact supplier).
2. Scroll to Temp Set-points - press Enter.
3. Scroll to Set DP Temp - press Enter.
4. Scroll to desired temperature - Press Enter.

 **Note:**

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

Refer to [Table: Dry pump and booster temperature settings](#) for default temperature settings and ranges.

**Table 32 Dry pump and booster temperature settings**

Temperature Setting	Range in which temperature can be set(°C)	Default value (°C)
Dry pump (Standard variants) iXM600, iXM1200	60 - 110	80
Dry pump (Standard variants) iXM200, iXM3000	60 - 110	110
Dry pump (T and TX variants)	60 - 130	130
Booster (Only TX variants)	-	85

## 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 four 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.

### **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.

### **WARNING: LOCKOUT AND TAGOUT**



Risk of injury or death. Electricity, nitrogen and water supplies are possible hazardous energy sources. Lockout and tagout sources before you do the maintenance to the pump.

### **WARNING: HOT SURFACES**



Risk of burns. Do not touch the pump exhaust or check valve while the pump is in operation since the temperatures of these parts can be high. These parts can be hot even after the system has stopped.

### **WARNING: USE PROTECTIVE EQUIPMENT**



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 present in the pumps and piping. Use of correct protective gloves and clothing along with a respirator is recommended if contact with hazardous substances is possible. Be cautious 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.

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 you do a monthly visual inspection of the system. Check that the cables, hoses and pipelines connected 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:
  - A. Do an inspection of the connections, pipelines, cables and fittings inside the pump enclosure, refer to [Inspect the connections, pipelines, cables and fittings](#) on page 67.
  - B. Examine and clean the exhaust pipe, elbow, and check valve.

 **Note:**

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

The system requires no maintenance. Pump protection sensors installed in the system do not require routine maintenance. The decommissioning operations that can be carried out, refer to [Relocate the system for decommissioning](#) on page 86 and [Drain the cooling water for decommissioning](#) on page 87. Maintenance must be carried out by our service centres refer to [Service](#) on page 91. The frequency of maintenance operations depends on the process.

## 7.1 Inspect the connections, pipelines, cables and fittings

If the system is not relocated for maintenance, make sure all supplies are locked out and tagged out before you start the procedure that follows:

1. Remove the enclosure side and top panels.
2. Check that all the connections are secure. Tighten all the 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, damaged or which leak.
4. Install the enclosure side and top panels again.

## 8. Fault finding

### 8.1 Warnings

The pump controller supplies 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 problem occurs in the pump, 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 supplied.

If a PDT is installed, the warning LED flashes to indicate a new warning. Refer to [PDT warnings](#) on page 68 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 and alarm display and acknowledgement](#) on page 51 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 33 Warnings**

Warning message on PDT	Action message on PDT
<a href="#">Warning 1.01 - Power interrupt</a> on page 70	Check pwr supply
<a href="#">Warning 31.13 - Gas missing</a> on page 70	See manual
<a href="#">Warning 31.01 - SYS CONFIG FAULT</a> on page 70	See manual
<a href="#">Warning 35.09 - N2Purge Low</a> on page 70	Check N <sub>2</sub> supply
<a href="#">Warning 35.11 - N2 Purge High</a> on page 70	Check N <sub>2</sub> supply
<a href="#">Warning 35.13 - Gas Sensor Fault</a> on page 70	Check Gas Module
<a href="#">Warning 39.11 - Exh Press High</a> on page 70	Exhaust Blocked Service Pump
<a href="#">Warning 39.13 - Exh Press Fault</a> on page 71	Check Gas Module
<a href="#">Warning 54.11 - MB Mtr Temp High</a> on page 71	Check Cooling
<a href="#">Warning 54.13 - Sensor missing</a> on page 71	Check MB thermistor
<a href="#">Warning 54.13 - Sensor Fault</a> on page 71	Check MB thermistor
<a href="#">Warning 55.11 - DP Temp High</a> on page 71	Check Cooling
<a href="#">Warning 55.13 - Sensor missing</a> on page 71	Check DP thermistor

Warning message on PDT	Action message on PDT
<i>Warning 55.13 - Sensor Fault</i> on page 71	Check DP thermistor
<i>Warning 56.11 - Exh Temp High</i> on page 72	Check Exhaust Temperature
<i>Warning 56.13 - Sensor Missing</i> on page 72	Check Exhaust Thermocouple
<i>Warning 56.13 - Sensor Fault</i> on page 72	Check Exhaust Thermocouple
<i>Warning 57.11 - DP Mtr Temp High</i> on page 72	Check Cooling
<i>Warning 57.13 - Sensor missing</i> on page 72	Check DP Mtr Thermistor
<i>Warning 57.13 - Sensor Fault</i> on page 72	Check DP Mtr Thermistor
<i>Warning 63.11 - DP Temp High</i> on page 72	Check Cooling
<i>Warning 63.13 - Sensor missing</i> on page 72	Check DP Thermistor
<i>Warning 63.13 - Sensor Fault</i> on page 73	Check DP Thermistor
<i>Warning 70.11 - DP E/C Temp High</i> on page 73	Check Cooling
<i>Warning 70.13 - Sensor missing</i> on page 73	Check DP Thermistor
<i>Warning 70.13 - Sensor Fault</i> on page 73	Check DP Thermistor
<i>Warning 71.13 - AC Sup Missing</i> on page 73	Check Acc Module
<i>Warning 84.11 - Exh Temp High</i> on page 73	Check Exh Pipe Temperature
<i>Warning 84.13 - Sensor missing</i> on page 73	Check Exh Pipe Thermistor
<i>Warning 84.13 - Sensor Fault</i> on page 73	Check Exh Pipe Thermistor
<i>Warning 152.01 - Valve Not Shut</i> on page 74*	Check Gate Valve
<i>Warning 153.01 - Valve Not Open</i> on page 74*	Check Gate Valve
<i>Warning 161.01 - GV Missing</i> on page 74	Check Gate Valve
<i>Warning 161.01 - GV Fault</i> on page 74	Check Gate Valve
<i>Warning 176.01 - MB zzzzzzzzzzzz</i> on page 74	xxxx yyyy Diag aaaa bbbb
<i>Warning 176.13 - No MB Inv Comms</i> on page 74	See manual
<i>Warning 186.01 - DP zzzzzzzzzzzz</i> on page 74	xxxx yyyy Diag aaaa bbbb
<i>Warning 186.13 - No DP Inv Comms</i> on page 74	See manual
<i>Warning 190.01 - Valve Missing</i> on page 75	Check DP Stator Valve
<i>Warning 190.01 - Valve Fault</i> on page 75	Check DP Stator Valve
<i>Warning 191.01 - Valve Missing</i> on page 75	Check DP Motor Valve
<i>Warning 191.01 - Valve Fault</i> on page 75	Check DP Motor Valve
<i>Warning 192.01 - Valve Missing</i> on page 75	Check DP EC Valve
<i>Warning 192.01 - Valve Fault</i> on page 75	Check DP EC Valve
<i>Warning 193.01 - Valve Missing</i> on page 75	Check MB STATOR Valve
<i>Warning 193.01 - Valve Fault</i> on page 75	Check MB STATOR Valve

\* This warning will only clear when the valve has successfully been opened and closed

 **Note:**

*Some of these warnings apply to pump sensors that are only present on certain dry pumping system variants.*

*Some of these warnings apply to accessories and can only be encountered if the applicable accessory is installed.*

<b>Fault</b>	<b>Warning 1.01 - Power interrupt</b>
<b>Cause</b>	<b>There has been a brownout of the electrical supply to the pump lasting more than 1 second.</b>
<b>Remedy</b>	Check the electrical supply.
<b>Fault</b>	<b>Warning 31.13 - Gas missing</b>
<b>Cause</b>	<b>The gas module is not communicating with the pump controller.</b>
<b>Remedy</b>	Contact us.
<b>Fault</b>	<b>Warning 31.01 - SYS CONFIG FAULT</b>
<b>Cause</b>	<b>The wrong type of gas module has been installed.</b>
<b>Remedy</b>	Contact us.
<b>Fault</b>	<b>Warning 35.09 - N2Purge Low</b>
<b>Cause</b>	<p><b>The nitrogen supply flow rate is too low.</b></p> <ul style="list-style-type: none"> <li>▪ The supply is possibly not connected or set to on.</li> <li>▪ The supply line or filter is possibly blocked.</li> </ul>
<b>Remedy</b>	Check the nitrogen supply is connected and set to on and that pipelines and filters are not blocked.
<b>Fault</b>	<b>Warning 35.11 - N2 Purge High</b>
<b>Cause</b>	<p><b>The Nitrogen supply flow rate is too high.</b></p> <ul style="list-style-type: none"> <li>▪ The gas module and PDT settings do not match.</li> </ul>
<b>Remedy</b>	Check the gas module and PDT settings, refer to <a href="#">Gas module configuration</a> on page 64.
<b>Fault</b>	<b>Warning 35.13 - Gas Sensor Fault</b>
<b>Cause</b>	<p><b>The Nitrogen supply flow rate is too high.</b></p> <ul style="list-style-type: none"> <li>▪ The gas module is possibly faulty or disconnected</li> </ul>
<b>Remedy</b>	Contact us.
<b>Fault</b>	<b>Warning 39.11 - Exh Press High</b>
<b>Cause</b>	<p><b>The pressure in the exhaust pipeline is too high.</b></p> <ul style="list-style-type: none"> <li>▪ A valve in the pipeline is possibly shut.</li> <li>▪ There is possibly process debris or condensation in the exhaust pipeline.</li> <li>▪ You can have too many pumping systems connected to the exhaust pipeline.</li> </ul>

Remedy Refer to [Unplanned shut down and alarms](#) on page 80 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 - Exh Press Fault**

**Cause Sensor is faulty or disconnected**

Remedy Contact us.

**Fault Warning 54.11 - MB Mtr Temp High**

**Cause The temperature of the booster pump is too high.**

Remedy Check that cooling water is connected, switched on and is to specification given in [Cooling water data](#) on page 21.

**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. [Cooling water data](#) on page 21

**Fault Warning 54.13 - Sensor Fault**

**Cause Sensor is faulty (short circuit).**

Remedy Check that the sensor is installed and is correctly connected.

**Fault Warning 55.11 - DP Temp High**

**Cause Pump temperature high**

Remedy Check that cooling water is connected, switched on and is to specification given in [Cooling water data](#) on page 21.

**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 55.13 - Sensor Fault**

**Cause Sensor is faulty (short circuit).**

Remedy Check that the sensor is installed and is correctly connected.

<b>Fault</b>	<b>Warning 56.11 - Exh Temp High</b>
Cause	Exhaust temperature high.
Remedy	Contact us.
<b>Fault</b>	<b>Warning 56.13 - Sensor Missing</b>
Cause	Sensor is missing (open circuit).
Remedy	Check that the sensor is installed and is correctly connected.
<b>Fault</b>	<b>Warning 56.13 - Sensor Fault</b>
Cause	Sensor is faulty (short circuit).
Remedy	Contact supplier.
<b>Fault</b>	<b>Warning 57.11 - DP Mtr Temp High</b>
Cause	Pump temperature high.
Remedy	Check that cooling water is connected, switched on and is to specification given in <a href="#">Cooling water data</a> on page 21.
<b>Fault</b>	<b>Warning 57.13 - Sensor missing</b>
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.
<b>Fault</b>	<b>Warning 57.13 - Sensor Fault</b>
Cause	Sensor is faulty (short circuit).
Remedy	Contact us.
<b>Fault</b>	<b>Warning 63.11 - DP Temp High</b>
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 <a href="#">Cooling water data</a> on page 21.
<b>Fault</b>	<b>Warning 63.13 - Sensor missing</b>
Cause	The dry pump temperature sensor has possibly become disconnected or failed
Remedy	Contact us.

<b>Fault</b>	<b>Warning 63.13 - Sensor Fault</b>
Cause	Sensor is faulty (short circuit)
Remedy	Contact us.
<b>Fault</b>	<b>Warning 70.11 - DP E/C Temp High</b>
Cause	Pump dry end cover temperature is high
Remedy	Check that the cooling water supply is connected and switched on. The supply must be as per the specification given in <a href="#">Cooling water data</a> on page 21.
<b>Fault</b>	<b>Warning 70.13 - Sensor missing</b>
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.
<b>Fault</b>	<b>Warning 70.13 - Sensor Fault</b>
Cause	Sensor is faulty (short circuit)
Remedy	Contact us.
<b>Fault</b>	<b>Warning 71.13 - AC Sup Missing</b>
Cause	The pump controller cannot communicate with the accessory module
Remedy	<ol style="list-style-type: none"> <li>1. Check that the accessory module is correctly connected to the pump and then cycle the power to the pump.</li> <li>2. If this warning continues, contact us.</li> </ol>
<b>Fault</b>	<b>Warning 84.11 - Exh Temp High</b>
Cause	The exhaust pipe temperature is too high.
Remedy	Contact us.
<b>Fault</b>	<b>Warning 84.13 - Sensor missing</b>
Cause	The exhaust pipe temperature sensor has possibly become disconnected or failed.
Remedy	Contact us.
<b>Fault</b>	<b>Warning 84.13 - Sensor Fault</b>
Cause	Sensor is faulty (short circuit)
Remedy	Contact us.

<b>Fault</b>	<b>Warning 152.01 - Valve Not Shut</b>
<b>Cause</b>	The foreline gate valve has failed to close.
<b>Remedy</b>	Examine the wiring and air supply to the Gate valve. This warning will only clear when the valve has successfully been opened and closed.
<b>Fault</b>	<b>Warning 153.01 - Valve Not Open</b>
<b>Cause</b>	The foreline gate valve has failed to open.
<b>Remedy</b>	Examine the wiring and air supply to the Gate valve. This warning will only clear when the valve has successfully been closed and opened.
<b>Fault</b>	<b>Warning 161.01 - GV Missing</b>
<b>Cause</b>	The foreline gate valve is disconnected or missing (open circuit)
<b>Remedy</b>	<ol style="list-style-type: none"> <li>1. Make sure that the sensor is installed and is correctly connected.</li> <li>2. If this warning continues, contact us.</li> </ol>
<b>Fault</b>	<b>Warning 161.01 - GV Fault</b>
<b>Cause</b>	The foreline gate valve is faulty (short circuit)
<b>Remedy</b>	<ol style="list-style-type: none"> <li>1. Make sure that the sensor is installed and is correctly connected.</li> <li>2. If this warning continues, contact supplier.</li> </ol>
<b>Fault</b>	<b>Warning 176.01 - MB zzzzzzzzzzzzz</b>
<b>Cause</b>	Booster Inverter gives warning code xxxx yyyy / Diagnostic registers aaaa bbbb.
<b>Remedy</b>	Refer to <a href="#">Inverter warnings and alarms</a> on page 83 for more information
<b>Fault</b>	<b>Warning 176.13 - No MB Inv Comms</b>
<b>Cause</b>	The pump controller cannot communicate with the booster inverter.
<b>Remedy</b>	Examine the wiring between the pump controller and the booster inverter.
<b>Fault</b>	<b>Warning 186.01 - DP zzzzzzzzzzzzz</b>
<b>Cause</b>	DP Inverter gives warning code xxxx yyyy/Diagnostic registers aaaa bbbb.
<b>Remedy</b>	Refer to <a href="#">Inverter warnings and alarms</a> on page 83 for more information
<b>Fault</b>	<b>Warning 186.13 - No DP Inv Comms</b>
<b>Cause</b>	The pump controller cannot communicate with the dry pump inverter.
<b>Remedy</b>	Examine the wiring between the pump controller and the dry pump inverter.

<b>Fault</b>	<b>Warning 190.01 - Valve Missing</b>
<b>Cause</b>	<b>The DP stator cooling solenoid valve is disconnected or missing (open circuit).</b>
<b>Remedy</b>	Make sure that the DP stator cooling solenoid valve is installed and is correctly connected.
<b>Fault</b>	<b>Warning 190.01 - Valve Fault</b>
<b>Cause</b>	<b>The DP stator cooling solenoid valve is faulty (short circuit).</b>
<b>Remedy</b>	Contact us.
<b>Fault</b>	<b>Warning 191.01 - Valve Missing</b>
<b>Cause</b>	<b>The DP motor cooling solenoid valve is disconnected or missing (open circuit).</b>
<b>Remedy</b>	Make sure that the DP motor cooling solenoid valve is installed and is correctly connected.
<b>Fault</b>	<b>Warning 191.01 - Valve Fault</b>
<b>Cause</b>	<b>The DP motor cooling solenoid valve is faulty (short circuit).</b>
<b>Remedy</b>	Contact us.
<b>Fault</b>	<b>Warning 192.01 - Valve Missing</b>
<b>Cause</b>	<b>The DP end cover cooling solenoid valve is disconnected or missing (open circuit)</b>
<b>Remedy</b>	Make sure that the DP stator cooling solenoid valve is installed and is correctly connected.
<b>Fault</b>	<b>Warning 192.01 - Valve Fault</b>
<b>Cause</b>	<b>The DP end cover cooling solenoid valve is faulty (short circuit)</b>
<b>Remedy</b>	Contact us.
<b>Fault</b>	<b>Warning 193.01 - Valve Missing</b>
<b>Cause</b>	<b>The MB Stator cooling solenoid valve is disconnected or missing (open circuit)</b>
<b>Remedy</b>	Make sure that the DP motor cooling solenoid valve is installed and is correctly connected.
<b>Fault</b>	<b>Warning 193.01 - Valve Fault</b>
<b>Cause</b>	<b>The MB Stator cooling solenoid valve is faulty (short circuit)</b>
<b>Remedy</b>	Contact us.

## 8.2 Alarms

The pump controller gives an alarm when a serious problem occurs.

The reason for the alarm selects if, the whole system or just the booster (if installed) will shut down. Refer to [Alarm conditions](#) on page 79 and [Unplanned shut down and alarms](#) on page 80 for more information on alarms.

If the system has shut down because of an alarm, correct the problem before you re-start 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 [PDT warnings](#) on page 68 for more information on how alarms are indicated and how they can be acknowledged through the PDT.

when 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 and alarm display and acknowledgement](#) on page 51 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 which should be taken.

**Table 34 Alarms**

Warning message on PDT	Action message on PDT
<a href="#">Alarm 1.01 - Stop Activated</a> on page 77	Reset EMS
<a href="#">Alarm 1.01 - Sys Config Fault</a> on page 77	Contact us
<a href="#">Alarm 39.12 - Exh Press High</a> on page 77	Exhaust Blocked Service Pump
<a href="#">Alarm 54.12 - MB Mtr Temp High</a> on page 77	Check Cooling
<a href="#">Alarm 55.12 - DP Temp High</a> on page 77	Check Cooling
<a href="#">Alarm 57.12 - DP Mtr Temp High</a> on page 78	Check Cooling
<a href="#">Alarm 63.12 - DP Temp High</a> on page 78	Check Cooling
<a href="#">Alarm 70.12 - DP E/C Temp High</a> on page 78	Check Cooling
<a href="#">Alarm 84.12 - Exh Temp High</a> on page 78	Check Exh Pipe Temperature
<a href="#">Alarm 174.10 - MB Low Speed</a> on page 78	Check MB Rotor
<a href="#">Alarm 176.01 - MB zzzzzzzzzzzz</a> on page 78	ffff xxxx yyyy Diag aaaa bbbb

Warning message on PDT	Action message on PDT
<a href="#">Alarm 176.01 - MB Not Running</a> on page 78	See manual
<a href="#">Alarm 176.13 - No MB Inv Comms</a> on page 78	See manual
<a href="#">Alarm 184.10 - DP Low Speed</a> on page 79	Check DP Rotor
<a href="#">Alarm 186.01 - DP INV zzzzzzzzzzzz</a> on page 79	ffff xxxx yyyy Diag aaaa bbbb
<a href="#">Alarm 186.01 - DP Not Running</a> on page 79	See manual
<a href="#">Alarm 186.13 - No DP Inv Comms</a> on page 79	See manual

#### **Fault Alarm 1.01 - Stop Activated**

<b>Cause</b>	The emergency stop has been activated. There is a fault with the EMS circuit or the EMS link plug has not been installed or is disconnected.
<b>Remedy</b>	If the EMS button has been used on the pump, refer to <a href="#">Restart the system after a controlled stop or alarm condition</a> on page 61 to reset it. If the EMS button has not been used, examine and reset the EMS circuit and restart the pump. The alarm message will remain on the display until the dry pumping system is restarted.

#### **Fault Alarm 1.01 - Sys Config Fault**

<b>Cause</b>	The pump system type has not been set properly.
<b>Remedy</b>	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**

<b>Cause</b>	The exhaust pressure has reached maximum allowed limit.
<b>Remedy</b>	Refer to <a href="#">Unplanned shut down and alarms</a> on page 80 to find the exhaust pressure that caused the alarm. Refer to <a href="#">Warning 39.11 - Exh Press High</a> on page 70 for causes and actions.

#### **Fault Alarm 54.12 - MB Mtr Temp High**

<b>Cause</b>	The booster temperature has reached the maximum allowed so the booster has stopped.
<b>Remedy</b>	Refer to <a href="#">Unplanned shut down and alarms</a> on page 80 to find the temperature that caused the alarm. Refer to <a href="#">Warning 54.11 - MB Mtr Temp High</a> on page 71 for causes and actions.

#### **Fault Alarm 55.12 - DP Temp High**

<b>Cause</b>	Pump temperature high alarm, which stops pump.
<b>Remedy</b>	Refer to <a href="#">Warning 55.11 - DP Temp High</a> on page 71 for causes and action.

<b>Fault</b>	<b>Alarm 57.12 - DP Mtr Temp High</b>
<b>Cause</b>	The dry pump end cover temperature has reached the maximum allowed limit so the dry pumping system has stopped.
<b>Remedy</b>	Refer to <a href="#">Warning 57.11 - DP Mtr Temp High</a> on page 72 for causes and actions.
<b>Fault</b>	<b>Alarm 63.12 - DP Temp High</b>
<b>Cause</b>	The dry pump internal temperature has reached the maximum allowed limit so the dry pumping system has stopped.
<b>Remedy</b>	Refer to <a href="#">Warning 63.11 - DP Temp High</a> on page 72 for causes and actions.
<b>Fault</b>	<b>Alarm 70.12 - DP E/C Temp High</b>
<b>Cause</b>	The dry pump end cover temperature has reached the maximum allowed limit so the dry pumping system has stopped
<b>Remedy</b>	Refer to <a href="#">Warning 63.11 - DP Temp High</a> on page 72 for causes and actions.
<b>Fault</b>	<b>Alarm 84.12 - Exh Temp High</b>
<b>Cause</b>	The exhaust pipe temperature has reached the maximum allowed limit so the dry pumping system has stopped.
<b>Remedy</b>	Refer to <a href="#">Warning 84.11 - Exh Temp High</a> on page 73 for causes and actions.
<b>Fault</b>	<b>Alarm 174.10 - MB Low Speed</b>
<b>Cause</b>	Booster speed too low - rotor is possibly locked
<b>Remedy</b>	Contact supplier.
<b>Fault</b>	<b>Alarm 176.01 - MB zzzzzzzzzzzz</b>
<b>Cause</b>	Booster Inverter gives alarm code xxxx yyyy/Diagnostic registers aaaa bbbb. ffff is the inverter fault count.
<b>Remedy</b>	Refer to <a href="#">Inverter warnings and alarms</a> on page 83 for more information.
<b>Fault</b>	<b>Alarm 176.01 - MB Not Running</b>
<b>Cause</b>	Booster Inverter will not start up when requested.
<b>Remedy</b>	Examine inverter fault history.
<b>Fault</b>	<b>Alarm 176.13 - No MB Inv Comms</b>
<b>Cause</b>	The pump controller cannot communicate with the booster inverter during startup checks.
<b>Remedy</b>	Examine the wiring between the pump controller and the booster inverter.

<b>Fault</b>	<b>Alarm 184.10 - DP Low Speed</b>
<b>Cause</b>	The dry pump speed is very low. The rotor is possibly locked.
<b>Remedy</b>	Cycle the power to the pump and attempt to restart. If this fails, contact us.
<b>Fault</b>	<b>Alarm 186.01 - DP INV zzzzzzzzzzzz</b>
<b>Cause</b>	DP Inverter gives alarm code xxxx yyyy / Diagnostic registers aaaa bbbb. ffff is the inverter fault count.
<b>Remedy</b>	Refer to <i>Inverter warnings and alarms</i> on page 83 for more information.
<b>Fault</b>	<b>Alarm 186.01 - DP Not Running</b>
<b>Cause</b>	Dry Pump Inverter will not start up when requested.
<b>Remedy</b>	Examine inverter fault history.
<b>Fault</b>	<b>Alarm 186.13 - No DP Inv Comms</b>
<b>Cause</b>	The pump controller cannot communicate with the dry pump inverter during start up checks.
<b>Remedy</b>	Examine the wiring between the pump controller and the dry pump inverter.

### 8.2.3 Alarm conditions



#### CAUTION: LOSS OF WARRANTY

If 'Run 'til crash' is selected, the pump(s) can get damaged and all the warranties are invalidated on the system equipment.

Normally, if an alarm condition exists, the control system will shut down the system.

For pumping systems which has a dry pump and booster combination, some alarms will cause only the booster to stop and not the full system.

#### Note:

*If required '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 if it has control of the pump.*

**Table 35 Alarm actions**

Alarm Description	Alarm stops dry pump	Alarm stops booster 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

### 8.3 Unplanned shut down and alarms

The system has a number of pump protection sensors that will give warnings and alarms, refer to [Table: Pump protection sensors](#).

**Table 36 Pump protection sensors**

Sensor	Warning condition triggered (°C)	Alarm condition triggered (°C)
Exhaust pressure transducer		
▪ All variants	0.35 barg (5 psig)	0.55 barg (8 psig)
Dry pump stator temperature		
▪ iXM200	120	130
▪ iXM200T	137	140
▪ iXM600	120	130
▪ iXM600T	137	140
▪ iXM1200	120	130
▪ iXM1200T	137	140
▪ iXM1200TX	137	140
▪ iXM3000	120	130
Dry pump motor temperature		
▪ Standard and T variants	70	80
Dry pump end cover temperature		
▪ T* and TX	105	110
Booster pump motor temperature		
▪ iXM600	70	80
▪ iXM600T	70	80
▪ iXM1200	70	80
▪ iXM1200T	70	80
Booster pump stator temperature		
▪ iXM1200TX	135	140

Sensor	Warning condition triggered (°C)	Alarm condition triggered (°C)
Booster pump end cover temperature		
▪ iXM3000	100	110
Dry pump motor thermal snap switch		
▪ All variants	-	150
Booster pump motor thermal snap switch		
▪ iXM3000	-	70

\* *T Xcede+ only.*

Refer to [Alarm conditions](#) on page 79 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 supplier.

 **Note:**

*The high temperature alarms on Edwards vacuum pumping 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 examined and the reason for the alarm identified. Once the fault has been corrected the system should be left for a minimum of 30 minutes before attempting to restart.*

## 8.4 Events

### 8.4.1 PDT Events

*Table 37 Events*

Warning message on PDT	Action message on PDT
<a href="#">Event 252.63 - Chassis short</a> on page 82	Check equipment newly connected
<a href="#">Event 252.65 - Chassis short</a> on page 82	
<a href="#">Event 253.63 - Accessory oload</a> on page 82	
<a href="#">Event 254.63 - Bus oload</a> on page 82	
<a href="#">Event 255.63 - Accessory oload</a> on page 82	
<a href="#">Event 256.63 - 24 V oload</a> on page 82	
<a href="#">Event 257.63 - Front Port oload</a> on page 82	
<a href="#">Event 258.63 - USB V oload</a> on page 83	

 **Note:**

*Some of these warnings apply to pump sensors that are only present on some dry pumping system variants.*

*Some of these warnings apply to accessories and can only be encountered if the particular accessory is installed.*

<b>Fault</b>	<b>Event 252.63 - Chassis short</b>
<b>Cause</b>	<b>Wiring fault on pump</b>
Remedy	Contact us.
<b>Fault</b>	<b>Event 252.65 - Chassis short</b>
<b>Cause</b>	<b>Wiring fault on pump</b>
Remedy	Contact us.
<b>Fault</b>	<b>Event 253.63 - Accessory oload</b>
<b>Cause</b>	<b>Faulty equipment has just been plugged in</b>
Remedy	<ol style="list-style-type: none"> <li>1. Examine the equipment recently connected to the pump. Make sure that is installed and correctly connected.</li> <li>2. If the warning does not disappear power cycle the pump.</li> <li>3. If the warning re-appears after power cycling, contact supplier.</li> </ol>
<b>Fault</b>	<b>Event 254.63 - Bus oload</b>
<b>Cause</b>	<b>Faulty equipment has just been plugged in</b>
Remedy	<ol style="list-style-type: none"> <li>1. Examine the equipment recently connected to the pump. Make sure that is installed and correctly connected.</li> <li>2. If the warning does not disappear power cycle the pump.</li> <li>3. If the warning re-appears after power cycling, contact us.</li> </ol>
<b>Fault</b>	<b>Event 255.63 - Accessory oload</b>
<b>Cause</b>	<b>Faulty equipment has just been plugged in</b>
Remedy	<ol style="list-style-type: none"> <li>1. Examine the equipment recently connected to the pump. Make sure that is installed and correctly connected.</li> <li>2. If the warning does not disappear power cycle the pump.</li> <li>3. If the warning re-appears after power cycling, contact us.</li> </ol>
<b>Fault</b>	<b>Event 256.63 - 24 V oload</b>
<b>Cause</b>	<b>Faulty equipment has just been plugged in</b>
Remedy	<ol style="list-style-type: none"> <li>1. Examine the equipment recently connected to the pump. Make sure that is installed and correctly connected.</li> <li>2. If the warning does not disappear power cycle the pump.</li> <li>3. If the warning re-appears after power cycling, contact us.</li> </ol>
<b>Fault</b>	<b>Event 257.63 - Front Port oload</b>
<b>Cause</b>	<b>Faulty equipment has just been plugged in</b>

- Remedy
1. Examine the equipment recently connected to the pump. Make sure that is installed and correctly connected.
  2. If the warning does not disappear power cycle the pump.
  3. If the warning re-appears after power cycling, contact us.

**Fault** Event 258.63 - USB V oload

**Cause** Faulty equipment has just been plugged in

- Remedy
1. Examine the equipment recently connected to the pump. Make sure that is installed and correctly connected.
  2. If the warning does not disappear power cycle the pump.
  3. If the warning re-appears after power cycling, contact us.

## 8.5 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.

*Table 38 Inverter warning and alarm status registers*

Inverter warning and alarm status registers	Text displayed on PDT as alert and fault history	Description	Recommended action
	0123456789012		
0800 0000	NO_INV_PARAMS	No inverter parameters set loaded.	No inverter parameters set loaded.
0000 0010	POWER_DOWN___	Supply voltage collapsed (power off)	Check Supply Voltage
0000 0008	POWER_DOWN___	Supply voltage collapsed (power off)	Check Supply Voltage
0040 0000	EMS_ACTIVATED	EMS activated	EMS activated
0080 0000	MISSING_PHASE	Missing Phase in mains supply	Missing Phase in mains supply
0000 0200	MTR_TEMP_HIGH	High Motor Temperature	Check cooling
0000 0020	MTR_TEMP_HIGH	High Motor Temperature	Check cooling
0000 0400	INV_TEMP_HIGH	High Inverter Sink Temperature	Check cooling
0000 0040	INV_TEMP_HIGH	High Inverter Sink Temperature	Check cooling
0000 0800	INV_TEMP_HIGH	High Inverter Processor Temperature	Check cooling
0008 0000	INV_TEMP_HIGH	High Inverter Temperature Trip	Check cooling
0000 0100	MISSING_PHASE	Missing Phase in mains supply	Missing Phase in mains supply
8000 0000	LOW_SPEED___	Acceleration timeout (Pump Seized/overload)	Acceleration timeout (Pump Seized/overload)

Inverter warning and alarm status registers	Text displayed on PDT as alert and fault history	Description	Recommended action
4000 0000	LOW_SPEED____	Overload timeout (Pump Seized/overload)	Overload timeout (Pump Seized/overload)
0004 0000	CURRENT_HIGH_	Over Current Trip (Possible Metal-metal contact)	Over Current Trip (Possible Metal-metal contact)
0000 0001	MTR_TEMP_LOW_	Low Motor Temperature	Low Motor Temperature
0000 0002	INV_TEMP_LOW_	Low Inverter Sink Temperature	Low Inverter Sink Temperature
0010 0000	INV_TEMP_LOW_	Low Inverter Temperature trip	Low Inverter Temperature trip
0002 0000	INV_VOLTS_HI_	Check supply voltage Check for windmilling	Check supply voltage Check for windmilling
0020 0000	INV_OUT_SHORT	Inverter Output Short Circuit - hard to fix in the field - possibly requires inverter change	Inverter Output Short Circuit
0001 0000	SPEED_HIGH____	Internal Inverter Control fault	Internal Inverter Control fault
0000 4000	MTR_OVERLOAD_	Motor overload (Pump Seized/overload)	Motor overload (Pump Seized/overload)
A:1000 W:0000 D1:8000 D2:0000	INV_COMMSLOSS	Loss of communications between drives in dual inverter	Loss of communications between drives in dual inverter
1000 0000	INV_TEST_FLT	Inverter self-test fault	Inverter self-test fault - swap inverter
0000 8000	INV_TEST_WRN	Inverter self-test warning	Inverter self-test warning (no need to swap inverter)
2000 0000	INV_TEST_FLT	Inverter self-test fault	Inverter self-test fault - swap inverter
A:0200 W:0000	INV_TEST_FLT	Inverter self-test fault	Inverter self-test fault - swap inverter
0100 0000	INV_PWM_TRIP_	All other sources (and causes) of PWM Trip inserted before PWM trip in the decode sequence	Inverter trip occurred. Report to us.
A0000 W0000 D1:0000 D2:0000 Ss1:0000 Ss2:0020	INV_SW_UPGRDE	Software upgrade has just occurred - not displayed on PDT as alert - only appears in fault log	Software upgrade has just occurred - not displayed on PDT as alert - only appears in fault log
Anything else	INV_OTHER_FLT	Inverter unidentified fault	Report to us.

## 9. Decommissioning

### 9.1 Decommissioning safety



#### **WARNING: MAINTENANCE SAFETY**

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



#### **WARNING: LOCKOUT AND TAGOUT**

Risk of injury or death. Electricity, nitrogen and water supplies are possible hazardous energy sources. Lockout and tagout sources before you do the maintenance to the pump.



#### **WARNING: HOT SURFACES**

Risk of burns. Do not touch the pump exhaust or check valve while the pump is in operation since the temperatures of these parts can be high. Let the pump cool for 1 hour before disconnecting.



#### **WARNING: USE PROTECTIVE EQUIPMENT**

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 Edwards 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 decommissioning the system.
- 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.
- Make sure that oil or water collected in the secondary containment drip tray is removed before you move the system.
- Protect sealing faces from damage.
- Replacement intervals will vary depending on your application.
- 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 has possibly overheated if it was misused, if it malfunctioned or if it was in a fire. Edwards Safety Data Sheets for fluorinated materials used in the pump are available on request.

The system requires no maintenance. Pump protection sensors installed in the system do not require routine maintenance. The decommissioning operations that can be carried out are described in [Relocate the system for decommissioning](#) on page 86 and [Drain the cooling water for decommissioning](#) on page 87. Maintenance must be carried out by our service centres (refer to [Service](#) on page 91). The frequency of maintenance operations depends on the process.

## 9.2 Relocate the system for decommissioning

### WARNING: USE 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.



### WARNING: TRANSPORTATION SAFETY

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 relocate the system from the operating location for maintenance:

1. Purge the system and shut down as described in [Shut down](#) on page 62 and let the system cool down.
2. Isolate the power and disconnect the mating half from the electrical supply connector, then isolate the water and the gas purge supply. Switch off the nitrogen and cooling water supplies. Disconnect the nitrogen supply, taking care as any trapped gas under pressure is released. Disconnect the cooling water supply followed by the cooling water return.
3. Switch off the nitrogen and cooling water supplies. Disconnect the nitrogen supply, taking care as any trapped gas under pressure is released. Disconnect the cooling water supply followed by the cooling water return.
4. Disconnect the inlet and outlet from the vacuum and exhaust systems and install blanking caps.
5. If necessary, disconnect the air extraction port from the factory extraction system.
6. If necessary, disconnect any accessories from the system.
7. Adjust the levelling feet so that the system rests on the castors.
8. Move the system to the location where maintenance will be done. After maintenance is complete, re-install the system as described in [Installation](#) on page 25.

### 9.3 Drain the cooling water for decommissioning



#### **WARNING: PERSONAL PROTECTIVE EQUIPMENT**

**Risk of injury. Personal protective equipment (PPE) can decrease the risks of injury or death to personnel and damage or destruction to equipment or products. Wear the correct PPE necessary for the task.**



#### **WARNING: HOT SURFACE**

**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. Relocate the system for decommissioning as stated in [Relocate the system for decommissioning](#) on page 86.
2. Connect a regulated clean dry air supply (5 bar (g) or 73 psi (g)) to the cooling water supply connection ([Figure: Controls/connectors on the rear of the system](#)). Do not turn on the air supply yet.
3. Connect a drain hose to the cooling water return connection ([Figure: Controls/connectors on the rear of the system](#)). Put the open end of the drain hose in an applicable collection container.
4. Turn on the clean dry air supply.
5. Monitor the drain hose outlet until no further cooling water is purged.
6. Attach the external EMS link plug (supplied) to the EMS connection on the rear of the system ([Figure: Controls/connectors on the rear of the system](#)). Failure to do so will result in being unable to purge the water system satisfactorily.
7. 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 two 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.

8. 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.

 **Note:**

*An alternative method to drain the cooling water from the system is to:*

*- obey the procedure described above until step 6*

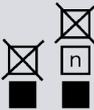
*- at Step 7 use the PDT to manually open all the system water valves (through the Test mode menu), as described in [Connect the cooling water supply](#) on page 45.*

## 9.4 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.



### **WARNING: STORAGE SAFETY**

Risk of injury or damage to equipment. Follow the pictorial symbols on outside of packages for transport and storage limitation.

Follow the procedure given in [Storage](#) on page 89 and then read form HS1 and fill out form HS2, which can be found at the back of printed manuals or can be downloaded from <http://edwardsvacuum.com/HSForms/>.

## 10. Storage



### **WARNING: COOLANT CONDENSATION IN PIPELINE**

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 (refer to [Drain the cooling water for decommissioning](#) on page 87). 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. Obey the procedure given in [Relocate the system for decommissioning](#) on page 86.
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 25 of this manual.

## 11. Disposal

Our products are supported by a world-wide network of our Service Centres. Each Service Centre offers a wide range of options including disposal.



### **WARNING: HAZARDOUS MATERIAL**

**Risk of damage to environment. Dispose of the system and any components safely and obey 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/](http://www.dtsc.ca.gov/hazardouswaste/perchlorate/)**

Refer to *Service* on page 91 for more information.

Dry pumping 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 can 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 company, the requirements of the Return of Equipment Procedure must be complied with. Read form HS1 and fill out form HS2, which can be downloaded from [edwardsvacuum.com/HSForms/](http://edwardsvacuum.com/HSForms/).**

### 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 in Belgium, Brazil, China, France, Germany, Israel, Italy, Japan, Korea, Singapore, United Kingdom, U.S.A and a world-wide network of distributors. The majority of 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:

- Model and Item Number of the equipment
- Serial number
- Item Number and description of 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 which has been serviced, repaired or rebuilt is returned with a full warranty.

The local Service Centres can also give our engineers to support on-site maintenance, service or repair of equipment. For more information about service options, contact our nearest Service Centre or the 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 send us a completed Declaration of Contamination of Vacuum Equipment and Components – Form HS2. The HS2 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.

We provide instructions for completing the form in the Declaration of Contamination of Vacuum equipment and Components – Procedure HS1.

If you are returning a vacuum pump, note the following:

- If a pump is configured to suit the application, make a record of the configuration before returning the pump. All replacement pumps will be supplied with default factory settings.

- Do not return a pump 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/](https://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 HS2 form, your equipment cannot be serviced.**

## 13. Accessories

The accessories available for use with the iXM dry pump system are:

### 13.1 Disconnect box

The disconnect box ensures full compliance with SEMI S2 by providing true EMO functionality and also provides interlock with photohelic switch.

*Table 39 Disconnect box*

Item	Item number
Photohelic switch and gauge kit	A50803000
Power disconnect box Low iXM200	EL0103003
Power disconnect box Low iXM600 / 1200	EL0103004
Power disconnect box High iXM200	EL0103005
Power disconnect box High iXM600 / 1200	EL0103006
Power disconnect box Low iXM3000	A50802000
Power disconnect box High iXM3000	Contact supplier

### 13.2 Accessory modules

Two accessory modules are available for the iXM dry pump system. The Active Accessory Module (AAM) gives connectivity for up to three directly connected accessories including a gate valve, abatement and water flow sensor. It also gives connectivity for up to two supported active accessories, two thermocouples and the pump status output. The Passive Accessory Module (PAM) allows up to 3 accessories to be connected to the accessory module interface.

An accessory module extension cable allows the AAM or PAM to be mounted up to 5 m away from the dry pump system.

*Table 40 Accessories modules*

Accessory module	Item number
AAM	D37480500
PAM	D37480550
Accessory module extension cable (5.0 m)	D37491502

### 13.3 Pump Display Terminal (PDT)

The PDT allows control and monitoring of the pump.

*Table 41 PDT*

Item	Item number
PDT	D37280700

## 13.4 PDT holster

The PDT holster holds the PDT and is attached to the pump or tool frame.

**Table 42 PDT holster**

Item	Item number
PDT holster 1 pack	D37209800
PDT holster 10 pack	D37209801

## 13.5 PDT extension cable

The PDT extension cable allows a PDT to be used away from the pump.

**Table 43 PDT extension cable 5-way XLR**

PDT extension cable	Item number
3.0 m	D37370591
5.0 m	D37370592
10.0 m	D37370595
15.0 m	D37370596
25.0 m	D37370597

## 13.6 Seismic restraint brackets

Installations requiring seismic restraints.

**Table 44 Seismic brackets**

Variants	Mounting points	Item number
Standard and T variant	Sides/4 off	A50882000
	Front and rear/4 off	A50885000
iXM3000 variants	Sides/4 off	A50768000
T* and TX variants only	Sides/4 off	A50899000
	Front and rear/4 off	A50900000

*\*TXcede+ only*

## 13.7 Nitrogen flow switch assembly

Provides a signal when flow is in limits and may be used as an interlock.

**Table 45 Nitrogen switch assembly**

Item	Item number
Nitrogen flow switch assembly	A50785000

## 13.8 Interface modules

### 13.8.1 MicroTIM

Tool specific control and monitoring via parallel interface (except for LAM-LON and RS232 Micro-TIM's which are serial interface devices).

*Table 46 Tool specific modules*

MicroTIMs	Item number
SPI	D37360310
MCM	D37360320
TEL	D37360330
E73	D37360340
LAM	D37360350
C3	D37360360
Hitachi	D37360370
eTIM	D37361500
LON TP-1250*	D37362000
EtherCAT®†	D37363000
Configuration storage	D37360390
RS232	D37370385

\* For use with Lam 2300 platforms with LON communication.

† EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

### 13.8.2 EMS modules

Tool specific controlled stop interfaces.

*Table 47 Tool specific EMS modules*

EMS Modules	Item number
SPI	D37370310
MCM	D37370320
LAM	D37370350
C3	D37370360

### 13.8.3 iGateway modules

The Pump LON to Ethernet iGateway and Serial to Ethernet iGateway give an additional Ethernet connection to the Drypump. This is used for connection to an Edwards Fabworks / EdCentra system or third party equipment using Semi E54.

The Pump-Serial to Pump-LON and Dual SIM Gateway connects to an Edwards Drypump. This gives connections to support LON networks and components and two isolated RS232 serial links with Edwards Serial Interface Module (SIM) protocol.

**Table 48 iGateway modules**

Item	Item number
Pump LON to Ethernet iGateway	D37374000
Pump Serial to Ethernet iGateway	D37374500
Pump-Serial to Pump-LON and Dual SIM iGateway	D37376500

**Note:**

All the PDT extension cables listed in [Table: PDT extension cable 5-way XLR](#) can be used to connect an iGateway to an iXM1200, an iXM600 and an iXM200 pump.

## 13.9 Exhaust check valve

**Table 49 Exhaust check valve kits**

Item	Item number
NW25 Exhaust check valve kit	A50880000
NW25 Exhaust heat elbow check valve kit	A50897000
NW40 Exhaust check valve kit	A50782000

## 13.10 Exhaust extraction cover kit

The exhaust extraction cover kit can be used to make sure safe gas extraction in the case of a leak from the pump's exhaust line.

**Table 50 Exhaust extraction cover kits**

Item	Item number
NW25 Exhaust extraction cover kit	A50881000
NW40 Exhaust extraction cover kit	A50780000

## 13.11 Constant flow water valves

The constant flow water valves will provide a set cooling water flow to the pumping system when required.

**Table 51 Constant flow water valves**

Item	Item number
Constant flow water valve 4 lpm (for iXM600/iXM1200/iXM3000)	A50883000
Constant flow water valve 3 lpm (for iXM200)	A50884000
Constant flow water valve 4 lpm (for iXM600 and iXM1200)	A50883000
Constant flow water valve 7 lpm (for iXM3000)	A50838016
Constant flow water valve 3 lpm (for iXM200)	A50883000

## 13.12 Water flow monitor assembly

The water flow monitor assembly gives water flow rate, which displays on PDT.

*Table 52 Water flow monitor assembly*

Item	Item number
Water flow monitor assembly	A50799000

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