Ingersoll Rand®

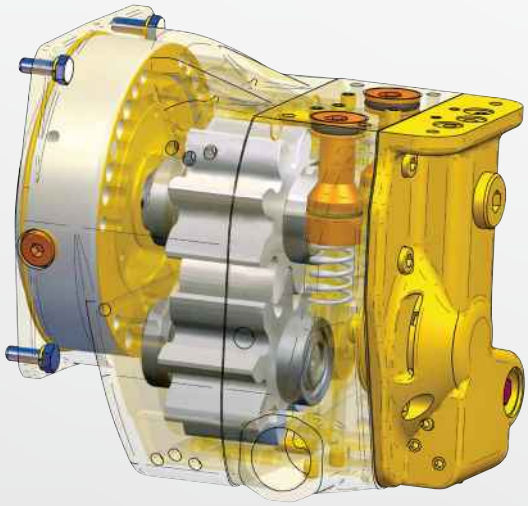
# Liftchain® Air Hoists

## Technical Guide

# *LIFTCHAIN® LC2A Series*

## Air Chain Hoists

This Technical Guide covers the Liftchain® LC2A range from the LC2A010S to LC2A250Q model fitted with 3,5hp and 6hp air motors.

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# Model Performances

## Liftchain® LC2A Series

### *1 Ton to 25 Ton Range Scope Range scope*

| Model number | Rated capacity (T) | Falls of load chain | Motor size (Hp) | Lifting speed at rated load (m/min) | Lifting speed at no load (m/min) | Lowering speed at rated load (m/min) | Air cons. at rated load (m3/min) | Air inlet size (BSP) | Sound pressure (1) (dbA) | Hoist weight (2) (kg) | Chain size (mm) | Chain weight/ 1 m extra lift (kg) | FEM / ISO Mechanical classification (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LC2A Standard Series** | | | | | | | | | | | | | |
| LC2A010SI | 1 | 1 | 3.5 | 7.0 | 11.0 | 8.5 | 4 | 3/4" | 78 | 38 | 8x24 | 1.4 | 1 Am / M4 |
| LC2A015SI | 1.5 | 1 | 3.5 | 6.2 | 11.0 | 8.5 | 4 | 3/4" | 78 | 38 | 8x24 | 1.4 | 1 Bm / M3 |
| LC2A020DI | 2 | 2 | 3.5 | 3.3 | 05.5 | 4.0 | 4 | 3/4" | 78 | 48 | 8x24 | 2.8 | 1 Am / M4 |
| LC2A030DI | 3 | 2 | 3.5 | 3.0 | 5.5 | 4 | 4 | 3/4" | 78 | 48 | 8x24 | 2.8 | 1 Bm / M3 |
| LC2A030SI | 3 | 1 | 3.5 | 4.0 | 6.4 | 5.0 | 4 | 3/4" | 76 | 84 | 13x36 | 3.8 | 1 Am / M4 |
| LC2A040SI | 4 | 1 | 6 | 3.9 | 7.0 | 4.5 | 5.2 | 1" | 76 | 90 | 13x36 | 3.8 | 1 Bm / M3 |
| LC2A060QI | 6 | 4 | 3.5 | 1.5 | 2.5 | 2.0 | 4 | 3/4" | 78 | 74 | 8x24 | 5.6 | 1 Bm / M3 |
| LC2A060DI | 6 | 2 | 3.5 | 1.9 | 3.2 | 2.5 | 4 | 3/4" | 79 | 108 | 13x36 | 7.6 | 1 Am / M4 |
| LC2A080DI | 8 | 2 | 6 | 1.8 | 3.5 | 2.2 | 4.4 | 1" | 76 | 118 | 13x36 | 7.6 | 1 Bm / M3 |
| LC2A060SI | 6 | 1 | 6 | 2.2 | 3.6 | 2.7 | 5.2 | 1" | 79 | 125 | 16x45 | 5.7 | 1 Bm / M3 |
| LC2A120DI | 12 | 2 | 6 | 1.1 | 1.8 | 1.3 | 5 | 1" | 79 | 170 | 16x45 | 11.4 | 1 Bm / M3 |
| LC2A180TI | 18 | 3 | 6 | 0.7 | 1.2 | 0.9 | 5 | 1" | 79 | 277 | 16x45 | 17 | 1 Bm / M3 |
| LC2A250QI | 25 | 4 | 6 | 0.5 | 0.9 | 0.6 | 5 | 1" | 79 | 324 | 16x45 | 22.8 | 1 Bm / M3 |

*(1) Sound pressure levels are measured per European Standard EN 14492-2*

*(2) Weight with standard height of lift (3 m) and standard length of control (2 m).*

*(3) FEM/ISO Mechanical classification for LC2A010S & LC2A020D is only 1 Bm/M3 when selecting Stainless Steel chain option.*

# Product Identification

Each hoist has an individual name plate riveted on the hoist body. The nameplate material is Stainless Steel.

For trolley mounted units, when necessary, a second nameplate with similar information is riveted on one trolley sideplate for easier identification.

ATEX marking is only available with CE certified models (“-E” option )


*LC2A nameplate sample*

# How To Order

Specify the complete model number as shown. Specify beam size, type and flange width. Note that 0 (zero) is a number, not a letter in model part numbers.

Example: LC2A030DIP3VU3M2AJ12-E

**LC2 A 010S I P3 HU 3M 2 AJ12 - E**

**Series**
**LC2** =LIFTCHAIN® series 2nd Generation

**Power type**
**A** = Air

**Range type**
**I** = Industrial
M = Mining (mining models available upon request)

**Capacity & falls of chain**
***010S*** = 1t single fall
015S = 1.5t single fall
020D = 2t double falls
030D = 3t double falls
030S = 3t single fall
040S = 4t single fall
060Q = 6t quadruple fall
060D = 6t double falls
060S = 6t single falls
080D = 8t double falls
120D = 12t double falls
180T = 18t triple falls
250Q = 25t quadruple falls

For Mining models with 2 load hooks, add the letter "S"
e.g. LC2A030DS
(Valid up to LC2A120D)

**Control type**
1 = Pull Chain
2 = 1 motor pendant
**3** = 2 motor pendant

**Suspension**
A = fixed lug
C = Swivel top hook
*PU= Plain rigid universal trolley (flat or tapered beam) 1T to 8T
PE = Plain rigid trolley (flat beam) 12T to 25T
PN = Plain rigid trolley (tapered beam) 12T to 25T
*GU= Geared rigid universal trolley (flat or tapered beam) 1T to 8T
GE = Geared rigid trolley (flat beam) 12T only
GN = Geared rigid trolley (tapered beam) 12T only
**HU* = Vane Motorized Industrial rigid universal Trolley 1T to 6T
*VU= Vane motorized rigid universal trolley (flat or tapered beam) 1T to 8T
*VE = Vane motorized rigid trolley (flat beam) 12T to 25T
*VN= Vane motorized rigid trolley (tapered beam) 12T to 25T
*RU= Gear motorized rigid universal trolley (flat or tapered beam) 6T and 8T
*RE = Gear motorized rigid trolley (flat beam) 12T to 25T
*RN= Gear motorized rigid trolley (tapered beam) 12T to 25T

* Add the letter "L" for low headroom trolley (eg: LVU or LRU)
* Add the letter "R" for rack & pinion configuration (e.g. RER)
* Add the letter "W" for Wide beam flange only available on PU, GU and HU from 1T to 3T (eg: PUW, GUW, HUW)

**Lift**
**3M** = 3 m standard
XX = Specify length in meter

**Control**
**2** = 2 m standard
XX = Specify length in meter

**CE package**
**-E** = Compliance with the European Machinery Directive

**Options**
**A** = Standard chain bucket
B = Large chain bucket
C = Extra large chain bucket
D = XXL chain bucket
**J** = Air Line Accessories** Specify J1: Filter; J2: Lubricator J3: Regulator or numerical combination
K = Cast iron pendant
M = Material traceability certificate as per EN 10204 3.1 on main load bearing part
P = Marine paint 150µ
QZ = Offshore paint 290µ incl. sandblasting
S = Stainless Steel Chain only available on LC2A010S & LC2A020D
T1 = Spark Resistance*** Package (ATEX Zone 1)
W = Witness test. Specify W1 for ABS, W2 for DNV or W3 for LRS or W4 for Client witness of load test

# Air Pressure Range

The performances shown in our catalogues and technical publications are obtained at 6.3 bar Dynamic Pressure.

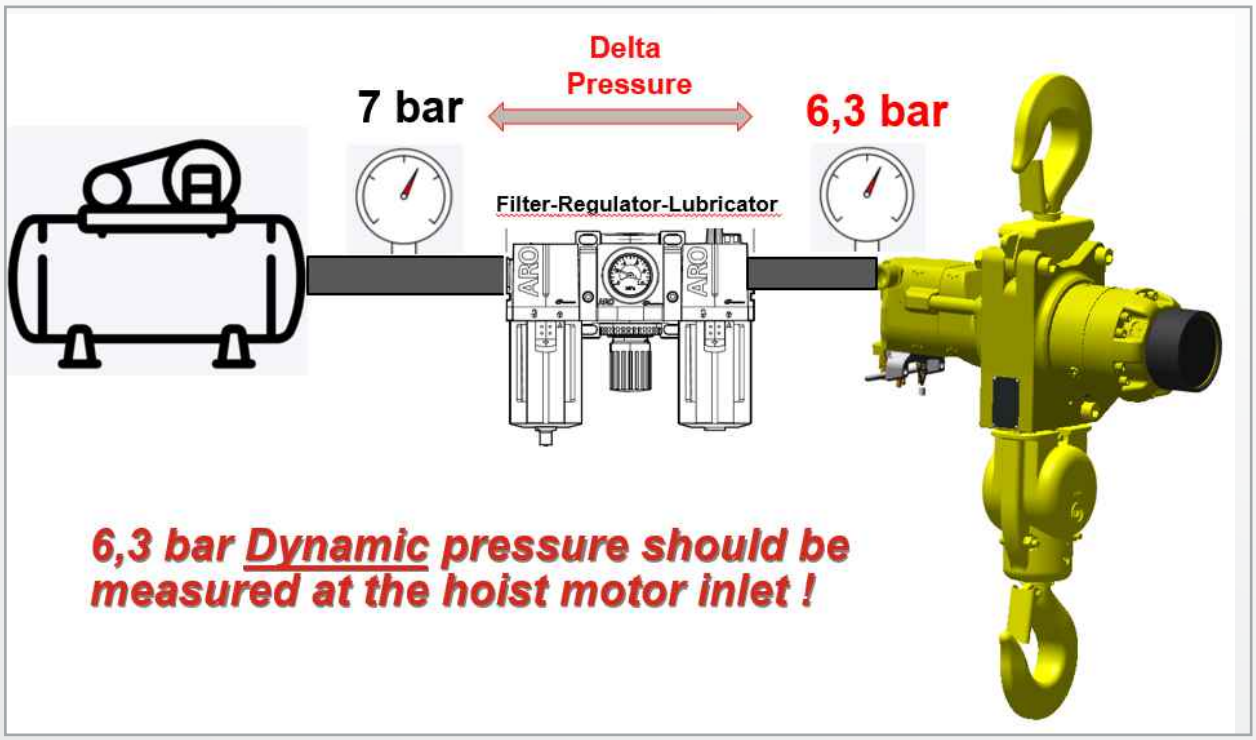
**There are various air pressure you can measure :**

**Airline Pressure**: Pressure delivered by the air compressor.

**Static Pressure:** Static pressure is measured when the hoist motor is **Not** running.

**Dynamic Pressure:** Dynamic pressure is measured when the hoist motor is running.

**Delta Pressure:** Pressure drop compensation (use of airline accessories or components)




If the Airline Pressure is over 7 bar, you must use an air pressure regulator of the appropriate size and flow. Air lines accessories such as filters, regulators, lubricators, recoil hoses, claw or quick connect fittings cause Pressure Drops. You must determine the right Delta Pressure needed to compensate the pressure drops caused by such elements.

# Air Supply Hoses

As with many other things in life, a simple detail can have a large consequence; it is the same when selecting air hoses and components for your hoist. The use of undersized air hose or any accessory creating a flow restriction on the air supply line will create a pressure drop and trigger low performances or even damages to the product.

| Model number | Rated capacity (T) | Falls of load chain | Motor size (Hp) | Minimum Air Hose Inside Diameter (in) |
|---|---|---|---|---|
| **LC2A Standard Series** | | | | |
| LC2A010SI | 1 | 1 | 3.5 | 3/4" |
| LC2A015SI | 1.5 | 1 | 3.5 | 3/4" |
| LC2A020DI | 2 | 2 | 3.5 | 3/4" |
| LC2A030DI | 3 | 2 | 3.5 | 3/4" |
| LC2A030SI | 3 | 1 | 3.5 | 3/4" |
| LC2A040SI | 4 | 1 | 6 | 1" |
| LC2A060QI | 6 | 4 | 3.5 | 3/4" |
| LC2A060DI | 6 | 2 | 3.5 | 3/4" |
| LC2A080DI | 8 | 2 | 6 | 1" |
| LC2A060SI | 6 | 1 | 6 | 1" |
| LC2A120DI | 12 | 2 | 6 | 1" |
| LC2A180TI | 18 | 3 | 6 | 1" |
| LC2A250QI | 25 | 4 | 6 | 1" |

Check the Model Performances chart to select the appropriate hose diameter which ensures adequate air flow depending on the motor inlet size. If your air hose is over 10 meters long, we recommend increasing the hose diameter to the next larger size.

# Air Treatment

**A suitable air treatment would consist in following the 4 below steps :**

a) Water removal

b) Particles removal

c) Pressure adjustment

d) Air Lubrication

Missing one of these steps could create poor performances and create excessive wear of internal components.

# Air Treatment *(continued)*

## Water Removal

Moisture that reaches the air motor through the air supply lines is a primary factor in determining the length of time between service overhauls.

An aftercooler at the compressor outlet would cool down the air and force water condensation. Water must be removed from the air system to prevent it from causing immeasurable damage to equipment and products downstream.

A water separator is essential following an aftercooler. The water separator creates a high speed centrifugal action which results in a separation efficiency of 99% for particles 10 micron and larger and collect moisture prior to distribution through the supply lines.

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## Particles Removal

Any dirt, or oil particles in the atmospheric air, from the compressor lubricant, the pipework system or air receiver may cause problems with the equipment and could damage internal parts.

It is necessary to place a suitable air filter before the lubricator to prevent dirt from entering the motor.
The strainer/filter should provide a minimum filtration of 20 microns and include an automatic or manual drain. It is recommeded to clean the strainer/filter periodically to maintain its operating efficiency.

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## Pressure Adjustment

The correct air pressure has to be provided to the hoist air inlet to ensure optimal performances; check section Air Pressure Range to determine the appropriate air regulator size.

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## Air Lubrication

To ensure continued and optimum operation of your hoist, the air lubricator must be filled with the correct lubricant. Pneumatic hoists need oil to perform correctly, provide highest efficiency and long life; it also prevents excessive heat build up and wear that could cause low performance.

Regulary check flow and level of air line lubricator (approximately 2 to 3 drops per minute required at maximum motor speed).

Recommended Air lubricant :
**ISO VG100 (SAE 30W)** lubricant [minimum viscosity 135 Cst at 104° F (40° C)].

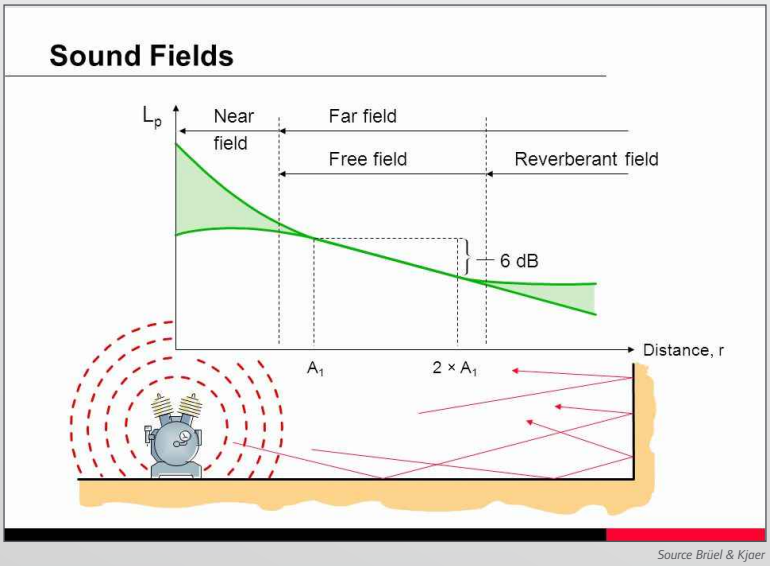
# Temperature Range

LC2A air hoists are designed for use in extreme conditions and can be operated with a wide temperature range.
**See below chart.**

| | Hook or Lug Suspension options C and A | | Industrial Trolley Suspension options PU, GU, HU | | Oil & Gas Trolley Suspension options PE, PN, GE, GN, VE, VN, RE, RN, LVU, LVE, LVN, LRU, LRE, LRN | |
|---|---|---|---|---|---|---|
| **Model number** | **Minimum Design Temperature (°C)** | **Maximum Design Temperature (°C)** | **Minimum Design Temperature (°C)** | **Maximum Design Temperature (°C)** | **Minimum Design Temperature (°C)** | **Maximum Design Temperature (°C)** |
| **LC2A Standard Series** | | | | | | |
| LC2A010SI | -10 | 60 | -10 | 60 | -10 | 60 |
| LC2A015SI | -10 | 60 | -10 | 60 | -10 | 60 |
| LC2A020DI | -10 | 60 | -10 | 60 | -10 | 60 |
| LC2A030DI | -10 | 60 | -10 | 60 | -10 | 60 |
| LC2A030SI | -10 | 60 | -10 | 60 | -10 | 60 |
| LC2A040SI | -10 | 60 | -10 | 60 | -10 | 60 |
| LC2A060QI | -10 | 60 | -10 | 60 | -10 | 60 |
| LC2A060DI | -20 | 60 | -10 | 60 | -20 | 60 |
| LC2A080DI | -20 | 60 | -10 | 60 | -20 | 60 |
| LC2A060SI | -20 | 60 | -10 | 60 | -20 | 60 |
| LC2A120DI | -20 | 60 | -10 | 60 | -20 | 60 |
| LC2A180TI | -20 | 60 | -10 | 60 | -20 | 60 |
| LC2A250QI | -20 | 60 | -10 | 60 | -20 | 60 |

# Noise level

Sound pressure levels data are shown on Section Model Performances
These sound pressure levels are as per EN ISO 4871, measured in an area of 1 meter distance from the machine.
LC2A series are equipped with a performant exhaust muffler which provides low sound pressure levels for enhanced operators comfort.




*Source Brüel & Kjaer*

# Testing

Testing is performed according to EN 14492-2+A1 "Power driven hoists". Each hoist is tested individually before shipment from the factory.

**The test procedure includes following steps :**

- Visual check of product conformance with specifications.
- Top and Bottom Limit Switches functionnal check
- Test at nominal load (SWL: Safe Working Load), speed, controls.
- Dynamic test at 110% of SWL
- Static Test at 125% of SWL: check of automatic brake holding the load for 5 minutes.
- *CE certified models with "-E" option models only:*
- Adjustment of Overload Protection between 110% and 125% of SWL (as per EN 14492-2+A1: the hoist should be able to lift 110% of SWL, and should **Not** lift 125% or more of SWL)



# Bolting Specification

Critical fasteners used on the LC2A range are Grade 8.8 as per ISO (see below chart).
Fasteners ISO grade 10.9 and ISO grade 12.9 are zinc plated.

| Size | Specification |
|---|---|
| **ISO Grade 8.8 bolting** | |
| ≤ M10 | Stainless Steel A4-80 |
| ≥ M12 | Hot-Dip Galvanized Steel |
| **ISO Grade 10.9 bolting** | |
| all sizes | Zinc plated (Geomet 500) |
| **ISO Grade 12.9 bolting** | |
| all sizes | Zinc plated (Geomet 500) |

# EC Conformity

Liftchain® LC2A hoists are delivered with European Committee CE certification when selecting "-E" option.

**All CE marked products are in accordance with at least the following rules:**

2006/42/EC - Machinery Directive

EN 14492-2+A1 - Power driven hoists.

EN ISO 12100:2010 - Safety of Machinery - general principles for design

EN ISO 13850:2015 - Safety of Machinery - Emergency stop equipment, functional aspects & principles for design.

ISO 4414:2011 - Pneumatic fluid power - General rules and safety requirements for systems and their components

EN ISO 80079 : Explosive atmospheres - Part 36 & 37 : Non-electrical equipment for explosive atmospheres

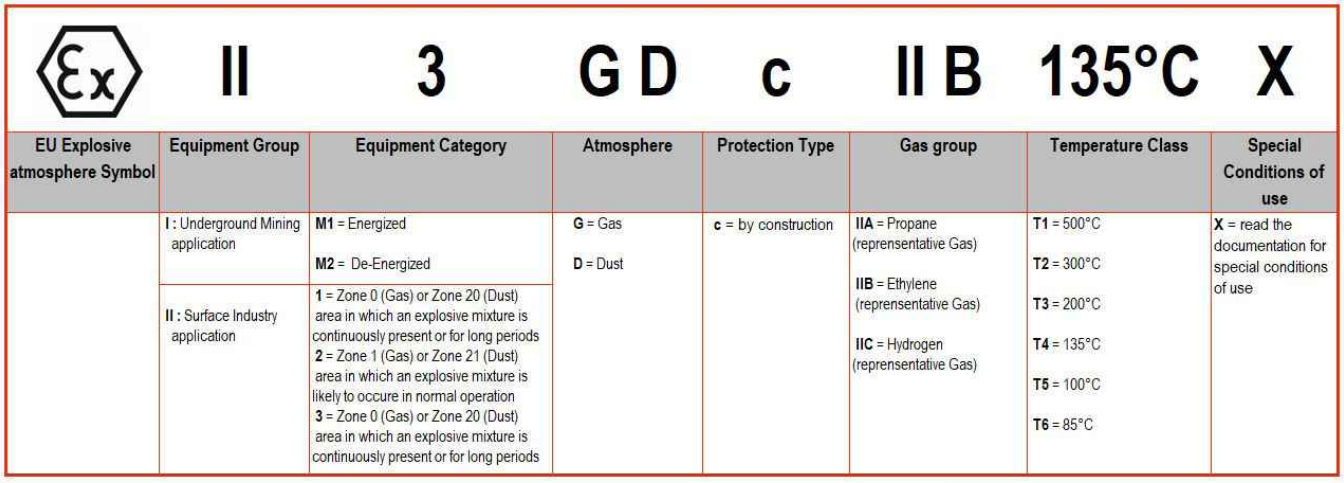
F E M 1.001 Heavy lifting appliances.

F E M 9.511 Cassification of mechanism - rules for the design of serial lifting equipment.

**In addition, all LC2A models are in accordance with other International or local rules :**
ASME B30/16: Overhead Underhung and Stationary Hoists DNV-OS-E101

# ATEX

LC2A ordered with "-E" suffix are in conformance with ATEX Directive 2014/34/EU.




| EU Explosive atmosphere Symbol | Equipment Group | Equipment Category | Atmosphere | Protection Type | Gas group | Temperature Class | Special Conditions of use |
|---|---|---|---|---|---|---|---|
| | I : Underground Mining application | M1 = Energized<br>M2 = De-Energized | G = Gas<br>D = Dust | c = by construction | IIA = Propane (reprensentative Gas)<br>IIB = Ethylene (reprensentative Gas)<br>IIC = Hydrogen (reprensentative Gas) | T1 = 500°C<br>T2 = 300°C<br>T3 = 200°C<br>T4 = 135°C<br>T5 = 100°C<br>T6 = 85°C | X = read the documentation for special conditions of use |
| | II : Surface Industry application | 1 = Zone 0 (Gas) or Zone 20 (Dust) area in which an explosive mixture is continuously present or for long periods<br>2 = Zone 1 (Gas) or Zone 21 (Dust) area in which an explosive mixture is likely to occure in normal operation<br>3 = Zone 0 (Gas) or Zone 20 (Dust) area in which an explosive mixture is continuously present or for long periods | | | | | |

**Ex Mark**

Signifies certification for use in an explosive atmosphere, followed by other symbol indicating the details of that certified use.

## Equipment Group

I : Mining Equipment group: *Select LC2A...-E Mining models*

II : Surface Industry group: *Select LC2A...-E models depending on the Equipment Category concerned.*

## Equipment Category

Equipment Category M1 (Mining Energized) : *Not offered*

Equipment Category M2 (Mining De-Energized) : *Select LC2A...-E Mining models*

Equipment Category 1 is intended for use in places classified as zone 0 or 20 (defined in standard EN 1127-1) in which explosive atmospheres are present continuously. *Not covered with LC2A standard range*

Equipment Category 2 is intended for use in places classified as zone 1 or 21 (defined in standard EN 1127-1) in which explosive atmospheres are only likely to occur. Protection is ensured during normal use and in the event of frequently occurring disturbances or normal equipment faults. *Select LC2A...-E with T1 option models.*

Equipment Category 3 is intended for use in places classified as zone 2 or 22 (defined in standard EN 1127-1) in which explosive atmospheres are only unlikely to occur. Protection is ensured during normal use. *Select LC2A...-E models.*

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*Category 2 equipment can also be used where Category 3 equipment is required.*

| MINIMUM ATEX REQUIREMENTS FOR NON-ELECTRICAL PRODUCTS | | |
|---|---|---|
| **Equipment Category** | **Manufacturer Requirements** | **IR LC2A Compliance** |
| Category 1 - Zone 0 / 20 | N.B. certification and Q A assessment | ✗ NO |
| Category 2 - Zone 1 / 21 | Manufacturer's technical file lodged with N.B. | ✓ **YES** : "-E" + "T1" models |
| Category 3 - Zone 2 / 22 | Manufacturer stores own technical file | ✓ **YES** : all "-E" models |
| *N.B. = Notified Body* | | |

# ATEX

## Type of Explosive Atmosphere

G: Evaluation for explosive atmospheres caused by gases, vapors or mists.
D: Evaluation for explosive atmospheres caused by dust.

## Type of protection

There's different ways to prevent explosion risks, LC2A hoists series are protected by construction, as as per EN13463-1 and EN13463-5.

**NON-ELECTRICAL EQUIPMENT**

**MECHANICAL PROTECTION CONCEPTS**

| STANDARDS | CODE | CONCEPT | ZONE |
|---|---|---|---|
| ✓ EN13463-1 | | general requirements | |
| EN13463-2 | fr | flow restriction | 2<br>22 |
| EN13463-3 | d | flameproof | 1<br>21 |
| ✓ EN13463-5 | c | ✓ constructional safety | 1<br>21 |
| EN13463-6 | b | control of ignition sources | 1<br>21 |
| EN13463-8 | k | liquid immersion | 1<br>21 |

**GAS GROUP**

| GAS GROUP | REPRESENTATIVE TEST GAS | IR LC2A Compliance |
|---|---|---|
| I | Mining Only : Methane or Combustible Dust | ✓ **YES** : "-E" Mining models Only |
| IIA | Propane | ✓ **YES**, All "-E" models |
| IIB | Ethylene | ✓ **YES**, All "-E" models |
| IIC | Hydrogen | ✗ NO |

*Gases are classified according to the ignitiability of gas-air mixture.*
*Refer to EN 60079-20-1 for classification of common gases and vapours.*

## Gas Group :

IIA group : *Select LC2A...-E or LC2A...-E with T1 option depending on the Equipment category.*

IIB group : *Select LC2A...-E or LC2A...-E with T1 option depending on the Equipment category.*

IIC group : Not offered

## Temperature Class

The temperature class defines the auto-ignition temperature of the specific gas/vapor in the area where the equipment is intended to be used. LC2A Hoists have the 135°C = T4 marking. it means that the maximum temperature of the hoist in any condition, will never go over 135°C.

It's important to understand that a T4 marked hoist can also be used in T3, T2 and T1 areas, because the auto-ignition temperature of the gas or vapor which may occur in those areas is above 135°C.

**TEMPERATURE CLASS**

| T CLASS | MAXIMUM SURFACE TEMPERATURE (*) |
|---|---|
| T1 | ✓ 450°C |
| T2 | ✓ 300°C |
| T3 | ✓ 200°C |
| T4 | ✓ 135°C |
| T5 | ✗ 100°C |
| T6 | ✗ 85°C |

# Mechanical Classification

LC2A Hoists **Mechanical classification** is rated as per **FEM 9.511** and complies with **ISO 4301/1.**
Each hoist model is classified with a **Mechanism Group.**

There's 2 factors which are necessary to determine the mechanism groupIt classifies the **Theorical loading conditions** and **operating time** in hours per day.

The chart shows the Mechanical Classification of LC2A standard models and the theorical number of hours of use at L4 (L4 means that the hoist will always be used at 100% of SWL).

| Model number | Rated capacity (T) | Falls of load chain | Motor size (Hp) | FEM / ISO Mechanical classification (1) | Theorical use in collective load 4 or L4 (Hours) |
|---|---|---|---|---|---|
| **LC2A Standard Series** | | | | | |
| LC2A010SI | 1 | 1 | 3.5 | 1 Am / M4 | 400 |
| LC2A015SI | 1.5 | 1 | 3.5 | 1 Bm / M3 | 800 |
| LC2A020DI | 2 | 2 | 3.5 | 1 Am / M4 | 400 |
| LC2A030DI | 3 | 2 | 3.5 | 1 Bm / M3 | 400 |
| LC2A030SI | 3 | 1 | 3.5 | 1 Am / M4 | 800 |
| LC2A040SI | 4 | 1 | 6 | 1 Bm / M3 | 400 |
| LC2A060QI | 6 | 4 | 3.5 | 1 Bm / M3 | 400 |
| LC2A060DI | 6 | 2 | 3.5 | 1 Am / M4 | 800 |
| LC2A080DI | 8 | 2 | 6 | 1 Bm / M3 | 400 |
| LC2A060SI | 6 | 1 | 6 | 1 Bm / M3 | 400 |
| LC2A120DI | 12 | 2 | 6 | 1 Bm / M3 | 400 |
| LC2A180TI | 18 | 3 | 6 | 1 Bm / M3 | 400 |
| LC2A250QI | 25 | 4 | 6 | 1 Bm / M3 | 400 |

*(1) FEM/ISO Mechanical classification for LC2A010S & LC2A020D is only 1 Bm/M3 when selecting Stainless Steel chain option.*

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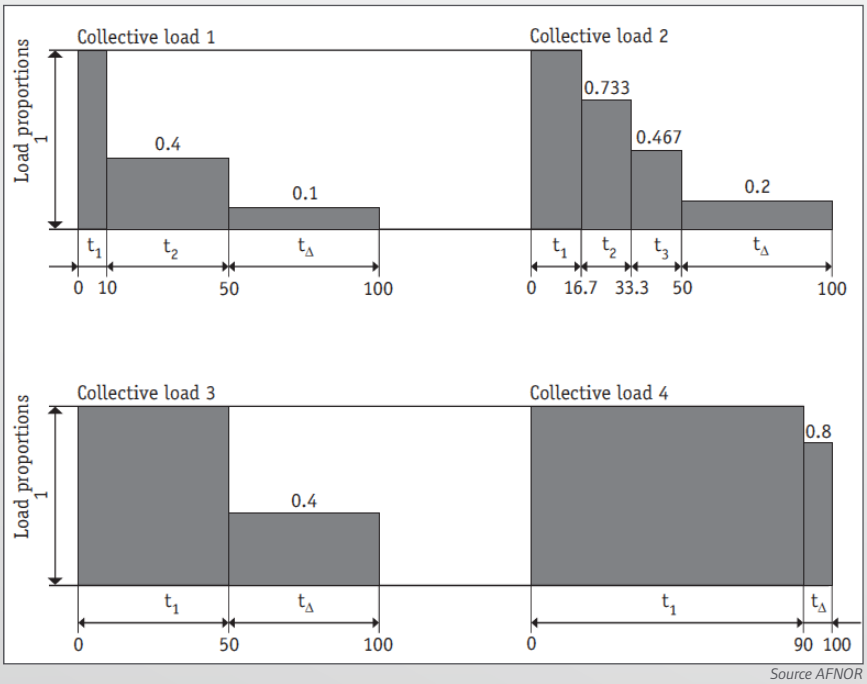
**Loading Conditions**
A hoist is sometimes used to lift various loads, some of them being very low versus the hoist capacity.
For such cases, FEM has set 4 categories of "Collective loads" as shown on below graphs :

Horizontal axis = Operating time in %
Vertical axis = Load in % of the hoist SWL (including "dead weight" such as lifting gears, slings...)




*Source AFNOR*

**Example for for collective load L1, the hoist is used**

10% operating time at 100% SWL

40% operating time at 40% SWL

50% operating time at average 10% of SWL

# Mechanical Classification

**Calculation of Safe Working Periods (S.W.P.)**

FEM 9.755 rule explains how to calculate the real loading conditions of a lifting device which is used to handle various loads. A formula allow the user to convert a mix of operation times with various loads into the equivalent Theorical Operation Time at Full load such as 1 Bm = 400 hours at Collective Load 4 or L4.

The result of this calculation inform the user if his product is in the **Safe Working Period** (S.W.P.) in order to compare it to the Theorical Number of Hours of use at full load (4 or L4).

When the **Safe Working Period** as reached the Theorical Operation Time at Full load, an overhaul of the hoist as to be performed to extend product lifetime with optimum performances and safety.

For lifting products on which the operation time is only manualy recorded, a correction factor of 1,2 is applied to cover record uncertainity.

| **S.W.P.** | = | **Operating Time** | * | **Collective Load Factor** | * | **Correction Factor** |
|---|---|---|---|---|---|---|
| Safe Working Period | | (category 1 to 4) | | (km) | | (f) |

**COLLECTIVE LOAD INFORMATION**

| COLLECTIVE LOAD | | DEFINITION OF COLLECTIVE LOAD | CUBIC AVERAGE | COLLECTIVE LOAD FACTOR |
|---|---|---|---|---|
| FEM 9.511 | ISO 4301/1 | | | |
| 1 (Low) | L1 | Driving mechanisms or parts thereof, which are only subject to the maximum stress in exceptional circumstances, and are only subject to very lowstresses continuously. | $k \leq 0.50$ | $km = k^3 = 0.125$ |
| 2 (Average) | L2 | Driving mechanisms or parts thereof, which are subject to the maximum stress often, and are only subject to low stresses continuously. | $0.50 < k \leq 0.63$ | $km = k^3 = 0.25$ |
| 3 (High) | L3 | Driving mechanisms or parts thereof, which are often subject to the maximum stress and are subject to average stresses continuously. | $0.63 < k \leq 0.80$ | $km = k^3 = 0.5$ |
| 4 (Very High) | L4 | Driving mechanisms or parts thereof, which are regularly subject to the maximum stress of adjacent stresses. | $0.80 < k \leq 1.00$ | $km = k^3 = 1$ |

# Mechanical Classification

**Example of S.W.P. calculation**

A one Ton air hoist LC2A010S , which is classified 1Am, has a Theorical 800 hours of use at 4 or L4 loading conditions. The hoist is used 180 days per year for various tasks, the cumulative time for each day of use is as following:

- 1 ton Engine handling: 2 hours
- 80 kg Wood pallets handling: 1 hour
- 550 kg gear Box handling: 3 hours

So in total, the hoist is used 6 hours a day but as some of the loads are very low versus the hoist maximum capacity, the following chart will help us to re-evaluate the Safe Working Period.

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For each operation, a collective load load factor "km" will be set depending on the load cubic average "k".

- 1 Ton Engine handling: k = 1 ; km will be 1 ; Collective Load is 4 or L4 (very High)
- 80 Kg Wood pallets handling: k = 0.08 ; km will be 0.125 Collective Load is 1 or L1 (Low)
- 550kg gear Box handling: k = 0.550 ; km will be 0.25 ; Collective Load is 2 or L2 (Average)

Now we enter these values in below chart to calculate the S.W.P.

**CALCULATING THE SAFE WORKING PERIOD (S.W.P.)**

| Application | Operating Time per day (hours) | COLLECTIVE LOAD FACTOR | | | | f Correction Factor (as per FEM 9.755 section 4.3) | S.W.P. Safe Working Period (hours) |
|---|---|---|---|---|---|---|---|
| | | L1 (Low) | L2 (Average) | L3 (High) | L4 (Very High) | | |
| | | 0.125 | 0.25 | 0.5 | 1 | 1.2 | |
| Engine handling | 2 | | | | 1 | 1.2 | 2 * 1 * 1.2 = 2.4 |
| Pallets handling | 1 | 0.125 | | | | 1.2 | 1 * 0.125 * 1.2 = 0.15 |
| Gear box handling | 3 | | 0.25 | | | 1.2 | 3 * 0.25 *1.2 = 0.9 |
| TOTAL : | 6 | | | | | | 2.4 + 0.15 + 0.9 = **3.45** |

---

In this example we can consider that the 6 hours of use with Low, Average and Very High various loads is equivalent to only 3.45 hours at Very High load.

**3.45** (hours) * **180** (days) = **621 (hours)**

The LC2A010S which is classified 1Am, has a Theorical 800 hours of use at L4, so 179 hours of use can be considered before a major overhaul, which corresponds to 52 days of operation in the same conditions.

# Hooks

**Hooks used on standard LC2A range have the following features:**

Material: Alloy Steel with Safety Latch
Class: 8
Safety factor: 5:1 (minimum)
Manufacturing:  as per EN 1677-1
Testing: as per DIN 15044 each hook is individually tested at minimum 2 x SWL
Coating: standard Industrial paint, RAL1023

**Optional  features**
- T1 option:
Bottom Hooks (not top hooks) are Bronze coated (0,3mm coating thickness)
it also includes Stainless steel safety latch & axle.

- P or QZ optional paints:
Top and bottom hooks and blocks are painted with the same P or QZ paint as the hoist body.
if T1 and P or QZ are ordered together : Top Hook is painted ; bottom block and/or hook have above T1 features.

# Chains

**Chains mounted on standard LC2A range have the following features:**

Material: Quenched and tempered steel
Coating: Zinc plated (electrolytic metal deposition 6-10µ)
Manufacturing:as per EN 818-7
Safety factor: 5:1 (minimum)

*Note : For LC2A010S and LC2A020D, Stainless steel chain can be ordered by adding suffix "S" in the model number*

| Model number | Rated capacity (T) | Falls of load chain | Chain size (mm) | Chain weight/ 1 m extra lift (kg) |
|---|---|---|---|---|
| **LC2A Standard Series** | | | | |
| LC2A010SI | 1 | 1 | 8x24 | 1.4 |
| LC2A015SI | 1.5 | 1 | 8x24 | 1.4 |
| LC2A020DI | 2 | 2 | 8x24 | 2.8 |
| LC2A030DI | 3 | 2 | 8x24 | 2.8 |
| LC2A030SI | 3 | 1 | 13x36 | 3.8 |
| LC2A040SI | 4 | 1 | 13x36 | 3.8 |
| LC2A060QI | 6 | 4 | 8x24 | 5.6 |
| LC2A060DI | 6 | 2 | 13x36 | 7.6 |
| LC2A060SI | 6 | 1 | 16x45 | 5.7 |
| LC2A080DI | 8 | 2 | 13x36 | 7.6 |
| LC2A120DI | 12 | 2 | 16x45 | 11.4 |
| LC2A180TI | 18 | 3 | 16x45 | 17 |
| LC2A250QI | 25 | 4 | 16x45 | 22.8 |

# Chains

**Chain Lubrication**

In order to minimize friction between chain links, the hoist chain must be lubricated on a frequent basis depending on conditions and rate of use.

The lifetime of a chain which is not lubricated is decreased by 15 to 20 times versus a chain which is frequently and correctly lubricated !

You can find chain lubricant in the IR range such as Penetro-Green CPN 47580935001 or any ISO VG220 to 320 oil (equivalent to SAE 50W to 90W EP).

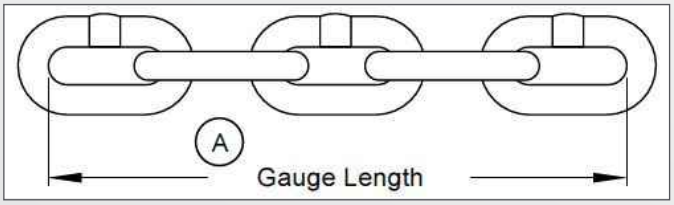

**Chain Inspection**

Check the chain for stretching. Measure the load chain over 5 link sections all along chain, paying particular attention to the most frequently reeved links.

Gauge Length. When any five links in the working length reaches or exceeds the discard length, replace entire chain. Always use genuine Ingersoll Rand replacement chain.

| Model number | Chain size (mm) | Normal length (mm) | Discard length (mm) |
|---|---|---|---|
| **LC2A Standard Series** | | | |
| LC2A010SI | 8x24 | 120 | 122 |
| LC2A015SI | 8x24 | 120 | 122 |
| LC2A020DI | 8x24 | 120 | 122 |
| LC2A030DI | 8x24 | 120 | 122 |
| LC2A030SI | 13x36 | 180 | 183 |
| LC2A040SI | 13x36 | 180 | 183 |
| LC2A060QI | 8x24 | 120 | 122 |
| LC2A060DI | 13x36 | 180 | 183 |
| LC2A060SI | 16x45 | 225 | 228 |
| LC2A080DI | 13x36 | 225 | 228 |
| LC2A120DI | 16x45 | 225 | 228 |
| LC2A180TI | 16x45 | 225 | 228 |
| LC2A250QI | 16x45 | 225 | 228 |

**Measure on 5 links**



# Trolleys

The LC2A range is availablewith a very large choice of trolleys.
There 3 things to be considered for a trolley choice:

a) Application Environment: Industrial or Oil & Gas

b) Drive system: Plain, Geared, Motorized or Motorized with Rack & Pinion

c) Headroom: Standard or Low Headroom version

**Application Environment**

For our LC2A hoists series up to 6 Ton* capacity, we offer the choice a large choice of trolleys divided in two categories depending on the environment of use:

** except LC2A060S*

## Industrial Trolley Series

- All steel construction
- 5:1 safety factor
- -10° C design temperature
- 3 drive options : plain, geared or motorized
- "W" Wide Beam option (up to 3T models)
- "T1" Spark resistant option

## Oil & Gas Trolley Series

- All steel construction
- 5:1 safety factor
- Standard or Low Headroom versions
- -20° C design temperature *
- 4 drive options : plain, geared, motorized or rack and pinion drive
- "M" 3.1 Material Traceability option
- "P" marine or "QZ" offshore paint option
- "T1" Spark resistant option

** Always check compatibility of the trolley design temperature with the hoist body*

# Trolleys

**Trolley Drives**

Several drives options can be selected for LC2A Series trolleys depending on the application requirements.

**These trolley have some specific features:**

**Plain (Push) Drive**

Simple and economic, these trolleys are operated manually. ideal for unfrequent operation and light loads.

**Geared Drive**

For occasional use where assistance for short travelling is needed. Offers more accurate load spotting.

**Motorized Drive**

Safe, comfortable and efficient all-purpose solution. Increase load handling effciency with variable-speed with the use of a pendant.

**Rack and Pinion Drive**

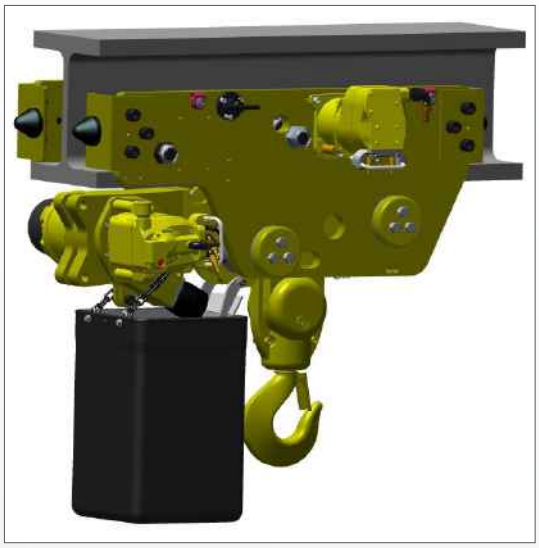
Best solution for use on sea ships or where beams have an inclination angle.

# Trolleys

**Low Headroom Models**
Low headroom trolleys are available for LC2A series from LC2A010S 1 ton to LC2A250Q 25 ton 4 falls.

**These trolley have some specific features:**

The hoist body is mounted in a horizontal position



Additional anti-tilt rollers are mounted on the side plates.

Intermediate steel frame mounted between the trolley sideplates to support one or two idle sprocket wheel.

Upper limit switches is offset under the idle sproket wheel steel frame.

# Trolleys

**Trolley side plates**

Sideplates are made of high quality steel.
They are equipped with anti-drop plates which are either bolted or obtained by profile bending.

As their construction is modular, the sideplates may have some holes which are not used depending on the options selected; it also allows a quick conversion of the unit.

---

**Wheels Profiles**

Different wheels profils can be found depending on the load capacity:

1 Ton to 8T capacity : wheels have a "Universal" profil which suits both Flat and Tapered beams all trolley options suited with universal wheels have the letter "U" in their option coding (such as PU,GU, HU, VU...)

*"U" Universal profil wheel*

12T to 100T capacity : "E" wheels : for Flat beams have letter "E" in their option coding (such as PE, VE, RE, LRE...)

*"E" Flat beam profil wheel*

"N" wheels for Tapered beams have letter "N" in their option coding (such as PN, VN, RN, LRN...)

*"N" Tapered beam profil wheel*

# Trolleys

**Trolley shafts**

The connection parts used to adjust the trolley depending on the beam width are called "trolley shafts". Their function is also to link the hoist body to the trolley through suspension plates which can be different depending on the hoist capacity and number of falls.

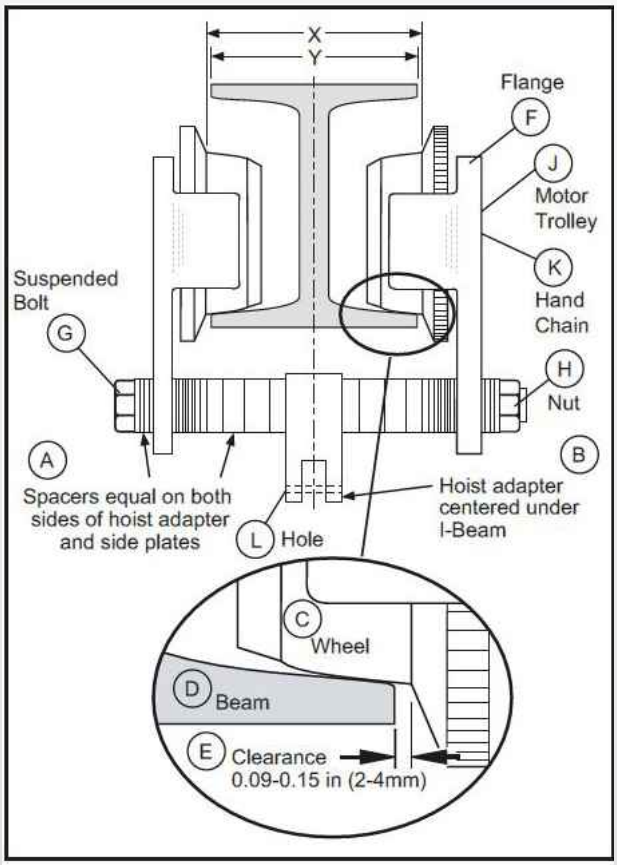
As their construction is modular, the sideplates may have some holes which are not used depending on the options selected; it also allows a quick conversion of the unit.

**Trolley adjustment**

Some spacers or washers are mounted on the shafts on the inner side or outer side of the trolley side plates to adjust the trolley correctly on the beam.

The adjusting range shown in our brochures and datasheets corresponds to the "X" value shown on below image.
A clearance "E" has to be set between the beam flange side and the wheels. Refer to the Product Information manual of your trolley hoist assembly to set the right clearance.

As their construction is modular, the sideplates may have some holes which are not used depending on the options selected; it also allows a quick conversion of the unit.



# Controls

**Several types of standard control are available for the LC2A range:**

"C1" option = Pull chain control

"P2" option = 2 buttons Pendant control (for up and down motion)

"P3" option = 4 buttons Pendant control (for up/down and left/right motion when using a trolley)

| Suspension Option | C1 Pull Chain Control | P2 2 Buttons Pendant Control | P3 4 buttons Pendant Control |
|---|---|---|---|
| **LC2A Standard Series** | | | |
| A | ✓ | ✓ | ✓ * |
| C | ✓ | ✓ | ✓ * |
| PU and PUW | ✓ | ✓ | ✗ |
| GU and GUW | ✓ | ✓ | ✗ |
| HU and HUW | ✗ | ✓ | ✓ |
| PU, PE and PN | ✗ | ✓ | ✓ * |
| GU, GE and GN | ✓ | ✓ | ✓ * |
| VU, VE and VN | ✗ | ✗ | ✓ |
| RU, RE and RN | ✗ | ✗ | ✓ |
| LVU, LVE and LVN | ✗ | ✗ | ✓ |
| LRU, LRE and LRN | ✗ | ✗ | ✓ |

*** : For applications where the user wants to use 2 buttons of the hoist pendant to control the motion of an external component such as a bridge crane or a motorized jib**

** except LC2A060S*

**P2 and P3 options control length.**
Control options P2 and P3 can accomodate up to 20 meters length without any problem.For longer control drop, we recommend to use Quick Exhaust Valves to be placed on the lifting/lowering control hoses in order to reduce response time.

For P2 or P3 control without e-stop, order CPN 38606760 (p/n 3615-0668) set of 2 valves.

For P2 or P3 control with e-stop, order CPN 38797684 (p/n 3526-0387) set of 3 valves.

# Paint

LC2A series are available with different paint qualities to match a large variety of Industrial environments.
Below chart shows the classification of corrosive environment as per ISO 12944.

| CORROSIVITY ENVIRONMENT AS PER ISO 12944 | | | |
|---|---|---|---|
| Corrosivity Category | Environment Examples | | Mimimum Recommended LC2A Paint system |
| | Exterior | Interior | |
| C1 Very low | N/A | Heated buildings with a clean atmosphere such as offices, shops, schools, hotels. | Standard |
| C2 Low | Atmosphere contaminated to a small extent, mainly rural regions. | Buildings which are not heated, where condensation may occur e.g. storehouses, sports halls. | Standard |
| C3 Medium | Industrial and urban atmosphere with an average sulphur oxide (IV) contamination level. Inshore areas of low salinity. | Production space of high humidity and certain air contamination e.g. foodstuff plants, laundries, breweries, dairies. | Standard |
| C4 High | Industrial areas and inshore areas of medium salinity. | Chemical plants, swimming pools, ship repair yards. | "P" option |
| C5-I Very High (Industrial) | Industrial areas of high humidity and aggressive atmosphere. | Buildings and areas of almost constant condensation and high contamination. | "QZ" option |
| C5-M Very High (Marine) | Inshore areas and offshore areas of high salinity. | Buildings and areas of almost constant condensation and high contamination. | "QZ" option |

**Paint systems**

The following chart shows the products and thickness used for each system (Standard, "P" and "QZ").

| LIFTCHAIN Series PAINT SYSTEMS | | | |
|---|---|---|---|
| System | STANDARD | MARINE "P" option | OFFSHORE "QZ" option (Norsok M-501 syst 1 Pre-qualified system) |
| Surface Preparation | Degreasing Cleaning | Degreasing Cleaning | Degreasing Cleaning Sandblasting **SA2.5** according to ISO 8501-1 |
| Primer | Hempadur 15553 50-60µ | Hempadur 15553 50-60µ | Hempadur AvantGuard 750 50-70µ |
| Tie Coat | N/A | Hempadur 47300 100-120µ | Hempadur 47300 130-150µ |
| Top Coat | Hempathane HS 55610 50-60µ | Hempathane HS 55610 50-60µ | Hempathane HS 55610 70-90µ |
| **Total DFT (Dry Film Thickness)** | **100 to 120µ** | **200 to 240µ** | **250 to 310µ** |

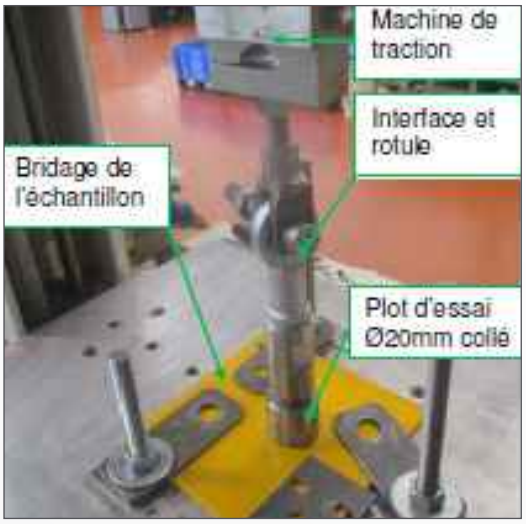
# Paint

**Pre-Qualified Paint system**
Our "QZ" option for offshore use is now using a "Pre-qualified" NORSOK M-501 system for carbon steel.

Pre-qualified means that the combination of products used in this system are offering the performances request by NORSOK M-501 specifications. Although it provides the highest quality coating for offshore use, this is not a Certified paint system (see image).

Our process follows the best surface preparation and paint application practices, while working with the best paint manufacturers to offer the highest quality of coatings with minimal COV emission and environmental impact.

Our Douai plant is ISO 14000 certified.

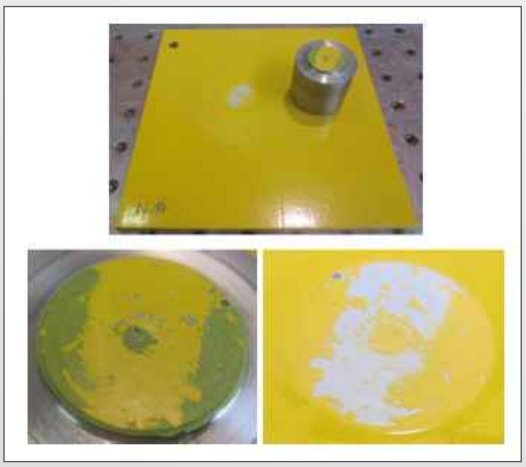



**Certified Paint system**
Some recognized associations have developped formulation of quality requirements for surface treatment;
These associations are known as FROSIO, ACQPA or NACE.
They provide guidance on how to properly do surface preparation and paint or coatings application, provide training and certification for operators and inspectors.

They cooperate and jointly develop standards for surface preparation and coating for all types of metals.
These standards are usually ISO8501 and SSPC-SP rules.

A certified paint is using pre-qualified system, operated by certified operators under surveillance of a certified inspector.

If your customer is asking for a certified paint for LC2A Series, please contact your Global Account Manager. This requires to be performed by an external painting company at extra cost and extended lead-time.

# Special Options and Accessories

Ingersoll Rand® has developped a lot of special options for very demanding applications.
These options are not shown in the brochures but can be supplied at extra price and delivery time.
Please consult your Global Account Manager for the following items:

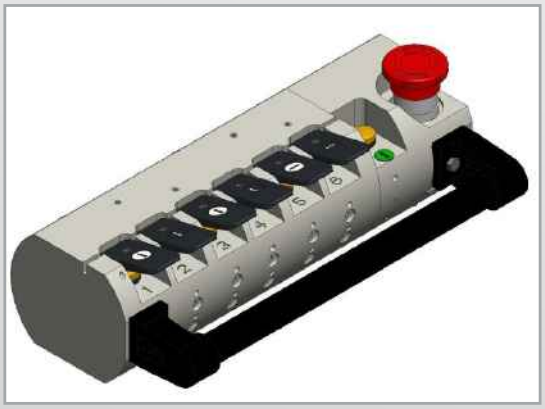
**Stainless Steel Chain Containers**
A large range of Stainless steel (SS316L material) chain basket are available for LC2A Series;
Refer to below chart for models already designed.

The capacity shown is the **chain length capacity**, not the height of lift capacity;
For instance, il your hoist is a LC2A080D dual fall hoist using 13x36 chain size, a 40m capacity chain container can be used for maximum 20 m height of lift.

| Chain size (mm) | Chain Container capacity | Part Number |
|---|---|---|
| **SS316L Chain Containers** | | |
| 8x24 | 30m | 7645-0875 |
| 8x24 | 60m | 7645-0891 |
| 13x36 | 26m | 7645-1197 |
| 13x36 | 40m | 7645-1199 |
| 16x45 | 26m | 7645-0883 |
| 16x45 | 40m | 7535-0125 |
| 16x45 | 60m | 7645-0877 |
| 16x45 | 80m | 7645-0879 |

**Six (6) Buttons Pendant Control**
The PHS6-U air operated pendant control allow the user to pilot some extra motion motors, for instance a complete air operated bridge crane system.

Contact your Global Account Manager for more information.



# Special Options and Accessories

**-20°C Filter Regulator Lubricator assembly**

In case your application needs a -20°C design temperature, a specific FRL assembly needs to be used.

Various sizes are available. Trolley support can also be supplied on demand.

**Contact your Global Account Manager for more information.**

Ingersoll Rand (NYSE:IR) advances the quality of life by creating comfortable, sustainable and efficient environments. Our people and our family of brands—including Club Car®, Ingersoll Rand®, Thermo King® and Trane®—work together to enhance the quality and comfort of air in homes and buildings; transport and protect food and perishables; and increase industrial productivity and efficiency. We are a $14 billion global business committed to a world of sustainable progress and enduring results.

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We are committed to using environmentally conscious print practices.

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