High Integrity Control Systems for Cranes

*the future is now - be there with us™*

# COMMANDER™

Remote Control, Crane Detection & Safety Systems

# HICS™

## High Integrity Control Systems

Buy British

Buy COMMANDER™

CE

# COMMANDER™

Specialist Designers & Manufacturers of Industrial **Infra-Red** & **Radio** Remote Control; **Infra-Red, Ultrasonic & Microwave** Crane Detection Systems for Horizontal & Vertical (multi-level) applications; Simplex & Duplex Data Communicators; High Integrity Control Systems, Eddy Current Brakes & Closed Loop Controllers for High Integrity Heavy Lift Cranes & other Material Handling Applications: **U.K. Designed & Manufactured.**

TP TechPoint™

# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design

## About us


**Commander Controls Limited** is a UK company formed in 1993 and was merged with two other associate companies to further develop remote control system technology using Infra-Red and Radio as transmission mediums and supported with advanced specialist microcomputer software management systems for secure signal coding and transmission and in addition to develop crane detection equipment as a safety product to automatically prevent collisions between crane structures during lifting operations using Microwave, Ultrasonic's and Infra-Red as communication mediums each with specific performance capability for a wide range of horizontal and multi-level vertical applications.

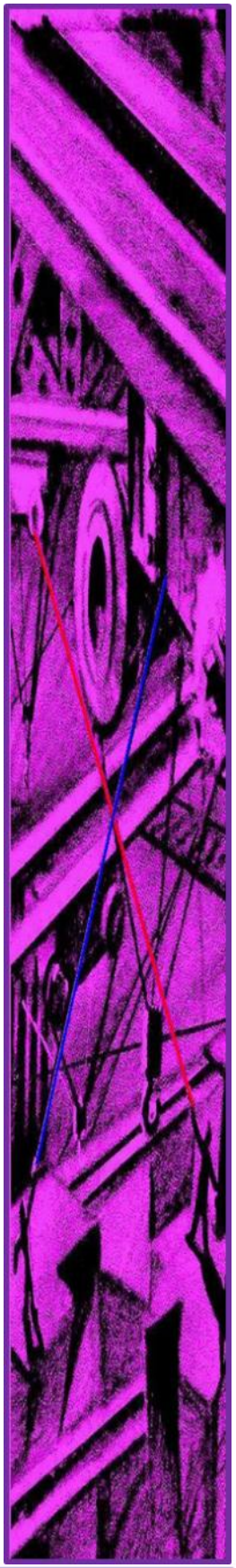
In 1998 **High Integrity Control Systems (HICS™)** was formed as a division to further expand a developing specialist crane control gear business in the high integrity lifting operations market to design and manufacture of AC & DC motor control systems and safety devices for conventional and high integrity lifting operations to include cranes in power station turbine halls, nuclear refuelling, spent fuel waste flask carriers, weapons loading, other military and heavy engineering.

HICS™ use the very latest in CAD technology in the design and manufacturing process.

engineering design tools include mechanical & electrical design software, combined with fast access computer systems, colour printers and plotters. HICS™ have already gained a successful track record in full scheme project design and contract management with a number of large OEM's and clients. Subject to contract terms, scheme designs can be presented on second and third party drawing borders. All scheme designs remain the intellectual property of HICS™ parent company, **Commander Controls Limited.**

To complement HICS™ motor control scheme designs, the company has developed an advanced range of Eddy Current Brakes (ECB's) for effective speed control and safety braking system in five sizes called ComDrive™ these are effectively controlled with ProSpeed-II™, a Closed Loop Speed Control System of common design for all five sizes of the ComDrive™ ECB system. These are all seismically qualified and fully type tested and certified by independent test house (BSI).

HICS™ have a forward development program for a number of products, included is a short distance passenger transportation system called LRV™. Details of the LRV™ development project can be seen later in this brochure and in graphic motion and more on our websites at:- www.commandersystems.co.uk & www.commander.co.uk

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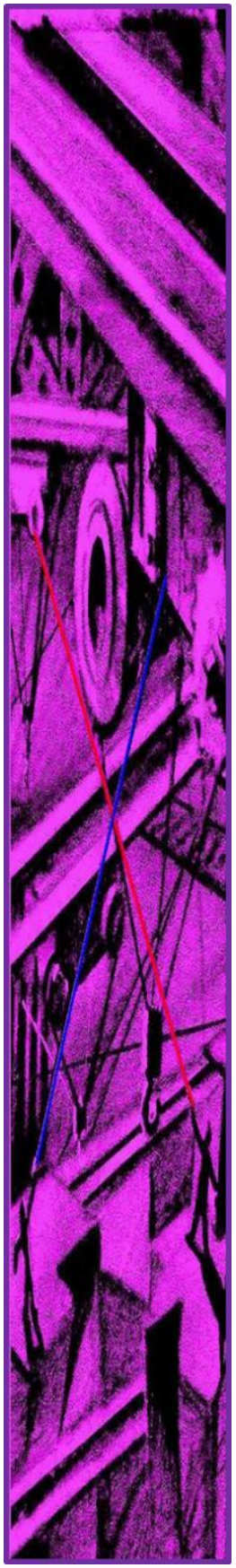
# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design

## Brochure Index



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# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design

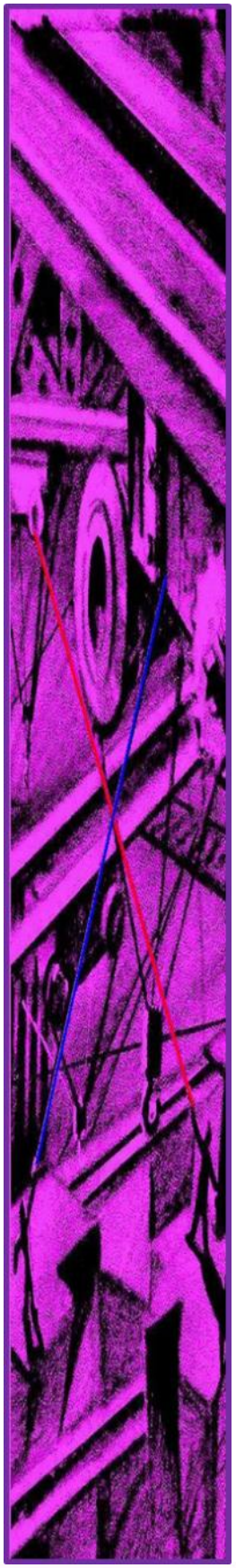
## Scheme Designs (page 1 of 2)

In order to arrive at this point, much of the client project requirements are already known, initially at the Tender stage. Contracts can usually be dealt with this way but some contracts can be arranged in a split costing budget system where scheme design is covered by a part 1 contract, with the actual build and test covered in part 2.

HICS™ scheme designs include all power distribution, low voltage control logic and interface terminal arrays and where required includes single, two or more safety channel logic using non generic hardware (different manufacturers), such a system would generally be required with cranes employed in handling volatile material such as in the nuclear environment and is designed to eliminate generic failure. Subject to the control mediums to be incorporated, designs can take into account for off crane ground based control methods such as remote control, control desk operations, fixed or mobile pendant operation or traditional in cab control. It is common to include a number of optional control systems for specific reasons.

Automated handling schemes and complex zone movement control plans for cranes in operationally restricted safety zones are entirely developed by HICS™ design engineers or from clients own ground operating system requirements. Where acceptable within a scheme, PLC's are incorporated for specific logic control.

All motor control gear and connectivity hardware of HICS™ design is housed in either standard locking cubicles (enclosures) and where a suite of enclosures are built as an assembled structure, these incorporate electrical and mechanical interlock systems as a standard feature for obvious personnel safety and integrity reasons. For low headroom constraints specially constructed cubicles (complete suites) can be designed and built to suit. HICS™ can build full EMC compliant (emission leak proof) enclosures, an example is shown following for a contract that was critical to the application.

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# HICS™ (High Integrity Control Systems) Complete Crane Electrical Scheme Design

## Scheme Designs (page 2 of 2)

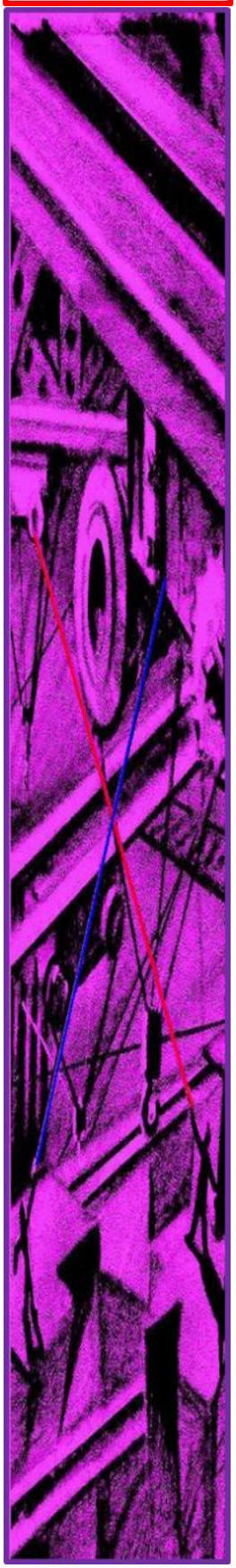
For effective motor speed control a number of scheme design options are available, these include but not limited to series resistance banks for slip-ring type electric motors like used for older convention applications, constructed using spool or grid type resistance banks, (with stainless steel options) and vermin control shields and optional ventilated methods.

Variable Frequency Drives (VFD's), Flux Vector Drives (FVD's) and Eddy Current Brakes (ECB's) all options can be fully integrated with the control scheme. Generally the control choice is application or integrity dependant or both. All drive electronic drive variants have suppression and filtering.

An important part of EMC compliance is the use of screened power cable networks between electronic speed control devices and the physical electrical drive motors. Where full EMC protection is required, all external cable routes between relevant control cubicles and interconnection termination boxes exit via special stainless steel EMC compression glands.

Throughout the construction phase, client representatives usual carry out build inspections at specific contract milestones.

HICS™ can also provide a full package of control equipment hardware and installation materials to comply with up to date standards, rules and regulations as laid down by the regulatory authorities, as a minimum, of the country of destination.



**Depending on the contract terms and value we can provide:-**

- **Full dimensional mechanical layout drawings**
- **Automatic inter-connecting continuance page related schematic drawings**
- **Full test plans formulated and carried out prior to despatch**
- **Bills of materials detailing the installed position of the parts**
- **Automatic connectivity termination sequencing**
- **Automatic component and wire labelling**
- **Designed schemes (as built) downloaded to CD for client record**
- **Full operating and maintenance manuals.**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# HICS™ (High Integrity Control Systems)
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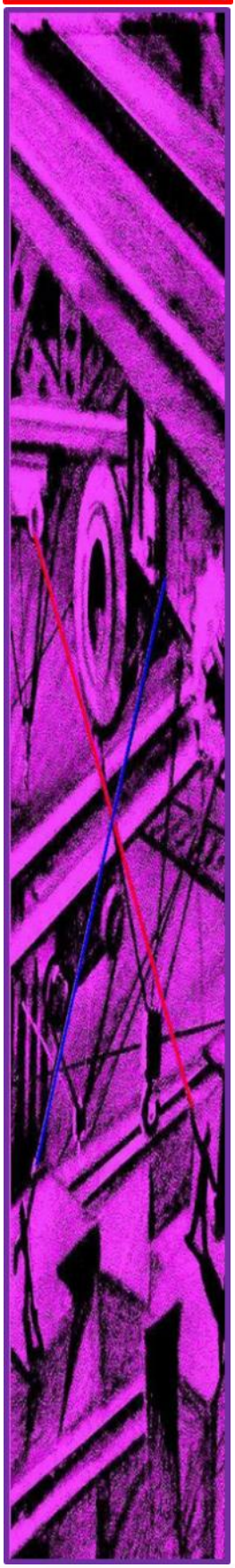
## Contract Procurement


On completion and finalisation of contract terms with clients, all HICS™ scheme designs are laid out and are segmented into various control sections with each cubicle hardware set being listed on to a cumulative master bill of materials which is contained within the company's stock control system to facilitate procurement and issue of parts for a sub assembly build. All component parts are sourced from recognised manufacturers' and their distributors. All supplies are certified for compliance.

Each sub-assembly has a specific bill of materials drawn from the master bill. Such definitive material procurement control ensures that components for sub assemblies are secured from suppliers on time and to budget. This method also ensures totally accuracy for each sub and final assembly build and helps provide a full history of traceability and component sourcing leading to production of life time records for client future reference.

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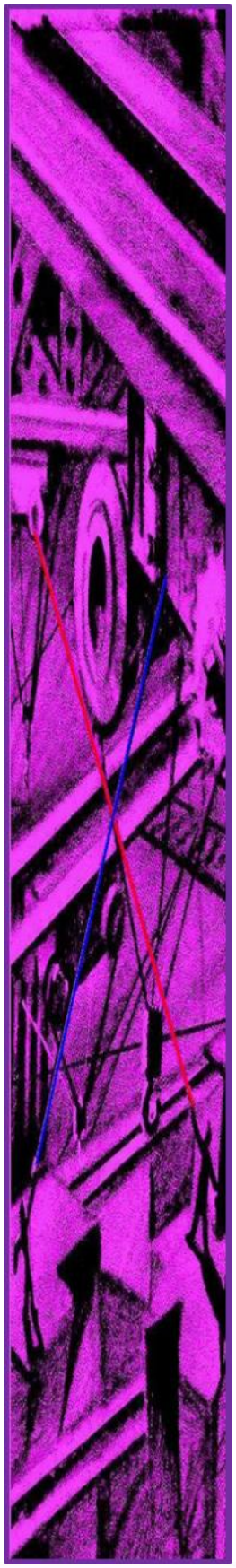
## Cubicle Suite Preparation

During the HICS™ scheme design phase the control suite cubicles are also determined and client approved prior to procurement. This applies if purpose designed and built for installation height limitations or even specific requirements such as for increased levels of EMC protection, or if standard cubicles meet the specification then these are procured in the normal way with all other components.

Whichever HICS™ design control suite type is to be used, it is usual for a fabricated rodent proof mounting plinth to be constructed. This is designed not only to provision for cubicle and resistance bank fixings but also to align with the supporting structure on the target crane structure. Fabricated plinths are also designed to provide enclosed segregated cableways for electrical (mains & control voltage) inter-connections between cubicles and end bridge connection boxes for cross bridge cable systems. The mounting plinth is levelled prior to cubicle installation to ensure cubicle doors and the assembly is 'squared' throughout construction.

All HICS™ cubicles are installed to the fabricated mounting plinth in a specific build plan order and are fitted out with various items of hardware (following), including mechanically linked door interlocking systems, including mains and control circuit isolators, indicators and other required components.

Usually the CPP (Crane Protective Panel) is the first cubicle running from left to right or right to left, then sequentially, all power control and devices with final cubicles being the low voltage control cubicles, generally one cubicle per motion and with separate cubicles where a number of channels (1, 2 or 3) exist in order to provide a high level of failsafe protection. Subject to the contract specifics the final fully tested control suite could be shipped to the crane structure manufacturer as a complete built assembly or dismantled and shipped in individual units or modules.

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# HICS™ (High Integrity Control Systems)
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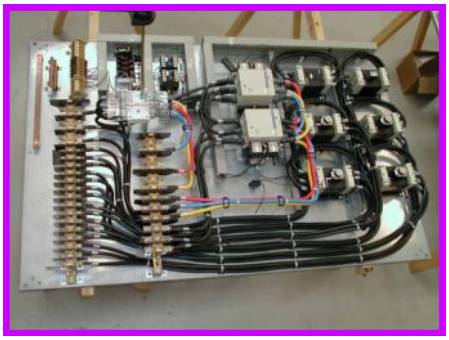
## Chassis Plate Sub Assemblies

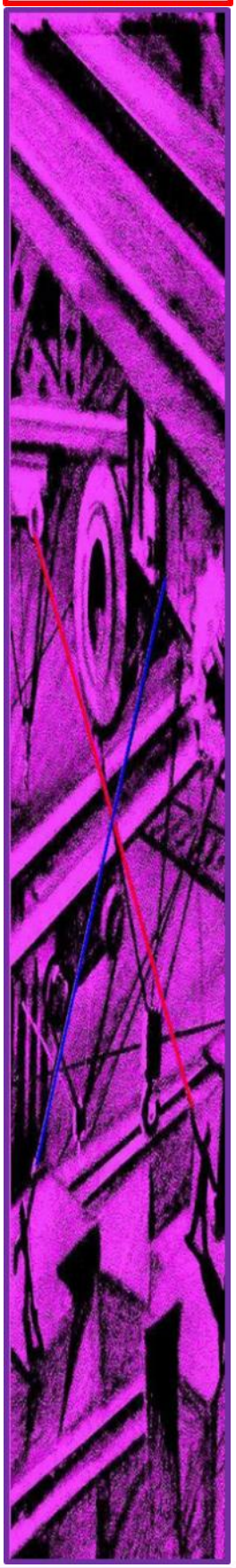


**HICS™** Scheme designs include all power distribution and low voltage control logic in single, two or more channel logic using non generic hardware (different manufacturers) thus to alleviate any possible generic fault becoming manifest, this protection would normally be required with cranes employed in handling volatile material such as in the nuclear industry.

**HICS™** control system sub-assemblies are built on rigid chassis plates to facilitate construction and individual modular testing and final offering up to the target cubicles fixing points. All fixed components are secured with drilled and tapped holes with location generated mechanical positions from the master mechanical layout drawings thus to eliminate and risk of rear fitted nuts to fixing bolts becoming loose. Some heavier component parts projected types are fixed on stand-off brackets or fixed to threaded riveted inserts.

**HICS™** sub-assemblies are pre-wired and tested at the assembly stage ready for inter-connection to adjacent sub-assemblies or I/O terminal rails. All wiring is terminated using various relevant crimp components. Standard Earth termination methodology is applied between all sub-assemblies and cubicles and cubicle to cubicle using secure bolting techniques thus providing PME bond.

Calibrated compression tools for cable terminations, bolts/nuts etc, are used.

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# HICS™ (High Integrity Control Systems)
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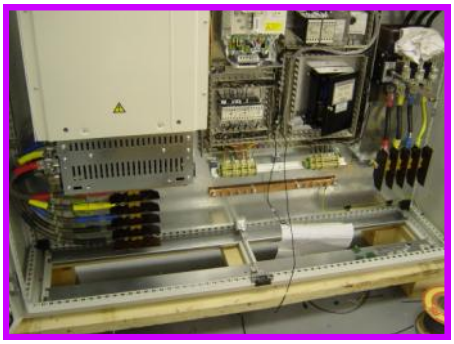
## Cubicle Assembly & Inter-wire



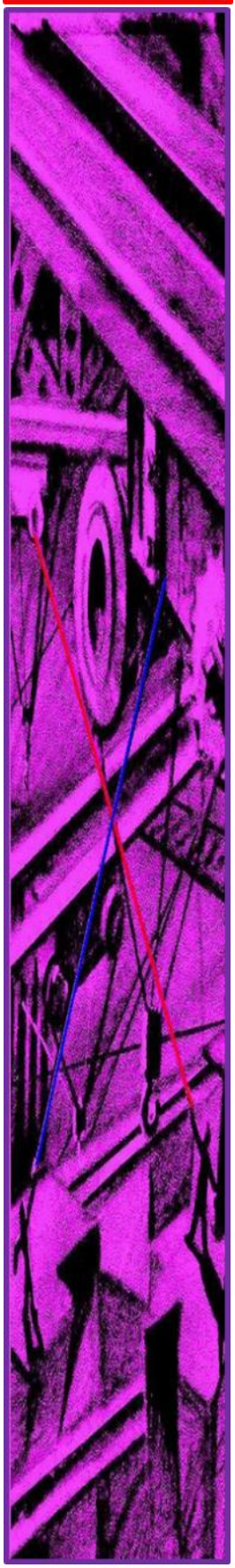


Pre-assembled HICS™ cubicle sub-assemblies are modular tested on completion and prior to installation to each designated cubicle.

Each HICS™ sub-assembly chassis plate with fitted components is installed into each relevant control scheme cubicle to a specific clearance dimension between the chassis plate and rear cubicle wall taking in to account clearance between the highest component and cubicle door. The chassis mounting stud design incorporates either turned barrel or hexagonal stand-off pillars secured to the cubicle framework to which washer kits and fitted locking/friction nuts complete the fixture of the sub-assembly.

Depending on the scheme supply/delivery, cubicle connectivity wiring which is loomed as a standard methodology is fully fitted and laid into the plinth mount channels as previously described to ensure correct cable lengths so if the supply is to be shipped in a dismantled condition then the looms are not fixed at this point, therefore following testing one end of the loom is disconnected in order to minimise on site work during installation.

Operating mechanisms that are cubicle door mounted and which are liked/coupler connected to mains isolators located on sub-assemblies are fitted as required. Similar with indicators, voltage and current meters etc. Mechanical and electrical security access door locking devices are also fitted and wired to the sub assembly now fitted.

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## Cubicle Suite Completions













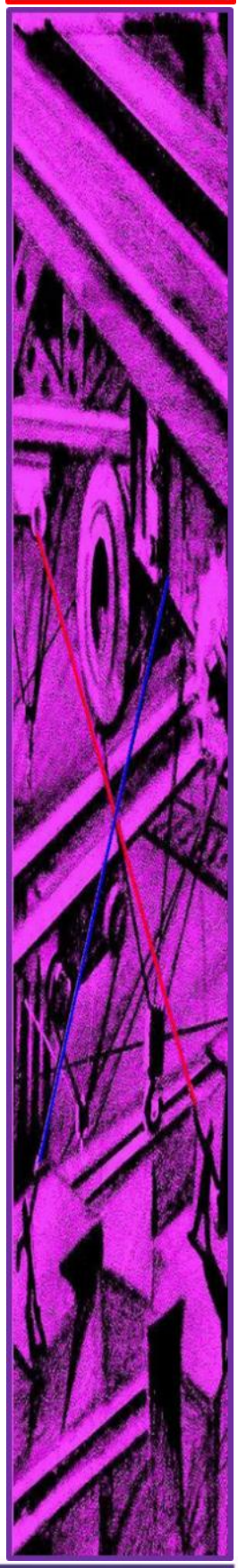


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# HICS™ (High Integrity Control Systems)
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## Control Desks & Crane Cabins

HICS™ Design and manufacture control desks and are constructed using high quality sheet steel laser cut and are machine folded to form the complete enclosure usually with a door and removable rear access cover and with laser cut control fixing positions and welded as required. Engraved labelling is used for all control device ID's.

Control desks are fully fitted out and can be fixed to ground and hard wired through a cable network (festoon system) to a target crane or as an option for practical, cost or efficiency reasons, control desks can also be supplied 'wheeled' for limited mobile use and with an umbilical cable connection.

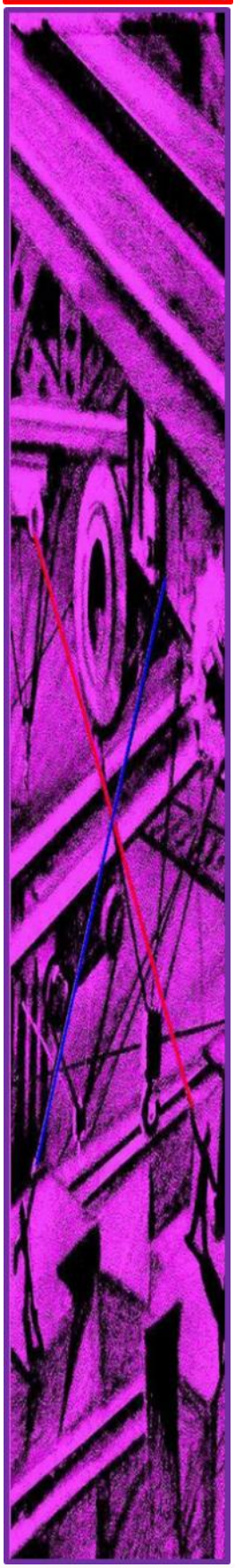
Optionally, control desks can be wirelessly connected to the target crane using Infra-Red or Radio Frequency with all commands being fully security coded.

Incorporated in the design is full CAT 3 dual channel/ EM Stop safety. This version can also be supplied for ground fixing or 'wheeled' for mobile use and with either plug in power source or can be battery operated with in built AC charger system.

HICS™ also design and manufacture crane control cabins and are constructed using high quality sheet steel laser cut and are machine folded to form a modular panel system (windows/doors) to facilitate assembly.

Cabins are fitted out with the required control media and similar to control desks can be supplied for hard wired integration or wireless using Infra-Red or Radio Frequency.

Operator seating can be fixed or rotational. Control cabins can also be supplied with Air Conditioning systems for operator health and safety reasons. Engraved labelling is used for all control device ID's.

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# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design

## Test & Final Inspection

As part of the build program various stages of the build are incorporated within the HICS™ critical path analysis therefore client is aware at all times when various stage inspections are due.

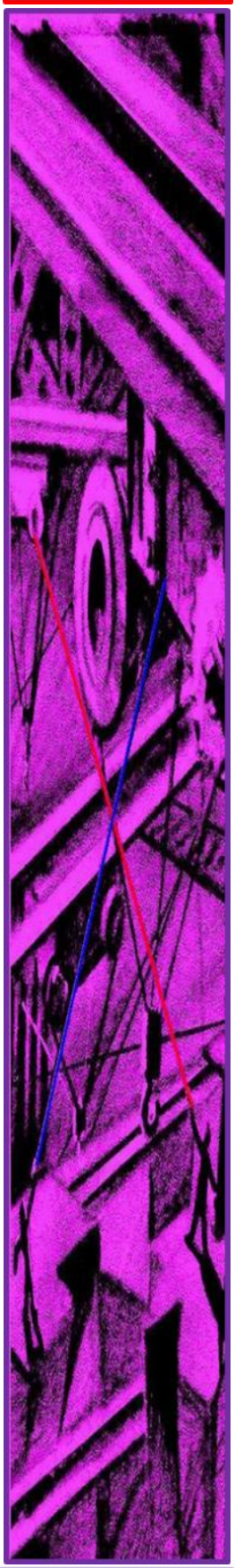
In house functionality tests and flash testing is carried and final witness testing prior to shipment.

Full sequence testing is carried out to pre-determined test plans. HICS™ engineers use specially built in house test console to facilitate test of each circuit and interlock system.

High Voltage Flash Testing is carried out to ensure no 'bridges' are apparent between wiring

Test and final inspection is no different to any other stage except that it is the point where acceptance of the scheme by the client takes place as installation in any case could be outside of the design and manufacture program thus could form part of the supply of a new crane, so installation would then be the responsibility of the crane OEM.

Following client approval, all test equipment is disconnected ready for scheme shipment either as a complete scheme or dismantled for shipping and maybe erection purposes. All hardware is protectively covered and shipped using dedicated transportation.

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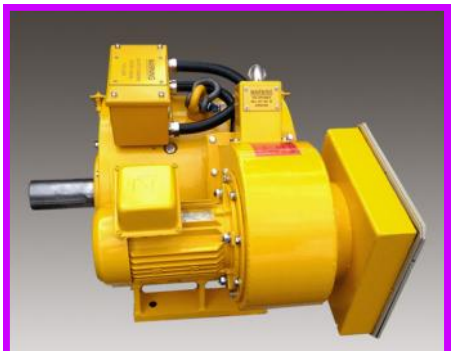
# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design

## Speed Control & Safety Systems
### ComDrive™ Eddy Current Brake Control & Safety System

**Safety * Reliability * High Efficiency * Low Maintenance * Field Proven System**
**Nuclear Industry Approved * Power Generation Industry Approved**

**ComDrive™ 4CE & 2CE Units (Vertical Air Intake)**

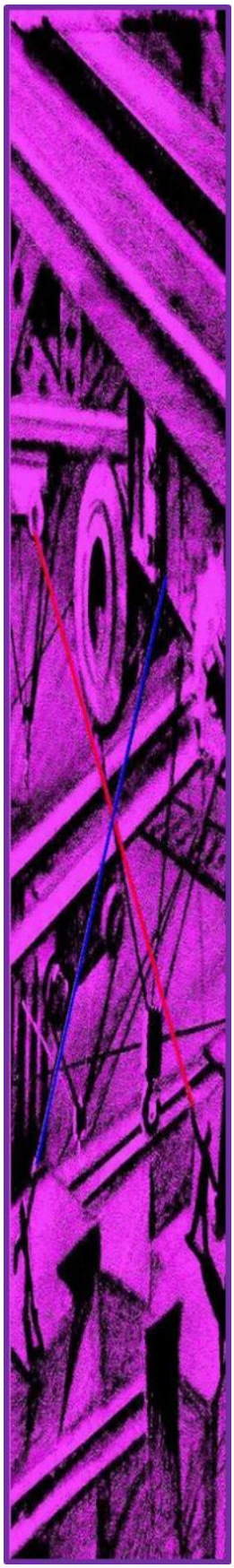
**ComDrive™ 2CE Unit (Angled 45º Air Intake)**



**ComDrive™ 2CE Units (side view) (Angled 45º Air Intake)**

**Commander Controls Limited** developed an advanced and highly efficient range of high performance **ComDrive™ Eddy Current Brake Systems** for use on high integrity overhead travelling cranes where accurate speed control and load safety is paramount. When used in conjunction with the **Prospeed-II™ Closed Loop Speed Control System**, and slip-ring type electric motors, contactor switch gear and specially graded resistances, the **ComDrive™** machine provides reliable failsafe speed control solution for Crane & Hoist applications. Accurate pre-set speed control up to 5 speeds can be achieved in both directions of movement between 7.5% and 60% of the applied motor rated speed. **ComDrive™** machine is IP54 rated and are available in 4 sizes from 2.2kW to 150kW (optional size 5). The **ComDrive™** machine is simple and reliable and is similar in construction to a squirrel cage (induction) motor, but has a DC field coil system with a solid steel balanced through ventilated rotor developed for higher efficiency and reliability as opposed to types using riveted laminations in their construction (these can overheat and magnetically oscillate and fatigue, such designs can reduce the machine life). **ComDrive™ Eddy Current Brake Units** are constructed to a uniform footprint from high quality tested and Mill certified materials. Cooling is provided by a separately driven forced air cooling fan motor with in-built air flow sensor which is coupled into and monitored by the **Prospeed-II™ Closed Loop Speed Control System**. This method of cooling has considerable advantages to performance and efficiency over the entire range of **ComDrive™** Machines. Cooler running means closer tolerances between the rotor and field coil pole pieces can be achieved particularly at low speeds. The monitored cooling fan assembly can be oriented during manufacture if required to suit close (low) headroom installations.

One level of Thermistor protection is provided as standard to protect against temperature rise. A **Metrosil™** device is incorporated to protect against field spikes. Standard finish.

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# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design

## Speed Control & Safety Systems
### ProSpeed-II™ Closed Loop Speed Control & Safety System

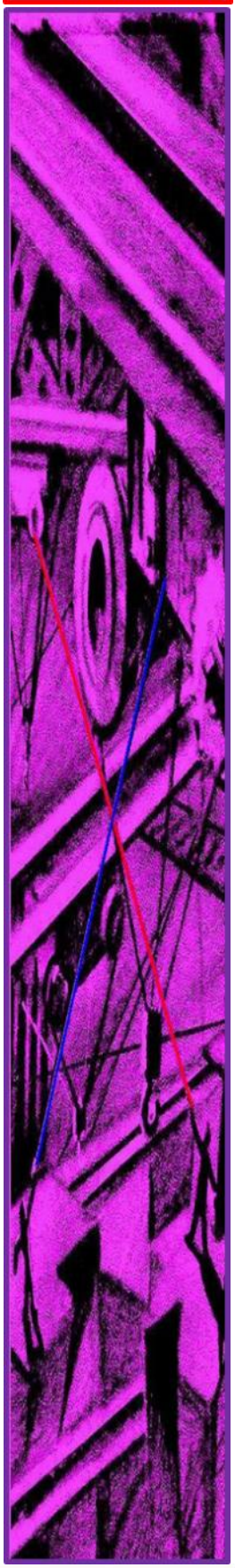
**Safety * Reliability * High Efficiency * Low Maintenance * Field Proven System**
**Nuclear Industry Approved * Power Generation Industry Approved**
**RFI Tested by BSI to BS 2011 Part 2 (various)**
**EMC Tested by BSI to EN 50081-2: 1993 & EN 50082-2 1995**

**ProSpeed-II™**
**Closed Loop Control System**

**Commander Controls Limited** developed this advanced and highly efficient Closed Loop Control System called **ProSpeed-II™** for the effective control of Eddy Current Brakes used on high integrity overhead travelling cranes and other equipment where accurate and constant speed control and load safety are paramount. Accurate speed control for up to 5 speeds (locking control devices) can be achieved in both directions of movement between 7.5% and 60% of the applied motor rated speed. When used in conjunction with the **ComDrive™ Eddy Current Brake** and slip-ring type electric motors, contactor switch gear and specially graded resistances, **ProSpeed-II™** provides a reliable failsafe speed control solution for Cranes & Hoists and can also be used to replace other makes of open or closed loop controls for eddy current brake systems. The all-steel design chassis plate can be easily adapted for alternative mounting footprints.

**ProSpeed-II™** has been environmentally tested and seismically qualified and fully certified. The all-steel design chassis plate can be easily adapted for alternative mounting footprints.

Complete units are usually ex stock for world-wide shipment.



**Typical ProSpeed-II™ Applications**

**High Integrity Steelworks * Heavy Engineering Cranes**

**Nuclear Fuel Reprocessing Handling Operations**

**Nuclear Reactor Refuelling (Charge) Cranes * Power Station Turbine Hall Cranes**

**Heavy Lift Shipbuilding Cranes * Other Electrically Power Machinery or Plant**

**Vessel Slip-way Winches**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# HICS™ (High Integrity Control Systems)
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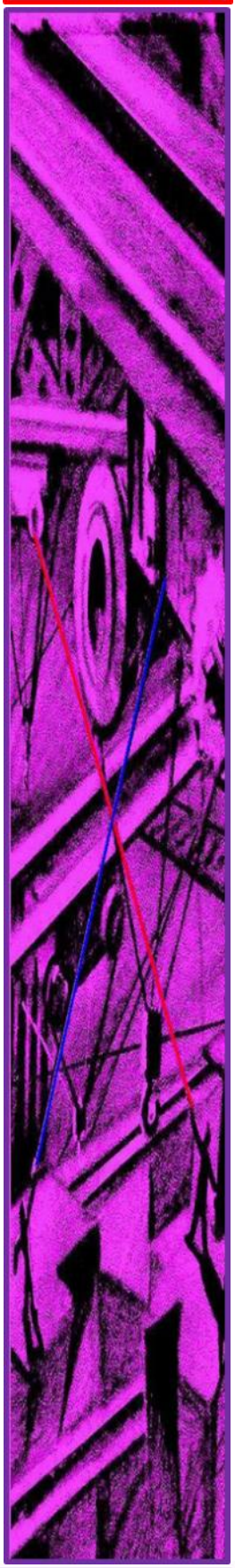
## Speed Control & Safety Systems
### COMMANDER™ Variable Frequency Drives (VFD's)



HICS™ supplied Variable Frequency Drive Systems (FVD's) are usually incorporated as an integrated component in a HICS™ control scheme or may also be supplied to installers or OEM's for own scheme integration. Speed Control & Safety Systems are an essential component in an overhead crane scheme design as correct utilisation helps reduce electrical hardware and considerable energy efficiency and safety factors. This type of drive is used on induction type motors and not slip-ring types.

Variable Frequency Drives convert AC (alternating current) power to DC (direct current). DC power (+/-) as many will know, can provide a considerable amount of control over speed and acceleration when used as the power source for electric 'armature type only' electric motors. Early power supplies were DC as AC did not exist, its application was wide ranging as well as domestic supplies it became extensively used in commerce & industry. These devices are a proprietary product which we can recommend to clients in a build project or the client may specify a preferred product OEM so as to maintain uniformity on site where other applications use similar devices, also familiarity by client maintenance personnel is also a preference factor. Variable Frequency Drives are ideal to control travel motions as usually the torque demand can be quite variable with constant acceleration and deceleration demands changing within a few seconds.

In new design cranes, the use of Variable Frequency Drives in a scheme provides many benefits which include a wide range of speed control settings (as above) and a number of cost savings, primarily in terms structural crane weight and dynamic structural design. Such savings dramatically reduce and therefore control impact factors (shock loadings) on both crane structures and buildings and consequent superimposed loadings on building supporting structures, again resulting in further financial benefits ultimately for the crane user enabling possibly higher safe working loads being carried using the more specific method of control and load movement

It is usual for applications where a user variable speed control system is required to be controlled by a remote control system with current or voltage stepped output, such as the COMMANDER™ E3/RDI7 Joy stick Remote Control System with stepped or step-less control. These products can be supplied using Infra-Red or Radio PLL Synthesiser, or a combination of both in order to provide a safe CloseStart™ 'in range' system when using radio formats. HICS™ can also provide where necessary supporting installation hardware to achieve compliance with EMC requirements. As part of the COMMANDER™ hardware a communications and control feature called the XBData™ system can be utilised. This optional feature enables elimination of costly cross bridge cable systems for control wiring and other hardware. Power is delivered Hoist (Crab/Trolley) by means of a conductor system fixed throughout the full extend of the bridge structure with power collection via conventional power collector shoes.

We have not used any photographs in this section due to the vast number of products available, of which many have specific features and availabilities.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# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design


## Speed Control & Safety Systems
### COMMANDER™ Flux Vector Drive Systems (FVD's)

HICS™ supplied Flux Vector Drive Systems (VFD's) are usually incorporated as an integrated component in a HICS™ control scheme or may also be supplied to installers or OEM's for own scheme integration. Speed Control & Safety Systems are an essential component in an overhead crane scheme design as correct utilisation helps reduce electrical hardware and considerable energy efficiency and safety factors. This type of drive is used on induction type motors and not slip-ring types.

Flux Vector Drives convert AC (alternating current) power to DC (direct current). DC power (+/-) as many will know, can provide a considerable amount of control over speed and acceleration when used as the power source for electric 'armature type only' electric motors. Early power supplies were DC as AC did not exist, such applications were wide ranging as well as domestic supplies it became extensively used in commerce & industry. These devices are a proprietary product which we can specify by recommendation to client in a build project or the client may specify a preferred product OEM so as to maintain uniformity on site where other applications use similar devices, also familiarity by client maintenance personnel is also a preference factor. Flux Vector Drives are ideal to control hoist motions as usually the torque demand can be quite variable with constant acceleration and deceleration demands changing within a few seconds.

In new design cranes, the use of Flux Vector Drives in a scheme provides many benefits which include a wide range of speed control settings (as above) and a number of cost savings, primarily in terms structural crane weight and dynamic structural design. Such savings dramatically reduce and therefore control impact factors (shock loadings) on both crane structures and buildings and consequent superimposed loadings on supporting structures, again resulting in further financial benefits ultimately for the crane user enabling possibly higher safe working loads being carried using the more specific method of control and load movement

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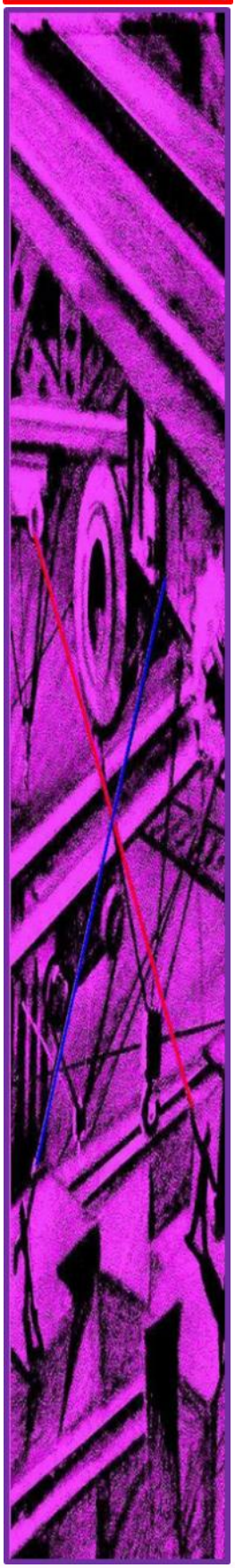


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# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design

## Speed Control & Safety Systems
### HICS™ Resistance Banks (Spool & Grid Types)

HICS™ Coil (Spool) Resistances

HICS™ Grid (Open) Resistances

HICS™ Coil (Spool) Resistances

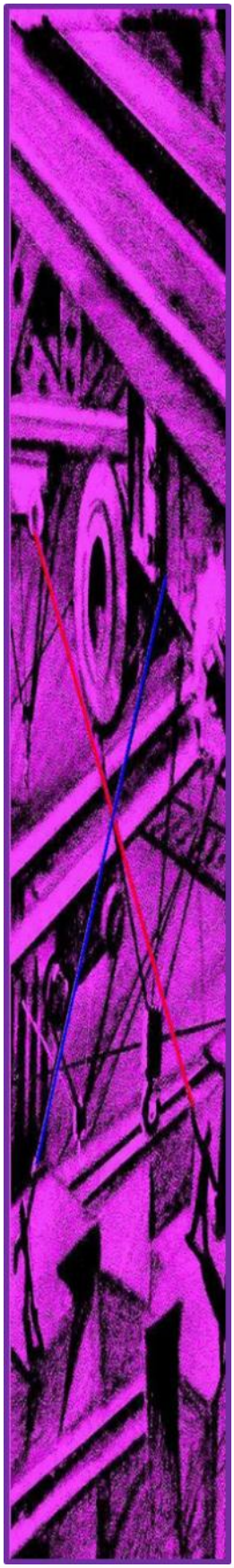
HICS™ supplied Resistance Banks do not alone effect speed control. Resistance Banks work like brakes on a vehicle but instead of setting a brake lever in steps to achieve brake release thus permitting the vehicle to move, resistance banks are set in specific sections thus to provide the required speed settings which stabilise to a constant between motor and resistances. This type of drive control can only be incorporated with slip-ring type motors and cannot be used with induction motors.

Resistance Banks for speed control can only be used on electric motors that incorporate a wound rotor, known therefore as a slip-ring motor. This type of motor has a stator which has electrical field coils wound in the structure and similar to a simple induction type motor. When energised an electromagnetic field is created and thus causes the rotor to excite and rotate in a given direction (this is determined by electrical phase rotation) exactly as an induction motor. Reversal of motor direction is as with the induction type motor, reversal of two phases to the stator connections.

The slip-ring type motor incorporates a rotor that also has electrical windings (coils) embodied therein, these are connected to a slip-ring assembly with brush gear thus to provide a connectivity method for external resistance bank connections.

Resistance Banks are divided into sections to suit the motor characteristics and numbers of speed stages required. The more resistance stages the wider range of speed control is available. Each resistance section is switched out across three poles using rotor contactors thus to permit a gradual increase of the motor speed. Not all speed settings are controlled by a ground based operator or even on-crane cab controls. Frequently timing systems are applied to automatically take the crane acceleration through the various crane speed steps thus to increase the motors rotational speed.

On start up, full resistance is in circuit to the three rotor poles. Gradually the drive motor gradually overcomes the resistance stage enabling maximum speed for the speed step. As each resistance section closes, motor acceleration speed progresses until all resistance stages are closed, the motor then becomes direct on line permitting full speed and torque.

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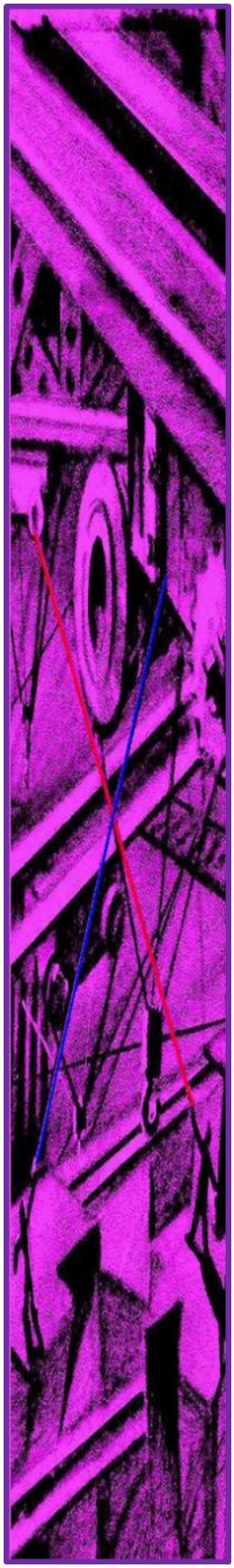
# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design

## Speed Control & Safety Systems
## HICS™ SoftStart™ Systems

HICS™ SoftStart™ System

HICS™ supplied SoftStart™ Systems are simple buffers for induction motors to initially, on start up, absorb the energy (torque) thus inhibiting the ramp up time to enable crane LT speed to ramp up slowly to a point where the absorbed energy forms a balance thus permitting the induction motor (s) to function at full speed.

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# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design

## COMMANDER™
## Infra-Red & Radio Joy-Stick Remote Control Systems


HICS™ designs can incorporate COMMANDER™ Remote Control, Collision Avoidance Systems and other Command & Communication Systems for effective control of scheme hardware.

For effective speed control the COMMANDER™ E3™ Joy-Stick **Infra-Red** Remote Control System with stepped or step-less interface controls is ideal. The E3™ remote control system can provide stepped (volt free relay outputs) or variable 4-20mA, or Voltage (0 -10V, 10-20V etc) interface to specific drive systems.

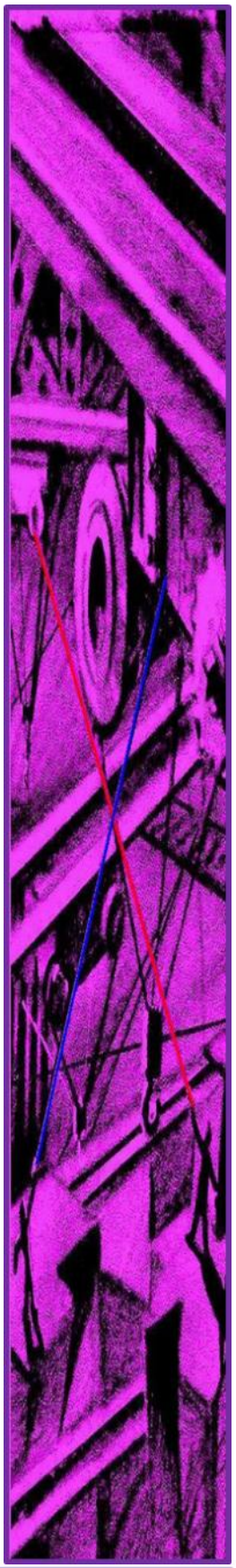

E3™ Joy-Stick with TalkBak™

Flexible alternative Command & Controls with TalkBak™ Signalling, Magnet or Vacuum Controls with safety features to prevent inadvertent load release.


For effective speed control the COMMANDER™ E3™ Joy-Stick **Radio** Remote Control System with stepped or step-less interface controls is ideal. The E3™ remote control system can provide stepped (volt free relay outputs) or variable 4-20mA, or Voltage (0 -10V, 10-20V etc) interface to specific drive systems. Radio systems can be supplied with **Infra-Red** CloseStart™.


E3™ Joy-Stick Expanded

For a complete range of COMMANDER™ remote control including push button versions, collision avoidance, command & communication systems please see our website www.commander.co.uk

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# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design

## COMMANDER™
## Horizontal Collision Avoidance Systems for Cranes

**IRCDS-HSD-II™ Horizontal**

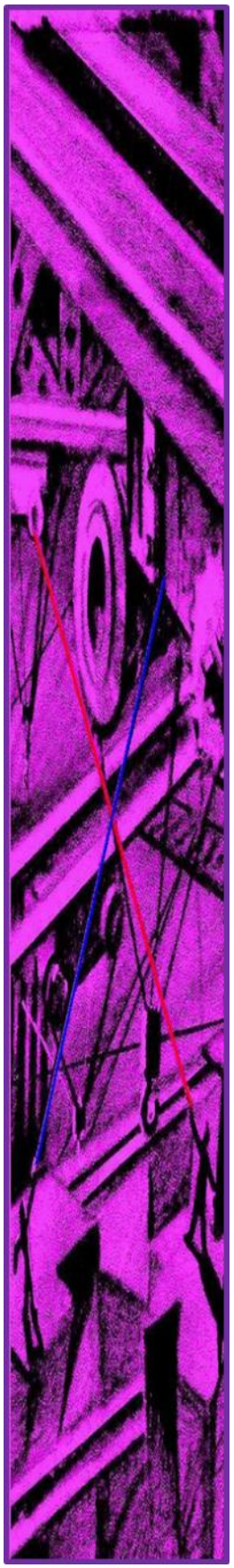
For safe **Crane2Crane**™ approach at high, medium or low speeds the **IRCDS-HSD-II**™ provides the ultimate continuous '**hand-shake**' protection. Effective at the standard 400M distance format, continuous communication between cranes is assured, any loss between the partners systems will inhibit the cranes from travelling in the opposing 'risk' directions. A system upgrade can be supplied for gantries or cranes of a greater distance than 400M A **BatBak**™ (Battery Back Up System) ensures communication is maintained thus protection levels are maintained even when the a particular crane is off line for maintenance or repair work.

**Morsonic-II™ Horizontal**

For safe **Crane2Crane**™ approach at high, medium or low speeds the **COMMANDER™ Morsonic-II™** provides continuous half duplex '**hand-shake**' protection for the maximum distance, effective at the standard 30M distance format, continuous operation when cranes are permitted to part the failsafe hardware will detect loss of communication between cranes if a failure occurs then the system will inhibit the cranes from travelling in the opposing 'risk' directions. A system back up, the **BatBak**™ (Battery Back Up System) ensures communication is maintained in an active mode thus to maintained protection levels even when the a particular crane is off line for maintenance or repair work.


**CDS™ Programmer**

**CDS**™ (Collision Avoidance Programmer) fit all device for all versions and is used to program each Collision Avoidance System type during installation. The **CDS**™ programmer unit connects to the mother and daughter PCB's. The input settings are stored in memory, this prevents any tampering by unauthorised persons after installation set up.

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# HICS™ (High Integrity Control Systems)
# Complete Crane Electrical Scheme Design

## COMMANDER™
## Vertical Collision Avoidance Systems for Cranes

**IRVCD™ Vertical Detection**

**IRTxE™/IRRxE™ Communicators**

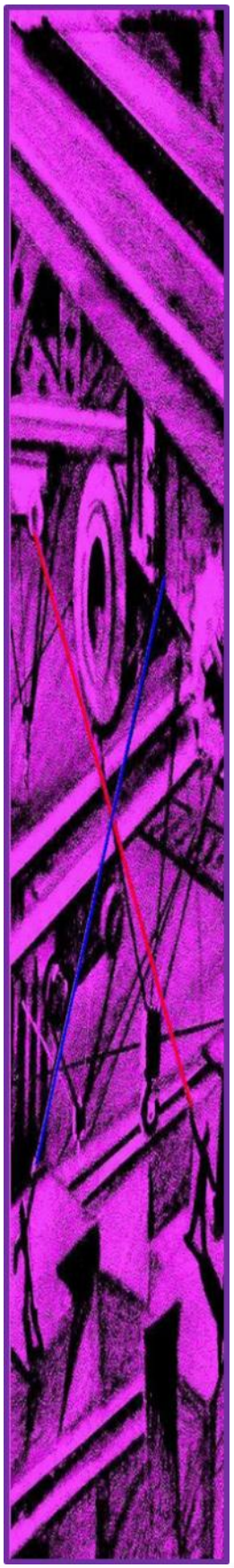
**EI™ Over-ride System**

The **COMMANDER™ IRVCD™** Vertical Crane Detection System for collision avoidance uses security coded infra-red signals to communicate vertically between cranes on 2, 3 or more gantry levels. Upper and Lower systems have similar hardware and features. All upper crane systems (above level 1) incorporate positional hook monitoring (limit/device not supplied) This monitoring feature provides a level of automation to the crane operating performance. If an upper crane has one or more hooks lowered then this 'upper' crane and any crane on lower levels which approach the intrusion zone will be inhibited from bridge forward/reverse travel motion. This means for example a crane on level 4 will communicate with a crane on level 1, then others as and when they appear within the intrusion zone.

All systems have a closed security loop incorporated to ensure signalling is maintained and has not failed. Power for each **IRVCD™** crane system is derived from a separate AC supply which remains isolated and active when the normal crane power supply is switched off for maintenance or other purposes. In the event a full power loss, the systems **BatBak™** (battery back up system) (built in) ensures a continuous given period power supply and will maintain presence status and continue to signal cranes above and below its own level. In the event of full power loss to the crane the system will go into visual and audible alarm mode to signal personnel of the condition. A key is required to silence the activated system. This signalling can be repeated by radio link to a ground based administration location.

The **EI™/RD-05™** Infra-Red 'conditional' travel over-ride system is designed for use by a second a supervisor/banks man to safely over-ride an automatic zone inhibit. The hand held transmitter features **AutoStart™** and operates using a specific common code periodic defined sector transmission system.

The **EI™** Infra-Red transmitter is for use by authorised persons. This system is a safety tool designed to ensure a lifting operation is effectively controlled within a 'normally' inhibited area. See **EI™/RD-05™** brochure for full specification.. The **IRVCD™** system is supplied 'scheme ready' to the installer or OEM.

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# HICS™ (High Integrity Control Systems)
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## COMMANDER™
## Infra-Red, Radio & Visual Signalling Systems


**LEDLamp-II™ 5 Colour Options**

The **COMMANDER™ LEDLamp-II™** can also be incorporated for reliable visual indicator systems (5 colours) these can be set to Static-mode or Flash-mode operation and applied for magnet controls, locks made etc. The **LEDLamp-II™** system uses high quality, high brightness energy saving coloured LED's with good visibility even in bright environments. Each unit has instant illumination when power is applied when switched by auxiliary power relay contact/functional power signal. **LEDLamp-II™** can be set to Static-or Flash-mode giving many combinations of static or colour flash-mode.

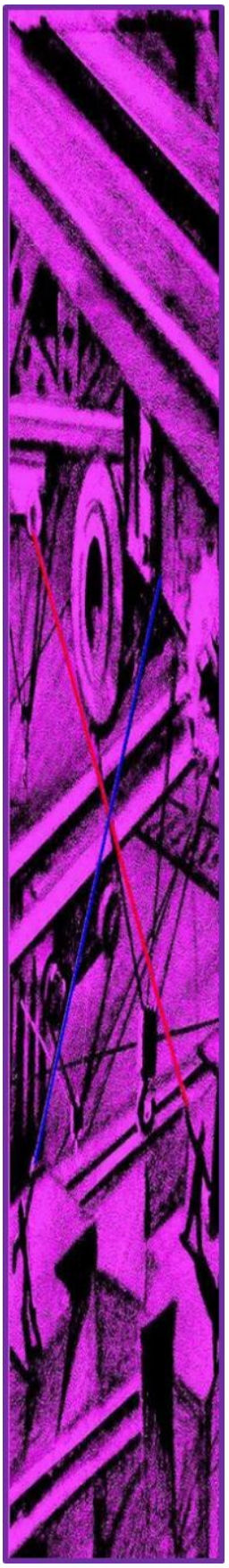
**TalkBak™ IR Signalling System**

The **COMMANDER™ TalkBak™** system uses factory set security coded **Infra-Red** signals to communicate horizontally between cranes or other objects mobile or static (end walls etc). The hardware can be supplied to operate in Simplex (1 way) mode or Duplex (2 way). The usual application for this product is for volt free integration to on crane control systems where either switch activity (limits, load cells etc) become active/inactive and the status is required to be known on the partner to indicate an inhibit or active function. Each system incorporates either 5 or 8 volt free channels to enable multiple choice configurations.

**TalkBak™ RF Signalling System**

The **COMMANDER™ TalkBak™ Radio** version signals to communicate between cranes or other objects mobile or static. The hardware can be supplied to operate in Simplex (1 way) mode or Duplex (2 way). The usual application for this product is for volt free integration to on crane control systems where either switch activity (limits, load cells etc) become active/inactive and the status is required to be known on the partner in the application to indicate an inhibit or active function. The system outputs a factory set security coded signals to the partner receiver (codes are taught between systems).

For a complete range of **COMMANDER™** remote control, collision avoidance, command & communication systems see www.commander.co.uk website.

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# HICS™ (High Integrity Control Systems)
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## COMMANDER™
## LRV™ Light Rail Passenger Movers (in Development)

**COMMANDER™/HICS™** design engineers have for some time been actively involved in the design and development of a Light Rail Vehicle.

The **COMMANDER-LRV™** is being developed for use in towns and cities where traffic congestion is a major problem for commuters, shoppers and often forgotten emergency services.

The **COMMANDER-LRV™** is also an ideal method of shopper transportation through malls.

In residential areas, the **COMMANDER-LRV™** is an ideal method of transport in to towns from suburbs or indeed as a link to high speed train connections for major cities. The infrastructure required is simple, a light rail is laid in the street or road along with passenger shelters at pickup and drop off points.

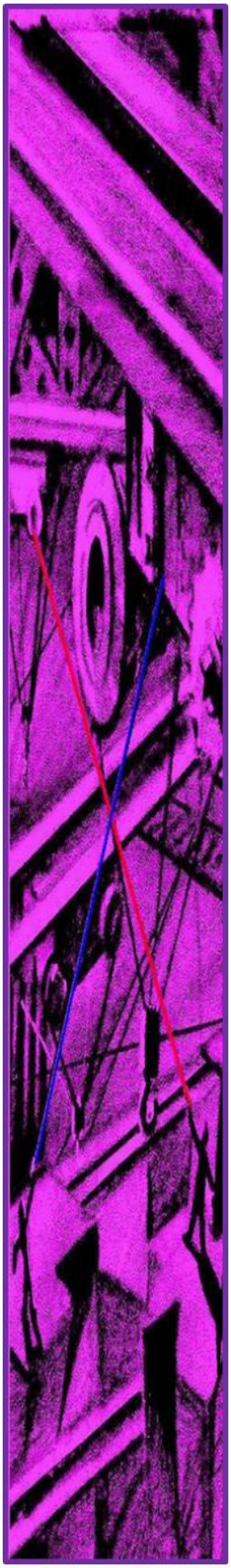
The **COMMANDER-LRV™** is powered from readily available 'under road' electricity supplies inductively coupled at each passenger pickup and drop off points to provide the motive power source between stops. This method of supplying a power source totally eliminates the need for traditional overhead pantograph power supply systems commonly associated with type of electrically powered vehicle.

Solar power batteries provide the power source for communications and on board services. Typically, each **COMMANDER-LRV™** is capable of carrying up to 35 seated passengers at speeds up to 50 kph (31.25mph) between passenger stops.

A single operator drives the vehicle in the conventional manner except that the vehicle route is pre-determined and can be monitored via a conventional GPS tracking system.

For driver presence and for security, Blue Tooth technology is incorporated to prevent unauthorised use

Check out the **COMMANDER-LRV™** video on our websites www.commandersystems.co.uk & www.commander.co.uk

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