

# ABB CS31

Intelligent decentralized automation system

General



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FPTC 404 364 P2001-e

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Machines and plant equipment, for reasons of competitiveness are becoming even more complex, the amount of information required from sensors and actuating devices is constantly expanding, causing heavier implementation and higher wiring costs.

The ABB Procontic CS 31 is designed to simplify implementation and wiring.

The CS 31 is a decentralized automation system.

The system is ideally suited to applications where modularity and cost reduction are key factors.

The CS 31 system comprises of the following :

- a central unit, enclosed within a compact case which can be screw or DIN rail mounted,
- remote input/output plug-in units, which are easily removeable. The plug-in base can be screw or DIN rail mounted,
- a simple twisted pair wire arrangement (RS 485), which is utilized for connection of the central unit to the I/O units.

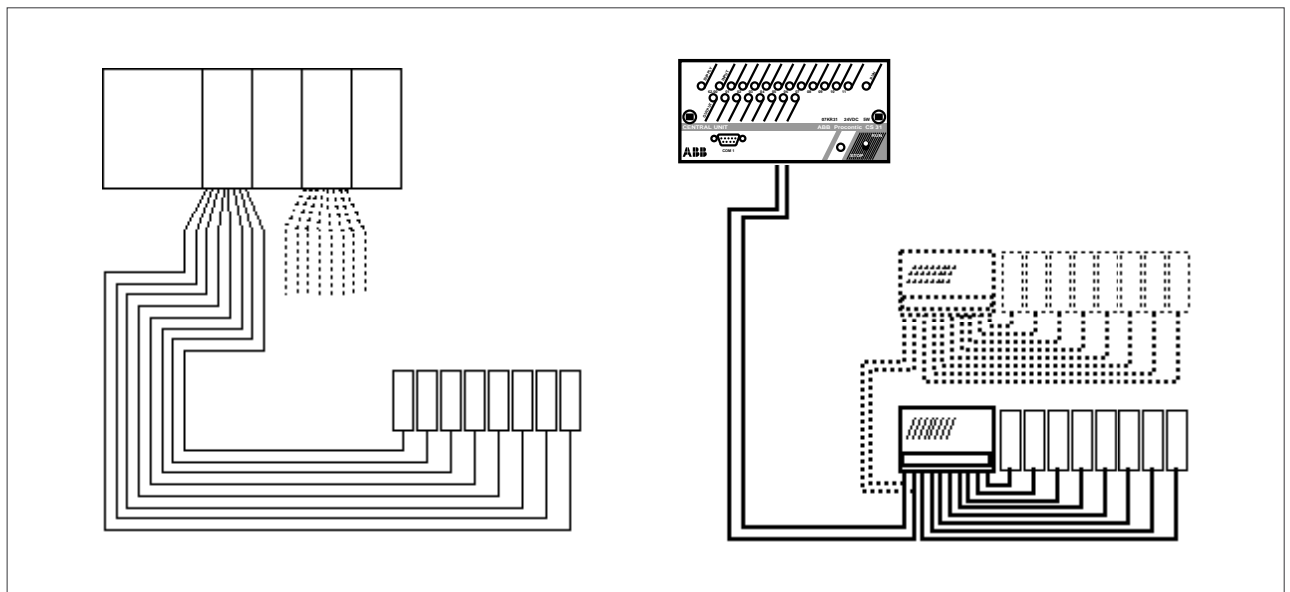
## 2 System description

The decentralized architecture of the ABB Procontic CS 31 system offers a superior solution to control system requirements:

- The central unit can be mounted within the control panel.
- The input/output units can be mounted local to the sensors and actuators.

As an example the central unit may be connected to remote units distributed along a process line.

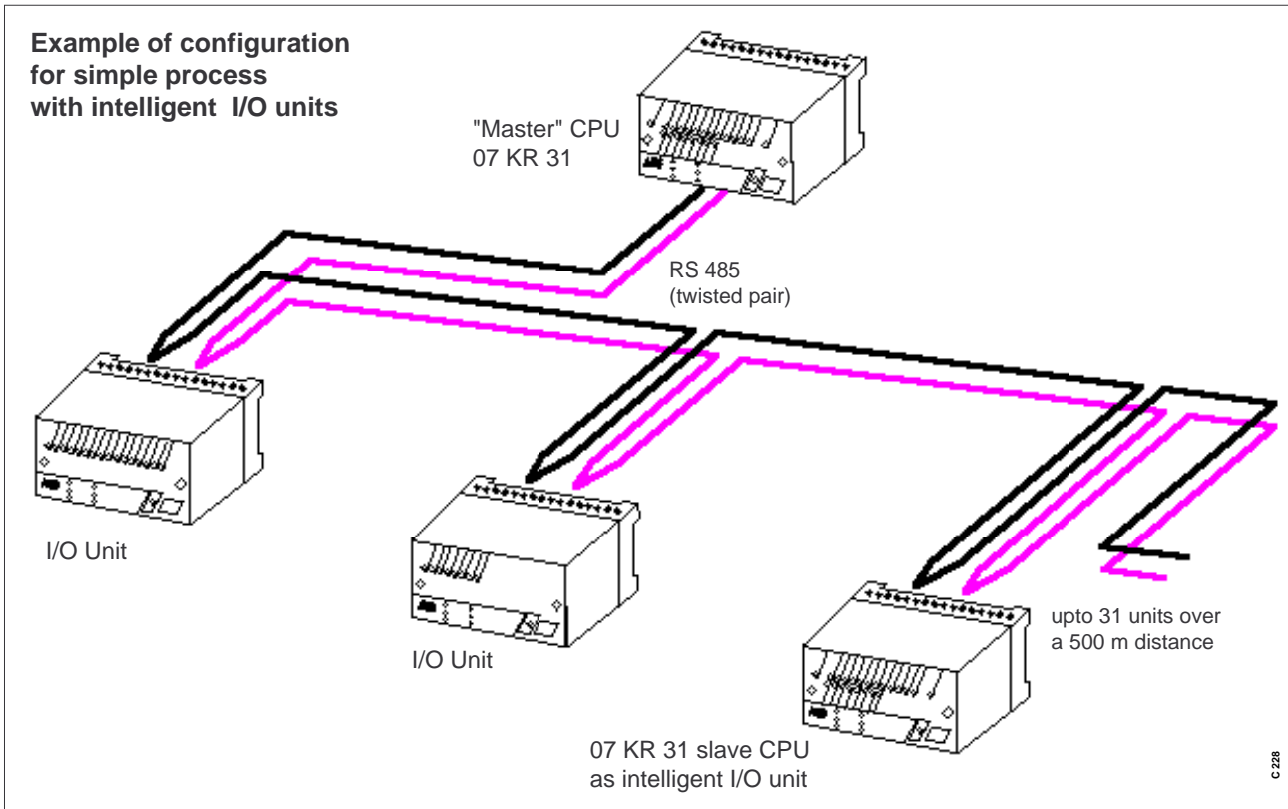
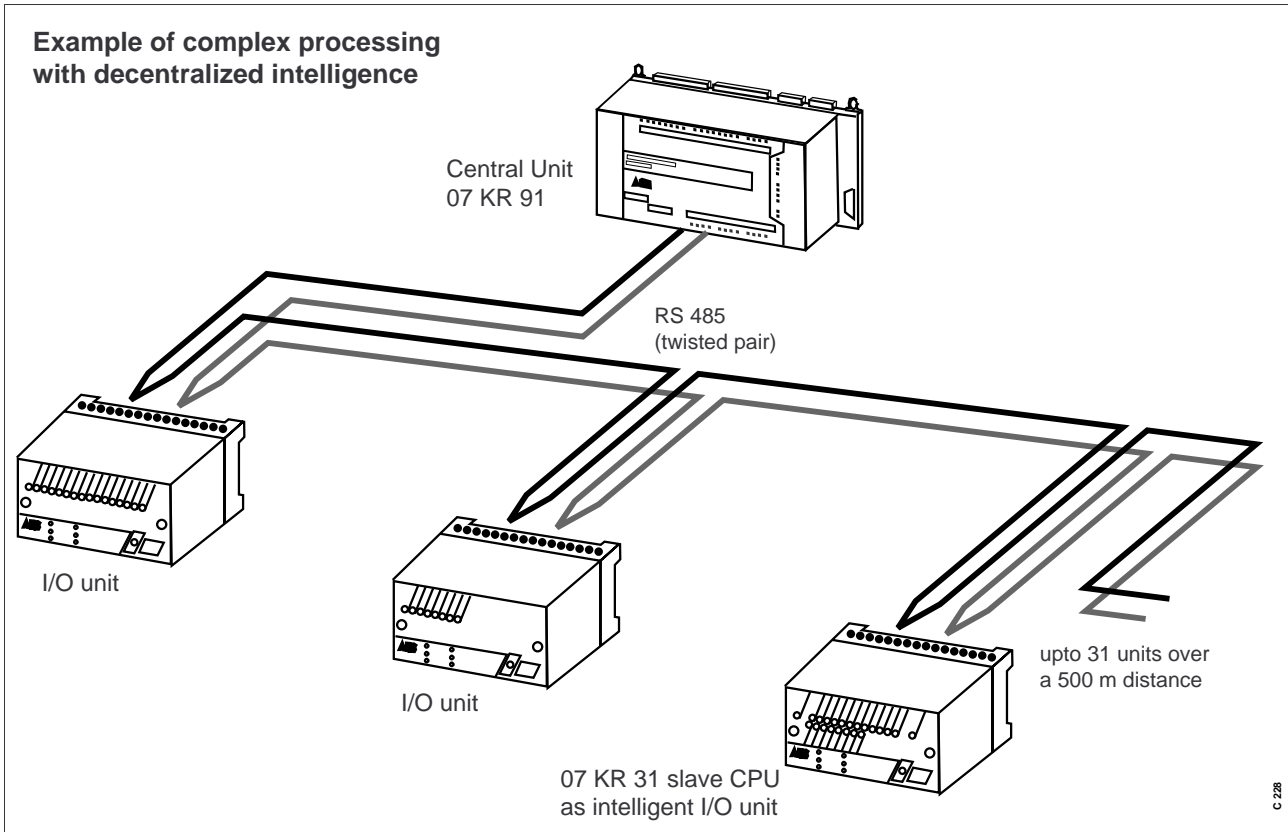
A cost reduction in wiring is possible upto 80% with the implementation of the CS 31 system.



Conventional wiring

Simplified wiring with  
the ABB Procontic CS 31 system

Example of configuration



## 2.1 CS 31 benefits

- decentralized architecture as opposed to centralized system,
- reduction of wiring costs (design, materials and commissioning time),
- configurable input/output units,
- extensive diagnosis functions,
- freely expandable network. Additional units can be connected whilst the installation is operational,
- simple transparent programming. All remote I/O channels are handled as though they were centralized,
- remote I/O facility is integral feature and not an additional unit,
- programmable serial communications (RS 232) connection to modem, printer, operator display etc...

## 2.2 Modular system

The comprehensive range of units enhances the modularity of the system.

For example :

The low profile 16 channel user configurable input/output unit can be mounted on the control panel door, with inputs and outputs connected to pushbuttons and pilot lamps.

## 2.3 Versatile range

The CS 31 is based upon two types of central units, 07 KR 91, 07 KT 92/07 KT 93 and 07 KR 31/07 KT 31.

The system can be configured to comply with most control system requirements (See previous configuration examples).

- 07 KR 91, 07 KT 92/07 KT 93 is designed for complex applications with an higher level of functionality (Data manipulation, PID regulation, etc...).
- 07 KR 31/07 KT 31 incorporates all of the functions required for smaller decentralized applications, thus providing an excellent Price/Performance ratio.

## 2.4 Diagnosis

The CS 31 system incorporates extensive diagnosis functions.

All of the remote units contain a microprocessor which is dedicated to the management of inputs/outputs and diagnosis facilities.

The diagnosis are accessed using the "test" button on the front of each remote unit, the results are displayed on the I/O status led's.

The diagnosis results can be incorporated with the user program thus enabling effective fault management.

## 2.5 Use of the CS 31 system

All of the remote units are easily interchangeable, even with the process in operation, as they are plug-in base mounted.

The screw terminals of the plug-in bases are used for connection to the process inputs and outputs.

Bases are screw or DIN rail mounted.

The DIL switches on the bases are used for coding the address of units.

Any additional connected units are automatically recognized by the central unit.

**NOTE :** The system may comprise of remote units of varying supply and input voltages.

## 2.6 Emergency operation

A system may comprise of many central units, however one single master and the remainders slaves.

If the bus communication is interrupted or the master unit fails the individual slave units continue with their own operation.

Central processing units - CPU		
Type	Description	Order code
07 KR 31	CPU - 2 K word user memory (EEPROM), twelve 24 VDC inputs Eight 2A relay outputs Programmable RS 232 port RS 485 system bus real time clock high speed counter 10 kHz high order functions PI data handling, etc... Master/Slave MODBUS built-in 24 VDC power supply 120 VAC power supply 230 VAC power supply	<b>FPR 360 0227 R1202</b> <b>FPR 360 0227 R0204</b> <b>FPR 360 0227 R0206</b>
07 KT 31	CPU - 2 K word user program (EEPROM), twelve 24 VDC inputs Eight 24 VDC/0.5A transistor outputs Programmable RS 232 port RS 485 system bus real time clock high speed counter 10 kHz high order functions PI data handling, etc... Master/Slave MODBUS built-in 24 VDC power supply 120 VAC power supply 230 VAC power supply	<b>FPR 360 0228 R1202</b> <b>FPR 360 0228 R0204</b> <b>FPR 360 0228 R0206</b>
07 KR 91	CPU - 7 K FLASH EPROM, twenty 24 VDC inputs Twelve 2A relay outputs Programmable RS 232 port RS 485 system bus real time clock high speed counter 10 kHz high order functions PID data handling, etc... 24 VDC power supply 120 or 230 VAC power supply	<b>GJR 525 0000 R0252</b> <b>GJR 525 0000 R0202</b>
07 KT 92	CPU - 14 K FLASH EPROM, twelve 24 VDC inputs Eight 24 VDC/ 0.5A transistor outputs 4 analogue inputs 12 bits resolution 2 analogue output 12 bits resolution 2 programmable RS 232 port RS 485 system bus real time clock high speed counter 50 kHz high order functions PID data handling, etc... 24 VDC power supply	<b>GJR 525 0500 R0202</b>
07 KT 92	CPU - 14 K FLASH EPROM, twelve 24 VDC inputs Eight 24 VDC/ 0.5A transistor outputs 4 analogue inputs 12 bits resolution 2 analogue output 12 bits resolution 2 programmable RS 232 port RS 485 system bus real time clock high speed counter 50 kHz high order functions PID data handling, etc... ARCNET built-in 24 VDC power supply	<b>GJR 525 0500 R0262</b>

## Central processing units - CPU (cont.)

Type	Description	Order code
07 KT 93	CPU - 14 K flash EPROM, twenty four 24 VDC inputs Sixteen 24 VDC/ 0.5A transistor outputs 2 programmable RS 232 port RS 485 system bus real time clock high speed counter 10 kHz high order functions PID data handling, etc... 24 VDC power supply	GJR 525 1300 R0101
07 KT 93	CPU - 14 K flash EPROM, twenty four 24 VDC inputs Sixteen 24 VDC/ 0.5A transistor outputs 2 programmable RS 232 port RS 485 system bus real time clock high speed counter 10 kHz high order functions PID data handling, etc... ARCNET built-in 24 VDC power supply	GJR 525 1300 R0171
Plug-in base		
Type	Description	Order code
ECZ	Plug-in base for I/O units 07 KR 31/07 KT 31 DIN rail or screw fixing	FPR 370 0001 R0001

## Binary input units

Type	Description	Order code
<b>ICSI 08 D1</b>	Input unit, eight 24 VDC inputs non-isolated configurable input delay: 2...32ms 24 VDC power supply 120 VAC power supply 230 VAC power supply	<b>FPR 331 5101 R1012</b> <b>FPR 331 5101 R0014</b> <b>FPR 331 5101 R0016</b>
<b>ICSI 08 E1</b>	Input unit, eight 24 V d.c. inputs isolated configurable input delay: 2...32ms 24 VDC power supply 120 VAC power supply 230 VAC power supply	<b>FPR 331 6101 R1012</b> <b>FPR 331 6101 R0014</b> <b>FPR 331 6101 R0016</b>
<b>ICSI 16 D1</b>	Input unit, sixteen 24 V d.c. inputs non-isolated configurable input delay: 2...32ms 24 VDC power supply 120 VAC power supply 230 VAC power supply	<b>FPR 331 5101 R1032</b> <b>FPR 331 5101 R0034</b> <b>FPR 331 5101 R0036</b>
<b>ICSI 16 E1</b>	Input unit, sixteen 24 VDC inputs isolated configurable input delay: 2...32ms 24 VDC power supply 120 VAC power supply 230 VAC power supply	<b>FPR 331 6101 R1032</b> <b>FPR 331 6101 R0034</b> <b>FPR 331 6101 R0036</b>
<b>ICSI 08 E3</b>	Input unit, eight 110 VAC isolated inputs 110 VAC power supply	<b>FPR 331 6301 R0014</b>
<b>ICSI 08 E4</b>	Input unit, eight 230 VAC isolated inputs 230 VAC power supply	<b>FPR 331 6401 R0016</b>

## Binary output units

<b>ICSO 08 R1</b>	Output unit, eight relay outputs 250 VAC / 2A 24 VDC power supply 120 VAC power supply 230 VAC power supply	<b>FPR 331 2101 R1022</b> <b>FPR 331 2101 R0024</b> <b>FPR 331 2101 R0026</b>
<b>ICSO 08 Y1</b>	Output unit, eight transistor outputs 24 VDC / 2A max. 8A for eight outputs isolated short-circuit proof 24 VDC power supply 120 VAC power supply 230 VAC power supply	<b>FPR 331 1101 R1022</b> <b>FPR 331 1101 R0024</b> <b>FPR 331 1101 R0026</b>
<b>ICSO 16 N1</b>	Output unit, sixteen transistor outputs 24 VDC / 0.5A 24 VDC power supply 120 VDC power supply 230 VDC power supply	<b>FPR 331 3101 R1052</b> <b>FPR 331 3101 R1054</b> <b>FPR 331 3101 R1056</b>

## Binary input/output units

Type	Description	Order code
<b>ICSK 20 F1</b>	<p>Input/output unit, twelve 24 VDC inputs non-isolated inputs eight relay outputs 250 VAC / 2A</p> <p>24 VDC power supply 120 VAC power supply 230 VAC power supply</p>	<p><b>FPR 332 7101 R1202</b> <b>FPR 332 7101 R0204</b> <b>FPR 332 7101 R0206</b></p>
<b>ICSK 20 N1</b>	<p>Input/output unit, twelve 24 VDC inputs non-isolated inputs eight transistor outputs 24 V ; 0.5 A</p> <p>24 VDC power supply 120 VDC power supply 230 VDC power supply</p>	<p><b>FPR 333 1001 R1202</b> <b>FPR 333 1001 R1204</b> <b>FPR 333 1001 R1206</b></p>
<b>ICSC 08 L1</b>	<p>Input/output unit, eight user configurable channels for 24 VDC input signals or for 24 VDC / 0.5A output signals max. 2A for eight outputs short-circuit proof, non-isolated configurable input delay : 2...32ms</p> <p>24 VDC power supply 120 VAC power supply 230 VAC power supply</p>	<p><b>FPR 331 9101 R1082</b> <b>FPR 331 9101 R0084</b> <b>FPR 331 9101 R0086</b></p>
<b>ICFC 16 L1</b>	<p>Input/output unit, sixteen user configurable channels for 24 VDC input signals or for 24 VDC / 0.5A output signals max. 4A for sixteen outputs short-circuit proof, non-isolated configurable input delay : 2...32ms low profile units 2 ECZ mounting bases are required 24 VDC power supply</p>	<p><b>FPR 331 9101 R1162</b></p>
<b>ICBG 32 L1</b>	<p>Input/output unit 16 inputs for 24 VDC input channels 8 transistor outputs 24 VDC 250 mA 8 user configurable input/output channels 24 VDC overload and short-circuit proof input signal delay : 7 ms 24 VDC power supply</p>	<p><b>GJR 525 1400 R0101</b></p>

## IP 65 remote units

Type	Description	Order code
<b>ICPI 08 D1</b>	Input unit, eight 24 VDC inputs Degree of protection IP 65 Protection against short circuit and overload 24 VDC power supply	<b>GJV 307 5614 R0101</b>
<b>ICPI 16 D1</b>	Input unit, sixteen 24 VDC inputs Degree of protection IP 65 Protection against short circuit and overload 24 VDC power supply	<b>GJV 307 5613 R0101</b>
<b>ICPO 08 H1</b>	Output unit, eight transistor outputs 24 VDC / 2A Degree of protection IP 65 Protection against short circuit and overload 24 VDC power supply	<b>GJV 307 5611 R0101</b>
<b>ICPO 16 H1</b>	Output unit, sixteen transistor outputs 24 VDC / 2A Degree of protection IP 65 Protection against short circuit and overload 24 VDC power supply	<b>GJV 307 5610 R0101</b>



## High speed counter unit

Type	Description	Order code
<b>ICSF 08 D1</b>	encoder unit or 3 independant up/counter 2 threshold detections counter preset Max. frequency 50kHz 7 transistor outputs 24 V d.c. 300mA 4 binary inputs 24 V d.c. Integral 5V, 15V, 24V power supply for encoder 24 VDC power supply 120 VAC power supply 230 VAC power supply	FPR 332 3101 R1012 FPR 332 3101 R0014 FPR 332 3101 R0016

## Remote display unit

<b>TCAD</b>	Display unit 2 lines, 32 characters 127 messages programmable + 1 background message buzzer (programmable) key function embedded variables 24 VDC power supply	FPR 320 3526 R1002
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## CS31 Bus units

<b>NCB</b>	CS31 bus amplifier up to 2km 24 VDC power supply	FPR 347 1200 R0006
<b>NCBR</b>	CS31 bus amplifier with redundancy amplification up to 2km 24 VDC power supply	FPR 347 1300 R0006

## Robot coupler unit

<b>ICBG 32 L7</b>	Robot coupler connect ABB S3 robot to CS 31 bus 16 inputs, 16 outputs for communication supply from robot rack	FPR 333 0705 R0321
<b>ICBG 64 L7</b>	Robot coupler connect ABB S3 robot to CS 31 bus 32 inputs, 32 outputs for communication supply from robot rack	FPR 333 0705 R0641

## Communication units

Type	Description	Order code
07 KP 90	CS 31 RCOM coupler used with 07 KT 92, 07 KR 91 R 0252, 07 KT 93 1 serial interface EIA RS232 24 VDC power supply	GJR 525 1000 R0202
07 KP 92	CS 31 coupler used with 07 KT 92, 07 KR 91 R 0252, 07 KT 93 Freely programmable in C language, stored in flash EPROM 2 serial interfaces EIA R232, EJA RS422 or EIA RS485 24 VDC power supply	GJR 525 1500 R101

## Accessories

Type	Description	Order code
<b>NCC 232</b>	RS 232/RS 232 isolated converter 24 VDC power supply	<b>FPR 347 1000 R0006</b>
<b>NCC 485</b>	RS 232/RS 485 isolated converter 24 VDC power supply	<b>FPR 347 1100 R0006</b>
<b>TCZ</b>	Handheld terminal	<b>FPR 320 0002 R1001</b>
<b>TCZ - adapter</b>	Adaptor "Off-line"	<b>FPTN 404 958 R0002</b>
<b>Cable Sub D9</b>	For programming and test	<b>FPTN 404 948 R0002</b>
<b>Cable Sub D25</b>	For programming and test	<b>FPTN 404 948 R0005</b>
<b>Cable Sub D9</b>	For ASCII or MODBUS communication	<b>FPTN 404 948 R0006</b>
<b>Cable Sub D25</b>	For ASCII or MODBUS communication	<b>FPTN 404 948 R0001</b>
<b>Cable for communication</b>	TCZ adaptor/printer 07 DR 12	<b>FPTN 404 948 R0004</b>

## Spare parts

Lithium battery for UCZA	<b>FPTN 404 949 R0001</b>
Lithium battery for TCZ	<b>FPTN 404 949 R0002</b>
5V battery for external power supply of TCZ	<b>FPTN 404 949 R0003</b>
Spare cable to connect TCZ to 07 KR 91 or UCZA/UCZB or PCZB or CS 20	<b>FPTN 404 975 R0001</b>

## 2.8 General characteristics

The CS 31 system is developed according to the international standard IEC 1131-2.

### ● Operating conditions

- Temperature :
  - operation 0 °C ... + 55 °C 32 ... 131 °F
  - storage - 40 °C ... + 75 °C - 40 ... 167 °F
  - transport - 25 °C ... + 75 °C - 13 ... 167 °F
- Humidity acc. to DIN 40040 class F without condensation :
  - average over the year 75 %
  - up to 30 days of a year 95 %
  - on the other days with regard to the average of the year, occasionally 85 %
- Air pressure :
  - operation 800 hPA ( 2000 m)
  - storage 660 hPA ( 3500 m)

### ● Mechanical data

- degree of protection IP 20
- housing UL94 V0  
UL94 V1 for central units serie 90, coupler 07KPxx and units ICDxx
- vibration each of three mutually perpendicular axes 10 Hz ... 57 Hz  
continuous : 0.0375 mm amplitude  
occasional : 0.075 mm amplitude  
57 Hz ... 150 Hz  
continuous : 0.5 g acceleration  
occasional : 1.0 g acceleration
- shocks occasional excursion to 15 g, 11 ms, halfsine in each of three mutually perpendicular axes
- impact withstand test for units with a power supply > 30 VAC. According to IEC 950 : a steel sphere with a mass of 500 g is to fall freely from a height of 1300 mm

### ● Mounting

- DIN rail 35 mm
- Screw mounting screws Ø 4 mm (M4)

### ● Serial interfaces

- for connection of the central unit to the remote units RS485, using screw terminals
- for programming and setting parameter RS232-C 9 pole D connector (female)

### ● Termination

- on the plug-in base ECZ use 60 °C copper conductor only
- Cross section :
  - bus wiring terminal : twisted pair AWG 24 (0.22 mm<sup>2</sup>) to AWG 18 (0.8 mm<sup>2</sup>)
  - earth terminal : rigid or stranded connector AWG 10 (5.2 mm<sup>2</sup>)
  - Others terminals :
    - inputs : stranded connector AWG 18 (0.8 mm<sup>2</sup>) to AWG 14 (2.1 mm<sup>2</sup>)
    - outputs : stranded connector AWG 14 (2.1 mm<sup>2</sup>)
    - power supply AWG 14 (2.1 mm<sup>2</sup>)
- on removable terminal block (small section) 2.5 mm<sup>2</sup> (copper No. AWG14)
- on removable terminal block (small section) 1.5 mm<sup>2</sup> (copper No. AWG16)
- screws tightening torque (for guidance only) 7 lbs. inch (0.8 Nm)

### ● Supply connections

- 24 VDC (process and power supply) 24 VDC (-20 %, +25 %, i.e. 19.2 ... 30V) incl. ripple  
ripple factor < 5 %
- 120 VAC power supply 120 VAC (-15%, +10%, i.e. 102 ... 132V) 50 Hz or 60 Hz (± 5 %)
- 230 VAC power supply 230 VAC (-15%, +10%, i.e. 195.5 ... 253V) 50 Hz or 60 Hz (± 5 %)

### ● Voltage drops and interruptions

- DC power supply interruption time 10 ms  
time interval between two drops 1s
- AC power supply interruption time 0.5 period  
time interval between two drops 1s

### ● Creepage distances and clearances

according to EN 61131-2 / IEC1131-2

### ● Insulation test voltages

the insulation test voltages are according to IEC 1131-2

## ● Electromagnetic compatibility (EMC)

– electrostatic discharge (ESD)	according to IEC 1000-4-2 (severity level 3)
test peak voltage :	
• at discharge thru air	8 kV
• at discharge thru relay's contact	6 kV
time between two discharges	> 1s
number of discharges on each selected point	10

– radiated electromagnetic field immunity test	according to IEC 1000-4-3
field strength	10 V/m (severity level 3)
frequency range	27 MHz to 1000 MHz
sweep speed	1.5 x 10E-3 decade/s

– fast transient burst test (FTT)	according to IEC 1000-4-4
interference voltage for :	
mains terminals 115/230 V	2 kV
mains terminals 24 V	2 kV
output terminals 24 V	1 kV
output terminals 115/230 V	2 kV
input terminals 24 V	1 kV
input terminals 115/230 V	2 kV
analogue input/output terminals	1 kV
CS 31 bus	2 kV
programming interface	0.5 kV

– surge immunity	according to IEC 1000-4-5
test voltage for assymetric coupling	common mode
power supply (115/230 VAC)	2 kV
power supply (24 VDC)	1 kV
digital inputs/outputs	1 kV
test voltage for symetric coupling	differential mode
power supply (115/230 VAC)	1 kV
power supply (24 VDC)	1 kV
digital inputs/outputs	1 kV

## ● ABB Procontic CS 31 system bus

The CS 31 bus is a shield twisted pair RS485

– cross	0.22 ... 0.8 mm <sup>2</sup> (N <sub>o</sub> AWG 24 ... N <sub>o</sub> AWG 18)
– twists	> 10 per metre
– resistance	100 /km

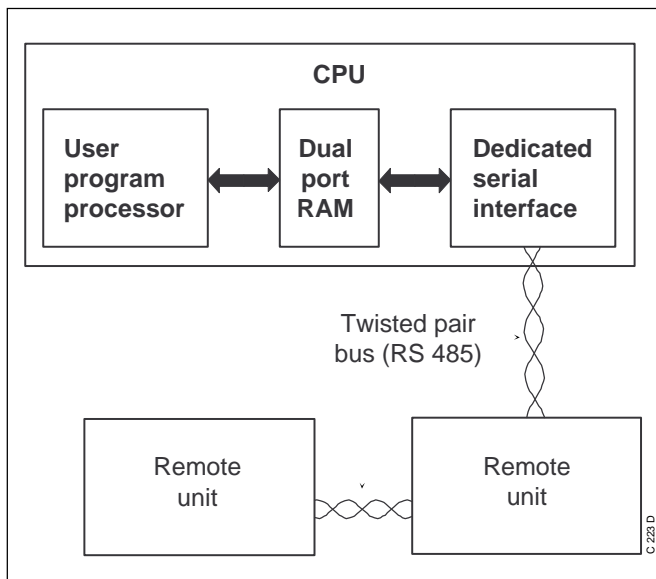
– impedance characteristic	100 to 150
– capacitance	< 150 nF/km
– shield	
– termination	120 , 1/4 Watt resistor connected at the end of the bus
– number of points of connections	31 slaves + 1 master

### 3 General operation

#### 3.1 CPU communication with remote units

Communication between the central units and the remote units requires no user intervention as it is carried out by a dedicated serial interface.

The dual port RAM of the central unit enables data transfer between the user program processor and the dedicated serial interface.



In the read cycle, data is taken from the remote unit and stored within the dual port RAM via the bus and dedicated serial interface, the user program processor then reads the data from the dual port RAM.

Similarly, data is transferred from the dual port RAM to the remote units via the dedicated serial interface and bus for the write cycle.

#### 3.2 Addressing of the remote units

All system bus request telegrams have an address. The remote unit which has the same address as the telegram receives and responds to the data.

The address of the remote unit is set using the DIL switches of the plug-in base.

The inputs and outputs have the following address structure: yy, xx

yy represents the remote unit number,  
xx represents the channel number.

#### Example

Address setting of DIL-switches : 03  
Number of channels on remote unit : 08

The I/O channels are simply addressed from 03, 00 to 03, 07 within the user program of the central unit, as though they were centralized.

#### 3.3 System bus

This is a simple 2-wire serial connection (RS 485).

Connection type	Serial RS 485
Mode	Half-Duplex
Baud rate	187.5 k bauds
Maximum length	500 metres
Isolation	opto-couplers
Material	twisted pair

**NOTE :** For the wiring precautions and characteristics see the "hardware" chapter.

## ● Installation of CS 31 system

### Generalities

Some installation rules have to be respected. These rules concern the ground concept, the connection of the CS 31 bus and the different power supplies installations.

The following main principles must be applied :

#### **Each type of signal has to be mounted separately**

- power supply 230 VAC
- analogue and low voltage signals

**The ground and power supply wires must be connected in star**

#### ● Refer to the description of each remote unit for connection of inputs and outputs.

#### ● Installation of the bus

The CS 31 bus is a RS 485 serial line and a shield twisted pair.

The CS 31 bus is a master slave bus. Only one master can be present on the bus.

The maximum length between the both extremities is 500 metres.

The master should be :

- a central unit : 07 KR 31, 07 KT 31, 07 KR 91, 07 KT 92, 07 KT 93, PCZB, UCZA/UCZB
- a PLC coupler : 07 CS 61 and 07 CS 91 for the ABB Procontic T 200 and T 300
- a PC board : 07 CM 90

#### ● Characteristics of the bus' cable

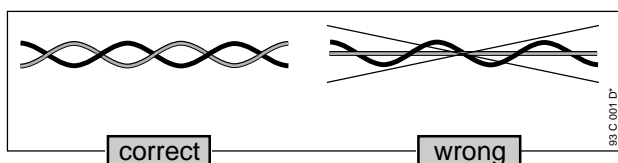
The CS 31 bus is a shield twisted pair RS 485

- cross 0.22 ... 0.8 mm<sup>2</sup>
- twists > 10 per metre
- resistance 100/km
- impedance
- characteristics 100 to 150
- capacitance < 150 nF/km
- shield
- termination 120 Ω, 1/4 Watt resistor connected at the ends of the bus

Example of supplier :

- ALCATEL MCX-T
- DRAKKA dracoda 2903

The twisted pair has to be symmetric



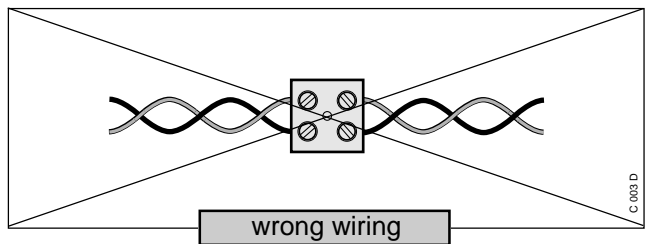
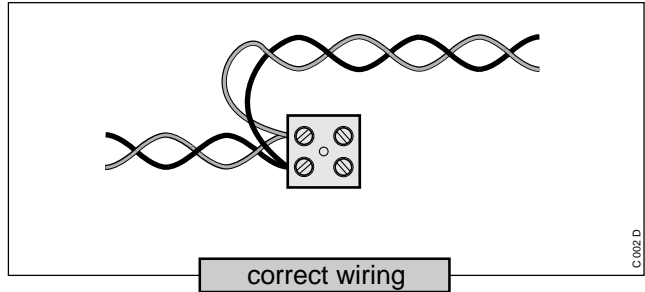
## ● Connections

The same type of cable should be used throughout the installation for the system bus (RS 485).

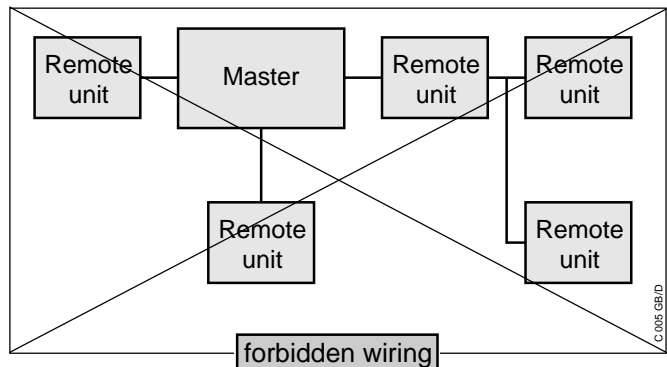
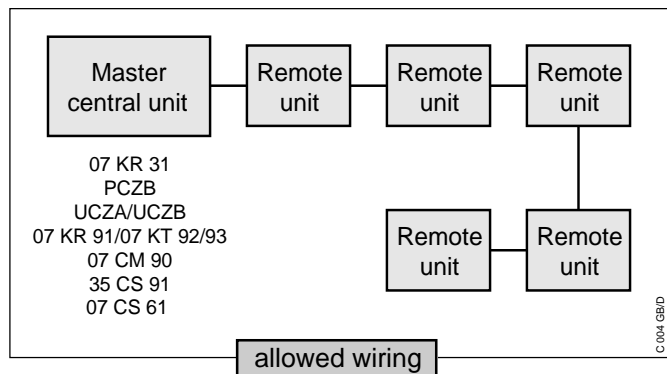
Avoid interruption of the bus, for example, when connecting cables at the marshalling cabinet.

Whenever interruption of the bus is absolutely necessary, it must be wired to the same side of the terminals.

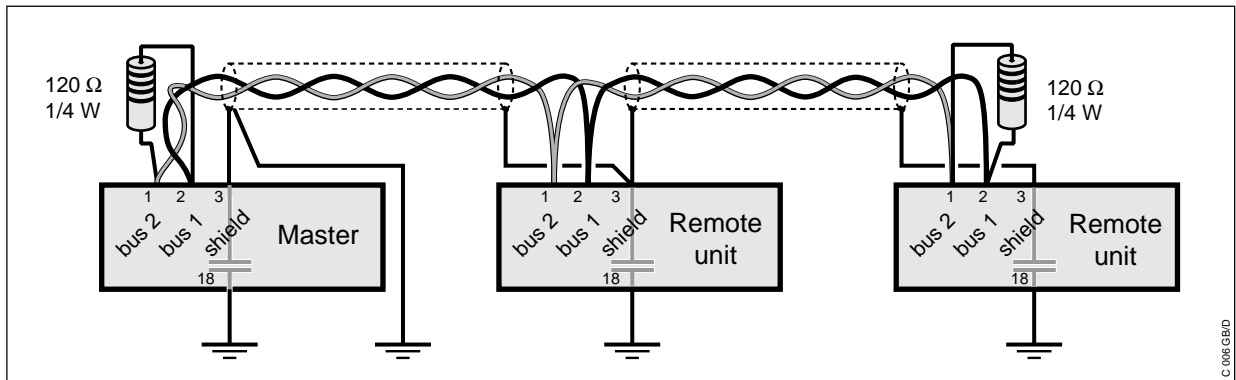
Example :



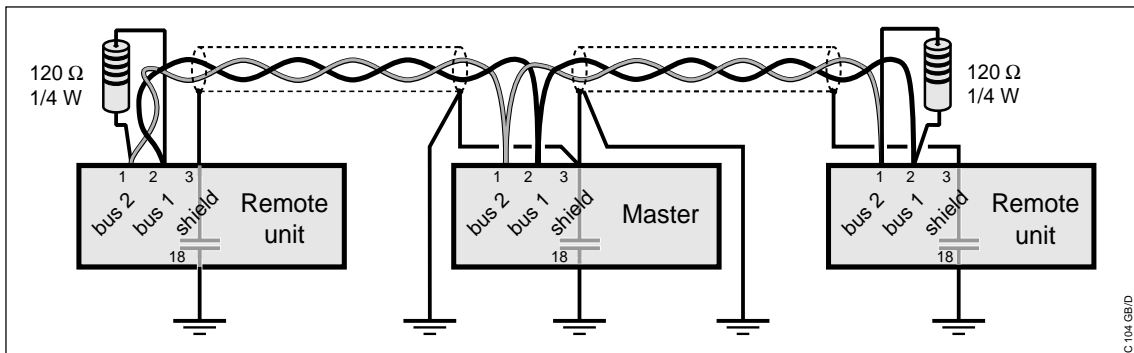
### "Star connection of the bus is forbidden !"



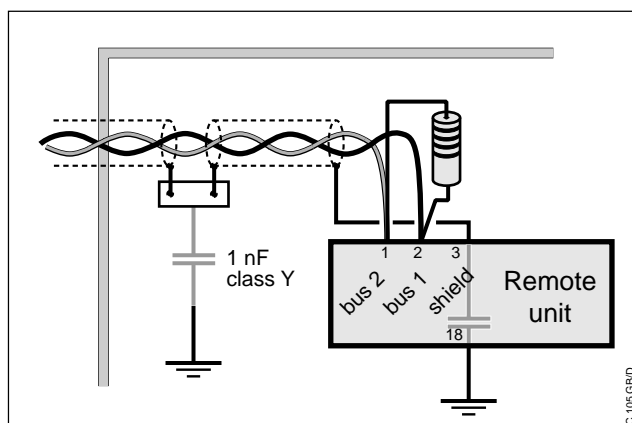
● Bus topology



The bus must be terminated with a 120 Ω, 1/4 Watt resistor, this must be connected at the ends of the bus.  
 The central units UCZA/UCZB, the couplers 07 CS 61 and 35 CS 91 have to be connected at an end of the bus.  
 The resistor 120 Ω is integrated.  
 The other central units and the PC board should be connected everywhere on the bus.  
 The shield of the bus must be connected to the earth near the master.



When noisy elements are in the area of the cabinet, it is better to connect the bus' shield to the ground via a capacitor 1 nF class Y directly at the access of the cabinet according the following diagram.



The system bus CS 31 is opto-isolated from all units.  
 The shield is connected to the earth through a capacitor 1 nF class Y, mounted in the plug-in base.  
 The maximum bus length is 500 metres.  
 In case of use of a bus amplifier or redondy amplifier refer to their own descriptions.

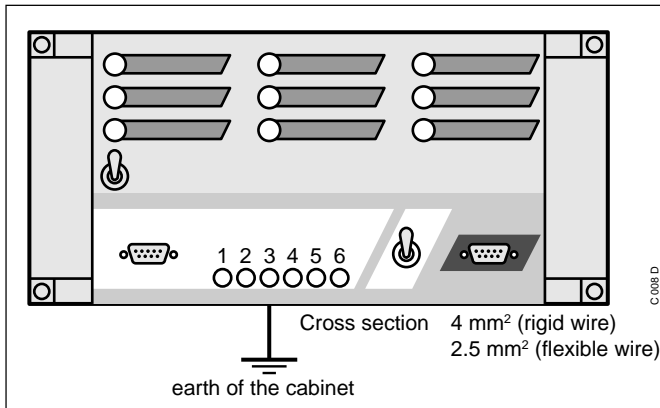
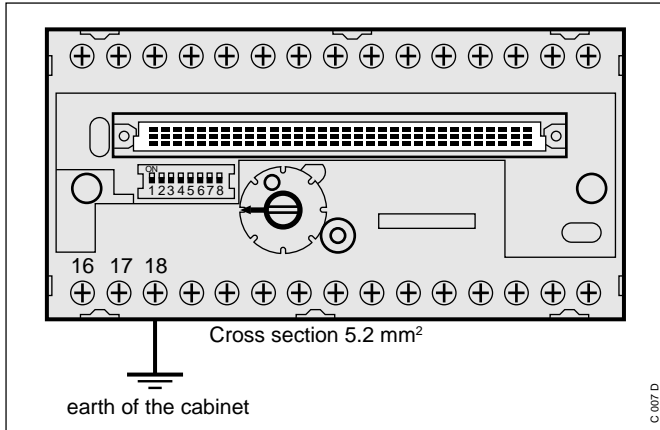
● **Ground concept and power supplies**

**Ground concept**

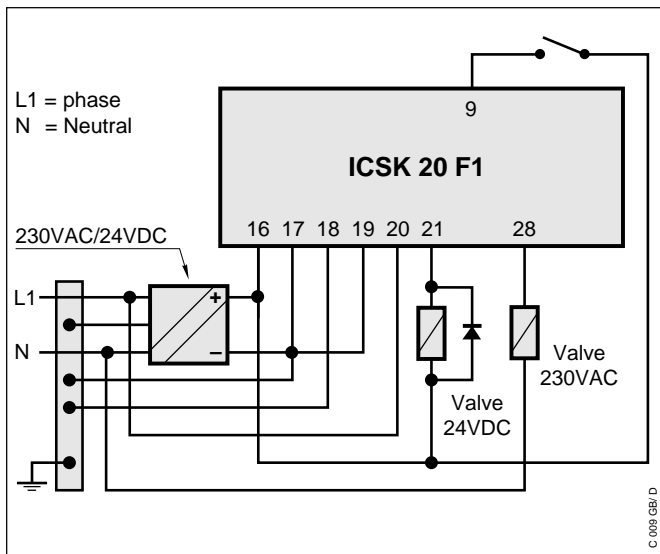
All CS31 products in a cabinet must be connected to the same earth.

When the remote units are outside the cabinet, they must be connected to the nearest earth.

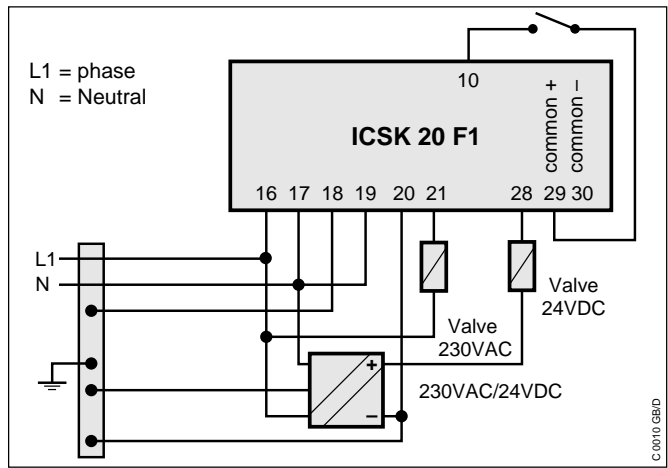
The connection to the earth has to be as short as possible (shorter than 25 cm).



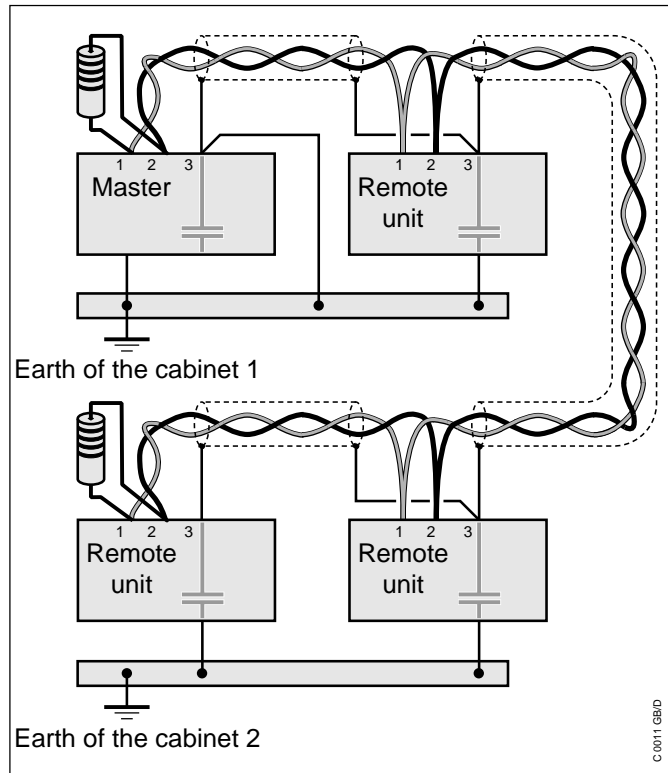
Example of connection with a 24 VDC power supply



Example of connection with a 230 VAC power supply

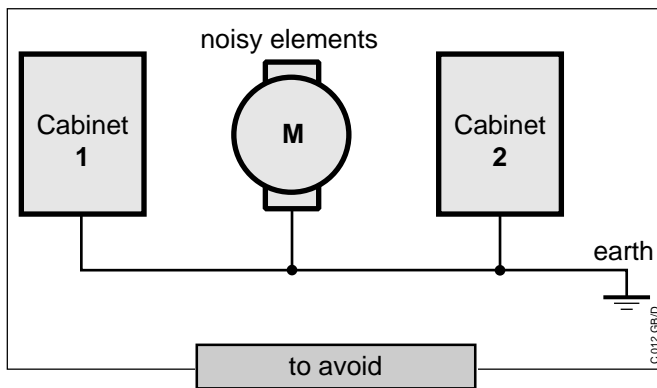
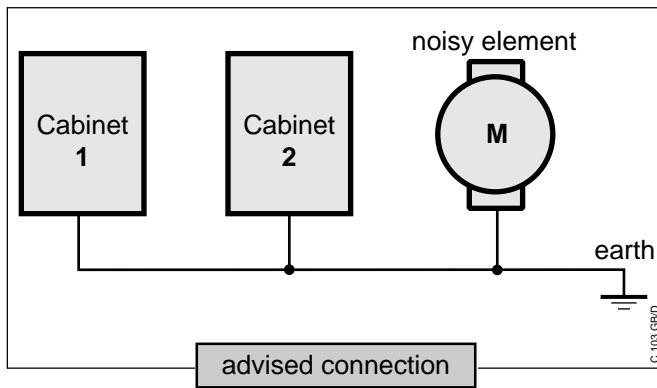


● **Ground concept with different cabinets**



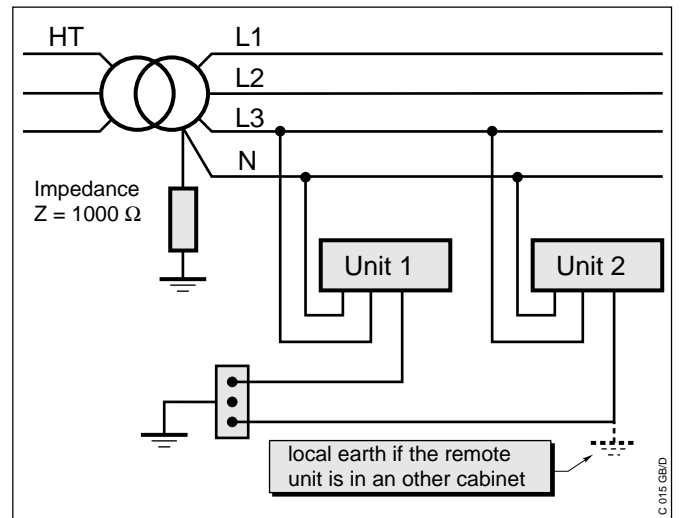
The capacitor is integrated in the plug-in base. When the cabinets are close from each others, the different earths have to be connected together with a cable with a cross section of at least 16 mm<sup>2</sup>.

The noisy elements (drives, motors, ...) haven't to be connected to the earth between two cabinets. The connection to the earth has to be near the noisier element.



### Power supply I-T

- The neutral is isolated from the earth
- The metallic parts are connected to the earth



In a noisy environment, an isolated transformer with a shield has used in each cabinet (even for 24 VDC version).

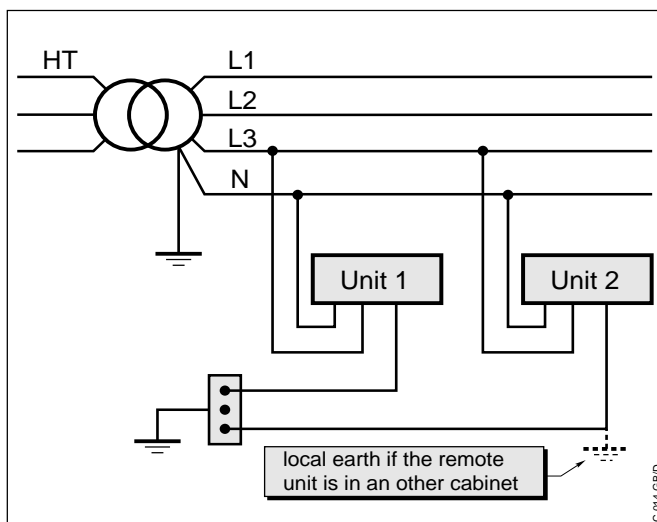
### • Types of power supplies

**Different types of power supplies are available.**

The main difference is the connection of the neutral and the metallic parts to the earth.

### Power supply T-T

- The neutral is connected to the earth. All metallic parts are connected to the earth

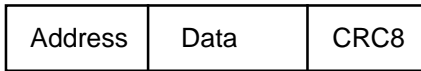


### 3.4 Transmission format

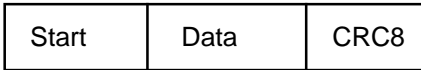
One single CPU is the master on the bus, all of the other remote units or CPU are considered to be slaves. The master CPU manages up to a maximum of 31 remote units on one bus. All messages are terminated with an error check (CRC8).

The format of the messages :

- request from the master CPU



- response from the remote units



During initialization, the central unit interrogates all of the remote units in succession, thus building an image of the system configuration.

On each cycle of the bus all of the remote units are interrogated.

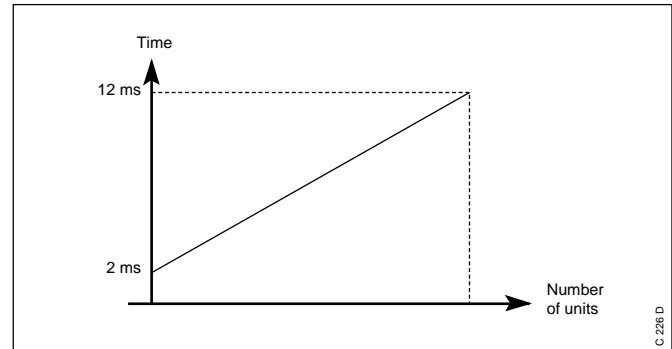
This updates all diagnosis information and recognizes additional remote units.

If the CPU or one of the remote units receives a message with a (CRC8) error, it is ignored. After ten consecutive transmission errors, an error "Bus error" is generated on the remote units and within the diagnostics of the central unit.

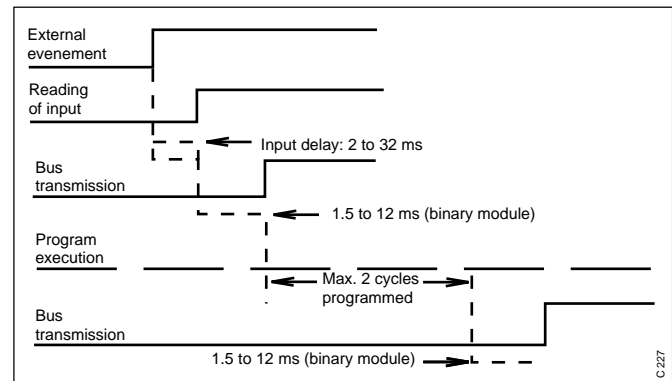
### 3.5 Bus refresh time

The refresh time depends on the configuration of the system, number and type of remote units.

The example below is for a system of remote units type ICSC 08 L1.



The user program and the bus refresh cycle are executed in serie with the 07 KR/KT 31, 07 KR 91 and 07 KT 92/93 central units. The time event diagram is shown below :



The bus transmission time is easily calculated from the configuration of the installation.

Communication time	
offset time Master CPU	2000 µs
Slave central units	
07 KR 31*	750 µs
07 KT 31*	750 µs
07 KR 91*	750 µs
07 KT 92*	750 µs
07 KT 93*	750 µs
* with factory setting	
time following the configuration :	
2 bytes in transmission	
2 bytes in receiving	516 µs
4 bytes in transmission	
4 bytes in receiving	750 µs
8 bytes in transmission	
8 bytes in receiving	1300 µs
12 bytes in transmission	
12 bytes in receiving	1850 µs
8 words in transmission	
8 words in receiving	2500 µs
Binary input units	
ICSI 08 D1	323 µs
ICSI 08 E1	323 µs
ICSI 08 E3/E4	323 µs
ICSI 16 D1	387 µs
ICSI 16 E1	387 µs
Binary output units	
ICSO 08 R1	260 µs
ICSO 08 Y1	260 µs
ISCO 16 N1	340 µs
Binary input/output units	
ICSC 08 L1	387 µs
ICFC 16 L1	516 µs
ICSK 20 F1	452 µs
ICSK 20 N1	452 µs
ICDG 32 L1	516/590 µs
	following the configuration
IP65 binary input/output units	
ICPI 08 D1	323 µs
ICPI 16 D1	387 µs
ICPO 08 H1	260 µs
ICPO 16 H1	340 µs

Analogue units	
ICSM 06 A6 (input/output)	1162 µs
ICSE 08 A6 (input)	1355 µs
ICSE 08 B5 (input)	1355 µs
ICST 08 A7 (input)	1355 µs
ICST 08 A8 (input)	1355 µs
ICST 08 A9 (input)	1355 µs
ICDT 08 B5 (input)	1355 µs
ICSA 04 B5 (output)	700 µs
Robot coupler card	
ICBG 32 L7	516 µs
ICBG 64 L7	750 µs
High speed counter	
ICSF 08 D1	1300 µs

### 3.5.1 Bus refresh time (T<sub>rb</sub>)

This time is equal to :

– with a master central unit serie 90 :

$$T_{rb} = T_{\text{offset}} + T_{\text{communication time}}$$

– with a master central unit serie 30 :

$$T_{rb} = T_{\text{offset}} + T_{\text{communication time}} + n * 100 (\mu\text{s})$$

with :

– T<sub>offset</sub> = 2 000 μs

– T<sub>communication time</sub> : see table

– n = number of slaves on the bus

#### Example of calculation

Configuration :

1 "Master" CPU .....	2 000 μs
1 ICSK 20 F1 .....	452 μs
1 ICSO 08 R1 .....	260 μs
1 ICSI 16 E1 .....	387 μs
1 ICFC 16 L1 .....	516 μs
1 ICSC 08 L1 .....	387 μs

– with a master central unit serie 90

$$T_{rb} = 4\,002 \mu\text{s} = 4 \text{ ms}$$

– with a master central unit serie 30

$$T_{rb} = 4\,502 \mu\text{s} = 4,5 \text{ ms}$$

### 3.5.2 Response time to energize an output from the activation of an input

See Part 3 page 5.3-1 for a master central unit serie 30.

See Part 4 pages 1-22 or 2-25 or 3-21 for a master central unit serie 90.