



**MCS Total
Solutions for all your
HVAC/R Control Needs**

Chiller Kits

Single Compressor - 108, 160, 209 TONS

Dual Compressor - 102, 165, 217 TONS

Based on R134A Refrigerant



**Flooded Chiller, Water Cooled
High Efficiency with VFD**

Primary Players

MCS ENCLOSURE WITH 10.1 TOUCHSCREEN

The MAGNUM +12 System is an expandable system starting with the MCS-MAGNUM-N-12 controller.

The enclosure includes the following components:

- MCS-MAGNUM-N - 12 Sensor inputs, 4 Digital inputs, 10 Relay outputs, 4 Analog outputs
- Touchscreen - 10.1 - LCD 1280X800 Resolution
- MCS-SI-BASE - Expansion board- 16 Sensor inputs
- MCS 12VDC Power Supply - 100watt Switch Mode
- 20A GFCI outlet, 20A Single-Pole Circuit Breaker
- 5 port Ethernet Hub
- BMS Network Terminal Block
- MCS-MODBUS I/O-12
- MCS-EXV-DRIVER
- MCS-PT1000 - Motor Temperature Sensor for Hanbell



HANBELL RE-SERIES COMPRESSOR

Next generation of innovative design screw compressor dedicated to newer high efficiency refrigerants.

- High-quality bearings -(radial and axial resistance)
- Additional bearings for backward rotation
- Heavy-duty design

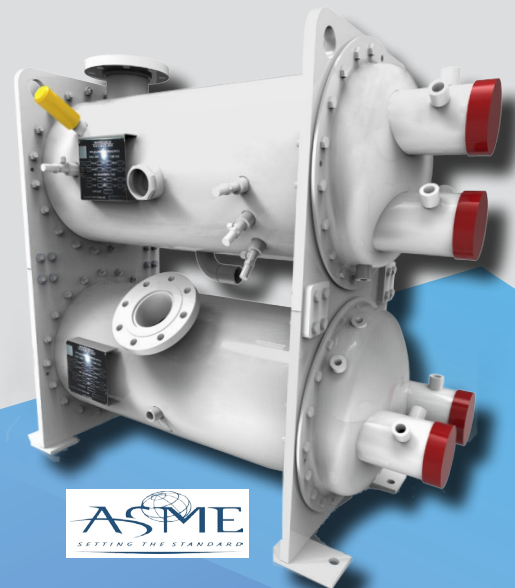
YASKAWA A-1000 VFD

Full featured drive, providing outstanding quality, performance flexibility, and environmental friendliness.

FLOODED EVAPORATOR & CONDENSER

Water Cooled Screw Chillers - Compact and Energy Efficient

- Low pressure drop on refrigerant & water side
- Uniform distribution of flow for uniform heat transfer
- Optimized velocity on refrigerant & water side
- Better overall heat transfer co-efficient
- Enhanced tube surfaces on water & refrigerant side
- Liquid droplet eliminated in flooded coolers
- High efficiency oil separation mechanism in IOS condenser
- Material as per ASME Sec-II D
- Smaller approach temperatures for coolers and condensers
- Built in Oil Separation in Condenser



ASME
SETTING THE STANDARD

Secondary Players

EXPANSION VALVE DRIVER

The **MCS-EXV-DRIVER** is used for the positioning and control of bipolar expansion valves, using an analog input of 0-10 VDC (0 VDC = 0% valve opening, 10 VDC = 100% valve opening).

EXV is used to precisely control refrigerant flow between condenser and evaporator to maintain the refrigerant level in the condenser.



EXPANSION VALVE

The **MCS-SERI / SEHI** are electronically operated step motor flow control valves, intended for the precise control of liquid refrigerant flow.

Synchronized signals to the motor provide discrete angular movement, which translates into precise linear positioning of the valve piston.



LEVEL SENSOR

The **MCS-LEVEL-SENSOR** indicator closely monitors refrigerant levels.

Uses infrared technology to detect liquid levels in condenser.

Our level probes provide a real-time feedback of liquid refrigerant levels within the condenser. The expansion valve will be modulated to maintain the condenser level.



PRESSURE TRANSDUCERS & CABLE

MCS Pressure Transducers are specially designed for use in HVAC/R applications, in the most demanding environments, where low cost is desired while maintaining high accuracy, long term reliability, and long life.

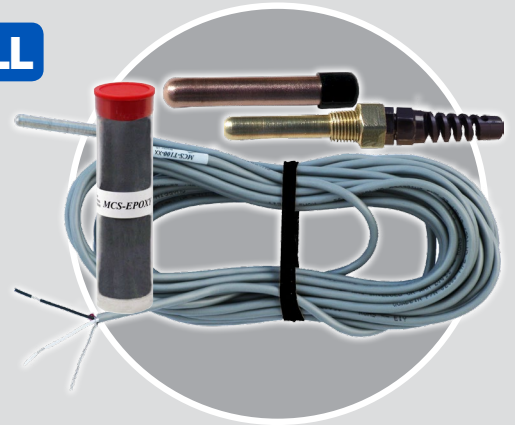
These transducers will be utilized to read suction, discharge, oil, and liquid refrigerant pressures.

Secondary Players

TEMPERATURE SENSOR / TUBE AND WELL

Included are the **MCS-T100 temperature** sensors, along with 20 foot of cable and the **MCS-TUBE+WELL-1/4"** which can be epoxied to a discharge or suction line in order to obtain temperature readings.

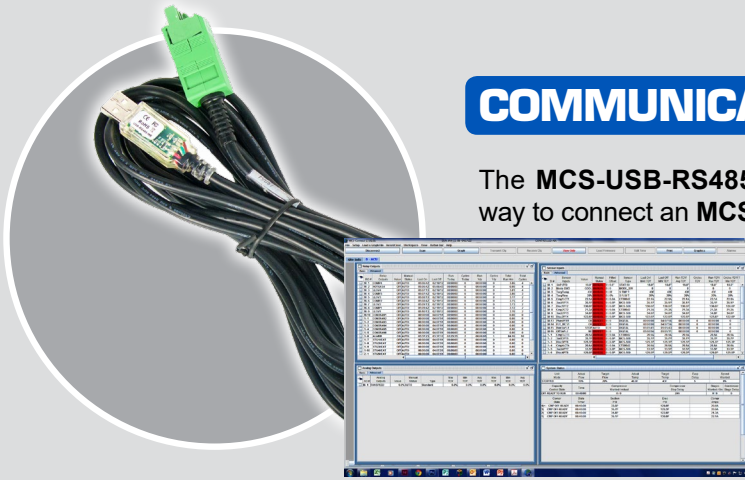
The MCS-Tube+Well temperature sensor comes prefilled with heat conductive compound to aid in transferring temperature to the sensor and **MCS-EPOXY** for securing to your pipe.



COMMUNICATION

The **MCS-USB-RS485** is a USB to RS485 cable that provides a fast simple way to connect an **MCS-MAGNUM** to a Laptop or PC.

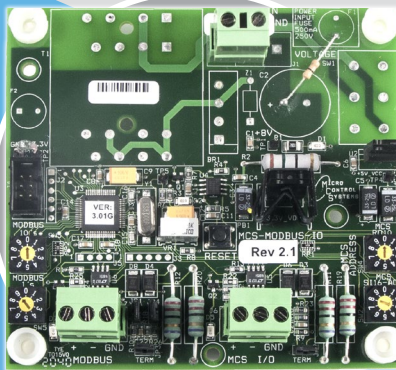
MCS-CONNECT permits the user to monitor the status of the micro controller in real time and, with proper authorization, changes can be made to the system.



CURRENT SENSOR

The **MCS Current Sensors** monitor current flow to electrical equipment. The magnitude of the current is converted to a linear 0 to 5vdc output signal which can be read as a standard analog input signal. The signal is used by MCS micro controllers for the following:

1. For slide valve positioning on screw machines
2. For high amp motor overload protection
3. For verification of device on / off
4. Used in kw calculations



MCS-MODBUS-IO-12

Communication over Modbus allows us to read and write information through the Yaskawa VFD.

Reading information such as:
Amps, volts, faults, KW, DC Bus voltage, heat sink temperature, and speed reference.

Writing information such as:
Compressor speed %, compressor Run/Stop command, and VFD reset command.

MCS Magnum Enclosure

MCS-EXV-DRIVER

MCS-MODBUS-IO-12

20 Amp and
5 Amp Breakers

Terminal Blocks
to land
hots and neutrals
for devices

Outlet for
Laptop plug-in power
at the box

12 Volt
Power Supply

Five (5) port
Ethernet Switch

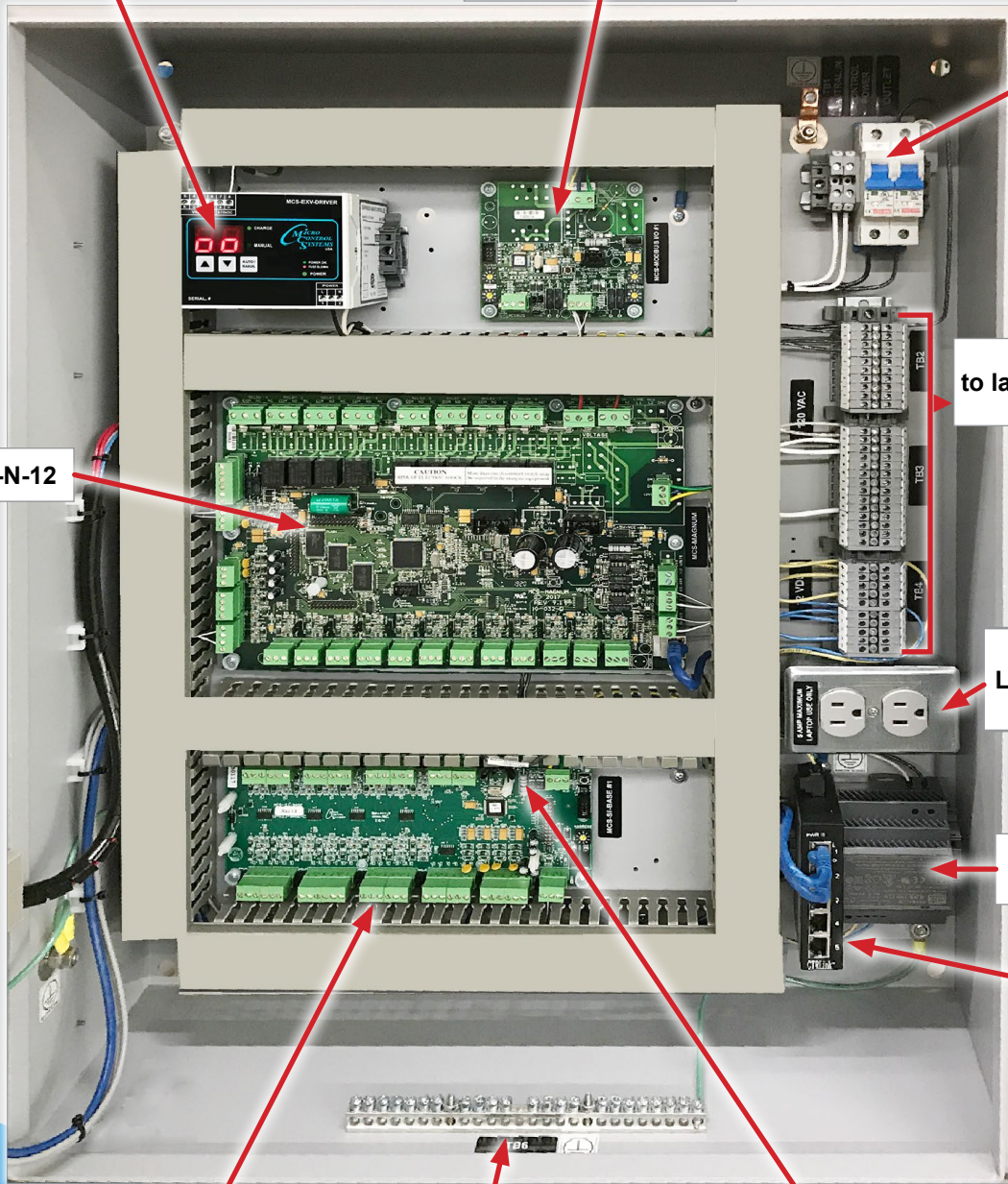
MCS-MAGNUM-N-12

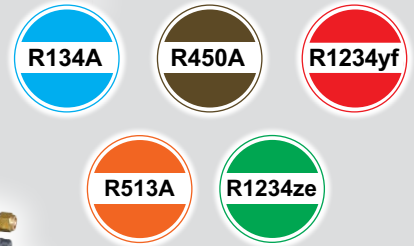


MCS-SI-BASE-12
EXPANSION BOARD

MCS-PT1000
TEMPERATURE SENSOR
(for reading Hanbell Motor)

Ground Bar for
Sensor Input shields





Cooling Capacity*

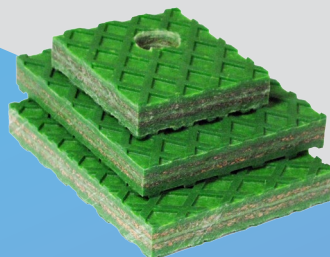
Compressors	R134a	R450A	R513A	R1234ze	R1234yf
RE-480 Single Compressor	108	98	106	82	104
RE-230 Dual Compressor	102	92	100	76	98
RE-710 Single Compressor	160	144	156	120	153
RE-340 Dual Compressor	165	148	160	123	156
RE- 920 Single Compressor	209	189	204	159	200
RE-480 Dual Compressor	217	196	212	164	208

*Tonnage estimated at Full Load
Operating conditions @ 40 Evaporating SST @105 Condensing SCT

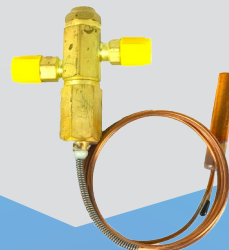
Extras Included



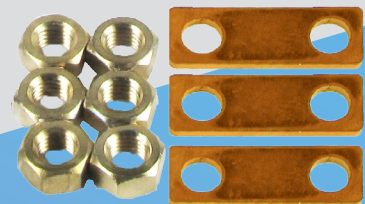
Hanbell RC-HBR-B09-Oil



Hanbell RC-MOUNTING PAD



Thermal Expansion Valve for Liquid Injection



Hanbell RC-JUMPER-BARS

MCS Typical Point List

Sample 108 Ton package

Relay Outputs

#	Output Name	Type	Description
M-1	Comp	Standard	Compressor VFD Enable (Virtual Point - Not Wired)
M-2	HotGasByps	Standard	Hot Gas Bypass: Turn ON or OFF
M-3	ChambrInj	Standard	Compressor Liquid Chamber Injection
M-4	FastUnld	Standard	Start Fast Unload Solenoid
M-5	MotorInj	Standard	Compressor Liquid Motor Injection
M-6	OilRtnSol	Standard	Oil return Solenoid
M-7	OilSepHeat	Standard	Oil Separator Heater
M-8	SPARE M-8	Standard	Not Used - Reserved for Expansion
M-9	WARNING	Standard	Warning Light: Unit is in a safety condition prior to a safety shut down
M-10	ALARM	Standard	Alarm Light: Unit is in a safety shut down

1-1	ChwPump	Standard	Chilled Water Pump
1-2	CndPump	Standard	Condenser Water Pump
1-3	Spare 1-3	Standard	Not Used - Reserved for Expansion
1-4	Spare 1-4	Standard	Not Used - Reserved for Expansion
1-5	Spare 1-5	Standard	Not Used - Reserved for Expansion
1-6	Spare 1-6	Standard	Not Used - Reserved for Expansion
1-7	Spare 1-7	Standard	Not Used - Reserved for Expansion
1-8	Spare 1-8	Standard	Not Used - Reserved for Expansion
1-9	Spare 1-9	Standard	Not Used - Reserved for Expansion
1-10	Spare 1-10	Standard	Not Used - Reserved for Expansion

Sensor Inputs

#	Output Name	Type	Description
M-1	ChilWtrIn	MCST100	Chilled Water In Temperature
M-2	ChilWtrOut	MCST100	Chilled Water Out Temperature
M-3	SuctPsi	MCS-200	Suction Refrigerant Pressure
M-4	DiscPsi	MCS-500	Discharge Refrigerant Pressure
M-5	OilPsi	MCS-500	Compressor Oil Pressure
M-6	LiqLinePsi	MCS-500	Liquid Refrigerant Pressure

MCS Typical Point List

Sample 108 Ton package

Sensor Inputs

#	Output Name	Type	Description
M-7	CmpAmps	CT-300	Compressor Motor Amps
M-8	SuctTmp	MCST100	Suction Refrigerant Temperature
M-9	DiscTmp	MCST100	Discharge Refrigerant Temperature
M-10	LiqLineTmp	MCST100	Liquid Refrigerant Temperature
M-11	MotorTmp	PT1000	Compressor Motor Temperature
M-12	CmpOilLvl	DIGITAL	Compressor Oil Level Switch
M-13	MtrFault	DIGITAL	Compressor Motor Fault
M-14	PhaseLoss	DIGITAL	Phase loss: Phase imbalance Monitor
M-15	Run-Stop	DIGITAL	Run/Stop Switch
M-16	Emg-Stop	DIGITAL	Emergency Stop Switch

1-1	EvapTmp	MCST100	Evaporator Barrel Refrigerant Temperature
1-2	CndFlow	DIGITAL	Condenser Water Flow Switch
1-3	ChwFlow	DIGITAL	Chilled Water Flow Switch
1-4	OilSepLvl	OilSepLvl	Oil Separator Level Switch
1-5	OilSepTmp	OilSepTmp	Oil Separator Temperature
1-6	CndWtrIn	CndWtrIn	Condenser Water In Temperature
1-7	CndWtrOut	CndWtrOut	Condenser Water Out Temperature
1-8	Spare 1-8	Spare1-8	Not Used - Reserved for Expansion
1-9	Spare 1-9	Spare1-9	Not Used - Reserved for Expansion
1-10	Spare 1-10	Spare1-10	Not Used - Reserved for Expansion
1-11	EvapDifPsi	EvapDifPsi	Evaporator Barrel Water Pressure Differential
1-12	CndDifPsi	CndDifPsi	Condenser Barrel Water Pressure Differential
1-13	Spare 1-13	Spare1-13	Not Used - Reserved for Expansion
1-14	CndLevel	CndLevel	Condenser Refrigerant Level Percentage
1-15	Spare 1-15	Spare1-15	Not Used - Reserved for Expansion
1-16	Spare 1-16	Spare1-16	Not Used - Reserved for Expansion

2-1	VFD Fault	MODBUS	Digital VFD Fault feedback
2-2	VFD Load%	MODBUS	Current Load percentage of VFD
2-3	VFD KW	MODBUS	KW Output of VFD

MCS Typical Point List

Sample 108 Ton package

Sensor Inputs

#	Output Name	Type	Description
2-4	VFD Amps	MODBUS	VFD Compressor Amps
2-5	VFD Volts	MODBUS	Voltage on VFD
2-6	VFD DC Bus	MODBUS	Voltage on DC Bus for VFD
2-7	VFD Hsink	MODBUS	Heat Sink Temperature for VFD
2-8	VFD FLT#	ModbusHex	VFD Fault Number
2-9	VFD Local	MODBUS	VFD Local/Manual
2-10	VFD%Ref	MODBUS	Wanted VFD percentage sent by Magnum Controller
2-11	Spare 2-11	SPARE	Not Used - Reserved for Expansion
2-12	Spare 2-12	SPARE	Not Used - Reserved for Expansion
2-13	Spare 2-13	SPARE	Not Used - Reserved for Expansion
2-14	VFD FltRst	User Logic	VFD Fault Reset
2-15	VFD Cmnd	User Logic	Commands VFD to Run/Stop/Reset
2-16	Spare 2-16	SPARE	Not Used - Reserved for Expansion

Analog Outputs

#	Output Name	Type	Description
M-1	Exv %	Standard	Electronic Expansion Valve Opening Percentage
M-2	Comp %	Standard	Compressor Speed Percentage (Virtual Point - Not Wired)
M-3	CndValve%	Standard	Condenser Valve Opening Percentage
M-4	Spare M-4	SPARE	Not Used - Reserved for Expansion

1-1	Spare 1-1	SPARE	Not Used - Reserved for Expansion
1-2	Spare 1-2	SPARE	Not Used - Reserved for Expansion
1-3	Spare 1-3	SPARE	Not Used - Reserved for Expansion
1-4	Spare 1-4	SPARE	Not Used - Reserved for Expansion

2-1	Comp %	Modbus Write	Compressor Speed Percentage (Modbus Write to VFD)
2-2	StrtCmp	Modbus Write	Start Compressor (Enable to VFD)
2-3	RunReset	Modbus Write	Writes Command to Reset VFD or Allow it to Run
2-4	Spare 2-4	SPARE	Not Used - Reserved for Expansion

Notes

Notes

Providing HVAC/R Solutions Worldwide



The MCS Commitment

The founders of Micro Control Systems Inc. have been in the manufacture of Microprocessor Controls their entire careers and have over eight decades of combined HVAC/R Microprocessor Controls experience. MCS was founded to meet the needs of the Utility and HVAC/R Industries with products based on the following design criteria:

- ◆ **Quality & Service**
 - ◆ **Cost Effectiveness**
 - ◆ **Ease of Use**

Our commitment is to provide practical solutions for the industries needs and to be both a leader and partner in the effective use of Microprocessor Controls.



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