INSTALLATION, OPERATING AND MAINTENANCE MANUAL

for the

Chamber Environment Controller
Model: CEC-3 Series

(Part No: KI17056AC 380V/440V
Part No: KI17056HA 220V)

(Intentionally Blank)

APPROVAL SHEET

DIVEX	
MANUAL NUMBER:	KI-OM-588
ADVITIUM NUMBER:	KI-OM-588
DOCUMENT TITLE:	Installation, Operating & Maintenance Manual - CEC-3 Series

REV	DATE	BY	CHECK	APP	COMMENTS
0	07/06/2009	R. Carli	N. Maske	R. Faustmann	First Issue
1	15/06/2011	R. Carli	N. Maske	N. Maske	Update as per ECN CT00273
2	26/11/2012	V. Garzon	N. Maske	M. Stevens	Update as per ECN 15120
3	28/03/2013	V. Garzon	M. Stevens	M. Stevens	ECN 15666
4					
5					
6					
7					

ORIGINAL ISSUE DATE:	7 July 2009
ORIGINAL DOCUMENT BY:	R. Carli
CHECKED BY:	N. Maske
APPROVED BY:	R. Faustmann

(Intentionally Blank)

TABLE OF CONTENTS

II. DATA SHEET

INSTRUCTION & MAINTENANCE MANUAL NO: KI-OM-588

……

FILENAME AND PATH:

……

EQUIPMENT TYPE: Chamber Environmental Controller - CEC-3

……

EQUIPMENT SERIAL NO:

……

CUSTOMER:

……

VESSEL / LOCATION: (IF KNOWN)

……

DATE OF ISSUE:

……

NOTE

Please quote the above information when contacting Divex regarding operational information of spare parts.

(Intentionally Blank)

III. DISCLAIMER

Whilst every effort has been made to ensure the accuracy of the information provided in this document, Divex makes no guarantees therefore.

Misuse of the equipment described in this manual could result in injury. It is the responsibility of the user to ensure that the equipment is used and maintained correctly and in accordance with the instructions provided in this manual in order to ensure safety of life and to prevent injury.

(Intentionally Blank)

IV. CONFIDENTIAL INFORMATION

This document is confidential and is the property of Divex It may not be distributed to persons or organizations other than the intended recipient without the prior written consent of the owner.

(Intentionally Blank)

V. WARRANTY

Divex Ltd warrants that its Chamber Environment Controller (Type CEC-3), conforms to the current product specification at the date of delivery and that the product will be free of patent defects in materials or workmanship for a period of twelve months from the date of delivery or for the first 3,000 operating hours, whichever occurs first.

Any component or sub-system which is established by Divex to be patently defective will, at Divex's option, be repaired or replaced on condition that such defective equipment is returned to Divex's manufacturing facility in Cape Town, South Africa, freight pre-paid. On completion of any repair or replacement, the equipment will be returned to the customer FOB Cape Town, South Africa. By agreement and upon prepayment by the customer of any transportation, on-site accommodation and subsistence expenses, Divex may dispatch personnel to perform on-site repairs.

The product specification and warranty terms are subject to alteration without prior notice and do not form part of any contract made between Divex and its customer.

This equipment should only be operated by suitably qualified persons conversant with the operation and maintenance of environmental conditioning equipment used in saturation dive systems. Before operating the equipment, the user must be fully acquainted with the instructions contained in this manual, as well as the individual component manufacturer's operating and maintenance information provided in the Appendixes.

Only genuine manufacturer's spare parts may be used in this Divex product. Use of other manufacturer's parts may cause degradation of performance or failure and will invalidate the warranty.

The following information is required by Divex when ordering spare parts:

- Customer's / owner's name
- Equipment serial number
- Spare part type / description
- Part number

(Intentionally Blank)

CHAPTER 1 GENERAL DESCRIPTION

1.1 INTRODUCTION

The Divex Chamber Environmental Controller (CEC) is designed to be used in conjunction with a Heater Chiller Skid (Previously Control Master Unit; CMU) with external controls and HCU 3/4 and 3/6 (Habitat Conditioning Units). The unit is specifically designed to provide control of the heating, cooling and dehumidification of a decompression chamber.

The system is comprised of the following major components:

- Temperature and humidity probe and transmitter.
- Temperature and humidity controllers.
- Three way control valves set to direct hot and cold fluid.
- Remote temperature and humidity readout
- Remote temperature and humidity set point control.

1.2 TABLE OF SPECIFICATIONS

	KI17056AC	KI17059HA
External Dimensions (mm)	850mm wide x 700mm high x 335mm deep	800mm wide x 1000mm high x 350mm deep
Power Supply	380V / 440V 3Amp	220V 3 Amp
Controls	1 Temperature and 1 humidity controller	
Cold Fluid Line	Cold fluid main line 1" tube terminated with 1" NPTF	
Hot Fluid Line	Hot fluid main line 1" tube terminated with 1" NPTF	
Chamber Humidity Control Fluid Line	$^1/_2$" tube terminated with $^1/_2$" NPTF	
Chamber Temperature Control Fluid Line	$^3/_4$" tube terminated with $^3/_4$" NPTF	

1.3 DESCRIPTION

The CEC-3 controller system is comprised of a piping manifold assembly and a control panel both mounted to a backing plate. Also included is a remote display and control face plate designed for mounting into a standard 19 inch rack or bulkhead mounted[1]. When connected, the remote face plate provides indication and control of the chamber environment at a distance from the chamber, usually at Saturation control. The major components of the unit are identified below.

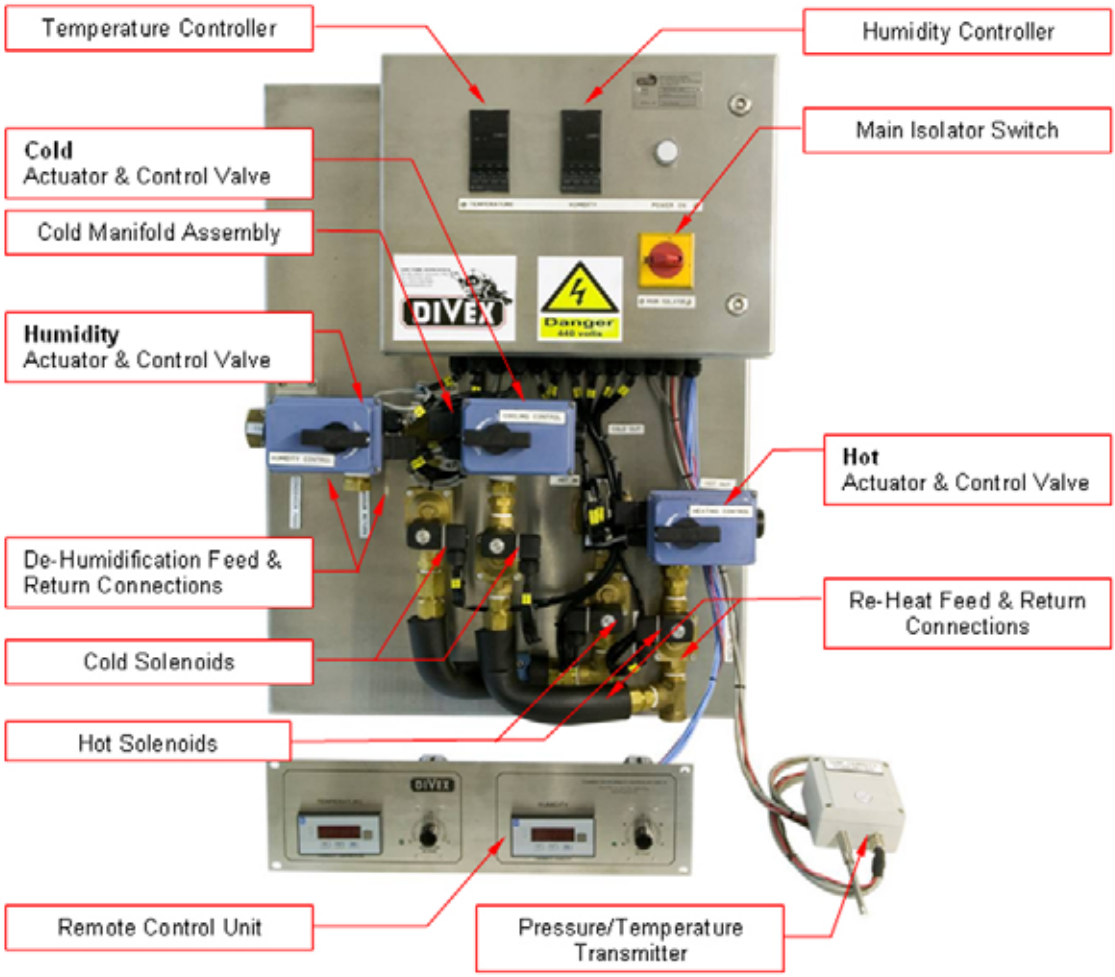


Fig 1.1 General Assembly and Part Identification model KI17056AC (380V/440V)

1. Contact us at sales@divexglobal.com if you are in doubt.

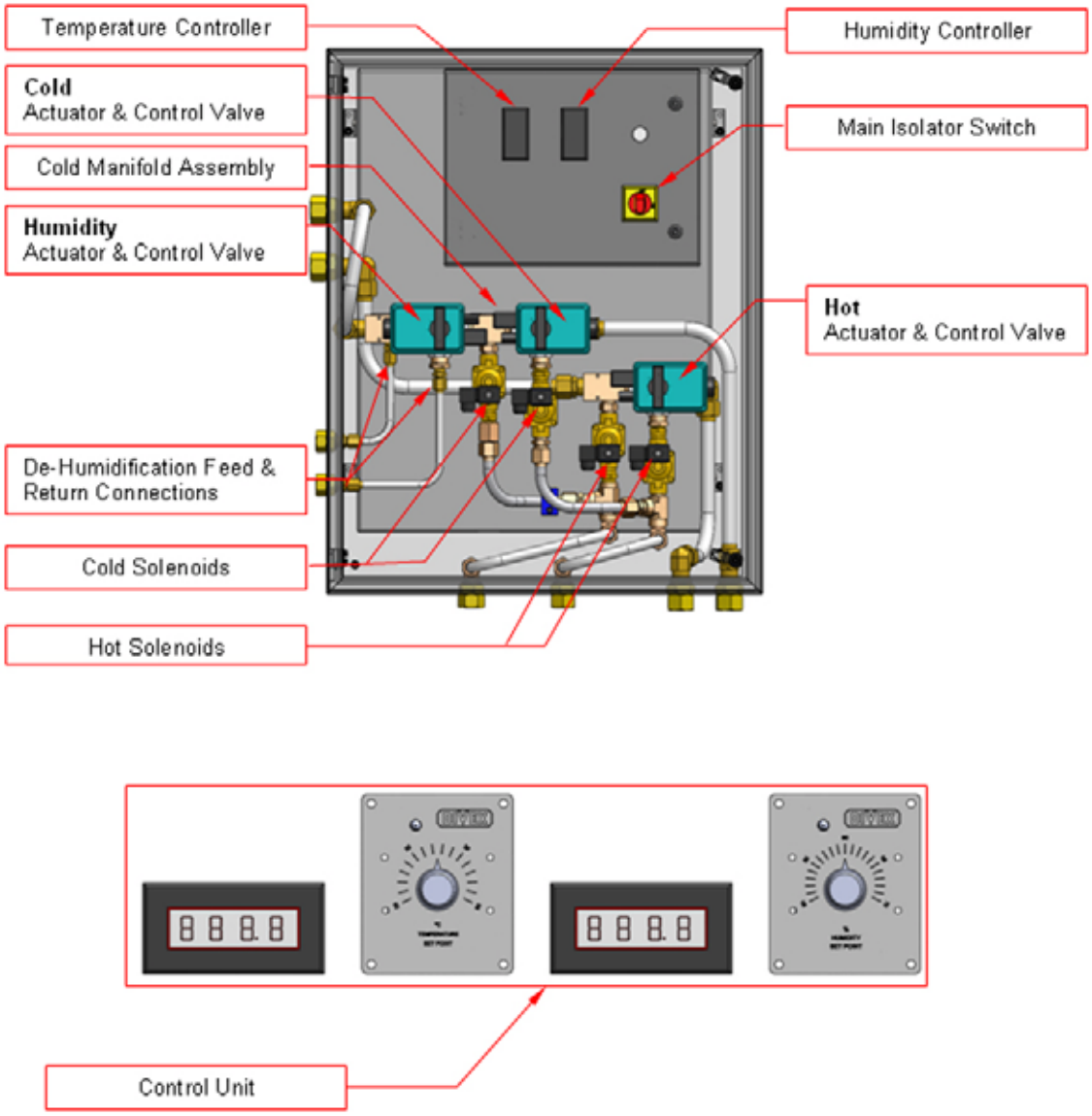


Fig 1.2 General Assembly and Part Identification model KI17056HA (320V)

The system is designed to control the temperature and humidity within a habitat of a saturation system. The CEC-3 unit governs the flow of the hot or cold fluid supplied by a Heater Chiller Skid (HCS) through three way Tee port valves that divert fluid as required to the re-heat and condensing coils of a Habitat Control Unit, HCU, inside the chamber.

The fluid used is a mixture of water and glycol to prevent freezing while allowing good heat transfer. The fluid flow through the unit is indicated below.

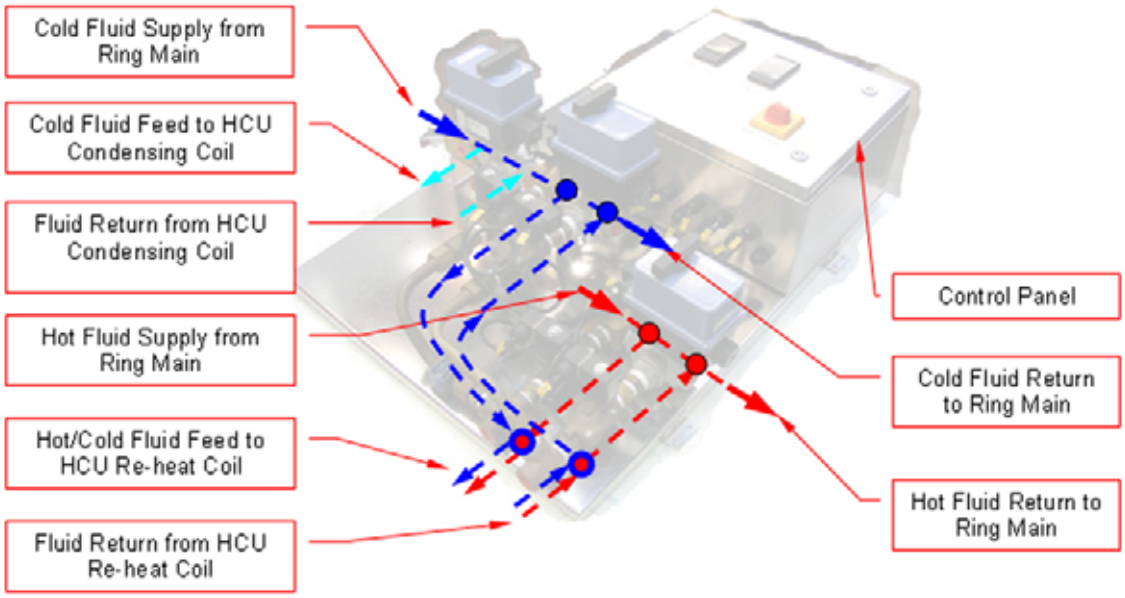


Fig 1.3 General Arrangement and Fluid Flow Overlay

The temperature and humidity of the chamber atmosphere is measured by a dual-sensor inside the chamber. A transmitter uses the measurements taken by the sensor and transmits the temperature and humidity data to the controllers and remote displays.

For an increase in chamber atmosphere temperature, the hot fluid control valve will allow more hot fluid to flow through the HCU (Habitat Conditioning Unit) coil and the cold fluid supply to the chamber will be stopped, thus heating the chamber. If a decrease in chamber atmosphere temperature is required, the cold fluid temperature control valve will allow more cold fluid to pass through the HCU coil and the hot fluid will be stopped, thereby cooling the chamber. If neither heating nor cooling is required, then both hot and cold streams will be allowed to bypass the HCU, thereby not doing any heating or cooling of the chamber.

In this way temperature control is achieved by governing the volume of either hot or cold fluid passing through the HCU reheat coil and not by mixing hot and cold streams.

The temperature control valves are actuated by an electronic temperature control unit. It can operate from full cooling to full heating or any position in between to obtain the desired chamber temperature. The required chamber temperature is set by selecting a set point on the temperature control potentiometer mounted on the remote control panel.

Relative humidity of chamber atmosphere is controlled by supplying chilled fluid to the dehumidification coil in the HCU. A portion of the main chilled fluid flow is diverted through the dehumidification coil via the humidity control valve. The dehumidification coil removes habitat moisture by condensing water vapour as it is drawn over the cold surfaces of the coil. The temperature of the dehumidification coil is controlled by the humidity controller which operates the humidity control valve. The required habitat relative humidity is selected by setting the humidity control potentiometer on the remote control panel.

The system integration of the CEC-3 in an installation is outlined in Appendix E which shows how two CEC-3 units may be used in the conditioning of the entry and main lock of a chamber.

CHAPTER 2 INSTALLATION AND SETUP

2.1 GENERAL INSTALLATION NOTES

The CEC-3 unit is most effective when installed within 2-5m from the Habitat Conditioning Unit (HCU). Variations in the length of the plumbing connecting the CEC-3 to a HCU will impact on system response and may necessitate a modification of the controller parameters to achieve more acceptable performance. All plumbing should be insulated with a minimum of 1/2 inch thick foam rubber insulation tube, Armaflex or equivalent. The CEC-3 is shipped mounted to a backing plate (AC model) or in a stainless enclosure (HA model) and the unit should be secured to a firm mounting and must not rely on pipe work to support it as this may compromise the integrity of the manifold system.

2.2 TYPICAL RING MAIN FLUID SYSTEM INSTALLATION

The CEC-3 is designed for integration into a ring main system supplying hot and chilled water/glycol fluid mix. The CEC-3 has 1” NPT hot and cold inlet and outlet connections to be supplied by and return to the ring main. Connections are indicated in Appendix E which shows the routing of the ring main system. The ring main piping connections should be 1” and may be either flexible or hard piped. Following the connection and flushing of all piping a leak test should be conducted on the ring main fluid system to ± 7 bar.

NOTE

Prior to leak testing the HCS header tank relief valves should be removed and replaced with blanks.

2.3 TYPICAL INSTALLATION OF THE CEC TO HCU 3/4 OR 3/6

The CEC-3 has female 1/2”NPT connections to be connected to the HCU condensing coil and female 3/4”NPT to be connected to the re-heat coil of the HCU as shown in Appendix E. The dehumidification lines may be either flexible or hard piped to the unit and the pipes or hoses must be a minimum of 1/2" in diameter.

The reheat lines may be either flexible or hard piped to the unit and the pipes or hoses must be a minimum of 3/4" in diameter.

	**CAUTION**
	INTERNAL PIPE WORK **All chamber internal pipe work must be done using the correct diameter hard pipe capable of resisting the high pressures within the chamber environment.**

IMPORTANT
Leak testing should be carried out on both dehumidification and temperature control lines up to ± 7 bar.

2.4 ELECTRICAL INSTALLATION AND REMOTE CONTROLS

2.4.1 ELECTRICAL INSTALLATION

All wiring of the CEC-3 is detailed in the electrical schematics shown in Appendix D.

	**CAUTION**
	All electrical wiring must be installed in a manner approved for the specific installation. Consult company/rig/inspection authority wiring regulations.

2.4.1.1 ELECTRICAL POWER REQUIREMENT

The CEC-3 uses a Switch Mode Power Supply to provide a 24 VDC supply to all control circuits, actuators and solenoids.

2.4.1.2 WIRING THE CEC SENSOR ASSEMBLY

The temperature/humidity transmitter used with the CEC-3 is a wall mounted unit that is placed within the chamber environment to be conditioned. The connections are to be made to the unit through an electrical penetrator in the chamber as indicated in the electrical schematics in Appendix D. As the sensor is incorporated into the transmitter body only power and signal transmission connections need to be made to the unit through the penetrator. (It is not necessary to tamper with the probe wire). Mount the sensor assembly in a convenient location within the chamber.

IMPORTANT
Sensor placement will have an impact on the effectiveness of the CEC control and its response to the environmental changes within the chamber. It should be mounted in an area with good gas flow but not directly in line with the gas flow out of HCU.

2.4.2 REMOTE CONTROL FACE PLATE

The CEC-3 is supplied with a remote control panel which will allow chamber temperature and humidity to be managed from S.A.T. control. The assembly is made up of two signal generators and two display units mounted into a single face plate (AC model) or separate face plates (HA model). The remote controls are designed to be fitted to a standard 19” rack or bulkhead mounted[1].

The signal generators of the remote control panel allow an operator to modify the input set-point, SV, of the temperature and humidity controllers through a dial adjustment. The display

1. Contact us at sales@divexglobal.com if you are in doubt.

units in the remote panel indicate the current environmental conditions measured by the temperature-humidity probe mounted inside the habitat.

IMPORTANT
It is important to check the calibration of the remote control and displays to optimise the performance of the CEC-3. (Refer to Chapter 4)

2.4.2.1 MOUNTING AND WIRING THE REMOTE CONTROL ASSEMBLY

The remote control assembly should be mounted in a 19” rack or bulkhead mounted within an area protected from the elements. A convenient placement is typically within the chamber or S.A.T. control area to facilitate convenient operation and monitoring. Check calibration of both the signal generators and the displays following long periods spent out of service, after installation or relocation of equipment.

2.4.2.2 WIRING THE PANEL

Both signal generators and remote displays are 24 VDC units. The remote control and display components are wired to terminals and must be wired to the main control panel terminals according to the wiring diagram.

2.5 INITIAL SYSTEM CHECK

Following installation, prior to being put into service, the CEC-3 should be tested to confirm the operation of the unit and the remote control.

2.6 REMOTE CONTROL PANEL FUNCTION CHECK

a. Switch on electrical power to the CEC-3 unit. (Turn on the power for the remote control, if on a separate supply)

b. Check that the remote temperature and humidity displays indicate the current conditions that the probe is sensing. (Refer to the component manual in Appendix F.3 for any setting adjustment)

c. Rotate the knobs of the remote signal generators individually through the range of the scale indicated on the etched face plate. Ensure that when the knob points to the maximum and minimum of the range that the set value, SV, indicated on the respective controller of the main panel shows the same value. If these values differ refer to section 4.4 for calibration procedure.

2.7 SOLENOID FUNCTION CHECK

The Solenoids are used to switch the flow through the reheat coil of the HCU between hot and cold. The solenoid switching is governed by the Error between the Set Point, SV, and the Measured Value, PV.

a. Switch on the CEC-3 unit power

b. Change the Set Value, SV, from below to above the Measured Value, PV (At least 5°C). The system will begin with the cold solenoids open and the hot solenoids closed. As the SV reaches PV the cold solenoids will close. When the SV is adjusted further the hot solenoids will open after a short delay. This control style will be reversed when returning the SV to the original position. The unit is designed to prevent the simultaneous opening of the hot and cold solenoid pairs in order to avoid cross flow between the hot and cold fluid lines.

2.8 SYSTEM START UP AND GENERAL FUNCTION CHECK

The following procedure outlines the basic functional system check. This test may be carried out following periods out of service, after installation or relocation of the unit. The CEC-3 unit must be fully plumbed and all lines primed to ensure effective testing. The ring main supply HCS should be running and both hot and cold lines at set point temperatures for the HCS. (Refer to the HCS manual for operational instructions)

	**CAUTION**
	Monitor the system fluid levels regularly during system priming, testing and normal operation.

a. Switch on the CEC-3 and any HCU's attached to the unit.

b. Set the remote temperature control to 32°C. This test is to check performance of the temperature control system. Set the humidity set point to maximum (70%) in order to prevent the dehumidification circuit from operating during the test.

c. Close the doors to the habitat and let the system operate in this mode.

d. Monitor the temperature of the chamber for the duration of the test and note the temperature at which the system stabilizes. The system should settle at the set point.

e. Pressurise the habitat to 6.9 bar (100 psi) on air. This will simulate density of helium at approximately 450 MSW (1500 FSW). The habitat temperature should gradually rise. The rate at which the temperature will rise depends on the habitat size and the ambient conditions. In cold environments, temperature rise may be slow. Allow the habitat to come up to temperature and be controlled at the set temperature.

f. At this time, control tests are performed with CEC maintaining the habitat at approximately 32°C (90°F) and the refrigeration system stable. Allow the system to run for at least 8 to 10 hours to ensure proper equipment performance. If the temperature

inside the habitat does not agree with the temperature readout on the remote control panel, refer to calibration procedure in Chapter 4, and recalibrate the readout. Eight to ten hours of running will allow the habitat to stabilize. This heat control test will confirm that the CEC is heating and controlling properly. If not, refer to step “j” below.

g. Now set the temperature control potentiometer to 26°C with the humidity control potentiometer at its lowest setting. This test will check if the system is cooling and dehumidifying. The habitat will cool down and the CEC will begin to maintain chamber temperature at 26°C. It may still require some cooling if outside environment is higher than 26°C. If it is colder than 26°C outside, controller may switch from cooling to heating mode. Allow controller to operate at this set point for another 8 to 10 hours. If at the end of this time the controller is performing satisfactorily, the unit may be shut down. If not, refer to step “j” below.

IMPORTANT
During this test the dehumidification may be active and deliver a cooling load to the chamber. This will initially add cooling to the environment but when approaching the temperature set point the controller may switch to heating to compensate for the extra heating load. This action will be determined by the proportional, derivative and integral action of the controller.

h. Change both temperature and humidity set points to the standard required working values.

i. Allow the system to stabilize and monitor the effect of standard chamber operations, such as showering, returning divers etc. Disturbances to the environment should cause the CEC-3 to adjust valve control and provide capacity as is required.

j. To ensure optimal performance, the standard operation or function of the unit may be adjusted to suit specific operational conditions. To achieve this the “auto tune” function may be run on each controller. If required, run auto tune on the temperature controller and only when complete, run it on the humidity controller. Follow these steps to run auto tune:

   a. Press mode key for 2 seconds
   b. Press set key until “r-L” is displayed and use up/down keys to change from “rEM” (remote) to “LoC” (local control)
   c. Press set key until “ArU” (PID/AT transfer) is displayed
   d. Select “on” (auto tuning) using up/down keys and press set key to run auto tune
   e. After auto tuning is complete (green “AT” stops flashing), change the controller back to “REM” (remote control).
   f. Refer to the controller instruction manual in Appendix F.2 for more information

k. Repeat function checks from step “f” if the auto tune function has been run and ensure acceptable system performance before the unit is placed into service. If required, refer to Chapter 5 for repair and maintenance and Chapter 6 for troubleshooting.

(Intentionally Blank)

CHAPTER 3 OPERATING INSTRUCTIONS

3.1 OPERATIONAL OUTLINE

The CEC-3 provides fully automated control of the environmental conditions of a habitat. Controllers govern the capacity delivered to the HCU unit within the chamber. The control is based on feedback received from temperature/humidity transmitter mounted within the habitat and operator input set points.

3.2 GENERAL OPERATION

The CEC-3 controls the amount of heating, cooling and dehumidification capacity provided to the HCU by diverting flow from the hot and/or cold ring main to the HCU condensing and reheat coils. This control is based on the action of two PID (Proportional, Integral and Derivative) controllers supplied with operator input set points and environmental inputs from a temperature/humidity transmitter. The control is active as soon as power is applied to the unit, providing all circuits are connected and functioning within specification.

3.3 PERFORMANCE CONSIDERATIONS

The performance of the CEC-3 in regard to the time required for the system to reach the set points is influenced by several parameters, these include:

- Habitat size
- Habitat insulation
- Number of divers in the habitat
- Activity in habitat
- Outside ambient temperature
- Temperature of breathing gas in the habitat
- Pressure in the habitat

3.3.1 OPERATING CONTROLS

The CEC-3 may be operated from the remote control panel, directly using the controllers or manually by adjusting the valves.

3.3.1.1 REMOTE CONTROL OPERATION

The CEC-3 is supplied with a remote control panel as the primary interface. This provides a facility to remotely input temperature and humidity set points to the PID controllers in the main control panel. Set points are manually adjusted using the knobs of the potentiometers.

The remote panel also indicates the current temperature and humidity of the habitat via electronic displays. The remote control panel is usually mounted in the chamber control area for easy access and operator feedback.

3.3.1.2 DIRECT CONTROLLER OPERATION (LOCAL CONTROL)

The control of the chambers heating, cooling and dehumidification may also be done locally by direct manipulation of the set points using the interface on the controllers in the CEC-3 main control panel. This type of operator interface will still provide automatic control of the habitat environment based on the input set points but is usually only utilized if the remote control panel fails and becomes non-functional. (Refer to the controller instruction manual in Appendix F.2 for information on using the controller interface and/or changing controller settings.)

3.3.1.3 MANUAL OPERATION

This type of control will require constant operator attendance and has no automated control. The use of manual operation is a last resort in the event that the CEC-3 unit fails or becomes non functional. To condition the environment manually it is necessary to activate the manual bypass screws of the relevant solenoid pair, (Hot or cold) to allow fluid flow through the circuit. Then use the manual operation handle of the corresponding actuator to rotate the T-port bypass valve and supply hot or cold fluid to the reheating coil. (Refer to Appendix F.5 and Appendix F.6 for actuator and solenoid operating manuals).

IMPORTANT
To ensure no cross flow of fluid between hot and cold circuits, close all solenoids before alternating solenoids. The circuit that is not in use should have the diverting T-port valves and actuators positioned to allow free flow through the ring main.

3.3.2 START UP PROCEDURE

The following procedure may be used to start up the unit from a fully shut down condition. It is assumed that all necessary connections have been made and the system installation has been previously commissioned in its current condition.

a. Check power supply and switch on the main control panel isolator

b. Set the remote temperature control potentiometer to the current temperature.

c. Set the remote humidity control potentiometer to the current humidity.

d. Turn on the cooling water supply to HCS

e. Turn on the HCS circulation pumps, heater and chiller

f. Turn on the HCU

g. Wait for the HCS supply to stabilize (hot and cold fluid supplies are at set point)

h. Check that fluid levels in the HCS hot and cold reservoirs are acceptable

i. Set the remote temperature control potentiometer to the desired temperature.

j. Set the remote humidity control potentiometer to the desired humidity.

k. Allow the system to run and monitor the habitat condition

l. Actuators will be constantly adjusted by the controller to provide correct heating or cooling capacity

If the temperature set point is above the habitat temperature the CEC-3 will provide hot fluid to the HCU reheat coil. If the set point is below the habitat temperature the CEC-3 will provide cold fluid to the HCU reheat coil. If the Humidity set point is below the habitat relative humidity cold fluid will be supplied to the condensing coil of the HCU regardless of the demand for cooling or heating for the temperature controller. No flow is given to the condensing coil if the humidity of the habitat is below the set point of the humidity controller.

3.3.3 SHUT DOWN PROCEDURE

To shut down the CEC-3, turn off control panel main isolator switch. The HCS and the HCU must be shut down as per their own procedures.

If free flow through the ring main is still required manually return the actuators to the normally open position. This may be necessary if a second CEC unit connected on the same ring main requires supply.

Alternatively set the controllers from RUN to STOP with the RUN/STOP transfer function and allow the actuators to return to the normally open position before switching off the main isolator. This will position the diversion valves to allow free flow through the CEC-3. Refer to Appendix F.2 the controller instruction manual in Appendix for details on the RUN/STOP transfer function.

	**CAUTION**
	Refer to the controller instruction manual in Appendix F.6 before changing any parameters of the controller programming.

(Intentionally Blank)

CHAPTER 4 ADJUSTMENTS AND CALIBRATION OF CONTROLS

4.1 CALIBRATION OUTLINE

Several components of the CEC-3 system are calibrated during fabrication. Calibration of these units may need to be checked if the system is serviced, parts replaced or the unit is moved or out of service for a long period of time. The following subsections outline the calibration of these components.

4.2 TEMPERATURE AND HUMIDITY CONTROLLER SET-UP

The temperature and humidity controllers are setup using three basic modes:

- **Parameter Setting Mode** – This mode is used to set control parameters such as event set values, proportional band, integral and derivative times etc. These parameters are set during fabrication and should only be changed if the parameter influence is fully understood and the change is necessary to satisfy the specific installation requirements.

- **Setup Setting Mode** – This mode is used to change other operation/control related parameters, communication parameters and data lock levels.

- **Engineering Mode** – This mode is used for a variety of setting adjustments and controller setup options. Engineering mode changes may only be done when the controller is in the stop mode. It is essential that a full understanding is gained of each function block and its influence on the system function before ANY changes are made.

CAUTION

All controller settings should only be adjusted by authorized, fully competent and qualified technical personnel.

IMPORTANT

Refer to the controller instruction manual in Appendix F.2 for details on controller setting function blocks, basic operation and menu access. A full list of the parameter settings for each controller may be found in Appendix C.

Dip switches located on the side of the controller are used for the selection of the remote and measured input type. The current CEC-3 design requires the setting of the dip switches as shown below.

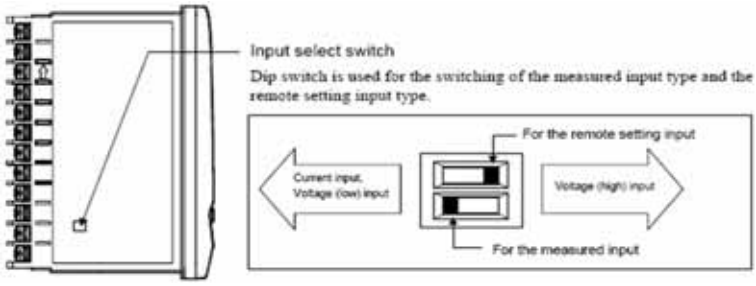


Fig 4.1 Dip Switch Setting

4.3 REMOTE SET POINT SIGNAL GENERATOR SETUP AND CALIBRATION

Two signal generators are used in the remote control panel, to output a set point to the respective controller. The set point input is based on a 2-10V signal for the temperature and 4-8V for the humidity signal generator. Calibrating these units so that the set point indicated by the pointer on the face plate correlates to the set point, SV, indicated on the controller display is done using controller parameters as well as through the mounting of the adjustment knob.

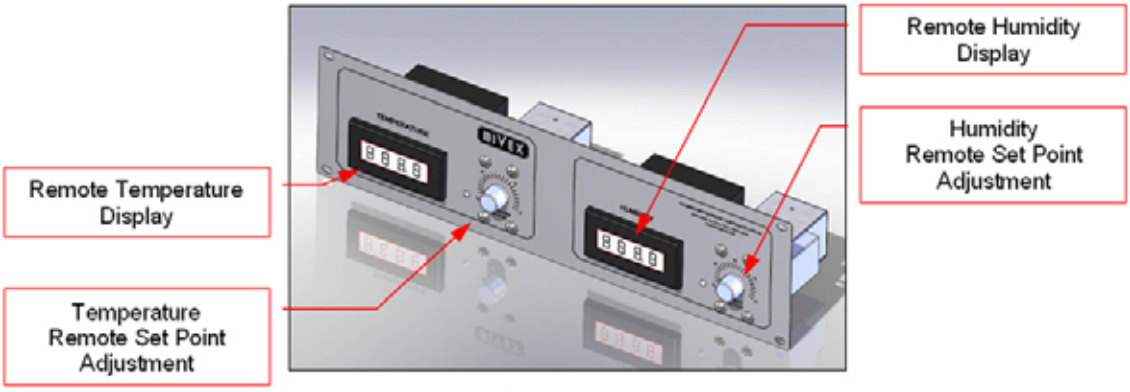


Fig 4.2 Remote Control Panel used with KI17056AC

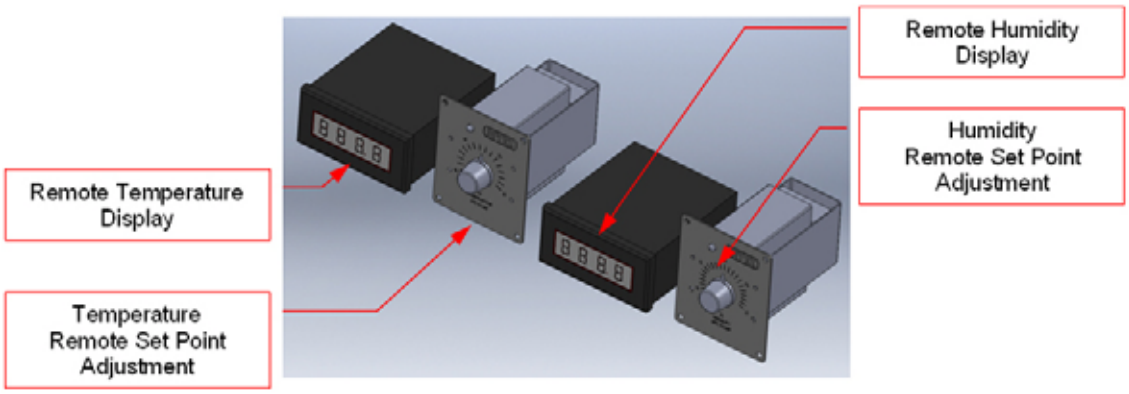


Fig 4.3 Remote Control Panel used with KI17056HA

The face plate humidity set point range is between 50% and 70% and the temperature set point is scaled between 20°C and 35°C. These values are etched onto the face plate. To ensure that the remote signal generator (pot), pointers are calibrated both the range and rotation of the scale output should be correct. The maximum, minimum, range and rotation of the SV scales in relation to the rotation of the knobs may be varied with the controller settings. If the maximum, minimum and range are correct the calibration of the pot may be done by adjusting the knob alignment on the shaft of the pot so that the pointer indicates the SV shown on the relative controller display and the following procedure may be used.

- Rotate the knob so that the SV indicated on the controller display is a mid range value
- Remove the top cover from the knob exposing the locking nut
- Loosen the lock nut and rotate the knob on the shaft to align the pointer with the displayed SV
- Tighten the locking nut with the knob in position on the shaft
- Rotate the knob through the full range of the face plate scale and confirm that the indicated values are reflected on the display for several points on the scale
- Replace the knob cover

IMPORTANT
The knob adjustment procedure is only valid if the controller settings relating to the range, maximum and minimum values are set correctly.

The following table details major controller parameters that influence the calibration of the remote signal generator:

MODE	PARAMETER DETAILS		PARAMETER EFFECT
Setup Setting Mode	rb	RS Bias	The Remote Setting Bias adjusts the rotational range of the input scale covered between the minimum and maximum values. (The angle between maximum and minimum)
Setup Setting Mode	rr	RS Ratio	The Remote Setting Ratio adjusts the rotation of the input scale. (Equivalent to rotating the knob on the remote signal generator shaft)
To enter the Setup Setting Mode, press the Shift (MODE) key while pressing the SET key. Move through the parameters by pressing the SET key. Use the mode key to highlight a digit and use the arrow keys to change the highlighted digit.			

MODE	FUNCTION BLOCK	PARAMETER DETAILS		PARAMETER EFFECT
Engineering Mode	F71	SLH	Setting limiter high	This sets the maximum SV output by the controller for the maximum signal input received from the remote signal generator.
Engineering Mode	F71	SLL	Setting limiter low	This sets the minimum SV output by the controller for the minimum signal input received from the remote signal generator.
Engineering Mode	F22	rlnP	Remote setting input type	This identifies the type of remote signal generator to be used.
To enter the Engineering Mode, press the Shift (MODE) key for 2 seconds while pressing the SET key. Move to the required function block using the arrow keys. To page through the selected function block press the SET key. When at the correct parameter highlight the digit to be changed using the MODE key and use the arrow keys to change the highlighted digit. (Engineering Mode Settings require the RUN/STOP transfer function to be set to STOP. When in PV/SV display, press the SET key for 1 second to show the operation mode. Press the MODE key several times to display the RUN/STOP screen. Use the arrow keys to change to STOP mode.)				

Further controller parameter settings are detailed in Appendix C, Refer to the Controller Instruction Manual in Appendix F.2 for display sequences associated with the controller parameters and settings.

4.4 REMOTE DISPLAY SETUP AND CALIBRATION

Two display units are used in the remote control panel to provide operator feedback. The displays read an output signal from the controllers in the main control panel. The displays are factory set to indicate the current chamber condition or Measured Value, PV. The readout may be calibrated for display range and offset to reflect the correct value as indicated on the controller display.

The following table details the remote display parameters for calibration:

MODE	PARAMETER DETAILS		PARAMETER EFFECT
Display Offset	OFSt	Display Offset	This value is displayed when the minimum signal is measured. Temperature set to -40, Humidity set to 0)
Display Span	SPAn	Display Span	This value plus the offset value is displayed when maximum signal is received. (Temperature is set to 120, Humidity is set to 100)
To set the parameters of the display press the 'Menu' button repeatedly until desired setting is reached. Press 'Select' to display the current value of the selected setting. The '+' and '–' buttons are used to change the value. 'Enter' will return the device to the main menu. The 'Back' button will exit the menu			

Refer to the remote Display Instruction Manual in Appendix F.3 for further parameter setting procedures.

The following table details the major controller parameters that would influence the calibration of the remote display:

MODE	FUNCTION BLOCK	PARAMETER DETAILS		PARAMETER EFFECT
Engineering Mode	F33	Ao	Transmission output type	This selects the type of output sent to the remote display (PV, SV, Error etc.)
Engineering Mode	F33	AHS	Transmission output scale high	This setting should correlate to the scale Maximum. (e.g. PV the maximum measured value form the temperature transmitter, 80°C)
Engineering Mode	F33	ALS	Transmission output scale low	This setting should correlate to the scale Minimum (e.g. PV the minimum measured value form the temperature transmitter, -40°C)
To enter the Engineering Mode, press the Shift (MODE) key for 2 seconds while pressing the SET key. Move to the required function block using the arrow keys. To page through the selected function block press the SET key. When at the correct parameter highlight the digit to be changed using the MODE key and use the arrow keys to change the highlighted digit. (Engineering Mode Settings require the RUN/STOP transfer function to be set to STOP. When in PV/SV display, press the SET key for 1 second to show the operation mode. Press the MODE key several times to display the RUN/STOP screen. Use the arrow keys to change to STOP mode.)				

Further controller parameter settings are detailed in Appendix C. Refer to the Controller Instruction Manual in Appendix F.3 for display sequences associated with the controller parameters and settings.

(Intentionally Blank)

CHAPTER 5 MAINTENANCE AND REPAIR

5.1 ROUTINE MAINTENANCE SCHEDULE

To ensure the continued operation of the CEC-3 unit within specification it is essential to monitor the system performance, conduct regular visual inspections while in service and schedule maintenance work based on observations. Thorough cleaning and visual inspections are recommended at intervals of at least 750 hours (1 month) of service. During inspection, check for signs of heat, physical or chemical damage to wiring insulation, seals or glands. In order to ensure that these inspections are conducted the following servicing schedule is provided as a guideline:

	**CAUTION**
	Only authorized, suitably qualified technicians should carry out maintenance and repair work to the equipment. **Disconnect external electrical power before proceeding with any cleaning, servicing or repair of the unit. Do not wet any electrical connections, the inside of the control panel or the remote controls.**

5.1.1 DAILY SERVICE AND INSPECTION

The daily service and inspection of the unit is used to monitor the system and identify potential faults. This is usually conducted during normal daily operations.

a. Check all pipe connections for leaks

b. Clean away any debris that may inhibit function of the valve actuators

c. Conduct visual inspection of the unit to identify any physical, chemical or thermal damage

d. If repair is required maintenance should be undertaken immediately. Refer to troubleshooting Chapter 6 for details outlining fault finding and corrective action.

e. Monitor the unit during service and ensure that it operates correctly and satisfactorily achieves the input set points.

5.1.2 SIX-MONTHLY SERVICE

The bi-annual service and inspection of the unit is used to recalibrate the unit and conduct service work on components at a convenient time. Refer to the spares list in Appendix B for part numbering and ordering details.

a. Check all pipe connections for leaks

b. Clean away any debris and carry out full cleaning of the unit

IMPORTANT
When cleaning the inside of the electrical control panel use a clean, dry air source to blow off all debris and dust. Use only clean, lint free cloth to wipe the inside of the electrical control box. Check all glands are tight following cleaning.

c. Conduct any maintenance, service or repair work that has been identified during the regular daily service inspections. Refer to troubleshooting Chapter 6 for details outlining fault finding and corrective action.

d. Conduct the remote control panel function check according to section 2.6.

e. Conduct the solenoid function check according to section 2.7.

f. Conduct the system start up and general function check according to section 2.8.

g. Check calibration of the unit as outlined in Chapter 4.

h. Monitor the unit following service and ensure that it operates correctly and satisfactorily achieves the input set points.

5.1.3 ANNUAL SERVICE

The annual service aims to conduct all tasks of the bi-annual service and in addition carrying out inspection of internal valve seats and valve function for preventative maintenance on the unit.

a. Pressure test all 3-way valves to check the valve seats

b. Pressure test all solenoid valves and check solenoid coils

c. Pressure test all check valves

d. Service or replace valves with worn valve seats

e. Carry out standard bi-annual service procedure

5.2 RECOMMENDED TOOLS AND SUPPLIES

In order to fully carry out all service and maintenance work technicians must be equipped with the relevant Imperial and Metric flat spanner sets, screwdrivers etc. It will also be necessary to have a calibrated thermometer and hygrometer to confirm the calibration of the system.

In order to reduce down time as a result of service and repair work, it is advised to keep spare parts for the system. The range or spare parts kept for the unit may vary and will be determined by application requirements. Divex recommendation is that a sufficient stock of spare parts is kept to conduct a full replacement of all serviceable components unless the installation provides for system redundancy via a backup system. Refer to the spares listing in Appendix B for ordering details of the recommended, available parts.

5.3 REMOVAL AND REPLACEMENT

No component should be removed or replaced until a complete understanding of overall system operation is achieved. Only parts specified by the manufacturer should be used as outlined in the spares listing in Appendix B. Data sheets for critical components are included in Appendix F.

Following the identification of faulty components through use of the troubleshooting procedures, parts should be replaced as soon as possible and a full bi-annual service conducted as outlined in section 5.1.

(Intentionally Blank)

CHAPTER 6 TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
No Heating/Cooling	No Supply from HCS	Check HCS function is within specification (Flow, temperatures set points etc.) Refer to HCS manual for fault-finding on the HCS unit. Check all pipework for leaks blockages.
	No valve action on CEC but good supply from HCS	See trouble shooting for no valve action
No Valve Action	No Power	Check power supply to the CEC. Check for tripped circuit breakers, blown fuses, and damaged wiring.
	Damaged valve seats	Remove the actuator from the valve. Check if valve may be rotated with a standard valve handle. Service or replace the valve.
	Faulty controller or connection	Check for blown fuses and damaged or loose wiring. Check continuity between controller and actuator. Check controller parameter settings have not been tampered with. Adjust remote set point or use the controller in manual mode to induce an MV output and check that this output is received by the actuator. Replace controller if faulty (Ensure new controllers are programmed according to the controller parameter settings outlined in Appendix C.)

PROBLEM	POSSIBLE CAUSE	SOLUTION
	Faulty actuator or connection	With the unit running manually rotate the actuator then release the handle. The actuator should return to the original position if it is functioning. Replace actuator if faulty.
No Remote Input	No power to remote panel	Check power supply to remote panel. Check continuity of connection between main and remote control panel. Check all panel fuses
	No signal from remote signal generators	Check if there is an output from the remote signal generator. Check continuity of connection between main & remote control panel. Replace signal generator if faulty
Indicated Remote Set Point Differs To The Controller Displayed SV	Calibration problem	Check output range of remote signal generator. If the range is correct recalibrate the knob on the signal generator by re-aligning it on the shaft.
	Controller parameters have been changed	Check the controller parameters relating to remote signal. Restore factory programmed controller settings, ()
Low Fluid Pressure	Leak in fluid return line plumbing	Shut down unit and check for leaks. Repair leaks, refill and prime system as required.
	Restriction in fluid output or return line	Clean all fluid return lines. Check for dented, crushed or otherwise restricted plumbing. Remove and replace / repair as necessary.
Temperature or Humidity Displays Off-Scale Readings	Open circuit in sensor wiring	Trace wiring and repair.

PROBLEM	POSSIBLE CAUSE	SOLUTION
	Faulty temperature transmitter	Replace the temperature transmitter. Temperature transmitter failure will cause loss of heating/cooling control. Without feedback for the temperature /humidity transmitter the CEC will have to be manually controlled. This may be done using the controllers in Manual mode to position the valves or with the power off using full manual control. (Temperature within the habitat will have to be closely monitored and appropriate changes to valve positions made until transmitter can be repaired.
	Faulty calibration	Recalibrate displays as outlined in Chapter 4.
	Electrical power to temperature transmitter faulty	Check Power supply to the temperature/humidity transmitter.
	Defective sensor	Check the continuity of all transmitter wiring. Check sensor for damage. Repair as necessary or replace.
	Defective temperature indicator	Replace temperature indicator.
Temperature or Humidity Indicator Won't Calibrate	Defective temperature Indicator	Replace temperature indicator.
Humidity Control Will Not Control	Incorrect controller settings	Check controller setup, PID parameters etc.
	Improper calibration	Check system calibration as outlined in Chapter 4.
	Defective wiring to sensor	Check Sensor wiring. Incorrect reading indicates faulty wiring. Replace/repair wiring and calibrate humidity control. Refer to Chapter 4 for calibration procedure.
Humidity Control Does Not Calibrate	Defective humidity transmitter	Replace transmitter.

PROBLEM	POSSIBLE CAUSE	SOLUTION
	Defective humidity controller	Check wiring for faults Check controller parameter settings are correct. Refer to Appendix C for controller parameter settings.
Reduced Performance Of The System (The HCU Does Not Cool Or Heat Effectively)	HCU blower inoperative.	Check HCU blower.
	Low or no fluid pressure.	Troubleshoot fluid supply from HCS.
	Temperature controller not properly calibrated.	Check the controller programming and calibrate the control parameters.
	Defective sensor wiring.	Check sensor wiring.
	No hot or cold water being supplied.	Check HCS operation.

APPENDIX A PART IDENTIFICATION

ITEM	DESCRIPTION	DIVEX PART NO	
		KI17056AC 320/440V	KI17056HA 220V
1	Temperature Controller	DO04796	
2	Cold Fluid Control Valve Actuator	DO03647	
3	Cold Fluid Control Valve - 1” NPT 3-Way T-Port S/S	DO05865	
4	Cold Fluid Manifold Block	DO03498	
5	Humidity Control Valve Actuator	DO03647	
6	Humidity Fluid Manifold Block	DO03497	
7	Humidity Control Valve - 1” NPT 3-Way T-Port S/S	DO05865	
8	Cold Feed Shut Off Valve Solenoid NC 3/4 NPT 2/2way 24V	DO05895	
9	Valve Check Buna N Brass 3/4 Male	DO2259B-6MM	
10	Cold Return Shut Off Valve Solenoid NC 3/4 NPT 2/2way 24V	DO05895	
11	Hot Fluid Manifold Block	DO03496	
12	Humidity Controller	DO04797	
13	Isolator 25Amp 3 Pole Din Mount + Handle	DO04994 + DO02878	
14	Hot Fluid Control Valve Actuator	DO03647	
15	Hot Fluid Control Valve - 1” NPT 3-Way T-Port S/S	DO05865	
16	Valve Check Buna N Brass 3/4 Male	DO2259B-6MM	
17	Hot Return Shut Off Valve Solenoid NC 3/4 NPT 2/2way 24V	DO05895	
18	Hot Feed Shut Off Valve Solenoid NC 3/4 NPT 2/2way 24V	DO05895	
19	Valve Check Buna N Brass 3/4 Male	DO2259B-6MM	
20	Signal Generator Temperature TCL 0-10 V 24 VDC	DO04798	
21	Temperature Remote Display Indicator 0-20 mA 24VDC Supply	DO06034	
22	Humidity Remote Display Indicator 0-20 mA 24VDC Supply	DO06034	
23	Signal Generator Humidity TCL 4-8 V 24 VDC	DO04799	

Please contact us at sales@divexglobal.com if you are in doubt.

MODEL KI17056AC

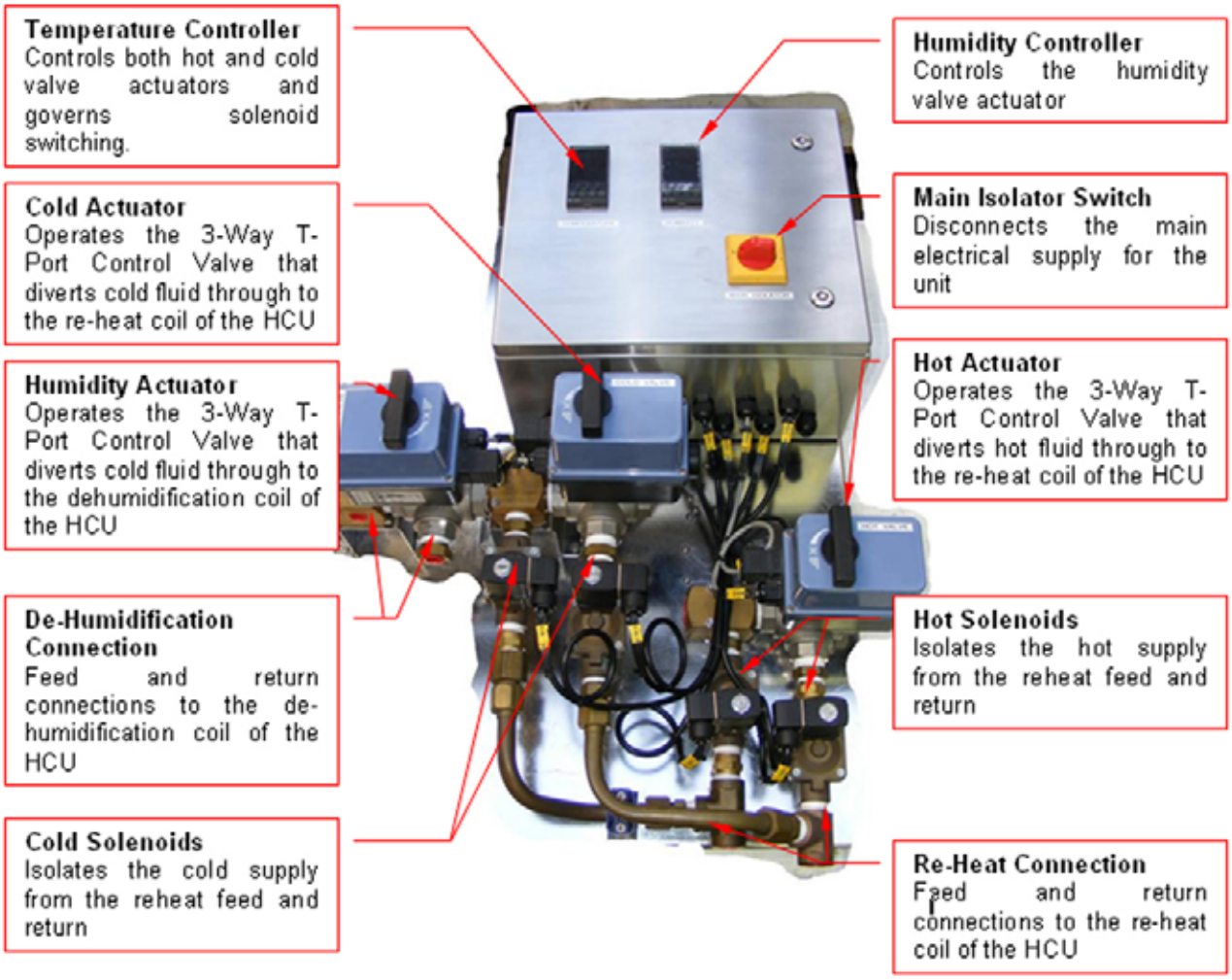


Fig A.1 General Assembly and Part Identification (AC model)

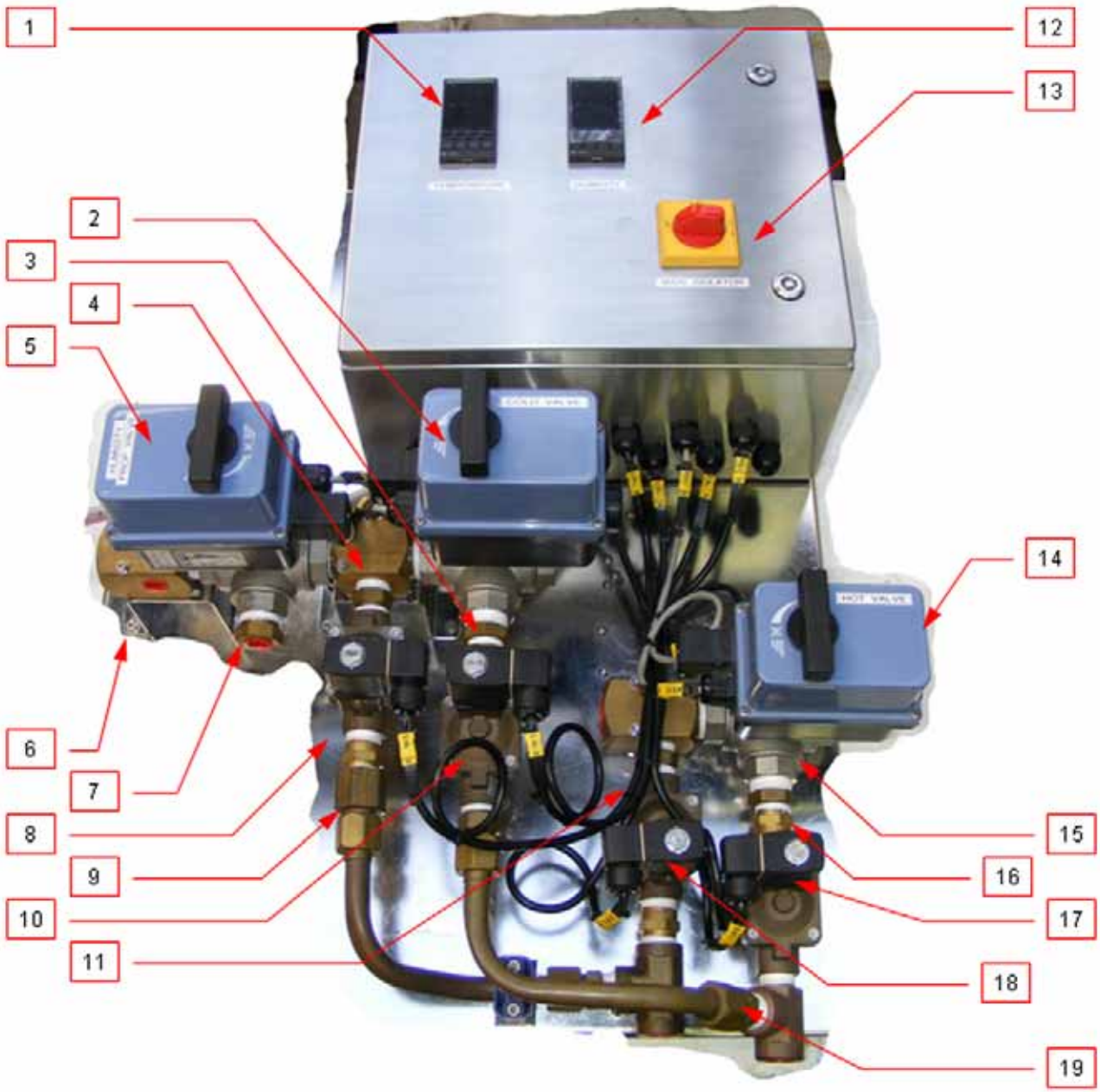


Fig A.2 General Assembly and Part Identification (AC model)

Fig A.3 Remote Control Panel

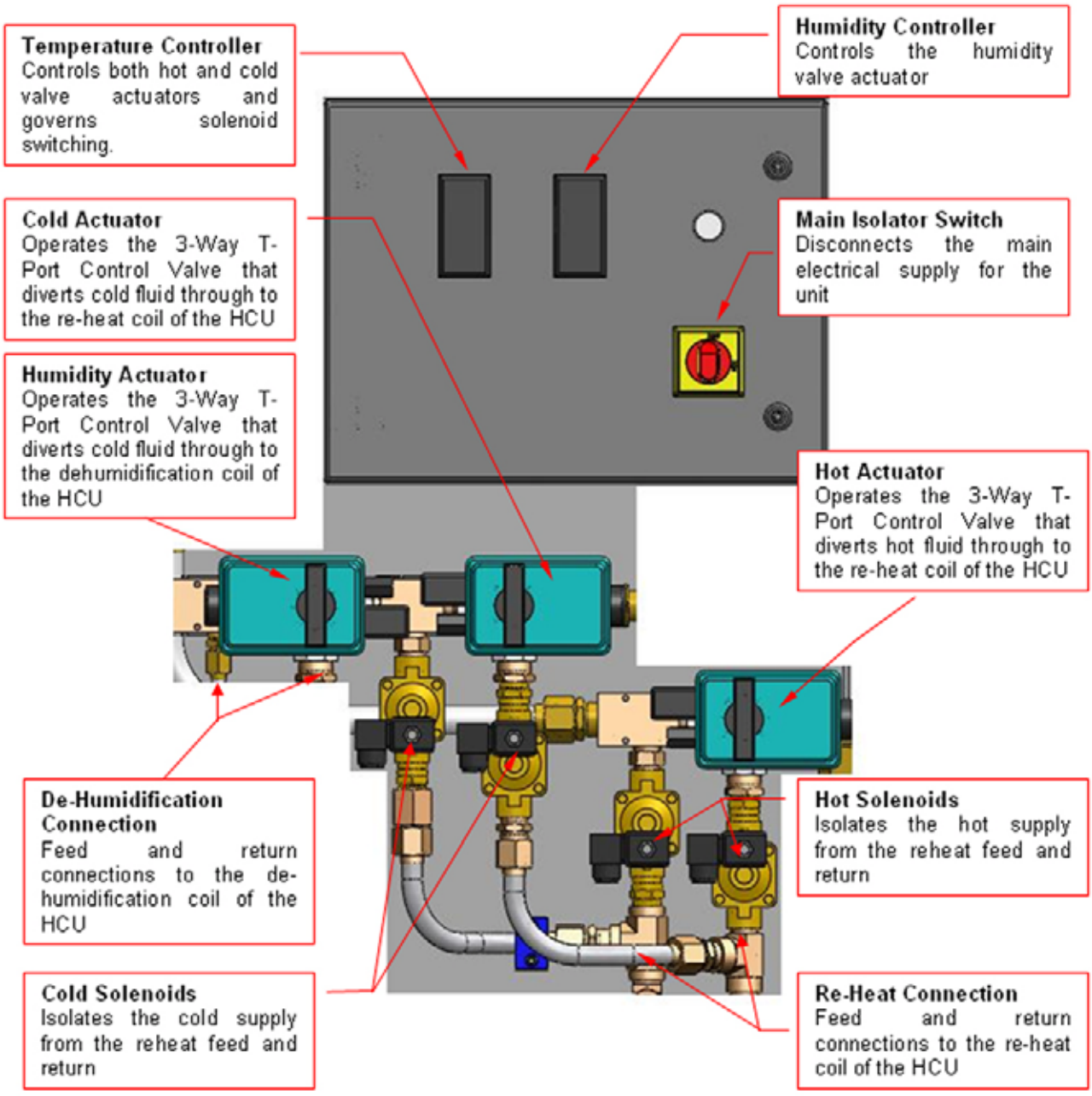


Fig A.4 General Assembly and Part Identification (HA model)

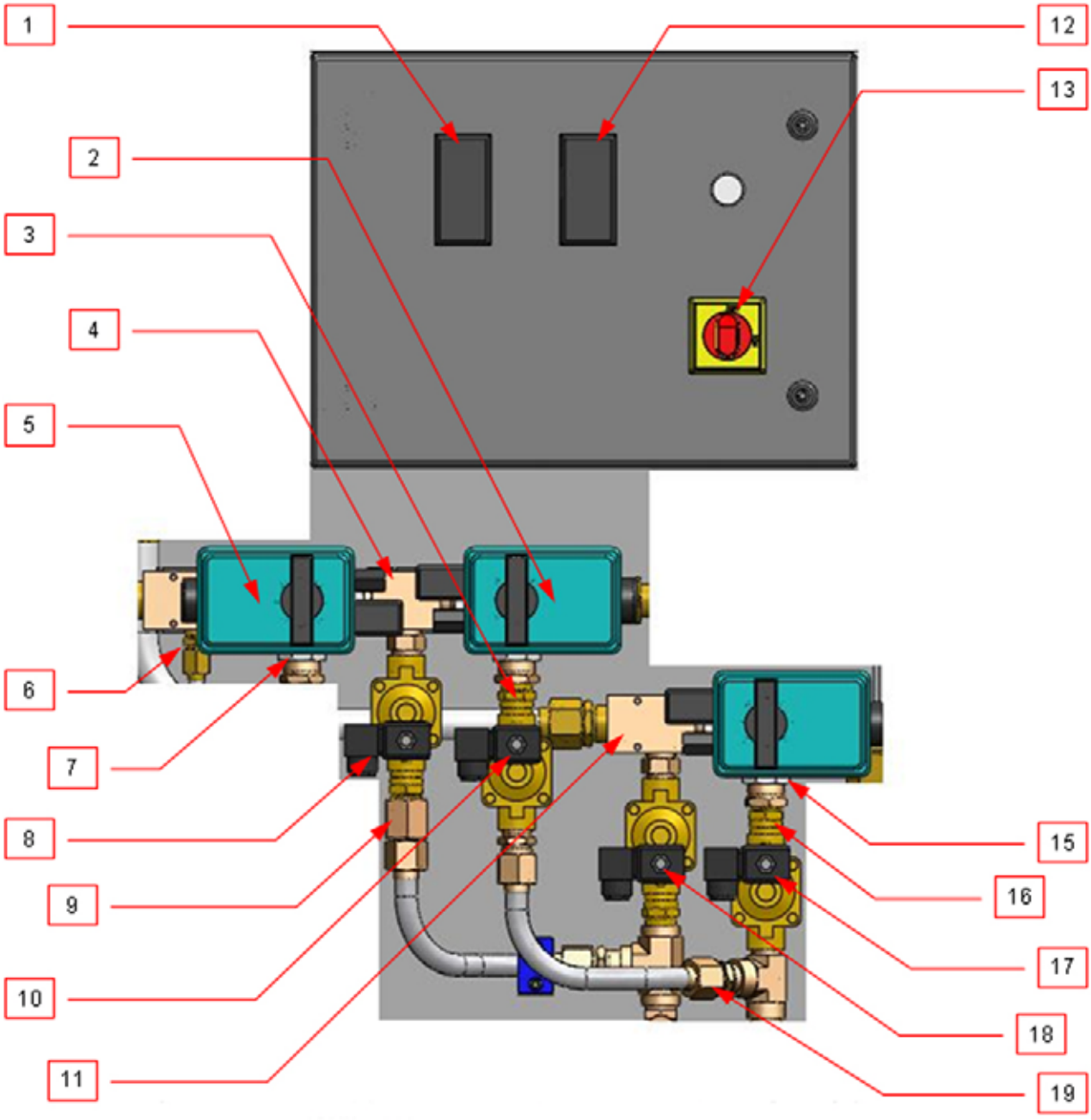


Fig A.5 General Assembly and Part Identification (HA model)

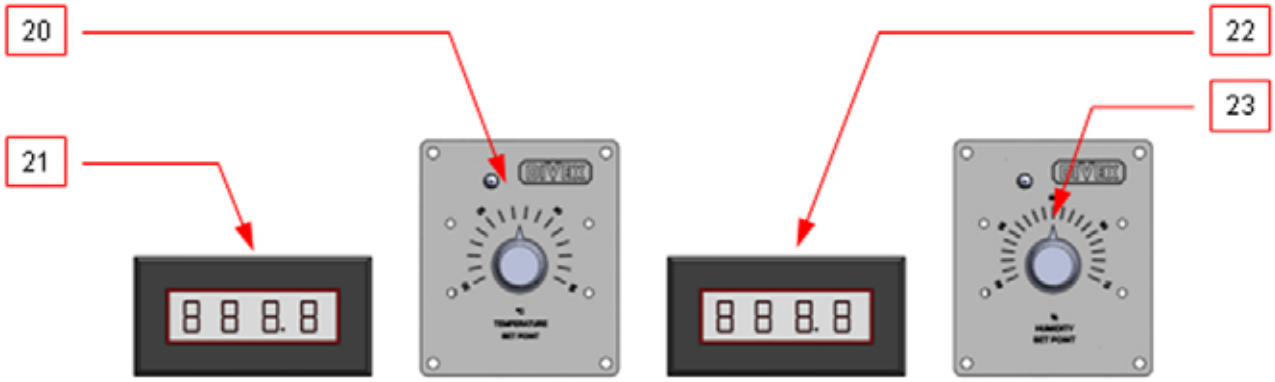


Fig A.6 Remote Control Panel

(Intentionally Blank)

APPENDIX B RECOMMENDED SPARE PARTS LIST & ACQUISITION FORM]

CEC Serial No:	**CEC / /**				
Request for: (mark appropriate)	Quotation & Delivery Details	YES	NO	Order Date:	DD / MM / YYYY
	Supply Based on Order No.	YES	NO	Order No:	

SPARES ACQUISITION SHEET

NOTE

Please attach full contact details to this sheet when placing orders and fill in required quantities in the table below before faxing or e-mailing this request to the nearest Divex office for attention.

DESCRIPTION	DIVEX MODEL NUMBER			
	KI17056AC	QTY	KI17059HA	QTY
Circuit Breaker 2P 6A C-Curve	DO04497		DO04497	
Circuit Breaker 2PH 2A 5kA Miniature	DO02882		DO02882	
Cold Fluid Manifold Block	DO03498		DO03498	
Fuse Anti-Surge 5x20mm 1Amp	DO04843		DO04843	
Hot Fluid Manifold Block	DO03496		DO03496	
Humidity Controller	DO04797		DO04797	
Humidity Fluid Manifold Block	DO03497		DO03497	
Isolator 25Amp 3 Pole Din Mount + Handle	DO04994 + DO02878		DO04994 + DO02878	
Power Supply 340-550V or 220V: 24VDC output	DO03904		EM793	
Relay 24 VDC 6 Amp Finder Slim-line	DO06093		DO06093	
Remote Display Indicator 0-20 mA 24VDC Supply	DO06034		DO06034	
Signal Generator Knob (Pointer, Shaft & Cap)	DO01364, DO01363, DO01362		DO01364, DO01363	
Signal Generator Temp. TCL 0-10 V 24 VDC	DO04798		DO04798	
Signal Generator Humidity TCL 4-8 V 24 VDC	DO04799		DO04799	
Temperature Controller	DO04796		DO04796	
Transmitter HG Temp 4-20mA Wall mount	DO05869		DO05869	
Valve Check Buna N Brass 3/4 Male	DO2259B-6MM		DO2259B-6MM	
Valve, Actuator	DO03647		DO03647	
Valve, Control - 1” NPT 3-Way T-Port S/S	DO05865		DO05865	
Valve, Solenoid NC 3/4 NPT 2/2way 24V	DO05895		DO05895	

APPENDIX C CONTROLLER PARAMETER SETTINGS

C.1 TEMPERATURE CONTROLLER PROGRAMME

To set the parameters of the display press the SET key for 2 seconds. Use the SET key to page through the function blocks. Use the shift (<) key to select the parameter to change. Change the setting using the arrow keys. Press the SET key to store the new value and move to the next function block.

TEMPERATURE CONTROLLER	PARAMETER SET MODE			
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
	EV1	Event 1 set value	26	Value at which event occurs
	EV2	Event 2 set value	26	Value at which event occurs
	EV3	Event 3 set value	50	Unused
	EV4	Event 4 set value	50	Unused
	LbA	Control loop break alarm	173	Unused
	Ldb	LBA deadband	0	Unused
	P	Proportional band (heat-side)	3.3	Set during AT
	I	Integral time (heat-side)	225	Set during AT
	D	Derivative time (heat-side)	56	Set during AT
	rPT	Control response parameter	2	
	Pc	Proportional band (cool-side)	3.3	Set during AT
	Ic	Integral time (cool-side)	225	Set during AT
	dc	Derivative time (cool-side)	56	Set during AT
	db	Overlap/Deadband	0	Overlap of hot/cold control
	Mr	Manual reset	0	Unused
	SVrU	Setting change rate limiter (up)	0 (off)	
	SVrd	Setting change rate limiter (down)	0 (off)	
	AST	Area soak time	0	
	LnKA	Link area number	0 (off)	

IMPORTANT
The values listed in the table above and those that follow are Divex factory settings for standard CEC-3 operation. If the auto tune function has been run or a competent technician has made adjustments, the values highlighted may change. Divex recommends that any manual changes to these parameters are only undertaken by fully trained and competent technicians.

To enter the Setup Setting Mode, press the Shift (MODE) key while pressing the SET key. Move through the parameters by pressing the SET key. Use the mode key to highlight a digit and use the arrow keys to change the highlighted digit.

TEMPERATURE CONTROLLER	SETUP SETTING MODE			
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
	HbA1	Heater break alarm 1 set point	0 (off)	Unused
	HbL1	Heater break alarm determination point 1	30	Unused
	HbH1	Heater melting determination point 1	30	Unused
	HbA2	Heater break alarm 2 set point	0 (off)	Unused
	HbL2	Heater break alarm determination point 2	30	Unused
	HbH2	Heater melting determination point 2	30	Unused
	Pb	PV Bias	0	Range/Sensitivity of PV scale
	dF	PV Digital filter	0 (off)	
	Pr	PV Ratio	1	Rotation of PV scale
	PLC	PV Low input cut-off	0	Unused
	Rb	RS Bias	17	Range/Sensitivity of RS scale (Increase=Increase of range)
	dF2	RS Digital filter	0 (off)	
	rr	RS Ratio	0.185	Rotation of RS scale (increase=anticlock)
	T	Proportional cycle time (heat-side)	20	Unused
	t	Proportional cycle time (cool-side)	20	Unused
	Add1	Device address 1	0	Unused
	bPS1	Communication Speed 1	19.2	Unused
	b1T1	Data bit configuration 1	8n1	Unused
	InT1	Interval time 1	10	Unused
	Add2	Device address 2	0	Unused
	bPS2	Communication Speed 2	19.2	Unused

TEMPERATURE CONTROLLER		SETUP SETTING MODE		
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
	b1T2	Data bit configuration 2	8n1	Unused
	InT2	Interval time 2	10	Unused
	LCK	Set lock level	0000	To lock functionality of keypad

To enter the Engineering Mode, press the Shift (MODE) key for 2 seconds while pressing the SET key. Move to the required function block using the arrow keys. To page through the selected function block press the SET key. When at the correct parameter highlight the digit to be changed using the MODE key and use the arrow keys to change the highlighted digit.

(Engineering Mode Settings require the RUN/STOP transfer function to be set to STOP. When in PV/SV display, press the SET key for 1 second to show the operation mode. Press the MODE key several times to display the RUN/STOP screen. Use the arrow keys to change to STOP mode.)

TEMPERATURE CONTROLLER	ENGINEERING MODE			
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
F10	SPCH	Stop display	1	
	dE	Bar graph display	1	
	dEUT	Bar graph display resolution	100	
	dSoP	PV Flashing display at input error	0	
F11	Fn1	Direct key 1	1	A/M Transfer Type 1 and 2
	Fn2	Direct key 2	1	Type 1 = MONI, Type 2 = R/L Transfer
	Fn3	Direct key 3	1	Type 1 = AREA, Type 2 = R/L RUN/STOP
	Fn	Direct key type	1	Selects the type of action of direct keys
F21	InP	Input type	15	Type of input device (transmitter) used
	UnIT	Display Unit	0	
	PGdP	Decimal point position	1	
	PGSH	Input scale high	80	High scale of input device
	PGSL	Input scale low	-40	Low scale of input device
	PoV	Input error determination point (high)	85	
	PUn	Input error determination (low)	-45	
	boS	Burnout direction	0	
	Sqr	Square root extraction	0	
	PFrq	Power supply frequency	0	
	SmP	Sampling cycle	1	
F22	R1nP	Remote setting input type	16	0 to 10V DC (Signal Generator)

TEMPERATURE CONTROLLER		ENGINEERING MODE		
FUNCTION BLOCK	**PARAMETER**		**SPEC. VALUE**	**DESCRIPTION**
	CODE	**DESCRIPTION**		
F23	dISL	Digital input (DI) assignment	1	
F30	LoGC	Output assignment	1	
	oTT1	Timer 1	0.0	
	oTT2	Timer 2	0.0	
	oTT3	Timer 3	0.0	
	oTT4	Timer 4	0.0	
	EXC	Energized/De-energized	0000	Status of DO1-4
	ALC1	Alarm (ALM) lamp lighting condition 1	0000	Lamp status of EV1-4
	ALC2	Alarm (ALM) lamp lighting condition 2	0011	Lamp status of HBA1 & 2
	SS	Output status at STOP mode	0010	
F33	Ao	Transmission output type	1	Selection of output to display (PV, MV, etc.)
	AHS	Transmission output scale high	80.0	High limit of output to display
	ALS	Transmission output scale low	-40.0	Low limit of output to display
F41	ES1	Event 1 type	10	MV1 High (Heat Side)
	Eho1	Event 1 hold action	0	Off
	EIL1	Event 1 interlock	0	Unused
	EH1	Event 1 differential gap	5	Prevents chattering of event output
	EVT1	Event 1 delay timer	5	Delay of action of event after trigger
	EEo1	Event 1 action at input error	0000	
F42	ES2	Event 2 type	12	MV1 High (Cool Side)
	Eho2	Event 2 hold action	0	Off
	EIL2	Event 2 interlock	0	Unused
	EH2	Event 2 differential gap	5	Prevents chattering of event output
	EVT2	Event 2 delay timer	5	Delay of action of event after trigger
	EEo2	Event 2 action at input error	0000	

TEMPERATURE CONTROLLER	ENGINEERING MODE			
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
F43	ES3	Event 3 type	0	Type of input used to trigger this event
	Eho3	Event 3 hold action	0	
	EIL3	Event 3 interlock	0	
	EH3	Event 3 differential gap	0.2	Prevents chattering of event output
	EVT3	Event 3 delay timer	0	Delay of action of event after trigger
	EEo3	Event 3 action at input error	0000	
F44	ES4	Event 4 type	0	Type of input used to trigger this event
	Eho4	Event 4 hold action	0	
	EIL4	Event 4 interlock	0	
	EH4	Event 4 differential gap	0.2	Prevents chattering of event output
	EVT4	Event 4 delay timer	0	Delay of action of event after trigger
	EEo4	Event 4 action at input error	0000	
F45	CTr1	CT1 ratio	800	
	CTA1	CT1 assignment	1	
	HbS1	Hearter break alarm 1 (HBA1) type	1	
	HbC1	Number of heater break alarm 1 (HBA1) delay times	5	
F46	CTr2	CT2 ratio	800	
	CTA2	CT2 assignment	0	
	HbS2	Hearter break alarm 2 (HBA2) type	1	
	HbC2	Number of heater break alarm 2 (HBA2) delay times	5	
F50	Pd	Hot/Cold start	0	Hot start 1
	PdA	Start determination point	3.6	
	CAM	External input type	0	
	MCH	Master channel selection	0	
	TrK	SV tracking	1	Used
	MVTS	MV Transfer function	0	
	PVTS	PV Transfer function	0	Unused

TEMPERATURE CONTROLLER	ENGINEERING MODE			
FUNCTION BLOCK	**PARAMETER**		**SPEC. VALUE**	**DESCRIPTION**
	CODE	**DESCRIPTION**		
F51	oS	Control action	3	Direct, reverse, heat/cool water, air etc.
	IddP	Integral/derivative time decimal point position	0	
	dGA	Derivative gain	6.0	
	oHH	ON/OFF action differential gap (upper)	1.0	
	oHL	ON/OFF action differential gap (lower)	1.0	
	AoVE	Action (high) at input error	0	
	AUnE	Action (low) at input error	0	
	PSM	Manipulated output value at input error	0.0	
	rMV1	Manipulated output value (MV1) at STOP mode	-5.0	
	rMV2	Manipulated output value (MV2) at STOP mode	-5.0	
	orU	Output change rate limiter (up) [MV1]	0.0	
	ord	Output change rate limiter (down) [MV1]	0.0	
	oLH	Output limiter (high) [MV1]	80	Limits the max. opening angle of actuator 1
	oLL	Output limiter (low) [MV1]	20	Limits the min. opening angle of actuator 1
	orU2	Output change rate limiter (up) [MV2]	0.0	
	Ord2	Output change rate limiter (down) [MV2]	0.0	
	oLH2	Output limiter (high) [MV2]	80	Limits the max. opening angle of actuator 2
	oLL2	Output limiter (low) [MV2]	20	Limits the min. opening angle of actuator 2
	PFF	Power feed forward selection	0	
	PFFS	Power feed forward gain	3.00	
	dTP	Derivative term operating factor	0	Measured value Derivative
	US	Undershot suppression factor	0.250	Set offset AT point from SV to stop overshoot during AT
F52	ATb	AT Bias	0.0	Offset

TEMPERATURE CONTROLLER	ENGINEERING MODE			
FUNCTION BLOCK	**PARAMETER**		**SPEC. VALUE**	**DESCRIPTION**
	CODE	**DESCRIPTION**		
	ATC	AT cycles	2	0=1.5, 1=2, 2=2.5, 3=3 cycles
	ATH	AT differential gap time	10.0	
	Aton	Output value with AT turned on	105.0	
	AToF	Output value with AT turned off	-105.0	
	PLH	Proportional band limiter (high) [heat-side]	100	
	PLL	Proportional band limiter (low) [heat-side]	0	
	ILH	Integral time limiter (high) [heat-side]	3600	
	ILL	Integral time limiter (low) [heat-side]	0	
	DLH	Derivative time limiter (high) [heat-side]	3600	
	DLL	Derivative time limiter (low) [heat-side]	0	
	PcLH	Proportional band limiter (high) [cool-side]	100	
	PcLL	Proportional band limiter (low) [cool-side]	0.1	
	IcLH	Integral time limiter (high) [cool-side]	3600	
	IcLL	Integral time limiter (low) [cool-side]	0	
	DcLH	Derivative time limiter (high) [cool-side]	3600	
	DcLL	Derivative time limiter (low) [cool-side]	0	
	PAJ	Proportional band adjustment factor [heat-side]	1.00	
	IAJ	Integral time adjusting factor [heat-side]	1.00	
	dAJ	Derivative time limiter (low) [cool-side]	1.00	
	PcAJ	Proportional band adjusting factor [cool-side]	1.00	
	IcAJ	Integral time adjusting factor [cool-side]	1.00	
	dcAJ	Derivative time adjusting factor [cool-side]	1.00	

TEMPERATURE CONTROLLER		ENGINEERING MODE		
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
F53	Ydb	Open/Close output neutral zone	0.1	
	YHS	Open/Close output differential gap	0.1	
	Ybr	Action at feedback resistance (FBR) input error	0	
	PoS	Feedback adjustment preparation	AdJ	
	MoT	Control motor time	10	
	oLA	Integrated output limiter	150.0	
	VAL	Valve action at STOP	0	
F54	STS	ST Start condition	0	
	STPK	ST Proportional band adjusting factor	1	
	STIK	ST Integral time adjusting factor	1	
	STdK	ST Derivative time adjusting factor	1	
F55	CHcG	Automatic temperature rise group	0	
	rSG	RUN/STOP group	0	
	CHrd	Automatic temperature rise dead time	10.0	
	CHrT	Automatic temperature rise gradient data	1.0	
F60	CMP1	Communication protocol 1	0	
	CMP2	Communication protocol 2	2	
F70	SVrT	Setting change rate limiter unit time	60	
	STdP	Soak time unit	1	
F71	SLH	Setting limiter (high)	35	Sets the value at max input from signal generator
	SLL	Setting limiter (low)	20	Sets the value at min input from signal generator
F91	C277	ROM version monitor	-28	
	WT	Integrated operating time monitor	0	
	TCJ	Holding peak value ambient temperature monitor	25.8	
	HEAT	Power feed forward input value monitor	0.0	

C.2 HUMIDITY CONTROLLER PROGRAMME

To set the parameters of the display press the SET key for 2 seconds. Use the SET key to page through the function blocks. Use the shift (<) key to select the parameter to change. Change the setting using the arrow keys. Press the SET key to store the new value and move to the next function block.

HUMIDITY CONTROLLER	PARAMETER MODE			
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
	EV1	Event 1 set value	13	Value at which event occurs
	EV2	Event 2 set value	13	Value at which event occurs
	EV3	Event 3 set value	50	Unused
	EV4	Event 4 set value	50	Unused
	LbA	Control loop break alarm	173	Unused
	Ldb	LBA deadband	0	Unused
	P	Proportional band (heat-side)	30	Set during AT
	I	Integral time (heat-side)	240	Set during AT
	d	Derivative time (heat-side)	0 (off)	Set during AT
	rPT	Control response parameter	2	
	Pc	Proportional band (cool-side)	80	Set during AT
	Ic	Integral time (cool-side)	87	Set during AT
	dc	Derivative time (cool-side)	22	Set during AT
	db	Overlap/Deadband	0	Overlap of hot/cold control
	Mr	Manual reset	0	Unused
	SVrU	Setting change rate limiter (up)	0 (off)	
	SVrd	Setting change rate limiter (down)	0 (off)	
	AST	Area soak time	0	
	LnKA	Link area number	0 (off)	

To enter the Setup Setting Mode, press the Shift (MODE) key while pressing the SET key. Move through the parameters by pressing the SET key. Use the mode key to highlight a digit and use the arrow keys to change the highlighted digit.

HUMIDITY CONTROLLER	SETUP SETTING MODE			
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
	HbA1	Heater break alarm 1 set point	0 (off)	Unused
	HbL1	Heater break alarm determination point 1	30	Unused
	HbH1	Heater melting determination point 1	30	Unused
	HbA2	Heater break alarm 2 set point	0 (off)	Unused
	HbL2	Heater break alarm determination point 2	30	Unused
	HbH2	Heater melting determination point 2	30	Unused
	Pb	PV Bias	0	Range/Sensitivity of PV scale
	dF	PV Digital filter	0 (off)	Rotation of PV scale
	Pr	PV Ratio	1	
	PLC	PV Low input cut-off	0	Unused
	rb	RS Bias	41	Range/Sensitivity of RS scale (Increase=Increase of range)
	dF2	RS Digital filter	0 (off)	
	rr	RS Ratio	0.307	Rotation of RS scale (increase=anticlock)
	T	Proportional cycle time (heat-side)	20	Unused
	t	Proportional cycle time (cool-side)	20	Unused
	Add1	Device address 1	0	Unused
	bPS1	Communication Speed 1	19.2	Unused
	b1T1	Data bit configuration 1	8n1	Unused
	InT1	Interval time 1	10	Unused
	Add2	Device address 2	0	Unused
	bPS2	Communication Speed 2	19.2	Unused
	b1T2	Data bit configuration 2	8n1	Unused
	InT2	Interval time 2	10	Unused
	LCK	Set lock level	0000	To lock functionality of keypad

To enter the Engineering Mode, press the Shift (MODE) key for 2 seconds while pressing the SET key. Move to the required function block using the arrow keys. To page through the selected function block press the SET key. When at the correct parameter highlight the digit to be changed using the MODE key and use the arrow keys to change the highlighted digit.

(Engineering Mode Settings require the RUN/STOP transfer function to be set to STOP. When in PV/SV display, press the SET key for 1 second to show the operation mode. Press the MODE key several times to display the RUN/STOP screen. Use the arrow keys to change to STOP mode.)

HUMIDITY CONTROLLER	ENGINEERING MODE			
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
F10	SPCH	Stop display	1	
	dE	Bar graph display	1	
	dEUT	Bar graph display resolution	100	
	dSoP	PV Flashing display at input error	0	
F11	Fn1	Direct key 1	1	A/M Transfer Type 1 and 2
	Fn2	Direct key 2	1	Type 1 = MONI, Type 2 = R/L Transfer
	Fn3	Direct key 3	1	Type 1 = AREA, Type 2 = R/L RUN/STOP
	Fn	Direct key type	1	Selects the type of action of direct keys
F21	InP	Input type	15	Type of input device (transmitter) used
	UnIT	Display Unit	0	
	PGdP	Decimal point position	1	
	PGSH	Input scale high	100	High scale of input device
	PGSL	Input scale low	0	Low scale of input device
	PoV	Input error determination point (high)	105	
	PUn	Input error determination (low)	0	
	boS	Burnout direction	0	
	Sqr	Square root extraction	0	
	PFrq	Power supply frequency	0	
	SmP	Sampling cycle	1	
F22	R1nP	Remote setting input type	16	0 to 10V DC (Signal Generator)
F23	dISL	Digital input (DI) assignment	1	

HUMIDITY CONTROLLER	ENGINEERING MODE			
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
F30	LoGC	Output assignment	1	
	oTT1	Timer 1	0.0	
	oTT2	Timer 2	0.0	
	oTT3	Timer 3	0.0	
	oTT4	Timer 4	0.0	
	EXC	Energized/De-energized	0000	Status of DO1-4
	ALC1	Alarm (ALM) lamp lighting condition 1	0000	Lamp status of EV1-4
	ALC2	Alarm (ALM) lamp lighting condition 2	0011	Lamp status of HBA1 & 2
	SS	Output status at STOP mode	0010	
F33	Ao	Transmission output type	1	Selection of output to display (PV, MV, etc.)
	AHS	Transmission output scale high	100.0	High limit of output to display
	ALS	Transmission output scale low	0.0	Low limit of output to display
F41	ES1	Event 1 type	0	MV1 High (Heat Side)
	Eho1	Event 1 hold action	0	Off
	EIL1	Event 1 interlock	0	Unused
	EH1	Event 1 differential gap	0.2	Prevents chattering of event output
	EVT1	Event 1 delay timer	0	Delay of action of event after trigger
	EEo1	Event 1 action at input error	0000	
F42	ES2	Event 2 type	0	MV1 High (Cool Side)
	Eho2	Event 2 hold action	0	Off
	EIL2	Event 2 interlock	0	Unused
	EH2	Event 2 differential gap	0.2	Prevents chattering of event output
	EVT2	Event 2 delay timer	0	Delay of action of event after trigger
	EEo2	Event 2 action at input error	0000	
F43	ES3	Event 3 type	0	Type of input used to trigger this event
	Eho3	Event 3 hold action	0	
	EIL3	Event 3 interlock	0	
	EH3	Event 3 differential gap	0.2	Prevents chattering of event output

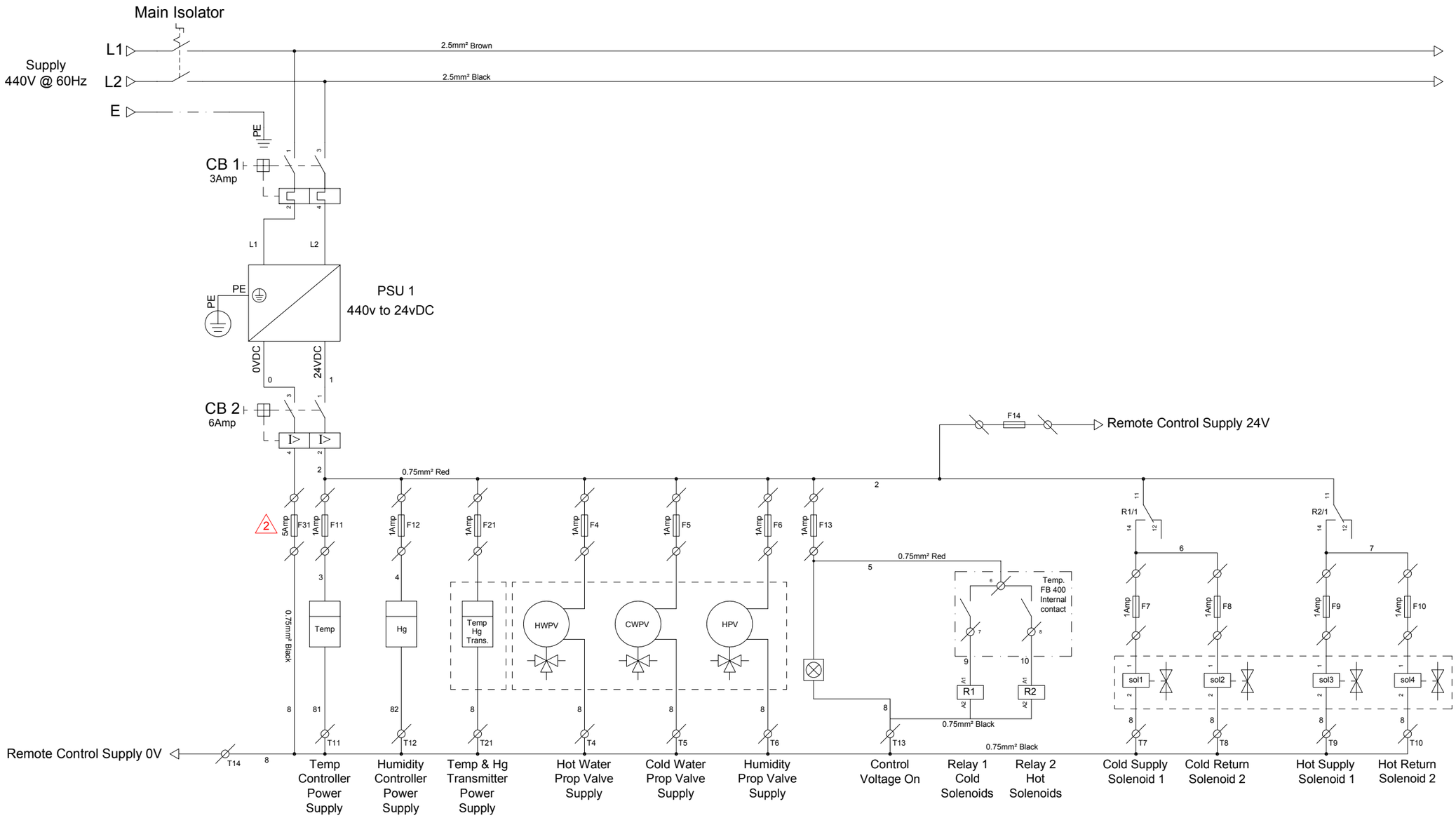
HUMIDITY CONTROLLER		ENGINEERING MODE		
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
	EVT3	Event 3 delay timer	0	Delay of action of event after trigger
	EEo3	Event 3 action at input error	0000	
F44	ES4	Event 4 type	0	Type of input used to trigger this event
	Eho4	Event 4 hold action	0	
	EIL4	Event 4 interlock	0	
	EH4	Event 4 differential gap	0.2	Prevents chattering of event output
	EVT4	Event 4 delay timer	0	Delay of action of event after trigger
	EEo4	Event 4 action at input error	0000	
F45	CTr1	CT1 ratio	800	
	CTA1	CT1 assignment	1	
	HbS1	Hearter break alarm 1 (HBA1) type	1	
	HbC1	Number of heater break alarm 1 (HBA1) delay times	5	
F46	CTr2	CT2 ratio	800	
	CTA2	CT2 assignment	0	
	HbS2	Hearter break alarm 2 (HBA2) type	1	
	HbC2	Number of heater break alarm 2 (HBA2) delay times	5	
F50	Pd	Hot/Cold start	0	Hot start 1
	PdA	Start determination point	3.0	
	CAM	External input type	0	
	MCH	Master channel selection	0	
	TrK	SV tracking	1	Used
	MVTS	MV Transfer function	0	
	PVTS	PV Transfer function	0	Unused
F51	oS	Control action	0	Direct, reverse, heat/cool water, air etc.
	IddP	Integral/derivative time decimal point position	0	
	dGA	Derivative gain	6.0	

HUMIDITY CONTROLLER	ENGINEERING MODE			
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
	oHH	ON/OFF action differential gap (upper)	0.1	
	oHL	ON/OFF action differential gap (lower)	0.1	
	AoVE	Action (high) at input error	0	
	AUnE	Action (low) at input error	0	
	PSM	Manipulated output value at input error	0.0	
	rMV1	Manipulated output value (MV1) at STOP mode	0	
	rMV2	Manipulated output value (MV2) at STOP mode	0	
	orU	Output change rate limiter (up) [MV1]	0.0	
	ord	Output change rate limiter (down) [MV1]	0.0	
	oLH	Output limiter (high) [MV1]	80	Limits the max. opening angle of actuator
	oLL	Output limiter (low) [MV1]	20	Limits the min. opening angle of actuator
	orU2	Output change rate limiter (up) [MV2]	0.0	
	Ord2	Output change rate limiter (down) [MV2]	0.0	
	oLH2	Output limiter (high) [MV2]	100	Limits the max. opening angle of actuator
	oLL2	Output limiter (low) [MV2]	0	Limits the min. opening angle of actuator
	PFF	Power feed forward selection	0	
	PFFS	Power feed forward gain	3.00	
	dTP	Derivative term operating factor	0	Measured value Derivative
	US	Undershot suppression factor	1	Set offset AT point from SV to stop overshoot during AT
F52	ATb	AT Bias	0.0	Offset
	ATC	AT cycles	1	0=1.5, 1=2, 2=2.5, 3=3 cycles
	ATH	AT differential gap time	10.0	
	Aton	Output value with AT turned on	105.0	
	AToF	Output value with AT turned off	-105.0	

HUMIDITY CONTROLLER	ENGINEERING MODE			
FUNCTION BLOCK	**PARAMETER**		**SPEC. VALUE**	**DESCRIPTION**
	CODE	**DESCRIPTION**		
	PLH	Proportional band limiter (high) [heat-side]	100	
	PLL	Proportional band limiter (low) [heat-side]	0	
	ILH	Integral time limiter (high) [heat-side]	3600	
	ILL	Integral time limiter (low) [heat-side]	0	
	DLH	Derivative time limiter (high) [heat-side]	3600	
	DLL	Derivative time limiter (low) [heat-side]	0	
	PcLH	Proportional band limiter (high) [cool-side]	100	
	PcLL	Proportional band limiter (low) [cool-side]	0.1	
	IcLH	Integral time limiter (high) [cool-side]	3600	
	IcLL	Integral time limiter (low) [cool-side]	0	
	DcLH	Derivative time limiter (high) [cool-side]	3600	
	DcLL	Derivative time limiter (low) [cool-side]	0	
	PAJ	Proportional band adjustment factor [heat-side]	1.00	
	IAJ	Integral time adjusting factor [heat-side]	1.00	
	dAJ	Derivative time limiter (low) [cool-side]	1.00	
	PcAJ	Proportional band adjusting factor [cool-side]	1.00	
	IcAJ	Integral time adjusting factor [cool-side]	1.00	
	dcAJ	Derivative time adjusting factor [cool-side]	1.00	
F53	Ydb	Open/Close output neutral zone	0.1	
	YHS	Open/Close output differential gap	0.1	
	Ybr	Action at feedback resistance (FBR) input error	0	

HUMIDITY CONTROLLER	ENGINEERING MODE			
FUNCTION BLOCK	PARAMETER		SPEC. VALUE	DESCRIPTION
	CODE	DESCRIPTION		
	PoS	Feedback adjustment preparation	AdJ	
	MoT	Control motor time	10	
	oLA	Integrated output limiter	150.0	
	VAL	Valve action at STOP	0	
F54	STS	ST Start condition	0	
	STPK	ST Proportional band adjusting factor	1	
	STIK	ST Integral time adjusting factor	1	
	STdK	ST Derivative time adjusting factor	1	
F55	CHcG	Automatic temperature rise group	0	
	rSG	RUN/STOP group	0	
	CHrd	Automatic temperature rise dead time	10.0	
	CHrT	Automatic temperature rise gradient data	1.0	
F60	CMP1	Communication protocol 1	0	
	CMP2	Communication protocol 2	2	
F70	SVrT	Setting change rate limiter unit time	60	
	STdP	Soak time unit	1	
F71	SLH	Setting limiter (high)	70	Sets the value at max input from signal generator
	SLL	Setting limiter (low)	50	Sets the value at min input from signal generator
F91	C277	ROM version monitor	-28	
	WT	Integrated operating time monitor	119	
	TCJ	Holding peak value ambient temperature monitor	120	
	HEAT	Power feed forward input value monitor	0.0	

APPENDIX D ELECTRICAL SCHEMATICS



NOTES

2 DENOTES CHANGES MADE AT THIS REVISION

ALL DIMENSIONS SHOWN ARE IN MM (UOS)

ALL DIMENSIONS BEFORE PLATING (UOS)

REMOVE ALL SHARP EDGES AND BURRS

DIMENSIONAL TOLERANCES

MACHINING		FABRICATION	
NO DECIMAL PLACES	±1.0	SIZE >0 <100	±0.5
ONE DECIMAL PLACE	±0.2	SIZE >100 <500	±1.5
TWO DECIMAL PLACE	±0.05	SIZE >500	±3.0
ANGULAR TOLERANCE	±0.5°	ANGULAR TOLERANCE	±0.5°

MATERIAL: N/A

FINISH: N/A

THIRD ANGLE PROJECTION

REV	DESCRIPTION	ECN No	BY	DATE	AUTH. BY
R06					
R05					
R04					
R03					
R02	FUSES ADDED	15120	MJ	07/01/13	SC
R01	UPDATED AS PER ECN	CT000253	RC	07/09/09	RF
R00	ISSUED FOR MANUFACTURE		DH	15/07/09	NM

DO NOT SCALE DRAWING

TITLE: CONTROL CIRCUIT FOR CONTROLLERS, PROP VALVES, SOL VALVES, RELAYS AND LEDS

CAD REF/DRG No.: DO5927S3

REV: R02

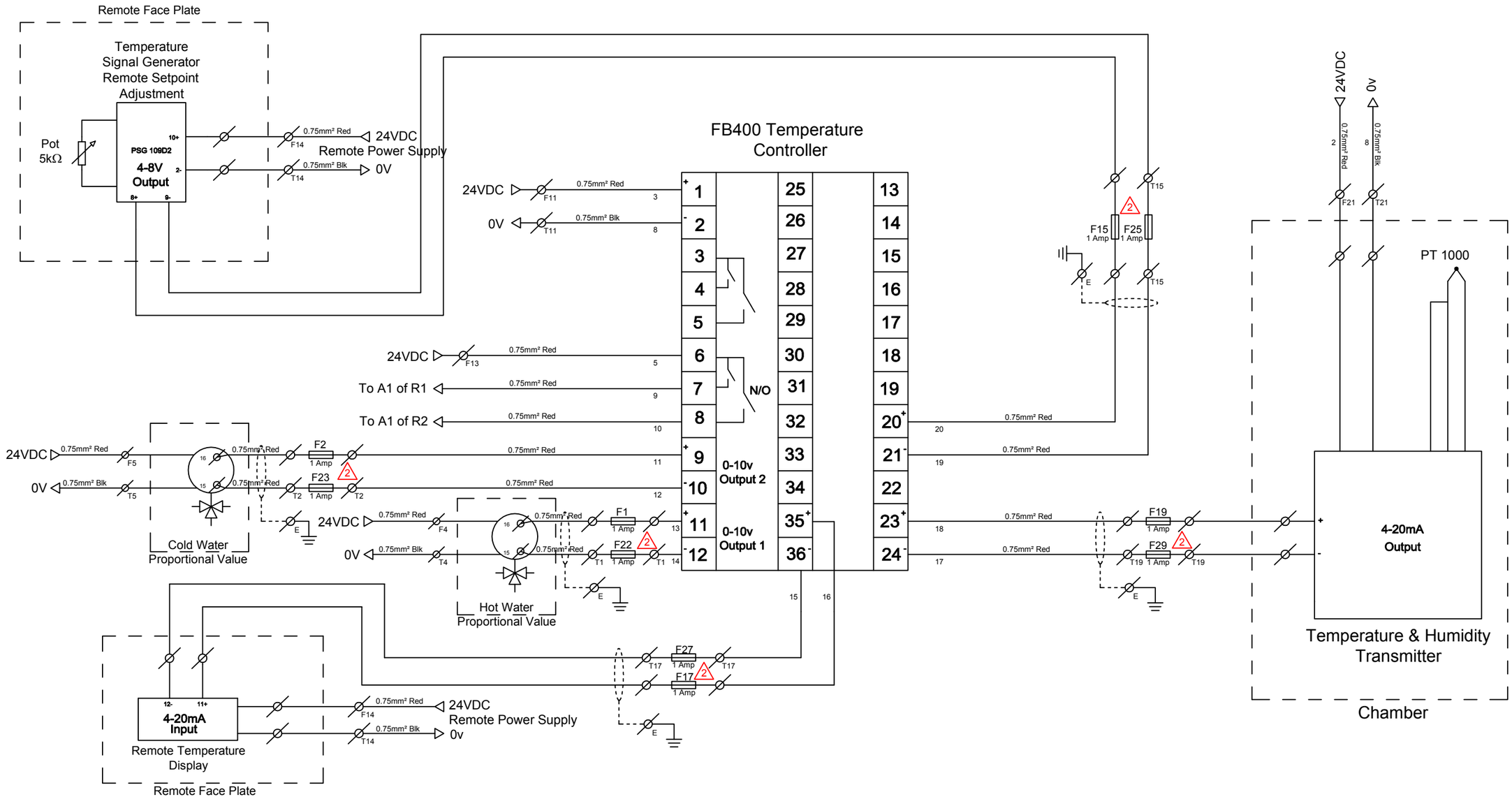
PART No.: 05927

PRODUCT / PROJECT No.: CEC-3

SIZE: A3 SCALE: NTS SHT: 3 OF: 5

DIVEX LIMITED
ENTERPRISE DRIVE
WESTHILL
ABERDEEN
AB32 6TQ
UNITED KINGDOM

Tel : +44(0)1224 740145
Fax : +44(0)1224 740172
email : info@divexglobal.com
www.divexglobal.com



NOTES

2 DENOTES CHANGES MADE AT THIS REVISION

ALL DIMENSIONS SHOWN ARE IN MM (UOS)
ALL DIMENSIONS BEFORE PLATING (UOS)
REMOVE ALL SHARP EDGES AND BURRS

DIMENSIONAL TOLERANCES

MACHINING		FABRICATION	
NO DECIMAL PLACES	±1.0	SIZE >0 <100	±0.5
ONE DECIMAL PLACE	±0.2	SIZE >100 <500	±1.5
TWO DECIMAL PLACE	±0.05	SIZE >500	±3.0
ANGULAR TOLERANCE	±0.5°	ANGULAR TOLERANCE	±0.5°

MATERIAL: N/A

FINISH: N/A

THIRD ANGLE PROJECTION

REV	DESCRIPTION	ECN No	BY	DATE	AUTH. BY
R06					
R05					
R04					
R03					
R02	FUSES ADDED	15120	MJ	07/01/13	SC
R01	UPDATED AS PER ECN	CT000253	RC	07/09/09	RF
R00	ISSUED FOR MANUFACTURE		DH	15/07/09	NM

DO NOT SCALE DRAWING

TITLE: TEMPERATURE CONTROLLER AND REMOTES

CAD REF/DRG No.: DO5927S4

REV: R02

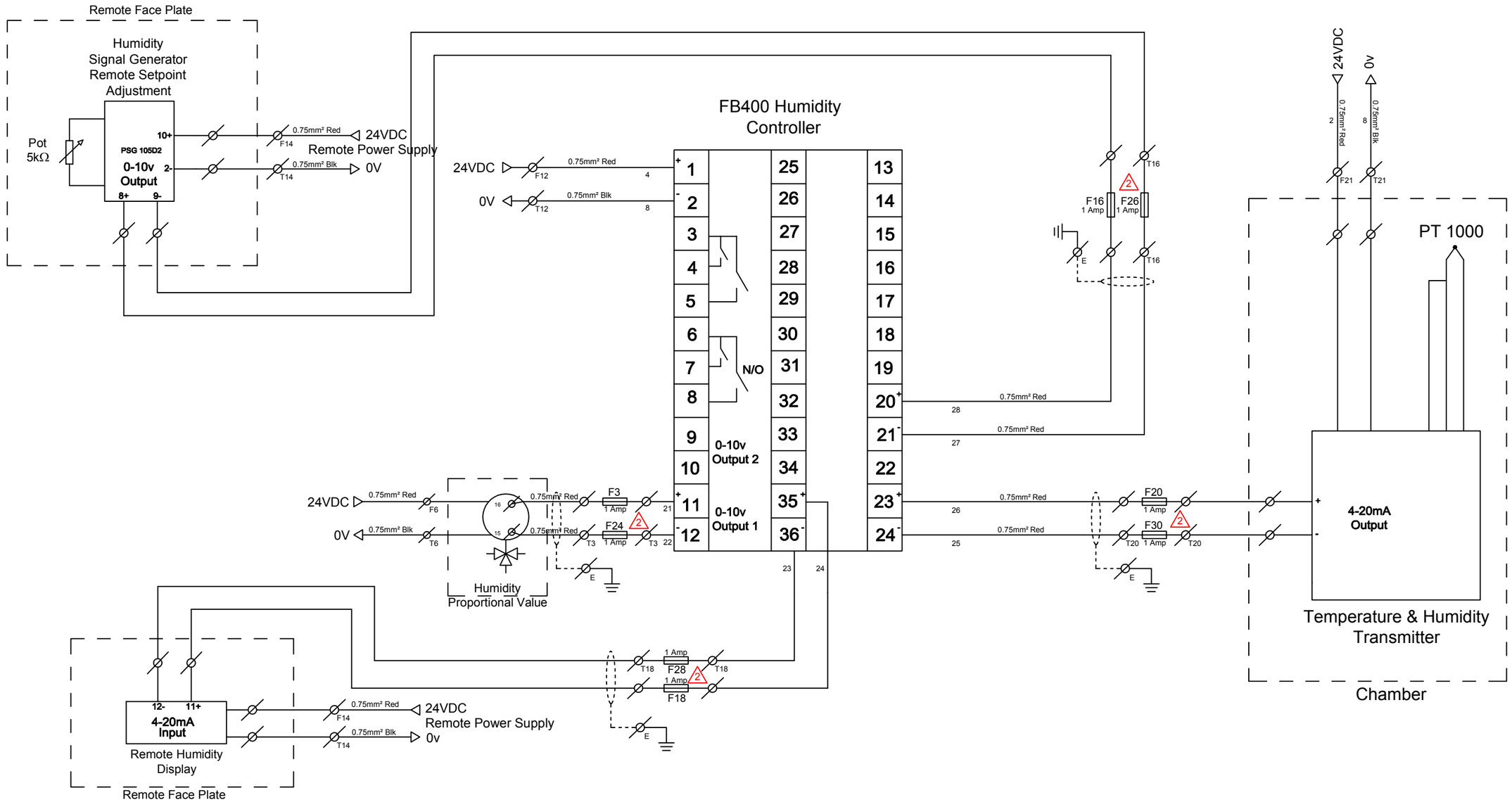
PART No.: 05927

PRODUCT / PROJECT No.: CEC-3

SIZE: A3 | SCALE: NTS | SHT 4 OF 5

DIVEX LIMITED
ENTERPRISE DRIVE
WESTHILL
ABERDEEN
AB32 6TQ
UNITED KINGDOM

Tel : +44(0)1224 740145
Fax : +44(0)1224 740172
email : info@divexglobal.com
www.divexglobal.com



NOTES

2 DENOTES CHANGES MADE AT THIS REVISION

ALL DIMENSIONS SHOWN ARE IN MM (UOS)

ALL DIMENSIONS BEFORE PLATING (UOS)

REMOVE ALL SHARP EDGES AND BURRS

DIMENSIONAL TOLERANCES

MACHINING		FABRICATION	
NO DECIMAL PLACES	±1.0	SIZE >0 <100	±0.5
ONE DECIMAL PLACE	±0.2	SIZE >100 <500	±1.5
TWO DECIMAL PLACE	±0.05	SIZE >500	±3.0
ANGULAR TOLERANCE	±0.5°	ANGULAR TOLERANCE	±0.5°

MATERIAL: N/A

FINISH: N/A

THIRD ANGLE PROJECTION

REV	DESCRIPTION	ECN No	BY	DATE	AUTH. BY
R06					
R05					
R04					
R03					
R02	FUSES ADDED	15120	MJ	07/01/13	SC
R01	UPDATED AS PER ECN	CT000253	RC	07/09/09	RF
R00	ISSUED FOR MANUFACTURE		DH	15/07/09	NM

DO NOT SCALE DRAWING

TITLE: HUMIDITY CONTROLLER AND REMOTES

CAD REF/DRG No.: DO5927S5

REV: R02

PART No.: 05927

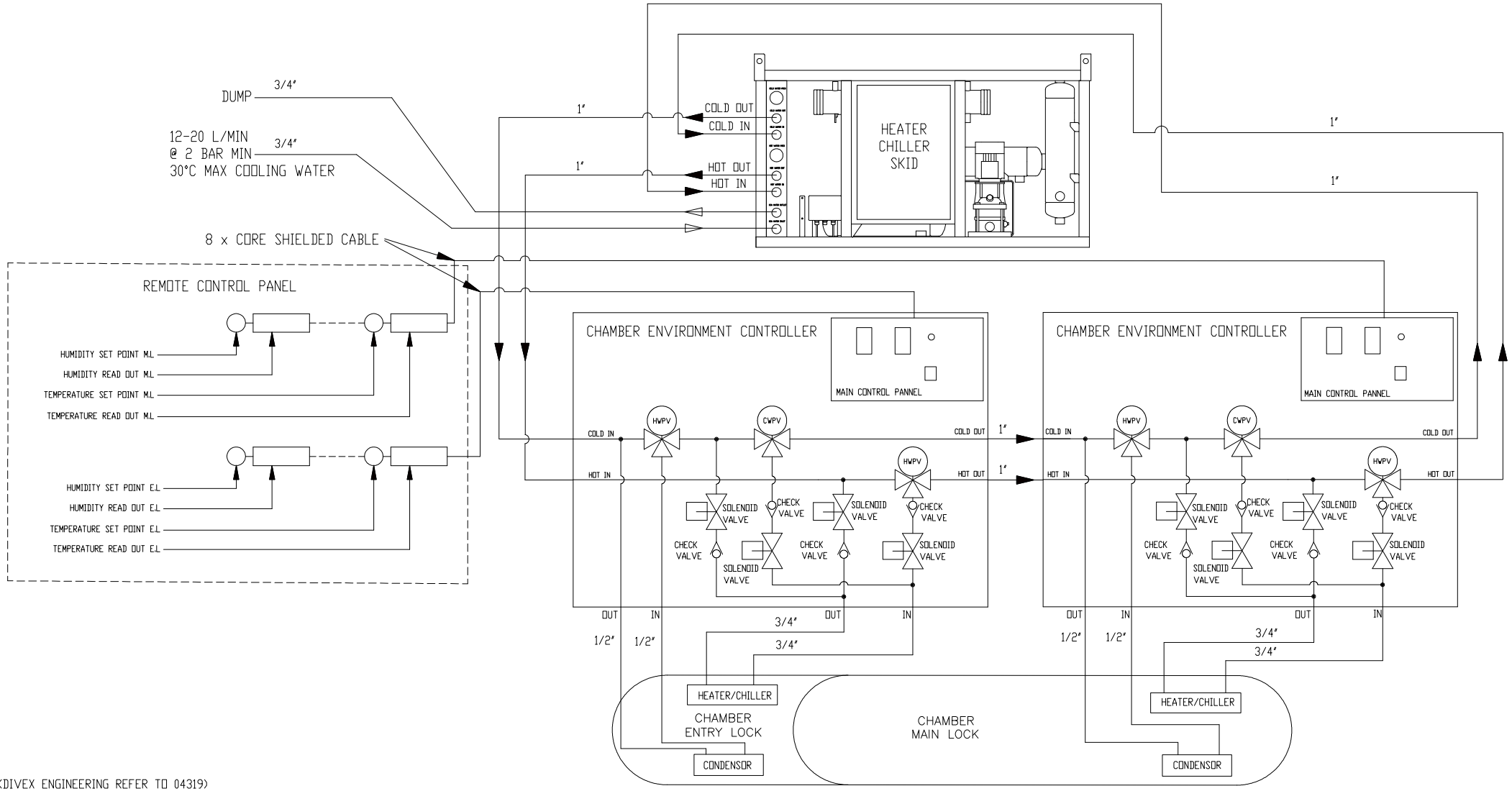
PRODUCT / PROJECT No.: CEC-3

SIZE: A3 | SCALE: NTS | SHT 5 OF 5

DIVEX LIMITED
ENTERPRISE DRIVE
WESTHILL
ABERDEEN
AB32 6TQ
UNITED KINGDOM

Tel: +44(0)1224 740145
Fax: +44(0)1224 740172
email: info@divexglobal.com
www.divexglobal.com

APPENDIX E PIPING SCHEMATIC



(DIVEX ENGINEERING REFER TO 04319)

THIRD ANGLE PROJECTION

MATERIAL:

FINISH:

MASS: (kg)

DIVEX (PTY) LTD
11 DAWN ROAD
MONTAGUE GARDENS
CAPE TOWN, 7441
SOUTH AFRICA.

TEL : +27 (0)21 551-2233
FAX : +27 (0)21 552-3547
EMAIL : info@divexglobal.com
www.divexglobal.com

A3

REV	DESCRIPTION OF REVISION	ECN	DRAWN BY	DATE	DRAFTING CHECK BY	DATE	ENGINEER CHECK BY	DATE	APPROVAL BY	DATE
R00	FIRST ISSUE	---	J.J	15/07/09	R.C	15/07/09	N.M	15/07/09	N.M	15/07/09

OVER-TO	±	±	±
0-6	0.1	0.2	0.5
6-30	0.2	0.5	1.0
30-100	0.3	0.8	1.5
100-300	0.5	1.2	2.0
300-1000	0.8	2.0	3.0
1000-3000	1.2	3.0	5.0
3000-PLUS	2.0	4.0	8.0
ANGLE	0.25°	0.5°	1°

SCALE: NTS

PRODUCT/PROJECT: HCS, CEC, HCU

ALL DIMENSIONS IN MM (UOS) DO NOT SCALE

ALL DIMENSIONS BEFORE PLATING (UOS)

REMOVE SHARP EDGES & BURRS

TITLE: PIPING SCHEMATIC

PART No. 06000

REV R00

CAD REF/DRG No. 06000

SHT 1 OF 1

APPENDIX F COMPONENT MANUALS

APPENDIX F.1 TEMPERATURE HUMIDITY TRANSMITTER

Driesen + Kern GmbH

Transmitter for Humidity and Temperature
Type DKRF470

All transducers of the DKRF470 series measure humidity and temperature. Optionally it is possible to obtain calculated parameters such as absolute humidity (g/m³), dewpoint (°C) and mixing ratio (g/kg). An interchangeable probe offers maximum service flexibility, low maintenance cost, and almost no down time. An ISO9001certificate as well as a DKD-certificate are available.

The DKRF470 series of transducers has been designed for applications in demanding applications, for example greenhouses, HVAC, swimming pools, climate chambers, process control.
Based on the most advanced Sensirion sensor technology (COMSens) it offers precise but affordable solutions to many measurement tasks.
The tranducers are resistant against dust as well as most chemicals and measure humidity with a high accuracy and reliability.

Capacitive CMOSens Sensor technology
The transmitters incorporate a state-of-the-art capacitive sensor element, which accurately measures temperature and relative humidity. It has an excellent accuracy of up to +/-1,8%RH.

The sensor head has a diameter of only 8mm and a length of 101mm and can be changed on site without recalibration. The sensor head is available as a spare part with or without calibration certificate.

Rugged housing
The rugged aluminium housing of the transducer is protected against dust and water (IP65). Therefore, the DKRF470-series is best suited for humid environment.

Flexible output signals
You may chose from loop powered 4..20mA (two-wire) or any of the standard 0..1V, 0..5V, 0..10V, 0..20mA outputs.

Am Hasselt 25
D-24576 Bad Bramstedt
www.driesen-kern.de

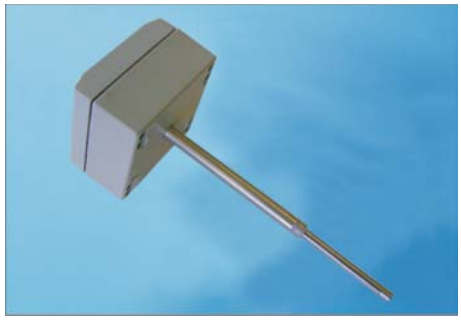
Postfach 1424
D-24572 Bad Bramstedt
www.driesen-kern.com

Tel. +49 (0) 4192 8170-0
Fax +49 (0) 4192 8170-99
info@driesen-kern.de

The DKRF471 is designed for wall mounting with the sensor fitted directly at the housing

DKRF471

.
The DKRF472 is designed for duct mounting and



DKRF472

the DKRF473 has a flexible sensor cable and a remote probe for direct process installation. The standard length of the sensor cable of the DKRF473 is 2m or 5m and can be extended to a length of 100m.

DKRF473

For even higher temperatures the DKRF473-EXT is available with a range of -40...+120°C.

DKRF473-EXT

The DKRF474 can be used in pressurzied pipes for up to 30MPa and can be used for temperatures up to 80°C.

DKRF474

Optional Display

As an option, an LCD display showing the actual values is available for alle DKRF470-transducers.

Calculated Values

The transducer can be set to display calculated values. Two analogue outputs for any of the desired parameters (relative or absolute humdity, dewpoint, mixing ratio and temperature) are available.

Order Code

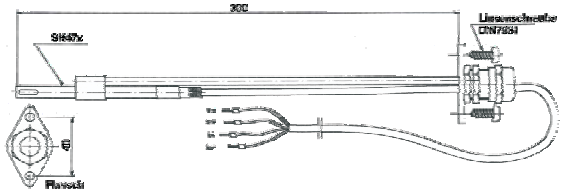
Please use the following order code for DKRF470 series

DKRF471	DKRF471-AA-OPT1-OPT2-XX
DKRF472	DKRF472-AA-KL-OPT1-OPT2-XX
DKRF473	DKRF473-AA-KL-OPT1-OPT2-XX
DKRF473-EXT	DKRF473-EXT-AA-KL-OPT1-OPT2-XX
DKRF474	DKRF474-AA-KL-OPT1-OPT2-XX

Accesories (optional)

Flansch400:

Mounting flange(L=300mm) for duct installation.



WM400:

Wall mount for DKRF473 (Stainless steel) with compression fitting.

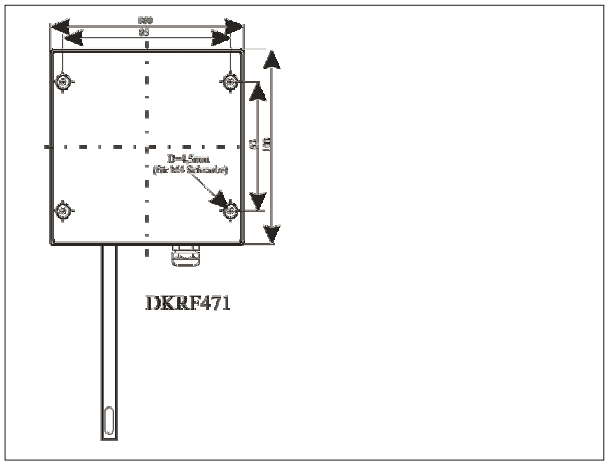
MHT-Humdity checks

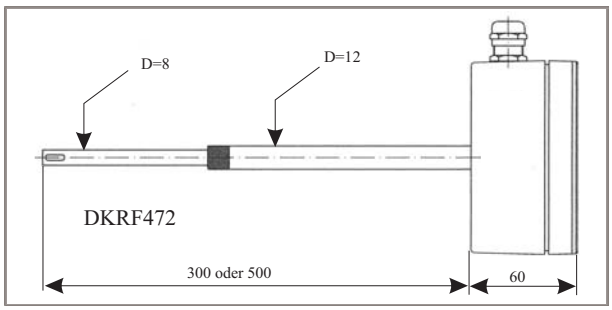
If you wish to check the accuracy of the probes, there are small climate chambers for field use available. The dimensions are D=40mm and H=90mm) and are available for the following reference humidities.

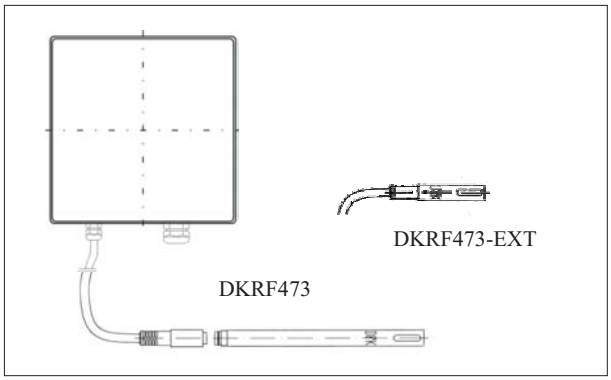
MHT0:	HumiCheck at 0,8% RH
MHT33:	HumiCheck at 33,6% RH
MHT75:	HumiCheck at 75,5 % RH

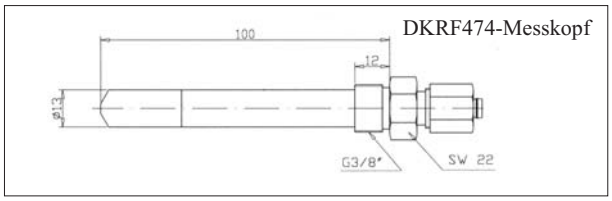
AA =Analogoutput	- 01 = 0-1VDC - 05 = 0-5VDC - 10 = 0-10VDC - 020 = 0-20mA - 420Z = 4-20mA two wire - 420D = 4-20mA three wire
-KL = Cablelength	-2000 = 2m cable -5000 = 5m cable
-OPT1 = Option1	STD = Channel1 =Relative humidity ABS = Abs. Humidity (0...30g/m³) TP = Dewpoint (-5...+60 °C) WB = Wet bulb temp. (-40...80°C) X = mixing ration (0...30g/kg)
-OPT2 = Option2	STD = Channel2 Temperature ABS = Abs. Humidity (0...30g/m³) TP = Dewpoint (-5...+60 °C) WB = Wet bulb temp. (-40...80°C) X = mixing ration (0...30g/kg)
-XX = Display Option	MD = with display OD = without display

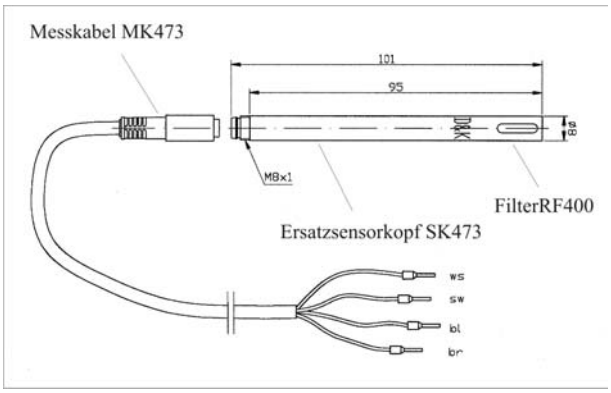
-Special
If you would like to obtain a special range for the values, these can be calibrated according to your demands.



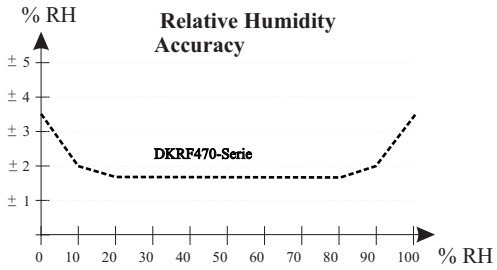


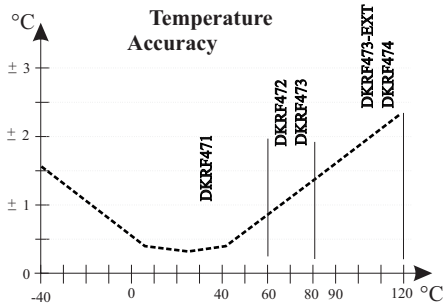






Specification





Humidity

Sensortype:	capacitive Sensirion CMOSens sensor element	
Range:	0..100%RH	
Accuracy:	+/-1.8%RH (20...80%RH)	
Response time:	4 seconds without filter,	
(63%)	15 seconds with filter	
Temperature		
Sensortype:	CMOSens-Structure	
Range:	DKRF471:	-40... +60°C
	DKRF472;473,474	-40... +80°C
	DKRF473-EXT:	-40...+120°C
Storage temperature:	DKRF470 Serie:	-40... +60°C
Accuracy:	0.3°C at 25°C	
Response time:	appr. 35 seconds	

Outputs

2x analogue outputs: 0...1V, 0...5V, 0...10V, 0...20mA, 4..20mA (loop powered two wire)

Calculated parameters

Optional: Absolute humidity, dewpoint, mixing ratio
Ranges: on inquiry

Electrical

Voltage supply and current consumption:

Output: 0..1V	6...25VDC, 1.5mA
Output: 0..5V	6...25VDC, 1.5mA
Output: 0..10V	11...25VDC, 1.9 mA
Output: 4..20mA	11...25VDC, 22mA/output

Load f. Current output: max. 500 Ohm
Load resistance for

Voltage outputs:	0..1V --> min. 2kOhm
	0..5V/0..10V --> min. 10kOhm
Housing material:	Aluminium AlSi12 DIN 1725
Classification:	IP65 (NEMA 4)
Cable gland:	PG9
Connections:	Screw terminals 0,25...1,5mm²

APPENDIX F.2 CONTROLLER RKC400

Digital Controller

FB400/FB900 Installation Manual

IMR01W01-E2

Thank you for purchasing the RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place this manual in a convenient location for easy reference.

This manual describes the handling precautions, mounting, wiring and specifications only. For the basic operations, see Quick Operation Manual (IMR01W02-E□). For the detail handling procedures and various function settings, please read if necessary the following separate manuals.

- FB400/FB900 Instruction Manual (IMR01W03-E□)
- FB400/FB900 Communication Instruction Manual (IMR01W04-E□)

The above manuals can be download from our website shown below.
URL: http://www.rkcinst.com/english/manual_load.htm

■ Product Check

Installation Manual (this manual) ..... 1 *
Quick Operation Manual (IMR01W02-E□) ..... 1 *
Parameter List (IMR01W06-E□) ..... 1 *
Seal (SAP-306 [for Unit and Direct key type 2) 1
Mounting bracket (with screw) 2 (FB900: 4)
Case rubber packing (FB400: KFB400-36<1>, FB900: KFB900-36<1>) 1

* The German, French, Italian, Spanish and Chinese versions of the document are also available. They can be downloaded from our website.

■ Safety Precautions

WARNING

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take adequate measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- To prevent instrument damage or failure, protect the power line and the input/output lines from high currents with a protection device such as fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

1. MOUNTING

WARNING

To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

1.1 Mounting Cautions

(1) This instrument is intended to be used under the following environmental conditions. **(IEC61010-1)** [OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]

(2) Use this instrument within the following ambient temperature and ambient humidity.
- Allowable ambient temperature: –10 to +50 °C
- Allowable ambient humidity: 5 to 95 % RH
  (Absolute humidity: MAX. W. C 29 g/m^3 dry air at 101.3 kPa)

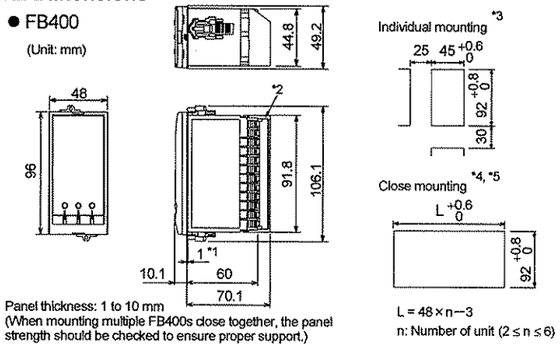
(3) Avoid the following conditions when selecting the mounting location:
- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the mainframe.
- Water, oil, chemicals, vapor or steam splashes.
- Excessive dust, salt or iron particles.
- Excessive induction noise, static electricity, magnetic fields or noise.
- Direct air flow from an air conditioner.
- Exposure to direct sunlight.
- Excessive heat accumulation.

(4) Take the following points into consideration when mounting this instrument in the panel.
- Provide adequate ventilation space so that heat does not build up.
- Do not mount this instrument directly above equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors).
- If the ambient temperature rises above 50 °C, cool this instrument with a forced air fan, cooler, or the like. However, do not allow cooled air to blow this instrument directly.
- In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
  High voltage equipment: Do not mount within the same panel.
  Power lines: Separate at least 200 mm.
  Rotating machinery: Separate as far as possible.
- Mount this instrument in the horizontal direction for panel. If you did installation except a horizontal direction, this causes malfunction.

1.2 Dimensions

● FB400

(Unit: mm)

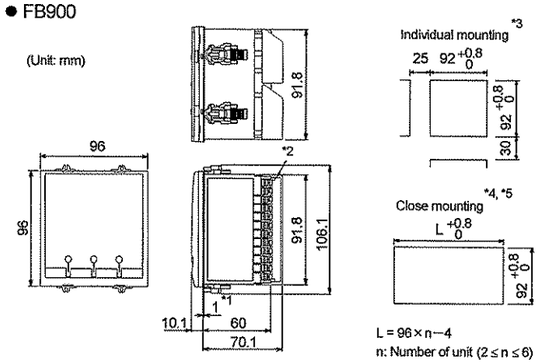


Panel thickness: 1 to 10 mm
(When mounting multiple FB400s close together, the panel strength should be checked to ensure proper support.)

L = 48 × n − 3
n: Number of unit (2 ≤ n ≤ 6)

● FB900

(Unit: mm)



Panel thickness: 1 to 10 mm
(When mounting multiple FB900s close together, the panel strength should be checked to ensure proper support.)

L = 96 × n − 4
n: Number of unit (2 ≤ n ≤ 6)

*1 Case rubber packing
*2 Terminal cover KFB400-58 <1> (option) [sold separately]
*3 When cutting out each mounting hole through a panel for individual mounting, observe that there is no bur or distortion along the panel cutout surface, or there is no bend on the panel surface. If so, the water resistant characteristics may worsen.
*4 Remove the case rubber packing. Because of closely mounting the FB400s or FB900s, protection will be compromised and not meet IP66 (NEMA 4X) by close mounting.
*5 When controllers are closely mounted, ambient temperature must not exceed 50 °C.

1.3 Procedures of Mounting and Removing

■ Mounting procedures

1. Prepare the panel cutout as specified in **1.2 Dimensions**.
2. Insert the instrument through the panel cutout.
3. Insert the mounting bracket into the mounting groove of the instrument. (Fig. 1)
4. Push the mounting bracket forward until the bracket is firmly secured to the panel. (Fig. 2)
5. Only turn one full revolution after the screw touches the panel. (Fig. 3)
6. The other mounting bracket should be installed the same way described in *3.* to *5.*

Fig. 1

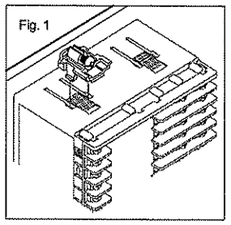


Fig. 2

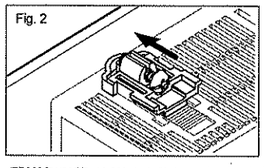
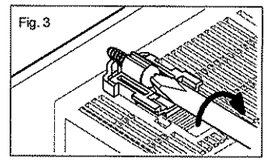


Fig. 3



(FB900 is used in the above figures for explanation, but the same mounting procedures also apply to FB400.)

The front of the instrument conforms to **IP66 (NEMA4X)** when mounted on the panel. For effective waterproof/dustproof, the gasket must be securely placed between instrument and panel without any gap. If gasket is damaged, please contact RKC sales office or the agent.

■ Removing procedures

1. Turn the power OFF.
2. Remove the wiring.
3. Loosen the screw of the mounting bracket. (Fig. 4)
4. Lift the latch of the mounting bracket (①), then pull the mounting bracket (②) to remove it from the case. (Fig. 4)
5. The other mounting bracket should be removed the same way described in *3.* and *4.*
6. Pull out the instrument from the mounting cutout while holding the front panel frame of this instrument. (Fig. 5)

Fig. 4

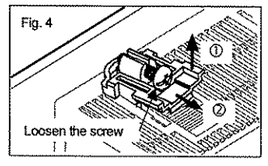
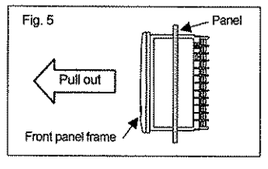


Fig. 5



2. WIRING

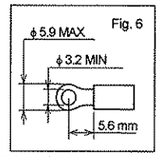
WARNING

To prevent electric shock or instrument failure, do not turn on the power until all the wiring is completed.

2.1 Wiring Cautions

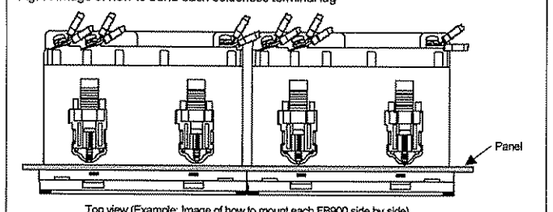
- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
  - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
  - Always install the noise filter on a grounded panel. Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
  - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.
- About five seconds are required as preparation time for contact output every time the instrument is turned on. Use a delay relay when the output line is used for an external interlock circuit.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply, supply power from a SELV circuit.
- This instrument is not furnished with a power supply switch or fuse. Therefore, if a fuse or power supply switch is required, install close to the instrument.
  Recommended fuse rating: Rated voltage 250 V, Rated current 1 A
  Fuse type: Time-lag fuse
- Use the solderless terminal appropriate to the screw size.
  Screw size: M3 × 6 (with 5.8 × 5.8 square washer)
  Recommended tightening torque: 0.4 N·m (4 kgf·cm)
  Applicable wire: Solid/twisted wire of 2 mm^2
  Recommended dimension: See fig. 6
  Recommended solderless terminals:
  Circular terminal with isolation
  (M3 screw, width 5.5 mm, hole diameter 3.2 mm)

Fig. 6



- Up to two solderless terminal lugs can be connected to one terminal screw, then refer to figure 7.

Fig. 7: Image of how to bend each solderless terminal lug

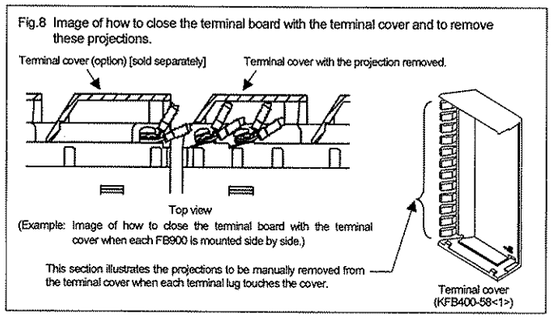


Top view (Example: Image of how to mount each FB900 side by side)

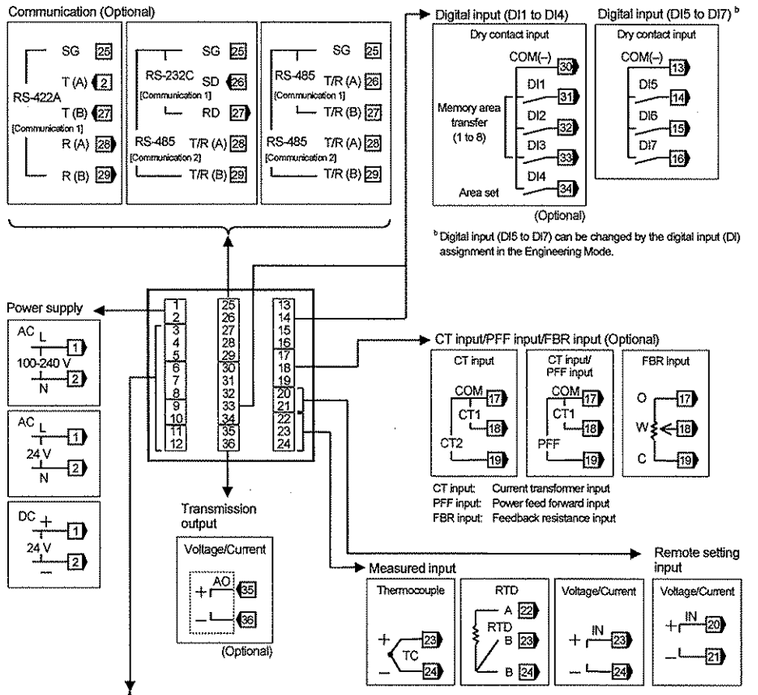
If solderless terminal lugs other than those in not recommended dimensions are used, terminal screws may not be tightened. In such a case, bend each solderless terminal lug in advance and then conduct wiring. If the terminal screw is forcibly tightened, it may be damaged.

- Caution for the terminal cover usage:
  If each solderless terminal lug touches the terminal cover, remove each projection from the terminal cover by manually bending it in front and in rear until broken. (Fig. 8)

Fig.8 Image of how to close the terminal board with the terminal cover and to remove these projections.



■ Terminal Configuration (All the terminal configuration of FB400 and FB900 is the same.)



a Output assignment

Output 1 (OUT1) and Output 2 (OUT2):
Control output or digital output can be allocated to OUT1 and OUT2.
For heat/cool control, OUT1 corresponds to the heat-side output and OUT2 corresponds to the cool-side output.
For position proportioning control, OUT1 corresponds to the open-side output and OUT2 corresponds to the close-side output.

Digital output 1 (DO1) to Digital output 4 (DO4):
Output of the event function can be allocated to DO1 to DO4.

The following two methods of the output assignments are available:
Specify when ordering (Initial setting code)
Setting by Output assignment (Engineering Mode)

Table 1: Output type

	OUT1 OUT2	DO1 to DO4	AO
Relay contact output (1)	O		
Relay contact output (2)		O	
Voltage pulse output	O		
Current output	O		O
Voltage output 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC	O		O
Voltage output 0 to 1 V DC			O
Triac output	O		
Open collector output	O		

(O: Indicates that an output specification is supported.)

3. SPECIFICATIONS

Measured input

Number of input: 1 point
Input type and range: See table 2.
Sampling cycle: 100 ms±0.3 %
(50 ms±5 % or 250 ms±0.3 % is selectable)
Influence of external resistance:
Approx. 0.2 μV/Ω
(Converted depending on TC types)
Influence of input lead: Approx. 0.01 %/Ω of PV (RTD input)
10 Ω or less per wire
Input impedance: TC input: Approx. 1 MΩ or more
Voltage (low) input: Approx. 1 MΩ or more
Voltage (high) input: Approx. 1 MΩ
Current input: Approx. 50 Ω
Sensor current: Approx. 250 μA (RTD input)
Action at input break:
TC input, Voltage (low) input: Upscale or downscale
RTD input: Upscale
Voltage (high) input, Current input:
Downscale
Action at input short circuit: Downscale (RTD input)
Input correction:
PV bias: –Input span to +Input span
PV ratio: 0.500 to 1.500
First order lag digital filter: 0.0 to 100.0 seconds (0.0: OFF)
Low level cutoff: 0.00 to 25.00 % of input span
Cold-junction temperature compensation error (TC input):
Within ±1.0 °C
Within ±1.5 °C (range of –10 to +50 °C)

Remote setting (RS) input

Number of input: 1 point (Not isolated from measured input)
Input type:
Voltage (low) input: 0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V DC
Voltage (high) input: 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC
Current input: 0 to 20 mA DC, 4 to 20 mA DC
Sampling cycle: Twice of the measured input sampling cycle
Input impedance:
Voltage (low) input: Approx. 1 MΩ or more
Voltage (high) input: Approx. 1 MΩ
Current input: Approx. 50 Ω
Action at input beak: Downscale
Input correction:
RS bias: –Input span to +Input span
RS ratio: 0.001 to 9.999
RS digital filter(first order lag): 0.0 to 100.0 seconds (0.0: OFF)
Allowable input voltage: Voltage (low) input: Within ±3.5 V
Voltage (high) input: Within ±12 V

Current transformer (CT) input [Optional]

Number of inputs: 2 points
(when PFF input is selected: 1 point)
CT type: CTL-6-P-N or CTL-12-S56-10-N
(Sold separately)
Input range: CTL-6-P-N: 0.0 to 30.0 A
CTL -12-S56-10L-N: 0.0 to 100.0 A
Automatic power frequency detection:
Power frequency can be set by automatic detection. No frequency may be able to be detected if at a CT value of less than 0.5A.
Sampling cycle: Twice of the measured input sampling cycle

Feedback resistance (FBR) input [Optional]

Number of input: 1 point
Permissible resistance range:
100 Ω to 10 kΩ (Standard: 135 Ω)
Input range: 0.0 to 100.0 %
(for adjustment span of open and close)
Sampling cycle: Twice of the measured input sampling cycle
Action at FBR break: Upscale

Power feed forward (PFF) input [Optional]

Number of input: 1 point (Use the special transformer)
Allowable voltage range:
Input of instrument: 0 to 20 V
Load power supply voltage:
120 V AC transformer (PFT-01):
0 to 168 V AC
240 V AC transformer (PFT-02):
0 to 336 V AC
Automatic power frequency detection:
Power frequency can be set by automatic detection.
Sampling cycle: Twice of the measured input sampling cycle

Digital input (DI)

Number of inputs: 7 points (DI1 to DI4 [optional], DI5 to DI7)
Input method: Dry contact input
Open state: 500 kΩ or more
Close state: 10 Ω or less
Contact current: 5 mA or less
Voltage at open: Approx. 5 V DC
Capture judgment time: 2 sampling (measured input) times

Output

Number of outputs: 7 points (OUT1, OUT2, DO1 to DO4, AO)
Output type: See table 1.
- Relay contact output (1)
Contact type: 1a contact
Contact rating (Resistive load):
250 V AC 3 A/ 30 V DC 1 A
Electrical life: 300,000 times or more (Rated load)
Mechanical life: 50 million times or more
(Switching: 180 times/min)

Table 2: Input type and Measured range

Input type	Measured range	Input type	Measured range
K	–200.0 to +400.0 °C	W5ReW26Re	0 to 2300 °C
	–200.0 to +800.0 °C		0 to 4200 °F
	–200 to +1372 °C	U	0.0 to 600.0 °C
	–328.0 to +400.0 °F		32.0 to 1112.0 °F
	–250.0 to +800.0 °F	L	0.0 to 900.0 °C
	–328 to +2502 °F		32.0 to 1652.0 °F
J	0.0 to 400.0 °C	Pt100	–100.00 to +100.00 °C
	–200.0 to +400.0 °C		–200.0 to +850.0 °C
	–200.0 to +800.0 °C		–199.99 to +199.99 °F
	–200 to +1200 °C		–328.0 to +1562.0 °F
	–200.0 to +700.0 °F	JPt100	–100.00 to +100.00 °C
	–328.0 to +1200.0 °F		–200.0 to +640.0 °C
	–328 to +2192 °F		–199.99 to +199.99 °F
T	–200.0 to +400.0 °C		–328.0 to +1184.0 °F
	–328.0 to +752.0 °F	±1 V	Programmable range (–19999 to +19999)
S, R	–50 to +1768 °C	0 to 5 V	
	–58 to +3214 °F	1 to 5 V	
E	–200.0 to +700.0 °C	0 to 10 V	
	–200 to +1000 °C	0 to 1 V	
	–328.0 to +1292.0 °F	0 to 100 mV	
	–328 to +1832 °F	0 to 10 mV	
B	0 to 1800 °C	±100 mV	
	0 to 3272 °F	±10 mV	
N	0 to 1300 °C	0 to 20 mA	
	0 to 2372 °F	4 to 20 mA	
PLII	0 to 1390 °C		
	0 to 2534 °F		

- Relay contact output (2)
Contact type: 1a contact
Contact rating (Resistive load):
250 V AC 1 A/ 30 V DC 1 A
Electrical life: 300,000 times or more (Rated load)
Mechanical life: 20 million times or more
(Switching: 300 times/min)
- Voltage pulse output
Output voltage: 0/12 V DC (Rating)
ON voltage: 11 V or more, 13 V or less
OFF voltage: 0.2 V or less
Allowable load resistance: 600 Ω or more
- Current output
Output current (Rating): 4 to 20 mA DC, 0 to 20 mA DC
Output range: 1 to 21 mA DC, 0 to 21 mA DC
Allowable load resistance: 600 Ω or less
Output impedance: 1 MΩ or more
- Voltage output
Output voltage (Rating): 0 to 10 V DC, 0 to 5 V DC, 1 to 5 V DC
0 to 1 V DC (AO only)
Output range: –0.5 to +10.5 V DC, –0.25 to +5.25 V DC, 0.8 to 5.2 V DC, –0.05 to +1.05 V DC
Allowable load resistance: 1 kΩ or more
Output impedance: 0.1 Ω or less
- Triac output
Output method: AC output (Zero-cross method)
Allowable load current: 0.5 A (Ambient temperature 40 °C or less)
Ambient temperature 50 °C: 0.3 A
Load voltage: 75 to 250 V AC
Minimum load current: 30 mA
ON voltage: 1.6 V or less (at maximum load current)
- Open collector output
Output method: Sink type
Allowable load current: 100 mA
Load voltage: 30 V DC or less
Minimum load current: 0.5 mA
ON voltage: 2 V or less (at maximum load current)
Leakage current at OFF: 0.1 mA or less

Communication [Optional]

Interface: Based on RS-232C, RS-485, or RS-422A, EIA standard
Multi-drop connection of RS-485 and RS-422A is available.
Protocol:
- RKC communication (ANSI X3.28-1976 subcategory 2.5, A4)
- Modbus-RTU
Termination resistor: Externally connected

General specifications

Power supply voltage:
- 100 to 240 V AC type:
90 to 264 V AC [Including power supply voltage variation], 50/60 Hz
(Rating 100 to 240 V AC)
Frequency variation: 50 Hz±10 %, 60 Hz±10 %
- 24 V AC type:
21.6 to 26.4 V AC [Including power supply voltage variation], 50/60 Hz
(Rating 24 V AC)
Frequency variation: 50 Hz±10 %, 60 Hz±10 %
- 24 V DC type:
21.6 to 26.4 V DC [Including power supply voltage variation]
(Rating 24 V DC)

Power consumption (at maximum load):
- 100 to 240 V AC type:
FB400: 7.8 VA max. (at 100 V AC), 11.9 VA max. (at 240 V AC)
FB900: 8.7 VA max. (at 100 V AC), 13.0 VA max. (at 240 V AC)
- 24 V AC type:
FB400: 8.2 VA max. (at 24 V AC) FB900: 9.3 VA max. (at 24 V AC)
- 24 V DC type:
FB400: 250 mA max. (at 24 V DC) FB900: 300 mA max. (at 24 V DC)
- Rush current: 12 A or less

Allowable ambient temperature: –10 to +50 °C
Allowable ambient humidity: 5 to 95 % RH
(Absolute humidity: MAX.W.C 29.3 g/m³ dry air at 101.3 kPa)
Insulation resistance:
Between measuring terminal and grounding:
20 MΩ or more at 500 V DC
Between power supply terminal and grounding:
20 MΩ or more at 500 V DC
Between power supply and measuring terminals:
20 MΩ or more at 500 V DC
When grounding is not provided: Between panels
Withstand voltage:

Time: 1 min.	①	②	③	④	⑤
① Grounding terminal					
② Power terminal	1500 V AC				
③ Measured input terminal	1500 V AC	2300 V AC			
④ Output terminal (Relay contact, Triac)	1500 V AC	2300 V AC	2300 V AC		
⑤ Output terminal (Voltage, Current)	1500 V AC	2300 V AC	1500 V AC		
⑥ Communication, digital input (DI) terminals	1500 V AC	2300 V AC	510 V AC	2300 V AC	1000 V AC

Transportation and Storage environment conditions:
- Shock: Height 800 mm or less
- Temperature: –25 to +55 °C (at storage),
–40 to +70 °C (at transport)
- Humidity: 5 to 100 % RH (Non condensing)

Weight: FB400: Approx. 230 g
FB900: Approx. 290 g

Standard

Safety standards: UL: UL61010-1
cUL: CAN/CSA-C22.2 No.1010.1
CE marking:
- LVD: EN61010-1
OVERVOLTAGE CATEGORYII,
POLLUTION DEGREE 2,
Class II (Reinforced insulation)
- EMC: EN61326
C-Tick: AS/NZS CISPR 11 (equivalent to EN55011)
Panel sealing: NEMA 4X (NEMA250), IP66 (IEC60529)
[Front panel]

4. MODEL CODE

■ Suffix code

FB400 FB900	-□□	-	□	*	□□□□	/	□□	□□□□	/	Y
	(1) (2)		(3)		(4) (5) (6) (7)		(8) (9)	(10)	(11)	(12)

: Indicates a specification code to be optional specified. If this section is blank, this means that no code is described on the nameplate.

(1) Output 1 (OUT1), (2) Output 2 (OUT2)
N: None (OUT2 only) 6: Voltage output (1 to 5 V DC)
M: Relay contact output 7: Current output (0 to 20 mA DC)
V: Voltage pulse output 8: Current output (4 to 20 mA DC)
4: Voltage output (0 to 5 V DC) T: Triac output
5: Voltage output (0 to 10 V DC) D: Open collector output

(3) Power supply voltage
3: 24 V AC/DC 4: 100 to 240 V AC

(4) Digital output (DO1 to 4)
N: None 4: DO1 + DO2 + DO3 + DO4

(5) CT input/Power feed forward input/Feedback resistance input
N: None
T: CT (2 points)
1: Power feed forward input
(one 100-120 V AC transformer included)
2: Power feed forward input
(one 200-240 V AC transformer included)
3: CT (1 point) + Power feed forward input (one 100-120 V AC transformer included)
4: CT (1 point) + Power feed forward input (one 200-240 V AC transformer included)
F: Feedback resistance input

(6) Transmission output (AO)
N: None 6: Voltage output (1 to 5 V DC)*
3: Voltage output (0 to 1 V DC)* 7: Current output (0 to 20 mA DC)*
4: Voltage output (0 to 5 V DC)* 8: Current output (4 to 20 mA DC)*
5: Voltage output (0 to 10 V DC)*
* If any one of the transmission outputs is specified (other than the code "N"), the digital inputs (from DI1 to 4) are automatically added.

(7) Communication function/Digital input (DI1 to 4)
N: None
1: Communication 1 (RS-232C) + No communication 2 *
4: Communication 1 (RS-422A) + No communication 2 *
5: Communication 1 (RS-485) + No communication 2 *
W: Communication 1 (RS-232C) + Communication 2 (RS-485) *
X: Communication 1 (RS-485) + Communication 2 (RS-485) *
Y: No communication 1 + Communication 2 (RS-485) *
D: Digital input (DI1 to 4) [Memory area transformer]
* If any one of the communication functions is also specified (other than the code "N"), the digital inputs (from DI1 to 4) are automatically added.

(8) Case color
N: White A: Black

(9) Quick start code
N: No quick start code (Configured at factory set value) *
1: Specify quick start code 1
2: Specify quick start code 1 and 2
* Factory set value: See the parameter list (IMR01W06-E□).

(10) Control Method [Quick start code 1]
No code: No specify quick start code
F: PID action with AT (Reverse action)
D: PID action with AT (Direct action)
G: Heat/cool PID action with AT
A: Heat/cool PID action with AT (for Extruder [air cooling])
W: Heat/cool PID action with AT (for Extruder [water cooling])
Z: Position proportioning PID action without FBR

(11) Measured input and Range [Quick start code 1]
No code: No specify quick start code
□□□: See range code table.

(12) Instrument specification
Y: Version symbol

■ Quick start code 2 (Initial setting code)

□□-□□□□-□□
(1) (2) (3) (4) (5) (6) (7) (8)

(1) Output assignments (OUT1, OUT2, and DO1 to DO4)
1 to 7: See output assignments table.

(2) Remote setting input
1: Voltage input (0 to 10 mV DC) 5: Voltage input (1 to 10 V DC)
2: Voltage input (0 to 100 mV DC) 6: Voltage input (1 to 5 V DC)
3: Voltage input (0 to 1 V DC) 7: Current input (0 to 20 mA DC)
4: Voltage input (0 to 5 V DC) 8: Current input (4 to 20 mA DC)

(3) Event function 1 (EV1), (4) Event function 2 (EV2),
(5) Event function 3 (EV3), (6) Event function 4 (EV4)
N: None L: Process low [1]
A: Deviation high Q: Deviation high [2]
B: Deviation low R: Deviation low [2]
C: Deviation high/low T: Deviation high/low [2]
D: Band V: SV high
E: Deviation high [1] W: SV low
F: Deviation low [1] 1: MV high
G: Deviation high/low [1] 2: MV low
H: Process high 3: Cooling MV high
I: Process low 4: Cooling MV low
K: Process high [1] 5: Control loop break alarm (LBA) [3]
[1] With hold action
[2] With re-hold action
[3] Can be selected only for Event 4 (EV4).

(7) CT type
N: CT1 (None), CT2 (None)
P: CT1 (CTL-6-P-N), CT2 (None)
S: CT1 (CTL-12-S56-10L-N), CT2 (None)
T: CT1 (CTL-6-P-N), CT2 (CTL-6-P-N)
U: CT1 (CTL-12-S56-10L-N), CT2 (CTL-12-S56-10L-N)

(8) Communication 1 protocol
N: None
1: RKC communication (ANSI X3.28)
2: Modbus

● Range code table
[Thermocouple (TC) input, RTD input]

Type	Code	Range (Input span)	Code	Range (Input span)
K	K35	–200.0 to +400.0 °C	KC4	–328.0 to +400.0 °F
	K40	–200.0 to +800.0 °C	KC6	–250.0 to +800.0 °F
	K41	–200 to +1372 °C	KC5	328 to 2502 °F
	K09	0.0 to 400.0 °C	KA4	0.0 to 800.0 °F
	K10	0.0 to 800.0 °C	KA1	0 to 800 °F
	K02	0 to 400 °C	KA2	0 to 1600 °F
	K04	0 to 800 °C		
J	J27	–200.0 to +400.0 °C	JC6	–328.0 to +1200.0 °F
	J32	–200.0 to +800.0 °C	JC7	–200.0 to +700.0 °F
	J15	–200 to +1200 °C	JB9	328 to 2192 °F
	J08	0.0 to 400.0 °C	JB6	0.0 to 800.0 °F
	J09	0.0 to 800.0 °C	JA1	0 to 800 °F
	J02	0 to 400 °C	JA2	0 to 1600 °F
	J04	0 to 800 °C		
T	T19	–200.0 to +400.0 °C	TC2	–328.0 to +752.0 °F
E	E21	–200.0 to +700.0 °C	EA9	–328.0 to +1292.0 °F
	E06	–200 to +1000 °C	EB1	–328 to +1832 °F
S	S06	–50 to +1768 °C	SA7	–58 to +3214 °F
R	R07	–50 to +1768 °C	RA7	–58 to +3214 °F
B	B03	0 to 1800 °C	BB2	0 to 3272 °F
N	N02	0 to 1300 °C	NA7	0 to 2372 °F
PLII	A02	0 to 1390 °C	AA2	0 to 2534 °F
W5ReW26Re	W03	0 to 2300 °C	WA2	0 to 4200 °F
U	U04	0.0 to 600.0 °C	UB2	32.0 to 1112.0 °F
L	L04	0.0 to 900.0 °C	LA9	32.0 to 1652.0 °F
Pt100	D21	–200.0 to +200.0 °C	DD1	–200.0 to +200.0 °F
	D34	–100.00 to +100.00 °C	DC8	–199.99 to +199.99 °F
	D35	–200.0 to +850.0 °C	DC9	–328.0 to +1562.0 °F
JPt100	P29	–100.00 to +100.00 °C	PC8	–199.99 to +199.99 °F
	P30	–200.0 to +640.0 °C	PC9	–328.0 to +1184.0 °F
			PD1	–200.0 to +200.0 °F

[Voltage input, Current input]

Type	Code	Range (Input span)
0 to 10 mV DC	101	Programmable range –19999 to +19999 (Factory set value: 0.0 to 100.0 %)
0 to 100 mV DC	201	
0 to 1 V DC	301	
0 to 5 V DC	401	
0 to 10 V DC	501	
1 to 5 V DC	601	
0 to 20 mA DC	701	
4 to 20 mA DC	801	
–100 to +100 mV DC	901	
–1 to +1 V DC	902	
–10 to +10 mV DC	903	

● Output assignments table

Code	OUT1	OUT2	DO1	DO2	DO3	DO4
1	MV1	MV2	EV1	EV2	EV3	EV4
2	MV1	MV2	EV1	EV2	EV3	HBA
3	MV1	MV2	EV1	EV2	HBA	FAIL
4	MV1	MV2	EV1	HBA	EV3	EV4
5	MV1	HBA	EV1	EV2	EV3	EV4
6	MV1	HBA	EV1	EV2	EV3	FAIL
7	MV1	FAIL	EV1	EV2	EV3	EV4

MV1: Control output 1, MV2: Control output 2, HBA: Heater break alarm, FAIL: Fail output (De-energized only)
[When used as Heat/cool control or position proportioning control, select any code of 1 to 4.]

The first edition: DEC. 2004 [IMQ00]
The second edition: JUN. 2005 [IMQ00]

RKC RKC INSTRUMENT INC.
HEADQUARTERS:
16-6, KUGAHARA 5-CHOME, OHTA-KU TOKYO 146-8515 JAPAN
PHONE: 03-3751-9799 (+81 3 3751 9799)
E-mail: info@rkcinst.co.jp
FAX: 03-3751-8585 (+81 3 3751 8585)
JUL. 2005

APPENDIX F.3 REMOTE READOUT

LM0 / PLM0 / PLM0-P
0 – 20 mA / 4 – 20 mA loop indicator

including optional 24V DC loop power supply (PLM0-P ONLY)

Operating instructions and Guarantee Certificate

www.icon-electronics.com

Description:

The input signal may be displayed as any value from –999 to 9999. The display can be set to increase or decrease as the input rises. This allows the display to indicate the real world value at the input to the transducer. The decimal point may be set to any position. An on-board 24V DC power supply (limited to 23mA) is included to power the loop (PLM0-P ONLY).The input offset and span may be adjusted for calibration purposes. All settings may be locked to avoid changes from being made by unauthorised personnel.

Operation:

The signal recieved is converted and displayed as 'real world' values. (eg. 0-100 °C ,not 4 -20mA). By setting the span to a negative value, the display will indicate lower values as the input rises.

Menu functionality:

All adjustments are made via the three front mounted buttons. Press the "MENU" button repeatedly until the desired setting is reached, press "SELECT" to display the current value of the selected setting. The "+" and "-" buttons are used to change the value. "ENTER" will return the device to the menu. The "BACK" button will exit the menu.

Adjustable parameters:

- **Display Offset "OFSt" (default value:0)**
  This value is displayed when the minimum signal is measured. (eg.4mA).

- **Display Span "SPAn" (default value:100)**
  This value plus the "OFSt" value is displayed when the maximum signal is measured (20mA). Eg. If the input signal is 4-20mA, "OFSt" = 100, and "SPAn"=100. The display will indicate 100 when 4mA is applied, and 200 (100+100=200) when 20mA is applied.

- **Decimal pointer "dEci" (default value:0)**
  Use this setting to adjust the decimal point to the desired position. (0.000 / 0.00 / 0.0 / 0)

- **Calibrate / Set input Offset "CAL.O" (default value: 4.00 mA)**
  This is the minimum input signal received. If a signal converter with an output of 4 – 20mA is used, change this value to "4.00" mA. This value may need to be adjusted in case the converter's offset has changed. (needs calibration)

- **Calibrate / Set input Span "CAL.S" (default value:16.00mA)**
  This is the difference between the minimum and maximum input signals. If the converter output is 4-20 mA, change this value to "16.00" mA. This value may need to be adjusted in case the converter's span has changed. (needs calibration)
  Note: The controller cannot accept signals greater than 20.6 mA, and will not allow values greater than this to be entered. I.e. the total of "CAL.O" plus "CAL.S" values cannot exceed 20.6. It may be necessary to reduce one of these values in order to increase the other.

- **Reset "RESt"**
  By selecting this setting, the device is reset to the factory defaults

Notes:

· Whenever the input signal is above or below the "CAL.O" or "CAL.S" values by more than 3%. The display indicates "Er.Hi" or "ER.Lo".

· Certain settings are reset to default when the device is re-configured. Re-check all settings to ensure they are correct before commissioning. (use the advanced menu)

Example: ***Set the device to convert a 4 to 20mA signal to –1.00 to +1.00.***

If all of the following settings are NOT available, exit the menu and activate the advanced menu.

1. Press “MENU” until “OFSt” is displayed.
2. Press “SELECT” to display the current offset. Use the “+” and “-” buttons to change the value to “-100”.
3. Press “ENTER”. “SPAn” is displayed.
4. Press “SELECT” and change the value to “200”.
5. Press “ENTER”. “dECi” is displayed.
6. Press “SELECT” and change the value until “0.00” is displayed.
7. Press “ENTER”. “CAL.O” is displayed.
8. Press “SELECT” and change the value to “4.00”.
9. Press “ENTER”. “CAL.S” is displayed.
10. Press “SELECT” and change the value to “16.00”.
11. Press “ENTER”. Press “BACK” to exit the menu.
    With a signal of 4mA, the device will now display “–1.00”, at 12mA, the display will show “0.00”, and at 20mA the display will indicate “1.00”.
    To display values from 0 to 1.000, change the offset and span settings to 0 and 1000, and set the decimal pointer the left most position.

Menu Configuration

When not in the menu, press and hold “+” and “-”. After 3 seconds the display will toggle through the available options:

“loc” = available parameters may be viewed, but not changed.
“u.loc” = available parameters may be changed.
“rEdu” = remove advanced parameters from menu.
“Full” = all parameters are available.
“CodE: = Enter a code between 1 & 9999.

To set an option, release the buttons while the option is being is played. To enter a code, release the buttons while “CodE” is displayed, then use “+” & “-” to enter a value.To skip code entry, press “Enter” while “CodE” is displayed.
Once the code is entered, the first four options are not available until the correct code is re-entered.
To clear the code (in case it is forgotten), hold the “+” & “-” buttons while the device powers up.

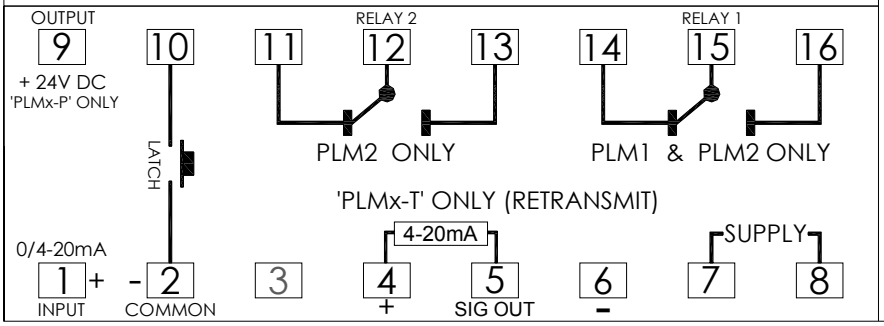
Specifications:

Display offset:	-999 to 9999
Display span:	-1999 to 9999
Display resolution:	0.01 to 1.000 (adjustable)
Input offset:	0 to 20.6 mA
Input span:	0 to 20.6 mA (offset + span maximum = 20.6 mA)
24V DC supply current limit (PLM0-P)	23mA
Measurement resolution:	20 uA
Accuracy	± 0.3% @ 25°C (% of full scale)
Input voltage:	± 15% of rated input

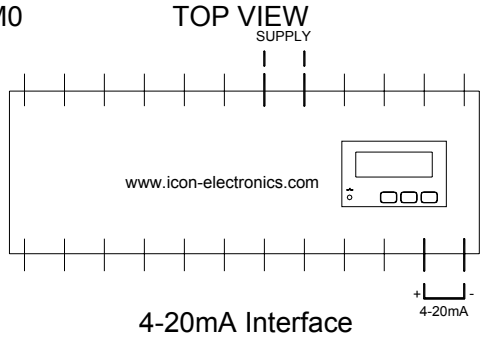
12 Month guarantee:

Our product is guaranteed for a 12 (twelve) month period from date of purchase. This guarantee is valid for defects arising from failure during specified conditions. This guarantee does not cover damage due to abuse, tampering or improper installation. Our company does not accept liability for any consequential damage or loss arising from product malfunction. Should this product prove to be defective, kindly return for inspection or repair. For further information contact your nearest distributor.

PLM 0/1/2 (0/4-20mA) LOOP MONITOR + 24V PSU www.icon-electronics.com



LM0



APPENDIX F.4 REMOTE SIGNAL GENERATOR

TCL

2. PSG Process Signal Generators

■ STANDARD SPECIFICATIONS

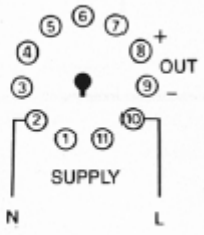
Supply	:	**110V or 220V AC – optional 24vdc**
Output	:	**Refer Model Number Code**
Setting Accuracy	:	**5% Typical, 10% max.**
Drift with Temperature	:	**Better than 200 ppm/ °C**
Max External load	:	**500 Ω**

■ MODEL NUMBER CODE

MODEL	SUFFIX CODE				DESCRIPTION
PSG–	□	□	□	□	
MOUNTING	1				11-PIN BASE
		0			
OUTPUT			□		REFER SIGNAL CODE
SUPPLY VOLTAGE				1 2 D2	110v AC 220v AC 24v DC

SIGNAL CODE			
1) 0 to 10 mV 5) 0 to 10V 9) Others	2) 0 to 100 mV 6) 1 to 5V	3) 0 to 1V 7) 0 to 20 mA	4) 0 to 5V 8) 4 to 20 mA

■ WIRING DIAGRAM



PROCESS SIGNAL GENERATOR
P S G

APPENDIX F.5 THREE WAY CONTROL VALVE

ACTIONNEUR ELECTRIQUE
ELECTRIC ACTUATOR
ELEKTRISCHER STELLANTRIEB

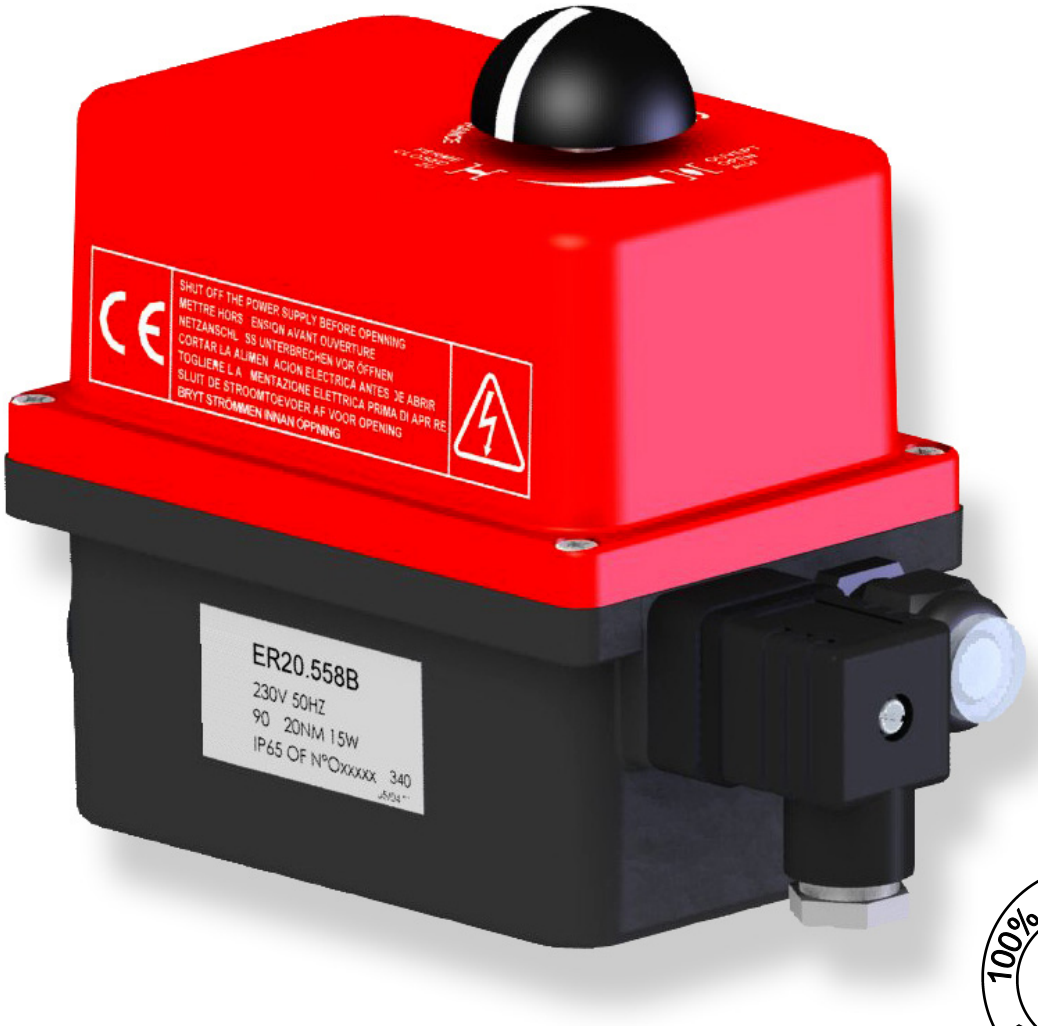
> 20-35-60-100

ER.P6

FR **DOCUMENTATION TECHNIQUE**
MISE EN SERVICE

GB ***TECHNICAL LITERATURE***
SET UP PROCEDURE

D **TECHNISCHE UNTERLAGEN**
BETRIEBSANLEITUNG



100% CONTROL MADE IN EU 100% CONTROL

Index

DESCRIPTION

These electric actuators have been designed to perform the control of a valve with 90° rotation. Please consult us for any different application. We cannot be held responsible if the mentioned actuators are used in contradiction to this advice.

SAFETY INSTRUCTIONS

To be read prior to the installation of the product

- The electric power supply must be switched-off before any intervention on the electric actuator (i.e. prior demounting its cover or manipulating the manual override knob).
- Any intervention must only be carried out by a qualified electrician or other person instructed in accordance with the regulations of electric engineering, safety, and all other applicable directives.
- Strictly observe the wiring and set-up instructions as described in the manual: otherwise, the proper working of the actuator can not be guaranteed anymore. Verify that the indications given on the identification label of the actuator fully correspond to the characteristics of the electric supply.
- The product must be protected by an easily accessible electric safety device (power isolator) corresponding to its power.
- As stipulated in the applicable regulation, the connection to earth contact is compulsory for devices with working voltages exceeding 42 V.
- Used symbols : Danger : risk of electric shock — Earth protection — Direct and alternating voltage

TRANSPORT AND STORAGE

- The forwarding agents being held as responsible for damages and delays of the delivered goods, the consignees are obliged to express if applicable their reserves, prior to accept the goods. The goods delivered directly ex works are subject to the same conditions.
- The transport to the place of destination is carried out by using rigid packing material.
- The products must be stored in clean, dry, and ventilated places preferably on appropriate palettes or shelves.

MAINTENANCE

- Maintenance is ensured by our factory. If the supplied unit does not work, please check the wiring according to the electric diagram as well as the power supply of the concerned electric actuator.
- For any question, please contact our after-sales service.
- To clean the outside of the actuator, use a lint and soapy water.
  DO NOT USE CLEANING PRODUCT WITH SOLVENT OR ALCOHOL

GUARANTEE

- 100% of the actuators are fully tested and set in the factory.
- These products are guaranteed two years from the delivery date or 50,000 operating cycles against all types of manufacturing and material faults (operating time and model class according to standard CEI34).
- This guarantee will only be valid if the unit has not been disassembled or self-repaired during its service life. It does not cover any wear and damage caused by shocks or faulty operation neither by the use of the unit under conditions not in accordance with its nominal characteristics. The guarantee is strictly limited to the replacement of original parts found defective on checking by our service personnel. The cost of shipping to our premises, the return of devices to the customer as well as the repair cost will be chargeable. We will not assume the responsibility for any direct or indirect accidents/risks originated by a failure of our products. The guarantee does not cover the consequences of breakdown and excludes any payments for indemnities. The accessories and adaptations are excluded from the guarantee. In the case where a customer has not proceeded to payments within the agreed period, our guarantee will be suspended until the delayed payments have been received and with the consequence that this suspension will not prolong the guarantee period in any case.

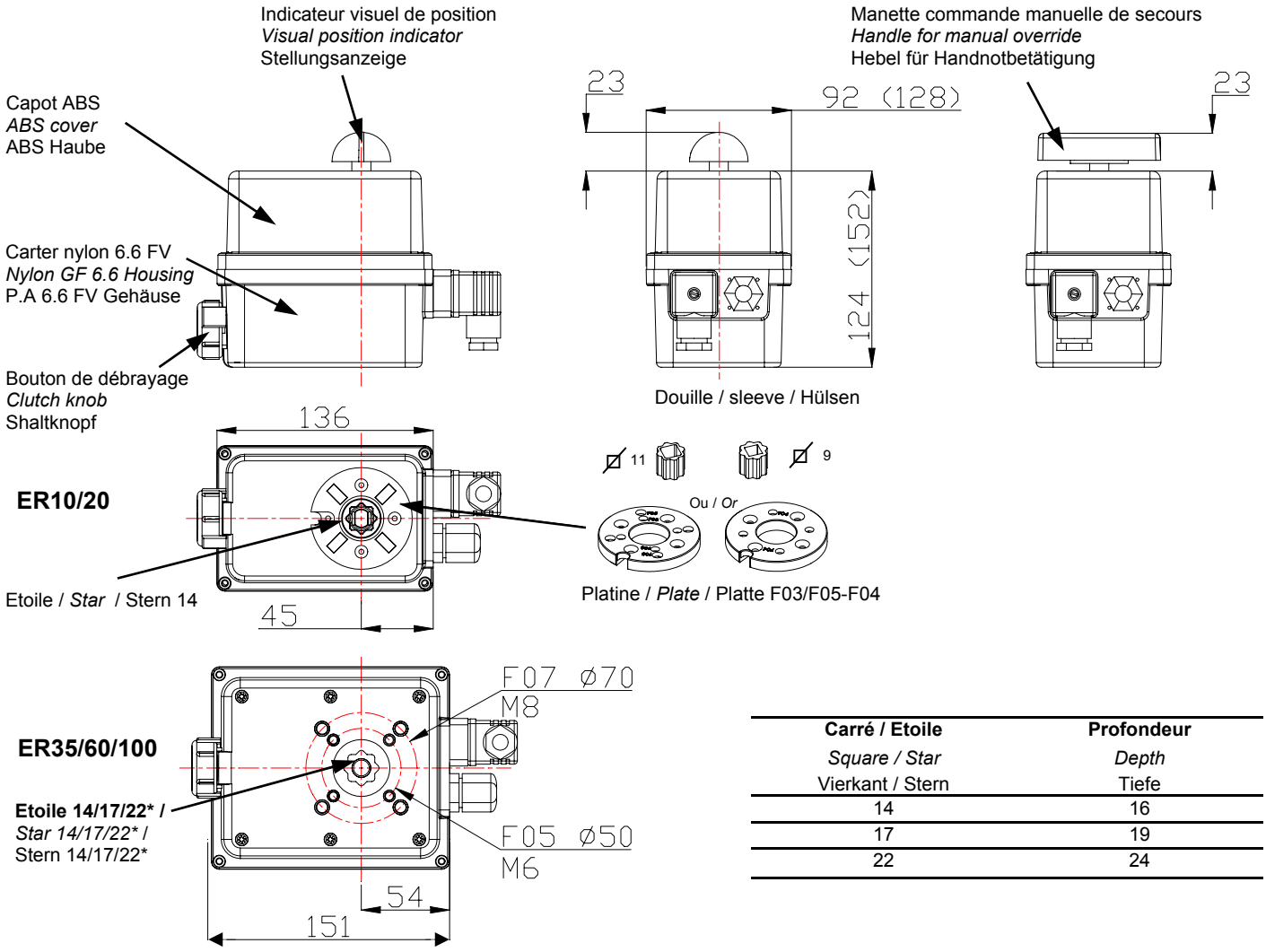
RETURN OF GOODS

- The customer is obliged to check the conformity of the goods with regard to their definition at the time of delivery.
- The acceptance of the goods by the purchaser disclaims the supplier of all responsibility if the purchaser discovers any non-conformity after the date of acceptance. In such case, the repair cost will be borne by the purchaser who will also exclusively bear all financial consequences of any resulting damage. Returned goods will only be accepted if our prior agreement has been given to this procedure : the goods must be sent free of all cost and being shipped solely and in their original packing. The returned goods will be credited to the purchaser with a reduction of 20% on the unit's price charged in accordance with the original invoice of the returned goods.

- Do not mount the actuator « upside down ».
- Do not mount the actuator less than 30 cm of a electromagnetic disturbances source.

Mechanical mounting

GB



Carré / Etoile *Square / Star* Vierkant / Stern	Profondeur *Depth* Tiefe
14	16
17	19
22	24

***Voir table de référence p.20** / *See reference table p.20* / Siehe Auswahl Tabelle Seite 20

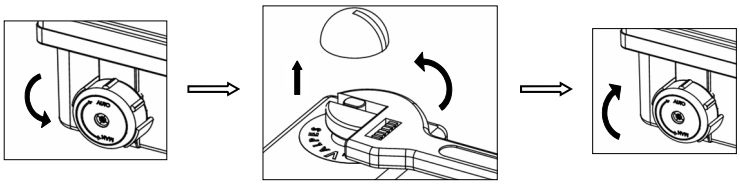
Fixation ISO F *ISO F fixation* ISO F Anschluss	Diamètre *Diameter* Diameter	Taraudé M *M threaded* M Gewinde	Nombre de vis *Screws quantity* Anzahl der Schrauben
F03	36	M5	4
F04	42	M5	4
F05	50	M6	4
F07	70	M8	4

Do not place the actuator « head down »
Do not approach any electromagnetic disturbances less than one foot from the motor

EMERGENCY MANUAL OVERRIDE

In case of an electric supply failure, it is possible to operate the actuator manually :

- Turn the knob (appendix p.17-18 mark 12) to position MAN and hold it in position.
- Turn the outgoing drive shaft of the actuator with the help of an adjusting spanner.
- In order to re-engage the reduction, release the knob.



Electric connection

RESPECT SAFETY INSTRUCTIONS

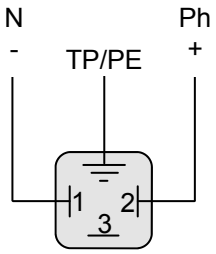
ACTUATOR PRE-SET IN FACTORY

Our cable glands are designed for cables with a diameter between 7mm and 12mm. The used cables must be able to withstand the ambient conditions (maximum temperature 55°C).

- Remove the position indicator, unscrew the four screws and take off the cover.

POWER SUPPLY WIRING

- Ensure that the voltage indicated on the actuator ID label corresponds to the voltage supply.
- Connect the wires to the connector (appendix p.17-18 mark 16) in accordance with the required control mode.



NOTA BENE : The actuator is always powered, so it must be connected to a disconnection system (switch, circuit breaker) to ensure the actuator power cut.

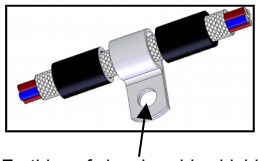
No common earth/ground connexion between the control (input and output signal) and the alimentation.
(Type 0-20 or 4-20mA : 5V DC max.)

NOTA BENE: The used wires must be rigid
(feedback voltages : 4 to 250V AC/DC)
The terminal temperature can reach 90°C

POSITIONING CARD WIRING (OUTPUT AND INPUT SIGNAL)

In order to avoid electromagnetic perturbations, it is compulsory to use shielded cables (cables longer than 3m).

- Unscrew the right gland and pass the cable.
- Connect the input signal between terminals 15 and 16.
  Terminal 15 is the negative polarity (-) and terminal 16 is the positive polarity (+).
- Connect the output signal between terminals 13 and 14.
  Terminal 13 is the positive polarity (+) and terminal 14 is the negative polarity (-).
- Tighten the cable gland.



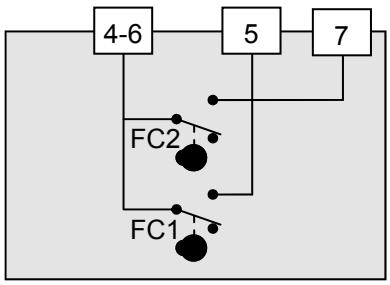
Earthing of signals cable shielding
ONLY for
ER 35-60-100 P6

Factory setting : by default, 4-20mA input and output signals with normal rotation sense.
To proceed to a new setting of the card : please see next page, “Parameter selection sequence”.
To check the proper operation of the card : please see next page, “Normal operating mode”.

WIRING OF THE FEEDBACK SIGNAL

Our actuators are equipped with two simple limit switch contacts normally set in their open position (NO). As per factory setting, the white cam is used to detect the open position (FC1) and the black cam is used to detect the closed position (FC2).
This feedback system accepts voltages between 24V and 240V AC/DC.

- Unscrew the right cable gland and insert the cable.
- Remove 25mm of the cable sheath and strip each wire by 8mm.
- Connect the wires to the terminal strip (appendix p.17-18 mark 13) in accordance with the diagram beside.
- Tighten the cable gland.



SETTING OF END LIMIT SWITCHES

The actuator is pre-set in our factory. Do not touch the two lower cams in order to avoid any malfunctioning or even damage to the actuator.

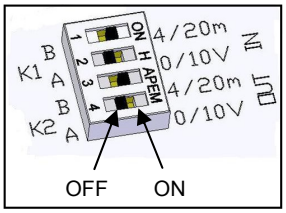
- To adjust the position of the auxiliary contacts, make rotate the two superior cams by using the appropriate wrench.

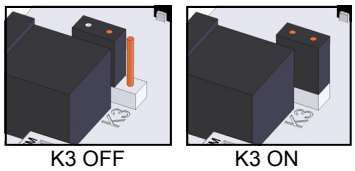
- Re-mount the cover, fasten the four screws and attach the position indicator.

PARAMETER SELECTION SEQUENCE

1 Shunts positioning K1, K2 and K3

- Position the shunts as follows (before modification, switch off the card) :





K3 OFF K3 ON

Input signal	Output signal	Schunt K1		Schunt K2		Schunt K3
		A	B	A	B	
0-10V	**0-10V**	ON	OFF	ON	OFF	OFF
0-10V	**0-20mA**	ON	OFF	OFF	ON	OFF
0-10V	**4-20mA**	ON	OFF	OFF	ON	ON
0-20mA	**0-10V**	OFF	ON	ON	OFF	OFF
0-20mA	**0-20mA**	OFF	ON	OFF	ON	OFF
0-20mA	**4-20mA**	OFF	ON	OFF	ON	ON
4-20mA	**0-10v**	OFF	ON	ON	OFF	OFF
4-20mA	**0-20mA**	OFF	ON	OFF	ON	OFF
4-20mA	**4-20mA**	OFF	ON	OFF	ON	ON

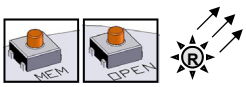
2 Selection of the flow direction of the valve

2.1 Normal flow direction (by default)
- Press the **OPEN** button and apply the operating voltage to the card while keeping this button depressed.
- The **green LED lights up**. Release the **OPEN** button.
- Disconnect the card.

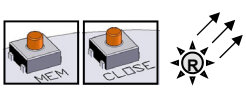
2.2 Inverse flow direction
- Press the **CLOSE** button and apply the operating voltage to the card while keeping this button depressed.
- The **red LED lights up**. Release the **CLOSE** button.
- Disconnect the card.

3 Selection of the type of set value

3.1 Voltage set value 0-10V
- Press the **MEM** button and apply the operating voltage to the card while keeping this button depressed.
- The **red LED will light up 3 times**. Release this button.
- Disconnect the card.

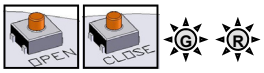


3.2 Current set value 0-20mA
- Press the **MEM** and **OPEN** buttons and apply the operating voltage to the card while keeping these buttons depressed.
- The **red LED will light up 3 times**. Release these buttons.
- Disconnect the card.



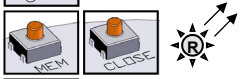
3.3 Current set value 4-20mA (by default)
- Press the **MEM** and **CLOSE** buttons and apply the operating voltage to the card while keeping these buttons depressed.
- The **red LED will light up 3 times**. Release these buttons.
- Disconnect the card.

4 Learning mode



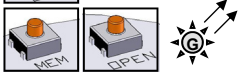
- Press the **OPEN** and **CLOSE** buttons and apply the operating voltage to the card while keeping these buttons depressed.
- The **2 LEDs will light up**. Release these buttons and the 2 LEDs will extinguish. The card is now in the learning mode.

- Press the **CLOSE** button to put the valve in its closed position. The **red LED will light up**.



- Store this selected closed position by pushing **MEM + CLOSE,** the **red LED will light up 3 times** as a confirmation of acknowledgement.

- Press the **OPEN** button to put the valve in its open position. The **green LED will light up**.



- Store this selected open position by pushing **MEM + OPEN,** the **green LED will light up 3 times** as a confirmation of acknowledgement.

- Now, the positions selected have been stored. Disconnect the card.

NORMAL OPERATING MODE

- Apply the operating voltage to the card. The **green LED will light up 3 times**.
- Under normal operating conditions, the green LED will light up when the drive motor opens the valve, and the red LED will light up when the drive motor closes it.
- If both LEDs remain extinguished, it means that the drive motor has not been triggered.

- In the case of an over torque, the motor stops and the **2 LEDS lights** then together to indicate the action of the torque limiter. To re-start it, you must either reverse the sense of rotation, either switch the power off and on.

Schéma électrique : Série ER P6

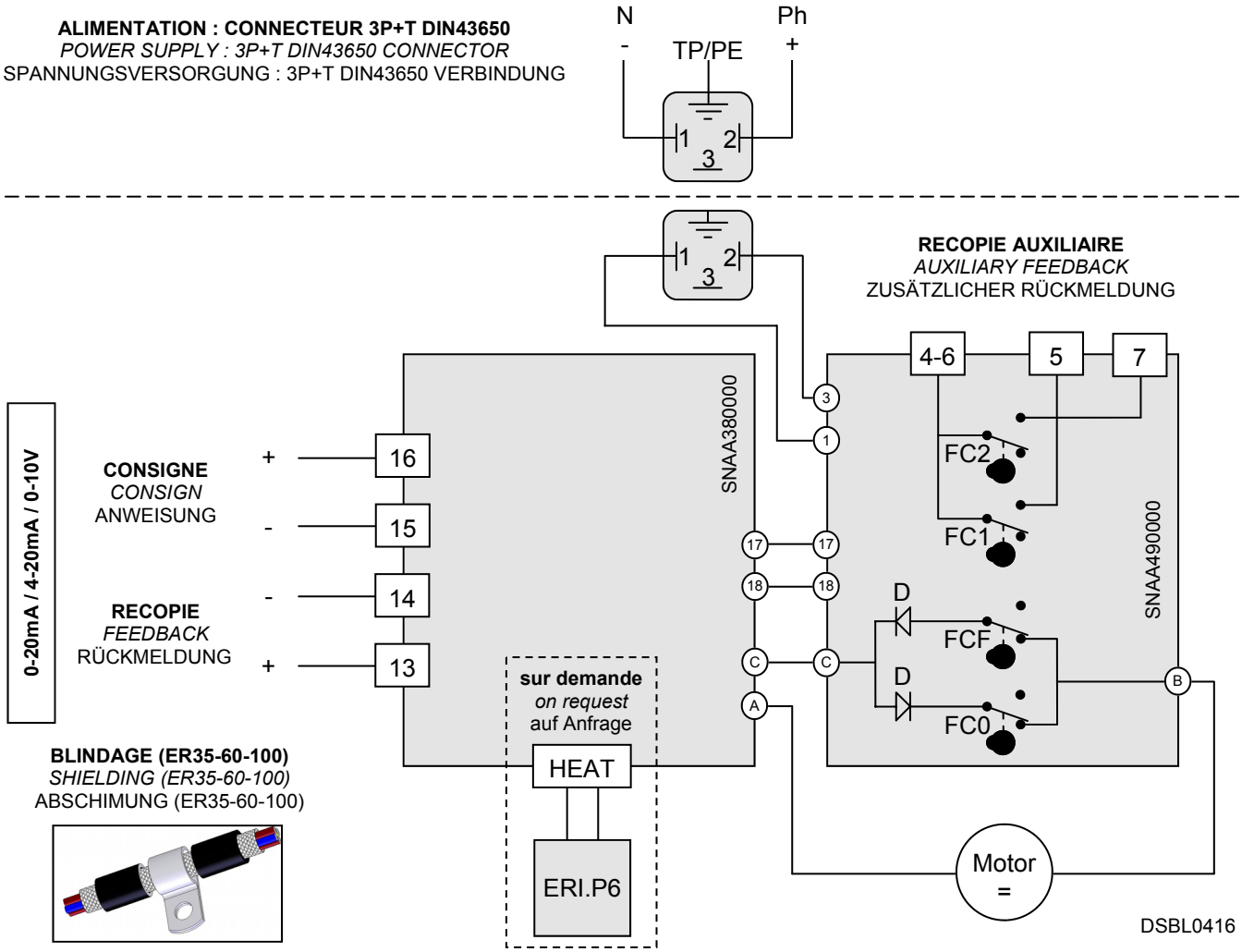
FR | GB | D

Electric wiring : P6 ER range

Schaltplan : P6 ER Serie

TENSION INDIQUEE SUR L'ACTIONNEUR : 24V AC/DC ou 100-240V AC (120-350V DC)
INDICATED VOLTAGE ON ACTUATOR : 24V AC/DC or 100-240V AC (120-350V DC)
SPANNUNG, DIE AUF ANTRIEBE GEZEIGT IST : 24V AC/DC ODER 100-240V AC (120-350V DC)

ALIMENTATION : CONNECTEUR 3P+T DIN43650
POWER SUPPLY : 3P+T DIN43650 CONNECTOR
SPANNUNGSVERSORGUNG : 3P+T DIN43650 VERBINDUNG



BLINDAGE (ER35-60-100)
SHIELDING (ER35-60-100)
ABSCHIMUNG (ER35-60-100)

La tension de pilotage doit être de type T.B.T.S. (Très Basse Tension de Sécurité)
The control voltage must be .S.E.L.V. (Safety Extra Low Voltage)
Berücksichtigen Sie für die Spannungsversorgung eine Schutzkleinspannung!

La température du bornier peut atteindre 90°C
The terminal temperature can reach 90°C
Die Terminal-Temperatur kann bis zu 90°C erreichen

NOTA BENE : Les câbles utilisés doivent être rigides (tensions pour la recopie : 4 à 250V AC/DC)
NOTA BENE: The used wires must be rigid (feedback voltages : 4 to 250V AC/DC)
NOTA BENE: Die Anschlusskabel müssen biegesteif sein (Rückmeldespannungen 4 bis 250V AC/DC)

Pas de masse commune entre la commande (consigne et recopie) et l'alimentation. (Type 0-20 ou 4-20mA : 5V DC max.)
No common earth/ground connexion between the control (input and output signal) and the alimentation. (Type 0-20 or 4-20mA : 5V DC max.)
Keine gemeinsame Masse zwischen der Bestellung des Signals und der Stromernährung. (0-20 oder 4-20mA : 5V DC maxi.)

REP	DESIGNATION BESCHREIBUNG
FC0	**Fin de course ouverture** *Open limit switch* Endschalter AUF
FCF	**Fin de course fermeture** *Close limit switch* Endschalter ZU
FC1	**Fin de course auxiliaire 1** *Auxiliary limit switch 1* Zusätzlicher Endschalter 1
FC2	**Fin de course auxiliaire 2** *Auxiliary limit switch 2* Zusätzlicher Endschalter 2

Données techniques

Technical data
Besondere Bedingungen

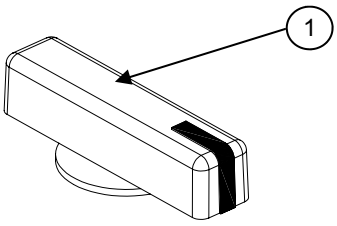
DONNEES TECHNIQUES / *TECHNICAL DATA*				
Type (actionneur électrique 1/4 tour) *Type (1/4 turn electric actuator)*	ER20	ER35	ER60	ER100
Protection IP / *IP protection* (EN60529)	IP65 (étanche aux poussières, jet d'eaux « débit <12.5 L/min » / *dusttight, water spraying « flow <12.5 L/min* »)			
Résistance à la corrosion (utilisation en intérieur et extérieur) *Corrosion resistance (outdoor and indoor use)*	Plastique / *plastic* : PA6.6 et / *and* ABS Toutes pièces métalliques :INOX 304 ou Acier + traitement Zn *Raw material* : 304 *Stainless Steel or Steel + Zn treatment*			
Température / *Temperature*	-10°C à/*to* +55°C			
Hydrométrie / *Hydrometry*	< 80% à 31°C (88°F) avec décroissance linéaire jusqu'à 50% à 40°C(selon EN61010-1) < 80% to 31°C (88°F) with lineary decrease down to 50% at 40°C (according EN61010-1)			
Degré de pollution / *Pollution degree*	Classe 2 / *Class 2*			
Altitude / *Altitude*	0 à/*to* 2000m			
Poids / *Weight*	1.1 Kg	2.9 Kg		
DONNEES MECANIQUES / *MECHANICAL DATA*				
Couple nominal / *Nominal torque*	15Nm	25Nm	45Nm	75Nm
Couple maximal / *Maximal torque*	20Nm	35Nm	60Nm	100Nm
Temps de manœuvre / *1/4 turn travel time*	20s	35s	60s	100s
Embase de fixation / *Mounting actuator base* (ISO5211)	Etoile/*Star* 14 F03-F04-F05	Etoile/*Star* 14 F05-F07	Etoile/*Star* 17 F05-F07	Etoile/*Star* 22 F05-F07
Angle de rotation / *Swing angle*	90			
Butées mécaniques / *Mechanical end stops*	90			
Commande manuelle / *Manual override*	Axe sortant / *Out axle*			
Sens de rotation / *Direction of rotation*	Sens antihoraire pour ouvrir / *Anticlockwise to open*			
DONNEES ELECTRIQUES / *ELECTRICAL DATA*				
Tension / *Voltage*	24V AC/DC ou/*or* 90V à/*to* 240V AC (90V à/*to* 350V DC)*			
Fréquence / *Frequency*	50/60Hz			
Puissance consommée / *Power consumption*	15W	15W ou/*or* 45W		45W
Catégorie surtension / *Overvoltage category*	Catégorie II / *Category II*			
Limiteur de couple / *Torque limiter*	Limiteur électronique / *Electronic limiter*			
Durée sous tension / *Duty cycle* (CEI34)	50%			
Tension maximale contacts fins de course *Limit switches maximal voltage*	4V à/to 250V AC/DC (Surtension catégorie II / *Overvoltage category II*)			
Courant maximal contacts fins de course *Limit switches maximal current*	5A			
Raccordement électrique / *Electrical connexion*	1 Presse étoupe ISO M20 / *1 ISO M20 gland* 1 connecteur 3P+T DIN43650 / 1 *DIN43650 3P+T connector*			
Résistance de réchauffage régulée *Regulated heating resistor*	En option (ERI.P6) / *In option (ERI.P6)*			

Liste des pièces détachées

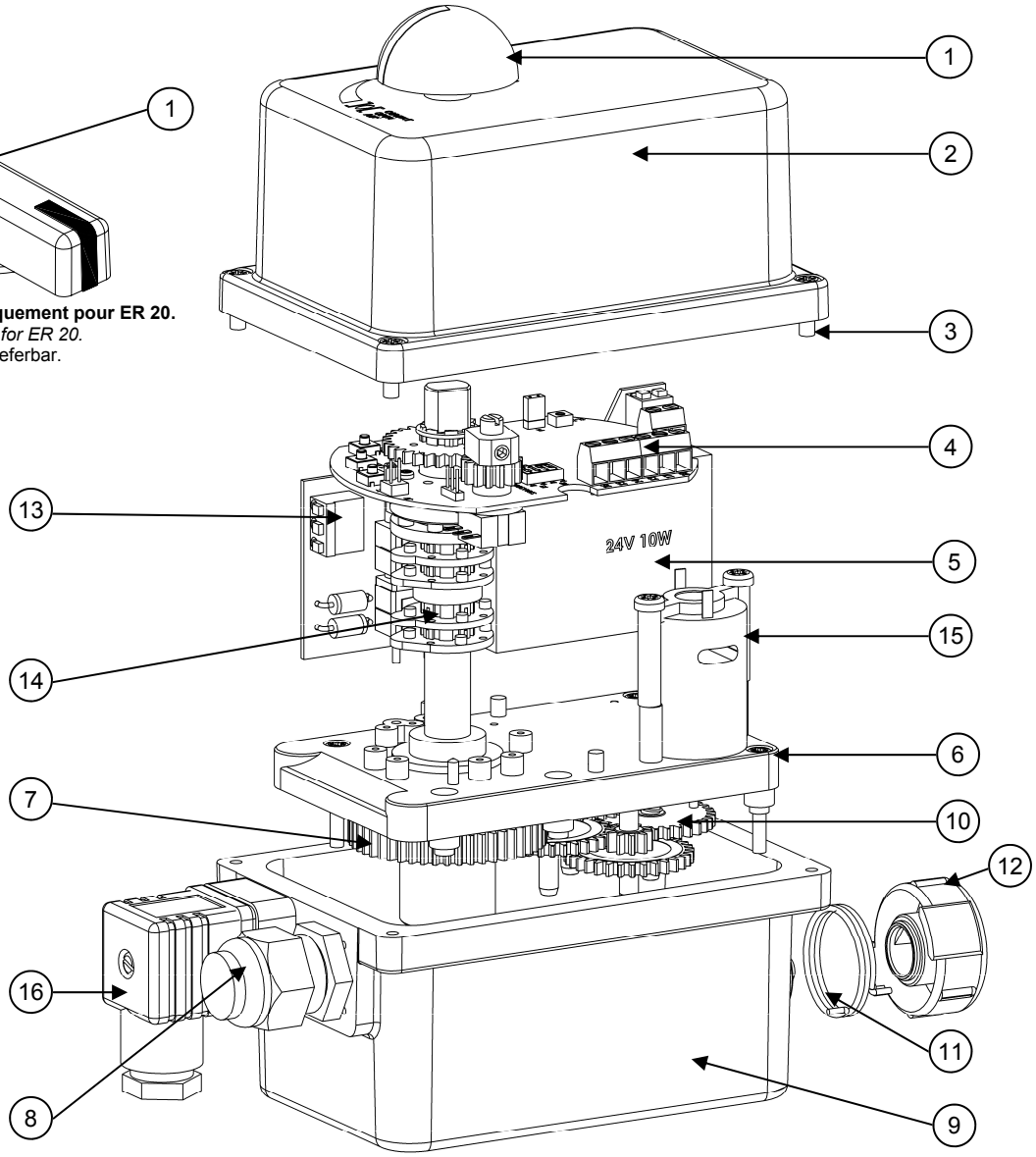
FR | GB | D

Spare parts list
Ersatzteilliste

ER 20 P6



Manette fournie uniquement pour ER 20.
Handle only provided for ER 20.
Hebel nur für ER 20 lieferbar.



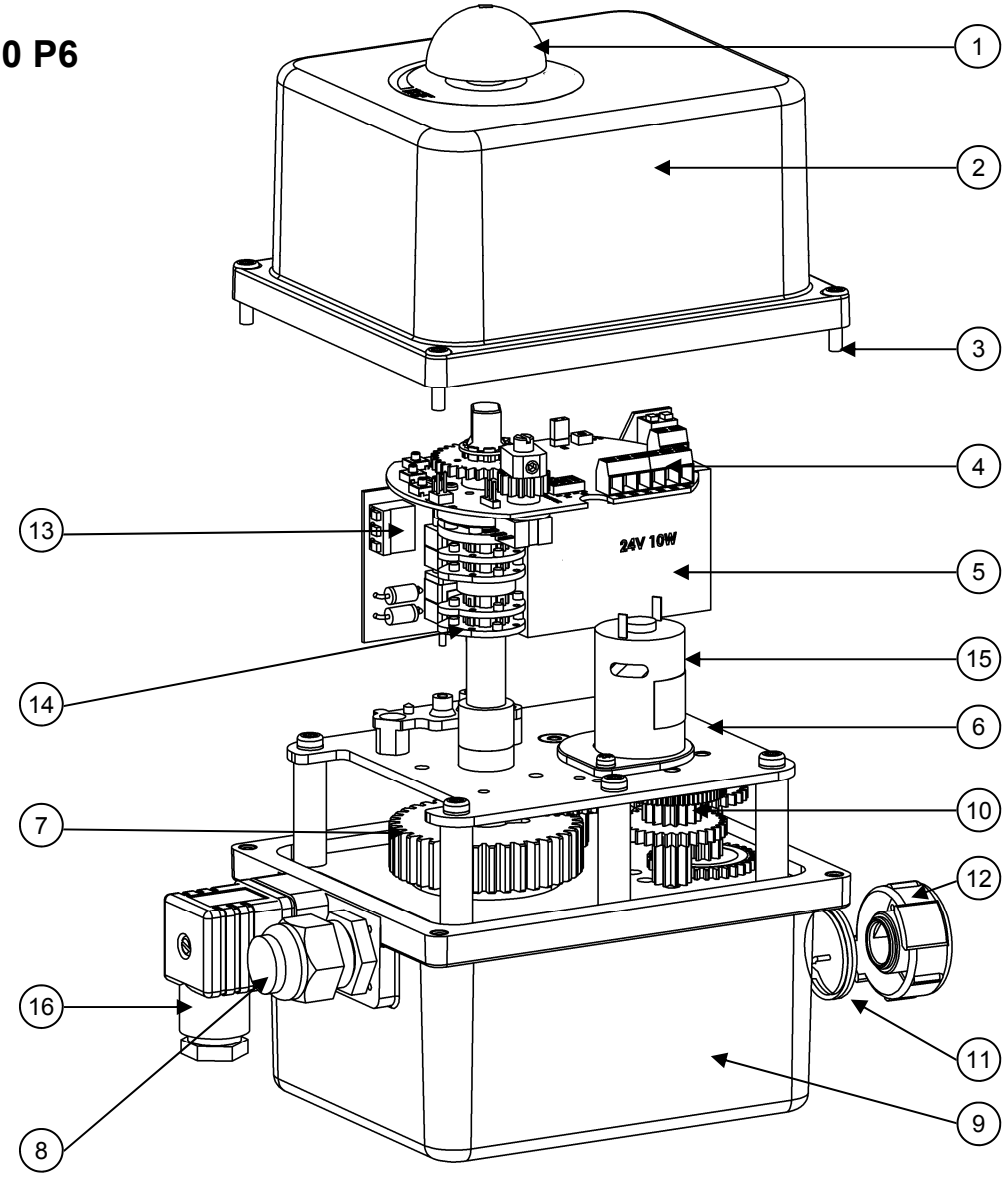
Rep.	Désignation	*Designation*	Bezeichnung
1	**Indicateur visuel de position**	*Visual position indicator*	Stellungsanzeige
2	**Capot ABS**	*ABS cover*	ABS Haube
3	**Vis inox**	*Stainless steel screws*	Edelstahl Schrauben
4	**Bornier signal entrée / sortie**	*Input / output terminal trip*	Anschlussklemmen des Signalgebers / Rückmeldung
5	**Carte d'alimentation**	*Power supply card*	Stromversorgung Karte
6	**Plaque réducteur**	*Gear box plate*	Getriebeplatte
7	**Entraîneur**	*Shaft + sleeve*	Antriebswelle
8	**Presse-étoupe ISO M20**	*ISO M20 gland*	PG Schrauben ISO M20
9	**Carter Nylon**	*Nylon housing*	Gehäuse
10	**Engrenages**	*Gears*	Getriebe
11	**Ressort**	*Spring*	Feder
12	**Bouton de débrayage**	*Clutch knob*	Schaltknopf
13	**Bornier fin de course auxiliaire**	*Aux. Limit switch terminal trip*	Zusätzlicher Endschalter
14	**Cames**	*Cams*	Nocken
15	**Moteur**	*Motor*	Motor
16	**Connecteurs 3P+T (DIN436560)**	*Connectors 3P+T (DIN436560)*	Gerätesteckdosen 3P+T (DIN436560)

Liste des pièces détachées

FR | GB | D

Spare parts list
Ersatzteilliste

ER35-60-100 P6

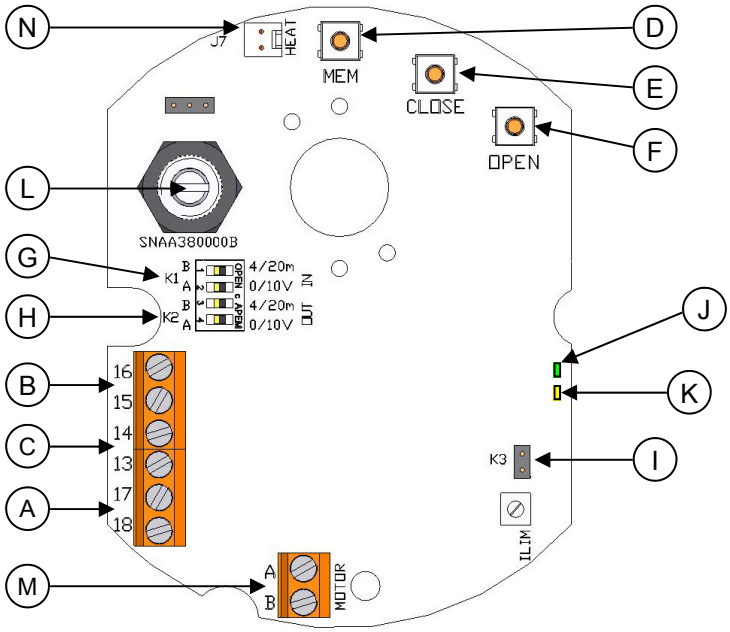


Rep.	Désignation	*Designation*	Bezeichnung
1	**Indicateur visuel de position**	*Visual position indicator*	Stellungsanzeige
2	**Capot ABS**	*ABS cover*	ABS Haube
3	**Vis inox**	*Stainless steel screws*	Edelstahl Schrauben
4	**Bornier signal entrée / sortie**	*Input / output terminal trip*	Anschlussklemmen des Signalgebers / Rückmeldung
5	**Carte d'alimentation**	*Power supply card*	Stromversorgung Karte
6	**Plaque réducteur**	*Gear box plate*	Getriebeplatte
7	**Entraîneur**	*Shaft + sleeve*	Antriebswelle
8	**Presse-étoupe ISO M20**	*ISO M20 gland*	PG Schrauben ISO M20
9	**Carter Nylon**	*Nylon housing*	Gehäuse
10	**Engrenages**	*Gears*	Getriebe
11	**Ressort**	*Spring*	Feder
12	**Bouton de débrayage**	*Clutch knob*	Schaltknopf
13	**Bornier fin de course auxiliaire**	*Aux. Limit switch terminal trip*	Zusätzlicher Endschalter
14	**Cames**	*Cams*	Nocken
15	**Moteur**	*Motor*	Motor
16	**Connecteurs 3P+T (DIN436560)**	*Connectors 3P+T (DIN436560)*	Gerätesteckdosen 3P+T (DIN436560)

Carte électronique

Electronic card
Elektronische Karte

Carte de positionnement P6 (0-20mA / 4-20mA / 0-10V)
P6 positioning card (0-20mA / 4-20mA / 0-10V)
P6 Regelungkarte (0-20mA / 4-20mA / 0-10V)



Rep.	Désignation	*Designation*	Bezeichnung
A	**Bornier d'alimentation 24V AC/DC**	*24V AC/DC power supply terminal trip*	24V AC/DC Spannungsversorgung
B	**Bornier de consigne**	*Instruction terminal trip*	Anschlussklemmen des Signalgebers
C	**Bornier de recopie**	*Feed back terminal trip*	Anschlussklemmen der Rückmeldung
D	**Bouton de réglage MEM**	*Adjustment button MEM*	Einstellknopf MEM
E	**Bouton de réglage CLOSE**	*Adjustment button CLOSE*	Einstellknopf CLOSE
F	**Bouton de réglage OPEN**	*Adjustment button OPEN*	Einstellknopf OPEN
G	**Cavalier K1**	*K1 shunt*	K1 Steckbrücke
H	**Cavalier K2**	*K2 shunt*	K2 Steckbrücke
I	**Cavalier K3**	*K3 shunt*	K3 Steckbrücke
J	**LEDs verte et rouge**	*Green and red LEDs*	Grüne und rote LEDs
K	**LED jaune : présence tension**	*Yellow LED : power supply indication*	Gelb LED : Stromversorgung Anzeige
L	**Potentiomètre**	*Potentiometer*	Potentiometer
M	**Connexion moteur**	*Motor connexion*	Motor Zusammenhang
N	**Connecteur résistance de réchauffage**	*Heating resistor connector*	Heizwiderstandsverbindung

Table de référence Série ER.P6

FR | GB | D

ER.P6 Series reference table
ER.P6 Serie Auswahl Tabelle

Code **POSI.**	Etoile/fixation* *Star/Fixation** Stern / Anschluss*	Couple *Torque* Drehmoment	Tensions *Voltages* Spannung	Puissance *Power* Leistung	Tps de man, *travel time* *Stellzeit*
ER20* **	14/F03-F04-F05	20Nm	90-240V AC **	15W	20s
ER20* **	14/F03-F04-F05	20Nm	24V AC/DC	15W	20s
ER35	14/F05-F07	35Nm	90-240V AC **	45W	35s
ER35	14/F05-F07	35Nm	24V AC/DC	45W	35s
ER60	17/F05-F07	60Nm	90-240V AC **	45W	60s
ER60	17/F05-F07	60Nm	24V AC/DC	45W	60s
ER100	22/F05-F07	100Nm	90-240V AC **	45W	100s
ER100	22/F05-F07	100Nm	24V AC/DC	45W	100s

*** douilles de réduction étoile de 14xcarré 9-11 , ou étoile de 22xcarré de 17, autres voir tableau**
reducing sleeves star 14 to square 9-11, star 22 to square 17, others see table
**** 90-240V AC pour** */ for* **50-60Hz et** */ and* **90-350V DC**
***** x = platine amovible F03 ou F04 ou F05, peut être commandée assemblée: préciser le E et F requis**
x = removable plate F03 or F04 or F05, can be ordered mounted: confirm the S & F needed.

Options */ Options /* Optionen

Description *Description* Beschreibung
Résistance de réchauffage 10W régulée / *Regulated heating resistor 10W* / Reguliert Heizwiderstand 10 W

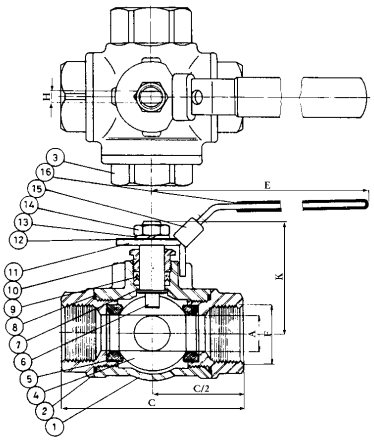
STAINLESS STEEL MULTI-PORTED BALL VALVES

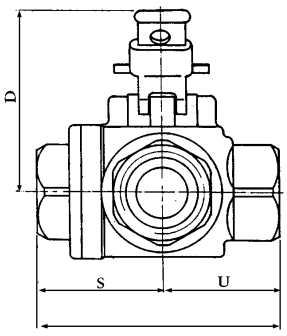
33-10-T

69 bar WOG
Stainless steel
ASTM A351 CF8M
Screwed BS 21
DN15 to DN50

33-10-T

Three-way T-port
Four seat rings
Reduced bore
Anti-blowout stem
Locking device



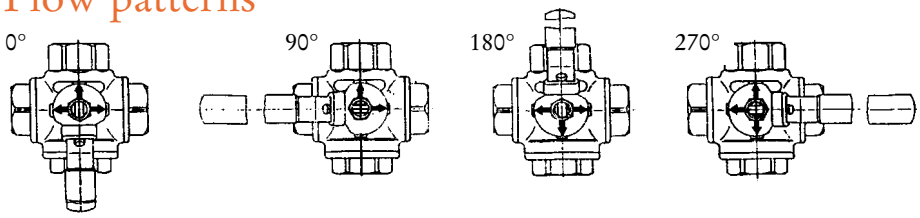


CONDOR

Applications – blending, diverting and segregating duties in process industries requiring the protection afforded by cast stainless steel in handling corrosive liquids and gases in piping systems. The versatility of the flow patterns illustrated opens up significant opportunities for highly cost effective system design. The valves may not only be used singly to connect three different flows, but also in series, sequentially or in tandem and crossover assemblies. Easily actuated for remote control systems.

Specification – all wetted parts are in ASTM A351 CF8M or equivalent. Body, cap and ends are investment cast which provides superior finish and impermeable material totally free from pinholes or other blemishes. The valve rotates – with 90° lockable stopping positions – through full 360° thus providing great diversity. Stem design is anti-blowout. The actuator mounting pad is cast integrally with the body. The valves are bi-directional with ends threaded BS 21 (ISO 7) taper.

Flow patterns



P/T ratings – rated 69 bar WOG; temperature range minus 76° Celsius to plus 232° Celsius the highest useful temperature for glass reinforced PTFE. Pressure capability reduces as valve DN increases; check with our Technical Department.

Materials

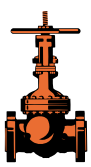
No	Part	Material	No	Part	Material
1	Body	ASTM A351 CF8M	9	Stem packing	PTFE
2	*Body cap*	*ASTM A351 CF8M*	*10*	*Gland nut*	*ASTM A479 304*
3	Blind cap	ASTM A351 CF8M	11	Handle	ASTM A479 304
4	*Ball*	*ASTM A479 316*	*12*	*Flow indicator*	*Aluminium*
5	Seat ring	Reinforced PTFE	13	Handle washer	ASTM A479 304
6	*Stem*	*ASTM A479 316*	*14*	*Handle nut*	*ASTM A479 304*
7	Thrust washer	Reinforced PTFE	15	Locking device	ASTM A479 304
8	*Gasket*	*PTFE*	*16*	*Handle cover*	*Plastic*

Testing – each valve is individually tested for tightness of body and seats.

Dimensions mm

DN	in	A	C	D	E	H	K	P	S	U
15	1/2	13	75	53	96	7	50	72	34	38
20	3/4	15	85	64	125	7	52	82	39	43
25	1	20	100	66	125	8	65	101	51	50
32	1 1/4	25	115	79	170	8	70	109	51	58
40	1 1/2	32	125	83	170	10	82	121	58	63
50	2	40	150	94	170	10	90	140	65	75

Options – full bore; sanitary end connections; pneumatic/electric actuation.



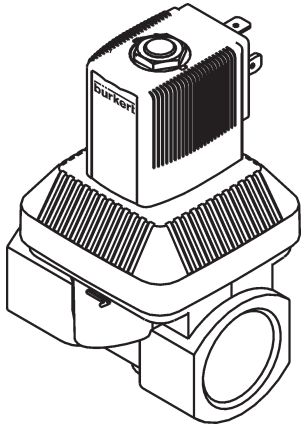
APPENDIX F.6 SOLENOID VALVES – NORMALLY CLOSED

Operating instructions
Manual de instrucciones

Betriebsanleitung
Notice d'utilisation

Type 6213

2/2-Wege-Magnetventil
Solenoid on/off valve, 2/2-way
Electrovanne 2/2 tout ou rien
Electroválvula todo/nada, 2/2 vías



bürkert
Fluid Control Systems

Sicherheit (D)

Bestimmungsgemäße Verwendung

Bitte beachten Sie die Hinweise dieser Betriebsanleitung sowie die Einsatzbedingungen und zulässigen Daten gemäß Datenblatt Typ 6213, damit das Gerät einwandfrei funktio-niert und lange einsatzfähig bleibt. Bei Nichtbeachtung dieser Hinweise sowie bei unzulässigen Ein-griffen in das Gerät entfällt jegliche Haftung unsererseits, ebenso erlischt die Garantie auf Geräte u. Zubehörteile! Das Gerät dient ausschließlich als 2/2-Wege-Magnetventil für die lt. Datenblatt zulässigen Medien. Eine andere oder darüber hinausgehende Benutzung gilt als ***nicht bestimmungsgemäß***. Für hieraus resultierende Schäden haftet Bürkert nicht. Das Risiko trägt allein der Anwender.

Geräte mit VDE-Kennzeichen auf dem Typschild haben die Zulassung nach DIN EN 60730 (VDE 0631). Die Zulassung ist auf folgende Punkte beschränkt:

max. Mediumstemperatur	50°C
Elektrischer Anschluß	Gerätesteckdose Typ 2508

ACHTUNG!

- **Halten Sie sich bei Einsatzplanung und Betrieb des Gerätes an die einschlägigen allgemein anerkannten sicherheitstechnischen Regeln.**
- **Treffen Sie geeignete Maßnahmen, um unbeabsichtigtes Betätigen oder unzulässige Beeinträchtigungen auszuschließen.**
- **Beachten Sie, daß in Systemen, die unter Druck stehen, Leitungen und Ventile nicht gelöst werden dürfen. Schalten Sie vor Eingriffen in das System in jedem Fall die Spannung ab!**
- **Achten Sie auf den einwandfreien Sitz der Dichtung beim Verschrauben der Spule mit der Gerätesteckdose.**

WARNUNG!

- **Verletzungsgefahr! Bei Dauerbetrieb kann die Spule sehr heiß werden.**

Safety (GB)

Proper Usage

To ensure the proper function of the device and promote long service lift, you must comply with the information in these Operating Instructions and the application conditions and specifications provided in the Type 6213 Data Sheet. Usage of the device in a manner that is contrary to these Operating Instructions or the application conditions and specifications provided in the Type 6213 Data Sheet is improper and will void your warranty. This device serves exclusively as a 2/2-way solenoid valve for the media stated to be permissible on the data sheet. Any other use is considered improper use. ***Bürkert will not be responsible for any improper use of the device.***

Devices with VDE symbol on the rating plate have approval to DIN EN 60730 (VDE 0631). Approval is limited to the following points:

Max. medium temperature	50°C
Electrical connection	female connector Type 2508

ATTENTION!

- **Be sure to observe generally accepted safety rules when planning, installing and using this device. For example, take suitable measures to prevent unintentional operations of the device.**
- **Do not impair the operation of the device.**
- **Do not attemp to detach or unscrew any lines or valves in the system that are under pressure, and always be sure to switch off the voltage supply before working on the system.**
- **When attaching the coil to the plug socket, be sure the seal is properly seated.**

WARNING!

- **Do not touch the coil during use as it becomes very hot.**

MAN 1000010697 ML Version: K Status: RL (released | freigegeben) printed: 26.11.2008

Sécurité (F)

Utilisation conforme aux prescriptions

Afin que l'appareil puisse fonctionner parfaitement et pendant longtemps, veuillez observer les instructions contenues dans cette notice d'utilisation ainsi que les conditions d'utilisation et les données admissibles mentionnées dans la fiche technique du type 6213. En cas d'inobservation de ces instruc-tions et d'interventions non autorisées dans l'appareil, nous décli-nons toute responsabilité et la garantie couvrant l'appareil et les accessoires s'éteint! L'appareil sert uniquement d'électrovanne 2/2 voies pour les fluides admis selon la fiche technique. Une autre utilisation ou une utilisation excédant ce contexte sera con-sidérée comme ***non conforme aux prescriptions***. Pour les dommages qui en résulteraient, le fabricant/fournisseur décline toute responsabilité. L'utilisateur seul en assume le risque.

Les appareils avec signe VDE sur la plaquette signalétique possèdent l'homologation selon DIN EN 60730 (VDE 0631). L'homologation se limite aux points suivants:

température max. du fluide	50°C
raccordement électrique	prise d'appareil type 2508

ATTENTION!

- **Pour la planification de l'utilisation et l'exploitation de l'appareil, veuillez vous en tenir aux règles applicables et généralement reconnues en matière de technique de sécurité.**
- **Prenez les mesures nécessaires pour exclure tout action-nement involontaire ou des altérations inadmissibles.**
- **Notez qu'il n'est pas permis de desserrer des conduites ou des vannes se trouvant sous pression dans des systèmes! Avant d'intervenir dans le système, coupez l'alimentation électrique dans tous les cas!**
- **Veillez à ce que le joint repose parfaitement lorsque vous visserez la bobine avec le connecteur.**

AVERTISSEMENT!

- **Risque de blessure! En cas de fonctionnement permanent, la bobine peut devenir très chaude.**

Seguridad (E)

Utilización con arreglo a las disposiciones

Se ruega observar las indicaciones contenidas en este Manual de instrucciones así como las condiciones de uso y datos admi-sibles con arreglo a la hoja de servicio Tipo 6213, de modo que el aparato funcione impecablemente y permanezca durante largo tiempo apto para el empleo. La inobservancia de estas indicaciones así como las intervenciones inadmisibles en el aparato suponen la declinación por nuestra parte de toda clase de responsabilidad, además de la extinción de la garantía de los aparatos y de las piezas de los acce-sorios. El aparato sirve exclusivamente como válvula magnética de 2/2 pasos para los medios autorizados según la hoja de datos. Cualquier otra utili-zación que vaya más e*lla* ***no será conforme a las disposi-ciones.*** El fabricante/suministrador no es responsable de los daños que de ello pudieran resultar. El riesgo corresponde únicamente al usuario.

Los aparatos con matrícula VDE en la placa indicadora tienen la autorización según DIN EN 60730 (VDE 0631). La autorización está limitada a los puntos siguientes:
Temperatura máx. del medio: 50°C; Conexión eléctrica: Caja de enchufe para aparatos eléctricos tipo 2508

¡ATENCIÓN!

- **Para la planificación y operación del aparato atenerse a las correspondientes reglas generales y reconocidas de la técnica de seguridad.**
- **Tomar las medidas apropiadas para excluir accionamientos no intencionados o perjuicios inadmisibles; prestar atención a que en el caso de sistemas que se encuentren bajo presión no deben desconec-tarse conducciones y válvulas.**
- **Antes de proceder a intervenciones en el sistema desconectar siempre la tensión.**
- **Prestar atención al asiento impecable de la empaquetadura al atornillar la válvula con la caja de enchufe para aparatos eléctricos.**

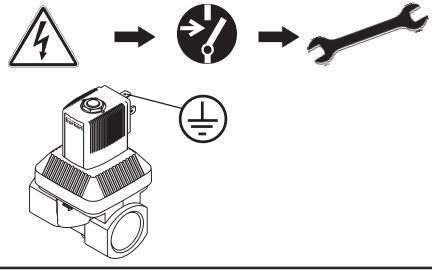
¡AVISO!

- **¡Peligro de lesiones! En estado de operación continua la bobina puede ponerse muy caliente.**

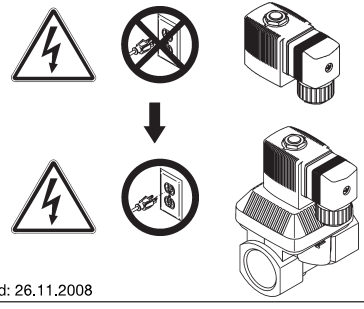
Sicherheit (D) (GB) (F) (E)

Safety / Sécurité / Seguridad

① Spannungsfreie Montage / Voltage-free assembly
Montage sans tension / Montaje libre de tensión



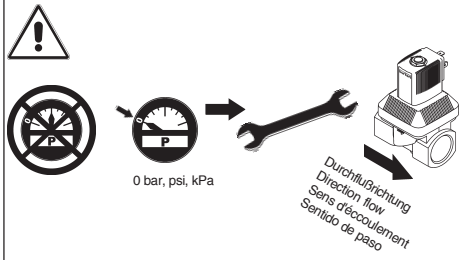
② Elektrischer Anschluß / Electrical connection /
Raccordement électrique / Conexión eléctrica



Sicherheit (D) (GB) (F) (E)

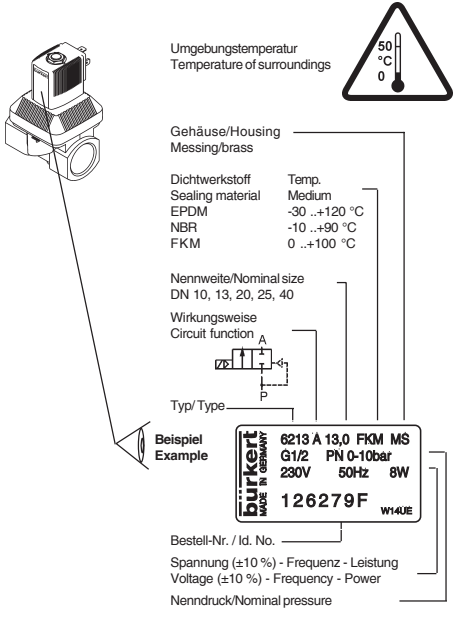
Safety / Sécurité / Seguridad

③ Fluidischer Anschluß / Fluid connection
Raccordement fluidique / Conexión fluídica



Technische Daten (D) (GB)

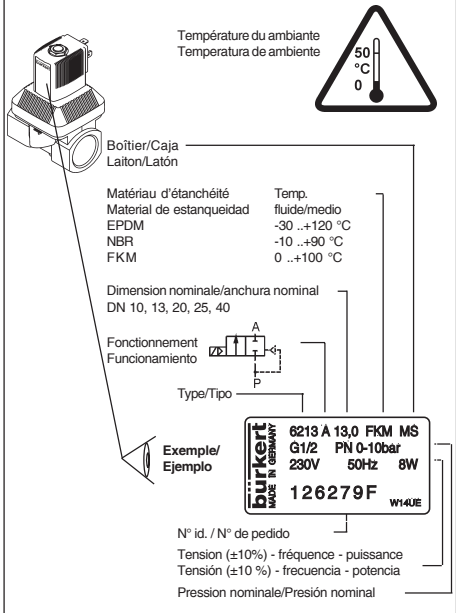
Technical Data



Technische Änderungen vorbehalten
We reserve the right to make technical changes without notice

Technische Daten (F) (E)

Caractéristiques techniques / Datos técnicos



Sous resérve de modification techniques.
Nos reservamos el derecho de llevar a cabo modificaciones tècnicas sin previo aviso.

Niederlassungen / Branch Offices

Contact addresses / Kontaktadressen

Germany / Deutschland / Allemange
Bürkert Fluid Control System
Sales Centre
Chr.-Bürkert-Str. 13-17
D-74653 Ingelfingen
Tel. + 49 (0) 7940 - 10 91 111
Fax + 49 (0) 7940 - 10 91 448

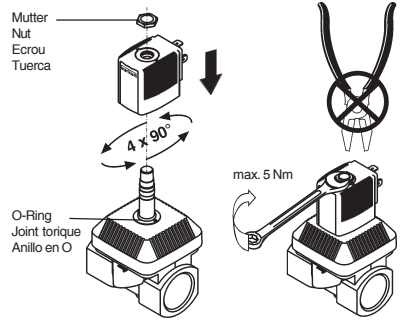
E-mail: info@de.buerkert.com

International
Contact addresses can be found on the internet at:
Die Kontaktadressen finden Sie im Internet unter:
Les adresses se trouvent sur internet sous :
www.burkert.com Bürkert / Company / Locations

Montage (D) (GB) (F) (E)

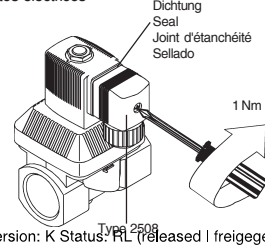
Montage / Assembly / Montage / Montaje

① Spulenmontage / Coil assembly /
Montage de la bobine / Montaje de bobina



② Gerätesteckdose / Instrument socket / Connecteur / Caja de enchufe para aparatos eléctricos

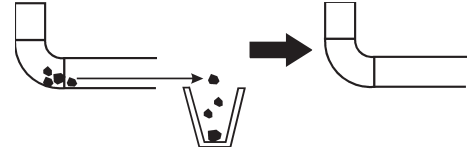
Immer den Schutzleiter anschließen!
Always connect the protective conductor!
Raccordez dans tous les cas le conducteur de protection!
Conectar en todo caso el conductor de puesta a tierra!



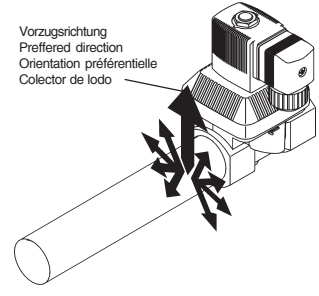
Montage (D) (GB) (F) (E)

Montage / Assembly/ Montage / Montaje

③ Rohrleitungen reinigen / Cleaning the piperuns
Nettoyer les conduites / Limpieza tuberías

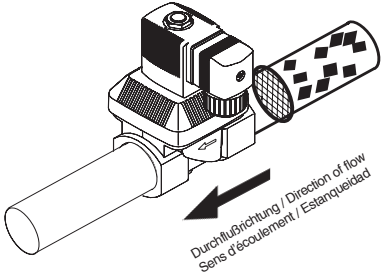


④ Einbaulage beliebig / Any assembly position /
Position de montage quelconque / Sentido de montaje discrecional

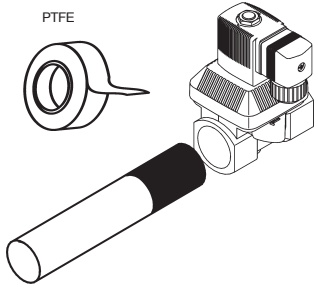


Montage / Assembly / Montage / Montaje

⑤ Schmutzfänger / Dirt trap / Collecteur d'impuretés / Sentido de paso

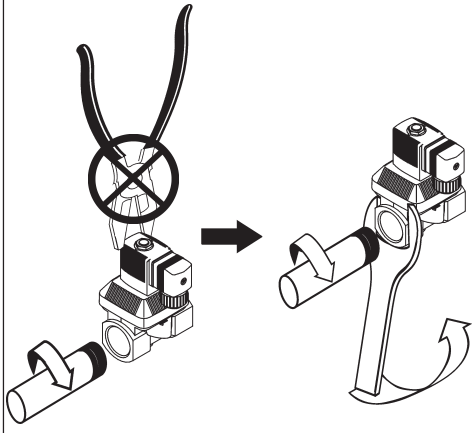


⑥ Abdichtung / Seal / Etanchéification / Atornillado



Montage / Assembly / Montage / Montaje

⑦ Einschrauben der Rohrleitungen
Screwing in the pipe connections
Vissage les conduites
Averías las tuberías



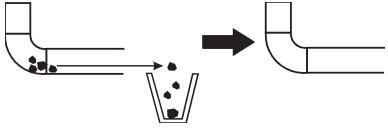
Troubleshooting / Dérangements / Averías

Spannung prüfen! / Check the voltage!
Vérifier la tension! / Comprobar tensión!

Druck prüfen! / Check the pressure!
Vérifier la pression! / Comprobar presión!

bar, psi, kPa

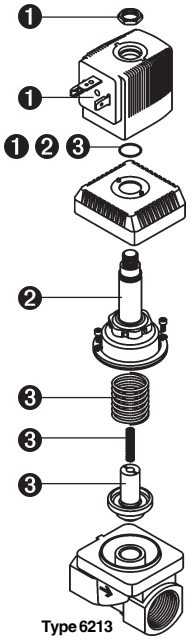
Rohrleitungen prüfen! / Check the piperun!
Vérifier les conduites! / Comprobar tuberías!



MAN 1000010037 ML Version: K Status: RL (released | freigegeben) printed: 26.11.2008

Ersatzteile Type 6213 (D) (GB) (F) (E)

Spare parts / Pièces de rechange / Pieza de repuesto



Type 6213

Ersatzteile Type 6213 (D) (GB) (F) (E)

Spare parts / Pièces de rechange / Pieza de repuesto

	1	2	3
	SET 1	**SET 7**	**SET 3**
(D)	Spulensatz	Stopfensatz	Verschleißteilsatz
(GB)	Coil kit	Set of stoppers	Set of wearing parts
(F)	Jeu de bobine	Jeu de bouchon	Jeu de pièces d'usure
(E)	Juego de bobina	Juego del tapón	Juego de piazas de cierre

(D) Bitte bestellen Sie Spule oder Armatur komplett unter Angabe der Identnummer des Gerätes lt. Typenschild,
z. B. Spulensatz für Typ 6213 Id.-Nr. XXX XXX X.
(GB) Please order coils or armatures complete, quoting the ident. number of the device according to the rating plate;
e. g., coil set for Type 6213 Id. No. XXX XXX X.
(F) Pièces de rechange: veuillez commander la bobine ou l'armature complète en indiquant le numéro d'identification de l'appareil selon la plaquette signalétique:
par ex. jeu de bobine pour type 6213 N° Id. XXX XXX X.
(E) Piazas de rerecambio: Pida bobina o accesorios completos indicando el número de identidad del aparato; placa indicadora del tipo; por ejemplo: juego de bobinas para tipo 6213 núm. de id. XXX XXXX.

Zulassungen (D) (GB) (F) (E)

Approvals / Homologation / Aprobaciones

e 1
023186

(D) Geräte, die das Typgenehmigungszeichnung tragen müssen, wurden beim Kraftfahrtbundesamt unter der Typgenehmigungsnummer
e1*72/245*95/54*3186*00
genehmigt und werden mit dem gezeigten Typgenehmigungszeichen in den Verkehr gebracht. Einen Auszug der Typgenehmigung erhalten Sie unter der unten stehenden Adresse.

e 1
023186

(GB) Devices that must carry the type approval marking have been approved by the Federal Office for Motorised Transport under the type approval number
e1*72/245*95/54*3186*00
and will be brought into circulation with the indicated type approval marking. You can obtain an excerpt from the type approval from the address below.

e 1
023186

(F) Les appareils qui doivent porter la marque dhomologation ont été homologués au „Kraftfahrtbundesamt (Service fédéral de la circulation automobile)“ sous le numéro
e1*72/245*95/54*3186*00
et seront mis en circulation avec la marque d'homologation indiquée. Vous recevrez un extrait de l'homologation à l'adresse ci-dessous

e 1
023186

(E) Los aparatos que deben llevar el símbolo de aprobación de tipo fueron aprobados por la Oficina federal de vehículos motorizados con el número de aprobación de tipo
e1*72/245*95/54*3186*00
y serán puestos en circulación con el símbolo de aprobación indicado. Para un extracto de la aprobación de tipo, rogamos ponerse en contacto con la dirección siguiente.

Bürkert Werke GmbH & Co. KG,
Zulassungsbeauftragter,
Christian Bürkert Str. 13-17,
D-74653 Ingelfingen

MAN 1000010037 ML Version: K Status: RL (released | freigegeben) printed: 26.11.2008