

SDCU-20 Smart Diagnostic and Control Unit



SDCU-20

INSTALLATION SET-UP OPERATING & SERVICE MANUAL

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WA	WARRANTY				
Tra	rade Marks:				



Legend 1



to comply with the prescribed requirements can lead to serious risks to people's health and damage to property.

2 Introduction



This document, IOM-SDCU-20, is the Installation, Operation and Maintenance manual (IOM) of SDCU-20, Smart Diagnostic and Control Unit and its optional on-board components (PST pushbutton, Diagnostic display, Pressure transmitter, I/O interface card, Position Limit Switches kit).

The IOM's of the options in separated enclosures are available in separated documents.

The IOM of the HART communication is available in the document "IOM-SDCU-Hart-Act". Refer to this manual for instructions relevant to commands via Hart and use of master SDC625.

This document does not contain the instructions relevant to the actuator and the pneumatic or hydraulic control units used with the SDCU-20.

Refer to documentation supplied with the actuator to view the mechanical, electrical and hydraulic/pneumatic diagrams.

WARNING!

This document is an integral part of the apparatus, which must be carefully read, understood and consulted before use and must be retained for future reference



Do not install, operate, or maintain a SDCU-20 without first being fully trained and qualified in valve, actuator and accessory installation, operation and maintenance, and carefully reading and understanding the contents of this manual, including all safety cautions and warnings. For any questions regarding these instructions, contact the factory before proceeding.

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General information 3

DVG Automation spa products are engineered, manufactured and tested in accordance with the quality control system complying with the international standard EN ISO 9001.

DVG Automation will not be responsible for any possible damage or physical injury resulting from use in other than the designated applications or by lack of care during installation, operation, adjustment and maintenance of the machine. Such risks lie entirely with the user. Depending on the specific working conditions, additional precautions may be requested. Considering that DVG Automation has no direct control over particular applications, operation or maintenance conditions, it is operator's responsibility to comply with all applicable safety rules. Contact urgently DVG Automation in case of dangerous situations not considered in the manual. It is total responsibility of the operator to be according to the local health and safety regulations.

Use of SDCU-20 4

SDCU-20: Smart Diagnostic Control Unit is an electronic device designed to test and control process valves operated by piston actuators and Solenoid Operated Valves (SOV's) in oil and gas industry. Its advanced diagnostic functions make it especially suitable for applications with safety valves. Emergency Shut-Down (ESD) function is not affected by the SDCU-20.

Application range covers simple cases (as actuator position limit switches and 4-20 mA position feedback) or more complex cases that include drive and test of SOV's, control of actuator position and PST and FST functions, Hart communication, management of pneumatic, hydraulic, single acting spring return, double acting, rotary quarter turn, linear, low and high operating pressure, etc. actuators, data logging and reports. The setting options allow easy adaptation to different applications and user needs.

5 **Storage**

Receipt

On receipt of the SDCU-20, always check any damage. Never install a damaged unit and report the detected defect to the forwarding agent.

Packing

Ensure that adequate protections were secured during transport.

Handling and Storage

Ensure that principal holes on enclosure are occluded with caps.

Storage temperature: $-40^{\circ}C \le T \le +85^{\circ}C$.

Unit identification 6





RINA











• It is prohibited to alter or remove the nameplate/s

WARNING!



7 Applicable regulations

2014/34/EU:	Directive on equipment and protective systems intended for use in potentially explosive atmospheres (ATEX)
2014/30/EU	EMC Directive (EMC)
EN 60079-0	Electrical apparatus for explosive gas atmospheres- Part 0: General requirements
EN 60079-1	Electrical apparatus for explosive gas atmospheres – Part 1: Flameproof enclosures "d"
EN 60079-11	Explosive Atmosphere – Part 11 – Equipment protection by intrinsic safety "i"
EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1:
	General requirements
2014/35/EU	Low Voltage Directive (LVD)
EN 60529	Specification for degrees of protection provided by enclosures (IP code)
IEC 60068-2-6	Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)
IEC 60068-2-27	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock
IEC 61508 Parts 1	-7: 2010 Functional safety of electrical/electronic/programmable electronic safety-related systems
EN 61000-6-2	Generic standards: Immunity standard for industrial environment (2005)
EN 61326-1	Electrical equipment for measurement control and laboratory use ed. 2013
 IEC 6100 	• IEC 61000-4-6 • IEC 61000-4-2
• IEC 6100	• IEC 61000-4-3 • IEC 61000-4-8
EN 61000-6-4	Generic standards. Emission standard for industrial environments ed. (2007) + A1 (2011)

8 Classification and Certification

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			Ш	
-	-	-	Ы	

ATEX certificate: EPT17 ATEX 2622X IECEx certificate: IECEx EUT 17.0009X IP 66/68 – EN 60529 Resistance to Vibration – IEC 60068-2-6 Seismic test – IEC 60068-2-27 SIL: certificate n° 17-SIL-0010009-04-TIC

• Reference standards IEC 61508 Parts 1-7:2010

• **Intended application:** The product is designed to be used in Safety Instrumented Systems (SIS) of any SIL rating for use in low demand applications for Partial Stroke Diagnostic Testing of Valve Systems (Emergency Shut-Down Valves) with no negative impact on the safety function performed by the SIS itself. It does not adversely affect the execution of the safety function and does not contribute to the PFDavg, when connected according to the Instruction for use.

Optional PST pushbutton:

- ATEX: EPT 17 ATEX 2611 X
- IECEx: certificate IECEx EUT 17.0005 X



SYMBOL	MEANING		
11	The symbol reported complies with annex II of the regulation n. 765/2008 of the		
	European parliament and of the council of 9 July 2008.		
XXXX	Registered number of the Notified Body involved in the verification of the product		
	Specific symbol of ATEX directive 2014/34/EU, Given in the annex II of the		
(EX)	directive		
II	Group of the equipment. Group II refers to equipment for use not in mining		
1.0	Category of the equipment subject of certification, in presence of potentially		
10	explosive atmospheres of gas, vapors, mist (G), is the category 1		
20	Category of the equipment subject of certification, in presence of potentially		
20	explosive atmospheres of gas, vapors, mist (G), is the category 2.		
Ex db	The type of electrical protection for the equipment corresponds to confinement in a		
	flameproof enclosure (EPL Gb)		
Fy ia	The type of electrical protection for the equipment corresponds to a intrinsically safe		
LA 10	circuit		
Ex ib	The type of electrical protection for the equipment corresponds to a intrinsically safe		
	circuit		
IIC	group of gas for which the equipment is suitable		
T5	The temperature class of the equipment (100°C)		
Ga	Equipment protection level, Equipment for explosive gas atmospheres, having		
	"VERY HIGH" LEVEL OF PROTECTION		
Gb	Equipment protection level, Equipment for explosive gas atmospheres, having		
	"HIGH" LEVEL OF PROTECTION		
1 D	Category of the equipment subject of certification, in presence of potentially		
	explosive atmospheres of dust (D), is the category 1.		
2 D	Category of the equipment subject of certification, in presence of potentially		
	explosive atmospheres of dust (D), is the category 2.		
Ex ia	The type of electrical protection for the equipment corresponds to a intrinsically safe		
Ex ib	The type of electrical protection for the equipment corresponds to a intrinsically safe		
	circuit		
IIIC	group of dust for which the equipment is suitable		
T 125°C	(conductive dusts)		
1 155 C	Equipment metasticn level. Equipment for explosive dust streamhores, having a		
Da	"VERY HIGH" LEVEL OF PROTECTION		
Db	Equipment protection level, Equipment for explosive dust atmospheres, having a,		
	"HIGH" LEVEL OF PROTECTION		
$-XX^{\circ}C \leq T_{amb} \leq +XX^{\circ}C$	Ambient temperature range		
Cert. n. XXXXXXXX	Certificate number issued by the notified body involved in the check of annex III of directive 2014/34/EU.		



8.1 Installation of Explosion Protected Smart Diagnostic Control Unit

In this section, further requirements for explosion proof type equipment are described.

For explosion proof type equipment, the description in this chapter is prior to other description in this user manual. The equipment has the type of protection Ex d (EPL Gb) and it is suitable for use in hazardous location. Although the internal components are already protected by a flameproof enclosure, up to six intrinsically safe limit switches can be additionally provided. In this case, each switch has to be connected separately to an already ATEX certified intrinsically safe associated apparatus with suitable safety related parameters.

Flameproof type of protection "Ex db"

- Applicable Standard: IEC/EN 60079-0, IEC/EN 60079-1
- Marking Code: II 2G Ex db IIC T5 Gb
 - Ambient Temperature: -40 to 85 °C (T5)
 - Enclosure: IP66 / IP68

Electrical Data

Maximum voltage:	250 Vac/Vdc
Maximum Limit Switch current:	16 A
Maximum power dissipation:	5 W

For intrinsically safe limit switches, the safe input parameters are: Ui=30V; li=120mA; Pi=0.9W; Li $\approx 0\mu$ H; Ci $\approx 0\mu$ F;

Installation

The equipment is suitable to be installed in classified areas as Zone 1 (or Zone 2)

- All wiring shall comply with local installation requirement
- The cable entry devices shall be of a certified flameproof type, suitable for the conditions of use
- When intrinsically safe limit switches are provided:
 - Each switch have to be connected to an already IEC Ex/ATEX certified "Ex ia" or "Ex ib" associated apparatus suitable for gas group IIC
 - All wiring shall comply with local installation requirements (see image below).

(Installation diagram)



9 Warnings



WARNING!

WARNING!

- Every notice in this manual, marked with the symbol shown to the left, concerns to the explosion risk and must be enforced by all operators working in potentially explosive areas.
- Not abiding by these rules can lead to health dangers for people and damages for things.



• Do not open in explosive atmosphere and/or while energized. The area must be cleaned from explosive mixture since residual capacitor charge could generate electrical spark and cause explosion

WARNING!

- *The equipment must not be mechanically connected to a separate heat source with temperature higher than* 85°C.
 - Cable glands and/or plugs must be IEC Ex certified.
 - Installation of equipment must be in accordance with IEC 60079-14 (latest edition) or national standard.

WARNING!

- Equipment must be securely connected to an earth ground.
 - Two screws are provided for external and internal connection to and earth conductor of the equipment.
 - Connection must be secure so that the electrical conductors cannot be readily loosened or twisted and contact pressure on electrical connection can be maintained in all conditions. Care must be taken to protect the connection against corrosion.
 - Minimum cross-sectional area of protective conductors should be according to IEC 60079-0 Table 10.

WARNING!

- <u>REPAIR</u> of equipment must be carried out according to IEC 60079-19 and only under control and authorization of DVG AUTOMATION S.p.A. or an authorized third-party.
- Nothing concerning the protection means can be modified.
- Violation of the above mentioned rules will cause loss of every feature of conformity to the certificate of the motor equipment.





• Check periodically that maximum dust thickness on enclosure does never exceeds 5mm.

WARNING!

- Perform electrical connections as per statutory requirements. In particular, check tightness and integrity of cable glands and/or plugs.
- Replace the **plastic plugs** of the **unused** enclosure entries by **metal** ones, to guarantee perfect weatherproof tightness and to comply with the explosion-proof protection codes (where applicable).
- If opening of any cover is necessary, before reassembling, check integrity of flame proof joint/s and gasket/s, clean thoroughly and apply a small quantity of silicon grease on mating surfaces and gasket. Tighten hex socket head screws.
- Flame proof joints cannot be repaired, damaged parts must be replaced

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10 SDCU-20 features



Optional Ex-e

junction box

8

맘

£

FSD

PST SOV

Beacon

position indicator

SDCU Main

Pressure senso

Local PST

Local

Position

senso

Piston

type actuato

 $\gamma \gamma \gamma$

display

pushbutton

S Additional

Additional

SOV B

To pneumatic

or hydraulic

components

7

Process valve

10.1 Main components:

Main unit:	SDCU-20 main card	Smart Diagnostic and Control Unit and position sensor	
Options of the Main unit: Local PST pushbutton Local PST		Local PST control (non-intrusive Hall effect)	
	SDCU-20 LS Position limit switches card and ca		
	Local diagnostic display	Local display to view alarms	
	Pressure transmitter 4-20 mA Pressure transmitter		
	I/O Filter interface card	Additional terminals and filter card	
	I/O IS interface card Additional terminals and I/O's Intrinsic Safety (
	I/O AN interface card	Additional terminals and 2 AI, 3 DI and 3 DO	
Optional modules:	SDCU-20-LOI	Local Operator Interface	
(in separated enclosure)	Ex-e junction box	Cable entry expansion	
	LCP	Local Control Panel	

Limit switches

Digital I/O

Local

Emergency Shut-Down mmand (ESD)

Pneumatic or

hydraulic supply

4-20 mA I/O, HART

Alarm contact / ESD2 command

10.2 Block diagrams

Here below are listed the main functions of the SDCU-20 electronics:

- To acquire the actuator position from position sensor.
- To acquire the commands from control room.
- To acquire the feedbacks from additional sensors (pressure, temperature, humidity, etc.).
- To process the acquired data and send
- commands to the SOV's in order to move actuator and process valve and carry out test functions (PST, FST, etc.).

DCS

Control room

SIS logic

solver

- To send status, alarms and warning signals to control room.
- To log alarms and collect data and graphs of performed tests.
- To collect data in case of ESD event.

10.3 SDCU-20 main card

The terminals A3/A4 supply the ESD/PST SOV through the NC contact of relay RL1.

Depending on the application RL1 can be set as NO. The terminals A5/A6 can be set to work as "Digital Input 2" or "24VDC/4-20 mA output".

The terminals B5/B6/B7/B8 can be set to work as "ESD command" in case of redundant ESD SOV or "output relay" (B7/B8).

The terminals B1/B2 can be set to work as "4-20mA input + Hart" or "4-20mA position feedback output". The "SDCU-20 Main card" is always present.

The presence of the "I/O interface card" and "SDCU-20-LS card" depends on type of application and user request.

The figure shows an example of SDCU-20 main card with I/O filter card and SDCU-20-LS kit with magnetic switches.



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ISO 9001, ISO 14001, OHSAS 18001 CERTIFIED

RINA



4-20 mA Pressure

transmitter

10.4 General features

- Die-cast aluminium or stainless steel SS 316L (CF3M) enclosure
- Beacon indicator, red and green, low profile, plastic transparent dome
- Non-intrusive, magnetic beacon indicator drive, patent 0001428132
- Captive bolts in the lid
- Stainless steel drive shaft
- ATEX, IECEx, IP, SIL certification
- Push-button actuated, push-in, spring loaded, terminal strips
- On board contactless Hall effect valve position sensor
- Suitable for pneumatic and hydraulic piston actuators, single and double acting, quarter turn and linear, high and low operating pressure
- 6 cable entries, ³/₄ NPT, ¹/₂ NPT, M20x1.5
- Optional kit with 2 position limit switches
- Toolless quick setting cams



Local diagnostic

display



10.6 Optional modules in separated enclosures

SDCU-20-LOI: Local Operator Interface (in additional separated enclosure) with graphic OLED display and 3 nonintrusive Hall effect pushbuttons for local setting, control and data reading. Multilanguage, user friendly menu. Real time clock and Lithium battery. Bluetooth for local wireless operation and export of collected data to a PC. Connected to SDCU-20 unit by cable max length 10 m. Available only upon request.

Ex-e junction box: Ex-e box containing only terminals and used to increase the number of terminals and cable entries. Wiring between SDCU-20 and junction box is done in factory. End user should connect its cables only to junction box.

LCP: Local Control Panel with lamps and pushbuttons.

See relevant IOM's to find detailed instructions.





10.7 Electrical features

- 0-24 VDC from SIS logic solver to power the ESD SOV (max 15W) through relay RL1 (N.C. contact), reverse polarity protection
 - Depending on the application the relay RL1 can be set as N.O. contact.
- 0-24 VDC main power to supply, reverse polarity protection:
 - o up to 2 x SOV's, SOV A and SOV B (max 15W each SOV)
 - \circ electronics, by on board isolated DC/DC converter (< 2.5W)
- 4-20 mA channel with HART communication over the same signal. Hart channel options:
 - o 4-20mA input +/- and Hart (Hart actuator type, current generator 24VDC, max 21mA, min 3.2mA, Rin 250 ohm). Hart can be disabled.
 - o 24VDC/4-20mA actuator position feedback output, reverse polarity protection (min 18VDC, min current 3.2mA, max load 750 ohm).
 - Point to point and multidrop operation
- 1 generic I/O channel. Configuration options:
 - o 24VDC/4-20 mA output pressure retransmission (if transmitter is present), isolated, reverse polarity protection (min 18VDC, min current 3.2mA, max load 750 ohm).
 - o 0-24VDC/5mA opto-coupled digital input 2 (DI2) (min 18VDC).
- 0-24VDC/5mA opto-coupled digital input 1 (DI1) (min 18VDC)
- 1 Output relay, SPST, normally closed, dry contacts, 24VDC/2A, 230VAC/0.5A. Configuration options: • Alarm to signal malfunction by opening the contact
- Contact in series to ESD command in case of redundant ESD SOV (max 15W), reverse polarity protection
- On board contactless Hall effect sensor to measure the analogue actuator position
- 2 output opto-relays to drive additional SOV A and SOV B
- 1 x 4-20 mA analogue input for optional pressure transmitter
- CAN bus terminals for connection to optional module SDCU-20-LOI, Local Operator Interface and I/O interface card
- Optional NFC adapter for RF coupling.
- Low power microcontroller ARM Cortex M0, 32 bit
- On board temperature, humidity and ESD signal sensors
- Operating temperature of electronics from -40 to +85 °C
- 1) The allowed tolerance of 24VDC from SIS depends on the voltage variations admitted by the coil of SOV's (in general it is +-10%)
- 2) The allowed tolerance of 24VDC main power depends on the voltage variations admitted by the coil of SOV A and SOV B (in general it is +-10%). If SOV A and B are not used, the electronics accepts larger voltage variations, 18-30VDC).
- 3) The 24VDC SIS and 24VDC main power are isolated, but they can be linked together by the on-board configuration options.
- 4) The 24VDC main power and 24VDC Hart are isolated, but they can be linked together by the on-board configuration options.

Position sensor data:

- Type: Contactless Hall effect
- Resolution: < 0.05%
- Linearity: < 0.5%
- Hysteresis: < 0.05%
- Thermal drift: 0.01%/10°C

Terminal strips data:

- Type: CAGE CLAMP with push-button
- Temperature stability: from -60 to 105°
- Conductor size: from 0.25 to 2.5 mm2
- Rating: IEC/EN 250V / 24A
- Contact: electrolytic copper, tin-plated
- Pin spacing: 5 mm





Local PST pushbutton:

- Lockable
- Screwed into a cable entry of the enclosure
- Magnetically operated reed relay
- Material AISI 316
- · Connected to Digital input 1 terminal





Local diagnostic display:

- Screwed into a cable entry of the enclosure
- Material AISI 316
- High visibility OLED display
- Automatic scrolling and visualization of SDCU-20 status and variables:
- SDCU OK, Position %, Pressure bar, Temperature °C, Humidity %
- Position Set %
- Test result, Alarm list, Warning list

4-20 mA Pressure transmitter:

- · Screwed into a cable entry of the enclosure
- Material AISI 316
- Pressure ranges:
 - 0-14 bar
 - 0-250 bar
 - 0-400 bar

SDCU-20-LS kit (Position limit switch kit):

The kit includes:

•2 x mechanical or magnetic or NAMUR position switches suitable for printed circuit board mounting. Magnetic switches are available in 2 versions, up to 1A and up to 3A.

Air/Oil

- Cam with mechanical or magnetic pin probes to operate the above switches
- · Electronic card with terminals and position switches

See coding table and corresponding data sheets.

Working mode:

The system that drives the switches consists of 1 cam on which a maximum of 3 pin probes can be mounted for each operating direction (total up to 6). The cam rotates integrally with the valve and by means of the pin probes activate the limit switches. The electrical signal of switches is used to remotely monitor the position of the valve. The angle between the pin probes (which defines the rotation angle of the valve) is adjustable between 65 ° and 145 °. The limit switches can be mechanical, magnetic or NAMUR types.



The components of the "SDCU-20-LS" limit switch kit do not interfere with the operation of the SDCU-20 electronics.

10.7.1 Electrical connections with remote control system (DCS, Logic Solver, etc.)

- By the terminal strips of the SDCU-20 electronic cards, according to electrical wiring scheme.
- If it is present, by the terminals of the junction box, according to electrical wiring scheme.







10.8 4-20 mA Input or Output and Hart communication channel

The terminals B1/B2 of the SDCU-20 main card can be set to work as 4-20mA input + Hart or 4-20mA position feedback output. Setting is done in factory according to user request. The electric characteristics are reported in the paragraph "Electrical features".

Refer to SDCU-20 Hart manual to see the instructions for using the Hart communication data and DD files.

Case 4-20 mA input + Hart:

The 4-20 mA input can be used as close/open command (4 mA close and 20 mA open) or alternatively as PST command according to setting done at factory. No additional voltage supply is required if pressure transmitter is absent (terminals D1/D2). Hart can be disabled.



Case 4-20 mA output:

The 4-20 mA output signal is the actuator position feedback. 4 mA corresponds to closed position and 20 mA to open position. No additional voltage supply is required if pressure transmitter is absent (terminals D1/D2). Hart not available

10.9 I/O interface cards

It is an optional electronic card mounted when it is necessary to increase the number of terminals and I/O's. It is available in 3 versions and its presence depends on the type of application.

- I/O Filter interface card
- I/O IS interface card
- I/O AI interface card

I/O Filter interface card

Features:

- electronic filters of "24VDC power" of the SDCU-20
- reverse voltage protection in case of redundant ESD

I/O IS interface card

Features:

- electronic filters of "24VDC power" of the SDCU-20
- reverse voltage protection in case of redundant ESD
- 3x optocoupled digital inputs (DI+ and DI-), max input current 5mA
- 5x optocoupled digital output, max current each out 0 16mA
- COM 0VDC for the digital output
- 24VDC out, max 48 mA
- Intrinsic Safety barriers by zener diodes, fuses and resistors for connection to Intrinsic Safety Local Control Panel (LCP) by means of Ex-e junction box.



I/O AI interface card

SIS Logic solver

ESD

+24VDC

Features:

- electronic filters of "24VDC power" of the SDCU-20
- reverse voltage protection in case of redundant ESD
- 2x AI, 4-20 mA Analogue Inputs, from 2 pressure transmitter.
- 3x DI, optocoupled digital inputs
- 3x DO, optocoupled digital outputs





SDCU-20 Main Unit



10.10 Optional junction box

In the simple applications of SDCU-20, the electrical connections are made on the terminals of electronic cards inside the SDCU-20 enclosure.

An optional Ex-e junction box can be added to facilitate the wiring and increase the number of terminals and cable entries. In general the connections between SDCU-20 and junction box are made in factory. The figure below shows an example of junction box for connection with an Intrinsic Safety LCP.



11 Main functions

PST, Partial Stroke Testing:

Remote start by Hart or hardwired by cable connected to Digital input 1 or 2.

Local start by optional Local PST Pushbutton, LCP (Local Control Panel) or SDCU-20-LOI

Setting of PST parameters by on board rotary/dip switches, by Hart or by optional SDCU-20-LOI.

Memorization of PST graph "Position versus time".

Memorization of PST graph "Pressure versus time" if the pressure sensor is present.

Comparison of PST graph with the PST signature, previously memorized, and generation of alarms and warning. **FST, Full Stroke testing:**

Remote start by Hart.

Local start optional SDCU20-LOI

Contactless analogue position sensor:

Setting of electronic travel limits by on board rotary/dip switches or by optional SDCU-20-LOI.

Position signal linearization for linear actuator.

4-20 mA position feedback retransmission.

Position feedback via Hart (if Hart channel is set as "Actuator type, 4-20 mA input") or via 4-20mA if the generic I/O channel is set as analogue 4-20 mA output.

Optional pressure sensor:

Pressure transmitter should be connected to terminals D1/D2, +24VDC sen /4-20mA in.

4-20mA pressure retransmission if the generic I/O channel is set as analogue 4-20 mA output.

Pressure retransmission only via Hart if the generic I/O channel is set as digital input 2.

Settings by on board rotary/dip switches or by optional SDCU-20-LOI.

Open/Close actuator control:

Remote actuator control by Hart or by digital inputs 1 and 2. Local control by optional SDCU-20-LOI and LCP (Local Control panel).

Output relay:

Voltage free, normally closed, SPST contact to signal alarm (open contact).

It can be set as contact to handle the redundant ESD signal (see ESD function options)

SOV A and SOV B control:

The function of SOV's A and B depends on the hydraulic/pneumatic circuit. They can be set to open or close the actuator or to start a pump.

On board sensors for diagnostics:

Tel. (+39) 0523 255811; Fax (+39) 0523 255890;

Fully Paid In Capital: Euro 1.000.000,00=

Microcontroller reads the analogue values of temperature, humidity of the electronic card and the following digital sensor "ESD signal on", "24VDC main power on", "24VDC sen on", "min/max current of pressure sensor", "min/max input current of Hart channel".

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On board setting and alarm signalling:

Setting is done in factory, only few parameters need to be set on site. On the card are available 1 rotary switch, 2 pushbuttons, 2 dip switches and one multicolour LED. The LED is red in case of alarm. It is orange in case of warning, it flashes green during configuration operations.

Current Time clock:

The SDCU-20 has on board Real Time Clock (RTC) but it has no backup battery to keep updated the time when the electric power fails. At any power on of SDCU-20 it is necessary to set the current time and date by Hart. If Hart is not available, at any power on cycle, the RTC restarts the time counter from the value of the last power off. Updating of RTC is not necessary if the SDCU-20 is used with the optional module SDCU-20-LOI.

Alarm history, logger and graphs:

Export of graphs, statistics and general data can be done by Hart DD, by SDCU-20-LOI and PC connected by Bluetooth.

ESD event:

In case of ESD the SDCU-20 only collects the data relevant to the event but it does not interfere with the emergency action.

Connection with SDCU-20-LOI:

SDCU-20 provides the interfaces for connection with the optional separated modules SDCU-20-LOI. **Connection with LCP:**

By the I/O interface card the Local Control Panel can be connected to the main card of SDCU-20.

11.1 PST function

The function **PST** (Partial Stroke Test) allows the user to check the correct functionality of the shut-down valve whilst it is **in operation** without having to fully stroke the valve. The test consists in partially closing the valve (PST on fail open valves are rare) and then returning it to its initial position. Actuator travel is configurable from 3 to 32%. The SDCU-20 collects the values of position, pressure (only where pressure sensor is foreseen) and time and then compares them with a reference **signature** previously memorized.

The position to reach during the PST is configurable. The PST command can be manual, by a local or remote hardwired signal, or automatic, at the end of a predetermined period of time. The execution of PST test extends the FST interval and decreases the **PFDavg**, as shown in the curve PFD vs. time.

11.2 FST function

The function **FST** (Full Stroke Test) consists in driving the shut-down valve to its closed position (FST of fail open valves is rare) and then returning it to its initial position. It checks the valve operation over a complete close/open cycle (Proof test). The SDCU-20 collects the values of position, pressure (only where pressure sensor is foreseen) and time and then compares them with a reference **signature** previously memorized.

11.3 TSOV function

The function **TSOV** (Test of Solenoid Operated Valves) is available only if the SDCU-20 is equipped with pressure transmitter to measure the pressure inside the cylinder. It consists in (de)energizing the SOV for a few milliseconds insufficient to move the valve and but sufficient to collect the pressure data to compare it with reference values previously memorized.

By analyzing curves and reports obtained from the above tests, a predictive maintenance program can be put in place to intervene before a failure interrupts the process.









11.4 ESD Emergency Shut-Down safety function

The ESD, Emergency Shut-Down safety function, is performed by means of the 0-24Vdc signal of logic solver of the Safety Instrumented System (SIS). This signal operates directly the ESD SOV's and the SDCU-20 does not affect neither actuator operation nor SIL characteristic. SDCU-20 only collects the data relevant to ESD event.

Case 1: 1 ESD SOV, 0-24VDC signal from SIS, DETT (De-energize to trip)

The 24VDC SIS (terminals A3/A4) through the normally closed (nc) contact of RL1 relay supplies the ESD SOV. Relay RL1 is normally de-energized. The ESD action is performed when the 24VDC goes to 0VDC. By the opto-coupler ESD sens. the microcontroller detects the presence / absence of ESD signal for diagnostic purpose.



Reverse polarity of 0-24VDC signal causes ESD action.

The microcontroller can open/close the contact of RL1 by controlling the opto-coupler OPT-1 to carry out PST/FST/open/close operation of piston actuator. Microcontroller monitors the actuator position through the position sensor. ESD command overrides any microcontroller command. In case of 24VDC main power failure the contact of RL1 remains closed. 0-24VDC SIS and 24VDC power are isolated.

Case 2: 2 redundant ESD SOV's, 2 isolated 0-24VDC signals from SIS, DETT (De-energize to trip)



The 24VDC SIS (terminals A3/A4) through the normally closed (nc) contact of RL1 relay supplies the ESD SOV. The ESD command works as described in the above case 1. The second 0-24VDC SIS R signal is connected to terminals B5/B8 and through the normally closed (nc) contact of RL2 relay supplies the ESD SOV R. Relay RL2 is normally de-energized.

The ESD action is performed when the 24VDC goes to 0VDC. Reverse polarity of 0-24VDC signal causes ESD action. The microcontroller can open/close the contact of RL2 by controlling the opto-coupler OPT-2 to carry out PST/FST/open/close operation of piston actuator. Microcontroller monitors the actuator position through the position sensor. ESD command overrides any microcontroller command. In case of 24VDC main power failure the contact of RL2 remains closed. 0-24VDC SIS and 24VDC power are isolated.

PST command is one only. It is performed as follows:

- SDCU-20 without 4-20 mA pressure transmitter: the PST cycle is done by means of one only SOV. At the next PST command the SOV's are exchanged.
- SDCU-20 with 4-20 mA pressure transmitter: the PST cycle is done by means of one only SOV. After 1 min the SDCU-20 carries out the test of the second SOV without moving the actuator. At the next PST command the SOV's are exchanged.

By external jumpers the 0-24VDC SIS signals can be linked together or linked with the 24VDC main power but the principle of operation does not change.



12 Installation

WARNING!	
	• Always wear protective clothing, shoes, gloves and eyewear when performing any installation or maintenance procedures to avoid personal injury.
•	• Check with your process or safety engineer for any additional measures that need to be taken.
	• Before removing the cover of SDCU-20 enclosure be sure that any voltage is off.
	• Maximum main voltage: check value on the NAMEPLATE
	• It is prohibited to alter or remove the nameplate
	• Check that actuator is in safe position
	Check that hydraulic / pneumatic supply is off

12.1 Safety Recommendation

The SDCU-20 should be connected to the voltage supply sources through electrical breakers at customer care. The Isolation/Protection devices (magneto-thermal switches, fuses etc.) should be:

- In accordance with the Local National Standards and plant rules
- Suitable located and easy to reach
- Properly marked to identify the disconnecting device
- Not interrupt the protective earth connector

The contacts of the output relay and limit switches are pure voltage free contacts. It is at customer care to install fuses (or any voltage/current protections) to isolate the voltages used to read the contact status.

12.2 Wiring and cables

Power cables: max. 2.5 mm² **Signal cables:** max. 2.5 mm²

Earthing and protective conductors: minimum cross-sectional area of protective conductors according to IEC 60079-0 Table 10, S = cross sectional area of phase conductor $[mm^2]$; S_p = minimum cross-sectional area of the corresponding protective conductor $[mm^2]$) S \leq 16; S_p=S 16 \leq S \leq 35; S_p=16

Grounding must be done according to statutory requirements.

Connect the internal / external ground screw to the external ground connection.

To avoid electromagnetic interference due to electrical cables coupling use separated cables for power and signals. Use shielded cables for analogue and data signals.

Insert the connection cables into the electrical enclosures through the cable glands (or conduits) and connect the electrical supply and the control signals to the SDCU-20 terminal blocks, according to the **Wiring Diagram**. Screw the cable glands (or the conduits) tightly into the threaded entries, in order to guarantee the weatherproof and explosion-proof protection (when applicable). Thread sealant is necessary for explosion proof capability.

Replace the plastic plugs of the **unused** enclosure entries by metal ones, to guarantee perfect weatherproof tightness and to comply with the explosion-proof protection codes (where applicable).

13 Maintenance and cleaning



The SDCU-20 is an electronic device enclosed in a weatherproof and explosion-proof housing, and does not require any particular maintenance. Also, there are not any special requirements regarding cleaning.

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14 Start-up procedure

14.1 General checks

Before powering the SDCU-20 the following check should be done:

- Temperature: it should be correct for the installation and according to the value indicated in the label on the SDCU-20 enclosure.
- Supply voltages: they should be correct for the installation and according to the electrical diagram and the label on the SDCU-20 enclosure.
- Wiring and electrical connections: they should be according to the electrical diagram.
- Actuator: the mechanical stop of the actuator should be already set and the actuator should be in safe position.
- Pneumatic / Hydraulic connections: they should be according to the operating diagram.
- Pneumatic / Hydraulic power: it should be available and according to the operating diagram.

Setting of SDCU-20 is done in factory, in accordance with the wiring diagram and user request. On site only few parameters should be set. Here below are described the procedures to set them by the on board rotary and dip-switches. The setting procedures by the optional SDCU-20-LOI are described in the IOM of the mentioned device. The figure shows the components of the SDCU-20 main card to set the parameters. Only an isolated screwdriver is required.



- Be sure that the actuator is in safe position.
- Remove the cover of the SDCU-20.
- Switch-on the electrical power (24VDC). Apply the pneumatic/hydraulic power.
- Set the open and close travel limits.
- If the analogue channel of B1/B2 terminals is set as "4-20 mA position feedback output", a multimeter can be used to view the position.
- If the analogue channel of B1/B2 terminals is set as "4-20 mA input" and Hart communication is enabled, the position can be read by a Hart master.
- The actuator should be in safe position. Set first the end of travel corresponding to the safe position.

The next paragraphs provide instructions to user for performing the procedures necessary for commissioning. Only the "Set of open and close travel limits" must always be done.

If the SDCU-20 is provided with PST/FST functions, also the procedures "PST calibration", "FST calibration", "PST travel setting" should be performed in the actuator commissioning. The procedure "Min/Max working pressure setting" is requested only if the SDCU-20 is fitted with pressure sensor.

If Hart communication is available the above procedures can be performed by Hart commands and by Hart master (see document "IOM-SDCU-Hart-Act").

The execution of other procedures described below (Dead band, Position linearization, etc.) depends on the type of application and in general are done by the manufacturer.



14.2 Set of open and close travel limits

By the procedure described below the actuator should be moved in the desired end travel position. The value of position is memorized as "**close position limit**" if rotary switch is in pos. 0 and as "**open position limit**" if it is in pos. 1. The SDCU-20 assigns 4 mA and 0% to acquired limit in closure and 20 mA and 100% to limit in opening.



Open and close the actuator to check the correct settings.

14.3 Min and Max Working Pressure

Execute the below procedure only if thee SDCU-20 is equipped with pressure transmitter. It allows setting the minimum and maximum working pressure. The max settable value is 600.0 bar. If Hart communication is available the setting of the min/max pressure can be done by the Hart master.





14.4 Set of PST travel %

The factory setting of PST travel % is 20%. The procedure shown here lets you change the value. Before initiating the procedure, move the actuator in the position where the PST cycle can be performed (i.e. fully open). The travel range is from 3 to 32%, selectable in steps. Values < 3 are set to 3 and > 32 are set to 32. For example to set 8%, select D as 1st number and the selection of the 2nd number is not required.



To set 10% select E as 1st number and then C as 2nd number. The total value is 8 + 2 = 10. If a new value of the PST travel % is entered, it is strongly recommended to perform a new calibration as indicated in the procedure. The calibration process is automatic and lasts several minutes. The next paragraph describes the calibration process. The end of calibration process is signalled by a green flash of LED DL1. In case of calibration failure the LED lights-up orange colour (see Troubleshooting paragraph).

PST travel setting and PST calibration are available also by Hart command.

14.5 PST calibration

The calibration process is automatic and lasts several minutes. The SDCU-20 performs 2 PST cycles at a distance of 3 minutes. To optimize the PST cycle, it can repeat the PST up to 10 times, each one at a distance of 3 min, the total time can vary from 3 to 30 min. The end of calibration process is signalled by a green flash of LED DL1. In case of calibration failure the LED lightsup orange colour (see Troubleshooting paragraph). PST travel setting and PST calibration are available also by Hart command.

Start condition Rotary sw = 2Press ENTER >3 sec Rotary sw = 0Dip-sw SW6-2 = onto go ahead Dip-sw SW6-2 = Dip-sw SW6-1 = off LED: 3 short and 1 long flash Dip-sw SW6-1 = off until ENTER is released IED = offRestore start conditior Wait until calibration process ends. Press ENTER to start Rotary sw = 5 to green flash: success perform PST calibration LED: 1 LED: 1 flash LED orange: warning Restore start condition to exit without calibration

14.6 FST calibration

The calibration process is automatic and lasts several minutes. The SDCU-20 performs 2 FST cycles at a distance of 3 minutes. To optimize the FST cycle, it can repeat the FST up to 10 times, each one at a distance of 3 min, the total time can vary from 3 to 30 min. The end of calibration process is signalled by a green flash of LED DL1. In case of calibration failure the LED lights-up orange colour (see Troubleshooting paragraph). FST calibration can be initiated also by an Hart command.





14.7 Hart enable/disable

The procedure is available only if the SDCU-20 was set at factory as "4-20 mA input + Hart". The procedure allows the user to enable and disable Hart communication. Refer to document IOM-SDCU-Hart-Act to see the instruction relevant to Hart communication.

Disable Hart communication



Enable Hart communication



14.8 Dead band

The procedure is available only if the positioning function was first activated at the factory. Positioning function is used to control the position of a modulating valve by an analogue or Hart setpoint. The positioner compares the present position of the actuator with the setpoint and drives the actuator in open or close direction until the position error is smaller than dead band. 5 values of dead band are available: 0.5%, 1%, 2%, 4% and 8%.





14.9 Position linearization

The procedure is not necessary in the rotary actuator.

In the **linear actuator**, the use of the procedure depends on the type of mechanical coupling between piston rod and position sensor. If it is not linear the procedure allows to restore the linear relationship between position and angle. If the SDCU-20 is supplied already mounted on the actuator, the procedure is performed at factory. The procedure is available only if it was first activated at factory.

Actuator in open position



14.10 Set of position limit switches

If the SDCU-20 is provided with SDCU-20-LS, optional position limit switches kit, it is necessary to adjust the position of cams which trigger the switches. Remove the cover of SDCU-20.

Move the actuator to end travel position. Connect a multimeter to terminals C and NC of switches (common and normally closed). Refer to electrical wiring or to block diagram to find the correct terminals. In case of NAMUR switches use a "NAMUR tester" instead of a multimeter. Loosen the screw (1-2 turn) and then slide the pin probe into the plastic groove of the cam to adjust the position where the switch change over. By the multimeter check the contact. When the pin probe is in the desired position, tighten the screw. Move the actuator in the other end of travel position and repeat the procedure. Open and close the actuator to check the correct setting.





14.11 Check of beacon position indicator

Mount the SDCU-20 cover having care that red sector of beacon indicates "actuator closed" and the green sector indicates "actuator open". In case adjust the position of transparent plastic dome that covers the green and red sectors as follows: loosen the Allen screw, rotate the plastic cover to the correct position and then tighten the screws.



15 Troubleshooting



SDCU-20 has a powerful diagnostic program to monitor the operation of the equipment. If the SDCU-20 is provided with Hart communication, the alarms and warnings can be viewed by Hart commands and

Hart master (see Instruction Manual "IOM-SDCU-Hart-Act").

If the SDCU-20 is equipped with the optional Local Diagnostic Display, the type of alarm and warning is visible on the display. The tables below show the messages visible on the display and corresponding to each alarm or warning. If neither Hart communication nor Local Diagnostic Display are available the following procedure allows to identify the type of alarm or warning.

Remove the SDCU-20 cover and then identify the type of malfunction by the below procedure and alarm and warning tables.

See "Start-up procedure"

paragraph to view the position of dip and rotary switches and LED DL1.

In case of malfunction, the LED DL1, on the main board of SDCU-20 lights-up, red in case of alarm, orange in case of warning.



In case of contemporary alarm and warning the LED lights-up red colour.

The table below shows the position of rotary switch to identify the type of alarm, the alarm descriptions and the message of the Local Diagnostic Display (if present).



ALARM TABLE

Rotary sw pos.	Rotary sw pos.	Description	Message of optional Local
Column	Column	Description	Diagnostic Display
Α	В		
1	1	Error of CRC of CAN bus	CRC CAN
1	2	Software error	Software
	1	Failed test of external SOV's	External test SOV
2	2	Failed test of SOV ESD R (Redundant)	Test SOV ESDR
2	3	Failed test of SOV's A-B	Test SOV A-B
	4	Failed test of SOV ESD	Test SOV ESD
	1	Slow operation	Slow operat
2	2	Fast operation	Fast operat
3	3	Failure to close	Failure close
	4	Failure to open	Failure open
	1	Valve blocked (start time FST/PST >5*ref. or no movement 10" after cmd)	Blocked valve
4	2	Valve damage	Valve damage
	3	Valve not connected to actuator	No valve connect
	1	Position sensor failure	Position sensor
5	2	24VDC to supply the pressure sensor failed	No 24V pressure
	3	Slow loss of pressure	Slow Loss pressure
6	-	FST-PST failed (time>5*ref.)	F-PST fail
7	-	HART current loop fault	HART loop 4-20mA
8	-	Failure of relay SOV ESD	Relay SOV ESD
9	-	24VDC to supply the SOV ESD not present	No 24V SOV ESD
Α	-	Interface card does not respond	LOI comm fail
В	-	Hardware failure	Hardware fail
C/D/E/F	-	Reserved	-

In case of Warning the LED DL1 lights on, orange colour. The following procedure and the below table allow identifying the type of warning.



The table below shows the position of rotary switch to identify the type of warning, the warning descriptions and the message of the Local Diagnostic Display (if present).

WARNING TABLE

Rotary sw pos.	Description	Message of optional Local Diagnostic Display
1	Position signal out of range	Position outrange
2	Pressure sensor failed	Pressure senor
3	Failed PST / FST	F-PST fail
4	Travel time of PST / FST greater than limits	F-PST too long
5	Break time of PST /FST greater than limits	F-PST bk too long
6	Calibration FST or PST failed	F-PST cal fail
7	FST or PST not performed	F-PST no start
8	Temperature inside the SDCU-20 enclosure out of limits	Temperat outrange
9	Humidity inside the SDCU-20 enclosure out of limits	Humidity outrange
Α	Working pressure out of range	PresWork over-und
В	Waiting 3 minutes between PST or FST operations	Waiting 3 mins
С	Pressure drop	PresWork drop
D	Configuration failure	Configur fail
E	Limit Swiches calibration not allowed (travel <45° or > 150°)	Cal L/S fail
F	Valve close direction wrong	Wrong valve dir

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In case of contemporary presence of alarms and warnings the LED DL1 lights-on red. In this case to view the warnings by the above procedure it is necessary to first repair the SDCU-20 to delete the alarms.

The following tables reports the corrective action to repair the SDCU-20 in case of alarm and warning

Alarm	Action to repair		
Error of CRC of CAN bus	Re-power the SDCU-20 and check if failure is still present, in case change the main card of SDCU-20		
Software error	Re-power the SDCU-20 and check if failure is still present, in case change the main card of SDCU-20		
Failed test of external SOV's	Check the SOV's, check the voltage supply and in case install new SOV's		
Failed test of SOV ESD R	Check the SOV, check the voltage supply and in case install new SOV		
Failed test of SOV's A-B	Check the SOV's, check the voltage supply and in case install new SOV's		
Failed test of SOV ESD	Check the SOV, check the voltage supply and in case install new SOV		
Slow operation	The valve moves slowly than reference signature. Check mechanical connections and pressure		
Fast operation	Check the connections between valve and actuator		
Failure to close	The valve is open, the SDCU-20 try to close but the position does not change		
Failure to open	The valve is closed, the SDCU-20 try to open but the position does not change		
Valve blocked	The valve is stuck. Check the valve		
Valve damage	The valve has hardened and moves slowly. Check the valve		
Valve not connected to actuator	The valve moves faster than reference. Check the connections between valve and actuator		
Position sensor failure	Check voltages, in case change position sensor or main card of SDCU-20		
24VDC of pressure sensor failed	Check the wiring, change the main card of SDCU-20		
Slow loss of pressure	Check pressure, check tubing, seals etc.		
FST-PST failed	Too long time for to perform the test (>5x reference). Check pressure, SOV's, actuator and valve		
HART current loop fault	Check wiring of 4-20mA current loop, in case change main card of SDCU-20		
Failure of relay SOV ESD	Check the relay RL1 and in case change the main card of SDCU-20		
24VDC of SOV ESD not present	Check the relay RL1, check the voltage to supply the ESD SOV		
Interface card does not respond	Check the electrical connections and in case change the main card of SDCU-20 or the SDCU-20-LOI		
Hardware failure	Check the electrical connections and in case change the main card of SDCU-20		

Warning	Action to repair
Position signal out of range	The position is $<0\%$ or $> 100\%$. Check and in case re-calibrate the travel limits
Pressure sensor failed	Check wiring between pressure sensor and main card of SDCU-20, in case change the pressure sensor
Failed PST / FST	Too long time to perform the test (>3x reference). Check pressure and mechanical connections
Travel time of PST / FST > limits	Travel time during PST/FST > references. Check pressure and mechanical connections
Break time of PST /FST > limits	Break time during PST-FST > references. Check if valve is jammed
Calibration FST or PST failed	Calibration procedure failed. Check working conditions
FST or PST not performed	PST-FST not performed. Wait 3 min or check if valve is in the correct position
Temperature SDCU-20 out of limits	Check the environment working condition
Humidity SDCU-20 out of limits	Check the environment working condition, check the cable glands
Working pressure out of range	Check working pressure
Waiting 3 min between PST/FST	SDCU-20 waits for 3 min before executing a PST or FST
Pressure drop	Actuator in steady state but pressure decrease. Check SOV, tubing, sealing, etc.
Configuration failure	A parameter is not correct. Find the wrong parameter and set it with a correct value
Limit Swiches calib. not allowed	Set travel position limit. Travel should be $<45^{\circ}$ or $> 150^{\circ}$
Valve close direction wrong	Check configuration, check wiring, check position sensor



16 Decommissioning



Disposal and recycling

At the end of the life the SDCU-20 must be disassembled.



Subject	Hazardous	Recyclable	Disposal
Electrical and electronic equipment	Yes	Yes	Use specialist recyclers
Glass	No	Yes	Use specialist recyclers
Metals	No	Yes	Use licensed recyclers
Plastics	No	Yes	Use specialist recyclers
Rubber (seals and o-rings)	Yes	No	May require special treatment before disposal,
			use specialist waste disposal companies
Battery (not present in the SDCU-	Yes	No	May require special treatment before disposal,
20)			use specialist waste disposal companies

17 Dimensions and weight

Dimensions and weights are given in the pictures below.



All dimensions are in mm

WEIGHT Aluminium version: 3 kg ±5% Stainless steel version: 8 kg ±5%





18 Coding table

The code to identify the SDCU-20 and relevant options is 17 characters long, each character from 0 to 9 and from A to Z. The first 3 characters identify the SDCU-20 series: "ADCxxxxxxxxxx". The below table shows the options of each character.





		Code:	ADC	4	Α	2	2	4	0	0	0	1	0	0	х	х	х
	SDCU-20 device: ADC																
	SDCU-20-LS (Limit Switches kit):			0													
	with mechanical sw, 1+1 SPDT			1													
	with mechanical sw, 2+2 SPDT			2													
	with magnetic reed sw, 2+2 SPDT			4													
	with Namur inductive sw, 1+1			5													
	spare			7													
	spare with magnetic reed sw. 1+1 SPDT, 3A			8													
Ш	Enclosure:																
∆ B	Die-cast Aluminium – NBR Elastomers Die-cast Aluminium – Eluorosilicone Elastomers				A												
F	Stainless Steel – NBR Elastomers				x												
U	Stainless Steel – Fluorosilicone Elastomers				Y												
2	No. 2 ISO M20x1.5					2											
	No. 3 ISO M20x1.5 No. 4 ISO M20x1.5					3 4											
ŭ	No. 5 ISO M20x1.5					5											
	No. 6 ISO M20X1.5 No. 2 ½" NPT					A											
	No. 3 ½" NPT					B											
	No. 5 ½" NPT					D											
	No. 6 ½" NPT No. 5 ¾" NPT + 1 ISO M27x1.5					E F											
	No. 2 3/4" NPT					v											
	No. 3 %" NPT No. 4 %" NPT					x											
	No. 5 ¾" NPT					Y Z											
	4-20 mA I/O + Hart com. channel:					L											
	not used						0										
	24VDC / 4-20 mA position feedback + Hart com.						2										
	4-20 mA input 4-20 mA input + Hart com						3 4										
	Digital input DI1:																
	not used							0									
	close cmd							2									
	PST cmd local PST pushbutton							3 4									
	General I/O:																
	not used if configured : 4-20 mA out:								0								
	pressure retransmission								1								
	if configured: digital input DI2:								2								
	open cmd close cmd								3 4								
	PST cmd								5								
	Output relay / Pressure transmitter / Local display:	local di	splav – pr	ot pr	acont					0							
	out. relay = not used pressure transm. = present	local di	splay = no	ot pr	esent					1							
	out. relay = alarm contact pressure transm. = not present out. relay = alarm contact pressure transm. = present	local di local di	splay = no splay = no	ot pr ot pr	esent esent	:				2 3							
	out. relay = redundant SIS pressure transm. = not present	local di	splay = no	ot pr	esent					4							
	out. relay = not used pressure transm. = present local display = not present out. relay = not used pressure transm. = not present local display = not present						6										
	out. relay = not used pressure transm. = present local display = present out. relay = alarm contact pressure transm. = not present local display = present						7 8										
	out. relay = alarm contact pressure transm. = present local display = present							9									
	out, relay = redundant SIS pressure transm. = not present out, relay = redundant SIS pressure transm. = present	local di local di	splay = pr splay = pr	eser eser	it it					A B							
	Outputs to drive SOV's A and B and motor of pump:										0						
	with SOV A to open/close, without SOV B / motor										1						
	with SOV B to open/close, without SOV A / motor with SOV A and SOV B, SOV A opens SOV B closes										2						
	with SOV A and SOV B, SOV A closes SOV B opens										4						
	with motor connected to out. A with motor connected to out. B										5 6						
	PST cmd:											0					
	PST cmd disabled PST cmd operates ESD SOV											1					
	PST cmd operates SOV A PST cmd operates SOV B											2 3					
	PST cmd operates SOV A and SOV B											4					
	24 VDC power: without 24VDC power												0				
	with 24VDC power												1				
	with 24VDC power, same of 24VDC Hart with 24VDC power, same of 24VDC SIS												2 3				
	with 24VDC power, same of 24VDC Hart and 24VDC SIS												4				
	without any option													0			
	with SDCU-20-LOI													1			
	with SDCU-20-LOI and NFC adapter													3			
	compact electro-hydraulic actuator with LCP type A													4 5			
	with LCP type B													6			
	with LCP type B and NFC adapter with LCP type B and NFC adapter													8			
	spare Wiring diagram:													9	x	x	x
															_	_	-

SDCU-20 CODING **TABLE**

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When used as an intrinsically safe equipment, the Limit switch kit can be have:

- maximum 4 separated mechanical SPDT limit switches manufactured by ITW or;
- maximum 2 separated mechanical DPDT limit switches manufactured by ITW or;
- maximum 4 separated magnetic limit switches manufactured by BDC or;

- maximum 2 separated inductive limit switches (Namur) manufactured by BDC

19 Special conditions for a safe use



Each switch must be supplied from a IEC Ex certified Ex ia IIC intrinsically safe source. Aluminum equipment, where installed in zone 0, must be installed in such way that it is eliminated the danger of ignition due to impact or friction.



20 Spare parts



Pos.	Code	Description	Q.ty
1	See coding table	Body of SDCU-20 enclosure	1
2	See coding table	Cover of SDCU-20 enclosure	1
6	DSBE0X07010	Thrust ring of plastic dome of beacon position indicator	1
7	DSBE0P05210	Transparent plastic dome of beacon position indicator	1
9	DSBE0P05310	Black dimmer of green/red sector	1
10	DSBE0P05111	Green sector (Open) of beacon position indicator	2
11	DSBE0P05112	Red sector (Close) of beacon position indicator	2
12	MSBE0V06012	Plastic dome (for green/red sectors), with magnets for beacon drive (outer side)	1
13	MSBE0V06011	Magnetic drive assembly of beacon indicator (inner side)	1
16	COR0A02325C0	OR 2325 W=1.78 Di=82.27-FLR 70 Shore	1
17	COR0A02562C0	OR 2562 W=1.78 Di=142.11-FLR 70 Shore	1
18	COR0ADIS09C0	OR glued W=1.78 Di=150-FLR 70 Shore	1
22	MSBI0R0PC0001	SDCU-20 main card	1
23	MSBE0R0PC	Limit switches card (code depends on limit switches type).	1
24	DLSBPC000	SDCU-20 I/O interface card (code depends on type)	1
26	DSBEFOR0001	Fork to support position sensor assembly	1
27	MSBE0P06000	Position sensor assembly	1
28	MSBE0P04091	SDCU-20 stem assembly	1
31	MSBE0P0	Cam assembly (code depends on type of limit switches)	1

The code of positions 31 and 23 depends on the type of limit switch kit (mechanical, magnetic or Namur type) The code of position 24 depends on type of I/O interface card used

21 Typical applications

Control

cables

0/+24VDC

SIS

+24VDC

PST pushbutton Local

4-20 mA position feedback

The below paragraphs shows the most common application of SDCU-20.

21.1 4-20 mA position feedback, limit switches

4-20 mA actuator position feedback and SDCU-20-LS limit switches kit (magnetic type). Available Namur and mechanical types.

On site it is only required to set the electronic travel limits and to position the pin probes on the cams to operate the limit switches.

Control cables: shielded cable for 24VDC/4-20 mA and multicore cables for limit switches.

0

OC

0

0

0 0

21.2 4-20 mA position feedback, ESD/PST SOV

SDCU-20

main card

Contactles position sensor

Пo

По

Local PST pushbutton is supplied on request. 4-20mA output available even if 0/24VDC SIS is off. Control cables: shielded cable for 24VDC/4-20 mA and multicore cable for 0/24VDC SIS.

4-20 mA actuator position feedback, local PST pushbutton,

ESD command for ESD/PST SOV. No pressure transmitter.

21.3 4-20 mA position feedback, 24VDC power and 0/24VDC SIS

+ ESD/PST

SOV

4-20 mA actuator position feedback, local PST pushbutton, ESD command for ESD SOV, "0/24VDC power" to supply electronics, 4-20 mA pressure transmitter. The 24VDC power is linked to "24VDC position feedback" by on board jumpers.

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The pressure transmitter and the local PST pushbutton are supplied on request. If local PST pushbutton is not requested the terminals B3/B4 are available as digital input 1 (to be used as remote PST or open/close commands).

By the configuration options the terminals A5/A6 can be set as 24VDC/4-20 mA pressure retransmission or digital input 2 (to be used as remote PST or open/close command). The terminals B7/B8 are available as alarm contact (SPST, NC, open contact in case of alarm).

By the setting options the PST can be performed by the ESD SOV, SOV A or SOV B.





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21.4 4-20 mA position feedback, one only 0/24VDC power/SYS

4-20 mA actuator position feedback, local PST pushbutton, ESD command for ESD SOV, "0/+24VDC power/SIS" to supply electronics, 4-20 mA pressure transmitter and SIS components. Just one 0-24VDC to supply everything.

When the 0/24VDC power/SIS switches off also the 4-20 mA goes off.

The pressure transmitter and the local PST pushbutton are supplied on request. If local PST pushbutton is not requested the terminals B3/B4 are available as digital input 1 (to be used as remote PST or open/close commands).

By the configuration options the terminals A5/A6 can be set as 24VDC/4-20 mA pressure retransmission or digital input 2 (to be used as remote PST or open/close command). The terminals B7/B8 are available as alarm contact (SPST, NC= open contact in case of alarm).



21.5 4-20 mA input, Hart, 24VDC power and 24VDC SIS

4-20 mA input with Hart communication, local PST pushbutton, ESD command for ESD SOV, "0/24VDC power" to supply electronics, additional SOV's A and B and 4-20 mA pressure transmitter.

By Hart: position value, configuration, diagnostic, PST and FST commands, open/close commands, pressure value. 4-20 mA and Hart communication are available even if 0/24VDC SIS = 0. Open/Close command available also by 4-20mA input.

By the configuration options the Hart communication can be disabled.

The pressure transmitter and the local PST pushbutton are supplied on request. If local PST pushbutton is not requested the terminals B3/B4 are available as digital input 1 (to be used as remote PST or open/close commands).

By the configuration options the terminals A5/A6 can be set as 24VDC/4-20 mA pressure or position retransmission or digital input 2 (to be used as remote PST or open/close command). The terminals B7/B8 are available as alarm contact (SPST, NC, open contact in case of alarm).

By the setting options the PST can be performed by the ESD SOV, SOV A or SOV B.



21.6 4-20 mA input, Hart, redundant ESD SOV

4-20 mA input with Hart communication, local PST pushbutton, ESD command for ESD SOV, ESD command for redundant ESD SOV R, "0/24VDC power" to supply electronics, additional SOV's A and B and 4-20 mA pressure transmitter.

By Hart: position value, configuration, diagnostic, PST and FST commands, open/close commands, pressure value. 4-20 mA and Hart communication are available even if 0/24VDC SIS and 0/24VDC R are off.

By the configuration options the Hart communication can be disabled.

The pressure transmitter and the local PST pushbutton are supplied on request. If local PST pushbutton is not requested the terminals B3/B4 are available as digital input 1 (to be used as remote PST or open/close commands).

By the configuration options the terminals A5/A6 can be set as 24VDC/4-20 mA pressure retransmission or digital input 2 (to be used as remote PST or open/close command).

By the setting options the PST can be performed by the ESD SOV and ESD SOV R or SOV A and SOV B.

21.7 4-20 mA input, Hart, ESD SOV, PST

4-20 mA input with Hart communication, ESD command for ESD/PST SOV. No pressure transmitter.

Commands by 4-20 mA: Open/Close.

By Hart: position value, configuration, diagnostic, PST and FST commands, open/close commands. Hart communication is

available even if 0/24VDC SIS is off.

By the configuration options the Hart communication can be disabled.

Local PST pushbutton can be supplied on request.











21.8 4-20 mA input, Hart, redundant ESD SOV's, LCP Intrinsic Safety



21.9 4-20 mA input, Hart, LCP, 2 pressure transmitters



- SDCU-20-LS, Limit switch kit (magnetic type)
- Intrinsic Safety LCP (Local Control Panel)
- Ex-e junction box
- I/O-IS interface card
- Single acting spring return piston actuator

- SDCU-20-LS, Limit switch kit (magnetic type)
- LCP (Local Control Panel)
- Ex-e junction box
- I/O-AI interface card
- 2 pressure transmitters for testing of SOV A and SOV B
- Double acting piston actuator



NOTE:

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