

Gas over oil actuator with ITVC electronic control. Interest and PST functions SIL 3 SIL 2 SIL 3 SIL 2 SIL 3 SIL 2 SIL 2 SIL 3 SIL 3

Gas over oil actuator with ITVC electronic control.

Typical applications include safety related Line Break detection, Emergency Shut-Down function, Partial Stroke Test and Remote Valve Control.

SIL 3 level of the safety functions, according to IEC61508, "Low Demand mode".

Designed for use "on field", in environment where operational failures could cause safety and pollution problems and production losses.



1 Product specifications

1.1 Electrical Power Supply

DC	From 22 to 60 Vdc
AC 1-PH	From 90 to 260 Vac 50/60 Hz
Power absorbed	From 5 to 45 W depending on the number of sensors and SOV's

Backup battery pack

Туре	12 V Rechargeable Lithium-ion			
Size	standard	double		
Capacity	53 Ah	160 Ah		
Operating time	12 h	36 h		
Recharge time	9 h	27 h		
Operating °C	-20 +85 °C	-20 +85 °C		



Example of gas over oil actuator with ITVC electronic controller and battery pack

Battery operation: in case of loss of main power supply, the ITVC takes the electrical power from batteries and works regularly. When main power returns, the ITVC restores the operations by mains and recharges the battery. **Operating** and **Recharge** time depend on the number of sensors. The values reported in the table consider 4x4-20mA transmitters (3 pressures and 1 position)

1.2 I/O's of Electronics		Analogue inputs	Digital inputs	Output relays	Analogue outputs	Coil drivers	BUS control
ITVC module	Terminal block (to user)	1	8	5	2		Standard 2 RS485 Modbus RTU
	Terminal block (to actuator)	4	4	3		8	On request: HART

• I/O's characteristics described in paragraphs 5, 6

1.3 Actuator performance data

Operating pressure: Sweet gas or Sour gas up to 160 barg (2306 psi) **Operating temperature**: Standard: from -20 °C to + 85 °C **Actuator type:** Double acting, quarter turn (Scotch Yoke) or Linear, On-Off service **Torque / Thrust range:** Quarter turn: up to 800 000 Nm / Linear: up to 1 500 000 N **Manual override:** 2 hand pumps, one for open and one for close

Limit	Limit switches: mechanical or magnetic operated switches, voltage free, max 30Vdc-	Configuration of
switch	250Vac/5A, or Namur proximity switches. Details available in "ASB series" data sheets.	limit switch box
box	4-20 mA Position Transmitter	depends on the
	Mechanical position Indicator: Beacon	user request

• Refer to actuator data sheets for detailed information

1.4 Safety related functions

The specific ITVC SIF functions "ESD Emergency ShutDown", "Line Break", "Differential line break", Panic Button and HIPPS comply with IEC61508, Low Demand mode, SIL 3. The SIL certificate is available on request.



1001 configuration

2003 configuration

Process Valve

Process Valve/s

Gas and

liquids

Gas and

liquids

Solenoid

Valve

SOV

Pipelin

Solenoid

Valves

SOV1

SOV2

Pipeline

Actuator

Actuator

Pressure

Ptl

ITVC

sensor

Pressure sensors

(Pt2)

Pt1

(Pt3)

ITVC

Line Break 2

2.1 Operating principle

The Line Break function of ITVC monitors the pipeline pressure and in case of abnormal pressure drop rates or dangerous pressures drives the process valve in closure.

ITVC performaces: logic solver function with redundancy of CPU's and voting mechanism, acquisition and record of pipeline pressure trends, local and remote control of actuator, PST function, ESD function, suitability for gas and liquids, installation at pipeline site

Architecture: 1001, 1002, 1003 and 2003 configuration according to user needs

2.2 Pressure events and Valve Control delay

The Line Break function detects the following pipeline pressure events:

- High pressure: the pressure exceeds the limit set by the parameter "Max pressure
- Low pressure: the pressure is lower than the limit set by the parameter "Min pressure"
- Pressure drop: the pipeline pressure drop / minute exceeds the limit set by the parameter "Pressure drop"

The reaction time is 400 ms. The ITVC generates the close command to close the valve only if the "Pressure event" persists for a time set by the parameter "Delay action". If the "Pressure event" disappears in the "Delay action" time, no action is done



Example of Line Break event registers. It shows date, time and type of event (D= Drop, L=Low, H=High) pressure

2.3 Operating mode

Acquisition	Valve Control is off. Continuous acquisition of pipeline pressure. Values are visible on the ITVC HMI as
	instantaneous measures and as 24h graphs. Two data are monitored, "Pressure increase / hour" and
	"Pressure decrease /hour". If they are outside limits set by the parameters "Max pressure increase" and
	"Max pressure decrease", a Warning signal is generated. After few minutes the Warning disappears, but
	the condition with date and time is recorded in the "Line Break warning" registers of the ITVC HMI.
Acquisition	Acquisition mode is active, in addition, if a "Pressure event" occurs the ITVC performs the Valve Control
and Valve	that is "to energize the SOV and stroke the valve in closure ". After that, the Valve Control is disabled. An
Control	Alarm is generated and no command to valve is available. Valve Control can be restored by a "manual
	enable" via ITVC HMI. The event condition is recorded in the "Line Break event" registers of ITVC HMI,
	with date, time and 24h "Pressure vs time" graph. Locally by the ITVC HMI, the Valve Control can be
	enabled/disabled. A remote digital input can be set as "Valve Control inhibit"
Monitor	Valve Control is off, all features of Acquisition mode are available, but if the check of "max/min pressure
	increase/decrease /hour" fails no warning is generated. The value is visible on the display of the ITVC HMI.

2.4 Line Break architecture

Architecture:	1001 (1 pressure sensor)	1002 (2 pressure sensors), 1003 and 2003 (3 pressure sensors)		
	No voting mechanism.	Voting mechanism. Test of under / over range and comparison of read values.		
Analogue	Test of under / over	Depending on type of failure and architecture, the system switches to safe		
inputs	range. The system goes	state or continues to operate until the MRT time (Maximum Time to Repair)		
	to safe state if test fails	expires and then switches in safe state. An Alarm or MRT alarm is generated		
CPU	2 independent CPU's working in parallel to manage input reading, logic processing and output enabling.			
	In case of failure of one CPU, the system switches in safe state. An Alarm is generated			
SOV drive	According to application needs one or two SOV's can be driven. Cyclic test of SOV coil integrity is			
	performed. An Alarm is generated if the test fails.			

DVG AUTOMATION S.p.A

Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti nº 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890;

Fully Paid In Capital: Euro 1.000.000,00=

REA 167410 - VAT 01494460338

ISO 9001, ISO 14001, OHSAS 18001 CERTIFIED

COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dvgautomation.it www.dvgautomation.it

RINA

2.5 Line Break signalling

The icon signals that the Valve Control is not available. The icon signals that Valve Control will be done if a pressure event is done. Signalling of Alarm, MRT alarm and Warning set to si

See IOM-ITVC Annex B to find detailed instructions about the Line Break function.

3 Line Break differential

It is an optional function available only on request and only if the above standard Line Break function is not active. It prevents valve or pipeline damaging if differential pressure across valve is outside the permissible limits.

Safe function description: the pipeline should be equipped with two 4-20 mA differential pressure transmitters, to measure the pressure upstream and downstream the process valve. The system works only in **1002** architecture. If the differential pressure is outside the configurable limits the ITVC drives actuator and valve in **safe position** (configurable stay in position, open, close). Reaction time 200msec. Remote and local open/close commands are no longer available. The ESD command is still available, in case of ESD the actuator moves to the ESD safety position.

Locally by the ITVC HMI

4 PST (Partial Stroke Test)

The **PST** (Partial Stroke Test) function allows checking the actuator and valve operation, **on line**. The test consists in driving the actuator to perform a small travel around the open position and then to compare the collected data with a reference **signature** previously memorized. If comparison is OK the test is passed. In the SIL calculation, the PST function increases the Proof Test Time and decreases the PFDawg.

4.1 PST signature PST signature can be performed **only manually**, by means of the ITVC HMI. The data collected during the PST signature execution reside in the ITVC memory until a **new signature** overwrite them. If the actuator is fitted with analogue position and pressure transmitters, they include also the "Position vs Time" and "Pressure vs Time" graphs. The signature data are compared with data collected after the execution of a normal PST cycle and if comparison is OK the test is passed, if comparison fails an Alarm is generated. The signature is visible by the ITVC HMI.

4.2 PST options

PST	Analogue: actuator equipped with 4-20 mA position transmitter. The PST travel can be set from 60% to
travel	100% of actuator position by the ITVC HMI
	Digital: actuator equipped with an additional switch to set the PST travel. It should be mechanically set to
	trip in an intermediate position between "fully open" and 60% of actuator travel
	Time: the actuator has neither position transmitter nor position switch, The ITVC clears the close
	command when the configured time has passed. The closing time can be set by the ITVC HMI. It should be
	set from 0 to 40% of time needed to fully close the valve
PST start	Automatic: PST cycle initiates automatically when the configured time of day and period of time expire.
	Configuration of time and period is done by the ITVC HMI
	Manual: PST cycle initiates by a local command (by ITVC HMI) or if a remote PST command is received
Graph	1000 or 2000 samples / each PST curve, min 150 curves can stay in the ITVC memory
accuracy	
Graph	Position versus Time: only if the actuator is equipped with analogue 4-20 mA position transmitter
type	Pressure versus Time: only if the actuator equipped with a transmitter to measure the pressure of cylinder.

4.3 PST History It includes: date and time of each PST cycle, PST result (passed, not passed), PST cycle duration, Position vs time and Pressure vs time graph (if actuator is fitted with the relevant analogue transmitter). PST history can be viewed by the ITVC HMI

DVG AUTOMATION S.p.A.

www.dvgautomation.it

Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti n° 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000.00=

REA 167410 - VAT 01494460338

ISO 9001, ISO 14001, OHSAS 18001 CERTIFIED

COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dvgautomation.it

RINA







Remotely by the ITVC Out relays

Monitor relay switches over when Valve Control is done. The auxiliary relays can be individually set to signal Line Break situations (see table 1)



4.4 FST (Full Stroke Test) and FST history

By this test the actuator carry out a complete closure from 100% open to 0% closed and then from 0% closed to 100% open. It can be initiated only manually by the ITVC HMI. The FST history includes date and time of each FST cycle, Position and Pressure vs time graphs (if actuator is fitted with the relevant analogue transmitters).

4.5 PST signalling The icon \mathbf{Z} on the local display signals that PST function is available. PST operation and alarm are locally signalled by the ITVC-HMI and remotely by the Monitor Relay and the auxiliary relays (see table 1)

5 Actuator control and ITVC features

Actuator control mode: setting of actuator control mode by means of the ITVC HMI. The following options are available:

- Local: The local pushbuttons of the ITVC HMI work as open, close, stop actuator commands. Push to run and latched control mode can be set
- OFF: No electric command to move the actuator is available
- **Remote:** The actuator is remotely controlled by the signals received from control room in the digital and analogue inputs. Push to run and latched mode can be set

ESD, Emergency Shut-Down:

- 2 independent ESD1 and ESD2 channels, diagnostic on each channel, 1002 or 2002 operation, ETT (Energize to trip) and DETT (De-energize to trip) options, momentary and latched with manual reset control modes.
- Interlock: Interlock function to remotely inhibit open or close. Configuration by ITVC HMI

Actuator safety position: Open, Close, Stayput positions, configurable by ITVC HMI

Monitor relay: it switches over in case of alarm, ESD and main power failure

Output 4-20mA retransmissions (position, pressure, see table 3)

Output signalling relays, see table 1

Redundant RS 485 Modbus RTU communication line (On request HART)

Bluetooth wireless communication

Sensor of Temperature of Electronics

Alarm, Warning, Event loggers and graphs Real time clock and battery

Example of Position vs. Time graph (PST function)



Human Machine Interface (HMI) with graphic LCD display and non-intrusive, touch-sensitive, pushbuttons. Multilanguage menu, icon based. User friendly navigation in the menu and access to it by password, to protect against unauthorized change.

Safety functions: the functions "ESD Emergency shutdown, Line Break, Differential Line Break, HIPPS and Panic Button" comply with IEC61508, Low Demand mode, SIL 3.

Separated mounting option: to mount the ITVC separately from actuator. The maximum length of cable between ITVC and actuator is 50m.

Optional Panic Button: local pushbutton to drive the actuator in safe position. Reaction time 600 ms Operating temperature: see limits reported in "Classification and Certification of ITVC module"

5.1 Configuration features

In general the setting of I/O's is done in the DVG Automation factory. It depends on the type of actuator and SOV's and on the remote control mode required by the user. On field site, the user should only set the actuator travel limits and if necessary modify few parameters to optimize the system performance.

5.2 Diagnostic features

Powerful diagnostic program to monitor hardware and software execution. The safe action execution depends on the seriousness of malfunction. Malfunctions are grouped in three categories: Alarm, MRT alarm and Warning

- Alarm: Action depends on the malfunction (only signalling, block of actuator, safe action)
- MRT alarm: The safe action starts only when the MRT (Maximum Time to Repair) expires.
- Warning: the ITVC does not perform any action

Detailed visualization of Alarms, MRT alarms and Warning by the local display. Remote signalling by Monitor relay and additional output relay (see table 1). Alarm history logger to record the Alarms, MRT alarms and dates



ISO 9001, ISO 14001, OHSAS 18001 CERTIFIED

Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000,00=

REA 167410 - VAT 01494460338 COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dvgautomation.it

www.dvgautomation.it

SHEET 5 DI 8



ITVC module

6 I/O's available to Remote Control

Terminal block 6.1 ITVC Terminal block (to user) **Optional** (to actuator) Panic Button Output • Monitor Relay: single side stable, voltage free SPDT contact, from 24 Vdc-ac to 230Vac / 5A. It collects relays the status of Alarm and MRT alarm **ITVC HMI:** • 4 relay: latching, voltage free SPST contact, from 24 HMI = Human Vdc-ac to 230Vac / 5A. Condition to switch and **Terminal block** Machine Interface contact action (make and break) configurable by (to user) ITVC HMI, see Table 1 Digital • 4 digital inputs, optocoupled, 1 common, from 22Vdc-ac to 130Vdc-ac, max 5 mA each input. inputs Open and Close remote commands from control room, reaction time 300 ms o IN3, IN4 remote commands, configurable by means of the ITVC HMI, see Table 2 • 2 independent ESD1 and ESD2 input channels: optocoupled, from 22Vdc-ac to 130Vdc-ac, max 5 mA each input, reaction time 600 ms. Configuration by means of the ITVC HMI, see IOM ITVC-Basic • 2 digital inputs, optocoupled, 1 common, from 22Vdc-ac to 130Vdc-ac, max 5 mA each input. • IN1 and IN2, remote commands, reaction time **300 ms.** Configuration by ITVC HMI, see Table 2 Analogue Not used input Analogue • 2 independent channels, 4-20 mA optocoupled insulating amplifiers, active and passive loop, max load 750 outputs ohm, 24Vdc. Output retransmission is available only if an analogue input is set as input to read the relevant transmitter. Output signal configuration by means of ITVC HMI, see Table 3. Service • Vr: 24 Vdc / 100 mA voltages • Vr1: 24 Vdc / 100 mA BUS • STD: 2 independent, redundant, optocoupled RS 485 Modbus RTU lines, max 90 devices each line. control • On request HART. 24VDC/4-20mA position feedback output + Hart over the same signal, vers. 7.5, EDD.

Table 1

Output relay options:						
Name	Description	Name	Description			
No set	No condition to trip	PST failed	PST failed			
Max pressure increase	Max pressure increase in Line Break operation	Selec OFF	Local selector in OFF			
Max pressure drop	Max pressure drop in Line Break operation	LS op	Electrical Switch in opening			
Warning	Warning. See Warnings in IOM-ITVC-Basic	LS cl	Electrical Switch in closing			
LB on	Line Break operation active.	LS PST	Limit switch PST			
High LB pres	High pressure in Line Break operation	Max pres decr	Max pressure decrease			
Low LB pres	Low pressure in Line Break operation	Temperature	Temperature alarm			
No voltage	Voltage failure	Pneum micro	Pneumatic micro-switch			
Pos no reach	Position not reached	Micro PST mech	Mechanical PST micro-switch			
Low bat	Low battery	Pressure switch	Pressure switch (repetition of digital input)			
Selec REM	Local selector in REMOTE	Performing PST	PST in execution			
Selec LOC	Local selector in LOCAL					

Table 2

Table 3

Digital input options	Analogue output options	
 Interlock open Interlock close PST command Remote STOP Line Break action inhibit Pressure switch 	 Pressure L1 retransmission Pressure L2 retransmission Pressure S3 retransmission ITVC temperature retransmission Valve position retransmission Position demand retransmission Pressure S4 retransmission 	4-20 mA Retransmission is available only if actuator is equipped with the relevant transmitter and an analogue input is set to read the signal (see Transmitter options)

DVG AUTOMATION S.p.A. Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti n° 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000,00= ISO 9001, ISO 14001, OHSAS 18001 CERTIFIED REA 167410 - VAT 01494460338 COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dygautomation.it www.dvgautomation.it SHEET 6 DI 8



7 I/O's to control the actuator

7.1 ITVC Terminal block (to actuator)

Input channels:		Analogue	Transmitter	Digital	Sensor
 4 analogue 4 digital They are available for connection of sensors from actuator and are configurable by the ITVC HMI. The table shows the sensor and transmitter options. 		Max 4x 4-20 mA transmitters	Line pressure L1 Line pressure L2 Line pressure S3 ITVC temperature Valve position Position Demand Cylinder pressure S4 24V sens	Max 4x ON-OFF sensors	Open Limit switch Close Limit switch PST travel switch S3 min pressure switch S3 max pressure switch PSLL switch PSHH switch Mechanical PST switch
Output channels:	8 coil drivers 3 relays Service voltage	24Vdc, fuse protection, to drive coils of SOV's. Test to check the coil integrity. The outputs are configurable by ITVC HMI. The settings include type of function (SOV to open, SOV to close, for ESD, for PST, etc.), and mode (de- energize / energize to operate) Available for special applications 24V/1.5A to supply the SOV coils			

7.2 ITVC HMI

Main functions:

To set the **actuator control mode** in LOCAL, OFF, REMOTE and to drive it **in opening and closing**. **To navigate** in the **MENU** to

- view and modify the working parameters
- view the values of the variables managed by the ITVC
- view loggers and graphs Alarms, curves, etc.



LED's signalling: 3 RGB LED's of pushbuttons 🛠 V 📣 , to signal the status of opening, closing, open closed, intermediate position, Alarm, MRT alarm, Warning

8 Classification and Certification of ITVC module

 EUM1 12 ATEX 0789 – ATEX 94/9/CE

 EUM1 12 ATEX 0789 – ATEX 94/9/CE

 II 2GD Ex db IIB+H₂ T5 Ex tb IIIC T88°C -60°C $\leq T_{amb} \leq +85°C$

 (Ex

 II 2GD Ex db IIB+H₂ T5 Ex tb IIIC T88°C -45°C $\leq T_{amb} \leq +85°C$

 (Ex

 II 2GD Ex db IIB+H₂ T5 Ex tb IIIC T88°C -45°C $\leq T_{amb} \leq +85°C$

 (Ex

 II 2GD Ex db IIB+H₂ T5 Ex tb IIIC T88°C -20°C $\leq T_{amb} \leq +85°C$

 IECEx EUT 14.0008

 IP 68 – EN 60529

 SIL 3 – IEC 61508

 TR CU – Certificate No. RU C-IT.ΓБ08.В.01875

 Resistance to Vibration – Certificate No. 223221TRFENV – IEC 60068-2-6

 Seismic test – Certificate No. 223221TRFENV – IEC 60068-2-7

Refer to data sheets of actuator to see classification and certification of actuator, SOV's, mechanical components, etc.

<u>Refer to IOM-ITVC-Basic and Annex A, B, C, D to see detailed instructions relevant to operation by</u> <u>ITVC HMI, troubleshooting, Alarm / MRT alarm / Warning tables, configuration options, etc.</u> <u>Refer to diagrams supplied with the actuator to see the electrical and hydraulic connections.</u>

DVG AUTOMATION S.p.A. Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti n° 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000,00= ISO 9001, ISO 14001, OHSAS 18001 CERTIFIED REA 167410 - VAT 01494460338 COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dvgautomation.it www.dvgautomation.it SHEET 7 DI 8



WARRANTY

DVG Automation S.p.a. products are warranted to be free from defects in materials and workmanship for a period of eighteen months from the date of delivery (unless otherwise agreed when ordering) if they are used according to DVG Automation S.p.a. recommended usages. DVG Automation S.p.a.'s liability is limited to the repair, purchase price refund, or replacement in kind, at DVG Automation S.p.a.'s sole option, of any products proved defective. DVG Automation S.p.a. reserves the right to discontinue manufacture of any products or change products materials, designs or specifications without notice.

Note: DVG Automation S.p.a. does not assume responsibility for the selection, use and/or maintenance of any product. Responsibility for proper selection, use and maintenance of any DVG Automation S.p.a. product remains solely with the purchaser and end user.

Trade Marks:

DVG AUTOMATION has used all reasonable resources and efforts to indicate and supply information regarding Registered Trade Marks[®] and Trade Marks[™] used in this document.

The absence of a Registered Trade Mark[®] or a Trade Marks^m identifier does not mean that a given word or technology is not a Registered Trade Mark[®] of a Trade Mark^m.

We acknowledge that all Registered Trade Marks[®] or Trade Marks[™] mentioned in this document, either with or without identifier, are the property of their respective owners.

Upon advise that we have erroneously omitted to identify Registered Trade Marks[®] or Trade Marks[™], we will rectify the next edition of this document.



HQ:I-29016 Cortemaggiore (PC), via G. Rossetti, 2 REA Nr 167410/ VAT Nr 01494460338 <u>www.dvgautomation.it</u> <u>info@dvgautomation.it</u> Tel. (+39) 0523 255811 Fax (+39) 0523 255890

DVG AUTOMATION S.p.A. Legal & Operative HQ: 29016 Cortemaggiore (Piacenza) Italy, Via G. Rossetti n° 2 Tel. (+39) 0523 255811; Fax (+39) 0523 255890; Fully Paid In Capital: Euro 1.000.000,00= ISO 9001, ISO 14001, OHSAS 18001 CERTIFIED REA 167410 - VAT 01494460338 COMPANY SUBJECT TO MANAGEMENT AND COORDINATION BY G.I.V.A. S.P.A. WITH HEADQUARTERS IN RHO (MILAN), RECORDED UNDER NUMBER 02917180172 IN MILAN'S REGISTER OF COMPANIES info@dvgautomation.it www.dvgautomation.it sHEET 8 DI 8