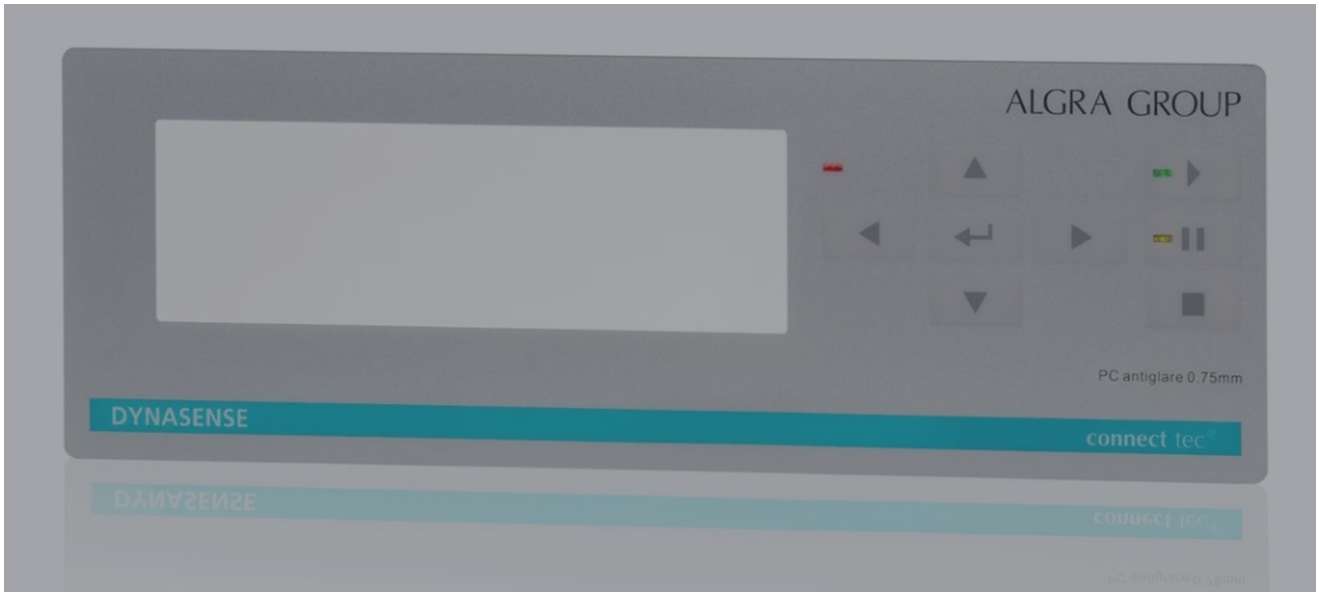
ALGRA GROUP

DYNASENSE

Resistive keypads for demanding environments

Technical white paper | Engineering review draft

DYNASENSE KEYPAD



View DYNASENSE on the Algra Group website

01 / TECHNOLOGY & USE CASES

DYNASENSE

Pressure-sensitive input for demanding environments

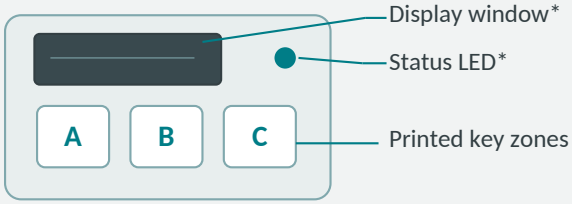
A thin, non-tactile resistive membrane keypad for products that need a flat front panel and straightforward connection to host electronics.

30–50 µm	0.15–0.75 mm	−40 to +100 °C
Actuation travel	Plastic overlay range	Operating and storage

How it switches

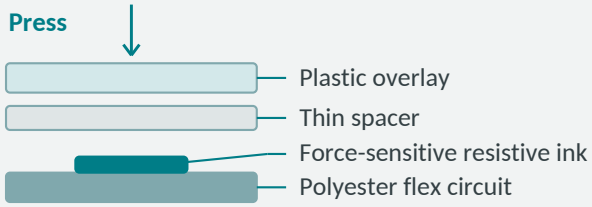
Pressing the plastic overlay transfers force through a thin spacer to a force-sensitive resistor in a polyester flex circuit. The conductive graphene-based nanocarbon ink reduces its electrical resistance under force. The host detects that change as a keypress. The stack moves only tens of micrometres and delivers no mechanical click. [1, 2]

Representative DYNASENSE keypad layout
(illustration; not a product photograph) [1, 2]



* Optional. Panel shape and artwork are illustrative.

DYNASENSE layer stack
(schematic; not to scale) [1, 2]



Pressing lowers the sensor resistance.

Where it fits

The smooth face can be designed for easy cleaning in medical and industrial settings. Pressure actuation works with gloves and non-metallic styli and can work when wet. Algra positions the keypad for outdoor use, resistance to vandalism, and competitive cost; the final panel design determines durability and cost. [1, 2]

Design implication

The keypad needs no dedicated IC or firmware. The host still handles input bias, state detection, debounce and application control. [1–3]

02 / PUBLISHED PRODUCT DATA

Specify the whole assembly

Overlay, backing and sealing affect actuation force, service life and environmental performance. Use the published examples to scope a design, then verify the selected build. [1, 2]

Parameter	Published value or design note [1, 2]
Switch / resistance	Flat, non-tactile resistive switch. Open >1 MΩ; closed <1 kΩ.
Operating / storage	−40 to +100 °C for both operating and storage.
Travel / key pitch	30–50 µm of movement. Minimum centre-to-centre pitch is 15–20 mm, depending on design.
Plastic overlay	0.15–0.75 mm. Matte or gloss finish; status LEDs and display windows can be designed in.
Cycle-life examples	>5 million actuations on 0.25 mm foil without stress cracks; >10 million on 0.50 mm polycarbonate (PC). Configuration-specific.
Ingress / environment	IP protection depends on the assembly. Algra positions the product as resistant to moisture, dust, temperature changes and EMI. No universal IP rating or EMC certification is implied.

Nominal actuation force

Overlay thickness	Nominal force [2]
0.25 mm	43–71 gf
0.38 mm	85–170 gf
0.50 mm	200–300 gf
0.75 mm	250–400 gf

gf = gram-force. These values illustrate standard design conditions; they are not procurement limits. [2]

Examples from the field

Rental bicycle: three-colour printed PC front panel. **Parking pay station:** PC overlay with PMMA support. **Industrial operator sample:** PC or PET panel with seven-colour rear printing and transparent LED areas. [1]

03 / HOST ELECTRONICS

Read it like a pushbutton

The Algra R&D interface note [3], dated 13 March 2019, sets out four connection options in “Dynasense Interface” and its attachment, “Dynasense Key evaluation.pdf”.

The note treats each key as a momentary switch: connect the keypad common to ground (GND), and pull each microcontroller (MCU) input up to the host logic supply. A press pulls that input low. The separate inverting Schmitt-trigger option changes the output polarity after conditioning. [3, 4]

Key state	MCU input[1]	Key resistance [2]
Released	High	Open >1 MΩ
Pressed	Low	Closed <1 kΩ

[1] With pull-up topology and no inversion; confirm both logic levels against the actual input thresholds.

Four connection options

Option [3]	Implementation and trade-off
01 MCU internal pull-up	Use the MCU’s internal bias and debounce in software. Check pull-up tolerance and pin behaviour at reset.
02 External pull-up	Use an external pull-up (about 4.7 kΩ in the note) and debounce in software.
03 Pull-up plus capacitor	The example uses about 4.7 kΩ and 10 µF for hardware debounce. Size for MCU thresholds and allowable actuation and release latency.
04 Inverting Schmitt trigger	Produces an active-high conditioned output. The example lists R1/R2 at about 4.7 kΩ and C1 at about 10 µF; verify the circuit and timing before using it.

Design to confirmed resistance limits

The Algra R&D interface note [3] records >40 MΩ idle and <200 Ω pressed as evaluation values, not product limits. Use published or configuration-confirmed resistance limits to check logic margins. Existing pushbutton hardware may be reusable if its bias, polarity and thresholds are compatible. [2–4]

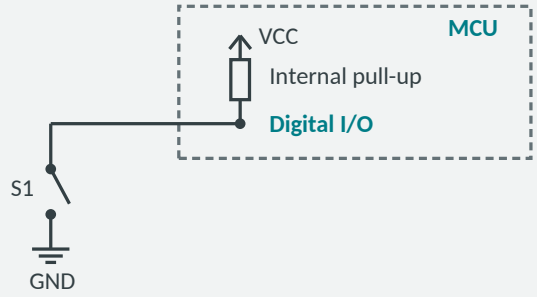
03 / HOST ELECTRONICS / CONTINUED

Four interface circuits

Single-key signal paths adapted from the Algra R&D interface note [3]. S1 represents one DYNASENSE key; GND is the host and keypad common.

01 MCU internal pull-up

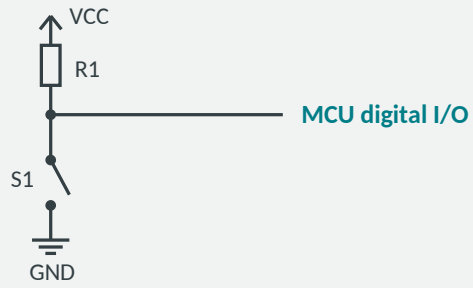
ACTIVE LOW / SOFTWARE DEBOUNCE



Enable the MCU's internal pull-up. No external components are required. The pull-up is shown explicitly inside the MCU.

02 External pull-up

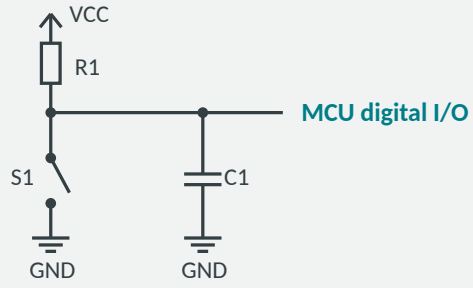
ACTIVE LOW / SOFTWARE DEBOUNCE



R1 ≈ 4.7 kΩ in the reference. Use the external pull-up and debounce in firmware.

03 Pull-up plus capacitor

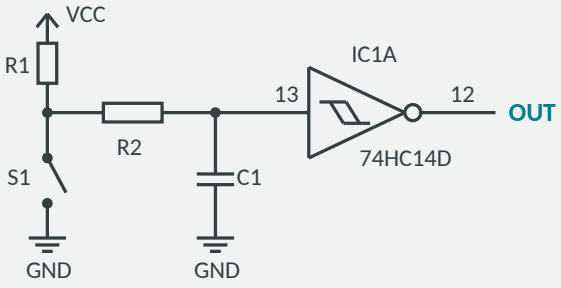
ACTIVE LOW / HARDWARE DEBOUNCE



R1 ≈ 4.7 kΩ; C1 ≈ 10 µF. C1 shunts the MCU input node to GND in parallel with S1.

04 Inverting Schmitt trigger

ACTIVE HIGH / HARDWARE DEBOUNCE



R1 and R2 ≈ 4.7 kΩ each; C1 ≈ 10 µF. R2 is in series from the switch node to pin 13; C1 shunts pin 13 to GND. Pin 12 is the conditioned output.

Before selecting values: The values above are examples, not specifications. Verify logic levels and thresholds, input behaviour at reset, and press and release latency on the actual host. For option 04, verify the selected device's pinout and follow its datasheet for supply and decoupling.

04 / MMDESIGN APPLICATION

Electric parasol evaluation

Keep the existing hardware for the first three prototypes and evaluate DYNASENSE in parallel. The motor and driver chain is expected to stay unchanged; check that assumption on the bench. [5]

What to validate before adoption

Check	Evidence to capture
Controller fit	Inspect the board, connector and controller for available inputs. Check bias, thresholds and logic polarity against the actual keypad.
Hold to move	Verify motion only while the intended key remains held and stopping on release. Measure end-to-end release latency, including debounce, driver response and motor stopping.
Fault behaviour	Verify safe behaviour at power-up, on conflicting commands, and with a disconnected or stuck input. A stuck active input can look like a held key; assess the system response separately.
Panel build	Test wet and gloved actuation on the actual overlay, support and enclosure. Check force, false triggers and release response across expected conditions.

Review boundary

This is a prototype evaluation plan, not design approval. DYNASENSE is an input device, not a certified safety function. Define and verify the system-level stop requirements before adoption.

Sources

[1] Algra Group. DYNASENSE membrane keypad. English product page.

[2] Algra Group. DYNASENSE. English product flyer, technical data and actuation-force table.

[3] Pio Bättig (Algra R&D). “Dynasense Interface.” Email and attachment, “Dynasense Key evaluation.pdf”, 13 March 2019. Internal engineering reference.

[4] Algra. Internal interface correspondence, 3 October 2024 and 17 December 2025. Bias, optional capacitance and pushbutton compatibility.

[5] MMDesign. “MMDesign – elektrischer Sonnenschirm.” Teams meeting, 24 November 2026. Prototype application context.